Realtek Ameba-1 Alink user guide

The document describes how to porting Alink into Ameba SDK and demonstrates how to use Alibaba ONEAPK to make Ameba connect to Ali Cloud and how to update new firmware over the air.

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1 Introduction

Ali Cloud provides an open security-rich and reliable cloud services for traditional hardware businesses and aspiring provide development platform for those interested in the development of the IOT enthusiasts. Internet based services include, but are not limited to: one-stop access to services, data analysis services, after-sales service support, firmware upgrade service (OTA) and equipment sharing services.

Alink is used to help the smart device to connect to the target AP and register to Ali cloud. It provides two ways to configure Wi-Fi for the smart device: **One-key configuration** and **Soft AP configuration.**

One-key configuration: A smart device will enter One-key configuration as default. It adjusts channels from 1 to 13 circularly to receive and analysis configuration packets sent from the mobile ONEAPK in promiscuous mode. By doing this for a short moment, the smart device can lock to the exact channel and get enough information of the target AP. After getting the target AP profile, it will try to link with the AP automatically.

Soft AP configuration: If the smart device does not get the target AP profile after one minute using One-key configuration, it will switch to Soft AP configuration. Firstly, the smart device will enter Soft AP mode, broadcast itself with the SSID "alink_*" and create a TCP server waiting client in. Secondly, ONEAPK in smart phone will make its Wi-Fi link with the Soft AP and connect to the TCP server as a client. Thirdly, the smart phone transfers the profile of the target AP which has internet access to the smart device through the TCP connection. Fourthly, the smart device switches to STA mode and try to link with the target AP. At last, the smart device will send broadcast UDP to declare successful connection and the smart phone will acknowledge a unicast UDP to declare the configuration is successful.

Alibaba provides a test APK named ONEAPK to help the developers to verify Alink configuration and Ali cloud service for smart devices. The ONEAPK logo is like  and you can get it by scanning the two-dimensional code shown as follows. The download URL is https://open.alink.aliyun.com/download/.

The table below shows some keywords and their descriptions in this document.

Keyword	Description
UUID	A UUID identifies a unique type of products. Each device will obtain a unique UUID from Ali cloud during registration process.
Key/Secret	Used for identity authentication. It is produced by Alibaba when one type of device registers to Ali IOT platform.

The combination of "UUID and Key/Secret can identify a unique smart device. Different devices of the same type must have different UUID.

To know more details about Ali Cloud service and to configure more function options, you can login Alibaba Smart living official website: https://open.alink.aliyun.com/.

2 Porting Alink patch

2.1 Add files to SDK folder

Step 1： Extract Ameba released SDK, eg. sdk-ameba1-v3.4b3.

Step 2： Create "alink" folder in $sdk\component\common\application\.

Step 3： Copy "alink.c"、 "alink_export.h"、"alink_export_rawdata.h"、"aws_lib.h"、"aws_platform.h"、"platform_porting.h"、 and "lib_alink.a" from 3.4b_patch_alink_v1.1_(v01).zip to $sdk\component\common\application\alink

Step 4： Copy “device_lock.h” from 3.4b_patch_alink_v1.1_(v01).zip to $sdk\component\os\os_dep\include\.(**remarks： only fo sdk_v3.4**)

Step 5： Copy “device_lock.c” from 3.4b_patch_alink_v1.1_(v01).zip to $sdk\component\os\os_dep. (**remarks： only fo sdk_v3.4**)

