EG06xK&Ex120K&EM060K Series

LwM2M Application Note

LTE-A Module Series

Version: 1.1

Date: 2024-09-25

Status: Released

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About the Document

Revision History

Version	Date	Author	Description
-	2021-12-16	Jacque YI	Creation of the document
1.0	2023-05-23	Jacque YI/ Noah DENG	First official release
1.1	2024-09-25	Noah DENG	1. Updated the declaration of AT command examples (Chapter 2.2). 2. Optimized the explanation of the <server_addr> parameter (Chapter 2.3.1). 3. Updated the example of AT+CNUM (Chapter 4.1). 4. Updated the server addresses in the examples of AT+QLWCFG (Chapter 4.1 and Chapter 4.2).

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1 Introduction

OMA Lightweight M2M (LwM2M) is a device management protocol designed for sensor networks and the demands of a machine-to-machine (M2M) environment. The LwM2M protocol, designed for remote management of M2M devices and related service enablement, features a modern architectural design based on REST, defines an extensible resource and data model and builds on an efficient secure data transfer standard called the Constrained Application Protocol (CoAP).

This document mainly introduces how to use the LwM2M feature with Quectel EG06xK, Ex120K and EM060K series modules through AT commands.

1.1. Applicable Modules

Table 1: Applicable Modules

Module Family	Module
EG06xK	EG065K Series
	EG060K Series
Ex120K	EM120K-GL
	EG120K Series
-	EM060K Series

2 LwM2M AT Commands

2.1. AT Command Introduction

2.1.1. Definitions

- **<CR>** Carriage return character.
- **<LF>** Line feed character.
- **<...>** Parameter name. Angle brackets do not appear on command line.
- **[...]** Optional parameter of a command or an optional part of TA information response. Square brackets do not appear on command line. When an optional parameter is not given in a command, the new value equals its previous value or the default settings, unless otherwise specified.
- **Underline** Default setting of a parameter.

2.1.2. AT Command Syntax

All command lines must start with **AT** or **at** and end with **<CR>**. Information responses and result codes always start and end with a carriage return character and a line feed character: **<CR><LF><response><CR><LF>**. In tables presenting commands and responses throughout this document, only the commands and responses are presented, and **<CR>** and **<LF>** are deliberately omitted.

Table 2: Types of AT Commands

Command Type	Syntax	Description
Test Command	**AT+<cmd>=?**	Test the existence of the corresponding command and return information about the type, value, or range of its parameter.
Read Command	**AT+<cmd>?**	Check the current parameter value of the corresponding command.
Write Command	**AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]**	Set user-definable parameter value.
Execution Command	**AT+<cmd>**	Return a specific information parameter or perform a specific action.

2.2. Declaration of AT Command Examples

The AT command examples in this document are provided to help you learn about the use of the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendations or suggestions about how to design a program flow or what status to set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there is a correlation among these examples, or that they should be executed in a given sequence. The URLs, domain names, IP addresses, usernames/accounts, and passwords (if any) in the AT command examples are provided for illustrative and explanatory purposes only, and they should be modified to reflect your actual usage and specific needs.

2.3. Description of AT Commands

2.3.1. AT+QLWCFG Configure Optional Parameters of LwM2M

This command configures optional parameters of LwM2M.

AT+QLWCFG Configure Optional Parameters of LwM2M	
Test Command **AT+QLWCFG=?**	Response **+QLWCFG: "security",(**list of supported **<serverID>**s**),(**list of supported **<SSID>**s**),<server_addr>,(**list of supported **<bootstrap>**s**),(**list of supported **<security_mode>**s**),<pskID>,<psk_key>** **+QLWCFG: "server",(**list of supported **<serverID>**s**),(**list of supported **<life_time>**s**),(**list of supported **<period_min>**s**),(**list of supported **<period_max>**s**),(**list of supported **<disable_timeout>**s**),(**list of supported **<storing>**s**),(**list of supported **<binding_mode>**s**)** **+QLWCFG: "epname/mode",(**list of supported **<mode>**s**)** **+QLWCFG: "urc",(**list of supported **<URC_onoff>**s**)** **+QLWCFG: "lwm2m_enable",(**list of supported **<operatorID>**s**),(**list of supported **<auto_startup>**s**)** **+QLWCFG: "hostdevice",<deviceID>,<manufacturer>,<model>,<sw_version>,<fw_version>,<hw_version>,<upgrade_time>** **+QLWCFG: "reset"** **+QLWCFG: "nettype",(**list of supported **<net_type>**s**)** **+QLWCFG: "testmode",<bootstrap_serverURL>** **OK**
Write Command Query/Set the resources of LwM2M security object.	Response If the optional parameters are omitted, query the current setting. **+QLWCFG: "security",<serverID>,<SSID>,<server_addr>,<boo**

