PROJECT REPORT

REAL-TIME RIVER QUALITY MONITORING AND CONTROL SYSTEM

TEAM ID: PNT2022TMID54363

Team Members

Kumaran S – 310619106065
Karthik Madhan - 310619106057
Poovarasan M – 310619106098
Meiyarasu V - 310619106076

INDEX

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 and random use of pesticides and chemical fertilizers in agriculture, which leads 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 heterogeneous areas 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 physical and 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.

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 Problem:

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:

Title & Author(s)	Year	Technique(s)	Findings/Pros/Cons
"AquaStat: An Arduino-based Water Quality Monitoring Device for Fish Kill Prevention in Tilapia Aquaculture using Fuzzy Logic" Mark Rennel D. Molato	2022	Fuzzy Logic	In the Philippines, Tilapia fish farming sector is vital to the economy in providing substantial employment, income and meeting local demand for protein sources of the Filipinos. The water parameters considered in this paper were temperature, dissolved oxygen, and pH level. The overall water quality obtained using the conventional method was compared to the overall water quality generated by AquaStat and obtained an accurate result.
"IoT based Industrial water quality monitoring system using temperature, pH and turbidity sensors" A.Divya, G.Vidhya krishnan	2019	ZigBee technology	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. m. This paper proposes a low cost water quality monitoring system using emerging technologies such as IoT, Machine Learning and ting which can replace traditional way of quality monitoring.
"A Survey on smart water monitoring and control using Internet of Things" M.K. Dipshika , Dr. P. Kannan Mr .S. Arun	2019	ZigBee technology	Nowadays, water scarcity has become an important crisis. Water scarcity is defined as the lack of sufficient available water in all the water resources particularly to meet the demands of water usage all over the world.
"Smartphone-based Real-Time Water Quality Monitoring System" Aaruththiran Manoharan, Zhang Yujia, Mohammad ali Bagherian	2019	Internet of Things (IoT) and Remote Sensing (RS)	In industrial based countries, most water bodies near urban areas are heavily polluted mainly due to legal or illegal dumping of wastewater laced with harmful organic chemicals, solvents, heavy metals, and urine from both humans and animals. The outcome of the project demonstrated the feasibility of using simple and cheap components, integrated with smartphone for real-time monitoring of water quality.

"Remote monitoring of waters quality from reservoirs" Sona R. Pawara, Siddhi Nalam, Saurabh Mirajkar, S. Gujar, Vaishali Nagmoti	2017	Convergence	Water bodies have seen a rise in chemical pollutants in recent years. Therefore quality testing has become an essential part of treatment. Currently in India, monitoring of water quality is done by physically going to water bodies and collecting samples which are then sent to be tested in laboratories.
"Reconfigurable smart water quality monitoring system in IoT environment" Cho Zin Myint, Lenin Gopal,	2017	Computer and Information Science	This paper presents a reconfigurable smart sensor interface device for water quality monitoring system in an IoT environment. The smart WQM system consists of Field Programmable Gate Array (FPGA) design board, sensors, Zigbee based wireless communication module and personal computer (PC). The FPGA board is the core component of the proposed system and it is programmed in very high speed integrated circuit hardware description language (VHDL) and C programming language using Quartus II software and Qsys tool.
"Internet of things enabled real time water quality monitoring system" S. Geetha and S. Gouthami	2017	IoT	Smart solutions for water quality monitoring are gaining importance with advancement in communication technology.The model developed is used for testing water samples and the data uploaded over the Internet are analyzed.
"Real-time remote monitoring system for aquaculture water quality" Luo Hongpin, Li Guanglin, Peng Weifeng Song Jie, Bai Qiuwei	2015	ZigBee and GPRS transmission	A multi-parameters monitoring system based on wireless network was set up to achieve remote real-time monitoring of aquaculture water quality, in order to improve the quality of aquaculture products and solve such problems as being difficult in wiring and high costs in current monitoring system.

"Design of low-cost autonomous water quality monitoring system" A. S. Rao, S. Marshall, J. Gubbi, M. Palaniswami, R. Sinnott, Vincent Pettigrovet	2013	Computing, Communications and Informatics	A low-cost wireless water physiochemistry sensing system is presented and the results indicate that with appropriate calibration, a reliable monitoring system can be established, and will allow catchment managers to continuously monitoring the quality of the water at higher spatial resolution than has previously been feasible.
"Using image processing technology for water quality monitoring system" Cheng-Liang Lai, Chien-Lun Chiu	2011	Machine Learning and Cybernetics	The inferential method as proposed by this study in recognizing two kinds of fish has come to a satisfactory effect and is successfully used in building a water quality monitoring system by utilizing the image processing and fuzzy inference in auto-recognizing the gesture of fish.

