Smart Farming

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Team Members:

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Motivation

The Future of Agriculture

- Smart farming, the fusion of traditional agriculture with cutting-edge IoT technology, represents the future of agriculture.

Quality and Efficiency

- Its primary objective is to enhance the quality of agricultural products while minimizing human intervention.

Addressing Farmer Challenges

- In response to the challenges faced by farmers today, we are dedicated to improving agricultural quality and quantity through intelligence calling it "smart farming".

Data-Driven Agriculture

- IoT technology, driven by data, empowers farmers with comprehensive crop monitoring capabilities.

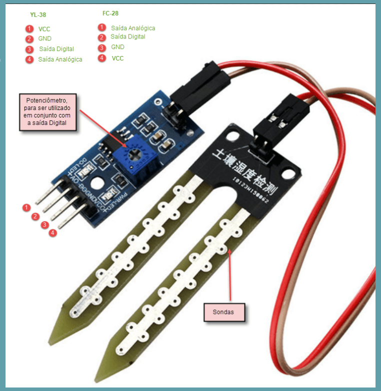
Precision Farming

- Smart farming tracks every aspect of crop production, issuing real-time alerts regarding crop health, soil conditions, and temperature requirements, accessible through interconnected smart devices.

Progress Overview

- Testing Sensors.
- Integrating The Sensors.
- Data Collection.
- Sending Data To The Server.
- Statistical Analysis.
- Alerts.
- Web Design.
- OM2M.

Soil Moisture Sensor

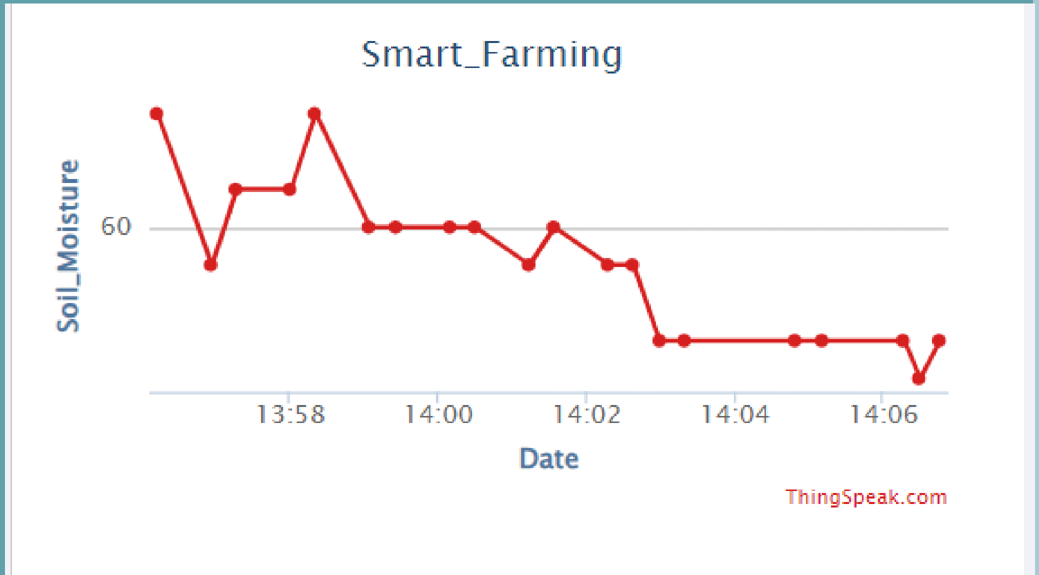


Working Principle:

- The Soil Moisture Sensor measures soil water content by assessing dielectric permittivity, which varies with moisture. It generates a voltage reflecting this permittivity, providing a water content reading.

Use Of Soil Moisture Sensor:

- To measure the soil moisture of the plant at any instance of time
- When the soil moisture reading is less than threshold value an alert is sent to the user.



