GAS LEAKAGE MONITORING & ALERTING SYSTEM FOR INDUSTRIES

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1 . INTRODUCTION

1. Project Overview

The Internet of things (IoT) is the system of gadgets, vehicles, and home machines that contain hardware, programming, actuators, and network which enables these things to interface, collaborate and trade information making life simpler by automating every small task around us . Conventional fields of installed frameworks, remote sensor systems, control frameworks computerization, and others all add to empowering the Internet of things. As much is IoT helping in automating tasks, the benefits of IoT can also be extended for enhancing the existing safety standards. Safety, the elementary concern of any project, has not been left untouched by IoT. A gas spill alludes to a hole of petroleum gas or different vaporous item from a pipeline or other regulation into any territory where the gas ought not be available . Since a little hole may steadily develop a hazardous convergence of gas, spills are perilous. Not withstanding causing flame and blast dangers, holes can slaughter vegetation, including huge trees, and may discharge amazing ozone harming substances to the environment .The traditional Gas Leakage Detector Systems though have great precision, fail to acknowledge a few factors in the field of alerting the people about the leakage. Gas Leakage Detector for society which having Smart Alerting techniques involving sending text message to the concerned authority and an ability performing data analytics on sensor readings. Our main aim is to proposing the gas leakage system for society where each flat have gas leakage detector hardware. This will detect the harmful gases in environment and alerting to the society member through alarm and sending notification.

2. Purpose

The proposed gas leakage monitoring system can help the people aware when the gas leakage takes place .This system much more effective in comparison with traditional Gas detector systems. This system will not only able to detect the leakage of gas but also alerting through audible alarms. Presence of excess amounts of harmful gases in environment then this system can notify the user. Is it has become more efficient more applicable to today's applications.

2.LITERATURE SURVEY

1.Existing problem

S.No	Paper Title	Author Name	Publication Year	Results
1.	Cloud Connected Smart Gas Leakage Detection And Safety Precaution System	Babuprasanth V	2014	This paper is using a device which offers a complete, low cost, powerful and user friendly way of real-time monitoring and remote control of gas leakages and prevention mechanisms in household and industrial areas.
2.	LPG Gas Leakage Detection and Alert System	E. Jebamalar Leavline , D. Asir Antony Gnana Singh , B. Abinaya H. Deepika	2017	The system provides constant monitoring and detection of gas leakage Using MQ-6 . On detection LED will glow and alarm sound is incoperated.
3.	Gas Leakage Detection and Smart Alerting and Prediction Using IoT	Asmita Varma, Prabhakar S, KayalvizhiJayavel	2017	The proposed gas leakage detector is promising in the Field of safety.
4.	Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor	Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu	2017	This paper 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.
5.	Gas leakage detection and alerting system using Arduino Uno	Syeda Bushra Shahewaz, Rajendra Prasad Ch.	2020	In this paper we make use of Arduino UNO and GSM module along with buzzer sound it also send sms to people of danger.

2.References

[1] Mohammad Reza Akhondi, Alex Talevski, Simon Carlsen, Stig Petersen. "Applications of Wireless Sensor Networks In the Oil, Gas And Resources Industries." International Conference On Advanced Information Networking And Applications, IEEE 2010.

[2] Petros Spachos , Liang Song and Dimitrios Hatzinakos. "Gas Leak Detection and Localization System Through Wireless Sensor Networks" The 11th Annual IEEE Consumer Communications and Networking Conference - Demos. IEEE, 2014.

[3] Falohun A.S., Oke A.O., Abolaji B.M. "Dangerous Gas Detection using an Integrated Circuit and MQ-9" in International Journal of Computer Applications (0975 –8887) Volume 135 – No.7, February 2016.

