



Internet Of Things Connected Communication Box (IoT-CCB)



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Supervisor

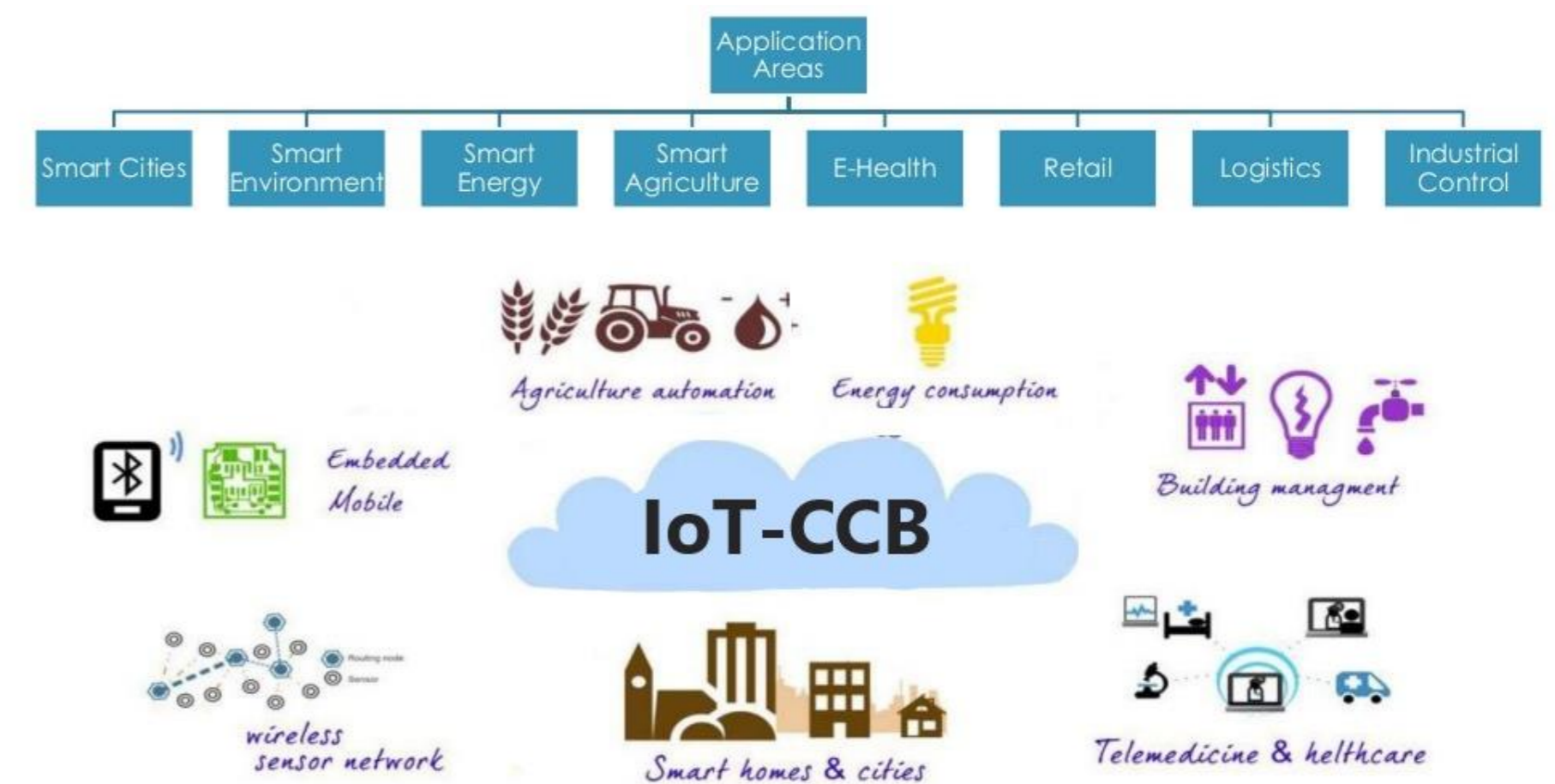
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Introduction

