REAL-TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM

A PROJECT REPORT

Submitted by **PNT2022TMID05994**

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It was a great learning experience. We would like to take this opportunity to express our gratitude.

DATE:

18/11/2022

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CONTENT

1. INTRODUCTION

The environment around consists of five key elements e.g., soil, water, climate, natural vegetation, and landforms. Among these water is the utmost crucial element for human life. It is also vital for the persistence of other living habitats [1]. Whether it is used for drinking, domestic use, and food production or recreational purposes, safe and readily available water is the need for public health [2]. So it is highly imperative for us to maintain water quality balance. Otherwise, it would severely damage the health of the humans and at the same time affect the ecological balance among other species [3]. Water pollution is a foremost global problem which needs ongoing evaluation and adaptation of water resource directorial principle at the levels of international down to individual wells. It has been studied that water pollution is the leading cause of mortalities and diseases worldwide. The records show that more than 14,000 people die daily worldwide due to water pollution. In many developing countries, dirty or contaminated water is being used for drinking without any proper prior treatment. One of the reasons for this happening is the ignorance of public and administration and the lack of water quality monitoring system which makes serious health issues [3, 4]. In this project, we depict the design of IBM cloud app (IBM app) [4-7] that assists to monitor the quality of water with the support of information sensed by the sensors dipped in water. Using different sensors, this system can collect various parameters from water, such as pH, dissolved oxygen, turbidity, conductivity, temperature, and so on. The rapid development of IBM app technology provides a novel approach to real-time data acquisition, transmission, and processing. The clients can get ongoing water quality information from far away. Now a day's Internet of

things (IoT) is an innovative technological phenomenon. It is shaping today's world and is used in different fields for collecting, monitoring and analysis of data from remote locations. IoT integrated network if everywhere starting from smart cities, smart power grids, and smart supply chain to smart wearable [7- 12]. Though IoT is still under applied in the field of environment it has huge potential. It can be applied to detect forest fire and early earthquake, reduce air population, monitor snow level, prevent landslide, and avalanche etc. Moreover, it can be implemented in the field of water quality monitoring and controlling system [4, 13]. Water quality monitoring has gained more interest among researchers in this twenty-first century. Numerous works are either done or ongoing in this topic focusing on various aspects of it. The key theme of all the projects was to develop an efficient, cost-effective, real-time water quality monitoring system which will integrate IBM cloud app and internet of things [14].

2. Related works

To design a good quality model, we reviewed different existing system developed by researchers. Different authors have proposed distinguished models to check water quality by analyzing the parameters such as temperature, pH and conductivity, and so on. By considering all these points, we designed a smart water monitoring system which can perform all these monitoring functions. Stephen Brosnan investigated a WSN to collect real time water quality parameters (WQP). Quio Tie-Zhn, developed online water quality monitoring system based on GPRS/GSM [15]. The information was sent by means of GPRS network, which helped to check remotely the WQP. Kamal Alameh presented web based WSN for monitoring water pollution using ZigBee and WiMAX networks. The system collected, processed measured data from sensors, and directed through ZigBee gateway to the web server by means of WiMAX network to monitor quality of water from large distances in real time. Dong He developed WQM system based on WSN [14]. The remote sensor was based on ZigBee network. WSN tested WQP and sent data to Internet using GPRS. With the help of Web, information was gathered at remote server. Vijayakumar et al., designed a low cost system design for real time water quality monitoring in IoT utilizes sensors to check many important physical and chemical parameters of water [16]. The parameters such as turbidity, temperature, pH, dissolved oxygen conductivity of water can be measured. In our project, we proposed a water quality monitoring system based on IoT.

Central Water Commission (CWC) monitors water quality, by collecting samples from representative locations within the processing & distribution system. These samples are analyzed at the well-equipped laboratories. At these laboratories samples from raw water, filter water and treated water are taken for analysis. The estimation of water parameters like turbidity, pH, dissolved oxygen, etc. is done with the help of meters. So the disadvantages of this existing system are that; there is no continuous and remote monitoring, human resource is required, less reliable, no monitoring at the source of waters i.e. no on field monitoring and the frequency of testing is very low. Due to these disadvantages of the existing system it is required to develop a system that will allow real time and continuous monitoring of water quality. Thus various advanced technologies for monitoring water quality have been proposed in the recent years. In the structure of the wireless sensor networking in which a number of sensor nodes are located in a lake is proposed. A much smaller number of UAVs also watch the lake and they are controlled by the central monitoring station (CMS). The sensor nodes and UAVs are both movable whereas the CMS is fixed. The CMS collects the information from the sensors and process them. In a framework for monitoring water quality by incorporating bacterial contamination of water for open water bodies using WSN (consisting of sensors for sensing parameters of interest), UV Light to probe the contamination of water and Fluorescence as a monitoring tool is proposed. Presents a web based wireless sensor network, for monitoring water pollution by means of Zigbee and WiMax technologies. This system would have a local Zigbee network that will be capable of measuring various water quality parameters, a WiMax network and web based monitoring with the help of a controlling computer. The system is intended to collect and process information, thus making decisions in real time via a remote web server. The data is directed through the Zigbee gateway from sensor nodes to the web server by means of a WiMax network, thus permitting users to distantly monitor the water quality from their place instead of gathering data from the scene. Experimental results reveals that the system is capable of monitoring water pollution in real time.

References

1.C. Pradinaud et al., "Defining freshwater as a natural resource: a framework linking water

use to the area of protection natural resources", *The international journal of life cycle assessment*, vol. 24, no. 5, pp. 960-974, 2019.

2.S. S. Ray and A. Ray, "Major ground water development issues in south asia: an overview" in Ground Water Development-Issues and Sustainable Solutions, Springer, pp. 3-11, 2019.

3.G. Ofosu, A. Dittmann, D. Sarpong and D. Botchie, "Socio-economic and environmental implications of Artisanal and Small-scale Mining (ASM) on agriculture and livelihoods", *Environmental Science & Policy*, vol. 106, pp. 210-220, 2020.

