REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM

Domain: INTERNET OF THINGS

A PROJECT REPORT

Submitted by

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FROM

KINGS COLLEGE OF ENGINEERING,THANJAVUR

In fulfillment of project in IBM-NALAYATHIRAN 2022

Team Id: PNT2022TMID46688

PROJECT GUIDES

Industry Mentor: Bharadwaj

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1. INTRODUCTION

1.1 Project Overview:

River Water quality monitoring System

River water which is used as drinking water is a very precious commodity for all human beings. The system consists of several sensors which are used for measuring physical and chemical parameters of water. The parameters such as temperature, pH, and dissolved oxygen of the water can be measured. Using this system, a person can detect pollutants from a water body from anywhere in the world. 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 micro-controller 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 IBM cloud Server and verify them to trigger the actions to be performed.

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 fieldsmen the parameters affecting the quality of river-water need to be analysed and to be used for water treatement purpose.

2.2 References:

1. N. Vijayakumar, R. Ramya

The real time monitoring of water quality in IoT environment. The parameters such as temperature, PH, turbidity, conductivity, dissolved oxygen of the water can be measured. The measured values from the sensors can be processed by the core controller. The raspberry PI B+ model can be used as a core controller (2015).

2. S. Thombre, R.U. Islam, K. Andersson, M.S. Hossain

IP based Wireless Sensor Networks : performance Analysis using Simulations and Experiments. Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, 7 (2016).

3. Rushikesh Kshirsagar, R.Mudhalwadkar, Saish Kalaskar

Design and Development of IoT Based Water Quality Measurement System. The idea about low-cost IOT based portable approach for water quality measurements system. Because of its low-cost approach, everyone can afford to use it to determine quality of water(2019).

4. K.S. Adu-Manu, C. Tapparello, W. Heinzelman, F.A. Katsriku, J.-D. Abdulai

Water quality monitoring using wireless sensor networks: Current trends and future research directions ACM Transactions on Sensor Networks (TOSN) (2017).

5. M.Chitra, D. Sadhihskumar, R. Aravindh, M. Murali, R. Vaittilingame

IoT based Water Flood Detection and Early Warning System. The collected information (data) from the water level sensor and temperature and humidity sensor passed to Thingview Android application in order to find the flow graph level of the water level in the river and temperature, humidity values and sends SMS to the registered contact mobile numbers (2020).

6. Dr.Geetha

IoT based real time water quality monitoring system using smart sensor

WQM is a cost effective and efficient system designed to monitor drinking water quality with the help of IOT(2020).

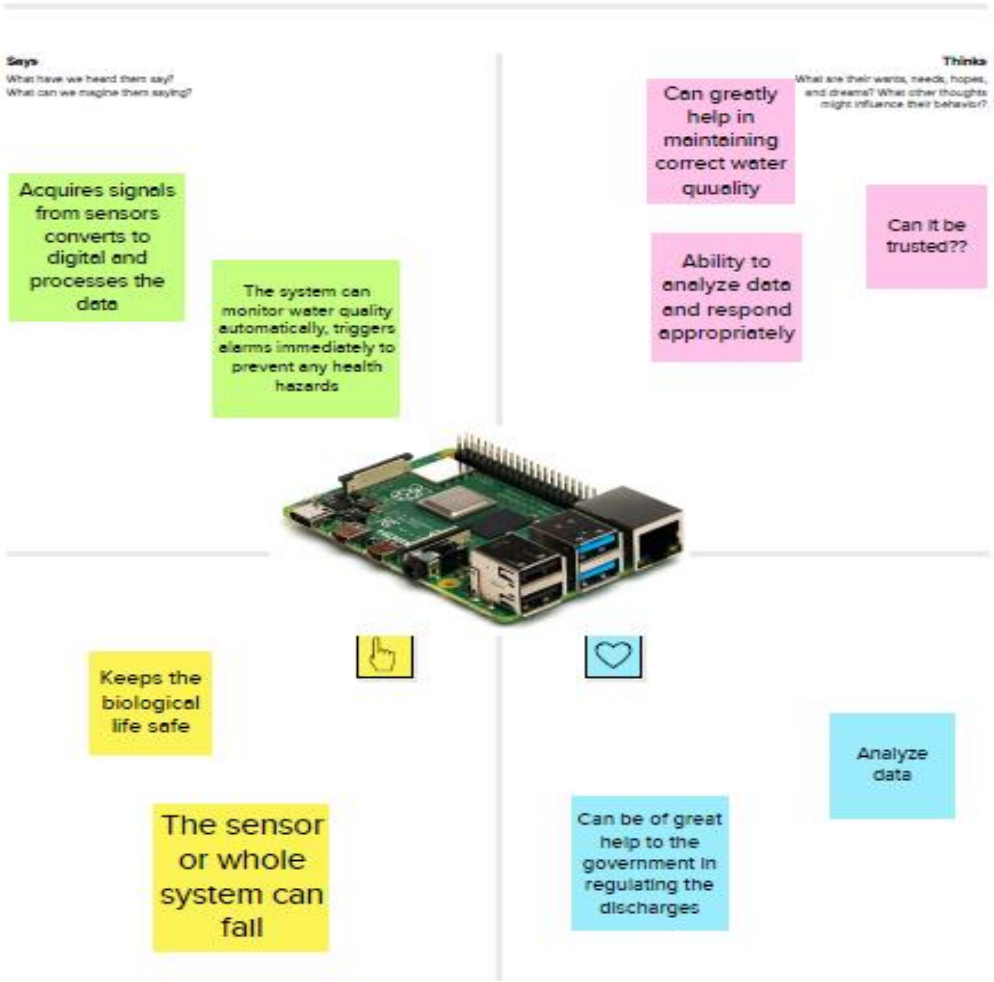
2.3 Problem Statement:

To reduce the water pollution in river and to monitor the parameters of river water and control measures can impact vegetation , health. The Real time analysis of (pH, Turbidity, Temperature) in river water .

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas:

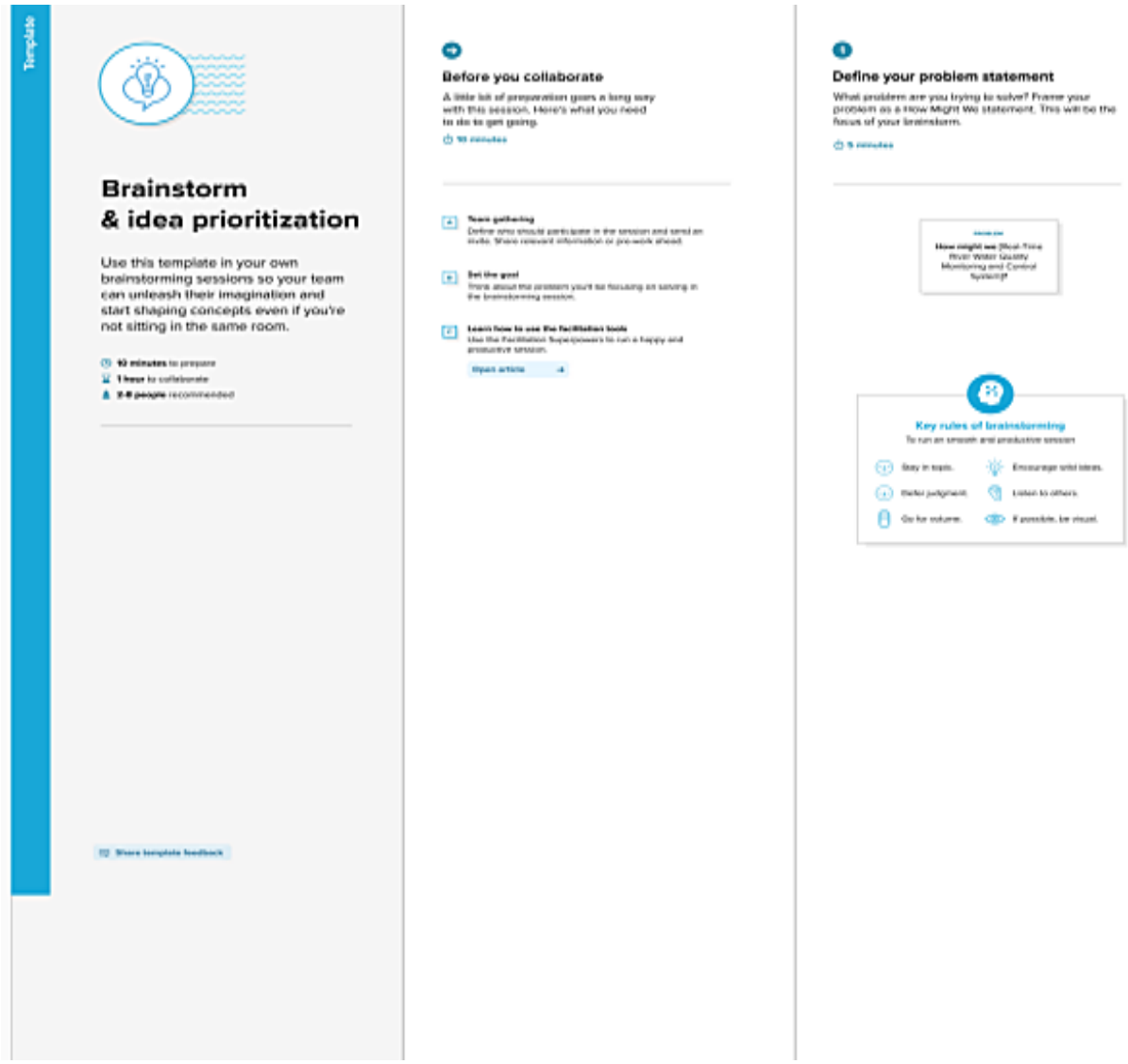
An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise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



