BC25&BC32

China Telecom IoT Platform Application Note

LPWA Module Series

Rev. BC25&BC32_China_Telecom_IoT_Platform_Application_Note_V1.0

Date: 2019-07-22

Status: Released

Our aim is to provide customers with timely and comprehensive service. For any assistance, please contact our company headquarters:

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Email: info @quectel.com

Or our local office. For more information, please visit:
http://quectel.com/support/sales.htm

For technical support, or to report documentation errors, please visit:
http://quectel.com/support/technical.htm
Or email to: support @quectel.com

GENERAL NOTES

QUECTEL OFFERS THE INFORMATION AS A SERVICE TO ITS CUSTOMERS. THE INFORMATION PROVIDED IS BASED UPON CUSTOMERS' REQUIREMENTS. QUECTEL MAKES EVERY EFFORT TO ENSURE THE QUALITY OF THE INFORMATION IT MAKES AVAILABLE. QUECTEL DOES NOT MAKE ANY WARRANTY AS TO THE INFORMATION CONTAINED HEREIN, AND DOES NOT ACCEPT ANY LIABILITY FOR ANY INJURY, LOSS OR DAMAGE OF ANY KIND INCURRED BY USE OF OR RELIANCE UPON THE INFORMATION. ALL INFORMATION SUPPLIED HEREIN IS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

COPYRIGHT

About the Document

History

Revision	Date	Author	Description
1.0	2019-07-22	Peyton LI	Initial

Contents

Table Index

1 Introduction

LwM2M (Lightweight Machine to Machine) is a secure, efficient and deployable client-server protocol for managing resource constrained devices on a variety of networks. LwM2M uses a modern architectural design based on REST, defines an extensible resource and data model and reuses and builds on an efficient secure data transfer standard called the Constrained Application Protocol (CoAP). It is a profile for device services based on CoAP (RFC 7252). LwM2M offers a light and compact secure communication interface together with an efficient data model, realizing the management and service enablement of M2M devices.

This document mainly introduces how to connect devices applying Quectel BC25 and BC32 modules to China Telecom IoT Platform (the Platform) and realize related functions through LwM2M.

2 The Platform Related AT Commands

In this chapter presented the AT commands related to connection and functions of the Platform.

2.1. AT Command Syntax

Table 1: Types of AT Commands and Responses

Test Command	**AT+<x>=?**	This command returns the list of parameters and value ranges set by the corresponding Write Command or internal processes.
Read Command	**AT+<x>?**	This command returns the currently set value of the parameter or parameters.
Write Command	**AT+<x>=<…>**	This command sets the user-definable parameter values.
Execution Command	**AT+<x>**	This command reads non-variable parameters affected by internal processes in the UE.

2.2. Description of AT Commands

2.2.1. AT+NCDPOPEN Connect Modules to the Platform

The command is used to connect modules to server of the Platform by configuring the IP address and port. If not configured, default of these parameters will be used.

Please refer to ***Chapter 5*** for possible **<err>** values.

AT+NCDPOPEN Connect Modules to the Platform	
Test Command **AT+NCDPOPEN=?**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <err>**

Write Command **AT+NCDPOPEN=<ip_addr>[,<port>[,<psk>]]**	Response If the module is successfully registered on the Platform: **OK** **+QLWEVTIND: 0** **+QLWEVTIND: 3** If there is any error: **ERROR** Or **+CME ERROR: <err>**
Maximum Response Time	300ms

Parameter

<ip_addr>	IP address of the server: "180.101.147.115".
<port>	Integer type. IP port of the Server. Default is 5683 when not configured or configured to 0. The range is 0-65535.
<psk>	String type. The key for encrypted devices. Dynamically generated by the Platform or set by the user when connecting modules to the server.

