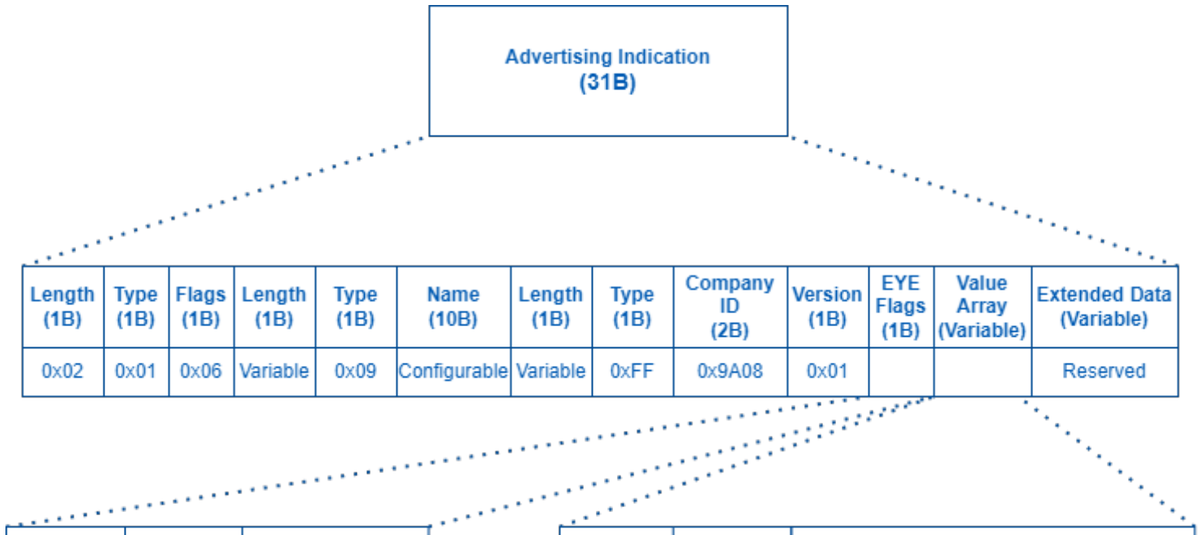
Sensor advertising



Length (1B)	Type (1B)	Flags (1B)	Length (1B)	Type (1B)	Name (10B)	Length (1B)	Type (1B)	Company ID (2B)	Version (1B)	EYE Flags (1B)	Value Array (Variable)	Extended Data (Variable)
0x02	0x01	0x06	Variable	0x09	Configurable	Variable	0xFF	0x9A08	0x01			Reserved

Data	Bit No.	Description
EYE Flags	0	Temperature value presence
	1	Humidity value presence
	2	Magnetic sensor presence
	3	Magnetic sensor state
	4	Movement sensor counter
	5	Movement sensor angle
	6	Low Battery indication
	7	Battery voltage value presence

Data	Size (Bytes)	Description
Value Array	2	Temperature value in Celsius **Note**: present only if bit 0 of EYE flags is set, otherwise is not being sent
	1	Humidity value in percent **Note**: present only if bit 1 of EYE flags is set, otherwise is not being sent
	2	Movement Sensor state and counter **Note**: present only if bit 4 of EYE flags is set, otherwise is not being sent
	3	Movement sensor angle **Note**: present only if bit 5 of EYE flags is set, otherwise is not being sent
	1	Battery Voltage **Note**: present only if bit 7 of EYE flags is set, otherwise is not being sent

Beacon and sensors data

iBeacon

Length (1B)	Type (1B)	Flags (1B)	Length (1B)	Type (1B)	Company ID (2B)	Beacon Type (2B)	Proximity UUID (16B)	Major (2B)	Minor (2B)	Calibrated Power (1B)
0x02	0x01	0x06	0x1A	0xFF	0x4C00	0x0215	Configurable	Configurable	Configurable	Variable

Eddystone

Length (1B)	Type (1B)	Flags (1B)	Length (1B)	Type (1B)	Services (2B)	Length (1B)	Type (1B)	UUID (2B)	Type (1B)	Power (1B)	Namespace ID (10B)	Instance ID (6B)	RFU (2B)
0x02	0x01	0x06	0x03	0x03	0xAAFE	0x17	0x16	0xAAFE	0x00	Variable	Configurable	Configurable	0x0000

Advertising Indication (31B) | **Scan Response (31B)**

Length (1B)	Type (1B)	Name (10B)	Length (1B)	Type (1B)	Company ID (2B)	Version (1B)	EYE Flags (1B)	Value Array (Variable)	Extended Data (Variable)
Variable	0x09	Configurable	Variable	0xFF	0x9A08	0x01			Reserved

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Protocol description

At the highest-level Bluetooth® LE advertising packet consists of Advertising Indication and Scan Response. Both packets can be maximum of 31 bytes in size. Advertising Indication packet is always broadcasted when Scan Response is broadcasted only if Observer device requests it by using Active Scan.

