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# IBM PROJECT

## GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES

**Batch:**B5-51ME

**Team ID:**PNT2022TMID53681

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- KRISHNAVIGNESH R
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## 1. INTRODUCTION

**ProjectOverview:**

Thisprojecthelpstheindustriesinmonitoringtheemissionofharmfulgases.Inseveralareas,theintegrationofgassensorshelpsinmonitoring thegasleakage.Ifinanyareagasleakageisdetectedtheadminswillbenotifiedalongwiththelocation.Inthewebapplication,adminscanviewthesensorparameters.

**Purpose:**

Inhalingconcentratedgascanleadtoasphyxiaandpossible death.Toovercomethesedisasters,wedesignedasystemformonitoringandalertingtheleakageofthoseharmfulgases.Thismakestheindustrialistsgetridofthefearofanydisasterscausedbythegases.

## 2. LITERATURESURVEY

**Existing Problem:**

This scheme is meant to fulfill the daily needs of the people.In our country 40 percent people die due to gas explosion at home. That number keepsgrowing. Even pregnant women and small children are affected.Using a GSM moduleandamobilephone,theGasLeakageMonitorisusedtofind,intimateleaks.ThebuzzerandLEDarethenactivatedafterthegasleakisdetectedusingabracketsensor.When thedesignatedtimehaspassed,itwillautomaticallyturnoff.

**References:**

[1] ShitalImade,PriyankaRajmane,AishwaryaGavali,V.N.Nayakwadi“Review paper on- LPG Gas leakage detection using IOT”: IJIRS –International Journal ofInnovativeResearch&Studies,Volume8,Issue2,Feb2018IJIRS:ISSNNO:2319-9725.[2]GasLeakage Detection Based on Arduino And Alarm Sound, Rhonnel S. Paculanan, Israel Carino,International Journal of Innovative Technology and Exploring Engineering (IJITEE) Vol 8, April2019.[3]Dr.ChetanaTukkoji,Mr.SanjeevKumar,“Reviewpaperon-LPGGasleakagedetectionusingIOT”:IJEAST–InternationalJournalofEngineeringAppliedScience&Technology,Volume4,Issue12,April2020IJEAST(online):603-609.[4]SanjoyDas,SahanaS,SoujanyaKSwathiMC,"GasleakagedetectionandpreventionusingIoT", InternationalJournalofScientificResearch% Engineering Trends. Vol 6, Issue 3, May-June 2020, ISSN (online): 2395-566X. [5] AmatulMunnaza, RupaTejaswi, Tarun Kumar Reddy, SarangaMoahan “IoT Based Gas LeakageMonitoring Syste”, Journal of Xi’an University of Architecture &Technology,Vol 12, ISSN No:1006-7930,Issue5,2020.[6]B.F.Alshammari,M.T.Chughtai,“IoTGasleakagedetectorandwarning generator”. Engineering and Technology and Applied Science Research Volume 10,IssueAugust2020.6142-6146.[7]GasLeakageDetectionandPreventionSystem,Shreyas

Thorat, Neha Tonape, International Journal of Trendy Research, Vol 4, Issue 7, Dec 2020, ISSNNO:2582-0958.[8]RohanKH1,NavanikaReddy,PranamyaMaddy,SachitGirish,Dr.BadariNathK "IOT based gas leakage detection and Alerting system": JRP Publications,Vol. 1(1), pp. 002-006,February2021.[9]D.Surie,O.Laguionie,T.Pederson,"Wirelesssensornetworkingofeverydayobjects inasmarthomeenvironment",ProceedingsoftheInternationalConferenceonIntelligent Sensors", Sensor Networks and Information ProcessingISSNIP- 2008, pp. 189 – 194.REFERENCE: [10] J. Tsado, O. Imoru, S.O. Olayemi, "Design and construction of a GSM basedgasleakAlertsystem"‖,IEEETransaction,IRJEEEVol.1(1),pp.002-006,September,2014.[11] M.Eisenhauer,P.Rosengren,P.Antolin,"ADevelopmentPlatformforIntegratingWirelessDevices and Sensors into Ambient Intelligence Systems", pp.1- 3. [12] HarshadaNavale, Prof.B.V.Pawar,"ArmBasedGasMonitoringSystem".InternationalJournalofScientific&Technology Research Volu me 3, Issue 6, June 2014. [13] ByeongkwanKang,SunghoiPark,Tacklim LeeandSehyun Park, "loTbased Monitoring System using Tri-level Context Making Model for SmartHomeServices",2015IEEEInternationalConferenceonConsumerElectronics(ICCE),2015.[14]Abhishek,P.Bharath,"Automationoflpgcylinderbookingandleakgemonitoringsystem,"InternationalJournalofCombinedResearchandDevelopment(IJCRD),pp.693–695,2016

## 3. Problem statement definition:

This device does not get damaged very quickly, and if itdoes get damaged, water is the main reason for it. This device is easily damaged by water.Therefore,thisdeviceshouldbeinstalledinaplacewherewaterdoesnotgo.Thisinstallationwillnotdamagethedevice,ifthedevicedoes,anexampleiswater.

This tool is considered to be one and very safe for the users. Mymembers are trusted. My members' invention is considered very safe for this country and itspeople and their families. Absence of this tool makes women in our country nervous by thespreadofgasintheirkitchenandisconsideredtobeasignofsomeaccident.Itisalsoproudtothinkofthis projectforpeople'slivesonlytoeliminatethisfear.

