H616 Android Q Wi-Fi/BT 配置说明书

1.0

2019.12.4

文档履历

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目录

1. 概述

介绍 Wi-Fi/BT 模组移植配置方法，目的是让 Wi-Fi/BT 模块的开发和使用人员根据该文档可以完成一些常规工作，解决常见问题。本文档将以 cupid-p2（h616-P2）方案为例，介绍 xradio、realtek 及 broadcom 模组的配置方法。H616 AndroidQ 平台已经支持 Wi-Fi/BT 模组自适应功能，默认使用模组自适应。

2. Xradio 模组的配置

适用于 XR819/XR829 模组

功能：Wi-Fi（station/softap/p2p）+ BT

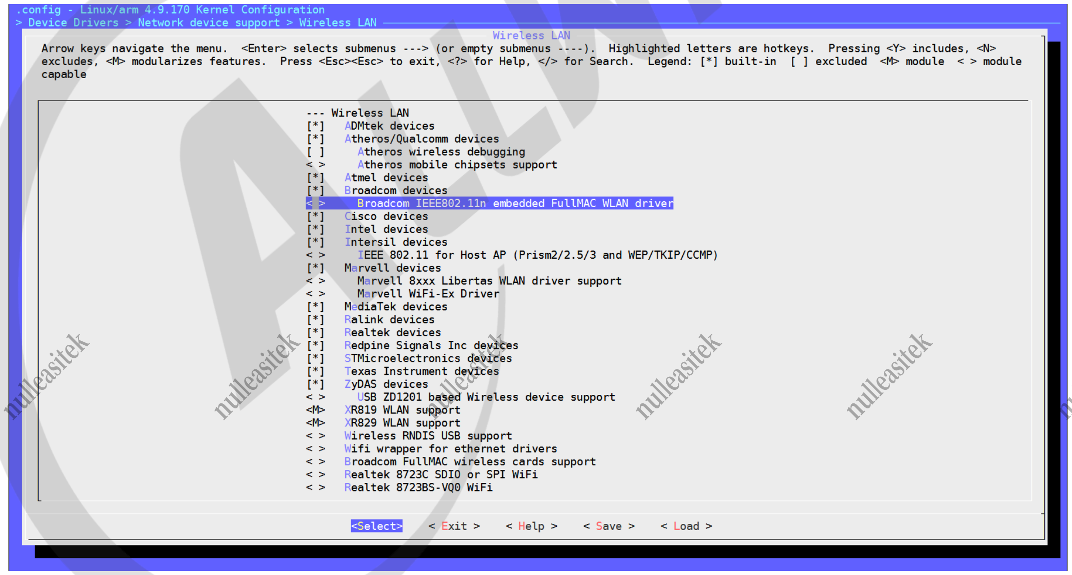
接口类型：SDIO + UART

说明：XR819 不支持 BT

2.1 内核驱动配置

2.1.1 Wi-Fi driver 编译为模块

在 longan/kernel/linux-4.9，执行 make menuconfig ARCH=arm64，将所需 Wi-Fi driver 编译为模块：



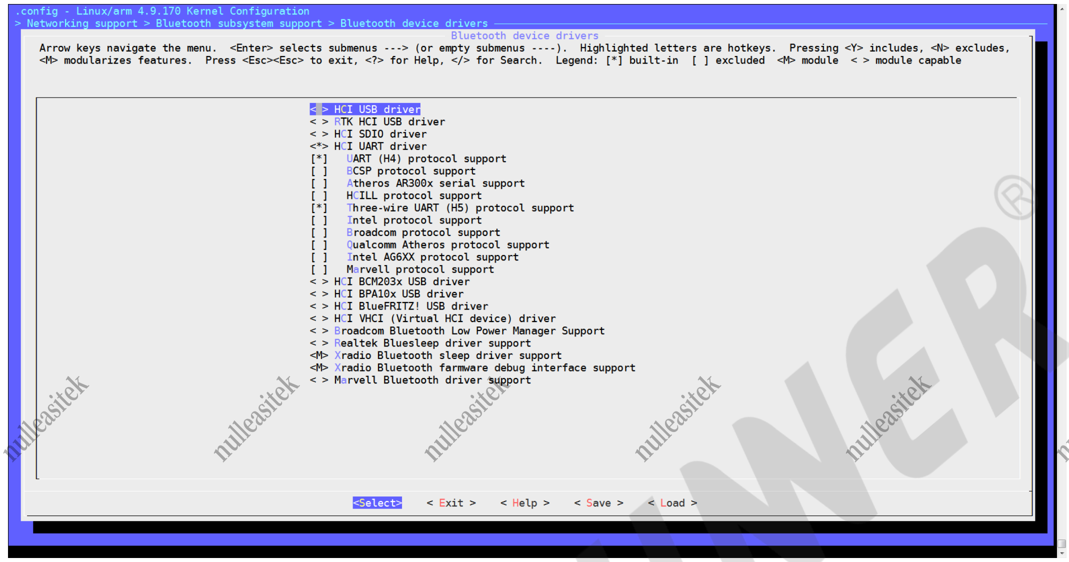
```
.config - Linux/arm 4.9.170 Kernel Configuration
> Device Drivers > Network device support > Wireless LAN ──────────────────────
                                  Wireless LAN
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N>
  excludes, <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module
  capable

                                    --- Wireless LAN
                                    [*]   ADMtek devices
                                    [*]   Atheros/Qualcomm devices
                                    [ ]     Atheros wireless debugging
                                    < >     Atheros mobile chipsets support
                                    [*]   Atmel devices
                                    [*]   Broadcom devices
                                    < >     Broadcom IEEE802.11n embedded FullMAC WLAN driver
                                    [*]   Cisco devices
                                    [*]   Intel devices
                                    [*]   Intersil devices
                                    < >     IEEE 802.11 for Host AP (Prism2/2.5/3 and WEP/TKIP/CCMP)
                                    [*]   Marvell devices
                                    < >     Marvell 8xxx Libertas WLAN driver support
                                    < >     Marvell WiFi-Ex Driver
                                    [*]   MediaTek devices
                                    [*]   Ralink devices
                                    [*]   Realtek devices
                                    [*]   Redpine Signals Inc devices
                                    [*]   STMicroelectronics devices
                                    [*]   Texas Instrument devices
                                    [*]   ZyDAS devices
                                    < >     USB ZD1201 based Wireless device support
                                    <M>   XR819 WLAN support
                                    <M>   XR829 WLAN support
                                    < >   Wireless RNDIS USB support
                                    < >   Wifi wrapper for ethernet drivers
                                    < >   Broadcom FullMAC wireless cards support
                                    < >   Realtek 8723C SDIO or SPI WiFi
                                    < >   Realtek 8723BS-VQ0 WiFi

                         <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 1: Xradio Wi-Fi 驱动配置

2.1.2 配置 sunxi-rf 驱动



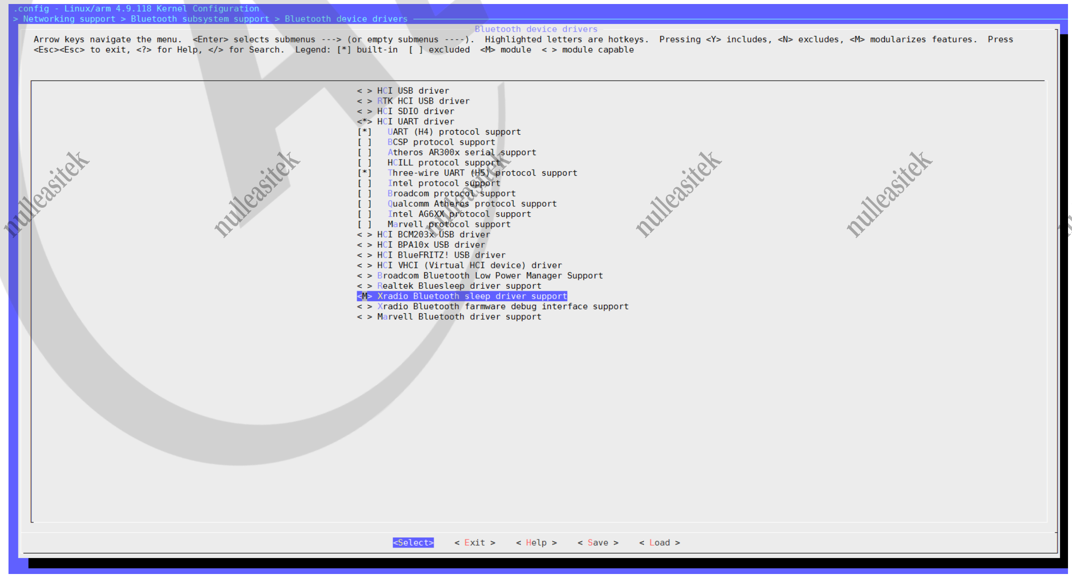
```
.config - Linux/arm 4.9.170 Kernel Configuration
> Networking support > Bluetooth subsystem support > Bluetooth device drivers
                              Bluetooth device drivers
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                        < > HCI USB driver
                        < > RTK HCI USB driver
                        < > HCI SDIO driver
                        <*> HCI UART driver
                        [*]   UART (H4) protocol support
                        [ ]   BCSP protocol support
                        [ ]   Atheros AR300x serial support
                        [ ]   HCILL protocol support
                        [*]   Three-wire UART (H5) protocol support
                        [ ]   Intel protocol support
                        [ ]   Broadcom protocol support
                        [ ]   Qualcomm Atheros protocol support
                        [ ]   Intel AG6XX protocol support
                        [ ]   Marvell protocol support
                        < > HCI BCM203x USB driver
                        < > HCI BPA10x USB driver
                        < > HCI BlueFRITZ! USB driver
                        < > HCI VHCI (Virtual HCI device) driver
                        < > Broadcom Bluetooth Low Power Manager Support
                        < > Realtek Bluesleep driver support
                        <M> Xradio Bluetooth sleep driver support
                        <M> Xradio Bluetooth farmware debug interface support
                        < > Marvell Bluetooth driver support

              <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 2: Sunxi-rf 驱动配置

2.1.3 配置 btlpm 驱动（BT 使用，XR819 忽略）



```
.config - Linux/arm 4.9.118 Kernel Configuration
> Networking support > Bluetooth subsystem support > Bluetooth device drivers
                              Bluetooth device drivers
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes features.  Press
  <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                        < > HCI USB driver
                        < > RTK HCI USB driver
                        < > HCI SDIO driver
                        <*> HCI UART driver
                        [*]   UART (H4) protocol support
                        [ ]   BCSP protocol support
                        [ ]   Atheros AR300x serial support
                        [ ]   HCILL protocol support
                        [*]   Three-wire UART (H5) protocol support
                        [ ]   Intel protocol support
                        [ ]   Broadcom protocol support
                        [ ]   Qualcomm Atheros protocol support
                        [ ]   Intel AG6XX protocol support
                        [ ]   Marvell protocol support
                        < > HCI BCM203x USB driver
                        < > HCI BPA10x USB driver
                        < > HCI BlueFRITZ! USB driver
                        < > HCI VHCI (Virtual HCI device) driver
                        < > Broadcom Bluetooth Low Power Manager Support
                        < > Realtek Bluesleep driver support
                        <M> Xradio Bluetooth sleep driver support
                        < > Xradio Bluetooth farmware debug interface support
                        < > Marvell Bluetooth driver support

              <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 3: Xradio btlpm 驱动配置

2.2 配置 DTS

文件路径：longan/device/config/chips/h616/configs/p2/board.dts

文件决定选用的模组的 GPIO pin 分配，在 H616 AndroidQ 平台上，Wi-Fi/BT 的配置从 sys_config.fex 移动至 board.dts。

2.2.1 Wi-Fi 部分

Wi-Fi 相关的 DTS 配置说明：

1. "clocks" 用于配置使用主控提供的 32k 时钟；
2. "pinctrl-0" 用于配置 pin 的复用功能；
3. "pinctrl-names" 用于配置 pin state；
4. "wlan_busnum" 表示 WiFi 所使用的 SDIO 控制器号；
5. "wlan_power" 表示给 WiFi 模组供电的 regulator 名称；
6. "wlan_io_regulator" 表示给 WiFi 模组的 GPIO 供电的 regulator 名称；
7. "wlan_regon" WiFi 模组 power on 控制引脚；
8. "wlan_hostwake" 表示 WiFi 唤醒主控的 GPIO；
9. "chip_en" 表示 WiFi 模组使能引脚，硬件未使用时不配置；
10. "power_en" 表示模块外部的电源开关控制引脚；
11. 以上所有项必须参看原理图进行配置，配置与原理图实际使用的资源保持一致；

Wi-Fi 参考配置如下：

```
wlan:wlan {
    compatible = "allwinner,sunxi-wlan";
    clocks = <&clk_losc_out>;
    pinctrl-0 = <&clk_losc_pins_a>;
    pinctrl-names = "default";
    wlan_busnum = <0x1>;
    wlan_power;
    wlan_io_regulator;
    wlan_regon = <&pio PG 18 1 0xffffffff 0xffffffff 0>;
    wlan_hostwake = <&pio PG 15 6 0xffffffff 0xffffffff 0>;
```

```
        chip_en;
        power_en;
        status = "okay";
    };
```

2.2.2 BT 部分

BT 相关的 DTS 配置说明：

1. "clocks" 用于配置使用主控提供的 32k 时钟；
2. "bt_power" 表示 BT 模组所用的供电，与 wlan_power 相同；
3. "bt_io_regulator" 表示 BT 模组所用的 IO 供电，与 wlan_regulator 相同；
4. "bt_rst_n" 表示 Bt 模组 power on 控制引脚；
5. "uart_index" 表示 BT 模组使用的硬件通信端口号；
6. "bt_wake" 表示 BT 模组休眠后被唤醒时的控制引脚；
7. "uart_index" 表示 BT 模组使用的硬件通信端口号；
8. "bt_hostwake" 表示 BT 模组中断输出引脚，用于唤醒 AP；

BT 参考配置如下：

```
    bt:bt {
        compatible = "allwinner,sunxi-bt";
        clocks = <&clk_losc_out>;
        bt_power;
        bt_io_regulator;
        bt_rst_n = <&pio PG 19 1 0xffffffff 0xffffffff 0>;
        status = "okay";
    };

    btlpm:btlpm {
        compatible = "allwinner,sunxi-btlpm";
        uart_index = <0x1>;
        bt_wake = <&pio PG 17 1 0xffffffff 0xffffffff 1>;
        bt_hostwake = <&pio PG 16 6 0xffffffff 0xffffffff 0>;
        status = "okay";
    };
```

2.3 配置 BoardConfig.mk

文件路径：android/device/softwinner/cupid-p2

BoardConfig.mk 文件决定 android 要加载哪一款 Wi-Fi 模组，以及是否支持蓝牙。

相比之前的 Android 的版本，此部分配置进行了简化。SDK 将一些繁琐的配置放到了 android/device/softwinner/common/config/wireless/wireless_config.mk，一般无需修改 wireless_config.mk。只需要按下面的格式在 BoardConfig.mk 配置即可。

2.3.1 Wi-Fi

XR819 Wi-Fi 配置：

