Wi-Fi 应用方案

Nov 2018

关于本手册

本手册介绍了 Wi-Fi 应用方案

发布说明：

版本	日期	编辑	描述
V1.0	2020/04/9	Andy	初始版本
V1.1	2020/04/17	Andy	增加电流测试方法 取消 GPIO 唤醒功能
V1.2	2020/04/17	Andy	增加冷启动与扫描时间测量 增加 GPIO_00 UART 升级检测
V1.3	2020/09/11	Andy	增加 SPI 主机与 I2C 从机界面 优化代码结构

文档变更通知&证书下载：

本文档更新不会逐一通知，用户需要使用时请自行去南方硅谷官网上下载最新版资料；需要相关证书的用户请联系南方硅谷客服　请知悉！

目录

1. 功能概述

- 支持设定每个信道侦听时间
- 支持设定最大扫描路由器数量
- 支持自定义输出格式
- 支持快速冷启动扫描
- 支持 Debug Uart/Data Uart/SPI master /I2C slave 输出扫描结果

2. SDK 编译说明

1、开发者按需求修改 projects/wifi_positioning/src/app/main.c 代码，设定相关参数。

2、安装编译工具，输入 make clean;make setup p=wifi_positioning;make 编译 sdk

3、USB 烧录固件

（编译环境搭建参考我司的开发文档）

3. 使用情景

3.1. 选择输出界面

打开 mian.c，选择所需要的界面结构体

```
41  extern position_inf_t uart_inf;
42  extern position_inf_t spimst_inf;
43  extern position_inf_t hsuart_inf;
44  extern position_inf_t i2cslv_inf;
45
46
47  static  position_inf_t *p_position_inf = &uart_inf;
48  //static  position_inf_t *p_position_inf = &hsuart_inf;
49  //static position_inf_t *p_position_inf = &spimst_inf;
50  //static position_inf_t *p_position_inf = &i2cslv_inf;
51
52  static uint8_t cal_result_flag = 0;
53
54  #define DEBUG_PIN GPIO_00
55  char DEBUG_MODE = 1;
```

3.2. 配置出输界面

3.2.1. Debug Uart(GPIO_03 GPIO_04)

修改 feature.mk 中的 UART_BAUD_RATE，可以修改 Debug Uart 输出的波特率

```
# 0 ==> Debug UART, 1==> Data UART
UART_BAUD_RATE                  := 115200
SETTING_UART_UPGRADE_BOOTLOADER := 0
SETTING_UART_UPGRADE_EN         := 1
BOOTLOADER_ENABLE_QE            := 0

SUPPORT_FFS                     := 0
SETTING_LOCK_CHIP_ID            := 2
SUPPORT_WIFI_POSITIONING        := 1
```

3.2.2. Data Uart(GPIO_06 GPIO_07)

修改 position_inf_hsuart.c 中的 Data Uart 初始化波特率，最高支持 4.8Mbps

```
static void hsuart_inf_init()
{
    drv_pinmux_manual_function_select_enable(SEL_UART1);
    drv_hsuart_init ();
    drv_hsuart_sw_rst ();
    drv_hsuart_set_fifo (HSUART_INT_RX_FIFO_TRIG_LV_16);
    drv_hsuart_set_format (115200, HSUART_WLS_8, HSUART_STB_1, HSUART_PARITY_DISABLE);
}
```

3.2.3. SPI master(GPIO_08 GPIO_10 GPIO_12 GPIO 13)

修改 position_inf_spimst.c 中的 SPI 初始化，修改 SPI 频率（最高 20M）与模式

```
10  static char READ_INFO_BUF[WIFI_INFO_BUF_SIZE];
11
12  static void spimst_inf_init()
13  {
14      drv_pinmux_manual_function_select_enable(SEL_SPI_MST);
15      drv_spimst_init(1*1000*1000,0,0);
16  }
```

