REAL-TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM

IBM PROJECT REPORT

Submitted by

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TABLE OF CONTENTS

1.INTRODUCTION

1.1 Project Overview

"River Water quality monitoring System" Water is one of the major compounds that profoundly influence ecosystem. But nowadays it is been exploited heavily due to rapid industrialization, human waste andrandom use of pesticides and chemical fertilizers in agriculture, whichleads to water contamination. Thus, a water monitoring system is necessary to observe the water quality in a large area such as lake, river, and aquaculture. As per the current world situation, Internet of Things (IoT) and remote sensing techniques are used in heterogeneousareas of research for supervising, congregate and analyzing data from the remote locations. In this paper, the suggested system is a minimal price real time water quality monitoring system in IoT environment.

This system comprise of numerous sensors for assessing the physicaland chemical parameter. The factors of water that can be assessed using these sensors are pH, turbidity, conductivity, dissolved oxygen.Using this system the real time quality of water bodies can be determined and the data uploaded over the Internet are analyzed. Current water quality monitoring system is a manual system with a monotonous process and is very time-consuming. This paper proposes a sensor-based water quality monitoring system. The system consists of several sensors which is used to measure physical and chemical parameters of the water. The main components of Wireless Sensor Network (WSN) include a microcontroller for processing the system, communication system for inter and intra node communication and several sensors.

1.2 Purpose

Water quality refers to chemical, physical biological and radio logical characteristics of water. It is a measure of the condition of water relative to the necessities of one or more bio-tic species and or to any human need or purposes .Water quality monitoring is defined as a sampling and analysis of the water in lake, stream, ocean and river and conditions of the water body. Smart water quality monitoring is a process of real-time monitoring and the analysis of water to identify changes in parameters based on the physical, chemical and biological characteristics.Monitoring water quality is clearly important: in our seas, our rivers, on the surface and in our ports, for both companies and the public. It enables us to assess how they are changing, analyze trends and to inform plans and strategies that improve water quality and ensures that water meets its designated use.There are several indicators determining water quality. These include dissolved oxygen, turbidity, bio indicators, nitrates, pH scale and water temperature.Monitoring water quality helps to identify specific pollutants, a certain chemical, and the source of the pollution.There are many sources of water pollution: wastewater from sewage seeping into the water supply; agricultural practices (e.g., the use of pesticides and fertilizer); oil pollution, river and marine dumping, port, shipping and industrial activity. Monitoring water quality and a water quality assessment regularly provides a source of data identify immediate issues – and their source.

* Identifying trends, short and long-term, in water quality.

* Data collected over a period of time will show trends, for example identifying increasing concentrations of nitrogen pollution in a river or an inland waterway. The total data will then help to identify key water quality parameters.

* Environmental planning methods: water pollution prevention and management. Collecting, interpreting and using data is essential for the development of a sound and effective water quality strategy. The absence of real-time data will however hamper the development of strategies and limit the impact on pollution control. Using digital systems and programs for data collection and management is a solution to this challenge.

* Monitoring water quality is a global issue and concern: on land and at sea. Within the European Union, the European Green Deal sets out goals for restoring biological biodiversity and reducing water pollution, as well as publishing various directives to ensure standards of water quality. Individual nation states, for example France, have also clear regulatory frameworks requiring the effective monitoring of water quality. In the United States, the Environmental Protection Agency (EPA) enforces regulations to address water pollution in each state.

* Across the world, countries increasingly understand the importance of effective water quality monitoring parameters and methods.

2.LITERATURE SURVEY

2.1 Existing System

Due to population growth, urbanization ,and climatic change ,competition for water resources is expected to increase, with a particular impact on agriculture, river water. Water will be suitableness to potable water monitoring compound spillage identification done rivers,remote estimation for swimming pools. It holds self-sufficient hubs that unite with the cloud to ongoing water control .The River water needed to be treated before it is used in agriculture feilds,hence the parameters affecting the quality of river-water need to be analysed and to be used for water treatement purpose.

2.2 References

1. Smart water quality Monitoing System [Author: Mr. Kumar K]
2. IOT Based Real time River Water Quality Monitoring System [Author: Elsevier B.V]
3. Real Time Water Quality Monitoring and Management [Author: Deepika gupta]
4. Intelligent System for Monitoring and Detecting Water Quality [Author: Jamal Mabrouki]
5. The Monitoring of Water Quality in IOT Environment [Author: Anuadha T]

2.3 Problem Statement Definition

The reduce the river water pollution and to monitor the parameters of river water and control measures can impact vegetation, health. The Real time analysis of Indicators of River water (Ph, salinity, nutrients, etc..,)

