MC65&M65&M08-R

DFOTA Application Note

GSM/GPRS/GNSS Module Series

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GENERAL NOTES

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About the Document

Revision History

Version	Date	Author	Description
1.0	2020-07-08	Oven TAO/ Simon HU	Initial

Contents

Table Index

Figure Index

1 Introduction

Quectel MC65&M65&M08-R modules support DFOTA (Delta Firmware Upgrade Over-The-Air) function, which allows you to upgrade or downgrade the firmware wirelessly. This document mainly describes how to upgrade the firmware of Quectel MC65&M65&M08-R modules via DFOTA.

Before firmware updating, a delta firmware package which contains only the differences between the source and the target firmware versions has to be obtained. In this way, the amount of data transmitted and the time taken can be reduced.

NOTE

For MC65&M65&M08-R modules, the maximum number of DFOTA is 800. It is recommended not to upgrade the firmware frequently because the Flash may be damaged when the number of DFOTA exceeds 800.

2 Firmware Upgrading Procedure via DFOTA

2.1. DFOTA Procedure over HTTP

The following chart illustrates the DFOTA procedure when the firmware package is stored on an HTTP server.

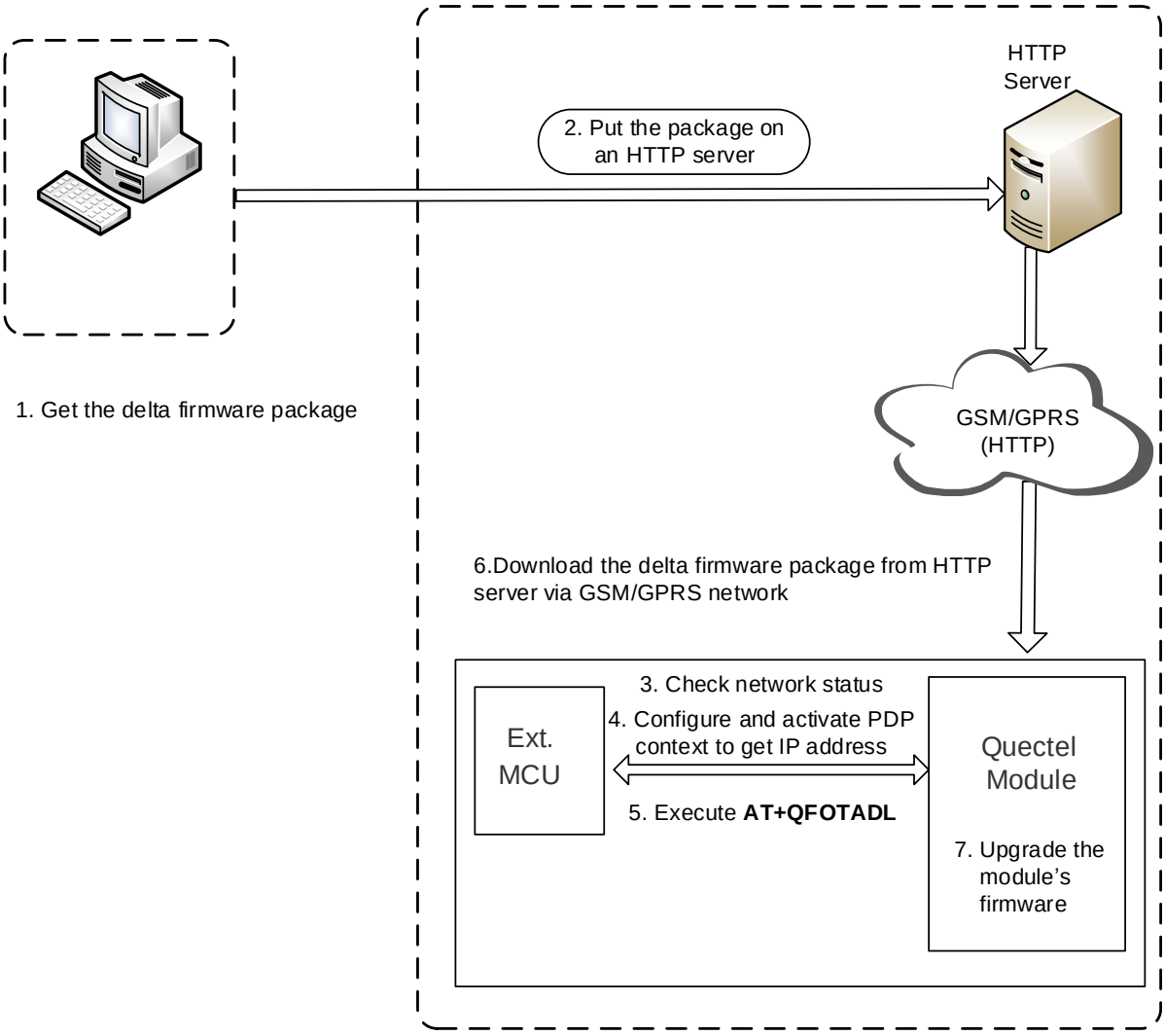

Figure 1: DFOTA Procedure over HTTP

As shown in the above figure, the following steps need to be performed to update the firmware when the firmware package is stored on an HTTP server:

Step 1: Get the delta firmware package from Quectel.
Step 2: Put the delta firmware package on HTTP server.
Step 3: Check network status.
Step 4: Configure and activate PDP context to get IP address.
Step 5: Execute **AT+QFOTADL**. Then the module will download the delta firmware package from HTTP server via GSM/GPRS network (**Step 6**) and upgrade the firmware (**Step 7**).

2.1.1. Get Delta Firmware Package

Before updating, check the source firmware version with **ATI** command and confirm the target firmware version, and then send the two firmware versions to Quectel or the module agents to get a delta firmware package.

