

EG06xK&Ex120K&EM060K Series LwM2M Application Note

LTE-A Module Series

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About the Document

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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 Series	Module
EG06xK	EG065K-NA
	EG060K-EA
Ex120K	EM120K-GL
	EG120K-EA
EM060K	EM060K-GL

2 Description of 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 omitted, the new value equals its previous value or its default setting, 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 corresponding Write Command and return information about the type, value, or range of its parameter.
Read Command	AT+<cmd>?	Check the current parameter value of a corresponding Write 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 how to use the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendation or suggestions about how you should design a program flow or what status you should set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there exists a correlation among these examples and that they should be executed in a given sequence.

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", (range of supported <serverID>s),(range of supported <SSID>s),<server_addr>,(list of supported <bootstrap>s),(list of supported <security_mode>s),<pskID>,<psk_key> +QLWCFG: "server", (range of supported <serverID>s),(range of supported <life_time>s),(range of supported <period_min>s),(range of supported <period_max>s),(range of supported <disable_timeout>s),(list of supports <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: "startup", (list of supported <auto_startup>s) +QLWCFG: "lwm2m_enable", (range of supported <operatorID>s),(list of supported <auto_startup>s) +QLWCFG: "fota", (list of supported <download>s),(list of supported <update>s) +QLWCFG: "hostdevice", (list of supported <hostID>s),<device ID>,<manufacturer>,<model>,<sw_version>,<fw_version>,<hw_version>,<upgrade_time> +QLWCFG: "reset" +QLWCFG: "nettype", (range of supported <net_type>s) +QLWCFG: "maxreconntime", (range of supported <unit_reconn_time>s),(range of supported <mult_reconn_time>s),(range of supported <max_delay_time>s)

	<p>+QLWCFG: "testmode",<bootstrap_serverURL></p> <p>OK</p>
<p>Write Command Read/configure the LwM2M server property AT+QLWCFG="security" [<serverID>,<SSID>,<server_addr>,<bootstrap>,<security_mode>,<pskID>,<psk_key>]]]</p>	<p>Response If the optional parameters are omitted, query the current setting: +QLWCFG: "security",<serverID>,<SSID>,<server_addr>,<bootstrap>,<security_mode> ... OK</p> <p>If <SSID>, <server_addr>, <bootstrap>, <security_mode>, <pskID> and <psk_key> are omitted, delete the property data of the specified <serverID>: OK Or ERROR</p> <p>If any of the other optional parameters is specified, configure the specified server property: OK Or ERROR</p>
<p>Write Command Read/configure the LwM2M server attribute AT+QLWCFG="server" [<serverID>,<life_time>,<period_min>,<period_max>,<disable_timeout>,<storing>,<binding_mode>]]]]]</p>	<p>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</p> <p>If any of the optional parameters are specified, configure the server attribute: OK Or ERROR</p>
<p>Write Command Read/configure mode of end point name AT+QLWCFG="epname/mode" [<mode>]</p>	<p>Response If the optional parameter is omitted, query the current setting: +QLWCFG: "epname/mode",<mode></p> <p>OK</p> <p>If the optional parameter is specified, configure the mode of end point name:</p>

	<p>OK Or ERROR</p>
<p>Write Command Read/configure LwM2M URC enablement AT+QLWCFG="urc",<URC_onoff></p>	<p>Response If the optional parameter is omitted, query the current setting: +QLWCFG: "urc",<URC_onoff></p> <p>OK</p> <p>If the optional parameter is specified, configure whether to enable URC report: OK Or ERROR</p>
<p>Write Command Read/configure the startup mode of LwM2M client for current operator AT+QLWCFG="startup",<auto_startup></p>	<p>Response If the optional parameter is omitted, query the current setting: +QLWCFG: "startup",<auto_startup></p> <p>OK</p> <p>If the optional parameter is specified, configure the startup mode: OK Or ERROR</p>
<p>Write Command Read/configure the startup mode of LwM2M client for one or all operators AT+QLWCFG="lwm2m_enable",<operatorID>,<auto_startup>]</p>	<p>Response If the optional parameters are omitted, query all the operators: +QLWCFG: "lwm2m_enable",<operatorID></p> <p>OK</p> <p>If <auto_startup> is omitted, query the specified operator: +QLWCFG: "lwm2m_enable",<operatorID></p> <p>OK</p> <p>If the optional parameters are specified, configure the startup mode: OK Or ERROR</p>
<p>Write Command Read/configure FOTA mode AT+QLWCFG="fota",<download>,<update></p>	<p>Response If the optional parameters are omitted, query the current setting: +QLWCFG: "fota",<download>,<update></p> <p>OK</p>