Problem Statement(PS)	I am (Customer)	I'm tryingto	But	Because	Which makes me feel
PS-1	I'm an villager who suffers from impure water issues.	I'm trying to take an initiative of consuming pure river water that prevent major and minor health issues in people.	But i can't achive due to that i can't find proper method than manual practices or can't find an apt product.	Because of poisonous state of water we are unable to use it efficiently because it creates major and minor health issues to villagers.	It makes me frustrated and makes me answerable for the health and Risk factors that the villagers take.
PS-2	I'm an farmer.	I'm developing food and Forage crops.	But often get disappointed due to chemical imbalance in the water Supply from river.	Since use Of fertizliers Itself produce necessary growth in crops the untreated river water Creates decay of crops which goes to waste.	It makes me to feel the clueless about my Farming techniques and survival.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users.Creatingan effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.
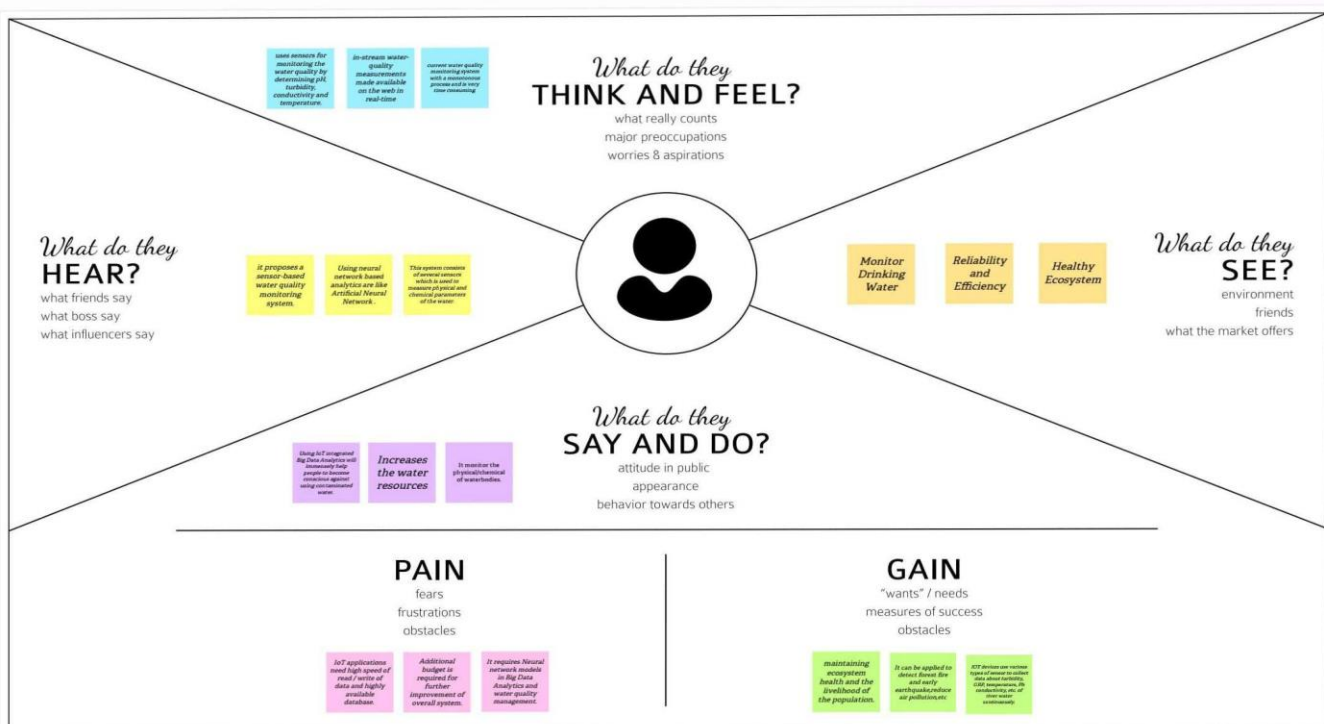
3.2 Ideation & Brainstorming

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volumeover value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.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.

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Water pollution is one of the biggest 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.
2.	Idea / Solution description	*By developing the REAL-TIME RIVER WATERQUALITY MONITORING AND CONTROL SYSTEM, the system sense and sends the random value of water bodies such as pH, turbidity and temperature to the IoT platform. And also the sensor values are viewed in the web application. *Notifies the admin if the random values cross the threshold values.
3.	Novelty / Uniqueness	*Error free data access management. *Statistical Process Control(SPC) facility, tomakethe application user friendly.
4.	Social Impact / Customer Satisfaction	It is estimated that around 70% of surface water in India is unfit for consumption. By this system, the method of monitoring and controlling decreases this percentage level and helps the people to drink healthy water.
5.	Business Model (Revenue Model)	*Cost effective equipped system. *The system budgets around the level, which makes the people to afford. *Application installation is also free of cost and flexible to user.
6.	Scalability of the Solution	The proposed system has less complexity and high performance by collecting and managing the data with the help of IoT and cloud services.

3.4 Problem Solution fit

1. CUSTOMER SEGMENT(S) `CS`	6. CUSTOMER LIMITATIONS `CL`	5. AVAILABLE SOLUTIONS `AS`
Common people and industrialist are our customers because, nowadays every common people need to know the quality of the water theydrink	An exhaustive systematic search was performed on all the indexing databases. The papers were classified based on methodologies. A taxonomy was derived by performing a deep scan on the classified papers. The contributions listed in this survey are exhaustive and lists all the state-of-the-art development in this area.	Accurate measuring of water quality using various sensors, make it available in all remote places
2. PROBLEMS / PAINS `PR`	**9. PROBLEM ROOT / CAUSE** `RC`	**7. BEHAVIOR** `BE`
This article is the first of a series of three related to the challenges that we faced to detect phishing attacks at scale with constraints on accuracy and performance. In this article, we will describe how—starting mainly from the email stream—we identify suspicious links and then fetch the content from the associated webpages.In the next article, we will describe how suspicious webpages are analyzed and assessed in real-time,with a focus on Supervised Learning techniques.	The water may be contaminated by means of nutrient pollution (Industry), Eutrophication, Algal blooms and so on.	Directly related: find better network availability, calculate the quality and quantity of water. Indirectly related: customers spend free time on making awareness of the system to others
3. TRIGGERS TO ACT `TR` I have found the following four psychological triggers that ecommerce platforms should adopt to increasecustomer urgency and drive sales:Utilize the personal touch,Encourage loyaltyIncentivize customers.	**10. YOUR SOLUTION** `SL` • We provide a good source to the public and we work based on public review. • The PH level of water isidentified. • Turbidity of water is identified.Conductivity of water is identified and also monitor the presence of chemical substances in water • Monthly report of maintaining the water will bedisplayed.	**8. CHANNELS of BEHAVIOR** `CH` ONLINE • People and industrialist may provide review and rating for the system. • The software used shouldbe properly studied by everyone to operate it. OFFLINE • Public and industrialist supply funds to develop thesystem and make the system to take a next move. • The hardware setup should be installed properly.
4. EMOTIONS `EM` The output is predicted accurately regarding the contamination of water, so as to avoid consumption of contaminated water by the people		

