PROJECT REPORT

GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES

TEAM ID: PNT2022TMID39307

TEAM MEMBERS

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CONTENT:

6.3 Reports from JIRA

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

7.1 Feature 1

7.2 Feature 2

7.3 Database Schema (if Applicable)

8. ADVANTAGES & DISADVANTAGES

9. CONCLUSION

10. FUTURE SCOPE

11. APPENDIX

Source Code

GitHub & Project Demo Link

1. INTRODUCTION

1.1 Project Overview:

GAS is a highly flammable chemical that consists of mixture of propane and butane. Gas is used for cooking at home, restaurant, and certain use for industry. They have certain weaknesses that make the gas leakage occur. The leakage of gases only can be detected by human nearby 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. This system was developed by using IOT to give real-time response to the user and the nearest fire station**.**

1.2 Purpose:

- The main objective of the work is designing microcontroller based harmful gas detecting and alerting system.

- If the gases exceed the normal level then an alarm is generated immediately and also an alert message (SMS) is sent to the authorized person through the INTERNET by the IBM cloud service.

- The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation.

- To design and develop an LPG Gas leakage monitoring & alert system using Arduino.

- To display the leakage alarm on a display board and send an alarm notification on SMS to any predefine mobile number.

- For the protection and security of LPG gas explosion problem, we design the IoT based system to prevent industrial accidents.

- So, this IOT based system award people to prevent accidents and safe from damage.

2. LITERATURE SURVEY

2.1 Existing Problem:

The sensor used in this model can sense and detect the leakage of the gas and the user gets notification regarding gas leakage and can also monitor the cylinder weight it can be taken to pre-book the new cylinder automatically. This proposed system can be useful in marketing sectors like hotels, shop etc. The main intention of this work is to ensure safe and easier way of gas booking and gas leakage detection to avoid disasters that may occur due to negligence.

2.2 References:

- Referred from IBM classes.
- Referred “The Internet of Things “Book by Samuel Greengard.
- Referred “The Fourth Industrial Revolution “Book by Klaus Schwab.
- A Shrivastava, R Prabhakar, R Kumar, R Verma, “GSM based gas leakage detection system." International Journal of Emerging Trends in Electrical and Electronics, vol. 3, no. 2, pp. 42-45, 2021.
- Mahalingam, A., R. T. Nayarit, and N. E. Masteries. "Design and implementation of an economic gas leakage detector." Recent Researches in Applications of Electrical and Computer Engineering, pp. 20-24, 2022.
- Meenakshi, A.A.; Meghana, R.B.N.; Krishna, P.R. LPG Gas Leakage Detection and Prevention System. Int. J. Future Revolute. Compute. Sci. Commune. Eng. 2020.

2.3 Problem Statement Definition

- GAS is a highly flammable chemical that consists off mixture of propane and butane. Gas is used for cooking at home, restaurant, and certain use for industry.

- They have certain weaknesses that make the gas leakage occur. The leakage of gases only can be detected by human nearby 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. This system was developed by using IOT to give real-time response to the user and the nearest fire station**.**

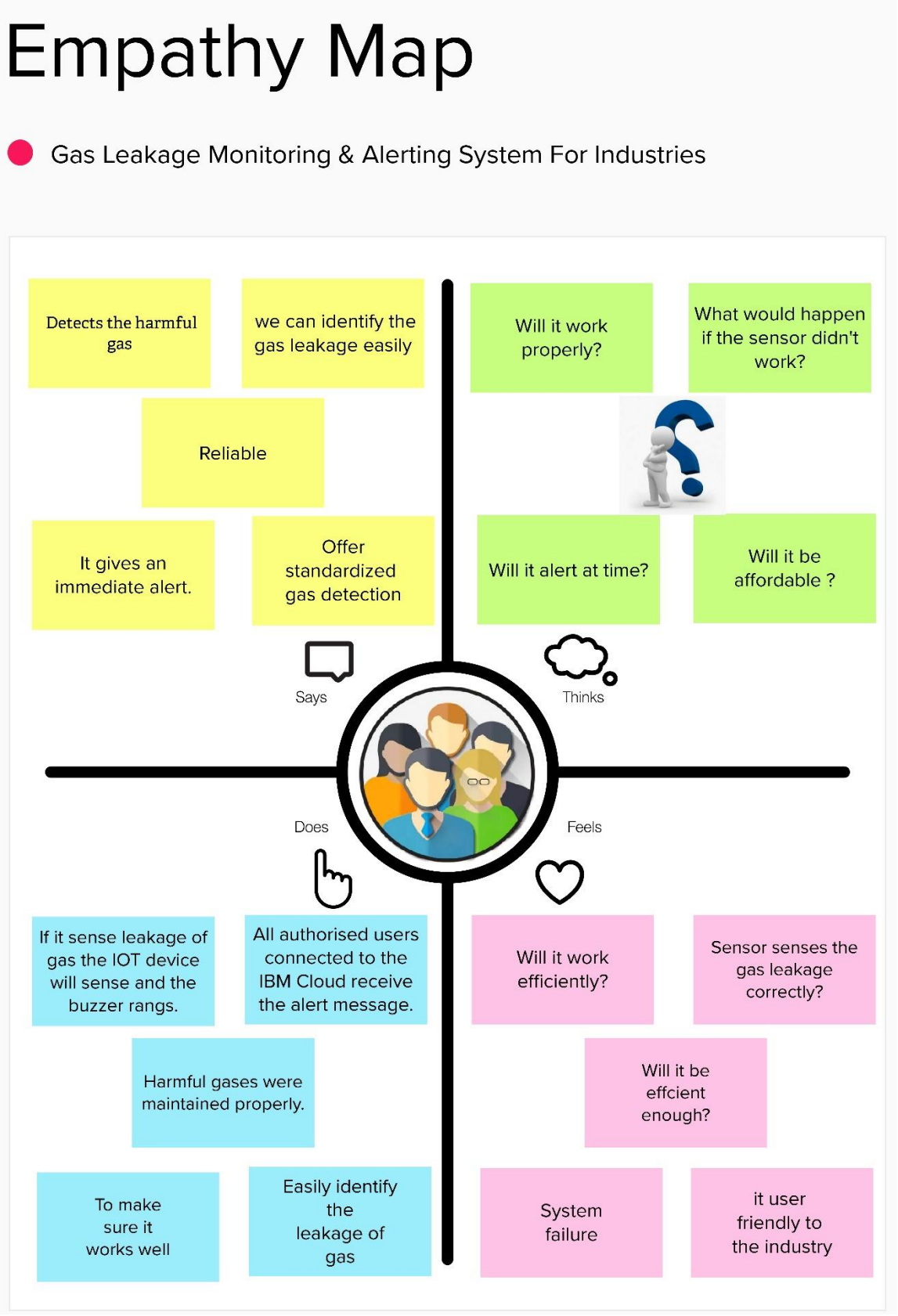
- Test results are demonstrated for an USB powered gas leakage detection system and it gives early warning signals under less severe conditions and activates a high-pitched alarm in case of emergency situations to safeguard the users.

- The aim of this paper is to propose and discuss a design of a gas leakage detection system that can automatically detect, alert and control gas leakage.

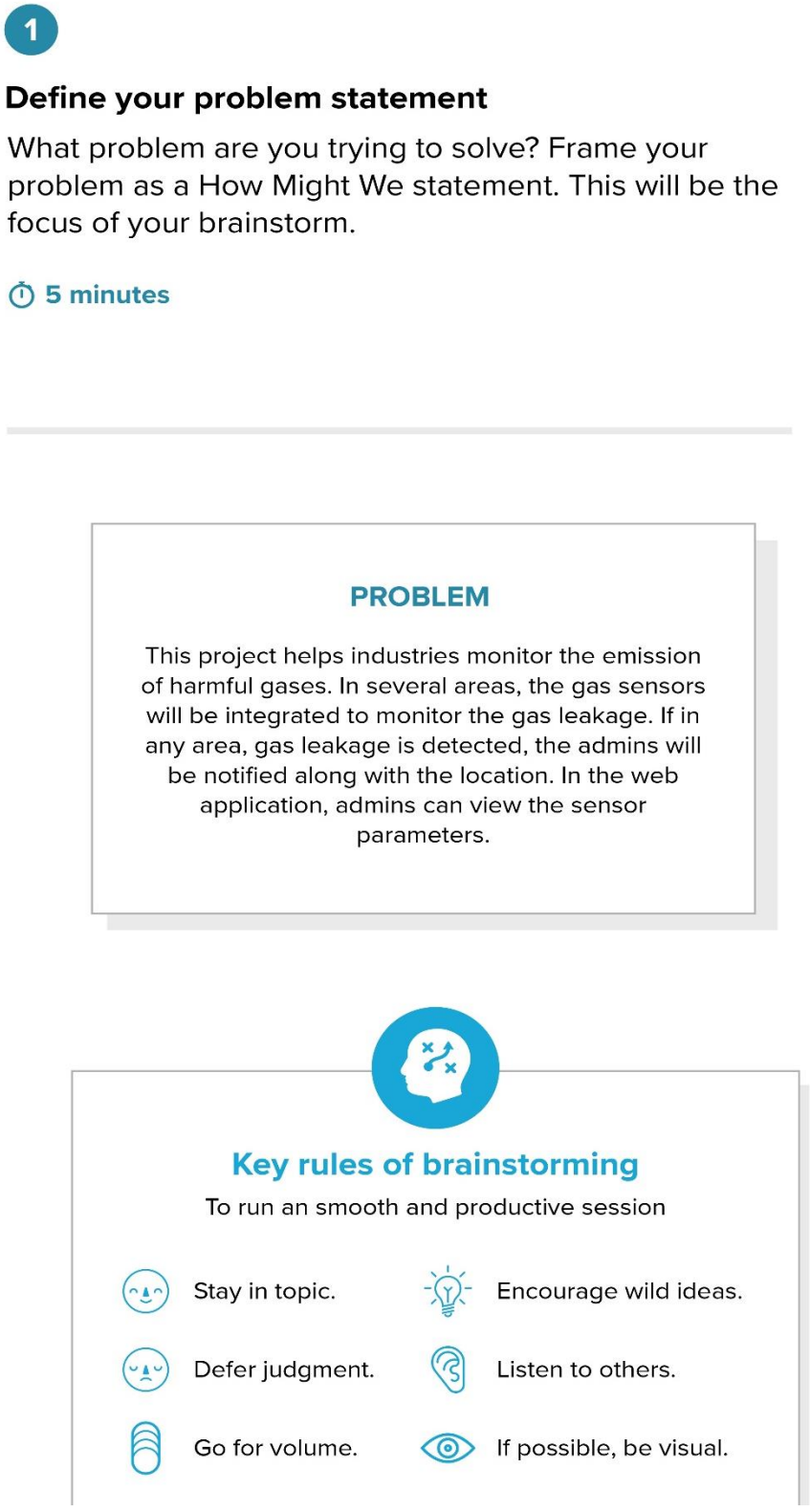
- This proposed system also includes an alerting system for the users. The system is based on a sensor that easily detects a gas leakage.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas:



