Crop Monitoring

USING ESP32 and LOCAL SERVER

Batch No: 10

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Aim/Scope:

- To design a crop monitoring system based on the Internet of things (IoT) and increase the productivity of the farmer in growing a particular crop in a Green House.

- A Green House is a covered area where plants grow and cultivate.

problem analysis

01 Optimized conditions

Primarily we need to know the optimized conditions for the plant (example: tomato) that are suitable to produce higher and effective yield

02 Variables

Variables such as PH value, temperature, Light levels, humidity, soil moisture should be monitored for ideal yield.

03 Data relay

A Cloud platform should be used to gather the data from the sensors to perform analysis and extract the necessary statistics.

04 Application

The farmer needs an application where all the data is organised and can be controlled anywhere in the world and it should help him making decisions.

proposed solution

01 The Brain of the Project

We are using ESP32 as the brain to sense and actuate things

02 Monitoring Variables

P H sensor, DHT 22 sensor, LDR, soil moisture sensor are used to measure P H levels, temperature, humidity, luminosity, soil moisture levels respectively.

03 Data relay

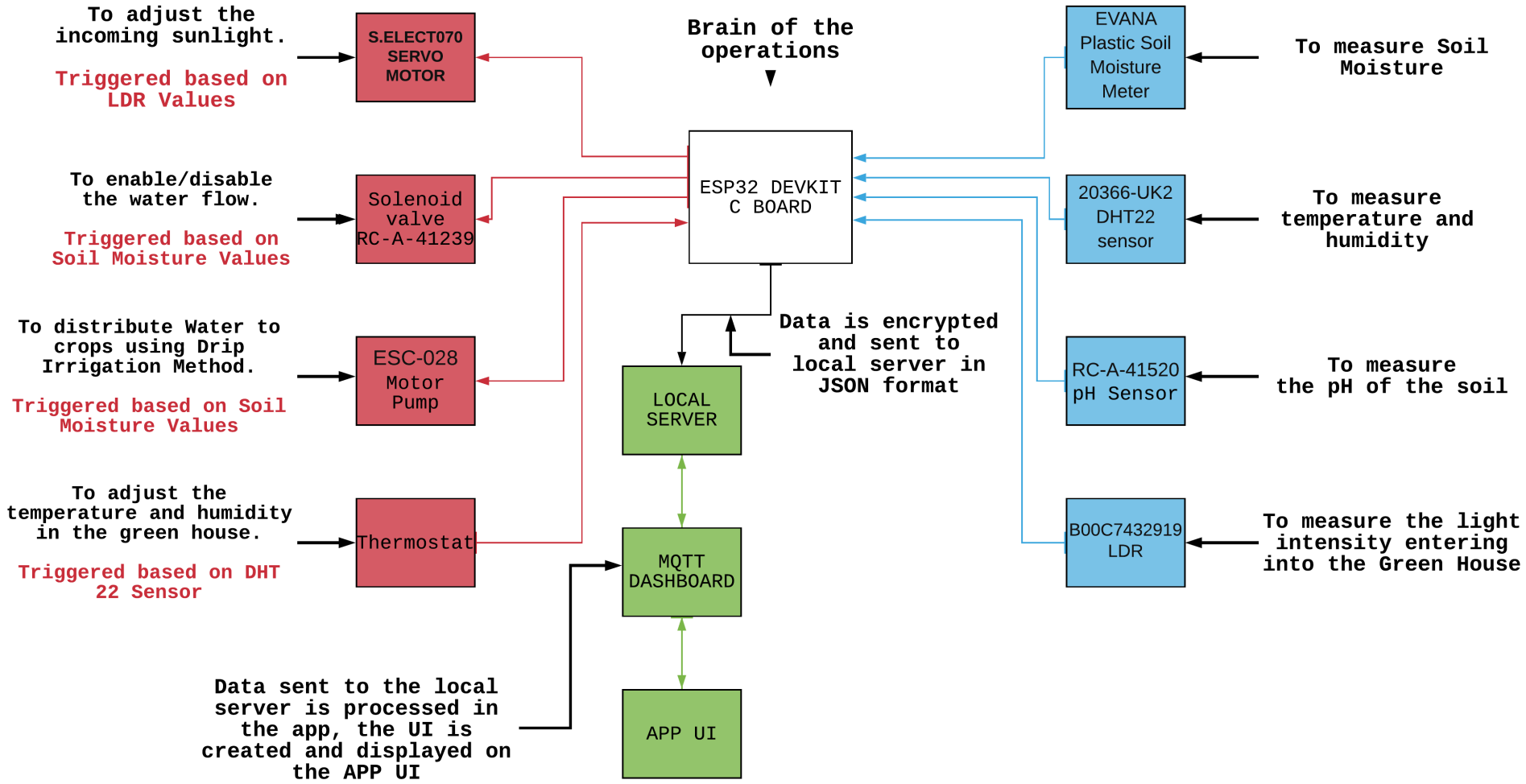
For relaying data we chose IBM cloud(bit expensive but has great features for future use) or Blynk Cloud (free, alternative). Here in the cloud the data from the sensors transmitted by ESP32 is gathered and organised.

