



SIM7000 Series_MQTT(S) _Application Note

LPWA Module

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About Document

Version History

Version	Date	Owner	What is new
V1.00	2018.09.28	Xiaobao.qu	First Release
V1.01	2019.01.23	Xiaobao.qu	Added Connecting Ali Cloud Function
V1.02	2020.07.28	Wenjie.Lai	All

Scope

This document applies to the following products

Name	Type	Size(mm)	Comments
SIM7000E/C/A/G	Cat-M1(/NB1/EGPRS)	24*24	
SIM7000E-N SIM7000C-N	NB1	24*24	

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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] SIM7000 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(S) Function

MQTT (Message Queue Telemetry Transport) is a messaging protocol based on the publish/subscribe paradigm under the ISO standard (ISO/IEC PRF 20922). It works on the TCP/IP protocol suite and is a publish/subscribe messaging protocol designed for remote devices with poor hardware performance and poor network conditions.

The MQTT protocol is a protocol designed for the communication of remote sensors and control devices with limited computing power and working on low-bandwidth, unreliable networks. It has the following main features:

- Use the publish/subscribe message mode to provide one-to-many message publishing and uncouple the application;
- Message transmission for shielding the payload content;
- Provide network connection using TCP/IP;
- There are three types of message publishing service quality:
 - ✧ "At most once," message publishing relies entirely on the underlying TCP/IP network. Message loss or duplication can occur. This level can be used in the following situations, environmental sensor data, loss of a read record does not matter, because there will be a second transmission in the near future.
 - ✧ "At least once" to ensure that the message arrives, but message duplication may occur.
 - ✧ "Only once" to ensure that the message arrives once. This level can be used in situations where repeated or missing messages can result in incorrect results.
- small transmission, low overhead (fixed length of the head is 2 bytes), protocol exchange is minimized to reduce network traffic;
- Use the Last Will and Testament features to notify the parties about the mechanism of client abort.

3 AT Commands for MQTT(S)

3.1 Overview

AT Command	Description
AT+SMCONF	Set MQTT Parameter
AT+CSSLCFG	SSL Configure
AT+SMSSL	Select SSL Configure
AT+SMCONN	MQTT Connection
AT+SMPUB	Send Packet
AT+SMSUB	Subscribe Packet
AT+SMUNSUB	Unsubscribe Packet
AT+SMSTATE	Inquire MQTT Connection Status
AT+SMPUBHEX	Set SMPUB Data Format to Hex
AT+SMDISC	Disconnection MQTT

3.2 Detailed Descriptions of Commands

3.2.1 AT+SMCONF Set MQTT Parameter

AT+SMCONF Set MQTT Parameter	
Test Command AT+SMCONF=?	Response +SMCONF: "MQTTParamTag","MQTTParamValue range" OK
Read Command AT+SMCONF?	Response +SMCONF: <MQTTParamTag>,<MQTTParamValue> OK
Write Command AT+SMCONF=<MQTTPa	Response OK

**ramTag>,<MQTTParamV
alue>**

or

ERROR

Parameters

<MQTTParamTag>

"CLIENTID" Client connection id

"URL" (indispensable parameter) server URL address

"server domain",["tcpPort"]

"server": Host or IP

"tcpPort": Port default is 1883

"KEEPTIME" Hold connect time. default is 60s

"CLEANSS" Session clean in. Default is 0.

Range of values:(0-1).

"USERNAME" User name. default null

"PASSWORD" Password. default null

"QOS" Send packet QOS level. range of values (0~2)

"TOPIC" Publish topic name

"MESSAGE" Publish message details

"RETAIN" Retain identification. Default is 0.

Range of values:(0-1)

<MQTTParamValue> MQTT Parameter value. Type and supported content depend on related **<MQTTParamTag>**.

