

OpenCPU FOTA Application Note

GPS/GPRS Module Series

Rev. OpenCPU_FOTA_Application_Note_V1.0

Date: 2014-11-12



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About the Document

History

Revision	Date	Author	Description
1.0	2014-11-12	Ablaze LU	Initial

Contents

About the Document.....	2
Contents.....	3
Table Index.....	4
Figure Index.....	5
1 Introduction	6
2 FOTA Flow	7
2.1. Compile and Generate a New Image Bin	8
2.2. Package Image Bin	8
2.3. Put Image Bin on the Server	8
2.4. Start FOTA Upgrade	9
3 FOTA API	10
3.1. QI_FOTA_StartUpgrade	10
4 How to Program FOTA	12
4.1. Define FOTA Downloading Protocol.....	12
4.2. Define GPIO for Watchdog.....	12
4.3. One API for FOTA.....	13
5 Package Tool.....	15
6 Appendix.....	16
6.1. Reference	16

Table Index

TABLE 1: REFERENCE DOCUMENTS	16
TABLE 2: ABBREVIATIONS	16

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Figure Index

FIGURE 1: OPENCPU FOTA FLOW.....	7
FIGURE 2: PACKAGE IMAGE BIN	8
FIGURE 3: OPENCPU FOTA PACKAGE TOOL	15

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1 Introduction

This document introduces the method of updating the embedded application by FOTA (Firmware Over The Air). Meanwhile, it describes how to program FOTA and use the package tool.

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2 FOTA Flow

FOTA updating process consists of the following steps:

- Step 1: Compile codes to generate a new image bin.
- Step 2: Package the image bin with “OpenCPU FOTA Package Tool”.
- Step 3: Put the image bin on the customer’s server.
- Step 4: Launch upgrading processing by sending some command locally or remotely.

