A LoRa and MQTT-Based Monitoring System

For Internal and External Beehives

Minju Jeon, Jiyun Kim, Sewon Kim, Seongmin Park, Bo Zhang

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Introduction

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Speaker : Minju Jeon

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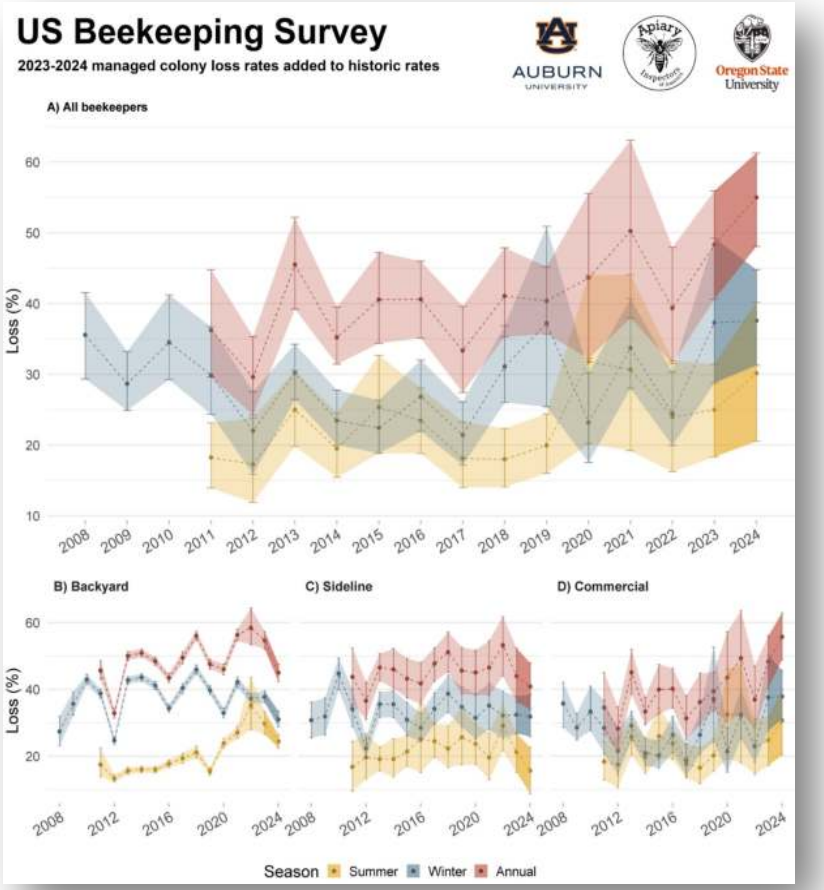
Introduction



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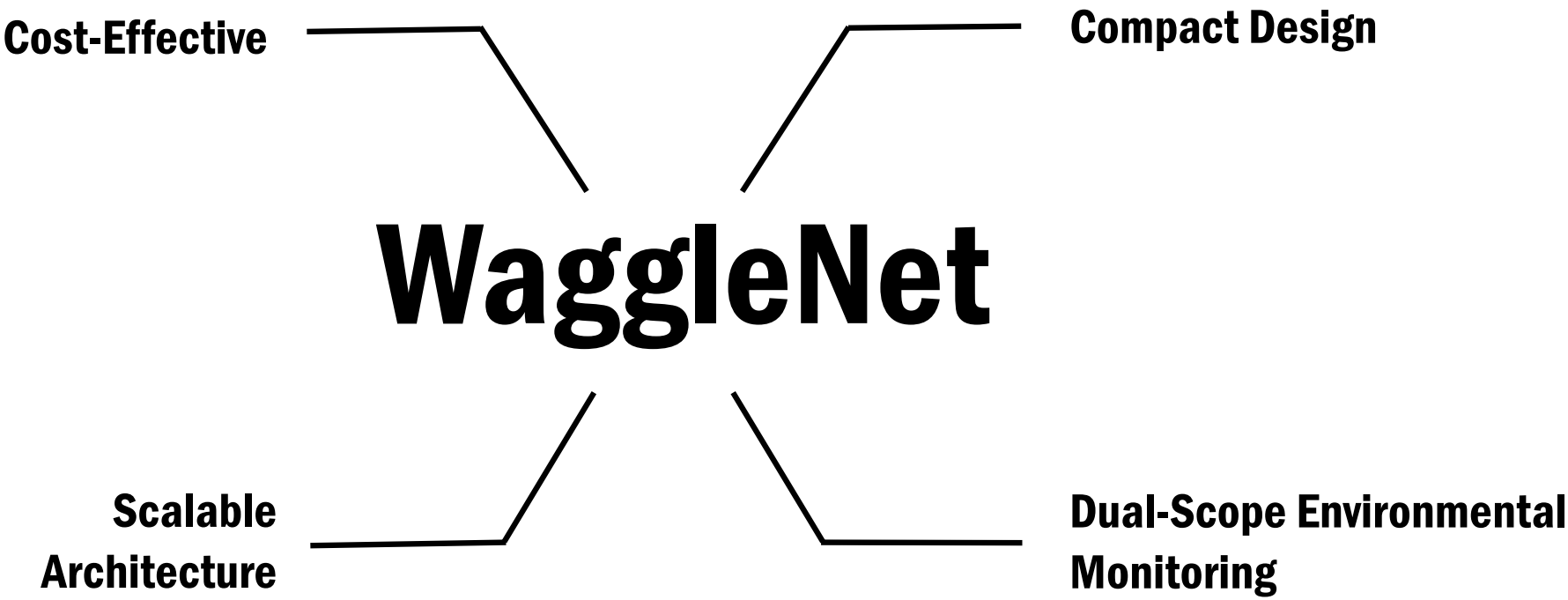
Introduction