- ❖ Internet of Things (IoT) is a new trend in technology and revolution of the Internet. Things start to become more intelligent and smart. They can share the data/information about themselves, the environment, situations, emergency call and they can get the data/information that has been shared by other things.
- ❖ IoT-CCB brings together the types of communication modules such as Wi-Fi, Bluetooth, Ethernet and main hub or PC which is Raspberry Pi. With IoT-CCB, users can easily access and analyze various data, such as temperature, humidity, illuminance, CO gas, air quality, etc. and can take necessary actions upon that information or can control the AC devices and the actuator, motors etc. automatically. As a result, it is a communication system between different protocols.
- ❖ The applications of IoT-CCB are multiple such as home automation, automotive, agriculture, because it is adjustable to almost any technology.

Application Areas



Specifications and Design Requirements

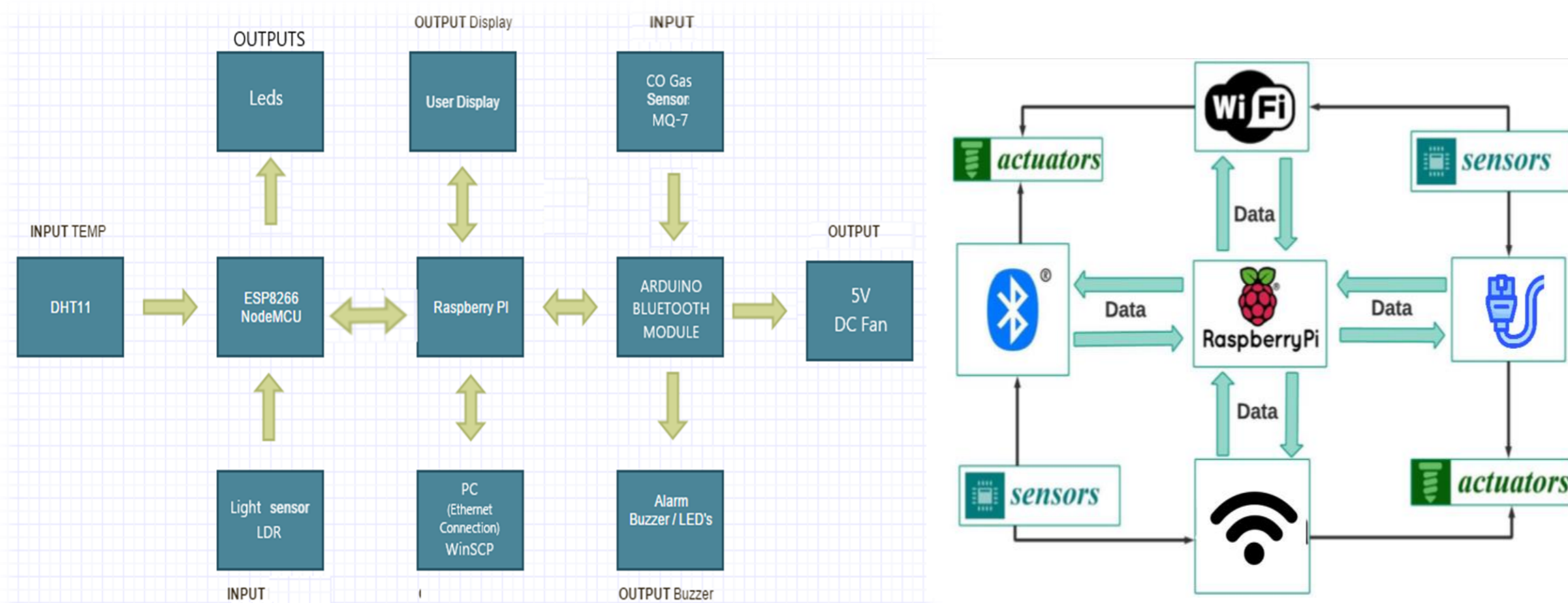


Figure 1 : IoT-CCB Service specifications

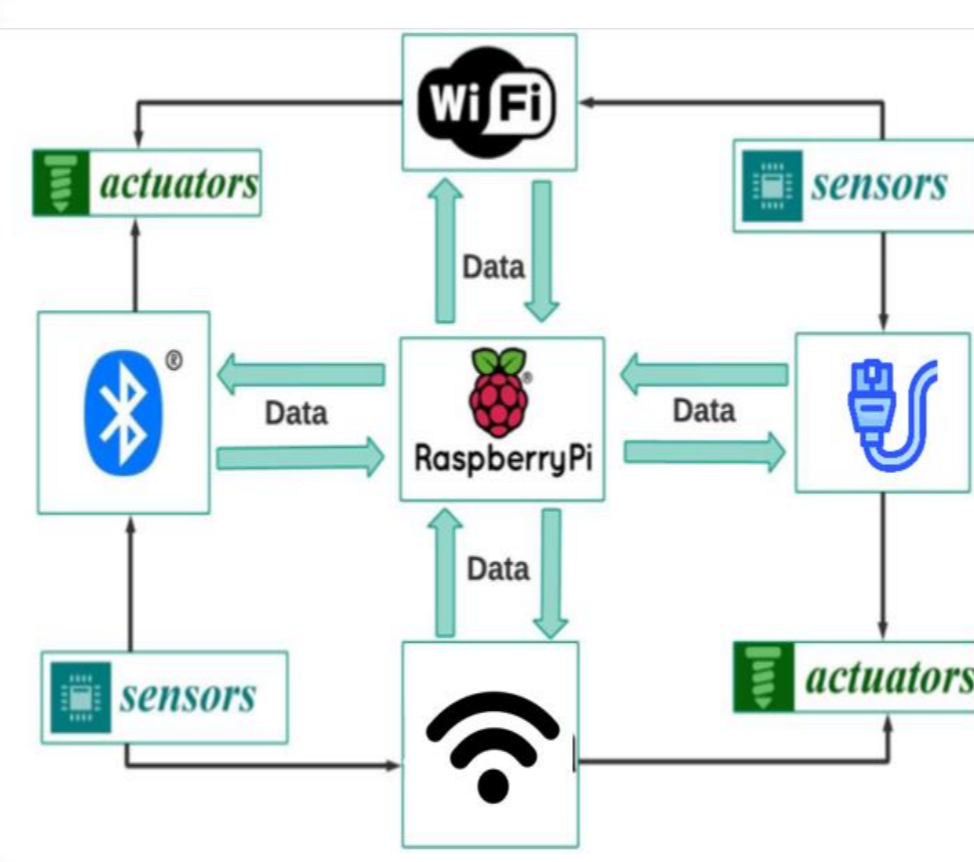


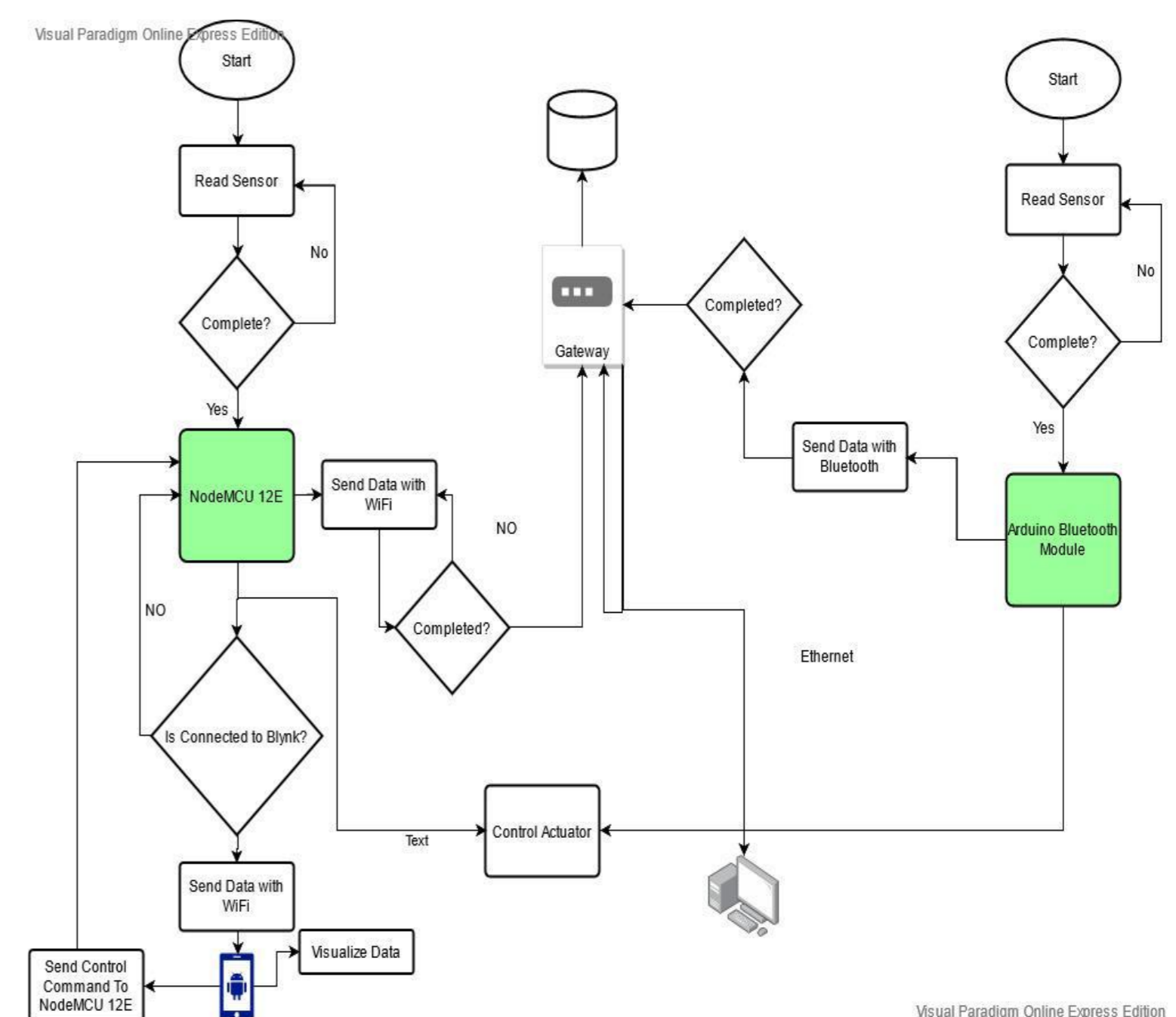
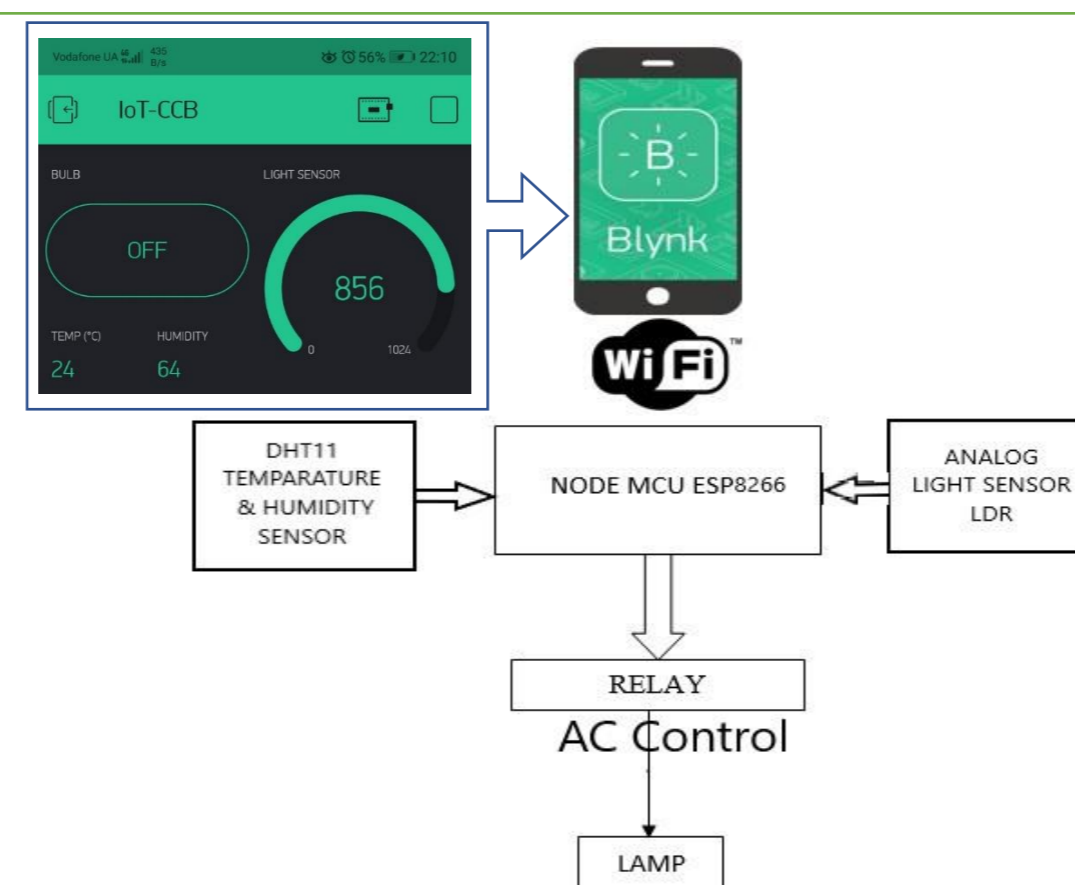
Figure 2 : IoT-CCB Design Requirements