2.3 Problem Statement:

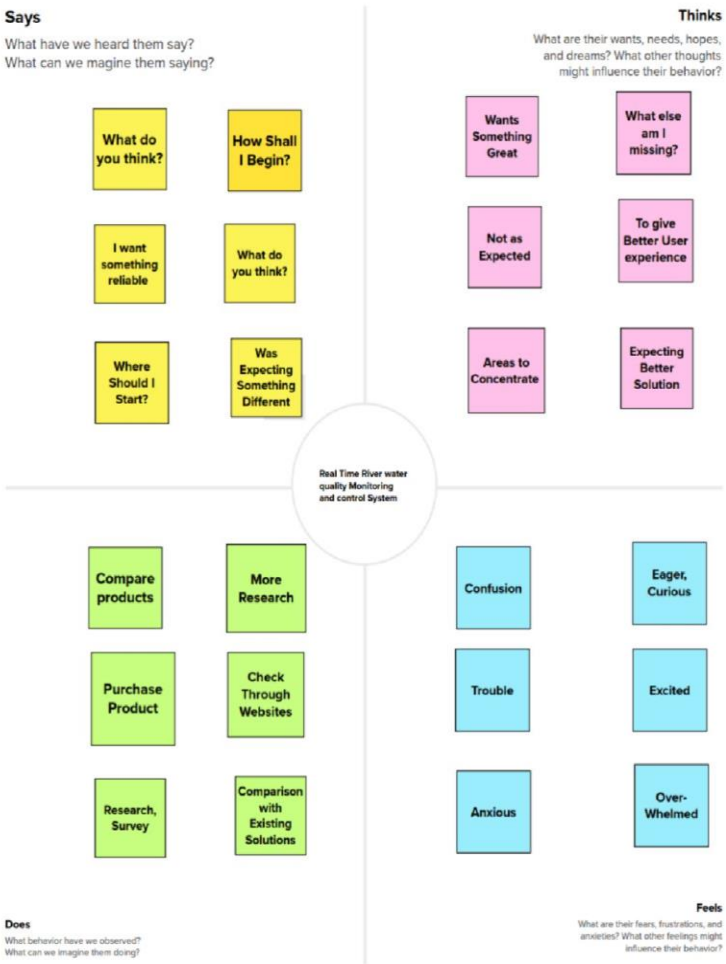
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	As a soft drink manufacturer, I am dealing with issues caused by the river that serves as my water source.	I'm attempting to cut down on my water filtration procedure by obtaining clean and high-quality river water for my products.	However, I am unable to succeed because I have not discovered a suitable alternative to manual labour or a workable solution.	We are unable to produce the best product possible because the filtration procedure is more time-consuming with poor water quality..	It is one of the barriers to my firm's success and makes me responsible for customer satisfaction.
PS-2	I'm a Limnologists	I need to assess the river's water quality in order to conduct research for my current thesis on river water management and its effects on ecosystems.	But, because I haven't found a good replacement for the manual method, I have to do it every time I need information about river water quality for analysis.	Because evaluating the river water quality takes extra time, I won't be able to complete my task on time.	It gives me the impression that, in order to complete my thesis as soon as possible, I will require an automated river water management and control system that will allow me to use the data it generates for my research.

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..,)

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas:

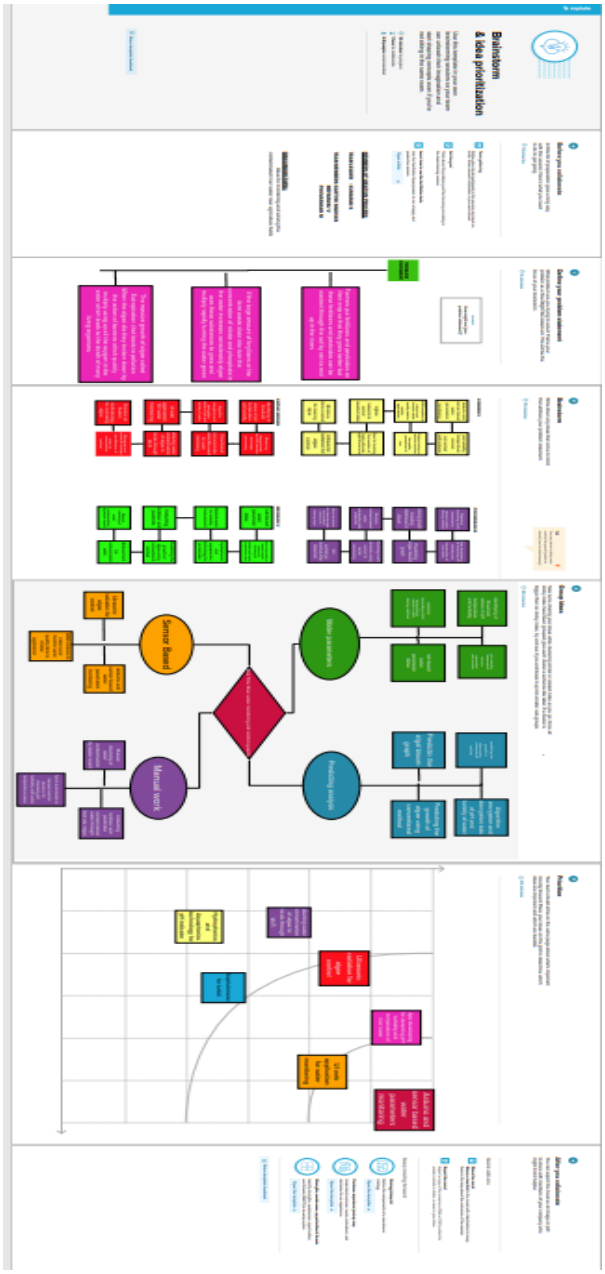
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users.Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise 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 volume over 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.