NOTES

1. The module's IMEI must be registered on the server first before using any function of the Platform. The registration address is: https://develop.ct10649.com:8093.
2. If the module is an encrypted one, it must be connected through the port 5684 with the **<psk>**.
3. If one **AT+NCDPOPEN** command has already been executed, **AT+NCDPCLOSE** must be executed before executing another **AT+NCDPOPEN**.
4. If the module is woken up from Deep Sleep, it has to be re-registered with **AT+NCDPOPEN**.
5. After **AT+NCDPOPEN** is executed, the module will keep trying connecting until the connection succeeds.

2.2.2. AT+NCDPCLOSE Disconnect Modules from the Platform

This command is used to disconnect the module from the Platform.

Please refer to ***Chapter 5*** for possible **<err>** values.

AT+NCDPCLOSE Disconnect Modules from the Platform	
Execution Command **AT+NCDPCLOSE**	Response **OK**

	If there is any error: **ERROR** Or **+CME ERROR: <err>**
Maximum Response Time	300ms

2.2.3. AT+NMGS Send Message to the Platform

The command is used to send data to the Platform through LwM2M protocol. It will respond **ERROR** or **+CME ERROR: <err>** if the message cannot be sent.

Please refer to ***Chapter 5*** for possible **<err>** values.

AT+NMGS Send Message to the Platform	
Write Command **AT+NMGS=<length>,<data>[,<type>]**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <err>**
Maximum Response Time	300ms

Parameter

<length>	Decimal length of message. The maximum is 512. Unit: byte.	
<data>	Data to be sent in hexadecimal format.	
<type>*	Integer type	
	0	Send NON message and set RAI mode to 0
	1	Send NON message and set RAI mode to 1
	2	Send NON message and set RAI mode to 2
	100	Send CON message and set RAI mode to 0
	101	Send CON message and set RAI mode to 1
	102	Send CON message and set RAI mode to 2

NOTES

1. "*" means under development.
2. Sending NON message means to send message without need for ACK from the server, while sending CON message means to send message with need for ACK from the server.
3. If RAI mode has been set, it will take effect on all data sent by the module to the server.
4. RAI mode being set to 0 means to release network normally, RAI mode being set to 1 means to

release network right now and RAI mode being set to 2 means to release network after receiving data.

5. The default value of **<type>** is 0. Thus, if **<type>** is omitted, it will be set to 0.

2.2.4. AT+NMGR Retrieve a Message Received from the Platform

The command is used to retrieve a message which has been received from the server of the Platform.

Please refer to ***Chapter 5*** for possible **<err>** values.

AT+NMGR Retrieve a Message Received from the Platform	
Execution Command **AT+NMGR**	Response If the message is not null and retrieved successfully: **+NMGR: <length>,<data>** **OK** If the message is null and retrieved successfully: **OK** If there is any error: **ERROR** Or **+CME ERROR: <err>**
Maximum Response Time	300ms

Parameter

<length>	The length of received message. Unit: byte.
<data>	Message received from the Platform in hexadecimal format.

NOTES

1. The command retrieves the oldest buffered message and deletes it from the buffer when the message is successfully retrieved.
2. In the case that the direct new message indication is enabled (**AT+NNMI=1**), received messages will be displayed directly in the URC and will not be saved in the buffer, thus, there is no need to manually retrieve the message with **AT+NMGR**.

2.2.5. AT+NNMI New Message Indication

The command is used to enable and disable the URC indication when a new downstream message from the Platform's server reaches the module.

Please refer to ***Chapter 5*** for possible **<err>** values.

AT+NNMI New Message Indication	
Read Command **AT+NNMI?**	Response **+NNMI: <status>** **OK**
Write Command **AT+NNMI=<status>**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <err>**
Maximum Response Time	300ms

Parameter

<status>	Integer type.	
	0	No indications
	1	Indications and message
	2	Indications only

NOTES

1. When **AT+NNMI=1** is configured, all messages received from the Platform will be returned directly with URC "**+NNMI: <length>,<data>**" and received messages will not be buffered.
2. When **AT+NNMI=2** is configured, the newly received message when the buffer is empty triggers an indication URC "**+NNMI**" while the received message will be buffered to be retrieved with **AT+NMGR**.
3. The buffer saves 2560 bytes of data at most, if a new message plus messages saved in the buffer exceeds 2560 bytes, the new message will be abandoned with a URC "**+NNMI: OC\"recv\",buff full**" returned indicating the buffer is full.

