NE310H2 & NL865H2
Quick Start Guide

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TECHNICAL
DOCUMENTATION

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APPLICABILITY TABLE

PRODUCTS

- NE310H2-W1
- NL865H2-W1

CONTENTS

1. INTRODUCTION

1.1. Scope

Scope of this document is to give an overview and basic instructions of how to start using the NE310H2 and NL865H2 module.

1.2. Audience

This document is intended for customers who want to use and test the NE310H2 and NL865H2 products.

1.3. Contact Information, Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com

Alternatively, use:

http://www.telit.com/support

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

http://www.telit.com

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. Related Documents

- NE310H2-W1 HW Design Guide, 1VV0301608
- NL865H2-W1 HW Design Guide, 1VV0301616
- NE310H2 Interfaces User Guide, 1VV0301617
- NL865H2 Interfaces User Guide, 1VV0301629
- NE310H2 and NL865H2 AT Commands User Guide, 1VV0301611
- xL865 Global Form Factor Application Note, 80000NT11207A
- xE310 Global Form Factor Application Note, 80617NT11846A

2. GENERAL DESCRIPTION

2.1. Module Main Features

The NE310H2-W1 and NL865H2-W1 are the NBIoT evolution of the Telit Series of LTE modules based on the xE310 and xL865 form factor.

Specified in the approved Release 14 of the 3GPP standard, Cat NB2 devices are specifically tailored for IoT applications, offering optimized power consumption and enhanced coverage.

- NBIoT Category NB2 3GPP release 14 compliant
- Half Duplex FDD (see HW Design guide for details on supported bands)
- Single Rx, single antenna
- 3GPP Rel. 12 Power Saving Mode (PSM)
- 3GPP Rel. 13 Extended Discontinuous Reception (eDRX)
- Control via AT commands according to 3GPP TS27.005, 27.007 and customized AT commands
- SMS
- IPv4/IPv6 stack with TCP and UDP protocol
- Over-the-Air firmware update
- UDP, TCP, TLS, HTTP, HTTPS, FTP, COAP, MQTT, NIDD, LWM2M

TIP:

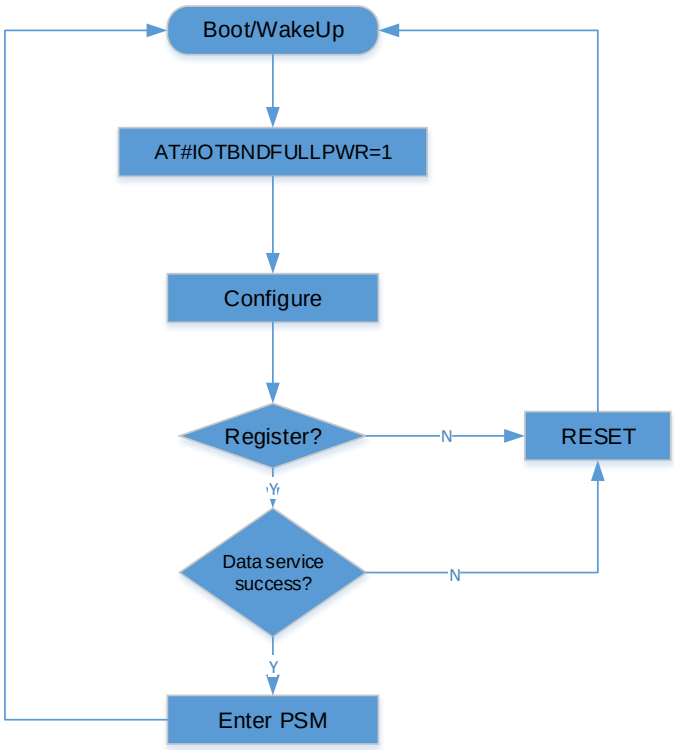
the IP address/port set in this document is just for test, when in product application, please instead with the proper value.

2.2. Communication Port

- NE310H2-W1 supports:
  - 3 UARTs (Main and secondary with flow control and Auxiliary with RX TX only)
  - USB for debug only.
- NL865H2-W1 supports:
  - 2 UARTs (Main with flow control and Auxiliary with RX TX only)
  - USB for debug only.

Product	UART Interface	Use
NE310H2-W1	UART0	Software Download AT Communication
	UART1	AT Communication
	AUX UART	Print Log
NL865H2-W1	UART0	Software Download AT Communication
	AUX UART	AT Communication

3. APPLICATION MAIN FLOW



TIP:
Configure step includes APN config / Band lock / Frequency lock / PSM config and so on.