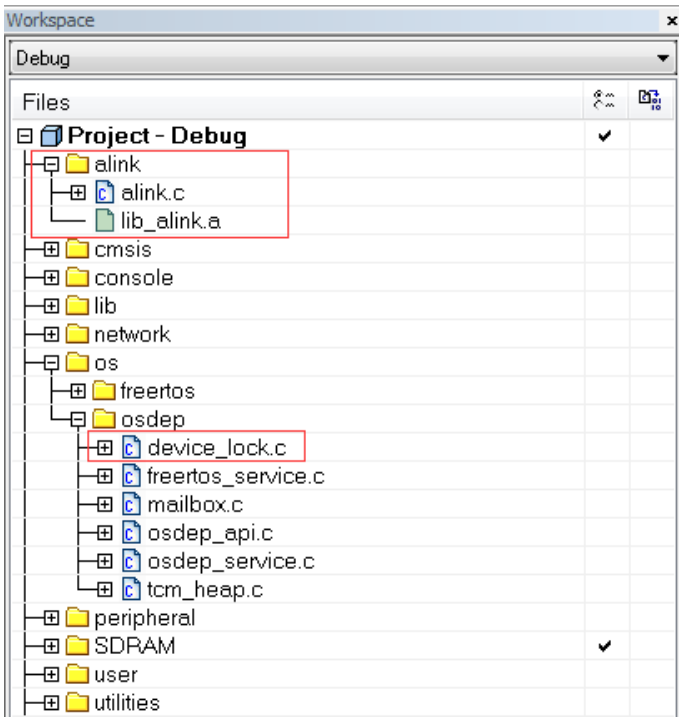
Step6： Replace "dhcp" folder which located at $sdk\component\common\network\. (**remarks： only fo sdk_v3.4**)

2.2 Add files to IAR project

Step 1: Open IAR project and add a new group “alink”.

Step 2: Add alink.c and lib_alink.a into alink group.

Step 3: Add device_lock.c into osdep group.



2.3 Other Configuration

2.3.1 platform_opts.h

The file location is $sdk\ project\realtek_ameba1_va0_example\inc\platform_opts.h. Please add CONFIG_ALINK define as follows.

```
#define CONFIG_ALINK 1
```

2.3.2 alink.c

The file location is $sdk\component\common\application\alink.c. You can add PASS_THROUGH define as follows.

```
#define PASS_THROUGH
```

PASS_THROUGH is defined only when using a iPhone, if defined, pass through mode will be enabled or JSON message mode will be enabled. Please mark it as default.

2.3.3 example_entry.c

The file location is $sdk\component\common\example\example_entry.c. You can add alink entry here if needed.

```
void example_entry(void)
{
    ……
    #if CONFIG_ALINK
        example_alink();
    #endif
    ……
}
```

2.3.4 lwipopts.h

The file location is $sdk\ component\common\api\network\include\lwipopts.h. If the following define does not exist, please add it, otherwise just change to 1.

```
#define LWIP_IGMP                    1
#define LWIP_TCP_KEEPALIVE                    1
```

2.3.5 config_rsa.h

The file location is $sdk\component\common\network\ssl\polarssl-1.3.8\include\polarssl\config_rsa.h. Please mark the following defines in order to ensure the establishment of SSL connection with Ali cloud.

```
//#define POLARSSL_SSL_PROTO_SSL3
//#define POLARSSL_SSL_PROTO_TLS1
//#define POLARSSL_SSL_PROTO_TLS1_1
```

2.3.6 FreeRTOSConfig.h

The file location is $sdk\project\realtek_ameba1_va0_example\inc\FreeRTOSConfig.h. Change configTOTAL_HEAP_SIZE from 60K to 70K because Alink need more heap.

```
#define configTOTAL_HEAP_SIZE        ( ( size_t ) ( 70 * 1024 ) ).
```

2.3.7 image2.icf

The file location is $sdk\ project\realtek_ameba1_va0_example\EWARM-RELEASE\image2.icf. Please notice that alink 、acloud and alinkporting code should only be placed at SDRAM now since SRAM is not enough to run acloud. Please add section ".alink.text"、".acloud.text" and ".alinkporting.text" to SDRAM block as follows.

```
175 define block SDRAM with fixed order{ section .sdram.text*,
176                                      section .sdram.data*,
177                                      section .mdns.text*,
178                                      section .mdns.data*,
179                                      section .alink.text*,
180                                      section .acloud.text*,
181                                      section .alinkporting.text*
```

3 Access Ali Cloud Example(Android)

Please download ONEAPP and install to your smart phone at first. The download link is http://open.alink.aliyun.com/download/. Then click APP to find setting entry:

Setting =>About=> Environment configure

After configuring environment, close APP and kill the process.

