



Smart Irrigation System for Large-Scale Plantations

Project Proposal

Team Name	AgriGenix
Category	University

Problem Definition

Introduction

Managing irrigation in large-scale plantations is a significant challenge, especially in areas where Wi-Fi or traditional communication networks are unavailable. Uneven water distribution, lack of real-time monitoring, and inefficient manual irrigation practices lead to resource wastage and reduced crop productivity. This problem was identified through observations of large agricultural setups where existing smart irrigation systems struggled due to connectivity limitations and scalability issues.

Problem Analysis

Large-scale plantations often span areas where reliable communication infrastructure, such as Wi-Fi, is unavailable. Current smart irrigation systems attempt to address irrigation automation but fall short in the following ways:

- **Connectivity Issues:** Wi-Fi-based systems are impractical for large plantations due to limited coverage and unreliable network access, particularly in remote areas.
- **High Infrastructure Costs:** Systems relying on multiple access points, gateways, or cellular networks incur high setup and maintenance costs, making them less viable for large-scale use.
- **Lack of Remote Control:** Many existing systems require farmers to be physically present to control irrigation, making management inefficient and time-consuming, especially for large plantations.

Proposed Solution

Proposed Product

Our Smart Automated Irrigation System is designed for **large-scale plantations**, offering **both manual and automated control** over irrigation. It efficiently **regulates water flow to plants**, ensuring optimal hydration based on real-time conditions. It utilizes a decentralized node-to-node communication network for seamless data transfer. Each irrigation **node is equipped with sensors to monitor soil moisture, temperature, and humidity, providing real-time data** to a central interface.

Users can **manually control the water supply or adjust watering levels as needed**, or they can **allow the system to automatically optimize irrigation based on collected data from sensors and future weather conditions obtained from an API**. The system promotes water conservation, improves crop yields, and simplifies irrigation management for large plantations.

Uniqueness of the Solution

The uniqueness of our Smart Irrigation System lies in its combination of decentralized communication and smart irrigation. Unlike traditional systems that rely on complex infrastructure or centralized networks, our solution enables seamless communication between irrigation nodes without the need for multiple access points or expensive gateways. This decentralized approach ensures scalability, reduces operational costs, and improves system reliability across large plantations. Additionally, new nodes can be easily integrated into the system, allowing for effortless expansion without major reconfiguration.

Furthermore, by leveraging real-time environmental data such as soil moisture, temperature, and weather forecasts, the system can automatically adjust irrigation schedules to optimize water usage. This makes it both cost-effective and highly efficient, promoting water conservation, improving crop yields, and simplifying large-scale irrigation management.

Technical Overview and Implementation

Technical Details

Our Smart Irrigation System utilizes advanced technology to enable seamless communication between irrigation nodes and a central control interface. Each node is **equipped with sensors that monitor key environmental parameters such as soil moisture, temperature, and humidity**. Users can **monitor these parameters in real-time through a mobile application GROWFLOW** developed using Flutter, allowing them to make informed decisions. The app also enables users to manually control the water supply and adjust watering levels for individual nodes, providing customizable irrigation management across the plantation.

For communication between nodes, we utilize **ESP32 microcontrollers** with ESP-NOW, ensuring efficient and low-latency data transmission. Additionally, weather data is fetched using weather data APIs, allowing the system to automatically optimize watering schedules based on environmental conditions. This integration helps conserve water while maintaining optimal conditions for crops. By leveraging IoT technology, our solution offers a scalable, user-friendly, and efficient irrigation management system for large-scale plantations.

User Scenario

Meet Kasuni, a plantation manager overseeing a large farm. She uses the Smart Automated Irrigation System to manage the irrigation of her crops. Using the mobile app, Kasuni can choose whether the system operates in automatic mode or manual mode. If she's busy, she can switch the system to automatic mode, allowing it to adjust watering schedules based on real-time data and weather forecasts. If Kasuni wants more control, she can access real-time data for each irrigation node placed in the field and manually adjust the watering levels for each one, whenever and wherever she needs, using her mobile phone. This flexibility ensures that Kasuni can efficiently manage her plantation's irrigation without constantly overseeing it.

