

IoT-Based Flood Monitoring and Early Warning System



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Introduction



- **Problem Statement:** Floods cause extensive damage to lives, infrastructure, and the environment. Monitoring and early detection are essential for mitigating risks.
- **Objective:** To develop a real-time flood monitoring system with early warning capabilities.
- **Key Features:**
 - Automated data collection from sensors.
 - Real-time alerts via SMS notifications.
 - Cloud-based data storage and visualization

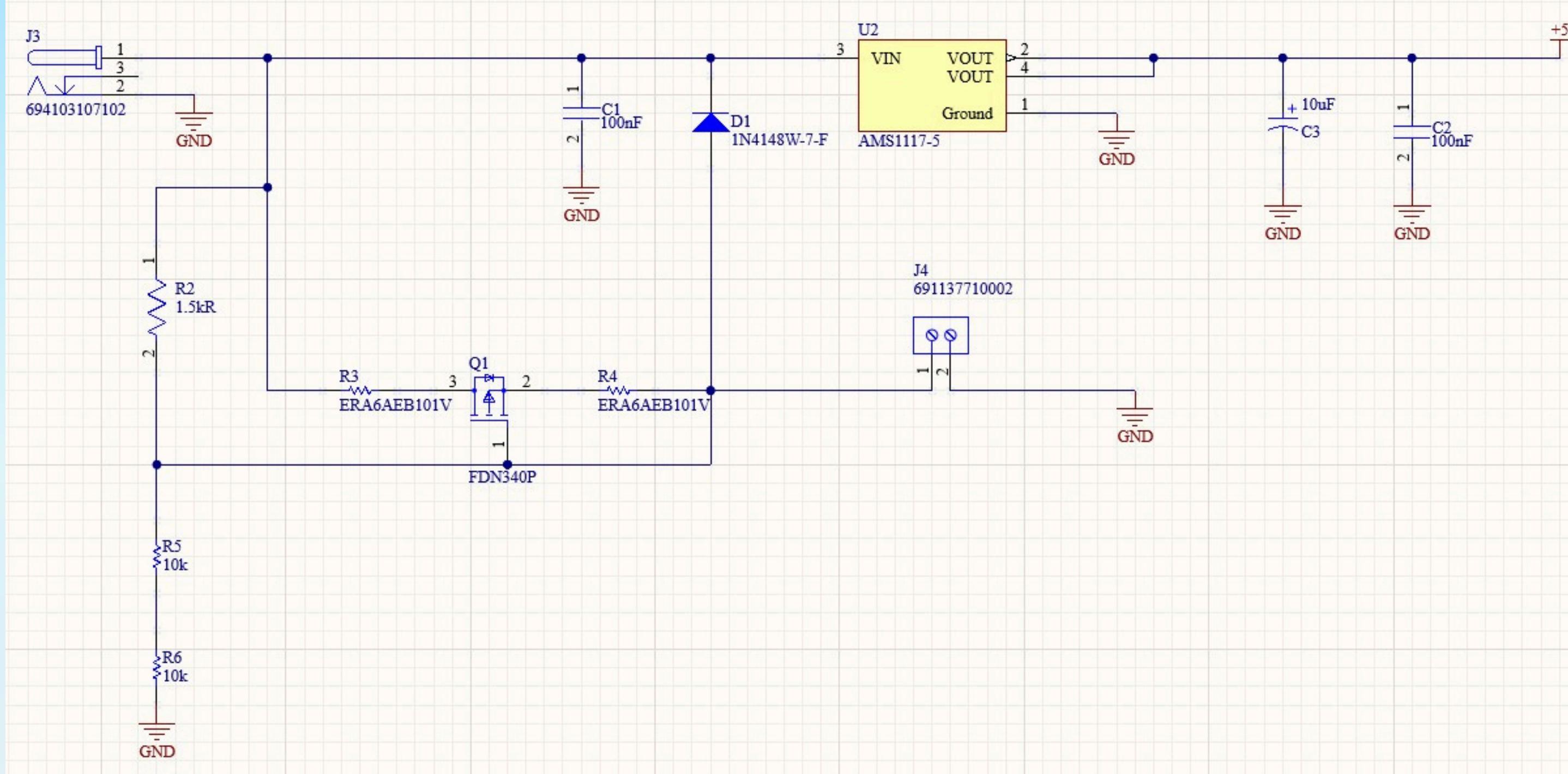
System Overview



- This system integrates IoT devices like ultrasonic sensors and DHT22 to monitor environmental parameters and notify users in case of potential flood risks.
- It leverages MQTT protocol, ThingSpeak cloud, and Node-RED for data handling, visualization, and notifications.

