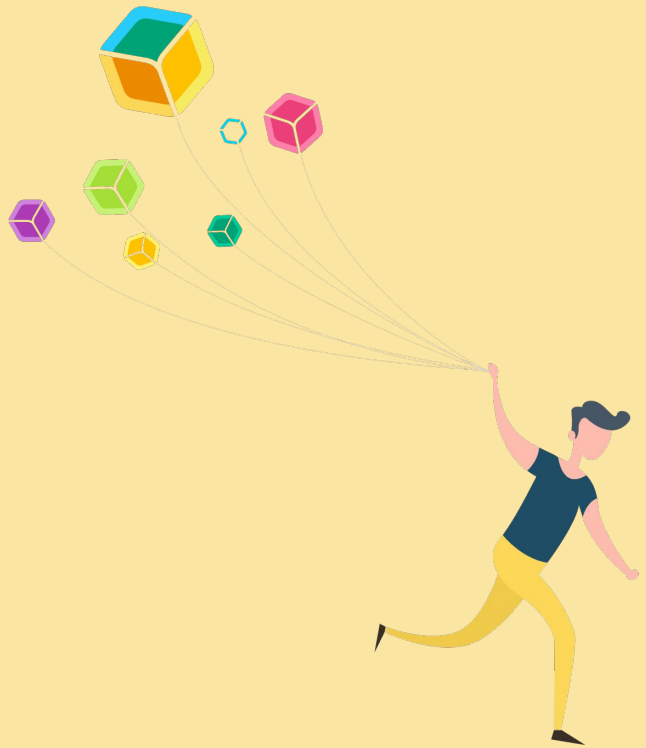


Building your own private LoRaWAN network server and gateway with balena.io in 1 click

The Things Conference 2022 - 23rd of September 2022 - Amsterdam

Speakers

Xose Pérez

Product Owner at RAK Wireless

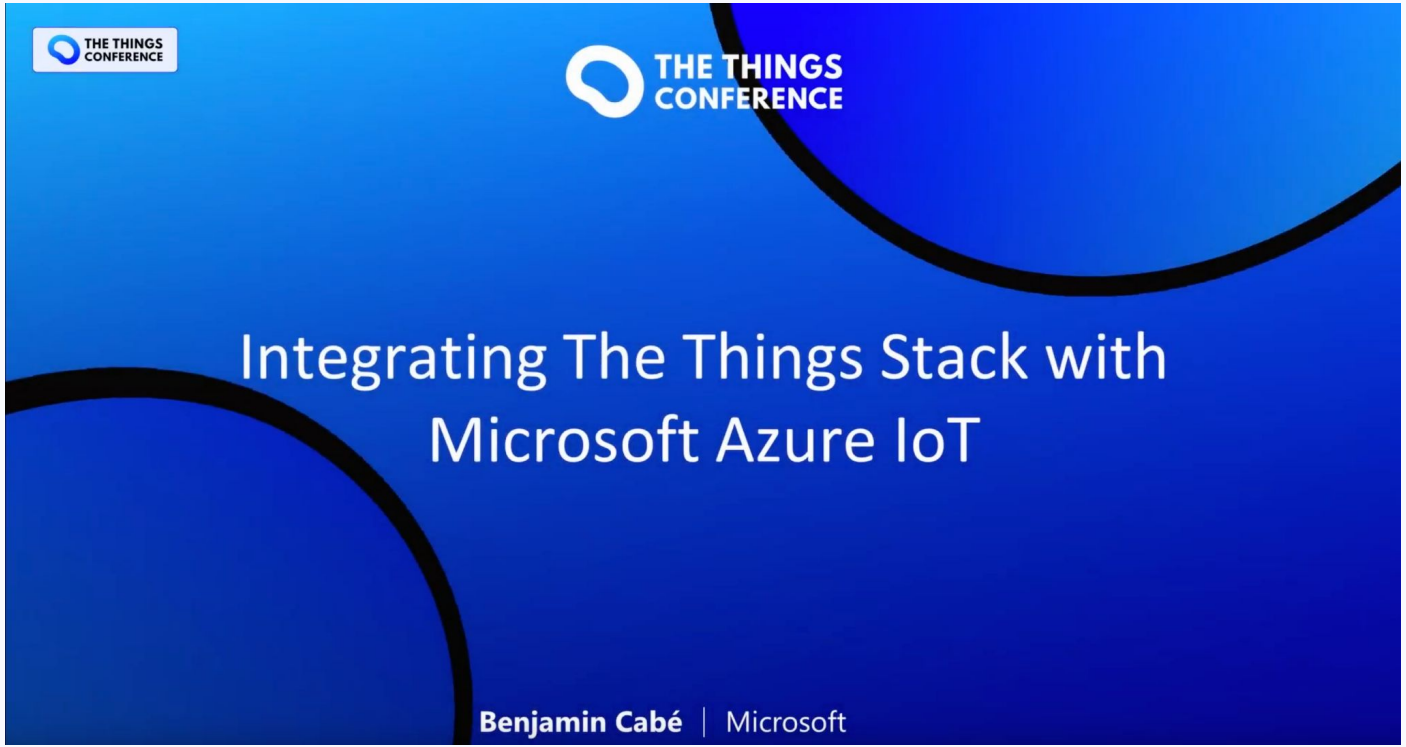
Ambassador at balena.io

Marc Pous

Developer Advocate at balena.io

Running IoT Barcelona, IoT Stars and IoT Coffee Talk

Inspired by Benjamin Cabé



https://www.youtube.com/watch?v=gte_IFRarGM

and Wienke

wienkegiezeman Initiator of The Things Network Jun 16

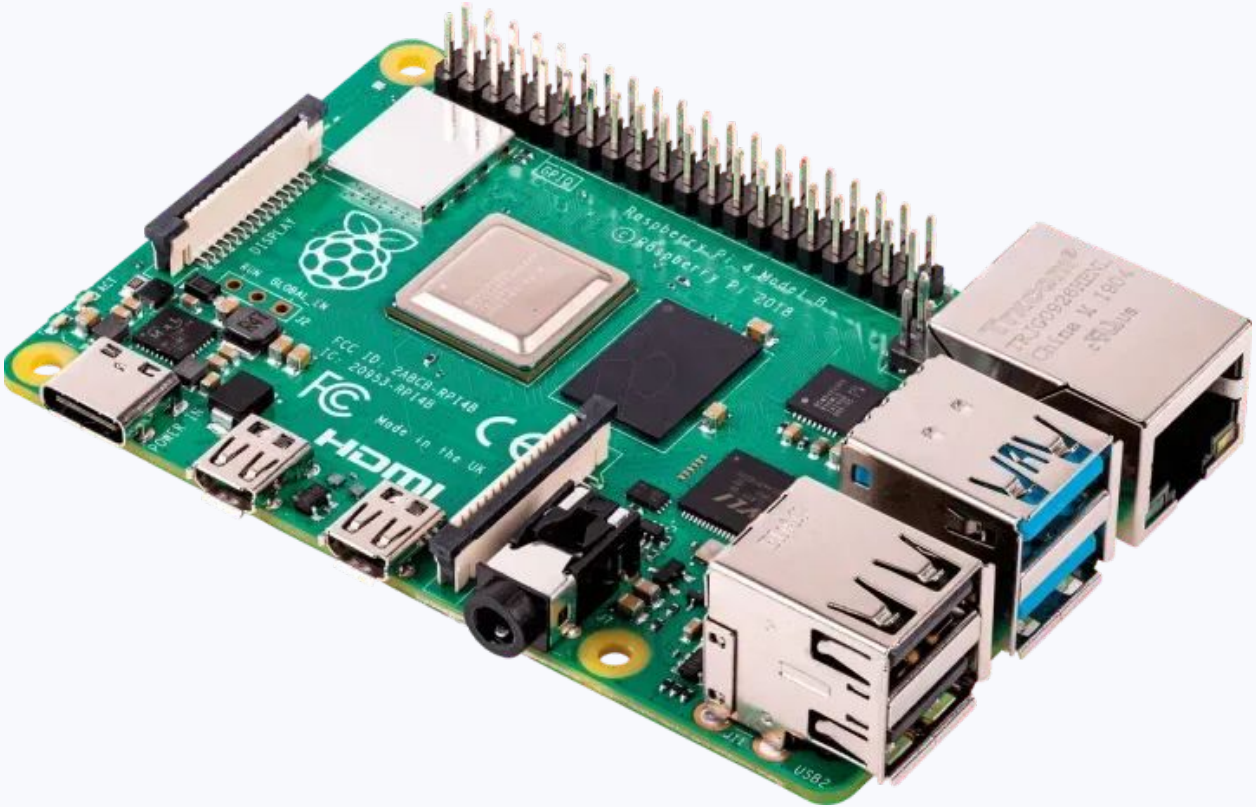
A few things we can conclude with data from TTN, TTI, Sigfox, NB-IoT and LoRa operator networks.

- The LPWAN network economics some expected to be there in 2015 don't work. LPWAN networks are almost impossible to monetize effectively with a healthy profit.
- It is the solution that brings in the value. And the solution requires the network to be tuned to that solution and operated with the anchor solution in mind. General purpose networks are very hard to build in a WAN setup in LPWAN, the market is moving towards using LPWAN in a LAN setup.
- Separation of LPWAN network and LPWAN solution economics is very hard. Best effort LPWAN packet forwarding is the best that can be done as a network value generation model.
- People are loving LoRaWAN because of long range and low power and that market is growing fast, 60% YoY. Mostly in a LPLAN setup.

Taking these observations into account we have a very optimistic view of the future. As the device growth is still very high on our network, so is usage. Again, our data show most usage is LP**LAN** and no traffic is shared across accounts. But the best efforts forwarding is super cool and allows for a lot of enterprise, government and community synergies that bring value all ways. Also we see a lot of synergies with network sharing with upcoming satellite IoT companies. Opening up closed nationwide LoRa networks through peering could bring synergies but they first have to accept that the business model is not in the network. Once they get that it will bring some opportunities.

https://www.thethingsnetwork.org/forum/t/helium-network-comparative-discussion/35177/150

Why not in the Edge with low cost SBCs?

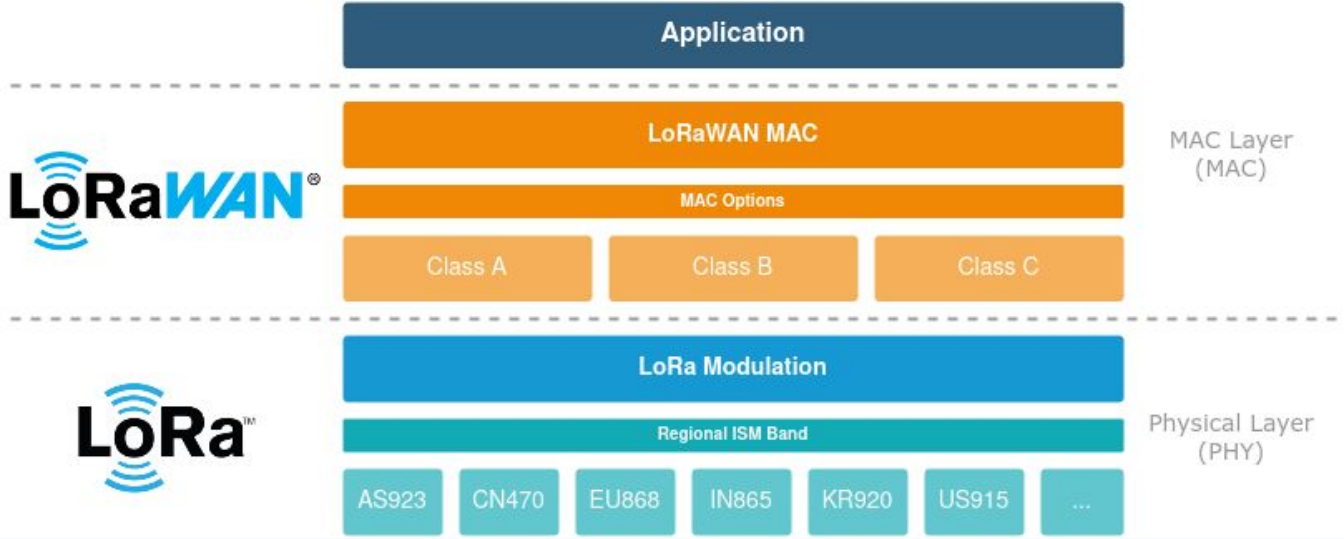


Or in the Edge with professional hardware?

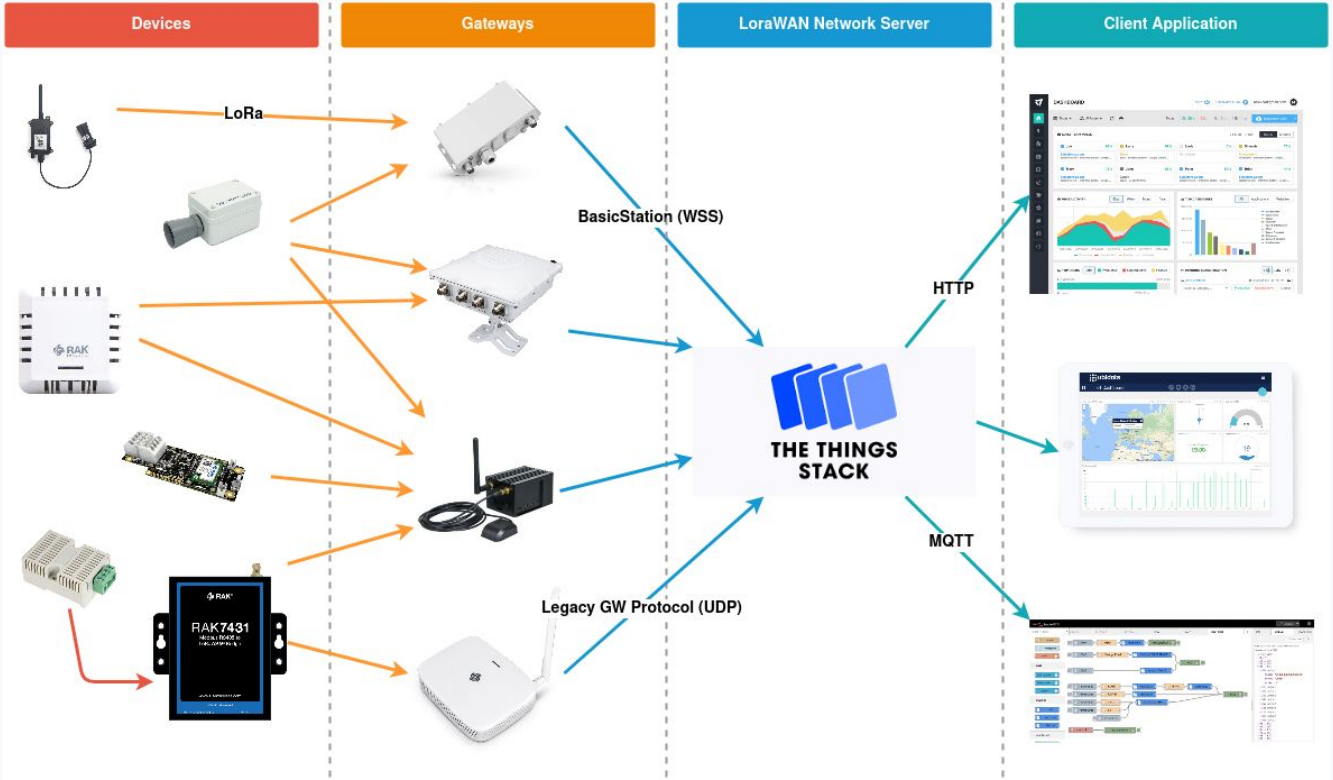
Some fundamentals for newbies (anyone?)

What is LoRa and LoRaWAN?

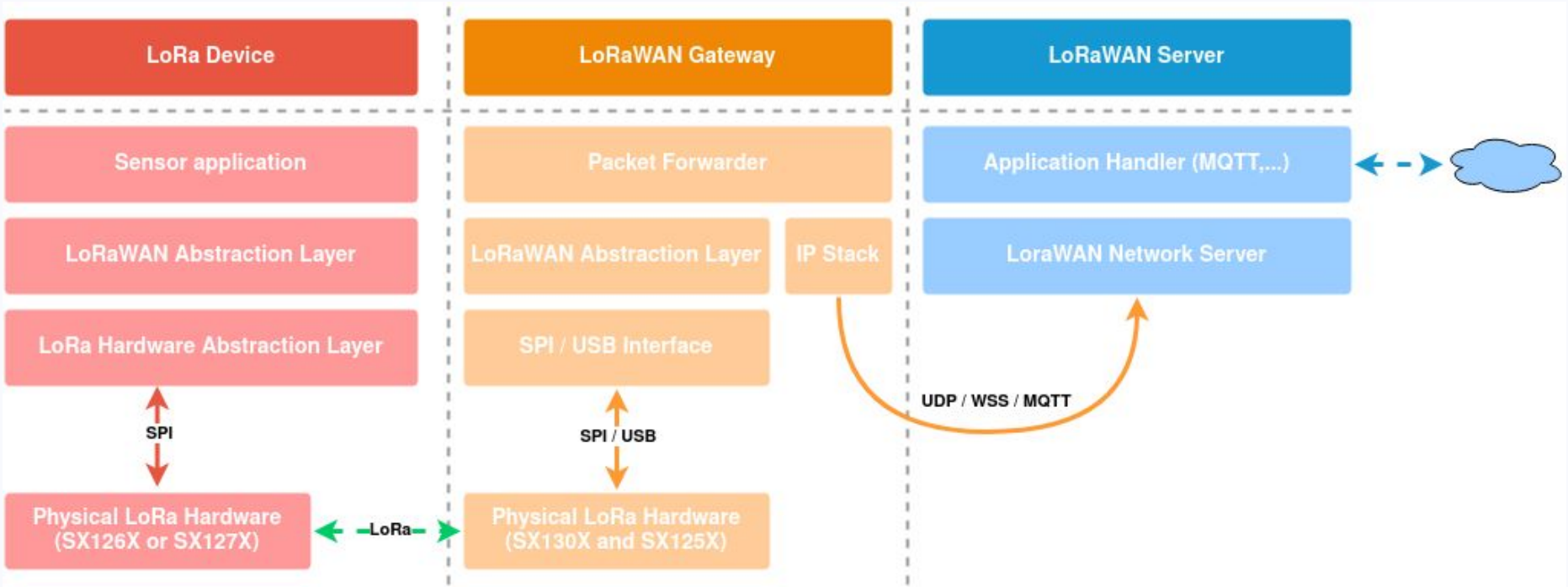
- **LoRa** is a radio modulation meant for Long Range communication using very little power.
- **LoRaWAN** is a Media Access Layer (MAC) protocol. A software layer that defines how devices use LoRa to transmit and receive messages on a network.



LoRaWAN Network Architecture



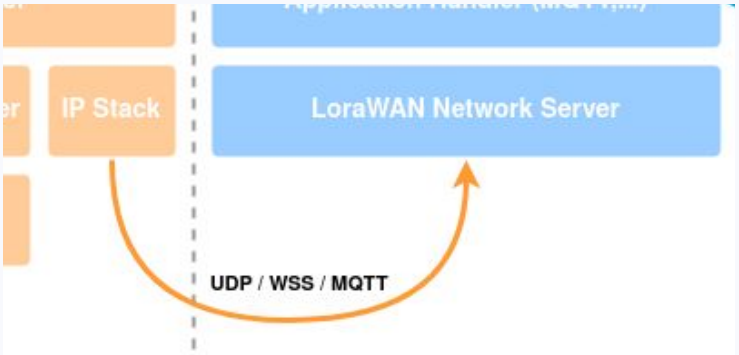
What is a LoRaWAN gateway?



What is a LoRa Packet Forwarder?

A **LoRa packet forwarder** is a service (software) running on the host of a LoRa-based gateway (with or without GPS). It forwards RF packets received by the concentrator (uplinks) to a *LoRaWAN Network Server* (LNS) through an IP link. It also transmits RF packets sent by the LNS (downlinks) through the same link to one or multiple devices.

Additionally, it may transmit beacon signals used for time coordinating devices within the network. These beacons may be transmitted GPS-synchronously across the entire network.



