LTE Standard MQTT Application Note

LTE Standard Module Series

Rev. LTE_Standard_MQTT_Application_Note_V1.2

Date: 2020-04-22

Status: Released

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About the Document

Revision History

Version	Date	Author	Description
1.0	2018-08-21	Chavis CHEN	Initial
1.1	2018-12-12	Slark WANG	Added Write Command AT+QMTCFG="qmtping" and its related information
1.2	2020-04-22	Chavis CHEN/ Domingo DENG/ Larson LI	1. Added applicable modules in Chapter 1. 2. Updated MQTT data interaction diagram in Chapter 2. 3. Updated description of Test Command AT+QMTCFG=? and added Write Command AT+QMTCFG="willex" in Chapter 3.2.1. 4. Added <pkt_timeout> configuration in the parameter table in Chapter 3.2.4, 3.2.6, 3.2.7 and 3.2.8. 5. Updated error codes of the URC in Table 4.

Contents

Table Index

1 Introduction

MQTT is a broker-based publish/subscribe messaging protocol designed to be open, simple, lightweight and easy to implement. It is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited.

This document mainly introduces how to use the MQTT function of Quectel LTE standard modules through AT commands.

1.1. Applicable Modules

This document is applicable to following Quectel modules.

Table 1: Applicable Modules

Module Series	Module
EC2x series	EC20 R2.1
	EC21 series
	EC25 series
EG2x-G	EG21-G
	EG25-G
EG9x series	EG91 series
	EG95 series
EM05 series	EM05 series

2 MQTT Data Interaction

This chapter gives the data interaction mechanism of MQTT function.
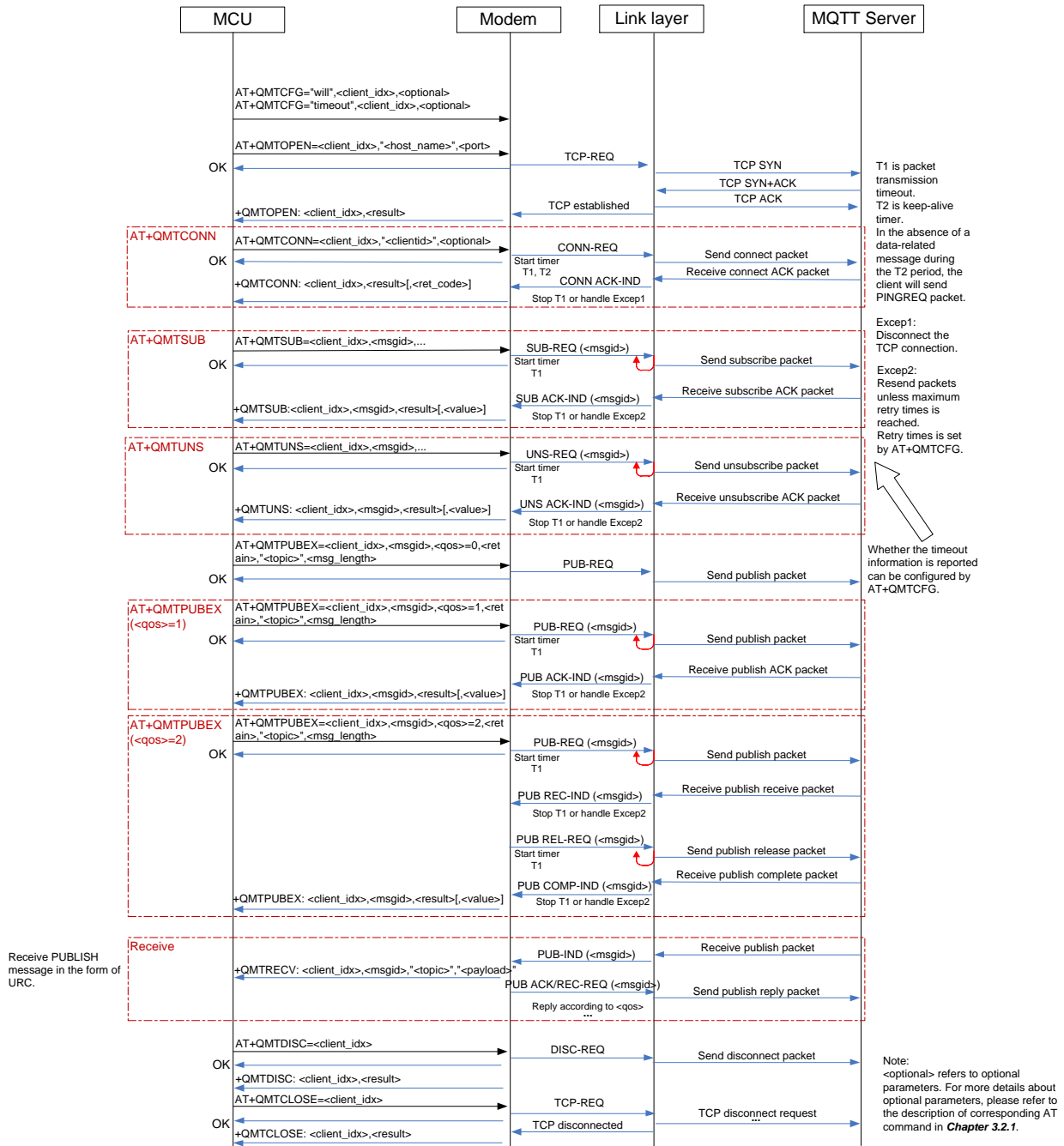
Figure 1: MQTT Data Interaction Diagram

3 MQTT Related AT Commands

This chapter presents the AT commands for operating MQTT function.

