

## DESCRIPTION DOCUMENT FOR WIFI TWO RELAY WITH POWER MONITORING MODULE

### **HARDWARE REVISION 0.1**

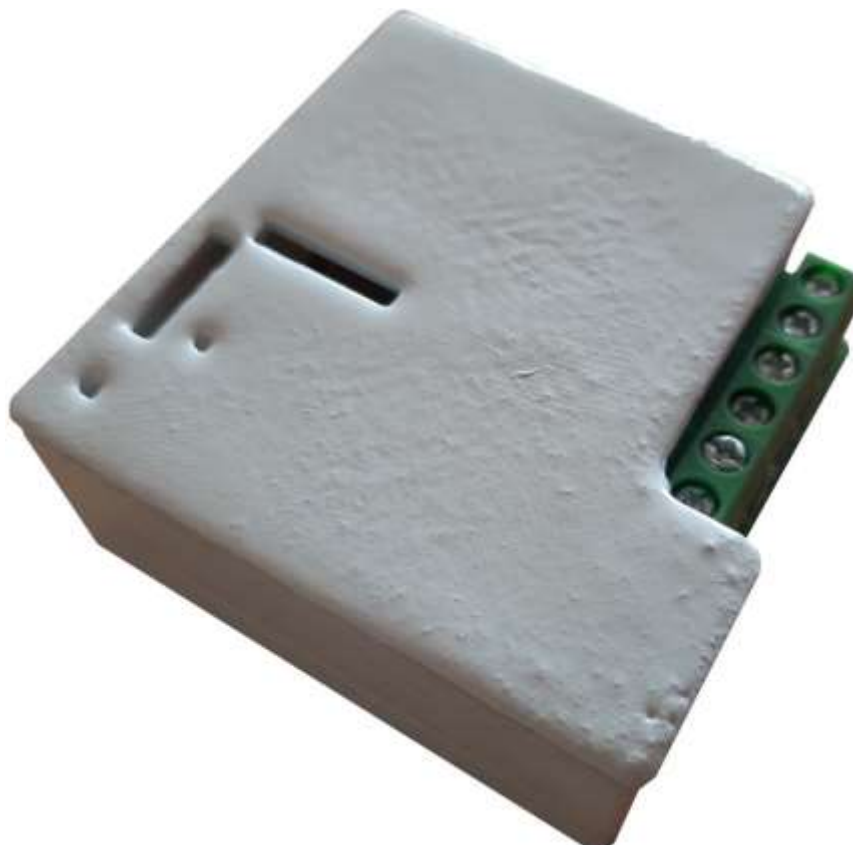
Department	Name	Signature	Date
Author			
Reviewer			
Approver			

### Revision History

Rev	Description of Change	Effective Date
A	Initial Release	

### ABSTRACT:

This document is a detailed product description that describes the effective features of the product. It includes a functional hardware description of the product with its internal block diagram and product images.



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## 1. ABBREVIATIONS

Term	Description
A	Ampere
AC	Alternating Current
ASIC	Application Specific Integrated Circuit
COM x	Communication Port (Where 'x' represents the port number)
COM	Common Pin of the Relay
DC	Direct Current
GPIO	General Purpose Input Output
HTTP	Hypertext Transfer Protocol
Hz	Hertz
I2C	Inter Integrated Circuit
IDE	Integrated Development Environment
IP	Internet Protocol
LED	Light Emitting Diode
MCU	Microcontroller Unit
MQTT	Message Queue Telemetry Transport
PCB	Printed Circuit Board
PWM	Pulse Width Modulation
SPI	Serial Peripheral Interface
SSID	Service Set Identifier
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
V	Volts
ZCD	Zero Crossover Detection

## 2. REFERENCES

Company Weblink	<a href="https://www.armtronix.in">https://www.armtronix.in</a>
Youtube Weblink	<a href="https://www.youtube.com/channel/UCr3QN65jDSxKDX4QPc03oQ">https://www.youtube.com/channel/UCr3QN65jDSxKDX4QPc03oQ</a>
Intractable's Weblink	<a href="https://www.instructables.com/member/Armtronix/">https://www.instructables.com/member/Armtronix/</a>
Github's Weblink	<a href="https://github.com/armtronix">https://github.com/armtronix</a>

## 3. PURPOSE

The purpose of this document is to outline the design description for the WiFi Two Relay with power monitoring Box. It provides a high-level summary of the product.

## 4. SCOPE

This document describes system architecture which includes Power supply, Relay, WiFi Module, Power monitoring, and other available GPIOs.

## 5. SAFETY AND WARNING

Note that, this board to be powered with AC 230V with required current. Work and handle carefully with AC power as it is harmful and danger for human beings. Touching live wire or board when it is ON is danger and not advisable, it may cause to death, please avoid it.

Even a 50 V AC supply is sufficient to kill you. Please Switch off the mains before you make or change connections, be very careful. If you are not sure of anything related to the AC supply lines, please call an electrician ask and him to help you with it. Do not attempt to interface to mains unless you have adequate training and access to appropriate safety equipment. Never work on high voltages by yourself when you are alone. Always ensure that you have a friend/partner who can see and hear you and who knows how to quickly turn off power in case of an accident. Use a 2A Fuse in series with the input to the board as a safety measure. Basic test codes are available on our GitHub web page. Please refer them.

**Fire Hazard:** Making wrong connections, drawing more than rated power, contact with water or other conducting material, and other types of misuse/overuse/malfunction can all cause overheating and risk starting a fire. Test your circuit and the environment in which it is deployed thoroughly before leaving it switched on and unsupervised. Always follow all fire safety precautions.

## 6. PRODUCT FEATURES

- Works directly with AC power 100 - 240 V AC 50-60 Hz.
- Product firmware can be updated/reloaded/changed as per user requirement.
- Small formfactor with 55 x 55 x 21 mm.
- Two relays with live AC powered output via NO pin of relay is accessible to user.
- Board outputs can handle loads up to 240W.
- WiFi with MQTT or HTTP protocol
- MQTT Authentication with Username and Password.
- Basic Firmware to enter SSID and password to connect to the router.
- Push Button on board Provided for device Reset.

### a. SPECIAL FEATURES

- AC to DC galvanic isolated Power supply on board.
- ESP8266-12 Wifi Module.
- Isolated AC Virtual Switch (physical switch can be rewired directly).
- Electro-Mechanical Relays to control loads.
- Output presence detection.
- Extra GPIOs for any external inputs like sensor if required.
- Protection Fuse for safety of on-board circuitry.
- I2C/GPIO accessible for expansion.

## 7. PRODUCT DESCRIPTION

### a. PHYSICAL DESCRIPTION

- AC to DC Power supply module
- Wifi Module
- AC Virtual Switch
- Electro-Mechanical Relay

### b. FUNCTIONAL DESCRIPTION

#### Block Diagram

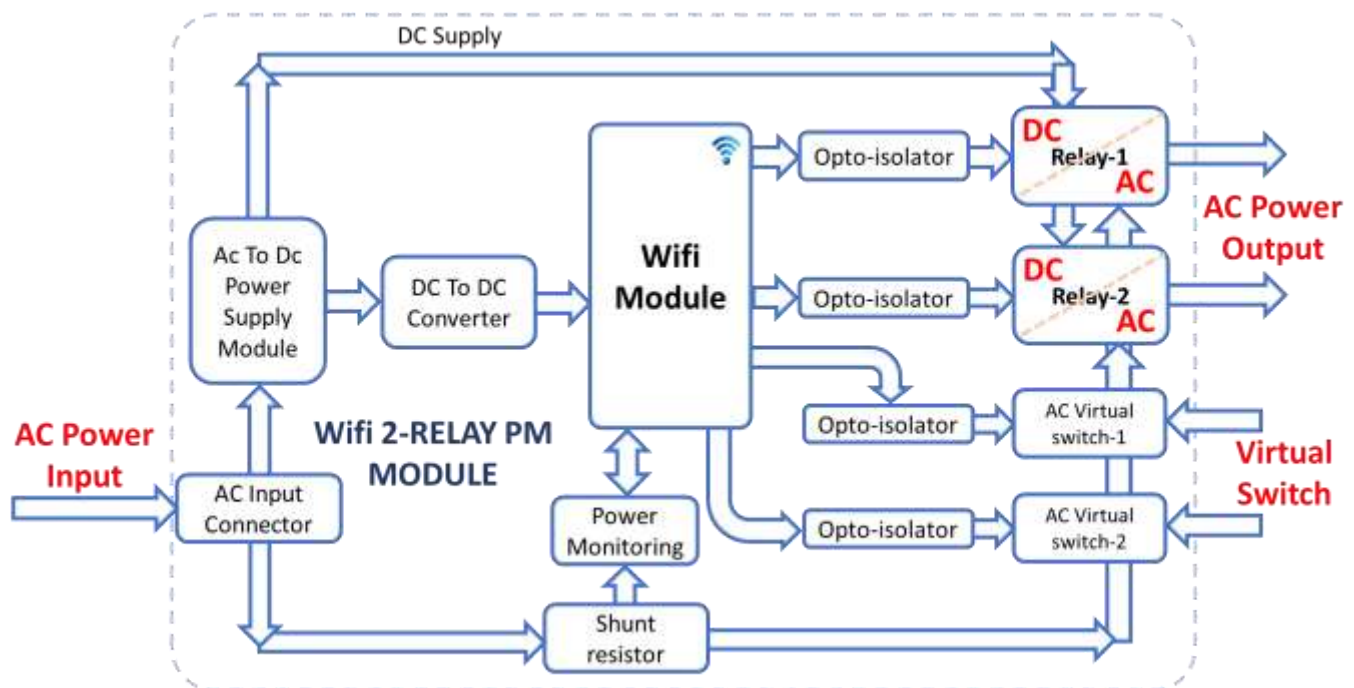


Figure 1: Block Diagram

WiFi Two Relay with Power Monitoring module is specially designed and brought to market for Wifi enabled Building automation application. This can handle a load at 240 V AC. There are two electro-mechanical relays mounted on board to control (ON/OFF) external electrical loads from a mobile application or webpages using MQTT/HTTP protocol. It also has features like, *power monitoring* and *isolated AC virtual switch*. The board has programming header (TX, RX, DTRE, RTSE) in compatible to NodeMCU which can be used with Arduino IDE to help the user to program using an external USB-UART converter. It has on-board *galvanic isolated power supply* module which takes standard AC voltage as input and provides required DC voltage as output. The DC voltage is used to power-up Wifi module used on board to establish Wifi communication and monitor & control loads.



## 8. SYSTEM OVERVIEW

### 1. AC to DC Power supply module

AC to DC converter is a switch mode galvanic isolated power supply. It rectifies and regulates voltage from 230 V AC to 5 V DC with output current capacity of 500 mA DC. The wattage of on-board power supply is at maximum of 2.5W.

The 5V supply is used to power on relay and USB-UATT converter. There is a DC-DC converter on board to regulate voltage from 5 V DC to 3.3 V DC to supply power to Wifi module.

### 2. Wifi Module

Wifi module used on the board is ESP32 with its minimum GPIOs are easily accessible in a header to user for their own application. Wifi module is powered on through 3.3 V DC. It works on both MQTT / HTTP protocol.

### 3. Electro Mechanical Relay

Electro Mechanical relay is powered by 5 V DC. The AC live powered terminal (NO) is given access to user in a terminal block to control loads. An opto-isolator based driver circuit is used to drive the relay, to create isolation between relay's AC and DC part. An opto-isolator based AC-DC isolation circuit is used to drive the relay.

### 4. Isolated AC Virtual Switch

Isolated AC Virtual switch circuit is connected to Wifi module through an opto isolator for AC-DC isolation. It gives a ZCD output to Wifi Module to detect the change in status of switch.

### 5. Power Monitoring

Power monitoring block is implemented in the hardware to monitor the consolidated power consumption by the loads. The circuit is based on single phase energy metering IC HLW8012. Which has ability to monitor voltage, current and active power and give the output in the form of pulses.

User need to convert these pulse output to appropriate parameters. With these parameters, user can be able to calculate the energy consumption by the loads.

