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School of Information Technology and Engineering

Smart Greenhouse Monitoring System using IOT.

PROJECT REPORT

Final Review

By

PRIYA NAYAK – 22MCA0365
PALAK NANDANI – 22MCA0390
ANKIT KUMAR- 22MCA0391

Under the guidance of

Prof. M. JOTHISH KUMAR

SITE

DECLARATION

We hereby declare that the report entitled **"Smart Greenhouse Monitoring System using IOT"** Submitted by Priya Nayak, Palak Nandani and Ankit Kumar, for the ITA5003 Internet of Things (EPJ) to Vellore Institute of Technology is a record of bonafide work carried out by me under the supervision of **Dr. Jothish Kumar M.**

I further declare that the work reported in this report has not been submitted and will not be submitted, either in part or in full, for any other courses in this institute or any other institute or university.

Place: Vellore

Date : 08/08/2023

Priya Nayak
Palak Nandani
Ankit Kumar

TABLE OF CONTENTS

1. Abstract

The smart system for greenhouses is made using technology called Internet of Things (IoT) which helps improve the way plants are grown and resources are man- aged. It uses small wireless devices placed throughout the greenhouse to measure important things like temperature, humidity, light, soil moisture, and carbon dioxide levels. These devices send this information to a central hub, which processes and analyzes the data. Users can access this information through a website or a phone app. The system also allows users to automatically control things like fans, watering systems, and shading based on specific rules. By using IoT, this smart greenhouse monitoring system helps create optimal conditions for plants, saves resources, increases productivity, and offers a more sustainable solution for modern farming.

Keywords: - Cisco Packet Tracer, Lawn Sprinkle, water level monitoring, temperature monitoring, Sensor, light, smart phone, Laptop, server, cloud, old car, solar, home appliance, etc.

2. Introduction

Greenhouses are designed to protect plants from harsh environmental conditions and provide a controlled growth environment. Monitoring the environmental conditions inside the greenhouse is essential for optimal plant growth. Traditional green- house monitoring requires manual observation, but by implementing IoT techniques, it can be monitored remotely from any location. Various sensors are used to monitor the greenhouse and take appropriate actions based on the sensed parameters. The system is set up with predefined conditions by the operator to ensure that the plants are not adversely affected by environmental variations.

3. Problem Statement

The problem we're addressing is that traditional greenhouse monitoring methods are not efficient and often require manual work. This leads to difficulties in maintaining the ideal conditions for plants to grow and can result in wasted resources and lower productivity. Additionally, it's challenging to monitor and control the greenhouse from a distance.

To solve these problems, we need a smart greenhouse monitoring system using IoT. This system would allow us to monitor the greenhouse in real-time, even from far away. We can keep track of important factors like temperature, humidity, light, soil moisture, and carbon dioxide levels. The system would also let us automate the control of greenhouse equipment based on predefined rules. By doing this, we can ensure that plants have the best possible conditions for growth, save resources, increase productivity, and make greenhouse farming more sustainable.

4. Architecture Design

The block diagram in Cisco Packet Tracer shows a Smart greenhouse system that uses IoT technology. It consists of different systems like temperature and humidity monitoring, fire and CO2 detection, smart lighting, moisture monitoring, solar energy generation, and a smart door system. All these devices are connected through the internet, allowing them to communicate with each other. To monitor and control the greenhouse, a smartphone is used. The system uses wireless devices for easy connectivity and operation.

