



Give a second life to any miner and create your own LoRaWAN network

The Things Conference 2022 - 22nd of September 2022 - Amsterdam



Speaker



Marc Pous

Developer Advocate at balena.io

Running [IoT Barcelona](#), [IoT Stars](#) and [IoT Coffee Talk](#)



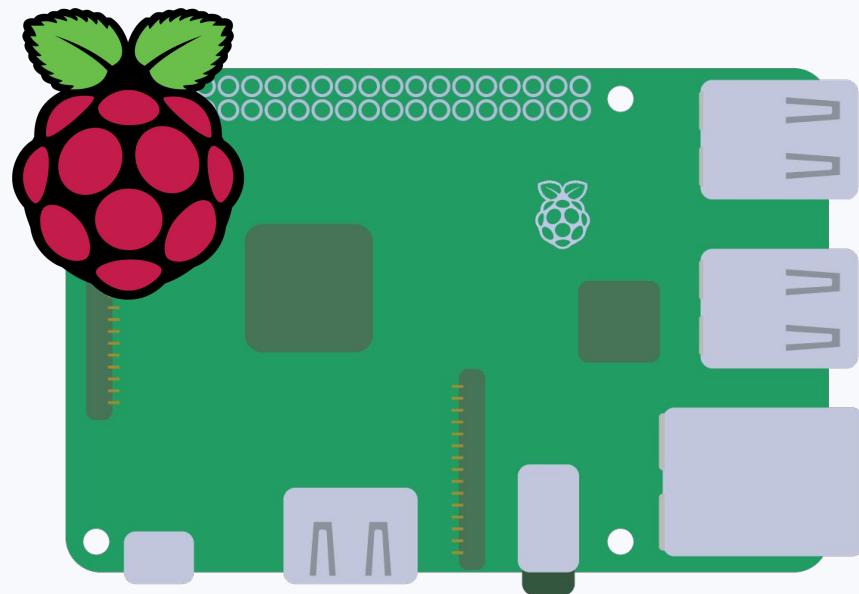
Who do manage
1 gateway today?

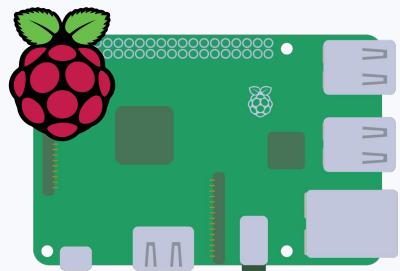
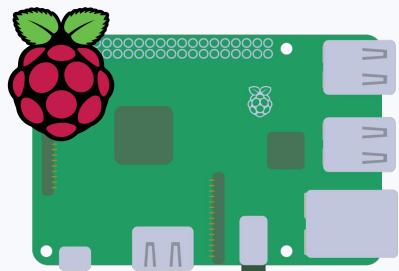
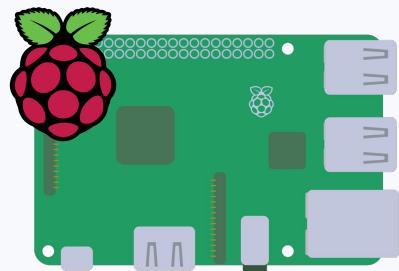
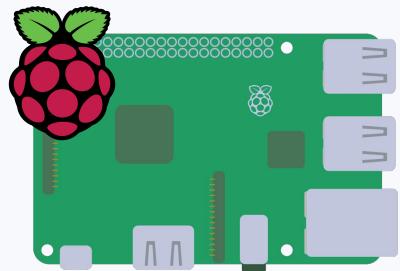
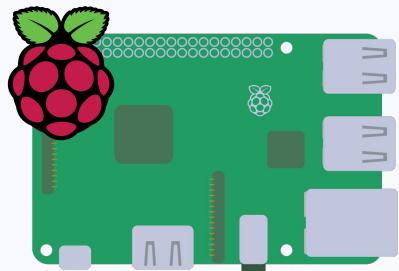
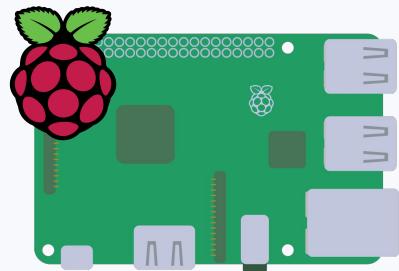
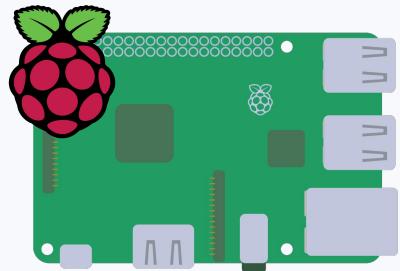
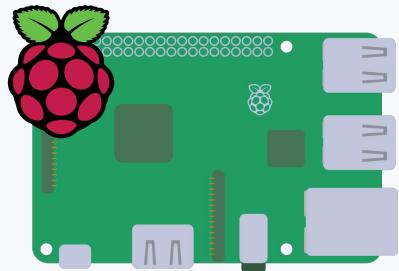
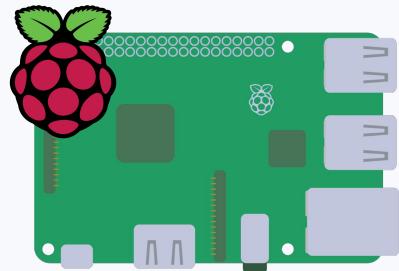
Who do manage more
than 1 gateway today?