3.1 One key configuration

Now we will step by step demonstration One-key configuration.

Step 1: Power on your smart device (ameba development board). It will enter one key configuration as default if no saved AP profile in the flash.

```
=========================================================

ROM Version: 0.2

Build ToolChain Version: gcc version 4.8.3 (Realtek ASDK-4.8.3p1 Build 2003)

=========================================================
Check boot type form eFuse
SPI Initial
Image1 length: 0x36e8, Image Addr: 0x10000bc8
Image1 Validate OK, Going jump to Image1
===== Enter Image 1 ====
SDR Controller Init

load NEW fw 0
Flash Image2:Addr 0xb000, Len 282520, Load to SRAM 0x10006000
Image3 length: 0x18cc0, Image3 Addr: 0x30000000
Img2 Sign: RTKWin, InfaStart @ 0x10006079
===== Enter Image 2 ====
#
Initializing WIFI ...
Start LOG SERVICE MODE

#
WIFI initialized

 Period = 0x00004e20ilable heap 0xbca8
WdgScalar = 0x0000ad9c
WdgCunLimit = 0x00000003

[alink_example_thread] No AP profile read from FLASH, start alink...

Starting AP Config.....
LwIP_DHCP: dhcp stop.
Deinitializing WIFI ...
WIFI deinitialized
Initializing WIFI ...
WIFI initialized
```

Step 2：Make sure that WiFi device on your phone has connected to a target AP with internet access.

Step 3：Open ONEAPK, **Add Device=> Search by category => Device classes**, find the entry of One key configure network.

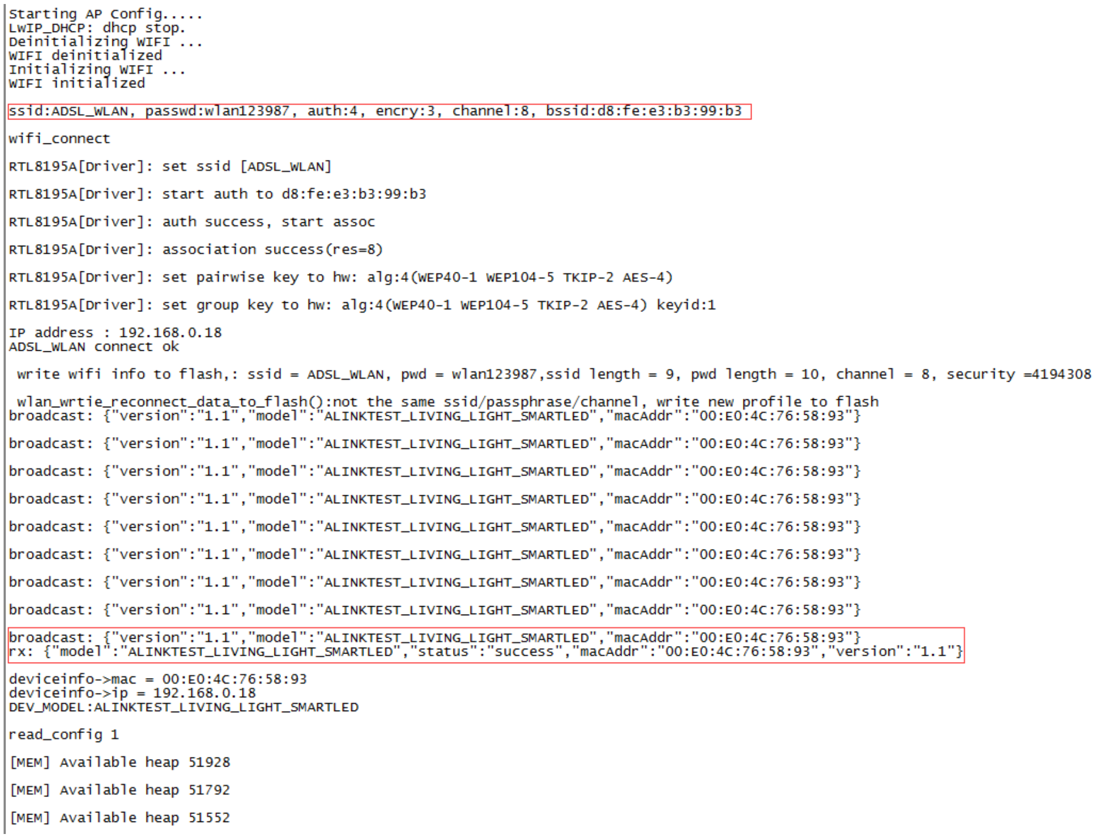
Then click "**next step**" button to enter configure AP interface：

