

# 88W8997 Connections On i.MX8MM-EVK & L5.4.70\_2.3.0

## 1. Hardware

- i.MX8MM-EVK (LPDDR4 version)
- AW-CM276MA-PUR

## 2. Software

- Linux bsp 5.4.70\_2.3.0
- PCIE-WLAN-UART-BT-8997-LNX\_6\_1\_55-IMX8-16.92.21.p84.4-16.92.21.p84.4-MM6X16423.P6-GPL

## 3. Connection diagram

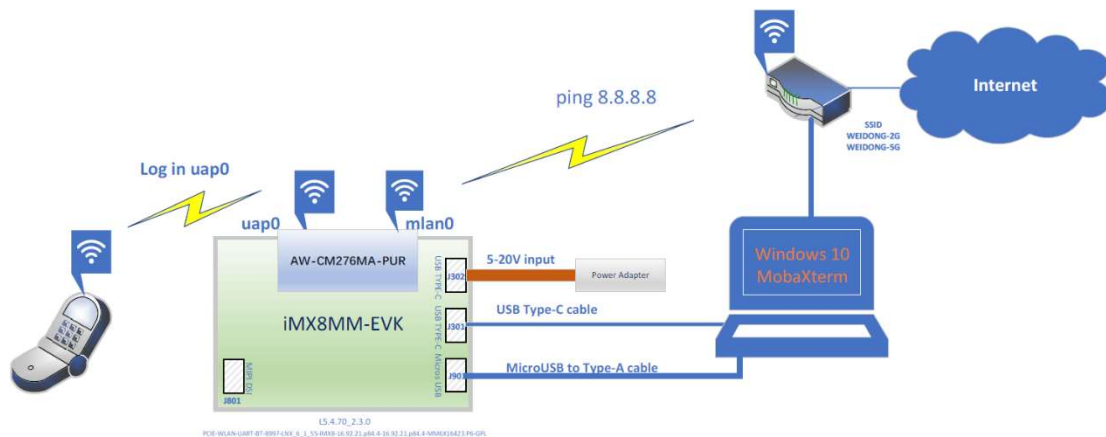


Figure 1 Test diagram

## [Target]

- ① Starting uap0 first, then starting mlan0
- ② 3 or more mobiles connect uap0 and keep linking status
- ③ mlan0 connects router and keep running "ping 8.8.8.8"

Confirming if mobiles link to uap0 are stable.

## 4. Preparation before test

- ① L5.4.70\_2.3.0 Demo Image

<https://www.nxp.com/design/design-center/software/embedded-software/i-mx-software/embedded-linux-for-i-mx-applications-processors:IMXLINUX>

Download it and burn it to eMMC on i.MX8MM-EVK

- ② 88W8997 FP92 driver

<https://www.nxp.com/products/wireless-connectivity/wi-fi-plus-bluetooth-plus-802-15-4/2-4-5-ghz-dual-band-2x2-wi-fi-5-802-11ac-plus-bluetooth-5-3-solution:88W8997?SAMLart=ST-AAF0E3YJDJej%2BJVBprc7Vu5rkUdez6F6xckQrAge91B7wDyUpDs99MT8#myDocument>

*Generic\_SD-WLAN-UART-BT-8997-LNX\_6\_1\_36-IMX8-16.92.21.p84.4-16.92.21.p84.4-MM6X16408.P2-GPL*

- ③ Building wifi driver for 5.4.70\_2.3.0
- ④ Copying Firmware & built driver to home directory of i.MX8MM-EVK

```
root@mx8mmevk:~# ls
FwImage bin wlan
root@mx8mmevk:~# ls bin wlan/*
bin wlan/README bin wlan/README_RBC bin wlan/load bin wlan/mlansvent.exe bin wlan/moolko bin wlan/wifidirectctl
bin wlan/README_MLAN bin wlan/README_UAP bin wlan/mlan-ko bin wlan/mlanctl bin wlan/saputl.exe
bin wlan/README_MLANLWS bin wlan/README_WIFIDIRECT bin wlan/mlan2040coex bin wlan/mlanlws bin wlan/unload
```

[Note] Log in board through SSH, so we need ethernet, don't forget it.

