For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

— 潘先强(Herbert Pan) —

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- Foreword

Currently, the NB-IoT modules of Quectel are applied in wide industries, which involve multi-form and multi-style IoT applications. However, due to sensitiveness in power consumption, it is neessary to take life duration of product and battery endurance into consideration in stage of application design. Based on common "power off" and "PSM" and targeted to the NB-IoT terminal application design, relevant design procedure is sorted out and arranged in this document for reference on development design and application.

二、Illustration

- Related design procedure and utilization illustrated in this document is just for reference on application development.
 For actual application, pelase query and refer to corresponding AT document and manual.
- The document will sort out based on common "Power off" and "PSM" application scenario, which will fous on main procedure design. For some solution on "interrupt", please integrate with actual bussiness. Meanwhile, please note the deployment of PSM shall be merged with power off.
- The "blue" mark in the document represents the relevant AT commands to be executed. Some important URC and AT response outputs are marked with "red"; At the same time pay attention to check the "notes";
- 4. The document contains multiple application protocols, which are marked with corresponding rule identifiers. The details are as follows:

Application Protocol	CODE	INDEX	Description
LwM2M	L	L-x-y-z	
ТСР	т	Т-х-у-z	x- the first digit indicates the corresponding application function
UDP	U	U-x-y-z	y- the second digit indicates the debugging order of the corresponding function z- the third digit represents the implementation methods of different functions
MQTT	Q	Q-X-Y-Z	of the corresponding application protocol, for example, -1, -2, and -3 respectively
HTTP	н	H-x-y-z	should be combined with the program processing and task invocation of mcu
RAI	R	R -x-y-z	

Ξ , Reference for Process of Developing Application

3.1 BC660K/BC950K

3.1.1 Access to CHN Telecom CTWING Platform(AEP)

3.1.1.1 in Power-off Mode

ApplicationThe terminal is connected to AEP platform of CHN Telecom, the interval of data
reported/upload is relatively long, the application logic of mcu or program is relatively
simple, and the PSM is not enabled

Reference for Process of Developing Application:

Process of AT Command		Notes
al		
<pre>//Power on,initial >> RDY >> +CFUN: 1 >> >> +CPIN: READY</pre>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1
<pre>//After powering or network, or prioriti; >> AT+CFUN=0 >> OK >> AT+QSCLK=1 >> OK //If the terminal net >> AT+QRST=1 >> OK</pre>	n, if the terminal (mcu) does not need to connect to the ze other tasks, you need to perform //Enter the deepsleep state //The deepsleep is enabled by default eds to connect to the network later, you can run //Reboot	In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1
h and register net	twork	
<pre>//Power on,initial >> >> RDY >> +CFUN: 1 >> >> +CPIN: READY >> +CPIN: READY >> AT+QBAND=0 >> OK >> AT+QSCLK=0 >> OK</pre>	//*If you did not execute the lock BAND in 5-1, skip the command //Disable the deepsleep	+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection and hardware design
	al //Power on,initial >> >> RDY >> >> +CFUN: 1 >> >> +CPIN: READY //After powering o network, or prioriti >> AT+CFUN=0 >> OK >> AT+QSCLK=1 >> OK //If the terminal ne >> AT+QRST=1 >> OK th and register ne //Power on,initial >> >> RDY >> >> +CFUN: 1 >> >> +CFUN: 1 >> >> +CFUN: READY >> AT+QBAND=0 >> OK	al //Power on, initial >> >RDY >> >RDY >> >+CFUN: 1 >> >+CFUN: 1 >> >+CFUN: READY //After powering on, if the terminal (mcu) does not need to connect to the network, or prioritize other tasks, you need to perform >> AT+CFUN=0 //Enter the deepsleep state >> OK >> OK //The deepsleep is enabled by default >> OK //Power on, initial >> >> AT+QSCLK=1 //The deepsleep is enabled by default >> OK //Power on, initial >> >> RDY >> >> +CFUN: 1 >>> >> +CFUN: 1 >>> >> +CFUN: 1 >>>>> >> +CFUN: 1 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

	>> AT+CPSMS=0	//Disable th PSM	
	>> OK		
	>> AT+CEDRXS=0,5	//Disable the eDRX	
	>> OK		
	// Configure the APN based on the req	uirement of SIM card	If APN needs to be configured for
2-2	>> AT+QCGDEFCONT="IPV4V6"," <apn>", "<use< td=""><td>rname>", "<password>"</password></td><td>the SIM card, please perform the</td></use<></apn>	rname>", " <password>"</password>	the SIM card, please perform the
	>> ОК		command, others can be ignored
			If return NO READY, indicates the
	>> AT+CPIN? //	/check the SIM status	check of SIM card is failed. You
2.2	>> +CPIN: READY		need to check the SIM card and
2-3	>>		hardware. So the program can be
	>> OK		directly powered off, or go to the
			above 1-2, into the low power state
	//Check the attribute values of the mod	dule	
	>> ATI	//Query module identification	
	>> Quectel_Ltd		
	>> xxxxxxx		
	>> Revision: xxxxxx		If the application design does not
2-4	>>		require this step, you can skip the
	>> OK		step
	>> AT+CGSN=1	//Query the IMEI	
	>> +CGSN: <imei></imei>		
	>>		
	>> OK		
		//Other queries	
	>> AT+CSCON=1		If the application design does not
2-5	>> OK		require this step, you can skip the
			step
		the DDC second tion is complete	
	//Indicates that	the RRC connection is complete	
	// to query the following parameters, it	ristration nativark is completed	If the application design does not
	S AT+CIMI		require this step, you can skip the
	>> 460113061353533		step
	>> 400113001333333		In the application design of the
	>> OK		terminal, you can execute
2-6	>> AT+NCCID	//Query the CCID of SIM	AT+QENG=0 to obtain the relevant
	>> +NCCID:89861122223000411769		network and signal reference, and
	>>		to encode RSRP, SNR, CELLID,
	>> ОК		EARFCN and PCI and upload the
	>> AT+QENG=0 //Query the information a	about the current camp on the cell	data to the server. It will helps for
	>> +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65	, <mark>14</mark> ,8,"4C10",0,9,3	troubleshoot problems.
	>>		
	>> ОК		
	// Query the network registration statu	IS	
	>> AT+CEREG? //Query the network regist	tration status	
2-7	>> +CEREG:0,2		
	>>		
	>> OK		

	//Periodic queries, such as 500ms intervals		
	>> AT+CEREG?	If the query only returns	
0.0	>> +CEREG:0,0 //+CEREG:0,2		+CEREG:0,0 or +CEREG:0,2 within
2-8	>>		the search time (no less than 2
	>> ОК		minutes); the program goes to 5-1
			If the program finally returns
	>> AT+CEREG?	>> AT+CEREG?	+CEREG:0,3 within the search time
	>> +CEREG:0,1 //+CEREG:0,5 (roaming)	>> +CEREG:0,3	(e.g. 2 minutes); Restart or try again
2-9	//the registered successfully	//the registration denied	in the next cycle. If +CEREG:0,3 is
	>>	>>	still returned after multiple
	>> ОК	>> OK	attempts, it is recommended to
			check the SIM card
	>> AT+CGPADDR //Query	the IP address obtained	
2.40	>> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:1	7ab:01f8:98b0:032e"	
2-10	>>		
	>> OK		
			CSQ=(RSSI+113)/2
	>> AT+CSQ //Query	the CSQ	CSQ corresponds to signal
0.44	>> +CSQ:xx,99		reference RSSI. In actual
2-11	>>	applications, it is recommended to	
	>> ОК	run AT+QENG=0 to obtain RSRP	
		and SNR	
		Time conversion:	
	>> AI+CCLK; //Query	ine current date and time	24/01/16,08:55:19+32/4(h)=
2-12	>>+CCLK: 24/01/16,08:55:19+32	2024/01/16,16:55:19	
	>> OK	If the default time is returned, pls	
		query the time for multiple times	
3- Acces	ss the AEP platform		
	//Set parameters and register AEP		
	>> AT+QSCLK=0 //Disable th	ne deepsleep function	
	>>		
	>> OK		
	>> OK >> AT+QLWCFG="auto_reg",0 //Disable th	e auto_registration function	
	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >></pre>	e auto_registration function	
	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK</pre>	e auto_registration function	
	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430</pre>	e auto_registration function 60025186",86400,3	The program or MCU needs to
	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430 //Set connection parameters of AEP platform</pre>	e auto_registration function 60025186",86400,3	The program or MCU needs to monitor the URC output of the
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430 //Set connection parameters of AEP platform >></pre>	e auto_registration function 60025186",86400,3	The program or MCU needs to monitor the URC output of the registration status of the platform,
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430 //Set connection parameters of AEP platform >> >> OK</pre>	e auto_registration function 60025186",86400,3	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430 //Set connection parameters of AEP platform >> >> OK >> OK >> AT+QLWADDOBJ=19,0,1,0 //Add object19 and</pre>	e auto_registration function 60025186",86400,3 resource for upload channel	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430 //Set connection parameters of AEP platform >> >> OK >> OK >> AT+QLWADDOBJ=19,0,1,0 //Add object19 and >></pre>	e auto_registration function 60025186",86400,3 resource for upload channel	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is exceeded
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430 //Set connection parameters of AEP platform >> >> OK >> OK >> AT+QLWADDOBJ=19,0,1,0 //Add object19 and >> >> OK</pre>	e auto_registration function 60025186",86400,3 resource for upload channel	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is exceeded
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430 //Set connection parameters of AEP platform >> >> OK >> OK >> AT+QLWADDOBJ=19,0,1,0 //Add object19 and >> >> OK</pre>	e auto_registration function 60025186",86400,3 resource for upload channel	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is exceeded
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"8685430 //Set connection parameters of AEP platform >> >> OK >> OK >> AT+QLWADDOBJ=19,0,1,0 //Add object19 and >> >> OK >> >> OK</pre>	e auto_registration function 60025186",86400,3 resource for upload channel	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is exceeded
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"86854300 //Set connection parameters of AEP platform >> >> OK >> OK >> AT+QLWADDOBJ=19,0,1,0 //Add object19 and r >> >> OK >> >> OK</pre>	e auto_registration function 60025186",86400,3 resource for upload channel esource for download channel	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is exceeded
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"86854300 //Set connection parameters of AEP platform >> >> OK >> OK >> AT+QLWADDOBJ=19,0,1,0 //Add object19 and >> >> OK >> >> OK</pre>	e auto_registration function 60025186",86400,3 resource for upload channel esource for download channel	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is exceeded
L3-1	<pre>>> OK >> AT+QLWCFG="auto_reg",0 //Disable th >> >> OK >> AT+QLWCONFIG=0,"221.229.214.202",5683,"86854300 //Set connection parameters of AEP platform >> >> OK >> OK >> AT+QLWADDOBJ=19,0,1,0 //Add object19 and >> >> OK >> >> OK >> >> OK</pre>	e auto_registration function 60025186",86400,3 resource for upload channel esource for download channel	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is exceeded

	>> +QLWADDOBJ: 0		
	>> AT+QLWREG	//Initiate registration	
	>>		
	>> OK		
	>>		
	>> +QLWURC: "registering",102,0		
	>>		
	>> +QLWREG: 0		
	>>		
	>> +QLWURC: "observe",7191,0,1	9,0,0	
	>> AT+QLWOBSRSP=7191,1,19,0,0),2,11,"68656c6c6f20776f726c64",0	
	//Response observe resource		
L3-2	>>		
	>> OK		
	>>		
	>> +QLWOBSRSP: 0		
	>> AT+QLWSTATUS?	//Query the status of the current connection	The program or mcu can query the
	>>		registration status of the platform
L3-3	>> +QLWSTATUS: 2	//registered	by AT+QLWSTATUS. After the query
	>>		returns +QLWSTATUS: 2,then the
	>> OK		data can be sent normally
	//Report/send data to AEP	platform	
	>> AT+QLWNOTIFY=19,0,0,2,11,"(58656c6c6f20776f726c64",0,1	
	//It is recommended to report dat	a of the CON type	
	>>		
	>> UK		CON type is recommended for
L3-4			"reporting of sending data. When
	>> +QLWNOTIFT. 0		successfully sent
	>> +01\W/LIRC: "report" 60516		successiony sent
	>>		
	>> +OIWURC: "report_ack".0.605	16	
	//the data is successfully reported	and the ACK message is received from the platform.	
	//Set the receiving data mo	de - Direct Output mode (default)	
	»>		
	>> +QLWURC: "write",40832,19,1,	0,2,9,"636f6d706c65746564",0	
	>> AT+QLWWRRSP=40832,2	//After receiving the data, respond platform	Currently, the BC660K/BC950K
L3-5	>>		supports only direct output mode
	>> OK		
	>>		
	>> +QLWWRRSP: 0		
	>> AT+QLWDEREG	//Initiate de-registration	
	>>		If the application design does not
L3-6	>> OK		require this step, you can skip the
	>>		step
	>> +QLWDEREG: 0	// de-registered	
4- Power	off after sending and r	eceiving data	
4-1	>> AT+CFUN=0	//Set minimum function	If the terminal is designed for
	>> OK		power-off mode and powered off

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	//wait for the return OK, then mcu control to power off; if not return OK after running		after data interaction is complete,	
	AT+	CFUN=0 for a long peri	iod of time (for example, 20s), you can power off directly.	you need to run AT+CFUN=0, then
				power off the terminal after return
				OK to avoid damage to the flash
5- Erase	e th	e historical fre	quency	
	//If	2-8 the registration ne	etwork is not successful within the set search time(such as 2min),	As described in 2.0, it is supported
	go	to		As described in 2-8, it is suggested
	>>	AT+CFUN=0	//Erase the historical frequency based on CFUN0	that in the program design, after
	>>	ОК		the first search fails to time out, the
	>>	AT+OCSEARECN	//Frase the historical frequency	frequency clearing program must
	>>		,, =	be executed. After run, follow the
5 1	>> AT LOD AND -1 29			2-7 to check the search status
5-1	//*Lock a specific frequency hand. Note that it is not recommended for non-specific			again;
	//*Lock a specific frequency band. Note that it is not recommended for non-specific			If the research fails to time out, you
	situ	lations		are advised to reboot without
	>>	ОК		clearing the frequency again. Or
	>>	AT+QRST=1	//Reboot, and re-search	wait for the next service cycle and
	>>	ОК	try again	
	Fol	low 2-7 above		tiy agam.
6- Excer	otio	n <mark>handling or in</mark>	terruption	
	1)	The program or mcu	needs to add the interrupt method of time-out or failure to register	
		the AEP platform, suc	h as re-registration or reboot.	If the terminal has strict
	2)	The program or mcu	needs to add the interrupt method of timeout or failure for	requirements on power
6-1		sending or receiving o	data, such as reboot.	consumption, it is recommended
	3)	In the case of exception	ons, when the program or mcu performs hardware reset or power-	that the program reasonably
		off directly, you need	to execute AT+CFUN=0 first, and return OK, then control	control timeout
		hardware reset or pov	wer-off: But software reset or reboot does not run AT+CFUN=0.	

3.1.1.2 in PSM Mode

	PSM function is enabled, and only the AEP platform of CHN telecom is connected. The
Application	data is reported/upload frequently, and the application logic of mcu or program is
	relatively complex

Reference for Process of Developing Application:

Index	Process of AT Command		Notes
1- Initi	al		
1-1	<pre>//Power on,initial >> >> RDY >> +CFUN: 1 >> >> +CPIN: READY</pre>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1
1-2	<pre>//After powering on, if network, or prioritize o >> AT+CFUN=0 >> OK >> AT+QSCLK=1</pre>	the terminal (mcu) does not need to connect to the ther tasks, you need to perform //Enter the deepsleep state //The deepsleep is enabled by default	In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or

	>> OK		mcu gives priority to other
			tasks, cfun0 can be executed to
	//If the terminal needs to connect to	o the network later, you can run	enter the low power mode.
	>> AT+QRST=1 //	/Reboot	If this requirement is not in the
	>> OK		application design, skip this
			step to 2-1
2- Sear	ch and register network		
2 0001	//Power on initial		
			+CDINI: NOT PEADY indicator
			that the module fails to shock
	>> KDY		
	>>		the sim card.so you need to
	>> +CFUN: 1		check the SIM card itself or the
	>>		pin connection and hardware
	>> +CPIN: READY		design
	>> AT+QBAND=0 //*If you did not ex	ecute the lock BAND in 7-1, skip the command	By AT+CPSMS=1,,
	>> OK		" <t3412 tau="">","<t3324>",</t3324></t3412>
2-1	>> AT+QSCLK=0	//Disable the deepsleep	you can configure the T3412
	>> OK		and T3324 timers properly
	>> AT+CPSMS=1,,,"01000010","00000000"	//Enable th PSM	which you need.at the same
	>> OK		time, after the completion of
	>> AT+CEDRXS=0,5	//Disable the eDRX	the registration network, by
	>> OK		AT+CEREG=5; +CEREG? You
	>> AT+QNBIOTEVENT=1,1	//Enable the URC of PSM	need to query the real value of
	>> OK		T3324,T3412/TAU provided by
	>> AT+QCFG="dsevent",1	//Disable the URC of Deepsleep	the network
	>> OK		
	// Configure the APN based on the	requirement of SIM card	If APN needs to be configured
2.2	>> AT LOCODESCONT-"IDV/AVG" "< ADN>" "<	for the SIM card, please	
2-2	>> AITQCGDEFCUNT- IPV4V0 , APN> , <	perform the command, others	
	>> UK		can be ignored
			If return NO READY, indicates
			the check of SIM card is failed.
	>> AI+CPIN?	//check the SIM status	You need to check the SIM card
2-3	>> +CPIN: READY		and hardware. So the program
	>>		can be directly powered off, or
	>> OK		go to the above 1-2, into the
			low power state
	//Check the attribute values of the r	nodule	
	>> ATI	//Query module identification	
	>> Quectel_ Ltd		
	- >> xxxxxxx		
	>> Revision: xxxxxx		
	>>>		If the application design does
2-4	>> OK		not require this step, you can
	>> AT+CGSN=1	//Query the IMFI	skip the step
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
		//Other queries	
		//Other queries	

	>> AT+CCC0N-1		If the application design does
2-5	>> OK		not require this step, you can
			skip the step
	»»		
	>> +CSCON:1 //Indicates that the RRC c	connection is complete	
	//To query the following parameters, it is recor	If the application design does	
	return +CSCON:1, or query after the registration	on network is completed	not require this step, you can
	>> AT+CIMI //Query	the IMSI	skip the step
	>> 460113061353533		In the application design of the
	>>		terminal, you can execute
26	>> OK		AT+QENG=0 to obtain the
2-0	>> AT+NCCID //Query	the CCID of SIM	relevant network and signal
	>> +NCCID:89861122223000411769	reference, and to encode RSRP,	
	>>		SNR, CELLID, EARFCN and PCI
	>> OK		and upload the data to the
	>> AT+QENG=0 //Query the information about the	current camp on the cell	server. It will helps for
	>> +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C	10",0,9,3	troubleshoot problems.
	>>		
	>> OK		
	// Query the network registration status		
	>> AT+CEREG? //Query the network registration sta	tus	
	>> +CEREG:0,2		
2-7	>>		
	>> OK		
	//Periodic queries, such as 500ms intervals		
			If the query only returns
			+CEREG:0,0 or +CEREG:0,2
2-8	>>+CEREG:0,0 //+CEREG:0,2		within the search time (no less
	>> 0//		than 2 minutes); the program
	>> UK	goes to 5-1	
			If the program finally returns
			+CEREG:0,3 within the search
		>> AI+CEREG?	time (e.g. 2 minutes); Restart or
2.0	>> +CEREG:0,1 //+CEREG:0,5 (roaming)	<pre>&gt;&gt; +CEREG:0,3</pre>	try again in the next cycle. If
2-9		// the registration defiled	+CEREG:0,3 is still returned
	>> 0¥		after multiple attempts, it is
	>> UK	>> UK	recommended to check the SIM
			card
	>> AT+CGPADDR //Query	the IP address obtained	
2-10	>> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17	7ab:01f8:98b0:032e"	
2-10	>>		
	>> OK		
			CSQ=(RSSI+113)/2
	>> AT+CSQ //Query t	the CSQ	CSQ corresponds to signal
2_11	>> +CSQ:xx,99		reference RSSI. In actual
2-11	>>		applications, it is recommended
	>> OK	to run AT+QENG=0 to obtain	
			RSRP and SNR

2-12	>> AT+CCLK? >> +CCLK: "24/01/16,08:55:19+32" >> >> OK	//Query the current date and time	Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times
3- Acces	s the AEP platform		
L3-1	<pre>//Set parameters and register AE &gt;&gt; AT+QLWCFG="auto_reg",0 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QLWCONFIG=0,"221.229.214.2022 //Set connection parameters of AEP platf &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QLWADDOBJ=19,0,1,0 //A &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; OK &gt;&gt;&gt; &gt;&gt; OK &gt;&gt;&gt;&gt; &gt;&gt; OK &gt;&gt;&gt; &gt;&gt; OK &gt;&gt;&gt;&gt;&gt; &gt;&gt; OK &gt;&gt;&gt;&gt;&gt;&gt; &gt;&gt; OK &gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt; &gt;&gt; +QLWURC: "registering",102,0 &gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;&gt;</pre>	<pre>//Disable the auto_registration function //Jisable the auto_registration ///Jisable the auto_registration ////Jisable the auto_registration ////Jisable the auto_registration ///////////Jisable the auto_registration ////////////////////////////////////</pre>	The program or MCU needs to monitor the URC output of the registration status of the platform, and should reboot if the waiting window time of the program is exceeded
L3-2	<pre>&gt;&gt; AT+QLWOBSRSP=7191,1,19,0,0,2,11,' //Response observe resource &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; +QLWOBSRSP: 0</pre>	"68656c6c6f20776f726c64",0	
L3-3	>> AT+QLWSTATUS? //C	Query the status of the current connection	the registration status of the platform by AT+QLWSTATUS. After the query returns +QLWSTATUS: 2,then the data can be sent normally
	//Report/send data to AEP platfo	orm	CON type is recommended for
L3-4	>> AT+QLWNOTIFY=19,0,0,2,11,"68656c	6c6f20776f726c64" <mark>,0,1</mark>	reporting or sending data.
	//It is recommended to report data of the	e CON type	When "report_ack" is received,

	»>	the data is successfully sent
	>> OK	
	»»	
	>> +QLWNOTIFY: 0	
	>>	
	>> +QLWURC: "report",60516	
	>>> · · · · · · · · · · · · · · · · · ·	
	>> +QLWURC: "report_ack",0,60516	
	//the data is successfully reported and the ACK message is received from the platform.	
	//Set the receiving data mode - Direct Output mode (default)	
	>>	
	>> +01WURC: "write" 40832 19 1 0 2 9 "636f6d706c65746564" 0	
	>> AT+OIWWRRSP=40832.2 //After receiving the data respond platform	Currently, the BC660K/BC950K
L3-5	>>	supports only direct output
	>> 0K	mode
4- Featu	ire of RAI	
Feature	1) After the data interaction is completed user on any AT ODING 0 "221 220 214 202" 4 (	
of RAI	1) After the data interaction is completed, you can run AI+QPING=0, "221.229.214.202",4,1	1,32,1
	>> AT+QPING=0,"221.229.214.202",4,1,32,1 //QPING method with RAI Flag	
	>> OK	
	»»	
	>> +QPING: 0,221.229.214.202,32,342,44	
	>>	
R4-1	>> +QPING: 0,1,1,0,342,342,342	RAI Implementation method
	>>	
	>> +CSCON:0 //If +CSCON:0 is returned within 0-2s, RAI is effective	
	>> AT+QSCLK=1 //Enable deepsleep mode	
	>> OK	
5- Enter	status PSM and Deepsleep	
	»>	
	>> +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state	
5-1	>>	
	>> +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state	
6- Exit	status of Deepsleep and <u>PSM</u>	
	//BC660K&BC950K support to wake up deepsleep by executing AT	
	command or pulling down PSM_EINT pin	
	»>	
	>> +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state	
	>> AT+OLWRECOVER //Trigger to recovery of the Lwm2m protocol	
	>>	Method to trigger PSM wake-
L6-1-1	>> OK	up
	>>	- P
	>> +OLWURC: "recovered".0.102.0	
	>> AT+01WNOTIFY=19.0.0.2.11 "68656c6c6f20776f726c64" 0.1 //Send data of the CON type	
	>>	
	>> 0K	

	»>	
	>> +QLWNOTIFY: 0	
	>>	
	>> +QNBIOTEVENT: "EXIT PSM" //Exit the PSM state	
	»>	
	>> +QLWURC: "report",26457	
	»>	
	>> +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup	
	>>	
	>> +QLWURC: "report_ack",0,26457	
	//the data is successfully reported and the ACK message is received from the platform	
	Go to 6-2,or goto L3-3 for sending data,or goto L3-5 for receving data,	
	and the subsequent process	
	//If you want to obtain the accurate signal reference in the current scene	
	immediately after the PSM is woked up, please refer to	
	//BC660K&BC950K support to wake up deepsleep by executing AT	
	command or pulling down PSM_EINT pin	
	>>	
	>> +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state	
	>> AT+QPING=0,"221.229.214.202",4,1 //Trigger to exit PSM by PING	
	>> OK	
	>> +QNBIOTEVENT: "EXIT PSM" //Exit the PSM state	
	>>	
	<pre>/// is recommended to obtain the signal reference after return the USECON:1</pre>	
		If the program or mou poods to
	>> +ODINC: 0 221 220 214 202 22 762 44	deal with other tasks, such as
	>>	collecting the base station cell
	>> +QPING: 0 1 1 0 762 762 762	signal after wake-up: It is
	>> AT+OFNG=0 //Query signal reference	recommended to refer to this
L6-1-2	>> +OFNG: 0.3686.11.121."05C4FF33"75865.14.8."4C10".0.9.3	method to trigger PSM wake-
	>>	up and obtain the network
	>> OK	signal after wake-up.
	>> AT+QLWRECOVER //Trigger to recovery of the Lwm2m protocol	If no such requirement in the
	»	program, ignore the process
	>> OK	
	>>	
	>> +QLWURC: "recovered",0,102,0	
	>> AT+QLWNOTIFY=19,0,0,2,11,"68656c6c6f20776f726c64",0,1 //Send data of the CON type	
	»>	
	>> OK	
	»>	
	>> +QLWNOTIFY: 0	
	>>	
	>> +QLWURC: "report",8824	
	»>	
	>> +QLWURC: "report_ack",0,8824	
	//the data is successfully reported and the ACK message is received from the platform	

