LATHA MATHAVAN ENGINEERING COLLGE

ALAGARKOVIL, KIDARIPATTI

DEPARTMENT OF ELECTRONICS AND COMMUNICATION

SUB CODE: HX8001

SUB NAME: Professional Readiness For Innovation, Employability and Entrepreneurship

Project Report

IoT ENABLED – REAL TIME WATER QUALITY MONITORING AND CONTROL SYSTEM

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Project Report

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INTRODUCTION:

1:PROJECT OVERVIEW:

Water pollution is one among the most important fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a coffee cost system for real time monitoring of the water quality in IOT(internet of things). The system contains several sensors is employed to measuring physical and chemical parameters of the water. The parameters like temperature, pH, turbidity, flow sensor of the water are often measured. The measured values from the sensors are often processed by the core controller. The Arduino model is core controller. Finally, the sensor data are often viewed on internet using WI-FI system. Index Terms—IOT, Sensors, Arduino.

2:PURPOSE:

There are numerous advances in the twenty-first century, but at the same time, pollutions, heating, and other forms of pollution are forming, and as a result, there is no safe beverage for the world's pollution. Water quality monitoring in real time is becoming more difficult as a result of increasing water scarcity, population growth, and other factors. As a result, better approaches for monitoring water quality metrics in real time are required[1]. The parameters of water quality the concentration of hydrogen ions is measured by pH. It indicates whether or not the water is acidic or alkaline. Pure water has a pH of 7, although it is acidic rather than alkaline. pH ranges from 0 to 14.It should be between 6.5 and 8.5 pH for drinking. Turbidity is a measurement of the unseen suspended particles in water. The greater the turbidity, the greater the risk of diarrhoea, cholera. If the turbidity is low, the water is safe to drink. The temperature sensor detects how hot or cold the water is. Flow sensor is a device that measures the flow of water. The traditional method of water quality monitoring entails manually collecting water samples from various sites. The use of wireless communication technologies is becoming more common to help people with their personal and daily duties. Many building control, automation, and data collecting applications have been created in recent years. There are numerous advantages, such as minimal cost, ease of installation, and maintenance. The remote device network can be used for a variety of tasks, including agriculture and traffic control, remote health care, forest management, security, and surveillance.

2, LITERATURE SURVEY:

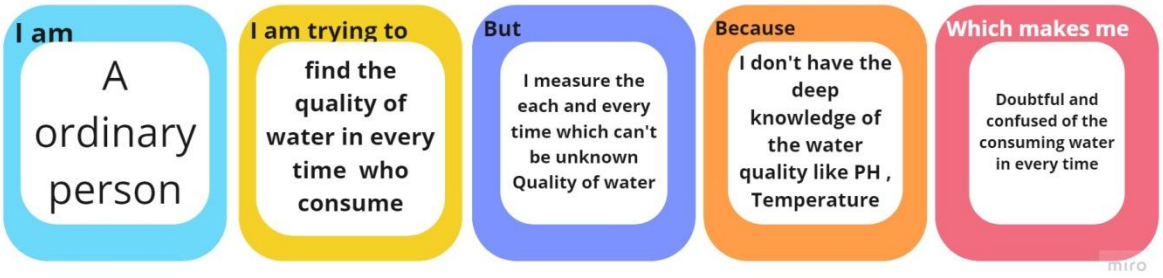
1.EXISTING PROBLEMS AND REFERENCES:

TITLE	AUTHOR	DATE	PUBLICATION	PROS/CONS
Real Time Water Quality Monitorn g System	MithilaBarab de ,ShrutiDanve	6, June 2015	https://www.resea rchgate.net	1. To obtain the water monitoring system with high frequency, high mobility, and low powered. 2. Another important fact of this system is the easy installation of the system that is the base station can be placed at the local residence close to the target area and the monitoring task can be done by any person with very less training at the beginning of the system installation. 3. Water pollution can be easily detected by this system, which will help in controlling it.
Internet of things enabled real time water quality monitori ng system	C S. Geetha and S.Gouthami	27, July 2017	https://link.springer.com	1. power efficient, simpler solution for in-pipe water quality monitoring based on Internet of Things technology is presented. 2. system also provides an alert to a remote user, when there is a deviation of water quality parameters from the pre-defined set of standard values. 3. Turbidity is a measure of cloudiness in the water. But only theOpto electronic devices such as LDR and LED are used to

				measure the turbidity.
EIoTBased Water Management Systems: Survey and Future Research Direction	Sherenismai , DianaW.Dawoud,NadhemIsmai,Ronald Marsh and Alis.Alshami	31,March 2022	https://ieeexplore.ieee.org.	1. Infrastructure and equipment conditions monitoring to predict any upcoming failures, leakage, tampering, or maintenance needs. 2. This technology can be beneficial in obtaining information, valuable for making business decisions, while a realtime history record can assist in monitoring changes in key physical reservoir parameters 3. This work aims to serve as a motivation for further research concerning IoT-based water management systems designated for oilfield applications
Real Time Quality Monitori ng System for Water in IoT Environment	DeepthiN1 , Rahul R A1 , Kiran M1 , Aishwarya S1 , PoornaPrajn a K M1	4, July 2020	http://www.ijp rse.com/	1.Water quality should be monitored properly to certify whether the quality is good or not. 2. In the paper they used the method called data acquisition process for monitoring the quality water. 3.Here in this system , have used Raspberri Pi as the micro controller.
IoT Based Realtime River Water Quality Monitori ng System	Mohammad Salah Uddin Chowdurya, Talha Bin Emranb ,SubhasishGhosha , AbhijitPatha	August 19-21, 2019	https://www.researchgate.net/publication/33 3642226	1. The main components of Wireless Sensor Network (WSN) include a microcontroller for processing the system, communication system for inter and intra node communication and

	ka , Mohd. ManjurAlam a ,NurulAbsara , Karl Anderssonc , Mohammad ShahadatHos saind			several sensors. 2. Due to the limitation of the budget, we only focus on measuring the quality of river water parameters. 3.But, This project can be extended into an efficient water management system of a local area.

2.PROBLEM DEFINE STATEMENT:

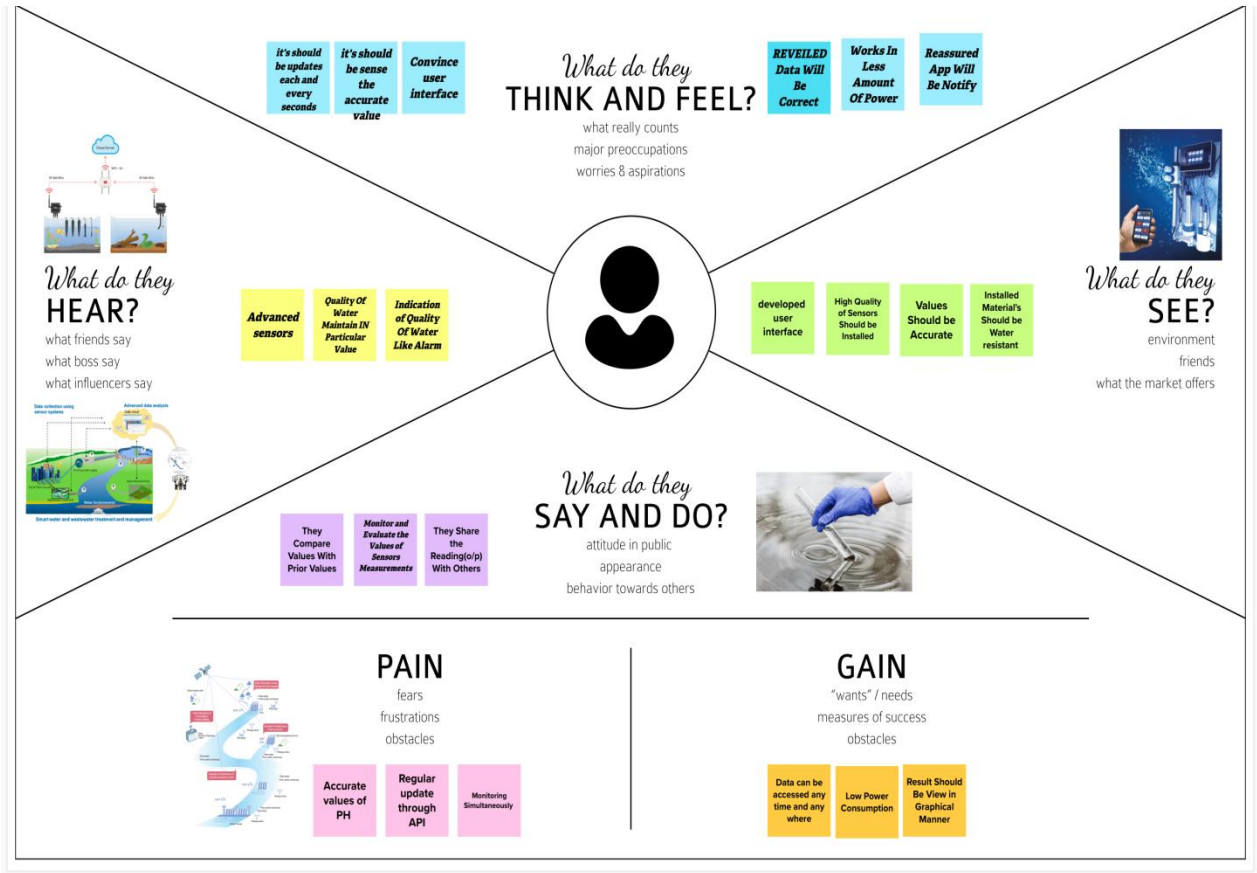


I am	Common people living a normal life on Earth	Common people living on Earth who consume water in their day-to-day life for different purpose

I'm trying to	Monitor the standard quality of the water	Wants to monitor the water consumed everyday whether the water is contaminated or pure, pH, temperature, salinity in it
But	Don't know to monitor the quality of water	Time consuming a lot for process of manual testing
Because	Lack of required knowledge	Common people lack knowledge of this type of testing, sensors etc.
Which makes me feel	Doubted and fearful of the consumed water	Lack of pure water by changes in environment and also causing various diseases by bacteria and virus are present in water

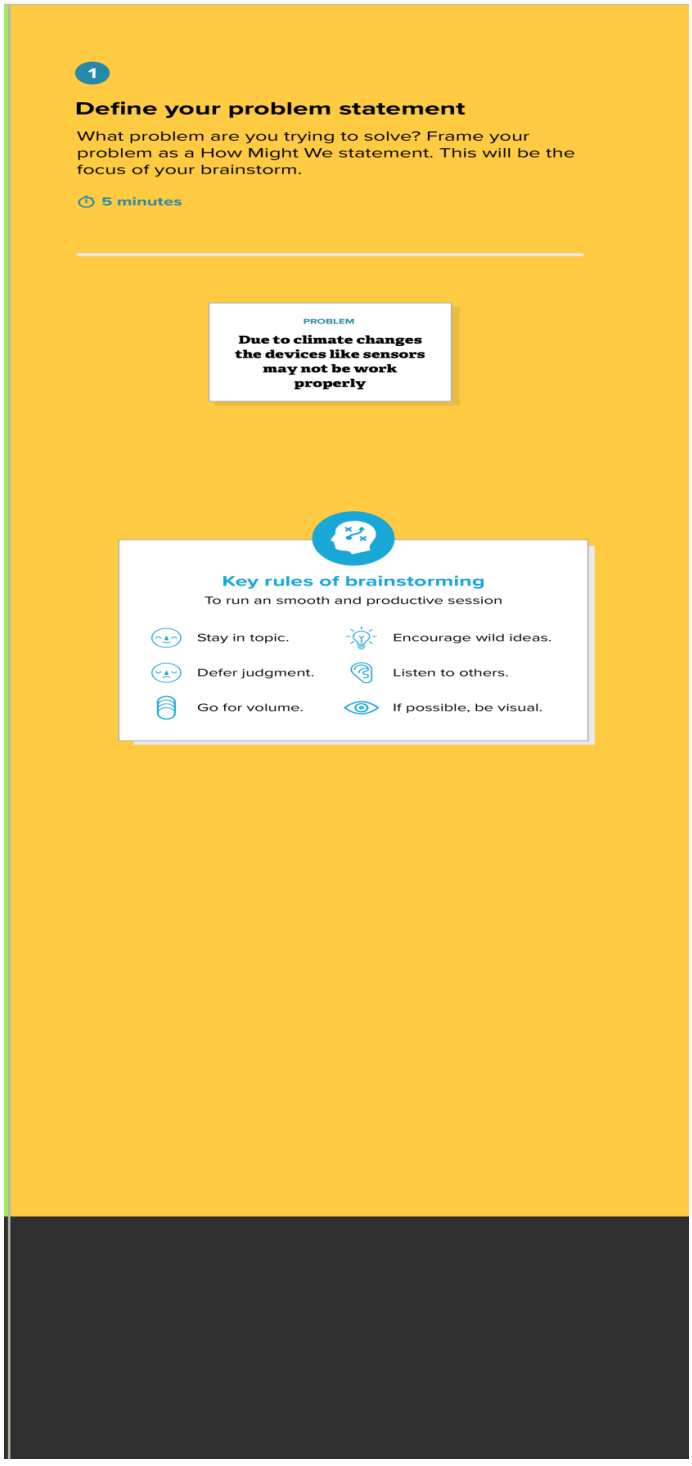
3. **IDEATION & PROPOSED SOLUTION**

EMPATHY MAP:

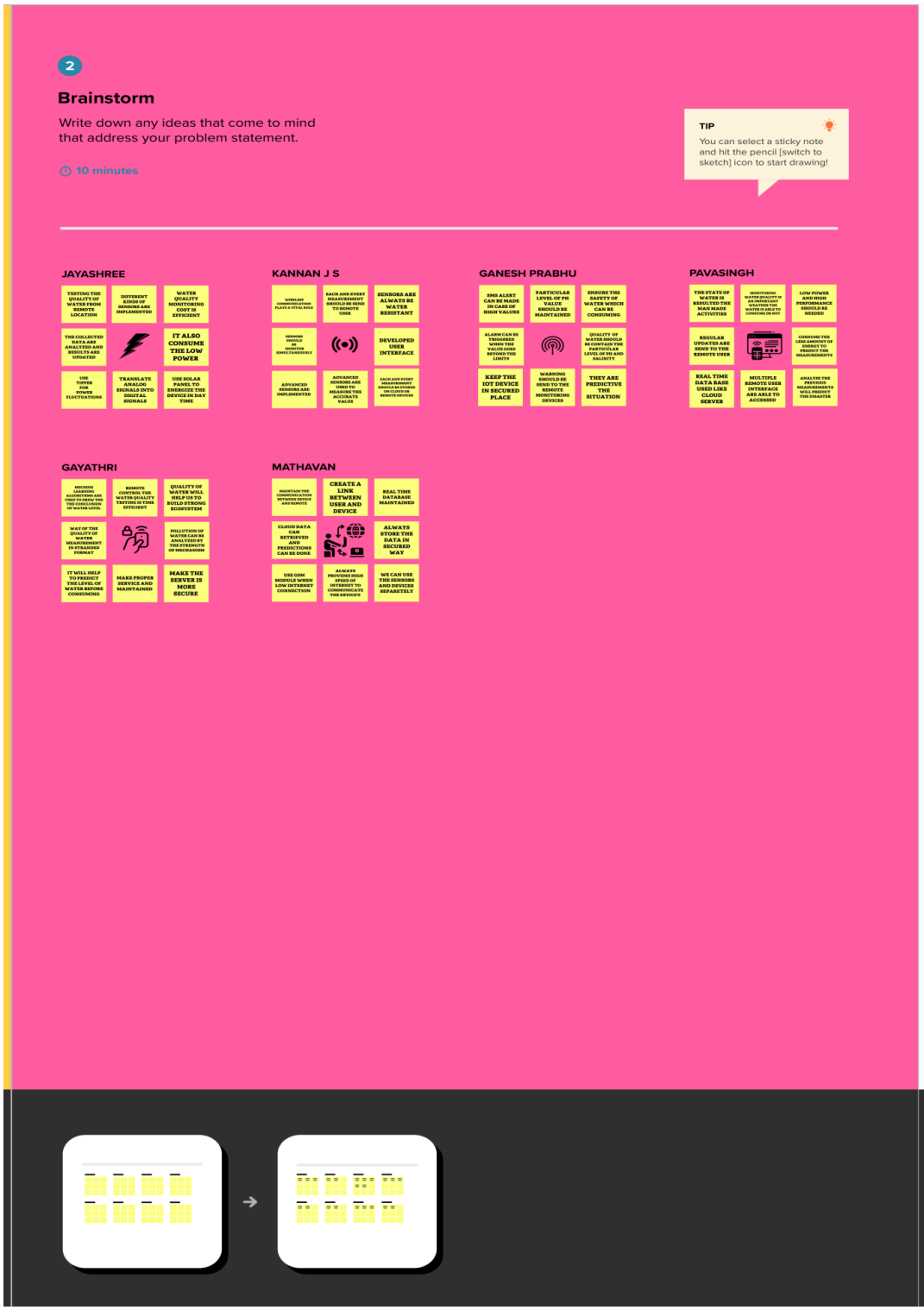


BRAINSTORMING AND IDEATION:

Step-1: Team Gathering, Collaboration and Select the Problem Statement


1
Define your problem statement
What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.
5 minutes
PROBLEM
Due to climate changes the devices like sensors may not be work properly
Key rules of brainstorming
To run an smooth and productive session
Stay in topic.
Encourage wild ideas.
Defer judgment.
Listen to others.
Go for volume.
If possible, be visual.

