

DESCRIPTION DOCUMENT FOR IoT HEAVY DUTY RELAY WITH POWER MONITORING BOX

HARDWARE REVISION 0.3

Department	Name	Signature	Date
Author			
Reviewer			
Approver			

Revision History

Rev	Description of Change	Effective Date
A	Initial Release	
B	GPIO configuration updated as per Hardware ver 0.3	20 MAR 2020

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.



Table of Contents

Revision History	1
1. ABBREVIATIONS	6
2. REFERENCES	6
3. PURPOSE	6
4. SCOPE	6
5. SAFETY AND WARNING	7
6. PRODUCT FEATURES	7
a. SPECIAL FEATURES	7
7. PRODUCT DESCRIPTION	8
a. PHYSICAL DESCRIPTION	8
b. FUNCTIONAL DESCRIPTION	8
8. SYSTEM OVERVIEW	9
9. TECHNICAL SPECIFICATION	10
a. ELECTRICAL SPECIFICATION	10
i. Input Electrical Specification	10
ii. Output Electrical Specification	10
b. MECHANICAL SPECIFICATION	11
i. PCB Dimension	11
ii. Box Dimension	11
10. ELECTRICAL CONNECTIONS	12
a. HEADER AND SWITCH DETAILS	12
b. ESP USED GPIO PIN CONFIGURATION:	12
c. APPLICATION WIRING DIAGRAM	13
i. Example-1:	13
d. HEADER PIN CONFIGURATION	14
i. Header J3:	14
ii. Header J7	14
iii. Header J8	14
11. HOW TO USE THE PRODUCT	15
a. CONFIGURE DEVICE TO EXISTING NETWORK	15
b. CONFIGURING DEVICE FOR MQTT MODE:	18
12. HOW TO CUSTOMISE FIRMWARE	20
a. STEPS TO LOAD PROGRAM TO ESP8266:	20
13. FREQUENTLY ASKED QUESTIONS ON HARDWARE (FAQ's)	23
14. INTEGRATION WITH "OPENHAB"	28
a. THINGS REQUIRED TO INSTALL OPENHAB ON RASPBERRY PI:	28
i. Important things to be downloaded:	28

ii.	Installing Raspberry Pi OS and Updating it:.....	28
iii.	Installing/Updating required sotware/drivers:	29
a)	To update Java please follow the instructions mentioned below:.....	29
b)	Install Java 8.....	29
c)	Install Mosquitto Mqtt Broker by using the following command	29
d)	Activating SSH if it is not Open in your Raspberry pi's terminal Type	29
e)	Installing OpenHab	29
f)	Now install OpenHAB with the following commands	30
b.	STEPS EXPLAINED ON, HOW TO USE OPENHAB IN WINDOWS	31
15.	FAQ ON OPENHAB.....	35
16.	INTEGRATION WITH "AMAZON ALEXA"	36
a.	STEPS TO INSTALL ALEXA APP IN SMARTPHONE.....	36
17.	INTEGRATION WITH "GOOGLE HOME"	40
a.	FOLLOWING STEPS EXPLAIN, HOW TO INTEGRATE GOOGLE HOME WITH OPENHAB	40

Table of figures

Figure 1: Block Diagram	8
Figure 2: PCB Mechanical Dimensions	11
Figure 3: Enclosure Dimension.....	11
Figure 4: Header and Switch positions	12
Figure 5: Load connection.....	13
Figure 6: Details Load connection diagram.....	13
Figure 7: Header J3 Pin Configuration	14
Figure 8: Device hosting Access point.....	15
Figure 9: Access point name	15
Figure 10: Hosting IP address.....	15
Figure 11: Web Server.....	16
Figure 12: Saving Configuration	16
Figure 13: Controlling a load	17
Figure 14: List of ESPs GPIOs available in dropdown list	17
Figure 15: Main Menu.....	18
Figure 16: Configuration Option	18
Figure 17: Option to configure to MQTT	19
Figure 18: Option to enter required MQTT details	19
Figure 19: BA019 to USB-UART converter connections.....	20
Figure 20: Board Selection	21
Figure 21: IDE Selection	21
Figure 22: COM port selection.	22
Figure 23: Code execution	22
Figure 24: Accessing device manager	23
Figure 25: Device manager window.....	23
Figure 26: USB port selection.....	24
Figure 27: USB driver update path selection	24
Figure 28: Searching for USB drivers.....	25
Figure 29: Main menu page of device via http	25
Figure 30: Sub menu to select configuration modes	26
Figure 31: Configuration details screen	26
Figure 32: MQTT parameter entry screen	27
Figure 33: Putty application for Raspberry Pi	31
Figure 34: Path for the file	31
Figure 35: OpenHAB sub folders, Accessing item folder	32
Figure 36: Login page of OpenHab.....	32
Figure 37: Menu bar of OpenHab	33
Figure 38: Home page of device with entered IP.....	33
Figure 39: Devices are categorized as Groups under frame	33
Figure 40: OpenHAB Add-ons binding option selection	34
Figure 41: Binding option selected as OpenHAB	35
Figure 42: Device selection to configure with OpenHAB	35
Figure 43: Alexa app bootup screen	36
Figure 44: Alexa app home screen.....	37
Figure 45: Check # of devices connected.....	37
Figure 46: Devices divided as groups in Alexa app	38
Figure 47: Names are defined for loads.....	39
Figure 48: Google Home app's Home screen.....	40
Figure 49: Google Home app's Settings screen	41

Figure 50: Google Home app's screen to Add IoT devices.....	41
Figure 51: Screen to Add cloud service provider	42
Figure 52: Login Screen	42
Figure 53: Apps's permission athentication screen	43
Figure 54: List of added devices.....	43
Figure 55: Device control screen.....	44

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	https://www.armtronix.in
Youtube Weblink	
Intractable's Weblink	
Github's Weblink	

3. PURPOSE

The purpose of this document is to outline the design description for the IoT Heavy Duty 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, RTC 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 Wiring diagram is available on our instructables page and github. 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.
- One relay with live AC powered output via NO or NC PIN of relay is accessible to user.
- Board output can handle Higher load.
- WiFi with MQTT or HTTP protocol
- MQTT Authentication with Username and Password.
- Basic Firmware to enter SSID and password to connect to the router.
- Firmware has ability to control device through HTTP and MQTT mode.
- Push Button on board Provided for device Reset.

a. SPECIAL FEATURES

- AC to DC Power supply module on board
- ESP8266-12 Wifi Module.
- AC Virtual Switch (physical switch can be rewired directly)
- Heavy Duty Electro-Mechanical Relay for higher current loads
- Output presence detection.
- Additional GPIOs for additional external inputs like sensor if required.
- Protection Fuse for safety of on-board circuitry.
- RTC on board.
- I2C 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

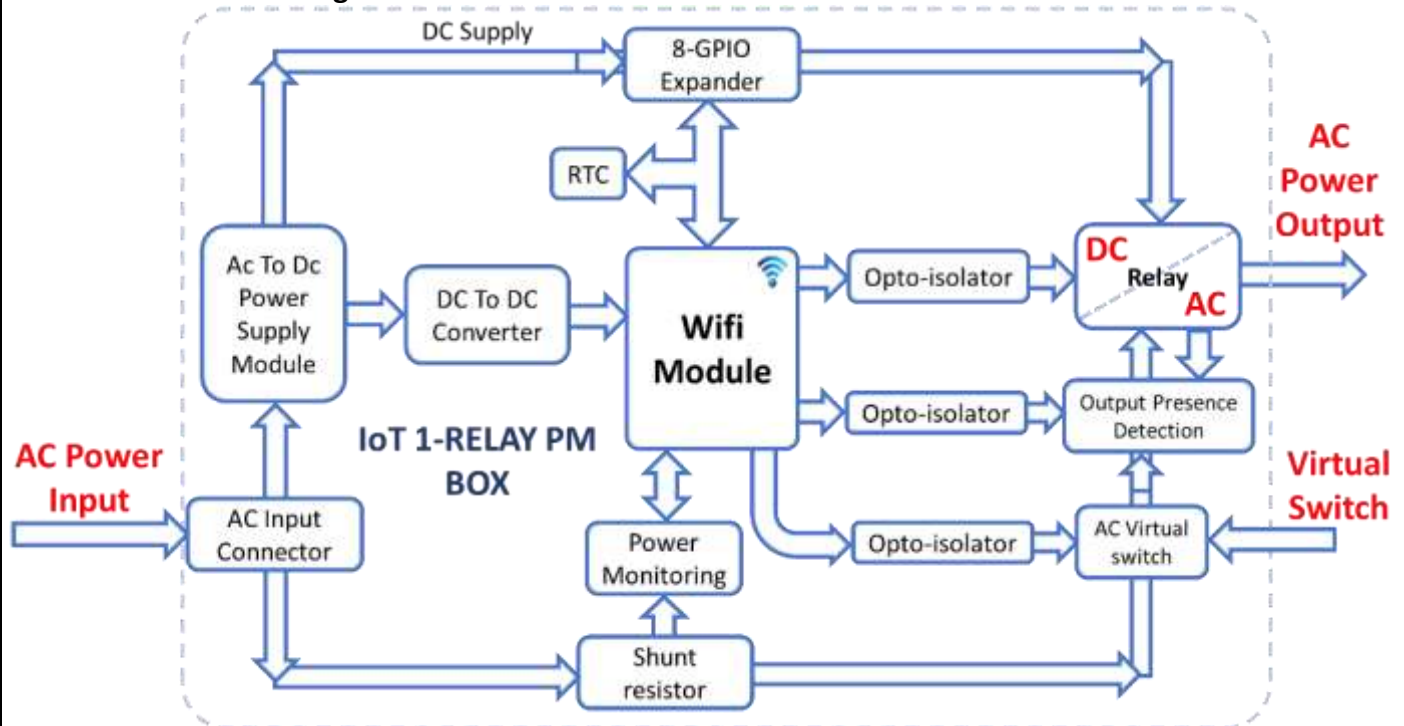


Figure 1: Block Diagram

IoT HDR PM (Heavy Duty Relay with Power Monitoring) box is special designed for Wifi enabled Building automation application. This can handle a load with High power consumption at 240 V AC. There is an electro-mechanical relay mounted on board to control (ON/OFF) external electrical loads from a mobile application using MQTT/HTTP protocol. It also has features like, power presence detection after relay and 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 for programming using an external USB-UART converter. It has on-board 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 via mobile phones.

8. SYSTEM OVERVIEW

1. AC to DC Power supply module

AC to DC converter is power supply module manufactured from Hi-Link part number HLK-PM01. This power supply module rectifies and regulates voltage from 230 V AC to 5 V DC with output current capacity of 0.6A DC. The power of HLK-PM01 is at maximum of 3W.

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. AC Virtual Switch

AC Virtual switch circuit is connected to Wifi module through an opto isolator 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.

6. I2C Expander

I2C expander provides general purpose input output expansion with an I2C interface to our other products compatible with ESP12 Node MCU header.

I2c Device Default address is 0x27

This I2C address can configured with help of resistors A0, A1 and A2 combination. It helps you to stack up multiple GPIO expander boards up to 8 numbers on top of one another, with different I2C address.

7. RTC

Real Time Clock DS1307 which is commonly used I2C based RTC for real time to schedule an operation in our board for home automation or any other automation application.

