PROJECT REPORT

IOT BASED REAL -TIME RIVER WATER QUALITY MONITORING AND CONTROLING SYSTEM

TEAM ID:PNT2022TMID49669

TEAM LEADER:K.ESAIVANI

TEAM MEMBER1:N.ESTHER

TEAM MEMBER2:E.MARIESWARI
TEAM MEMBER3:M.SHIYAMALA

PROJECT REPORT FORMAT

INTRODUCTION:

project overview:

Water is the primary need of all living beings without water is impossible.With the advancement of technology and industrialization, environmental pollutions.Our lives depend on the quality of water that we consume in different ways,from juices which are produced by the industries .Any imbalance in the quality of water would severely affect the humans health and at the same time it would affect the ecological balance among all species .Water quality refers to the chemical,biological,radiological and biological parameters of the water.The essential parmeters of the water quality vary based on the application of water.For example for aquariums,it is necessary to maintain the temperature ,ph level ,dissloved oxygen level,turbidity ,and the level of the water in a certain normal range in order to ensure the safety of the fish inside the aquarium.For the industrial and house hold applications,waters are more essential tobe monitored frequently then the others,depending on the usage of the water.

purpose:

The purpose is to ensure that safe drinking water is supplied to the public and wastewater is treated to an acceptable level that is safe for discharge into public stream,river,and waterways.Monitoring provides the objective evidence necessary to make sound decision on managing water quality today and in the future.To protect,restore,and enchance environment quality towards good public health,environment integrity,and economic viability.

LITERATURE SURVEY:

The water treatment plants purpose was only to get the chemical compound reading of the water and sent it to BAKAL SETIA AIR JOHOR ,for BAKAJ is the one that decides what the next step is going to be taken . stopping the plant operation requires BAKAJ approval even if the technician confirms the water is polluted . BAKAJ actions is not immediate when they receive information knowing that the water is polluted .they would wait around a few hours to half a day to really confirms the water is polluted then only they would instruct the water treatment plant to stop operation . with the time wasted , polluted water would already be in the residential water supply tank thus would prevent people from getting their water.

1. **REFERENCE:** T. perumal, N.sulaiman , and c.y.long , "internet of things Enabled water Monitoring System ", 2015 1EEE4th GLOB . conf .consum. Electron .internet , pp 86-87, 2015 .

2. S. madakam , r. ramaswamy, and s.tripathi , "internet of thing A literature review,''j.Comput. Commun .., vol.no3 no 5 ,app .164-173,2015

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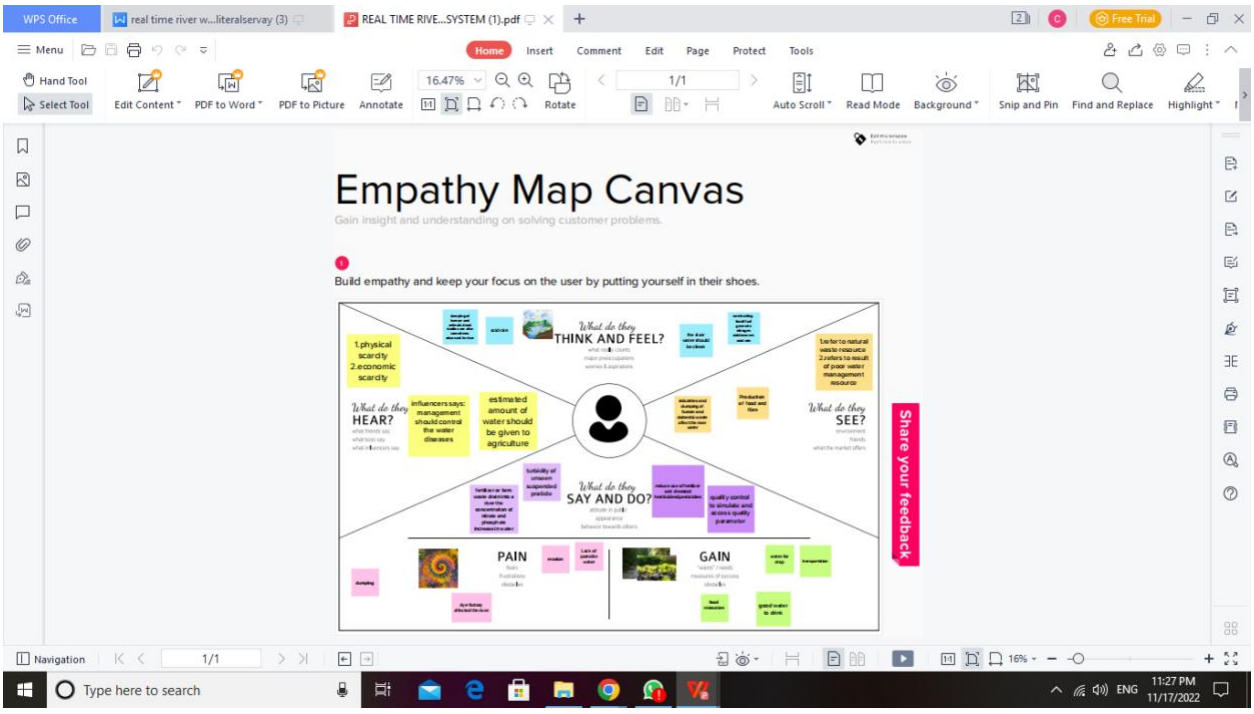
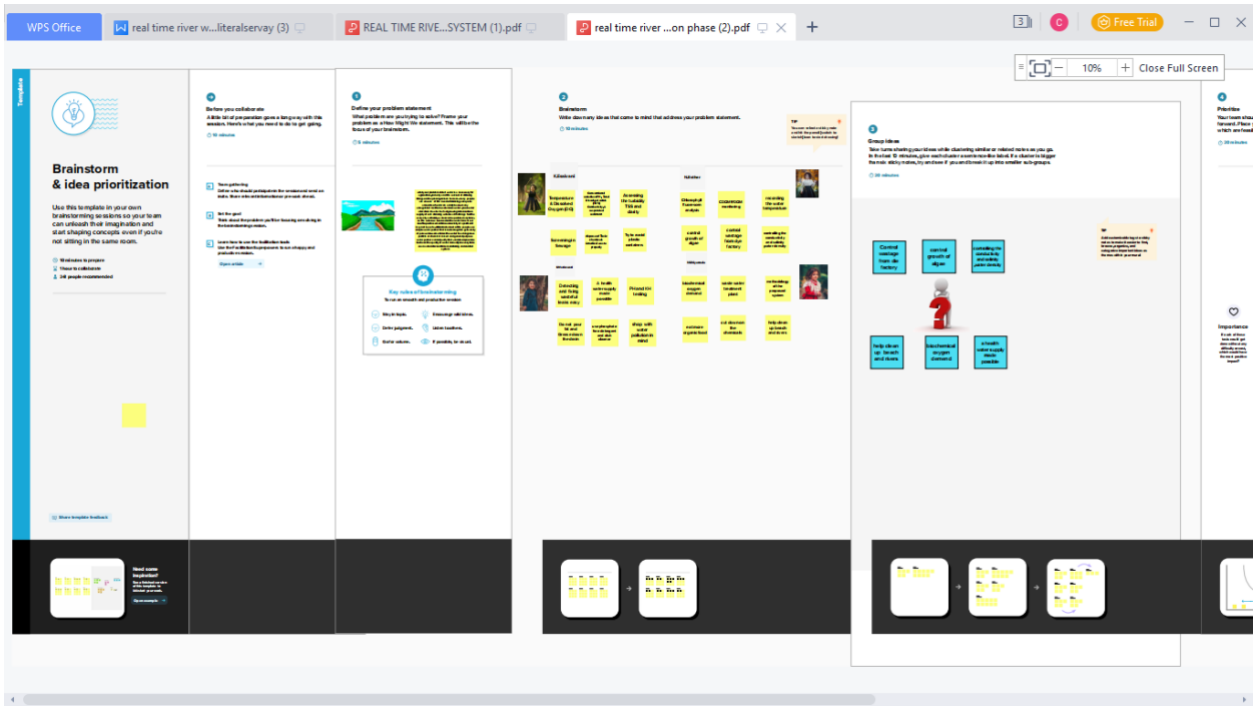
3.IDEATION &PROPOSED SOLUTION

