

# Design & Implementation Of Lab Automation Using Google Assistant, Node MCU , & BLINK Android App

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**ABSTRACT** In recent years, the advancements in Information and Communication Technology (ICT) are mainly focused on the Internet of Things (IoT). In a real-world scenario, IoT based services improve the domestic environment and are used in various applications. Home automation based IoT is versatile and popular applications. In home automation, all home appliances are networked together and able to operate without human involvement. Home automation gives a significant change in humans life which gives smart operating of home appliances. This motivated us to develop a new solution which controls some home appliances like light, fan, door cartons, energy consumption, and level of the Gas cylinder using various sensors like LM35, IR sensors, LDR module, Node MCU ESP8266, and Arduino UNO

This paper include functionality of node esp8266 are connected with either of above given house application like fan, light, water pump, gardening with help of coding and hosting online with web server. All the functionality is handled by Mobile App created in android application, from which house application are controlled with help of internet. This paper is clarifying that monitoring of circuit devices through wireless using Node MCU and controlling using App Blynk. According to requirement of need one can connect multiple device like sensors, appliance).

**Keywords** - Home automation, NodeMCU(ESP8266), Wi-Fi, IFTTT Application, Blynk Application, Google Assistant, Smartphone.

## I. INTRODUCTION

### 1. INTRODUCTION

IoT (internet of things) in recent years have become lifestyle of human being with great potential. Even it is focusing on different task that are requirement of human intelligence. In today's scenario IoT has opened doors to that cover up all requirements of human dealings in their daily life. Example like purchasing of goods, monitoring of resources and remotely control them from any corner of the world. Think about a world were personal refrigerator will provide you list of all your stuff required for upcoming few days base on your present utilization in it. Even envisage your fridge is interactive with Home automation refers to remotely monitoring the conditions of home and performing the required actuation. Through home automation, household devices such as TV, light bulb, fan, etc. are assigned a unique address and are connected through a common home gateway. These can be

remotely accessed and controlled from any PC, mobile or laptop. That can drastically decrease energy consumption and get better the living environment as well as enhancing the indoor safety.

Lab automation is also named as domestics or Smart Lab. It incorporates the manage plus automation of light, warming, ventilation, cooling and security, similarly as home appliances. Wi-Fi will be most preferred for remote monitoring and control. Even now when technology is handy enough only the well to do people of the society are blessed with the new smart home devices such as Amazon Echo, Google Home etc, as these devices costs are a bit high. However, not everyone is wealthy enough to be able to afford a human assistant, or some smart home kit. Hence, the need for finding an inexpensive and smart assistant for normal families keep growing.

This project proposes a very inexpensive system. It uses the Google Assistant, the IFTTT application and the NodeMCU esp8266 Wi-Fi microcontroller, the Adafruit application, as the major components along with a relay and other driver boards. Till now we have used Google Assistant to react to inquiries regarding atmosphere condition, cash rates, course, date and time, etc. Google Assistant can achieve something past answer these request. Presently we can utilize Google Assistant to control our home apparatuses by giving common language voice directions and with the assistance of adafruit application and IFTTT (If This Then That) application the directions are decoded and afterward sent to the microcontroller. All of the components are connected over the internet using Wi-Fi which puts this system under the IOT.

## 2. SYSTEM REQUIREMENT

### 2.1 ARDUINO IDE

The ARDUINO integrated development environment (IDE) is a cross stage application (for Windows, macOS, Linux) that is written in the programming language Java. It is utilized write and upload programs to Arduino compatible boards, but also,

with the help of 3rd party cores, other vendor development boards. Here we are using NodeMCU.

NodeMCU is an open source improvement board and firmware arranged in the for the most part used ESP8266 - 12E WiFi module. This ESP8266 progression board genuinely takes after Arduino Nano. The Arduino IDE additionally supports the languages C and C++ utilizing exceptional guidelines of code organizing. The Arduino IDE supplies a software library from the wiring venture, which gives numerous basic info and yield methodology. It empowers us to program the ESP8266WiFi module with the direct and earth shattering LUA programming language or Arduino IDE.

## 2.2 IFTTT

IFTTT is named after the programming prohibitive clarification "if this, by then that." IFT-TT is both a webpage and an adaptable application that pushed in 2010 and has the maxim "Set the Internet to work for you animals". The idea is that we use IFTTT to automate everything from your most adored applications and objectives to application attracted embellishments and smart devices. Here, IFTTT application is utilized to cross over any barrier between the Google Assistant directions and the Blink.