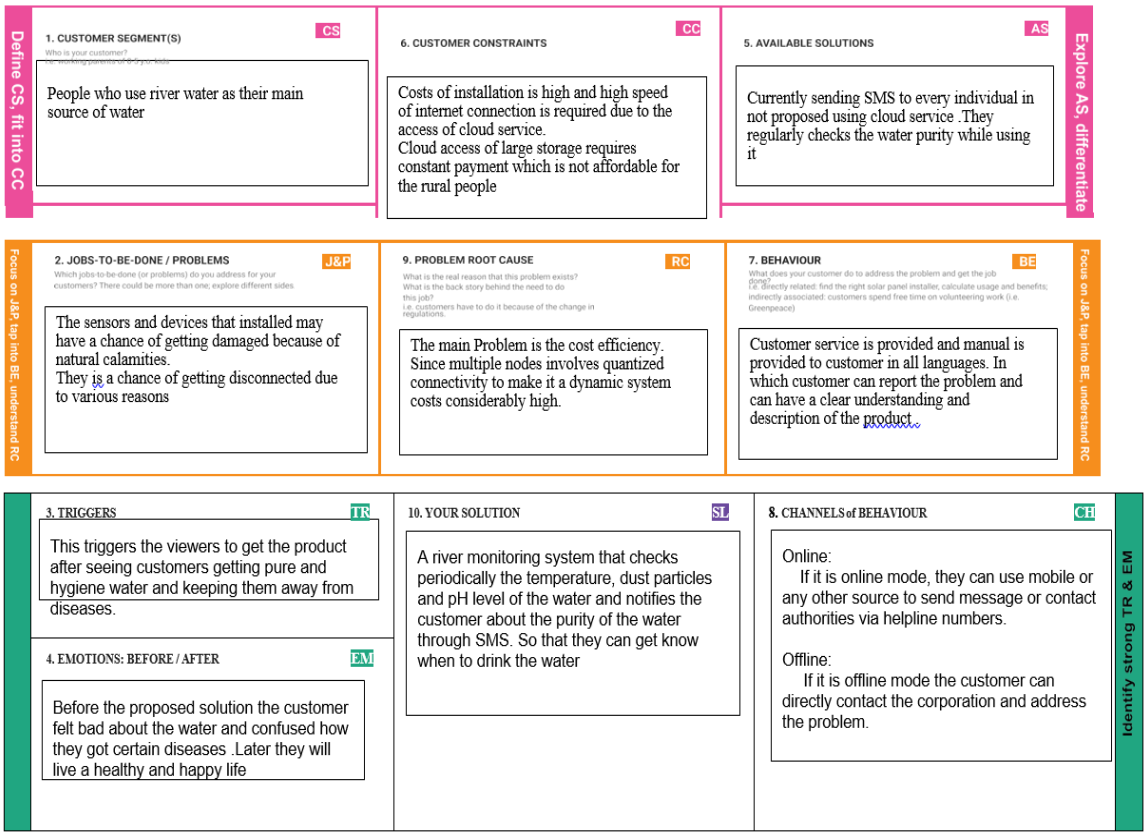
Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.



3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Water is a finite resource that is necessary for agriculture, industry and the survival of all living things on the planet, including humans. Poor water allocation, inefficient consumption, lack of competent and integrated water management are all factors that contribute to this problem.
2.	Idea / Solution description	• Using accessible sensors at a distant location, monitor water parameters such as pH, dissolved oxygen, turbidity, conductivity, and so on. • Testing the water samples and the data uploaded over the Internet are analyzed.
3.	Novelty / Uniqueness	• Many unregulated methods waste more water. • So, this technique will be more effective to predict the quality of water.
4.	Social Impact / Customer Satisfaction	• It can be expanded to track hydrologic, air pollution, industrial, and agricultural output, among other things. • It prevents people from affecting various diseases.
5.	Business Model (Revenue Model)	• Large scale deployment of monitoring equipment along rivers and lakes, with IoT technology as the carrier, big data, cloud computing technology as the starting point. • It is used through the establishment of a system management platform, to provide a full range of water quality monitoring plan.
6.	Scalability of the Solution	• The remote sensing technology is the cornerstone of IoT-based water quality monitoring. • Efficient use and water monitoring are potential constraint for home or office water management system.

3.4 PROBLEM SOLUTION:



4 REQUIREMENT ANALYSIS

4.1 *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 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 and the 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 send to Arduino.
FR-5	Ultrasonic generator	At regular interval times the waves are generated to clear algae 25%,50%,75%,100%

4.2 *Non-functional Requirements:*

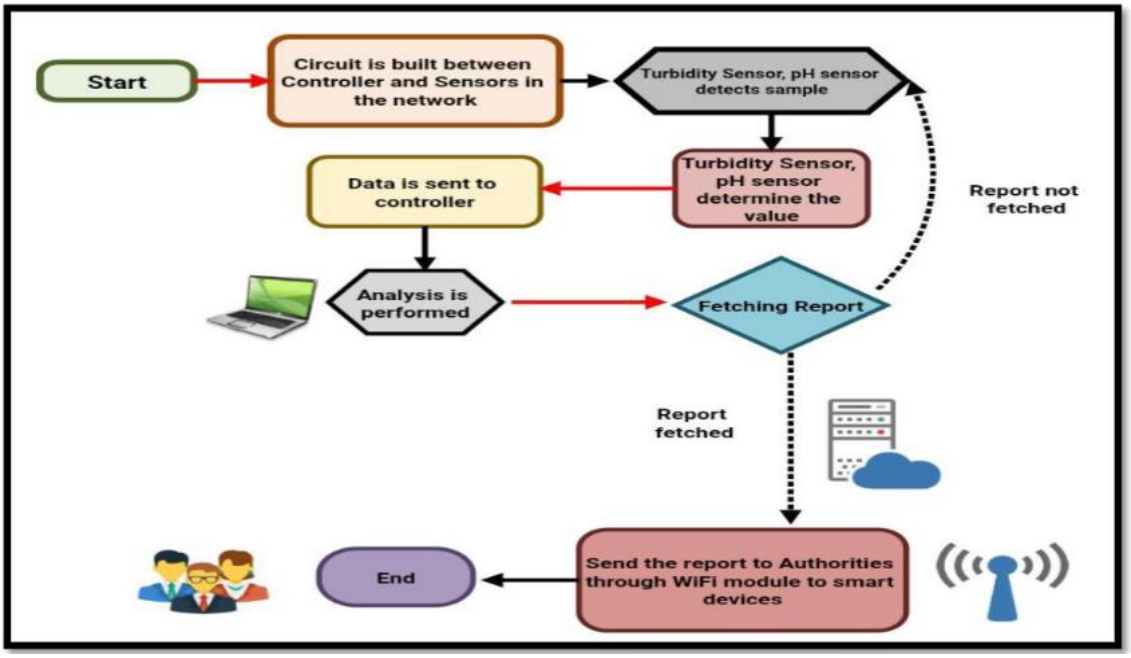
Following are the non-functional requirements of the proposed solution.

