

A Wireless Device Driver: Atheros ath5k

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General Outline

- Introduction
- Methodology
- Result
- Test
- Compare Theory with Testing
- Conclusion & Future Works

Introduction

- Wireless is the most popular type of communication.
- Linux is using more in research and daily life.
➔ Projects to optimize wireless communication.
- Problems: not much documents about implementation/operation of a specific driver.
➔ A project to research an open source driver: ath5k driver for WLAN card using Atheros chipsets.

Methodology

- Atheros chipsets are favored by open-source community.
- Ath5k is a completely free-and-open-source wireless driver for Atheros wireless card.
- Stable.
- Including in Linux Kernel since version 2.6.

Methodology

- Structure of ath5k folder: 30 files.
- Tracing line by line.

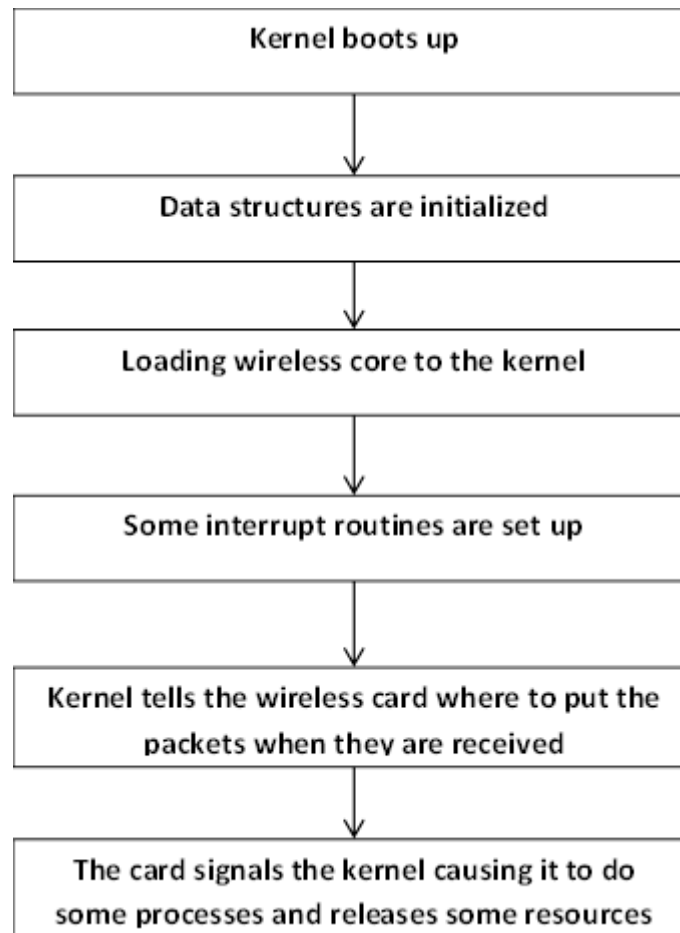
```
root@ubuntu-12-10: /home/phuong/Downloads/compat-wireless-3.5.4-1/drivers/net/wireless/ath/ath5k# ls
ahb.c      attach.o  desc.o    Kconfig   pcu.o      rkill.c
ani.c      base.c    dma.c     led.c     phy.c      rkill.o
ani.h      base.h    dma.o     led.o     phy.o      sysfs.c
ani.o      base.o    eeprom.c  mac80211-ops.c qcu.c      sysfs.o
ath5k.h    caps.c    eeprom.h  mac80211-ops.o qcu.o      trace.h
ath5k.ko   caps.o    eeprom.o  Makefile  reg.h
ath5k.mod.c debug.c   gpio.c    modules.order reset.c
ath5k.mod.o debug.h   gpio.o    pci.c     reset.o
ath5k.o    desc.c    initvals.c pci.o     rfbuffer.h
attach.c   desc.h    initvals.o pcu.c     rfgain.h
root@ubuntu-12-10: /home/phuong/Downloads/compat-wireless-3.5.4-1/drivers/net/wireless/ath/ath5k#
```

Methodology

- Expect result about:
 - basic operation such as: transmission/reception.
 - configuration driver.
 - building function calls in flow diagram.
 - using driver debug to prove theory.

