REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEM

Category: INTERNET OF THINGS

A PROJECT REPORT

Submitted by

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FROM

JP COLLEGE OF ENGINEERING,AYIKUDI,TENKASI.

In fulfillment of project in IBM-NALAYATHIRAN

2022 Team Id: PNT2022TMID50089

PROJECT GUIDES

Industry Mentor: Bharadwaj

Faculty Mentor: P. Stella Rose Malar

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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 radiological 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 ensure 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 field, hence the parameters affecting the quality of river-water need to be analyse and to be used for water treatement purpose.

2.2 References:

1. 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).

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. 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).

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:

The reduce the river water pollution and to monitor the parameters of river water and control measures can impact vegetation,health. The Real time analysis of Indicators of River water(Ph,salinity,nutrients,etc..,)

IDEATION & PROPOSED SOLUTION

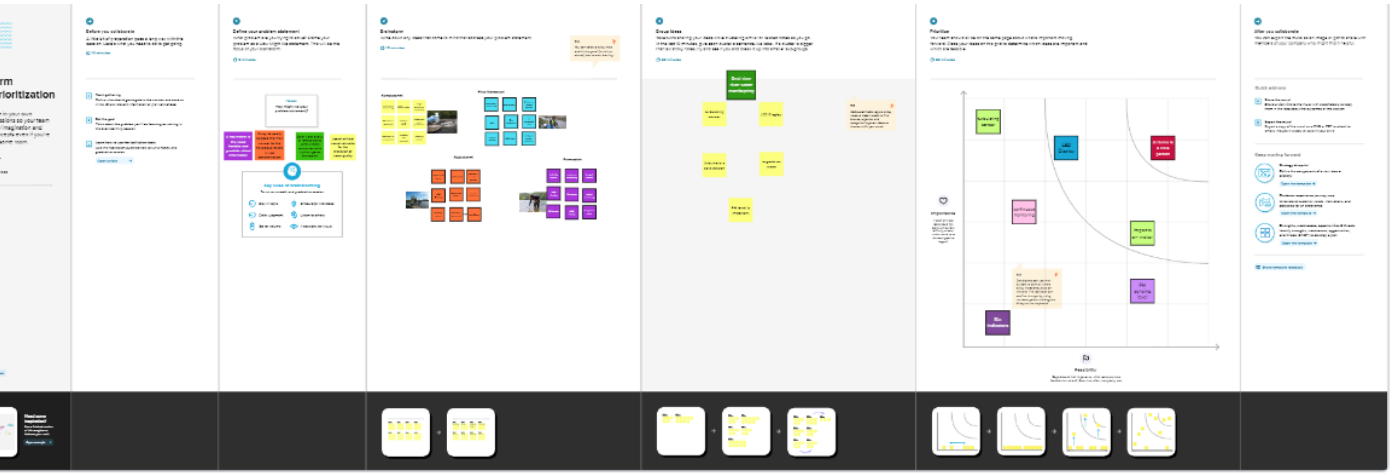
3.1 Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors 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.

