

Add devices and gateways to ChirpStack

October 2022

1 Create an organization

In order to add gateways and devices to ChirpStack, an organization needs to be created. Below are the steps to follow.

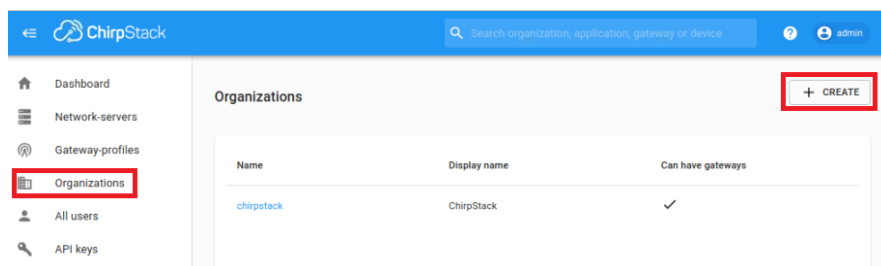


Figure 1: Tab to create an organization.

Organization name *

Aquaculture-project

The name may only contain words, numbers and dashes.

Display name *

Aquaculture-project

Gateways

☒ Organization can have gateways

When checked, it means that organization administrators are able to add their own gateways to the network. Note that the usage of the gateways is not limited to this organization.

Max. number of gateways *

0

The maximum number of gateways that can be added to this organization (0 = unlimited).

Devices

Max. number of devices *

0

The maximum number of devices that can be added to this organization (0 = unlimited).

CREATE ORGANIZATION

Figure 2: Fill in the organization data and press "create organization".

2 Create the Network Server

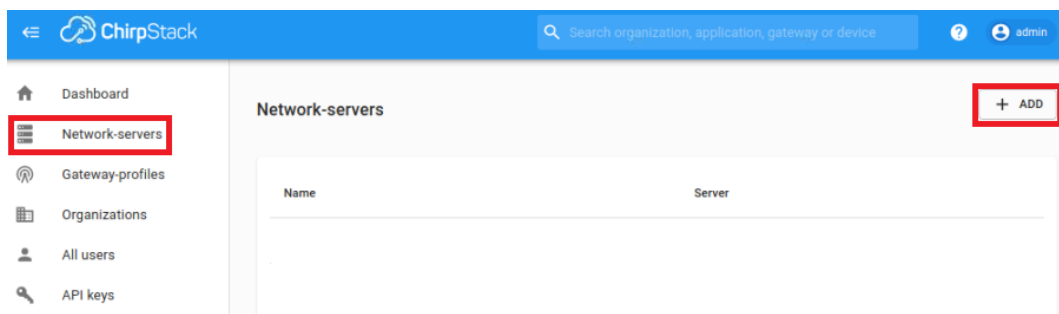


Figure 3: Tab to create the Network Server.



Figure 4: Give the network server a name and fill the following field with the parameter configured in the chirpstack-network-server.toml file.

3 Create a Gateway profile

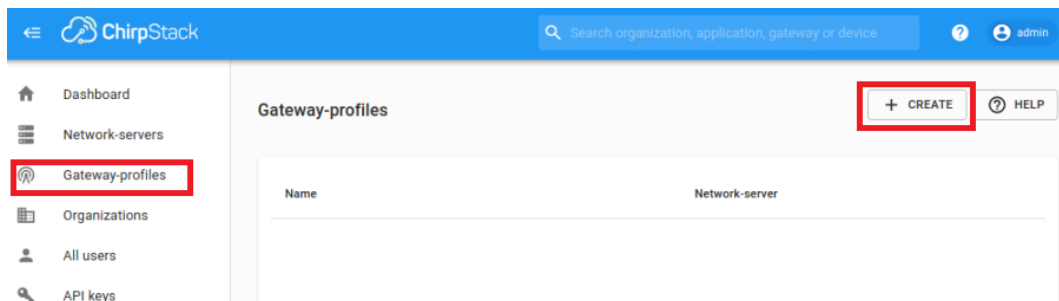


Figure 5: Tab to create the Gateway profile.

Gateway-profiles / Create

Name *
Aqua-pro-GtwProfile
A short name identifying the gateway-profile.

Stats interval (seconds) *
30
The stats interval in which the gateway reports its statistics. The recommended value is 30 seconds.

Enabled channels *
0,1,2
The channels active in this gateway-profile as specified in the LoRaWAN Regional Parameters specification. Separate channels by comma, e.g. 0, 1, 2. Extra channels must not be included in this list.

