PROJECT REPORT

PROJECT TITLE: GAS LEAKAGE MONITORING & ALERTING SYSTEM FOR INDUSTRIES

TEAM ID: PNT2022TMID14274

TEAM MEMBERS:

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4. DURAISELVI M

1. INTRODUCTION

1.1 PROJECT OVERVIEW

Home fires have been taking place frequently and the threat to human lives and properties is growing in recent years. Liquid petroleum gas (LPG) is highly inflammable and can burn even at some distance from the source of leakage. Most fire accidents are caused because of a poor-quality rubber tube or the regulator is not turned off when not in use. Therefore, developing the gas leakage alert system is very essential. Hence, this paper presents a gas leakage alert system to detect the gas leakage and to alarm the people onboard.

2. LITERATURE SURVEY

1. Rohan Chandra Pandey, Manish Verma, LumeshKumar Sahu 2017. Internet of Things (IOT) Based Gas LeakageMonitoring and Alerting System with MQ-2 Sensor. Thispaper choice of using a real time gas leakage monitoringandSensing the output levels of gas has been clearly observedbythe help of this system.

2. Asmita Varma, Prabhakar S, Kayalvizhi Jayavel 2017. GasLeakage Detection and Smart Alerting and PredictionUsingIoT. The proposed gas leakage detector is promisingintheField of safety.

3. Chaitali Bagwe, Vidya Ghadi, Vinayshri Naik, NehaKunte2018. IOT Based Gas Leakage Detection SystemwithDatabase Logging, Prediction and Smart Alerting. Thesystemprovides constant monitoring and detection of gasleakagealong with storage of data in database for predictionsandanalysis. The IOT components used helps in makingthesystem much more cost effective in comparisonwithtraditional Gas detector systems.

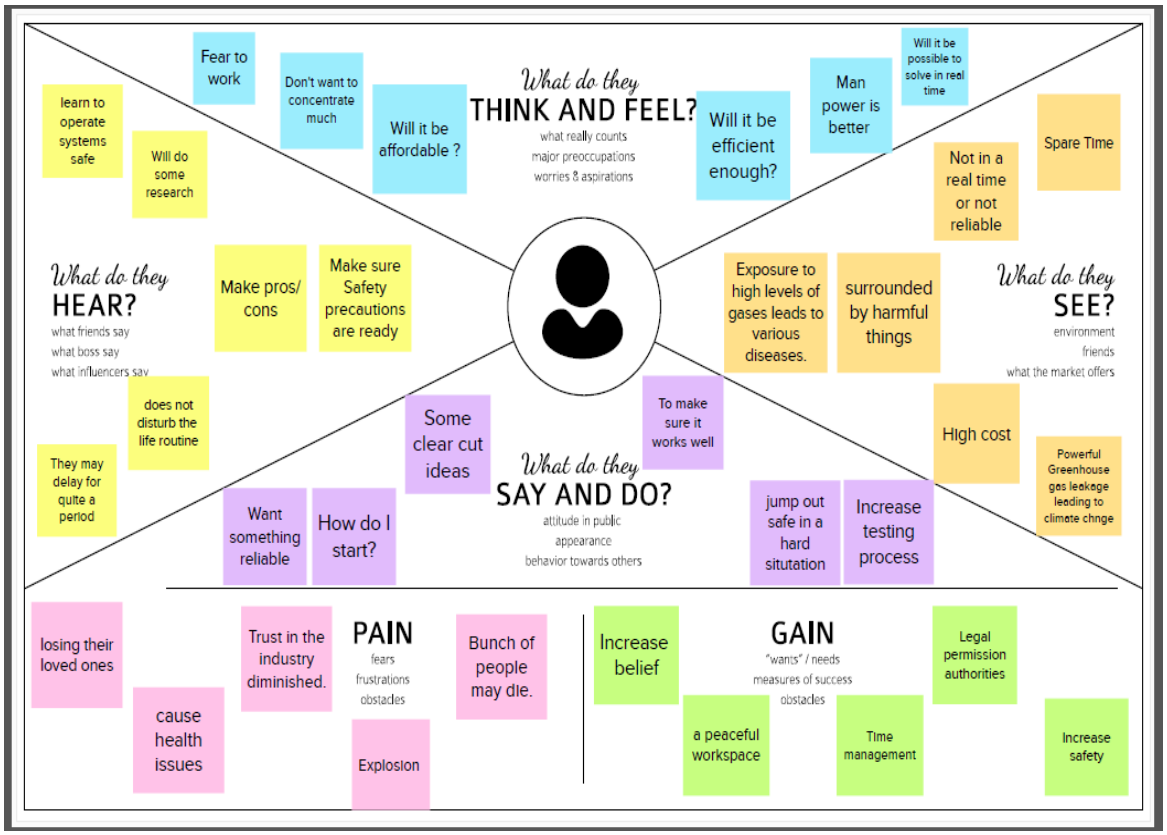
4. Rohan Chandra Pandey, Manish Verma, LumeshKumar Sahu, Saurabh Deshmukh 2018. Internet of Things(IoT) Based Gas Leakage Monitoring and Alerting SystemwithMq-6 Sensor. A discussion on how the aims and objectivesaremet is presented. An overall conclusion IOT basedtoxicgasdetector is it has become more efficient, more applicabletotoday's applications and smarter.

