DS03A-LB Outdoor LoRaWAN Door Sensor User Manual

Last modified by Xiaoling (/xwiki/bin/view/XWiki/Xiaoling) on 2023/07/19 17:06

Table of Contents:

1. Introduction

1.1 What is DS03A-LB LoRaWAN Door Sensor

The Dragino DS03A-LB is a **LoRaWAN Door Sensor** for Internet of Things solution. It detects door open/close status and uplinks to IoT server via LoRaWAN network. us can see the door status, open duration, open counts in the IoT Server.

The LoRa wireless technology used in DS03A-LB allows device to send data and reach extremely long ranges at low data-rates. It provides ultra-long range spread spect communication and high interference immunity whilst minimizing current consumption.

The DS03A-LB will send periodically data every 2 hours as well as for each door open/close action. It also counts the door open times and calculates the last door open duration. Users can also disable the uplink for each open/close event, instead, DS03A-LB can count each open event and uplink periodically.

DS03A-LB supports **Datalog Feature,** it can save the data when there is no LoRaWAN network and uplink when network recover.

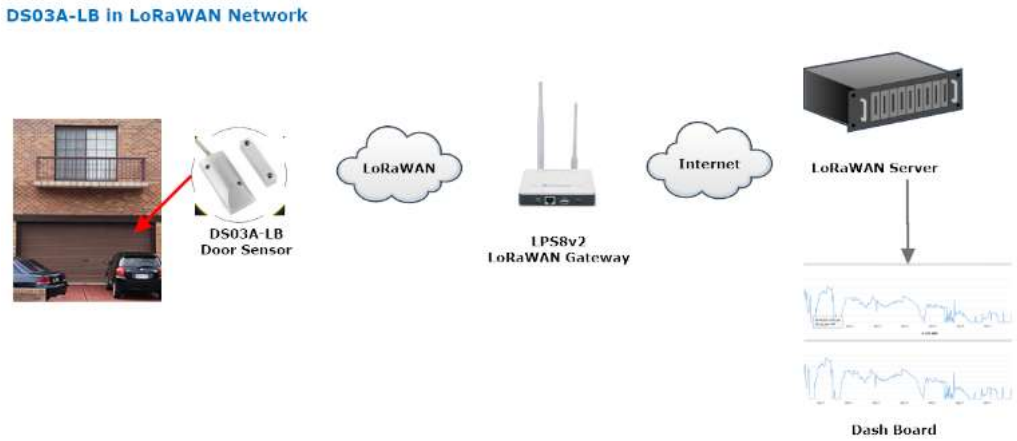
DS03A-LB has the **Open Alarm Feature**, user can set this feature so the device will send an alarm if the door has been open for a certain time.

DS03A-LB is designed for outdoor use. It has a weatherproof enclosure and industrial level battery to work in low to high temperatures

DS03A-LB **supports BLE configure** and **wireless OTA update** which make user easy to use.

DS03A-LB is powered by **8500mAh Li-SOCI2 battery**, it is designed for long term use up to 5 years.

Each DS03A-LB is pre-load with a set of unique keys for LoRaWAN registrations, register these keys to local LoRaWAN server and it will auto connect after power on.



1.2 Features

- LoRaWAN 1.0.3 Class A
- Ultra-low power consumption
- Bands: CN470/EU433/KR920/US915/EU868/AS923/AU915/IN865
- Door Open/Close detect
- Door open/close statistics
- Datalog Feature, Open Alarm Feature
- Support Bluetooth v5.1 and LoRaWAN remote configure
- Support wireless OTA update firmware
- Uplink on periodically
- Downlink to change configure
- 8500mAh Battery for long term use
- Wall Mountable
- Outdoor Use

1.3 Specification

Common DC Characteristics:

- Supply Voltage: built in 8500mAh Li-SOCI2 battery , 2.5v ~ 3.6v
- Operating Temperature: -40 ~ 85°C

LoRa Spec:

- Frequency Range, Band 1 (HF): 862 ~ 1020 Mhz
- Max +22 dBm constant RF output vs.
- RX sensitivity: down to -139 dBm.
- Excellent blocking immunity

Battery:

- Li/SOCI2 un-chargeable battery
- Capacity: 8500mAh
- Self-Discharge: <1% / Year @ 25°C
- Max continuously current: 130mA
- Max boost current: 2A, 1 second

Power Consumption

- Sleep Mode: 5uA @ 3.3v
- LoRa Transmit Mode: 125mA @ 20dBm, 82mA @ 14dBm

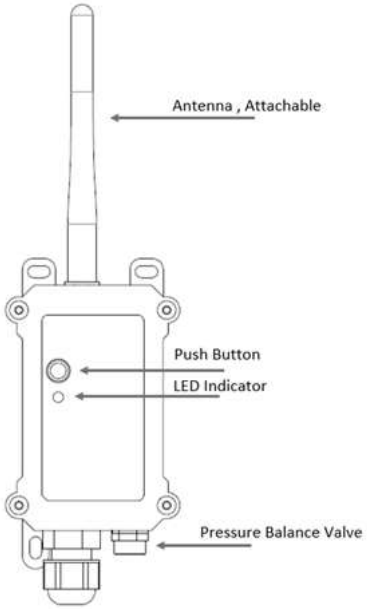
1.4 Applications

1.5 Sleep mode and working mode

Deep Sleep Mode: Sensor doesn't have any LoRaWAN activate. This mode is used for storage and shipping to save battery life.

Working Mode: In this mode, Sensor will work as LoRaWAN Sensor to Join LoRaWAN network and send out sensor data to server. Between each sampling/tx/rx periodic sensor will be in IDLE mode), in IDLE mode, sensor has the same power consumption as Deep Sleep mode.

1.6 Button & LEDs



Behavior on ACT	Function	Action
Pressing ACT between 1s < time < 3s	Send an uplink	If sensor is already Joined to LoRaWAN network, sensor will send an uplink packet, **blue led** will blink once. Meanwhile, BLE module will be active and user can connect via BLE to configure device.
Pressing ACT for more than 3s	Active Device	**Green led** will fast blink 5 times, device will enter **OTA mode** for 3 seconds. And then start to JOIN LoRaWAN network. **Green led** will solidly turn on for 5 seconds after joined in network. Once sensor is active, BLE module will be active and user can connect via BLE to configure device, no matter if device join or not join LoRaWAN network.
Fast press ACT 5 times.	Deactivate Device	**Red led** will solid on for 5 seconds. Means Device is in Deep Sleep Mode.

1.7 BLE connection

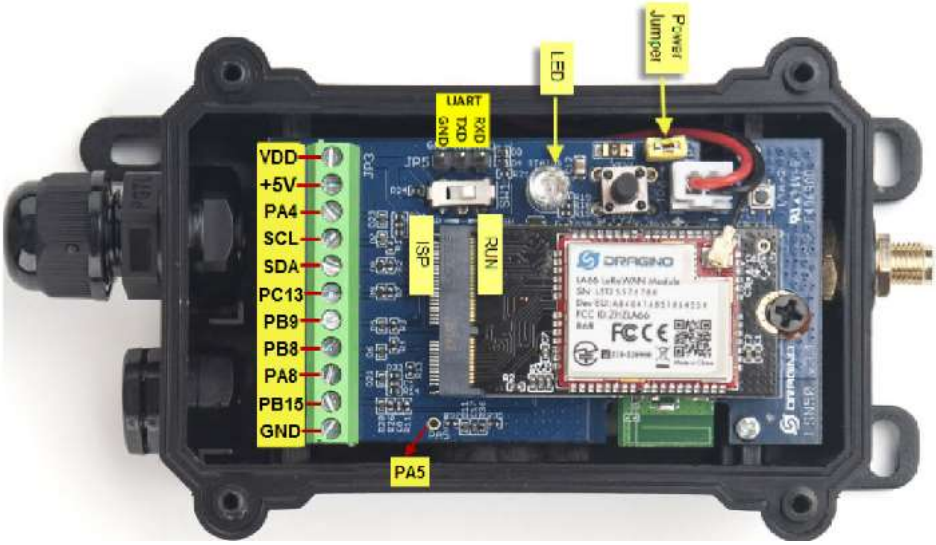
DS03A-LB support BLE remote configure.

BLE can be used to configure the parameter of sensor or see the console output from sensor. BLE will be only activate on below case:

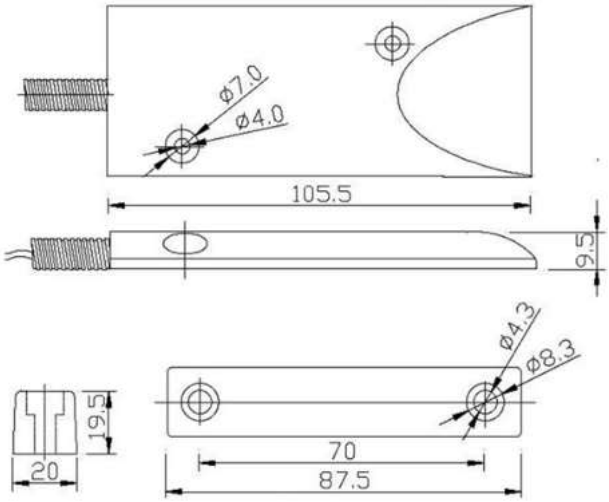
- Press button to send an uplink
- Press button to active device.
- Device Power on or reset.