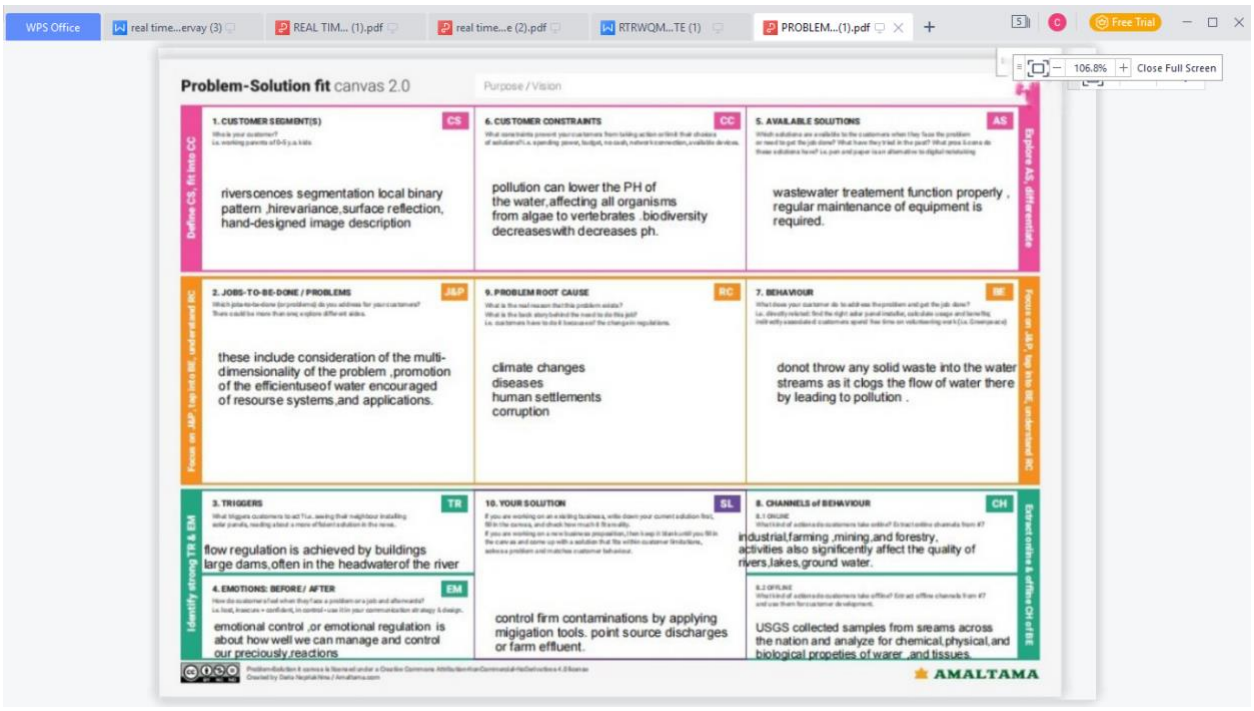
EMPATHY MAP CANVAS



IDEATION &BRAINSTORMING



PROBLEM SOLUTION FIT



Problem-Solution fit canvas 2.0

Purpose / Vision

1. CUSTOMER SEGMENT(S) CS

riverscences segmentation local binary pattern ,hirevariance,surface reflection, hand-designed image description

6. CUSTOMER CONSTRAINTS CC

pollution can lower the PH of the water,affecting all organisms from algae to vertebrates .biodiversity decreaseswith decreases ph.

5. AVAILABLE SOLUTIONS AS

wastewater treatement function properly , regular maintenance of equipment is required.

Define CS, fit into CC — Explore AS, differentiate

2. JOBS-TO-BE-DONE / PROBLEMS J&P

these include consideration of the multi-dimensionality of the problem ,promotion of the efficientuseof water encouraged of resourse systems,and applications.

9. PROBLEM ROOT CAUSE RC

climate changes
diseases
human settlements
corruption

7. BEHAVIOUR BE

donot throw any solid waste into the water streams as it clogs the flow of water there by leading to pollution .

Focus on J&P, tap into BE, understand RC — Focus on J&P, tap into BE, understand RC

3. TRIGGERS TR

flow regulation is achieved by buildings large dams,often in the headwaterof the river

4. EMOTIONS: BEFORE / AFTER EM

emotional control ,or emotional regulation is about how well we can manage and control our preciously reactions

10. YOUR SOLUTION SL

control firm contaminations by applying migigation tools. point source discharges or farm effluent.

