GL53MG(Plus) @Track Air Interface Firmware Update

EGPRS/LTE Cat-M1/LTE Cat-NB2/GNSS Tracker

TRACGL53MGFTAN0101

V1.01

Driving Smarter IoT

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History

Version	Date	Author	Description of Change
1.00	August 15, 2020	Eden Zhang	Initial.
1.01	August 10, 2022	Eden Zhang	Added UPD Code 273.

1. Scope

This document describes the FOTA (firmware over the air) update for Queclink's GL53MG(Plus), which enables end users to update the firmware of the GL53MG(Plus) remotely without having to bring devices to the service centre. Thus the service provider of the GL53MG(Plus) can conveniently promote new features or bug fixes to end users and improve customer experience.

During the firmware update, the following are involved:

- ✧ the terminal: the GL53MG(Plus) whose firmware is to be updated
- ✧ the backend server: the server which remotely controls the terminal and receives report from the terminal
- ✧ the file server: the server which hosts the packages of the update

The file server and the backend server can be hosted on the same machine.

This document describes the process of the firmware update and the necessary message exchange during the update, while the following information isn't covered:

- ✧ The timing and the strategy that the backend server initiates the update
- ✧ The deployment method of the update package
- ✧ How to set up a file server
- ✧ The communication between the backend server and the file server

2. Message

2.1. Command and Acknowledgement

The command **AT+GTUPD** is used to start and stop the firmware update remotely.

2.1.1. Start the Firmware Update

To start the firmware update, the backend server sends the **AT+GTUPD (Sub-command: 0)** command to the device. Upon receiving this command, the device is informed of where and how to download the package.

➢ **Start: AT+GTUPD=**

Example: **AT+GTUPD=gl53,0,0,20,0,,,http://101.230.71.114:20100/GL53MGR00A06V05M512_upd.bin,0,0,0,12345678,380,FFFF$** **AT+GTUPD=gl53,0,0,20,0,,,http://180.169.235.202:20100/GL53MG_modem_0223_0219_upd.bin,0,7,1,12345678,380,FFFF$**			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Password	4 – 20	'0'-'9', 'a'-'z', 'A'-'Z'	gl53
Sub-Command	1	0	
Max Download Retry	1	0 – 3	0
Download Timeout	2	10 – 30 min	20
Download Protocol	1	0	0
Download User Name	<=6	'0'-'9', 'a'-'z', 'A'-'Z'	
Download Password	<=6	'0'-'9', 'a'-'z', 'A'-'Z'	
Download URL	<=100	legal URL	
Reserved	0		
Update Type	1	0|1|7	0
Extended Status Report	1	0|1	0
Identifier Number	<=8	00000000 - FFFFFFFF	
Serial Number	4	0000-FFFF	
Tail Character	1	$	$

✧ <*Password*>: The valid characters for the password include '0'-9', 'a'-'z', and 'A'-'Z'. The default value is "gl53".

✧ <*Sub-Command*>: The sub-command of **AT+GTUPD**. 0 means "Start the firmware update".

✧ <*Max Download Retry*>: The parameter that specifies the maximum number of retries to download the update package upon download failure.

- <*Download Timeout*>: The parameter that specifies the expiration timeout of one download. If the download expires, it is considered to be failure.
- <*Download Protocol*>: The protocol used to download the package. Only HTTP is supported now. Set it to 0.
- <*Download User Name*>: If the file server uses authentication, the user name is specified here.
- <*Download Password*>: If the file server uses authentication, the password is specified here.
- <*Download URL*>: The parameter that specifies the URL to download the package. The URL is a complete path and must contain an http header, such as http://.
- <*Reserved*>: Reserved for future use.
- <*Update Type*>: The parameter that specifies the type of the firmware to be updated.
  - 0: BB firmware
  - 1: MCU firmware
  - 7: Modem firmware
- <*Extended Status Report*>: The parameter that indicates the message to be reported for the configuration update status when <*Report Enable*> is 1. In HEX format, this parameter will be ignored and only the **+RESP:GTUPD** message will be sent to the backend server.
  - 0: Report the **+RESP:GTUPD** message to indicate the firmware update status.
  - 1: Report the **+RESP:GTEUD** message to indicate the firmware update status.
- <*Identifier Number*>: The parameter that identifies the firmware update request. It will be included in the **+RESP:GTEUD** message to indicate the request it is related to.
- <*Serial Number*>: The exact serial number will be sent back to the platform in ACK. It is in hexadecimal format. It begins from 0000 and increases by 1 every time. It should roll back after "FFFF".
- <*Tail Character*>: A character to indicate the end of the command. It must be '$'.

