OM-O2S / OM-O2SP

Onion Omega2S IoT compute modules

Configuring an External 5GHz WiFi Adapter R01

Application Note

Abstract

This document describes the steps required to use an external 5GHz WiFi USB Adapter based on the RTL8821AU chipset with the Omega2 IoT computer family for WiFi connectivity.

The Omega's built-in WiFi radio operates on the 2.4 GHz band. An external radio is required to join or host 5 GHz WiFi networks.

A common 5 GHz WiFi radio chipset is the RTL8821AU, this document describes how to use an RTL8821AU-based USB WiFi adapter to enable 5 GHz WiFi networking with the Omega2 platform. Specifically, this document outlines:

- Prerequisites
- Steps to install the driver and properly configure the system to use the driver
- Procedure to scan the surrounding area for WiFi networks
- Connect to a WiFi network as a client - for both 2.4GHz and 5GHz networks
- Host a WiFi access point

One important note: the RTL8821AU chipset does not support multiple virtual interfaces, so it can act either as an Access Point or as a Client, but **cannot do both at the same time**.

Prerequisites

Before proceeding, ensure that your Omega2 device is running firmware version 0.3.0 or higher. See the guide on updating the Omega for more details on the process.

Installing and Configuring the Driver

1. Install the driver kernel module

```
opkg update
opkg install kmod-rtl8812au
```

2. Update `/lib/netifd/wireless/mac80211.sh`

In function mac80211_interface_cleanup, comment out `iw dev del` command. Result should look like this:

```
mac80211_interface_cleanup() {
        local phy="$1"

        for wdev in $(list_phy_interfaces "$phy"); do
                ip link set dev "$wdev" down 2>/dev/null
                #iw dev "$wdev" del
        done
```

```
}
```

3. Add the following to `/etc/config/network`

```
config interface 'usbwan'
        option ifname 'wlan0'
        option proto 'dhcp'
        option hostname 'OnionOmega2'
```

4. Add new WiFi interface to `/etc/config/wireless` by adding the below:

```
config wifi-device 'radio1'
      option type 'mac80211'
      option channel 'auto'
      option htmode 'HT20'
      option hwmode '11g'
      option path 'platform/101c0000.ehci/usb1/1-1/1-1:1.0'
      option disabled '0'

config wifi-iface 'default_radio1'
      option device 'radio1'
      option mode 'sta'
      option ifname 'wlan0'
      option encryption 'psk2'
      option network 'usbwan'
      option disabled '0'
      option ssid 'YouSSIDHere'
      option key 'YouSecurityKeyHere'
```

5. Enable the new `radio1` WiFi device

```
wifi up radio1
```

Scanning for WiFi networks

Note: for scan to work, `wifi-iface 'default_radio1'` in `/etc/config/wireless` must be enabled (If you've followed the installation instructions above, it will be enabled).

Command to scan:

```
iw wlan0 scan
```

Will output text-based info on all 2.4 GHz and 5GHz WiFi networks in surrounding area.

Sample output of data shown for a scanned network:

```
BSS 00:25:9c:13:9b:6f(on wlan0)
        TSF: 591754486 usec (0d, 00:09:51)
        freq: 2422
        beacon interval: 100 TUs
        capability: ESS (0x0431)
        signal: -60.00 dBm
        last seen: 0 ms ago
        SSID: networkname
        RSN:     * Version: 1
                 * Group cipher: CCMP
                 * Pairwise ciphers: CCMP
                 * Authentication suites: PSK
                 * Capabilities: 16-PTKSA-RC 1-GTKSA-RC (0x000c)
        HT capabilities:
                Capabilities: 0x6d
                        RX LDPC
                        HT20
                        SM Power Save disabled
                        RX HT20 SGI
                        RX HT40 SGI
                        No RX STBC
                        Max AMSDU length: 3839 bytes
                        No DSSS/CCK HT40
                Maximum RX AMPDU length 65535 bytes (exponent: 0x003)
                Minimum RX AMPDU time spacing: 4 usec (0x05)
                HT TX/RX MCS rate indexes supported: 0-23, 32
        HT operation:
                 * primary channel: 3
                 * secondary channel offset: no secondary
                 * STA channel width: 20 MHz
```