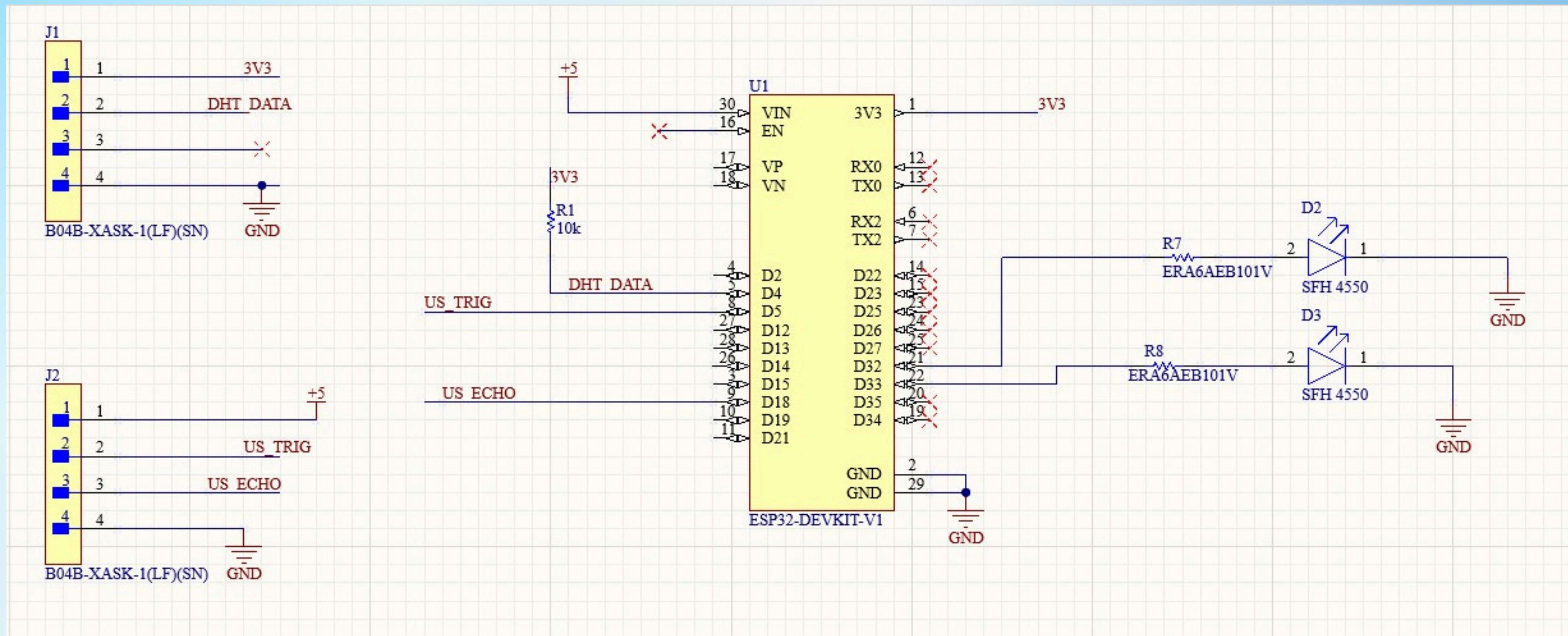
PCB Schematic

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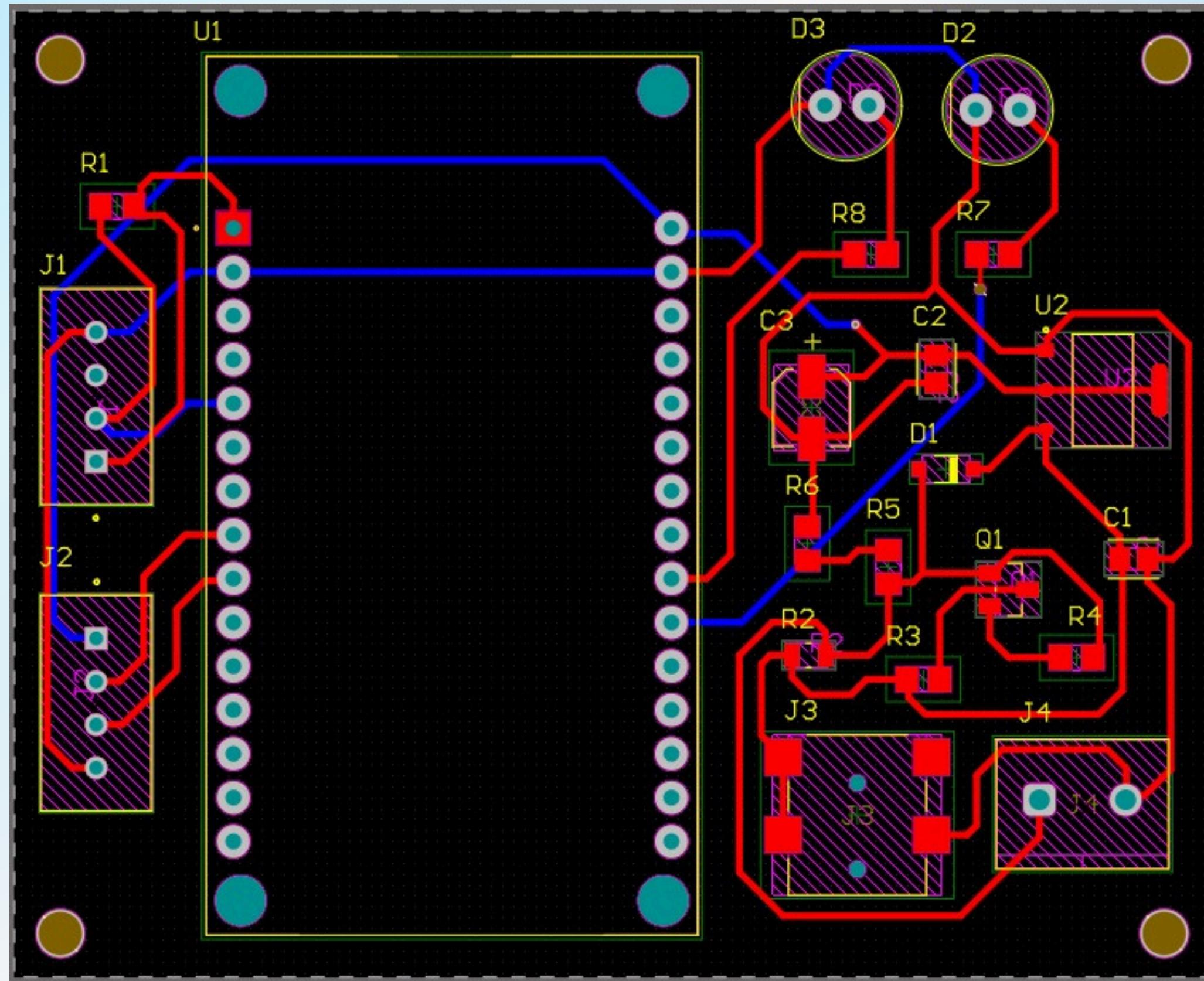