8. CHANNELS of BEHAVIOUR CH

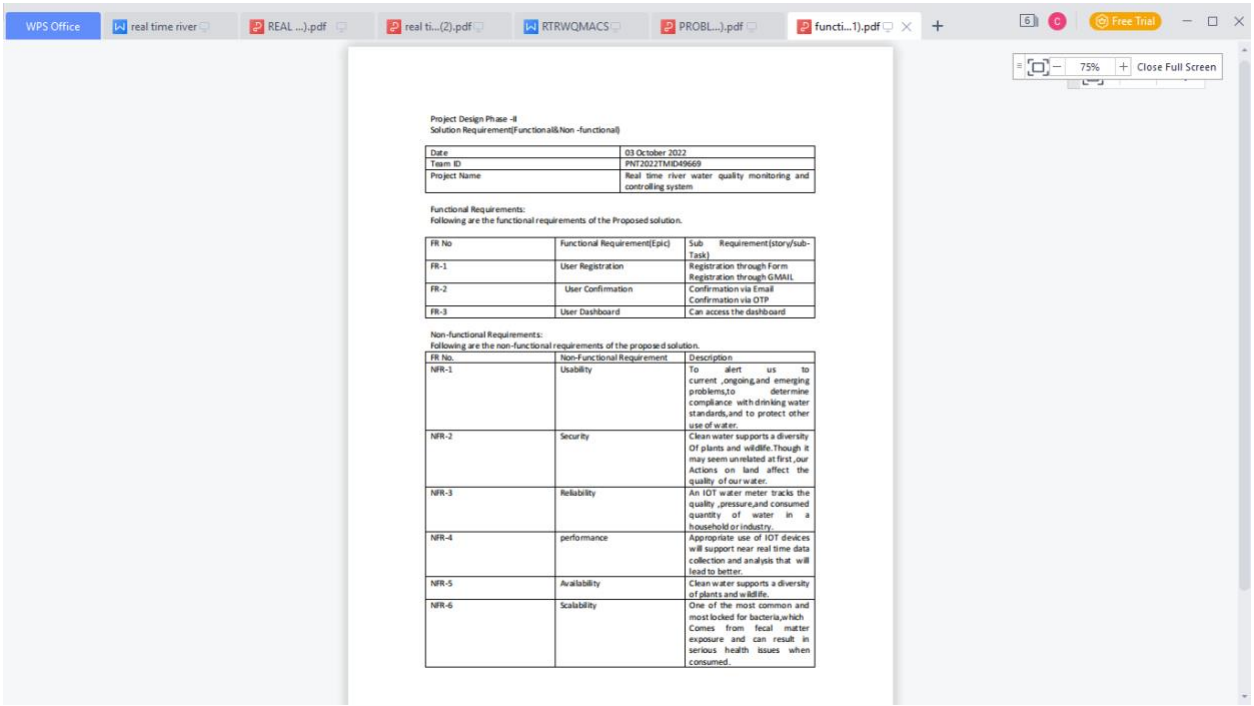
industrial,farming ,mining,and forestry, activities also significently affect the quality of rivers,lakes,ground water.

USGS collected samples from sreams across the nation and analyze for chemical,physical,and biological propeties of warer ,and tissues.

Identify strong TR & EM — Extract online & offline CH of BE

AMALTAMA

REQUIREMENT ANALYSIS:



Project Design Phase -II
Solution Requirement(Functional& Non -functional)

Date	03 October 2022
Team ID	PNT2022TMID49669
Project Name	Real time river water quality monitoring and controlling system

Functional Requirements:
Following are the functional requirements of the Proposed solution.

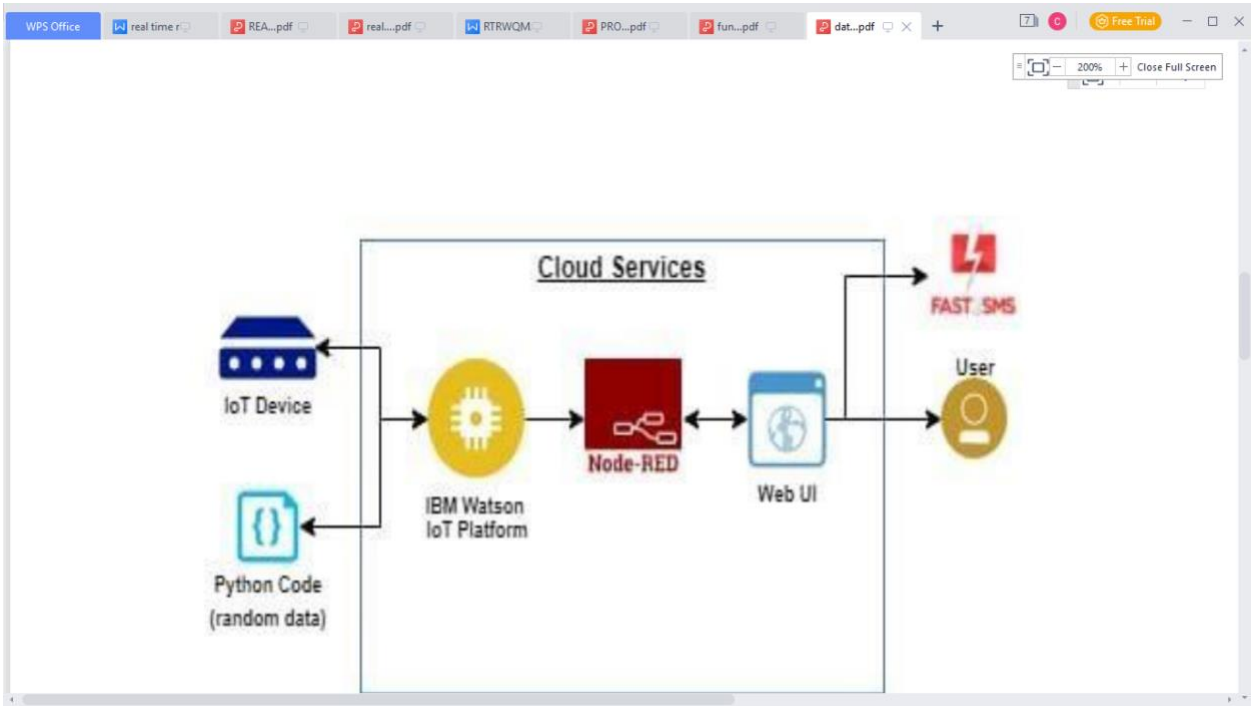
FR No	Functional Requirement(Epic)	Sub Requirement(story/sub-Task)
FR-1	User Registration	Registration through Form Registration through GMAIL
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Dashboard	Can access the dashboard

Non-functional Requirements:
Following are the non-functional requirements of the proposed solution.