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

	Go to 6-2,or goto L3-3 fo	or sending data,or goto L3-5 for receving data,	
	and the subsequent proc	Cess	
	//Manual TAU update		TAU update manually can avoid
	>> AT+CPSMS=0		automatic update of TAU cycle
	>> OK		over time so non-service power
6-2	>> AT+CPSMS=1,,,"01000010"	,"0000000"	consumption can be reduced: If
	>> OK		no requirement in the
	Go to L3-3 for sending d	ata,or goto L3-5 for receving data, and the	application ignore this step
	subsequent process		application, ignore this step
7- Eras	e the historical freque	ncy	
	//If 2-8 the registration r	network is not successful within the set search	As described in 2-8, it is
	time(such as 2min), go to	0	suggested that in the program
	>> AT+CFUN=0	//Erase the historical frequency based on CFUN0	design, after the first search
	>> OK		fails to time out, the frequency
	>> AT+QCSEARFCN	//Erase the historical frequency	clearing program must be
	>> OK		executed. After run, follow the
7-1	>> AT+QBAND=1,28		2-7 to check the search status
	//*Lock a specific frequency ba	and. Note that it is not recommended for non-specific	again;
	situations		If the research fails to time out,
	>> OK		you are advised to reboot
	>> AT+QRST=1	//Reboot, and re-search	without clearing the frequency
	>> OK		again. Or wait for the next
	Follow 2-7 above		service cycle and try again.
8- Exce	otion handling or inter	ruption	
			If the terminal has strict
			requirements on power
	1) The program or mcu shall	add the interrupt method of timeout or failure of AEP	consumption, it is
	platform registration, such	as re-registration or reboot;	recommended that the
	2) The program or mcu shall	add the interrupt method of sending or receiving data	program reasonably control
	timeout or failure, such as	reboot;	timeout.
	3) The program or mcu shou	Id add interrupt methods that cannot enter PSM normally or	If unable to enter PSM or wake
8-1	cannot wake up PSM, such	n as reboot;	up from PSM, it is
8-1	· · · · · · · · · · · · · · · · · · ·		
8-1	4) In the case of exceptions,	when the program or mcu performs hardware reset or power-	recommended to compare the
8-1	4) In the case of exceptions, off directly, you need to ex	when the program or mcu performs hardware reset or power- xecute AT+CFUN=0 first, and return OK, then control	recommended to compare the normal time to enter PSM or
8-1	<ol> <li>In the case of exceptions, off directly, you need to ex hardware reset or power-or</li> </ol>	when the program or mcu performs hardware reset or power- xecute AT+CFUN=0 first, and return OK, then control off; But software reset or reboot does not run AT+CFUN=0.	recommended to compare the normal time to enter PSM or exit PSM. If the time exceeds,
8-1	<ol> <li>In the case of exceptions, off directly, you need to ex hardware reset or power-or</li> </ol>	when the program or mcu performs hardware reset or power- xecute AT+CFUN=0 first, and return OK, then control off; But software reset or reboot does not run AT+CFUN=0.	recommended to compare the normal time to enter PSM or exit PSM. If the time exceeds, power off or reboot should can
7-1 8- Excer	<ul> <li>&gt;&gt; AT+QBAND=1,28</li> <li>//*Lock a specific frequency basiliuations</li> <li>&gt;&gt; OK</li> <li>&gt;&gt; AT+QRST=1</li> <li>&gt;&gt; OK</li> <li>Follow 2-7 above</li> <li>&gt;&gt; tion handling or inter</li> <li>1) The program or mcu shall platform registration, such</li> <li>2) The program or mcu shall timeout or failure, such as</li> <li>3) The program or mcu shou cannot wake up PSM, such</li> </ul>	and. Note that it is not recommended for non-specific //Reboot, and re-search  ruption  add the interrupt method of timeout or failure of AEP as re-registration or reboot; add the interrupt method of sending or receiving data reboot; Id add interrupt methods that cannot enter PSM normally or as reboot;	2-7 to check the search status again; If the research fails to time out you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again. If the terminal has strict requirements on power consumption, it is recommended that the program reasonably control timeout. If unable to enter PSM or wake up from PSM, it is

#### 3.1.2 Access to Leshan Platform

#### 3.1.2.1 in Power-off Mode

	The terminal is connected to Leshan platform, the interval of data reported/upload is
Application	relatively long, the application logic of mcu or program is relatively simple, and the PSM is
	not enabled

# **Reference for Process of Developing Application:**

Index		Notes	
1- Initi	al		
1-1	<pre>//Power on,initial &gt;&gt; RDY &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY</pre>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1
1-2	<pre>//After powering o network, or priorit &gt;&gt; AT+CFUN=0 &gt;&gt; OK &gt;&gt; AT+QSCLK=1 &gt;&gt; OK  //If the terminal net &gt;&gt; AT+QRST=1 &gt;&gt; OK</pre>	on, if the terminal (mcu) does not need to connect to the tize other tasks, you need to perform //Enter the deepsleep state //The deepsleep is enabled by default eeds to connect to the network later, you can run //Reboot	In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1
2- Searc	ch and register ne	etwork	
2-1	<pre>//Power on,initial &gt;&gt;     RDY &gt;&gt;     +CFUN: 1 &gt;&gt;     +CFUN: READY &gt;&gt; +CPIN: READY &gt;&gt; AT+QBAND=0 &gt;&gt; OK &gt;&gt; OK &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+CPSMS=0 &gt;&gt; OK &gt;&gt; OK &gt;&gt; OK</pre>	//*If you did not execute the lock BAND in 5-1, skip the command //Disable the deepsleep //Disable th PSM //Disable the eDRX	+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection and hardware design
2-2	// Configure the A >> AT+QCGDEFCONT=' >> OK	PN based on the requirement of SIM card "IPV4V6"," <apn>", "<username>", "<password>"</password></username></apn>	If APN needs to be configured for the SIM card, please perform the command, others can be ignored
2-3	>> AT+CPIN? >> +CPIN: READY >> >> OK	//check the SIM status	If return NO READY, indicates the check of SIM card is failed. You need to check the SIM card and hardware. So the program can be directly powered off, or go to the above 1-2, into the low power state
2-4	<pre>//Query the attribu &gt;&gt; ATI &gt;&gt; Quectel_Ltd</pre>	ute values of the module //Query module identification	If the application design does not require this step, you can skip the step

	>> xxxxxxx		
	>> Revision: xxxxxxx		
	>>		
	>> OK		
	>> AT+CGSN=1 //Query	the IMEI	
	>> +CGSN: <imei></imei>		
	»»		
	>> OK		
	//Other c	ueries	
			If the application design does not
2-5	>> AI+CSCON=1		require this step, you can skip the
	>> OK		step
	>>		
	>> +CSCON:1 //Indicates that the RRC c	onnection is complete	
	//To query the following parameters, it is recor	nmended to guery after	
	return +CSCON:1 or query after the registration	n network is completed	If the application design does not
	>> AT+CIMI //Ouerv	the IMSI	require this step, you can skip the
	>> 460113061353533		step
	~~ +00113001333333		In the application design of the
			terminal, you can execute
2-6		the CCID of CIM	AT+QENG=0 to obtain the relevant
	>> AI + NCCID //Query		network and signal reference, and
	>> +NCCID:89861122223000411769		to encode RSRP, SNR, CELLID,
	>>		EARFCN and PCI and upload the
	>> OK		data to the server. It will helps for
	>> AT+QENG=0 //Query the information about the	current camp on the cell	troubleshoot problems.
	>> +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C	10",0,9,3	
	»>		
	>> OK		
	// Query the network registration status		
	>> AT+CEREG? //Query the network registration status		
	>> +CEREG:0,2		
2-7	>>		
	>> OK		
	//Periodic queries, such as 500ms intervals		
	>> AT+CEREG?		If the query only returns
20	>> +CEREG:0,0 //+CEREG:0,2		+CEREG:0,0 or +CEREG:0,2 within
2-0	»>		the search time (no less than 2
	>> OK		minutes); the program goes to 5-1
			If the program finally returns
2-9	>> AT+CEREG?	>> AT+CEREG?	+CEREG:0,3 within the search time
	>> +CEREG:0,1 //+CEREG:0,5 (roaming)	>> +CEREG:0,3	(e.g. 2 minutes); Restart or try again
	//the registered successfully	//the registration denied	in the next cycle. If +CEREG:0,3 is
	>>	>>	still returned after multiple
	>> OK	>> OK	attempts, it is recommended to
			check the SIM card
	>> AT+CGPADDR //Ouerv	the IP address obtained	
2-10	<pre>&gt;&gt; +CGPADDR: 0."10.21.53.152"."2409.8d30.0114.0242.13</pre>	7ab:01f8:98b0:032e"	
	>>		

	>> OK		
2-11	<pre>&gt;&gt; OK &gt;&gt; AT+CSQ //Query the CSQ &gt;&gt; +CSQ:xx,99 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+CCLK? //Query the current date a &gt;&gt; +CCLK: "24/01/16,08:55:19+32" &gt;&gt; &gt;&gt; OK</pre>	nd time	CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times
-3- Acces	ss the leshan platform		
	<pre>//Set parameters and register leshan &gt;&gt; AT+QSCLK=0 //Disable the deepsleep funct &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QIDNSCFG=0,"8.8.8.8","223.6.6.6" //Configure the valid DNS &gt;&gt; OK</pre>	tion	
	<pre>&gt;&gt; AT+QLWCFG="auto_reg",0 //Disable the auto_registration function &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QLWCONFIG=0,"leshan.eclipseprojects.io",5683,"urn:imei:866207055068526",86400,3 //Set connection parameters of leshan platform</pre>		The program or MCU needs to monitor the URC output of the
L3-1	>> OK >> AT+QLWADDOBJ=3311,0,3,5706,5701,5850 //Add object3311 ar >> >> OK >>	nd resources	registration status of the platform, and should reboot if the waiting window time of the program is exceeded
	<pre>&gt;&gt; +QLWADDOBJ: 0 &gt;&gt; AT+QLWREG //Initiate registration &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; +QLWURC: "registering",102,0 &gt;&gt; &gt;&gt; +QLWREG: 0</pre>		
L3-2	<pre>&gt;&gt; AT+QLWSTATUS? //Query the status of the current conr &gt;&gt; &gt;&gt; +QLWSTATUS: 2 //registered &gt;&gt; &gt;&gt; OK</pre>	nection	The program or mcu can query the registration status of the platform by AT+QLWSTATUS. After the query returns +QLWSTATUS: 2,then the data can be sent normally
L3-3	<pre>&gt;&gt; &gt;&gt; +QLWURC: "observe",43605,0,3311,0,5706 &gt;&gt; AT+QLWOBSRSP=43605,1,3311,0,5706,1,5,"white",0 //Response observe resource &gt;&gt;</pre>		

	>> OK		
	>>		
	>> +QLWOBSRSP: 0		
	//Report/send data to leshan pla	atform	
	>> AT+QLWNOTIFY=3311,0,5706,1,6,"or	range",0,1	
	//It is recommended to report data of th	ne CON type	
	>>		
	>> OK		CON type is recommended for
	>>		reporting or sending data. When
L3-4	>> +OIWNOTIFY: 0		"report ack" is received the data is
	>>		successfully sent
	>> +01W/JBC: "report" 60516		
	>> IOIMURC: "report only" 0.00516		
	////	he ACK measures is measized for mother relations	
	//the data is successfully reported and th	ne ACK message is received from the platform.	
	//Set the receiving data mode -	Direct Output mode (default)	
	>>		
	>> +QLWURC: "write",38156,3311,0,570	06,2,4,"626c7565",0	
L3-5	>> AT+QLWWRRSP=38156,2 //	After receiving the data, respond platform	Currently, the BC660K/BC950K
	>>		supports only direct output mode
	>> OK		
	>>		
	>> +QLWWRRSP: 0		
	>>AT+QLWDELOBJ=3311 //	/Delete the subscribed object	
	>>		
	>>OK		
	>>		
	>>+QLWDELOBJ: 0		If the application design door not
136	>>		require this stop, you can skip the
L3-0	>>+QLWURC: "ping",0,102,0		require this step, you can skip the
	>> AT+QLWDEREG //	/Initiate de-registration	step
	>>		
	>> OK		
	>>		
	>> +QLWDEREG: 0 //	de-registered	
4- Power	off after sending and receiv	ving data	
			If the terminal is designed for
	>> AT+CFUN=0 //	/Set minimum function	power-off mode and powered off
	>> OK		after data interaction is complete,
4-1	//Wait for the return OK, then mcu co	ontrol to power off; If not return OK after running	you need to run AT+CFUN=0, then
	AT+CFUN=0 for a long period of time (fo	r example, 20s), you can power off directly.	power off the terminal after return
			OK to avoid damage to the flash
5- Frase	the historical frequency		
	//If 2-8 the registration network is not su	iccessful within the set search time(such as 2min), go	As described in 2-8, it is suggested
	to		that in the program design, after
	>> AT+CFUN=0 //Frase the	e historical frequency based on CEUNO	the first search fails to time out, the
5-1	>> OK		frequency clearing program must
	>> AT+OCSEARECN //Frace th	ne historical frequency	be executed After run follow the
		ic mistorical nequency	2-7 to check the search status
	~~ UN		Z-1 to theth the sedicit status

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	>> AT+QBAND=1,28		again;		
	//*Lock a specific frequency band. Note that it is not recommended for non-specific		If the research fails to time out, you		
	situations		are advised to reboot without		
	>> OK		clearing the frequency again. Or		
	>>	AT+QRST=1 //Reboot, and re-search	wait for the next service cycle and		
	>> OK		try again.		
	Follow 2-7 above				
6- Exce	ptio	n handling or interruption			
	1)	The program or mcu needs to add the interrupt method of time-out or failure to register			
		the leshan platform, such as re-registration or reboot.	If the terminal has strict		
	2)	The program or mcu needs to add the interrupt method of timeout or failure for sending	requirements on power		
6-1	or receiving data, such as reboot.		consumption, it is recommended		
	3)	In the case of exceptions, when the program or mcu performs hardware reset or power-	that the program reasonably		
		off directly, you need to execute AT+CFUN=0 first, and return OK, then control	control timeout		
		hardware reset or power-off; But software reset or reboot does not run AT+CFUN=0.			

#### 3.1.2.2 in PSM Mode

Application	PSM function is enabled, and only the Leshan platform is connected. The data is reported/upload frequently, and the application logic of mcu or program is relatively
	complex

# **Reference for Process of Developing Application:**

Index	Process of AT Command		Notes
1- Initi	al		
1-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; +CFUN: 1 &gt;&gt;</pre>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on,
1-2	<pre>&gt;&gt;+CPIN: READY //After powering on, if the terminal network, or prioritize other tasks, yo &gt;&gt; AT+CFUN=0 // &gt;&gt; OK &gt;&gt; AT+QSCLK=1 // &gt;&gt; OK //If the terminal needs to connect to &gt;&gt; AT+QRST=1 // &gt;&gt; OK</pre>	(mcu) does not need to connect to the bu need to perform /Enter the deepsleep state The deepsleep is enabled by default O the network later, you can run /Reboot	start from 2-1 In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1
2- Searc	ch and register network		
2-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY</pre>		+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to

	>>	check the SIM card itself or the
	>> +CFUN: 1	pin connection and hardware
	>>	design
	>> +CPIN: READY	By AT+CPSMS=1,,
	>> AT+QBAND=0 //*If you did not execute the lock BAND in 7-1, skip the command	" <t3412 tau="">","<t3324>",</t3324></t3412>
	>> OK	you can configure the T3412
	>> AT+QSCLK=0 //Disable the deepsleep	and T3324 timers properly
	>> OK	which you need.at the same
	>> AT+CPSMS=1,,,"01000010","00000000" //Enable th PSM	time, after the completion of
	>> ОК	the registration network, by
	>> AT+CEDRXS=0,5 //Disable the eDRX	AT+CEREG=5; +CEREG? You
	>> ОК	need to query the real value of
	>> AT+QNBIOTEVENT=1,1 //Enable the URC of PSM	T3324,T3412/TAU provided by
	>> OK	the network
	>> AT+QCFG="dsevent",1 //Disable the URC of Deepsleep	
	>> OK	
		If APN needs to be configured
	// Configure the APN based on the requirement of SIM card	for the SIM card, please
2-2	>> AT+QCGDEFCONT="IPV4V6"," <apn>", "<username>", "<password>"</password></username></apn>	perform the command, others
	>> OK	can be ignored
		If return NO READY, indicates
		the check of SIM card is failed.
	>> AT+CPIN? //check the SIM status	You need to check the SIM card
2-3	>> +CPIN: READY	and hardware. So the program
	>>>	can be directly powered off, or
	>> OK	go to the above 1-2, into the
		low power state
	//Check the attribute values of the module	
	>> ATI //Query module identification	
	>> Quectel_Ltd	
	>> xxx xxxx	
	>> Revision: xxxxxxx	
	>>	If the application design does
2-4	>> OK	not require this step, you can
	>> AT+CGSN=1 //Query the IMEI	skip the step
	>> +CGSN: <imei></imei>	
	»>	
	>> OK	
	//Other queries	
		If the application design does
2-5	>> AT+CSCON=1	not require this step, you can
	>> OK	skip the step
	»>	If the application design does
	>> +CSCON:1 //Indicates that the RRC connection is complete	not require this step, you can
	//To query the following parameters, it is recommended to query after	skip the step
2-6	return +CSCON:1, or query after the registration network is completed	In the application design of the
	>> AT+CIMI //Query the IMSI	terminal, you can execute
	>> 460113061353533	AT+QENG=0 to obtain the
	>>	relevant network and signal
L	1	

2-7	<pre>&gt;&gt; OK &gt;&gt; AT+NCCID //Query &gt;&gt; +NCCID:89861122223000411769 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QENG=0 //Query the information about the of &gt;&gt; +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C1 &gt;&gt; &gt;&gt; OK // Query the network registration status &gt;&gt; OK // Query the network registration status &gt;&gt; AT+CEREG? //Query the network registration status &gt;&gt; +CEREG:0,2 &gt;&gt; &gt;&gt; OK //Periodic queries, such as 500ms intervals</pre>	the CCID of SIM surrent camp on the cell .0",0,9,3	reference, and to encode RSRP, SNR, CELLID, EARFCN and PCI and upload the data to the server. It will helps for troubleshoot problems.
2-8	>> <b>AT+CEREG?</b> >> +CEREG:0,0 //+CEREG:0,2 >> >> OK		If the query only returns +CEREG:0,0 or +CEREG:0,2 within the search time (no less than 2 minutes); the program goes to 5-1
2-9	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,1 //+CEREG:0,5 (roaming) //the registered successfully &gt;&gt; &gt;&gt; OK</pre>	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,3 //the registration denied &gt;&gt; &gt;&gt; OK</pre>	If the program finally returns +CEREG:0,3 within the search time (e.g. 2 minutes); Restart or try again in the next cycle. If +CEREG:0,3 is still returned after multiple attempts, it is recommended to check the SIM card
2-10	>> AT+CGPADDR //Query >> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17 >> >> OK	the IP address obtained ab:01f8:98b0:032e"	
2-11	>> AT+CSQ //Query t >> +CSQ:xx,99 >> >> OK	he CSQ	CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR
2-12	>> AT+CCLK? //Query th >> +CCLK: "24/01/16,08:55:19+32" >> >> OK	ne current date and time	Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times
3- Acces	s the leshan platform //Set parameters and register leshan		The program or MCU needs to
L3-1	>> AT+QSCLK=0 //Disable th	e deepsleep function	monitor the URC output of the registration status of the

	>> OK	platform, an	d should reboot if
	>> AT+QIDNSCFG=0,"8.8.8.8","223.6.6.6" //Configure the valid DNS	the waiting	window time of the
	>> OK	program is e	exceeded
	>> AT+QLWCFG="auto_reg",0 //Disable the auto_registration function		
	>>		
	>> OK		
	>>		
	AT+QLWCONFIG=0,"leshan.eclipseprojects.io",5683,"urn:imei:866207055068526",864	0,3	
	//Set connection parameters of leshan platform		
	>>		
	>> OK		
	>> AT+QLWADDOBJ=3311,0,3,5706,5701,5850 //Add object3311 and resources		
	>>		
	>> OK		
	»>		
	>> +QLWADDOBJ: 0		
	>> AT+QLWREG //Initiate registration		
	»>		
	>> OK		
	»»		
	>> +QLWURC: "registering",102,0		
	»>		
	>> +QLWREG: 0		
	>> AT+OLWSTATUS? //Ouery the status of the current connection	The program	n or mcu can query
	>>	the registrat	ion status of the
L3-2	>> +OLWSTATUS: 2 //registered	platform by	AT+QLWSTATUS.
	>>	After the qu	ery returns
	>> OK	+QLWSTATU	S: 2,then the data
		can be sent	normally
	>>		
	>> +QLWURC: "observe",43605,0,3311,0,5706		
	>> AT+QLWOBSRSP=43605,1,3311,0,5706,1,5,"white",0		
L3-3	//Response observe resource		
	>> 		
	>> UK		
	>>		
	>>+QLWOBSRSP: 0		
	// Report/send data to leshan platform		
	//It is recommended to report data of the CON type		
	>> 0K	CON type is	recommended for
	>>	reporting or	sending data.
L3-4	>> +QLWNOTIFY: 0	When "repo	rt ack" is received.
	>>	the data is s	uccessfully sent
	>> +QLWURC: "report",60516		, i i i i i i i i i i i i i i i i i i i
	»>		
	>> +QLWURC: "report_ack",0,60516		
	//the data is successfully reported and the ACK message is received from the platform.		

L3-5	<pre>//Set the receiving data mode - Direct Output mode (default) &gt;&gt; &gt;&gt; +QLWURC: "write",38156,3311,0,5706,2,4,"626c7565",0 &gt;&gt; AT+QLWWRRSP=38156,2 //After receiving the data, respond platform &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; +QLWWRRSP: 0</pre>	Currently, the BC660K/BC950K supports only direct output mode
4- Featu	ire of RAI	
Feature		
of RAI	1) After the data interaction is completed, you can run AT+QPING=0,"8.8.8.8",4,1,32,1	
R4-1	>> AT+QPING=0,"8.8.8.8",4,1,32,1 //QPING method with RAI Flag >> OK >> >> +QPING: 0,8.8.8.8,32,275,51 >> >> +QPING: 0,1,1,0,275,275,275 >> >> +CSCON:0 //If +CSCON:0 is returned within 0-2s, RAI is effective >> AT+QSCLK=1 //Enable deepsleep mode >> OK	RAI implementation method
5- Enter	status PSM and Deepsleep	
5-1	<pre>&gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state</pre>	
6- EXIT	<pre>//BC660K&amp;BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state &gt;&gt; AT+QLWRECOVER //Trigger to recovery of the Lwm2m protocol &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; +QLWURC: "recovered",0,102,0 &gt;&gt; AT+QLWNOTIFY=3311,0,5706,1,3,"red",0,1 //Send data of the CON type &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; +QLWNOTIFY: 0 &gt;&gt; &gt;&gt; +QLWNOTIFY: 0 &gt;&gt; &gt;&gt; +QLWURC: "report",26457 &gt;&gt; &gt;&gt; +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup &gt;&gt;</pre>	Method to trigger PSM wake- up