04 Application

Our application is a web app which is created using NODE RED or An android or IOS App developed using the Blynk instances using the API calls. The Application features will be explained in later slides

BLOCK DIAGRAM

- Example: Optimal Conditions for Tomato
- Temp:18 C to 30 C (day time)
- They stop growing above 35 C for some types.
- If the temp is > 30 C during night time (the fruit will not turn red)
- 85 % - preferred Humidity
- 6.0 to 6.8 - preferred PH levels
- Watering 2 times a day using the drip irrigation method. Depending upon the soil moisture



FLOW CHART

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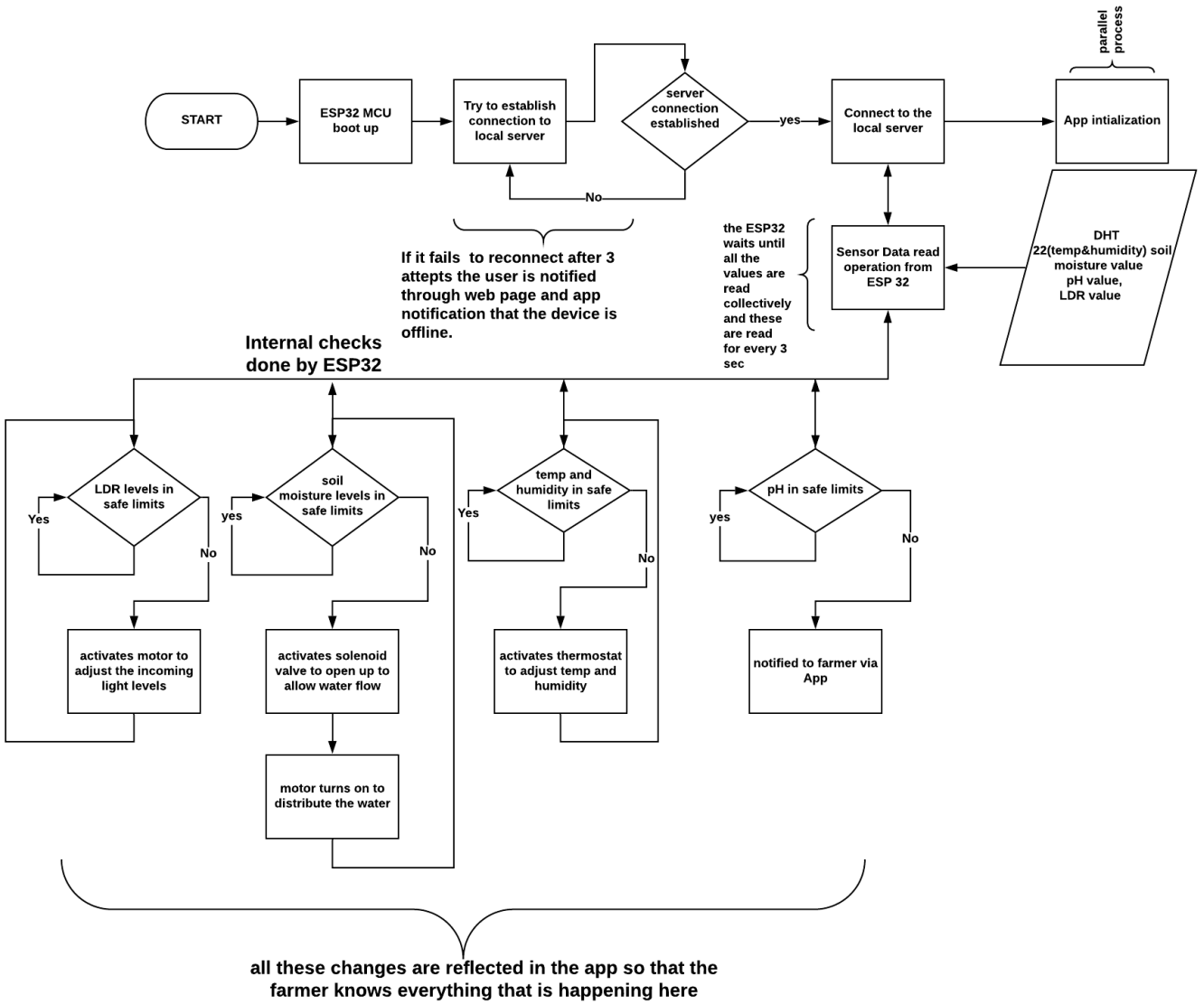