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

5.1Data 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



5.2 SOLUTION AND TECHNICAL ARCHITECTURE

Summary

This code pattern explains how to build an IOT based river water monitoring and controlling system with some predefined values.

Flow

- Feed the data received from the Sensor unit which are placed in the river sides.
- The collected data will be displayed in the Web page to the user.
- Then the collected data is sent to the data base, where the collected data and the predefined data are checked and monitored.
- If any data exceed the predefined data then the control signal will send to the Admin.
- The collected data will be stored in the IBM cloud storage.
  Later the data will be controlled by the admin via UI.

Components & Technologies:

S.No	Component	Description	Technology
1.	Sensor Data	The data is collected form the various sensor placed in the river sides.	ESP32Wifi module Raspberry Pie.
2.	Database for Storage	The data/info need to be stored for accessing it in future	MySQL-Oracle
3.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
4.	Cloud Database	Database Service on Cloud	IBM cloud
5.	Data Storage	File storage requirements	IBM Block Storage

Application Characteristics:

S.No	Characteristics	Description	Technology
1.	PH level Monitoring	The PH level of river water can be monitoredvia placing sensors in rivers.	PH-sensor
2.	Air Quality Monitoring	Theclarityandpurity ofriver water can be monitored	Surface Mount Sensor
3.	Temperature Monitoring	The temperature of river water can be monitored	Temperature sensor
4.	Water Treatment	can be used as both a safety device in the water purification process as carbon dioxide, methane, and carbon monoxide are some of the key gases produced during the treatment process	NDIR gas sensors
4.	Soil Condition Monitoring	Soil condition monitoring sensors allow farmers to collect data about rainfall, temperature, and other metrics over time to track trends and predict irrigation needs.	Acoustic sensor

5.3 User Stories

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

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 email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		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
		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 through the mail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can receive login credentials	High	Sprint-1
	User Interface	USN-6	As a user, I should not need any pre requisites to handle the UI	I can use it in a friendly manner.	Medium	Sprint-1
Customer (Web user)	Dashboard	WUSN-1	As a web user, able to access the inputs from the sensors	I can know quality of water.	High	Sprint-1
Customer Care Executive	View Manner	CCE-1	As a customer care, Data visualization must be in good understandable view.	I can understand the various data comparisons by visuals.	High	Sprint-1
	Taste	CCE-2	As a customer care, I can able to view the composition of water (e.g. Minerals, etc.)	I can know the composition and whether healthy to drink or not.	High	Sprint-1
	Colour Visibility	CCE-3	As a customer care, I should know the water colour	I can Know its colour.	High	Sprint-1
Administrator	Risk Tolerant	ADMIN-1	Administrator should handle the system, server and take care of the application.	Admin should monitor and store the records with caution.	High	Sprint-2

6.1 SPRINT PLANNING & SCHEDULING:

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	Kumaran S
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Karthik Madhan
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Poovarasan M
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Meiyarasu V
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	Kumaran S
Sprint-1	User Interface	USN-6	As a user, I should not need any pre requisites to handle the UI	1	Medium	Karthik Madhan
Sprint-1	Dashboard	WUSN-1	As a web user, able to access the inputs from the sensors	2	High	Poovarasan M
Sprint-1	View Manner	CCE-1	As a customer care, Data visualization must be in good understandable view.	2	High	Meiyarasu V
Sprint-1	Taste	CCE-2	As a customer care, I can able to view the composition of water (e.g. Minerals, etc.)	1	High	Kumaran S
Sprint-1	Colour Visibility	CCE-3	As a customer care, I should know the water colour	1	High	Karthik Madhan
Sprint-2	Risk Tolerant	ADMIN-1	Administrator should handle the system, server and take care of the application.	1	High	Kumaran S