2.1.2. Put Delta Firmware Package on HTTP Server

Since Quectel does not provide such servers, an HTTP server needs to be established before using DFOTA function. Then put the delta firmware package on the server, and record the storage path.

2.1.3. Check Network Status

Before firmware upgrading, check whether the module has registered on the network after it is powered on.

The relevant AT commands are listed below:

- **AT+CSQ**: Query signal quality.
- **AT+CGREG?**: Query network registration status.

For more details about the above commands, please refer to ***document [1]***.

If the module has registered on the network, the PDP context can be configured and activated, otherwise please check the insertion of the (U)SIM card and the connection of Antenna. If needed, please contact Quectel Technical Supports Team.

2.1.4. Configure and Activate PDP Context to Get IP Address

After module registers on the network, configure and activate the PDP context to get IP address.

The relevant AT commands are listed below:

- **AT+QIFGCNT=<id>**: Select PDP context.
- **AT+QICSGP=1[,<APN>,<user_name>,<password>]**: Select GPRS as the bearer and configure APN.
- **AT+QIREGAPP**: Start task.
- **AT+QIACT**: Activate PDP context to get IP address.

For more details about the above commands, please refer to ***document [1]***.

2.1.5. Execute AT Command to Upgrade the Firmware

After getting the IP address, execute **AT+QFOTADL** command and then the module will download the delta firmware package from the HTTP server wirelessly and upgrade the firmware. For more details about this command, please refer to ***Chapter 3***.

2.2. DFOTA Procedure over Local File System

The following chart illustrates the DFOTA procedure when the firmware package is stored on local file system.

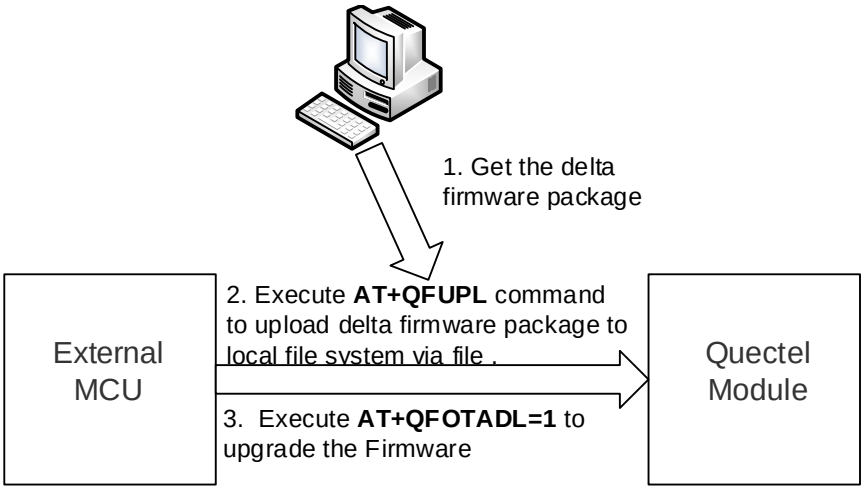

Figure 2: DFOTA Procedure over Local File System

2.2.1. Get Delta Firmware Package

Before updating, check the source firmware version with **ATI** command and confirm the target firmware version, and then send the two firmware versions to Quectel or the module agents to get a delta firmware package.

