CHAPTER 1

INTRODUCTION

1.1 Project Overview

This project help the industries to monitor the temperature and humidity fluctuation. In several areas, the beacon scanner will be integrated to monitor the temperature fluctuations. If in any area temperature fluctuation is detected then the admin will be notified and at the same time workers at the hazard area also notified by the hazardous message . In web application, admin can view the sensor parameters. The parameters like hazardous temperature levels and humidity level data are displayed to the Watson IoT platform. The device will subscribe to application and sends the alert level to the workers and to the admin parallelly. We use IOT technology for enhancing the existing safety standards of industries this prototype has been to bring a revolution in the field of safety against the temperature and humidity fluctuations.

1.2 Purpose

The sensor-enabled solution helps to prevent the high risk of fire explosion within and outside the premises. The temperature sensor helps to detect the temperature fluctuation that occurs in the industrial area to avoid the hazardous consequences like fire breakouts .Ensuring employee's life safety and security. In every day many people are facing some industrial hazards like fire hazards, chemical exposure. It causes workers have physical and psychological problems in industrial plants. Any industry in the world. Which works make a electricity and other efficient products for peoples. So, we cannot avoid these industrial plants, but we can control the risk of power plants. Because we using automatic alarm based on IoT. Create mobile application it works detect the fire hazard in the industry. We using IoT device and web application it can protect the workers and protect the physical equipment's of the plant. This intelligent device can help to growth of industries and improve the security protection basics of IoT make automation and give solution to the risks. This IOT integrated with controller and sensors for intelligent monitoring and controlling purposes like avoid hazards in industrial sides. System is made automated through IoT which improves the efficiency and reduces the efforts and it reduce hazards fire, burn, gas leakage, toxic gases, explosion, physical problems of peoples and industry.

CHAPTER 2

2.LITERATURE SURVEY:

2.1 EXISTING PROBLEM:

The need to industrialize to compete with global standards is a complete requisite to realize a booming economy. However, there is no question that it has wreaked havoc on the environment caused industrial emissions of dangerous chemicals. This study aimed to create a system that will allow Industrial plants and factories to monitor the emission of the smoke stacks. But leakage can take place through pipes or regulators or knobs which may cause accidents like suffocation, uneasiness or sometimes.The existing system in gas leakage detection is done using microcontroller.This system contains only few application like gas leakage detection and producing an alarm signal whenever temperature is detected. Earlier infrared thermometer and RF sensor are used to detect the temperature that occurs in Industrial plant. But with time, these technologies failed to adapt the requirements which the industry because at earlier days, small scale industries only survived and they doesn't use large machinery. Hence, Infrared thermometer are enough to detect the temperature at the industrial plant. Nowadays, Industries are larger in scale and uses large machinery which cause heat protection due to the friction of equipment.

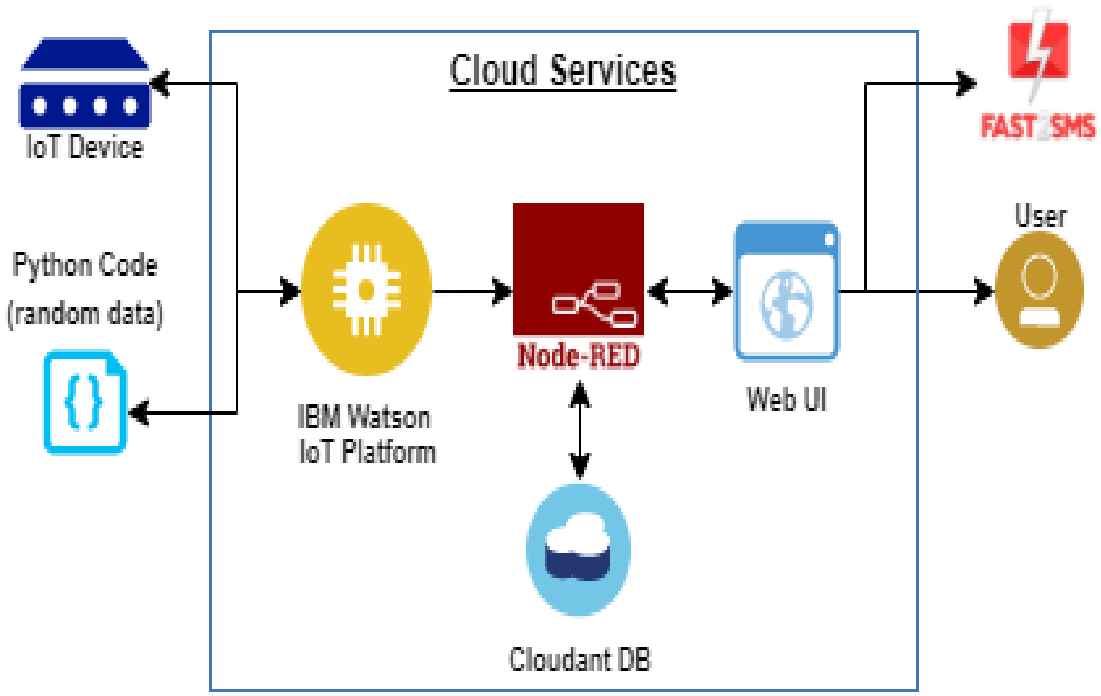
2.2 References

1. Anitha Varghese, Rahul N. Gore, Himashri Kour, Mihit Gandhi, Deepaknath Tandur.
2. Apeksha Rane, Bhushan Vidhale, Priyanka Hemant Kale, Ganesh Khekare.
3. Mehedi Hasan, Abdul Hasib Siddique, Farida Habib Semantha, Fahad Faisal, Mohammed Rezwanul Islam, Mosfiqun Nahid Hassan.
4. S. Drakshayani, Y. LaksmiManjusha, P. Ramadevi,V. Madhuravani, K. Rama Sugun.
5. K. Krishna Kishore, M.H. Sai Kumar, M. B. S. Murthy.
S. Sharifah, Compact Portable Industrial Automation Kit for Vocational School and Industrial Training, IOP Conference Series: Materials Science and Engineering 384, p.012011 (Bandung, Indonesia, 2018).

DOI:10.1088/1757-899X/384/1/012011.

