HAZARDOUS AREA MONITORING FOR INDUSTRIAL PLANT POWERED BY IOT

NALAAIYA TIRAN PROJECT BASED LEARNING ON PROFESSIONAL READLINESS FOR INNOVATION, EMPLOYABILITY AND ENTERPRENEURSHIP

A PROJECT REPORT

UDHAYA SHANKAR .S	**611819104054**
MOHAMMED IMRAN .N	**611819104027**
RAGUL .K	**611819104034**
DINESH .S	**611819104011**

TEAM ID : PNT2022TMID40922

FACULTY MENTOR NAME : B.SAKTHIVEL

INDUSRTY MENTOR NAME : BHARADWAJ

EVALUATOR NAME : DR.S.CHANDRA SEKARAN

P.S.V. COLLEGE OF ENGINEERING AND TECHNOLOGY

(An ISO 9001:2015 Certified Institution)
(Accredited by NAAC with ‘A’ Grade)

KRISHNAGIRI-635 108

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ANNA UNIVERSITY::CHENNAI 600 025

BONAFIDE CERTIFICATE

This is to certify that the project report "**HAZARDOUS MONITORING FOR INDUSTRIAL PLANT POWERED BY IOT"** is the bonafide record of a Nalaiya Thiran work done by **UDHAYA SHANKAR.S(611819104054),MOHAMMED IMRAN.N(611819104027), RAGUL.K (611819104034), DINESH.S (611819104011)** who carried out the research under my supervision.

SIGNATURE

Prof. B. SAKTHIVEL.,M.E.,(Ph.D).,
Head of the Department,
Dept. of Computer Science &
Engineering,
P.S.V.College of Engineering
&Technology,
Krishnagiri-635 108

SIGNATURE

Prof. B. SAKTHIVEL.,M.E.,(Ph.D).,
Faculty Mentor,
Dept. of Computer Science
Engineering,
P.S.V.College of Engineering
& Technology,
Krishnagiri-635 108

Submitted for the Nalaaiya Tiran Project Report Held on ……………… at P.S.V. College of Engineering and Technology, Krishnagiri.

INTERNAL EXAMINER **EXTERNAL EXAMINER**

ACKNOWLDGEMENT

At this pleasing moment of having successfully completed My Project,I wish to convey our sincere thanks and gratitude to our beloved Chairman, **Dr. P. SELVAM, M.A., B.Ed., M.Phil., Ph.D.,** who provided all the facilities and support to me.

I would like to express my sincere thanks to my beloved Principal **Dr. P. LAWRENCE, M.E., Ph.D.**, for forwarding us to do our project and offering adequate duration in completing my project.

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I have great pleasure to express my sense of gratitude to our Evaluator Guide **Dr. S. CHANDRA SEKARAN, M.E,Ph.D.,** Professor, Department of Computer Science for being the great inspiration to us.

Last but not least the whole thing will be incomplete if we don’t acknowledge our beloved Parents who are everything for us.

UDHAYA SHAKNKAR .S

MOHAMMED IMRAN .N

RAGUL .K

DINESH .S

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ABSTRACT

• In some industrial plants there are some areas which are to be monitored time to time.

• Sometimes the conditions may become critical which may lead to loss of property and also human loss .

• To monitor the conditions we can integrate the smart devices in the areas which are needed to be montored. Every device will be acting as a beacon and it is connected to temperature sensors.

• We can broadcast the temperature data along the location of that particular area through beacons.

• The persons who generally monitor these places will be given a wearable device which will be acting as a beacon scanner. Whenever the person enters the desired area then he can view the required parameters and can be alerted these are sent to cloud.

• Industrial accidents are as old as industry itself and so are preventive measures.The Standards for Explosive Areas or Atmospheres have also has evolved diversely worldwide based on the local needs of the industries for the overall safe operation of the plants. Explosion and an fire are two of the major constituents of these mishaps.

CHAPTER-1

INTRODUCTION

1.1 PROJECT OVERVIEW

- Technology advancement is a never-ending process; thus, we must be well-equipped and informed about new developments. Day-to-Day human life has gotten more convenient as a result of these technological improvements. Automation has evolved into a must need.
- The internet today provides access to all data and systems, and web technology is continually expanding. A network interface enables remote management and control of embedded devices using a web-based embedded system.
- Controlling Internet of Things (IoT) devices is done through web controllers, often known as E-controllers. A web controller, often known as an Econtroller, is a set of embedded systems and software stacks that is the most extensively used method of web development in the world.
- Instead of employing large server systems for monitoring, administering, and handling data, remote login and monitoring using a distributed web control system produced using web pages generated in web applications are increasingly used instead of big server systems for monitoring, administering, and processing data.
- Web control systems that leverage IoT has three characteristics: energy savings, comfort, and efficiency. Our main objective is to adapt the Internet control system to the Internet of Things, allowing users to access the application over the Internet from anywhere in the globe.
- IoT monitoring allows you to analyze dynamic systems and analyze billions of events and alerts. IoT monitoring also enables you to bridge the gap between devices and businesses by collecting and analyzing a wide range of IoT data at a web scale across connected devices, consumers, and apps.
- The Arduino Mega is the brain of the project connected to the component and operates them with the code embedded in it. Sensors like smoke sensors, humidity, and temperature sensors are used to monitor the surroundings of the machine.

1.2 PURPOSE

- Android user via C2DM Service presents a WSN prototype for accesing the remote room temperature monitoring which can be used for fire saftey operations viva an android platform.
- This paper influenced our work in selecting the plat form for alerting the user and connecting it with central controller.
- This paper provided insights about applications of IoT based systems in industrial environments, and how multiple sensors are unified together.
- To reduce the green house effect by real time monitoring and controlling of C02 emission caused due to vehicles and industries using cognitive IoT.
- This paper gives insights about the domain of Cognitive IoT.
- It can be implemented as an extension of our project.
- IoT is a platform which has varied applications in day-to-day life ranging from domestic to industrial.
- The system we are going to implement aims to provide a low cost, low maintenance and robust architecture for analyzing hazardous situations in heavy industries.
- Various papers published in the field of IoT have touched different aspects of this project.
- Through this, we can monitor the temperature parameters of the Hazardous Areas Montoring for Industrial plants Powered by IoT.
- The area is integrated with smart beacon devices which will be broadcasting the temperature of that particular area.
- Every person working in those areas will be given smart wearable devices which will be acting as beacon scanners.

CHAPTER-2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

- To monitoring industrial parameter monitoring and power consumption control.
- To the Data availability and easy remote configuration.
- To the accomplishment of requirements of industrial sensors.
- To design strategies in achieving robust nodes, security in communication.
- Implementation of a real WSN is done to measure industrial parameters and to.
- perform experimental validations.

2.2 REFERENCES

1. Ganga, D., & Ramachandran, V. (2018). IoT-based vibration analytics of Electrical Machines. IEEE Internet of Things Journal, 5(6), 4538–4549.

2. Design of complex wind power generation parameter control system based on embedded control combined with internet of things Web Intelligence 17(2), 131–139.

3. An efficient named-data-networking-based IOT Cloud Framework. IEEE Internet of Things Journal, 7(4), 3453–3461 Saha, S., & Majumdar, A. (2017).

4. Data Centre temperature monitoring with ESP8266 based wireless sensor network and cloud based dashboard with Real Time Alert System. 2017 Devices for Integrated Circuit (DevIC) Chawla, Y. P. (2022).

5. Wi-Fi Computing Network empowers Wi-Fi Electrical Power Network. Cloud Computing Enabled Big-Data Analytics in Wireless Ad-Hoc Networks, 49–64.C.-H., Lee, H.-S., & Kim, S.-K. (2017).

6. A study on response characteristics of photoelectric type smoke detector chamber due to dust and wind velocity. Fire Science and Engineering, 31(1), 50–57

2.3 PROBLEM STATEMENT DEFINITION

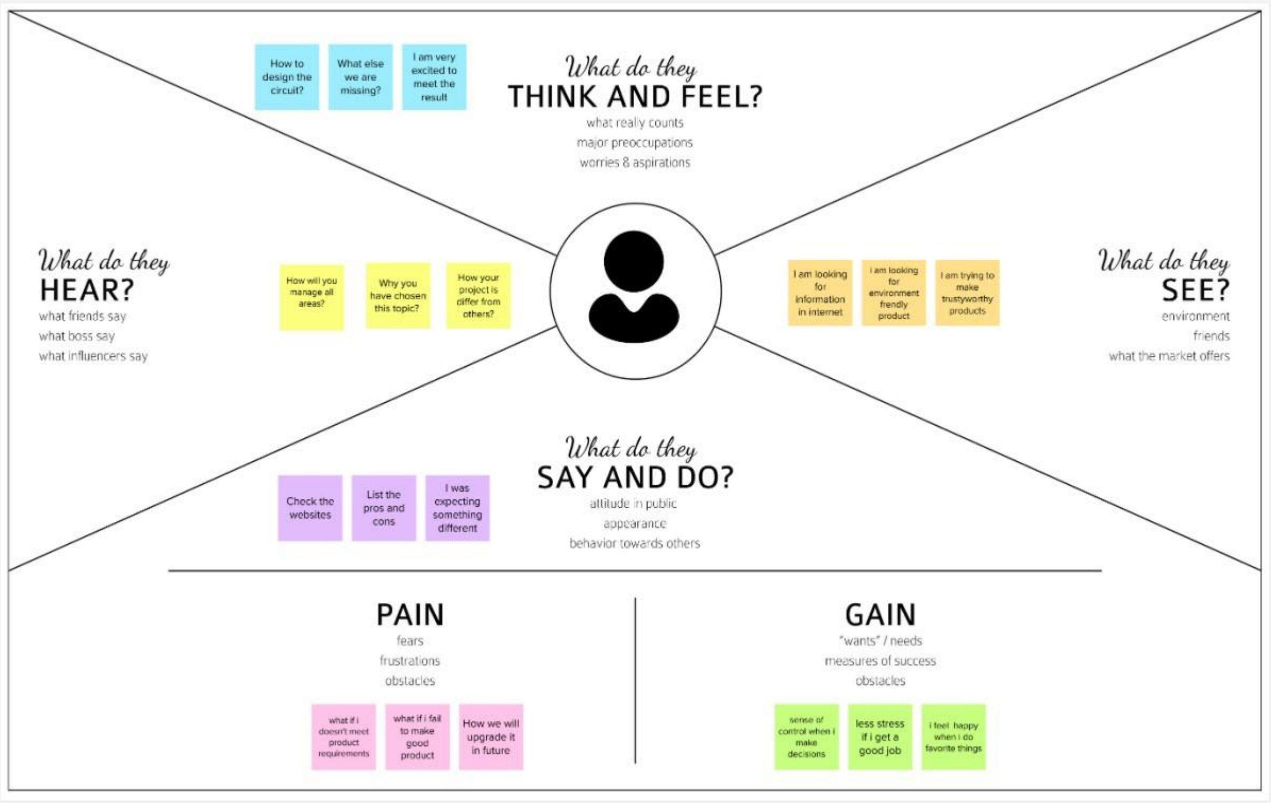
Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love. A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

Problem Statement (PS)	**I am (customer)**	**I'm trying to**	**But**	**Because**	**Which makes Me feel**
PS-1	Savior	Alert people before entering into the hazards area by IOT	The humans cannot involve in dangerous process	Industries contains dangerous gas and material, it may harmful to humans	Good
PS-2	Protector	Help peoples to know Where is hazard area	May the technica l errors occurs	Due to some unwanted things, which were done by the environment	Bad