Network-server *
Aq-Pro-NetServer

ADD EXTRA CHANNEL **CREATE GATEWAY-PROFILE**

Figure 6: Example of the Gateway profile configuration, in this case only 3 channels were enabled, but it can be more, depending on the regional parameters.

4 Create a service profile

Gateways need to be associated with a service profile.

ChirpStack Search organization, application, gateway or device ? admin

Organizations
All users
API keys
Aquaculture-project
Org. dashboard
Org. users
Org. API keys
Service-profiles
Device-profiles
Gateways
Applications

Service-profiles **+ CREATE**

Name	ID	Network Server
Select the organization name		

Figure 7: Tab to create the service profile.

Service-profiles / Create

Service-profile name *

Aqua-pro-ServiceProfile

A name to identify the service-profile.

Network-server *

Aq-Pro-NEtServer

The network-server on which this service-profile will be provisioned. After creating the service-profile, this value can't be changed.

☒ **Add gateway meta-data**

GW metadata (RSSI, SNR, GW geoloc., etc.) are added to the packet sent to the application-server.

☐ **Enable network geolocation**

When enabled, the network-server will try to resolve the location of the devices under this service-profile. Please note that you need to have gateways supporting the fine-timestamp feature and that the network-server needs to be configured in order to provide geolocation support.

Device-status request frequency

0

Frequency to initiate an End-Device status request (request/day). Set to 0 to disable.

Minimum allowed data-rate *

0

Minimum allowed data rate. Used for ADR.

Maximum allowed data-rate *

0

Maximum allowed data rate. Used for ADR.

☐ **Private gateways**

Gateways under this service-profile are private. This means that these gateways can only be used by devices under the same service-profile.

CREATE SERVICE-PROFILE

Figure 8: With the service profile, it is indicated to which network server the gateway will connect, and if signal status parameters will be added.

5 Add a Gateway

With the configurations made so far, a gateway can now be added.

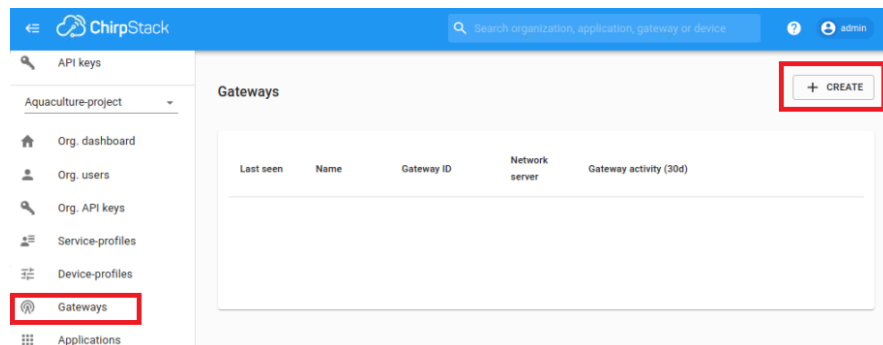


Figure 9: Tab to add a gateway.

Gateways / Create

GENERAL TAGS METADATA

Gateway name *
Aqua-Pro-LoraGtW01
The name may only contain words, numbers and dashes.

Gateway description *
LoRa gateway that integrates the HELTEC HT-M01 module

Gateway ID *
31 33 30 37 29 00 5f 00 **MSB** ↻

Network-server *
Aq-Pro-NEtServer ▼
Select the network-server to which the gateway will connect. When no network-servers are available in the dropdown, make sure a service-profile exists for this organization.

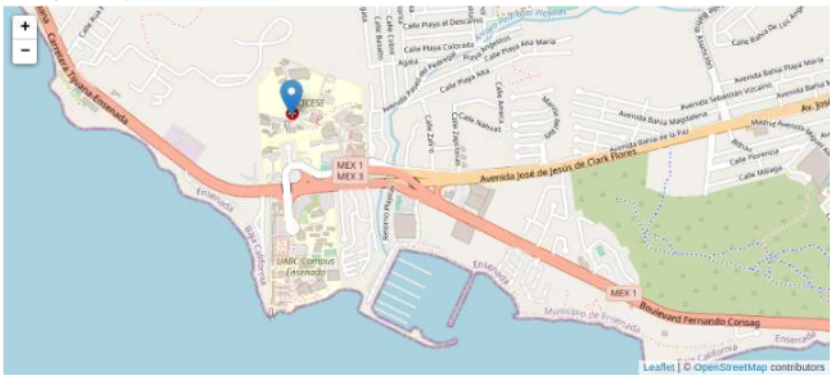
Service-profile
Aqua-Pro-ServiceProfile ▼
Select the service-profile under which the gateway must be added. The available service-profiles depend on the selected network-server, which must be selected first.