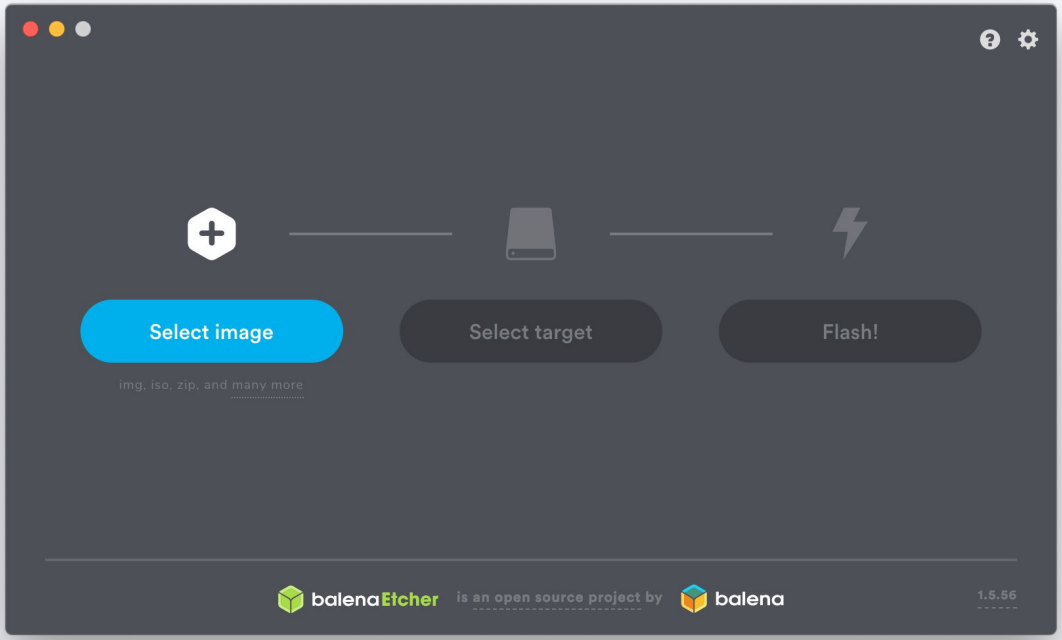
What is a LoRaWAN Network Server?

A **LoRaWAN Network Server (LNS)** is the service (software) at the core of every LoRaWAN Network that enables connectivity, management, and monitoring of devices, gateways and end-user applications. It is responsible for the security, scalability and reliability of data routing throughout the network.

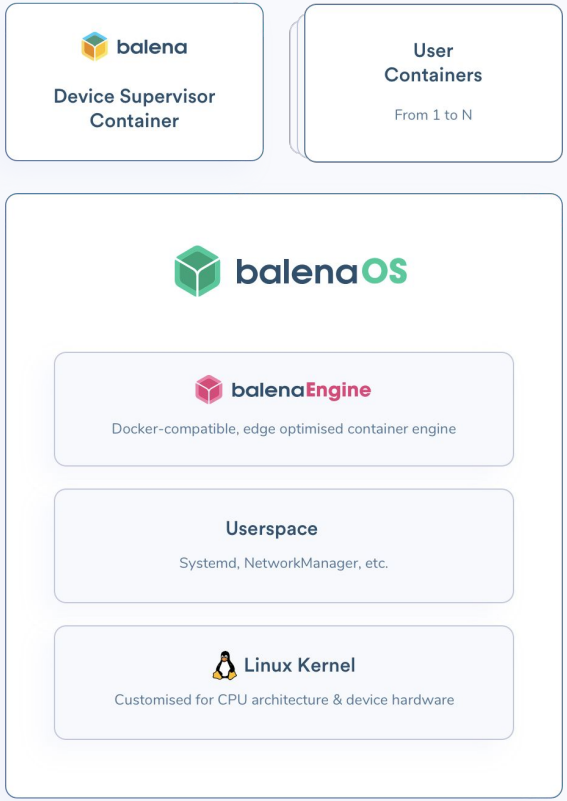
There are several LNS available as SaaS from different providers and also a few Open Source solutions. The Things Stack and ChirpStack are two of the most advanced OS LNS solutions.

How to build my own LoRaWAN Network Server?

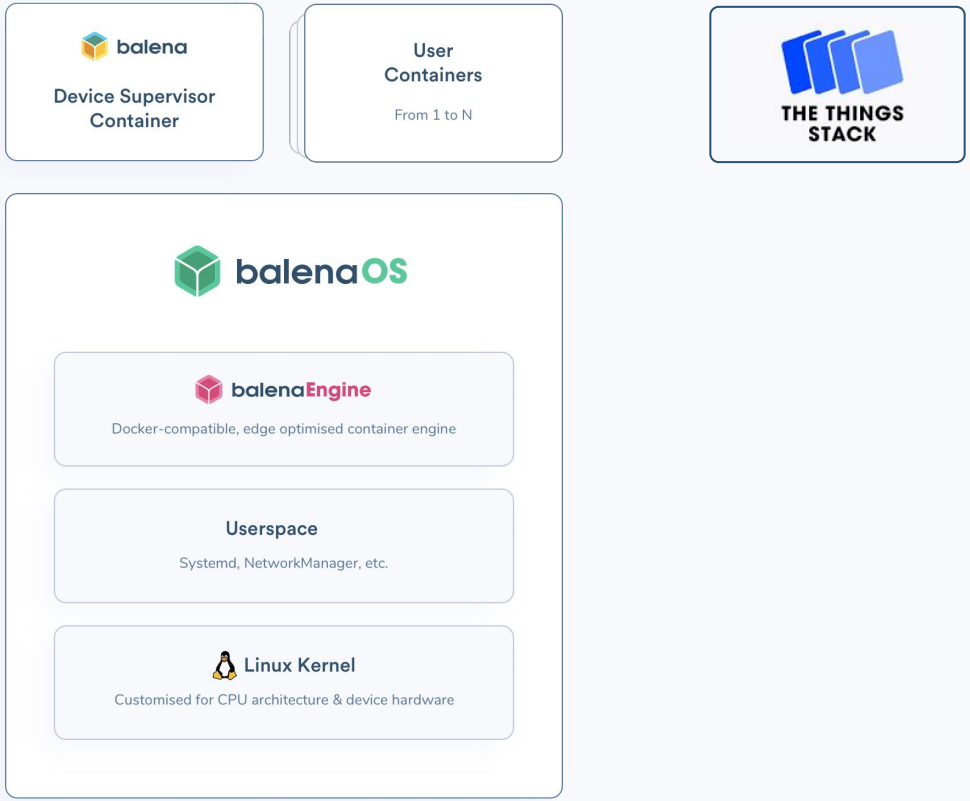
Anyone know this?



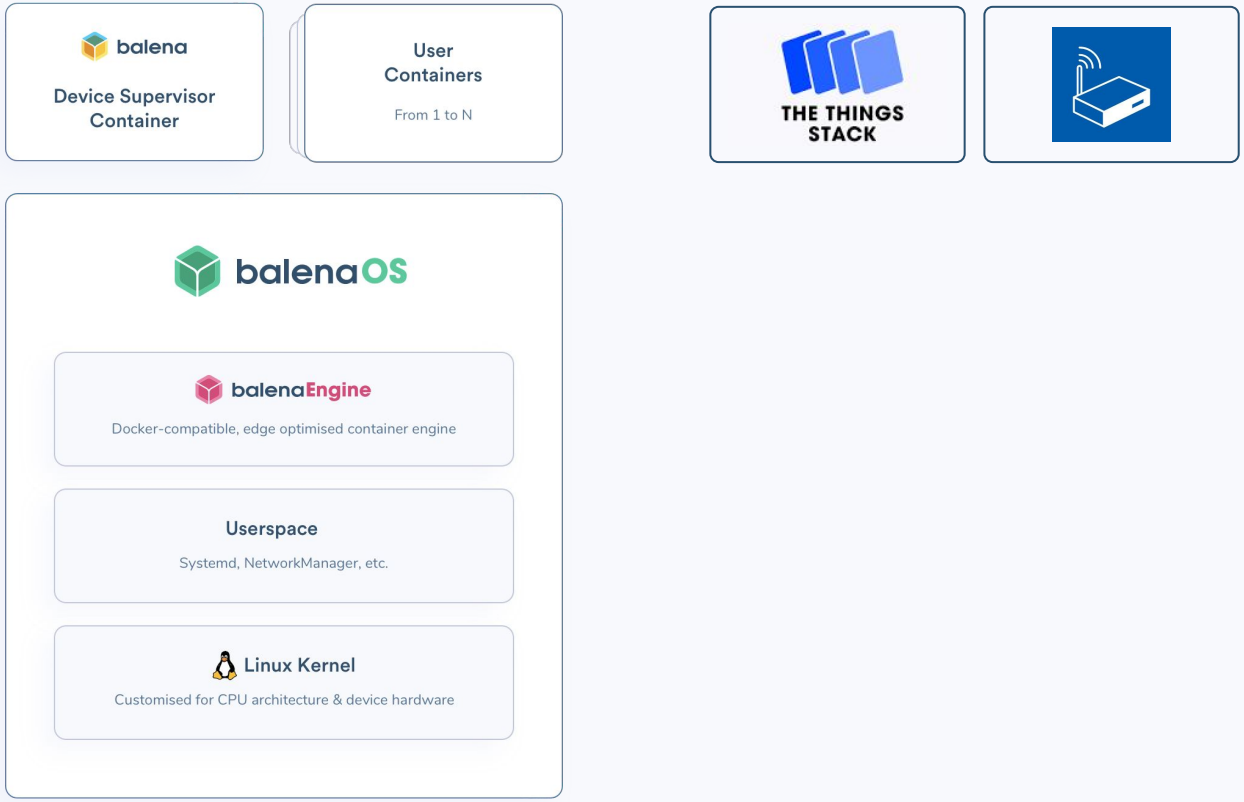
Let’s take advantage of the containers in the Edge



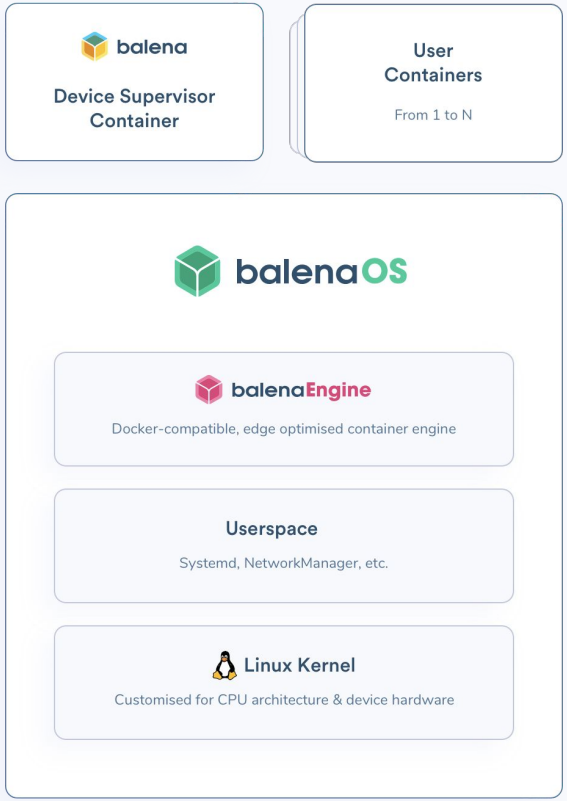
Let’s take advantage of the containers in the Edge

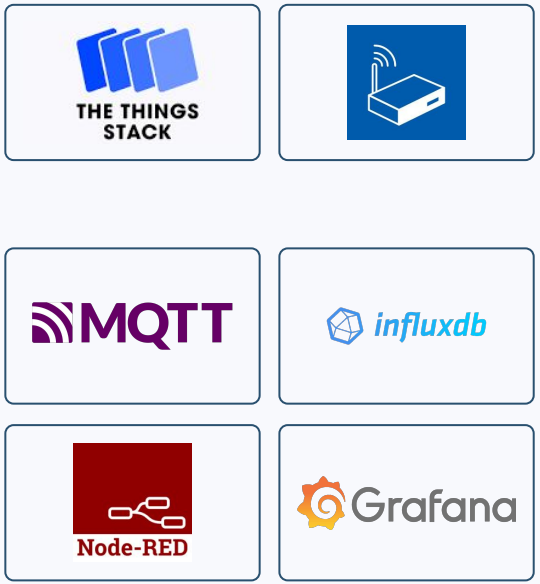


Let’s take advantage of the containers in the Edge



Let’s take advantage of the containers in the Edge





Let’s build it live!

1. Prepare your device (RAK7391 or any Pi + concentrator).
2. Deploy the App to the balena Fleet and add the device.
3. Add the Gateway on your local The Things Stack.
4. Connect your LoRa Node and see the data flowing!

RAK7391 - WisGate Connect

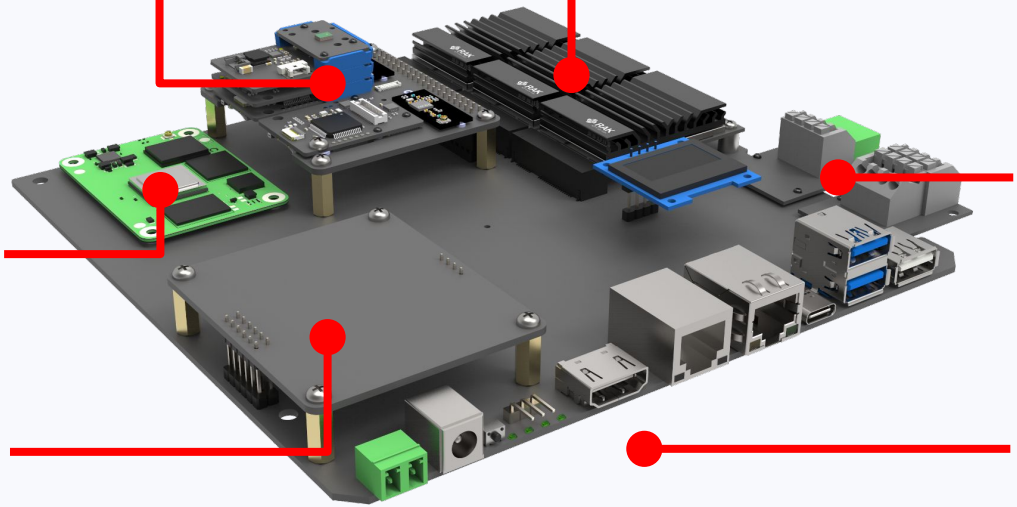
- IoT device based on Compute Module 4
- Modular multi-RAN platform
- WisBlock IO compatible for IIoT
- Multiple power supply options
- Multiple configurations (developer, desktop, indoor gateway, outdoor gateway)

RAK7391 - WisGate Connect

RPi header
Compatible with 100s of existing “hats”

Compute Module 4
Up to 32Gb eMMC and 8Gb DDR4

PoE module

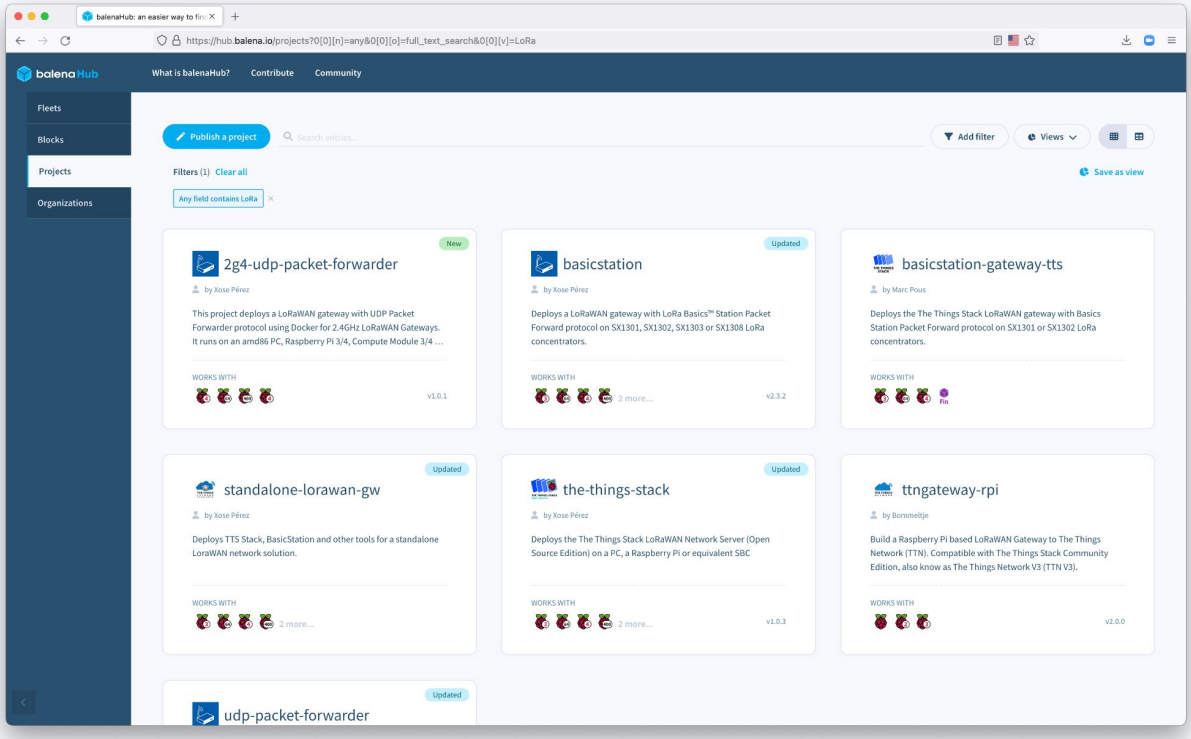


3x MiniPCIe slots (LoRaWAN, 4G, HaLoW, Zigbee,...)

2x WisBlock IO slots
Compatible with 10s of existing IIoT modules

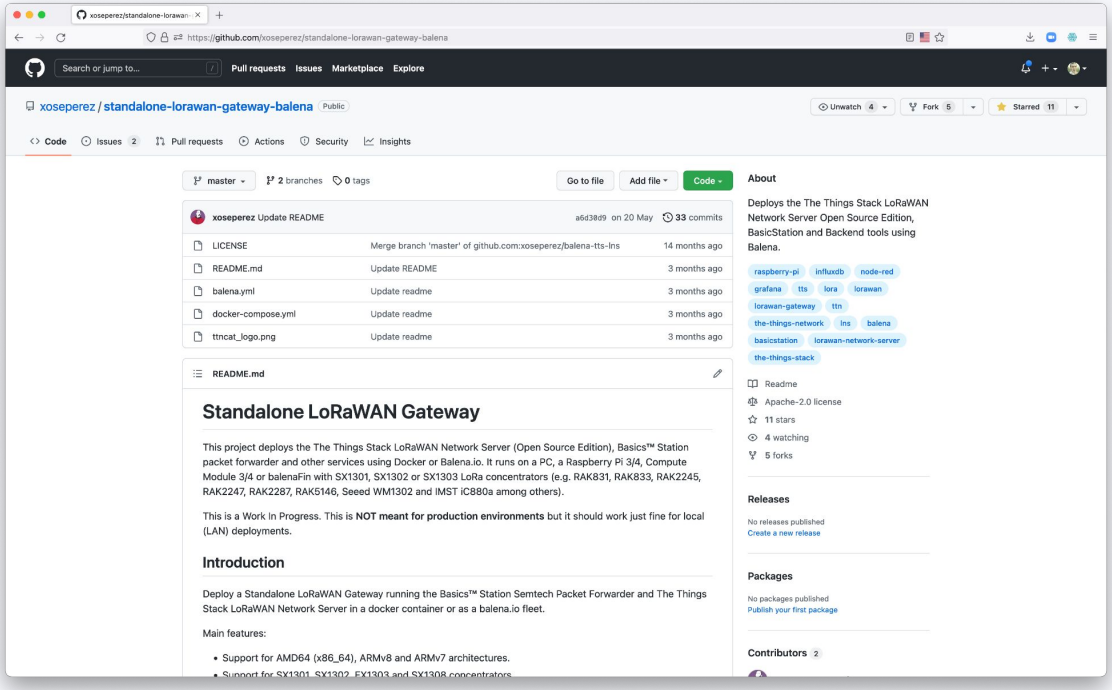
1x M.2 B-key slot (5G, NVMe, SATA)