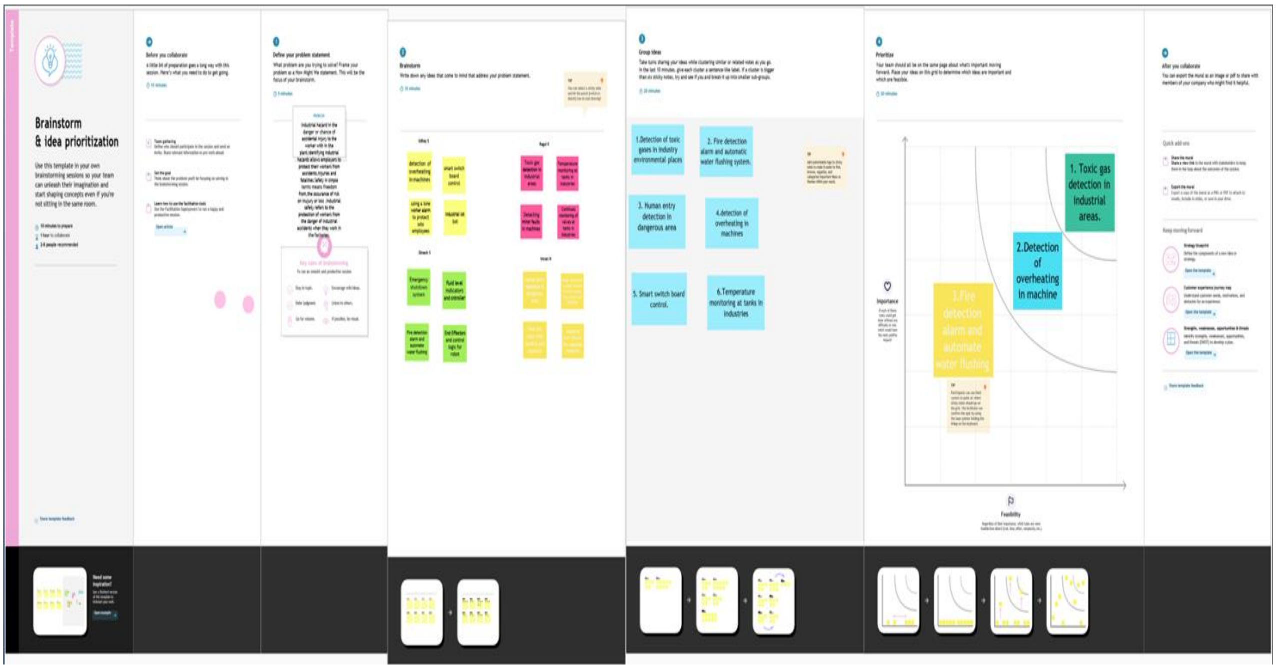
CHAPTER-3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS


How to design the circuit?
What else we are missing?
I am very excited to meet the result
What do they
THINK AND FEEL?
what really counts
major preoccupations
worries & aspirations
What do they
HEAR?
what friends say
what boss say
what influencers say
How will you manage all areas?
Why you have chosen this topic?
How your project is differ from others?
I am looking for information in internet
i am looking for environment friendly product
I am trying to make trustworthy products
What do they
SEE?
environment
friends
what the market offers
What do they
SAY AND DO?
attitude in public
appearance
behavior towards others
Check the websites
List the pros and cons
I was expecting something different
PAIN
fears
frustrations
obstacles
what if i doesn't meet product requirements
what if i fail to make good product
How we will upgrade it in future
GAIN
"wants" / needs
measures of success
obstacles
sense of control when i make decisions
less stress if i get a good job
i feel happy when i do favorite things

3.2 IDEATION & BRAINSTORMING

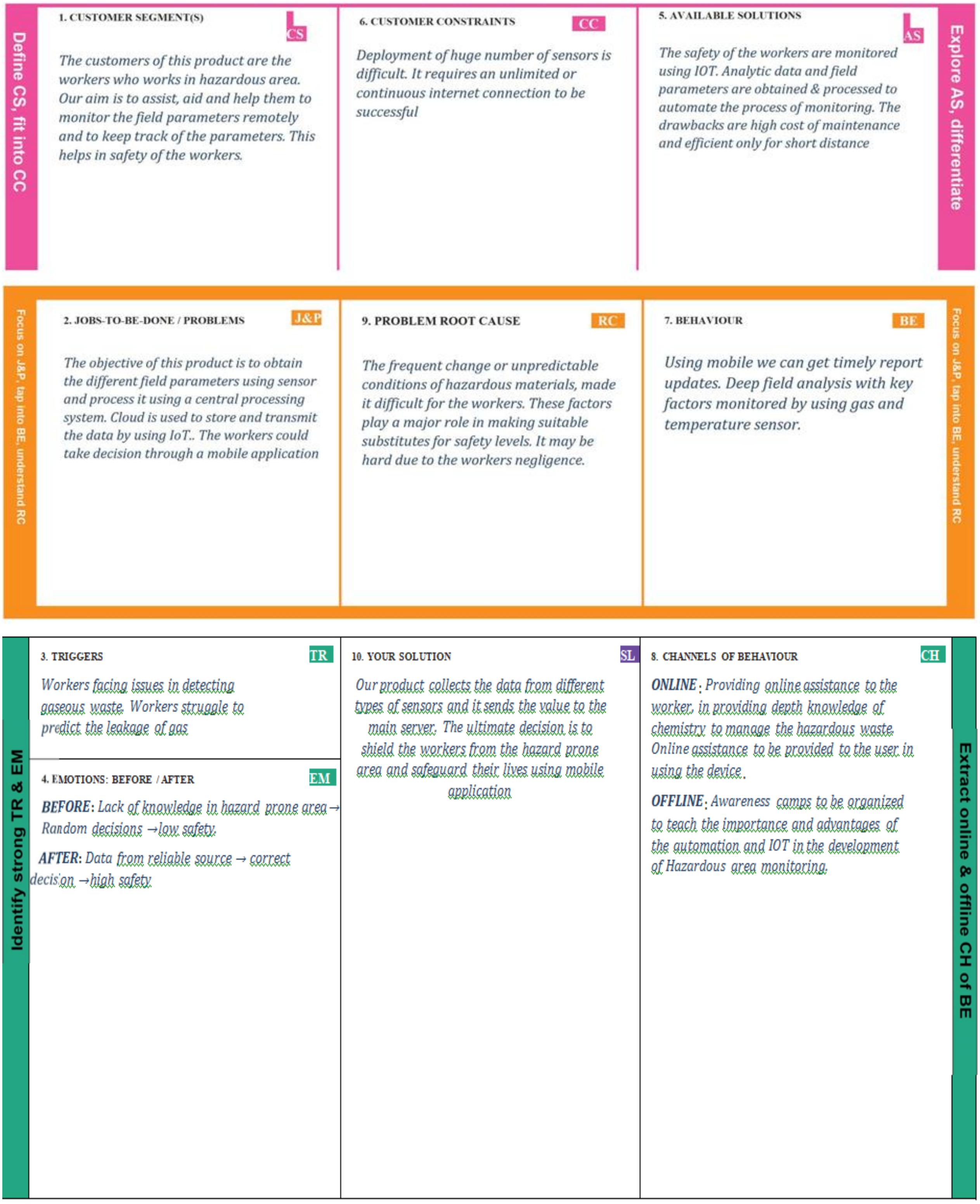

Brainstorm
& idea prioritization
Group ideas
1.Detection of toxic gases in industry environmental places
2. Fire detection alarm and automatic water flushing system.
3. Human entry detection in dangerous area
4.detection of overheating in machines
5. Smart switch board control.
6.Temperature monitoring at tanks in industries
Prioritize
Importance
Feasibility
1. Toxic gas detection in industrial areas.
2.Detection of overheating in machine
3.Fire detection alarm and automate water flushing

3.3 PROPOSED SOLUTION

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	To monitor and alert the industrial workers the risk of toxic or hazardous gases presents within the area of an industry, ensuring the safety of the workers.
2.	Idea / Solution description	Providing a wearable device which collects the data(temperature) via beacon sensors and displays it. An alert message is also sent to mobile whenever high temperature (or) toxic gases are detected within the area through SMS using API. Ensuring precautions and safety of the workers.
3.	Novelty / Uniqueness	• Makes it easier to know the temperature (or) any hazardous gases present in the area without the worker having to constantly doing manual checks. • Provides different solution to ensure the safety of the workers. • Wearable devices display the current temperature present in the area all the time. • Alerts via SMS to mobiles of the workers when high temperature is detected. • Alerts on both the wearable device and mobile application occurs simultaneously to prevent the worker from entering into hazardous areas.

4.	Social Impact / Customer Satisfaction	• Ensures safety. • Saves lives of workers. • Comfortable & User-friendly. • Simple and reliable. • Helps in taking necessary precautions to avoid the risk of endangering human lives. • Necessary updates and more functions can be added to the mobile application to make it easier to use.
5.	Business Model (Revenue Model)	• Through our mobile application the revenue can be made in the form of pop-up advertisements, overlay ads from third party services. • Wearable devices can be priced and sold by the industry to the workers.
6.	Scalability of the Solution	• Large no. of people can be supplied with the wearable devices to ensure their safety. • Beacon sensors cover large amount of area and supplies data accurately and more readily. • Multiple users can receive alert messages and notifications simultaneously regarding hazardous gases without any delay. • Each user has individual wearable device and mobile devices which provide information accordingly. • It ensures the safety of each and every worker working in harmful gases and high temperature environment.

3.4 PROBLEM SOLUTION FIT



Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

The customers of this product are the workers who works in hazardous area. Our aim is to assist, aid and help them to monitor the field parameters remotely and to keep track of the parameters. This helps in safety of the workers.

6. CUSTOMER CONSTRAINTS CC

Deployment of huge number of sensors is difficult. It requires an unlimited or continuous internet connection to be successful

5. AVAILABLE SOLUTIONS AS

The safety of the workers are monitored using IOT. Analytic data and field parameters are obtained & processed to automate the process of monitoring. The drawbacks are high cost of maintenance and efficient only for short distance

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

The objective of this product is to obtain the different field parameters using sensor and process it using a central processing system. Cloud is used to store and transmit the data by using IoT.. The workers could take decision through a mobile application

9. PROBLEM ROOT CAUSE RC

The frequent change or unpredictable conditions of hazardous materials, made it difficult for the workers. These factors play a major role in making suitable substitutes for safety levels. It may be hard due to the workers negligence.

7. BEHAVIOUR BE

Using mobile we can get timely report updates. Deep field analysis with key factors monitored by using gas and temperature sensor.

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

Workers facing issues in detecting gaseous waste. Workers struggle to predict the leakage of gas

4. EMOTIONS: BEFORE / AFTER EM

BEFORE: Lack of knowledge in hazard prone area→ Random decisions →low safety.

AFTER: Data from reliable source → correct decision →high safety

10. YOUR SOLUTION SL

Our product collects the data from different types of sensors and it sends the value to the main server. The ultimate decision is to shield the workers from the hazard prone area and safeguard their lives using mobile application

8. CHANNELS OF BEHAVIOUR CH

ONLINE : Providing online assistance to the worker, in providing depth knowledge of chemistry to manage the hazardous waste. Online assistance to be provided to the user in using the device .

OFFLINE: Awareness camps to be organized to teach the importance and advantages of the automation and IOT in the development of Hazardous area monitoring.

Extract online & offline CH of BE

CHAPTER-4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR.No	**Functional Requirement (Epic)**	**Sub Requirement (Story / Sub-Task)**
FR-1	User Registration	Registration through Form Online Payment for the service
FR-2	User Access	Access the details using web browser Access the details using mobile application
FR-3	User alert	Gets alert as an SMS message Gets alert alarm in the working area.