Sidebar labels: Define CS, fit into CL · Focus on PR, tap into BE, understand RC · Identify strong TR & EM · Explore AS, differentiate · Focus on PR, tap into BE, understand RC · Extract online & offline CH of BE

4. REQUIREMENT ANALYSIS

4.1 Functional Requirements

Functional requirements which are needed in this project are listed down and the description for all the needed software is given.

| FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Email Registration through product mobile UI
FR-2	User Confirmation	Confirmation via Email,Confirmation via OTP Confirmation via Message
FR-3	Ph level detection	To monitor the water quality Ph sensor is used andthe signals are send to Ardino.
FR-4	Turbidity detection	Turbidity sensor measures the clarity of element or muddiness utter in the water and the signals are sendto Arduino.
FR-5	Ultrasonic generator	At regular interval times the waves are generatedto clear algae 25%,50%,75%,100%

4.2 Non-Functional Requirements

Non-functional requirements deals with all non-functional and hardware components which are involved in this project and their description is listed.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It has simple monitoring system and efficient to use.
NFR-2	**Security**	Mobile application is secured with firewall protection.
NFR-3	**Reliability**	Real time sensor output values with future predicted data storage. 98% efficient monitoring output. It also gives assurance for aquaculture safety.
NFR-4	**Performance**	It has greater performance and environmentally safe model.
NFR-5	**Availability**	In the form of mobile UI 24 x 7 monitoring system.
NFR-6	**Scalability**	Highly Scalable. It is capable to produce a best final output.
NFR-7	**Stability**	The stability is very high
NFR-8	**Efficiency**	It is highly efficient, high mobility and low powered.