PCB Schematic

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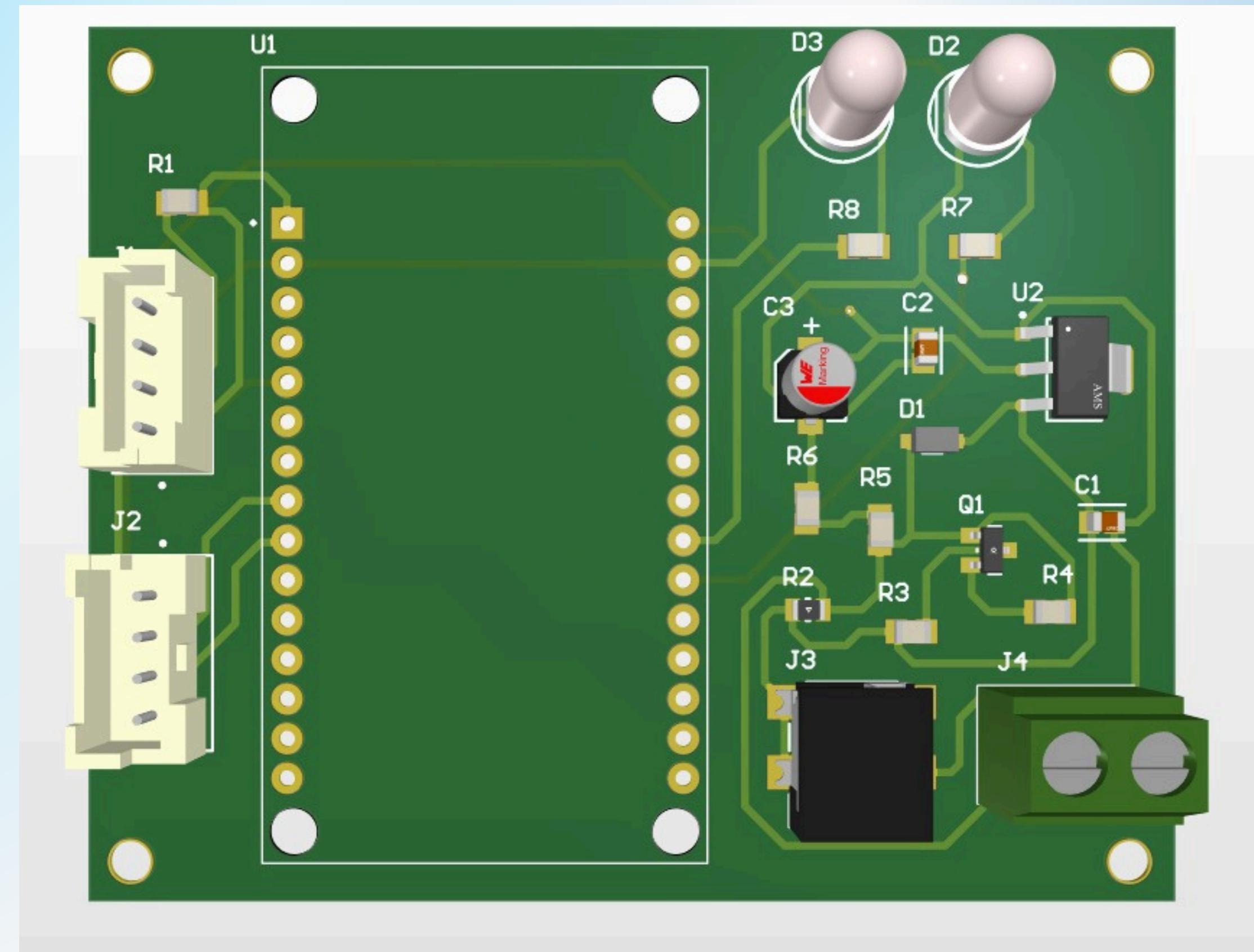
PCB Layout

