02/05/2024 Installing Wifi adapter in petalinux

02/05/2024 Installing Wifi adapter in petalinux

Finding chipset of Wifi adapter in linux

- Use `lsusb` to list the connected USB devices in board:

```
xilinx-kr260-starterkit-20222:~$ lsusb
Bus 004 Device 002: ID 0424:5744 Microchip Technology, Inc. (formerly SMSC) Hub
Bus 004 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 003 Device 003: ID 0424:2740 Microchip Technology, Inc. (formerly SMSC) Hub Controller
Bus 003 Device 002: ID 0424:2744 Microchip Technology, Inc. (formerly SMSC) Hub
Bus 003 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0424:5744 Microchip Technology, Inc. (formerly SMSC) Hub
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 004: ID 0424:2740 Microchip Technology, Inc. (formerly SMSC) Hub Controller
Bus 001 Device 005: ID 0bda:f179 Realtek Semiconductor Corp. RTL8188FTV 802.11b/g/n 1T1R 2.4G WLAN Adapter
Bus 001 Device 003: ID 0424:2240 Microchip Technology, Inc. (formerly SMSC) Ultra Fast Media
Bus 001 Device 002: ID 0424:2744 Microchip Technology, Inc. (formerly SMSC) Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
xilinx-kr260-starterkit-20222:~$
```

  As device is listed it will list the chipset name, as in above:

```
Realtek Semiconductor Corp. RTL8188FTV 802.11b/g/n 1T1R 2.4G WLAN Adapter
```

Getting the driver source

Here for `RTL8188FTV` driver available at : https://github.com/kelebek333/rtl8188fu/tree/master

Configuring Makefile to compile for arm64 architecture using kernel build

- configuring kernel makefile help:https://github.com/aircrack-ng/rtl8188eus/issues/50
- Actual configuration:

```
414 ifeq ($(CONFIG_PLATFORM_ARM64_RPI), y)
415 EXTRA_CFLAGS += -DCONFIG_LITTLE_ENDIAN
416 EXTRA_CFLAGS += -DCONFIG_IOCTL_CFG80211 -DRTW_USE_CFG80211_STA_EVENT
417 ARCH ?= arm64
418 CROSS_COMPILE ?= aarch64-linux-gnu-
419 KVER ?= 5.15.36+gitAUTOINC+19984dd147-r0
420 #KBUILD_EXTMOD ?= /home/l3ima/Projects/kernel_hid/kernel-headers/lib/modules/4.9.223-Dark-Ages-Décimo/source
421 KSRC := /home/logictronix03/petalinux_workspace/kr260_2022_2_ros_bringup/build/tmp/work/xilinx_k26_kr-xilinx-linux/linux-xlnx/5.15.36+gitAUTOINC+19984dd147-r0/linux-xilinx_k26_kr-standard-build/
422 MODDESTDIR := /home/logictronix03/petalinux_workspace/kr260_2022_2_ros_bringup/
423 INSTALL_PREFIX :=
424 endif
425
426
427 ifneq ($(KERNELRELEASE),)
```

Note:

Some common Makefile format:

Platform Section

These makefile is written for multiple platforms so has config section for platfomrs:

```
 92 CONFIG_PLATFORM_ARM_RK3188 = n
 93 CONFIG_PLATFORM_ARM_URBETTER = n
 94 CONFIG_PLATFORM_ARM_TI_PANDA = n
 95 CONFIG_PLATFORM_MIPS_JZ4760 = n
 96 CONFIG_PLATFORM_DMP_PHILIPS = n
 97 CONFIG_PLATFORM_MSTAR_TITANIA12 = n
 98 CONFIG_PLATFORM_MSTAR = n
 99 CONFIG_PLATFORM_SZEBOOK = n
100 CONFIG_PLATFORM_ARM_SUNxI = n
101 CONFIG_PLATFORM_ARM_SUN6I = n
102 CONFIG_PLATFORM_ARM_SUN7I = n
103 CONFIG_PLATFORM_ARM_SUN8I_W3P1 = n
104 CONFIG_PLATFORM_ARM_SUN8I_W5P1 = n
105 CONFIG_PLATFORM_ACTIONS_ATM702X = n
106 CONFIG_PLATFORM_ACTIONS_ATV5201 = n
107 CONFIG_PLATFORM_ACTIONS_ATM705X = n
108 CONFIG_PLATFORM_ARM_SUN50IW1P1 = n
109 CONFIG_PLATFORM_ARM_RTD299X = n
110 CONFIG_PLATFORM_ARM_SPREADTRUM_6820 = n
111 CONFIG_PLATFORM_ARM_SPREADTRUM_8810 = n
112 CONFIG_PLATFORM_ARM_WMT = n
113 CONFIG_PLATFORM_TI_DM365 = n
114 CONFIG_PLATFORM_MOZART = n
115 CONFIG_PLATFORM_RTK119X = n
116 CONFIG_PLATFORM_NOVATEK_NT72668 = n
117 CONFIG_PLATFORM_HISILICON = n
118 CONFIG_PLATFORM_ARM64_RPI = y
119 ###############################################################
120
121 CONFIG_DRVEXT_MODULE = n
122
123 export TopDIR ?= $(shell pwd)
```