## ⑤ Replacing original driver files & FW with above built driver & FW

```
root@imx8mmevk:~/bin_wlan# cp ./*.ko /lib/modules/5.4.70-2.3.0+g4f2631b022d8/kernel/drivers/net/wireless/nxp/mxm_wifiex/wlan_src/
root@imx8mmevk:~/bin_wlan# cp ./FwImage/pcieuart8997_combo_v4.bin /lib/firmware/nxp/
```

## ⑥ Checking wifi\_mod\_para.conf

```
PCIE8997 = {
    cfg80211_wext=0xf
    wfd_name=p2p
    max_vir_bss=1
    cal_data_cfg=none
    drv_mode=3
    ps_mode=2
    auto_ds=2
    fw_name=nxp/pcieuart8997_combo_v4.bin
}
```

We only need STA & AP, so set drv\_mod=3

## ⑥ wpa\_supplicant.conf Configuration for STA (mLAN0)

# nano /etc/wpa\_supplicant.conf

```
ctrl_interface=/var/run/wpa_supplicant
update_config=1

network={
    ssid="WEIDONG-2G"
    psk="Apple_20220801"
    proto=RSN
    key_mgmt=WPA-PSK
    pairwise=CCMP TKIP
    group=CCMP TKIP
}
```

## ⑦ hostapd.conf configuration for AP (uap0)

# mv /etc/hostapd.conf /etc/hostapd-bak.conf

# nano /etc/hostapd.conf

```
ctrl_interface=/var/run/hostapd
interface=uap0
driver=nl80211
ssid=8997-uap0_2G
hw_mode=g
channel=1
max_num_sta=10
auth_algs=1
beacon_int=100
dtim_period=1
wmm_enabled=1
ignore_broadcast_ssid=0
wpa_key_mgmt=WPA-PSK
wpa=2
wpa_pairwise=CCMP
wpa_passphrase=1234567890
own_ip_addr=192.168.6.2
```

## ⑧ udhcpd configuration for AP (uap0)

```
# nano udhcpd.conf
```

```
start 192.168.6.10
end 192.168.6.20
interface uap0          #default: eth0
max_leases 11          #default: 254
remaining yes          #default: yes
auto_time 7200         #default: 7200 (2 hours)
decline_time 3600     #default: 3600 (1 hour)
conflict_time 3600    #default: 3600 (1 hour)
offer_time 60         #default: 60 (1 minute)
min_lease 60          #default: 60
lease_file /etc/udhcpd.leases
opt dns 192.168.1.1    #external router IP
option subnet 255.255.255.0
opt router 192.168.6.1 # uap0 gw IP
option domain local
option lease 864000
```

```
# touch /etc/udhcpd.leases
```