bit of the subsequent process          Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status is subsequent process       Image: status is subsequent process         Image: status subsequent process			
//the data is uccessfully reported and the ACK message is received from the platform       Go to 6-2,or goto 1.3-3 for sending data,or goto 1.3-5 for receiving data, and the subsequent process         //ff.you want to obtain the accurate signal reference in the current scene immediately after the PSM is woked up, please refer to 0       //ff.GotoK&BC/SSDK Support to wake up deepleep by executing AT command or pulling down PSM_EINT pin         >>		>> +QLWURC: "report_ack",0,26457	
Go to 6-2,or goto L3-3 for sending data, or goto L3-5 for receiving data, and the subsequent process     Image: command or pulling down PSM_EINT pin       >>		//the data is successfully reported and the ACK message is received from the platform	
and the subsequent process       ///f you want to obtain the accurate signal reference in the current scene immediately after the PSM is woked up, please refer to         //// KC660K&BC59OK support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin		Go to 6-2 or goto L3-3 for sending data or goto L3-5 for receiing data.	
Inf you want to obtain the accurate signal reference in the current scene immediately after the PSM is woked up, please refer to //BC660K&BC950K support to wake up deepsleep by executing AT command or pulling down PSM EINT pin         >>		and the subsequent process	
Immediately after PSM is worked up, please refer to         //BC660K&BC350K support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>         >>         >>         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >         >        <		///f you want to obtain the accurate simply reference in the surrent scene	
Immediately after the PSM is woked up, please refer to         //ECG60x8.8E/S0x support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>         (MBIOTEVENT: "EXIT DEFPSLEEP" //Exit the deepsleep state         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>         >>          >>          >>          >>          >>          >>          >>          >>          >>          >>		//if you want to obtain the accurate signal reference in the current scene	
//BCG60X8BC390K support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>         >>         >>         CANSIDTEVENT. "EXIT DEEPSLEEP"       //Exit the deepsleep state         >>       AT-QUING-0; 8.8.8.3",4,1         >>       (/Trigger ow exit PSM by PING)         >>       >>         >>       (MBIOTEVENT."Exit DEEPSLEEP"         //It's recommended to obtain the signal reference after return the +CSCON:1         >>       +CPING: 0.8.8.8.32,275,51         >>       +CPING: 0.1,0,275,275,275         >>       +CPING: 0.1,0,275,275,275         >>       +CPING: 0.1,0,275,275,275         >>       -         >>       +CPING: 0.1,0,275,275,275         >>       -         >>       +CPING: 0.1,0,275,275,275         >>       -         >>       -         >>       -         >>       -         >>       -         >>       -         >>       -         >>       -         >>       -         >>       -         >>       -         >>       -         >		immediately after the PSM is woked up, please refer to	
L8-12 Command or pulling down PSM_EINT pin Seq08IOTEVENT: "EXIT DEEPSLEP" //Exit the deepsleep state SAT-QPING-0,"8.8.8.8",4,1 //Trigger to exit PSM by PING SOK Seq08IOTEVENT: "EXIT PSM" //Exit the PSM state SecCODN: 1 //It is recommended to obtain the signal reference after return the +CSCON:1 SecCODN: 1 //It is recommended to obtain the signal reference after return the +CSCON:1 SecCODN: 1 //It is recommended to obtain the signal reference after return the +CSCON:1 SecCODN: 1 //It is recommended to obtain the signal reference after return the +CSCON:1 SecCODN: 1 //It is recommended to obtain the signal reference after return the +CSCON:1 SecCODN: 1,10,275,275,275 SecCODN: 0,110,275,275,275 SecCODN: 1,1121,"05CEEF33", 75,8,65,148,"4CI0",0,9,3 Return of the transkey were up, 11 is recommended to refere to this method to trigger PSM wake-up, 11 fin such requirement in the program. ignore the process SecCODN: 2 SecCODN		//BC660K&BC950K support to wake up deepsleep by executing AT	
I.6-1-2          >>       (CM00107EVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state         >>       (CM00107EVENT: "EXIT DEEPSLEEP" //Exit the PSM state         >>       (CM0107EVENT: "EXIT PSM" //Exit the PSM state         >>       (CM0107EVENT: "Exit report psm or mcu needs to deal with the three state state or psm or mcu needs to deal with the three state state or psm or mcu needs to deal with the three state state or psm or mcu needs to deal with the three state state or psm or mcu needs to deal with the three state state state or psm or mcu needs to deal with the three state state or psm or mcu needs to deal with the three state state or psm or mcu needs to deal with the three state state or psm or mcu needs to deal with the three state state or psm or mcu needs to deal with the three state state state stat		command or pulling down PSM_EINT pin	
Part QNBOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state          >> AT QNBOTEVENT: "EXIT PSM"       //Figger to exit PSM by PING         >> OK       >>         >> ONBOTEVENT: "EXIT PSM"       //Exit the PSM state         >>       >> CSCON: 1         //It is recommended to obtain the signal reference after return the +CSCON:1       >>         >>       +         >> + OPING: 0.8.8.8.32,275,51       If the program or mcu needs to deal with other tasks, such as collecting the base station cell signal after wake-up.1 ti is recommended to refer to this method to trigger PSM wake-up and obtain the network signal after return the +CSCON:1         >>       >> (QENG: 0.3686, 11,121,"05CAEF33", ~75,-8,65,14.8," aCl0",0,9,3       recommended to refer to this method to trigger PSM wake-up and obtain the network signal after wake-up.1 ti is recommended to refer to this method to trigger PSM wake-up and obtain the network signal after wake-up.1 ti is recommended to refer to this method to trigger PSM wake-up and obtain the network signal after wake-up.1 ti is recommended to refer to this method to trigger PSM wake-up and obtain the network signal after wake-up.1 ti is recommended to refer to this method to trigger PSM wake-up and obtain the network signal after wake-up.1 ti is recommended to refer to this method to trigger PSM wake-up and obtain the network signal after wake-up.1 ti is recommended to refer to this method to trigger PSM wake-up and the subsequent process         >> OK       >         >> OK       >         >> AT-QUWNOTIFY-3311,0,5706,1,3,"red",0,1       //Sem data of the CON type         >> +		>>	
AT-QPING-0,"8.8.8.%,4,1 //Trigger to exit PSM by PING >> CK >> 4QNBIOTEVENT: "EXIT PSM" //Exit the PSM state >> 4QNBIOTEVENT: "EXIT PSM" //Exit the PSM state >> 4CSCON: 1 //Exit the resonanced to obtain the signal reference after return the +CSCON: 1 >> 4CSCON: 1 //Exit seconanced to obtain the signal reference after return the +CSCON: 1 >> 4CPING: 0,8.8.8,32,275,51 >> 4QPING: 0,11,0,275,275,275 Collecting the base station cell >> 4QPING: 0,11,0,275,275,275 Collecting the base station cell program, ignore the program up and obtain the network signal after wake-up. If no such requirement in the program, ignore the process >> 4QUWURC: "recovered",0,102,0 >> 4T+QUWURC: "recovered",0,102,0 >> 4T+QUWURC: "recovered",0,102,0 >> 4T+QUWURC: "recovered",0,102,0 >> 4T+QUWURC: "recovered",0,102,0 >> 4T+QUWURC: "report_8824 >> 4QUWURC: "rep		>> +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state	
L6-1-2 SOK SOCON:1 (// Use recommended to obtain the signal reference after return the +CSCON:1 SOK </td <td></td> <td>&gt;&gt; AT+QPING=0,"8.8.8.8",4,1 //Trigger to exit PSM by PING</td> <td></td>		>> AT+QPING=0,"8.8.8.8",4,1 //Trigger to exit PSM by PING	
<ul> <li>+QNBIOTEVENT: "EXIT PSM" //Exit the PSM state</li> <li>+QNBIOTEVENT: "EXIT PSM" //Exit the PSM state</li> <li>+QPING: 0.8.8.8.32,275.51</li> <li>+QPING: 0.1,1,0,275,275.275</li> <li>&gt;AT+QENG=0 //Query signal reference</li> <li>&gt;AT+QENG=0 //Query signal reference</li> <li>&gt;AT+QENG=0,0,1,1,0,275,275.275</li> <li>&gt;AT+QENG=0 //Query signal reference</li> <li>&gt;AT+QENG=0,0,1,1,0,275,275.8,-65,14,8,"4C10",0,9.3</li> <li>&gt;AT+QENG=0,0,1,0,0276,1,3,"red",0,1 //Send data of the Lom2m protocol</li> <li>&gt; AT+QUWURC: "recovered",0,10,0</li> <li>&gt; AT+QUWURC: "report_,8824</li> <li>&gt; AUMURC: "report_,8824</li> <li>&gt; AUMURC: "report_,8824</li> <li>&gt; AUMURC: "report_,8824</li> <li>&gt; AT+CPSMS=0</li> <li>&gt; OK</li> <li>&gt; AT+CPSMS=0</li> <li>&gt; OK</li> <li>&gt; AT+CPSMS=0</li> <li>&gt; OK</li> <li>SoK</li> <li>&gt; AT+CPSMS=1, "Q100010" '0000000'</li> <li>&gt; OK</li> <li>&gt; AT+CPSMS=1, "Q100010" '0000000'</li> <li>&gt; OK</li> <li>&gt; AT+CPSMS=1, "Q100010" '0000000'</li> <li>&gt; OK</li> <li>&gt; AT+CPSMS=1, "Q100010" '0000000'</li> <li>&gt; OK</li> <li>&gt; OK<td></td><td>&gt;&gt; OK</td><td></td></li></ul>		>> OK	
L8-1.2 S + QNBIOTEVENT: "EXIT PSM" //Exit the PSM state S + CSCON: 1 //It is recommended to obtain the signal reference after return the +CSCON:1 S + QPING: 0,8.8.8.8,32,275,51 S + QPING: 0,8.8.8.8,32,275,51 S + QPING: 0,1,1,0,275,275,275 S + QPING: 0,3686,11,121,"OSCAEE33", 75,-8,-65,14,8,"4C10",0,9.3 T + QENG: 0,13,10,3706,1,3,"red",0,1 //Send data of the CON type S + QENVIDITF: 0 S + QENVIDIT		»>	
LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-1-2 LB-		>> +ONPLOTEVENT: "EVIT DSM" //Evit the DSM state	
L6-1-2 > +CSCON: 1 //it is recommended to obtain the signal reference after return the +CSCON:1 >> +CPING: 0,8.8.8.8,32,275,51 If the program or mcu needs to deal with other tasks, such as >+CPING: 0,1,1,0,275,275,275 Collecting the base station cell signal after wake-up, it is recommended to refer to this method to trigger FSM wake- up and obtain the network signal after wake-up. It is and after wake-up. It signal after wake-up. It is no such requirement in the program, ignore the process CK > CULWURC: "recovered",0,102,0 > AT+QLWURC: "report",8824 > +QLWURC: "report",8824 > +QLWURC: "report",8824 > +QLWURC: "report",8824 > +QLWURC: "report",8824 > CK >			
Figure 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1		>>	
//tis recommended to obtain the signal reference after return the +CSCON:1       >         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >>       +         >       +		>> +CSCON: 1	
>> +QPING: 0,8.8.8,32,275,51 +4QPING: 0,1,1,0,275,275,275 AT4QENG=0 //Query signal reference > 4T4QENG=0 //Query signal reference > 40E-11-2 > +QENG: 0,3686,11,121,'05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3 > +QENG: 0,3686,11,121,'05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3 recommended to refer to this method to trigger PSM wake- up and obtain the network > 0K > 0K > +QLWNRC: 'recovered",0,102,0 > AT+QUWNOTIFY: 0 > +QLWNNOTIFY: 0 > +QLWNRC: "report",8824 > +QLWURC: "report",0,02,0 > TAU update manually can avoid autom the platform Go to 6-2,or goto 13-3 for sending data,or goto 13-5 for receving data, and the subsequent process > OK S OK </td <td></td> <td><pre>//It is recommended to obtain the signal reference after return the +CSCON:1</pre></td> <td></td>		<pre>//It is recommended to obtain the signal reference after return the +CSCON:1</pre>	
P>+0PING: 0,8.8.8,32,275,51 > H0PING: 0,8.8.8,32,275,51 Calculation of the program or muneeds to independent of the polymer signal reference Calculation of the polymer signal reference </td <td></td> <td>»</td> <td></td>		»	
Notes and the subsequent process Art-QENG: 0,1,1,0,275,275,275 Art-QENG: 0,3686,11,121,'05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3 PAGENG: 0,3686,11,121,'05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3 Pagende to refer to this method to trigger PSM wake- Up and obtain the network SOK Up and obtain the network Signal after wake-up. It is recommended to refer to this method to trigger PSM wake- Up and obtain the network signal after wake-up. If no such requirement in the program, ignore the process SOK S		>> +QPING: 0,8.8.8.8,32,275,51	If the program or mcu needs to
<ul> <li>&gt;&gt; +QPING: 0,1,0,275,275,275</li> <li>&gt; AT+QENG=0 //Query signal reference</li> <li>&gt;&gt; +QENG: 0,3686,11,121,"05C4EF33",-75,8,-65,14,8,"4C10",0,9,3</li> <li>&gt;&gt; +QENG: 0,368,14,",0,102,0</li> <li>&gt;&gt; +QENG: 0,102,0</li> <li>&gt;&gt; +QENG: 0,12,3,10,000,0</li> <li>&gt;</li></ul>		»>	deal with other tasks, such as
SAT+QENG=0 //Query signal reference Signal after wake-up; It is recommended to refer to this method to trigger PSM wake-up SOK SAT+QLWRECOVER //Trigger to recovery of the Lwm2m protocol SOK		>> +QPING: 0,1,1,0,275,275,275	collecting the base station cell
L6-1-2       >> +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3       recommended to refer to this method to trigger PSM wake-up and obtain the network signal after wake-up.         >> OK       >> AT+QLWRECOVER       //Trigger to recovery of the Lwm2m protocol       signal after wake-up.         >> OK       >> OK       signal after wake-up.       If no such requirement in the program, ignore the process         >> OK       >>       >> +QLWURC: "recovered",0,102,0       stratequivement in the program, ignore the process         >> OK       >>       >>       >> OK       stratequivemont for each of the CON type         >>       >>       >>       >>       >>         >> OK       >>       >>       >>       >>         >> OK       >>       >>       >>       >>         >> OK       >>       >>       >>       >>         >> +QLWURC: "report",8824       >>       >>       >>         >> +QLWURC: "report_ack",0,8824       >>       >>       >>         //the data is successfully reported and the ACK message is received from the platform       TAU update manually can avoid automatic update of TAU cycle over time, so,non-service power consumption can be reduced, if no requirement in the application, ignore this step reduced, if no requirement in the application, ignore this step		>> AT+QENG=0 //Query signal reference	signal after wake-up; It is
L6-1-2 >> OK >> OK >> AT+QLWRECOVER //Trigger to recovery of the Lwm2m protocol >> OK >> CK >> QK >> QK AT+QLWURC: "report",8824 >> QUUURC: "report",8824 >> QKUURC: "report",8824 >> QKUURC: "report",8824 >> QKUURC: "report",8824 >> QK And the subsequent process //Manual TAU update >> AT+QEMS=0 >> QK Go to 6-2,or goto L3-3 for sending data,or goto L3-5 for receving data, and the subsequent process ATAU update manually can avoid automatic update of TAU cycle over time, so,non-service power consumption can be reduced; if no requirement in the application, ignore this step		>> +OFNG: 0.3686.11.121."05C4FF33"75865.14.8."4C10".0.9.3	recommended to refer to this
<ul> <li>So K</li> <li< td=""><td>L6-1-2</td><td>&gt;&gt;</td><td>method to trigger PSM wake-</td></li<></ul>	L6-1-2	>>	method to trigger PSM wake-
6-2       AT+QLWRECOVER       //Trigger to recovery of the Lwm2m protocol       signal after wake-up.         >>       AT+QLWRECOVER       //Trigger to recovery of the Lwm2m protocol       signal after wake-up.         >>       N       Signal after wake-up.       If no such requirement in the program, ignore the process         >>       AT+QLWNOTIFY:3311,0,5706,1,3,"red",0,1       //Send data of the CON type       Program, ignore the process         >>       AT+QLWNOTIFY:0       >>       Program, ignore the process         >>       +QLWURC: "report",8824       >         >>       +QLWURC: "report",8824       >         >>       +QLWURC: "report_ack",0,8824       //the data is successfully reported and the ACK message is received from the platform       Go to 6-2, or goto 1.3-3 for sending data, or goto 1.3-5 for receiving data, and the subsequent process         6-2       >> AT+CPSMS=1,,,"0100010","0000000"       >> OK       TAU update manually can avoid automatic update of TAU cycle over time, so, non-service power consumption can be reduced; If no requirement in the application, ignore this step			up and obtain the network
SALAQUARECOVER       // Ingger to recovery of the LWM2th protocol       signal arter wake-up.         Signal arter wake-up.       If no such requirement in the         >> OK       >         >> +QLWURC: "recovered",0,102,0       >         >> AT+QUWNOTIFY=3311,0,5706,1,3,"red",0,1       //Send data of the CON type         >>       >>         >> OK       >>         >> OK       >>         >> +QLWURC: "report",8824       >>         >>       >>         >> +QLWURC: "report",8824       >>         >>       >>         >> +QLWURC: "report_ack",0,8824       >         >>       >>         >> +QLWURC: "report_ack",0,8824       >         >>       >>         >> +QLWURC: "report_ack",0,8824       >         >>       >>         >> +QLMURC: "report_ack",0,8824       >         >>       >>         >> OK       >         So K       >         >> OK       >         >> OK <td></td> <td></td> <td></td>			
<ul> <li>Solution in the process</li> <li>Solution of the subsequent process</li> </ul>		>> AI+QLWRECOVER // Ingger to recovery of the LWH2m protocol	signal after wake-up.
<ul> <li>SOK</li> <li>Sok</li> <li>Program, ignore the process</li> <li>Sok</li> <li>Sok</li></ul>		»	If no such requirement in the
S> +QLWURC: "recovered",0,102,0 >AT+QLWNOTIFY=3311,0,5706,1,3,"red",0,1 //Send data of the CON type >> >> OK >> 0K >> +QLWNOTIFY: 0 >> >> +QLWURC: "report",8824 >> +QLWURC: "report",8824 >> +QLWURC: "report",0,8824 //the data is successfully reported and the ACK message is received from the platform Go to 6-2, or goto 1.3-3 for sending data, or goto 1.3-5 for receving data, and the subsequent process AT+CPSMS=0 >> 0K 6-2 %AT+CPSMS=1,,,"01000010","0000000" > 0K Go to 1-3-3 for sending data, or goto 1.3-5 for receving data, and the subsequent process TAU update manually can avoid automatic update of TAU cycle over time, so,non-service power consumption can be reduced; If no requirement in the application, ignore this step		>> OK	program, ignore the process
6-2 S+QLWURC: "recovered",0,102,0 > AT+QLWNOTIFY=3311,0,5706,1,3,"red",0,1 //Send data of the CON type >> OK >> OK >> +QLWNOTIFY: 0 >> +QLWURC: "report",8824 >> +QLWURC: "report ack",0,8824 //the data is successfully reported and the ACK message is received from the platform Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process I/Manual TAU update >> AT+CPSMS=0,,01000010","00000000" > OK 6-2 So K Go to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process TAU update manually can avoid automatic update of TAU cycle over time, so,non-service power consumption can be reduced; If no requirement in the application, ignore this step		»>	
6-2 > AT+QLWNOTIFY=3311,0,5706,1,3,"red",0,1 //Send data of the CON type > OK > OK > OK > +QLWNOTIFY: 0 > +QLWURC: "report",8824 > +QLWURC: "report_ack",0,8824 //the data is successfully reported and the ACK message is received from the platform Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process 7/Manual TAU update > AT+CPSMS=1,,,"01000010","00000000" > OK Go to 1.3-3 for sending data, or goto L3-5 for receving data, and the subsequent process 6-2		>> +QLWURC: "recovered",0,102,0	
6-2   >> N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N   N N <t< td=""><td></td><td>&gt;&gt; AT+QLWNOTIFY=3311,0,5706,1,3,"red",0,1 //Send data of the CON type</td><td></td></t<>		>> AT+QLWNOTIFY=3311,0,5706,1,3,"red",0,1 //Send data of the CON type	
6-2   >> OK   >> +QLWNOTIFY: 0   >>   >> +QLWURC: "report",8824   >>   >> +QLWURC: "report_ack",0,8824   //the data is successfully reported and the ACK message is received from the platform   Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process   //Manual TAU update   >> AT+CPSMS=0   >> OK   6-2   >> AT+CPSMS=1,,,"01000010","00000000"   >> OK   Go to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process		»>	
S> S>+QLWNOTIFY: 0 S> S>+QLWURC: "report",8824 S> S>+QLWURC: "report_ack",0,8824 //the data is successfully reported and the ACK message is received from the platform Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process //Manual TAU update S> AT+CPSMS=0 S> OK Go to L3-3 for sending data, or goto L3-5 for receving data, automatic update of TAU cycle over time, so,non-service power consumption can be reduced; If no requirement in the application, ignore this step		>> OK	
>> +QLWNOTIFY: 0>>>>>> +QLWURC: "report",8824>>>>>> +QLWURC: "report_ack",0,8824//the data is successfully reported and the ACK message is received from the platformGo to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process//Manual TAU update>> AT+CPSMS=0>> 0K>> 0KGo to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process6-2		>>	
6-2       > AT+CPSMS=1,,,,"01000010","00000000"         6-2       > AT+CPSMS=1,,,,"01000010","00000000"         >> OK       So to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process		>> +QI WNQTIFY: 0	
<ul> <li>b) +QLWURC: "report",8824</li> <li>b) +QLWURC: "report_ack",0,8824</li> <li>c) //the data is successfully reported and the ACK message is received from the platform</li> <li>Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process</li> <li>f)/Manual TAU update</li> <li>b) AT+CPSMS=0</li> <li>c) OK</li> <li>6-2</li> <li>b) AT+CPSMS=1,,,"01000010","00000000"</li> <li>c) OK</li> <li>c) CK</li> <li>Go to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process</li> </ul>			
<ul> <li>b) + QLWORC. Teport ,8224</li> <li>b) + QLWURC: "report_ack",0,8824</li> <li>c) //the data is successfully reported and the ACK message is received from the platform</li> <li>Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process</li> <li>c) //Manual TAU update</li> <li>b) AT+CPSMS=0</li> <li>c) OK</li> <lic) li="" ok<=""> <li>c) OK</li> <l< td=""><td></td><td></td><td></td></l<></lic)></ul>			
S> >> +QLWURC: "report_ack",0,8824 //the data is successfully reported and the ACK message is received from the platform Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process //Manual TAU update >> AT+CPSMS=0 >> 0K 6-2 >> AT+CPSMS=1,,,"01000010","00000000" > 0K Go to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process If no requirement in the application, ignore this step		22 FULWORC. TEPOTT ,0024	
<ul> <li>b&gt; +QLWURC: "report_ack",0,8824</li> <li>//the data is successfully reported and the ACK message is received from the platform</li> <li>Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data,</li> <li>and the subsequent process</li> <li>//Manual TAU update</li> <li>&gt;&gt; AT+CPSMS=0</li> <li>&gt;&gt; 0K</li> <li>6-2</li> <li>&gt;&gt; AT+CPSMS=1,,,"01000010","0000000"</li> <li>&gt;&gt; 0K</li> <li>Go to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process</li> </ul>		»>	
//the data is successfully reported and the ACK message is received from the platform         Go to 6-2,or goto L3-3 for sending data,or goto L3-5 for receving data,         and the subsequent process         //Manual TAU update         >> AT+CPSMS=0         >> OK         0K         Go to L3-3 for sending data,or goto L3-5 for receving data, and the         subsequent process		>> +QLWURC: "report_ack",0,8824	
Go to 6-2, or goto L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process       Table to the sendence of th		//the data is successfully reported and the ACK message is received from the platform	
and the subsequent processImage: Construction of the application, ignore this step//Manual TAU updateTAU update manually can avoid automatic update of TAU cycle>> AT+CPSMS=0TAU update manually can avoid automatic update of TAU cycle>> OKover time, so,non-service>> OKpower consumption can beSubsequent processreduced; If no requirement in the application, ignore this step		Go to 6-2,or goto L3-3 for sending data,or goto L3-5 for receving data,	
//Manual TAU update       TAU update manually can avoid automatic update of TAU cycle         >> AT+CPSMS=0       automatic update of TAU cycle         >> OK       over time, so,non-service         >> AT+CPSMS=1,,,"01000010","0000000"       power consumption can be         >> OK       reduced; If no requirement in         Go to L3-3 for sending data, or goto L3-5 for receving data, and the       the application, ignore this step		and the subsequent process	
<ul> <li>AT+CPSMS=0</li> <li>&gt; OK</li> <li>AT+CPSMS=1,,,"01000010","0000000"</li> <li>&gt; OK</li> <li>SOK</li> <li>OK</li> <li>Go to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process</li> </ul>		//Manual TAU update	TALL undate manually can avoid
<ul> <li>6-2</li> <li>Solver time, so, non-service</li> <li></li></ul>		>> AT+CPSMS=0	automatic undate of TALL and
6-2 >> AT+CPSMS=1,,,"01000010","0000000" >> OK Go to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process		>> OK	
>> OK Go to L3-3 for sending data, or goto L3-5 for receivng data, and the subsequent process power consumption can be reduced; If no requirement in the application, ignore this step	6-2	>> AT+CPSMS=1,,,"01000010","00000000"	over time, so,non-service
Go to L3-3 for sending data, or goto L3-5 for receving data, and the subsequent process		>> OK	power consumption can be
subsequent process		Go to L3-3 for sending data.or goto L3-5 for receiing data, and the	reduced; If no requirement in
		subsequent process	the application, ignore this step

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

7- Eras	e the histori	cal frequency	
	//lf 2-8 the r	egistration network is not successful within the set search	As described in 2-8, it is
	time(such as	2min), go to	suggested that in the program
	>> AT+CFUN=0	//Erase the historical frequency based on CFUN0	design, after the first search
	>> OK		fails to time out, the frequency
	>> AT+QCSEARF	CN //Erase the historical frequency	clearing program must be
	>> OK		executed. After run, follow the
7-1	>> AT+QBAND=	1,28	2-7 to check the search status
	//*Lock a specif	ic frequency band. Note that it is not recommended for non-specific	again;
	situations		If the research fails to time out,
	>> OK		you are advised to reboot
	>> AT+QRST=1	//Reboot, and re-search	without clearing the frequency
	>> OK		again. Or wait for the next
	Follow 2-7 abov	ve	service cycle and try again.
8- Exce	otion handlin	g or interruption	
			If the terminal has strict
			requirements on power
	1) The progra	m or mcu shall add the interrupt method of timeout or failure of leshan	consumption, it is
	platform re	gistration, such as re-registration or reboot;	recommended that the
	2) The progra	m or mcu shall add the interrupt method of sending or receiving data	program reasonably control
	timeout or	failure, such as reboot;	timeout.
8-1	3) The progra	m or mcu should add interrupt methods that cannot enter PSM normally or	If unable to enter PSM or wake
	cannot wak	e up PSM, such as reboot;	up from PSM, it is
	4) In the case	of exceptions, when the program or mcu performs hardware reset or power-	recommended to compare the
	off directly,	you need to execute AT+CFUN=0 first, and return OK, then control	normal time to enter PSM or
	hardware n	eset or power-off; But software reset or reboot does not run AT+CFUN=0.	exit PSM. If the time exceeds,
			power off or reboot should can
			be operated

#### 3.1.3 TCP Application

#### 3.1.3.1 in Power-off Mode

Amplication	The terminal is connected to the TCP server, the interval of data reported/upload is relatively
Application	long, the application logic of mcu or program is relatively simple, and the PSM is not enabled

## **Reference for Process of Developing Application:**

Index	Process of AT Command	Notes
1- Initi	al	
1-1	//Power on,initial >> >> RDY >> >> +CFUN: 1 >> >> +CPIN: READY	Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1

1-2	<pre>//After powering on, if the terminal (mcu) does not need to connect to the network, or prioritize other tasks, you need to perform &gt;&gt; AT+CFUN=0 //Enter the deepsleep state &gt;&gt; OK &gt;&gt; AT+QSCLK=1 //The deepsleep is enabled by default &gt;&gt; OK </pre>	In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low
	<pre>//If the terminal needs to connect to the network later, you can run &gt;&gt; AT+QRST=1 //Reboot &gt;&gt; OK</pre>	power mode. If this requirement is not in the application design, skip this step to 2-1
2- Searc	h and register network	
	//Power on,initial >> >> RDY >> >> +CFUN: 1	
2-1	<pre>&gt;&gt; &gt;&gt; +CPIN: READY &gt;&gt; AT+QBAND=0 //*If you did not execute the lock BAND in 5-1, skip the command &gt;&gt; OK</pre>	+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection
	<pre>&gt;&gt; AT+QSCLK=0 //Disable the deepsleep &gt;&gt; OK &gt;&gt; AT+CPSMS=0 //Disable th PSM &gt;&gt; OK &gt;&gt; AT+CEDRXS=0,5 //Disable the eDRX</pre>	and hardware design
2-2	<pre>&gt;&gt; OK // Configure the APN based on the requirement of SIM card &gt;&gt; AT+QCGDEFCONT="IPV4V6","<apn>", "<username>", "<password>" &gt;&gt; OK</password></username></apn></pre>	If APN needs to be configured for the SIM card, please perform the command, others can be ignored
2-3	>> AT+CPIN? //check the SIM status >> +CPIN: READY >> >> OK	If return NO READY, indicates the check of SIM card is failed. You need to check the SIM card and hardware. So the program can be directly powered off, or go to the above 1-2, into the low power state
2-4	<pre>//Check the attribute values of the module &gt;&gt; ATI //Query module identification &gt;&gt; Quectel_Ltd &gt;&gt; xxxxxxx &gt;&gt; Revision: xxxxxxx &gt;&gt; &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+CGSN=1 //Query the IMEI &gt;&gt; +CGSN:<imei> &gt;&gt; &gt;&gt; OK //Other queries</imei></pre>	If the application design does not require this step, you can skip the step