2.3 Problem Statement Definition

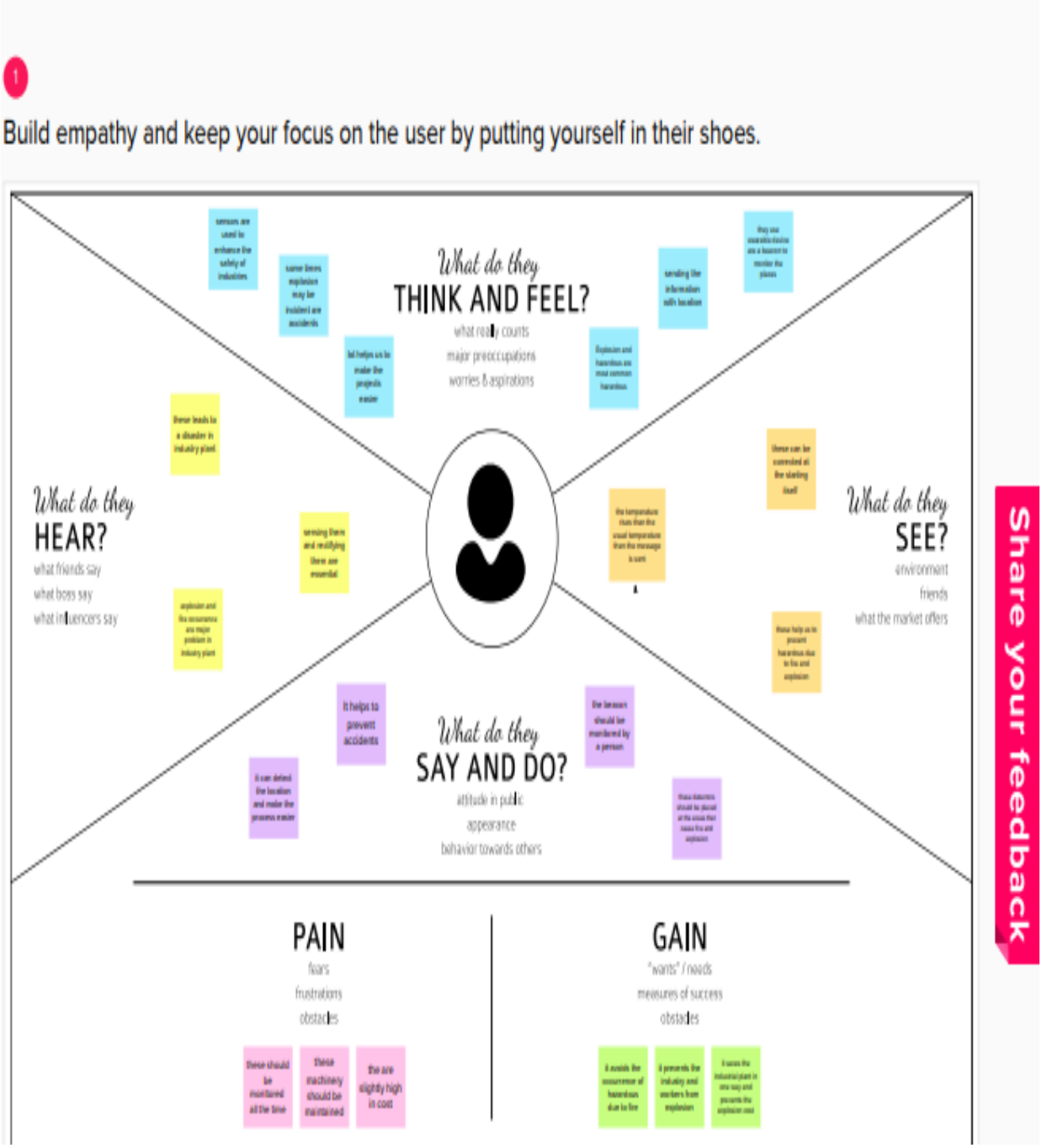
As we can see in today's world only some devices like PC's and mobiles are connected to internet. Now-a-days world is fully overtaken by the internet and internet of things. Internet is use for basic need of all human beings. The Internet of Things (IOT) is the network of physical objects. It simply means to monitor a physical device or machine or it is inter-networking of physical devices which is embedded with electronics, sensors, software and network connectivity to enable it to achieve greater value and services by exchanging data with the manufacturer IOT permits objects to be sensed or controlled remotely across the network infrastructure. The result improves accuracy, economic benefits, efficiency and reduces intervention of human. In this paper we are going to deal with basic and important concepts of IOT and its scope in upcoming future. This paper studies the need of IOT in day-to-day life for different applications and gives brief information about IOT. IOT contributes significantly toward revolutionary farming methods. So, we are trying to demonstrate IOT in hazardous area monitoring for industrial plant. Temperature sensors monitors temperature and humidity fluctuations in industry.



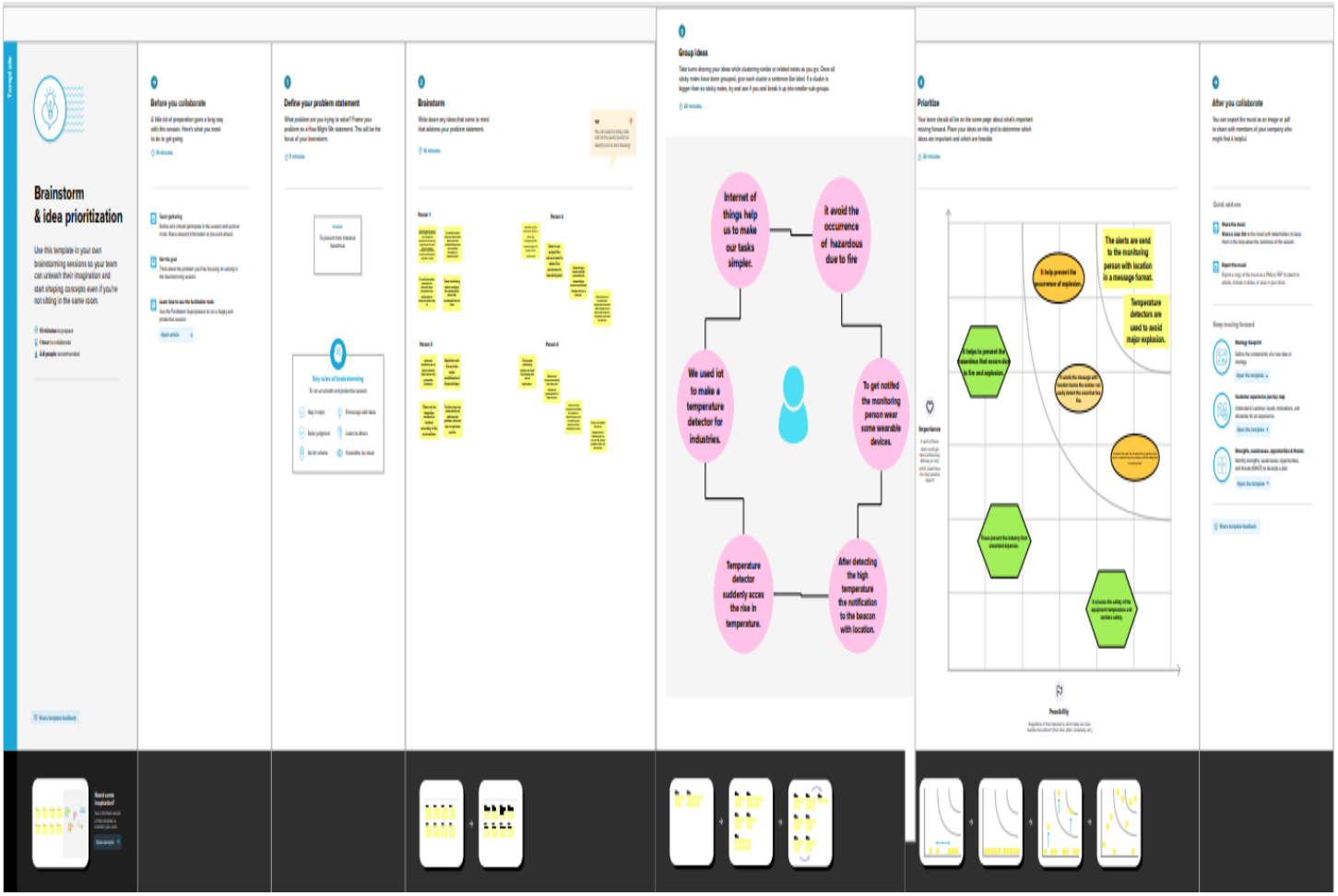
CHAPTER 3

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas:



3.2 IDEATION AND BRAINSTROMING


Brainstorm
& idea prioritization
Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.
Before you collaborate
Define your problem statement
Brainstorm
Group ideas
Internet of things help us to make our tasks simpler.
It avoid the occurrence of hazardous due to fire
We used iot to make a temperature detector for industries.
To get notified the monitoring person wear some wearable devices.
Temperature detector suddenly acces the rise in temperature.
After detecting the high temperature the notification to the beacon with location.
Prioritize
It help prevent the occurrence of explosion.
The alerts are send to the monitoring person with location in a message format.
Temperature detectors are used to avoid major explosion.
After you collaborate

