



## How to setup wifi connection



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Even if the example is related to the RTL8723BU chip (this chip calls for a WiFi (minimally 802.11g/n) and Bluetooth 4.0 LE), most of the commands are generic ones and can be applied to any platform.



## 1 ifconfig

Verify the wlan0 interface is present (that means drivers have been started and the WiFi firmware loaded):

### 1.1 Check WLAN interface

```
Board $> ifconfig -a
lo          Link encap:Local Loopback
           LOOPBACK MTU:65536 Metric:1
           RX packets:0 errors:0 dropped:0 overruns:0 frame:0
           TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

```
wlan0      Link encap:Ethernet HWaddr 60:F1:89:3F:F6:0E
           BROADCAST MULTICAST MTU:1500 Metric:1
           RX packets:0 errors:0 dropped:0 overruns:0 frame:0
           TX packets:1 errors:0 dropped:0 overruns:0 carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:0 (0.0 B)  TX bytes:10 (10.0 B)
```

### 1.2 Initialize WLAN interface

```
Board $> ifconfig wlan0 192.168.43.135 broadcast 192.168.43.255 netmask 255.255.255.0
```

```
Board $> ifconfig wlan0 up
```

```
Board $> ifconfig wlan0
wlan0      Link encap:Ethernet HWaddr 60:F1:89:3F:F6:0E
           inet addr:192.168.43.135 Bcast:192.168.43.255 Mask:255.255.255.0
           UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
           indicate that your interface is UP */ /* UP
           RX packets:19 errors:0 dropped:0 overruns:0 frame:0
           TX packets:19 errors:0 dropped:0 overruns:0 carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:1774 (1.7 KiB)  TX bytes:2326 (2.2 KiB)
```



## 2 iw

The next phase is to scan for any wireless access points with the command:

### 2.1 Scan available SSID (AP)

- Get only SSID name

```
Board $> iw dev wlan0 scan |grep SSID
SSID: NETWORK1
SSID: NETWORK2
```

- List full SSID information

```
Board $> iw dev wlan0 scan
BSS 00:23:5e:4a:28:f9(on wlan0)
  TSF: 0 usec (0d, 00:00:00)
  freq: 2412
  beacon interval: 100 TUs
  capability: ESS ShortPreamble ShortSlotTime (0x0421)
  signal: -72.00 dBm
  last seen: 0 ms ago
  SSID: NETWORK1
  Supported rates: 1.0* 2.0* 5.5* 6.0 9.0 11.0* 12.0 18.0
  DS Parameter set: channel 1
  TIM: DTIM Count 0 DTIM Period 1 Bitmap Control 0x0 Bitmap[0] 0x2
  Country: FR Environment: Indoor/Outdoor
  Channels [1 - 13] @ 20 dBm
  BSS Load:
    * station count: 1
    * channel utilisation: 30/255
    * available admission capacity: 23437 [*32us]
  ERP: <no flags>
  Extended supported rates: 24.0 36.0 48.0 54.0
  WMM:
    * Parameter version 1
    * u-APSD
    * BE: CW 15-1023, AIFSN 3
    * BK: CW 15-1023, AIFSN 7
    * VI: CW 7-15, AIFSN 2, TXOP 3008 usec
    * VO: CW 3-7, AIFSN 2, TXOP 1504 usec
BSS 00:23:5e:96:57:20(on wlan0)
  TSF: 0 usec (0d, 00:00:00)
  freq: 2412
  beacon interval: 100 TUs
  capability: ESS Privacy ShortPreamble ShortSlotTime (0x0431)
  signal: -66.00 dBm
  last seen: 0 ms ago
  SSID: NETWORK2
  Supported rates: 1.0* 2.0* 5.5* 6.0 9.0 11.0* 12.0 18.0
  DS Parameter set: channel 1
  Country: FR Environment: Indoor/Outdoor
  Channels [1 - 13] @ 20 dBm
  BSS Load:
    * station count: 8
    * channel utilisation: 48/255
    * available admission capacity: 23437 [*32us]
  ERP: <no flags>
```



```
RSN:      * Version: 1
          * Group cipher: CCMP
          * Pairwise ciphers: CCMP
          * Authentication suites: IEEE 802.1X 00-40-96:0
          * Capabilities: 4-PTKSA-RC 4-GTKSA-RC (0x0028)
Extended supported rates: 24.0 36.0 48.0 54.0
WMM:     * Parameter version 1
          * u-APSD
          * BE: CW 15-1023, AIFSN 3
          * BK: CW 15-1023, AIFSN 7
          * VI: CW 7-15, AIFSN 2, TXOP 3008 usec
          * VO: CW 3-7, AIFSN 2, TXOP 1504 usec
```



## 3 Wlan Network attachment (without system which manage systemd-networkd configuration)

### 3.1 Configure your WiFi connection

Configure WiFi connection by using `wpa_supplicant` tool

- Check current configuration

```
Board $> cat /etc/wpa_supplicant.conf
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=0
update_config=1
network={
    key_mgmt=NONE
}
```

- Set the WiFi network name and password

```
Board $> wpa_passphrase <your_ssid_name> <your_ssid_key> >> /etc/wpa_supplicant.conf
```

- Check new configuration