balenaHub LoRaWAN apps

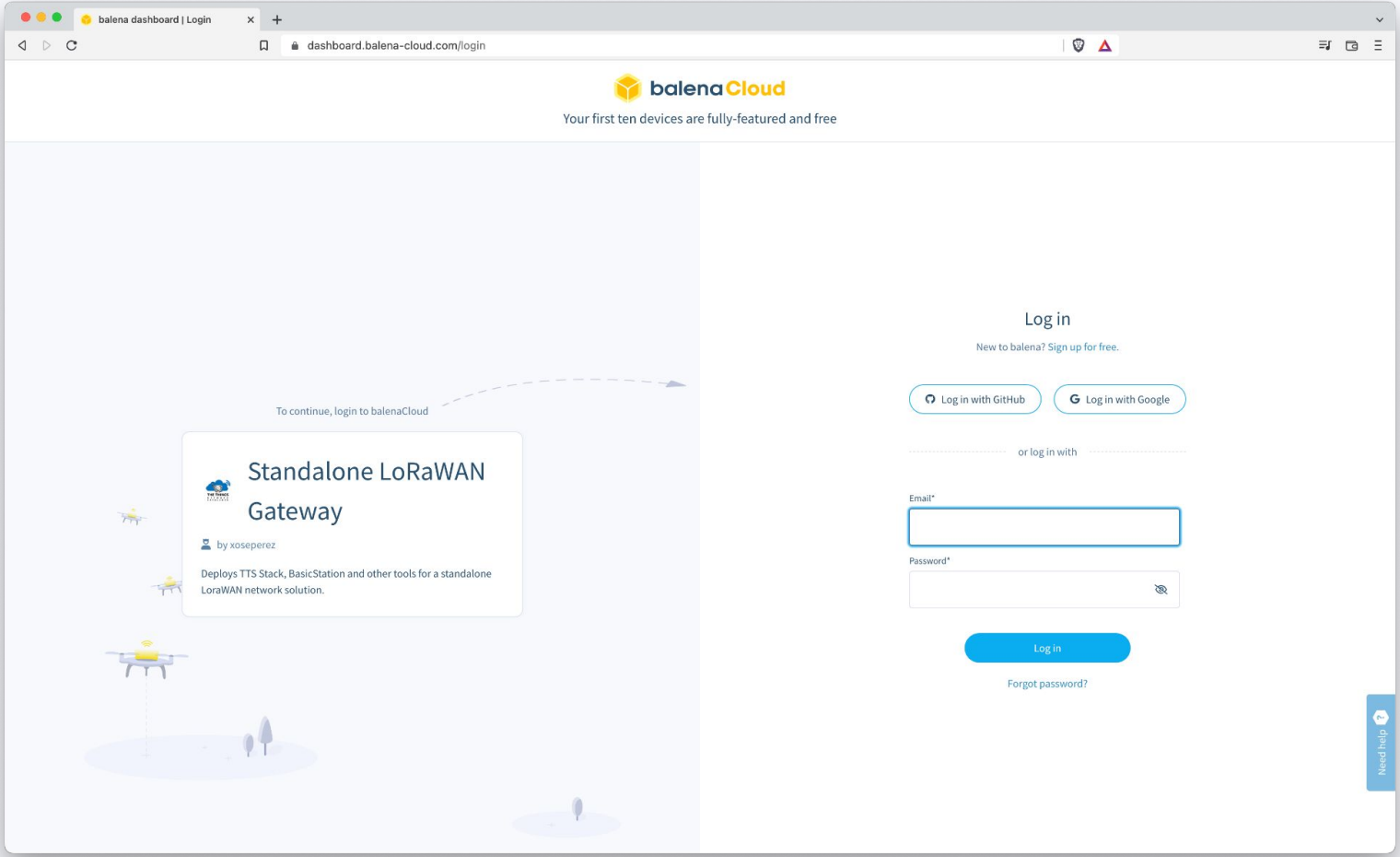


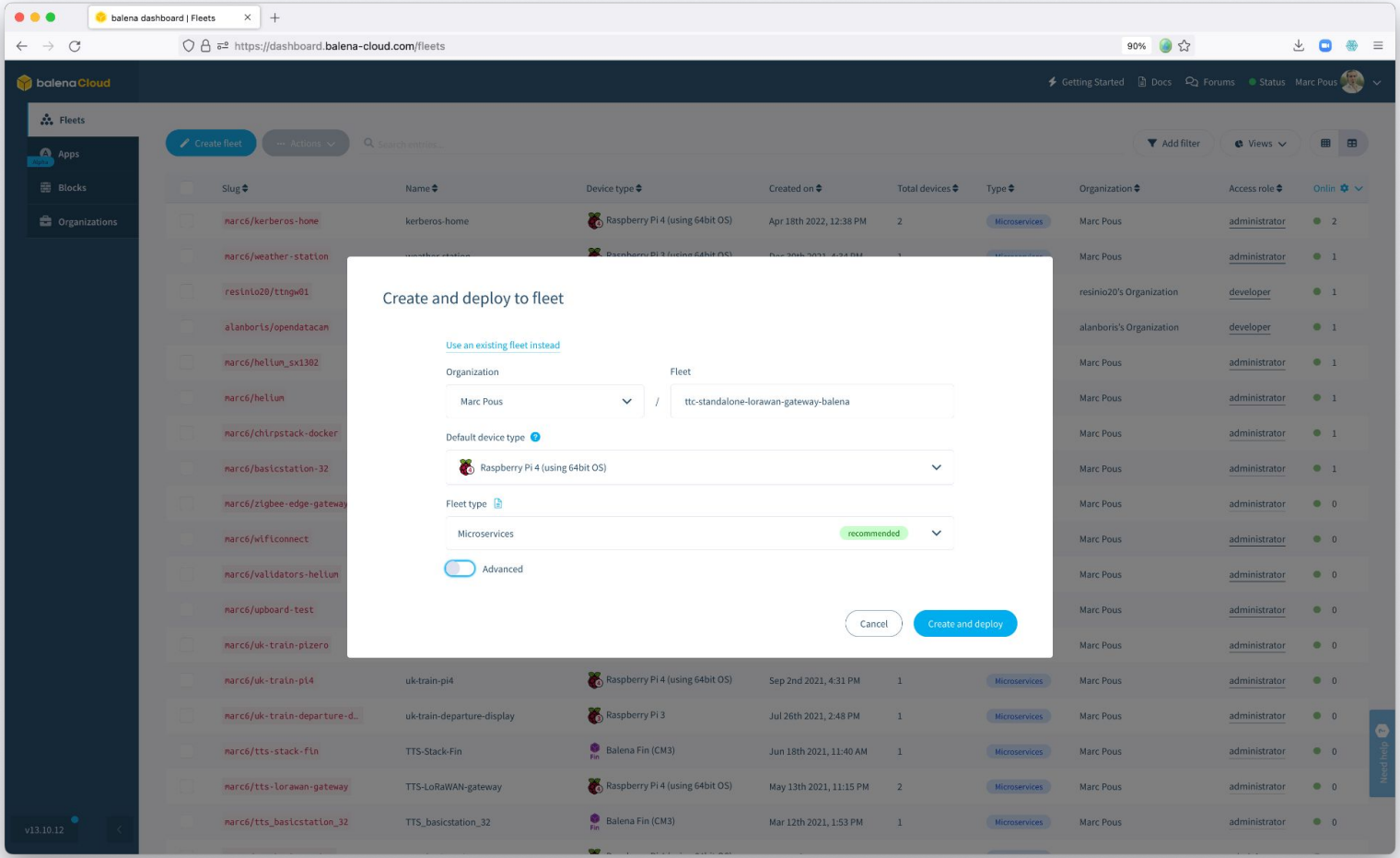
https://hub.balena.io/projects?0%5B0%5D%5Bn%5D=any&0%5B0%5D%5Bo%5D=full_text_search&0%5B0%5D%5Bv%5D=LoRa

or to the github repository



https://github.com/xoseperez/standalone-lorawan-gateway-balena


balena dashboard | Login
dashboard.balena-cloud.com/login
balenaCloud
Your first ten devices are fully-featured and free
To continue, login to balenaCloud
Standalone LoRaWAN Gateway
by xoseperez
Deploys TTS Stack, BasicStation and other tools for a standalone LoraWAN network solution.
Log in
New to balena? Sign up for free.
Log in with GitHub
Log in with Google
or log in with
Email*
Password*
Log in
Forgot password?
Need help


balena dashboard | Fleets
https://dashboard.balena-cloud.com/fleets
90%
balenaCloud
Getting Started
Docs
Forums
Status
Marc Pous
Fleets
Apps
Blocks
Organizations
Create fleet
Actions
Add filter
Views
Slug
Name
Device type
Created on
Total devices
Type
Organization
Access role
Onlin
marc6/kerberos-home
kerberos-home
Raspberry Pi 4 (using 64bit OS)
Apr 18th 2022, 12:38 PM
2
Microservices
Marc Pous
administrator
marc6/weather-station
Marc Pous
administrator
resinio20/ttngw01
resinio20's Organization
developer
alanboris/opendatacan
alanboris's Organization
developer
marc6/helium_sx1302
Marc Pous
administrator
marc6/helium
Marc Pous
administrator
marc6/chirpstack-docker
Marc Pous
administrator
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marc6/zigbee-edge-gateway
Marc Pous
administrator
marc6/wificonnect
Marc Pous
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marc6/validators-helium
Marc Pous
administrator
marc6/upboard-test
Marc Pous
administrator
marc6/uk-train-pizero
Marc Pous
administrator
marc6/uk-train-pi4
uk-train-pi4
Raspberry Pi 4 (using 64bit OS)
Sep 2nd 2021, 4:31 PM
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Microservices
Marc Pous
administrator
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Raspberry Pi 3
Jul 26th 2021, 2:48 PM
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Microservices
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TTS-Stack-Fin
Balena Fin (CM3)
Jun 18th 2021, 11:40 AM
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Microservices
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TTS-LoRaWAN-gateway
Raspberry Pi 4 (using 64bit OS)
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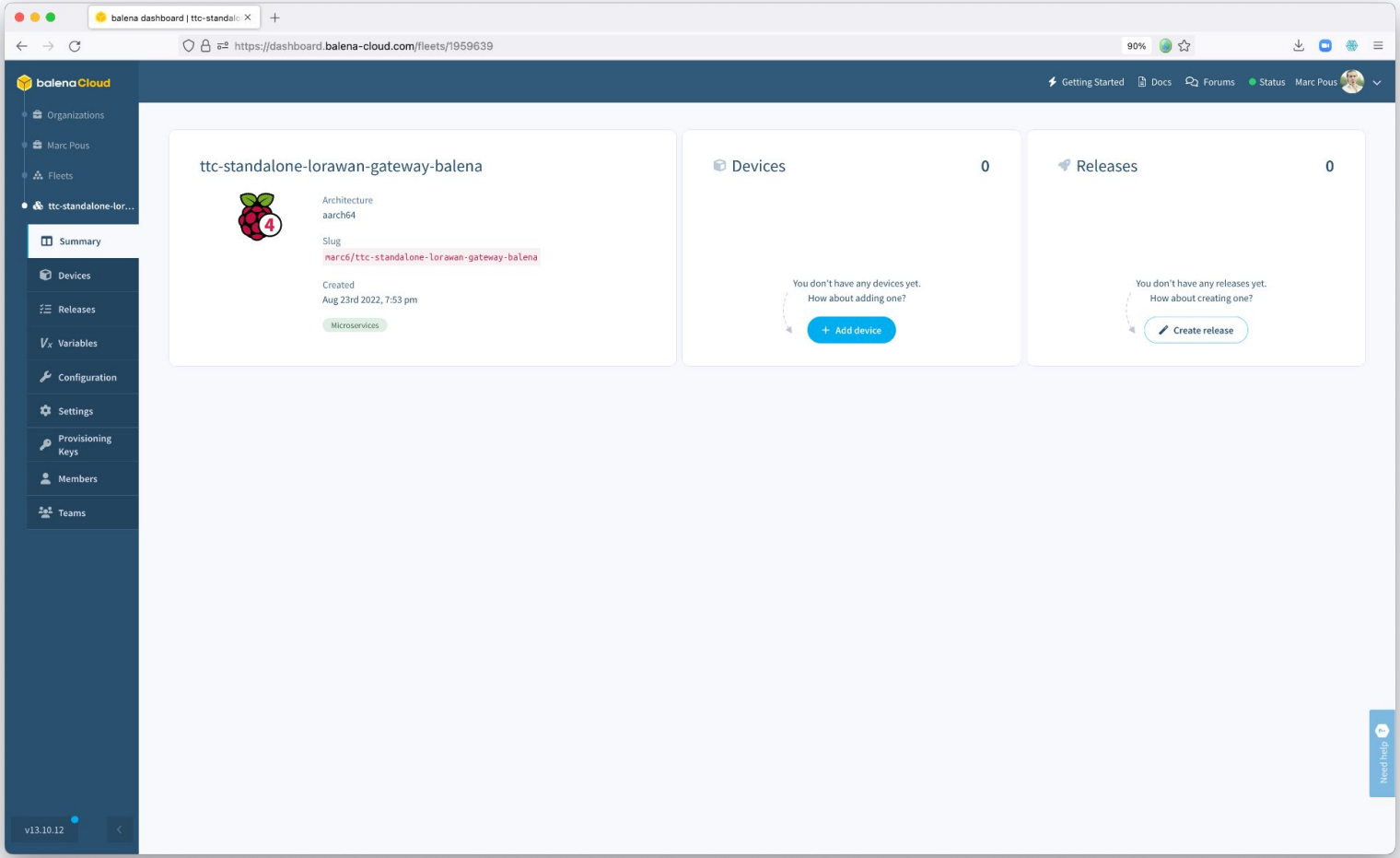
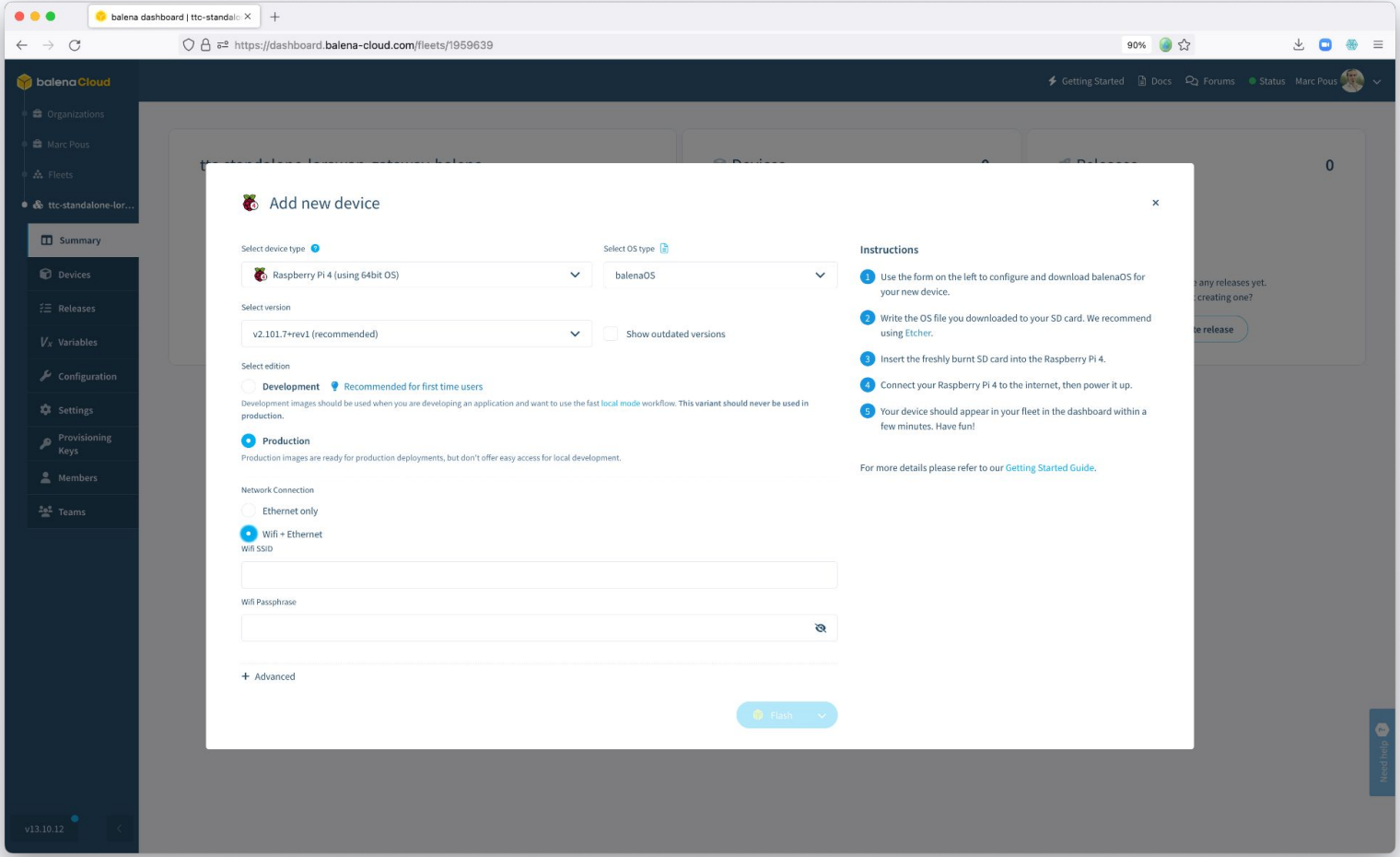
marc6/tts_basicstation_32
TTS_basicstation_32
Balena Fin (CM3)
Mar 12th 2021, 1:53 PM
1
Microservices
Marc Pous
administrator
v13.10.12
Create and deploy to fleet
Use an existing fleet instead
Organization
Marc Pous
Fleet
ttc-standalone-lorawan-gateway-balena
Default device type
Raspberry Pi 4 (using 64bit OS)
Fleet type
Microservices
recommended
Advanced
Cancel
Create and deploy
Need help


balena dashboard | ttc-standalo
https://dashboard.balena-cloud.com/fleets/1959639
90%
balenaCloud
Getting Started
Docs
Forums
Status
Marc Pous
Organizations
Marc Pous
Fleets
ttc-standalone-lor...
Summary
Devices
Releases
Variables
Configuration
Settings
Provisioning Keys
Members
Teams
v13.10.12
ttc-standalone-lorawan-gateway-balena
Architecture
aarch64
Slug
marc6/ttc-standalone-lorawan-gateway-balena
Created
Aug 23rd 2022, 7:53 pm
Microservices
Devices
0
You don't have any devices yet.
How about adding one?
Add device
Releases
0
You don't have any releases yet.
How about creating one?
Create release
Need help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https://dashboard.balena-cloud.com/fleets/1959639
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balenaCloud
Getting Started
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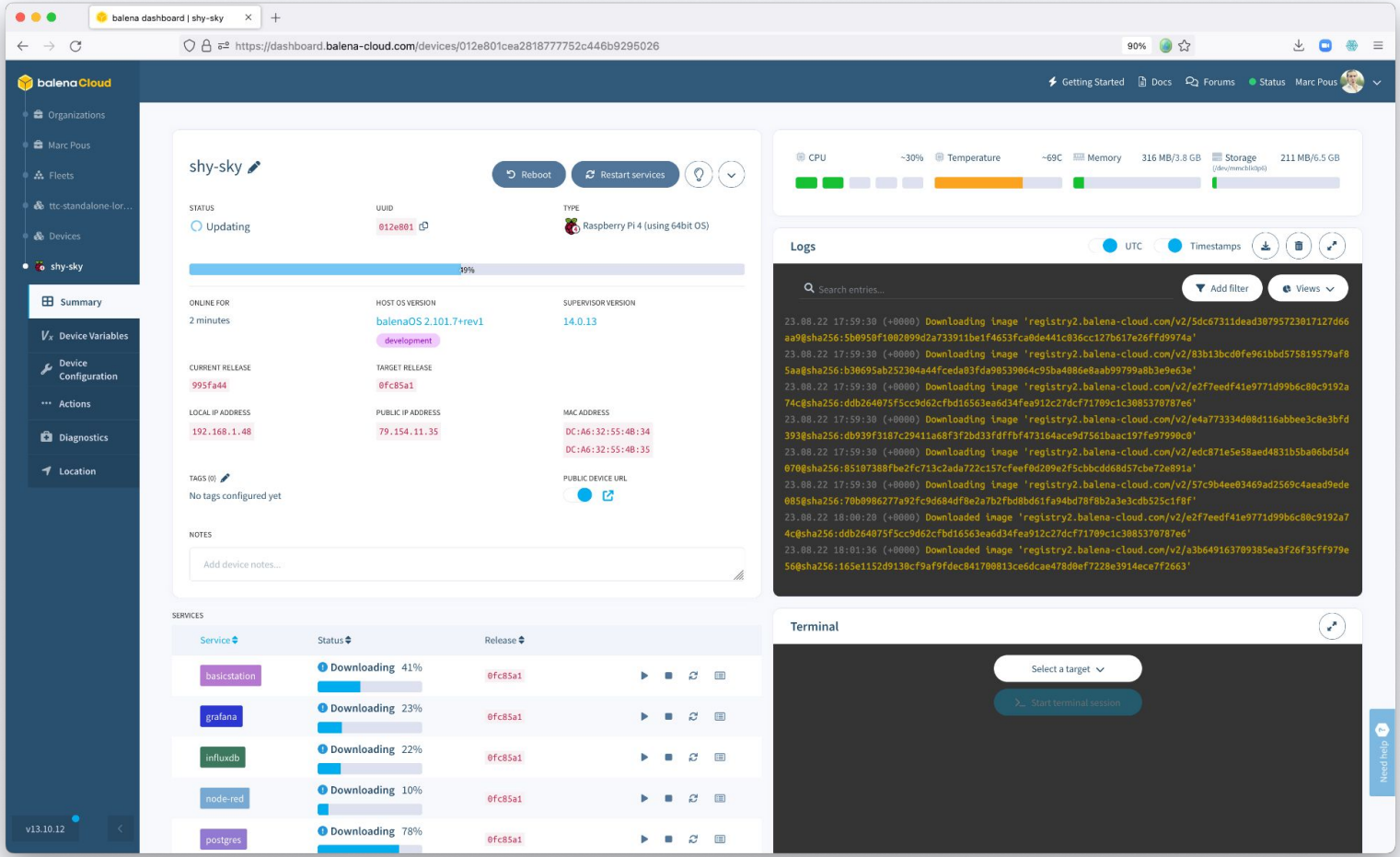
Forums
Status
Marc Pous
Organizations
Marc Pous
Fleets
ttc-standalone-lor...
Summary
Devices
Releases
Variables
Configuration
Settings
Provisioning Keys
Members
Teams
v13.10.12
Add new device
Select device type
Raspberry Pi 4 (using 64bit OS)
Select OS type
balenaOS
Select version
v2.101.7+rev1 (recommended)
Show outdated versions
Select edition
Development
Recommended for first time users
Development images should be used when you are developing an application and want to use the fast local mode workflow. This variant should never be used in production.
Production
Production images are ready for production deployments, but don't offer easy access for local development.
Network Connection
Ethernet only
Wifi + Ethernet
Wifi SSID
Wifi Passphrase
+ Advanced
Flash
Instructions
1 Use the form on the left to configure and download balenaOS for your new device.
2 Write the OS file you downloaded to your SD card. We recommend using Etcher.
3 Insert the freshly burnt SD card into the Raspberry Pi 4.
4 Connect your Raspberry Pi 4 to the internet, then power it up.
5 Your device should appear in your fleet in the dashboard within a few minutes. Have fun!
For more details please refer to our Getting Started Guide.
Need help