2.2.6. AT+NCFG* Configuration Command of the Platform

This command is used to configure functions of the Platform.

Please refer to ***Chapter 5*** for possible **<err>** values.

AT+NCFG* Configuration Command of the Platform	
Test Command **AT+NCFG=?**	Response **+NCFG: 0[,(0-2592000)]** **OK** If there is any error: **ERROR** Or **+CME ERROR: <err>**
Write Command **AT+NCFG=<mode>[,<value>]**	Response If **<value>** is presented, configure the **<mode>**: **OK** If **<value>** is omitted, query the current **<mode>**: **+NCFG: value** **OK** If there is any error: **ERROR** Or **+CME ERROR: <err>**
Maximum Response Time	300ms

Parameter

<mode>	Integer type. 0 Lifetime configure
<value>	Integer type when **<mode>=0**. Default is 86400. Unit: second. Range: 0-2592000.

NOTES

1. "*" means under development.
2. If the lifetime is configured to 0, lifetime will not be included in the registration package when the module is registered to the server, at the same time, the module will not send the update package to the server.
3. Lifetime will be reset to default after the module is rebooted. If the lifetime is configured when the module has already been connected to the Platform, it will only take effect when the module is reconnected next time.
4. If the lifetime is configured to a value from 1 to 900, it will be taken as 900.

2.2.7. AT+NMSTATUS* Query the Register Status

This command is used to query the register status.

Please refer to ***Chapter 5*** for possible **<err>** values.

AT+NMSTATUS* Query the Register Status	
Read Command **AT+NMSTATUS?**	Response **+NMSTATUS: <status>** **OK** If there is any error: **ERROR** Or **+CME ERROR: <err>**
Maximum Response Time	300ms

Parameter

<status>	String type	
	UNINITIALISED	Connection not initialized by **AT+NCDPOPEN** yet
	REGISTERING	Try to register to the server
	REJECTED_BY_SERVER	Connect request rejected by the server
	TIMEOUT_AND_RETRYING	Connect time out and try to reconnect
	REGISTERED	Registered successfully
	DEREGISTERED	Disconnected successfully by **AT+NCDPCLOSE**
	RESUMPTION_FAILED	Session resumption failed of DTLS connect

NOTES

1. "*" means under development.
2. If the status is REJECTED_BY_SERVER, please check whether the module is connecting to the Platform with correct IP address and port, and check whether the IMEI, before executing **AT+NCDPOPEN**, has been registered on the Platform. Then execute **AT+NCDPCLOSE** and then **AT+NCDPOPEN** to reconnect.
3. If the status is TIMEOUT_AND_RETRYING, please check whether the IP address and port are correct, and, for encrypted devices, check the **<psk>** as well. Then, try to reconnect.

3 The Platform Related URCs

In this chapter listed URCs relevant to China Telecom IoT Platform and their descriptions.

Table 2: URCs Related to the Platform

Index	URC	Description
[1]	**+QLWEVTIND: <type>**	Indicate the module's status.
[2]	**+NNMI[: <length>,<data>]**	Indicate a new message has been received.
[3]	**+NNMI: OC\"recv\",buff full**	Indicate the buffer is full.

3.1. "+QLWEVTIND" URC to Indicate Status of Modules

The URC mainly indicates the status of modules.

"+QLWEVTIND: <type>" URC to Indicate Status of Modules	
URC Format: **+QLWEVTIND: <type>**	Indicate the module's status.

Parameter

<type>	Integer type	
	-1	Indicate the connection open failed, abnormal event has occurred
	0	Indicate the module is registered
	3	Indicate the module is observed
	4	Indicate the CON message is sent successfully
	5	Indicate the CON message failed to be sent

3.2. “+NNMI” URC to Indicate A New Message Has Been Received

The URC mainly indicates a new message that has been received from the Platform.

