GAS LEAKAGE MONITORING AND ALTERING AND SYSTEM FOR INDUSRIES

Date	25 November 2022
Team ID	PNT2022TMID47518
Project Name	Project – IOT based gas leakage monitoring and altering system for industries
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Team Members	G.Hemavathi, G.Priyadharshini, P.Sumithra,G.Veerapandi

ABSTRACT:

Internet of Things (IOT) is the networking of 'things' by which physical things can communicate with the help of sensors, electronics, software, and connectivity. These systems do not require any human interaction. Internet of Things aim towards making life simpler by automating every small task around us. As much is IOT helping in automating tasks, the benefits of IOT can also be extended for enhancing the existing safety standards. Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system can also be used in homes and offices. 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. Therefore we have used the IOT technology to make a Gas Leakage Detector for society which having Smart Alerting techniques involving sending.

INTRODUTION:

The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play.

Projections for the impact of IO T on the Internet and economy are impressive, with some anticipating as many as 100 billion connected IO T devices and a global economic impact of more than $11 trillion by 2025. The Internet of Things (IO T) is an important topic in technology industry, policy, and engineering circles. This technology is embodied in a wide spectrum of networked products, systems, and sensors, which take advantage of advancements in computing power, electronics miniaturization, and network interconnections to offer new capabilities. The large-scale implementation of IO T devices promises to transform many aspects of the way we live For consumers, new I O T products like Internet-enabled appliances, home automation components, and energy management devices are moving us toward a vision of the " smart home'' , offering more security and energy efficiency. IO T systems like networked vehicles, intelligent traffic systems, and sensors embedded in roads and bridges move us closer to the idea of " smart cities'' , which help minimize conge stion and energy consumption. IO T technology offers the possibility to transform agriculture, industry, and energy production and distribution by increasing the availability of information

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LITERATURE SURVEY:

A number of reviews on the subject of gas leakage detection techniques were done in the past either as part ofresearch papers/technical reports on a certain leak detection method and other gas related subjects

A.Mahalingam,r.T. Naayagi,n.E. Mastorakis ; they introduce design and implementation of an economic gasleakage detector. They gave the formulation of many problems in previous gas leakage detectors. They toldthatseveral standards have been formulated for the design of a gas leakage detection system such as IEEE, BS5730and IEC.For this work, the recommended UK safety standards have been adopted. The proposed alarmsystemismainly meant to detect LPG leakage, which is most commonly used in residential and commercial premises. Thesystem detects not only the presence of gas (gas leak), but also the amount of leakage in the air, and accordinglyraises an appropriate audio visual alarm. The objective of the system is to detect LPG gases such as propane andbutane. The allowed UK level for butane is 600 ppm above which it is considered to be of high level and poses adanger. The proposed system ensures a continuous monitoring of the gas levels. If the gas level increases above the normalthreshold level of 400 ppm butane (LPG), the system starts to issue early warning alarms at 100ms interval, whichimplies low level gas leakage. If the leakage level increases to 575 ppm of butane (LPG), the systemactivates highseverity audio alarms at 50 ms intervals warning the occupants to run to safety.

P.Meenakshi Vidya, S.Abinaya, G.Geetha Rajeshwari, N.Guna," Automatic LPG detection and hazardcontrolling" published in April 2014 published in April 2014 proposed the leakage detection and real time gasmonitoring system. In this system, the gas leakage is detected and controlled by means of exhaust fan. The level ofLPG in cylinder is also continuously monitored.

Pal-Stefan Murvaya, Ioan Sileaa, 2008, they told in their survey on gas leak detection and localization techniquesvarious ways to detect the gas leakage. They introduce some old or new technique to detect the gas. The proposedtechniques in their paper are nontechnical methods, hardware-based methods which include acoustic methods, optical methods and active methods.
In their survey they told a wide variety of leak detecting techniques is availablefor gas pipelines. Some techniques have been improved since their first proposal and some new ones were designedas a result of advances in sensor manufacturing and computing power. However, each detection method comes withits advantages and disadvantages. Leak detection techniques in each category share some advantages anddisadvantages. For example, all external techniques which involve detection done from outside the pipeline by visual observationorportable detectors are able to detect very small leaks and the leak location, but the detection time is verylong. Methods based on the mathematical model of the pipe have good results at high flow rates while at lowflowrates amass balance-based detection system would be more suitable. This disadvantage is prone to disappear for someofthese techniques due to forthcoming technological advancements.[3]

Srinivasan,Leela,Jeyabharathi, Kirthik,Rajasree; in this research paper they told about gas leakage detectionandcontrol. In this paper, the gas leakage resulting into fatal inferno has become a serious problemin householdandother areas wherehousehold gas is handled and used. It alerts the subscriber through the alarm and the status displaybesides turning off the gas supply valve as a primary safety measure. [4]

Falohun A.S., Oke A.O., and Abolaji B.M. 2016, in this paper they proposed their dangerous gasdetection using an integrated circuit and MQ-9. In this basically, they used an embedded design whichincludes typical input and output devices include switches, relays, solenoids, LEDs, small or customLCDdisplays, radio frequency devices, and sensors for data such as temperature, humidity, light level etc. Embedded systemsusually have no keyboard, screen, disks, printers, or other recognizable I/O devices of a personal computer, andmaylack human interaction device. The amount and type of detectors and the type of fire alarm systemthat one choosesfor property protection will depend on the owner' s property protection goals, the value of the property andtherequirements of the owner' s insurance company. Generally, heat detection will be used in all areas that are not considered high value. Here again, one of the mostcommon mistakes in fire alarm generally, heat detection will be used in all areas that are not considered high value. Here again, one of the most common mistakes in fire alarm system application is to provide partial protectionof abuilding and expect high performance from the installed systems of any kind.System application is to provide partialprotection of a building and expect high performance from the installed systems of any kind. [5]

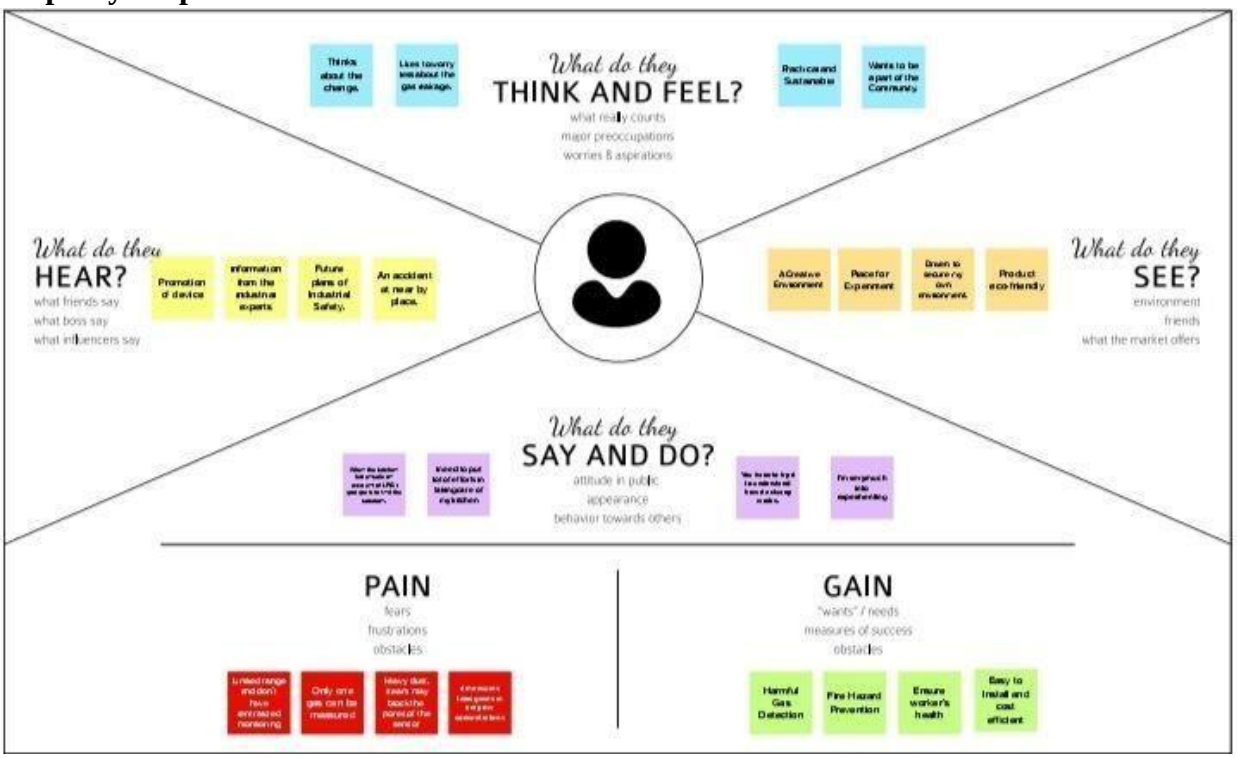
Hina Ruqsar, Chandana R , Nandini R , Dr. T P Surekha , have proposed a system that along withmonitoring and detection of gas leakage, real time data is made available through real time feed overinternet They have used Xively IOT platform to provide real time sensor data over the internevalue chain of production using networked sensors.

