



SIM7500_SIM7600_SIM7800 Series MQTT(S) Application Note

LTE Module

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About Document

Version History

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V2.00	2020.8.6	Ning lv	Update the format
V3.00	2022.02.08	Haotian Wang	Update the format

Scope

This document applies to SIM7500 series, SIM7600 series and SIM7800 series.

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1 Introduction

1.1 Purpose of the document

Based on module AT command manual, this document will introduce MQTT(S) application process. Developers could understand and develop application quickly and efficiently based on this document.

1.2 Related documents

[1] SIM7500_SIM7600 Series_AT Command Manual

1.3 Conventions and abbreviations

Abbreviation	Description
MQTT	Message Queuing Telemetry Transport

2 MQTT Introduction

MQTT (Message Queuing Telemetry Transport) is a lightweight broker-based publish/subscribe messaging protocol. It is a machine-to-machine (M2M)/"Internet of Things" connectivity protocol. It was designed as an extremely lightweight publish/subscribe messaging transport. It is useful for connections with remote locations where a small code footprint is required and/or network bandwidth is at a premium.

2.1 Characteristic

- **Support client/server mode;**

- ✧ The publish/subscribe message pattern to provide one-to-many message distribution and decoupling of applications
- ✧ A messaging transport that is agnostic to the content of the payload
- ✧ The use of TCP/IP to provide basic network connectivity
- ✧ Three qualities of service for message delivery
- ✧ A small transport overhead (the fixed-length header is just 2 bytes), and protocol exchanges minimized to reduce network traffic
- ✧ A mechanism to notify interested parties to an abnormal disconnection of a client using the Last Will and Testament feature

2.2 Request Method

According to the MQTT standard, MQTT provides a variety of request methods. CONNECT, SUBSCRIBE, PUBLISH, UNSUBSCRIBE, DISCONNECT, PINGREQ

No	Method	Description
1	CONNECT	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.
2	SUBSCRIBE	The SUBSCRIBE message allows 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. The SUBSCRIBE message also specifies the QoS level at which the subscriber wants to receive published messages.
3	PUBLISH	A PUBLISH message is sent by a client to a server for distribution to interested

		subscribers. Each PUBLISH message is associated with a topic name (also known as the Subject or Channel). This is a hierarchical name space that defines taxonomy of information sources for which subscribers can register an interest. A message that is published to a specific topic name is delivered to connected subscribers for that topic.
4	UNSUBSCRIBE	An UNSUBSCRIBE message is sent by the client to the server to unsubscribe from named topics.
5	DISCONNECT	The DISCONNECT message is sent from the client to the server to indicate that it is about to close its TCP/IP connection. This allows for a clean disconnection, rather than just dropping the line.
6	PINGREQ	The PINGREQ message is an "are you alive?" message that is sent from a connected client to the server.

The SIM7500/SIM7600/SIM7800 series supports several methods: CONNECT, SUBSCRIBE, PUBLISH, UNSUBSCRIBE, DISCONNECT.

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3 AT Commands for MQTT(S)

Command	Description
AT+CMQTTSTART	Start MQTT service
AT+CMQTTSTOP	Stop MQTT service
AT+CMQTTACCQ	Acquire a MQTT client
AT+CMQTTREL	Release a MQTT client
AT+CMQTTSSLCFG	Set the SSL context
AT+CMQTTWILLTOPIC	Input the topic of will message
AT+CMQTTWILLMSG	Input the will message
AT+CMQTTCONNECT	Connect to a MQTT server
AT+CMQTTDISC	Disconnect from server
AT+CMQTTTOPIC	Input the publish message topic
AT+CMQTTPAYLOAD	Input the publish message body
AT+CMQTTPUB	Publish a message to server
AT+CMQTTSUBTOPIC	Input a subscribe message topic
AT+CMQTTSUB	Subscribe a message to server
AT+CMQTTUNSUBTOPIC	Input a unsubscribe message topic
AT+CMQTTUNSUB	Unsubscribe a message to server
AT+CMQTTCFG	Configure the MQTT Context

For detail information, please refer to "SIM7500_SIM7600 Series_AT Command Manual ".

4 Bearer Configuration

Usually module will register PS service automatically.

4.1 PDN Auto-activation

//Example of PDN Auto-activation.

AT+CPIN?

Check SIM card status

+CPIN: READY

OK

AT+CSQ

Check RF signal

+CSQ: 27,99

OK

AT+CGREG?

Check PS service

+CGREG: 0,1

OK

AT+COPS?