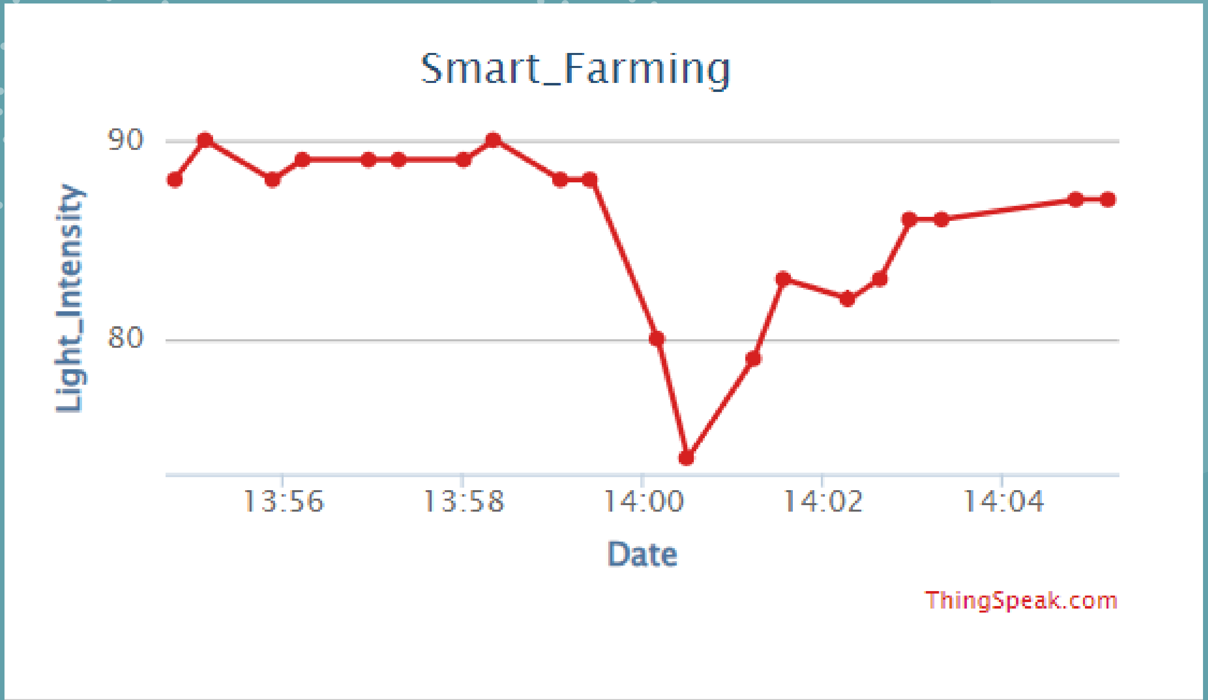
LDR Sensor

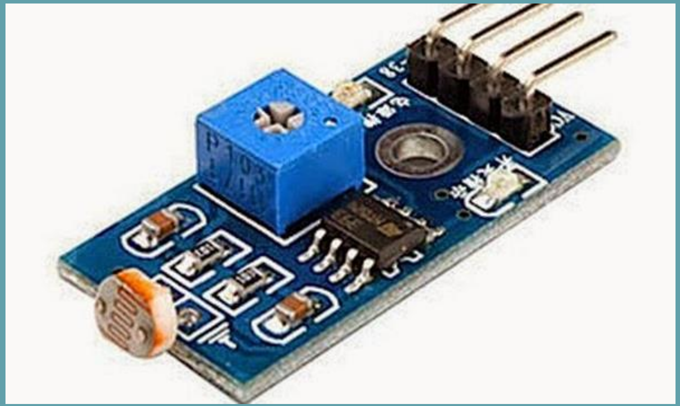
Working Principle:

- An LDR (Light Dependent Resistor) works by changing its electrical resistance in response to the amount of light it receives. More light leads to lower resistance, while less light results in higher resistance. This property allows LDRs to detect and measure variations in light levels.

Use Of LDR Sensor:

- To measure the intensity of light upon the plant at any instance of time.
- When the reading is outside the range, an alert is sent to the user.