Note: All buffered messages will be deleted before BB and Modem firmware downloading.

2.1.2. Stop the Firmware Update

Before the device finishes downloading the update package, the backend server can use the **AT+GTUPD (Sub-command: 1)** command to cancel the current firmware update. If the package is downloaded successfully, this command is ignored.

➢ **Stop: AT+GTUPD=**

Example: **AT+GTUPD=gl53,1,,,,,0001$**			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Password	4 – 20	'0'-'9', 'a'-'z', 'A'-'Z'	gl53
Sub-command	1	1	

Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial Number	4	0000-FFFF	
Tail Character	1	$	$

✧ <*Sub-Command*>: The sub-command of **AT+GTUPD**. 1 means “Cancel the current firmware update process”.

2.1.3. Acknowledgement

The acknowledgement message of the **AT+GTUPD** command:

➢ **+ACK:GTUPD,**

Example: +ACK:GTUPD,2E0100,868487004352084,GL53MG,0001,20201111145934,1C64$			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Protocol Version*>: The protocol version that the device conforms to. The first two characters XX indicate the device type. **2E** means GL53MG, and **87** means GL53MG Plus. The middle two characters represent the major version number and the last two characters represent the minor version number. Both of the major version and the minor version are hex digits. For example, **020A** means version 2.10.
✧ <*Unique ID*>: The device’s IMEI.
✧ <*Device Name*>: An ASCII string for the name of the device.
✧ <*Serial Number*>: The <*Serial Number*> in the **AT+GTUPD** command.
✧ <*Send Time*>: The local time when receiving the right **AT+GTXXX** command.
✧ <*Count Number*>: The self-increasing count number will be included in every acknowledgment message. The count begins from 0000 and increases by 1 every time. It will roll back after “FFFF”.

2.2. Report

During the firmware update process, the device reports its status to the backend server via the message **+RESP:GTUPD** upon entering different phases, including the update confirmation information, package download information and firmware update information.

2.2.1. Firmware Update Report in ASCII Format

2.2.1.1. Update Confirmation

The device sends the update confirmation information to the backend server if:

- ✧ the update command is confirmed by the device
- ✧ the update command is refused by the device
- ✧ the update process is canceled by the backend server or refused because of an incorrect URL
- ✧ the update command is refused because of low battery

➢ **Confirmation: +RESP:GTUPD,**

Example: +RESP:GTUPD,2E0100,868487004352084,GL53MG,100,,20201111145212,1C4B$			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Code	3	100 - 103|110 - 114|170 - 173	
Reserved	0		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

- ✧ <*Code*>: The parameter that indicates the confirmation information.
  - 100/110/170: The update command is confirmed by the device.
  - 101/111/171: The update command is refused by the device.
  - 102/112/172: The update process is canceled by the backend server or refused because of an incorrect URL.
  - 103/113/173: The update process is refused because of low battery.
  - 114: The update command is refused by the device because MCU firmware doesn't support the update.

Note: If the value of <*Update Type*> in the command **AT+GTUPD** is 1, the value of <*Code*> will be 110/111/112/113/114. If the value of <*Update Type*> in the command **AT+GTUPD** is 7, the value of <*Code*> will be 170/171/172/173.