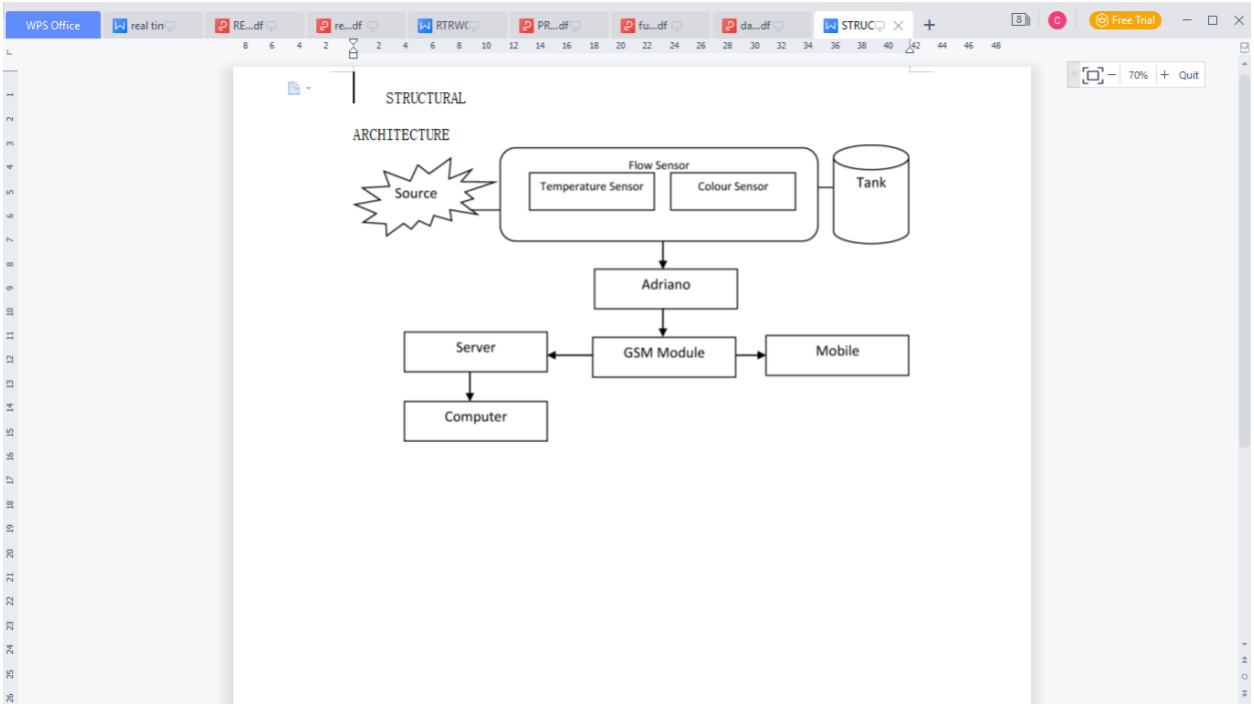
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	To alert us to current ,ongoing,and emerging problems,to determine compliance with drinking water standards,and to protect other use of water.
NFR-2	Security	Clean water supports a diversity Of plants and wildlife.Though it may seem unrelated at first ,our Actions on land affect the quality of our water.
NFR-3	Reliability	An IOT water meter tracks the quality ,pressure,and consumed quantity of water in a household or industry.
NFR-4	performance	Appropriate use of IOT devices will support near real time data collection and analysis that will lead to better.
NFR-5	Availability	Clean water supports a diversity of plants and wildlife.
NFR-6	Scalability	One of the most common and most locked for bacteria,which Comes from fecal matter exposure and can result in serious health issues when consumed.

PROJECT DESIGN :

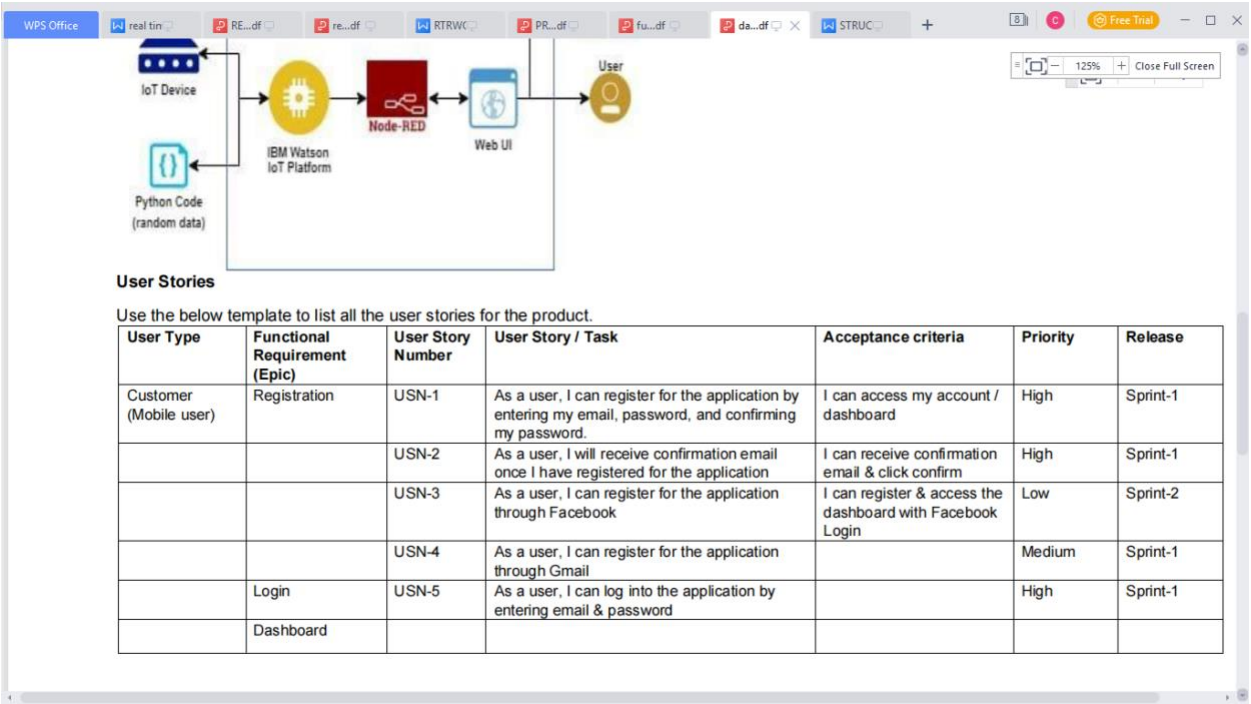
DATA FLOW DIAGRAM:



SOLUTION ARCHITECTURE:



USER STORIES:



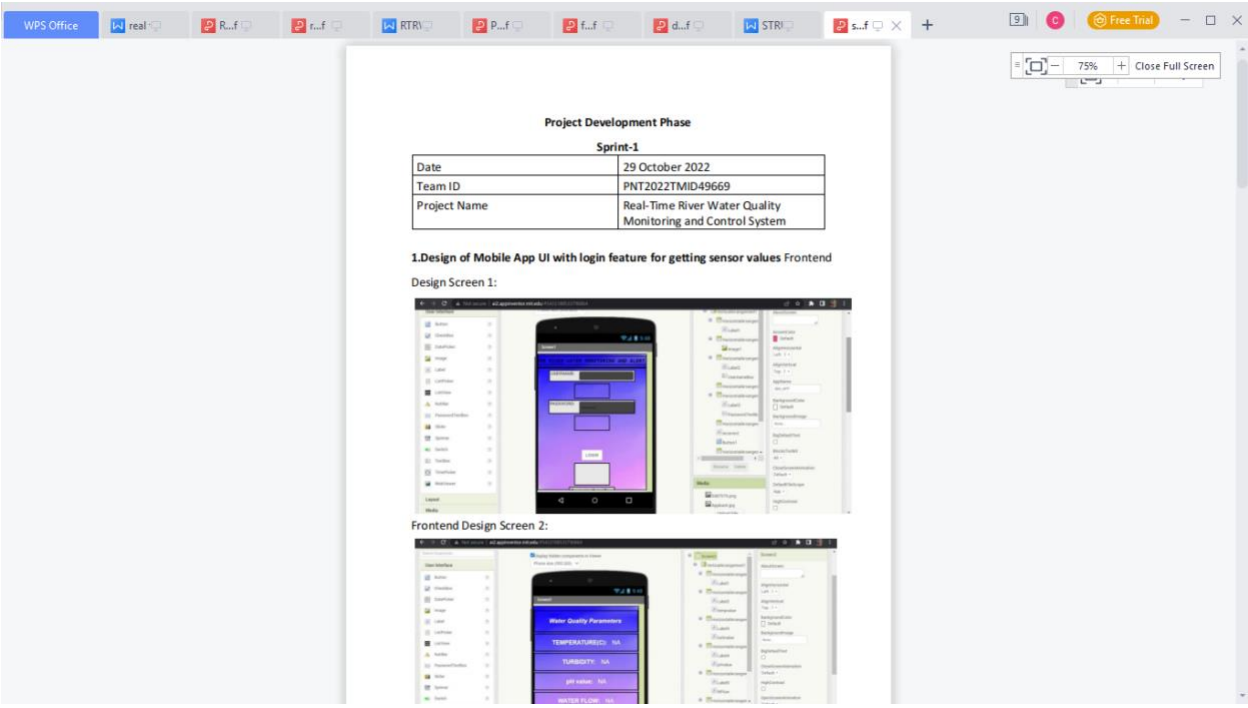
User Stories

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 Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard					

PROJECT PLANNING &SCHEDULING :

SPRINT PLANNING:



Project Development Phase

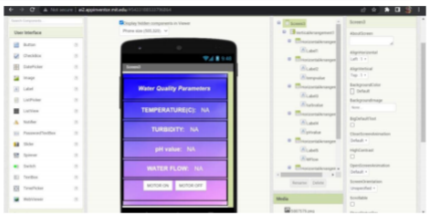
Sprint-1

Date	29 October 2022
Team ID	PNT2022TMID49669
Project Name	Real-Time River Water Quality Monitoring and Control System

1.Design of Mobile App UI with login feature for getting sensor values Frontend

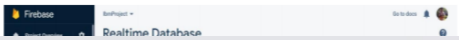
Design Screen 1:

Frontend Design Screen 2:



Backend :

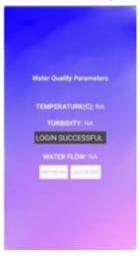
Firebase db for storing login credentials:



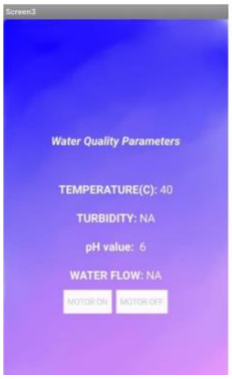
WPS Office real R...f r...f RTR\ P...f f...f d...f STR\ s...f Free Trial 75% Close Full Screen

1.Incorrect login information are tested.

2.Upon successful login



3.Display of different sensor values

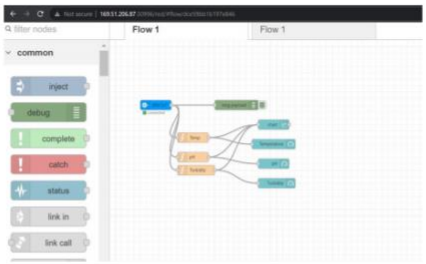


Project Development phase
Sprint-2

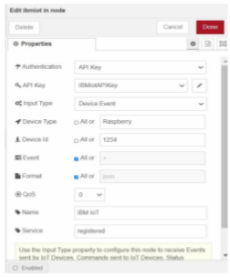
Date	5th November 2022
Team ID	PNT2022TMID49669
Project Name	Real-Time River Water Quality Monitoring and Control System

Design of web application using Node-Red

Using Dashboard nodes for create UI(Web application):