Step-2: Brainstorm, Idea Listing and Group2



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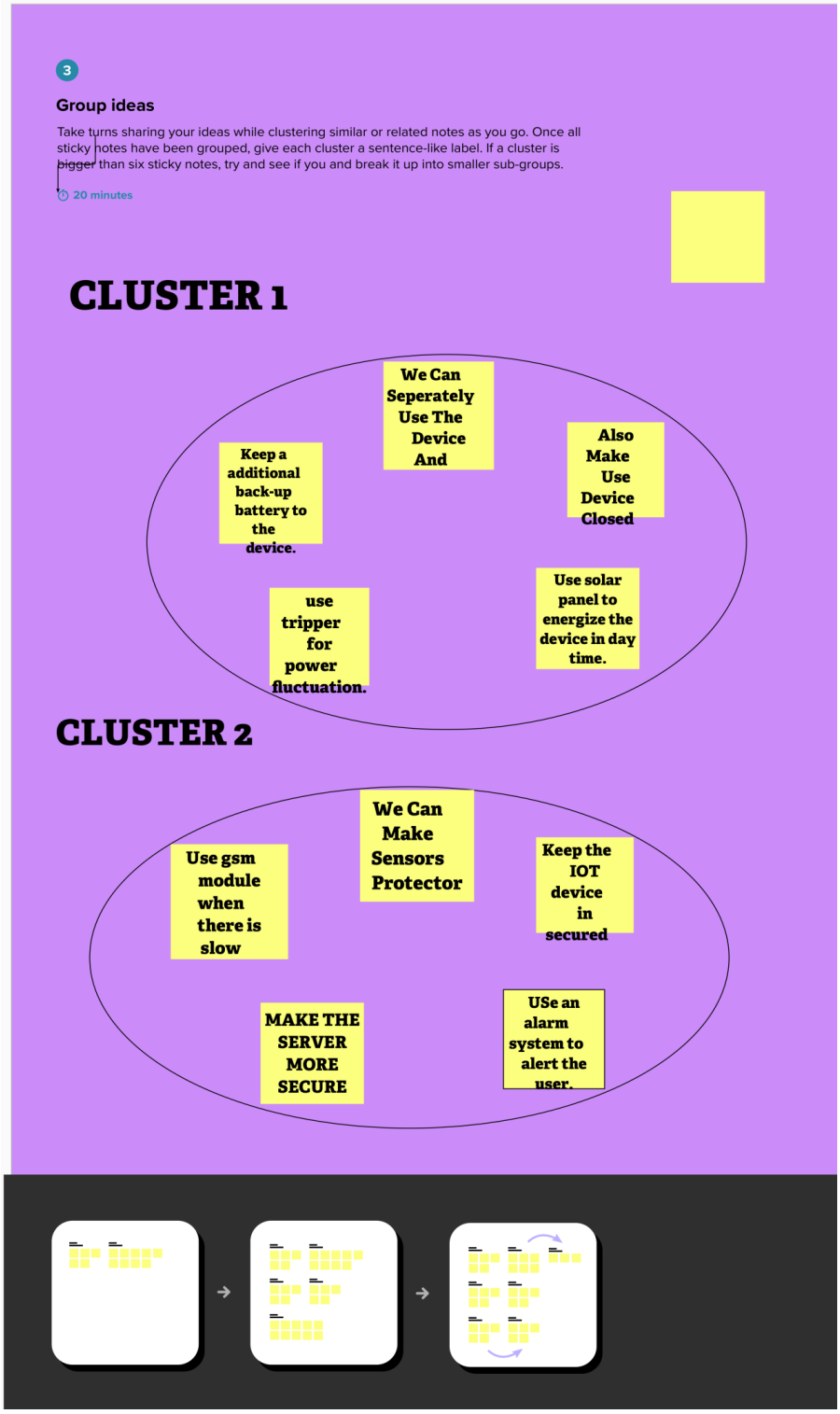
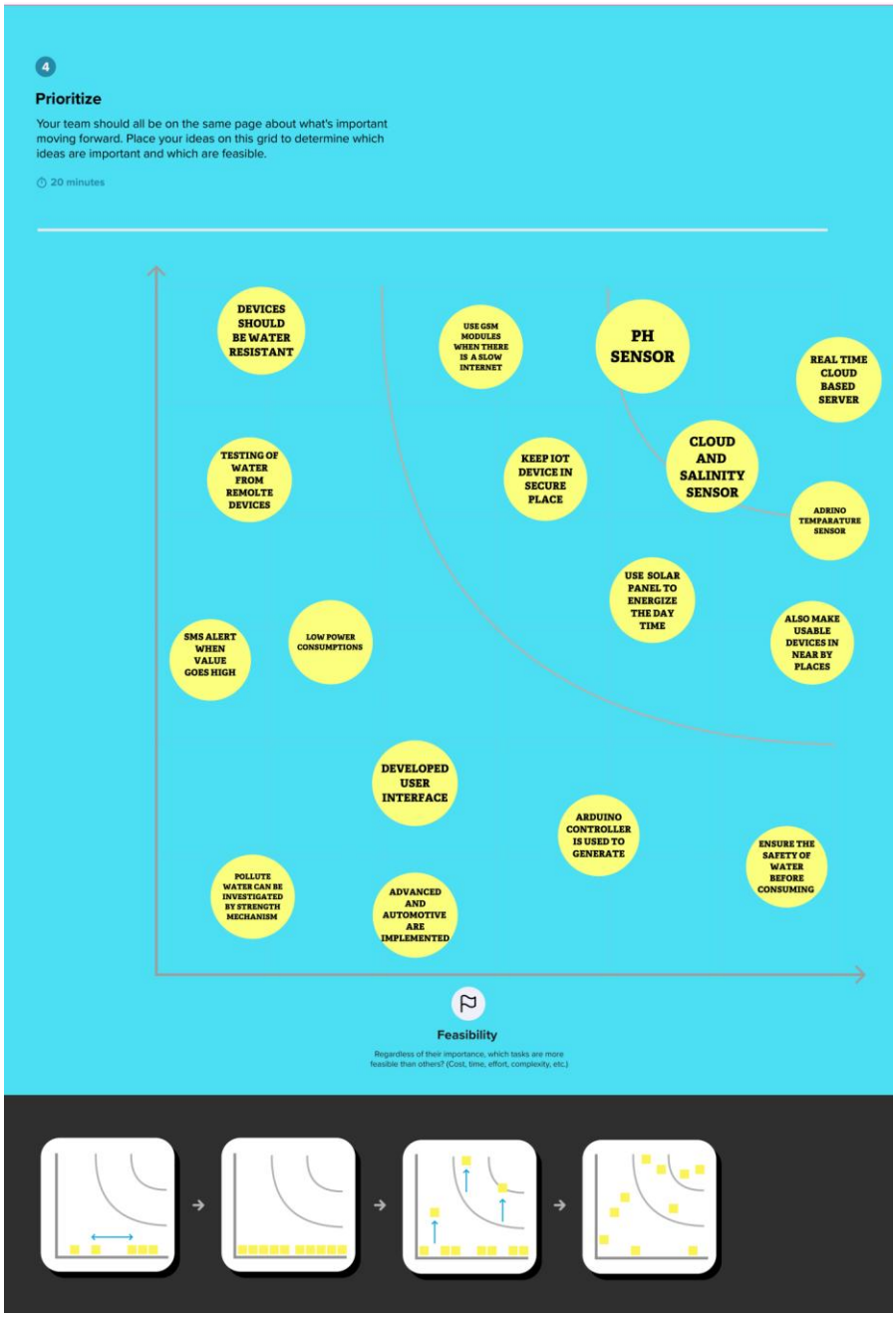
STEP 3 GROUP IDEA



STEP 4:PRIORITIZE



AFTER YOU COLLABRATE:

3.Proposed Solution:

S. No.	Parameter	Description
1.	**Problem Statement (Problem to be solved)**	IOT Based Real Time River Water Quality Monitoring and Control System
2.	**Idea / Solution description**	1. To monitor the quality of water using sensors like Temperature, Potentiometer(pH), Turbidity, Salinity and so on. 2. Collecting those data and storing it in cloud and perform analyse to check if the water is contaminated or not for drinking. 3. If the water is contaminated an alert is made to the user/ local authority through SMS or can be viewed through web application anytime.
3.	**Novelty / Uniqueness**	1. Based on the collected data prediction is made whether the water can be used for cultivation of specific crops and suitable for the aquatic animals.
4.	**Social Impact / Customer Satisfaction**	Algal growth, fertilizers, pesticides cause river pollution which can impact all living beings. Better monitoring and control measures can impact health and vegetation massively.
5.	**Business Model (Revenue Model)**	Service based product is developed to serve the local people to know the quality of water before consuming it or using it for any purpose. This prevents health issues or at most loss of living being.
6.	**Scalability of the Solution**	Developing the product as both web and mobile application it is portable, and data can be accessed from anywhere anytime. provide a real-time monitoring and a feasible solution for remote or distant places where water quality laboratory is not present.

SOLUTION FIT:

RealTimeWaterQualityManagementandControlSystem | ProjectDesignPhase-I-SolutionFitTemplate | TeamID:PNT2022TMID47600

DefineCS,fitintoCC

1.CUSTOMERSEGMENT(S) CS

Normal people and industrialist are our customer because all the have the basic knowledge in water quality and also they need a pure water. Weare targeting the people who are have the basic knowledge and who need to know the quality of water. As well as who are having water based industries.

6.CUSTOMERCONSTRAINTS CC

Network availability and availabledevice are the biggest issue face by thecustomers and they need to spend a time to getdaily update, it may high budget for somepeople. The resources in terms of financialaswellas manpowerareinadequate.

5. AVAILABLESOLUTIONS

- The temperature of water can bemonitored.
- The PH level of water is monitored and identified.
- Amount of oxygen dissolved inwater.
- Any kind of chemical substances should be presence in water.

ExploreAS,differentiate

Focuson J&P,tapintoBE,understandRC

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

All the people and industrialist are suffers to know the quality of water and also monitor the PH, Humidity, presence of chemical substances, amount of dissolved oxygen. They are only need the quality of water because impure water should because the various diseases.

9.PROBLEMROOTCAUSE RC

The reason for available of this project to monitor the quality of water as well as the various substances are presence in water. We took this project to break the myth of utilizing the technology and also reduce the manpower

7.BEHAVIOUR BE

Directly related: Find betternetwork availability, calculate the qualityandquantityof water and also monitor simultaneously the quality and quantity of water.

Indirectly related: We should make the awareness to all other industries as well as people

Focuson J&P,tapinoBE;

Identify strong TR &EM

3. TRIGGERS TR

- By installing this project, wecantrigger people by seeing theirneighbor make the utilization oftechnology more useful andreading about a more efficientsolutioninthe news.
- In case of without using mobileapp, one should always be thereto maintain the parameters andthe maintenance cost should bepaid.

10. YOURSOLUTION SL

- We provide a good source tothepublic and we work basedon publicreview.
- The PH level of water isidentified.
- Turbidity of water isidentified.
- Conductivity of water isidentified and also monitor the presence of chemical substances in water

8. CHANNELSOFBEHAVIOUR CH

ONLINE:

- People and industrialist may provide reviewandratingforthesystem.
- The software used shouldbe properly studied byeveryoneto operateit.
- The software andhardware connectionsshouldbegive nproperly.

Findstrong TR& EM

- But, in case of using mobile appthemaintenance costcan beavoided and we can be able tomonitorthe parameters.

4.EMOTIONS:BEFORE/ AFTER EM

BEFORE:

- Before implementing this projectpeople feel it difficult to enjoy boatingfishingandprovisionofsafedrinking.
- They also face major problems in thedevelopment of industrial,hydroelectric and agricultural waterrequirements.

AFTER:

- After implementing this projectpeople can be able to face all theseabove-mentionedproblemseasily

- Temperature of water isalwaysmonitored.
- Amountofoxygendissolvedin the water.
- TDS are used to describe thesalinitylevelofwater.
- Monthly report ofmaintaining the water will bedisplayed.

OFFLINE:

- Public and industrialist supply funds to develop thesystem and make the system totakeanextmove.
- Thehardwaresetupshouldbeinstalledproperly.
- All the kind of hardware should be water resistant.