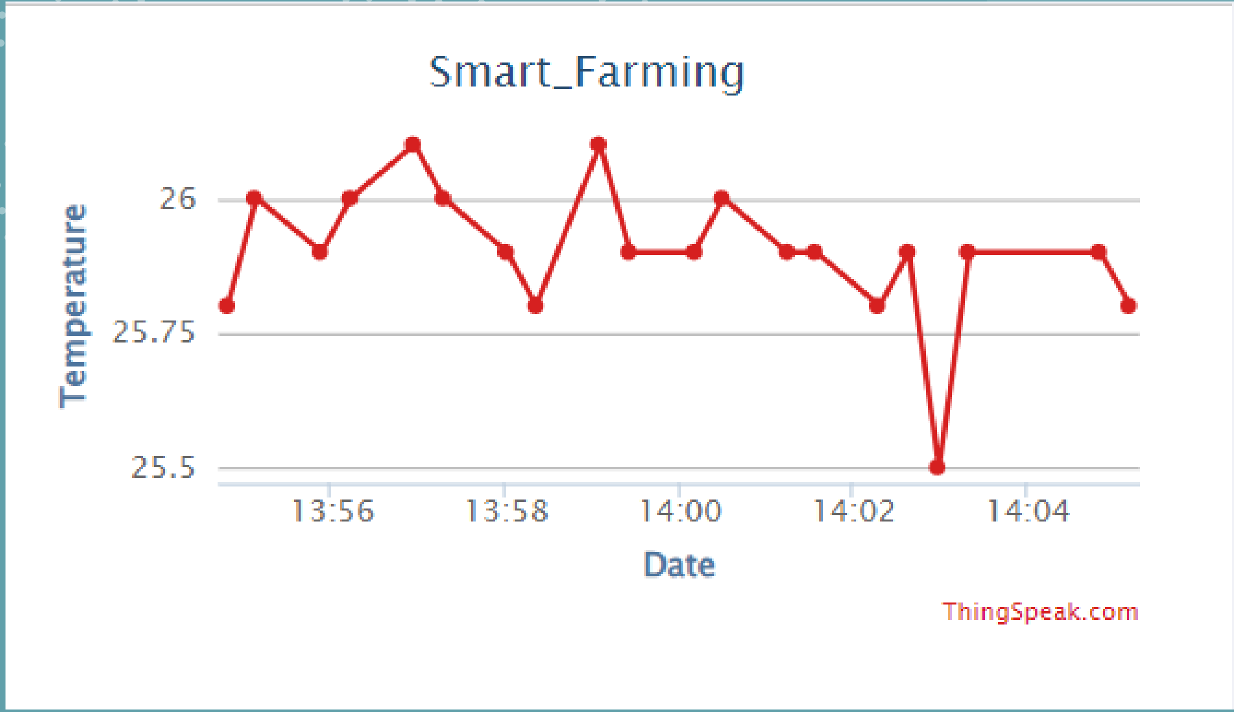
DHT 11 Sensor

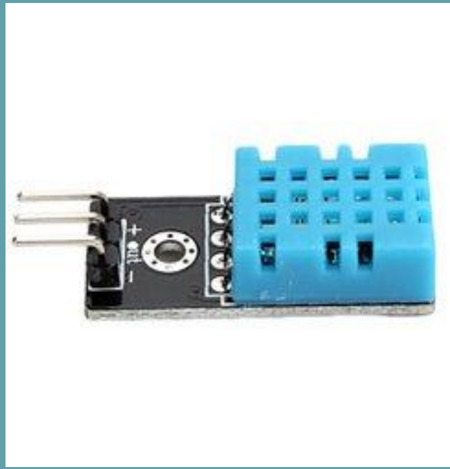
Working Principle:

- The DHT11 is a temperature and humidity sensor that operates by measuring changes in resistance of a humidity-sensitive element(polymer) and built in thermistor in response to temperature and humidity variations. It converts these changes into digital signals for microcontrollers to read.

Use Of DHT11 Sensor:

- To measure the Temperature and humidity in the plant's surroundings at any instance of time
- When the reading is outside the range, an alert is sent to the user.





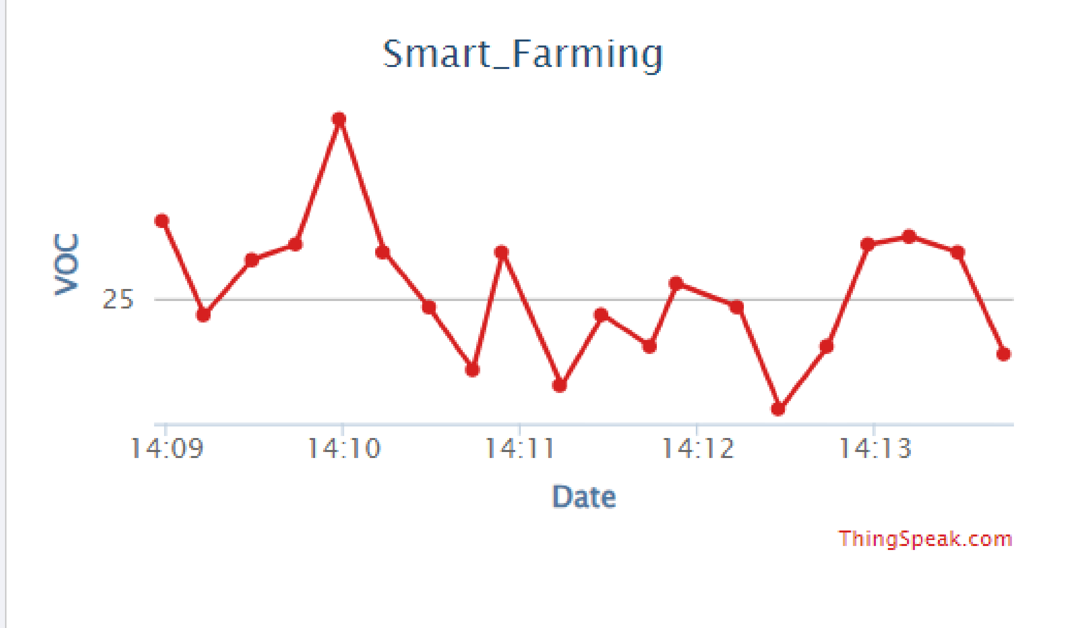
VOC Sensor

Working Principle:

- SGP30 measures TVOC and CO2 using a heated metal-oxide sensor. It gauges air quality by tracking resistance changes. With an integrated MCU, it compensates for temperature and humidity, ensuring precise readings.
- Communication with the sensor is typically through an I2C interface.