NOTE:
As per default setting and as shown in the above diagram, the module after the Power ON will enter in Power Saving state if no activities are requested. In order to change this setting is possible to use the AT#TSLK=1 command after the startup.

4. NETWORK REGISTRATION

4.1. PDN Connection Setup

AT*MCGDEFCONT command, set the connection settings for PDN connection.

In NB-IOT, when the module attach to the NB-IOT network, after it power on, it performs a PDN connection setup. Thus, the PDN connection settings must be set and stored in the NVRAM preior to the attcach procudeure so it will be used by the module during the attach procedure.

The set parameters of this command will take effect after restart the module.

AT*MCGDEFCONT=<PDP_type>[,<APN>[,<username>[,<password>]]]

The standard +CGDCONT command, should be used to define PDP context.

4.1.1. Auto Dial

Once the module power on, it will establishPDN connection automatically. And will report +IP:xxx.xxx.xxx.xxx when PS connection established. As shown below:

*MATREADY: 1

+CFUN: 1

+CPIN: READY

+IP: 100.82.105.9

4.2. Fast Registration

In order to shorten the register process with the network the below commands may be used to narrow down the number of bands and frequancies to scan.

AT*MFRCLLCK - Lock UE to specific frequency and optionally Cell ID

This command is used to lock UE to specific frequency and optionally Cell ID.

It will take effect once setting, and will be invalid after restart the module

AT*MFRCLLCK=1,10,3,301 // Lock to EARFCN 10, offset 0, PCI 301

OK

AT*MFRCLLCK=0 //Remove lock

OK

AT*MBSC - Lock BAND

This command is used to lock a specific band, and it will take effect after restart the module

AT*MBSC=3,3,5,8 //lock three bands, that is band3,5,8

*MBSC: 0

OK

AT*MBANDSL - Set Modem NB-IOT Search Prefer Band List

This command is to define the search prefer list

AT*MBANDSL=1,1,2,3,5 // Enable and se the prefer list

OK

4.3. Signal strength and quality

If the mobile device is already registered on the network. The following AT commands can be used to query the received signal strength and quality, thus giving an indication of the reliability of the wireless link.

AT+CESQ
Assuming that the module is not connected to the antenna or the network cannot be covered at all, there are:

AT+CESQ

+ CESQ: 99,99,255,255,255,255 // In this case, the module cannot be connected to the network

OK

Now, the antenna is connected to the module and the network coverage reaches the current position. Execute the above AT command again:

AT+CESQ

+ CESQ: 17,99,255,255,26,87 // 17 is the received signal strength indicator

OK

4.4. Module registration network status query

Execute the following AT command to verify whether the module has been registered on the EPS network using E-UTRAN method:

AT+CEREG?

AT+CEREG? // Verify that the module is registered

+ CEREG: 0,1 // registered

OK

Now, suppose there is no signal (the module is not connected to the antenna) and execute this command again:

AT+CEREG?

+ CEREG: 0,3 // In this case, the module cannot be connected to the network

OK

AT+CEREG=2 // Enable EPS network registration and position information to report actively, the results are as follows:

+ CEREG: <stat> [, [<tac>], [<ci>], [<AcT>]]

4.5. Operator Information

Use the following AT command to return to the current mode, currently selected operator and current access technology:

AT+COPS?

E.g:

AT+COPS?

+ COPS: 0,0, "46011", 9

OK

Now, if there is no signal (the module is not connected to the antenna) and it is assumed that the detailed extended error return result has been enabled. Execute the above command again:

AT+COPS?

+ COPS: 0 // In this case, the module did not select an operator

OK

4.6. PPP dial

Configure Ubuntu Dialup Connection:

1) Send command AT#TSLK=1 before PPP dail.
2) Issue command “sudo gedit /etc/ppp/options”
3) Change crtscts to nocrtscts, comment modem, lcp-echo-interval, lcp-echo-failure

   #lcp-echo-interval

   #lcp-echo-failure

5. DNS SCRIPT

If the base station does not allocate DNS, then you need to configure the DNS server through the AT command EDNSSET. If the module is not configured with a DNS server, all services related to domain name resolution cannot be performed. EDNSSET can be configured with two IPV4 DNS servers and two IPV6 DNS servers.After EDNSSET configures DNS, it needs to re-register the network to take effect.The following demonstrates an example of setting up an ipv4 DNS server, then re-registering the network, and using the EDNS command to resolve the domain name.