Gateway-profile
Aqua-pro-GtwProfile ▼
Optional. When assigning a gateway-profile to the gateway, ChirpStack Network Server will attempt to update the gateway according to the gateway-profile. Note that this does require a gateway with ChirpStack Concentratord.

☐ **Gateway discovery enabled**
When enabled (and ChirpStack Network Server is configured with the gateway discover feature enabled), the gateway will send out periodical pings to test its coverage by other gateways in the same network.

Gateway altitude (meters) *
120
When the gateway has an on-board GPS, this value will be set automatically when the network has received statistics from the gateway.

Gateway location ([set to current location](#))



Drag the marker to the location of the gateway. When the gateway has an on-board GPS, this value will be set automatically when the network receives statistics from the gateway.

ADD BOARD CONFIGURATION **CREATE GATEWAY**

Figure 10: To add the gateway, all the previously created resources are needed, in addition to the Gateway_ID.

At the end of the registration process, it is possible to observe that the least seen status is a few seconds ago.

Gateways

+ CREATE

Last seen	Name	Gateway ID	Network server	Gateway activity (30d)
a few seconds ago	Aqua-Pro-LoraGtw01	3133303729005f00	Aq-Pro-NETServer	

Rows per page: 10 1-1 of 1 < >

Figure 11: Gateway status at the end of the registration process.

It is also possible to see the status of the gateway in the main dashboard of the organization.

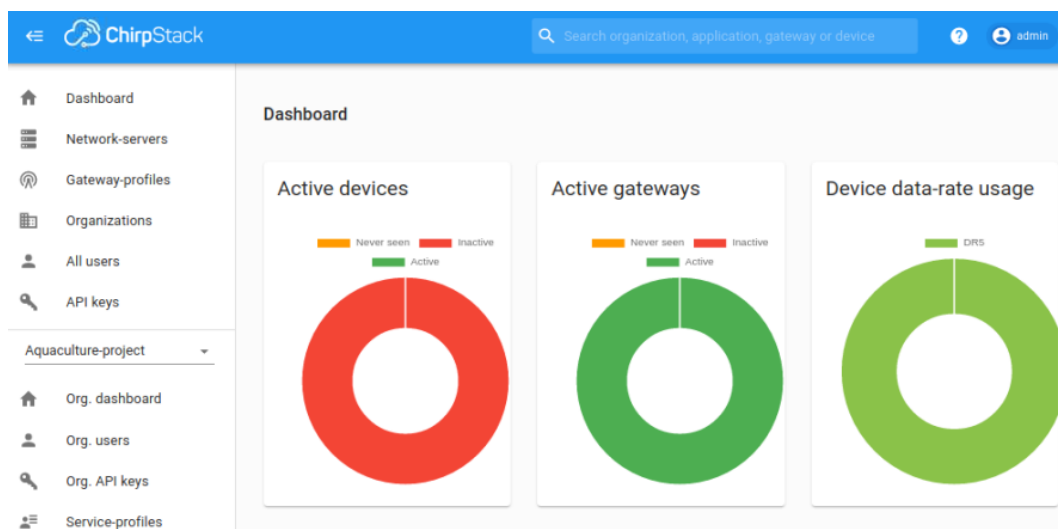


Figure 12: Gateway status on dashboard.

6 Create a device profile

To begin the process of registering a device on ChirpStack, you must already have the service profile. The device profile describes how to connect and authenticate a group of devices.

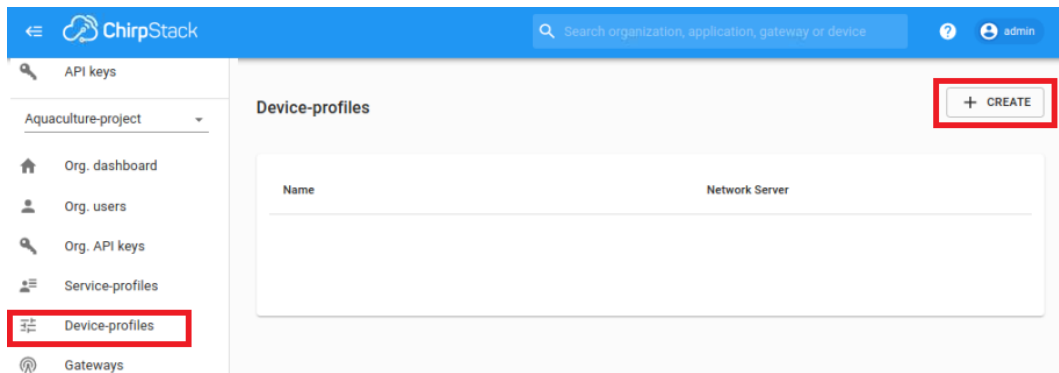


Figure 13: Tap to create the device profile.