Use Of VOC Sensor:

- To measure the VOC Levels in the plant's surroundings at any instance of time
- When the reading is outside the range, an alert is sent to the user.



Integrating the Sensors & Sending Data to the Server

Sensor Integration: We have integrated the DHT11, LDR, and soil moisture sensor into our project using a ESP32. Each sensor is connected to the ESP32 through appropriate interfaces, and we have written code to read data from these sensors.

Data Processing: Once we collect data from the sensors, we process it on the ESP32 to ensure accuracy and consistency. This involve calibration or filtering to remove noise from the sensor readings. We then store this processed data in variables or data structures within the microcontroller's memory.

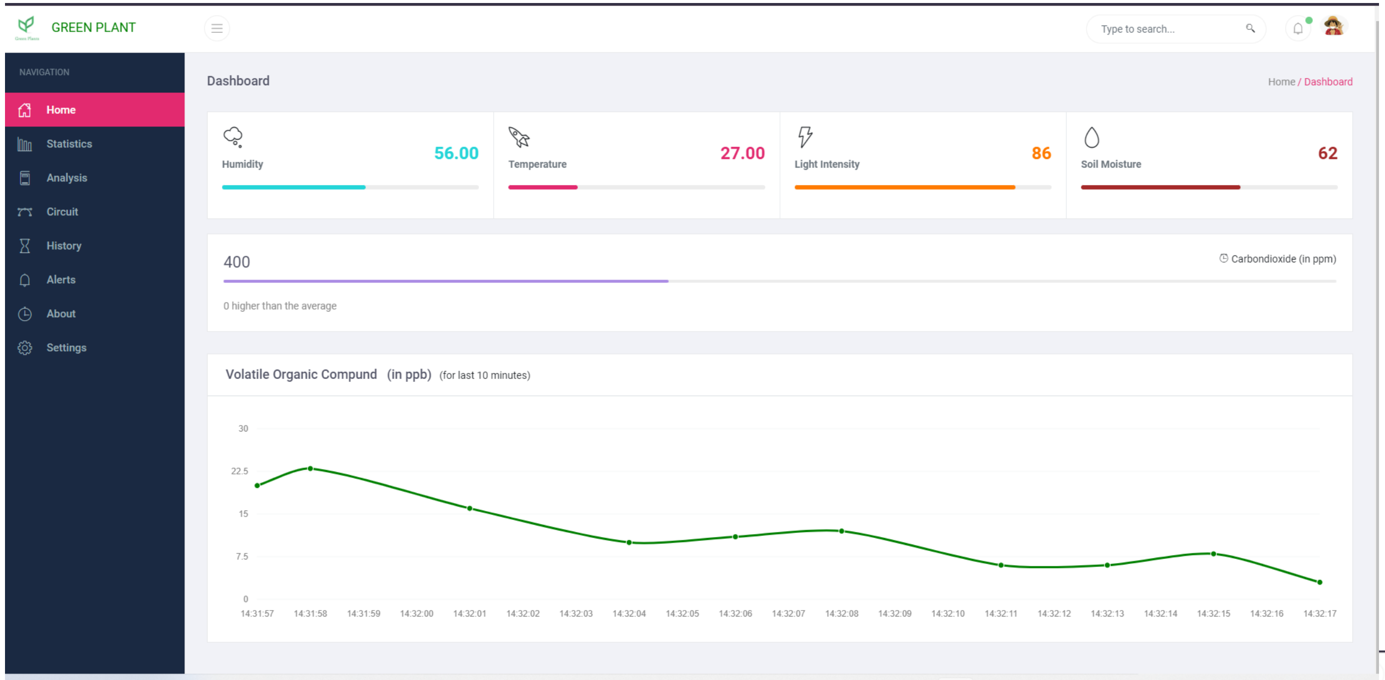
Sending Data to Server: To transmit the sensor data to a server, we use Wi-Fi to establish a connection to the server using MQTT and then send the data to Thingspeak. On the server side, we have a program or script that listens for incoming data and stores it in a database and is presented in graphs to perform real-time analysis.