AT+QLWCFG="security"[,<serverID>[,<SSID>,<server_addr>,<bootstrap>,<security_mode>[,<pskID>,<psk_key>]]]	**tstrap>,<security_mode>** **OK** If only **<serverID>** is specified and all the other optional parameters are omitted, delete the resources of LwM2M security object of the specified **<serverID>**. **OK** If all optional parameters are specified, set the resources of LwM2M security object. **OK** If there is any error: **ERROR**
Write Command Query/Set the resources of LwM2M server object. **AT+QLWCFG="server"[,<serverID>,<life_time>[,<period_min>[,<period_max>[,<disable_timeout>[,<storing>[,<binding_mode>]]]]]]**	Response If the optional parameters are omitted, query the current setting. **+QLWCFG: "server",<serverID>,<life_time>,<period_min>,<period_max>,<disable_timeout>,<storing>,<binding_mode>** **OK** If only **<serverID>** is specified and all other optional parameters are omitted, delete the LwM2M server properties of the specified **<serverID>**. **OK** If all optional parameters are specified, set the LwM2M server properties. **OK** If there is any error: **ERROR**
Write Command Query/Set mode of endpoint name. **AT+QLWCFG="epname/mode"[,<mode>]**	Response If the optional parameter is omitted, query the current setting. **+QLWCFG: "epname/mode",<mode>** **OK** If the optional parameter is specified, set the mode of endpoint name. **OK** If there is any error:

	ERROR
Write Command Query/Set LwM2M URC enablement. **AT+QLWCFG="urc"[,<URC_onoff>]**	Response If the optional parameter is omitted, query the current setting. **+QLWCFG: "urc",<URC_onoff>** **OK** If the optional parameter is specified, set whether to enable URC report. **OK** If there is any error: **ERROR**
Write Command Query/Set the startup mode of LwM2M client for one or all operators. **AT+QLWCFG="lwm2m_enable"[,<operatorID>[,<auto_startup>]]**	Response If the optional parameters are omitted, query all the operator IDs that enable LwM2M client to auto-start after the module is booted. **+QLWCFG: "lwm2m_enable",<operatorID>** **[+QLWCFG: "lwm2m_enable",<operatorID>]** **[…]** **OK** If **<auto_startup>** is omitted, query whether the LwM2M client under the specified operator network will auto-start after the module is booted. **+QLWCFG: "lwm2m_enable",<auto_startup>** **OK** If the optional parameters are specified, set the startup mode of LwM2M client for one or all operators. **OK** If there is any error: **ERROR**
Write Command Query/Set host device information. **AT+QLWCFG="hostdevice"[,<deviceID>[,<manufacturer>[,<model>[,<sw_version>[,<fw_version>[,<hw_version>[,<upgrade_time>]]]]]]]**	Response If the network is not Verizon and the optional parameters are omitted, query the current host device information. **+QLWCFG: "hostdevice",<deviceID>,<manufacturer>,<model>,<sw_version>** **OK**

	If the network is Verizon and the optional parameters are omitted, query the current host device information under Verizon network. **+QLWCFG: "hostdevice",<deviceID>,<manufacturer>,<model>,<sw_version>,<fw_version>,<hw_version>,<upgrade_time>** **OK** If the network is not Verizon, **<fw_version>**, **<hw_version>**, and **<upgrade_time>** are omitted and other optional parameters are specified, set host device information. **OK** If the network is Verizon and all optional parameters are specified, set host device information. **OK** If there is any error: **ERROR**
Write Command Erase LwM2M client running record. **AT+QLWCFG="reset"**	Response **OK** Or **ERROR**
Write Command Query/Set the network type of LwM2M client. **AT+QLWCFG="nettype"[,<net_type>]**	Response If the optional parameter is omitted, query the current setting. **+QLWCFG: "nettype",<net_type>** **OK** If the optional parameter is specified, set the network type. **OK** If there is any error: **ERROR**
Write Command Set the test mode. **AT+QLWCFG="testmode"[,<bootstrap_serverURL>]**	Response If the optional parameter is omitted, query the current setting. **+QLWCFG: "testmode",<bootstrap_serverURL>** **OK** If the optional parameter is specified, set the test mode. **OK** If there is any error:

	ERROR
Maximum Response Time	150 ms
Characteristics	The commands take effect immediately. The configurations are saved automatically except **<net_type>**.