For example, in this case it is specified if the devices authenticate through OTAA/APB, if class B or class C devices will be included, and the instructions to encode or decode the device data (CODEC).

The screenshot shows the 'Device-profiles / Create' form. The 'GENERAL' tab is selected. The form includes the following fields:

- Device-profile name ***: Aqua-Pro-DeviceProfile
- Network-server ***: Aq-Pro-NetServer
- LoRaWAN MAC version ***: 1.0.2
- LoRaWAN Regional Parameters revision ***: A
- ADR algorithm ***: Default ADR algorithm (LoRa only)
- Max EIRP ***: 0
- Uplink interval (seconds) ***: 10

The 'CREATE DEVICE-PROFILE' button is visible at the bottom right.

Figure 14: General configuration of the device profile.

Device-profiles / Create

GENERAL JOIN (OTAA / ABP) CLASS-B CLASS-C CODEC TAGS

☒ Device supports OTAA

CREATE DEVICE-PROFILE

Figure 15: It is specified that the device used supports OTAA authentication.

Device-profiles / Create

GENERAL JOIN (OTAA / ABP) CLASS-B CLASS-C CODEC TAGS

☐ Device supports Class-B

CREATE DEVICE-PROFILE

Device-profiles / Create

GENERAL JOIN (OTAA / ABP) CLASS-B CLASS-C CODEC TAGS

☒ Device supports Class-C

Select this option when the device will operate as Class-C device immediately after activation. In case it sends a DeviceModelInd mac-command when it changes to Class-C, do not select this option.

Class-C confirmed downlink timeout *

5

Class-C timeout (in seconds) for confirmed downlink transmissions.

CREATE DEVICE-PROFILE

Figure 16: Specifies whether the device supports class B and class C of the LoRaWAN protocol.

7 Create an application

The application groups devices that perform similar functions, through the device profile, where the CODEC of the data is also found.

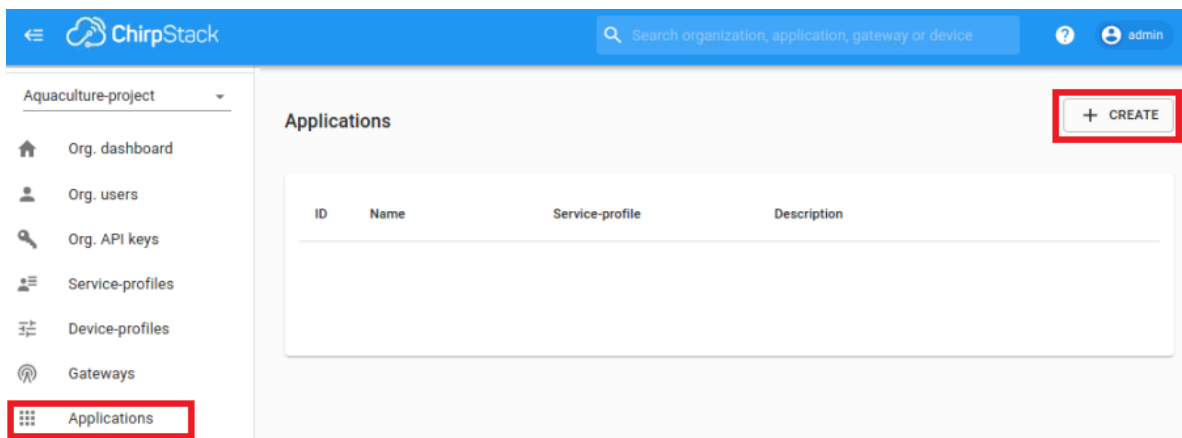


Figure 17: Tap to create an application.