I2c Device Default address is 0x68

9. TECHNICAL SPECIFICATION

a. ELECTRICAL SPECIFICATION

i. Input Electrical Specification

Input Specifications				
Description	Min	Typ	Max	Unit
Voltage AC	100	220	230	Volts
Current AC	-	0.1	-	Amps
Power AC	-	3	-	Watts
Frequency	50	-	60	Hz

ii. Output Electrical Specification

Relay Output Specifications (Maximum)				
Description	Min	Typ	Max	Unit
Voltage AC	-	-	240	Volts
Power AC	-	-	6000	Watts
Voltage DC			30	Volts
Power DC			600	Watts

b. MECHANICAL SPECIFICATION

i. PCB Dimension

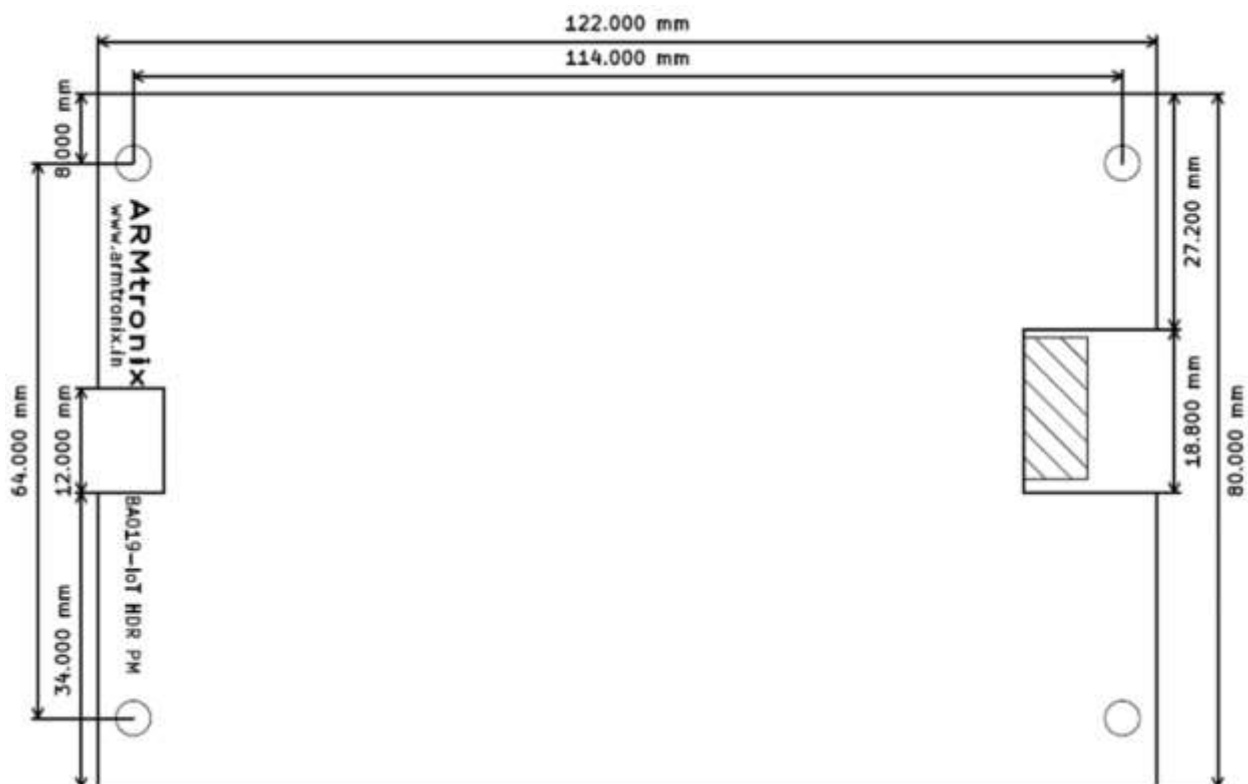
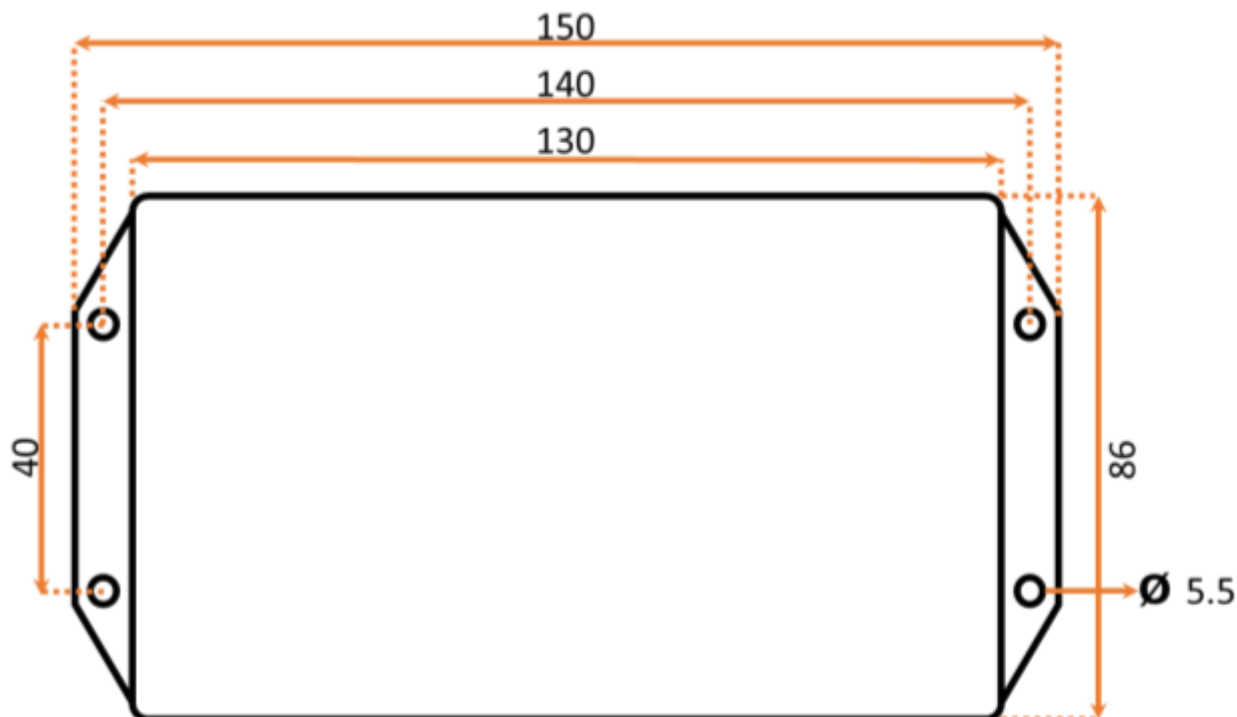


Figure 2: PCB Mechanical Dimensions

ii. Box Dimension



Note: All dimensions are in mm only.

Figure 3: Enclosure Dimension

10. ELECTRICAL CONNECTIONS

a. HEADER AND SWITCH DETAILS

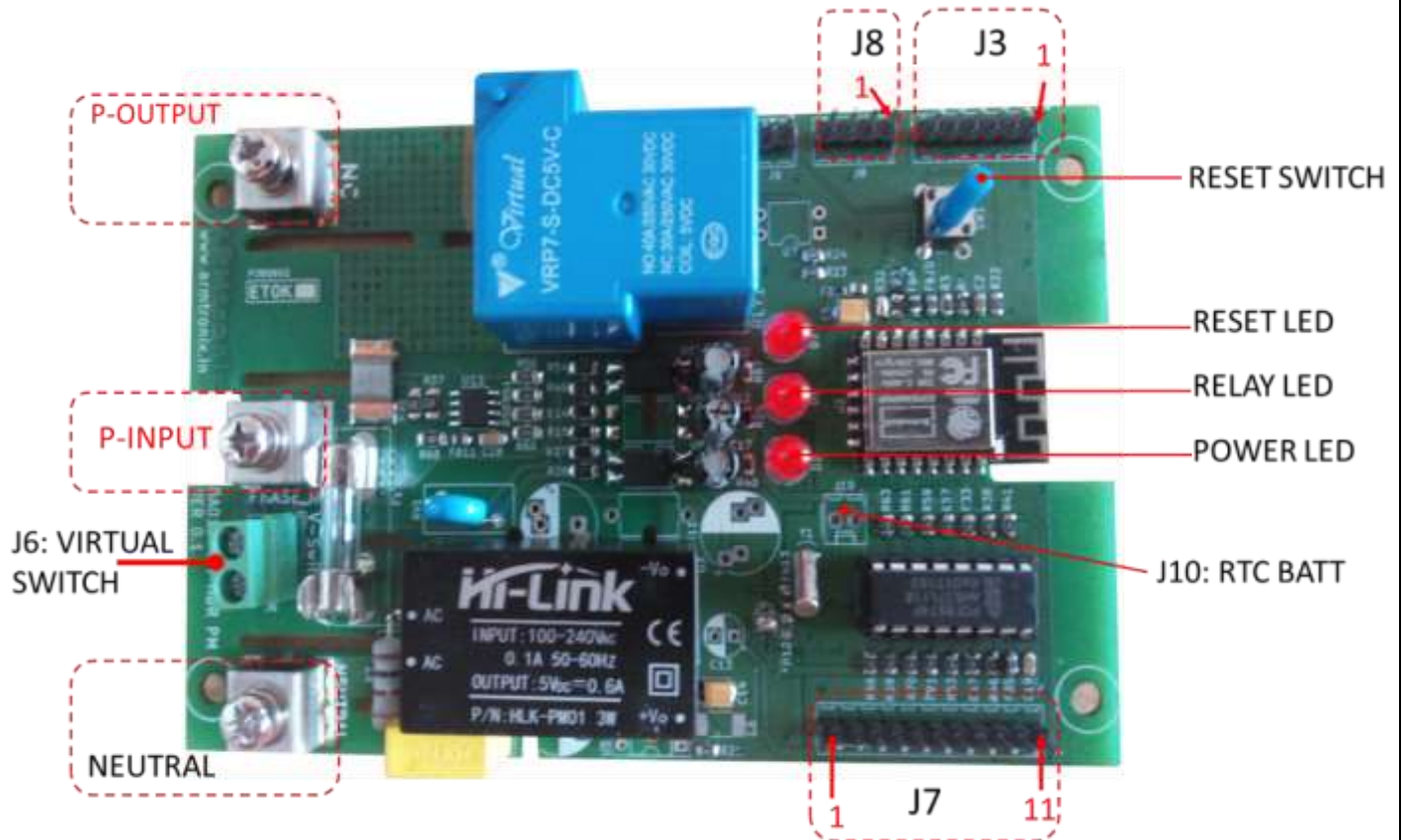


Figure 4: Header and Switch positions

Note:

- For higher loads, please do not use the on-board neutral and recommended to use external neutral.
- 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
16	D8	GPIO15	HLW8012_SEL
20	D1	GPIO5	Virtual Switch
7	D7	GPIO13	HLW8012_CF1
5	D5	GPIO14	HLW8012_CF
19	D2	GPIO4	Relay
4	D0	GPIO16	Relay output detection
17	D4	GPIO2	I2C_SCL
18	D3	GPIO0	I2C_SDA

Table 1:: ESP Pin Configuration

c. APPLICATION WIRING DIAGRAM

i. Example-1:

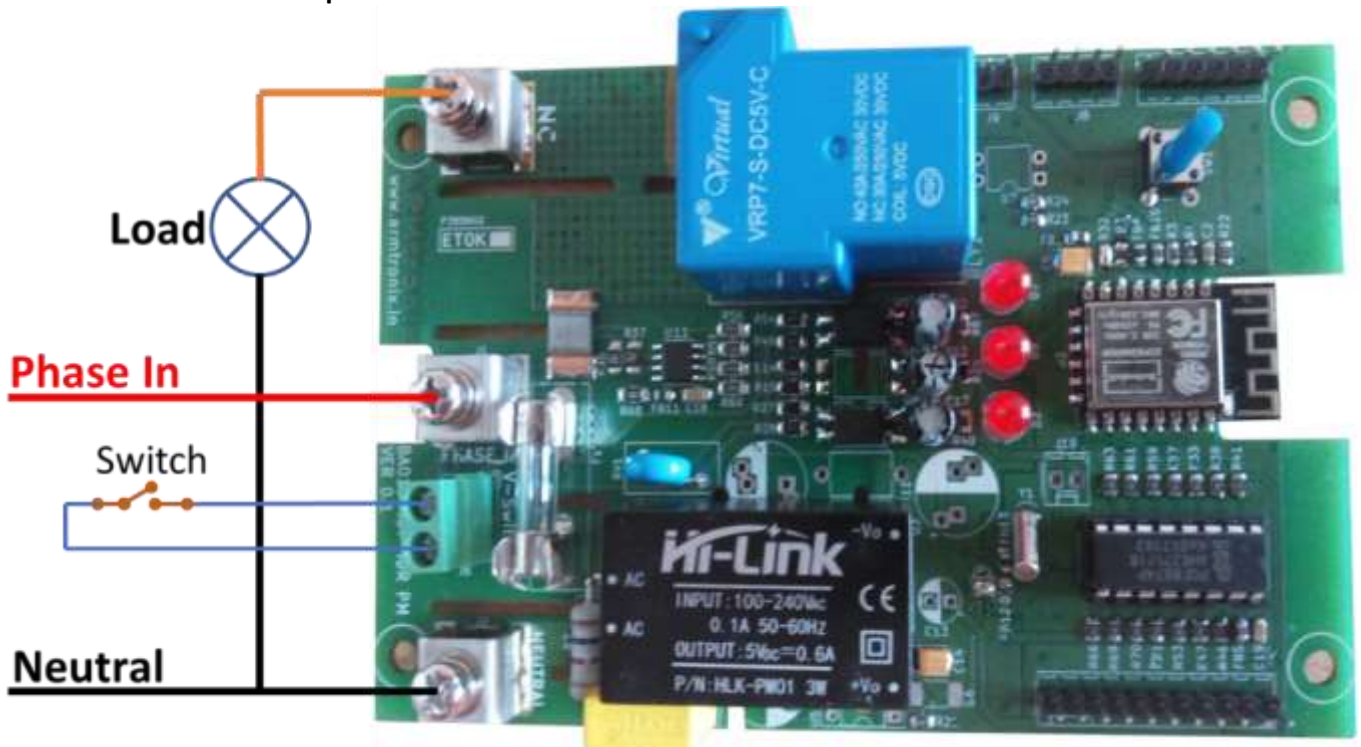


Figure 5: Load connection

Figure 5 represents about connection between electrical load and relay output connector.

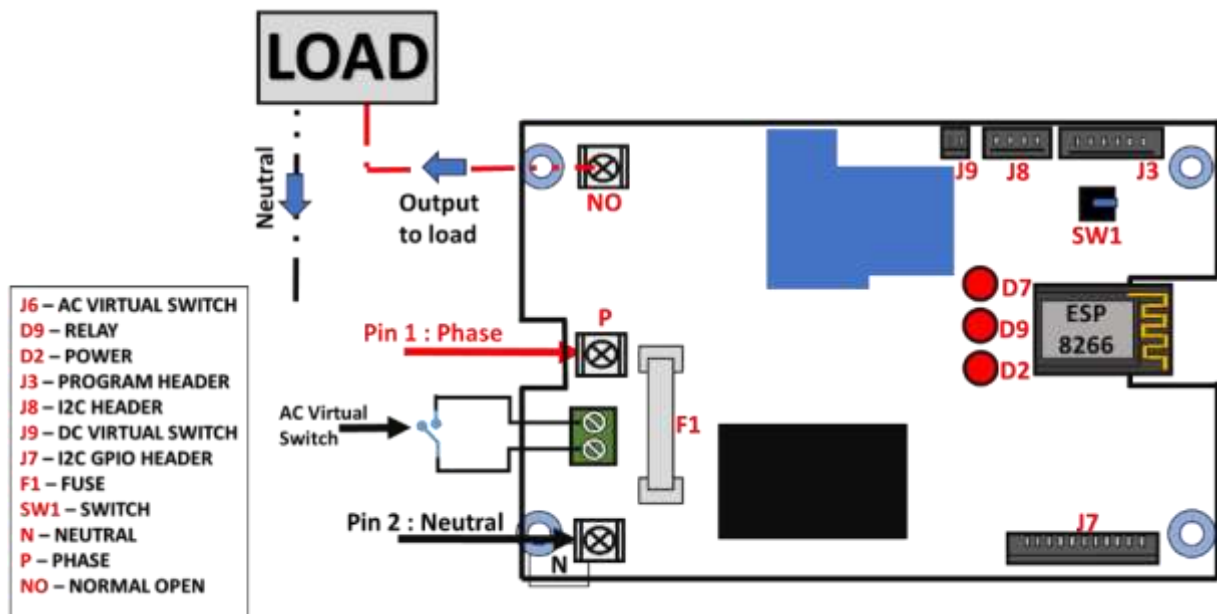


Figure 6: Details Load connection diagram

d. HEADER PIN CONFIGURATION

i. Header J3:

Header Pin #	ESP8266-12 Pin #	Designator	Description
1	-	5V	5V output or input
2	22	TxDE	Transmission from board
3	21	RxDE	Reception by board
4	-	RTSE	
5	-	DTRE	
6	-	GNDD	Ground

Figure 7: Header J3 Pin Configuration

ii. Header J7

Header Pin	PCF8574P GPIO #	Designator	Description
1	1	P1	PCF_GPIO1
2	2	P2	PCF_GPIO2
3	3	P3	PCF_GPIO3
4	4	P4	PCF_GPIO4
5	5	P5	PCF_GPIO5
6	6	P6	PCF_GPIO6
7	7	P7	PCF_GPIO7
8	-	GNDD	GNDD
9	-	+5V	5V DC
10	-	P0	PCF_GPIO0
11	-	ADC_Ex	ESP ADC_Ex up to 3.3V DC

Table 2: Header J7 Pin Configuration

iii. Header J8

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

Table 3: Header J8 Pin Configuration

11. HOW TO USE THE PRODUCT

a. CONFIGURE DEVICE 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 D2 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 6 below:

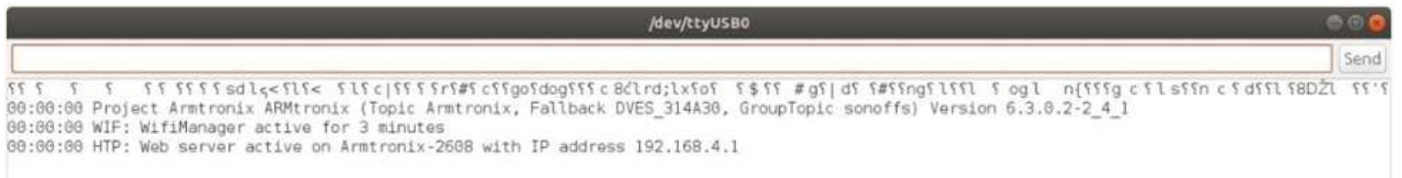


Figure 8: Device hosting Access point

9. Connect the mobile to access point with Armtronix-(MAC ID) within 3 minutes as shown below.
EX: Armtronix-2608 as shown in Figure 7 below:

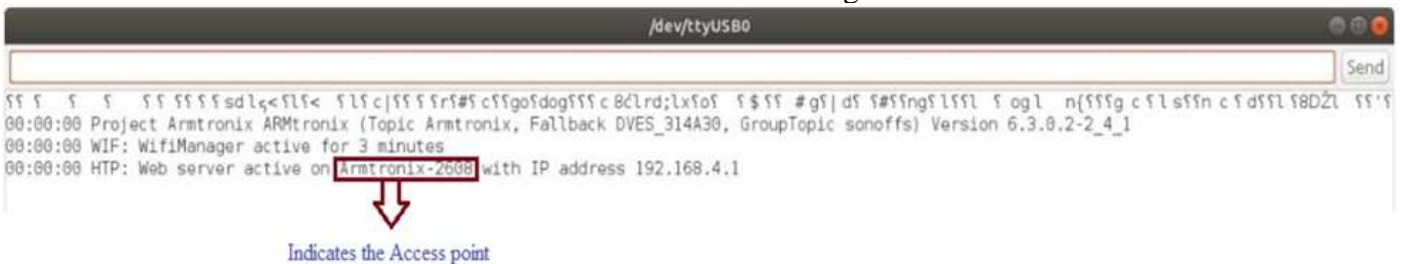


Figure 9: Access point name

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 8 below:

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

Figure 10: 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 9 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 11: Web Server

Once the **Configuration** is done it displays the message as shown in the figure 10 below,



Figure 12: 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 11 below.



Figure 13: 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 12, below.

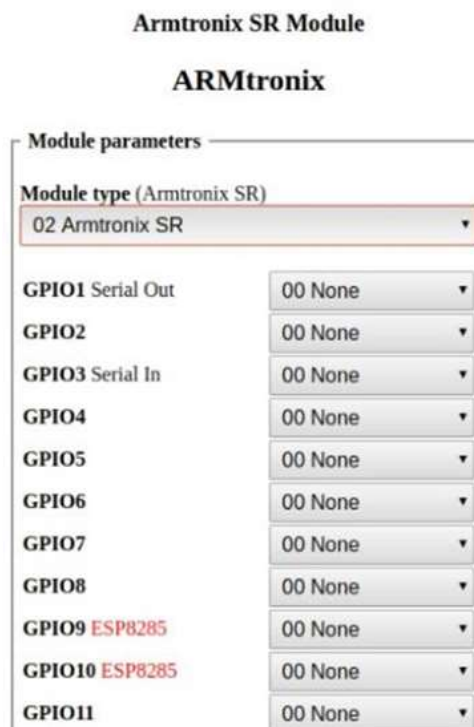


Figure 14: List of ESPs GPIOs available in dropdown list

12. One more advantage is that the user can easily **Configure** and **Upgrade** his **Firmware** through smartphone and option is also provided to choose file directly from the phone if it is available as shown in figure 11.