OM2M Implementation: *In our smart farming initiative, OM2M's modular architecture fosters sensor interoperability, serving as a secure centralized repository for environmental, crop, and equipment data. This seamless integration enhances efficiency and real-time decision-making.*

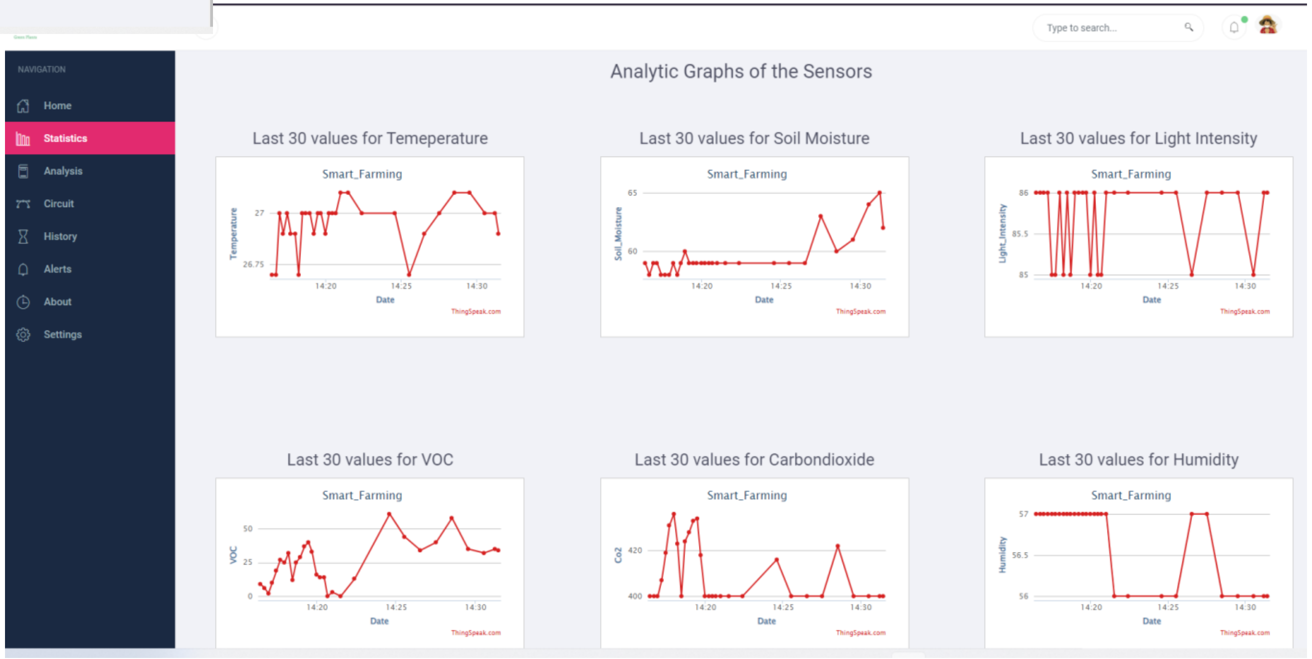
Functionalities Made in Web Page

- **Home Page :** Consists of the current values of sensors and Plot of VOC values
- **Statistics Page :** Consists of Graphs of sensor data retrieved from Thingspeak.
- **Analysis Page :** Consists threshold values of each sensor for the Plant selected by the user and the current values of each sensor.
- **Circuit Page :** Consists of the entire circuit diagram of the system.
- **History Page :** Here the user can select Dates in which they want to see the sensor data generated between the timeline**.**
- **Alerts Page :** When the current values of the sensors are not in the range of threshold values an alert is generated and is shown in Alerts Page.
- **About Page :** Consists of the information of the project and team members.
- **Settings Page :** Here the user can make certain changes:
    - The user can choose the number of values for observation in the Statistics Page.
    - The user can change Plant and if the Plant is present in the Database then the corresponding Threshold values are shown in the Analysis Page.