[4]Ashish Shrivastava,Ratnesh Prabhaker, Rajeev Kumar and Rahul Verma "GSM BASED GAS LEAKAGE DETECTION SYSTEM" in International Journal of Technical Research and Applications e-ISSN: 2320-8163,www.ijtra.com Volume 1, Issue 2 (may-june 2013). [5]Sunithaa.J, sushmitha.D,"Embedded control system for LPG leakage detection and Prevention", International conference on computing and control engineering.(ICCCE 2012),12 & 13 April 2012.

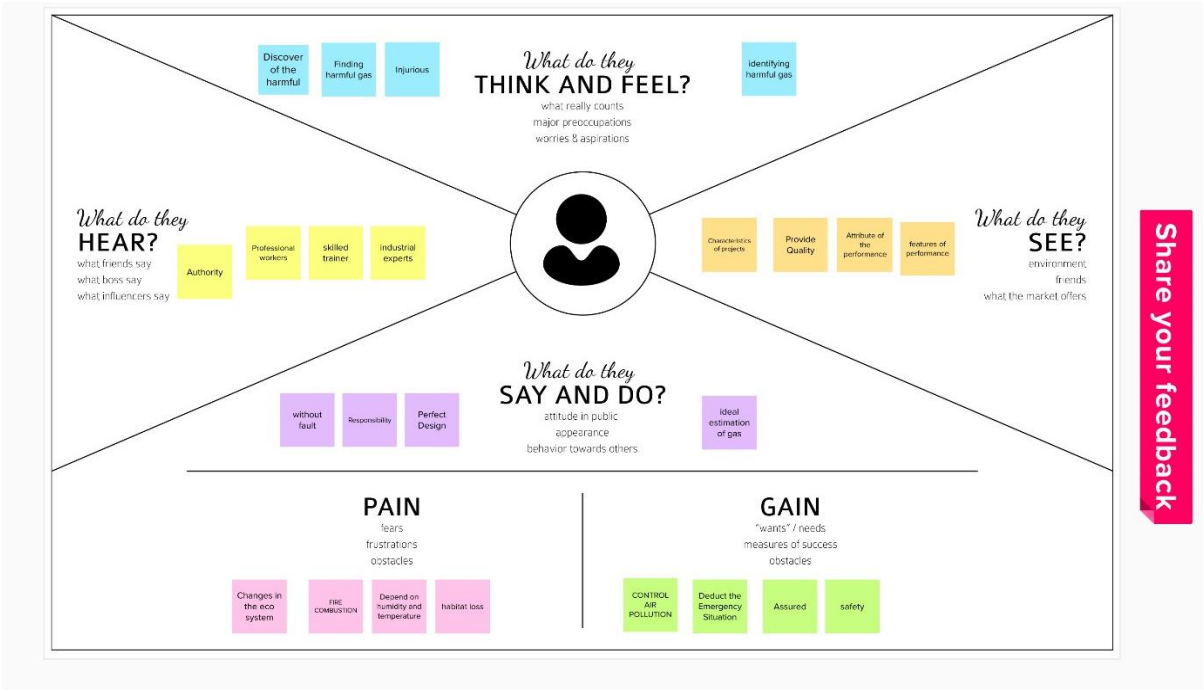
[6]Mr. SagarShinde, Mr .S. BB. Patil,Dr. A. J. Patil, "Development of movable gas tanker leakage detection using wireless sensor network based on embedded system",International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 6, NovemberDecember 2012, pp.1180-1183

3. Problem Statement Definition

Problem Statement (PS)	**I am (Customer)**	**I am trying to**	**But**	**Because**	**Which makes me feel**
PS-1	Industrialist	Monitor gas leakage in the industry	I don’t have any system for monitoring	The affordable of the system is high and the systems are sometimes making disasters	Unsafe
PS-2	Industrialist	Control the gas leakage	Also, the installation process is too complicated	The number of sensors is unpredictable and the positioning of equipment is improper	Disastrous