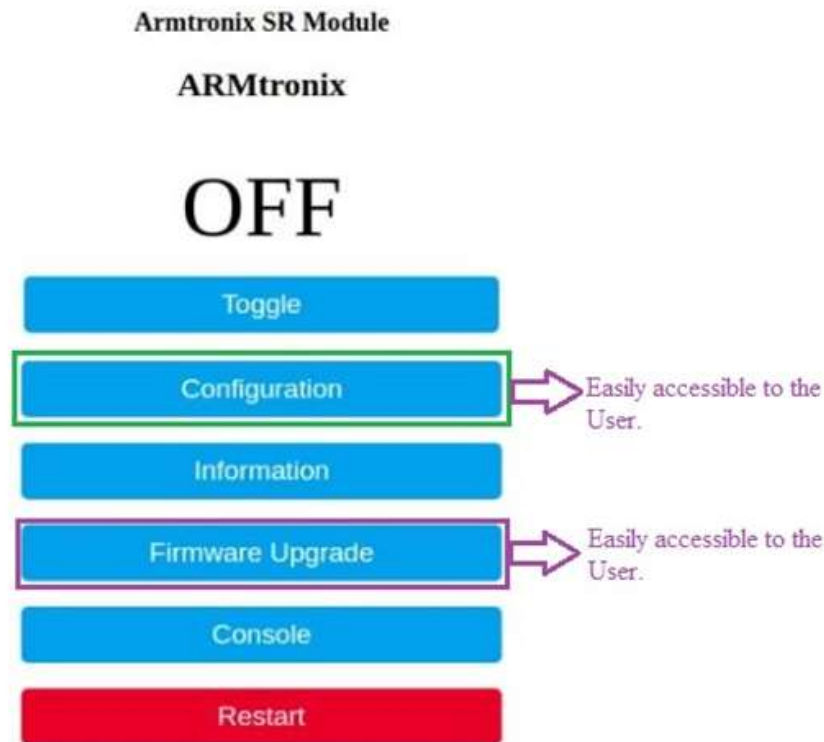


Figure 15: Main Menu

b. CONFIGURING DEVICE FOR MQTT MODE:

1. click on the Configuration option as shown in the figure 14,



Figure 16: Configuration Option

- Click on Configure MQTT option provided as shown in the figure 15 below,



Figure 17: Option to configure to MQTT

- User shall click on the SAVE button as shown in figure 16 below, once after entering required details to get access to MQTT protocol from the web server.

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

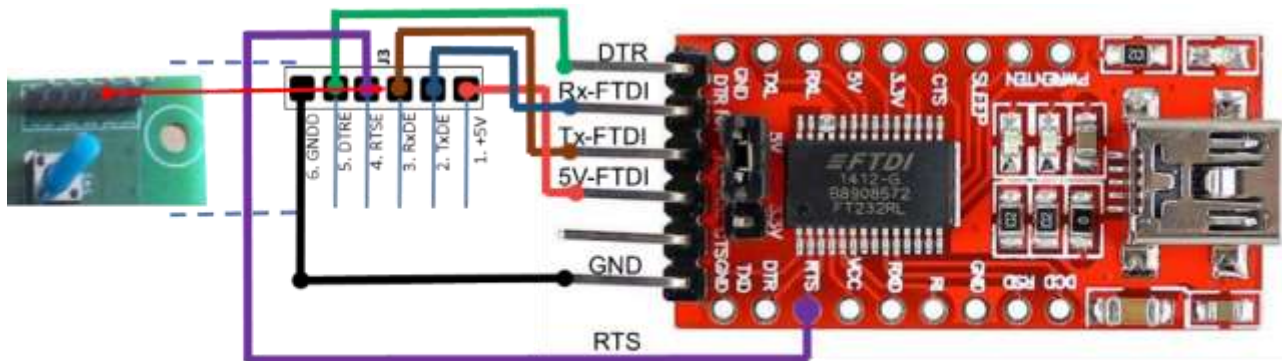
Figure 18: Option to enter required MQTT details

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 17 below:



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

Figure 19: BA019 to USB-UART converter connections

3. Open your code in Arduino IDE.

4. Click on Tools Tab, move mouse pointer on “Board: xxxxxxxxxxxx” and click on “NodeMCU0.9 (ESP-12 Module)” as shown in figure 18.

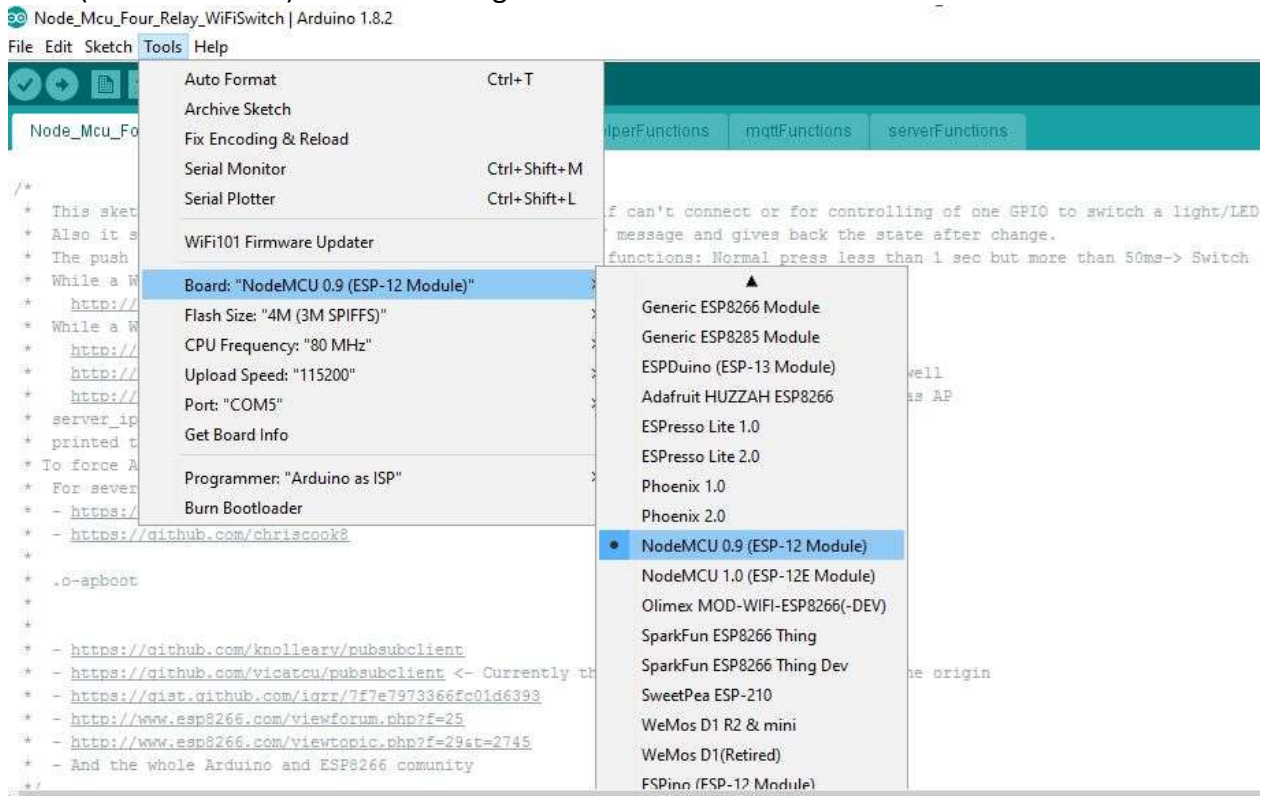


Figure 20: Board Selection

5. Click on tools tab, move mouse pointer to “Programmer: “Arduino as ISP””, under this click on “Arduino as ISP” to select. Refer to figure 19

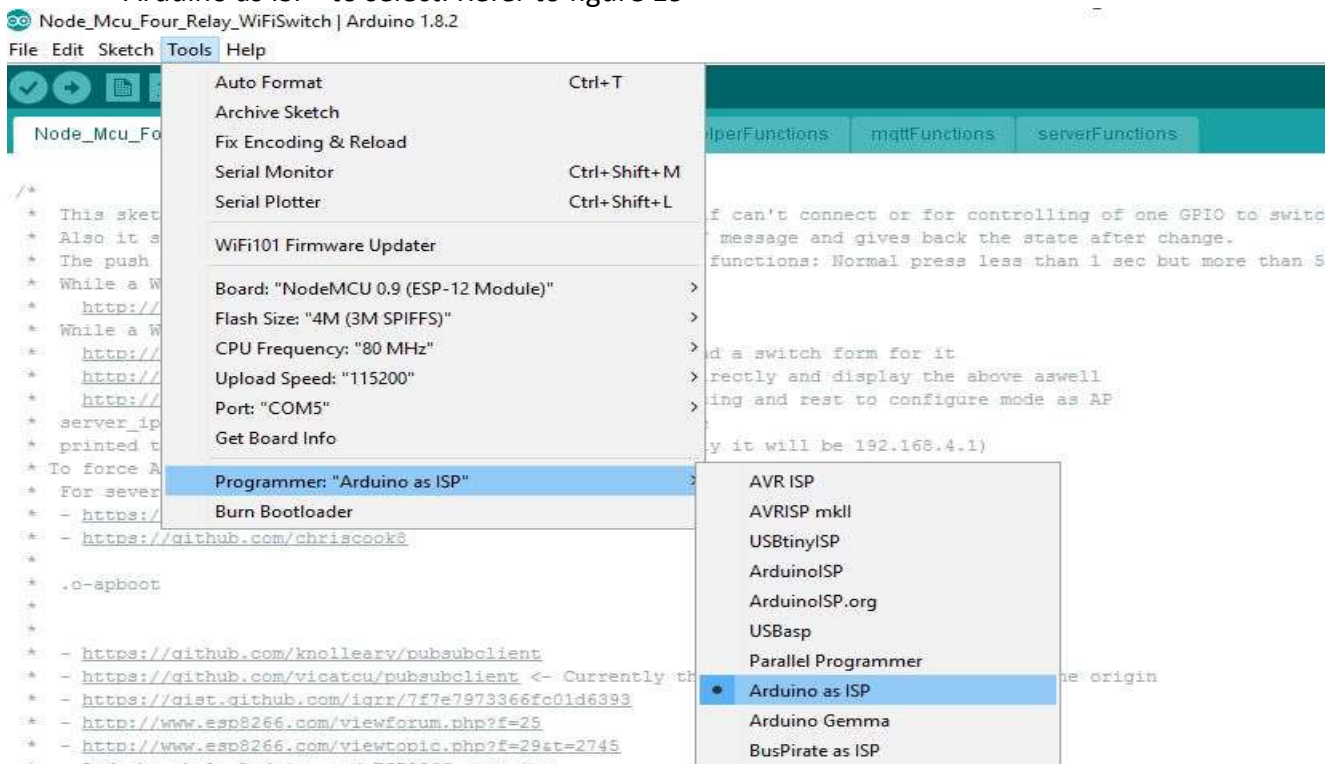


Figure 21: IDE Selection

6. 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 20.