	>> AT+CSCON=1		If the application design does not
2-5	>> OK		require this step, you can skip the
			step
	>>		
	>> +CSCON:1 //Indicates that the RRC c	onnection is complete	
	//To query the following parameters, it is recommended to query after		
	return +CSCON:1, or query after the registratio	n network is completed	If the application design does not
	>> AT+CIMI //Query	the IMSI	require this step, you can skip the
	>> 460113061353533		step
	>>		In the application design of the
	>> OK		terminal, you can execute
2-6	>> AT+NCCID //Query	the CCID of SIM	AT+QENG=0 to obtain the relevant
	>> +NCCID:89861122223000411769		network and signal reference, and
	>>		to encode RSRP, SNR, CELLID,
	>> ОК		EARFCN and PCI and upload the
	>> AT+QENG=0 //Query the information about the o	current camp on the cell	data to the server. It will helps for
	>> +QENG: 0.3686.11.121."05C4EF33"75865.14.8."4C2	10".0.9.3	troubleshoot problems.
	>>>	- /-/-/-	
	>> OK		
	// Query the network registration status		
	>> AT+CEREG? //Query the network registration sta	tus	
	>> +CEREG:0.2		
2-7	>> +CEREG:0,2		
2-1	>> 0/		
	//Deriodic queries such as E00ms intervals		
	//renoule queries, such as soonis intervals		
	>> AT+CEREG?		If the query only returns
	>> AI + CEREC: 0 0 /// CEREC: 0 0		+CEREG:0.0 or +CEREG:0.2 within
2-8	>> (CEREG.0,0 // (CEREG.0,2		the search time (no loss than 2
	>> OK		minutes): the program goes to 5, 1
			If the program finally returns
			- CEREC:0.2 within the search time
	>> AI+CEREG?	>> AI+CEREG?	+CEREG.0,5 within the search time
0.0	>> +CEREG:0,1 //+CEREG:0,5 (roaming)	>> +CEREG:0,3	(e.g. 2 minutes); Restart or try again
2-9	//the registered successfully	//the registration denied	In the next cycle. If +CEREG:0,3 is
	>>	>> 	still returned after multiple
	>> OK	>> OK	attempts, it is recommended to
			check the SIM card
	>> AT+CGPADDR //Query	the IP address obtained	
2-10	>> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17	7ab:01f8:98b0:032e"	
	>>		
	>> OK		
			CSQ=(RSSI+113)/2
	>> AT+CSQ //Query the CSQ		CSQ corresponds to signal
2-11	>> +CSQ:xx,99	>> +CSQ:xx,99	
	»>		applications, it is recommended to
	>> OK		run AT+QENG=0 to obtain RSRP
	OK		
			and SNR
2-12	>> AT+CCLK? //Query t	he current date and time	and SNR Time conversion:

	»>	2024/01/16,16:55:19
	>> OK	If the default time is returned, pls
		query the time for multiple times
3– Conne	ct to TCP server	
	//Configure optional parameters	
	>> AT+QICFG="dataformat",0,0	
	»>	
	>> OK	In the actual development, please
T3-1	>> AT+QICFG="showlength",1	configure parameters according to
	>>	vour requirement
	>> OK	
	>> AT+QICFG="showRA",1	
	>>	
	>> OK	
	//Set the TCP server parameters and initiate the connection	
	>> AT+QIOPEN=0,0,"TCP","220.180.239.212",8058,0,1 //Direct push mode	
	»»	
	>> OK	
<b>T</b> 0.0	»>	
13-2	>> +QIOPEN: 0,0	
	>> AI+QISTALE=1,0 //Query TCP connection status	
	>>	
	>> +QISTATE. 0, TCP , 220.160.239.212 ,6056,0,2,0,1	
	>> 0K	
	//Send data in non-data mode	
	>> AT+OISEND=0.19."this is a test text" //Send data	
	>>	
	>> OK	
T3-3-1	»>	
	>> SEND OK	
	>>	
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data	
	//Send data in data mode	
	>> AT+QISEND=0	
	>>	
	>> > this is a test text	
	//After ">" is responded, input the data and tap "Ctrl" + "Z" to send it	
T3-3-2	>>	
	>> OK	
	>>	
	>> SEND OK	
	>>	
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data	
	//Switch receiving mode to Buffer access mode	In actual development, if your
T3-4	Ur the parameter access_mode of AI +QIUPEN is set to 0	requirement is buffer access mode,
	//switch the receive mode to Buffer access mode	please configure access_mode to 0
	>> OK	in AT+QIOPEN

	>> AT+QISEND=0 //Send data in data mode	
	>>	
	>> > this is a test text	
	//After ">" is responded, input the data and tap "Ctrl" + "Z" to send it	
	»>	
	>> OK	
	>>	
	>> SEND OK	
	>>	
	>> +QIURC: "recv",0,12,"220.180.239.212",8058 //Receive the URC of data	
	>> AT+QIRD=0,1200 //Read the data in buffer	
	>>	
	>> +QIRD: 12,0,"220.180.239.212",8058,"hello world"	
	>>	
	>> OK	
	>> AT+QICLOSE=0 //Close TCP connection	
	»>	
T3-5	>> OK	
	»>	
	>> CLOSE OK	
4- Power	off after sending and receiving data	
		If the terminal is designed for
	>> AT+CFUN=0 //Set minimum function	power-off mode and powered off
	>> OK	after data interaction is complete,
4-1	//Wait for the return OK, then mcu control to power off; If not return OK after running	you need to run AT+CFUN=0, then
	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	power off the terminal after return
		OK to avoid damage to the flash
5- Erase	the historical frequency	
	//If 2-8 the registration network is not successful within the set search time(such as 2min),	As described in 2.9, it is suggested
	go to	As described in 2-6, it is suggested
	>> AT+CFUN=0 //Erase the historical frequency based on CFUN0	that in the program design, after
	>> OK	frequency clearing program must
	>> AT+QCSEARFCN //Erase the historical frequency	he executed After run follow the
	>> OK	2.7 to shock the soarch status
5-1	>> AT+QBAND=1,28	
	//*Lock a specific frequency band. Note that it is not recommended for non-specific	lf the research fails to time out you
	situations	are advised to reboot without
	>> OK	clearing the frequency again Or
	>> AT+QRST=1 //Reboot, and re-search	wait for the next service cycle and
	>> OK	try again
	Follow 2-7 above	try agam.
6- Excep	tion handling or interruption	
	1) The program or mcu needs to add the interrupt method of time-out or failure to register	
	the AEP platform, such as re-registration or reboot.	If the terminal has strict
	2) The program or mcu needs to add the interrupt method of timeout or failure for	requirements on power
6-1	sending or receiving data, such as reboot.	consumption, it is recommended
	3) In the case of exceptions, when the program or mcu performs hardware reset or power-	that the program reasonably
	off directly, you need to execute $AT+CFUN=0$ first, and return OK, then control	control timeout
	hardware reset or power-off; But software reset or reboot does not run AT+CFUN=0.	

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

#### 3.1.3.2 in PSM Mode

Application	PSM function is enabled, and only the TCP server is connected. The data is reported/upload frequently, and the application logic of mcu or program is relatively
	complex

# **Reference for Process of Developing Application:**

Index	Process of AT	Command	Notes
1- Initi	al		
1-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY</pre>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1
1-2	<pre>//After powering on, if the terminal (m network, or prioritize other tasks, you &gt;&gt; AT+CFUN=0 //En &gt;&gt; OK &gt;&gt; AT+QSCLK=1 //Th &gt;&gt; OK  //If the terminal needs to connect to th &gt;&gt; AT+QRST=1 //Re &gt;&gt; OK</pre>	he network later, you can run	In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1
2- Searc	h and register network		
2-1	<pre>//Power on,initial &gt;&gt; RDY &gt;&gt; RDY &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY &gt;&gt; AT+QBAND=0 //*If you did not exect &gt;&gt; OK &gt;&gt; AT+QSCLK=0 &gt;&gt; OK &gt;&gt; AT+CPSMS=1,,,"01000010","00000000" &gt;&gt; OK &gt;&gt; AT+CEDRXS=0,5 &gt;&gt; OK &gt;&gt; AT+QNBIOTEVENT=1,1 &gt;&gt; OK &gt;&gt; AT+QCFG="dsevent",1 &gt;&gt; OK</pre>	ute the lock BAND in 7-1, skip the command //Disable the deepsleep //Enable th PSM //Disable the eDRX //Enable the URC of PSM //Disable the URC of Deepsleep	+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection and hardware design By AT+CPSMS=1,, " <t3412 tau="">","<t3324>", you can configure the T3412 and T3324 timers properly which you need.at the same time, after the completion of the registration network, by AT+CEREG=5; +CEREG? You need to query the real value of T3324,T3412/TAU provided by the network</t3324></t3412>

2-2	<pre>// Configure the APN based on the requirement of SIM card &gt;&gt; AT+QCGDEFCONT="IPV4V6","<apn>", "<username>", "<password>" &gt;&gt; OK</password></username></apn></pre>	If APN needs to be configured for the SIM card, please perform the command, others can be ignored
2-3	<pre>&gt;&gt; AT+CPIN? //check the SIM status &gt;&gt; +CPIN: READY &gt;&gt; &gt;&gt; OK</pre>	If return NO READY, indicates the check of SIM card is failed. You need to check the SIM card and hardware. So the program can be directly powered off, or go to the above 1-2, into the low power state
2-4	<pre>//Check the attribute values of the module &gt;&gt; ATI //Query module identification &gt;&gt; Quectel_Ltd &gt;&gt; xxxxxxx &gt;&gt; Revision: xxxxxxx &gt;&gt; &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+CGSN=1 //Query the IMEI &gt;&gt; +CGSN:<imei> &gt;&gt; &gt;&gt; OK //Other queries</imei></pre>	If the application design does not require this step, you can skip the step
2-5	>> <b>AT+CSCON=1</b> >> OK	If the application design does not require this step, you can skip the step
2-6	<pre>&gt;&gt; &gt;&gt; +CSCON:1 //Indicates that the RRC connection is complete //To query the following parameters, it is recommended to query after return + CSCON:1, or query after the registration network is completed &gt;&gt; AT+CIMI //Query the IMSI &gt;&gt; 460113061353533 &gt;&gt; &gt;&gt;  &gt;&gt;  &gt;&gt;  &gt;&gt; OK &gt;&gt; AT+NCCID //Query the CCID of SIM &gt;&gt; +NCCID:89861122223000411769 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QENG=0 //Query the information about the current camp on the cell &gt;&gt; +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3 &gt;&gt;  &gt;&gt; OK</pre>	If the application design does not require this step, you can skip the step In the application design of the terminal, you can execute AT+QENG=0 to obtain the relevant network and signal reference, and to encode RSRP, SNR, CELLID, EARFCN and PCI and upload the data to the server. It will helps for troubleshoot problems.
2-7	<pre>// Query the network registration status &gt;&gt; AT+CEREG? //Query the network registration status &gt;&gt; +CEREG:0,2 &gt;&gt; &gt;&gt; OK //Periodic queries, such as 500ms intervals</pre>	

2-8	>> AT+CEREG? >> +CEREG:0,0 //+CEREG:0,2 >> >> OK		If the query only returns +CEREG:0,0 or +CEREG:0,2 within the search time (no less than 2 minutes); the program goes to 5-1	
2-9	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,1 //+CEREG:0,5 (roaming) //the registered successfully &gt;&gt; &gt;&gt; OK</pre>	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,3 //the registration denied &gt;&gt; &gt;&gt; OK</pre>	If the program finally returns +CEREG:0,3 within the search time (e.g. 2 minutes); Restart or try again in the next cycle. If +CEREG:0,3 is still returned after multiple attempts, it is recommended to check the SIM card	
2-10	<pre>&gt;&gt; AT+CGPADDR //Query the IP address obtained &gt;&gt; +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17ab:01f8:98b0:032e" &gt;&gt; &gt;&gt; OK</pre>			
2-11	>> AT+CSQ //Query the CSQ >> +CSQ:xx,99 >> >> OK		CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR	
2-12	<pre>&gt;&gt; AT+CCLK? //Query the current date and time &gt;&gt; +CCLK: "24/01/16,08:55:19+32" &gt;&gt; &gt;&gt; OK</pre>		Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times	
3- Acces	ccess the TCP server			
T3-1	<pre>//Configure optional parameters &gt;&gt; AT+QICFG="dataformat",0,0 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QICFG="showlength",1 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QICFG="showRA",1 &gt;&gt; &gt;&gt; OK</pre>		In the actual development, please configure parameters according to your requirement	
T3-2	<pre>//Set the TCP server parameters and initiate the &gt;&gt; AT+QIOPEN=0,0,"TCP","220.180.239.212",8058,0,1 &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; OK</pre>	e connection //Direct push mode		
	<pre>&gt;&gt; AT+QISTATE=1,0 &gt;&gt; +QISTATE: 0,"TCP","220.180.239.212",8058,0,2,0,1</pre>	//Query TCP connection status		

	>>			
	>> UK			
	//Send data in hon-data mode			
	>> AT+QISEND=0,19,"this is a test text" //Send data			
	»>			
T3-3-1	>> OK			
	»»			
	>> SEND OK			
	>>			
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data			
	//Send data in data mode			
	>> AT+QISEND=0			
	»>			
	>> > this is a test text			
	//After ">" is responded, input the data and tap "Ctrl" + "Z" to send it			
T3-3-2	»»			
	>> OK			
	>>			
	>> SEND OK			
	>>			
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data			
	//Switch receiving mode to Buffer access mode			
	Or the parameter access mode of AT+QIOPEN is set to 0			
	>> AT+QISWTMD=0,0 //Switch the receive mode to Buffer access mode			
	>>			
	>> OK			
	>> AT+QISEND=0 //Send data in data mode			
	>>			
	>> > this is a test text			
	//After ">" is responded, input the data and tap "Ctrl" + "7" to send it	In actual development, if your		
	>>	requirement is buffer access		
T3-4	>> 0K	mode, please configure		
	>>	access_mode to 0 in		
	>> SEND OK	AT+QIOPEN		
	>> +OULINC: "recy" 0.12 "220.180.239.212" 8058 //Receive the LINC of data			
	>> AT+OIRD=0 1200			
	>> (OPD: 12.0 "220.190.220.212" 9059 "bollo world"			
	>> (QIND: 12,0, 220.180.255.212 ,8058, Hello world			
	>> 0K			
4- Featu	Feature of RAI			
Feature				
of RAI				
	>> AT+QPING=0,"8.8.8.8",4,1,32,1 //QPING method with RAI Flag			
R4-1	>> OK	RAI implementation method		
	>>			
	>> +QPING: 0,8.8.8.8,32,729,51			

	>> +QPING: 0,1,1,0,729,729,729		
	>> +CSCON:0 //If +CSCON:0 is returned within 0-2s, RAI is effective		
	>> AT+QSCLK=1 //Enable deepsleep mode >> OK		
5- Enter	r status PSM and Deepsleep		
	>>>		
5-1	>> +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state >>		
	>> +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state		
6- Exit	xit status of Deepsleep and PSM		
	//BC660K&BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin		
	>> +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state		
	>> AT+QIOPEN=0,0,"TCP","220.180.239.212",8058,0,1 //Recreate the TCP connection		
	>>		
	>> OK	Method to trigger PSM wake-	
T6-1-1	>>	up	
	>> +QNBIOTEVENT: "EXIT PSM" //Exit the PSM state		
	>>		
	>> +CSCON: 1 //Indicates that the KKC connection is established after the PSIM is wakeup		
	>> +OIOPEN: 0.0 //The TCP connection was established successfully		
	Go to 6-2,or goto T3-3 for sending data,or goto L3-5 for receving data,		
	and the subsequent process		
	//If you want to obtain the accurate signal reference in the current scene		
	immediately after the PSM is woked up, please refer to		
	//BC660K&BC950K support to wake up deepsleep by executing AT		
	command or pulling down PSM_EINT pin		
	>>		
	>> +QNBIOTEVENT: EXIT DEEPSLEEP //EXIT the deepsleep state	If the program or mou needs to	
	>> Air gior En-0,0, rer , 220100/255/212 ,0050,0,1 //necreate the rer connection	deal with other tasks, such as	
	>> OK	collecting the base station cell	
	>>	signal after wake-up; It is	
T6-1-2	>> +QNBIOTEVENT: "EXIT PSM" //Exit the PSM state	recommended to refer to this	
10-1-2	>>	method to trigger PSM wake-	
	>> +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup	up and obtain the network	
		signal after wake-up.	
	>> +QIOPEN: U,U // The TCP connection was established successfully	IT no such requirement in the	
	>> +0ENG: 0.3686 11 121 "05C4FE33" -75 -8 -65 14 8 "4C10" 0.9 3	program, ignore the process	
	>>		
	>> OK		
	>> AT+QISEND=0,51,"rsrp=-75,snr=14,cellid=05C4EF33,earfcn=3686,pci=121"		
	//Send current signal reference data		
	>>		

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

	>> OK		
	>>		
	>> SEND OK		
	Go to 6-2,or goto T3-3		
	subsequent process		
	//Manual TAU update		
	>> AT+CPSMS=0		TAU update manually can avoid
	>> OK		automatic update of TAU cycle
6-2	>> AT+CPSMS=1,,,"01000010","00000000"		over time, so,non-service power
	>> OK		consumption can be reduced; If
	Go to T3-3 for sending data or receiing data, and the subsequent		no requirement in the
	process		application, ignore this step
7- Eras	se the historical frequ	Jency	
	//If 2-8 the registration	network is not successful within the set search	As described in 2-8, it is
	time(such as 2min) go	time(such as 2min), go to	
	>> AT+CFUN=0	//Erase the historical frequency based on CFUN0	design, after the first search
	>> OK		fails to time out, the frequency
	>> AT+QCSEARFCN	//Erase the historical frequency	clearing program must be
	>> OK	,,,,, ., ., ., ., ., ., .,	executed. After run, follow the
7-1	>> AT+QBAND=1,28		2-7 to check the search status
	//*Lock a specific frequency band. Note that it is not recommended for non-specific		again:
	situations		If the research fails to time out,
	>> OK		you are advised to reboot
	>> AT+QRST=1	//Reboot, and re-search	without clearing the frequency
	>> OK		again. Or wait for the next
	Follow 2-7 above		service cycle and try again.
8- Exce	eption handling or inte	erruption	, , , ,
			If the terminal has strict
			requirements on power
	1) The program or mcu sha	all add the interrupt method of timeout or failure of leshan	consumption, it is
	platform registration, such as re-registration or reboot:		recommended that the
	2) The program or mcu shall add the interrupt method of sending or receiving data		program reasonably control
	timeout or failure, such as reboot:		timeout.
8-1	3) The program or mcu should add interrupt methods that cannot enter PSM normally or		If unable to enter PSM or wake
	cannot wake up PSM, su	ich as reboot;	up from PSM, it is
	4) In the case of exception	s, when the program or mcu performs hardware reset or power-	recommended to compare the
	off directly, you need to	execute AT+CFUN=0 first, and return OK, then control	normal time to enter PSM or
	hardware reset or powe	r-off; But software reset or reboot does not run AT+CFUN=0.	exit PSM. If the time exceeds.
			power off or reboot should can
			be operated

## 3.1.4 UDP Application

#### 3.1.4.1 in Power-off Mode

Application	The terminal is connected to the UDP server, the interval of data reported/upload is relatively
Application	long, the application logic of mcu or program is relatively simple, and the PSM is not enabled

# **Reference for Process of Developing Application:**

Index	Process of AT Command	Notes		
1- Initi	itial			
1-1	//Power on,initial >> >> RDY >> >> +CFUN: 1 >> >> +CPIN: READY	Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1		
1-2	<pre>//After powering on, if the terminal (mcu) does not need to connect to the network, or prioritize other tasks, you need to perform &gt;&gt; AT+CFUN=0 //Enter the deepsleep state &gt;&gt; OK &gt;&gt; AT+QSCLK=1 //The deepsleep is enabled by default &gt;&gt; OK  //If the terminal needs to connect to the network later, you can run &gt;&gt; AT+QRST=1 //Reboot &gt;&gt; OK</pre>	In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1		
2- Searc	h and register network			
2-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY &gt;&gt; +CPIN: READY &gt;&gt; AT+QBAND=0 //*If you did not execute the lock BAND in 5-1, skip the command &gt;&gt; OK &gt;&gt; AT+QSCLK=0 //Disable the deepsleep &gt;&gt; OK &gt;&gt; AT+CPSMS=0 //Disable th PSM &gt;&gt; OK &gt;&gt; AT+CEDRXS=0,5 //Disable the eDRX &gt;&gt; OK</pre>	+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection and hardware design		
	// Configure the APN based on the requirement of SIM card	If APN needs to be configured for		
2-2	>> AT+QCGDEFCONT="IPV4V6"," <apn>", "<username>", "<password>" &gt;&gt; OK</password></username></apn>	the SIM card, please perform the command, others can be ignored		
2-3	>> AT+CPIN? //check the SIM status >> +CPIN: READY >> >> OK	If return NO READY, indicates the check of SIM card is failed. You need to check the SIM card and hardware. So the program can be directly powered off, or go to the above 1-2, into the low power state		
2-4	//Check the attribute values of the module	If the application design does not		
	>> ATI //Query m	odule identification	require this step, you can skip the	
------	--------------------------------------------------------------------------------	-------------------------------------	----------------------------------------	
	>> Quectel_Ltd		step	
	>> xxxxxxx			
	>> Revision: xxxxxxx			
	»»			
	>> ОК			
	>> AT+CGSN=1 //Query t	he IMEI		
	>> +CGSN: <imei></imei>			
	»»			
	>> OK			
	//Other q	ueries		
	>> AT+CSCON-1		If the application design does not	
2-5	>> OK	require this step, you can skip the		
			step	
	»»			
	>> +CSCON:1 //Indicates that the RRC co	onnection is complete		
	//To query the following parameters, it is recom	nmended to query after	If the application design does not	
	return +CSCON:1, or query after the registration	n network is completed	require this step, you can skip the	
	>> AT+CIMI //Query t	he IMSI	sten	
	>> 460113061353533		step	
	>>		terminal you can evagute	
26	>> ОК		AT CENC-0 to obtain the relevant	
2-0	>> AT+NCCID //Query	the CCID of SIM	AT+QENG=0 to obtain the relevant	
	>> +NCCID:89861122223000411769			
	>>		to encode RSRP, SNR, CELLID,	
	>> ОК		data to the conversit will halps for	
	>> AT+QENG=0 //Query the information about the c	urrent camp on the cell	traublackast problems	
	>> +QENG: 0, <mark>3686</mark> ,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3		troubleshoot problems.	
	>>			
	>> OK			
	// Query the network registration status			
	>> AT+CEREG? //Query the network registration stat	us		
	>> +CEREG:0,2			
2-7	>>			
	>> OK			
	//Periodic queries, such as 500ms intervals			
	>> AT+CEREG?		If the query only returns	
2-8	>> +CEREG:0,0 //+CEREG:0,2		+CEREG:0,0 or +CEREG:0,2 within	
	»>		the search time (no less than 2	
	>> OK		minutes); the program goes to 5-1	
2-9			If the program finally returns	
	>> AT+CEREG?	>> AT+CEREG?	+CEREG:0,3 within the search time	
	>> +CEREG:0,1 //+CEREG:0,5 (roaming)	>> +CEREG:0,3	(e.g. 2 minutes); Restart or try again	
	//the registered successfully	//the registration denied	in the next cycle. If +CEREG:0,3 is	
	>>	>>	still returned after multiple	
	>> OK	>> OK	attempts, it is recommended to	
			check the SIM card	
2-10	>> AT+CGPADDR //Query	the IP address obtained		

	>> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17ab:01f8:98b0:032e"	
	>>	
	>> OK	
	>> AT+CSO //Quary the CSO	CSQ = (RSSI + 113)/2
	>> +CSO vy 99	reference RSSL In actual
2-11	>>	applications it is recommended to
	>> 0K	run AT+OFNG=0 to obtain RSRP
		and SNR
		Time conversion:
	>> AT+CCLK? //Query the current date and time	24/01/16,08:55:19+32/4(h)=
2-12	>> +CCLK: "24/01/16,08:55:19+32"	2024/01/16,16:55:19
	>>	If the default time is returned, pls
	>> UK	query the time for multiple times
3- Conne	ect to UDP server	
	//Configure optional parameters	
	>> AT+QICFG="dataformat",0,0	
	>>>	
	>> OK	In the actual development, please
U3-1	>> AT+QICFG="showlength",1	configure parameters according to
	>> 	your requirement
	>> UK	
	>> AI+QIC+G="SNOWRA",1	
	>> OK	
	//Set the TCP server parameters and initiate the connection	
	>> AT+QIOPEN=0,0,"UDP","220.180.239.212",8058,0,1 //Direct push mode	
	»»	
	>> OK	
	>>	
U3-2	>> +QIOPEN: 0,0	
	>> AT+QISTATE=1,0 //Query TCP connection status	
	»>	
	>> +QISTATE: 0,"UDP","220.180.239.212",8058,0,2,0,1	
	»»	
	>> OK	
	//Send data in non-data mode	
	>> 0K	
T3-3-1	>>	
	>> SEND OK	
	»>	
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data	
	//Send data in data mode	
	>> AT+QISEND=0	
T3-3-2	>>	
	>> > this is a test text	
	//After ">" is responded, input the data and tap "Ctrl" + "Z" to send it	

	>>	
	>> SEND OK	
	>>	
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data	
	//Switch receiving mode to Buffer access mode	
	Or the parameter access_mode of AT+QIOPEN is set to 0	
	>> AT+QISWTMD=0,0 //Switch the receive mode to Buffer access mode	
	>>	
	>> OK	
	>> AT+QISEND=0 //Send data in data mode	
	»>	
	>> > this is a test text	
	//After ">" is responded, input the data and tap "Ctrl" + "Z" to send it	In actual development, if your
T2 4	»>	requirement is buffer access mode,
13-4	>> OK	please configure access_mode to 0
	>>	in AT+QIOPEN
	>> SEND OK	
	»>	
	>> +QIURC: "recv",0,12,"220.180.239.212",8058 //Receive the URC of data	
	>> AT+QIRD=0,1200 //Read the data in buffer	
	>>	
	>> +QIRD: 12,0,"220.180.239.212",8058,"hello world"	
	>>	
	>> OK	
	>> AT+OICLOSE=0 //Close UDP connection	
	>>	
T3-5	>> 0K	
	>>	
	>> CLOSE OK	
4- Power	off after sending and receiving data	
		If the terminal is designed for
	>> AT+CFUN=0 //Set minimum function	power-off mode and powered off
	>> 0K	after data interaction is complete
4-1	//Wait for the return OK, then more control to nower off: If not return OK after running	you need to run AT+CEUN=0 then
	AT+CELIN=0 for a long period of time (for example 20s) you can nower off directly	power off the terminal after return
		OK to avoid damage to the flash
5- Eroo	the historical frequency	
	//if 2.8 the registration network is not successful within the set search time(such as 2min)	As described in 2-8, it is suggested
	7/11 2-8 the registration network is not successful within the set search time(such as 21111),	that in the program design after
	So to	the first search fails to time out the
	//Erase the historical frequency based on Crono	the first search fails to time out, the
		he are and a fitter must fellow the
5-1	//trase the historical frequency	be executed. After run, follow the
		2-7 to check the search status
	>> AI+QBAND=1,28	again;
	//*Lock a specific frequency band. Note that it is not recommended for non-specific	If the research fails to time out, you
	situations	are advised to reboot without
	>> OK	clearing the frequency again. Or

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

	>>	AT+QRST=1	//Reboot, and re-search	wait for the next service cycle and
	>>	ЭК		try again.
	Follow 2-7 above			
6- Exce	otio	n handling or interruption		
	1)	The program or mcu needs to add the inter	rupt method of time-out or failure to register	
		the AEP platform, such as re-registration or	reboot.	If the terminal has strict
	2)	The program or mcu needs to add the inter	rupt method of timeout or failure for	requirements on power
6-1		sending or receiving data, such as reboot.		consumption, it is recommended
	3)	In the case of exceptions, when the program	m or mcu performs hardware reset or power-	that the program reasonably
		off directly, you need to execute AT+CFUN=	0 first, and return OK, then control	control timeout
		hardware reset or power-off; But software re	eset or reboot does not run AT+CFUN=0.	