4.G. W. Y. BOOK and N. Delhi, "Central Ground Water Board", 2020.

5.R. Srinivas, A. P. Singh, K. Dhadse and C. Garg, "An evidence based integrated watershed modelling system to assess the impact of non-point source pollution in the riverine ecosystem", *Journal of Cleaner Production*, vol. 246, pp. 118963, 2020.

6.G. G. Haile, Q. Tang, S. Sun, Z. Huang, X. Zhang and X. Liu, "Droughts in East Africa: Causes impacts and resilience", *Earth-science reviews*, vol. 193, pp. 146-161, 2019.

7.X. Zhang et al., "Urban drought challenge to 2030 sustainable development goals", *Science of the Total Environment*, vol. 693, pp. 133536, 2019.

8.S. L. Fong, A. A. A. b. A. Bakar, F. Y. Ahmed and A. Jamal, "Smart Transportation System Using RFID", *Proceedings of the 2019 8th International Conference on Software and Computer Applications*, pp. 579-584, 2019.

9.H. Razalli, M. H. Alkawaz and A. S. Suhemi, "Smart IOT Surveillance Multi-Camera Monitoring System", *2019 IEEE 7th Conference on Systems Process and Control (ICSPC)*, pp. 167-171, 2019.

10.A. A. Hapsari, A. I. Hajamydeen, D. J. Vresdian, M. Manfaluthy, L. Prameswono and E. Yusuf, "Real Time Indoor Air Quality Monitoring System Based on IoT using MQTT and Wireless Sensor Network", *2019 IEEE 6th International Conference on Engineering Technologies and Applied Sciences (ICETAS)*, pp. 1-7, 2019.

11.M. Besbes, J. Chahed and A. Hamdane, "Water Demand Management and Non Conventional Resources" in National Water Security:, Springer, pp. 125-147, 2019.

12.P. H. Gleick, Dirty-water: estimated deaths from water-related diseases 2000-2020, Citeseer, 2002.

13.S. D. Richardson and S. Y. Kimura, "Emerging environmental contaminants: Challenges facing our next generation and potential engineering solutions", *Environmental Technology & Innovation*, vol. 8, pp. 40-56, 2017.

14.B. Cox, "A review of dissolved oxygen modelling techniques for lowland rivers", *Science of the Total Environment*, vol. 314, pp. 303-334, 2003.

15.S. Munusamy, S. N. S. Al-Humairi and M. I. Abdullah, "Automatic Irrigation System: Design and Implementation", *2021 IEEE 11th IEEE Symposium on Computer Applications & Industrial Electronics (ISCAIE)*, pp. 256-260, 2021.

16.S. N. S. Al-Humairi, D. R. T. Ravindran, M. I. Abdullah, B. Hamzah and M. H. Alkawaz, "Intelligent Monitoring System for Oil Well Efficiency", *2020 16th IEEE International Colloquium on Signal Processing & Its Applications (CSPA)*, pp. 13-17, 2020.

17.J. Fick, R. H. Lindberg, J. Parkkonen, B. r. Arvidsson, M. Tysklind and D. J. Larsson, "Therapeutic levels of levonorgestrel detected in blood plasma of fish: results from screening rainbow trout exposed to treated sewage effluents", *Environmental science & technology*, vol. 44, no. 7, pp. 2661-2666, 2010.

18.A. F. Horn, N. S. Nielsen and C. Jacobsen, "Iron-mediated lipid oxidation in 70% fish oil-in-water emulsions: effect of emulsifier type and pH", *International journal of food science & technology*, vol. 47, no. 5, pp. 1097-1108, 2012.

19.M. H. Wilson et al., "CO 2 recycling using microalgae for the production of fuels", *Applied Petrochemical Research*, vol. 4, no. 1, pp. 41-53, 2014.

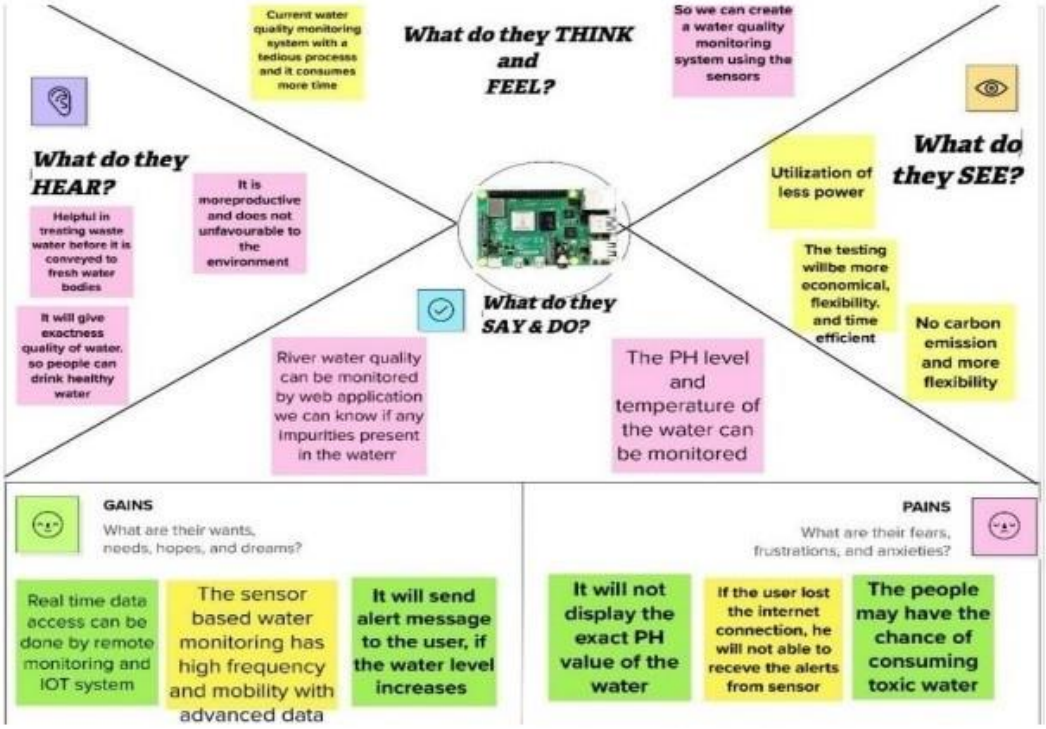
20.J. C. Davis, "Minimal dissolved oxygen requirements of aquatic life with emphasis on Canadian

species: a review", *Journal of the Fisheries Board of Canada*, vol. 32, no. 12, pp. 2295-2332, 1975.