```
# 1. Wifi Configuration
BOARD_WIFI_VENDOR := xradio
BOARD_USR_WIFI := xr819
WIFI_DRIVER_MODULE_PATH := "/system/vendor/modules/xr819.ko"
WIFI_DRIVER_MODULE_NAME := "xr819"
WIFI_DRIVER_MODULE_ARG := ""
```

XR829 Wi-Fi 配置：

```
# 1. Wifi Configuration
BOARD_WIFI_VENDOR := xradio
BOARD_USR_WIFI := xr829
WIFI_DRIVER_MODULE_PATH := "/system/vendor/modules/xr829.ko"
WIFI_DRIVER_MODULE_NAME := "xr829"
WIFI_DRIVER_MODULE_ARG := ""
```

SDK 默认使用模组自适应，因此 SDK 中 Wi-Fi 默认配置如下：

推荐使用模组自适应，此处无需做任何修改。

```
# 1. Wifi Configuration
BOARD_WIFI_VENDOR := common
BOARD_USR_WIFI :=
WIFI_DRIVER_MODULE_NAME :=
WIFI_DRIVER_MODULE_PATH :=
WIFI_DRIVER_MODULE_ARG :=
```

说明：

1. "#" 符号起注释的作用；
2. "BOARD_WIFI_VENDOR := xradio" 指明使用 xradio 的 Wi-Fi 模组，常见的有 broadcom、realtek、xradio；
3. "BOARD_USR_WIFI" 指明具体使用的 wifi 型号；
4. "WIFI_DRIVER_MODULE_PATH" 表示该模组的驱动 ko 的路径；
5. "WIFI_DRIVER_MODULE_NAME" 表示该模组的驱动名称；

2.3.2 BT

XR819 BT 配置:
因为 XR819 没有 BT，所以可以留空或者注释，也可以如下配置：

```
# 2. Bluetooth Configuration
BOARD_BLUETOOTH_VENDOR := none
BOARD_HAVE_BLUETOOTH_NAME :=
```

XR829 BT 配置:

```
# 2. Bluetooth Configuration
BOARD_BLUETOOTH_VENDOR := xradio
BOARD_HAVE_BLUETOOTH_NAME := xr829
```

由于 SDK 默认使用模组自适应，因此 SDK 中 BT 默认配置如下：
推荐使用模组自适应，此处无需做任何修改。

```
# 2. Bluetooth Configuration
BOARD_BLUETOOTH_VENDOR := common
BOARD_HAVE_BLUETOOTH_NAME :=
```

说明：

1. "BOARD_BLUETOOTH_VENDOR" 指明使用哪个厂商的 BT 模组，常见的有 broadcom、realtek、xradio；
2. "BOARD_HAVE_BLUETOOTH_NAME" 指定蓝牙模组型号。

2.4 配置 init 文件

此部分由 Allwinner 整合，一般客户不需要修改，只需要确认无误。

2.4.1 Wi-Fi 资源和服务配置

文件路径：

1、不使用模组自适应

android/device/softwinner/common/config/wireless/initrc/init.wireless.wlan.rc

2、使用模组自适应

android/hardware/aw/wireless/wlan/config

```
on post-fs-data
    # Create the directories used by the Wireless subsystem
    mkdir /data/vendor/wifi 0771 wifi wifi
    mkdir /data/vendor/wifi/wpa 0770 wifi wifi
    mkdir /data/vendor/wifi/wpa/sockets 0770 wifi wifi

# broadcom/realtek/xradio wifi sta p2p concurrent service
service wpa_supplicant /vendor/bin/hw/wpa_supplicant \
    -O/data/vendor/wifi/wpa/sockets -dd \
    -g@android:wpa_wlan0
    interface android.hardware.wifi.supplicant@1.0::ISupplicant default
    interface android.hardware.wifi.supplicant@1.1::ISupplicant default
    interface android.hardware.wifi.supplicant@1.2::ISupplicant default
    socket wpa_wlan0 dgram 660 wifi wifi
    class main
    disabled
    oneshot
```

2.4.2 BT 资源和服务配置

文件路径：

1、不使用模组自适应

android/device/softwinner/common/config/wireless/initrc/init.wireless.bluetooth.rc

2、使用模组自适应

android/hardware/aw/wireless/bluetooth/config

```
on boot
    # UART device
    chmod 0660 ${persist.vendor.bluetooth_port}
    chown bluetooth net_bt_admin ${persist.vendor.bluetooth_port}

    # bluetooth power up/down interface
    chmod 0660 /sys/class/rfkill/rfkill0/state
    chmod 0660 /sys/class/rfkill/rfkill0/type
    chown bluetooth net_bt_admin /sys/class/rfkill/rfkill0/state
    chown bluetooth net_bt_admin /sys/class/rfkill/rfkill0/type
    write /sys/class/rfkill/rfkill0/state 0

    # bluetooth MAC address programming
    chown bluetooth net_bt_admin ${ro.bt.bdaddr_path}

on property:persist.vendor.bluetooth_vendor=broadcom
    insmod /vendor/modules/bcm_btlpm.ko
    setprop vendor.driver.lpm.load 1

on property:persist.vendor.bluetooth_vendor=realtek
    insmod /vendor/modules/rtl_btlpm.ko
    setprop vendor.driver.lpm.load 1

on property:persist.vendor.bluetooth_vendor=xradio
    insmod /vendor/modules/xradio_btlpm.ko
    insmod /vendor/modules/xradio_btfdi.ko
    setprop vendor.driver.lpm.load 1

on property:persist.vendor.bluetooth_vendor=sprd
    insmod /vendor/modules/sprdbt_tty.ko
    chmod 0666 /sys/class/rfkill/rfkill1/state
    chmod 0666 /sys/class/rfkill/rfkill1/type
    chmod 0660 /dev/ttyBT0
    chown bluetooth net_bt_admin /dev/ttyBT0
    setprop vendor.driver.lpm.load 1


on property:vendor.driver.lpm.load=1
    chmod 0660 /proc/bluetooth/sleep/lpm
    chmod 0660 /proc/bluetooth/sleep/btwrite
    chmod 0660 /proc/bluetooth/sleep/btwake
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/lpm
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/btwrite
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/btwake

on property:persist.vendor.bluetooth_vendor=realtek && property:sys.boot_completed=1
    setprop persist.vendor.bluetooth.rtkcoex true

on property:persist.vendor.bluetooth_vendor=realtek && property:sys.boot_completed=0
    setprop persist.vendor.bluetooth.rtkcoex false

on property:persist.vendor.bluetooth_vendor=xradio && property:vold.post_fs_data_done=1
    mkdir /data/vendor/bluetooth 0771 bluetooth bluetooth
    mkdir /data/vendor/bluetooth/sdd 0770 bluetooth bluetooth
    mkdir /data/vendor/bluetooth/fdi 0770 bluetooth bluetooth
```

2.5 配置 manifest 文件

路径：android/device/softwinner/common/config/wireless/manifest

本文件为 Wi-Fi HIDL 配置，请确保下面部分有被正确配置。本文件一般不需要修改。

2.5.1 manifest_wifi.xml

```
<manifest version="1.0" type="device" target-level="4">
    <hal format="hidl">
        <name>android.hardware.wifi</name>
        <transport>hwbinder</transport>
        <version>1.3</version>
        <interface>
            <name>IWifi</name>
            <instance>default</instance>
        </interface>
    </hal>
    <hal format="hidl">
        <name>android.hardware.wifi.hostapd</name>
        <transport>hwbinder</transport>
        <version>1.1</version>
        <interface>
            <name>IHostapd</name>
            <instance>default</instance>
        </interface>
    </hal>
    <hal format="hidl">
        <name>android.hardware.wifi.supplicant</name>
        <transport>hwbinder</transport>
        <version>1.2</version>
        <interface>
            <name>ISupplicant</name>
            <instance>default</instance>
        </interface>
    </hal>
</manifest>
```

2.5.2 manifest_bluetooth.xml

```
<manifest version="1.0" type="device" target-level="4">
    <hal format="hidl">
        <name>android.hardware.bluetooth</name>
        <transport>hwbinder</transport>
        <version>1.0</version>
        <interface>
            <name>IBluetoothHci</name>
            <instance>default</instance>
        </interface>
    </hal>
</manifest>
```

2.6 配置 wireless_config.mk

路径:android/device/softwinner/common/config/wireless
本文件一般不需要修改，只需要确认存在即可。其作用是：

1. 解析 BoardConfig.mk 里面的 Wi-Fi/BT 的配置。
2. 把一些零散的 Wi-Fi/BT 配置集中管理，并能根据不同的模组厂完成相应的配置。

2.7 firmware 路径

xradio 的 Wi-Fi firmware 路径：android/hardware/xradio/wlan/kernel-firmware
xradio 的 BT firmware 路径：android/hardware/xradio/bt/firmware

2.8 配置 bt_vendor.conf(BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth
注意：由于 SDK 默认是模组自适应，bt_vendor.conf 文件不是这样配置。如果要配置 xradio 模组的 Uartbandrate，可参考如下：

```
# UART hci commnication bandrate
Uartbandrate=1500000
```

注意：
XR819 没有 BT，不需要配置该部分；

2.9 配置 bdroid_buildcfg.h(BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth
本文件主要配置 COD、Stack 编译宏等，一般不需要修改。

```
/*
 * Copyright (C) 2012 The Android Open Source Project
 *
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 *
 * http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */

#ifndef _BDROID_BUILDCFG_H
#define _BDROID_BUILDCFG_H

/*
#define BTM_DEF_LOCAL_NAME "XRADIO Bluetooth"
 */

// SERVICE_CLASS:0x1A (Bit17 -Networking,Bit19 - Capturing,Bit20 -Object Transfer)
// MAJOR CLASS: COMPUTER
// MINOR CLASS: TABLET
#define BTA_DM_COD {0x1A, 0x01, 0x1C}

#define BTA_GATT_DEBUG FALSE

#define PORT_RX_BUF_LOW_WM (10)
#define PORT_RX_BUF_HIGH_WM (40)
#define PORT_RX_BUF_CRITICAL_WM (45)
#define PORT_CREDIT_RX_MAX (48)

#define HCI_MAX_SIMUL_CMDS (1)
#define BTM_BLE_SCAN_SLOW_INT_1 (144)
#define BTM_BLE_SCAN_SLOW_WIN_1 (16)
#define BTM_MAX_VSE_CALLBACKS (6)

#define BTM_BLE_CONN_INT_MIN_DEF 0x06
#define BTM_BLE_CONN_INT_MAX_DEF 0x0C
#define BTM_BLE_CONN_TIMEOUT_DEF 200

//#define BTIF_HF_SERVICES (BTA_HSP_SERVICE_MASK)
//#define BTIF_HF_SERVICE_NAMES { BTIF_HSAG_SERVICE_NAME, NULL }

#define BTA_DISABLE_DELAY 1000 /* in milliseconds */
#define BTA_HOST_INTERLEAVE_SEARCH FALSE
```

```
/*heartbeat log define*/
#define BTPOLL_DBG FALSE
/*hci log define*/
#define BTHC_DBG FALSE
/*avdtp log define*/
//#define AVDT_DEBUG TRUE
/*BT log verbose*/
#define BT_TRACE_VERBOSE TRUE
/* BT trace messages*/
#define BT_USE_TRACES TRUE
/*A2DP SINK ENABLE*/
#define BTA_AV_SINK_INCLUDED FALSE
#define BLE_LOCAL_PRIVACY_ENABLED TRUE
#define USE_AUDIO_TRACK TRUE
/*BT lib vendor log*/
//#define BTVND_DBG TRUE
/*page timeout */
#define BTA_DM_PAGE_TIMEOUT 8192
#define BTM_LOCAL_IO_CAPS_BLE BTM_IO_CAP_KBDISP
#define BT_HCI_DEVICE_NODE_MAX_LEN 512

#define KERNEL_MISSING_CLOCK_BOOTTIME_ALARM TRUE
#endif
```

2.10 配置 vnd_cupid-p2.txt(BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth

本文件为蓝牙编译期间的配置文件，配置硬件通信接口、波特率、firmware 路径、LPM/DEBUG 状态、PCM 接口等。除硬件通信接口及波特率外，一般不需要修改。如需支持 hfp 功能，请按 AP 端 PCM 接口参数配置 SCO 参数

注意：本文件的名字务必保持：vnd_<platform>.txt，否则不会生效。

```
#Set baudrate to 1500000
UART_TARGET_BAUD_RATE=1500000
BLUETOOTH_UART_DEVICE_PORT = "/dev/ttyS1"
FW_PATCHFILE_LOCATION = "/vendor/etc/firmware/"
VENDOR_LIB_CONF_FILE = "/vendor/etc/bluetooth/bt_vendor.conf"
LPM_IDLE_TIMEOUT_MULTIPLE = 5
#LPM_SLEEP_MODE = FALSE
LPM_BT_WAKE_POLARITY = 1
LPM_HOST_WAKE_POLARITY = 0
PROC_BTWRITE_TIMER_TIMEOUT_MS = 0
```