4.2 NON-FUNCTIONAL REQUIREMENT

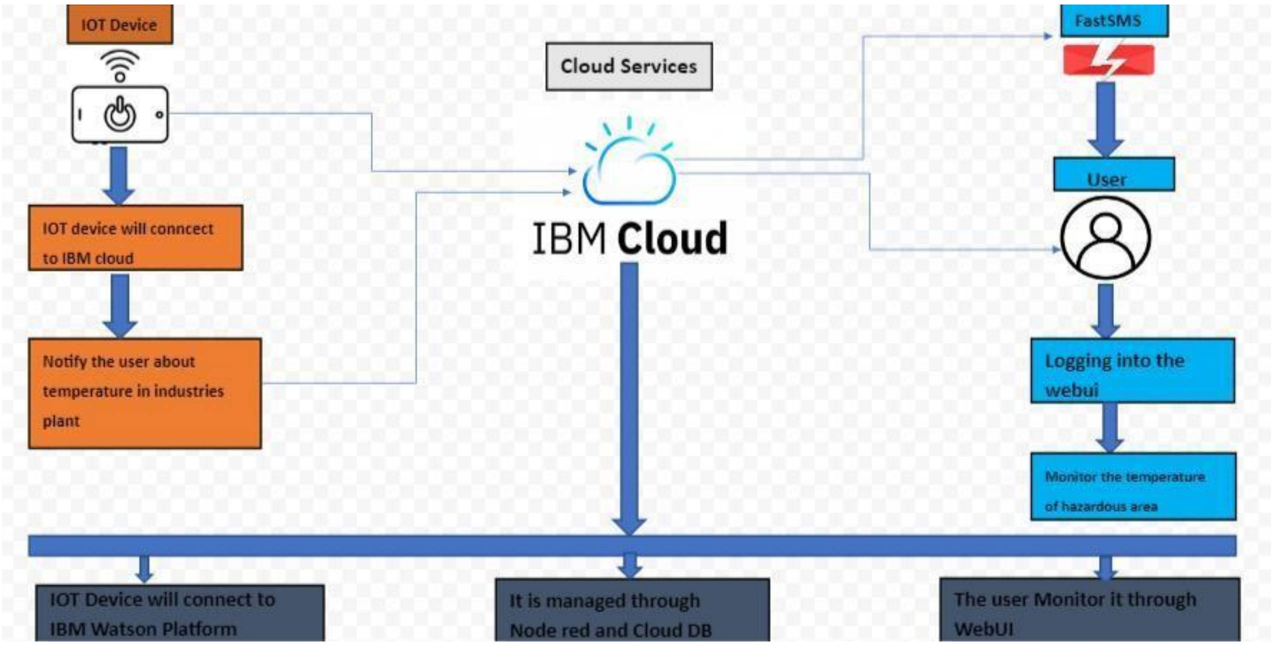
FR.No	**Non-Functional Requirement**	**Description**
NFR-1	Usability	The device must be usable by the customer anywhere
NFR-2	Security	Data from the sensors are stored securely and away from other data
NFR-3	Reliability	Data can be retrieved anytime and no data is discarded without customer knowledge
NFR-4	Performance	No performance delay in case of large number of data or more parameters

CHAPTER-5

PROJECT DESIGN

5.1 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.


IOT Device
Cloud Services
FastSMS
IOT device will conncect to IBM cloud
IBM Cloud
User
Notify the user about temperature in industries plant
Logging into the webui
Monitor the temperature of hazardous area
IOT Device will connect to IBM Watson Platform
It is managed through Node red and Cloud DB
The user Monitor it through WebUI

5.2 SOLUTION & TECHNICAL ARCHITECTURE

• To monitor the condition, we can integrate the smart device in the area which are needed to be monitored every device will be acting as a beacon and it is connected to temperature sensors**.**

• In this project, we create an IoT-based hazards monitoring system specifically suited to the requirements of mining, refining, and manufacturing industries

• The system actively records, processes and analyzes the temperature of the surroundings, which is a prime safety parameter in areas where molten metal is processed, manufacturing is done or welds are made, if a parameter is violated.

• The system sends an immediate notification to a set of a preset list of users on their smartphone and continues logging and monitoring data for further analysis to suggest improvements in the safety regulation of the industry.

• Broadcast the temperature data along with the location of that particular area through beacons. The persons who generally monitor these places will be given a wrist band and cell phones by alerting the call and SMS.

• Whenever the person enters the desired area then he can view the required parameters and can be alerted, these are sent to the cloud storage.

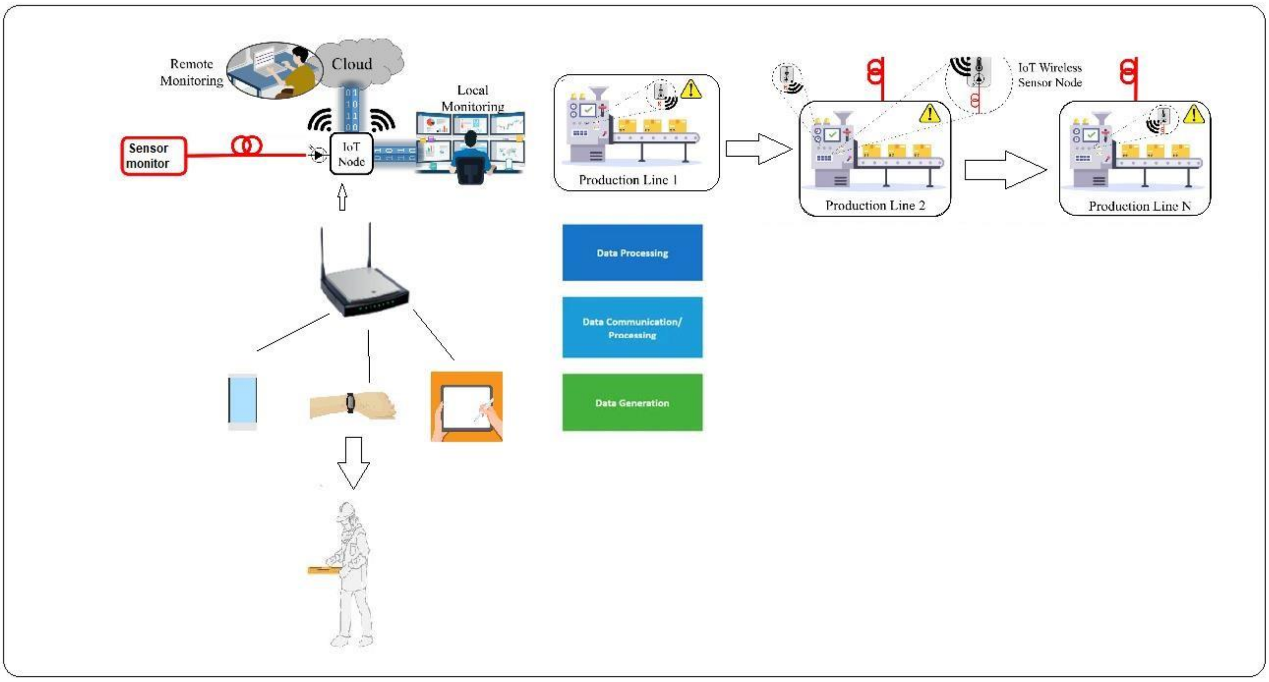


Table-1 : Components & Technologies

S.No	Component	Description	Technology
1.	User Interface	Web UI, Mobile App, Chatbot , MIT inventor etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	IoT applications use machine learning algorithms to analyze massive amounts of connected sensor data in the cloud.	Java / Python

3.	Application Logic-2	The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.	IBM Watson STT service
4.	Application Logic-3	Watson Assistant lets you build conversational interfaces into any application, device, or channel. Add a natural language interface to your application to automate interactions with your end users.	IBM Watson Assistant
5.	Database	IoT data comes in three different types, based on the device generating it and the use case.	MySQL, NoSQL, etc.
6.	Cloud Database	Cloudant handles software and hardware provisioning, management and scaling, and support.	IBM DB2, IBM Cloudant etc.
7.	File Storage	IBM Cloud® Block Storage is persistent, high-performance iSCSI storage that is provisioned and managed independently of compute instances. iSCSI-based Block Storage LUNs are connected to authorized devices through redundant multi-path I/O (MPIO) connections.	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Runtime APIs Admin HTTP API This HTTP-based API can be used to remotely administer the runtime. It is used by the Node-RED	IBM Weather API, etc.

		Editor and command-line admin tool. Hooks The Hooks API provides a way to insert custom code into certain key points of the runtime operation. Storage This API provides a pluggable way to configure where the Node- RED runtime stores data.	
9.	External API-2	Editor APIs The APIs available in the editor for nodes and plugins to use. This includes a set set of standard UI widgets that can be used within a node’s edit template. Module APIs The APIs provided by npm modules that Node- RED is built from. These can be used to embed Node-RED into existing Node.js applications.	Aadhar API, etc.
10.	Machine Learning Model	OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.	Object Recognition Model, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration	Local, Cloud Foundry, Kubernetes, etc.

Table-2 : Application Characteristics

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	It is an open-source IoT framework. The main purpose of the framework is data collection and device management. Further, it uses IoT protocols like HTTP, MQTT, and CoAP for device connectivity. It is also highly scalable as every type of device easily integrated	Technology of Opensource framework
2.	Security Implementations	Safety The IoT platform should never do something it isn't supposed to do. The principal game changer regarding software in the domain of IoT is safety coupled with accountability and responsibility. Security The IoT platform must ensure proper device management (via authentication and authorization mechanisms), data privacy, integrity, and confidentiality via secure communication and encryption of data. Security is especially crucial for an IoT platform, as it will rely more on automated security.	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Portability The IoT platform must be portable if it is destined to heterogeneous nodes. This may be achieved by leveraging virtualization technologies (for example, by using the Java Virtual Machine), or packing the deliverable into host operating system oblivious form (like the Docker image).	Technology used

4.	Availability	Load balancing is a core networking solution used to distribute traffic across multiple servers in a server farm. Load balancers improve application availability and responsiveness and prevent server overload.	Technology used
5.	Performance	Fog Computing is a new paradigm and an extension of Cloud Computing. This better performance results justifies the suitability of IoT applications using Fog-Based Cloud Network approach. Imperva and other CDNs can be used to reduce your website's latency, improving overall site performance and UX.	Technology used

5.3 USER STORIES

User Type	**Functional Requireme-nt (Epic)**	**User Story Number**	**User Story / Task**	**Acceptance criteria**	**Priority**	**Release**
Customer (Industrial Owner)	Registration	USN-1	As an Industrial Owner, I can register into the application by entering email & password	I can access my account / dashboard	High	Sprint-1
	Data Modules	USN-2	As an Industrial Owner, I can get message about the temperature and humidity	I can receive confirmation email & click confirm	High	Sprint-1

	Login	USN-3	As an industrial Owner, I can login into my account through email and Password	I can access my account	Medium	Sprint-2
	Dashboard	USN-4	As an Industrial Owner, I can monitor of temperature	I can access the Login id/pass word	High	Sprint-1
Customer (Industrial Worker)	Registration	USN-1	As an Industrial Worker, I can register into the application by entering email & password	I can access my account / dashboard	High	Sprint-1
	Data Modules	USN-2	As an Industrial Worker, I can get message about the temperature and humidity	I can receive confirmation email & click confirm	High	Sprint-1
	Login	USN-3	As an industrial Owner, I can login into my account through email and Password	I can access my account	Medium	Sprint-2
	Dashboard	USN-4	As an Industrial Owner, I can get alert high temperature	I can access the Login id/pass word	High	Sprint-1

CHAPTER-6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

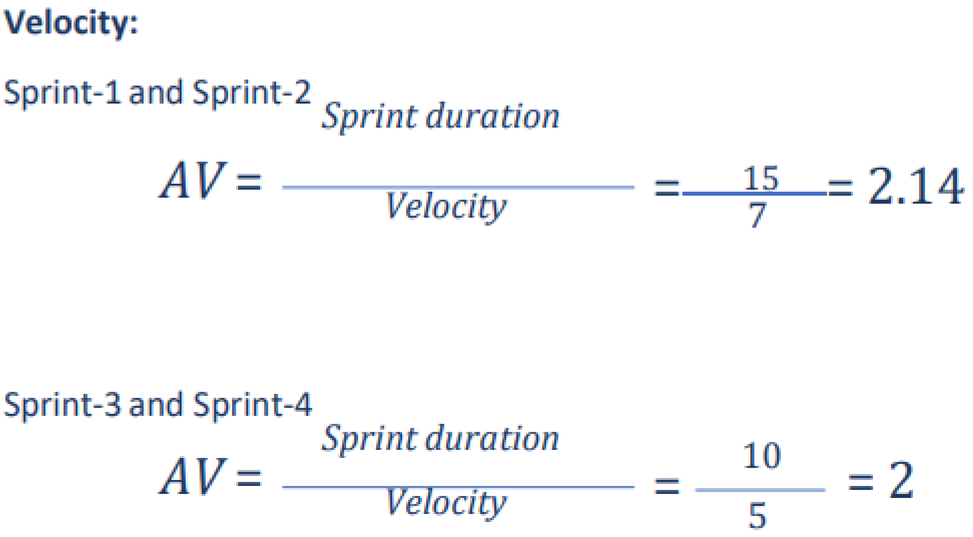
TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering Information by referring the, technical papers, research publications etc.	17 October 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	27 October 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility &importance.	27 October 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	27 October 2022
Problem Solution Fit	Prepare problem - solution fit document.	27 October 2022
Solution Architecture	Prepare solution architecture document.	27 October 2022