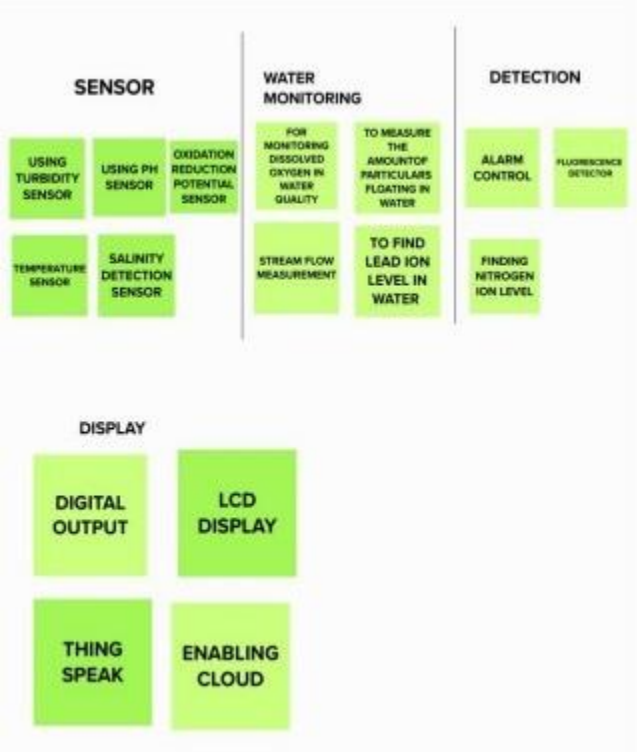
1. IDEATION & PROPOSED SOLUTION

Empathy Map Canvas

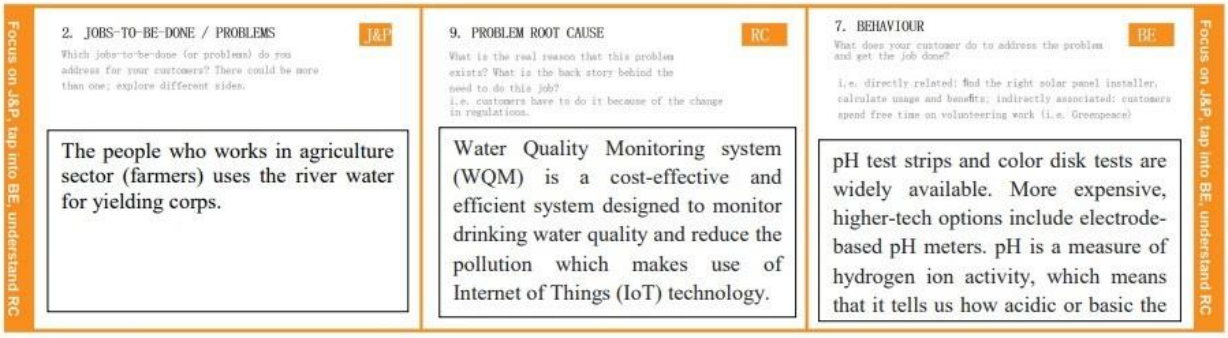
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise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

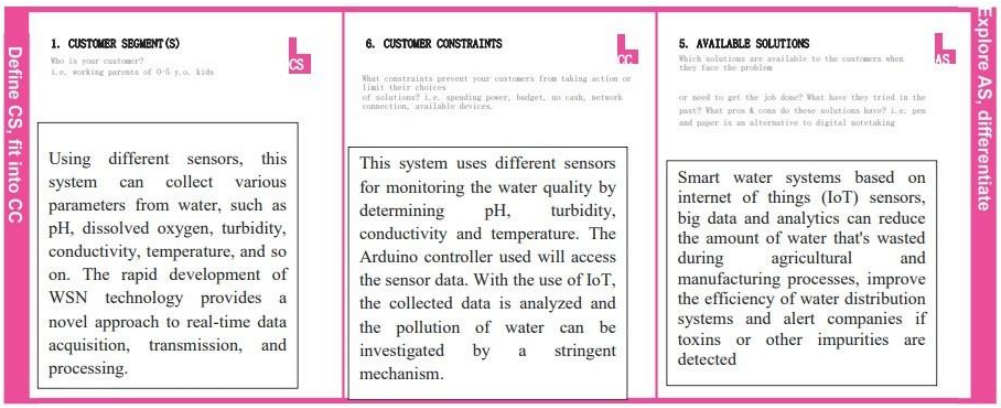


Ideation & Brainstorming



Proposed Solution





The main aim is to develop a system for continuous monitoring of river water quality at remote places using wireless sensor networks with low power consumption, low-cost and high detection accuracy. pH, conductivity, turbidity level, etc. are the limits that are analyzed to improve the water quality. Following are the aims of idea implementation

(a) To measure water parameters such as pH, dissolved oxygen, turbidity, conductivity, etc. using available sensors at a remote place.

(b) To assemble data from various sensor nodes and send it to the base station by the wireless channel.

(c) To simulate and evaluate quality parameters for quality control.

(d) To send SMS to an authorized person routinely when water quality detected does not match the preset standards, so that, necessary actions can be taken.