5. Shital Imade, Priyanka Rajmanes, Aishwarya Gavali 2018. Gas Leakage Detection and Smart Alerting SystemUsingIoT.In this paper we use IOT technology for enhancingtheexisting safety

standards. While making this prototypehasbeen to bring a revolution in the field of safety against theleakage of harmful and toxic gases

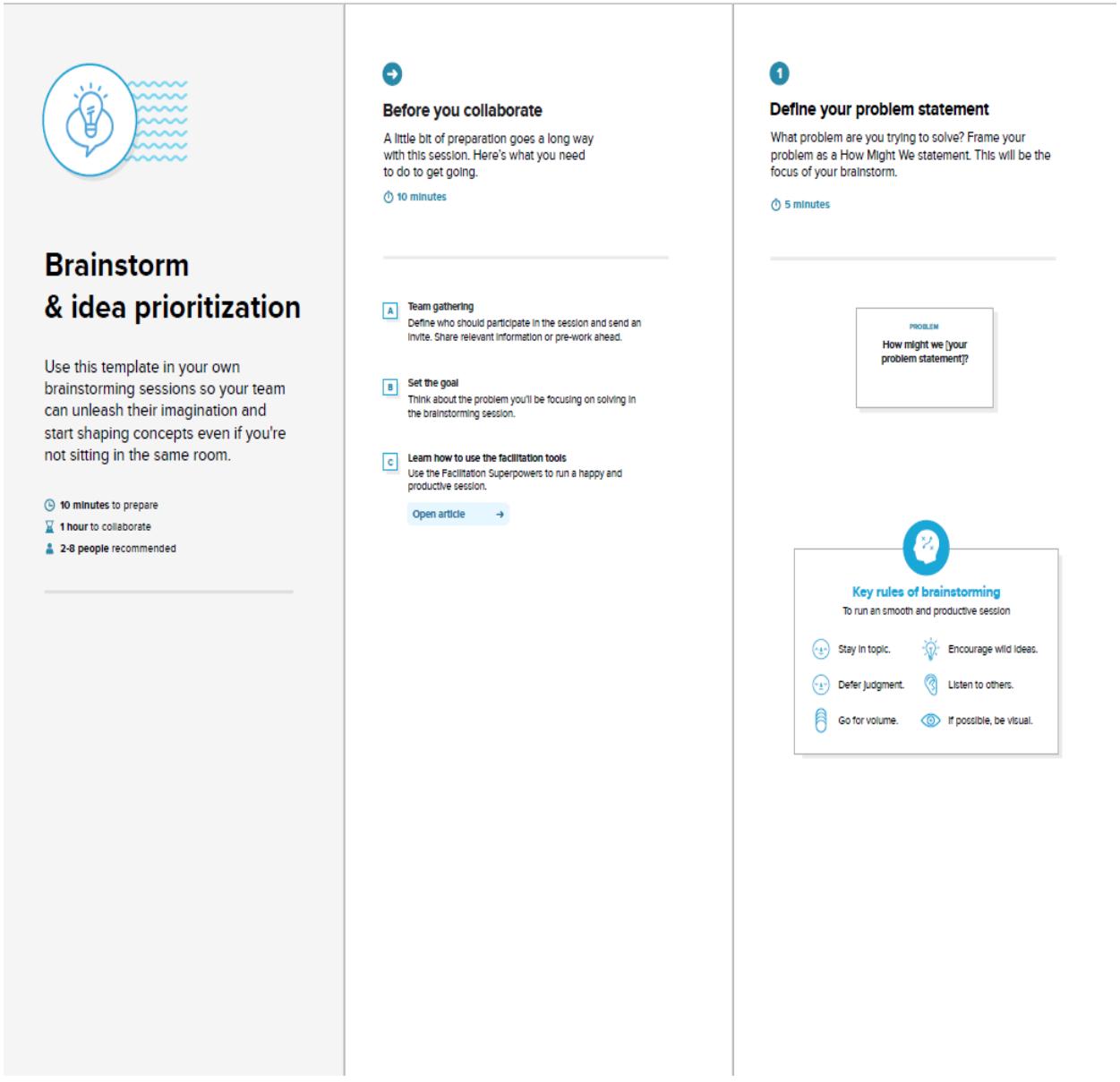
3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map



