Phase 4 submission

Phase 4 : Development Part 2

Topic: Environment Management system

Environmental monitoring

Abstract:

- Our Environmental Monitoring IoT project integrates cutting-edge technology to create a sustainable future. Leveraging Internet of Things (IoT) devices, sensors, and data analytics, it aims to monitor and analyze environmental parameters such as temperature and humidity in real-time.
- In Environmental Monitoring IoT projects, various sensors are deployed to measure and monitor different environmental parameters. Some commonly used sensors include:
    1. Temperature Sensors
    2. Humidity Sensors
- In this phase4 we will continue building our project.
- We are developing the environmental monitoring platform.

VARIOUS TOOLS USED FOR THIS PROJECT :

- Sensors: IoT environmental monitoring systems rely on a variety of sensors designed to measure parameters like temperature, humidity, air quality, water quality, soil moisture, radiation levels, and more. These sensors are strategically deployed to collect real-time data.

- IoT Devices: These are the hardware components that house sensors, process data, and facilitate communication. Devices like Raspberry Pi, Arduino, or specialized IoT modules are commonly used to collect data from sensors and transmit it to central systems.

- Communication Networks: Data from sensors is transmitted using various communication protocols, such as Wi-Fi, Bluetooth, LoRaWAN, Zigbee, or cellular networks. The choice of network depends on the specific application's range and data transfer requirements.

- IoT Platform: Data collected by sensors is sent to an IoT platform or cloud service, such as AWS IoT, Google Cloud IoT, or Microsoft Azure IoT. These platforms provide storage, data processing, real-time monitoring, and visualization tools.

- Data Processing and Analytics: The collected data is processed and analyzed to derive valuable insights. Advanced analytics techniques may be used to detect trends, anomalies, and patterns within the data.

Program file:

1.Html Code: (index.html)

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="UTF-8">
    <title>Environmental Monitoring Platform</title>
    <link rel="stylesheet" type="text/css" href="styles.css"> <!-- Link to
your CSS file -->
</head>
<body>
    <header>
        <h1>Environmental Monitoring Platform</h1>
    </header>
    <nav>
        <ul>
            <li><a href="#real-time-data">Real-Time Data</a></li>
            <li><a href="#data-visualization">Data Visualization</a></li>
            <li><a href="#about">About Us</a></li>
        </ul>
    </nav>
    <p align=" center">Environmental monitoring refers to the process of
systematically observing, measuring, <br>
        and assessing various environmental factors and conditions to
understand and manage the state of the environment. <br>
        This practice is essential for tracking changes in the environment,
identifying potential issues, and making informed decisions
        to protect and sustain the natural world. <br>
        Environmental monitoring encompasses a wide range of parameters and
areas, including:</p>
    <section id="updates">
        <h2>Latest Updates</h2>
        <ul>
            <li><strong>October 2023:</strong> New sensor data added for air
quality monitoring.</li>
            <li><strong>September 2023:</strong> Improved data visualization
features.</li>
        </ul>
    </section>

    <main>
```

```
        <section class="sensor-data">
            <h2>Real-Time Data</h2>
            <div class="data-display">
                <div class="data-item">
                    <h3>Temperature</h3>
                    <p id="temperature">Loading...</p> <!-- Temperature value
will be updated via JavaScript -->
                </div>
                <div class="data-item">
                    <h3>Humidity</h3>
                    <p id="humidity">Loading...</p> <!-- Humidity value will
be updated via JavaScript -->
                </div>
            </div>
        </section>
        <section class="data-visualization">
            <h2>Data Visualization</h2>
            <canvas id="chart"></canvas> <!-- Add data visualization elements
here, e.g., charts or graphs -->
        </section>
        <script src="https://cdn.jsdelivr.net/npm/chart.js"></script>
        <canvas id="lineChart"></canvas>