Results and Discussion

- ❖ NodeMCU 12e ESP8266 Wi-fi Module satisfies the 802.11 b/g/n protocols. It is certificate by WiFi Alliance. It implements TCP/IP and full 802.11 b/g/n WLAN MAC protocol. It is designed with advanced power management technologies and intended for mobile devices, wearable electronics and the Internet of Things applications.
- ❖ HC-05 Bluetooth technology operates in the unlicensed industrial, scientific and medical (ISM) band at 2.4 to 2.485 GHz, using a spread spectrum. The 2.4 GHz ISM band is available. HC-05 Bluetooth Module is introduced low energy technology to the Bluetooth Core Specification, can operate for months or even years on tiny, coin-cell batteries. This technology gives us new opportunities for bringing life for new devices that are low-cost and operate with low power wireless connectivity.
- ❖ The Ethernet local area network provides a communication system for high speed data exchange among PC and Pi. It is a local area network (LAN) technologies based on the data frame.
- ❖ More features like LoRa, Zigbee protocols also can be added IoT-CCB project to enrich its communication environment. And also the data which are detected from sensors can be stored to cloud system. For management and user interface an application can be created.

Solution Methodology

- ❖ The router which is at home provides Internet access to devices that are within the range of about 20 - 40 meters from the source. NodeMCU which is integrated ESP8266 Wi-Fi Module kit connects the router. Then it has internet access and can send sensor detection datas to Blynk application thanks to api address. NodeMCU gets temperature and light data from DHT and LDR sensors. Then it sends it to smartphone over wi-fi protocol. The data can be visualize in Blynk app. Also light bulb, or any actuators can be controlled by smartphone.



RPi Web Server - ESP8266 MQTT

GPIO 4 is currently off

Turn on

GPIO 5 is currently off

Turn on

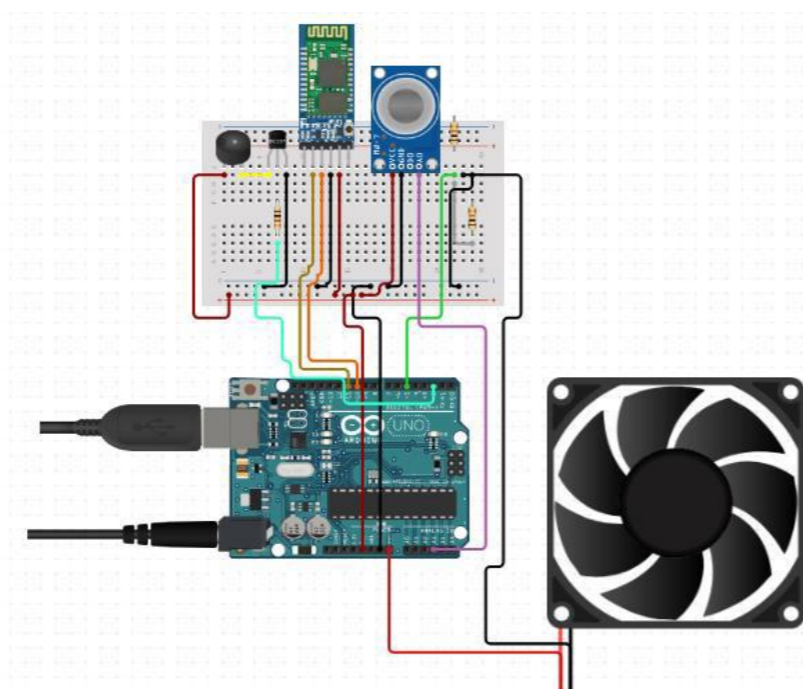
DHT Readings (updated)

