Internet of Things based Automation using Artificial Intelligence

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Abstract-

*T**he Internet of Things(IoT) has become a hot topic in the present tech-driven world. Internet of Things is one of the promising technology used to control objects connected to Internet through IP address, which enables objects to collect and exchange data. Internet of Things is expanding itself into different areas. Home Automation is one of the trend in application of IoT for realizing smart cities. In the paper, we are developing a system which will control through MQTT protocol. MQTT has been utilized as a platform to provide IoT services which will monitor the applications and generate alerts or take intelligent decisions using concept of IoT. Nodemcu was used as aIoT end device connecting relays to the platform via wifi channel. Home scenario is created and designed IoT messages satisfying the scenario requirement. We also implemented Automation through HTML web page. A main contribution of this paper is that it summarizes uses of Intenet of Things in Home Automation with Artificial Intelligence to monitor and control the appliances.*

Keywords— Artificial Intelligence, Amazon Web Services, Automation, IOT, MQTT.

I. INTRODUCTION

It is impossible for someone to predict that IOT would come into existence in a very short period of time. IOT is one of the promising technology used to control objects connected to internet through IP address. In Real Time Application such as smart home, smart cities, smart grids and intelligent transportation. It has also expanded its features into medical fields such as instruments and many more.Smart home is one in which various electronic and electric appliances are wired up to a central computer control system so that they can either be switched on and off at certain times.

Message Queue Telemetry Transport is M2M communication platform. In IOT it has been used as message transfer binding protocol. MQTT system consists of MQTT broker and clients. Client subscribes and unsubscribes to the topic. When an MQTT client has certain information to broadcast, it publishes the data to the MQTT broker.AWS is very attractive for small IoT business applications because they provide large computing capacity quicker and cheaper than a client company building an actual physical server farm. A smart home scenario is created and designed IoT messages satisfying the scenario requirements. And also implemented the smart home system in hardware and software and verified the system operation. An MQTT broker is built on AWS.

Motivation

With the recent development of mobile devices (smart phones), its demand is increasing day by day and because of its multi dimensional functionalities and most enhanced technology, the demand for advance mobile applications in daily life has also increased. As today's generation is very busy, individuals sometimes may forget to switch off various home appliances or not sure about whether the devices are on or off.

II. METHODOLOGY

In this paper, Two prototypes areimplemented. The first one will mostly be used for a small network of home automation. And the second one will be used for a plenty of such devices through AWS.

1. Controlling appliances from Webserver using NodeMcu.

The basic step is to operate LED that has connected to the Nodemcu, the Nodemcu has programmed from Arduino IDE to control the LED.

We will connect the Esp8266 to the Wi-Fi router using SSID and password of our Home network Wifi , where the esp8266 connect to our wifi and create a webserver, which can be accessed by looking through the serial Monitor of the Arduino window or you can also log into your Wifi router and check for the list of clients connected to your Wi-Fi router.

Fig.1HTML web page.

2. Controlling appliances using MQTT.

ESP8266 acts as a gateway for data transmission through wifi.ESP8266 is configured as MQTT client subscribing for the commands to control the actuation.

ESP8266 subscribes for the topic to receive commands to control LED connected to the GPIOs of ESP8266.MQTT broker is set up for ESP8266 to publish and subscribe application messages.Other MQTT clients such as mobile,PC can connect to MQTT server through existing communication technologies such as Ethernet,2G,3G,wifi etc.
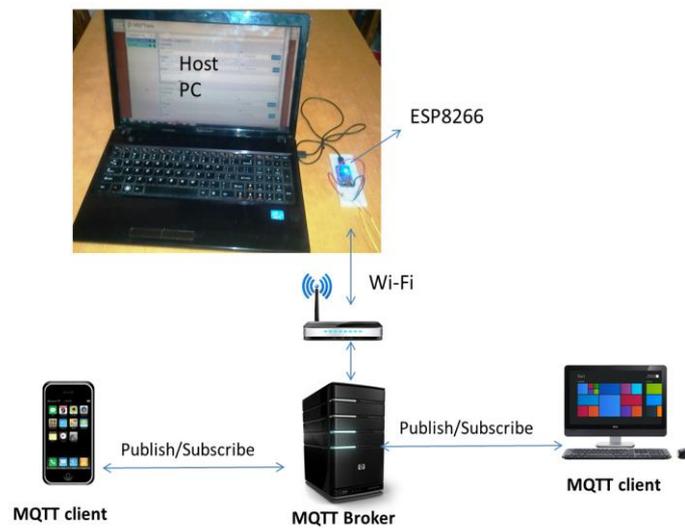