The detailed scheme of a water quality monitoring system is shown in Figure 1

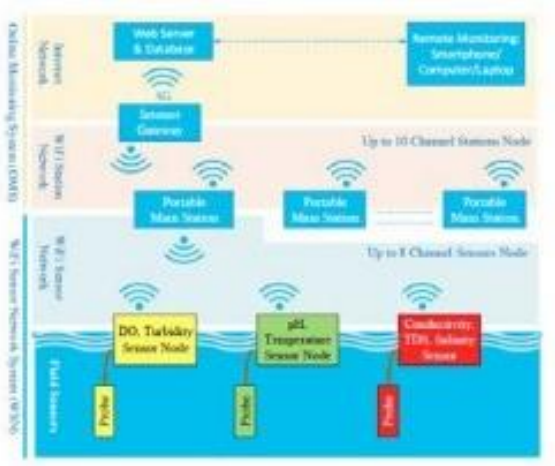


Fig. 1. Full scheme of the system. In the proposed architecture, each water reservoir will be attached with a sensor node equipped with a set of sensor probes capable of measuring the parameters like pH, turbidity etc. According to the specifications of the sensor probes and the processor board of the sensor the signal conditioning circuit will be designed to generate the sensor output to the processor board through Analog to Digital Converter. The processor board processes the data according to the quality specifications and transmits to the central server through the transceiver. The measured data in each of the reservoir shall be sent to the central server through the respective

transceivers either directly or indirectly through other sensor or repeater nodes

Problem Solution fit

S.NO	Parameter	Description
1	**Problem Statement (Problem to be solved)**	**Due to population growth,urbanization,and climatic change,competition for waterresources is expected to increase,with a particular impact on agriculture,river water.**
2	**Idea / Solution description**	**To monitor the water supply we implement IoT (Internet of Things)setup, for river water quality monitoring systems periodically checks,dust particles,temperature and PH level by sensors and notifies for public when the water quality vaires.**
3	**Novelty / Uniqueness**	**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.**

4	**Social Impact / Customer Satisfaction**	**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.**
5	**Business Model (Revenue Model)**	**It costs low compared to other model.Our real time quality monitoring model has sensors easily helps to monitor and predict the affected water scale easily in farming, drinking water,aquaculture,and other industries.It notifies by sending directly to the corporation and they can further notify the people to aware immediately.Quick actions can be taken.With the help of efficient use of mobile network,IoT and continuous monitoring it will be revolutionized model.**

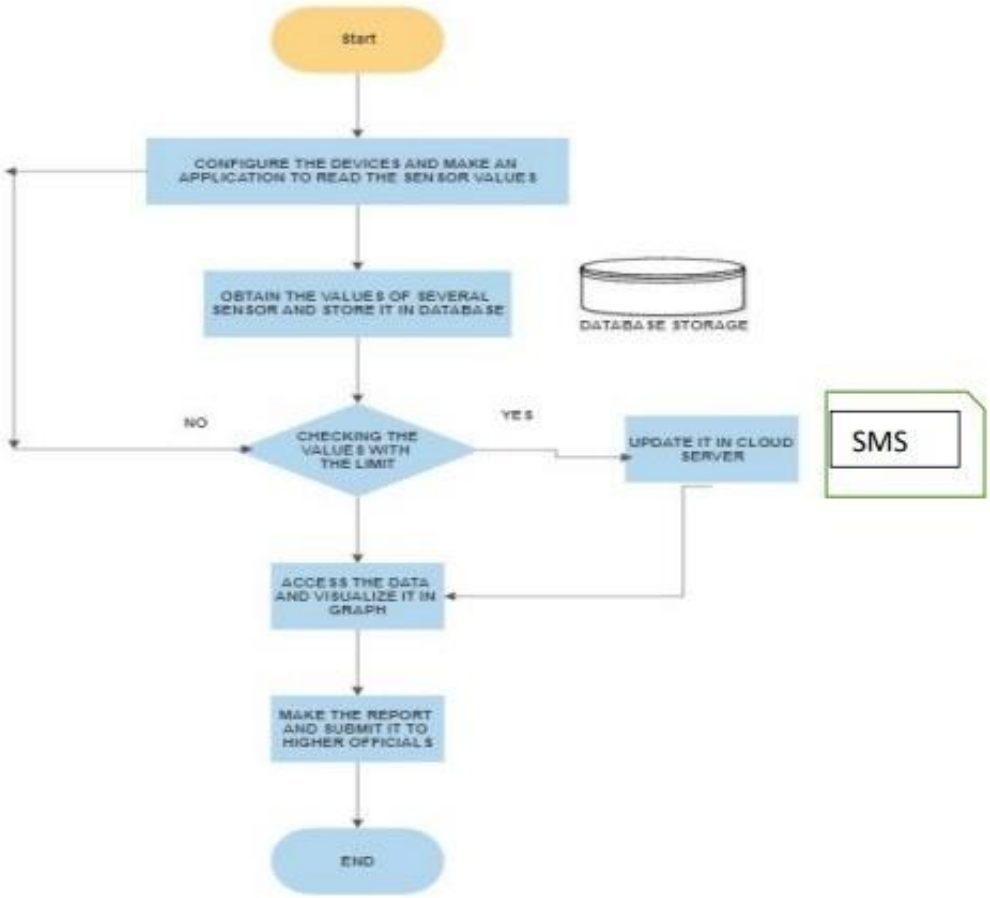
6	**Scalability of the Solution**	**Checking the river water quality for providing clean drinking water for the people, farming, promoting aquaculture, and other industries. It is the best replacement for checking water quality in laboratories and it is user-friendly.If we add more advanced sensors in future it can be used to monitor multiple levels in water.It will show continuous real time values in maintaining the quality of water.**

1. **REQUIREMENT ANALYSIS**

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**	**MySQL-Oracle**
3	**File Storage**	**File storage require**	**IBM Block Storage or Other Storage Service or Local Filesyst**
4	**Cloud Database**	**Database Service**	**IBM cloud**
5	**Data Storage**	**File storage requirements**	**IBM Block Storage**