Input the right passphrase of the target AP：

Click “**search for devices”** button to start configuration：

- 搜索到设备...
- 设备注册到智能云
- 设备添加

Step 4： After a few seconds, ameba will get the target AP's profile and connect to the target AP. After link built and IP address gotten, ameba and smart phone will exchange UDPs to discover each other and complete binding process. Then ameba will register to Ali cloud.



```
Starting AP Config.....
LwIP_DHCP: dhcp stop.
Deinitializing WIFI ...
WIFI deinitialized
Initializing WIFI ...
WIFI initialized

ssid:ADSL_WLAN, passwd:wlan123987, auth:4, encry:3, channel:8, bssid:d8:fe:e3:b3:99:b3

wifi_connect

RTL8195A[Driver]: set ssid [ADSL_WLAN]

RTL8195A[Driver]: start auth to d8:fe:e3:b3:99:b3

RTL8195A[Driver]: auth success, start assoc

RTL8195A[Driver]: association success(res=8)

RTL8195A[Driver]: set pairwise key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4)

RTL8195A[Driver]: set group key to hw: alg:4(WEP40-1 WEP104-5 TKIP-2 AES-4) keyid:1

IP address : 192.168.0.18
ADSL_WLAN connect ok

 write wifi info to flash,: ssid = ADSL_WLAN, pwd = wlan123987,ssid length = 9, pwd length = 10, channel = 8, security =4194308

 wlan_wrtie_reconnect_data_to_flash():not the same ssid/passphrase/channel, write new profile to flash
broadcast: {"version":"1.1","model":"ALINKTEST_LIVING_LIGHT_SMARTLED","macAddr":"00:E0:4C:76:58:93"}

broadcast: {"version":"1.1","model":"ALINKTEST_LIVING_LIGHT_SMARTLED","macAddr":"00:E0:4C:76:58:93"}

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broadcast: {"version":"1.1","model":"ALINKTEST_LIVING_LIGHT_SMARTLED","macAddr":"00:E0:4C:76:58:93"}
rx: {"model":"ALINKTEST_LIVING_LIGHT_SMARTLED","status":"success","macAddr":"00:E0:4C:76:58:93","version":"1.1"}

deviceinfo->mac = 00:E0:4C:76:58:93
deviceinfo->ip = 192.168.0.18
DEV_MODEL:ALINKTEST_LIVING_LIGHT_SMARTLED

read_config 1

[MEM] Available heap 51928

[MEM] Available heap 51792

[MEM] Available heap 51552
```

Step 5：If the smart device registers to smart cloud successfully, the smart phone ONEAPK will automatically jump to the following page, then you can control your smart device now.

