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CHAPTER 1

INTRODUCTION

1.1PROJECT OVERVIEW

The motto of our project is to measure the purity of water and warn the people when the water is undrinkable and unusable. River water quality can be monitored by the web application. The PH level of the water can be monitored. Water temperature can be monitored. Alerting the authorities if the water quality is not good so that they can go and announce the localities not to drink that water.This will help authorities to know about the quality of water.

1.2 PURPOSE

The Ecological status of a country has an effect on the growth of a country and that includes the river water quality which affects the people health. Nowadays, the river water is polluted to the point where we use money to buy a drinkable water and still some people use the polluted river water for drinking and house chore purposes .To avoid people from getting sick ,we use multiple sensors to detect the quality of water and alarms the people when the river water gets unusable. An IoT-based river monitoring solution is an advanced and well-equipped system which is highly scalable.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

Existing system has a mechanisms which are semi-automated or manually controlled devices which are to be handled by a person responsible for monitoring the water quality. There is need to have human intervention in taking various reading of the water parameters. The existing method makes it difficult for people to know the different parameters of water like turbidity temperature in pH.

2.2 REFERENCES

https://aeronsystems.com/iot/water-quality-monitoring/

https://www.fondriest.com/environmental-measurements/environmental-monitoring-applications/stream-and-river-monitoring/

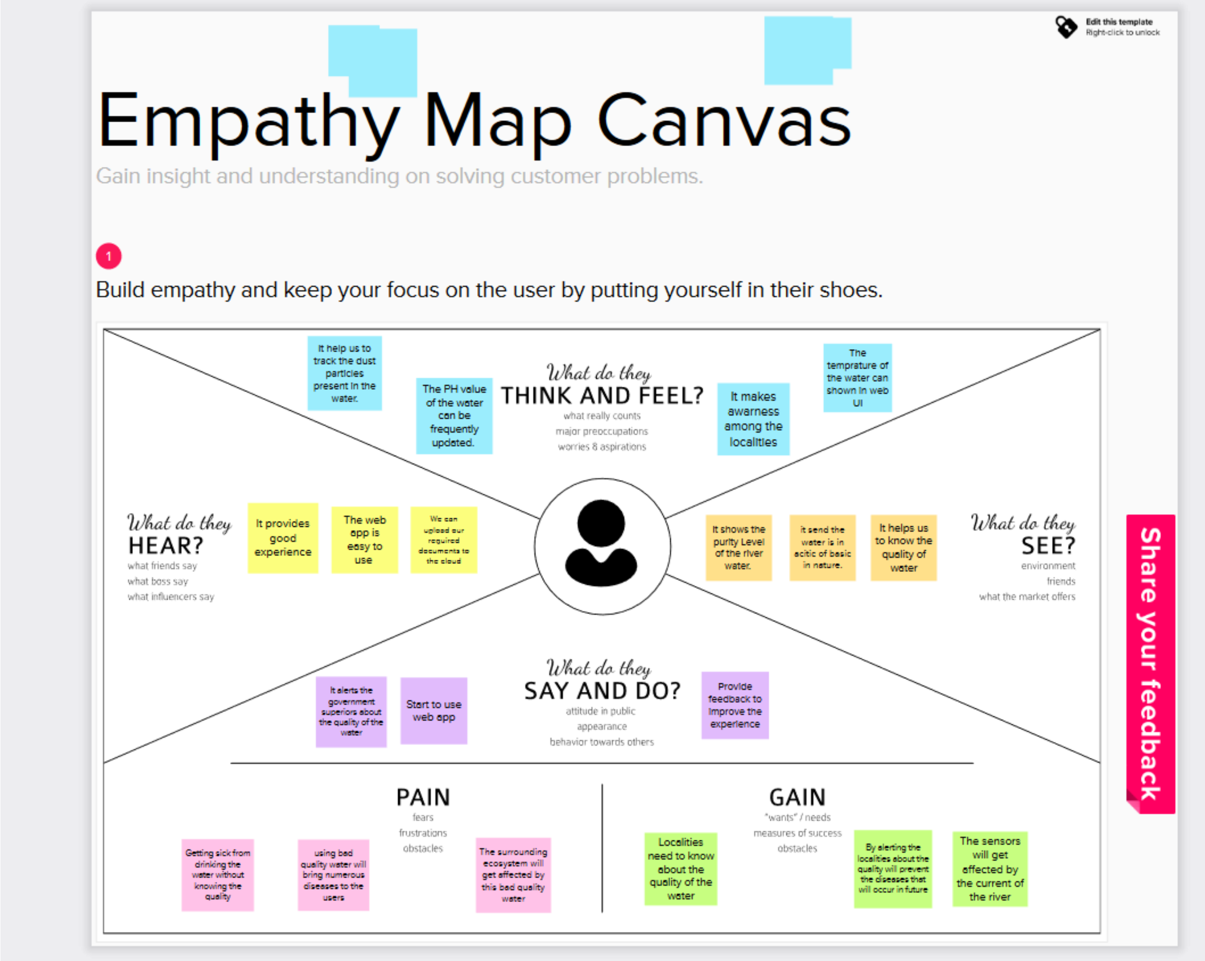
2.3 PROBLEM STATEMENT DEFINITION

Current water quality monitoring system is a manual system with a monotonous process and is very time-consuming.We propose this solution to make it easier and to refrain people from drinking impure water which are affected by bacteria and viruses.

CHAPTER 3

IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



Empathy Map Canvas

Gain insight and understanding on solving customer problems.

1

Build empathy and keep your focus on the user by putting yourself in their shoes.

What do they THINK AND FEEL?

what really counts

major preoccupations

worries & aspirations

- It help us to track the dust particles present in the water.
- The PH value of the water can be frequently updated.
- It makes awarness among the localities
- The temprature of the water can shown in web UI

What do they HEAR?

what friends say

what boss say

what influencers say

- It provides good experience
- The web app is easy to use
- We can upload our required documents to the cloud

What do they SEE?

environment

friends

what the market offers

- It shows the purity Level of the river water.
- it send the water is in acitic of basic in nature.
- It helps us to know the quality of water

What do they SAY AND DO?

attitude in public

appearance

behavior towards others

- It alerts the government superiors about the quality of the water
- Start to use web app
- Provide feedback to improve the experience

PAIN

fears

frustrations

obstacles

- Getting sick from drinking the water without knowing the quality
- using bad quality water will bring numerous diseases to the users
- The surrounding ecosystem will get affected by this bad quality water

GAIN

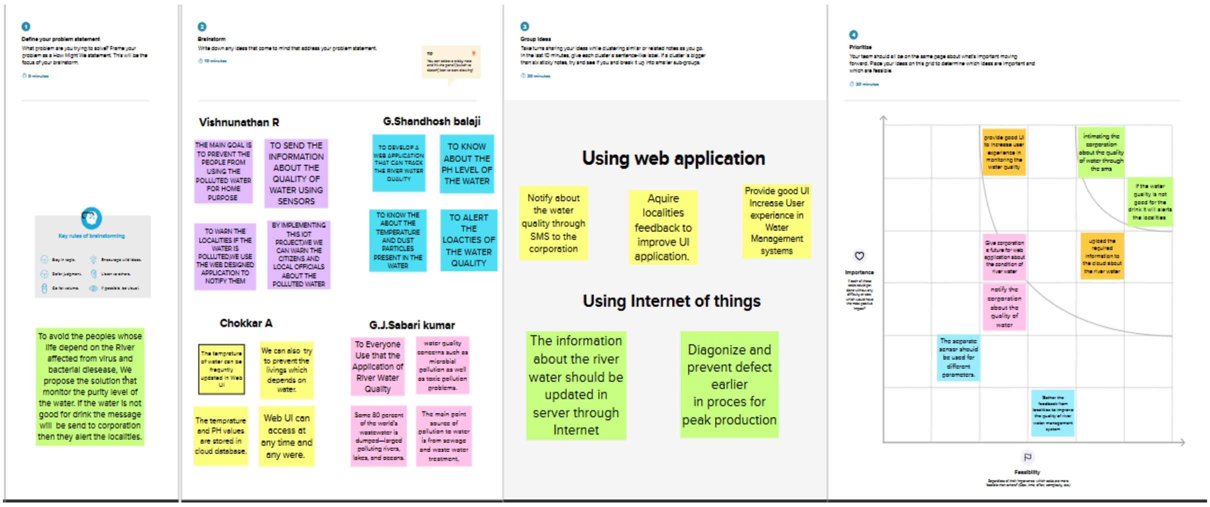
"wants" / needs

measures of success

obstacles

- Localities need to know about the quality of the water
- By alerting the localities about the quality will prevent the diseases that will occur in future
- The sensors will get affected by the current of the river

3.2 IDEATION AND BRAINSTORMING



1

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

Key rules of brainstorming

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

To avoid the peoples whose life depend on the River affected from virus and bacterial diesease, We propose the solution that monitor the purity level of the water. If the water is not good for drink the message will be send to corporation then they alert the localities.

2

Brainstorm

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

10 minutes

TIP

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

Vishnunathan R

- THE MAIN GOAL IS TO PREVENT THE PEOPLE FROM USING THE POLLUTED WATER FOR HOME PURPOSE
- TO SEND THE INFORMATION ABOUT THE QUALITY OF WATER USING SENSORS
- TO WARN THE LOCALITIES IF THE WATER IS POLLUTED,WE USE THE WEB DESIGNED APPLICATION TO NOTIFY THEM
- BY IMPLEMENTING THIS IOT PROJECT,WE WE CAN WARN THE CITIZENS AND LOCAL OFFICIALS ABOUT THE POLLUTED WATER

G.Shandhosh balaji

- TO DEVELOP A WEB APPLICATION THAT CAN TRACK THE RIVER WATER QUALITY
- TO KNOW ABOUT THE PH LEVEL OF THE WATER
- TO KNOW THE ABOUT THE TEMPERATURE AND DUST PARTICLES PRESENT IN THE WATER
- TO ALERT THE LOACTIES OF THE WATER QUALITY

Chokkar A

- The temprature of water can be freguntly updated in Web UI
- We can also try to prevent the livings which depends on water.
- The temprature and PH values are stored in cloud database.
- Web UI can access at any time and any were.