PROJECT DESIGN

Data Flow Diagrams



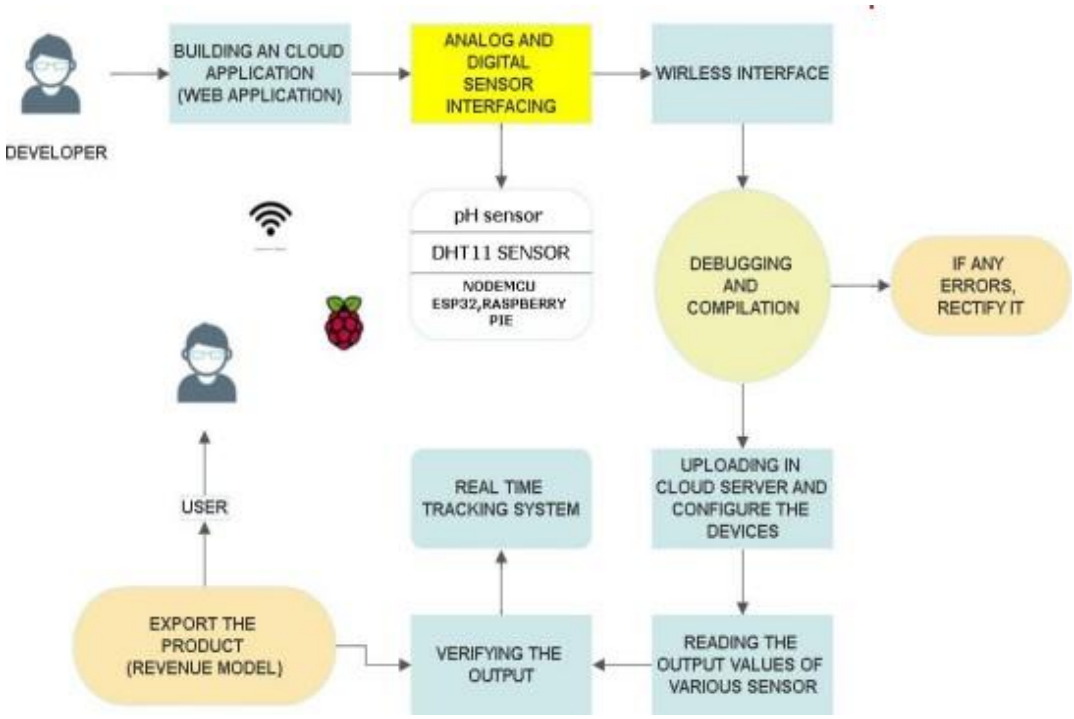
Solution & Technical Architecture

Solution 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 thesoftware to project stakeholders. Define features, development phases, and solution requirements. Provide specifications according to which the solution is defined, managed, and delivered.

Solution Architecture Diagram



PROJECT 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	BASKAR T, ANAND M, HARIHARAN M, KARTHICK M
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	BASKAR T, ANAND M, HARIHARAN M, KARTHICK M
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	BASKAR T, ANAND M, HARIHARAN M, KARTHICK M
Sprint-1	Login	USN-5	As a user, I can log into the application by Entering email & password	1	High	BASKAR T, ANAND M, HARIHARAN M, KARTHICK M

Project Tracker, Velocity & Burndown Charts :

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	27 Oct 2022
Sprint-2	20	6 Days	28 Oct 2022	04 Nov 2022	30	30 Oct 2022
Sprint-3	20	6 Days	03 Nov 2022	10 Nov 2022	49	04 Nov 2022
Sprint-4	20	6 Days	08 Nov 2022	15 Nov 2022	50	09 Nov 2022

CODING & SOLUTIONING

ibmpublish.py - E:\IBM PROJECTS\ibmpublish.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 = "84708c"
deviceType = "abcd"
deviceId = "12345"
authMethod = "token"
authToken = "12345678"
def myCommandCallback (cmd):
    print ("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="lighton":
        print ("led is on")
    elif status == "lightoff":
        print ("led is off")
    else:
        print ("please send proper command")
try:
        deviceOptions = {"org": organization, "type": deviceType, "id": deviceId
        deviceCli= ibmiotf.device.Client (deviceOptions)


#..
except Exception as e:
        print ("Caught evention connecting devica: %s" % str(e))
        sys.exit()

