Application Notes

How to tune the SDIO wifi

Revision 0.1

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Revision history

Revision	Date	Owner	Changes
0.1	January 11, 2013	Jiamin	

1. Overview

1.1 Purpose of this document

This document tells users how to tune the SDIO wifi

2. Software operation

2.1 Kernel 配置

Kernel 的配置主要是修改 common/customer 目录下对应的 deconfig 文件和 BSP 文件。

config 文件 配置

CONFIG_AM_WIFI=y
CONFIG_AM_WIFI_SD_MMC=y
CONFIG_SDIO_DHD_CDC_WIFI_40181_MODULE=m
CONFIG_SDIO_DHD_CDC_WIFI_AP6xxx_MODULE=m（4.1 上的 AP6xxx 使用该 config）
CONFIG_BCM40181_WIFI=y
CONFIG_SDIO_HARD_IRQ=n
CONFIG_BCM40181_HW_OOB=y
CONFIG_BCM40181_OOB_INTR_ONLY=y
CONFIG_BCM40181_POWER_ALWAYS_ON=y（这个 config，只有在硬件上支持系统休眠时，能对 wifi 持续供电的情况下，才添加）

BSP 文件配置

SDIO 卡配置

红色部分是 SDIO 卡设置

```
static struct aml_card_info meson_card_info[] = {
   [0] = {
      .name         = "sd_card",
      .work_mode     = CARD_HW_MODE,
      .io_pad_type       = SDHC_CARD_0_5,
      .card_ins_en_reg    = CARD_GPIO_ENABLE,
      .card_ins_en_mask   = PREG_IO_29_MASK,
      .card_ins_input_reg = CARD_GPIO_INPUT,
      .card_ins_input_mask    = PREG_IO_29_MASK,
      .card_power_en_reg  = CARD_GPIO_ENABLE,
      .card_power_en_mask = PREG_IO_31_MASK,
      .card_power_output_reg  = CARD_GPIO_OUTPUT,
      .card_power_output_mask = PREG_IO_31_MASK,
      .card_power_en_lev  = 0,
      .card_wp_en_reg     = 0,
      .card_wp_en_mask    = 0,
      .card_wp_input_reg  = 0,
```

```
        .card_wp_input_mask = 0,
        .card_extern_init   = 0,
    },
#if 1
    [1] = {
        .name         = "sdio_card",
        .work_mode     = CARD_HW_MODE,
        .io_pad_type       = SDHC_GPIOX_0_9,
        .card_ins_en_reg    = 0,
        .card_ins_en_mask   = 0,
        .card_ins_input_reg = 0,
        .card_ins_input_mask    = 0,
        .card_power_en_reg  = 0,
        .card_power_en_mask = 0,
        .card_power_output_reg  = 0,
        .card_power_output_mask = 0,
        .card_power_en_lev  = 0,
        .card_wp_en_reg     = 0,
        .card_wp_en_mask    = 0,
        .card_wp_input_reg  = 0,
        .card_wp_input_mask = 0,
        .card_extern_init   = sdio_extern_init,
    },
#endif
};
```

wifi 32K 时钟设置

```
static void wifi_clock_enable(int is_on)
{
    //set clk 32k for wifi
    //GPIOX_12 (CLK_OUT3)  //reg : 108b  sr_sl:22-25  div:13-19    enable:21

gpio_set_status(PAD_GPIOX_12,gpio_status_out);                          //set  GPIOX_12 out
aml_set_reg32_mask(P_HHI_GEN_CLK_CNTL2,1<<22);//set clk source
aml_clr_reg32_mask(P_HHI_GEN_CLK_CNTL2,0x3f<<13);//set div ==1
aml_set_reg32_mask(P_HHI_GEN_CLK_CNTL2,1<<21);//set enable clk
aml_set_reg32_mask(P_PERIPHS_PIN_MUX_3,0x1<<21);//set mode GPIOX_12-->CLK_OUT3
}
```

