GENERAL NOTES

SIMCOM OFFERS THIS INFORMATION AS A SERVICE TO ITS CUSTOMERS, TO SUPPORT APPLICATION AND ENGINEERING EFFORTS THAT USE THE PRODUCTS DESIGNED BY SIMCOM. THE INFORMATION PROVIDED IS BASED UPON REQUIREMENTS SPECIFICALLY PROVIDED TO SIMCOM BY THE CUSTOMERS. SIMCOM HAS NOT UNDERTAKEN ANY INDEPENDENT SEARCH FOR ADDITIONAL RELEVANT INFORMATION, INCLUDING ANY INFORMATION THAT MAY BE IN THE CUSTOMER’S POSSESSION. FURTHERMORE, SYSTEM VALIDATION OF THIS PRODUCT DESIGNED BY SIMCOM WITHIN A LARGER ELECTRONIC SYSTEM REMAINS THE RESPONSIBILITY OF THE CUSTOMER OR THE CUSTOMER’S SYSTEM INTEGRATOR. ALL SPECIFICATIONS SUPPLIED HEREIN ARE SUBJECT TO CHANGE.

COPYRIGHT

THIS DOCUMENT CONTAINS PROPRIETARY TECHNICAL INFORMATION WHICH IS THE PROPERTY OF SIMCOM LIMITED., COPYING OF THIS DOCUMENT AND GIVING IT TO OTHERS AND THE USING OR COMMUNICATION OF THE CONTENTS THEREOF, ARE FORBIDDEN WITHOUT EXPRESS AUTHORITY. OFFENDERS ARE LIABLE TO THE PAYMENT OF DAMAGES. ALL RIGHTS RESERVED IN THE EVENT OF GRANT OF A PATENT OR THE REGISTRATION OF A UTILITY MODEL OR DESIGN. ALL SPECIFICATION SUPPLIED HEREIN ARE SUBJECT TO CHANGE WITHOUT NOTICE AT ANY TIME.

SIMCom Wireless Solutions Limited
Building B, SIM Technology Building, No.633 Jinzhong Road, Changning District, Shanghai P.R.China
Tel: +86 21 31575100
Email: simcom@simcom.com

For more information, please visit:
https://www.simcom.com/download/list-863-en.html

For technical support, or to report documentation errors, please visit:
https://www.simcom.com/ask/ Or email to: support@simcom.com

Copyright © 2020 SIMCom Wireless Solutions Limited All Rights Reserved.
About Document

Version History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1.00</td>
<td>2020-06-19</td>
<td>All</td>
<td>New version</td>
</tr>
</tbody>
</table>

Scope

This document applies to the following products

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Size(mm)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A7600XX-XXXX</td>
<td>LTE</td>
<td>30.0<em>30.0</em>2.5</td>
<td>N/A</td>
</tr>
<tr>
<td>A7620</td>
<td>CAT1/LTE</td>
<td>24.0<em>24.0</em>2.5</td>
<td>N/A</td>
</tr>
<tr>
<td>A7670X</td>
<td>CAT1/LTE</td>
<td>24.0<em>24.0</em>2.5</td>
<td>N/A</td>
</tr>
<tr>
<td>A5360E</td>
<td>CAT4/WCDMA</td>
<td>30.0<em>30.0</em>2.5</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Contents

### About Document

- Version History .................................................................................................................... 1
- Scope ........................................................................................................................................... 1

### Contents ........................................................................................................................................ 2

### 1 Introduction

1.1 Purpose of the document ................................................................................................................. 3
1.2 Related documents .......................................................................................................................... 3
1.3 Conventions and abbreviations ....................................................................................................... 3
1.4 The process of Using MQTT(S) AT Command ................................................................................ 4
1.5 Error Handling.................................................................................................................................. 5

### 2 AT Commands for MQTT(S)

2.1 Overview of AT Commands for MQTT(S) ........................................................................................ 6

### 3 MQTT Examples

3.1 Access to MQTT server not SSL/TLS .............................................................................................. 7
3.2 Connect to SSL/TLS MQTT server (not verify server) ................................................................. 10
3.3 Access to SSL/TLS MQTT server (only verify the server)............................................................ 11
3.4 Access to SSL/TLS MQTT server (verify server and client) ......................................................... 14
3.5 Access to MQTT server without checking UTF8 coding ............................................................... 16

### 4 Appendix

4.1 Summary of Error Codes ............................................................................................................... 18
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;