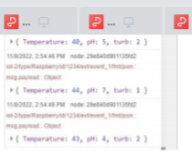


IBMIOT input node configuration:

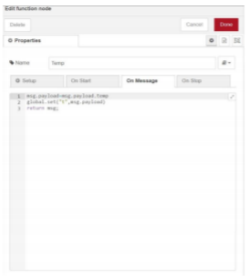


Debug Node output:

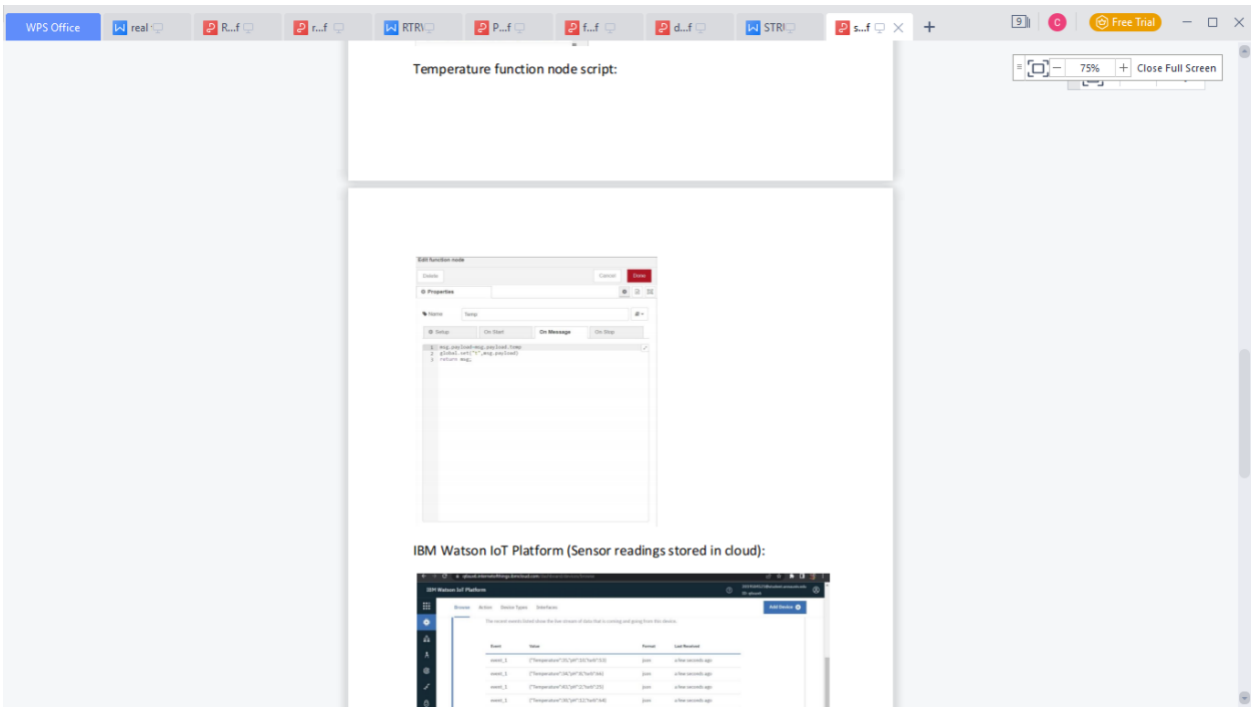
WPS Office RTF STF Free Trial 75% Close Full Screen

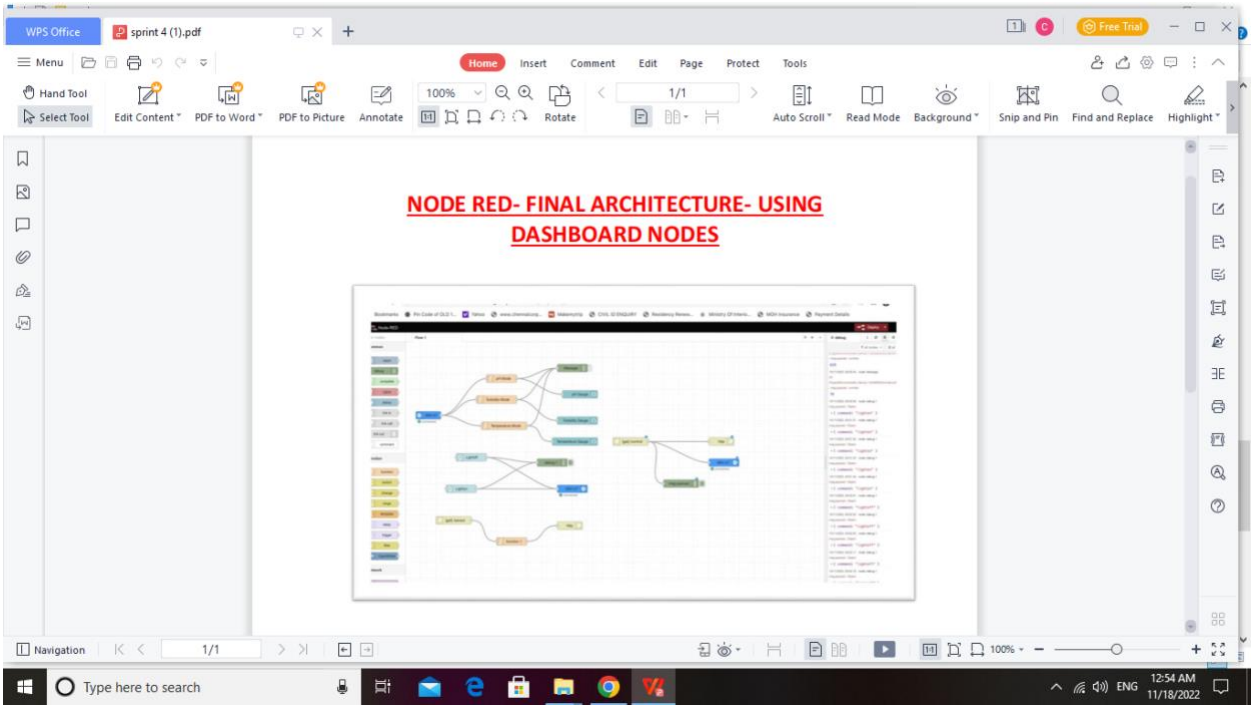


Temperature function node script:



IBM Watson IoT Platform (Sensor readings stored in cloud):