Note:

You can use command AT+CGCONTRDP=1 to query whether the network allocates DNS.

```
AT+EDNSSET=0,0,"114.114.114.114"
OK

AT+CFUN=0
OK

AT+CFUN=1
OK

+CPIN: READY

+IP: 100.113.57.57

AT+EDNS="www.google.com
OK

+EDNS:31.13.83.1
```

6. TCP/UDP SCRIPT

An example of UDP communication over NB-IoT is reported below; in this scenario, The ESOC command is used to create a socket, you can use parameters to control whether it is UDP or TCP,ESOCON is used to establish a connection (UDP does not need to connect, here is only used to mark the address information of the communication peer, mainly for the consistency of AT commands),ESOSEND sends data, the data format is a hexadecimal string.+ESOMNI is used to report the received data(Hexadecimal string format).If you want to send data in the original format, you need to use ESODATAMODE to enter the data mode, you can use "+++" to exit the data mode to the command line mode, you must close the data channel after using ESODATAMODE. ESOCL closes the socket.

Note:

The interval between the three +++ should be less than 1s, and the interval between the first +and other inputs or the last + and other inputs should be greater than 1s.

6.1.1. Example for UDP

```
AT+ESOC=1,2,1                                   // Create UDP socket
+ESOC=0
OK
 AT+ESOCON=0,12345,"192.168.1.1"                // Open a session to a server
OK
AT+ESOSEND=0,8,4142434445464748,1               // Send 8 bytes to the server
OK
+ESONMI=0,8,4141424243434545                    // Get 8 bytes from the server
 AT+ESOCL=0                                     // Terminate the session with the server
OK
```

6.1.2. Example for TCP

```
AT+CGPADDR=0                                    // Read IP address

AT+ESOC=1,1,1                                   // Create TCP socket

+ESOC=0

OK

 AT+ESOCON=0,12345,"192.168.1.1"                // Open a session to a server

OK

AT+ESOSEND=0,8,4142434445464748,1               // Send 8 bytes to the server

OK

+ESONMI=0,8,4141424243434545                    // Get 8 bytes from the server

 AT+ESOCL=0                                     // Terminate the session with the server

OK
```

7. FTP/FTPS SCRIPT

An example of FTP/FTPS communication over NB-IoT is reported below; in this scenario, FTPOPEN is used to connect to the server. NB-IOT may be slow to connect to the FTPS server and it may take a few seconds.FTPPUTCON is used to establish a data channel connection with the server to provide services for uploading files.The FTPPUTDATA parameter indicates whether it is the last packet to upload data.

AT+FTPOPEN="192.168.1.1",21,"test","test",1,0,61000

OK

+FTPOPEN: OPEN SUCCESS

AT+FTPSIZE=/,testwu1.txt

+FTPSIZE: 34

OK

AT+FTPPUTCON=/,testwu1.txt

OK

+FTPPUTCON: SUCCESS

AT+FTPPUTDATA=0

CONNECT

NO CARRIER

AT+FTPPUTDATA=1

CONNECT

NO CARRIER

+FTPPUTDATA: END SUCCESS

AT+FTPGET=/,testwu1.txt,0,512

OK

+FTPGET:512,Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()123

Hello!testTE

+FTPGET:488,ST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()Hello!testTEST123567890!@#$%^&*()123

+FTPGET: END

AT+FTPCLOSE

OK

8. NIDD SCRIPT

AT+NIDD=0,PDN,user,password // Create NIDD account

+NIDD=0,Account_ID

OK

AT+NIDD=1,Accunt_ID // Create NIDD Sockett

+NIDD=1,NIDD_ID

OK

AT+NIDD=2,NIDD_ID // Set NIDD socket

OK

AT+NIDD=3,NIDD_ID,”3132333435 // Send data to the server

OK

+NIDD=4,NIDD_ID,”3637383941” // Reciev data from the server

9. PSM AND EDRX

9.1. PSM overview

Power Saving mode is a feature designed, in 3GPP Rel 12, for the IoT devices, in order to save battery consumption and therefore potentially achieve 10 years of battery life.

In the period of the time before the PSM, devices was turned off in order to conserve the battery power. Consequently, every power on of the device, an attach procedure to the network was performed. The acomulative energy consumption during a life time of a device can be significant and this can be avoided by using the PSM.

The PSM cycle actually stops the paging in front of the network and defines the interval between periodic Tracking Area Update (TAU) message. During the PSM time the device can't receive any MT message (Data/SMS) from the network side.
This will decrease the battery consumption due to the decreasing of the device <-> network messaging.
During the PSM time, the IoT device will enter a low power mode, and will save battery consumption by not sending network messages.