balena dashboard | shy-sky
https://dashboard.balena-cloud.com/devices/012e801cea2818777752c446b9295026
balenaCloud
Getting Started
Docs
Forums
Status
Marc Pous
Organizations
Marc Pous
Fleets
ttc-standalone-lor...
Devices
shy-sky
Summary
Device Variables
Device Configuration
Actions
Diagnostics
Location
v13.10.12
shy-sky
Reboot
Restart services
STATUS
Updating
UUID
012e801
TYPE
Raspberry Pi 4 (using 64bit OS)
39%
ONLINE FOR
2 minutes
HOST OS VERSION
balenaOS 2.101.7+rev1
development
SUPERVISOR VERSION
14.0.13
CURRENT RELEASE
99sfa44
TARGET RELEASE
0fc85a1
LOCAL IP ADDRESS
192.168.1.48
PUBLIC IP ADDRESS
79.154.11.35
MAC ADDRESS
DC:A6:32:55:4B:34
DC:A6:32:55:4B:35
TAGS (0)
No tags configured yet
PUBLIC DEVICE URL
NOTES
Add device notes...
CPU
~30%
Temperature
~69C
Memory
316 MB/3.8 GB
Storage
211 MB/6.5 GB
Logs
UTC
Timestamps
Search entries...
Add filter
Views
23.08.22 17:59:30 (+0000) Downloading image 'registry2.balena-cloud.com/v2/5dc67311dead30795723017127d66aa9@sha256:5b0950f1002099d2a733911be1f4653fca0de441c036cc127b617e26ffd9974a'
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23.08.22 17:59:30 (+0000) Downloading image 'registry2.balena-cloud.com/v2/e2f7eedf41e9771d99b6c80c9192a74c@sha256:ddb264075f5cc9d62cfbd16563ea6d34fea912c27dcf71709c1c3085370787e6'
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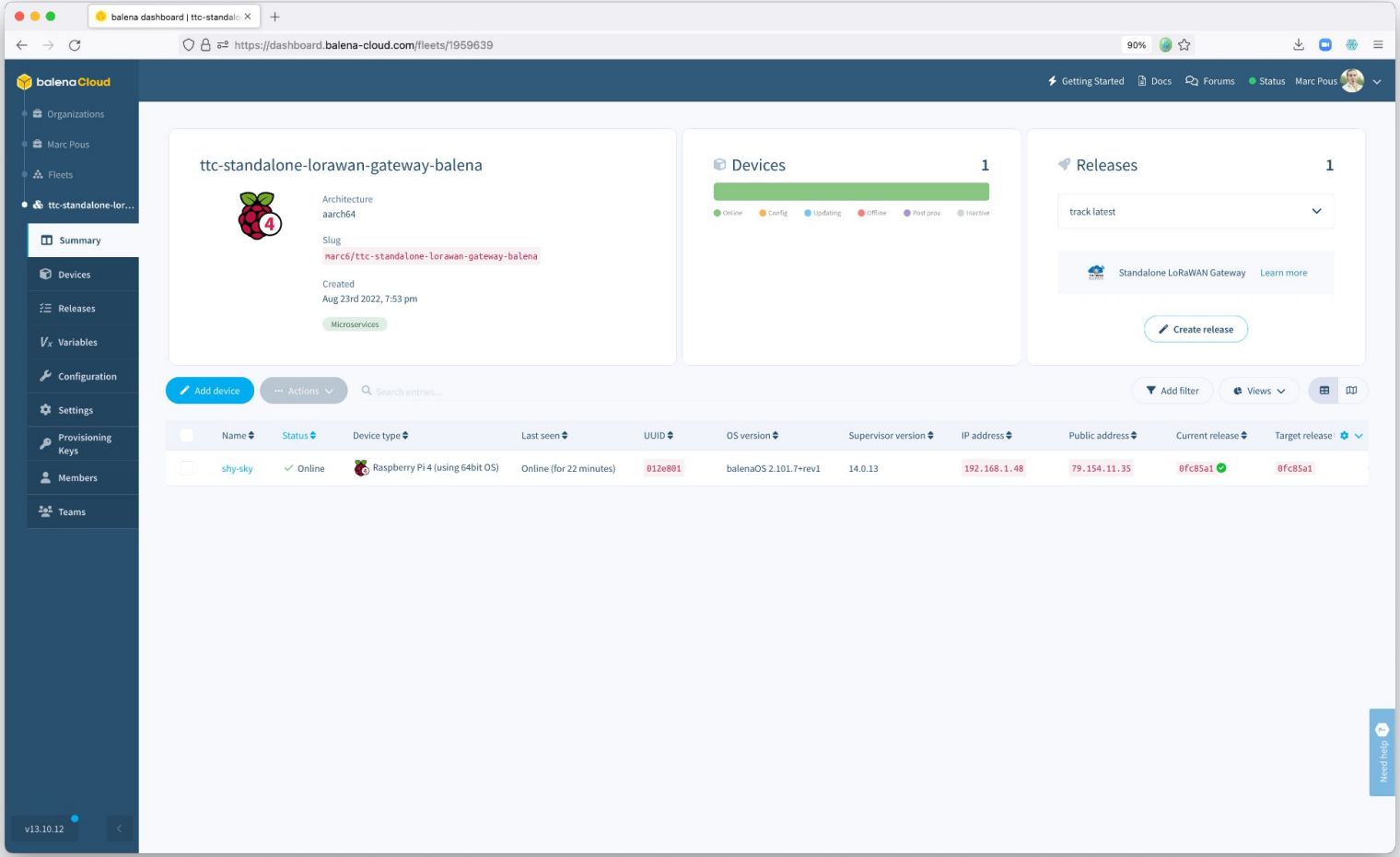
23.08.22 17:59:30 (+0000) Downloading image 'registry2.balena-cloud.com/v2/edc871e5e58aed4831b5ba06bd5d4070@sha256:85107388fbe2fc713c2ada722c157cfeef0d209e2f5cbbcdd68d57cbe72e891a'
23.08.22 17:59:30 (+0000) Downloading image 'registry2.balena-cloud.com/v2/57c9b4ee03469ad2569c4aead9ede085@sha256:70b0986277a92fc9d684df8e2a7b2fbd8bd61fa94bd78f8b2a3e3cdb525c1f8f'
23.08.22 18:00:20 (+0000) Downloaded image 'registry2.balena-cloud.com/v2/e2f7eedf41e9771d99b6c80c9192a74c@sha256:ddb264075f5cc9d62cfbd16563ea6d34fea912c27dcf71709c1c3085370787e6'
23.08.22 18:01:36 (+0000) Downloaded image 'registry2.balena-cloud.com/v2/a3b649163709385ea3f26f35ff979e56@sha256:165e1152d9130cf9af9fdec841700813ce6dcae478d0ef7228e3914ece7f2663'
SERVICES
Service
Status
Release
basicstation
Downloading 41%
0fc85a1
grafana
Downloading 23%
0fc85a1
influxdb
Downloading 22%
0fc85a1
node-red
Downloading 10%
0fc85a1
postgres
Downloading 78%
0fc85a1
Terminal
Select a target
Start terminal session
Need help


balena dashboard | ttc-standalo
https://dashboard.balena-cloud.com/fleets/1959639
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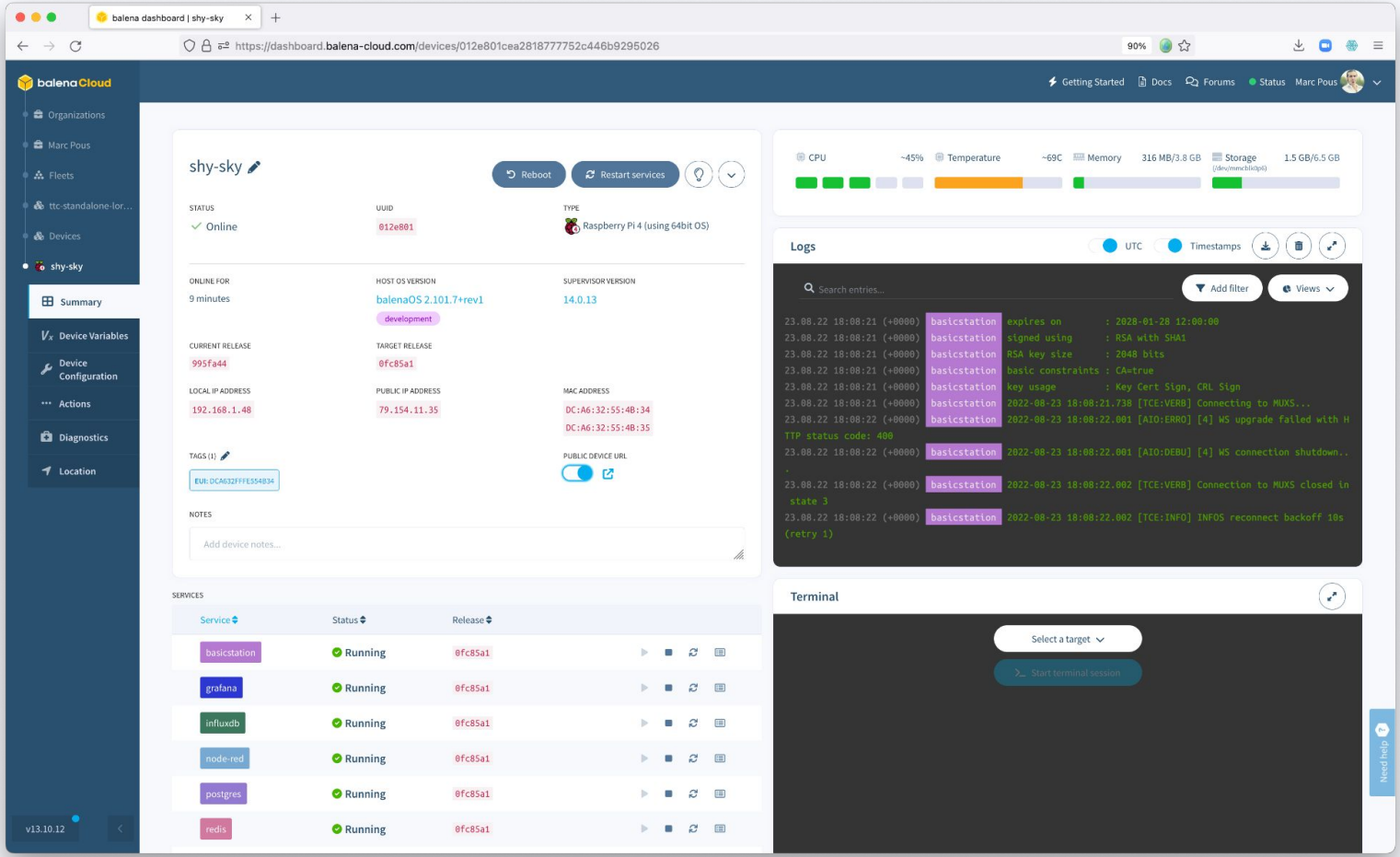
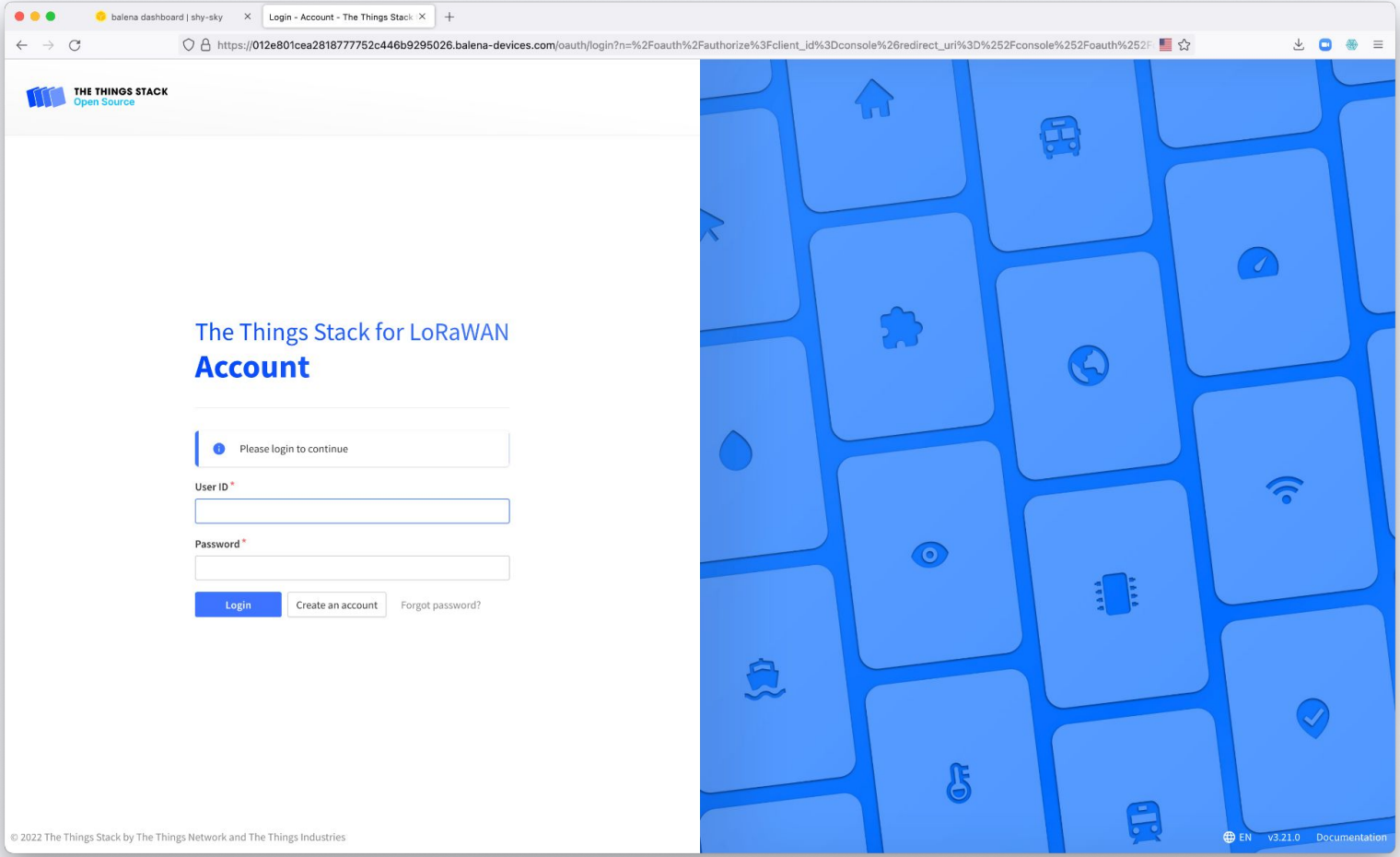
ttc-standalone-lor...
Summary
Devices
Releases
Variables
Configuration
Settings
Provisioning Keys
Members
Teams
v13.10.12
ttc-standalone-lorawan-gateway-balena
Architecture
aarch64
Slug
marc6/ttc-standalone-lorawan-gateway-balena
Created
Aug 23rd 2022, 7:53 pm
Microservices
Devices
1
Online
Config
Updating
Offline
Post prov
Inactive
Releases
1
track latest
Standalone LoRaWAN Gateway
Learn more
Create release
Add device
Actions
Search entries...
Add filter
Views
Name
Status
Device type
Last seen
UUID
OS version
Supervisor version
IP address
Public address
Current release
Target release
shy-sky
Online
Raspberry Pi 4 (using 64bit OS)
Online (for 22 minutes)
012e801
balenaOS 2.101.7+rev1
14.0.13
192.168.1.48
79.154.11.35
0fc85a1
0fc85a1
Need help


balena dashboard | shy-sky
https://dashboard.balena-cloud.com/devices/012e801cea2818777752c446b9295026
balenaCloud
Getting Started
Docs
Forums
Status
Marc Pous
Organizations
Marc Pous
Fleets
ttc-standalone-lor...
Devices
shy-sky
Summary
Device Variables
Device Configuration
Actions
Diagnostics
Location
v13.10.12
shy-sky
Reboot
Restart services
STATUS
Online
UUID
012e801
TYPE
Raspberry PI 4 (using 64bit OS)
ONLINE FOR
9 minutes
HOST OS VERSION
balenaOS 2.101.7+rev1
development
SUPERVISOR VERSION
14.0.13
CURRENT RELEASE
995fa44
TARGET RELEASE
0fc85a1
LOCAL IP ADDRESS
192.168.1.48
PUBLIC IP ADDRESS
79.154.11.35
MAC ADDRESS
DC:A6:32:55:4B:34
DC:A6:32:55:4B:35
TAGS (1)
EUI: DCA632FFFE554B34
PUBLIC DEVICE URL
NOTES
Add device notes...
SERVICES
Service
Status
Release
basicstation
Running
0fc85a1
grafana
Running
0fc85a1
influxdb
Running
0fc85a1
node-red
Running
0fc85a1
postgres
Running
0fc85a1
redis
Running
0fc85a1
CPU
~45%
Temperature
~69C
Memory
316 MB/3.8 GB
Storage
1.5 GB/6.5 GB
Logs
UTC
Timestamps
Search entries...
Add filter
Views
23.08.22 18:08:21 (+0000) basicstation expires on : 2028-01-28 12:00:00
23.08.22 18:08:21 (+0000) basicstation signed using : RSA with SHA1
23.08.22 18:08:21 (+0000) basicstation RSA key size : 2048 bits
23.08.22 18:08:21 (+0000) basicstation basic constraints : CA=true
23.08.22 18:08:21 (+0000) basicstation key usage : Key Cert Sign, CRL Sign
23.08.22 18:08:21 (+0000) basicstation 2022-08-23 18:08:21.738 [TCE:VERB] Connecting to MUXS...
23.08.22 18:08:22 (+0000) basicstation 2022-08-23 18:08:22.001 [AIO:ERRO] [4] WS upgrade failed with HTTP status code: 400
23.08.22 18:08:22 (+0000) basicstation 2022-08-23 18:08:22.001 [AIO:DEBU] [4] WS connection shutdown...
23.08.22 18:08:22 (+0000) basicstation 2022-08-23 18:08:22.002 [TCE:VERB] Connection to MUXS closed in state 3
23.08.22 18:08:22 (+0000) basicstation 2022-08-23 18:08:22.002 [TCE:INFO] INFOS reconnect backoff 10s (retry 1)
Terminal
Select a target
Start terminal session
Need help



Used ID: admin // Password: changeme

balena dashboard | shy-sky

Overview - Console - The Thing

https://012e801cea2818777752c446b9295026.balena-devices.com/console/

THE THINGS STACK Open Source

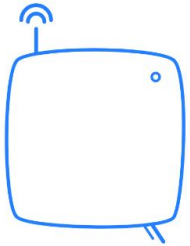
Overview | Applications | Gateways | Organizations | admin

Welcome to the Console!

Get started right away by creating an application or registering a gateway.

Need help? Have a look at our Documentation.