Other Conventions:
MQTT(Message Queuing Telemetry Transport);
SSL(Secure Sockets Layer);
PDP(Packet Data Protocol);
1.4 The process of Using MQTT(S) AT Command

- **AT+CMQTTSTART**
  - (PDP active and initialize MQTT(S) service)
  - AT+CMQTTCONNECT
    - (Connect to a MQTT(S) server)
  - AT+CMQTTTOPIC
    - (Set the topic for publish)
  - AT+CMQTTSUB
    - (Subscribe a message to server)
  - AT+CMQTTUNSUBTOPIC
    - (Set the topic for unsubscribe)
  - AT+CMQTTUNSUB
    - (Unsubscribe a message to server)
  - AT+CMQTTUNSUBTOPIC
    - (Unsubscribe a message to server)
  - AT+CMQTTPAYLOAD
    - (Set the message body of a publish message)
  - AT+CMQTTTPUB
    - (Publish a message to server)
  - AT+CMQTTDISC
    - (Disconnect from the server)
  - AT+CMQTTSTOP
    - (Stop MQTT service)

**PDP Context:**
- Configure PDP Context by AT+CGDCONT=<cid>,<pdp_type>,<apn>
- Activate the PDP Context by AT+CGACT=<state>,[<cid>]
- Query IP address of the PDP context by AT+CGACT?

**AT+CMQTTSTART:**
- AT+CMQTTSTART also can activate the PDP Context. But it cannot customize PDP activation parameters.

**CMQTTSUBTOPIC:**
- Can set up to ten topics

**CMQTTUNSUBTOPIC:**
- Can set up to ten topics

**UE system information:**
- If <System Mode> is "NO SERVICE", it means network status has some problem.

**PDP Context:**
- 1. Configure PDP Context by AT+CGDCONT=<cid>,<pdp_type>,<apn>
- 2. Activate the PDP Context by AT+CGACT=<state>,[<cid>]
- 3. Query IP address of the PDP context by AT+CGACT?

**CS Service:**
- If <stat> of AT+CREG? equals to 1, it means that the module has registered on CS domain service. Reboot the module if false.

**PS Service:**
- If <stat> of AT+CGREG?/AT+CEREG? equals to 1, it means that the module has registered on PS domain service.

**SIM Card Status:**
- Execute AT+CPIN?, if response is +CPIN:READY, means SIM Card Status is normal. Reboot the module or check SIM card status if AT+CPIN? fails to identify SIM card in 20s.

**Signal quality:**
- Execute AT+CQUAL to query signal quality. If rssi is equals to 0, please check SIM card status or reboot the module.

**UE system information:**
- If System Mode is "NO SERVICE", it means network status has some problem.
1.5 Error Handling

For more details, please refer to A7600 Series_AT Command Manual.
2 AT Commands for MQTT(S)

2.1 Overview of 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 client</td>
</tr>
<tr>
<td>AT+CMQTREL</td>
<td>Release a client</td>
</tr>
<tr>
<td>AT+CMQTSSLCFG</td>
<td>Set the SSL context (only for SSL/TLS MQTT)</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+CMQTTCHECK</td>
<td>Connect to MQTT server</td>
</tr>
<tr>
<td>AT+CMQTTDISC</td>
<td>Disconnect from server</td>
</tr>
<tr>
<td>AT+CMQTTTOPIC</td>
<td>Input the topic of publish message</td>
</tr>
<tr>
<td>AT+CMQTTPAYLOAD</td>
<td>Input the publish message</td>
</tr>
<tr>
<td>AT+CMQTTTPUB</td>
<td>Publish a message to server</td>
</tr>
<tr>
<td>AT+CMQTTSUBTOPIC</td>
<td>Input the topic of subscribe message</td>
</tr>
<tr>
<td>AT+CMQTTSUB</td>
<td>Subscribe a message to server</td>
</tr>
<tr>
<td>AT+CMQTTUNSUBTOPIC</td>
<td>Input the topic of unsubscribe message</td>
</tr>
<tr>
<td>AT+CMQTTUNSUB</td>
<td>Unsubscribe a message to server</td>
</tr>
<tr>
<td>AT+CMQTTCFG</td>
<td>Configure the MQTT Context</td>
</tr>
</tbody>
</table>

For detail information, please refer to “A7600 Series_AT Command Manual”.