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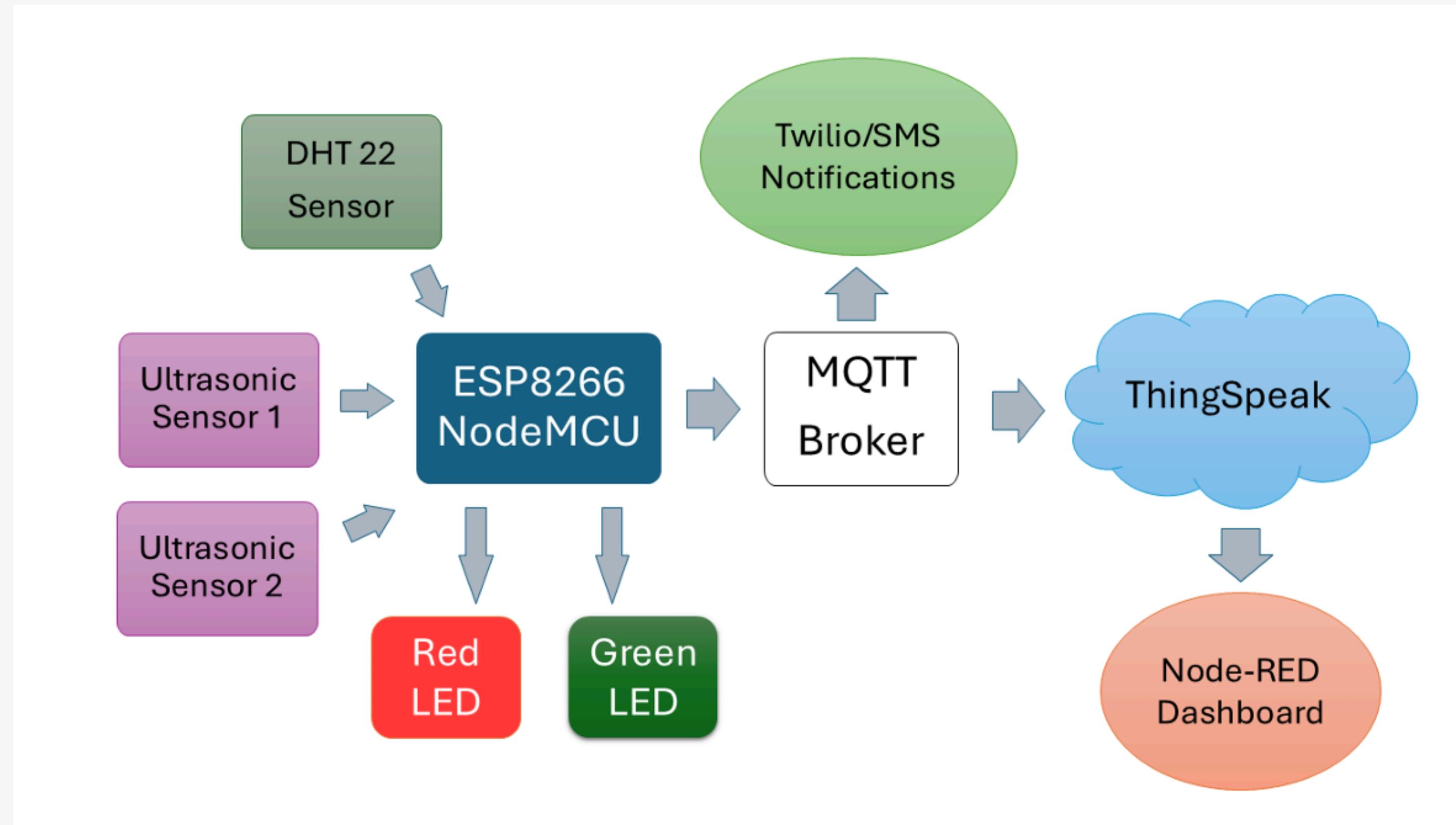