Build tool config section

Depending upon enabled platform selected build tool is configured as shown below:

```
414 ifeq ($(CONFIG_PLATFORM_ARM64_RPI), y)
415 EXTRA_CFLAGS += -DCONFIG_LITTLE_ENDIAN
416 EXTRA_CFLAGS += -DCONFIG_IOCTL_CFG80211 -DRTW_USE_CFG80211_STA_EVENT
417 ARCH ?= arm64
418 CROSS_COMPILE ?= aarch64-linux-gnu-
419 KVER ?= 5.15.36+gitAUTOINC+19984dd147-r0
420 #KBUILD_EXTMOD ?= /home/l3lma/Projects/kernel_hid/kernel-headers/lib/modules/4.9.223-Dark-Ages-Décimo/source
421 KSRC := /home/logictronix03/petalinux_workspace/kr260_2022_2_ros_bringup/build/tmp/work/xilinx_k26_kr-xilinx-linux/linux-xlnx/5.15.36+gitAUTOINC+19984dd147-r0/linux-xilinx_k26_kr-standard-build/
422 MODDESTDIR := /home/logictronix03/petalinux_workspace/kr260_2022_2_ros_bringup/
423 INSTALL_PREFIX :=
424 endif
425
```

Lastly at the end there are make command options:

```
export CONFIG_RTL8188FU = m

all: modules

modules:
	$(MAKE) ARCH=$(ARCH) CROSS_COMPILE=$(CROSS_COMPILE) -C $(KSRC) M=$(shell pwd)  modules

strip:
	$(CROSS_COMPILE)strip $(MODULE_NAME).ko --strip-unneeded

installfw:
	mkdir -p /lib/firmware/rtlwifi
	cp -n firmware/* /lib/firmware/rtlwifi/.

install:
	install -p -m 644 $(MODULE_NAME).ko  $(MODDESTDIR)
	/sbin/depmod -a ${KVER}

uninstall:
	rm -f $(MODDESTDIR)/$(MODULE_NAME).ko
	/sbin/depmod -a ${KVER}

config_r:
	@echo "make config"
	/bin/bash script/Configure script/config.in


.PHONY: modules clean

clean:
	cd hal/phydm/ ; rm -fr */*.mod.c */*.mod */*.o */.*.cmd */*.ko
	cd hal/phydm/ ; rm -fr *.mod.c *.mod *.o .*.cmd *.ko
	cd hal/led ; rm -fr *.mod.c *.mod *.o .*.cmd *.ko
	cd hal ; rm -fr */*/*.mod.c */*/*.mod */*/*.o */*/.*.cmd */*/*.ko
	cd hal ; rm -fr */*.mod.c */*.mod */*.o */.*.cmd */*.ko
	cd hal ; rm -fr *.mod.c *.mod *.o .*.cmd *.ko
	cd core/efuse ; rm -fr *.mod.c *.mod *.o .*.cmd *.ko
	cd core ; rm -fr *.mod.c *.mod *.o .*.cmd *.ko
	cd os_dep/linux ; rm -fr *.mod.c *.mod *.o .*.cmd *.ko
	cd os_dep ; rm -fr *.mod.c *.mod *.o .*.cmd *.ko
	rm -fr Module.symvers ; rm -fr Module.markers ; rm -fr modules.order
	rm -fr *.mod.c *.mod *.o .*.cmd *.ko *~
	rm -fr .tmp_versions
endif
```

