Home Automation Using IoT And MQTT

B.Hooavrththanan[1], Dr.A.Kunthavai[2]
[1, 2] Dept of Computer Science Engineering
[1, 2] Coimbatore Institute of Technology

Abstract- *In the era of Internet of Things (IoT) and digital technology automation of everything has become more popular. With home automation user can control and oversee every home appliances from anywhere at anytime. This system has large advantages, since it can be implemented by simply connecting household appliance and electrical devices with wireless technology. In our system, a cloud-based home automation system is being implemented using the wireless protocol(mqtt) and wifi similar devices for the wide range of communication which are controlled through an user end device. Also to every user this system provides an user friendly approach with seamless communication*

Keywords- IoT, Protocol, Mqtt, Wifi, Device.

I. INTRODUCTION

As technology developing faster, researchers are taking it as an advantage to implement new intelligent systems or enhancing the existing systems. Home automation systems or smart home systems are getting more popular nowadays. Usually, the basic tasks of turning on and turning off certain devices either remotely or nearby. Home automation systems enable users to control and monitor every home appliance from remote places. The available wireless technologies infrared, Bluetooth, ZigBee, Wi-Fi, RFID, and GSM are used to develop commercially viable smart home systems. Using the underlying wireless data network such as IEEE 802.11 (Wi-Fi) is the underlying concept of an RF-based system. This paper explains the design and development of a cloud-based home automation system. Nowadays many cloud vendors offering their services free of cost. So, this system is cost-effective, secure, and reliable. MQTT protocol has in-built security features so it provides security at Secure Socket Layer (SSL) level. A user can send relevant commands through the cloud to control home appliances from remote places. This system is a combination of Wi-Fi, cloud MQTT, ESP32, relays, and a power supply unit.

II. IMPLEMENTATION

ESP8266: Manufacturers are making wirelessly networkable microcontroller modules using the ESP8266 chip. The ESP8266 is a system-on-a-chip. It has multiple capabilities such as 2.4Ghz Wi-Fi support, general-purpose input/output, inter-integrated circuit, Analog-to-digital conversion (10bit ADC), serial peripheral interface, I2S interfaces with DMA(sharing pins with GPIO), UART(on dedicated pins, plus transit only UART can be enabled on GPIO2). It also has a 32 bit RISC CPU based on the TensilicaXtensa L106 running at 80MHz. it has 64KB boot RAM with external flash memory access.

The modules: Various vendors have consequently created multiple modules containing the ESP8266 chip at their cores. These modules have specific monikers such as “Wi07c” and “ESP-01” through “ESP-13”, while other modules might be ill-labeled and just referred to by a general description- e.g- “ESP8266 wireless transceiver”. ESP8266 based modules have demonstrated themselves as a capable, low-cost, networkable foundation for facilitating endpoint IoT developments.

Relays: A simple electromechanical switch, the relay is made up of an electromagnet and a set of contacts. They are found hidden in all sorts of devices. The first computers in the early 50’s used relays to implement Boolean gates. In this article, we will look at how relays work with their applications. Relays are amazingly simple with four parts. Electromagnet, Armature, Spring, and a set of electrical contacts.

A relay is an electrically operated switch that uses an electromagnet to mechanically operate a switch. It also uses other operating principles such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal. They are also used when several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers and also in telephone exchanges. In telegraph circuits, they repeated the signal coming in from one circuit and re-transmitted it on another circuit. In telephone exchanges and early computers, they were used to perform logical operations.

A contactor is a type of relay. It is used to handle the high power required to directly control an electric motor. Solid-state relays control power circuits with no moving parts. They are used instead of using a semiconductor device to perform switching. Relays with calibrated operating characteristics multiple operating coils are used to protect electrical circuits from current overload. In modern electric

power systems, these functions that are mentioned are performed by digital instruments called "protective relays".

Magnetic latching relays require one pulse of coil power to move their contacts in one direction and a redirected pulse to move them back. Repeated pulses from the same input do not affect the direction. These kinds of relays are useful in applications where interrupted power should not be able to transition the contacts. They can have either single or dual coils. On a single coil device, the magnetic latching relay will operate in one direction when power is applied with one polarity. They will reset the direction when the polarity is reversed. On a dual coil device, the polarized voltage is applied to the reset coil and transitions the contacts. AC controlled magnetic latch relays have single coils and employ steering diodes to differentiate between operate and reset commands.

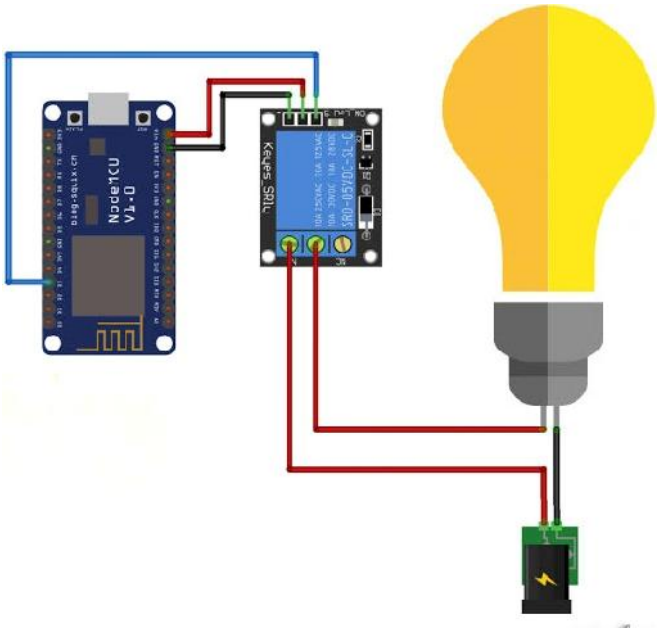

Figure-1 ESP8266 WITH RELAY

Figure-1 explains the proposed system design. Users can send relevant commands to control the home appliances through the MQTT broker. ESP32 receives these messages from the MQTT broker and control appliances accordingly through comunicating with the relay which controls these electronic appliances.