#### 3.1.4.2 in PSM Mode

	PSM function is enabled, and only the UDP server is connected. The data is
Application	reported/upload frequently, and the application logic of mcu or program is relatively
	complex

# Reference for Process of Developing Application:

Index	Process of AT Command		Notes
1- Initi	al		
1-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY</pre>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1
1-2	<pre>//After powering on, if the terminal (mcu) does not need to connect to the network, or prioritize other tasks, you need to perform &gt;&gt; AT+CFUN=0 //Enter the deepsleep state &gt;&gt; OK &gt;&gt; AT+QSCLK=1 //The deepsleep is enabled by default &gt;&gt; OK  //If the terminal needs to connect to the network later, you can run &gt;&gt; AT+QRST=1 //Reboot &gt;&gt; OK</pre>		In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1
2- Searc	h and register network		
2-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY</pre>		+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection and hardware design By AT+CPSMS=1,,

	>> AT+QBAND=0 //*If you did not execute the lock BAND in 7-1, skip the command		" <t3412 tau="">","<t3324>",</t3324></t3412>
	>> ОК		you can configure the T3412
	>> AT+QSCLK=0 //Disable the deepsleep		and T3324 timers properly
	>> OK		which you need.at the same
	>> AT+CPSMS=1,,,"01000010","00000000"	//Enable th PSM	time, after the completion of
	>> OK		the registration network, by
	>> AT+CEDRXS=0,5	//Disable the eDRX	AT+CEREG=5; +CEREG? You
	>> OK		need to query the real value of
	>> AT+QNBIOTEVENT=1,1	//Enable the URC of PSM	T3324,T3412/TAU provided by
	>> OK		the network
	>> AT+QCFG="dsevent",1	//Disable the URC of Deepsleep	
	>> OK		
			If APN needs to be configured
	// Configure the APN based on the re	equirement of SIM card	for the SIM card, please
2-2	>> AT+QCGDEFCONT="IPV4V6"," <apn>", "<u< td=""><td>sername&gt;", "<password>"</password></td><td>perform the command, others</td></u<></apn>	sername>", " <password>"</password>	perform the command, others
	>> OK		can be ignored
			If return NO READY, indicates
			the check of SIM card is failed.
	>> AT+CPIN?	//check the SIM status	You need to check the SIM card
2-3	>> +CPIN: READY		and hardware. So the program
	>>		can be directly powered off, or
	>> OK		go to the above 1-2, into the
			low power state
	//Check the attribute values of the m	odule	
	>> ATI	//Query module identification	
	>> Quectel Ltd		
	>> xxxxxxx		
	>> Revision: xxxxxx		
	>>		If the application design does
2-4	>> OK		not require this step, you can
	>> AT+CGSN=1	//Query the IMEI	skip the step
	>> +CGSN: <imei></imei>	// Quei / ene	
	>>		
	>> OK		
		//Other queries	
	<u> </u>	,, , , <b>4</b>	If the application design does
2-5	>> AT+CSCON=1		not require this step, you can
20	>> OK		skin the sten
	>>		If the application design does
	>> +CSCON:1 //Indicates th	nat the RRC connection is complete	not require this step, you can
	//To query the following parameters	it is recommended to query after	skin the sten
	return +CSCON:1 or query after the	registration network is completed	In the application design of the
	>> AT+CIMI	//Ouery the IMSI	terminal, you can execute
2-6	>> 460113061353533	,,,	AT+OFNG=0 to obtain the
	>>		relevant network and signal
	>> OK		reference and to encode RSRP
	>> AT+NCCID	//Query the CCID of SIM	SNR CELLID FARECN and PCI
	>> +NCCID:89861122223000/111769		and unload the data to the
	>> 110010.03001122223000411/03		conver It will halps for
	~~		server. it will helps for

	<pre>&gt;&gt; OK &gt;&gt; AT+QENG=0 //Query the information about the current camp on the cell &gt;&gt; +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3 &gt;&gt; &gt;&gt; OK</pre>		troubleshoot problems.
2-7	<pre>// Query the network registration status &gt;&gt; AT+CEREG? //Query the network registration status &gt;&gt; +CEREG:0,2 &gt;&gt; &gt;&gt; OK //Periodic queries, such as 500ms intervals</pre>		
2-8	>> <b>AT+CEREG?</b> >> +CEREG:0,0 //+CEREG:0,2 >> >> OK		If the query only returns +CEREG:0,0 or +CEREG:0,2 within the search time (no less than 2 minutes); the program goes to 5-1
2-9	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,1 //+CEREG:0,5 (roaming) //the registered successfully &gt;&gt; &gt;&gt; OK</pre>	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,3 //the registration denied &gt;&gt; &gt;&gt; OK</pre>	If the program finally returns +CEREG:0,3 within the search time (e.g. 2 minutes); Restart or try again in the next cycle. If +CEREG:0,3 is still returned after multiple attempts, it is recommended to check the SIM card
2-10	>> AT+CGPADDR //Query >> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17 >> >> OK	the IP address obtained 7ab:01f8:98b0:032e"	
2-11	>> AT+CSQ //Query the CSQ >> +CSQ:xx,99 >> >> OK		CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR
2-12	<pre>&gt;&gt; AT+CCLK? //Query the current date and time &gt;&gt; +CCLK: "24/01/16,08:55:19+32" &gt;&gt; &gt;&gt; OK</pre>		Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times
-3- Acces	//Configure optional parameters		
T3-1	<pre>&gt;&gt; AT+QICFG="dataformat",0,0 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QICFG="showlength",1 &gt;&gt; &gt;&gt; OK</pre>		In the actual development, please configure parameters according to your requirement

	>> AT+OICEG="chowPA" 1		
	>> AITQICIG- SHOWINA ,I		
	~~		
	>> OK		
	//Set the TCP server parameters and initia	ate the connection	
	>> AT+QIOPEN=0,0,"UDP","220.180.239.212",8058	8,0,1 //Direct push mode	
	>>		
	>> OK		
	>>		
T3-2	>> +QIOPEN: 0,0		
	>> AT+OISTATE=1.0	//Query TCP connection status	
		0.1	
	>>+QISTATE: 0, UDP , 220.180.239.212 ,8058,0,2,	0,1	
	>>		
	>> OK		
	//Send data in non-data mode		
	>> AT+QISEND=0,19,"this is a test text"	//Send data	
	>>		
T2 2 4	>> OK		
13-3-1	>>		
	>> SEND OK		
	>>		
	>> +OIURC: "recv".0.12."220.180.239.212".8058."h	ello world" //Receive data	
	//Send data in data mode		
	>> AT LOISEND-0		
	>>		
	>>> this is a test text		
	//After ">" is responded, input the data and tap "Ct	rl" + "Z" to send it	
T3-3-2	>>		
	>> OK		
	>>		
	>> SEND OK		
	>>		
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"h	ello world" //Receive data	
	//Switch receiving mode to Buffer access	mode	
	Or the parameter access mode of AT+OIO	OPEN is set to 0	
	>> AT+OISWTMD=0.0 //Switch the	receive mode to Buffer access mode	
		a data wa da	
	>> AI+QISEND=0 //Send data I	n data mode	In actual development, if your
	>>>		requirement is buffer access
T3-4	>> > this is a test text		mode, please configure
	//After ">" is responded, input the data and tap "Ct	rl" + "Z" to send it	access mode to 0 in
	>>		
	>> OK		
	>>		
	>> SEND OK		
	>>		
	>> +QIURC: "recv",0,12,"220.180.239.212",8058	//Receive the URC of data	
	>> AT+QIRD=0,1200	//Read the data in buffer	

	>>	
	>> +QIRD: 12,0,"220.180.239.212",8058,"hello world"	
	»»	
	>> OK	
4- Feati	ire of RAI	
Feature		
of RAI	2) After the data interaction is completed, you can run AT+QPING=0,"8.8.8.8",4,1,32,1	
	>> AT+QPING=0,"8.8.8.8",4,1,32,1 //QPING method with RAI Flag	
	>> OK	
	>>	
	>> +QPING: 0,8.8.8.8,32,729,51	
R4-1	»	RAI implementation method
	>> +QPING: 0,1,1,0,729,729,729	
	>> ///f + CSCON+0 is returned within 0.25. BALis effective	
	>> AT+OSCIK=1 //Enable deensleen mode	
	>> OK	
5- Ente	status PSM and Deepsleep	
	»	
F 4	>> +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state	
5-1	>>	
	>> +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state	
6- Exit	status of Deepsleep and PSM	1
	//BC660K&BC950K support to wake up deepsleep by executing AT	
	command or pulling down PSM_EINT pin	
	>> +QNBIOLEVENI: "EXIL DEEPSLEEP" //Exit the deepsleep state	
	//After exit deensleen the program or mou can directly send LIDP data	
	>>	
	>> OK	
	»»	Method to trigger PSM wake-
U6-1-1	>> SEND OK	up
	>>	
	>> +QNBIOTEVENT: "EXIT PSM" //Exit the PSM state	
	>>	
	> +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup	
	>>	
	<pre>&gt;&gt; +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data</pre>	
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data Go to 6-2,or goto T3-3 for sending data,or goto L3-5 for receiving data, and the subsequent process	
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data Go to 6-2,or goto T3-3 for sending data,or goto L3-5 for receving data, and the subsequent process //If you want to obtain the accurate signal reference in the current score	If the program or mou needs to
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data Go to 6-2,or goto T3-3 for sending data,or goto L3-5 for receving data, and the subsequent process //If you want to obtain the accurate signal reference in the current scene immediately after the PSM is woked up please refer to	If the program or mcu needs to deal with other tasks, such as
	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data Go to 6-2,or goto T3-3 for sending data,or goto L3-5 for receving data, and the subsequent process //If you want to obtain the accurate signal reference in the current scene immediately after the PSM is woked up, please refer to //BC660K&BC950K support to wake up deepsleep by executing AT	If the program or mcu needs to deal with other tasks, such as collecting the base station cell
U6-1-2	>> +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data Go to 6-2,or goto T3-3 for sending data,or goto L3-5 for receving data, and the subsequent process //If you want to obtain the accurate signal reference in the current scene immediately after the PSM is woked up, please refer to //BC660K&BC950K support to wake up deepsleep by executing AT command or pulling down PSM EINT pin	If the program or mcu needs to deal with other tasks, such as collecting the base station cell signal after wake-up; It is
U6-1-2	<pre>&gt;&gt; &gt;&gt; &gt;&gt; +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data Go to 6-2,or goto T3-3 for sending data,or goto L3-5 for receving data, and the subsequent process //If you want to obtain the accurate signal reference in the current scene immediately after the PSM is woked up, please refer to //BC660K&amp;BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt;</pre>	If the program or mcu needs to deal with other tasks, such as collecting the base station cell signal after wake-up; It is recommended to refer to this
U6-1-2	<pre>&gt;&gt; &gt;&gt; &gt;&gt; +QIURC: "recv",0,12,"220.180.239.212",8058,"hello world" //Receive data Go to 6-2,or goto T3-3 for sending data,or goto L3-5 for receving data, and the subsequent process //If you want to obtain the accurate signal reference in the current scene immediately after the PSM is woked up, please refer to //BC660K&amp;BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP"</pre>	If the program or mcu needs to deal with other tasks, such as collecting the base station cell signal after wake-up; It is recommended to refer to this method to trigger PSM wake-

	>>		signal after wake-up.
	>> OK		If no such requirement in the
	>>		program, ignore the process
	>> +QNBIOTEVENT: "EXIT P	SM"	
	>>		
	>> +CSCON: 1 //Indicates	that the RRC connection is established after the PSM is wakeup	
	>>		
	>> +QPING: 0,8.8.8.8,32,69	9,51	
	>>		
	>> +QPING: 0,1,1,0,699,699	9,699	
	>> AT+QENG=0		
	>>		
	>> +QENG: 0,3686,11,121,"	05C4EF33",-72,-2,-70,18,8,"4C10",0,0,3	
	>>		
	>> OK		
	>> AT+QISEND=0,51,"rsrp=	-72,snr=18,cellid=05C4EF33,earfcn=3686,pci=121"	
	//Send current signal refere	ence data	
	>>		
	>> UK		
	>> SEIND UK	2 for conding data or receiving data and the	
	subsequent process	s for sending data of receiving data, and the	
	//Manual TALL undate		
	>> AT+CPSMS=0		TAU update manually can avoid
	>> OK		automatic update of TAU cycle
6-2	>> AT+CPSMS=1"01000010"."00000000"		over time, so,non-service power
	>> OK		consumption can be reduced; If
	Go to U3-3 for sending	no requirement in the	
	process		application, ignore this step
7- Erase	the historical freq	uency	
	//If 2-8 the registratio	n network is not successful within the set search	As described in 2-8, it is
	time(such as 2min), go	o to	suggested that in the program
	>> AT+CFUN=0	//Erase the historical frequency based on CFUN0	design, after the first search
	>> OK		fails to time out, the frequency
	>> AT+QCSEARFCN	//Erase the historical frequency	clearing program must be
	>> OK		executed. After run, follow the
7-1	>> AT+QBAND=1,28		2-7 to check the search status
	//*Lock a specific frequency	y band. Note that it is not recommended for non-specific	again;
	situations		If the research fails to time out,
	>> OK		you are advised to reboot
	>> AT+QRST=1	//Reboot, and re-search	without clearing the frequency
	>> OK		again. Or wait for the next
	Follow 2-7 above		service cycle and try again.
8- Excep	tion handling or int	cerruption	
	1) The program or mcu sl	hall add the interrupt method of timeout or failure of leshan	If the terminal has strict
8-1	platform registration, s	such as re-registration or reboot;	requirements on power
	2) The program or mcu shall add the interrupt method of sending or receiving data		consumption, it is
	timeout or failure, such as reboot;		recommended that the

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

3)	The program or mcu should add interrupt methods that cannot enter PSM normally or	program reasonably control
	cannot wake up PSM, such as reboot;	timeout.
4)	In the case of exceptions, when the program or mcu performs hardware reset or power-	If unable to enter PSM or wake
	off directly, you need to execute AT+CFUN=0 first, and return OK, then control	up from PSM, it is
	hardware reset or power-off; But software reset or reboot does not run AT+CFUN=0.	recommended to compare the
		normal time to enter PSM or
		exit PSM. If the time exceeds,
		power off or reboot should can
		be operated

# 3.1.5 MQTT-based AWS IoT Application

#### 3.1.5.1 in Power-off Mode

	The terminal is connected to the MQTT of AWS IoT platform, the interval of data
Application	reported/upload is relatively long, the application logic of mcu or program is relatively
	simple, and the PSM is not enabled

# **Reference for Process of Developing Application:**

Index	Process of AT Command		Notes		
1- Initial					
1-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY</pre>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1		
1-2	//After powering on, if the terminal (mcu) does not need to connect to the network, or prioritize other tasks, you need to perform         >> AT+CFUN=0       //Enter the deepsleep state         >> OK       //Enter the deepsleep is enabled by default         >> OK       //The deepsleep is enabled by default         >> OK       //If the terminal needs to connect to the network later, you can run         >> AT+QST=1       //Reboot         >> OK       //Reboot		In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1		
2- Search and register network					
2-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt;</pre>		+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection and hardware design		

	>> +CPIN: READY	
	>> AT+QBAND=0 //*If you did not execute the lock BAND in 5-1, skip the command	
	>> OK	
	>> AT+QSCLK=0 //Disable the deepsleep	
	>> OK	
	>> AT+CPSMS=0 //Disable th PSM	
	>> OK	
	>> AT+CEDRXS=0.5 //Disable the eDRX	
	>> OK	
	// Configure the ADN based on the remainment of CINA could	
	// Configure the APN based on the requirement of SIM card	If APN needs to be configured for
2-2	>> AT+QCGDEFCONT="IPV4V6"," <apn>", "<username>", "<password>"</password></username></apn>	the SIM card, please perform the
	>> OK	command, others can be ignored
		If return NO READY, indicates the
		check of SIM card is failed. You
	>> AI+CPIN? //cneck the SIMI status	need to check the SIM card and
2-3	>> +CPIN: READY	hardware. So the program can be
	>>	directly powered off, or go to the
	>> OK	shove $1-2$ into the low power
		state
	//Check the attribute values of the module	
	>> ATI //Query module identification	
	>> Quectel_Ltd	
	>> xxxxxxx	
	>> Revision: xxxxxxx	
	>>	If the application design does not
2-4	>> 0K	require this step, you can skip the
		step
	>> +CG2N: <imei></imei>	
	»>	
	>> OK	
	//Other queries	
		If the application design does not
2-5	>> AI+CSCON=1	require this step, you can skip the
	>> OK	step
	>>	
	>> +CSCON:1 //Indicates that the RRC connection is complete	
	//To guary the following parameters, it is recommended to guary ofter	If the application design does not
	// to query the following parameters, it is recommended to query after	require this step, you can skip the
	return +CSCON:1, or query after the registration network is completed	step
	>> AT+CIMI //Query the IMSI	In the application design of the
	>> 460113061353533	terminal you can execute
	»»	AT+OENG=0 to obtain the
2-6	>> OK	
	>> AT+NCCID //Query the CCID of SIM	relevant network and signal
	>> +NCCID:89861122223000411769	reference, and to encode RSRP,
	>>	SNR, CELLID, EARFCN and PCI and
		upload the data to the server. It
		will helps for troubleshoot
	>> AI +QENG=0 //Query the information about the current camp on the cell	problems.
	>> +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3	
	>>>	

	>> OK				
2-7	// Query the network registration status >> AT+CEREG? //Query the network registration status >> +CEREG:0,2				
21	>> OK //Periodic queries, such as 500ms intervals				
2-8	>> AT+CEREG? >> +CEREG:0,0 //+CEREG:0,2 >>		If the query only returns +CEREG:0,0 or +CEREG:0,2 within the search time (no less than 2 minutes); the program goes to 5-1		
2-9	>> AT+CEREG?       >> AT+CEREG?         >> +CEREG:0,1 //+CEREG:0,5 (roaming)       >> +CEREG:0,3         //the registered successfully       //the registration denied         >>       >>         >> OK       >> OK		If the program finally returns +CEREG:0,3 within the search time (e.g. 2 minutes); Restart or try again in the next cycle. If +CEREG:0,3 is still returned after multiple attempts, it is recommended to check the SIM card		
2-10	>> AT+CGPADDR //Query th >> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17al >> >> OK	ne IP address obtained b:01f8:98b0:032e"			
2-11	>> AT+CSQ //Query the CSQ >> +CSQ:xx,99 >> >> OK		CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR		
2-12	<pre>&gt;&gt; AT+CCLK? //Query the current date and time &gt;&gt; +CCLK: "24/01/16,08:55:19+32" &gt;&gt; &gt;&gt; OK</pre>		Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times		
3– Conn	3- Connect to AWS loT server				
Q3-1	<pre>//Testing AWS IoT connectivity &gt;&gt; AT+QIDNSCFG=0,"8.8.8.8","8.8.4.4" &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QPING=0,"a9ohm2zbim3d5-ats.iot.us-east-1.amazonaws.com",4,1 &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; +QPING: 0,54.204.191.103,32,356,237 &gt;&gt;</pre>		In the actual development, please configure parameters according to your requirement		
Q3-2	<pre>&gt;&gt; +QPING: 0,1,1,0,356,356,356 //Load the CA certificate and key files</pre>				

	>> AT+QSSLCFG=0,0,"cacert" // Upload the RootCA.pem to the FILE system	
	>>	
	>>>	
	>>BEGIN CERTIFICATE	
	>> MIIDQTCCAimgAwIBAgITBmyfz5m/jAo54vB4ikPmljZbyjANBgkqhkiG9w0BAQsF	
	>>	
	>> rqXRfboQnoZsG4q5WTP468SQvvG5	
	>>END CERTIFICATE	
	>> +QSSLCFG: 0.0."cacert".1187	
	// The byte size of the indication must correspond to the byte size of the content of	
	AmazonRootCA1.pem	
	>>	
	>> UK	
	>> AT+OSSICEG=0.0 "clientcert" // Unload the certificate nem crt to the EILE system	
	>> An essent - o, o, element - // opiolo the certificate.periller to the file system	
	>> MilDwjcCAkkgAwiBAgivAkp/2ndynviloswiNdnc/En+dsPP14MA0GCSdGSib3DQEB	
	>> ++KMINCN/OHJZDIZJZL65XKtQm99M0J0bbN121JZm3V34nqOUYF16351CaA64DQ==	
	>>END CERTIFICATE	
	>> +QSSLCFG: 0,0,"clientcert",1224	
	// The byte size of the indication must correspond to the byte size of the content of xxx-	
	certificate.pem.crt	
	>>	
	>> OK	
	>> AT+QSSLCFG=0,0,"clientkey" // Upload the private.pem.key to the FILE system	
	>>	
	>>>	
	>>BEGIN RSA PRIVATE KEY	
	>> MIIEowIBAAKCAQEA3rCImNdAS6x43he0Zn0hq7BGHrdt3ttljYmTsCVttkcdGX3+	
	>>	
	>> cnEBCR2U3DpU1qNrn0D8r8qCJjWbYJwzEbEoFaKi8zHuhLLVuuus	
	>>END RSA PRIVATE KEY	
	>>	
	>> +QSSLCFG: 0,0,"clientkey", <mark>1675</mark>	
	// The byte size of the indication must correspond to the byte size of the content of xxx-	
	private.pem.key	
	»>	
	>> OK	
	//MQTT and SSL configuration	
	>> AT+QSSLCFG=0,0,"seclevel",2 //SSL authorization mode:server authentication	
	>>	
Q3-3	>> OK	
	>> AT+QMTCFG="ssl",0,1,0,0 //Enable SSL and configure SSL context/connect index	
	>>	
	>> OK	

	>> AT+QMTCFG="version",0,1 //Configure the MQTT version	
	»>	
	>> OK	
	>> AT+QSSLCFG=0,0 //Query and validate the results of the current configuration	
	»>	
	>> +QSSLCFG: 0,0,"seclevel",2	
	>> +QSSLCFG: 0,0,"sslversion",4	
	>> +QSSLCFG: 0,0,"dataformat",0,0	
	>> +QSSLCFG: 0,0,"timeout",90	
	>> +QSSLCFG: 0,0,"debug",0	
	>> +QSSLCFG: 0,0,"cacert",1187	
	>> +QSSLCFG: 0,0,"clientcert",1224	
	>> +QSSLCFG: 0,0,"clientkey",1675	
	>> +QSSLCFG: 0,0,"dtls",0	
	>> +QSSLCFG: 0,0,"dtlsversion",2	
	>>	
	>> OK	
	//MQTT of AWS IoT to connect and subscribe	
	>> AT+QMTOPEN=0,"a9ohm2zbim3d5-ats.iot.us-east-1.amazonaws.com",8883	
	// Open the MQTT SSL connection	
	>>	
	>> OK	
	>>	
	>> +QMTOPEN: 0,0	
	>> AT+QMTCONN=0,"smartKit001" // Initiate the MQTT server connection	
Q3-4	>>	
	>> OK	
	>>	
	>> +QMTCONN: 0,0,0	
	>> AT+QMTSUB=0,1,"toaws/smartKit001/update/message",1 // Subscribe to related topic	
	>>	
	>> OK	
	>>	
	>> +OMTSUB: 0.1.0.1	
	//MQTT publish	
	Publish fixed-length messages in non-data mode	
	»	
	AT+OMTPUB=0.1.1.0 "aws/meter001/data/report/message".23 "{"temp" 22.5 "humi" 68}"	
	// Publish messages to related topic	
	>>	
Q3-5-1	>> OK	
	»>	
	>> +OMTPUB: 0.1.0	
	>>	
	>> +OMTRECV: 0.0."toaws/smartKit001/update/message"."{ "message": "Hello from AW/S IoT	
	console"}"	
	//MQTT publish	
Q3-5-2	Publish fixed-length messages in data mode	

	SS AT LONATOLID=0.1.1.0 "outer (meter 001 (deter (report (measured)" 22	
	>> AT+QMTPOB=0,1,1,0, aws/meter001/data/report/message ,25	
	>>>	
	>> "{"temp",22.5,"humi",68}" // Publish data	
	»»	
	>> OK	
	>>	
	>> +QMTRECV: 0,0, "toaws/smartkit001/update/message", "{ "message : "Helio from AWS to I	
	console"}"	
	//MQTT publish	
	Publish variable-length messages in data mode	
	>> AT+QMTPUB=0,1,1,0,"aws/meter001/data/report/message"	
	>>>	
	>> "/"temp" 22 5 "humi" 68\" // Publish data	
Q3-5-3	>>	
	>> OK	
	»>	
	>> +QMTPUB: 0,1,0	
	»>	
	>> +QMTRECV: 0,0,"toaws/smartKit001/update/message","{ "message": "Hello from AWS IoT	
	console"}"	
	// initiating MQTT connection disconnected	
00.0	>>	
Q3-0	>> OK	
	>>	
	>> +QMTCLOSE: 0,0	
4– Powe	r off after sending and receiving data	
		If the terminal is designed for
		power-off mode and powered off
	>> AI +CFUN=U //Set minimum function	after data interaction is complete,
4-1	>> OK	you need to run AT+CFUN=0,
	//Wait for the return OK, then mcu control to power off; If not return OK after running	
		then nower off the terminal after
	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	then power off the terminal after
	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	then power off the terminal after return OK to avoid damage to the
	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	then power off the terminal after return OK to avoid damage to the flash
5- Eras	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	then power off the terminal after return OK to avoid damage to the flash
5- Eras	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested
5- Eras	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after
5- Eras	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.  the historical frequency //If 2-8 the registration network is not successful within the set search time(such as 2min), go to >> AT+CFUN=0 //Erase the historical frequency based on CFUN0	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out,
5- Eras	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program
5- Eras	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to >> AT+CFUN=0 //Erase the historical frequency based on CFUN0 >> OK >> AT+QCSEARFCN //Erase the historical frequency	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run,
5- Eras	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to >> AT+CFUN=0 //Erase the historical frequency based on CFUN0 >> OK >> AT+QCSEARFCN //Erase the historical frequency >> OK	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search
5- Eras	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to >> AT+CFUN=0 //Erase the historical frequency based on CFUN0 >> OK >> AT+QCSEARFCN //Erase the historical frequency >> OK >> AT+OBAND=1.28	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again:
<b>5 Eras</b>	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to >> AT+CFUN=0 //Erase the historical frequency based on CFUN0 >> OK >> AT+QCSEARFCN //Erase the historical frequency >> OK >> AT+QBAND=1,28 //tlock a specific frequency based Note that it is not recommended for non-specific situations	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again;
<b>5 Eras</b>	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out,
<b>5- Eras</b>	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to  >> AT+CFUN=0 //Erase the historical frequency based on CFUN0  >> OK  >> AT+QCSEARFCN //Erase the historical frequency >> OK  >> AT+QBAND=1,28 //*Lock a specific frequency band. Note that it is not recommended for non-specific situations >> OK	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without
<b>5- Eras</b>	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to  >> AT+CFUN=0 //Erase the historical frequency based on CFUN0  >> OK  >> AT+QCSEARFCN //Erase the historical frequency >> OK  >> AT+QBAND=1,28 //*Lock a specific frequency band. Note that it is not recommended for non-specific situations >> OK  >> AT+QRST=1 //Reboot, and re-search	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or
<b>5 Eras</b>	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly. <b>the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to  >> AT+CFUN=0 //Erase the historical frequency based on CFUN0  >> OK  >> AT+QCSEARFCN //Erase the historical frequency >> OK  >> AT+QBAND=1,28 //*Lock a specific frequency band. Note that it is not recommended for non-specific situations >> OK  >> AT+QRST=1 //Reboot, and re-search >> OK	then power off the terminal after return OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

	6- Exception handling or interruption				
		1)	The program or mcu needs to add the interrupt method of time-out or failure to register		
			the AEP platform, such as re-registration or reboot.	If the terminal has strict	
		2)	The program or mcu needs to add the interrupt method of timeout or failure for sending	requirements on power	
(	6-1		or receiving data, such as reboot.	consumption, it is recommended	
		3)	In the case of exceptions, when the program or mcu performs hardware reset or power-	that the program reasonably	
			off directly, you need to execute AT+CFUN=0 first, and return OK, then control hardware	control timeout	
			reset or power-off; But software reset or reboot does not run AT+CFUN=0.		

