BC25&BC32
DFOTA Application Note

LPWA Module Series

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GENERAL NOTES

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About the Document

History

Revision	Date	Author	Description
1.0	2019-07-15	Fonda FANG	Initial

Contents

Table Index

1 Introduction

Quectel BC25 and BC32 modules support DFOTA (Delta Firmware Upgrade Over-The-Air) feature, which allows customers to upgrade or downgrade firmware wirelessly.

In DFOTA, a delta firmware package, which only contains the differences between the source and the target firmware version, is needed. In this way, the amount of data transmitted and time consumed can be reduced.

This document mainly describes how to upgrade the firmware of Quectel BC25 and BC32 modules via DFOTA.

2 DFOTA Procedure

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

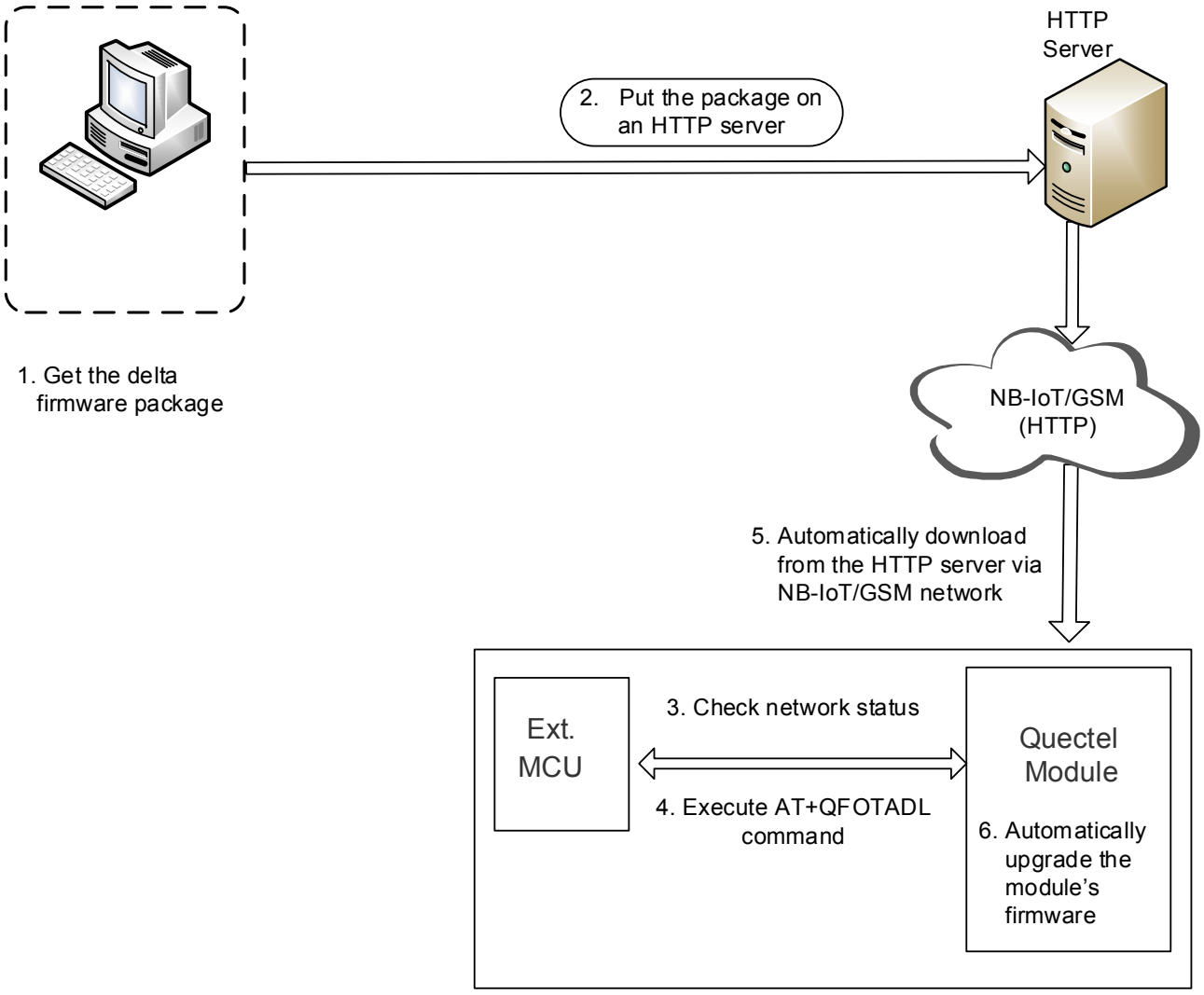

Figure 1: DFOTA Procedure

As shown in the above figure, customers only need to perform the following steps to upgrade 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 an HTTP server.