2.2.1.2.Package Download

The device sends the package download information to the backend server if:

- ✧ the device starts to download the package
- ✧ the device finishes downloading the package successfully
- ✧ the device fails to download the package

➢ **Download: +RESP:GTUPD,**

Example: +RESP:GTUPD,2E0100,868487004352084,GL53MG,200,1,20201111145212,1C4C$			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Code	3	200 - 203|210 - 212|270 - 273	
Download Times	1	1 – 4	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

- ✧ <*Code*>: The parameter that indicates the download information.
  - 200/210/270: The device starts to download the package.
  - 201/211/271: The device finishes downloading the package successfully.
  - 202/212/272: The device fails to download the package.
  - 203/273: The update process is refused because of an incorrect firmware version.
- ✧ <*Download Times*>: The count number of the package download.

Note: If the value of <*Update Type*> in the command **AT+GTUPD** is 1, the value of <*Code*> will be 210/211/212. If the value of <*Update Type*> in the command **AT+GTUPD** is 7, the value of <*Code*> will be 270/271/272/273.

2.2.1.3.Firmware Update

The device sends the firmware update information to the backend server if:

- ✧ the device starts to update the firmware
- ✧ the device finishes updating the firmware successfully
- ✧ the device fails to update the firmware
- ✧ the update process doesn't start because of low battery

➢ **Update: +RESP:GTUPD,**

Example: +RESP:GTUPD,2E0100,868487004352118,GL53MG,300,,20201111150056,002E$			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Code	3	300 - 303|310 - 313|370 - 373	
Reserved	0		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Code*>: The parameter that indicates the update information.

- 300/310/370: The device starts to update the firmware.
- 301/311/371: The device finishes updating the firmware successfully.
- 302/312/372: The device fails to update the firmware.
- 303/313/373: The update process doesn't start because of low battery.

Note: If the value of <*Update Type*> in the command **AT+GTUPD** is 1, the value of <*Code*> will be 310/311/312/313. If the value of <*Update Type*> in the command **AT+GTUPD** is 7, the value of <*Code*> will be 370/371/372/373.

2.2.2. Extended Firmware Update Report in ASCII Format

2.2.2.1.Update Confirmation

The device will send the update confirmation information to the backend server if:

✧ the update command is confirmed by the device
✧ the update command is refused by the device
✧ the update process is canceled by the backend server or refused because of an incorrect URL
✧ the update command is refused because of low battery

➢ **+RESP:GTEUD,**

Example: +RESP:GTEUD,2E0100,868487004352084,GL53MG,100,,12345678,,,,,20201111162024,1CD8$			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	

Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Code	3	100 - 103|110 - 113|170 - 173	
Reserved	0		
Identifier Number	8	(HEX)	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Code*>: The parameter that indicates the confirmation information.

- 100/110/170: The update command is confirmed by the device.
- 101/111/171: The update command is refused by the device.
- 102/112/172: The update process is canceled by the backend server or refused because of an incorrect URL.
- 103/113/173: The update process is refused because of low battery.

Note: If the value of <*Update Type*> in the command **AT+GTUPD** is 1, the value of <*Code*> will be 110/111/112/113. If the value of <*Update Type*> in the command **AT+GTUPD** is 7, the value of <*Code*> will be 170/171/172/173.

2.2.2.2.Package Download

The device will send the package download information to the backend server if:

✧ the device starts to download the package
✧ the device finishes downloading the package successfully
✧ the device fails to download the package

➢ **+RESP:GTEUD,**

Example: **+RESP:GTEUD,2E0100,868487004352084,GL53MG,200,1,12345678,,,,,20201111162024,1CD9$**			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Code	3	200 - 203|210 - 212|270 - 273	
Download Times	1	1 - 4	
Identifier Number	8	(HEX)	

Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Code*>: The parameter that indicates the download information.
- 200/210/270: The device starts to download the package.
- 201/211/271: The device finishes downloading the package successfully.
- 202/212/272: The device fails to download the package.
- 203/273: The update process is refused because of an incorrect firmware version.

