

PROJECT REPORT

REAL-TIME RIVER QUALITY MONITORING AND CONTROL SYSTEM

TEAM ID:

PNT2022TMID15981

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1. INTRODUCTION :

1.1 Project overview:

Real-time river quality monitoring and control system : 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 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. Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Data collected at the apart site can be displayed in a visual format on a server PC with the help of Spark streaming analysis through Spark MLlib, Deep learning neural network models, Belief Rule Based (BRB) system and is also compared with standard values. If the acquired value is above the threshold value automated warning SMS alert will be sent to the agent. The uniqueness of our proposed paper is to obtain the water monitoring system with high frequency, high mobility, and low powered. Therefore, our proposed system will immensely help Bangladeshi populations to become conscious against contaminated water as well as to stop polluting the water.

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 :

A Wireless Sensor Network for River Water Quality Monitoring in India
This paper introduces a river water quality monitoring system based on wireless sensor network which helps in continuous and remote monitoring of the water quality data in India. The wireless sensor node in the system is designed for monitoring the pH of water, which is one of the main parameters that affect the quality of water.

2.2 Reference :

1) AUTHOR: J. Navarajan

DESCRIPTION: An Detection on water pollution and water management using smart sensors IOT to ensure the safe supply of drinking water the quality should be monitored in real time for that purpose new approach IOT (Internet of Things) based water quality monitoring has been proposed. This system consists some sensors. Which measure the water quality parameter such as pH, turbidity, conductivity, dissolved oxygen, temperature. The measured values from the sensors are processed by microcontroller and these processed values are transmitted remotely to the core controller that is raspberry pi using Zigbee protocol. Based on a study of existing water quality monitoring system and scenario of water we can say that proposed system is more suitable to monitor water quality parameters in real time. Based on a study of existing water quality monitoring system and scenario of water we can say that proposed system is more suitable to monitor water quality parameters in real time.

2) AUTHOR: Natasa Markovic

DESCRIPTION: A Sensor Web for River Water Pollution Monitoring and Alert System Sensor Web has provided infrastructure for collecting and processing data from distributed and heterogeneous sensors. This set of technologies has found various implementations, especially in the area of environmental monitoring. The Sensor Web architecture for crisis management, described in this paper, provides active monitoring of measuring parameters and timely responses in cases of environmental disasters. The River Water Management and Alert System built on this architecture enable access, control and management of river water pollution.

3) AUTHOR: K. A. UnnikrishnaMenon

DESCRIPTION: An Wireless Sensor Network for River Water Quality Monitoring in India This paper introduces a river water quality monitoring system based on wireless sensor network which helps in continuous and remote monitoring of the water quality data in India. The wireless sensor node in the system is designed for monitoring the pH of water, which is one of the main parameters that affect the quality of water. Wireless sensor Network which aids in River Water Quality Monitoring. This paper also proposes a novel technique for the design of a water quality sensor node which can be used for monitoring the pH of water.

4) AUTHOR: B. Aswinkumar

DESCRIPTION: This research paper focuses on Detection on water pollution and water management using smart sensors IOT. To ensure the safe supply of drinking water the quality should be monitored in real time for that purpose new approach IOT (Internet of Things) based water quality monitoring has been proposed. This system consists some sensors. Which measure the water quality parameter such as pH, turbidity, conductivity, dissolved oxygen, temperature. The measured values from the sensors are processed by microcontroller and these processed values are transmitted remotely to the core controller that is raspberry pi using Zigbee protocol. Based on a study of existing water quality monitoring system and scenario of water we can say that proposed system is more suitable to monitor water quality parameters in real time. Based on a study of existing water quality monitoring system and scenario of water we can say that proposed system is more suitable to monitor water quality parameters in real time.

5) AUTHOR: Leonid Stoimenovet

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disasters. The River Water Management and Alert System built on this architecture enable access, control and management of river water pollution.

6) AUTHOR: Alif Akbar Pranata, Jae Min Lee

DESCRIPTION: This paper investigates a real-time water quality monitoring system by using a proposed broker less publisher subscriber (pub/sub) architecture framework. On the system, sensors sense the water measurement metrics, including temperature, pH, and dissolved oxygen level. All collected data are stored in a database and computed stochastically for further analysis on water quality. A complementary experiment compares the proposed pub/sub architecture and MQTT, a lightweight protocol on which IoT mostly uses, to show better performance of the proposed architecture in case of network latency and throughput for diverse message payload size, thus suggesting the future IoT implementation of the system.

