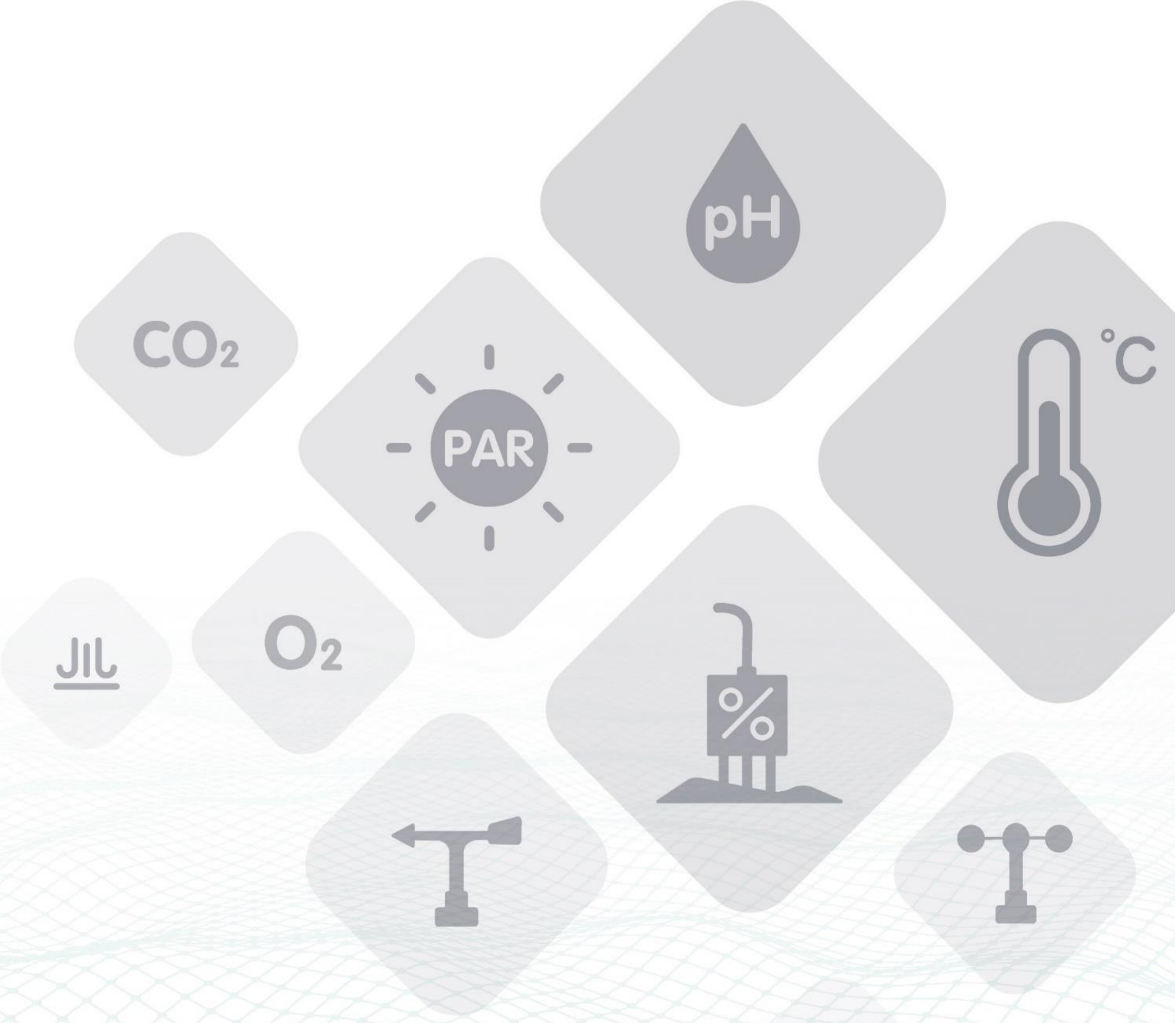
SENSECAP

SenseCAP Application Note

How to work with The Things Gateway and add device in TTN console

Version: V1.0



© 2008-2019 Seeed Technology Co., Ltd. All rights reserved. www.seeed.cc

Table of Contents

© 2008-2019 Seeed Technology Co., Ltd. All rights reserved. www.seeed.cc

1.Overview

SenseCAP Sensor Nodes are designed on The Things Network LoRaWAN servers, the firmware supports standard LoRaWAN 1.0 protocol, making it possible to connect to other 3rd-party LoRaWAN gateways and servers.

