MAHENDRA INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Mahendhirapuri, Mallasamudram,Namakkal- 637 503

Office of the Controller of Examinations

A PROJECT REPORT

Submitted by

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In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

In

COMPUTER SCIENCE AND ENGINEERING

MAHENDRA INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

MAHENDHIRAPURI, MALLASAMUDRAM,NAMAKKAL- 637 503

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BONAFIDE CERTIFICATE

Certified that this project report **"IoT Based Real-Time River Water Quality Monitoring And Control System"** is the Bonafide workof our team **"DHIVYA R (611619104027), KIRUBA T (611619104053), KIRUTHIKA S (611619104054), MATHUMITHA S (611619104060), MONIKA T (611619104067) "**who carried out the project work under my supervision.

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Submitted for the end semester viva voce examination held on ……..

……	……
Internal Examiner	External Examiner

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CERTIFICATE OF PROJECT APPROVAL

This is to certify that the Project report titled **"IoT Real-Time River Water Quality Monitoring And Control System"** is the approved record of work done by**"DHIVYA R (611619104027), KIRUBA T (611619104053), KIRUTHIKA S (611619104054), MATHUMITHA S(611619104060), MONIKA T(611619104067) "** in partial fulfillment for the award of the Degree of B.E Computer Science and Engineeringduring the academic year 2019-2023.

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Date: (Signature with seal)

Submitted for the end semester viva voce examination held on _____

Internal Examiner External Examiner

ACKNOWLEDGEMENT

We would like to take this opportunity to say our thanks to the people who have helped us make this project a reality.

We wish to express our sincere thanks to our honorable chairman, **Shri. M.G.Bharath Kumar B.Ed., M.A., M.I.S.T.E.,** of our Educational trust, Kalipatty andthe Managing Directors **Er.Ba.Mahendiran B.E.,** and **Er.Maha Ajay Prasad B.E.,** providing an extraordinary infrastructure.

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Above all we would like to express my sincere gratitude and thanks to our parents for their valuable comments and suggestions for making success.

ABSTRACT

River water quality monitoring and control analysis is an interesting in project we make it with the help of internet of things. 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 uniquenessof 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.

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TABLE OF CONTENT

1. INTRODUCTION

1.1 PROJECT OVERVIEW

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River Water quality monitoring System Water is one of the major compounds that profoundly influence ecosystem. But, nowadays it is been exploited heavily due to rapid industrialization, human waste and random use of pesticides and chemical fertilizers in agriculture, which leads to water contamination. Thus, a water monitoring system is necessary to observe the water quality in a large area such as lake river, and aquaculture. As per the current world situation, Internet of Things (IoT) and remote sensing techniques are used in heterogeneous areas of research for supervising, congregate and analyzing data from the remote locations. In this paper, the suggested system is a minimal price real time water quality monitoring system in IoT environment. This system comprise of numerous sensors for assessing the physical and chemical parameter. The factors of water that can be assessed using these sensors are pH, turbidity, conductivity, dissolved oxygen. Using this system the real time quality of water bodies can be determined and the data uploaded over the Internet are analyzed.

1.2 PURPOSE

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

2. LITERATURE SURVEY

2.1 Existing Problem:

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

2.2 References:

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

2.3 Problem Statement:

The reduce the river water pollution and to monitor the parameters of river water andcontrol 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 ofriver water	we can't use water with acidic nature for cool drinks manufacturing	indecisive


I am
A Farmer
I'm trying to
use river water for irrigation
But
i dont know the quality and level of the water
Because
i dont know how to measure the quality of the water
Which makes me feel
frustrated