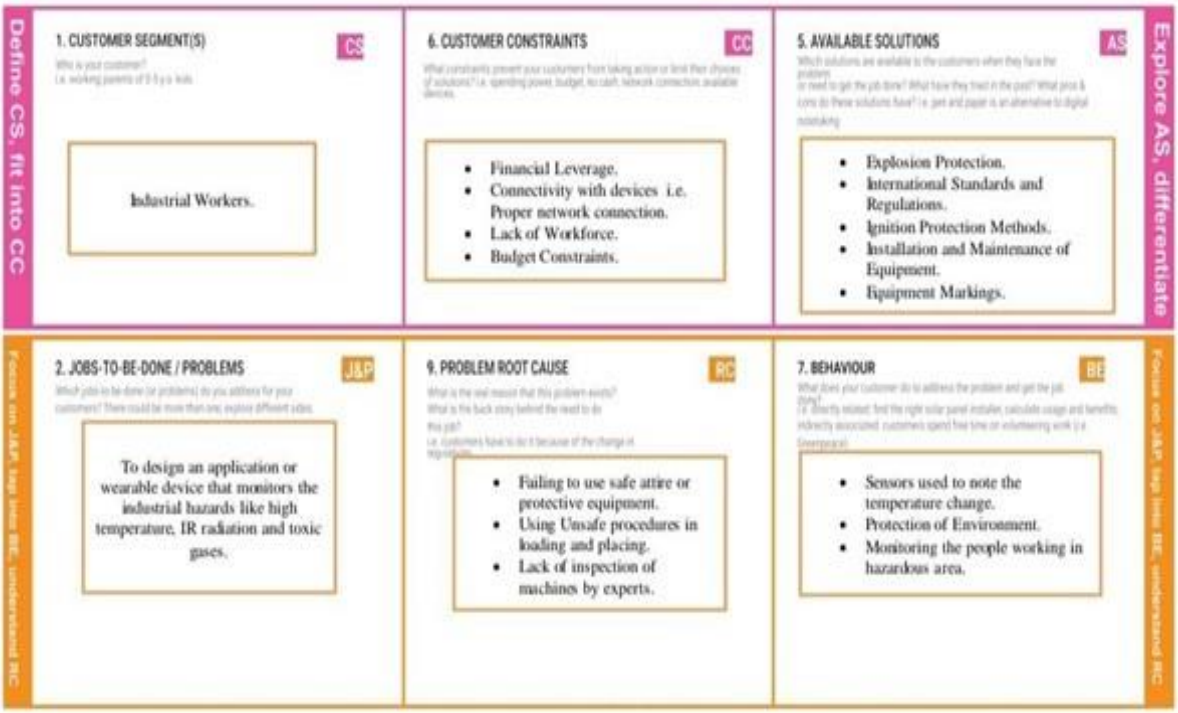
3.3 PROPOSED SOLUTION

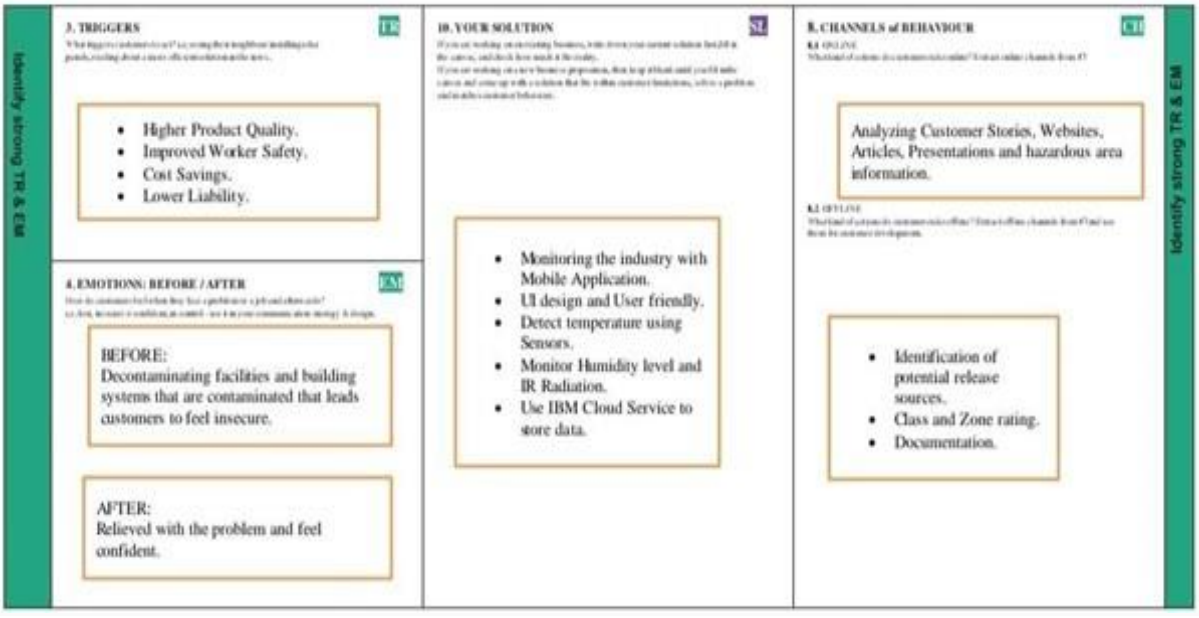
Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Hazardous Area Monitoring for Industrial Plant powered by IoT
2.	Idea / Solution description	Hazardous Area Monitoring for Industrial Plant powered by IoT is a project report that focuses on the necessity of the monitoring of hazardous areas in industrial plants. Industrial plants are the ones that contain both hazardous and non Hazardous areas. The monitoring of the hazardous areas in industrial plants is 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 help in easy monitoring of the hazardous areas. There can be smart devices integrated at the hazardous areas that can help in detecting any fishy things that can occur in the particular area.
3.	Novelty / Uniqueness	A hazardous area is any area with an atmosphere containing, or potentially containing, gases, vapor or dust which are flammable or explosive. These areas are rigorously analyzed with condition monitoring when installing equipment to minimize the risk to individuals and assets. It is crucial that equipment operating in these conditions are effectively monitored to pre-empt any issues before they occur. Unlike most industries, these issues not only result in downtime, but present a significant safety risk.