2.3 Problem Statement :

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..,)

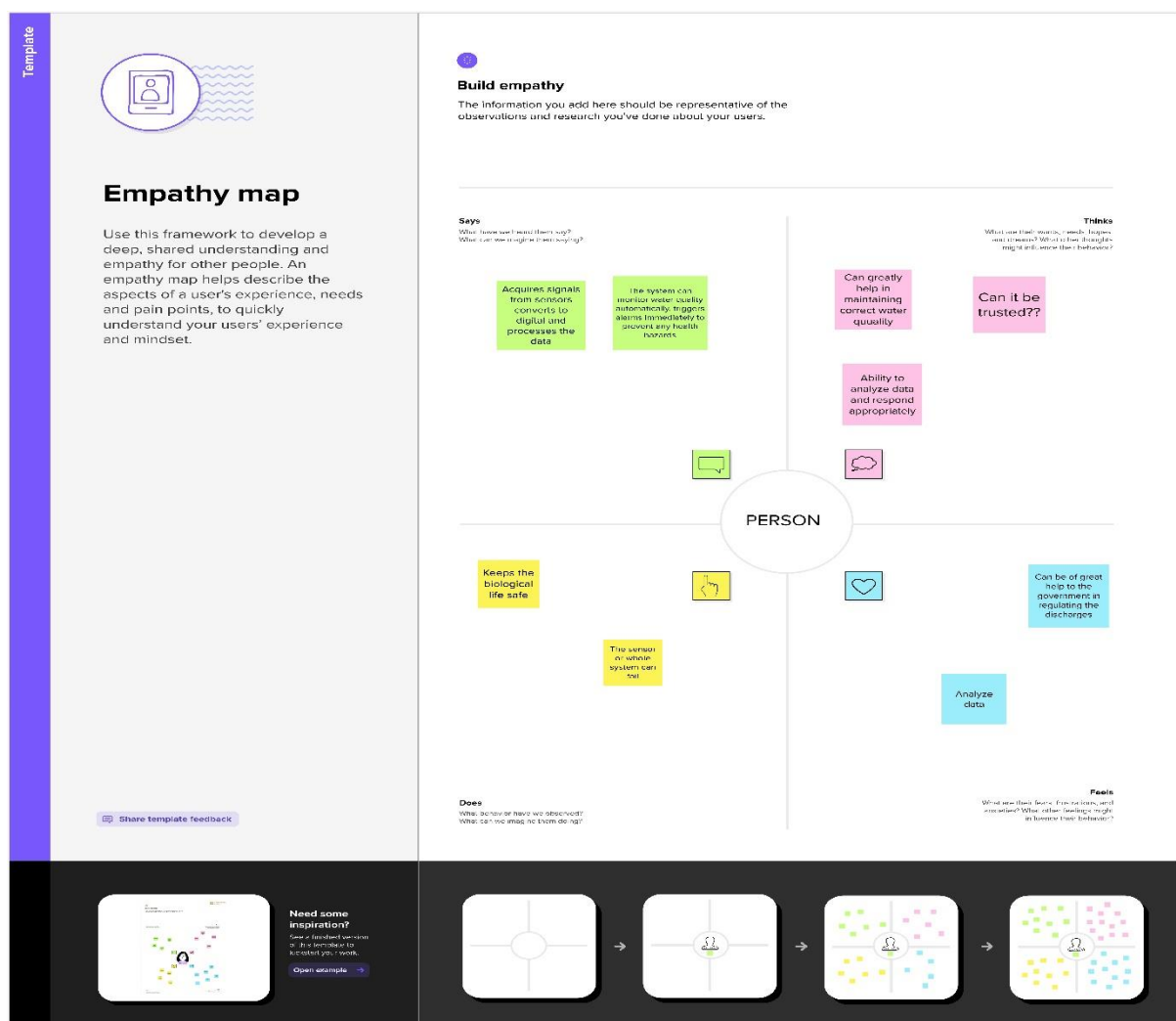
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	A Farmer	use river water for irrigation	i dont know the quality and level of the water	i dont know how to measure the quality of the water	frustrated
PS-2	An Industrialist	use river water for drinks manufcuring	i dont know the pH level of river water	we can't use water with acidic nature for cool drinks manufacturing	indecisive



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 help 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.

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

Template



Brainstorm & idea prioritization

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

⌚ 10 minutes to prepare
🕒 1 hour to collaborate
👥 2-8 people recommended

[Share template feedback](#)

➡

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

⌚ 10 minutes

A

Team gathering

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B

Set the goal

Think about the problem you'll be focusing on solving in the brainstorming session.

C

Learn how to use the facilitation tools

Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#) ➡

MEMBERS OF IDEATION PHASE :

TEAM LEADER: SARAVANA KUMAR D

TEAM MEMBERS: SANTHOSH K M
SANTHOSH KUMAR K
SARAVANAN S

DISCUSSION TOPIC:
Ideas for monitoring and solving the contaminated river water near agriculture fields

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


How might we [your problem statement]?

PROBLEM STATEMENT


Farmers put fertilizers and pesticides on their crop so that they grow better but these fertilizers and pesticides can be washed through the soil by rain to end up in the rivers.



If the large amount of fertilizers or the farm waste drain into river the concentration of nitrate and phosphate in the water increases considerably algae uses these substances to grow and multiply rapidly turning the water green.