CONSLUSION:

Internet of Things is a new revolution of the Internet & it is a key research topic for researcher inembedded, computer science & information technology area due to its very diverse area of application &heterogeneous mixture of various communications and embedded technology in its architecture. In ourmodern scenario the usage of LPG has increased in a greater manner. As a result of this,the damagescaused by the leakage of gas is increasing day by day. So as to eradicate this problems we are introducinghighly advanced system known as Internet Of Things(IOT) . It is used in wide range of applications inpresent day society and introducing a vast scope to the future. Our proposed system is more effective andeco friendly due to the reason of detecting the leakage of gas and controlling the gas valve. So it is mainlydesigned for the safety of people and property. Using IOT ,it also allows us to book the gas from the gasagency ,when the weight of the gas cylinder reduces below a threshold value .Thus people could easilyuse their time effectively. It also uses to alert the consumers about the wastage of gas while removing theutensils from the burner by using an object detection sensor

Ideation Phase
Empathize & Discover

Empathy Map Canvas:



Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No	Parameter	Description
1	Problem Statement (Problem to be solved)	In the project helps the industries identify the gas leakage They have certain weakness that make the glass leakage occur. This system will help to detect the presence of gas leakage.
2.	Idea / Solution description	The gas detection sensors are installed strategically on different location for real time monitoring. A gas monitoring solution not only detects toxic gases but also identifies changes in air quality.
3.	Novelty / Uniqueness	The device is user friendly Design novelty correlates mainly to the purpose and context of the produced combinations. Novelty is aided by little not by briefs.

4.	Social Impact / Customer Satisfaction	• The statistics underscore the challenge of producing quality vehicles while satisfying customer. • That product quality and customer satisfaction associated with the cost and safety. • Workers with irrespective of fear of gas leakage.
5.	Business Model (Revenue Model)	• As the product usage can be understood by everyone, it is easy for them to use it properly for their safest organization.
6.	Scalability of the Solution	• Gas leakage is more sensitivity and accuracy for the workers efficiency.

Project Design Phase-I - Solution Fit

Define CS, fit into CC	CS **1. CUSTOMER SEG-MENT(S)** Most of the Industry workers are Engaged with gases related production.	CC **6. CUSTOMER CON-STRAINTS** It measures a toxic gasesin very low concentrations has ability to detect wide level of gas.	AS **5. AVAILABLE SO-LUTIONS** Real time gas monitors can overcome delayed response times to such gas leaks. Test benches, quick connectors, leak tester, are some of the available solutions.	Differentiate **Explore AS and**

J&P, tap into BE, understand RC

Focus on

2. JOBS-TO-BE-DONE / PROBLEMS

J&P

Once before the gas is released it should be undergone several methods to remove the toxic present in gas. The gas level is rises above a certain level , it is important to raise an alarm. IOT can be used to continuously monitoring gas leaks on a large scale from a great distances.

9. PROBLEM ROOT CAUSE

RC

Burning natural gas produces nitrogen oxide, carbon monoxide, and methane. Even the though get our end products or needful chemical solutions.

7. BEHAVIOUR

Calculate usa
benefits of the system.
product will sell to the c
by the project clients.
customer volunteer work

Identity strong TR & EM

3. TRIGGERS TR

This kind of device is very Important because their may many gases that are harmful to organic life. Reviews or feedback from workers.

4. EMOTIONS: BEFORE / AFTER EM

Before
When they face a problem to feel discomfort , confused.

After
The endpoint will regain their confidence, gives happiness and feels gratitude towards it.

10. YOUR SOLUTION SL

This application is developed to notify workers by SMS alert and buzzer beep sound in emergency areas. Alarm will be set on so that the workers can know about the leak and run into a safe place.

8. CHANNELS OF BEHAVIOUR CH

Online
Using the social medias for publish.

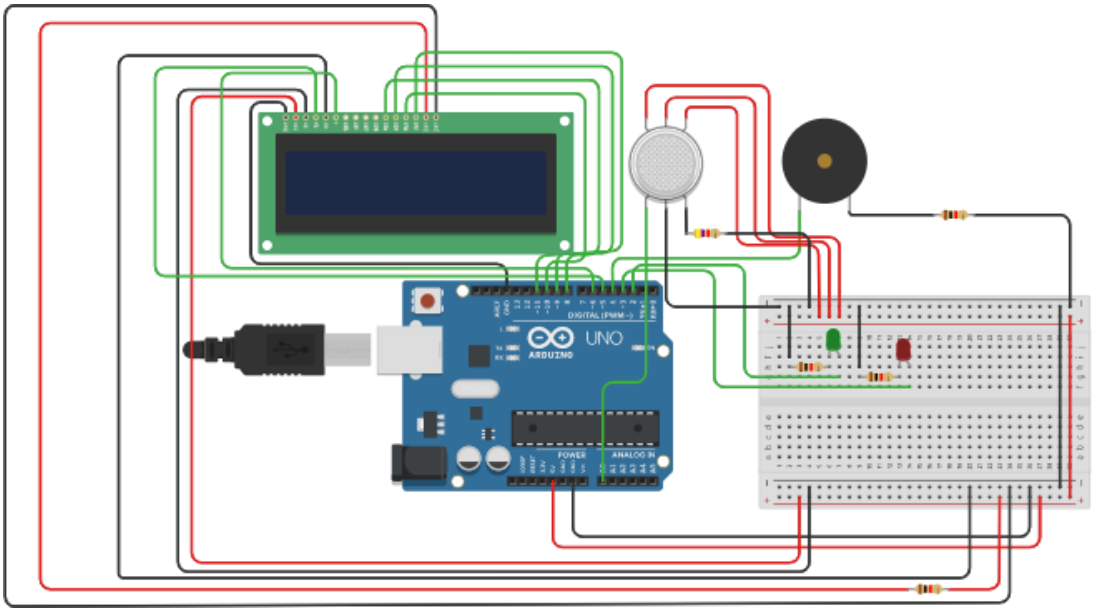
Offline
- TV advertisements
- Give a Booklets.

Identity strong TR & EM

SOLUTION ARCHITECTURE:

Solution architecture is a complex process

- A wide range of MQ -4 sensors is available is market.
- Than can measure methane, butane, LPG, smoke, alcohol, ethanol, carbon monoxide, hydrogen gas, ammonia, etc.
- These sensors are widely used in smoke detection, gas detection and air quality monitoring system.



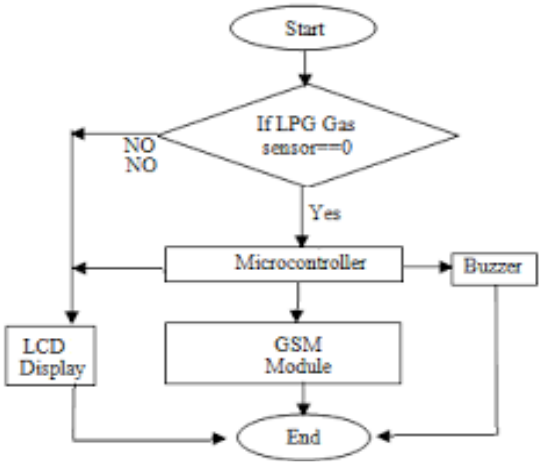
CUSTOMER JOURNEY MAP

	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5
OBJECTIVES	Write a goal or activity	Gas leakage detection systems protect personnel and the environment from potentially hazards exposure to gases	The system comprises of sensors for detecting gas leak interfaced to microcontroller that will give an alert to user whenever there is a gas leakage, display warning information by using liquid.	Gas leak detection system gas leak detection is the process of identifying potentially hazards gas leaks by sensors these sensor usually employ an audible alarm to alert people when dangerous gas has been detected.	An alarm management system represents the series of actions a system performs in an event of gas leakage.
NEEDS	Write a need you want to meet	Fire hazard prevention	Harmful gas detection	Oxygen level measurement	Prompt gas leak alerts
FEELINGS	Write a emotion you expect the customer to have	Happy about this solution	Embrassed on the solution and promoted the good words towards this project.	happy	Encouraging towards this project and giving good feedbacks.
BARRIERS	Write a potential challenge	Higher officials	Commercial companies	The gasses are toxic in nature,	Moreover, gaseou s blasts are another

	to your objective			resulting in human unconsciousness and even death if consumed in large quantities.	disaster that everyone-working in a factory or at home –would want to avoid at all costs!
AWARENESS	Write how to create awareness	Online ads and social media	Television ads	newspaper	Direct communication with industralists and customer
SERVICE	Write what at all services are provided	Provide warranty	Help desk/chat	Free instalization	Free sevice for atleast 1 year once

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	elease
Customer (Mobile user)	Web Application	USN-1	You can view the gas leakage detection results by accessing the web page directly on to the site as a user.	I can access it on my own web pages	High	Sprint-1
	User Availability	USN-2	As a user can directly check the gas maintenance of threshold.	Given reach the greater threshold level.	High	Sprint-1
	Additive availability	USN-3	As a user, can alert and recycle the damage gas flowing tubes.	I can see the threshold value whether it is maintain or not	Low	Sprint-2
	Expectations	USN-4	Monitoring the result based on using valuable sensor	I can expect	Medium	Sprint-1
	Login	USN-5	Login as user using the identity		High	Sprint-1
Customer (Web user)			Web user I can view the obtained result	View the result for web pages directly.	High	Sprint -1
Customer Care Executive			Customer care executive can I see the outputs for gas leakage and alerting system.	Can I accept the terms.	Medium	Sprint-1
Administrator			Industry supervisor we can detect the gas leakage based on the devices	Show the result based on the gas detected.	High	Sprint-1

Use the below template to list all the user stories for the product.