3.2 Soft AP configuration

Step 1：Power on your smart device (ameba development board). After about one minute, it will leave One-key configuration mode and enter Soft AP configuration mode which means the smart device will enter Soft AP mode, broadcast itself with the SSID “alink_*” and create a TCP server waiting TCP client in.

```
Starting SoftAP mode ...
LwIP_DHCP: dhcp stop.
Deinitializing WIFI ...
WIFI deinitialized
Initializing WIFI ...
WIFI initialized

alink_light started

setup softap & tcp-server

server: ac1ffefa  Port: 65125 created

In AP Mode, current AP: alink_light

In AP Mode, current AP: alink_light

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In AP Mode, current AP: alink_light

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In AP Mode, current AP: alink_light

In AP Mode, current AP: alink_light
```

Step 2：Make sure that WiFi device on your phone has connected to a target AP with internet access.

Step 3： Open ONEAPK, **Add Device=> Search by category => Device classes**, find the entry of Soft AP configure network.

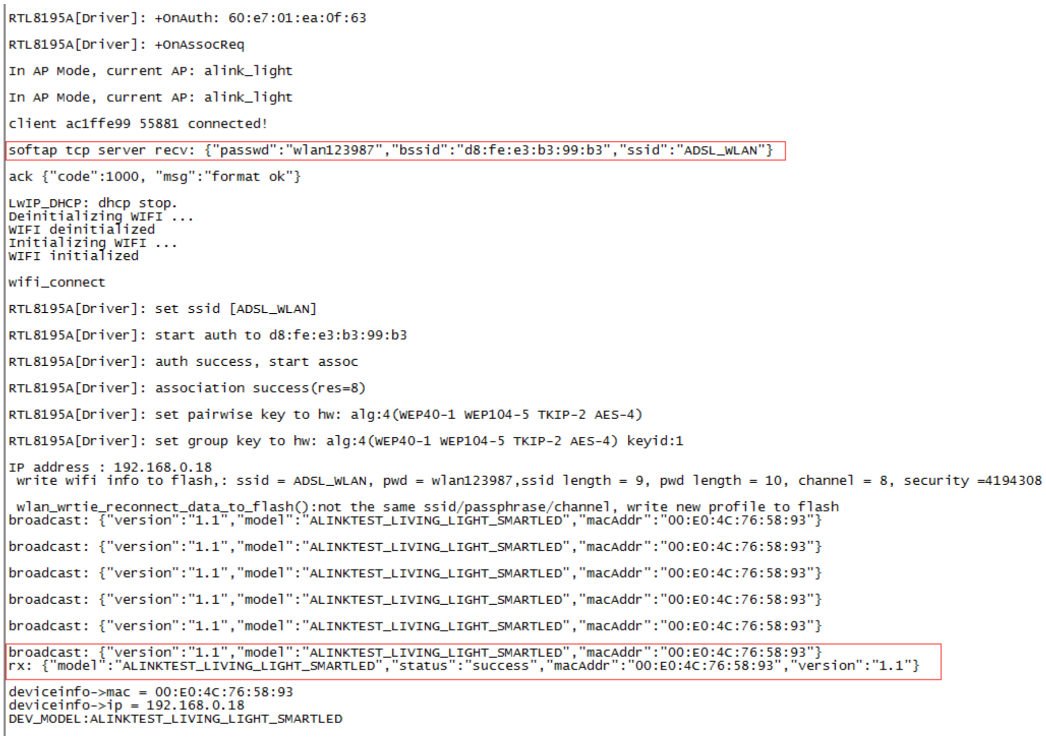
Click "**confirm the device into the SoftAP configure network state"** button to enter configure AP interface.

Input the right passphrase for the target AP.

Click “**search for devices”** button to start configuration.

After doing this, ONEAPK will make its Wi-Fi link with the Soft AP and connect to the TCP server as a TCP client. Then the smart phone will transfer the target AP’s profile to the smart device through the TCP connection.

