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	2019.9.2	Zhiyuan.tang	First Release
V1.02	2020.2.26	Wenjie.Lai	Add product types
V1.02	2020.7.8	Ping.zhang	All

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
+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="CLENASS",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 use AT+CLTS=1 reboot.
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+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="CLENASS",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"," myclient.key"	//cert.pem is certificate, key.pem is key of cert.pem
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 OK	//Open wireless connection. Parameter 0 is PDP index, parameter 1 means active.
+APP PDP: 0,ACTIVE AT+CNACT? +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	//Get local IP
AT+SMCONF="URL","a1kUAJknr0y.iot-as-mqtt.cn-shanghai.aliyuncs.com",1883 OK	//The format of domain name is : productKey.iot-as-mqtt.cn-shanghai.aliyuncs.com Note: a1kUAJknr0y is product_key
AT+SMCONF="USERNAME","7000C&a1kUAJknr0y" OK	//The format of username is: deviceName&productKey Note: a1kUAJknr0y is product_key 7080 is device Name
AT+SMCONF="PASSWORD","56bf1f37de9ce2591f5699eea1117a43dae9bd11" OK	//The password is generated by SHA1 algorithm
AT+SMCONF="CLIENTID","a1kUAJknr0y.7080|securemode=3,timestamp=2524608000000,signmethod=hmacsha1,gw=0|" OK	//The format of client id is: productKey.deviceName|securemode=3,signmethod=hmacsha1,gw=0| Note: a1kUAJknr0y is product_key 7080 is deviceName
AT+SMCONN OK	//Connect ok

5.3.2 MQTTS Connecting Ali Cloud Function

//Example of MQTTS Connecting Ali Cloud Function.

AT+CNACT=0,1	//Check SIM card status
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+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=3,timestamp=2524608000000,signmethod=hmacsha1,gw=0|"	//The format of client id is: productKey.deviceName|securemode=3,signmethod=hmacsha1,gw=0| a1kUAJknr0y is product_key 7080 is deviceName
OK	
AT+SMSSL=2,"aliiot_ca.pem","simcom.cert.pe	//Configure SSL connect index

m"

OK

AT+SMCONN   //Connect ok

OK