3.2 Ideation & Brainstorming:



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2

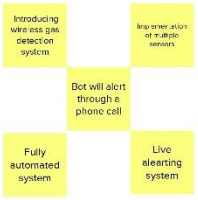
Brainstorm

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

10 minutes

NITHISH KUMAR

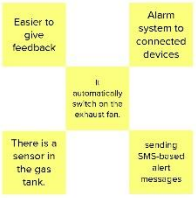
SATHYA



SUBASHINI

SURYA

VISHAL GANDHI



3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, 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.

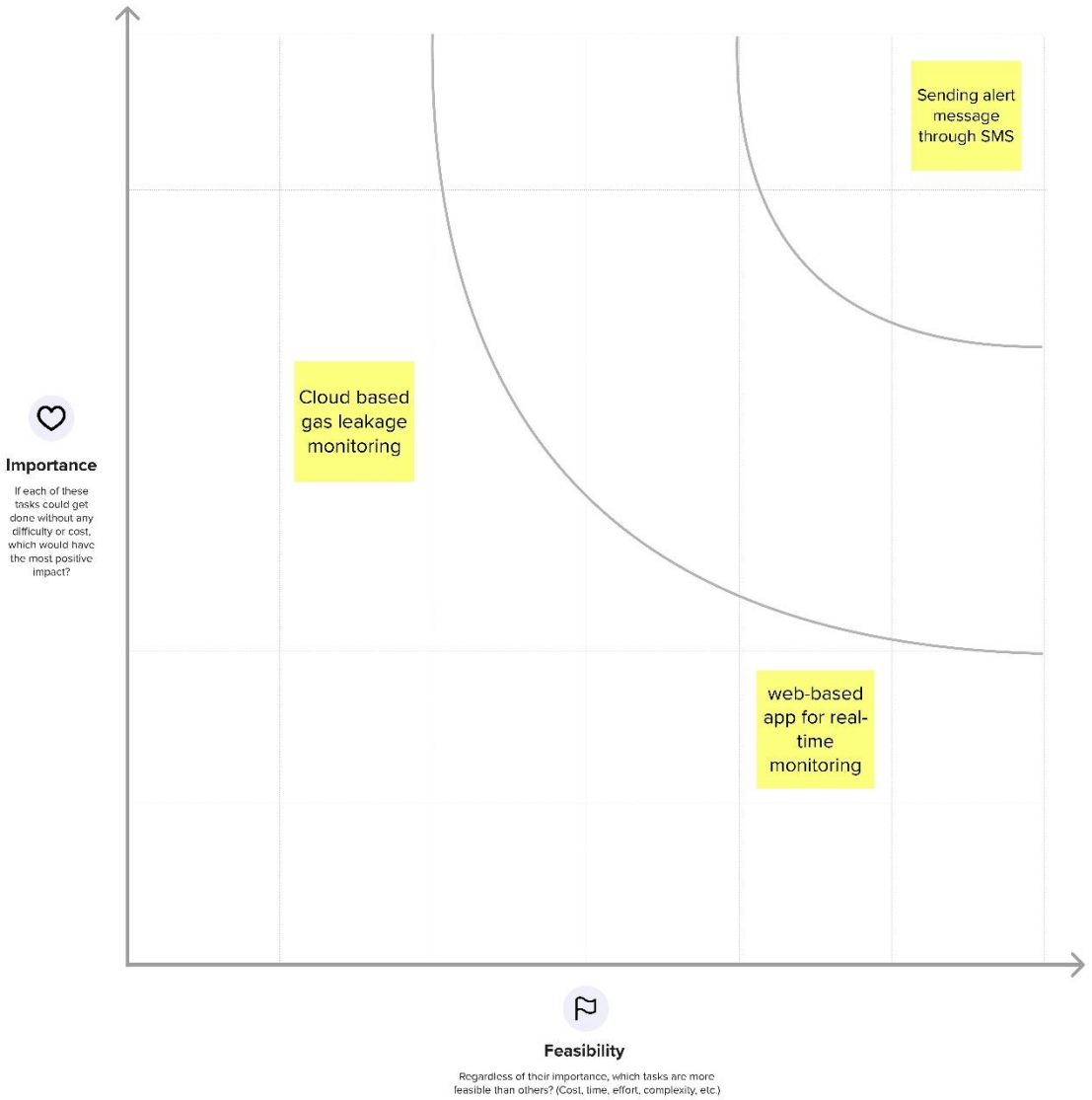
20 minutes

4

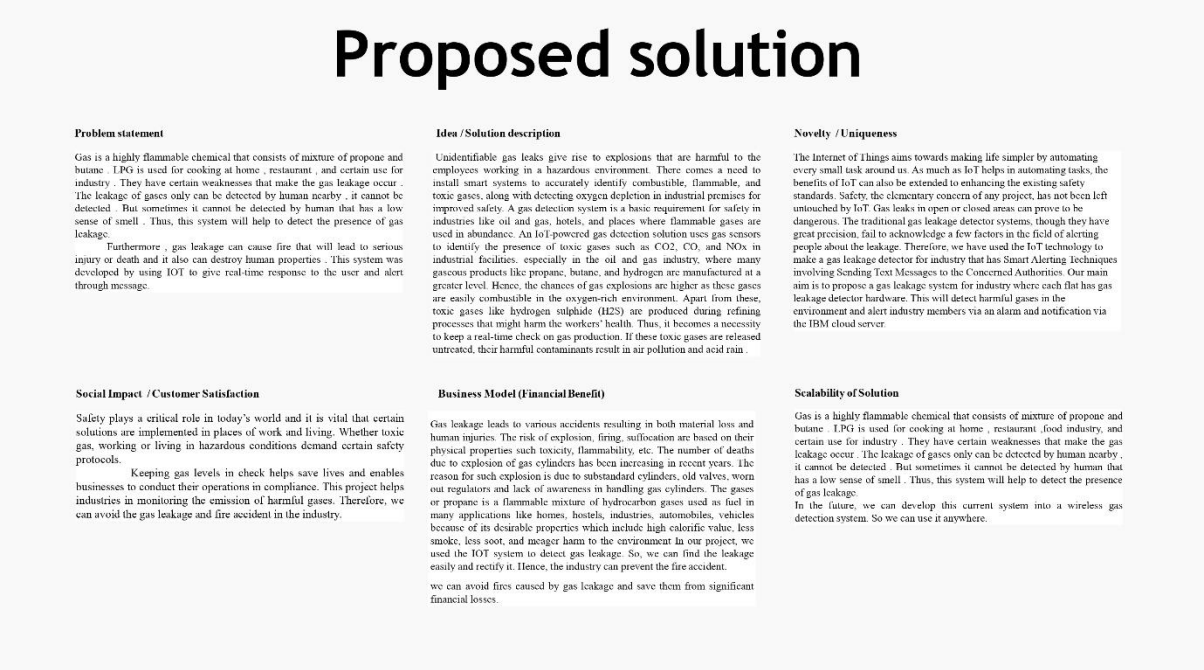
Prioritize

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

20 minutes



3.3 Proposed solution:



Proposed solution

Problem statement

Gas is a highly flammable chemical that consists of mixture of propone and butane . LPG is used for cooking at home , restaurant , and certain use for industry . They have certain weaknesses that make the gas leakage occur . The leakage of gases only can be detected by 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.

Furthermore , gas leakage can cause fire that will lead to serious injury or death and it also can destroy human properties . This system was developed by using IOT to give real-time response to the user and alert through message.

Idea / Solution description

Unidentifiable gas leaks give rise to explosions that are harmful to the employees working in a hazardous environment. There comes a need to install smart systems to accurately identify combustible, flammable, and toxic gases, along with detecting oxygen depletion in industrial premises for improved safety. A gas detection system is a basic requirement for safety in industries like oil and gas, hotels, and places where flammable gases are used in abundance. An IoT-powered gas detection solution uses gas sensors to identify the presence of toxic gases such as CO2, CO, and NOx in industrial facilities. especially in the oil and gas industry, where many gaseous products like propane, butane, and hydrogen are manufactured at a greater level. Hence, the chances of gas explosions are higher as these gases are easily combustible in the oxygen-rich environment. Apart from these, toxic gases like hydrogen sulphide (H2S) are produced during refining processes that might harm the workers' health. Thus, it becomes a necessity to keep a real-time check on gas production. If these toxic gases are released untreated, their harmful contaminants result in air pollution and acid rain .

Novelty / Uniqueness

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 leaks in open or closed areas can prove to be dangerous. The traditional gas leakage detector systems, though they have great precision, fail to acknowledge a few factors in the field of alerting people about the leakage. Therefore, we have used the IoT technology to make a gas leakage detector for industry that has Smart Alerting Techniques involving Sending Text Messages to the Concerned Authorities. Our main aim is to propose a gas leakage system for industry where each flat has gas leakage detector hardware. This will detect harmful gases in the environment and alert industry members via an alarm and notification via the IBM cloud server.