3.1. AT Command Syntax

3.1.1. 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.

3.1.2. AT Command Syntax

The **AT** or **at** prefix must be added at the beginning of each command line. Entering **<CR>** will terminate a command line. Commands are usually followed by a response that includes **<CR><LF><response><CR><LF>**. Throughout this document, only the response **<response>** will be presented, **<CR><LF>** are omitted intentionally.

Table 2: Type of AT Commands and Responses

Test Command	AT+<cmd>=?	This command returns the list of parameters and value ranges set by the corresponding Write Command or internal processes.
Read Command	AT+<cmd>?	This command returns the currently set value of the parameter or parameters.
Write Command	AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]	This command sets the user-definable parameter values.
Execution Command	AT+<cmd>	This command reads non-variable parameters affected by internal processes in the module.

3.2. Description of MQTT Related AT Commands

3.2.1. AT+QMTCFG   Configure Optional Parameters of MQTT

This command configures optional parameters of MQTT.

AT+QMTCFG Configure Optional Parameters of MQTT	
Test Command **AT+QMTCFG=?**	Response **+QMTCFG: "version",(**range of supported **<client_idx>**s**),(**list of supported **<vsn>**s**)** **+QMTCFG: "pdpcid",(**range of supported **<client_idx>**s**),(**range of supported **<cid>**s**)** **+QMTCFG: "ssl",(**range of supported **<client_idx>**s**),(**list of supported **<SSL_enable>**s**),(**range of supported **<SSL_ctx_idx>**s**)** **+QMTCFG: "keepalive",(**range of supported **<client_idx>**s**),(**range of supported **<keep_alive_time>**s**)** **+QMTCFG: "session",(**range of supported **<client_idx>**s**),(**list of supported **<clean_session>**s**)** **+QMTCFG: "timeout",(**range of supported **<client_idx>**s**),(**range of supported **<pkt_timeout>**s**),(**range of supported **<retry_times>**s**),(**list of supported **<timeout_notice>**s**)** **+QMTCFG: "will",(**range of supported **<client_idx>**s**),(**list of supported **<will_fg>**s**),(**range of supported **<will_qos>**s**),(**list of supported **<will_retain>**s**),"willtopic","willmessage"** **+QMTCFG: "willex",(**range of supported **<client_idx>**s**),(**list of supported **<will_fg>**s**),(**range of supported **<will_qos>**s**),(**list of supported **<will_retain>**s**),"willtopic",(**range of supported **<will_len>**s**)** **+QMTCFG: "recv/mode",(**range of supported **<client_idx>**s**),(**list of supported **<msg_recv_mode>**s**),(**list of supported **<msg_len_enable>**s**)** **+QMTCFG: "aliauth",(**range of supported **<client_idx>**s**),"productkey","devicename","devicesecret"** **+QMTCFG: "qmtping",(**range of supported **<client_idx>**s**),(**range of supported **<qmtping_interval>**s**)** **OK**
Write Command Configure the MQTT protocol version **AT+QMTCFG="version",<client_idx>[,<vsn>]**	Response If **<vsn>** is omitted, query the MQTT protocol version: **+QMTCFG: "version",<vsn>**

	OK
	If **\<vsn\>** is specified and the MQTT connection is not established, configure the MQTT protocol version:
	OK
	Or
	ERROR
Write Command Configure the PDP to be used by the MQTT client **AT+QMTCFG="pdpcid",\<client_idx\>[,\<cid\>]**	Response If **\<cid\>** is omitted, query the PDP to be used by the MQTT client: **+QMTCFG: "pdpcid",\<cid\>** **OK** If **\<cid\>** is specified and the MQTT connection is not established, configure the PDP to be used by the MQTT client: **OK** Or **ERROR**
Write Command Configure Will information **AT+QMTCFG="will",\<client_idx\>[,\<will_fg\>[,\<will_qos\>,\<will_retain\>,"\<will_topic\>","\<will_msg\>"]]**	Response: If **\<will_fg\>**, **\<will_qos\>**, **\<will_retain\>**, "**\<will_topic\>**" and "**\<will_msg\>**" are omitted, query the Will information: **+QMTCFG: "will",\<will_fg\>[,\<will_qos\>,\<will_retain\>,"\<will_topic\>","\<will_msg\>"]** **OK** If **\<will_fg\>**, **\<will_qos\>**, **\<will_retain\>**, "**\<will_topic\>**" and "**\<will_msg\>**" are specified and the MQTT connection is not established, configure the Will information: **OK** Or **ERROR**
Write Command Configure Will information **AT+QMTCFG="willex",\<client_idx\>[,\<will_fg\>[,\<will_qos\>,\<will_retain\>,"\<will_topic\>",\<will_len\>]]**	Response If **\<will_fg\>**, **\<will_qos\>**, **\<will_retain\>**, "**\<will_topic\>**", **\<will_len\>** are omitted, query the current configuration: **+QMTCFG: "willex",\<will_fg\>,[\<will_qos\>,\<will_retain\>,"\<will_topic\>","\<will_msg\>"]** **OK** If **\<will_fg\>**, **\<will_qos\>**, **\<will_retain\>**, "**\<will_topic\>**", **\<will_len\>** are specified, configure the Will information: **>**