Customer Journey	Prepare the customer journey maps to understand the user interactions &experiences with the application (entry to exit).	29 October 2022
Functional Requirement	Prepare the functional requirement document.	29 October 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	29 October 2022
Technology Architecture	Prepare the technology architecture diagram.	29 October 2022
Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	31 October 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop &submit the developed code by testing it.	19 November 2022

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for application by entering my email password and confirming it.	5	High	Udhaya Shankar.S, Ragul.K
		USN-2	As a user, I will receive confirmation email once I have registered for the application	5	High	Mohammed Imran.N,Dinesh.S
Sprint-1	Login	USN-3	As a user, I can log into the application by entering email & password	5	Medium	Udhaya Shankar.S, Ragul.K
Sprint-2	Post Job	USN-6	As a recruiter, I must post the job vacancy with description	6	High	Mohammed Imran.N,Dinesh.S
Sprint-2	Job Search	USN-4	As a job seeker, I can search for the desired companies	9	High	Udhaya Shankar.S, Ragul.K
Sprint-3	Apply	USN-5	As a job seeker, I can apply for a company	6	High	Mohammed Imran.N,Dinesh.S
Sprint-3	Send Confirmation	USN-7	Confirmation mail is sent from the respected company	4	High	Udhaya Shankar.S, Ragul. K
Sprint-4	Dashboard	USN-8	As a user, I need to maintain the my actions in an application	6	High	Mohammed Imran.N,Dinesh.S
Sprint-4	Recruiter Review	USN -9	As a recruiter, I must make the reviews appear on the candidate’s profile	3	High	Udhaya Shankar.S, Ragul.K
Sprint-4	Chatbot	USN-10	As a user, I can interact with Watson Assistant to resolve my queries on skills to be learnt	1	Low	Mohammed Imran.N,Dinesh.S

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	15	7 Days	24 Oct 2022	31 Oct 2022	15	31 Oct 2022
Sprint-2	15	7 Days	1 Nov 2022	07 Nov 2022	15	07 Nov 2022
Sprint-3	10	5 Days	08 Nov 2022	12 Nov 2022	10	12 Nov 2022
Sprint-4	10	5 Days	14 Nov 2022	19 Nov 2022	10	19 Nov 2022



Velocity:

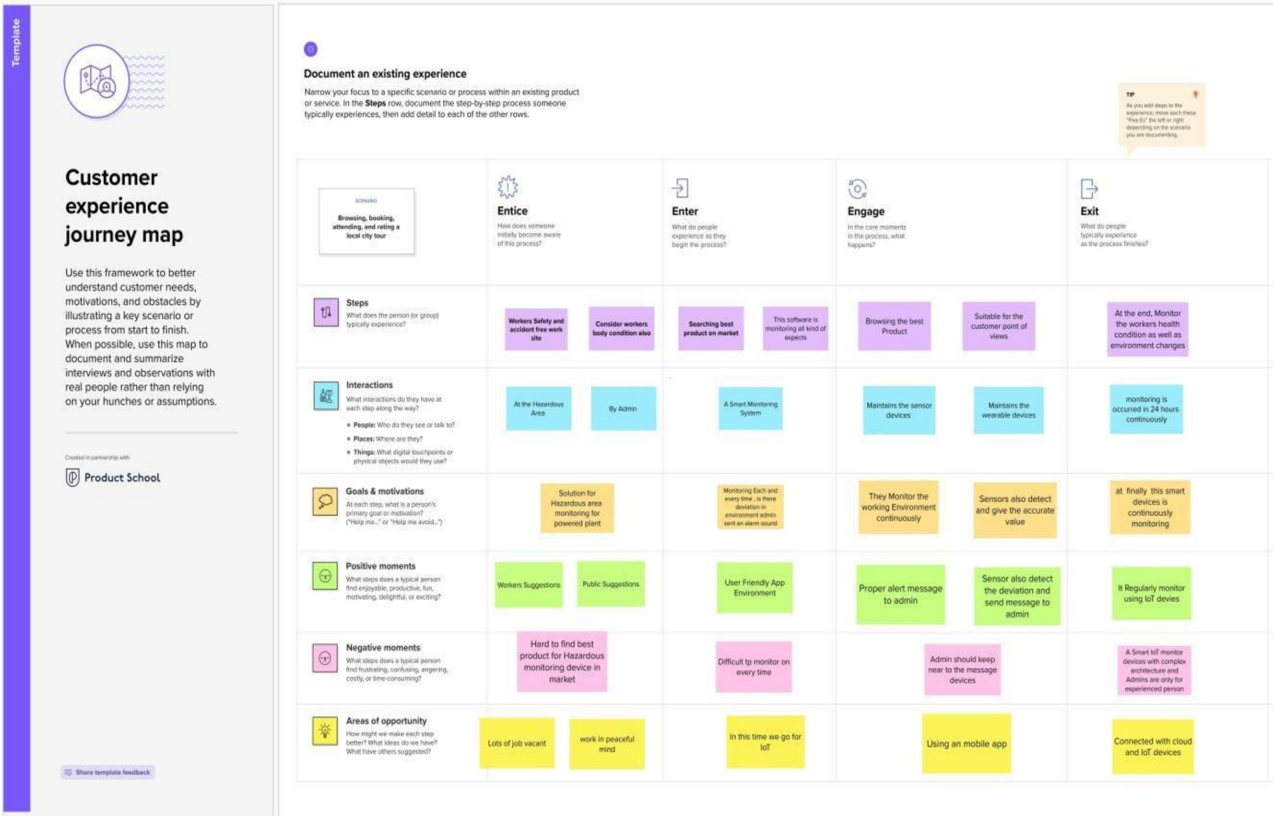
Sprint-1 and Sprint-2

$$AV = \frac{Sprint\ duration}{Velocity} = \frac{15}{7} = 2.14$$

Sprint-3 and Sprint-4

$$AV = \frac{Sprint\ duration}{Velocity} = \frac{10}{5} = 2$$

6.3 REPORTS FROM JIRA



Template

Customer experience journey map

Use this framework to better understand customer needs, motivations, and obstacles by illustrating a key scenario or process from start to finish. When possible, use this map to document and summarize interviews and observations with real people rather than relying on your hunches or assumptions.

Created in partnership with

Product School

Share template feedback

Document an existing experience

Narrow your focus to a specific scenario or process within an existing product or service. In the **Steps** row, document the step-by-step process someone typically experiences, then add detail to each of the other rows.

TIP

As you add steps to the experience, move each these "Five Es" the left or right depending on the scenario you are documenting.

SCENARIO Browsing, booking, attending, and rating a local city tour	**Entice** How does someone initially become aware of this process?	**Enter** What do people experience as they begin the process?	**Engage** In the core moments in the process, what happens?	**Exit** What do people typically experience as the process finishes?
Steps What does the person (or group) typically experience?	Workers Safety and accident free work site Consider workers body condition also	Searching best product on market This software is monitoring all kind of aspects	Browsing the best Product Suitable for the customer point of views	At the end, Monitor the workers health condition as well as environment changes
Interactions What interactions do they have at each step along the way? **People:** Who do they see or talk to? **Places:** Where are they? **Things:** What digital touchpoints or physical objects would they use?	At the Hazardous Area By Admin	A Smart Monitoring System	Maintains the sensor devices Maintains the wearable devices	monitoring is occurred in 24 hours continuously
Goals & motivations At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	Solution for Hazardous area monitoring for powered plant	Monitoring Each and every time , is there deviation in environment admin sent an alarm sound	They Monitor the working Environment continuously Sensors also detect and give the accurate value	at finally this smart devices is continuously monitoring
Positive moments What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?	Workers Suggestions Public Suggestions	User Friendly App Environment	Proper alert message to admin Sensor also detect the deviation and send message to admin	It Regularly monitor using IoT devies
Negative moments What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?	Hard to find best product for Hazardous monitoring device in market	Difficult tp monitor on every time	Admin should keep near to the message devices	A Smart IoT monitor devices with complex architecture and Admins are only for experienced person
Areas of opportunity How might we make each step better? What ideas do we have? What have others suggested?	Lots of job vacant work in peaceful mind	In this time we go for IoT	Using an mobile app	Connected with cloud and IoT devices