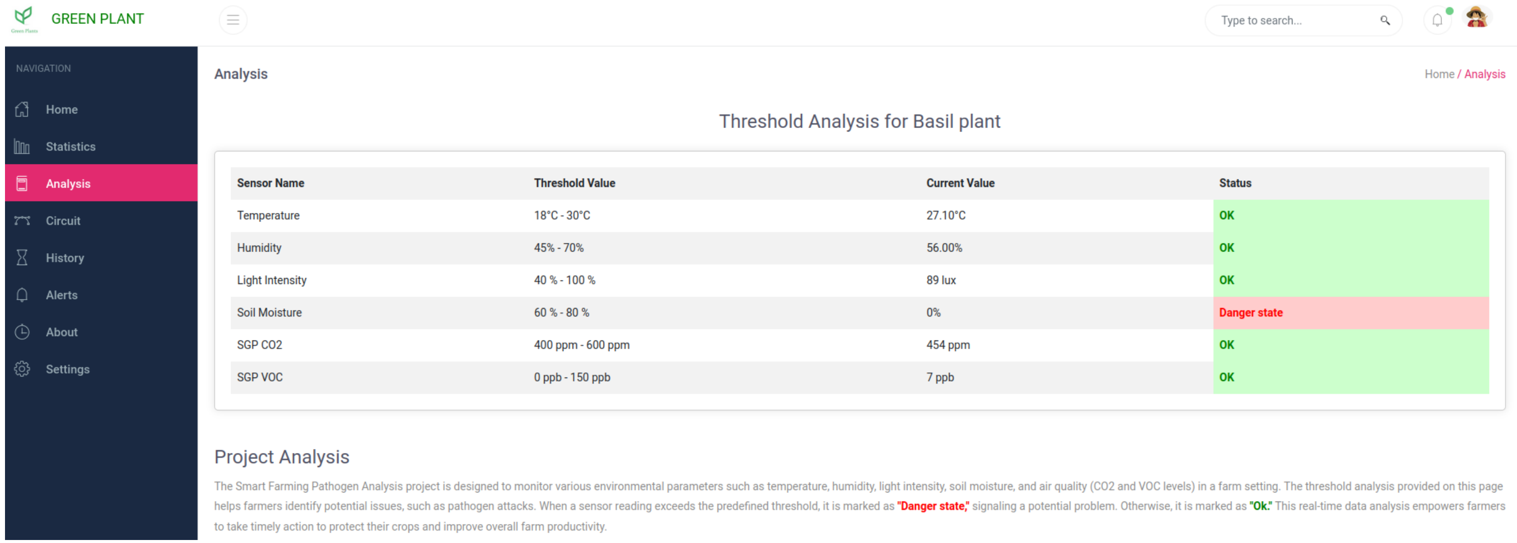
Home



Statistics



Analysis



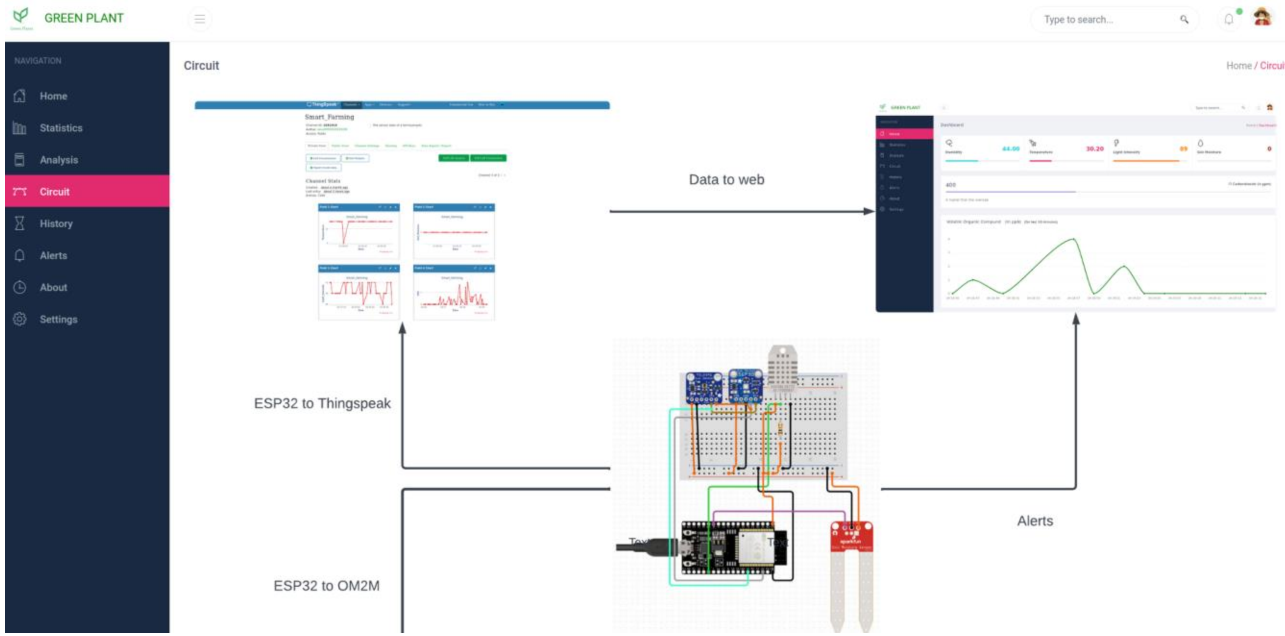
Threshold Analysis for Basil plant

Sensor Name	Threshold Value	Current Value	Status
Temperature	18°C - 30°C	27.10°C	OK
Humidity	45% - 70%	56.00%	OK
Light Intensity	40 % - 100 %	89 lux	OK
Soil Moisture	60 % - 80 %	0%	Danger state
SGP CO2	400 ppm - 600 ppm	454 ppm	OK
SGP VOC	0 ppb - 150 ppb	7 ppb	OK

Project Analysis

The Smart Farming Pathogen Analysis project is designed to monitor various environmental parameters such as temperature, humidity, light intensity, soil moisture, and air quality (CO2 and VOC levels) in a farm setting. The threshold analysis provided on this page helps farmers identify potential issues, such as pathogen attacks. When a sensor reading exceeds the predefined threshold, it is marked as **"Danger state,"** signaling a potential problem. Otherwise, it is marked as **"Ok."** This real-time data analysis empowers farmers to take timely action to protect their crops and improve overall farm productivity.