Step 3: Check the status of network.

Step 4: Execute **AT+QFOTADL** command. Then the module will automatically download the package from the HTTP server via NB-IoT network or GSM network (**Step 5**) and finally automatically upgrade the module's firmware (**Step 6**).

NOTES

1. Since BC32 supports both NB-IoT and GSM networks, BC32 also supports to download upgrade files through GSM network.
2. When BC32 is under GSM network, it is needed to manually configure PDP and activate IP with the command **AT+CGDCONT** after **Step 3**.
3. Please refer to *Quectel_BC25_AT_Commands_Manual* or *Quectel_BC32_AT_Commands_Manual* for more details about the AT commands other than **AT+QFOTADL** in this chapter, .

2.1. Acquire Delta Firmware Package

Before upgrading, the source firmware version needs to be checked by executing **ATI** command and the target firmware version needs to be decided. Then, customers should send the two firmware versions to Quectel or the responsible agent to get a delta package.

2.2. Put Delta Package on HTTP Server

Customers need to setup their own HTTP servers when applying DFOTA, since Quectel does not provide such a server. Then, after the delta firmware package is put on the server and the HTTP path is recorded, the module will be able to acquire the delta firmware package through the HTTP path by executing the corresponding AT command.

NOTE

Please record the HTTP path (URL) where the delta firmware package is put for the **AT+QFOTADL** command in ***Chapter 3***.

2.3. Check Network Status

After the module is powered on, please make sure it is registered on network before the firmware upgrading.

Relevant AT commands are listed below:

- **AT+CESQ:** Query signal quality
- **AT+COPS?:** Query the network type and registration status
- **AT+CGPADDR:** Query allocated IP address for the default PDN

2.4. Execute AT Command to Upgrade the Firmware

After the network status is confirmed to be ready, **AT+QFOTADL** command can be executed to start the download. Then the module will download the delta firmware package from the HTTP server wirelessly and upgrade the firmware automatically. For more details, please refer to ***Chapter 3***.

3 DFOTA AT Commands

AT+QFOTADL command enables the automatic firmware upgrade for Quectel module via DFOTA. After the command is executed, the package will be automatically downloaded to the module from the HTTP server. After the package download completes, the module will start to upgrade its firmware automatically. If firmware is upgraded successfully, the module will reboot, otherwise it will return an error and exit from DFOTA.

3.1. AT+QFOTADL DFOTA via HTTP Server

If the delta firmware package is stored on an HTTP server, **AT+QFOTADL=<httpURL>** command should be executed to enable the automatic firmware upgrade via DFOTA. Then the module will download the delta firmware package from the HTTP server wirelessly and upgrade the firmware automatically.

AT+QFOTADL DFOTA via HTTP Server	
Test Command **AT+QFOTADL=?**	Response **OK**
Write Command **AT+QFOTADL=<httpURL>**	Response **OK** **+QIND: "FOTA","HTTPSTART"** **+QIND: "FOTA","DOWNLOADING",<percent>** **+QIND: "FOTA","DOWNLOADING",<percent>** **...** **+QIND: "FOTA","HTTPEND",<http_err>** **+QIND: "FOTA","START"** **+QIND: "FOTA","UPDATING",<percent>** **+QIND: "FOTA","UPDATING",<percent>** **...**

	+QIND: "FOTA","END",<fota_err> If there is any error: **ERROR** Or **+CME ERROR: <http_err>**

Parameter

<httpURL>	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 of the HTTP server.
<http_port>	Integer type. The port of the HTTP server. The default value is 80. The range is 1-65535.
<http_file_path>	String type. The file name in HTTP server.
<http_err>	Integer type. The HTTP error code. 0 means download successfully. Any other value means an error. Please refer to ***Chapter 5*** for more details.
<percent>	Integer type. The download or upgrade progress in percentage.
<fota_err>	Integer type. 0 means upgraded successfully. Any other value means an error. Please refer to ***Chapter 5*** for more details.