G.J.Sabari kumar

- To Everyone Use that the Application of River Water Quality
- water quality concerns such as microbial pollution as well as toxic pollution problems.
- Some 80 percent of the world's wastewater is dumped—largely polluting rivers, lakes, and oceans.
- The main point source of pollution to water is from sewage and waste water treatment,

3

Group Ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

Using web application

- Notify about the water quality through SMS to the corporation
- Aquire localities feedback to improve UI application.
- Provide good UI Increase User experiance in Water Management systems

Using Internet of things

- The information about the river water should be updated in server through Internet
- Diagonize and prevent defect earlier in proces for peak production

4

Prioritize

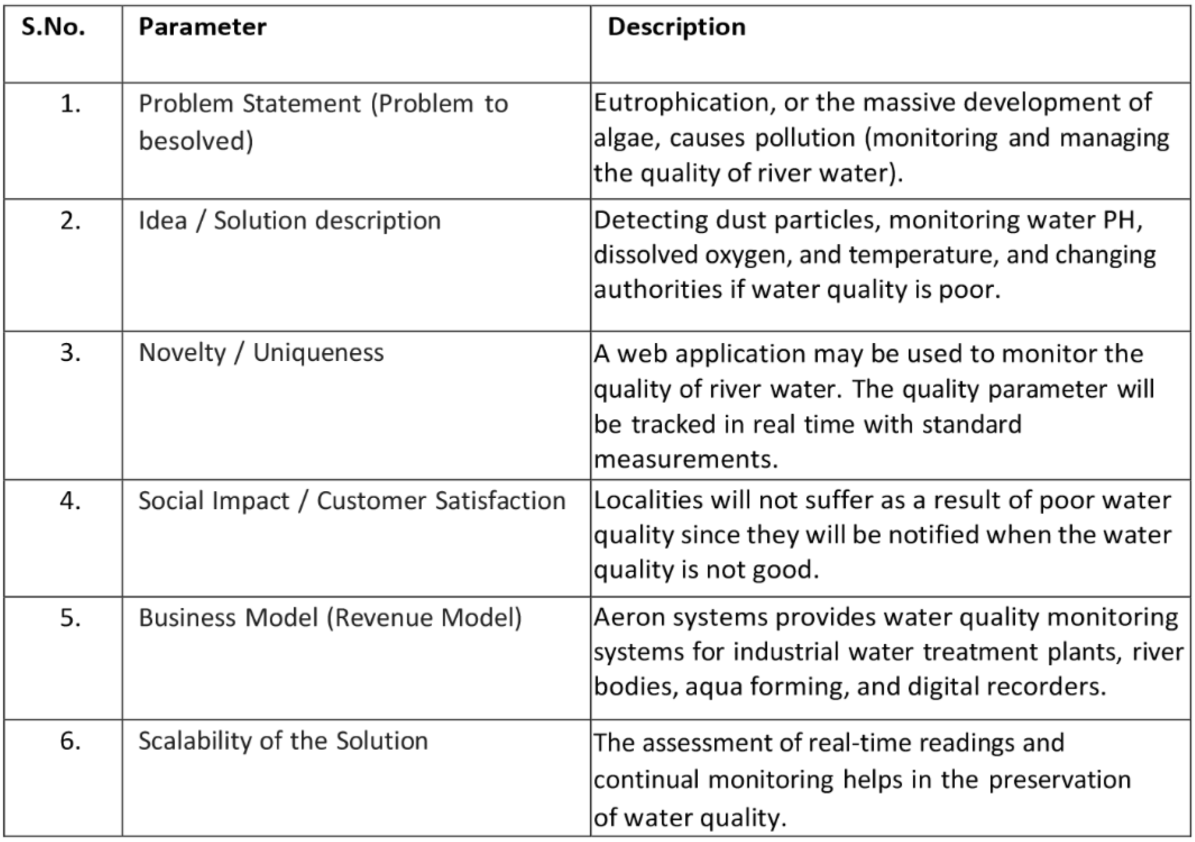
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

- provide good UI to increase user experience in monitoring the water quality
- intimating the corporation about the quality of water through the sms
- If the water quality is not good for the drink it will alerts the localities
- Give corporation a future for web application about the condition of river water
- upload the required information to the cloud about the river water
- notify the corporation about the quality of water
- The separate sensor should be used for different parameters.
- Gather the feedback from localities to improve the quality of river water management system

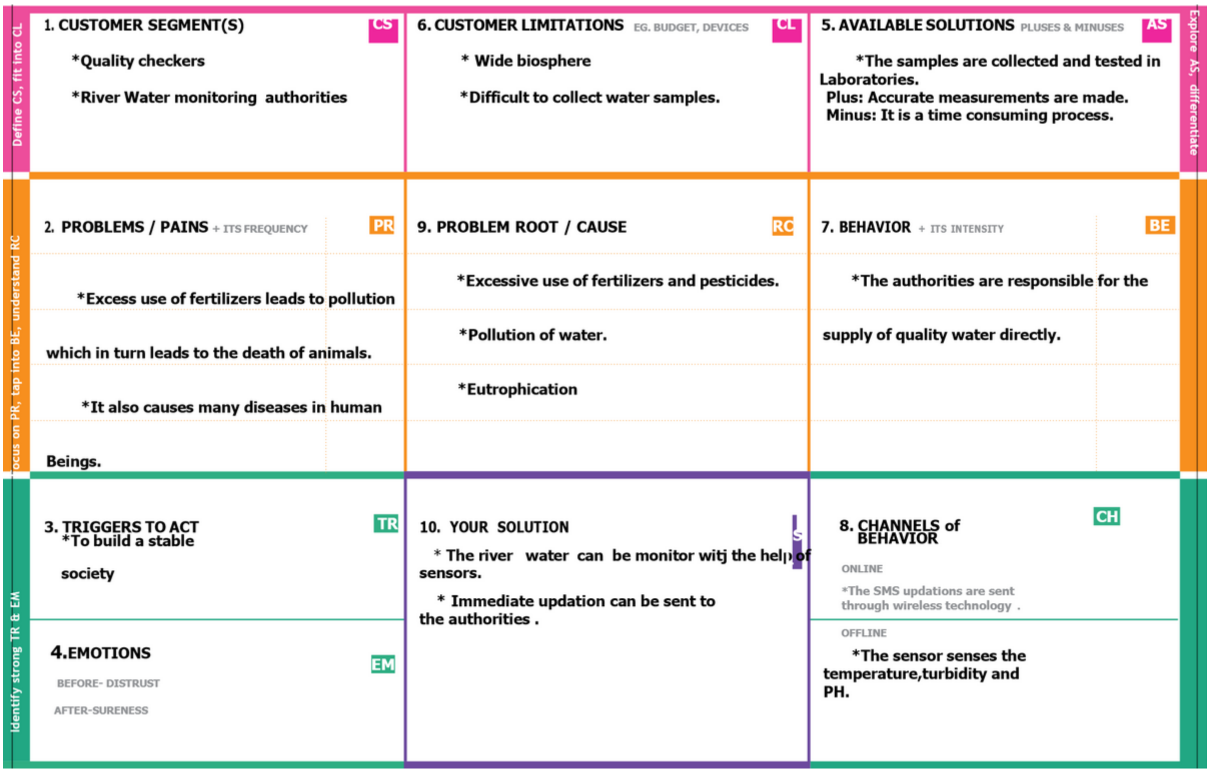
Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Feasibility
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

3.3 PROPOSED SOLUTION



S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	Eutrophication, or the massive development of algae, causes pollution (monitoring and managing the quality of river water).
2.	Idea / Solution description	Detecting dust particles, monitoring water PH, dissolved oxygen, and temperature, and changing authorities if water quality is poor.
3.	Novelty / Uniqueness	A web application may be used to monitor the quality of river water. The quality parameter will be tracked in real time with standard measurements.
4.	Social Impact / Customer Satisfaction	Localities will not suffer as a result of poor water quality since they will be notified when the water quality is not good.
5.	Business Model (Revenue Model)	Aeron systems provides water quality monitoring systems for industrial water treatment plants, river bodies, aqua forming, and digital recorders.
6.	Scalability of the Solution	The assessment of real-time readings and continual monitoring helps in the preservation of water quality.

3.4 PROPOSED SOLUTION FIT



Define CS, fit into CL

1. CUSTOMER SEGMENT(S) CS

*Quality checkers

*River Water monitoring authorities

6. CUSTOMER LIMITATIONS EG. BUDGET, DEVICES CL

* Wide biosphere

*Difficult to collect water samples.

5. AVAILABLE SOLUTIONS PLUSES & MINUSES AS

*The samples are collected and tested in Laboratories.
Plus: Accurate measurements are made.
Minus: It is a time consuming process.

Explore AS, differentiate

ocus on PR, tap into BE, understand RC

2. PROBLEMS / PAINS + ITS FREQUENCY PR

*Excess use of fertilizers leads to pollution which in turn leads to the death of animals.

*It also causes many diseases in human Beings.