Circuit



History

GREEN PLANT

Type to search...

ATION

- Home
- Statistics
- Analysis
- Circuit
- History
- Alerts
- About
- Settings

History

Home / History

History data of the Plant

From: 13 / 11 / 2023 To: 21 / 11 / 2023 Submit

Date-Time	Temperature	Humidity	VOC	CO2	Soil moisture	Light intensity
2023-11-14T02:28:54+05:30	28.50	54.00	0	400	0	0.00
2023-11-14T02:29:24+05:30	28.50	49.00	0	400	0	0.00
2023-11-14T02:29:27+05:30	28.10	49.00	0	400	0	0.00
2023-11-14T02:29:49+05:30	28.20	49.00	0	400	0	0.00
2023-11-14T02:29:52+05:30	28.10	49.00	0	400	0	0.00
2023-11-14T02:29:55+05:30	28.20	49.00	0	400	0	0.00
2023-11-14T02:29:57+05:30	28.10	49.00	0	400	0	0.00
2023-11-14T02:30:15+05:30	28.10	49.00	0	400	0	0.00
2023-11-14T02:30:18+05:30	28.20	49.00	0	400	0	0.00
2023-11-14T02:30:20+05:30	28.10	49.00	0	402	0	91.00

Settings

GREEN PLANT

Type to search...