    </main>
    <section id="about">
        <h2>About Us</h2>
        <p>Welcome to the Environmental Monitoring Platform, where we provide
real-time data and visualizations to help you monitor environmental
conditions. Our mission is to promote sustainability and environmental
awareness.</p>
    </section>
    <section id="contact">
        <h2>Contact Us</h2>
        <p>If you have any questions or feedback, please feel free to contact
us at <a href="mailto:contact@example.com">contact@example.com</a>.</p>
    </section>
    <section id="disclaimer">
        <h2>Disclaimer</h2>
        <p>Information provided on this platform is for informational purposes
only. Please consult with experts for critical decisions related to the
environment.</p>
    </section>
    <footer>
        <p>&copy; 2023 Environmental Monitoring Platform</p>
    </footer>
    <script src="node.js"></script> <!-- Link to your JavaScript file for
real-time updates -->
</body>
```

```
</html>
```

1. **<!DOCTYPE html>**: This declaration specifies that the document follows HTML5 standards.
2. **<html>**: The root element of an HTML document.
3. **<head>**: This section contains metadata and links to external resources. In this case, it links to an external CSS file and sets the document's character encoding.
4. **<meta charset="UTF-8">**: Specifies the character encoding of the document as UTF-8, which is a widely used encoding for handling text in different languages.
5. **<title>Environmental Monitoring Platform</title>**: Sets the title of the web page, which appears in the browser's title bar or tab.
6. **<link rel="stylesheet" type="text/css" href="styles.css">**: Links an external CSS file named "styles.css" to style the web page.
7. **<body>**: The main content of the web page is contained within the **<body>** element.
8. **<header>**: The header section typically contains the title or logo of the website. In this case, it displays the title "Environmental Monitoring Platform."
9. **<nav>**: This section contains navigation links. It's structured as an unordered list **<ul>** with list items **<li>**, each of which contains an anchor **<a>** element for navigation.
10. **<p align="center">**: This paragraph element aligns its text to the center. However, the **align** attribute is deprecated in HTML5, and it's recommended to use CSS for text alignment.
11. The **<p>** element provides information about environmental monitoring, its purpose, and what it encompasses. It's a description of the environmental monitoring concept.
12. **<section id="updates">**: This section is labeled "Latest Updates" and contains an unordered list **<ul>** of updates. Each update is presented as a list item **<li>** with a date and a description.

13. **<main>**: The main content of the web page, which contains various sections related to real-time data, data visualization, and information about the platform.
14. **<section class="sensor-data">**: This section is dedicated to displaying real-time sensor data. It contains two data items, "Temperature" and "Humidity," each with a heading **<h3>** and a placeholder paragraph **<p>** for data to be loaded via JavaScript.
15. **<section class="data-visualization">**: This section is for data visualization. It currently includes a canvas element **<canvas>** with the ID "chart" where data visualization elements like charts or graphs can be added. Additionally, it includes a script to include the Chart.js library for creating charts and another canvas element with the ID "lineChart."
16. **<section id="about">**: This section provides information about the platform, its mission, and what it offers.
17. **<section id="contact">**: This section offers contact information, including an email address where users can reach out with questions or feedback.
18. **<section id="disclaimer">**: This section includes a disclaimer regarding the informational nature of the platform and advises users to consult with experts for critical decisions related to the environment.
19. **<footer>**: The footer section displays a copyright notice for the year 2023, indicating ownership of the content.
20. **<script src="node.js"></script>**: This script element links to an external JavaScript file named "node.js." This file is used for real-time updates and functionality related to the platform.

2.CSS Code : (Styles.css)

```
/* Reset some default styles to ensure consistency across browsers */
html, body, h1, h2, h3, p {
    margin: 0;
    padding: 0;
}

body {
    font-family: Arial, sans-serif; /* Set the default font for the entire
page */
}
```

```css
header {
    background-color: #333; /* Set a dark background color for the header */
    color: #fff; /* Set text color to white */
    padding: 10px;
    text-align: center;
}

h1 {
    font-size: 24px;
}

nav ul {
    list-style: none;
    text-align: center;
}

nav ul li {
    display: inline;
    margin-right: 20px;
}

nav a {
    text-decoration: none;
    color: #007bff;
}

nav a:hover {
    text-decoration: underline;
}

#updates {
    background-color: #f0f0f0; /* Set a light background color for the "Latest Updates" section */
    padding: 20px;
}