Background and Requirement

[redacted]

Speaker : Sewon Kim

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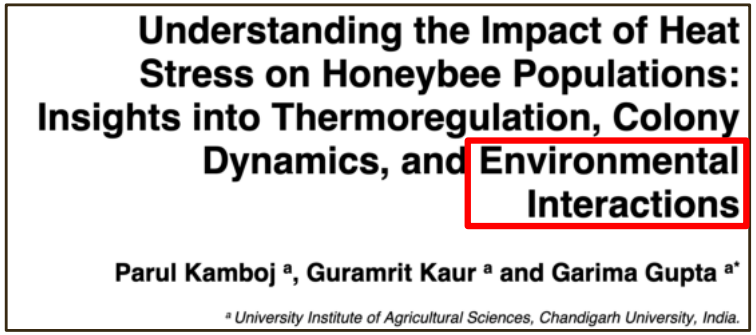
Background: Why External Conditions Matter

diversity

Article

Exploring the External Environmental Drivers of Honey Bee Colony Development

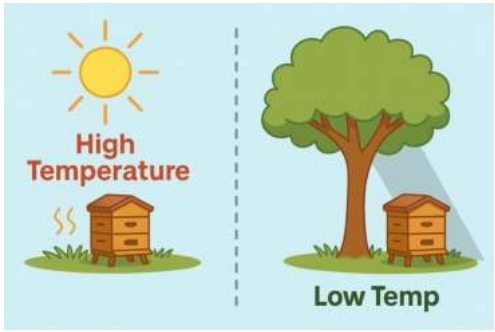
Nuno Capela [1,*], Artur Sarmento [1], Sandra Simões [1], Sara Lopes [1], Sílvia Castro [1], António Alves da Silv
Joana Alves [1], Yoko L. Dupont [2], Dirk C. de Graaf [3] and José Paulo Sousa [1]



Understanding the Impact of Heat Stress on Honeybee Populations: Insights into Thermoregulation, Colony Dynamics, and Environmental Interactions

Parul Kamboj [a], Guramrit Kaur [a] and Garima Gupta [a*]

[a] University Institute of Agricultural Sciences, Chandigarh University, India.