9. PROBLEM ROOT / CAUSE RC

*Excessive use of fertilizers and pesticides.

*Pollution of water.

*Eutrophication

7. BEHAVIOR + ITS INTENSITY BE

*The authorities are responsible for the supply of quality water directly.

Identify strong TR & EM

3. TRIGGERS TO ACT TR
*To build a stable society

4.EMOTIONS EM

BEFORE- DISTRUST

AFTER-SURENESS

10. YOUR SOLUTION S

* The river water can be monitor witj the help of sensors.

* Immediate updation can be sent to the authorities .

8. CHANNELS of BEHAVIOR CH

ONLINE

*The SMS updations are sent through wireless technology .

OFFLINE

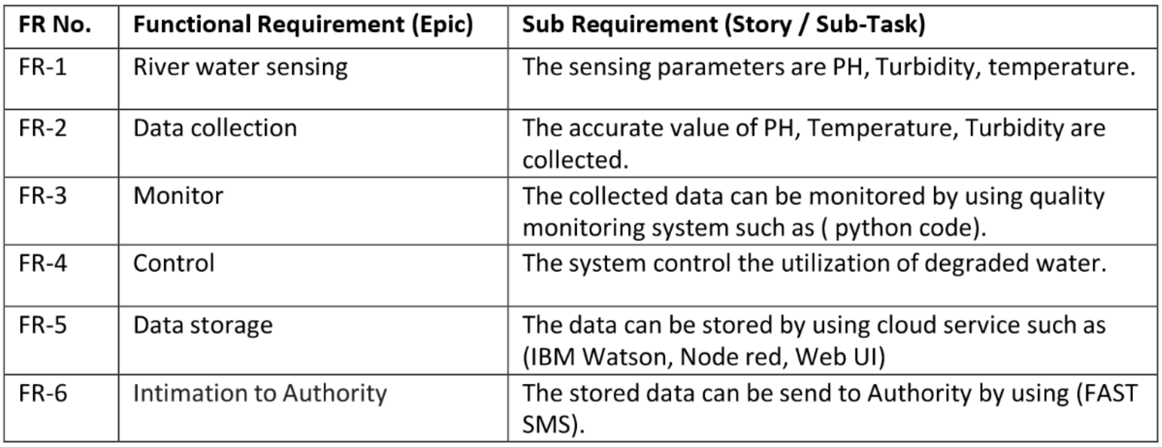
*The sensor senses the temperature,turbidity and PH.

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

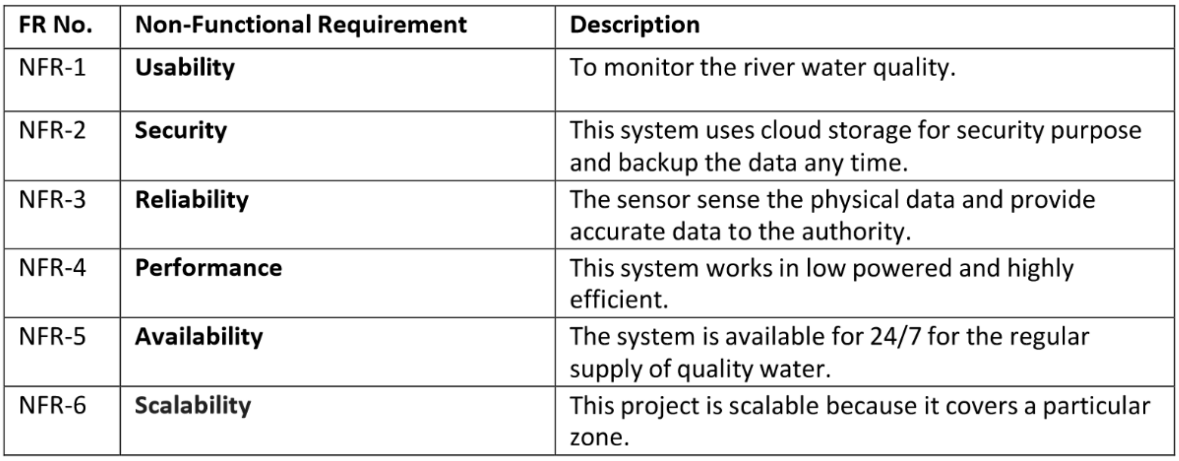
Following are the functional requirements of propesed solution



FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	River water sensing	The sensing parameters are PH, Turbidity, temperature.
FR-2	Data collection	The accurate value of PH, Temperature, Turbidity are collected.
FR-3	Monitor	The collected data can be monitored by using quality monitoring system such as (python code).
FR-4	Control	The system control the utilization of degraded water.
FR-5	Data storage	The data can be stored by using cloud service such as (IBM Watson, Node red, Web UI)
FR-6	Intimation to Authority	The stored data can be send to Authority by using (FAST SMS).

4.2 NON-FUNCTIONAL REQUIREMENTS

Following are the non-functional requirements of the proposed solution



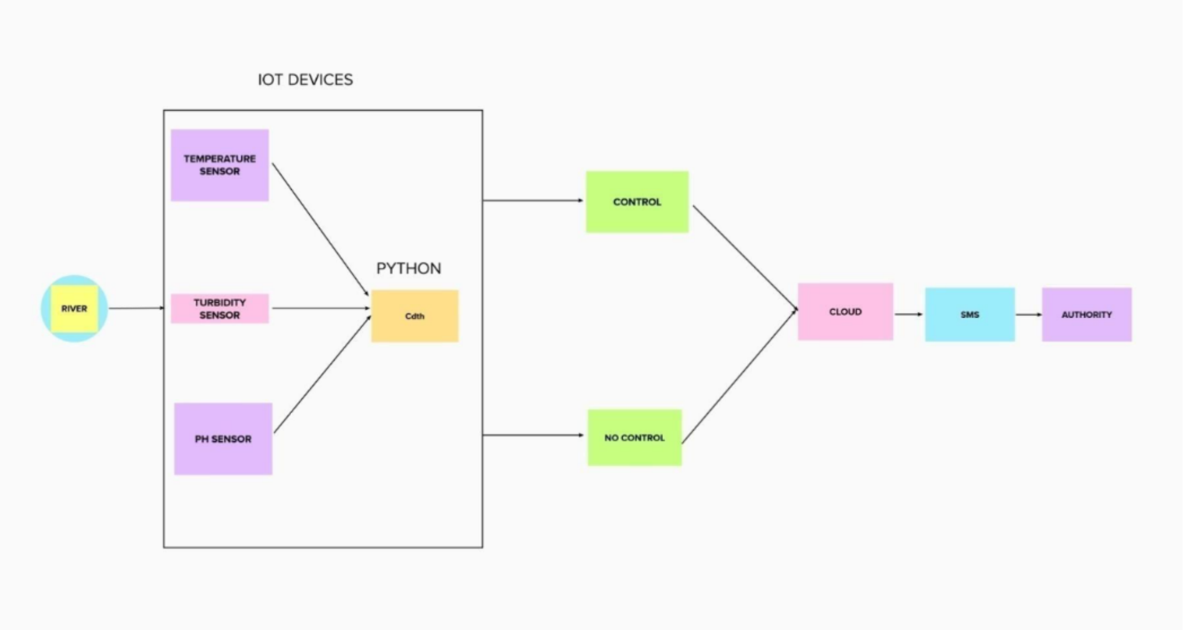
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	To monitor the river water quality.
NFR-2	**Security**	This system uses cloud storage for security purpose and backup the data any time.
NFR-3	**Reliability**	The sensor sense the physical data and provide accurate data to the authority.
NFR-4	**Performance**	This system works in low powered and highly efficient.
NFR-5	**Availability**	The system is available for 24/7 for the regular supply of quality water.
NFR-6	**Scalability**	This project is scalable because it covers a particular zone.