## 9. TECHNICAL SPECIFICATION

### a. ELECTRICAL SPECIFICATION

#### i. Input Electrical Specification

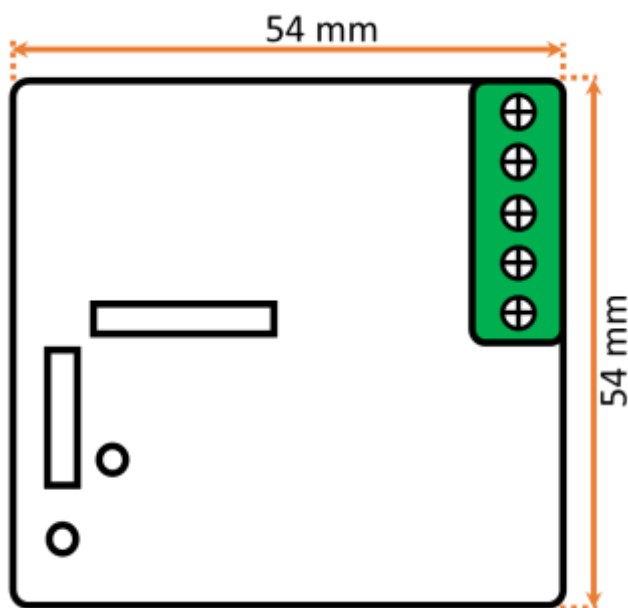
Input Specifications				
Description	Min	Typ	Max	Unit
Voltage AC	100	220	240	Volts
Current AC	-	0.1	-	Amps
Power AC	-	2.5	-	Watts
Frequency	50	-	60	Hz

#### ii. Output Electrical Specification

Relay Output Specifications (Maximum)				
Description	Min	Typ	Max	Unit
Voltage AC	-	-	500	Volts
Power AC	-	-	500	Watts

**b. MECHANICAL SPECIFICATION**

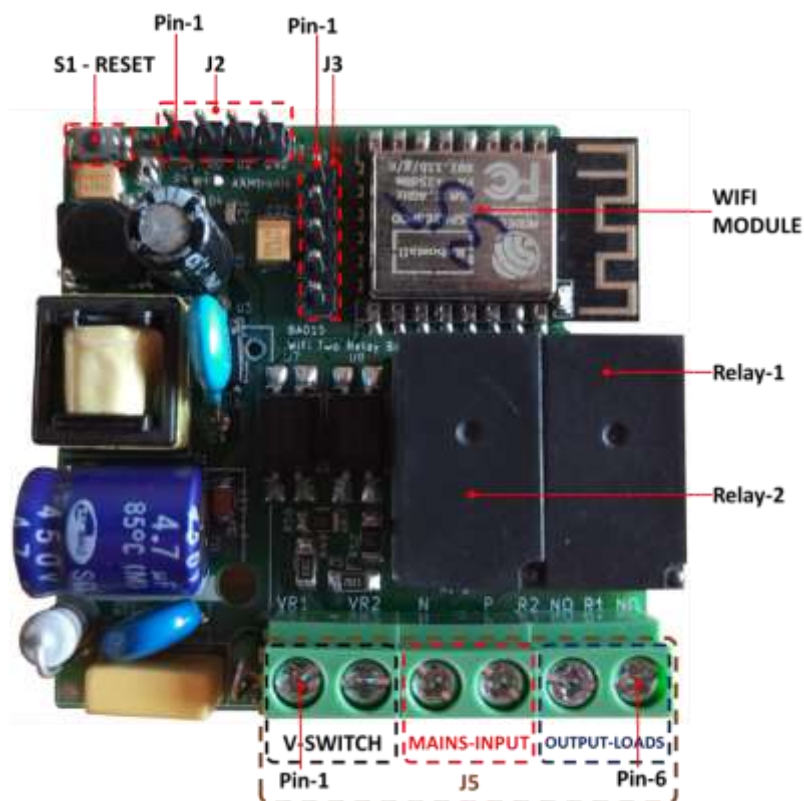
**i. Box Dimension**



**Figure 2: Box Dimension**

## 10. ELECTRICAL CONNECTIONS

### a. HEADER AND SWITCH DETAILS



**Figure 3: Header and Switch positions**

Note:

- On-Board fuse is only for SMPS and not for loads.

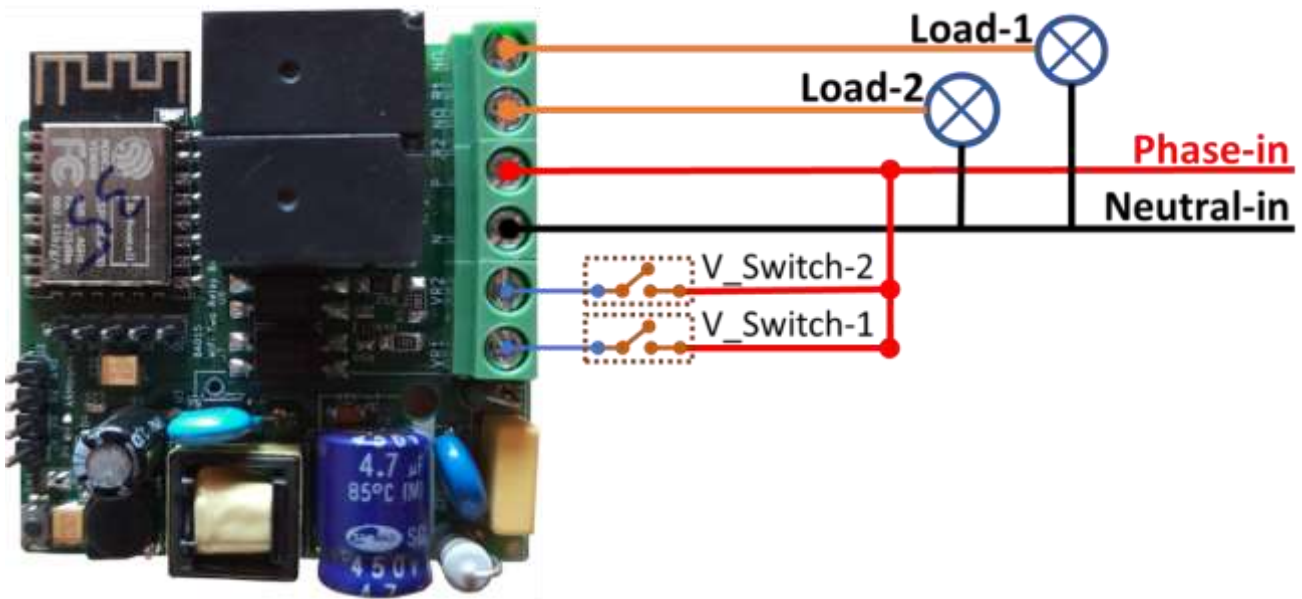
### b. ESP USED GPIO PIN CONFIGURATION:

ESP8266-12 Pin no.	Arduino Pin #	Designator	Description
20	D1	GPIO5	Relay_1
19	D2	GPIO4	Relay_2
6	D6	GPIO12	Virtual_Switch_1
4	D0	GPIO16	Virtual_Switch_2
16	D8	GPIO15	EM_SEL
7	D7	GPIO13	EM_CF1
5	D5	GPIO14	EM_CF
17	D4	GPIO2	I2C_SCL
18	D3	GPIO0	I2C_SDA

**Table 1:: ESP Pin Configuration**

### c. APPLICATION WIRING DIAGRAM

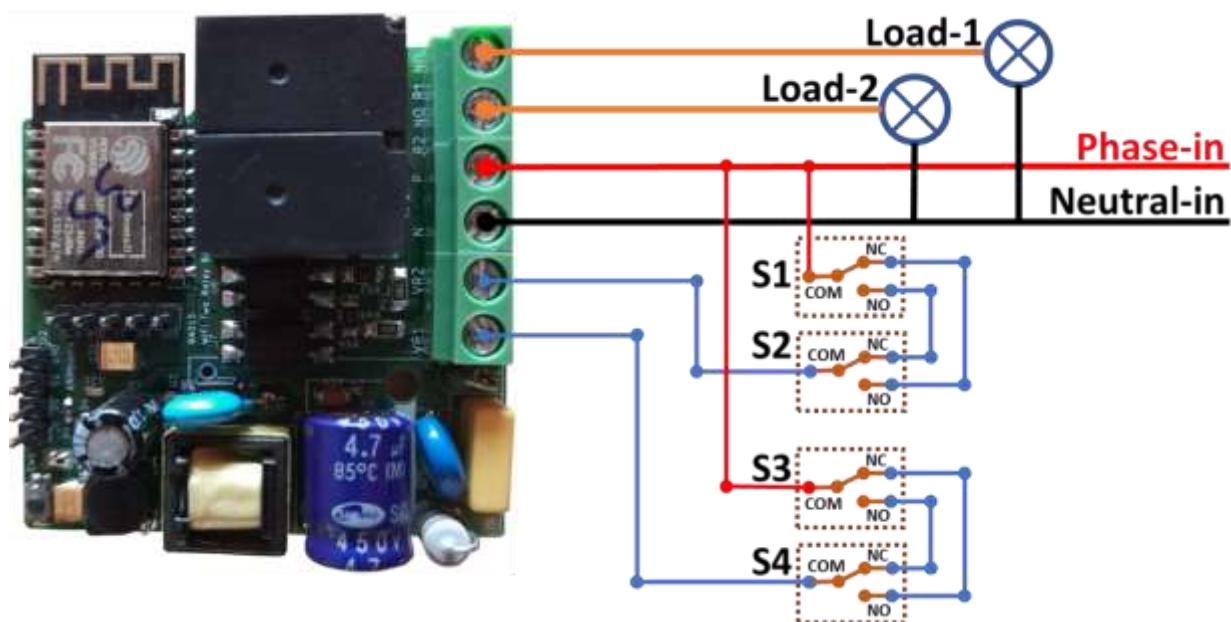
#### i. Example-1: Basic operation mode



**Figure 4: Basic application connection diagram**

Figure 4 represents about connection between electrical load, AC virtual switches and board for basic operation.

#### ii. Example-2: Two-way switch operation mode.



**Figure 5: Two-way switch connection diagram**

Figure 5 represents about connection between electrical load, AC virtual switches and board in two-way switch mode operation.

#### d. HEADER PIN CONFIGURATION

##### i. Header J3:

Header Pin #	ESP8266-12 Pin #	Designator	Description
1	-	RTSE	Ready to send ESP
2	-	DTRE	Data terminal ready ESP
3	22	TxDE	Transmission from ESP
4	21	RxDE	Reception by ESP
5	ADC	Ex_ADC	ESP ADC with External up to 3.3V DC

**Figure 6: Header J3 Pin Configuration**

##### ii. Header J2

Header Pin	ESP GPIO #	Designator	Description
1	-	+5V	5V DC
2	0	GPIO0*	ESP_GPIO0
3	2	GPIO2*	ESP_GPIO2
4	-	GNDD	Common Ground

**Table 2: Header J2 Pin Configuration**

##### iii. Header J5

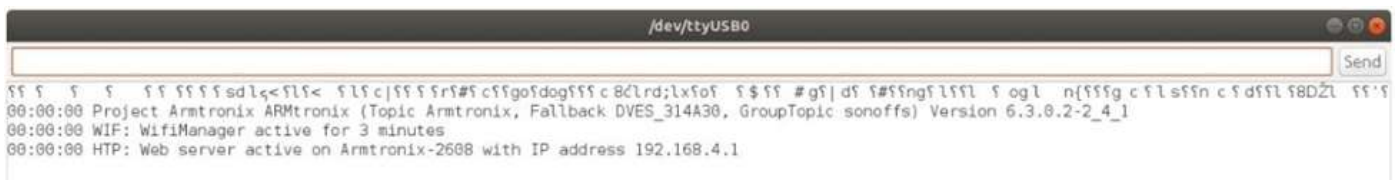
Header Pin	Description	Type
1	AC_VirtualSwitch_1	AC Input
2	AC_VirtualSwitch_2	AC Input
3	Neutral	AC Input
4	Phase	AC Input
5	Load_1	AC Output
6	Load_2	AC Output

**Table 3: Header J5 Pin Configuration**

## 11. HOW TO USE THE PRODUCT

### a. CONFIGURE THE DEVICE LOADED WITH TASMOTA FIRMWARE TO EXISTING NETWORK

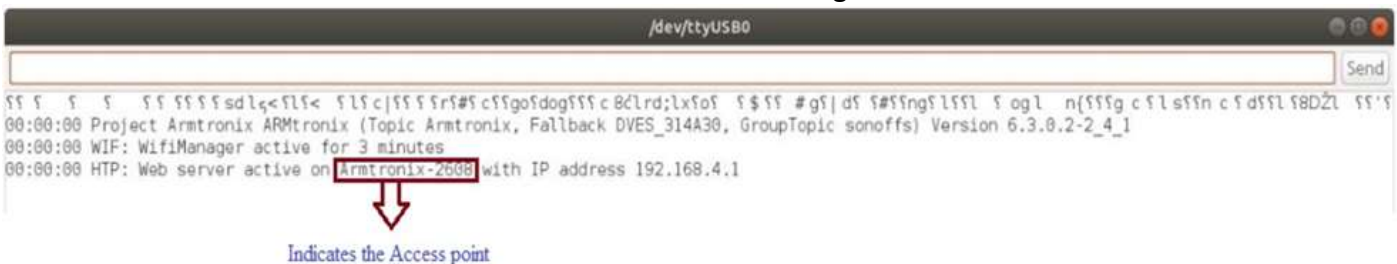
1. Make an input AC phase and Neutral connection as shown in Figure 4.
2. Use an electrical external fuse and MCB with rating 2A/250V, in series to input connections for the purpose of safety.
3. Check and make sure that there is no short circuit between phase and neutral.
4. Ensure that, required safety precautions are taken care.
5. Power ON the device by turning ON the main input supply.
6. Then observe the LED on the device is in ON condition to make sure device is powered up.
7. If the device has NOT powered ON, then turn OFF the main input supply and recheck for connections by following above steps.
8. Once the device Powered ON, it will host an access point as shown in Figure 7 below:



**Figure 7: Device hosting Access point**

9. Connect the mobile to access point with Armtronix-(MAC ID) within 3 minutes as shown below.

EX: Armtronix-2608 as shown in Figure 8 below:



**Figure 8: Access point name**

10. Once the MAC ID is obtained connect to the Wifi through your Smartphone and you will get an IP address as shown in the figure 9 below:

```
WiFi connected
mDNS responder started
192.168.1.34
Web server started
```

**Figure 9: Hosting IP address**

11. After connecting, open any browser and enter the IP address which is displayed on your Smartphone it opens the Web Server as shown in the Figure 10 below, then enter the SSID and Password and you can give the Host name of your choice (just for your reference) then click on SAVE button.