“+NNMI” URC to Indicate A New Message Has Been Received	
URC Format: **+NNMI[: <length>,<data>]**	A new message has been received.

Parameter

<length>	The length of the received message.
<data>	The new message that has been received.

3.3. “+NNMI: OC\"recv\",buff full” URC to Indicate the Buffer Is Full

The URC mainly indicates the buffer is full.

“+NNMI: OC\"recv\",buff full” URC to Indicate the Buffer Is Full	
URC Format: **+NNMI: OC\"recv\",buff full**	The buffer is full.

4 Examples

This chapter offers the examples about how to apply AT commands related to the Platform to realize relevant functions.

4.1. Connect Unencrypted Device to the Platform and Disable Deep Sleep

```
AT+QSCLK=0                          //Disable Deep Sleep
OK

AT+CPSMS=0                          //Disable PSM
OK

AT+CEDRXS=0                         //Disable eDRX
OK

AT+CGDCONT?                         //Query whether the module registers on network successfully
+CGDCONT: 1,"IP","CMNBIOT","100.96.147.151",0,0          //Registered and ready

OK

AT+NCDPOPEN="180.101.147.115"       //Connect module to the server of the Platform
OK                                  //Executed successfully

+QLWEVTIND: 0                       //The module has been registered

+QLWEVTIND: 3                       //Data can be sent to the Platform

AT+NNMI=1                           //Set the new message indication mode to “Indications and
                                    message”
OK

AT+NMGS=7,010548454c4c4f            //Send message to the Platform
OK

+NNMI: 4,AAAA0000                   //The message received from the Platform
```

```
AT+NNMI=0                                   //Set the new message indication mode to “No indications”
OK

AT+NMGS=7,010548454c4c4f
OK

AT+NMGR                                     //Retrieve a message in the buffer received from the Platform
+NMGR: 4,AAAA0000                           //The message received from the Platform

OK

AT+NNMI=2                                   //Set the new message indications mode to “Indications only”
OK

AT+NMGS=7,010548454c4c4f                    //Send message to the Platform
OK

+NNMI                                       //A new message has been received

AT+NMGR                                     //Retrieve a message in the buffer received from the Platform
+NMGR: 4,AAAA0000                           //The message received from the Platform

OK

AT=NCDPCLOSE                                //Disconnect the module from the Platform
OK
```

4.2. Connect Encrypted Devices to the Platform and Disable Deep Sleep

```
AT+QSCLK=0                                  //Disable Deep Sleep
OK

AT+CPSMS=0                                  //Disable PSM
OK

AT+CEDRXS=0                                 //Disable eDRX
OK

AT+CGDCONT?                                 //Query whether the module registers on network successfully
+CGDCONT: 1,"IP","CMNBIOT","100.96.147.151",0,0          //Registered and ready
```

```
OK

AT+NCDPOPEN="180.101.147.115",5684,"d32804b8cb6701dc4d698ad67ec0ed25"
                                    //When the device is encrypted, execute the command with
                                      the port 5684 and <psk> to connect the device
OK                                  //Executed successfully

+QLWEVTIND: 0                       //The module has been registered

+QLWEVTIND: 3                       //Data can be sent to the Platform

AT+NNMI=1                           //Set the new message indication mode to “Indications and
                                      message”
OK

AT+NMGS=7,010548454c4c4f            //Send message to the Platform
OK

+NNMI: 4,AAAA0000                   //The message received from the Platform

AT+NNMI=0                           //Set the new message indication mode to “No indications”
OK

AT+NMGS=7,010548454c4c4f
OK

AT+NMGR                             //Retrieve a message in the buffer received from the Platform
+NMGR: 4,AAAA0000                   //The message received from the Platform

OK

AT+NNMI=2                           //Set the new message indication mode to “Indications only”
OK

AT+NMGS=7,010548454c4c4f            //Send message to the Platform
OK

+NNMI                               //New message has been received

AT+NMGR                             //Retrieve a message in the buffer received from the Platform
+NMGR: 4,AAAA0000                   //The message received from the Platform

OK
```

```
AT=NCDPCLOSE                    //Disconnect the module from the Platform
OK
```