Query Network information, operator and network mode 7, LTE network

+COPS: 0,0," CHINA MOBILE",7

OK

5 MQTT(S) Examples

5.1 MQTT Function

5.1.1 Access to MQTT server without SSL/TLS

//Example of Access to MQTT server without SSL/TLS.

```
AT+CMQTTSTART           Start MQTT service, activate PDP context
OK

+CMQTTSTART: 0
AT+CMQTTACCQ=0, "client test0"   Acquire one client which will connect to a MQTT
OK                               server not SSL/TLS
AT+CMQTTWILLTOPIC=0,10         Set the will topic for the CONNECT message
>0123456789
OK
AT+CMQTTWILLMSG=0,6,1         Set the will message for the CONNECT message
>qwerty
OK
AT+CMQTTCONNECT=0,"tcp://test.mosquitto.   Connect to a MQTT server
org:1883",60,1
OK

+CMQTTCONNECT: 0,0
AT+CMQTTSUB=0,10,1           Subscribe one topic from the server
>simcomtest
OK

+CMQTTSUB: 0,0
AT+CMQTTTOPIC=0,10         Set the topic for the PUBLISH message
> simcomtest

OK
AT+CMQTTPAYLOAD=0,9         Set the payload for the PUBLISH message
>mqtt_test
OK
AT+CMQTTTPUB=0,1,60         Publish a message
```

OK

+CMQTTPUB: 0,0

+CMQTTRXSTART: 0,10,9

Receive publish message from server

+CMQTTRXTOPIC: 0,10

simcomtest

+CMQTTRXPAYLOAD: 0,9

mqtt_test

+CMQTTRXEND: 0

AT+CMQTTSUBTOPIC=0,9,1

Set one topic for the SUBSCRIBE message

>123456789

OK

AT+CMQTTSUB=0

Subscribe a message

OK

+CMQTTSUB: 0,0

AT+CMQTTUNSUB=0,9,0

Unsubscribe one topic from the server

>simcommsg

OK

+CMQTTUNSUB: 0,0

AT+CMQTTDISC=0,120

Disconnect from server

OK

+CMQTTDISC: 0,0

AT+CMQTTREL=0

Release the client

OK

AT+CMQTTSTOP

Stop MQTT Service

OK

+CMQTTSTOP: 0

5.1.2 Access to MQTT server without checking UTF8 coding

//Example of Access to MQTT server without checking UTF8 coding.

AT+CMQTTSTART

Start MQTT service, activate PDP context

OK

+CMQTTSTART: 0

AT+CMQTTACQ=0, "client test0"

Acquire one client which will connect to a MQTT server not SSL/TLS

OK

AT+CMQTTCFG="checkUTF8",0,0

Configure not checking UTF8 coding

OK

AT+CMQTTCONNECT=0,"tcp://test.mosquitto.org:1883",60,1 OK	Connect to a MQTT server
+CMQTTCONNECT: 0,0 AT+CMQTTSUB=0,9,1 > 000000? OK	Subscribe one topic which is not UTF8 coding string, The data can input by hexadecimal format
+CMQTTSUB: 0,0 AT+CMQTTTOPIC=0,9 > 000000? OK	Set the topic for the PUBLISH message
AT+CMQTTTPUB=0,1,60 OK	Publish a message
+CMQTTTPUB: 0,0 +CMQTTTRXSTART: 0,9,0 +CMQTTTRXTOPIC: 0,9 000000?	Receive publish message from server
+CMQTTTRXEND: 0 AT+CMQTTDISC=0,120 OK	Disconnect from server
+CMQTTDISC: 0,0 AT+CMQTTREL=0 OK	Release the client
AT+CMQTTSTOP OK	Stop MQTT Service
+CMQTTSTOP: 0	

5.2 MQTTS Function

5.2.1 Connect to SSL/TLS MQTT server (not verify server)

// Example of Access to a MQTT server without verifying the server

AT+CMQTTSTART Start MQTT service, activate PDP context

OK

+CMQTTSTART: 0

AT+CMQTTACCQ=0,"client test0",1

Acquire one client which will connect to a SSL/TLS MQTT server

OK

AT+CMQTTWILLTOPIC=0,10

Set the will topic for the CONNECT message

>0123456789

OK

AT+CMQTTWILLMSG=0,6,1

Set the will message for the CONNECT message

> qwerty

OK

AT+CMQTTCONNECT=0,"tcp://test.mosquitto.org:8883",60,1

Connect to a MQTT server

OK

+CMQTTCONNECT: 0,0

AT+CMQTTTOPIC=0,13

Set the topic for the PUBLISH message

> dddrrrggghhkhk

OK

AT+CMQTTPAYLOAD=0,60

Set the payload for the PUBLISH message

>01234567890123456789012345678901234567

8901234567890123456789

OK

AT+CMQTTPUB=0,1,60

Publish a message

OK

+CMQTTPUB: 0,0

AT+CMQTTSUBTOPIC=0,9,1

Set one topic for the SUBSCRIBE message

>123456789

OK

AT+CMQTTSUB=0

Subscribe a message

OK

+CMQTTSUB: 0,0

AT+CMQTTSUB=0,9,1

Subscribe one topic from the server

>simcommmsg

OK

+CMQTTSUB: 0,0

AT+CMQTTUNSUB=0,9,0

Unsubscribe one topic from the server

>simcommmsg

OK

+CMQTTUNSUB: 0,0

AT+CMQTTDISC=0,120

Disconnect from server

OK

+CMQTTDISC: 0,0

AT+CMQTTREL=0

Release the client

OK

AT+CMQTTSTOP

Stop MQTT Service

OK

+CMQTTSTOP: 0

5.2.2 Access to SSL/TLS MQTT server (only verify the server)

//Example of Access to SSL/TLS MQTT server (only verify the server)