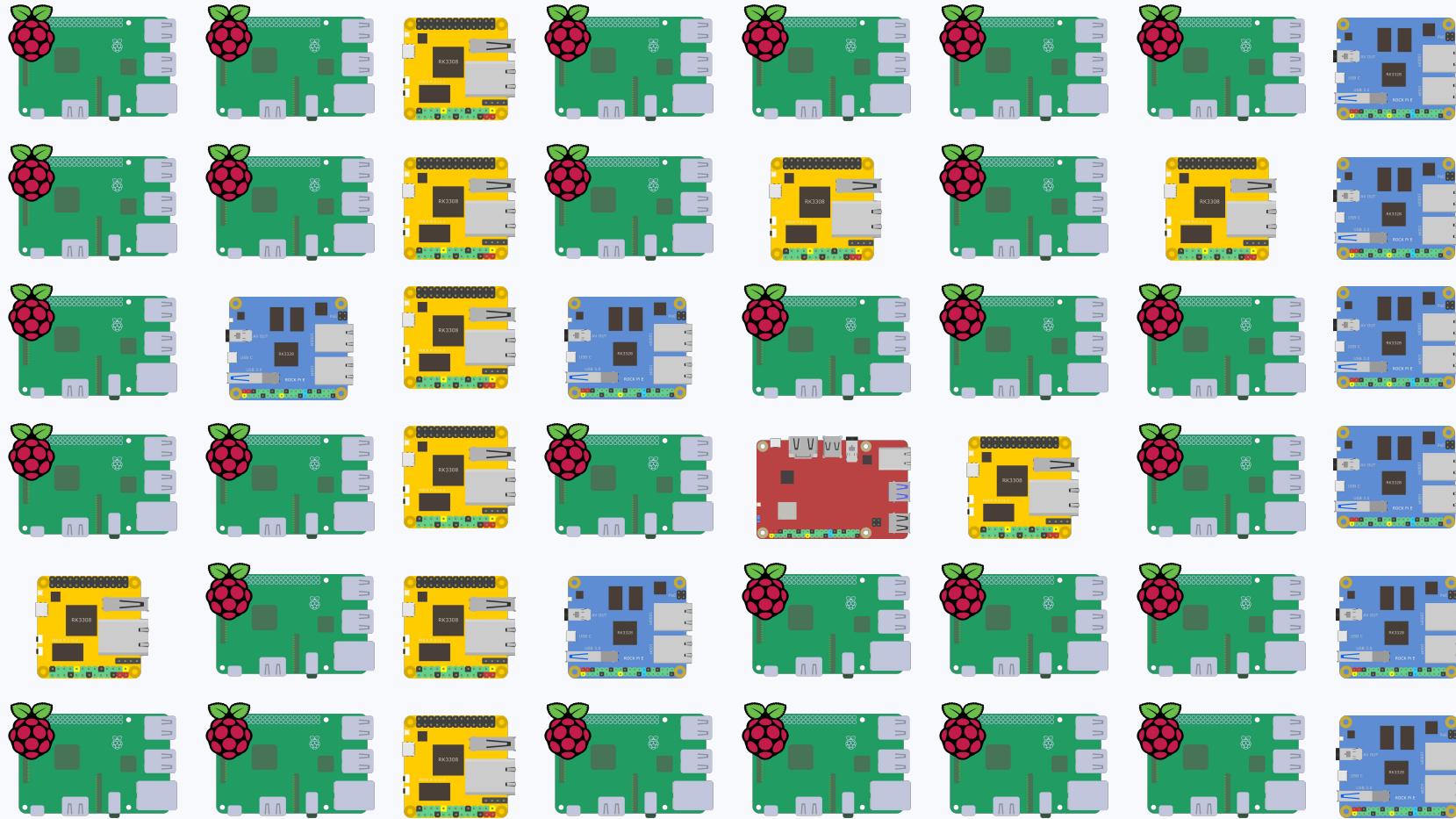
* **fleet owner** (n.): the person responsible for building and managing groups of connected IoT (Internet of Things) devices.