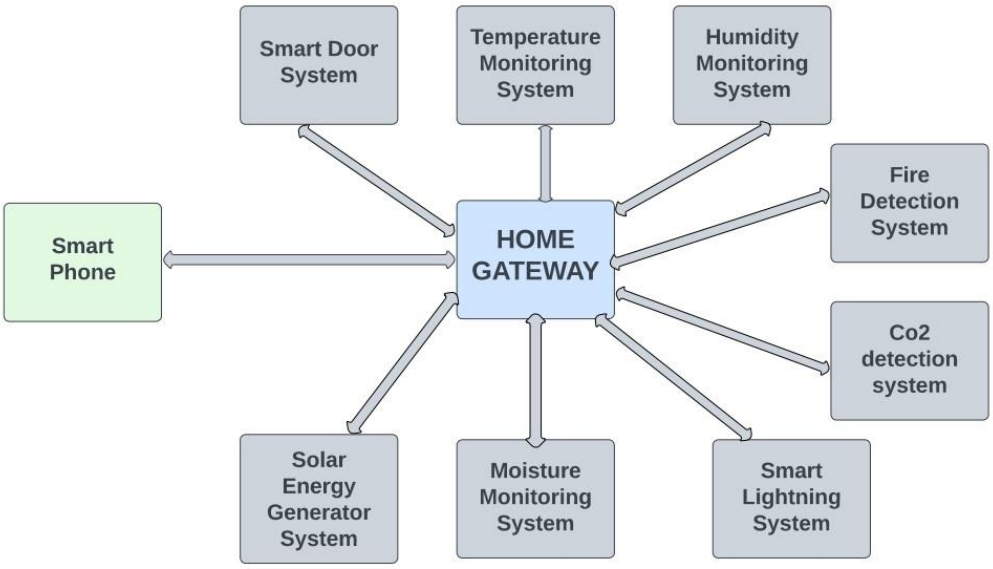


Fig1: Block Diagram

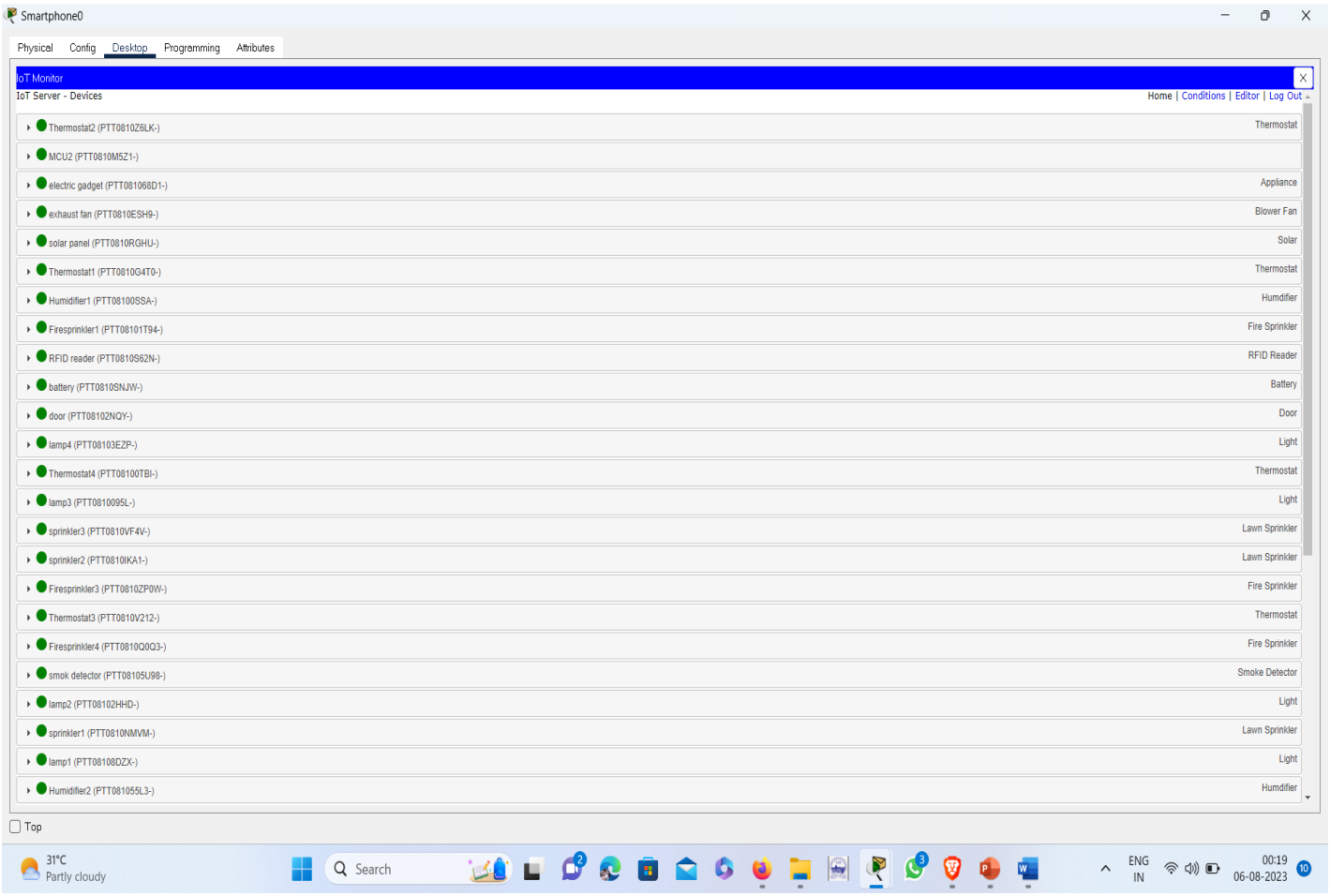


Fig2: smartphone monitoring

5. Methodology and Implementation

In this project, we are utilizing Cisco Packet Tracer to construct the greenhouse setup. By connecting the sensors, a network is created, and data on environmental factors is stored in the cloud.