The massive growth of algae called Eutrophication that leads to pollution. When the algae die they broken down by the action of bacteria which quickly multiply using up all the oxygen in the water which leads to the death of many animal.



Step-2: Brainstorm, Idea Listing and Grouping :

12

2

Brainstorm

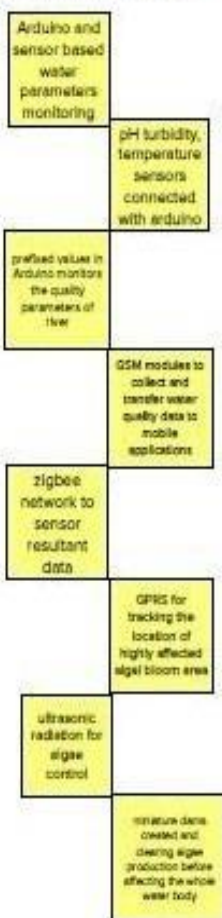
Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil (switch to sketch) icon to start drawing!

SARAVANA KUMAR D



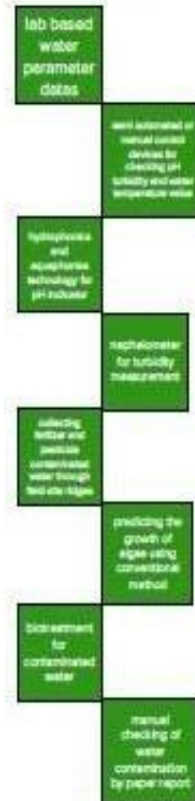
SANTHOSH K M



SANTHOSH KUMAR K



SARAVANAN S



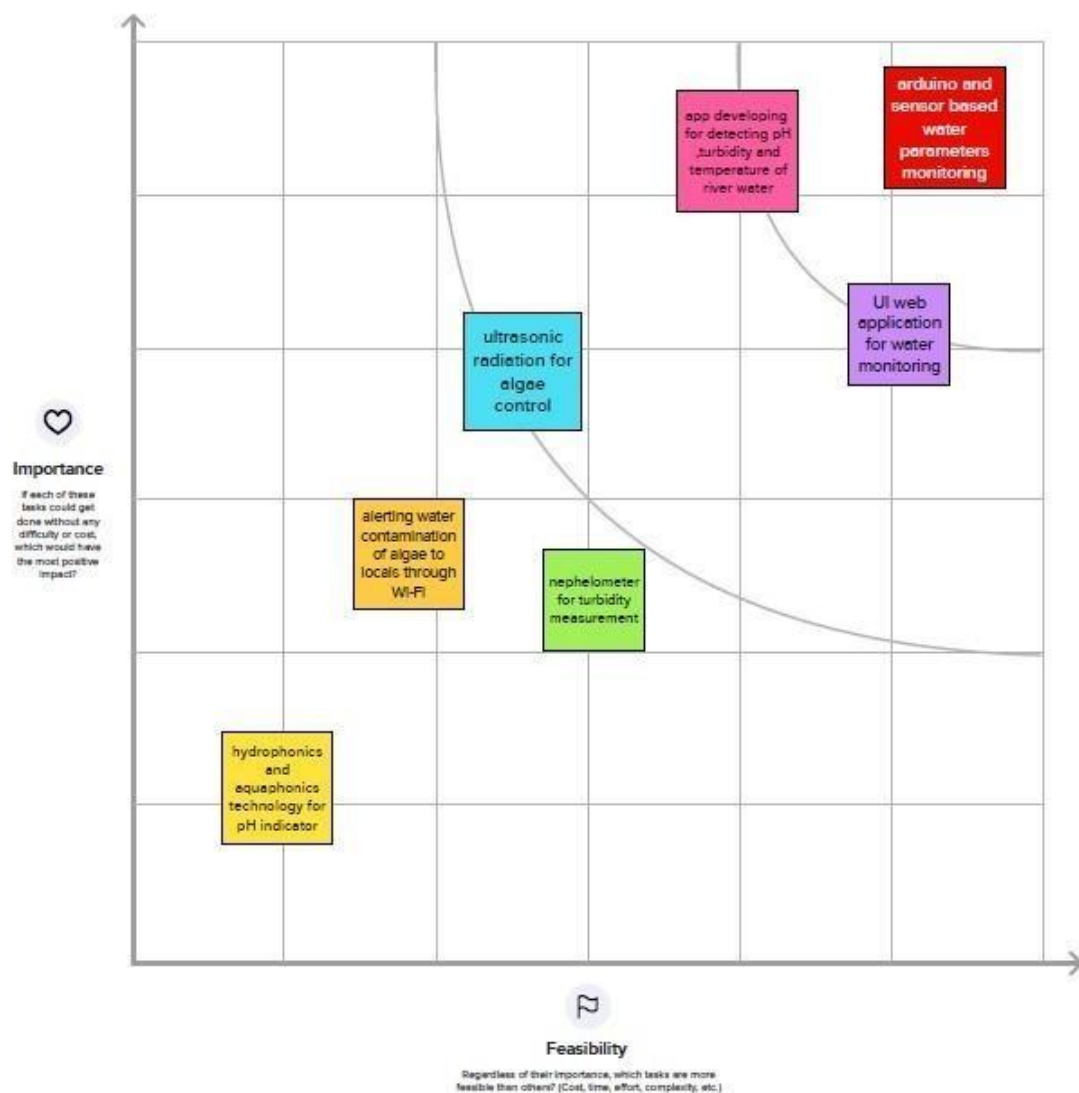
Step-3: Idea Prioritization :