		Condition monitoring is integral in industrial operations to avoid downtime, to implement maintenance and to reduce the risk of failure. Remote condition monitoring has previously been limited in hazardous areas due to the lack of cost-effective and easy to install solutions – and the often-challenging environments in which this equipment exists. For example, equipment used in subsea applications or on offshore operations cannot be monitored as frequently or easily.
4.	Social Impact / Customer Satisfaction	1) To prevent pollution 2) Real-time plant monitoring 3) Automated detection 4) Excellent customer experience 5) Reduced risks of disasters
5.	Business Model (Revenue Model)	Raspberry -Pi 3 Temperature Sensor - DS18B20 Gas Sensor - MQ 5/9 Breadboard Raspbian OS (Running on Rpi-3) Simple push API Thing speak Cloud Platform
6.	Scalability of the Solution	This system can be deployed in many industrial areas like mining, underground factories, metal refineries, automatic welding factories and even heavy parts production lines. It will help to provide a safe and efficient working environment in wich aroos, while also opening new paths to improve the safety parameters of these places

3.4 PROPOSED SOLLUTION FIT





CHAPTER 4

4. REQUIREMENT ANALYSIS

4.1 Functional Requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data collection	The beacon sensor should be able to collect the temperature from temperature sensor and it should store the data in them and they should have al the data related to their coverage area
FR-2	Location detection	The beacon should send correct location to the wearable device and then when the worker or the wearable device gets near to the detected location itshould give an beep or buzzer to alert them
FR-3	Data coinciding	The beacon should be able to sent the alert or the datboth to the wearable device and administration dashboard through cloud proportionally
FR-4	Wearable device (display)	The device should display the temperature were the worker currently present, and it must be monitored bythe worker often
FR-5	SMS notification	Here if the area were the worker is working reaches thelimit of temperature where it meets the dangerous level then they receive message to their phone by alerting them to leave the area immediately
FR-6	Admin dashboard	When the area of industry reaches the dangerous limit of temperature then the cloud should the notification to their dashboard then the admin should take the precaution to prevent the industry from danger or from any loss

4.2 Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Here wearable devices that are given to the worker should be compact and comfortable to them to use in daily basis. And then the device must be in working condition. And it should alert them when the temperature fluctuates to high limit it should not take time are delay to notify then it causes danger so it should be in correct working manner
NFR-2	**Security**	The link between the beacon sensor and the cloud must be secure and safe all the data must be secured and stored.The temperature data in the cloud and in the dashboard must be secured and should be monitored regularly
NFR-3	**Reliability**	The wearable device that are used by the workers should be maintained without any fault are without any delay messages If any delay or fault .The beacon sensor must also be rectified and maintained without any delay are fault if any fault are any miscommunications occurs then it should be replaced are get replaced immediately
NFR-4	**Performance**	The device should send the data to the cloud and from cloud it should be sent to the worker and the Admin dashboard hence the project needs . Then the message are the data send in real time should be sent in lesser delay of time it should be as mush as faster
NFR-5	**Availability**	The worker who are working in the plant who uses the wearable device they should be notified by the temperature of their current location and rather at any time and any place at the plant
NFR-6	S**calability**	If the area of the plant is increased than the coverage we should install new beacon sensors and it should be linked to the old beacon sensors and it should be linked to the cloud and they can be processed It can be modified for some other plant.

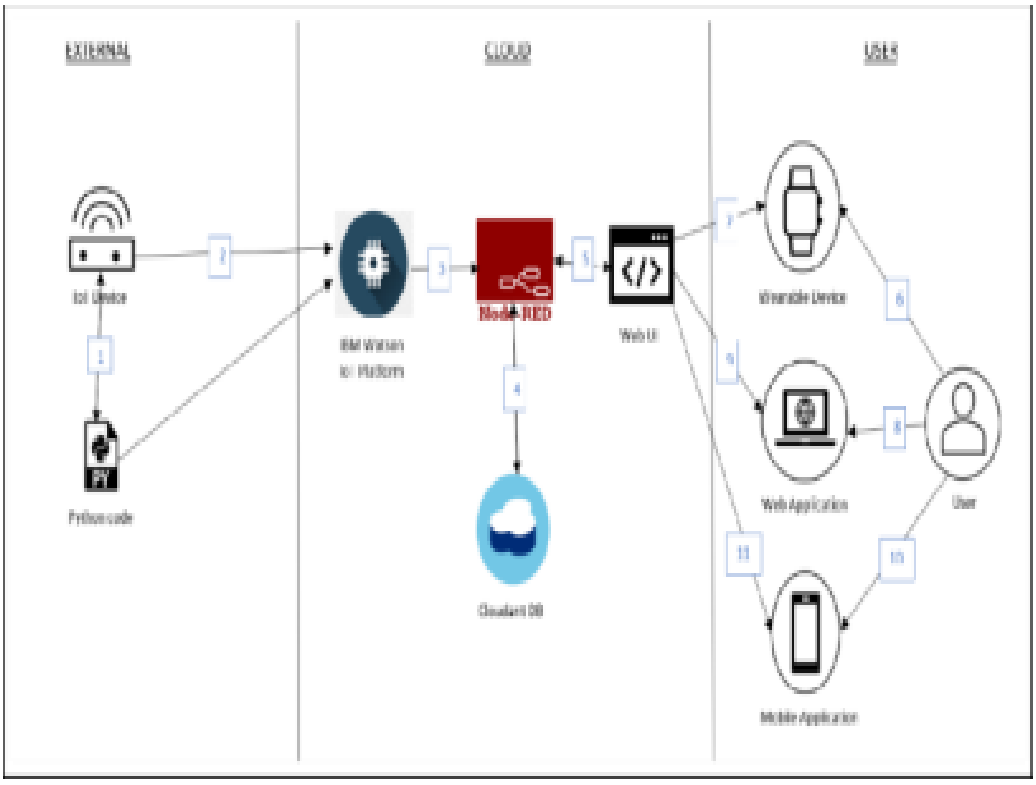
CHAPTER 5

5. PROJECT DESIGN

5.1 Data Flow Diagram:

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)



1.A code should be developed to collect all the temperature details from the industry it should be derived to link IOT device.

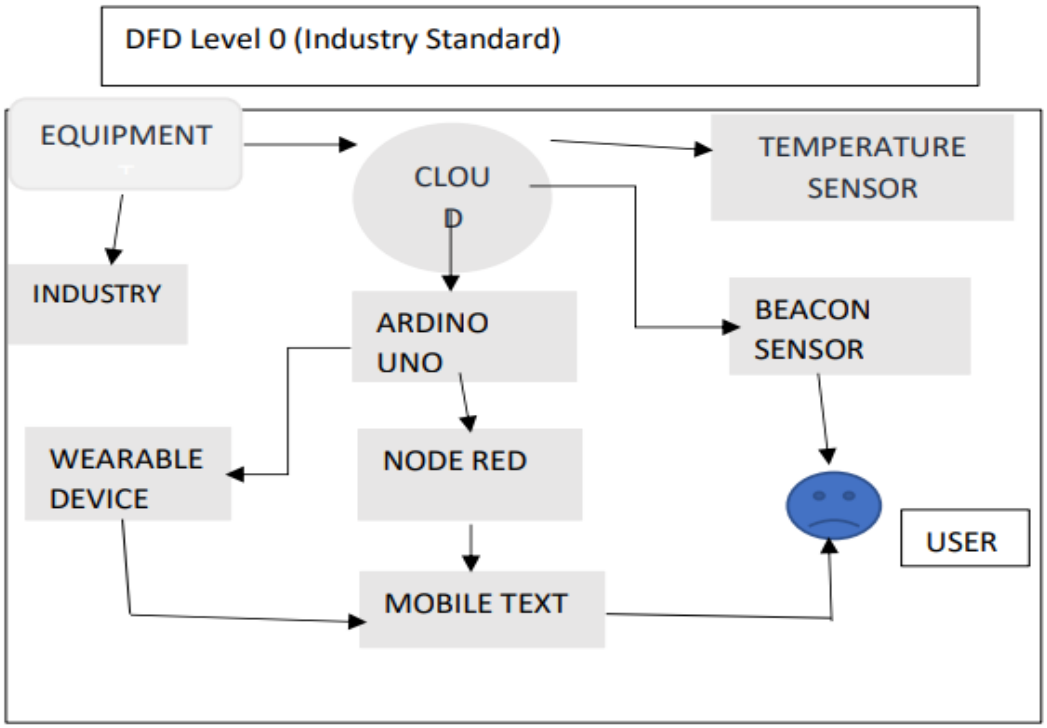
2. IOT device is connected with IBM Watson IBM platform to collect the data.