CHAPTER-7

CODING & SOLUTIONING

7.1 WEB APP

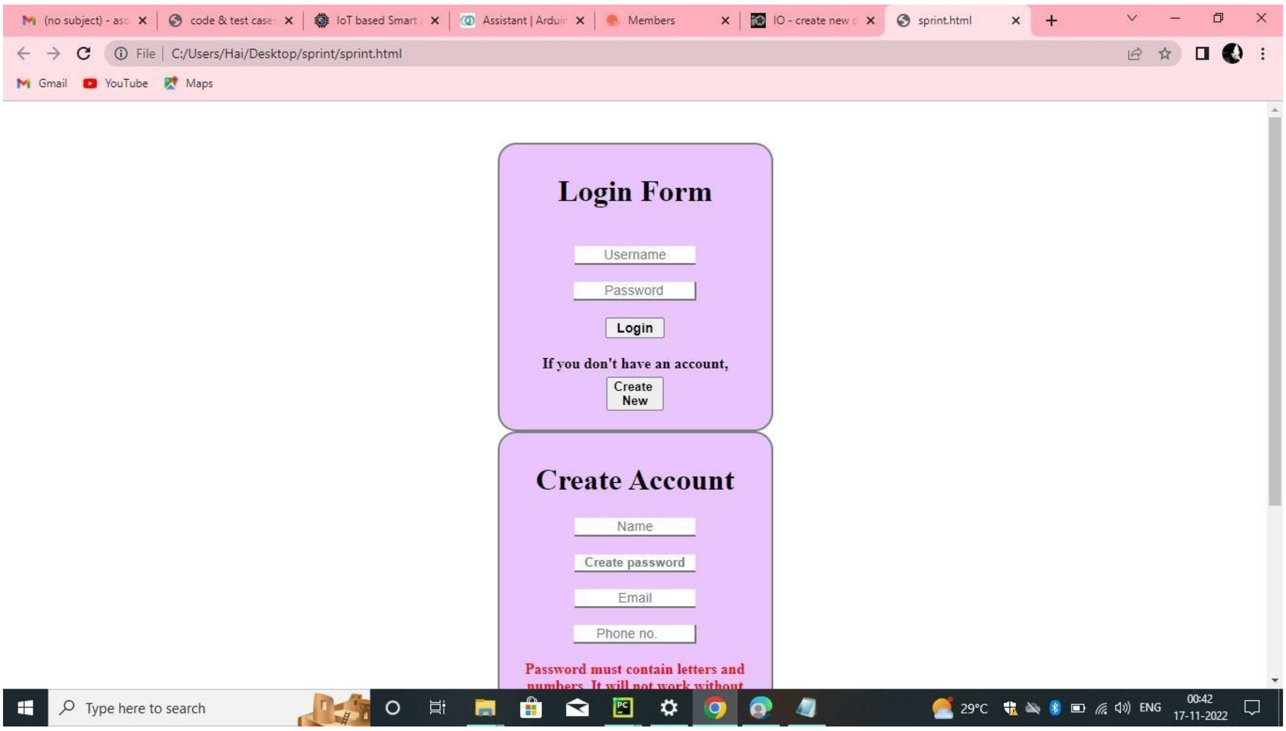
LOGIN PAGE :

```
<!DOCTYPE html>
<html>
 <head>
  <base target="_top">
  <script>
   function AddRow()
  {
   var   usernamee   =   document.getElementById("usernamee").value;
   var   passwordd   =   document.getElementById("passwordd").value;
   var email = document.getElementById("email").value;
   var phone = document.getElementById("phone").value;
   if  (usernamee==""||  passwordd==""||  email==""||  phone=="")  {
    return false;
   }
   else
   {        google.script.run.AddRecord(usernamee,passwordd,email,phone);
   document.getElementById("page2_id1").className  =  "page2_id1-off";
   document.getElementById("page3_id1").className = "page3_id1";

  }
  }
  function LoginUser()
  {
  Var   username   =   document.getElementById("username").value;
  var

  password =

  document.getElementById("password").value;
 google.script.run.withSuccessHandler(function(output)
  {
   if(output == 'TRUE')
   {
     var  url1  ='http://www.google.com'; var
     winRef = window.open(url1);
       winRef                 ?                 google.script.host.close()                 :
 window.onload=function(){document.getElementById('url').href = url1;}
   }
   else if(output == 'FALSE')
   {
    document.getElementById("errorMessage").innerHTML = "Invalid data";
   }
  }).checkLogin(username, password);
  }
function function1(){
  document.getElementById("page1_id1").className  =  "page1_class1-off";
  document.getElementById("page2_id1").className = "page2_id1";

}
function
function3()
{
 document.getElementById("page3_id1").className   =   "page3_id1-off";
 document.getElementById("page1_id1").className = "page1_id1";
}
```

```
  </script>
  <style>
/page1/
.page1_class1-off{
      display: none;

  }
/page2/
.page2_class1{        display:
   none;
  }
.page2_id1-off{
   display:none;
 }
   display: none;

   }
   /page2/
   .page2_class1{    display:
   none;
   }
   .page2_id1-
   off{display:none;
   }
/page3/
.page3_class1{
   display:none;

}
.page3_id1-

off{display:none;
}
input[type=text]:hover{
      border-bottom:2px solid black;
```

```
     }
input[type=number]:hover{
      border-bottom:2px solid black;
     }
input[type=password]:hover{     border-
      bottom:2px solid black;
    }
     </style>
<meta name="viewport" content="width=device-width, initial-scale=1.0">


  </head>
  <body>
             <br><br>
         <!--page1-->
<center>
 <div class="page1_class1" id="page1_id1"
 style="background-color:rgb(234, 196, 255);border:2px solid gray;border-radius:
 20px;width: 250px;padding-top: 10px;padding-bottom: 20px;padding-left:20px;
 padding-right: 20px;">
   <h1>Login Form</h1>
   <br>
   <input type="text" id="username" placeholder="Username" style="border-top:
   none;border-right:none;border-left: none;outline: none; text-align: center;
   font-size:0.9em ;width: 50%;font- weight:bold;"/><br>
   <br>
   <input type="password" id="password" placeholder="Password" style="border-top:
    none;border-right: none;border-left: none;outline: none; text-align: center;
   font-size:0.9em ;width: 50%;font- weight:bold;"/>
   <br><span id="errorMessage" style="color: red" ></span><br>
   <input type="submit" value="Login" onclick="LoginUser()"
   style="float: centre;padding-top: 1px;padding-bottom: 1px;padding-left: 10px;

   padding-right: 10px;font-size: 0.9em;font-weight:bold;"
/><br>

   <br>

   <b>If you don't have an account,</b><input type="button"

   onClick="function1()" value="CreateNew" style="margin-top: 5px;font-weight:bold;" />


 </div>

          <!--page2->
<div class="page2_class1" id="page2_id1"

style="background-color:rgb(234, 196, 255);border:2px solid gray;

border-radius: 20px;width: 250px;padding-top: 10px;padding-bottom:

20px;padding-left:20px;padding-right: 20px;">
     <h1>Create Account</h1>

   <input type="text" id="usernamee" placeholder="Name" style="border-top:

   none;border-right:none;border-left: none;outline: none; text-align: center;

   font-size:0.9em ;width: 50%;font- weight:bold;"/><br>

            <br>

   <input type="password" id="passwordd" placeholder="Create password"

   style="border-top: none;border-right: none;border-left: none;outline: none;

   text-align: center;font-size: 0.9;width:50%;font-weight:bold;" /><br>

               <br>

   <input type="text" id="email" placeholder="Email" style="border-top: none;

   border-right:none;border-left: none;outline: none; text-align: center;

   font-size:0.9em ;width: 50%;font- weight:bold;"/><br>

            <br>

   <input type="number" id="phone" placeholder="Phone no."

   style="border-top: none;border-right: none;border-left: none;outline: none;

   text-align: center;font-size:0.9em ;width: 50%;font-weight:bold;" /><br><br>

   <b style="color:red;">Password must contain letters and numbers.
   It will not work without letters and numbers.
       </b>
  <br>
  <br>
   <input type="submit" value="Create" onclick="AddRow()"
   style="float: centre;padding-top: 1px;padding-bottom: 1px;padding-left: 10px;
   padding-right: 10px;font-size: 0.9em;font-weight:bold;"/>
             <br>
          </div>
<!--page3-->
 <div class="page3_class1" id="page3_id1"
 style="background:none;border:2px solid gray;border-radius: 20px;width: 250px;
 padding-top: 10px;padding-bottom: 20px;padding-left: 20px;padding- right: 20px;">
 <center>
   <h2> Your account has been successfully created.
   Login to your account</h2>
<input type="submit"  onClick="function3()" value="Login" style="font-weight:bold;">
<br>
   </div>
   </center>
      </body>
    </html>
```

OUTPUT :

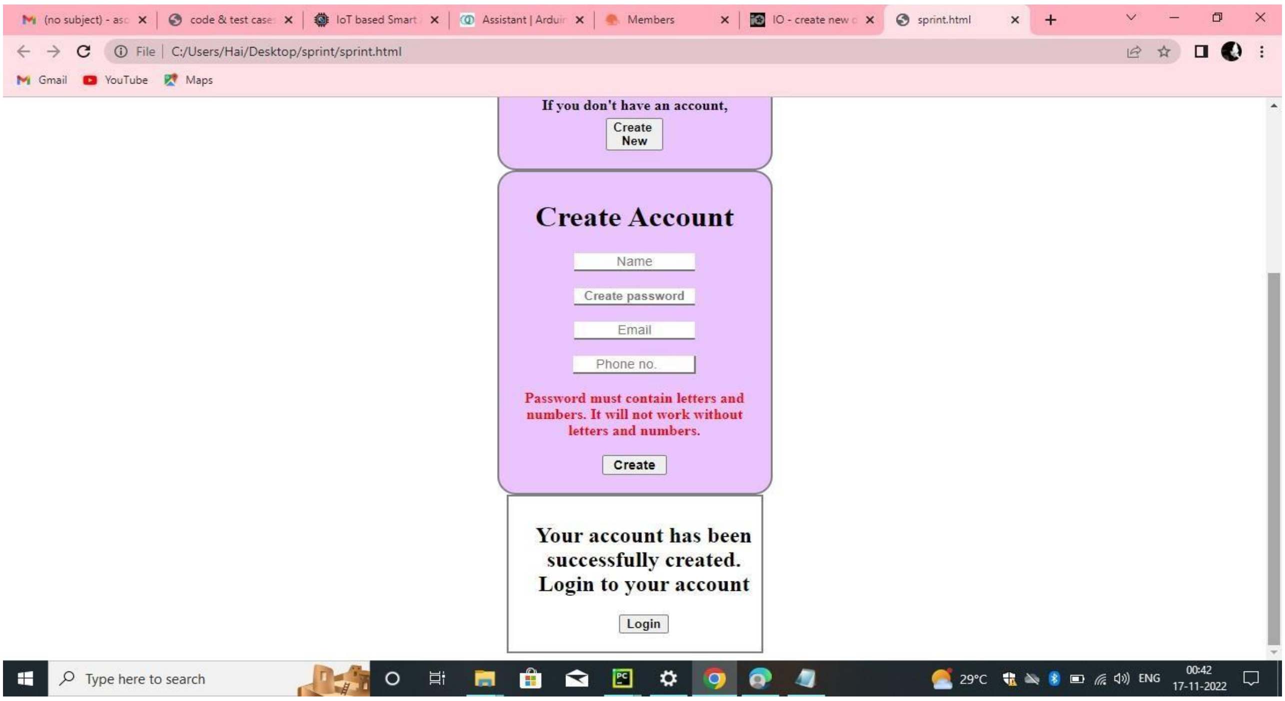


Login Form

If you don't have an account,

Create Account

Password must contain letters and numbers. It will not work without



If you don't have an account,

Create Account

Password must contain letters and numbers. It will not work without letters and numbers.

Your account has been successfully created. Login to your account

7.2 IOT DEVICE

WOKWI CODE :

```
#include <WiFi.h>//library for wifi #include
<PubSubClient.h>
#include "DHT.h"// Library for dht11
#define DHTPIN 15     // what pin we're connected to#define
DHTTYPE DHT22
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dhtconnected
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);

//-------credentials of IBM Accounts--------//

#define ORG "aqudbz"//IBM ORGANITION ID
#define DEVICE_TYPE "NodeMCU"//Device type mentioned in ibm watson IOT Platform#define
DEVICE_ID "12345"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "EON8Q6-UN@GTJ&zH-Q"  //Toke
nString data3;


float Humidity, Temp;
//-------- Customise the above values --------//

char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event performand format
in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd REPRESENT commandtype AND
COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication methodchar token[] =
TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id
//-------------------------------------------------------------------
```

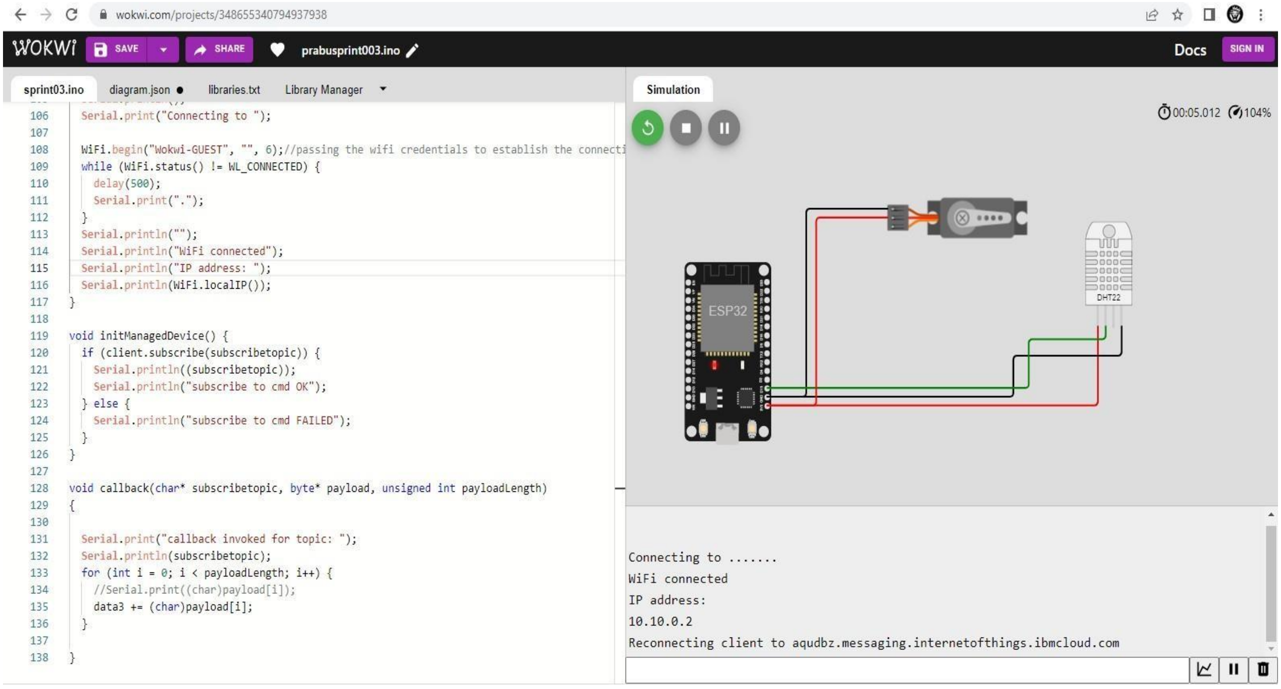
```
WiFiClient wifiClient; // creating the instance for wificlient

PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined client id bypassing
parameter like server id,portand wificredential

void setup()// configureing the ESP32

{

Serial.begin(115200);

dht.begin();

delay(10);          Serial.println();

wificonnect(); mqttconnect();

}

void loop()// Recursive Function

{

Humidity = dht.readHumidity();

Temp = dht.readTemperature();

Serial.print("Temp:");

Serial.println(Temp);


Serial.print("Humidity:");

Serial.println(Humidity);

PublishData(Temp,Humidity);delay(1000);

if        (!client.loop())        {

mqttconnect();

}

/....................................retrieving to Cloud.................................. /

void PublishData(float Temp, float Humidity) { mqttconnect();//function call for

connecting to ibm

/*

creating the String in in form JSon to update the data to ibm cloud
```

```
*/
String payload = "{\"Temp\":"; payload
+= Temp;
payload += ","
"\"Humidity\":";
payload +=
Humidity;
payload += "}";

Serial.print("Sending payload: ");
Serial.println(payload);
if (client.publish(publishTopic, (char*) payload.c_str()))
{
   Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it will printpublish ok
in Serial monitor or else it will print publish failed
}
 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() //function defination for wificonnect
{

Serial.println();
Serial.print("Connecting to ");
WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish the
connectionwhile (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];
}
}
```