Connecting to a 2.4GHz Network

Populate your WiFi network configuration in `/etc/config/wireless`

```
config wifi-device 'radio1'
      option type 'mac80211'
      option channel 'auto'
      option htmode 'HT20'
      option hwmode '11g' # must be 11g for 2.4GHz networks
      option path 'platform/101c0000.ehci/usb1/1-1/1-1:1.0'
      option disabled '0'

config wifi-iface 'default_radio1'
      option device 'radio1'
      option mode 'sta'
      option ifname 'wlan0'
      option encryption 'psk2' # available options: psk2, psk, wep, none
# psk2 for WPA2, psk for WPA, wep for WEP, none for no encryption
      option network 'usbwan'
      option disabled '0'
      option ssid 'YourSSIDHere' # your network SSID here
      option key 'YourSecurityKeyHere' # your network key here
```

Run the following command to initiate the connection:

```
wifi
```

Connecting to a 5GHz Network

Populate your WiFi network configuration in `/etc/config/wireless`

```
config wifi-device 'radio1'
      option type 'mac80211'
      option channel 'auto'
      option htmode 'HT20'
      option hwmode '11a' # must be set to 11a to take advantage of faster
network speeds
      option path 'platform/101c0000.ehci/usb1/1-1/1-1:1.0'
      option disabled '0'
```

```
config wifi-iface 'default_radio1'
      option device 'radio1'
      option mode 'sta'
      option ifname 'wlan0'
      option encryption 'psk2'
# available options: psk2, psk, wep, none
# psk2 for WPA2, psk for WPA, wep for WEP, none for no encryption
      option network 'usbwan'
      option disabled '0'
      option ssid 'YourSSIDHere' # your network SSID here
      option key 'YourSecurityKeyHere' # your network key here
```

Run the following command to initiate the connection:

```
wifi
```

Hosting an Access Point

The USB WiFi adapter can be configured to host a WiFi Access Point. However, the RTL8821AU chipset does not support multiple virtual interfaces, so it can act either as an Access Point or as a Client, but **cannot do both at the same time**.

2.4GHz Access Point

Populate `/etc/config/wireless` with the desired access point configuration:

```
config wifi-device 'radio1'
        option type 'mac80211'
        option channel '9'  # cannot be auto, must be set to a channel
        option hwmode '11g' # must be 11g for 2.4 GHz networks
        option path 'platform/101c0000.ehci/usb1/1-1/1-1:1.0'
        option disabled '0'
        option htmode 'HT20'

config wifi-iface 'default_radio1'
```

```
        option device 'radio1'
        option network 'wlan'
        option mode 'ap'
        option ssid 'Omega2-2.4G' # network name - up to the end-user
        option encryption 'psk2'
        option key '12345678' # network password - up to the end-user
```

Restart the WiFi adapter with the following command:

```
wifi
```

To check that the Access Point is up, run the `iwinfo` command:

```
# iwinfo
wlan0     ESSID: "Omega2-2.4G"
          Access Point: 00:13:EF:F1:02:B3
          Mode: Master  Channel: 9 (2.452 GHz)
          Tx-Power: unknown  Link Quality: 0/100
          Signal: unknown  Noise: unknown
          Bit Rate: 72.2 MBit/s
          Encryption: unknown
          Type: wext  HW Mode(s): 802.11abg
          Hardware: unknown [Generic WEXT]
          TX power offset: unknown
          Frequency offset: unknown
          Supports VAPs: no  PHY name: wlan0
```

5GHz Access Point

The RTL8821AU chipset does not support multiple virtual interfaces, so it can act either as an Access Point or as a Client, but cannot do both at the same time.

Populate `/etc/config/wireless` with the desired access point configuration:

```
config wifi-device 'radio1'
        option type 'mac80211'
        option channel '36' # cannot be auto, must be set to a channel
        option hwmode '11a' # must be 11a for 5 GHz networks
        option path 'platform/101c0000.ehci/usb1/1-1/1-1:1.0'
```

```
        option disabled '0'
        option htmode 'HT20'

config wifi-iface 'default_radio1'
        option device 'radio1'
        option network 'wlan'
        option mode 'ap'
        option ssid 'Omega2-5G' # network name - up to the end-user
        option encryption 'psk2'
        option key '12345678' # network password - up to the end-user
```

Restart the WiFi adapter with the following command:

```
wifi
```

To check that the Access Point is up, run the `iwinfo` command:

```
# iwinfo
wlan0     ESSID: "Omega2-5G"
          Access Point: 00:13:EF:F1:02:B3
          Mode: Master  Channel: 36 (5.180 GHz)
          Tx-Power: unknown  Link Quality: 0/100
          Signal: unknown  Noise: unknown
          Bit Rate: 72.2 MBit/s
          Encryption: unknown
          Type: wext  HW Mode(s): 802.11abg
          Hardware: unknown [Generic WEXT]
          TX power offset: unknown
          Frequency offset: unknown
          Supports VAPs: no  PHY name: wlan0
```