```
BT_WAKE_VIA_PROC_NOTIFY_DEASSERT = TRUE
BT_WAKE_VIA_PROC = TRUE
BTVND_DBG = TRUE
BTHW_DBG = TRUE
VNDUSERIAL_DBG = TRUE
UPIO_DBG = TRUE
SCO_PCM_ROUTING = 0x00
SCO_PCM_IF_CLOCK_RATE = 0x04
SCO_PCM_IF_FRAME_TYPE = 0x00
SCO_PCM_IF_SYNC_MODE = 0x00
SCO_PCM_IF_CLOCK_MODE = 0x00
PCM_DATA_FMT_SHIFT_MODE = 0x00
PCM_DATA_FMT_FILL_BITS = 0x03
PCM_DATA_FMT_FILL_METHOD = 0x00
PCM_DATA_FMT_FILL_NUM = 0x00
PCM_DATA_FMT_JUSTIFY_MODE = 0x0
```

注意：1、XR819 不需要配置该部分；2、XR829 暂不支持 HFP；

3. Broadcom 模组的配置

适用于 AP6181/AP6212/AP6255/AP6330/AP6335/AP6356s 等模组

功能：Wi-Fi（station/softap/p2p）+ BT

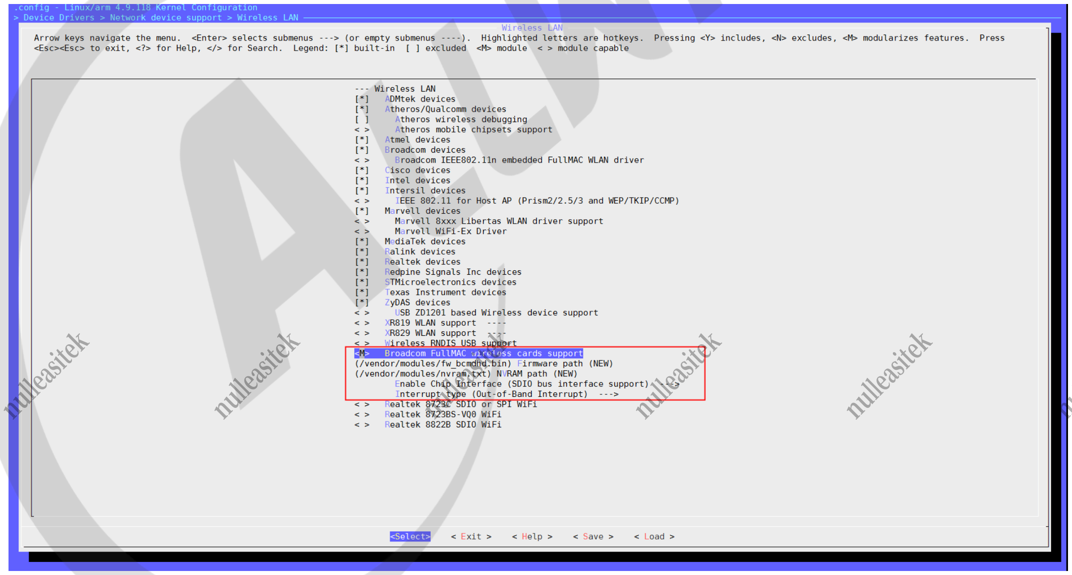
接口类型：SDIO + UART

说明：以下章节以 AP6330 为例进行说明。

3.1 内核驱动配置

3.1.1 wifi driver 编译为模块

在 longan/kernel/linux-4.9 中执行 make menuconfig ARCH=arm64，将所需 Wi-Fi driver 编译为模块：



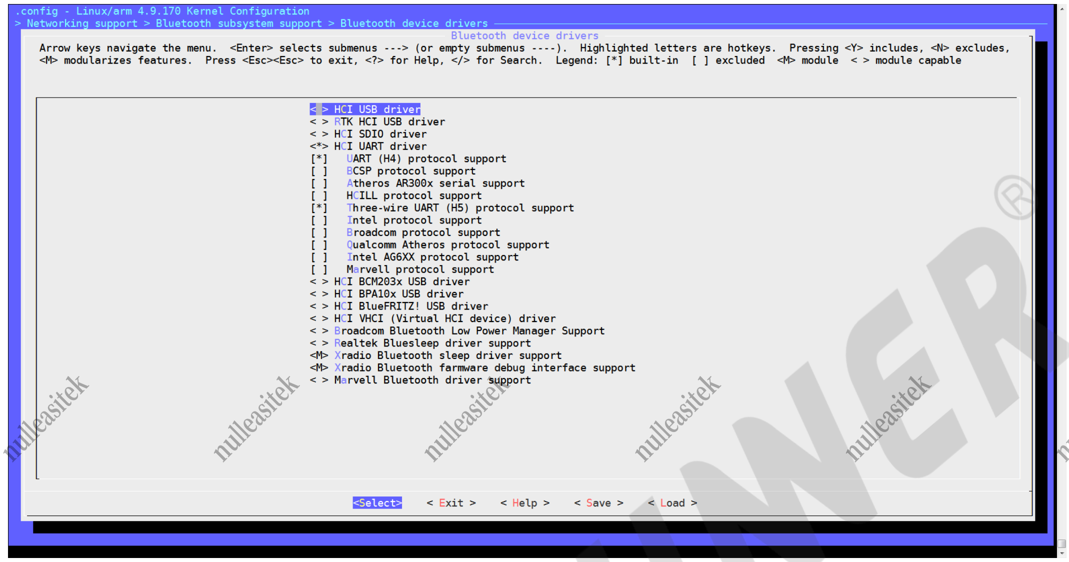
```
.config - Linux/arm 4.9.118 Kernel Configuration
> Device Drivers > Network device support > Wireless LAN ─────────────────────
                                   Wireless LAN
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes features.  Press
  <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                    --- Wireless LAN
                    [*]   ADMtek devices
                    [*]   Atheros/Qualcomm devices
                    [ ]     Atheros wireless debugging
                    < >     Atheros mobile chipsets support
                    [*]   Atmel devices
                    [*]   Broadcom devices
                    < >     Broadcom IEEE802.11n embedded FullMAC WLAN driver
                    [*]   Cisco devices
                    [*]   Intel devices
                    [*]   Intersil devices
                    < >     IEEE 802.11 for Host AP (Prism2/2.5/3 and WEP/TKIP/CCMP)
                    [*]   Marvell devices
                    < >     Marvell 8xxx Libertas WLAN driver support
                    < >     Marvell WiFi-Ex Driver
                    [*]   MediaTek devices
                    [*]   Ralink devices
                    [*]   Realtek devices
                    [*]   Redpine Signals Inc devices
                    [*]   STMicroelectronics devices
                    [*]   Texas Instrument devices
                    [*]   ZyDAS devices
                    < >     USB ZD1201 based Wireless device support
                    < >   XR819 WLAN support  ----
                    < >   XR829 WLAN support  ----
                    < >   Wireless RNDIS USB support
                    <M>   Broadcom FullMAC wireless cards support
                    (/vendor/modules/fw_bcmdhd.bin) Firmware path (NEW)
                    (/vendor/modules/nvram.txt) NVRAM path (NEW)
                            Enable Chip Interface (SDIO bus interface support)  --->
                            Interrupt type (Out-of-Band Interrupt)  --->
                    < >   Realtek 8723C SDIO or SPI WiFi
                    < >   Realtek 8723BS-VQ0 WiFi
                    < >   Realtek 8822B SDIO WiFi

                  <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 4: Broadcom wifi 驱动配置

3.1.2 配置 sunxi-rf 驱动



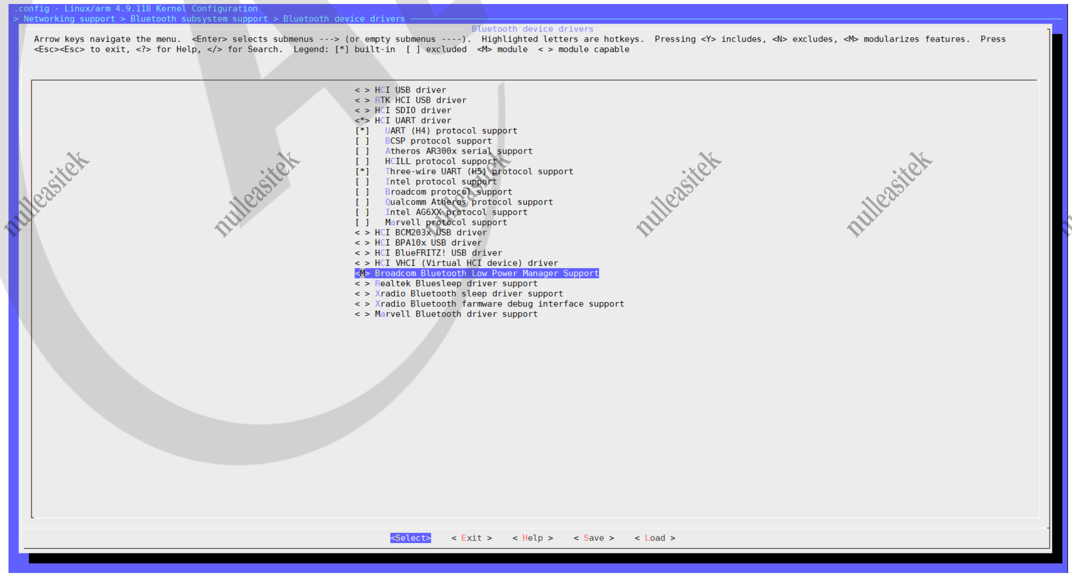
```
.config - Linux/arm 4.9.170 Kernel Configuration
> Networking support > Bluetooth subsystem support > Bluetooth device drivers
                                    Bluetooth device drivers
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                         < > HCI USB driver
                         < > RTK HCI USB driver
                         < > HCI SDIO driver
                         <*> HCI UART driver
                         [*]   UART (H4) protocol support
                         [ ]   BCSP protocol support
                         [ ]   Atheros AR300x serial support
                         [ ]   HCILL protocol support
                         [*]   Three-wire UART (H5) protocol support
                         [ ]   Intel protocol support
                         [ ]   Broadcom protocol support
                         [ ]   Qualcomm Atheros protocol support
                         [ ]   Intel AG6XX protocol support
                         [ ]   Marvell protocol support
                         < > HCI BCM203x USB driver
                         < > HCI BPA10x USB driver
                         < > HCI BlueFRITZ! USB driver
                         < > HCI VHCI (Virtual HCI device) driver
                         < > Broadcom Bluetooth Low Power Manager Support
                         < > Realtek Bluesleep driver support
                         <M> Xradio Bluetooth sleep driver support
                         <M> Xradio Bluetooth farmware debug interface support
                         < > Marvell Bluetooth driver support

                    <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 5: Sunxi-rf 驱动配置

3.1.3 配置 btlpm 驱动（BT 使用）



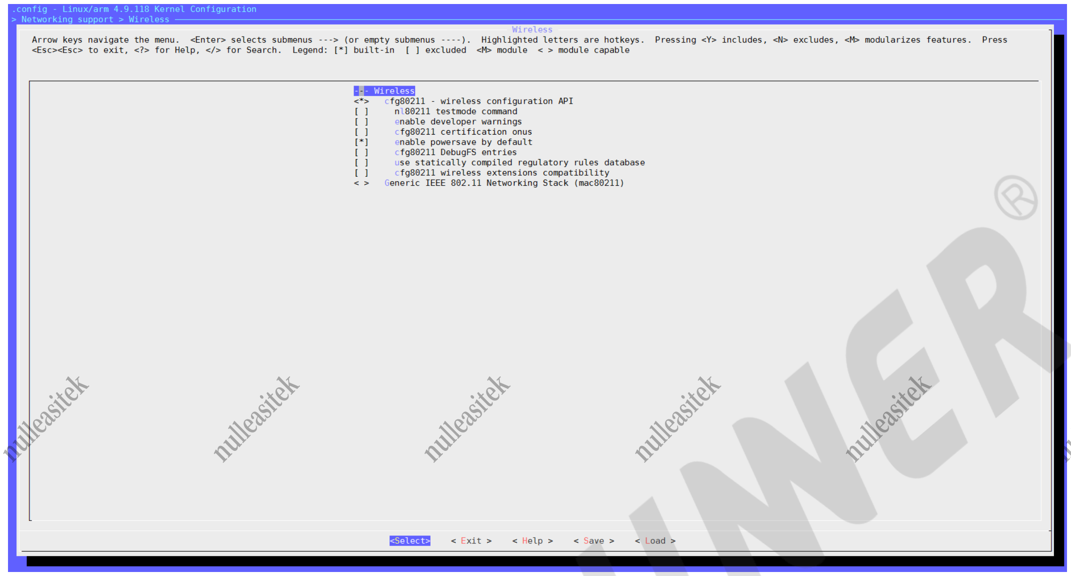
```
.config - Linux/arm 4.9.118 Kernel Configuration
> Networking support > Bluetooth subsystem support > Bluetooth device drivers
                                    Bluetooth device drivers
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes features.  Press
  <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                         < > HCI USB driver
                         < > RTK HCI USB driver
                         < > HCI SDIO driver
                         <*> HCI UART driver
                         [*]   UART (H4) protocol support
                         [ ]   BCSP protocol support
                         [ ]   Atheros AR300x serial support
                         [ ]   HCILL protocol support
                         [*]   Three-wire UART (H5) protocol support
                         [ ]   Intel protocol support
                         [ ]   Broadcom protocol support
                         [ ]   Qualcomm Atheros protocol support
                         [ ]   Intel AG6XX protocol support
                         [ ]   Marvell protocol support
                         < > HCI BCM203x USB driver
                         < > HCI BPA10x USB driver
                         < > HCI BlueFRITZ! USB driver
                         < > HCI VHCI (Virtual HCI device) driver
                         <M> Broadcom Bluetooth Low Power Manager Support
                         < > Realtek Bluesleep driver support
                         < > Xradio Bluetooth sleep driver support
                         < > Xradio Bluetooth farmware debug interface support
                         < > Marvell Bluetooth driver support