WOKWI OUTPUT :

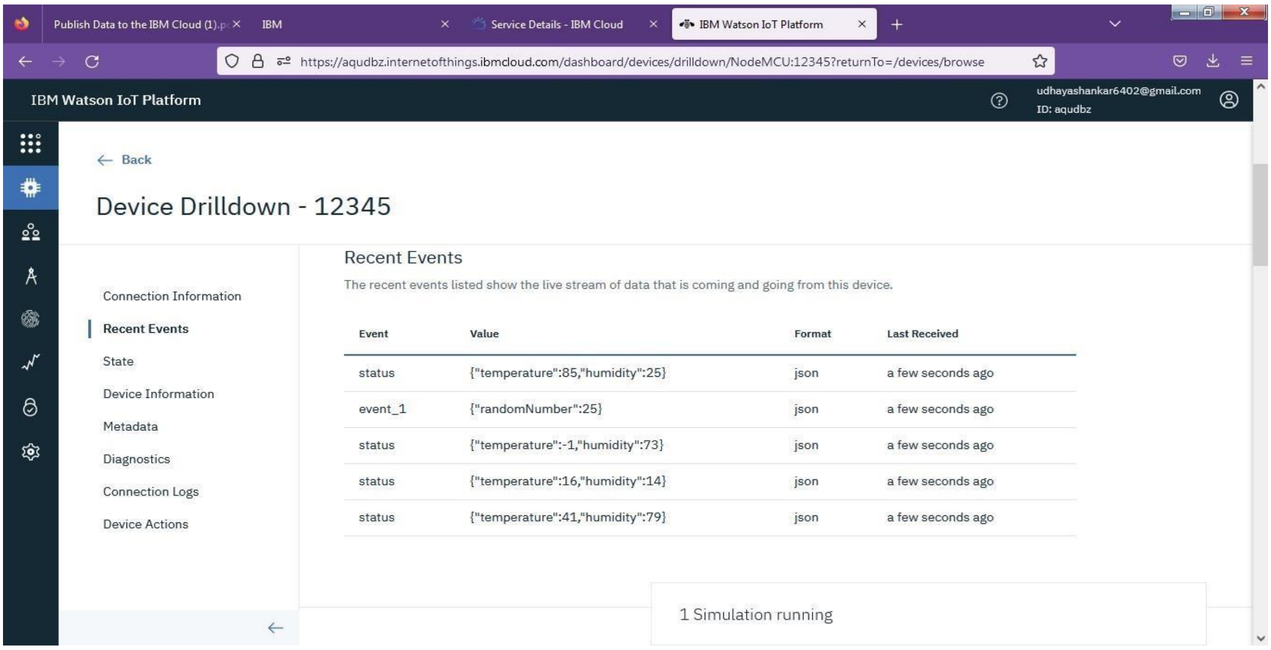


```
  Serial.print("Connecting to ");

  WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish the connecti
  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];
  }

}
```

```
Connecting to .......
WiFi connected
IP address:
10.10.0.2
Reconnecting client to aqudbz.messaging.internetofthings.ibmcloud.com
```

7.3 DATABASE SCHEMA

IBM WATSON PLATFORM :


Publish Data to the IBM Cloud (1).p
IBM
Service Details - IBM Cloud
IBM Watson IoT Platform
https://aqudbz.internetofthings.ibmcloud.com/dashboard/devices/drilldown/NodeMCU:12345?returnTo=/devices/browse
IBM Watson IoT Platform
udhayashankar6402@gmail.com
ID: aqudbz
Back
Connection Information
Recent Events
State
Device Information
Metadata
Diagnostics
Connection Logs
Device Actions

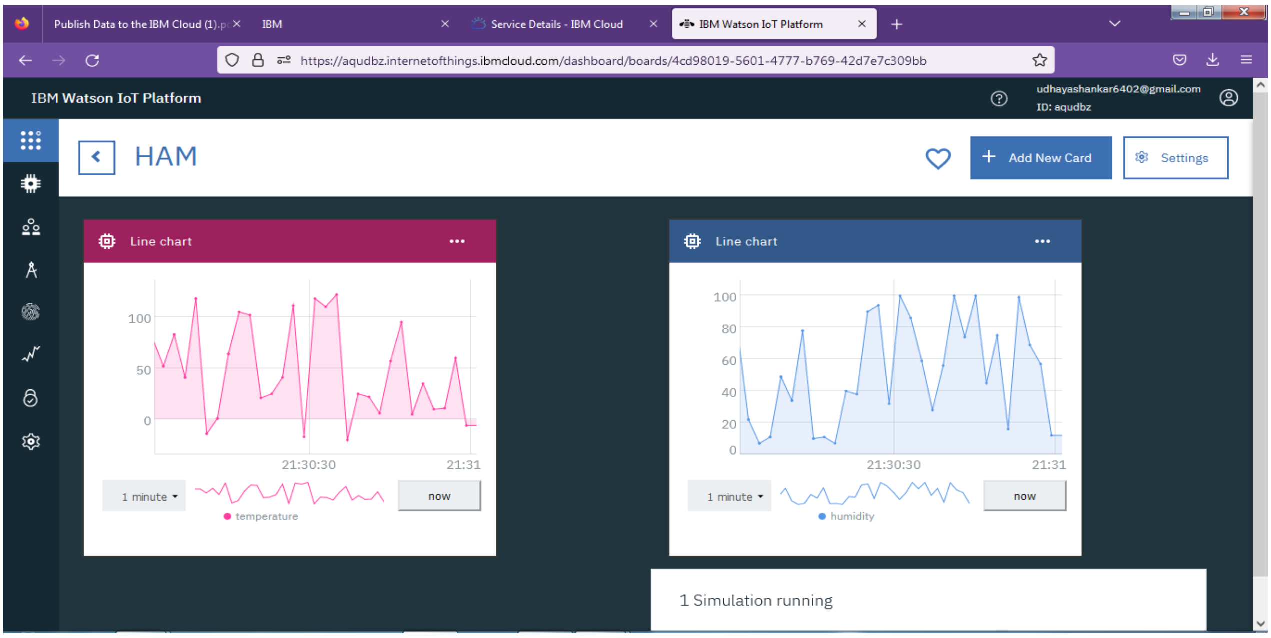
Device Drilldown - 12345

Recent Events

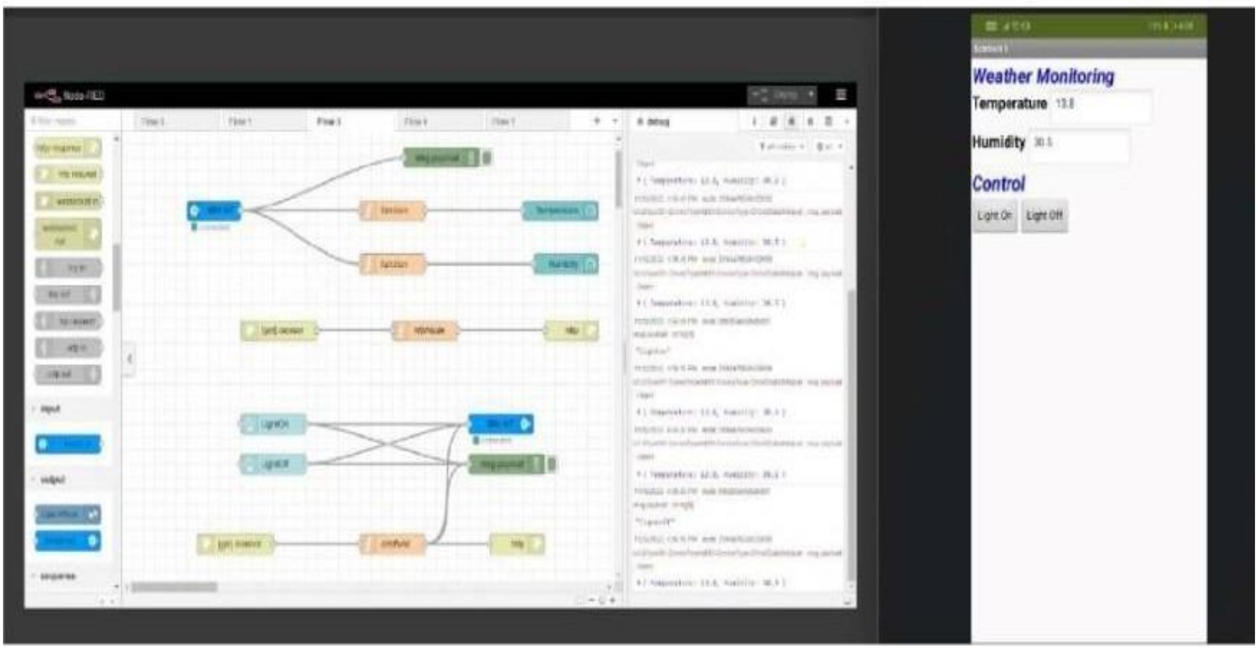
The recent events listed show the live stream of data that is coming and going from this device.

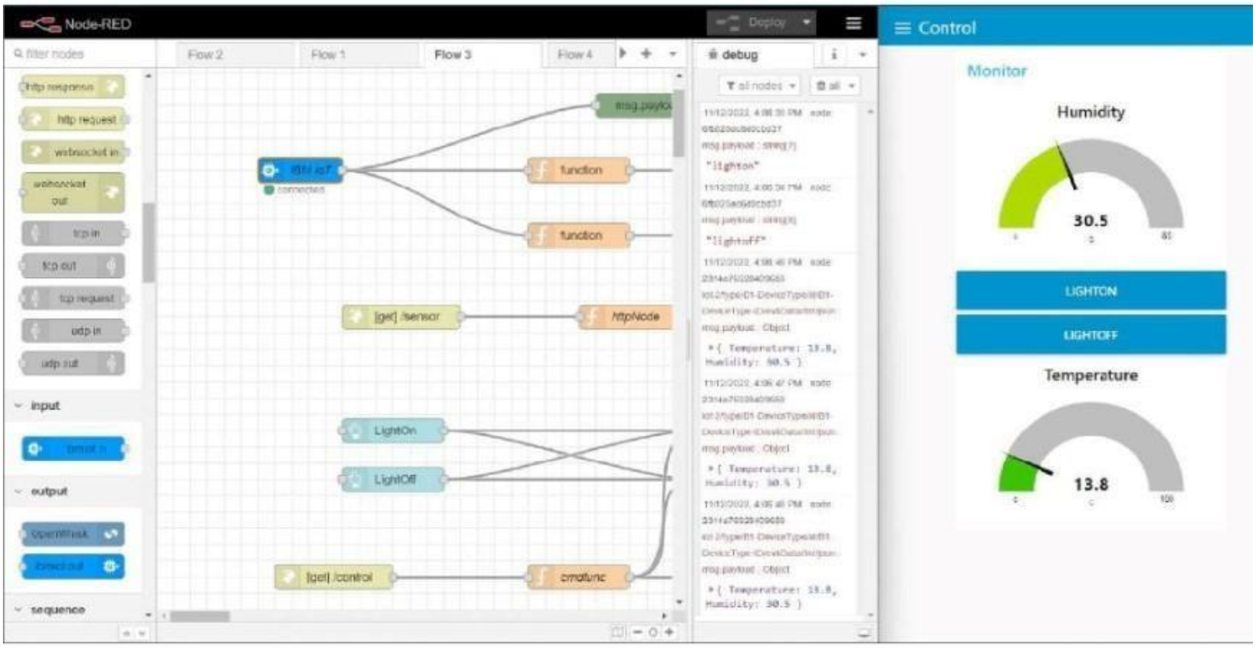
Event	Value	Format	Last Received
status	{"temperature":85,"humidity":25}	json	a few seconds ago
event_1	{"randomNumber":25}	json	a few seconds ago
status	{"temperature":-1,"humidity":73}	json	a few seconds ago
status	{"temperature":16,"humidity":14}	json	a few seconds ago
status	{"temperature":41,"humidity":79}	json	a few seconds ago