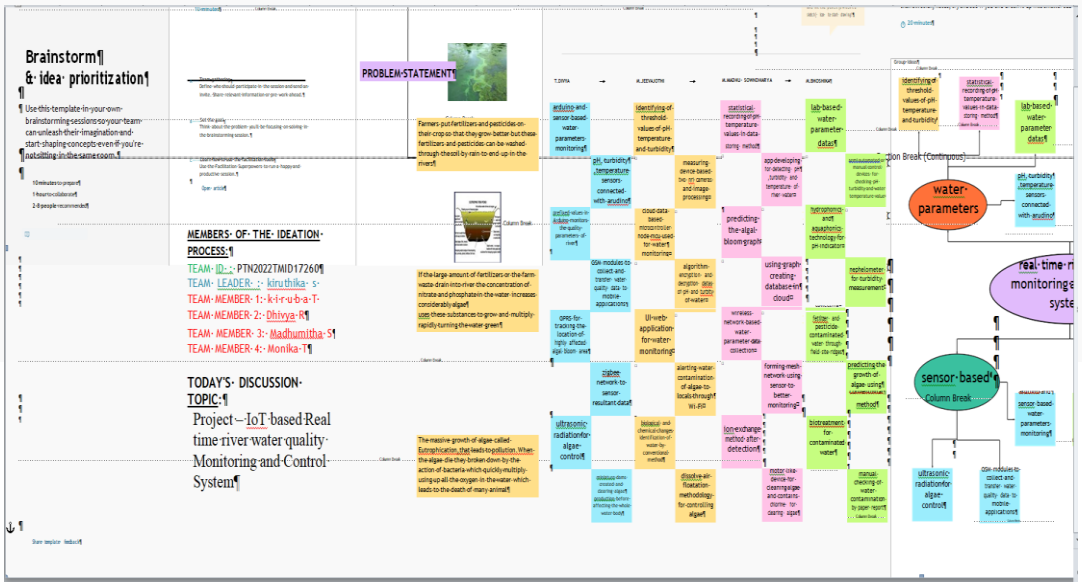

An Industrialist
use river water for drinks manufcuring
i dont know the pH level of river water
we can't use water with acidic nature for cool drinks manufacturing
indecisive

3.IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

3.2 IDEATION AND 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 concept even if you are not sitting in the same room.



3.3 Proposed solution

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To prevent children for abuse andmake them safe
2.	Idea / Solution description	compact wearable gadget pressure button which can the parentscan find the a hacker easier
3.	Novelty / Uniqueness	Pressure button with Gsm
4.	Social Impact/ Customer Satisfaction	It is useful to working parents when they are leaving children
5.	Business Model (Revenue Model)	wearable gadget
6.	Scalability of the Solution	compact and easy to use

3.4 Problem solution fit

4. Requirement analysis

4.1 Functional requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User authorization levels	Complete mapping are given in hierarchical manner in order to show only the specific data
FR-2	Historical data	The data are stored in the cloud from the beginning stage till the updation
FR-3	User authentication	The credentials is accessible only to the authorized users to access the model
FR-4	User rules and laws	There is some specific guidelines which has to be followed by the users