Parameter

<serverID>	Integer type. Server type. 0 Bootstrap server 1 DM server 2 Diagnostics server 3 Repository server
<SSID>	Integer type. Short server ID. Custom parameter. Range: 1–65534. 100 Bootstrap server under Verizon network 101 Diagnostics server under Verizon network 102 DM server under Verizon network 1000 Repository server under Verizon network Others Other specified servers
<server_addr>	String type. Server address. The format is "address:port", for example, "coaps://example.com:5684".
<bootstrap>	Integer type. Whether it is necessary to connect Bootstrap server. 0 No (Only valid when **<serverID>**≠0) 1 Yes (Only valid when **<serverID>**=0)
<security_mode>	Integer type. Encryption method. 0 Pre-shared key mode 3 Unencrypted mode
<pskID>	String type. Pre-shared key ID. Only valid when **<security_mode>**=0.
<psk_key>	String type in hexadecimal. Pre-shared key. Only valid when **<security_mode>**=0.
<life_time>	Integer type. The lifetime of receiving heartbeat package by server. Range: 1–86400. Default: 60. Unit: second.
<period_min>	Integer type. The minimum response period. Range: 1–86400. Default: 1. Unit: second.
<period_max>	Integer type. The maximum response period. Range: 1–86400. Default: 60. Unit: second.
<disable_timeout>	Integer type. The interval to the next connection after disconnecting from the LwM2M server. Range: 1–86400. Default: 86400. Unit: second.
<storing>	Integer type. Whether to save the server information. 0 Not save 1 Save
<binding_mode>	String type. The binding mode used to connect to the LwM2M server. "U" UDP

	"UQ" UDP with Queue mode "S" SMS "SQ" SMS with Queue mode "US" UDP and SMS "UQS" UDP and SMS with Queue mode
<mode>	Integer type. The format of endpoint name. 3 The endpoint name format: urn:imei:xxxxx 6 The endpoint name format: urn:imei-msisdn:xxxxx-xxx 7 The endpoint name format: urn:imei-imsi:xxxxx-xxx 8 China Mobile DM endpoint name
<URC_onoff>	Integer type. Whether to enable LwM2M URC report. 0 Disable LwM2M URC report 1 Enable LwM2M URC report
<operatorID>	Integer type. Operator type. 0 all operators 1 other operators or no SIM card is inserted 2 Verizon 3 AT&T 4 CMCC 5 DoCoMo 6 Sprint 7 T-Mobile 8 Rogers 9 Bell 10 Telus 11 SoftBank 12 KDDI 13 Rakuten 14 Telstra 15 Deutsche Telekom 16 SK Telecom 17 Korea Telecom 18 LGU+
<auto_startup>	Integer type. For the specified operator, whether the LwM2M function will auto-start. 0 LwM2M will not auto-start when the module is booted. 1 LwM2M will auto-start when the module is booted
<deviceID>	String type. The unique identification code of host device.
<manufacturer>	String type. The manufacturer name of host device.
<model>	String type. The model of host device.
<sw_version>	String type. The software version number of host device.
<fw_version>	String type. The firmware version number of host device.
<hw_version>	String type. The hardware version number of host device.

<upgrade_time>	Integer type. The seconds from January 1,1970 00:00:00 to the last firmware or software update time. If no timestamp is available, 0 is returned.
<net_type>	Integer type. The network type. 0 Others 1 Verizon 2 AT&T
<bootstrap_serverURL>	String type. The bootstrap server URL. If **<bootstrap_serverURL>** is "0", it indicates to clear all the configured URLs and use the default commercial server URL.

2.3.2. AT+QLWREG Send a Register Request to the LwM2M Server

This command sends a register request to the LwM2M server.

AT+QLWREG Send a Register Request to the LwM2M Server	
Test Command **AT+QLWREG=?**	Response **OK**
Execution Command **AT+QLWREG**	Response **OK** Or **ERROR**
Maximum Response Time	150 ms
Characteristics	-

2.3.3. AT+QLWUPDATE Send an Update Request to the LwM2M Server

This command sends an update request to the LwM2M server.

AT+QLWUPDATE Send an Update Request to the LwM2M Server	
Test Command **AT+QLWUPDATE=?**	Response **OK**
Write Command **AT+QLWUPDATE=<SSID>**	Response **OK** Or **ERROR**
Maximum Response Time	150 ms
Characteristics	The command takes effect immediately. The configuration is not saved.

Parameter

<SSID>	Integer type. Server ID. The Bootstrap server is not included.	
	0	All servers
	101	Diagnostics server under Verizon network
	102	DM server under Verizon network
	1000	Repository server under Verizon network
	Others	Other specified servers

2.3.4. AT+QLWDEREG Send a Deregister Request to the LwM2M Server

This command sends a deregister request to the LwM2M server.