#updates h2 {
    font-size: 22px;
}

.main-content {
    padding: 20px;
}

.sensor-data {
    border: 1px solid #ccc;
    padding: 20px;
}
```

```
.data-item {
    margin: 10px 0;
}

.data-item h3 {
    font-size: 18px;
}

.data-visualization {
    margin-top: 20px;
}

canvas#lineChart {
    width: 100%; /* Make the chart fill the available space */
    height: 300px; /* Set a fixed height for the chart */
}

h2 {
    font-size: 22px;
    margin-top: 20px;
}

ul {
    list-style-type: disc;
    margin-left: 20px;
}

footer {
    background-color: #333;
    color: #fff;
    text-align: center;
    padding: 10px;
}

/* Add specific styles for other sections like "About Us," "Contact Us," and
"Disclaimer" if needed */
```

3.Java Script : (node.js)

```
// Function to update the temperature and humidity values
function updateSensorData() {
    // Simulate data retrieval (you would replace this with actual data)
    const temperatureValue = Math.random() * 30 + 10; // Random temperature
between 10 and 40
    const humidityValue = Math.random() * 60 + 40; // Random humidity between
40 and 100
```

```
    // Update the HTML elements with the new values
    document.getElementById("temperature").textContent =
temperatureValue.toFixed(2) + "°C";
    document.getElementById("humidity").textContent = humidityValue.toFixed(2)
+ "%";
}

// Function to create a random chart for data visualization (you can replace
this with a real chart library)
function createRandomChart() {
    const ctx = document.getElementById("chart").getContext("2d");

    const data = {
        labels: ["Jan", "Feb", "Mar", "Apr", "May"],
        datasets: [
            {
                label: "Temperature",
                data: [Math.random() * 10 + 20, Math.random() * 10 + 20,
Math.random() * 10 + 20, Math.random() * 10 + 20, Math.random() * 10 + 20],
                borderColor: "#FF5733",
                borderWidth: 2,
            },
            {
                label: "Humidity",
                data: [Math.random() * 20 + 80, Math.random() * 20 + 80,
Math.random() * 20 + 80, Math.random() * 20 + 80, Math.random() * 20 + 80],
                borderColor: "#33FF57",
                borderWidth: 2,
            },
        ],
    };

    const config = {
        type: "line",
        data: data,
    };

    new Chart(ctx, config);
}

// Update sensor data and chart every 5 seconds (you can adjust the interval)
setInterval(() => {
    updateSensorData();
    createRandomChart();
}, 5000);

// Call the update functions on page load
updateSensorData();
```

```
createRandomChart();
// Function to create a line chart using Chart.js
function createLineChart() {
    const ctx = document.getElementById("lineChart").getContext("2d");

    // Sample data (replace with your actual data)
    const data = {
        labels: ["Jan", "Feb", "Mar", "Apr", "May"],
        datasets: [
            {
                label: "Temperature (°C)",
                data: [15, 18, 20, 22, 25],
                borderColor: "#FF5733",
                borderWidth: 2,
                fill: false,
            },
            {
                label: "Humidity (%)",
                data: [45, 42, 40, 38, 35],
                borderColor: "#33FF57",
                borderWidth: 2,
                fill: false,
            },
        ],
    };

    const options = {
        scales: {
            x: {
                type: "category",
                labels: data.labels,
            },
            y: {
                beginAtZero: true,
                max: 30, // Set the maximum value for the y-axis
            },
        },
    };

    const config = {
        type: "line",
        data: data,
        options: options,
    };