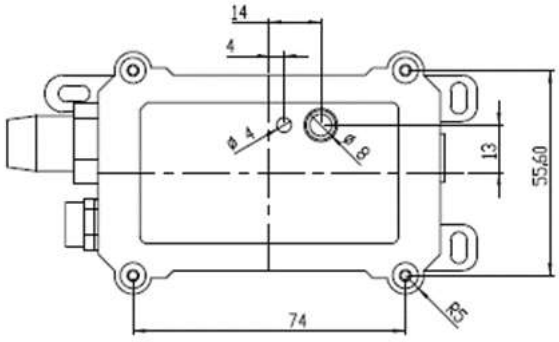
If there is no activity connection on BLE in 60 seconds, sensor will shut down BLE module to enter low power mode.

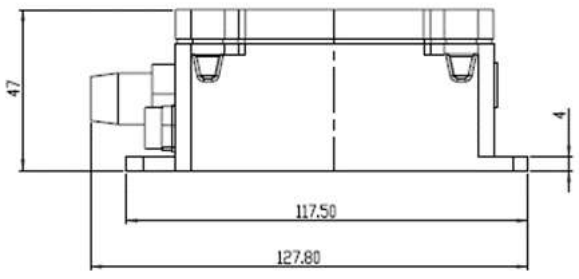
1.8 Pin Definitions

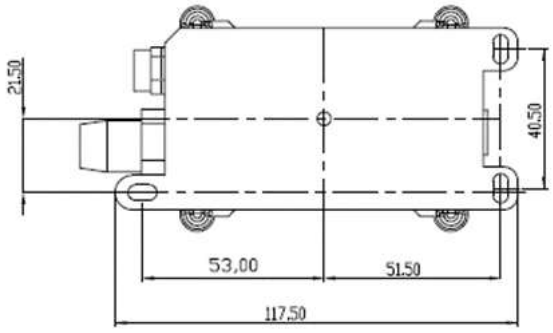


1.9 Mechanical









1.10 Magnet Distance

- Wood Door: 10mm ~ 30mm
- Iron Door: 30 ~ 45mm

2. Configure DS03A-LB to connect to LoRaWAN network

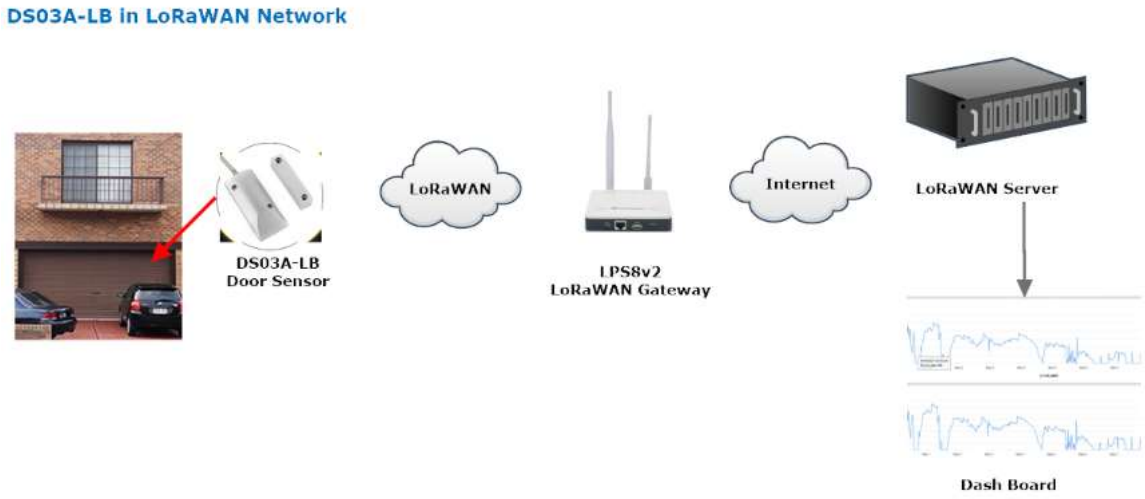
2.1 How it works

The DS03A-LB is configured as **LoRaWAN OTAA Class A** mode by default. It has OTAA keys to join LoRaWAN network. To connect a local LoRaWAN network, you nee input the OTAA keys in the LoRaWAN IoT server and press the button to activate the DS03A-LB. It will automatically join the network via OTAA and start to send the sens value. The default uplink interval is 2 hours.

2.2 Quick guide to connect to LoRaWAN server (OTAA)

Following is an example for how to join the TTN v3 LoRaWAN Network (https://console.cloud.thethings.network/) . Below is the network structure; we use the LPS8v2 (https://www.dragino.com/products/lora-lorawan-gateway/item/228-lps8v2.html) as a LoRaWAN gateway in this example.

The LPS8v2 is already set to connected to TTN network (https://console.cloud.thethings.network/) , so what we need to now is configure the TTN server.

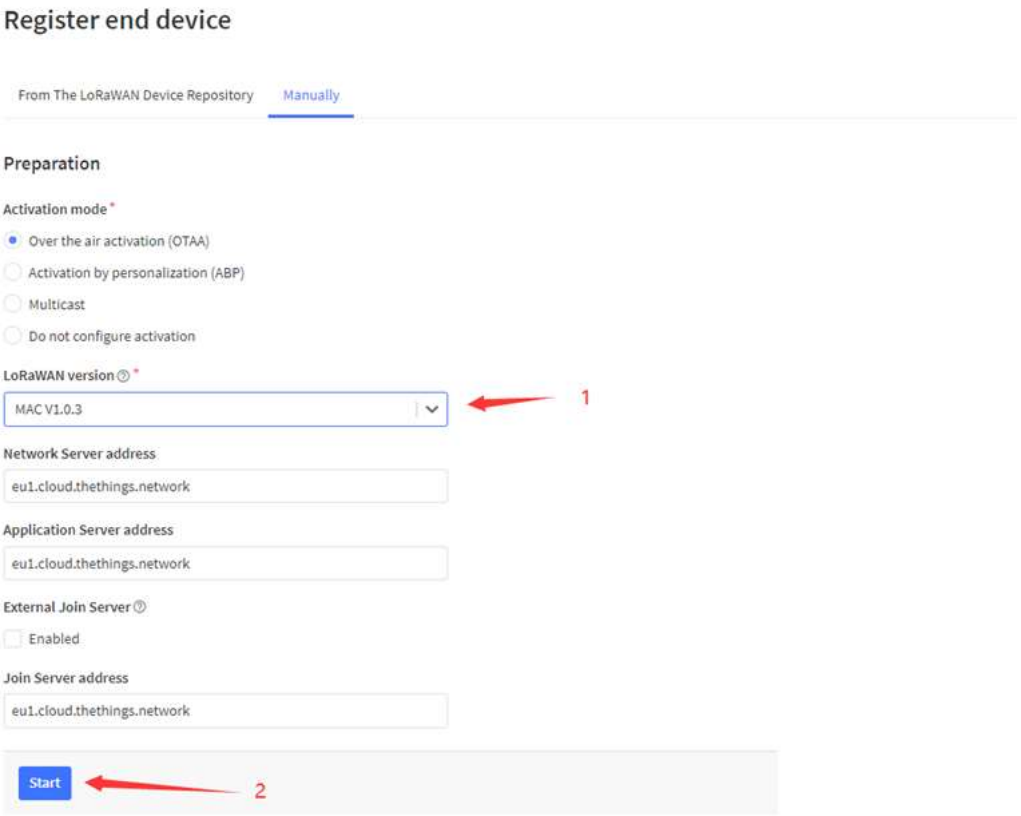


Step 1: Create a device in TTN with the OTAA keys from DS03A-LB.

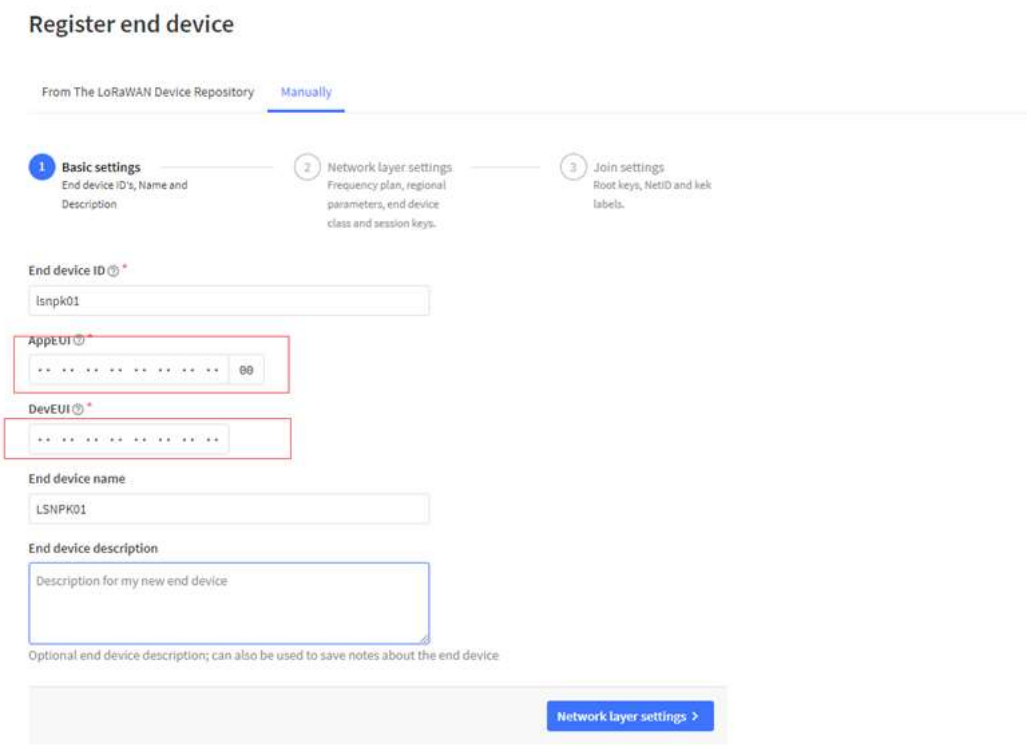
Each DS03A-LB is shipped with a sticker with the default device EUI as below:

You can enter this key in the LoRaWAN Server portal. Below is TTN screen shot:

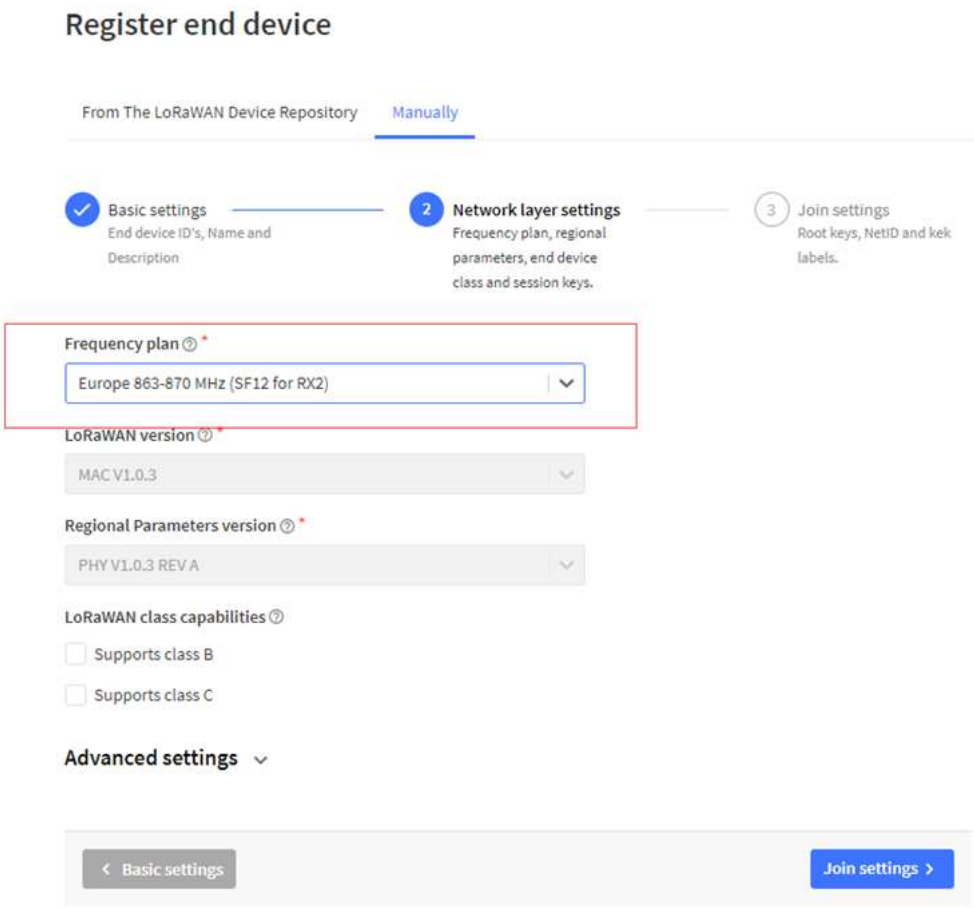
Register the device



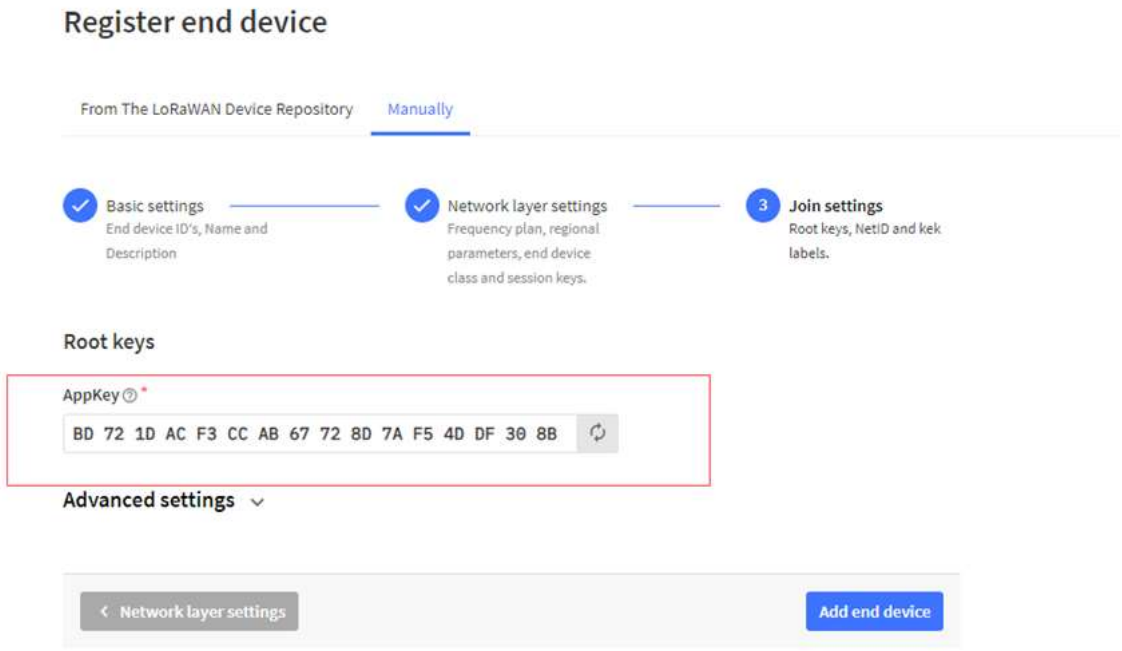
Add APP EUI and DEV EUI



Add APP EUI in the application



Add APP KEY



Step 2: Activate on DS03A-LB

Press the button for 5 seconds to activate the DS03A-LB.

Green led will fast blink 5 times, device will enter **OTA mode** for 3 seconds. And then start to Join LoRaWAN network. **Green led** will solidly turn on for 5 seconds after joi in network.

After join success, it will start to upload messages to TTN and you can see the messages in the panel.

2.3 Uplink Payload

2.3.1 Device Status, FPORT=5

Include device configure status. Once DS03A-LB Joined the network, it will uplink this message to the server. After that, DS03A-LB will uplink Device Status every 12 hou

Users can also use the downlink command**(0x26 01)** to ask DS03A-LB to resend this uplink. This uplink payload also includes the DeviceTimeReq to get time.

The Payload format is as below.

Device Status (FPORT=5)					
Size (bytes)	**1**	**2**	**1**	**1**	**2**
Value	Sensor Model	Firmware Version	Frequency Band	Sub-band	BAT

Example parse in TTNv3

Sensor Model: For DS03A-LB, this value is 0x1B

Firmware Version: 0x0100, Means: v1.0.0 version

Frequency Band:

0x01: EU868

0x02: US915

0x03: IN865

0x04: AU915

0x05: KZ865

0x06: RU864

0x07: AS923

0x08: AS923-1

0x09: AS923-2

0x0a: AS923-3

0x0b: CN470

0x0c: EU433

0x0d: KR920

0x0e: MA869

Sub-Band:

AU915 and US915:value 0x00 ~ 0x08

CN470: value 0x0B ~ 0x0C

Other Bands: Always 0x00

Battery Info:

Check the battery voltage.

Ex1: 0x0B45 = 2885mV

Ex2: 0x0B49 = 2889mV

2.3.2 Sensor Configuration, FPORT=4

DS03A-LB will only send this command after getting the downlink command **(0x26 02)** from the server.

Sensor Configuration FPORT=4							
Size(bytes)	**3**	**1**	**1**	**2**	**1**	**2**	**1**

Value	TDC (unit:sec)	Disalarm	Keep status1	Keep time1(unit: sec)	Keep status2	Keep time2(unit: sec)	Alarm interval(unit: min)

Example parse in TTNv3

- **TDC: (default: 0x001C20)**

Uplink interval for the Open/Close Event, default value is 0x001C20 which is 7200 seconds = 2 hours.

- **Disalarm: (default: 0)**

If Disalarm = 1, DS03A-LB will only send uplink at every TDC periodically. This is normally use for pulse meter application, in this application, there are many open/close event, and platform only care about the total number of pulse.

If Disalarm = 0, DS03A-LB will send uplink at every TDC periodically and send data on each open/close event. This is useful for the application user need to monitor the open/close event in real-time.

Note: When Disalarm=0, a high frequently open/close event will cause lots of uplink and drain battery very fast.

- **Keep Status1 & Keep Time1 & Keep Status2 & Keep Time2**

Shows the configure value of Alarm Base on Timeout Feature

- **Alarm interval(default: 0)**

When the state of the door sensor has not been changed after the timeout alarm, the device will send a uplink every alarm interval. It will stop the alarm until the state of th door sensor is changed after the timeout alarm.