Temperature: 23.6°C

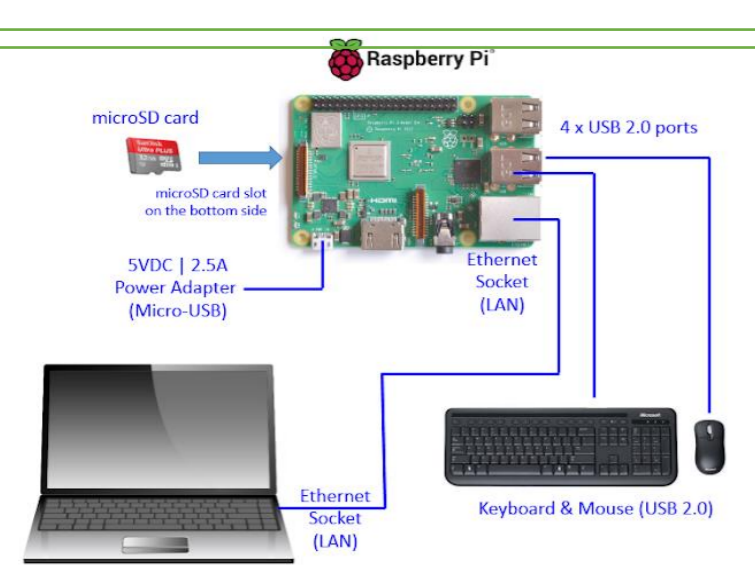
Humidity: 70%

- ❖ NodeMCU 12E (ESP-8266 WiFi Module) is connected Raspberry Pi with Wi-Fi. The data exchange between NodeMCU 12E (ESP-8266 WiFi Module) and Pi is carried out through the Message Queuing Telecommunications Transport MQTT protocol. MQTT is a messaging protocol i.e it was designed for transferring messages, and uses a publish and subscribe model and uses TCP/IP protocol.[1]

- ❖ A standalone web server on Raspberry Pi is created with html. It displays the temperature and humidity readings with a DHT11 sensor. Also two outputs can be controlled from an ESP8266 using MQTT protocol. In order to create the web server i used a Python microframework called Flask.



- ❖ The Interfacing Bluetooth module with Arduino can communicate (receive/send data) with Raspberry Pi as main hub over bluetooth communication protocol.
- ❖ In Bluetooth Module part of IoT-CCB Project, Arduino gathers sensor data from a simple MQ-7 gas sensor and transfer it to the Pi.
- ❖ Need to choose the correct 'outgoing' COM port of the bluetooth module to view the data on the serial monitor. Then to see the sensor data and time on the serial monitor is possible. If the gas value is greater than 600, buzzer starts to alarm and then the fan can be run from raspberry pi by pressing "0".



- ❖ PC can send/receive data to Raspberry Pi over direct ethernet connection. In order to transfer files from Raspberry Pi to PC (Windows) or vice versa TCP/IP SSH service is used. TCP/IP is a communication protocol that allows to control and send/receive data. And SSH or Secure Shell is a secure network protocol for operating network services.
- ❖ WinSCP file & data transfer application is used. WinSCP is a free SFTP, SCP and FTP client for Windows. WinSCP can be used to present, copy and manage files and folders. It uses SFTP (SSH File Transfer Protocol) to log into a Raspberry Pi using its username and password and by default uses port 22 for communications.

References

- [1] Cope, S. 'How MQTT Works', <http://www.steves-internet-guide.com/mqtt-works/>

Acknowledgements

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