NOTE

If the module is powered off during "**+QIND: "FOTA","UPDATING",<percent>**", the module will automatically enter force 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",1%

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

...

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

4 Examples

4.1. DFOTA via HTTP Server under NB-IoT Network

```
//Upgrade firmware when delta firmware package is stored on an HTTP server.
//The HTTP server address is "http://224.168.203.812:3029/update.pack".

AT+COPS?                    //Query network status
+COPS: 0,2,"46011",9        //The fourth parameter 9 means NB-IoT network

OK

//Under NB-IoT network, the module will use the parameter configured by AT+QCGDEFCONT and automatically activate IP

AT+CGDCONT?
+CGDCONT: 1,"IP","cmnbiot","100.68.194.234",0,0

OK

//Execute AT+QFOTADL command to enable automatic firmware upgrade via DFOTA, and then the module will start to download the delta firmware package and upgrade firmware automatically.
AT+QFOTADL= "http://224.168.203.812:3029/update.pack"
OK
+QIND: "FOTA","HTTPTART"

+QIND: "FOTA","DOWNLOADING",1%

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

...

+QIND: "FOTA","DOWNLOADING",100%

+QIND: "FOTA","HTTPEND",0          //The package from HTTP server is successfully downloaded
```

```
+QIND: "FOTA","START"

+QIND: "FOTA","UPDATING",1%

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

...

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

+QIND: "FOTA","END",0                    //The firmware is successfully upgraded
```

4.2. DFOTA via HTTP Server under GSM Network (BC32)

```
//Upgrade firmware when delta firmware package is stored on an HTTP server.
//The HTTP server address is "http://224.168.203.812:3029/update.pack".

AT+COPS?                    //Query network status
+COPS: 0,2,"46011",0        //The fourth parameter 0 means GSM network

OK

//When BC32 is under GSM network, it is needed to configure PDP and activate IP manually before downloading
AT+CGDCONT=1,"IP"
OK

AT+CGACT=1,1
OK

AT+CGDCONT?
+CGDCONT: 1,"IP","","100.68.194.234",0,0

OK

//Execute AT+QFOTADL command to enable automatic firmware upgrade via DFOTA, and then the module will start to download the delta firmware package and upgrade firmware automatically.
AT+QFOTADL= "http://224.168.203.812:3029/update.pack"
OK
+QIND: "FOTA","HTTPTART"
```

```
+QIND: "FOTA","DOWNLOADING",1%

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

...

+QIND: "FOTA","DOWNLOADING",100%

+QIND: "FOTA","HTTPEND",0          //The package from HTTP server is successfully downloaded

+QIND: "FOTA","START"

+QIND: "FOTA","UPDATING",1%

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

...

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

+QIND: "FOTA","END",0              //The firmware is successfully upgraded
```

5 Summary of Error Codes

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

Table 1: Summary of <http_err> Codes

<http_err>	Meaning
0	Download successfully
6500	Unknown mistake
6501	Illegal parameter
6502	Upgrade package is too large
6503	Download failed
6504	Upgrade package not found
6505	Upgrade package failed to write flash
6506	There are no differential packages in the module file system
6507	Differential packet verification error
6509	Allocate memory failed

Table 2: Summary of <fota_err> Codes

<fota_err>	Meaning
0	Upgraded successfully
6508	Upgrade failed

6 Appendix A References

Table 3: Related Documents

SN	Document Name	Remark
[1]	Quectel_BC25_AT_Commands_Manual	AT commands manual for BC25
[2]	Quectel_BC32_AT_Commands_Manual	AT commands manual for BC32

Table 4: Terms and Abbreviations

Abbreviation	Description
DFOTA	Delta Firmware Upgrade Over-The-Air
HTTP	Hyper Text Transport Protocol (Secure)
LPWA	Low Power Wide Area
NB-IoT	Narrowband Internet of Things