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.
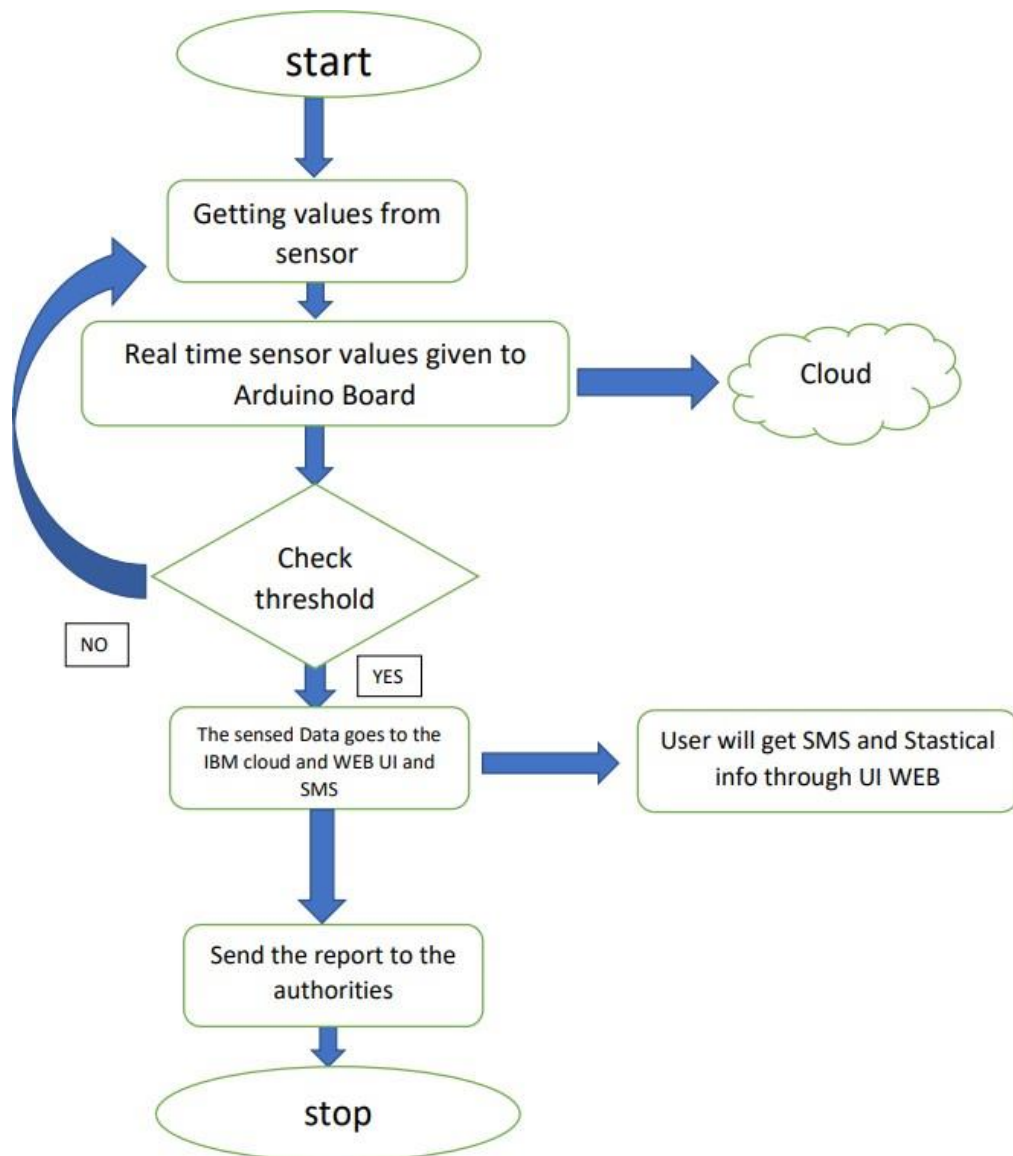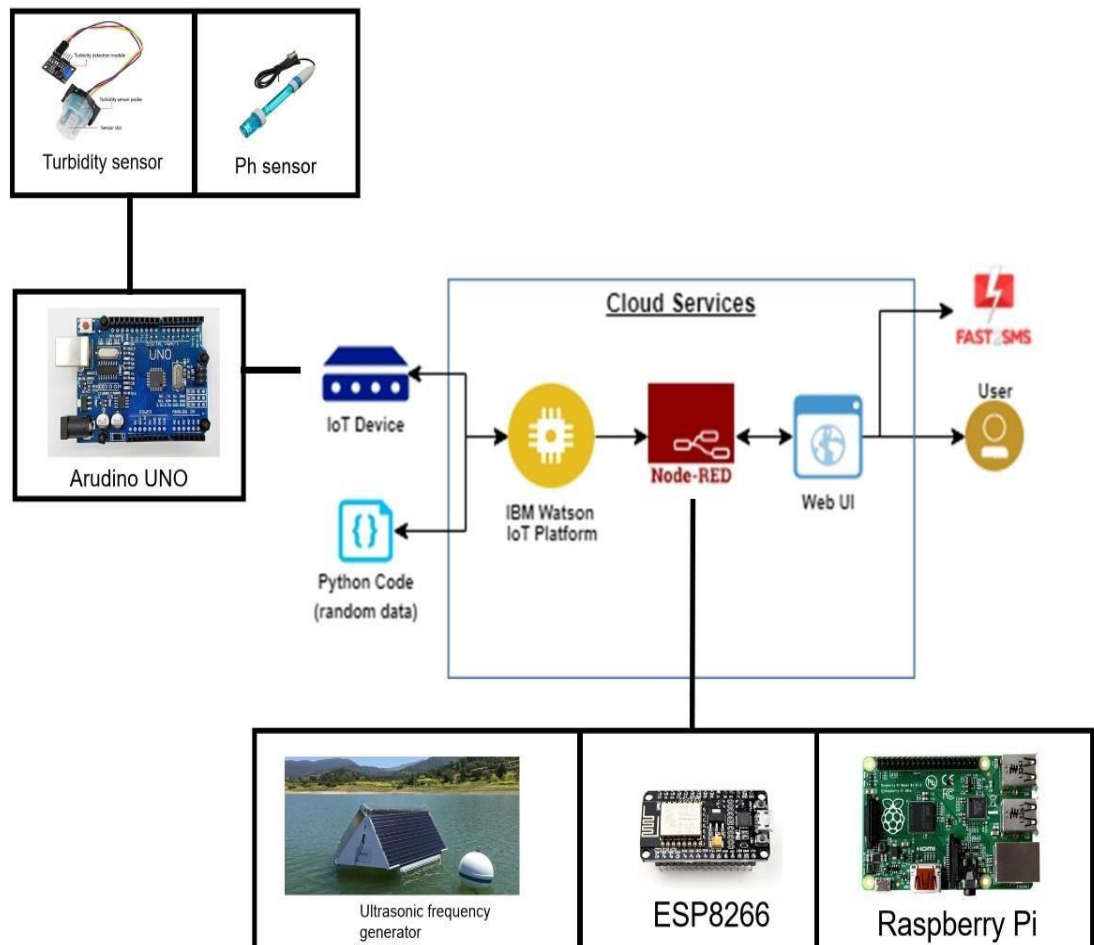
5.2 Solution & Technical Architecture

Solution architecture is a complex process – with many sub-processes – that bridges the 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.

Technical architecture:

Technical Architecture include all the Components & Technologies required and Application Characteristics.
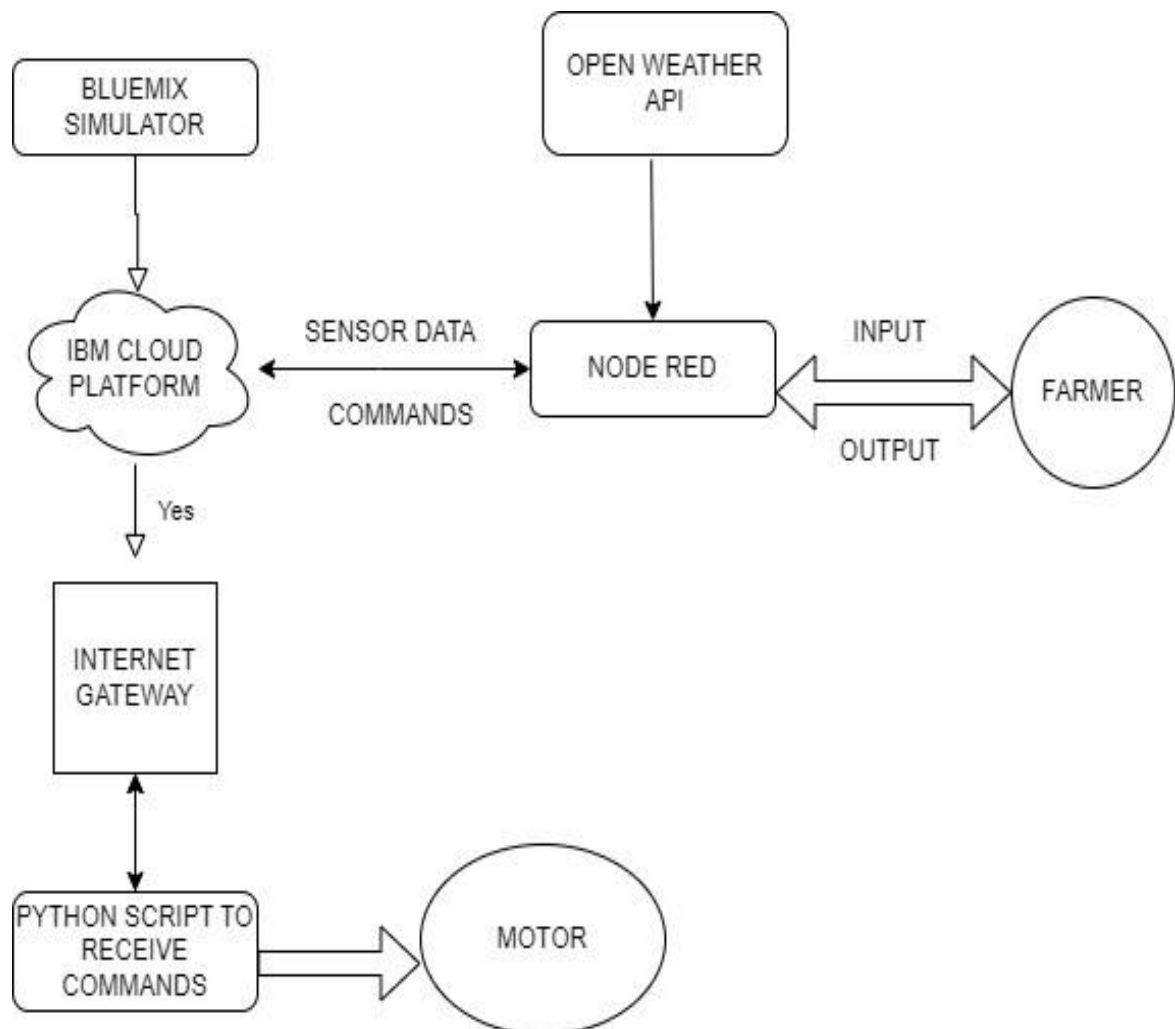
5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my registered mobile number	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive OTP once I have registered for the application	I can receive confirmation OTP & click confirm link	High	Sprint-1
		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		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering mobile number and OTP received	I can access easily	High	Sprint-1
		USN-6	As a user my mobile application should work without errors about 90% of time	I can get reliable information	Medium	Sprint -1
Customer (Web user)	Dashboard	USN-7	As a user I need information simplified and easily understandable	I can understand info better	High	Sprint -1
		USN-8	As a user I like to edibility quality of water	I can use know about water quality	Medium	Sprint -1
Customer Care Executive		USN-9	As a user I prefer to have executives who can help out in problem shooting	I can solutions easily	High	Sprint -2
Administrator	Risk tollerance	USN-5	As an administrator who can handle system maintainance	Should monitor the records properly	High	Sprint -1

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	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Jayakumar
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	KavinKarthik
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Manokar
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Raghu
Sprint-1	Login	USN-5	As a user, I can log into the application by Entering email & password	1	High	Jayakumar

Estimated Effort:

Velocity:

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

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 suchas Scrum. However, burn down charts canbe applied to any project containing measurable progress over time.
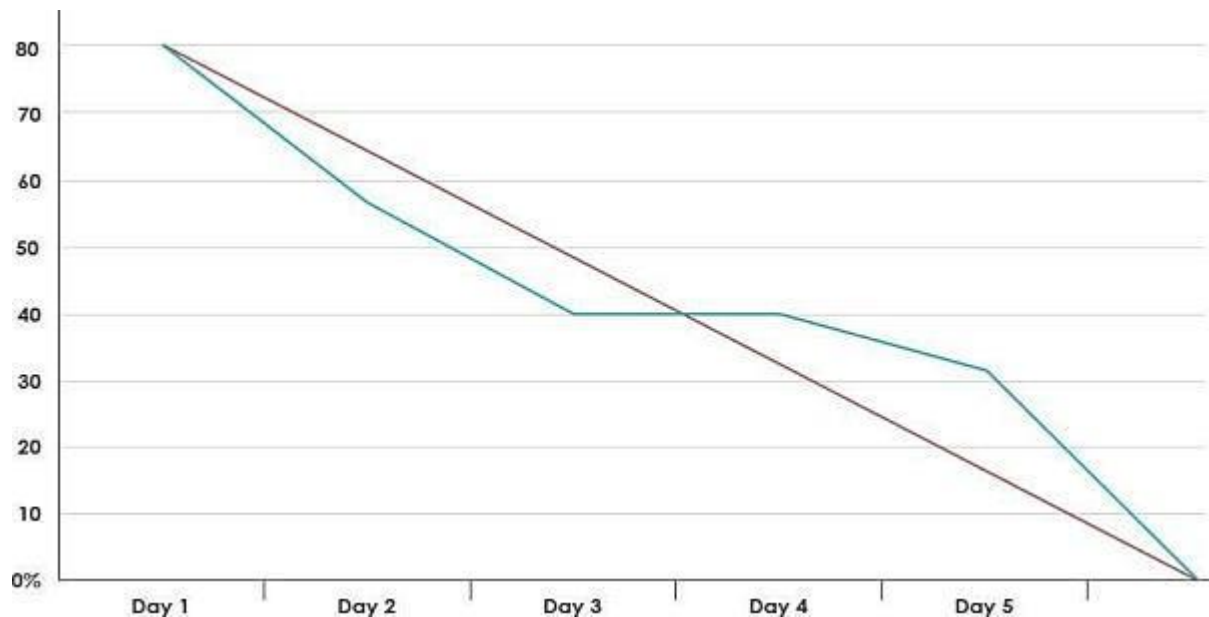
Overall burndown chart:

16
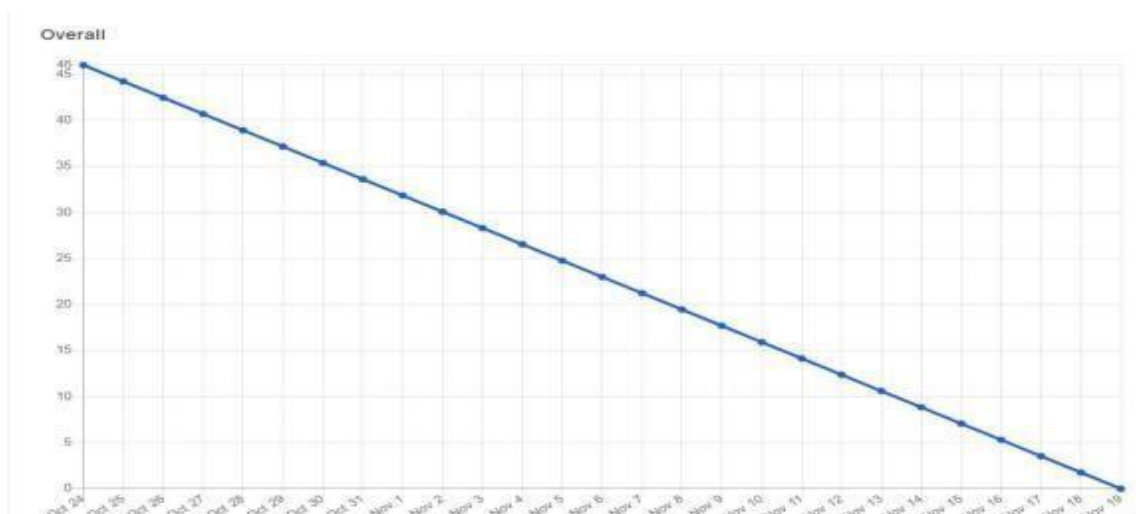
6.2 Sprint Delivery Schedule

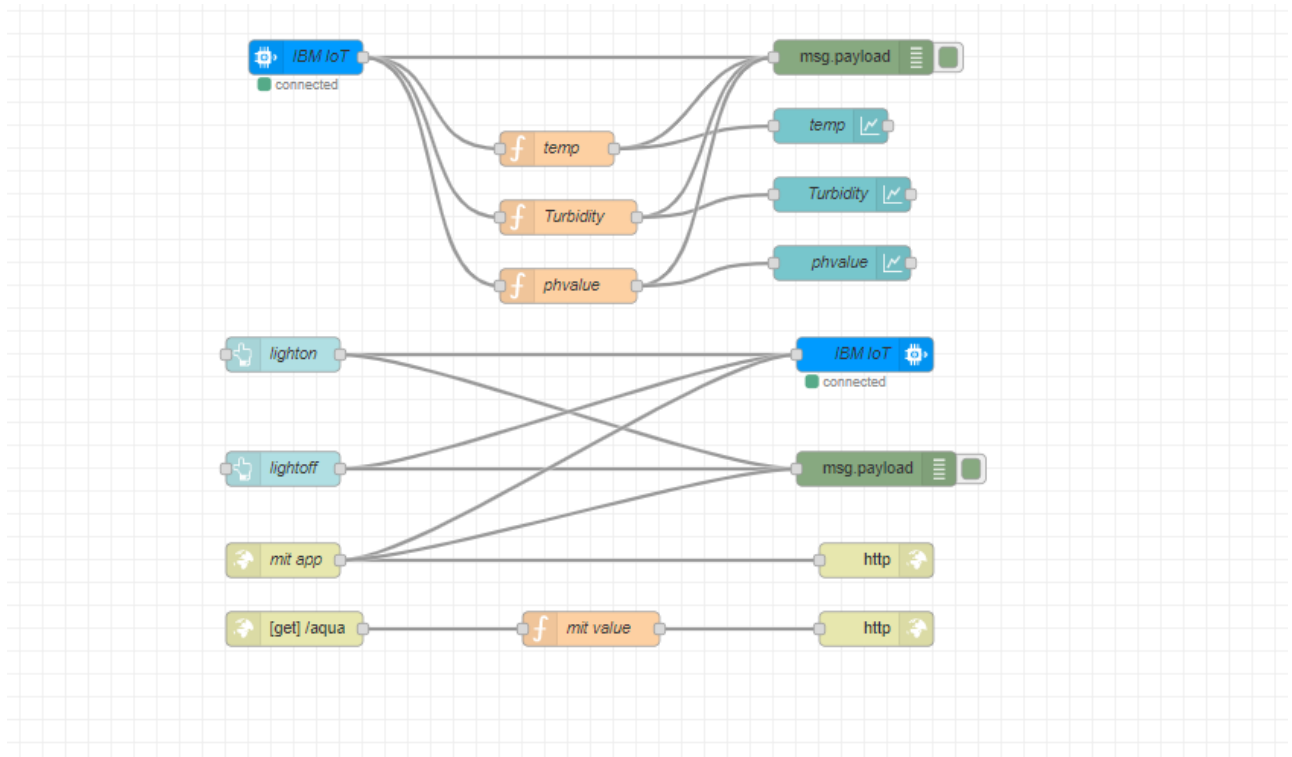| TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project is done by gathering information about related details on technical papers and web browsing	28 SEPTEMBER 2022
Empathy Map	Prepare Empathy Map Canvas to combine thoughts and pains, gains of the project with all team members	24 SEPTEMBER 2022
Ideation	Brainstorming session is conducted with all team members to list out all the ideas and prioritise the top 3 ideas	25 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	23 SEPTEMBER 2022
Problem Solution Fit	Prepare problem - solution fit document.	30 SEPTEMBER 2022
Solution Architecture	Prepare solution architecture document with basic design ideas	28 SEPTEMBER 2022
Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application	20 OCTOBER 2022
Functional Requirement	functional requirement is prepared with listing both functional and non -functional needs	8 OCTOBER 2022