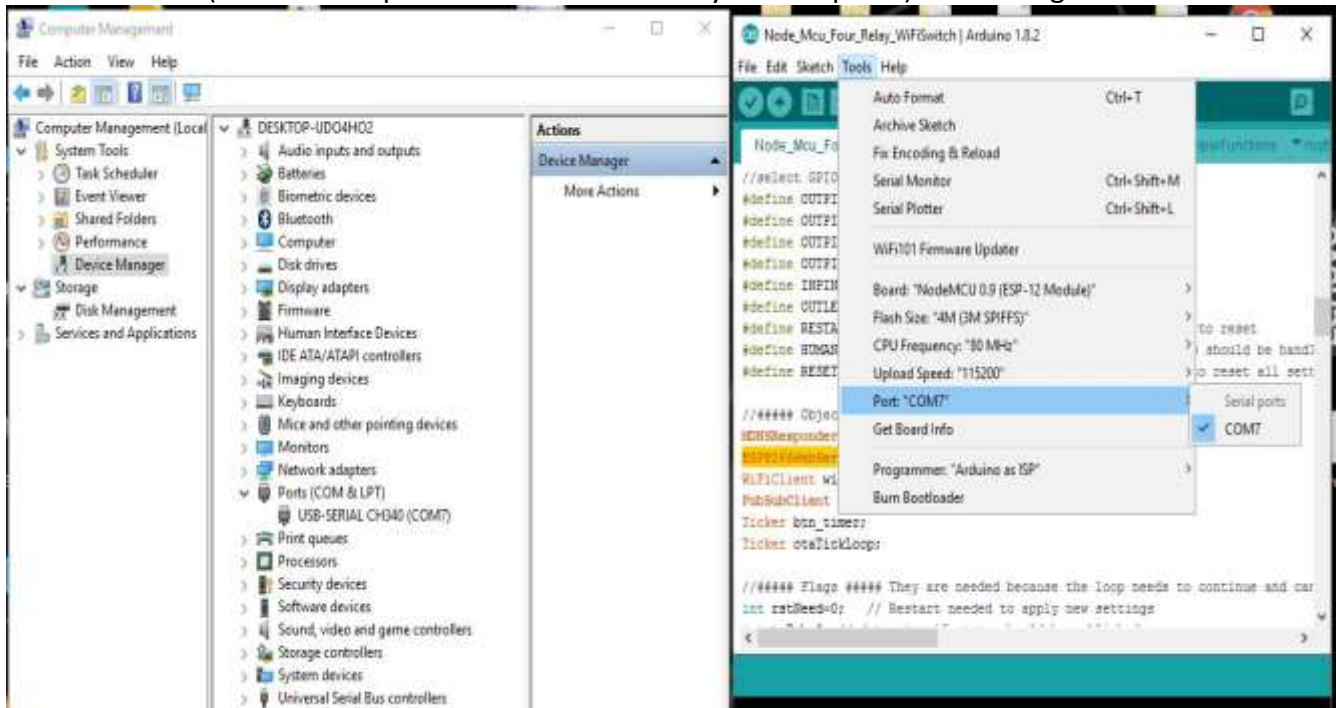


Figure 22: COM port selection.

7. Run the program. Refer to Figure 20.

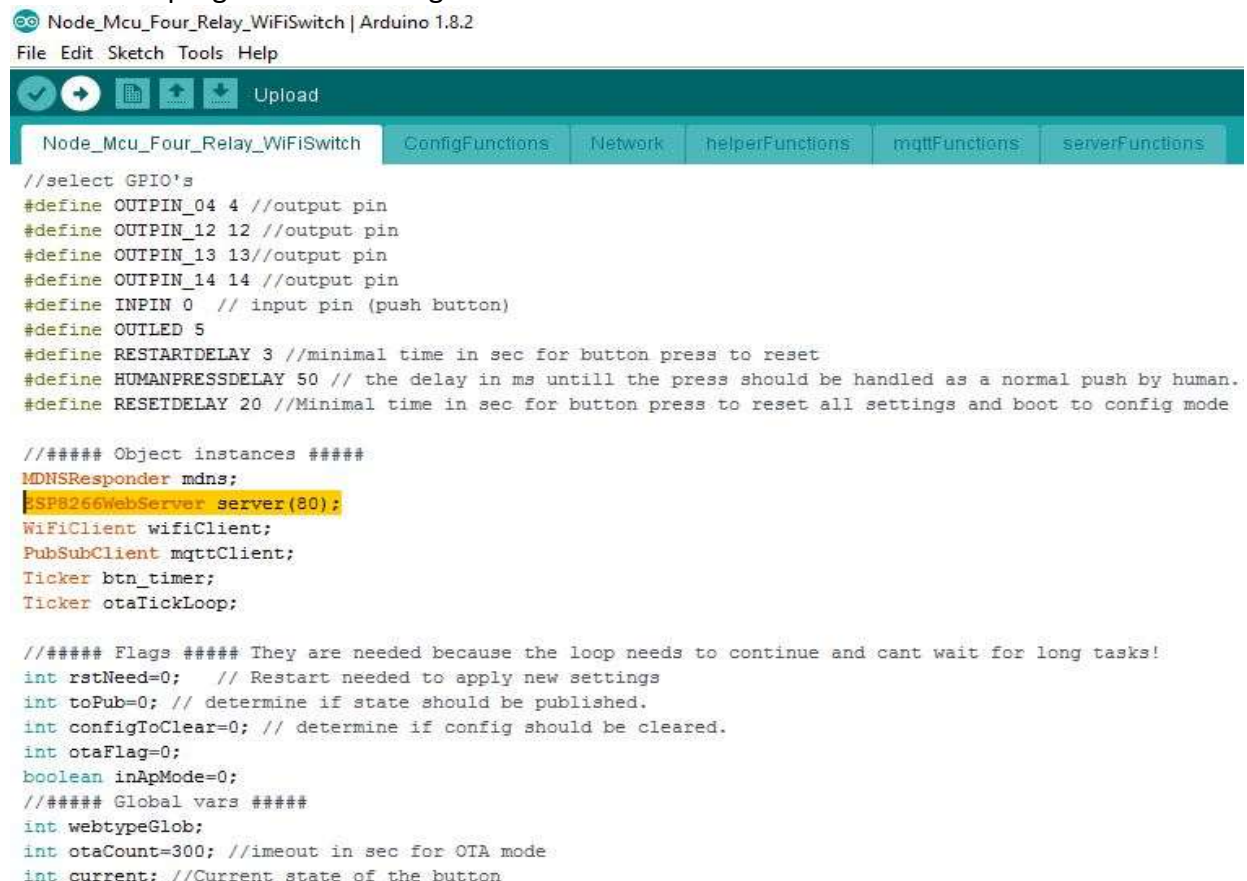


Figure 23: Code execution

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.

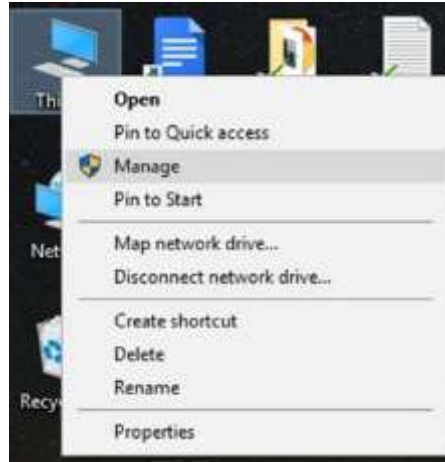


Figure 24: Accessing device manager

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

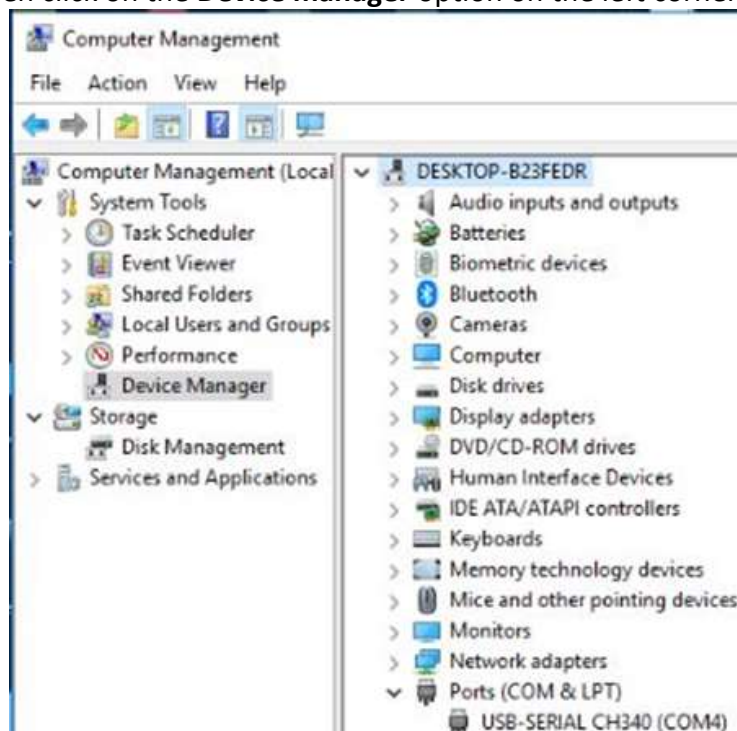


Figure 25: Device manager window

Step 5: Select USB-SERIAL xxxxx

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

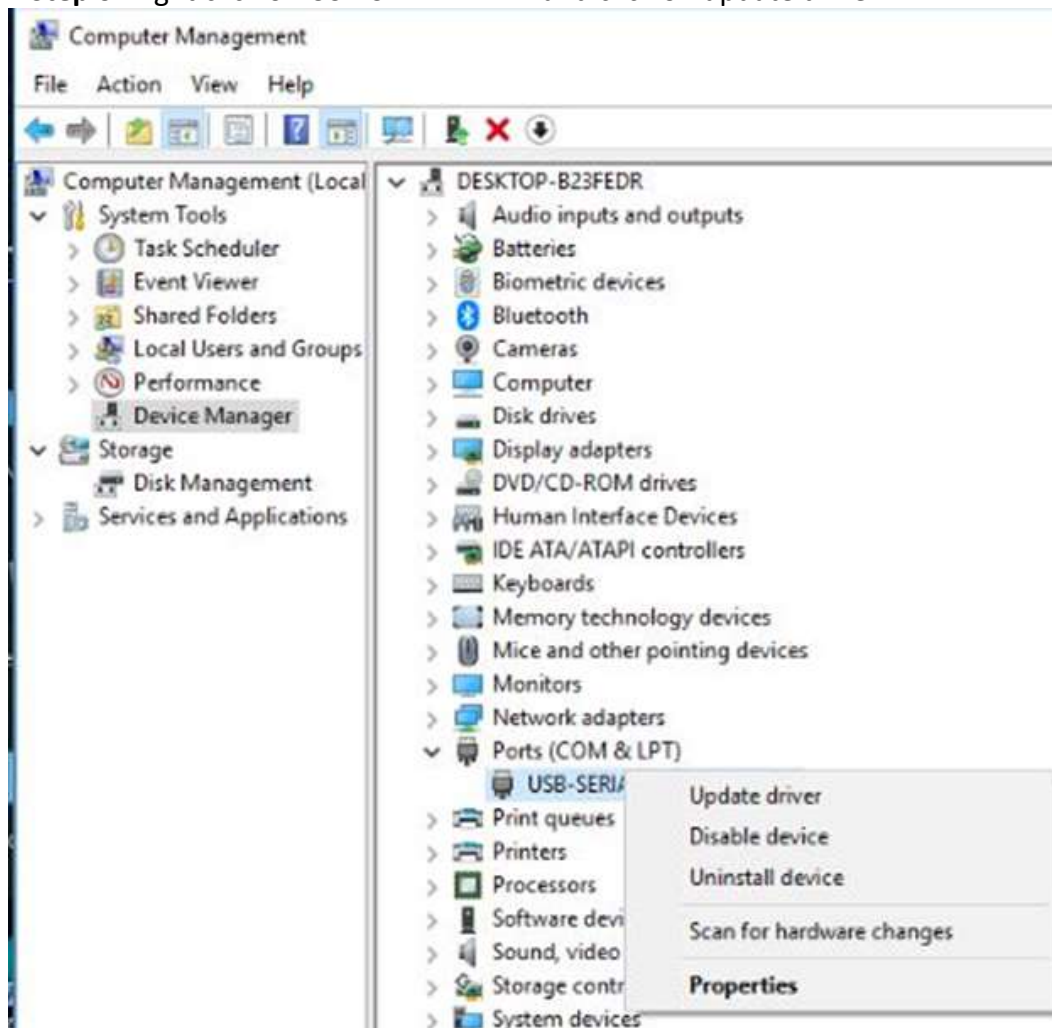


Figure 26: USB port selection

Step 7: Then click on Search automatically as shown below

Update Drivers - USB-SERIAL CH340 (COM4)

How do you want to search for drivers?

- Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
- Browse my computer for driver software
Locate and install driver software manually.

Figure 27: 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...

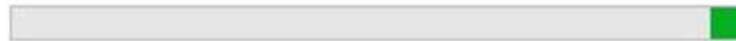


Figure 28: Searching for USB drivers

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 29: Main menu page of device via http

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

Armtronix SD Module

ARMtronix



Figure 30: 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 31: 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 32: 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)
- 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/>)

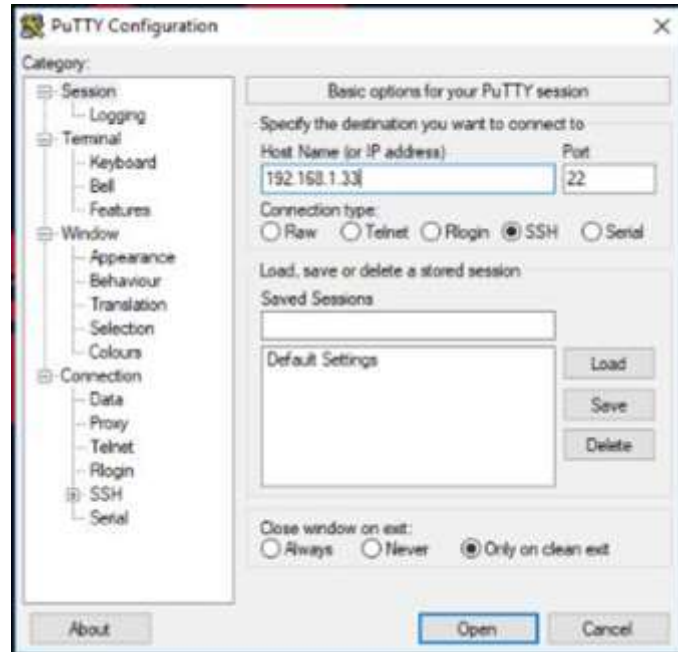


Figure 33: Putty application for Raspberry Pi

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.

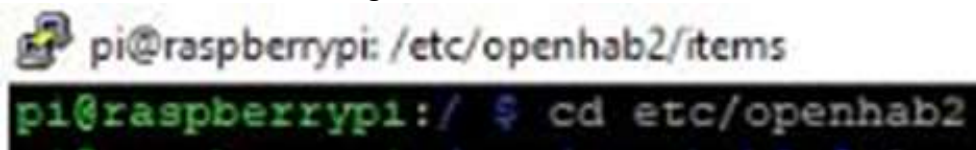


Figure 34: Path for the file

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?o=1**, (IP address is different for different boards) for toggling (**ON / OFF**).

Example: **http://192.168.1.22/ay?o=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 35: 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.

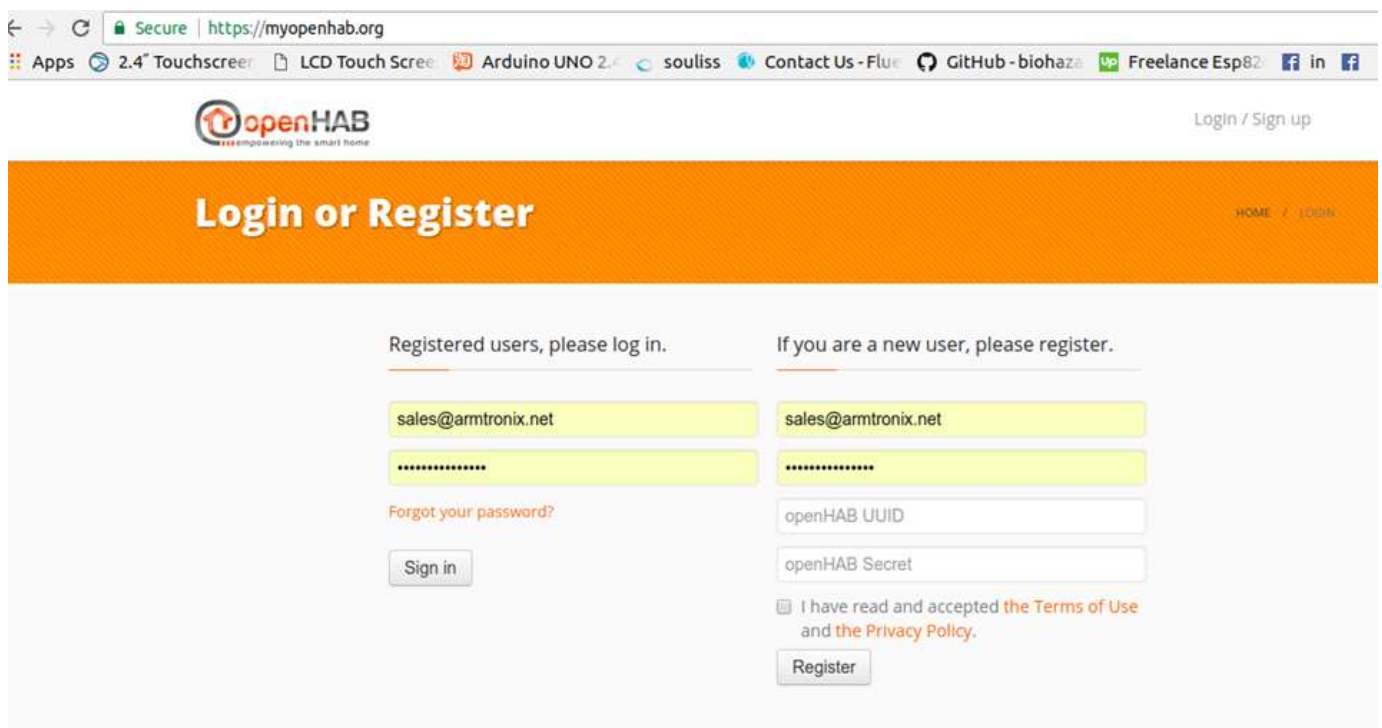


Figure 36: Login page of OpenHab

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



Home

Items

Event log

Notifications

Online

Figure 37: 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

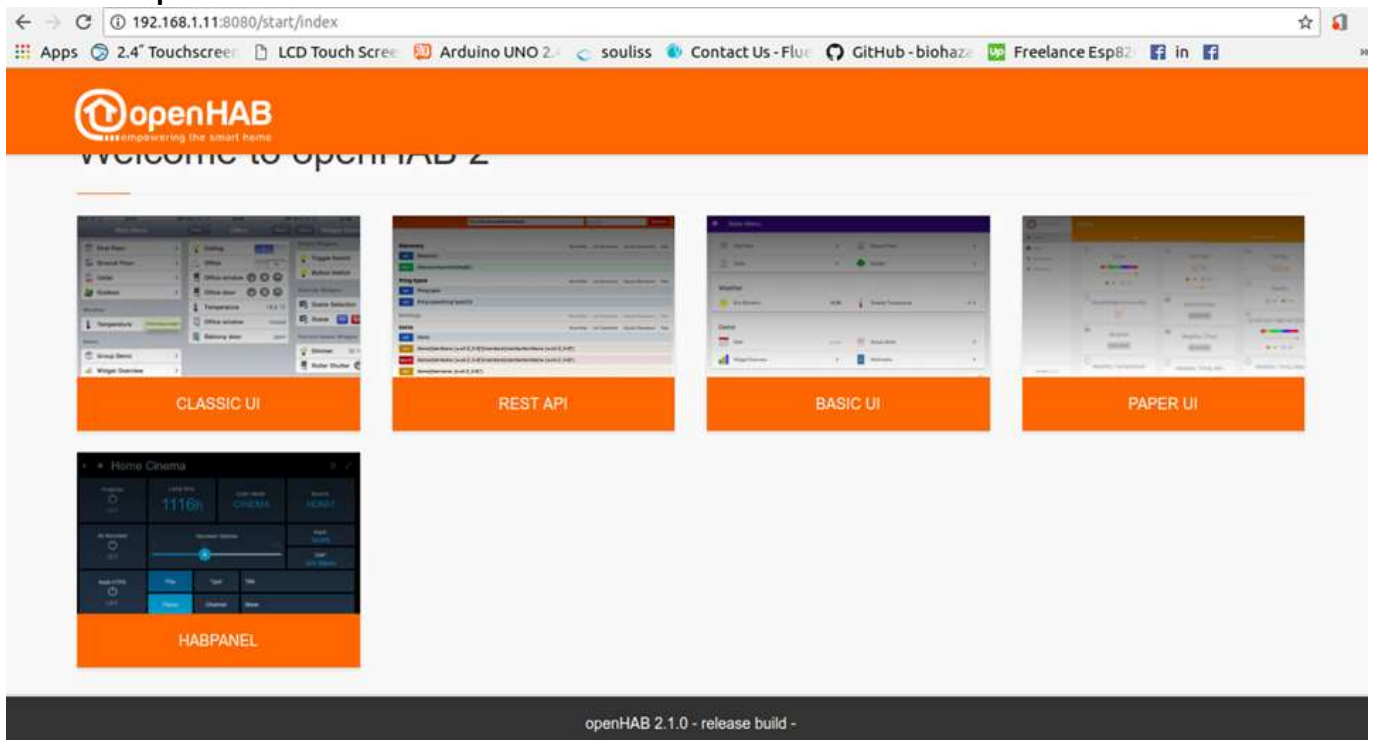


Figure 38: Home page of device with entered IP

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.

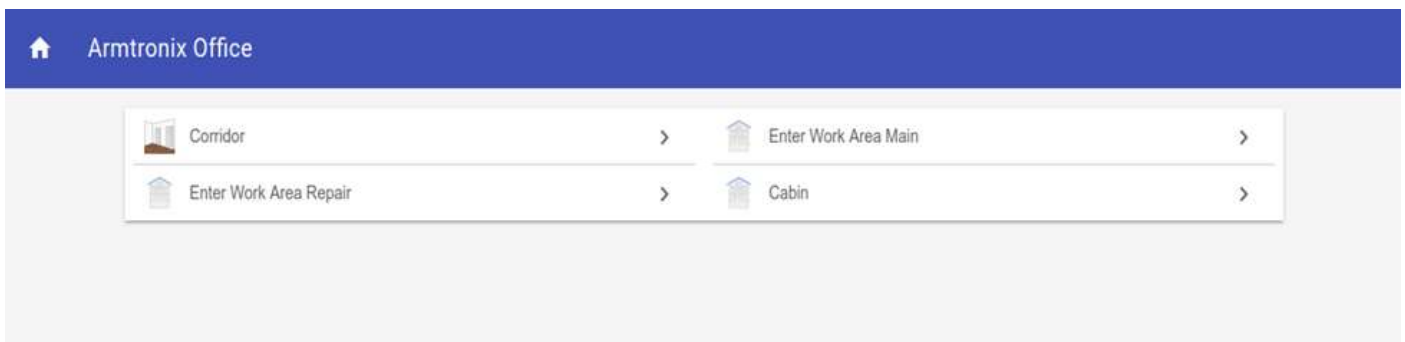


Figure 39: Devices are categorized as Groups under frame

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.

