Porting Realtek Bluetooth USB driver into Android 4.2.x Guide

Date: 2014/04/14

Version: 2.16_P24

version	date	author	description
V1.0	2012/xx/xx	Ranhui champion	Basic architecture of USB driver and SDK
V2.0	2013/05/25	wang	Add Bluedroid patch
V2.1	2013/06/02		Add Bluedroid patch
V2.2	2013/07/04	Champion Wang morgan	Add Bluedroid patch Driver issues modify
V2.3	2013/08/15	Champion	1. Change patch code download method :use new style patch 2. add pid table of 8761A
V2.3_P11	2013/08/16	BT team	Add bluedroid issues patch 1~11
V2.4_P11	2013/08/27		Modify next RX URB sending strategy.
V2.5_P11	2013/09/12		Modify logs , add pid table of 8761AW
V2.6_P11	2013/10/01		Add bt_list.* for device_found_notify_only_once.patch
V2.7_P11	2013/10/28		fix type error of 8821 fw name
V2.8_P17	2013/11/10		Add patch code 12~17 and modify
V2.9_P17	2013/12/05		Refine driver flow
V2.9_P21	2013/12/25		Add patch code 18~21 and modify
V2.10_P21	2014/01/03		Add support for kernel 3.8
V2.11_P21	2014/01/03		Add pid&vid
V2.12_P21	2014/02/18		Add support for kernel 3.13
V2.13_P21	2014/03/11		Add hot plug function
V2.14_P21	2014/03/17		Add pid&vid
V2.15_P21	2014/03/31		Fix Data lost when read less bytes than skb len
V2.16_P21	2014/03/31		Update pid&vid
V2.16_P24	2014/04/14		Add patch code 22~24

Contents

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一． **Introduction**

In this document, we introduce how to support rtk 8723AS-VAU in android system.

Android version: 4.2

二． **Kernel**

(1) Add rtk_btusb driver

Copy the **rtk_btusb.h & rtk_btusb.c** file we supplied to the directory **kernel/drivers/bluetooth/**.

Then modify the "Kconfig" and "Makefile" files in the same directory as follows:

Add the following contents in **Kconfig**：

```
config BT_RTKBTUSB
     tristate "RTK HCI USB driver"
     depends on USB
     help
        RTK Bluetooth HCI USB driver.
```

Add the following contents in **Makefile**:

```
obj-$(CONFIG_BT_RTKBTUSB)+= rtk_btusb.o
```

(2) Add uhid driver (used by Bluedroid Stack for Bluetooth HID)

Copy the **uhid.c** file we supplied to the directory **kernel/drivers/hid/**

Copy the **uhid.h** file we supplied to the directory **kernel/include/linux/**

Then modify the "Kconfig" and "Makefile" files in the same directory as follows:

Add the following contents in **Kconfig**：

```
config UHID
      tristate "User-space I/O driver support for HID subsystem"
      depends on HID
      default n
      ---help---
      Say Y here if you want to provide HID I/O Drivers from user-space.
      This allows to write I/O drivers in user-space and feed the data from
      the device into the kernel. The kernel parses the HID reports, loads the
      corresponding HID Device Driver or provides input devices on top of
      your user-space device.

      This driver cannot be used to parse HID-reports in user-space and write
      special HID-drivers. You should use hidraw for that.
      Instead, this driver allows to write the transport-layer driver in
      user-space like USB-HID and Bluetooth-HID do in kernel-space.

      If unsure, say N.

      To compile this driver as a module, choose M here: the
      module will be called uhid.
```

Add the following contents in **Makefile**:

```
obj-$(CONFIG_UHID)          += uhid.o
```

(3) Configuration

Modify the "platform configuration" file in the directory **kernel/arch/arm/configs/** to support Bluetooth USB. The "platform configuration" file is the file you can use to compile kernel. If there is no this file in your platform, you can modify the ".config" file directly. Using command "make menuconfig" to modify the options is fine too. You can choose any method you like to do this. No matter which method you would like to choose, the following options should be set as y.

```
CONFIG_UHID=y
CONFIG_BT_RTKBTUSB=m
```

