

# Quick Start Guide for RTKM

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## Introduction

RTKM is a pre-allocated memory management feature. It manages memory sizes larger than 1 page size (4096 bytes<sup>1</sup>). It can prevent the memory fragmentation issue during something like install/uninstall or any dynamic memory requesting operation from the WiFi driver, but the cost is there will be always some memories occupied til the end of RTKM life cycle.

### 1. Support driver

AX series and driver version higher than 1.19.

### 2. Setup RTKM

It can configure by CONFIG\_RTKM in *Makefile* or *platform/{platform}.mk*

{value} : n/m/y

n: not support

m: standalone

The driver will build two ko modules (*rtkm.ko* and *{rtk wi-fi}.ko*).

Insert *rtkm.ko* **before** insert *wi-fi.ko*.

the rtkm memory will be released only when the *rtkm.ko* is removed.

y: built-in

The driver only build one *{rtk wi-fi}.ko*

the rtkm memory will be released when the module is removed.

### 3. Pre-allocate memory

Method 1: Predefined Macros in *Makefile* or *platform/{platform}.mk*

You can define the *RTKM\_MPOOL\_{0 ~ 8}* to allocate usage per page order pool size.

*RTKM\_MPOOL\_{order}={value}*

```
CONFIG_RTKM = y
EXTRA_CFLAGS += -DRTKM_MPOOL_0=0
EXTRA_CFLAGS += -DRTKM_MPOOL_1=12292
```

<sup>1</sup> In x86 Linux, one page size is 4Kb

```
EXTRA_CFLAGS += -DRTKM_MPOOL_2=1
EXTRA_CFLAGS += -DRTKM_MPOOL_3=132
EXTRA_CFLAGS += -DRTKM_MPOOL_4=0
EXTRA_CFLAGS += -DRTKM_MPOOL_5=0
EXTRA_CFLAGS += -DRTKM_MPOOL_6=0
EXTRA_CFLAGS += -DRTKM_MPOOL_7=3
EXTRA_CFLAGS += -DRTKM_MPOOL_8=0
```

#### Method 2: module parameter

You can use the module parameter *mpool* to allocate usage per page order pool size.

*mpool*: pre-allocated memory pool (array of int)

```
$ insmod rtkm.ko mpool=0,12292,1,132,0,0,0,3,0
```

Order	mpool	Size <sup>2</sup> (byte)	Trace bit mask	Default value
0	RTKM_MPOOL_0	0x1000	0x01	0
1	RTKM_MPOOL_1	0x2000	0x02	0
2	RTKM_MPOOL_2	0x4000	0x04	0
3	RTKM_MPOOL_3	0x8000	0x08	0
4	RTKM_MPOOL_4	0x10000	0x10	0
5	RTKM_MPOOL_5	0x20000	0x20	0
6	RTKM_MPOOL_6	0x40000	0x40	0
7	RTKM_MPOOL_7	0x80000	0x80	0
8	RTKM_MPOOL_8	0x100000	0x100	0

Note: Please contact FAE for initial value setting.

## 4. Checking and Debugging

Checking current pre-allocate memory usage.

```
$ cat /proc/net/rtl8852bu/rtkm
===== RTKM
=====
order    use    peak    alloc+    size
-----
  1    12291    12292    12292 100696064
  2         1         1         1   16384
  3      132      132      132  4325376
  7         2         2         3  1572864
sum    12426    12427    12428 106610688
```

#### Debugging/Tracing pre-allocate memory

Enable debug trace by set the bit mask.

##### Method 1: proc file system

echo order bit mask to /proc/net/rtl8852bu/rtkm

```
$ echo 0x8 > /proc/net/rtl8852bu/rtkm
```

##### Method 2: module parameter

<sup>2</sup> In x86 system, size = PAGE\_SIZE(4Kb) \* ( 1 << Order )

parm: rtkm\_trace:Trace memory pool (uint)

```
$ insmod rtkm.ko rtkm_trace=0x8
```

Driver logs:

```
rtkm: _kmalloc: require(00000000c52a3603, 32768) usage(3 132/132)
dbg_rtw_zmalloc+0x58/0xac [8852bu]
phl_register_tx_ring+0xf7/0x1a8 [8852bu]
phl_alloc_stainfo_sw+0x8eb/0x983 [8852bu]
rtw_phl_wifi_role_alloc+0x5e6/0x9f1 [8852bu]
```

## Memory leak

When rtkm destroy, if the memory entries still in used, rtkm will print trace log for debugging.

Negative example log:

```
rtkm: rtkm_prealloc_destroy
rtkm: rtkm_destroy_phy
rtkm: ===== RTKM
=====
rtkm: order      use      peak    alloc+    size
rtkm: -----
rtkm:    1        1        1    4098  33570816
rtkm: rtkm_destroy_phy: memory leak! order=1 num=1
rtkm: rtkm_destroy_phy: rb tree leak! order=1
rtkm: rtkm_destroy_phy: memory leak! (00000000bc134dab, 8192)
dbg_rtw_zmalloc+0x58/0xac [8852bu]
alloc_txring+0x7f/0x150 [8852bu]
_rtw_init_xmit_priv+0x33d/0x37e [8852bu]
rtw_init_drv_sw+0x80/0x1bd [8852bu]
rtkm: rtkm_prealloc_destroy: done
```

## 5. Document revision history

Version	Date YYYY-MM-DD	Remarks
1.0	2022-05-17	Initial release