The screenshot shows the 'Applications / Create' form. It has three main input fields: 'Application name *' with the value 'Parameter-sensing', 'Application description *' with the value 'Sensing of DO, pH, temperature and TDS parameters', and 'Service-profile *' with the value 'Aqua-Pro-ServiceProfile'. Below the 'Service-profile' field, there is a note: 'The service-profile to which this application will be attached. Note that you can't change this value after the application has been created.' At the bottom right of the form, there is a 'CREATE APPLICATION' button, highlighted with a red box.

Figure 18: You assign a name and a description of what you are going to do with the devices.

8 Add devices to the app

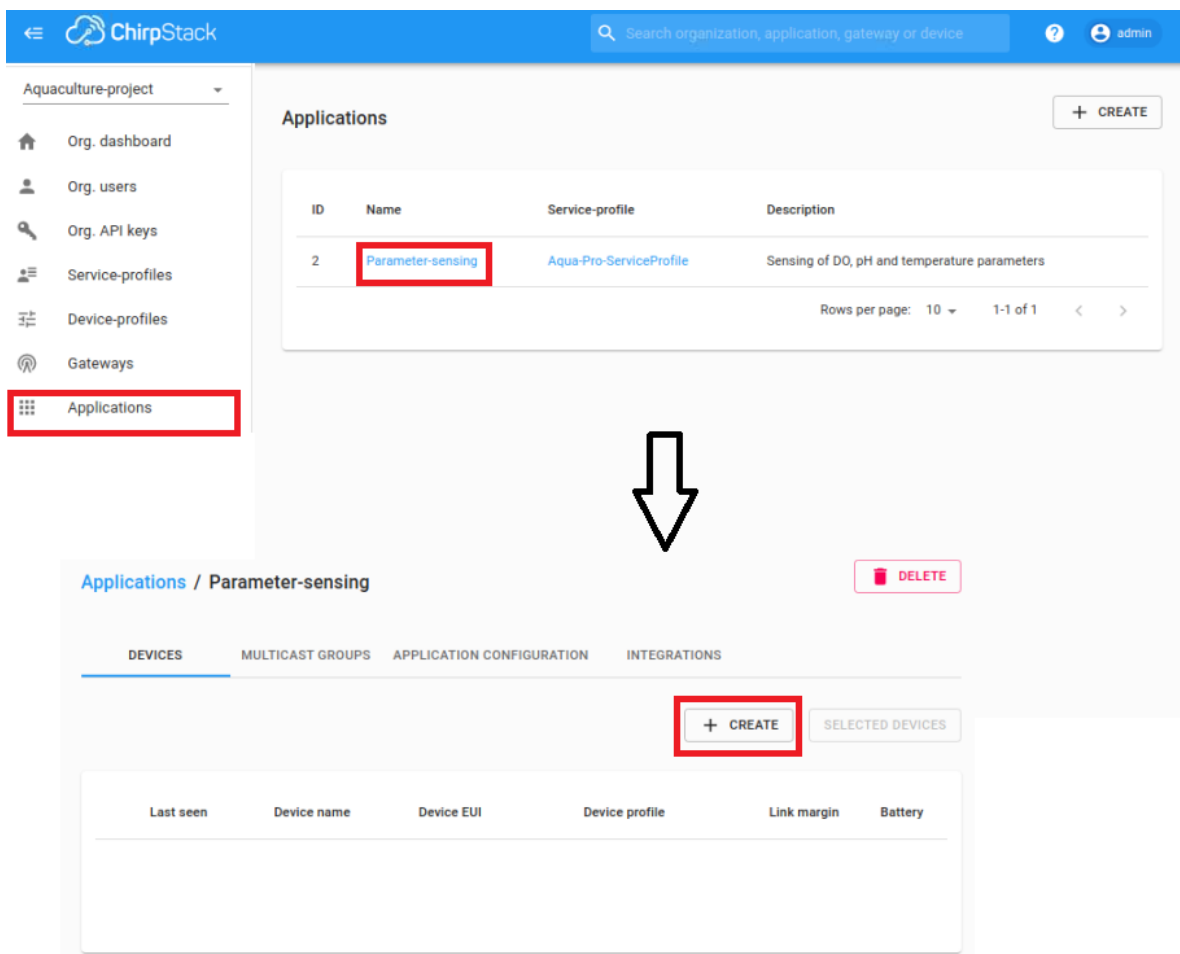


Figure 19: Path to follow to add devices to the app.

Device EUI is primary for OTAA connection. The Device EUI can be generated with the button displayed on the screen and is used in device programming.

The device profile is selected from the tab and the options are displayed.