Functional Requirements:

Following are the functional requirements of the proposed solution.

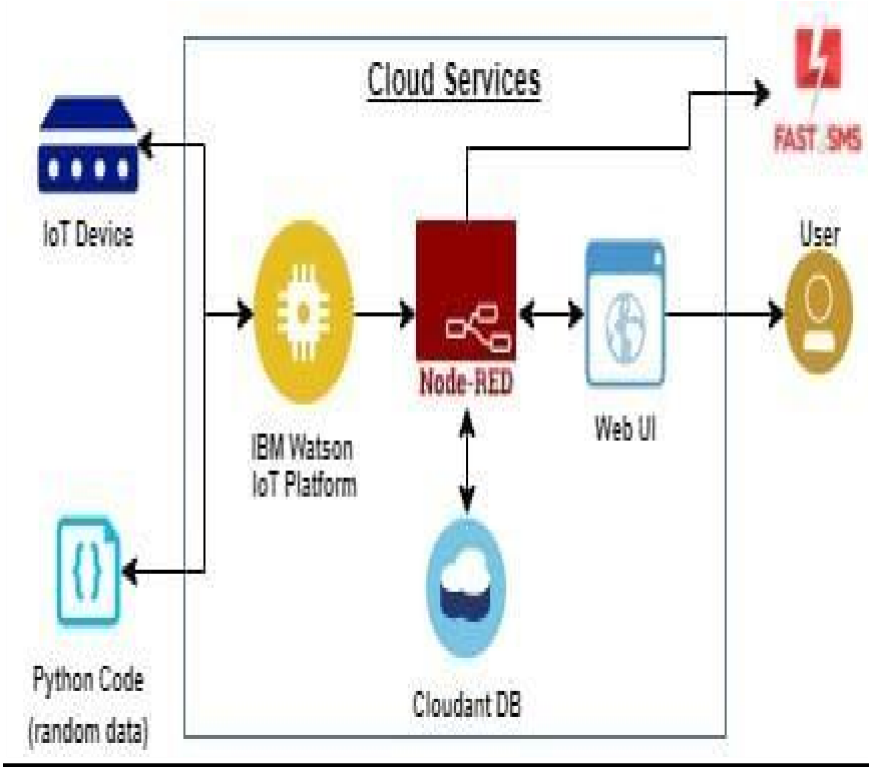
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Receiving in the user end	Gas level details will be displayed through LCD an alarm will be beeps on the buzzer .
FR-2	Monitoring	Level of gas is monitored using sensor and if there is any leakage, alert can be sent through messages and with a buzzer sound.
FR-3	Sensitivity	Specialised of the gas in all similar systems.
FR-4	User Interface	Emergency calls and messages are with application system.

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Set of techniques for design and development are implemented.
NFR-2	**Security**	Strategically improvement of the process ensures less risk.
NFR-3	**Reliability**	Can be able to provide accurate values. It might have a capacity to recognize the smoke.
NFR-4	**Performance**	Arduino response time will be fast and detect the smoke is quickly.
NFR-5	**Availability**	Daily used for day and night.
NFR-6	**Scalability**	Probability of performance is high.

MODEL FOR GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES



ACTIVITY LIST

Phase	Phase Description	Activity Number	Activity
		1.1	Access the resources (courses) & guided project workspace

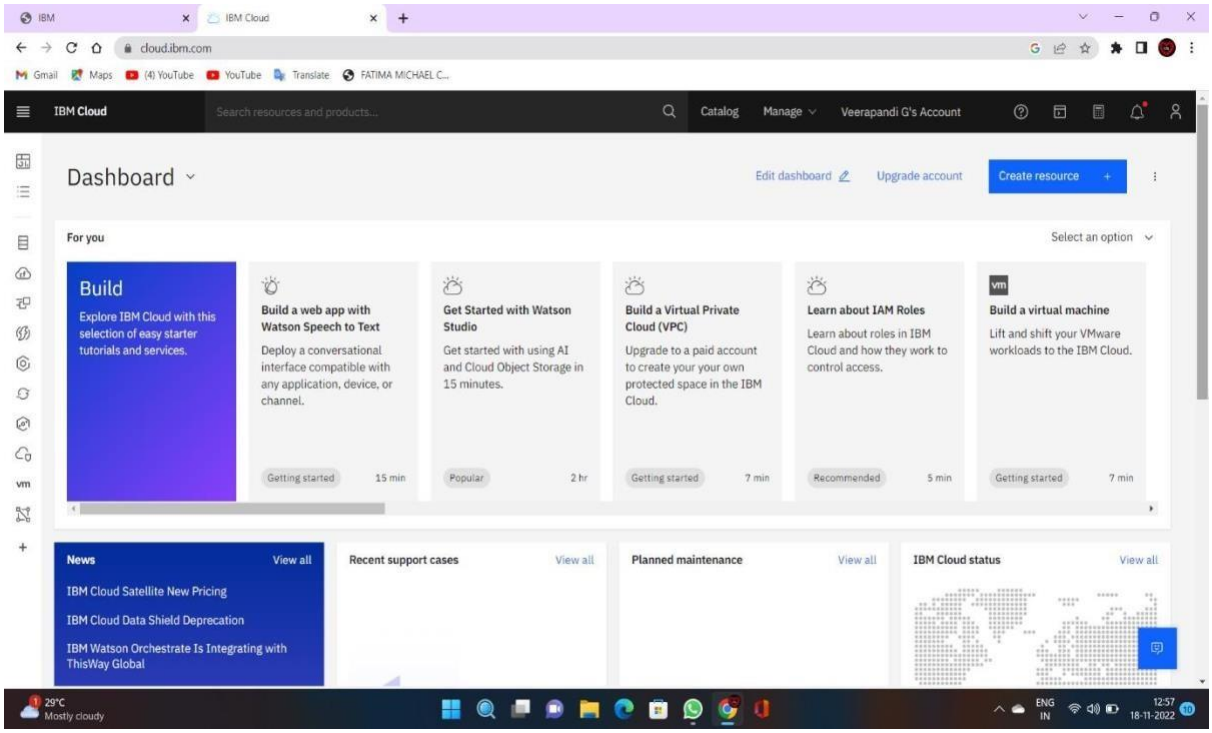
1	**Preparation Phase** (Prerequisites, Registrations, Environment Set-up, etc.)	1.2	Register on IBM Academic Initiative & Apply Feature code for IBM Cloud Credits
		1.3	Create GitHub account & collaborate with Project Repository in project workspace
		1.4	Set-up the Laptop / Computers based on the prerequisites for each technology track
2	**Ideation Phase** (Literature Survey, Empathy map, Ideation)	2.1	Literature survey on the selected project & Information Gathering
		2.2	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem state
		2.3	List the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on
3	**Project Design Phase -I** (Proposed Solution, Problem-Solution Fit, Solution Architecture)	3.1	Prepare the proposed solution document, which includes the novelty, feasibility of idea, busin etc.
		3.2	Prepare problem - solution fit document
		3.3	Prepare the Solution Architecture
4	**Project Design Phase - II** (Requirement Analysis, Customer Journey, Data Flow Daigrams, Technology Architecture)	4.1	Prepare the customer journey maps to understand the user interactions & experiences with the
		4.2	Prepare the Functional Requirement Document & DataFlow Daigrams
		4.3	Prepare Technology Architecture of the solution

5	**Project Planning Phase** (Milestones & Tasks, Sprint Schedules)	5.1	Prepare Milestone & Activity List, Sprint Delivery Plan
6	**Project Development Phase** (Coding & Solutioning, Acceptance Testing, Performance Testing)	6.1	Project Development - Delivery of Sprint-1
		6.2	Project Development - Delivery of Sprint-2
		6.3	Project Development - Delivery of Sprint-3

