PROJECT DOCUMENTATION

Date	19 November 2022
Team ID	PNT2022TMID46764
Project Name	Hazardous area monitoring for industrial plant powered by IOT

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ABSTRACT:

The Internet of Things (IoT) is a new sector that aims to connect "things," "people," and "machines" to the internet. Modernization and automation are sweeping the globe, with IoT-based industrial monitoring solutions at the forefront. The importance of assessing the state of the industry is vital to the safety and efficiency of the products. The goal of this study is to create an IoT-based industrial monitoring system with intelligent sensors. Because of the integration of big data, the Blynk app can be used to monitor status from anywhere on the planet. Data analysis has been streamlined, allowing for easier IoT monitoring. The proposed technology could be beneficial to manufacturing industries. Adding technology to

any kind of manufacturing industry will assure the safety and well-being of the people as well as prevent accidents. Using automation technology reduces the chances of loss and accidents in the machinery world.

INTRODUCTION:

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 industrial monitoring system connects itself with the open-source app Blynk. Blynk connects itself with esp8266 for virtual control of the devices along with getting updates. 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.

LITERATURE SURVEY:

In today's world, the use of wireless technology is becoming beneficial for the leisure and safety of people. Many wireless technologies like IOT, AR, AI, etc are in good demand for adaption of a new lifestyle. Keeping these inventions in the mark, we desired to create a sensor network for prevention and detection of hazards and using the samewireless sensors and then elimination of the cause which led to the hazard. The sensors encapsulated in the prototype are for fire, gas, temperature, humidity. Now the most crucial [1].

The parameter for hazard is fire. Temperature, gas, and humidity are the parameters that can be monitored at a prior notice for the preventing the occurrence of a huge fire. If these parameters are under control, it might prevent fire and vice versa. For the elimination and extinguishing the fire, we have used water as the extinguishing element. The prototype also contains a voice module. This is a device which records audio notes and then plays them for an audio alert of the parameter detected. For example, if there is the presence of any harmful

gas like carbon mono-oxide in the surrounding, the gas is detected by the sensor and the voice module plays the audio output "gas detected". It is necessary to record the appropriate voice audio note for each parameter respectively. Thus, this prototype can be very beneficial for workers in industries, power plants, etc for the prevention of a hazard that might destroy machinery as well as can risk the life of the workers [2].

At first, mechanization in industries was done using steam and water power. As the progression occurred, power was presented and was utilized in enterprises for large scale manufacturing. At the point when PCs were developed, it was intended to play out different capacities. As time went on, PCs have become less pricey, and afterward, almost all ventures commenced making use of it for monitoring when you consider that it diminished an important awesome mission at hand experienced by human beings and still it is taken into consideration as the high-quality preference to govern and screen an application [3].

In any case, numerous industries regularly have only a fundamental alert framework regardless of the sort which is turned on by squeezing a solitary catch. IoT is once in a while utilized, and regardless of whether they do have utilized IoT, just a few sensors are utilized, which is the reason the framework isn't bombed verification and accordinglyincapable. Laborers don't think about the circumstance since they are advised to empty the premises on the off chance that the alert goes off. The vast majority of the modern mishaps have had terrible outcomes as forever, property and condition is a burdensome errand [4].

Wellbeing in such a domain and security, if there should arise an occurrence of any disaster, can be generally significant for compassionate, legitimate, and budgetary reasons. Ongoing checking is for the most part required in such cases as it just takes matters of seconds for the circumstance to go from awful to more regrettable if no moves are made. Mechanization is given essential concentration in the framework for what it's worth in the essential necessity in the businesses in the twenty-first century. Distinctive control advances are utilized for checking and control of the frameworks, while the correspondence between a framework and a client is commonly acknowledged online through remote correspondence systems [5].

IDEATION & PROPOSED SOLUTION

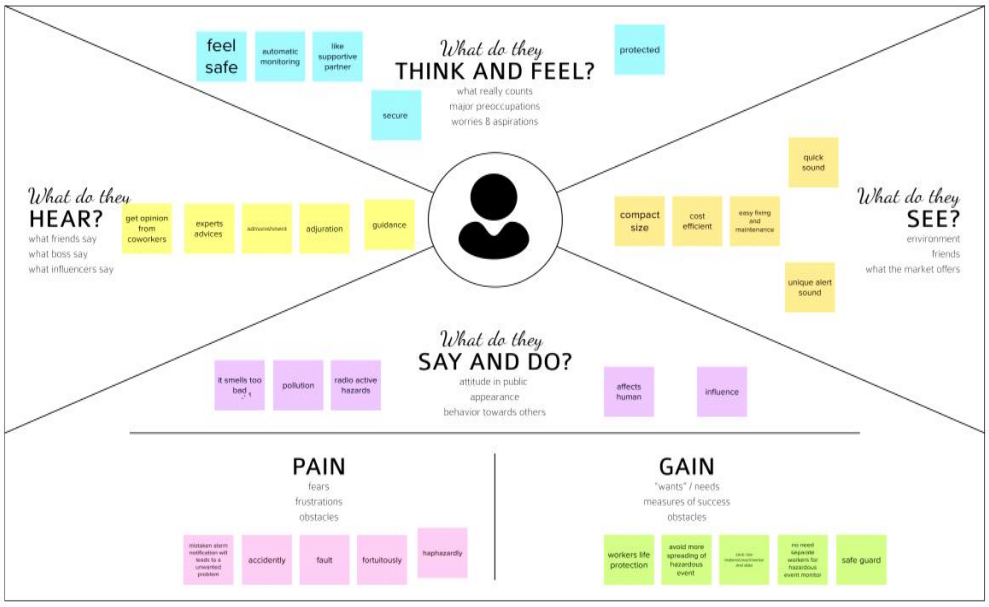
4.1 Empathy Map Canvas

Empathy Map Canvas

Gain insight and understanding on solving customer problems.

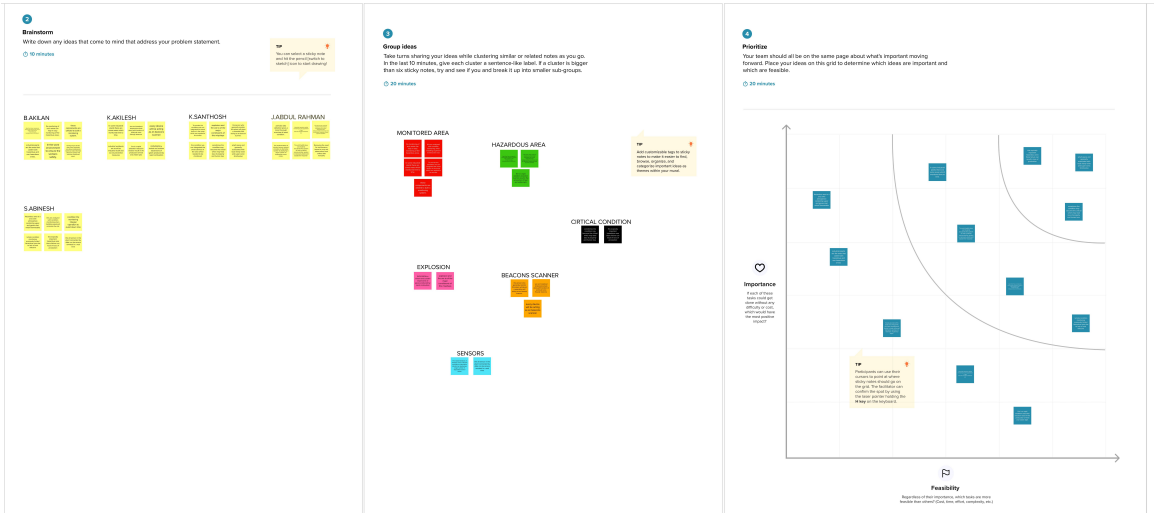
1

Build empathy and keep your focus on the user by putting yourself in their shoes.