2

Brainstorm

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

10 minutes

Person 1

We use Water Quality, conductivity Sensor in this project.

we use pHsensor; Turbidity Sensor in this project.

we use The temperature sensor connected to this Waspmote sensor unit measured temperature of the river up .

we use GSM modulus in this project

Person 2

Connect, collect and start processing IoT data quickly and easily with the IBM Watson IoT® Platform.

The ESP8266 module enables microcontrollers to connect to 2.4 GHz Wi-Fi, using IEEE 802.11 bgn

For Monitoring water quality with IOT we use Turbidity ,pH, Temperature ,Dissolved Oxygen ,Conductivity and TDS ,Salinity.

Measuring pH or power of hydrogen tells if the water is acidic or basic in nature.

Person 3

We use Map view showing geo-location of all the systems.

we use application, website and cloud computing to receive the notification from destination

We use IBM Cloud computing to save the data.

Through remote monitoring smart phone/ computer/ laptop

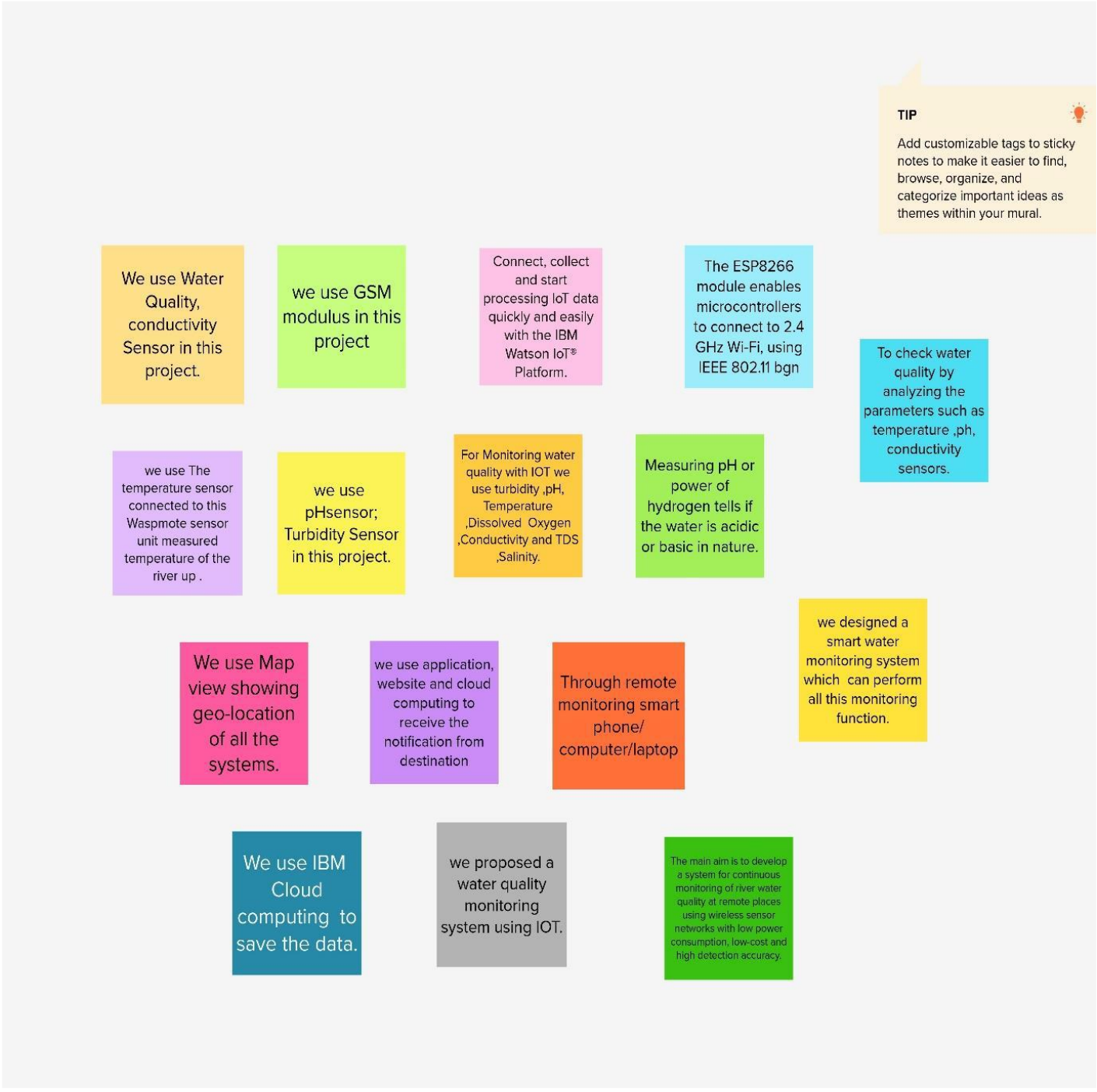
Person 4

To check water quality by analyzing the parameters such as temperature ,ph, conductivity sensors.

we designed a smart water monitoring system which can perform all this monitoring function.

we proposed a water quality monitoring system using IOT.

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.