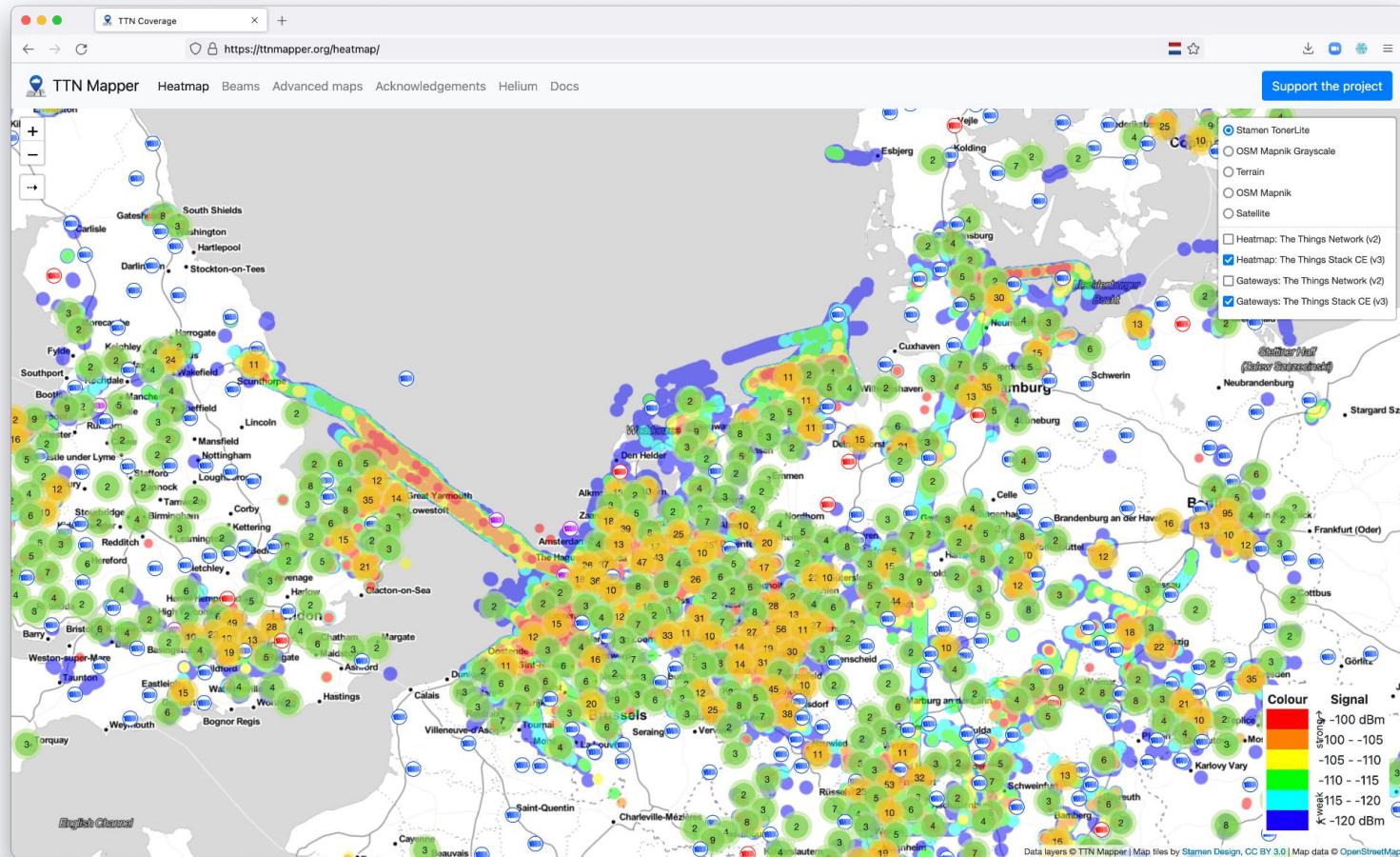


We are all fleet
owners!