✧ <*Download Times*>: The count number of the package download.

Note: If the value of <*Update Type*> in the command **AT+GTUPD** is 1, the value of <*Code*> will be 210/211/212. If the value of <*Update Type*> in the command **AT+GTUPD** is 7, the value of <*Code*> will be 270/271/272/273.

2.2.2.3.Firmware Update

The device will send the firmware update information to the backend server if:
✧ the device starts to update firmware
✧ the device finishes updating the firmware successfully
✧ the device fails to update the firmware
✧ the update process doesn't start because of low battery

➢ **+RESP:GTEUD,**

Example: +RESP:GTEUD,2E0100,868487004352084,GL53MG,300,,12345678,,,,,20201111162553,1CE5$			
Parameter	**Length (byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Code	3	300 - 303|310 - 313|370 - 373	
Reserved	0		
Identifier Number	8	(HEX)	
Reserved	0		
Reserved	0		

Reserved	0		
Reserved	0		
Send time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Code*>: The parameter that indicates the update information.

- 300/310/370: The device starts to update the firmware.
- 301/311/371: The device finishes updating the firmware successfully.
- 302/312/372: The device fails to update the firmware.
- 303/313/373: The update process does not start because of low battery.

Note: If the value of <*Update Type*> in the command **AT+GTUPD** is 1, the value of <*Code*> will be 310/311/312/313. If the value of <*Update Type*> in the command **AT+GTUPD** is 7, the value of <*Code*> will be 370/371/372/373.

3. Firmware Update Process

The firmware update process includes four steps.

3.1. Initiation of the Update Process

The backend server sends the **AT+GTUPD (Sub-command: 0)** command to the device to initiate the update process. Along with this command, the backend server sends necessary information for the device to start the update process.

It is the backend server's duty to decide when and how to initiate the firmware update process to all the devices it controls. As the response messages collector and the controller, the backend server has all the information it needs to start an update process including the current firmware versions of the devices it controls (retrieved with the **AT+GTRTO** command), the version of the latest available firmware and the location of the proper update packages.

3.2. Confirmation of the Update Process

Upon the **AT+GTUPD (Sub-command: 0)** command, the device will first check the current battery capacity. If the battery capacity can't support the update process, it will report the **+RESP:GTUPD (Code: 103)** message to notify the backend server that the update process is to be aborted because of low battery. If the battery capacity is ample, the device will send the **+RESP:GTUPD** message with confirmation information to the backend server. Then the update process proceeds to the next step.

If the update command is confirmed, the device will turn into a non-interactive mode, during which the end user can't make phone calls, and all incoming calls are rejected automatically until the update process finishes. At the meantime, the device will ignore all the commands that are received from the backend server but not related to the update process. Also the device will stop sending all the reports that aren't related to the update process.

3.3. Download of the Update Package

If the update command is confirmed, the device will use the information sent by the backend server to download the update package. If the device fails to download the update package, it will retry the "Max Download Retry" times that is configured in the upgrade command. If all attempts fail, the update process will be aborted and the device will automatically reboot to go back to the normal working mode. If the download succeeds, the update process will proceed to the next step. Either way, the device will send the **+RESP:GTUPD** message with download information to the backend server.

Before the package is downloaded, the backend server can send the **AT+GTUPD (Sub-command: 1)** command to cancel the current update process. This is the only chance to abort during the update process.

3.4. Update of the Firmware

After downloading the package successfully, the device will check the battery capacity again. If the battery can't support the update process, the device will report the **+RESP:GTUPD (Code: 303)** message to notify the backend server that the update process is to be aborted because of low battery. If the battery capacity is ample, the device will send the **+RESP:GTUPD (Code: 300)** message to the backend server to indicate the start of the update. Then it will use the update package to update the firmware. After the update, whether it succeeds or fails, the device will reboot automatically. After the device boots up, it sends the **+RESP:GTUPD** message with update information to the backend server and works as usual.

3.5. An Example of Successful Update