Inside + Outside ➔ Context output

Requirement: What We Designed For

Scalability
Easy node expansion/removal

Accessibility
Real-time mobile app

Comprehensive Hive-Environment Analysis
Internal + External data

Low-Cost Implementation
Uses LoRa, not GSM/ LTE + Cost Low

System Architecture

Speaker : Sewon Kim

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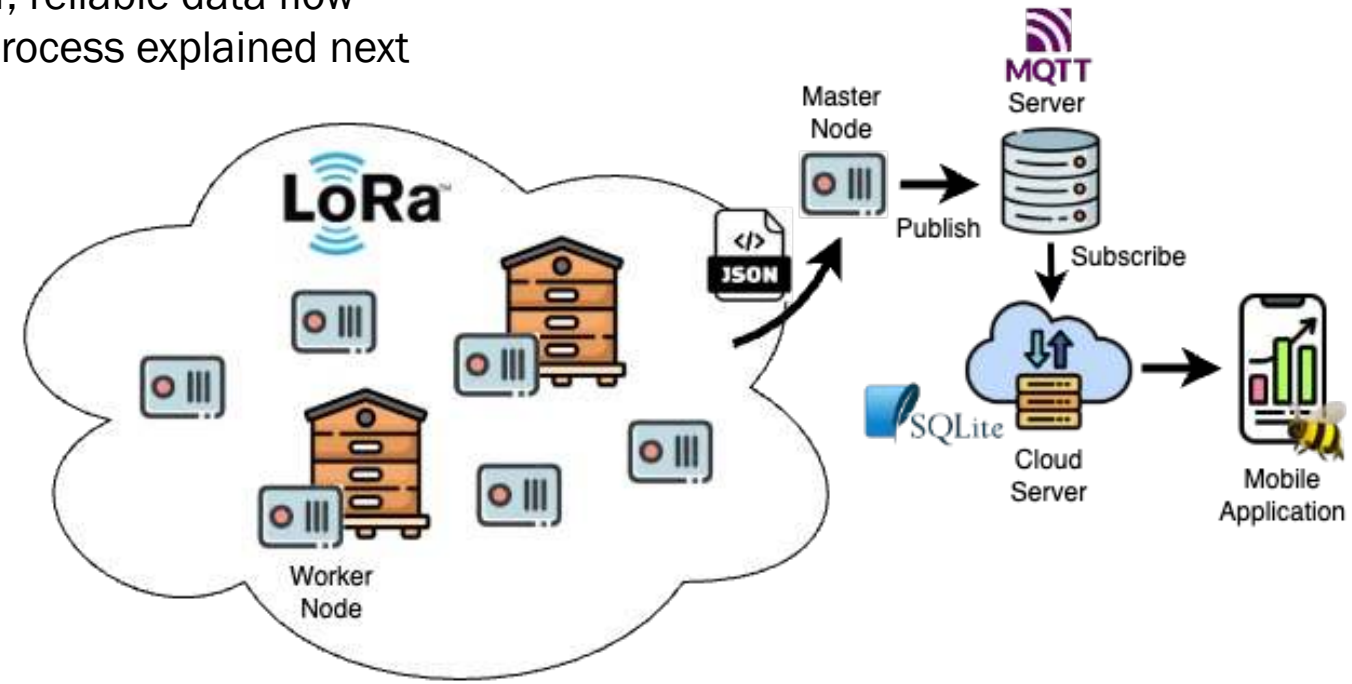
System Architecture: End-to-End Data Flow

LoRa → MQTT → Cloud → Mobile
Low-power, reliable data flow
Detailed process explained next



Hardware

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Speaker : Jiyun Kim

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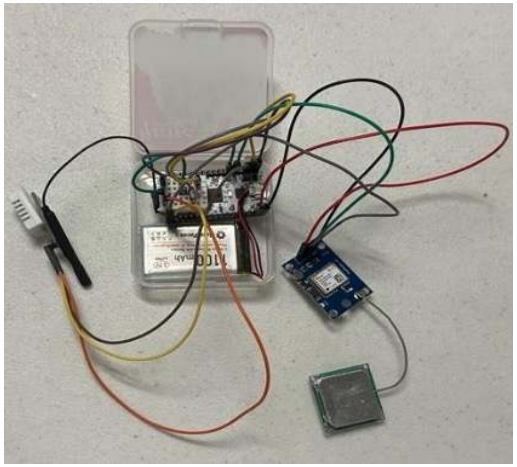
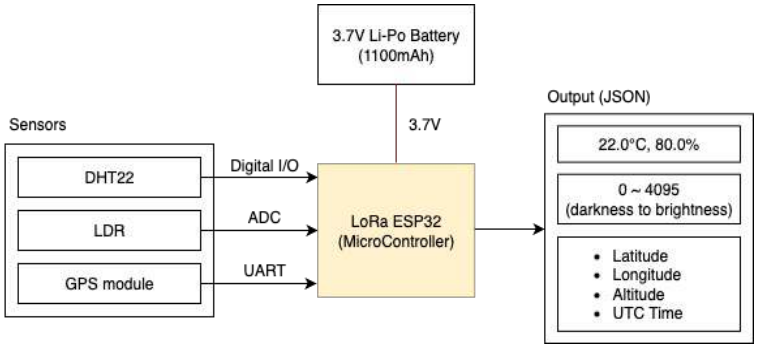
Hardware