2.3.3 Real-Time Open/Close Status, Uplink FPORT=2

DS03A-LB will send this uplink **after** Device Status once join the LoRaWAN network successfully. And DS03A-LB will send uplinks when:

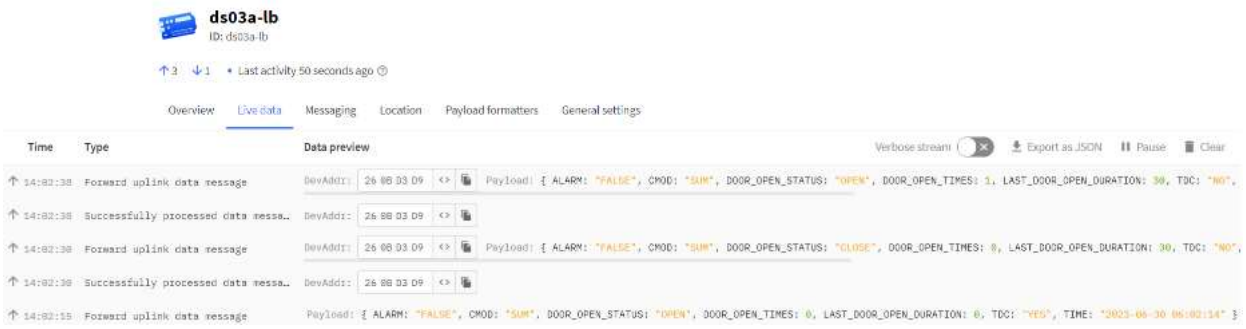
- Every 2 hours, this interval can be changed.
- There is an Open/Close event. (This info can be disabled by AT+DISALARM=1)

1) When AT+TTRCHANNEL=1, Uplink Payload totals 11 bytes. (Default mode)

Real-Time Open/Close Status, FPORT=2				
Size(bytes)	**1**	**3**	**3**	**4**
Value	Status & Alarm	Total open door events	The last door open duration (unit: sec)	Unix TimeStamp

Status & Alarm:

Size(bit)	**[bit7:bit4]**	**bit3**	**bit2**	**bit1**	**bit0**
Value	Reserve	Count mod	TDC flag 0:No;1:Yes	Alarm 0: No Alarm; 1: Alarm	Status 0: Close; 1: Open



- **Count mod:Default=0**

0: Uplink total open door times since factory

1: Uplink total open door times since last FPORT=2 uplink.

- **TDC flag**

When the flag is 1, it means sending packets at normal time intervals.

Otherwise, it is a packet sent at non-TDC time.

- **Alarm**

See Alarm Base on Timeout

- **Status**

This bit is 1 when the door sensor is open and 0 when it is close.

- **Total open door events**

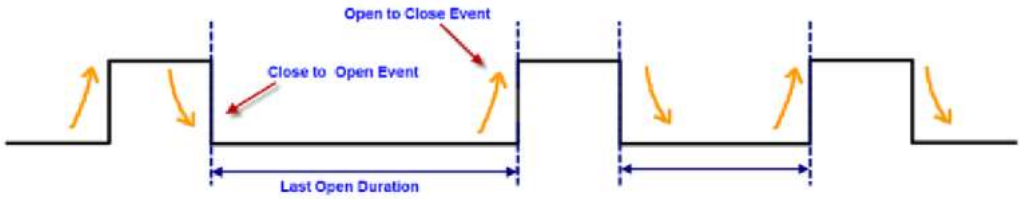
Total pulse/counting base on open door.

Range (3 Bytes) : 0x000000 ~ 0xFFFFFF . Max: 16777215

- **The last door open duration**

Door sensor last open duration.

Unit: sec.



2) When AT+TTRCHANNEL=2, Uplink Payload totals 18 bytes.

(When the maximum DR of some frequencies is 11 bytes, it will cause the server to receive empty packets)

Note:When using the AT+TTRCHANNEL=2 command, the Datalog function cannot be used.

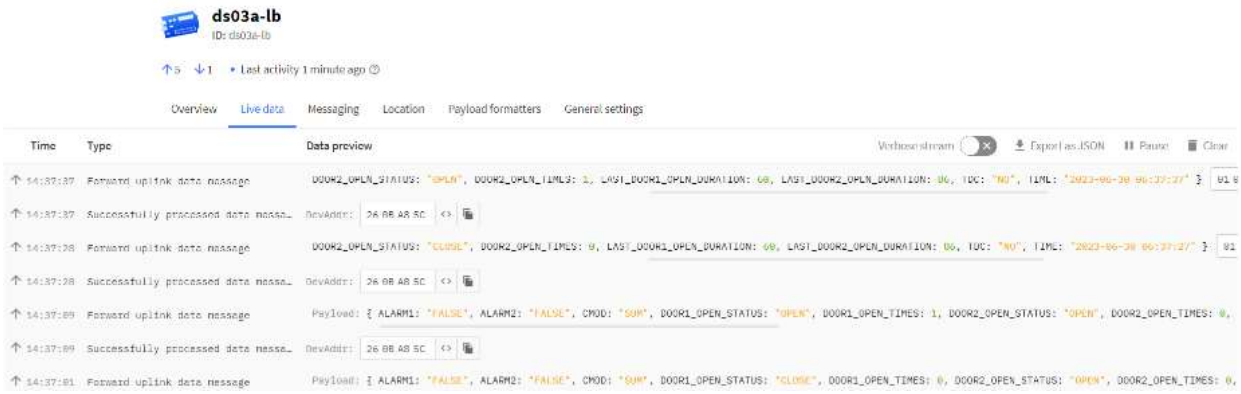
Real-Time Open/Close Status, FPORT=2							
Size(bytes)	**1**	**3**	**3**	**4**	**1**	**3**	**3**
Value	Status1 & Alarm1	Total open door events1	The last door open duration1 (unit: sec)	Unix TimeStamp	Status2 & Alarm2	Total open door events2	The last door open duration2 (unit: sec)

Status1 & Alarm1:

Size(bit)	**[bit7:bit4]**	**bit3**	**bit2**	**bit1**	**bit0**
Value	Reserve	Count mod	TDC flag 0:No;1:Yes	Alarm1 0: No Alarm; 1: Alarm (PA8 of pin)	Status1 0: Close; 1: Open (PA8 of pin)

Status2 & Alarm2:

Size(bit)	**[bit7:bit2]**	**bit1**	**bit0**
Value	Reserve	Alarm2 0: No Alarm; 1: Alarm (PA4 of pin)	Status2 0: Close; 1: Open (PA4 of pin)



- **Count mod:Default=0**

0: Uplink total open door times since factory

1: Uplink total open door times since last FPORT=2 uplink.

- **TDC flag**

When the flag is 1, it means sending packets at normal time intervals.

Otherwise, it is a packet sent at non-TDC time.

- **Alarm1 or Alarm2**

See Alarm Base on Timeout

- **Status1 or Status2**

This bit is 1 when the door sensor is open and 0 when it is close.

- **Total open door events1 or Total open door events2**

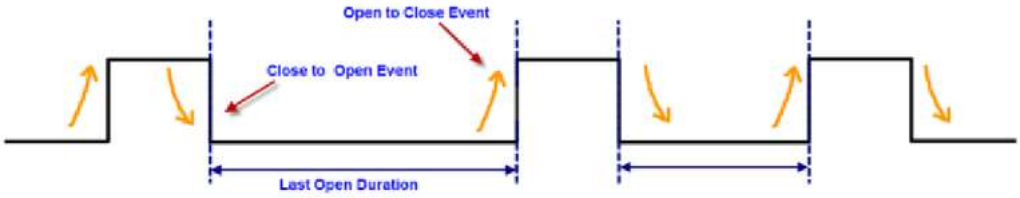
Total pulse/counting base on open door.

Range (3 Bytes) : 0x000000 ~ 0xFFFFFF . Max: 16777215

- **The last door open duration1 or The last door open duration2**

Door sensor last open duration.

Unit: sec.



2.3.4 Historical Door Open/Close Event, FPORT=3

DS03A-LB stores sensor values and users can retrieve these history values via the downlink command.

The historical payload includes one or multiplies entries and every entry has the same payload as Real-Time open/close status.

Real-Time Open/Close Status, FPORT=3				
Size(bytes)	**1**	**3**	**3**	**4**
Value	Status & Alarm	Total open door events	The last door open duration (unit: sec)	Unix TimeStamp

Status & Alarm:

Size(bit)	**bit7**	**bit6**	**[bit5:bit4]**	**bit3**	**bit2**	**bit1**	**bit0**
Value	No ACK message	Poll Message Flag	Reserve	Count mod	TDC flag 0:No; 1:Yes	Alarm 0: No Alarm; 1: Alarm	Status 0:Close; 1: Open

- Each data entry is 11 bytes and has the same structure as Real-Time open/close status, to save airtime and battery, DS03A-LB will send max bytes according to th current DR and Frequency bands.

