LPWAN FOR SMART AGRICULTURE

MEET OUR TEAM

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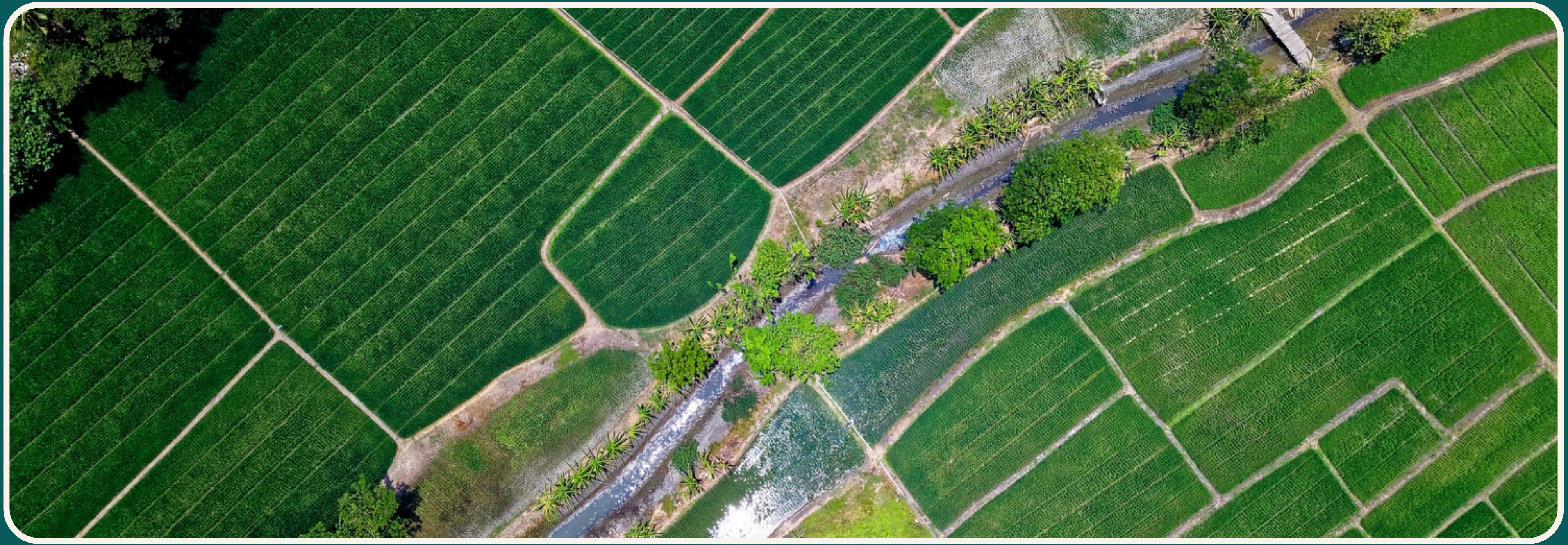
THE PROBLEM



Modern agriculture increasingly relies on real-time environmental data to improve crop yields, monitor soil conditions, and detect early signs of hazards such as drought or disease. However, many rural and remote farming locations lack access to reliable, high-bandwidth infrastructure. Traditional wireless technologies often consume too much power or have limited range, making them unsuitable for large-scale outdoor deployments. There is a need for a low-cost, energy-efficient communication network that can provide wide-area coverage while supporting basic sensor-based monitoring tasks across large agricultural fields.

OUR GOAL

This project aims to simulate a Low-Power Wide Area Network (LPWAN) designed for agricultural use, where minimal power consumption and wide coverage are essential. The goal is to develop a lightweight communication topology capable of supporting basic environmental monitoring and providing early alerts. LPWAN technology is well-suited for these scenarios, offering long-range connectivity with low energy demands, making it ideal for deployment in remote or large-scale farming environments.

OUR SOLUTION

1. To enable long-range, energy-efficient communication in remote environments, this project integrates IoT devices that would utilize LPWAN technology. By utilizing a lightweight communication protocol such as LoRaWAN or custom peer-to-peer messaging, the system avoids the complexity and overhead of full IP stacks.

2. Due to the current limitations of Cisco's Packet Tracer, which does not natively support LoRa or sub-GHz radio communication protocols, we were unable to fully emulate the LoRa-based system in its intended form. To address this, we implemented a comparable simulation using available wireless sensor nodes and adjusted parameters to reflect similar constraints, such as limited bandwidth, low data rates, and long-range propagation characteristics.