Step 4: The smart device switches to STA mode and try to link with the target AP. After link built and IP address got, the smart device will send broadcast UDP to declare successful connection and the smart phone will acknowledge a unicast UDP to declare the configuration is successful. Then the smart device will register to Ali cloud.



```
RTL8195A[Driver]: +OnAuth: 60:e7:01:ea:0f:63

RTL8195A[Driver]: +OnAssocReq

In AP Mode, current AP: alink_light

In AP Mode, current AP: alink_light

client ac1ffe99 55881 connected!

softap tcp server recv: {"passwd":"wlan123987","bssid":"d8:fe:e3:b3:99:b3","ssid":"ADSL_WLAN"}

ack {"code":1000, "msg":"format ok"}

LwIP_DHCP: dhcp stop.
Deinitializing WIFI ...
WIFI deinitialized
Initializing WIFI ...
WIFI initialized

wifi_connect

RTL8195A[Driver]: set ssid [ADSL_WLAN]

RTL8195A[Driver]: start auth to d8:fe:e3:b3:99:b3

RTL8195A[Driver]: auth success, start assoc

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IP address : 192.168.0.18
 write wifi info to flash,: ssid = ADSL_WLAN, pwd = wlan123987,ssid length = 9, pwd length = 10, channel = 8, security =4194308

 wlan_wrtie_reconnect_data_to_flash():not the same ssid/passphrase/channel, write new profile to flash
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broadcast: {"version":"1.1","model":"ALINKTEST_LIVING_LIGHT_SMARTLED","macAddr":"00:E0:4C:76:58:93"}

broadcast: {"version":"1.1","model":"ALINKTEST_LIVING_LIGHT_SMARTLED","macAddr":"00:E0:4C:76:58:93"}
rx: {"model":"ALINKTEST_LIVING_LIGHT_SMARTLED","status":"success","macAddr":"00:E0:4C:76:58:93","version":"1.1"}

deviceinfo->mac = 00:E0:4C:76:58:93
deviceinfo->ip = 192.168.0.18
DEV_MODEL:ALINKTEST_LIVING_LIGHT_SMARTLED
```

Step 5: If the smart device registers to smart cloud successfully, the smart phone ONEAPK will automatically jump to the following page, then you can control your smart device now.

4 OTA

Over The Air function is achieved to upgrade the new firmware. Here goes an example of OTA test.

Assume that the current assigned version number running in the smart device is "1.0.3" which can be modified in alink.c file.

```
00069: #ifdef ALINK_OTA
00070: #define DEV_VERSION "1.0.3"
00071: #else
00072: #define DEV_VERSION "1.0.3"
00073: #endif
```

And a new firmware “**ota.bin**” with a higher assigned version number "1.1" is placed in Ali cloud which you can view from **ONEAPK->Setting-> Device management -> Current device.**

Step 1: Click " **firmware upgrade** " to jump to the following upgrade page.

Step 2： Click " **upgrade now**" to start to download the new firmware.

As device's serial log shows, it begins to download firmware.

```
**********************Bind port = 49178

alink_save_file ret=1
alink_save_file ret=1
alink_save_file ret=1
alink_save_file ret=1
alink_save_file ret=1
alink_save_file ret=1
alink_save_file ret=1
alink_save_file ret=1
```

In ONEAPK, it will show the download percentage like this :

Step 3： After download completed, the device will automatically reboot. The device's serial log shows as follows.

```
[MEM] Available heap 11528
<ALINK/INFO> [alink_post#1214]: Response for posting acquired successfully.

[ota_upgrade] signature 35393138,31313738
[ota_upgrade] Update OTA success!
[ota_upgrade] Ready to reboot
[MEM] Available heap 14552
```

In ONEAPP, when the progress bar reaches 100%, click "confirm" to finish upgrading firmware. Then it will jump to the following page, it shows "Your smart device's firmware is the newest".