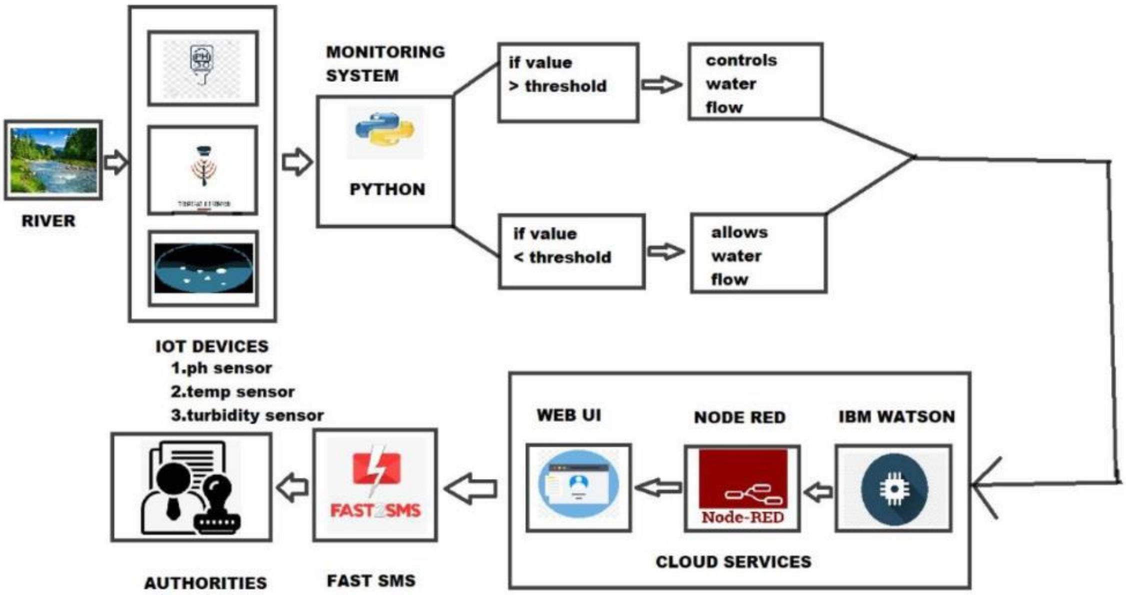
CHAPTER 5

PROJECT DESIGN

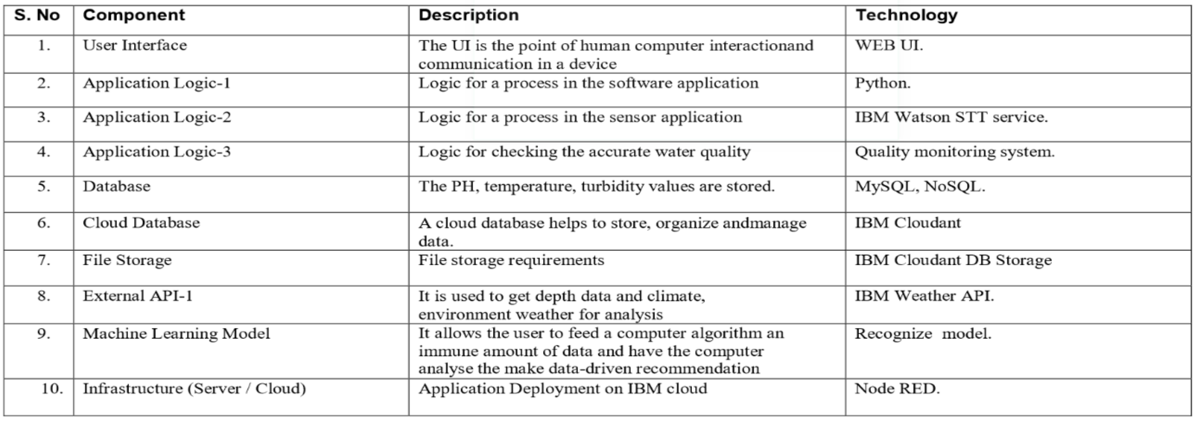
5.1 DATA FLOW DIAGRAMS

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

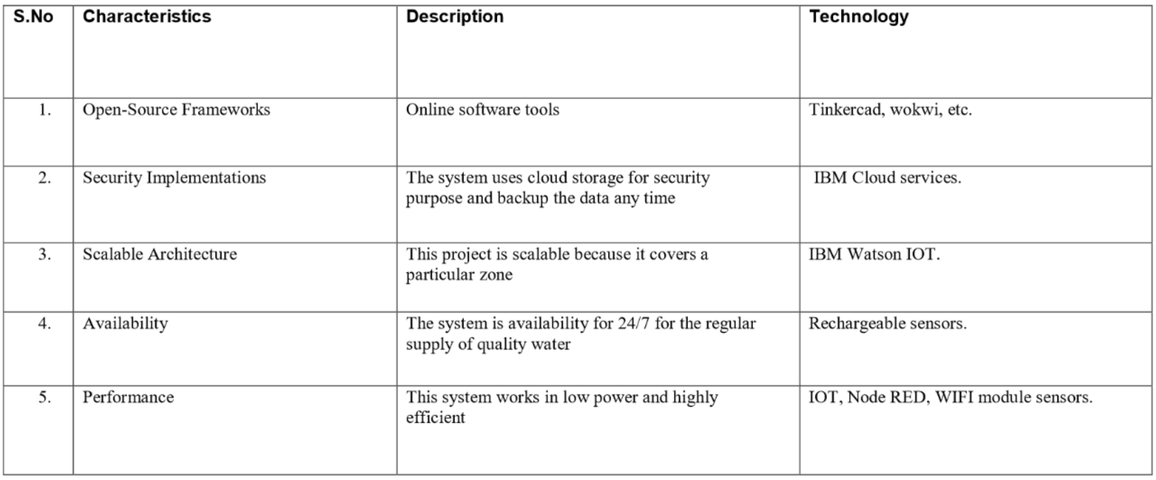




5.2 SOLUTION & TECHNICAL ARCHITECTURE



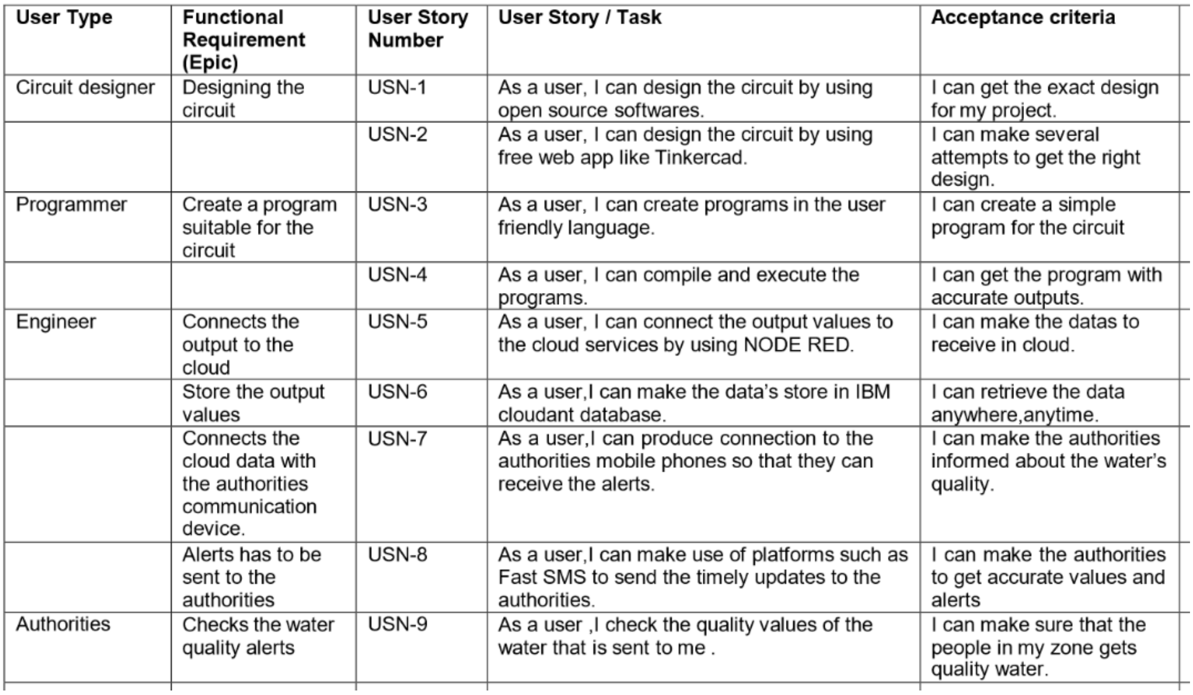
S. No	Component	Description	Technology
1.	User Interface	The UI is the point of human computer interactionand communication in a device	WEB UI.
2.	Application Logic-1	Logic for a process in the software application	Python.
3.	Application Logic-2	Logic for a process in the sensor application	IBM Watson STT service.
4.	Application Logic-3	Logic for checking the accurate water quality	Quality monitoring system.
5.	Database	The PH, temperature, turbidity values are stored.	MySQL, NoSQL.
6.	Cloud Database	A cloud database helps to store, organize andmanage data.	IBM Cloudant
7.	File Storage	File storage requirements	IBM Cloudant DB Storage
8.	External API-1	It is used to get depth data and climate, environment weather for analysis	IBM Weather API.
9.	Machine Learning Model	It allows the user to feed a computer algorithm an immune amount of data and have the computer analyse the make data-driven recommendation	Recognize model.
10.	Infrastructure (Server / Cloud)	Application Deployment on IBM cloud	Node RED.



S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Online software tools	Tinkercad, wokwi, etc.
2.	Security Implementations	The system uses cloud storage for security purpose and backup the data any time	IBM Cloud services.
3.	Scalable Architecture	This project is scalable because it covers a particular zone	IBM Watson IOT.
4.	Availability	The system is availability for 24/7 for the regular supply of quality water	Rechargeable sensors.
5.	Performance	This system works in low power and highly efficient	IOT, Node RED, WIFI module sensors.