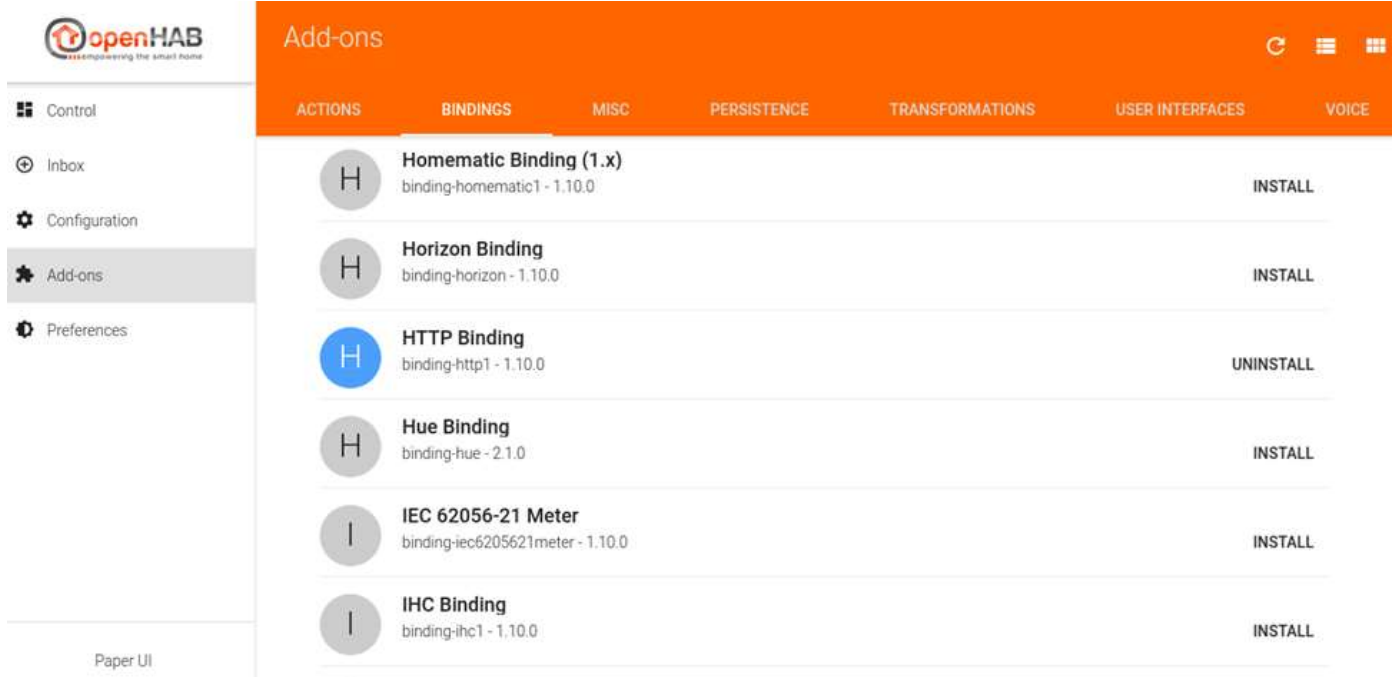


Figure 40: OpenHAB Add-ons binding option selection

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).

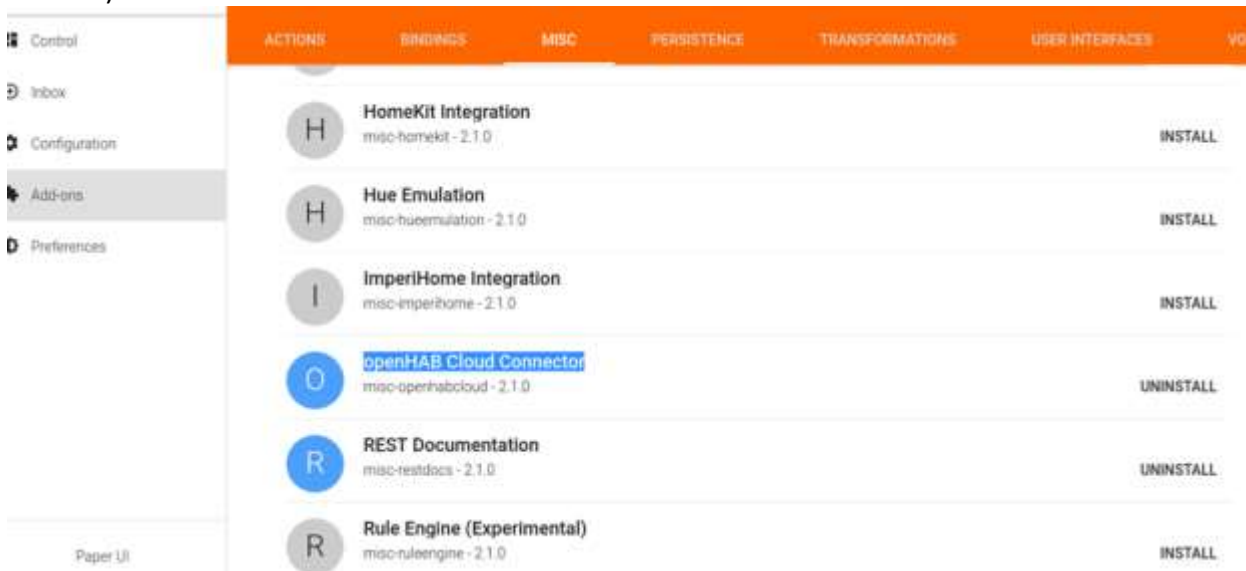


Figure 41: Binding option selected as OpenHAB

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.

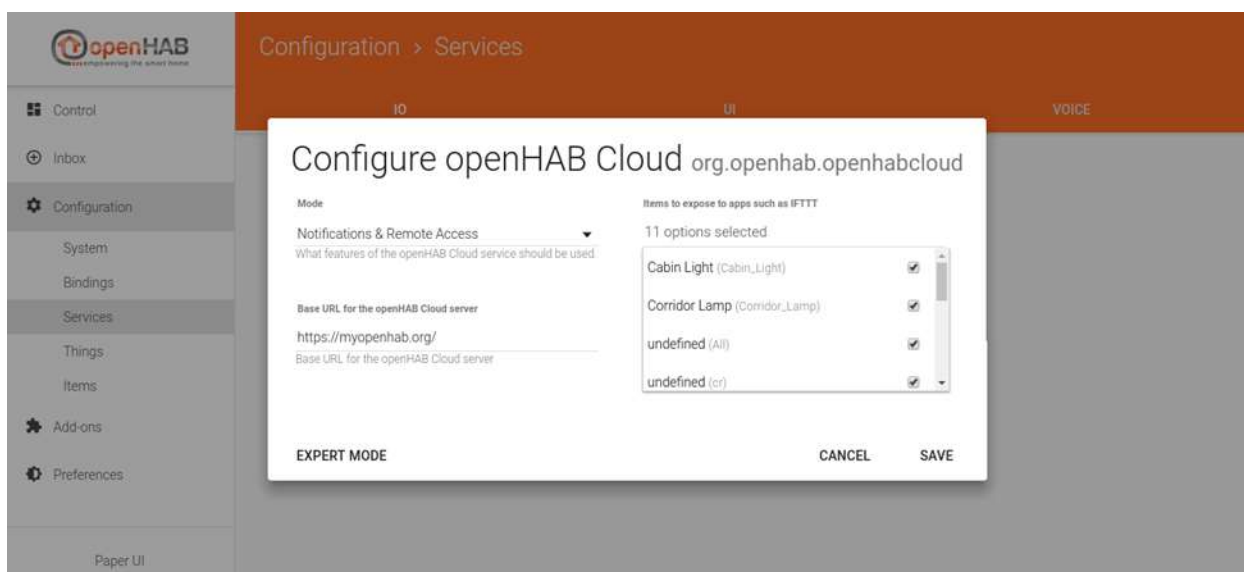


Figure 42: Device selection to configure with OpenHAB

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 43: 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 44: 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.

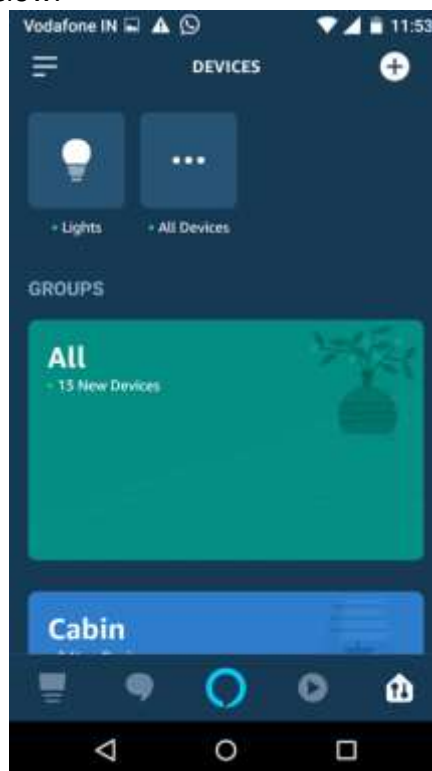


Figure 45: Check # of devices connected

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.

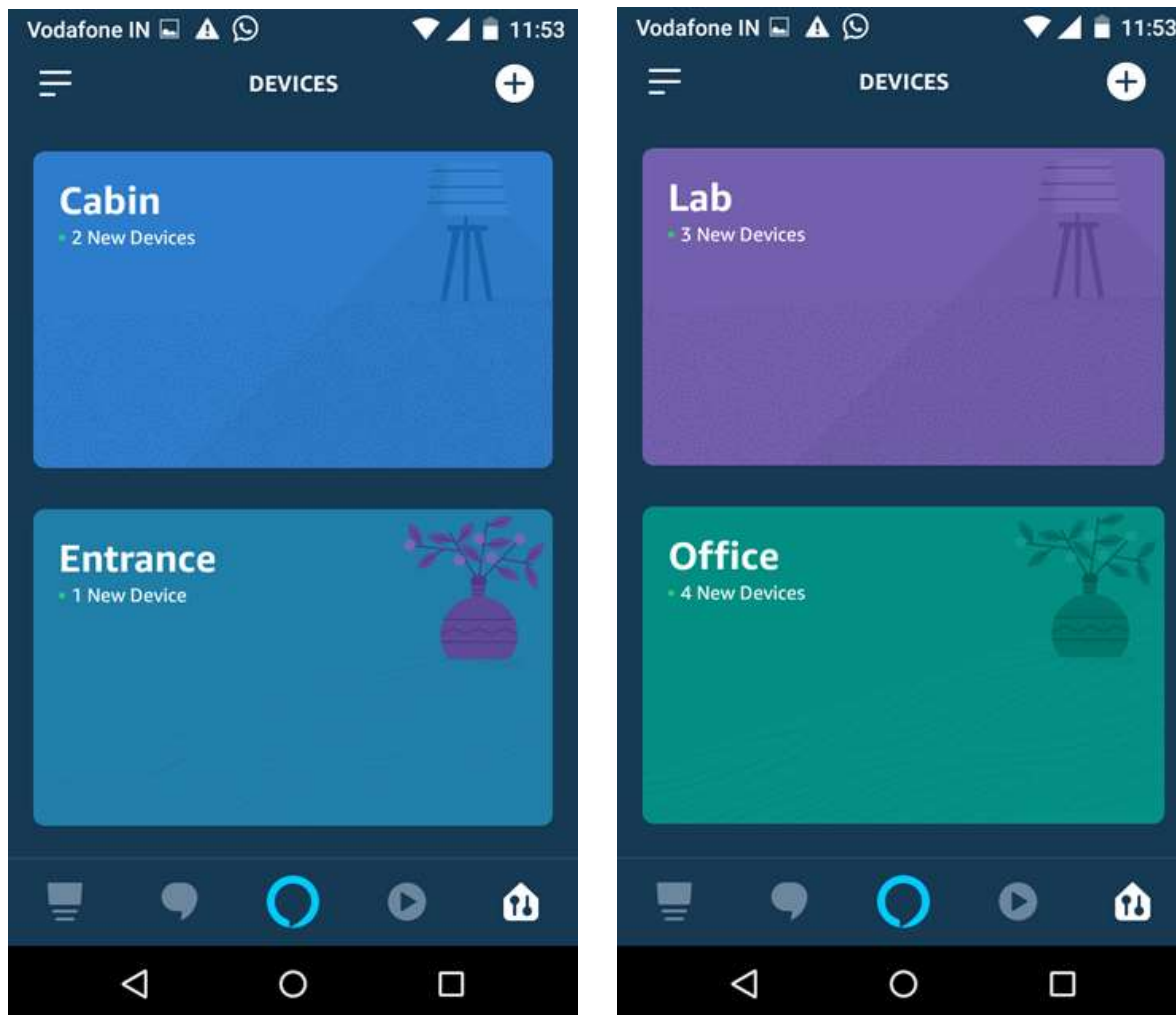


Figure 46: Devices devided as groups in Alexa app

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.