Cross compiling the driver source

- Followed previous cross compiling steps to compile the driver along with following forum post for help: https://support.xilinx.com/s/question/0D52E00006xR2PESA0/unable-to-use-marvel-driver-based-ublox-evb-lily-wifi-dongle-with-kria-som?language=en_US

```
make ARCH=${ARCH} CROSS_COMPILE=${CROSS_COMPILE} KERNELDIR=${KERNELDIR} clean
```

Loading the driver

Error while loading driver:

```
xilinx-kr260-starterkit-20222:~$ Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_inform_bss_frame_data (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_scan_done (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_remain_on_channel_expired (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_new_sta (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_disconnected (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol wiphy_new_nm (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_ready_on_channel (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol wiphy_register (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_put_bss (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_roamed (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol ieee80211_get_channel_khz (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_ibss_joined (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_michael_mic_failure (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol wiphy_apply_custom_regulatory (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_rx_mgmt_khz (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_del_sta_sinfo (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol wiphy_unregister (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_get_bss (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol ieee80211_freq_khz_to_channel (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_mgmt_tx_status (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_connect_done (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol cfg80211_unlink_bss (err -2)
Apr 30 07:08:01 xilinx-kr260-starterkit-20222 kernel: rtl8188fu: Unknown symbol wiphy_free (err -2)
```

Solved after loading `modprobe cfg80211`

Next error for firmware not found:

```
xilinx-kr260-starterkit-20222:~$ Apr 30 07:12:39 xilinx-kr260-starterkit-20222 kernel: platform regulatory.0: Direct firmware load for regulatory.db fa
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel:
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: ====================================================
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: ==== Launching Wi-Fi driver! (Powered by Rockchip) ====
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: ====================================================
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: Realtek 8188FU USB WiFi driver (Powered by Rockchip) init.
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: RTL871X: module init start
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: RTL871X: rtl8188fu v4.3.23.6_20964.20170110
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: RTL871X: hal_com_config_channel_plan chplan:0x20
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: usb 1-1.2: Direct firmware load for rtlwifi/rtl8188fufw.bin failed with error -2
Apr 30 07:12:43 xilinx-kr260-starterkit-20222 kernel: usb 1-1.2: Firmware rtlwifi/rtl8188fufw.bin not available
Apr 30 07:12:44 xilinx-kr260-starterkit-20222 kernel: RTL871X: rtw_ndev_init(wlan0) if1 mac_addr=00:e0:20:30:ae:82
Apr 30 07:12:44 xilinx-kr260-starterkit-20222 kernel: RTL871X: module init ret=0

xilinx-kr260-starterkit-20222:~$ ifconfig
eth0: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
       ether 00:0a:35:0f:33:c6  txqueuelen 1000  (Ethernet)
       RX packets 0  bytes 0 (0.0 B)
```

Solved after adding firmware at /lib/firmware/rtlwifi

```
xilinx-kr260-starterkit-20222:/etc# ls /lib/firmware/rtlwifi/
rtl8188fufw.bin
xilinx-kr260-starterkit-20222:/etc#
```