Temperature sensor to sense the environment temperature, humidity sensor to check the humidity, soil moisture sensor to detect the amount of water present in soil and CO2 detector to
check the concentration of CO2 in the air. Solar cells are used as the energy generator in the designed system and a smart door system is implemented to control the access.

A. TEMPERATURE MONITORING SYSTEM

Thermostats, heating and cooling elements, temperature sensors, and other components make up a temperature monitoring system.

A temperature sensor monitors the ambient temperature and displays the reading on a connected LED or monitor. The sensor's temperature reading is translated into the proper format and provided to the thermostat as input.

Based on the temperature that the temperature sensor detects, a thermostat is used to regulate the temperature in a greenhouse. When the temperature drops below the specified value, the heater is triggered, and when the temperature rises over the set value, the cooler is active. When the temperature within the greenhouse is within the permitted range for the growth of plants, the thermostat is set to the off position.

B. HUMIDITY MONITORING SYSTEM

Humidity sensors and humidifiers are part of a humidity monitoring system.

A humidity sensor determines how much water (or humidity) is in the air. The usage of a humidifier helps to keep the air moist. When the humidity level in the greenhouse drops below the desired level, the humidifier starts to work.

C. FIRE SAFETY SYSTEM

Fire sprinklers, fire detectors, and siren are all parts of a fire detection system. A fire detector detects the presence of fire by looking for smoke, which is a byproduct of fire. A message is sent to the security panel and the fire alarm is set off as soon as a fire is discovered. As soon as a fire detector senses a fire during a fire emergency, the sprinkler will automatically activate. Things that are available in Cisco packet tracer and that have been programmed are used to depict fire.

D. CO2 DETECTING SYSTEM

CO2 detector and exhaust fan are part of the CO2 detecting system. A carbon dioxide detector measures the amount of carbon dioxide present in the atmosphere. Chemical and IR sensors are the two main categories of CO2 detectors. CO2 has a significant impact on how quickly plants develop. Maintaining the greenhouse's CO2 level is essential.

As a result, a C02 sensor is employed to track CO2 levels. When the greenhouse's CO2 levels are high compared to the desired value, the exhaust fan is turned on high; when they are moderate compared to the

acceptable value, it is turned on low; and when they are within the acceptable range, it is turned off. A used car that produces a lot of CO2, CO, and contributes to pollution is utilized to manufacture CO2 in order to test the planned system's functionality.

E. SMART LIGHT SYSTEM

Smart lights are part of smart lighting systems. Smart lights are used to construct smart lighting systems. The smart light's built-in sensor will determine when to turn on the light based on the amount of sunshine. Smart lights are switched on when sunlight is below the specified level and off when sunlight is above the intended level. To manage the lighting setups, this project uses a smart lighting system.

F. SOIL MOISTURE MONITORING SYSTEM

Sprinklers and a water level monitor are included in a soil moisture monitoring system.
A water level monitor detects the amount of water in the soil, which is a sign of how moist the soil is. For optimum plant growth, a specific level of soil moisture must be maintained. Water sprinklers are turned on when the moisture content drops below the predetermined level. In this study, a water level sensor is used to measure the amount of moisture in the soil. When the moisture level drops below a certain threshold, a lawn sprinkler is activated to maintain the soil's moisture level.

G. SOLAR CELL

The solar cell also includes a power meter and a battery. Using the right method, a solar panel converts sunlight into power. The power meter, which monitors power across the connected device, can be used to determine the power generated by the solar panel. The battery that powers all the devices converts and stores the electricity produced by the solar panel. This project uses solar cells, which are environmentally benign, to power all the equipment.