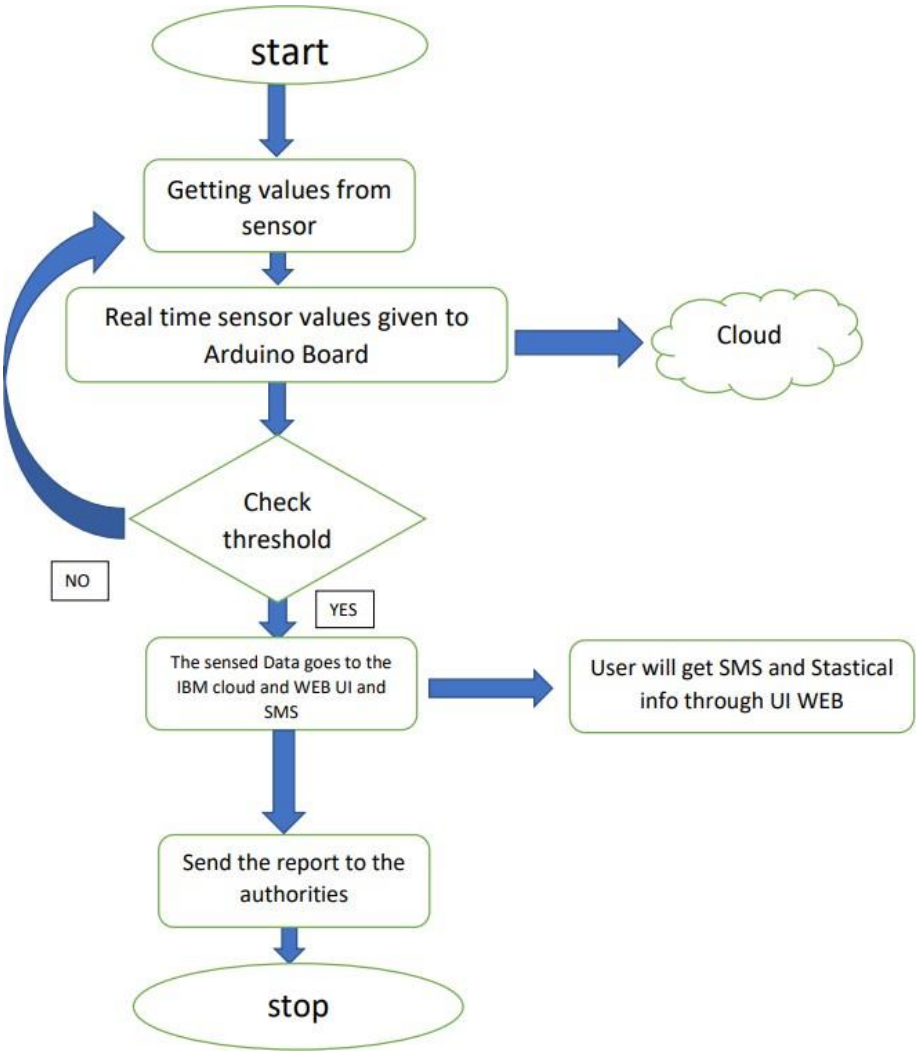
4.2 Non-Functional requirements:

FR No.	Non-Functional Requirement	Description
NFR -1	**Usability**	The final data should be easily understandable
NFR -2	**Security**	The model are designed in a secured manner in order to maintain the privacy