	<p>If the optional parameters are specified, configure the FOTA mode: OK Or ERROR</p>
<p>Write Command Read/configure host device information if the network is not Verizon AT+QLWCFG="hostdevice",<hostID>,<deviceID>,<manufacturer>,<model>,<sw_version>]</p>	<p>Response If the optional parameters are omitted, query the current setting: +QLWCFG: "hostdevice",<hostID>,<deviceID>,<manufacturer>,<model>,<sw_version> OK If the optional parameters are specified, configure host device information: OK Or ERROR</p>
<p>Write Command Read/configure host device information under Verizon network AT+QLWCFG="hostdevice",<hostID>,<deviceID>,<manufacturer>,<model>,<sw_version>,<fw_version>,<hw_version>,<upgrade_time>]]]]]]]]]</p>	<p>Response If the optional parameters are omitted, query the current setting: +QLWCFG: "hostdevice",<hostID>,<deviceID>,<manufacturer>,<model>,<sw_version>,<fw_version>,<hw_version>,<upgrade_time> OK If any of the optional parameters is specified, configure host device information: OK Or ERROR</p>
<p>Execution Command Erase LwM2M client running record AT+QLWCFG="reset"</p>	<p>Response OK Or ERROR</p>
<p>Write Command Read/configure the net type of LwM2M client AT+QLWCFG="nettype",<net_type>]</p>	<p>Response If the optional parameter is omitted, query the current setting: +QLWCFG: "nettype",<net_type> OK If the optional parameter is specified, configure the net type: OK Or ERROR</p>

<p>Write Command Read/configure the reconnection attribute AT+QLWCFG="maxreconntime "[,<unit_reconn_time>,<mult_reconn_time>,<max_delay_time>]</p>	<p>Response If the optional parameters are omitted, query the current setting: +QLWCFG: "maxreconntime",<unit_reconn_time>,<mult_reconn_time>,<max_delay_time> OK If the optional parameters are specified, configure the specified reconnection: OK Or ERROR</p>
<p>Write Command Configure the test mode AT+QLWCFG="testmode" [<bootstrap_serverURL>]</p>	<p>Response If the optional parameter is omitted, query the current setting: +QLWCFG: "testmode",<bootstrap_serverURL> OK If the optional parameter is specified, configure the test mode: OK Or ERROR</p>
<p>Maximum Response Time</p>	<p>150 ms</p>
<p>Characteristics</p>	<p>The commands take effect immediately. The configurations will be saved automatically while the <net_type> will not be saved.</p>

Parameter

<p><serverID></p>	<p>Integer type. Server type. 0 Bootstrap server 1 DM server 2 Diagnostics server 3 Repository server</p>
<p><SSID></p>	<p>Integer type. Short server ID. Custom parameter. Range: 1–65535. For Verizon network, the valid values are: 100 Bootstrap server 101 Diagnostics server 102 DM server 1000 Repository server</p>
<p><server_addr></p>	<p>String type. Server address. The format is "address:port", for example "coaps://boot.lwm2m.vzwdm.com:5684".</p>
<p><bootstrap></p>	<p>Integer type. Bootstrap server flag.</p>