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



3.3 Proposed Solution:

Project Design Phase-I
Proposed Solution Template

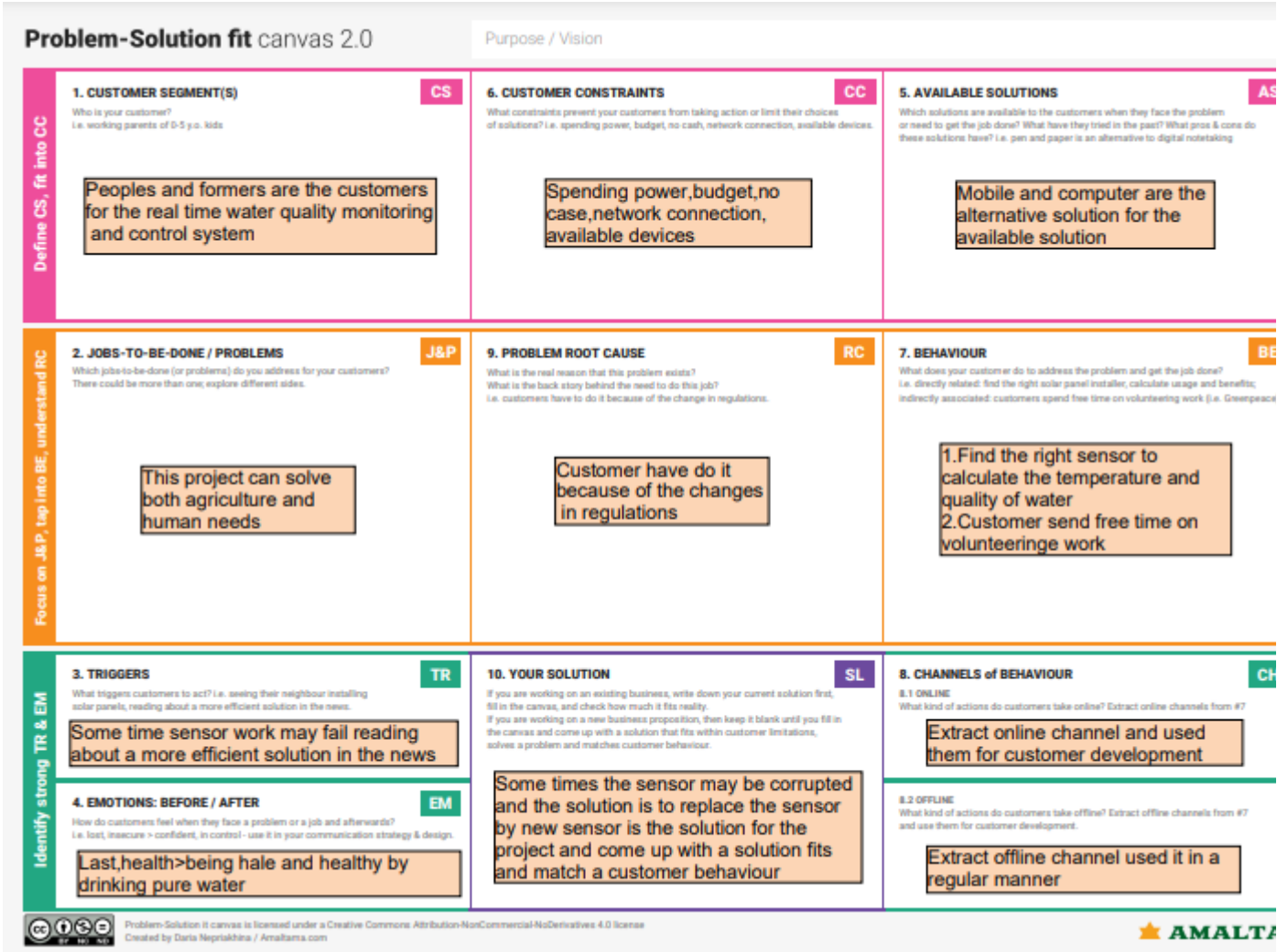
Date	24 September2022
Team ID	PNT2022TMID50089
Project Name	Project – IOT based Real time time river water quality monitoring and control
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Due to the fast growing urbanization supply of safe drinking water is challenge for the every city authority.So the water we reserved in the water tank at our roof top or basement in our society or apartment may not be safe. And we can check the quality of the water anytime and anywhere.
2.	Idea / Solution description	The key team of the project was to develop an efficient cost effective which will integrate wireless sensor network and internet of things.
3.	Novelty / Uniqueness	In this project, we depict of wireless sensor network that assists to monitor the quality of water with the support of information sensed by the sensor dipped in water.
4.	Social Impact / Customer Satisfaction	One of the reason for this happening is the ignorance of public and administration and the lack of water quality monitoring system which makes serious health issues.
5.	Business Model (Revenue Model)	In complex engineering business,it is useful to consider a OPEX model rather than a CAPEX model.
6.	Scalability of the Solution	The ph level of the water is measured using the sensor.