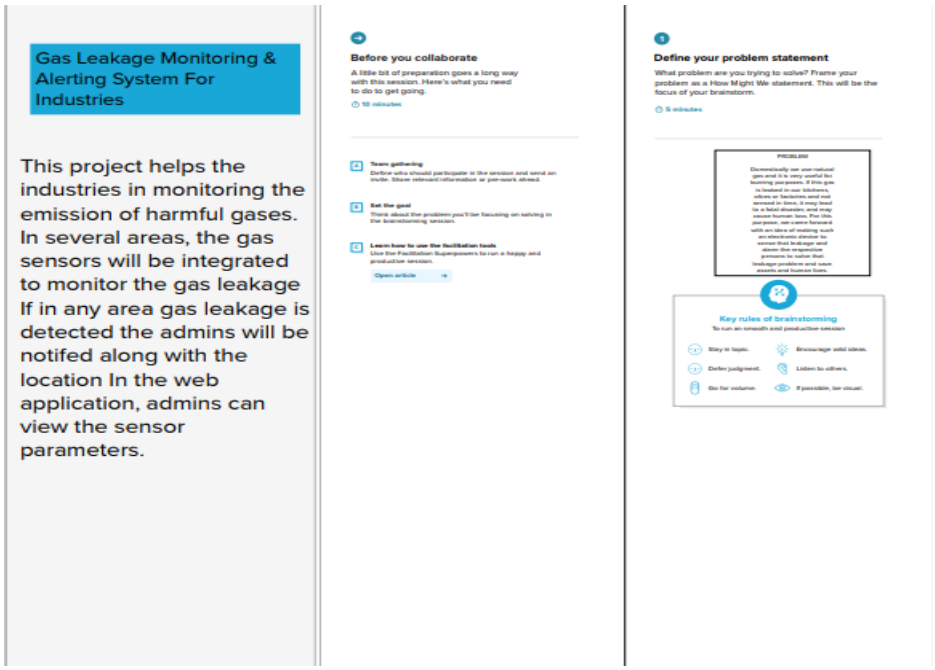
3.IDEATION & PROPOSED SOLUTION

1.Empathy Map Canvas



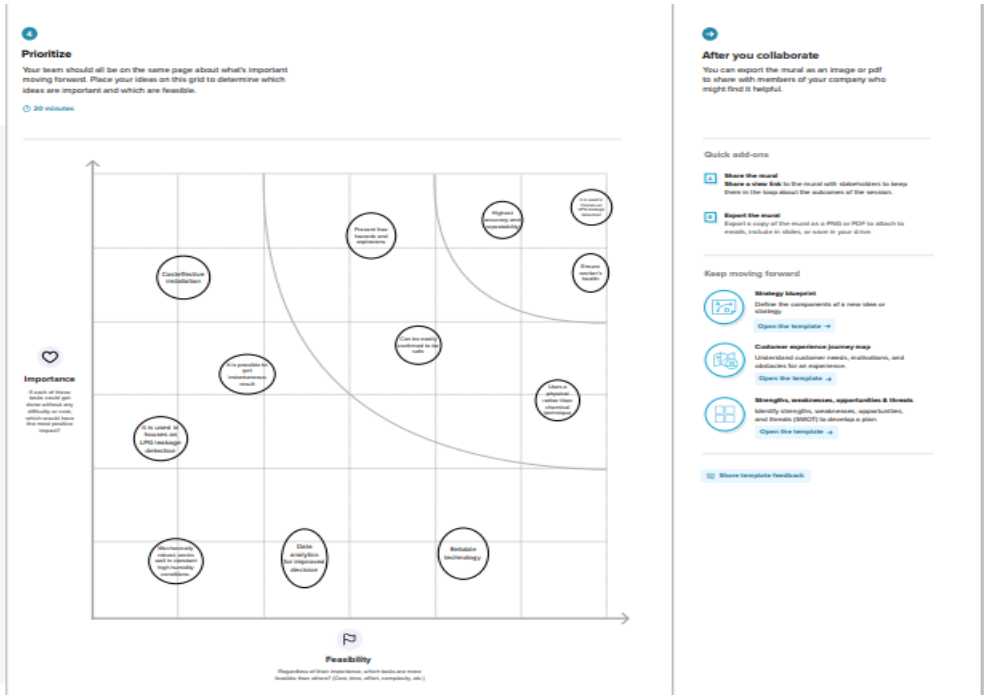
2.Ideation & Brainstorming

Team Gathering, Collaboration and Select the Problem Statement



Brainstorm, Idea Listing and Grouping

Idea Prioritization



3. Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	In gas industries there are some places that are too noisy . As we already known gas canspread easily in open atmosphere . In those areas workers can't hear the siren sound when the gas leakage alerting system alerts.And also there is no way for the neighbouring people to know when the gas leakage occurs. They have to know when the gas leakage occurs to get evaculate fromthe area to save themselves and to escape from fire explosion which can create damage 412 miles(660km). That shouldn't be happen. It will cause a large amount of damage and causes economic crisis for those people and people would be died by explosion. To avoid the explosion during the gas leakage we can alert the workers in the noisy areas with red flash alert and send alert messages to the neighbouring areas as a full screen notifications and also to place siren at the streets of neighbouring areas. By this way we can save the people from the explosion and we can alert them whilegas leakage . So that people can move to asafe area. By this way we can help them toevaculate and move to a safe place.
2.	Idea / Solution description	The LCD screen has three colours with ”gas leaking”: *red *yellow *green Where the green colour indicates that thereis no gas leakage occurs. Yellow colors denotes

		that the gas has leaked for a certainlevel but not the critical level. The red colour denotes that the gas has leaked for a wide range of area . So people need to evaculate.when the gas leakage reach the critical level(red colour) it'll turn on the buzzer to alert the people. When the red light turns on the red sirens in the whole factory. And also sends alert messages to the neighbouring people. Whereas the redsiren wirks for the whole factory and alertmessages will be send for the whole neighbouring people. The mq-2 gas detector works when gas volume range reaches between 200pp to5000ppm. When the mq-2 detect the gas concentration reaches 250 and above the data will be sent to the esp32 to process the instructions. Esp32 will request authentication to the web server to communicate with the alert message gateway before the gas leak information sent to the user. Then the user will receive warning notification as a full screen notification via the number that has been registered and also the alerting siren will alert the people and the workers in the gas industries.