CODING &SCHEDULING:

```
#include <Wire.h>
```

```
#include <Adafruit_ADS1015.h>

#include <OneWire.h>
#include <DallasTemperature.h>
#define ONE_WIRE_BUS 14             // GPIO pin on which the DS18B20 is
connected :D5 on esp12e

OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature DS18B20(&oneWire);

// lcd ----- SDA=D2/GPIO4,  SCL=D1/GPIO5
const int trigPin = D7;
const int echoPin = D8;
// defines variables
long duration;
int distance;
int tankheight=27;
int mydistance;


#define analogpin A0
int sensorval=0;
long int avgval;
float b;
// #define turbpin adc0
int buf[10],temp ;
int senseRawValue; //Some variable
float senseTurbidity; //Some floating variable


//SDA=D2/GPIO4,  SCL=D1/GPIO5 to connect the adc1115 properly.

Adafruit_ADS1115 ads(0x48);
float Voltage = 0.0;


void setup() {
  // put your setup code here, to run once:
```

```
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  Serial.begin(9600);
  ads.begin(); //  enables the ADC1115
  Serial.println("Initializing All Sensors.....................");
}

void loop() {
  // put your main code here, to run repeatedly:

    myturb();
    Serial.println(" ");
    delay(200);
    level();
    Serial.println(" ");
    delay(200);
    mytemp();
    Serial.println(" ");
    delay(200);
    myph();
    delay(200);
  Serial.println("\n");

}

float myph(){
  for(int i=0;i<10;i++){
    buf[i]= analogRead(analogpin);
    delay(100);
    }
  for(int i=0;i<9;i++){
    for(int j=i;j<10;j++){
      if(buf[i]>buf[j]){
        temp=buf[j];
        buf[i]=buf[j];
        buf[j]=temp;
        }
      }
```

```
   }
  avgval=0;
  for(int i=2;i<8;i++){avgval+=buf[i];    }

  float phvol=(float)avgval*5.0/1024/6 ;
  float phval= -3.6585*phvol+21.864;   /// to calculate the ph of various
substance
  Serial.print("pH Value:  ");
  Serial.println(phval);

  //Serial.print("Voltage = ");
  //Serial.println(phvol);
  delay(1000);
  }

void myturb(){
  int16_t adc0;  // we read from the ADC, we have a sixteen bit integer as a
result

  adc0 = ads.readADC_SingleEnded(0);
  Voltage = (adc0 * 0.1875)/1000;
  float volt5= Voltage+1 ;       ///to round Voltage above to 5V(reqire
voltage)
 // Serial.println(adc0);
 // Serial.println(volt5);       // print nw voltage that would bbe read by turb
sensor
//senseRawValue = analogRead(adc0); //Read input raw value fromt the
sensor
senseTurbidity = volt5;    //senseRawValue * (5.0 / 1024.0); //Convert
analog data from 0 -1024 to voltage 0 - 5v;
Serial.print("TURBIDITY VALUE:  "); //Print the output data to the serial
Serial.print(senseTurbidity);
delay(1000);
 // increased turbidity, our voltage drops

  if (senseTurbidity>3.2 ){
    Serial.print("\t Water is clear \n");
   }
```

```
 if (senseTurbidity<3.2 && senseTurbidity>2.9 ){
   Serial.print("\t Water is a little cloudy \n");
  }

 else if(senseTurbidity<2.9)
  Serial.print("\t Warning!!. Water is muddy/very cloudy!!! \n");
 }

void level(){
    // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads the echoPin, returns the sound wave travel time in
microseconds
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  mydistance= duration*0.034/2;
  distance= tankheight-mydistance;
  // Prints the distance on the Serial Monitor
  Serial.print("Distance: ");
  Serial.print(distance);
      if (distance<10&& distance>=5){
  Serial.print("\t The water level: FULL \n");
  }

    else if (distance>10 && distance<16){
  Serial.print("\t The water level: NORMAL\n");
  }

    else if (distance>16){
  Serial.print("\t The water level: LOW \n");
  }
  delay(1000);
```