3.4 PROBLEM SOLUTION:



4 REQUIREMENT ANALYSIS

4.1 *Functional Requirements:*

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through e-mail id & Mobile Number
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Web Application	Node service
FR-4	Configure to Device	IBM Watson IoT Platform
FR-5	Database	Cloudant DB
FR-6	Python Script	IBM IoT Platform

4.2 *Non-functional Requirements:*

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to Test the Quality Of Water to Drink
NFR-2	**Security**	Information About The Water Is Noted
NFR-3	**Reliability**	More Consistency and Dependability
NFR-4	**Performance**	Easy to Monitor and & Test the Quality of Water
NFR-5	**Availability**	Available IN defined Geofence
NFR-6	**Scalability**	To exceed future Demand

5 PROJECT DESIGN

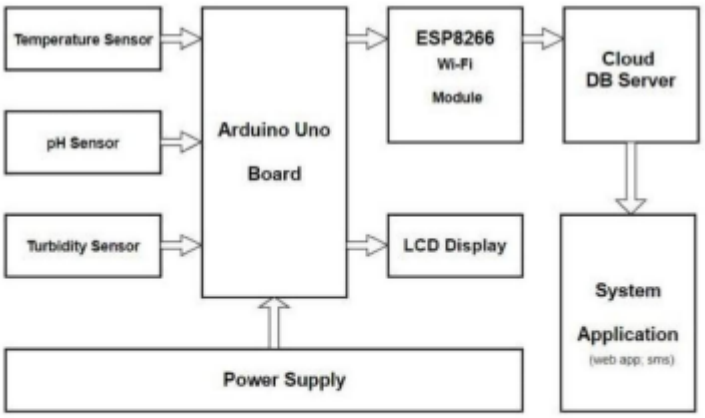
5.1 Data Flow Diagrams:

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.

Project Design Phase-II
Data Flow Diagram &User Stories

Date	19.10.2022
Team ID	PNT2022TMID50089
Project Name	IoT Based Real time river water quality monitoring and control system
Maximum Marks	4 Marks

DATA FLOW DIAGRAM:



USER STORIES:

User Type	Functional Requirement	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 email and Mobile number	I can access my GPS moderm	High	Sprint-1
Customer (Web User)	Web Application	USN-2	Create a web application to check the Ph level of the Water	Create with LED display Service	High	Sprint-1
Customer Care Executive	Configure to device	USN-3	Create and Configure IBM Cloud Service with devices	Create with IBM Watson IoT platform	low	Sprint-2
Customer (Data Base)	To store information data	USN-4	The entire data will be store in Database	Create a database in Cloudant DB	High	Sprint-2
Customer	To Communicat e with the sensor	USN-5	Notifies to check whether the water is pure or not	Develop a python Script	High	Sprint-1