Create an application

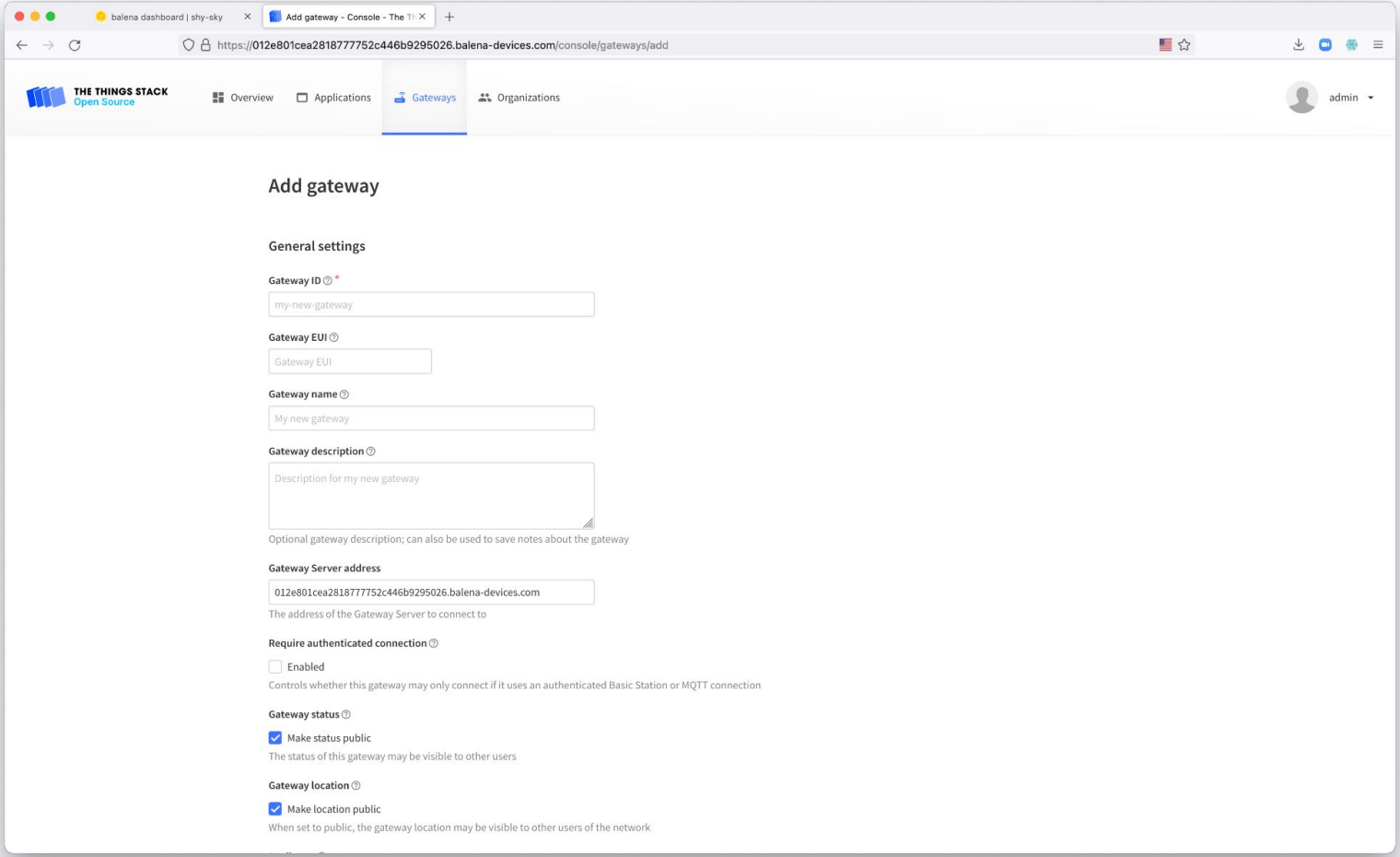


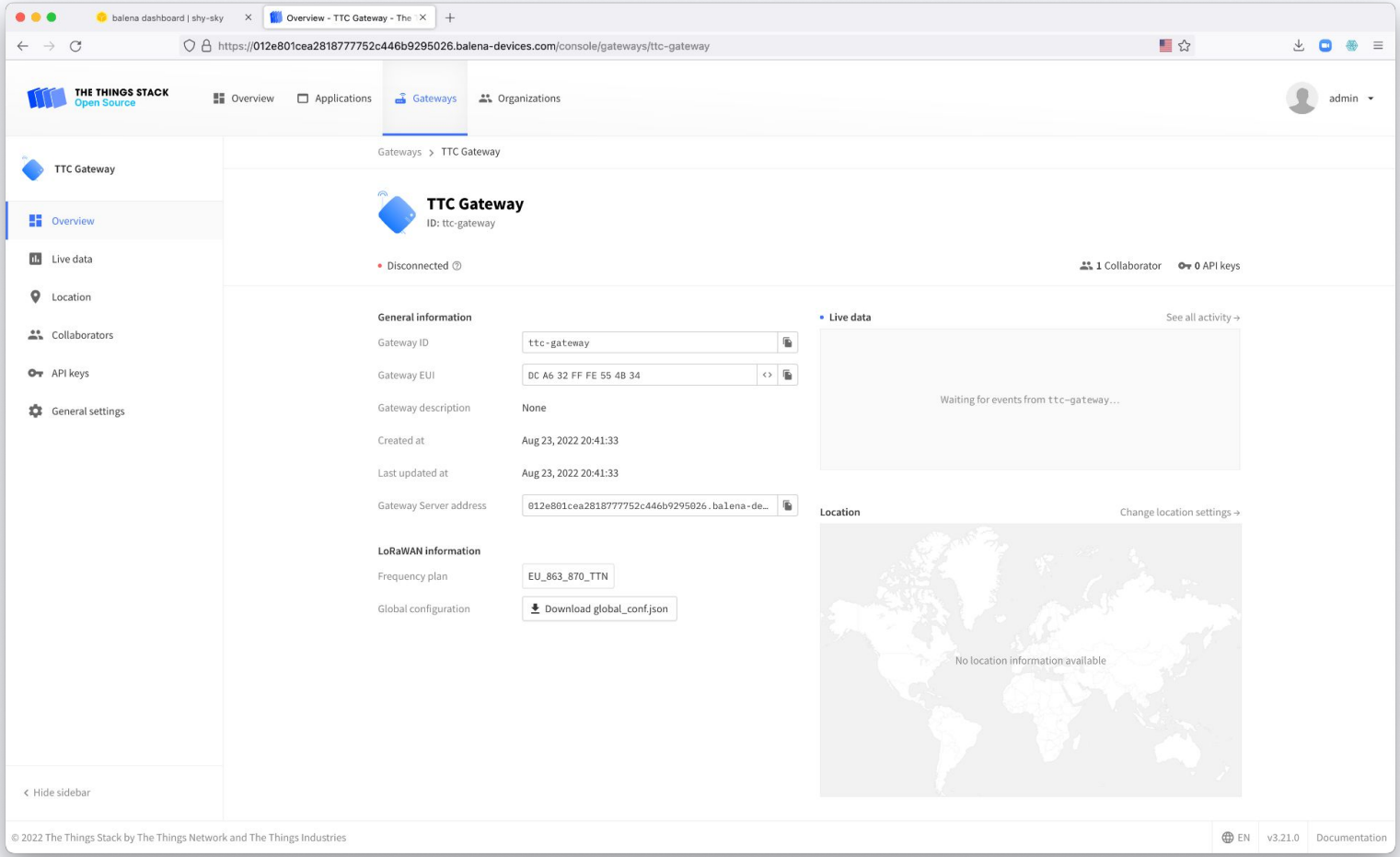
Register a gateway

Version info

Component status

Application Server


balena dashboard | shy-sky
Add gateway - Console - The Th
https://012e801cea2818777752c446b9295026.balena-devices.com/console/gateways/add
THE THINGS STACK
Open Source
Overview
Applications
Gateways
Organizations
admin
Add gateway
General settings
Gateway ID *
my-new-gateway
Gateway EUI
Gateway EUI
Gateway name
My new gateway
Gateway description
Description for my new gateway
Optional gateway description; can also be used to save notes about the gateway
Gateway Server address
012e801cea2818777752c446b9295026.balena-devices.com
The address of the Gateway Server to connect to
Require authenticated connection
Enabled
Controls whether this gateway may only connect if it uses an authenticated Basic Station or MQTT connection
Gateway status
Make status public
The status of this gateway may be visible to other users
Gateway location
Make location public
When set to public, the gateway location may be visible to other users of the network


balena dashboard | shy-sky
Overview - TTC Gateway - The
https://012e801cea2818777752c446b9295026.balena-devices.com/console/gateways/ttc-gateway
THE THINGS STACK
Open Source
Overview
Applications
Gateways
Organizations
admin
TTC Gateway
Overview
Live data
Location
Collaborators
API keys
General settings
Hide sidebar
Gateways > TTC Gateway
TTC Gateway
ID: ttc-gateway
Disconnected
1 Collaborator
0 API keys
General information
Gateway ID
ttc-gateway
Gateway EUI
DC A6 32 FF FE 55 4B 34
Gateway description
None
Created at
Aug 23, 2022 20:41:33
Last updated at
Aug 23, 2022 20:41:33
Gateway Server address
012e801cea2818777752c446b9295026.balena-de...
LoRaWAN information
Frequency plan
EU_863_870_TTN
Global configuration
Download global_conf.json
Live data
See all activity →
Waiting for events from ttc-gateway...
Location
Change location settings →
No location information available
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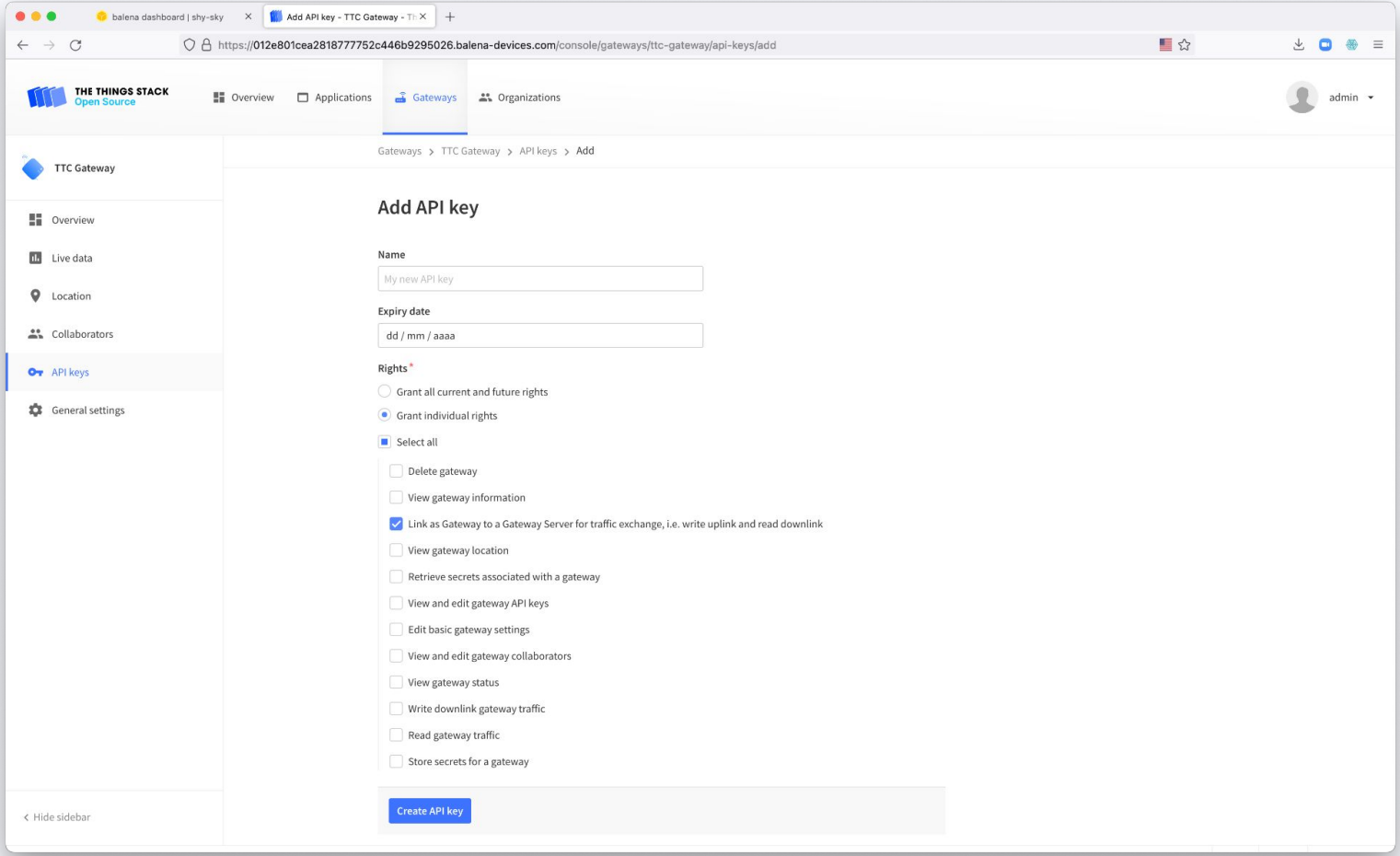
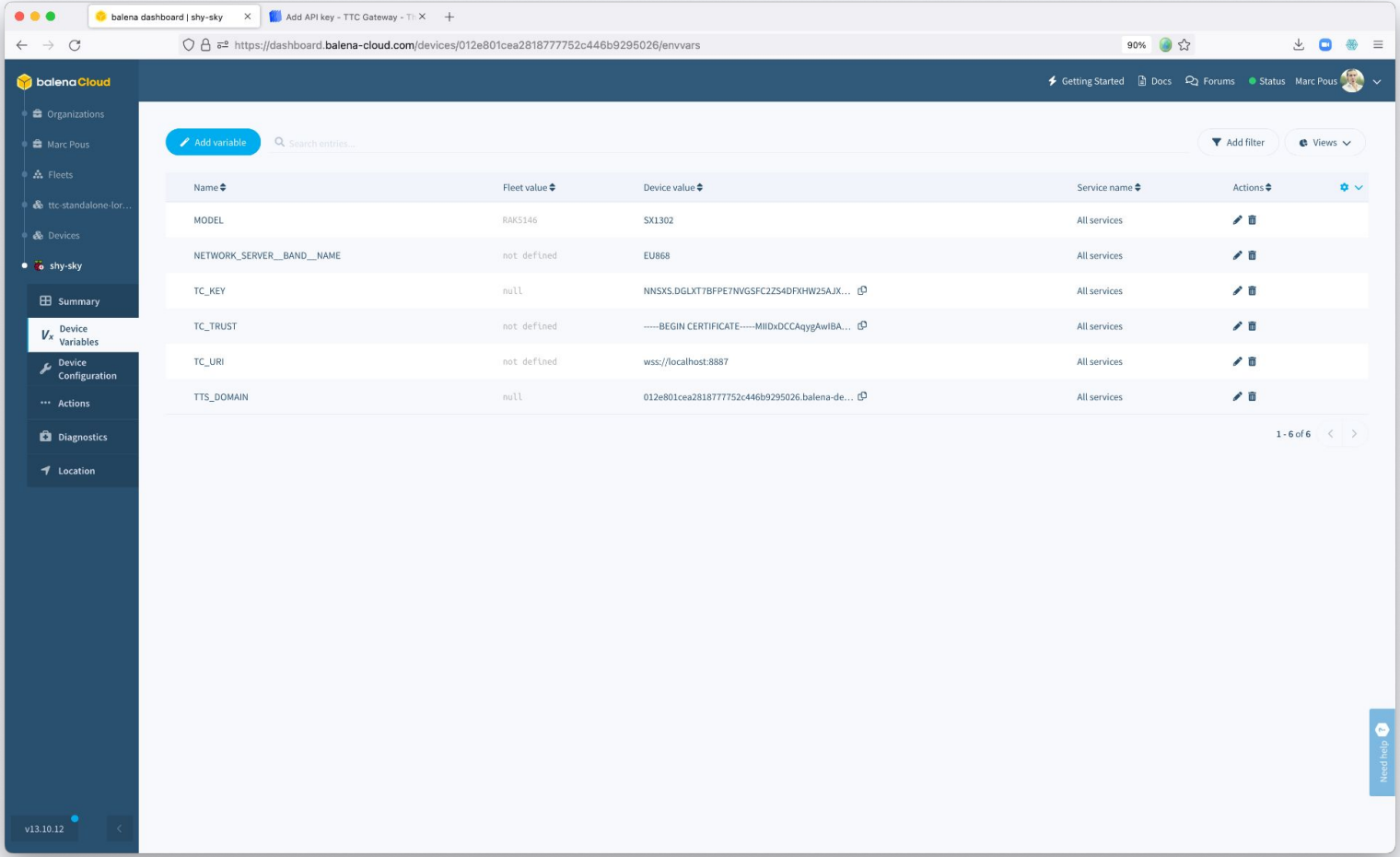
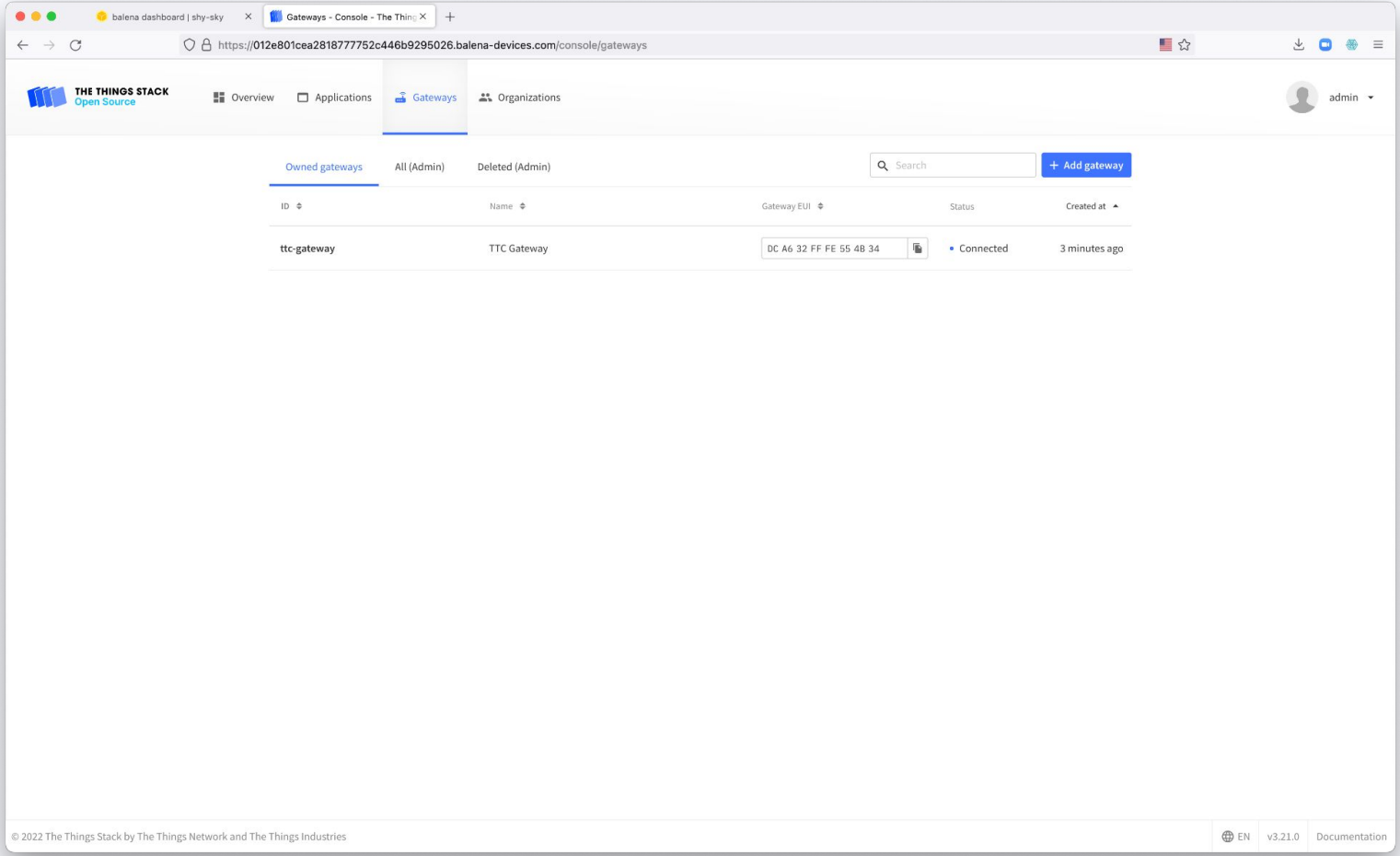
EN
v3.21.0
Documentation