To support more BT HID devices, we advice to open all "Special HID driver" options, the sample file of Tegra4 dalmore platform is located in **kernel/tegra4_hid_defconfig**

```
CONFIG_HID_A4TECH=y
CONFIG_HID_ACRUX=y
CONFIG_HID_ACRUX_FF=y
CONFIG_HID_APPLE=y
CONFIG_HID_BELKIN=y
…
```

(4) PAN support

Modify the "platform configuration" file in the directory **kernel/arch/arm/configs/** to support PAN. The following options should be set as y.

```
CONFIG_TUN=y
```

(5) AVRCP support

Modify the "platform configuration" file in the directory **kernel/arch/arm/configs/** to support AVRCP. The following options should be set as y.

```
CONFIG_INPUT_UINPUT=y      # User level driver support
CONFIG_INPUT_MISC=y
```

(6) Selective suspend support

This feature can be used on Linux kernel version later than 2.6.33   .It is disabled in driver by default. Make sure the OS support this function.

Change BTUSB_RPM defines in **kernel/drivers/bluetooth/rtk_btusb.h** to enable this function.

```
#define BTUSB_RPM        1 * USB_RPM
```

(7) Other issue

If the USB DMA requires 4 bytes alignment (like Rockchip platform), bt driver should also be modified as follows:

```
// kernel/drivers/bluetooth/rtk_btusb.c
btfcd_write() {
    …
    if (!skb)
        return -ENOMEM;
    skb_reserve(skb, -1); // Add this line
    …
}
```

三.　 **Framework**

(1) Bluetooth Vendor Library

Android 4.2 switch BlueZ from Bluedroid stack and vendor needs to implement the Bluetooth vendor library to communicate with Bluetooth chipset.

The power control and open/close BT device functions are all located in the bluetooth vendor library.

Add the folder **libbt-vendor/** we supplied to the directory **hardware/realtek/bt/**. If this folder does not exist then please add it.

Add platform config file **vnd_{platform}.txt** in **hardware/realtek/bt/libbt-vendor/include/**

```
BLUETOOTH_UART_DEVICE_PORT = "/dev/rtk_btusb"
BTVND_DBG = FALSE
```

Add bt_list.* into external/bluetooth/bluedroid/hci/

Copy the **bt_list.c** file we supplied to the directory **src/**

Copy the **bt_list.h** file we supplied to the directory **include/**

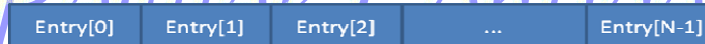Then modify the **Android.mk** files in the same directory as follows:

```
LOCAL_SRC_FILES := \
        src/bt_hci_bdroid.c \
        src/lpm.c \
        src/bt_hw.c \
        src/btsnoop.c \
        src/utils.c \
        src/bt_list.c
```
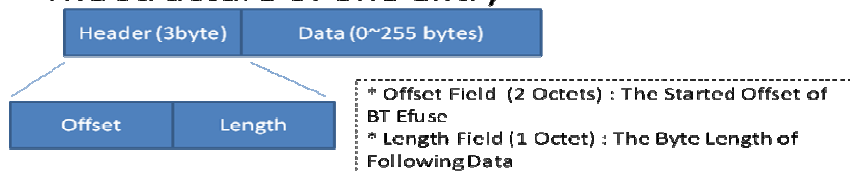
(2) Bluetooth Parameter Configuration

You can modify file **rtl8723a_config** according to your platform settings

The structure of our configure file data is as follows

For example:

```
[Signature Section]
55 AB 23 87           ## signature = 0x8723AB55   ##do not change
08 00                 ## data section length = 8 bytes


[Data Section]
27 00 01 63 FE 00 01 01
## internal 32K
```

If you use external 32k clock, you should modify the follow entry

```
27 00 01 E3 FE 00 01 00        ## external 32K
```

 Note: All Bluetooth related parameters can be configured by Bluetooth software configuration except the following situation
   (1) 32K clock, you should check wifi efuse 0x0B and modify BT config file too
   (2) Set   LOAD_CONFIG   1   in rtk_btusb.h to download config file, otherwise 0 not download

```
#define LOAD_CONFIG      1
```