Two types of Timers can be requested by the device to the network:

1. T3324 Active Time
   This timer defines the time the IoT device stays in active/idle mode, following a TAU procedure OR data transmition. During this time, the device still performs paging with the network. Once the timer is expired the device will switch to PSM mode.
2. T3412 TAU time
   This time defines the interval between two periodic Tracking Area Updates. Actually this timer can be set even if the PSM is disable.

NOTE:
User can request the two timers value, but the network decides the final vlaue.

9.2. PSM script

Module supports 3GPP command AT+CPSMS and custom Telit command AT#CPSMS that simplifies and improve PSM management.

AT+CPSMS=[<mode>[,<Requested_Periodic-RAU>[,<Requested_GPRS-READY-timer>[,<Requested_Periodic-TAU>[,<Requested_Active-Time>]]]]]

The set command controls the setting of the UEs power saving mode (PSM) parameters. The command controls whether the UE wants to apply PSM or not, as well as the requested extended periodic RAU value and the requested GPRS READY timer value in GERAN, the requested extended periodic TAU value in E-UTRAN and the requested Active Time value. Find the relevant parameters below.

<mode>

0	Disable PSM
1	Enable PSM
2	Disable PSM and all the previous parameters set shall be removed to restore them to default values. (The parameter is not supported for the moment)

<Requested_Periodic-RAU>string type; 8-bit single byte. Request setting RAU cycle (T3412) unde GERAN/UTRAN network.

<Requested_GPRS-READY-timer>: string type; 8-bit single byte. Request setting GPRS READY cycle (T3324) under GERAN/UTRAN network.

<Requested_Periodic-TAU>: string type; 8-bit single byte. Request setting RAU cycle (T3412) under LTE network.

<Requested_Active-Time>: string format, 8 bytes. Request the Active Time value T3324 of the module. The default value is 20 seconds, that is, the module goes into dormant state 20s after reporting TAU to network by default.

AT+CPSMS?

Read command presents the current CPSMS configuration returned by the network, in the format:

+CPSMS: <mode>,[<Requested_Periodic-RAU>],[<Requested_GPRS-READY-timer>],[<Requested_Periodic-TAU>],[<Requested_Active-Time>]

Here below a simple script shows the AT+CPSMS functionalities.

AT+CPSMS? // PSM feature is OFF

+CPSMS: 0

OK

AT+CPSMS=1,,, "00011000","00001010" // Enable PSM feature: T3412=4Hs, T3324=20s

OK

A TAU (Tracking Area Update) is triggered, timer negotiation with the network starts; the procedure is fast, unsolicited are disabled we suggest to wait about 2s before proceeding with the next step

AT+CPSMS=1,,, "00011000","00001010" // It goes into dormant state 20s after reporting TAU to network every 4 hours in LTE network.

OK

Timers T3412 and T3324 start when module move from CONNECTED state to IDLE state (RRC Connection Release).

TIMERS START POINT (RRC Connection release)

20s

Active Time T3324 EXPIRE

The module enters automatically in PSM sleep (module turns off)

E.g. let's assume that at a certain point in time the user wants to use the module to send data; it is possible even if the module is in PSM; the user can wake module up with WAKE pin (see turn on procedure defined in HW user guide)

+CPIN: READY

The module is just turned on and it does not interact with the network, the T3412 timer is still running from TIMERS START POINT

AT+ESOC=1,2,1

+ESOC=0

OK

AT+ESOCON=0,7000,"219.144.130.27"

OK

AT+ESOSEND=0,10,30313233343536373839

OK

AT+ESOCL=0

OK

New TIMERS START POINT: the module was in CONNECTED state, after RRC Connection Release from the network it moves to IDLE state, this reset the two timers

TIMERS START POINT (RRC Connection release)

20s

Active Time T3324 EXPIRE

The module enters automatically in PSM sleep (module turns off)

4Hs (T3412-T3324)

Tracking Area Update period T3412 EXPIRE

The module exits automatically from PSM sleep (module turns on); Tracking Area Update is triggered

+CPIN: READY

9.3. eDRX overview

eDRX is the extended of the DRX feature, designed in 3GPP Rel 13, for IoT devices in order to reduce power consumption and increase battery life.

eDRX allows to increase the time, in which the IoT device is not listening to the network. The device can configure the eDRX cycle (TeDRX) and every cycle can be configured with the Paging Transmition Window time (Tptw).

When TeDRX expires, it is restarted and Tptw is started. When Tptw expires, the device stops monitoring paging occasions.

NOTE:

This eDRX feature can be used with or without the PSM feature.

With eDRX the device can be reachable but still keep low power consumption.