3.	Novelty / Uniqueness	• Using materials that are resistant to fire lowers the risk for combustion such as stainless steel • Fix product offset problems by choosing a more stable and good load detector • The position of the LCD and LEDdisplays is placed on the conspicuous part • Improvemnent to the

		position of the gas detector that neede to be placed in the area close to the gas pipes. • The gas detectors detect gas leakesand delivers the signals to the alerting system by using ESP32 The OGI camera uses a unique spectral method that enables it to detect a gas compund.The filter is mounted in front of the detector amd cooled along with it to prevent any radiation exchange between thefilter and the detector
4.	Social Impact / Customer Satisfaction	The alerting system would keep the workerssafety from dangerous accidents like explosions...The alerting sound would be audiable and it will alert people and keep them safe from fire explosion. The customers would feel safe and less stressed because of our alerting system. They don't need to worry all the time
5.	Business Model (Revenue Model)	Our top priority for our customer is to provide a high level safety through our product. Our AI alerts the people and the workers by siren and alerting messages. And the system is always needed to upgradeand to get serviced for a proper maintainance. We would get profit by selling and installing and upgrading our AI for the gas industries. They can't just installed and left they needed to get serviced. Because our productis most time efficient. And we can make profit by servicing ,upgrading, installing devices. And at some places some gases canfreeze the sensor so that should be replaced. We can get profit forever just by upgrading and services. There is no way to face loss until there is no fuel and gas

		industries exist.Because there are many gas and fuel industries in this world we have a lot of customers around the world. 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. Alerting through the red siren and alerting full screen message specifically mentioned in the program source code for alerting about the gas leakage to all people.