Working

01 The Micro Controller checks for abnormality for in the conditions and performs actions as coded for each abnormal condition.

02 So,when the temperature exceeds the threshold, thermostat is triggered to bring the temperature to normal condition. If there is no thermostat water is sprinkled to lower the temperature

03 When the PH levels exceed or gets limited it notifies the farmer and suggests a soil type suitable to it.

04 Based upon the soil moisture value the solenoid valve allows the water flow and this water is pumped out using the water pump.

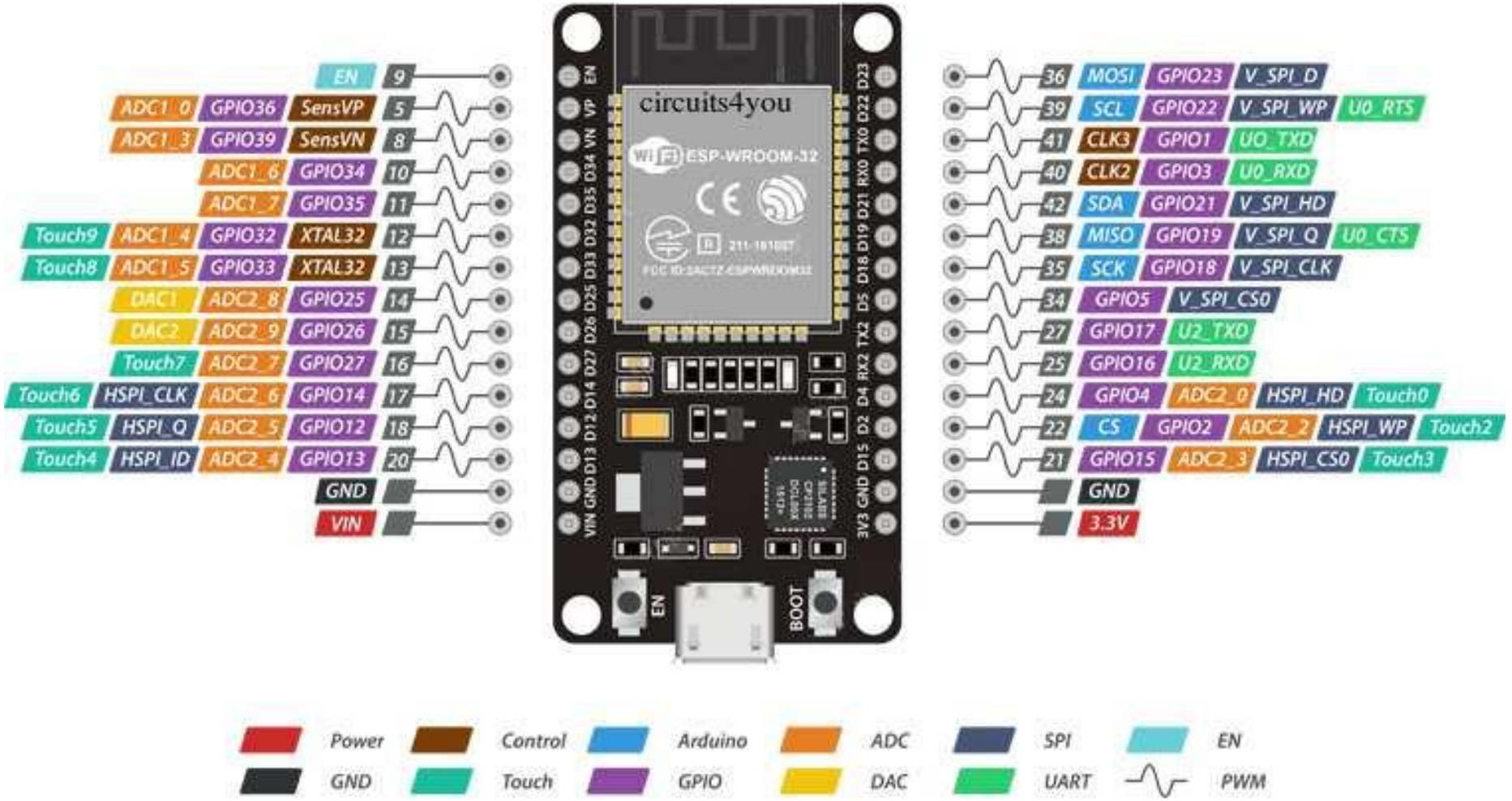
05 LDR is used to monitor light levels and it can be used to determine what amount of luminosity is required for a particular plant.