3 MQTT Examples

Before all FTP(S) related operations, we should ensure the following:
Ensure network is available:

```at
AT+CSQ
+CSQ: 23,0
OK
AT+CREG?
+CREG: 0,1
OK
AT+CGREG?
+CGREG: 0,1
OK
AT+CPSI?
+CPSI: LTE,Online,460-00,0x333C,39589680,308,EUT
RAN-BAND3,1350,5,0,0,54,0,22
OK
//In WCDMA/GSW, you need to continue to execute the following instructions
AT+CGDCONT=cid,"ip","APN"
OK
AT+CGACT=1,cid
OK
AT+CGACT?
+CGACT: 1,1
OK
```

3.1 Access to MQTT server not SSL/TLS

Following commands shows how to communicate with a MQTT server.
// start MQTT service, activate PDP context
AT+CMQTTSSTART
OK

+CMQTTSSTART: 0
// Acquire one client which will connect to a MQTT server not SSL/TLS
AT+CMQTTACCQ=0,"client test0"
OK

// Set the will topic for the CONNECT message
AT+CMQTTWILLTOPIC=0,10
>

OK
// Set the will message for the CONNECT message
AT+CMQTTWILLMSG=0,6,1
>

OK
// Connect to a MQTT server
AT+CMQTTCONNECT=0,"tcp://test.mosquitto.org:1883",60,1
OK

+CMQTTCONNECT: 0,0
// Subscribe one topic from the server
AT+CMQTTSUB=0,9,1
>

OK

+CMQTTSUB: 0,0
// Set the topic for the PUBLISH message
AT+CMQTTTOPIC=0,9
>

OK
// Set the payload for the PUBLISH message
AT+CMQTTPAYLOAD=0,60
>

OK
// Publish a message
AT+CMQTTPUB=0,1,60
OK
+CMQTTPUB: 0,0  
//receive publish message from server  
+CMQTTRXSTART: 0,9,60  
+CMQTTRXTOPIC: 0,9  
simcommsmsg  
+CMQTTRXPAYLOAD: 0,60  
0123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789  
+CMQTTRXEND: 0  
// Set one topic for the SUBSCRIBE message  
AT+CMQTTSUBTOPIC=0,9,1  
>  
OK  
// Subscribe a message  
AT+CMQTTSUB=0  
OK  
+CMQTTSUB: 0,0  
// Unsubscribe one topic from the server  
AT+CMQTTSUB=0,9,0  
>  
OK  
+CMQTTSUB: 0,0  
// Disconnect from server  
AT+CMQTTDISC=0,120  
OK  
+CMQTTDISC: 0,0  
//Release the client  
AT+CMQTTREL=0  
OK  
//stop MQTT Service  
AT+CMQTTSTOP  
OK  
+CMQTTSTOP: 0
### 3.2 Connect to SSL/TLS MQTT server (not verify server)

Following commands shows how to access to a MQTT server without verifying the server. It needs to configure the authentication mode to 0, and then it will connect to the server successfully.

```c
// start MQTT service, activate PDP context
AT+CMQTTSTART
OK

+CMQTTSTART: 0
// Acquire one client which will connect to a SSL/TLS MQTT server
AT+CMQTTACCQ=0,"client test0",1
OK
// Set the will topic for the CONNECT message
AT+CMQTTWILLTOPIC=0,10
>
OK
// Set the will message for the CONNECT message
AT+CMQTTWILLMSG=0,6,1
>
OK
// Connect to a MQTT server
AT+CMQTTCONNECT=0,"tcp://test.mosquitto.org:8883",60,1
OK

+CMQTTCONNECT: 0,0
// Set the topic for the PUBLISH message
AT+CMQTTTOPIC=0,13
>
OK
// Set the payload for the PUBLISH message
AT+CMQTTTPAYLOAD=0,60
>
OK
// Publish a message
AT+CMQTTTPUB=0,1,60
OK

+CMQTTTPUB: 0,0
```
// Set one topic for the SUBSCRIBE message
AT+CMQTTSUBTOPIC=0,9,1
>
OK