#### 3.1.5.2 in PSM Mode

	PSM function is enabled, and only the MQTT of AWS IoT platform is connected. The data
Application	is reported/upload frequently, and the application logic of mcu or program is relatively
	complex

# **Reference for Process of Developing Application:**

Index	Process of AT Command		Notes		
1- Init	Initial				
	//Power on,initial		Boot log output, mcu can also		
	>>		determine whether it is		
	>> RDY		normal boot;		
1-1	>>		If the terminal needs to		
	>> +CFUN: 1		connect to the network		
	>>		immediately after power on,		
	>> +CPIN: READY		start from 2-1		
			In the application design,		
	//After powering of	on, if the terminal (mcu) does not need to connect to the	when the module is powered		
	network, or priorit	tize other tasks, you need to perform	on after the device is powered		
	>> AT+CFUN=0	//Enter the deepsleep state	on, if the terminal has no		
	>> OK		network requirements		
1-2	>> AT+QSCLK=1	<pre>//The deepsleep is enabled by default</pre>	temporarily or mcu gives		
1-2	>> OK		priority to other tasks, cfun0		
			can be executed to enter the		
	//If the terminal needs to connect to the network later, you can run		low power mode.		
	>> AT+QRST=1	//Reboot	If this requirement is not in		
	>> OK		the application design, skip		
			this step to 2-1		
2- Seard	2- Search and register network				
	//Power on, initial		+CPIN: NOT READY indicates		
	>>		that the module fails to check		
	>> RDY		the sim card.so you need to		
	>>		check the SIM card itself or		
2_1	>> +CFUN: 1		the pin connection and		
2-1	>>		hardware design		
	>> +CPIN: READY		By AT+CPSMS=1,,		
	>> AT+QBAND=0	//*If you did not execute the lock BAND in 7-1, skip the command	" <t3412 tau="">","<t3324>",</t3324></t3412>		
	>> OK		you can configure the T3412		
	>> AT+QSCLK=0	//Disable the deepsleep	and T3324 timers properly		

	>> OK	which you need.at the same
	>> AT+CPSMS=1,,,"01000010","00000000" //Enable th PSM	time, after the completion of
	>> OK	the registration network, by
	>> AT+CEDRXS=0.5 //Disable the eDRX	AT+CEREG=5; +CEREG? You
	>> OK	need to guery the real value
	>> AT+ONBIOTEVENT=1 1 //Enable the LIBC of PSM	of T3324 T3412/TAU provided
		by the network
	>> AT+OCEC="decuant" 1 //Dicable the LIPC of Decusion	by the network
		If ADN people to be configured
	// Configure the APN based on the requirement of SIM card	for the CIM card place
2-2	>> AT+QCGDEFCONT="IPV4V6"," <apn>", "<username>", "<password>"</password></username></apn>	for the shirt card, please
	>> OK	perform the command, others
		can be ignored
		If return NO READY, indicates
		the check of SIM card is failed.
	>> AT+CPIN? //check the SIM status	You need to check the SIM
2-3	>> +CPIN: READY	card and hardware. So the
	>>	program can be directly
	>> ОК	powered off, or go to the
		above 1-2, into the low power
		state
	//Check the attribute values of the module	
	>> ATI //Query module identification	
	>> Quectel_Ltd	
	>> xxxxxxx	
	>> Revision: xxxxxxx	
	>>	If the application design does
2-4	>> OK	not require this step, you can
	>> AT+CGSN=1 //Query the IMEI	skip the step
	>> +CGSN: <imei></imei>	
	>>	
	>> OK	
	//Other queries	
		If the application design does
2-5	>> AT+CSCON=1	not require this step, you can
	>> OK	skip the step
	>>	
	>> +CSCON:1 //Indicates that the RRC connection is complete	If the application design does
	//To query the following parameters, it is recommended to query after	not require this step, you can
	return +CSCON:1 or query after the registration network is completed	skip the step
		In the application design of
		the terminal, you can execute
2.6	>> 40011300133333	AT+QENG=0 to obtain the
2-0		relevant network and signal
	>> UK	reference, and to encode
	>> AT+NCCID //Query the CCID of SIM	RSRP, SNR, CELLID, EARFCN
	>> +NCCID:89861122223000411769	and PCI and upload the data
	>>	to the server. It will helps for
	>> OK	troubleshoot problems.
	>> AT+QENG=0 //Query the information about the current camp on the cell	

	>> +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10		
	>> OK		
2-7	<pre>// Query the network registration status &gt;&gt; AT+CEREG? //Query the network registration statu &gt;&gt; +CEREG:0,2 &gt;&gt; &gt;&gt; OK //Periodic queries, such as 500ms intervals</pre>		
2-8	>> AT+CEREG? >> +CEREG:0,0 //+CEREG:0,2 >> OK		If the query only returns +CEREG:0,0 or +CEREG:0,2 within the search time (no less than 2 minutes); the program goes to 5-1
2-9	>> AT+CEREG?       >> AT+CEREG?         >> +CEREG:0,1 //+CEREG:0,5 (roaming)       >> +CEREG:0,3         //the registered successfully       //the registration denied         >>       >>         >> OK       >> OK		If the program finally returns +CEREG:0,3 within the search time (e.g. 2 minutes); Restart or try again in the next cycle. If +CEREG:0,3 is still returned after multiple attempts, it is recommended to check the SIM card
2-10	>> AT+CGPADDR //Query th >> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17al >> >> OK	e IP address obtained b:01f8:98b0:032e"	
2-11	>> AT+CSQ //Query the CSQ >> +CSQ:xx,99 >> >> OK		CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR
2-12	<pre>&gt;&gt; AT+CCLK? //Query the current date and time &gt;&gt; +CCLK: "24/01/16,08:55:19+32" &gt;&gt; &gt;&gt; OK</pre>		Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times
3- Acces	ss the AWS lot server		
Q3-1	<pre>//Testing AWS loT connectivity &gt;&gt; AT+QIDNSCFG=0,"8.8.8.8","8.8.4.4" &gt;&gt; &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+QPING=0,"a9ohm2zbim3d5-ats.iot.us-east-1.amazonaws.com",4,1 &gt;&gt; &gt;&gt; OK &gt;&gt; OK</pre>		In the actual development, please configure parameters according to your requirement

	>> +QPING: 0,54.204.191.103,32,356,237	
	>>	
	>> +QPING: 0,1,1,0,356,356,356	
	//Load the CA certificate and key files	
	>> AT+QSSLCFG=0.0."cacert" // Upload the RootCA.pem to the FILE system	
	>>	
	>> MIIDQICCAImgAwIBAgIIBmytz5m/jAo54vB4ikPmIjZbyjANBgkqhkiG9w0BAQsF	
	»»	
	>> rqXRfboQnoZsG4q5WTP468SQvvG5	
	>>END CERTIFICATE	
	>> +QSSLCFG: 0,0,"cacert",1187	
	// The byte size of the indication must correspond to the byte size of the content of	
	AmazonRootCA1.pem	
	>>	
	>> OK	
	>> AT+QSSLCFG=0,0,"clientcert" // Upload the certificate.pem.crt to the FILE system	
	>>	
	>>>	
	>>BEGIN CERTIFICATE	
	>> MIIDWiCCAkKgAwIBAgIVAKn/znavrMfoSWNahC/I n+asPPI4MA0GCSaGSIb3DOFB	
	>> +++kMaCN/oHIzDI2izI65Y/z0m00MojobbN121i7m2y24aq0yVET6251CoA64D0	
Q3-2		
	>>+QSECFG: 0,0, clientcert, 1224	
	// The byte size of the indication must correspond to the byte size of the content of xxx-	
	certificate.pem.crt	
	>>	
	>> OK	
	>> AT+QSSLCFG=0,0,"clientkey" // Upload the private.pem.key to the FILE system	
	»>	
	>>>	
	>>BEGIN RSA PRIVATE KEY	
	>> MIIEowIBAAKCAQEA3rCImNdAS6x43he0Zn0hq7BGHrdt3ttIjYmTsCVttkcdGX3+	
	»»	
	>> cnEBCR2U3DpU1qNrn0D8r8qCJjWbYJwzEbEoFaKi8zHuhLLVuuus	
	>>END RSA PRIVATE KEY	
	>>	
	>>+OSSLCFG: 0.0."clientkev".1675	
	// The byte size of the indication must correspond to the byte size of the content of yyy-	
	nrivate nem key	
	producipulitacy	
	>> 0K	
	//MOTT and SSL configuration	
03.3		
Q0-0	>> AI+QSSLCFG=U,U, "secievel", 2 //SSL authorization mode:server authentication	
	>>	

	>> OK	
	>> AT+QMTCFG="ssl",0,1,0,0 //Enable SSL and configure SSL context/connect index	
	»>	
	>> OK	
	>> AT+QMTCFG="version",0,1 //Configure the MQTT version	
	>>	
	>> OK	
	>> AT+OSSLCFG=0.0 //Query and validate the results of the current configuration	
	>>	
	>> +0SSI CEG: 0.0 "seclevel" 2	
	$> + 0.551 CEG \cdot 0.0^{+}$ schereion" 4	
	>> + 0.551 CEG: 0.0 "dataformat" 0.0	
	$> + 0.551 CEG \cdot 0.0$ "timeout" 90	
	$\sim 1035$ CFG: 0.0 "debug" 0	
	>>+QSSLCFG: 0,0 "execut" 1187	
	>> +QSSLCFG: 0,0, catert ,1107	
	>> +Q32CFG: 0,0,, client(celt, 1224	
	>> +QSSLCFG: 0,0,° CHENTKEY°,1675	
	>> +QSSLCFG: 0,0," dtls",0	
	>> +QSSLCFG: 0,0,"atlsversion",2	
	>> OK	
	//NOTT of NMS lot to connect and subscribe	
	>> AI+QMIOPEN=0,"a9ohm2zbim3d5-ats.iot.us-east-1.amazonaws.com",8883	
	// Open the MQTTSSL connection	
	»>	
	>> OK	
	»>	
	>> +QMTOPEN: 0,0	
	>> AT+QMTCONN=0,"smartKit001" // Initiate the MQTT server connection	
Q3-4	>>	
	>> OK	
	>>	
	>> +QMTCONN: 0,0,0	
	>> AT+QMTSUB=0,1,"toaws/smartKit001/update/message",1 // Subscribe to related topic	
	>>	
	>> OK	
	>>	
	>> +QMTSUB: 0,1,0,1	
	//MQTT publish	
Q3-5-1	Publish fixed-length messages in non-data mode	
	>>	
	AT+QMTPUB=0,1,1,0,"aws/meter001/data/report/message",23,"{"temp",22.5,"humi",68}"	
	// Publish messages to related topic	
	>>	
	>> OK	
	>>	
	>> +QMTPUB: 0,1,0	
	»»	

	>> +QMTRECV: 0,0,"toaws/smartKit001/update/message","{ "message": "Hello from AWS IoT console"		
	Publish fixed length messages in data mode		
	>> AI+QWIPOB=0,1,1,0, "aws/meter001/data/report/message",23		
	>> "{"temp",22.5,"humi",68}" // Publish data		
Q3-5-2	>>>		
	>> OK		
	»		
	>> +QMTPUB: 0,1,0		
	>>		
	>> +QMTRECV: 0,0,"toaws/smartKit001/update/message", "{ "message": "Hello from AWS loT		
	console"}"		
	//MQTT publish		
	Publish variable-length messages in data mode		
	>> AT+QMTPUB=0,1,1,0,"aws/meter001/data/report/message"		
	»>>		
	>> "{"temp",22.5,"humi",68}" // Publish data		
Q3-5-3	»»		
	>> OK		
	»»		
	>> +QMTPUB: 0,1,0		
	>>		
	>> +QMTRECV: 0,0, "toaws/smartKit001/update/message", "{ "message": "Hello from AWS IoT		
4- Feat	ure of RAI		
Feature	e 3) After the data interaction is completed, you can run AT+QPING=0."8.8.8.8".4.1.32.1		
OT KAI			
	>> AI+QPING=0, 8.8.8.8, 4,1,32,1 //QPING method with RAI Flag		
	>> +001NC+0.9.9.9.9.22.720.51		
	>> (QFING: 0,8.0.0.5,52,723,51		
R4-1	>> + OPING: 0.1.1.0.729.729.729	RAI implementation method	
	>> \Q IIVQ. 0,1,1,0,725,725		
	$//lf + CSCON \cdot 0$ //lf + CSCON \cdot 0 is returned within 0.2s RAL is effective		
	>> AT+OSCI K=1 //Enable deensleen mode		
	>> OK		
5- Ente	nter status PSM and Deepsleep		
	>>		
	>> +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state		
5-1	>>> ···		
	>> +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state		
6- Exit	status of Deepsleep and PSM	1	

	//BC660K&BC950K support to wake up deepsleep by executing AT	
	command or pulling down PSM_EINT pin	
	>>	
	>> +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state	
	//Recreate the MQTT connection	
	>> AT+QSSLCFG=0,0,"seclevel",2	
	>>	
	>> OK	
	>> AT+QMTCFG="ssl",0,1,0,0	
	>>	
	>> OK	
	>> AT+QMTCFG="version",0,1	
	>>	
	>> ОК	
	>> AT+QMTOPEN=0,"a9ohm2zbim3d5-ats.iot.us-east-1.amazonaws.com",8883	Method to trigger PSM wake-
16-1-1	>>	up
	>> OK	
	>>	
	>> +QNBIOTEVENT: "EXIT PSM" //Exit the PSM state	
	>>	
	>> +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup	
	>>	
	>> +QMTOPEN: 0,0	
	>> AT+QMTCONN=0,"meter001"	
	>>	
	>> OK	
	>>	
	>> +QMTCONN: 0,0,0 //The MQTT connection was established successfully	
	Go to 6-2,or goto Q3-5 for sending data or receving data, and the	
	subsequent process	
	//If you want to obtain the accurate signal reference in the current scene	
	immediately after the PSM is woked up, please refer to	
	//BC660K&BC950K support to wake up deepsleep by executing AT	
	command or pulling down PSM_EINT pin	
	>>	
	>> +QNBIOTEVENT: "EXIT DEEPSLEEP"	If the program or mcu needs
	>> AT+QPING=0,"8.8.8.8",4,1	to deal with other tasks, such
	>>	as collecting the base station
	>> OK	cell signal after wake-up; it is
Q6-1-2	>>	recommended to refer to this
	>> +QNBIOTEVENT: "EXIT PSM"	method to trigger PSM wake-
	>>	up and obtain the network
	>> +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup	signal after wake-up.
	>>	If no such requirement in the
	>> +QPING: 0,8.8.8.8,32,699,51	program, ignore the process
	>>	
	>> +QPING: 0,1,1,0,699,699,699	
	>> AT+QENG=0 //Query signal reference	
	>>	

	To beoblighter bevelopment and Application rocess in tower on and rok	THORE
	>> +QENG: 0,3686,11,121,"05C4EF33",-72,-2,-70,18,8,"4C10",0,0,3	
	>>	
	>> OK	
	//Recreate the MQTT connection	
	>> AT+QSSLCFG=0,0,"seclevel",2	
	>>	
	>> OK	
	>> AT+QMTCFG="ssi",0,1,0,0	
	»>	
	>> 0K	
	>> AT+OMTCFG="version".0.1	
	>>	
	>> 0K	
	>> AT+OMTOPEN=0 "agobm2zbim3d5-ats int us-east-1 amazonaws com" 8883	
	>> AI+QWICONN=0, meterool	
	>> 	
	>> UK	
	>>	
	>> +QMTCONN: 0,0,0 //The MQTT connection was established successfully	
	Go to 6-2, or go to Q3-5 for sending data or receiing data, and the	
	subsequent process	
	//Manual TAU update	TAU update manually can
	>> AT+CPSMS=0	avoid automatic update of
	>> OK	TAU cycle over time, so,non-
6-2	>> AT+CPSMS=1,,,"01000010","00000000"	service power consumption
	>> OK	can be reduced; If no
	Go toQ3-5 for sending data or receiring data, and the subsequent process	requirement in the
		application, ignore this step
7- Eras	e the historical frequency	
	//If 2-8 the registration network is not successful within the set search	As described in 2-8, it is
	time(such as 2min), go to	suggested that in the program
	>> AT+CFUN=0 //Erase the historical frequency based on CFUN0	design, after the first search
	>> OK	fails to time out, the frequency
	>> AT+QCSEARFCN //Erase the historical frequency	clearing program must be
	>> OK	executed. After run, follow the
7-1	>> AT+QBAND=1,28	2-7 to check the search status
	//*Lock a specific frequency band. Note that it is not recommended for non-specific	again;
	situations	If the research fails to time
	>> OK	out, you are advised to reboot
	>> AT+QRST=1 //Reboot, and re-search	without clearing the frequency
	>> OK	again. Or wait for the next
	Follow 2-7 above	service cycle and try again.
8- Exce	ption handling or interruption	
0.1	1) The program or mcu shall add the interrupt method of timeout or failure of leshan	If the terminal has strict
0-1	platform registration, such as re-registration or reboot;	requirements on power

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

2)	The program or mcu shall add the interrupt method of sending or receiving data timeout	consumption, it is
	or failure, such as reboot;	recommended that the
3)	The program or mcu should add interrupt methods that cannot enter PSM normally or	program reasonably control
	cannot wake up PSM, such as reboot;	timeout.
4)	In the case of exceptions, when the program or mcu performs hardware reset or power-	If unable to enter PSM or
	off directly, you need to execute AT+CFUN=0 first, and return OK, then control hardware	wake up from PSM, it is
	reset or power-off; But software reset or reboot does not run AT+CFUN=0.	recommended to compare the
		normal time to enter PSM or
		exit PSM. If the time exceeds,
		power off or reboot should
		can be operated

# 3.1.6 MQTT-based Alibaba Cloud Application

#### 3.1.6.1 in Power-off Mode

	The terminal is connected to the MQTT of Alibaba cloud platform, the interval of data
Application	reported/upload is relatively long, the application logic of mcu or program is relatively
	simple, and the PSM is not enabled

# **Reference for Process of Developing Application:**

Index	Process of AT Command		Notes
1- Init	ial		
1-1	//Power on,initial >> >> RDY >> >> +CFUN: 1 >>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after
	>> +CPIN: READY		power on, start from 2-1
1-2	<pre>//After powering on, if the terminal (mcu) does not need to connect to the network, or prioritize other tasks, you need to perform &gt;&gt; AT+CFUN=0 //Enter the deepsleep state &gt;&gt; OK &gt;&gt; AT+QSCLK=1 //The deepsleep is enabled by default &gt;&gt; OK //If the terminal needs to connect to the network later, you can run</pre>		In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the
	>> AT+QRST=1 //R >> OK	Reboot	application design, skip this step to 2-1
2- Sear	ch and register network		
2-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt;</pre>		+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection
	>> +CFUN: 1		and hardware design

	>>		
	>> +CPIN: READY		
	>> AT+QBAND=0	//*If you did not execute the lock BAND in 5-1, skip the command	
	>> OK		
	>> AT+QSCLK=0	//Disable the deepsleep	
	>> OK		
	>> AT+CPSMS=0	//Disable th PSM	
	>> OK		
	>> AT+CEDRXS=0.5	//Disable the eDRX	
	>> OK	,,	
	// Configure the APN	based on the requirement of SIM card	If APN needs to be configured for
2-2	>> AT+OCGDEECONIT="ID)////6" "" "cucorpamo>" "consequents"		the SIM card, please perform the
	>> 0K		command others can be ignored
			If return NO READV indicates the
			check of SIM card is failed. You
	>> AT+CPIN?	//check the SIM status	need to check the SIM card and
2_3	>> +CPIN: READY		hardware. So the program can be
2-0	>>		directly powered off or go to the
	>> OK		ahere 1.2 into the low power
			state
		underson of the mandrale	state
	//Check the attribute	values of the module	
	>> All	//Query module identification	
	>> Quectel_Ltd		
	>> xxxxxxx		
	>> Revision: xxxxxxx		If the application design does not
2-4	>>		require this step, you can skip the
	>> OK		step
	>> AT+CGSN=1	//Query the IMEI	
	>> +CGSN: <imei></imei>		
	>>		
	>> OK		
		//Other queries	
	>> AT+CSCON=1		If the application design does not
2-5	>> OK		require this step, you can skip the
	-		step
	>>		
	>> +CSCON:1	//Indicates that the RRC connection is complete	If the application design does not
	//To query the follow	ing parameters, it is recommended to query after	require this step, you can skip the
	return +CSCON:1, or	query after the registration network is completed	step
2-6	>> AT+CIMI	//Query the IMSI	In the application design of the
	>> 460113061353533		terminal, you can execute
	>>		AT+QENG=0 to obtain the
	>> OK		relevant network and signal
	>> AT+NCCID	//Query the CCID of SIM	reference, and to encode RSRP,
	>> +NCCID:898611222230	00411769	SNR, CELLID, EARFCN and PCI and
	>>		upload the data to the server. It
	>> OK		will helps for troubleshoot
	>> AT+QENG=0 //Q	uery the information about the current camp on the cell	problems.
	>> +QENG: 0, <mark>3686</mark> ,11, <mark>121</mark> ,	," <mark>05C4EF33</mark> ",- <mark>75,</mark> -8,-65, <b>14</b> ,8,"4C10",0,9,3	

	>> >> OK				
2-7	<pre>&gt;&gt; OK // Query the network registration status &gt;&gt; AT+CEREG? //Query the network registration status &gt;&gt; +CEREG:0,2 &gt;&gt; &gt;&gt; OK //Periodic queries, such as 500ms intervals</pre>				
2-8	>> AT+CEREG? >> +CEREG:0,0 //+CEREG:0,2 >>		If the query only returns +CEREG:0,0 or +CEREG:0,2 within the search time (no less than 2 minutes); the program goes to 5-1		
2-9	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,1 //+CEREG:0,5 (roaming) //the registered successfully &gt;&gt; &gt;&gt; OK</pre>	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,3 //the registration denied &gt;&gt; &gt;&gt; OK</pre>	If the program finally returns +CEREG:0,3 within the search time (e.g. 2 minutes); Restart or try again in the next cycle. If +CEREG:0,3 is still returned after multiple attempts, it is recommended to check the SIM card		
2-10	>> AT+CGPADDR //Query th >> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17al >> >> OK				
2-11	>> AT+CSQ //Query the CSQ >> +CSQ:xx,99 >> >> OK		CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR		
2-12	<pre>&gt;&gt; AT+CCLK? //Query the current date and time &gt;&gt; +CCLK: "24/01/16,08:55:19+32" &gt;&gt; &gt;&gt; OK</pre>		Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times		
3- Connect to Alibaba Cloud server					
Q3-1	//Configuring DNS >> AT+QIDNSCFG=0,"223.5.5.5","223.6.6.6" >> >> OK				
Q3-2	<pre>//MQTT configuration &gt;&gt; AT+QMTCFG="version",0,1 //Configure the MQTT version &gt;&gt; OK &gt;&gt; AT+QMTCFG="keepalive",0,1200 //Configure the keepalive &gt;&gt; OK &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07"</pre>				

