



Key Authentication Based Door Lock Monitoring System using MQTT on ESP8266

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Abstract:

An ESP 8266 is Wi-Fi enabled wireless microcontroller. It has been implemented in this scenario in a door mounted security system with the help of a sensor. The basic components that are used here are a reed switch, an alarm, an ESP 8266 module and a e power supply. 3 interfaces have been used. First an ESP 8266, which is connected to a buzzer and a reed switch. These three components have been mounted on the door frame. The second interface is an application which will run on either a stationary workstation or a mobile workstation. The third component is a server, which will handle traffic routing and synchronization tasks when a scenario with multiple doors is involved. These three interfaces will be connected and synchronization will be carried out with the help of the MQTT protocol. Two of these three interfaces i.e the application and the door mounted system will serve as clients whereas the server will be the broker. The system will use a messaging mechanism to ensure two step verification either via email or via a text message. This system will be fault tolerant and scalable because it will be easy to facilitate addition of new devices.

Keywords:IoT (Internet of Things), ESP8266,MQTT Protocol.Mosquitto Broker

I. INTRODUCTION

Home automation is being used pervasively in today's world. Nowadays almost everything which uses computers or microprocessors is being automated in some or the other way. This project concentrates more on the automation of home security. Automated home security has many advantages, although it provides lesser security than actual physical security. It is primarily flexible because we can change it in our accordance. It is also simpler to maintain. It is considerably more economical and it also provides cost effectiveness to an already flexible price. The application which uns on home security can be made as efficient as the programmer wants it to be. If the entities being protected are important, then more funds can be put in to make a more stable and efficient application. The application used in this paper, however, is one which is economical and can be used by anyone wanting basic security measures but not wanting to spend a lot of money. It is a lightweight, cost effective, application specific system.

II. MESSAGE QUEUE TELEMETRY TRANSPORT (MQTT):

The Message Queue Telemetry Transport protocol which is commonly referred to as the MQTT protocol is a wireless communication protocol which is employed in the internet of things. It works over a local network. It is a lightweight alternative for HTTP. It works on the publish/ subscribe mechanism. It was originally designed for the IOT domain. This project employs the MQTT protocol for achieving communication within the interfaces. The protocol works in a simple way; one or more entities will subscribe to a topic.

Whenever a publisher publishes any message over the communication medium over the same topic, all the subscribed entities to that topic will get a copy of that message. In this scenario, the ESP 8266 module will initially be the publisher when the door is unlocked. Then it will publish over the door status topic and then it will switch over to being a subscriber for the user status topic and wait for input from the user application. In case of authorization it will reset the system and in case of unauthorized access or authorization failure the ESP 8266 will trigger the buzzer.

III. THE WORKING OFPROPOSED MODEL

This model has been deisgned with the current home security applications scenarios and the purpose of a low budget but efficient system in mind. MQTT has 3 QOS levels; fire and target, delivered atleast once and delivered exactly once. Out of these three, this project will be employing the delivered at least once i.e the second level for quality of service to ensure optimal communication.

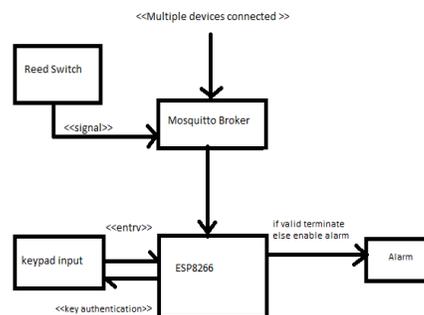


Figure.1. Block Diagram of proposed solution

The model uses a central subscriber program because this application might be employed to control multiple doors and hence multiple ESP8266 door mounted systems. This ensures that the system built will be scalable i.e new processors can be added very easily.

IV. DOOR LOCK SYSTEM

The flowchart below describes about the flow of execution of the system. The proposed system has many advantages. Firstly it has replaced the traditional HTTP protocol with MQTT protocol. Also the proposed system has been implemented with customized firmware on ESP8266 which has option of using any other available firmware. Whenever any user get entry inside the house, the system starts the timer alarm, during which the user has to enter the key which is authenticated.