When using SenseCAP Sensor Nodes with SenseCAP LoRaWAN Gateway, there is no need of complex configuration. You can use it out-of-the-box, with the cloud platform and API services, saving you time in development.

SenseCAP Sensor Nodes uses OTAA (Over The Air Activation), so theoretically three credentials (Device EUI, App EUI, App Key) are needed to configure and adapt the SenseCAP Sensor Nodes to your LoRaWAN network.

© 2008-2019 Seeed Technology Co., Ltd. All rights reserved.

2.Retrieve SenseCAP Credentials

Get device’ s appEUI and appkey

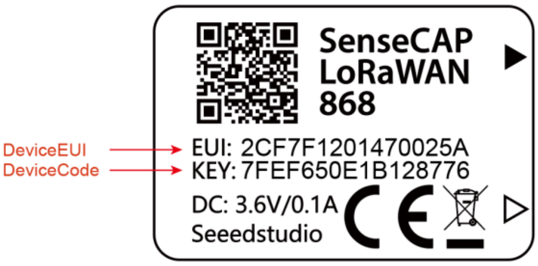
SenseCAP sensor device’ s appEUI and appkey have been flash into device by Seeed. Use HTTP API to retrieve App EUI and App Key. You can use any HTTP tools or browser to issue an HTTP GET request.

```
curl
https://sensecap-makerapi.seeed.cc/v1/security/device/node/acquirePrivateLorawanDeviceinfo?nodeEui=2CF7F1201470025A&deviceCode=7FEF650E1B128776
```

In the API, replace the **DeviceEUI** and deviceCode with your own **Device EUI** and Device Code respectively. And you will get the following response.

```
{
  "code": "0",
  "data": {
    "nodeEui": "2CF7F1201470025A",
    "deviceCode": "7FEF650E1B128776",
    "lorawanInformation": {
      "dev_eui": "2CF7F1201470025A",
      "app_eui": "8000000000000006",
      "app_key": "8B6E4F5DA7DB9A485C9A60D36CD2EA39"
    }
  },
  "time": 0.01
}
```

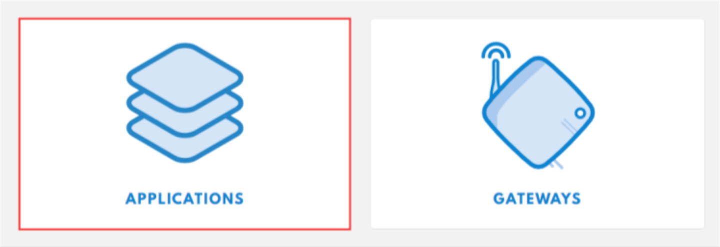
DeviceEUI and DeviceCode is on the SenseCAP product label.