Setting up the IFT-TT application at first requires venturing in after which we have to make an applet and sooner or later "This", for example the trigger, here we select Google Assistant and subsequently we will type in the approaches to manage which the Google Assistant ought to react and to this mentioning it should control the mechanical get-together/move related with it. The reaction course from the Goggle Assistant can what's more be circled in as required. In the wake of masterminding the trigger, for instance "This" of the application we need to design the "That". What should be done once the Google Assistant hears the requesting which we basically composed? This is picked by setting "That" of the application. We click "That" decision which is used to accessory Google Assistant with Blink.

Resulting to picking Blink . Before long enter what information we have to send to which feed of Blink dashboard. This makes the activity for the trigger for example the Google Assistant solicitation. when we use Google Assistant on flexible and give voice demand, applet made in IFT-TT get this course and will send information '1' to the Blink feed. This will trigger the occasion on Blink App dashboard which is unendingly observed by the microcontroller.



**Fig-1:** Screen Shot Of the Ifttt Application After Creating Several Applets

## 2.2 GOOGLE ASSISTANT

Google Assistant is Google's voice-controlled impressive right hand. It's was at initial an expansion of Google Now - intended to be precious - while working up Google's current "OK Google" voice controls.

At first, Google Now shrewdly hauled out critical data for you: it knew where you worked, and it knew your get-together domains and visiting plans, the entertainments packs you increased in value, and what captivated you so it could give you particular data that had any sort of impact. Google Assistant can take part in two-manner discussions living behind organization's previous remote helper. Additionally it is accessible in various dialects giving solace to client

## 2.3 Node MCU

The NodeMCU is an open source programming and rigging advancement condition that is worked around an incredibly unobtrusive System-on-a-Chip called the ESP- 8266. It contains every single basic piece of the front line PC.

It operates at a voltage of 3.3V. It is a development board which is compatible with the Arduino IDE. Many existing Arduino shields can be plugged directly into the board as it includes standard Arduino headers. It has 16 GPIO pins. It has 4Megabytes of flash memory along with a clock speed of 80MHz-160MHz, around 50k of usable RAM and an on chip Wifi Transceiver.

## 2.4 Blynk

Blynk is an internet of things platform which allows controlling electronic devices remotely using its iOS and android apps. It provides dashboard by which user can create graphic interface using different widgets. Blynk can also store and display sensor data. Blynk provides libraries for most of the popular hardware platforms like Arduino, ESP8266 [1], Raspberry pi, SparkFun etc.

In the Blynk three most important components are App, Server and Libraries. App can help to create the interface. Server is responsible for all the communication between app and the hardwires. And Libraries enables communication for hardware with the server using commands.

Node MCU is the main components in the above diagram. It is connected with external power source with cable. Next important component is relay. Here we use 5V DC relay as switch. Using the relay, we can convert DC power to AC. Relay is connected with Node MCU and bulb. Using the blynk app we can operate the all devices using the blynk server. In blynk app different button are added, using those buttons we can on/off the switch.

### 3. SYSTEM ARCHITECTURE AND WORKING

The architecture of the system developed is based on the client server model. Here, the devices including smart phones and microcontrollers are treated as clients which are connected to central server. Figure 2 shows the broad client server architecture implemented. The architecture can be divided into 4 layers namely- Home appliance layer, control unit layer, server layer and client layer. The communication between the home appliance layer and control unit layer is through wired medium and that between the control unit and the server is either by LAN or Wi-Fi. The server is basically HTTP based and communicates with clients through API requests.