	Input the Will message. When the actual size of data is greater than **<will_len>**, the first **<will_len>** byte(s) data will be sent out. **OK** Or **ERROR**
Write Command Configure timeout of message delivery **AT+QMTCFG="timeout",<client_id x>[,<pkt_timeout>,<retry_times>,< timeout_notice>]**	Response If **<pkt_timeout>**, **<retry_times>** and **<timeout_notice>** are omitted, query the timeout of message delivery: **+QMTCFG: "timeout",<pkt_timeout>,<retry_times>,<timeou t_notice>** **OK** If **<pkt_timeout>**, **<retry_times>** and **<timeout_notice>** are specified and the MQTT connection is not established, configure timeout of message delivery: **OK** Or **ERROR**
Write Command Configure the session type **AT+QMTCFG="session",<client_id x>[,<clean_session>]**	Response If **<clean_session>** is omitted, query the session type: **+QMTCFG: "session",<clean_session>** **OK** If **<clean_session>** is specified and the MQTT connection is not established, configure the session type: **OK** Or **ERROR**
Write Command Configure the keep-alive time **AT+QMTCFG="keepalive",<client_ idx>[,<keep_alive_time>]**	Response If **<keep_alive_time>** is omitted, query the keep-alive time: **+QMTCFG: "keepalive",<keep_alive_time>** **OK** If **<keep_alive_time>** is specified and the MQTT connection is not established, configure the keep-alive time: **OK** Or **ERROR**
Write Command Configure the MQTT SSL mode and SSL context index	Response If **<SSL_enable>** and **<SSL_ctx_idx>** are omitted, query the MQTT SSL mode and SSL context index:

AT+QMTCFG="ssl",<client_idx>[,<SSL_enable>,<SSL_ctx_idx>]	+QMTCFG: "ssl",<SSL_enable>[,<SSL_ctx_idx>] **OK** If **<SSL_enable>** and **<SSL_ctx_idx>** are specified and the MQTT connection is not established, configure the MQTT SSL mode and SSL context index: **OK** Or **ERROR**
Write Command Configure receiving mode when data is received from server **AT+QMTCFG="recv/mode",<client_idx>[,<msg_recv_mode>[,<msg_len_enable>]]**	Response If **<msg_recv_mode>** and **<msg_len_enable>** are omitted, query the MQTT message receiving mode: +QMTCFG: "recv/mode",<msg_recv_mode>,<msg_len_enable> **OK** If **<msg_recv_mode>** and **<msg_len_enable>** are specified and the MQTT connection is not established, configure the receiving mode when data is received from server: **OK** Or **ERROR**
Write Command Configure Alibaba device information for Alibaba Cloud **AT+QMTCFG="aliauth",<client_idx>[,"<product_key>","<device_name>","<device_secret>"]**	Response If **"<product_key>"**, **"<device_name>"** and **"<device_secret>"** are omitted, query the device information: +QMTCFG: "aliauth","<product_key>","<device_name>","<device_secret>" **OK** If **"<product_key>"**, **"<device_name>"** and **"<device_secret>"** are specified and the MQTT connection is not established, configure Alibaba device information for Alibaba Could: **OK** Or **ERROR**
Write Command Configure the MQTT heartbeat interval **AT+QMTCFG="qmtping",<client_idx>[,<qmtping_interval>]**	Response If **<qmtping_interval>** is omitted, query the current configuration: +QMTCFG: "qmtping",<qmtping_interval>

	OK
	If **\<qmtping_interval\>** is specified, and the MQTT connection is not established, configure the MQTT heartbeat interval: **OK** Or **ERROR**
Maximum Response Time	300 ms
Characteristics	These commands take effect immediately. The configurations will not be saved.

Parameter

\<client_idx\>	Integer type. MQTT client identifier. Range: 0–5.
\<vsn\>	Integer type. MQTT protocol version.
	<u>3</u> MQTT protocol V3.1
	4 MQTT protocol V3.1.1
\<cid\>	Integer type. The PDP to be used by the MQTT client. Range: 1–16. Default: 1.
\<will_fg\>	Integer type. Configure the Will flag.
	<u>0</u> Ignore the Will flag configuration
	1 Require the Will flag configuration
\<will_qos\>	Integer type. Quality of service for message delivery.
	<u>0</u> At most once
	1 At least once
	2 Exactly once
\<will_retain\>	Integer type. The Will retain flag is only used on PUBLISH messages.
	<u>0</u> When a client sends a PUBLISH message to a server, the server will not hold on to the message after it has been delivered to the current subscribers.
	1 When a client sends a PUBLISH message to a server, the server should hold on to the message after it has been delivered to the current subscribers.
\<will_topic\>	String type. Will topic string. Range: 1–256.
\<will_msg\>	String type. The Will message defines the content of the message that is published to the Will topic when the client is unexpectedly disconnected. Range: 0–256.
\<will_len\>	Integer type. The length of Will message. Range: 0–256.
\<pkt_timeout\>	Integer type. Timeout of the packet delivery. Range: 1–60. Default: 5. Unit: s.
\<retry_times\>	Integer type. Retry times when packet delivery times out. Range: 0–10. Default: 3.
\<timeout_notice\>	Integer type. Whether to report timeout message when transmitting packet.
	<u>0</u> Not report
	1 Report
\<clean_session\>	Integer type. Configure the session type.
	0 The server must store the subscriptions of the client after it disconnects.