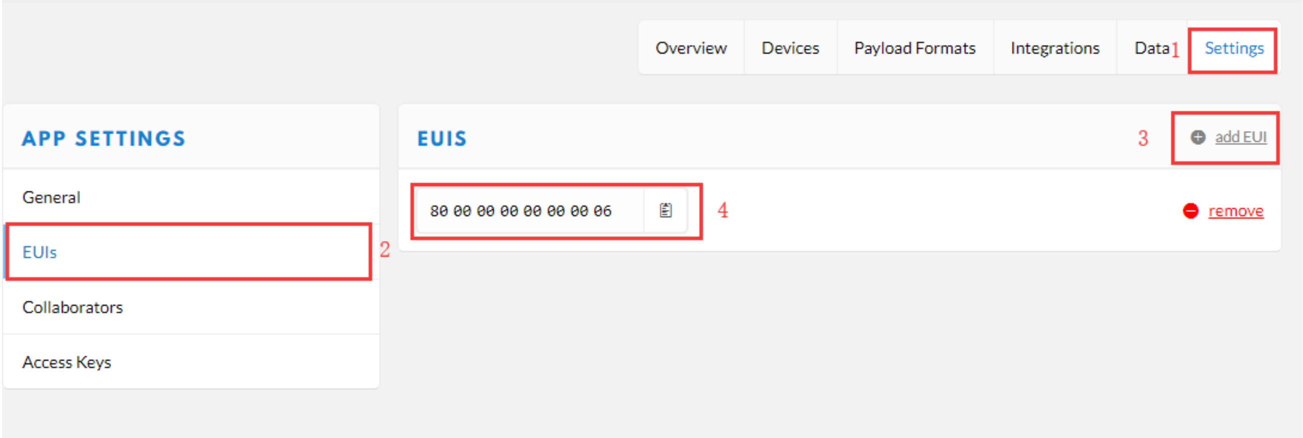
Add appEUI in The things network Console