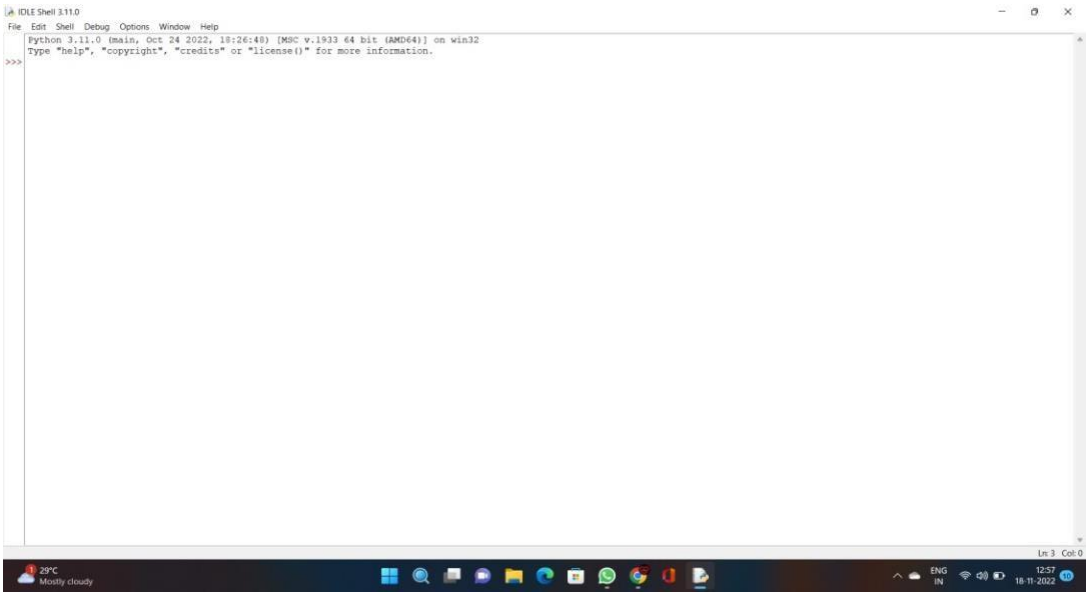
SPRINT PLAN

Identifythe Problem	1
Preparea Abstract,Problem Statement	2
List a requiredobject needed	3
Create a Codeand Run it	4
Makea Prototype	5
Testwiththe createdcode and checkthe designedprototypeis	6
Solutionfor the Problemis Found!!	7

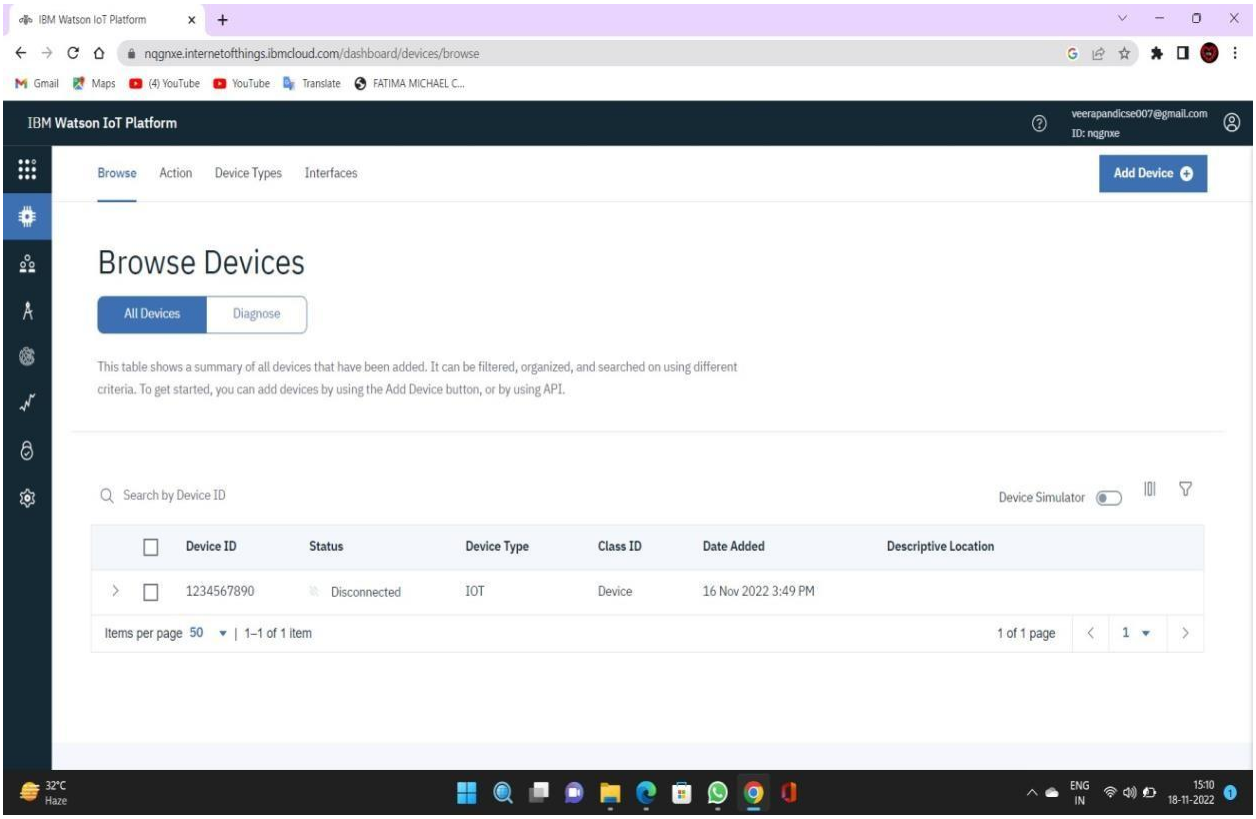
IBM CLOUD SERVICE



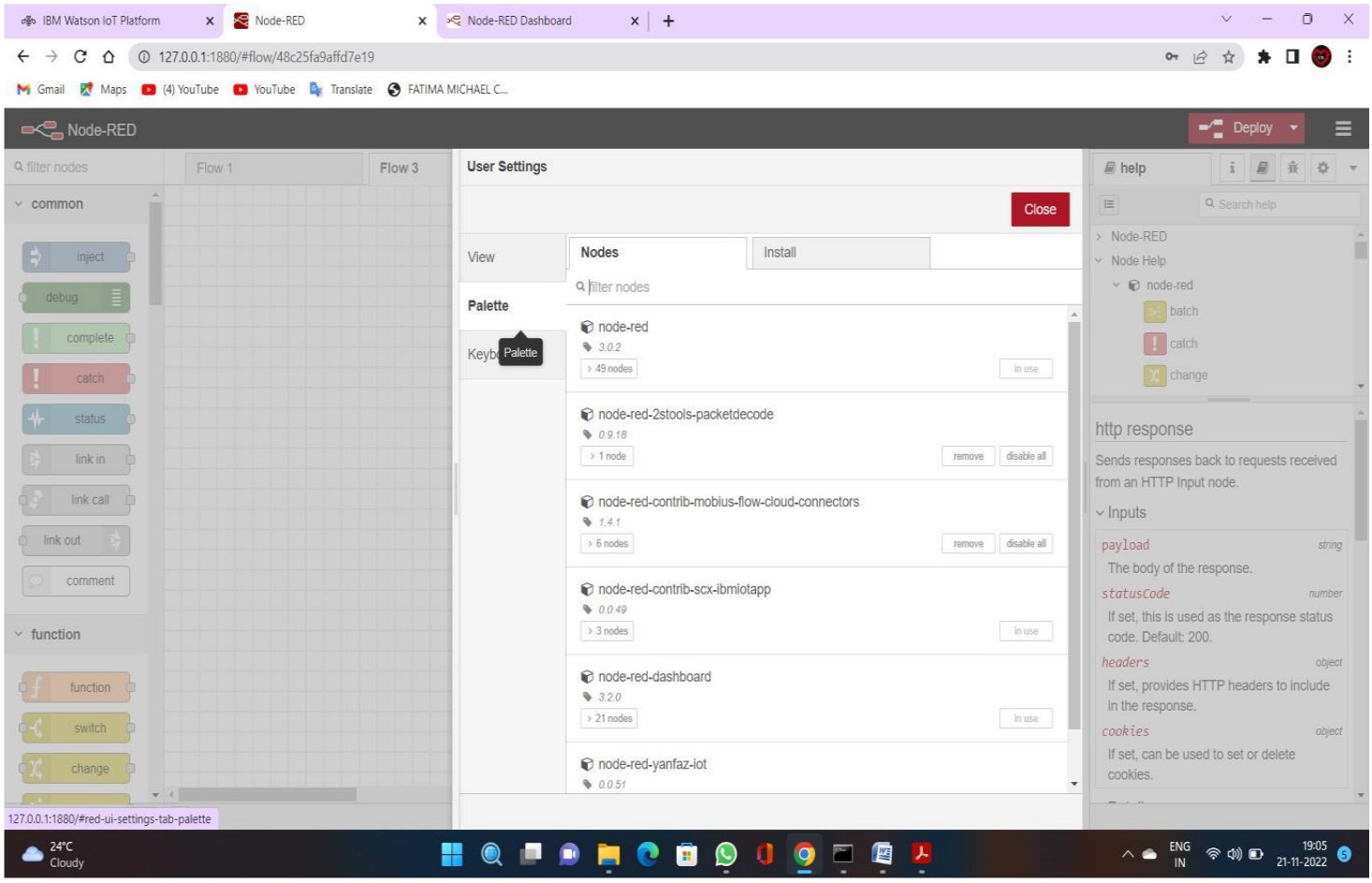
SOFTWARE


IDLE Shell 3.11.0
File Edit Shell Debug Options Window Help
Python 3.11.0 (main, Oct 24 2022, 18:26:48) [MSC v.1933 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
Ln: 3 Col: 0
29°C
Mostly cloudy
ENG
IN
12:57
18-11-2022