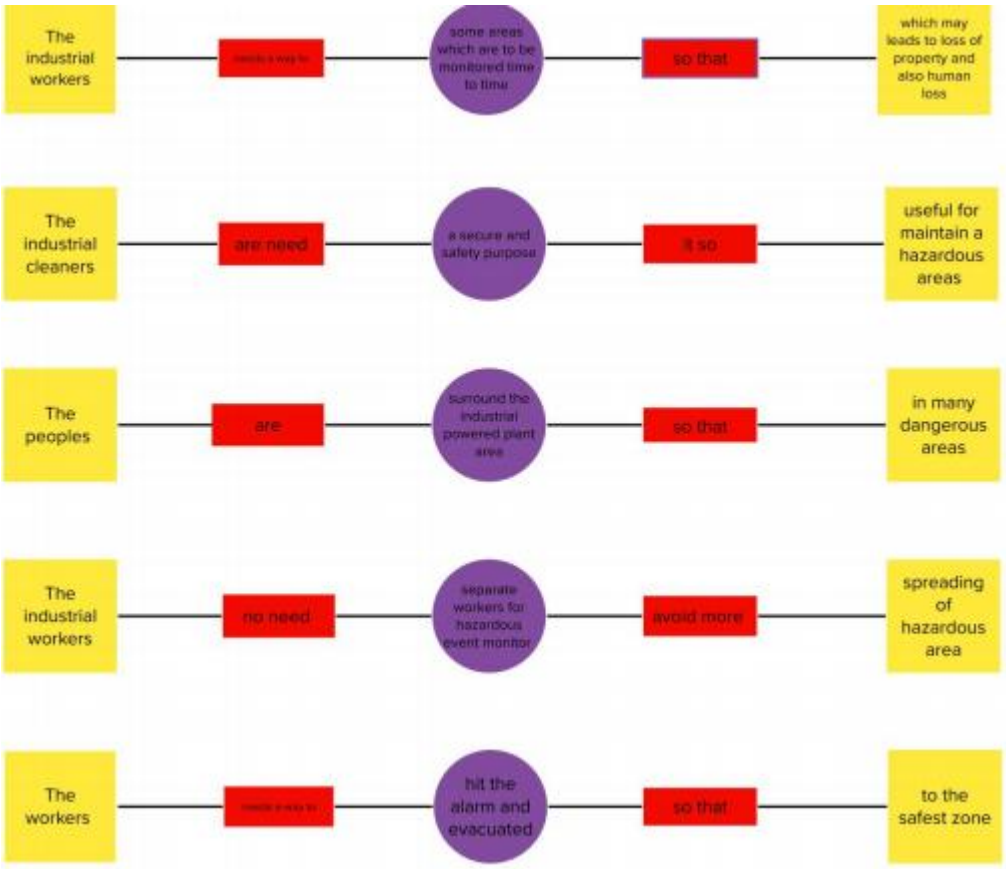


Share your feedback

4.2 Ideation & Brainstorming



4.4 Problem Statement



Proposed Solution Template:

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

S.No.	Parameter	Description
•	Problem Statement (Problem to be solved)	• An accident occurs in an industrial plant and an alarm sounds to alert. • The industrial plant area is surrounded by people and thus there are many dangerous areas .So people should be kept in separate place.
•	Idea / Solution description	**Idea :** If there is a failure in a hazardous area inside an industrial plant, there is loss of production, human loss, loss of property etc. **Solution Description :** So if the industrial plant is in a private place, there will be no problem.
•	Novelty / Uniqueness	**Novelty :** Total care schemes are now a comman feature in the sales of power generation and propulsion plant. **Uniqueness :** Temperature sensors are low - cost ,precise ,and extremely reliable in repeated experiments.They are desirable for both embedded and surface mount

		applications.
•	Social Impact / Customer Satisfaction	**Social Impact :** It emits toxic fumes that affect the body and cause severe disease. The industrial plant occupied a farming land. **Customer Satisfication :** The indutrial plant create employment for the people through man power and contributes to the economy of the place. Exports the products produced by the industry to foreign countries.
•	Business Model (Revenue Model)	• When the dealing or the transaction take place between two companies. • High traffic blog that place ads to earn profit. • You make money by selling goods and services to consumers,online and in person.
•	Scalability of the Solution	• The ability of a computer application or product **(hardware or software)** to continue to function well when it is changed in size or volume in order to meet a user need. • An application program would be

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

A few parts are expensive in the factory and if they break it will cost more to rebuild.
If the industrial plant damaged in innerside they're not nearly as easy to spot, which makes them harder to fix.

9. PROBLEM ROOT CAUSE RC

- There is a possibility of accidents due to carelessness of the workers in the factory.
- Hazardous area is where there is a risk of fire due to toxic gas or flammable gas escaping from the factory.
- Inhalation of such toxic gases is likely to causes physical harm to workers.

7. BEHAVIOUR B

- Industrial accidents are as old as industry itself so are preventive measures.
- The standards for explosive areas or atmosphe have also has evolved diversely worldwide, based the local needs of the industrial for the overall s operation of the plants.
- Explosion and an fire are two of the ma constituents of these misshapes.
- Depending upon the environment, these can termed 'Accidents' or fade away as simply 'incidents' or 'Near Misses' in the statistics.