3D View

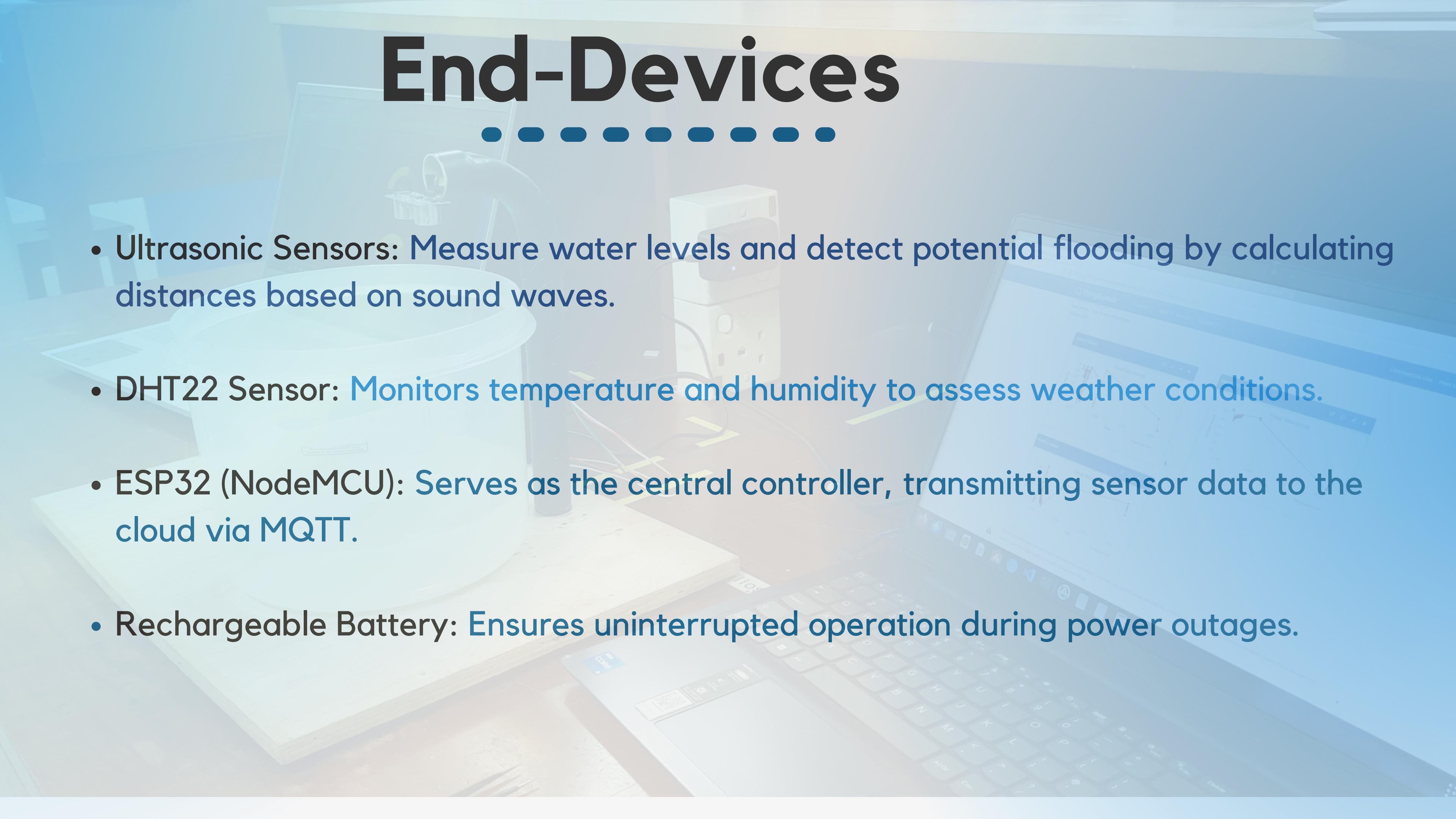
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System Architecture