**Armtronix SD Module**

**ARMtronix**

Scan for wifi networks

**Wifi parameters**

**AP1 SSId ()**

**AP1 Password**

**AP2 SSId ()**

**AP2 Password**

**Hostname (%s-%04d)**

**Save**

Figure 10: Web Server

Once the **Configuration** is done it displays the message as shown in the figure 11 below,



Figure 11: Saving Configuration



Then user get access to control the load i.e he can Switch ON / OFF using TOGGLE button as shown in the figure 12 below.



Figure 12: Controlling a load

One advantage is that, this Web server provides Multiple Options, that is GPIO's are accessible to the user where a drop down is provided for different application as shown in the figure 13, below.

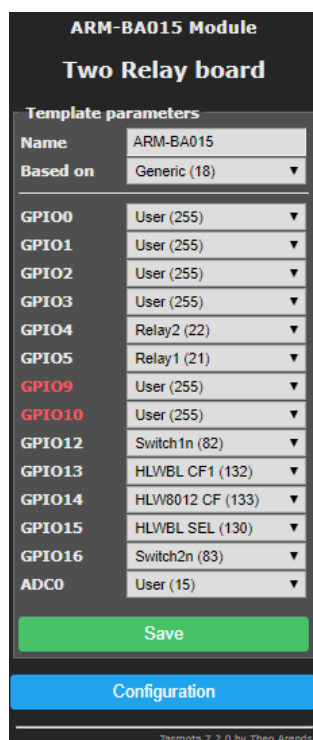


Figure 13: List of ESPs GPIOs available in dropdown list



12. One more advantage is that the user can easily **Configure** and **Upgrade** his **Firmware** through smartphone and an option also provided to choose file directly from the phone if it is available as shown in figure 14.

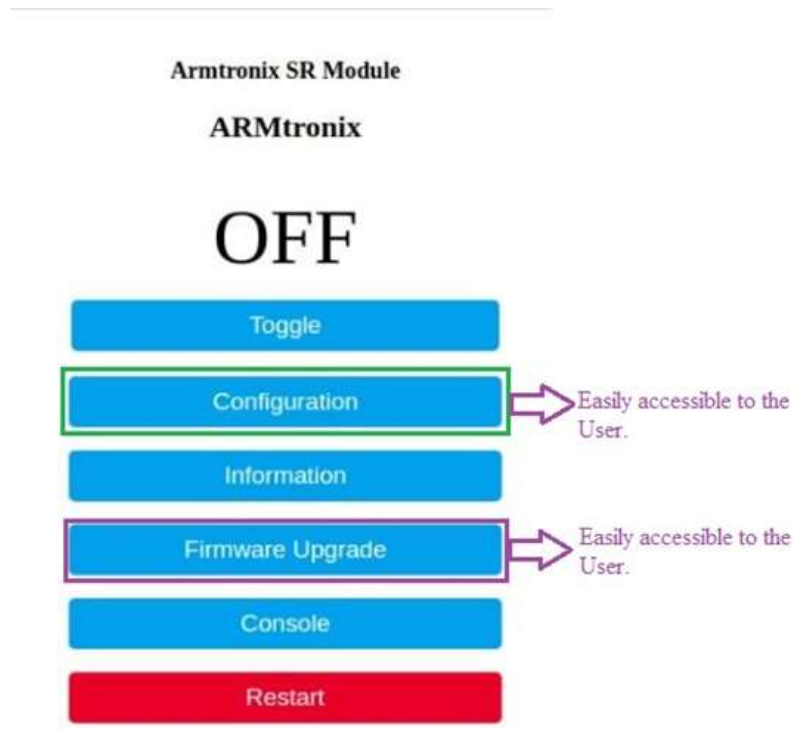


Figure 14: Main Menu

#### i. CONFIGURING DEVICE FOR MQTT MODE:

13. click on the Configuration option as shown in the figure 15,



Figure 15: Configuration Option

14. Click on Configure MQTT option provided as shown in the figure 16 below,



Figure 16: Option to configure to MQTT

15. User shall click on the SAVE button as shown in figure 17 below, once after entering required details to get access to MQTT protocol from the web server.

MQTT parameters

Host ()

Port (1883)

Client (DVES\_F85231)

User (DVES\_USER)

Password

Topic = %topic% (Armtronix)

Full Topic (%prefix%/%topic%/)

Figure 17: Option to enter required MQTT details

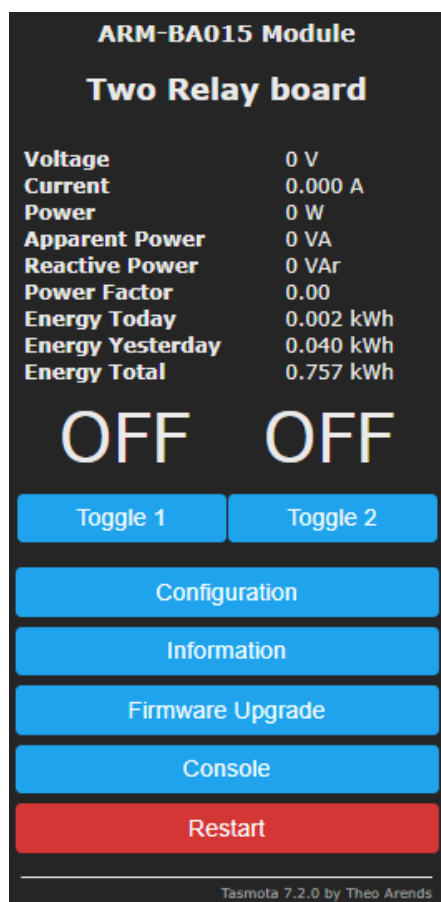
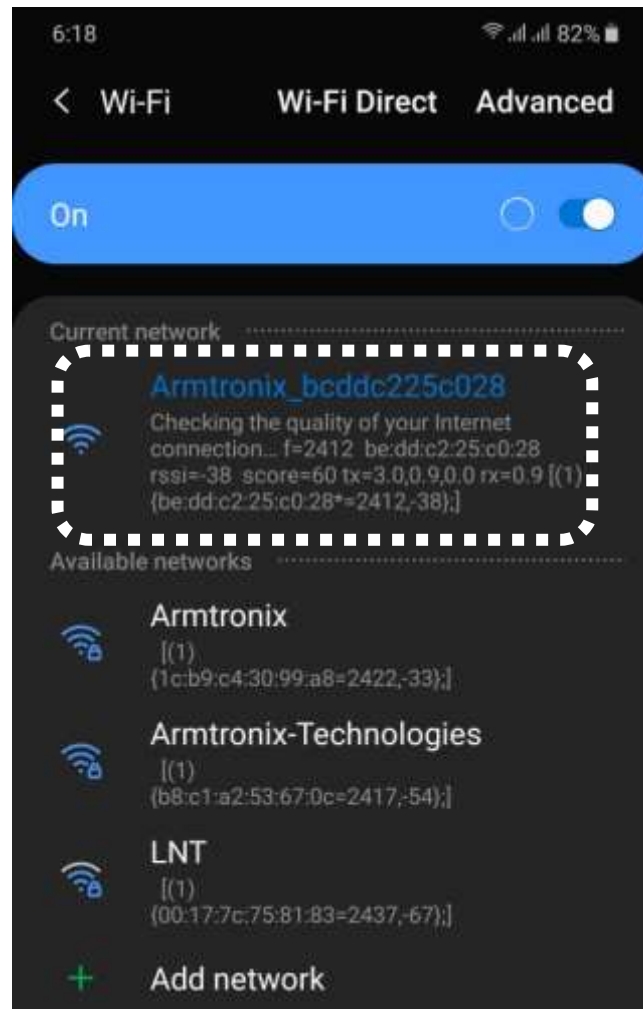


Figure 18: Example test results

# b. CONFIGURE DEVICE LOADED WITH ARMtronix FIRMWARE TO EXISTING NETWORK

1. Follow steps 1 to 7 of section 11.a of this document.
2. Once the device Powered ON, it will host an access point as shown in Figure 19 below:



**Figure 19: Device hosting Access point**

5. Once you find the Access Point hosted by the device, connect to it through your Smartphone.

6. Once connected, open any web browser in your connected smart phone and type 192.168.4.1 and you will access page shown in below Figure 20:



**Figure 20: Device configuration settings page**

7. Enter all the required details like SSID and password of router or access point to which the device should get connect and MQTT broker IP, username, password (if any) and pub-sub topic to control and monitor the device.
8. Click on save/submit button to save and restart the device. On restarting the device will be connected to above specified router or access point.

9. After the device connected to your router or AP, kindly search for devices IP address from router or AP and type the same IP address in your web browser to get the control web page of the device as shown in the below Figure 21.



Figure 21: Homepage of the device

10. Click on the “**Control Outputs**” tab button to access the Control and Monitor page as shown in below Figure 22.



Figure 22: Control and monitor page of the device

11. Click on “**Clear settings and boot into Configmode**” button to re-configure the device to different network, on clicking the button you get the page shown in Figure 20.

## 12. HOW TO CUSTOMISE FIRMWARE

You can program this board using Arduino IDE. Please follow the below steps to program the board by yourself with easy steps as mentioned below:

### a. STEPS TO LOAD PROGRAM TO ESP8266:

1. Use external USB-UART converter between computer and this board.
2. Connect external USB-UART converter with DTR and RTS pins shown in Figure 23 below:

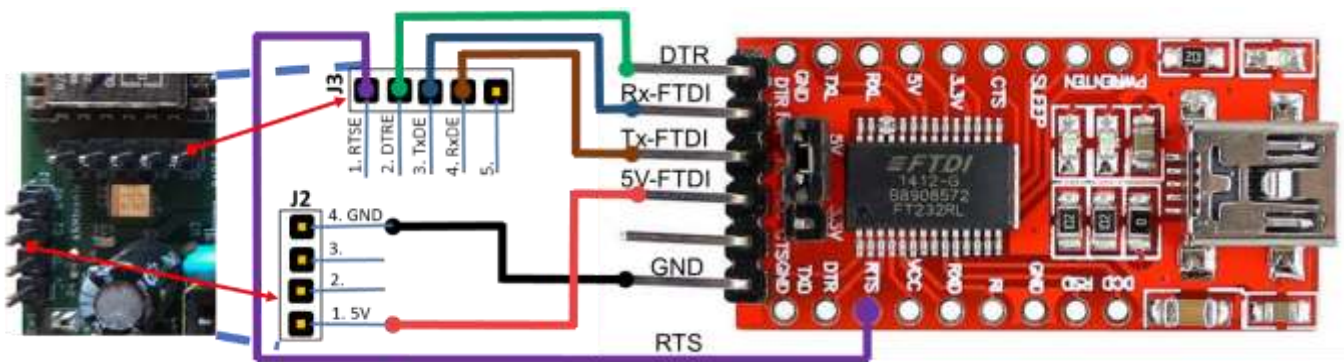


Figure 23: BA015 to USB-UART converter connections

J3 Header			USB-UART Converter	
J3 Pin No.	Pin Description		Pin Description	
1	RTSE		RTS	
2	DTRE		DTR	
3	TxDE		RXD	
4	RxDE		TXD	
J2 Pin No.	Pin Description			
1	VCC_5V		5V	
4	DGND		GND	

Table 4: USB-UART to baord pin configuration

3. Open your code in Arduino IDE.



- Click on Tools Tab, move mouse pointer on “Board: xxxxxxxxxxxx” and click on “NodeMCU1.0 (ESP-12 Module)” as shown in figure 24.

