SMART WATER MANAGEMENT

PHASE-4

PLATFORM ARCHIETECTURE

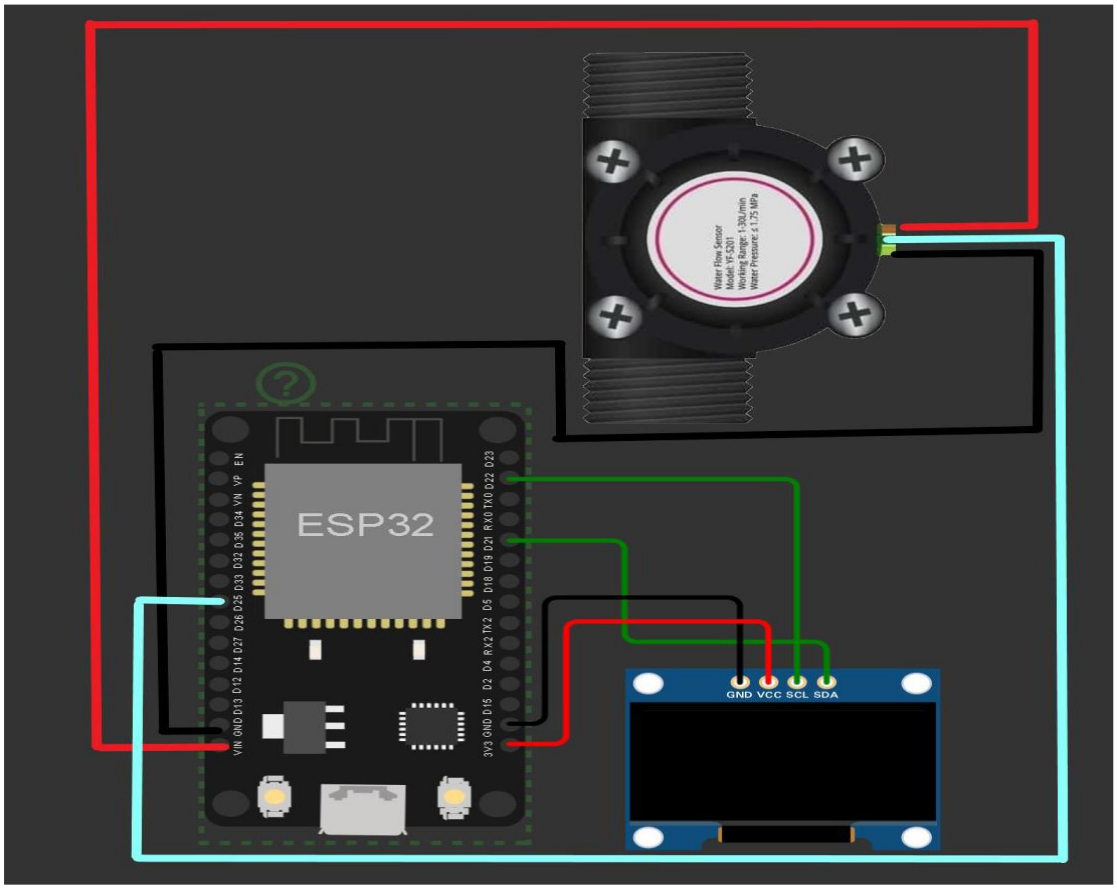
OVERVIEW:

Creating a web page code for IoT with a smart water management using an ESP32, YF-S201 flow sensor, and a 0.96-inch OLED display in HTML would require more than just HTML. You would need HTML, CSS, JavaScript, and some server-side code to interact with the ESP32.

DESIGNING:

Now let us interface YF-S201 Hall-Effect Water Flow Sensor with Nodemcu ESP32 & OLED Display. The OLED Display will show Water Flow Rate & Total Volume of Water passed through the pipe. The same Flow Rate & Volume data can be sent to Server after an interval of 15 seconds regularly. Similarly using MQTT or AJAX Protocol better wireless communication can be achieved.

But now let us see the IoT Water Flow Meter Circuit Diagram & Connection.



- Connect the **VCC** pin of the YF-S201 flow sensor to the **5V** pin of the ESP32.
- Connect the **GND** pin of the YF-S201 flow sensor to the **GND** pin of the ESP32.
- Connect the **SIGNAL** pin of the YF-S201 flow sensor to any of the available GPIO pins on the ESP32. For this example, we will use **GPIO 25**.
- Connect the **VCC** pin of the OLED display to the **3.3V** pin of the ESP32.
- Connect the **GND** pin of the OLED display to the **GND** pin of the ESP32.
- Connect the **SCL** pin of the OLED display to **GPIO 22** on the ESP32.
- Connect the **SDA** pin of the OLED display to **GPIO 21** on the ESP32.