## 5. Starting test

### ① Stopping connmand service

```
# systemctl stop connman.service
```

### ② loading wifi driver

```
# modprobe moal mod_para=nxp/wifi_mod_para.conf
```

```
root@imx8mmevk:~# modprobe moal mod_para=nxp/wifi_mod_para.conf
[ 6627.309740] mlan: loading out-of-tree module taints kernel.
[ 6627.487207] wlan: Loading MWLAN driver
[ 6627.496809] wlan: Register to Bus Driver...
[ 6627.503081] wlan_pcie 0000:01:00.0: enabling device (0000 -> 0002)
[ 6627.510001] PCI memory map Virt0: 00000000c20ca51 PCI memory map Virt2: 00000000e94f6d3f
[ 6627.518800] Attach moal handle ops, card interface type: 0x204
[ 6627.524983] rps set to 0 from module param
[ 6627.529877] PCIE8997: init module param from usr cfg
[ 6627.535050] card_type: PCIE8997, config block: 0
[ 6627.539806] cfg80211_wext=0xf
[ 6627.542826] wfd_name=p2p
[ 6627.545514] max_vir_bss=1
[ 6627.548247] cal_data_cfg=none
[ 6627.551236] drv_mode = 3
[ 6627.553844] ps_mode = 2
[ 6627.556405] auto_ds = 2
[ 6627.558884] fw_name=nxp/pcieuart8997_combo_v4.bin
[ 6627.563842] rx_work=1 cpu_num=4
[ 6627.567026] Enable moal_recv_amsdu_packet
[ 6627.571385] Attach mlan adapter operations.card_type is 0x204.
[ 6627.587622] Request firmware: nxp/pcieuart8997_combo_v4.bin
[ 6628.210678] FW download over, size 622824 bytes
[ 6628.915970] WLAN FW is active
[ 6628.919044] on_time is 6629019711767
[ 6628.954487] FW country code WW does not match with US
[ 6628.960478] fw_cap_info=0x587c7fa3, dev_cap_mask=0xffffffff
[ 6628.966309] max_p2p_conn = 8, max_sta_conn = 8
[ 6628.993015] Register NXP 802.11 Adapter mlan0
[ 6629.000991] wlan: uap%d set max_mtu 2000
[ 6629.023022] Register NXP 802.11 Adapter uap0
[ 6629.028083] wlan: version = PCIE8997--16.92.21.p84.4-MM6X16423.p6-(FP92)
[ 6629.035563] wlan: Register to Bus Driver Done
[ 6629.039992] wlan: Driver loaded successfully
```

### ③ Starting uap0

```
# ifconfig uap0 192.168.6.2 netmask 255.255.255.0 up
# hostapd -d -B /etc/hostapd.conf
```

```
n180211: hidden SSID not in use
n180211: privacy=1
n180211: auth_algs=0x1
n180211: wpa_version=0x2
n180211: key_mgmt_suites=0x2
n180211: pairwise_ciphers=0x10
n180211: group_cipher=0x10
n180211: beacon_ies - hexdump(len=10): 7f 08 04 00 00 02 21 00 00 40
n180211: proberesp_ies - hexdump(len=10): 7f 08 04 00 00 02 21 00 00 40
n180211: assocresp_ies - hexdump(len=10): 7f 08 04 00 00 02 21 00 00 40
n180211: ap_max_inactivity=300
WPA: Start group state machine to set initial keys
WPA: group state machine entering state GTK_INIT (VLAN-ID 0)
GTK - hexdump(len=16): [REMOVED]
WPA: group state machine entering state SETKEYSDONE (VLAN-ID 0)
wpa_driver_nl80211_set_key: ifindex=4 (uap0) alg=3 addr=0xaaacc2bfa78 key_idx=1 set_tx=1 seq_len=0 key_len=16
n180211: KEY_DATA - hexdump(len=16): [REMOVED]
broadcast key
n180211: Set uap0 operstate 0->1 (UP)
netlink: Operstate: ifindex=4 linkmode=-1 (no change), operstate=6 (IF_OPER_UP)
n180211: TX queue param set: queue=0 aifs=1 cw_min=3 cw_max=7 burst_time=15 --> res=0
n180211: TX queue param set: queue=1 aifs=1 cw_min=7 cw_max=15 burst_time=30 --> res=0
n180211: TX queue param set: queue=2 aifs=3 cw_min=15 cw_max=63 burst_time=0 --> res=0
n180211: TX queue param set: queue=3 aifs=7 cw_min=15 cw_max=1023 burst_time=0 --> res=0
uap0: interface state UNINITIALIZED->ENABLED
uap0: AP-ENABLED
uap0: Setup of interface done.
```

```
# udhcpd -S /etc/udhcpd-uap0.conf -f &
```