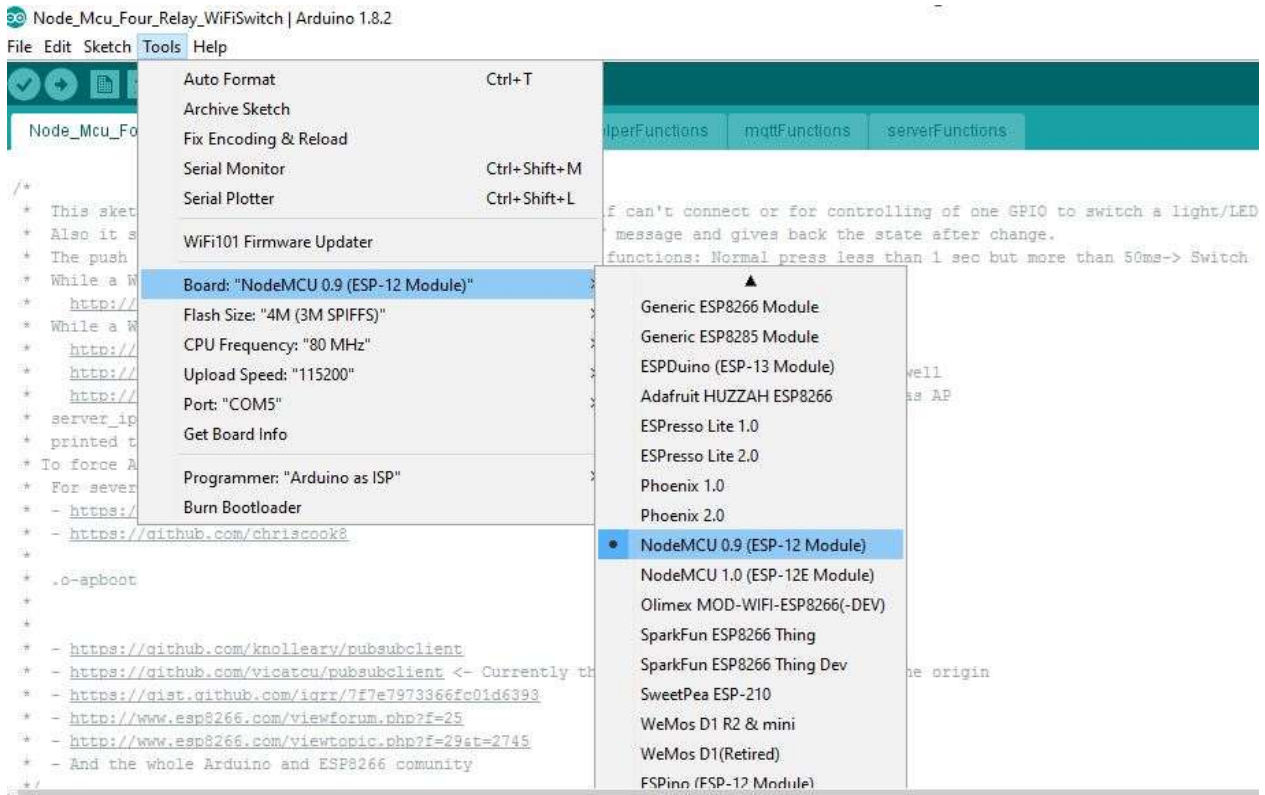


Figure 24: Board Selection

- Click on tools tab, move mouse pointer to “Programmer: “Arduino as ISP””, under this click on “Arduino as ISP” to select. Refer to figure 25

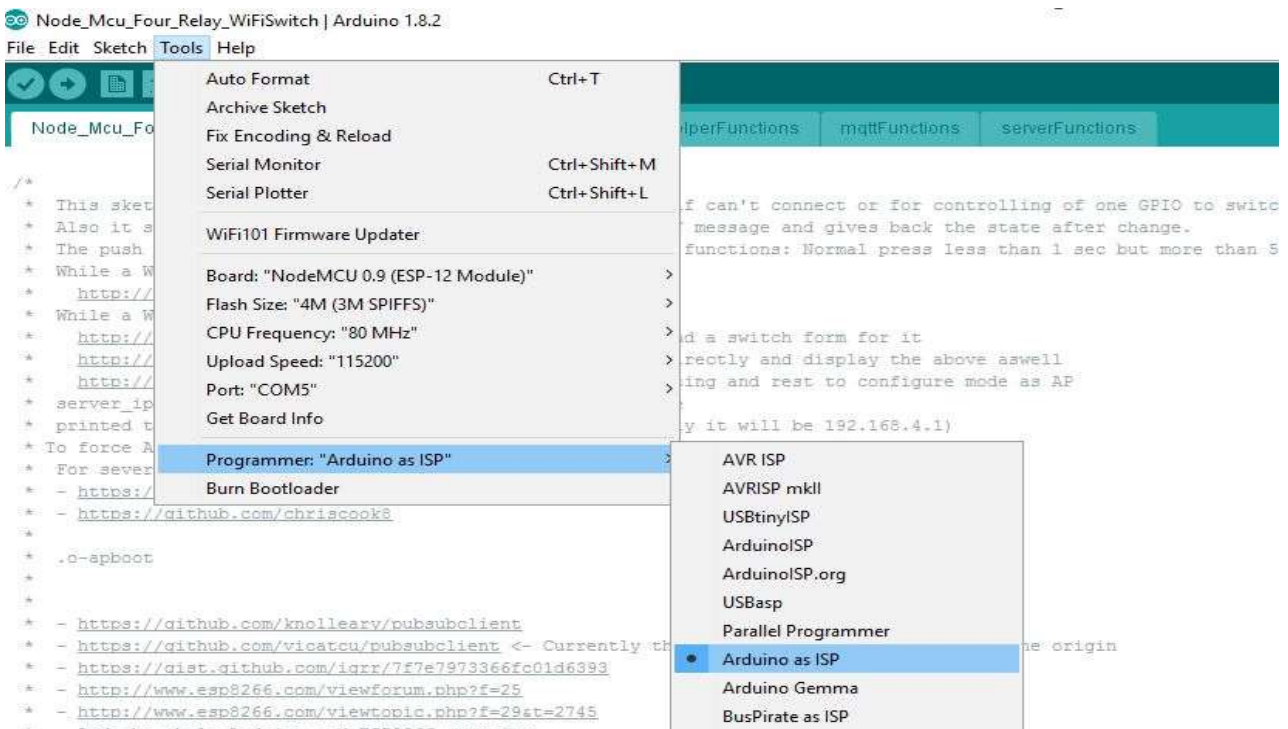


Figure 25: IDE Selection



- Click on tools tab, move mouse pointer to "Port: "COMx", under this click on "COMx" to select. ("x" refers to port number available in your computer) Refer to figure 61.

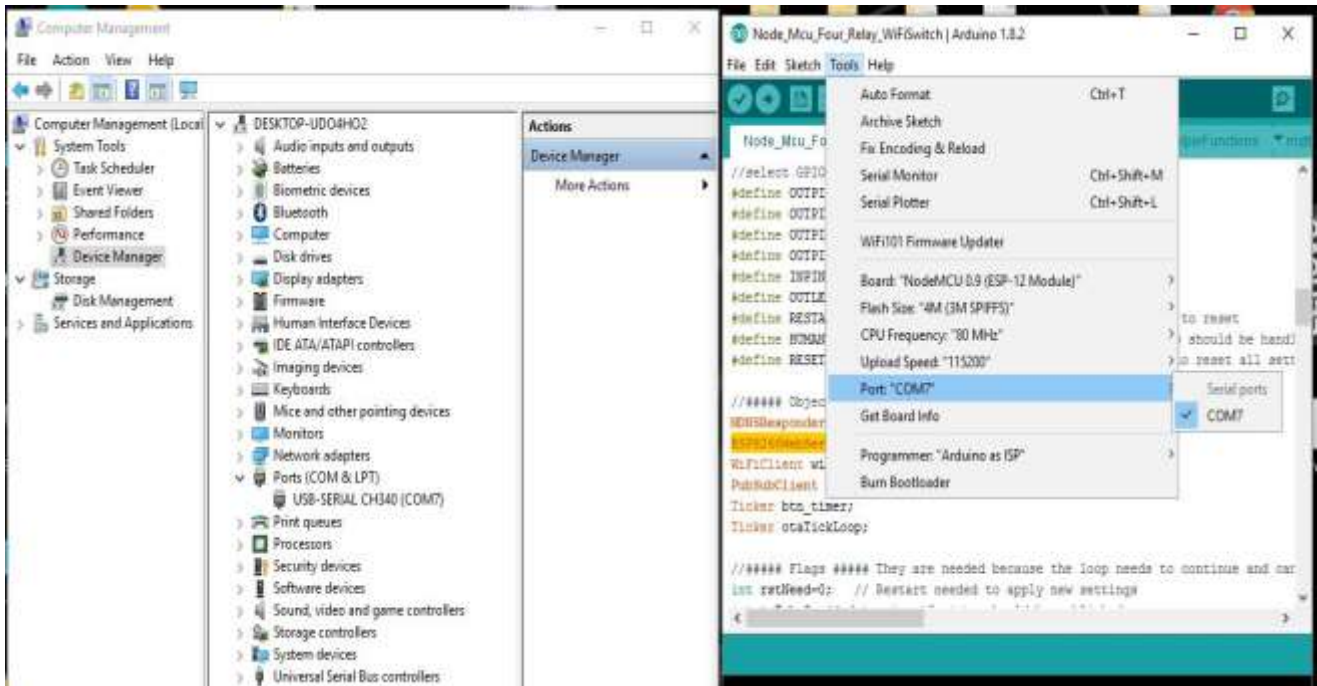


Figure 26: COM port selection.

- Run the program. Refer to Figure 27.

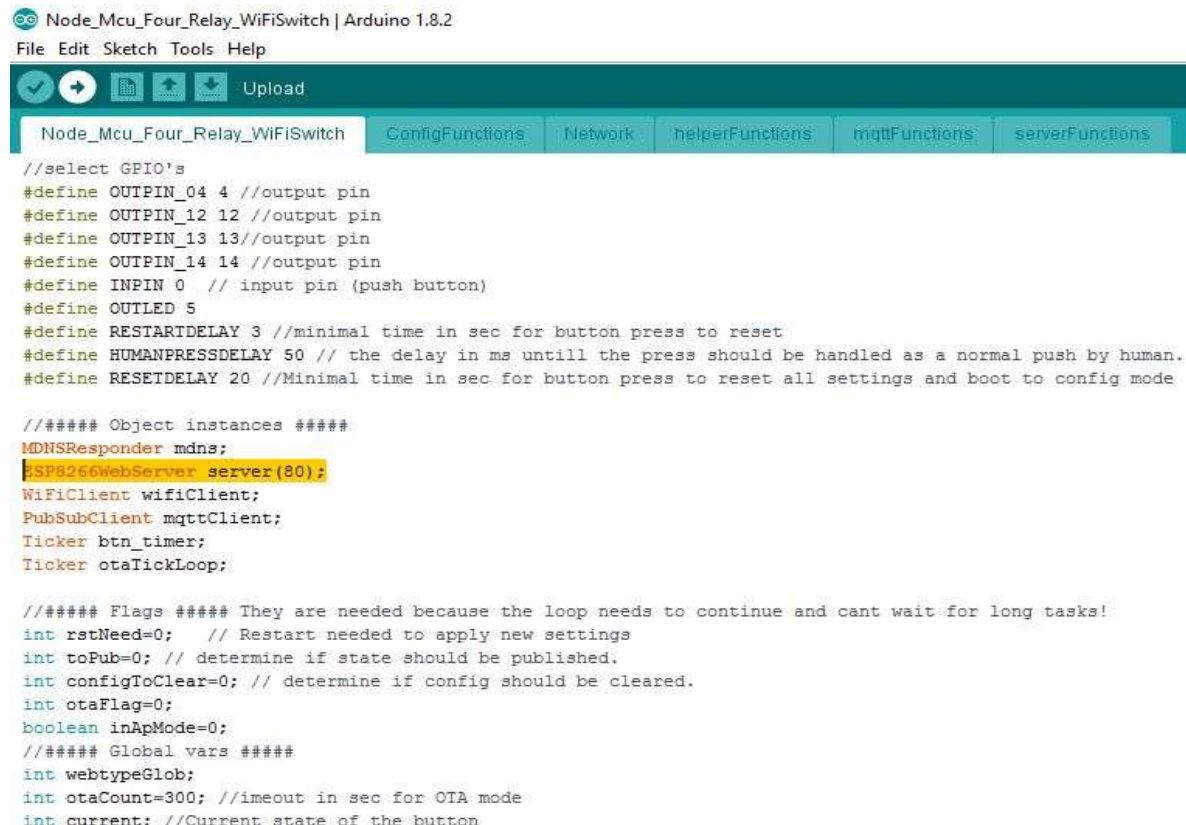


Figure 27: Code execution

### 13. FREQUENTLY ASKED QUESTIONS ON HARDWARE (FAQ's)

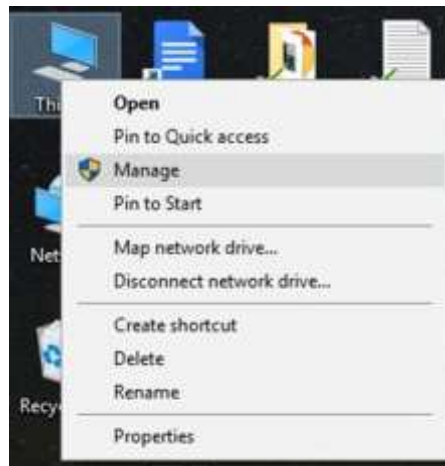
**i. Although you are connecting USB to your computer but not able to run or upload the program?**

Necessary and required **drivers** has to be installed on your computer so that you can easily connect, run, and upload the program.

Steps are as follows to install USB drivers:

**Step 1:** Right click on the **This PC** or **PC** icon

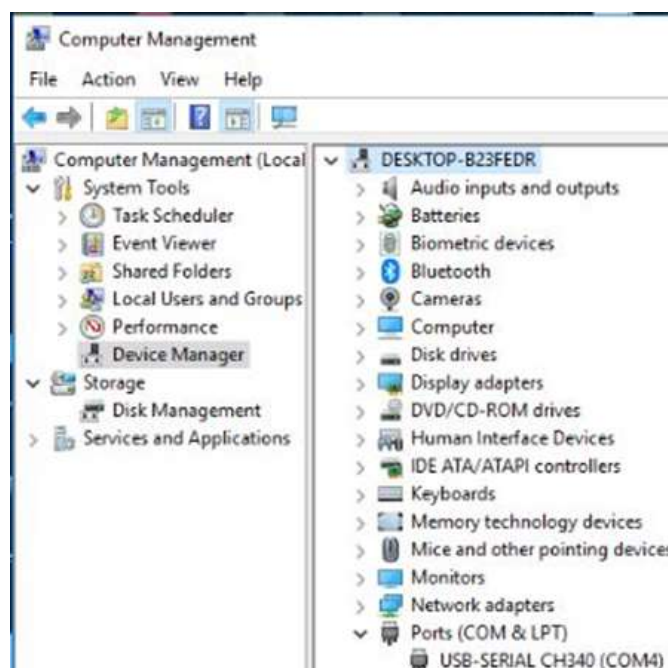
**Step 2:** Click on **Manage** option.