The user can request the two timers value, but in the end, the network makes the decision.

9.4. eDRX script

Module supports 3GPP commands AT+CEDRXS, AT+CEDRXRDP and custom Telit command AT#CEDRXS that simplifies and improve eDRX management.

AT+CEDRXS=[<mode>,[,<AcT-type>[,<Requested_eDRX_value>]]]

Set command controls the setting of the UEs eDRX parameters. The command controls whether the UE wants to apply eDRX or not, as well as the requested eDRX value for each specified type of access technology. Find the relevant parameters below.

<mode>integer data to enable/disable eDRX. This parameter can be applied to all the specified types of access technology,

0 Disable EDRX

1 Enable eDRX

2 Enable eDRX and enable active submission in the following formats:
+CEDRXP:<AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]

3 Disable eDRX and all the previous parameters set shall be removed to restore them to default values.

<AcT-type>: integer data, access technology type

0 Access technology without using eDRX. The parameter is only used to actively report result codes.

5 E-UTRAN (NB-S1 mode)

<Requested_eDRX_value > : half a byte in a 4 bit format. The eDRX value refers to bit-4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008). For the coding and the value range, see Extended DRX parameters information element in 3GPP TS 24.008, Table 10.5.5.32/3GPP TS 24.008. Default value is "0000".

AT+CEDRXS?

Read command returns the current settings for each defined value of <AcTtype> in the format:

+CEDRXS: <AcT-type>,<Requested_eDRX_value>

Here below a simple script shows the AT+CEDRXS functionalities. The test is performed using a network simulator but the same can be applied on live network.

AT+CEDRXS=1,5,"1101"