// Subscribe a message
AT+CMQTTSUB=0
OK

+CMQTTSUB: 0,0

// Subscribe one topic from the server
AT+CMQTTSUB=0,9,1
>
OK

+CMQTTSUB: 0,0

// Unsubscribe one topic from the server
AT+CMQTTUNSUB=0,9,0
>
OK

+CMQTTUNSUB: 0,0

// Disconnect from server
AT+CMQTTDISC=0,120
OK

+CMQTTDISC: 0,0

// Release the client
AT+CMQTTREL=0
OK

// stop MQTT Service
AT+CMQTTSTOP
OK

+CMQTTSTOP: 0

3.3 Access to SSL/TLS MQTT server (only verify the server)

Following commands shows how to access to a SSL/TLS MQTT server with verifying the server. It needs to configure the authentication mode to 1 and the right server root CA, and then it will connect to the server.
successfully.

```c
// Set the SSL version of the first SSL context
AT+CSSLCFG="sslversion",0,4
OK

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

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

// start MQTT service, activate PDP context
AT+CMQTTSTART
OK

+CMQTTSTART: 0

// Acquire one client which will connect to a SSL/TLS MQTT server
AT+CMQTTACCQ=0,"client test0",1
OK

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

// Set the will topic for the CONNECT message
AT+CMQTTWILLTOPIC=0,10
>

OK

// Set the will message for the CONNECT message
AT+CMQTTWILLMSG=0,6,1
>

OK

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

+CMQTTCONNECT: 0,0

// Set the topic for the PUBLISH message
AT+CMQTTTOPIC=0,13
>

OK

// Set the payload for the PUBLISH message
AT+CMQTTPAYLOAD=0,60
```
OK
// Publish a message
AT+CMQTTPUB=0,1,60
OK

+CMQTTPUB: 0,0
// Set one topic for the SUBSCRIBE message
AT+CMQTTSUBTOPIC=0,9,1
>

OK
// Subscribe a message
AT+CMQTTSUB=0
OK

+CMQTTSUB: 0,0
// Subscribe one topic from the server
AT+CMQTTSUB=0,9,1
>

OK

+CMQTTSUB: 0,0
// Unsubscribe one topic from the server
AT+CMQTTUNSUB=0,9,0
>

OK

+CMQTTUNSUB: 0,0
// Disconnect from server
AT+CMQTTDISC=0,120
OK

+CMQTTDISC: 0,0
// Release the client
AT+CMQTTREL=0
OK
// stop MQTT Service
AT+CMQTTSTOP
OK

+CMQTTSTOP: 0
3.4 Access to SSL/TLS MQTT server (verify server and client)

Following commands shows how to access to a SSL/TLS MQTT server with verifying the server and client. It needs to configure the authentication mode to 2, the right server root CA, the right client certificate and key, and then it will connect to the server successfully.

```plaintext
// Set the SSL version of the first SSL context
AT+CSSLCFG="sslversion",0,4
OK

// Set the authentication mode(verify server and client) of the first SSL context
AT+CSSLCFG="authmode",0,2
OK

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

// Set the client certificate of the first SSL context
AT+CSSLCFG="clientcert",0,"cert.pem"
OK

// Set the client key of the first SSL context
AT+CSSLCFG="clientkey",0,"key_cert.pem"
OK

// start MQTT service, activate PDP context
AT+CMQTTSTART
OK

+CMQTTSTART: 0

// Acquire one client which will connect to a SSL/TLS MQTT server
AT+CMQTTACCQ=0,"client test0",1
OK

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

// Set the will topic for the CONNECT message
AT+CMQTTWILLTOPIC=0,10
>

OK

// Set the will message for the CONNECT message
AT+CMQTTWILLMSG=0,6,1
>

OK
```
// Connect to a MQTT server
AT+CMQTTCONNECT=0,"tcp://hooleeping.com:8883",60,1
OK

+CMQTTCONNECT: 0,0
// Set the topic for the PUBLISH message
AT+CMQTTTOPIC=0,13
>
OK

// Set the payload for the PUBLISH message
AT+CMQTTPAYLOAD=0,60
>
OK

// Publish a message
AT+CMQTTPUB=0,1,60
OK

+CMQTTPUB: 0,0
// Set one topic for the SUBSCRIBE message
AT+CMQTTSUBTOPIC=0,9,1
>
OK

// Subscribe a message
AT+CMQTTSUB=0
OK

+CMQTTSUB: 0,0
// Subscribe one topic from the server
AT+CMQTTSUB=0,9,1
>
OK

+CMQTTSUB: 0,0
// Unsubscribe one topic from the server
AT+CMQTTUNSUB=0,9,0
>
OK

+CMQTTUNSUB: 0,0
// Disconnect from server
3.5 Access to MQTT server without checking UTF8 coding

Following commands shows how to communicate with a MQTT server without checking UTF8 coding.