AT+QLWDEREG	**Send a Deregister Request to the LwM2M Server**
Test Command **AT+QLWDEREG=?**	Response **OK**
Execution Command **AT+QLWDEREG**	Response **OK** Or **ERROR**
Maximum Response Time	150 ms
Characteristics	-

3 LwM2M Related URCs

This chapter describes LwM2M-related URCs.

3.1. +QLWURC: "pdp active" PDP Activation Result Indication

This URC reports the PDP activation result. Users should use **AT+CGACT** to activate PDP first before sending a registration request to the LwM2M server. For more information on **AT+CGACT**, please refer to ***document [1]***.

+QLWURC: "pdp active" PDP Activation Result Indication	
+QLWURC: "pdp active",<result>,<APN>	This URC reports the PDP activation result.

Parameter

<result>	String type. The PDP activation result. "successfully" "failed"
<APN>	String type. APN name.

3.2. +QLWURC: "initial" Initialization Result Indication

This URC reports the initialization result of the connection between client and the LwM2M server.

+QLWURC: "initial" Initialization Result Indication	
+QLWURC: "initial",<result>,<SSID>	This URC reports the connection initialization result.

Parameter

<result>	String type. The initialization result. "successfully" "failed"

<SSID>	Integer type. Server ID. 100 Bootstrap server under Verizon network 101 Diagnostics server under Verizon network 102 DM server under Verizon network 1000 Repository server under Verizon network Others Other specified servers

3.3. +QLWURC: "dtls" DTLS Handshake Result Indication

This URC reports the DTLS handshake result if the encryption method is used.

+QLWURC: "dtls" DTLS Handshake Result Indication	
+QLWURC: "dtls",<result>,<SSID>	This URC reports the DTLS handshake result.

Parameter

<result>	String type. DTLS handshake result. "successfully" "failed"
<SSID>	Integer type. Server ID. 100 Bootstrap server under Verizon network 101 Diagnostics server under Verizon network 102 DM server under Verizon network 1000 Repository server under Verizon network Others Other specified servers

3.4. +QLWURC: "dns" DNS Resolution Result Indication

This URC reports the DNS resolution result.

+QLWURC: "dns" DNS Resolution Result Indication	
+QLWURC: "dns",<result>,<SSID>	This URC reports the DNS resolution result.

Parameter

<result>	String type. DNS resolution result. "successfully"

	"failed"
<SSID>	Integer type. Server ID. 100 Bootstrap server under Verizon network 101 Diagnostics server under Verizon network 102 DM server under Verizon network 1000 Repository server under Verizon network Others Other specified servers

3.5. +QLWURC: "bootstraping" Bootstrap Working Indication

This URC reports the Bootstrap is working.

+QLWURC: "bootstraping" Bootstrap Working Indication	
+QLWURC: "bootstraping"	This URC reports the Bootstrap is working.

3.6. +QLWURC: "bootstrap" Bootstrap Working Result Indication

This URC reports the working result of Bootstrap.

+QLWURC: "bootstrap" Bootstrap Working Result Indication	
+QLWURC: "bootstrap",<result>,<SSID>	This URC reports the Bootstrap working result.

Parameter

<result>	String type. The working result of Bootstrap. "successfully" "failed"
<SSID>	Integer type. Server ID. 100 Bootstrap server under Verizon network Others Other specified servers

3.7. +QLWURC: "registering" Registration Start Indication

This URC is reported when the client is registering on the LwM2M server.

+QLWURC: "registering" Start Registration Indication	
+QLWURC: "registering"	This URC reports the client is registering.

3.8. +QLWURC: "ready" Registration Result Indication

This URC reports the registration result after the registration request is sent to the LwM2M server.

+QLWURC: "ready" Registration Result Indication	
+QLWURC: "ready",<result>,<SSID>	This URC reports the registration result.

Parameter

<result>	String type. The registration result. "successfully" "failed"
<SSID>	Integer type. Server ID. The Bootstrap server is not included. 101 Diagnostics server under Verizon network 102 DM server under Verizon network 1000 Repository server under Verizon network Others Other specified servers

3.9. +QLWURC: "update" Update Result Indication

This URC reports the update result after the update request is sent to the LwM2M server.

+QLWURC: "update" Update Result Indication	
+QLWURC: "update",<result>,<SSID>	This URC reports the update result.