Data Flow Diagrams	Draw the data flow diagrams and submit user stories	9 OCTOBER 2022
Technology Architecture	Prepare architecture with components & technologies,	10 OCTOBER 2022
Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	22 OCTOBER 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.	15 NOV 2022

6.3 Reports From JIRA

7.CODING & SOLUTIONING

7.1 Node Red Service Associated with IBM Cloud

OUTPUT:

19

7.2 Code

This code is written to add the feature of registration page for the user application for getting real time data and notifications

```html
<html>
<head>

<title> REGISTERATION PAGE
</title>

<script>

function fun()

{

window.location.href="C:\Users\student\Desktop\success.html";

}

</script>
<h1 style="text-align: center;">REGISTERATION PAGE</h1>

</head>
<body background="C:\Users\student\Desktop\real water.jpg" style="background-size:
100%;">
<br>

<br>
<form> Name

<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 title
<br>

1.<label> Cloud computing </label><br> 2.<label> Internet of things </label><br> 3.<label>
Aritificialintelligence</label><br>

<br>

<label> Gender :

</label><br>

<input type="radio" name="male"/> Male <br>

<input type="radio" name="female"/> Female <br>
```

```html
<input type="radio" name="other"/> Other

<br>
<br>

<br>
<label> Phone :
</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" onclick="fun()" value="Submit"/>

</form>

</body>
</html>
```

REGISTERATION COMPLETED

```html
<html>
<head>
</head>
<body>

<center><img src="tick.png" alt="centered image" height="230" width="250"> </center>

<div class="success-msg">
<i class="fa fa-check"></i></div>

<center><h1>Registered Successfully</h1></center>>
</div>

</body>
</html>
```
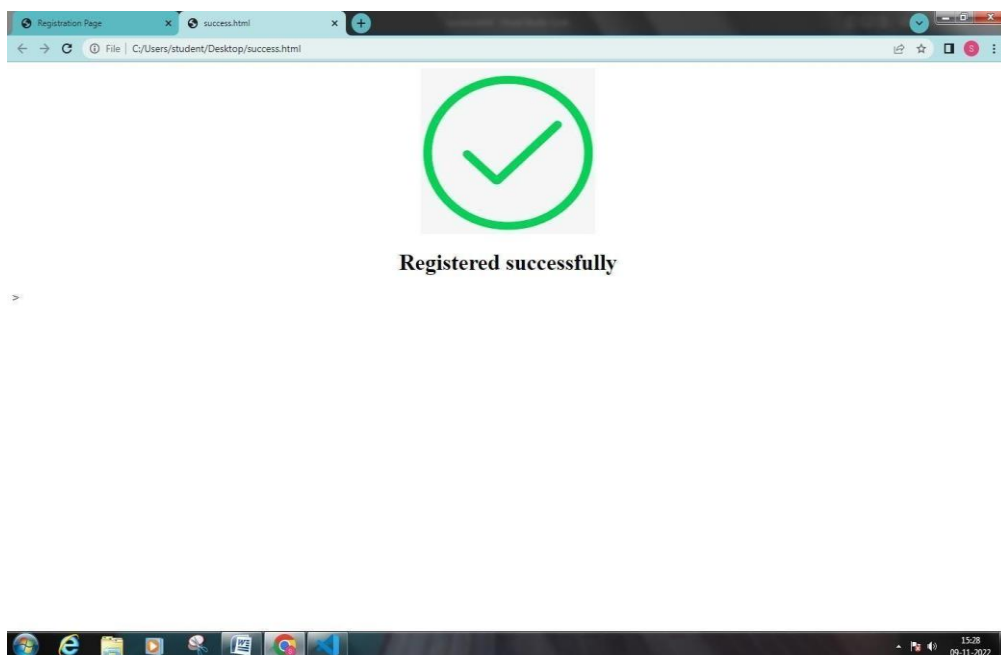
8. TESTING

8.1 Test Cases

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	15	0	0	15
Client Application	45	0	0	45
Security	1	0	0	1
Outsource Shipping	2	0	0	2
Exception Reporting	10	0	0	10
Final Report Output	4	0	0	4
Version Control	3	0	0	3

8.2 User Acceptance Testing

1.Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEMS. 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.

Test case id	Feature	Component	Test Scenario	Steps to Execute	Test Data	Actual Result	Status
Login page	Functional	Home page	Verify user is able to see the Given app	1.Download the given APK File 2.Click on download button 3.Verify login popup displayed or not"	APK File	Working as expected	Pass
Login page	Functional	Home page	Verify user is able to see the Login/Signuppopup whenuser open the Aqua Meter	1. Download the given APK File 2.Click on download button 3.Verify login popup displayed or not"	APK File	Working as expected	Pass
Login page	Functional	Home page	Verify the UIelements in Login/Signuppopup	1. Download the given APK File 2.Click on download button 3.Verify login popup with below UI elements: A .Username text box A .password text box B .Submit button	APK File	Working as Expected	Pass
Login Page	Functional	Home page	Verify user isable to log into application with Valid credentials	"1 Download the given APK File 2.Click on download button 3.Enter Valid "Given " username in Username text box 4.Enter valid password in password text box 5.Click on Submit button"	Username: Username Password: Password	Working as Expected	Pass
Login Page	Functional	Home page	Verify user is able to see the output	1.output displayed	APKFile	Working as Expected	Pass