1 Simulation running



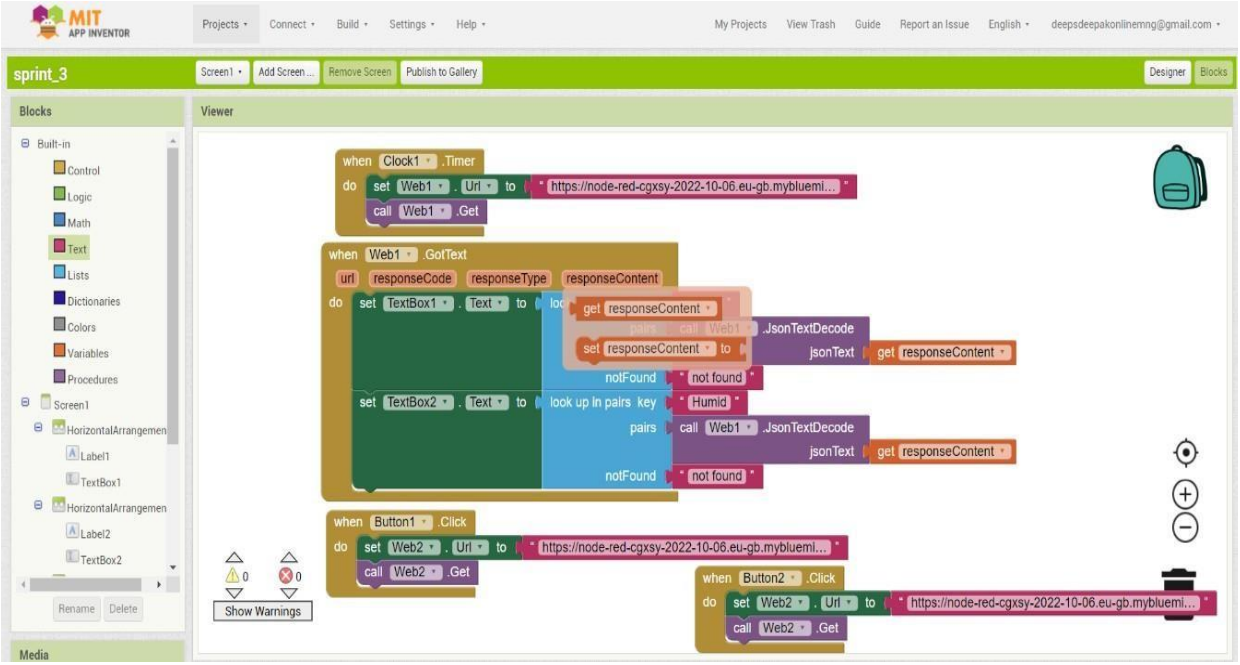
NODE-RED PLATFORM :





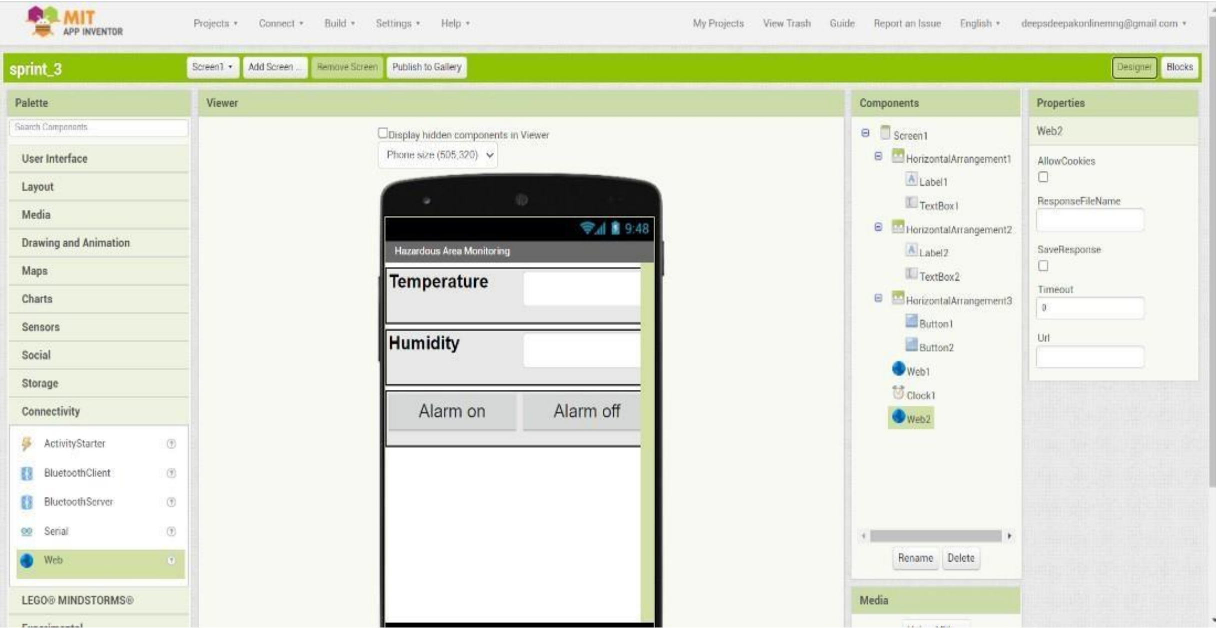
```
11/12/2022, 4:08:30 PM  node: [illegible]
msg.payload : string[7]
"lighton"
11/12/2022, 4:08:34 PM  node: [illegible]
msg.payload : string[8]
"lightoff"
11/12/2022, 4:08:46 PM  node: [illegible]
iot-2/type/D1-DeviceType/id/D1-DeviceType-ID/evt/Data/fmt/json
msg.payload : Object
▸{ Temperature: 13.8, Humidity: 30.5 }
11/12/2022, 4:06:47 PM  node: [illegible]
iot-2/type/D1-DeviceType/id/D1-DeviceType-ID/evt/Data/fmt/json
msg.payload : Object
▸{ Temperature: 13.8, Humidity: 30.5 }
11/12/2022, 4:05:48 PM  node: [illegible]
iot-2/type/D1-DeviceType/id/D1-DeviceType-ID/evt/Data/fmt/json
msg.payload : Object
▸{ Temperature: 13.8, Humidity: 30.5 }
```

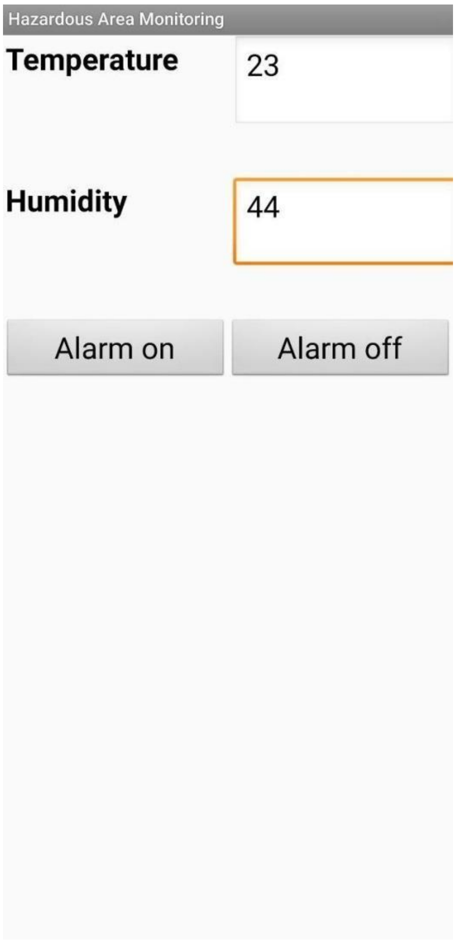
MIT APPLICATION INVENTOR :



```
when Clock1 .Timer
do  set Web1 . Url to " https://node-red-cgxsy-2022-10-06.eu-gb.mybluemi... "
    call Web1 .Get

when Web1 .GotText
  url  responseCode  responseType  responseContent
do  set TextBox1 . Text to  loo[k up in pairs key]  get responseContent
                                 pairs  call Web1 .JsonTextDecode
                                        set responseContent to
                                                  jsonText  get responseContent
                                 notFound  " not found "
    set TextBox2 . Text to  look up in pairs key  " Humid "
                                 pairs  call Web1 .JsonTextDecode
                                                  jsonText  get responseContent
                                 notFound  " not found "

when Button1 .Click
do  set Web2 . Url to " https://node-red-cgxsy-2022-10-06.eu-gb.mybluemi... "
    call Web2 .Get

when Button2 .Click
do  set Web2 . Url to " https://node-red-cgxsy-2022-10-06.eu-gb.mybluemi... "
    call Web2 .Get
```

ALARM CONDITION :





Hazardous Area Monitoring

Temperature 23

Humidity 44

CHAPTER-8

TESTING

8.1 TEST CASES

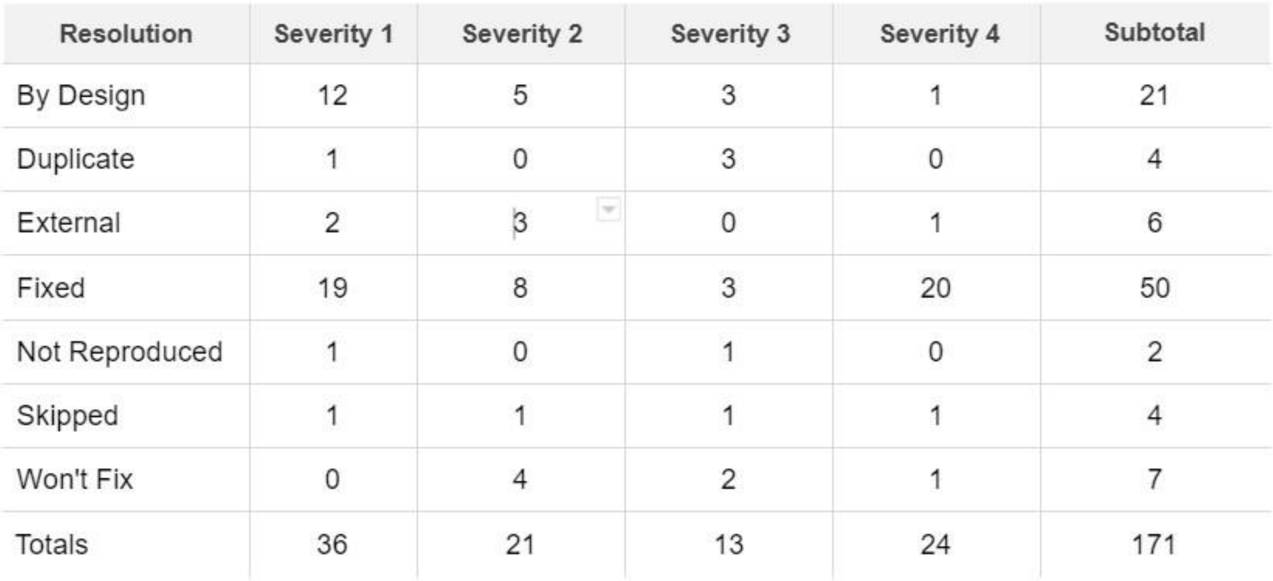
Test Case	Precondition	Test Steps	Test Data	Expected Result
Verify login with credentials	User should have a network connection	1.Launch URL 2.Enter valid user name and password 3.Click on “Login” button	Username:acde Password:nasbxagxqu	User should be able to login successfully
Verify login with invalid credentials	User should have a network connection	1.Launch URL 2.Enter invalid user name or password 3.Click on “Login” button	Username:cade Password:nasbxagxqu	User should not be able to login successfully
Beacon sensing the temperature	Beacon should be in a working condition	1.Set up beacon in the hazardous environment 2.Integrate with the software	Sensor1:Tempe rature-23	Beacon should be able to sense the temperature accurately
Collecting beacon signals	The beacon should have temperature sensors	1.Integrate the beacon with the software and cloud 2.Process the continuously received data	Sensor-1: 34 Sensor-2:33 sensor-3:30	The software should be able to collect the sensors data successfully
Generation of warning message	Integration of beacon and the software	1.Integrate the beacon with the software and cloud 2.Process the continuously received data 3.Check for temperature breach 4.If detected send the trigger messages to the registered devices	Software:”ZONE-3 is under danger”	The software should be able to generate the warning message successfully