3.7V Li-Po Battery
(1100mAh)
3.7V
Output (JSON)
Sensors
DHT22
LDR
GPS module
Digital I/O
ADC
UART
LoRa ESP32
(MicroController)
22.0°C, 80.0%
0 ~ 4095
(darkness to brightness)
Latitude
Longitude
Altitude
UTC Time

Software

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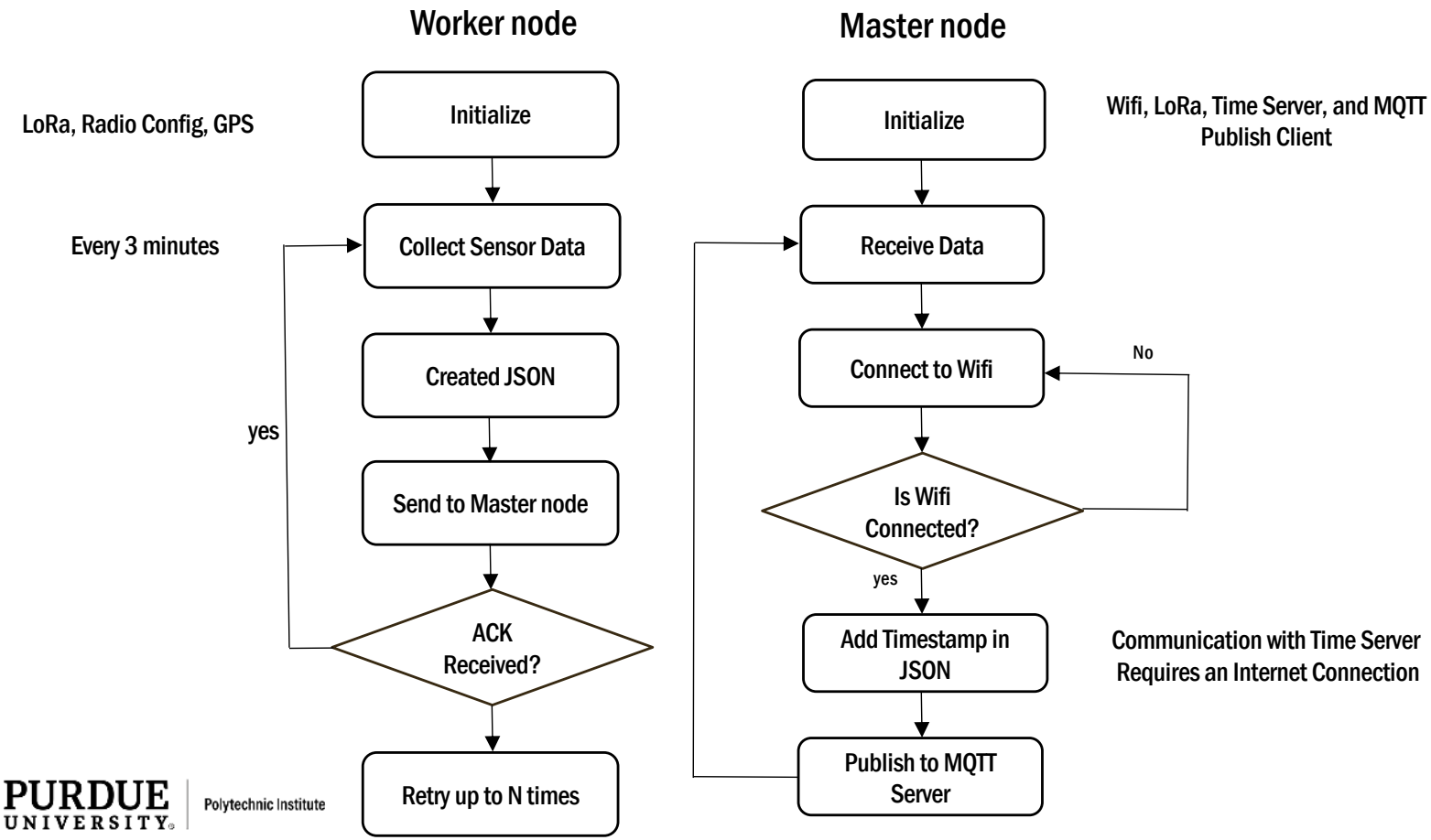
Software