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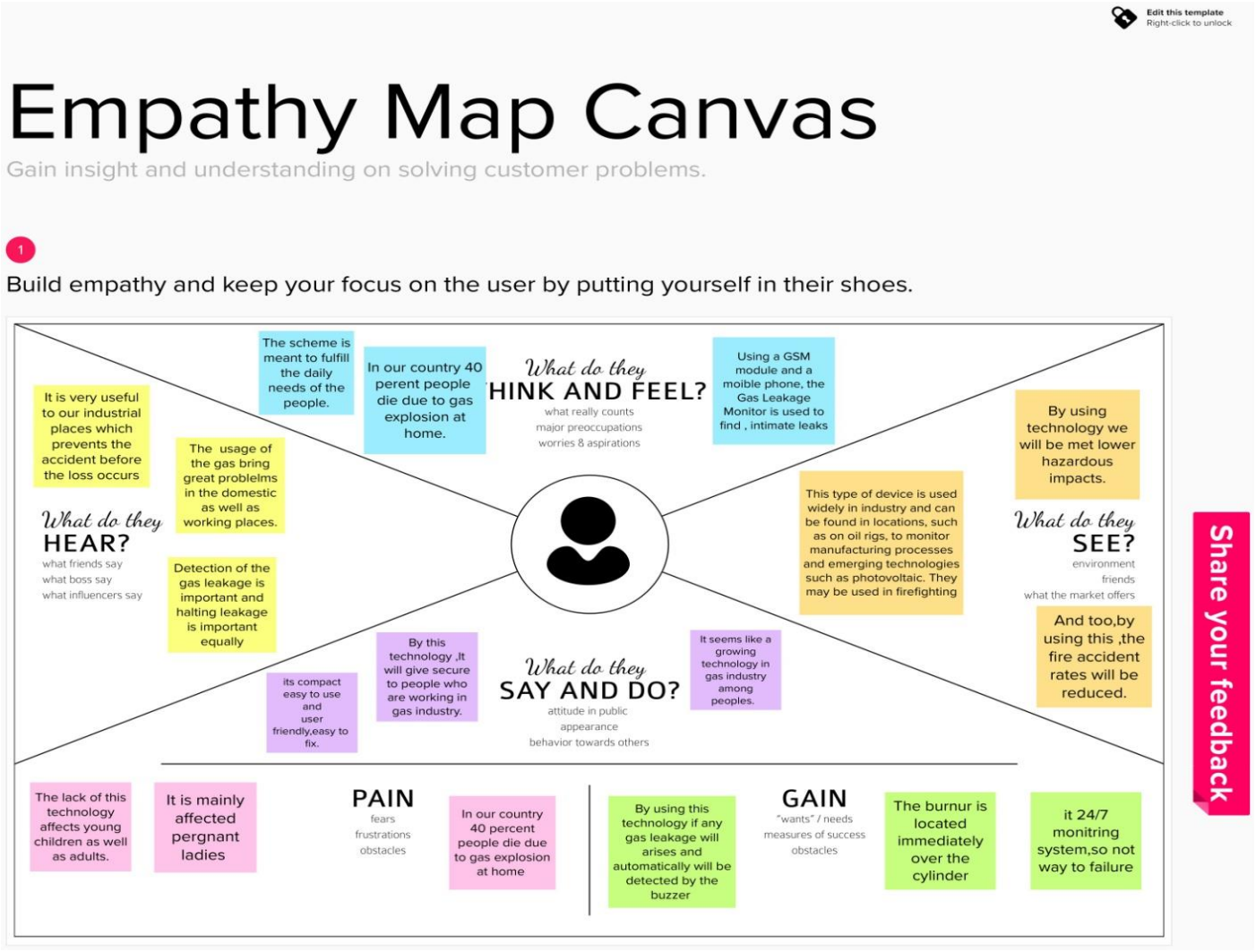
## 4. IDEATION &PROPOSED SOLUTION:

### EmpathyMapCanvas:



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# Ideation&Brainstorming:

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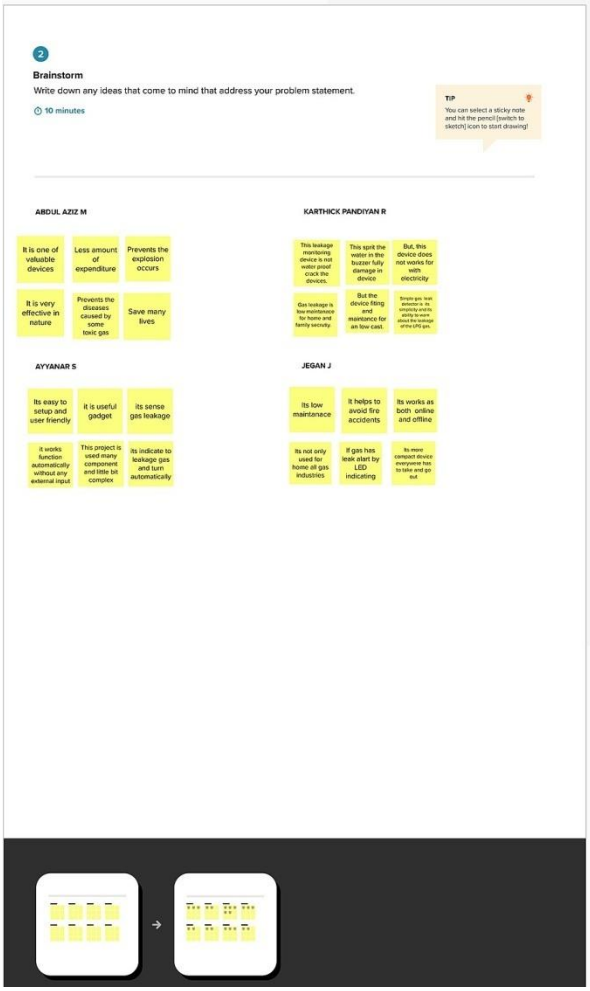
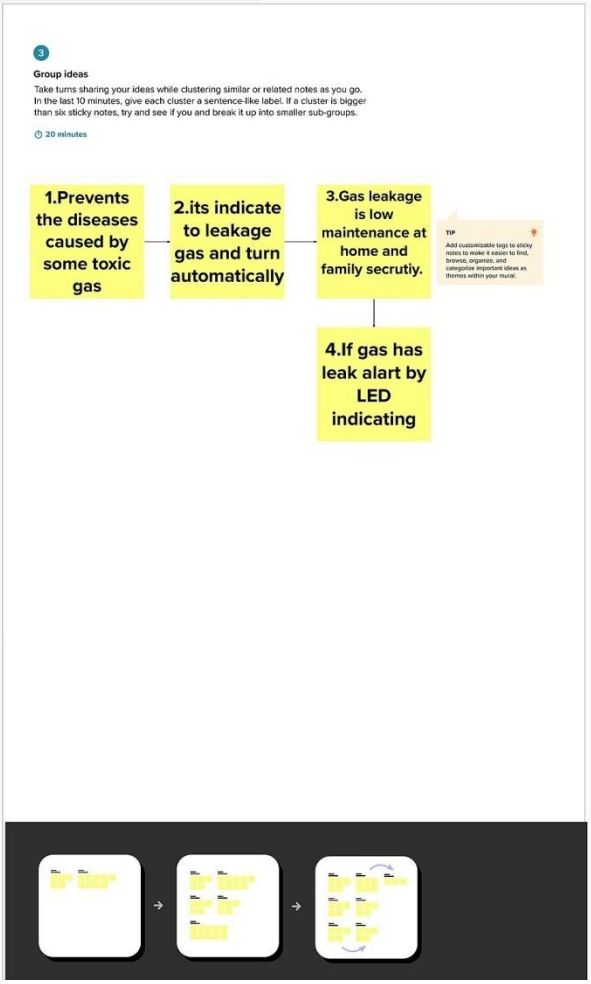