5.3 USER STORIES

The user stories of the proposed solution are listed below



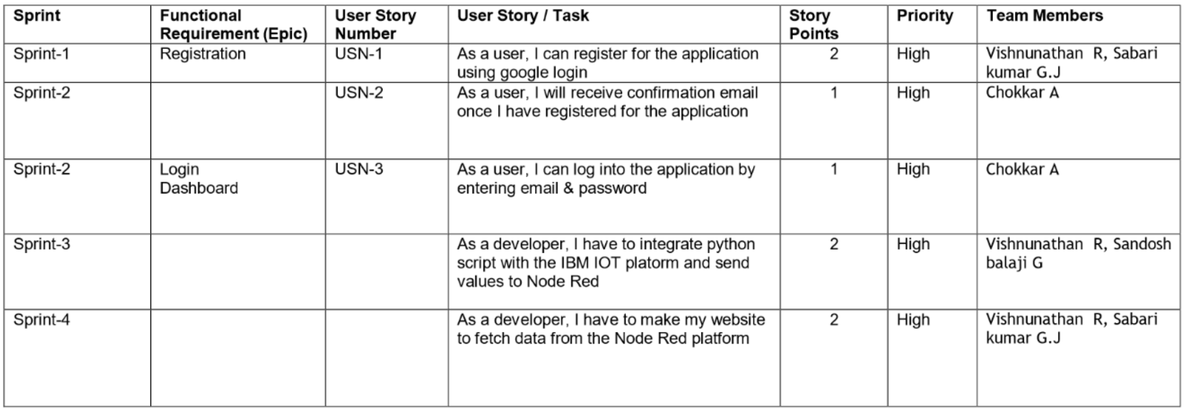
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria
Circuit designer	Designing the circuit	USN-1	As a user, I can design the circuit by using open source softwares.	I can get the exact design for my project.
		USN-2	As a user, I can design the circuit by using free web app like Tinkercad.	I can make several attempts to get the right design.
Programmer	Create a program suitable for the circuit	USN-3	As a user, I can create programs in the user friendly language.	I can create a simple program for the circuit
		USN-4	As a user, I can compile and execute the programs.	I can get the program with accurate outputs.
Engineer	Connects the output to the cloud	USN-5	As a user, I can connect the output values to the cloud services by using NODE RED.	I can make the datas to receive in cloud.
	Store the output values	USN-6	As a user,I can make the data's store in IBM cloudant database.	I can retrieve the data anywhere,anytime.
	Connects the cloud data with the authorities communication device.	USN-7	As a user,I can produce connection to the authorities mobile phones so that they can receive the alerts.	I can make the authorities informed about the water's quality.
	Alerts has to be sent to the authorities	USN-8	As a user,I can make use of platforms such as Fast SMS to send the timely updates to the authorities.	I can make the authorities to get accurate values and alerts
Authorities	Checks the water quality alerts	USN-9	As a user ,I check the quality values of the water that is sent to me .	I can make sure that the people in my zone gets quality water.

CHAPTER 6

PROJECT PLANNING AND SCHEDULING

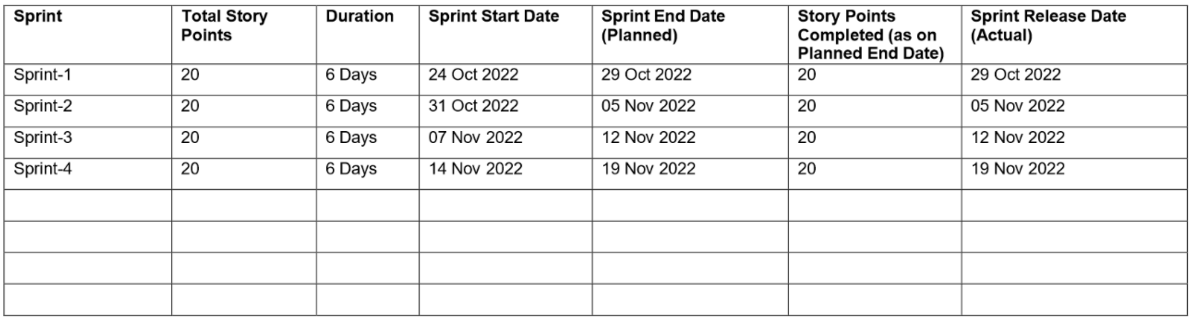
6.1 SPRINT PLANNING AND ESTIMATION

The below table shows the planning and estimation of sprints



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 using google login	2	High	Vishnunathan R, Sabari kumar G.J
Sprint-2		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Chokkar A
Sprint-2	Login Dashboard	USN-3	As a user, I can log into the application by entering email & password	1	High	Chokkar A
Sprint-3			As a developer, I have to integrate python script with the IBM IOT platorm and send values to Node Red	2	High	Vishnunathan R, Sandosh balaji G
Sprint-4			As a developer, I have to make my website to fetch data from the Node Red platform	2	High	Vishnunathan R, Sabari kumar G.J

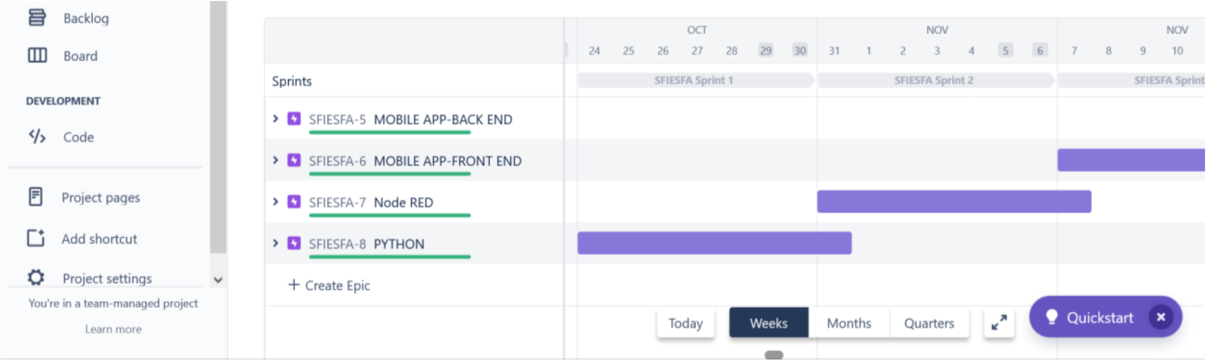
6.2 SPRINT DELIVERY SCHEDULE

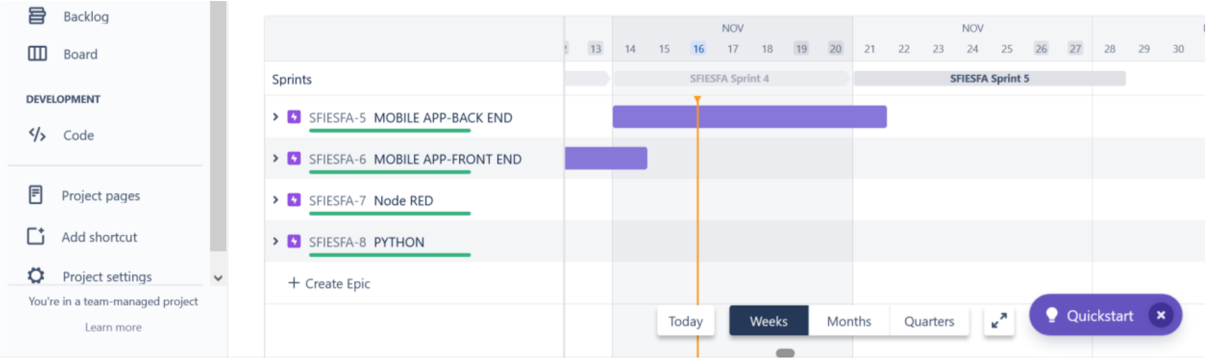


Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 REPORTS FROM JIRA

Jira is a software application used for issue tracking and project management. The tool, developed by the Australian software company Atlassian, has become widely used by agile development teams to track bugs, stories, epics, and other tasks.

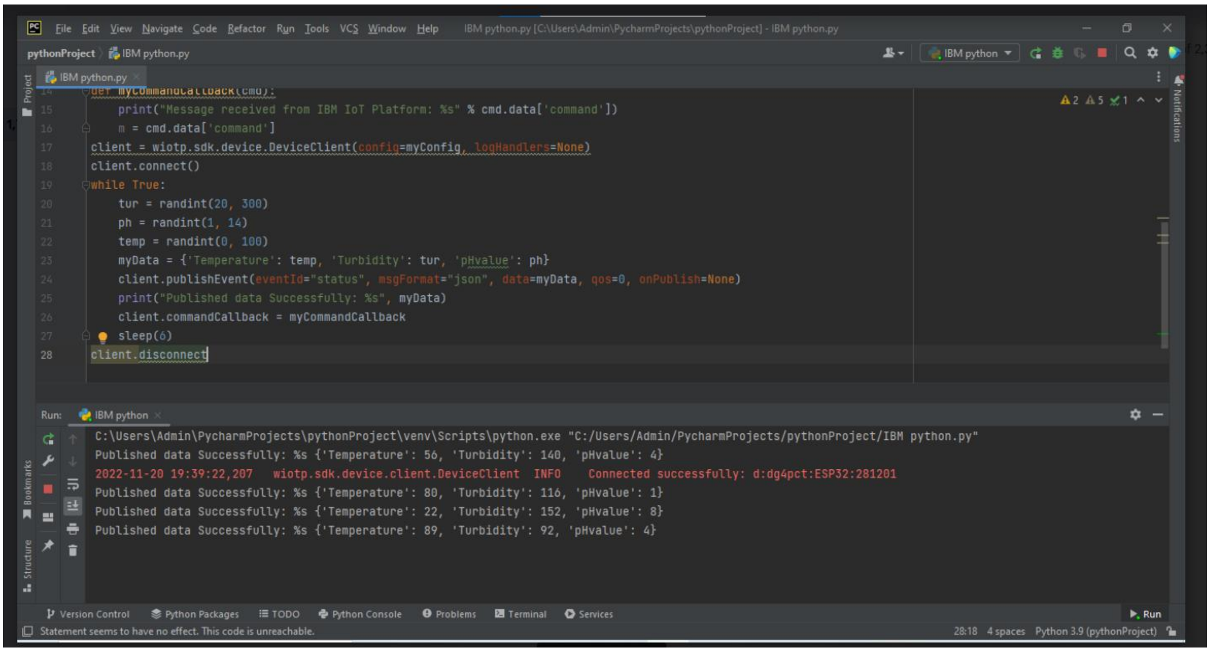




CHAPTER 7

CODING & SOLUTIONING

7.1 FEATURE 1



File Edit View Navigate Code Refactor Run Tools VCS Window Help
IBM python.py [C:\Users\Admin\PycharmProjects\pythonProject] - IBM python.py
pythonProject
IBM python.py
Run: IBM python
Version Control
Python Packages
TODO
Python Console
Problems
Terminal
Services
Statement seems to have no effect. This code is unreachable.
28:18 4 spaces Python 3.9 (pythonProject)

```
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m = cmd.data['command']
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
while True:
    tur = randint(20, 300)
    ph = randint(1, 14)
    temp = randint(0, 100)
    myData = {'Temperature': temp, 'Turbidity': tur, 'pHvalue': ph}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    sleep(6)
client.disconnect
```

```
C:\Users\Admin\PycharmProjects\pythonProject\venv\Scripts\python.exe "C:/Users/Admin/PycharmProjects/pythonProject/IBM python.py"
Published data Successfully: %s {'Temperature': 56, 'Turbidity': 140, 'pHvalue': 4}
2022-11-20 19:39:22,207   wiotp.sdk.device.client.DeviceClient  INFO    Connected successfully: d:dg4pct:ESP32:281201
Published data Successfully: %s {'Temperature': 80, 'Turbidity': 116, 'pHvalue': 1}
Published data Successfully: %s {'Temperature': 22, 'Turbidity': 152, 'pHvalue': 8}
Published data Successfully: %s {'Temperature': 89, 'Turbidity': 92, 'pHvalue': 4}
```

