

BG96 DFOTA User Guide

LTE Module Series

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Our aim is to provide customers with timely and comprehensive service. For any assistance, please contact our company headquarters:

Quectel Wireless Solutions Co., Ltd.

7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

Tel: +86 21 5108 6236

Email: info@quectel.com

Or our local office. For more information, please visit:

<http://www.quectel.com/support/sales.htm>

For technical support, or to report documentation errors, please visit:

<http://www.quectel.com/support/technical.htm>

Or email to: support@quectel.com

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About the Document

History

Revision	Date	Author	Description
1.0	2017-12-19	Matt YE/ Lucifer YAN	Initial
1.1	2018-12-20	Matt YE/ Lane HAO	1. Added AT+QCFGEXT="fota_apn" command. 2. Added some error codes in Chapter 5.

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1 Introduction

Quectel BG96 module supports DFOTA (Delta Firmware Upgrade Over-the-air) function, which allows customers to upgrade or downgrade the firmware over the air.

Before firmware upgrading or downgrading, customers only need to get a delta firmware package which contains only the differences between the source and the target firmware versions. By this way, the amount of data transmitted and the time taken can be reduced.

This document mainly describes how to upgrade the firmware of Quectel BG96 module via DFOTA.

2 Firmware Upgrade Procedure via DFOTA

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

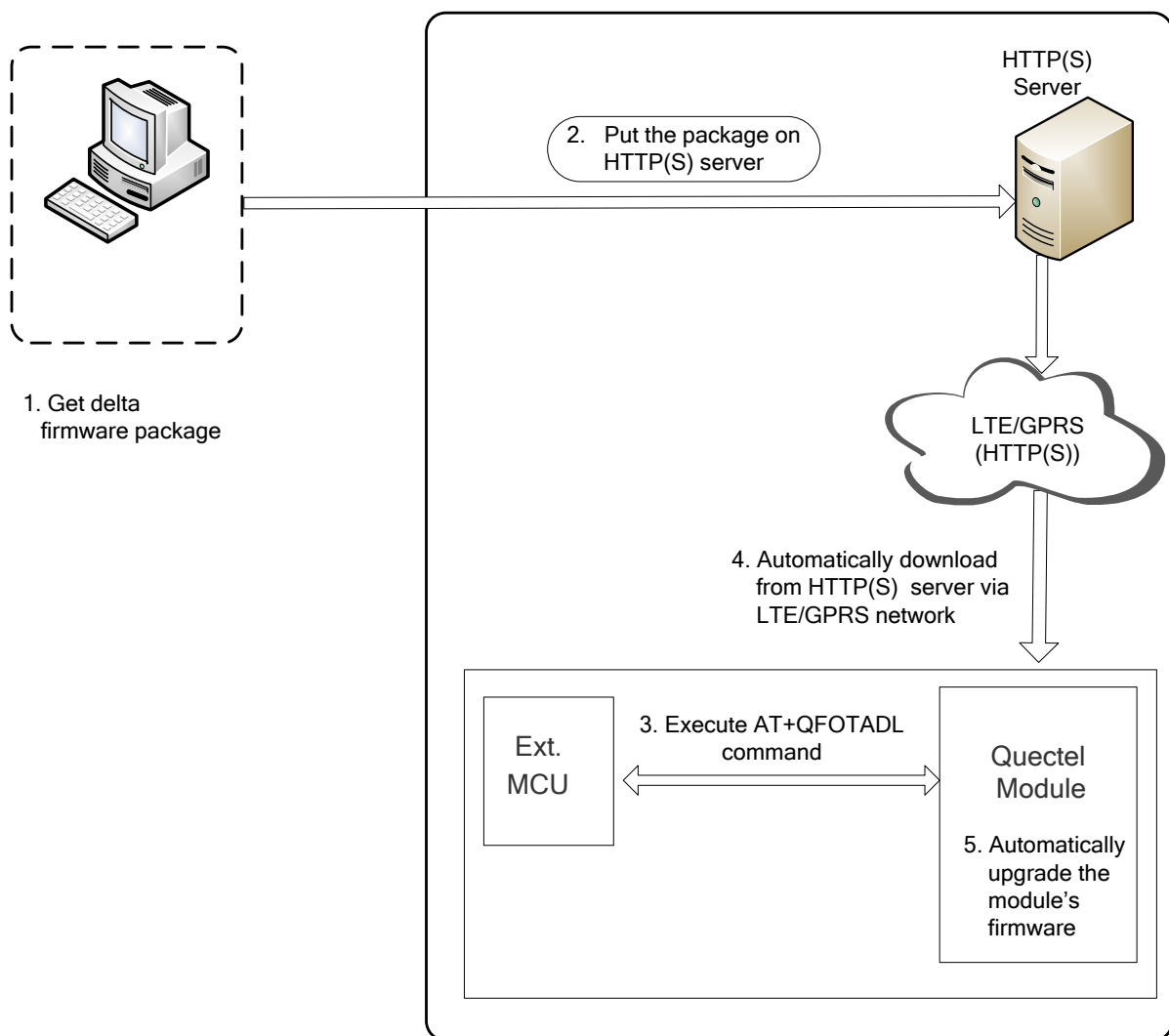


Figure 1: Firmware Upgrade Procedure via DFOTA

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 HTTP(S) server:

- Step 1:** Get the delta firmware package from Quectel.
- Step 2:** Put the delta package on HTTP(S) server.
- Step 3:** Execute **AT+QFOTADL** command. Then the module will automatically download the package from HTTP(S) server via LTE/GPRS network (**Step 4**) and finally automatically upgrade the module's firmware (**Step 5**).

2.1. Get Delta Firmware Package

Before upgrading, customers need to check the source firmware version by executing **ATI** command and get to know the target firmware version, then customers should send the two firmware versions to Quectel or the module supplier so as to get a delta package.

2.2. Put Delta Package on HTTP(S) Server