For example, in the US915 band, the max payload for different DR is:

1. DR0: max is 11 bytes so one entry of data

2. DR1: max is 53 bytes so devices will upload 4 entries of data (total 44 bytes)

3. DR2: total payload includes 11 entries of data

4. DR3: total payload includes 22 entries of data.

If DS03A-LB doesn't have any data in the polling time. It will uplink 11 bytes of 0

Downlink:

0x31 64 9E 7D 34 64 9E 7E 9C 05

Uplink:

45 00 00 00 00 00 00 64 9E 7D 48 40 00 00 00 00 00 63 64 9E 7D 9C 41 00 00 01 00 00 63 64 9E 7D A4 40 00 00 01 00 00 8D 64 9E 7E 31 43 00 00 02 00 00 8D 64 9E 44 48 00 00 02 00 00 1F 64 9E 7E 59 4B 00 00 03 00 00 1F 64 9E 7E 6B

Parsed Value:

[COUNTMOD, TDC_FLAG, ALARM, DOOR_STATUS, OPEN_DOOR_TIMES, LAST_DOOR_OPEN_DURATION, TIME]

[SUM,YES,FALSE,OPEN,0,0,2023-06-30 06:59:20],

[SUM,NO,FALSE,CLOSE,0,99,2023-06-30 07:00:44],

[SUM,NO,FALSE,OPEN, 1,99,2023-06-30 07:00:52],

[SUM,NO,FALSE,CLOSE,1,141,2023-06-30 07:03:13],

[SUM,NO,TRUE,OPEN, 2,141,2023-06-30 07:03:32],

[PART,NO,FALSE,CLOSE,2,31,2023-06-30 07:03:53],

[PART,NO,TRUE,OPEN, 3,31,2023-06-30 07:04:11],

```
Stop Tx events when read sensor data
0001
0002 2023/6/30 06:59:20 bat:3660 mod:0 status:open open_times:0 last_open_duration:0 alarm:False tdc:yes
0003 2023/6/30 07:00:44 bat:3666 mod:0 status:close open_times:0 last_open_duration:99 alarm:False tdc:no
0004 2023/6/30 07:00:52 bat:3660 mod:0 status:open open_times:1 last_open_duration:99 alarm:False tdc:no
0005 2023/6/30 07:03:13 bat:3666 mod:0 status:close open_times:1 last_open_duration:141 alarm:False tdc:no
0006 2023/6/30 07:03:32 bat:3666 mod:0 status:open open_times:2 last_open_duration:141 alarm:true tdc:no
0007 2023/6/30 07:03:53 bat:3666 mod:1 status:close open_times:2 last_open_duration:31 alarm:False tdc:no
0008 2023/6/30 07:04:11 bat:3666 mod:1 status:open open_times:3 last_open_duration:31 alarm:true tdc:no
Start Tx events

OK
```

2.4 Payload Decoder file

In TTN, use can add a custom payload so it shows friendly.

In the page **Applications --> Payload Formats --> Custom --> decoder** to add the decoder from: https://github.com/dragino/dragino-end-node-decoder (https://github.com/dragino/dragino-end-node-decoder)

2.5 Datalog Feature

Datalog Feature is to ensure IoT Server can get all sampling data from Sensor even if the LoRaWAN network is down. For each sampling, DS03A-LB will store the readir future retrieving purposes.

Note:After the device is reset,in cumulative counting mode,the last stored count value will be read as the initial value.

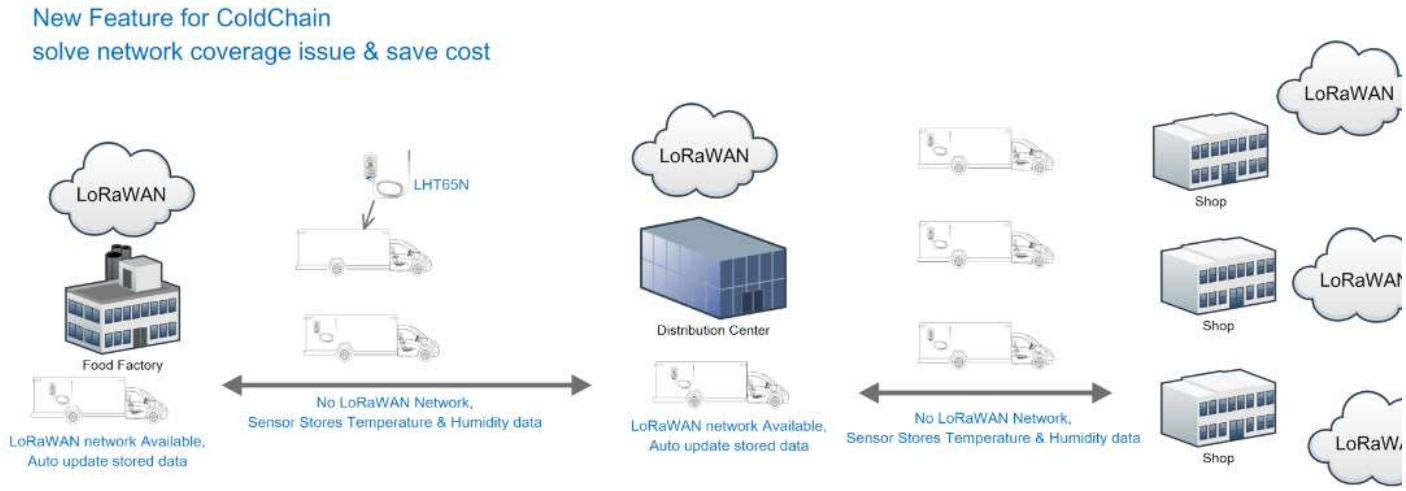
2.5.1 Ways to get datalog via LoRaWAN

Set PNACKMD=1, DS03A-LB will wait for ACK for every uplink, when there is no LoRaWAN network,DS03A-LB will mark these records with non-ack messages and store sensor data, and it will send all messages (10s interval) after the network recovery.

- a) DS03A-LB will do an ACK check for data records sending to make sure every data arrive server.

- b) DS03A-LB will send data in **CONFIRMED Mode** when PNACKMD=1, but DS03A-LB won't re-transmit the packet if it doesn't get ACK, it will just mark it as a NOI ACK message. In a future uplink if DS03A-LB gets a ACK, DS03A-LB will consider there is a network connection and resend all NONE-ACK Message.

Below is the typical case for the Datalog Feature (Set PNACKMD=1)



2.5.2 Unix TimeStamp

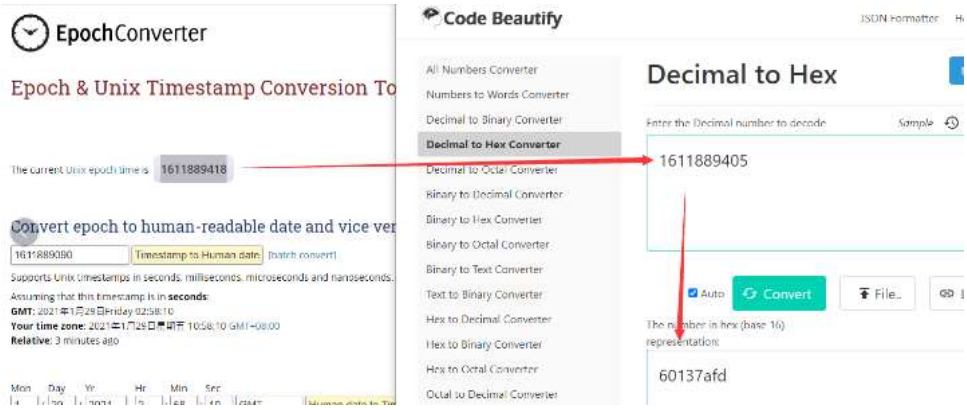
DS03A-LB uses Unix TimeStamp format based on

Size (bytes)	4	1
DeviceTimeAns Payload	32-bit unsigned integer : Seconds since epoch*	8bits unsigned integer: fractional-second in ½^8 second steps

Figure 10 : DeviceTimeAns payload format

User can get this time from link: https://www.epochconverter.com/ (https://www.epochconverter.com/) :

Below is the converter example



So, we can use AT+TIMESTAMP=1611889405 or downlink 3060137afd00 to set the current time 2021 – Jan -- 29 Friday 03:03:25

2.5.3 Set Device Time

User need to set **SYNCMOD=1** to enable sync time via MAC command.

Once DS03A-LB Joined LoRaWAN network, it will send the MAC command (DeviceTimeReq) and the server will reply with (DeviceTimeAns) to send the current time to DS03A-LB. If DS03A-LB fails to get the time from the server, DS03A-LB will use the internal time and wait for next time request (AT+SYNCTDC to set the time request pe default is 10 days).

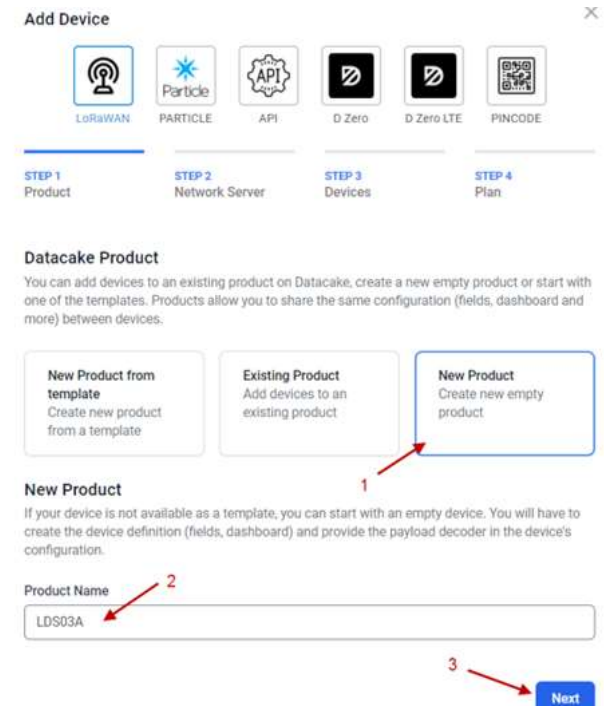
Note: LoRaWAN Server need to support LoRaWAN v1.0.3(MAC v1.0.3) or higher to support this MAC command feature, Chirpstack,TTN v3 and loriot support b TTN v2 doesn't support. If server doesn't support this command, it will through away uplink packet with this command, so user will lose the packet with time request for TTN v2 if SYNCMOD=1.