2
Brainstorm
Write down any ideas that come to mind that address your problem statement.
10 minutes
TIP
You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!
ABDUL AZIZ M
It is one of valuable devices
Less amount of expenditure
Prevents the explosion occurs
It is very effective in nature
Prevents the diseases caused by some toxic gas
Save many lives
KARTHICK PANDIYAN R
This leakage monitoring device is not water proof crack the devices.
This sprit the water in the buzzer fully damage in device
But, this device does not works for with electricity
Gas leakage is low maintenace for home and family secruity.
But the device fitting and maintance for an low cast.
Simple gas leak detection using electricity and its ability to warn about the leakage of the LPG gas.
AYYANAR S
Its easy to setup and user friendly
it is useful gadget
its sense gas leakage
it works function automatically without any external input
This project is used many component and little bit complex
its indicate to leakage gas and turn automatically
JEGAN J
Its low maintenace
It helps to avoid fire accidents
Its works as both online and offline
Its not only used for home all gas industries
If gas has leak alart by LED indicating
Its more compact device everyonee has to take and go out


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
1.Prevents the diseases caused by some toxic gas
2.its indicate to leakage gas and turn automatically
3.Gas leakage is low maintenance at home and family secrutiy.
4.If gas has leak alart by LED indicating
TIP
Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

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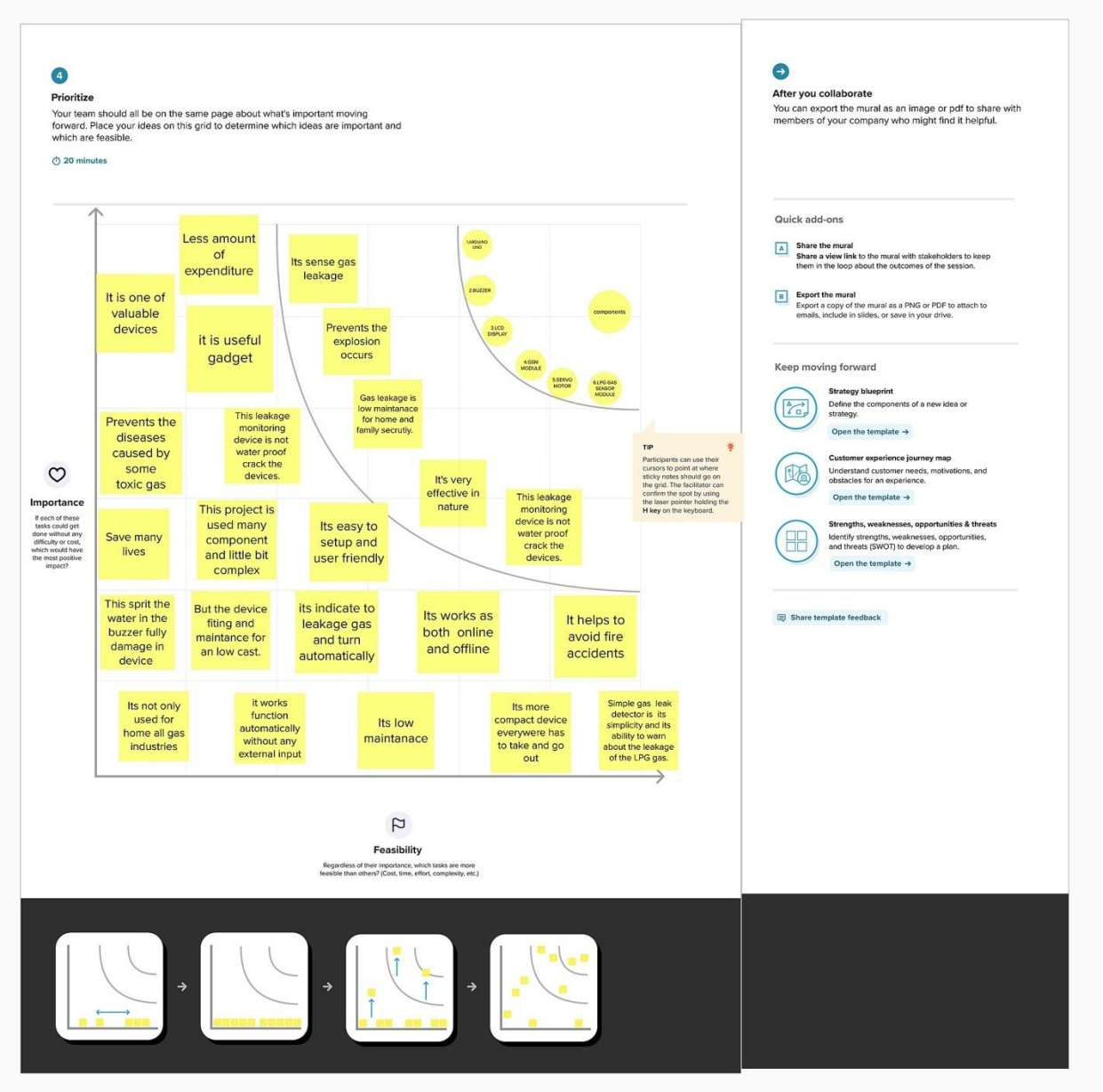
4
Prioritize
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.
20 minutes
Less amount of expenditure
Its sense gas leakage
It is one of valuable devices
it is useful gadget
Prevents the explosion occurs
components
Prevents the diseases caused by some toxic gas
This leakage monitoring device is not water proof crack the devices.
Gas leakage is low maintanace for home and family secrutiy.
It's very effective in nature
This leakage monitoring device is not water proof crack the devices.
Save many lives
This project is used many component and little bit complex
Its easy to setup and user friendly
This sprit the water in the buzzer fully damage in device
But the device fiting and maintance for an low cast.
its indicate to leakage gas and turn automatically
Its works as both online and offline
It helps to avoid fire accidents
Its not only used for home all gas industries
it works function automatically without any external input
Its low maintanace
Its more compact device everywere has to take and go out
Simple gas leak detector is its simplicity and its ability to warn about the leakage of the LPG gas.
Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Feasibility
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)
TIP
Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the H key on the keyboard.
After you collaborate
You can export the mural as an image or pdf to share with members of your company who might find it helpful.
Quick add-ons
A Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.
B Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.
Keep moving forward
Strategy blueprint
Define the components of a new idea or strategy.
Open the template →
Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →
Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →
Share template feedback