BTSMP1 uses Advertising Indication to send beacon data which can be configured to select between iBeacon and Eddystone protocols or to be disabled at all. In that case, data which is shown as Scan Response in protocol overview will be sent as Advertising Indication without Scan Response following it.

Scan Response is used to send device name and manufacturer specific data. Manufacturer specific data includes Teltonika Company ID (0x089A) and protocol version (0x01). It is followed by Flag Encoded Data (Table 1) and Extended Data (Table 2). Later on, protocol will be highly configurable in and will allow to disable/enable sending of device name or any sensor value allowing to reduce size of the packet being sent.

Teltonika BTSX devices are transmitting one or two packets depending on the selected protocol. Broadcast packet + Scan response packet.

A scan response packet is sent when an active scan is used, within the BLE layer of communication. The default for our FM devices and many other applications for example our EYE Appication or nRF connect Application is an active scan.

There are three protocols, with the following packets:

1.iBeacon + EYE Sensors

2.Eddystone + EYE Sensors

For **iBeacon + EYE Sensors** and **Eddystone + EYE Sensors** protocols only iBeacon/Eddystone packet is broadcasted and will be seen by both active and passive scans, to see the EYE Sensors packet you need to use an active scan. In other words in an environment where no BLE devices are scanning with an active scan or in case when there are no scanning devices at all, only the iBeacon/Eddystone packet will be sent by the BTS device to conserve energy.

3. EYE Sensors

With **EYE Sensors** protocol, the EYE Sensor packet becomes broadcast. In other words, in an environment where no BLE devices are scanning with an active scan or in case when there are no scanning devices at all EYE Sensors packet will be sent by the BTS device.

More Information on Active vs passive scans

Device Name has the following default value for Beacon – ID1_XXXXXXX

Table 1. Flag Encoded Date

Data	Size (Bytes)	Description
Flags	1	Each set bit (0-7) means the presence of value (0-7). Bits: 0 – Temperature value presence 1 – Humidity value presence 2 – Magnetic sensor presence 3 – Magnetic sensor state (1 magnetic field is detected/0 magnetic field is not detected) Valid value is present only if bit 2 flag is set. 4 – Movement sensor counter 5 – Movement sensor angle 6 – Low Battery indication (if set to 1 low battery voltage detected) 7 – Battery voltage value presence
Value 0	2	Temperature Value in Celsius / 100

NOTE: present only if bit 0 is set, otherwise is not being sent

Humidity

Value 1 1

Value in percent
NOTE: present only if bit 1 is set, otherwise is not being sent

Movement Sensor counter

Value 2 2

Most significant bit indicates movement state and 15 least significant bits represent count of movement events.
NOTE: present only if bit 4 is set, otherwise is not being sent

Movement sensor angle

Value 3 3

Most significant byte – pitch (-90/+90)
Two least significant bytes – roll (-180/+180)
NOTE: present only if bit 5 is set, otherwise is not being sent

Battery Voltage

Value 4 1

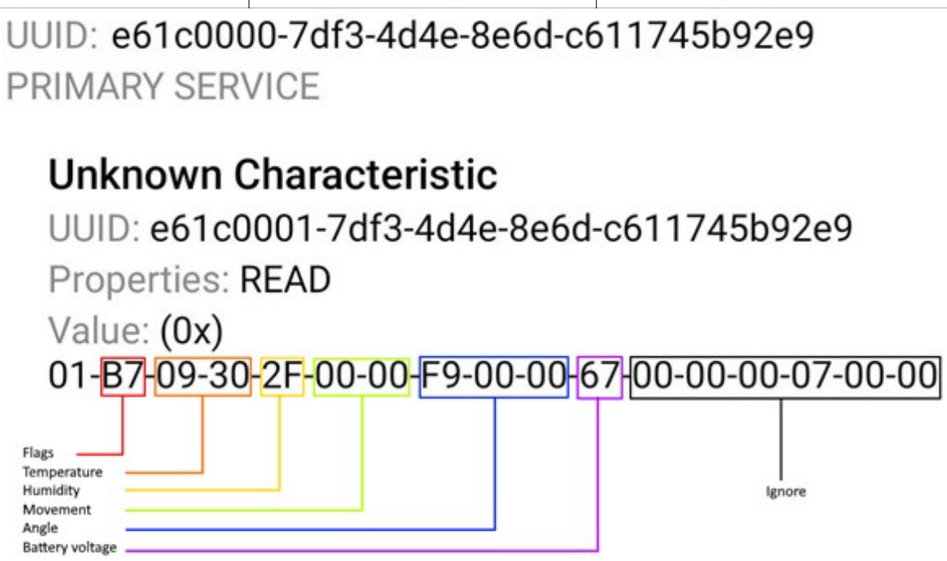
Battery voltage in mV = 2000 + VALUE * 10
NOTE: present only if bit 7 is set, otherwise is not being sent