Social Impact / Customer Satisfaction

Safety plays a critical role in today's world and it is vital that certain solutions are implemented in places of work and living. Whether toxic gas, working or living in hazardous conditions demand certain safety protocols.

Keeping gas levels in check helps save lives and enables businesses to conduct their operations in compliance. This project helps industries in monitoring the emission of harmful gases. Therefore, we can avoid the gas leakage and fire accident in the industry.

Business Model (Financial Benefit)

Gas leakage leads to various accidents resulting in both material loss and human injuries. The risk of explosion, firing, suffocation are based on their physical properties such toxicity, flammability, etc. The number of deaths due to explosion of gas cylinders has been increasing in recent years. The reason for such explosion is due to substandard cylinders, old valves, worn out regulators and lack of awareness in handling gas cylinders. The gases or propane is a flammable mixture of hydrocarbon gases used as fuel in many applications like homes, hostels, industries, automobiles, vehicles because of its desirable properties which include high calorific value, less smoke, less soot, and meager harm to the environment In our project, we used the IOT system to detect gas leakage. So, we can find the leakage easily and rectify it. Hence, the industry can prevent the fire accident.

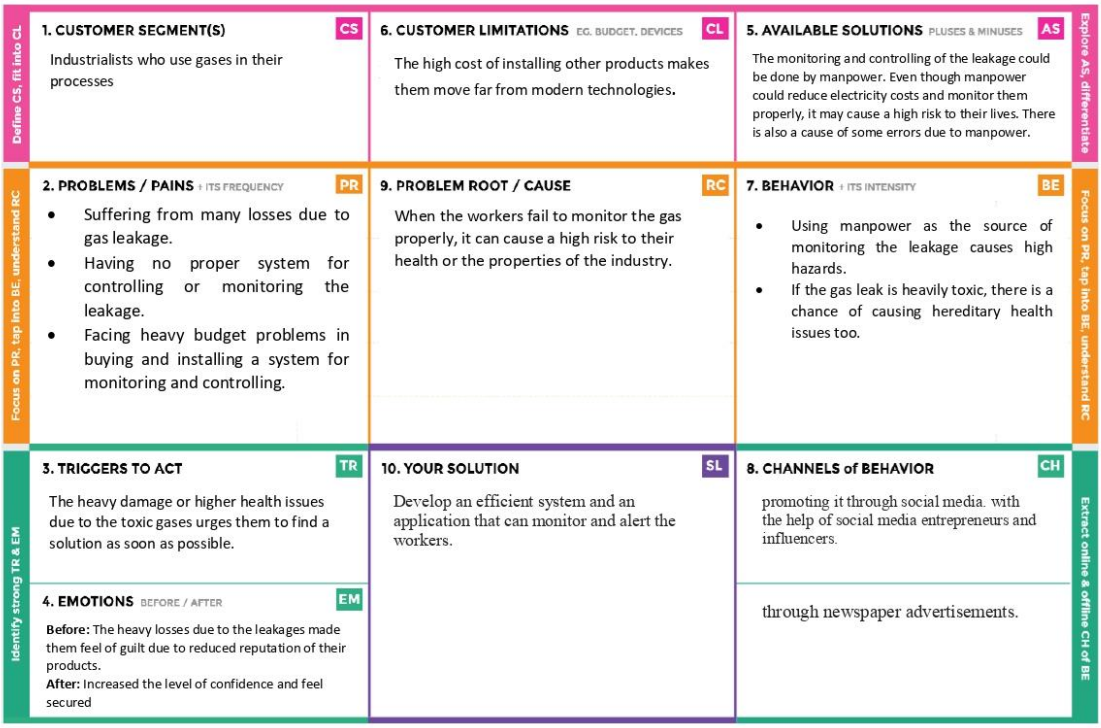
we can avoid fires caused by gas leakage and save them from significant financial losses.

Scalability of Solution

Gas is a highly flammable chemical that consists of mixture of propone and butane . LPG is used for cooking at home , restaurant ,food industry, and certain use for industry . They have certain weaknesses that make the gas leakage occur . The leakage of gases only can be detected by 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.

In the future, we can develop this current system into a wireless gas detection system. So we can use it anywhere.

3.4 Problem Solution Fit:



Define CS, fit into CL

1. CUSTOMER SEGMENT(S) CS

Industrialists who use gases in their processes

6. CUSTOMER LIMITATIONS EG. BUDGET, DEVICES CL

The high cost of installing other products makes them move far from modern technologies.

5. AVAILABLE SOLUTIONS PLUSES & MINUSES AS

The monitoring and controlling of the leakage could be done by manpower. Even though manpower could reduce electricity costs and monitor them properly, it may cause a high risk to their lives. There is also a cause of some errors due to manpower.

Explore AS, differentiate

Focus on PR, tap into BE, understand RC

2. PROBLEMS / PAINS + ITS FREQUENCY PR

- Suffering from many losses due to gas leakage.
- Having no proper system for controlling or monitoring the leakage.
- Facing heavy budget problems in buying and installing a system for monitoring and controlling.

9. PROBLEM ROOT / CAUSE RC

When the workers fail to monitor the gas properly, it can cause a high risk to their health or the properties of the industry.

7. BEHAVIOR + ITS INTENSITY BE

- Using manpower as the source of monitoring the leakage causes high hazards.
- If the gas leak is heavily toxic, there is a chance of causing hereditary health issues too.

Focus on PR, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TO ACT TR

The heavy damage or higher health issues due to the toxic gases urges them to find a solution as soon as possible.

4. EMOTIONS BEFORE / AFTER EM

Before: The heavy losses due to the leakages made them feel of guilt due to reduced reputation of their products.
After: Increased the level of confidence and feel secured

10. YOUR SOLUTION SL

Develop an efficient system and an application that can monitor and alert the workers.

8. CHANNELS of BEHAVIOR CH

promoting it through social media. with the help of social media entrepreneurs and influencers.

through newspaper advertisements.

Extract online & offline CH of BE

4. REQUIREMENT ANALYSIS

4.1 Functional Requirement:

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Objectives	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

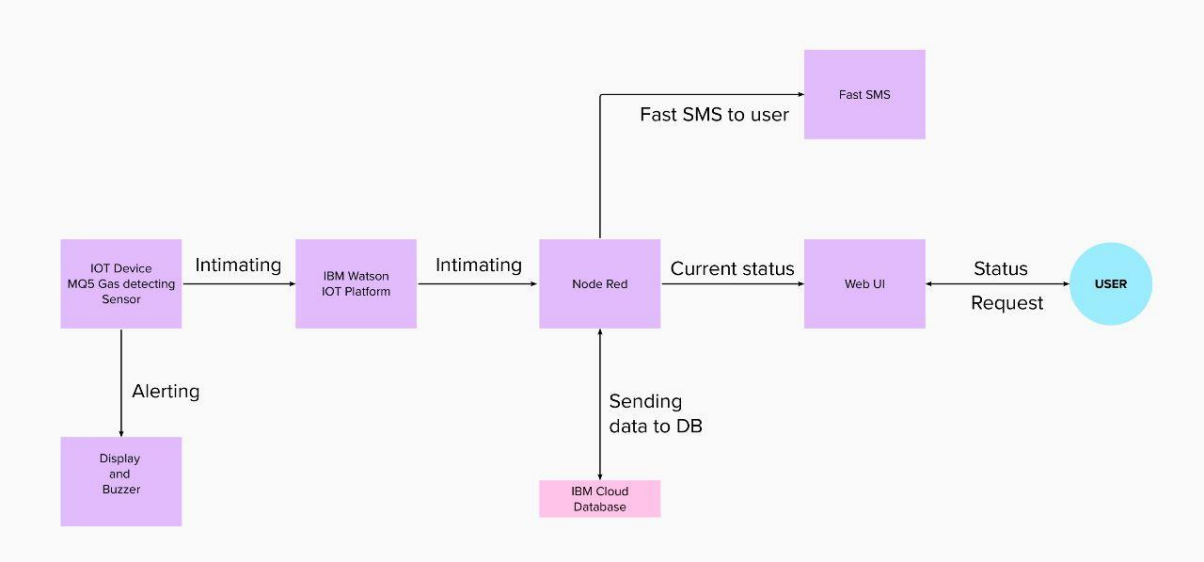
4.2 Non-Functional Requirement:

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

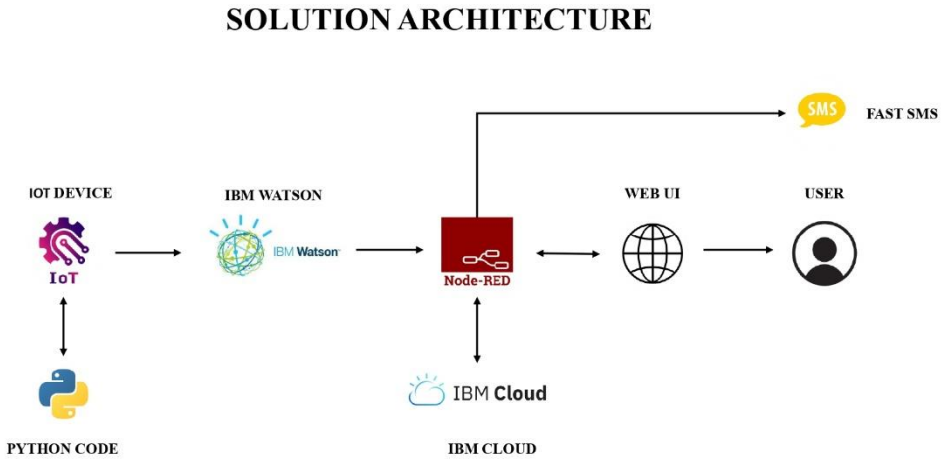
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The web application is simple and easy to use. Efficiency is high.
NFR-2	**Security**	The application runs accurately.
NFR-3	**Reliability**	The application can be accessed at anytime and anywhere.
NFR-4	**Performance**	It performs to detect the gas leakage and give alerting message to the user.
NFR-5	**Availability**	The web application is highly secure. Software is protected from unauthorized access.
NFR-6	**Scalability**	Application is not limited to the users.