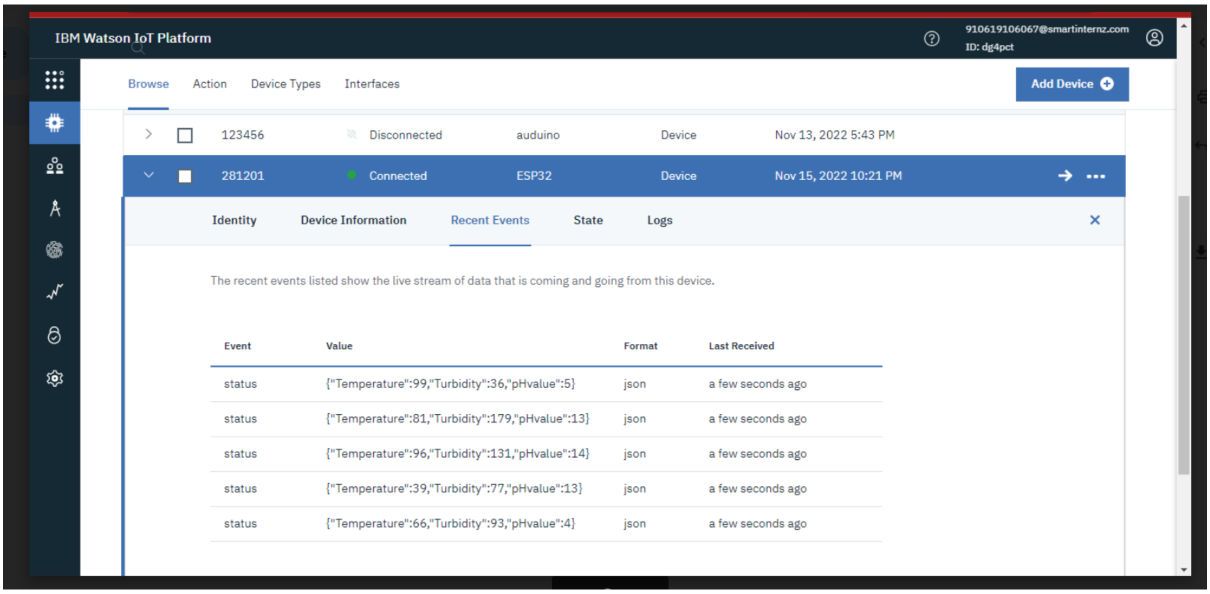
7.2 FEATURE 2

Python code:

```
import wiotp.sdk.device
from time import*
from random import*
myConfig = {
    "identity": {
        "orgId": "dg4pct",
        "typeId": "ESP32",
        "deviceId": "281201"
    },
    "auth": {
        "token": "28122001"
    }
}
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" %
cmd.data['command'])
    m = cmd.data['command']
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
while True:
    tur = randint(20, 300)
    ph = randint(1, 14)
    temp = randint(0, 100)
    myData = {'Temperature': temp, 'Turbidity': tur, 'pHvalue': ph}
    client.publishEvent(eventId="status", msgFormat="json", data=myData,
qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    sleep(6)
client.disconnect
```

Output

In the IBM Watson IoT Platform you can visualize the connectivity to the IBM IoT platform and the values generated.



123456	Disconnected	auduino	Device	Nov 13, 2022 5:43 PM
281201	Connected	ESP32	Device	Nov 15, 2022 10:21 PM

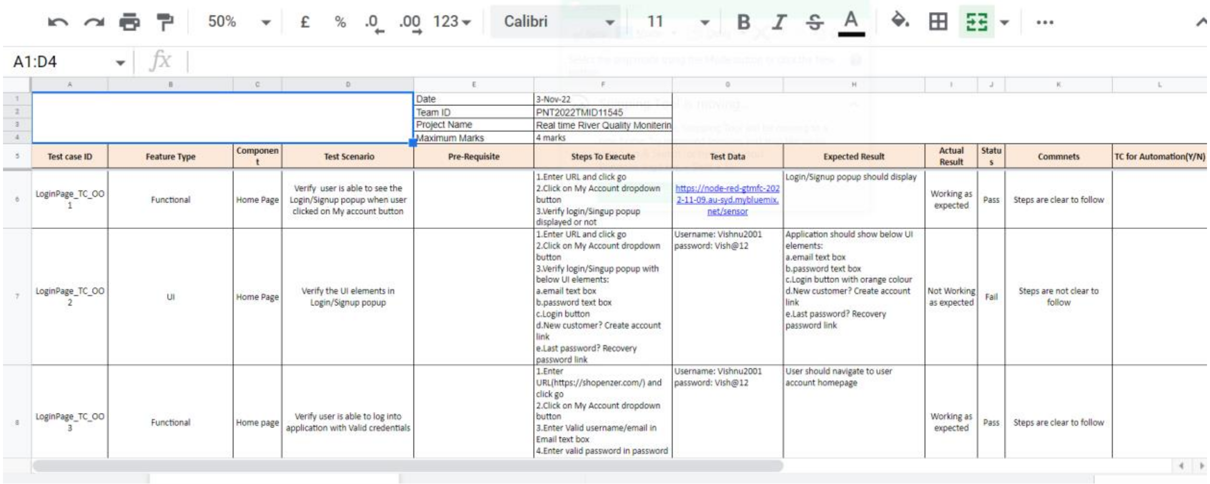
The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
status	{"Temperature":99,"Turbidity":36,"pHvalue":5}	json	a few seconds ago
status	{"Temperature":81,"Turbidity":179,"pHvalue":13}	json	a few seconds ago
status	{"Temperature":96,"Turbidity":131,"pHvalue":14}	json	a few seconds ago
status	{"Temperature":39,"Turbidity":77,"pHvalue":13}	json	a few seconds ago
status	{"Temperature":66,"Turbidity":93,"pHvalue":4}	json	a few seconds ago

CHAPTER 8

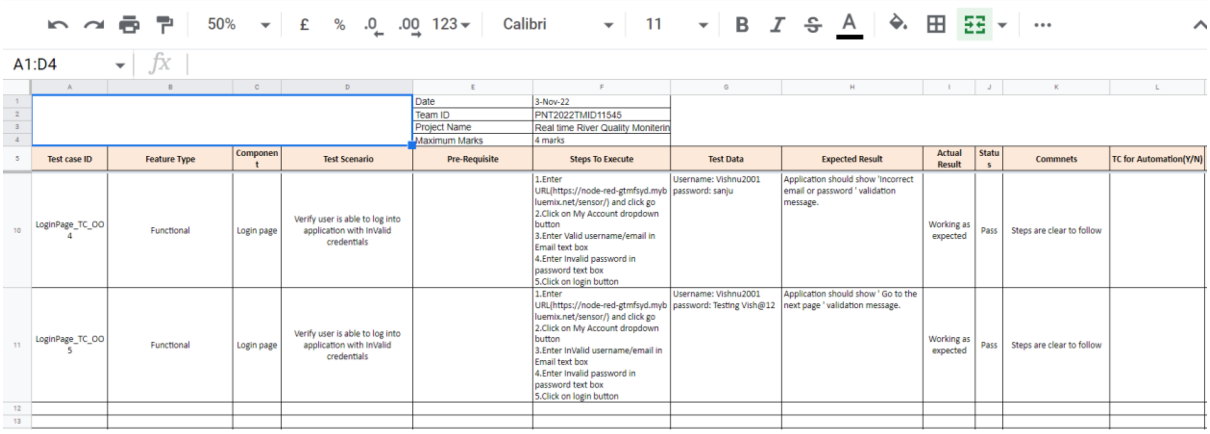
TESTING

8.1 TEST CASES



Date	3-Nov-22
Team ID	PNT2022TMID11545
Project Name	Real time River Quality Moniterin
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)
LoginPage_TC_OO1	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	https://node-red-gtmfc-2022-11-09.au-syd.mybluemix.net/sensor	Login/Signup popup should display	Working as expected	Pass	Steps are clear to follow	
LoginPage_TC_OO2	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	Username: Vishnu2001 password: Vish@12	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Not Working as expected	Fail	Steps are not clear to follow	
LoginPage_TC_OO3	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password	Username: Vishnu2001 password: Vish@12	User should navigate to user account homepage	Working as expected	Pass	Steps are clear to follow	