Define CS, fit into CC

CS

1. CUSTOMER SEGMENT(S)

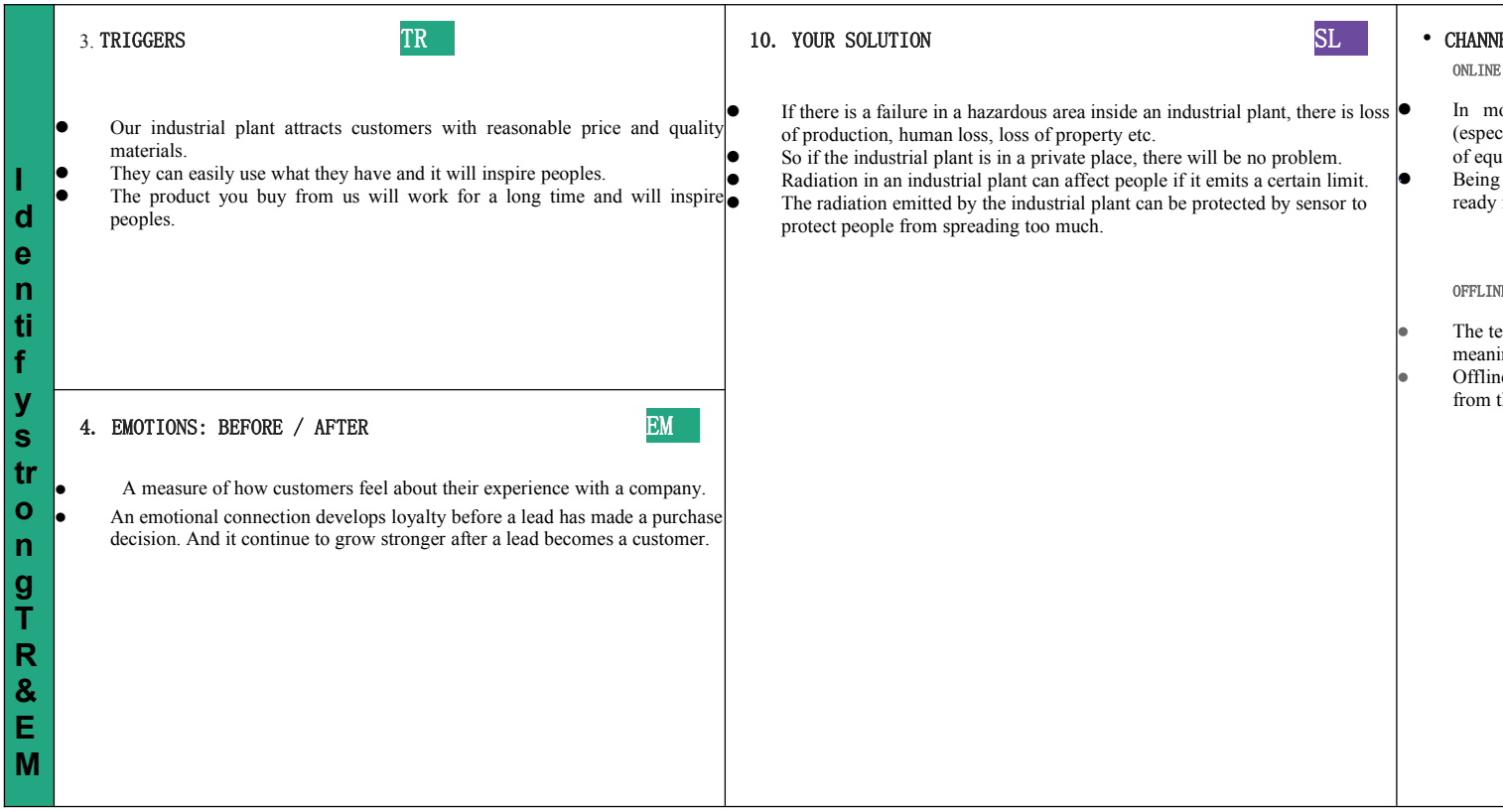
The customers are
- Government
- Domestic citizens
- Private companies

6. CUSTOMER CONSTRAINTS CC

- The coal needed for the industrial plant should be investigated and taken from where it is most available.
- The quality of the results we deliver to our customers is unmatched and we have more than just denominations.
- All machinery and materials required for industrial plant must be imported.

5. AVAILABLE SOLUTIONS

- That industrial plant mixes more ch the products it produces.
- But they do not fear chemicals substance in their industrial plant.
- As soon as their, products are mac sent to the final stage of testing for fi



REQUIREMENT ANALYSIS

5.1 Functional requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration on Email
FR-2	User Confirmation	Confirmation in Email and Confirmation in OTP
FR-3	User Login	User id and password to sign in.
FR-4	User Dashboard	Show product list and details.

FR-5	Place your Order	Select product and place order by using user address,phone number.
FR-6	Order Delivered	Deliver the product to customer on time.

5.2 Non-Functional requirements

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	• The monitoring of the hazardous areas in industrial plants is more important from time to time. If the damage that occurs in hazardous areas can result in the loss of property or lives. • So monitoring of such areas can be easily monitoring of the hazardous areas.
NFR-2	**Security**	• Industrial Security Management emphasizes the general security techniques and the ethical responsibilities of those involved. • The work covers general security management, security personnel management, operational management, public relations and the perils of mismanagement.
NFR-3	**Reliability**	• All the products coming out through the industrial process are of quality.
NFR-4	**Performance**	• All kinds of machines running in the plant are fast and have good performance. • Having a monitoring system makes it easy to monitor the hazardous area. • Due to the presence of monitoring system, the industrial plant is immediately alarmed if there in danger.
NFR-5	**Availability**	• Protection from system failures. • You can use multi type of programming commands to the device.
NFR-6	**Scalability**	• The ability of a device to adapt to the changes in the environment . • It can handle a large increase in users without strain.