5. PROJECT DESIGN

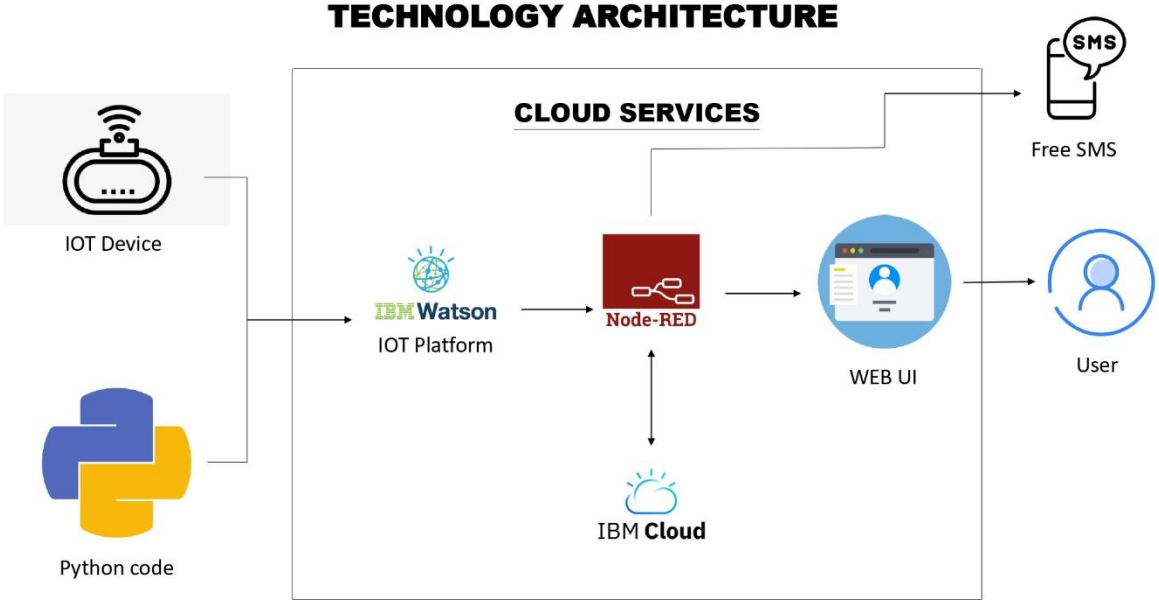
5.1 Data Flow Diagram:



5.2 Solution & Technical Architecture:



TECHNOLOGY ARCHITECTURE



5.3 User Stories:

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 email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
Customer (Mobile user)	Sign-in	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
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 by entering 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 see the information about their products	I can access the website through my account	Medium	Sprint -2
Customer (Web user)	Website	USN-7	As a user I can see the dashboard and login page in the right top	I can access the website and place order through login my user account	High	Sprint-1
Customer Care Executive	Website	USN-8	As a user I can contact the customer care through helpline or contact number given	I can get to contact to the customercare.	Medium	Sprint-2
Administrator	Service	USN-9	I can get reply from the adimistrator.	The administrator will solve the issues faced by me	High	Sprint-1

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning:

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	22 October 2022
Team ID	PNT2022TMID39307
Project Name	GAS LEAKAGE MONITORING & ALERTING SYSTEM
Maximum Marks	8 Marks

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

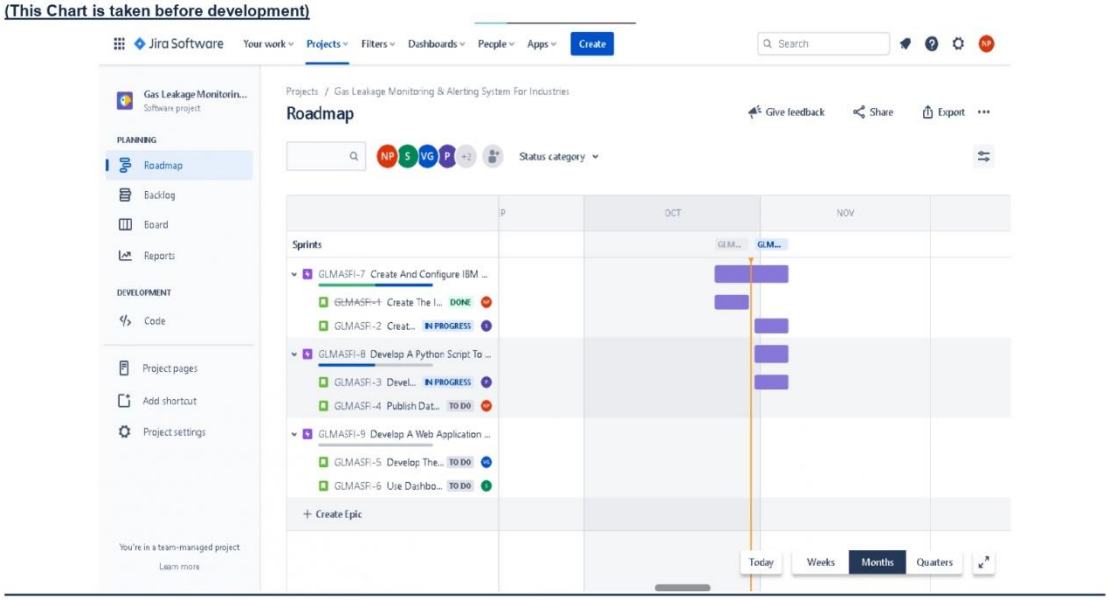
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

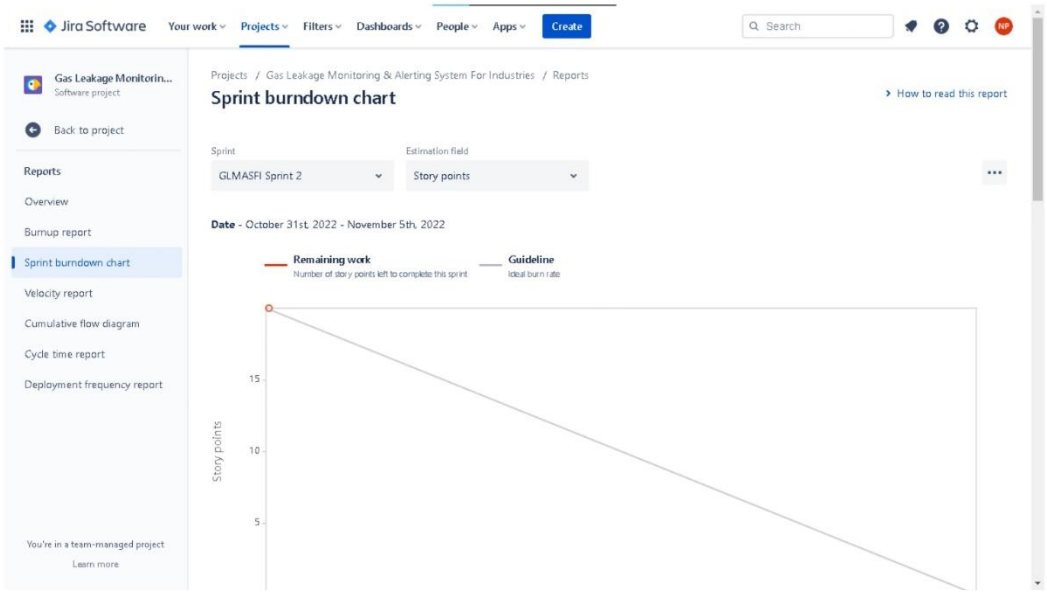
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

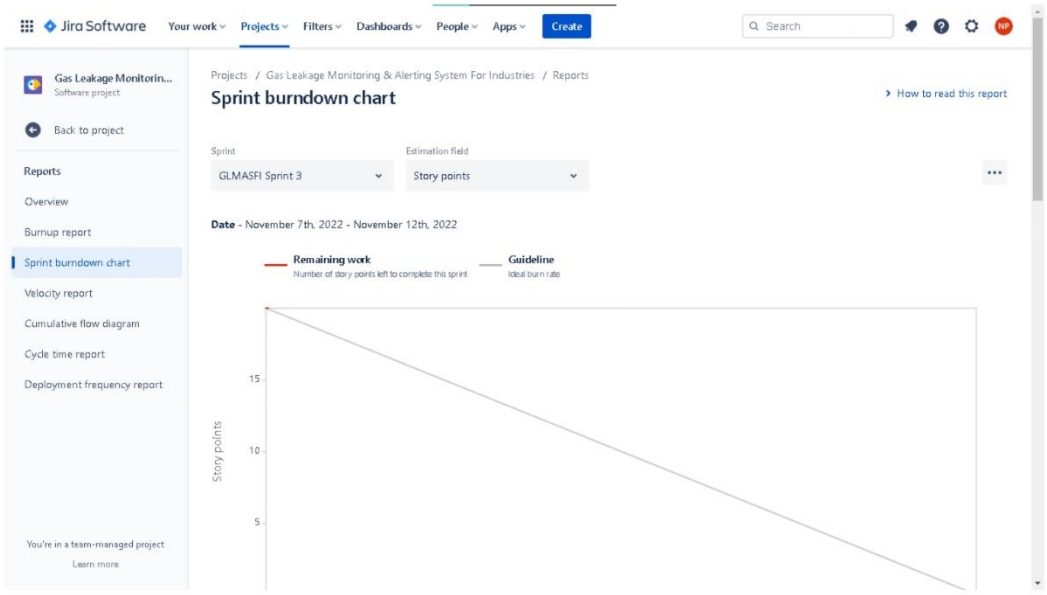
AV = Sprint duration/velocity = 20/6 = 3.33

Burndown Chart: A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

(This Chart is taken before development)




Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Gas Leakage Monitorin...
Software project
Back to project
Reports
Overview
Burnup report
Sprint burndown chart
Velocity report
Cumulative flow diagram
Cycle time report
Deployment frequency report
You're in a team-managed project
Learn more
Projects / Gas Leakage Monitoring & Alerting System For Industries / Reports
Sprint burndown chart
How to read this report
Sprint
GLMASFI Sprint 2
Estimation field
Story points
Date - October 31st, 2022 - November 5th, 2022
Remaining work
Number of story points left to complete this sprint
Guideline
Ideal burn rate
Story points
15
10
5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Software project
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Reports
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Sprint burndown chart
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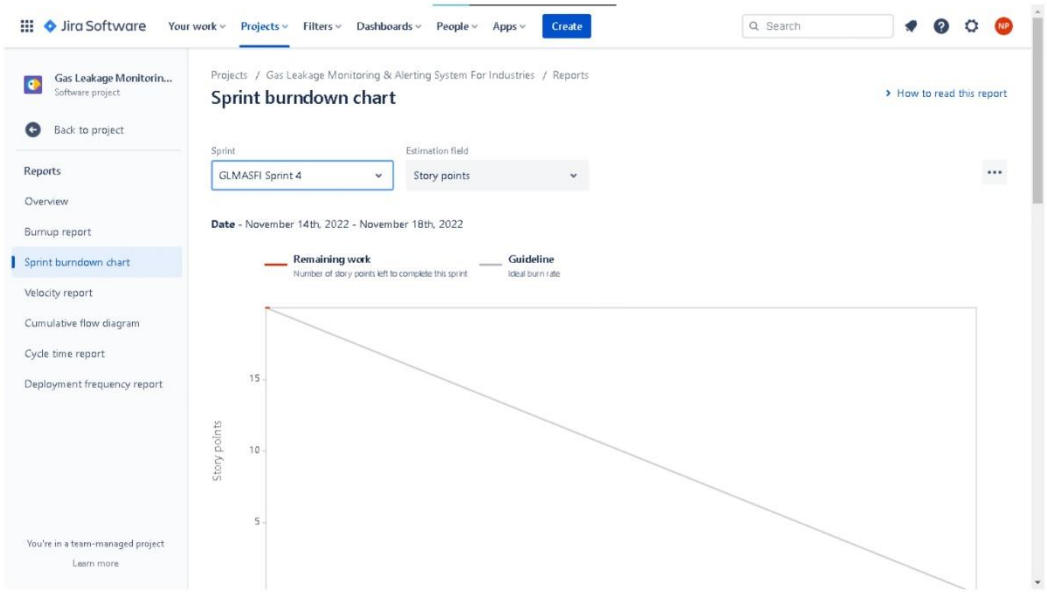
Cumulative flow diagram
Cycle time report
Deployment frequency report
You're in a team-managed project
Learn more
Projects / Gas Leakage Monitoring & Alerting System For Industries / Reports
Sprint burndown chart
How to read this report
Sprint
GLMASFI Sprint 3
Estimation field
Story points
Date - November 7th, 2022 - November 12th, 2022
Remaining work
Number of story points left to complete this sprint
Guideline
Ideal burn rate
Story points
15
10
5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Software project
Back to project
Reports
Overview
Burnup report
Sprint burndown chart
Velocity report
Cumulative flow diagram
Cycle time report
Deployment frequency report
You're in a team-managed project
Learn more
Projects / Gas Leakage Monitoring & Alerting System For Industries / Reports
Sprint burndown chart
How to read this report
Sprint
GLMASFI Sprint 4
Estimation field
Story points
Date - November 14th, 2022 - November 18th, 2022
Remaining work
Number of story points left to complete this sprint
Guideline
Ideal burn rate
Story points
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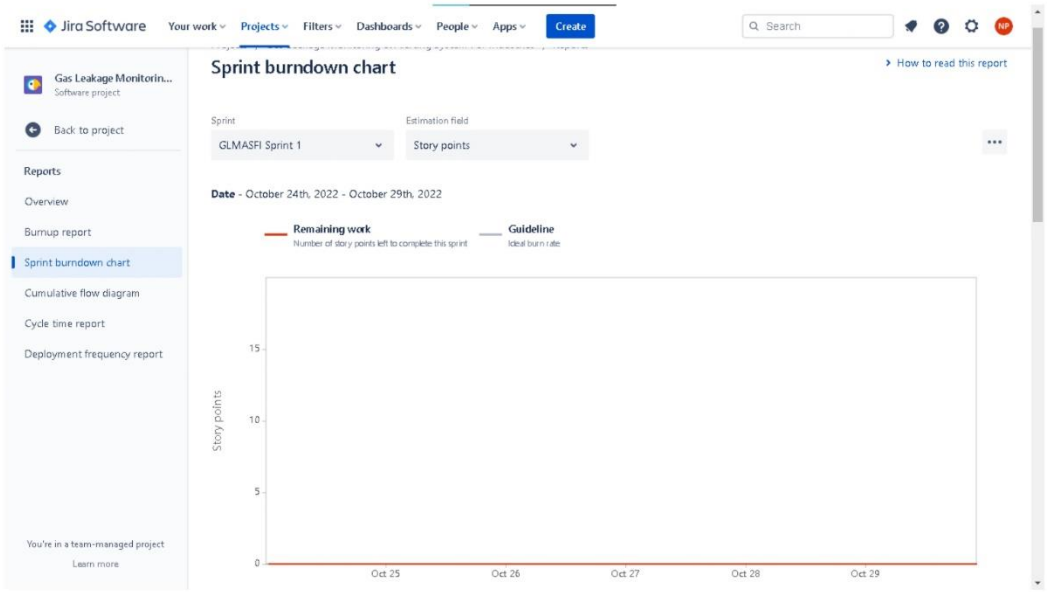
10
5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Your work
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Gas Leakage Monitorin...
Software project
Back to project
Reports
Overview
Burnup report
Sprint burndown chart
Cumulative flow diagram
Cycle time report
Deployment frequency report
You're in a team-managed project
Learn more
Sprint burndown chart
How to read this report
Sprint
GLMASFI Sprint 1
Estimation field
Story points
Date - October 24th, 2022 - October 29th, 2022
Remaining work
Number of story points left to complete this sprint
Guideline
Ideal burn rate
Story points
15
10
5
0
Oct 25
Oct 26
Oct 27
Oct 28
Oct 29

6.2 Sprint Delivery Schedule:

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	30 October 2022
Team ID	PNT2022TMID39307
Project Name	Project – Gas leakage monitoring and alerting system for industries
Maximum Marks	8 Marks

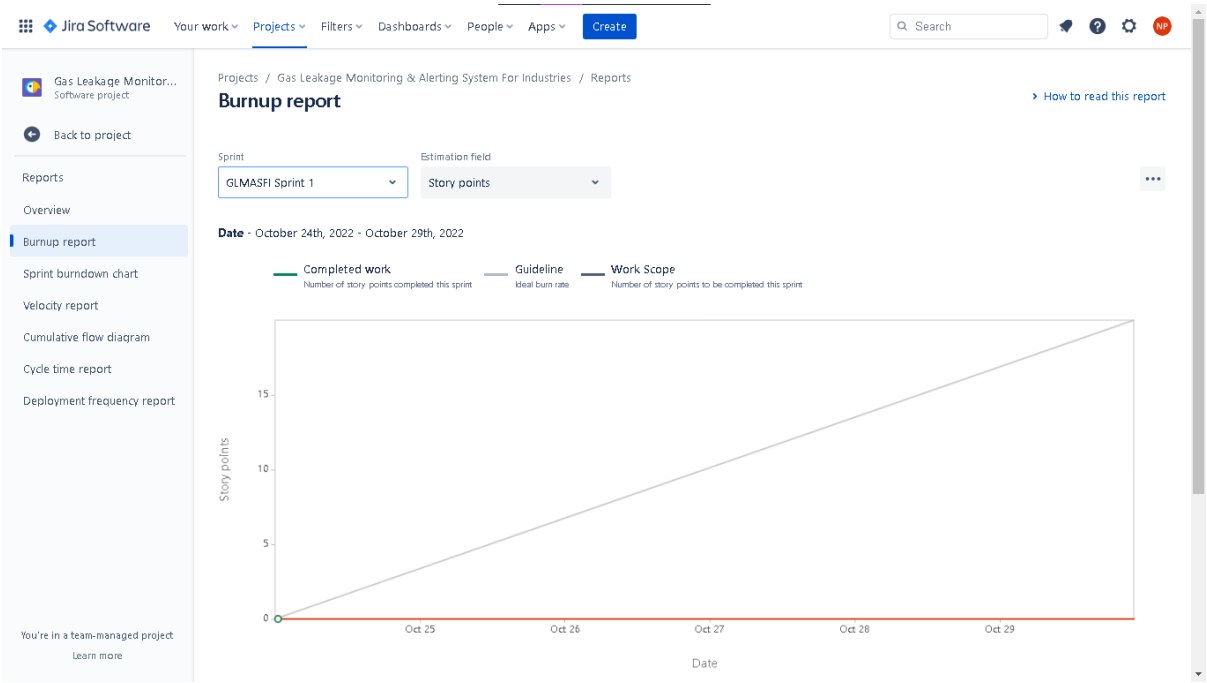
Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Sprint	Functional Requirement (Epic)	User Story Number	Task	Story Points	Priority	Team Members
Sprint-1	Create the IBM Watson IoT Platform and A Device	USN- 1	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials.	20	High	NITHISH KUMAR P
Sprint-2	Create Node-RED Service	USN- 2	To create a web application create a Node-RED service.	10	Medium	SURYA A
Sprint-2	Develop the Python Code	USN- 3	Develop a python script to send the random sensor data of Hazardous gas levels, temperature, humidity, pressure, etc.	10	Medium	SUBASHINI P
Sprint-3	Publish Data to The IBM Cloud	USN- 4	Python code is used to send random sensor data to the cloud and also to receive commands from the cloud. Below is the reference link provided for the python program to publish and subscribe from the IBM Watson IoT Platform.	10	High	NITHISH KUMAR P
Sprint-3	Develop the Web Application Using Node-RED	USN- 5	Configure the Node-RED flow to receive data from the IBM IoT platform. And also use Cloudant DB nodes to store the received sensor data in the cloudant DB	10	Medium	VISHAL GANDHI G
Sprint-4	Use Dashboard Nodes for Creating UI (Web App)	USN- 6	As a user, I need to access the website very quickly without registration / Create IBM Watson IOT Platform	10	Medium	SATHYA R

