Frame specifications

LORA TAG

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This document describes the payload of data frames in ELA Innovation's line of LoRa products.

2. Applicable product(s)

LoRa ID

IDF32002

LoRa TEMP

IDF32003

LoRa HOME

IDF32004

LoRa n'TRACK

IDF32005

3. Uplink frame format

Version v1.0.3

LoRa frames - Uplink

Based on the sensor information established during configuration, the Tag creates frames to be transmitted using the following format:

LoRa tag (TAGLORA) uplink frame format									
Fixed length					*Variable length*				
ELA header 2 bytes	FW_rev 1 byte	Protocol_rev 1 byte	Frame_cnt 3 bytes	Frame_type 1 byte	Sensor 1		Sensor 2 to n-1	Sensor n	
					SensorInfo 1 byte	SensorData 0 to 16 bytes	...	Sensor Info 1 byte	Sensor Data 0 to 16 bytes

Field description

Field	Length	Description
ELA header	2 bytes	Field reserved for information to be defined
FW_rev	1 byte	TAGLORA firmware version
Protocol_rev	1 byte	TAGLORA protocol version (frame format)
Frame_cnt	3 bytes	Counter of the number of frame transmission attempts by the tag since the last JOIN sequence (application start or stop)
Frame_type	1 byte	Frame information Bits 7-4: frame type • 0: Standard mode periodic frame • 1: Motion mode periodic frame • 2: Non periodic detection frame for magnetic state change • 3: Non periodic motion detection frame • 4-15: RFU Bits 3-0: Number of sensors • 0: no sensors (advertising frame) • 1-15: number of sensors in the frame
SensorInfo	1 byte	Information about the sensor Bits 7-4: Sensor type • 0: Temperature (T) • 1: Humidity/temperature (RTH) • 2: magnetic Hall effect (MAG) • 3: Movement (MOV) • 4: 3D Accelerometer (ANG) • 5: Luminosity (LUX) • 6: Geolocation (GPS) • 7-15: RFU Bits 3-0: Number of information bytes for the sensor (length of SensorData field) • 0-15: Number of information bytes for the sensor

SensorData	0-15 bytes	Sensor values

Description of the detailed fields for all sensors:

Champ		Longueur	Description
Header Ela		2 octets	Field reserved, not editable
FW_rev		1 octet	TAGLORA firmware version, not editable
Protocol_rev		1 octet	TAGLORA protocol version, not editable
Frame_cnt		3 octets	Counter of the number of frame transmission attempts by the tag since the last JOIN sequence (application start or stop)
Frame_type		1 octet	Frame information
Sensor Temperature (TEMP)	SensorInfo	1 octet	0x02 (bit7-4=0 et bit3-0=2)
	SensorData	2 octets	Temperature stored in 16 bits signed by 0,01°C step
Sensor Temperature + Relative humidity RHT	SensorInfo	1 octet	0x13 (bit7-4=1 et bit3-0=3)
	SensorData	3 octets	Temperature stored in 16 bits signed by 0,01°C step Relative humidity stored in 8 bits unsigned by 1 % RH step from 0 to 100 %
Sensor Magnetic Hall effect (MAG)	SensorInfo	1 octet	0x22 (bit7-4=2 and bit3-0=2)
	SensorData	2 octets	Event counter stored in 15MSB (unsigned) Current status stored in LSB
Sensor Movement (MOV)	SensorInfo	1 octet	0x32 (bit7-4=3 and bit3-0=2)
	SensorData	2 octets	Overflow counter stored in 15MSB (unsigned) Current status stored in LSB
Capteur Luminosity (LUX)	SensorInfo	1 octet	0x54 (bit7-4=5 and bit3-0=4)
	SensorData	4 octets	Luminosity stored in 32bits unsigned by 0,01 Lux step
Capteur Geolocation (GPS)	SensorInfo	1 octet	0x6D (bit7-4=6 et bit3-0=13)
	SensorData	13 octets	Longitude stored in 4 octets (float32) Latitude stored in 4 octets (float32) Altitude in meters stored in 2 octets (unsigned) Velocity (Km/h) stored in 2 octets (unsigned) Information stored in 1 octet (uint8): • Bit 7-6: information fix (0=not of fix, 1=fix OK) • Bit 5-0: Number of satellites

- Example with “LoRa TEMP” format:

Raw data:
0x01030101 00009C 01 02 0AAB

Details:

LEN.	TYPE	VALUE
4	0x01030101	Field reserved
3	0x00009C	156 frames transmit of the TAG
1	0x01	Standard mode periodic frame, number of sensors= 1
1	0x02	Sensor Temperature
2	0x0AAB	Data sensor 0x0AAB=2731 * 0,01°C = **27,31°C**

Note: for a negative temperature, 2’s complement is made: -27.31°C will be 55F5

- Example with “LoRa HOME” format:

Raw data:
0x10301010000030313 0B3829 22 0003 54000

Details:

LEN.	TYPE	VALUE
4	0x01030101	Field reserved
3	0x00009c	156 frames transmit of the TAG
1	0x03	Standard mode periodic frame, number of sensors= 3
1	0x13	Sensor RHT
3	0x0B3829	Temperature: 0x0B38=2872 * 0,01°C = **28,72°C**
		Humidity: 0x29= 41% RH
1	0x22	Sensor MAG
2	0x0003	Event counter stored in 15 bits (MSB): 1 magnetic field detection
		Current status (LSB)= 1 magnet detected
1	0x54	Sensor LUX
4	0x0000F760	Luminosity: 0xF760= 63328 * 0.01 lux = 633.28 lux

- Example with “LoRa ID » format:

Raw data:
0x10301010000412 22 2200183 2000B

Details:

LEN.	TYPE	VALUE
4	0x01030101	Field reserved
3	0x000041	65 frames transmit of the TAG
1	0x22	Non periodic detection frame for magnetic state change, number of sensors= 2
1	0x22	Sensor MAG
2	0x0018	Event counter stored in 15 bits (MSB): 24 magnetic field detection
		Event status (LSB)= 0 no magnet detected
1	0x32	Sensor MOV
2	0x000B	Overflow counter stored in 15 bits (MSB): 5 motion detections
		Event status (LSB)= 1 detected motion

- Example with “LoRa n’TRACK”:

Raw data :

0x1030101000001332200003200576D4074A455422E78F5003C000F46

Details:

LEN.	TYPE	VALUE	
4	0x01030101	Field reserved	
3	0x000020	32 frames transmit of the TAG	
1	0x33	Non periodic motion detection frame, number of sensors = 3	
1	0x22	Sensor MAG	
2	0x0000	Event counter stored in 15 bits (MSB): no magnetic field detection	
		Event status (LSB)= 0 no magnet detected	
1	0x32	Sensor MOV	
2	0x000B	Overflow counter stored in 15 bits (MSB): 5 motion detections	
		Event status (LSB)= 1 detected motion	
1	0x6D	Sensor GPS	
13	0x4074A455422E78F5003C000F46	Longitude	0x4074A455 = 3.82253
		Latitude	0x422E78F5=43.6181
		Altitude	003C= 60 mètres
		Velocity	000F=15*0.1km/h=1.5km/h
		Info	0b01= FIX valid
			0x6= 6 satellites

Note:

Longitude and latitude are coded in hexadecimal. To convert the data into GPS coordinates, use the hexadecimal conversion to a float (sign, exponents, mantisse). These coordinates are in decimal degrees (DD). A brief flashing of the LED is provided to indicate the geolocation search.

4. Downlink frame format

The LoRaWAN protocol offers two-way communication, which means that you can transfer data to the LoRa device.

In reception mode, the tag interprets downlink messages received by the LoRaWAN module and executes the associated actions. In Class A, reception mode is activated right after transmission. Class C allows reception at any time, but it consumes significantly more power than Class A.

List of applicable commands:

COMMANDS	ACTIONS	REKATED PRODUCTS
LED_ON	Switch on the LED (blinking)	LoRa ID LoRa TEMP LoRa HOME LoRa n'TRACK
LED_OFF	Turn the LED off	LoRa ID LoRa TEMP LoRa HOME LoRa n'TRACK
LED_ON XXXX	Switch on the LED (XXXX in seconds)	LoRa ID LoRa TEMP LoRa HOME LoRa n'TRACK
Classe A	Switch to the class A	LoRa ID LoRa TEMP LoRa HOME LoRa n'TRACK
Classe C	Switch to the class C	LoRa ID LoRa TEMP LoRa HOME LoRa n'TRACK

Downlink message format:

Downlink frame format				
Fixed length				*Variable length*
ELA header 2 bytes	FW_rev 1 byte	Protocol_rev 1 byte	CmdInfo 1 byte	CmdData 0-16 bytes

Field description

Field	Length	Description
ELA header	2 bytes	Field reserved for information to be defined
FW_rev	1 byte	TAGLORA firmware version
Protocol_rev	1 byte	TAGLORA protocol version (frame format)

CmdInfo	1 byte	Information about the command type Bits 7-4: command type • 0: LED • 1: Buzzer • 2: Reserved • 3: LoRa class • 4-15: Reserved Bits 3-0: Number of bytes in CmdData field • 0-15: Number of bytes in CmdData field
CmdData	0-16 bytes	Command parameters

4.1 LED activation

The parameters for the LED activation command are as follows:

CmdInfo	CmdData
0x02 Bits 7-4 = 0, bits 3-0 =2	Duration of LED activation in seconds, on a 16-bit unsigned integer

Example of a LED activation command:

- 000102030200 20: LED blink (1 Hz) for 32 seconds.

As soon as this command is received, the tag activates the LED for the period specified in the *CmdData* field.

4.2 Changing LoRaWAN Class

The parameters for the Class change command are as follows:

CmdInfo	**CmdData**
0x31 Bits 7-4 = 2, bits 3-0 = 2	LoRa Class on an 8-bit unsigned integer • 0x00 = Class A • 0x01 = Class B (not currently supported) • 0x02 = Class C • 0x03 to 0xFF = not supported

Example of a command to change LoRaWAN Class:

- 000102033102: Switch to Class C.

As soon as this command is received, the tag modifies its operating Class based on the value provide specified in the *CmdData* field. This change implies a new OTAA procedure with the server