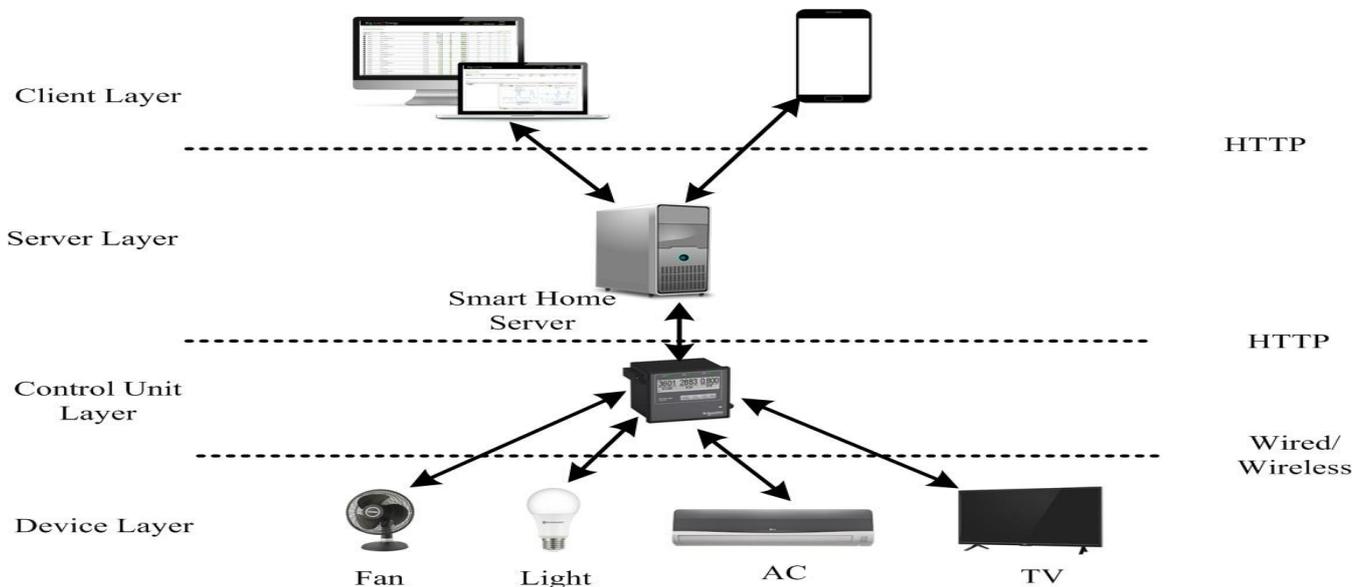


Fig 2: Client server architecture

There are four kinds of request methods used to communicate with HTTP server, which are as below:

- A. *GET request*: used to retrieve data stored in the server.
- B. *PUT request*: used to replace a data with the new value.
- C. *POST request*: used to add multiple data in the same database below the previous data.
- D. *DELETE request*: used to delete a data from the database.

The working of the client server architecture is given as algorithmic steps:

- Step1: Initialize the clients; connect to the internet and server.
- Step2: Stand-by and wait for the HTTP requests.
- Step3: If request is received, then forward it to the microcontroller.
- Step4: Process the response received and update the General Purpose Input-Output (GPIO) pin of Node MCU.
- Step5: Turn ON/OFF the device connected to the GPIO through relay, based on the request received.

The implementation of this work is divided into two parts- hardware development and software development. In the hardware part, the home controller is designed by using Node MCU and in software part an android application is developed whose details are as given below.

#### A. Software design

##### A.1. Android application

An android application is designed using android Studio software with the minimum android support of 4.4 ice-cream sandwich (API 23). The app consists of splash screen activity and the device controlling activity as shown in figure 3. The software uses SDK's (software development tool kit) for development. It uses XML language for Front End design and derived Java as back end language.

The app is coded in JAVA to send http 'put' request to the server on button press. An API key is added in the code so that the app could connect to the server. Figure 3(a)-3(d) shows the screen shots of the developed app. When we use Google Assistant with same account which was used for IFTTT and Blynk on mobile and give voice command as "Ok Google, Turn ON LIGHT", applet created in IFTTT get this direction and will send data '1' to the Blynk. This will trigger the occasion on Adafruit dashboard which is continuously checked by the microcontroller (here NodeMCU). This microcontroller will make a move according to the data change on the Blink App

After connecting and programming all the components, we conducted the experiment. The results was very conclusive about google assistant working with hardware control and the system responded well to all train commands. The diagram below shows the complete prototype completion of the projected method.