	0	Not bootstrap (Only valid when <serverID> is not 0)
	1	Bootstrap (Only valid when <serverID>=0)
<security_mode>		Integer type. Encryption method.
	0	Pre-share key mode
	3	No security mode
<pskID>		String type. Pre-shared key identity. Only valid when <security_mode>=0.
<psk_key>		String type in hexadecimal. Pre-share 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 value: 1. Unit: second.
<period_max>		Integer type. The maximum response period. Range: 1–86400. Default value: 60. Unit: second.
<disable_timeout>		Integer type. The interval to the next connection after disconnecting from the LwM2M server. Range: 1–86400. Default value: 86400. Unit: second.
<storing>		Integer type. Whether to save the server information.
	0	Do not save
	1	Save
<binding_mode>		String type. The binding mode used to connect 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.
	0	Disable LwM2M URC report
	1	Enable LwM2M URC report
<auto_startup>		Integer type.
	0	LwM2M will not be started automatically when the module is powered on
	1	LwM2M will be started automatically when the module is powered on
<operator_id>		Integer type. Operator type.
	0	operator_all
	1	operator_default (No SIM card is inserted)
	2	VZW
	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	DT
	16	SKT
	17	KT
	18	LGU+
<download>		Integer type. The mode of downloading delta firmware package.
	0	Download package manually
	1	Download package automatically
<update>		Integer type. The update mode of FOTA.
	0	Update manually
	1	Update automatically
<hostID>		Integer type. The identity of host device. Range: 0–1.
<deviceID>		String type. The device ID 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 time stamp is available, 0 is returned.
<net_type>		Integer type. The network type.
	0	Others
	1	Verizon
	2	AT&T
<unit_reconn_time>		Integer type. The coefficient of the wait time before retrying. Range: 1–86400. Default value: 1 (300 under AT&T network). Unit: second.
<mult_reconn_time>		Integer type. Base number of the wait time before retrying. Range: 2–86400. Default value: 2 (5 under AT&T network).
<max_delay_time>		Integer type. The max delay time of the wait time before retrying. Range: 0–86400. Default value: 0 (86400 under AT&T network). Unit: second. The module will retry to connect if <max_delay_time> is greater than the delay time calculated by the following formula, otherwise, it will end reconnection.

Delay time = <unit_reconn_time> x <mult_reconn_time> ^
reconnection times.

<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 will not be saved.

Parameter

<SSID>	Integer type. Short server ID. 0 All servers Others Other specified servers
--------	---

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

This command launches 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 gives LwM2M related URCs and descriptions.

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

This URC is reported to the activation result of PDP. The PDP should be activated before sending register request to the LwM2M server.

+QLWURC: "pdp active" PDP Activation Indication

+QLWURC: "pdp active",<result>,<APN>

This URC is reported to indicate the PDP activation result.

Parameter

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

3.2. +QLWURC: "initial" Initialization Indication

This URC is reported to the initialization result of connection between client and the LwM2M server.

+QLWURC: "initial" Initialization Indication

+QLWURC: "initial",<result>,<SSID>

This URC is reported to indicate the connection initialization result.

Parameter

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

<SSID>	Integer type. Short server ID.
	0 All servers
	Others Specified server

3.3. +QLWURC: "dtls" DTLS Handshake Indication

This URC is reported to indicate the DTLS handshake result if the encryption method is used.

+QLWURC: "dtls" DTLS Handshake Indication

+QLWURC: "dtls",<result>,<SSID>

This URC is reported to indicate the DTLS handshake result.

Parameter

<result>	String type. DTLS handshake result. "successfully" "failed"
<SSID>	Integer type. Short server ID. 0 All servers Others Specified server

3.4. +QLWURC: "dns" DNS Resolution Indication

This URC is reported to indicate the DNS resolution result.

+QLWURC: "dns" DNS Resolution Indication

+QLWURC: "dns",<result>,<SSID>

This URC is reported to indicate the DNS resolution result.

Parameter

<result>	String type. DNS resolution result. "successfully" "failed"
<SSID>	Integer type. Short server ID. 0 All servers Others Specified server

3.5. +QLWURC: "bootstraping" Bootstrap Working Indication

This URC is reported when Bootstrap is working.

+QLWURC: "bootstraping" Bootstrap Working Indication	
+QLWURC: "bootstraping"	This URC is reported to indicate that the Bootstrap is working.