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## ProposedSolution:

| S.NO | Parameter | Description |
|---|---|---|
| 1. | ProblemStatement (Problemtobesolved) | This monitoring is used toprevent fire accidents dueflammable gas leakage inhouse fromcylinders,industries,hospitals, hotelsetc. |
| 2. | Idea/Solutiondescription | This monitoring system usescloud and iot based hardwares and sensors.Thesensorsinthesystemd etectsflammable gaseouscomponents in theenvironment and temperatureusing iot system and sendindicationviaalarmsand lights. |
| 3. | Novelty/Uniqueness | The uniqueness of thissystem is that it uses cloudduetothis,thealarmcanbet o the person via sms to hismobilewhenheisnotin home. |
| 4. | SocialImpact/CustomerSati sfaction | It helps in many ways to thesociety it prevents fireaccidents due carelesshandle of gas cylinders . thisisareal-timesystemssoitisfasterandaccid entscanbe preventedveryeasily. |
| 5. | BusinessModel(RevenueMo del) | This is a cloud based realtimesystem,thatcollectstheda ta from the environmentvery quickly i.e.temperature,humidityand oxygencomposition.using |

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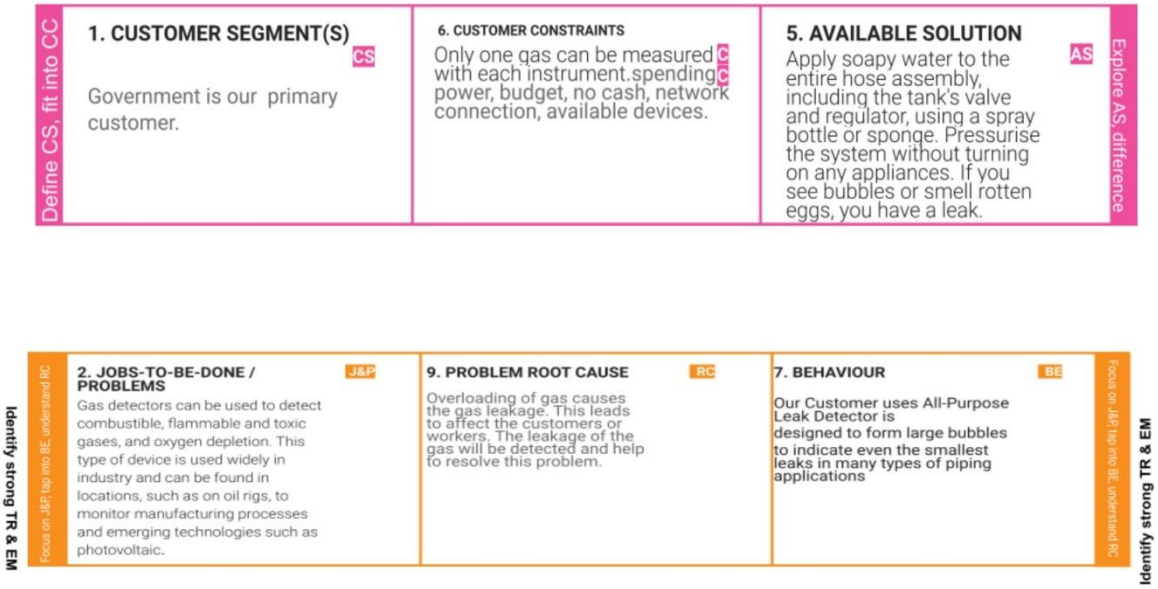
|---|---|---|
| | | sensorsandindicatevia alarmsandlights. |
| **6.** | ScalabilityoftheSolution | Accuracy.<br>Lowcost.<br>Lessmaintenance.<br>Reliability. |

## ProblemSolutionFit:

**Project Title: Gas Leakage Monitoring and Alerting System** **Project Design Phase-I: Solution Fit Template** **Team ID: PNT2022TMID45387**



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## 5.REQUIREMENTANALYSIS

## FunctionalRequirement:

| FRNo. | FunctionalRequirement (EPIC) | SubRequirement(Story/ Sub-Task) |
|---|---|---|
| FR-1 | Createcloudaccount | RegistrationthroughForm RegistrationthroughGmailR egistrationthroughLink |
| FR-2 | UserConfirmation | ConfirmationviaEmail ConfirmationviaOT |
| FR-3 | UserLogin | UserLoginViaMailidAnd Password |
| FR-4 | Cloudregistration | Connectthehardwaredevice |
| FR-5 | Connecttomobile | Connectthecloudwiththe mobilephone |
| FR-6 | ConnectHardware | Connecthardwaretothegas cylindersorinthewall |