H. SMART DOOR SYSTEM

RFID reader, RFID card, and smart door make up a smart door system. The RFID card provided to the maintainers is read using an RFID (Radio frequency identification) reader. Only when the card ID that the reader reads matches one of the card IDs that have been provided to it is the status of the RFID reader valid. When the card ID that the RFID reader reads doesn't match one of the card IDs that were provided to it as valid card IDs, the reader's status is considered invalid. When it detects no RFID cards, the reader's status is waiting. Only when the International Journal of Engineering Research & Technology (IJERT) is present does the smart door open. The RFID reader is operational. Tags (RFID cards) are given to greenhouse keepers so they can enter the greenhouse's entrance.

6. Software

The implementation of a smart greenhouse utilizing, Cisco packet tracer is presented in this study. Cisco created the software tool known as Cisco packet tracer. It is possible to build various network topologies, ranging from simple to sophisticated, and to design solutions for smart cities, industries, homes, etc.

7. Network

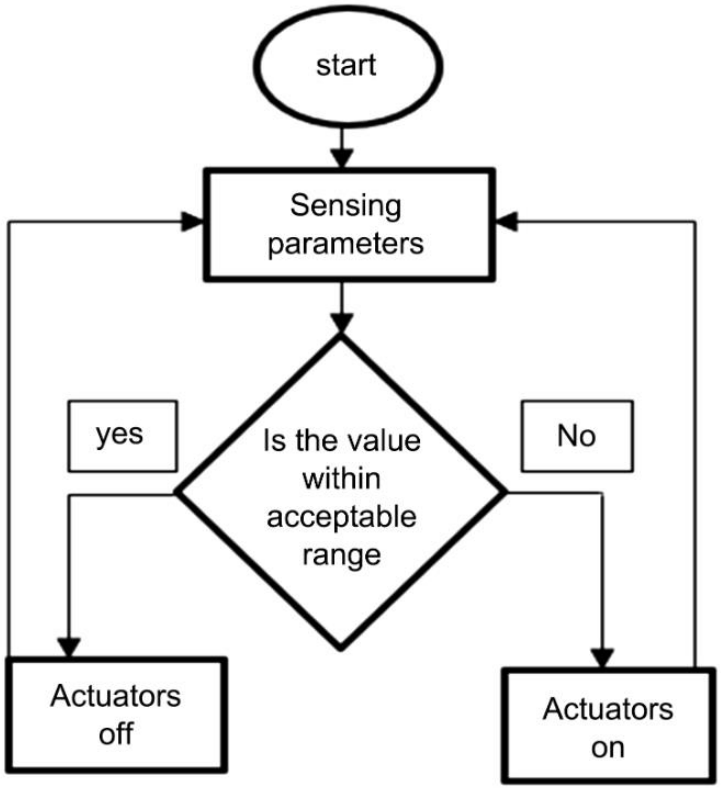


Fig3: Flowchart

In Fig.3 shows the general flow chart of the methodology used in this project. The same procedure is used for all the systems used in this design. First the sensors sense their respective parameters and the values sensed are converted into the appropriate format which are then fed to the actuators. The actuators are activated based on the input given following predefined conditions.