3.6. +QLWURC: "bootstrap" Bootstrap Indication

This URC is reported to indicate the working result of Bootstrap.

+QLWURC: "bootstrap" Bootstrap Indication	
+QLWURC: "bootstrap",<result>,<SSID>	This URC is reported to indicate the Bootstrap working result.

Parameter

<result>	String type. The working result of Bootstrap. "successfully" "failed"
<SSID>	Integer type. Short server ID. 0 All servers Others Specified server

3.7. +QLWURC: "registering" Start Registration Indication

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

+QLWURC: "registering" Start Registration Indication	
+QLWURC: "registering"	This URC is reported to indicate that the client is registering.

3.8. +QLWURC: "ready" Registration Indication

This URC is reported to indicate the registration result after sending the register request to the LwM2M server.

+QLWURC: "ready" Registration Indication

+QLWURC: "ready",<result>,<SSID>

This URC is reported to indicate the registration result.

Parameter

<result>	String type. The registration result. "successfully" "failed"
<SSID>	Integer type. Short server ID. 0 All servers Others Specified server

3.9. +QLWURC: "update" Update Indication

This URC is reported to indicate the update result after sending the update request to the LwM2M server.

+QLWURC: "update" Update Indication

+QLWURC: "update",<result>,<SSID>

This URC is reported to indicate the update result.

Parameter

<result>	String type. Update result. "successfully" "failed"
<SSID>	Integer type. Short server ID. 0 All servers Others Specified server

3.10. +QLWURC: "deregister" Deregistration Indication

This URC is reported to indicate the deregistration result after sending deregister request to the LwM2M

server.

+QLWURC: "deregister" Deregistration Indication**+QLWURC: "deregister",<SSID>**

This URC is reported to indicate the deregistration result.

Parameter

<SSID>	Integer type. Short server ID.
0	All servers
Others	Specified server

4 Examples

This chapter gives the examples to explain how to use LwM2M related AT commands. Please start the following test after inserting the SIM card and turning it on.

4.1. Login to the VZW LwM2M Test Server

```

AT+QLWDEREG
OK
AT+QLWCFG="RESET"
OK
AT+QLWCFG="security"
+QLWCFG: "security",0,100,"coaps://boot.lwm2m.vzwdm.com:5684",1,0
+QLWCFG: "security",2,101,"coaps://diag.lwm2m.vzwdm.com:5684",0,0

OK
AT+QLWCFG="security",0
OK
AT+QLWCFG="security"
+QLWCFG: "security",2,101,"coaps://diag.lwm2m.vzwdm.com:5684",0,0
OK
AT+GSN
865814040000216

OK
AT+CNUM
+CNUM: "Line 1", "+15404498889", 145

OK
AT+QLWCFG="security",0,100,"coaps://xvzwcdpii.xdev.motive.com:5684",1,0,"urn:imei-msisdn:8
65814040000216-5404498889", "d6160c2e7c90399ee7d207a22611e3d3a87241b0462976b935341d00
0a91e747"
OK
AT+QLWCFG="security"
+QLWCFG: "security",0,100,"coaps://xvzwcdpii.xdev.motive.com:5684",1,0
+QLWCFG: "security",2,101,"coaps://diag.lwm2m.vzwdm.com:5684",0,0

OK
    
```

```

AT+QLWCFG="startup",1
OK
AT+CFUN=1,1
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 VZW LwM2M Test Server by Test Mode

```

AT+QLWDEREG
OK
AT+QLWCFG="testmode","0" //Use the command to clear currently existing
                           configuration files
OK
AT+QLWCFG="testmode","coaps://xvzwcpii.xdev.motive.com:5684" //Configure BS server URL
                                                                which will connect to
OK
AT+QLWCFG="startup",1
OK
AT+CFUN=1,1 //Restart the module for the configuration to
              take effect
OK
    
```

5 Appendix References

Table 3: Related Documents

Document Name
[1] Quectel_EG06xK&Ex120K&EM060K_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
FOTA	Firmware Over-The-Air
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