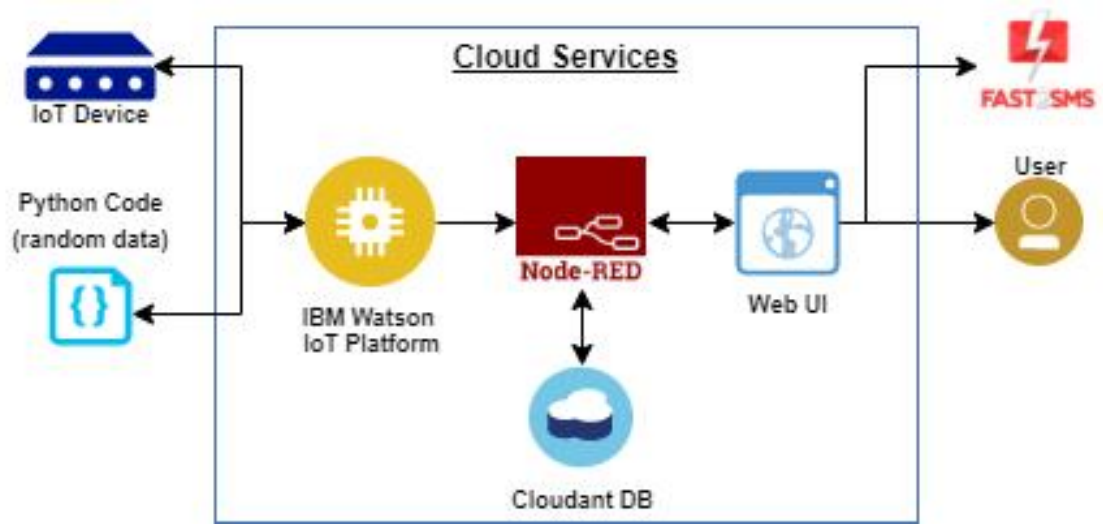
PROJECT DESIGN

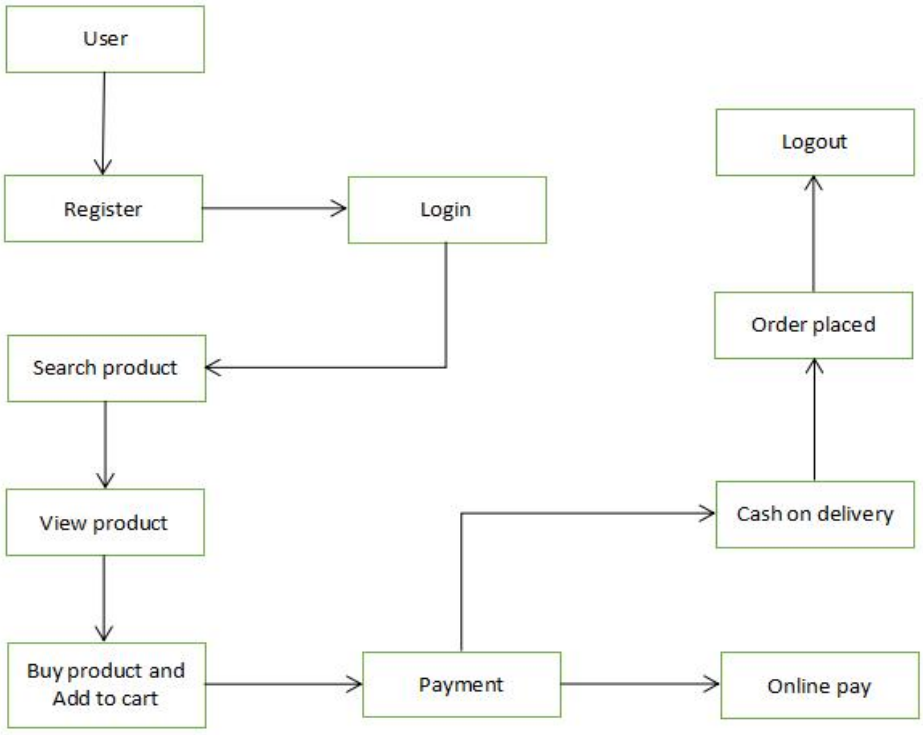
6.1 Data Flow Diagrams

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.

Example: (Simplified)





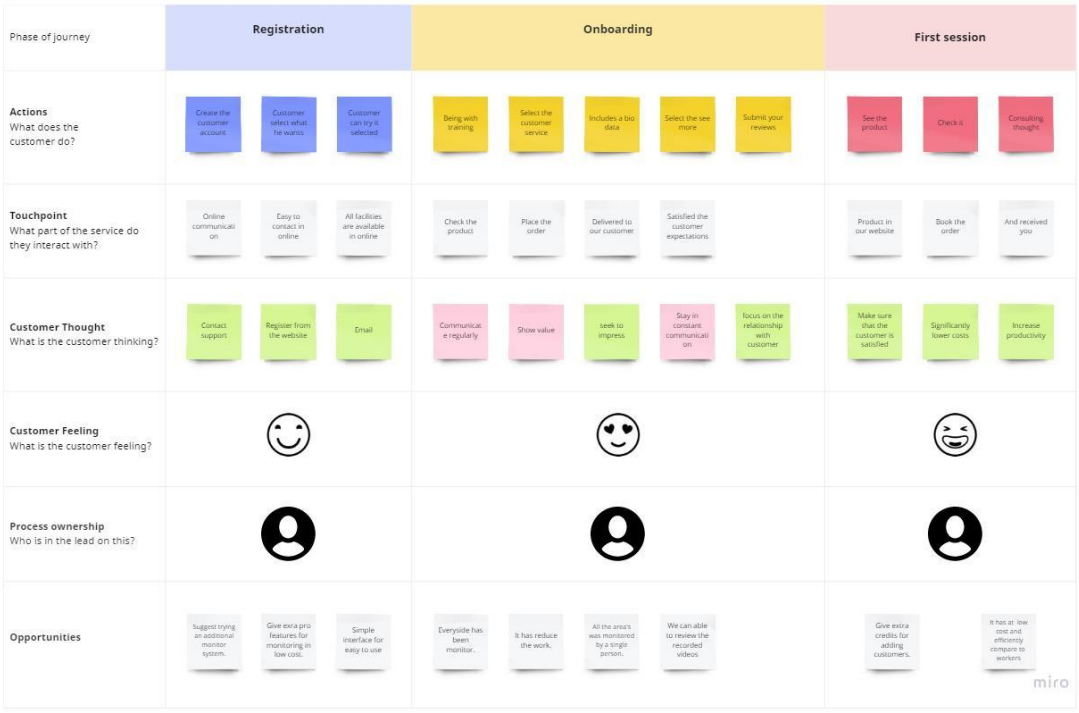
User Stories

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

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptanc

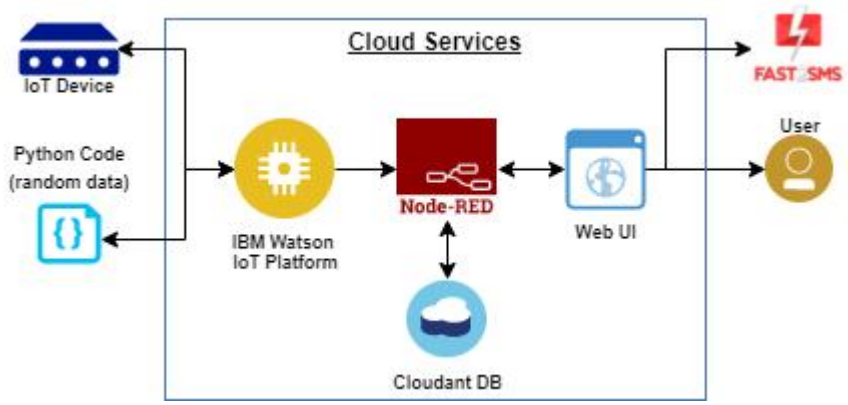
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptanc
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can acces dashboard
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receiv email & clic
		USN-3	As a user, I can register for the application through Facebook	I can regist dashboard Login
		USN-4	As a user, I can register for the application through Gmail	I can regist
	Login	USN-5	As a user, I can log into the application by entering email & password	I can use e password f
	Dashboard	USN-6	As a user, I can view the product list and details	I can selec
	Order	USN-7	As a user, I can place the order	I can see th shipping
Customer (Web user)	Online	USN-8	As a user, I can buying a product online is very easy	I can use th and feautu
Customer Care Executive	Contact support	USN-9	As a user, If I have some problems and doubts can be corrected by the qualified in - service and experts only.	I can call c any time an customer a free service
Administrator	Account	USN-10	As a administrator, I do select my details and view my details and so login the email and password.	I can use to available o dashboard
Customer (Product user)	Product	USN-11	As a user, I can receive the product and also good product in industrial plant. Then to use was result in prefect	I can share in good rev
		USN-12	As a user, I think in product after use is good feel and is new preformance and this completely satisfied.	I can never chance of a come to tal the product

Customer Journey Map



Technical Architecture:
The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Skills Required:
Python,IOT Cloud Platform ,IBM Cloud,Node- RED,IBM IoT Platform,IBM Nodered,IBM Cloudant DB



Note: Use random values in python for sensor data as physical hardware is not available.