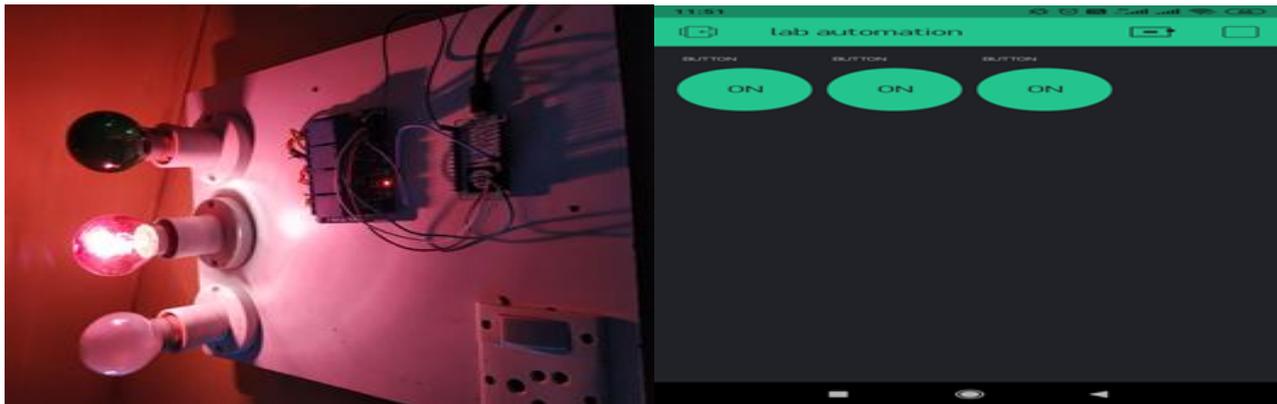


Fig 3:- Light ON / OFF By blink App

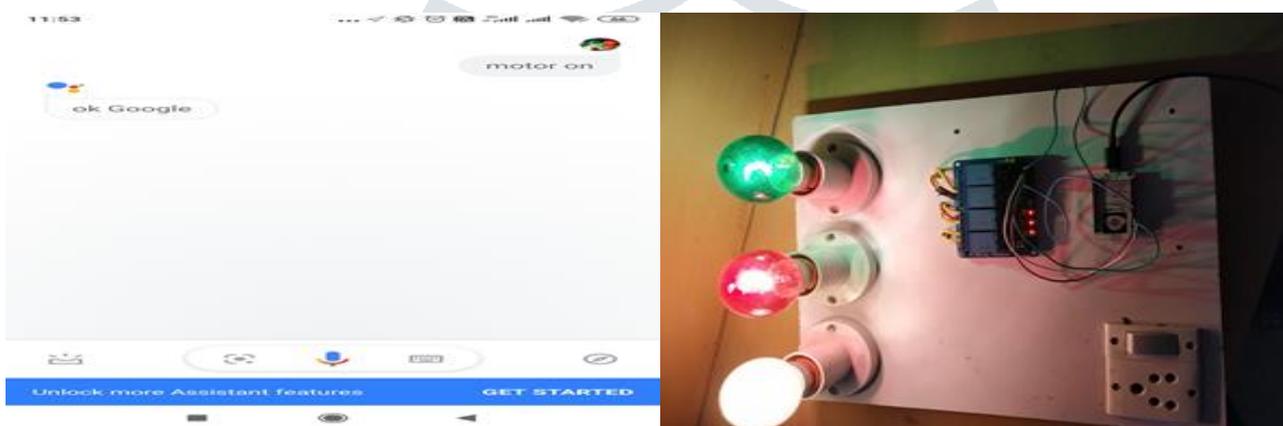


Fig 4:- Light ON/OFF By Google Assistance

#### 4. RESULTS AND APPLICATIONS

Relay module system connected to the home appliances to be controlled and linked to one another via Wi-Fi using Node MCU ESP8266 controller chip. For user interface, IOS version of Blynk app with custom designed layout and buttons was used to facilitate monitoring and controlling various connected things.

The screenshots of the results of the designed system obtained on android application are shown in Figure 3.

By pressing virtual button on the smart phone, the home appliances can be controlled from any remote location. One advantage of this app is that it can be shared within all the family members of the house. When one-member switches ON or OFF an appliance, the action will be apparent to all other members sharing the app. Similarly, real-time as well as historical data of measurements of temperature, humidity, GPS location, distance -measure etc. can be obtained from anywhere using the app.

Further, this system can be employed in many places such as banks, hospitals, laboratories, traffic stations, residential apartments, house, streets, poultry farms, greenhouse etc. In a nutshell, this system can be used at multiple fields and areas in order to make them operate smartly

#### 5. CONCLUSION AND FUTURE WORKS

This paper has introduced a lab management system. This paper is mainly focused on overcoming everyday problems faced by the people in world where regular power cut-off, unmanaged urbanization, lack of manpower in agriculture and farming, etc are blatantly evident. Our prototypical system is applicable to real-time home security, automation, monitoring and controlling of remote systems. The main aim of this project was to propose a considerably cost effective voice controlled (Google Assistant) Lab automation controlling generally all kind of Lab appliances found at Computer Lab . The home automation utilizing IOT has been experimentally demonstrated to work attractive by connecting simple appliances to it and the appliances were effectively controlled remotely through internet using voice commands. This will help the users to monitor the condition of various home parameters in the home anytime anywhere

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