Fig.2 Network Setup

The login credentials can be obtained by creating an account in MQTT and the same information is verified in the code along with users Wifi, SSID and password. Later it can subscribe for any number of fans or lights or other devices and operate it with account.
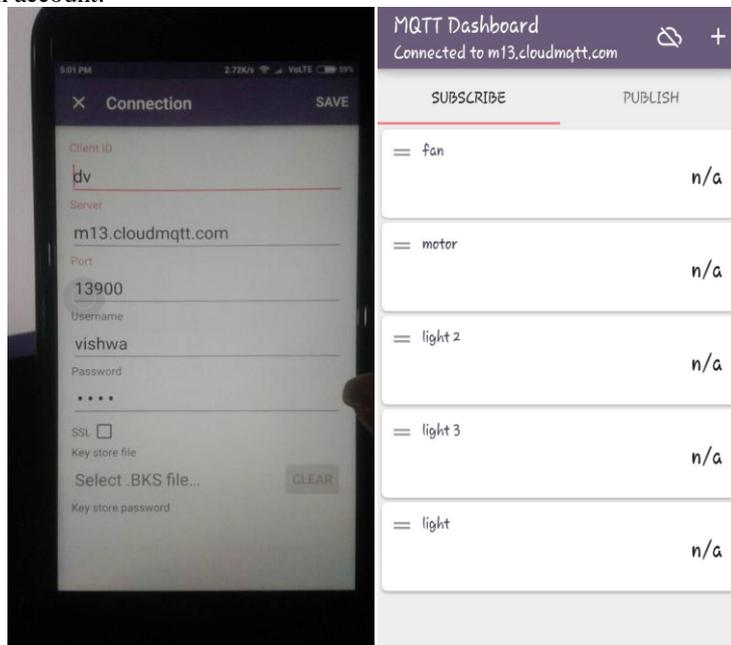

Fig.3 MQTT App.

The MQTT protocol operates on consuming less energy. The HTTP protocol operates on consuming more energy. On comparing the latency between MQTT and HTTP, the MQTT servers has lower latency and perform dynamically than the HTTP servers. The MQTT servers operate on low data traffic, but HTTP operates and consumes high data traffic.
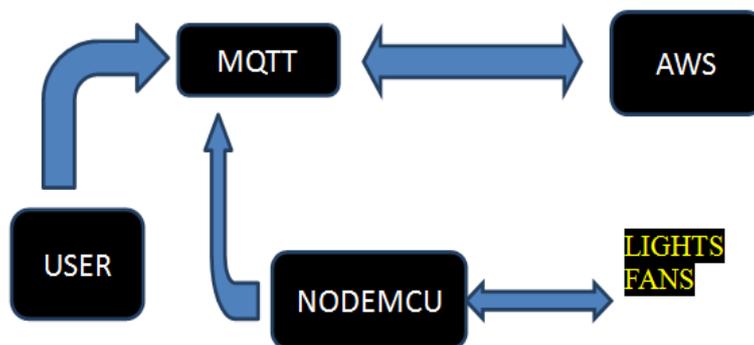

Fig.4 Block Diagram.