End-Devices



- Ultrasonic Sensors: Measure water levels and detect potential flooding by calculating distances based on sound waves.
- DHT22 Sensor: Monitors temperature and humidity to assess weather conditions.
- ESP32 (NodeMCU): Serves as the central controller, transmitting sensor data to the cloud via MQTT.
- Rechargeable Battery: Ensures uninterrupted operation during power outages.

Management Interface

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- Node-RED Dashboard: A web-based platform displaying real-time data, accessible via computers or smartphones.
- ThingSpeak Cloud: Stores and processes sensor data, triggering alerts when thresholds are met.
- Twilio SMS Notifications: Sends real-time alerts to users when water levels are critical.



Node-RED

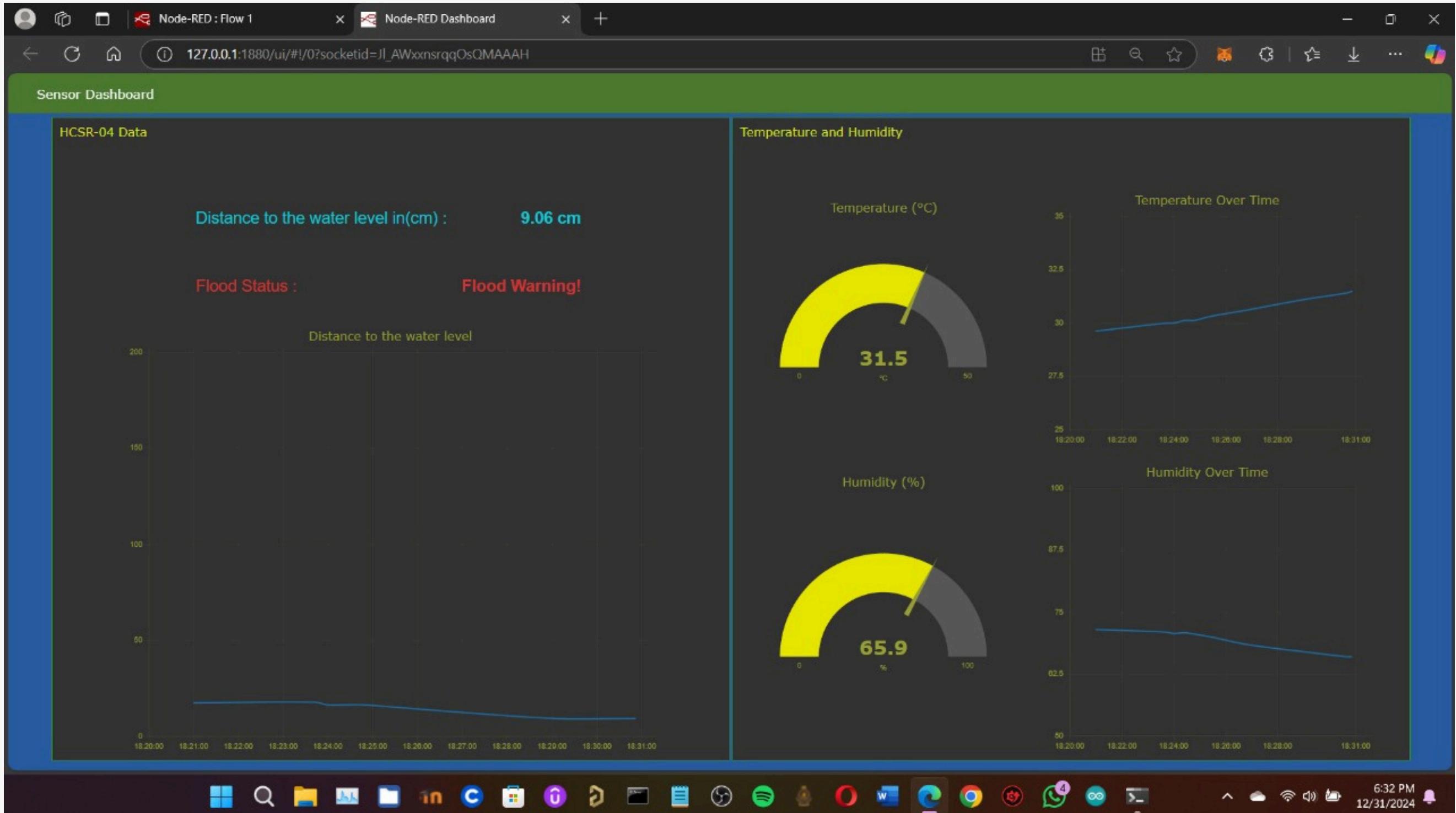
Functional Workflow



- Data Collection: Sensors gather water levels, temperature, and humidity data.
- Data Transmission: ESP32 sends data to the ThingSpeak cloud via MQTT.
- Data Processing: Node-RED processes and visualizes data; sends SMS alerts if thresholds are breached.
- Power Management: Switches to battery power during outages.



Node-RED Dashboard





ThingSpeak Integration

ThingSpeak™ Channels ▾ Apps ▾ Devices ▾ Support ▾ Commercial Use How to Buy PH

Flood Monitoring

Channel ID: 2794249
Author: mwa0000029482639
Access: Private

Private View Public View Channel Settings Sharing API Keys Data Import / Export

+ Add Visualizations + Add Widgets Export recent data MATLAB Analysis MATLAB Visualization