(3) Patch file add

   There are two ways to add the rtk firmware patch file to android, chose one of the below:
   a) Copy   patch   files   we   supplied   to   the   directory **device/{vendor}/partner/realtek/bt/firmware/**, and then modify the **device.mk** file in the **device/{vendor}/{platform}** directory as follows:

```
#Realtek add start
$(call                                              inherit-product,
device/nvidia/partner/realtek/bt/firmware/rtl8723a/device-rtl.mk)
#realtek add end
```

   Note: In Tegra4 dalmore platform, the directory is device/nvidia/dalmore.
   b) Copy patch files we supplied to the following directory after you finish compile the android:

```
//put the files to the directory as follows:
out/target/product/{platform}/system/etc /firmware/rtl8723a_fw
out/target/product/{platform}/system/etc /firmware/rtl8723a_config
```

   Note：The Patch file and config file location and names should be same with definition in rtk_btusb.c

```
static patch_info patch_table[] = {
    …,
    { 0xb723, 0x8723, "rtl8723b_fw", "rtl8723b_config", NULL, 0 },
    { 0, 0x1200, "rtl8723a_fw", "rtl8723a_config", NULL, 0 } //default
};
```

(4) Load usb driver and BT config file

Copy the **bdroid_buildcfg.h** file we supplied to the directory **device/{vendor}/{platform}/bluetooth/**

Modify the **ueventd.{platform}.rc** file in **device/{vendor}/{platform}**

/dev/rtk_btusb	0660	bluetooth	bluetooth

Load the driver in **init.{platform}.rc**

```
on boot
    …
    # USB device
    insmod /system/lib/modules/rtk_btusb.ko
    chmod 0660 /dev/rtk_btusb
    chown bluetooth net_bt_stack /dev/rtk_btusb
    …
```

(5) Make sure the Bluetooth support is enable

Modify the **product.mk** file in **build/core/**

```
_product_stash_var_list += \
    ...
    BOARD_HAVE_BLUETOOTH \
    BOARD_HAVE_BLUETOOTH_BCM \
    BOARD_HAVE_BLUETOOTH_QCOM \
    BOARD_HAVE_BLUETOOTH_RTK \
    …
```

Confirm the **BoardConfig.mk** file which your platform using (always in the directory **device/{vendor}/{platform}**), and make sure

```
BOARD_HAVE_BLUETOOTH := true
BOARD_HAVE_BLUETOOTH_RTK := true
#BOARD_HAVE_BLUETOOTH_BCM := true
BOARD_BLUETOOTH_BDROID_BUILDCFG_INCLUDE_DIR ?=
device/{vendor}/{platform}/bluetooth
```

If it does not exist then please add it.

(6) Enable Bluetooth feature in your SDK

Some SDK may not including bluedroid packages, so please check below packages are including in your system.

PRODUCT_PACKAGES += \

bluetooth.default\

libbt-vendor\

Bluetooth

If Bluetooth function not enabled in setting page, please add android.hardware.bluetooth.xml in your makefile.

PRODUCT_COPY_FILES
+=$(LOCAL_PATH)/android.hardware.bluetooth.xml:system/etc/permissions/android.hardware.bluetooth.xml