                    <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 6: Broadcom btlpm 驱动配置

3.1.4 配置 cfg80211



```
.config - Linux/arm 4.9.118 Kernel Configuration
> Networking support > Wireless
                                                  Wireless
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes features.  Press
  <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                                       --- Wireless
                                       <*>   cfg80211 - wireless configuration API
                                       [ ]     nl80211 testmode command
                                       [ ]     enable developer warnings
                                       [ ]     cfg80211 certification onus
                                       [*]     enable powersave by default
                                       [ ]     cfg80211 DebugFS entries
                                       [ ]     use statically compiled regulatory rules database
                                       [ ]     cfg80211 wireless extensions compatibility
                                       < >   Generic IEEE 802.11 Networking Stack (mac80211)

                                          <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 7: cfg80211 配置

3.2 配置 DTS

文件路径：longan/device/config/chips/h616/configs/p2/board.dts

文件决定选用的模组的 GPIO pin 分配，在 H616 AndroidQ 平台上，Wi-Fi/BT 的配置从 sys_config.fex 移动至 board.dts。

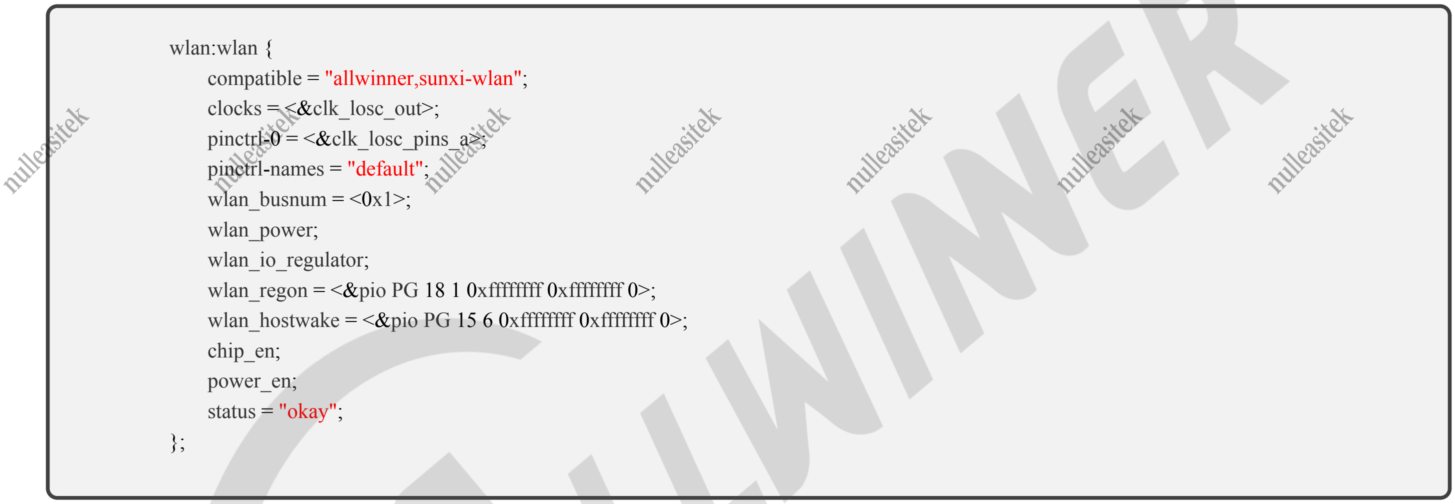
3.2.1 Wi-Fi 部分

Wi-Fi 相关的 DTS 配置说明：

1. "clocks" 用于配置使用主控提供的 32k 时钟；
2. "pinctrl-0" 用于配置 pin 的复用功能；
3. "pinctrl-names" 用于配置 pin state；
4. "wlan_busnum" 表示 WiFi 所使用的 SDIO 控制器号；
5. "wlan_power" 表示给 WiFi 模组供电的 regulator 名称；

6. "wlan_io_regulator" 表示给 WiFi 模组的 GPIO 供电的 regulator 名称；
7. "wlan_regon" WiFi 模组 power on 控制引脚；
8. "wlan_hostwake" 表示 WiFi 唤醒主控的 GPIO；
9. "chip_en" 表示 WiFi 模组使能引脚，硬件未使用时不配置；
10. "power_en" 表示模块外部的电源开关控制引脚；
11. 以上所有项必须参看原理图进行配置，配置与原理图实际使用的资源保持一致；

Wi-Fi 参考配置如下：



```
wlan:wlan {
    compatible = "allwinner,sunxi-wlan";
    clocks = <&clk_losc_out>;
    pinctrl-0 = <&clk_losc_pins_a>;
    pinctrl-names = "default";
    wlan_busnum = <0x1>;
    wlan_power;
    wlan_io_regulator;
    wlan_regon = <&pio PG 18 1 0xffffffff 0xffffffff 0>;
    wlan_hostwake = <&pio PG 15 6 0xffffffff 0xffffffff 0>;
    chip_en;
    power_en;
    status = "okay";
};
```

3.2.2 BT 部分

BT 相关的 DTS 配置说明：

1. "clocks" 用于配置使用主控提供的 32k 时钟；
2. "bt_power" 表示 BT 模组所用的供电，与 wlan_power 相同；
3. "bt_io_regulator" 表示 BT 模组所用的 IO 供电，与 wlan_regulator 相同；
4. "bt_rst_n" 表示 Bt 模组 power on 控制引脚；
5. "uart_index" 表示 BT 模组使用的硬件通信端口号；
6. "bt_wake" 表示 BT 模组休眠后被唤醒时的控制引脚；
7. "uart_index" 表示 BT 模组使用的硬件通信端口号；
8. "bt_hostwake" 表示 BT 模组中断输出引脚，用于唤醒 AP；

BT 参考配置如下：

```
    bt:bt {
        compatible = "allwinner,sunxi-bt";
        clocks = <&clk_losc_out>;
        bt_power;
        bt_io_regulator;
        bt_rst_n = <&pio PG 19 1 0xffffffff 0xffffffff 0>;
        status = "okay";
    };

    btlpm:btlpm {
        compatible = "allwinner,sunxi-btlpm";
        uart_index = <0x1>;
        bt_wake = <&pio PG 17 1 0xffffffff 0xffffffff 1>;
        bt_hostwake = <&pio PG 16 6 0xffffffff 0xffffffff 0>;
        status = "okay";
    };
```

3.3 配置 BoardConfig.mk

文件路径：android/device/softwinner/cupid-p2
BoardConfig.mk 文件决定 android 要加载哪一款 Wi-Fi 模组，以及是否支持蓝牙。
相比之前的 Android 的版本，此部分配置进行了简化。SDK 将一些繁琐的配置放到了 android/device/softwinner/common/config/wireless/wireless_config.mk，一般无需修改 wireless_config.mk。只需要按下面的格式在 BoardConfig.mk 配置即可。

3.3.1 Wi-Fi

AP6330 Wi-Fi 配置：

```
# 1. Wifi Configuration
BOARD_WIFI_VENDOR := broadcom
BOARD_USR_WIFI := ap6330
WIFI_DRIVER_MODULE_PATH := "/system/vendor/modules/bcmdhd.ko"
WIFI_DRIVER_MODULE_NAME := "bcmdhd"
WIFI_DRIVER_MODULE_ARG := ""
```

SDK 默认使用模组自适应，因此 SDK 中 Wi-Fi 默认配置如下：
推荐使用模组自适应，此处无需做任何修改。

```
# 1. Wifi Configuration
BOARD_WIFI_VENDOR := common
BOARD_USR_WIFI :=
WIFI_DRIVER_MODULE_NAME :=
WIFI_DRIVER_MODULE_PATH :=
WIFI_DRIVER_MODULE_ARG :=
```

说明：

1. "#" 符号起注释的作用；
2. "BOARD_WIFI_VENDOR := broadcom" 指明使用 broadcom 的 Wi-Fi 模组，常见的有 broadcom、realtek、xradio；
3. "BOARD_USR_WIFI" 指明具体使用的 wifi 型号；
4. "WIFI_DRIVER_MODULE_PATH" 表示该模组的驱动 ko 的路径；
5. "WIFI_DRIVER_MODULE_NAME" 表示该模组的驱动名称；

3.3.2 BT

AP6330 BT 配置:

```
# 2. Bluetooth Configuration
BOARD_BLUETOOTH_VENDOR := broadcom
BOARD_HAVE_BLUETOOTH_NAME := ap6330
```

由于 SDK 默认使用模组自适应，因此 SDK 中 BT 默认配置如下：
推荐使用模组自适应，此处无需做任何修改。

```
# 2. Bluetooth Configuration
BOARD_BLUETOOTH_VENDOR := common
BOARD_HAVE_BLUETOOTH_NAME :=
```

说明：

1. "BOARD_BLUETOOTH_VENDOR" 指明使用哪个厂商的 bt 模组，常见的有 broadcom、realtek、

xradio；

2. "BOARD_HAVE_BLUETOOTH_NAME" 指定蓝牙模组型号。

3.4 配置 init 文件

此部分由 Allwinner 整合，一般客户不需要修改，只需要确认无误。

3.4.1 Wi-Fi 资源和服务配置

文件路径：

1、不使用模组自适应

android/device/softwinner/common/config/wireless/initrc/init.wireless.wlan.rc

2、使用模组自适应

android/hardware/aw/wireless/wlan/config

```
on post-fs-data
    # Create the directories used by the Wireless subsystem
    mkdir /data/vendor/wifi 0771 wifi wifi
    mkdir /data/vendor/wifi/wpa 0770 wifi wifi
    mkdir /data/vendor/wifi/wpa/sockets 0770 wifi wifi

# broadcom/realtek/xradio wifi sta p2p concurrent service
service wpa_supplicant /vendor/bin/hw/wpa_supplicant \
    -O/data/vendor/wifi/wpa/sockets -dd \
    -g@android:wpa_wlan0
    interface android.hardware.wifi.supplicant@1.0::ISupplicant default
    interface android.hardware.wifi.supplicant@1.1::ISupplicant default
    interface android.hardware.wifi.supplicant@1.2::ISupplicant default
    socket wpa_wlan0 dgram 660 wifi wifi
    class main
    disabled
    oneshot
```

3.4.2 BT 资源和服务配置

文件路径：

1、不使用模组自适应

android/device/softwinner/common/config/wireless/initrc/init.wireless.bluetooth.rc

2、使用模组自适应

android/hardware/aw/wireless/bluetooth/config

```
on boot
    # UART device
    chmod 0660 ${persist.vendor.bluetooth_port}
    chown bluetooth net_bt_admin ${persist.vendor.bluetooth_port}

    # bluetooth power up/down interface
    chmod 0660 /sys/class/rfkill/rfkill0/state
    chmod 0660 /sys/class/rfkill/rfkill0/type
    chown bluetooth net_bt_admin /sys/class/rfkill/rfkill0/state
    chown bluetooth net_bt_admin /sys/class/rfkill/rfkill0/type
    write /sys/class/rfkill/rfkill0/state 0

    # bluetooth MAC address programming
    chown bluetooth net_bt_admin ${ro.bt.bdaddr_path}

on property:persist.vendor.bluetooth_vendor=broadcom
    insmod /vendor/modules/bcm_btlpm.ko
    setprop vendor.driver.lpm.load 1

on property:persist.vendor.bluetooth_vendor=realtek
    insmod /vendor/modules/rtl_btlpm.ko
    setprop vendor.driver.lpm.load 1

on property:persist.vendor.bluetooth_vendor=xradio
    insmod /vendor/modules/xradio_btlpm.ko
    insmod /vendor/modules/xradio_btfdi.ko
    setprop vendor.driver.lpm.load 1

on property:persist.vendor.bluetooth_vendor=sprd
    insmod /vendor/modules/sprdbt_tty.ko
    chmod 0666 /sys/class/rfkill/rfkill1/state
    chmod 0666 /sys/class/rfkill/rfkill1/type
    chmod 0660 /dev/ttyBT0
    chown bluetooth net_bt_admin /dev/ttyBT0
    setprop vendor.driver.lpm.load 1
```

```
on property:vendor.driver.lpm.load=1
    chmod 0660 /proc/bluetooth/sleep/lpm
    chmod 0660 /proc/bluetooth/sleep/btwrite
    chmod 0660 /proc/bluetooth/sleep/btwake
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/lpm
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/btwrite
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/btwake

on property:persist.vendor.bluetooth_vendor=realtek && property:sys.boot_completed=1
    setprop persist.vendor.bluetooth.rtkcoex true

on property:persist.vendor.bluetooth_vendor=realtek && property:sys.boot_completed=0
    setprop persist.vendor.bluetooth.rtkcoex false

on property:persist.vendor.bluetooth_vendor=xradio && property:vold.post_fs_data_done=1
    mkdir /data/vendor/bluetooth 0771 bluetooth bluetooth
    mkdir /data/vendor/bluetooth/sdd 0770 bluetooth bluetooth
    mkdir /data/vendor/bluetooth/fdi 0770 bluetooth bluetooth
```

3.5 配置 manifest 文件

路径：android/device/softwinner/common/config/wireless/manifest

本文件为 Wi-Fi HIDL 配置，请确保下面部分有被正确配置。本文件一般不需要修改。

3.5.1 manifest_wifi.xml

```
<manifest version="1.0" type="device" target-level="4">
    <hal format="hidl">
        <name>android.hardware.wifi</name>
        <transport>hwbinder</transport>
        <version>1.3</version>
        <interface>
            <name>IWifi</name>
            <instance>default</instance>
        </interface>
    </hal>
    <hal format="hidl">
        <name>android.hardware.wifi.hostapd</name>
        <transport>hwbinder</transport>
        <version>1.1</version>
        <interface>
            <name>IHostapd</name>
            <instance>default</instance>
        </interface>
    </hal>
    <hal format="hidl">
        <name>android.hardware.wifi.supplicant</name>
        <transport>hwbinder</transport>
        <version>1.2</version>
        <interface>
            <name>ISupplicant</name>
            <instance>default</instance>
        </interface>
    </hal>
</manifest>
```

3.5.2 manifest_bluetooth.xml

```
<manifest version="1.0" type="device" target-level="4">
    <hal format="hidl">
        <name>android.hardware.bluetooth</name>
        <transport>hwbinder</transport>
        <version>1.0</version>
        <interface>
            <name>IBluetoothHci</name>
            <instance>default</instance>
        </interface>
    </hal>
</manifest>
```

3.6 配置 wireless_config.mk

路径:android/device/softwinner/common/config/wireless
本文件一般不需要修改，只需要确认存在即可。其作用是：

1. 解析 BoardConfig.mk 里面的 Wi-Fi/BT 的配置。

2. 把一些零散的 Wi-Fi/BT 配置集中管理，并能根据不同的模组厂完成相应的配置。

3.7 firmware 路径

broadcom 模组固件路径：android/hardware/broadcom/wlan/bcmdhd/firmware 或 android/hardware/aw/wireless/parter/ampak/firmware

3.8 配置 bt_vendor.conf (BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth 此文件一般不需要修改

```
# UART device port where Bluetooth controller is attached
UartPort = /dev/ttyS1

# Firmware patch file location
FwPatchFilePath = /vendor/etc/firmware/

# Firmware name
# Do not specify FwPatchFileName = xxx.hcd to enable FwAutoDetection
# FwPatchFileName = bcm43438a0.hcd
```

3.9 配置 bdroid_buildcfg.h(BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth
本文件主要配置 COD、Stack 编译宏等，一般不需要修改。

```
/*
 * Copyright (C) 2012 The Android Open Source Project
 *
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 *
 * http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */

#ifndef _BDROID_BUILDCFG_H
#define _BDROID_BUILDCFG_H

/*
#define BTM_DEF_LOCAL_NAME "XRADIO Bluetooth"
 */

// SERVICE_CLASS:0x1A (Bit17 -Networking,Bit19 - Capturing,Bit20 -Object Transfer)
// MAJOR CLASS: COMPUTER
// MINOR CLASS: TABLET
#define BTA_DM_COD {0x1A, 0x01, 0x1C}

#define BTA_GATT_DEBUG FALSE

#define PORT_RX_BUF_LOW_WM (10)
#define PORT_RX_BUF_HIGH_WM (40)
#define PORT_RX_BUF_CRITICAL_WM (45)
#define PORT_CREDIT_RX_MAX (48)