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## Non-functionalRequirements:

| FRNo. | Non-Functional Requirement | Description |
|---|---|---|
| NFR-1 | Usability | ● Itisuserfriendly<br>● Easytohandle<br>● Processissimple |
| NFR-2 | Security | ● Thedeviceishighlysecure.<br>● Privacyismaintained |
| NFR-3 | Reliability | ● Thedeviceismorereliable<br>● Thedeviceismoretrustableintough conditions |
| NFR-4 | Performance | ● Theperformanceismoreaccurate.<br>● Itisarealtime application |
| NFR-5 | Availability | ● Itcanbeavailableeasily.<br>● Itrequiresveryfewhardware components. |
| NFR-6 | Scalability | ● Lessmaintenance.<br>● Lowcost.<br>● Compact. |

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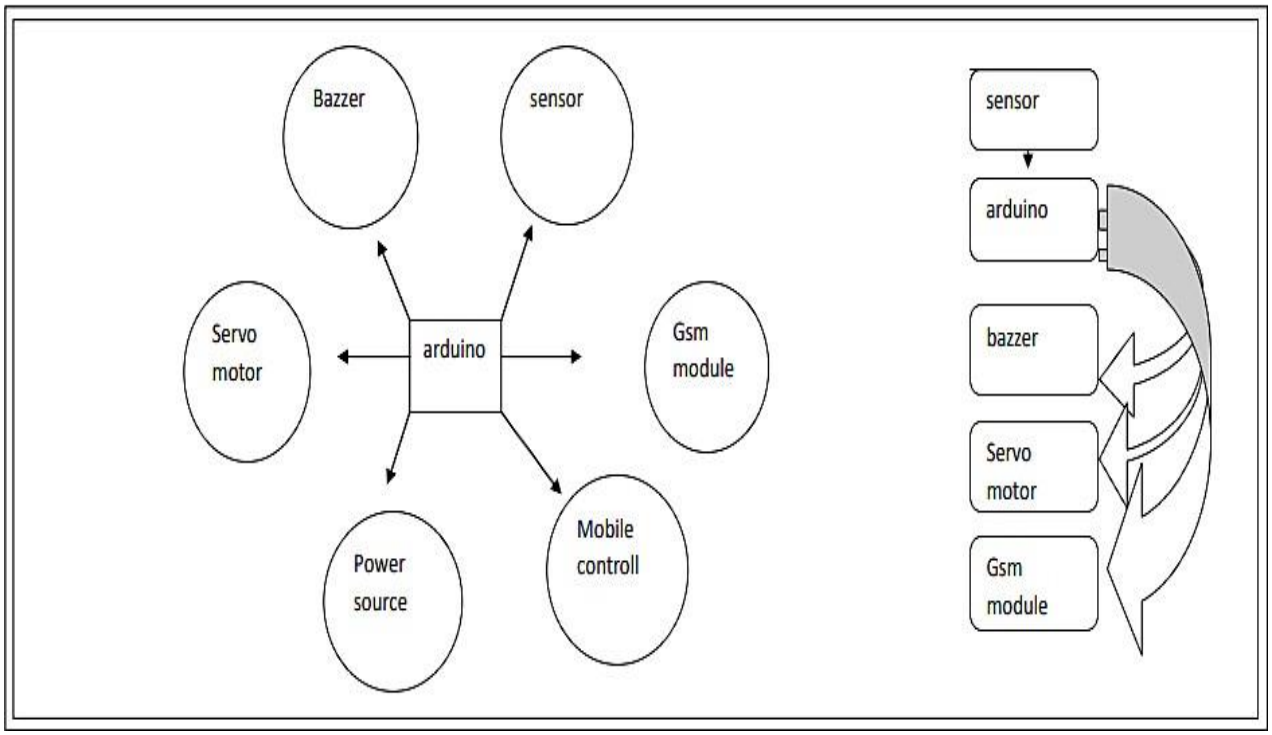
## 5. PROJECTDESIGN:

**DataFlowDiagrams:**

**Data Flow Diagram:**



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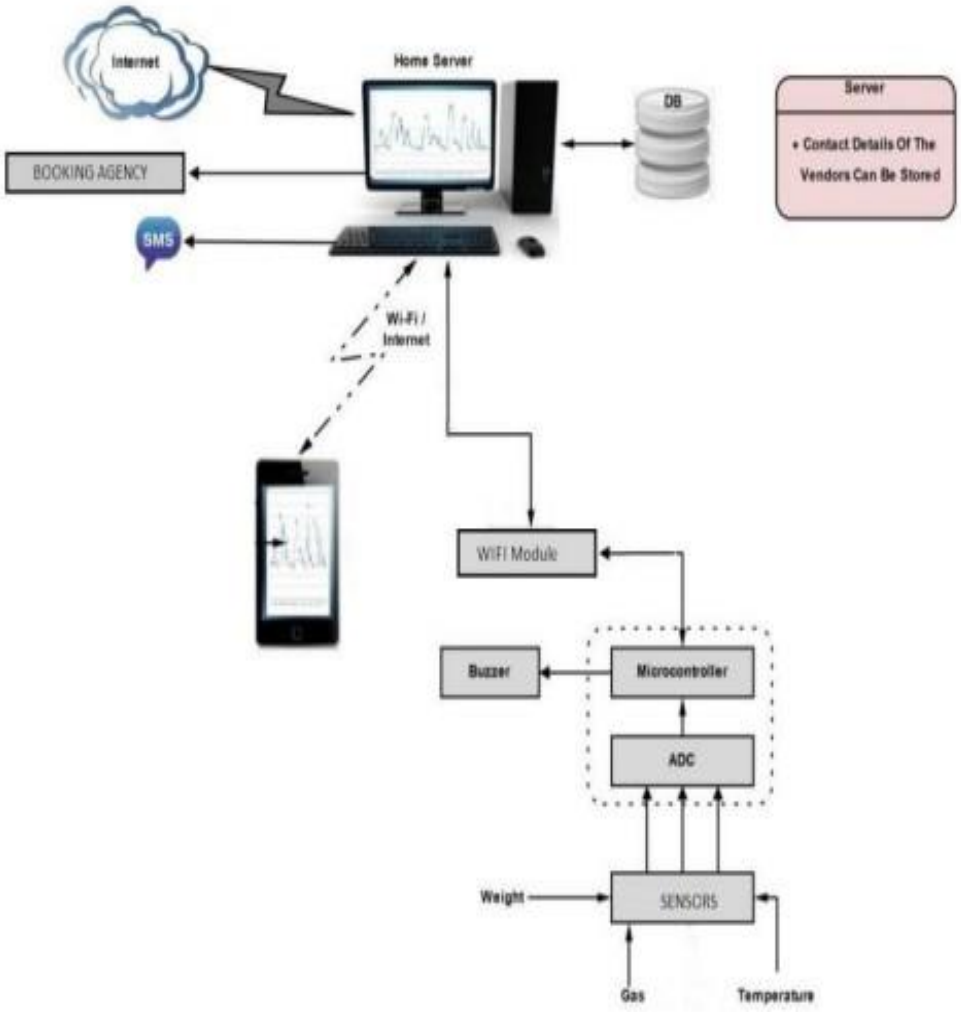
**Solution&TechnicalArchitecture:**