If the person fails to provide the key to the system, then the system starts alarming and a notification is sent to the owners regarding the breach. [3] The purpose of using a mosquito broker because the broker acts like a router which accepts all the MQTT protocol transmitted packets, filter out unnecessary packet heaggg...g.gder and transmit.

The MQTT server is helps to transfer messages between MQTT clients and server hosted. The notification provided to the user can be using system generated message or any application used in android/iOSSmartphones. The proposed system will be developed using C/C++ language due to easy handling of message stacks and has built in library for MQTT protocol and availability of limited storage. [3] The communication between ESP8266 and reed switch is using WiFi because of the limited range of WiFi which has the advantage of short range.

V. MQTT PROTOCOL

MQTT is Message Queuing Telemetry Transport protocol. It uses TCP transport layer protocol to send the messages over the network. MQTT protocol is a broker based pub/sub protocol. Broker is a main part of the protocol which contains topics. Each client can be a publisher that send message to the broker to a specific topic and subscriber that receive automatic message every time. server has to publish data and client has to subscriber the particular topic to get that data. Now if client side has two devices like laptop and mobile phone and both have subscribed temperature topic then whatever the data of temperature sensed that sends through broker to these two devices.

VI. MOSQUITTO BROKER

The counterpart to a MQTT client is the MQTT broker, which is the heart of any publish/subscribe protocol. Depending on the concrete implementation, a broker can handle up to thousands of concurrently connected MQTT clients. The broker is primarily responsible for receiving all messages, filtering them, decide who is interested in it and then sending the message to all subscribed clients. It also holds the session of all persisted clients including subscriptions and missed messages. Another responsibility of the broker is the authentication and authorization of clients. And at most of the times a broker is also extensible, which allows to easily integrate custom authentication, authorization and integration into backend systems. Especially the integration is an important aspect, because often the broker is the component, which is directly exposed on the internet and handles a lot of clients and then passes messages along to downstream analyzing and processing systems.

VII. FUTURE SCOPE

The proposed solution is designed based on the present condition the problems faced in home security currently. The next step for improvising the system would to provide high level encryption to the packets transmitted over the IoT. Also replacing key authentication by speech authentication which would require high level of speech processing. Today's mobile application implements face detection in various camera application, using this technology we can develop application which takes image and send it to the ESP which detects person as valid or invalid and report to the owner of the house. Such technology is expected in coming future. IoT has been a developing technology and not only in home automation but further development is expected in IoT market.

VIII. CONCLUSION

Today's growing technology in field of IoT has resulted in need of an efficient system for home security and also considering the demand of end consumer and manufacturer, we have implemented the system which is very much fast, cost effective in terms of hardware and development cost. In this paper we have tried to implement ESP8266 with MQTT protocol in Internet of Things (IoT) to provide security to user. The implementation is based on user convenience and to overcome some of the drawback of the previous existing digital door lock systems.

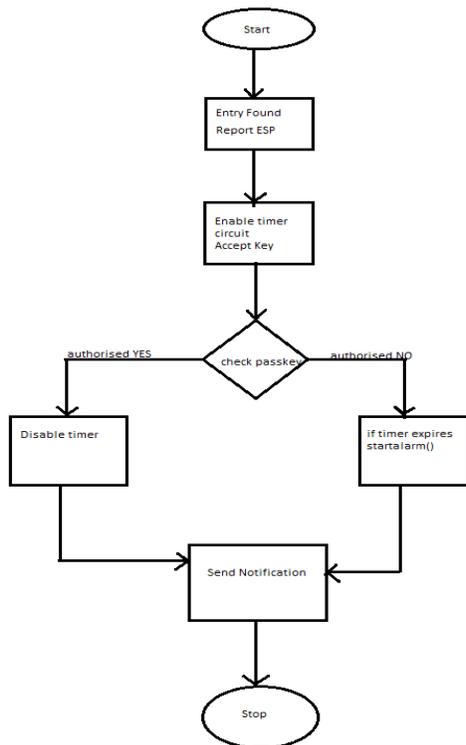


Figure.2. Flowchart of system execution

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