**Figure 28: Accessing device manager**

**Step 3:** To understand whether USB is connected or not ensure that your USB LED is blinking when connected to the respective port

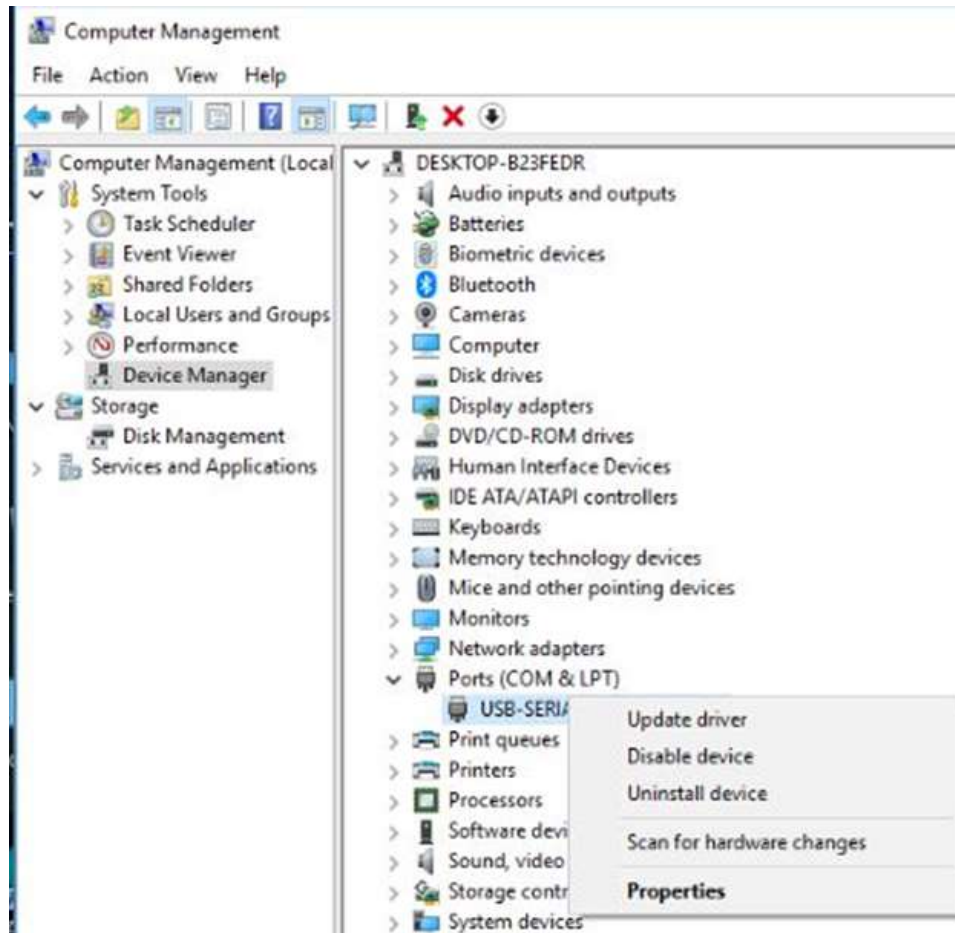
**Step 4:** Then click on the **Device manager** option on the left corner and select Ports option



**Figure 29: Device manager window**

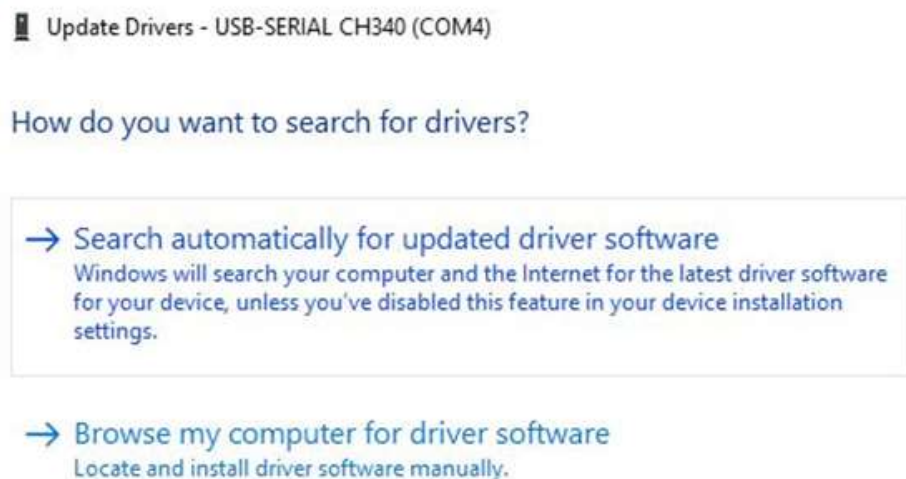
**Step 5:** Select USB-SERIAL xxxxx

**Step 6:** Right click on USB-SERIAL xxxxx and click on update driver




**Figure 30: USB port selection**

**Step 7:** Then click on Search automatically as shown below

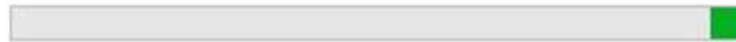


**Figure 31: USB driver update path selection**

**Step 8:** Then check whether required drivers are installed properly.

←  Update Drivers - USB-SERIAL CH340 (COM4)

Searching online for drivers...



**Figure 32: Searching for USB drivers**

**Step 9:** Then proceed with the further procedure run, upload the program.

## ii. How to reconfigure your Wifi Board?

Steps is as follows:

**Step 1:** enter the IP address (198.168.xxx.xxx) URL and will be directly connected to the Web server as shown in the figure below and click on **Configuration** option.



**Figure 33: Main menu page of device via http**

**Step 2:** Select the **Configuration Wifi** option from the list.

### Armtronix SD Module

## ARMtronix



**Figure 34: Sub menu to select confiration modes**

**Step 3:** Modify the SSID and Password as per your choice, also one more **SSID** and **Password** option is provided as backup. If the first SSID and Password is not connected to the Wifi then the second SSID and Password (if provided) will automatically get connected. You can provide Hostname (as per your choice).

### Armtronix SD Module

## ARMtronix

Scan for wifi networks

Wifi parameters

AP1 SSId ()

AP1 Password

AP2 SSId ()

AP2 Password

Hostname (%s-%04d)

Save

**Figure 35: Configuration details screen**



**Step 4:** Go to Step 2 and click on “Configure MQTT”

MQTT parameters

Host ()

Port (1883)

1883

Client (DVES\_F85231)

DVES\_%06X

User (DVES\_USER)

DVES\_USER

Password

.....

Topic = %topic% (Armtronix)

Armtronix

Full Topic (%prefix%/ %topic%/)

%prefix%/ %topic%/

Save

**Figure 36: MQTT parameter entry screen**

**Step 5:** Enter the MQTT parameters and click on **SAVE** button.

## 14. INTEGRATION WITH “OPENHAB”

### a. THINGS REQUIRED TO INSTALL OPENHAB ON RASPBERRY PI:

- Raspberry Pi 3 X 1
- SD Card 16 Gb X1
- 2A Power Supply 5V with USB data cable (micro)/USB Charger X1
- Raspberry Pi Case (Optional)
- SD Card Reader
- Monitor
- Keyboard
- Mouse
- HDMI to VGA Cable (optional in case Monitor is of VGA type)
- Amazon echo/ Amazon echo dot

### i. Important things to be downloaded:

- NOOBS from Raspberry Pi Website
- (<https://www.raspberrypi.org/downloads/noobs/>)
- SD Card Formatter  
([https://www.sdcard.org/downloads/formatter\\_4/eula\\_windows/index.html](https://www.sdcard.org/downloads/formatter_4/eula_windows/index.html))
- You should have active internet connection to update the OS and install Java updated version
- Putty for SSH in case you are using windows (<http://www.putty.org/>)
- FileZilla (optional) in case you want to transfer some demo files directly to pi  
(<https://filezilla-project.org/download.php>)

### ii. Installing Raspberry Pi OS and Updating it:

- First Step is to setup your Raspberry Pi. To do that, NOOBS should be extracted into a folder, example let's say folder “NOOBS”.
- In this folder you will find around three folders (defaults, OS, overlays) and around fourteen files (Not mentioned here).
- Plug in your SD card reader with the 16GB SD card inserted to your computer USB. Format it using the SD card formatter (FAT32 format)
- Dump/Copy the contents of NOOBS folder into the formatted SD card (3 Folders + around 14 files)
- Eject the SD card reader, plug out the SD card and place it on your Raspberry Pi SD card holder
- Connect Power Supply/Charger, monitor via HDMI /VGA (HDMI to VGA Cable required in case monitor is of VGA type), Keyboard, Mouse to the raspberry pi.
- Power on the Charger/Power supply
- Raspberry Pi takes you through the setup process and it is quite simple and intuitive.
- A few points to be considered while installing are, select Debian/Raspbian OS while installing, select Us keyboard /Language for most of the countries except UK and give access to the internet, you have to set up your SSID and Password.
- Once the installation is done please cross check that you are connected to the internet.
- If you are not connected to the internet then on the right-hand corner of the computer you

will see an icon/Wifi icon (something like a computer icon) click it, it will show you various Wifi connections available.

- Pick the appropriate SSID. It will ask you to enter its Key (password).
- Once that is done open the terminal (greyish black color monitor image) found on left hand side mid corner.
- Type "**sudo apt-get update**"
- After the source list is updated on the same terminal type "**sudo apt-get upgrade**"
- This will take some time but will update your raspberry pi OS
- This will setup your Raspberry Pi
- Now we have few things to install and will be discussed in the next step.

iii. Installing/Updating required software/drivers:

**a) To update Java please follow the instructions mentioned below:**

- Check Java version by typing "java -version" in the terminal
- If your java version is lesser than "1.8.0\_101" please follow the below commands
- First remove openjdk
- sudo apt-get purge openjdk\*
- add packet source
- sudo nano /etc/apt/sources.list
- add the following lines at the end of the sources.list file
- deb http://ppa.launchpad.net/webupd8team/java/ubuntu trusty main
- deb-src http://ppa.launchpad.net/webupd8team/java/ubuntu trusty main
- 

**b) Install Java 8**

- sudo apt-get update sudo apt-get install oracle-java8-installer sudo apt-get install oracle-java8-set-default
- remove old Java
- sudo apt-get purge openjdk\*
- sudo apt-get purge java7\*
- sudo apt-get autoremove
- check success of upgrade by typing
- java -version
- Check if it is above "1.8.0\_101"
- 

**c) Install Mosquitto Mqtt Broker by using the following command**

- sudo apt-get install mosquitto
- To install mqtt client use
- sudo apt-get install mosquitto\_client
- 

**d) Activating SSH if it is not Open in your Raspberry pi's terminal Type**

- sudo raspi-config
- Go to Interfacing Options and press enter
- There you will find P2 SSH Enable/Disable SSH
- Select that by using up/down arrow key and press enter



- We are basically enabling the ssh option for further use.

#### e) Installing OpenHab

We can now continue to install OpenHab on raspberry pi. To do this, open terminal again and type the following commands

- `sudo apt-get update`
- `sudo apt-get upgrade`
- `sudo apt-get install screen mc vim git htop`
- First, add the openHAB 2 Bintray repository key to your package manager and allow Apt to use the HTTPS Protocol:
- `Wget -qO - 'https://bintray.com/user/downloadSubjectPublicKey?username=openhab' | sudo apt-key add -`
- `sudo apt-get install apt-transport-https`
- `echo 'deb https://dl.bintray.com/openhab/apt-repo2 stable main' |`
- `sudo tee/etc/apt/sources.list.d/openhab2.list`
- `sudo apt-get update`

#### f) Now install OpenHAB with the following commands

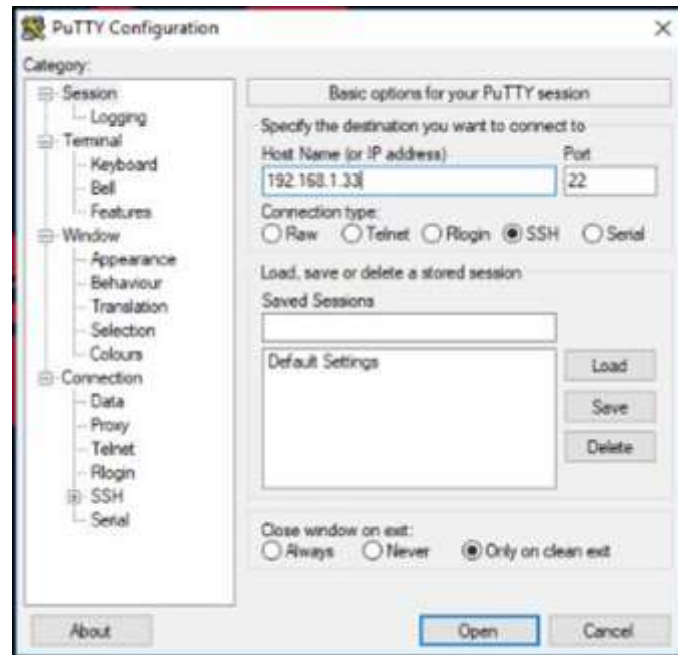
- `sudo apt-get install openhab2`
- When you choose to install an add-on, openHAB will download it from the internet on request. If you plan to disconnect your machine from the internet, then you have to install the add-ons package.
- `sudo apt-get install openhab2-addons`
- If everything goes well, you can start openHAB and register, it will be automatically executed at system startup.
- `sudo systemctl start openhab2.service` `sudo systemctl status openhab2.service`
- `sudo systemctl daemon-reload`
- `sudo systemctl enable openhab2.service`
- The first start may take up to 15 minutes, you should be able to reach the openHAB 2 Dashboard at `http://your_raspberry_pi_ip:8080` at this point from any computer in the same network, any browser.
- Once you open it, click on the Paper UI and then go to addons.
- Inside addons click on bindings.
- Here go the Http Binding and install it (here instead of mqtt we are configuring armtronix boards under Http mode).