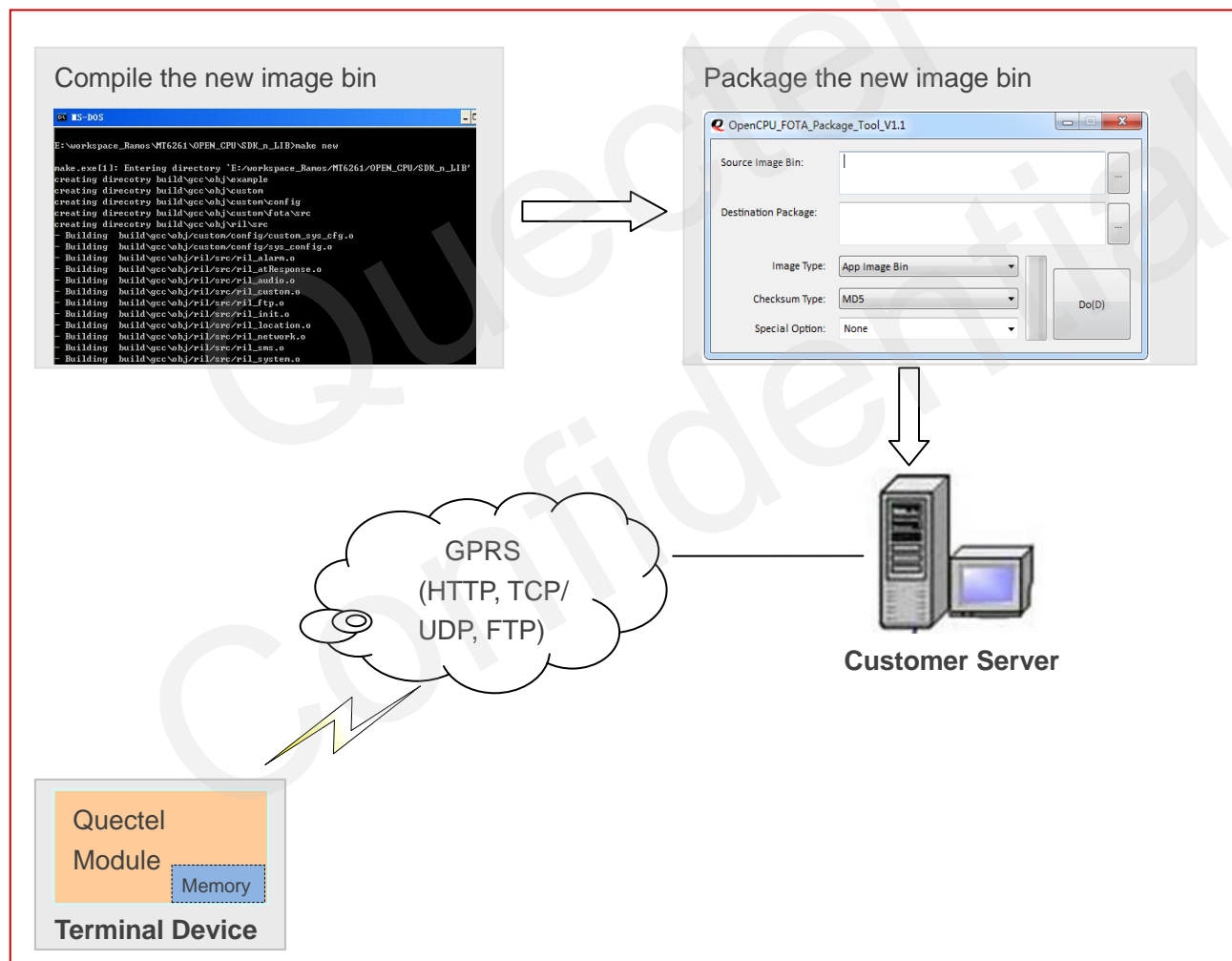


Figure 1: OpenCPU FOTA Flow

2.1. Compile and Generate a New Image Bin

Compile the new codes which you want to upgrade. Quectel_OpenCPU_User_Guide introduces how to compile codes to generate a new bin file.

2.2. Package Image Bin

Open “OpenCPU FOTA Package Tool”, select “APPGS3MDM32A01.bin” in Source Image Bin, and the other parameters will be set by default. Click the “Do(D)” button, an object image bin file “APPGS3MDM32A01_Upgrade_Package.bin” will be generated. You can rename the image bin file.

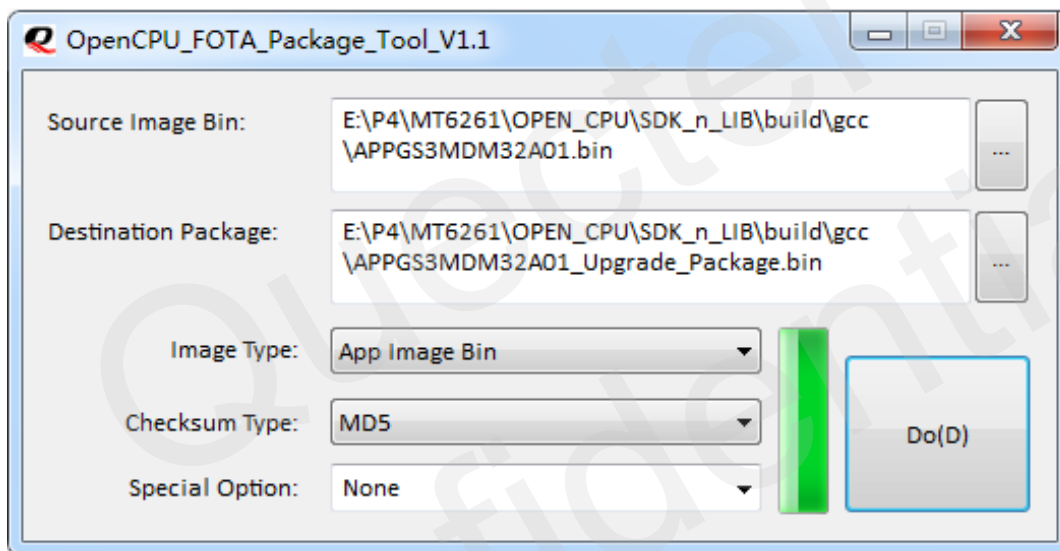


Figure 2: Package Image Bin

2.3. Put Image Bin on the Server

First of all, you need to build a server which can be accessed by module via FTP or HTTP. And then, put the image bin file “APPGS3MDM32A01_Upgrade_Package.bin” in the server.