	1	The server must discard any previously maintained information about the client and treat the connection as "clean".
<keep_alive_time>		Integer type. Keep-alive time. Range: 0–3600. Default: 120. Unit: s. It defines the maximum time interval between messages received from a client. If the server does not receive a message from the client within 1.5 times of the keep-alive time period, it disconnects the client as if the client has sent a DISCONNECT message.
	0	The client will not be disconnected
<SSL_enable>		Integer type. Configure the MQTT SSL mode.
	0	Use normal TCP connection for MQTT
	1	Use SSL TCP secure connection for MQTT
<SSL_ctx_idx>		Integer type. SSL context index. Range: 0–5.
<msg_recv_mode>		Integer type. Configure the MQTT message receiving mode.
	0	MQTT message received from server will be contained in URC.
	1	MQTT message received from server will not be contained in URC.
<msg_len_enable>		Integer type. Whether length of MQTT message received from server will be contained in URC.
	0	Not contained
	1	Contained
<product_key>		String type. Product key issued by Alibaba Cloud.
<device_name>		String type. Device name issued by Alibaba Cloud.
<device_secret>		String type. Device secret key issued by Alibaba Cloud.
<qmtping_interval>		Integer type. The heartbeat interval. Range: 5–60. Default: 5. Unit: s.

NOTES

1. If **<will_fg>**=1, then **<will_qos>**, **<will_retain>**, "**<will_topic>**" and "**<will_msg>**" must be specified. Otherwise they will be omitted.
2. **<clean_session>**=0 is only effective when the server supports the operation.
3. If MQTT connection is configured to SSL mode, **<SSL_ctx_idx>** must be specified. Also, customers need to use **AT+QSSLCFG** to configure the SSL version, cipher suite, secure level, CA certificate, client certificate, client key and ignorance of RTC time, which will be used in MQTT SSL handshake procedure.
4. Please ensure that message delivery does not time out while it is still being sent.
5. **AT+QMTCFG="aliauth"** command is only used for Alibaba Cloud. If it is configured, "**<username>**" and "**<password>**" in **AT+QMTCONN** can be omitted.

3.2.2. AT+QMTOPEN Open a Network for MQTT Client

This command opens a network for MQTT client.

AT+QMTOPEN Open a Network for MQTT Client	
Test Command **AT+QMTOPEN=?**	Response **+QMTOPEN: (**range of supported **<client_idx>**s**),"<host_name>",(**range of supported **<port>**s**) **OK**
Read Command **AT+QMTOPEN?**	Response **[+QMTOPEN: <client_idx>,"<host_name>",<port>]** **OK** Or **ERROR**
Write Command **AT+QMTOPEN=<client_idx>,"<host_name>",<port>**	Response **OK** **+QMTOPEN: <client_idx>,<result>** Or **ERROR**
Maximum Response Time	120 s, determined by network
Characteristics	/

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<host_name>	String type. The address of the server. It could be an IP address or a domain name. The maximum size is 100 bytes.
<port>	Integer type. The port of the server. Range: 1–65535.
<result>	Integer type. Result of the command execution.
	-1 Failed to open network
	0 Network opened successfully
	1 Wrong parameter
	2 MQTT identifier is occupied
	3 Failed to activate PDP
	4 Failed to parse domain name
	5 Network connection error

3.2.3. AT+QMTCLOSE Close a Network for MQTT Client

This command closes a network for MQTT client.

AT+QMTCLOSE Close a Network for MQTT Client	
Test Command **AT+QMTCLOSE=?**	Response **+QMTCLOSE: (**range of supported **<client_idx>**s**)** **OK**
Write Command **AT+QMTCLOSE=<client_idx>**	Response **OK** **+QMTCLOSE: <client_idx>,<result>** Or **ERROR**
Maximum Response Time	30 s
Characteristics	/

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<result>	Integer type. Result of the command execution.
	-1 Failed to close network
	0 Network closed successfully

3.2.4. AT+QMTCONN Connect a Client to MQTT Server

This command connects a client to MQTT server. When a TCP/IP socket connection is established from a client to a server, a protocol level session must be created using a CONNECT flow.