2.2.2. Upload Delta Firmware Package to Local File System

The relevant AT command is listed below:

- **AT+QFUPL=<file_name>[,<file_size>[,<timeout>[,<ackmode>]]]**: upload file to local file system.

For more details about this command, please refer to ***document [2]***.

2.2.3. Execute AT Command to Upgrade the Firmware

After the delta is uploaded, execute **AT+QFOTADL** command to upgrade the firmware.

3 DFOTA Related AT Commands

The **AT+QFOTADL** command is used to trigger the firmware upgrading for module via DFOTA.

3.1. AT+QFOTADL=<HTTP_URL> Trigger DFOTA over HTTP

When the delta firmware package is stored on HTTP server, executing **AT+QFOTADL=<HTTP_URL>** will make the module download the delta firmware package from the HTTP server. If downloading is successful, the module will update the firmware. When updating completes successfully, the module will reboot, otherwise it will return an error, exit from DFOTA and continue to run on the source firmware version.

AT+QFOTADL=<HTTP_URL> Trigger DFOTA over HTTP	
Test Command **AT+QFOTADL=?**	Response **OK**
Write Command **AT+QFOTADL=<HTTP_URL>**	Response **OK** **+QIND: "FOTA","HTTPSTART"** **+QIND: "FOTA","DOWNLOADING",<percent>** **+QIND: "FOTA","DOWNLOADING",<percent>** **...** **+QIND: "FOTA","HTTPEND",<FOTA_err>** **+PDP DEACT** **+QIND: "FOTA","START"** **+QIND: "FOTA","UPDATING",<percent>** **+QIND: "FOTA","UPDATING",<percent>** **...** **+QIND: "FOTA","END",<FOTA_err>**

	If the error is related to ME function: **+CME ERROR: <FOTA_err>**
Maximum Response Time	300 ms
Characteristics	Take effect immediately (determined by network). Remain invalid after powering down.

Parameter

<HTTP_URL>	String format. The max length is 255 bytes. It should be started with "HTTP://", for example: "HTTP://<HTTP_server_URL>/<HTTP_port>/<HTTP_file_path>".
<HTTP_server_URL>	String type. The IP address or domain name of the HTTP server.
<HTTP_port>	Integer type. The port of the HTTP server. Range: 1-65535. Default value: 80.
<HTTP_file_path>	String type. The file name in HTTP server.
<FOTA_err>	Integer type. The error code during downloading or upgrading. 0 Downloaded or updated successfully. Others Error code. Please refer to ***Chapter 5*** for more details.
<percent>	Integer type. The download or upgrade progress in percentage. Range: 1-100. Unit: %.

NOTE

If the module is powered off during **+QIND: "FOTA","UPDATING",<percent>**, process**,** the module will automatically enter forced upgrade mode. When it is powered on next time, it will continue to update. The update interface is shown as below:

+QIND: "FOTA","START"

+QIND: "FOTA","UPDATING",2%

+QIND: "FOTA","UPDATING",4%

...

+QIND: "FOTA","END",0

3.2. AT+QFOTADL=<para> Trigger DFOTA over Local File System

When the delta firmware package is stored on Local File System, executing **AT+QFOTADL=<para>** will make the module update the firmware. When updating completes successfully, the module will reboot, otherwise it will return an error, exit from DFOTA and continue to run on the source firmware version.

AT+QFOTADL=<para>	**Trigger DFOTA over Local File System Firmware**
Test Command **AT+QFOTADL=?**	Response **OK**
Write Command **AT+QFOTADL=<para>**	Response **OK** **+QIND: "FOTA","START"** **+QIND: "FOTA","UPDATING",<percent>** **+QIND: "FOTA","UPDATING",<percent>** **...** **+QIND: "FOTA","END",<FOTA_err>** If the error is related to ME function: **+CME ERROR: <FOTA_err>**
Maximum Response Time	10 s
Characteristics	Take effect immediately (determined by network). Invalid after powering down.