    new Chart(ctx, config);
}
```

```
// Call the createLineChart function when the document is ready
document.addEventListener("DOMContentLoaded", createLineChart);
```

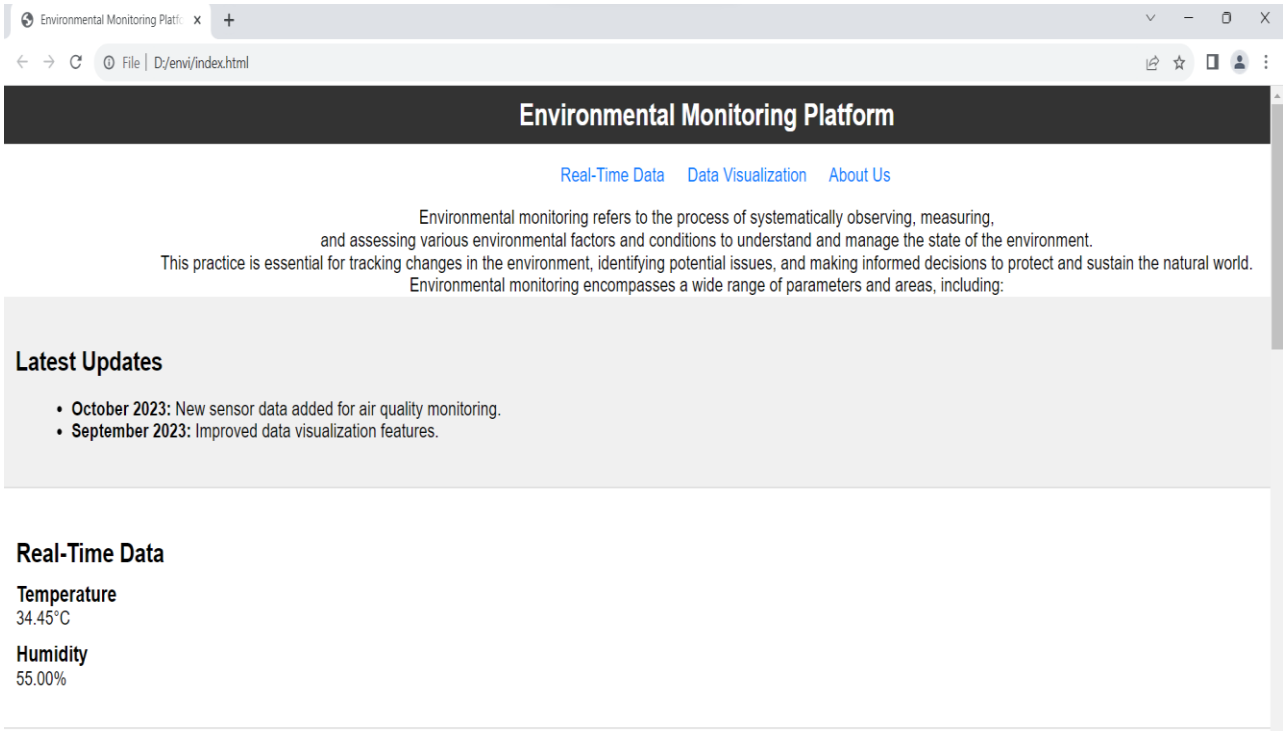
The provided JavaScript code contains functions to update sensor data, create a random chart for data visualization, and create a line chart using the Chart.js library. Let's break down the code and provide an explanation:

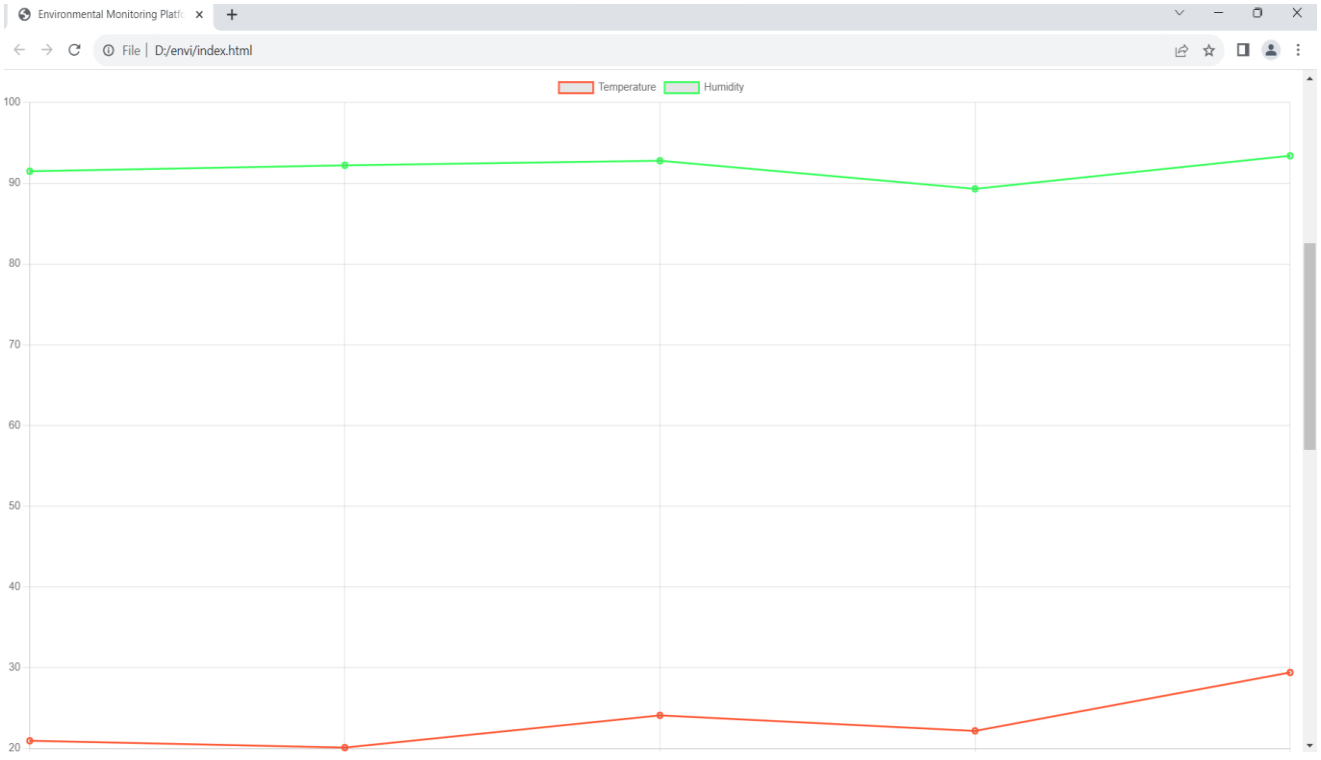
1. **updateSensorData Function**:
    - This function simulates the update of temperature and humidity values. In a real application, you would replace the random data with actual sensor data.
    - It generates random values for temperature and humidity within specified ranges.
    - It updates the HTML elements with the new values, specifically the elements with IDs "temperature" and "humidity."
2. **createRandomChart Function**:
    - This function creates a random chart for data visualization. Please note that in a real application, you would use a real charting library and actual data.