REQUIREMENT ANALYSIS:

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 through registered credintials register confirmation e-mails
FR-2	**User Confirmation**	Confirmation via Email Confirmation via OTP/SMS
FR-3	**Log in to the System**	Enter the OTP Check the Credentials Check the Access/Server
FR-4	**Manage the Modules**	Manage the system Admins of user Manage and Monitor Details of System UserManage the User Roles Manage the User Accessability and User PermissionManage User Details Privacy
FR-5	**Check Process Details**	Temperature DetailsPH Details Turbitidy Details dissolved oxygen level in water presence of chemical substances in water
FR-6	**Log out**	Save the existing measurements Exit

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Make Easier to Use ,More Efficiency to Use,Reduction of Errors While Using thisTechniques
NFR-2	**Security**	end by end encypted protocol in Data Authentication, Sensitive data proctected personally identifiable information(PII) other informationdetails of users and networks

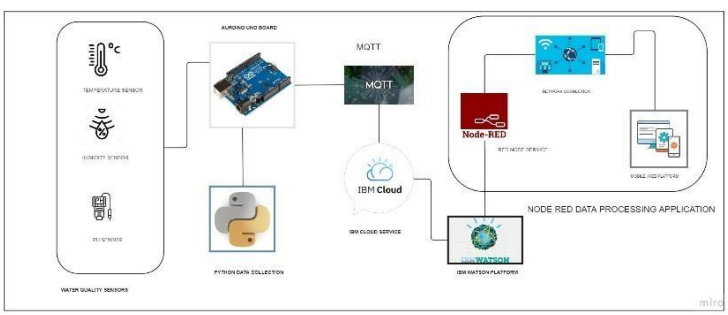
NFR-3	**Reliability**	Providees the objective evidence necessary to makedecisions on managing water quality today and in future also. This techniques make good communication betweenthe user and the networks and it also achieves a better trade-off between costs and reliability
NFR-4	**Performance**	Implementing Monitoring River Water, by using sensing sensor to monitor the river water parametersmaking more useful for various environmental Usage.
NFR-5	**Availability**	PH Monitoring,Conductivity Analysis,CDOM(Dissolved Organic Matter),Measure of Carbonate and bicarbonate levels in water,this techniques made possible by linking information in water
NFR-6	**Scalability**	Automatic Water Sampler, PH testing, Recording the water temparature,chlorophyll flurorescence analysismeasuring the dissolved oxygen levels.

5. **PROJECT DESIGN**

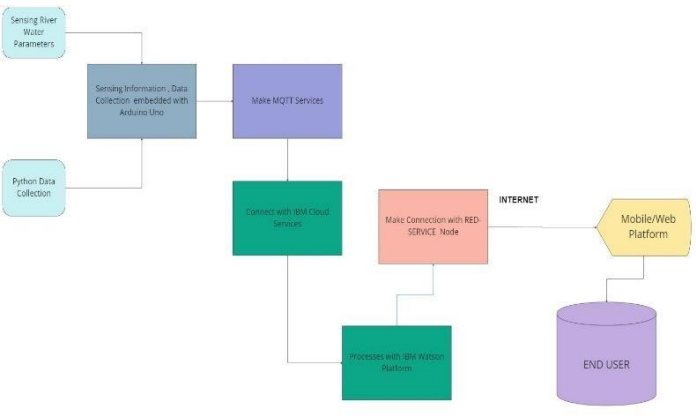
5.1. **Data Flow Diagrams**:

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.

DATA FLOW:



DATA FLOW DIAGRAM:



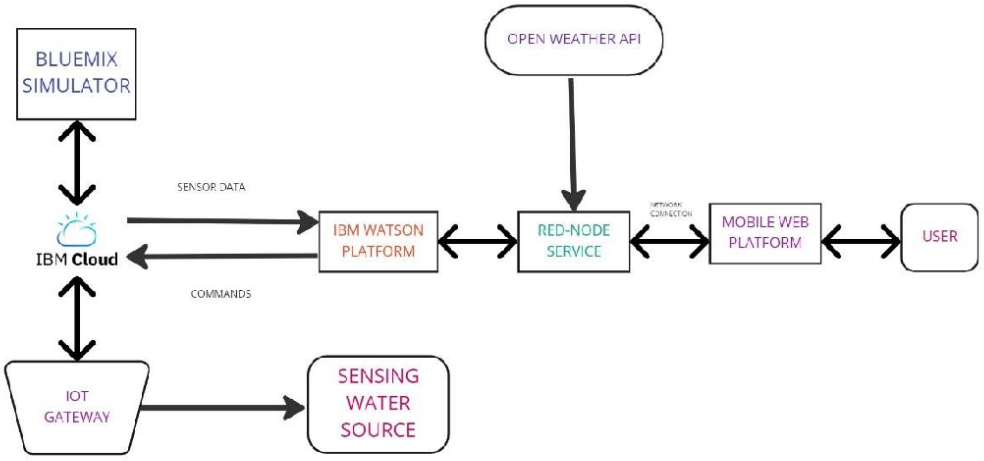
5.2. Technical Architecture:

Real-Time River Water Quality Monitoring and ControlSystem

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

Example: The IoT - enabled Water Quality Monitoring (WQM) system enables real-time monitoring of freshwater resources

TECHNOLOGY ARCHITECHTURE



INDUSTRY 2.0 TECHNICAL ARCHITECTURE

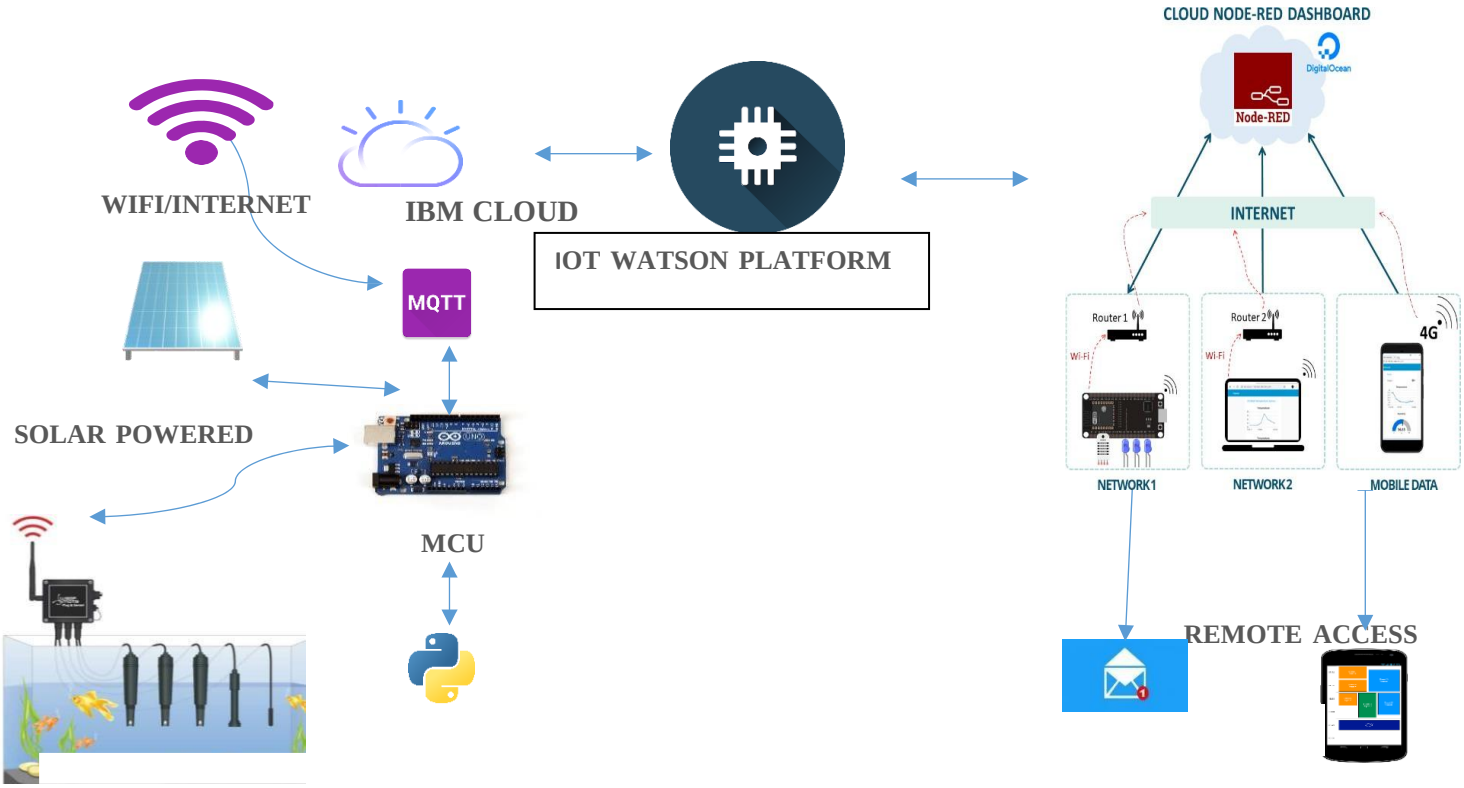


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts withapplication	HTML, CSS, Node-Red ,Cloud,etc
2.	Application Logic-1	Logic for a process in theapplication	JAVA/PYTHON
3.	Application Logic-2	Logic for a process in theapplication	IBM WATSON STT services
4.	Application Logic-3	Logic for a process in theapplication	IBM WATSON Assistant
5.	Database	Data Type, Configurations etc	MySQL, Postgres SQL
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc
7.	File Storage	File storage requirements	IBM Block Storage or Other StorageService or Local File system
8.	External API-1	Purpose of External API used inthe application	IBM Weather API, etc
9.	External API-2	Purpose of External API used inthe application	Aadhar API, etc

10.	Machine LearningModel	Purpose of External API used inthe application	Object Recognition Model, etc..
11.	Infrastructure (Server / Cloud)	Application Deployment onLocal 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 Framework s	List the open-sourceframeworks used	Technology of OpenSource framework
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	Technology used
4.	Availability	Justify the availability of application	Technology used
5.	Performance	Design consideration for the performance of the application	Technology used

5.3. User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user/remote user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
	Notification	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
	Signup through third parties	USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register and access the dashboard with Google credentials	Medium	Sprint-1
	Login	USN-5	As a user, I	I can	High	Sprint-1

			can log into the application by entering email & password	register and access the dashboard through the application cred		
	Dashboard					
Customer (Web user)		USN-6	As I am a customer I need a proper support and service	Each and every process was under firewall /security protocol	High	Each sprint
CustomerCare Executive		USN-7	24/7 service can provided by company			Sprint 3
Administrator		USB-8	Who will have the entire access of this project	All the access was with encrypted	High	Each sprint

6. PROJECT PLANNING & SCHEDULING

6.1. Sprint Planning & Estimation:

Product Backlog, Sprint Schedule, and Estimation :

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 the application byentering my email, password, and confirmingmy password.	2	High	Kannan, Jayashree.
Sprint-1		USN-2	As a user, I will receive confirmation emailonce I have registered for the application	1	High	Gnash prabhu, gayathri.
Sprint-2		USN-3	As a user, I can register for the applicationthrough Facebook	2	Low	Gnash prabhu, gayathri.
Sprint-1		USN-4	As a user, I can register for the applicationthrough Gmail	2	Medium	Gnash prabhu, gayathri.
Sprint-1	Login	USN-5	As a user, I can log into the application byentering email & password	1	High	Kannan, Jayashree.
	Dashboard					

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint -2	User interface experience	USN-6	As a user I need a proper user interface for the project which was contain the graphical representation of received data from the sensors	2	High	Kannan, Jayashree.
Sprint -2		USN-7	As a user, I can create a IBM cloud account for the data base which should able to store the data and gather the data from the sensors	1	Medium	Gnash prabhu, gayathri.
Sprint -2		USN-8	As I a user I can create node-red app for providing commands to the sensors in the IBM cloud	2	Medium	Kannan, Jayashree.
Sprint -2		USN-9	As a user, I can create IOT Watson assistant for converting the sensors data to the digital data	2	Low	Gnash prabhu, gayathri.
Sprint -2		USN-10	As a user, I can create a fast to SMS app For providing alert the user which consuming water was not have the quality of consumable	1	High	Kannan, Jayashree.
Sprint -2		USN-11	As I a user, I can make cloudant data base in the IBM cloud for storing the data from the sensors for future references	2	High	Kannan, Jayashree.
Sprint -3	App interface creation	USN-12	As I a user, I can use the MIT APP INVERTER for creating the user interface which contains interface between of IBM cloud	1	Medium	Gnash prabhu, gayathri.
Sprint -3		USN-13	As I am a user, I can create a dashboard which was containing graphical representing the sensors measurements	1	Medium	Gnash prabhu, gayathri.
Sprint -3		USN-14	As I am a user, I can save or delete the previous measurements which was contain the sensor measurements	2	High	Kannan, Jayashree.
Sprint -3		USN-15	As I am a user, I need the devices was properly insulated and the devices was must be a water resistant	2	High	Kannan, Jayashree.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint -3		USN-16	As I am a user, I can create the devices which was implemented in the project should be maintain properly with the particular interval of time	1	Low	Gnash prabhu , gayathri.
Sprint -3		USN-17	As I am a user, I need a simultaneous data collecting data from the sensors and also save the received data to the cloudant /clouddashboard	2	Low	Kannan, Jayashree .
Sprint -3		USN-18	As a user, I can manage the devices which wasimplemented in the project	1	High	Kannan, Jayashree .
Sprint -3	User development	USN-19	As a admin, I can manage all the devices andfind the drawbacks and also rectify that	1	High	Kannan, Jayashree .
Sprint -3		USN-20	As a admin, I can manage the devices which was not working not properly I should replace that device	1	Medium	Gnash prabhu , gayathri.
Sprint -3		USN-21	As a admin, I can monitor the devices whichwas sending the correct data or not	1	Low	Gnash prabhu, gayathri .
Sprint -3		USN-22	As a admin, I can make changes in the user interface which was able to understand the measurements was easily understandable by user/industry person	2	High	Kannan, Jayashree .

Sprint -4	User command centre	USN-23	As a admin, I can create the command option in the user interface and able to perform thedevices based on the commands	2	High	Kannan, Jayashree .
Sprint -4		USN-24	As a user, I can give the command to the devicewhich was already able understand the command and also perform the function which was mention in the command	2	Medium	Gnash prabhu, gayathri .
Sprint -4		USN-25	As a user, I can need user interface was alwaysbe an eco-friendly which was designed in the user interface	2	Medium	Gnash prabhu, gayathri .
Sprint -4		USN-26	As a user, I need a user interface which wascontains HTTP command format and also should contain the web page interface	1	High	Kannan, Jayashree .

Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**
Sprint -4		USN-27	As a user, I can make the measurements was also capable to know the web interface	1	Low	Gnash prabhu, gayathri.
Sprint -4		USN-28	As a user, I need a proper statement of the measurements of the data and also	1	Low	Gnash prabhu, gayathri.