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

⌚ 20 minutes



3.3 Proposed Solution :

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Massive growth of algae called eutrophication leads to pollution (monitoring and controlling the quality of river water)
2.	Idea / Solution description	Detecting the dust particles , PH level of water,Dissolved oxygen and temperature to be monitored and altering the authorities if water quality is not good.
3.	Novelty / Uniqueness	River water quality can be monitored by web application. Quality parameter will track continuously with standard measurements.
4.	Social Impact / Customer Satisfaction	Localities will not get suffered by poor quality of water by alerting them when the water quality is not good.
5.	Business Model (Revenue Model)	Water quality monitoring system by aeron systemsfor industrial water treatment plant, river bodies, aqua forming , digital loggers.
6.	Scalability of the Solution	Measuring of real time values and continuous monitoring helps in maintaining the quality ofwater.

3.4 Problem Solution fit :

Project Title: Real-Time River Water Quality Monitoring and Control System

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMD15981

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) <small>Who is your customer? i.e. working parents of 0-5 y.o. kids</small> CS	6. CUSTOMER CONSTRAINTS <small>What constraints prevent your customers from taking action or limit their choices of solutions? (i.e. spending power, budget, no cash, network connection, available devices)</small> CC	5. AVAILABLE SOLUTIONS <small>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? (i.e. pen and paper is an alternative to digital)</small> AS	Explore AS, differentiate
	People living in rural areas near to the river, who uses river water.	Water quality monitoring system is used for identify the water pollution on specific area. People may find it hard to recover if any fault occurs, this system prevent people from water pollution.	Individual notification to each people could be sent, it is not possible. this system will still notify the corporation and they can further notify the people to aware.	
Focus on J&P, tap into BE, understand RC	2. JOBS-TO-BE-DONE / PROBLEMS <small>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one, explore different sides.</small> J&P	9. PROBLEM ROOT CAUSE <small>What is the real reason that this problem exists? What is the back story behind the need to do this job? (i.e. customers have to do it because of the change in regulations)</small> RC	7. BEHAVIOUR <small>What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</small> BE	Focus on J&P, tap into BE, understand RC
	The river water quality monitoring system that checks periodically, the dust particles, temperature and PH level and gave notifies for the public when the water quality varies	We know that the sensor are expensive and the system needs more than one sensors to work, these sensors are used periodically to check the quality of water and if any problem, need to be replace frequently.	The customer could use the user guide provided to overcome the problem or else they can report and contact the corporation. They will take care of the problem.	

3. TRIGGERS <small>What triggers customers to act? (i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news)</small> TR	10. YOUR SOLUTION <small>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</small> SL	8. CHANNELS OF BEHAVIOUR 8.1 ONLINE <small>What kind of actions do customers take online? Extract online channels from #7</small> 8.2 OFFLINE <small>What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</small> CH
River water quality analysis work by Checking the river water quality for providing clean drinking water for the people, farming, promoting aquaculture, and other industries. It is the best replacement for checking water quality in laboratories. The best quality is that it is user-friendly.	This technology can automatically monitor the water quality. The water detection sensor has a unique advantage. It consumes less time than a manual method for checking polluted levels. Information is sent at in faster rate to authorities and action can be taken immediately affected rate of pollution is reduced	ONLINE: <ul style="list-style-type: none"> Public may provide review and rating for the system. The software used should be properly studied by everyone to operate it. The software and hardware connections should be given properly
4. EMOTIONS: BEFORE / AFTER <small>How do customers feel when they face a problem or a job and afterwards? (i.e. lost, associate > confident, in control - use it in your communication strategy & design)</small> EM		
BEFORE: <ul style="list-style-type: none"> Before implementing this project people feel it was difficult to enjoy boating, fishing, and provision safe drinking. They also face major problems in the development of industrial, hydroelectric, and agricultural water requirements. AFTER: <ul style="list-style-type: none"> After implementing this project people can be able to face all these above-mentioned problems easily. 		