WIFI 上电引脚，中断引脚 gpio 设置，以及 sdio 接口的内部上拉设置

```
static void wifi_gpio_init(void)
{
//set status
    //WIFI_EN WIFI_PWREN  WLAN_RST --->out        :0
gpio_set_status(PAD_GPIOC_8,gpio_status_out);
//WIFI_WAKE -->1GPIOX_11   in      :
     gpio_set_status(PAD_GPIOX_11,gpio_status_in);
```

```
//set pull-up
aml_clr_reg32_mask(P_PAD_PULL_UP_REG4,0xf|1<<8|1<<9|1<<11|1<<12);
aml_clr_reg32_mask(P_PAD_PULL_UP_REG2,1<<7|1<<8|1<<9);
}
```

WIFI 上电函数

```
void extern_wifi_set_enable(int is_on)
{
DBG_LINE_INFO();
   gpio_set_status(PAD_GPIOC_8,gpio_status_out);//set wifi_en gpio mode out
   if(is_on){
    gpio_out(PAD_GPIOC_8,1);
    printk("WIFI  Enable! \n");
              }
else{
    gpio_out(PAD_GPIOC_8,0);
              printk("WIFI  Disenable! \n");
}
}
```

WIFI wake 中断设置

在 sdio_extern_init 函数中添加

```
gpio_set_status(PAD_GPIOX_11,gpio_status_in);
gpio_irq_set(PAD_GPIOX_11,GPIO_IRQ(4,GPIO_IRQ_HIGH));
```

2.2 Rootfs *配置(android 4.1)*

对于 rootfs 上的设置，主要在 device/amlogic/xxxx（对应的项目名）目录下，对以下三个文件进行修改：

1. init.rc
2. BoardConfig.mk
3. Xxx.mk

Init.rc 配置

创建一些 wifi 使用的配置目录

```
on post-fs-data
   mkdir /data/misc/wifi 0770 wifi wifi
   mkdir /data/misc/wifi/sockets 0770 wifi wifi
   chmod 0770 /data/misc/wifi
   chmod 0660 /data/misc/wifi/wpa_supplicant.conf
```

```
    chown wifi wifi /data/misc/wifi
    chown wifi wifi /data/misc/wifi/sockets
    chown wifi wifi /data/misc/wifi/wpa_supplicant.conf

  on boot
    setprop wifi.interface wlan0
    mkdir /data/misc/dhcp 0770 dhcp dhcp
    chmod 0770 /data/misc/dhcp
```

添加 **wifi** 相关的 **service**

```
service wpa_supplicant /system/bin/wpa_supplicant \
  -iwlan0 -Dnl80211 -c/data/misc/wifi/wpa_supplicant.conf -e/data/misc/wifi/entropy.bin
  #   user wifi
  #   group wifi inet keystore
  class main
  socket wpa_wlan0 dgram 0660 wifi wifi
  disabled
  oneshot

service dhcpcd_wlan0 /system/bin/dhcpcd -ABKL
  class main
  group dhcp system
  disabled
  oneshot
```

需要支持 p2p 的话则需添加

```
service p2p_supplicant /system/bin/wpa_supplicant \
  -iwlan0 -Dnl80211 -c/data/misc/wifi/wpa_supplicant.conf \
  -N -ip2p0 -Dnl80211 -c/data/misc/wifi/p2p_supplicant.conf -e/data/misc/wifi/entropy.bin -
puse_p2p_group_interface=1
  #   user wifi
  #   group wifi inet keystore
  class main
  socket wpa_wlan0 dgram 0660 wifi wifi
  disabled
  oneshot

service dhcpcd_p2p /system/bin/dhcpcd -ABKL
  class main
  group dhcp system
  disabled
  oneshot
```

hostap 服务添加

```
service hostapd /system/bin/hostapd_wps /data/misc/wifi/hostapd.conf
```

```
class main
disabled
oneshot
```