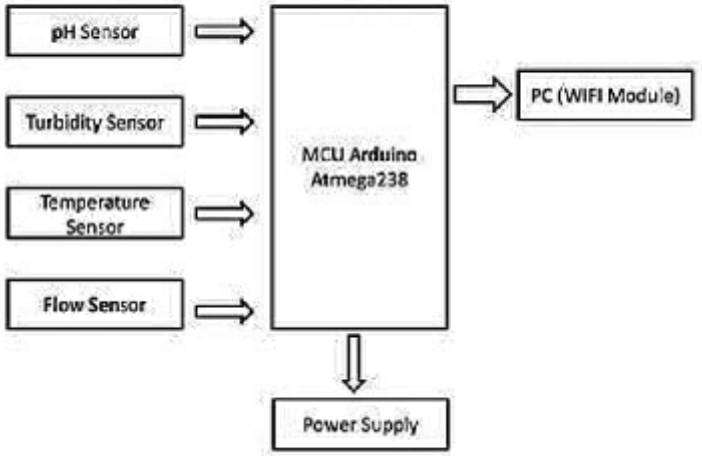
5.2 SOLUTION AND TECHNICAL ARCHITECTURE

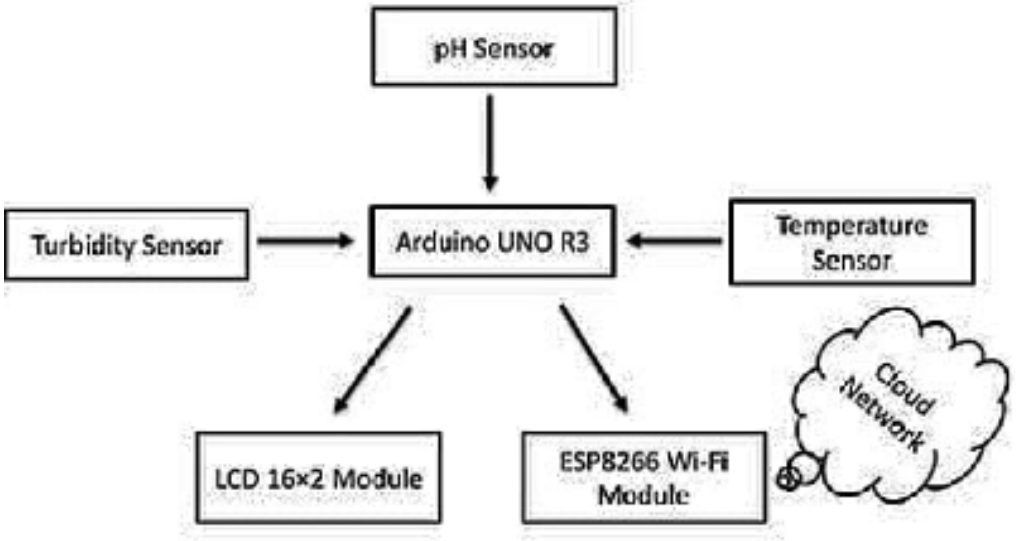
Summary

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

Flow

- Feed the data received from the Sensor unit which are placed in the river sides.
- The collected data will be displayed in the Web page to the user.
- Then the collected data is sent to the database, where the collected data and the predefined data are checked and monitored.
- If any data exceeds 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





Application Characteristics:

S.No	Characteristics	Description	Technology
1.	PH level Monitoring	The PH level of river water can be monitoredvia	PH-sensor

		placing sensors in rivers.	
2.	Air Quality Monitoring	Theclarityandpurity ofriver water can be monitored	Surface Mount Sensor
3.	Temperature Monitoring	The temperature of river water can be monitored	Temperature sensor
4.	Water Treatment	can be used as both a safety device in the water purification process as carbon dioxide, methane, and carbon monoxide are some of the key gases produced during the treatment process	NDIR gas sensors
4.	Soil Condition Monitoring	Soil condition monitoring sensors allow farmers to collect data about rainfall, temperature, and other metrics over time to track trends and predict irrigation needs.	Acoustic sensor

5.3 User Stories

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

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

TEAM ID	PNT2022TMID50089
PROJECT NAME	IOT Based Real- Time River Quality Monitoring and Control System.

Product Backlog, Sprint Schedule, and Estimation (4 Mark))

Sprint	Functional Requirement(Epic)	User Number	User Story / Task story	Story points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for application by enter in email, password, and confirming My password.	2	HIGH	Ramalakshmi
	Registration via Facebook	USN 3	As a user, I can register for application throughFacebook	2	LOW	Priya maheswari
	Registration via Mail ID		As a user, I can register for the application through Gmail	2	MEDIUM	
Sprint-2	Confirmation	USN-2	As a user, I will receive confirmation email once registered for the application	1	HIGH	Prama sakthi
	Login	USN-5	As a user, I can log into application by entering & password	1	HIGH	Rajalakshmi
	IBM Cloud serviceAccess		Get access to IBMservices.		HIGH	
Sprint-3	Create the IBM IoT and device Settings	USN-6	To create the IBM Platform and integrate the	2	HIGH	Ramalaksmi