3.2.4. I2C Slave(GPIO_21 GPIO_22)

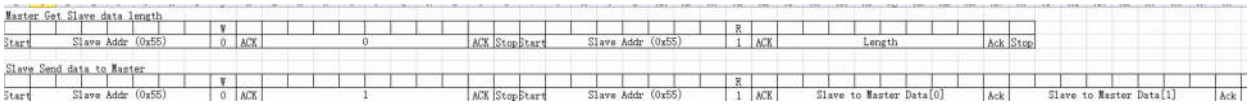
修改 position_inf_i2cslav.c，可修改从机地址与中断 GPIO

```
static void i2cslv_inf_init()
{
    drv_pinmux_manual_function_select_enable(SEL_I2C_SLV);
    drv_i2c_slv_init(DRV_I2C_DEFAULT, 0x55);
    drv_i2c_slv_register_recv_isr(i2c_rx_get_callback);
    drv_i2c_slv_register_tx_done_isr(i2c_tx_done_callback);
    drv_gpio_set_dir(I2C_INT_GPIO, GPIO_DIR_OUT);
    drv_gpio_set_mode(I2C_INT_GPIO, PIN_MODE_GPIO);
    drv_gpio_set_logic(I2C_INT_GPIO, GPIO_LOGIC_HIGH);
}
```

I2C 读写时序

1、主机读取从机 REG = 0x00 的数据，长度为 1 个 Bytes。代表设备有多少数据需要上报，最长 255。

2、主机读取从机 REG = 0X01 的数度，长度为第一步中读取的长度，代码实际数据。



3.3. 配置格式

默认输出格式“5A len(AP 数量) MAC 地址，RSSI| MAC 地址，RSSI”

```
wifi_info_update("5A %02d ", reportcnt);
for(i = 0; i < reportcnt; i++)
{
    wifi_info_update("%02x:%02x:%02x:%02x:%02x:%02x,-%d|", aplist[i].mac[0], aplist[i].mac[1], aplist[i].mac[2]
        , aplist[i].mac[3], aplist[i].mac[4], aplist[i].mac[5], aplist[i].rssi);
}
```

4. 串口升级与调试

1、默认 SDK 使用 GPIO 3-4 作为 debug uart，当 GPIO_00 拉低，且开机时输入 m 字符，即可进入 bootloader 烧录模式，使用 xmodem 协议传输升级固件。并且开机后可以看到 Debug Log。

2、bootloader 默认有 500ms 的等待用户输入时间

3、当 GPIO_00 悬空或拉高则不作检查，加快开机速度。

4、逻辑代码位于：

```
157  void custom_upgrade() {
158  #if defined(FOTA_OPTION) && (FOTA_OPTION == 1)
159      fota_fs_upgrade();
160  #endif
161  #if defined(UART_UPGRADE_EN) && (UART_UPGRADE_EN == 1)
162      if(hal_gpio_get_logic(GPIO_00) == 0)
163          uart_fw_upgrade(500);    // wait 500mS for uart fw upgrade
164  #endif
```