4. REQUIREMENT ANALYSIS :

4.1 Functional requirement :

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 Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Ph level detection	Ph sensor is used to monitor the water quality and the signals are send to Arduino.
FR-4	Turbidity detection	Turbidity sensor TS-300B measures the turbidity (counter of suspended matter) in the wash water and the signals are send to Arduino.
FR-5	Ultrasonic generator	Waves generated at regular interval times to clear algae 25% ,50%, 100%

4.2 Non-Functional requirements :

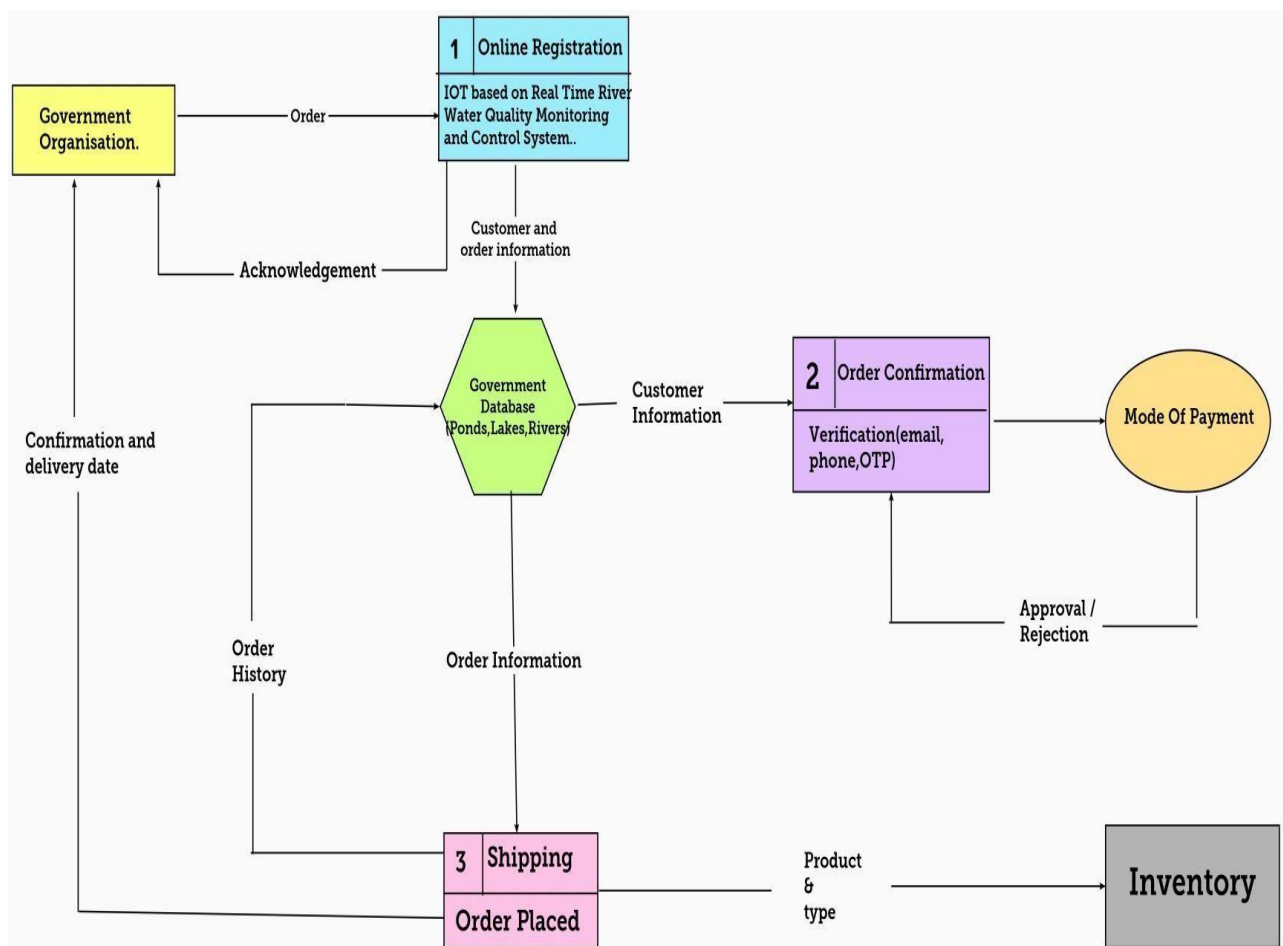
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Efficient to use and has simple monitoring system.
NFR-2	Security	Mobile application is secured with firewalls protection.
NFR-3	Reliability	Real time sensor output values with future predicted data storage.98% efficient monitoring output . Assurance for aquaculture safety.
NFR-4	Performance	Greater performance and environmental safe model.
NFR-5	Availability	In 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	It is highly stable .
NFR-8	Efficiency	It is highly efficient and it has simple monitoring system .