Applications / Parameter-sensing / Devices / Create


GENERAL VARIABLES TAGS

Device name *
DEVPROF-EU433

The name may only contain words, numbers and dashes.

Device description *
Sensing of DO, pH, temperature and TDS parameters

Device EUI *
06 5e f5 5d b9 52 74 b9 MSB 

Device-profile *
Aqua-Pro-DeviceProfile 

☐ Disable frame-counter validation

Note that disabling the frame-counter validation will compromise security as it enables people to perform replay-attacks.


☐ Device is disabled

ChirpStack Network Server will ignore received uplink frames and join-requests from disabled devices.




CREATE DEVICE

Figure 20: General configuration to add a device to application.

Once the device is configured, the ChirpStack web platform provides the OTAA parameters for device programming. These can be generated in the corresponding tab. There is a button to display the one that is being used, or in another case a new one can be generated.

Applications / Parameter-sensing / Devices / DEVPROF-EU433  DELETE

DETAILS CONFIGURATION **KEYS (OTAA)** ACTIVATION DEVICE DATA LORAW. >

Application key *
6a c5 83 34 32 b8 cc 58 9a 1a 3c b7 81 ec bf 2d MSB   

For LoRaWAN 1.0 devices. In case your device supports LoRaWAN 1.1, update the device-profile first.

SET DEVICE-KEYS

Figure 21: Set OTAA parameters to device.

If the device has not tried to communicate with the gateway at least once, the activation tab is empty. To obtain the activation data it is necessary to make at least

one connection attempt, so the window fills the data to complete the programming of the device. Activation parameters are used to program the device.

Applications / Parameter-sensing / Devices / DEVPROF-EU433-prueba

DETAILS CONFIGURATION KEYS (OTAA) **ACTIVATION** DEVICE DATA LORAW. >

CLEAR DEVNONCE

This device has not (yet) been activated.

Figure 22: Activation tab empty.

Applications / Parameter-sensing / Devices / DEVPROF-EU433

DETAILS CONFIGURATION KEYS (OTAA) **ACTIVATION** DEVICE DATA LORAW. >

CLEAR DEVNONCE

Device address *
01 8b d9 27

MSB

While any device address can be entered, please note that a LoRaWAN compliant device address consists of an AddrPrefix (derived from the NetID) + NwkAddr.

Network session key (LoRaWAN 1.0) *
.....

Application session key (LoRaWAN 1.0) *
.....

Uplink frame-counter *
1

Downlink frame-counter (network) *
1

Figure 23: Activation tab with the parameters.

In the LoRaWAN Frames and Device Data tabs you can view the data that is received from the end node and the events that each packet causes.

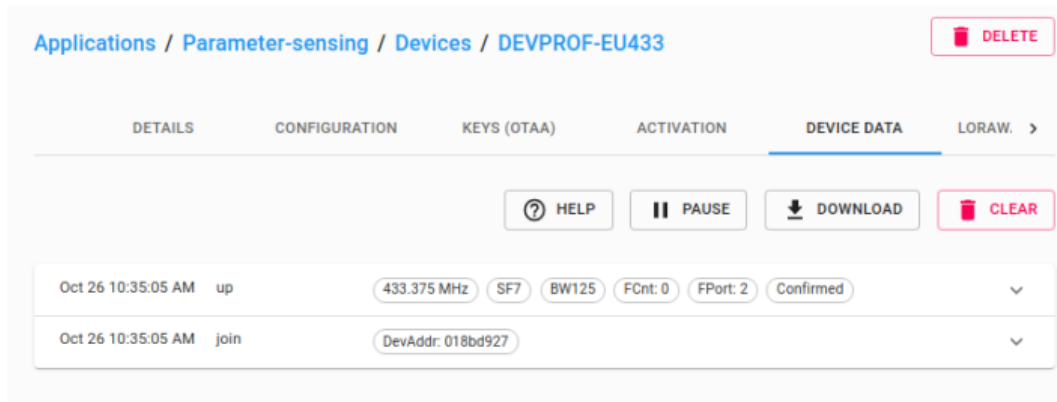


Figure 24: Device Data tab.



Figure 25: LoRaWAN Frames Tab.

It must be considered that the first time the device is connected, authentication may take a few attempts, so you have to wait for the data to start receiving, despite the fact that the LoRaWAN frames are registered in the program.

An example of programming code for a device can be seen in the repository <https://github.com/AleDelMen/Aquaculture-IoT-device> in the path *Aquaculture-IoT-device* → *EndDevice* → *aquaculture_project.ino*.