BoadConfig.mk 配置

指定 wifi 驱动的名字，以及 firmware 的位置

```
WIFI_DRIVER := bcm40183
WIFI_DRIVER_MODULE_PATH := /system/lib/dhd.ko
WIFI_DRIVER_MODULE_NAME := dhd
WIFI_DRIVER_MODULE_ARG  := "firmware_path=/etc/wifi/40183/fw_bcm40183b2.bin
nvram_path=/etc/wifi/40183/nvram.txt"
WIFI_DRIVER_FW_PATH_STA :=/etc/wifi/40183/fw_bcm40183b2.bin
WIFI_DRIVER_FW_PATH_AP  :=/etc/wifi/40183/fw_bcm40183b2_apsta.bin
WIFI_DRIVER_FW_PATH_P2P :=/etc/wifi/40183/fw_bcm40183b2_p2p.bin

#WIFI_DRIVER := bcm40181
#WIFI_DRIVER_MODULE_PATH := /system/lib/dhd.ko
#WIFI_DRIVER_MODULE_NAME := dhd
#WIFI_DRIVER_MODULE_ARG  := "firmware_path=/etc/wifi/40181/fw_bcm40181a2.bin
nvram_path=/etc/wifi/40181/nvram.txt"
#WIFI_DRIVER_FW_PATH_STA :=/etc/wifi/40181/fw_bcm40181a2.bin
#WIFI_DRIVER_FW_PATH_AP  :=/etc/wifi/40181/fw_bcm40181a2_apsta.bin
#WIFI_DRIVER_FW_PATH_P2P :=/etc/wifi/40181/fw_bcm40181a2_p2p.bin

BOARD_WLAN_DEVICE := bcmdhd
WIFI_DRIVER_FW_PATH_PARAM   := "/sys/module/dhd/parameters/firmware_path"
```

WPA_SUPPLICANT 设置

```
WPA_SUPPLICANT_VERSION := VER_0_8_X
BOARD_WPA_SUPPLICANT_DRIVER := NL80211
BOARD_WPA_SUPPLICANT_PRIVATE_LIB := lib_driver_cmd_bcmdhd
BOARD_HOSTAPD_DRIVER        := NL80211
BOARD_HOSTAPD_PRIVATE_LIB   := lib_driver_cmd_bcmdhd
```

xxxx.mk 配置

wifi firmware 以及 wpa_supplicant.conf 拷贝

```
# WiFi
PRODUCT_PACKAGES += \
```

```
    40183/nvram.txt \
    40183/fw_bcm40183b2.bin \
    40183/fw_bcm40183b2_apsta.bin \
    40183/fw_bcm40183b2_p2p.bin \
    wl \
    dhd \
    wpa_supplicant.conf

PRODUCT_PACKAGES += \
    40181/nvram.txt \
    40181/fw_bcm40181a2.bin \
    40181/fw_bcm40181a2_apsta.bin \
    40181/fw_bcm40181a2_p2p.bin \
    wl \
    dhd \
    wpa_supplicant.conf
```

AP6xxx 模块的 firmware 都放在 hardware/amlogic/wifi/AP6xxx 目录下，以下是 AP6181 的 firmware 拷贝，其他模块也按照相应的目录进行拷贝

```
PRODUCT_COPY_FILES += hardware/amlogic/wifi/AP6xxx/AP6181/Wi-Fi/fw_bcm40181a2.bin:system/etc/wifi/40181/fw_bcm40181a2.bin
PRODUCT_COPY_FILES += hardware/amlogic/wifi/AP6xxx/AP6181/Wi-Fi/fw_bcm40181a2_apsta.bin:system/etc/wifi/40181/fw_bcm40181a2_apsta.bin
PRODUCT_COPY_FILES += hardware/amlogic/wifi/AP6xxx/AP6181/Wi-Fi/fw_bcm40181a2_p2p.bin:system/etc/wifi/40181/fw_bcm40181a2_p2p.bin
PRODUCT_COPY_FILES += hardware/amlogic/wifi/AP6xxx/AP6181/Wi-Fi/nvram_ap6181.txt:system/etc/wifi/40181/nvram.txt
```