Login TTN console https://console.thethingsnetwork.org/

Click Applications

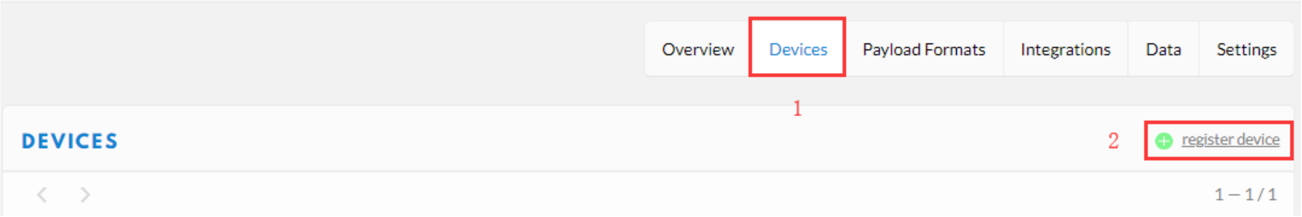


Then chose Settings->EUIs->add EUI->add device’ s appEUI

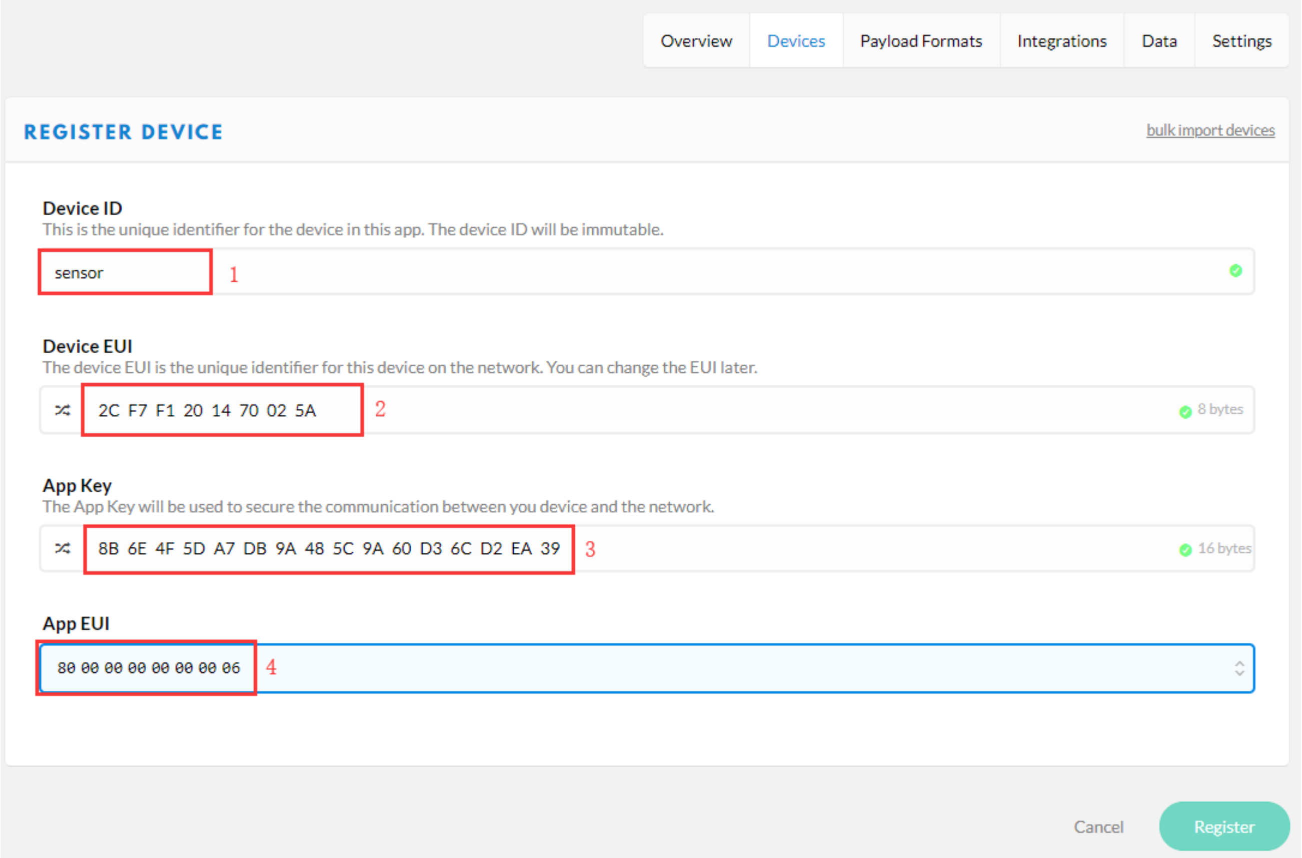


Add Devices

Chose Devices->Register device



Then name your device and past the Device EUI and App Key(get it from HTTP API), chose the App EUI you just added. At last , click the Register button. A new device has been add in your TTN account.



Device ID
This is the unique identifier for the device in this app. The device ID will be immutable.
sensor

Device EUI
The device EUI is the unique identifier for this device on the network. You can change the EUI later.
2C F7 F1 20 14 70 02 5A

App Key
The App Key will be used to secure the communication between you device and the network.
8B 6E 4F 5D A7 DB 9A 48 5C 9A 60 D3 6C D2 EA 39

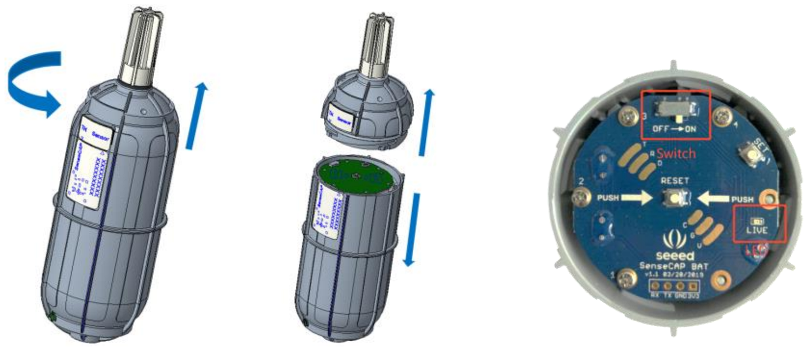
App EUI
80 00 00 00 00 00 00 06

The next step is power on the device and check the data on console

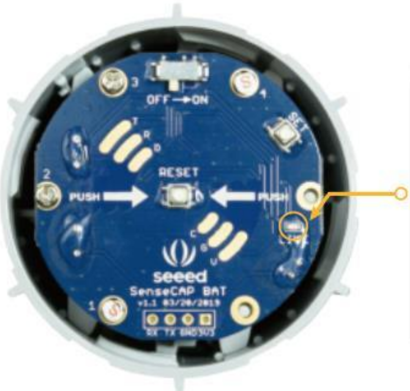
© 2008-2019 Seeed Technology Co., Ltd. All rights reserved. www.seeed.cc

3.Power on the Device

1) The switch is hidden inside the device. You can open the device by turning the Sensor Probe part counterclockwise.