AT+CSSLCFG="sslversion",0,4

Set the SSL version of the first SSL context

OK

AT+CSSLCFG="authmode",0,1

Set the authentication mode(verify server) of the first SSL context

OK

AT+CSSLCFG="cacert",0,"server_ca.pem"

Set the server root CA of the first SSL context

OK

AT+CMQTTSTART

Start MQTT service, activate PDP context

OK

+CMQTTSTART: 0

AT+CMQTTACCQ=0,"client test0",1

Acquire one client which will connect to a SSL/TLS MQTT server

OK

AT+CMQTTSSLCFG=0,0

Set the first SSL context to be used in the SSL connection

OK

AT+CMQTTWILLTOPIC=0,10

Set the will topic for the CONNECT message

>0123456789

OK

AT+CMQTTWILLMSG=0,6,1

Set the will message for the CONNECT message

>qwerty

OK

AT+CMQTTCONNECT=0,"tcp://mqttps_server:port",60,1

Connect to a MQTT server, input the right server and port

OK

+CMQTTCONNECT: 0,0 AT+CMQTTTOPIC=0,13 >ddrrrrggghhk	Set the topic for the PUBLISH message
OK	
AT+CMQTTPAYLOAD=0,60 >01234567890123456789012345678901234567 8901234567890123456789	Set the payload for the PUBLISH message
OK	
AT+CMQTTTPUB=0,1,60 OK	Publish a message
+CMQTTTPUB: 0,0 AT+CMQTTSUBTOPIC=0,9,1 >123456789	Set one topic for the SUBSCRIBE message
OK	
AT+CMQTTSUB=0 OK	Subscribe a message
+CMQTTSUB: 0,0 AT+CMQTTSUB=0,9,1 >simcommsg OK	Subscribe one topic from the server
+CMQTTSUB: 0,0 AT+CMQTTUNSUB=0,9,0 >simcommsg OK	Unsubscribe one topic from the server
+CMQTTUNSUB: 0,0 AT+CMQTTDISC=0,120 OK	Disconnect from server
+CMQTTDISC: 0,0 AT+CMQTTREL=0 OK	Release the client
AT+CMQTTSTOP OK	Stop MQTT Service
+CMQTTSTOP: 0	

5.2.3 Access to SSL/TLS MQTT server (verify server and client)

```
//Access to SSL/TLS MQTT server (verify server and client).
AT+CSSLCFG="sslversion",0,4           Set the SSL version of the first SSL context
OK
AT+CSSLCFG="authmode",0,2           Set the authentication mode(verify server and
OK                                     client) of the first SSL context
AT+CSSLCFG="cacert",0,"ca_cert.pem" Set the server root CA of the first SSL context
OK
AT+CSSLCFG="clientcert",0,"cert.pem" Set the client certificate of the first SSL context
OK
AT+CSSLCFG="clientkey",0,"key_cert.pem" Set the client key of the first SSL context
OK
AT+CMQTTSTART                         start MQTT service, activate PDP context
OK

+CMQTTSTART: 0
AT+CMQTTACCQ=0,"client test0",1      Acquire one client which will connect to a SSL/TLS
OK                                     MQTT server
AT+CMQTTSSLCFG=0,0                   Set the first SSL context to be used in the SSL
OK                                     connection
AT+CMQTTWILLTOPIC=0,10               Set the will topic for the CONNECT message
>0123456789

OK
AT+CMQTTWILLMSG=0,6,1                Set the will message for the CONNECT message
>qwerty

OK
AT+CMQTTCONNECT=0,"tcp://hooleeping.co Connect to a MQTT server
m:8883",60,1
OK

+CMQTTCONNECT: 0,0
AT+CMQTTTOPIC=0,13                  Set the topic for the PUBLISH message
>ddrrrrggghhk

OK
AT+CMQTTPAYLOAD=0,60                Set the payload for the PUBLISH message
>01234567890123456789012345678901234567
8901234567890123456789

OK
AT+CMQTTTPUB=0,1,60                 Publish a message
OK
```

+CMQTTPUB: 0,0
AT+CMQTTSUBTOPIC=0,9,1 Set one topic for the SUBSCRIBE message
>123456789

OK

AT+CMQTTSUB=0 Subscribe a message
OK

+CMQTTSUB: 0,0
AT+CMQTTSUB=0,9,1 Subscribe one topic from the server
>simcommsg
OK

+CMQTTSUB: 0,0
AT+CMQTTUNSUB=0,9,0 Unsubscribe one topic from the server
>simcommsg
OK

+CMQTTUNSUB: 0,0
AT+CMQTTDISC=0,120 Disconnect from server
OK

+CMQTTDISC: 0,0
AT+CMQTTREL=0 Release the client
OK

AT+CMQTTSTOP Stop MQTT Service
OK

+CMQTTSTOP: 0