2.4. Start FOTA Upgrade

To start FOTA upgrade, you can launch the process locally or remotely. If the device is portable, you can design a local method to launch the FOTA upgrade, such as a button or a menu item; and if the device is unattended, a remote method of launching the FOTA upgrade would be better. For example, a call, a short message, or a special frame of TCP/UDP data can be used to start the FOTA upgrade remotely.

For remote method, you can send the upgrade command to a lot of devices simultaneously.

After receiving the upgrade command or request, the program just need to call one API “**QI_FOTA_StartUpgrade()**”to start FOTA upgrade.

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3 FOTA API

OpenCPU FOTA solution enables to call one API to finish the FOTA related programming. The URL address, port and the account information should be included in the parameter.

3.1. QI_FOTA_StartUpgrade

This function is designed to start FOTA upgrading process. You just need to call this API function to launch FOTA upgrading when the update data is ready in FTP or HTTP server.

- **Prototype**

```
typedef bool (* Callback_Upgrade_State)(Upgrade_State state, s32 fileDLPercent);  
  
s32 QI_FOTA_StartUpgrade(u8* url, ST_GprsConfig* apnCfg, Callback_Upgrade_State  
callbcak_UpgradeState_Ind);
```

- **Parameters**

url:

[IN]: the URL address of the destination bin file, and other relative information, such as port, user name and password.

The URL format for HTTP is: <http://hostname/filePath/fileName:port>

If ":port" is ignored, it means the port is HTTP default port(80)

The URL format for FTP is: <ftp://hostname:password/filePath/fileName:port@username>

If ":port" is ignored, it means the port is FTP default port(21)

If no username and password, "@username:password" can be ignored. You must make sure there is no '@' char before the "@username:password" string.

Example 1: <ftp://www.jjj.com/filePath/xxx.bin:8021@username:password>

Example 2: <ftp://www.jjj.com/filePath/xxx.bin@username:password>

Example 3: <ftp://192.168.10.10/filePath/APP.bin>

Example 4: <http://23.11.67.89/filePath/xxx.bin>

Example 5: <http://www.quectel.com:8080/filePath/xxx.bin>

apnCfg:

[IN]: the APN related parameters.

callbacak_UpgradeState_Ind:

[OUT]: callback function that reports the upgrading state. If it's NULL, a default callback function "Fota_Upgrade_States" will be adopted.

- **Return**

0: indicates this function successes

-1: indicates this function fails

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4 How to Program FOTA

Quectel provides a simple upgrade interface. Customer only needs to fill in APN and URL as required to achieve the upgrade function. Please refer to the following instructions to write the upgrade process.

4.1. Define FOTA Downloading Protocol

FOTA function is controlled by three Macros defined in the file “custom_feature_def.h”.

```
/******  
 * FOTA Feature Definition  
*****/  
#define __OCPU_FOTA_APP__  
#define __OCPU_FOTA_BY_FTP__  
//#define __OCPU_FOTA_BY_HTTP__
```

You can use FTP server or HTTP server as the destination server. Whatever which one is chosen, the macro “__OCPU_FOTA_APP__” needs to be defined.

For FTP:

If download the upgrade package from a FTP server, you need to define the macro “__OCPU_FOTA_BY_FTP__” and comment the definition of the macro “__OCPU_FOTA_BY_HTTP__”.

For HTTP:

If download the upgrade package from a HTTP server, you need to define the macro “__OCPU_FOTA_BY_HTTP__” and comment the definition of the macro “__OCPU_FOTA_BY_FTP__”.

4.2. Define GPIO for Watchdog

OpenCPU FOTA provides two GPIO pins, it can be used to feed external watchdog during updating. Application can specify the GPIO pins according to the design.

The watchdog parameters are defined as follows:

```
//define PINNAME_CTS for feed watchdog.
static const ST_ExtWatchdogCfg wtdCfg = {
    PINNAME_CTS,      //Specify a pin which connects to the external watchdog
    PINNAME_END       //Specify another pin for watchdog if needed
};
```

4.3. One API for FOTA

Set APN according to your actual situation and fill in the URL according to the format required. And then, call the function “**QI_FOTA_StartUpgrade()**” to start the upgrade process.