    - It utilizes the Chart.js library to create a line chart.
    - The chart includes two datasets (Temperature and Humidity) with random data points.
    - The chart's configuration includes labels, colors, and other properties.
    - The chart is drawn on the canvas element with the ID "chart."
3. **Updating Data and Chart on an Interval**:
    - **setInterval** is used to repeatedly update sensor data and create a new random chart every 5 seconds (5000 milliseconds). You can adjust the interval to suit your needs.
    - The **updateSensorData** function and **createRandomChart** function are called within the interval to provide updated data and charts.
4. **Calling Update Functions on Page Load**:

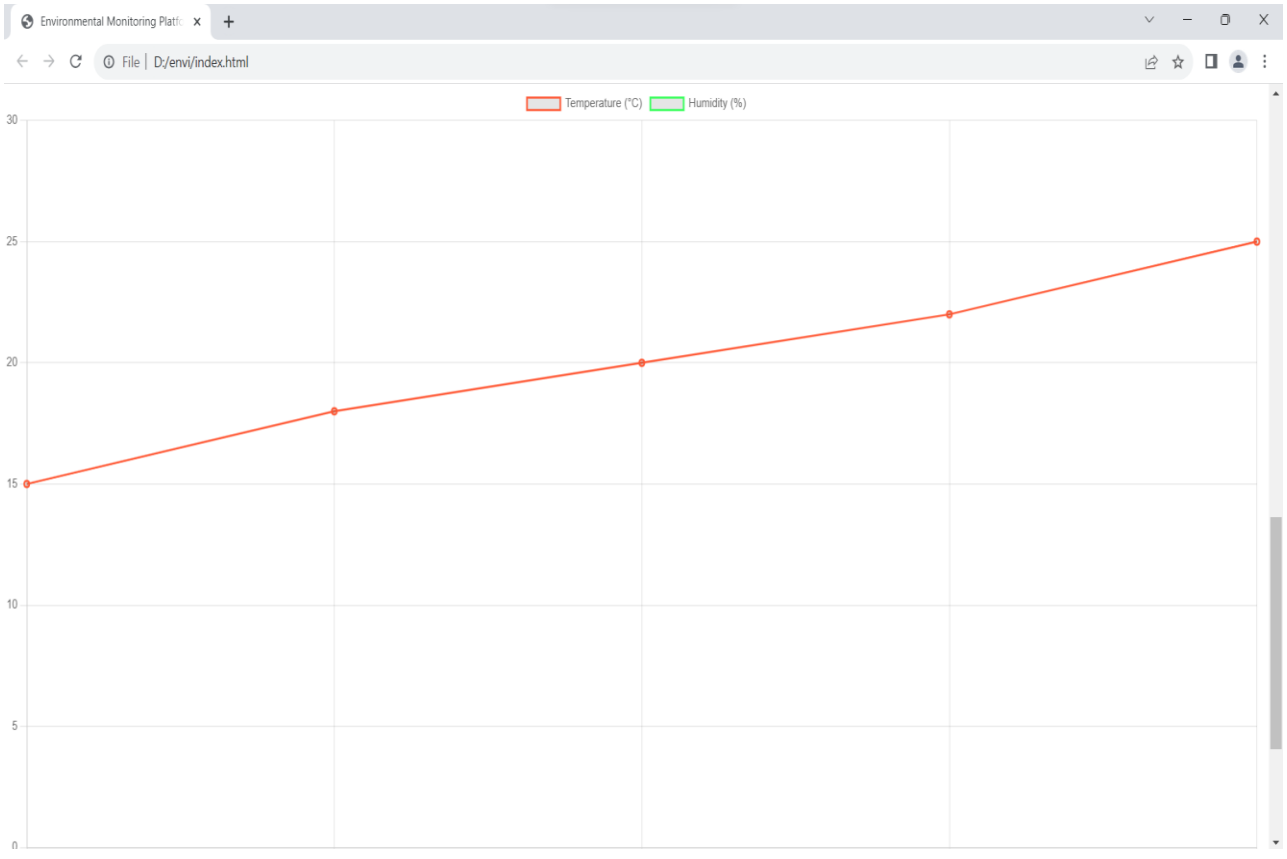
- To ensure that the sensor data and initial chart are displayed when the page loads, the **updateSensorData** and **createRandomChart** functions are called immediately after defining them.

5. **createLineChart Function**:
    - This function is responsible for creating a line chart using the Chart.js library. It is distinct from the **createRandomChart** function.
    - It defines the sample data for the line chart (temperature and humidity values for different months). In a real application, you would replace this with your actual data.
    - The function sets various chart properties, including labels, colors, and scale configurations.
6. **Calling createLineChart on Page Load**:
    - To ensure that the line chart is displayed when the document is ready, the **createLineChart** function is called when the "DOMContentLoaded" event is triggered.

Result:




Environmental Monitoring Platfc
File | D:/envi/index.html
Temperature
Humidity
100
90
80
70
60
50
40
30
20


Environmental Monitoring Platfc
File | D:/envi/index.html
Temperature (°C)
Humidity (%)
30
25
20
15
10
5
0

Conclusion:

In conclusion, an Environmental Monitoring System using the Internet of Things (IoT) represents a transformative and highly valuable technology for addressing a wide range of environmental challenges. This system monitor the temperature and humidity of the environment.