TIP
Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.
We use Water Quality, conductivity Sensor in this project.
we use GSM modulus in this project
Connect, collect and start processing IoT data quickly and easily with the IBM Watson IoT® Platform.
The ESP8266 module enables microcontrollers to connect to 2.4 GHz Wi-Fi, using IEEE 802.11 bgn
To check water quality by analyzing the parameters such as temperature ,ph, conductivity sensors.
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We use Map view showing geo-location of all the systems.
we use application, website and cloud computing to receive the notification from destination
Through remote monitoring smart phone/ computer/laptop
We use IBM Cloud computing to save the data.
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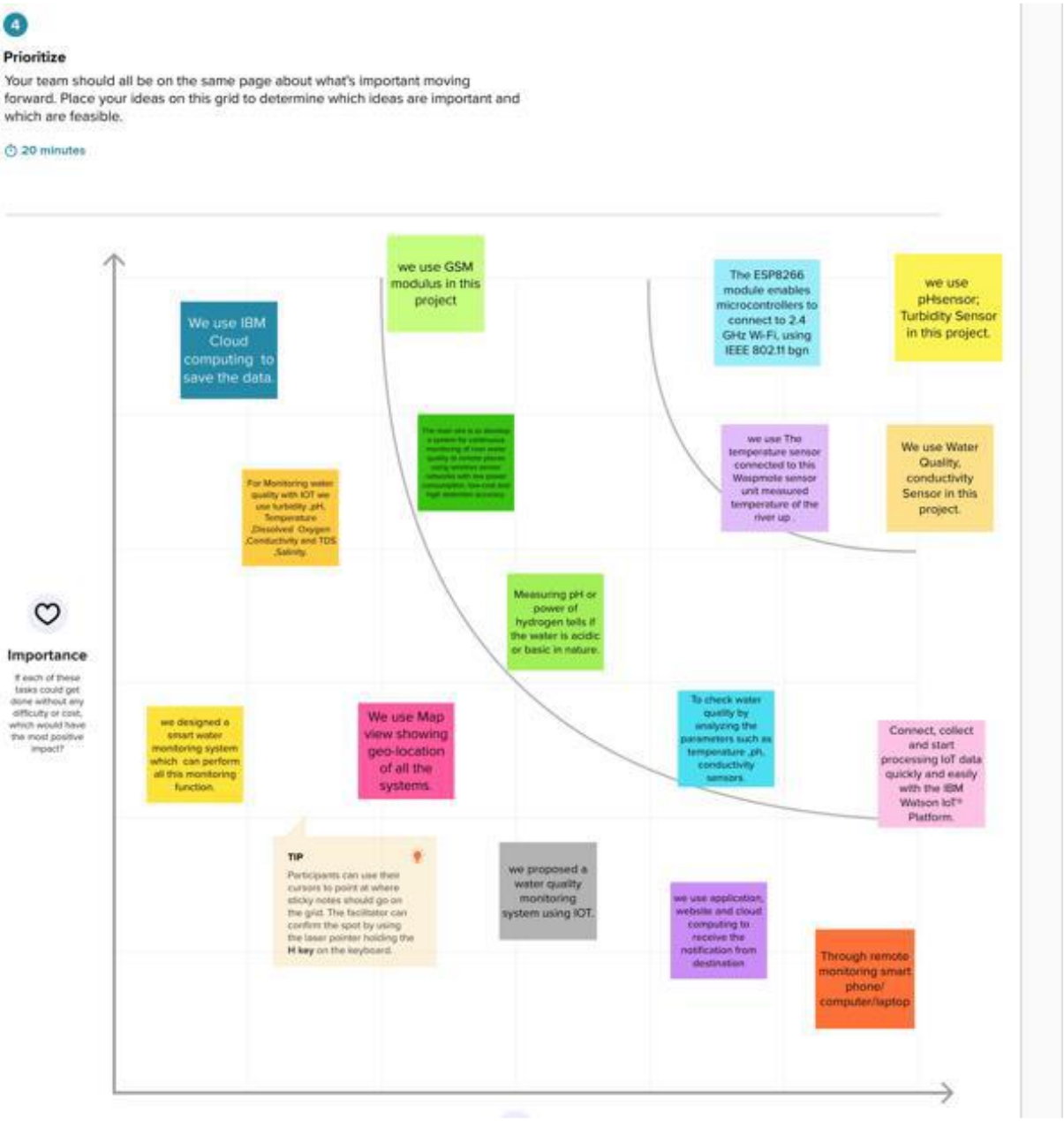
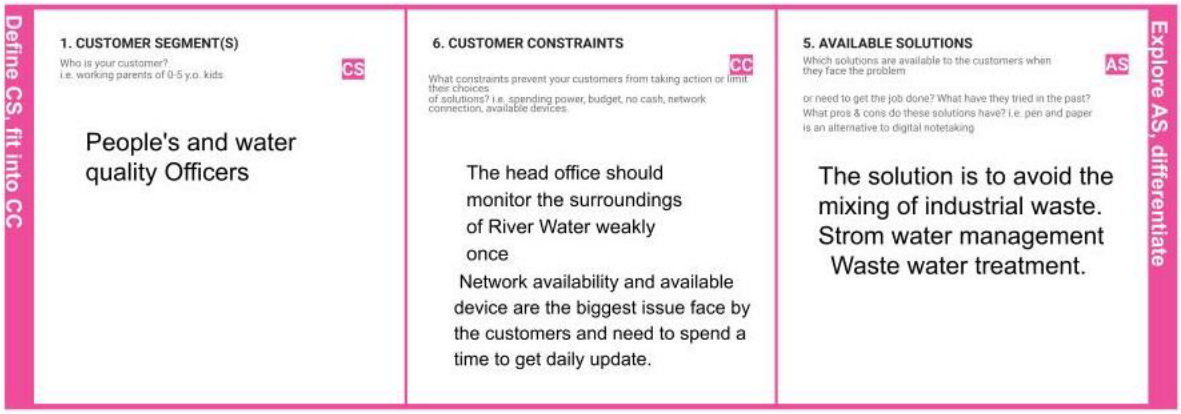


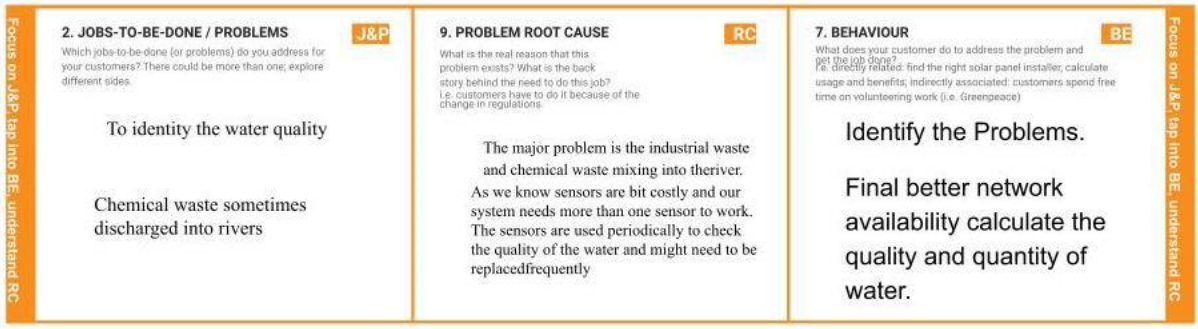
3.3 Proposed Solution:

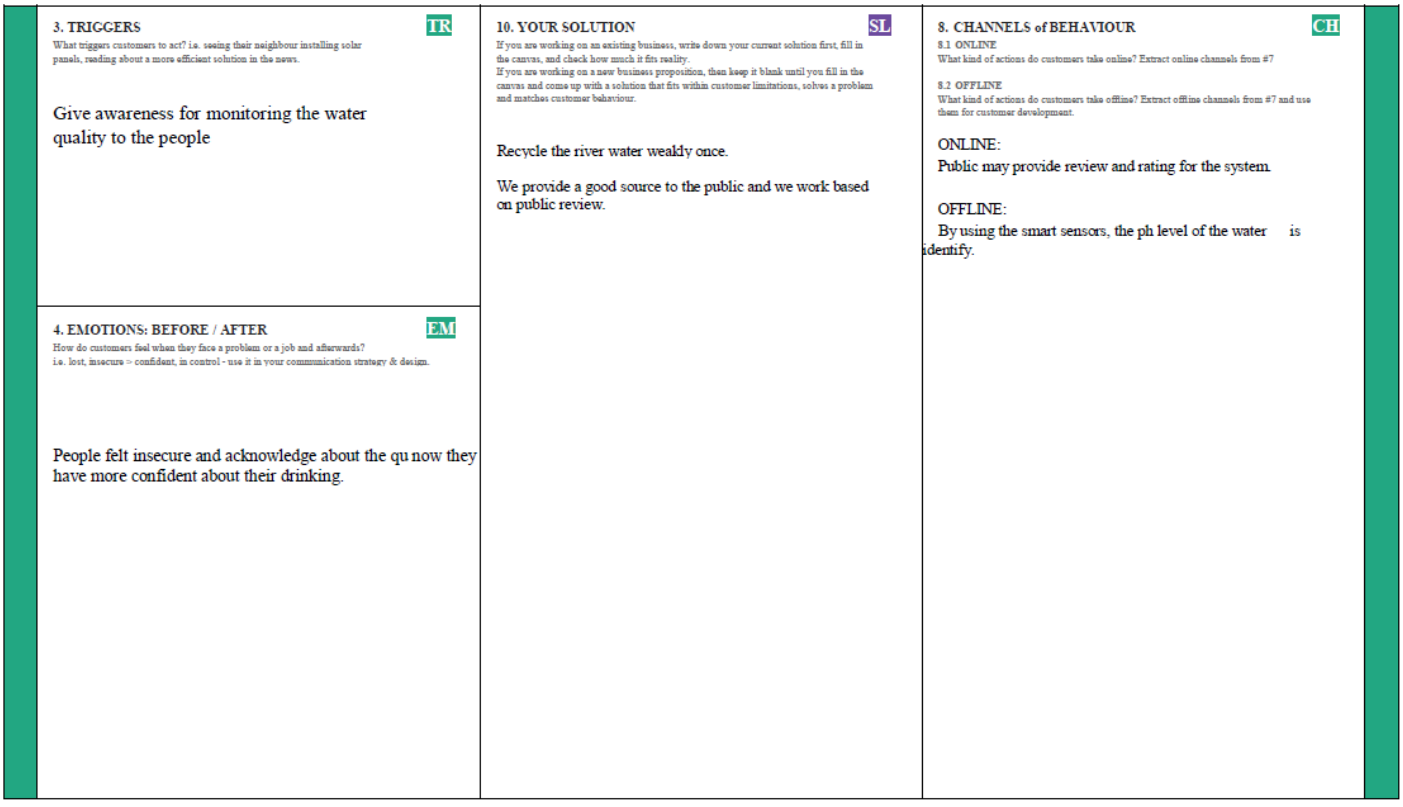
S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To find the PH level, Temperature and Dust particles in Water

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	If the water quality is not good it will insist the people to not drink or use the water as a warning message via mobile app
5.	Business Model (Revenue Model)	It help people to become conscious against using contaminated water as well as to stop polluting the water.
6.	Scalability of the Solution	The process of operating this Model is very easy. As it can be operated from using the mobile phone as well

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 using mobile number
FR-2	User Confirmation	Confirmation via OTP
FR-3	Ultrasonic generator	Periodically the waves are generated to destroy algae in the range of 25%,50%,100%
FR-4	Ph level detection	To observe the water quality, Ph sensor is used and the signals are conveyed to the Arduino.
FR-5	Turbidity detection	Turbidity sensor measures the purity of element or marshy utter in the water and the signals are delivered to Arduino

4.2 *Non-functional Requirements:*

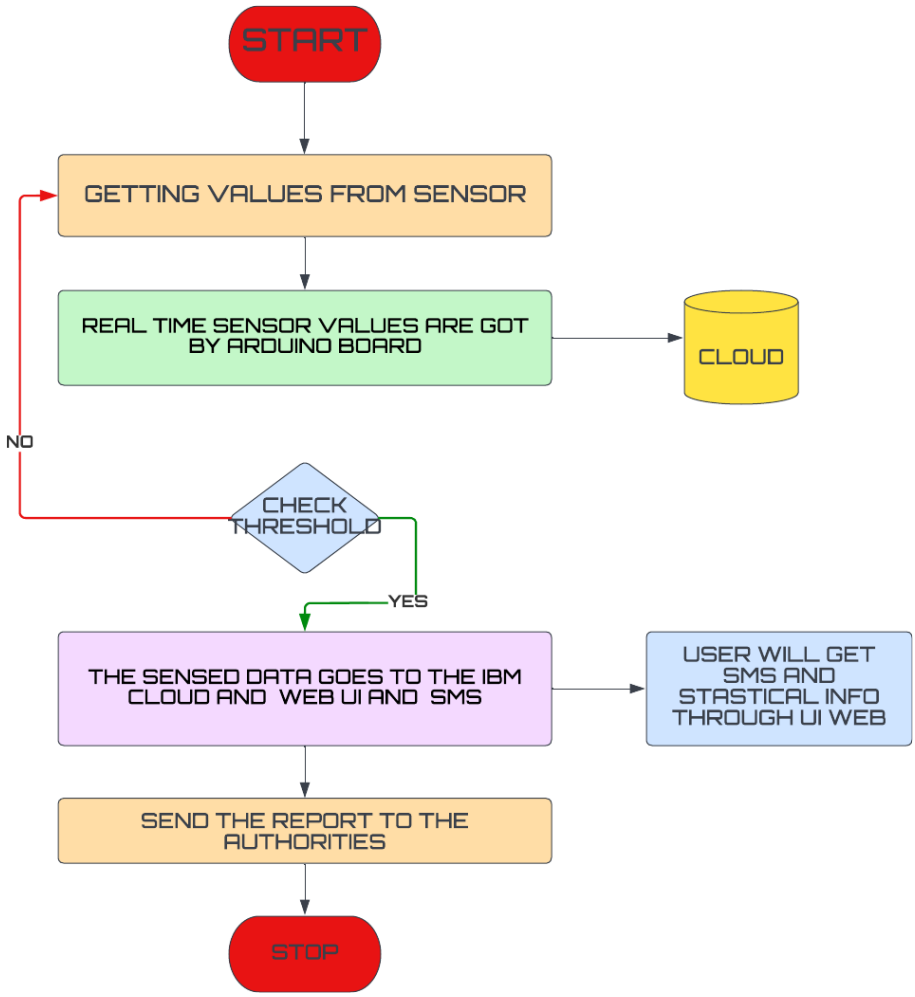
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Monitors the flow and quality of ground water, and investigates surface- and ground-water interactions.
NFR-2	**Security**	The data and information are secured in the application by using the application firewall.
NFR-3	**Reliability**	The Real time sensor output values with future predicted data storage with output efficiency of 98%. It also gives certainty for aquaculture safety.
NFR-4	**Performance**	The performance of system has higher efficiency and environmental friendly.
NFR-5	**Availability**	It is available in the form of mobile UI 24 x 7 monitoring system.
NFR-6	**Scalability**	The system has high scalability. Able to be changed in size or scale to give the best output.
NFR-7	**Stability**	The ability of the system to bring itself back to its stable configuration. The stability is high.
NFR-8	**Efficiency**	The monitoring system is highly efficient,high mobility with consumption of power.

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 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 Mobile app 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 Web UI.

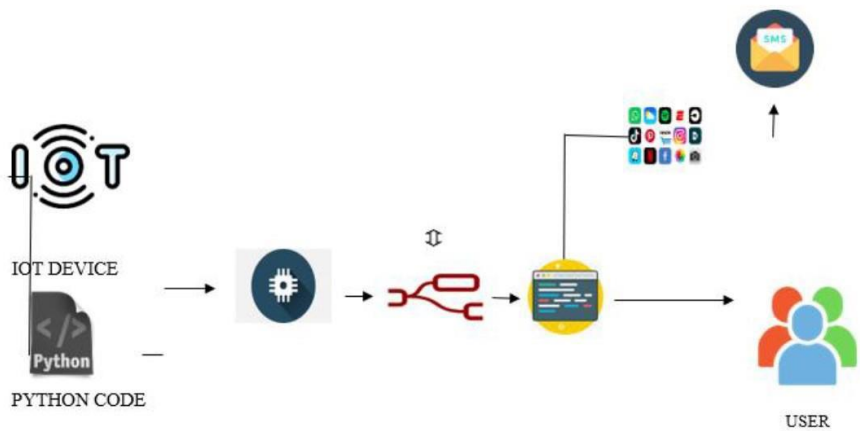


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Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application	HTML, CSS, Node-Red ,Cloud,etc
2.	Application Logic-1	Logic for a process in the application	JAVA/PYTHON
3.	Application Logic-2	Logic for a process in the application	IBM WATSON STT services
4.	Application Logic-3	Logic for a process in the application	BM WATSON Assistant
5.	Database	Data Type, Configurations etc	MySQL, PostgresSQL
6.	Cloud Database	Database Service on Cloud	IBM DB2,IBM Cloudant etc
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc
9.	External API-2	Purpose of External API used in the application	Mobile number otp
10.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
	Open-Source Frameworks	List the open-source frameworksused	Technology of Opensource framework
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	Technology used
4.	Availability	Justify the availability of application	Technology used
5.	Performance	Design consideration for the performance of the application	Technology used