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Server

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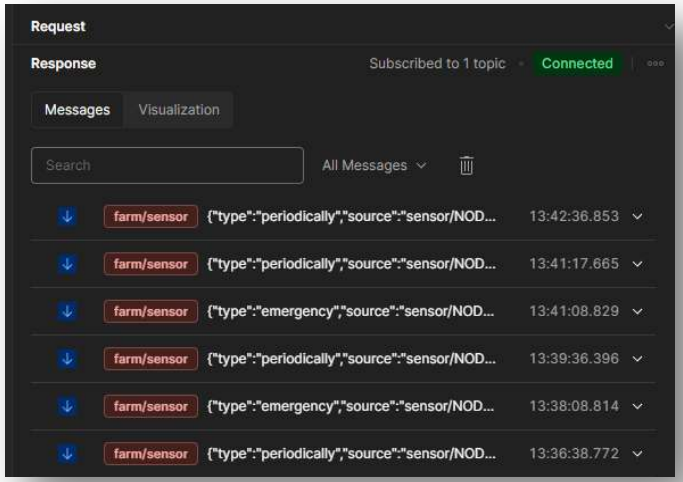
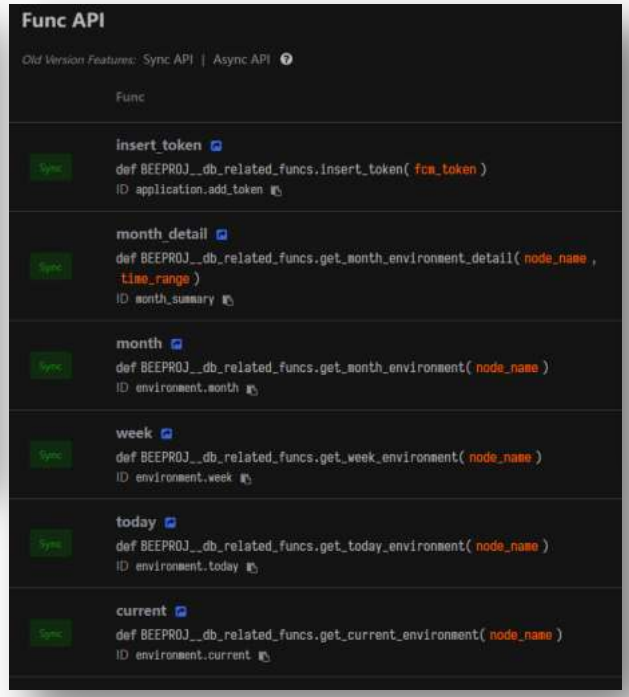
Server

