

NetOP Technology

LPWAN Sensors

Configuration Protocol Definition

v1.1

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Document History

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1.0	30/07/2018	Initial document	GA
1.1	04/03/2019	Added new configs and permission table	BB



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HOW TO DECODE YOUR DATA

Communication between server and device for configuration is based on a protocol determined by NetOP. There are some minor differences between device-server and server-device communications. These will be explained in next chapters.

1) Data Frame

Server and device can send commands in specific data format and rules to each other. These commands can be used to get available configurations, post new configurations, delete available configurations and response back. Table 1 gives the data frame format.

Table 1: Data Frame

1-byte								4	2	1	1	n	1	1	n					1	1	n	1	
7	6	5	4	3	2	1	0	byte	byte	byte	byte	byte	byte	byte	byte	byte					byte	byte	byte	byte
Protocol Header								Serial Number	Total Byte Length	Configuration Block 1			Configuration Block 2			...				Configuration Block n			Checksum Byte	
Config Bit	Reserved			Reserve bit	Version					Block Length & type	Parameter 1	Value	Block Length & type	Parameter 2	Value	Block Length & type	Parameter n	Value						
1	X			X	0 - 7																			

2) Protocol Header

The header is used to indicate that the data is a configuration message, to determine command types and define protocol version. The definition of each one is given in table 2.

Table 2: Protocol header bits and definitions

Config Bit	If bit value is '1', it means that incoming message is for configuration.
Reserve bit	It is reserved for future use.
Version	It determines version number of configuration protocol.

3) Serial Number

Serial number of device. Use 0xFFFFFFFF if it's not known or for broadcast purposes.

Serial Number	It consists of 4-bytes unsigned integer. It is a unique number belong to each device.
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4) Total Byte Length

It is the number of bytes after itself (including configuration blocks, excluding checksum).

5) Configuration Block

Each block consists of 3 parameters. Definitions of them are given in table 3.

Table 3: Configuration block bytes and definitions

Block Length& type	It gives information about total byte length of parameter and new value of related data block. Most significant 2 bits represents the type. 0:get 1: post 2: delete 3:response Least significant 6 bits represents the length. The length is maximum 64 bytes.
Parameter	It is 1-byte unsigned integer that is used to define parameter type. The table 4 gives all parameter list.
Value	It is only used with post command. It indicates new value of related parameter. It's also used when device send a response block.

Parameter list is given in table 4.

Table 4: Parameter List

No	Command Types	Data Length	Sensor Types
0x00	Clear EEPROM (Usage with POST of this parameter will clear the EEPROM content)	1	GENERAL PARAMETERS
0x01	Restart Device (Usage with POST will restart the device)	1	
0x02	Device State (shows the state of device)	1	
0x03	Serial Number (serial number of the DEVICE)	4	
0x04	Alive Message Period (in seconds)	4	
0x05	Hardware Version	2	
0x06	Software Version	2	

0x07	Number of Slots (number of total slots. Can be used to determine slot configuration numbers)	1	
0x08	Plugged Slots (shows plugged sensors. One bit for each slot.)	1	
0x09	Connectivity Firmware Version (ASCII)	X	
0x0A	Connectivity Module Name (ASCII)	X	
0x0B	Parameter List Version (shows the version of this list.)	1	
0x0C	LED Indication on transmission on/off (boolean)	1	
0x0D	Current UTC timestamp	4	
0x0E	Battery Level (battery level as percentage)	1	
0x0F	Enable Log Transmit (boolean)	1	
0x20	Serial Number of sensor board that plugged to this slot	4	
0x21	Sensor Function (same as protocol document)	2	
0x22	Sensor Board Type (same as protocol document)	1	
0x23	Read Period (in seconds)	4	
0x24	Transmit Period (in seconds)	4	
0x25	Timestamp on/off (enable / disable read timestamp. Boolean)	1	
0x26	Hardware Version	2	
0x27	Software Version	2	
0x28	External Trigger Sensor (shows what sensor will be triggered via this slot. One bit for each slot.)	1	
0x29	Sensor Specific Memory (not functional for now.)	32	
0x30	Serial Number of sensor board that plugged to this slot	4	SLOT 2 - SENSOR
0x31	Sensor Function	2	
0x32	Sensor Board Type	1	
0x33	Read Period	4	
0x34	Transmit Period	4	
0x35	Timestamp on/off	1	
0x36	Hardware Version	2	
0x37	Software Version	2	
0x38	External Trigger Sensor	1	
0x39	Sensor Specific Memory (not functional for now.)	32	
0x40	Serial Number of sensor board that plugged to this slot	4	SLOT 3 - SENSOR
0x41	Sensor Function	2	
0x42	Sensor Board Type	1	
0x43	Read Period	4	
0x44	Transmit Period	4	
0x45	Timestamp on/off	1	

0x46	Hardware Version	2	SLOT 4 - SENSOR
0x47	Software Version	2	
0x48	External Trigger Sensor	1	
0x49	Sensor Specific Memory (not functional for now.)	32	
0x50	Serial Number of sensor board that plugged to this slot	4	
0x51	Sensor Function	2	
0x52	Sensor Board Type	1	
0x53	Read Period	4	
0x54	Transmit Period	4	
0x55	Timestamp on/off	1	
0x56	Hardware Version	2	
0x57	Software Version	2	
0x58	External Trigger Sensor	1	
0x59	Sensor Specific Memory (not functional for now.)	32	