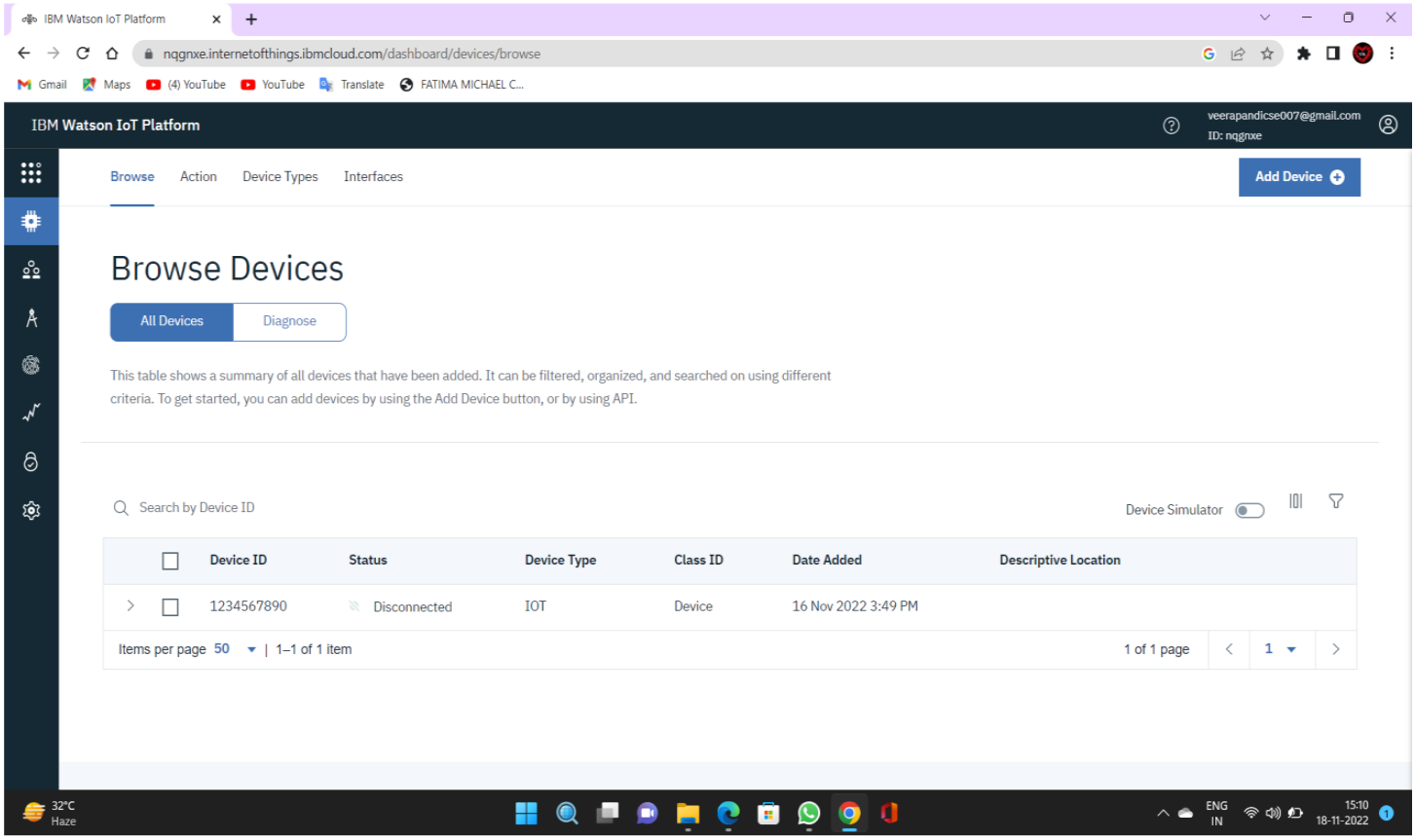
Creating The IBM Watson IoT Platform And A Device



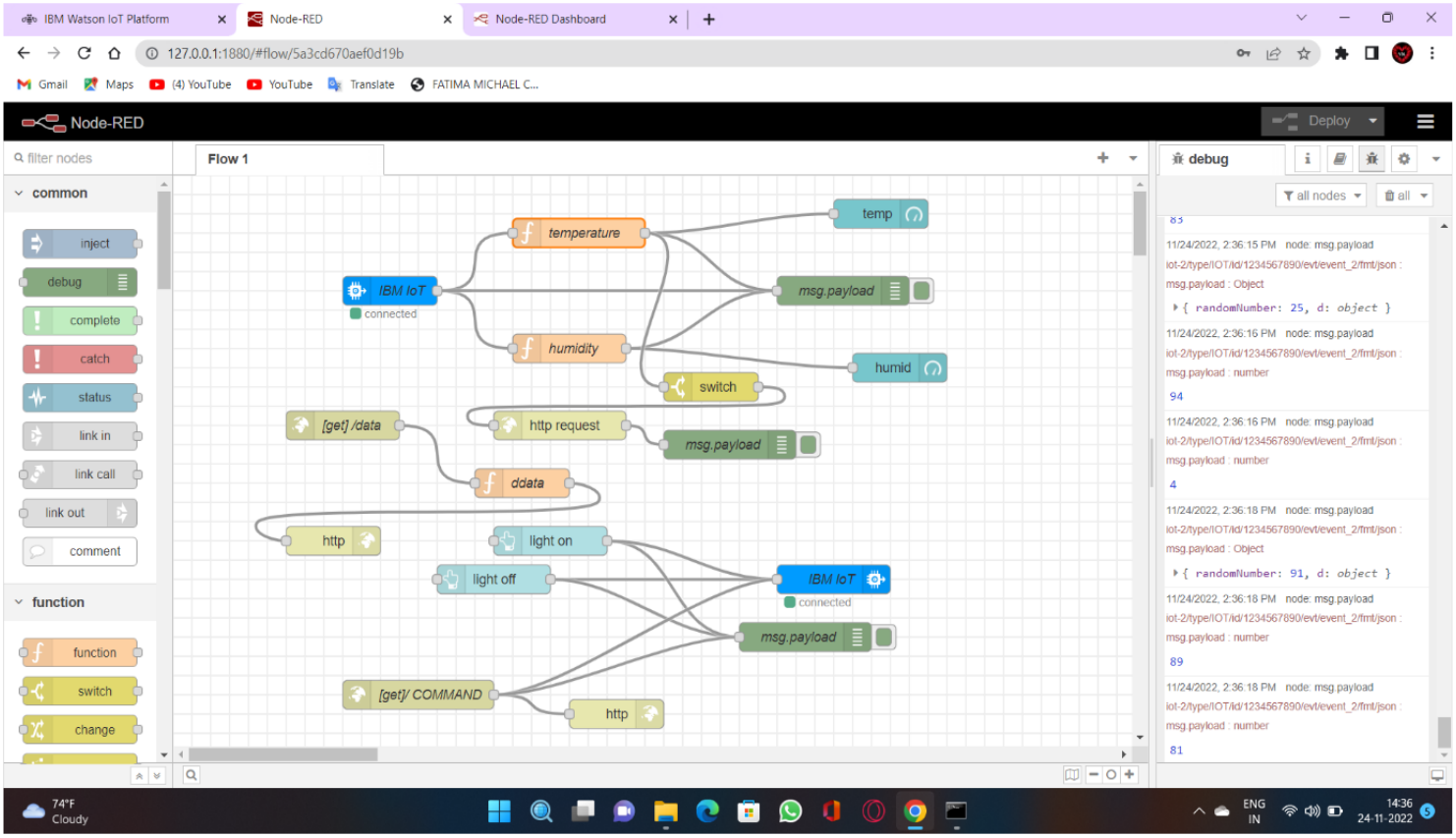
GAS LEAKAGE MONITORING AND ALERTING SYSTEM
CREATE Node-RED SERVICES