balena dashboard | shy-sky
Add API key - TTC Gateway - Th
https://012e801cea2818777752c446b9295026.balena-devices.com/console/gateways/ttc-gateway/api-keys/add
THE THINGS STACK
Open Source
Overview
Applications
Gateways
Organizations
admin
TTC Gateway
Overview
Live data
Location
Collaborators
API keys
General settings
Hide sidebar
Gateways > TTC Gateway > API keys > Add
Add API key
Name
My new API key
Expiry date
dd / mm / aaaa
Rights *
Grant all current and future rights
Grant individual rights
Select all
Delete gateway
View gateway information
Link as Gateway to a Gateway Server for traffic exchange, i.e. write uplink and read downlink
View gateway location
Retrieve secrets associated with a gateway
View and edit gateway API keys
Edit basic gateway settings
View and edit gateway collaborators
View gateway status
Write downlink gateway traffic
Read gateway traffic
Store secrets for a gateway
Create API key


balena dashboard | shy-sky
Add API key - TTC Gateway - Th
https://dashboard.balena-cloud.com/devices/012e801cea2818777752c446b9295026/envvars
90%
balenaCloud
Getting Started
Docs
Forums
Status
Marc Pous
Organizations
Marc Pous
Fleets
ttc-standalone-lor...
Devices
shy-sky
Summary
Device Variables
Device Configuration
Actions
Diagnostics
Location
v13.10.12
Add variable
Search entries...
Add filter
Views
Name
Fleet value
Device value
Service name
Actions
MODEL
RAK5146
SX1302
All services
NETWORK_SERVER__BAND__NAME
not defined
EU868
All services
TC_KEY
null
NNSXS.DGLXT7BFPE7NVGSFC2ZS4DFXHW25AJX...
All services
TC_TRUST
not defined
-----BEGIN CERTIFICATE-----MIIDxDCCAqygAwIBA...
All services
TC_URI
not defined
wss://localhost:8887
All services
TTS_DOMAIN
null
012e801cea2818777752c446b9295026.balena-de...
All services
1 - 6 of 6
Need help


balena dashboard | shy-sky
Gateways - Console - The Thing
https://012e801cea2818777752c446b9295026.balena-devices.com/console/gateways
THE THINGS STACK
Open Source
Overview
Applications
Gateways
Organizations
admin
Owned gateways
All (Admin)
Deleted (Admin)
Search
Add gateway
ID
Name
Gateway EUI
Status
Created at
ttc-gateway
TTC Gateway
DC A6 32 FF FE 55 4B 34
Connected
3 minutes ago
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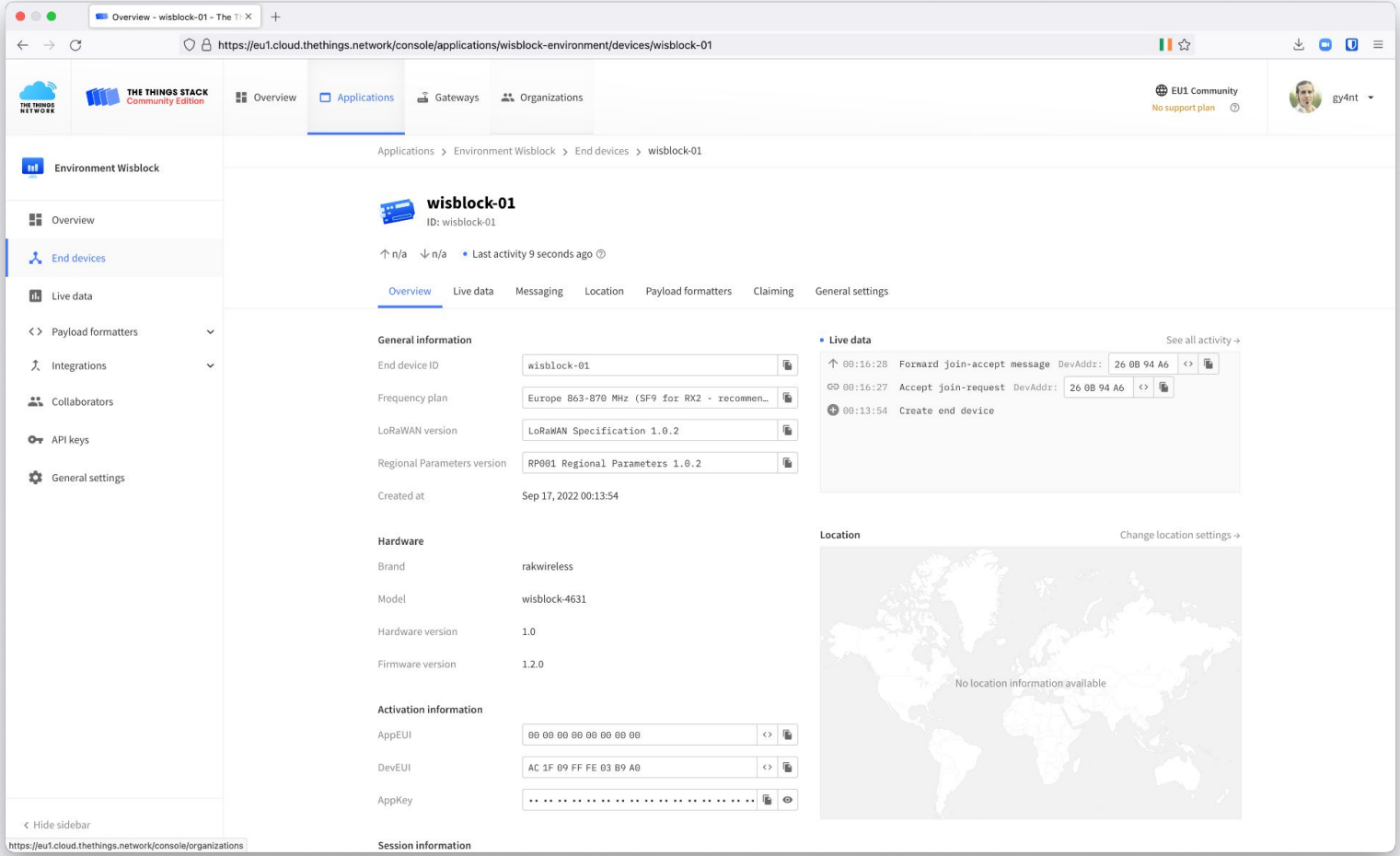
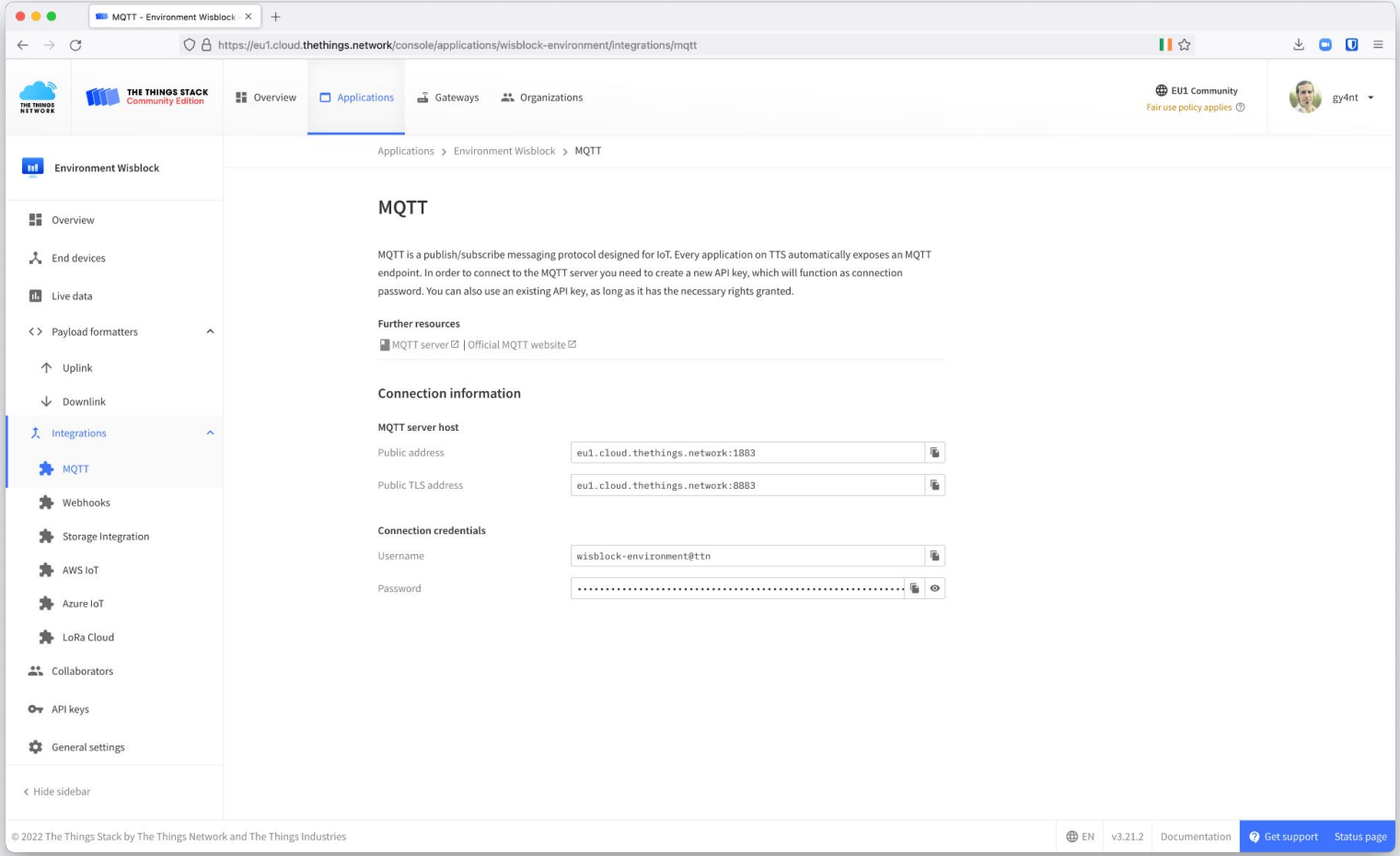

Overview - wisblock-01 - The TI
https://eu1.cloud.thethings.network/console/applications/wisblock-environment/devices/wisblock-01
THE THINGS STACK
Community Edition
Overview
Applications
Gateways
Organizations
EU1 Community
No support plan
gy4nt
Environment Wisblock
Overview
End devices
Live data
Payload formatters
Integrations
Collaborators
API keys
General settings
Hide sidebar
Applications > Environment Wisblock > End devices > wisblock-01
wisblock-01
ID: wisblock-01
n/a
n/a
Last activity 9 seconds ago
Overview
Live data
Messaging
Location
Payload formatters
Claiming
General settings
General information
End device ID
wisblock-01
Frequency plan
Europe 863-870 MHz (SF9 for RX2 - recommen…
LoRaWAN version
LoRaWAN Specification 1.0.2
Regional Parameters version
RP001 Regional Parameters 1.0.2
Created at
Sep 17, 2022 00:13:54
Hardware
Brand
rakwireless
Model
wisblock-4631
Hardware version
1.0
Firmware version
1.2.0
Activation information
AppEUI
00 00 00 00 00 00 00 00
DevEUI
AC 1F 09 FF FE 03 B9 A0
AppKey
Session information
Live data
See all activity
00:16:28 Forward join-accept message DevAddr: 26 0B 94 A6
00:16:27 Accept join-request DevAddr: 26 0B 94 A6
00:13:54 Create end device
Location
Change location settings
No location information available
https://eu1.cloud.thethings.network/console/organizations