06 If the plant or crop is grown indoor we always use CFL(Compact fluorescent lamp) as a substitute to sunlight.

Features of the App

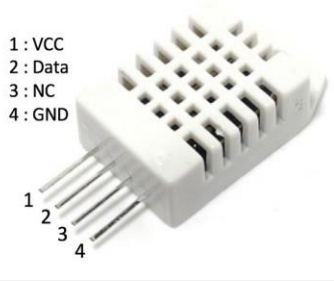
- The Optimal conditions can be set before. The farmer can choose what type of plant or crop he/she wants to grow from the dataset. The Micro controller is set to monitor for those conditions.
- Every action is logged inside the cloud and the same is notified to the farmer. So that he/she can overview the process and they can also manually over-ride the settings .
- Every Threshold value can be set
- The App can be manual over rided
- **Beautiful and intuitive user interface**

PINOUT ESP-WROOM 32



ESP32 Dev. Board Pinout

Used Hardware: Sensors & Actuators



DHT 22 Sensor

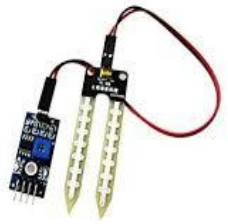
To measure Temperature And Humidity

Water Pump

To pump water to the crops

LDR

To measure luminosity



Soil moisture Sensor

To measure the moisture of the soil

Servo Motor

To open or close the window blinds to allow sunlight or restrict it

PH sensor

To measure the PH of the soil

Thermostat

To regulate temperature and Humidity

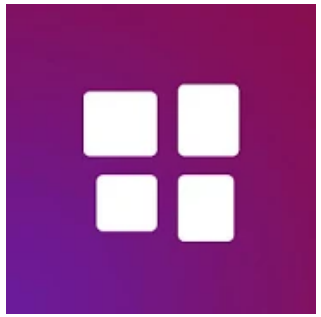
Used Software

Arduino IDE

To Program the ESP32 Devkit C Board

Mosquitto

An MQTT server and broker



MQTT Dashboard

The App to show the information relayed by the ESP32 via MQTT broker

Conclusion

01 **Efficiency**

The Crops can be grown in more efficient manner.

02 **Yield**

A positive growth in the yield rate can be observed by using this.

03 **Condition Monitoring**

The factors effecting the Crop's growth can be constantly monitored

04 **Application**

The App helps in providing the important data and push notifications are enabled to notify farmer about crucial moments.

BASE PAPER LINK:https://ieeexplore.ieee.org/document/7855968

thank you