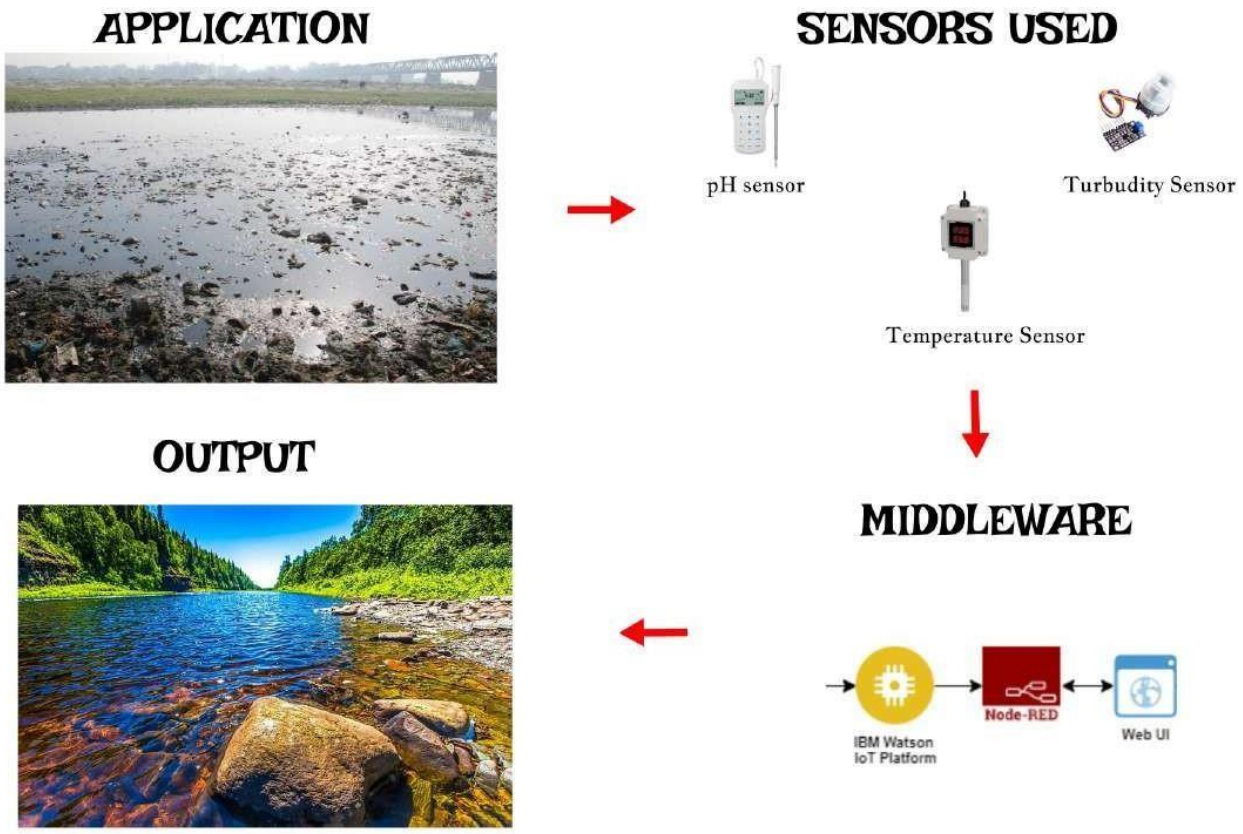
NFR -3	**Reliability**	Even if there is a firmware issue (failures) the last updated data's are stored in adefault manner.
NFR -4	**Performance**	High quality sensors are used to ease the customers work. .
NFR -5	**Availability**	The model are designed in such a way that are available, usable and can be modified anytime.
NFR -6	**Scalability**	. The system are scaled according to the size of the water body(varies).

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

UserType	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptancecriteria	Priority	Release
Customer (Mobile user)	Registration	USN-1 (FATHER)	As a user, I can register by entering my email,and password, and confirming my password. I can access thelocation	I can access my account/dashboard and receive a confirmation email & clickconfirm	High	Sprint-1

			childr en using the creden als providedas a Father.			
		USN-2 (MOTH ER)	As a user, Ican register by entering my em ail,and password, and confirming my password. I can acc essthe loca onof children using the credentials provide as a mother	I can access my account/ dashboar d and receive a confirma on email & click confirm	High	Spri nt-1

		USN-3 (GUARDIA N/ CARETAKER)	As a user, Ican monitorthe children's ac vi using	I can access my account/dashboar d and receive a confirma on email & click confirm	Medi u m	Spri nt-1
	Login	USN-4	As a user, I can log into the applica on by entering my email & password.	I can access my account/dashboard.	Medi u m	Spri nt-2
	Dashboard	USN-5	As a user, can Fix the geofence for my child's that I will receive alerts if my child crosses the geofence and monitor the child's pulse and check whether the device is plugged In or not.	I can monitor the current loca on of my child.	High	Spri nt-2

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint planning and 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

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6.2 SPRINT DELIVERY SCHEDULE