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

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	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

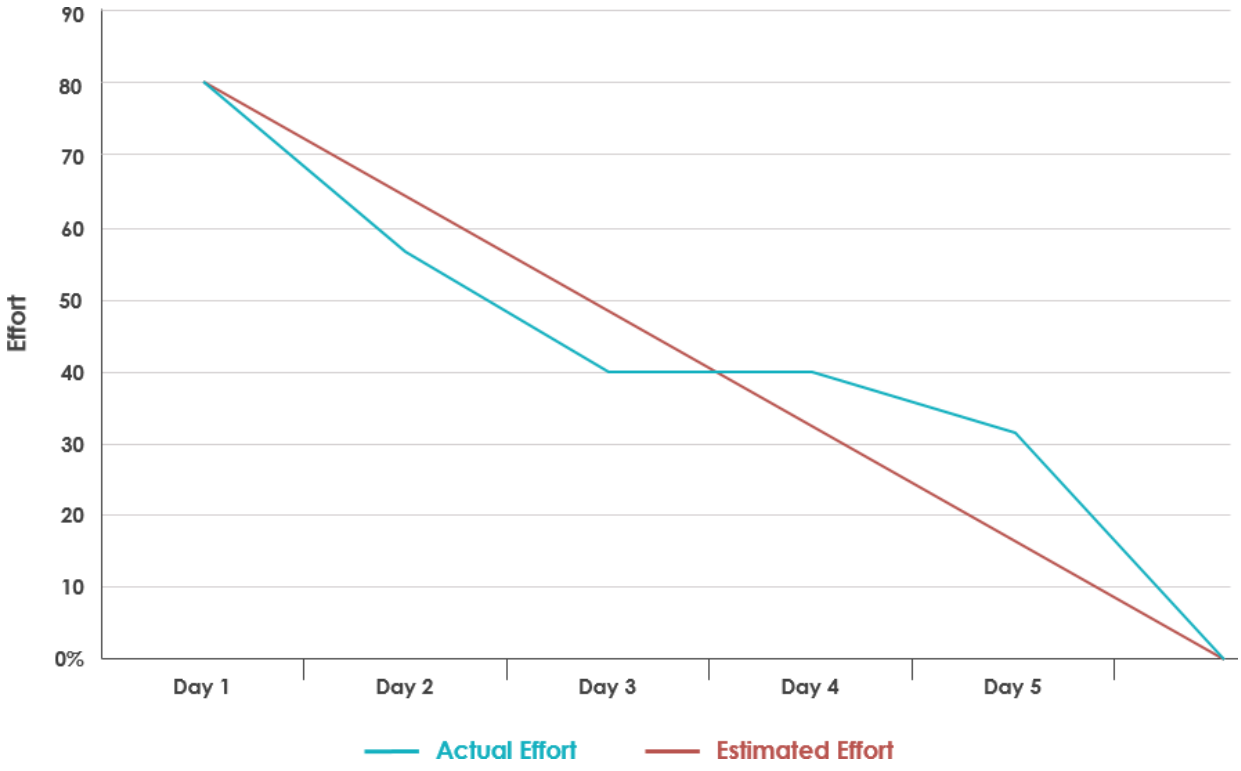
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

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

The average velocity (AV) per iteration unit =3.33

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



7. CODING & SOLUTIONING :

7.1.FEATURE:

HTML CODE FOR USER REGSTATION;

```
<html>
<head>
<title>
Registration Page
</title>
</head>
<body>
<br>
<br>
<form>
user credintials
<label> Firstname </label>
<input type="text" name="firstname" size="15"/> <br> <br>
<label> Middlename: </label>
<input type="text" name="middlename" size="15"/> <br> <br>
<label> Lastname: </label>
<input type="text" name="lastname" size="15"/> <br> <br>
</select>
project domain
<label> internet of things </label>
<br>
<br>
<br>
<label>
Gender :
</label><br>
<input type="radio" name="male"/> Male <br>
<input type="radio" name="female"/> Female <br>
<input type="radio" name="Prefer not to say"/> Prefer not to say
<br>
<br>
<br>
<label>
contact details</details> :
</label>
<input type="text" name="country code" value="+91" size="2"/>
<input type="text" name="phone" size="10"/> <br> <br>
```

Address

<textarea cols="80" rows="5" value="address">
</textarea>

Email:
<input type="email" id="email" name="email"/>

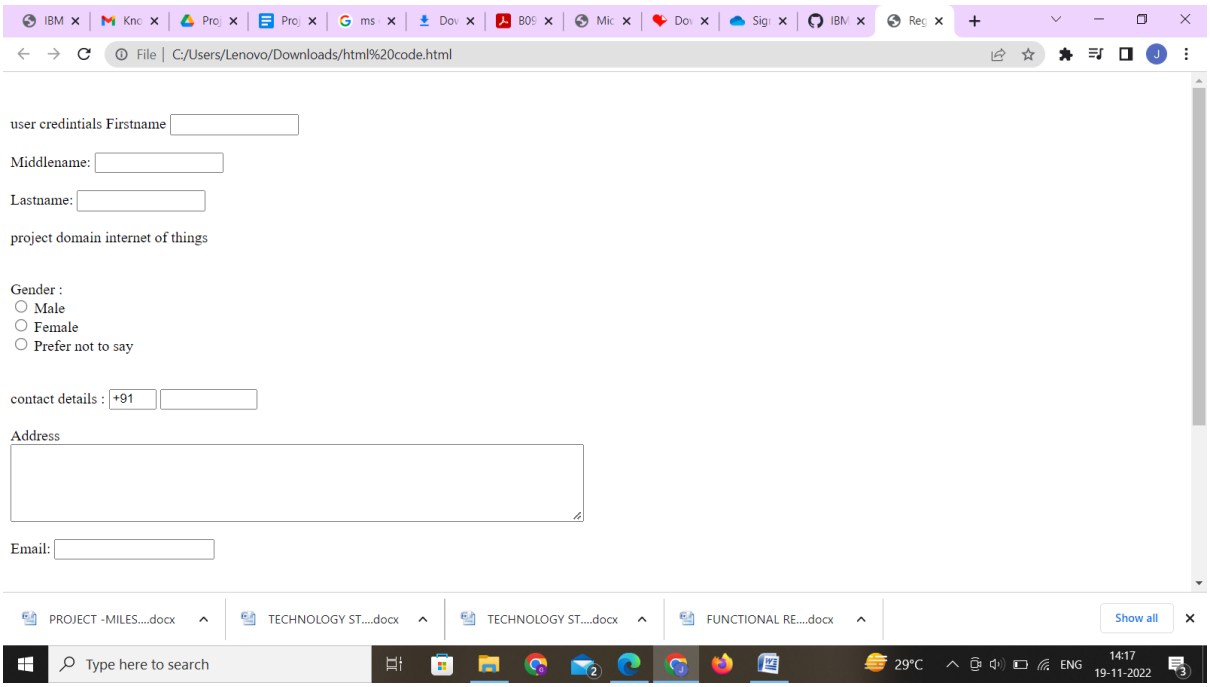
Password:
<input type="Password" id="pass" name="pass">

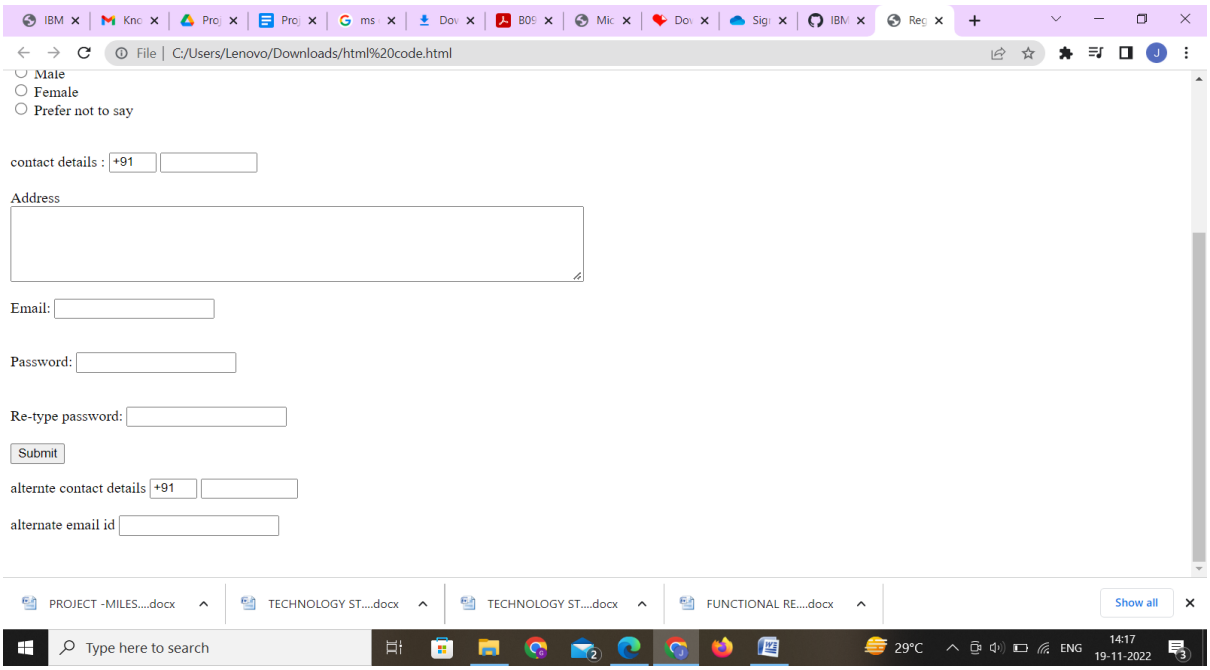
Re-type password:
<input type="Password" id="repass" name="repass">

<input type="button" value="Submit"/>
</form>
</body>
alternte contact details
<input type="text" name="country code" value="+91" size="2"/>
<input type="text" name="phone" size="10"/>

alternate email id
<input type="altrernate email id" name="alternate email"/>

<body>
<html>
OUTPUT:





USER LOGIN PAGE CREATION USING HTML CODE:

```
<!DOCTYPE
html>
        <html>
        <head>
         <h1> Real time water quality monitoring system</h1>
        <metaname="viewport" content="width=device-width, initial-scale=1">
        <style>
        body {font-family: Arial,Impact, 'Arial Narrow Bold', sans-serif, sans-serif;}
        /* Full-width input fields */
        input[type=text], input[type=password] {
          width: 150;
```

```
  padding: 23px 24px;
  margin: 8px 0;
  display: inline-block;
  border: 1px solid #ccc;
  box-sizing: border-box;
}
/* Set a style for all buttons */
button {
  background-color: #04AA6D;
  color:blue;
  padding: 15px 21px;
  margin: 8px 0;
  border: none;
  cursor: pointer;
  width: 102;
}
button:hover {
  opacity: 0.7;
}
/* Extra styles for the cancel button */
.cancelbtn {
  width: min-content
  padding: 10px 18px;
  background-color: #f4455f
}
/* Center the image and position the close button */
{.imgcontainer { }
```

```
  text-align: right: ;
  margin: 24px 0 12px 0;
  position: relative
}
img {Real time water quality monitoring and control system}: {
  width: 56;
  border-radius:50%;
}
.container {
  padding: 16px;
}
span.psw {
  float: right;
  padding-top: 16px;
}
/* The Modal (background) */
.modal {
  display: none; /* Hidden by default */
  position: fixed; /* Stay in place */
  z-index: 1; /* Sit on bottom*/
  left: 0;
  top: 0;
  width: 100%; /* full width */
  height: 100%; /* medium height */
  overflow: auto; /* Enable scroll if needed */
  background-color: ybg(0,0,0); /* Fallback color */
  background-color: rgba(0,0,0,0.4); /* Black w/ transprenant */
```

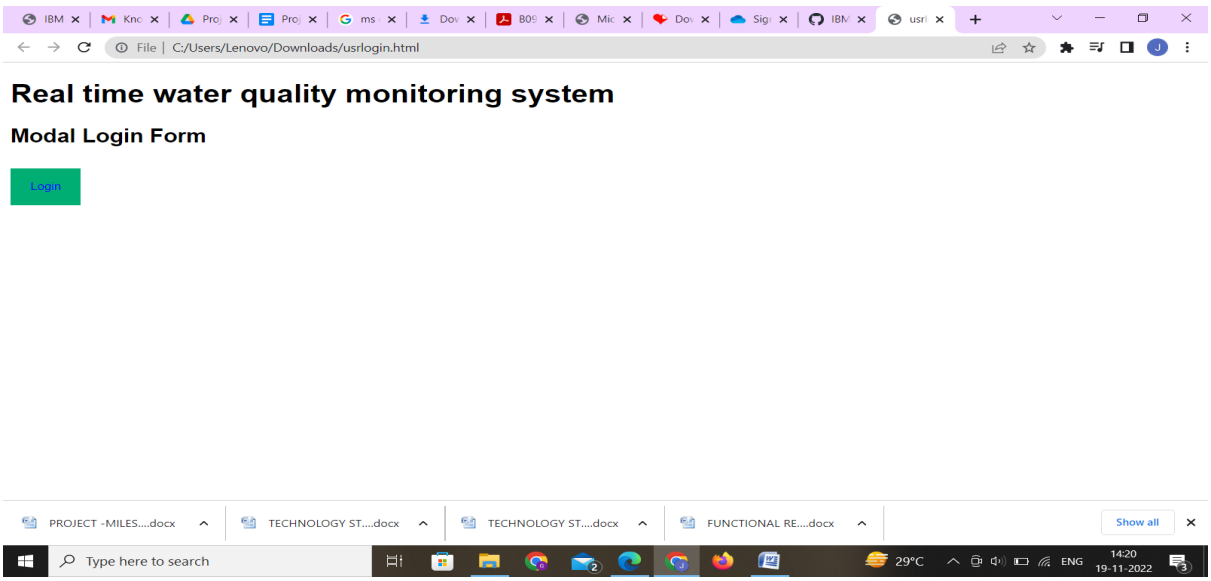
```
  padding-top: 60px;
}
/* Modal Content/Box */
.modal-content {
  background-color: #fefefe;
  margin: 5% auto 15% auto; /* 5% from the top, 15% from the bottom and centered */
  border: 1px solid #888;
  width: 65%; /* Could be more or less, depending on screen size */
}
/* The Close Button (x) */
.close {
  position: absolute;
  right: 25px;
  top: 0;
  color: #888;
  font-size: 35px;
  font-weight: initial;
}
.close:hover,
.close:focus {
  color: red;
  cursor: pointer;
}
/* Add Zoom Animation */
.animate {
  -webkit-animation: animatezoom 0.6s;
```