24

9.RESULTS

9.1 Performance Metrices

S.No	Project Name	Scope/feature	NFT - Risk Assessment						
			Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Voluem Changes	Risk Score	Justification
1	REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM	New	Low	No Changes	Moderate	3days	>5 to 10%	ORANGE	As we have seen the changes

Performance Table

PARAMETER	PERFORMANCE	DESCRIPTION
ADMIN TESTING	95%-100%	The Testing Done Before It Is Deployed As An App
CUSTOMER SATISFACTION	75-85%	The Customer Need To Be Satisfied WithThe Mobile Application
USER INTERFACE	65-85%	The App Can Used By Anyone.(Ease Of Access)
SEVER RESPONSE	50-75%	url - response
DATA VALIDATION WITH NO. OF TEST CASE	60-80% (15-30 TESTCASE)	Valid Data From The App
ERROR	3-5%	Real-Time Delay May Occur

10. ADVANTAGES AND DISADVANTAGES

Advantages:

* The prototype developed for water quality maintenance is very beneficial for safeguarding public health and also adds to the clean environment.
* The automation of this water monitoring, cleaning and control process removes the need of manual labor and thus saves time and money.
* The automation of the system makes the control and monitoring process more efficient and effective.
* Real time monitoring on mobile phone which is possible through the interface of plc with Arduino and Bluetooth module allows remote controlling of the system.

Disadvantages:

* It is difficult to collect the water samples from all the area of the water body.
* The cost of analysis is very high.
* The lab testing and analysis takes some time and hence the lab results does not reflect real time water quality measurement due to delay in measurement.
* The process is time consuming due to slow process of manual data collection from different locations of the water body.
* The method is prone to human errors of various forms.

11. CONCLUSION

Real-time monitoring of water quality by using IoT integrated Big Data Analytics will immensely help people to become conscious against using contaminated water as well as to stop polluting the water. The research is conducted focusing on monitoring river water quality in real-time. Therefore, IoT integratedbig data analytics is appeared to be a better solution as reliability, scalability, speed, and persistence can be provided.

The system has good flexibility. Only by replacing the corresponding sensors and changing the relevant software programs, this system can be used to monitor other water quality parameters.

12. FUTURE SCOPE

We use water detection sensor has unique advantage. It consumes less time to monitor than a manual method for checking polluted levels, and notifies immediately to reduce affected rate of pollution in water. People who are living in rural areas near to the river will be very satisfied with our idea. It will be useful to monitor water pollution in specific area.So this system prevent people from water pollution. It will be used for farming purpose to check quality water, temperature and PH level.

Our Impact of this project is also create a social satisfaction for farmers too. The scalabilty of this project gives the addition of more different type of sensors. By interfacing the relay we can control the supply of water. We can also implement as a revenue model.

APPENDIX

Source Code

Python Code ToPublish Data

```python
import
time
import
sys
import
ibmiotf.application
import
ibmiotf.device
import random
organization="3alb
gm"
deviceType="Node
MCU"
deviceId="1234"
authMethod="toke
n"
authToken="12345
678"
try:

    deviceOptions={"org": organization,"type": deviceType,"id":
deviceId,"auth-method":authMethod,"auth-token": authToken}
    deviceCli=ibmiotf.device.Client(dev
iceOptions)except Exception as e:
    print("caught exception connecting
```

```
        device:%s" % str(e))sys.exit()


  deviceCli.co

  nnect()while

  True:

temp=random.randint(-20,125)

hum=random.randint(0,100)

data={'temperature':temp,'humidity':hu

m}

        def myOnPublishCallback():

         print("published temperature=%d" %temp,"humidity=%d" %hum,"to ibm
          watson")
  success=deviceCli.publishEvent("IotSensor","json",data,qos=0,on_publish=my

        OnPublishCallback) if not success:

           print("Not connected

        to IoTF")time.sleep(3)

  deviceCli.disconnect()
```

Python Code For Random Value Generation:

```
#importing Random function to generate the value

import random as rand

for i in range(5):

   print("Test case:",i+1)

   print("Welcome to Real-Time River Water Quality Monitoring and Control
System")

   temperature = int(rand.randint(-40,125))

   pH = int(rand.randint(0,14))

   DO = int(rand.randint(0,100))

   TSS = int(rand.randint(0,3700))
```

```python
Manganese = int(rand.randint(0,1000))

Copper = int(rand.randint(0,2000))

ammonia_Nitrate = int(rand.randint(0,100))

Hardness = int(rand.randint(0,1000))

Zinc =  int(rand.randint(0,100))

Conductivity =  f"{float(rand.uniform(0.001,2000)):.2f}"

Chloride = int(rand.randint(0,200))

Sulphate = int(rand.randint(0,1000))

#These variables store value of ramdom data to be shared to the cloud

#printing the values

print(

    "Temperature:", temperature,

    "\npH:", pH,

    "\nDO:", DO,

    "\nTSS:", TSS,

    "\nManganese:", Manganese,

    "\nCopper:", Copper,

    "\nAmmonia & Nitrate:",ammonia_Nitrate,

    "\nHardness:",Hardness,

    "\nZinc:", Zinc,

    "\nConductivity:", Conductivity,

    "\nChloride:", Chloride,

    "\nSulphate:", Sulphate, "\n"

)
```

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-46804-1660784893

Demo Link: https://youtu.be/MnAsdoeXGvE