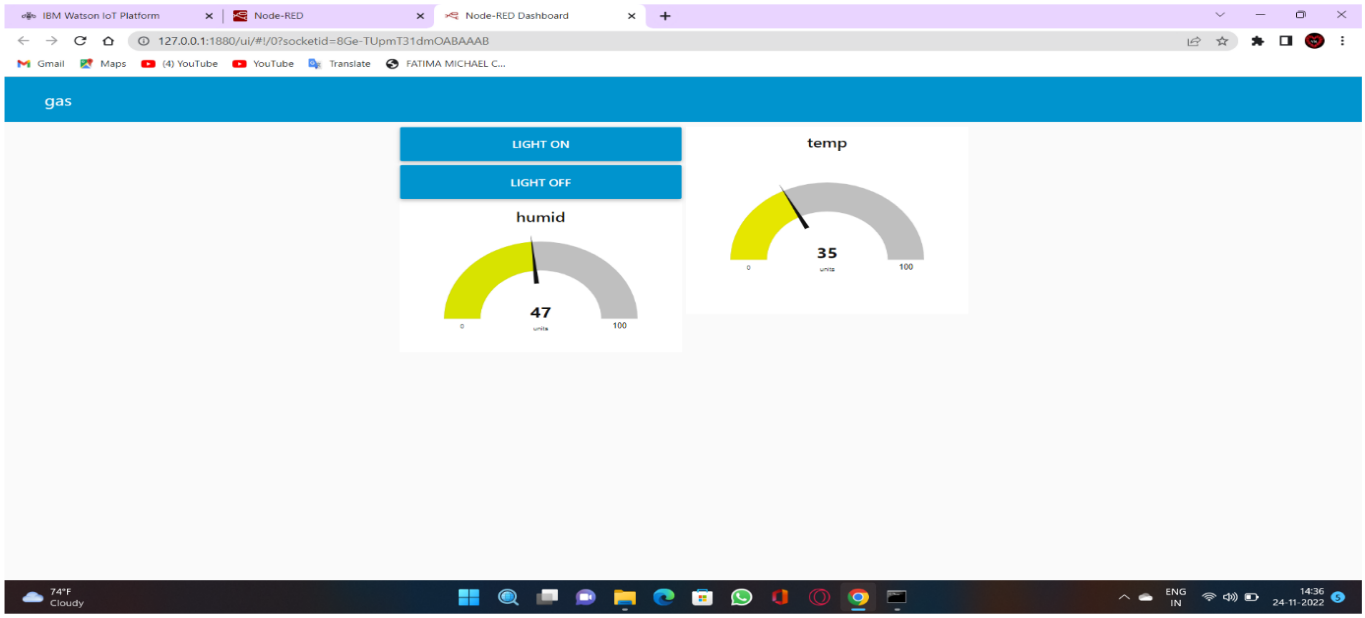


Creating The IBM Watson IoT Platform And A Device

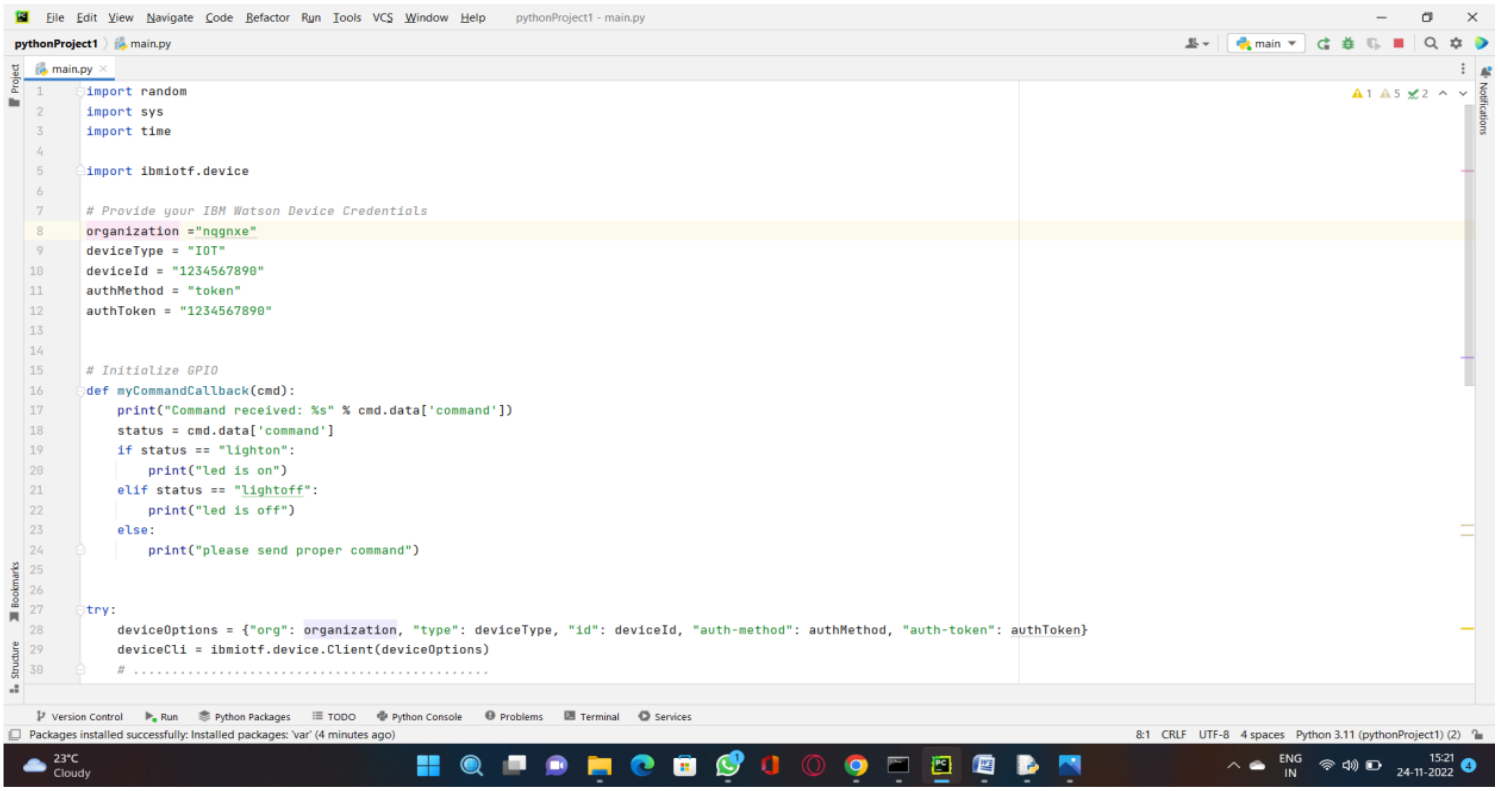


Develop The Web Application Using Node-RED





Develop The Python Code



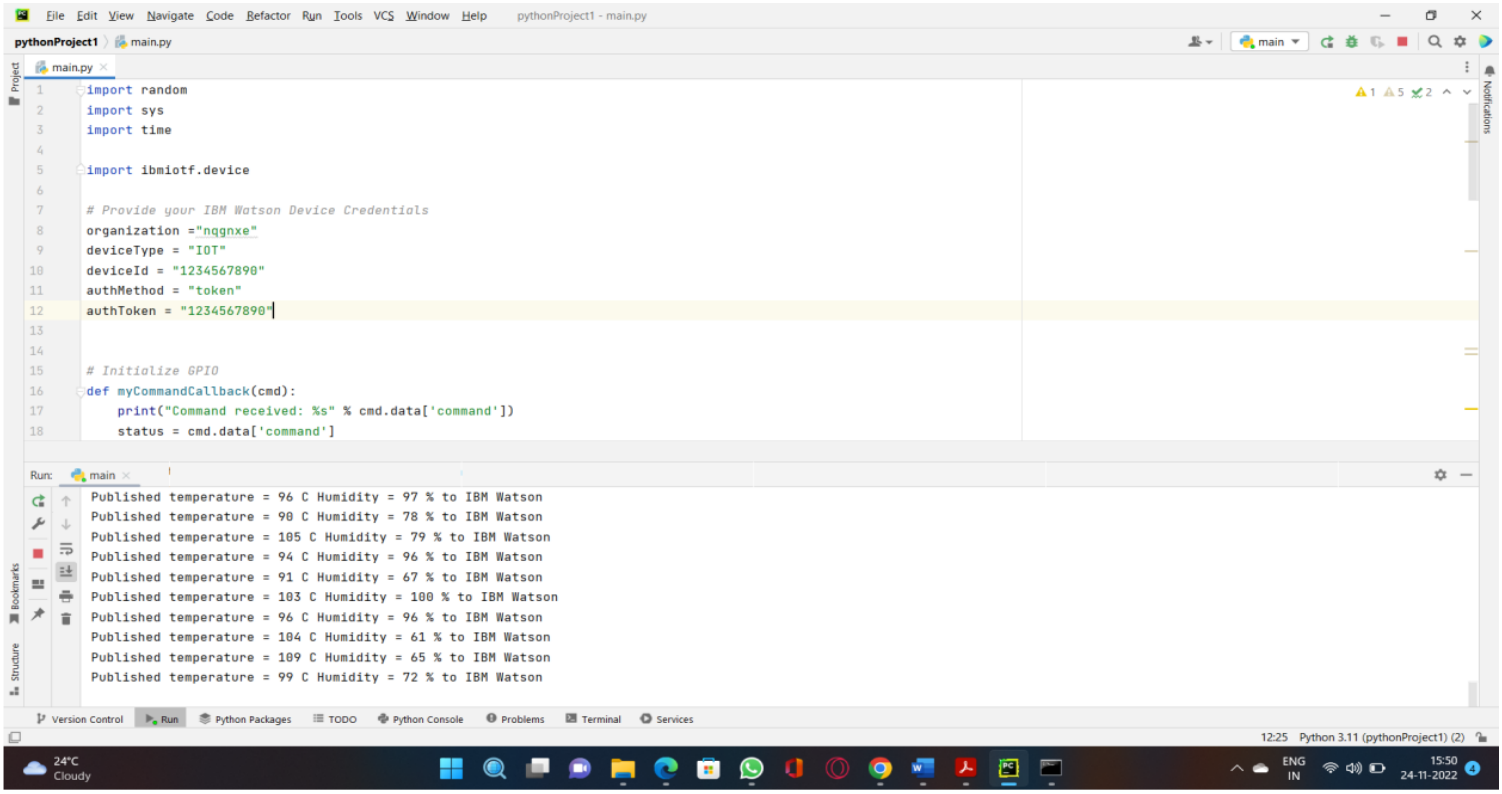
PYTHON CODE FOR GAS, TEMPERATURE AND HUMIDITY