2) After opening the device, flip the switch to “ON”, the LED on the lower-right corner will flash, indicating it’ s powered on. Please wait for 5~10 seconds, and the LED will flash quickly for 2 seconds, indicating it’ s connected to the network.



LED Status

After powering on the device

1. Flashing once after powering on 1s later, then turn OFF
2. Quick flashing for 2s about 5s later, means join the network sucessfully
3. Stay OFF to save battey after join the network
4. Please push the reset button to re-join the network if the LED still not start quick flashing 15s after powering on

After powering on the device:

(1) The LED will flash once, and then it’ s in OFF status.

(2) Wait for about 5s, it will quick flash for 2s, indicating it’ s connected to the network.

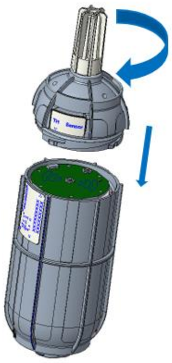
seeed The IoT Hardware Enabler © 2008-2019 Seeed Technology Co., Ltd. All rights reserved. www.seeed.cc

(3) Stay OFF to save power consumption after joining the network.

(4) After it’ s on for 15s, if the LED doesn’ t flash quickly, press RESET to rejoin the network.

Note: Each device will constantly sync with the cloud within 1 minute after it’ s connected to the network. This process takes up LoRa communication channel. When multiple devices are powered on and connected to the network at the same time, it might congest the LoRa network, leading to failure in accessing the network. Hence, we suggest each device is powered on at an interval of 1 minute.