4.Problem Solution

Define CS, fit into CC

1. CUSTOMER SEGMENT(S)

CS

- Engineers
- Industrialists
- Safety control personals

6. CUSTOMER CONSTRAINTS

C

- According to the square feets, the devices should be installed.
- Network connection
- Affordable budget

5. AVAILABLE SOLUTIONS

A

- Upgrade to premium network plan.
- Man-power is used to monitor the leakage.
- Availing network connection from a reliable service provider.

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

2. JOBS-TO-BE-DONE / PROBLEMS

J&P

- The device's ability to withstand harsh environments is questionable.
- Due to a network problem, the data could not always be uploaded to the cloud.

9. PROBLEM ROOT CAUSE

RC

- The quality of the material from which the device is made plays a crucial role in the device's ability to function in harsh environments.
- If the workers do not control properly, the gas may pose a high risk

7. BEHAVIOUR

BE

- A hostile environment is only prevalent in certain industries; therefore, the frequency of such a problem is low. In such a case, the customer complains several times to get attention.
- The network problem is wide spread as most of the industries are located in the country side. Here

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

3.TRIGGERS TO ACT

- Severe damage or more serious health problems from toxic gases force them to seek a solution as soon as possible.
- Device usage is displayed in the newsfeed may trigger the people to install it.

4. EMOTIONS: BEFORE / AFTER

- Before: user feels insecure and deceived.
- After: user feels confident, secured and sincerity of developers

10. YOUR SOLUTION

- Device can be manufactured in various standards based on the environment.
- Develop an economical system and an application which will monitor and alert the users.

8.CHANNELS of BEHAVIOUR

8.1 ONLINE

- Virtual community
- Social community
- Email to developer

8.2 OFFLINE

- Complaint letters

4.REQUIREMENT ANALYSIS

1.Functional requirement

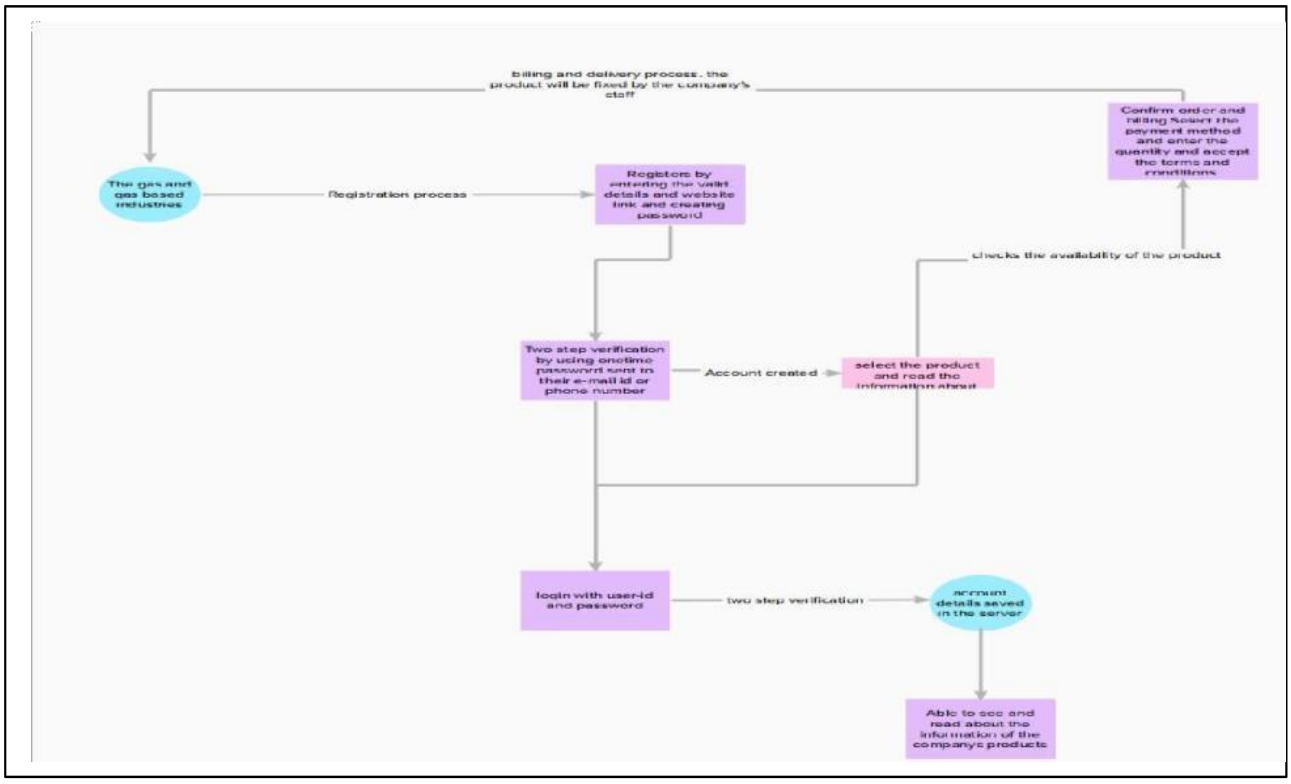
Functional Requirement (Epic)	**Sub Requirement (Story / Sub-Task)**
User Registration	Registration through Form Online Payment for the service
User Access	Access the details using web browser Access the details using mobile application
User alert	Gets alert as an SMS message Gets alert alarm in the working area.

