SIM7500_SIM7600_SIM7800 Series
MQTT(S)_Application Note

LTE Module
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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


1.3 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

<table>
<thead>
<tr>
<th>No</th>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CONNECT</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>SUBSCRIBE</td>
<td>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.</td>
</tr>
</tbody>
</table>
### MQTT Messages

<table>
<thead>
<tr>
<th>Step</th>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>PUBLISH</td>
<td>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.</td>
</tr>
<tr>
<td>4</td>
<td>UNSUBSCRIBE</td>
<td>An UNSUBSCRIBE message is sent by the client to the server to unsubscribe from named topics.</td>
</tr>
<tr>
<td>5</td>
<td>DISCONNECT</td>
<td>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.</td>
</tr>
<tr>
<td>6</td>
<td>PINGREQ</td>
<td>The PINGREQ message is an &quot;are you alive?&quot; message that is sent from a connected client to the server.</td>
</tr>
</tbody>
</table>

The SIM7600 series supports several methods: CONNECT, SUBSCRIBE, PUBLISH, UNSUBSCRIBE, DISCONNECT.
## 3. AT Commands for MQTT(S)

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT+CMQTTSTART</td>
<td>Start MQTT service</td>
</tr>
<tr>
<td>AT+CMQTTSTOP</td>
<td>Stop MQTT service</td>
</tr>
<tr>
<td>AT+CMQTTACCQ</td>
<td>Acquire a MQTT client</td>
</tr>
<tr>
<td>AT+CMQTTREL</td>
<td>Release a MQTT client</td>
</tr>
<tr>
<td>AT+CMQTTSSLCFG</td>
<td>Set the SSL context</td>
</tr>
<tr>
<td>AT+CMQTTWILLTOPIC</td>
<td>Input the topic of will message</td>
</tr>
<tr>
<td>AT+CMQTTWILLMSG</td>
<td>Input the will message</td>
</tr>
<tr>
<td>AT+CMQTTCONNECT</td>
<td>Connect to a MQTT server</td>
</tr>
<tr>
<td>AT+CMQTDDISC</td>
<td>Disconnect from server</td>
</tr>
<tr>
<td>AT+CMQTTTOPIC</td>
<td>Input the publish message topic</td>
</tr>
<tr>
<td>AT+CMQTTPAYLOAD</td>
<td>Input the publish message body</td>
</tr>
<tr>
<td>AT+CMQTTPUB</td>
<td>Publish a message to server</td>
</tr>
<tr>
<td>AT+CMQTTSTOPTOPIC</td>
<td>Input a subscribe message topic</td>
</tr>
<tr>
<td>AT+CMQTTSUBSTRTPIC</td>
<td>Subscribe a message to server</td>
</tr>
<tr>
<td>AT+CMQTTSUBUNSTOPIC</td>
<td>Input a unsubscribe message topic</td>
</tr>
<tr>
<td>AT+CMQTTUNSUB</td>
<td>Unsubscribe a message to server</td>
</tr>
<tr>
<td>AT+CMQTTFCFG</td>
<td>Configure the MQTT Context</td>
</tr>
</tbody>
</table>

For detail information, please refer to “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?  
+CPIN: READY  
OK

AT+CSQ  
+CSQ: 27,99  
OK

AT+CGREG?  
+CGREG: 0,1  
OK

AT+COPS?  
+COPS: 0,0," CHINA MOBILE",7  
OK

Check SIM card status
Check RF signal
Check PS service
Query Network information, operator and network mode 7, LTE network
5. MQTT(S) Samples

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
OK

+CMQTTSTART: 0
AT+CMQTTACCQ=0,"client test0"
OK
AT+CMQTTWILLTOPIC=0,10
>0123456789
OK
AT+CMQTTWILLMSG=0,6,1
>qwerty
OK
AT+CMQTTCONNECT=0,"tcp://test.mosquitto.org:1883",60,1
OK

+CMQTTCONNECT: 0,0
AT+CMQTTSUB=0,10,1
>simcomtest
OK

+CMQTTSUB: 0,0
AT+CMQTTTOPIC=0,10
> simcomtest
OK

AT+CMQTTPAYLOAD=0,9
>mqtt_test
OK
AT+CMQTTNúmero=0,1,60
OK

Publish a message
OK
+CMQTTSTART: 0
AT+CMQTTSTART
OK

AT+CMQTTSTOP
OK

5.1.2 Access to MQTT server without checking UTF8 coding

//Example of Access to MQTT server without checking UTF8 coding.
AT+CMQTTSTART
OK