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 :

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 riversides.
- ✓ 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 from the various sensor placed in the river sides.	ESP32Wifi modul eRaspberry 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 monitored via placing sensors in rivers.	PH-sensor
2.	Air Quality Monitoring	The clarity and purity of river 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

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 email, password, and confirming my password.	They can access my account/dashboard	HIGH	SPRINT-1
		USN-2	As a user, I will receive a confirmation email once I have registered for the application	They can receive e confirmation email & click confirm	HIGH	SPRINT-2
		USN-3	As a user, I can register for the application through Google	They can register & access the dashboard with Google	HIGH	SPRINT-1
		USN-4	As a user, I can register for the application through Gmail	They can register through the mail.	MEDIUM	SPRINT-2
	Login	USN-5	As a user, I can log into the application by entering email, password & captcha	They can receive login credentials.	HIGH	SPRINT-1
	Interface	USN-6	As a user, the interface should be user-friendly manner	They can able to access easily.	MEDIUM	SPRINT-1
Customer (Web user)	Dashboard	USN-7	As a user, I can access the specific info(ph value, temp, humidity, quality).	They can able to know the quality of the water	HIGH	SPRINT-1
Customer (input)	View manner	USN-8	As a user, I can view data in visual representation manner(graph)	They can easily understand by visuals.	HIGH	SPRINT-1
	Taste	USN-9	As a user , I can able to view the quality(salty) of the water	They can easily know whether it is salty or not	HIGH	SPRINT-1
	Colour visibility	USN-10	As a user , I can able predict the water colour	Thry can easily know the condition by colour	HIGH	SPRINT-1
Administrator	Risk tolerant	USN-11	An administrator who Is handling the system should update and take care of the application	Admin should monitor the records properly.	MEDIUM	SPRINT-3

6. PROJECT PLANNING & SCHEDULING :

6.1 Sprint Planning & Estimation :

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.	06 OCTOBER 2022
Empathy Map	Prepared Empathy Map Canvas to combine thoughts and pains, gains of the project with all team members .	08 OCTOBER 2022
Ideation	Brainstorming session is conducted with all team members to list out all the ideas and prioritise the top 3 ideas.	09 OCTOBER 2022
Proposed Solution	Prepared the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	28 OCTOBER 2022
Problem Solution Fit	Prepared problem solution fit document.	30 OCTOBER 2022

6.2 Sprint Delivery Schedule :

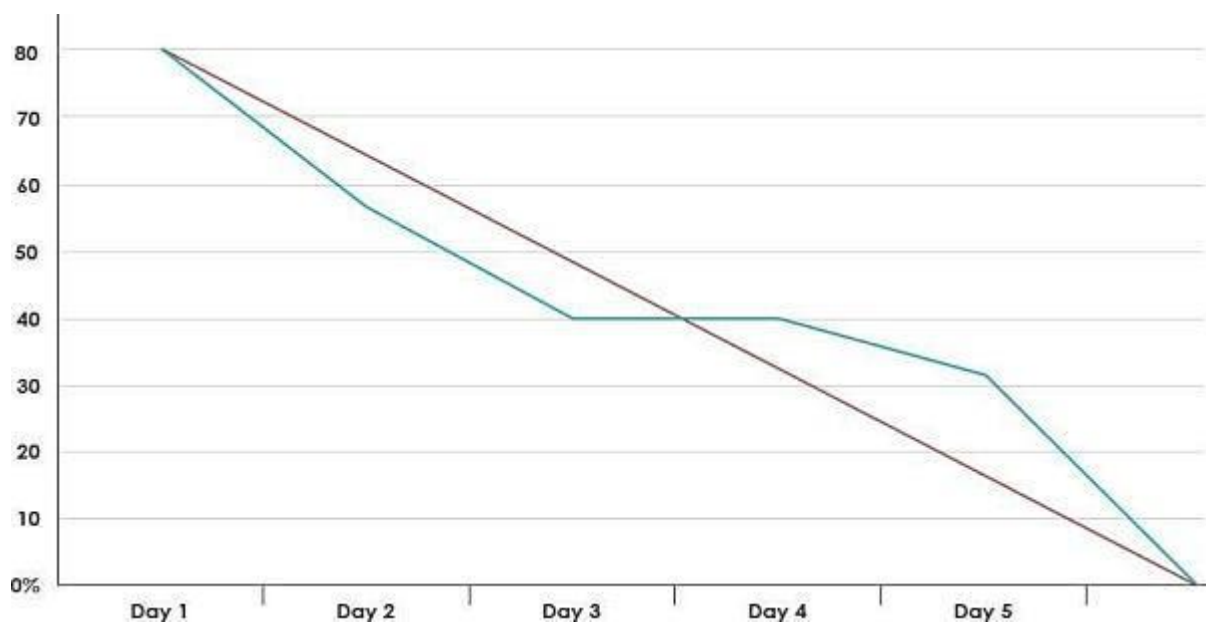
Product Backlog, Sprint Schedule, and Estimation

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:

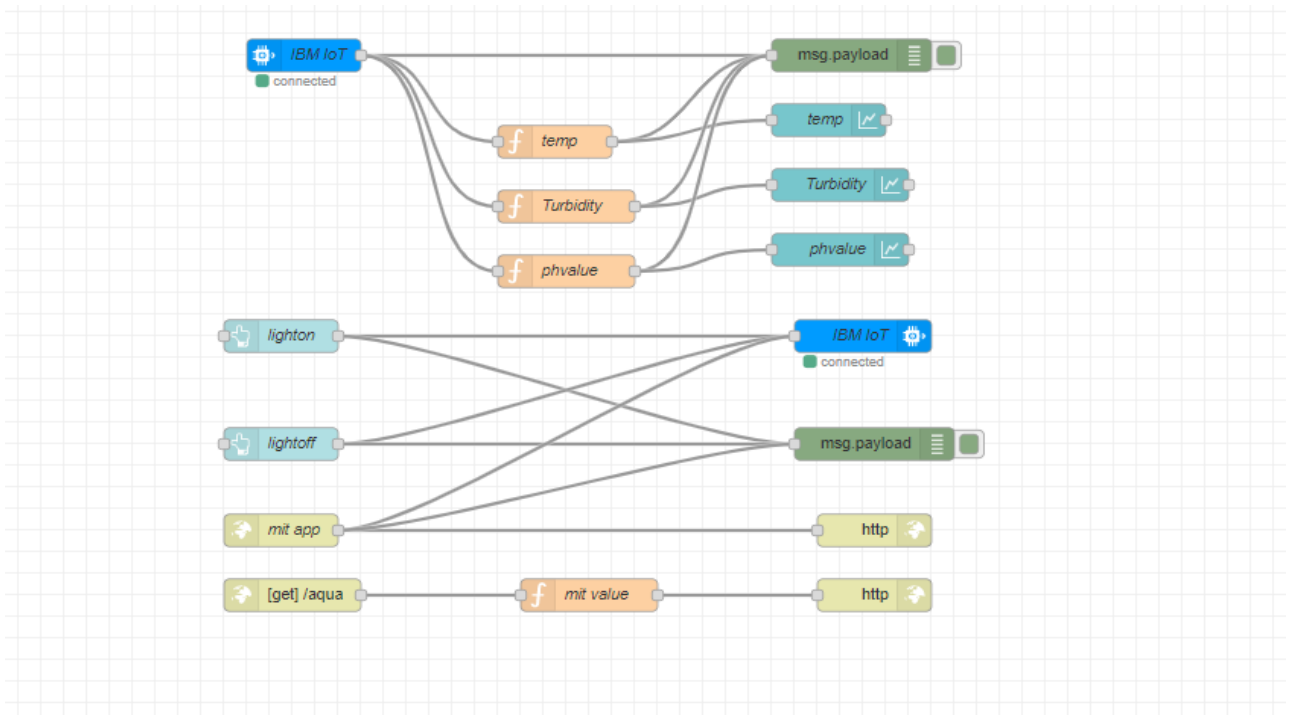
$$AV = \frac{\text{sprint duration}}{\text{velocity}} = \frac{20}{10} = 2$$

BURNDOWN CHART :

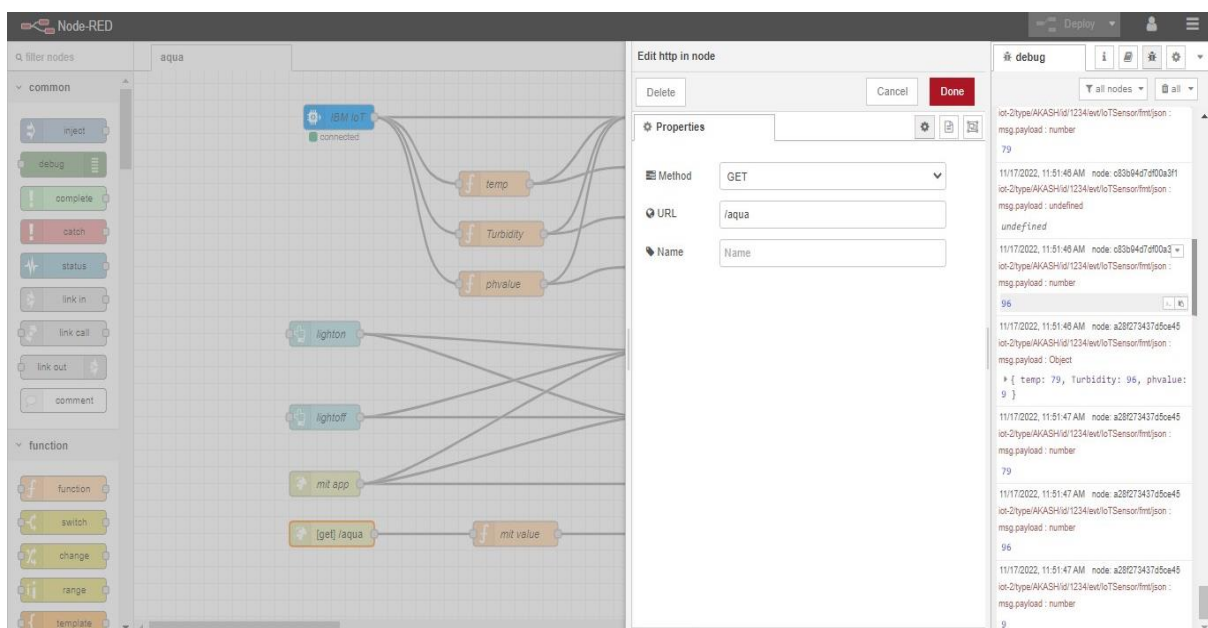


7. CODING AND SOLUTIONING :

7.1 Feature 1:



7.2 Feature 2:



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 :

✓ 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).

