How to configure built-in WIFI module

This wiki page describes wifi setting instructions and available with OGA HW Rev 1.1 only.

Module Key Features

Items	Specifications
Module	ESP-WROOM-S2
MCU	ESP8266EX
WIFI Protocol	802.11 b/g/n, up to 72.2 Mbps of data rate
Frequency Range	2.4 GHz ~ 2.5 GHz (2400 MHz ~ 2483.5 MHz)
Interface	SDIO interface up to 50MHz, SDIO v2.0

Configuring WIFI station mode (1) - using [Configuration] Menu

You can activate WIFI connection with built-in WIFI module ('wlan0' node) using [CONFIGURATION] menu of Emulationstation.
Please refer to this wiki page.
-> Setting Network

Configuring WIFI station mode (2) - using command line

Or you can establish WIFI network using the following instuctions.

First, check **esp8089** module is loaded normally.

```
$ lsmod
Module                  Size  Used by
esp8089               266240
sch_fq_codel           20480  5
ip_tables              24576
x_tables               32768  1 ip_tables
```

```
ipv6                   372736  24
```

Turn on wifi radio.

```
# nmcli radio wifi on
```

You can get all available WIFI list as following.

```
$ nmcli dev wifi list
IN-USE  SSID            MODE   CHAN  RATE        SIGNAL  BARS  SECURITY
        SSID_1          Infra  1     130 Mbit/s  92      ▂▄▆   WPA1 WPA2
        SSID_2          Infra  11    130 Mbit/s  92      ▂▄▆   WPA2 802.1
        SSID_3          Infra  11    130 Mbit/s  92      ▂▄▆   WPA2
```

Enter SSID and password data.

```
$ nmcli dev wifi con 'SSID_1' password 'password_of_ssid1'
```

If there is no issue during network establishment, you will get IP information.

```
$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group
default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group
default qlen 1000
    link/ether ab:cd:ef:12:34:56 brd ff:ff:ff:ff:ff:ff
    inet 192.168.0.5/24 brd 192.168.0.255 scope global dynamic noprefixroute
wlan0
       valid_lft 6830sec preferred_lft 6830sec
    inet6 fe80::1234:1234:1234:1234/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

Then, check ping operation.

```
$ ping google.com
```

Configuring WIFI AP mode

There is no GUI menu to configure WIFI AP mode for now.
Please use the following instruction via command line.

1. Update & Upgrade

```
$ sudo apt update -y
$ sudo apt upgrade -y
```

2. Install Packages

```
$ sudo apt install -y dhcpcd5
$ sudo apt install -y hostapd dnsmasq
```

Since the configurations are not ready yet, so display related services now.

```
$ sudo systemctl disable hostapd
$ sudo systemctl disable dnsmasq
```

3. Setup (1) - Configuring a static IP

To configure the static IP address, please edit a dhcpcd configuration file, /etc/dhcpcd.conf.
Go to the end fo this file and add the following lines.
For this example, we will use a static IP, 192.168.4.1.

```
$ vi /etc/dhcpcd.conf
```

```
interface wlan0
    static ip_address=192.168.4.1/24
    nohook wpa_supplicant
```

4. Setup (2) - Configuring the access point host software - 'hostapd'

(1) You need to edit the hostapd configuration file in /etc/hostapd.

```
$ vi /etc/hostapd/hostapd.conf
```

```
interface=wlan0
driver=nl80211
ssid=${NameOfNetwork}
hw_mode=${hw_mode}
channel=7
wmm_enabled=
macaddr_acl=
auth_algs=1
ignore_broadcast_ssid=
wpa=2
wpa_passphrase=${password}
wpa_key_mgmt=WPA-PSK
wpa_pairwise=TKIP
```

```
rsn_pairwise=CCMP
```

ESP8266ex supports 2.4GHz band, so we will set 'hw_mode' ad 'g' for this example.

- a = IEEE 802.11a (5 GHz)
- b = IEEE 802.11b (2.4 GHz)
- g = IEEE 802.11g (2.4 GHz)
- ad = IEEE 802.11ad (60 GHz)

(2) Then need to tell the system where to find this configuration file.

```
$ vi /etc/default/hostapd
```

```
DAEMON_CONF="/etc/hostapd/hostapd.conf"
```

5. Setup (3) - Configuring DHCP server - 'dnsmasq'

Add the following information in the dnsmasq configuration file, /etc/dnsmasq.conf.

```
$ vi /etc/dnsmasq.conf
```

```
# If you don't want dnsmasq to read /etc/resolv.conf or any other
# file, getting its servers from this file instead (see below), then
# uncomment this.
no-resolv

# If you want dnsmasq to listen for DHCP and DNS requests only on
# specified interfaces (and the loopback) give the name of the
# interface (eg eth0) here.
# Repeat the line for more than one interface.
interface=wlan0

# On systems which support it, dnsmasq binds the wildcard address,
# even when it is listening on only some interfaces. It then discards
# requests that it shouldn't reply to. This has the advantage of
# working even when interfaces come and go and change address. If you
# want dnsmasq to really bind only the interfaces it is listening on,
# uncomment this option. About the only time you may need this is when
# running another nameserver on the same machine.
bind-interfaces

# Uncomment this to enable the integrated DHCP server, you need
# to supply the range of addresses available for lease and optionally
# a lease time. If you have more than one network, you will need to
# repeat this for each network on which you want to supply DHCP
# service.
dhcp-range=192.168.4.3,192.168.4.20,12h
```

6. Setup (4) - Configuring Network

Create /etc/network/interfaces.
Make sure that 3rd line is blocked using “#”.

```
allow-hotplug wlan0
iface wlan0 inet manual
#    wpa-conf /etc/wpa_supplicant/wpa_supplicant.conf
```

7. Start services

```
$ sudo systemctl enable dnsmasq
$ sudo systemctl start dnsmasq

$ sudo systemctl enable hostapd
$ sudo systemctl start hostapd
```

```
$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group
default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group
default qlen 1000
    link/ether ab:cd:ef:12:34:56 brd ff:ff:ff:ff:ff:ff
    inet 192.168.4.1/24 brd 192.168.4.255 scope global noprefixroute wlan0
       valid_lft forever preferred_lft forever
    inet6 fe80::1234:1234:1234:1234/64 scope link
       valid_lft forever preferred_lft forever
```

Checking basic connection

If you get fails during network setup, please check the followings using ssh with a USB-to-Ethernet adapter or UART console.

mmc1 node

```
$ cat /sys/kernel/debug/mmc1/ios
clock:          50000000 Hz
vdd:            21 (3.3 ~ 3.4 V)
bus mode:       2 (push-pull)
chip select:     (don't care)
```

```
power mode:     2 (on)
bus width:      2 (4 bits)
timing spec:    2 (sd high-speed)
signal voltage: 0 (3.30 V)
driver type:    0 (driver type B)
```

sdio id

```
$ cat /sys/bus/sdio/devices/mmc1\:0001\:1/modalias
sdio:c00v6666d1111
```

module

```
$ lsmod
Module                  Size  Used by
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x_tables               32768  1 ip_tables
ipv6                  372736  24
```

Workaround to support Suspend/Resume with esp8089 module

/lib/systemd/system-sleep/sleep

```
#!/bin/bash

case $1 in
  pre)
       rmmod esp8089
       ;;
  post)
       modprobe -i esp8089
       ;;
esac
```

```
$ sudo chmod a+x /lib/systemd/system-sleep/sleep
```