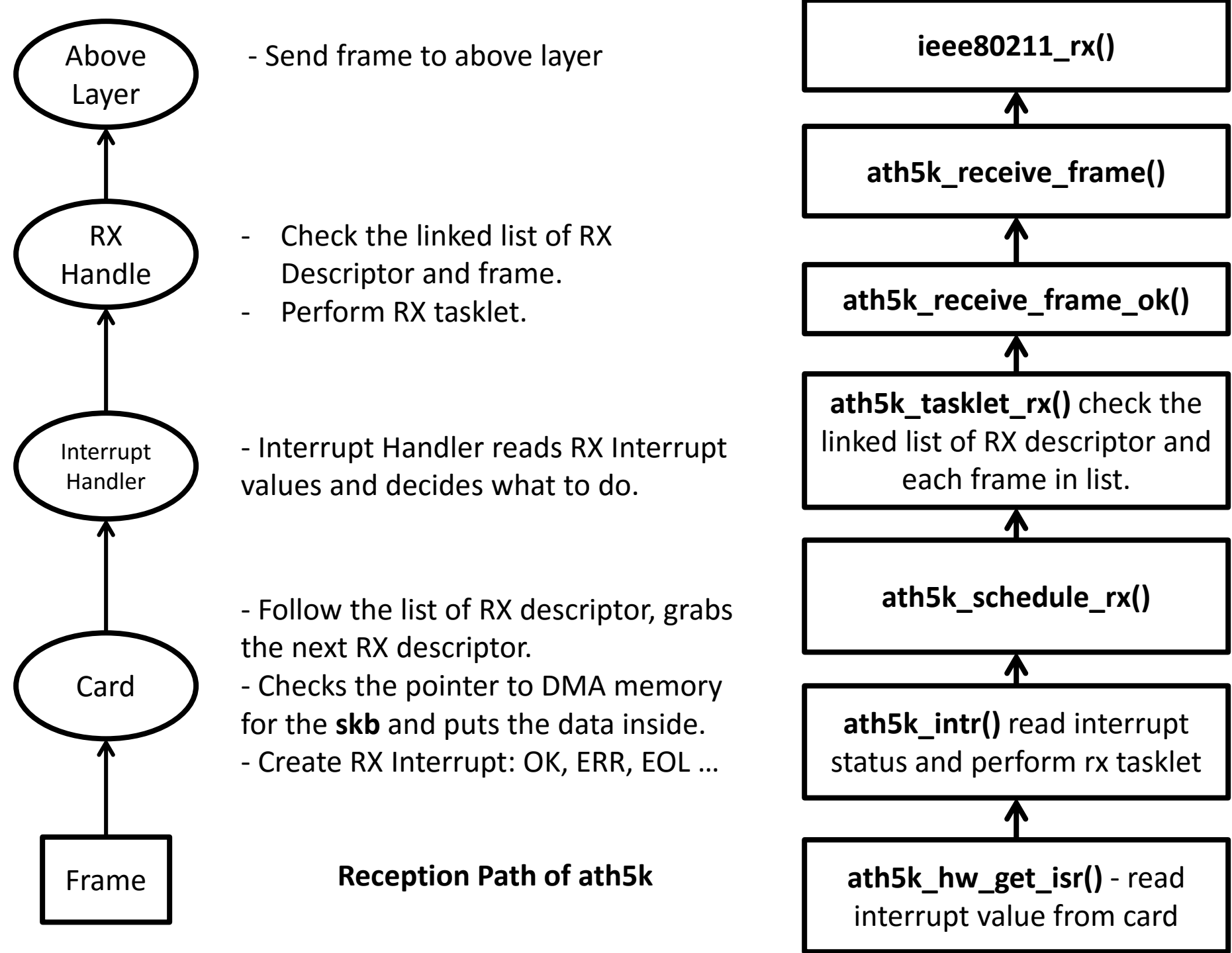
Result

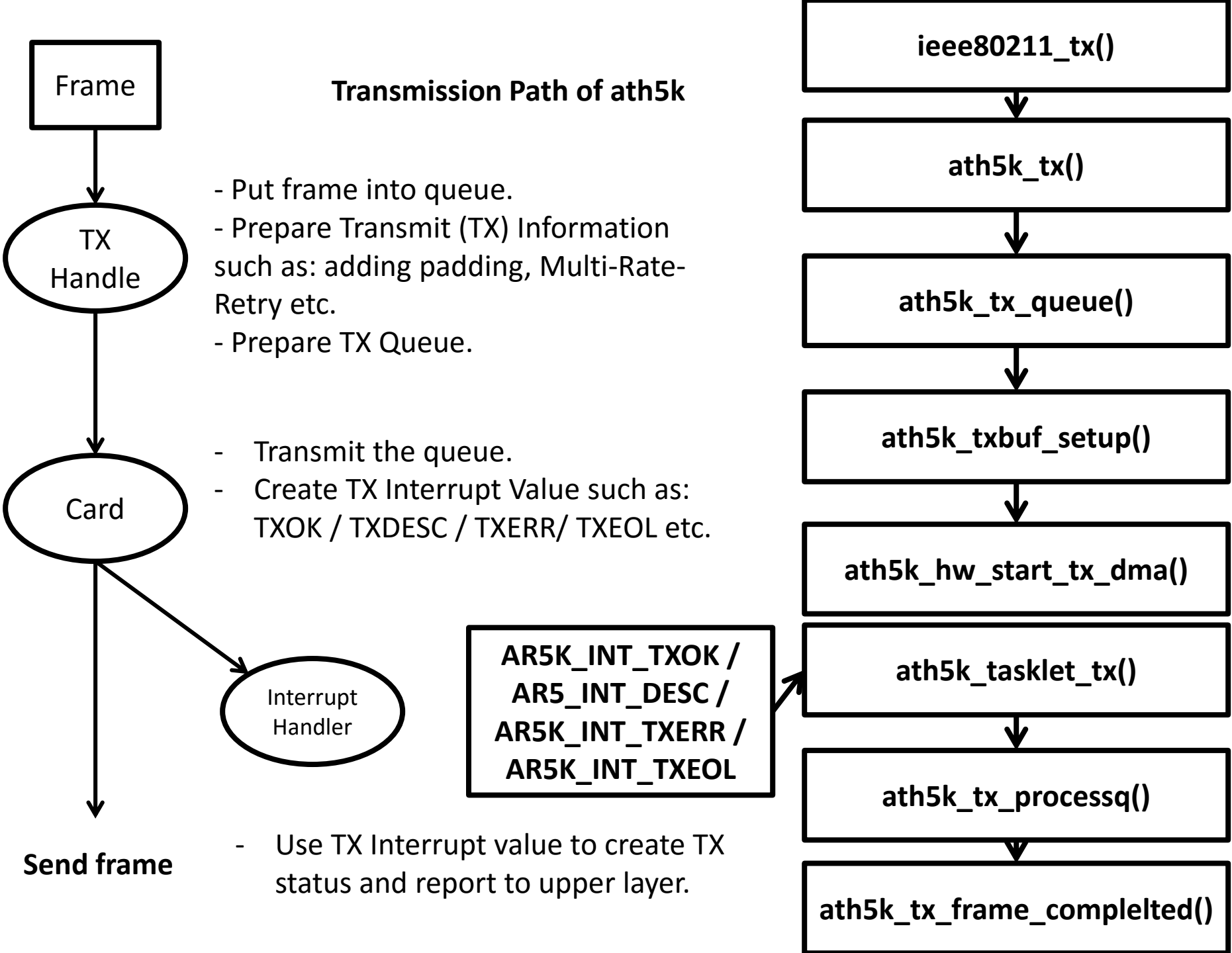
- Basic operation of a Linux wireless driver:



Result

- Reception (RX)Path
- Transmission (TX) Path
- Configuration Path





User space



Kernel



mac80211



Driver

Configuration Path of ath5k

- command to change
operation mode



- analyzes command.
- passes command's value to
cfg80211_ops and
mac80211_ops.



- mac80211_ops stores value.
- passes value to driver
through the matching function
with callbacks that has
received value.