3.2 IDEATION &BRAINSTORMING

Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

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

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Team Leader

Continuos monitoring for gas detection | Affordable market price | Elimination of hazardous gases
Simple circuit connection | Continue emergence of new technologies | Reducing health related problems
Reducing the abolition capability | Reduce of mechanical moving parts | clear ventilation

Team Member 1

Reducing the cost | reduce number of used detectors | Increasing accuracy
everyday monitoring | automatic window open if gas leakage detected | hire experienced employees
exist power consumption | simple connections | Check all components

Team Member 2

MANISHA S

Health checkup for all employees | Avoid spreading of gases | Oxygen supply
Reducing errors | Increase the awareness | Use less detectors for monitoring
Avoid silly mistakes | Using affordable components | Keep watching whole organization

Team Member 3

SATHIYAPRIYA N

Increase the chance of accurate results | Increase the stability | Analyse the toxic gases
Reducing the limitations | IoT implementation for security | Security
pollution level checking | Accurate measures | Maintenance free

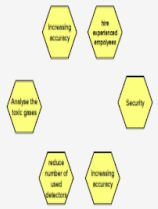
3

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 and break it up into smaller sub-groups.

20 minutes

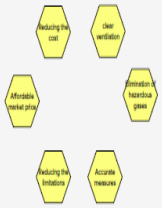
PUBLIC



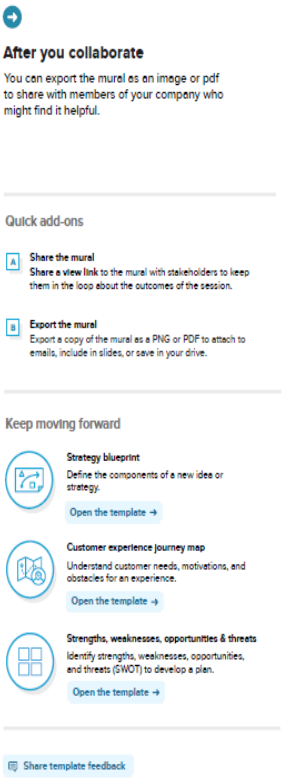
TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