When using the DFOTA function, customers need to setup an HTTP(S) server by themselves, for Quectel does not provide such a server. Then customers should put the delta firmware package on the server, and record the HTTP(S) path. The module will get the delta package from the path after executing corresponding AT command.

2.3. Check APN Setting

After putting the delta firmware package on the HTTP(S) server, there is a need to check whether the APN is set properly. For instance, the APN for Telstra (U)SIM card should be "**Telstra.internet**", and the relevant AT commands are listed below:

- Query DFOTA APN: **AT+QCFGEXT="fota_apn"**
- Set DFOTA APN: **AT+QCFGEXT="fota_apn",0,"Telstra.internet"**

2.4. Check Network Status

After APN setting confirmation, please check whether the data network is registered before firmware upgrading.

The relevant AT commands are listed below:

- Query signal quality: **AT+CSQ**
- Query network registration status: **AT+CEREG?** or **AT+CGREG?**
- Query the registered operator: **AT+COPS?**

For more details about the above commands, please refer to *Quectel_BG96_AT_Commands_Manual*.

2.5. Execute AT Command to Upgrade the Firmware

After APN setting and network status confirmation, customers need to execute **AT+QFOTADL** command. Then the module will download the firmware package from the HTTP(S) server over the air and upgrade the firmware automatically. For more details, please refer to **Chapter 3**.

3 Description of DFOTA AT Commands

3.1. AT+QFOTADL Upgrade Firmware via DFOTA

AT+QFOTADL command enables automatic firmware upgrade for module via DFOTA. After executing the command, the module will automatically download the package from HTTP(S) server. After the package download is finished, the module will automatically upgrade the module's firmware. If firmware is upgraded successfully, the module will reboot, otherwise it will return an error and exit from DFOTA.

AT+QFOTADL Upgrade Firmware via DFOTA

Test Command	Response
AT+QFOTADL=?	OK

3.1.1. AT+QFOTADL=<httpURL> Upgrade Firmware When Delta Package is Stored on HTTP(S) Server

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

AT+QFOTADL=<httpURL> Upgrade Firmware When Delta Package is Stored on HTTP(S) Server

Write Command	Response
AT+QFOTADL=<httpURL>	OK
	+QIND: "FOTA","HTTPSTART"
	+QIND: "FOTA","HTTPEnd",<http_err>
	+QIND: "FOTA","START"
	+QIND: "FOTA","UPDATING",<percent>
	+QIND: "FOTA","UPDATING",<percent>
	...
	+QIND: "FOTA","RESTORE",<percent>
	+QIND: "FOTA","RESTORE",<percent>
	...
	+QIND: "FOTA","END",<err>