Date	3-Nov-22
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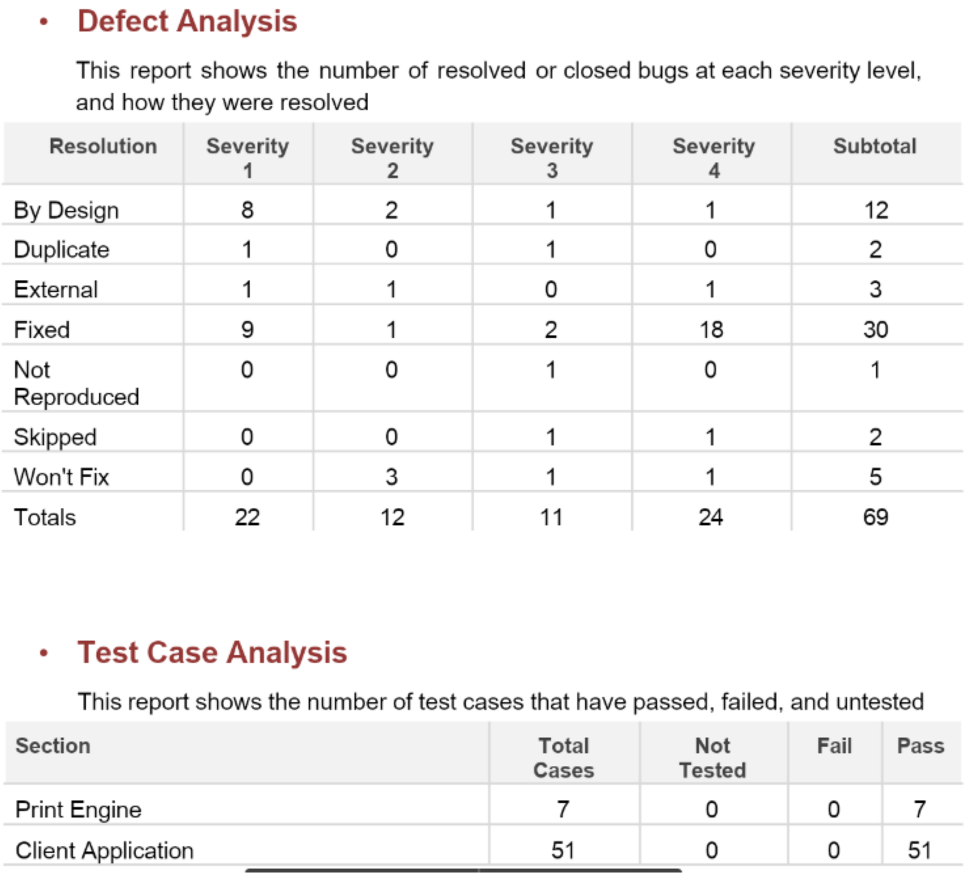
Maximum Marks	4 marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)
LoginPage_TC_OO4	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Enter URL(https://node-red-gtmfsyd.mybluemix.net/sensor/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: Vishnu2001 password: sanju	Application should show 'Incorrect email or password ' validation message.	Working as expected	Pass	Steps are clear to follow	
LoginPage_TC_OO5	Functional	Login page	Verify user is able to log into application with InValid credentials		1.Enter URL(https://node-red-gtmfsyd.mybluemix.net/sensor/) and click go 2.Click on My Account dropdown button 3.Enter InValid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: Vishnu2001 password: Testing Vish@12	Application should show ' Go to the next page ' validation message.	Working as expected	Pass	Steps are clear to follow	

8.2 USER ACCEPTANCE TESTING

The purpose of user acceptance testing is to briefly explain the test coverage and open issues of the product.



- **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	8	2	1	1	12
Duplicate	1	0	1	0	2
External	1	1	0	1	3
Fixed	9	1	2	18	30
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	3	1	1	5
Totals	22	12	11	24	69

- **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	7	0	0	7
Client Application	51	0	0	51

CHAPTER 9

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

Real-time Analysis of Water

IoT-based systems are advanced versions of technology inclusion in the water industry. The solutions are equipped with quality sensor devices that capture accurate information from the assets and transfer it to the user's dashboard in real-time. This benefits the users in massive ways, identifying and analysing the water in all aspects.

Remote Monitoring

IoT strengthens the real-time insight gathering and enables remote monitoring for the water authorities. Even when there is a shortage of staff or anyone is travelling, they can check on their business's performance through an interconnected system, which is well-structured with the help of IoT technology. It provides an accurate response to the users.

DISADVANTAGES

The reliability is one of the main issues of smart sensors. If they get damaged or stolen, they can affect many systems badly. At laboratories, samples of raw water, filter water and treated water are taken for analysis, these analysis can be performed by human intervention which for specific period only. The disadvantage of this system is, water is not monitoring seamlessly, and it always needs a human intervention.

CHAPTER 10

CONCLUSION

This project gave us the chance to learn new technologies and work with new tools, this was a real proof that IBM has taught us to be long-life learners and to master self-learning before teaching us other class materials. Of course, this project is a combination of what we learned from all the training and orientation sessions conducted by IBM, altogether with what we learned from other disciplines and also by ourselves about IoT.

In general, the project was successful and worked properly and succeeded in delivering the prototype on due time. We are proud and happy for this achievement especially that this our first theoretically, practically online stimulated project . It enabled us to get concrete results and to realize that we can indeed build products that would be beneficial in real life and that we can customize it upon demand as future projects.

CHAPTER 11

FUTURE SCOPE

Compared to the previous related works, the cost of the system prototype is considerably low.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. This system could also be implemented in various industrial processes. The system can be modified according to the needs of the user. We conclude that all the objectives of the proposed system have been achieved. The system has wide application and it is usable and affordable by all categories of users.

CHAPTER 12

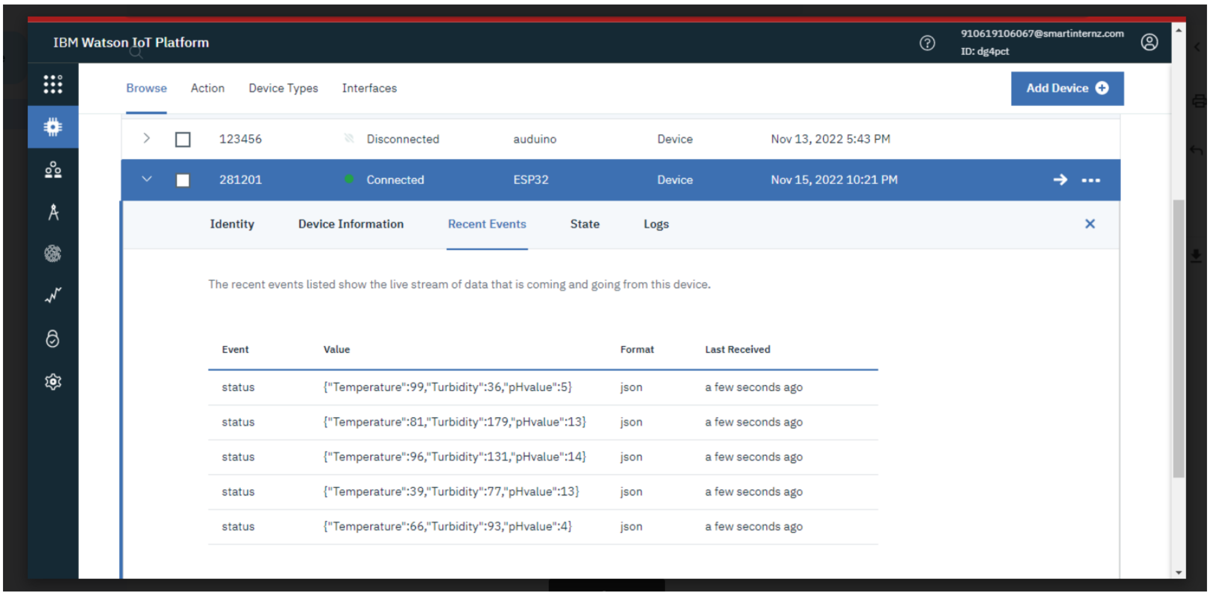
APPENDIX

12.1 SOURCE CODE

```
import wiotp.sdk.device
from time import*
from random import*
myConfig = {
    "identity": {
        "orgId": "dg4pct",
        "typeId": "ESP32",
        "deviceId": "281201"
    },
    "auth": {
        "token": "28122001"
    }
}
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m = cmd.data['command']
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
while True:
    tur = randint(20, 300)
    ph = randint(1, 14)
    temp = randint(0, 100)
    myData = {'Temperature': temp, 'Turbidity': tur, 'pHvalue': ph}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback
    sleep(6)
client.disconnect
```