GATT Characteristics

Name	Service UUID	Characteristic UUID	Data Type	Min	Max	Default Value	Notes
Device Name	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0016-7df2-4d4e-8e6d-c611745b92e9	ASCII	0	12	Unique for each device	-
Tx Power Lever	1804	2a07	SINT8	-14	8	2	Possible values: -14, -11, -8, -5, -2, 2, 4, 8
Protocol Type	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0001-7df2-4d4e-8e6d-c611745b92e9	UINT8	0	4* *Max 2 with 01.02.10+ firmware	1 for EYE_Beacon, 4 for EYE_Sensor* *with 01.02.10+ firmware 1 for both EYE_Beacon & EYE_Sensor	0 - iBeacon 1 - Eddystone 2 - EYE Sensor 3 - iBeacon + EYE Sensor* 4 - Eddystone + EYE Sensor* *01.02.10+ sensors are enabled over *Activate / Deactivate Sensors*
Activate / Deactivate Sensors*	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0021-7df2-4d4e-8e6d-c611745b92e9	UINT8	0	15 (0b1111)	4 (0b0100) for EYE_Beacon, 15 (0b1111) for EYE_Sensor	(LSb) bit 0 – Temperature Bit 1 – Humidity

*from 01.02.10+ firmware							Bit 2 – Magnetic Bit 3 - Movement E.g. EYE_Sensor disabled movement & enabled temperature, humidity, magnetic sensors 7 (0b0111)
Advertising Interval	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0002-7df2-4d4e-8e6d-c611745b92e9	UINT16	1000	10000	5000	miliseconds
Sub Advertising Interval	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0003-7df2-4d4e-8e6d-c611745b92e9	UINT16	20	1000	100	Used by repeats, miliseconds
Advertising Repeats	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0004-7df2-4d4e-8e6d-c611745b92e9	UINT16	1	10	1	Repeats work only if Advertising Interval is more than 2000 ms and Repeats set to more than 1
iBeacon ID	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0005-7df2-4d4e-8e6d-c611745b92e9	BYTE ARRAY	20 bytes	20 bytes	Unique for each device	16 B - UUID 2 B - major 2 B - minor
Eddystone ID	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0006-7df2-4d4e-8e6d-c611745b92e9	BYTE ARRAY	16 bytes	16 bytes	Unique for each device	10 B - Namespace 6 B - Instance
Command	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0007-7df2-4d4e-8e6d-c611745b92e9	Command characteristic				
Password	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0008-7df2-4d4e-8e6d-c611745b92e9	BYTE ARRAY	6 bytes	6 bytes	123456	Always 6 Digits
Movement Start	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0013-7df2-4d4e-8e6d-c611745b92e9	UINT16	0	300	5	seconds
Movement Stop	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0014-7df2-4d4e-8e6d-c611745b92e9	UINT16	0	300	5	seconds
Password Counter	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0019-7df2-4d4e-8e6d-c611745b92e9	UINT8	0 (counter)	10 (counter)	0	Byte 0 – counter, Byte 1 and 2 - timeout
Master Password (PUK)	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0020-7df2-4d4e-8e6d-c611745b92e9	UINT8	8 bytes	8 bytes	MAC address dependency	Byte array
Manufacturer sleep (Hibernate mode)	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0018-7df2-4d4e-8e6d-c611745b92e9	UINT8	0	1	1	0 – sleep disabled, 1 – sleep enabled
User ADV Spam Duration	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0022-7df2-4d4e-8e6d-c611745b92e9	UINT16	1	300	30	WakeUp Advertising Spam Duration in seconds
RSSI Calibration Value	e61c0000-7df2-4d4e-8e6d-c611745b92e9	e61c0023-7df2-4d4e-8e6d-c611745b92e9	INT8	-100	127	127	RSSI value in dBm 127 – Use default calib. table
Manufacturer	180A	2A29	BYTE	-	-	Not Configurable	Read Only. Ex. "Teltonika"