Parameter

<para>	Integer type.	
	1	Start upgrade.
<percent>	Integer type. The upgrade progress in percentage. Range: 1-100. Unit: %.	
<FOTA_err>	Integer type. The error code during downloading or upgrading.	
	0	Downloaded or updated successfully.
	Others	Error code. Please refer to ***Chapter 5*** for more details.

NOTES

1. The delta firmware name must be "fota.pack".
2. If the baud rate of the module is configurated to a fixed value, the module will report **+QIND: "FOTA","UPDATING",<percent>** via the same baud rate after reboot. If the baud rate of the module is configurated to adaptive mode, the module will report **+QIND: "FOTA","UPDATING",<percent>**

via baud rate 115200.

3. If the module is powered off during **+QIND: "FOTA","UPDATING",<percent>**, the module will automatically enter forced upgrade mode when powered on next time and continue the upgrading progress. The upgrade interface is shown as below:

+QIND: "FOTA","START"

+QIND: "FOTA","UPDATING",2%

+QIND: "FOTA","UPDATING",4%

...

+QIND: "FOTA","END",0

4 Examples

4.1. DFOTA over HTTP

```
//Upgrade firmware when delta firmware package is stored on an HTTP server.
//The HTTP server address is “http://www.quectel.com:8111/DFOTA/A2B.pack”.
AT+CSQ;+CGREG?;+CPIN?                    //Query network status.
+CSQ: 25,0

+CGREG: 0,1

+CPIN: READY

OK
AT+QIFGCNT=0
OK
AT+QICSGP=1,"CMNET"                      //Configure the PDP context.
OK
AT+QIREGAPP
OK
AT+QIACT                                 //Activate the PDP context to get IP address.
OK
//Execute AT+QFOTADL command to enable DFOTA over HTTP, and then the module will start to download the delta firmware package and update firmware.
AT+QFOTADL="http://www.quectel.com:8111/DFOTA/A2B.pack"
OK

+QIND: "FOTA","HTTP START"               //Start download

+QIND: "FOTA","DOWNLOADING",0%           //Download progress

+QIND: "FOTA","DOWNLOADING",10%
...
+QIND: "FOTA","DOWNLOADING",100%
```

```
+QIND: "FOTA","HTTPEND",0          //Finish downloading the package from HTTP server.

+PDP DEACT

+QIND: "FOTA","START"              //Start update

+QIND: "FOTA","UPDATING", 2%       //Update progress

+QIND: "FOTA","UPDATING", 4%
...
+QIND: "FOTA","UPDATING", 100%

+QIND: "FOTA","END",0              //Upgraded successfully
```

4.2. DFOTA over Local File System

//Execute **AT+QFUPL** command to upload the delta firmware package to the local file system.

```
AT+QFUPL="fota.pack",156104      //The delta firmware name must be "fota.pack"
CONNECT                          //After this string is reported, the host starts to send file content to
                                   module.

+QFUPL: 156104,4300

OK
```

//Execute **AT+QFOTADL** to enable DFOTA over Local File System, and then the module will start to upgrade firmware.

```
AT+QFOTADL=1
OK

+QIND: "FOTA","START"            //Start update

+QIND: "FOTA","UPDATING", 2%     //Update progress

+QIND: "FOTA","UPDATING", 4%
...
+QIND: "FOTA","UPDATING", 100%
```

+QIND: "FOTA","END",0	//Upgraded successfully

5 Summary of Error Codes

The error code indicates an error related to mobile equipment or network. The details about <FOTA_err> are described in the following tables.

Table 1: Summary of <FOTA_err> Codes

<FOTA_err>	Meaning
6500	Unknown error
6501	Invalid parameter
6502	Package too large
6503	Download failed
6504	Package not found
6505	Write file failed
6506	Package not exist
6507	Package error
6508	Update failed
6509	No memory

6 Appendix A References

Table 2: Related Documents

SN	Document Name	Remark
[1]	Quectel_ MC65&M65&M08-R _AT_Commands _Manual	MC65&M65&M08-R AT commands manual
[2]	Quectel_GSM_FILE_AT_Commands_Manual	File AT commands manual for GSM modules

Table 3: Terms and Abbreviations

Abbreviation	Description
APN	Access Point Name
DFOTA	Delta Firmware Upgrade Over-The-Air
FOTA	Firmware Over-The-Air
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HTTP	Hypertext Transfer Protocol
IP	Internet Protocol
PDP	Packet Data Protocol
URL	Uniform Resource Locator