AT+SMCONF="CLIENTID","id"

OK

AT+SMCONF="KEEPTIME",60

OK

AT+SMCONF="URL","test.mosquitto.org","1883"

OK

AT+SMCONF="CLEANSS",1

OK

AT+SMCONF="QOS",1

OK

AT+SMCONF="TOPIC","will topic"

OK

AT+SMCONF="MESSAGE","will message"

OK

AT+SMCONF="RETAIN",1

OK

Example

3.2.2 AT+CSSLCFG SSL Configure

AT+CSSLCFG SSL Configure

Write command

Response

AT+CSSLCFG="convert",<ssltype>,<cname>[,<keyname>[,<passkey>]]	<p>OK</p> <p>If failed:</p> <p>+CME ERROR: <err></p> <hr/> <p>Parameters</p> <p><ssltype></p> <ul style="list-style-type: none"> 1 QAPI_NET_SSL_CERTIFICATE_E 2 QAPI_NET_SSL_CA_LIST_E 3 QAPI_NET_SSL_PSK_TABLE_E <p><cname> String type(string should be included in quotation marks): name of cert file</p> <p><keyname> String type(string should be included in quotation marks):name of key file</p> <p><passkey> String type (string should be included in quotation marks):value of passkey</p> <hr/>
Parameter Saving Mode	-
Max Response Time	-
Reference	-

3.2.3 AT+SMSSL Select SSL Configure

AT+SMSSL Select SSL Configure	
Read Command AT+SMSSL?	Response +SMSSL: <index>,<ca list>,<cert name> OK
Write Command AT+SMSSL=<index>,<ca list>,<cert name>	Response OK or ERROR
	Parameters <index> SSL status, range: 0-6 <ca list> CA_LIST file name, length 20 byte <cert name> CERT_NAME file name, length 20 byte
Example	AT+SMSSL=1,calist,certname OK

3.2.4 AT+SMCONN MQTT Connection

AT+SMCONN MQTT Connection

Execution Command AT+SMCONN	Response OK or ERROR
Example	AT+SMCONN OK

3.2.5 AT+SMPUB Send Packet

AT+SMPUB Send Packet	
Test Command AT+SMPUB=?	Response +SMPUB: <topic>,<content length>,(0-2),(0-1) OK
Write Command AT+SMPUB=<topic>,<content length>,<qos>,<retain>	Response OK or ERROR Parameters <topic> Subscribe packet <qos> Send packet QOS level, range: 0~2 <content length> Message length, range: 0~512 <retain> Server hold message range: 0~1
Example	AT+SMPUB="001",10,1, 1 OK

3.2.6 AT+SMSUB Subscribe Packet

AT+SMSUB Subscribe Packet	
Test Command AT+SMSUB=?	Response +SMSUB: "topic",qos OK
Write Command AT+SMSUB=<topic>,<qos>	Response OK or ERROR Parameters <topic> Subscribe packet

	<qos> Send packet qos level, range: 0~2
Example	AT+SMSUB="001",1 OK

3.2.7 AT+SMUNSUB Unsubscribe Packet

AT+SMUNSUB Unsubscribe Packet	
Read Command AT+SMUNSUB=?	Response +SMUNSUB: "topic" OK
Write Command AT+SMUNSUB=<topic>	Response OK or ERROR
	Parameters <topic> Subscribe subject
Example	AT+SMUNSUB="001" OK

3.2.8 AT+SMSTATE Inquire MQTT Connection Status

AT+SMSTATE Inquire MQTT Connection Status	
Read Command AT+SMSTATE?	Response +SMSTATE: <status> OK
	Parameters <status> 0 Expression MQTT disconnect state 1 Expression MQTT on-line state
Example	AT+SMSTATE? +SMSTATE: 1 OK

3.2.9 AT+SMPUBHEX Set SMPUB Data Format to Hex

AT+SMPUBHEX Set SMPUB Data Format to Hex	
Test Command AT+SMPUBHEX=?	Response +SMPUBHEX: (0-1) OK
Read Command AT+ SMPUBHEX?	Response +SMPUBHEX: <status> OK PARAMETERS <status> 0 SMPUB data format is normal 1 SMPUB data format is hex
Write Command AT+SMPUBHEX=<status>	Response OK or ERROR Parameters <status> SMPUB format status, range: 0~1
Example	AT+SMPUBHEX=1 OK

3.2.10 AT+SMDISC Disconnect MQTT

AT+SMDISC Disconnect MQTT	
Execution Command AT+SMDISC	Response OK or ERROR
Example	AT+SMDISC OK

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+CGDCONT=1,"IP","" //Configure APN for registration when needed
OK
AT+CSQ //Check RF signal
+CSQ: 27,99

OK
AT+CGATT? //Check PS service.
+CGATT: 1 //1 indicates PS has attached.