AT+QMTCONN Connect a Client to MQTT Server	
Test Command **AT+QMTCONN=?**	Response **+QMTCONN: (**range of supported **<client_idx>**s**),"clienti d","username","password"** **OK**
Read Command **AT+QMTCONN?**	Response **[+QMTCONN: <client_idx>,<state>]** **OK** Or

	ERROR
Write Command **AT+QMTCONN=<client_idx>,"<clienti d>"[,"<username>","<password>"]**	Response **OK** **+QMTCONN: <client_idx>,<result>[,<ret_code>]** Or **ERROR**
Maximum Response Time	**<pkt_timeout>** (default 5 s), determined by network
Characteristics	/

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<clientid>	String type. The client identifier string.
<username>	String type. User name of the client. It can be used for authentication.
<password>	String type. Password corresponding to the user name of the client. It can be used for authentication.
<result>	Integer type. Result of the command execution. 0　Packet sent successfully and ACK received from server 1　Packet retransmission 2　Failed to send packet
<state>	Integer type. MQTT connection state. 1　MQTT is initializing 2　MQTT is connecting 3　MQTT is connected 4　MQTT is disconnecting
<ret_code>	Integer type. Connection status return code. 0　Connection Accepted 1　Connection Refused: Unacceptable Protocol Version 2　Connection Refused: Identifier Rejected 3　Connection Refused: Server Unavailable 4　Connection Refused: Bad User Name or Password 5　Connection Refused: Not Authorized
<pkt_timeout>	Integer type. Timeout of the packet delivery. Range: 1–60. Default: 5. Unit: s. The value can be configured by **AT+QMTCFG="timeout",<client_idx>[,<pkt_timeout>,<retry_times>,<timeout_notice>]**.

NOTE

If a client with the same Client ID is already connected to the server, the "older" client must be disconnected by the server before completing the CONNECT flow of the new client.

3.2.5. AT+QMTDISC   Disconnect a Client from MQTT Server

This command disconnects a client from MQTT server. A DISCONNECT message is sent from the client to the server to indicate that it is about to close its TCP/IP connection.

AT+QMTDISC Disconnect a Client from MQTT Server	
Test Command **AT+QMTDISC=?**	Response **+QMTDISC: (**range of supported **<client_idx>**s**)** **OK**
Write Command **AT+QMTDISC=<client_idx>**	Response **OK** **+QMTDISC: <client_idx>,<result>** Or **ERROR**
Maximum Response Time	30 s
Characteristics	/

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<result>	Integer type. Result of the command execution.
	-1 Failed to close connection
	0 Connection closed successfully

3.2.6. AT+QMTSUB   Subscribe to Topics

This command subscribes to one or more topics. A SUBSCRIBE message is sent by a client to register an interest in one or more topic names with the server. Messages published to these topics are delivered from the server to the client as PUBLISH messages.

AT+QMTSUB Subscribe to Topics	
Test Command **AT+QMTSUB=?**	Response **+QMTSUB: (**range of supported **<client_idx>**s**),<msgid>,**list of **["topic",qos]** **OK**
Write Command **AT+QMTSUB=<client_idx>,<msgid>** **,"<topic1>",<qos1>[,"<topic2>",<qo**	Response **OK**

s2>…]	**+QMTSUB: <client_idx>,<msgid>,<result>[,<value>]** Or **ERROR**
Maximum Response Time	**<pkt_timeout> × <retry_times>** (default 15 s), determined by network
Characteristics	/

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<msgid>	Integer type. Message identifier of packet. Range: 1–65535.
<topic>	String type. Topic that the client wants to subscribe to or unsubscribe from.
<qos>	Integer type. The QoS level at which the client wants to publish the messages.
	<u>0</u> At most once
	1 At least once
	2 Exactly once
<result>	Integer type. Result of the command execution.
	0 Sent packet successfully and received ACK from server
	1 Packet retransmission
	2 Failed to send packet
<value>	Integer type.
	If **<result>** is 0, it is a vector of granted QoS levels.
	If **<result>** is 1, it means the times of packet retransmission.
	If **<result>** is 2, it will not be presented.
<pkt_timeout>	Integer type. Timeout of the packet delivery. Range: 1–60. Default: 5. Unit: s. The value can be configured by **AT+QMTCFG="timeout",<client_idx>[,<pkt_timeout>,<retry_times>,<timeout_notice>]**.
<retry_times>	Integer type. Retry times when packet delivery times out. Range: 0–10. Default: 3.

NOTE

The **<msgid>** is only present in messages where the QoS bits in the fixed header indicate QoS level 1 or 2. It must be unique amongst the set of "inflight" messages in a particular direction of communication. It typically increases by exactly one, from one message to the next, but it is not compulsory in actual practice.

3.2.7. AT+QMTUNS   Unsubscribe from Topics

This command unsubscribes from one or more topics. An UNSUBSCRIBE message is sent by the client to the server to unsubscribe from named topics.