	Create a node red service	USN-7	To create a node red		MEDIUM	

			Integrate the IBM Watson along with the Web	UI		Prama sakthi
	Create a Web UI USN 8		To create a Web UI, to the data from the cloud and display all parameters	2	MEDIUM	Raja lakshmi
	To develop a Python code	USN-9	Create a python code the physical quantity and store Data to Sense	2	MEDIUM	
Sprint-4	Publish Data to cloud	. USN-10	Publish Data that is sensed the microcontroller Cloud	3	HIGH	Ramalakshmi
	Fast-SMS Service	USN-11	Use Fast SMS to send messages once the parameters like pH, Turbidity and temperature the threshold goes beyond	3	HIGH	Priya maheswari Prama sakthi
	Testing	USN-12	Final Testing of project and deliverables	3	MEDIUM	Raja lakshmi

Sprint	Total Story	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed	Sprint ReleaseDate (as

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date(Planned)	Story Points Completed Planned	Sprint ReleaseDate (as on(Actual) End Date)
Sprint-1	20	4 Days 24	Oct2022	28 Oct 2022	20	29Oct 2022
Sprint-2	20	5 Days 28	Oct 2022	30 Nov 2022	20	04Nov2022
Sprint-3	20	6 Days 02	Nov 2022	04 Nov 2022	20	11Nov2022
Sprint-4	20	9 Days 10	Nov 2022	16Nov 2022	20	19Nov2022

Velocity:

Imagine we have 10 -day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

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

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

6.PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING & SCHEDULING:

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 proposedsolution document, whichincludes the novelty,feasibility of idea,business model, socialimpact, scalability ofsolution, 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

Project Planning Phase

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	IBM Cloud serviceAccess		Get access to IBMservices.		HIGH	
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Sprint-3	Create the IBM IoT and device Settings	USN-6	To create the IBM Platform and integrate the microcontroller with send the sensed data on Cloud	2	HIGH	Ramalaksmi Priya maheswari
	Create a node red service	USN-7	To create a node red		MEDIUM	

			Integrate the IBM Watson along with the Web	UI		Prema sakthi
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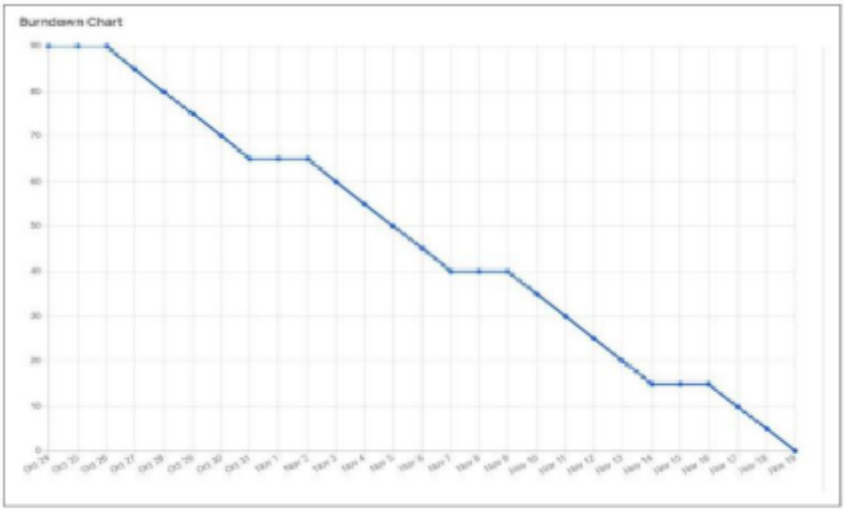


6.3 REPORT FROM JIRA

TIMELINE CREATED USING JIRA SOFTWARE

LISTS IN JIRA:

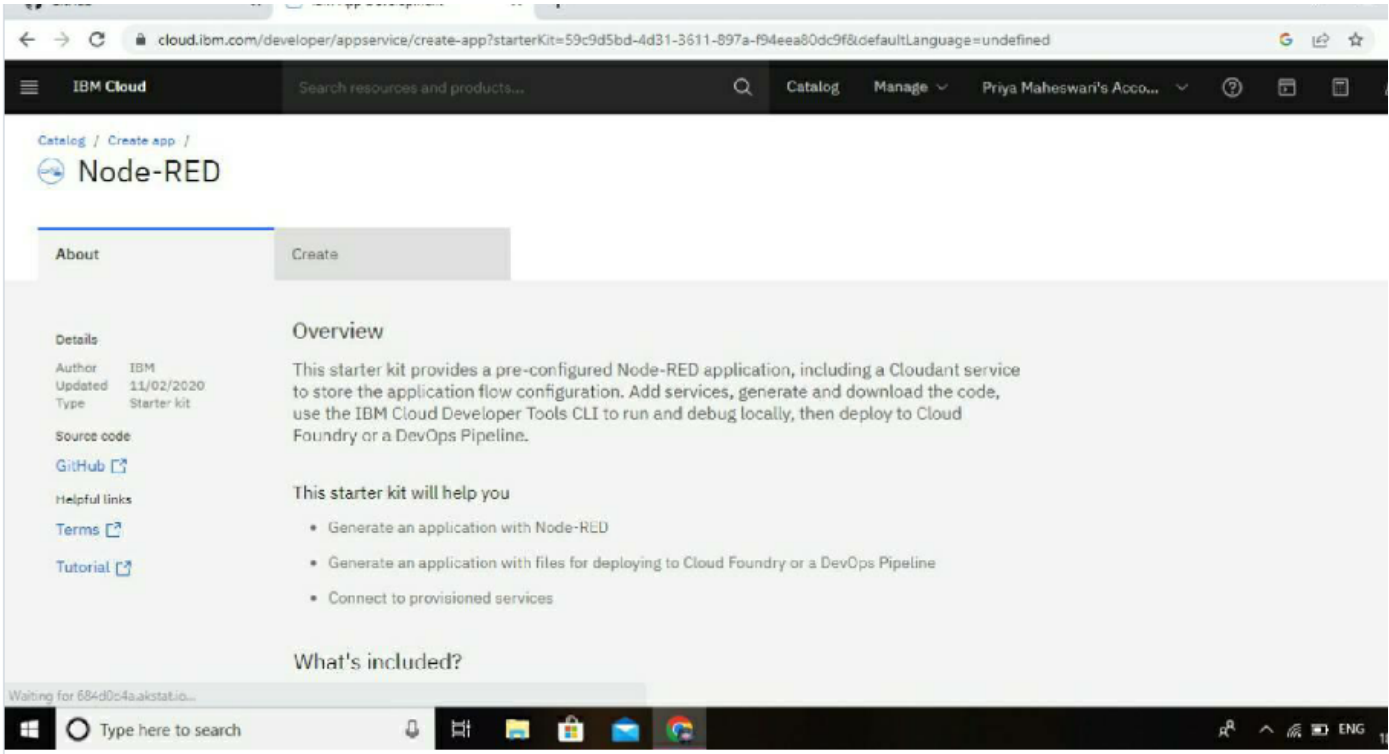
	Key	Summary	Status	Category
	RE-1	CREATE IBM CLOUD ACCOUNT	DONE	PREREQUISITE
	RE-2	CONFIGURE NODE RED SERVICES AND IBM WATSON IOT PLA..	DONE	PREREQUISITE
	RE-3	CREATE DEMO APP IN MIT APP INVENTOR 2.	DONE	MOBILE APPLICATION
	RE-4	USING AI COMPANION DEPLOY THE APP IN MOBILE	DONE	DEPLOYMENT AND TESTING
	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

ISSUES :