合入 Fix Android 4.2 Bluedroid Stack Bug 的 patch

此 patch 主要在修正 Android 原生代碼的 bug, 如附件 bluedroid issues/內的相關.patch 文件, 請參照

下表的說明更新 SDK 內的相關檔案, 用以修正已知的 Android 原生 BT 問題

Item	description	Note
1	btm_int.h.patch Fix issue when pairing with no hid device.	
2	btm_sec.c.patch: Fix issue when pair with hid device.	
3	AdapterState.java : modify disconnect timeout from 8s to 80s, fix turning off fail	
4	Constants.java.patch : Add comments for how to make BT OPP support more mime types	
5	pair_headset_show_pin_request.patch 配对 A2dp 耳机的过程中，同时作 inquiry 操作；DUT 端弹出 PIN 码请求输入界面；用户点击在"搜索"时, 不要清空 inquiry database, 保留设备的 COD 信息的, 就不会在配对时出现 PIN 框	
6	Add_protection_to_GKI.patch 反复开关 bt 过程中由于多个线程调用 GKI_timer 模块导致链表出错, 在对链表操作之前加入保护	
7	pair_closed_hid_fail.patch : 配对 hid 设备时，关闭 hid 设备，有可能会使 UI 一直处于 pairing 的状态；在连接 Hid 设备失败，BTA_HH_OPEN_EVT 出现 error 时，通知上层配对失败，可结束 UI 一直 pairing 的状态。	
8	pair_fail_while_inquiry.patch 当 pair 与 inquiry 同时进行时，有可能会使 pair 失败，UI 一直处于 pairing 的状态；由于 bluedroid 的缺陷，配对的同时进行 inquiry 可能无法完成 sdp search 过程； 有两种情况会出现这种情况： 　1. 从"蓝牙配对请求"对话框点"配对"诱发"搜索" 　2. 在配对时手动开始"搜索" 提高配对的优先级，在配对时，disable inquiry。	

9	pair_pan_device_ui_show_disconnecting.patch 　　解除支持 PAN 的设备配对时，先 disconnect()，如果 PAN 的 connect state 为 disconnected，由于 PANService 在断开连接时，不会 check 连接状态，可能会出现错误的状态变化 disconnected—>disconnecting，使得再次配对成功时，UI 显示 disconnecting。	
10	specific_uuidList_for_MSI_FS300.patch Fix bug：Bluetooth Compatibility:连線 A2DP 耳機(MSI FS300),沒有 Profiles 的選項. 必現。 修改：MSI FS300 搜索 SDP 失败，在函数 bta_dm_sdp_result 中获取 device name，当 device name 为 MSI FS300 时，生成特殊的 uuid list 并上传。该 bug 是耳机的问题，SDK 没有问题。	
11	hci_cmd_buffer_overflow.patch Fix bug：BT enable 有时 bluedroid stack 会出现 HCI Comamnd timeout 的错误. 原因是 bluedroid 对于 HCI Command FlowControl 的处理有误.	
12	device_found_notify_only_once.patch Fix bug：CTS 测试时，会根据 device found 消息来 Show BT device list，并不会过滤同一 MAC 地址的设备,导致在 UI 上显示同一 MAC 地址的设备多次，有的客户不接受这样的处理,所以修改了这边的处理方法,只通知一次.其实 Android 的 Bluetooth UI 是会做这样的处理的,但是 CTS 工具却不会.	
13.	userial.patch Fix bug：userial_write 调用的 write 系统调用返回值未做判断。	
14.	fix_inquiry_too_long.patch	
15.	Add workaround for bt open fail.	
16.	Add restart_bt_when_patch_download_fail.patch	
17.	save_changed_name.patch save name to conifg file immediately after changed	
18.	Add add_pair_retry.patch	
19.	Add fix_hid_could_not_pair.patch	
20.	Add fix_opp_resend_file.patch	
21.	Add add_delay_after_opp_transfer.patch	
22.	Add set_scan_type_standard.patch	
23.	Add extend_RFC_timeout_from_3_to_30.patch	
24.	Add change_page_timeout_to_10s.patch	

Some known issues in bluedroid 4.2.0 for Notice:

1.When we do the frequently BT on/off testing,the GKI timer module of Bluedroid would crash

and BT could not be disabled. (sometimes) <Nagarjuna>, this issue is identified and there are 2 behaviors, noted as:

(1)BT cannot be turned OFF [Seen during non BT ON-OFF scenarios also]

(a) This was because of command timeout errors, where stack lost communication with chip.

(b)This should have been fixed in 4.2.2 as I could see changes to flow control logic.

(2) BT cannot be turned ON

(a) This is because Frameworks and BT stack state-machines are out of sync. Issue seen on all Android 4.2 devices available so far.

(b)Google bug 50241<https://code.google.com/p/android/issues/detail?id=50241> is raised for the same.

2. As sending file (OPP) to other device failed, click the resend option from the notification do not work. (always) This is issue with OPP application and not with bluedroid stack. Again this issue seen on all Android 4.2 devices available so far Google bug 48764<https://code.google.com/p/android/issues/detail?id=48764> raised for the same.

3. When choosing the device name to pair or transmit file, click the device name do not work. (sometimes)