AT+QMTUNS	Unsubscribe from Topics
Test Command **AT+QMTUNS=?**	Response **+QMTUNS: (**range of supported **<client_idx>**s**),<msgid>,list of ["topic"]** **OK**
Write Command **AT+QMTUNS=<client_idx>,<msgid> ,"<topic1>"[,"<topic2>"…]**	Response **OK** **+QMTUNS: <client_idx>,<msgid>,<result>[,<value>]** Or **ERROR**
Maximum Response Time	**<pkt_timeout>** × **<retry_times>** (default 15 s), determined by network
Characteristics	/

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<msgid>	Integer type. Message identifier of packet. Range: 1–65535.
<topic>	String type. Topic that the client wants to subscribe to or unsubscribe from.
<result>	Integer type. Result of the command execution.
	0 Sent packet successfully and received ACK from server
	1 Packet retransmission
	2 Failed to send packet
<value>	Integer type.
	If **<result>** is 0, it is a vector of granted QoS levels.
	If **<result>** is 1, it means the times of packet retransmission.
	If **<result>** is 2, it will not be presented.
<pkt_timeout>	Integer type. Timeout of the packet delivery. Range: 1–60. Default: 5. Unit: s. The value can be configured by **AT+QMTCFG="timeout",<client_idx>[,<pkt_timeout>,<retry_times>,<timeout_notice>]**.
<retry_times>	Integer type. Retry times when packet delivery times out. Range: 0–10. Default: 3.

3.2.8. AT+QMTPUBEX   Publish Messages

This command publishes messages with fixed length by a client to a server for distribution to interested subscribers. Each PUBLISH message is associated with a topic name. If a client subscribes to one or more topics, any message published to those topics will be sent by the server to the client as a PUBLISH message.

AT+QMTPUBEX   Publish Messages

Test Command **AT+QMTPUBEX=?**	Response **+QMTPUBEX: (**range of supported **<client_idx>**s**), <msgid>,(**range of supported **<qos>**s**),(**list of supported **<retain>**s**),"topic","length"** **OK**
Write Command **AT+QMTPUBEX=<client_idx>,<msgi d>,<qos>,<retain>,"<topic>",<msg_l ength>**	Response **>** Input the data to be sent. When the actual size of data is greater than **<msg_length>**, the first **<msg_length>** byte(s) data will be sent out. **OK** **+QMTPUBEX: <client_idx>,<msgid>,<result>[,<value>]** Or **ERROR**
Maximum Response Time	**<pkt_timeout>** × **<retry_times>** (default 15 s), determined by network
Characteristics	/

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<msgid>	Integer type. Message identifier of packet. Range: 0–65535. It will be 0 only when **<qos>**=0.
<qos>	Integer type. The QoS level at which the client wants to publish the messages.
	0 At most once
	1 At least once
	2 Exactly once
<retain>	Integer type. Whether or not the server will retain the message after it has been delivered to the current subscribers.
	0 Not retain
	1 Retain
<topic>	String type. Topic that needs to be published.
<msg_length>	Integer type. Length of message to be published.
<result>	Integer type. Result of the command execution.
	0 Packet sent successfully and ACK received from server (message that published when **<qos>**=0 does not require ACK)
	1 Packet retransmission
	2 Failed to send packet
<value>	Integer type.

	If **<result>** is 1, it means the times of packet retransmission.
	If **<result>** is 0 or 2, it will not be presented.
<pkt_timeout>	Integer type. Timeout of the packet delivery. Range: 1–60. Default: 5. Unit: s. The value can be configured by **AT+QMTCFG="timeout",<client_idx>[,<pkt_timeout>,<retry_times>,<timeout_notice>]**.
<retry_times>	Integer type. Retry times when packet delivery times out. Range: 0–10. Default: 3.

NOTES

1. If this command is executed successfully and gets **OK** back, the client can continue to publish new packet. The maximum quantity of transmitting packets should not be greater than the inflight window size: 5. Otherwise, **ERROR** will be returned.
2. After executing this command, the client will be ready to send data, which will be sent as payload. The maximum length of the input data is 1500 bytes at a time.
3. PUBLISH messages can be sent either from a publisher to the server, or from the server to a subscriber. When a server publishes messages to a subscriber, the following URC will be returned to notify the host to read the received data that is reported from MQTT server: **+QMTRECV: <client_idx>,<msgid>,"<topic>"[,<payload_length>],"<payload>"**. For more details about the URC description, please refer to *Chapter 4.2*..

3.2.9. AT+QMTRECV   Read Messages from Buffers

This command reads messages from storage buffer where the messages are stored when they are reported by the server.

AT+QMTRECV Read Messages from Buffers	
Test Command **AT+QMTRECV=?**	Response **OK**
Read Command **AT+QMTRECV?**	Response **+QMTRECV: <client_idx>,<store_status_0>,<store_status_1>,<store_status_2>,<store_status_3>,<store_status_4>** **OK** If there is no MQTT connection: **OK**
Write Command **AT+QMTRECV=<client_idx>[,<recv_id>]**	Response **[(**List of **+QMTRECV: <client_idx>,<msgid>,"<topic>"[,<payload_len>],"<payload>")]** **OK**

	If there is no MQTT connection: **ERROR**
Characteristics	/

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<store_status>	Integer type. Indicate whether there is a message stored in the buffer. 0 means no, and 1 means yes. The maximum quantity of message that can be stored in the buffer is 5. Therefore, URC reports maximally 5 messages simultaneously.
<recv_id>	Integer type. Indicate the serial number of every single message received. Range: 0–4.
<msgid>	Integer type. Message identifier of packet. Range: 0–65535. It will be 0 only when **<qos>**=0.
<topic>	String type. Topic that needs to be published.
<payload_len>	Integer type. The length of payload.
<payload>	String type. The payload that relates to the topic name.