NB-IoT Settings		
No	Parameters	Data Length
0xC0	IP address (ASCII, max 39 bytes)	39
0xC1	Port Number (ASCII, max 5 bytes)	5
0xC2	APN (ASCII, max 32 bytes)	32
0xC3	PLMN Code (ASCII, max 5 bytes)	5
0xC4	Autoconnect Function (Boolean)	1
0xC5	Scrambling Function(Boolean)	1
0xC6	Enable BIP Function (Boolean)	1
0xC7	Cell Reselection Function (Boolean)	1
0xC8	Avoid Function (Boolean)	1
0xC9	Combine Attach Function (Boolean)	1
0xCA	IMEI	15
0xCB	SIM Card ID	21
0xCC	NB-IoT Band	2
0xCD	IMSI	15
0xCE	PSM Active Timer	1
0xCF	PSM Timer Period	1

LoRa Settings		
No	Parameters	Data Length
0xC0	ADR Enable (boolean)	1
0xC1	Data Rate (uint8)	1

0xC2	Confirmed Uplink Enable (boolean)	1
0xC3	Application Port (uint8)	1
0xC4	Num of Trials for Joining (uint8)	1
0xC5	OTAA Enable (boolean)	1
0xC6	Enable Public Network (boolean)	1
0xC7	Device EUI	8
0xC8	Application EUI	8
0xC9	Application Key	16
0xCA	Enable Static Address (boolean)	1
0xCB	Device Address	4
0xCC	Network Session Key	16
0xCD	Application Session Key	16
0xCE	Network ID	4
0xCF	Antenna Gain (float)	4
0xD0	RX2 Window Frequency	4
0xD1	RX2 Window Data Rate	4
0xD2	Enable Duty Cycle (boolean)	1

6) Checksum Byte

This byte is used to check whether data is sent successfully. Checksum of all frame.

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Permissions

GET, POST, DELETE permissions are given in the following table.

Parameter	Permissions
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Category	Code	Parameter Definition	After Device Activated		
			GET	POST	DELETE
General Parameters	0x00	Clear EEPROM	0	0	0
	0x01	Restart Device	0	1	1
	0x02	Device State	1	0	0
	0x03	Serial Number	1	0	0
	0x04	Alive Message Period	1	1	1
	0x05	Hardware Version	1	0	0
	0x06	Software Version	1	0	0
	0x07	Number Of Slots	1	0	0
	0x08	Plugged Sensors	1	0	0
	0x09	Connectivity Firmware Version	1	0	0
	0x0A	Connectivity Module Name	1	0	0
	0x0B	Parameter List Version	1	0	0
	0x0C	LED Indication On Transmit	1	1	1
	0x0D	Current UTC Timestamp	1	1	1
	0x0E	Battery Level	1	0	0
	0x0F	Enable Log Transmit	1	1	1
	0x10	Device Active Schedule	1	1	1
Slot Parameters	0x20/30/40/50	Slot Serial Number	1	0	0
	0x21/31/41/51	Slot Function	1	0	0
	0x22/32/42/52	Slot Board Type	1	0	0
	0x23/33/43/53	Slot Read Period	1	1	1
	0x24/34/44/54	Slot Transmit Period	1	1	1
	0x25/35/45/55	Slot Read Timestamp Enable	1	1	1

	0x26/36/46/56	Slot Hardware Version	1	0	0
	0x27/37/47/57	Slot Software Version	1	0	0
	0x28/38/48/58	Slot Trigger To	1	1	1
	0x29/39/49/59	Slot Specific Information	1	1	1
LoRa Connectivity Parameters	0xC0	Lora ADR Enable	1	1	1
	0xC1	Lora Data Rate	1	1	1
	0xC2	Lora Confirmed Message	1	1	1
	0xC3	Lora Application Port	1	1	1
	0xC4	Lora Num Of Trials to Join	1	1	1
	0xC5	Lora OTAA Enable	1	1	1
	0xC6	Lora Public Network	1	1	1
	0xC7	Lora Device EUI	1	0	0
	0xC8	Lora Application EUI	1	1	1
	0xC9	Lora Application Key	1	1	1
	0xCA	Lora Device Address Static	1	1	1
	0xCB	Lora Device Address	1	1	1
	0xCC	Lora Nwkskey	1	1	1
	0xCD	Lora Appskey	1	1	1
	0xCE	Lora Network ID	1	1	1
	0xCF	Lora Antenna Gain	1	1	1
	0xD0	Lora RX2 Window Frequency	1	1	1
	0xD1	Lora RX2 Window Data Rate	1	1	1
	0xD2	Lora Duty Cycle	1	0	0
NB-IoT Connectivity Parameters	0xC0	IP address	1	1	1
	0xC1	Port Number	1	1	1

0xC2	APN	1	1	1
0xC3	PLMN Code	1	1	1
0xC4	Connection Type	1	1	1
0xC5	Scrambling Function	1	1	1
0xC6	Enable BIP Function	1	1	1
0xC7	Cell Reselection Function	1	1	1
0xC8	Avoid Function	1	1	1
0xC9	Combine Attach Function	1	1	1
0xCA	IMEI	1	0	0
0xCB	SIM Card ID	1	0	0
0xCC	NB-IoT Band	1	1	1
0xCD	IMSI	1	0	0
0xCE	PSM Active Timer	1	1	1
0xCF	PSM Timer Period	1	1	1

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