If there is any error:

ERROR

Parameter

<httpURL>	String format. The max length is 255 bytes. It should be started with "HTTP://" or "HTTPS://", 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(S) server.
<http_port>	Integer type. The port of the HTTP(S) server. The default value is 80. The range is 1-65535.
<http_file_path>	String type. The file name in HTTP(S) server.
<http_err>	Integer type. The HTTP(S) error code. 0 means upgraded successfully. Any other value means an error. Please refer to Chapter 5 for more details.
<percent>	Integer type. The upgrade progress in percentage.
<err>	Integer type. 0 means upgraded successfully. Any other value means an error. Please refer to Chapter 5 for more details.

NOTES

- "RESTORE" means the process of copying the upgraded firmware to the original partition from backup partition.
- If the module is powered down during "RESTORE", the module will automatically enter into forced upgrade mode when power up next time and continue upgrade from "RESTORE". The upgrade interface is shown as below:

```
+QIND: "FOTA", "Last upgrade was not finished, continue upgrade"
+QIND: "FOTA", "RESTORE", 1%
+QIND: "FOTA", "RESTORE", 2%
...
+QIND: "FOTA", "RESTORE", 100%
+QIND: "FOTA", "END", 0
```
- (1) If SSL certificates are needed while downloading the firmware package from an HTTPS server, then they should be uploaded to */datatx* of BG96, and must be renamed in accordance with the following rules:
 - The root certificate must be renamed into *fota_cacert.pem*;
 - The client certificate must be renamed into *fota_client_cert.pem*;
 - The private key must be renamed into *fota_client_key.pem*.
- (2) Certificate upload methods:
 - Quectel QEFS Explorer tool can be used to upload the certificates. For more details about the tool, please refer to *Quectel_BG96_QEFS_Explorer_User_Guide*.
 - AT+QFUPL** command can also be used to upload the certificates. For more details about the command, please refer to *Quectel_BG96_FILE_AT_Commands_Manual*.

3.1.2. AT+QFOTADL=<para> Upgrade Firmware When Delta Package is Stored in Local File System

If the delta firmware package has already been stored in the module's file system, **AT+QFOTADL=<para>** command should be executed to enable automatic firmware upgrade via DFOTA. Then the module will upgrade the firmware automatically.

AT+QFOTADL=<para> Upgrade Firmware When Delta Package is Stored in Local File System

Write Command	Response
AT+QFOTADL=<para>	OK
	+QIND: "FOTA", "START"
	+QIND: "FOTA", "UPDATING", <percent>
	+QIND: "FOTA", "UPDATING", <percent>
	...
	+QIND: "FOTA", "RESTORE", <percent>
	+QIND: "FOTA", "RESTORE", <percent>
	...
	+QIND: "FOTA", "END", <err>
	If there is any error, response: ERROR

Parameter

<para>	Integer type. 1 Start upgrade
<percent>	Integer type. The upgrade progress in percentage.
<err>	Integer type. 0 means upgraded successfully. Any other value means an error. Please refer to Chapter 5 for more details.

NOTES

- "RESTORE" means the process of copying the upgraded firmware to the original partition from backup partition.
- The storage path for delta firmware package is */fota/update.zip*. Both the path and the package name cannot be modified. Customers can use the QEFS Explorer tool provided by Quectel to upload the upgrade package.
- If the module is powered down during "RESTORE", the module will automatically enter into forced upgrade mode when power up next time and continue upgrade from "RESTORE". The upgrade interface is shown as below:

+QIND: "FOTA", "Last upgrade was not finished, continue upgrade"

```
+QIND: "FOTA","START"
+QIND: "FOTA","RESTORE",1%
+QIND: "FOTA","RESTORE",2%
...
+QIND: "FOTA","RESTORE",100%
+QIND: "FOTA","END",0
```

3.2. AT+QCFGEXT="fota_apn" Configure IP Family and APN for DFOTA

The command is used to configure the IP family type and APN for DFOTA.