CODE FOR ESP32:

Creating the complete code for an ESP32 with a YF-S201 water flow detector and a web server to serve the web page would be a comprehensive task. Below is a simplified code using the Arduino IDE and the ESP32 core for Arduino.The required libraries should be installed in the Arduino IDE for the ESP32.

```
#include <WiFi.h>
#include <WiFiClient.h>
#include <WebServer.h>
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

// Replace with your network credentials
const char* ssid = "YourWiFiSSID";
const char* password = "YourWiFiPassword";

WebServer server(80);
```

```
// Initialize the OLED display
#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64
#define OLED_RESET    -1
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, OLED_RESET);

volatile unsigned int pulse;
unsigned int flowRate;
unsigned int flowMilliLitres;
unsigned long totalMilliLitres;
unsigned long oldTime;

// Water flow sensor input
const int sensorInterrupt = 0;
const int sensorPin = 2;

void ICACHE_RAM_ATTR pulseCounter() {
  pulse++;
}

void setup() {
  // Connect to Wi-Fi
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.println("Connecting to WiFi...");
```

```
}
Serial.println("Connected to WiFi");

// OLED display setup
if(!display.begin(SSD1306_I2C_ADDRESS, 4, 15)) {
  Serial.println(F("SSD1306 allocation failed"));
  for(;;);
}

display.display();
delay(2000);
display.clearDisplay();
display.setTextSize(1);
display.setTextColor(SSD1306_WHITE);

// Initialize the water flow sensor
pinMode(sensorPin, INPUT);
digitalWrite(sensorPin, HIGH);

pulse = 0;
flowRate = 0;
flowMilliLitres = 0;
totalMilliLitres = 0;
oldTime = 0;

// Attach an interrupt to the sensor input
attachInterrupt(digitalPinToInterrupt(sensorPin), pulseCounter, FALLING);
```

```
  // Define the route to serve the HTML page
  server.on("/", HTTP_GET, handleRoot);

  // Start the server
  server.begin();
}

void loop() {
  server.handleClient();

  unsigned long currentTime = millis();

  if (currentTime - oldTime > 1000) {
    detachInterrupt(sensorInterrupt);
    flowRate = (pulse / 7.5);  // 7.5 is the number of pulses per liter
    flowMilliLitres = (flowRate / 60) * 1000;
    totalMilliLitres += flowMilliLitres;
    oldTime = currentTime;
    pulse = 0;
    attachInterrupt(digitalPinToInterrupt(sensorPin), pulseCounter, FALLING);
  }
}

void handleRoot() {
  // Create the HTML page to display the flow rate
  String html = "<html><body>";
  html += "<h1>Water Flow Detector</h1>";
  html += "<p>Flow Rate: " + String(flowRate) + " L/min</p>";
```

```
  html += "</body></html>";

  server.send(200, "text/html", html);
}
```

HTML CODE:

```
<!DOCTYPE html>
<html>
<head>
   <title>IoT Smart Water Management</title>

     <link rel="stylesheet" href="style.css">
</head>
<body>
   <h1 style="color:rgb(12, 185, 216); ">Smart Water Management</h1>
   <p><b>Rate: <span id="flowRate">0.00</span> L/min</b></p>
   <p><b>Volume: <span id="totalVolume">0.00</span> L</b></p>

   <canvas id="chart" width="400" height="200"></canvas>

   <script src="script.js">

   </script>

</body>
</html>
```

CSS CODE:

```
body{

background-image:url(https://wallpapercrafter.com/sizes/2560x1440/291957-faucet-fountain-water-dispenser-water-running.jpg);
   font-family: Arial, sans-serif;
   background-color: #f0f0f0;
   margin: 0;
   padding: 0;
   text-align: center;
}

h1 {
   color: #333;
}

p {
   font-size: 21px;
}

canvas {
   background-color: #fff;
   margin: 20px auto;
   display: block;
}
```

JAVA SCRIPT:

```
const flowRateDisplay = document.getElementById("flowRate");
const totalVolumeDisplay = document.getElementById("totalVolume");
const chart = document.getElementById("chart").getContext("2d");

let flowData = [];

function updateData(flowRate, totalVolume) {
flowRateDisplay.textContent = flowRate.toFixed(2);
totalVolumeDisplay.textContent = totalVolume.toFixed(2);

flowData.push(flowRate);
if (flowData.length > 10) {
flowData.shift();
}

chart.clearRect(0, 0, 400, 200);

chart.beginPath();
chart.moveTo(0, 200);
flowData.forEach((flow, index) => {
chart.lineTo(index * 40, 200 - flow * 10);
});
chart.stroke();
}

// Function to fetch data from ESP32 server
function fetchData() {
```

```
fetch('/data') // Replace with the URL of your ESP32 server
.then(response => response.json())
.then(data => {
updateData(data.flowRate, data.totalVolume);
})
.catch(error => {
console.error("Error fetching data: " + error);
});
}

// Periodically fetch data from the server
setInterval(fetchData, 1000);
```

In this setup, the ESP32 measures the flow rate and total volume of water used. It also displays this information on the OLED screen.