custom_ota.c

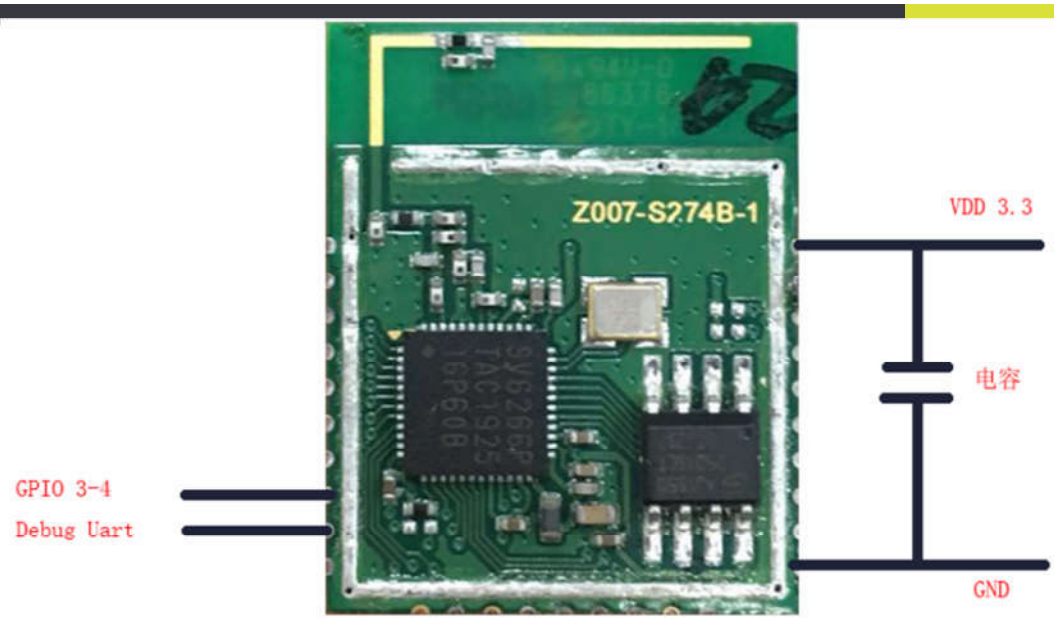
```
10  #define TEST_GPIO   GPIO_00
11  extern void mstick_mdelay(uint32_t ms);
12  // this function will execute before boot system start.
13  void _boot_init() {
14      hal_gpio_set_mode(TEST_GPIO, PIN_MODE_GPIO);
15      hal_gpio_set_dir(TEST_GPIO, GPIO_DIR_IN);
16      hal_gpio_set_pull(TEST_GPIO, GPIO_PULL_UP);
17      mstick_mdelay(1);
18      if(hal_gpio_get_logic(TEST_GPIO) == 0)
19      {
20          tiny_printf_display(1);
21      }
22      else
23      {
24          tiny_printf_display(0);
25      }
```