6.2 SPRINT DELIVERY SCHEDULE

Product Backlog, Sprint Schedule, and Estimation

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

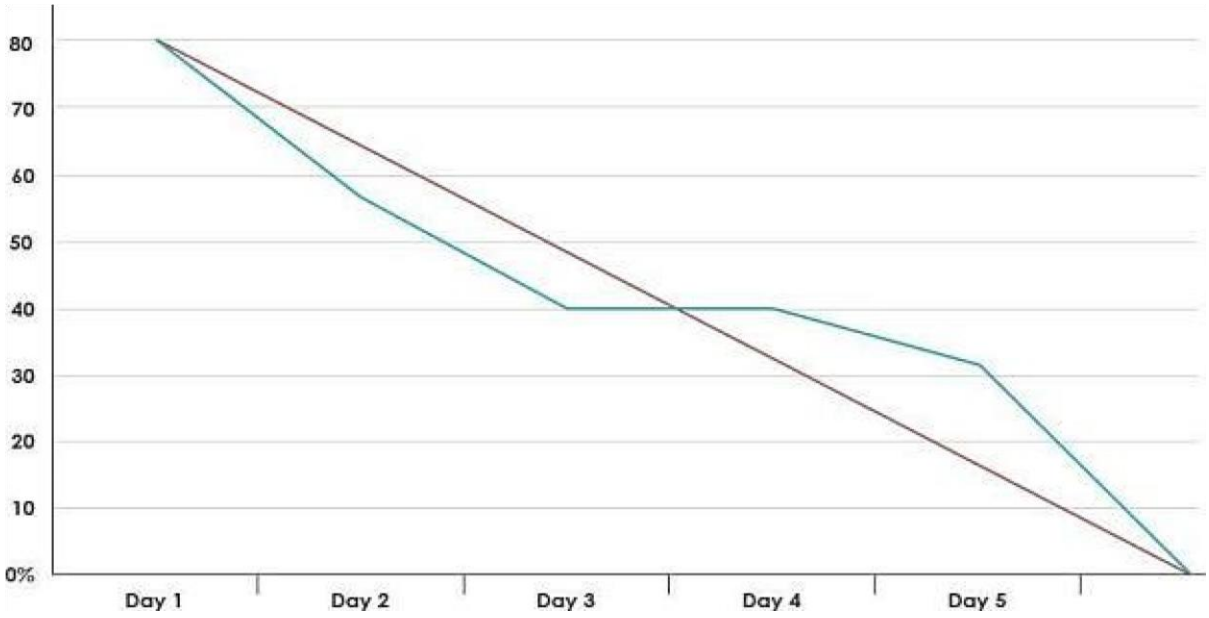
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	30	30 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	49	06 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	50	07 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)

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

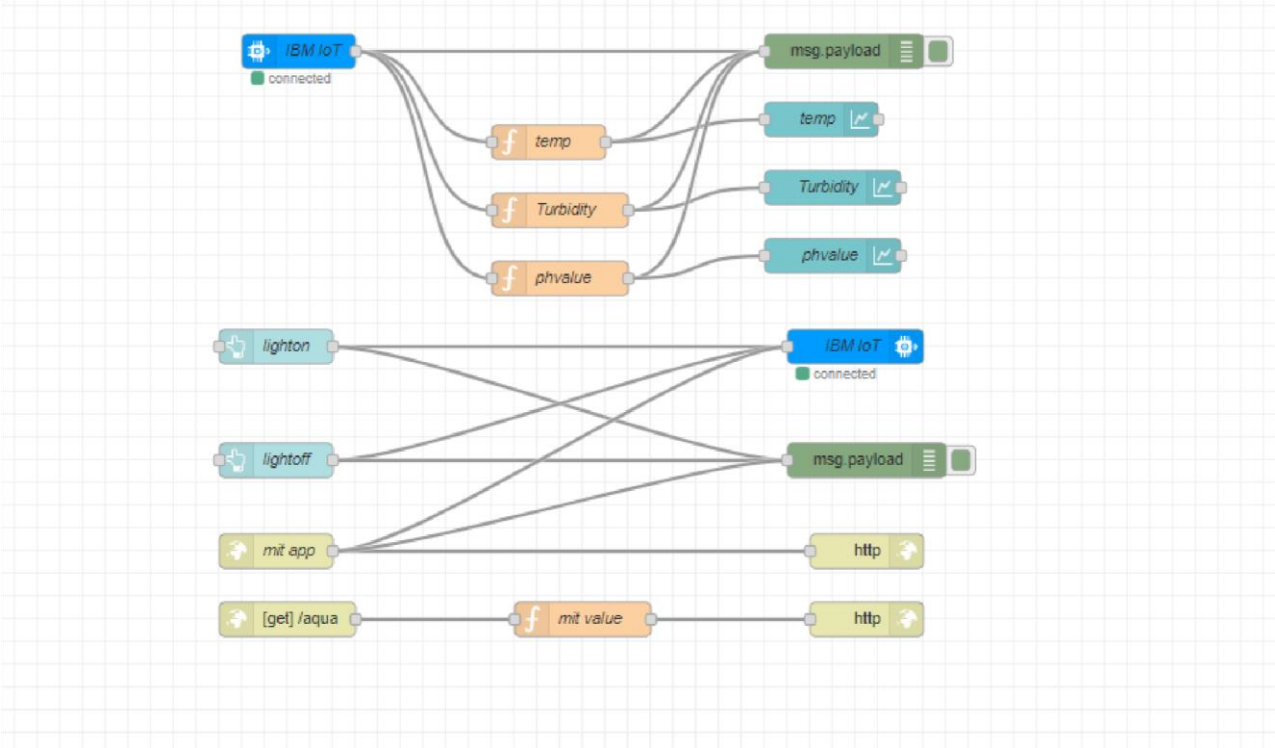
Burndown Chart:



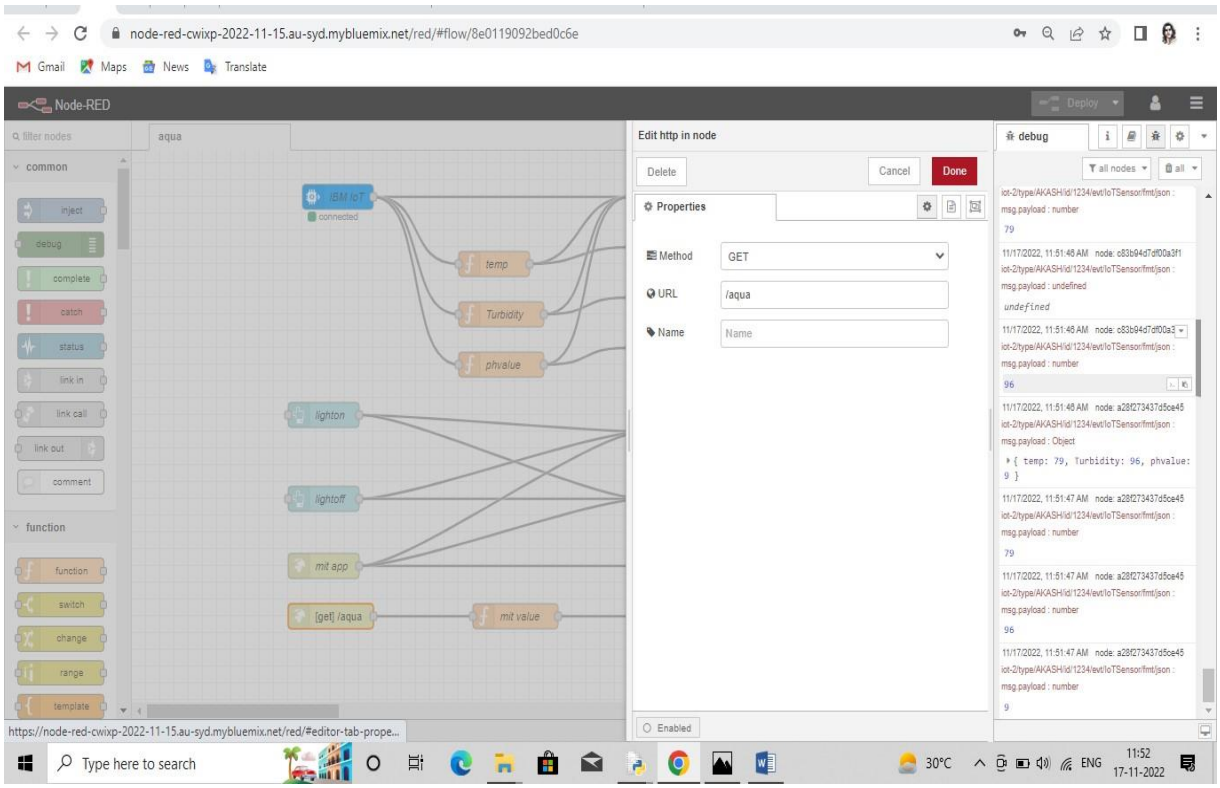
6.3 REPORT FROM JIRA

7.CODING AND SOLUTIONING

7.1 NODE RED SERVICE ASSOCIATED WITH IBM CLOUD:



Node red Outputs:



8.TESTING

8.1 Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	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).

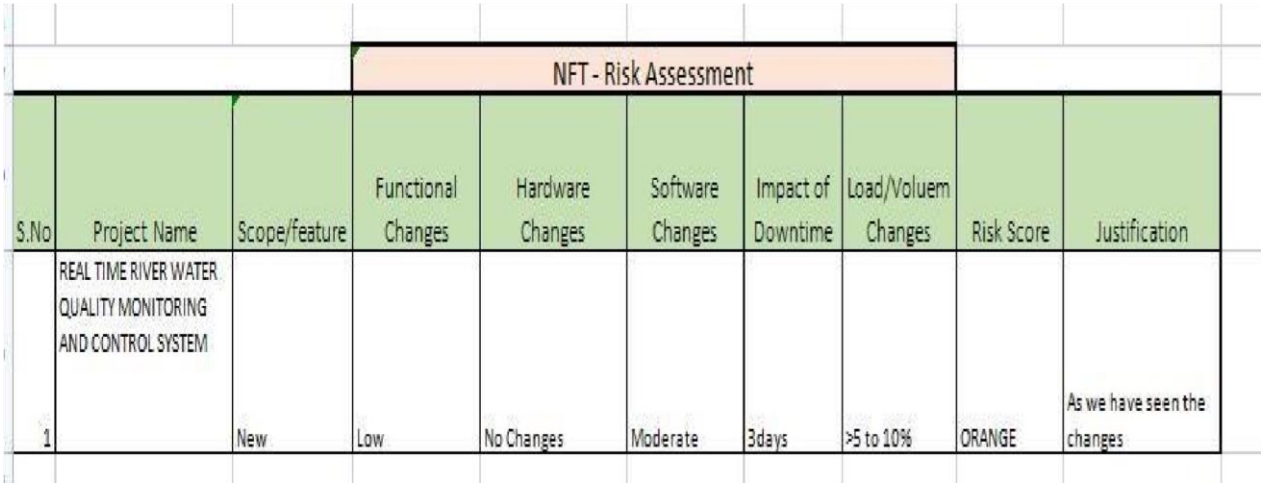
2. Defect Analysis

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/Signup popup when user 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 UI elements in Login/Signup popup	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 is able 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

9.RESULT

9.1 PERFROMANCE METRICS:



			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	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 WITH THE 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

Thus our project is used to Monitoring of Turbidity, PH & Temperature of Water makes use of water detection sensor with unique advantage and existing GSM network. The system can monitor water quality automatically, and it is low in cost and does not require people on duty. So the water quality testing is likely to be more economical, convenient and fast. 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.