After installing the http binding go to the tab MISC and install openHAB Cloud Connector. This is required for internet access and to interface it with Alexa.

You can also go to the USER interface tab and install the Basic/Classic UI to control your appliances after integration.

## b. STEPS EXPLAINED ON, HOW TO USE OPENHAB IN WINDOWS

**Step 1:** Open Putty Configuration application and enter the IP address 193.168.1.33 as shown in the figure below and make sure to select the connection type as SSH and click on OPEN. Putty for SSH in case you are using windows ( <http://www.putty.org/>)



**Figure 37: Putty application for Raspberry Pi**

**Step 2:** Login as Pi and enter the password as raspberry.

**Login as :** pi

root@192.168.1.33's

**Password :** raspberry

**Step 3:** Type the command as `etc/openhab2` on the Terminal (greyish black color monitor) to enter into Openhab2 file as shown in the figure below.



**Figure 38: Path for the file**

**Step 4:** `cd /etc/openhab2/sitemaps/` You will be in the site map folder you need to create a file with extension as `.sitemap`, To do that

Type nano

**Amtronix\_Office.sitemap Example:** "Armtronix\_Office.sitemap" is the name of that file . Once you press enter, it will give you a blank file for editing. Site map is basically a layout.

**Group item=w10 label="Single relay" icon="group"**

```
{
    Switch item=w101 label="Relay"
}
```

**Step 7:** Next thing is to create the file with **.item** as an extension. To do this change to your item directory by typing **cd /etc/openhab2/items**. For http mode, the URL **http://(IP address of the board)/ay?0=1**, (IP address is different for different boards) for toggling (**ON / OFF**).

**Example:** **http://192.168.1.22/ay?0=1**

```
pi@raspberrypi:/etc/openhab2 $ ls
html icons items persistence rules scripts services sitemaps sounds things transform
pi@raspberrypi:/etc/openhab2 $ cd items
pi@raspberrypi:/etc/openhab2/items $
```

Figure 39: OpenHAB sub folders, Accessing item folder

**Group w101**

**Switch w101 "Relay"(w10,Lights)**

```
{http=">[ON:POST:http://192.168.1.22/ay?o=1] >[OFF:POST:http://192.168.1.22/ay?o=1]"}
```

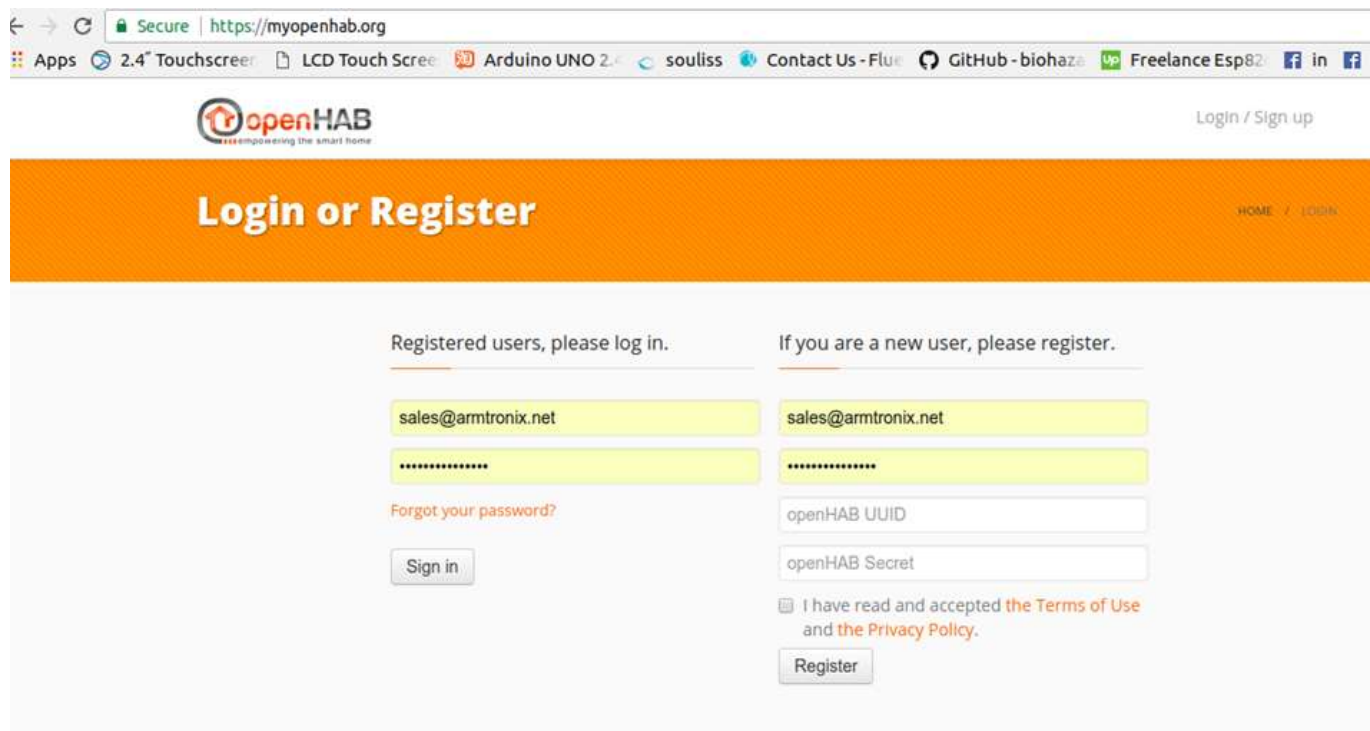
```
Switch w101 "Relay" (w10,Lights) {http=">[ON:POST: http://192.168.1.22/ay?o=1] >[OFF:POST: http://192.168.1.22/ay?o=1] "}
```

**Step 8:** Code for Item file in MQTT mode, where 'sub' indicates the subscribe topic which is mentioned during the configuration.

**Switch sr "Relay"(w10)**

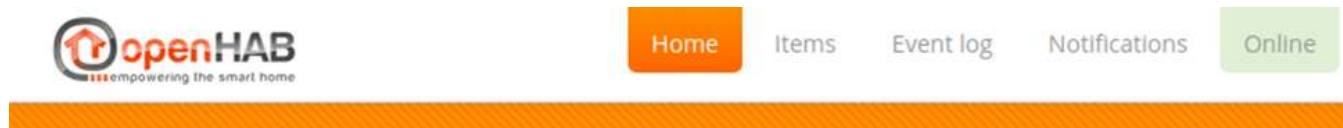
```
{mqtt">[broker:test_sub/test/:command:ON:D2_ON],>[broker:test_sub/test/:command:OFF:D2_OFF],>[broker:/w10:state:MAP(w10d2.map)]",autoupdate="false"}
```

**Step 9:** You can Register yourself in OpenHAB by typing the URL **https://myopenhab.org**, if you have already registered then you can enter the E-mail address and password and then click on **Sign in**, as shown in the figure below.



**Figure 40: Login page of OpenHAB**

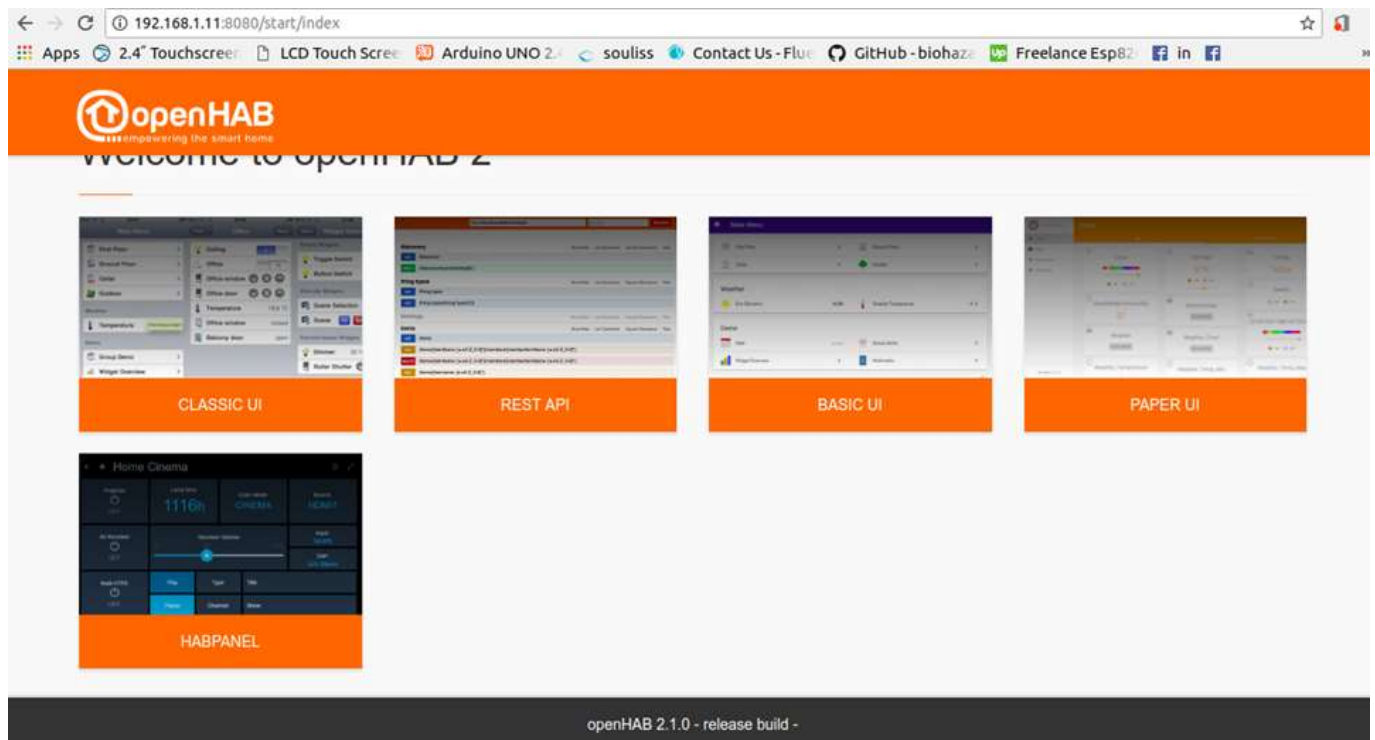
**Step 10:** Once you register yourself with the OpenHAB you will be taken to the following page as shown in the figure below.



**Figure 41: Menu bard of OpenHAB**

**Step 11:** Enter the IP address for which your Board is configured, then you will be taken to the following page as shown in the figure below.

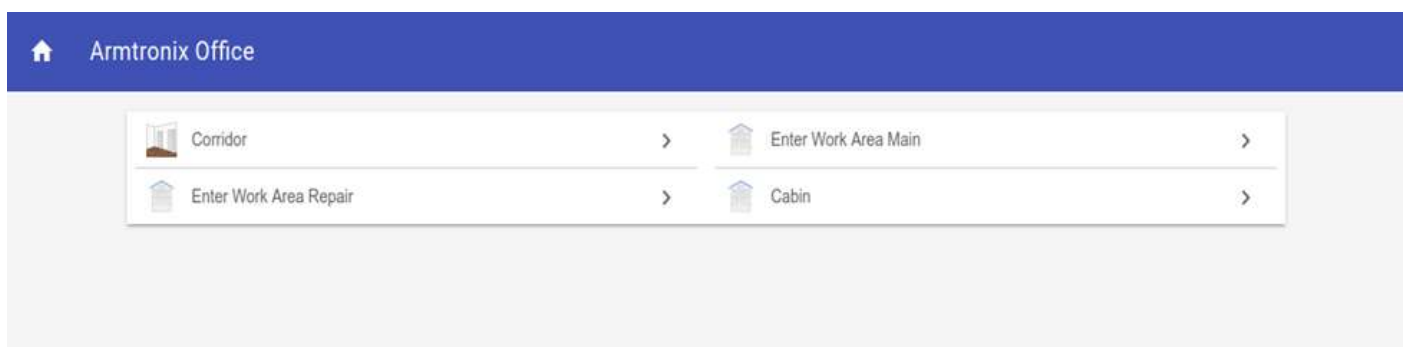
**Example:** 192.168.1.11



**Figure 42: Home page of device with entered IP**

**Step 12:** After creating the Sitemap file in **.sitemap** extension and Item file in **.item** extension as mentioned in the previous steps, the external appearance in OpenHab application is as shown in the figure below.