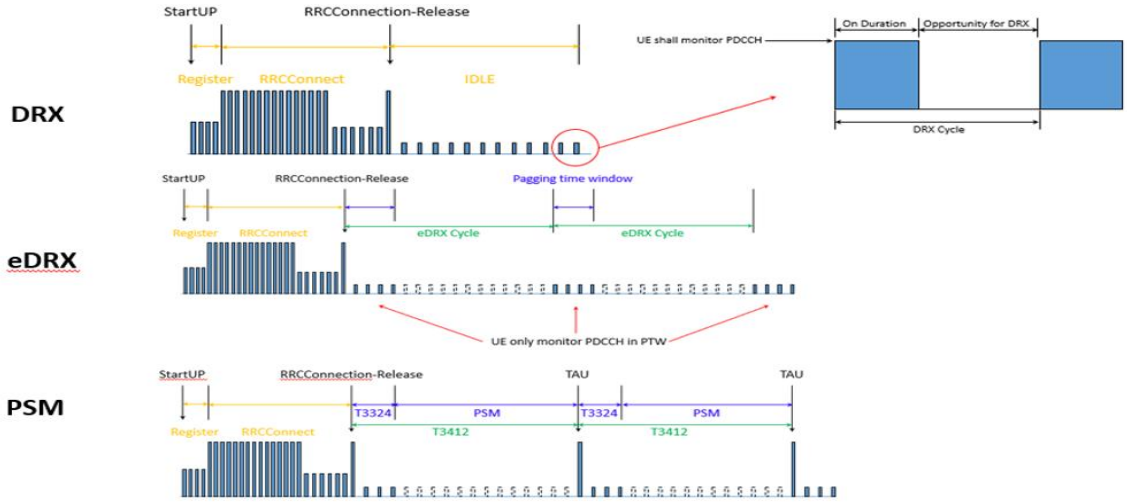
OK

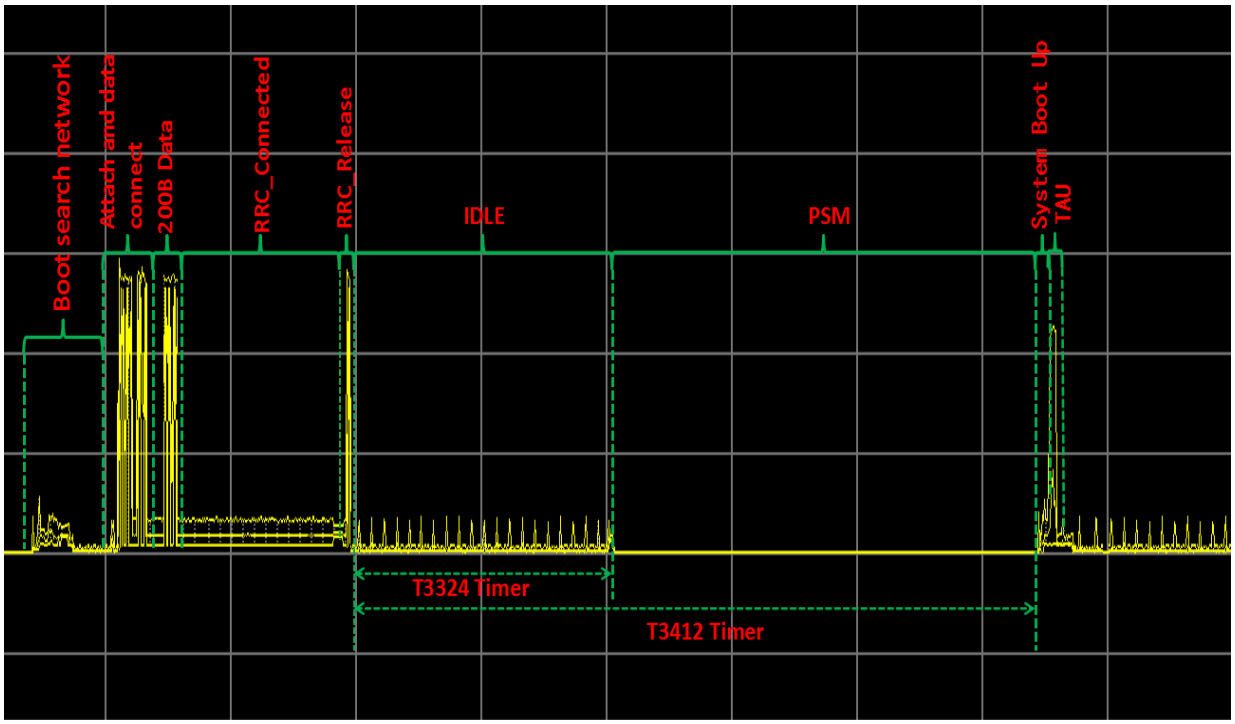
AT+CEDRXS?

+CEDRXS: 5,"1101"

OK

9.5. PSM/eDRX Graphs





10. MQTT

MQTT stands for Message Queue Telemetry Transport, It is a publish/subscribe, extremely simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency or unreliable networks. And port 1883 is reserved for MQTT, port 8883 is also reserved for using MQTT over SSL.

```
AT+EMQNEW="192.168.1.1","1883",50000,100        ------- create an MQTT instance
+EMQNEW: 0                                      ------- mqtt instance id

OK

AT+EMQCON=0,4,"myclientid",1000,1,0,"test","123456"   ------- connect the server
OK

AT+EMQSUB=0,"topic",1                           ------- send SUBSCRIBE packet to server
OK

AT+EMQPUB=0,"topic",1,0,0,4,"31323334"          ------- send PUBLISH packet to server
OK

+EMQPUB:0,"topic",1,0,0,4,"31323334"            ------- reoprt  packet received from server

AT+EMQUNSUB=0,"topic"                           ------- send UNSUBSCRIBE packet to server
OK

AT+EMQDISCON=0                                  ------- send DISCONNECT packet to server
OK
```

11. FTP FOTA

An example of FTP FOTA communication over NB-IoT is reported below; in this scenario, FTPOPEN is used to connect to the server. FTPGETOTA is used to download the FTP FOTA package. FTPCLOSE is used to close the link of FTP FOTA. OTAUP is used to reset the module to upgrade the firmware.

AT+CGMR

M0J.00010-B001

OK

AT+FTPOPEN=ftp.test.com,21,username,password,1,0

OK

+FTPOPEN: OPEN SUCCESS

AT+FTPGETOTA=/tlttest,updateB.zip

OK

+FOTADL: 100%

FOTA DOWNLOADED

AT+FTPCLOSE

OK

AT+OTAUP

OK

FOTA UPDATING

F1: 0000 0000

V0: 0000 0000 [0001]

00: 0006 000C

01: 0000 0000

U0: 0000 0001 [0000]

T0: 0000 00B4

Leaving the BROM

*MATREADY: 1

+CFUN: 1
FOTA SUCCESS
+CPIN: READY

+IP: 100.82.105.9
AT+CGMR

M0J.00010-B002
OK

12. LWM2M

First of all, The user need to connect to LwM2M server. The module supports there ways to connect to LwM2M server.
The first way is to use bootstarp mode based on DTLS. The bootstrap mode requires the help of a LwM2M Bootstrap-Server to achieve the ultimate goal to connect a LwM2M Server. In the bootstarp mode, the module require credentials information for securely communicate with LwM2M Servers .
The following is the usage of AT cmd.

```
AT+ELMREG=1,"54.209.23.144","5683","BS868613030014677",300
+ELMREG=0

OK

+ELMEVT:connect success

+ELMEVT:bootstraping

+ELMEVT:lifetime changed,value:21600

+ELMEVT:bootstrap success

+ELMEVT:connect success

+ELMEVT:registering

+ELMEVT:register success
```

The second way is to use registeration mode based on DTLS. In this mode, the module require credentials information for securely communicate with LwM2M Servers .