Team Details

Please provide the necessary details of your team. All fields, including photographs, are required



- Team Leader
- I.P. Mavishan Pasira
- 0742399698
- pasiramavishan@gmail.com



- Team Member
- Nilupulee Amarathunga
- 0762811062
- nilupuleeamarathunga@gmail.com



- Team Member
- Dineth Perera
- 0703250727
- prabashanaperera123@gmail.com

Additional Information

Include any additional information or attachments that support your proposal.
Please ensure that the content provided does not exceed this page.

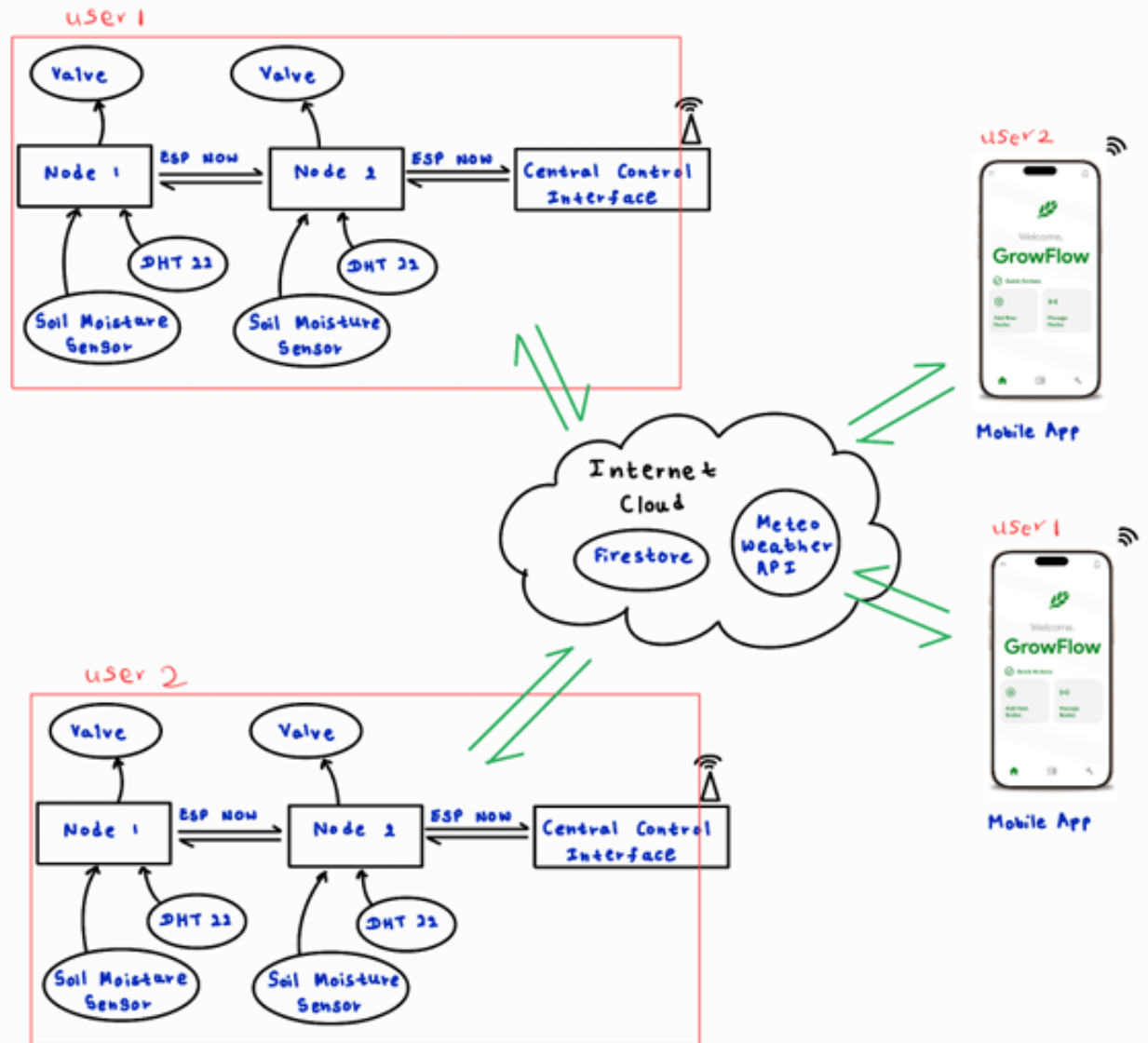


Figure 0-1Block Diagram for our architecture