#define HCI_MAX_SIMUL_CMDS (1)
#define BTM_BLE_SCAN_SLOW_INT_1 (144)
#define BTM_BLE_SCAN_SLOW_WIN_1 (16)
#define BTM_MAX_VSE_CALLBACKS (6)

#define BTM_BLE_CONN_INT_MIN_DEF 0x06
#define BTM_BLE_CONN_INT_MAX_DEF 0x0C
#define BTM_BLE_CONN_TIMEOUT_DEF 200

//#define BTIF_HF_SERVICES (BTA_HSP_SERVICE_MASK)
//#define BTIF_HF_SERVICE_NAMES { BTIF_HSAG_SERVICE_NAME, NULL }

#define BTA_DISABLE_DELAY 1000 /* in milliseconds */
#define BTA_HOST_INTERLEAVE_SEARCH FALSE

/*heartbeat log define*/
#define BTPOLL_DBG FALSE
/*hci log define*/
#define BTHC_DBG FALSE
/*avdtp log define*/
//#define AVDT_DEBUG TRUE
/*BT log verbose*/
#define BT_TRACE_VERBOSE TRUE
/* BT trace messages*/
#define BT_USE_TRACES TRUE
/*A2DP SINK ENABLE*/
#define BTA_AV_SINK_INCLUDED FALSE
#define BLE_LOCAL_PRIVACY_ENABLED TRUE
#define USE_AUDIO_TRACK TRUE
```

```
/*BT lib vendor log*/
//#define BTVND_DBG TRUE
/*page timeout */
#define BTA_DM_PAGE_TIMEOUT 8192
#define BTM_LOCAL_IO_CAPS_BLE BTM_IO_CAP_KBDISP
#define BT_HCI_DEVICE_NODE_MAX_LEN 512

#define KERNEL_MISSING_CLOCK_BOOTTIME_ALARM TRUE
#endif
```

3.10 配置 vnd_cupid-p2.txt(BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth

本文件为蓝牙编译期间的配置文件，配置硬件通信接口、波特率、firmware 路径、LPM/DEBUG 状态、PCM 接口等。除硬件通信接口及波特率外，一般不需要修改。如需支持 hfp 功能，请按 AP 端 PCM 接口参数配置 SCO 参数

注意：本文件的名字务必保持：vnd_<platform>.txt，否则不会生效。

```
#Set baudrate to 1500000
UART_TARGET_BAUD_RATE=1500000
BLUETOOTH_UART_DEVICE_PORT = "/dev/ttyS1"
FW_PATCHFILE_LOCATION = "/vendor/etc/firmware/"
VENDOR_LIB_CONF_FILE = "/vendor/etc/bluetooth/bt_vendor.conf"
LPM_IDLE_TIMEOUT_MULTIPLE = 5
#LPM_SLEEP_MODE = FALSE
LPM_BT_WAKE_POLARITY = 1
LPM_HOST_WAKE_POLARITY = 0
PROC_BTWRITE_TIMER_TIMEOUT_MS = 0
BT_WAKE_VIA_PROC_NOTIFY_DEASSERT = TRUE
BT_WAKE_VIA_PROC = TRUE
BTVND_DBG = TRUE
BTHW_DBG = TRUE
VNDUSERIAL_DBG = TRUE
UPIO_DBG = TRUE
SCO_PCM_ROUTING = 0x00
SCO_PCM_IF_CLOCK_RATE = 0x04
SCO_PCM_IF_FRAME_TYPE = 0x00
SCO_PCM_IF_SYNC_MODE = 0x00
SCO_PCM_IF_CLOCK_MODE = 0x00
PCM_DATA_FMT_SHIFT_MODE = 0x00
PCM_DATA_FMT_FILL_BITS = 0x03
PCM_DATA_FMT_FILL_METHOD = 0x00
```

```
PCM_DATA_FMT_FILL_NUM = 0x00
PCM_DATA_FMT_JUSTIFY_MODE = 0x0
```

4. Realtek 模组的配置

适用于 rtl8822bs/rtl8723bs(cs)/rtl8723bs-vq0/rtl8822cs 等

功能：Wi-Fi（station/softap/p2p）+ BT

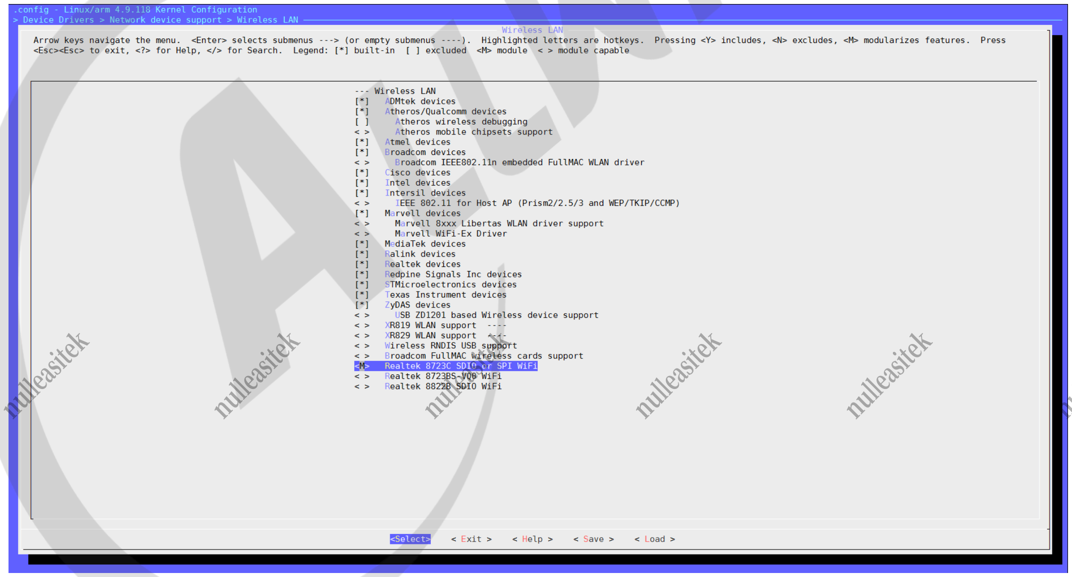
接口类型：SDIO + UART

说明：以上模组移植说明大同小异，以 rtl8822bs 为例合并移植说明；

4.1 内核驱动配置

4.1.1 Wi-Fi driver 编译为模块

在 longan/kernel/linux-4.9 执行 make menuconfig ARCH=arm64，将所需 Wi-Fi driver 编译为模块：



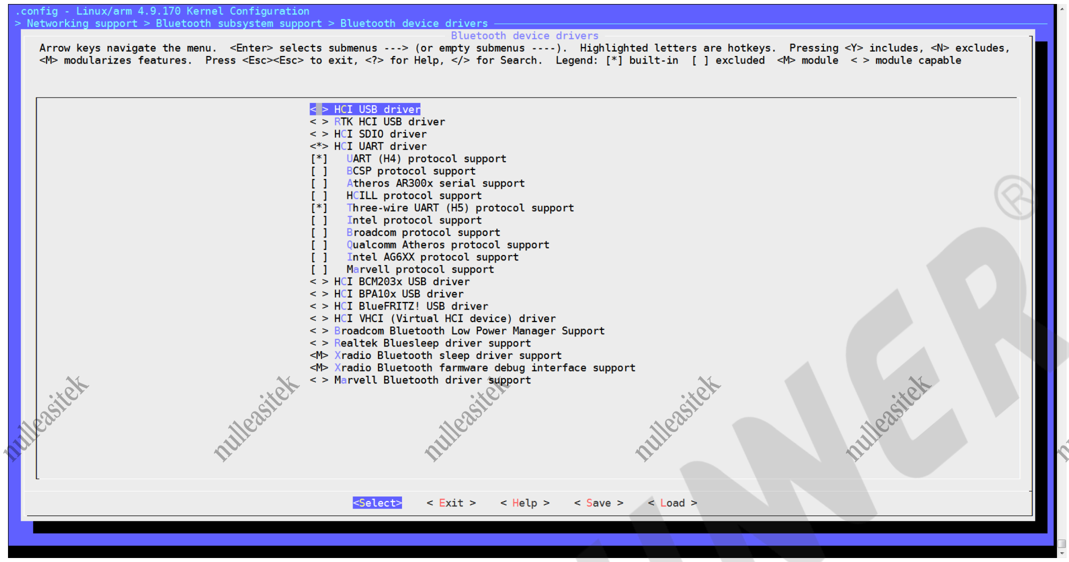
```
.config - Linux/arm 4.9.118 Kernel Configuration
> Device Drivers > Network device support > Wireless LAN
                                  Wireless LAN
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes features.  Press
  <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                    --- Wireless LAN
                    [*]   ADMtek devices
                    [*]   Atheros/Qualcomm devices
                    [ ]     Atheros wireless debugging
                    < >     Atheros mobile chipsets support
                    [*]   Atmel devices
                    [*]   Broadcom devices
                    < >     Broadcom IEEE802.11n embedded FullMAC WLAN driver
                    [*]   Cisco devices
                    [*]   Intel devices
                    [*]   Intersil devices
                    < >     IEEE 802.11 for Host AP (Prism2/2.5/3 and WEP/TKIP/CCMP)
                    [*]   Marvell devices
                    < >     Marvell 8xxx Libertas WLAN driver support
                    < >     Marvell WiFi-Ex Driver
                    [*]   MediaTek devices
                    [*]   Ralink devices
                    [*]   Realtek devices
                    [*]   Redpine Signals Inc devices
                    [*]   STMicroelectronics devices
                    [*]   Texas Instrument devices
                    [*]   ZyDAS devices
                    < >     USB ZD1201 based Wireless device support
                    < >   XR819 WLAN support  ----
                    < >   XR829 WLAN support  ----
                    < >   Wireless RNDIS USB support
                    < >   Broadcom FullMAC wireless cards support
                    <M>   Realtek 8723C SDIO or SPI WiFi
                    < >   Realtek 8723BS-VQ0 WiFi
                    < >   Realtek 8822B SDIO WiFi

                <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 8: Realtek Wi-Fi 驱动配置

4.1.2 配置 sunxi-rf 驱动



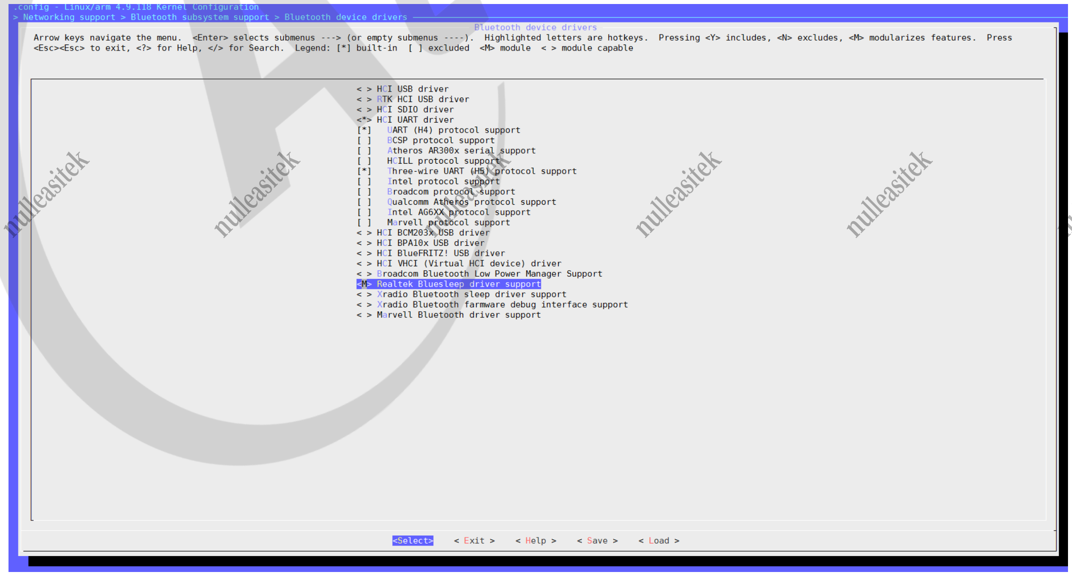
```
.config - Linux/arm 4.9.170 Kernel Configuration
> Networking support > Bluetooth subsystem support > Bluetooth device drivers
                              Bluetooth device drivers
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                      < > HCI USB driver
                      < > RTK HCI USB driver
                      < > HCI SDIO driver
                      <*> HCI UART driver
                      [*]   UART (H4) protocol support
                      [ ]   BCSP protocol support
                      [ ]   Atheros AR300x serial support
                      [ ]   HCILL protocol support
                      [*]   Three-wire UART (H5) protocol support
                      [ ]   Intel protocol support
                      [ ]   Broadcom protocol support
                      [ ]   Qualcomm Atheros protocol support
                      [ ]   Intel AG6XX protocol support
                      [ ]   Marvell protocol support
                      < > HCI BCM203x USB driver
                      < > HCI BPA10x USB driver
                      < > HCI BlueFRITZ! USB driver
                      < > HCI VHCI (Virtual HCI device) driver
                      < > Broadcom Bluetooth Low Power Manager Support
                      < > Realtek Bluesleep driver support
                      <M> Xradio Bluetooth sleep driver support
                      <M> Xradio Bluetooth farmware debug interface support
                      < > Marvell Bluetooth driver support

                 <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 9: Sunxi-rf 驱动配置

4.1.3 配置 btlpm 驱动（BT 使用）



```
.config - Linux/arm 4.9.118 Kernel Configuration
> Networking support > Bluetooth subsystem support > Bluetooth device drivers
                              Bluetooth device drivers
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes, <M> modularizes features.  Press
  <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                      < > HCI USB driver
                      < > RTK HCI USB driver
                      < > HCI SDIO driver
                      <*> HCI UART driver
                      [*]   UART (H4) protocol support
                      [ ]   BCSP protocol support
                      [ ]   Atheros AR300x serial support
                      [ ]   HCILL protocol support
                      [*]   Three-wire UART (H5) protocol support
                      [ ]   Intel protocol support
                      [ ]   Broadcom protocol support
                      [ ]   Qualcomm Atheros protocol support
                      [ ]   Intel AG6XX protocol support
                      [ ]   Marvell protocol support
                      < > HCI BCM203x USB driver
                      < > HCI BPA10x USB driver
                      < > HCI BlueFRITZ! USB driver
                      < > HCI VHCI (Virtual HCI device) driver
                      < > Broadcom Bluetooth Low Power Manager Support
                      <M> Realtek Bluesleep driver support
                      < > Xradio Bluetooth sleep driver support
                      < > Xradio Bluetooth farmware debug interface support
                      < > Marvell Bluetooth driver support