2.Non-Functional requirements

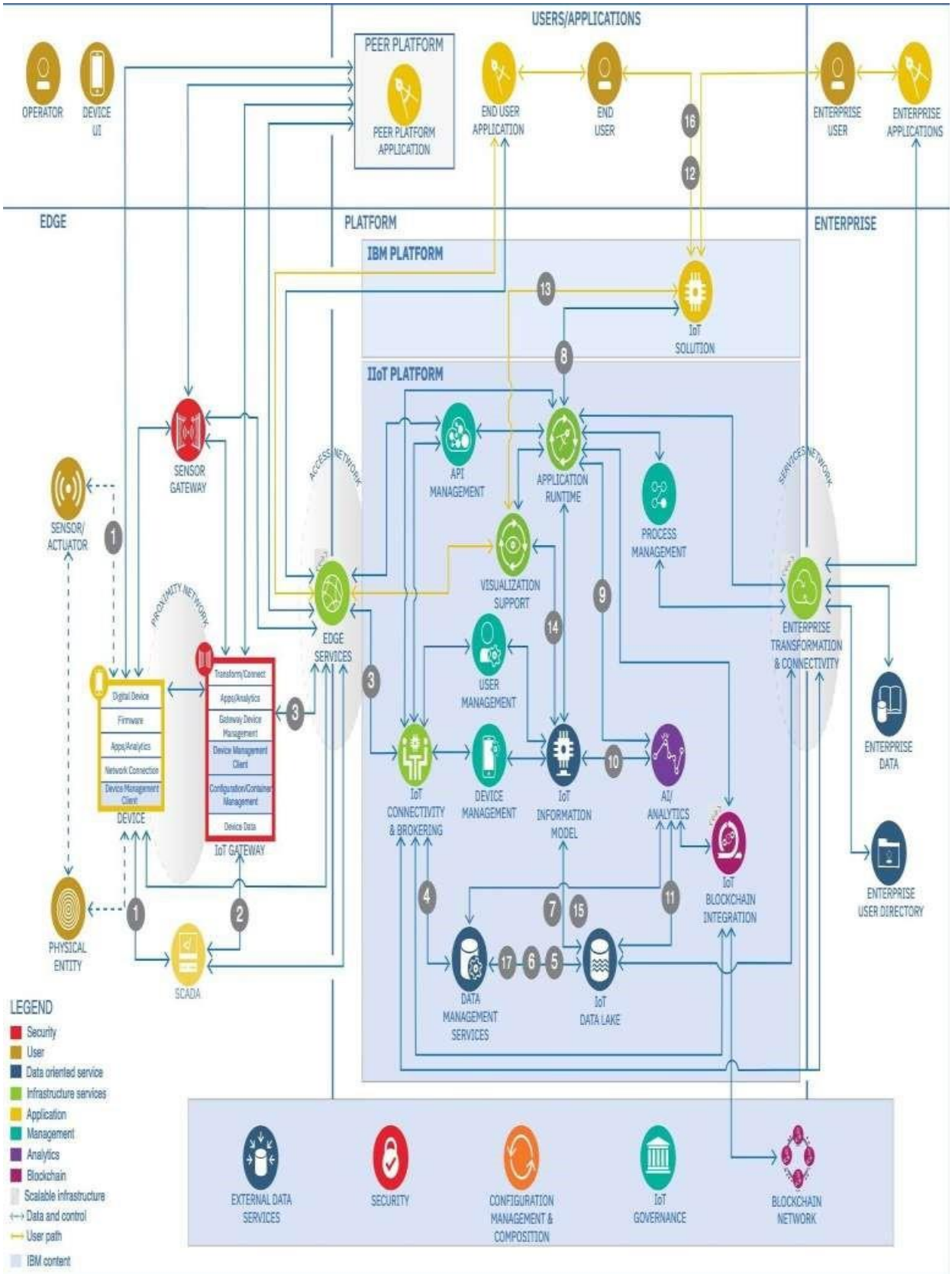
Non-Functional Requirement	**Description**
Usability	The device must be usable by the customer anywhere
Reliability	Data can be retrieved anytime and no data is discarded without customer knowledge
Performance	No performance delay in case of large number of data or parameters
Scalability	Device must be capable of measuring conditions even in large industry
Security	Data from the sensor are stored securely and away from other data