3. Node red service is used for next step for IOT platform is set.

4. Cloud is used for storing the data.

5. For web applications node red will help to do the process so they were connected to each other

6.(6,7,8,9,10,11) user uses some wearable devices are a mobile app to receive the information.

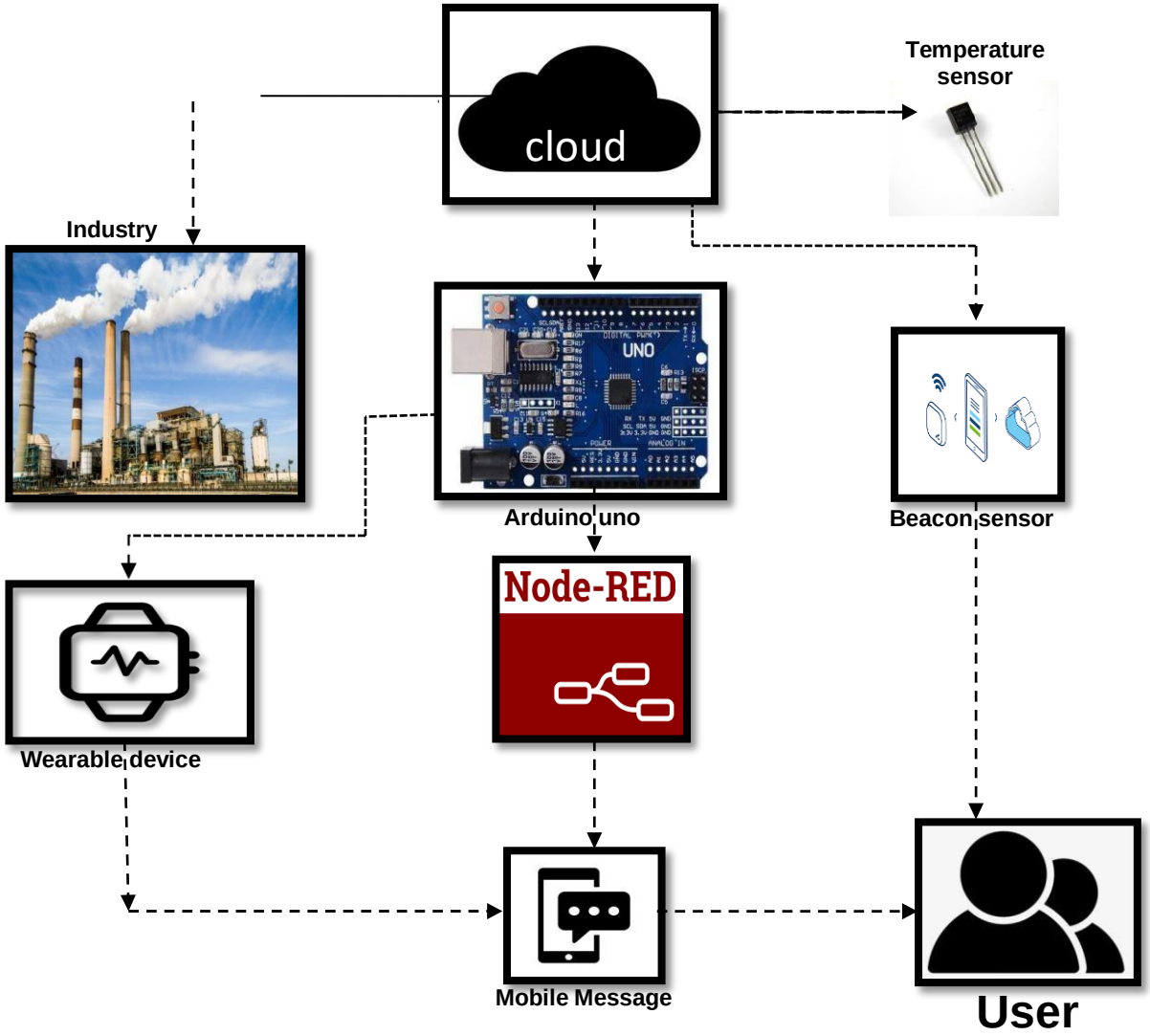


5.2 Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridgesthe gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed,and delivered.

5.2 Solution Architecture Diagram:



5.3 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	Acceptance criteria	Priority	Release
Professional (project head)	installation	USN-1	Here the technician is used to install the beacon sensor at the industry at correct points which is used to sense the message signals to be alerted	A beacon can be identified from any point from the area of the project	High	Sprint-1
	Data gathering	USN-2	The beacons used here use sensors to collect all the temperature data from their coverage area	The temperature of the covered area is obtained and saved	High	Sprint-1
	Data coincide	USN-3	Beacons are instructed to send the data collected to the cloud if any danger is seen then they are sent to the wearable watch and get notified by workers	These data are sent to the cloud in correct manner and they are sent to other devices	High	Sprint-2
worker	Wearable device	USN-4	Here the wearable device should show the data that has been sent by the beacon and it should be monitored by the worker	The worker can see the temperature of the area through the device	Medium	Sprint-1
	Wearable device adjustments	USN-5	Here the worker can adjust the wearable device according to their taste	The adjustment should ensure them to have a comfortable with it present	low	Sprint-2
	Wearable device customization	USN-6	The user can adjust the fonts of the letters in the device to their need in the device itself	They can set the device display to their needs	low	Sprint-2
	SMS notification	USN-7	The wearable device has the data that has been sent by the beacon sensor and then when the area has fluctuation of high temperature then it sends SMS their linked phone	The workers are alerted by SMS as soon as the temperature fluctuation detected by the beacon sensor	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Administrator	Admin dashboard	USN-8	The beacon sent message to cloud then they sent it to the administrator dashboard	The data in beacon can be seen by the administrator through dashboard	Medium	Sprint-2
	Dashboard customisation	USN-9	The admin can customise their dashboard according to their needs and priorities which can be easy to access	They can customise their dashboard	Medium	Sprint-2

CHAPTER 6

6. PROJECT PLANNING & SCHEDULING:

6.1 Sprint Planning & Estimation:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Hardware	USN-1	Sensor and wi-fi module with python code.	2	High	Vishwapoojitha Padmapriya .S, Vaishaly.R Padmapriya.AR
Sprint-1	Software	USN-2	IBM Watson IoT platform,Workflows for IoT scenarious using Node-red	2	High	Vishwapoojitha Padmapriya .S, Vaishaly.R Padmapriya.AR
Sprint-2	MIT app	USN-3	To develop an mobile application usingMIT	2	High	Vishwapoojitha Padmapriya .S, Vaishaly.R Padmapriya.AR
Sprint-1	Web UI	USN-4	To make the user to interact with software	2	High	Vishwapoojitha Padmapriya .S, Vaishaly.R Padmapriya.AR