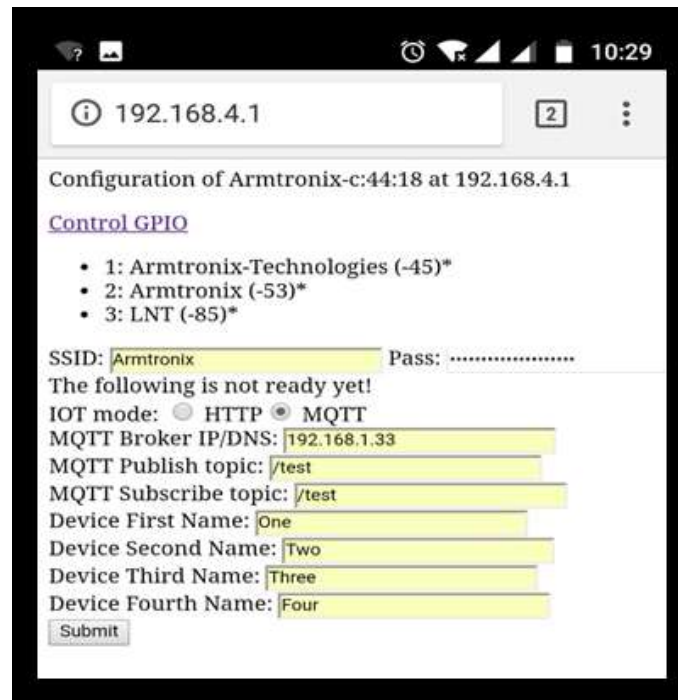


Figure 47: Names are defined for loads

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

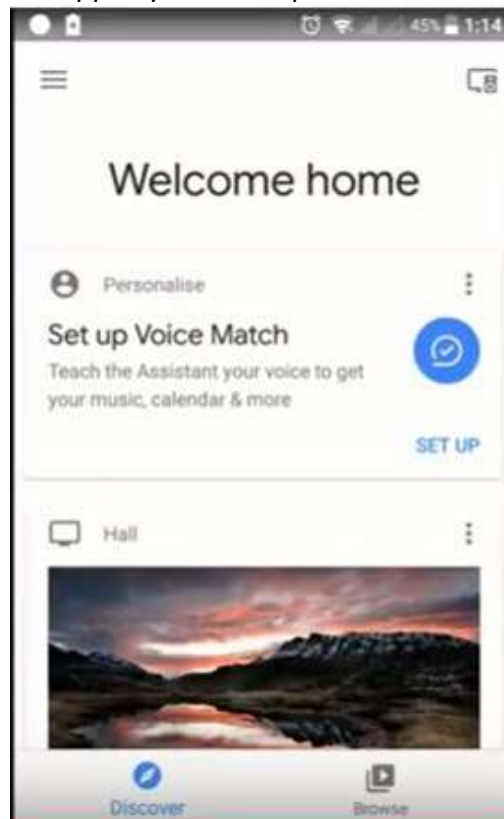


Figure 48: Google Home app's Home screen

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

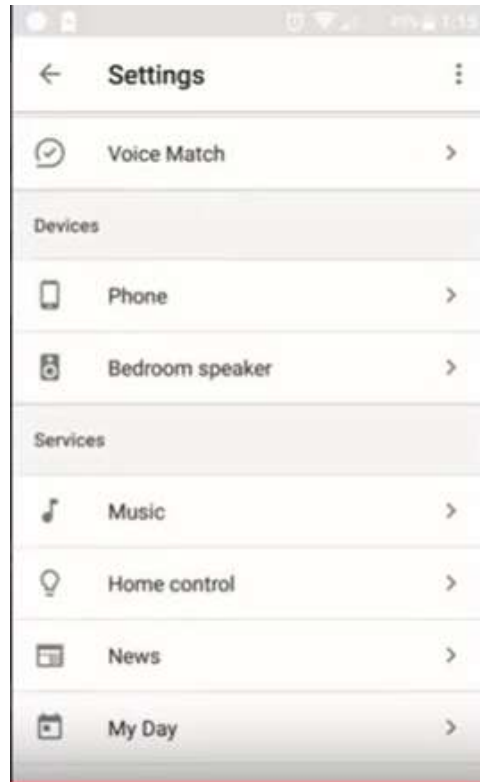


Figure 49: Google Home app's Settings screen

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

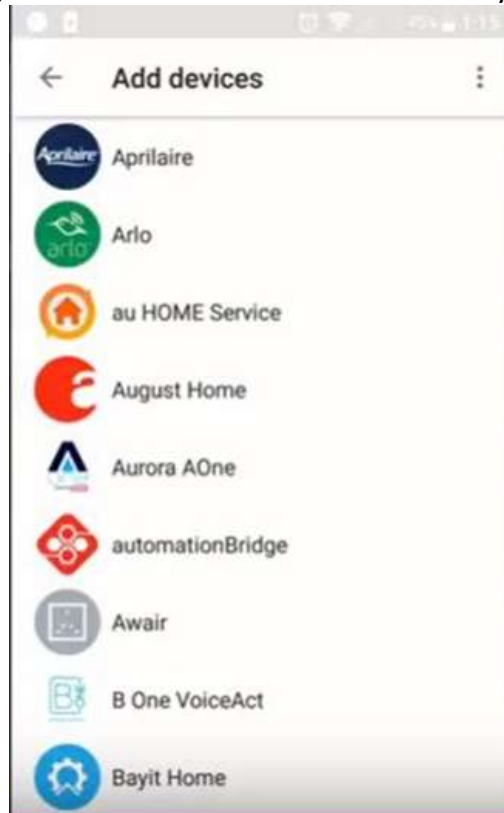


Figure 50: Google Home app's screen to Add IoT devices

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 51: Screen to Add cloud service provider

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



Figure 52: Login Screen

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

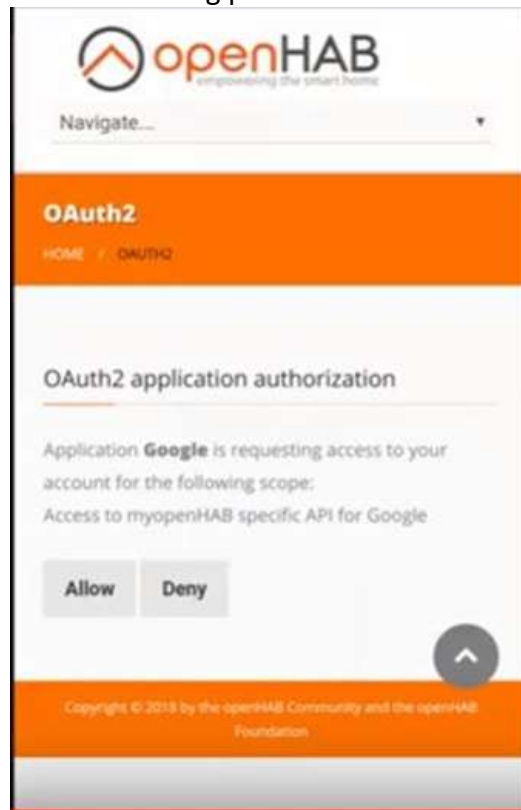


Figure 53: Apps's permission athentication screen

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

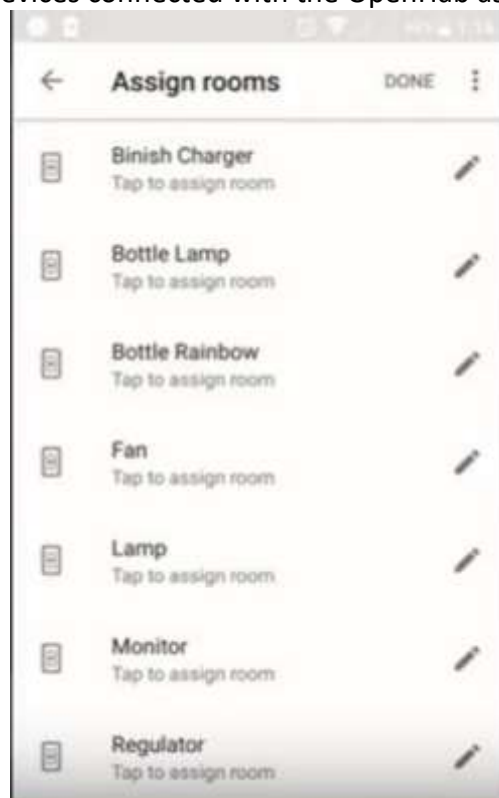


Figure 54: List of added devices

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

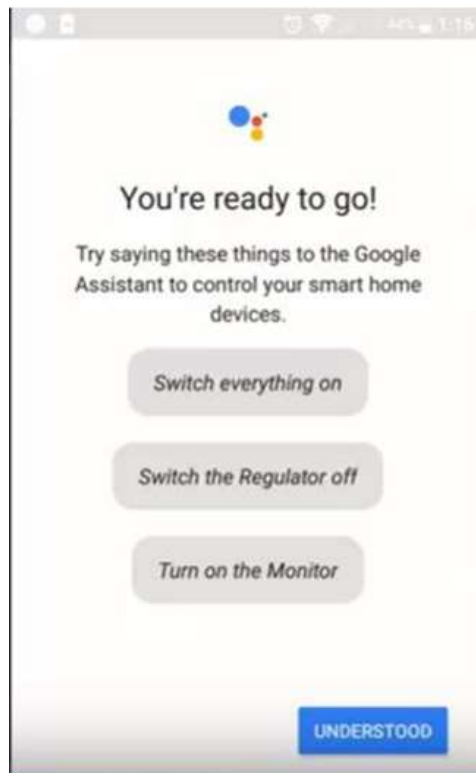


Figure 55: Device control screen



DOCUMENT #: BA019

DOCUMENT REV: B

DOCUMENT NAME: DESIGN DESCRIPTION, IoT HEAVY DUTY RELAY WITH POWER MONIORING BOX.

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