SIM7070_SIM7080_SIM7090 Series_MQTT(S) _Application Note

LPWA Module

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About Document

Version History

Version	Date	Owner	What is new
V1.00	2019.09.02	Zhiyuan.tang	First Release
V1.01	2020.02.26	Wenjie.Lai	Add product types
V1.02	2020.07.08	Ping.zhang	All
V1.03	2021.05.26	Xiaohui.Xu	Add chapter 5.3.3 and 5.3.4 for One Device One Secret

Scope

This document applies to the following products

Name	Type	Size(mm)	Comments
SIM7080G	CAT-M/NB	17.6*15.7*2.3	N/A
SIM7070G/SIM7070E	CAT-M/NB/GPRS	24*24*2.4	N/A
SIM7070G-NG	NB/GPRS	24*24*2.4	N/A
SIM7090G	CAT-M/NB	14.8*12.8*2.0	N/A

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] SIM7070_SIM7080_SIM7090 Series_AT Command Manual
[2] SIM7070_SIM7080_SIM7090 Series_SSL_Application Note

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) Introduction

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)

Command	Description
AT+CSSLCFG	Configure SSL parameters of a context identifier
AT+SMCONF	Set MQTT Parameter
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
AT+SMALIAUTH	Set Alibaba Cloud Parameter（One device One Secret）
AT+SMALIDYNA	Set Alibaba Cloud Dynamic Register Parameter（One Product One Secret）
+SMSUB	MQTT Receive Subscribe Data

For detail information, please refer to "SIM7070_SIM7080_SIM7090 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: 20,0

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

OK
AT+COPS?                          //Query Network information, operator and network.
+COPS: 0,0,"CHN-CT",9             //Mode 9 means 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=0,1,"ctnb"               //Before activation please use AT+CNCFG to set APN\user name\password if needed.

OK
AT+CNACT=0,1                      //Activate network, Activate 0th PDP.
OK

+APP PDP: 0,ACTIVE
```

AT+CNACT?	//Get local IP
+CNACT: 0,1,"10.94.36.44" **+CNACT: 1,0,"0.0.0.0"** **+CNACT: 2,0,"0.0.0.0"** **+CNACT: 3,0,"0.0.0.0"**	
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. Some operators need to set APN first when registering the network.
OK	
AT+CFUN=1	//Enable RF
OK **+CPIN: READY**	
AT+CGATT?	//Check PS service. 1 indicates PS has attached.
+CGATT: 1 **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=0,1,"ctnb"	//Before activation please use AT+CNCFG to set APN\user name\password if needed.
OK	
AT+CNACT=0,1	//Activate network, Activate 0th PDP.
OK	

```
+APP PDP: 0,ACTIVE
AT+CNACT?                                   //Get local IP
+CNACT: 0,1,"10.94.36.44"
+CNACT: 1,0,"0.0.0.0"
+CNACT: 2,0,"0.0.0.0"
+CNACT: 3,0,"0.0.0.0"

OK
```

5 MQTT(S) Examples

5.1 MQTT Function

```
//Example of MQTT Function.

AT+CNACT=0,1                          //Open wireless connection parameter 0 is PDP
                                      Index, parameter 1 means active.
OK

+APP PDP: 0,ACTIVE
AT+CNACT?                             //Get local IP

+CNACT: 0,1,"10.94.36.44"
+CNACT: 1,0,"0.0.0.0"
+CNACT: 2,0,"0.0.0.0"
+CNACT: 3,0,"0.0.0.0"

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+SMCONF="CLEANSS",1                 //Clear session
OK
AT+SMCONF="CLIENTID","simmqtt"        //Set client ID，need not set it after clear session
OK
AT+SMCONN
OK
AT+SMSUB="information",1              //Subscription packet

OK
AT+SMPUB="information",5,1,1          //Send packet, 5 is packet length.
>hello                               Get data on server
OK

+SMSUB: "information","hello"
```

```
AT+SMUNSUB="information"                    //Unsubscription packet
OK
AT+SMDISC                                   //Disconnect MQTT
OK
AT+CNACT=0,0                                //Disconnect wireless
OK

+APP PDP: 0,DEACTIVE
```

5.2 MQTTS Function

```
//Example of MQTTS Function.