The following is the usage of AT cmd.

```
AT+ELMREG=0,"192.168.1.1","5684","PSK8686130300111111",300,"868613030011111","3132344446"
+ELMREG=0

OK

+ELMEVT:connect success

+ELMEVT:registering

+ELMEVT:register success
```

The third way is to use registeration mode without DTLS. This mode is insecure.

The following is the usage of AT cmd.

```
AT+ELMREG=0,"192.168.1.1","5683","T868613030014444",300
+ELMREG=0

OK

+ELMEVT:connect success

+ELMEVT:registering

+ELMEVT:register success
```

After connecting to LwM2M server successfully, The user can add or delete Object using “AT+ELMADDOBJ” or “AT+ELMDELOBJ”.

The following is the usage of AT cmd.

```
AT+ELMADDOBJ=0,3200,0
OK

+ELMEVT:update success

AT+ELMDELOBJ=0,3200
OK

+ELMEVT:update success
```

The user also can update lifetime using “AT+ELMUPDATE”.

The following is the usage of AT cmd.

```
AT+ELMUPDATE=0,200
OK

+ELMEVT:set success
```

After connecting to LwM2M server successfully, the LwM2M server will send device management request to module including Read, Write or Excute. and the module will report request information using “+ELMREAD” , “+ELMWRITE” or “+ELMEXECUTE”.after receiving the report information , the user need to use “AT+ELMREADRSP”,“AT+ELMWRITERSP” or “AT+ELMEXECUTERSP” to send reponse infomation to LwM2M server.

The following is the usage of AT cmd.

```
+ELMREAD:0,3200,0,1,5501
AT+ELMREADRSP=0,3200,0,1,5501,I,2,33
```

OK

+ELMWRITE: 0, 5, 2, 1,1,S, 5, “ABCDE”

AT+ELMWRITERSP=0,0

OK

+ELMEXECUTE:0,3303,0,5605

AT+ELMEXECUTERSP=0,0

OK

If LwM2M server is interested in some objects, the server will send observe request to module and the module will report observe request information using “+ELMOBSERVE”.Then the user should send response information using “AT+ELMOBSERVERSP”.

After the Observation is successfully, the user can report information about object to LwM2M server using “AT+ELMSEND”.

The following is the usage of AT cmd.

+ELMOBSERVEREQ:0,3200,0,1,5501

AT+ELMOBSERVERSP=0,0,3200,0,1,5501,I,1,0

OK

AT+ELMSEND=0,1,3200,0,5501,I,2,33

OK

+ELMEVT:send success

+ELMEVT:send confirm success

The user can use “AT+ELMDEREG” to disconnect from LwM2M server.If the module has registered with LwM2M server successfuly. The module will report “+ELMEVT:deregister success” and “+ELMEVT:clean complete”. if the module has not finished registeration with LwM2M server.The module only reports “+ELMEVT:clean complete”.

The following is the usage of AT cmd.

AT+ELMDEREG=0

OK

+ELMEVT:deregister success

+ELMEVT:clean complete

13. TLS

TLS can be used on top of a transport-layer security protocol like TCP. There are three main components to TLS: Encryption, Authentication, and Integrity.

1. Encryption: hides the data being transferred from third parties.

2. Authentication: ensures that the parties exchanging information are who they claim to be.

3. Integrity: verifies that the data has not been forged or tampered with.

```
AT+TLSCFG="host_name",localhost                  ---config hostname
OK

AT+TLSCFG="auth_mode",2                          --- config auth_mode
OK

AT+TLSCFG="handshake_timeout",60000   -          ---config handshake_timeout
OK

AT+TLSCFG="view_mode",1                          --- config view mode
OK

AT+TLSCFG="CA_CERT",1326                         --- config CA certification

CONNECT
receive 350 data
receive 350 data
receive 350 data
receive 276 data

NO CARRIER
AT+TLSCFG="CLI_CERT",1330                        --- config client certification

CONNECT
receive 350 data
receive 350 data
receive 350 data
receive 280 data

NO CARRIER

AT+TLSCFG="CLI_KEY",1700                         --- config client key

CONNECT
```

receive 350 data
receive 350 data
receive 350 data
receive 350 data
receive 300 data