			ARRAY				
Model	180A	2A24	BYTE ARRAY	-	-	Not Configurable	Read Only. Ex. "BTSID1"
Serial	180A	2A25	BYTE ARRAY	-	-	Not Configurable	Not used
Hardware	180A	2A27	BYTE ARRAY	-	-	Not Configurable	Read Only. Ex. "Table:1 Volt:325
Firmware	180A	2A26	BYTE ARRAY	-	-	Not Configurable	Read Only. Ex. "1.1.0-beta"
System ID	180A	2A23	BYTE ARRAY	-	-	Not Configurable	Not used
MAC	180A	652143dc-dec6-4fb1-bd46-3e919d2410a6	BYTE ARRAY	6	6	Not Configurable	Read Only. ex. 112233445566 -> 11:22:33:44:55:66
Calibration ID	180A	a610249f-913e-46bd-b14f-c6dedc432165	BYTE ARRAY	9	12	Not Configurable	Read Only. e.g. 295268313 *Only with EN12830 certified devices
Scan Response Data	e61c0000-7df3-4d4e-8e6d-c611745b92e9	e61c0001-7df3-4d4e-8e6d-c611745b92e9	BYTE ARRAY	17	17	Not Configurable	Scan Response Data, see picture for detail view of data structure



Command characteristic

Command's name	Data to send	Description
Write to flash	0x0010	Writes set parameters to flash
General boot	0x0011	Enter boot mode
Instant reset	0x0012	Software reset
Reset after connection	0x0013	Reset after disconnect
Get hw voltage	0x0014	Sets detected hw voltage in response data
Keep connection alive	0x0015	Resets disconnect timer

Restore defaults	0x0016	Sets all configurable parameters to default values

EYE Sensor Bluetooth® frame parsing example

Unparsed Data

02010 61A FF 4C00 0215 FFFFFFFF0B8C404510C655AAB636EBEF BB70 0055 02 0C 09 4D50315F31323334353637 0E FF9A08 01 B7 08B412 0CCB 0BFFC7 67

Parsed Data

Parameter	HEX Code Part	Actual Value
Length	02	
Type	01	
Flags	06	
Length	1A	
Type	FF	
Apple company identifier (big endian)	4C00	
Beacon type	0215	
UUID	FFFFFFFF0B8C404510C655AAB636EBEF	
Major	BB70	
Minor	0055	
Power	02	
Length	0C	
Type	09	
Device name	4D50315F31323334353637	
Length	0F	
Type	FF	
Teltonika company ID (big endian)	9A08	
Protocol version	01	
Flags	B7	Raw value example 0xB7. Data has to be interpretated as binary value. In this example would be (MSB)1011 0111(LSB) and is parsed from least significant byte(LSB). 0 – Temperature value presence. 1 Means device is reading and transmitting temperature value. 1 – Humidity value presence. 1 Means device is reading and transmitting humidity value. 2 – Magnetic sensor presence. 1 Means device is reading and transmitting Magnetic sensor value. 3 – Magnetic sensor state (1 magnetic field is detected/0 magnetic field is not detected) Valid value is present only if bit 2 flag is set. 4 – Movement sensor counter. 1 Means device is reading and transmitting movement state and count values.

		5 – Movement sensor angle. 1 Means device is reading and transmitting angle roll and pitch values. 6 – Low Battery indication. 0 – Means device battery is from 100 to 15 % (When value changes to 1 Battery level is lower than 15 %. 7 – Battery voltage value presence. 1 Means device is reading and transmitting battery voltage value.
Temperature	08B4	Raw value example 0x08B4 hex, 2228 dec. Raw value needs to be divided by 100. **Real temperature** is 22,28 Celsius.
Humidity	12	Raw value example 0x12 hex, 18 dec. Decimal value is humidity in percent. Humidity 18 %
Movement	0CCB	(MSB)0000 1100 1100 1011(LSB) binary 0 - Most significant byte(MSB) represents **Movement status**. In this case device is not moving 0. If it was 1 device is moving. 000 1100 1100 1011 – represent detected movements count 3275 decimal value means device has detected total 3275 movement events,
Angle	0BFFC7	0B – Most significant byte represents **device pitch**. Device pitch can be from -90 to 90 degrees. In this example device pitch is 0000 1011 (2's complement) = 11° degrees. FFC7– Two least significant bytes represent **device roll**. Device roll can be from -180 to 180 degrees. In this example device Roll is 1111 1111 1100 0111 (2's complement) = -57° degrees
Battery voltage	67	**Battery voltage –** raw value example 0x67 hex. Decimal value of parameter 103**.** To calculate battery voltage need to use calculation 2000 + (VALUE * 10). In this case battery voltage value 2000+(103x10)= 3030 mV