### ④ Connect mobile to uap0



### ⑤ Starting STA (connect wlan0 to external router)

```
# wpa_supplicant -d -B -i wlan0 -c /etc/wpa_supplicant.conf -Dnl80211 &
```

```

[ 7598.145771] wlan: SCAN COMPLETED: scanned AP count=34
[ 7598.167997] wlan: HostMlme wlan0 send auth to bssid 34:XX:XX:XX:ef:2b
[ 7598.190508] wlan0:
[ 7598.190574] wlan: HostMlme Auth received from 34:XX:XX:XX:ef:2b
[ 7598.199147] uap0:
[ 7598.199161] wlan: HostMlme Auth received from 34:XX:XX:XX:ef:2b
[ 7598.210977] CMD_RESP: cmd 0x121 error, result=0x2
[ 7598.215867] IOCTL failed: 00000000bacf6018 id=0x200000, sub_id=0x200024 action=2, status_code=0x3
[ 7598.224776] Get multi-channel policy failed
[ 7599.230501] CSA/ECSA: Switch to new channel 11 complete!
[ 7599.235966] OLD BW = 0 NEW BW = 0
[ 7599.243427] wlan: HostMlme wlan0 Connected to bssid 34:XX:XX:XX:ef:2b successfully
[ 7599.267078] wlan0:
[ 7599.267156] wlan: Send EAPOL pkt to 34:XX:XX:XX:ef:2b
[ 7599.288535] wlan0:
[ 7599.288581] wlan: Send EAPOL pkt to 34:XX:XX:XX:ef:2b
[ 7599.306652] IPv6: ADDRCONF(NETDEV_CHANGE): wlan0: link becomes ready
[ 7599.319202] woal_cfg80211_set_rekey_data return: gtk_rekey_offload is DISABLE

```

```
# udhcpc -i wlan0
```

```

root@inx8mmevk:~#
root@inx8mmevk:~#
root@inx8mmevk:~# udhcpc -i wlan0
udhcpc: started, v1.31.0
udhcpc: sending discover
udhcpc: sending select for 192.168.1.101
udhcpc: lease of 192.168.1.101 obtained, lease time 7200
/etc/udhcpc.d/50default: Adding DNS 165.114.52.147
/etc/udhcpc.d/50default: Adding DNS 165.114.89.4
root@inx8mmevk:~#

```

```

root@inx8mmevk:~# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=107 time=51.7 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=107 time=57.6 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=107 time=48.5 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=107 time=61.9 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=107 time=51.5 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=107 time=45.3 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=107 time=48.5 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=107 time=51.4 ms
64 bytes from 8.8.8.8: icmp_seq=9 ttl=107 time=44.6 ms
64 bytes from 8.8.8.8: icmp_seq=10 ttl=107 time=48.1 ms

```

## ⑥ Observing uap0 connections on mobile



Run these 2 commands, then ping network address directly.

```
# echo "nameserver 8.8.8.8" >> /etc/resolv.conf
```

```
# echo "nameserver 8.8.4.4" >> /etc/resolv.conf
```

Then run ping command on SSH terminal.

```
# ping www.baidu.com
```

```
root@imx8mmevk:~# ping www.baidu.com
PING www.wshifen.com (103.235.46.40) 56(84) bytes of data.
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=1 ttl=45 time=55.6 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=2 ttl=45 time=51.3 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=3 ttl=45 time=44.4 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=4 ttl=45 time=55.5 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=5 ttl=45 time=63.3 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=6 ttl=45 time=49.2 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=7 ttl=45 time=74.3 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=8 ttl=45 time=54.7 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=9 ttl=45 time=46.9 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=10 ttl=45 time=50.7 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=11 ttl=45 time=46.0 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=12 ttl=45 time=58.6 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=13 ttl=45 time=54.3 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=14 ttl=45 time=50.5 ms
64 bytes from 103.235.46.40 (103.235.46.40): icmp_seq=15 ttl=45 time=48.4 ms
```

Serial terminal & SSH terminal run ping commands at the same time.

- Serial terminal : ping 8.8.8.8
- SSH terminal : ping [www.baidu.com](http://www.baidu.com)