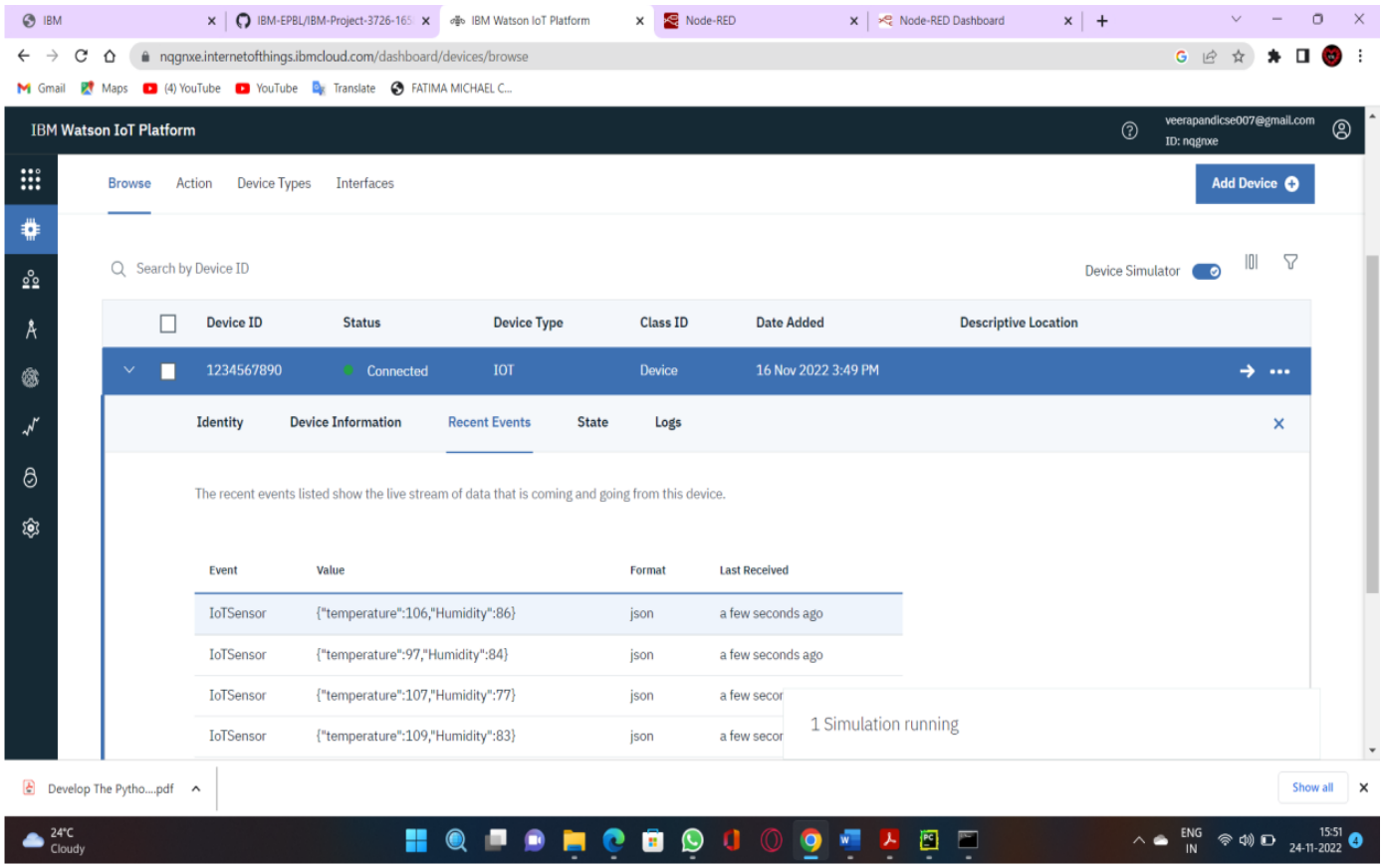
CODING:

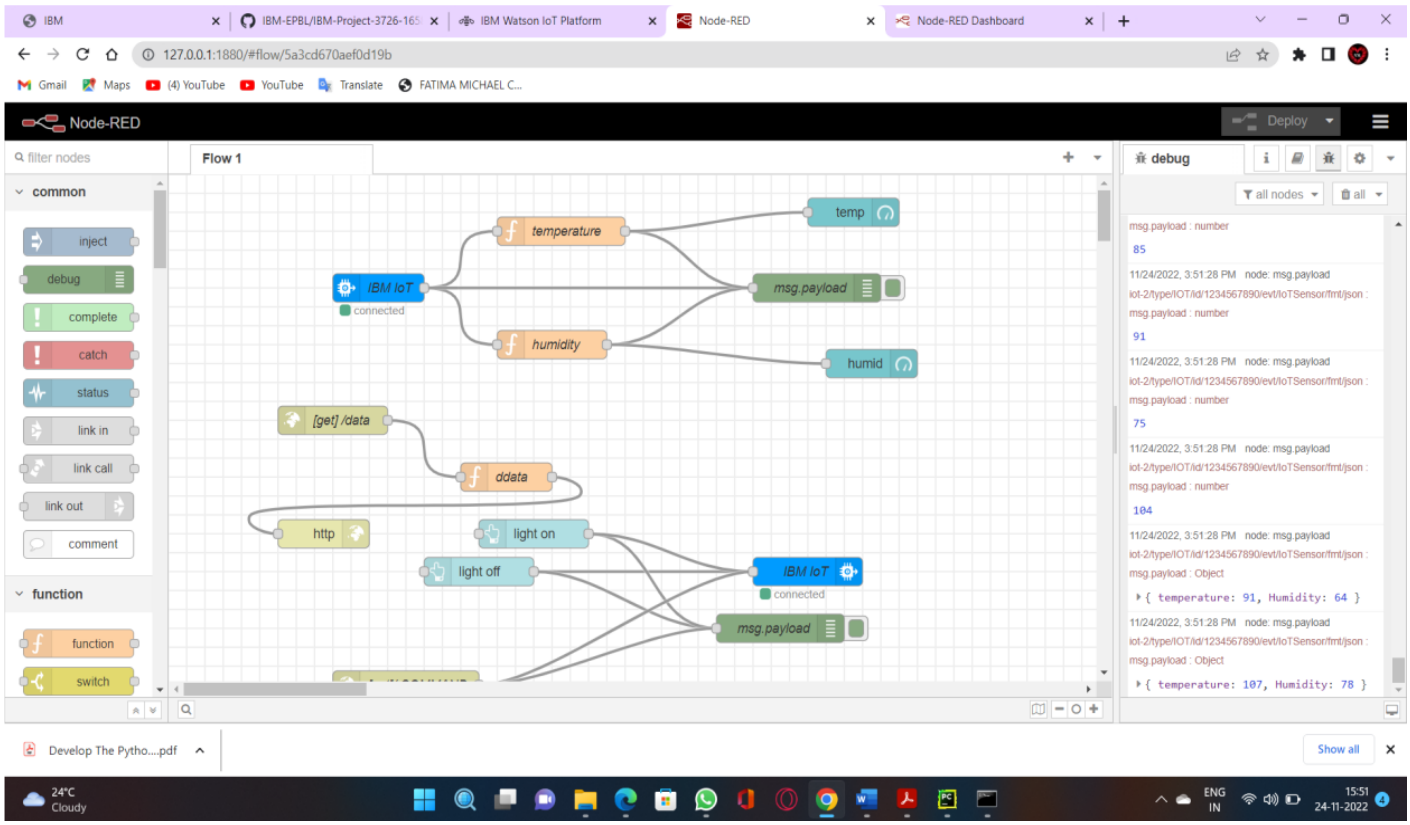
```
import random
import sys
import time
import ibmiotf.device
# Provide your IBM Watson Device Credentials
organization ="nqgnxe"
deviceType = "IOT"
deviceId = "1234567890"
authMethod = "token"
authToken = "1234567890"

 # Initialize GPIO
def myCommandCallback(cmd):
 print("Command received: %s" % cmd.data['command'])
status = cmd.data['command']
if status == "lighton":
print("led is on")
elif status == "lightoff":
 print("led is off")
else:
print("please send proper command")
```