This code sets up a web server on your ESP32, displays the flow rate on a connected OLED display, and serves a simple HTML page displaying the flow rate.

Make sure to replace "YourWiFiSSID" and "YourWiFiPassword" with your actual Wi-Fi credentials.

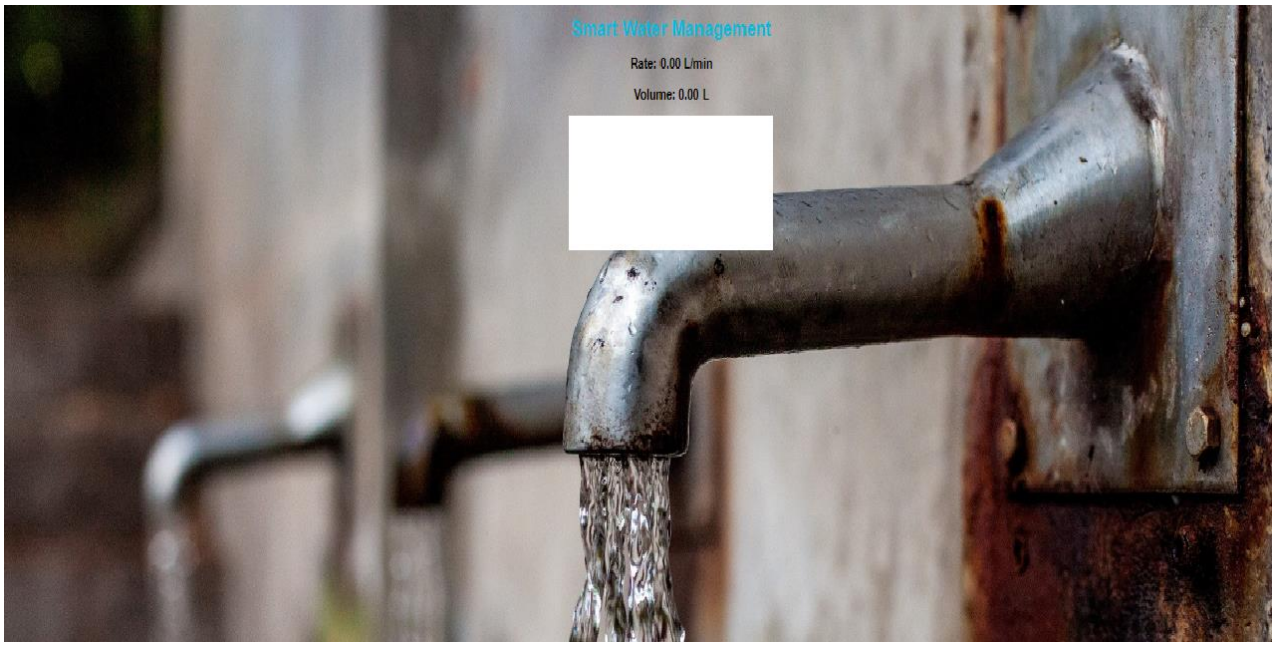
The YF-S201 sensor generates pulses based on the flow rate, and the code counts these pulses to calculate the flow rate.

We have a basic HTML structure with a title, header, and a paragraph to display the flow rate.

JavaScript is used to fetch data from the ESP32's API endpoint, which should be set up on the ESP32 to provide the current flow rate.

We update the flow rate on the web page every 1 seconds using setInterval.

Here is the platform to receive and display water usage data sent by iot device:



The above image shows the demo of the smart water management. The white space will display the chart after the flow meter gets the readings. The water flow rate and volume rate will be shown and refresh for every 1 second.

CLOUD PLATFORM GOVERNANCE AND COMPLIANCE PROTOCOLS:

1. **Choose a Cloud Provider:** Sign up for a free tier cloud service like AWS, free resources for new users.

2. **Set Up an IoT Device:** You'll need an IoT device or simulator to send data to your cloud platform. Raspberry Pi or Arduino are popular choices. You can also simulate IoT devices using software.

3. **Data Ingestion:** Create an IoT Hub or similar service on your chosen cloud platform to ingest data from your devices. This service typically has a free tier with limited usage.

4. **Data Storage:** Store the incoming data in a database or storage service. Most cloud providers offer free or low-cost database services for small projects.

5. **Data Processing:** You can use serverless functions or containers to process the data. AWS Lambda or Google Cloud Functions are examples of serverless options with a free tier.

6. **Data Visualization:** Use free tools like Grafana, Kibana, or cloud-based dashboards to visualize your IoT data.

7. **Set Up Alerts:** Configure alerts and notifications for specific conditions using cloud monitoring services. Some free tier options may be available.

8. **Security:** Ensure the security of your IoT data and devices. Most cloud providers offer basic security features in their free tiers.

9. **Scaling:** As your project grows, you might need to move to a paid tier or optimize your setup for cost-efficiency.

10. **Documentation and Learning:** Learn and document as you go. Most cloud providers offer extensive documentation and tutorials.