A brief analysis and hardware designing of IOT based Home Automation using Blynk and Node MCU

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Abstract

This paper presents a resolution for home automation using blynk. Everthought of a life where you could just command your home appliances to work as you need just by using smart phone in one app. The main purpose of this project is to develop a home automation system using an Node MCU board with Internet being remotely controlled by any Android OS smart phone. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate

In order to achieve this, a relay module is interfaced to the Node MCU board at the receiver end while on the transmitter end, a blynk application on the cell phone sends ON/OFF commands to the receiver where loads are connected. By touching the specified location on the blynk, the loads can be turned ON/OFF remotely through this technology. The loads are operated by IOT board through Relay Module

Keyword: IOT, NodeMCU, Wi-fi, IDE, Digital I/O Pin.

Introduction

In this project we are going to build a simple home automation project allows you to control home appliance from anywhere. Blynk provides very good and attractive interface.

NodeMCU is very popular in Home Automation. It's WiFi capabilities and Arduino IDE support making it easier for IoT Applications. It is very tiny and has many Digital I/O pins, Serial Communication and I2C Communication. NodeMCU has a micro USB port to program it using your existing mobile cable (no additional programmer needed). There is a successor called ESP32 Development board which has more Analog pins and Digital pins. You can use any one of them for this project according to your requirements. Here we will be using NodeMCU.

Blynk is a mobile application which has its own server to process user requests. It is an open source application and anybody can use it in their Home Automation to control devices, monitor sensor data and get a notification by some trigger actions.

Things that you'll need:

- Node MCU.
- Relay Board.
- Jumper Cables.
- Blynk app.
- Smartphone.

- Arduino software.
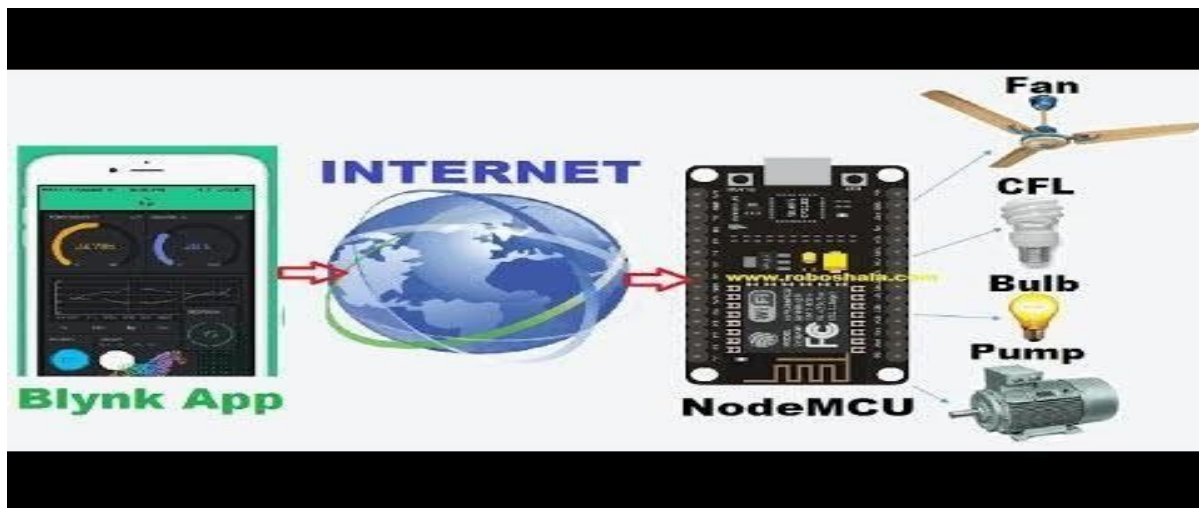
System Design And Implementation