MDDDE

1. Manage: Planning, assigned team roles, network design, IoT sensor configuration, Integration
2. Define: Identified problems such as wildfire risks
3. Design: Designed a network topology, selected appropriate sensors
4. Develop: Built and configured the IoT network with LPWAN Protocol
   Evaluate: Conducted system testing

TEAM SOLUTION

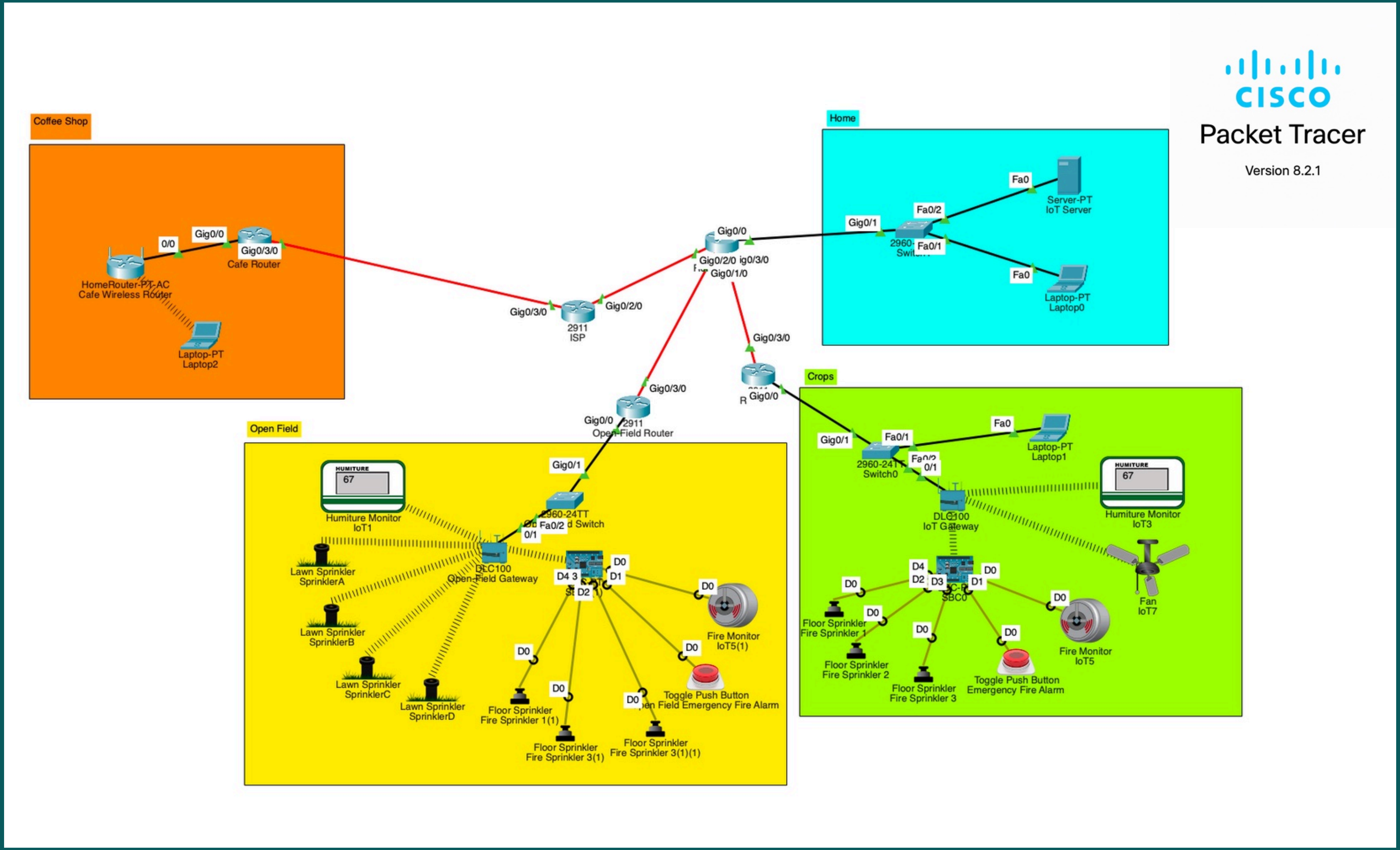
Our solution is to design and deploy a low-power wireless network to support environmental monitoring sensors across the farm, transmitting critical data back to an offsite location (e.g., the farmhouse) for analysis and alerts.

NETWORK OVERVIEW

Our packet tracer models a smart agricultural environment using segmented zones connected through a central backbone to mimic LPWAN communication behavior.

- Environmental sensors (e.g., humidity, fire, sprinklers) connected to an IoT gateway.
- Includes additional environmental sensors and actuators (e.g., fan, fire alarms).
- Data is collected via an IoT gateway and passed to the IoT server.
- Central processing location with an IoT server and monitoring laptop. This acts as the offsite data collector and alert generator.
- All communications route through an ISP and routed backbone, simulating wide-area low-power connectivity.

NETWORK OVERVIEW CONT.



LIVE DEMO

THANK YOU