GOVERNMENT



Step-3: Idea Prioritization

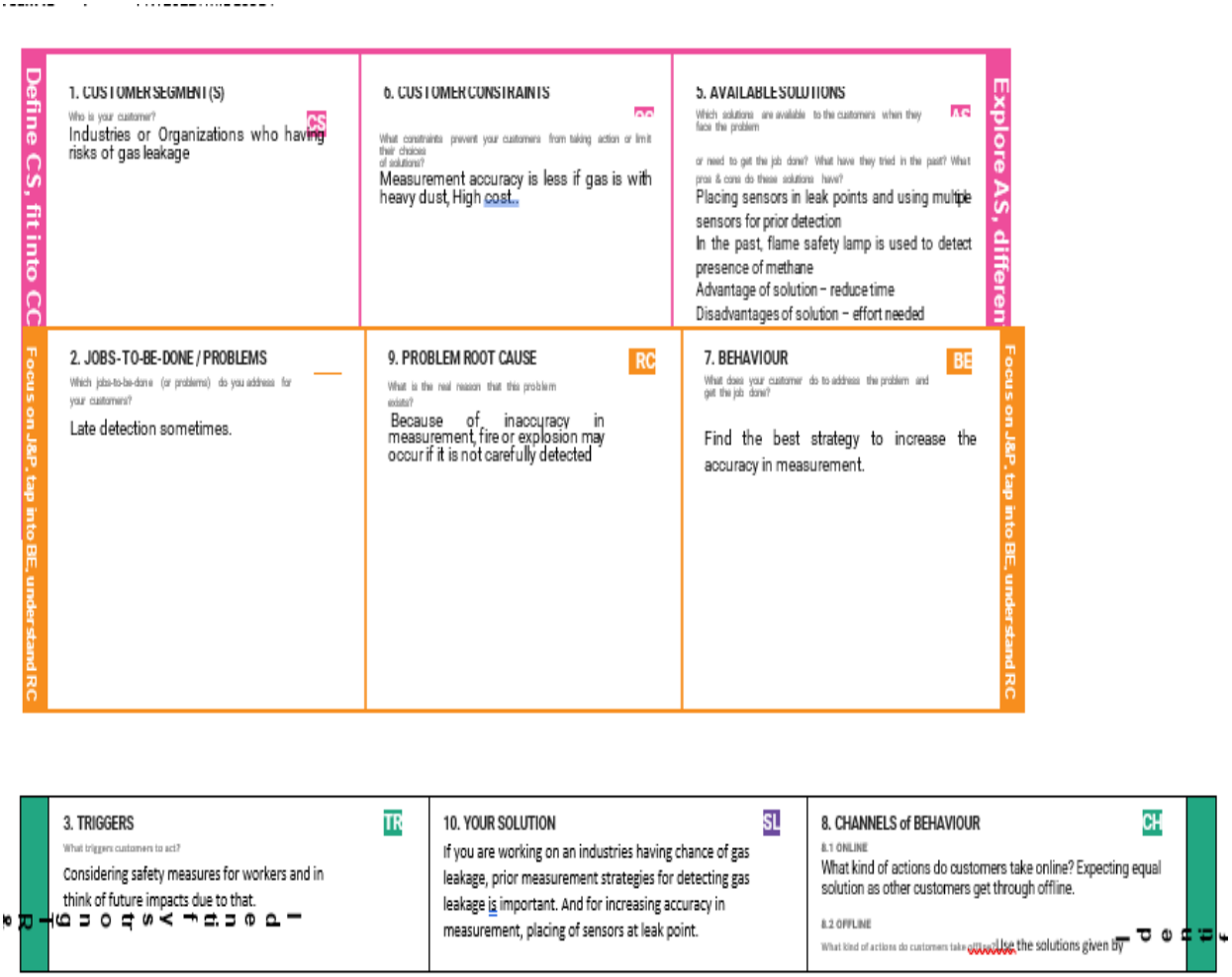


3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The leakage of gases only can be detected by human nearby and if there are no human nearby, it cannot be detected. But sometimes it cannot be detected by human that has a low sense of smell. Thus, this system will help to detect the presence of gas leakage.
2.	Idea / Solution description	If the system detects the level of gas in the air that exceeds the safety level it will activate the alarm which includes the buzzer to alert the users at industries of the abnormal condition and to take any necessary action.
3.	Novelty / Uniqueness	Reducing the cost of the gas leakage detector and increasing the accuracy percentage.
4.	Social Impact / Customer Satisfaction	These leaks *cause safety threats and secondary accidents* for those working in industry and the environment

5.	Business Model (Revenue Model)	The gas detector market is forecast to reach $2.96 billion by 2025, growing at a CAGR of 4% during 2019-2025.
6.	Scalability of the Solution	A wide range of *industrial* fixed *gas detectors* featuring flexible integration, simple installation, user-friendly operation

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	User convenience	Through message notification we can easily get data of gas level and in case of gas leakage, it can directly send notification to nearby hospitals and police station
FR-2	User visibility	Gas level can be monitored by users if there is any leakage and they will be receiving alert notification.
FR-3	User reception	The notification for the gas level and leakage can be send through messages.
FR-4	User understanding	User can monitor the level of gas with help of the data. If there is an increase in gas level then the alerts will be given
FR-5	User performance	When the user gets notified ,they could turn on the water sprinkler or exhaust fan.