deviceCli.connect()
while True:
    temp=random.randint (90,110)
    Humid=random.randint (60,100)
    data = {'temp' : temp, 'Humid': Humid }
    def myonPublishCallback():
        print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % Humid
    success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publis
    if not success:
        print("Not connected to IOTF")
        time.sleep (10)
        deviceCli.commandCallback = myCommandCallback
deviceCli.disconnect()
```

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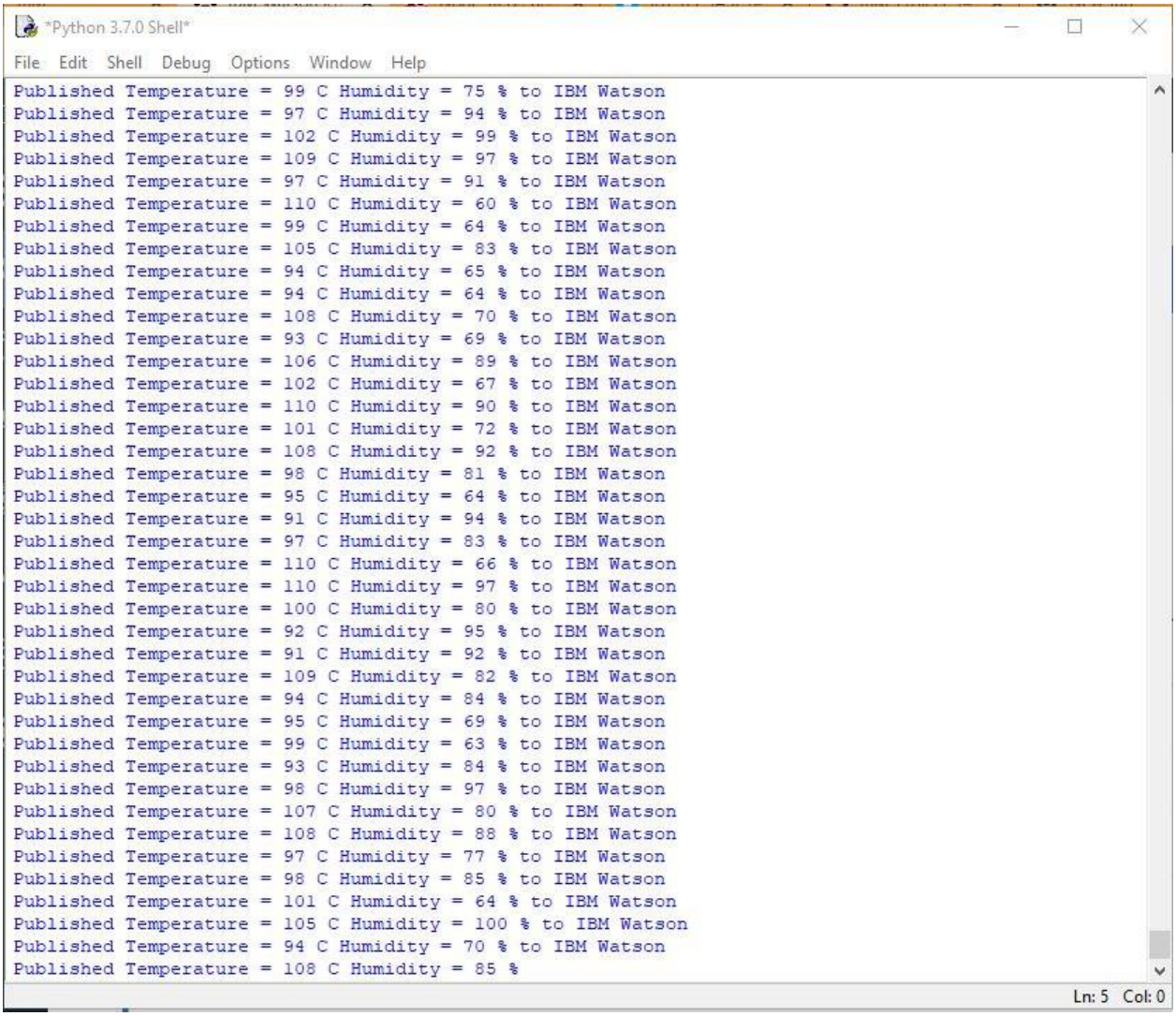
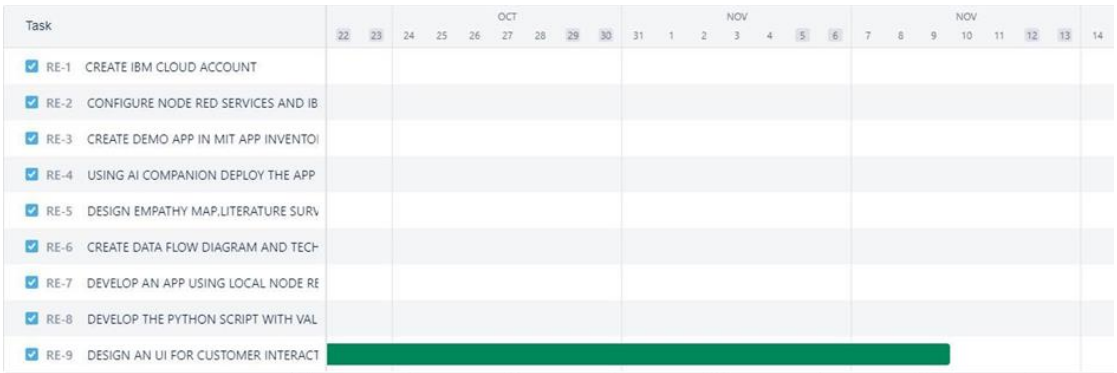


REPORT FROM JIRA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RE-3 CREATE DEMO APP IN MIT APP INVENTOI
RE-4 USING AI COMPANION DEPLOY THE APP
RE-5 DESIGN EMPATHY MAP,LITERATURE SURV
RE-6 CREATE DATA FLOW DIAGRAM AND TECH
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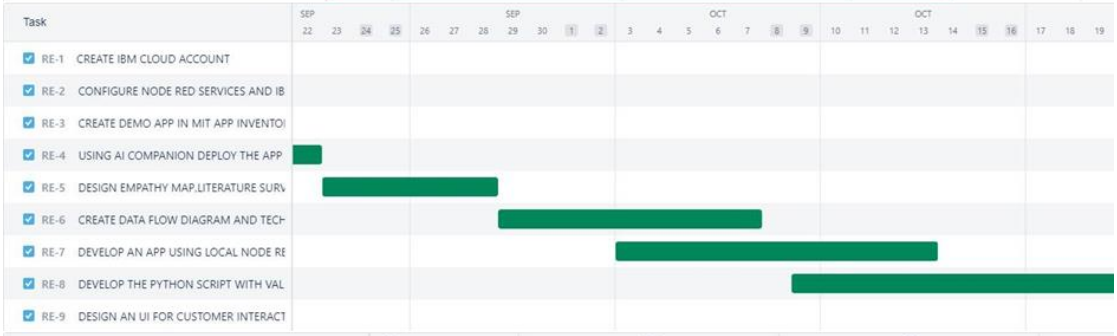
RE-8 DEVELOP THE PYTHON SCRIPT WITH VAL
RE-9 DESIGN AN UI FOR CUSTOMER INTERACT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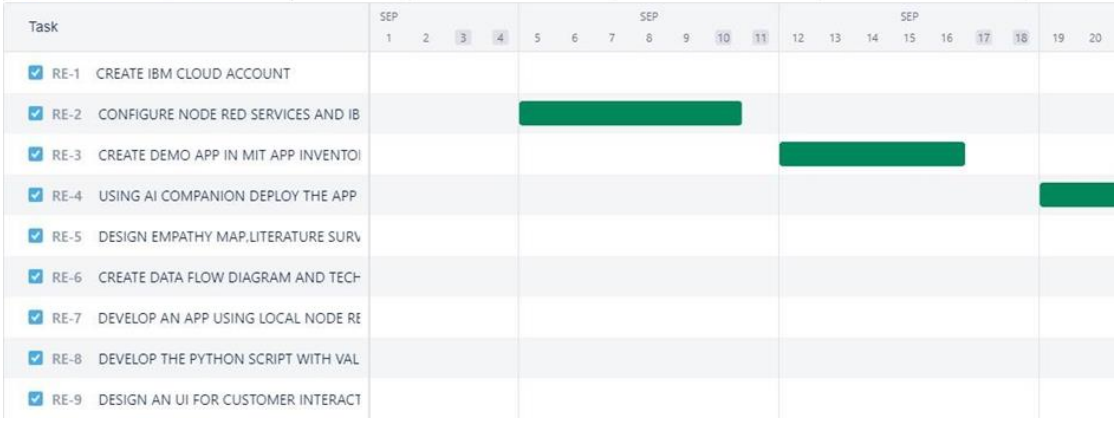
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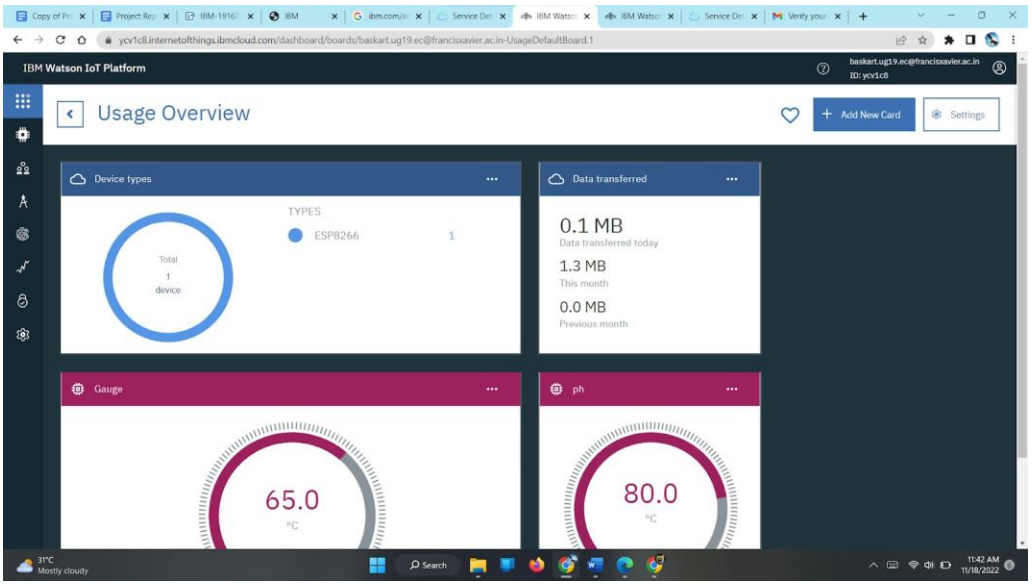
ISSUES :

Name	Type	Related Schemes
ERROR IN MSG PAYLOAD EVENTS	Base	Default Issue Type Scheme
ISSUE IN CONFIGURING NODE RED DASHBOARD	Base	Default Issue Type Scheme
ERROR 1101 IN MIT APP INVENTOR	Subtask	Default Issue Type Scheme
URL NOT RESPONDED THE NODE RED DATA URL NOT RESPONDED	Subtask	Default Issue Type Scheme

Key	Summary	Status	Category
RE-1	CREATE IBM CLOUD ACCOUNT	DONE	PREREQUISITE