添加 **wifi** 的 **xml** 文件

```
PRODUCT_COPY_FILES += \
frameworks/native/data/etc/android.hardware.wifi.xml:system/etc/permissions/android.hardware.wifi.xml \
frameworks/native/data/etc/android.hardware.wifi.direct.xml:system/etc/permissions/android.hardware.wifi.direct.xml \
```

（注：android.hardware.wifi.direct.xml 需要平台支持 wifi p2p 才添加）

拷贝驱动模块

```
PRODUCT_COPY_FILES += $(LOCAL_PATH)/dhd.ko:system/lib/dhd.ko
```

2.3 Rootfs 配置（*android 4.2*）

Android 4.2 中很多 wifi 公共性的配置已经放在 device/amlogic/common/wifi.mk 中了，所以我们只需要配置两个文件：init.rc 和 xxxx.mk

Init.rc 配置

Init.rc 配置与 android 4.1 一样，请参考 4.1 的配置

Xxxx.mk

若平台的 wifi 芯片是 40181
则配置为
WIFI_MODULE := bcm40181
include device/amlogic/common/wifi.mk

若平台的 wifi 芯片是 40183
则配置为
WIFI_MODULE := bcm40183
include device/amlogic/common/wifi.mk

3. Sample

3.1 Android 4.1 AP6181 移植

Config 文件修改

添加 Sdio wifi 相关的 config，请参考 2.1 Kernel 配置的 config 文件配置这一节

BSP 文件修改

这里 wifi_wake 脚是 GPIOX11，wifi_en 脚是 GPIOAO3

Wifi_wake 中断设置以及 sdio 卡设置

```
static void sdio_extern_init(void)
{
   gpio_set_status(PAD_GPIOX_11,gpio_status_in);
   gpio_irq_set(PAD_GPIOX_11,GPIO_IRQ(4,GPIO_IRQ_HIGH));

   #ifdef CONFIG_AM_WIFI
   extern_wifi_set_enable(1);
   #endif
}

static struct aml_card_info meson_card_info[] = {
   [0] = {
      .name         = "sd_card",
      .work_mode     = CARD_HW_MODE,
      .io_pad_type       = SDHC_CARD_0_5,
      .card_ins_en_reg    = CARD_GPIO_ENABLE,
      .card_ins_en_mask   = PREG_IO_29_MASK,
      .card_ins_input_reg = CARD_GPIO_INPUT,
      .card_ins_input_mask    = PREG_IO_29_MASK,
      .card_power_en_reg  = CARD_GPIO_ENABLE,
      .card_power_en_mask = PREG_IO_31_MASK,
      .card_power_output_reg  = CARD_GPIO_OUTPUT,
      .card_power_output_mask = PREG_IO_31_MASK,
      .card_power_en_lev  = 0,
      .card_wp_en_reg     = 0,
      .card_wp_en_mask    = 0,
      .card_wp_input_reg  = 0,
      .card_wp_input_mask = 0,
      .card_extern_init   = 0,
   },
```

```
#if 1
    [1] = {
        .name         = "sdio_card",
        .work_mode     = CARD_HW_MODE,
        .io_pad_type       = SDHC_GPIOX_0_9,
        .card_ins_en_reg    = 0,
        .card_ins_en_mask   = 0,
        .card_ins_input_reg = 0,
        .card_ins_input_mask    = 0,
        .card_power_en_reg  = 0,
        .card_power_en_mask = 0,
        .card_power_output_reg  = 0,
        .card_power_output_mask = 0,
        .card_power_en_lev  = 0,
        .card_wp_en_reg     = 0,
        .card_wp_en_mask    = 0,
        .card_wp_input_reg  = 0,
        .card_wp_input_mask = 0,
        .card_extern_init   = sdio_extern_init,
    },
#endif
};
```