Fig.1: Basic system Architecture of Home automation

The hardware also called the Control Unit comprises of the NodeMCU microcontroller and the Realy board. NodeMCU's digital output pins are connected to the Relay pins of the Relay board. Finally, each Relay is connected to an appliance.NodeMCU (ESP8266)NodeMCU is an open source based firmware developed for ESP8266 wifi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. NodeMCU Development board.Since NodeMCU is open source platform, their hardware design is open for edit/modify/build.NodeMCU Dev Kit/board consist of ESP8266 wifi enabled chip. The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266 WiFi Module.
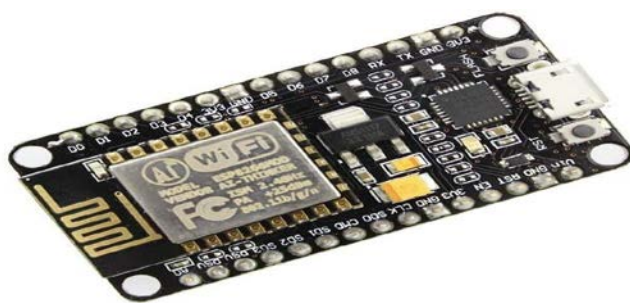

Fig. 2: Node MCU (ESP8266)

Relay Module

A relay is basically a switch which is operated by an electromagnet. The electromagnet requires a small voltage to get activated which we will give from the Arduino or bettery and once it is activated, it will pull the contact to make the high voltage circuit.
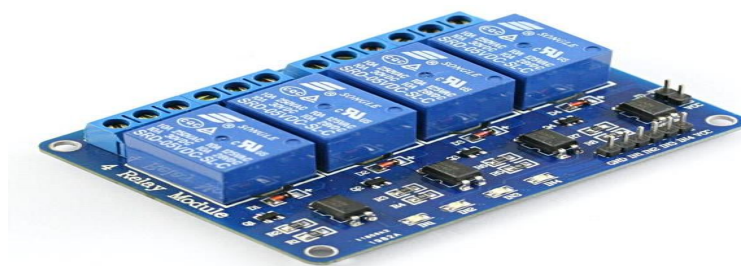
Fig. 3: Relay Module

The relay module is a separate hardware device used for remote device switching. With it you can remotely control devices over a network or the Internet. Devicescan be remotely powered on or off with commands coming from ClockWatch Enterprise delivered over a local or wide area network. You can control computers, peripherals or other powered devices from across the office or across the world.The Relay module can be used to sense external On/Off conditions and to control a variety of external devices. The PC interface connection is made through the serial port.The Relay module houses two SPDT relays and one wide voltage range, optically isolated input. These are brought out to screw-type terminal blocks for easy field wiring. Individual LED's on the front panel monitor the input and two relay lines. The module is powered with an AC adapter.

Blynk Application

Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets.