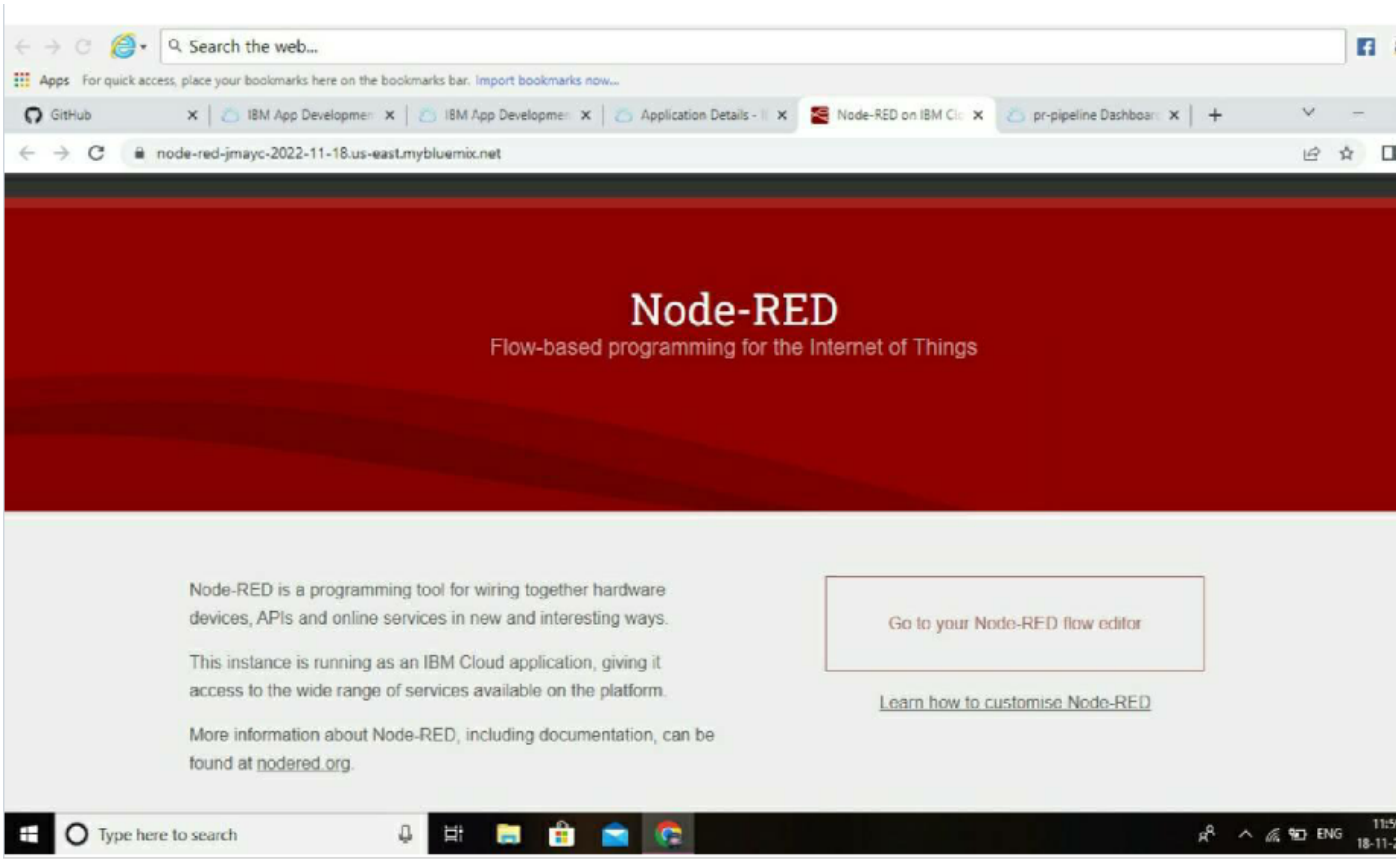
Name	Type	Related Schemes
ERROR IN MSG PAYLOAD EVENTS	Base	Default Issue Type Scheme
ISSUE IN CONFIGURING NODE RED DASHBOARD	Base	Default Issue Type Scheme
ERROR 1101 IN MIT APP INVENTOR	Subtask	Default Issue Type Scheme
URL NOT RESPONDED THE NODE RED DATA URL NOT RESPONDED	Subtask	Default Issue Type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