时钟及上电 GPIO 设置

```
static void wifi_gpio_init(void)
{
//set status
    //WIFI_EN WIFI_PWREN  WLAN_RST --->out  :0
    gpio_set_status(PAD_GPIOAO_3,gpio_status_out);
    //WIFI_WAKE -->1GPIOX_11   in   :
        gpio_set_status(PAD_GPIOX_11,gpio_status_in);
    //set pull-up
    aml_clr_reg32_mask(P_PAD_PULL_UP_REG4,0xf|1<<8|1<<9|1<<11|1<<12);
    aml_clr_reg32_mask(P_PAD_PULL_UP_REG2,1<<7|1<<8|1<<9);
}

static void wifi_clock_enable(int is_on)
{
    //set clk 32k for wifi
    //GPIOX_12 (CLK_OUT3)  //reg : 108b  sr_sl:22-25  div:13-19    enable:21
    DBG_LINE_INFO();

    gpio_set_status(PAD_GPIOX_12,gpio_status_out);        //set  GPIOX_12 out
    aml_set_reg32_mask(P_HHI_GEN_CLK_CNTL2,1<<22);//set clk source
    aml_clr_reg32_mask(P_HHI_GEN_CLK_CNTL2,0x3f<<13);//set div ==1
    aml_set_reg32_mask(P_HHI_GEN_CLK_CNTL2,1<<21);//set enable clk
    aml_set_reg32_mask(P_PERIPHS_PIN_MUX_3,0x1<<21);//set mode GPIOX_12-->CLK_OUT3
}
```

```
void extern_wifi_set_enable(int is_on)
{
   DBG_LINE_INFO();
   gpio_set_status(PAD_GPIOAO_3,gpio_status_out);//set wifi_en gpio mode out
   if(is_on){
      gpio_out(PAD_GPIOAO_3,1);
      printk("WIFI  Enable! \n");
         }
   else{
      gpio_out(PAD_GPIOAO_3,0);
            printk("WIFI  Disenable! \n");
   }
}
EXPORT_SYMBOL(extern_wifi_set_enable);

.....

void wifi_dev_init(void)
{
   DBG_LINE_INFO();
   wifi_clock_enable(1);
   udelay(200);
   wifi_gpio_init();

}
```

在 meson_init_machine 函数中添加 wifi_dev_init 函数调用

BoardConfig.mk 修改

```
WIFI_DRIVER := bcm40181
WIFI_DRIVER_MODULE_PATH := /system/lib/dhd.ko
WIFI_DRIVER_MODULE_NAME := dhd
WIFI_DRIVER_MODULE_ARG  := "firmware_path=/etc/wifi/40181/fw_bcm40181a2.bin
nvram_path=/etc/wifi/40181/nvram.txt"
WIFI_DRIVER_FW_PATH_STA :=/etc/wifi/40181/fw_bcm40181a2.bin
WIFI_DRIVER_FW_PATH_AP  :=/etc/wifi/40181/fw_bcm40181a2_apsta.bin
WIFI_DRIVER_FW_PATH_P2P :=/etc/wifi/40181/fw_bcm40181a2_p2p.bin

BOARD_WLAN_DEVICE := bcmdhd
WIFI_DRIVER_FW_PATH_PARAM   := "/sys/module/dhd/parameters/firmware_path"

WPA_SUPPLICANT_VERSION := VER_0_8_X
BOARD_WPA_SUPPLICANT_DRIVER := NL80211
BOARD_WPA_SUPPLICANT_PRIVATE_LIB := lib_driver_cmd_bcmdhd
BOARD_HOSTAPD_DRIVER       := NL80211
BOARD_HOSTAPD_PRIVATE_LIB   := lib_driver_cmd_bcmdhd
```