4 MQTT Related URCs

This chapter gives MQTT related URCs and descriptions.

Table 3: MQTT Related URCs

SN	URC Format	Description
[1]	**+QMTSTAT: <client_idx>,<err_code>**	When the state of MQTT link layer is changed, the client will close the MQTT connection and report the URC.
[2]	**+QMTRECV: <client_idx>,<msgid>,"<topic>"[,<payload_len>],"<payload>"**	Reported when the client has received the packet data from MQTT server.
[3]	**+QMTRECV: <client_idx>,<recv_id>**	Reported when the message that received from MQTT server has been stored in buffer.
[4]	**+QMTPING: <client_idx>,<result>**	When the state of MQTT link layer is changed, the client will close the MQTT connection and report the URC.

4.1. +QMTSTAT   URC to Indicate State Change in MQTT Link Layer

The URC begins with **+QMTSTAT:**. It will be reported when there is a change in the state of MQTT link layer.

+QMTSTAT URC to Indicate State Change in MQTT Link Layer	
+QMTSTAT: <client_idx>,<err_code>	When the state of MQTT link layer is changed, the client will close the MQTT connection and report the URC.

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<err_code>	Integer type. An error code. Please refer to *Table 4* for details.

Table 4: Error Codes of the URC

<err_code>	Description	How to do
1	Connection is closed or reset by peer.	Execute **AT+QMTOPEN** command and reopen MQTT connection.
2	Sending PINGREQ packet timed out or failed.	Deactivate PDP first, and then activate PDP and reopen MQTT connection.
3	Sending CONNECT packet timed out or failed.	1. Check whether the inputted user name and password are correct. 2. Make sure the client ID is not used. 3. Reopen MQTT connection and try to send CONNECT packet to server again.
4	Receiving CONNACK packet timed out or failed.	1. Check whether the inputted user name and password are correct. 2. Make sure the client ID is not used. 3. Reopen MQTT connection and try to send CONNECT packet to server again.
5	The client sends DISCONNECT packet to sever and the server closes MQTT connection.	This is a normal process.
6	The client closes MQTT connection due to packet sending failure all the time.	1. Make sure the data is correct. 2. Try to reopen MQTT connection since there may be network congestion or an error.
7	The link is not alive or the server is unavailable.	Make sure the link is alive or the server is available currently.
8	The client closes the MQTT connection.	Try to reconnect.
9–255	Reserved for future use.	

4.2. +QMTRECV   URC to Notify the Host to Read MQTT Packet Data

The URC begins with **+QMTRECV:**. It is mainly used to notify the host to read the received MQTT packet data that is reported from MQTT server.

+QMTRECV URC to Notify the Host to Read MQTT Packet Data	
+QMTRECV: <client_idx>,<msgid>,"<topic>"[,<payload_len>],"<payload>"	Notify the host to read the received data that is reported from MQTT server.
+QMTRECV: <client_idx>,<recv_id>	Reported when the message that received from MQTT server has been stored in buffer.

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.
<msgid>	Integer type. The message identifier of packet.
<topic>	String type. The topic that received from MQTT server.
<payload_len>	Integer type. The length of payload.
<payload>	String type. The payload that relates to the topic name.
<recv_id>	Integer type. Indicate the serial number of every single message received. Range: 0–4.

4.3. +QMTPING   URC to Indicate PING State of Keep-alive in MQTT

The URC begins with **+QMTPING:**. It will be reported when server does not receive a message from the client within 1.5 times of the keep-alive time period and it will disconnect the client as if the client has sent a DISCONNECT message.

+ QMTPING URC to Indicate PING State of Keep-alive in MQTT	
+QMTPING: <client_idx>,<result>	When the state of MQTT link layer is changed, the client will close the MQTT connection and report the URC.

Parameter

<client_idx>	Integer type. MQTT client identifier. Range: 0–5.	
<result>	Integer type. Result of PING state.	
.	1	Failed

5 Examples

This chapter gives the examples to explain how to use MQTT related AT commands.

5.1. Example of MQTT Operation without SSL

```
//Configure receiving mode.
AT+QMTCFG="recv/mode",0,0,1
OK

//Configure Alibaba device information for Alibaba cloud.
AT+QMTCFG="aliauth",0,"oyjtmPI5a5j","MQTT_TEST","wN9Y6pZSIIy7Exa5qVzcmigEGO4kAazZ"
OK
AT+QMTOPEN=?
+QMTOPEN: (0-5),"hostname",(1-65535)

OK

//Open a network for MQTT client.
AT+QMTOPEN=0,"iot-as-mqtt.cn-shanghai.aliyuncs.com",1883
OK

+QMTOPEN: 0,0              //Opened the MQTT client network successfully.
AT+QMTOPEN?
+QMTOPEN: 0,"iot-as-mqtt.cn-shanghai.aliyuncs.com",1883

OK
AT+QMTCONN=?
+QMTCONN: (0-5),"clientid","username","password"

OK

//Connect a client to MQTT server.
//If Alibaba Cloud is connected, customers can use AT+QMTCFG="aliauth" command to configure the
device information in advance, and do not need to provide username/password here anymore.
AT+QMTCONN=0,"clientExample"
OK
```