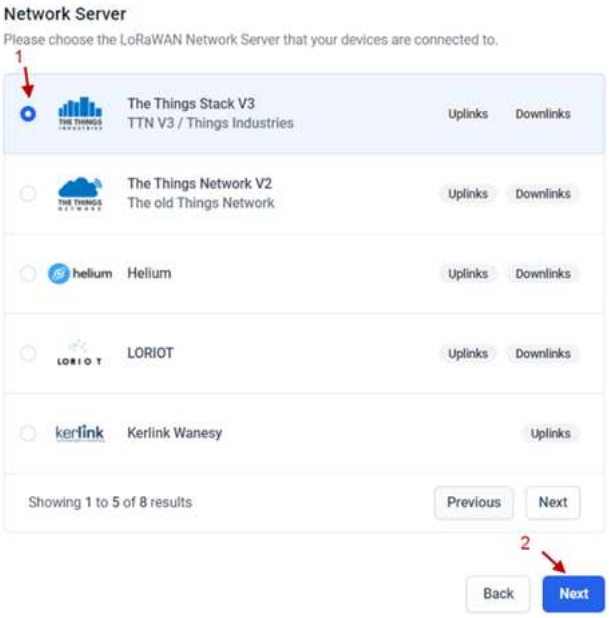
2.6 Show Data in DataCake IoT Server

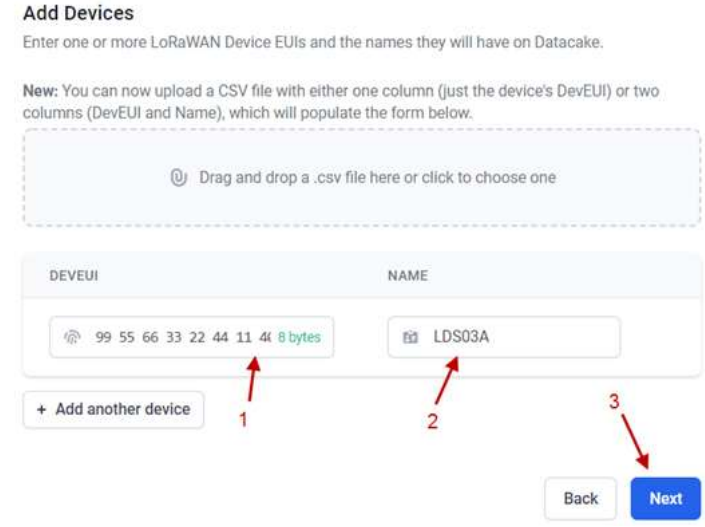
Datacake IoT platform provides a human-friendly interface to show the sensor data, once we have sensor data in TTN V3, we can use Datacake to connect to TTN V3 an the data in Datacake. Below are the steps:

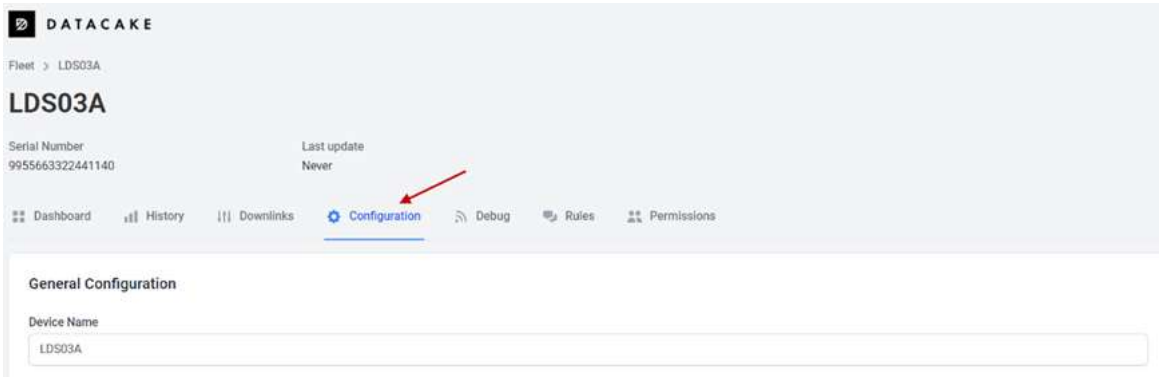
Step 1: Link TTNv3 to Datacake.https://docs.datacake.de/lorawan/lns/thethingsindustries#create-integration-on-tti (https://docs.datacake.de/lorawan/lns/thethingsindustries#create-integration-on-tti)

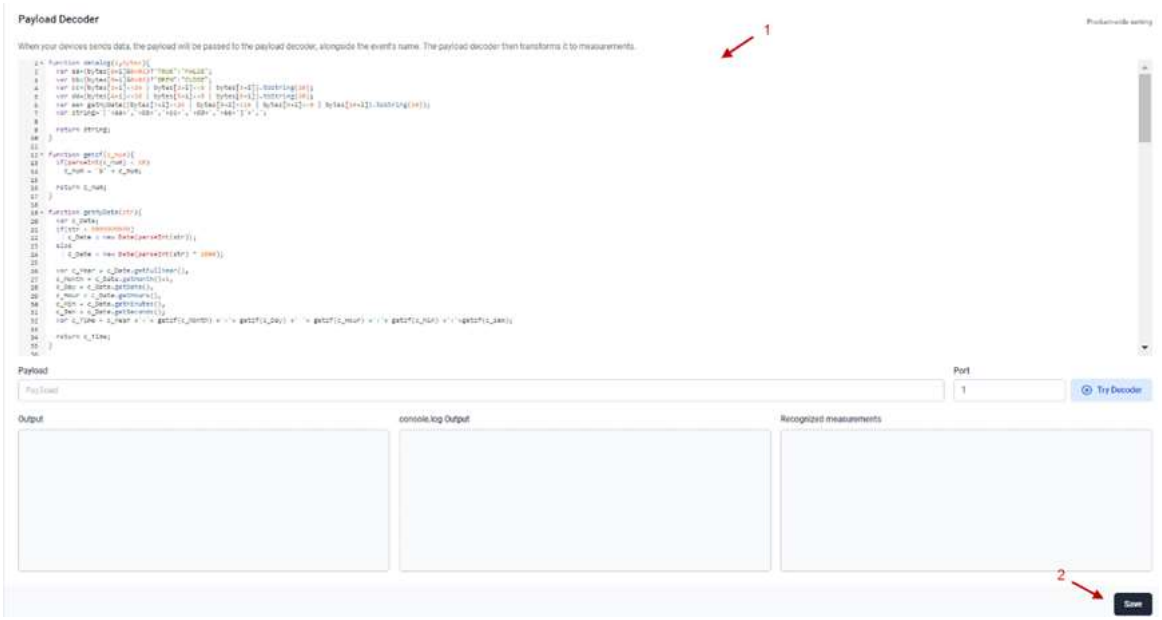
Step 2: Configure DS03A-LB in Datacake.


Add Device
LoRaWAN
PARTICLE
API
D Zero
D Zero LTE
PINCODE
STEP 1
Product
STEP 2
Network Server
STEP 3
Devices
STEP 4
Plan
Datacake Product
You can add devices to an existing product on Datacake, create a new empty product or start with one of the templates. Products allow you to share the same configuration (fields, dashboard and more) between devices.
New Product from template
Create new product from a template
Existing Product
Add devices to an existing product
New Product
Create new empty product
1
New Product
If your device is not available as a template, you can start with an empty device. You will have to create the device definition (fields, dashboard) and provide the payload decoder in the device's configuration.
Product Name
2
LDS03A
3
Next

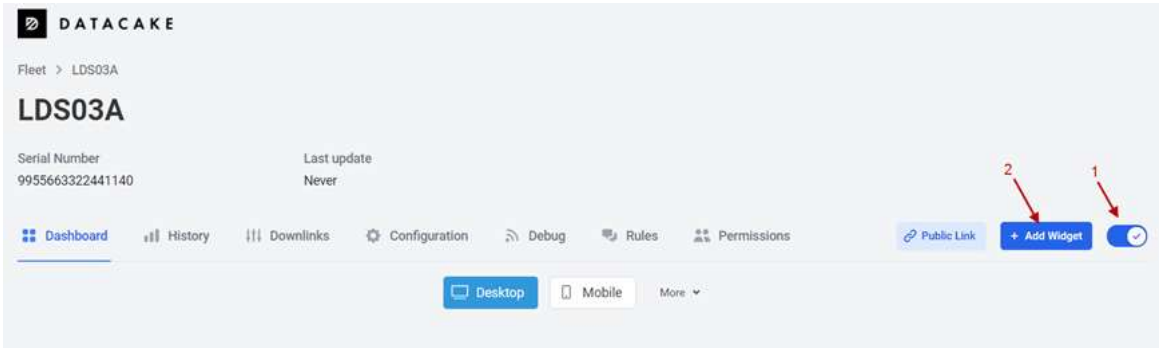

Network Server
Please choose the LoRaWAN Network Server that your devices are connected to.
1
The Things Stack V3
TTN V3 / Things Industries
Uplinks
Downlinks
The Things Network V2
The old Things Network
Uplinks
Downlinks
Helium
Uplinks
Downlinks
LORIOT
Uplinks
Downlinks
Kerlink Wanesy
Uplinks
Showing 1 to 5 of 8 results
Previous
Next
2
Back
Next