```
Board $> cat /etc/wpa_supplicant.conf
ctrl_interface=/var/run/wpa_supplicant
ctrl_interface_group=0
update_config=1
network={
    ssid="your_ssid_name"
    psk="your_ssid_key"
}
```



If no WPA key replace `psk=...` with `key_mgmt=NONE`

#### 3.1.1 Connect to SSID

```
Board $> wpa_supplicant -B -iwlan0 -c /etc/wpa_supplicant.conf
Successfully initialized wpa_supplicant
```

#### 3.1.2 link to SSID

```
Board $> iw wlan0 link
SSID: NETWORK1
freq: 2462
RX: 501 bytes (3 packets)
TX: 4056 bytes (22 packets)
```



```

signal: -75 dBm
tx bitrate: 12.0 MBit/s
bss flags: short-preamble short-slot-time
dtim period: 1
beacon int: 100

```

### 3.1.3 Assign IP address to WLAN interface

Use the DHCP client to obtain an address (assuming wireless network (associated to) has a DHCP server):

```
Board $> dhclient wlan0
```

Use the ip command to verify the IP address assigned by the DHCP. The IP address is 192.168.43.135 from below.

```

Board $> ip addr show wlan0
3: wlan0: mtu 1500 qdisc mq state UP qlen 1000
    link/ether 74:e5:43:a1:ce:65 brd ff:ff:ff:ff:ff:ff
    inet 192.168.43.135/24 brd 192.168.1.255 scope global wlan0
    inet6 fe80::76e5:43ff:feal:ce65/64 scope link
        valid_lft forever preferred_lft forever

```

### 3.1.4 Check connectivity

The most basic connectivity test is to use the “ping” command. In this example, the wireless router (associated to) has an IP address of 192.168.43.1:

```

Board $> ping 192.168.43.1
PING 192.168.43.1 (192.168.43.1): 56 data bytes
64 bytes from 192.168.43.1: seq=0 ttl=64 time=14.905 ms
64 bytes from 192.168.43.1: seq=1 ttl=64 time=30.387 ms
64 bytes from 192.168.43.1: seq=2 ttl=64 time=20.462 ms

```

- Note : Enter <CTRL+C> to terminate the ping session.



## 4 Automatic WiFi configuration at start up

### 4.1 networkctl

Systemd has a specific service for the network named **systemd-networkd**, this service comes with the tool **networkctl** which allows to show the status of each network interface.

```
Board $> networkctl --no-pager
IDX LINK          TYPE          OPERATIONAL SETUP
 1 lo              loopback      carrier     unmanaged
 2 eth0            ether         routable    configured
 3 sit0            sit           no-carrier  unmanaged
 4 ip6tnl0         tunnel6       no-carrier  unmanaged
 5 wlan0           wlan          no-carrier  unmanaged
 6 wlan1           wlan          no-carrier  unmanaged
```

6 links listed.

We can see that the **eth0** interface is managed by networked via the information **configured** and the interface is used (**routable**).

### 4.2 How to set a wireless configuration with networkd

The goal is to configure an wlan network interface via systemd-networkd configuration.

All the network configurations are stored on **/lib/systemd/network** or **/etc/systemd/network**

Create the file dedicated to wireless interface "**/lib/systemd/network/51-wireless.network**" :

```
Board $> echo "[Match]" > /lib/systemd/network/51-wireless.network
Board $> echo "Name=wlan0" >> /lib/systemd/network/51-wireless.network
Board $> echo "[Network]" >> /lib/systemd/network/51-wireless.network
Board $> echo "DHCP=ipv4" >> /lib/systemd/network/51-wireless.network
```

Check content is as follow

```
Board $> cat /lib/systemd/network/51-wireless.network
[Match]
Name=wlan0
[Network]
DHCP=ipv4
```

For attaching this wireless interface to a specific network, we need to have some information like SSID of network and password.

To see the list of wireless network available:

```
Board $> ifconfig wlan0 up
Board $> iw dev wlan0 scan |grep SSID
      SSID: NETWORK1
      SSID: NETWORK2
```

Associate the wireless network to wireless interface, here wlan0:





```
Board $> mkdir -p /etc/wpa_supplicant/
        echo "ctrl_interface=/var/run/wpa_supplicant" > /etc/wpa_supplicant
/wpa_supplicant-wlan0.conf
        echo "eapol_version=1" >> /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
        echo "ap_scan=1" >> /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
        echo "fast_reauth=1" >> /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
        echo "" >> /etc/wpa_supplicant/wpa_supplicant-wlan0.conf
        wpa_passphrase SSID_OF_NETWORK PASSWORD_OF_NETWORK >> /etc/wpa_supplicant
/wpa_supplicant-wlan0.conf
```

Where **SSID\_OF\_NETWORK** **PASSWORD\_OF\_NETWORK** correspond to the SSID and password of wireless network.



the name of file on /etc/wpa\_supplicant must contains the name of wireless interface:  
wpa\_supplicant-**wlan0**.conf

To enable and start the wireless configuration:

```
Board $> systemctl enable wpa_supplicant@wlan0.service
        systemctl restart systemd-networkd.service
        systemctl restart wpa_supplicant@wlan0.service
```

Receive

Transmit

uniprocessor

Dynamic Host Configuration Protocol (See [https://en.wikipedia.org/wiki/Dynamic\\_Host\\_Configuration\\_Protocol](https://en.wikipedia.org/wiki/Dynamic_Host_Configuration_Protocol) for more details)