                 <Select>    < Exit >    < Help >    < Save >    < Load >
```

图 10: Realtek btlpm 驱动配置

4.2 配置 DTS

文件路径：longan/device/config/chips/h616/configs/p2/board.dts
文件决定选用的模组的 GPIO pin 分配，在 H616 AndroidQ 平台上，Wi-Fi/BT 的配置从 sys_config.fex 移动至 board.dts。

4.2.1 Wi-Fi 部分

Wi-Fi 相关的 DTS 配置说明：

1. "clocks" 用于配置使用主控提供的 32k 时钟；
2. "pinctrl-0" 用于配置 pin 的复用功能；
3. "pinctrl-names" 用于配置 pin state；
4. "wlan_busnum" 表示 WiFi 所使用的 SDIO 控制器号；
5. "wlan_power" 表示给 WiFi 模组供电的 regulator 名称；
6. "wlan_io_regulator" 表示给 WiFi 模组的 GPIO 供电的 regulator 名称；
7. "wlan_regon" WiFi 模组 power on 控制引脚；
8. "wlan_hostwake" 表示 WiFi 唤醒主控的 GPIO；
9. "chip_en" 表示 WiFi 模组使能引脚，硬件未使用时不配置；
10. "power_en" 表示模块外部的电源开关控制引脚；
11. 以上所有项必须参看原理图进行配置，配置与原理图实际使用的资源保持一致；

Wi-Fi 参考配置如下：

```
wlan:wlan {
    compatible = "allwinner,sunxi-wlan";
    clocks = <&clk_losc_out>;
    pinctrl-0 = <&clk_losc_pins_a>;
    pinctrl-names = "default";
    wlan_busnum = <0x1>;
    wlan_power;
    wlan_io_regulator;
    wlan_regon = <&pio PG 18 1 0xffffffff 0xffffffff 0>;
    wlan_hostwake = <&pio PG 15 6 0xffffffff 0xffffffff 0>;
```

```
        chip_en;
        power_en;
        status = "okay";
    };
```

4.2.2 BT 部分

BT 相关的 DTS 配置说明：

1. "clocks" 用于配置使用主控提供的 32k 时钟；
2. "bt_power" 表示 BT 模组所用的供电，与 wlan_power 相同；
3. "bt_io_regulator" 表示 BT 模组所用的 IO 供电，与 wlan_regulator 相同；
4. "bt_rst_n" 表示 Bt 模组 power on 控制引脚；
5. "uart_index" 表示 BT 模组使用的硬件通信端口号；
6. "bt_wake" 表示 BT 模组休眠后被唤醒时的控制引脚；
7. "uart_index" 表示 BT 模组使用的硬件通信端口号；
8. "bt_hostwake" 表示 BT 模组中断输出引脚，用于唤醒 AP；

BT 参考配置如下：

```
    bt:bt {
        compatible = "allwinner,sunxi-bt";
        clocks = <&clk_losc_out>;
        bt_power;
        bt_io_regulator;
        bt_rst_n = <&pio PG 19 1 0xffffffff 0xffffffff 0>;
        status = "okay";
    };

    btlpm:btlpm {
        compatible = "allwinner,sunxi-btlpm";
        uart_index = <0x1>;
        bt_wake = <&pio PG 17 1 0xffffffff 0xffffffff 1>;
        bt_hostwake = <&pio PG 16 6 0xffffffff 0xffffffff 0>;
        status = "okay";
    };
```

4.3 配置 BoardConfig.mk

文件路径：android/device/softwinner/cupid-p2

BoardConfig.mk 文件决定 android 要加载哪一款 Wi-Fi 模组，以及是否支持蓝牙。

相比之前的 Android 的版本，此部分配置进行了简化。SDK 将一些繁琐的配置放到了 android/device/softwinner/common/config/wireless/wireless_config.mk，一般无需修改 wireless_config.mk。只需要按下面的格式在 BoardConfig.mk 配置即可。

4.3.1 Wi-Fi

rtl8822bs Wi-Fi 配置：

```
# 1. Wifi Configuration
BOARD_WIFI_VENDOR := realtek
BOARD_USR_WIFI := 88x2bs
WIFI_DRIVER_MODULE_PATH := "/system/vendor/modules/88x2bs.ko"
WIFI_DRIVER_MODULE_NAME := "88x2bs"
WIFI_DRIVER_MODULE_ARG := "ifname=wlan0 if2name=p2p0"
```

SDK 默认使用模组自适应，因此 SDK 中 Wi-Fi 默认配置如下：

推荐使用模组自适应，此处无需做任何修改。

```
# 1. Wifi Configuration
BOARD_WIFI_VENDOR := common
BOARD_USR_WIFI :=
WIFI_DRIVER_MODULE_NAME :=
WIFI_DRIVER_MODULE_PATH :=
WIFI_DRIVER_MODULE_ARG :=
```

说明：

1. "#" 符号起注释的作用；
2. "BOARD_WIFI_VENDOR := realtek" 指明使用 realtek 的 Wi-Fi 模组，常见的有 broadcom、realtek、xradio；
3. "BOARD_USR_WIFI" 指明具体使用的 Wi-Fi 型号；
4. "WIFI_DRIVER_MODULE_PATH" 表示该模组的驱动 ko 的路径；

5. "WIFI_DRIVER_MODULE_NAME" 表示该模组的驱动名称；realtek 的各个 Wi-Fi 的驱动名称不一样，需根据实际情况设置；

4.3.2 BT

rtl8822bs BT 配置:

```
# 2. Bluetooth Configuration
BOARD_BLUETOOTH_VENDOR := realtek
BOARD_HAVE_BLUETOOTH_NAME := rtl88x2bs
```

由于 SDK 默认使用模组自适应，因此 SDK 中 BT 默认配置如下：
推荐使用模组自适应，此处无需做任何修改。

```
# 2. Bluetooth Configuration
BOARD_BLUETOOTH_VENDOR := common
BOARD_HAVE_BLUETOOTH_NAME :=
```

说明：

1. "BOARD_BLUETOOTH_VENDOR" 指明使用哪个厂商的 bt 模组，常见的有 broadcom、realtek、xradio；
2. "BOARD_HAVE_BLUETOOTH_NAME" 指定蓝牙模组型号。

4.4 配置 init 文件

此部分由 Allwinner 整合，一般客户不需要修改，只需要确认无误。

4.4.1 Wi-Fi 资源和服务配置

文件路径：

1、不使用模组自适应

android/device/softwinner/common/config/wireless/initrc/init.wireless.wlan.rc

2、使用模组自适应

android/hardware/aw/wireless/wlan/config

```
on post-fs-data
    # Create the directories used by the Wireless subsystem
    mkdir /data/vendor/wifi 0771 wifi wifi
    mkdir /data/vendor/wifi/wpa 0770 wifi wifi
    mkdir /data/vendor/wifi/wpa/sockets 0770 wifi wifi

# broadcom/realtek/xradio wifi sta p2p concurrent service
service wpa_supplicant /vendor/bin/hw/wpa_supplicant \
    -O/data/vendor/wifi/wpa/sockets -dd \
    -g@android:wpa_wlan0
    interface android.hardware.wifi.supplicant@1.0::ISupplicant default
    interface android.hardware.wifi.supplicant@1.1::ISupplicant default
    interface android.hardware.wifi.supplicant@1.2::ISupplicant default
    socket wpa_wlan0 dgram 660 wifi wifi
    class main
    disabled
    oneshot
```

4.4.2 BT 资源和服务配置

文件路径：

1、不使用模组自适应

android/device/softwinner/common/config/wireless/initrc/init.wireless.bluetooth.rc

2、使用模组自适应

android/hardware/aw/wireless/bluetooth/config

```
on post-fs-data
    # Create the directories used by the Wireless subsystem
    mkdir /data/vendor/wifi 0771 wifi wifi
    mkdir /data/vendor/wifi/wpa 0770 wifi wifi
    mkdir /data/vendor/wifi/wpa/sockets 0770 wifi wifi

# broadcom/realtek/xradio wifi sta p2p concurrent service
service wpa_supplicant /vendor/bin/hw/wpa_supplicant \
    -O/data/vendor/wifi/wpa/sockets -dd \
    -g@android:wpa_wlan0
    interface android.hardware.wifi.supplicant@1.0::ISupplicant default
    interface android.hardware.wifi.supplicant@1.1::ISupplicant default
    interface android.hardware.wifi.supplicant@1.2::ISupplicant default
    socket wpa_wlan0 dgram 660 wifi wifi
    class main
    disabled
    oneshot
```

4.4.3 init.wireless.bluetooth.rc

BT 资源和服务配置相关的文件：

```
on boot
    # UART device
    chmod 0660 ${persist.vendor.bluetooth_port}
    chown bluetooth net_bt_admin ${persist.vendor.bluetooth_port}

    # bluetooth power up/down interface
    chmod 0660 /sys/class/rfkill/rfkill0/state
    chmod 0660 /sys/class/rfkill/rfkill0/type
    chown bluetooth net_bt_admin /sys/class/rfkill/rfkill0/state
    chown bluetooth net_bt_admin /sys/class/rfkill/rfkill0/type
    write /sys/class/rfkill/rfkill0/state 0

    # bluetooth MAC address programming
    chown bluetooth net_bt_admin ${ro.bt.bdaddr_path}

on property:persist.vendor.bluetooth_vendor=broadcom
    insmod /vendor/modules/bcm_btlpm.ko
    setprop vendor.driver.lpm.load 1

on property:persist.vendor.bluetooth_vendor=realtek
    insmod /vendor/modules/rtl_btlpm.ko
    setprop vendor.driver.lpm.load 1
```

```
on property:persist.vendor.bluetooth_vendor=xradio
    insmod /vendor/modules/xradio_btlpm.ko
    insmod /vendor/modules/xradio_btfdi.ko
    setprop vendor.driver.lpm.load 1

on property:persist.vendor.bluetooth_vendor=sprd
    insmod /vendor/modules/sprdbt_tty.ko
    chmod 0666 /sys/class/rfkill/rfkill1/state
    chmod 0666 /sys/class/rfkill/rfkill1/type
    chmod 0660 /dev/ttyBT0
    chown bluetooth net_bt_admin /dev/ttyBT0
    setprop vendor.driver.lpm.load 1

on property:vendor.driver.lpm.load=1
    chmod 0660 /proc/bluetooth/sleep/lpm
    chmod 0660 /proc/bluetooth/sleep/btwrite
    chmod 0660 /proc/bluetooth/sleep/btwake
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/lpm
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/btwrite
    chown bluetooth net_bt_admin /proc/bluetooth/sleep/btwake

on property:persist.vendor.bluetooth_vendor=realtek && property:sys.boot_completed=1
    setprop persist.vendor.bluetooth.rtkcoex true

on property:persist.vendor.bluetooth_vendor=realtek && property:sys.boot_completed=0
    setprop persist.vendor.bluetooth.rtkcoex false

on property:persist.vendor.bluetooth_vendor=xradio && property:vold.post_fs_data_done=1
    mkdir /data/vendor/bluetooth 0771 bluetooth bluetooth
    mkdir /data/vendor/bluetooth/sdd 0770 bluetooth bluetooth
    mkdir /data/vendor/bluetooth/fdi 0770 bluetooth bluetooth
```

4.5 配置 manifest 文件

路径：android/device/softwinner/common/config/wireless/manifest
本文件为 Wi-Fi HIDL 配置，请确保下面部分有被正确配置。本文件一般不需要修改。

4.5.1 manifest_wifi.xml

```
<manifest version="1.0" type="device" target-level="4">
    <hal format="hidl">
        <name>android.hardware.wifi</name>
        <transport>hwbinder</transport>
        <version>1.3</version>
        <interface>
            <name>IWifi</name>
            <instance>default</instance>
        </interface>
    </hal>
    <hal format="hidl">
        <name>android.hardware.wifi.hostapd</name>
        <transport>hwbinder</transport>
        <version>1.1</version>
        <interface>
            <name>IHostapd</name>
            <instance>default</instance>
        </interface>
    </hal>
    <hal format="hidl">
        <name>android.hardware.wifi.supplicant</name>
        <transport>hwbinder</transport>
        <version>1.2</version>
        <interface>
            <name>ISupplicant</name>
            <instance>default</instance>
        </interface>
    </hal>
</manifest>
```

4.5.2 manifest_bluetooth.xml

```
<manifest version="1.0" type="device" target-level="4">
    <hal format="hidl">
        <name>android.hardware.bluetooth</name>
        <transport>hwbinder</transport>
        <version>1.0</version>
        <interface>
            <name>IBluetoothHci</name>
            <instance>default</instance>
        </interface>
    </hal>
</manifest>
```

4.6 配置 wireless_config.mk

路径:android/device/softwinner/common/config/wireless
本文件一般不需要修改，只需要确认存在即可。其作用是：

1. 解析 BoardConfig.mk 里面的 Wi-Fi/BT 的配置。
2. 把一些零散的 Wi-Fi/BT 配置集中管理，并能根据不同的模组厂完成相应的配置。

4.7 Firmware 路径

realtek 的 BT 固件路径：android/hardware/realtek/bluetooth/firmware，Wi-Fi 不需要 Firmware。

4.8 配置 rtkbt.conf (BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth
本文件为蓝牙配置文件，配置蓝牙名称、硬件通信接口路径、COD 等。除硬件通信接口，一般不需要修改。

```
# RELEASE NAME: 20171107_BT_ANDROID_8.x
# Bluetooth Device Name; NULL or comment means "ro.product.model"
# Name=Realtek Bluetooth

# Indicate USB or UART driver bluetooth
# For usb device:
# BtDeviceNode=/dev/rtk_btusb
# For uart device:
BtDeviceNode=/dev/ttyS1

# Device Class
DevClassServiceClass=0x1A
DevClassMajorClass=0x01
DevClassMinorClass=0x1C

# Enable BtSnoop logging function
# valid value : true, false
RtkBtsnoopDump=false

# BtSnoop log output file
BtSnoopFileName=/data/misc/bluedroid/btsnoop_hci.cfa

# Preserve existing BtSnoop log before overwriting
BtSnoopSaveLog=true

#bit0 = 1,don't show heartbeat packet in btsnoop
RtkbtLogFilter=1

# configuration for uart card to save HCI log for slave
H5LogOutput=0

# Enable Coex log
BtCoexLogOutput=0

# Enable net btsnoop Dump
RtkBtsnoopNetDump=false

# Enable auto restart bt
RtkBtAutoRestart=true
```

4.9 配置 bdroid_buildcfg.h(BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth
本文件主要配置 COD、Stack 编译宏等，一般不需要修改。

```
/*
 * Copyright (C) 2012 The Android Open Source Project
 *
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 *
 * http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */
```