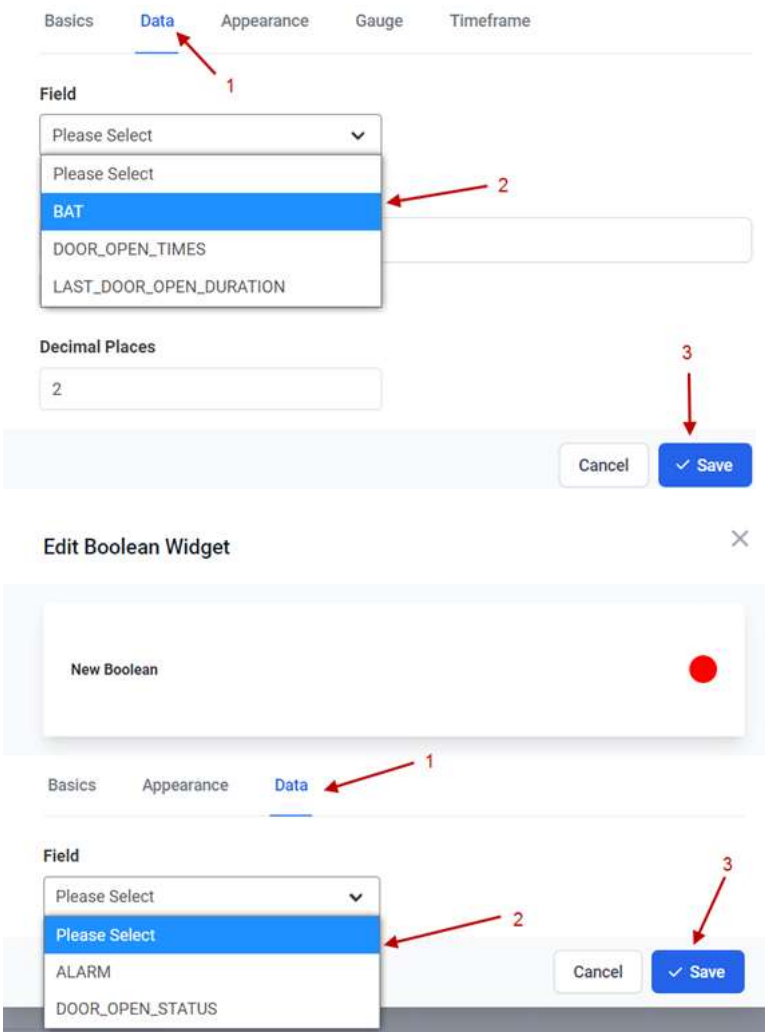

Add Devices
Enter one or more LoRaWAN Device EUIs and the names they will have on Datacake.
New: You can now upload a CSV file with either one column (just the device's DevEUI) or two columns (DevEUI and Name), which will populate the form below.
Drag and drop a .csv file here or click to choose one
DEVEUI
NAME
99 55 66 33 22 44 11 4(8 bytes
LDS03A
+ Add another device
1
2
3
Back
Next

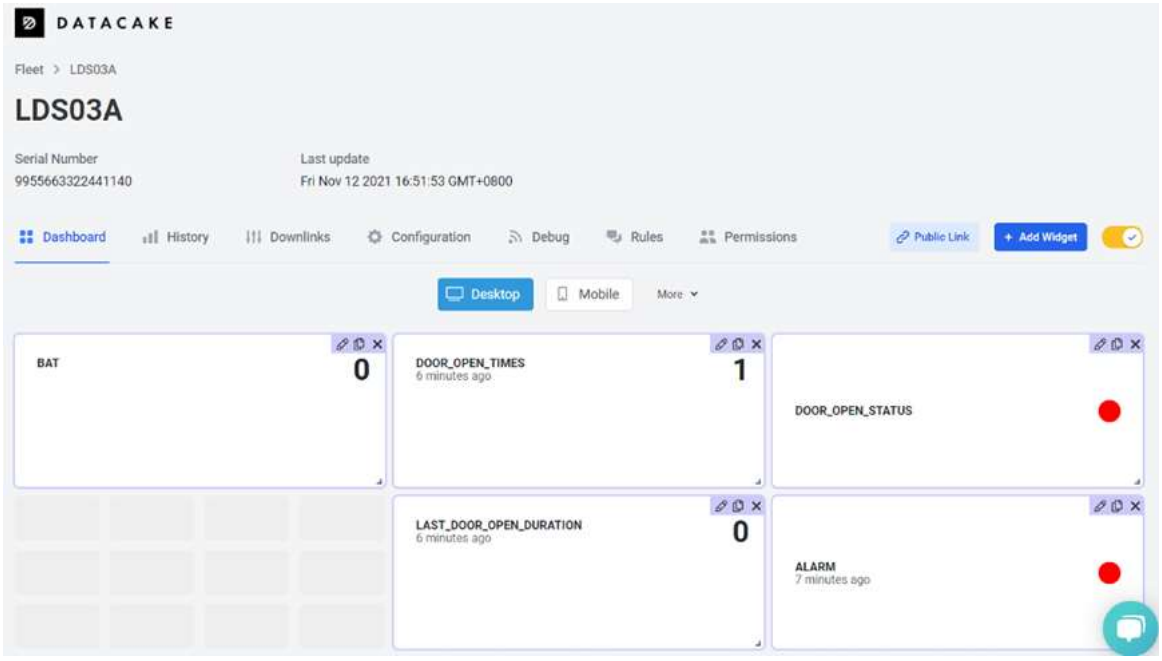

DATACAKE
Fleet > LDS03A
LDS03A
Serial Number
9955663322441140
Last update
Never
Dashboard
History
Downlinks
Configuration
Debug
Rules
Permissions
General Configuration
Device Name
LDS03A


Payload Decoder
1
Payload
Port
Try Decoder
Output
console.log Output
Recognized measurements
2
Save


Fields
Fields describe the data the device will store.
1
+ Add Field
2
NAME
IDENTIFIER
TYPE
CURRENT VALUE
LAST UPDATE
BAT
BAT
Float
0
5 minutes ago
DOOR_OPEN_TIMES
DOOR_OPEN_TIMES
Float
0
3 minutes ago
LAST_DOOR_OPEN_DURATION
LAST_DOOR_OPEN_DURATION
Float
0
3 minutes ago
ALARM
ALARM
Boolean
False
a few seconds ago
DOOR_OPEN_STATUS
DOOR_OPEN_STATUS
Boolean
False
a few seconds ago


DATACAKE
Fleet > LDS03A
LDS03A
Serial Number
9955663322441140
Last update
Never
2
1
Dashboard
History
Downlinks
Configuration
Debug
Rules
Permissions
Public Link
+ Add Widget
Desktop
Mobile
More





2.7 Frequency Plans

The DS03A-LB uses OTAA mode and below frequency plans by default. If user want to use it with different frequency plan, please refer the AT command sets.

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20Frequency%20Band/ (http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20Frequency%20Band/

2.8 Firmware Change Log

Firmware download link: https://www.dropbox.com/sh/b0uwyzjs4px4eao/AADvI7fPRwsFKTgIEmaRRuaaa?dl=0
(https://www.dropbox.com/sh/b0uwyzjs4px4eao/AADvI7fPRwsFKTgIEmaRRuaaa?dl=0)

3. Configure DS03A-LB

3.1 Configure Methods:

DS03A-LB supports below configure method:

- AT Command via Bluetooth Connection (**Recommended**): BLE Configure Instruction (http://wiki.dragino.com/xwiki/bin/view/Main/BLE%20Bluetooth%20Remote%20Configure/) .
- AT Command via UART Connection : See Connection (http://wiki.dragino.com/xwiki/bin/view/Main/UART%20Access%20for%20LoRa%20ST%20v4%20base%20model/#H2.3UARTConnectionforSN50v3basemotherboa
- LoRaWAN Downlink. Instruction for different platforms: See IoT LoRaWAN Server (http://wiki.dragino.com/xwiki/bin/view/Main/) section.

3.2 General Commands

These commands are to configure:

- General system settings like: uplink interval.
- LoRaWAN protocol & radio related command.

They are same for all Dragino Devices which support DLWS-005 LoRaWAN Stack. These commands can be found on the wiki:

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20AT%20Commands%20and%20Downlink%20Command/
(http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20AT%20Commands%20and%20Downlink%20Command/)

3.3 Commands special design for DS03A-LB

These commands only valid for DS03A-LB, as below:

3.3.1 Set Transmit Interval Time

Feature: Change LoRaWAN End Node Transmit Interval.

AT Command: AT+TDC

Command Example	Function	Response
AT+TDC=?	Show current transmit Interval	30000 OK the interval is 30000ms = 30s
AT+TDC=60000	Set Transmit Interval	OK Set transmit interval to 60000ms = 60 seconds

Downlink Command: 0x01

Format: Command Code (0x01) followed by 3 bytes time value.

If the downlink payload=0100003C, it means set the END Node's Transmit Interval to 0x00003C=60(S), while type code is 01.