NAVIGATION

- Home
- Statistics
- Analysis
- Circuit
- History
- Alerts
- About
- Settings

Settings

Home / Settings

General Settings

Username: test

Name: Test1

Email: test1@gmail.com

Password: ••••••••

Monitoring Plant: Basil

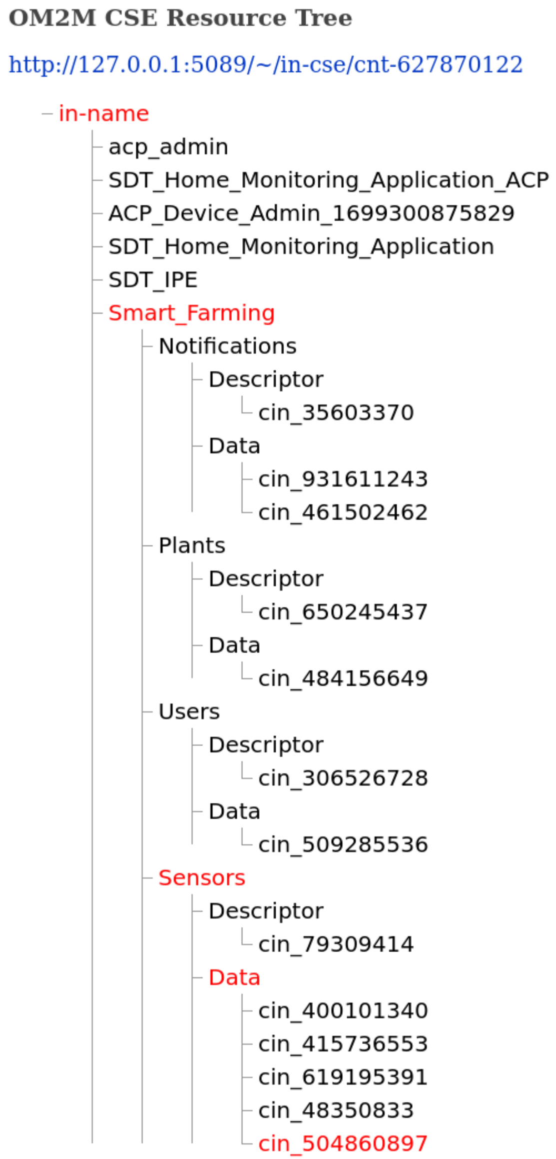
No of Readings in Graphs: 40

Reset Save Changes

Term & Conditions Privacy & Policy

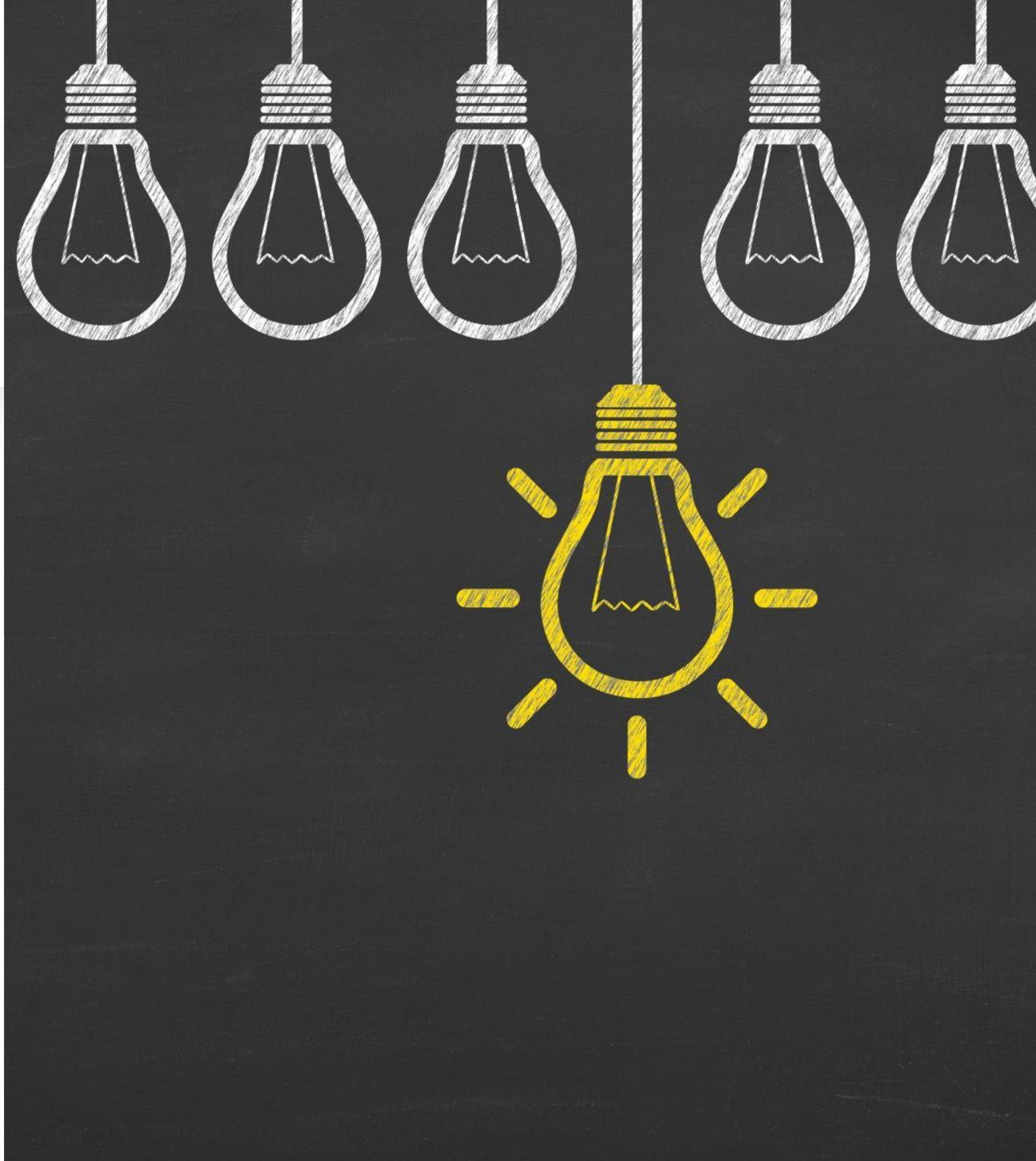
OM2M Implementation

- Developed an interoperable oneM2M (OM2M) solution for **sensor data storage**, ensuring seamless communication and compatibility across diverse IoT devices. The implementation adheres to oneM2M standards, promoting effective interoperability for a cohesive and unified ecosystem.



CHALLENGES

- **Power Supply and Energy Efficiency:** Power management is critical when working with sensors for extended periods, especially in remote or outdoor environments. We need to design power-efficient circuits and possibly explore energy harvesting techniques to extend the project's runtime without frequent battery replacements.
- **Sensor Calibration and Accuracy:** Ensuring that the sensors are accurately calibrated is a significant challenge. Calibration is crucial to obtaining reliable data from these sensors.
- **Data Handling and Communication:** Collecting data from multiple sensors and transmitting it to a central monitoring system or storage platform can be complex. Challenges include selecting the appropriate communication protocol (e.g., Wi-Fi, Bluetooth, LoRa), dealing with data transmission errors, ensuring data integrity, and managing data storage.



INDIVIDUAL CONTRIBUTIONS

Web Design , OM2M , MQTT – Dileepkumar Adari

Soil Moisture Sensor , Alerts , SGP30 – Revanth

DHT Sensor , Analysis page , Data Collection – Gajawada Bharath

LDR Sensor , About Page , ppt – Chaganti Karthikeya


THANK YOU