



NB-IoT message protocol

Dual Inventive CRM3000

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About this document

HISTORY

Revision	Date	Author	Description
1.0.0	Jan 09 th 2019	Winer Bao	Initial
1.0.1	Jan 16 th 2019	Winer Bao	Time delta subtype
1.0.2	Jan 18 th 2019	Winer Bao	Alert and Serial number + Firmware version subtype
1.0.3	Apr 2 nd 2019	Winer Bao	Add IMEI number to every message.
1.0.4	May 20 th 2019	Winer Bao	Add payload examples. Append Alert subtype content description.

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1. Introduction

This document specifies the protocol used to send the log message. The device uses the NB-IoT network to send packets, each up to 512 bytes of data, to the server. To properly extract the data out of the log message, the server must follow the protocol described in this document.

2. Log message format

The device, called node hereinafter, sends out log messages at an user-definable interval. The log message might include information such as battery level of the node, external temperature, internal temperature, accelerometer data and capacitive touch. All log messages contain a timestamp and modem statistics. Each sample iteration is preceded by a delta time or full time subtype.

Contact the node manufacturer for the protocol version and device type information. All messages contain the IMEI number indicated by the subtype 0x13.

Table 1: Log message format and content

Response message format				
Protocol version [1 byte]	Device type [2 bytes]	0x0001 [2 bytes]	Subtype [1 byte]	Content [506 bytes]
Message type		Subtype	Content	
Battery voltage in mV		0x00	[2 bytes]	
External temperature in m°C		0x01	[4 bytes]	
Internal temperature in m°C		0x02	[4 bytes]	
Accelerometer X-, Y-, Z-axis		0x03	[1 byte] X-axis [1 byte] Y-axis [1 byte] Z-axis	
Capacitive touch		0x04	[2 bytes]	
Modem statistics in binary format		0x06	[2 bytes] Signal power [2 bytes] Total power [2 bytes] TX power [4 bytes] TX time [4 bytes] RX time [4 bytes] Celltower ID [1 byte] ECL [2 bytes] SNR [2 bytes] EARFCN [2 bytes] PCI [2 bytes] RSRQ	
Timestamp in seconds		0x0B	[4 bytes] Time relative to 1 Jan 1970 00:00AM	
Time delta in seconds		0x0C	[2 bytes] Time difference between last sample and current sample	
Alert		0x0D	[2 byte] Alerts summation [2 bytes] Alert change mask Used during Alfex production test.	
Serial – and firmware version number		0x0E	[2 bytes] Product number [4 bytes] Serial number [1 byte] Firmware version major [1 byte] Firmware version minor [1 byte] Firmware version revision [1 byte] Firmware version beta	

IMEI number	0x13	[8 bytes] Modem IMEI number 64 bit unsigned integer
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3. Payload examples

To better understand how a uplink payload is constructed several examples are given in this chapter. The payload must be read byte by byte from left to right. Please refer to the protocol described in chapter 2 for the size of each subtype content. The subtype order and content values are for illustrative purposes and may vary from your payload. These payload examples are valid and may be used during the software development.

Table 2: first uplink payload on power-on example

Payload	
01000100010b5ce265771300031530be93895906fc1cfc5d00c8000004a20000fb540195456600006e189201f0ff940e04580000006a010100010c00000d200220000c00030400c0000e7e0100006cde0200005bcc03c1110c	
Parsed data	
PROTOCOL_VERSION	01
DEVICE_TYPE	0001
MESSAGE_TYPE	0001
SUBTYPE_FULLTIME	0b
FULLTIME_CONTENT	5ce26577
SUBTYPE_IMEI	13
IMEI_CONTENT	00031530be938959
SUBTYPE_MDMSTAT	06
MDMSTAT_CONTENT	fc1c fc5d 00c8 000004a2 0000fb54 01954566 00 006e1892 01f0 ff94
SUBTYPE_SERIALFIRMWARE	0e
SERIALFIRMWARE_CONTENT	0458 0000006a 01 01 00 01
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	0000
SUBTYPE_ALERT	0d
ALERT_CONTENT	2002 2000
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	0003
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c0
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e7e
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006cde
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	00005bcc
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	c1 11 0c

Table 3: uplink payload example

Payload	
01000100010b5cdd31221300031530be93895906fc1cfc6100c8000003a60000fa9b0195456600005a189201f0ff910c011c0400c2000e7e0100006ea102000058de03e1f6c50c012c0400c2000e830100006e4402000057e403e0f5c60c012c0400c2000e7b0100006dc702000057e403e0f5c60c012c0400c2000e7d0100006e8702000058de03e2f2c60c012c0400c2000e7f0100006e8402000058de03e1f3c60c012c0400c2000e770100006e1302000058de03e1f3c50c012c0400c2000e860100006e5902000058de03e1f3c60c012c0400c2000e770100006e5902000058de03e1f3c60c012c0400c2000e88010006f1f02000059d803e2f0c70c012c0400c2000e770100006f1602000059d803e2f0c60c012c0400c2000e820100006e1b02000058de03e2f0c70c012c0400c2000e7e0100006df002000057e403e2f0c6	
Parsed data	
PROTOCOL_VERSION	01
DEVICE_TYPE	0001
MESSAGE_TYPE	0001
SUBTYPE_FULLTIME	0b
FULLTIME_CONTENT	5cdd3122
SUBTYPE_IMEI	13
IMEI_CONTENT	00031530be938959
SUBTYPE_MDMSTAT	06
MDMSTAT_CONTENT	fc1c fc61 00c8 000003a6 0000fa9b 01954566 00 005a 1892 01f0 ff91
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	011c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e7e
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006ea1
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000058de
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e1 f6 c5
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e83
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006e44
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000057e4
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e0 f5 c6

SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e7b
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006dc7
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000057e4
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e0 f5 c6
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e7d
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006e87
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000058de
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e2 f2 c6
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e7f
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006e84
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000058de
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e1 f3 c6
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	011c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e77
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006e13
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000058de
SUBTYPE_ACCELERO	03

ACCELERO_CONTENT	e1 f3 c5
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e86
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006e59
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000058de
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e1 f3 c6
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e77
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006e59
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000058de
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e1 f3 c6
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e88
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006f1f
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000059d8
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e2 f0 c7
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e77
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006f16
SUBTYPE_INTERNALTEMP	02

INTERNALTEMP_CONTENT	000059d8
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e2 f0 c6
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e82
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006e1b
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000058de
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e2 f0 c7
SUBTYPE_DELTATIME	0c
DELTATIME_CONTENT	012c
SUBTYPE_CAPTOUCH	04
CAPTOUCH_CONTENT	00c2
SUBTYPE_BATTERYVOLT	00
BATTERYVOLT_CONTENT	0e7e
SUBTYPE_EXTERNALTEMP	01
EXTERNALTEMP_CONTENT	00006df0
SUBTYPE_INTERNALTEMP	02
INTERNALTEMP_CONTENT	000057e4
SUBTYPE_ACCELERO	03
ACCELERO_CONTENT	e2 f0 c6