5.PROJECT DESIGN

1.Data Flow Diagrams



2.Solution & Technical Architecture



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
Customer (Mobile user)	confirmation	USN-2	As a user, I will receive confirmation emailonce I have registered for the application	I can receive confirmationemail & click confirm	High	Sprint-1
Customer (Mobile user)	Sign-in	USN-3	As a user, I can register for the applicationthrough Facebook	I can register & access the dashboard withFacebook Login	Low	Sprint-2
Customer (Mobile user)	Sign-in	USN-4	As a user, I can register for the application through Gmail	I can register and login through gmail	Medium	Sprint-1
Customer (Mobile user)	Login	USN-5	As a user, I can log into the application byentering email & password	I can login through the username/gmail and password	High	Sprint-1
Customer (Mobile user/PCuser)	Dashboard	USN-6	As a user I can see the dashboard and seethe information about their products	I can access the websitethrough my account	Medium	Sprint -2
Customer (Webuser)	Website	USN-7	As a user I can see the dashboard and loginpage in the right top	I can access the websiteand place order through logn my user account	High	Sprin-3
Customer Care Executive	Website	USN-8	As a user I can contact the customer carethrough helpline or contact number given	I can get to contact to thecustomercare.	Medium	Sprint-4
Administrator	Service	USN-9	I can get reply from the adimistrator.	The administrator will solve the issues faced byme	High	Sprint-4