Guidelines:
1. Through this, we can r in industrial plants.
2. The area is integrated temperature of that pa
3. Whenever the person on his wearable device the mobile through SM
4. Through this wearable dashboard, the admin necessary precautions
5. Every person working will be acting as beaco

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript, C# etc.

2.	Application Logic-1	Logic for a process in the application	Java / Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
9.	External API-2	Purpose of External API used in the application	Aadhar API, etc.
10.	Machine Learning Model	Purpose of Machine Learning Model	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	.NET	Version : 4.7.3
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	e.g. SHA-256, IAM Controls, OWASP etc
3.	Scalability Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	Technology used
4.	Availability	Justify the availability of application (e.g. use of load balancers, distributed servers etc.)	Technology used

PROJECT PLANNING & SCHEDULING

Sprint Planning

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

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	S
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	
Sprint-1		USN-3	As a user, I can register for the application	

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	S
			through Facebook	
Sprint-1		USN-4	As a user, I can register for the application through Gmail	
Sprint-2	Login	USN-5	As a user, I can log into the application by entering email & password	
Sprint-3	Dashboard	USN-6	As a user, I can view the product list and details	
Sprint-4	Order	USN-7	As a user, I can place the order and pay on online	
Sprint-5	Delivered	USN-8	As a user, I can receive the product	

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

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story P Comple Planne
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20

Velocity:

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

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

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

```
import time

import sys

import ibmiotf.application

import ibmiotf.device

import random
```

```
#Provide your IBM Watson Device Credentials
organization = "bxobbs"
deviceType = "b5ibm"
deviceId = "b5device"
authMethod = "token"
authToken = "b55m1eibm"

# Initialize GPIO



def myCommandCallback(cmd):
   print("Command received: %s" % cmd.data['command'])
   status=cmd.data['command']
   if status=="lighton":
      print ("led is on")
   else :
      print ("led is off")

   #print(cmd)




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

    temp=random.randint(0,100)
    Humid=random.randint(0,100)

    data = { 'temp' : temp, 'Humid': Humid }
    #print data
    def myOnPublishCallback():
      print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % Humid, "to IBM Watson")

    success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publish=myOnPublishCallback)
    if not success:
      print("Not connected to IoTF")
    time.sleep(1)

    deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

ibmiotpublishsubscribe.py

Open with Google Docs

Displaying ibmiotpublishsubscribe.py.

TESTING
User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

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

3. Test Case Analysis

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

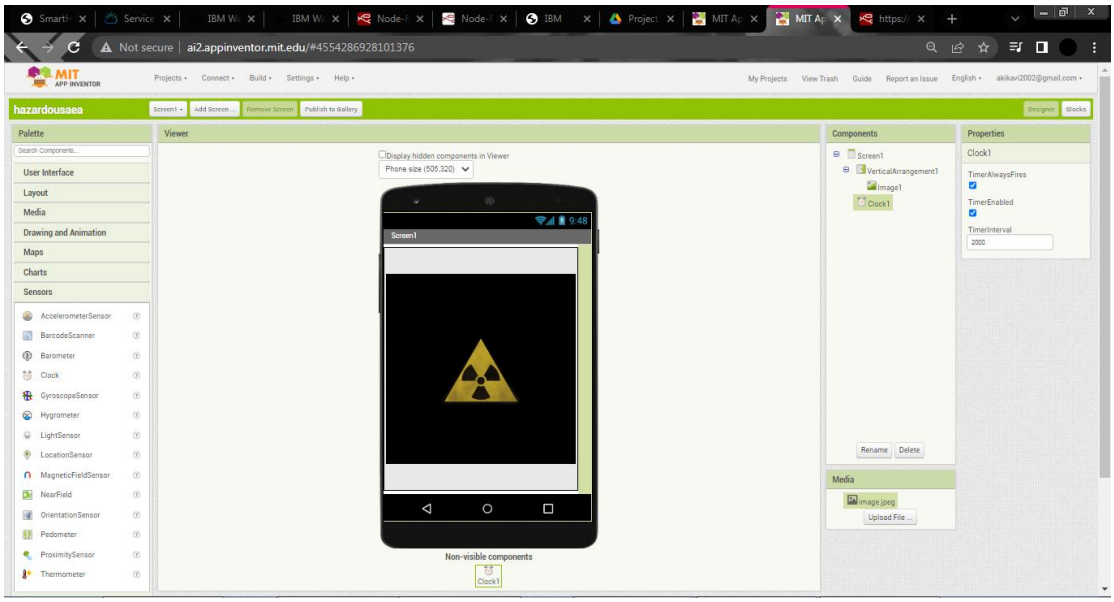
Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51

Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

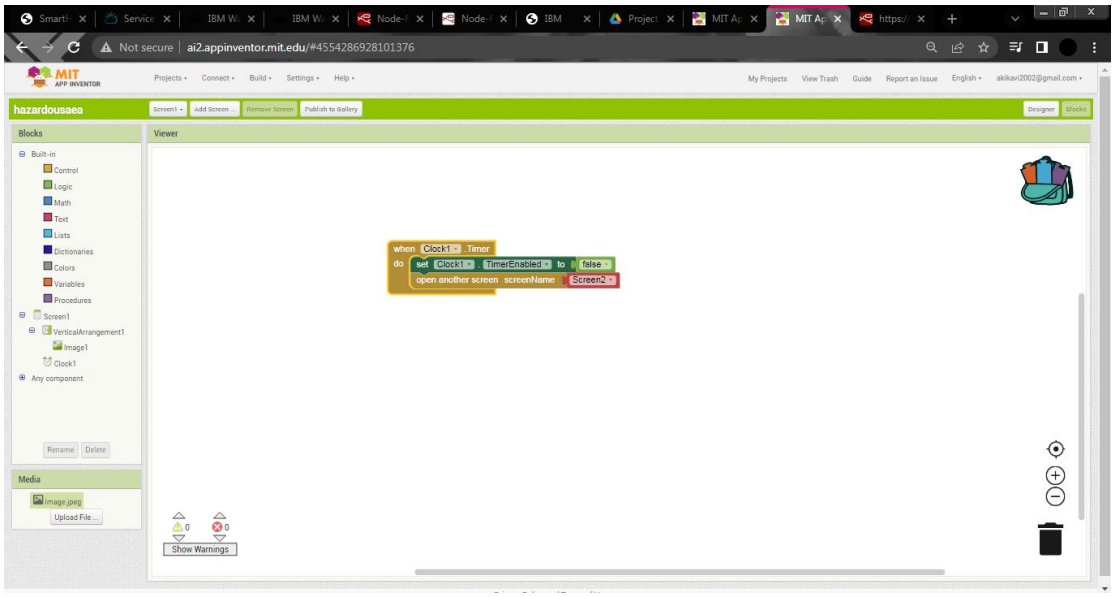