	//Configure the device certificate for Ali Cloud:ProductKey,DeviceName,DeviceSecret	
	>>	
	>> OK	
	//MQIT of Alibaba Cloud to connect	
	>> AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883	
	// Open the MQTT connection	
	>>	
	>> UK	
Q3-3		
	>> AT+OMTCONN=0 "device001" // Initiate the MOTT server connection	
	>> A representation of device of a representation of the represent	
	>> OK	
	>>	
	>> +QMTCONN: 0,0,0	
	//MQTT publish	
	Publish fixed-length messages in non-data mode	
	>> AT+QMTPUB=0,1,1,0,"/sys/i2uq00ze3N3/device001/thing/event	
	/property/post",99,"{"id":"null","params":{"temp":23.6,	
	"humi":82},"version":"1.0","method":"thing.event.property.post"}"	
	>>	
Q3-4-1	>> OK	
	>>	
	>> +QMTPUB: 0,1,0	
	>>	
	>> +QMTRECV: 0,0,"/sys/i2uq00ze3N3/device001/thing/event/property	
	<pre>/post_reply","{"code":200,"data":{},"id":"null","message":"success"</pre>	
	,"method":"thing.event.property.post","version":"1.0"}"	
	//MQTT publish	
	Publish fixed-length messages in data mode	
	>> AT+QMTPUB=0,1,1,0,"/sys/i2uq00ze3N3/device001/thing	
	/event/property/post",99	
	>>>	
	>> {"id":"null","params":{"temp":18.5,"humi":79},	
Q3-4-2	"Version":"1.0", "method":"thing.event.property.post"} // Publish data	
	>> OV	
	>> +OMTPUB: 0.1.0	
Q3-4-3	>>	
	>> +OMTRECV: 0.0."/sys/i2ua00ze3N3/device001/thing/event/property	
	/post_reply"."{"code":200."data":{}."id":"null"."message":"success".	
	"method":"thing.event.property.post","version":"1.0"}"	
	//MQTT publish	
	Publish variable-length messages in data mode	
	>> AT+QMTPUB=0,1,1,0,"/sys/i2uq00ze3N3/device001/thing	
	/event/property/post"	

	»>	
	>>>	
	>> {"id":"null","params":{"temp":18.5,"humi":79},	
	"version":"1.0","method":"thing.event.property.post"} // Publish data	
	>>	
	>> OK	
	>>	
	>> +OMTPUB: 0.1.0	
	>>	
	>> +OMTRECV: 0.0 "/sys/i2ua00ze3N3/device001/thing/event/property	
	/nost_renty" "{"rode": 200 "data":{} "id":"null" "message":"success"	
	"method"."thing event property post" "version"."1 0"\"	
Q3-5		
	>> +OMTRECV: 0.0."/i2uc00zo2N2/dovice001/user/reply:""LED.status:off"	
	>> +QiviTreCv. 0,0, /izuquozesits/device001/usei/Tepiy , ELD status.off	
	// initiating MQTT connection disconnected	
03-6		
QUU		
	>> +OMTCLOSE: 0.0	
4- Powe	r off after sending and receiving data	
		If the terminal is designed for
		nower-off mode and powered off
	>> AT+CFUN=0 //Set minimum function	after data interaction is complete
4-1	>> ОК	vou need to run AT+CEUN=0
	//Wait for the return OK, then mcu control to power off; If not return OK after running	then nower off the terminal after
	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	return OK to avoid damage to the
		flash
5- Eras	e the historical frequency	
	//If 2-8 the registration network is not successful within the set search time(such as 2min), go	As described in 2-8, it is
	to	suggested that in the program
	>> AT+CFUN=0 //Erase the historical frequency based on CFUN0	design, after the first search fails
	>> OK	to time out, the frequency clearing
	>> AT+QCSEARFCN //Erase the historical frequency	program must be executed. After
	>> OK	run, follow the 2-7 to check the
5-1	>> AT+QBAND=1,28	search status again;
	//*Lock a specific frequency band. Note that it is not recommended for non-specific situations	If the research fails to time out,
	>> OK	you are advised to reboot without
	>> AT+QRST=1 //Reboot, and re-search	clearing the frequency again. Or
	>> OK	wait for the next service cycle and
	Follow 2-7 above	try again.
6- Exce	otion handling or interruption	
6-1	1) The program or mcu needs to add the interrupt method of time-out or failure to register	If the terminal has strict
	the AEP platform, such as re-registration or reboot.	
	2) The program or mcu needs to add the interrupt method of timeout or failure for sending	consumption it is recommended
	or receiving data, such as reboot.	that the program reasonably
	3) In the case of exceptions, when the program or mcu performs hardware reset or power-	control timeout
	off directly, you need to execute AT+CFUN=0 first, and return OK, then control hardware	

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

reset or power-off; But software reset or reboot does not run AT+CFUN=0.
--------------------------------------------------------------------------

#### 3.1.6.2 in PSM Mode

	PSM function is enabled, and only the MQTT of Alibaba cloud platform is connected. The
Application	data is reported/upload frequently, and the application logic of mcu or program is
	relatively complex

# **Reference for Process of Developing Application:**

Index	Process of AT Command	Notes
1- Init	ial	
1-1	//Power on,initial	Boot log output, mcu can also
	>>	determine whether it is
	>> RDY	normal boot;
	»>	If the terminal needs to
	>> +CFUN: 1	connect to the network
	>>	immediately after power on,
	>> +CPIN: READY	start from 2-1
		In the application design,
	//After powering on, if the terminal (mcu) does not need	to connect to the when the module is powered
	network, or prioritize other tasks, you need to perform	on after the device is powered
	>> AT+CFUN=0 //Enter the deepsleep state	on, if the terminal has no
	>> OK	network requirements
1.2	>> AT+QSCLK=1 //The deepsleep is enabled b	y default temporarily or mcu gives
1-2	>> OK	priority to other tasks, cfun0
		can be executed to enter the
	//If the terminal needs to connect to the network later, yo	u can run low power mode.
	>> AT+QRST=1 //Reboot	If this requirement is not in
	>> OK	the application design, skip
		this step to 2-1
2- Seard	ch and register network	
	//Power on,initial	+CPIN: NOT READY indicates
	»>	that the module fails to check
	>> RDY	the sim card.so you need to
	»>	check the SIM card itself or
	>> +CFUN: 1	the pin connection and
	>>	hardware design
	>> +CPIN: READY	By AT+CPSMS=1,,
	>> AT+QBAND=0 //*If you did not execute the lock BAND in 7-1,	skip the command " <t3412 tau="">","<t3324>",</t3324></t3412>
2-1	>> OK	you can configure the T3412
	>> AT+QSCLK=0 //Disable the deepslee	p and T3324 timers properly
	>> OK	which you need.at the same
	>> AT+CPSMS=1,,,"01000010","00000000" //Enable th PSM	time, after the completion of
	>> OK	the registration network, by
	>> AT+CEDRXS=0,5 //Disable the eDRX	AT+CEREG=5; +CEREG? You
	>> OK	need to query the real value
	>> AT+QNBIOTEVENT=1,1 //Enable the URC of PSN	۸ of T3324,T3412/TAU provided
	>> OK	by the network

	>> AT+QCFG="dsevent",1 //Disable the URC of Deepsleep	
	>> OK	
	// Configure the APN based on the requirement of SIM card	If APN needs to be configured for the SIM card, please
2-2	>> AT+QCGDEFCONT="IPV4V6"," <apn>", "<username>", "<password>" &gt;&gt; OK</password></username></apn>	perform the command, others
		can be ignored
		If return NO READY, indicates
		the check of SIM card is failed.
	>> AT+CPIN? //check the SIM status	You need to check the SIM
2-3	>> +CPIN: READY	card and hardware. So the
2.0	>>	program can be directly
	>> OK	powered off, or go to the
		above 1-2, into the low power
		state
	//Check the attribute values of the module	
	>> ATI //Query module identification	
	>> Quectel_Ltd	
	>> XXXXXXX	
	>> Revision: xxxxxx	If the application design does
2-4	>>	not require this step, you can
		skip the step
	>> AI+CGSN=1 //Query the IMEI	
	>> 0r	
	//Other queries	
		If the application design does
2-5	>> AT+CSCON=1	not require this step, you can
	>> OK	skip the step
	>>	
	>> +CSCON:1 //Indicates that the RRC connection is complete	
	//To query the following parameters, it is recommended to query after	r If the application design does
	return +CSCON:1, or query after the registration network is complete	d not require this step, you can
	>> AT+CIMI //Query the IMSI	skip the step
	>> 460113061353533	In the application design of
	>> 	the terminal, you can execute
2-6		AI+QENG=0 to obtain the
	>> AI + IVCCID //Query the CCID of Silvi	reference, and to opcode
	>> TINCUD.03001122223000411703	
	>> OK	and PCI and upload the data
	>> AT+OENG=0 //Query the information about the current camp on the cell	to the server. It will helps for
	>> +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3	troubleshoot problems.
	>>	
	>> OK	
	// Query the network registration status	
0.7	>> AT+CEREG? //Query the network registration status	
2-7	>> +CEREG:0,2	
	>>	

	>> OK //Periodic queries, such as 500ms intervals		
2-8	>> AT+CEREG? >> +CEREG:0,0 //+CEREG:0,2 >> >> OK		If the query only returns +CEREG:0,0 or +CEREG:0,2 within the search time (no less than 2 minutes); the program goes to 5-1
2-9	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,1 //+CEREG:0,5 (roaming) //the registered successfully &gt;&gt; &gt;&gt; OK</pre>	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,3 //the registration denied &gt;&gt; &gt;&gt; OK</pre>	If the program finally returns +CEREG:0,3 within the search time (e.g. 2 minutes); Restart or try again in the next cycle. If +CEREG:0,3 is still returned after multiple attempts, it is recommended to check the SIM card
2-10	<pre>&gt;&gt; AT+CGPADDR //Query the IP address obtained &gt;&gt; +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17ab:01f8:98b0:032e" &gt;&gt; &gt;&gt; OK</pre>		
2-11	>> <b>AT+CSQ</b> //Query the CSQ >> +CSQ:xx,99 >> >> OK		CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR
2-12	<pre>2 &gt;&gt; AT+CCLK? //Query the current date and time 2 +CCLK: "24/01/16,08:55:19+32" &gt;&gt;  &gt;&gt; OK</pre>		Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times
3- Acce	ss the Alibaba <u>Cloud server</u>		1 
Q3-1	//Configuring DNS >> AT+QIDNSCFG=0,"223.5.5.5","223.6.6.6" >> >> OK		
Q3-2	<pre>//MQTT configuration &gt;&gt; AT+QMTCFG="version",0,1 //Configure the &gt;&gt; OK &gt;&gt; AT+QMTCFG="keepalive",0,1200 //Configure the l &gt;&gt; OK &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","33 //Configure the device certificate for Ali Cloud:ProductKe &gt;&gt; &gt;&gt; OK</pre>	MQTT version keepalive af2ccf1273f1b8866effc4d64b85d07" ry,DeviceName,DeviceSecret	

	//MQTT of Alibaba Cloud to connect	
	>> AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883	
	// Open the MQTT connection	
	>>	
Q3-3	>> OK	
	>>	
	>> +QMTOPEN: 0,0	
	>> AT+QMTCONN=0,"device001" // Initiate the MQTT server connection	
	>>	
	>> OK	
	>>	
	>> +QMTCONN: 0,0,0	
	//MQTT publish	
	Publish fixed-length messages in non-data mode	
	>> AT+QMTPUB=0,1,1,0,"/sys/i2uq00ze3N3/device001/thing/event	
	<pre>/property/post",99,"{"id":"null","params":{"temp":23.6,</pre>	
	"humi":82},"version":"1.0","method":"thing.event.property.post"}"	
	>>	
Q3-4-1	>> OK	
	>>	
	>> +QMTPUB: 0,1,0	
	»>	
	>> +QMTRECV: 0,0,"/sys/i2uq00ze3N3/device001/thing/event/property	
	/post_reply","{"code":200,"data":{},"id":"null","message":"success"	
	,"method":"thing.event.property.post","version":"1.0"}"	
	//MQTT publish	
	Publish fixed-length messages in data mode	
	>> AT+QMTPUB=0,1,1,0,"/sys/i2uq00ze3N3/device001/thing	
	/event/property/post",99	
	>> 	
	>> ("id"-"null" "parame" ("tomp":19 5 "hum":70)	
	"version":"1.0" "method":"thing event property post"} // Publish data	
Q3-4-2		
	>> 0K	
	>>	
	>> +QMTPUB: 0.1.0	
	>>	
	>> +QMTRECV: 0,0,"/sys/i2uq00ze3N3/device001/thing/event/property	
	/post_reply","{"code":200,"data":{},"id":"null","message":"success",	
	"method":"thing.event.property.post","version":"1.0"}"	
	//MQTT publish	
	Publish variable-length messages in data mode	
	>> AT+QMTPUB=0,1,1,0,"/sys/i2uq00ze3N3/device001/thing	
Q3-4-3	/event/property/post"	
	>>	
	>>>	
	>> {"id":"null","params":{"temp":18.5,"humi":79},	

	"version":"1.0","method":"thing.event.property.post"} // Publish data	
	>>	
	>> ОК	
	>>	
	>> +QMTPUB: 0,1,0	
	>>	
	>> +QMTRECV: 0,0,"/sys/i2uq00ze3N3/device001/thing/event/property	
	<pre>/post_reply","{"code":200,"data":{},"id":"null","message":"success",</pre>	
	"method":"thing.event.property.post","version":"1.0"}"	
	//MQTT server push	
Q3-5	>>	
	>> +QMTRECV: 0,0,"/i2uq00ze3N3/device001/user/reply","LED status:off"	
4- Feat	ure of RAI	
Feature		
of RAI	1) After the data interaction is completed, you can run AT+QPING=0,"8.8.8.8",4,1,32,1	
	>> AT+QPING=0,"8.8.8.8",4,1,32,1 //QPING method with RAI Flag	
	>> OK	
	>>	
	>> +QPING: 0,8.8.8,32,729,51	
R4-1	>>	RAI implementation method
	>> +QPING: 0,1,1,0,729,729,729	
	>>	
	>> +CSCON:0 //If +CSCON:0 is returned within 0-2s, RAI is effective	
	>> AT+QSCLK=1 //Enable deepsleep mode	
	>> UK	
5- Ente	er status PSM and Deepsleep	
5- Ente	<pre>&gt;&gt; status PSM and Deepsleep &gt;&gt; //Enter the PSM state</pre>	
5- Ente	>>         >>         >> +QNBIOTEVENT: "ENTER PSM"         //Enter the PSM state	
5- Ente	>>       >>         >>       +QNBIOTEVENT: "ENTER PSM"         //Enter the PSM state         >>         >>         >>         >>         >>         >>         >>         >>	
5- Ente 5-1 6- Exit	er status PSM and Deepsleep         >>         >> +QNBIOTEVENT: "ENTER PSM"         //Enter the PSM state         >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"         //Enter the deepsleep state         : status of Deepsleep and PSM	
5- Ente 5-1 6- Exit	er status PSM and Deepsleep         >>         >> +QNBIOTEVENT: "ENTER PSM"         //Enter the PSM state         >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"         //Enter the deepsleep state         : status of Deepsleep and PSM         //BC660K&BC950K support to wake up deepsleep by executing AT	
5- Ente 5-1 6- Exit	er status PSM and Deepsleep         >>         >> +QNBIOTEVENT: "ENTER PSM"         //Enter the PSM state         >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"         //Enter the deepsleep state         : status of Deepsleep and PSM         //BC660K&BC950K support to wake up deepsleep by executing AT command or pulling down PSM EINT pin	
5- Ente 5-1 6- Exit	er status PSM and Deepsleep         >>         >>         +QNBIOTEVENT: "ENTER PSM"         //Enter the PSM state         >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"         //Enter the deepsleep state         : status of Deepsleep and PSM         //BC660K&BC950K support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>	
5- Ente 5-1 6- Exit	>r       status PSM and Deepsleep         >>       >> +QNBIOTEVENT: "ENTER PSM"       //Enter the PSM state         >>       >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"       //Enter the deepsleep state         :       status of Deepsleep and PSM         //BC660K&BC950K support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>         >>         >> +QNBIOTEVENT: "EXIT DEEPSLEEP"	
5- Ente	er       status PSM and Deepsleep         >>       >> +QNBIOTEVENT: "ENTER PSM"       //Enter the PSM state         >>       >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"       //Enter the deepsleep state         :       status of Deepsleep and PSM         //BC660K&BC950K support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>         >> +QNBIOTEVENT: "EXIT DEEPSLEEP"         //Exit the deepsleep state         //Recreate the MQTT connection	
5- Ente	>>       >>         >> +QNBIOTEVENT: "ENTER PSM"       //Enter the PSM state         >>       >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"       //Enter the deepsleep state         : status of Deepsleep and PSM         //BC660K&BC950K support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>         >> +QNBIOTEVENT: "EXIT DEEPSLEEP"         //Exit the deepsleep state         //Recreate the MQTT connection         >>	
5- Ente	>>         >>         >>         >>         >>         >>         >>         >>         >>         //BC660K&BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin         >>         >>         >>         >>         //Recreate the MQTT connection         >>         AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07"	
5- Ente	status PSM and Deepsleep         >>         >> +QNBIOTEVENT: "ENTER PSM"         //Enter the PSM state         >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"         //Enter the deepsleep state         status of Deepsleep and PSM         //BC660K&BC950K support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>         >> +QNBIOTEVENT: "EXIT DEEPSLEEP"         //Recreate the MQTT connection         >>         AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07"         >> OK	Method to trigger PSM wake-
5- Ente 5-1 6- Exit	status PSM and Deepsleep         >>         >> +QNBIOTEVENT: "ENTER PSM"         //Enter the PSM state         >>         >> +QNBIOTEVENT: "ENTER DEEPSLEEP"         //Enter the deepsleep state         :         status of Deepsleep and PSM         //BC660K&BC950K support to wake up deepsleep by executing AT         command or pulling down PSM_EINT pin         >>         >> +QNBIOTEVENT: "EXIT DEEPSLEEP"         //Recreate the MQTT connection         >>         AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07"         >> OK         >> AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883	Method to trigger PSM wake-
5- Ente 5-1 6- Exit	<pre>status PSM and Deepsleep &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state status of Deepsleep and PSM //BC660K&amp;BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state //Recreate the MQTT connection &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07" &gt;&gt; OK &gt;&gt; AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883 &gt;&gt;</pre>	Method to trigger PSM wake- up
5- Ente 5-1 6- Exit	<pre>status PSM and Deepsleep &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state &gt;&gt; tatus of Deepsleep and PSM //BC660K&amp;:BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state //Recreate the MQTT connection &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07" &gt;&gt; OK &gt;&gt; AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883 &gt;&gt; &gt;&gt; OK</pre>	Method to trigger PSM wake- up
5- Ente 5-1 6- Exit	<pre>status PSM and Deepsleep &gt;&gt; +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state : status of Deepsleep and PSM //BC660K&amp;BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state //Recreate the MQTT connection &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07" &gt;&gt; OK &gt;&gt; AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883 &gt;&gt; &gt;&gt; OK</pre>	Method to trigger PSM wake- up
5- Ente 5-1 6- Exit	<pre>status PSM and Deepsleep &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state status of Deepsleep and PSM //BC660K&amp;/BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state //Recreate the MQTT connection &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07" &gt;&gt; OK &gt;&gt; AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883 &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; OK</pre>	Method to trigger PSM wake- up
5- Ente 5-1 6- Exit	<pre>r status PSM and Deepsleep &gt;&gt; +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state status of Deepsleep and PSM //BC660K&amp;BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state //Recreate the MQTT connection &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07" &gt;&gt; OK &gt;&gt; AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883 &gt;&gt; &gt;&gt; OK &gt;&gt; &gt;&gt; OK</pre>	Method to trigger PSM wake- up
5- Ente 5-1 6- Exit	<pre>r status PSM and Deepsleep &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state &gt;&gt; &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state : status of Deepsleep and PSM //BC660K&amp;BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state //Recreate the MQTT connection &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07" &gt;&gt; 0K &gt;&gt; AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883 &gt;&gt; &gt;&gt; 0K &gt;&gt; &gt;&gt; 0K &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT PSM" //Exit the PSM state &gt;&gt; &gt;&gt; +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup</pre>	Method to trigger PSM wake- up
5- Ente 5-1 6- Exit	<pre>&gt;&gt; status PSM and Deepsleep &gt;&gt; +QNBIOTEVENT: "ENTER PSM" //Enter the PSM state &gt;&gt; +QNBIOTEVENT: "ENTER DEEPSLEEP" //Enter the deepsleep state status of Deepsleep and PSM //BC660K&amp;BC950K support to wake up deepsleep by executing AT command or pulling down PSM_EINT pin &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT DEEPSLEEP" //Exit the deepsleep state //Recreate the MQTT connection &gt;&gt; AT+QMTCFG="aliauth",0,"i2uq00ze3N3","device001","3af2ccf1273f1b8866effc4d64b85d07" &gt;&gt; 0K &gt;&gt; AT+QMTOPEN=0,"iot-06z00hxss3rggno.mqtt.iothub.aliyuncs.com",1883 &gt;&gt; &gt;&gt; 0K &gt;&gt; &gt;&gt; +QNBIOTEVENT: "EXIT PSM" //Exit the PSM state &gt;&gt; &gt;&gt; +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup &gt;&gt;</pre>	Method to trigger PSM wake- up

		Mode
	>> AT+QMTCONN=0,"device001"	
	>>>	
	>> OK	
	»	
	>> +QMTCONN: 0,0,0 //The MQTT connection was established successfully	
	Go to 6-2, or goto Q3-4 for sending data or receving data, and the	
	subsequent process	
	//If you want to obtain the accurate signal reference in the current scene	
	immediately after the PSM is woked up, please refer to	
	//BC660K&BC950K support to wake up deepsleep by executing AT	
	command or pulling down PSM_EINT pin	
	»»	
	>> +QNBIOTEVENT: "EXIT DEEPSLEEP"	
	>> AT+QPING=0,"8.8.8.8",4,1	
	>>	
	>> OK	
	>>	
	>> +QNBIOTEVENT: "EXIT PSM"	
	>>	
	>> +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup	
	»»	
	>> +QPING: 0,8.8.8.8,32,699,51	If the program or mcu needs
	»»	to deal with other tasks, such
	>> +QPING: 0,1,1,0,699,699,699	as collecting the base station
	>> AT+QENG=0 //Query signal reference	cell signal after wake-up; It is
	>>	recommended to refer to this
Q6-1-2	>> +OENG: 0.3686.11.121."05C4EF33"72270.18.8."4C10".0.0.3	method to trigger PSM wake-
	>>	up and obtain the network
	>> 0K	signal after wake-up.
	//Recreate the MOTT connection	If no such requirement in the
	»>	program, ignore the process
	AT+OMTCFG="aliauth".0."i2uo00ze3N3"."device001"."3af2ccf1273f1b8866effc4d64b85d07"	
	>> OK	
	>> AT+OMTOPEN=0."iot-06z00hxss3rggno.mgtt.iothub.alivuncs.com".1883	
	>>	
	>> 0K	
	>>	
	>> +OMTOPEN: 0.0	
	>> AT+OMTCONN=0."device001"	
	>>	
	>> 0K	
	>>	
	>> +OMTCONN: 0.0.0 //The MOTT connection was established successfully	
	Go to 6-2.or goto 03-4 for sending data or receiving data and the	
	subsequent process	
	//Manual TAU update	TAU update manually can
	>> AT+CPSMS=0	avoid automatic update of
6-2	>> OK	TAU cycle over time, so non-
	>> AT+CPSMS=1,,,"01000010","00000000"	service power consumption
		sei nee pener consumption

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

	>> ОК		can be reduced; If no
	Go to Q3-4 for send	ling data or receving data, and the subsequent process	requirement in the
			application, ignore this step
7- Eras	se the historical f	requency	
			As described in 2-8, it is
	//If 2-8 the registrat	tion network is not successful within the set search	suggested that in the
	time(such as 2min),	go to	program design, after the first
	>> AT+CFUN=0	//Erase the historical frequency based on CFUN0	search fails to time out, the
	>> OK		frequency clearing program
	>> AT+QCSEARFCN	//Erase the historical frequency	must be executed. After run,
74	>> OK		follow the 2-7 to check the
7-1	>> AT+QBAND=1,28		search status again;
	//*Lock a specific freque	ncy band. Note that it is not recommended for non-specific situations	If the research fails to time
	>> OK		out, you are advised to reboot
	>> AT+QRST=1	//Reboot, and re-search	without clearing the
	>> OK		frequency again. Or wait for
	Follow 2-7 above		the next service cycle and try
			again.
8- Exce	ption handling or i	interruption	
			If the terminal has strict
			requirements on power
	1) The program or mcu	u shall add the interrupt method of timeout or failure of leshan	consumption, it is
	platform registration	n, such as re-registration or reboot;	recommended that the
	2) The program or mcu	u shall add the interrupt method of sending or receiving data timeout	program reasonably control
	or failure, such as re	boot;	timeout.
8-1	3) The program or mct	u should add interrupt methods that cannot enter PSM normally or	If unable to enter PSM or
	cannot wake up PSN	٨, such as reboot;	wake up from PSM, it is
	4) In the case of except	tions, when the program or mcu performs hardware reset or power-	recommended to compare
	off directly, you nee	d to execute AT+CFUN=0 first, and return OK, then control hardware	the normal time to enter PSM
	reset or power-off; E	But software reset or reboot does not run AT+CFUN=0.	or exit PSM. If the time
			exceeds, power off or reboot

# 3.1.7 HTTP(s) Application

#### 3.1.7.1 in Power-off Mode

Application	The terminal is connected to the HTTP(s) server, the interval of data reported/upload is relatively long, the application logic of mcu or program is relatively simple, and the PSM is not enabled
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# **Reference for Process of Developing Application:**

Index	Process of AT Command	Notes
1- Initi	al	
	//Power on,initial	Boot log output, mcu can also
1-1	>>	determine whether it is normal
	>> RDY	boot;