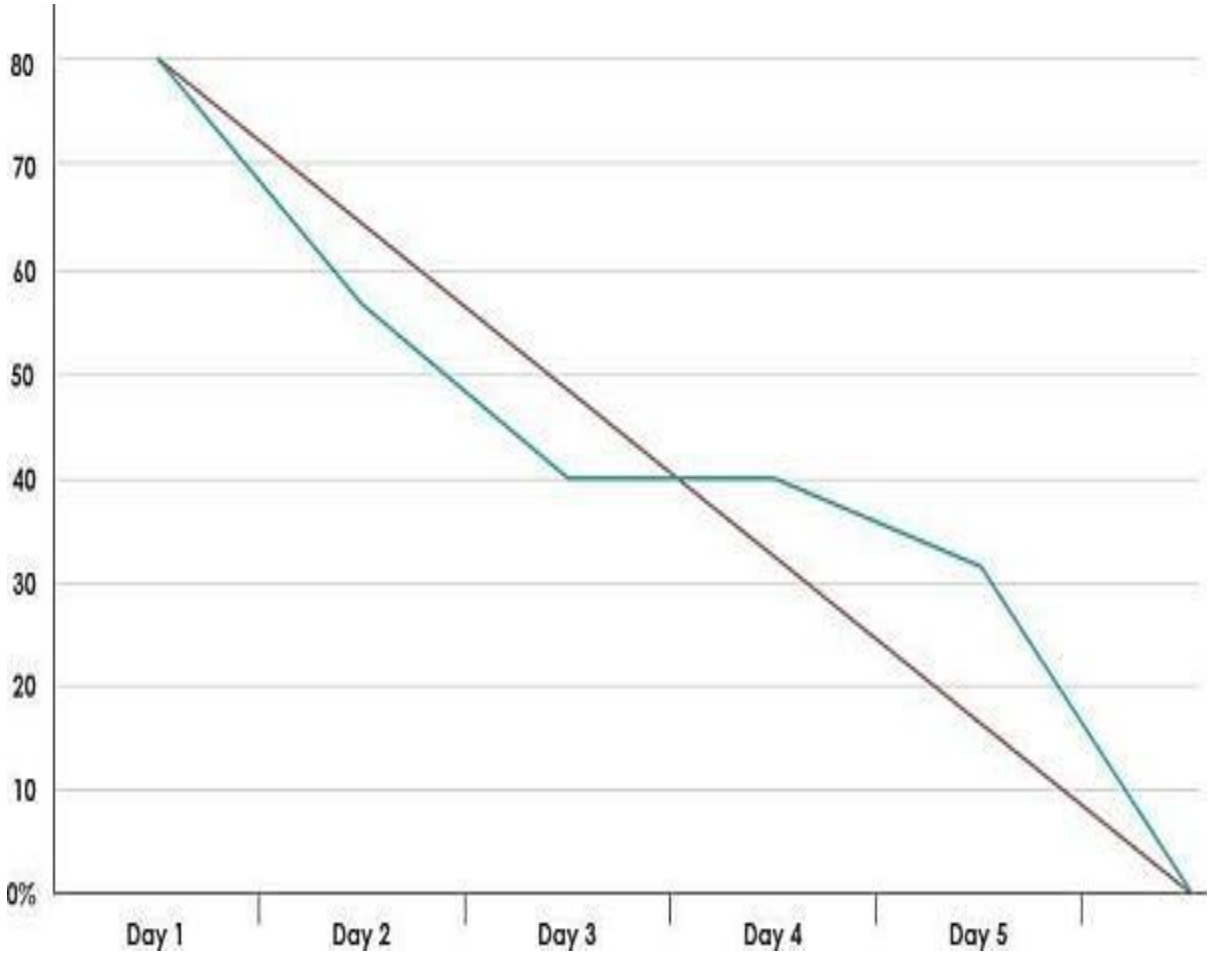
- Product Backlog
- Sprint Schedule
- Estimation

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:

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

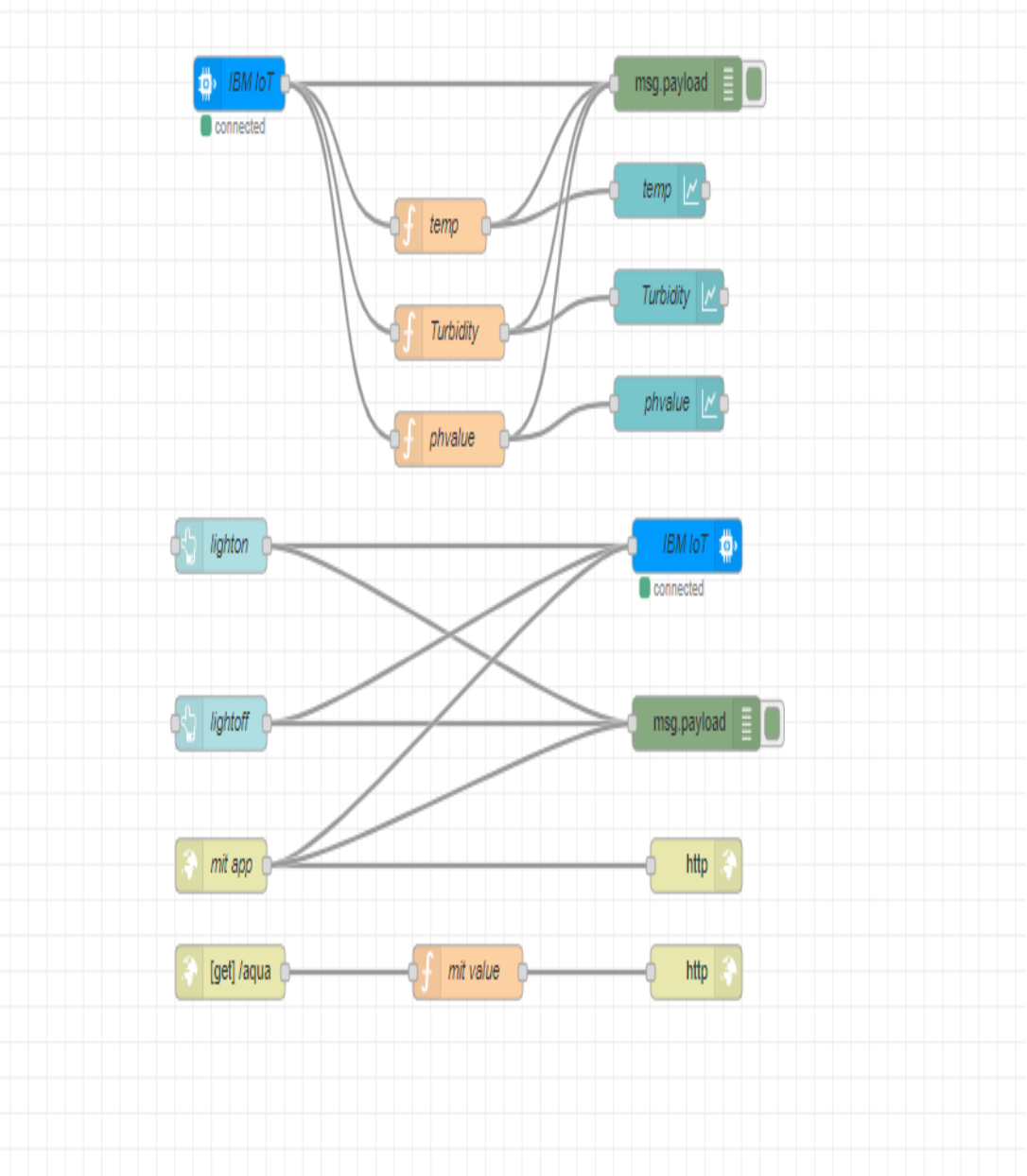
Burndown Chart:



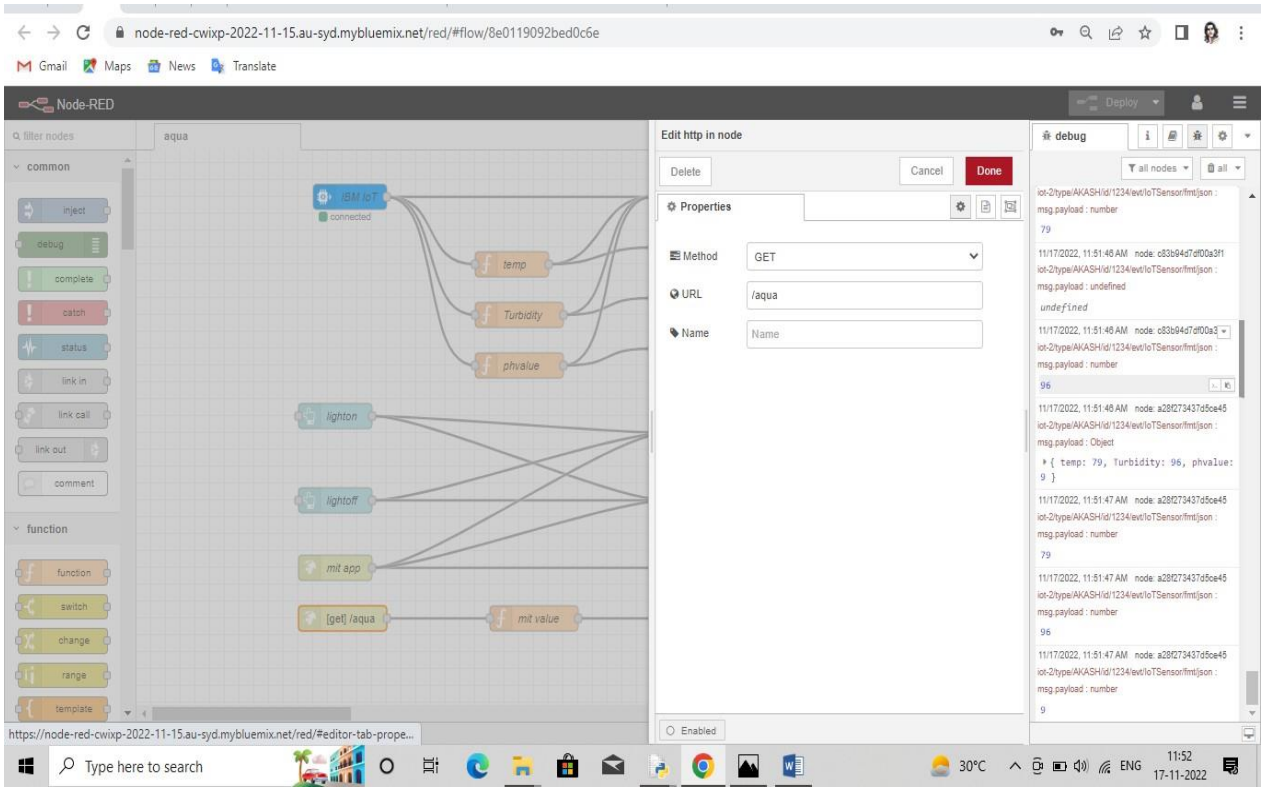
6.3 REPORT FROM JIRA

7. CODING & SOLUTIONING

7.1 NODE RED SERVICE ASSOCIATED WITH IBM CLOUD



NODE RED OUTPUT



8. TESTING

8.1 Test Case Analysis

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

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

8.3USER ACCEPTANCE TESTING:

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues ofthe "**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 eachseverity level, and how they were resolved

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

9. RESULT

9.1 PERFROMANCE METRICS

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

PERFORMANCE METRICES

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	DATA VALIDATION WITH NO. OF TEST CASE	VALID DATA FROMTHE 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 enviroinment .
- 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 otherobjects 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 will be used for farming purpose to check quality water, temperature and PH level. Our Impact of this project is also create a social satisfaction for farmers too. The scalabilty of this project gives the addition of more different type of sensors. By interfacing the relay we can control the supply of water. We can also implement as a revenue model.This system could also be implemented in various industrial processes. The system can be modified according to the needs of the user and can be implemented along with lab view to monitor data on computers.