7.CODING

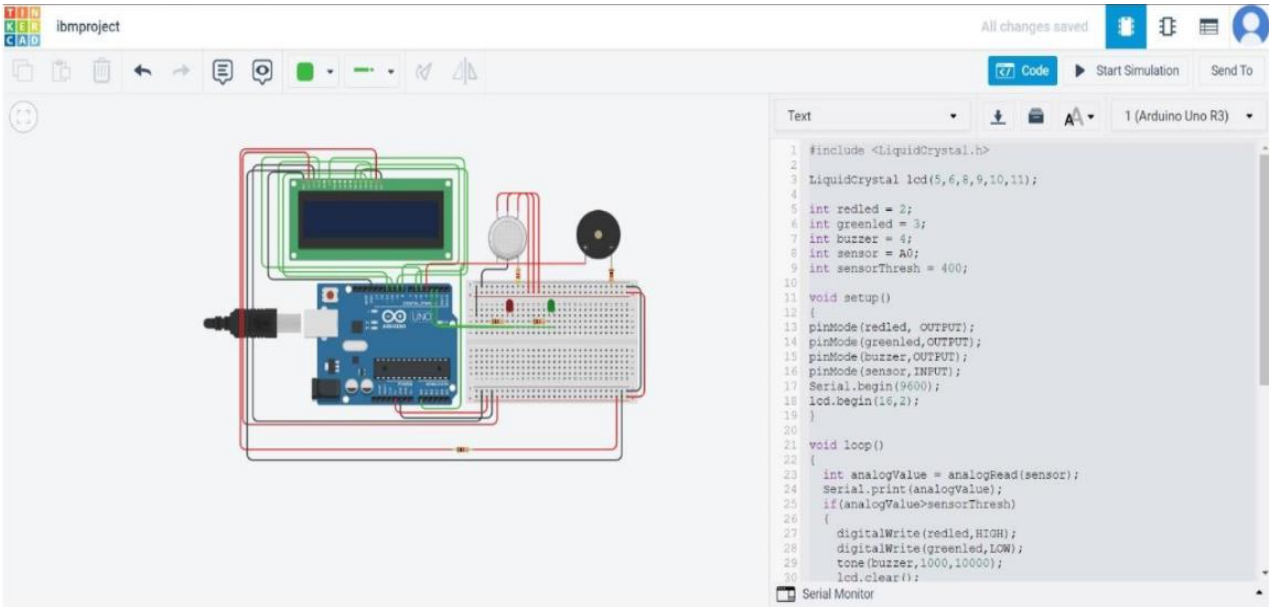
```
#include <LiquidCrystal.h>
LiquidCrystal lcd(5,6,8,9,10,11);
int redled = 2;
int greenled = 3;
int buzzer = 4;
int sensor = A0;
int sensorThresh = 400;
void setup()
{
pinMode(redled, OUTPUT);
pinMode(greenled,OUTPUT);
pinMode(buzzer,OUTPUT);

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(700);
    lcd.clear();
    lcd.setCursor(0,1);
    lcd.print("EVACUATE");
    delay(700);
  }
  else
  {
    digitalWrite(greenled,HIGH);
    digitalWrite(redled,LOW);
    noTone(buzzer);

    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("SAFE");
    delay(700);
    lcd.clear();
    lcd.setCursor(0,1);
    lcd.print("ALL CLEAR");
    delay(700);
  }
}
```

8.RESULTS



9.ADVANTAGES & DISADVANTAGES:

ADVANTAGE:

- The gas leakage monitoring and alerting system help to prevent fire breakouts.
- Alerting system helps in sending sms to alert people

DISADVANTAGE:

- Gas interference is one of the disadvantage when installed in industries.
- Poor stability and greater environmental impact.
-

10.CONCLUSION:

This applicable is usefully for the industrial and domestic purpose. This system uses GSM technique to send alert massage to respective person when the gas leaks occurs . The main advantage of this simple gas leak detector is its simplicity and its ability to warn about the leakage which makes us save people in dangerous situations .

11.FUTURE SCOPE:

Major future scope could be including a Automatic Shut-off device which will turn off the gas supply whenever it will detect any gas leakage. This system can be implemented in Industries, Hotels and wherever the LPG cylinders are used.