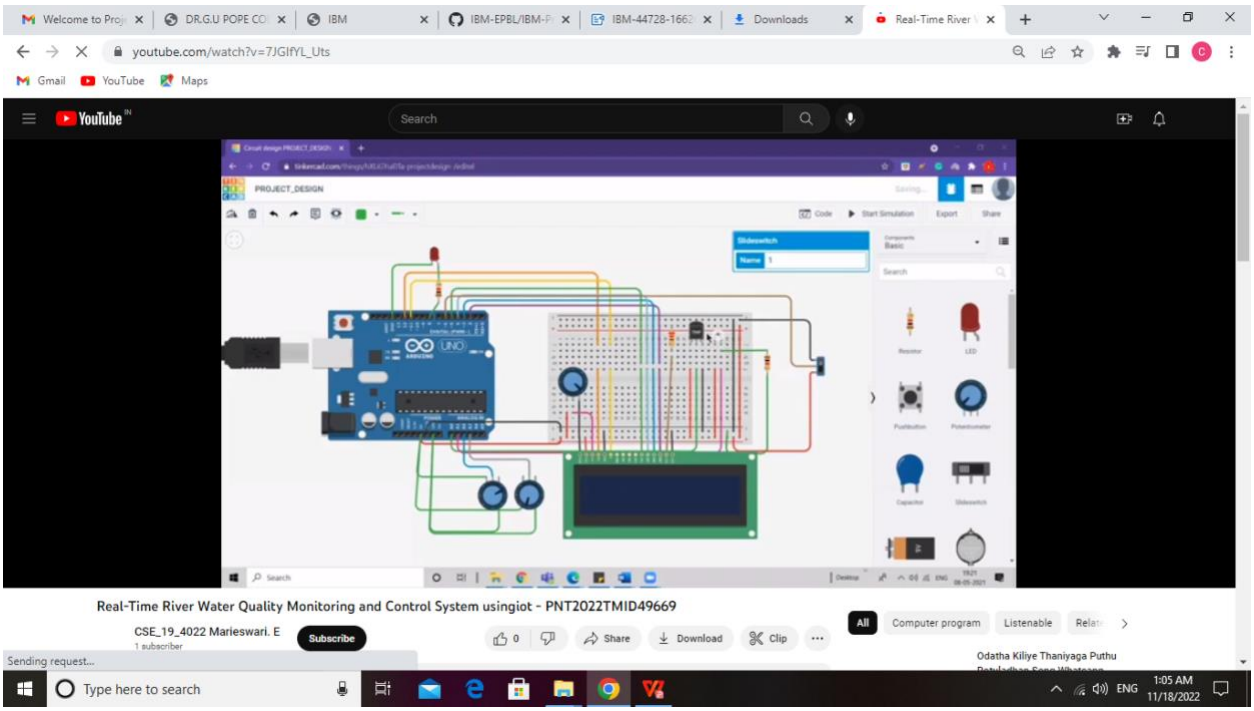
```
 }

 void mytemp(){
  float temp;
 DS18B20.requestTemperatures();
 temp=DS18B20.getTempCByIndex(0);
 Serial.print("Temperature: ");
 Serial.println(temp);
 delay(1000);
 }

int httpCode = http.POST(data);

    // httpCode will be negative on error
    if (httpCode > 0) {
     // HTTP header has been send and Server response header has been
handled
      Serial.printf("[HTTP] GET... code: %d\n", httpCode);

      // file found at server
      if (httpCode == HTTP_CODE_OK || httpCode ==
HTTP_CODE_MOVED_PERMANENTLY) {
        String payload = http.getString();
        Serial.println(payload);
      }
    } else {
      Serial.printf("[HTTP] GET... failed, error: %s\n",
http.errorToString(httpCode).c_str());
    }

    http.end();
  } else {
    Serial.printf("[HTTP} Unable to connect\n");
  }
 }

 delay(10000);
```

```
}


//////////////////////Various Sensor functions//////////////////////
float myph(){
  for(int i=0;i<10;i++){
    buf[i]= analogRead(analogpin);
    delay(100);
    }
  for(int i=0;i<9;i++){
    for(int j=i;j<10;j++){
      if(buf[i]>buf[j]){
        temp=buf[j];
        buf[i]=buf[j];
        buf[j]=temp;
        }
      }
    }
  avgval=0;
  for(int i=2;i<8;i++){avgval+=buf[i];    }

  float phvol=(float)avgval*5.0/1024/6 ;
  float phval= -3.6585*phvol+21.864;   /// to calculate the ph of various
substance
  Serial.print("pH Value:  ");
  Serial.println(phval);
  return phval;
  //Serial.print("Voltage = ");
  //Serial.println(phvol);
  delay(1000);
  }

float myturb(){
  int16_t adc0;  // we read from the ADC, we have a sixteen bit integer as a
result

  adc0 = ads.readADC_SingleEnded(0);
  Voltage = (adc0 * 0.1875)/1000;
```

```
  float volt5= Voltage+1 ;       ///to round Voltage above to 5V(reqire
voltage)
 // Serial.println(adc0);
 // Serial.println(volt5);       // print nw voltage that would bbe read by turb
sensor
//senseRawValue = analogRead(adc0); //Read input raw value fromt the
sensor
senseTurbidity = volt5;    //senseRawValue * (5.0 / 1024.0); //Convert
analog data from 0 -1024 to voltage 0 - 5v;
Serial.print("TURBIDITY VALUE:  "); //Print the output data to the serial
Serial.print(senseTurbidity);
Serial.print("\n");
return senseTurbidity;
delay(1000);

 // increased turbidity, our voltage drops

  if (senseTurbidity>3.2 ){
     Serial.print("\t Water is clear \n");
    }
  if (senseTurbidity<3.2 && senseTurbidity>2.9 ){
     Serial.print("\t Water is a little cloudy \n");
    }

  else if(senseTurbidity<2.9)
    Serial.print("\t Warning!!. Water is muddy/very cloudy!!! \n");
  }

 float mylevel(){
      // Clears the trigPin
    digitalWrite(trigPin, LOW);
    delayMicroseconds(2);
    // Sets the trigPin on HIGH state for 10 micro seconds
    digitalWrite(trigPin, HIGH);
    delayMicroseconds(10);
    digitalWrite(trigPin, LOW);
    // Reads the echoPin, returns the sound wave travel time in
microseconds
```

```
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  mydistance= duration*0.034/2;
  distance= tankheight-mydistance;
  return distance;
  // Prints the distance on the Serial Monitor
  Serial.print("Distance: ");
  Serial.print(distance);
       if (distance<10&& distance>=5){
  Serial.print("\t The water level: FULL \n");
  }

    else if (distance>10 && distance<16){
  Serial.print("\t The water level: NORMAL\n");
  }

    else if (distance>16){
  Serial.print("\t The water level: LOW \n");
  }
  delay(1000);


}

 float mytemp(){
   float temp;
 DS18B20.requestTemperatures();
 temp=DS18B20.getTempCByIndex(0);
 Serial.print("Temperature: ");
 Serial.println(temp);
 return temp;
 delay(1000);
 }
```

RESULT:



ADVANTAGE:

Preserving the quality of freshwater is important for the drinking-water supply, food production and recreational water use. Water quality can be compromised by the presence of infectious agents, toxic chemicals, and radiological hazards.Monitoring is necessary to ensure that our waters can continue to support the many different ways we use these resources and to track whether protection and restoration measures are working.River water quality is important because rivers are a major source of water used for drinking and by industry. Rivers also support a wide variety of wildlife and in some areas of the world are used extensively for recreation.

Disadvantage:

Differentiated data from the main station is given to environment and public department using internet. system are data accuracy, reliability and efficiency. The drawback of this system is that it cannot provide real time monitoring of water parameters.The system is less effective as sensors are installed very deep inside the water and their positions are fixed. The sensors are very expensive. Moreover their maintenance cost is also very high.

CONCLUSION:

Monitoring of real time quality of Water from reserve tankof house and colony makes use of PH, turbidity andtemperature sensor with Raspberry Pi and existing Cloudsystem for data analytics. The system can monitor waterquality automatically, triggers alarms immediately toprevent any health hazards and it is low in cost and doesnot require people on duty. So, the system is likely to bemore economical, convenient and fast. The system hasgood flexibility. Only by replacing the correspondingsensors and changing the relevant software programs, thissystem can be used to monitor other water qualityparameters. The operation is simple. The system can beexpanded to monitor hydrologic, air pollution, industrialand agricultural production and so on.

DEMO VIDEO LINK:
http://youtu.be/7JGIFYL_Uts