+QMTCONN: 0,0,0   //Connected the client to MQTT server successfully.
AT+QMTSUB=?
+QMTSUB: (0-5), <msgid>,list of ["topic",qos]

OK

//Subscribe to topics.
AT+QMTSUB=0,1,"topic/example",2
OK

+QMTSUB: 0,1,0,2
AT+QMTSUB=0,1,"topic/pub",0
OK

+QMTSUB: 0,1,0,0

//If a client subscribes to a topic and other devices publish the same topic to the server, the module will report the following information.
+QMTRECV: 0,0,"topic/example",36,"This is the payload related to topic"

//Unsubscribe from topics.
AT+QMTUNS=0,2,"topic/example"
OK

+QMTUNS: 0,2,0
AT+QMTPUBEX=?
+QMTPUBEX: (0-5),<msgid>,(0-2),(0,1),"topic","length"

OK

//Publish messages. After receiving **>**, input data "This is test data, hello MQTT." and then send it. The maximum length of the data is 1500 bytes and the data that beyond 1500 bytes will be omitted.
AT+QMTPUBEX=0,0,0,0,"topic/pub",30
>This is test data, hello MQTT.
OK

+QMTPUBEX: 0,0,0

//If a client subscribes to a topic named "topic/pub" and other devices publish the same topic to the server, the module will report the following information.
+QMTRECV: 0,0,"topic/pub",30,"This is test data, hello MQTT."

//Disconnect a client from MQTT server.

AT+QMTDISC=0

OK

+QMTDISC: 0,0   //Connection closed successfully.

5.2. Example of MQTT Operation with SSL

//Configure receiving mode.
AT+QMTCFG="recv/mode",0,0,1
OK

//Configure MQTT session into SSL mode.
AT+QMTCFG="ssl",0,1,2
OK

//If SSL authentication mode is "server authentication", store CA certificate to RAM.
AT+QFUPL="RAM:cacert.pem",1758,100
CONNECT
<Input the cacert.pem data, the size is 1758 bytes>
+QFUPL: 1758,384a

OK

//If SSL authentication mode is "server authentication", store CC certificate to RAM.
AT+QFUPL="RAM:client.pem",1220,100
CONNECT
<Input the client.pem data, the size is 1220 bytes>
+QFUPL: 1220,2d53

OK

//If SSL authentication mode is "server authentication", store CK certificate to RAM.
AT+QFUPL="RAM:user_key.pem",1679,100
CONNECT
<Input the user_key.pem data, the size is 1679 bytes>
+QFUPL: 1679,335f

OK

//Configure CA certificate.
AT+QSSLCFG="cacert",2,"RAM:cacert.pem"
OK

```
//Configure CC certificate.
AT+QSSLCFG="clientcert",2,"RAM:client.pem"
OK


//Configure CK certificate.
AT+QSSLCFG="clientkey",2,"RAM:user_key.pem"
OK


//Configure SSL parameters.
AT+QSSLCFG="seclevel",2,2                //SSL authentication mode: server authentication
OK
AT+QSSLCFG="sslversion",2,4              //SSL authentication version
OK
AT+QSSLCFG="ciphersuite",2,"0xFFFF"   //Cipher suite
OK
AT+QSSLCFG="ignorelocaltime",2,1      //Ignore the time of authentication.
OK


//Start MQTT SSL connection
AT+QMTOPEN=0,"a1zgnxur10j8ux.iot.us-east-1.amazonaws.com",8883
OK


+QMTOPEN: 0,0


//Connect to MQTT server
AT+QMTCONN=0,"M26_0206"
OK


+QMTCONN: 0,0,0


//Subscribe to topics.
AT+QMTSUB=0,1,"$aws/things/M26_0206/shadow/update/accepted",1
OK


+QMTSUB: 0,1,0,1


//Publish messages.
AT+QMTPUBEX=0,1,1,0,"$aws/things/M26_0206/shadow/update/accepted",32
>This is publish data from client
OK


+QMTPUBEX: 0,1,0


//If a client subscribes to a topic named "$aws/things/M26_0206/shadow/update/accepted" and other
```

devices publish the same topic to the server, the module will report the following information.

+QMTRECV: 0,1,"$aws/things/M26_0206/shadow/update/accepted",32,"This is publish data from client"

//Disconnect a client from MQTT server.
AT+QMTDISC=0
OK

+QMTDISC: 0,0

6 Appendix A References

Table 5: Related Documents

SN	Document Name	Remark
[1]	MQTT V3.1 Protocol Specification	MQTT protocol specification version 3.1
[2]	MQTT V3.1.1 Protocol Specification	MQTT protocol specification version 3.1.1

Table 6: Terms and Abbreviations

Abbreviation	Description
ACK	Acknowledgement
MQTT	Message Queuing Telemetry Transport
QoS	Quality of Service
RAM	Random Access Memory
SSL	Secure Sockets Layer
TCP	Transmission Control Protocol
URC	Unsolicited Result Code