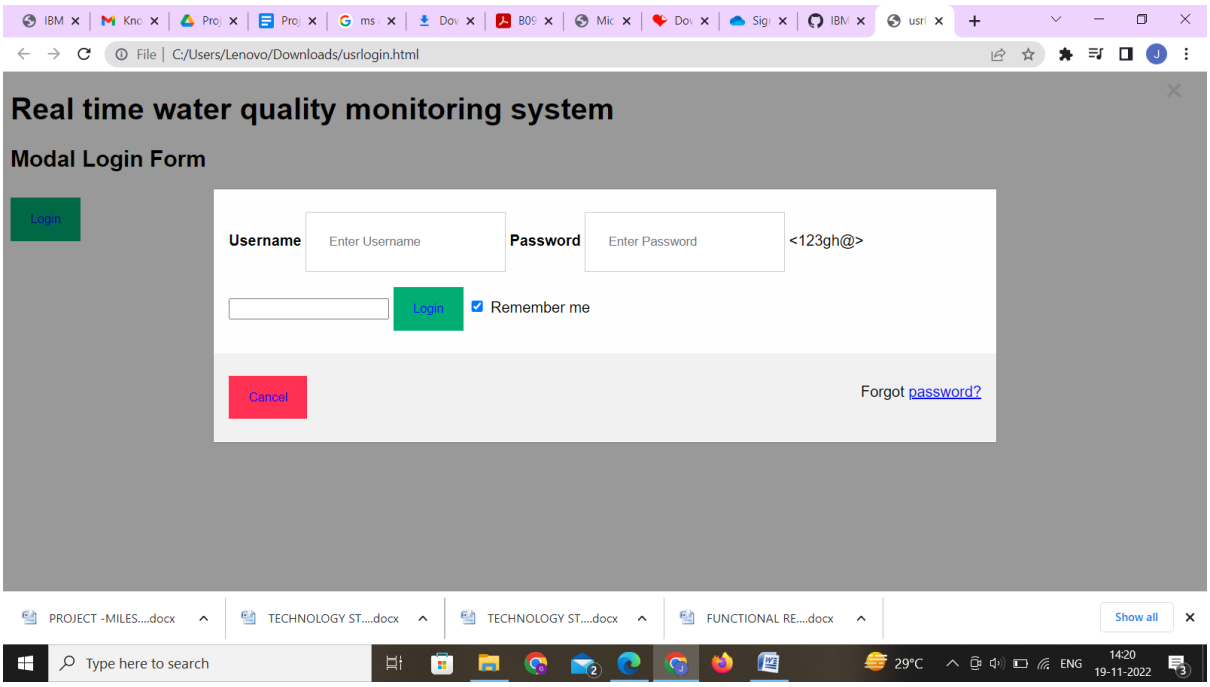
```
  animation: animatezoom 0.6s
}
@-webkit-keyframes animatezoom {
  from {-webkit-transform: scale(0)}
  to {-webkit-transform: scale(1)}
}

@keyframes animatezoom {
  from {transform: scale(2)}
  to {transform: scale(1)}
}
/* Change styles for span and cancel button on extra small screens */
@media screen and (max-width: 300px) {
  span.psw {
     display: block;
     float: none;
  }
  .cancelbtn {
     width: 100%;
  }
}
</style>
</head>
<body>
<h2>Modal Login Form</h2>
<button onclick="document.getElementById('id01').style.display='block'"
style="width:auto;">Login</button>
```

```
<div id="id01" class="modal">


  <form class="modal-content animate" action="/action_page.php" method="post">

    <div class="imgcontainer">

      <span onclick="document.getElementById('id01').style.display='none'"
class="close" title="Close Modal">&times;</span>

    </div>

    <div class="container">

      <label for="uname"><b>Username</b></label>

      <input type="text" placeholder="Enter Username" name="uname" required>


      <label for="psw"><b>Password</b></label>

      <input type="password" placeholder="Enter Password" name="psw" required>

      <label for="captch"></label><123gh@><label>

       <input type="captcha" 123@g="Enter captcha" name="captcha" requried>

      <button type="submit">Login</button>

      <label>


        <input type="checkbox" checked="checked" name="remember"> Remember
me

      </label>

    </div>


    <div class="container" style="background-color:#f1f1f1">

      <button type="button"
onclick="document.getElementById('id01').style.display='none'"
class="cancelbtn">Cancel</button>

      <span class="psw">Forgot <a href="#">password?</a></span>
```

```
    </div>
  </form>
</div>
<script>
// Get the modal
var modal = document.getElementById('id03');
// When the user clicks anywhere outside of the modal, close it
window.onclick = function(event) {
    if (event.target == modal) {
        modal.style.display = "none";
    }
}
</script>
</body>
</html>
```

OUTPUT:





FEATURE 2:

PYTHON DATA FOR RANDOM DATA PUBLISHING:

DEVELOP THE PYTHON SCRIPT:

```
# -*- coding: utf-8 -*-

"""

reated on Fri Nov 11 07:57:51 2022


@author: KANNAN

"""


import random

import time
```

```
#IBM Watson IOT Platform
#pip install wiotp-sdk
import wiotp.sdk.device

myConfig = {
    "identity": {
        "orgId": "eqfbco",
        "typeId": "REAL_TIME_WATER_QUALITY_MONITORING",
        "deviceId":"PNT2022TMID47600"
    },
    "auth": {
        "token": "T-axiVGwn*pPDJJ&bW"
}
}

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)
    PH=random.randint(0,14)
```

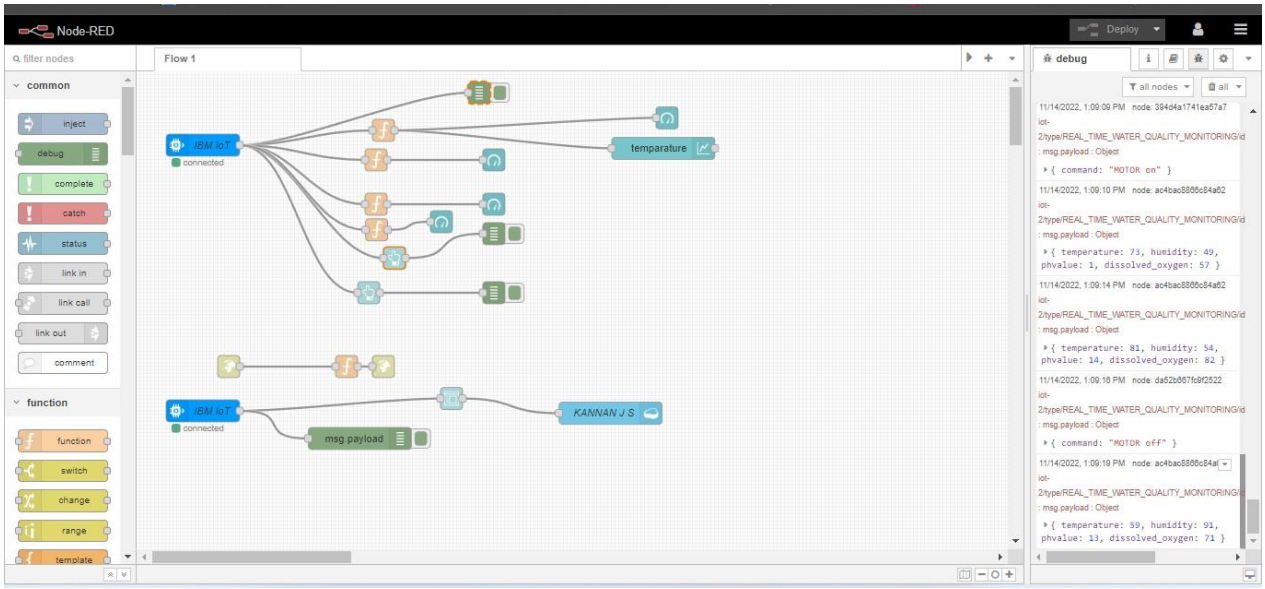
```
O2=random.randint(0,100)
myData={'temperature':temp, 'humidity':hum, 'phvalue':PH, 'dissolved_oxygen':O2}
client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
print("Published data Successfully: %s", myData)
client.commandCallback = myCommandCallback
time.sleep(5)
client.disconnect(5)
```

8.Testing

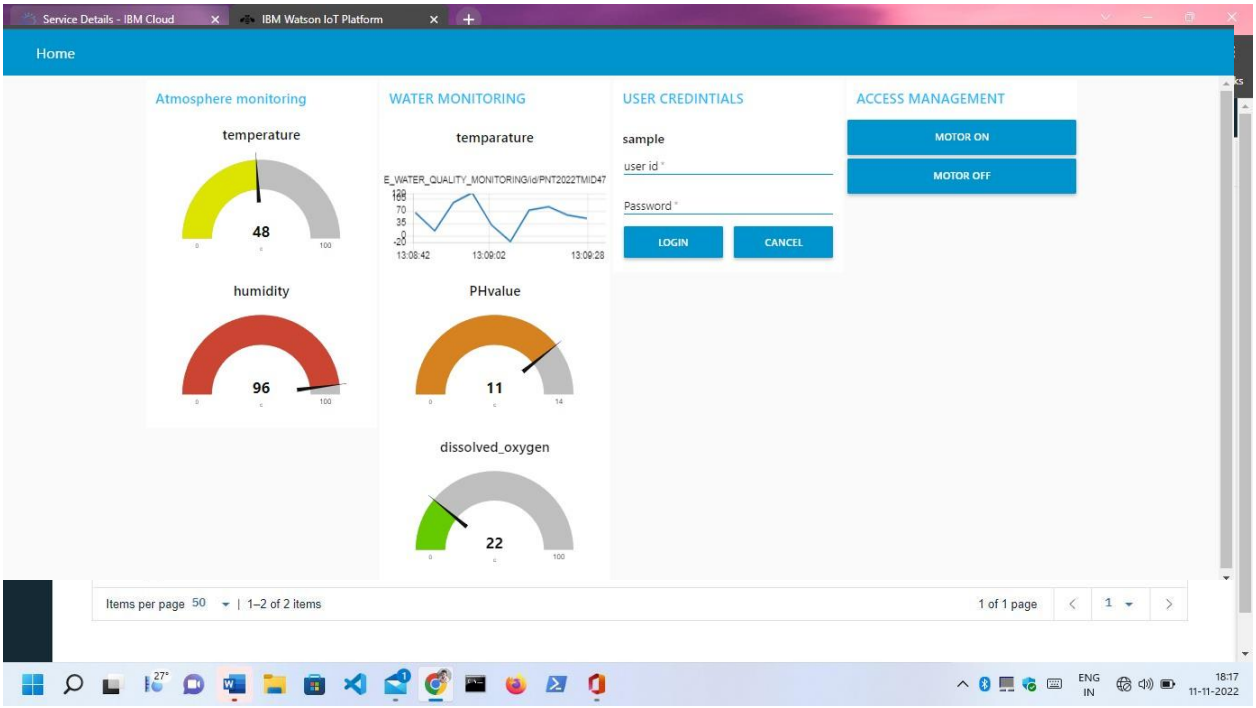
8.1.TEST CASES:

8.1 .1.NODE-RED TESTING:

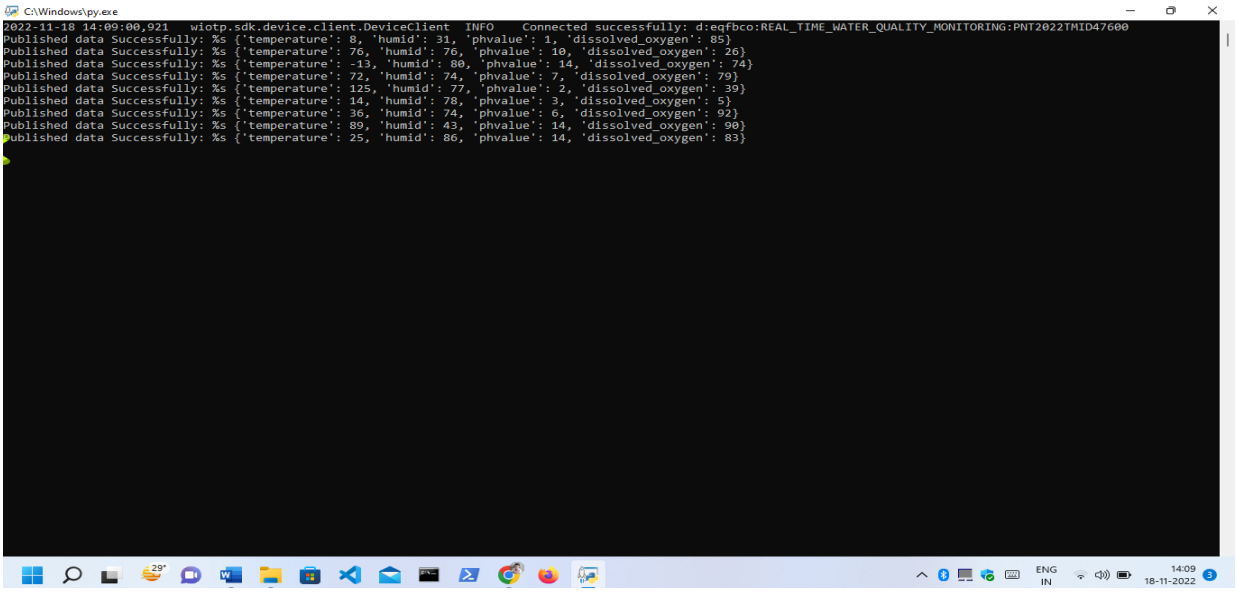
NODE-RED DASHBOARD



NODE-RED WEB UI INTERFACE

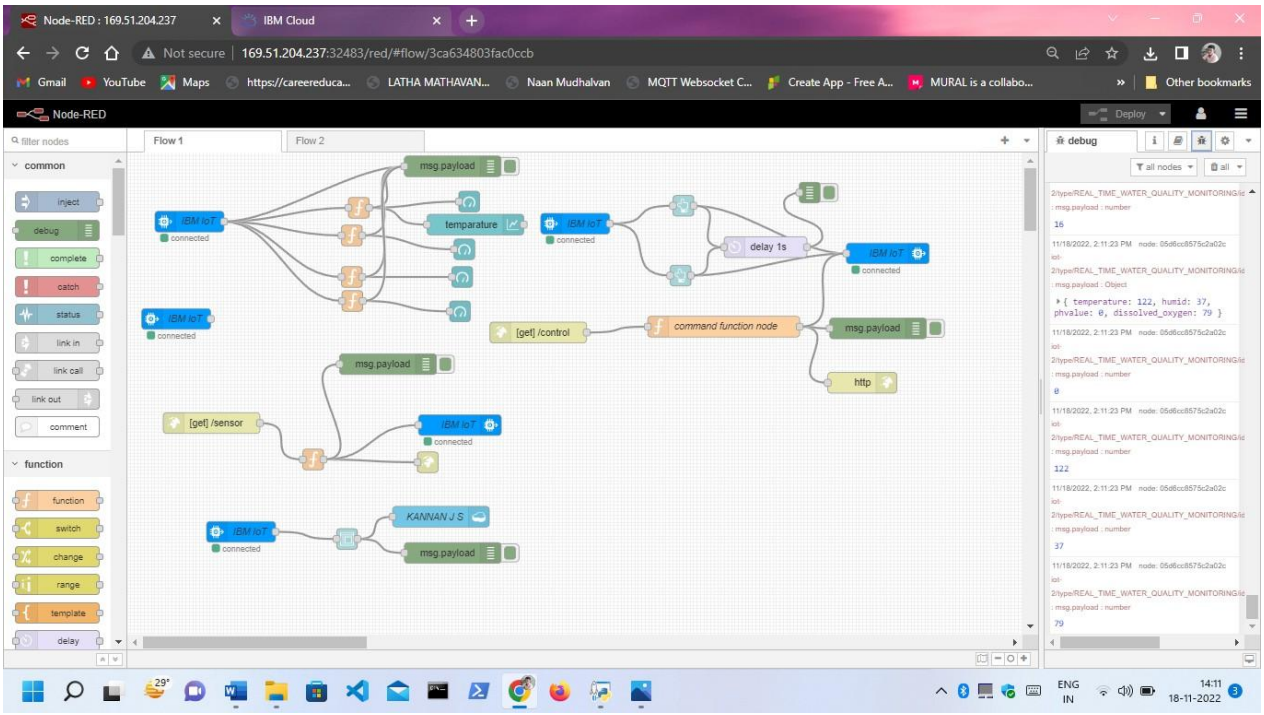


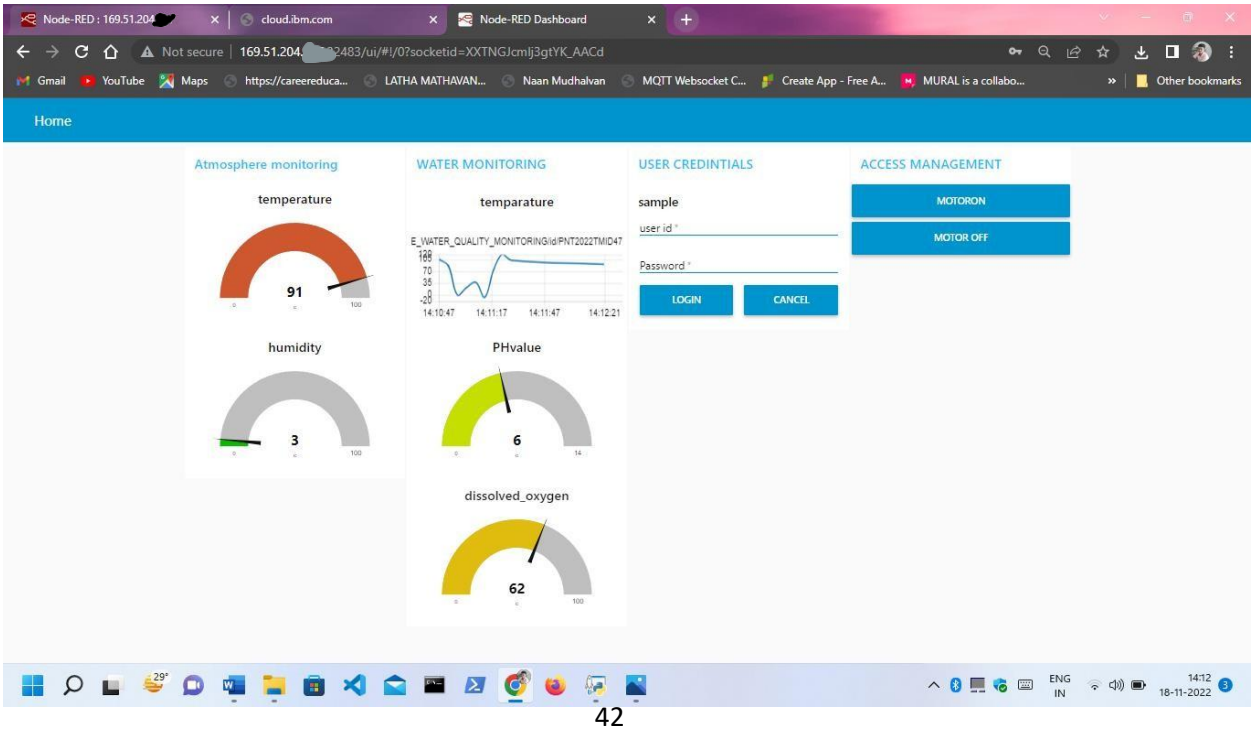
8.1.2. IBM CLOUD INTERFACE TESTING:



PUBLISHING PUTHON DATA TO THE IBM CLOUD:

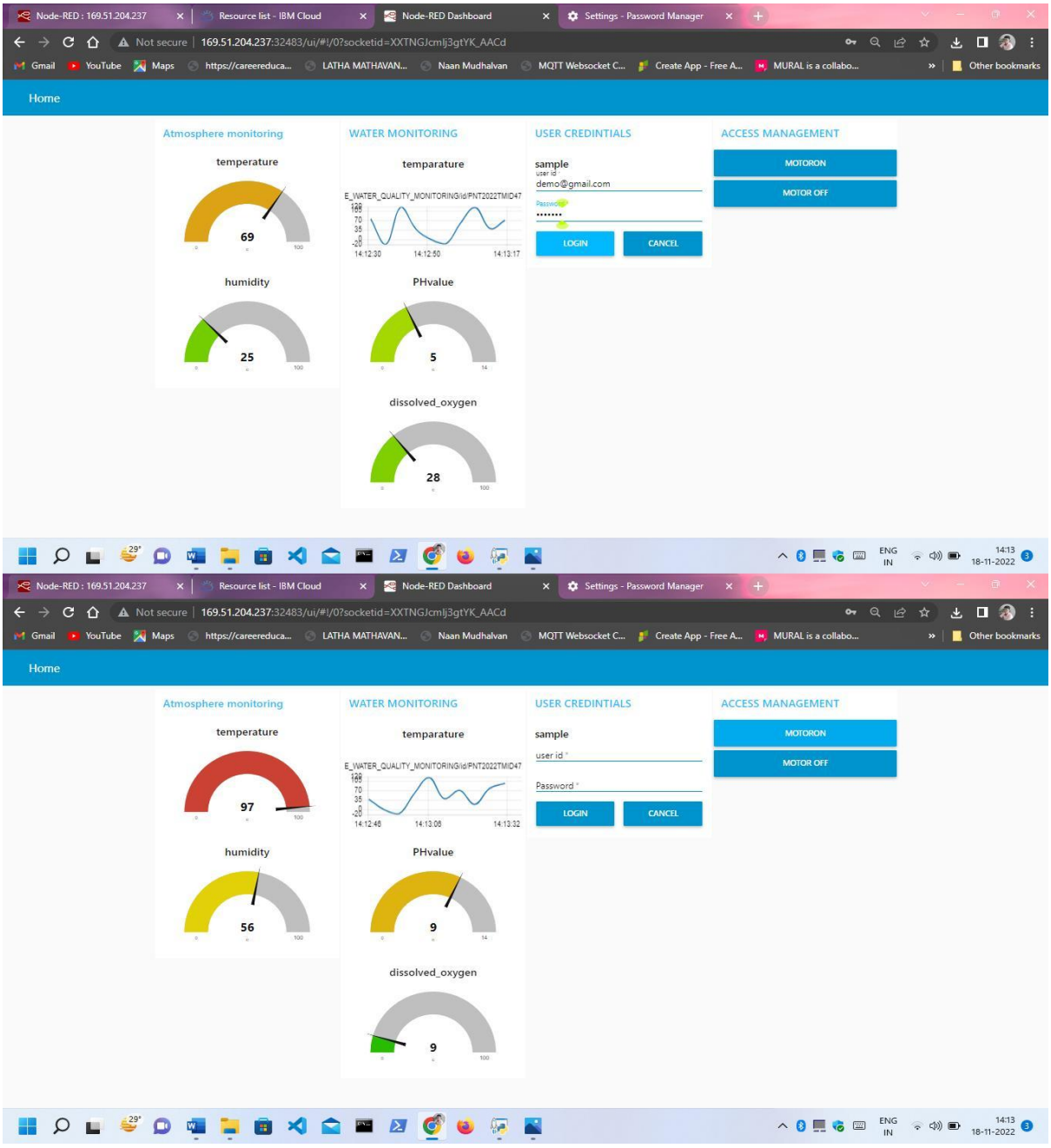
GETTING THE DATA FROM THE PYTHON THROUGH THE IBM WATSON DEVICE TO THE NODE-RED

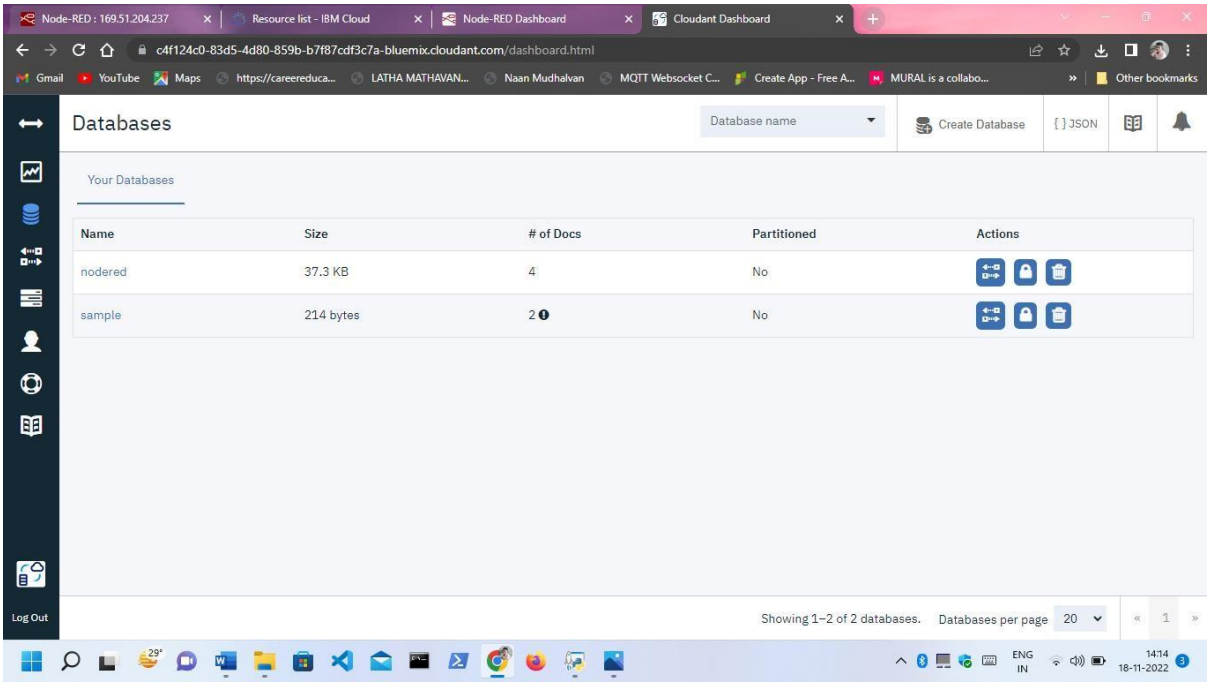


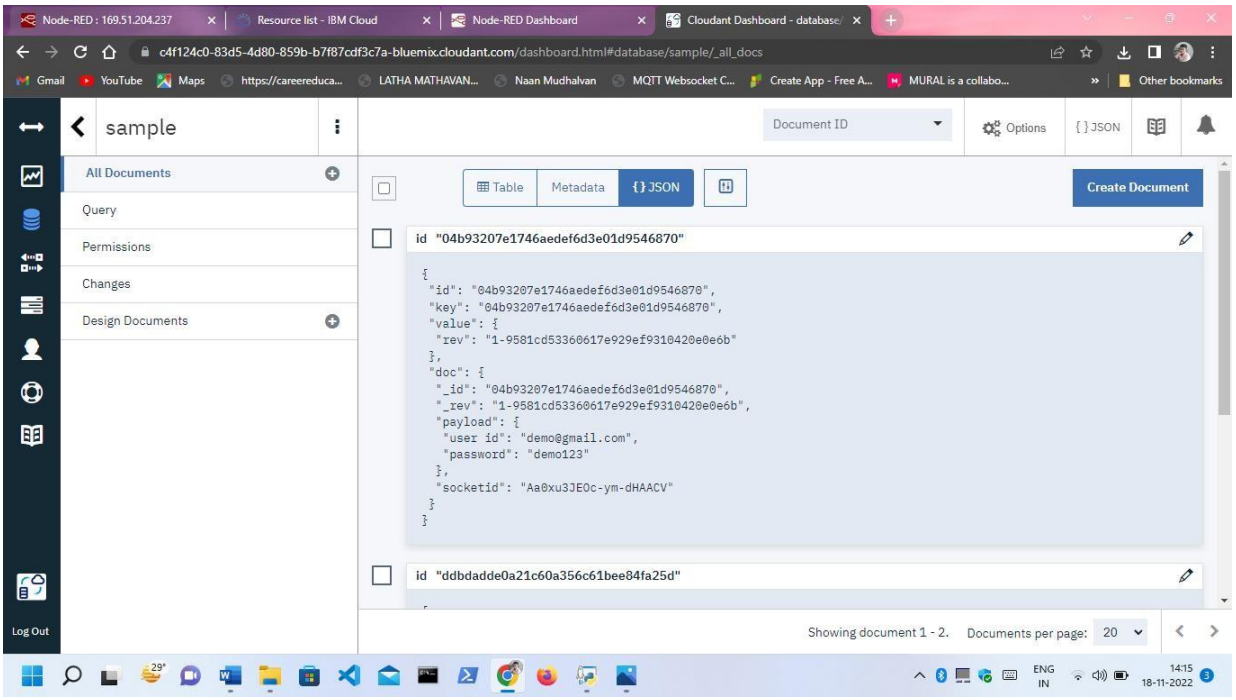


SORING THE USER DATA FROM THE WEB UI INTERFACE:

USING CLOUDANT DATABASE TO STORE THE USER INFORMATION

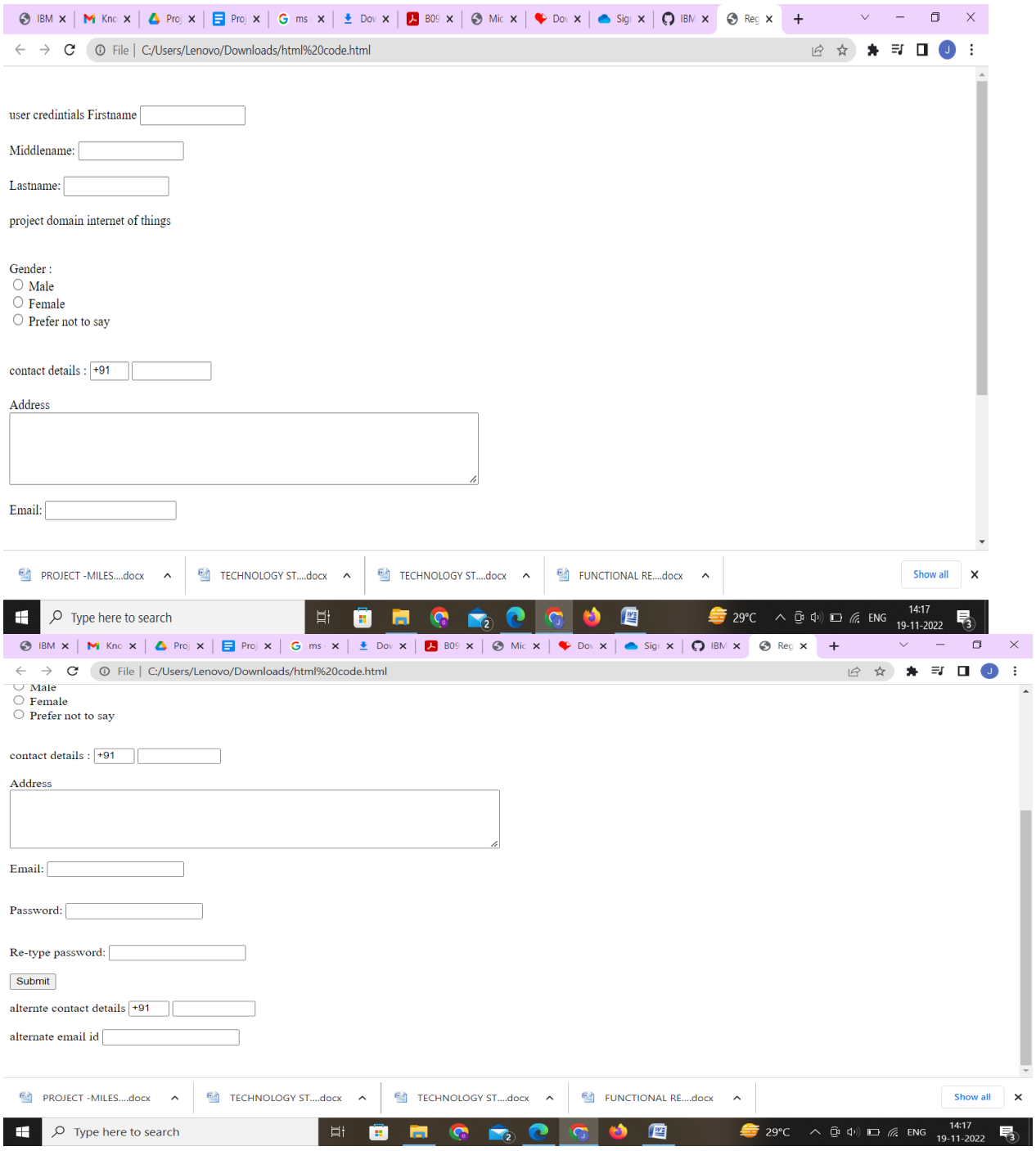



Node-RED : 169.51.204.237
Resource list - IBM Cloud
Node-RED Dashboard
Cloudant Dashboard
c4f124c0-83d5-4d80-859b-b7f87cdf3c7a-bluemix.cloudant.com/dashboard.html
Databases
Database name
Create Database
{ } JSON
Your Databases
Name
Size
# of Docs
Partitioned
Actions
nodered
37.3 KB
4
No
sample
214 bytes
2
No
Log Out
Showing 1–2 of 2 databases.
Databases per page
20