Here is the test log:

```
xilinx-kr260-starterkit-20222:~$ lsusb
Bus 004 Device 002: ID 0424:5744 Microchip Technology, Inc. (formerly SMSC) Hub
Bus 004 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 003 Device 003: ID 0424:2740 Microchip Technology, Inc. (formerly SMSC) Hub Controller
Bus 003 Device 002: ID 0424:2744 Microchip Technology, Inc. (formerly SMSC) Hub
Bus 003 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0424:5744 Microchip Technology, Inc. (formerly SMSC) Hub
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 005: ID 0424:2740 Microchip Technology, Inc. (formerly SMSC) Hub Controller
Bus 001 Device 004: ID 0bda:f179 Realtek Semiconductor Corp. RTL8188FTV 802.11b/g/n 1T1R 2.4G WLAN Adapter
Bus 001 Device 003: ID 0424:2240 Microchip Technology, Inc. (formerly SMSC) Ultra Fast Media
Bus 001 Device 002: ID 0424:2744 Microchip Technology, Inc. (formerly SMSC) Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
xilinx-kr260-starterkit-20222:~$ ifconfig wlan0
wlan0: error fetching interface information: Device not found
xilinx-kr260-starterkit-20222:~$ sudo su
Password:
xilinx-kr260-starterkit-20222:/home/petalinux# ls
firmware_b4096-kr260-dpu-trd.zip  rtl8188fu.ko  rtl8188fufw.bin
xilinx-kr260-starterkit-20222:/home/petalinux# modprobe cfg80211
xilinx-kr260-starterkit-20222:/home/petalinux# May  2 02:09:08 xilinx-kr260-starterkit-20222 kernel: platform regulatory.0: Direct firmware load for regulatory.db failed with error -2

xilinx-kr260-starterkit-20222:/home/petalinux# insmod ./rtl8188fu.ko
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel:
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: ====================================================
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: ==== Launching Wi-Fi driver! (Powered by Rockchip) ====
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: ====================================================
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: Realtek 8188FU USB WiFi driver (Powered by Rockchip) init.
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: RTL871X: module init start
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: RTL871X: rtl8188fu v4.3.23.6_20964.20170110
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: RTL871X: hal_com_config_channel_plan chplan:0x20
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: RTL871X: rtw_ndev_init(wlan0) if1 mac_addr=00:e0:20:30:ae:82
May  2 02:09:32 xilinx-kr260-starterkit-20222 kernel: RTL871X: module init ret=0
xilinx-kr260-starterkit-20222:/home/petalinux# ifconfig wlan0
wlan0: flags=4098<BROADCAST,MULTICAST>  mtu 1500
       ether 00:e0:20:30:ae:82  txqueuelen 1000  (Ethernet)
       RX packets 0  bytes 0 (0.0 B)
       RX errors 0  dropped 0  overruns 0  frame 0
       TX packets 0  bytes 0 (0.0 B)
       TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

xilinx-kr260-starterkit-20222:/home/petalinux#
```

After setting up wpa_supplicant unable to connect to wifi

Created `wpa_supplicant.conf` file at `/etc` folder

```
network={
ssid="LogicTronix_2.4"
```

```
proto=RSN
key_mgmt=WPA-PSK
pairwise=CCMP TKIP
group=CCMP TKIP
psk="CLB2776CC4"
}
```

- running `ifup wlan0` stuck at discover
- possible wpa-supplicant not installed
- command helps : https://www.olimex.com/forum/index.php?topic=3984.0

Tenda Tenda W311MI v6.0, Tenda U2 v5.0. driver source code:

https://github.com/lynxlikenation/aic8800/tree/main

Steps for building driver for Tenda W311MI

For interfacing new devices to the any linux system which is not supported by the inbuild kernel driver, one has to build kernel while enabling the driver if available in kernel source and
if not available there is no other option but to build the device driver.
So here are the few steps for building the device driver:

1. First get the hardware info like chipset used in your wifi dongle using `lsusb` command. This will list the USB device and device info. In your case of Tenda USB device it must be: `Bus 001 Device 004: ID 2604:0013 Tenda AIC8800DC`. This suggest wifi adapter using `AIC8800DC` chipset.
2. As `arm64` platform driver is not available for above device, get the source code for the device driver: https://github.com/lynxlikenation/aic8800/tree/main Now get this repo in KR260 board using `git clone https://github.com/lynxlikenation/aic8800.git` command. Go through the readme and script files to understand the driver installation. Run the install script to copy the firmware to respective destinations and update the udev rules.
3. For building the driver go to `aic8800/drivers/aic8800` folder and update the Makefile for building `arm64` platform instead of aarch86_64:

```
ifeq ($(CONFIG_PLATFORM_UBUNTU), y)
KDIR  := /lib/modules/$(shell uname -r)/build
PWD   := $(shell pwd)
KVER := $(shell uname -r)
MODDESTDIR := /lib/modules/$(KVER)/kernel/drivers/net/wireless/aic8800
ARCH ?= arm64
CROSS_COMPILE ?=
endif
```

4. Next build the driver by running `make` command. This will create `*.ko` files at `aic8800_fdrv` `aic_load_fw` folders. These are the driver for your USB wifi driver chipset.

5. Now before loading these drivers, load dependency driver by running: `modprobe cfg80211`. Then load drivers in order: first `insmod aic_load_fw/aic_load_fw.ko` and then `aic8800_fdrv/aic8800_fdrv.ko` with root privilege.
   This is just loading of the device driver. If it loads successfully and device is available it will create `wlan0` interface. You can use net tools like `iwconfig` to get the available wifi interfaces. And after that I hope you can configure wifi credential as in any embedded Linux devices like RPi etc.