AT+QCFGEXT="fota_apn" Configure IP Family and APN for DFOTA

Write Command AT+QCFGEXT="fota_apn"	Response +QCFGEXT: "fota_apn",<ip_type>,<apn>,<username>,<password> OK If there is any error, response: ERROR
Write Command AT+QCFGEXT="fota_apn",<ip_type>,<apn>,<username>,<password>	Response OK If there is any error, response: ERROR

Parameter

<ip_type>	Integer type. IP family type. 0 IPv4 address family 1 IPv6 address family 2 IPv4 and IPv6 address family
<apn>	String type. Access point name.
<username>	String type. Username of the selected APN.
<password>	String type. Password of the selected APN.

4 Examples

4.1. Upgrade Firmware from HTTPS Server by DFOTA

```
//Upgrade firmware when delta firmware package is stored on an HTTPS server.
//The HTTPS server address is "https://www.quectel.com:100/update.zip".

AT+QCFGEXT="fota_apn",0,"Telstra.internet" //Query DFOTA APN setting
OK
AT+QCFGEXT="fota_apn"
+QCFGEXT: "fota_apn",0,"Telstra.internet","",""

OK
AT+CSQ;+CEREG?;+CGREG?;+COPS? //Query network status
+CSQ: 26,99

+CEREG: 0,1

+CGREG: 0,4

+COPS: 0,0,"Telstra Mobile Telstra",8

OK

//Execute AT+QFOTADL command to enable automatic firmware upgrade via DFOTA, and then the
module will start to download the delta package and upgrade firmware automatically.

AT+QFOTADL="https://www.quectel.com:100/update.zip"
OK
+QIND: "FOTA","HTTPSTART"
+QIND: "FOTA","HTTPEND",0 //Finish downloading the package from HTTPS server.
+QIND: "FOTA","START"
+QIND: "FOTA","UPDATING", 1%
+QIND: "FOTA","UPDATING", 2%
...
+QIND: "FOTA","UPDATING", 100%
+QIND: "FOTA","RESTORE", 1%
+QIND: "FOTA","RESTORE", 2%
```

```
...  
+QIND: "FOTA", "RESTORE", 100%  
+QIND: "FOTA", "END", 0 //Finish upgrading the firmware.
```

4.2. Upgrade Firmware from Local File System by DFOTA

//The delta firmware package has already been stored in the module's file system.

//Execute **AT+QFOTADL** command to enable automatic firmware upgrade via DFOTA, and then the module will start to download the firmware package and upgrade firmware automatically..

AT+QFOTADL=1

OK

```
+QIND: "FOTA", "START"  
+QIND: "FOTA", "UPDATING", 1%  
+QIND: "FOTA", "UPDATING", 2%  
...  
+QIND: "FOTA", "UPDATING", 100%  
+QIND: "FOTA", "RESTORE", 1%  
+QIND: "FOTA", "RESTORE", 2%  
...  
+QIND: "FOTA", "RESTORE", 100%  
+QIND: "FOTA", "END", 0 //Finish upgrading the firmware.
```

5 Summary of Error Codes

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

Table 1: Summary of <http_err> Codes

<http_err>	Meaning
0	Download successful
701	HTTP(S) unknown error
702	Server connection failed
703	Request failed
704	Download timeout
706	File not exist
707	Write data to file failed
708	Downloaded file is too large

Table 2: Summary of <err> Codes

<err>	Meaning
0	Upgraded successfully
504	Firmware upgrade failed
505	Upgrade package not exist
506	Upgrade package check failed
511	Package is mismatched with the current firmware

6 Appendix A References

Table 3: Related Documents

SN	Document Name	Remark
[1]	Quectel_BG96_AT_Commands_Manual	AT commands manual for BG96
[2]	Quectel_BG96_QEFS_Explorer_User_Guide	User guide for QEFS Explorer tool
[3]	Quectel_BG96_FILE_AT_Commands_Manual	FILE AT commands manual for BG96

Table 4: Terms and Abbreviations

Abbreviation	Description
DFOTA	Delta Firmware Upgrade Over-the-Air
GPRS	General Packet Radio Service
HTTP(S)	Hyper Text Transport Protocol (Secure)
LTE	Long Term Evolution