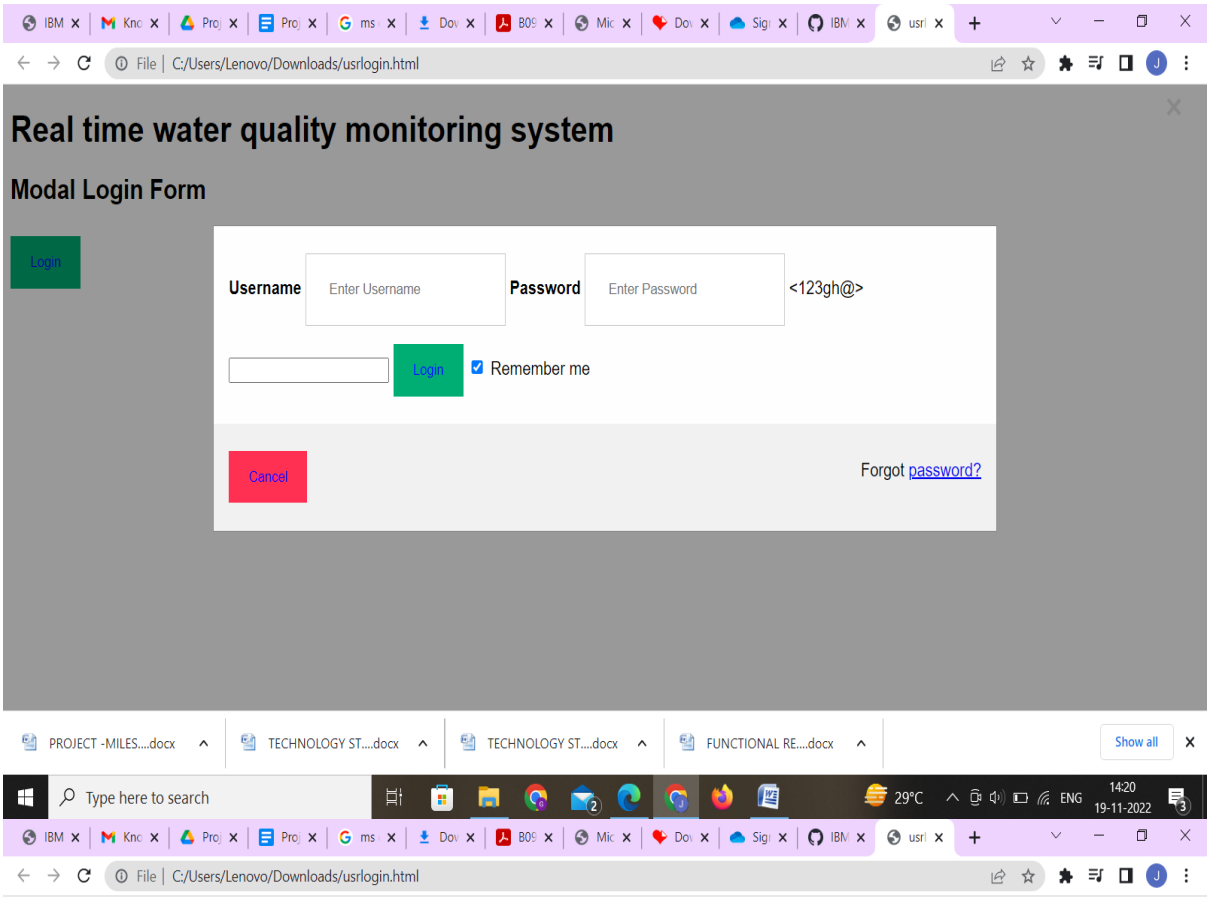

Node-RED : 169.51.204.237
Resource list - IBM Cloud
Node-RED Dashboard
Cloudant Dashboard - database/
c4f124c0-83d5-4d80-859b-b7f87cdf3c7a-bluemix.cloudant.com/dashboard.html#database/sample/_all_docs
sample
Document ID
Options
{ } JSON
All Documents
Query
Permissions
Changes
Design Documents
Table
Metadata
{ } JSON
Create Document
id "04b93207e1746aedef6d3e01d9546870"
{
"id": "04b93207e1746aedef6d3e01d9546870",
"key": "04b93207e1746aedef6d3e01d9546870",
"value": {
"rev": "1-9581cd53360617e929ef9310420e0e6b"
},
"doc": {
"_id": "04b93207e1746aedef6d3e01d9546870",
"_rev": "1-9581cd53360617e929ef9310420e0e6b",
"payload": {
"user id": "demo@gmail.com",
"password": "demo123"
},
"socketid": "Aa0xu3JEOc-ym-dHAACV"
}
}
id "ddbdadde0a21c60a356c61bee84fa25d"
Log Out
Showing document 1 - 2.
Documents per page:
20

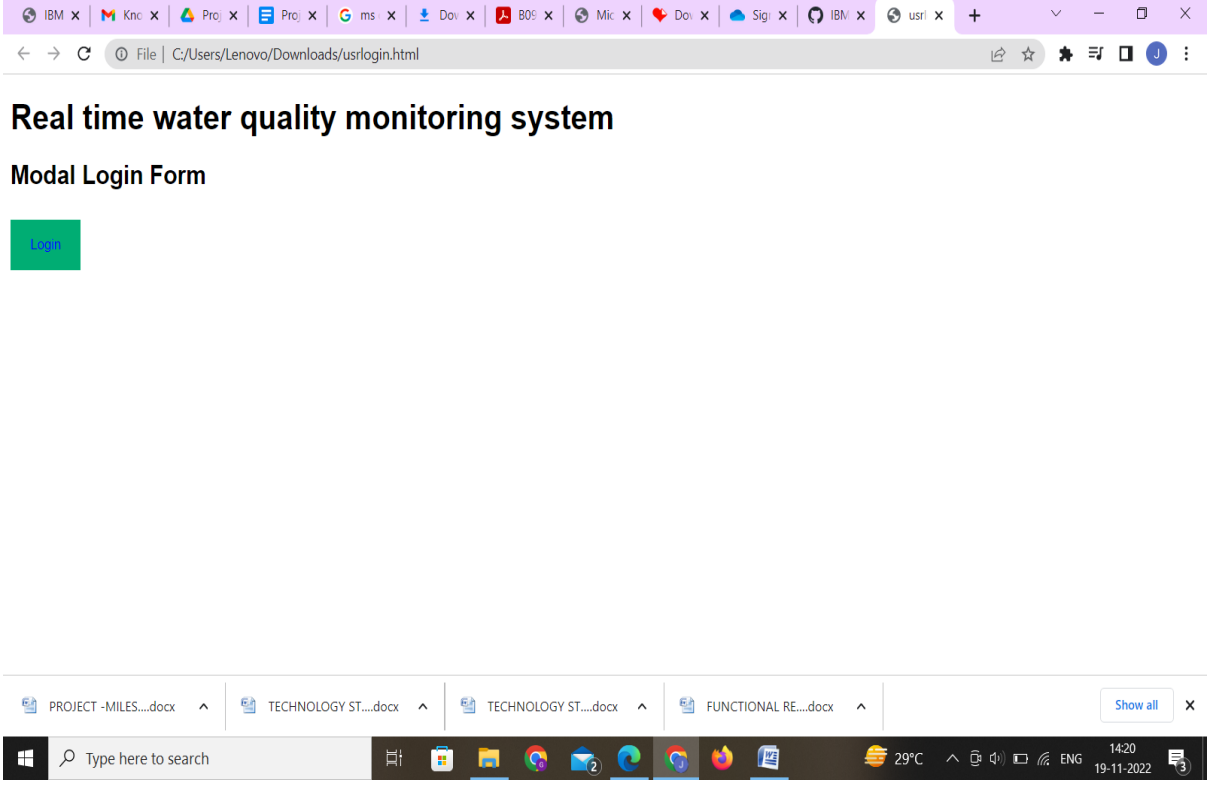
1.1.USER ACCEPTANCE TESTING:

8.2.1. USER REGISTATION FORM :



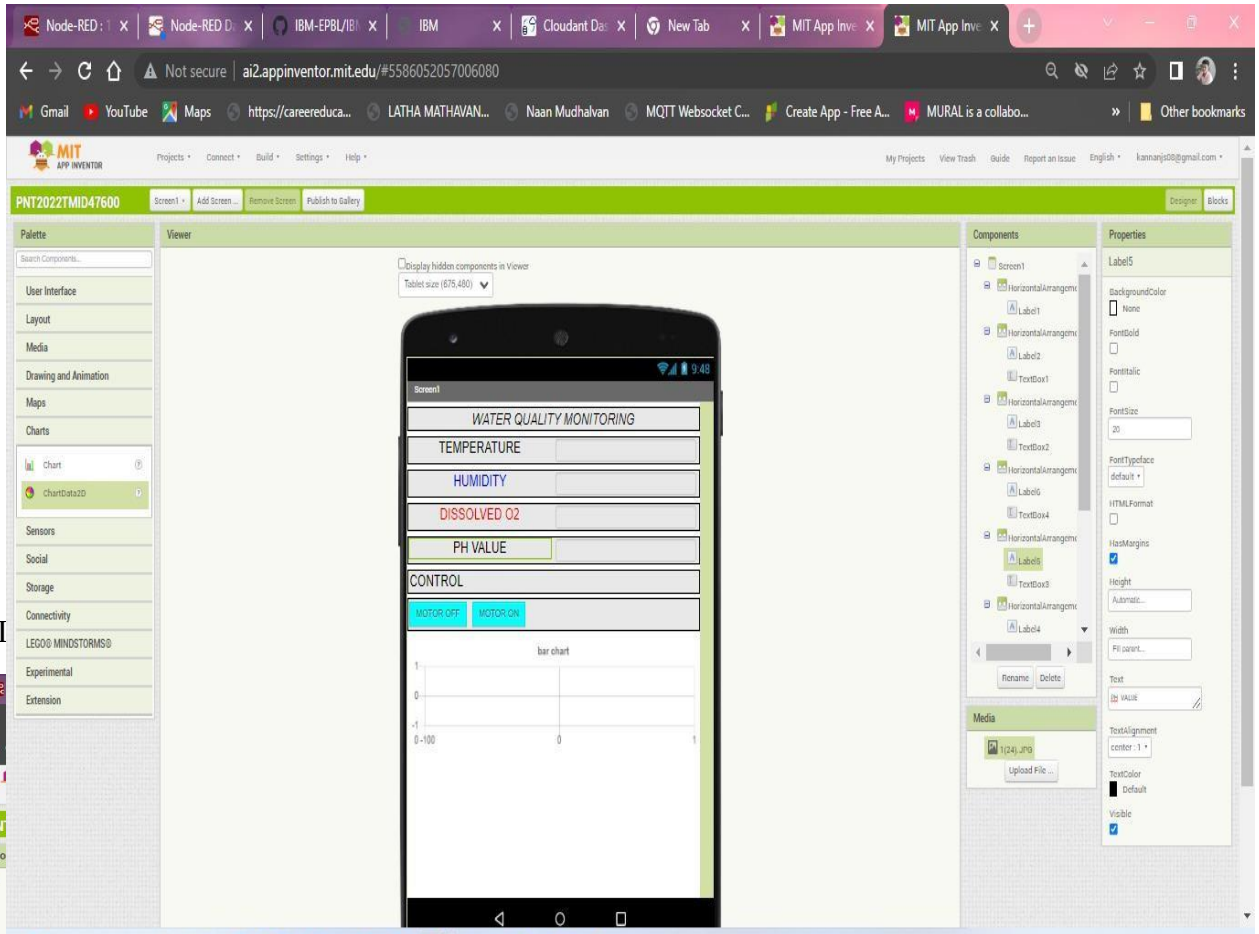
8.2.2.USER LOGIN PREVIEW


File | C:/Users/Lenovo/Downloads/usrlogin.html
Real time water quality monitoring system
Modal Login Form
Login
Username
Enter Username
Password
Enter Password
<123gh@>
Login
Remember me
Cancel
Forgot password?
PROJECT -MILES....docx
TECHNOLOGY ST....docx
TECHNOLOGY ST....docx
FUNCTIONAL RE....docx
Show all
Type here to search
29°C
ENG
14:20
19-11-2022

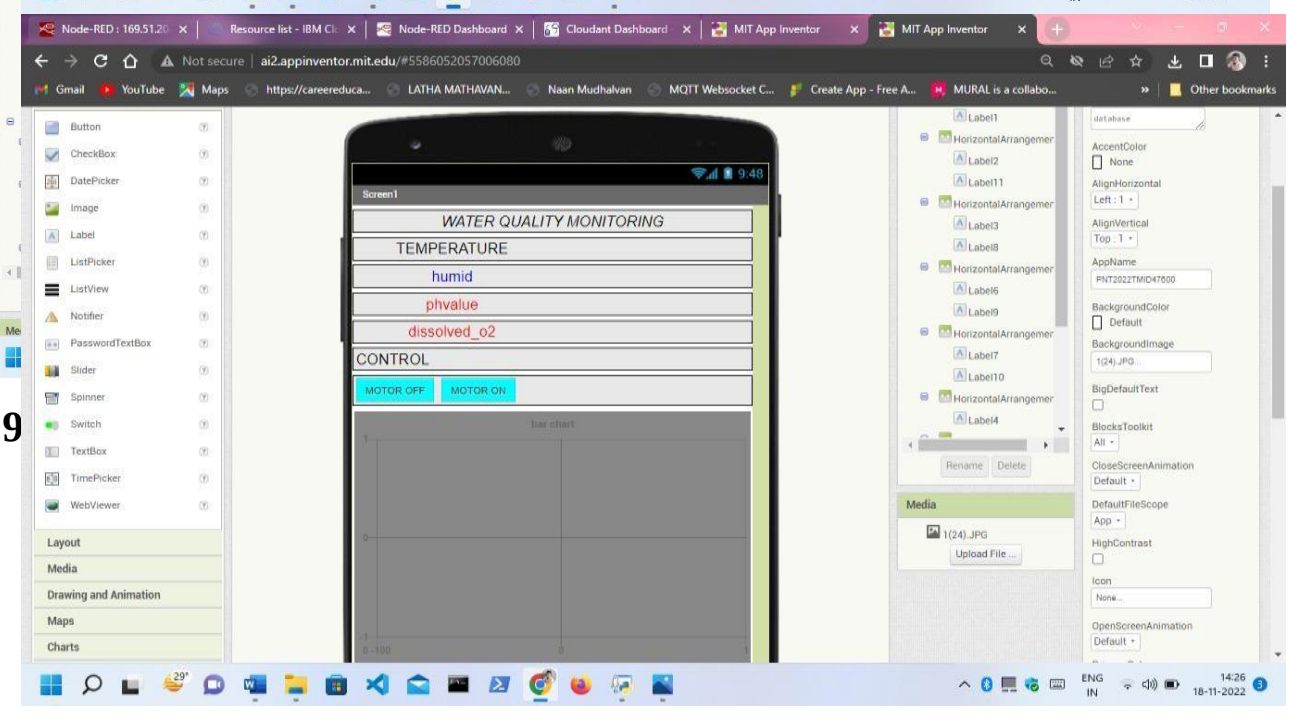

File | C:/Users/Lenovo/Downloads/usrlogin.html
Real time water quality monitoring system
Modal Login Form
Login
PROJECT -MILES....docx
TECHNOLOGY ST....docx
TECHNOLOGY ST....docx
FUNCTIONAL RE....docx
Show all
Type here to search
29°C
ENG
14:20
19-11-2022