12.2 SOFTWARES USED

IBM Watson IoT Platform

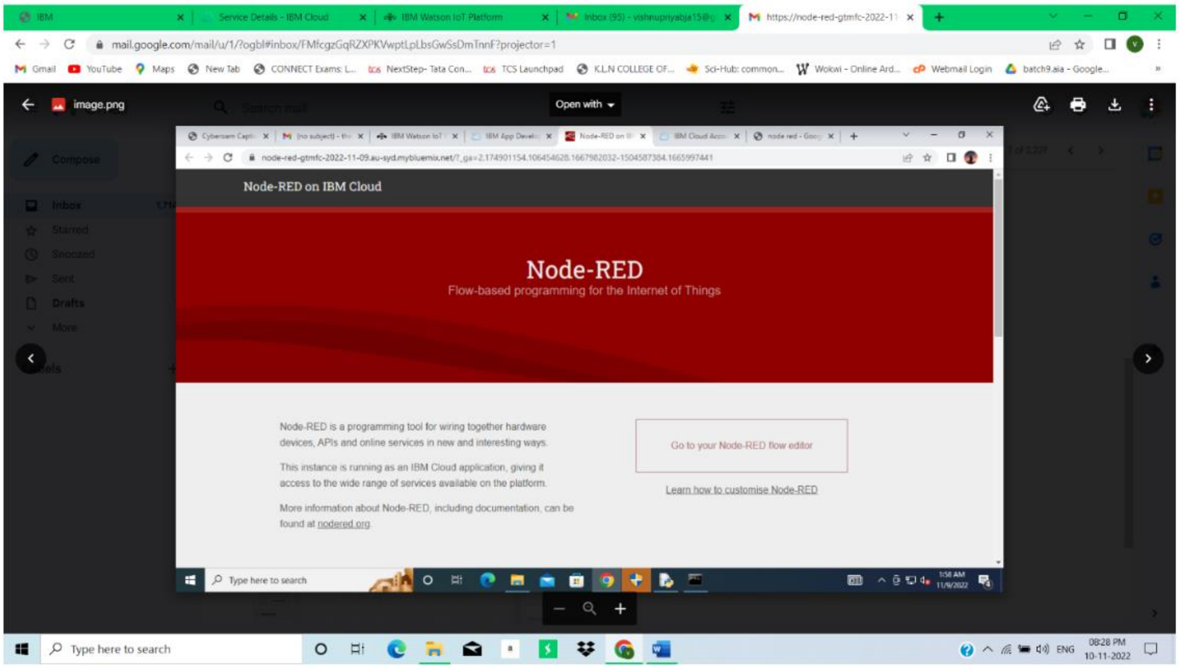


123456	Disconnected	auduino	Device	Nov 13, 2022 5:43 PM
281201	Connected	ESP32	Device	Nov 15, 2022 10:21 PM

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

Event	Value	Format	Last Received
status	{"Temperature":99,"Turbidity":36,"pHvalue":5}	json	a few seconds ago
status	{"Temperature":81,"Turbidity":179,"pHvalue":13}	json	a few seconds ago
status	{"Temperature":96,"Turbidity":131,"pHvalue":14}	json	a few seconds ago
status	{"Temperature":39,"Turbidity":77,"pHvalue":13}	json	a few seconds ago
status	{"Temperature":66,"Turbidity":93,"pHvalue":4}	json	a few seconds ago

NodeRED



Node-RED on IBM Cloud

Node-RED

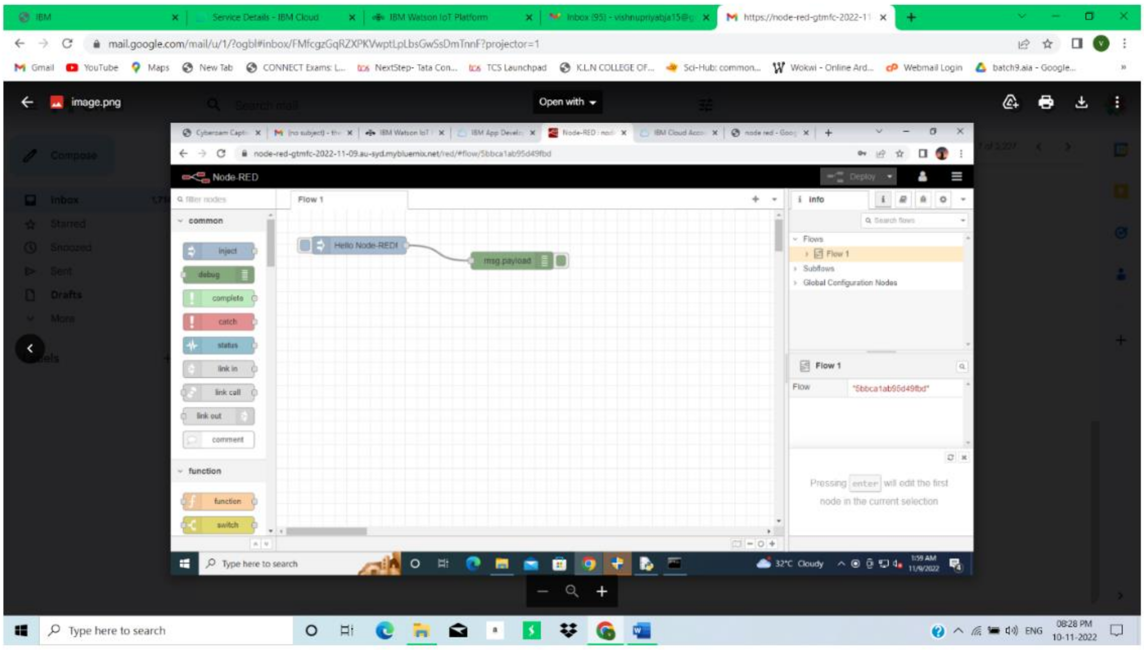
Flow-based programming for the Internet of Things

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.

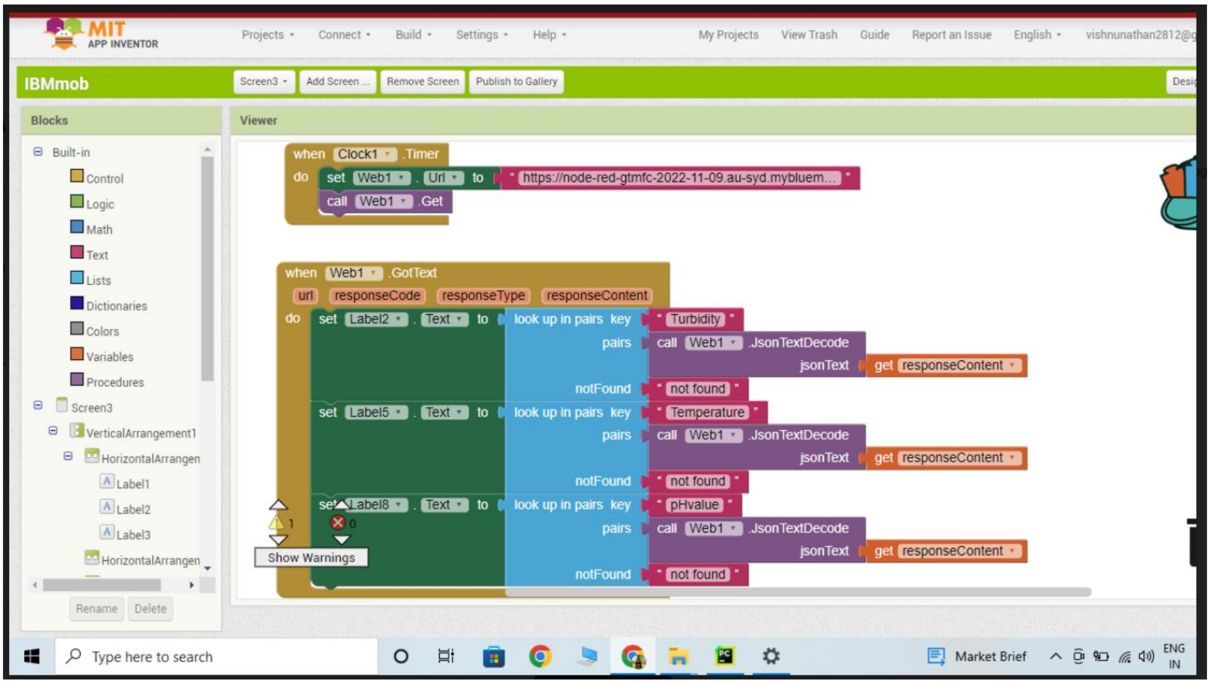
mail.google.com/mail/u/1/?ogbl#inbox/FMfcgzGqRZXPKVwptLpLbsGwSsDmTnnF?projector=1
image.png
Open with
node-red-gtmfc-2022-11-09.au-syd.mybluemix.net/?_ga=2.174901154.106454628.1667982032-1504587384.1665997441
Go to your Node-RED flow editor
Learn how to customise Node-RED
Type here to search
1:58 AM
11/9/2022
08:28 PM
10-11-2022



Pressing enter will edit the first node in the current selection

mail.google.com/mail/u/1/?ogbl#inbox/FMfcgzGqRZXPKVwptLpLbsGwSsDmTnnF?projector=1
image.png
Open with
node-red-gtmfc-2022-11-09.au-syd.mybluemix.net/red/#flow/5bbca1ab95d49fbd
Node-RED
Deploy
filter nodes
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
Flow 1
Hello Node-RED!
msg.payload
info
Search flows
Flows
Flow 1
Subflows
Global Configuration Nodes
Flow 1
Flow
"5bbca1ab95d49fbd"
Type here to search
32°C Cloudy
1:59 AM
11/9/2022
08:28 PM
10-11-2022

MIT APP INVENTOR



```
when Clock1 .Timer
do  set Web1 . Url to " https://node-red-gtmfc-2022-11-09.au-syd.mybluem... "
    call Web1 .Get

when Web1 .GotText
 url  responseCode  responseType  responseContent
do  set Label2 . Text to  look up in pairs  key " Turbidity "
                                           pairs  call Web1 .JsonTextDecode
                                                            jsonText  get responseContent
                                        notFound " not found "
    set Label5 . Text to  look up in pairs  key " Temperature "
                                           pairs  call Web1 .JsonTextDecode
                                                            jsonText  get responseContent
                                        notFound " not found "
    set Label8 . Text to  look up in pairs  key " pHvalue "
                                           pairs  call Web1 .JsonTextDecode
                                                            jsonText  get responseContent
                                        notFound " not found "
```

12.3 GitHub and Project Demo Link

https://github.com/IBM-EPBL/IBM-Project-48519-1660808433

https://youtu.be/WLvRGpw3uCs