RE-2	CONFIGURE NODE RED SERVICES AND IBM WATSON IOT PLA...	DONE	PREREQUISITE
RE-3	CREATE DEMO APP IN MIT APP INVENTOR 2.	DONE	MOBILE APPLICATION
RE-4	USING AI COMPANION DEPLOY THE APP IN MOBILE	DONE	DEPLOYMENT AND TESTING
RE-5	DESIGN EMPATHY MAP,LITERATURE SURVEY FOR OUR PROJE...	DONE	IDEATION PHASE
RE-6	CREATE DATA FLOW DIAGRAM AND TECHINICAL ARCHITECT...	DONE	PHASE 1
RE-7	DEVELOP AN APP USING LOCAL NODE RED AND DEPLOY IT T...	DONE	SPRINT DETAILS
RE-8	DEVELOP THE PYTHON SCRIPT WITH VALID DEVICE CREDEN...	DONE	SPRINT DETAILS
RE-9	DESIGN AN UI FOR CUSTOMER INTERACTING AND GET IT FO...	DONE	SPRINT DETAILS

Solution



TESTING

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

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	9	5	4	3	21
Duplicate	2	0	2	0	4
External	3	4	1	2	10
Fixed	10	1	5	17	33
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	2	3
Won't Fix	0	3	3	1	7
Totals	24	13	17	2	79

				5	

PERFORMANCE 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

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.

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 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

13.1 SOURCE CODE:

PYTHON CODE TO PUBLISH DATA

#program to publish data in IBM Watson iot platform import time import sys import ibmiotf.application import ibmiotf.device import random

#Provide your IBM Watson Device Credentials

#Org_ID organization = "84708c"

#Device Type deviceType = "ab cd"

#device ID deviceId = "12345" #Method of Authentication authMethod = "token"

#Auth-token authToken = "12345678"