## Solution Architecture Diagram:



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## USER STORIES :

| UserType | FunctionalRequirement (Epic) | User Story Number | UserStory/Task | Acceptancecriteria | Priority | Release |
|---|---|---|---|---|---|---|
| Customer (Mobileuser) | Registration | USN-1 | Asauser,Icanregister for theapplicationby enteringmyemail,password, andconfirmingmy password. | I can accessmyaccount/dashboard | High | Sprint-1 |
| | | USN-2 | Asauser,Iwillreceive confirmation emailonceIhave registeredforthe application | I can receiveconfirmationemail & clickconfirm | High | Sprint-1 |
| | | USN-3 | Asauser,Icanregister for theapplication throughFacebook | I can register &access thedashboardwith FacebookLogin | High | Sprint-2 |
| | | USN-4 | Asauser,Icanregister for theapplication throughGmail | Icanaccessbymessage | Medium | Sprint-1 |
| | Login | USN-5 | As a user, I can logintotheapplication byenteringemail& password | No need tologinmailid | High | Sprint-1 |
| Customer(Web user) | Dashboard | | | | | |
| Customer CareExecutive | Registeraion | USN-1 | User want to usesimcardandgsm module | Messagerecivер forarduino connectedsim | High | Sprint-1 |
| | | USN-1 | Sensorand module | Allcomponent isconnectedto | High | Sprint-1 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | arduino | | |
| Administrator | DATA | USN-1 | What is Maincomponentint his project | Arduino | High | Sprint-2 |
| | | | | | | |
| power | Dc | USN-1 | Howmuchpower isrequired | 9visenff | High | Sprint-1 |
| | | | | | | |

## 6.PROJECTPLANNINGANDSCHEDULING:

## SprintPlanning&Estimation:

| Sprint | FunctionalRequirement (Epic) | UserStory Number | UserStory/ Task | Story Points | Priority | TeamMembers |
|---|---|---|---|---|---|---|
| Sprint-1 | DataPreparation&Data Visualization | USN-1 | As a user, IprovideSafetyto thecustomers | 5 | High | KarthickpandiyanR |
| Sprint-1 | | USN-2 | As an Analyst, Icollectthedata& Providemeaningf ulinsightsthrough IBMCloud | 3 | High | JeganJ |
| Sprint-2 | Dashboard | USN-3 | Asauser,Iwant to make sure thesafeenvironme nt. | 3 | High | AyyanarS |
| Sprint-2 | | USN-4 | As an Analyst, Iwill upload thedatainIBMClo udto createainteractive dashboard | 3 | Medium | AbdulAzizM |
| Sprint-3 | Report | USN-5 | As a user, I wanttosecuretheli ves anddataofeach | 3 | Medium | KarthickpandiyanR |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | | | employee thatreportaparticular event | | | |
| Sprint-3 | | USN-6 | As an Analyst, IwilluseIBMCloudtogeneratea report | 3 | Medium | JeganJ |
| Sprint-4 | Story | USN-7 | As a user, I canonlyunderstandthe Analysis inanimatedpresentationof dataset | 5 | Medium | AyyanarS |
| Sprint-4 | | USN-8 | As an Analyst, IuseIBMtocreatean animatedpresentation(Story)ofthe dataset | 3 | High | AbdulAzizM |

## SprintDeliverySchedule:

| Sprint | TotalStory Points | Duration | SprintStart Date | Sprint EndDate( Planned) | StoryPointsCompleted(asonPlannedEnd Date) | SprintReleaseDate(Actual) |
|---|---|---|---|---|---|---|
| Sprint-1 | 5 | 6Days | 24Oct2022 | 24Oct2022 | 5 | 29Oct2022 |
| Sprint-2 | 5 | 6Days | 31Oct2022 | 05Nov2022 | 5 | 05Nov2022 |
| Sprint-3 | 5 | 6Days | 07Nov2022 | 12Nov2022 | 5 | 12Nov2022 |
| Sprint-4 | 5 | 6Days | 14Nov2022 | 19Nov2022 | 5 | 15Nov2022 |

## Velocity:

We have an 6 day sprint duration and the velocity of the team is 4 (points per sprint).To calculate the the team Average velocity(AV) per iteration unit (story points per day).

