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**Artificial Intelligence and Data Science**

**Project Title**

**:**

**Smart Water System**

**Semester/ Year**

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**V**

**/ III**

**Project Title:** Smart Water System

**Phase 4:**Development Part 2 - Building the Data-Sharing Platform

**Introduction:**

The goal of this phase is to create a real-time data-sharing platform for monitoring water consumption using IoT sensors. The platform provides a web-based interface for users to view and track real-time water consumption data.

**Technology Stack:**

The platform leverages several technologies to achieve real-time data sharing:

* **Flask:** A lightweight Python web framework for building web applications.
* **Flask-SocketIO:** An extension for Flask that simplifies WebSocket integration for real-time communication.
* **HTML and JavaScript:** Used for building the front-end interface.
* **Socket.IO:** A real-time, bidirectional communication library for web applications.

**Data Sources:**

The platform is designed to receive real-time water consumption data from IoT sensors. These sensors could include flow sensors, smart water meters, ultrasonic sensors and

**Server-Side (Python) Code:**

The Flask server-side code is responsible for:

Creating a Flask application and configuring it with a secret key.

Setting up a SocketIO instance associated with the Flask app.

Defining a function get\_realtime\_water\_consumption() to retrieve real-time water consumption data from the IoT sensors. This function may involve interfacing with the sensors and returning the data.

Handling the root route ("/") to serve the HTML template to clients.

Setting up a SocketIO event handler for 'connect', which continuously emits real-time water consumption data to clients every 5 seconds.

**Python code :**

from flask import Flask, render\_template

from flask\_socketio import SocketIO

app = Flask(\_\_name\_\_)

app.config['SECRET\_KEY'] = 'your-secret-key'

socketio = SocketIO(app)

# Function to retrieve real-time water consumption data from IoT sensors

def get\_realtime\_water\_consumption():

# Replace this with your code to connect to the sensors and retrieve data

# You may need to use a library or API provided by your sensor hardware or platform.

# For demonstration purposes, we'll use a placeholder value.

return 5.3 # Replace this with actual data retrieval logic.

@app.route('/')

def index():

return render\_template('index.html')

@socketio.on('connect')

def handle\_connect():

print('Client connected')

while True:

water\_consumption = get\_realtime\_water\_consumption()

socketio.emit('water\_consumption', {'water\_consumption': water\_consumption})

socketio.sleep(5) # Update data every 5 seconds (adjust as needed)

if \_\_name\_\_ == '\_\_main\_\_':

socketio.run(app, debug=True)

**Front-End (HTML and JavaScript) Code:**

The front-end code is responsible for:

Loading the Socket.IO library for WebSocket communication.

Establishing a WebSocket connection to the server upon page load.

Listening for 'water\_consumption' events from the server, which contain real-time water consumption data.

Updating the displayed water consumption value in real-time on the web page.

**HTML Code :**

<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>Real-time Water Consumption</title>

<script src="https://cdnjs.cloudflare.com/ajax/libs/socket.io/4.0.1/socket.io.min.js"></script>

<script>

document.addEventListener('DOMContentLoaded', () => {

var socket = io.connect('http://' + document.domain + ':' + location.port);

socket.on('water\_consumption', function(msg) {

var consumptionElement = document.getElementById('consumption');

consumptionElement.innerHTML = msg.water\_consumption.toFixed(2) + ' gallons';

});

});

</script>

</head>

<body>

<h1>Real-time Water Consumption</h1>

<p>Current Water Consumption: <span id="consumption">0.00 gallons</span></p>

<!-- Add elements for water conservation tips and challenges here -->

</body>

</html>

**Data Flow:**

When a user accesses the platform in a web browser, the server sends the HTML template to the client.

The client-side JavaScript code establishes a WebSocket connection to the server using Socket.IO.

The server periodically retrieves real-time water consumption data from the IoT sensors using the get\_realtime\_water\_consumption() function.

The server emits this data to all connected clients using the 'water\_consumption' event.

Clients receive the data and update the displayed water consumption value in real-time.

**Conclusion :**

In conclusion, our real-time water consumption monitoring platform, built on Flask, Flask-SocketIO, HTML, and JavaScript, offers a robust solution for tracking water usage from diverse IoT sensors. This platform bridges the gap between IoT data sources and end-users through a user-friendly web interface, ensuring immediate access to vital water consumption data. Its adaptability to various sensor types makes it highly versatile. By implementing real-time communication with the help of Socket.IO, we enable users to stay informed and take proactive measures for efficient water management. This platform serves as a solid foundation for enhancing water conservation efforts and driving sustainability.