boot_init.c

5、目前只有 Debug Uart 具有升级功能

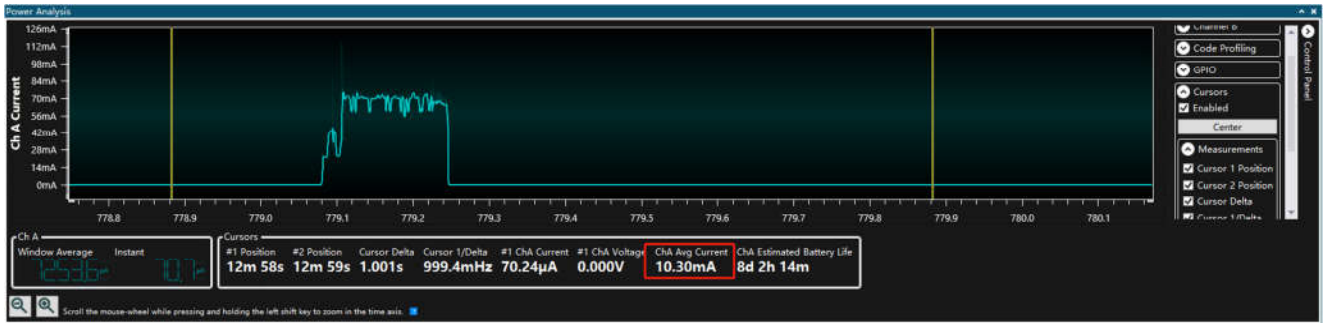
5. 实际测量

接线示意图

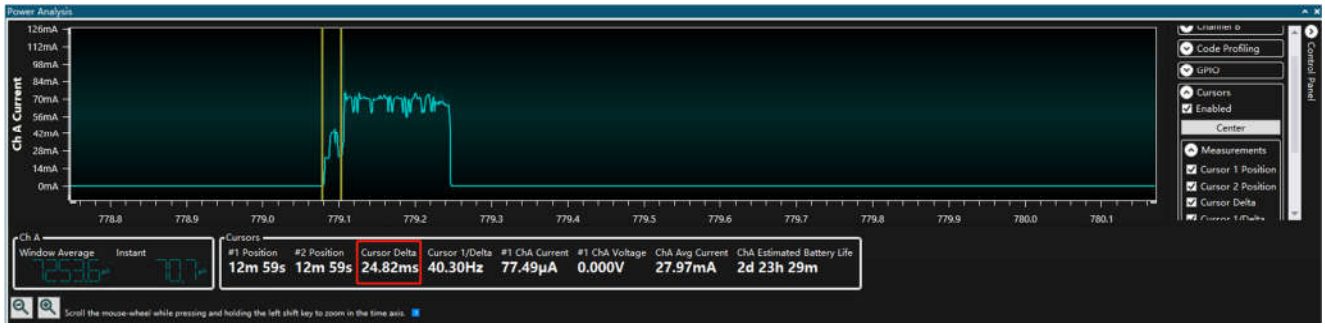


使用默认参数，信道侦听间隔 110ms，最大扫描 10 个路由器

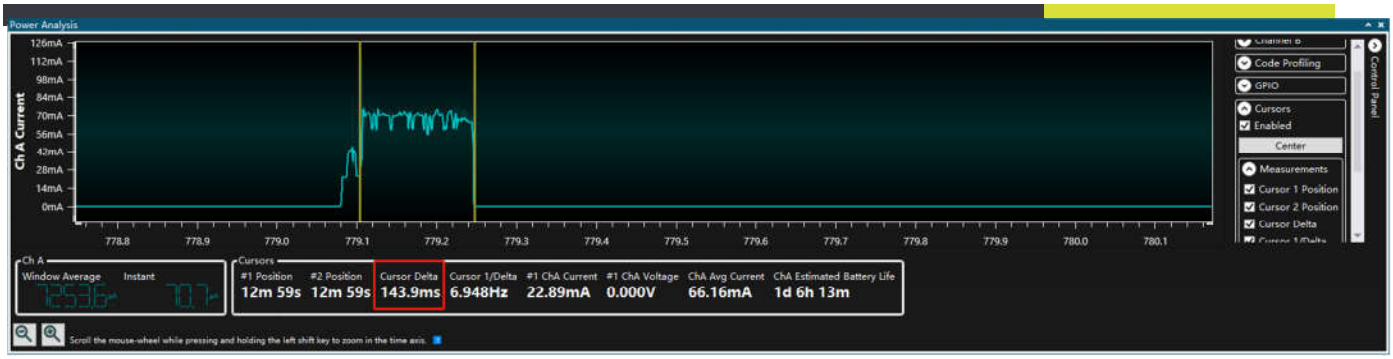
1、冷启动扫描(平均电流 10.3 mA)