Channel Stats

Created: 7 days ago
Last entry: about 12 hours ago
Entries: 893

Field 1 Chart

Flood Monitoring

distance

Date

ThingSpeak.com

Field 2 Chart

Flood Monitoring

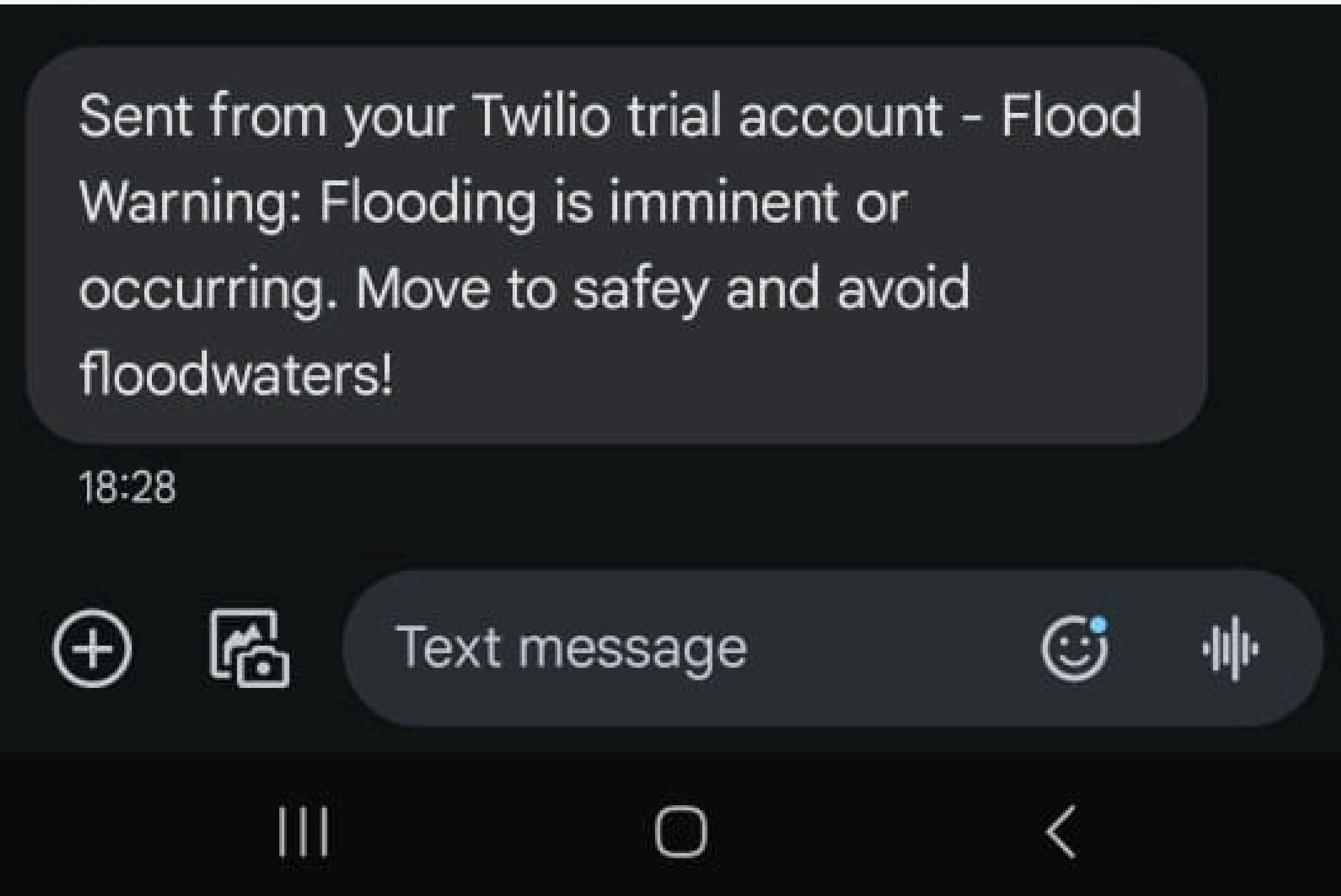
temperature

Date

ThingSpeak.com

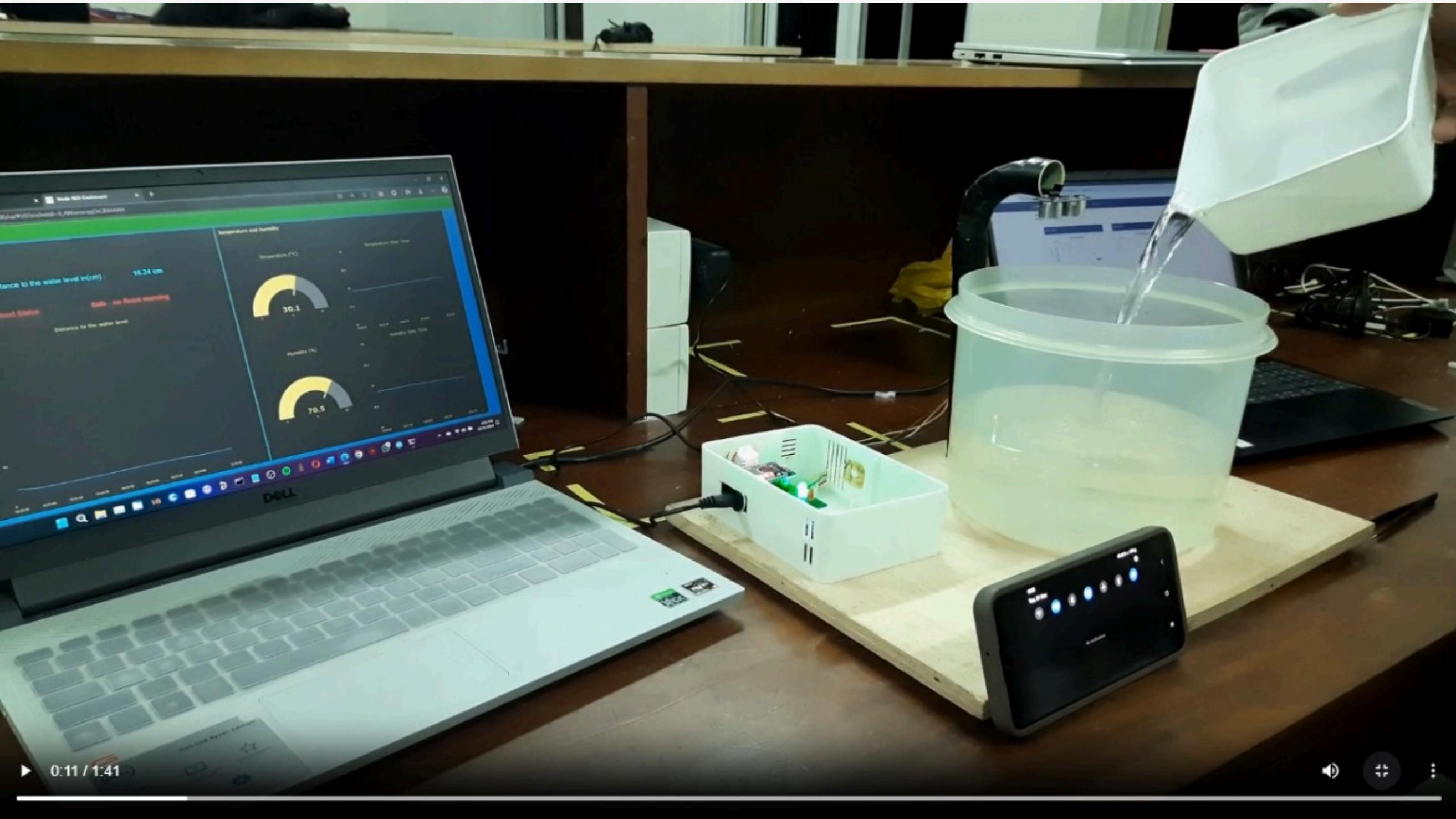


Twilio





Working Prototype



Thank You



