SIM82XX_SIM83XX Series _MQTT(S)_Application Note

5G Module

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About Document

Version History

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V1.00	2020.3.23	Ning.Lv	First Release
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Scope

This document applies to the SIMCom SIM820X series, SIM821X series, SIM826X series and SIM83XX series.

Contents

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] SIM82XX_SIM83XX Series_AT Command Manual

1.3 Conventions and abbreviations

In this document, the GSM engines are referred to as following term:

- ME (Mobile Equipment);
- MS (Mobile Station);
- TA (Terminal Adapter);
- DCE (Data Communication Equipment) or facsimile DCE (FAX modem, FAX board);

In application, controlling device controls the GSM engine by sending AT Command via its serial interface. The controlling device at the other end of the serial line is referred to as following term:

- TE (Terminal Equipment);
- DTE (Data Terminal Equipment) or plainly "the application" which is running on an embedded system;

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 minimised 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.

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 “SIM82XX_SIM83XX Series_AT Command Manual“.

4 Bearer Configuration

Usually module will register PS service automatically.

4.1 PDN Auto-activation

```
AT+CPIN?
+CPIN: READY                                                    // Check Status of SIM Card

OK
AT+CSQ
+CSQ: 27,99                                                     // Check RF Signal

OK
AT+CGREG?
+CGREG: 0,1                                                     // Check Status of PS Service

OK
AT+CEREG?
+CEREG: 0,1

OK
AT+COPS?
+COPS: 0,0,"CHN-UNICOM",13                                      // Check Information of Operator

OK
AT+CPSI?
+CPSI:  NR5G_SA,Online,460-00,0x161816,13190066179,476,NR5G
_BAND41,504990,-1130,-140,30                                    // Check Information of Network

OK
AT+CGDCONT=1, "IP", "CMNET"                                     // Set PDP context Parameters
OK
AT+CGDCONT?
+CGDCONT:
1,"IPV4","CMNET","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0      // Check Information of PDP Context
```

```
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 server not SSL/TLS
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:1883",60,1	Connect to a MQTT server
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+CMQTTPUB=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+CMQTTACCQ=0,"client test0"            Acquire one client which will connect to a MQTT
OK                                       server not SSL/TLS
AT+CMQTTCFG="checkUTF8",0,0              Configure not checking UTF8 coding
OK
```

AT+CMQTTCONNECT=0,"tcp://test.mosquitto.org:1883",60,1	Connect to a MQTT server
OK	
+CMQTTCONNECT: 0,0	
AT+CMQTTSUB=0,9,1	Subscribe one topic which is not UTF8 coding string, The data can input by hexadecimal format
>鼢鼢鼢鼢?	
OK	
+CMQTTSUB: 0,0	
AT+CMQTTTOPIC=0,9	Set the topic for the PUBLISH message
>鼢鼢鼢鼢?	
OK	
AT+CMQTTPUB=0,1,60	Publish a message
OK	
+CMQTTPUB: 0,0	
+CMQTTRXSTART: 0,9,0	Receive publish message from server
+CMQTTRXTOPIC: 0,9	
鼢鼢鼢鼢?	
+CMQTTRXEND: 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 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 **OK**	Acquire one client which will connect to a SSL/TLS MQTT server
AT+CMQTTWILLTOPIC=0,10 **>0123456789** **OK**	Set the will topic for the CONNECT message
AT+CMQTTWILLMSG=0,6,1 **> qwerty** **OK**	Set the will message for the CONNECT message
AT+CMQTTCONNECT=0,"tcp://test.mosquitt.org:8883",60,1 **OK**	Connect to a MQTT server
+CMQTTCONNECT: 0,0	
AT+CMQTTTOPIC=0,13 **> dddrrrggghhhk** **OK**	Set the topic for the PUBLISH message
AT+CMQTTPAYLOAD=0,60 **>012345678901234567890123456789012345678901234567890123456789** **OK**	Set the payload for the PUBLISH message
AT+CMQTTPUB=0,1,60 **OK**	Publish a message
+CMQTTPUB: 0,0	
AT+CMQTTSUBTOPIC=0,9,1 **>123456789** **OK**	Set one topic for the SUBSCRIBE message
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                                   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
OK                                              first SSL context
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
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://mqtts_server:p         Connect to a MQTT server, input the right server
ort",60,1                                       and port
OK

+CMQTTCONNECT: 0,0
AT+CMQTTTOPIC=0,13                              Set the topic for the PUBLISH message
>dddrrrggghhhk
OK
AT+CMQTTPAYLOAD=0,60                            Set the payload for the PUBLISH message
>012345678901234567890123456789012345678
890123456789012345678
```

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
>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	

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 client) of the first SSL context
OK	
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 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://hooleeping.com:8883",60,1	Connect to a MQTT server
OK	
+CMQTTCONNECT: 0,0	
AT+CMQTTTOPIC=0,13	Set the topic for the PUBLISH message
>dddrrrggghhhk	
OK	
AT+CMQTTPAYLOAD=0,60	Set the payload for the PUBLISH message
>012345678901234567890123456789012345678901234567890123456789	
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
>simcommsg	
OK	
+CMQTTSUB: 0,0	

AT+CMQTTUNSUB=0,9,0 **>simcommsg** **OK** **+CMQTTUNSUB: 0,0**	Unsubscribe one topic from the server
AT+CMQTTDISC=0,120 **OK** **+CMQTTDISC: 0,0**	Disconnect from server
AT+CMQTTREL=0 **OK**	Release the client
AT+CMQTTSTOP **OK** **+CMQTTSTOP: 0**	Stop MQTT Service