Credits: <https://gristleking.com/antennas-for-helium/>

Why do every fleet
owner need fleet
management tools?



Why do every fleet owner needs fleet management tools?

1. Software and HostOS updates



Why do every fleet owner needs fleet management tools?

1. Software and HostOS updates
2. Device management tools (diagnostics, SSH, logs, etc.)



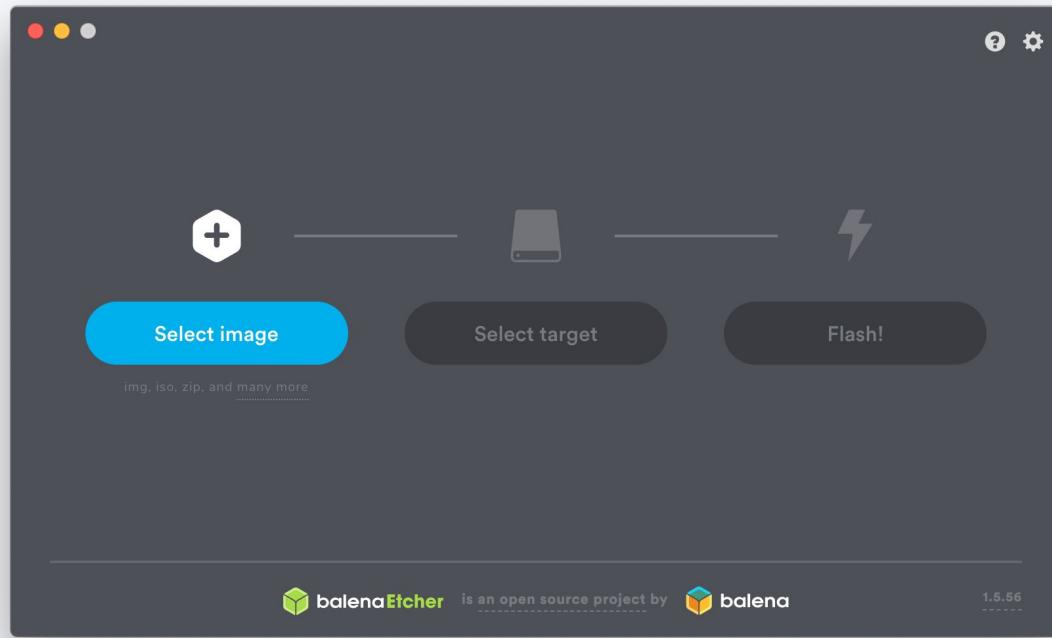
Why do every fleet owner needs fleet management tools?

1. Software and HostOS updates
2. Device management tools (diagnostics, SSH, logs, etc.)
3. Use 21st century tools (open source stack, containers, CI, etc.)