7.CODING AND SOLUTIONING

7.1 NODE RED SERVICE ASSOCIATED WITH IBM CLOUD:


cloud.ibm.com/developer/appservice/create-app?starterKit=59c9d5bd-4d31-3611-897a-f94eea80dc9f&defaultLanguage=undefined
IBM Cloud
Search resources and products...
Catalog
Manage
Priya Maheswari's Acco...
Catalog / Create app /
Node-RED
About
Create
Details
Author IBM
Updated 11/02/2020
Type Starter kit
Source code
GitHub
Helpful links
Terms
Tutorial
Overview
This starter kit provides a pre-configured Node-RED application, including a Cloudant service to store the application flow configuration. Add services, generate and download the code, use the IBM Cloud Developer Tools CLI to run and debug locally, then deploy to Cloud Foundry or a DevOps Pipeline.
This starter kit will help you
Generate an application with Node-RED
Generate an application with files for deploying to Cloud Foundry or a DevOps Pipeline
Connect to provisioned services
What's included?
Type here to search
ENG

Node red Das


Search the web...
Apps
For quick access, place your bookmarks here on the bookmarks bar. Import bookmarks now...
GitHub
IBM App Developmen
IBM App Developmen
Application Details -
Node-RED on IBM Cl
pr-pipeline Dashboar
node-red-jmayc-2022-11-18.us-east.mybluemix.net
Node-RED
Flow-based programming for the Internet of Things
Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways.
This instance is running as an IBM Cloud application, giving it access to the wide range of services available on the platform.
More information about Node-RED, including documentation, can be found at nodered.org.
Go to your Node-RED flow editor
Learn how to customise Node-RED
Type here to search
ENG

8. TESTING

8.1 Test Case Analysis

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

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

8.2 USER ACCEPTANCE TESTING:

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of
the REAL TIME RIVER WATER QUALITY MONITORING AND CONTROL SYSTEMS project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

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	25	79

9.RESULT

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)
SERVER 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 phones 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 do not reflect real time water quality measurement due to delay in measurement.
- The process is time consuming due to the 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 sensors with unique advantages 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, we 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 to.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 it 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 a 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 = "abcd"
#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 evention 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,'DissolvedOxyge
n':DissolvedOxygen,'conductivity':conductivity}
    #define myon publish callback 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()
```

HTML CODE:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <style>
    h1 {text-align: center;}
    p {text-align: center;}
    div {text-align: center;}
    body {
      background-image: url("https://thumbs.dreamstime.com/b/clear-transparent-light-blue water-pool-texture-background-150961732.jpg");
      background-color: #cccccc;
    }
    </style>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=
1.0">    <title>Login page in HTML</title>
```

```
</head>
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<body>


   <h1>Login Page</h1>
   <form action="">
      <!-- Headings for the form -->
      <div class="headingsContainer">
         <h3>Sign in</h3>
         <p>Sign in with your username and password</p>
      </div>


      <!-- Main container for all inputs -->
      <div class="mainContainer">
         <!-- Username -->
         <label for="username">Your username</label>
         <input type="text" placeholder="Enter Username" name="username" re


quired>            <br><br>


         <!-- Password -->
         <label for="pswrd">Your password</label>
 <input type="password" placeholder="Enter Password" name="pswrd" required>


         <!-- sub container for the checkbox and forgot password li
nk -->            <div class="subcontainer">
            <label>
              <input type="checkbox" checked="checked" name="remember"> Reme
mber me               </label>
            <p class="forgotpsd"> <a href="#">Forgot Password?</a
></p>            </div>
  <button type="submit" onclick="window.location.href = 'https://node-red-qltdp-2022-
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11-07.eu-gb.mybluemix.net/ui';">Login</button>
```

```
            <!-- Sign up link -->
            <p class="register">Not a member?  <a href="#">Register here!</a></p>


        </div>
      </p>


    </form>
</body>
</html>
```

13.2 GIT-HUB LINK:

https://github.com/IBM-EPBL/IBM-Project-38001-1660367295

PROJECT DEMO LINK:

https://node-red-jmayc-2022-11-18.us-east.mybluemix.net/red/#flow/4ff67e4659cc3103