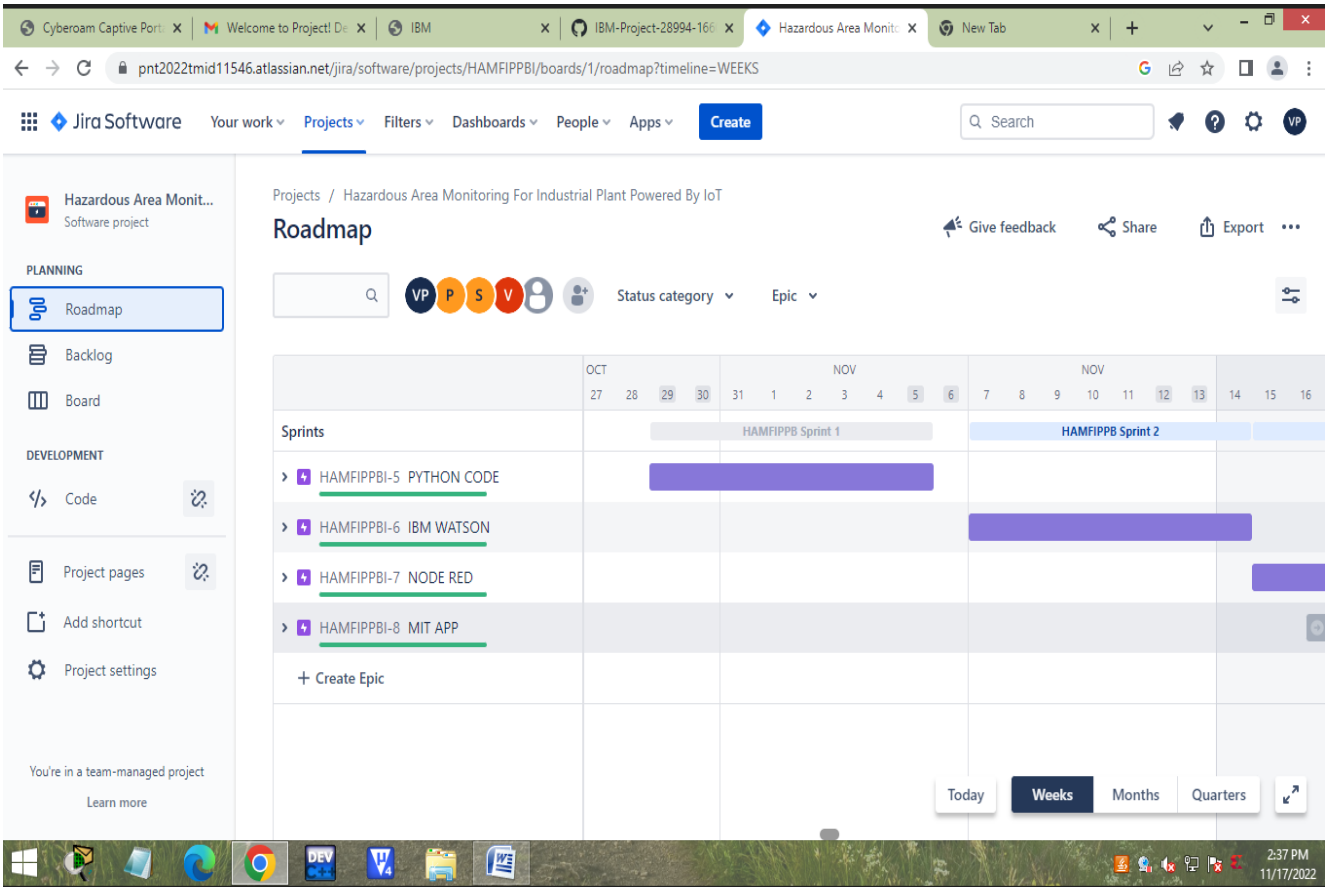
6.2 Sprint delivery schedule:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 OCT 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022		5th NOV 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		12th NOV 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		14th NOV 2022

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

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

6.3 Reports from JIRA:



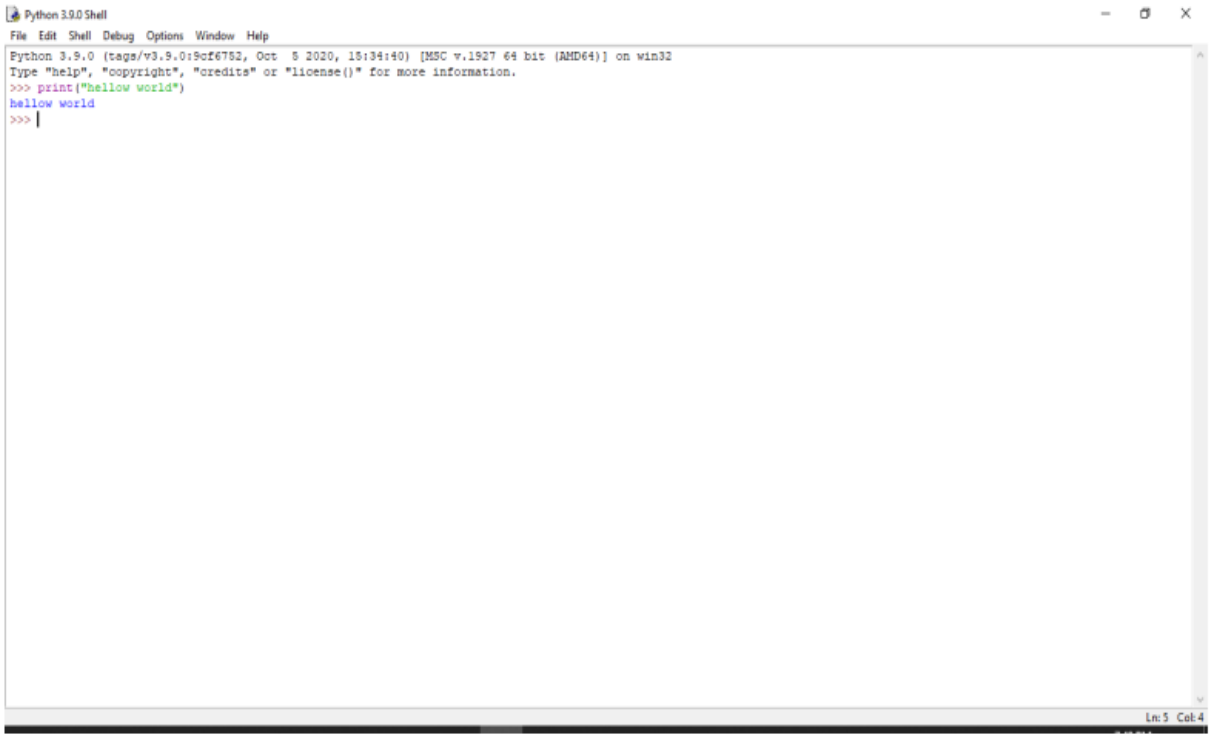
CHAPTER 7

7.CODING & SOLUTIONING:

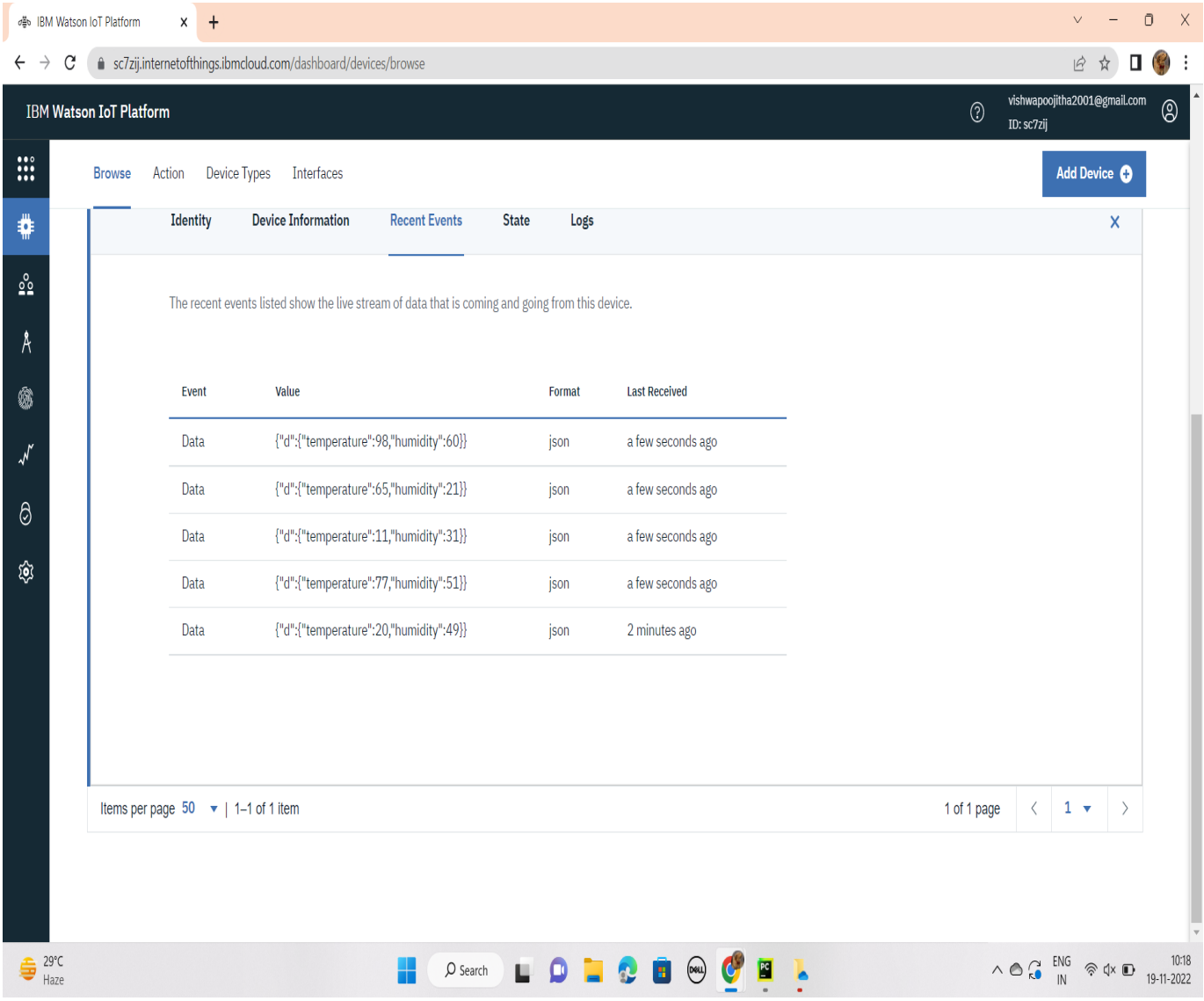
7.1 Feature 1:

HAZARDOUS AREA MONITORING FOR INDUSTRIAL PLANT POWERED BY IOT

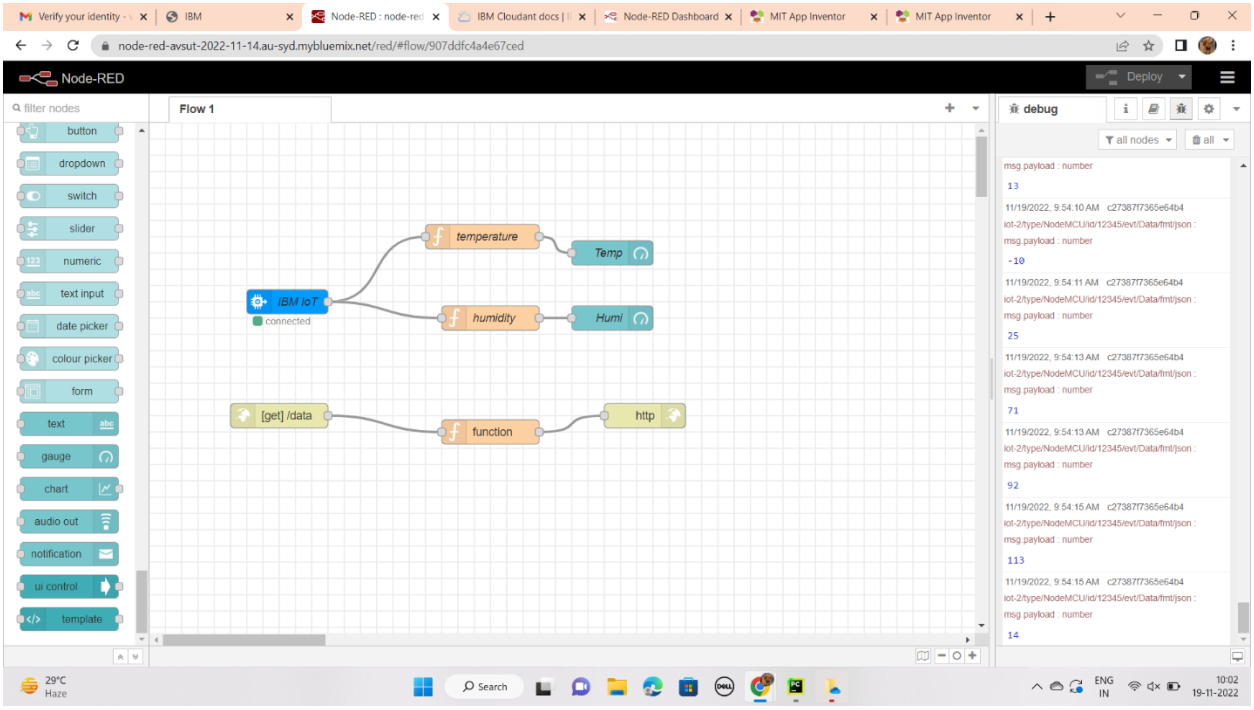
Language: python.



7.2 Feature 2:


IBM Watson IoT Platform
sc7zij.internetofthings.ibmcloud.com/dashboard/devices/browse
IBM Watson IoT Platform
vishwapoojitha2001@gmail.com
ID: sc7zij
Browse
Action
Device Types
Interfaces
Add Device
Identity
Device Information
Recent Events
State
Logs
The recent events listed show the live stream of data that is coming and going from this device.
Event
Value
Format
Last Received
Data
{"d":{"temperature":98,"humidity":60}}
json
a few seconds ago
Data
{"d":{"temperature":65,"humidity":21}}
json
a few seconds ago
Data
{"d":{"temperature":11,"humidity":31}}
json
a few seconds ago
Data
{"d":{"temperature":77,"humidity":51}}
json
a few seconds ago
Data
{"d":{"temperature":20,"humidity":49}}
json
2 minutes ago
Items per page 50
1–1 of 1 item
1 of 1 page
1
29°C
Haze
Search
ENG
IN
10:18
19-11-2022