13.APPENDIX

13.1 SOURCE CODE

PYTHON CODE TO PUBLISH DATA

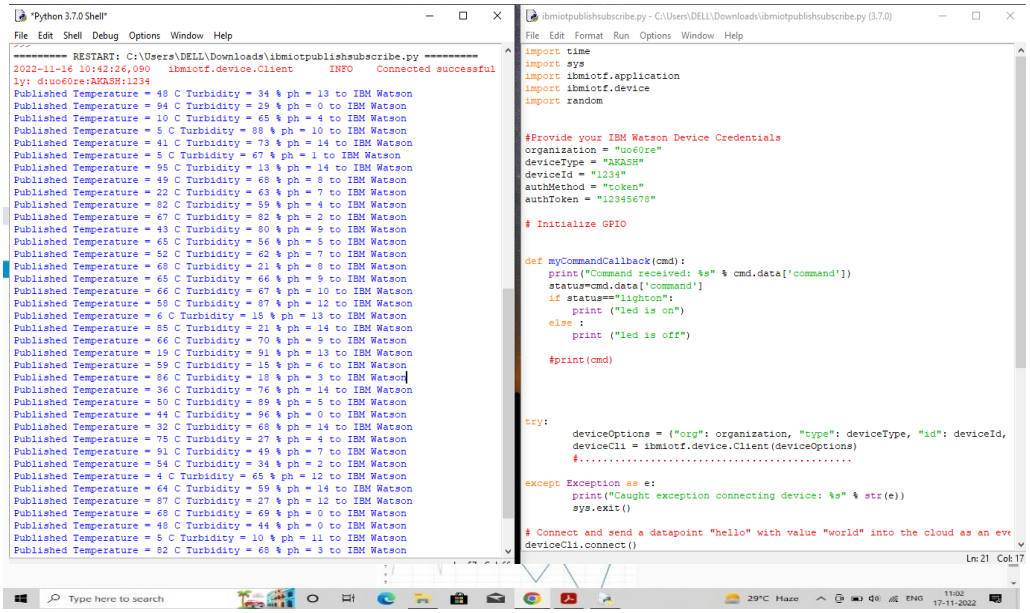
```
    Importtime
    import sys
    import
    ibmiotf.application
    import ibmiotf.device
    import random



    #Provide your IBM Watson
DeviceCredentials
    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(deviceOption
s)
            #.....
```

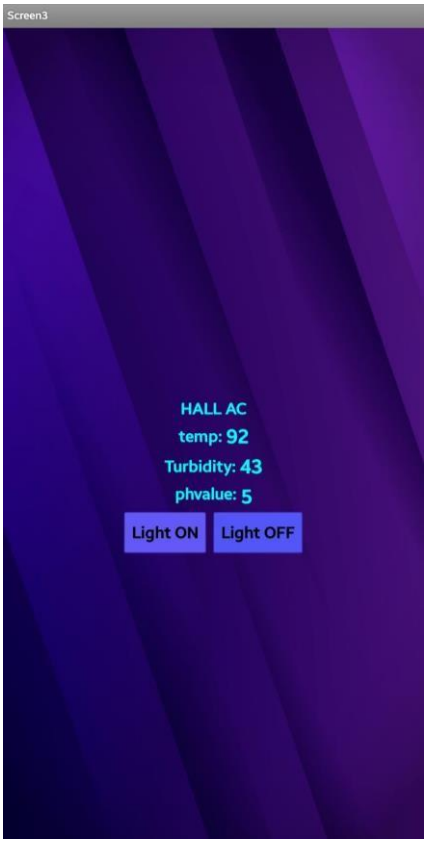
```
    # Connect and send a datapoint
"hello" with value "world" into the
cloudas an event of type "greeting"
10 times
    deviceCli.connect()

    while True:
        #Get Sensor Data from DHT11

        temp=random.randint(60,10

0)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.commandCallb
ack =myCommandCallback
# Disconnect the device and
application from the cloud
    deviceCli.disconnect()
```

OUTPUT



MOBILE APP:



13.4 GIT-HUB LINK& PROJECT DEMO LINK

GIT-HUB LINK

https://github.com/IBM-EPBL/IBM-Project-29663-1660128244

PROJECT DEMO LINK

1. **https://node-red-cwixp-2022-11-15.au-syd.mybluemix.net/red/#flow/8e0119092bed0c6e**

2. **https://youtu.be/m92WyLjxO5A**