5.3 User Stories

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

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 Google	I can register & access the dashboard with Google Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through G mail	I can access through Gmail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	Login Details are received to me.	High	Sprint-1
	Interface	USN-6	As a user, I can log into the application by entering email & password.	Easy Access application	High	Sprint-1
Customer (Web user)	Dashboard	WUSN-7	As a web User, I can get all information (data)(Temp etc..)	I can easily Understand how to use it.	High	Sprint-1
Customer Care Executive	View Perspective	CCE	As a Customer care, I can view the data in graph plots	Easy Understanding of Graphs	High	Sprint-1
Administrator	Risk factor	ADMIN-1	As a Admin, Update must be done at each step and take care of any errors	Heavy Monitoing is Required.	High	Sprint-2

6. PROJECT PLANNING AND SCHEDULING

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 confirmingMy password.	2	High	DIVAKARAN J
	Registration via Facebook	USN-3	As a user, I can register for the applicationthrough Facebook	2	Low	
	Registration via Mail ID	USN-4	As a user, I can register for the applicationthrough Gmail	2	Medium	
Sprint-2	Confirmation	USN-2	As a user, I will receive confirmation email onceIhave registered for the application	1	High	
	Login	USN-5	As a user, I can log into the application byentering email & password	1	High	
	IBM Cloud service Access		Get access to IBM cloud services.	2	High	
Sprint-3	Create the IBM WatsonIoT and device Settings	USN-6	To create the IBM Watson IoT Platform and integrate the microcontroller with it, to send the sensed data onCloud	2	High	SATHISHT, SACHINR, SURESHKARTHIK J
	Create a node red service	USN-7	To create a node red service to integrate the IBMWatson along with the Web UI	2	medium	SATHISHT, SACHINR, SURESHKARTHIKJ
	Create a Web UI	USN-8	To create a Web UI, to access the data from the cloudAnd display all parameters.	2	Medium	SATHISH T
	To develop a Python code	USN-9	Create a python code to sense the physical quantityAnd store data.	2	Medium	DIVAKARAN J

						SACHIN R
	Publish Data to cloud.	USN-10	Publish Data that is sensed by the microcontroller to theCloud	3	Hi gh	SURESHKA RT HIK J
Sprint-4	Fast-SMS Service	USN-11	Use Fast SMS to send alert messages once the parameters like pH, Turbidity and temperature goes beyond the threshold	3	Hi gh	SATHIS H T, DIVAKA RAN J
	Testing	USN-12	Testing of project and final deliverables	3	Me diu m	

6.2 SPRINT DELIVERY SCHEDULE

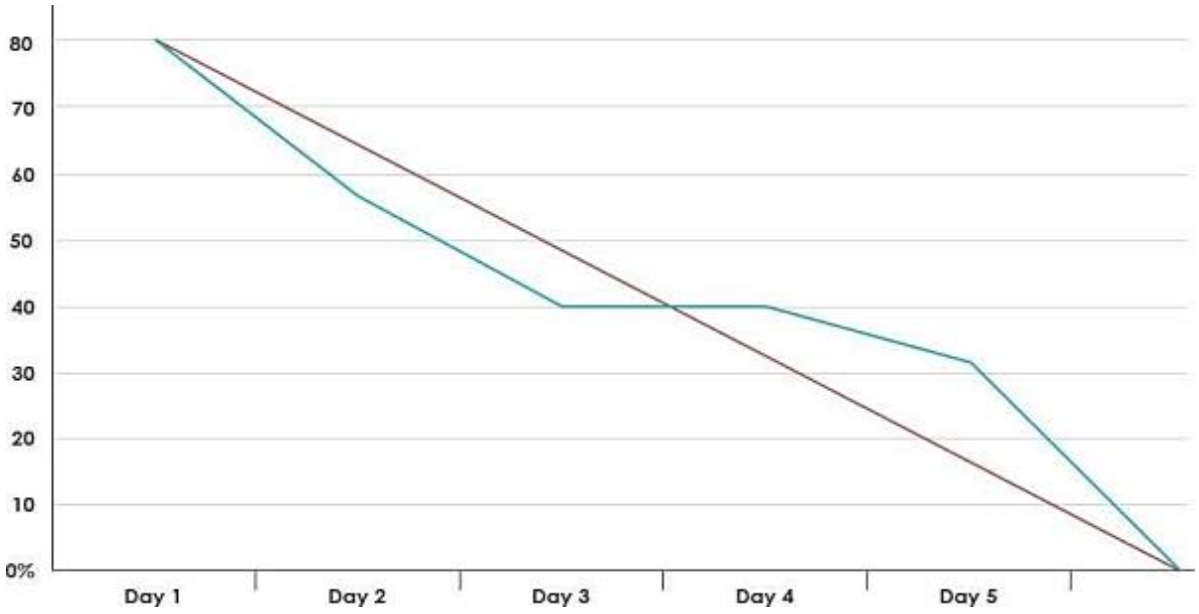
Project Tracker, Velocity & Burndown Charts

Sprint	Total Story Points	Durati on	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (ason Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	27 Oct 2022	02 Nov 2022	20	04 Nov 2022
Sprint-2	20	6 Days	03 Nov 2022	09 Nov 2022	30	11 Nov 2022
Sprint-3	20	5 Days	10 Nov 2022	15 Nov 2022	49	16 Nov 2022
Sprint-4	20	4 Days	15 Nov 2022	19 Nov 2022	50	19 Nov 2022

Velocity:

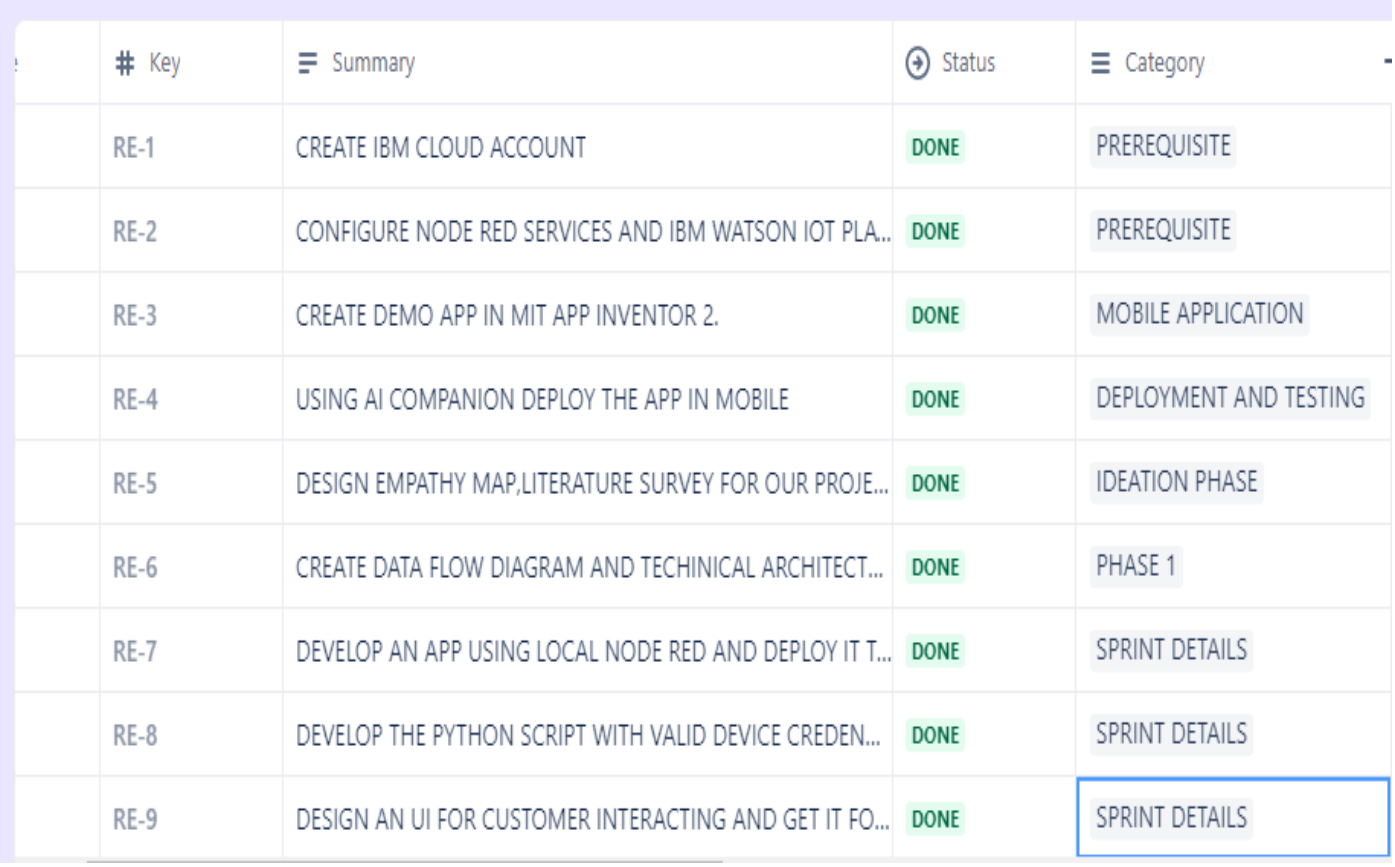
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown Chart:


80
70
60
50
40
30
20
10
0%
Day 1
Day 2
Day 3
Day 4
Day 5

6.3 REPORT FROM JIRA

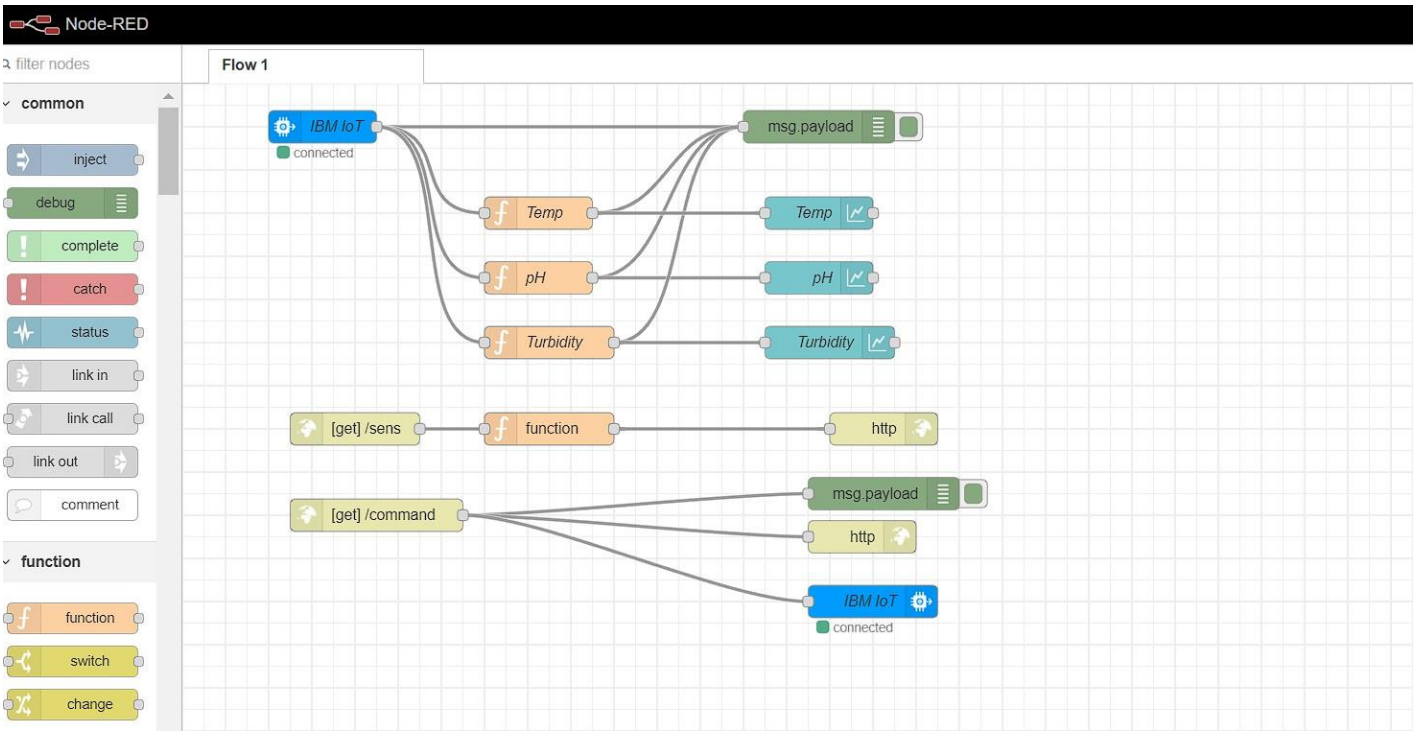
JIRA SOFTWARE



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

7. CODING AND SOLUTIONING

7.1 NODE RED SERVICE ASSOCIATED WITH IBM CLOUD:



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	30	0	0	30
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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	7	5	1	3	19
Duplicate	2	0	2	0	4
External	3	4	1	2	10
Fixed	8	1	5	17	31
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	2	3
Won't Fix	0	3	3	1	7
Totals	20	13	15	25	75

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	70-85%	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	80-90%	App-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 Mobile.

FUTURE SCOPE

In future we water detection sensor has unique advantage. I will increase the realtime data transferring time and alerts people before consuming it .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. 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:

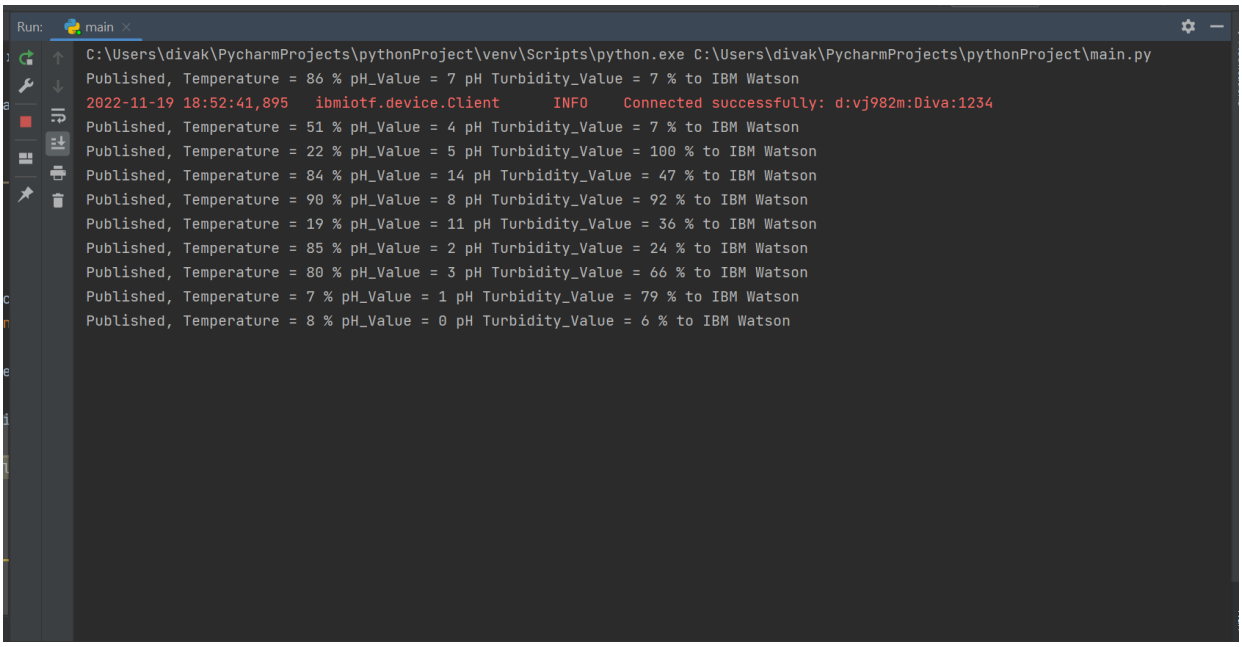
PYTHON CODE TO PUBLISH DATA

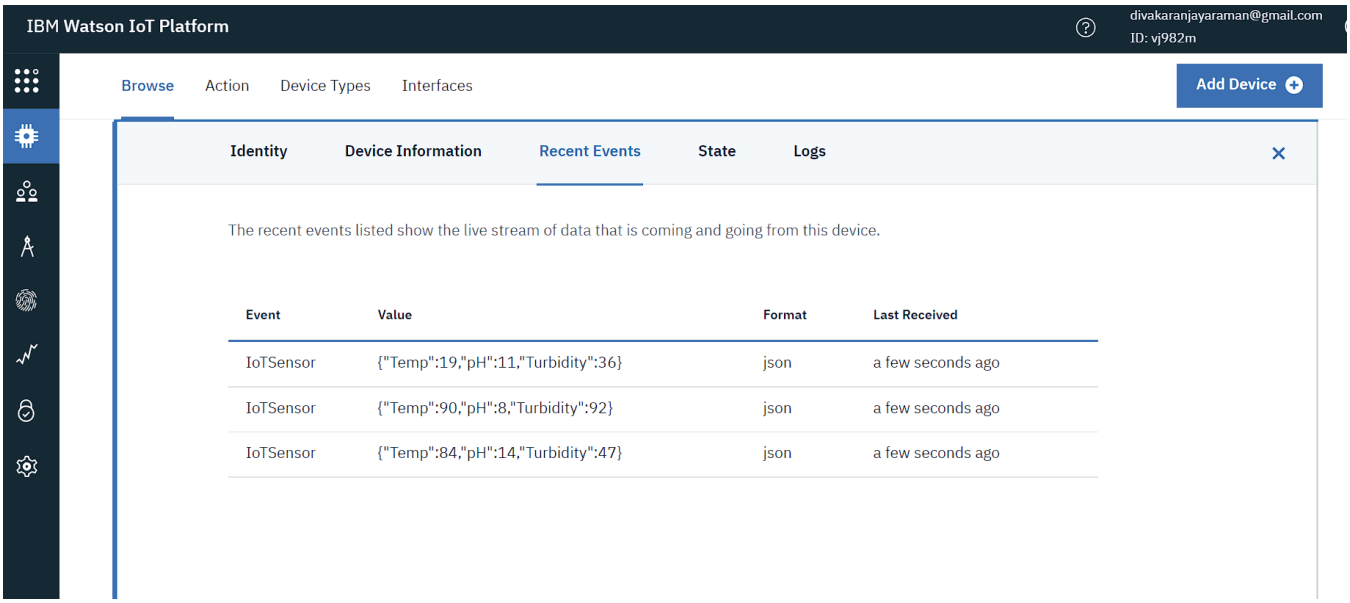
```
import random
import sys
import time

import ibmiotf.device

organization = "vj982m"
deviceType = "Diva"
deviceId = "1234"
authMethod = "token"
authToken = "123456789"



def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status = cmd.data['command']
    if status == "Alert message":
        print("Alert ON")
    elif status == "Alert OFF":
        print("Alert Message")
```

```
    else:
        print("please send proper command")



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()

deviceCli.connect()

while True:

    Temp = random.randint(0, 100)
    pH = random.randint(0, 14)
    Turbidity = random.randint(0, 100)

    data = {'Temp': Temp, 'pH': pH, 'Turbidity': Turbidity}



    def myOnPublishCallback():
```

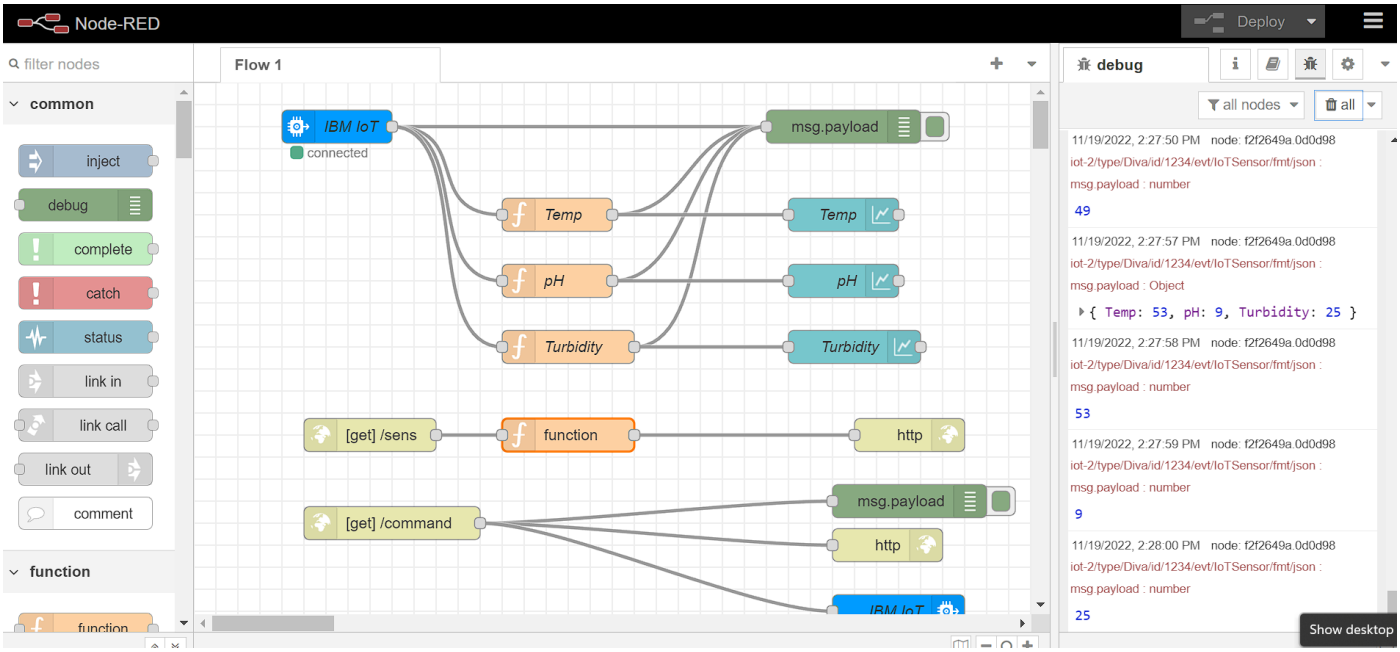
```
        print("Published, Temperature = %s %%" % Temp, "pH_Value = %s pH" %
pH, "Turbidity_Value = %s %%" % Turbidity,
              "to IBM Watson")



    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

deviceCli.disconnect()
```