- Example 1: Downlink Payload: 0100001E // Set Transmit Interval (TDC) = 30 seconds
- Example 2: Downlink Payload: 0100003C // Set Transmit Interval (TDC) = 60 seconds

3.3.2 Set Power Output Duration

Control the output duration 5V . Before each sampling, device will

1. first enable the power output to external sensor,

2. keep it on as per duration, read sensor value and construct uplink payload

3. final, close the power output.

AT Command: AT+5VT

Command Example	Function	Response
AT+5VT=?	Show 5V open time.	0 (default) OK
AT+5VT=500	Close after a delay of 500 milliseconds.	OK

Downlink Command: 0x07
Format: Command Code (0x07) followed by 2 bytes.

The first and second bytes are the time to turn on.

- Example 1: Downlink Payload: 070000 **--->** AT+5VT=0
- Example 2: Downlink Payload: 0701F4 **--->** AT+5VT=500

3.3.3 Enable / Disable Alarm

Feature: Enable/Disable Alarm for open/close event. Default value 0.

AT Command:

Command Example	Function	Response
AT+DISALARM=1	End node will only send packets in TDC time.	OK
AT+DISALARM=0	End node will send packets in TDC time or status change for door sensor	OK

Downlink Command:

0xA7 01 // Same As AT+DISALARM=1

0xA7 00 // Same As AT+DISALARM=0

3.3.4 Alarm Base on Timeout

DS03A-LB can monitor the timeout for a status change, this feature can be used to monitor some events such as door opening too long etc. Related Parameters are:

- **Keep Status: Status to be monitor**

Keep Status = 1: Monitor Close to Open event

Keep Status = 0: Monitor Open to Close event

- **Keep Time: Timeout to send an Alarm**

Range 0 ~ 65535(0xFFFF) seconds.

If **keep time = 0**, Disable Alarm Base on Timeout feature.

If **keep time > 0**, device will monitor the keep status event and send an alarm when status doesn't change after timeout.

- **Downlink Command**

Command: 0xA9 aa bb cc dd

A9: Command Type Code

aa: 01:TTRIG1; 02:TTRIG2

bb: status to be monitored

cc dd: timeout.

1) AT+TTRIG1 : (PA8 of pin)

AT Command to configure:

- **AT+TTRIG1=1,30 -->** When the **Keep Status** change from close to open, and device remains in open status for more than 30 seconds. DS03A-LB will send an up packet, the Alarm1 bit(the second bit of 1st byte of payload) on this uplink packet is set to 1.

  AT+TTRIG1=0,30 --> When the **Keep Status** change from open to close, and device remains in open status for more than 30 seconds. DS03A-LB will send an up packet, the Alarm1 bit (the second bit of 1st byte of payload) on this uplink packet is set to 1.
- **AT+TTRIG1=0,0 -->** Default Value, disable timeout Alarm.

Downlink Command to configure:

If user send 0xA9 01 01 00 1E: equal to AT+TTRIG1=1,30 **or** 0xA9 01 00 00 00: Equal to AT+TTRIG1=0,0.

2) AT+TTRIG2 : (PA4 of pin,need to use AT+TTRCHANNEL=2)

AT Command to configure:

- **AT+TTRIG2=1,30 -->** When the **Keep Status** change from close to open, and device remains in open status for more than 30 seconds. DS03A-LB will send an up packet, the Alarm2 bit (the second bit of 12st byte of payload) on this uplink packet is set to 1.

  AT+TTRIG2=0,30 --> When the **Keep Status** change from open to close, and device remains in open status for more than 30 seconds. DS03A-LB will send an up packet, the Alarm2 bit (the second bit of 12st byte of payload) on this uplink packet is set to 1.
- **AT+TTRIG2=0,0 -->** Default Value, disable timeout Alarm.

Downlink Command to configure:

If user send 0xA9 02 00 00 1E: equal to AT+TTRIG2=0,30 **or** 0xA9 02 00 00 00: Equal to AT+TTRIG2=0,0.

3.3.5 TTRIG1 & TTRIG2 timeout status alarm

It needs to be used with AT+TTRIG1 or AT+TTRIG2. When TTRIG1 or TTRIG2 times out and causes an alarm, and the status does not change subsequently, an alarm pa will be sent at the alarm interval.

AT Command:

Command Example	Function	Response
AT+TTRALARM=0	disable continuous alarm	OK
AT+TTRALARM=60	The alarm interval is 60 minutes (unit: minutes)	OK

Downlink Command:

Example: 0C aa => AT+TTRALARM= aa

3.3.6 Count Mod

Feature: Manually set the count mode.

AT Command:

Command Example	Function	Response
AT+COUNTMOD=0	the count value keeps accumulating mode	OK
AT+COUNTMOD=1	the count value will be reset after each TDC time(Last Close Duration Reset after each uplink)	OK

Downlink Command:

Example: 0B aa => AT+COUNTMOD = second byte

3.3.7 Number of channel of door sensors

Feature: Set the number of door sensor channels.

AT Command:

Command Example	Function	Response
AT+TTRCHANNEL=1	Set as single channel, only use PA8 pin as interrupt pin.	OK
AT+TTRCHANNEL=2	Set as dual channel, use PA8 pin and PA4 pin as interrupt pin.	OK

Downlink Command:

Example: 0D aa => AT+TTRCHANNEL = second byte

3.3.8 Set Time Sync Mode

Feature: Enable/Disable Sync system time via LoRaWAN MAC Command (DeviceTimeReq), LoRaWAN server must support v1.0.3 protocol to reply to this command.

SYNCMOD is set to 1 by default. If user wants to set a different time from the LoRaWAN server, the user needs to set this to 0.

AT Command:

Command Example	Function	Response
AT+SYNCMOD=1	Enable Sync system time via LoRaWAN MAC Command (DeviceTimeReq) The default is zero time zone.	OK

AT+SYNCMOD=1,8	Enable Sync system time via LoRaWAN MAC Command (DeviceTimeReq) Set to East eight time zone.	OK
AT+SYNCMOD=1,-12	Enable Sync system time via LoRaWAN MAC Command (DeviceTimeReq) Set to West Twelve Time Zone.	OK

Downlink Command:

0x28 01 // Same As AT+SYNCMOD=1

0x28 01 08 // Same As AT+SYNCMOD=1,8

0x28 01 F4 // Same As AT+SYNCMOD=1,-12

0x28 00 // Same As AT+SYNCMOD=0

3.3.9 Clear the open door times and the duration of the last open door

AT Command:

Command Example	Function	Response
AT+CLRC	clear the open door times and the duration of the last open door.	OK

Downlink Command:0xA6 01

The sensor will clear the open door times and the duration of the last open door.

3.3.10 Set the count value of the number of open door

AT Command:

Command Example	Function	Response
AT+SETCNT=1,100	Set the open door times of PA8 pin to 100 times.	OK
AT+SETCNT=1,0	Clear the open door times of PA8 pin.	OK
AT+SETCNT=2,50	Set the open door times of PA4 pin to 100 times.	OK

Downlink Command:

0xA6 01 00 00 64 ==> AT+SETCNT=1,100

0xA6 01 00 00 00 ==> AT+SETCNT=1,0

0xA6 02 00 00 32 ==> AT+SETCNT=2,50

4. Battery & Power Consumption

DS03A-LB use ER26500 + SPC1520 battery pack. See below link for detail information about the battery info and how to replace.

Battery Info & Power Consumption Analyze
(http://wiki.dragino.com/xwiki/bin/view/Main/How%20to%20calculate%20the%20battery%20life%20of%20Dragino%20sensors%3F/) .

5. OTA firmware update

User can change firmware DS03A-LB to:

- Change Frequency band/ region.
- Update with new features.
- Fix bugs.

Firmware and changelog can be downloaded from : **Firmware download link (http://wiki.dragino.com/xwiki/bin/view/Main/Firmware%20OTA%20Update%20for%20Sensors/)**

Methods to Update Firmware:

- (Recommanded way) OTA firmware update via wireless: **http://wiki.dragino.com/xwiki/bin/view/Main/Firmware%20OTA%20Update%20for%20Sensors/ (http://wiki.dragino.com/xwiki/bin/view/Main/Firmware%20OTA%20Update%20for%20Sensors/)**
- Update through UART TTL interface: **Instruction (http://wiki.dragino.com/xwiki/bin/view/Main/UART%20Access%20for%20LoRa%20ST%20v4%20base%20model/#H1.LoRaSTv4baseHardware)** .

6. FAQ

7. Order Info

Part Number: **DS03A-LB-XX**

XX: The default frequency band

- **AS923**: LoRaWAN AS923 band
- **AU915**: LoRaWAN AU915 band
- **EU433**: LoRaWAN EU433 band
- **EU868**: LoRaWAN EU868 band
- **KR920**: LoRaWAN KR920 band
- **US915**: LoRaWAN US915 band
- **IN865**: LoRaWAN IN865 band
- **CN470**: LoRaWAN CN470 band

8. Packing Info

Package Includes:

- DS03A-LB LoRaWAN Temperature Sensor

Dimension and weight:

- Device Size: cm
- Device Weight: g
- Package Size / pcs : cm
- Weight / pcs : g

9. Support

- Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8. Due to different timezones we cannot offer live support. However, your questions will be answer soon as possible in the before-mentioned schedule.
- Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to Support@dragino.cc (mailto:Support@dragino.cc) .