RESULTS

Step 1:

Screen 1(Designer)

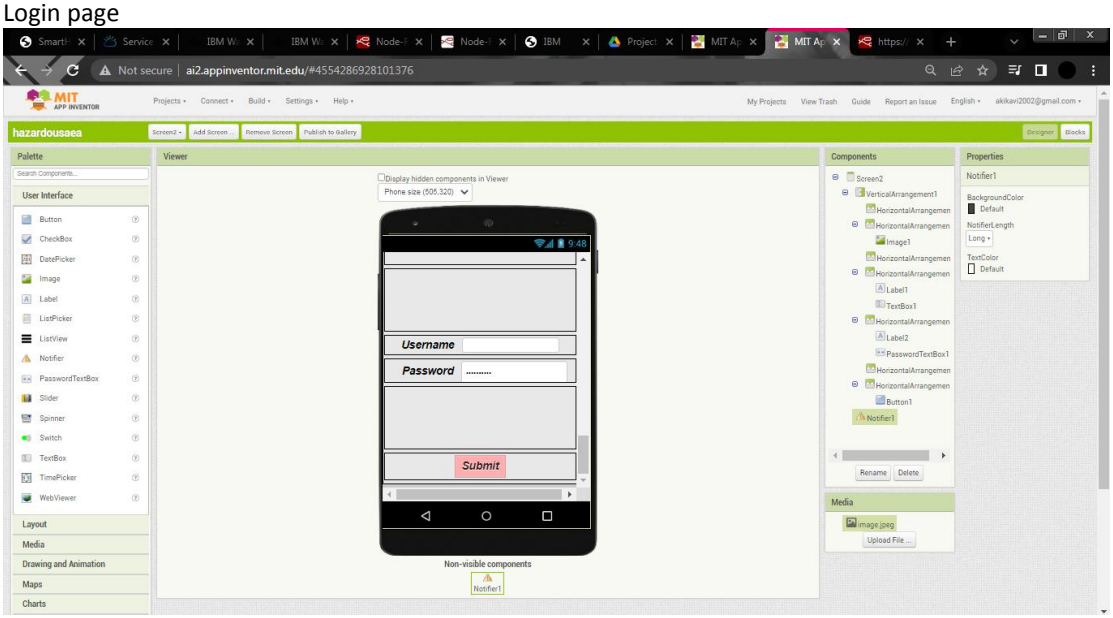


Screen 1(Blocks)

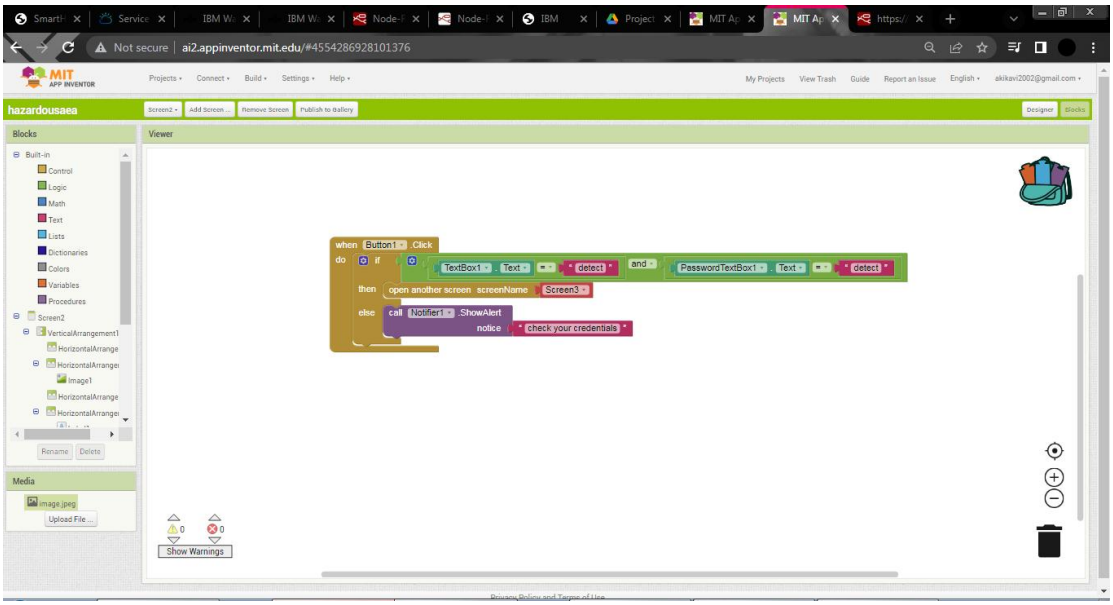


Step 2:

Screen 2(Designer)
Login page

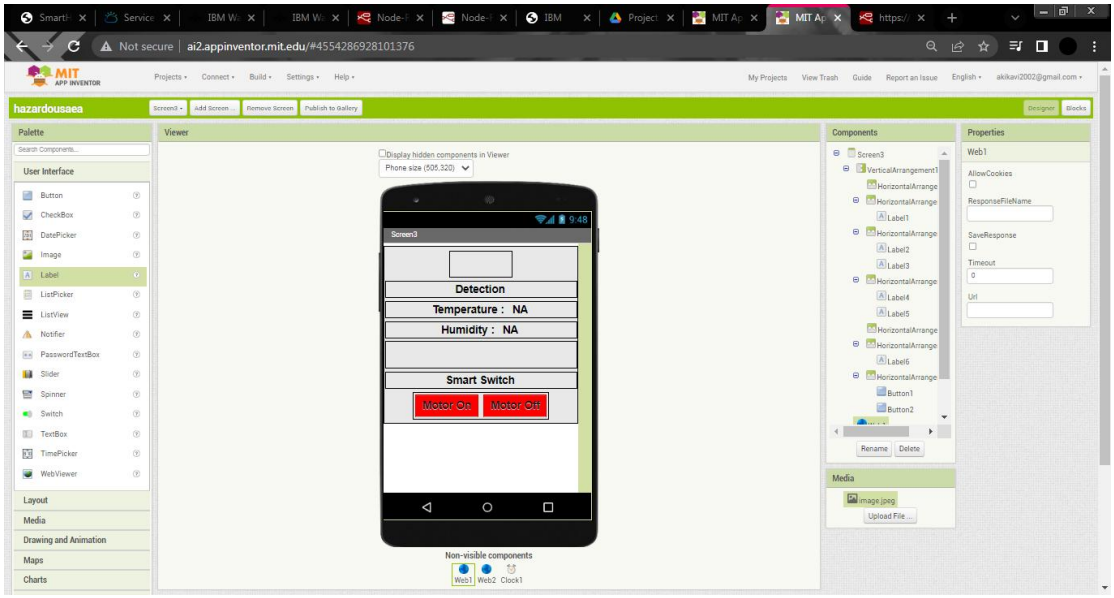


Screen 2(Blocks)

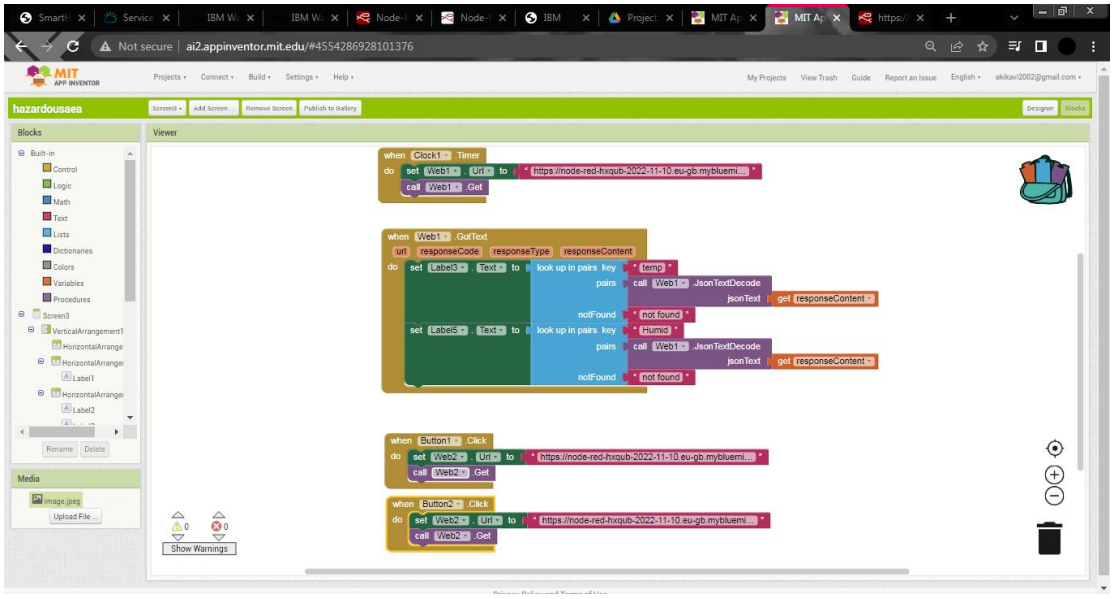


Step 3:

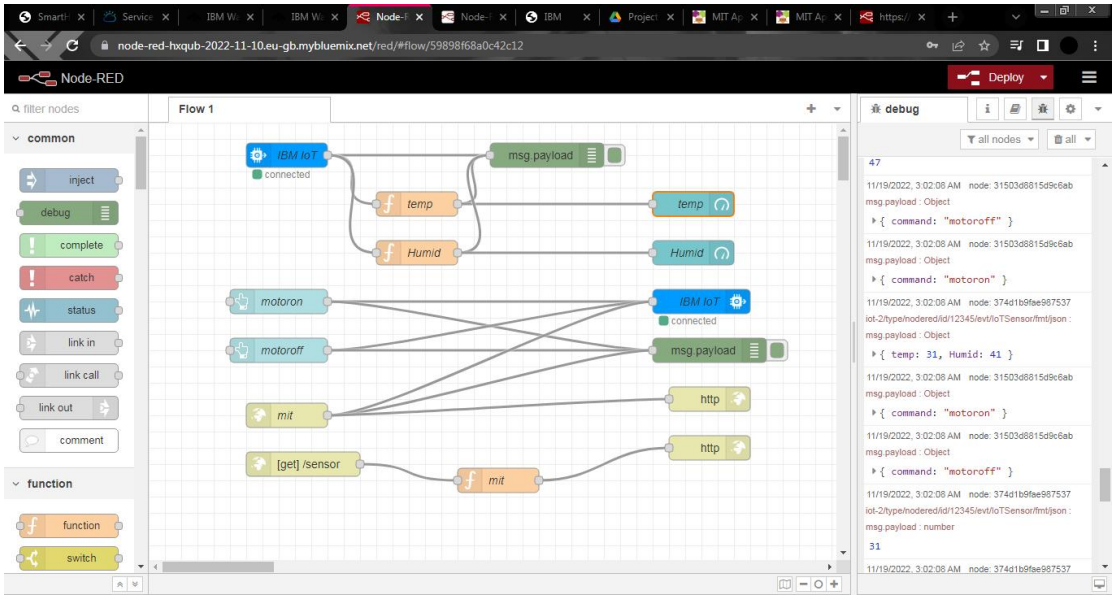
Screen 3(Designer)



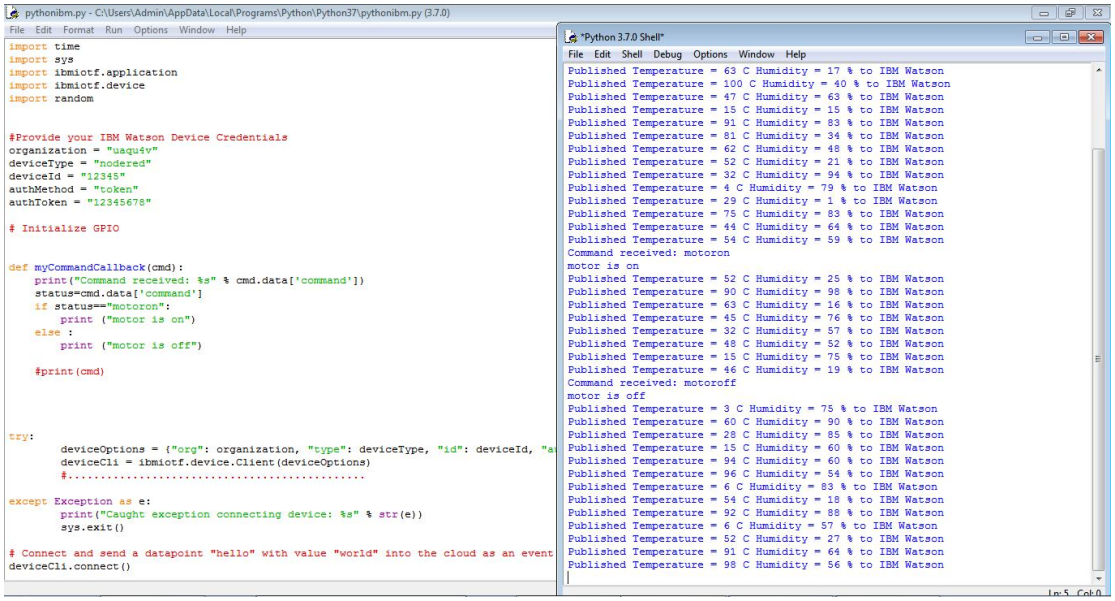
Screen 3(Blocks)



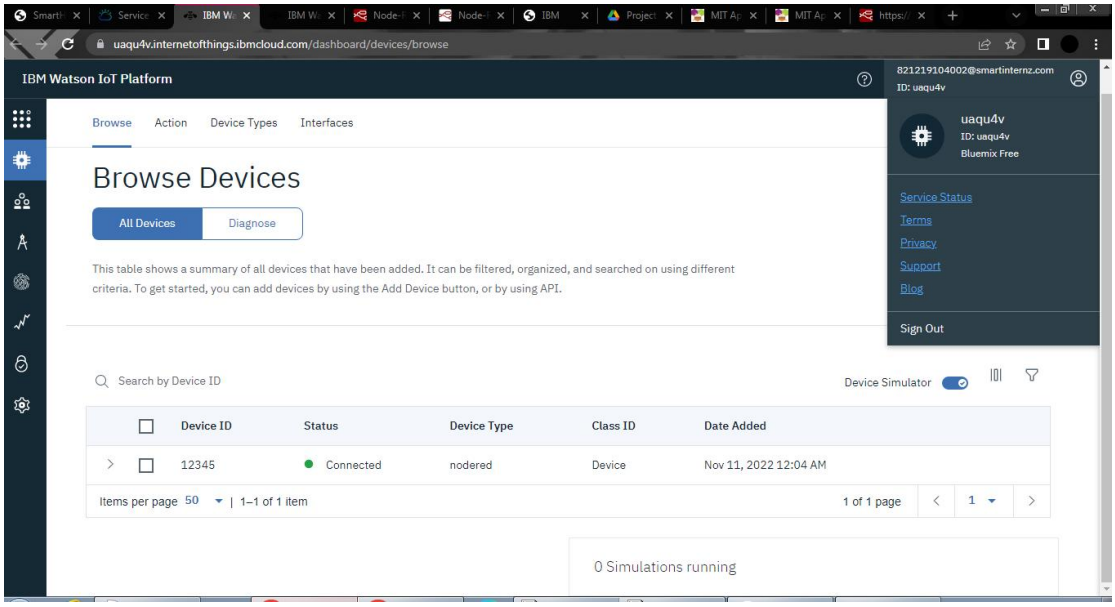
Node red output:



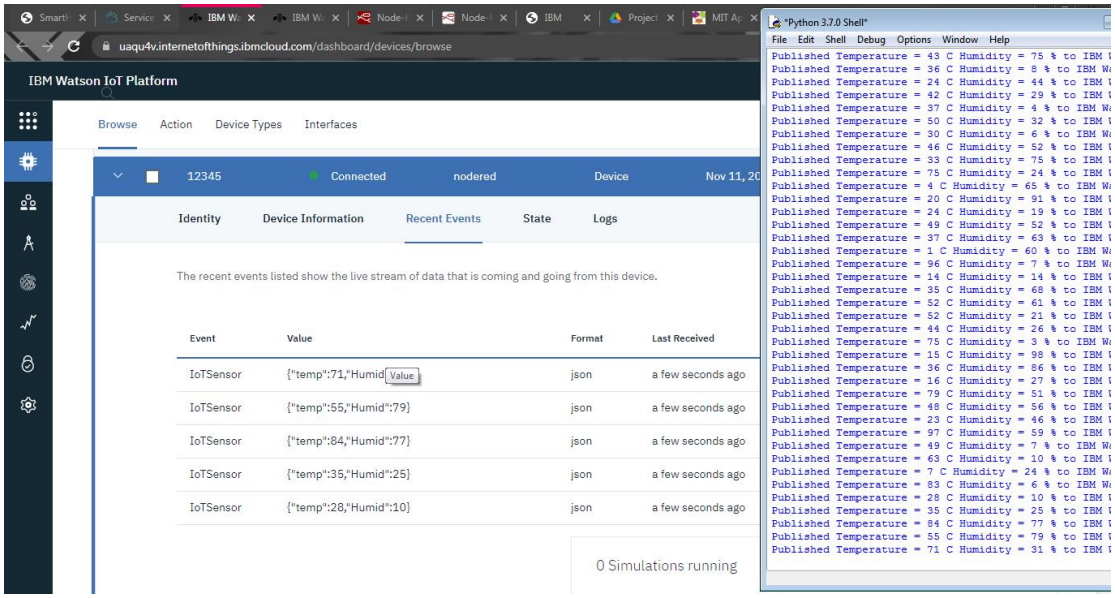
Pyhton code output:



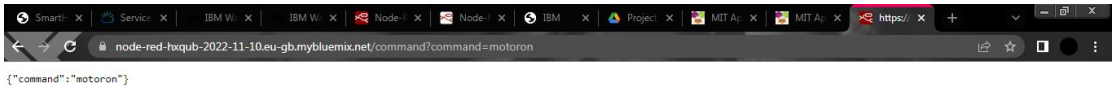
IBM watson IOT platform Device:



Output:



GET/command=motoron:



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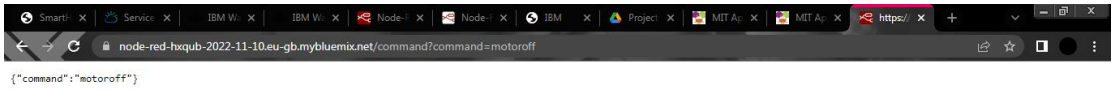

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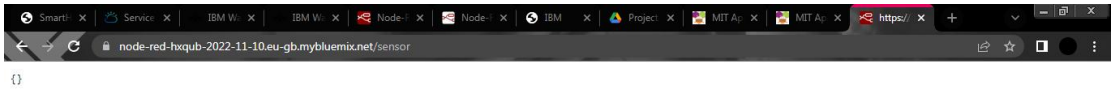

http link : https://node-red-hxqub-2022-11-10.eu-gb.mybluemix.net/sensor

ADVANTAGES & DISADVANTAGES

Remote monitoring: Real-time remote monitoring via connected IoT devices and smart alerts can diagnose illnesses, treat diseases and save lives in case of a medical emergency.

Prevention: Smart sensors analyze health conditions, lifestyle choices and the environment and recommend preventative measures, which will reduce the occurrence of diseases and acute states.

Reduction of healthcare costs: IoT reduces costly visits to doctors and hospital admissions and makes testing more affordable.

Medical data accessibility: Accessibility of electronic medical records allow patients to receive quality care and help healthcare providers make the right medical decisions and prevent complications.