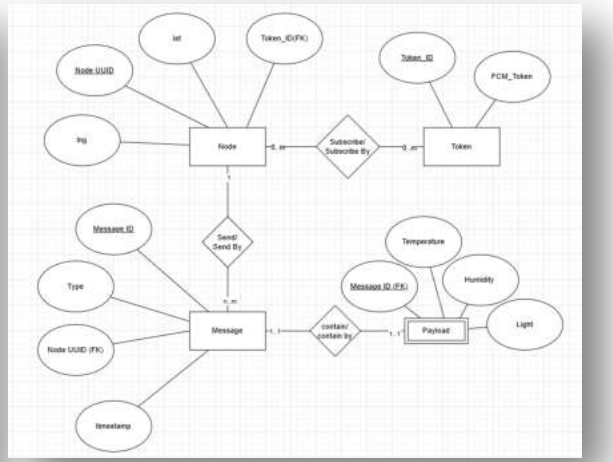
MQTT server



Cloud server



Database



Mobile Application

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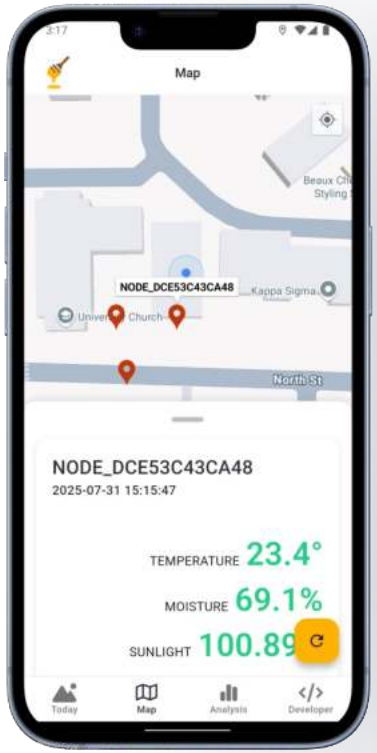
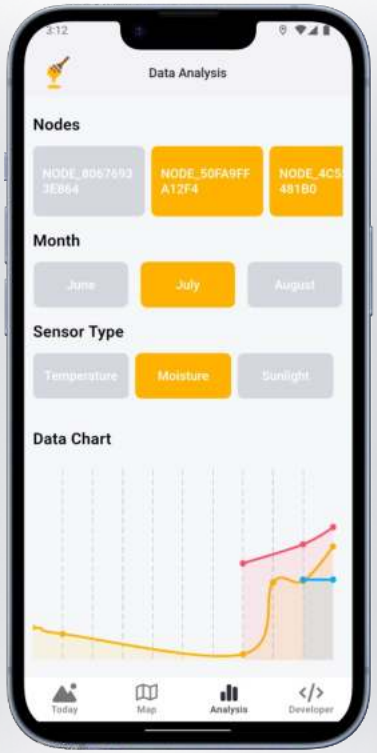
Mobile Application

Map Screen

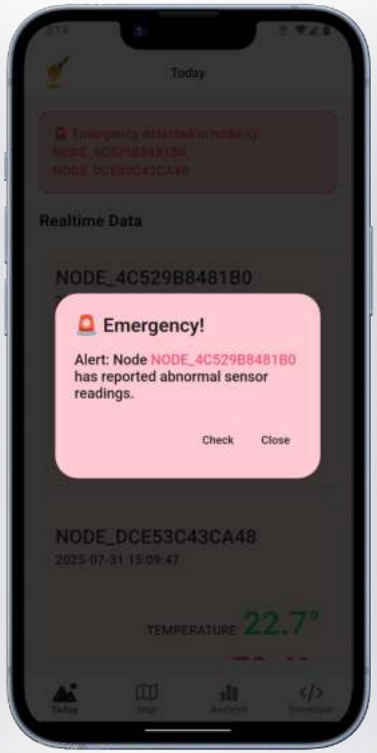


Graph Screen



Home Screen

Emergency Alarm



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Video Demo

[redacted]

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Video Demo

Result and Future Plan

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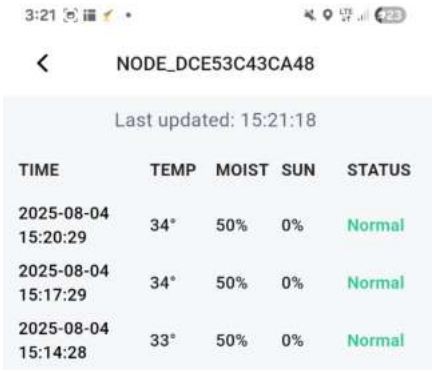
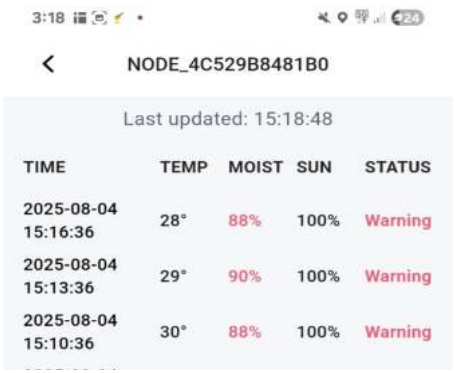
Result and Future Plan



inside



outside

1. Access point
2. Hardware miniaturization
3. AI-based optimal beehive placement recommendation

Thank You

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