AT+CNACT=0,1                                //Open wireless connection parameter 0 is PDP
                                            index, parameter 1 means active. and execute
                                            AT+CLTS=1 then reboot the device.
OK

+APP PDP: 0,ACTIVE
AT+CCLK?                                    //Before connecting, you need to confirm that the
                                            time has been synchronized.
+CCLK: "21/05/26,13:37:37+32"

OK
AT+CNACT?                                   //Get local IP
+CNACT: 0,1,"10.94.36.44"
+CNACT: 1,0,"0.0.0.0"
+CNACT: 2,0,"0.0.0.0"
+CNACT: 3,0,"0.0.0.0"

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+CFSWFILE=3,"myclient.key",0,2110,1000        //Send key file success
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+SMCONF="CLEANSS",1                           //Clear session
OK
AT+SMCONF="CLIENTID","simmqtt"                  //Set client ID，need not set it after clear session
OK
AT+CSSLCFG="CONVERT",2,"ca.crt"                 //rootCA.pem is CA certificate
OK
AT+CSSLCFG="CONVERT",1,"myclient.crt","         //cert.pem is certificate, key.pem is key of cert.pem
myclient.key"
OK
AT+SMSSL=1,"ca.crt","myclient.crt"              //Set CA certificate and cert certificate name
OK
AT+SMCONN
OK
AT+SMSUB="information",1                        //Subscription packet
OK
AT+SMPUB="information",5,1,1                    //Send packet, 5 is packet length.
>hello                                          Get data on server
OK

+SMSUB: "information","hello"
AT+SMUNSUB="information"                        //Unsubscription packet
OK
AT+SMDISC                                       //Disconnect MQTT
OK
AT+CNACT=0,0                                    //Disconnect wireless
OK

+APP PDP: 0,DEACTIVE
```

5.3 Connecting Ali Cloud Function

5.3.1 MQTT Connecting Ali Cloud Function

//Example of MQTT Connecting Ali Cloud Function.	
AT+CNACT=0,1	//Open wireless connection. Parameter 0 is PDP index, parameter 1 means active.
OK	
+APP PDP: 0,ACTIVE	
AT+CNACT?	//Get local IP
+CNACT: 0,1,"10.94.36.44" **+CNACT: 1,0,"0.0.0.0"** **+CNACT: 2,0,"0.0.0.0"** **+CNACT: 3,0,"0.0.0.0"**	
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&a1kUAJknr0y"	//The format of username is: deviceName&productKey Note: a1kUAJknr0y is product_key 7080 is device Name
OK	
AT+SMCONF="PASSWORD","56bf1f37de9ce2591f5699eea1117a43dae9bd11"	//The password is generated by SHA1 algorithm
OK	
AT+SMCONF="CLIENTID","a1kUAJknr0y.7080|securemode=3,timestamp=2524608000000,signmethod=hmacsha1,gw=0|"	//The format of client id is: productKey.deviceName|securemode=3,signmethod=hmacsha1,gw=0| Note: a1kUAJknr0y is product_key 7080 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=0,1                                    //Open wireless connection parameter 0 is PDP index, parameter 1 means active. and execute AT+CLTS=1 then reboot the device.

OK

+APP PDP: 0,ACTIVE
AT+CCLK?                                        //Before connecting, you need to confirm that the time has been synchronized.

+CCLK: "21/05/26,13:37:37+32"

OK
AT+CNACT?                                       //Get local IP
+CNACT: 0,1,"10.94.36.44"
+CNACT: 1,0,"0.0.0.0"
+CNACT: 2,0,"0.0.0.0"
+CNACT: 3,0,"0.0.0.0"

OK
AT+CSSLCFG="CONVERT",2,"aliiot_ca.pem"          //Convert aliiot_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","7080&a1kUAJknr0y"         //The format of username is:
                                                deviceName&productKey
                                                Note:
                                                a1kUAJknr0y is product_key
                                                7080 is deviceName
OK
```