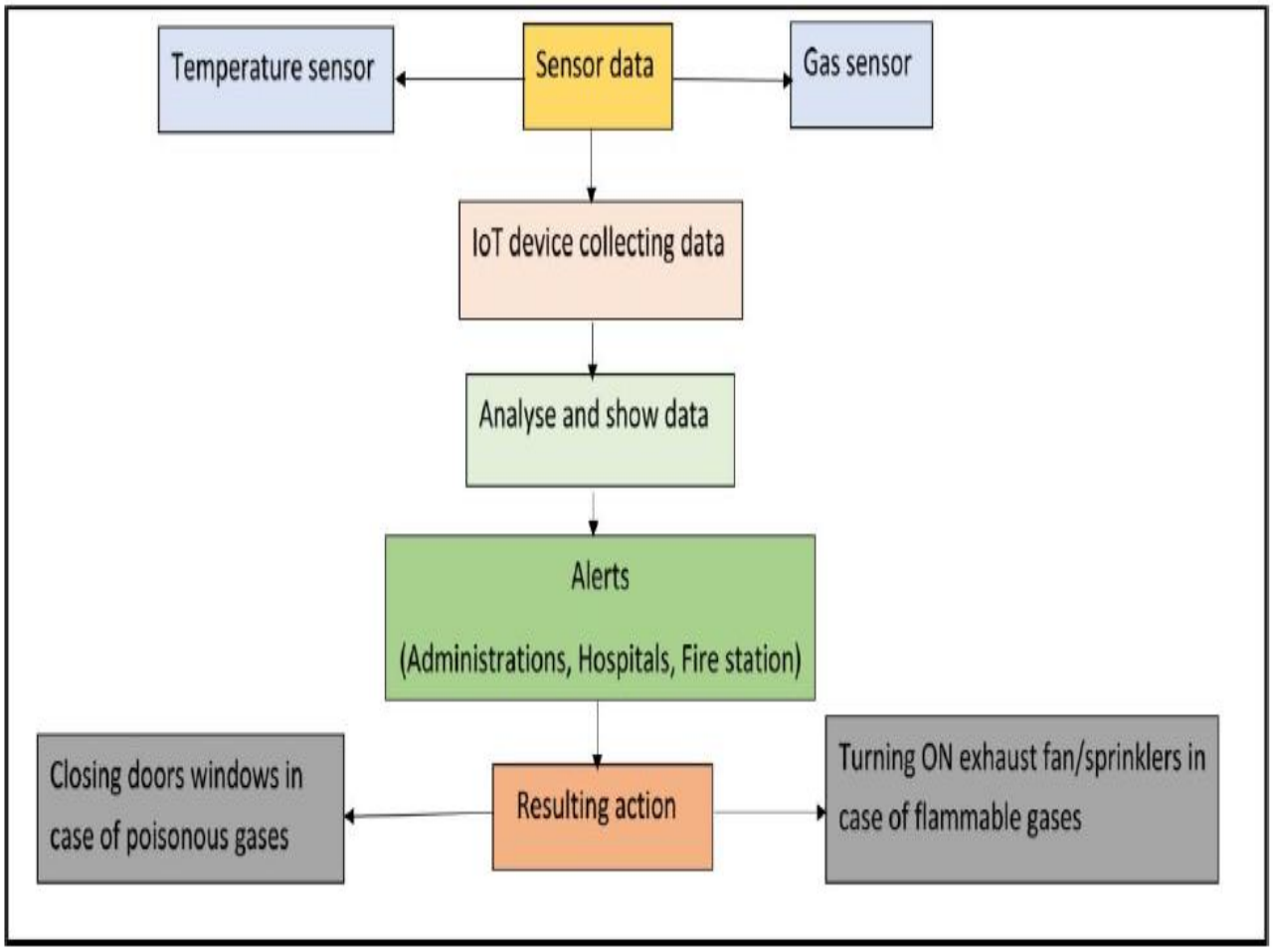
Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It updates data periodically and protects the workers in industries.
NFR-2	**Security**	In case of emergency alerts, industrial properties and human beings are protected from fire accidents.
NFR-3	**Reliability**	It will provide most accurate information and have Capacity to recognize the hazardous gas which is true or not.
NFR-4	**Performance**	During fire, water sprinklers and exhaust fans are used .
NFR-5	**Availability**	It can be accessed both day and night.
NFR-6	**Scalability**	Once the sensor got fails it can be easily replaced.