+CMQTTSTART: 0
AT+CMQTTSTART: 0,"client test0"
OK

AT+CMQTTCFG="checkUTF8",0,0
OK

OK

+CMQTTUNSUB: 0,0
AT+CMQTTUNSUB=0,9,0
>simcommsg
OK

+CMQTTUNSUB: 0,0
AT+CMQTTUNSUB=0,9,0
>simcommsg
OK

+CMQTTUNSUB: 0,0
AT+CMQTTUNSUB=0,9,0
>simcommsg
OK
AT+CMQTTCONNECT=0,"tcp://test.mosquitto.org:1883",60,1
OK

+CMQTTCONNECT: 0,0
AT+CMQTTSUB=0,9,1
>盼盼盼盼
OK

+CMQTTSUB: 0,0
AT+CMQTTTOPIC=0,9
>盼盼盼盼
OK

AT+CMQTTTOPIC=0,9
>盼盼盼盼
OK

AT+CMQTTSTART=0
>盼盼盼盼
OK

+CMQTTSTART: 0
AT+CMQTTSTOP
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+CMQTTPROPERTIES=0,"client test0",1

OK

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

OK

AT+CMQTTWILLTOPIC=0,10>

0123456789

OK

AT+CMQTTWILLMSG=0,6,1

> qerty

OK

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

OK

+CMQTTCONNECT: 0,0

AT+CMQTTTOPIC=0,13>

dddrreegggghhh

OK

AT+CMQTTTPROPERTIES=0,60>

0123456789012345678901234567890123456789012345678901234567890123456789

OK

AT+CMQTTTPROPERTIES=0,1,60

OK

AT+CMQTTTPROPERTIES=0,0

OK

AT+CMQTTTPROPERTIES=0,9,1>

123456789

OK

AT+CMQTTTPROPERTIES=0

OK

+CMQTTTPROPERTIES=0,0

AT+CMQTTTPROPERTIES=0,9,1>

simcommsg

OK

+CMQTTTPROPERTIES=0,0

AT+CMQTTTPROPERTIES=0,9,0>

simcommsg

OK
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  
OK
Set the SSL version of the first SSL context

AT+CSSLCFG="authmode",0,1  
OK
Set the authentication mode(verify server) of the first SSL context

AT+CSSLCFG="cacert",0,"server_ca.pem"  
OK
Set the server root CA of the first SSL context

AT+CMQTTSTART  
OK
Start MQTT service, activate PDP context

AT+CMQTTSTART=0  
OK
Acquire one client which will connect to a SSL/TLS MQTT server

AT+CMQTTSSLCFG=0,0  
OK
Set the first SSL context to be used in the SSL connection

>0123456789  
OK
Set the will topic for the CONNECT message

>qwerty  
OK
Set the will message for the CONNECT message

AT+CMQTTCONNECT=0,"tcp://mqtts_server:port",60,1  
OK
Connect to a MQTT server, input the right server and port
+CMQTTCONNECT: 0,0
AT+CMQTTOPIC=0,13
>ddrrrgghhhh

OK
AT+CMQTTPAYLOAD=0,60
>0123456789012345678901234567890123456
89012345678901234567890

OK
AT+CMQTTPUB=0,1,60
OK

+CMQTTPUB: 0,0
AT+CMQTTSUBTOPIC=0,9,1
>123456789

OK
AT+CMQTTSUB=0
OK

+CMQTTSUB: 0,0
AT+CMQTTSUB=0,9,1
>simcommsmsg
OK

+CMQTTSUB: 0,0
AT+CMQTTSUNSUB=0,9,0
>simcommsmsg
OK

+CMQTTSUNSUB: 0,0
AT+CMQTTDISC=0,120
OK

+CMQTTDISC: 0,0
AT+CMQTTREL=0
OK
AT+CMQTSTSTOP
OK

+CMQTSTSTOP: 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+CMQTTSSTART  start MQTT service, activate PDP context
OK

+CMQTTSSTART: 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 >0123456789  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://holleeping.com:8883",60,1  Connect to a MQTT server
OK

+CMQTTCONNECT: 0,0
AT+CMQTTTOPIC=0,13 >ddrtrggghhhk  Set the topic for the PUBLISH message
OK
AT+CMQTTPAYLOAD=0,60  Set the payload for the PUBLISH message
>01234567890123456789012345678901234567
8901234567890123456789
OK
AT+CMQTTPUB=0,1,60  Publish a message
OK
+CMQTTSTOP: 0

Set one topic for the SUBSCRIBE message

AT+CMQTTSUBTOPIC=0,9,1
>123456789
OK

Subscribe a message

AT+CMQTTSUB=0
OK

Subscribe one topic from the server

+CMQTTSUB: 0,0
AT+CMQTTSUB=0,9,1
>simcomms
OK

Unsubscribe one topic from the server

AT+CMQTTUNSUB=0,9,0
>simcomms
OK

Disconnect from server

AT+CMQTTDISC=0,120
OK

Release the client

+CMQTTDISC: 0,0
AT+CMQTTREL=0
OK

Stop MQTT Service

AT+CMQTTSTOP
OK

+CMQTTSTOP: 0