// start MQTT service, activate PDP context
AT+CMQTTSTART
OK

+CMQTTSTART: 0
// Acquire one client which will connect to a MQTT server not SSL/TLS
AT+CMQTTACCQ=0,"client test0"
OK
// Configure not checking UTF8 coding
AT+CMQTTCFG="checkUTF8",0,0
OK
// Connect to a MQTT server
AT+CMQTTCONNECT=0,"tcp://198.41.30.241:1883",60,1
OK

+CMQTTCONNECT: 0,0
// Subscribe one topic which is not UTF8 coding string.
//The data can input by hexadecimal format.
AT+CMQTTSUB=0,9,1
>
OK
+CMQTTSUB: 0,0
// Set the topic for the PUBLISH message
AT+CMQTTOPIC=0,9
>
OK
// Publish a message
AT+CMQTTPUB=0,1,60
OK

+CMQTTPUB: 0,0
// receive publish message from server
+CMQTTRXSTART: 0,9,0
+CMQTTRXTOPIC: 0,9

+CMQTTRXEND: 0
// Disconnect from server
AT+CMQTTDISC=0,120
OK

+CMQTTDISC: 0,0
// Release the client
AT+CMQTTREL=0
OK
// stop MQTT Service
AT+CMQTTSTOP
OK

+CMQTSTOP: 0
## 4 Appendix

### 4.1 Summary of Error Codes

<table>
<thead>
<tr>
<th>Code of <code>&lt;err&gt;</code></th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>operation succeeded</td>
</tr>
<tr>
<td>1</td>
<td>failed</td>
</tr>
<tr>
<td>2</td>
<td>bad UTF-8 string</td>
</tr>
<tr>
<td>3</td>
<td>sock connect fail</td>
</tr>
<tr>
<td>4</td>
<td>sock create fail</td>
</tr>
<tr>
<td>5</td>
<td>sock close fail</td>
</tr>
<tr>
<td>6</td>
<td>message receive fail</td>
</tr>
<tr>
<td>7</td>
<td>network open fail</td>
</tr>
<tr>
<td>8</td>
<td>network close fail</td>
</tr>
<tr>
<td>9</td>
<td>network not opened</td>
</tr>
<tr>
<td>10</td>
<td>client index error</td>
</tr>
<tr>
<td>11</td>
<td>no connection</td>
</tr>
<tr>
<td>12</td>
<td>invalid parameter</td>
</tr>
<tr>
<td>13</td>
<td>not supported operation</td>
</tr>
<tr>
<td>14</td>
<td>client is busy</td>
</tr>
<tr>
<td>15</td>
<td>require connection fail</td>
</tr>
<tr>
<td>16</td>
<td>sock sending fail</td>
</tr>
<tr>
<td>17</td>
<td>timeout</td>
</tr>
<tr>
<td>18</td>
<td>topic is empty</td>
</tr>
<tr>
<td>19</td>
<td>client is used</td>
</tr>
<tr>
<td>20</td>
<td>client not acquired</td>
</tr>
<tr>
<td>21</td>
<td>client not released</td>
</tr>
<tr>
<td>22</td>
<td>length out of range</td>
</tr>
<tr>
<td>23</td>
<td>network is opened</td>
</tr>
<tr>
<td>24</td>
<td>packet fail</td>
</tr>
<tr>
<td>25</td>
<td>DNS error</td>
</tr>
<tr>
<td>26</td>
<td>socket is closed by server</td>
</tr>
<tr>
<td>27</td>
<td>connection refused: unaccepted protocol version</td>
</tr>
<tr>
<td>28</td>
<td>connection refused: identifier rejected</td>
</tr>
<tr>
<td>29</td>
<td>connection refused: server unavailable</td>
</tr>
<tr>
<td></td>
<td>Error Message</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>30</td>
<td>connection refused: bad user name or password</td>
</tr>
<tr>
<td>31</td>
<td>connection refused: not authorized</td>
</tr>
<tr>
<td>32</td>
<td>handshake fail</td>
</tr>
<tr>
<td>33</td>
<td>not set certificate</td>
</tr>
<tr>
<td>34</td>
<td>Open session failed</td>
</tr>
<tr>
<td>35</td>
<td>Disconnect from server failed</td>
</tr>
</tbody>
</table>