$$AV = \frac{SPRINTDURATION}{VELOCITY} = \frac{6}{4} = 1.5$$

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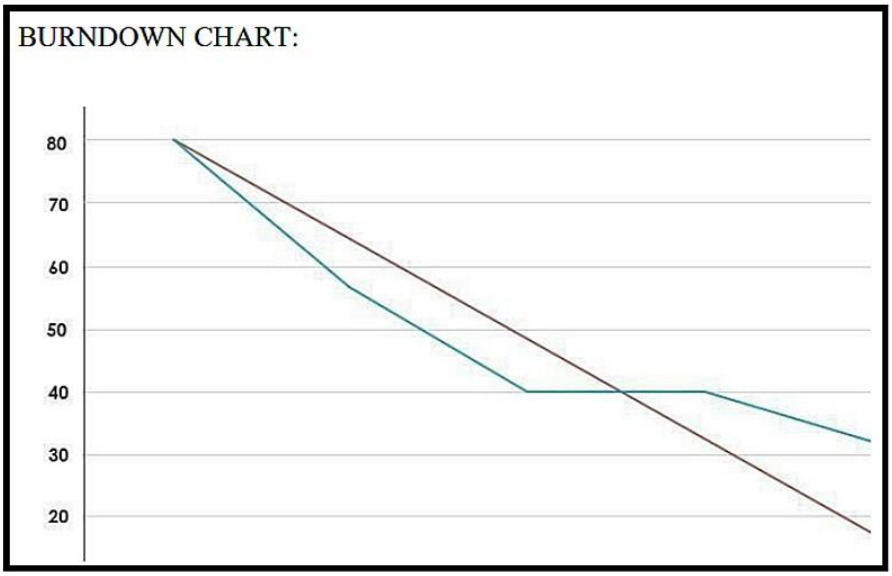
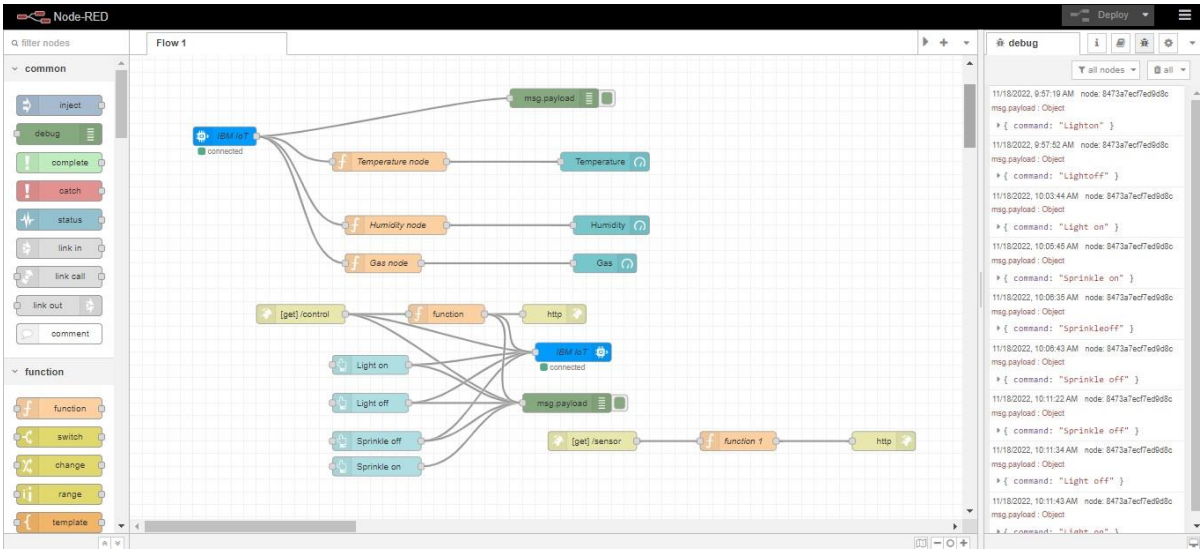



## 6. CODINGANDSOLUTIONING:

**Feature1(NodeRedOutput)**



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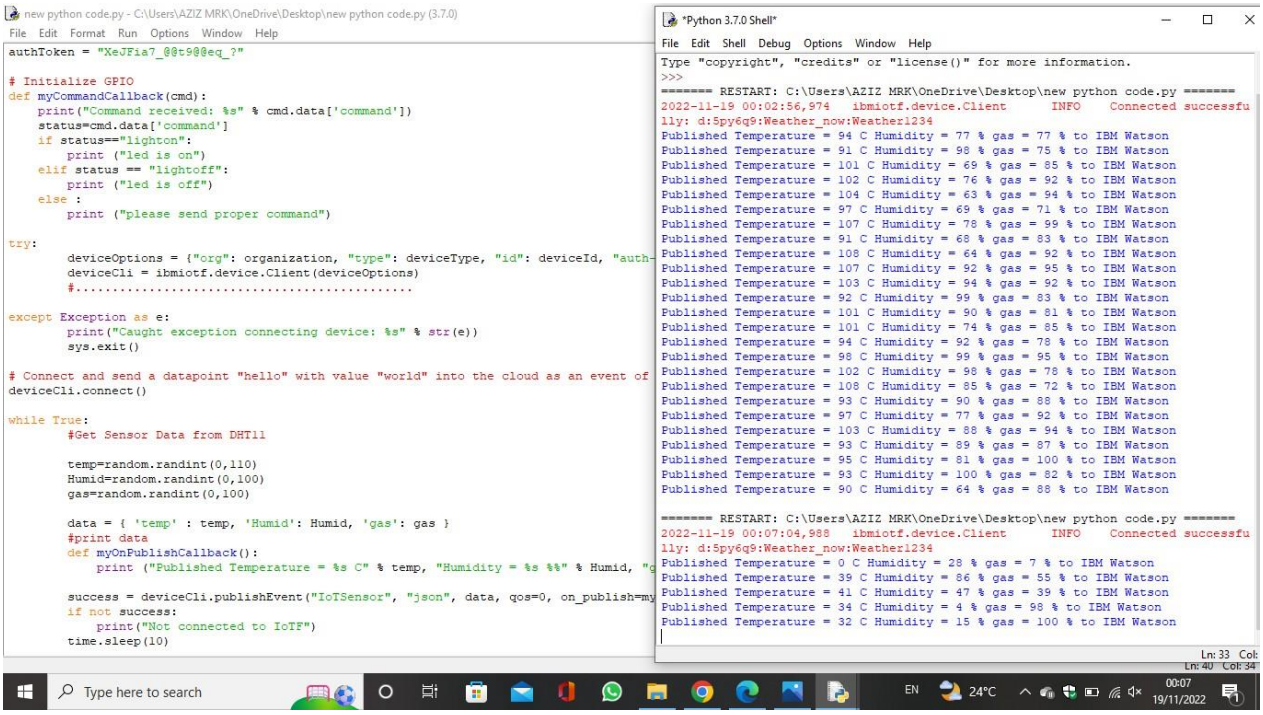
**Feature2:(PythonOutput)**