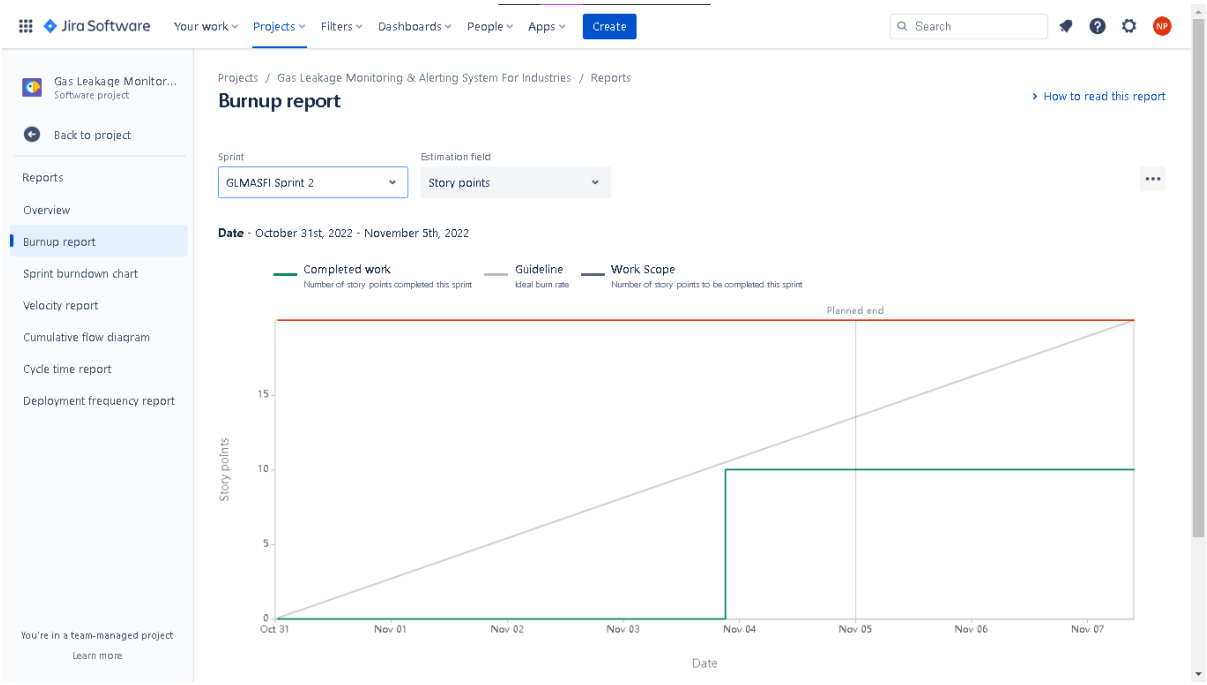
6.3 Reports from JIRA:

6.3.1 Burnup report:

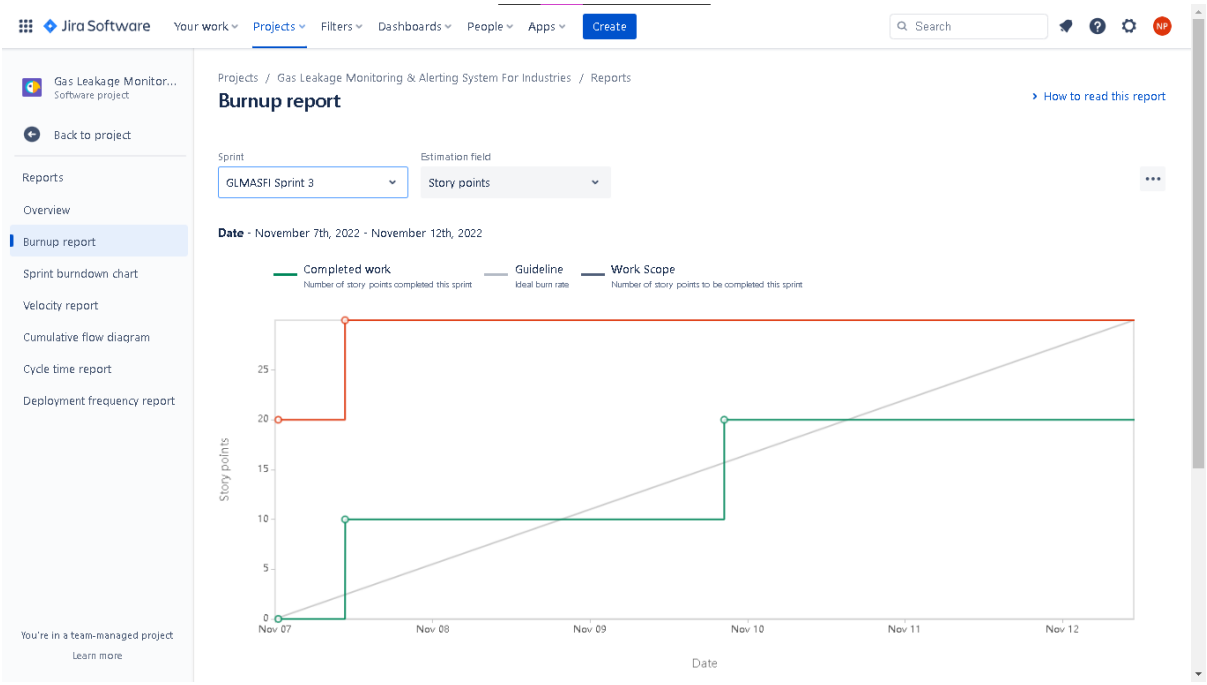
SPRINT 1



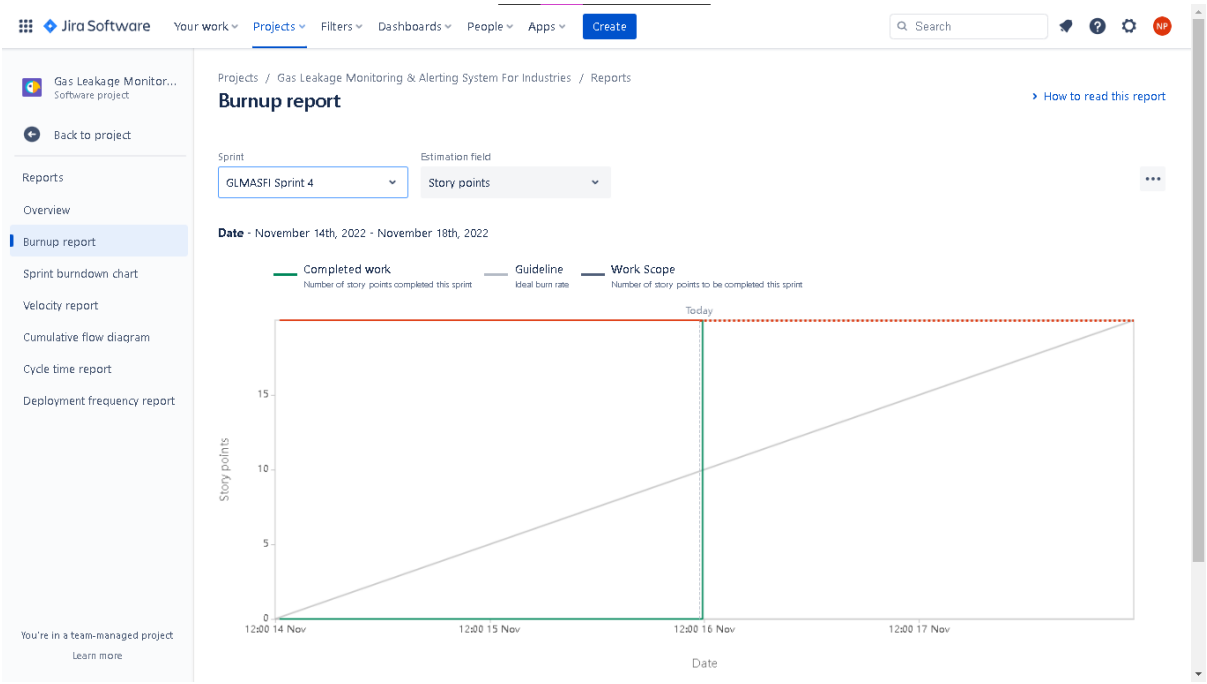
SPRINT 2



SPRINT 3

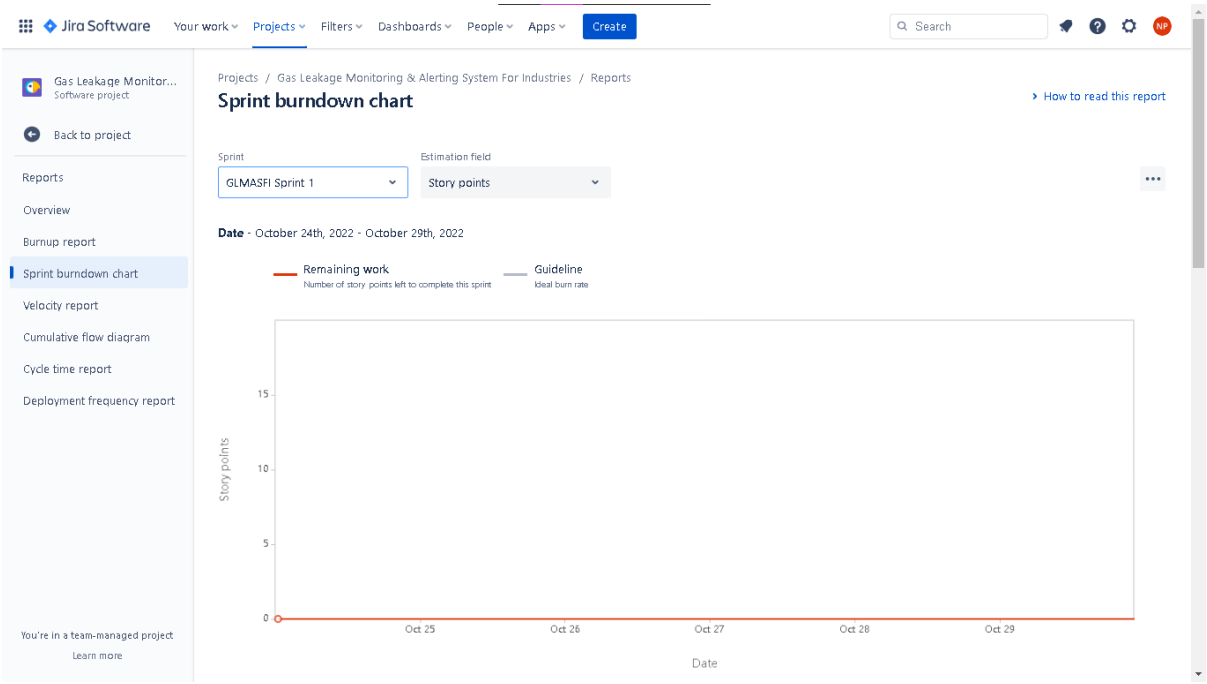


SPRINT 4

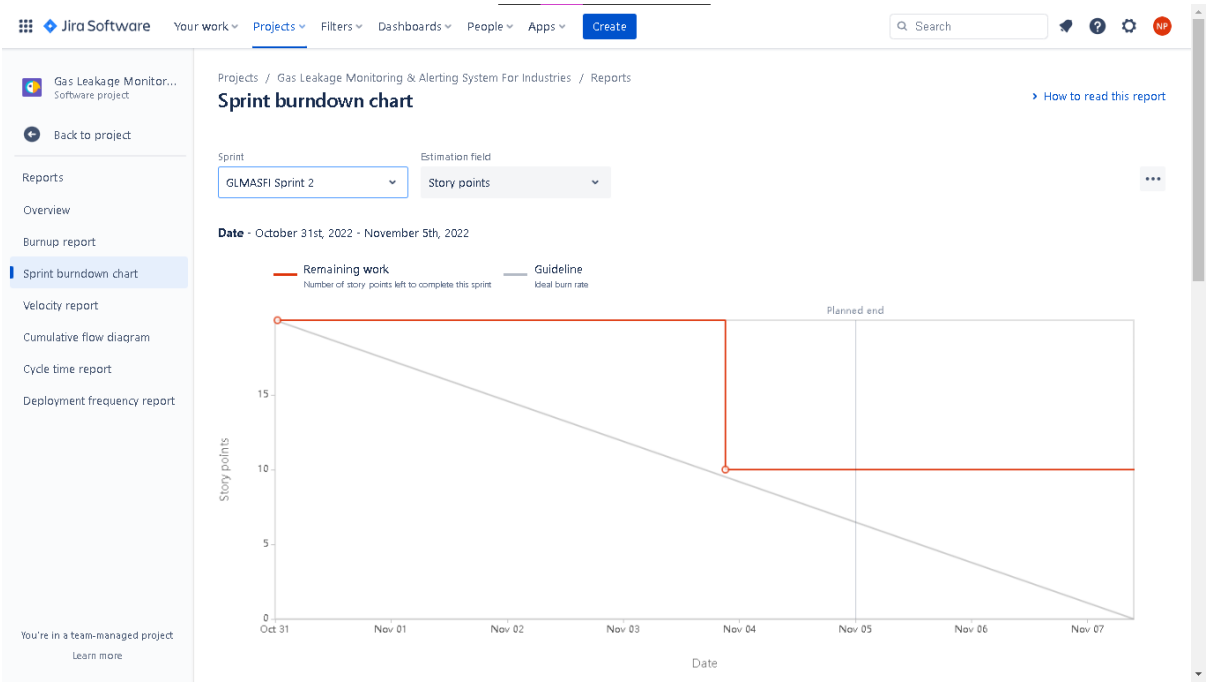


6.3.2 Sprint Burndown chart:

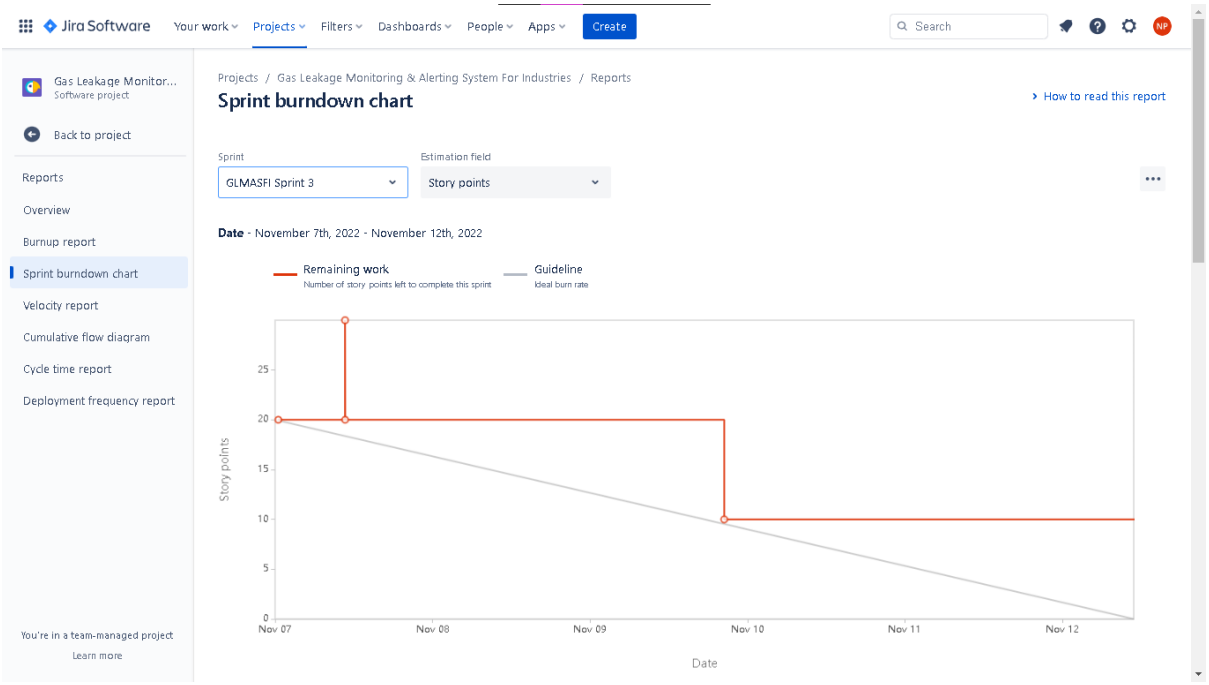
SPRINT 1



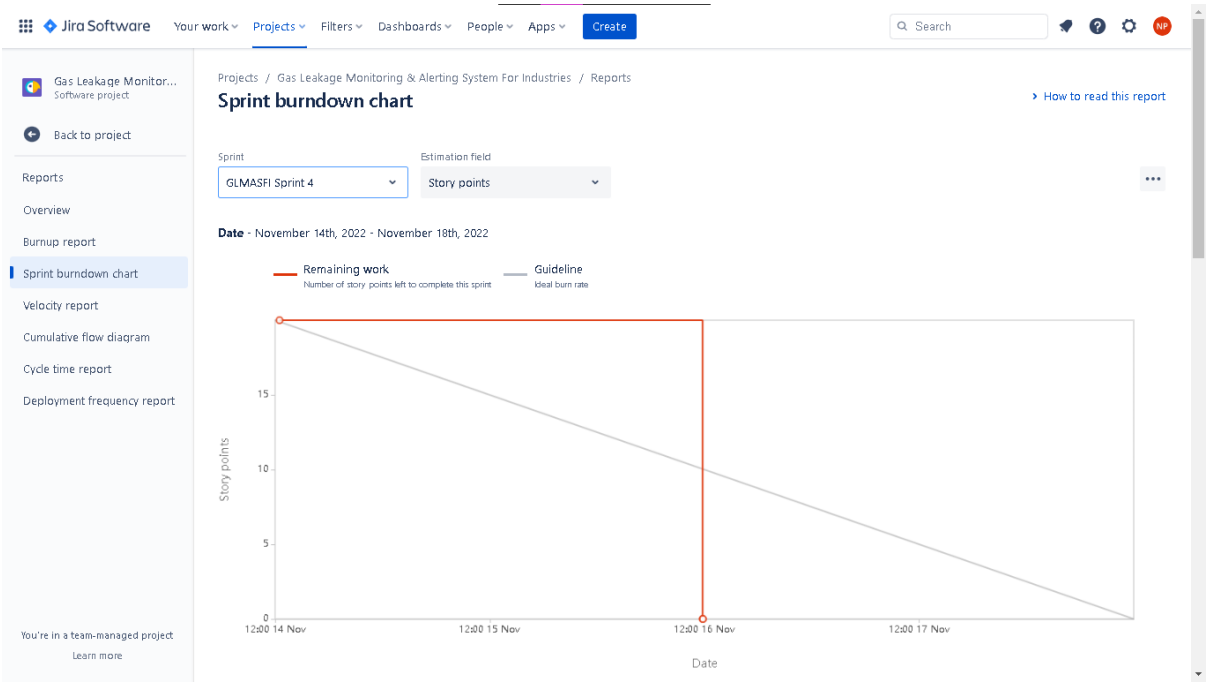
SPRINT 2



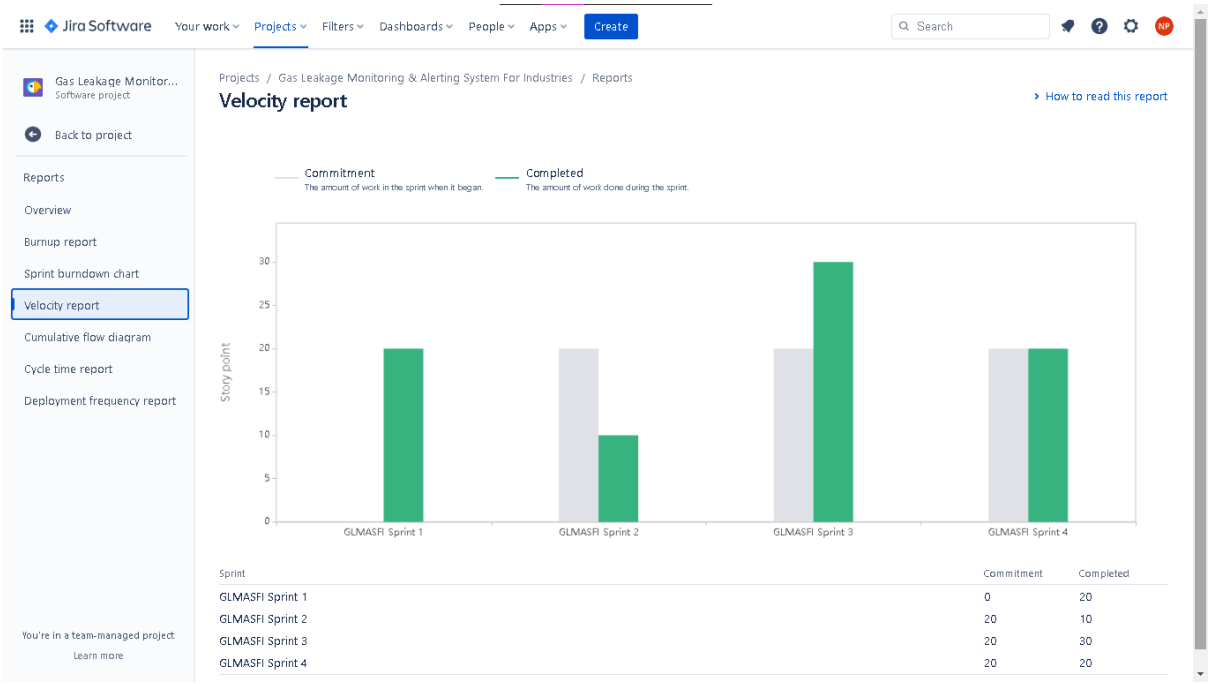
SPRINT 3



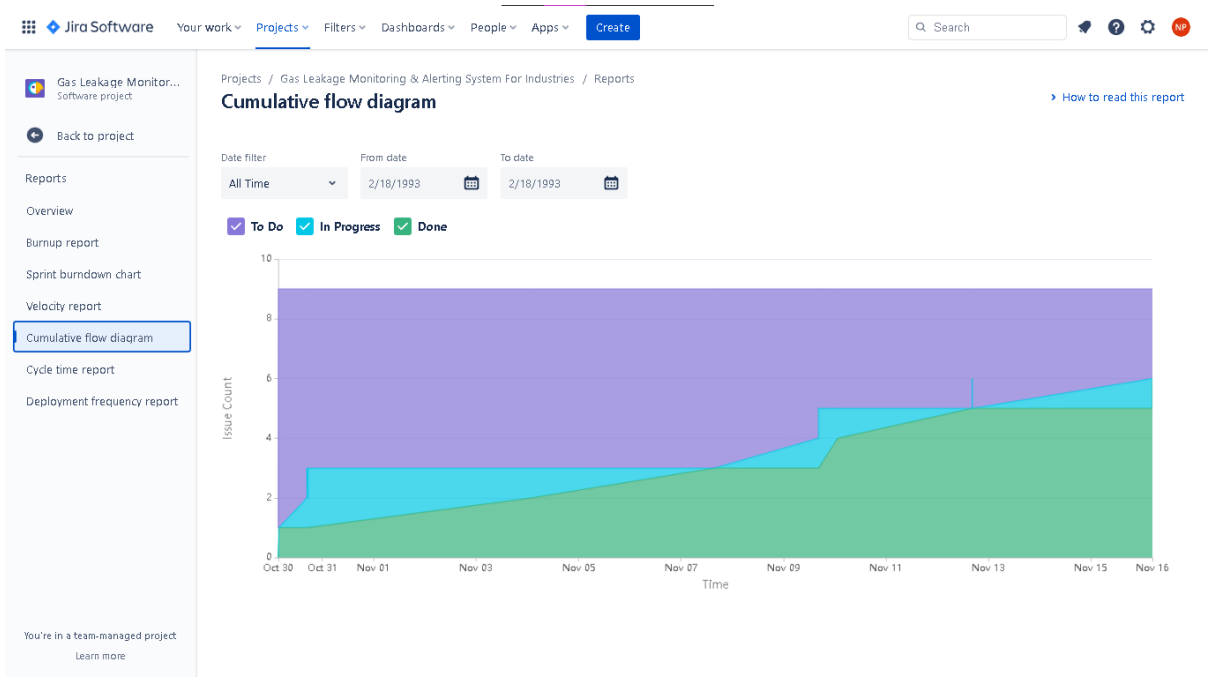
SPRINT 4



6.3.3 Velocity report:



6.3.4 Cumulative flow diagram:



7. CODING & SOLUTIONING

7.1 IOT 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.println(analogValue);
if(analogValue>sensorThresh)

{
  digitalWrite(redled,HIGH);
  digitalWrite(greenled,LOW);
  tone(buzzer,1000,10000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.println("WARNING");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("GAS IS LEAKING");
  delay(1000);
}

else

{
  digitalWrite(greenled,HIGH);
  digitalWrite(redled,LOW);
  noTone(buzzer);
  lcd.clear();
```

```
    lcd.setCursor(0,0);
    lcd.print("SAFE");
    delay(1000);
    lcd.clear();
    lcd.setCursor(0,1);
    lcd.print("ALL CLEAR");
    delay(1000);
  }
}
```

8. ADVANTAGES AND DISADVANTAGES

8.1 Advantages:

Gas Leakage detection systems are a great way to spend less time setting up and more time on the job. Many factories are required by law to have a gas detection system in place before work can begin. This is also true of drilling rigs. Hardwired gas detectors can take up to two weeks to implement and calibrate before any money can be made on the project. This is because wires have to be trenched in the ground and buried. Conversely, wireless detectors usually only take a few days at the most to set up. Wireless systems are also made to withstand a wider range of temperatures and weather changes. Hardwired systems sometimes tend to fail in particularly harsh winter climates; wireless detectors can withstand temperatures all the way down to -40 degrees Fahrenheit.

Wireless systems can also be connected to the Internet for available readings at any given time. This allows all safety managers to view gas levels at all points of the project. Systems of this nature are especially beneficial on work sites in which there have been previous accidents and leaks. It is also a great way to closely monitor confined spaces in which higher gas levels can nearly instantly turn the air into poison.

8.2 Disadvantages:

As for disadvantages to the gas leakage detection system, there don't seem to be many. Most users are perfectly happy with the service provided by their wireless system. Some complain that they need to be calibrated more often. This can add up if you are continually buying gas calibration kits. Additionally, the wireless system is not cheap. Anyone looking for an inexpensive detector to do the bare minimum of what is necessary under the law will not be happy with a wireless system. Safety is one of the most important aspects of running a business, especially one that encounters these types of dangers on a regular basis. If you are concerned about budget, a hardwired system will still get the job done.