5.PROJECT DESIGN

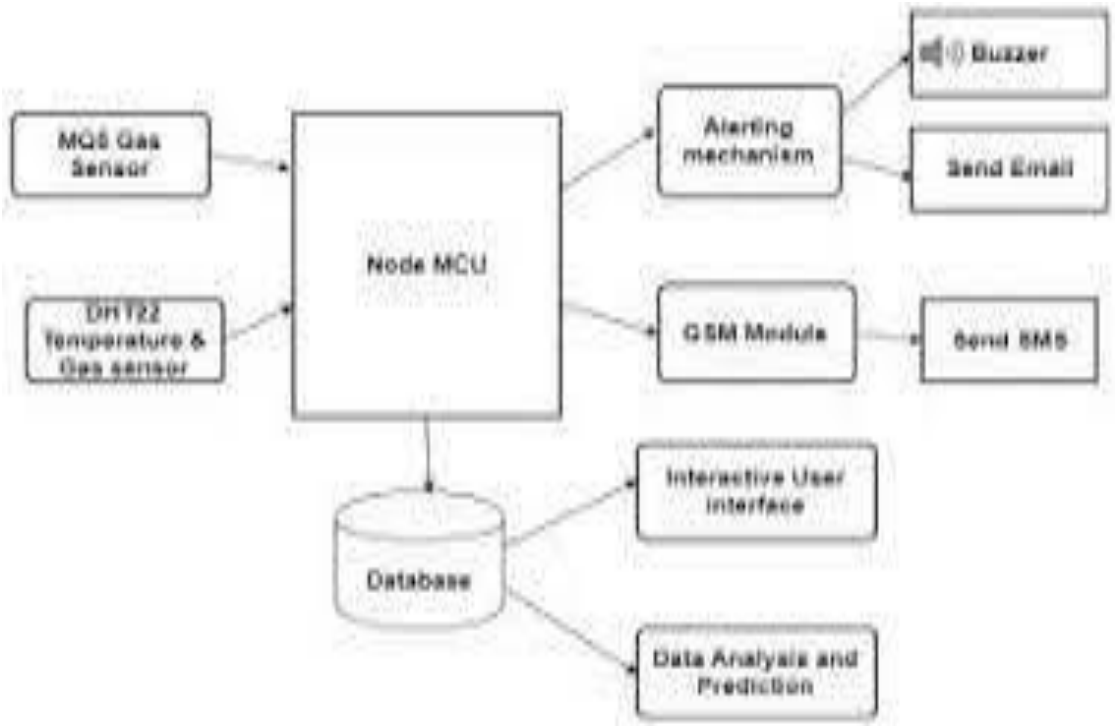
5.1 Data Flow Diagram



5.2 Solution Architecture

Solution architecture is a complex process – with many sub-processes that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.



6.PROJECT PLANNING &SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	Create and initialize accounts in various public APIs like OpenWeatherMap API.	1	LOW	Dharun kumar WA David kirubakaran I Dhatsenaagini S Duraiselvi M
Sprint-1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location.	1	MEDIUM	Dharun kumar WA David kirubakaran I Dhatsenaagini S Duraiselvi M
Sprint-2	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	MEDIUM	Dharun kumar WA David kirubakaran I Dhatsenaagini S Duraiselvi M
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH	Dharun kumar WA David kirubakaran I Dhatsenaagini S Duraiselvi M
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW	Dharun kumar WA David kirubakaran I Dhatsenaagini S Duraiselvi M