MQTT - Environment Wisblock
https://eu1.cloud.thethings.network/console/applications/wisblock-environment/integrations/mqtt
THE THINGS STACK
Community Edition
Overview
Applications
Gateways
Organizations
EU1 Community
Fair use policy applies
gy4nt
Environment Wisblock
Overview
End devices
Live data
Payload formatters
Uplink
Downlink
Integrations
MQTT
Webhooks
Storage Integration
AWS IoT
Azure IoT
LoRa Cloud
Collaborators
API keys
General settings
Hide sidebar
Applications > Environment Wisblock > MQTT
MQTT
MQTT is a publish/subscribe messaging protocol designed for IoT. Every application on TTS automatically exposes an MQTT endpoint. In order to connect to the MQTT server you need to create a new API key, which will function as connection password. You can also use an existing API key, as long as it has the necessary rights granted.
Further resources
MQTT server | Official MQTT website
Connection information
MQTT server host
Public address
eu1.cloud.thethings.network:1883
Public TLS address
eu1.cloud.thethings.network:8883
Connection credentials
Username
wisblock-environment@ttn
Password
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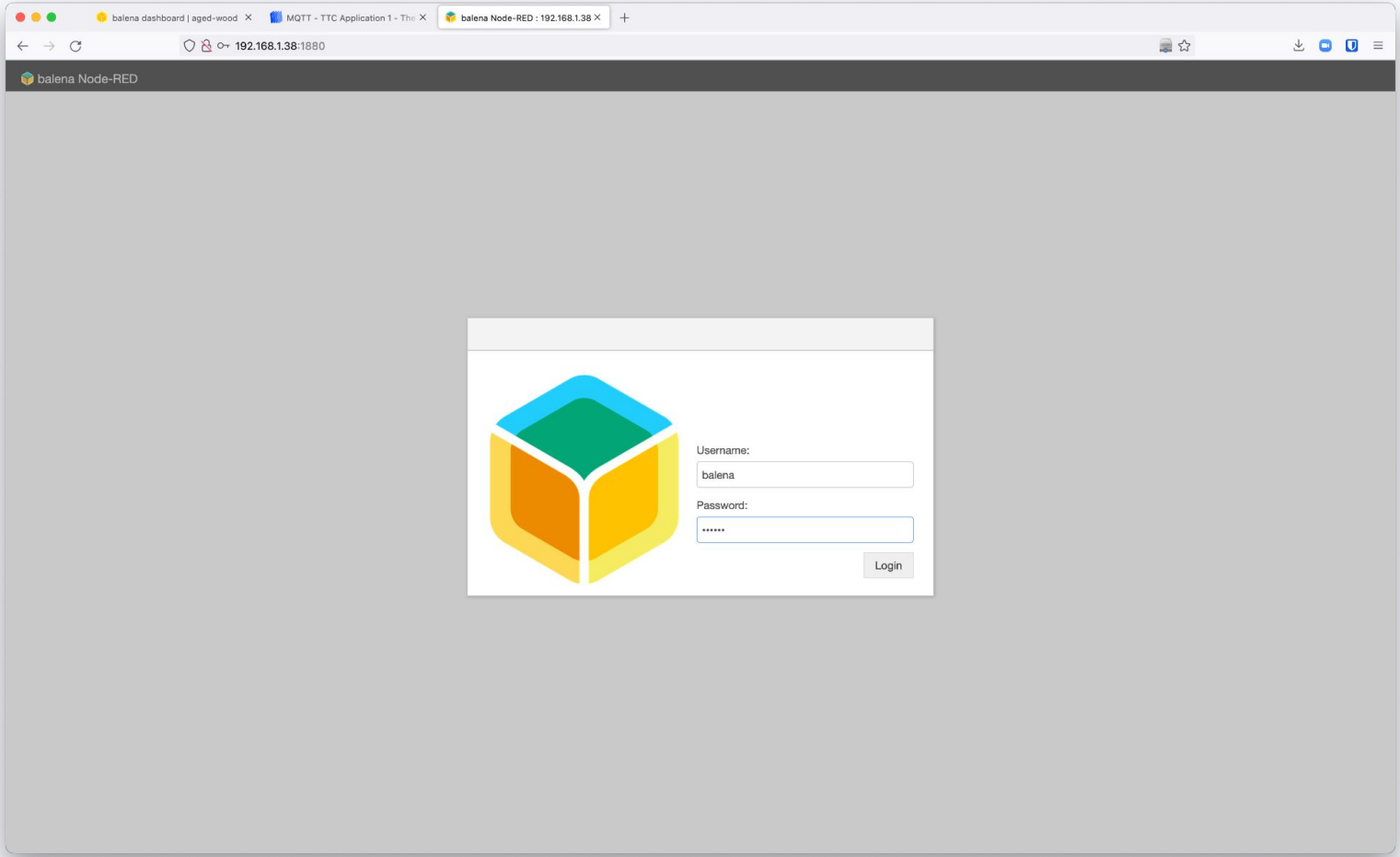
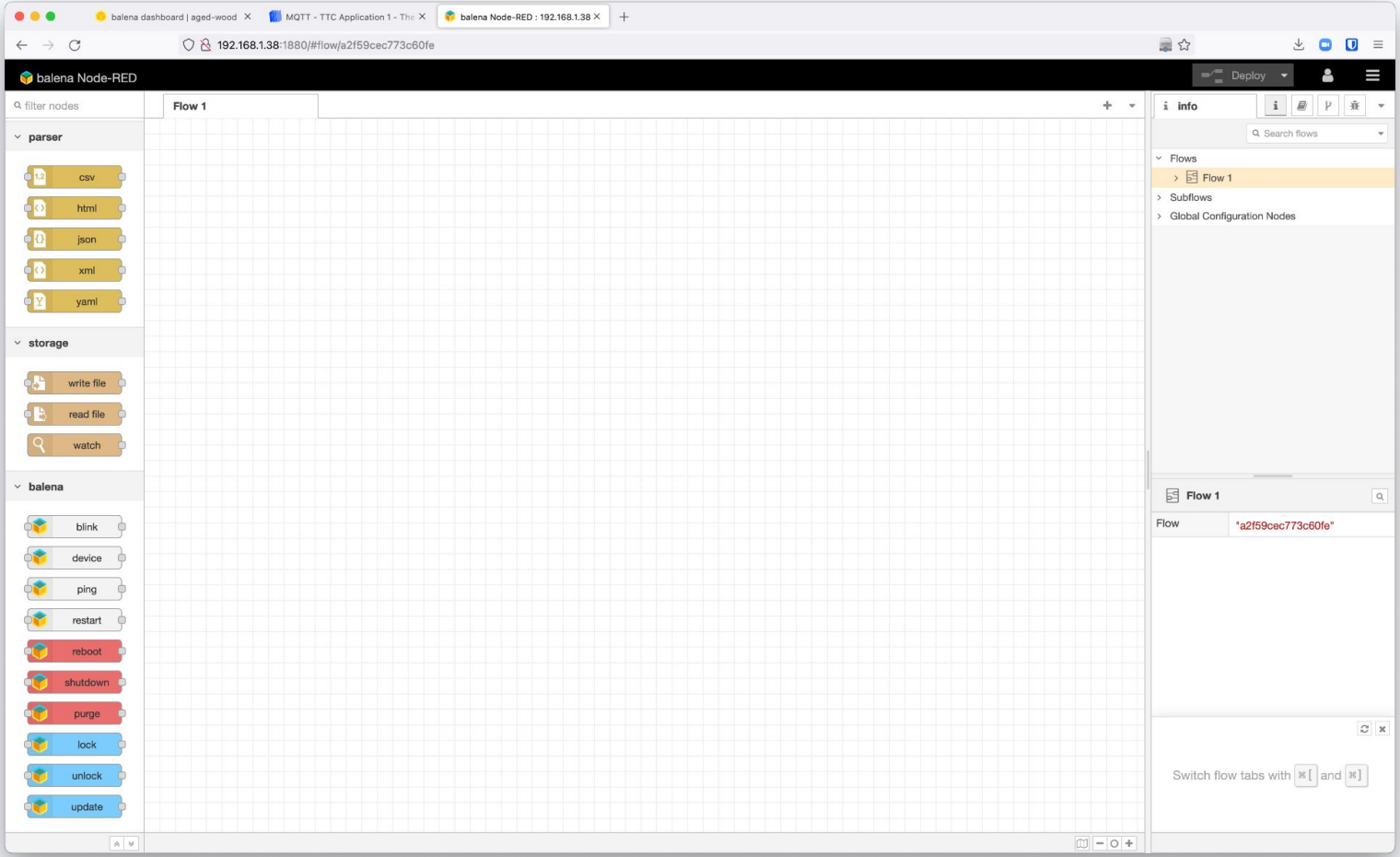
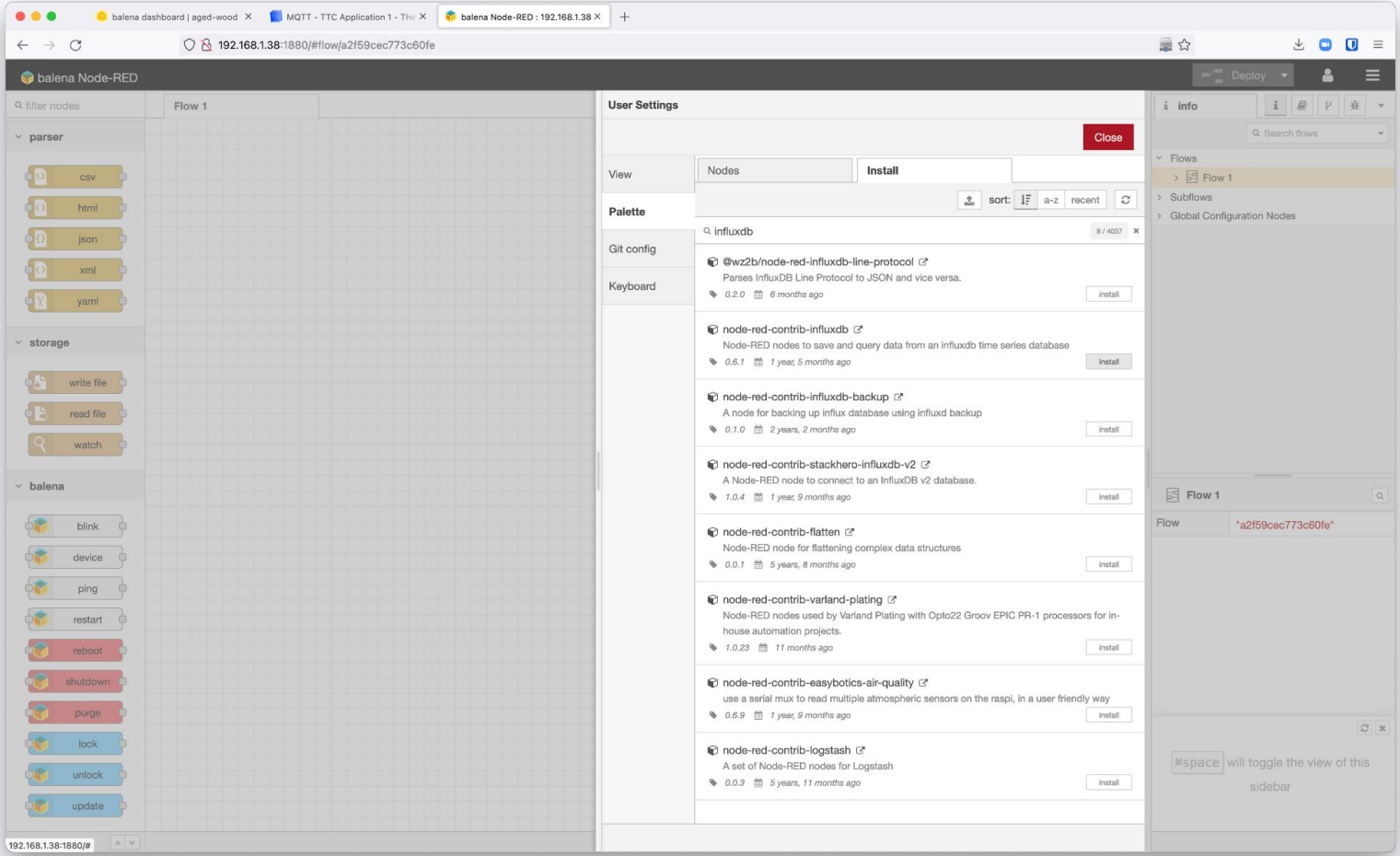
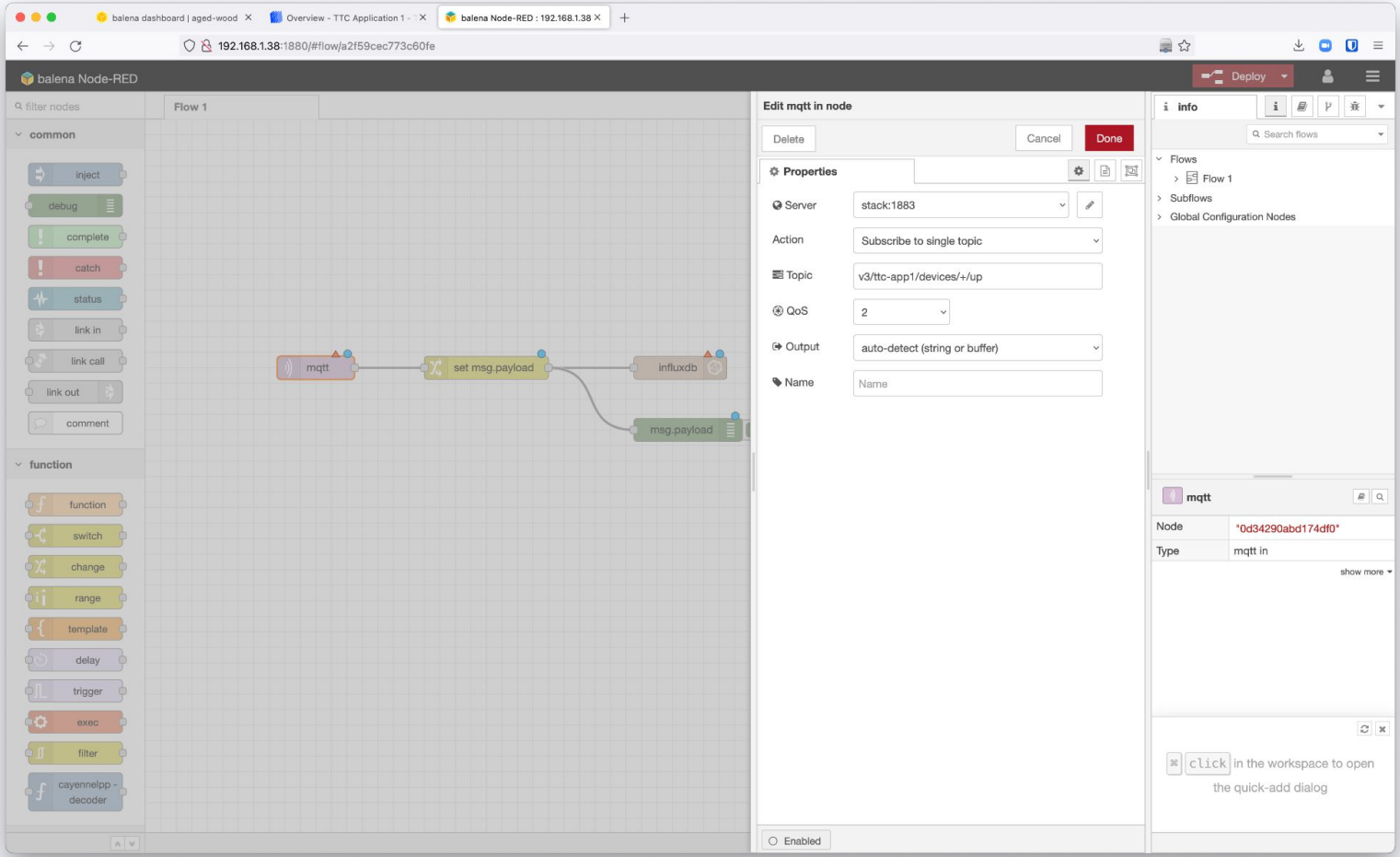
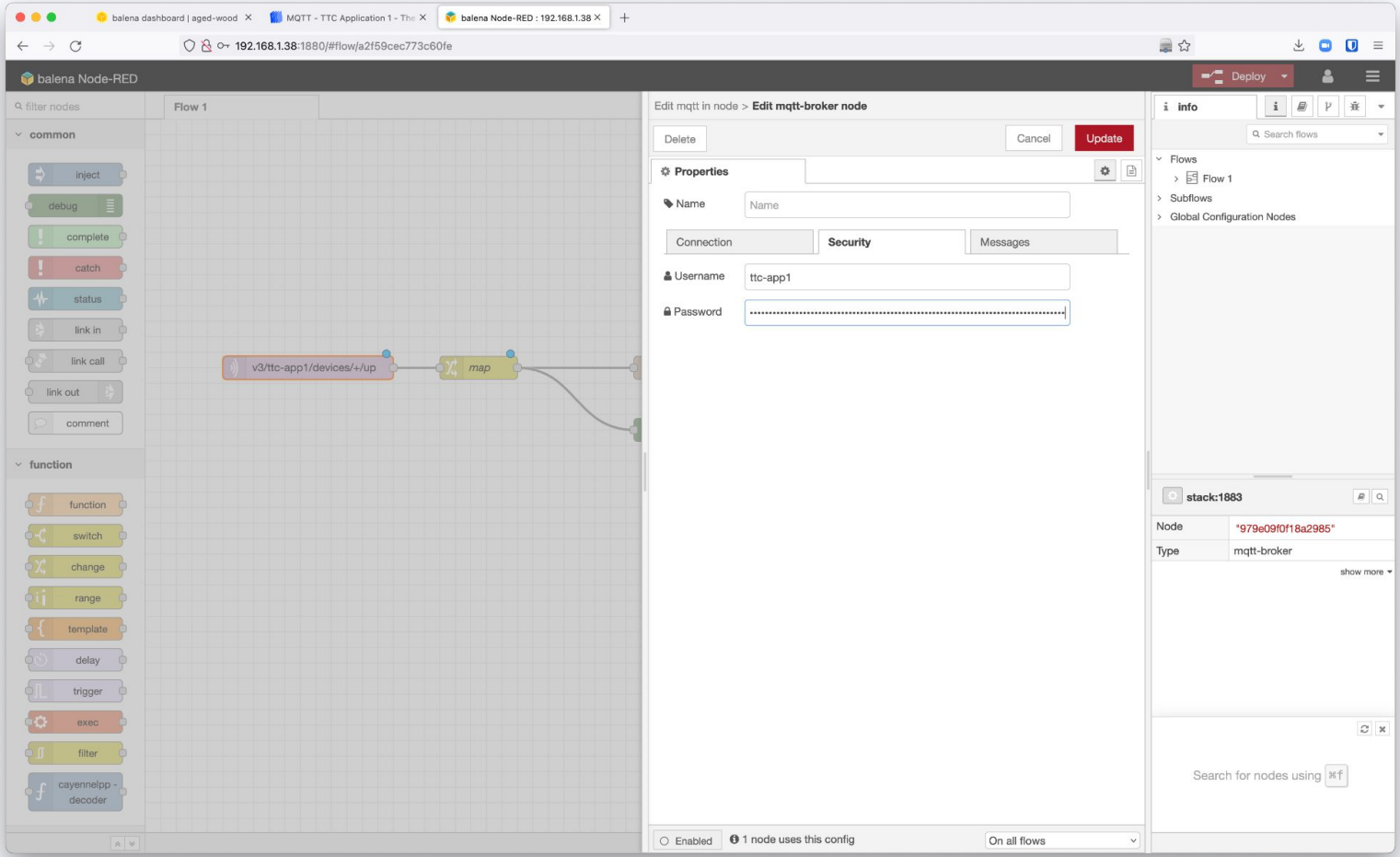
v3.21.2
Documentation
Get support
Status page

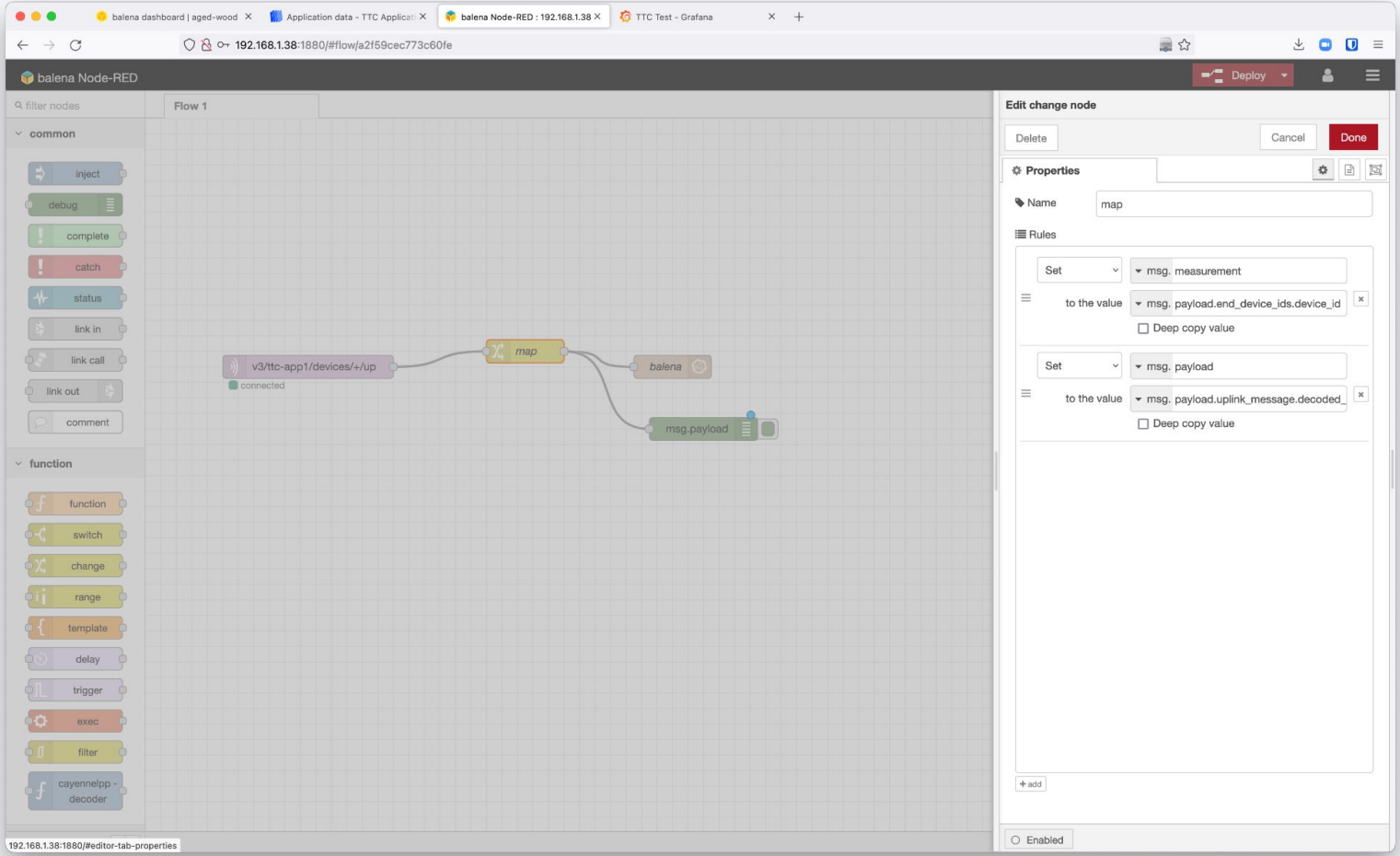

balena dashboard | aged-wood
MQTT - TTC Application 1 - The
balena Node-RED : 192.168.1.38
192.168.1.38:1880
balena Node-RED
Username:
balena
Password:
Login

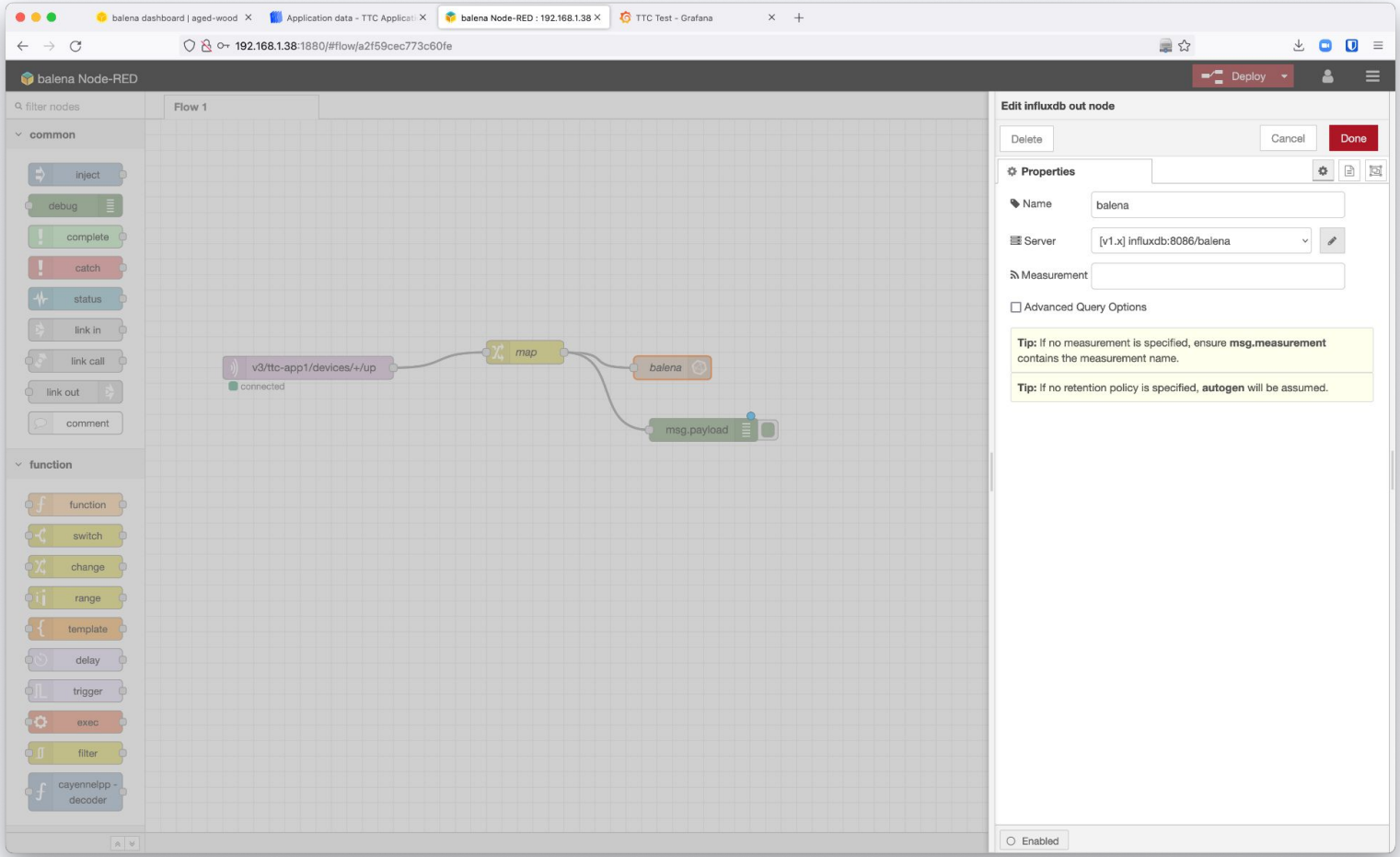

balena dashboard | aged-wood
MQTT - TTC Application 1 - The
balena Node-RED : 192.168.1.38
192.168.1.38:1880/#flow/a2f59cec773c60fe
balena Node-RED
Deploy
filter nodes
Flow 1
parser
csv
html
json
xml
yaml
storage
write file
read file
watch
balena
blink
device
ping
restart
reboot
shutdown
purge
lock
unlock
update
info
Search flows
Flows
Flow 1
Subflows
Global Configuration Nodes
Flow 1
Flow
"a2f59cec773c60fe"
Switch flow tabs with ⌘[and ⌘]