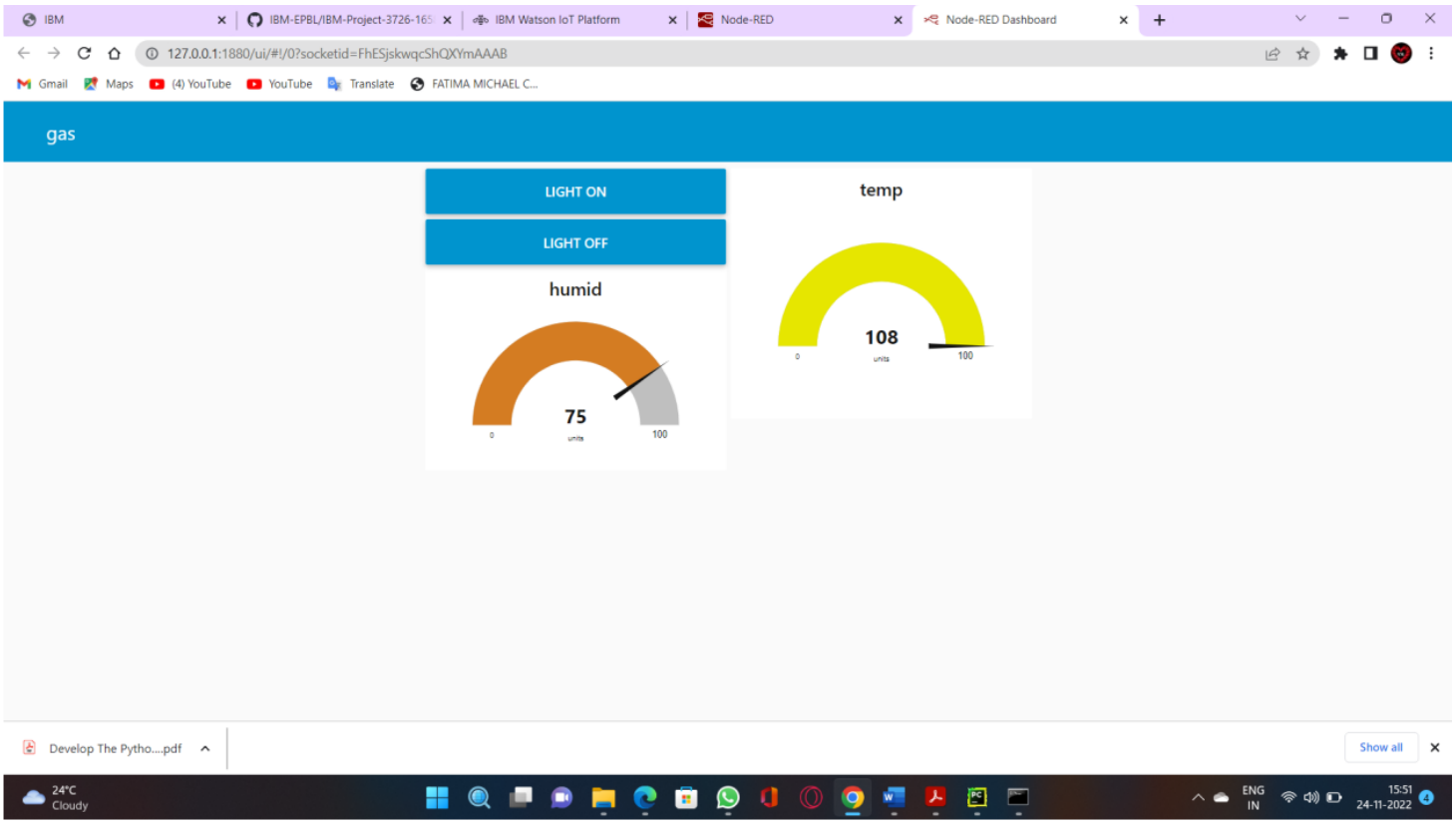
```
 try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method":
authMethod, "auth-token": authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)
# ..............................................
except Exception as e:
print("Caught exception connecting device: %s" % 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
temperature = random.randint(90, 110)
Humidity = random.randint(60, 100)
data = {'temperature': temperature, 'Humidity': Humidity}
# print data
 def myOnPublishCallback():
print("Published temperature = %s C" % temperature, "Humidity = %s %%" % Humidity, "to IBM
Watson")
 success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
if not success: print("Not connected to IoTF")
 time.sleep(10)
deviceCli.commandCallback = myCommandCallback deviceCli.disconnect()
```

OUTPUT:




IBM Watson IoT Platform
veerapandicse007@gmail.com
ID: nqgnxe
Browse
Action
Device Types
Interfaces
Add Device
Search by Device ID
Device Simulator
Device ID
Status
Device Type
Class ID
Date Added
Descriptive Location
1234567890
Connected
IOT
Device
16 Nov 2022 3:49 PM
Identity
Device Information
Recent Events
State
Logs
The recent events listed show the live stream of data that is coming and going from this device.
Event
Value
Format
Last Received
IoTSensor
{"temperature":106,"Humidity":86}
json
a few seconds ago
IoTSensor
{"temperature":97,"Humidity":84}
json
a few seconds ago
IoTSensor
{"temperature":107,"Humidity":77}
json
IoTSensor
{"temperature":109,"Humidity":83}
json
1 Simulation running

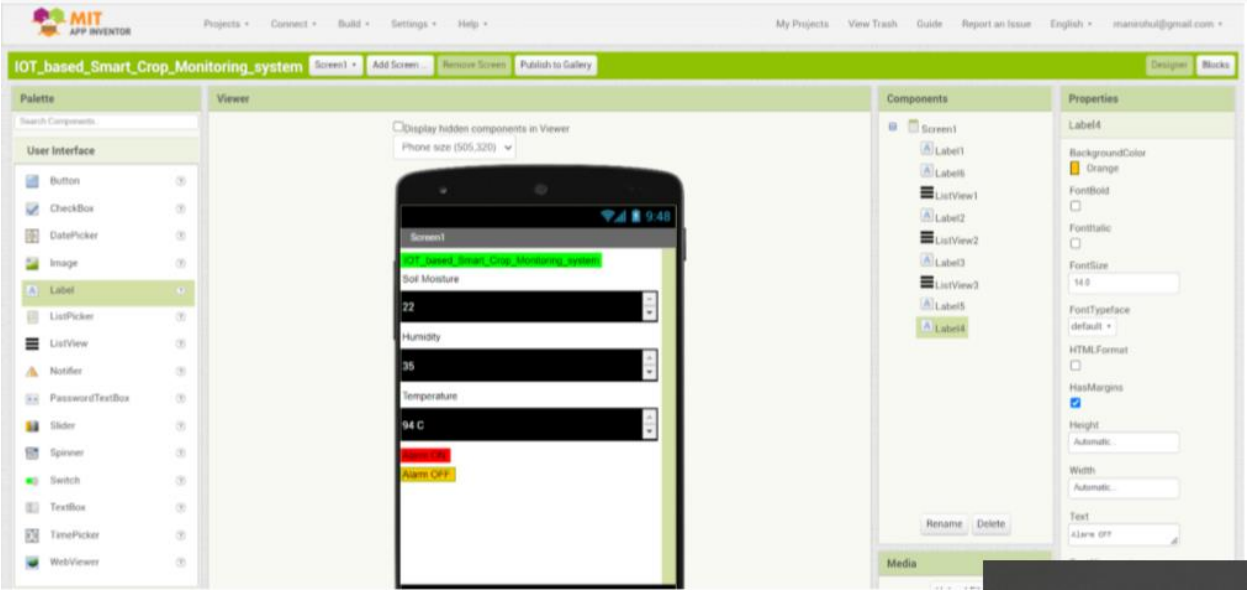

Node-RED
Deploy
Flow 1
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
temperature
humidity
IBM IoT
connected
temp
msg.payload
humid
[get] /data
ddata
http
light on
light off
IBM IoT
connected
msg.payload
debug
msg.payload : number
85
11/24/2022, 3:51:28 PM node: msg.payload
91
75
104
msg.payload : Object
{ temperature: 91, Humidity: 64 }
{ temperature: 107, Humidity: 78 }



DEVELOP MIT APP

Step 1: MIT app invertor to design the app

Step 2: customize the app interface to display the values



Feature:

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

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

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.

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.

GITHUB

https://github.com/IBM-EPBL/IBM-Project-3726-1658593732