PROJECT REPORT

Project Name **Gas Leakage monitoring & Alerting system for Industries**

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INTRODUCTION

Gas Leakage monitoring & Alerting system for Industries

The Internet of Things is a developing theme of specialized, social, and monetary centrality. Customer items, tough goods, cars and trucks, modern and utility segments, sensors, and other regular articles are being joined with Internet availability and amazing information systematic capacities that guarantee to change the manner in which we work, live, and play. Projections for the effect of IoT on the Internet and economy are amazing, with some foreseeing upwards of 100 billion associated IoT gadgets and a worldwide financial effect of more than $11 trillion by 2025. The Internet of Things (IoT) is an essential theme in innovation industry, strategy, and designing circles . This innovation is encapsulated in a wide range of arranged items, frameworks, and sensors, which exploit headways in processing power, gadgets scaling down, and organize interconnections to offer new capacities. The expansive scale usage of IoT gadgets guarantees to change numerous parts of the manner in which we live. For shoppers, new IoT items like Internet-empowered machines, home mechanization parts, and vitality the executive's gadgets are pushing us toward a dream of the "savvy home", offering greater security and vitality effectiveness. IoT frameworks like arranged vehicles, savvy traffic frameworks, and sensors implanted in streets and scaffolds draw us nearer to "brilliant urban areas", which help limit clog and vitality utilization. IoT innovation offers the likelihood to change horticulture, industry, and vitality creation and dissemination by expanding the accessibility of data along the esteem chain of generation utilizing arranged sensors.

Project Flow:

1. The parameters like temperature, humidity, and soil moisture are updated to the Watson IoT platform.
2. The device will subscribe to the commands from the mobile application and control the motors accordingly.
3. APIs are developed using Node-RED service for communicating with Mobile Application.
4. A mobile application is developed using the MIT App inventor to monitor the sensor parameters and control the motors.

To accomplish this, we have to complete all the activities and tasks listed below:

1. Create and configure IBM Cloud Services
2. Create IBM Watson IoT Platform
3. Create a device & configure the IBM IoT Platform
4. Create Node-RED service
5. Create a database in Cloudant DB to store all the sensor parameters
6. Develop a python script to publish and subscribe to the IBM IoT platform
7. Configure the Node-RED and create APIs for communicating with mobile application
8. Develop a mobile application to display the sensor parameters and control the motors

LITERATURE SURVEY:

1.Gas leakage detection and alerting system using Arduino Uno

Shahewaz, Syeda Bushra, and Ch Rajendra Prasad. "Gas leakage detection and alerting system using Arduino Uno." *Global Journal of Engineering and Technology Advances* 5.3 (2020): 029-035.

2. Sensor-Based Gas Leakage Detector System

Khan, Mohammad Monirujjaman. "Sensor-based gas leakage detector system." *Engineering Proceedings* 2.1 (2020): 28.

IDEATION PHASE:

REFER:
https://github.com/IBM-EPBL/IBM-Project-20375-1659718101/blob/main/IdeationPhase/ideation.png

BRAINSTORMING:
https://github.com/IBM-EPBL/IBM-Project-20375-1659718101/blob/main/IdeationPhase/Brainstorm%20and%20idea%20map%20-%20Pranav.pdf

EMPATHY MAP:
https://github.com/IBM-EPBL/IBM-Project-20375-1659718101/blob/main/IdeationPhase/Empathy%20map1.png

PROBLEM SOLUTION FIT:

https://github.com/IBM-EPBL/IBM-Project-20375-1659718101/blob/main/PROJECT%20DESIGN%20PHASE-1/Problem%20Solution%20Fit%20(1).pdf

FUNCTIONAL REQUIREMENT:

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR NO.	Functional Requirement(Epic)	Sub Requirement(Story/Sub-Task)
FR-1	Monitoring	Level of gas is monitored using sensor and if there is any leakage, alert can be sent through messages and with a buzzer sound.
FR-2	User Reception	The data like the level of gas in environment can be send through messages
FR-3	User Understanding	The user can monitor the level of gas with the help of the data. If there is an increase in gas level then the alert will be given by message or buzzer sound.
FR-4	User Performance	When the user gets notified, they could take precaution steps like turning the gas off, turn on the exhaust fan/sprinkler to avoid accidents.