## 7. TESTING:

### Testcases:

### UserAcceptanceTesting:

## 8. RESULTS:

### PerformanceTesting:

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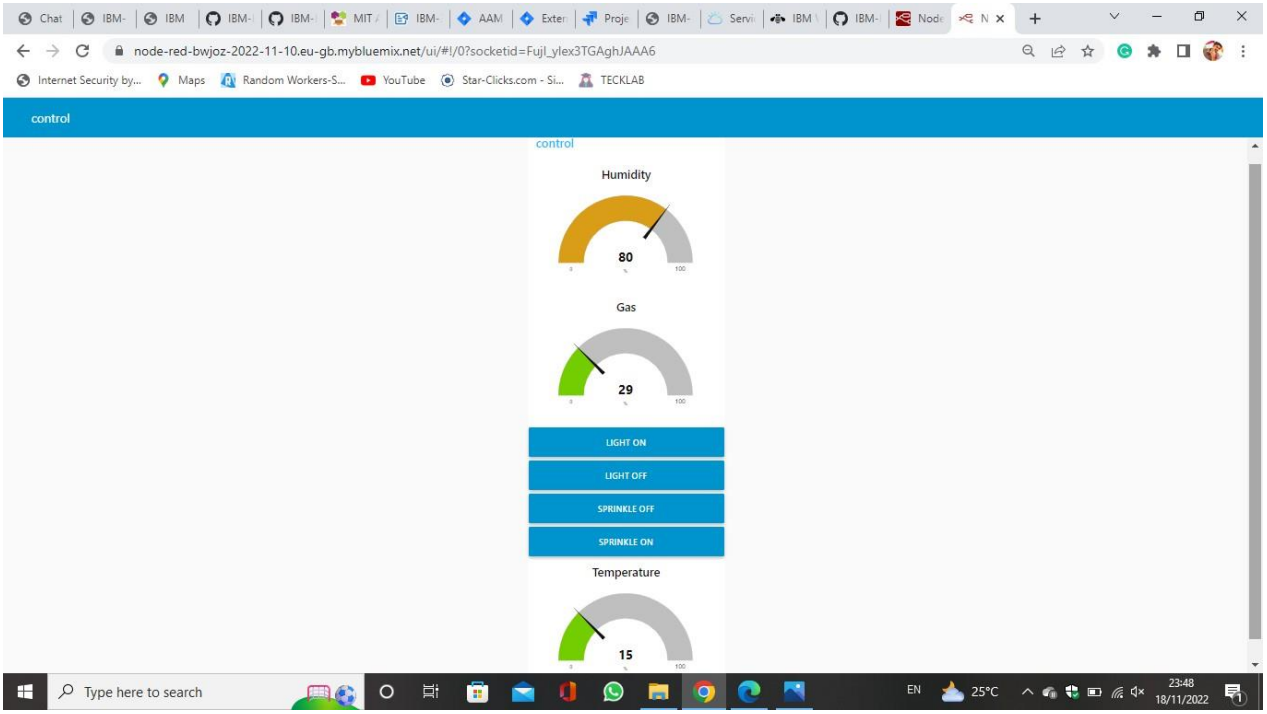
## 9. WEBAPPLICATIONDASHBOARD:




## 10. ADVANTAGESANDDISADVANTAGES

**Advantages:**

- Detecttheconcentrationofthegases
- Thesensor-enabledsolutionhelpspreventthehighriskofgasexplosionsandaffectinganycasualtieswithinandoutsidethepremises.
- Getreal-timealertsaboutthegaseouspresenceintheatmosphere
- Preventfirehazardsandexplosions
- Ensureworker'shealth
- Real-timeupdatesaboutleakages
- Cost-effectiveinstallation
- Measureoxygenlevelaccuracy
- Getimmediategasleakalerts

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**Disadvantage:**

- Getimmediategasleakalerts
- Whenheavydust,steamorfogblocksthelaserbeam,thesystemwillnotbeabletotakemeasurements

## 11. MOBILEAPPLICATION:

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## 12. CONCLUSION:

Gasleakageleadstosevereaccidentsresultinginmateriallossesandhuman injuries.Gas leakage occurs due to poor maintenance of equipment andinadequateawarenessofthepeople.Hence,gasleakagedetectionisessentialto preventaccidentsandtosavehumanlives.ThispaperpresentedLPGleakagedetectionandalertsystem.This systemtriggersbuzzerandnotificationtoalertpeoplewhengasleakageisdetected.Thissystemisbasicyetreliable.

## 13. FUTURESCOPE:

Major cities of India are pushing Smart Home application, gas monitoringsystemisapartofSmartHomeapplication.EnhancingIndustrialSafetyusingIoT.Thissystem can be implemented in Industries, Hotels and wherever the gas cylinders areused. This system can be used in industries involving applications such as Furnace,Boilers,Gaswelding,Gascutting,SteelPlants,Metallurgicalindustries,FoodprocessingIndustries,GlassIndustries,Plasticindustries,Pharmaceuticals,Aerosolmanufacturing.Ashospitalsrequiretoprovidemaximumpossiblesafetytopatients,thissystemcanbeusedtokeeptrackofallthecylindersusedinit.SomeofthecylindersusedareOxygencylinder,Carbondioxidecylinder,Nitrousoxidecylinder.Asmanystudentsarenaivetherisk of causing accidents is high. Hence, our system can also be used in schools,colleges.Manycollegeshavewellestablishedlabsincludingchemistrylaband pharmaceuticallabswheregasburnersareused.Severalmedicalequipmentrequiresgascylinders.

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## 14. APPENDIX:

### SourceCode:

- **https://github.com/IBM-EPBL/IBM-Project-11348-1659320878/tree/main/Final%20Deliverables/sorce%20code**

### GitHubandProjectDemoLink:

- **https://github.com/IBM-EPBL/IBM-Project-11348-1659320878**
- **PROJECT DEMO LINK**