**Example:** ARMtronix Office.



**Figure 43: Devices are categorized as Groups under frame**

**Step 13:** In OpenHab application you will be provided with the options such as Control, Inbox, Configuration, Add-on and Preferences. If you click on Add-on option then you will be provided with many options as shown in the figure below.

**Example:** Add-on option in that Binding option and you can select any binding of your choice and install it (basically ARMtronix boards are configured for HTTP mode), which is suitable for your application.

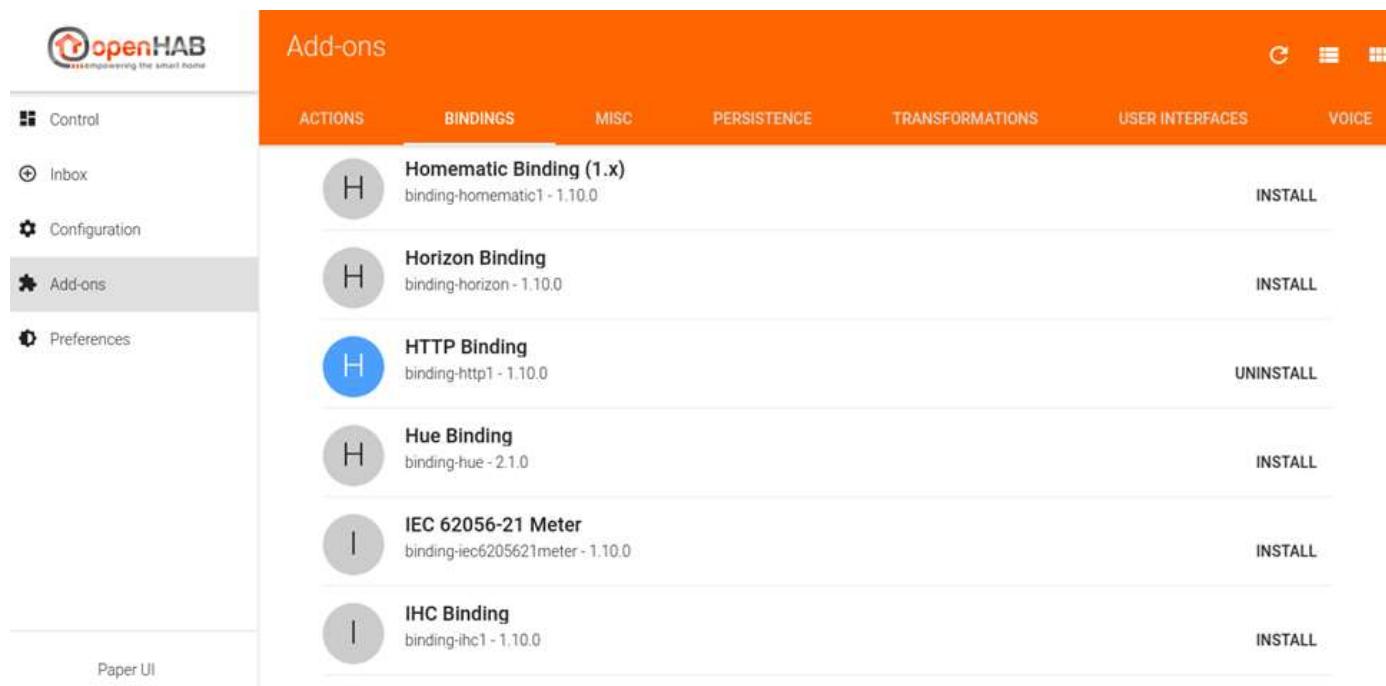


Figure 44: OpenHAB Add-ons binding option selection

## 15. FAQ ON OPENHAB

### i. How To Configure OpenHab Application?

Consider the following steps to configure your OpenHab application.

**Step 1:** Make sure that your Smartphone is connected to the OpenHab cloud connector, if not then click on Add-on option in that you have to select the MISC option under that check whether OpenHab cloud connector is installed first, if not install it (It is required basically to interface with Alexa).

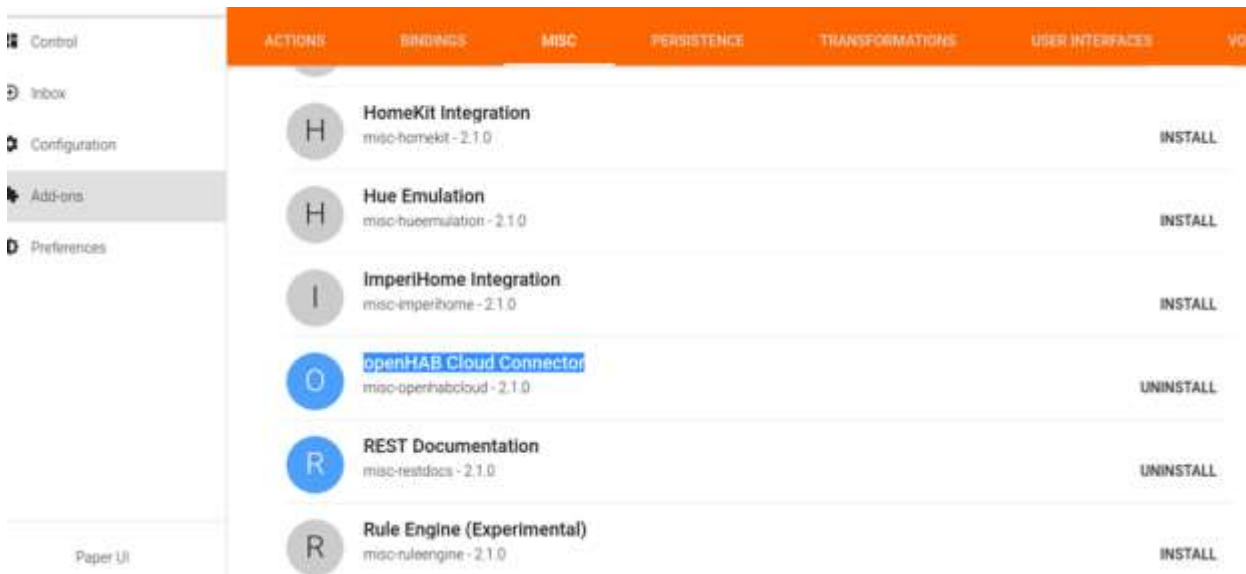


Figure 45: Binding option selected as OpenHAB

**Step 2:** In OpenHab application there is Configuration option under that select the option Services then a dialog box appears where you are able to see Configure OpenHab cloud and you can check the Mode, for that you will be provided with the dropdown where you can select the suitable Mode for your application, Base URL for OpenHab cloud server and items to expose to apps and you can select by clicking on the checkboxes provided in front of the options and you can save it by clicking on the SAVE option, as shown in the figure below.

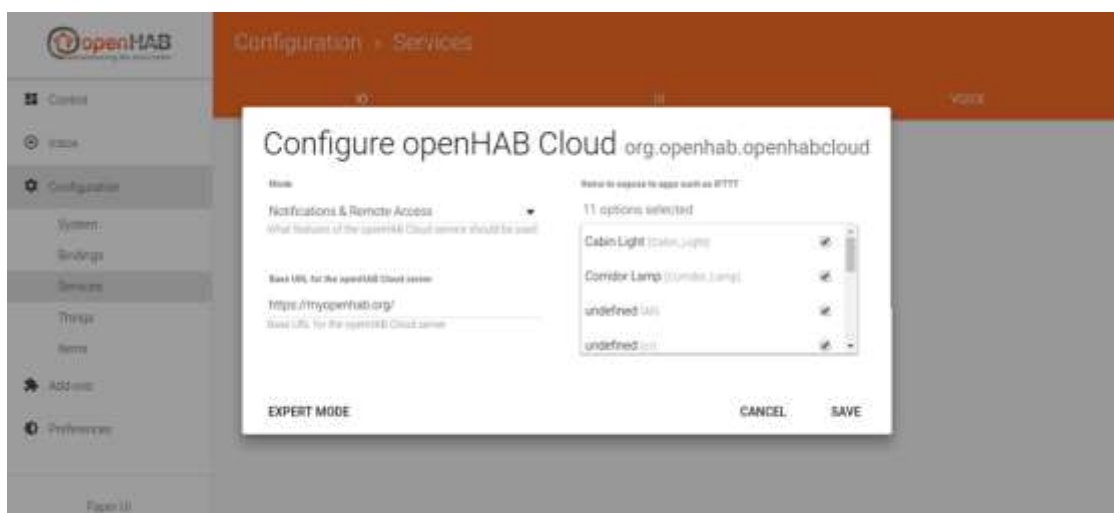


Figure 46: Device selection to configure with OpenHAB



## 16. INTEGRATION WITH “AMAZON ALEXA”

### a. STEPS TO INSTALL ALEXA APP IN SMARTPHONE

- Download the Amazon Alexa app from the Google Play Store.
- Open it and sign in to your Amazon account.
- Open Settings on your Android phone
- Open Apps
- Tap "Default Apps"
- Select "Assist & voice input"
- Choose Alexa instead of Google Assistant.

After you've followed the steps above, you'll see a prompt to talk to Alexa. It'll ask for permissions, so tap "Allow" to let Alexa hear your requests and control devices in your smart home.

Now you'll be able to hold the home button to pull up Alexa. You can use Alexa to turn on smart lights at home ("Alexa, turn on the living room lights," for example)

Following steps explain how to use Amazon Alexa through your Smartphone

**Step 1:** Click on Amazon Alexa app installed in your Smartphone.



**Figure 47: Alexa app bootup screen**




**Step 2:** Click on  the icon which is present on the right-bottom corner of your Smartphone as shown in the figure below.



Figure 48: Alexa app home screen

**Step 3:** Click on **All Devices** option to check which devices are connected to the Amazon Alexa as shown in the figure below.

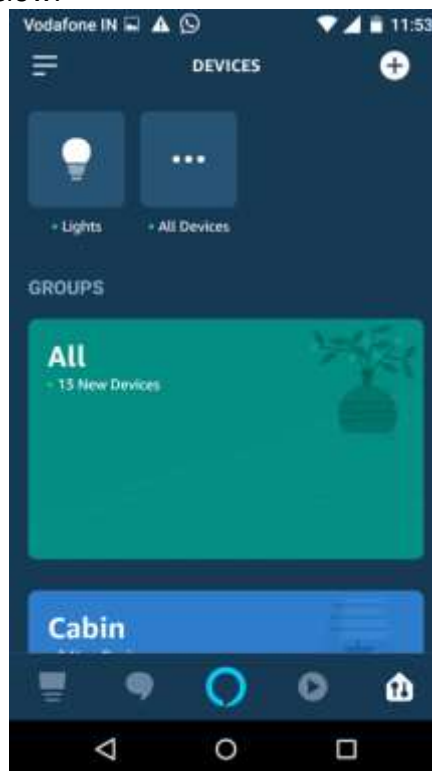


Figure 49: Check # of devices connected

**Step 4:** You can make groups of your choice and it shows how many devices are connected to that particular group as shown in the figure below,

Example: Cabin, Lab, Entrance, Office etc.