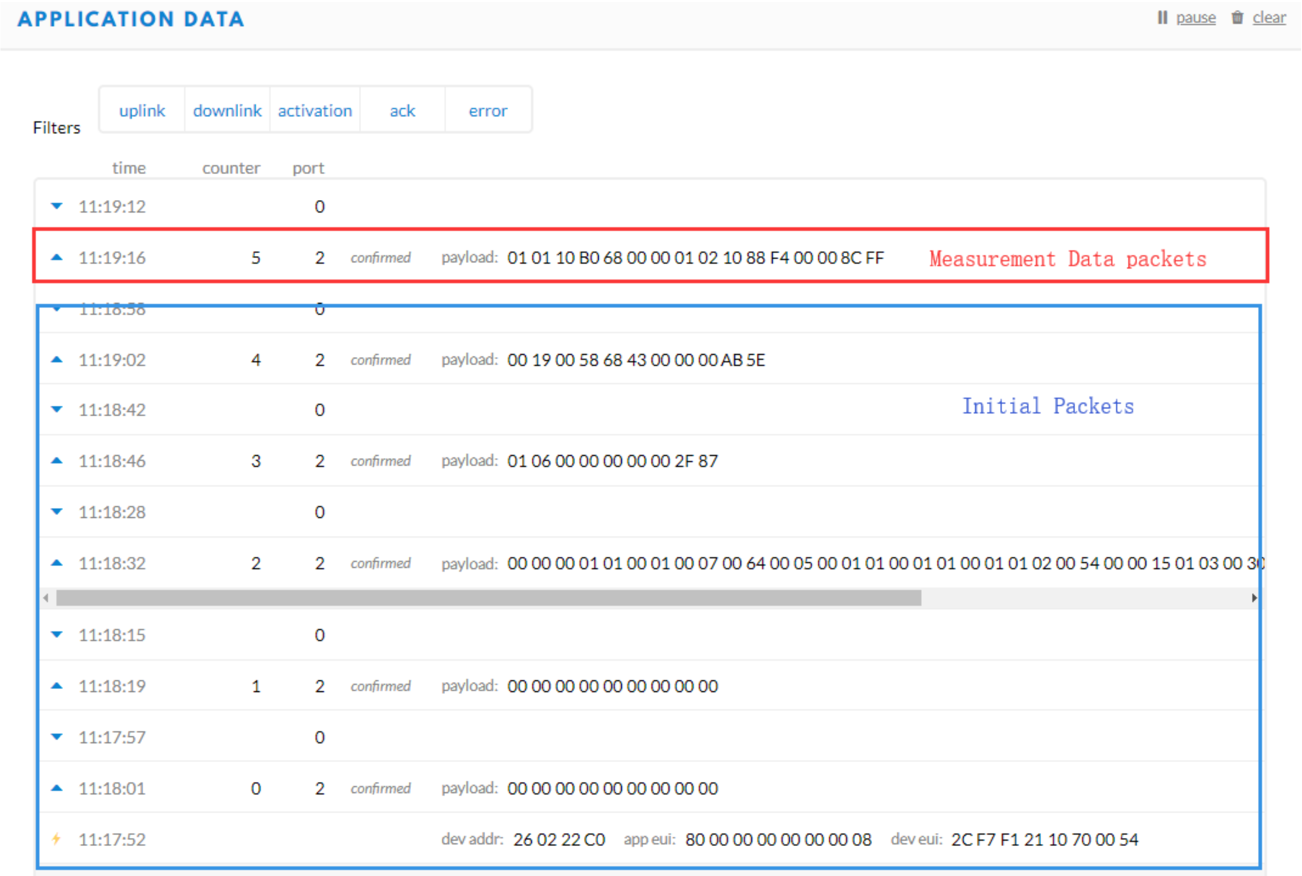
3）After accessing the network, please connect the Sensor Probe back to the Sensor Node Controller by turning it clockwise. Please note the labels on both sides should be aligned as the image below, or it will not be put back in the right way. Only when the Sensor Probe is connected to the Sensor Node Controller correctly can the device upload data.



© 2008-2019 Seeed Technology Co., Ltd. All rights reserved. www.seeed.cc

4.Get Data and Parsing

Entering "Data" page, and you will see the network data (if the data doesn' t show up, please press the RESET button on the sensor probe to reconnect to the network).



```
time      counter  port
11:19:12           0
11:19:16  5        2    confirmed  payload: 01 01 10 B0 68 00 00 01 02 10 88 F4 00 00 8C FF
11:18:58           0
11:19:02  4        2    confirmed  payload: 00 19 00 58 68 43 00 00 00 AB 5E
11:18:42           0
11:18:46  3        2    confirmed  payload: 01 06 00 00 00 00 00 2F 87
11:18:28           0
11:18:32  2        2    confirmed  payload: 00 00 00 01 01 00 01 00 07 00 64 00 05 00 01 01 00 01 01 00 01 01 02 00 54 00 00 15 01 03 00 3
11:18:15           0
11:18:19  1        2    confirmed  payload: 00 00 00 00 00 00 00 00 00
11:17:57           0
11:18:01  0        2    confirmed  payload: 00 00 00 00 00 00 00 00 00
11:17:52                           dev addr: 26 02 22 C0   app eui: 80 00 00 00 00 00 00 08   dev eui: 2C F7 F1 21 10 70 00 54
```

With successful access to the network, please connect the Sensor Probe back to the Sensor Node Controller by turning it clockwise. Please note the labels on both sides should be aligned as the image below, or it will not be put back in the right way. When the Sensor Probe is connected to the Sensor Node Controller correctly, the device can upload data.