MQTT:

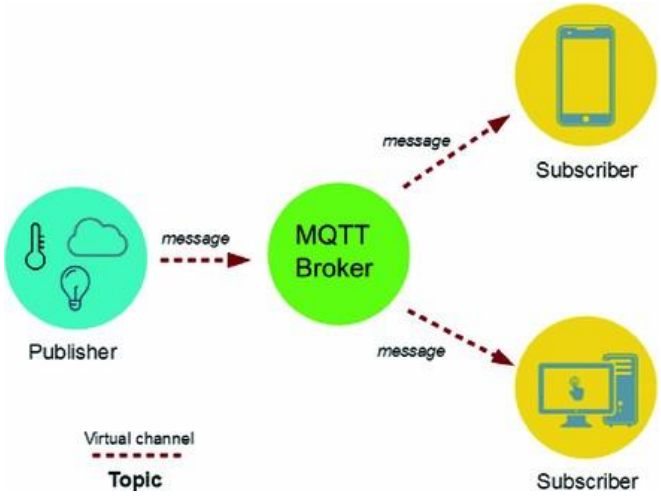

Figure-2 Mqtt architecture

Figure-2 explains MQTT architecture. IBM introduced a lightweight Message Queue telemetry Transport protocol to provide machine-to-machine (M2M) communications. MQTT works on top of the TCP layer and provides publish/subscribe asynchronous communications. Publish/subscribe provides the best IOT services than request/response protocols since clients do not require to wish updates so that it requires less bandwidth. In MQTT broker (server) contains topics. Clients can act as a publisher and send messages to the broker for a specific topic. Subscribers receive messages from brokers. MQTT is a low overhead protocol even it is running on top of TCP. It also supports the request/response of constrained application protocol (COAP). MQTT brokers need username and passwords to provide security which is controlled by Transport Layer Security and Secure Socket Layer (TLS/SSL). COAP has the problem of packet loss because of the lack of TCPs retransmission procedure. The author explained the lower loss of pockets but it can support less traffic to guarantee reliability.

III. CONCLUSION

In this system, a home automation system using MQTT and ESP32 is being implemented. To test the system Android MQTT client pre-available application has been used, But it is not user-friendly. As a future work one can develop an android or ios application with a good user interface. It helps in controlling home appliances very easily.

REFERENCES

[1] K. Gill, S. Yang, F. Yao, and X. Lu, “A ZigBee-BasedHomeAutomationSystem,”IEEETrans.Consum.Electron.,vol.55, no.2,pp.422–430, 2009.

[2] S. Kanagamalliga, S. Vasuki, A. V. Priya, and V. Viji,“A Zigbee and Embedded based Security Monitoring

andControl System," Int. J. Inf. Sci. Tech., vol. 4, no. 3, pp.173–178,2014.

[3] J.Zhu,X.Gao,Y.Yang,H.Li,Z.Ai,andX.Cui,"Developingavoicecontrolsystemforzigbee-basedhomeautomationnetworks,"in20102ndIEEEInternationalConference on Network Infrastructure andDigitalContent, 2010,pp. 737–741.

[4] Dr.D.Kothandaraman,Dr.C.Chellappan,HumanActivityDetectionSystemUsingInternetOfThings,InternationalJournalonComputerScienceandEngineering(IJCSE),Vol.9No.11Nov2017,

[5] P. S. Pandey, D.S. Chauhan, R. Singh, "The Real Time Hardware Design and simulation of moving messageDisplay System Integrated with PLCC Modem" Innovative Systems Design and Engineering, ISSN 2222-1727 (Paper) ISSN2222-2871(Online),Vol.3,No.10, (2012).

[6] Oudji,S.,Courrèges,S.,Paillard,J.N.,Magneron,P.,Meghdadi,V.,Brauers,C.,andKays,R."Radiofrequency Interconnection between SmartGrid and Smart Meters Using KNX-RF and 2.4 GHzStandardProtocols for Efficient Home Automation Applications".Journal of Communications, Vol.10, No.10,(2015).

[7] Kumar, M., and Shimi, S. L. "Voice Recognition Based Home Automation System for Paralyzed People.System",Vol.4, No.10, (2015)

[8] A.N.Shewale,J.P.Bari."RenewableEnergyBasedHomeAutomationSystemUsingZigBee"(2015)

[9] Dey, S., T. Kundu, S. Mukherjee, and M. Sarkar. "Web Based Real-time Home Automation and SecuritySystem"(2015).

[10] Amrutha, S., Aravind, S., A. Mathew, S. S., Rajasree, R., and Priyalakshmi, S. "Speech Recognition BasedWirelessAutomationofHomeLoads-EHome. System",Vol.4,No.1,(2015).