MP Driver Document

Commands and Setup for 2.4G

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CHANGE HISTORY

VERSION	DATE	REMARKS
1.0	2013/02/7	FIRST RELEASE
1.1	2013/09/11	UPDATE MIB VALUE AND FORMAT

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1. Introduction

Realtek Wi-Fi Linux driver supports driver based Mass Production functions. Customers can utilize these functions to do EMI test and other simple TX and RX test. Under Realtek Wi-Fi turnkey, we use Linux utility *"iwpriv"* to get and set I/O control to WLAN driver. The following commands are executed under Linux command prompt. The MP functions will only operate after the WLAN interface is opened.

2. MP Commands Description

1. Start MP mode:

"iwpriv wlan0 mp_start"

After executing this command, WLAN driver enters MP mode and stops transmitting and receiving any packets. All connection with other stations will be broken. Beacon transmitting is also stopped. If the original state is client mode, the roaming will be stopped.

2. Stop MP mode:

"iwpriv wlan0 mp_stop"

After executing this command, WLAN driver will stops transmitting and receiving packets initialized by other commands. It will not return to normal operation mode. System should close the WLAN interface and open again to let WLAN to work normally.

3. Set Tx rate:

"iwpriv wlan0 mp_rate rate"

- ***Rate:*** sets the rate of Tx packets, for example:
  - 2 for 1M, 4 for 2M, 11 for 5.5M, 22 for 11M
  - 12 for 6M, ……, 108 for 54M,
  - 128 for MCS0, 129 for MCS1, …, 143 for MCS15

  Set the data rate of continuous transmitting.

4. Set operational channel:

"iwpriv wlan0 mp_channel channel"

- ***channel:*** sets the channel to send and receive packets.

  Set the operational channel of transmitting and receiving packets.

5. Set operational bandwidth:

"iwpriv wlan0 mp_bandwidth [40M=40m,shortGI=sgi]"

- ***40m:*** sets the operational bandwidth, 1 for 40M mode, 0 for 20M mode
- ***sgi:*** sets guard interval of transmitting MCS packet, 1 for short GI, 0 for long GI.

Set the operational bandwidth for transmitting and receiving packets. Set the guard interval for transmitting MCS packets. If the parameters are not given, the default action is set bandwidth to 20M mode and long GI to transmitting packets.

6. Set TX power:

"iwpriv wlan0 mp_txpower [patha=x,pathb=y]"

- ***x:*** sets TX power level for path-A
- ***y:*** sets TX power level for path-B

Set the transmitting power level of path A and path B. If the parameters are not given, the driver will set TX power according to the flash setting.

7. Set PHY related parameters:

"iwpriv wlan0 mp_phypara [xcap=x]"

- ***x:*** sets the value of crystal capacitor, X = 0 ~63

Set the PHY related parameters of crystal capacitor. Default initial value is 0x20 (32). When x < 32, increase internal cap, X >32 decrease internal cap.

This command is draft command, and it is not support for every chipset.

8. Set BSSID:

"iwpriv wlan0 mp_bssid bssid"

- ***bssid:*** sets the BSSID of transmitting packets

Set the BSSID of transmitting packets. It's format is 802.3 MAC address.

9. Set antenna for Tx:

"iwpriv wlan0 mp_ant_tx ant"

- ***ant:*** sets the operational antenna for TX, a for antenna A, b for antenna B, ab for antenna A and B.

Set the operational antenna for TX on the target board.

10. Set antenna for Rx:

"iwpriv wlan0 mp_ant_rx ant"

- ***ant:*** sets the operational antenna for RX, a for antenna A, b for antenna B, ab for antenna A and B

  Set the operational antenna for RX on the target board.

11. Start air Rx mode:

"iwpriv wlan0 mp_arx start/stop"

- ***start:*** clears counters and start to accumulate RX packets
- ***stop:*** stops counts and show the statistics

This command is for air receiving test. Use *start* command to clear all the counters and start to accumulate the received packets. Use *stop* command to stop counting and show the statistics of correct packets and CRC-error packets.

12. Start continuous TX mode:

"iwpriv wlan0 mp_ctx time=t,count=n,background,stop,pkt,cs,stone"

- ***t:*** sets the number of seconds to send packets
- ***n:*** sets the number of packets to send
- ***background:*** sends packets in background mode
- ***stop:*** stops the background sending
- ***pkt:*** sends packet tx, i.e., not sent by hardware
- ***cs:*** sends carrier suppression
- ***stone:*** sends single tone

This command is for continuous transmitting test. Use ***time*** command to assign the time to send packets. Use ***count*** command to assign the number of packets to send. If both of ***time*** and ***count*** are not specified, the sending function will continue infinitely. It can be stopped when any key is pressed (should be specifically implemented in other platform) while ***background*** command is not specified. If ***cs*** is specified, the sending signal will be a carrier suppression signal. Use ***stone*** command to send single tone signal for frequency testing. If ***stone*** is specified, the sending signal will be single tone and not a distinguishable packet any more. Use ***background*** command to tell driver to send packets in background. The command line control will return and packet sending is continuous. It can be stopped by ***stop*** command. By default, packets will be sent by hardware for shorter duty cycle. If ***pkt*** is specified, packets will be sent by software.