AWS offers a suite of cloud computing services that make up an on demand communication platform.We use this service for the Artificial Intelligence.As we control the devices through MQTT app,the device status gets updated in the AWS.Such data logs for a long period of time should be uploaded,for the system to artificially think and control along with the environment

III. IMPLEMENTING ALGORITHM

Before the start of the paper, the components and devices are connected to the bread board and the power is supplied. Ensure that all the devices are in good condition and the power supplied is adequate. If the power supplied is more than the required then the lights may get burnt in the long run.

Controlling Appliances using MQTT protocol.
1. Install Esplorer.
   After the installation of Esplorer, based on the requirement the programis coded. The LUA programming code used in this project will be feasible in Esplorer. And the program is saved.
2. Select COM port, port number,and the Baud rate.
   Now after the components are connected, the required COM port, port number and the baud rate are selected accordingly.
3. Enter SSID and password of wifi.
   The details of SSID and proxy network of the internet connection say from the wifi router is mentioned in the program.
4. Connect Nodemcu to internet through wifi.
   This is connected to the internet to control the appliances based on the program input.
5. Upload the program and run.
   The program is verified and uploaded and it is executed on the Esplorer.
6. Open application in mobile.
   The MQTT app is used here.
       i) Device name: you can give any name for the device.
       The number of devices to be connected say light, fans and many more are mentioned here.
       ii) Device type: Switch.
       The on and off of the devices mentioned above is controlled by the switch type.
       iii) Topic: give topic for MQTT.
   MQTT client subscribes and unsubscribes to the topic. When an MQTT client has certain information to broadcast, it publishes the data to the MQTT broker.
7. Send commands.
   A standard syntax mentioned below:
   [Name]: {"X:Y"}
   Where
   Name is the device name.
   'X' is the pin number of NodeMCU to which it the respective device is connected.
   'Y' is the status of the device i.e 0 for OFF and 1 for ON.
8. The on/off of the devices is being updated in AWS.
   Each and every control made by the user is saved in the web and can be accessed.
9. Observing the devices for a long period of time the datalogs is created and uploaded.
   The saved data is observed for specified period say a month and is uploaded so that it thinks and acts according to the environment.

Fig.5 MQTT Protocol.
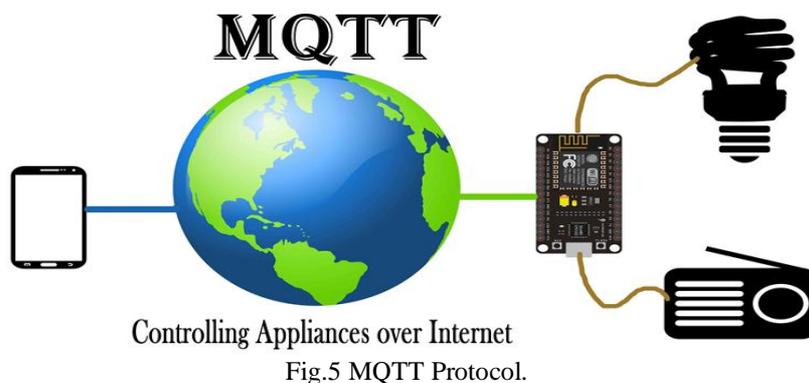
IV. CONCLUSIONS& FUTURE SCOPE

This paper helps in making the lifestyle of people smarter, easier and efficient in less cost and less difficulty by changing over to the world of IoT.In this paper, created Smart Home scenario is created and designed IoT messages satisfying scenario requirement and implemented automation with MQTT protocol. And also implemented Automation through HTML webpage.The MQTT and HTTP protocols are also compared based on the energy consumption, latency, data traffic. Sometimes there will be an delay in the process, we developed a system for automation using IoT with the help of Artificial Intelligence to make system automated which will take Intelligent decisions.

This paper can be further developed by integrating it with the internet to monitor your home while accessing from anywhere. By doing this, one can keep an eye on his or her home through an internet, connected to the user's mobile phone or PC or laptop. This will not only improve the security of your home in this modern days world but will also assist in conservation of energy like if you left any home appliance switched on by mistake, then you can check the status of the appliance on the graphical interface made on your mobile and can switch it off using the internet connectivity.

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