The operation is simple. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It has widespread application and extension value.By keeping the embedded devices in the environment for monitoring enables self protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network.

Then the collected data and analysis results will be available to the end user through the Wi-Fi.

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.This system could also be implemented in various industrial processes. The system can be

modified according to the needs of the user and can be implemented along with lab view to monitor data on computers.

13.APPENDIX

13.1 SOURCE CODE:

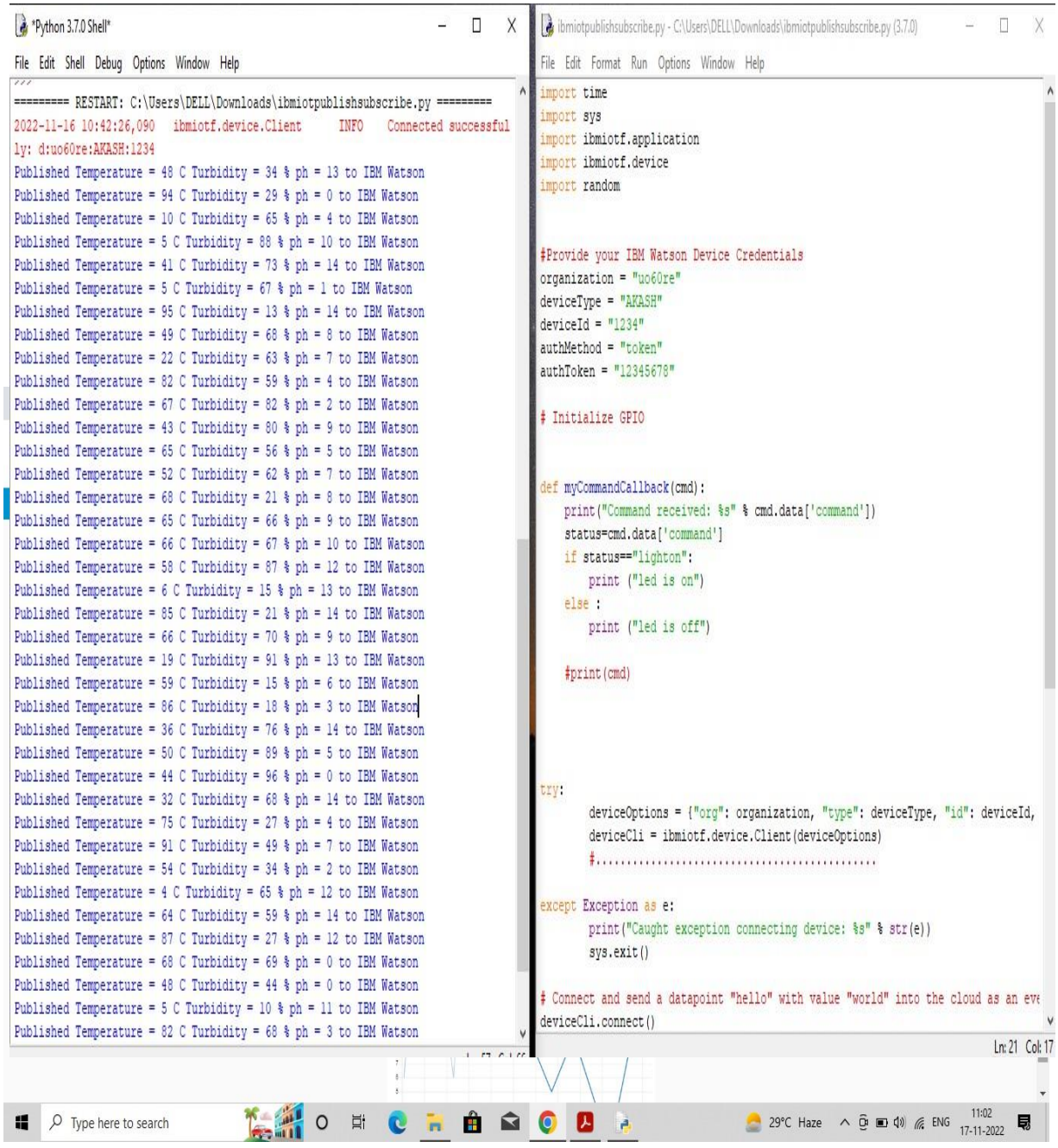
PYTHON CODE TO PUBLISH DATA

```
import time import
sys

import ibmiotf.application
import ibmiotf.device import
random



#Provide your IBM Watson Device
Credentials organization =
"o1ur3v " deviceType =
"ESP32" deviceId =
"311212" authMethod
= "token" authToken =
"3102310231"



# Initialize GPIO



def myCommandCallback(cmd):
   print("Command received: %s" %
```

```
cmd.data['command'])
    status=cmd.data['command']
    if status=="lighton":       print
    ("led is on")    else:       print
    ("led is off")

      #print(cmd)



    try:       deviceOptions    =    {"org":
organization,  "type":  deviceType,  "id":
deviceId, "auth-method": authMethod,
"auth-token": authToken}
    deviceCli =
ibmiotf.device.Client(deviceOptions)
            #.....

    except Exception as e:
            print("Caught exception
connecting device: %s" % str(e))
            sys.exit()

    # Connect and send a datapoint
"hello" with value "world" into the cloud
as an event of type "greeting" 10 times
    deviceCli.connect()

    while True:
        #Get Sensor Data from DHT11

        temp=random.randint(60,100)
```

```
Turbidity=random.randint(0,100)
    phvalue=random.randint(2,14)


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

        success =
deviceCli.publishEvent("IoTSensor",
"json", data, qos=0,
on_publish=myOnPublishCallback)
if not success:
          print("Not connected to
IoTF")
    time.sleep(10)


        deviceCli.commandCallback = myCommandCallback


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

OUTPUT


Python 3.7.0 Shell
File Edit Shell Debug Options Window Help
======== RESTART: C:\Users\DELL\Downloads\ibmiotpublishsubscribe.py ========
2022-11-16 10:42:26,090 ibmiotf.device.Client INFO Connected successfully: d:uo60re:AKASH:1234
Published Temperature = 48 C Turbidity = 34 % ph = 13 to IBM Watson
Published Temperature = 94 C Turbidity = 29 % ph = 0 to IBM Watson
Published Temperature = 10 C Turbidity = 65 % ph = 4 to IBM Watson
Published Temperature = 5 C Turbidity = 88 % ph = 10 to IBM Watson
Published Temperature = 41 C Turbidity = 73 % ph = 14 to IBM Watson
Published Temperature = 5 C Turbidity = 67 % ph = 1 to IBM Watson
Published Temperature = 95 C Turbidity = 13 % ph = 14 to IBM Watson
Published Temperature = 49 C Turbidity = 68 % ph = 8 to IBM Watson