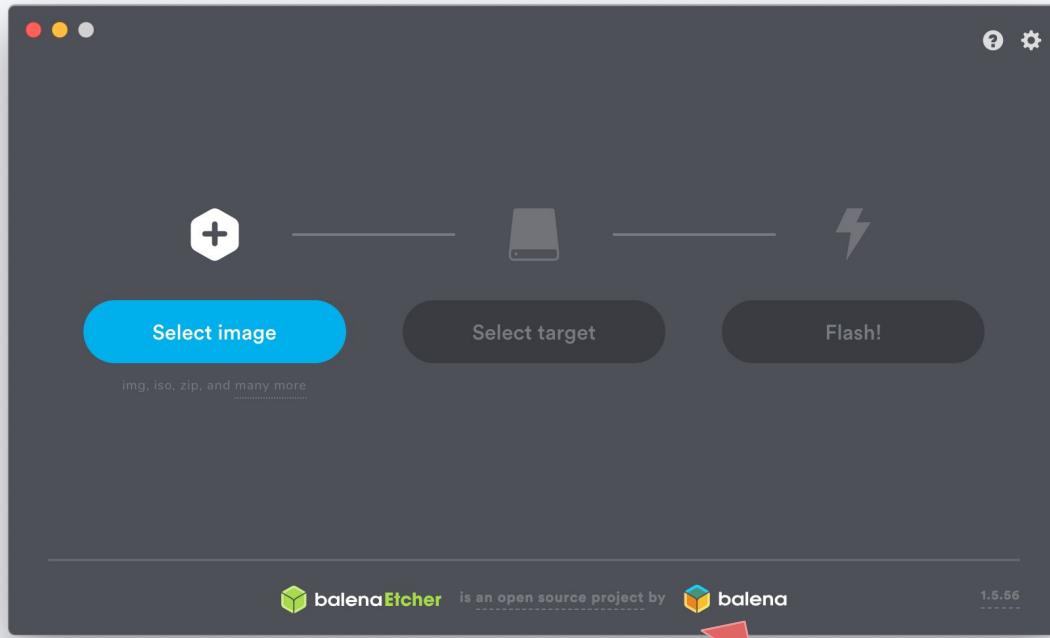


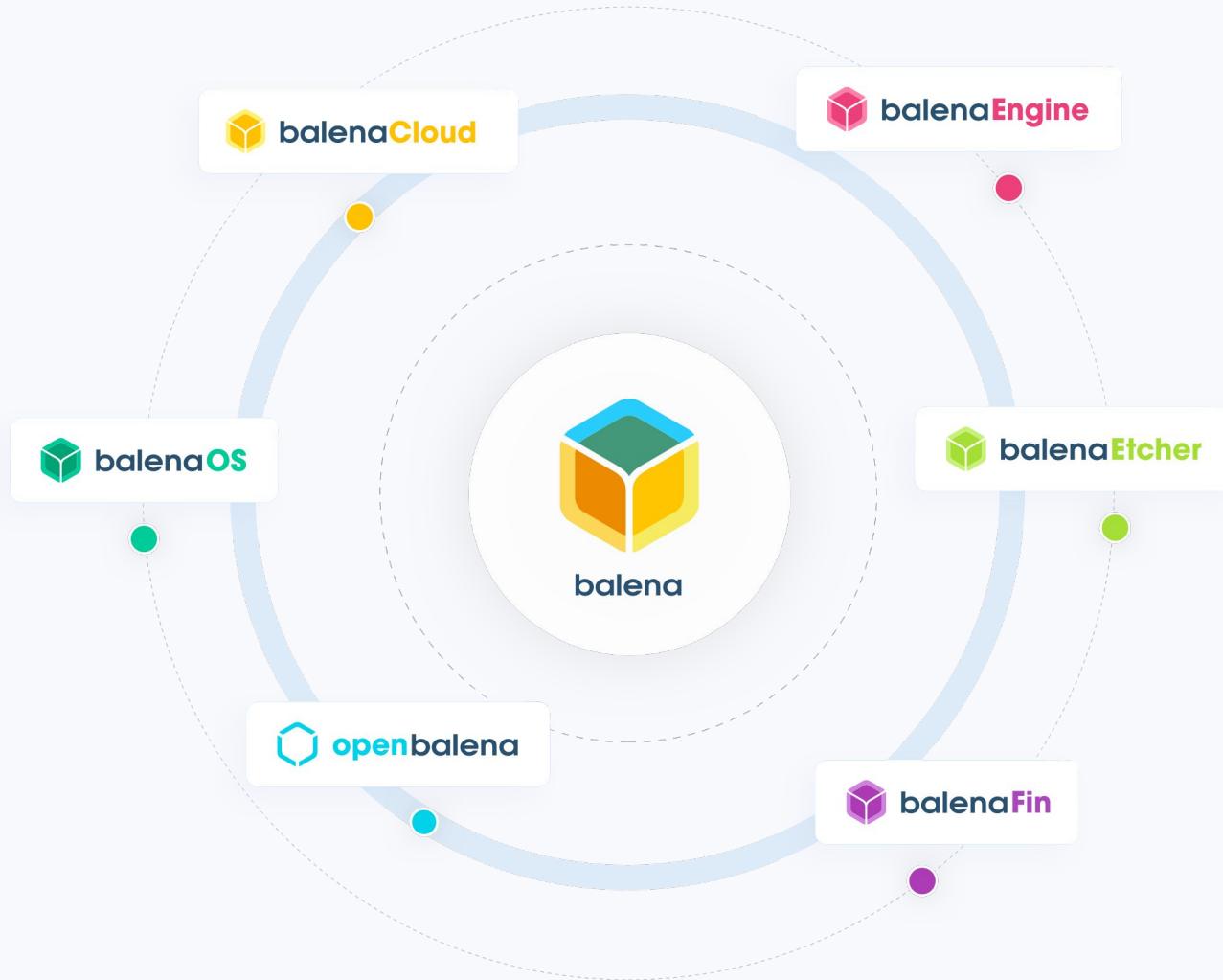
My recommendation?