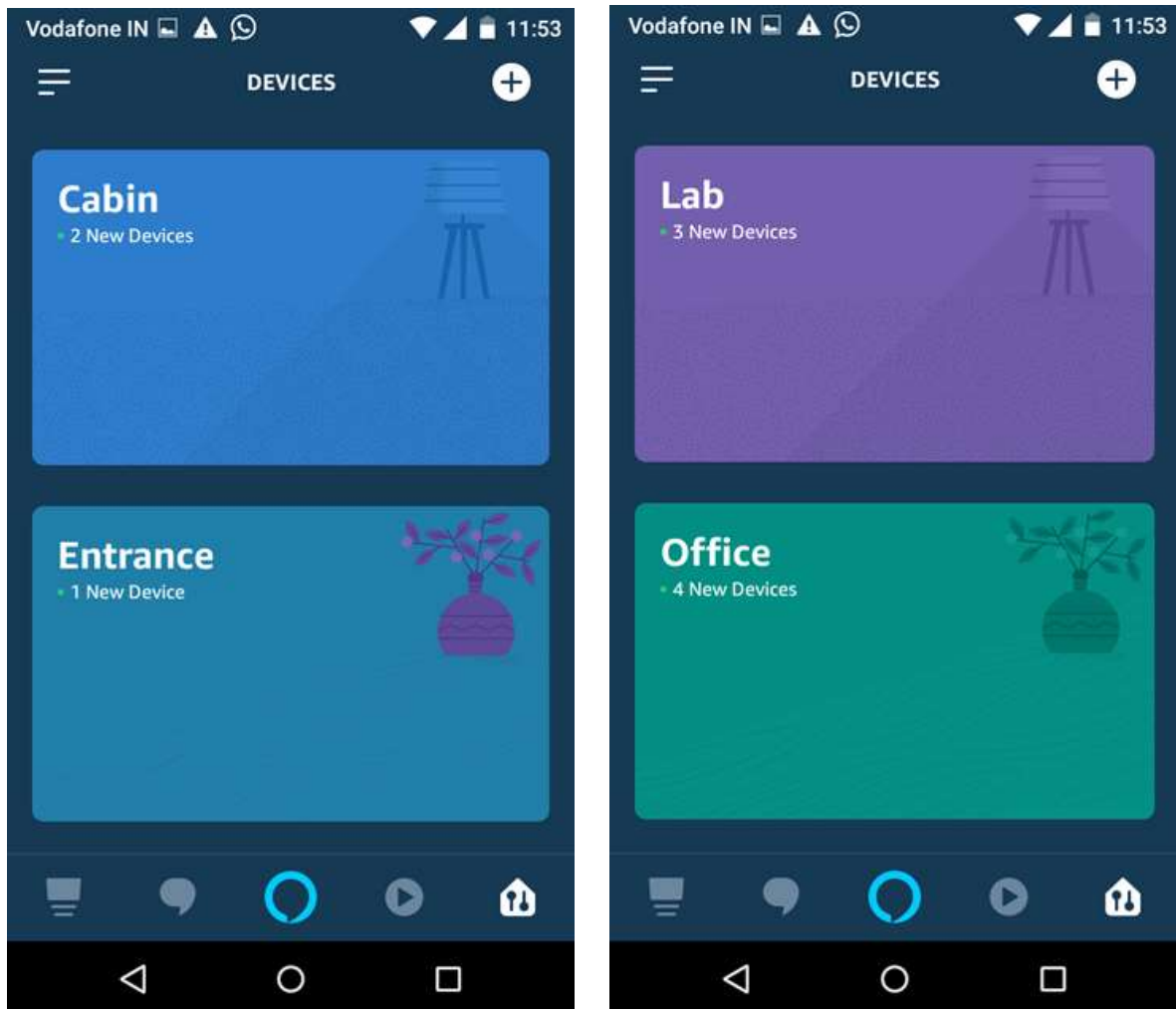


Figure 50: Devices divided as groups in Alexa app

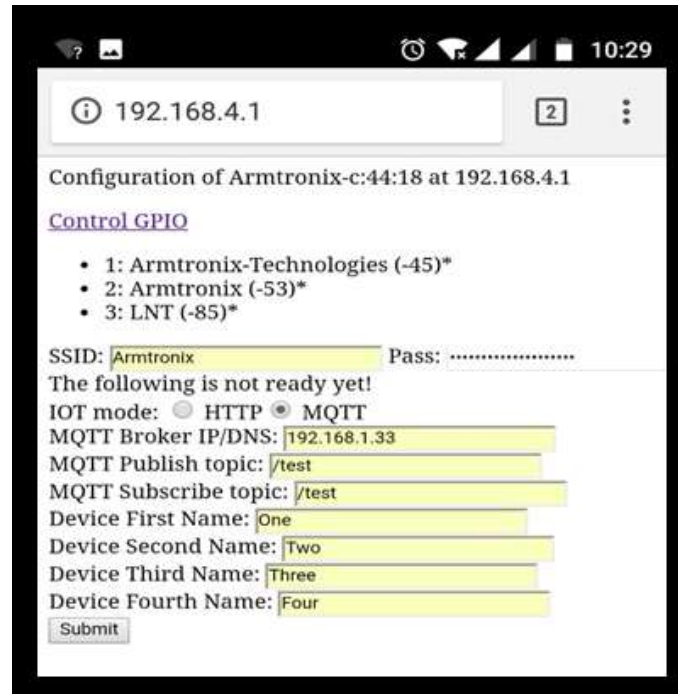
**Step 5:** Upon voice recognition by Alexa you can control Loads (Fan, Lights) by giving commands.

**Example:**     **Alexa turn ON Cabin Lights**  
                       **Alexa turn OFF Cabin Lights**

**Alexa turn ON Office Lights**  
**Alexa turn OFF Office Lights**

**Note:** Ensure that to interface with Alexa you are connected to the "OpenHAB Cloud Connector".

**Step 6:** Ensure that when you click on All option under groups, it displays the device name which you have mentioned during the configuration time as shown in the figure below.



**Figure 51: Names are defined for loads**

## 17. INTEGRATION WITH “GOOGLE HOME”

### a. FOLLOWING STEPS EXPLAIN, HOW TO INTEGRATE GOOGLE HOME WITH OPENHAB

To use the OpenHab integration for Google Assistant on your smartphone, you will need the Google Assistant or Google Home app (iOS or Android)

Before you start integration, make sure that the OpenHAB is installed and configured with our devices.

**Step 1:** Make sure Google Play Services is up to date

- Visit "Google Assistant" app entry in Google Play Store on Android
- Set up the voice-activated speaker, Pixel, or Android phone (version 6+) with the same test account
- Make sure you're the correct user
- Start the updated Google Assistant app on your phone

**Step 2:** Open Google Assistant app in your Smartphone as shown in the figure below

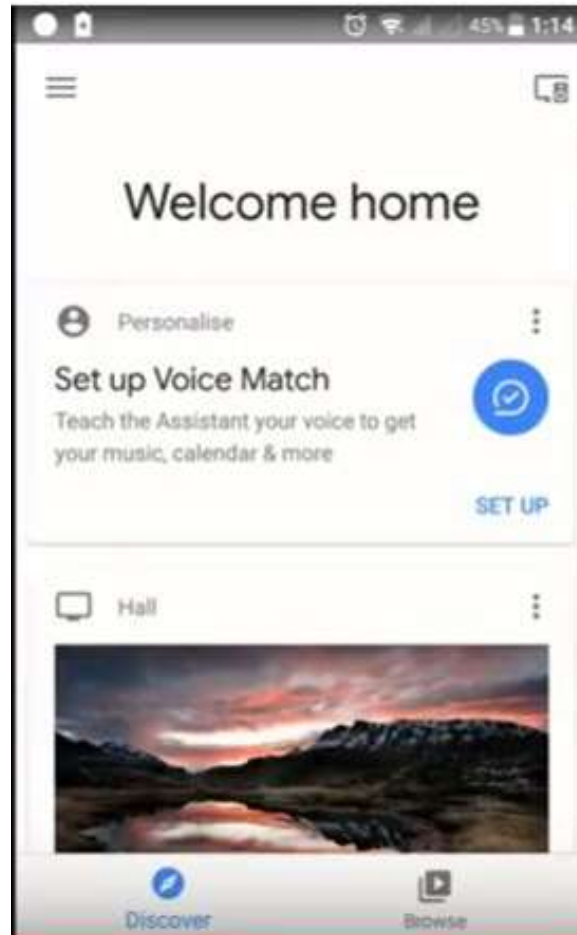
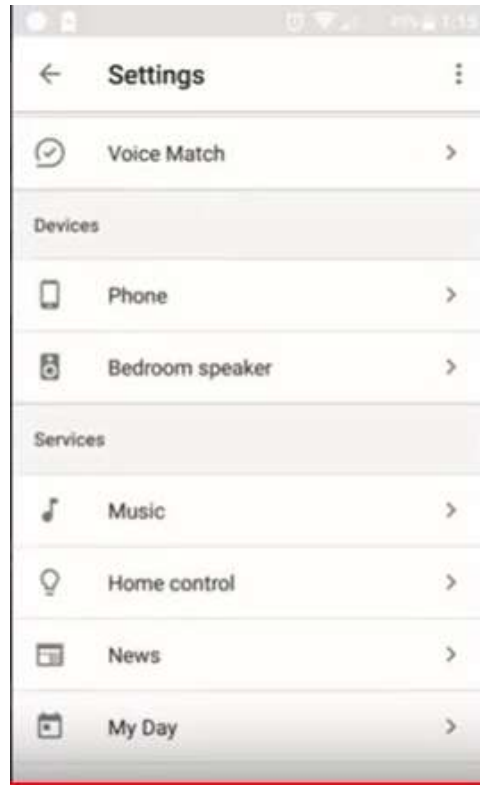


Figure 52: Google Home app's Home screen

**Step 3:** Go to Settings, under that go to services there you will be able to see the option Home control, click it.



**Figure 53: Google Home app's Settings screen**

**Step 4:** Click on the “+” sign under Home control which will take you to the Add devices



Figure 54: Google Home app's screen to Add IoT devices

**Step 5:** Under Add devices select the option OpenHab as shown in the figure below

**Note:** Ensure that your Smartphone is connected to the OpenHab cloud connector



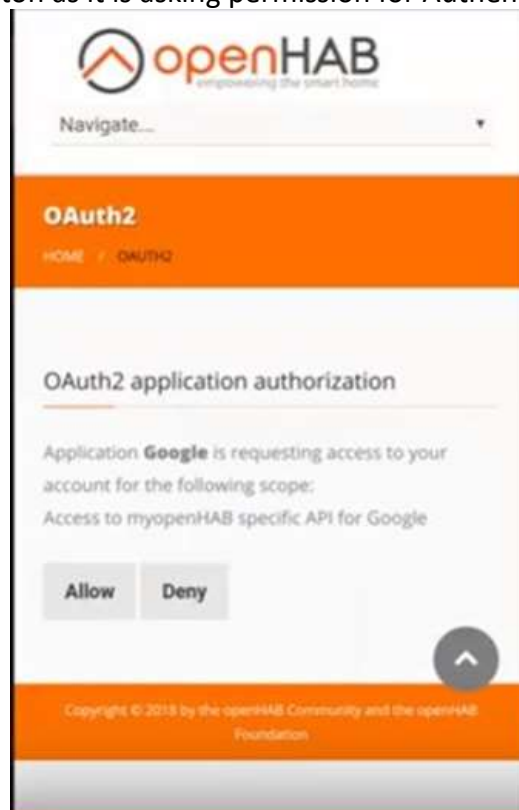
Figure 55: Screen to Add cloud service provider

**Step 6:** Click on OpenHab and enter the E-mail ID and Password.



**Figure 56: Login Screen**

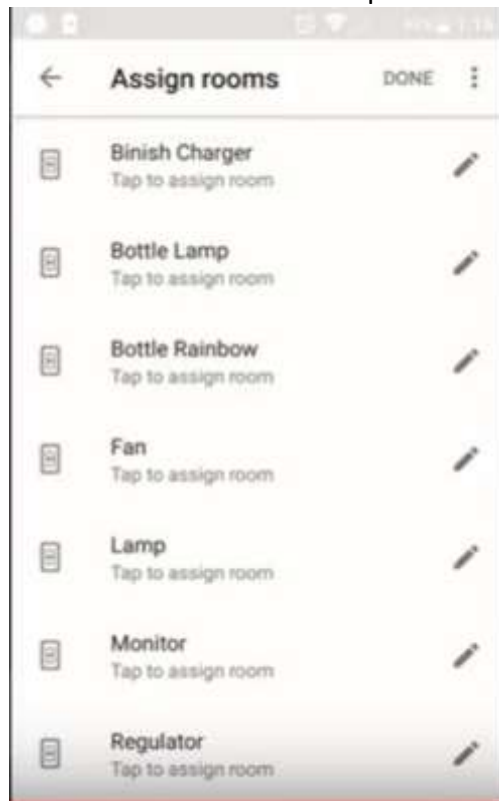
**Step 7:** Click on Allow button as it is asking permission for Authentication with Google home.



**Figure 57: Apps's permission authentication screen**



**Step 8:** It will display the devices connected with the OpenHab as shown in the figure below.



**Figure 58: List of added devices**

**Step 9:** Now it is ready to give commands and upon voice recognition Google home respond to the commands given.

Example: **Google turn on fan**

**Google turn off fan**

**Google turn on Lights**

**Google turn off Lights**

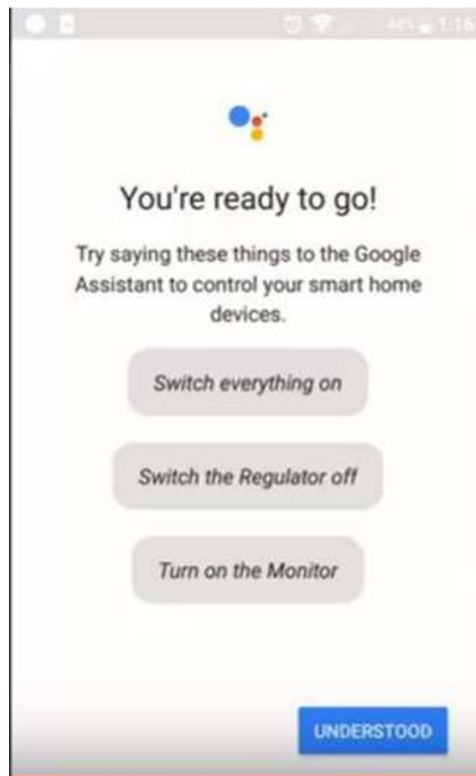


Figure 59: Device control screen



**DOCUMENT #:** BA015

**DOCUMENT REV:** A

**DOCUMENT NAME:** DESIGN DESCRIPTION, IoT HEAVY DUTY RELAY WITH POWER MONITORING MODULE.

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