Published Temperature = 22 C Turbidity = 63 % ph = 7 to IBM Watson
Published Temperature = 82 C Turbidity = 59 % ph = 4 to IBM Watson
Published Temperature = 67 C Turbidity = 82 % ph = 2 to IBM Watson
Published Temperature = 43 C Turbidity = 80 % ph = 9 to IBM Watson
Published Temperature = 65 C Turbidity = 56 % ph = 5 to IBM Watson
Published Temperature = 52 C Turbidity = 62 % ph = 7 to IBM Watson
Published Temperature = 68 C Turbidity = 21 % ph = 8 to IBM Watson
Published Temperature = 65 C Turbidity = 66 % ph = 9 to IBM Watson
Published Temperature = 66 C Turbidity = 67 % ph = 10 to IBM Watson
Published Temperature = 58 C Turbidity = 87 % ph = 12 to IBM Watson
Published Temperature = 6 C Turbidity = 15 % ph = 13 to IBM Watson
Published Temperature = 85 C Turbidity = 21 % ph = 14 to IBM Watson
Published Temperature = 66 C Turbidity = 70 % ph = 9 to IBM Watson
Published Temperature = 19 C Turbidity = 91 % ph = 13 to IBM Watson
Published Temperature = 59 C Turbidity = 15 % ph = 6 to IBM Watson
Published Temperature = 86 C Turbidity = 18 % ph = 3 to IBM Watson
Published Temperature = 36 C Turbidity = 76 % ph = 14 to IBM Watson
Published Temperature = 50 C Turbidity = 89 % ph = 5 to IBM Watson
Published Temperature = 44 C Turbidity = 96 % ph = 0 to IBM Watson
Published Temperature = 32 C Turbidity = 68 % ph = 14 to IBM Watson
Published Temperature = 75 C Turbidity = 27 % ph = 4 to IBM Watson
Published Temperature = 91 C Turbidity = 49 % ph = 7 to IBM Watson
Published Temperature = 54 C Turbidity = 34 % ph = 2 to IBM Watson
Published Temperature = 4 C Turbidity = 65 % ph = 12 to IBM Watson
Published Temperature = 64 C Turbidity = 59 % ph = 14 to IBM Watson
Published Temperature = 87 C Turbidity = 27 % ph = 12 to IBM Watson
Published Temperature = 68 C Turbidity = 69 % ph = 0 to IBM Watson
Published Temperature = 48 C Turbidity = 44 % ph = 0 to IBM Watson
Published Temperature = 5 C Turbidity = 10 % ph = 11 to IBM Watson
Published Temperature = 82 C Turbidity = 68 % ph = 3 to IBM Watson
ibmiotpublishsubscribe.py - C:\Users\DELL\Downloads\ibmiotpublishsubscribe.py (3.7.0)
File Edit Format Run Options Window Help
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "uo60re"
deviceType = "AKASH"
deviceId = "1234"
authMethod = "token"
authToken = "12345678"
# Initialize GPIO
def myCommandCallback(cmd):
print("Command received: %s" % cmd.data['command'])
status=cmd.data['command']
if status=="lighton":
print ("led is on")
else :
print ("led is off")
#print(cmd)
try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
deviceCli = ibmiotf.device.Client(deviceOptions)
#.....
except Exception as e:
print("Caught exception connecting device: %s" % str(e))
sys.exit()
# Connect and send a datapoint "hello" with value "world" into the cloud as an eve
deviceCli.connect()
Ln: 21 Col: 17
Type here to search
29°C Haze
ENG
11:02
17-11-2022

MOBILE APP:

13.2 GIT-HUB LINK:

https://github.com/IBM-EPBL/IBM-Project-42091-1660649253

PROJECT DEMO LINK:

1. https://drive.google.com/drive/folders/1ljZ3sw8r6LSUFaeqen2B_GIW7pwdHQdW