Anyone know this?

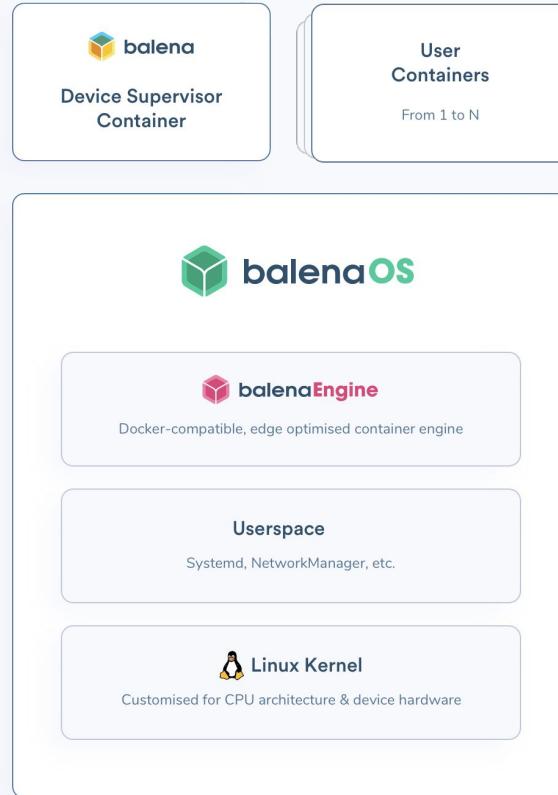


Anyone know this?



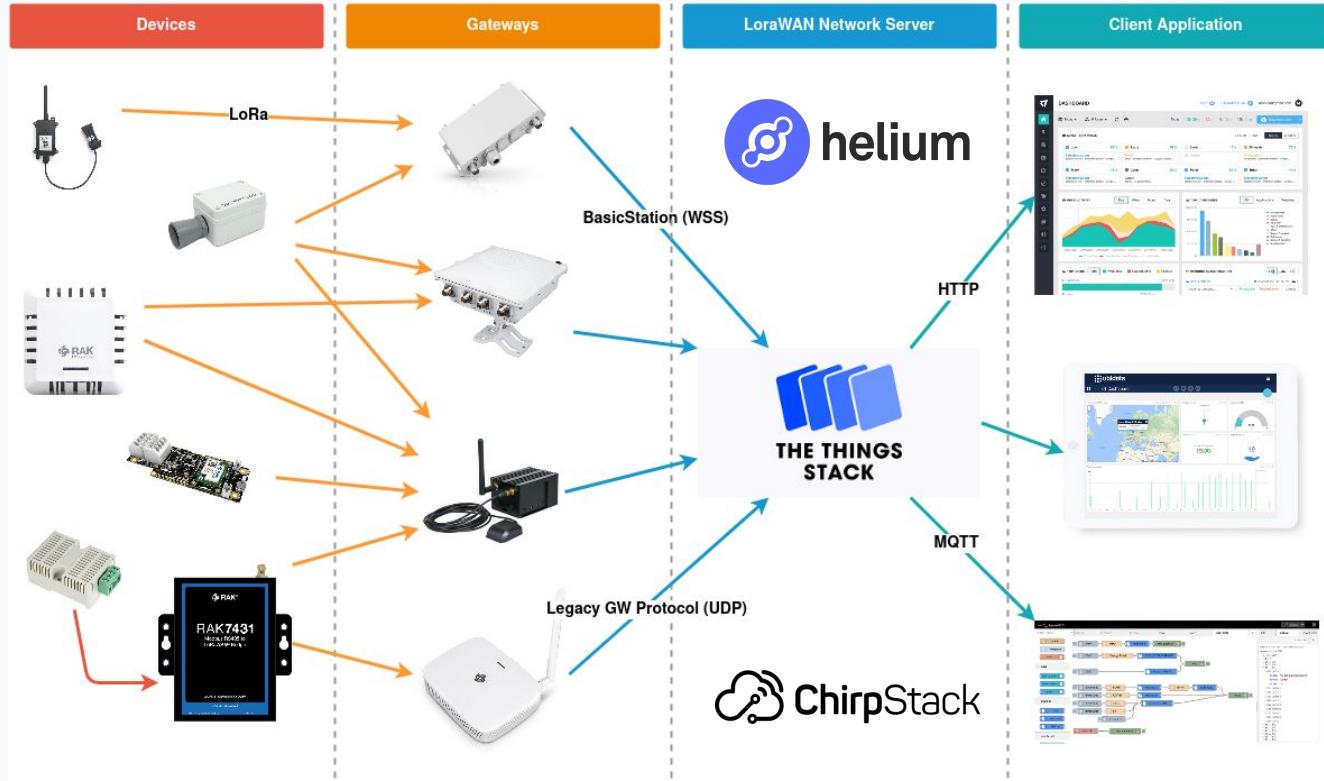


Let's take advantage of the containers in the Edge



Using fleet
management tools,
you can give a 2nd life
to anything!