8. Result

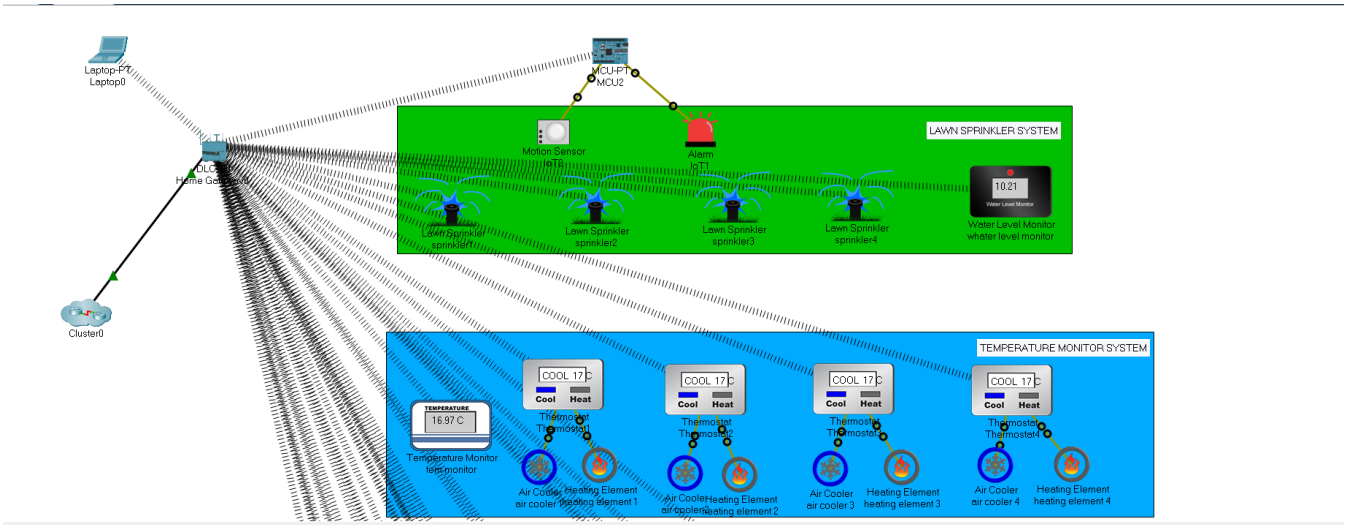


Figure 1

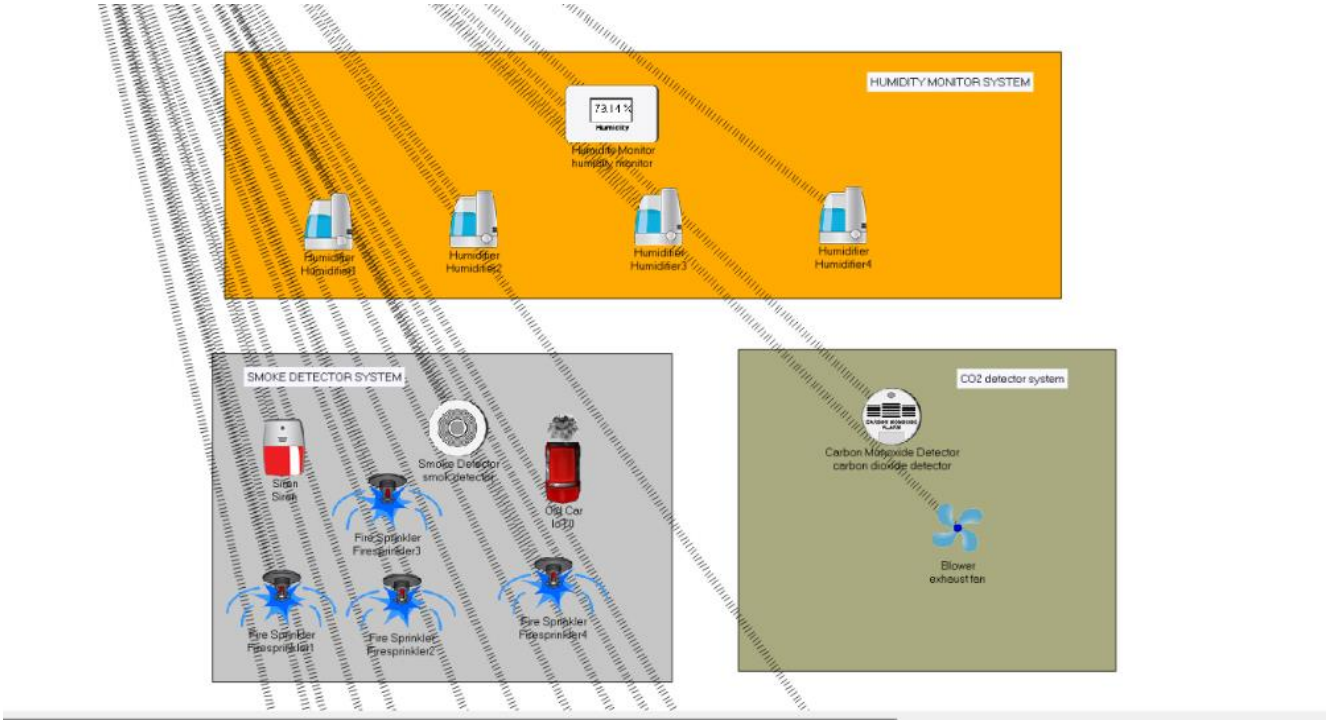


Figure 2

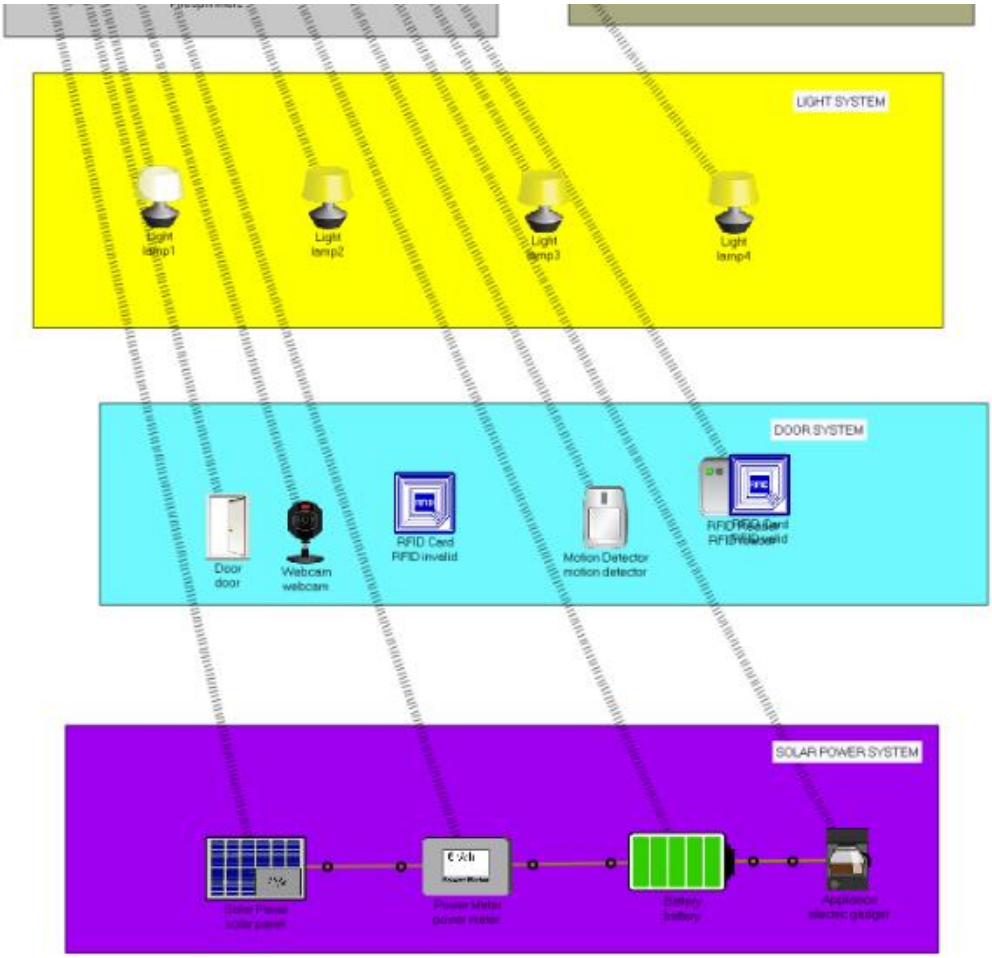


Figure 3

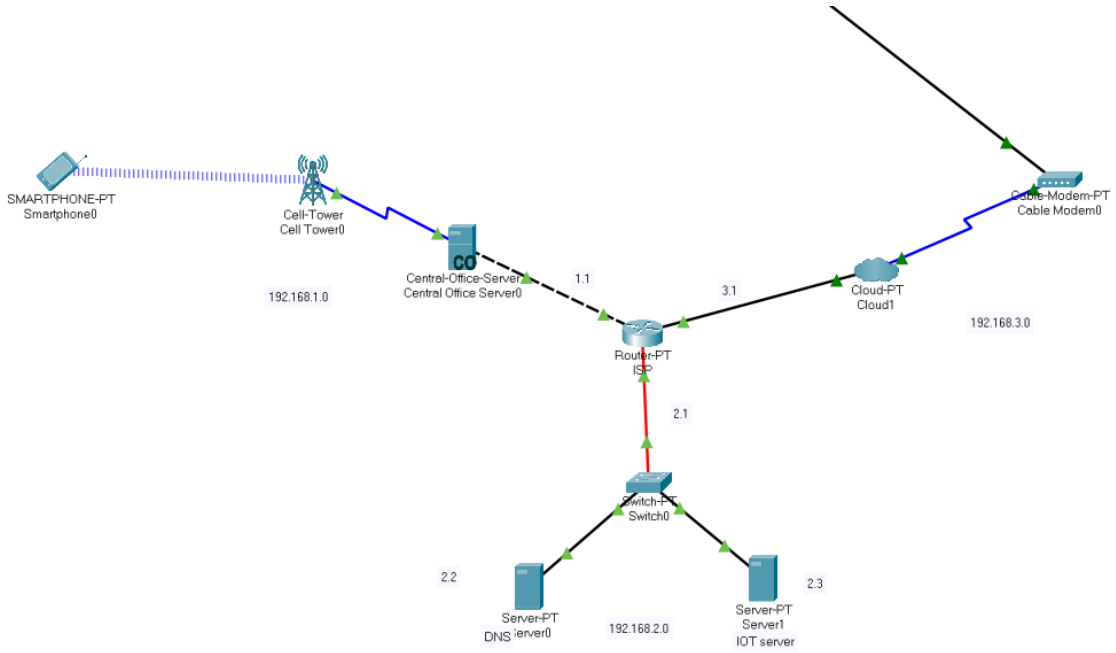
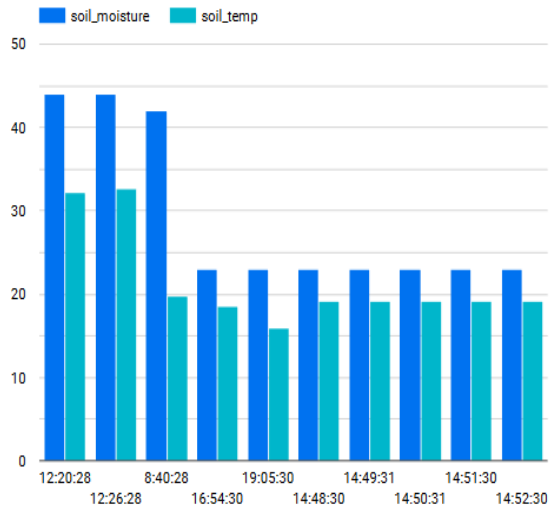


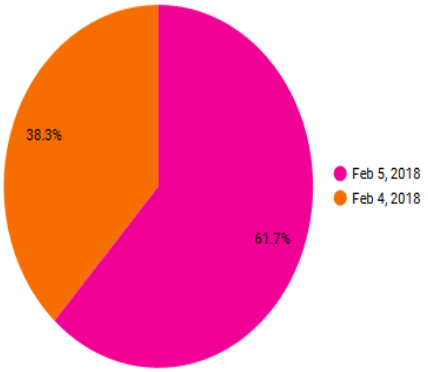
Figure 4

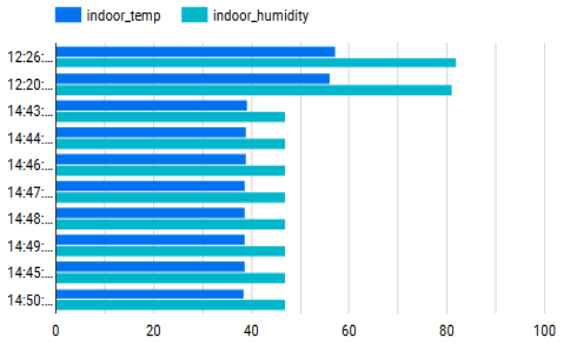
9. Conclusion

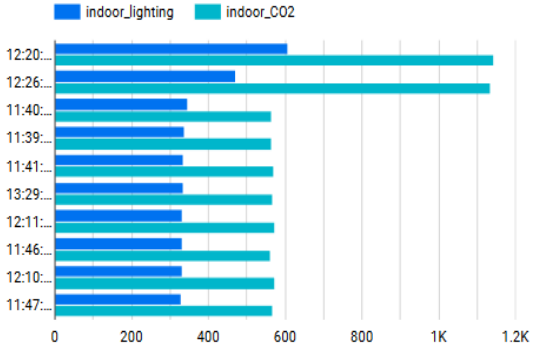
Today, greenhouses are frequently utilised to boost productivity and cultivate plants in a controlled atmosphere. Making it smarter makes maintenance easier since it eliminates the need for manual environmental condition monitoring. According to the predetermined conditions, actuators are actuated and sensors are employed to sense. This essay outlines the fundamental concept of using a greenhouse to cultivate plants. This paper describes the fundamental sensors and equipment necessary to maintain the green house conditions with solar-powered electricity generation, intelligent lighting, and other monitoring systems.