Packet Parsing

Packet Initialization

seeed studio The IoT Hardware Enabler © 2008-2019 Seeed Technology Co., Ltd. All rights reserved. www.seeed.cc

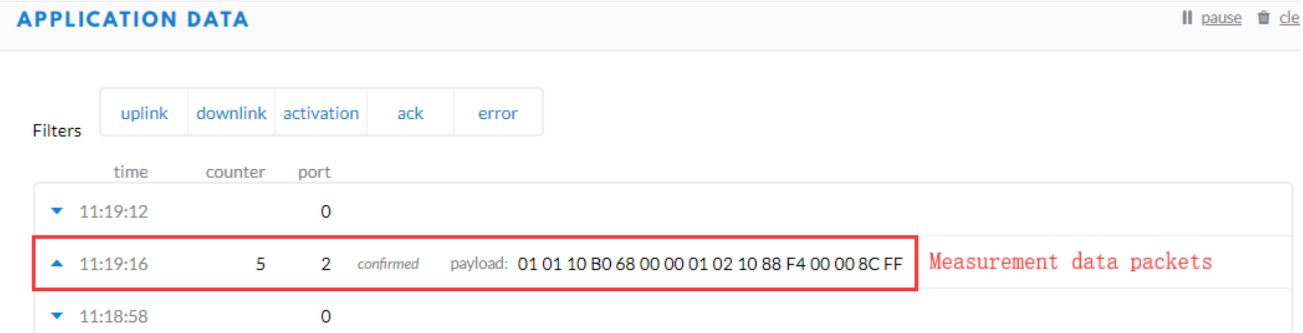
After being powered on or reboot, SenseCAP Sensor Nodes will be connected to the network using OTAA activation method. Each Sensor Node will send data packets to the server, including the following data:

Initial packets **(**no need to learn about these initial packets**)**

- Two all-zero payload packets, to drain pending downlink messages from the server.
- Two packets with device info including hardware version, software version, battery level, sensor hardware & software version, sensor EUI, power and sensor power time counter at each channel.
- One packet to request the UTC time from the server.
- One packet to receive the preset UTC time from the serve.
- One packet to echo the received UTC time to the server (for verification).

Measurement data packets

- The only thing we should pay attention to is the sensor measurement data packets



time	counter	port		
11:19:12		0		
11:19:16	5	2	*confirmed*	payload: 01 01 10 B0 68 00 00 01 02 10 88 F4 00 00 8C FF
11:18:58		0		

Measurement data packets

Packet Structure

The structure of the frame is shown in the image below.

channel	frame type	frame content
1 byte	2 bytes	≥ 4 bytes

© 2008-2019 Seeed Technology Co., Ltd. All rights reserved. www.seeed.cc

1 byte for channel， default as 1, means sensor has been well connected.

2 bytes for frame type, in this case, it will be 0110 and 0210, means temperature value and humidity value

4 bytes for content, is the sensor value with CRC

The frame content is sent in **little-endian byte order**

Example:

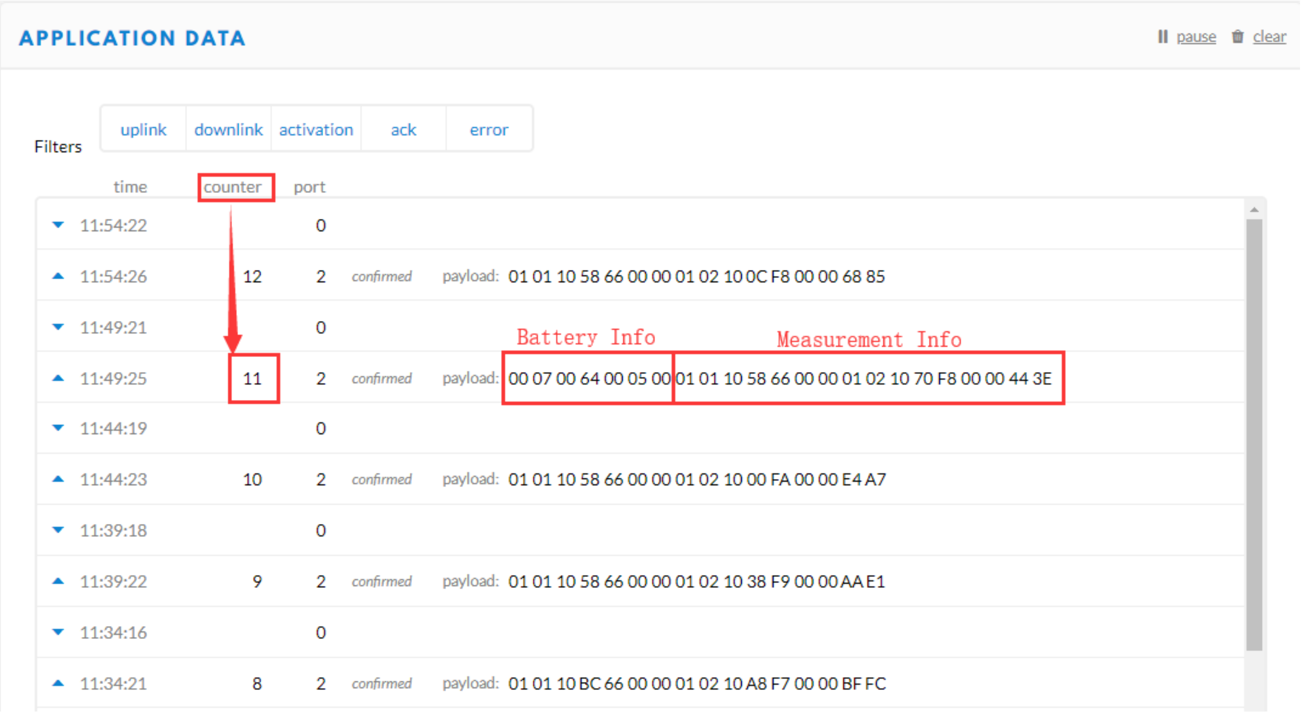
Air Temperature & Humidity Sensor measurement packet: 010110B0680000010210088F400008CFF

Divide the data into 3 sections

1	Temperature	010110B0680000	01 is the channel number. 0110 is 0x1001 *(little-endian byte order)*, which is the measurement ID for air temperature. B0680000 is actually 0x000068B0, whose equivalent decimal value is 26800. Divide it by 1000, you’ ll get the actual measurement value for air temperature as **26.8℃**.
2	Humidity	01021088F40000	0210 is 0x1002 *(little-endian byte order)*, which is the measurement ID for air humidity. 88F40000 is actually 0x0000F488, whose equivalent decimal value is 62600. Divide it by 1000, you’ ll get the actual measurement value for air humidity as 62.6%RH.
3	CRC	8CFF	The CRC verification part.

Exception

Please note the counter number, after 10 packets , it will follows one special packet with battery info.
You can either ignore this packet or get rid of the battery info in your code.



time	counter	port		
▼ 11:54:22		0		
▲ 11:54:26	12	2	confirmed	payload: 01 01 10 58 66 00 00 01 02 10 0C F8 00 00 68 85
▼ 11:49:21		0		
▲ 11:49:25	11	2	confirmed	payload: 00 07 00 64 00 05 00 01 01 10 58 66 00 00 01 02 10 70 F8 00 00 44 3E
▼ 11:44:19		0		
▲ 11:44:23	10	2	confirmed	payload: 01 01 10 58 66 00 00 01 02 10 00 FA 00 00 E4 A7
▼ 11:39:18		0		
▲ 11:39:22	9	2	confirmed	payload: 01 01 10 58 66 00 00 01 02 10 38 F9 00 00 AA E1
▼ 11:34:16		0		
▲ 11:34:21	8	2	confirmed	payload: 01 01 10 BC 66 00 00 01 02 10 A8 F7 00 00 BF FC

Battery Info

Measurement Info

seeed studio The IoT Hardware Enabler

© 2008-2019 Seeed Technology Co., Ltd. All rights reserved.