xxxx.mk 修改

```
# WiFi
PRODUCT_PACKAGES += \
   40181/nvram.txt \
   40181/fw_bcm40181a2.bin \
   40181/fw_bcm40181a2_apsta.bin \
   40181/fw_bcm40181a2_p2p.bin \
   wl \
   dhd \
   wpa_supplicant.conf

      PRODUCT_COPY_FILES += \
      frameworks/native/data/etc/android.hardware.wifi.xml:system/etc/permissions/android.hardware.wifi.xml \
      frameworks/native/data/etc/android.hardware.wifi.direct.xml:system/etc/permissions/android.hardware.wifi.dire
      ct.xml \


PRODUCT_COPY_FILES += hardware/amlogic/wifi/AP6xxx/AP6181/Wi-
Fi/fw_bcm40181a2.bin:system/etc/wifi/40181/fw_bcm40181a2.bin
PRODUCT_COPY_FILES += hardware/amlogic/wifi/AP6xxx/AP6181/Wi-
Fi/fw_bcm40181a2_apsta.bin:system/etc/wifi/40181/fw_bcm40181a2_apsta.bin
PRODUCT_COPY_FILES += hardware/amlogic/wifi/AP6xxx/AP6181/Wi-
Fi/fw_bcm40181a2_p2p.bin:system/etc/wifi/40181/fw_bcm40181a2_p2p.bin
PRODUCT_COPY_FILES += hardware/amlogic/wifi/AP6xxx/AP6181/Wi-
Fi/nvram_ap6181.txt:system/etc/wifi/40181/nvram.txt

PRODUCT_COPY_FILES += $(LOCAL_PATH)/dhd.ko:system/lib/dhd.ko
```

Init.rc 修改

```
        on post-fs-data
           mkdir /data/misc/wifi 0770 wifi wifi
           mkdir /data/misc/wifi/sockets 0770 wifi wifi
           chmod 0770 /data/misc/wifi
           chmod 0660 /data/misc/wifi/wpa_supplicant.conf
           chown wifi wifi /data/misc/wifi
           chown wifi wifi /data/misc/wifi/sockets
           chown wifi wifi /data/misc/wifi/wpa_supplicant.conf

        on boot
           setprop wifi.interface wlan0
           mkdir /data/misc/dhcp 0770 dhcp dhcp
           chmod 0770 /data/misc/dhcp
```

Service 添加

```
service p2p_supplicant /system/bin/wpa_supplicant \
   -iwlan0 -Dnl80211 -c/data/misc/wifi/wpa_supplicant.conf \
   -N -ip2p0 -Dnl80211 -c/data/misc/wifi/p2p_supplicant.conf -e/data/misc/wifi/entropy.bin -
puse_p2p_group_interface=1
   #   user wifi
   #   group wifi inet keystore
   class main
   socket wpa_wlan0 dgram 0660 wifi wifi
   disabled
   oneshot

service wpa_supplicant /system/bin/wpa_supplicant \
   -iwlan0 -Dnl80211 -c/data/misc/wifi/wpa_supplicant.conf -e/data/misc/wifi/entropy.bin
   #   user wifi
   #   group wifi inet keystore
   class main
   socket wpa_wlan0 dgram 0660 wifi wifi
   disabled
   oneshot

service hostapd /system/bin/hostapd_wps /data/misc/wifi/hostapd.conf
   class main
   disabled
   oneshot

service dhcpcd_wlan0 /system/bin/dhcpcd -ABKL
   class main
   group dhcp system
   disabled
   oneshot

service dhcpcd_p2p /system/bin/dhcpcd -ABKL
   class main
   group dhcp system
   disabled
   oneshot

service iprenew_wlan0 /system/bin/dhcpcd -n
   class main
   disabled
   oneshot

service iprenew_p2p /system/bin/dhcpcd -n
   class main
   disabled
   oneshot
```