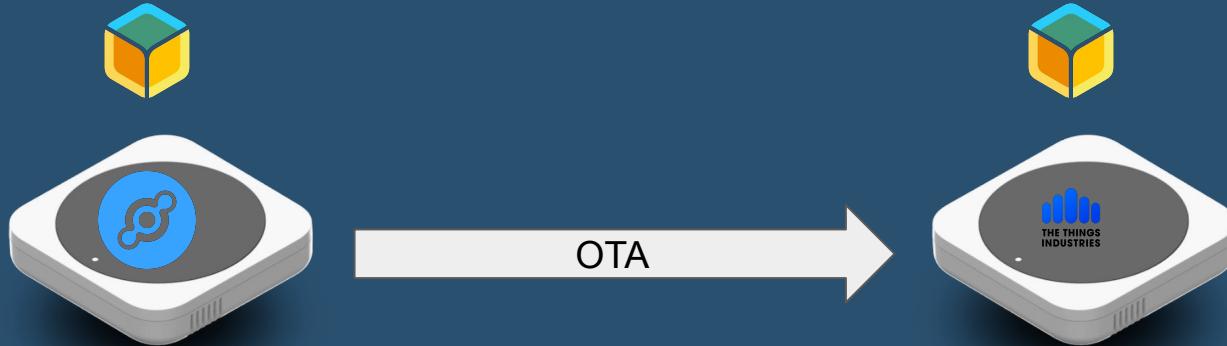
LoRaWAN Network Architecture



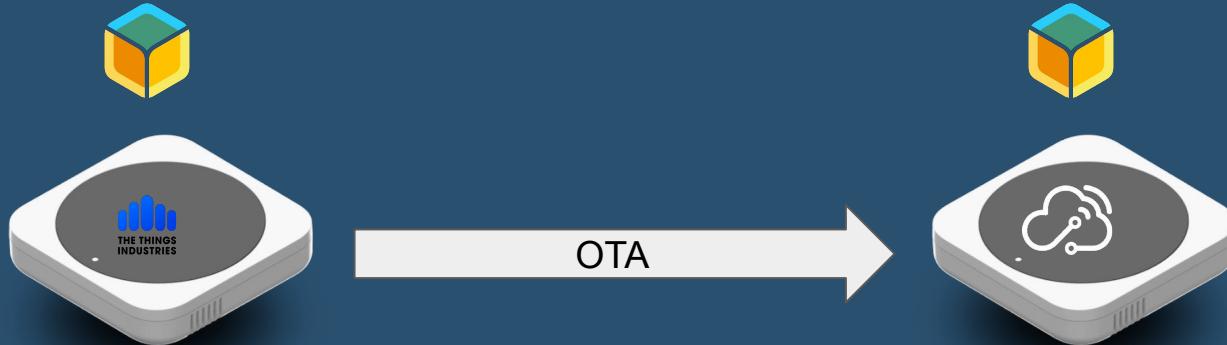
Let's give a second life
to a fleet of hotspots!

Here, live!









- 1 Have a fleet of LoRaWAN hotspots running on balena (or not).
- 2 Deploy a new App to the balena Fleet.
- 3 Add the Gateways to your new fleet.
- 4 Add them to TTS Discovery and test the “new” Gateways.



helium-data-only by Marc Pous X +

https://hub.balena.io/organizations/marc6/apps/helium-data-only

balenaHub What is balenaHub? Contribute Community

Organizations marc6 Apps helium data only

Back to Apps

helium-data-only

by Marc Pous

Description Deploy the Helium Data Only Hotspot that doesn't mine any HNT

Works With

Version v0.0.0 View code | 319 MB | last updated at: 22 Jul 2022

Deploy Report issue

What is a data-only Helium Hotspot?