OK
AT+COPS? //Query Network information, operator and network
+COPS: 0,0,"CHN-CT",9 mode 9, NB-IOT network

OK
AT+CGNAPN //Query the APN delivered by the network after the
//CAT-M or NB-IOT network is successfully
//registered.
+CGNAPN: 1,"ctnb" // "ctnb" is APN delivered by the CAT-M or NB-IOT
//network. APN is empty under the GSM network.

OK
AT+CNCFG=1,"ctnb","cdma","1234" //Before activation please use AT+CNCFG to set
//APN\user name\password if needed.

OK
AT+CNACT=1 //Activate network
OK

```

```
+APP PDP: ACTIVE
AT+CNACT? //Get local IP
+CNACT: 0,1,"10.94.36.44"

OK
```

4.2 APN Manual configuration

If not attached automatically, could configure correct APN setting.

//Example of APN Manual configuration.

```
AT+CFUN=0 //Disable RF
+CPIN: NOT READY

OK
AT+CGDCONT=1,"IP","ctnb" //Set the APN manually
OK
AT+CFUN=1 //Enable RF
OK

+CPIN: READY
AT+CGATT? //Check PS service.
+CGATT: 1 //1 indicates PS has attached.

OK
AT+CGNAPN //Query the APN delivered by the network after the
CAT-M or NB-IOT network is successfully
registered.
+CGNAPN: 1,"ctnb" // "ctnb" is APN delivered by the CAT-M or NB-IOT
network. APN is empty under the GSM network.
OK
AT+CNCFG=1,"ctnb","cdma","1234" //Before activation please use AT+CNCFG to set
APN\user name\password if needed.
OK
AT+CNACT=1 //Activate network
OK

+APP PDP: ACTIVE
AT+CNACT? //Get local IP
+CNACT: 0,1,"10.94.36.44"
```

OK

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5 MQTT(S) Examples

5.1 MQTT Function

//Example of MQTT Function

```
AT+CNACT=1,"cmnet" //Open wireless connection //parameter CMNET is
                    //APN, this parameter needs to set different APN
                    //values according to different cards

OK

+APP PDP: ACTIVE
AT+CNACT? //Get local IP
+CNACT: 1,"10.181.182.177"

OK
AT+SMCONF="URL",117.131.85.139,6000 //Set up server URL
OK
AT+SMCONF="KEEPTIME",60 //Set MQTT time to connect server
OK
AT+SMCONN
OK
AT+SMSUB="update",1 //Subscription packet
OK
AT+SMPUB="update","5",1,1 //Send packet
>hello //Get data on server
OK
+SMSUB: "update","hello"
AT+SMUNSUB="update" //Unsubscription packet
OK
AT+SMDISC //Disconnect MQTT
OK
AT+CNACT=0 //Disconnect wireless
OK

+APP PDP: DEACTIVE
AT+CNACT=1,"cmnet"
```

5.2 MQTTS Function

//Example of MQTTS Function

```

AT+CNACT=1,"cmnet" //Open wireless connection //parameter CMNET is
                        //APN, this parameter needs to set different APN
                        //values according to different cards

OK

+APP PDP: ACTIVE
AT+CNACT? //Get local IP
+CNACT: 1,"10.181.182.177"

OK
AT+CFSINIT //Init FS AT command
OK
AT+CFSWFILE=3,"ca.crt",0,2110,1000 //After download, sent certificate file through the
                                        //serial port.
                                        //2110 is certificate size.
                                        //Send CA file success