```
#ifndef _BDROID_BUILDCFG_H
#define _BDROID_BUILDCFG_H

/*
#define BTM_DEF_LOCAL_NAME "XRADIO Bluetooth"
 */

// SERVICE_CLASS:0x1A (Bit17 -Networking,Bit19 - Capturing,Bit20 -Object Transfer)
// MAJOR CLASS: COMPUTER
// MINOR CLASS: TABLET
#define BTA_DM_COD {0x1A, 0x01, 0x1C}

#define BTA_GATT_DEBUG FALSE

#define PORT_RX_BUF_LOW_WM (10)
#define PORT_RX_BUF_HIGH_WM (40)
#define PORT_RX_BUF_CRITICAL_WM (45)
#define PORT_CREDIT_RX_MAX (48)

#define HCI_MAX_SIMUL_CMDS (1)
#define BTM_BLE_SCAN_SLOW_INT_1 (144)
#define BTM_BLE_SCAN_SLOW_WIN_1 (16)
#define BTM_MAX_VSE_CALLBACKS (6)

#define BTM_BLE_CONN_INT_MIN_DEF 0x06
#define BTM_BLE_CONN_INT_MAX_DEF 0x0C
#define BTM_BLE_CONN_TIMEOUT_DEF 200

//#define BTIF_HF_SERVICES (BTA_HSP_SERVICE_MASK)
//#define BTIF_HF_SERVICE_NAMES { BTIF_HSAG_SERVICE_NAME, NULL }

#define BTA_DISABLE_DELAY 1000 /* in milliseconds */
#define BTA_HOST_INTERLEAVE_SEARCH FALSE

/*heartbeat log define*/
#define BTPOLL_DBG FALSE
/*hci log define*/
#define BTHC_DBG FALSE
/*avdtp log define*/
//#define AVDT_DEBUG TRUE
/*BT log verbose*/
#define BT_TRACE_VERBOSE TRUE
/* BT trace messages*/
#define BT_USE_TRACES TRUE
/*A2DP SINK ENABLE*/
#define BTA_AV_SINK_INCLUDED FALSE
#define BLE_LOCAL_PRIVACY_ENABLED TRUE
#define USE_AUDIO_TRACK TRUE
/*BT lib vendor log*/
//#define BTVND_DBG TRUE
/*page timeout */
```

```
#define BTA_DM_PAGE_TIMEOUT 8192
#define BTM_LOCAL_IO_CAPS_BLE BTM_IO_CAP_KBDISP
#define BT_HCI_DEVICE_NODE_MAX_LEN 512

#define KERNEL_MISSING_CLOCK_BOOTTIME_ALARM TRUE
#endif
```

4.10 配置 vnd_cupid-p2.txt(BT)

文件路径：android/device/softwinner/cupid-p2/configs/bluetooth
本文件为蓝牙编译期间的配置文件，配置硬件通信接口、波特率、firmware 路径、LPM/DEBUG 状态、PCM 接口等。除硬件通信接口及波特率外，一般不需要修改。如需支持 hfp 功能，请按 AP 端 PCM 接口参数配置 SCO 参数
注意：本文件的名字务必保持：vnd_<platform>.txt，否则不会生效。

```
#Set baudrate to 1500000
UART_TARGET_BAUD_RATE=1500000
BLUETOOTH_UART_DEVICE_PORT = "/dev/ttyS1"
FW_PATCHFILE_LOCATION = "/vendor/etc/firmware/"
VENDOR_LIB_CONF_FILE = "/vendor/etc/bluetooth/bt_vendor.conf"
LPM_IDLE_TIMEOUT_MULTIPLE = 5
#LPM_SLEEP_MODE = FALSE
LPM_BT_WAKE_POLARITY = 1
LPM_HOST_WAKE_POLARITY = 0
PROC_BTWRITE_TIMER_TIMEOUT_MS = 0
BT_WAKE_VIA_PROC_NOTIFY_DEASSERT = TRUE
BT_WAKE_VIA_PROC = TRUE
BTVND_DBG = TRUE
BTHW_DBG = TRUE
VNDUSERIAL_DBG = TRUE
UPIO_DBG = TRUE
SCO_PCM_ROUTING = 0x00
SCO_PCM_IF_CLOCK_RATE = 0x04
SCO_PCM_IF_FRAME_TYPE = 0x00
SCO_PCM_IF_SYNC_MODE = 0x00
SCO_PCM_IF_CLOCK_MODE = 0x00
PCM_DATA_FMT_SHIFT_MODE = 0x00
PCM_DATA_FMT_FILL_BITS = 0x03
PCM_DATA_FMT_FILL_METHOD = 0x00
PCM_DATA_FMT_FILL_NUM = 0x00
PCM_DATA_FMT_JUSTIFY_MODE = 0x0
```

5. Wi-Fi/BT 模组自适应介绍

5.1 自适应配置方式

Wi-Fi 自适应是指一个固件可以同时支持多款模组。目前，市场上的 Wi-Fi 模组一般采用 SDIO/USB 作为传输接口，因此自适应模块暂时只支持 SDIO/USB 接口的 Wi-Fi 模组。SDK 默认使用模组自适应。使用方式，配置方式仅仅在 BoardConfig.mk 有区别：
路径：android/device/softwinner/cupid-p2
配置成如下方式即可：

```
# wifi and bt configuration
# 1. Wifi Configuration
BOARD_WIFI_VENDOR := common
BOARD_USR_WIFI :=
WIFI_DRIVER_MODULE_NAME :=
WIFI_DRIVER_MODULE_PATH :=
WIFI_DRIVER_MODULE_ARG :=

# 2. Bluetooth Configuration
BOARD_BLUETOOTH_VENDOR := common
BOARD_HAVE_BLUETOOTH_NAME :=
```

只需把 BOARD_WIFI_VENDOR 和 BOARD_BLUETOOTH_VENDOR 配为 common。
注意：如果配置之后无法正常工作，请参考上面 xradio、broadcom、realtek 模组移植步骤确保驱动和其他配置已经正确配置。

5.2 自适应的核心实现

路径：android/hardware/aw/wireless 读者可以找到相关代码了解一下。
以下几个系统属性可以关注一下：
1. persist.vendor.overlay.module_info；
2. persist.vendor.overlay.wlan_vendor；
3. persist.vendor.overlay.bluetooth_vendor；
4. persist.vendor.overlay.bluetooth_support；

6. 如何添加支持一款尚未支持的 Wi-Fi/BT 模组

目前市面上使用较多的 Wi-Fi/BT 模组是 broadcom 和 realtek 两家的，下面就以 broadcom 和 realtek 为例来说明如何添加支持一款尚未支持的模组；本章节主要介绍前面章节没介绍的内容，请结合前面章节的内容完成一款新模组的移植。

6.1 添加支持一款新的 broadcom 模组

SDK 中已经集成了 broadcom Wi-Fi 驱动 bcmdhd，因此无需再移植 wifi 驱动；需要做的移植主要工作有如下几部分：

1. 添加 Wi-Fi/BT firmware；
2. 确认 board.dts 中模组的 GPIO pin 正确分配；
3. 适配 Wi-Fi/BT 模组自适应；

在此以添加 AP6356S 为例详细描述以上三个步骤：

6.1.1 添加 firmware

路径：android/hardware/aw/wireless/partner/ampak/firmware
参考 ap6330 目录，在该目录下新建 ap6356s 子目录，把 AP6356S 的 firmware 和配置文件放到 ap6356s 中。

6.1.2 确认 board.dts 配置

路径：longan/device/config/chips/h616/configs/p2
当前 SDK 中的 board.dts 已经有模组的 GPIO 配置，如果硬件连接不一样，请根据实际硬件原理图进行配置。

6.1.3 适配 Wi-Fi/BT 模组自适应

模组自适应的适配主要有 3 个工作:

1. 获取 Wi-Fi 模组 device_id;
2. 修改 wifi_list 列表；
3. 修改 BT firmware 检测表；

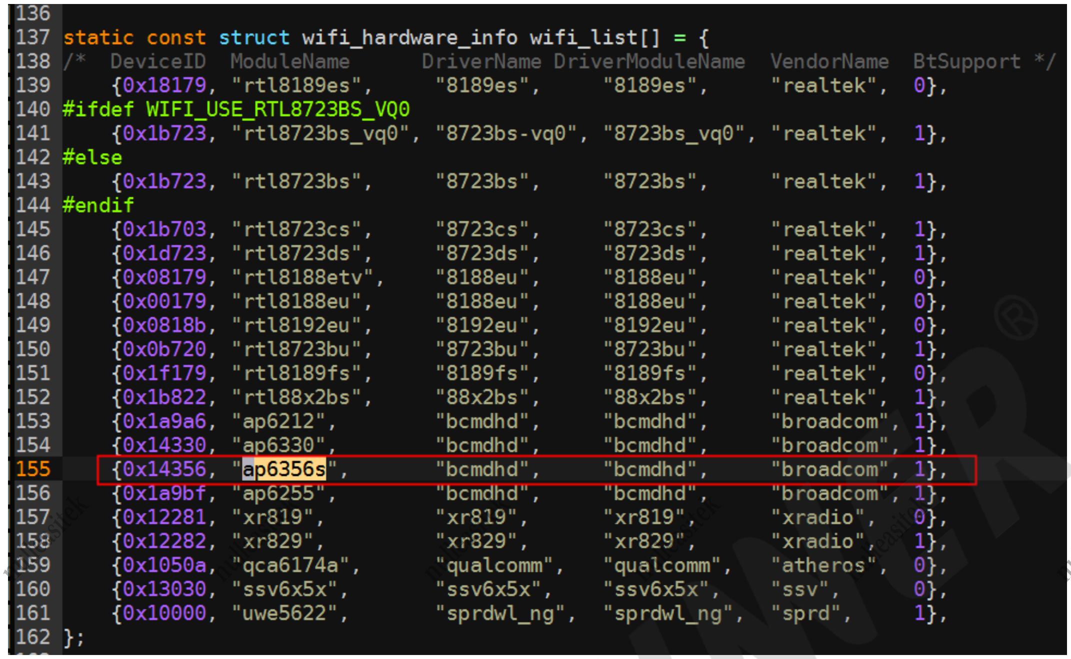
6.1.3.1 获取模组 device_id

Broadcom 系列的 Wi-Fi 模组在驱动中没有对应的 device_id，只有 chip_id，因此需通过上电扫卡的方式来获取 device_id：

1. echo 1 > /sys/devices/virtual/misc/sunxi-wlan/rf-ctrl/power_state；
2. echo 1 > /sys/devices/virtual/misc/sunxi-wlan/rf-ctrl/scan_device；
3. cat /sys/bus/sdio/devices/mmcx:000x:x/device；
4. SDIO 接口 Wi-Fi 模组的 device_id 值是步骤 4cat 出来的值加上 0x10000。USB 接口的不需要；

6.1.3.2 修改 wifi_list 列表

文件路径：android/hardware/aw/wireless/hwinfo/libhwinfo.c
找到 wifi_list 数组，按照格式添加 ap6356s 的信息。如下图所示：



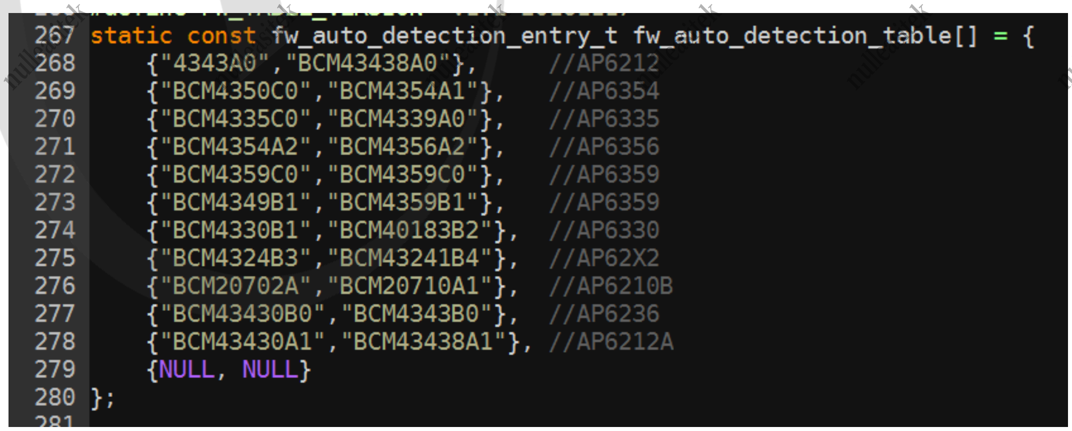
```
static const struct wifi_hardware_info wifi_list[] = {
/*  DeviceID  ModuleName        DriverName DriverModuleName  VendorName  BtSupport */
    {0x18179, "rtl8189es",      "8189es",     "8189es",     "realtek",   0},
#ifdef WIFI_USE_RTL8723BS_VQ0
    {0x1b723, "rtl8723bs_vq0", "8723bs-vq0", "8723bs_vq0", "realtek",   1},
#else
    {0x1b723, "rtl8723bs",      "8723bs",     "8723bs",     "realtek",   1},
#endif
    {0x1b703, "rtl8723cs",      "8723cs",     "8723cs",     "realtek",   1},
    {0x1d723, "rtl8723ds",      "8723ds",     "8723ds",     "realtek",   1},
    {0x08179, "rtl8188etv",     "8188eu",     "8188eu",     "realtek",   0},
    {0x00179, "rtl8188eu",      "8188eu",     "8188eu",     "realtek",   0},
    {0x0818b, "rtl8192eu",      "8192eu",     "8192eu",     "realtek",   0},
    {0x0b720, "rtl8723bu",      "8723bu",     "8723bu",     "realtek",   1},
    {0x1f179, "rtl8189fs",      "8189fs",     "8189fs",     "realtek",   0},
    {0x1b822, "rtl88x2bs",      "88x2bs",     "88x2bs",     "realtek",   1},
    {0x1a9a6, "ap6212",         "bcmdhd",     "bcmdhd",     "broadcom",  1},
    {0x14330, "ap6330",         "bcmdhd",     "bcmdhd",     "broadcom",  1},
    {0x14356, "ap6356s",        "bcmdhd",     "bcmdhd",     "broadcom",  1},
    {0x1a9bf, "ap6255",         "bcmdhd",     "bcmdhd",     "broadcom",  1},
    {0x12281, "xr819",          "xr819",      "xr819",      "xradio",    0},
    {0x12282, "xr829",          "xr829",      "xr829",      "xradio",    1},
    {0x1050a, "qca6174a",       "qualcomm",   "qualcomm",   "atheros",   0},
    {0x13030, "ssv6x5x",        "ssv6x5x",    "ssv6x5x",    "ssv",       0},
    {0x10000, "uwe5622",        "sprdwl_ng",  "sprdwl_ng",  "sprd",      1},
};
```

图 11: wifi list

6.1.3.3 修改 BT firmware 检测表

AMPAK 模组的 chipid 和 firmware 的名字一般是对不上的，所以需要配置一下关系表，否则不能正确加载 BT firmware。

如下图所示：