6.2 MILESTONE AND ACTIVITY LIST

Sprint	Functional Requirement (Epic)	UserStory Number	UserStory / Task	Story Points	Priority	Team Members
Sprint-1	IDE	USN-1	Installingall the software whichis requiredlike python IDE	2	High	Dharun kumar WA David kirubakaran I Dhatsenaagiri S Duraiselvi M
Sprint-1	Checking the simulation with conditions	USN-1	Simulating the circuits and experimenting	2	High	Dharun kumar WA David kirubakaran I Dhatsenaagiri S Duraiselvi M

7.CODING & SOLUTIONING

7.1 Feature 1

- IoT device
- IBM Watson Platform
- Node red
- Cloudant DB
- Web UI
- MIT App Inventor
- Python code

8. ADVANTAGES

- Get real-time alerts about the gaseous presence in the atmosphere
- Prevent fire hazards and explosions
- Supervise gas concentration levels
- Ensure worker’s health
- Real-time updates about leakages
- Cost-effective installation
- Data analytics for improved decisions
- Measure oxygen level accuracy
- Get immediate gas leak alerts

9. DISADVANTAGES

- Individual one gas can be measured with each instrument.
- When heavy dust, steam or fog blocks the laser beam, the system will not be able to take measurements.
- This is also the case when a person or vehicle blocks the path.

10. CONCLUSION

The advantage of this simple gas leak detector is its simplicity and its ability to warn about the leakage of the LPG gas. This system uses GSM technique to send alert message to respective person if no one is there in the house and then gas leaks occurs, GSM module is there to send immediate messages to the respective person regarding the gas leak. The main advantage of this system is that it off the regulator knob of the cylinder automatically when gas leakage detected.

11.APPENDIX

11.1 Source Code

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(6, 7, 8, 9, 10, 11);

float gasPin = A0;

float gasLevel;

int ledPin = 2;

int buttonPin = 3;

int buzzPin = 4;

int buttonState;

int fan = 5;


void setup()

{

  pinMode(ledPin, OUTPUT);

  pinMode(buttonPin, INPUT);

  pinMode(gasPin,INPUT);

  pinMode(fan,OUTPUT);

  Serial.begin(9600);

  lcd.begin(16, 2);

  lcd.setCursor(0,0);
```

```
  lcd.print(" Welcome");
  lcd.setCursor(0,2);
  lcd.print("GAS LEAKAGE SYSTEM");
  delay(500);
  lcd.clear();
}

void loop()
{
  // Read the value from gas sensor and button
  gasLevel = analogRead(gasPin);
  buttonState = digitalRead(buttonPin);

  // call the function for gas detection and button work

  gasDetected(gasLevel);
  buzzer(gasLevel);
  exhaustFanOn(buttonState);
}

// Gas Leakage Detection & Automatic Alarm and Fan ON
```

```
void gasDetected(float gasLevel)
{
  if(gasLevel >= 300)
{
   digitalWrite(buzzPin,HIGH);
    digitalWrite(ledPin,HIGH);
    digitalWrite(fan,HIGH);
    lcd.setCursor(0,0);
   lcd.print("GAS:");
    lcd.print(gasLevel);
   lcd.setCursor(0,2);
   lcd.print("FAN ON");
   delay(1000);
   lcd.clear();
  }
else
{
   DigitalWrite(ledPin,LOW);
    digitalWrite(buzzPin,LOW);
    digitalWrite(fan,LOW);
    lcd.setCursor(0,0);
   lcd.print("GAS:");
```

```
    lcd.print(gasLevel);
   lcd.setCursor(0,2);
   lcd.print("FAN OFF");
   delay(1000);
   lcd.clear();
  }
}

//BUZZER
void buzzer(float gasLevel)
{
if(gasLevel>=300)
  {
  for(int i=0; i<=30; i=i+10)
  {
  tone(4,i);
  delay(400);
  noTone(4);
  delay(400);
  }
  }
}
```

```
// Manually Exhaust FAN ON


void exhaustFanOn(int buttonState)
{
  if(buttonState == HIGH)
{
    digitalWrite(fan,HIGH);
    lcd.setCursor(0,0);
   lcd.print("Button State:");
    lcd.print(buttonState);
    lcd.setCursor(0,2);
    lcd.print("FAN ON");
    delay(10000);
    lcd.clear();
  }
}
```

12. GitHub

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-9805-1659076305