Improved treatment management: IoT devices help track the administration of drugs and the response to the treatment and reduce medical error.

Improved healthcare management: Using IoT devices, healthcare authorities can get valuable information about equipment and staff effectiveness and use it to suggest innovations.

Research: Since IoT devices are able to collect and analyze a massive amount of data, they have a high potential for medical research purposes.

CONCLUSION & FUTURE SCOPE

Currently, IoT is present and gaining more traction in a lot of fields, and one of the most important field is industrial applications. There are a huge number of ways in which industries can make use of IoT tn improve working conditions, efficiency, cutting c‹mts and improving the overall growth of the sector. However, hazard monitoring and mitigation is often overlooked in industrial areas.
Therefore, this project specifically aims tn make use of IoT to actively mon- itor and analyze various factors in a typical heavy industrial zone like tempera- ture and levels of gases in the em'ironment. If the above parameters exceed the recommended aafe values, the system can traclc the same and inue alerta. Also, the data generated in real time can provide important information about how smoothly the ark ie going on in different zones.

This system can be deployed in many industrial areas like mining, under- ground factories, metal refineries, automatic welding factories and even heavy parts production lines. It will help tn provide a safe and efficient working en- vironment in such areae, while also opening new paths to improve the safety parameters of these places.

GitHub & Project Demo Link

https://youtu.be/3myP-COm1cs