OUTPUT

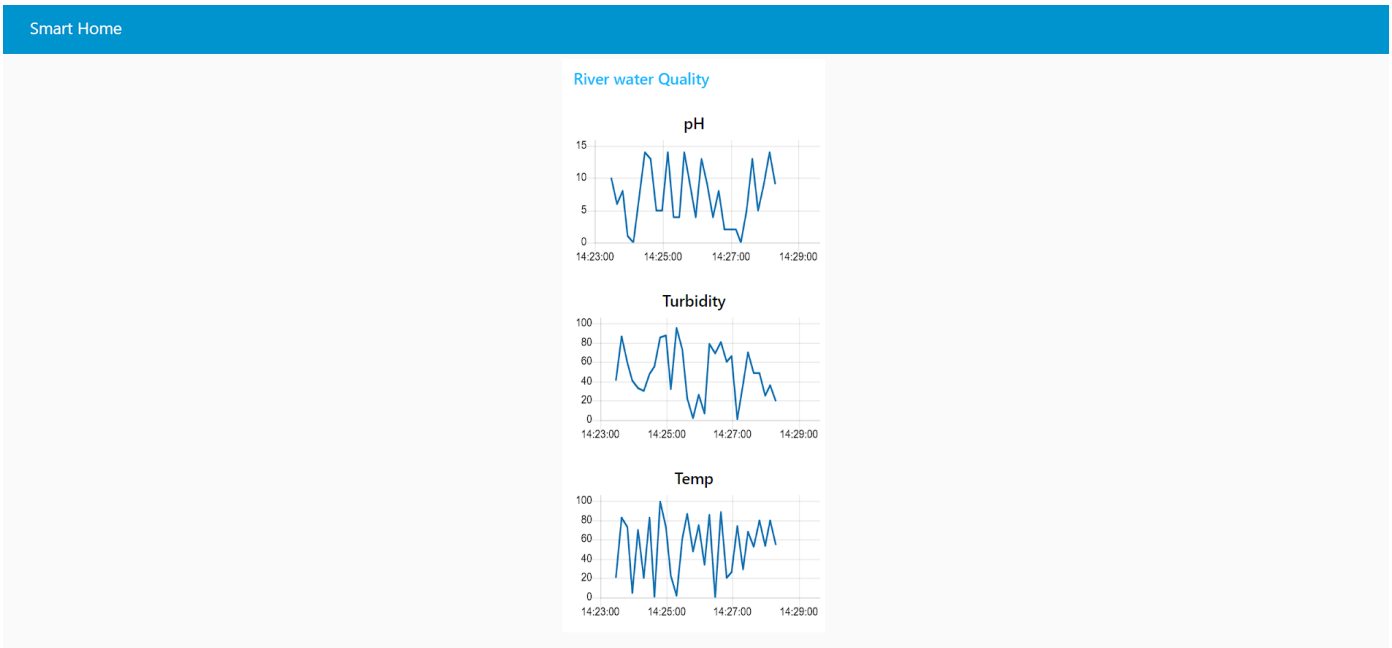

Run: main
C:\Users\divak\PycharmProjects\pythonProject\venv\Scripts\python.exe C:\Users\divak\PycharmProjects\pythonProject\main.py
Published, Temperature = 86 % pH_Value = 7 pH Turbidity_Value = 7 % to IBM Watson
2022-11-19 18:52:41,895 ibmiotf.device.Client INFO Connected successfully: d:vj982m:Diva:1234
Published, Temperature = 51 % pH_Value = 4 pH Turbidity_Value = 7 % to IBM Watson
Published, Temperature = 22 % pH_Value = 5 pH Turbidity_Value = 100 % to IBM Watson
Published, Temperature = 84 % pH_Value = 14 pH Turbidity_Value = 47 % to IBM Watson
Published, Temperature = 90 % pH_Value = 8 pH Turbidity_Value = 92 % to IBM Watson
Published, Temperature = 19 % pH_Value = 11 pH Turbidity_Value = 36 % to IBM Watson
Published, Temperature = 85 % pH_Value = 2 pH Turbidity_Value = 24 % to IBM Watson
Published, Temperature = 80 % pH_Value = 3 pH Turbidity_Value = 66 % to IBM Watson
Published, Temperature = 7 % pH_Value = 1 pH Turbidity_Value = 79 % to IBM Watson
Published, Temperature = 8 % pH_Value = 0 pH Turbidity_Value = 6 % to IBM Watson


IBM Watson IoT Platform
divakaranjayaraman@gmail.com
ID: vj982m
Browse
Action
Device Types
Interfaces
Add Device
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
{"Temp":19,"pH":11,"Turbidity":36}
json
a few seconds ago
IoTSensor
{"Temp":90,"pH":8,"Turbidity":92}
json
a few seconds ago
IoTSensor
{"Temp":84,"pH":14,"Turbidity":47}
json
a few seconds ago

Node RED



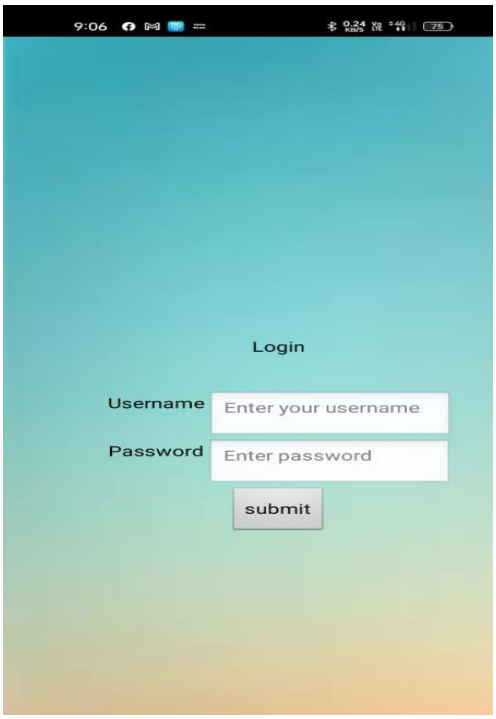
WEB APP:

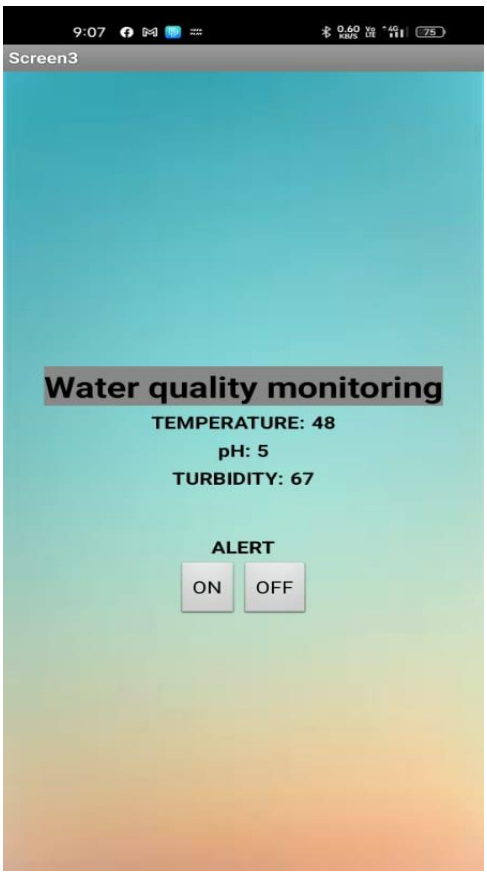


Link : http://159.122.181.90:31660/ui/#!/0?socketid=1vQi3JLs2BYLBPbeAAAB

MOBILE APP


9:06
River water quality monitoring


9:06
Login
Username
Enter your username
Password
Enter password
submit



13.2 GIT-HUB LINK:

https://github.com/IBM-EPBL/IBM-Project-44597-1660725449

PROJECT DEMO LINK:

1. **https://vj982m.internetofthings.ibmcloud.com/dashboard/boards/divakaranjayaraman@gmail.com-UsageDefaultBoard**

2. **http://159.122.181.90:31660/ui/#!/0?socketid=1vQi3JLs2BYLBPbeAAAB**