4.3. Connect Device to the Platform and Enable Deep Sleep

```
AT+QSCLK=0                      //Disable Deep Sleep
OK

AT+CPSMS=1                      //Enable PSM
OK

AT+CEDRXS=1                     //Enable eDRX if needed
OK

AT+CGDCONT?                     //Query whether the module registers on network successfully
+CGDCONT: 1,"IP","CMNBIOT","100.96.147.151",0,0          //Registered and ready

OK

AT+NCDPOPEN="180.101.147.115"   //Connect the module to the Platform
OK                              //Executed successfully

+QLWEVTIND: 0                   //The module has been registered

+QLWEVTIND: 3                   //Data can be sent to the Platform

AT+NNMI=1                       //Set the new message indication mode to “Indications and
                                message”
OK

AT+NMGS=7,010548454c4c4f        //Send message to the Platform
OK

+NNMI: 4,AAAA0000               //The message received from the Platform

AT+NNMI=0                       //Set the new message indication mode to “No indications”
OK

AT+NMGS=7,010548454c4c4f
OK

AT+NMGR                         //Retrieve a message in the buffer received from the Platform
```

```
+NMGR: 4,AAAA0000                    //The message received from the Platform

OK

AT+NNMI=2                            //Set the new message indication mode to “Indications only”
OK

AT+NMGS=7,010548454c4c4f             //Send message to the Platform
OK

+NNMI                                //A new message has been received

AT+NMGR                              //Retrieve a message in the buffer received from the Platform
+NMGR: 4,AAAA0000                    //The message received from the Platform

OK

AT=NCDPCLOSE                         //Disconnect the module from the Platform
OK

AT+QSCLK=1                           //Enable Deep Sleep
OK

+QATSLEEP                            //Entering Deep Sleep

+QATWAKEUP                           //The module is woken up from Deep Sleep

AT+QSCLK=0                           //Disable Deep Sleep
OK

AT+CGDCONT?                          //Query whether the module registers on network successfully
+CGDCONT: 1,"IP","CMNBIOT","100.96.147.151",0,0          //Registered and ready

OK

AT+NCDPOPEN="180.101.147.115"        //Connect the module to the Platform
OK                                   //Executed successfully

+QLWEVTIND: 0                        //The module has been registered

+QLWEVTIND: 3                        //Data can be sent to the Platform
```

5 Summary of <err> Codes

This chapter introduces the error values related to BC25 and BC32 modules.

Table 3: General Errors (27.007)

Code of <err>	Description
3	Operation not allowed
4	Operation not supported
23	Memory failure
30	No network service
50	Execute fail
52	Option not support
53	Param invalid
159	Uplink busy/flow control
285	wait for session resumption
286	wait for data sending

NOTE

AT+CMEE=<n> command disables (**<n>=0**) or enables (**<n>=1**, **<n>=2**) the use of final result code **+CME ERROR:<err>**. For details of this command, refer to *Quectel_BC25_AT_Commands_Manual* or *Quectel_BC32_AT_Commands_Manual* please.

6 Appendix A References

Table 4: Terms and Abbreviations

Abbreviation	Description
ACK	Acknowledgement
CON	Confirmable
eDRX	Extended Discontinuous Receive
IMEI	International Mobile Equipment Identity
IoT	Internet of Things
LwM2M	Lightweight Machine to Machine
NB-IoT	Narrow Band Internet of Things
LPWA	Low-Power Wide-Area
NON	Non-confirmable
PDN	Public Data Network
PSM	Power Saving Mode
RAI	Release Assistance Indication
URC	Unsolicited Result Code