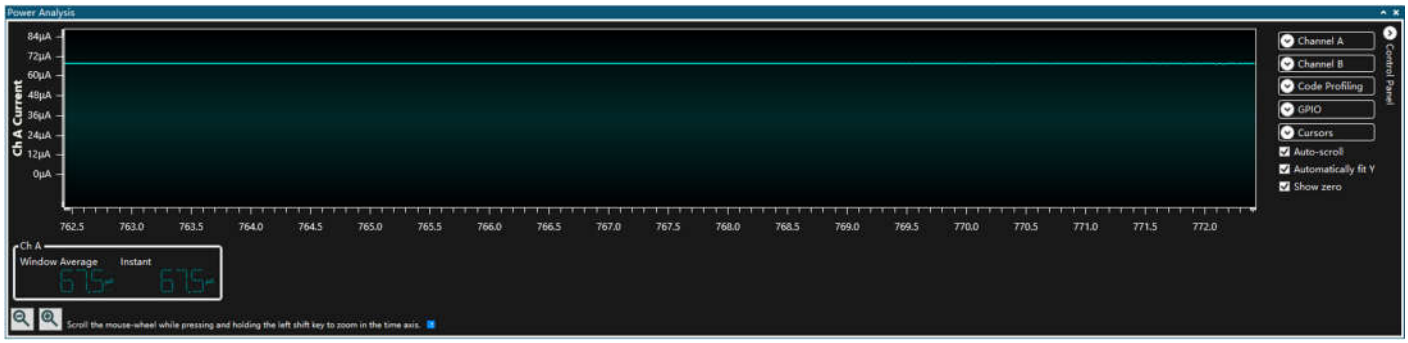
2、冷启动时间（24.82 ms）



3、扫描时长（143.9 ms）



4、扫描结束休眠底电流（VCC LDO_EN 供 3.3V,67.5 uA）



5、测试环境路由器信息

SSID	MAC Address	RSSI	SNR	Chan	Width	802.11	Max Rate	WEP	WPA	WPA2	WPS	Password	WPS PIN	Vendor	First	Last	Type
Epsilon Alpha Phi 0...	C2:FF:D4:AF:78:35	-83	28	1	20	b, g, n	300			PSK-CCMP					18:08:26	00:00:44 ago	Infrastructure
[Hidden]	92:2A:A8:C7:E5:DB	-32	99	1	20	b, g, n	216.7			PSK-CCMP					18:08:31	00:00:18 ago	Infrastructure
dlink-045	BC:5F:F6:73:1C:09	-53	78	1+5	40	b, g, n	300		PSK-CCMP	PSK-CCMP				SHENZHEN MERCURY C	18:08:20	now	Infrastructure
Epsilon Alpha Phi	C0:FF:D4:AF:78:35	-82	30	1	20	b, g, n	300			PSK-CCMP	1.0			Netgear Inc	18:08:23	00:00:47 ago	Infrastructure
SSV-APB-2.4G_IoT	80:2A:A8:C7:E5:DB	-33	99	1	20	b, g, n	216.7			PSK-CCMP				Ubiquiti Networks, Inc.	18:08:20	00:00:08 ago	Infrastructure
SSV-GUEST	82:2A:A8:C7:E5:DB	-34	99	1	20	b, g, n	216.7			PSK-CCMP					18:08:20	00:00:10 ago	Infrastructure
TOTOLINK_3a36f8	F4:28:53:3A:36:F8	-31	99	1+5	40	b, g, n	150		PSK-CCMP	PSK-(TKIP|CCMP)	1.0			Zioncom Electronics (Shi	18:08:20	00:00:04 ago	Infrastructure
ZTE B880_2226	EE:1D:7F:75:77:78	-56	73	2	20	b, g, n	72.2			PSK-CCMP	1.0				18:08:20	now	Infrastructure
A6-CESHI	CC:81:DA:BC:92:F8	-61	65	3	20	b, g, n	300	Open							18:08:23	00:00:08 ago	Infrastructure
WDR5600_2.4G	48:7D:2E:FB:27:A8	-46	90	4+8	40	b, g, n	450		PSK-CCMP	PSK-CCMP					18:08:20	00:00:04 ago	Infrastructure
SZJXnfcc	74:05:A5:97:02:79	-73	45	6+2	40	b, g, n, ac	450		PSK-CCMP	PSK-CCMP					18:08:28	00:00:10 ago	Infrastructure
wtwd-test3	14:D1:69:05:0D:04	-48	86	6+2	40	b, g, n	300			PSK-CCMP	1.0				18:08:20	now	Infrastructure
FASTxxx	30:FC:68:9E:E3:C9	-16	99	6	20	b, g	54		PSK-CCMP	PSK-CCMP					18:08:20	now	Infrastructure
[Hidden]	1C:13:86:68:77:D9	-55	75	6	20	b, g, n	144.4			PSK-CCMP	1.0				18:08:20	00:00:26 ago	Infrastructure
vivo X7	18:E2:9F:15:E7:38	-65	58	6	20	b, g, n	72.2			PSK-CCMP					18:08:20	00:00:04 ago	Infrastructure
[Hidden]	14:D1:69:05:0D:05	-65	58	6+2	40	b, g, n	300			PSK-CCMP					18:08:23	00:00:42 ago	Infrastructure
FAST310	B8:55:10:55:9D:E8	-24	99	6	20	b, g, n	72.2		PSK-(TKIP|CCMP)	PSK-(TKIP|CCMP)	1.0			Zioncom Electronics (Shi	18:08:20	now	Infrastructure
[Hidden]	44:59:F3:4C:FE:29	-72	46	6	20	b, g, n	300			PSK-CCMP					18:08:47	00:00:23 ago	Infrastructure