13. Query air Rx statistics:

"iwpriv wlan0 mp_query"

This command is for packet counting. Under packet transmitting, use this command to get the number of packets being transmitted. Under receiving, use this command to get the statistics of correct packets and CRC-error packets.

14. Get temperature from chip

"iwpriv wlan0 mp_ther"

This command is for getting temperature from chip. The gotten value should write to flash, and it is used for "tx-power tracking" method.

3. How to use MP commands

The standard procedure is as below:

Start procedure:

- Configure Wi-Fi MIBs to determine types of Band (5G/2.4G), Mode(A/B/G/N) and PA(extPA/intPA).
- Open Wi-Fi driver and enter MP mode.
- Use mp commands to dynamically set channel, rate, antenna, power level…and etc.
- Use mp commands to perform TX/RX verifications and query statistics.

Stop procedure:

- After done testing, exit MP mode and re-open Wi-Fi driver.

Below will introduce the command lists for examples.

(1) Init and Open Wi-Fi MP Driver

iwpriv wlan0 set_mib macPhyMode=0 //config Single MAC single PHY
iwpriv wlan0 set_mib phyBandSelect=1 //config band = 2.4G
iwpriv wlan0 set_mib mp_specific=1 //enable MP mode, this is must be executed
ifconfig wlan0 down
ifconfig wlan0 up //close and open driver to activate mib setting.
iwpriv wlan0 mp_start //enter MP mode

(2) Configure Band Mode

iwpriv wlan0 set_mib phyBandSelect=1 //config band = 2.4G
iwpriv wlan0 set_mib mp_specific=1 //enable MP mode, this is must be executed
iwpriv wlan0 set_mib ther=0 //disable TX-Power tracking
ifconfig wlan0 down
ifconfig wlan0 up //close and open driver to activate mib setting.
iwpriv wlan0 mp_start //enter MP mode.

(3) Configure Basic Settings of MP

These configurations can be applied immediately. (No need to down/up WiFi driver)

iwpriv wlan0 mp_txpower patha=12,pathb=11 //config tx power indices of pathA=12, pathB=11

iwpriv wlan0 mp_ant_tx a //config antenna A to perform Tx

iwpriv wlan0 mp_ant_rx a //config antenna B to perform Rx

iwpriv wlan0 mp_rate 72 //config data rate = 36 Mbps

iwpriv wlan0 mp_bandwidth 40M=0,shortGI=1 //config bandwidth = 40Mhz, GI = short.

iwpriv wlan0 mp_phypara xcap=0 //config CrystalCap value = 0

(4) Perform MP Testing

(A) Test Item: Packets TX

iwpriv wlan0 mp_ctx count=1000,background,pkt //start sending 1000 packets

iwpriv wlan1 mp_query //get the statistics

iwpriv wlan0 mp_ctx stop //stop Tx test.

(B) Test Item: Continuous TX

iwpriv wlan0 mp_ctx background //start continuous Tx

iwpriv wlan0 mp_ctx stop //stop Tx test

(C) Test Item: Continuous TX Single Tone

iwpriv wlan0 mp_ctx background,stone //start sending single stone signal

iwpriv wlan0 mp_ctx stop //stop Tx test

(D) Test Item: Carrier Suppression TX

iwpriv wlan0 mp_ctx background,cs //start sending carrier suppression signal

iwpriv wlan0 mp_ctx stop //stop Tx test

(E) Test Item: Packets RX

iwpriv wlan0 mp_arx start //start air Rx

iwpriv wlan1 mp_query //get the statistics

iwpriv wlan0 mp_arx stop //stop Rx Test

(F) Get Thermal Value

iwpriv wlan0 mp_ther

After testing functions of TX/RX, it should use this command to get temperature of the chipset to know what normal temperature is when Wi-Fi works.

(5) Exit MP Mode

iwpriv wlan0 mp_stop //exit MP mode

ifconfig wlan0 down //close WLAN interface

iwpriv wlan0 set_mib mp_specific=0

ifconfig wlan0 up //open again for normal operation

4. Flash commands

After finishing Mass Production test, the tester needs to save the calibration results (see Appendix) and thermal value in the flash for normal operation. There are some fields in flash to save the calibration results:

The following flash fields name start with HW_WLANX. The X is either 0 or 1 depends on which interface 8812 is plugged in.

(1) CCK TX-Power value for 2.4G:

HW_WLAN0_TX_POWER_CCK_A

HW_WLAN0_TX_POWER_CCK_B

Ex. flash set HW_WLAN0_TX_POWER_CCK_A 30 30 30 31 31 31 31 31 31 32 32 32 32 32

Note: There are 14 values for 14 channels for each path.

(2) HT 40Mhz 1S TX-Power value for 2.4G:

HW_WLAN0_TX_POWER_HT40_1S_A

HW_WLAN0_TX_POWER_HT40_1S_B

Ex. flash set HW_WLAN0_TX_POWER_HT40_1S_A 30 30 30 31 31 31 31 31 31 32 32 32 32 32

Note: There are 14 values for HT 1 spatial stream in 40MHz mode of 14 channels for each path.