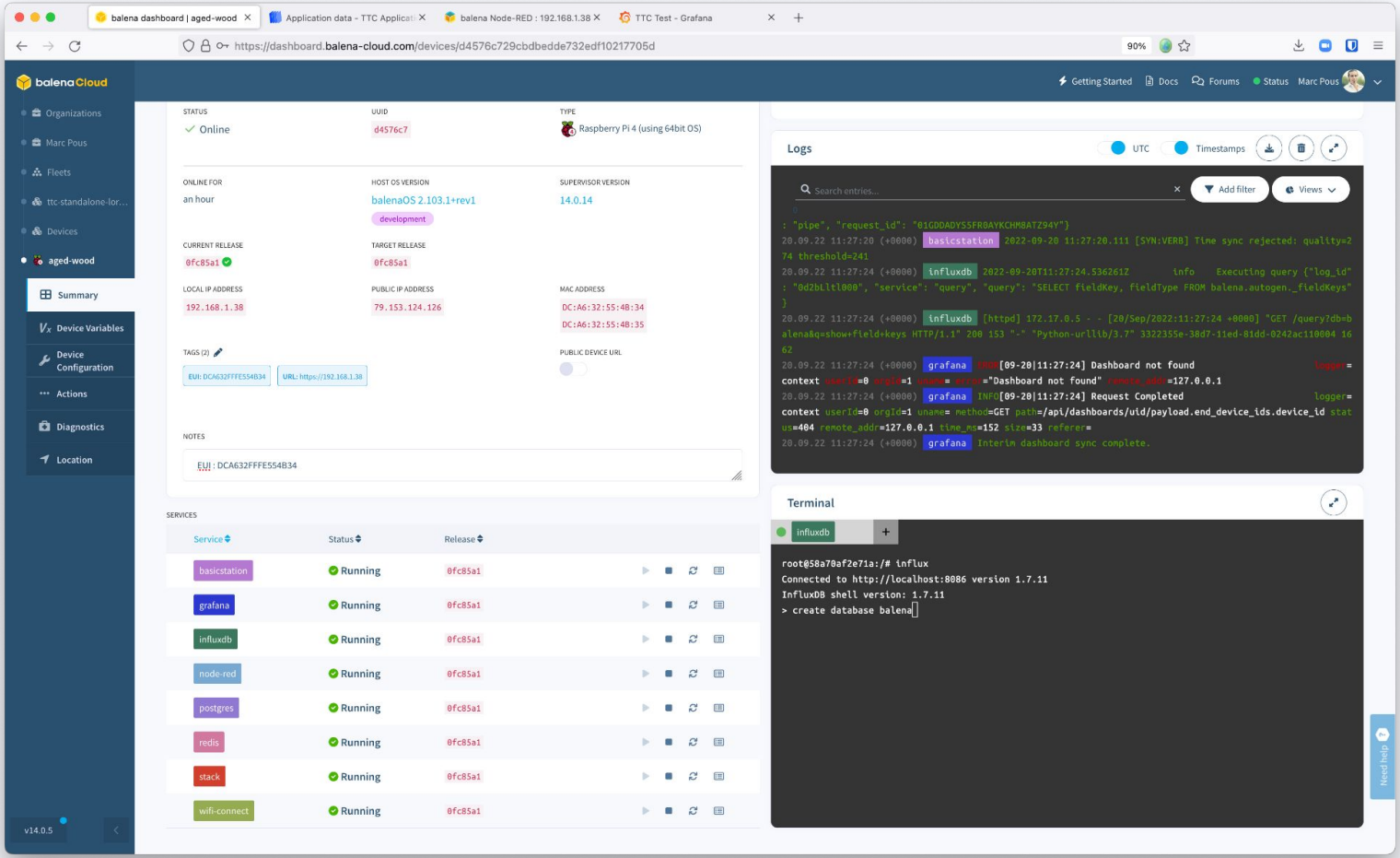

balena dashboard | aged-wood
MQTT - TTC Application 1 - The
balena Node-RED : 192.168.1.38
192.168.1.38:1880/#flow/a2f59cec773c60fe
balena Node-RED
Deploy
filter nodes
Flow 1
parser
csv
html
json
xml
yaml
storage
write file
read file
watch
balena
blink
device
ping
restart
reboot
shutdown
purge
lock
unlock
update
User Settings
Close
View
Palette
Git config
Keyboard
Nodes
Install
sort:
a-z
recent
influxdb
8 / 4037
@wz2b/node-red-influxdb-line-protocol
Parses InfluxDB Line Protocol to JSON and vice versa.
0.2.0
6 months ago
install
node-red-contrib-influxdb
Node-RED nodes to save and query data from an influxdb time series database
0.6.1
1 year, 5 months ago
install
node-red-contrib-influxdb-backup
A node for backing up influx database using influxd backup
0.1.0
2 years, 2 months ago
install
node-red-contrib-stackhero-influxdb-v2
A Node-RED node to connect to an InfluxDB v2 database.
1.0.4
1 year, 9 months ago
install
node-red-contrib-flatten
Node-RED node for flattening complex data structures
0.0.1
5 years, 8 months ago
install
node-red-contrib-varland-plating
Node-RED nodes used by Varland Plating with Opto22 Groov EPIC PR-1 processors for in-house automation projects.
1.0.23
11 months ago
install
node-red-contrib-easybotics-air-quality
use a serial mux to read multiple atmospheric sensors on the raspi, in a user friendly way
0.6.9
1 year, 9 months ago
install
node-red-contrib-logstash
A set of Node-RED nodes for Logstash
0.0.3
5 years, 11 months ago
install
info
Search flows
Flows
Flow 1
Subflows
Global Configuration Nodes
Flow 1
Flow
"a2f59cec773c60fe"
⌘space will toggle the view of this sidebar
192.168.1.38:1880/#

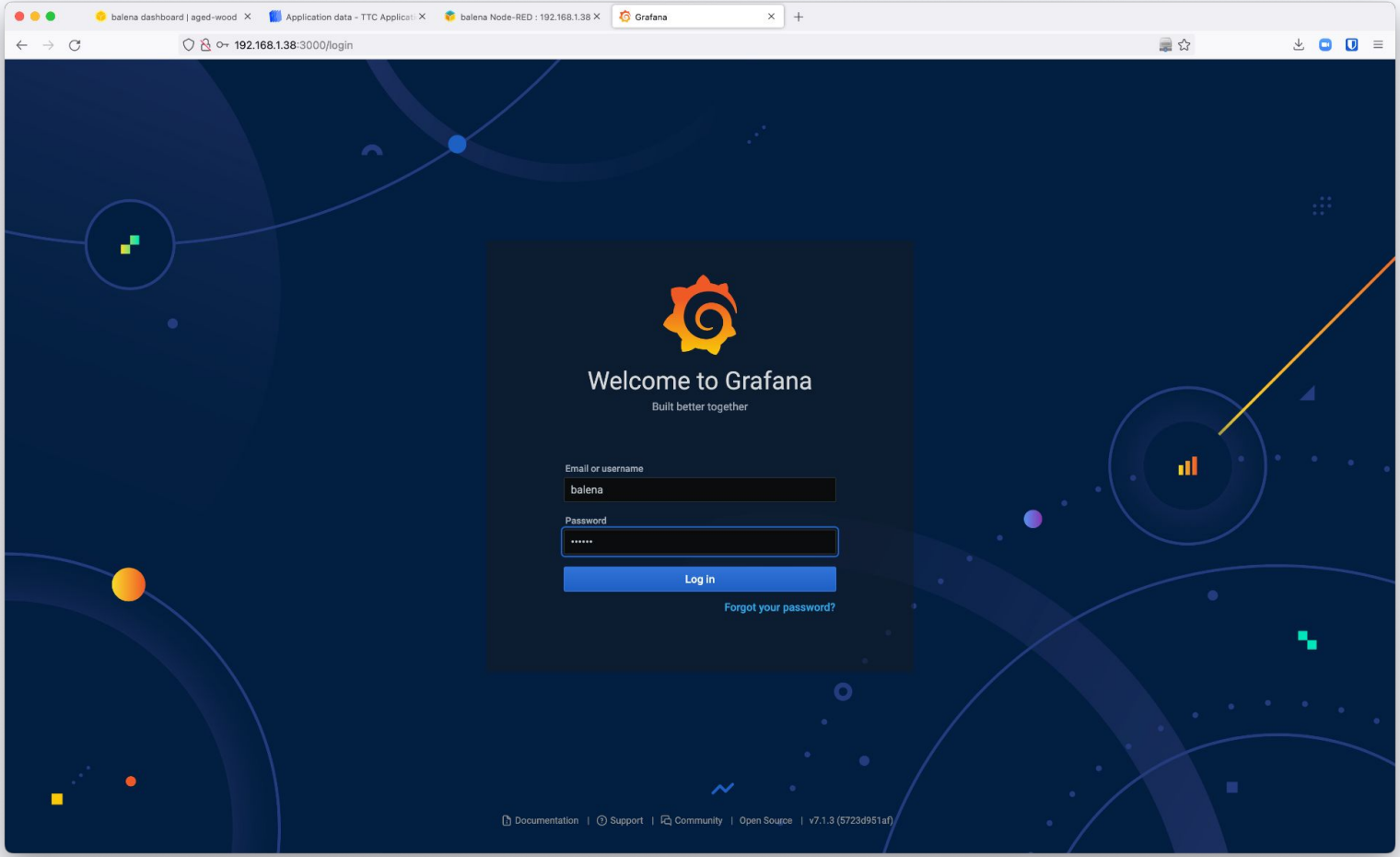

balena dashboard | aged-wood
Overview - TTC Application 1
balena Node-RED : 192.168.1.38
192.168.1.38:1880/#flow/a2f59cec773c60fe
balena Node-RED
Deploy
filter nodes
Flow 1
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
change
range
template
delay
trigger
exec
filter
cayennelpp - decoder
mqtt
set msg.payload
influxdb
msg.payload
Edit mqtt in node
Delete
Cancel
Done
Properties
Server
stack:1883
Action
Subscribe to single topic
Topic
v3/ttc-app1/devices/+/up
QoS
2
Output
auto-detect (string or buffer)
Name
Name
Enabled
info
Search flows
Flows
Flow 1
Subflows
Global Configuration Nodes
mqtt
Node
"0d34290abd174df0"
Type
mqtt in
show more
click in the workspace to open the quick-add dialog

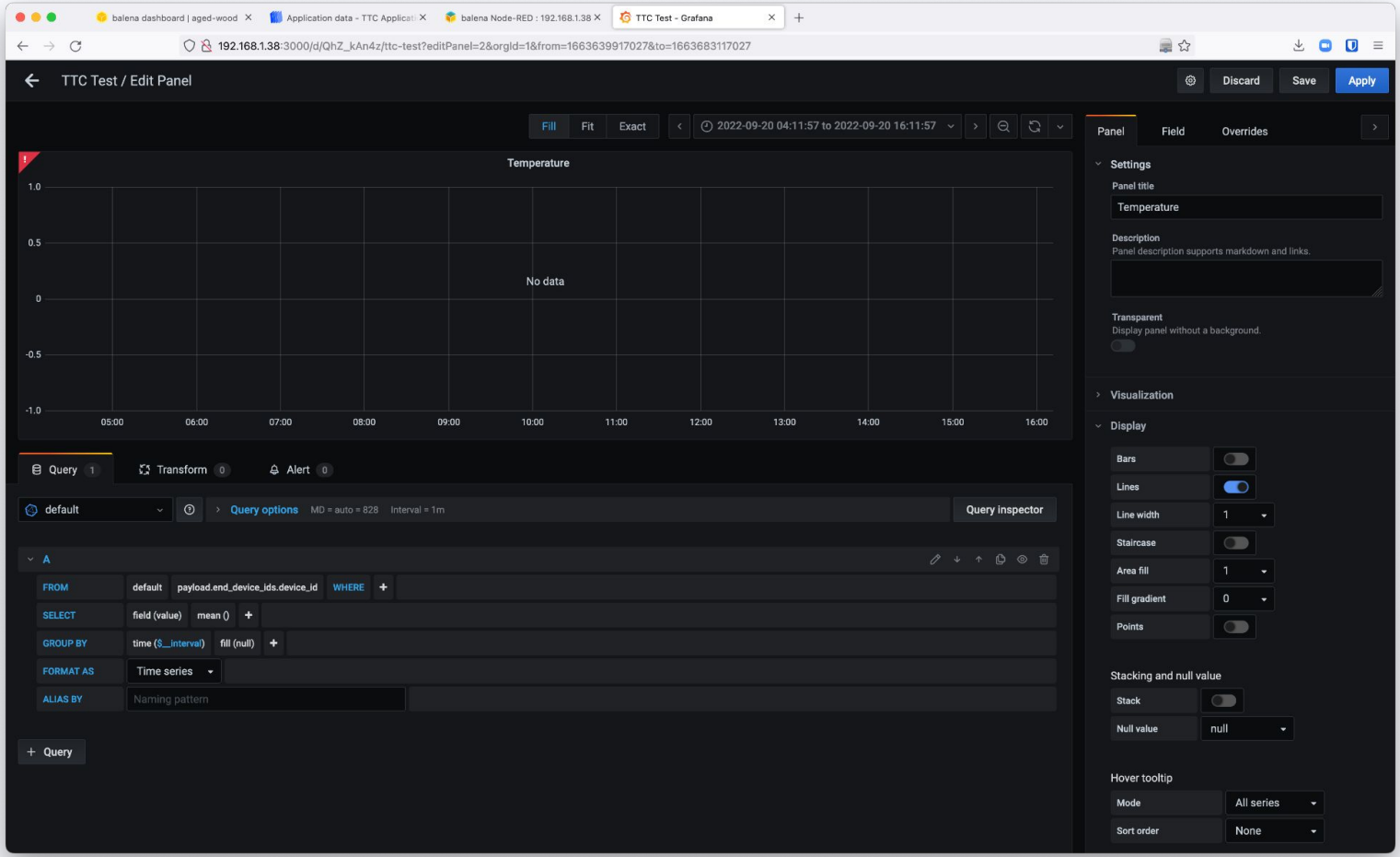

balena dashboard | aged-wood
MQTT - TTC Application 1 - The
balena Node-RED : 192.168.1.38
192.168.1.38:1880/#flow/a2f59cec773c60fe
balena Node-RED
Deploy
filter nodes
Flow 1
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
change
range
template
delay
trigger
exec
filter
cayennelpp - decoder
v3/ttc-app1/devices/+/up
map
Edit mqtt in node > Edit mqtt-broker node
Delete
Cancel
Update
Properties
Name
Name
Connection
Security
Messages
Username
ttc-app1
Password
Enabled
1 node uses this config
On all flows
info
Search flows
Flows
Flow 1
Subflows
Global Configuration Nodes
stack:1883
Node
"979e09f0f18a2985"
Type
mqtt-broker
show more
Search for nodes using ⌘f


balena dashboard | aged-wood
Application data - TTC Applicati
balena Node-RED : 192.168.1.38
TTC Test - Grafana
192.168.1.38:1880/#flow/a2f59cec773c60fe
balena Node-RED
Deploy
filter nodes
Flow 1
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
change
range
template
delay
trigger
exec
filter
cayennelpp - decoder
v3/ttc-app1/devices/+/up
connected
map
balena
msg.payload
Edit change node
Delete
Cancel
Done
Properties
Name
map
Rules
Set
msg. measurement
to the value
msg. payload.end_device_ids.device_id
Deep copy value
Set
msg. payload
to the value
msg. payload.uplink_message.decoded_
Deep copy value
+ add
Enabled
192.168.1.38:1880/#editor-tab-properties


balena dashboard | aged-wood
Application data - TTC Applicati
balena Node-RED : 192.168.1.38
TTC Test - Grafana
192.168.1.38:1880/#flow/a2f59cec773c60fe
balena Node-RED
Deploy
filter nodes
Flow 1
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
change
range
template
delay
trigger
exec
filter
cayennelpp - decoder
v3/ttc-app1/devices/+/up
connected
map
balena
msg.payload
Edit influxdb out node
Delete
Cancel
Done
Properties
Name
balena
Server
[v1.x] influxdb:8086/balena
Measurement
Advanced Query Options
Tip: If no measurement is specified, ensure msg.measurement contains the measurement name.
Tip: If no retention policy is specified, autogen will be assumed.
Enabled


balena dashboard | aged-wood
Application data - TTC Applicat
balena Node-RED : 192.168.1.38
TTC Test - Grafana
https://dashboard.balena-cloud.com/devices/d4576c729cbdbedde732edf10217705d
90%
balena Cloud
Getting Started
Docs
Forums
Status
Marc Pous
Organizations
Marc Pous
Fleets
ttc-standalone-lor...
Devices
aged-wood
Summary
Device Variables
Device Configuration
Actions
Diagnostics
Location
v14.0.5
STATUS
Online
UUID
d4576c7
TYPE
Raspberry Pi 4 (using 64bit OS)
ONLINE FOR
an hour
HOST OS VERSION
balenaOS 2.103.1+rev1
development
SUPERVISOR VERSION
14.0.14
CURRENT RELEASE
0fc85a1
TARGET RELEASE
0fc85a1
LOCAL IP ADDRESS
192.168.1.38
PUBLIC IP ADDRESS
79.153.124.126
MAC ADDRESS
DC:A6:32:55:4B:34
DC:A6:32:55:4B:35
TAGS (2)
EUI: DCA632FFFE554B34
URL: https://192.168.1.38
PUBLIC DEVICE URL
NOTES
EUI : DCA632FFFE554B34
SERVICES
Service
Status
Release
basicstation
Running
0fc85a1
grafana
Running
0fc85a1
influxdb
Running
0fc85a1
node-red
Running
0fc85a1
postgres
Running
0fc85a1
redis
Running
0fc85a1
stack
Running
0fc85a1
wifi-connect
Running
0fc85a1
Logs
UTC
Timestamps
Search entries...
Add filter
Views
: "pipe", "request_id": "01GDDADY55FR0AYKCHM8ATZ94Y"}
20.09.22 11:27:20 (+0000) basicstation 2022-09-20 11:27:20.111 [SYN:VERB] Time sync rejected: quality=274 threshold=241
20.09.22 11:27:24 (+0000) influxdb 2022-09-20T11:27:24.536261Z info Executing query {"log_id": "0d2blltl000", "service": "query", "query": "SELECT fieldKey, fieldType FROM balena.autogen._fieldKeys"}
20.09.22 11:27:24 (+0000) influxdb [httpd] 172.17.0.5 - - [20/Sep/2022:11:27:24 +0000] "GET /query?db=balena&q=show+field+keys HTTP/1.1" 200 153 "-" "Python-urllib/3.7" 3322355e-38d7-11ed-81dd-0242ac110004 1662
20.09.22 11:27:24 (+0000) grafana EROR[09-20|11:27:24] Dashboard not found logger=context userId=0 orgId=1 uname= error="Dashboard not found" remote_addr=127.0.0.1
20.09.22 11:27:24 (+0000) grafana INFO[09-20|11:27:24] Request Completed logger=context userId=0 orgId=1 uname= method=GET path=/api/dashboards/uid/payload.end_device_ids.device_id status=404 remote_addr=127.0.0.1 time_ms=152 size=33 referer=
20.09.22 11:27:24 (+0000) grafana Interim dashboard sync complete.
Terminal
influxdb
root@58a70af2e71a:/# influx
Connected to http://localhost:8086 version 1.7.11
InfluxDB shell version: 1.7.11
> create database balena
Need help


balena dashboard | aged-wood
Application data - TTC Applicati
balena Node-RED : 192.168.1.38
Grafana
192.168.1.38:3000/login
Welcome to Grafana
Built better together
Email or username
balena
Password
Log in
Forgot your password?
Documentation | Support | Community | Open Source | v7.1.3 (5723d951af)

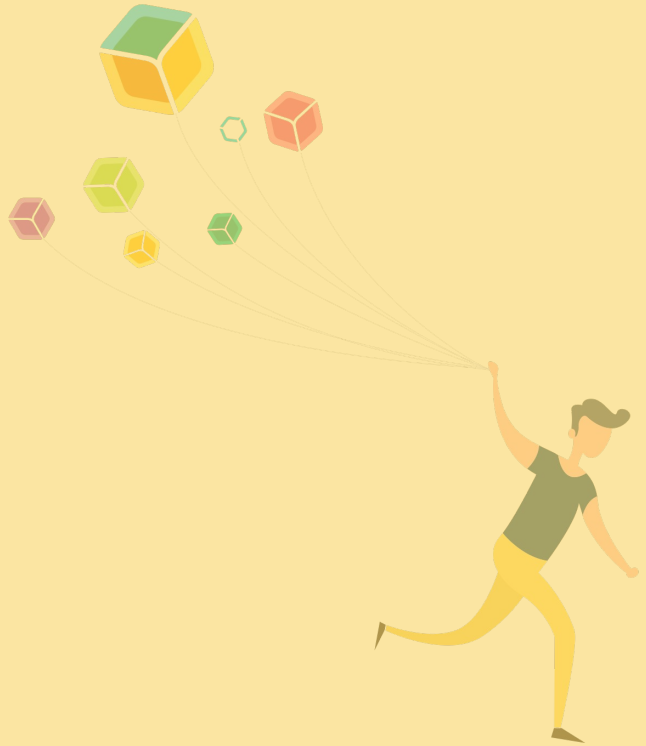

balena dashboard | aged-wood
Application data - TTC Applicat
balena Node-RED : 192.168.1.38
TTC Test - Grafana
192.168.1.38:3000/d/QhZ_kAn4z/ttc-test?editPanel=2&orgId=1&from=1663639917027&to=1663683117027
TTC Test / Edit Panel
Discard
Save
Apply
Fill
Fit
Exact
2022-09-20 04:11:57 to 2022-09-20 16:11:57
Temperature
1.0
0.5
0
-0.5
-1.0
No data
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
Query 1
Transform 0
Alert 0
default
Query options
MD = auto = 828
Interval = 1m
Query inspector
A
FROM
default
payload.end_device_ids.device_id
WHERE
SELECT
field (value)
mean ()
GROUP BY
time ($__interval)
fill (null)
FORMAT AS
Time series
ALIAS BY
Naming pattern
Query
Panel
Field
Overrides
Settings
Panel title
Temperature
Description
Panel description supports markdown and links.
Transparent
Display panel without a background.
Visualization
Display
Bars
Lines
Line width
1
Staircase
Area fill
1
Fill gradient
0
Points
Stacking and null value
Stack
Null value
null
Hover tooltip
Mode
All series
Sort order
None

Let’s wrap-up!

Why do we do this?

- Reduce friction to create private LoRaWAN networks.
- Enable the IoT developers and professionals.
- Feel free to contribute!

Questions?



Building your own private LoRaWAN network server and gateway with balena.io in 1 click

The Things Conference 2022 - 23rd of September 2022 - Amsterdam