✓ 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 Performance Metrics :

			NFT - Risk Assessment						
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volumen 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.

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 willbe used for farming purpose to check quality water, temperature and PHlevel. Our Impact of this project is also create a social satisfaction for farmers too. The scalability 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 :

PYTHON CODE TO PUBLISH DATA :

```
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, "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 successful
ly: 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
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    else :
        print ("led is off")

    #print(cmd)

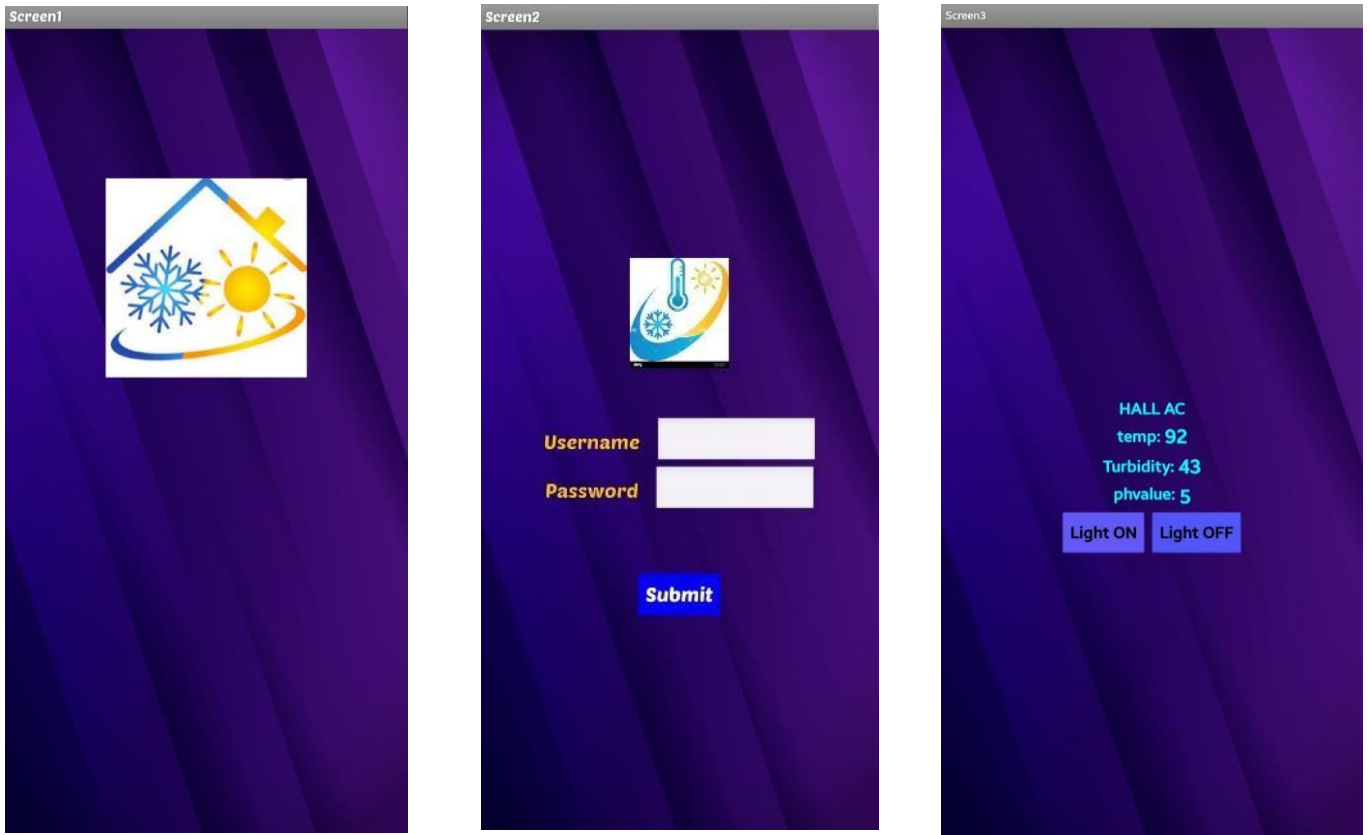
try:
    deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
deviceCli = ibmiotf.device.Client(deviceOptions)
#.....

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
```

MOBILE APP:



GITHUB LINK :

[IBM-EPBL/IBM-Project-12166-1659439253: Real-Time River Water Quality Monitoring and Control System \(github.com\)](https://github.com/IBM-EPBL/IBM-Project-12166-1659439253)

PROJECT DEMO LINK :

[Folder - Google Drive](#)