You can use Blynk's platform quickly without a ton of learning time. It can support both Arduino and Raspberry Pi over Wi-Fi, Ethernet, or an ESP8266 chip.
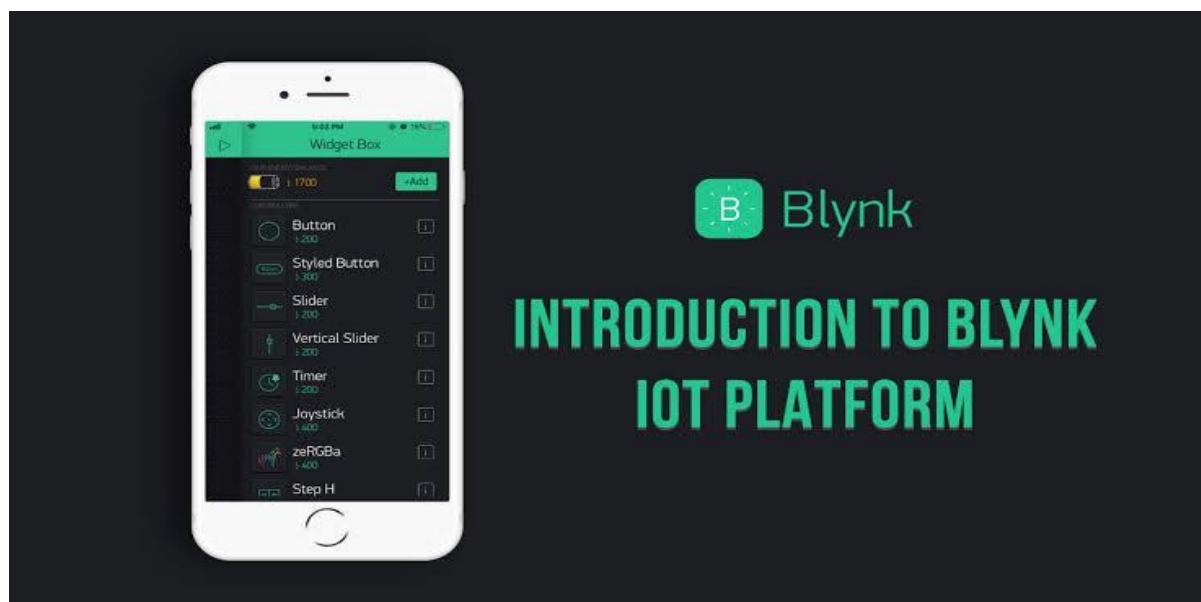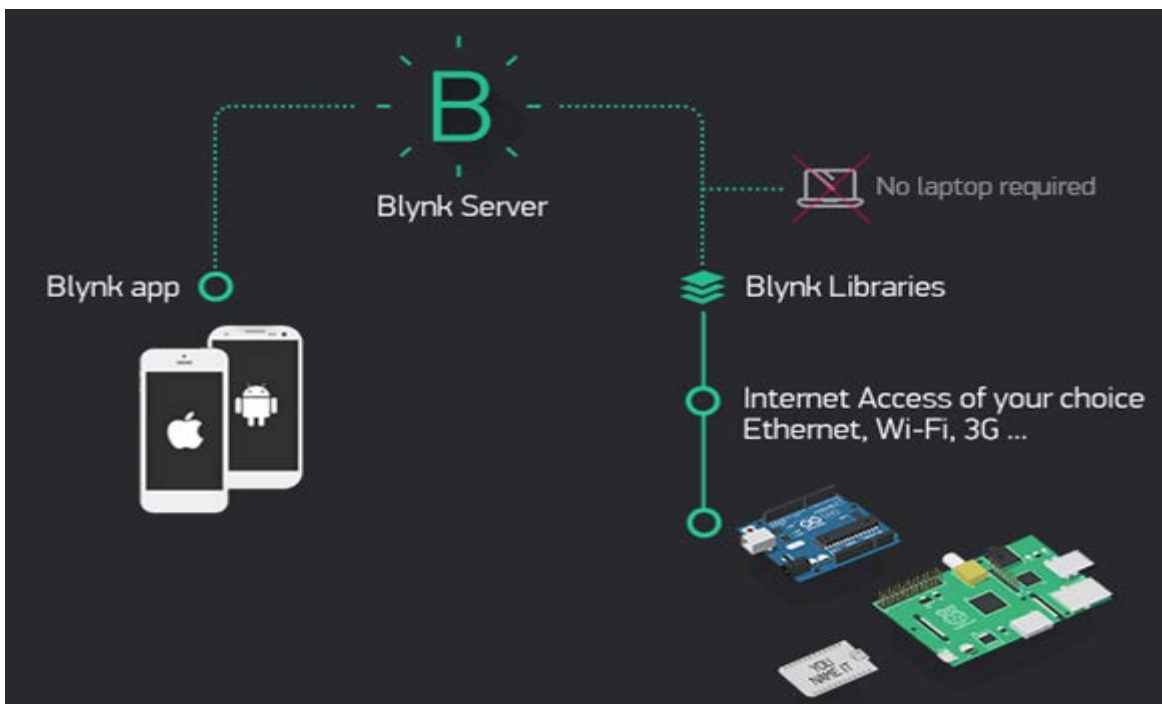