Parameter

<result>	String type. Update result. "successfully"

	"failed"
<SSID>	Integer type. Server ID. The Bootstrap server is not included. 101 Diagnostics server under Verizon network 102 DM server under Verizon network 1000 Repository server under Verizon network Others Other specified servers

3.10. +QLWURC: "deregister" Deregistration Result Indication

This URC reports the deregistration result after the deregistration request is sent to the LwM2M server.

+QLWURC: "deregister" Deregistration Result Indication	
+QLWURC: "deregister",<SSID>	This URC reports the deregistration result.

Parameter

<SSID>	Integer type. Server ID. The Bootstrap server is not included. 101 Diagnostics server under Verizon network 102 DM server under Verizon network 1000 Repository server under Verizon network Others Other specified servers

4 Examples

This chapter gives examples to explain how to use LwM2M related AT commands. Please start the following test after inserting the SIM card and enable it. For some AT commands mentioned but not described in detail in this document, you can see ***document [1]*** for more details.

4.1. Login to the Verizon LwM2M Test Server

```
AT+QLWDEREG                    //Send a deregister request to the LwM2M Server.
OK
AT+QLWCFG="reset"              //Erase LwM2M client running record.
OK
AT+QLWCFG="security"           //Query the resources of LwM2M security object.
+QLWCFG: "security",0,100,"coaps://example.com:5684",1,0
+QLWCFG: "security",2,101,"coaps://example.com:5684",0,0

OK
AT+QLWCFG="security",0         //Delete the property data of Bootstrap server.
OK
AT+QLWCFG="security"           //Query the current setting.
+QLWCFG: "security",2,101,"coaps://example.com:5684",0,0

OK
AT+GSN                         //Request International Mobile Equipment Identity.
865814040000216

OK
AT+CNUM                        //Query the subscribers' number from the (U)SIM.
+CNUM: "Line 1","+358501234567",145

OK
AT+QLWCFG="security",0,100,"coaps://example.com:5684",1,0,"urn:imei-msisdn:865814040000216-5404498889","d6160c2e7c90399ee7d207a22611e3d3a87241b0462976b935341d000a91e747"
                               //Set the property data of Bootstrap server.
OK
AT+QLWCFG="security"           //Query the current setting.
+QLWCFG: "security",0,100,"coaps://example.com:5684",1,0
```

```
+QLWCFG: "security",2,101,"coaps://example.com:5684",0,0

OK
AT+CFUN=1,1                          //Set the device to full functionality after it is reset.
OK

+QLWURC: "pdp active","successfully","VZWADMIN"
+QLWURC: "dns","successfully",100
+QLWURC: "dtls","successfully",100

+QLWURC: "bootstraping"
+QLWURC: "bootstrap","successfully",100
+QLWURC: "dns","successfully",102
+QLWURC: "dns","successfully",101
+QLWURC: "dtls","successfully",102
+QLWURC: "ready","successfully",102
+QLWURC: "pdp active","successfully","VZWINTERNET"
+QLWURC: "dns","successfully",1000
+QLWURC: "update","successfully",102
+QLWURC: "dtls","successfully",101
+QLWURC: "dtls","successfully",1000
+QLWURC: "ready","successfully",101
+QLWURC: "ready","successfully",1000

OK
```

4.2. Login to the Verizon LwM2M Test Server by Test Mode

```
AT+QLWDEREG                                  //Send a deregister request to the LwM2M server.

OK
AT+QLWCFG="testmode","0"                     //Clear the existing configured URLs.
OK
AT+QLWCFG="testmode","coaps://example.com:5684"   //Configure Bootstrap server URL which the module will connect to.

OK
AT+CFUN=1,1                                  //Set the device to full functionality after it is reset.

OK
```

5 Appendix References

Table 3: Related Document

Document Name
[1] Quectel_EG06xK&Ex120K&EM06xK_Series_AT_Commands_Manual

Table 4: Terms and Abbreviations

Abbreviation	Description
APN	Access Point Name
AT&T	American Telephone & Telegraph
CMCC	China Mobile Communications Corporation
CoAP	Constrained Application Protocol
DM	Device Management
DNS	Domain Name Server
DTLS	Datagram Transport Layer Security
ID	Mostly refers to Identifier in terms of software
LTE	Long Term Evolution
LwM2M	Lightweight Machine to Machine
PDP	Packet Data Protocol
PSK	Pre-Shared Key
REST	Representational State Transfer
SKT	SK Telecom
SMS	Short Message Service

SSID	Service Set Identifier
TA	Terminal Adapter
UDP	User Datagram Protocol
URC	Unsolicited Result Code
URL	Uniform Resource Locator
VZW	Verizon Wireless