[Hidden]	1C:13:86:68:77:D5	-57	71	6	20	b, g, n	144.4			PSK-CCMP	1.0				18:08:44	00:00:26 ago	Infrastructure
CEO	1C:13:86:68:77:D4	-58	70	6	20	b, g, n	144.4			PSK-CCMP	1.0				18:08:20	now	Infrastructure
Wechat_ap_2.4G	8A:25:93:0E:42:76	-49	85	6+10	40	b, g, n	450			PSK-CCMP					18:08:20	now	Infrastructure
TP-LINK_4564	50:FA:84:80:45:64	-44	93	6+10	40	b, g, n	450	Open						TP-LINK TECHNOLOGIE	18:08:23	now	Infrastructure
OptN38002g	04:A1:51:96:3C:AE	-45	91	6	20	b, g, n	300	Open						NETGEAR INC.	18:08:28	now	Infrastructure
WW-SOFT2	80:8F:1D:84:35:C8	-60	66	11+7	40	b, g, n, ac	600		PSK-CCMP	PSK-CCMP					18:08:20	00:00:08 ago	Infrastructure
icommAP1	04:79:70:8C:9F:EC	-60	66	11+7	40	b, g, n	300			PSK-CCMP	1.0				18:08:20	now	Infrastructure
[Hidden]	04:79:70:8C:9F:ED	-58	70	11+7	40	b, g, n	300			PSK-CCMP					18:08:41	00:00:04 ago	Infrastructure
Rusta SZ1	94:0C:6D:6F:CC:A8	-77	38	11	20	b, g, n	72.2			PSK-CCMP				TP-LINK TECHNOLOGIE	18:08:23	00:00:26 ago	Infrastructure
WDR7300	0C:48:54:3E:6D:5B	-77	38	11+7	40	b, g, n	300		PSK-(TKIP|CCMP)	PSK-(TKIP|CCMP)					18:08:20	00:00:26 ago	Infrastructure
TP-Hk-csrz2018	94:D9:B3:93:39:E3	-53	78	11+7	40	b, g, n	450		PSK-CCMP	PSK-CCMP					18:08:20	00:00:10 ago	Infrastructure
TP-LINK_F9FF	94:D9:B3:98:F9:FF	-43	95	11+7	40	b, g, n	300		PSK-CCMP	PSK-CCMP					18:08:20	now	Infrastructure
Xiaomi_MI3_2.4G	78:11:DC:64:DA:0F	-41	96	11	20	b, g, n	144.4			PSK-CCMP	1.0				18:08:19	00:00:04 ago	Infrastructure
WDR6500	48:7D:2E:F8:F1:6C	-32	99	11+7	40	b, g, n	450	Open							18:08:20	now	Infrastructure
uusss	6C:59:40:F5:11:EC	-67	55	12+8	40	b, g, n	300		PSK-CCMP	PSK-CCMP				SHENZHEN MERCURY C	18:08:23	00:00:04 ago	Infrastructure
A1-2.4G-SG	A0:63:91:6A:D4:BA	-80	33	13	20	b, g	54			PSK-CCMP	1.0			Netgear Inc	18:08:20	00:00:47 ago	Infrastructure
PHICOMM_js	6A:DB:54:D5:60:6A	-36	99	13	20	b, g, n, ac	300		PSK-(TKIP|CCMP)	PSK-(TKIP|CCMP)					18:08:20	now	Infrastructure
pt-0909	E4:D3:32:0B:C6:9C	-48	86	13	20	b, g, n	300		PSK-(TKIP|CCMP)	PSK-(TKIP|CCMP)				TP-LINK TECHNOLOGIE	18:08:20	00:00:04 ago	Infrastructure
DIR-816 2.4G	74:DA:DA:97:7B:50	-45	91	13	20	b, g, n	300			PSK-CCMP					18:08:20	now	Infrastructure

实际测试中，由于环境中的路由器数量不同，功耗会有所差异

6. 注意事项

- 建议 host 控制 Wi-Fi 模组的 VCC，当不需要扫描时可关闭 Wi-Fi 电源。如果 VCC 有供电，而 LDO_EN 拉

低待机的话，有 2 uA 的底电流。

- LDO_EN 需要比 VCC 延时 2ms 拉起。