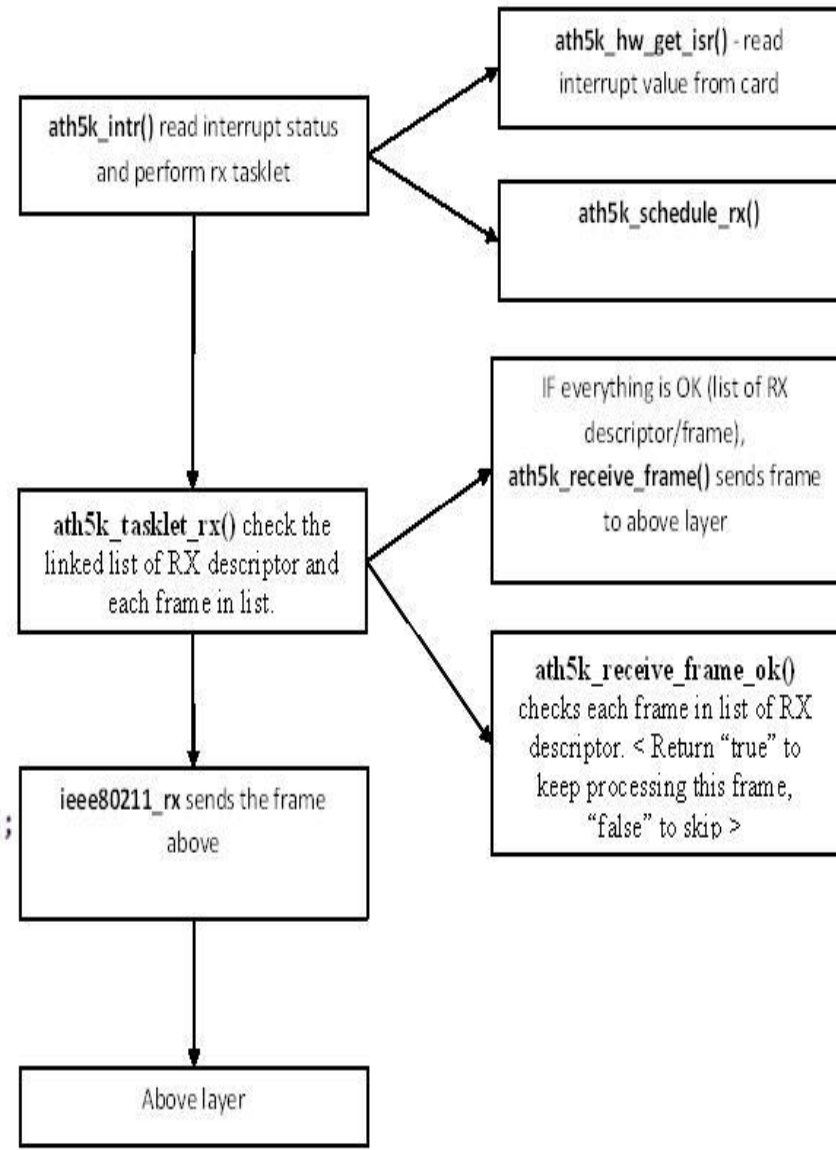


- calls driver function to
changes driver's parameter
value.