AT+SMCONF="PASSWORD","56bf1f37de9ce2591f5699eea1117a43dae9bd11"	//The password is generated by SHA1 algorithm
OK	
AT+SMCONF="CLIENTID","a1kUAJknr0y.7080|securemode=2,timestamp=2524608000000,signmethod=hmacsha1,gw=0|"	//The format of client id is: productKey.deviceName|securemode=2,signmethod=hmacsha1,gw=0| a1kUAJknr0y is product_key 7080 is deviceName
OK	
AT+SMSSL=2,"aliiot_ca.pem","simcom.cert.pem"	//Configure SSL connect index
OK	
AT+SMCONN	//Connect ok
OK	

5.3.3 MQTT Quick Connecting Ali Cloud Function(One Device One Secret)

//Example of MQTT Quick Connecting Ali Cloud Function(One Device One Secret).	
AT+CNACT=0,1	//Open wireless connection. Parameter 0 is PDP index, parameter 1 means active.
OK	
+APP PDP: 0,ACTIVE	
AT+CNACT?	//Get local IP
+CNACT: 0,1,"10.94.36.44"	
+CNACT: 1,0,"0.0.0.0"	
+CNACT: 2,0,"0.0.0.0"	
+CNACT: 3,0,"0.0.0.0"	
OK	
AT+SMCONF="URL","a1mGfEydcDb.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+SMALIAUTH="a1mGfEydcDb","SIM7080_test","1cea33667e1bec1ce074c63762168e99"	//Set the Alibaba Cloud device parameters: Note: a1mGfEydcDb is product_key SIM7080_test is device Name 1cea33667e1bec1ce074c63762168e99 is device Secret

```
OK
AT+SMCONN                                   //Connect ok
OK
```

5.3.4 MQTTS Ali Cloud Dynamic Register Function(One Product One Secret)

```
//Example of MQTTS Ali Cloud Dynamic Register Function(One Product One Secret)

AT+CNACT=0,1                                //Open wireless connection parameter 0 is PDP
                                            index, parameter 1 means active. and execute
                                            AT+CLTS=1 then reboot the device.
OK

+APP PDP: 0,ACTIVE
AT+CCLK?                                    //Before connecting, you need to confirm that the
                                            time has been synchronized.
+CCLK: "21/05/26,13:37:37+32"

OK
AT+CNACT?                                   //Get local IP
+CNACT: 0,1,"10.94.36.44"
+CNACT: 1,0,"0.0.0.0"
+CNACT: 2,0,"0.0.0.0"
+CNACT: 3,0,"0.0.0.0"

OK
AT+SMCONF="URL","a1mGfEydcDb.iot-as-mq      //The format of domain name is :
tt.cn-shanghai.aliyuncs.com",1883           productKey.iot-as-mqtt.cn-shanghai.aliyuncs.com
                                            Note:
                                            a1mGfEydcDb is product_key
OK
AT+SMALIDYNA="a1mGfEydcDb","device1","       //Set the Alibaba Cloud Dynamic Register
UK2iuVb8yBUjQ286"                           parameters:
                                            Note:
                                            a1mGfEydcDb is product_key.
                                            device1 is device Name, user can define it by
                                            themselves.
                                            UK2iuVb8yBUjQ286 is Product Secret.
OK
AT+SMCONN                                   //Connect ok
OK
```

+SMSUB: /ext/regnwl,{"clientId":"xF6cnBFV7GnoFKulQtEn000100","productKey":"a1mGfEydcDb","deviceName":"device3","deviceToken":"^1^1608097095451^6d7eb3914f7ed15"}	//After the dynamic registration is successful, the Alibaba Cloud will return “clientId” & ”deviceToken” which needed by future connection.