All things considered, the reliability and real-time level monitoring provided by wireless gas detection systems makes them the top-of-the-line solution for gas leaks. The initial cost may be enough to deter you from pursuing this option, but consider what type of business you run. If you have a small confined space prone to frequent accidents, you will be glad you went with the wireless system. However, if your building is large and open-air, wired systems may be the better solution.

9. CONCLUSION

We have used the IOT technology to make a 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. This system will be able to detect the gas in environment using the gas sensors. This will prevent form the major harmful problem.

10. FUTURE SCOPE

A mobile gas sensing robot can be constructed to sense the leakage of gas through pipelines as the robot can move on a track which is situated along the length of the pipeline.

11. APPENDIX

```
#include <WiFi.h>
#include <PubSubClient.h>
#include "DHT.h"
#define DHTPIN 15
#define DHTTYPE DHT22
#define LED 2

DHT dht (DHTPIN, DHTTYPE);

void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);



#define ORG "tuh7yy"
#define DEVICE_TYPE "glmaas"
#define DEVICE_ID "12345"
#define TOKEN "12345678"
String data3;
float h, t;
```

```
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
char publishTopic[] = "iot-2/evt/Data/fmt/json";
char subscribetopic[] = "iot-2/cmd/command/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);



void setup()
{
  Serial.begin(115200);
  dht.begin();
  pinMode(LED,OUTPUT);
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();
}

void loop()
```

```
{

  h = dht.readHumidity();
  t = dht.readTemperature();
  Serial.print("temp:");
  Serial.println(t);
  Serial.print("Humid:");
  Serial.println(h);

  PublishData(t, h);
  delay(1000);
  if (!client.loop()) {
    mqttconnect();
  }
}

void PublishData(float temp, float humid) {
  mqttconnect();

  String payload = "{\"temp\":";
  payload += temp;
  payload += "," "\"Humid\":";
  payload += humid;
  payload += "}";
```

```
  Serial.print("Sending payload: ");
  Serial.println(payload);

  if (client.publish(publishTopic, (char*) payload.c_str())) {
    Serial.println("Publish ok");
  } else {
    Serial.println("Publish failed");
  }

}

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);
  if(data3=="lighton")
  {
Serial.println(data3);
digitalWrite(LED,HIGH);
  }
  else
  {
Serial.println(data3);
digitalWrite(LED,LOW);
  }
data3="";
}
```

GitHub Link :

https://github.com/IBM-EPBL/IBM-Project-31543-1660202147

Project Demo Link :

https://drive.google.com/file/d/1aCWuPZQkeIrJYeY1c5H3bDJ6Oz6s4V2t/view?usp=share_link