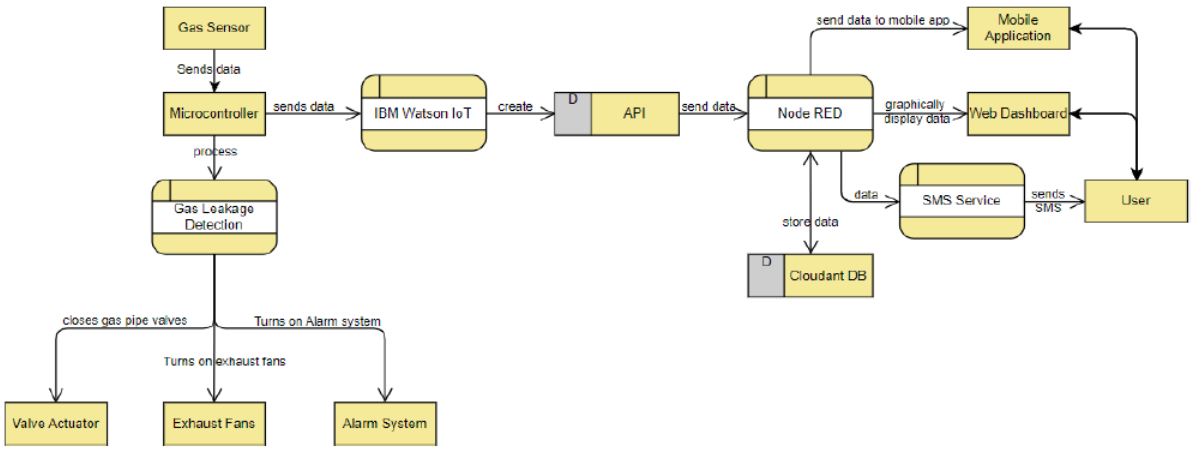
Non-Functional Requirements:

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

NFR NO.	Non-Functional	Requirement Description
NFR-1	Usability	It updates the data regularly as well as protects the workers.
NFR-2	Security	As a result of emergency alert, we can be able to protect both the humans and properties. Precaution steps could be taken.
NFR-3	Reliability	Can be able to provide accurate values. It might have a capacity to recognize the smoke accurately and does not give a false
NFR-4	Performance	Sprinklers and exhaust fans are used in case of emergency
NFR-5	Availability	It can be used everyday, it includes day and nights.
NFR-6	Scalability	Sensors can be replaced every time it fails

PROJECT DESIGN AND PLAN:

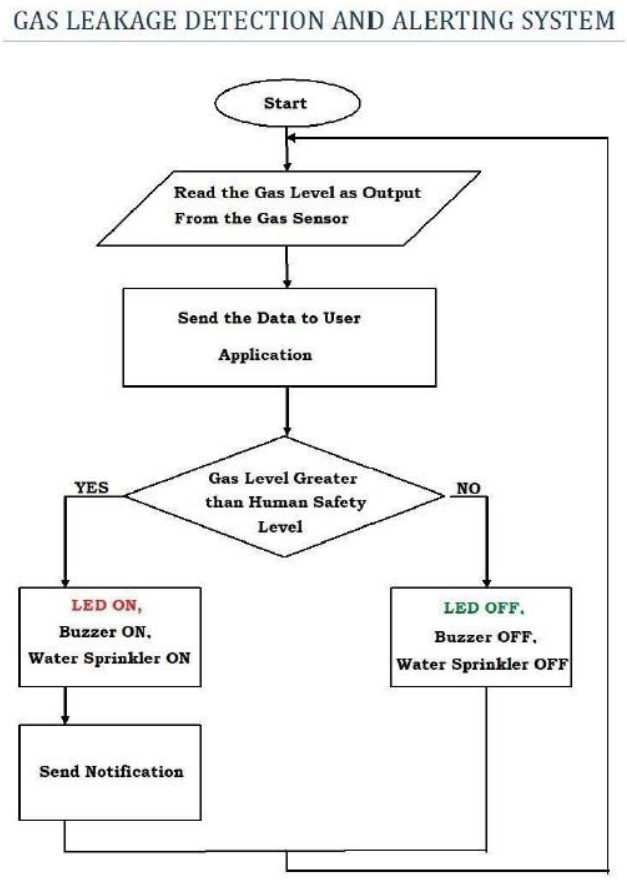
Data Flow Diagram:



User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Industry owner)	*Registration*	*USN-1*	*As a user, I can register for the application by entering my email, password, and confirming my password.*	*Register to the application by email and password with password confirmation.*	*High*	*Sprint-1*
Customer (Industry Owner)	*Confirmation*	*USN-2*	*I will receive confirmation email once Ihave registered for the application*	*Receive confirmation email & click confirm*	*High*	*Sprint-1*
Customer (Industry Owner)	*Authorize*	*USN-3*	*As a user, I will enable the supervisor to monitor the gas leakage system status.*	*Provide access to supervisor.*	*High*	*Sprint-1*
Customer (Supervisor)	*Login*	*USN-4*	*As a user, I can log into the application by entering email &password.*	*Get access to dashboard.*	*High*	*Sprint-1*
Customer (Supervisor)	*Monitor*	*USN-5*	*As a user, I can monitor the status of the gas leakage system.*	*Status of gas leakage system.*	*High*	*Sprint-1*
Customer (Line Workers)	*Notification*	*USN-6*	*As a user, I can get (alarm system) alert about gas leakage.*	*Get alert about gas leak.*	*Medium*	*Sprint-2*
Customer (Supervisor)	*Notification*	*USN-7*	*As a user, I can get SMS notification & alarming alert about gas leakage.*	*Get alert about gas leakage.*	*Medium*	*Sprint-2*
Customer (Industry Owner)	*Sign-Up*	*USN-9*	*As a user, I can sign-up using Facebook login.*	*I can sign-up with the application using Facebook.*	*Low*	*Sprint-3*
Customer (Supervisor)	*Sign-Up*	*USN-10*	*As a user, I can sign-up using Google login.*	*I can sign-up with the application Google using.*	*Low*	*Sprint-3*
Administrator	*Service Request*	*USN-11*	*As a user, I can request for service in case of any issue with gas leakage monitoring system*	*Get service from provider*	*Low*	*Sprint-3*
Administrator	*Increase dservice*	*USN-12*	*As a user, I can request for scaling up the gas leakage monitoring system.*	*Get service from the provider.*	*Low*	*Sprint-4*
Customer (Industry Supervisor)	*Leakage detection*	*USN-13*	*Look for gas leakage in any other container*	*Access the monitor Display*	*High*	*Sprint-1*

Flow Chart


GAS LEAKAGE DETECTION AND ALERTING SYSTEM
Start
Read the Gas Level as Output From the Gas Sensor
Send the Data to User Application
Gas Level Greater than Human Safety Level
YES
NO
LED ON,
Buzzer ON,
Water Sprinkler ON
LED OFF,
Buzzer OFF,
Water Sprinkler OFF
Send Notification

PROJECT PLANNING AND SCHEDULING:

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

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Hardware and Software	USN-1	Sensors without wifi - Simulation.	2	High	Yashwanth, Prasanth, Arun Prakash, Mugilan
Sprint-2	Software	USN-2	IBM Watson IoT platform, Workflows for IoT scenarios using Node-red	2	High	Yashwanth, Prasanth, Arun Prakash, Mugilan
Sprint-3	MIT app	USN-3	To develop an mobile application using MIT	2	High	Yashwanth, Prasanth, Arun Prakash, Mugilan
Sprint-4	WebUI	USN-4	To make the user to interact with software.	2	High	Yashwanth, Prasanth, Arun Prakash, Mugilan

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		5thNOV 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		12thNOV 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		14thNOV 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)

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

CODING AND SOLUTIONING:

To make the user to interact with software:

Receiving commands from IBM cloud using Python program:

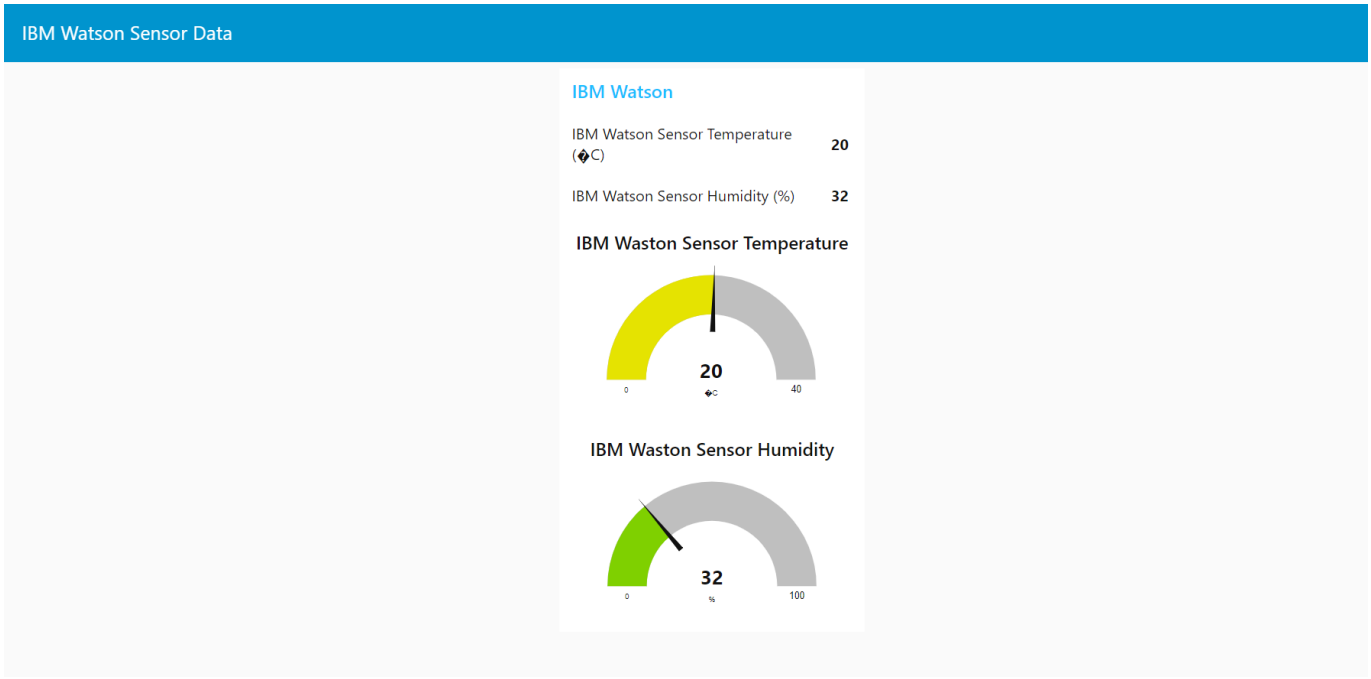
```
#IBM Watson IOT Platform
#pip install wiotp-sdk
import wiotp.sdk.device
import time
import random
myConfig = {
    "identity": {
        "orgId": "wv4o8f",
        "typeId": "NodeMCU",
        "deviceId":"12345"
    },
    "auth": {
        "token": "123456789"
    }
}

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(20,25)
    hum=random.randint(0,50)
    myData={'temperature':temp, 'humidity':hum}
    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()
```

USER INTERFACE – WEB APPLICATION:



The purpose of this document is to briefly explain the test coverage and open issuesof the Gas leakage detection and alerting system using Arduino Uno Application project at the time of the release to User Acceptance Testing (UAT).

1. Defect Analysis

This report showsthe number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

2. Test Case Analysis

This report shows the number of test cases that have passed, failed,and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

FEATURES:

- Comparative real time data from the internet
- Visual graph for easier understanding
- Separate tab for motor control and voice alert on commands
- SMS notification once the value falls below the threshold limit.

Advantages & Disadvantages

Advantages:

• • The sensor-enabled solution helps prevent the high risk of gas explosions and affecting any casualties within and outside the premises.

• • Increase in convenience.

• • Less labour cost.

• • Better standards of living.

Disadvantages:

• Lack of internet/connectivity issues.

• Added cost of internet and internet gateway infrastructure.

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 massage 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 [13]. The main advantage of this system is that it off the regulator knob of the cylinder automatically when gas leakage detected.

Github link https://github.com/IBM-EPBL/IBM-Project-20375-1659718101

Demo Video link:
https://drive.google.com/file/d/1T_q4EgM7bOcwV_xlxQqfc3TZywgDDley/view?usp=sharing