(3) HT 40Mhz 2S TX-Power difference for 2.4G:

HW_WLAN0_TX_POWER_DIFF_HT40_2S

Ex. flash set HW_WLAN0_TX_POWER_DIFF_HT40_2S 17 17 17 17 17 17 17 17 17 17 17 17 17 17

Note: There are 14 values for HT 2 spatial streams in 40Mhz mode of 14 channels. For each value, the lower 4 bits stands for difference between HT40_1S for path A, and the higher 4 bits stands for difference between HT40_1S for path B.

(4) HT 20MHz TX-Power difference for 2.4G:

HW_WLAN0_TX_POWER_DIFF_HT20

Ex. flash set HW_WLAN0_TX_POWER_DIFF_HT20 33 33 33 33 33 33 33 33 33 34 34 34 34 34

Note: There are 14 values for HT 20MHz mode of 14 channels. For each value, the lower 4 bits stands for difference between HT40_1S for path A, and the higher 4 bits stands for

difference between HT40_1S for path B

(5) OFDM TX-Power difference for 2.4G:

HW_WLAN0_TX_POWER_DIFF_OFDM

Ex. flash set HW_WLAN0_TX_POWER_DIFF_OFDM 67 67 67 67 67 67 67 67 67 52 52 52 52 52

Note: There are 14 values for OFDM of 14 channels. For each value, the lower 4 bits stands for difference between HT40_1S for path A, and the higher 4 bits stands for difference between HT40_1S for path B

(10) Thermal value (temperature) for TX-Power tracking

HW_WLAN0_11N_THER

Ex: flash set HW_WLAN0_11N_THER A

A is the value from “iwpriv wlan0 mp_ther”

Note: The thermal value is the base value of doing TX-Power tracking when the temperature is changed.

5. Appendix — Channel Group

After finishing Mass Production test, the tester will get several value of TX-Power-Index. The channel groups in 2.4G are as below:

	Group1-LOW	Group1-MID	Group1-HIGH
Channel	1-3	4-9	10-14

And assume the TX-Power is as below

	Group1-LOW	Group1-MID	Group1-HIGH
CCK_A	0x23(35)	0x24(36)	0x25(37)
CCK_B	0x23(35)	0x24(36)	0x25(37)
HT40_1S_A	0x1e(30)	0x1f(31)	0x20(32)
HT40_1S_B	0x1e(30)	0x1f(31)	0x20(32)
OFDM_A	0x20(32)	0x21(33)	0x22(34)
OFDM_B	0x21(33)	0x22(34)	0x23(35)
HT20_1S_A	0x1d(29)	0x1e(30)	0x1f(31)
HT20_1S_B	0x1c(28)	0x1c(28)	0x1c(28)
HT40_2S_A	0x1e(30)	0x1f(31)	0x20(32)
HT40_2S_B	0x1e(30)	0x1f(31)	0x20(32)

The commands of flash should be as

flash set HW_WLAN0_TX_POWER_CCK_A 35 35 35 36 36 36 36 36 36 37 37 37 37 37

flash set HW_WLAN0_TX_POWER_CCK_B 35 35 35 36 36 36 36 36 36 37 37 37 37 37

flash set HW_WLAN0_TX_POWER_HT40_1S_A 30 30 30 31 31 31 31 31 31 32 32 32 32 32

flash set HW_WLAN0_TX_POWER_HT40_1S_B 30 30 30 31 31 31 31 31 31 32 32 32 32 32

And the other three commands for difference TX-POWER should be as

flash set HW_WLAN0_TX_POWER_DIFF_OFDM 50 50 50 50 50 50 50 50 50 50 50 50 50 50

flash set HW_WLAN0_TX_POWER_DIFF_HT20 239 239 239 239 239 239 239 239 239 239 239 239 239 239

flash set HW_WLAN0_TX_POWER_DIFF_HT40_2S 0 0 0 0 0 0 0 0 0 0 0 0 0 0

The difference is “BABABABABABABABABABABABABABA”, B means the difference of Path-B in each channel and A means the difference of Path-A in each channel. The formula in driver to calculate TX-Power is

```
(((diff & 0x08) == 0x08)? (ht40 - (0x10 - diff)) :(ht40 + diff))
```

Example 1 (channel 1, Path-A, OFDM): 0x1e+0x2 = 0x20

Example 2 (channel 1, Path-B, HT20): 0x1e-(0x10-0xe) = 0x1c

- TX_POWER_DIFF_OFDM

Channel 1 :

Path A : 0x20 – 0x 1e = 0x2

Path B : 0x21 – 0x1e = 0x3

➔ Ch1 power diff with OFDM is 32(hex)[B=3 , A=2] ➔ 50 (dec)

- TX_POWER_DIFF_HT20

Channel 1 :

Path A : 0x1d – 0x1e = -1 (0xf)

Path B : 0x1c – 0x1e = -2 (0xe)

➔ Ch1 power diff with HT20 is ef(hex)[B=e, A=f] ➔ 239(dec)