DOWNLOAD

OK
AT+CFSWFILE=3,"myclient.crt",0,2110,1000 //Send cert file success

DOWNLOAD

OK
AT+CFSTERM //Free data buffer
OK
AT+SMCONF="URL",117.131.85.139,6001 //Set up server URL
OK
AT+SMCONF="KEEPTIME",60 //Set MQTT time to connect server
OK
AT+CSSLCFG=convert,2,ca.crt //rootCA.pem is CA certificate
OK
AT+CSSLCFG=convert,1,myclient.crt,myclient. //cert.pem is certificate, key.pem is key of cert.pem
key
OK
AT+SMSSL=1,ca.crt,myclient.crt //Set CA certificate and cert //certificate name
OK
AT+SMCONN
OK
AT+SMSUB="update",1 //Subscription packet
OK
AT+SMPUB="update","5",1,1 //Send packet

```

```

>hello //Get data on server
OK
+SMSUB: "update","hello"
AT+SMUNSUB="update" //Unsubscription packet
OK
AT+SMDISC //Disconnect MQTT
OK
AT+CNACT=0 //Disconnect wireless
OK
+APP PDP: DEACTIVE

```

5.3 Connecting Ali Cloud Function

5.3.1 MQTT Connecting Ali Cloud Function

//Example of MQTT Connecting Ali Cloud Function

```

AT+CNACT=1,"cmnet" //Open wireless connection parameter //CMNET is
APN, this parameter //needs to set different APN
values //according to different cards
OK
+APP PDP: ACTIVE
AT+CNACT? //Get local IP
+CNACT: 1,"10.181.182.177"
OK
AT+SMCONF=url,a1kUAJknr0y.iot-as-mqtt.cn //The format of domain name is :
-shanghai.aliyuncs.com,1883 //productKey.iot-as-mqtt.cn-//shanghai.aliyuncs.co
m
Note:
//a1kUAJknr0y is product_key
OK
AT+SMCONF=username,7000C&a1kUAJknr0 //The format of username is:
y //deviceName&productKey
//Note:
//a1kUAJknr0y is product_key
//7000C is device Name
OK

```

```

AT+SMCONF=password,56bf1f37de9ce2591f5699eea1117a43dae9bd11 //The password is generated by SHA1 algorithm
OK
AT+SMCONF=clientid,"a1kUAJknr0y.7000C|securemode=3,timestamp=2524608000000,signaturemethod=hmacsha1,gw=0|" //The format of client id is:
//productKey.deviceName|securemod///e=3,signaturemethod=hmacsha1,gw=0|
//Note:
//a1kUAJknr0y is product_key
//7000C is deviceName
OK
AT+SMCONN //Connect ok
OK

```

5.3.2 MQTTS Connecting Ali Cloud Function

```

//Example of MQTTS Connecting Ali Cloud Function
AT+CNACT=1,"cmnet" //Open wireless connection parameter //CMNET is APN, this parameter needs to set different APN values //according to different cards
OK
+APP PDP: ACTIVE
AT+CNACT? //Get local IP
+CNACT: 1,"10.181.182.177"
OK
AT+CSSLCFG=convert,2,aliot_ca.pem //Convert aliot_ca.pem
//Note: Import certificates, please refer to CFSWFILE command
OK
AT+CSSLCFG=convert,1,simcom.cert.pem,simcom.private.key //Convert cert file
OK
AT+SMCONF=url,a1kUAJknr0y.iot-as-mqtt.cn-shanghai.aliyuncs.com,1883 //The format of domain name is :
//productKey.iot-as-mqtt.cn-//shanghai.aliyuncs.com
//Note:
//a1kUAJknr0y is product_key
OK
AT+SMCONF=username,7000C&a1kUAJknr0 //The format of username is:

```

```
y //deviceName&productKey
//Note:
//a1kUAJknr0y is product_key
//7000C is deviceName

OK
AT+SMCONF=password,56bf1f37de9ce2591f5 //The password is generated by SHA1 algorithm
699eea1117a43dae9bd11

OK
AT+SMCONF=clientid,"a1kUAJknr0y.7000C|s //The format of client id is:
ecuremode=3,timestamp=252460800000,sig //productKey.deviceName|securemode=3,signmeth
nmethod=hmacsha1,gw=0|" od=hmacsha1,gw=0|

//a1kUAJknr0y is product_key
//7000C is deviceName

OK
AT+SMSSL=2,aliot_ca.pem,simcom.cert.pem //Configure SSL connect index

OK
AT+SMCONN //Connect ok

OK
```

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