IOT Dashboard



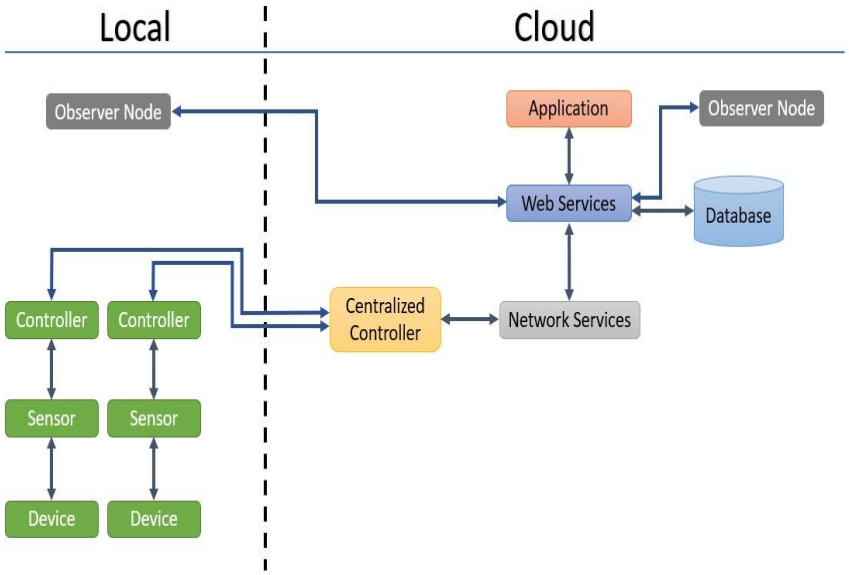






IOT Level

Level – 6



References:

[1] Rupali Satpute, Hemant Gaikwad, Shoaib Khan, Aaditya Inamdar, Deep Dave," IOT Based Greenhouse Monitoring System", IJRASET ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887 Volume 6 Issue IV, April 2018

[2] Prince Immanuel Alexander. S, Dinesh Kumar. J, Lavanya. G," IOT BASED GREENHOUSE MONITORING AND CONTROLLING", © 2018 IJRTI | Volume 3, Issue 8 | ISSN: 2456-3315

[3] Shamshiri, Ramin, Fatemeh Kalantari, K. C. Ting, Kelly R. Thorp, Ibrahim A. Hameed, Cornelia Weltzien, Desa Ahmad, and Zahra Mojgan Shad, "Advances in greenhouse automation and controlled environment agriculture: A transition to plant factories and urban farming", International Journal of Agricultural and Biological Engineering 11, no. 1 (2018)

[4] Roop pahuja, H.K. Verma, moinUddin. June 2013 "A Wireless Sensor Networks for Greenhouse Climate Control" IEEE CS on PERVASIVE computing

[5] Keerthi.v, "Cloud based greenhouse monitoring system", Int. Journal of Engineering Research and Applications ISSN: 2248-9622, Vol. 5, Issue 10, (Part - 3) October 2015, pp.35-41

[6] P.S. Asolkar, U.S Bhadade, "An Effective method of controlling the Greenhouse and Crop Monitoring using GSM", IEEE sponsored International Conference on Computing Communication Control and Automation, 2015.

7] Kim Yunseop, Robert G. Evans, William M. Iversen, "Remote sensing and control of an irrigation system using a distributed wireless sensor network", IEEE Transactions on Instrumentation and
Measurement, vol. 57, no. 7, July 2008.

[8] Timmerman, G. J., and P. G. H. Kamp. "Computerised environmental control in greenhouses." PTC, The Netherlands, Page (s) 15124 (2003).

[9] Mois George, Sanislav Teodora, Silviu C. Folea, "A Cyber Physical System for Environmental Monitoring", IEEE Transactions on Instrumentation and Measurement, vol. 65, no. 6, June 2016.

[10] Remya Koshy, M D Yaseen, K Fayis, Shaji Nisil, N J Harish, M Ajay, "Greenhouse Monitoring and Control Based on IOT Using WSN", ITSI Transactions on Electrical and Electronics Engineering, vol. 4, no. 3, 2016.

[11] Abinash Kumar, Sahilkumar Chakraborty, B Sahana,"Three way route distribution", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org
ICIOT - Conference Proceeding, 2016.

[12] N. Fathima, A. Ahammed, R. Banu, B.D. Parameshachari, and N.M. Naik, "Optimized neighbor discovery in Internet of Things (IoT)," In Proc. of International Conference on Electrical, Electronics, Communication, Computer, and Optimization Techniques (ICEECCOT), pp. 1-5, 2017.