7.3 Database schema:



CHAPTER 8

8.TESTING

8.1 TEST CASES:

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Executed By			
2	PYTHON CODING		To generate random values for the parameters Temperature and Humdity.		1.Open python 2.Write the program to generate random variables for the parameter using a random libraries 3.Run the program		The code must run successfully and random values must be generated.	Working as expected	Pass	A.R.Padmapriya, R.Vaishaly			
3	Node Red		To establish connection in IBM watson IoT platform and then configuring node for the parameters.		1.Open Node Red using IBM cloud. 2.Installing package to connect with IBM watson and configure the node with the authentication key and ID using IBM watson IoT platform. 3.Arrange the functional nodes for the parameters and configure them. 4. Connect all nodes with msgpayload and deploy them.		1.Open Node-Red using ibm cloud. 2.Installing package to connect with IBM watson and configure the noden with the authentication key and ID using IBMwatson IoT platform. 3.Arrange the functional nodes for the paramters and configure them. 4.connect all nodes with msgpayload and deploy them.	working as expected	Pass	S.Padmapriya, J.V.K.Vishwapoojitha			
4	Watson	Add device	To display values in IBM Watson and generate API key for node red		1.To create IBM watson platform in services in your IBM cloud account 2.Launch the IBM watson to IoT platform. 3.Create a new device. 4.give credential like device type,deviceid,authentication token to generate API keys		IBM watson connection must be established.	Working as expected	pass	R.Vaishaly, J.V.K.Vishwapoojitha			
5	Web UI	Temperatur e,Humidity	To display the ALERT Message in the node red		We have to take the functional module and connect to the IBM watson IoT Platform.		Message in the node red	Working as expected	Pass	S.Padmapriya, J.V.K.Vishwapoojitha			
6	MIT Application		To display the Temperature and Humidity values through application		1.To develop the Frontend and Backend. 2.Paste the URL of the node red to the backend. 3.Output is displayed.		TEMPERATURE AND HUMIDITY value are shared through the message	Working as expected	pass	R.Vaishaly, J.V.K.Vishwapoojitha			

8.2 USER ACCEPTANCE:

CHAPTER 9

9. RESULTS

9.1 PERFORMANCE METRICES:

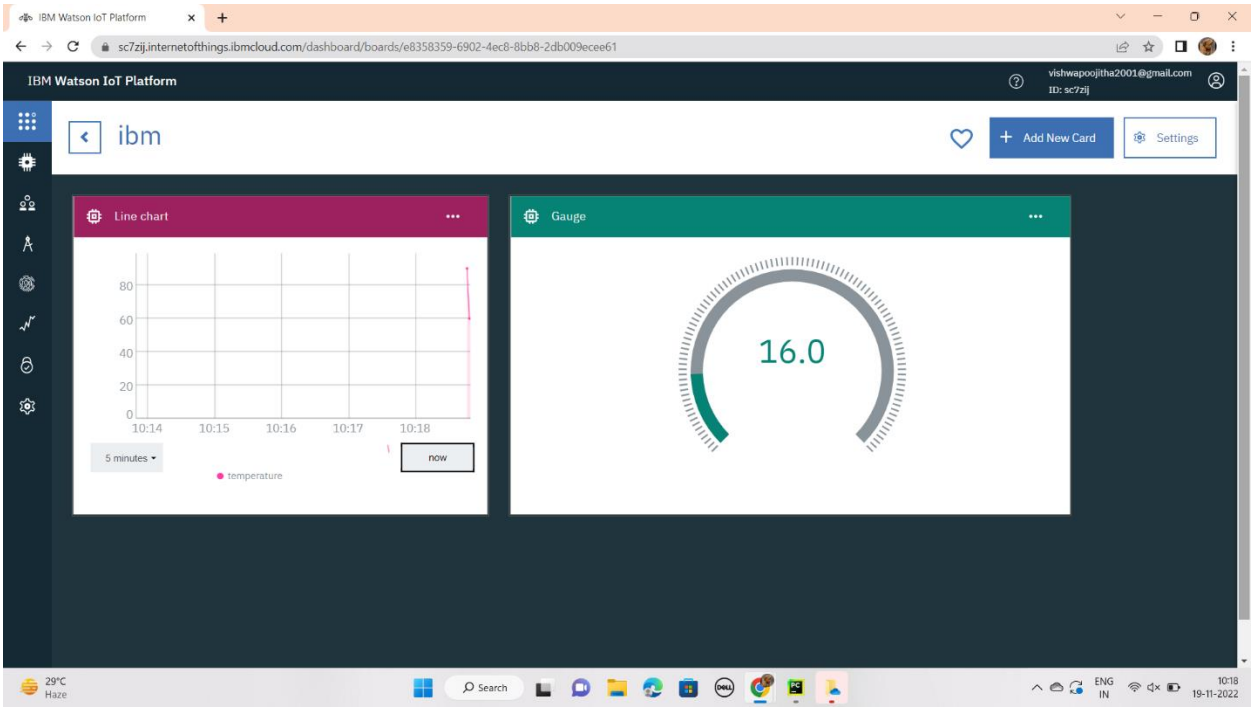
Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Executed By			
2	PYTHON CODING		To generate random values for the parameters Temperature and Humdity.		1.Open python 2.Write the program to generate random variables for the parameter using a random libraries 3.Run the program		The code must run successfully and random values must be generated.	Working as expected	Pass	A.R.Padmapriya, R.Vaishaly			
3	Node Red		To establish connection in IBM watson IoT platform and then configuring node for the parameters.		1.Open Node Red using IBM cloud. 2.Installing package to connect with IBM watson and configure the node with the authentication key and ID using IBM watson IoT platform. 3.Arrange the functional nodes for the parameters and configure them. 4. Connect all nodes with msgpayload and deploy them.		1.Open Node-Red using ibm cloud. 2.Installing package to connect with IBM watson and configure the noden with the authentication key and ID using IBMwatson IoT platform. 3.Arrange the functional nodes for the paramters and configure them. 4.connect all nodes with msgpayload and deploy them.	working as expected	Pass	S.Padmapriya, J.V.K.Vishwapoojitha			
4	Watson	Add device	To display values in IBM Watson and generate API key for node red		1.To create IBM watson platform in services in your IBM cloud account 2.Launch the IBM watson to IoT platform. 3.Create a new device. 4.give credential like device type,deviceid,authentication token to generate API keys		IBM watson connection must be established.	Working as expected	pass	R.Vaishaly, J.V.K.Vishwapoojitha			
5	Web UI	Temperature,Humidity	To display the ALERT Message in the node red		We have to take the functional module and connect to the IBM watson IoT Platform.		Message in the node red	Working as expected	Pass	S.Padmapriya, J.V.K.Vishwapoojitha			
6	MIT Application		To display the Temperature and Humidity values through application		1.To develop the Frontend and Backend. 2.Paste the URL of the node red to the backend. 3.Output is displayed.		TEMPERATURE AND HUMIDITY value are shared through the message	Working as expected	pass	R.Vaishaly, J.V.K.Vishwapoojitha			

SENSOR PERFORMANCE:

NFT - Risk Assessment									
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Voluem Changes	Risk Score	Justification
1	Plasma Donor	New	Low	No Changes	Moderate		>5 to 10%	ORAINGE	As we have seen the chnages

NFT - Detailed Test Plan				
S.No	Project Overview	NFT Test approach	umptions/Dependencies/R	Approvals/SignOff
1	Plasma Donor			

End Of Test Report								
S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff



10. ADVANTAGES AND DISADVANTAGES

10.1 Advantages:

- Quickly finding any issue that occurs in the industrial plant
- Keeping the records of the reading and data of temperature level
- Predict the problem before the occurance
- Ensuring the safety and security of the workers
- No need for routine survey

10.2 Disadvantages

- Misuse of privacy data
- Expense will be increased
- Communication channel disconnection will occur often
- Complex issues

12. CONCLUSION:

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 large number of ways in which industries can make use of IOT to improve working conditions, efficiency, cutting cost, and improving the overall growth of the industry. However, hazard monitoring and mitigation often overlooked in industrial areas.

Therefore , this project specifically aims into the make use of IOT to actively monitor and analyze various factors in a typical heavy industrial zone like temperature and levels of gases in the environment. If the above values are exceds from the given limit , the system track the area and alerts the admin and the workers at the area , also the data generated at the real time can provide important information about the hazard on going on the different areas.

The system can be deployed in many industrial areas like meta refineries , automated welding factories, and even at heavy part production lines , it will provide a safe and secure environment to the workers and to the admin of the industry.