Test

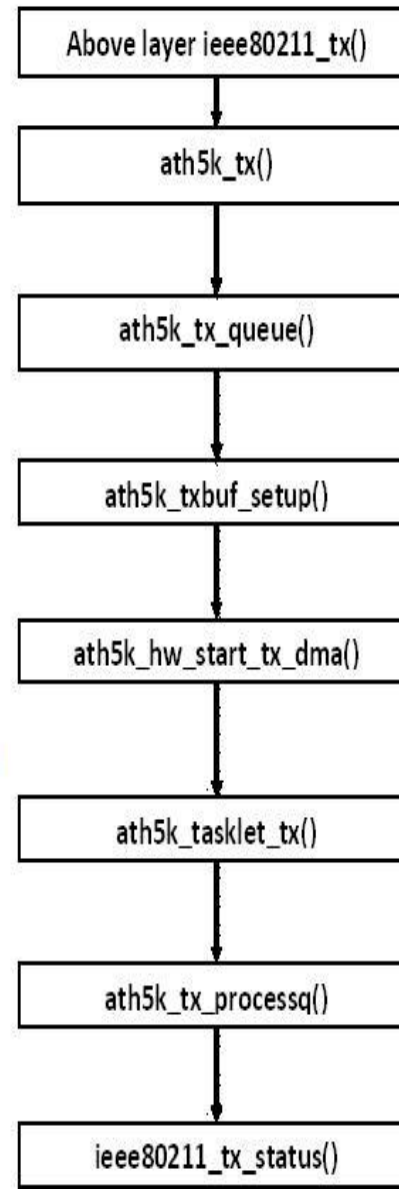
Compare TX/RX with Testing

funcgraph_entry:		ath5k_intr() {
funcgraph_entry:	1.706 us	ath5k_hw_is_intr_pending();
funcgraph_entry:	+ 13.196 us	ath5k_hw_get_isr();
funcgraph_entry:	1.568 us	ath5k_hw_is_intr_pending();
funcgraph_entry:		ath5k_set_current_imask() {
funcgraph_entry:	4.031 us	ath5k_hw_set_imr();
funcgraph_exit:	8.314 us	}
funcgraph_exit:	+ 28.785 us	}
funcgraph_entry:		ath5k_tasklet_rx() {
funcgraph_entry:	0.101 us	ath5k_hw_get_rxdp();
funcgraph_entry:	0.330 us	ath5k_hw_proc_5212_rx_status();
funcgraph_entry:	4.185 us	ath5k_rx_skb_alloc();
funcgraph_entry:	0.461 us	ath5k_remove_padding();
funcgraph_entry:	4.658 us	ath5k_hw_get_tsf64();
ath5k_rx:	[0xf2f49280] RX skb=f1ebd400	
funcgraph_entry:		ieee80211_rx() {
funcgraph_entry:		ieee80211_rx_handlers() {
funcgraph_entry:	0.222 us	ieee80211_rx_h_michael_mic_verify();
funcgraph_entry:		ath5k_intr() {
funcgraph_entry:	1.789 us	ath5k_hw_is_intr_pending();
funcgraph_entry:	+ 13.136 us	ath5k_hw_get_isr();
funcgraph_entry:	1.620 us	ath5k_hw_is_intr_pending();
funcgraph_entry:		ath5k_set_current_imask() {
funcgraph_entry:	7.212 us	ath5k_hw_set_imr();
funcgraph_exit:	7.987 us	}
funcgraph_exit:	+ 27.150 us	}



Compare TX/RX with Testing

funcgraph_entry:			ieee80211_tx() {
funcgraph_entry:	0.357 us		ieee80211_tx_prepare();
funcgraph_entry:	0.105 us		ieee80211_tx_h_michael_mic_add();
funcgraph_entry:	0.132 us		ieee80211_tx_set_protected();
funcgraph_entry:			ath5k_tx() {
funcgraph_entry:			ath5k_tx_queue() {
ath5k_tx:	[0xf2af1280]	TX skb=f1bbdf00 q=2	
funcgraph_entry:	0.326 us		ath5k_hw_setup_4word_tx_desc();
funcgraph_entry:	0.312 us		ath5k_hw_setup_mrr_tx_desc();
funcgraph_entry:	1.722 us		ath5k_hw_start_tx_dma();
funcgraph_exit:	5.813 us		}
funcgraph_exit:	6.885 us		}
funcgraph_exit:	+ 13.920 us		}
funcgraph_entry:			ath5k_tasklet_tx() {
funcgraph_entry:	1.699 us		ath5k_hw_get_txdp();
funcgraph_entry:	0.270 us		ath5k_hw_proc_4word_tx_status();
funcgraph_entry:	1.188 us		ath5k_remove_padding();
ath5k_tx_complete:	[0xf2af1280]	TX end skb=ed82c800 q=2 stat=0 rssi=39 ant=1	
funcgraph_entry:	+ 10.538 us		ieee80211_tx_status();
funcgraph_entry:	1.579 us		ath5k_hw_get_txdp();
funcgraph_entry:	0.278 us		ath5k_hw_proc_4word_tx_status();
funcgraph_entry:			ath5k_set_current_imask() {
funcgraph_entry:	7.166 us		ath5k_hw_set_imr();
funcgraph_exit:	7.886 us		}
funcgraph_exit:	+ 31.942 us		}



Conclusion & Future Works

- Building a brief overview of an open source wireless driver ath5k.
- Proposing theory for further research.
- Implementing some functions to configure a card using ath5k driver: RX/TX Power.

Thank you for listening