NO CARRIER
AT+TLSOPEN=192.168.1.1,8557 --- connect tls server
+TLSSTAT:1

OK

AT+TLSSEND=74656c69745f73656e645f636d645f74657374
+TLSSEND: 19 --- send Hexadecimal string

OK

+TLSRECV: 28,telit_send_cmd_test --- receive data from server

AT+TLSSENDRAW=31,60 --- send raw data
CONNECT --- enter data mode
receive 31 data --- data mode reveive 31 data

NO CARRIER --- exit data mode

+TLSSEND:31 --- send raw data
OK
+TLSRECV: 31,telit_sendraw_cmd_test --- receive data from server

AT+TLSSTAT --- get tls state
+TLSSTAT:1

OK

AT+TLSCLOSE --- close tls
+TLSSTAT:0

OK

14. HTTP

The Hypertext Transfer Protocol (HTTP) is an application-level protocol for distributed, collaborative, hypermedia information systems. It is a generic, stateless protocol which can be used for many tasks beyond its use for hypertext, such as name servers and distributed object management systems, through extension of its request methods, error codes and headers.

AT+EHTTPCREATE=0,41,41,""http://192.168.1.1:61613/",,,0,,0,,0," // create a HTTP client

+EHTTPCREAT:0 // 0: client id

OK

AT+EHTTPCON=0 // connect the server

OK

AT+EHTTPSEND=0,27,27,"0,0,9,"/Test.txt",0,,0,,0,," // get the file with path /Test.txt

OK

+EHTTPNMIH:0,404,157,Server: nginx/1.12.2 // report the header part of response

Date: Thu, 20 Dec 2018 09:14:27 GMT

Content-Type: application/json;charset=UTF-8

Transfer-Encoding: chunked

Connection: keep-alive

+EHTTPNMIC:0,0,129,258,7b2274696d657374616d70223a22323031382d31322d32305430393a31343a323
72e3338302b30303030222c22737461747573223a3430342c226572726f72223a224e6f7420466f756e64222c
226d657373616765223a224e6f206d6573736167652061661696c61626c65222c2270617468223a222f54657
3742e747874227d

// reprot the content part of response

AT+EHTTPSEND=0,113,113,"0,1,9,"/postjson",0,,16,"application/json",66,7b2274657374223a313233343536
2c226d657373616765223a313333323432347d," //Send HTTP-post request

OK

+EHTTPNMIH:0,200,157,Server: nginx/1.12.2

Date: Thu, 20 Dec 2018 09:14:41 GMT

Content-Type: application/json;charset=UTF-8

Transfer-Encoding: chunked

Connection: keep-alive

+EHTTPNMIC:0,0,33,66,7b2274657374223a3132333435362c226d657373616765223a313333323432347d

AT+EHTTPSEND=0,77,77,"0,2,4,"/put",0,,33,"application/x-www-form-
urlencoded",18,746573743d74657374," //Send HTTP-put request

OK

+EHTTPNMIH:0,200,143,Server: nginx/1.12.2
Date: Thu, 20 Dec 2018 09:14:57 GMT
Content-Type: text/plain;charset=UTF-8
Content-Length: 14
Connection: keep-alive

AT+EHTTPDISCON=0 //Disconnect HTTP
OK
AT+EHTTPDESTROY=0 //Destroy the http client instance
OK

15. GLOSSARY AND ACRONYMS

	Description
TTSC	Telit Technical Support Centre
USB	Universal Serial Bus
HS	High Speed
DTE	Data Terminal Equipment
UMTS	Universal Mobile Telecommunication System
WCDMA	Wideband Code Division Multiple Access
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
UART	Universal Asynchronous Receiver Transmitter
HSIC	High Speed Inter Chip
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
ADC	Analog – Digital Converter
DAC	Digital – Analog Converter
I/O	Input Output
GPIO	General Purpose Input Output
CMOS	Complementary Metal – Oxide Semiconductor
MOSI	Master Output – Slave Input
MISO	Master Input – Slave Output
CLK	Clock
MRDY	Master Ready
SRDY	Slave Ready
CS	Chip Select
RTC	Real Time Clock
PCB	Printed Circuit Board
ESR	Equivalent Series Resistance
VSWR	Voltage Standing Wave Radio
VNA	Vector Network Analyzer

16. DOCUMENT HISTORY

Revision	Date	Changes
0	2020-08-12	First issue
1	2020-09-03	Updated examples

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Link to **www.telit.com** and contact our technical support team for any questions related to technical issues.

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