Fig. 4: Blynk app Platform

Fig. 5: Functioning of the Blynk application

Hardware Assembly

1. We'll have to connect the NodeMCU with the Relay board, you can choose to do it with a bread board or without. But I prefer doing it using a Breadboard.
2. Connect the D1 pin of NodeMCU with Pin 1 of Relay. Similarly connect D2 pin of NodeMCU with Relay pin 2, D3 with Relay 3 and D4 with Relay 4.
3. Connect vcc pin of relay with 3v pin of NodeMCU.
4. Now to power up the NodeMCU you can use a normal phone charger, just make sure its voltage is not too high. And to power up the Relay board, you can use a battery or a separate breadboard power supplier.
5. As we are using a four-channel relay you can connect at most 4 electronic appliances to the Relay and control them over the internet.
6. Now if you want to connect your household appliances like Fan, Lights etc. which are connected to the main power of your house, I would recommend you take the help of a professional electrician and ask him/her to connect those appliances to the relay. Because working with the mains is no joke and if not done properly, can cause a serious damage.
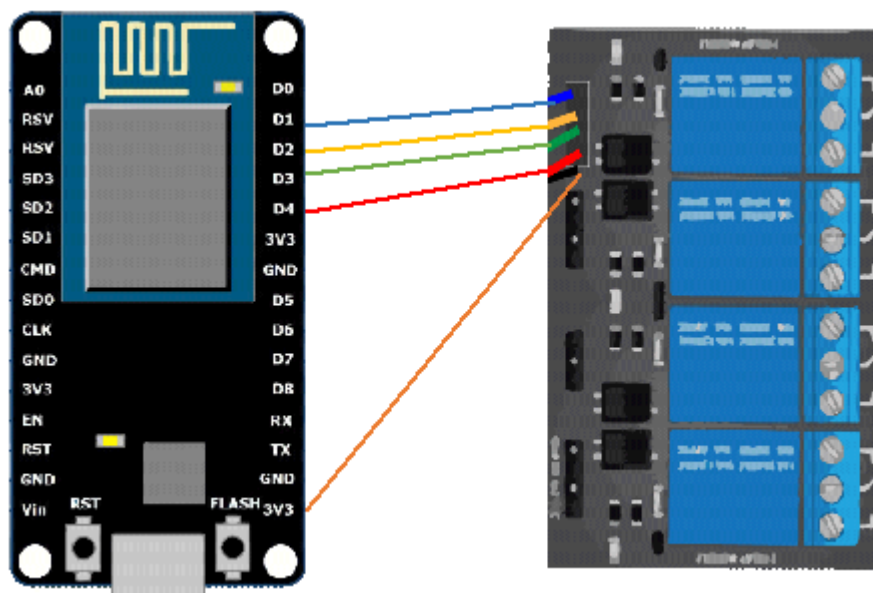
Fig. 6 : Connection between NodeMCU and relay module.

At this point, we have a fully functional connection between the NodeMCU, Blynk app and our electrical appliances. So, you can directly run your Blynk project from your phone and turn the electrical appliances on or off using the buttons that we created in the app. And if you are satisfied with this and don't want to connect the NodeMCU with the Google Assistant and control the appliances using voice commands, then you don't have to read the remaining tutorial and you can stop right here. Otherwise let's move forward.

Result

The result was positive and the system responded well. The diagram below shows the complete prototype implementation of the proposed system.
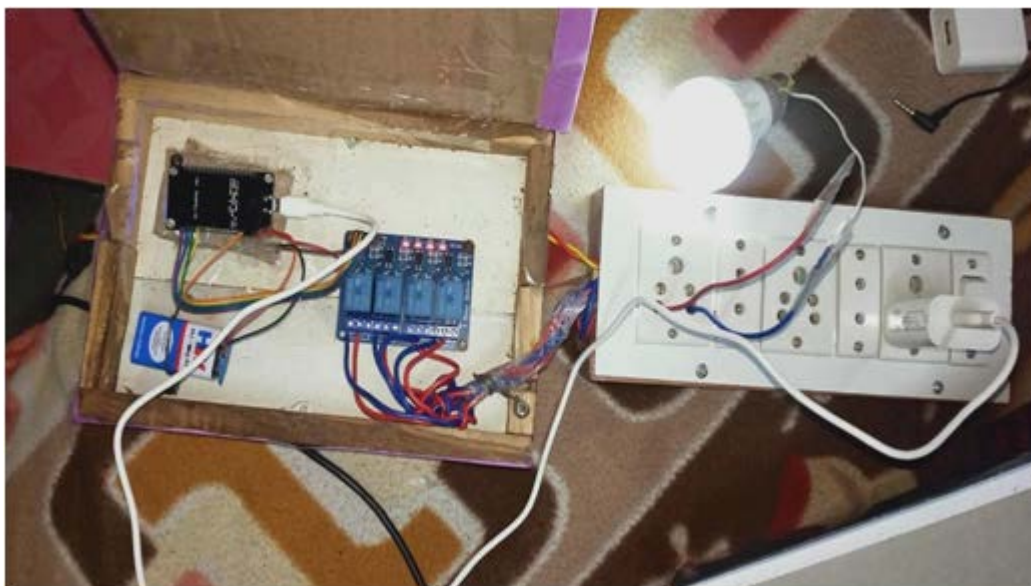

Fig.7: Home automation with controlling light

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