8.2.3.BUILDING A MOBILE APP:

USING MIT APP INVENTOR:

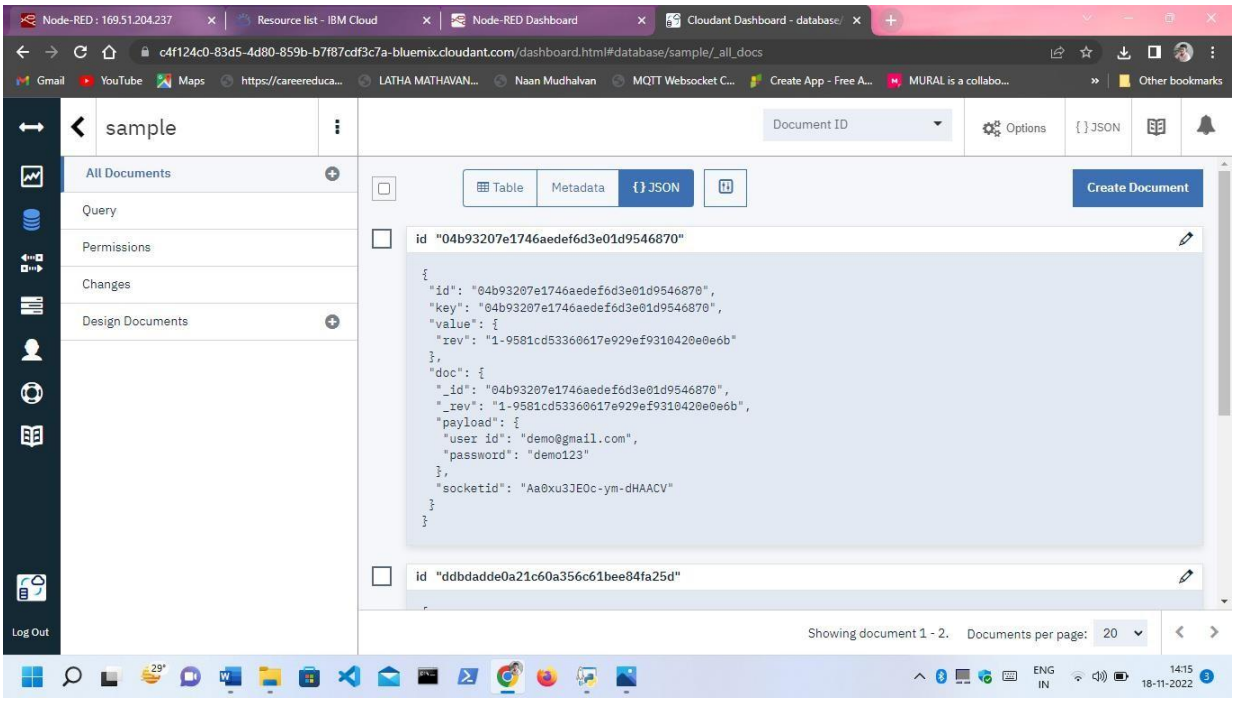


MI



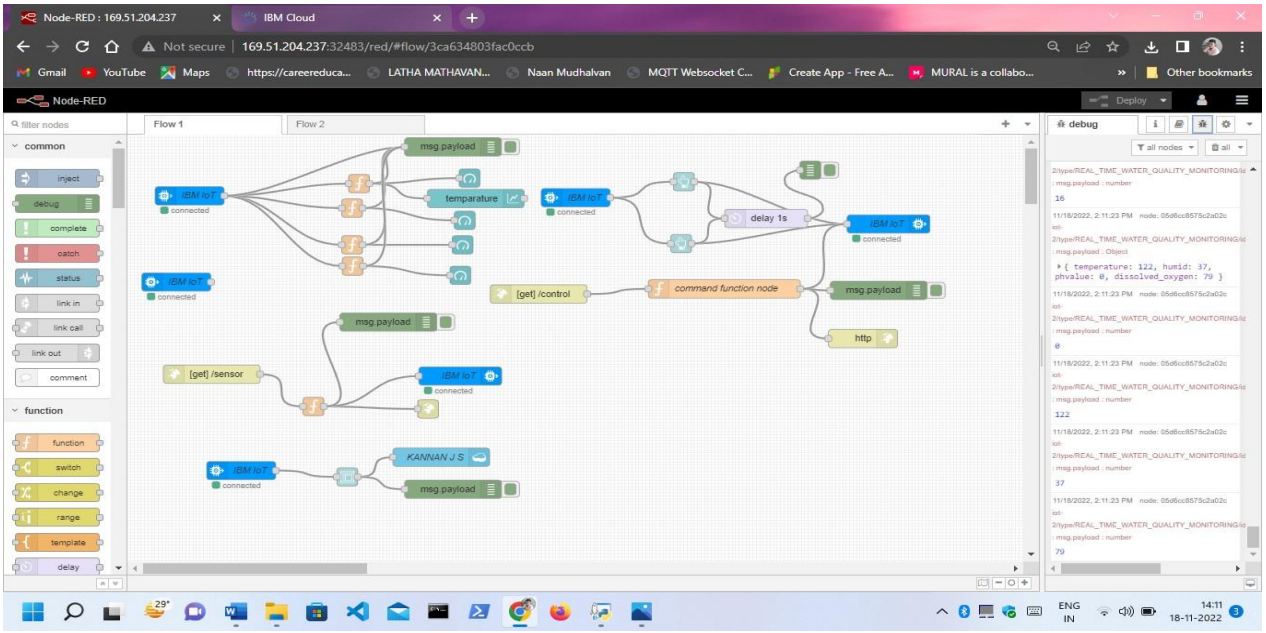
9

9.1. PERFORMANCE METRICES:
SORING DATA FROM USER TO CLOUDANT:



USING PYTHON CODE SUCCESFULLY PUBLISHED TO THE CLOUD DEVICE AND ALSO NODE-RED:

UCCESFULLY GET THE VALUES FROM THE PYTHON WITH THE INTERFACE OF IBM IOT WATSON DEVICE



10.ADVANTAGES AND TESTING:

10.1. ADVANTAGES:

- Use to measure the quality of water .
- Use to analyze which the water was capable to drink.
- Access the device through Remotely.
- Access and Understand the procedure was User Friendly.
- Easily Monitor the device.
- Everyone should able to have some basics of knowledge of water consuming.

10.2. DISADVANTAGES:

- Regular maintain of device
- Always should provide the high Speed Internet.

11. CONCLUSION:

Water turbidity, PH, and temperature are monitored using a water detection sensor that has a unique advantage and is already connected to a IBM CLOUD. The technology can automatically monitor water quality, is low-cost, and does not require personnel to be on duty. As a result, water quality testing will most likely be more cost-effective, convenient, and quick. The method is very adaptable. This system may be used to monitor different water quality metrics by simply replacing the matching sensors and modifying the required software packages. The procedure is straightforward. The system can be expanded to track hydrologic, air pollution, industrial, and agricultural output, among other things. It is widely used and has a large number of applications. Keeping embedded devices in the environment for monitoring allows the environment to protect itself. (i.e., smart environment). This will necessitate the deployment of sensor devices in the environment for data collection and processing. We can bring the environment to life by placing sensor devices in it, allowing it to communicate with other things over the network. The end user will then have access to the collected data and analysis results via Wi-Fi.

12. FUTURE SCOPE:

To develop the device this was able to access through the GPS module and also to get the vales from the sensors with high speed of internet connectivity

To get the graphical representation of the measurements in real time monitoring

And also to store the previous data from the sensor to the cloud storing device

13.APPENDIX:

13.1. SOURCE CODE:

User registration source code:

```
<html>
<head>
<title>
Registration Page
</title>
</head>
<body>
<br>
<br>
<form>
user credintials
<label> Firstname </label>
<input type="text" name="firstname" size="15"/> <br> <br>
<label> Middlename: </label>
<input type="text" name="middlename" size="15"/> <br> <br>
<label> Lastname: </label>
<input type="text" name="lastname" size="15"/> <br> <br>
</select>
project domain
<label> internet of things </label>
<br>
<br>
<br>
<label>
Gender :
</label><br>
<input type="radio" name="male"/> Male <br>
<input type="radio" name="female"/> Female <br>
<input type="radio" name="Prefer not to say"/> Prefer not to say
```

```
<br>
<br>
<br>
<label>
contact details</details> :
</label>
<input type="text" name="country code" value="+91" size="2"/>
<input type="text" name="phone" size="10"/> <br> <br>
Address
<br>
<textarea cols="80" rows="5" value="address">
</textarea>
<br> <br>
Email:
<input type="email" id="email" name="email"/> <br>
<br> <br>
Password:
<input type="Password" id="pass" name="pass"> <br>
<br> <br>
Re-type password:
<input type="Password" id="repass" name="repass"> <br> <br>
<input type="button" value="Submit"/>
</form>
</body>
alternte contact details
<input type="text" name="country code" value="+91" size="2"/>
<input type="text" name="phone" size="10"/> <br> <br>
alternate email id
<input type="altrernate email id" name="alternate email"/> <br>
<br> <br>
<body>
<html>
```

User login source code:

```
<!DOCTYPE
html>

                    <head>
                     <h1> Real time water quality monitoring system</h1>
                    <metaname="viewport" content="width=device-width, initial-scale=1">
                    <style>
                    body {font-family: Arial,Impact, 'Arial Narrow Bold', sans-serif, sans-serif;}
```

```
/* Full-width input fields */
input[type=text], input[type=password] {
  width: 150;
  padding: 23px 24px;
  margin: 8px 0;
  display: inline-block;
  border: 1px solid #ccc;
  box-sizing: border-box;
}
/* Set a style for all buttons */
button {
  background-color: #04AA6D;
  color:blue;
  padding: 15px 21px;
  margin: 8px 0;
  border: none;
  cursor: pointer;
  width: 102;
}
button:hover {
  opacity: 0.7;
}
/* Extra styles for the cancel button */
.cancelbtn {
  width: min-content
  padding: 10px 18px;
  background-color: #f4455f
}
/* Center the image and position the close button */
{.imgcontainer { }
  text-align: right: ;
  margin: 24px 0 12px 0;
  position: relative
}
img {Real time water quality monitoring and control system}: {
  width: 56;
  border-radius:50%;
}
.container {
  padding: 16px;
}
span.psw {
  float: right;
  padding-top: 16px;
```

```
}
/* The Modal (background) */
.modal {
  display: none; /* Hidden by default */
  position: fixed; /* Stay in place */
  z-index: 1; /* Sit on bottom*/
  left: 0;
  top: 0;
  width: 100%; /* full width */
  height: 100%; /* medium height */
  overflow: auto; /* Enable scroll if needed */
  background-color: ybg(0,0,0); /* Fallback color */
  background-color: rgba(0,0,0,0.4); /* Black w/ transprenant */
  padding-top: 60px;
}
/* Modal Content/Box */
.modal-content {
  background-color: #fefefe;
  margin: 5% auto 15% auto; /* 5% from the top, 15% from the bottom and
centered */
  border: 1px solid #888;
  width: 65%; /* Could be more or less, depending on screen size */
}
/* The Close Button (x) */
.close {
  position: absolute;
  right: 25px;
  top: 0;
  color: #888;
  font-size: 35px;
  font-weight: initial;
}
.close:hover,
.close:focus {
  color: red;
  cursor: pointer;
}
/* Add Zoom Animation */
.animate {
  -webkit-animation: animatezoom 0.6s;
  animation: animatezoom 0.6s
}
@-webkit-keyframes animatezoom {
  from {-webkit-transform: scale(0)}
```

```
 to {-webkit-transform: scale(1)}
}

@keyframes animatezoom {
 from {transform: scale(2)}
 to {transform: scale(1)}
}
/* Change styles for span and cancel button on extra small screens */
@media screen and (max-width: 300px) {
 span.psw {
    display: block;
    float: none;
 }
 .cancelbtn {
    width: 100%;
 }
}
</style>
</head>
<body>
<h2>Modal Login Form</h2>
<button onclick="document.getElementById('id01').style.display='block'"
style="width:auto;">Login</button>
<div id="id01" class="modal">

 <form class="modal-content animate" action="/action_page.php"
method="post">
   <div class="imgcontainer">
     <span onclick="document.getElementById('id01').style.display='none'"
class="close" title="Close Modal">&times;</span>
   </div>
   <div class="container">
     <label for="uname"><b>Username</b></label>
     <input type="text" placeholder="Enter Username" name="uname" required>

     <label for="psw"><b>Password</b></label>
     <input type="password" placeholder="Enter Password" name="psw"
required>
     <label for="captch"></label><123gh@><label>
      <input type="captcha" 123@g="Enter captcha" name="captcha" requried>
     <button type="submit">Login</button>
     <label>

      <input type="checkbox" checked="checked" name="remember">
```

```
Remember me
      </label>
    </div>

    <div class="container" style="background-color:#f1f1f1">
      <button                                                    type="button"
onclick="document.getElementById('id01').style.display='none'"
class="cancelbtn">Cancel</button>
      <span class="psw">Forgot <a href="#">password?</a></span>
    </div>
  </form>
</div>
<script>
// Get the modal
var modal = document.getElementById('id03');
// When the user clicks anywhere outside of the modal, close it
window.onclick = function(event) {
    if (event.target == modal) {
        modal.style.display = "none";
    }
}
</script>
</body>
</html>
```

Python source code:

DEVELOP THE PYTHON SCRIPT:

```
# -*- coding: utf-8 -*-

"""

reated on Fri Nov 11 07:57:51 2022



@author: KANNAN

"""



import random

import time
```

```
#IBM Watson IOT Platform
#pip install wiotp-sdk
import wiotp.sdk.device

myConfig = {
    "identity": {
        "orgId": "eqfbco",
        "typeId": "REAL_TIME_WATER_QUALITY_MONITORING",
        "deviceId":"PNT2022TMID47600"
    },
    "auth": {
        "token": "T-axiVGwn*pPDJJ&bW"
}
}

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)
    PH=random.randint(0,1
    4)
    O2=random.randint(0,1
    00)
    myData={'temperature':temp, 'humidity':hum, 'phvalue':PH, 'dissolved_oxygen':O2}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0,
    onPublish=None)print("Published data Successfully: %s", myData)
    client.commandCallback =
    myCommandCallbacktime.sleep(5)
client.disconnect(5)
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-54604-1662357024/tree/main

PROJECT DEMO:

https://youtu.be/SpBPjXhHsiI