Please write the URL as requested, otherwise it will lead to upgrade failure. About URL format, please refer to section 4.

```
#define URL_ADDR          ftp://192.168.10.10/filePath/app.bin:21@abc:abc

ST_GprsConfig apnCfg;
QI_strncpy(apnCfg.apnName, "CMNET", QI_strlen("CMNET"));
QI_strncpy(apnCfg.apnUserId, "123", QI_strlen("123"));
QI_strncpy(apnCfg.apnPasswd, "123", QI_strlen("123"));

static bool CallBack_UpgradeState_Ind(Upgrade_State state, s32 fileDLPercent);
s32 ret = QI_FOTA_StartUpgrade(URL_ADDR, &apnCfg, CallBack_UpgradeState_Ind);

static bool CallBack_UpgradeState_Ind(Upgrade_State state, s32 fileDLPercent)
{
    switch(state)
    {
        case UP_START:
        case UP_CONNECTING:
        case UP_CONNECTED:
        case UP_GETTING_FILE:
        case UP_GET_FILE_OK:
            QI_Debug_Trace("<-- Fota Upgrading... -->\r\n");
            break;
        case UP_FOTAINITFAIL:
        case UP_URLDECODEFAIL:
        case UP_UPGRADFAILED:
            QI_Debug_Trace("<-- Fota Upgrade failed!! -->\r\n");
            QI_Reset(0);
```

```
        return FALSE;
    case UP_SYSTEM_REBOOT:
    {
        QI_Debug_Trace("<--system will reboot, and upgrade. -->\r\n");
        return TRUE;
    }
    default:
        break;
}
}
```

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5 Package Tool

The new firmware needs to be packaged with the tool “**Quectel FOTA Package Tool**”. The tool is placed in the "SDK/tools" directory.

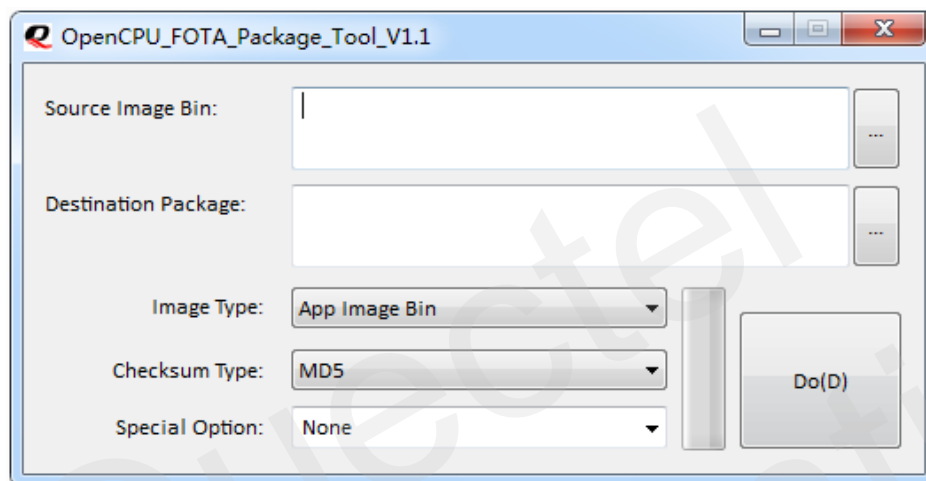


Figure 3: OpenCPU FOTA Package Tool

- **Source Bin and Destination Bin**

Please select the APP bin that you want to package from the “Source Image Bin” column. Select the storage location of the bin that you packaged from “Destination Package”, also you can rename the file that you have packaged.

- **Image Type**

Currently “Image Type” only supports APP update, and does not support Core update. So you can only choose “App Image Bin”.

- **Checksum Type**

Checksum Type supports “MD5” algorithm. With this choice, checksum data will be written into the destination file. After the update data is downloaded from server and written into module, the module will do checksum to check if there losts any data before the update data reaches the module.

- **Special Option**

This item is for some special purposes. In general, you need to select “None”.

6 Appendix

6.1. Reference

Table 1: Reference Documents

SN	Document Name
[1]	Quectel_OpenCPU_User_Guide

Table 2: Abbreviations

Abbreviation	Description
App	OpenCPU Application
Core	Core System, OpenCPU Operating System
OS	Operating System
SDK	Software Development Kit
API	Application Programming Interface
FOTA	Firmware Over The Air
MD5	Message Digest Algorithm 5