```
# exception handling method

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



#to handle the errors except Exception as
e:
print ("Caught event ion connecting device: %s" % str(e)) sys.exit() #device connection
deviceCli.connect()
#while Loop for getting the values while True:
    Ph=random.randint (6,8)

    WaterTurbidity=random.randint (15,100)  salinity=random.randint
    (500,1000)          DissolvedOxygen=random.randint          (60,130)
    conductivity=random.randint (100,1200) data = {'Ph' : Ph,
'WaterTurbidity':WaterTurbidity,'salinity':salinity,'DissolvedOxygen':

DissolvedOxygen,'conductivity':conductivity}
    #define myonpublishcallback
    function def myonPublishCallback():
print ("Published Ph = %s" % Ph, "WaterTurbidity = %s %%" %

WaterTurbidity,"salinity = %s" % salinity,"DissolvedO2 = %s" %

DissolvedOxygen,"conductivity = %s" % conductivity) if(Ph<7.4 and salinity < 600 and
        DissolvedOxygen < 80 and
conductivity < 200): if(Ph>7.4 and salinity > 900 and DissolvedOxygen > 120 and
```

conductivity > 1100):

print("UNSAFE, THE VALUES OF PARAMETERS ARE

NOT IN THE RANGE") else: print("Quality of River water is measured and its correct")

success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,

on_publish = myonPublishCallback) if not success:

print("Not connected to IOTF")

#sleep time time.sleep(10) #disconnect device deviceCli.disconnect()__

OUTPUT

```
Type "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: E:\IBM PROJECTS\ibmpublish.py ==========
2022-11-17 20:42:47,069   ibmiotf.device.Client      INFO    Connected successfully: d:84708c:a
bcd:12345
Published Ph = 8 WaterTurbidity = 54 % salinity = 862 DissolvedO2 = 81 conductivity = 175
Quality of River water is measured and its correct
```

Python 3.7.0 Shell

File Edit Shell Debug Options Window Help

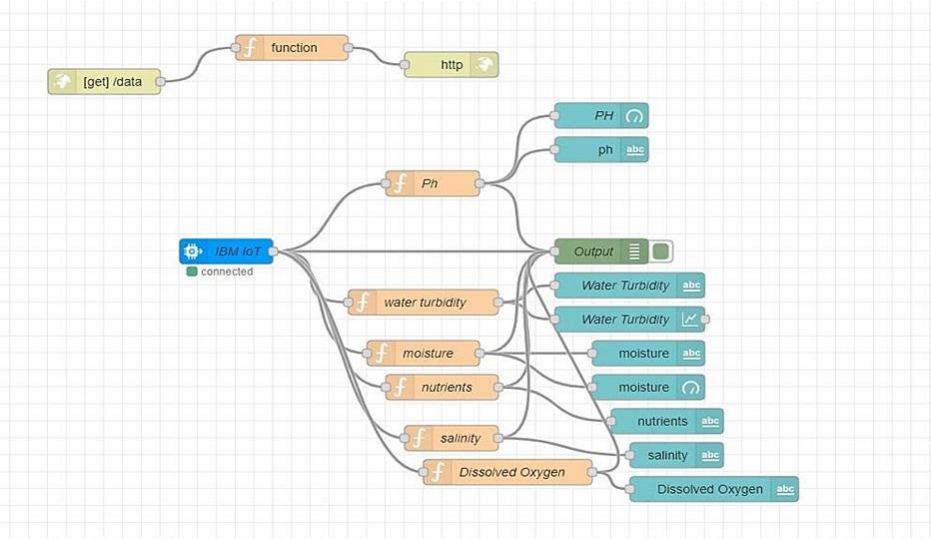
```
Quality of River water is measured and its correct
Published Ph = 6 WaterTurbidity = 80 % salinity = 652 DissolvedO2 = 123 conductivity = 306
Quality of River water is measured and its correct
Published Ph = 8 WaterTurbidity = 57 % salinity = 579 DissolvedO2 = 121 conductivity = 459
Quality of River water is measured and its correct
Published Ph = 7 WaterTurbidity = 85 % salinity = 703 DissolvedO2 = 106 conductivity = 165
Quality of River water is measured and its correct
Published Ph = 8 WaterTurbidity = 61 % salinity = 872 DissolvedO2 = 124 conductivity = 892
Quality of River water is measured and its correct
Published Ph = 6 WaterTurbidity = 75 % salinity = 934 DissolvedO2 = 119 conductivity = 351
Quality of River water is measured and its correct
Published Ph = 7 WaterTurbidity = 65 % salinity = 732 DissolvedO2 = 102 conductivity = 1104
Quality of River water is measured and its correct
Published Ph = 7 WaterTurbidity = 97 % salinity = 791 DissolvedO2 = 75 conductivity = 887
Quality of River water is measured and its correct
Published Ph = 8 WaterTurbidity = 47 % salinity = 992 DissolvedO2 = 111 conductivity = 770
Quality of River water is measured and its correct
Published Ph = 8 WaterTurbidity = 23 % salinity = 570 DissolvedO2 = 73 conductivity = 135
Quality of River water is measured and its correct
Published Ph = 6 WaterTurbidity = 76 % salinity = 516 DissolvedO2 = 88 conductivity = 226
Quality of River water is measured and its correct
Published Ph = 8 WaterTurbidity = 23 % salinity = 754 DissolvedO2 = 127 conductivity = 1101
Quality of River water is measured and its correct
```

Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
12345	Connected	abcd	Device	Nov 9, 2022 9:43 PM	

Identity | Device Information | Recent Events | State | Logs

The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
IoTSensor	{"Ph":6,"WaterTurbidity":34,"salinity":605,"Disso...	json	a few seconds ago
IoTSensor	{"Ph":7,"WaterTurbidity":48,"salinity":871,"Disso...	json	a few seconds ago
event_1	{"Water_Turbidity":41,"Ph":1,"moisture":51,"nutr...	json	a few seconds ago
IoTSensor	{"Ph":8,"WaterTurbidity":88,"salinity":729,"Disso...	json	a few seconds ago
IoTSensor	{"Ph":6,"WaterTurbidity":23,"salinity":504,"Disso...	json	a few seconds ago



Demo link:

https://drive.google.com/file/d/1lc7G-uZyKl2uGxqEkDFGKP3FNK8Eaybi/view?usp=share_link