```
static const fw_auto_detection_entry_t fw_auto_detection_table[] = {
    {"4343A0","BCM43438A0"},      //AP6212
    {"BCM4350C0","BCM4354A1"},    //AP6354
    {"BCM4335C0","BCM4339A0"},    //AP6335
    {"BCM4354A2","BCM4356A2"},    //AP6356
    {"BCM4359C0","BCM4359C0"},    //AP6359
    {"BCM4349B1","BCM4359B1"},    //AP6359
    {"BCM4330B1","BCM40183B2"},   //AP6330
    {"BCM4324B3","BCM43241B4"},   //AP62X2
    {"BCM20702A","BCM20710A1"},   //AP6210B
    {"BCM43430B0","BCM4343B0"},   //AP6236
    {"BCM43430A1","BCM43438A1"},  //AP6212A
    {NULL, NULL}
};
```

图 12: fw auto detection table

第一列是 chipid，第二列是 firmware 的名字。

6.2 添加支持一款新的 realtek 模组

realtek Wi-Fi 一般需要移植驱动。需要做的移植主要工作有如下几部分：

1. 移植 Wi-Fi 驱动；
2. 添加 BT firmware；
3. 确认 board.dts 中模组的 GPIO pin 正确分配；
4. 适配 Wi-Fi/BT 模组自适应；

在此以添加 rtl8822cs 为例详细描述以上四个步骤：

6.2.1 移植 wifi 驱动

6.2.1.1 添加驱动代码

首先需要向 Wi-Fi 原厂申请驱动代码, 将驱动代码放到如下路径:
longan/kernel/linux-4.9/drivers/net/wireless
在本例子中把 8822cs 的驱动文件夹命名为 rtl8822cs

6.2.1.2 修改 wireless 目录下的 Kconfig

路径：longan/kernel/linux-4.9/drivers/net/wireless/Kconfig
添加

```
source "drivers/net/wireless/rtl8822cs/Kconfig"
```

6.2.1.3 修改 wireless 目录下的 Makefile

路径：longan/kernel/linux-4.9/drivers/net/wireless/Makefile

添加

```
obj-$(CONFIG_RTL8822CS) += rtl8822cs/
```

6.2.1.4 修改 rtl8822cs 目录下的 Makefile

realtek Wi-Fi 驱动一般选择默认选择 I386 平台,即在 Makefile 中定义 ``CONFIG_PLATFORM_I386_PC = y"，需要修改成如下：

```
CONFIG_PLATFORM_I386_PC = n
....
CONFIG_PLATFORM_ARM_SUNxI = y
```

6.2.1.5 修改 platform 文件

针对 SDIO 和 USB 接口模组分别介绍。

（1）SDIO 模组

路径：longan/kernel/linux-4.9/drivers/net/wireless/rtl8822cs/platform/platform_ARM_SUNnI_sdio.c

可以从其他 realtek sdio 模组目录拷贝 platform_ARM_SUNnI_sdio.c 替换此文件。或使用以下代码覆盖:

```
/******************************************************************************
 *
 * Copyright(c) 2013 Realtek Corporation. All rights reserved.
 *
 * This program is free software; you can redistribute it and/or modify it
 * under the terms of version 2 of the GNU General Public License as
 * published by the Free Software Foundation.
 *
 * This program is distributed in the hope that it will be useful, but WITHOUT
 * ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or
 * FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for
 * more details.
 *
 * You should have received a copy of the GNU General Public License along with
 * this program; if not, write to the Free Software Foundation, Inc.,
 * 51 Franklin Street, Fifth Floor, Boston, MA 02110, USA
 *
 *
 ******************************************************************************/
/*
 * Description:
 * This file can be applied to following platforms:
 * CONFIG_PLATFORM_ARM_SUNxI
 */
#include <drv_types.h>
#ifdef CONFIG_GPIO_WAKEUP
#include <linux/gpio.h>
#endif

#ifdef CONFIG_MMC
#if defined(CONFIG_PLATFORM_ARM_SUNxI)
extern void sunxi_mmc_rescan_card(unsigned ids);
extern void sunxi_wlan_set_power(int on);
extern int sunxi_wlan_get_bus_index(void);
extern int sunxi_wlan_get_oob_irq(void);
extern int sunxi_wlan_get_oob_irq_flags(void);
#endif
#ifdef CONFIG_GPIO_WAKEUP
extern unsigned int oob_irq;
#endif
#endif /* CONFIG_MMC */

/*
 * Return:
 * 0: power on successfully
 * others: power on failed
 */
int platform_wifi_power_on(void)
{
    int ret = 0;

#ifdef CONFIG_MMC
{

#if defined(CONFIG_PLATFORM_ARM_SUNxI)
    int wlan_bus_index = sunxi_wlan_get_bus_index();
    if (wlan_bus_index < 0)
        return wlan_bus_index;

    sunxi_wlan_set_power(1);
	mdelay(100);
	sunxi_mmc_rescan_card(wlan_bus_index);
#endif
	RTW_INFO("%s: power up, rescan card.\n", __func__);

#ifdef CONFIG_GPIO_WAKEUP
#if defined(CONFIG_PLATFORM_ARM_SUNxI)
	oob_irq = sunxi_wlan_get_oob_irq();
#endif
#endif /* CONFIG_GPIO_WAKEUP */
}
#endif /* CONFIG_MMC */

	return ret;
}

void platform_wifi_power_off(void)
{
#ifdef CONFIG_MMC
#if defined(CONFIG_PLATFORM_ARM_SUNxI)
	int wlan_bus_index = sunxi_wlan_get_bus_index();
	if (wlan_bus_index < 0)
		return;

	sunxi_wlan_set_power(0);
	mdelay(100);
	sunxi_mmc_rescan_card(wlan_bus_index);
#endif
	RTW_INFO("%s: remove card, power off.\n", __func__);
#endif /* CONFIG_MMC */
}
```

完成以上步骤之后，在 longan/kernel/linux-4.9，执行 make menuconfig ARCH=arm64，将所需 Wi-Fi driver 编译为模块，进行编译。

（2）USB 模组

路径：longan/kernel/linux-4.9/drivers/net/wireless/rtl8822cs/platform/platform_ARM_SUNxI_usb.c

可以从其他 realtek usb 模组目录下拷贝 platform_ARM_SUNxI_usb.c 替换此文件。或使用以下代码覆盖：

```
/******************************************************************************
 *
 * Copyright(c) 2013 Realtek Corporation. All rights reserved.
 *
 * This program is free software; you can redistribute it and/or modify it
 * under the terms of version 2 of the GNU General Public License as
 * published by the Free Software Foundation.
 *
 * This program is distributed in the hope that it will be useful, but WITHOUT
 * ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or
 * FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for
 * more details.
 *
 * You should have received a copy of the GNU General Public License along with
 * this program; if not, write to the Free Software Foundation, Inc.,
 * 51 Franklin Street, Fifth Floor, Boston, MA 02110, USA
 *
 *
 ******************************************************************************/
/*
 * Description:
 * This file can be applied to following platforms:
 * CONFIG_PLATFORM_ARM_SUNXI Series platform
 *
 */
#include <drv_types.h>

extern int sunxi_usb_disable_hcd(__u32 usbc_no);
extern int sunxi_usb_enable_hcd(__u32 usbc_no);
extern int sunxi_wlan_get_bus_index(void);
extern void sunxi_wlan_set_power(int on);

int platform_wifi_power_on(void)
{
	int ret = 0;
	int wlan_bus_index = sunxi_wlan_get_bus_index();
	if (wlan_bus_index < 0)
		return wlan_bus_index;
	sunxi_wlan_set_power(1);
	mdelay(100);
	sunxi_usb_enable_hcd(wlan_bus_index);
	return ret;
}

void platform_wifi_power_off(void)
{
	int wlan_bus_index = sunxi_wlan_get_bus_index();
	if (wlan_bus_index < 0)
		return wlan_bus_index;
	sunxi_usb_disable_hcd(wlan_bus_index);
	sunxi_wlan_set_power(0);
}
```

6.2.2 添加 bt firmware

路径：AndroidQ/android/hardware/realtek/bluetooth/firmware
把 rtl8822cs_config 和 rtl8822cs_fw 添加到此目录。

6.2.3 确认 board.dts 配置

路径：longan/device/config/chips/h616/configs/p2
当前 SDK 中的 board.dts 已经有模组的 GPIO 配置，如果硬件连接不一样，请根据实际硬件原理图进行配置。

6.2.4 适配 Wi-Fi/BT 模组自适应

模组自适应的适配主要有两个工作:

1. 获取 Wi-Fi 模组 device_id;
2. 适配 wifi_list 列表；

6.2.4.1 获取模组 device_id

realtek 的 device_id 可以在 wifi 驱动代码中获得
(1)SDIO 模组
路径:longan/kernel/linux-4.9/drivers/net/wireless/rtl8822cs/os_dep/linux/sdio_intf.c

```
#ifdef CONFIG_RTL8822C
	{SDIO_DEVICE(0x024c, 0xC822), .class = SDIO_CLASS_WLAN, .driver_data = RTL8822C},
	{SDIO_DEVICE(0x024c, 0xD821), .class = SDIO_CLASS_WLAN, .driver_data = RTL8822C}, /* 8821DS */
#endif
```

从以上的代码可以看到 8822cs 的 device_id 为 0xC822，使用该值加上 0x10000 是最终的 device_id 值。

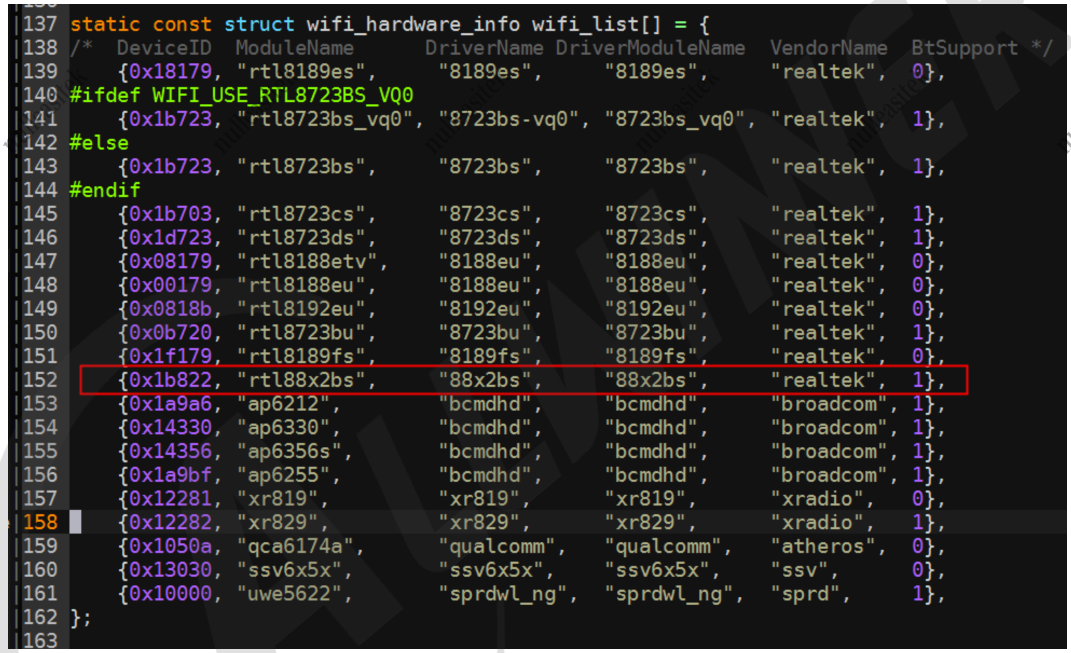
(2)USB 模组

在 os_dep/linux/usb_intf.c 里面查找，最终的 device_id 值不需要加上 0x10000。

6.2.4.2 适配 wifi_list 列表

文件路径：android/hardware/aw/wireless/hwinfo/libhwinfo.c

找到 wifi_list 数组，参考 rtl8822bs 的信息添加模组信息。如下图所示：



```
static const struct wifi_hardware_info wifi_list[] = {
/*  DeviceID  ModuleName       DriverName DriverModuleName   VendorName  BtSupport */
    {0x18179, "rtl8189es",     "8189es",     "8189es",       "realtek",  0},
#ifdef WIFI_USE_RTL8723BS_VQ0
    {0x1b723, "rtl8723bs_vq0", "8723bs-vq0", "8723bs_vq0",   "realtek",  1},
#else
    {0x1b723, "rtl8723bs",     "8723bs",     "8723bs",       "realtek",  1},
#endif
    {0x1b703, "rtl8723cs",     "8723cs",     "8723cs",       "realtek",  1},
    {0x1d723, "rtl8723ds",     "8723ds",     "8723ds",       "realtek",  1},
    {0x08179, "rtl8188etv",    "8188eu",     "8188eu",       "realtek",  0},
    {0x00179, "rtl8188eu",     "8188eu",     "8188eu",       "realtek",  0},
    {0x0818b, "rtl8192eu",     "8192eu",     "8192eu",       "realtek",  0},
    {0x0b720, "rtl8723bu",     "8723bu",     "8723bu",       "realtek",  1},
    {0x1f179, "rtl8189fs",     "8189fs",     "8189fs",       "realtek",  0},
    {0x1b822, "rtl88x2bs",     "88x2bs",     "88x2bs",       "realtek",  1},
    {0x1a9a6, "ap6212",        "bcmdhd",     "bcmdhd",       "broadcom", 1},
    {0x14330, "ap6330",        "bcmdhd",     "bcmdhd",       "broadcom", 1},
    {0x14356, "ap6356s",       "bcmdhd",     "bcmdhd",       "broadcom", 1},
    {0x1a9bf, "ap6255",        "bcmdhd",     "bcmdhd",       "broadcom", 1},
    {0x12281, "xr819",         "xr819",      "xr819",        "xradio",   0},
    {0x12282, "xr829",         "xr829",      "xr829",        "xradio",   1},
    {0x1050a, "qca6174a",      "qualcomm",   "qualcomm",     "atheros",  0},
    {0x13030, "ssv6x5x",       "ssv6x5x",    "ssv6x5x",      "ssv",      0},
    {0x10000, "uwe5622",       "sprdwl_ng",  "sprdwl_ng",    "sprd",     1},
};
```

图 13: wifi list 列表

7. Declaration

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