Reception of warning message by the worker’s device	Integration of the software and the worker’s device	1.Register the worker’s device in the software 2.Integrate the beacon with the worker’s device 3.Enable the provision to receive messages from the software and the beacon	Worker’s Device:”EVACUATE IMMEDIATELY”	The worker’s device should be able to receive the warning message successfully
Storage of data on cloud	Availability of cloud storage	1.Setup a cloud storage 2.Integrate the beacon with the software and the cloud 3.Process the sensor’s data 4.Store the processed data in cloud	Sensor data,beacon signals, linked devices,Trigger warning messages	The cloud storage should be compatible to store all the processed data

8.2 USER ACCEPTANCE TESTING

Defect Analysis :

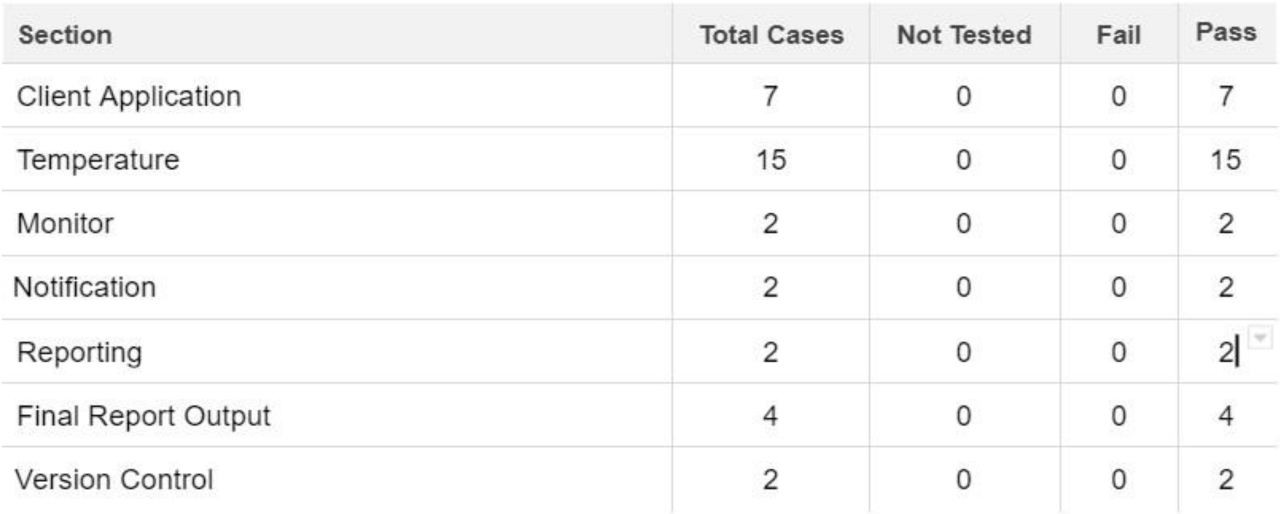
This report shows the number of resolved or closed bugs at each severity level, and how they were resolved.



Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	12	5	3	1	21
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	19	8	3	20	50
Not Reproduced	1	0	1	0	2
Skipped	1	1	1	1	4
Won't Fix	0	4	2	1	7
Totals	36	21	13	24	171

Test Case Analysis :

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



Section	Total Cases	Not Tested	Fail	Pass
Client Application	7	0	0	7
Temperature	15	0	0	15
Monitor	2	0	0	2
Notification	2	0	0	2
Reporting	2	0	0	2
Final Report Output	4	0	0	4
Version Control	2	0	0	2

CHAPTER-9

RESULTS

9.1 PERFORMANCE METRICS

S.No	Parameter	Performance
1	Response time	0.1(20 trials)
2	Workload	400 users(Calculated based on the cloud spaces)
3	Revenue	Industrial Power plants
4	Efficiency	Simple and straightforward workflow which makes the process efficient
5	Down Time	Almost no down time due to IBM cloud enabled solutions

CHAPTER-10

ADVANTAGES & DISADVANTAGES

ADVANTAGES :

Open source access:

The application is easily available and can be accessed through a pc or a mobile device.

Easy Navigation:

The UI is user friendly and offers easy access and navigation across the website.

- Increases user alertness with alarms and triggers.
- Keeps record of all the information for future reference and analysis.

DISADVANTAGES :

- Only limited users can access the software.
- Not a generalized model.
- Large number of rules.
- Needs continuous monitoring.
- Can detect the abnormalities only when the data is continuously fed.

CHAPTER-11

CONCLUSION

CONCLUSION :

There are many ways to monitor a hazardous area in a power plant.Various techniques and technologies strive to provide properly secured softwares and devices.Our system aim to provide that protection by adopting the latest IoTtechnologies.We eliminated the delay in the transfer of signals by using beacons.The data is continuously processed and trigger messages are sent in case of detecting a temperature breach.

CHAPTER-12

FUTURE SCOPE

FUTURE SCOPE :

In future we intend to build add-ons for our system by sending trigger messages to the cobots.These robots could help with quickening the evacuation process.Once temperature breach is detected the sprinkler sensors could be immediately activated,electricity could be cut off.The measure of the employees' vitals could also added as a separate function.

CHAPTER-13

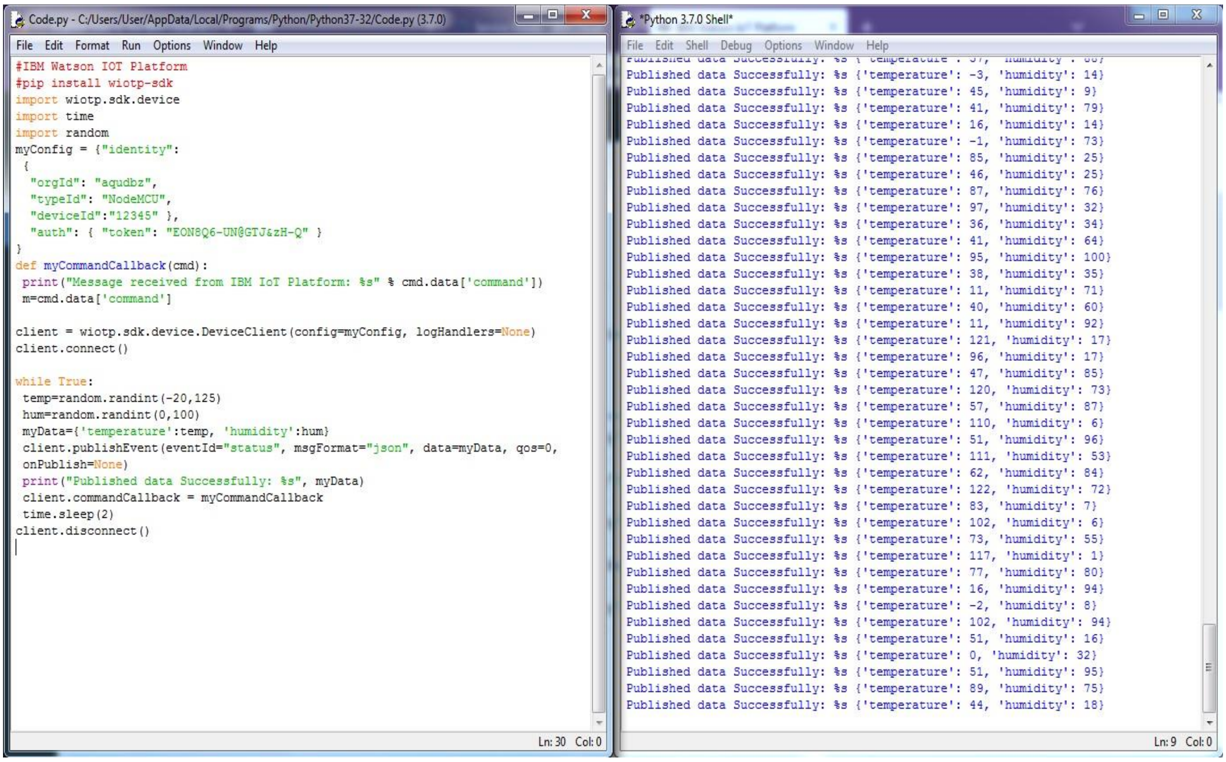
APPENDIX

SOURCE CODE :

```
#IBM Watson IOT Platform
#pip install wiotp-sdk
import wiotp.sdk.device
import time
import random
myConfig = {"identity":

{
  "orgId": "aqudbz",
  "typeId": "NodeMCU",
  "deviceId":"12345" },
  "auth": { "token": "EON8Q6-UN@GTJ&zH-Q" }
}

 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(-20,125)
 hum=random.randint(0,100)
 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()
```

OUTPUT :


Code.py - C:/Users/User/AppData/Local/Programs/Python/Python37-32/Code.py (3.7.0)
File Edit Format Run Options Window Help
Ln: 30 Col: 0
Python 3.7.0 Shell
File Edit Shell Debug Options Window Help
Ln: 9 Col: 0

```
#IBM Watson IOT Platform
#pip install wiotp-sdk
import wiotp.sdk.device
import time
import random
myConfig = {"identity":
 {
  "orgId": "aqudbz",
  "typeId": "NodeMCU",
  "deviceId":"12345" },
  "auth": { "token": "EON8Q6-UN@GTJ&zH-Q" }
}
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(-20,125)
 hum=random.randint(0,100)
 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()
```

```
Published data Successfully: %s {'temperature': -3, 'humidity': 14}
Published data Successfully: %s {'temperature': 45, 'humidity': 9}
Published data Successfully: %s {'temperature': 41, 'humidity': 79}
Published data Successfully: %s {'temperature': 16, 'humidity': 14}
Published data Successfully: %s {'temperature': -1, 'humidity': 73}
Published data Successfully: %s {'temperature': 85, 'humidity': 25}
Published data Successfully: %s {'temperature': 46, 'humidity': 25}
Published data Successfully: %s {'temperature': 87, 'humidity': 76}
Published data Successfully: %s {'temperature': 97, 'humidity': 32}
Published data Successfully: %s {'temperature': 36, 'humidity': 34}
Published data Successfully: %s {'temperature': 41, 'humidity': 64}
Published data Successfully: %s {'temperature': 95, 'humidity': 100}
Published data Successfully: %s {'temperature': 38, 'humidity': 35}
Published data Successfully: %s {'temperature': 11, 'humidity': 71}
Published data Successfully: %s {'temperature': 40, 'humidity': 60}
Published data Successfully: %s {'temperature': 11, 'humidity': 92}
Published data Successfully: %s {'temperature': 121, 'humidity': 17}
Published data Successfully: %s {'temperature': 96, 'humidity': 17}
Published data Successfully: %s {'temperature': 47, 'humidity': 85}
Published data Successfully: %s {'temperature': 120, 'humidity': 73}
Published data Successfully: %s {'temperature': 57, 'humidity': 87}
Published data Successfully: %s {'temperature': 110, 'humidity': 6}
Published data Successfully: %s {'temperature': 51, 'humidity': 96}
Published data Successfully: %s {'temperature': 111, 'humidity': 53}
Published data Successfully: %s {'temperature': 62, 'humidity': 84}
Published data Successfully: %s {'temperature': 122, 'humidity': 72}
Published data Successfully: %s {'temperature': 83, 'humidity': 7}
Published data Successfully: %s {'temperature': 102, 'humidity': 6}
Published data Successfully: %s {'temperature': 73, 'humidity': 55}
Published data Successfully: %s {'temperature': 117, 'humidity': 1}
Published data Successfully: %s {'temperature': 77, 'humidity': 80}
Published data Successfully: %s {'temperature': 16, 'humidity': 94}
Published data Successfully: %s {'temperature': -2, 'humidity': 8}
Published data Successfully: %s {'temperature': 102, 'humidity': 94}
Published data Successfully: %s {'temperature': 51, 'humidity': 16}
Published data Successfully: %s {'temperature': 0, 'humidity': 32}
Published data Successfully: %s {'temperature': 51, 'humidity': 95}
Published data Successfully: %s {'temperature': 89, 'humidity': 75}
Published data Successfully: %s {'temperature': 44, 'humidity': 18}
```

GitHub & Project Demo Link :

GitHub Link :

https://github.com/IBM-EPBL/IBM-Project-44823-1660726953

Wokwi Link :

https://wokwi.com/projects/348655340794937938