	>> >> +CFUN: 1 >> >> +CPIN: READY		If the terminal needs to connect to the network immediately after power on, start from 2-1	
1-2	<pre>//After powering on, if the terminal (mcu) does not need to conne network, or prioritize other tasks, you need to perform &gt;&gt; AT+CFUN=0 //Enter the deepsleep state &gt;&gt; OK &gt;&gt; AT+QSCLK=1 //The deepsleep is enabled by default &gt;&gt; OK</pre>	ct to the	In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0	
	<pre>//If the terminal needs to connect to the network later, you can ru &gt;&gt; AT+QRST=1 //Reboot &gt;&gt; OK</pre>	n	can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1	
2- Searc	h and register network			
2-1	<pre>&gt;&gt; RDY &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY &gt;&gt; AT+QBAND=0 //*If you did not execute the lock BAND in 5-1, skip the c &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+QSCLK=0 //Disable the deepsleep &gt;&gt; OK &gt;&gt; AT+CPSMS=0 //Disable th PSM &gt;&gt; OK &gt;&gt; AT+CEDRXS=0,5 //Disable the eDRX &gt;&gt; OK</pre>	command	+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection and hardware design	
2-2	// Configure the APN based on the requirement of SIM card >> AT+QCGDEFCONT="IPV4V6"," <apn>", "<username>", "<password>"</password></username></apn>		If APN needs to be configured for the SIM card, please perform the	
	>> OK		command, others can be ignored	
2-3	>> AT+CPIN? //check the SIM status >> +CPIN: READY >> >> OK		check of SIM card is failed. You need to check the SIM card and hardware. So the program can be directly powered off, or go to the above 1-2, into the low power state	
2-4	<pre>//Check the attribute values of the module &gt;&gt; ATI //Query module identification &gt;&gt; Quectel_Ltd &gt;&gt; xxxxxxx &gt;&gt; Revision: xxxxxxx &gt;&gt; &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+CGSN=1 //Query the IMEI</pre>		If the application design does not require this step, you can skip the step	
	>> +CGSN: <imei></imei>			
------	-------------------------------------------------------------------------	------------------------------------	------------------------------------------	--
	»»			
	>> OK			
	//Other q			
	>> AT+CSCON=1		If the application design does not	
2-5	>> OK		require this step, you can skip the	
			step	
	>>			
	>> +CSCON:1 //Indicates that the RRC connection is complete			
	// To query the following parameters, it is recon	If the application design does not		
	return +CSCON: I, or query after the registratio	n network is completed	require this step, you can skip the	
	>> ALT-CIVIT //Query the INISI		step	
	>> 400113001333333		In the application design of the	
	>> 0k		terminal, you can execute	
2-6	>> AT+NCCID //Query	the CCID of SIM	AT+QENG=0 to obtain the relevant	
	>> +NCCID:89861122223000411769		network and signal reference, and	
	>>		to encode RSRP, SNR, CELLID,	
	>> OK		EARFCN and PCI and upload the	
	>> AT+QENG=0 //Query the information about the current camp on the cell		data to the server. It will helps for	
	>> +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3		troubleshoot problems.	
	»>			
	>> OK			
	// Query the network registration status			
	>> AT+CEREG? //Query the network registration stat	tus		
	>> +CEREG:0,2			
2-7	>>			
	>> OK			
	//Periodic queries, such as 500ms intervals			
	>> AT+CEREG?		If the query only returns	
2-8	>> +CEREG:0,0 //+CEREG:0,2		+CEREG:0,0 or +CEREG:0,2 within	
	>>		the search time (no less than 2	
	>> OK		minutes); the program goes to 5-1	
			If the program finally returns	
	>> AI+CEREG?	>> AI+CEREG?	+CEREG:0,3 Within the search time	
2-0	//the registered successfully	//the registration denied	in the pert cycle. If $\pm$ CEREC:0.3 is	
2-5	// the registered successfully		still returned after multiple	
	>> 0K	>> 0K	attempts, it is recommended to	
			check the SIM card	
	>> AT+CGPADDR //Query	the IP address obtained		
	>> +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17ab:01f8:98b0:032e"			
2-10	»»			
	>> OK			
	>> AT+CSQ //Query t	he CSQ	CSQ=(RSSI+113)/2	
2 11	>> +CSQ:xx,99		CSQ corresponds to signal	
2-11	»>		reference RSSI. In actual	
	>> OK		applications, it is recommended to	

		run AT+QENG=0 to obtain RSRP
2-12	<pre>&gt;&gt; AT+CCLK? //Query the current date and time &gt;&gt; +CCLK: "24/01/16,08:55:19+32" &gt;&gt; &gt;&gt; OK</pre>	Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times
3– Conne	ct to HTTP(s) server	
H3-1	<pre>//Configure the parameters for HTTP &gt;&gt; AT+QHTTPCFG="contextid",0 &gt;&gt; OK &gt;&gt; AT+QHTTPCFG="requestheader",0 &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+QHTTPCFG="ssl",0,0 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QHTTPCFG="ssl",0,0</pre>	In the actual development, please configure parameters according to your requirement
H3-2	<pre>&gt;&gt; OK //Set the SSL parameters for HTTPs &gt;&gt; AT+QSSLCFG=0,0,"sslversion",4 &gt;&gt; OK &gt;&gt; AT+QSSLCFG=0,0,"dtls",1 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QSSLCFG=0,0,"dtlsversion",2 &gt;&gt; OK &gt;&gt; AT+QSSLCFG=0,0,"dtlsversion",2 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QSSLCFG=0,0,"ciphersuite",0xFFFF &gt;&gt; &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+QSSLCFG=0,0,"sni",1 &gt;&gt; OK</pre>	In the actual development, please configure parameters according to your requirement
H3-3	<pre>//Connect to HTTPs and send a GET or POST service &gt;&gt; AT+QIDNSCFG=0,"223.5.5.5","8.8.8.8" //Configure reliable DNS &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+QHTTPURL=57,80 &gt;&gt; &gt;&gt; &gt;&gt;</pre>	In the actual development, please configure parameters according to your application

	>>>	
	>> +QHTTPGET: 0,200,99	
	>> AT+QHTTPPOST=146	
	»»	
	>>>	
	>> {"DATETIME":"20240528T143744Z","IMEI":"868020030003890","NCU_FW_VER":100,	
	"GAS_METER":1265035,"CSQ":29,"MCU_TEMP":28,"BAT_VOL":3665,"METER_TYPE":7}	
	>> OK	
	»>	
	>> +QHTTPPOST: 0,200,139	
	>> AT+QHTTPREAD=139	
	»»	
	>> +QHTTPREAD: 139,0	
	>> {"module":{"code":"700.101.1001"."name":"GAS_METER_RECEIVER.PUSH	
	MEASUREMENT"."version":"1.1.3"}."data":{"messageId":"194083404774019072"}}	
	>>	
	>> 0K	
1- Dower	off after cending and receiving data	
		If the terminal is designed for
	>> AI+CFON=0 //Set minimum function	power-off mode and powered off
4-1		after data interaction is complete,
	//Wait for the return OK, then mcu control to power off; if not return OK after running	you need to run AI+CFUN=0, then
	AT+CFUN=0 for a long period of time (for example, 20s), you can power off directly.	power off the terminal after return
		OK to avoid damage to the flash
5- Erase	the historical frequency	OK to avoid damage to the flash
5- Erase	the historical frequency //If 2-8 the registration network is not successful within the set search time(such as 2min),	OK to avoid damage to the flash As described in 2-8, it is suggested
5- Erase	the historical frequency //If 2-8 the registration network is not successful within the set search time(such as 2min), go to	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after
5- Erase	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUN0	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the
5- Erase	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUN0         >> OK	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must
5- Erase	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUN0         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the
5- Erase	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUN0         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status
5- Erase	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> AT+QBAND=1,28	As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status
<b>5- Erase</b> 5-1	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUN0         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific	As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you
<b>5- Erase</b> 5-1	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific situations	As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without
<b>5- Erase</b> 5-1	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific situations         >> OK	As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without
<b>5– Erase</b> 5-1	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific         situations         >> OK         >> AT+QRST=1       //Reboot, and re-search	As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the payt service cycle and
<b>5- Erase</b>	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific         situations         >> OK         >> OK         >> OK	As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again
<b>5– Erase</b> 5-1	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min),         go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific situations         >> OK         >> AT+QRST=1       //Reboot, and re-search         >> OK         >> OK	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again.
5- Erase 5-1 6- Excep	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min), go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific situations         >> OK         >> AT+QRST=1         >> OK         Follow 2-7 above         tion handling or interruption	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again.
5- Erase 5-1 6- Excep	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min), go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific situations         >> OK         >> AT+QRST=1         >> OK         Follow 2-7 above         tion handling or interruption         4) The program or mcu needs to add the interrupt method of time-out or failure to register	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again.
5-1 5-1 6- Excep	the historical frequency         //If 2-8 the registration network is not successful within the set search time(such as 2min), go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK         >> AT+QCSEARFCN       //Erase the historical frequency         >> OK         >> AT+QBAND=1,28         //*Lock a specific frequency band. Note that it is not recommended for non-specific situations         >> OK         >> OK         >> AT+QRST=1         //Reboot, and re-search         >> OK         Follow 2-7 above         tion handling or interruption         4) The program or mcu needs to add the interrupt method of time-out or failure to register the AEP platform, such as re-registration or reboot.	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again.
5- Erase 5-1 6- Excep	<b>b the historical frequency</b> //If 2-8 the registration network is not successful within the set search time(such as 2min), go to         >> AT+CFUN=0       //Erase the historical frequency based on CFUNO         >> OK       //Erase the historical frequency         >> OK       //Reboot, and re-search         >> OK       //Reboot, and re-search         >> OK       //Reboot, and re-search         >> OK       //Erase the interrupt method of time-out or failure to register         the AEP platform, such as re-registration or reboot.       5)         5) The program or mcu needs to add the interrupt method of timeout or failure for	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again.
5-1 5-1 6- Excep	<ul> <li>the historical frequency</li> <li>//If 2-8 the registration network is not successful within the set search time(such as 2min), go to</li> <li>&gt; AT+CFUN=0 //Erase the historical frequency based on CFUNO</li> <li>&gt; OK</li> <li>&gt; AT+QCSEARFCN //Erase the historical frequency</li> <li>&gt; OK</li> <li>&gt; AT+QBAND=1,28</li> <li>//*Lock a specific frequency band. Note that it is not recommended for non-specific situations</li> <li>&gt; OK</li> <li>&gt; AT+QRST=1 //Reboot, and re-search</li> <li>&gt; OK</li> <li>Follow 2-7 above</li> <li>tion handling or interruption</li> <li>4) The program or mcu needs to add the interrupt method of time-out or failure to register the AEP platform, such as re-registration or reboot.</li> <li>5) The program or mcu needs to add the interrupt method of timeout or failure for sending or receiving data, such as reboot.</li> </ul>	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again. If the terminal has strict requirements on power consumption, it is recommended
5-1 6- Except	<ul> <li>the historical frequency</li> <li>//If 2-8 the registration network is not successful within the set search time(such as 2min), go to</li> <li>&gt; AT+CFUN=0 //Erase the historical frequency based on CFUN0</li> <li>&gt; OK</li> <li>&gt; AT+QCSEARFCN //Erase the historical frequency</li> <li>&gt; OK</li> <li>&gt; AT+QBAND=1,28</li> <li>//*Lock a specific frequency band. Note that it is not recommended for non-specific situations</li> <li>&gt; OK</li> <li>&gt; AT+QRST=1 //Reboot, and re-search</li> <li>&gt; OK</li> <li>Follow 2-7 above</li> <li>tion handling or interruption</li> <li>4) The program or mcu needs to add the interrupt method of time-out or failure to register the AEP platform, such as re-registration or reboot.</li> <li>5) The program or mcu needs to add the interrupt method of timeout or failure for sending or receiving data, such as reboot.</li> <li>6) In the case of exceptions, when the program or mcu performs hardware reset or power-</li> </ul>	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again. If the terminal has strict requirements on power consumption, it is recommended that the program reasonably
5-1 5-1 6-1	<ul> <li>the historical frequency</li> <li>//If 2-8 the registration network is not successful within the set search time(such as 2min), go to</li> <li>&gt;&gt; AT+CFUN=0 //Erase the historical frequency based on CFUN0</li> <li>&gt;&gt; OK</li> <li>&gt;&gt; AT+QCSEARFCN //Erase the historical frequency</li> <li>&gt;&gt; OK</li> <li>&gt;&gt; AT+QBAND=1,28 //*Lock a specific frequency band. Note that it is not recommended for non-specific situations</li> <li>&gt;&gt; OK</li> <li>&gt;&gt; AT+QRST=1 //Reboot, and re-search</li> <li>&gt;&gt; OK</li> <li>Follow 2-7 above</li> <li>tion handling or interruption</li> <li>4) The program or mcu needs to add the interrupt method of time-out or failure to register the AEP platform, such as re-registration or reboot.</li> <li>5) The program or mcu needs to add the interrupt method of timeout or failure for sending or receiving data, such as reboot.</li> <li>6) In the case of exceptions, when the program or mcu performs hardware reset or power-off directly, you need to execute AT+CFUN=0 first, and return OK, then control</li> </ul>	OK to avoid damage to the flash As described in 2-8, it is suggested that in the program design, after the first search fails to time out, the frequency clearing program must be executed. After run, follow the 2-7 to check the search status again; If the research fails to time out, you are advised to reboot without clearing the frequency again. Or wait for the next service cycle and try again. If the terminal has strict requirements on power consumption, it is recommended that the program reasonably control timeout

For BC660K&BC950K Development and Application Process in Power-off and PSM Mode

#### 3.1.7.2 in PSM Mode

	PSM function is enabled, and only the HTTP(s) server is connected. The data is
Application	reported/upload frequently, and the application logic of mcu or program is relatively
	complex

# **Reference for Process of Developing Application:**

Index	Process of AT Command		Notes	
1- Initi	Initial			
1-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY</pre>		Boot log output, mcu can also determine whether it is normal boot; If the terminal needs to connect to the network immediately after power on, start from 2-1	
1-2	<pre>//After powering on, if the terminal (m network, or prioritize other tasks, you &gt;&gt; AT+CFUN=0 //Ent &gt;&gt; OK &gt;&gt; AT+QSCLK=1 //The &gt;&gt; OK  //If the terminal needs to connect to th &gt;&gt; AT+QRST=1 //Ret &gt;&gt; OK</pre>	cu) does not need to connect to the need to perform ter the deepsleep state e deepsleep is enabled by default ne network later, you can run	In the application design, when the module is powered on after the device is powered on, if the terminal has no network requirements temporarily or mcu gives priority to other tasks, cfun0 can be executed to enter the low power mode. If this requirement is not in the application design, skip this step to 2-1	
2- Searc	h and register network			
2-1	<pre>//Power on,initial &gt;&gt; &gt;&gt; RDY &gt;&gt; &gt;&gt; +CFUN: 1 &gt;&gt; &gt;&gt; +CPIN: READY &gt;&gt; AT+QBAND=0 //*If you did not execut &gt;&gt; OK &gt;&gt; AT+QSCLK=0 &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+CPSMS=1,,,"01000010","00000000" &gt;&gt; OK &gt;&gt; AT+CEDRXS=0,5 &gt;&gt; OK</pre>	tte the lock BAND in 7-1, skip the command //Disable the deepsleep //Enable th PSM //Disable the eDRX //Enable the URC of PSM	+CPIN: NOT READY indicates that the module fails to check the sim card.so you need to check the SIM card itself or the pin connection and hardware design By AT+CPSMS=1,, " <t3412 tau="">","<t3324>", you can configure the T3412 and T3324 timers properly which you need.at the same time, after the completion of the registration network, by AT+CEREG=5; +CEREG? You need to query the real value of</t3324></t3412>	
	>> OK >> AT+QCFG="dsevent",1 >> OK	//Disable the URC of Deepsleep	T3324,T3412/TAU provided by the network	

2-2	<pre>// Configure the APN based on the requirement of SIM card &gt;&gt; AT+QCGDEFCONT="IPV4V6","<apn>", "<username>", "<password>" &gt;&gt; OK</password></username></apn></pre>	If APN needs to be configured for the SIM card, please perform the command, others can be ignored
2-3	<pre>&gt;&gt; AT+CPIN? //check the SIM status &gt;&gt; +CPIN: READY &gt;&gt; &gt;&gt; OK</pre>	If return NO READY, indicates the check of SIM card is failed. You need to check the SIM card and hardware. So the program can be directly powered off, or go to the above 1-2, into the low power state
2-4	<pre>//Check the attribute values of the module &gt;&gt; ATI //Query module identification &gt;&gt; Quectel_Ltd &gt;&gt; xxxxxxx &gt;&gt; Revision: xxxxxxx &gt;&gt; &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+CGSN=1 //Query the IMEI &gt;&gt; +CGSN:<imei> &gt;&gt; &gt;&gt; OK //Other queries</imei></pre>	If the application design does not require this step, you can skip the step
2-5	>> <b>AT+CSCON=1</b> >> OK	If the application design does not require this step, you can skip the step
2-6	<pre>&gt;&gt; &gt;&gt; +CSCON:1 //Indicates that the RRC connection is complete //To query the following parameters, it is recommended to query after return + CSCON:1, or query after the registration network is completed &gt;&gt; AT+CIMI //Query the IMSI &gt;&gt; 460113061353533 &gt;&gt; &gt;&gt;  &gt;&gt;  &gt;&gt;  &gt;&gt; OK &gt;&gt; AT+NCCID //Query the CCID of SIM &gt;&gt; +NCCID:89861122223000411769 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QENG=0 //Query the information about the current camp on the cell &gt;&gt; +QENG: 0,3686,11,121,"05C4EF33",-75,-8,-65,14,8,"4C10",0,9,3 &gt;&gt;  &gt;&gt; OK</pre>	If the application design does not require this step, you can skip the step In the application design of the terminal, you can execute AT+QENG=0 to obtain the relevant network and signal reference, and to encode RSRP, SNR, CELLID, EARFCN and PCI and upload the data to the server. It will helps for troubleshoot problems.
2-7	<pre>// Query the network registration status &gt;&gt; AT+CEREG? //Query the network registration status &gt;&gt; +CEREG:0,2 &gt;&gt; &gt;&gt; OK //Periodic queries, such as 500ms intervals</pre>	

2-8	>> AT+CEREG? >> +CEREG:0,0 //+CEREG:0,2 >> >> OK		If the query only returns +CEREG:0,0 or +CEREG:0,2 within the search time (no less than 2 minutes); the program goes to 5-1
2-9	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,1 //+CEREG:0,5 (roaming) //the registered successfully &gt;&gt; &gt;&gt; OK</pre>	<pre>&gt;&gt; AT+CEREG? &gt;&gt; +CEREG:0,3 //the registration denied &gt;&gt; &gt;&gt; OK</pre>	If the program finally returns +CEREG:0,3 within the search time (e.g. 2 minutes); Restart or try again in the next cycle. If +CEREG:0,3 is still returned after multiple attempts, it is recommended to check the SIM card
2-10	<pre>&gt;&gt; AT+CGPADDR //Query the IP address obtained &gt;&gt; +CGPADDR: 0,"10.21.53.152","2409:8d30:0114:0242:17ab:01f8:98b0:032e" &gt;&gt; </pre>		
2-11	<pre>&gt;&gt; AT+CSQ //Query the CSQ &gt;&gt; +CSQ:xx,99 &gt;&gt; &gt;&gt; OK</pre>		CSQ=(RSSI+113)/2 CSQ corresponds to signal reference RSSI. In actual applications, it is recommended to run AT+QENG=0 to obtain RSRP and SNR
2-12	<pre>&gt;&gt; AT+CCLK? //Query the current date and time &gt;&gt; +CCLK: "24/01/16,08:55:19+32" &gt;&gt; &gt;&gt; OK</pre>		Time conversion: 24/01/16,08:55:19+32/4(h)= 2024/01/16,16:55:19 If the default time is returned, pls query the time for multiple times
3- Acces	<pre>ss the HTTP(s) server //Configure the parameters for HTTP &gt;&gt; AT+QHTTPCFG="contextid",0 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QHTTPCFG="requestheader",0 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QHTTPCFG="ssl",0,0 &gt;&gt; &gt;&gt; OK &gt;&gt; AT+QHTTPCFG="ssl",0,1 &gt;&gt;</pre>		In the actual development, please configure parameters according to your requirement
H3-2	<pre>&gt;&gt; UK //Set the SSL parameters for HTTPs &gt;&gt; AT+QSSLCFG=0,0,"sslversion",4 &gt;&gt; &gt;&gt; OK &gt;&gt; OK &gt;&gt; AT+QSSLCFG=0,0,"dtls",1 &gt;&gt;</pre>		In the actual development, please configure parameters according to your requirement

	, ,	
	>> OK	
	>> AT+QSSLCFG=0,0,"dtlsversion",2	
	»»	
	>> OK	
	>> AT+OSSLCEG=0.0."ciphersuite".0xFFFF	
	>> AI+QSSLCFG=0,0,"SNI",1	
	>>>	
	>> OK	
	//Connect to HTTPs and send a GET or POST service	
	>> AT+QIDNSCFG=0,"223.5.5.5","8.8.8.8" //Configure reliable DNS	
	»»	
	>> OK	
	>> AT+QHTTPURL=57,80	
	»»	
	>>>	
	>> https://ncu-receiver.fukuku.saico.dev/gas-meter/push/****	
	>> 0K	
	>> AitQniirGei-60	
	>>	
	>> UK	
	»»	
	>> +QHTTPGET: 0,200,99	In the actual development,
H3-3	>> AT+QHTTPPOST=146	please configure parameters
	»>	according to your application
	>>>	
	>> {"DATETIME":"20240528T143744Z","IMEI":"868020030003890","NCU_FW_VER":100,	
	"GAS_METER":1265035,"CSQ":29,"MCU_TEMP":28,"BAT_VOL":3665,"METER_TYPE":7}	
	>> ОК	
	»»	
	>> +QHTTPPOST: 0,200,139	
	>> AT+OHTTPREAD=139	
	>>	
	>> +ΟΗΤΤΡRΕΔD: 139.0	
	>> "@mm.tcAb. 155,0	
	MEASUREMENT" "vorcion":"1.1.2") "data":("massagald":"104082404774010072"))	
	MEASOREMENT, VEISION . 1.1.5 /, Udia .{ messageid . 194085404774019072 }}	
	>>	
	>> UK	
4- Featu	re of RAI	
Feature		
of RAI	1) After the data interaction is completed, you can run AT+QPING=0,"8.8.8.8",4,1,32,1	
	>> AT+QPING=0,"8.8.8.8",4,1,32,1 //QPING method with RAI Flag	
	>> OK	
	>>	
R4-1	>> +QPING: 0,8.8.8.8,32,729,51	RAI implementation method
	>>	
	>> +OPING: 0.1.1.0.729.729.729	

	>>		
	>> +CSCON:0 //If	+CSCON:0 is returned within 0-2s, RAI is effective	
	>> AT+QSCLK=1 //E	nable deepsleep mode	
	>> OK		
5- Enter	status PSM and Deepsleep		
5-1	>>		
	>> +QNBIOTEVENT: "ENTER PSM"	//Enter the PSM state	
	>>		
	>> +QNBIOTEVENT: "ENTER DEEPSLEEP"	//Enter the deepsleep state	
6- Exit	status of Deepsleep and PSM		
	//BC660K&BC950K support to w	ake up deepsleep by executing AT	
	command or pulling down PSM_	EINT pin	
	>>		
	>> +QNBIOTEVENT: "EXIT DEEPSLEEP"	//Exit the deepsleep state	
	//Recreate the HTTP connection		
	H3-1,H3-2,H3-3		
H6-1-1			Method to trigger PSM wake-
	>> +QNBIOTEVENT: "EXIT PSM"	//Exit the PSM state	up
	>>		
	>>+CSCON: 1 //Indicates that the KRC connection is established after the PSW is wakeup		
	>> +OHTTPPOST: 0 200 139 //The POST was established successfully		
	Go to 6-2 or goto T3-3 for sending data or goto L3-5 for receiving data		
	and the subsequent process		
	//If you want to obtain the accur	ate signal reference in the current scene	
	immediately after the PSM is wo	ked up, please refer to	
	//BC660K&BC950K support to wake up deepsleep by executing AT		
	command or pulling down PSM_EINT pin		
	>>		
	>> +QNBIOTEVENT: "EXIT DEEPSLEEP"	//Exit the deepsleep state	
	>> AT+QPING=0,"8.8.8.8",4,1,32	//Trigger PSM wake-up	
	>>		If the program or mou needs to
	>> OK		deal with other tasks, such as
	>>		collecting the base station cell
	>> +QNBIOTEVENT: "EXIT PSM"		signal after wake-up; It is
	>>		recommended to refer to this
16-1-2	>> +CSCON: 1 //Indicates that the RRC connection is established after the PSM is wakeup		method to trigger PSM wake-
	>>		up and obtain the network
	>> +QPING: 0,8.8.8.8,32,1284,51		signal after wake-up.
	>> +OPING: 0.1.1.0.1284.1284.1284		If no such requirement in the
	>> AT+OFNG=0		program, ignore the process
	>> +QENG: 0,3686,11,121."05C4EF33"7	75,-8,-65, <b>14</b> ,8,"4C10".0,9.3	
	>>	-, -,,- ,-, -, ,-,-,-	
	>> ОК		
	//Recreate the HTTP connection		
	H3-1,H3-2,H3-3		
	//It is recommended to report the data	of relevant signal reference over HTTP	
	"rsrp=-75,snr=14,cellid=05C4EF33,earfc	n=3686,pci=121"	

	Go to 6-2,or goto R4-1		
	//Manual TAU update	e	TAU update manually can avoid
6-2	>> AT+CPSMS=0		automatic update of TAU cycle
	>> OK		over time, so,non-service power
	>> AT+CPSMS=1,,,"01000010","00000000"		consumption can be reduced; If
	>> OK		no requirement in the
	Go to R4-1		application, ignore this step
7- Eras	e the historical fre	quency	
	//If 2-8 the registrati	on network is not successful within the set search	As described in 2-8, it is
	time(such as 2min), g	jo to	suggested that in the program
	>> AT+CFUN=0	//Erase the historical frequency based on CFUN0	design, after the first search
	>> OK		fails to time out, the frequency
	>> AT+QCSEARFCN	//Erase the historical frequency	clearing program must be
	>> OK		executed. After run, follow the
7-1	>> AT+QBAND=1,28		2-7 to check the search status
	//*Lock a specific frequency band. Note that it is not recommended for non-specific		again;
	situations		If the research fails to time out,
	>> OK		you are advised to reboot
	>> AT+QRST=1	//Reboot, and re-search	without clearing the frequency
	>> OK		again. Or wait for the next
	Follow 2-7 above		service cycle and try again.
8- Exce	ption handling or in	terruption	
			If the terminal has strict
			requirements on power
	1) The program or mcu	shall add the interrupt method of timeout or failure of leshan	consumption, it is
	platform registration, such as re-registration or reboot;		recommended that the
	2) The program or mcu	shall add the interrupt method of sending or receiving data	program reasonably control
	timeout or failure, such as reboot;		timeout.
8-1	3) The program or mcu	should add interrupt methods that cannot enter PSM normally or	If unable to enter PSM or wake
	cannot wake up PSM,	such as reboot;	up from PSM, it is
	4) In the case of exception	ons, when the program or mcu performs hardware reset or power-	recommended to compare the
	off directly, you need	to execute AT+CFUN=0 first, and return OK, then control	normal time to enter PSM or
	hardware reset or pov	wer-off; But software reset or reboot does not run AT+CFUN=0.	exit PSM. If the time exceeds,
			power off or reboot should can
			be operated