A Data-Only Helium Hotspot is a variation of Helium Hotspots that can participate on the Helium Network by transferring data from the end devices (LoRaWAN nodes). They are eligible for Network Data Transfer Rewards but not Proof of Coverage Rewards. If you only need to send/receive data through the Helium Network this is a good solution.

Installation instructions

Hardware and software needed

- Raspberry Pi 0/2/3/4 or [balenaFin](#)
- RAK 2287 SPI LoRa concentrator and RAK2287 Pi Hat
- SD card
- [balenaEtcher](#)

Deploy the code

Running this project is as simple as deploying it to a balenaCloud application. You can do it in just one click by using the button [Fork this Fleet](#).

This project is currently based on Nebra Light Hotspot. Once the Hotspot is online and the services `packet-forwarder` and `gateways` are downloaded and installed.

Configure Device Variables

[Go to Device Variables](#)

- This project is compatible with all the Raspberry Pi family running RAK2287 LoRa concentrator (SPI based) with a Pi Hat. In case you use something different change the `VARIANT` variable. If you have doubts check the [Nebra list of compatible hardware](#).
- By default the defined region is Europe (EU868). If you are not based in Europe change the variable `REGION_OVERRIDE` to US915 or something different. Check different regions available [here](#).

Test the Data Only Hotspot

At this point go to Terminal and enter the following command

Share this Twitter Facebook LinkedIn

<https://hub.balena.io/organizations/marc6/apps/helium-data-only>



balena dashboard | muddy-pie

https://dashboard.balena-cloud.com/devices/f723db721013de4a555df8beb363edc5

Getting Started Docs Forums Status Marc Pous

muddy-pie

STATUS Online **UUID** f723db7 **TITLE** Raspberry Pi 4 (using 64bit OS)

ONLINE FOR 23 minutes **HOST OS VERSION** balenaOS 2.103.1+rev1 **SUPERVISOR VERSION** 14.0.14

CURRENT RELEASE c0ecfb **TARGET RELEASE** c0ecfbb

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 (0) No tags configured yet

NOTES
Add device notes...

SERVICES

Service	Status	Release
helium-miner	Running	c0ecfb
packet-forwarder	Running	c0ecfbb

CPU ~75% **Temperature** ~60C **Memory** 370 MB/3.8 GB **Storage** (dev/mmcblk0p1) 657 MB/28.3 GB

Logs

Search entries... Add filter Views

```
19.09.22 20:51:03 (+0000) packet-forwarder INFO: Received pkt from note: 4800008B (fcnt=0)
19.09.22 20:51:03 (+0000) packet-forwarder
19.09.22 20:51:03 (+0000) packet-forwarder JSON up: ("rxpk": [{"jver": 1, "tst": 1242360968, "chan": 3, "rfch": 0, "freql": 867.100000, "mld": 8, "stat": 1, "modu": "LORA", "datr": "SF7BW125", "codr": "4/5", "rssls": -47, "lsnr": 14.0, "foff": 17991, "rssl": -46, "size": 21, "data": "QIsAAEgAAAAB1Zib/IbIg030FJA9"}])
19.09.22 20:51:03 (+0000) helium-miner INFO uplink @1242360968 us, 867.10 MHz, Ok(DataRate(SF7, BW125)), snr: 14, rssl: -47, len: 21 from AA:55:5A:00:00:00:00:00:00, module: gateway
19.09.22 20:51:03 (+0000) packet-forwarder INFO: [up] PUSH_ACK received in 1 ms
19.09.22 20:51:06 (+0000) packet-forwarder INFO: [down] PULL_ACK received in 0 ms
19.09.22 20:51:16 (+0000) packet-forwarder INFO: [down] PULL_ACK received in 0 ms
19.09.22 20:51:22 (+0000) packet-forwarder
```

Terminal

Select a target Start terminal session



氦气控制台

https://console.helium.com/devices/dea0d62c-c890-4e19-887c-d9416989af6a

Menu Search Console... ?

marc@balena.io balena 872

REAL TIME PACKETS

● Live Data

● Integration Success
● Integration Error
● No Integration

Flows

NODES

Devices < **Devices**

Functions

Integrations

CONFIGS

Alerts

Profiles

Packets

ADMIN

Coverage

Organizations

Data Credits

Users

v2.2.23

RSSI

Time Passed in Seconds

Event Log Expand All Filter Events w/ Commands Show Dropped Uplinks: Late Inactive Device Export JSON

Event	Type	No. of Hotspots	Time
+ ▲ 2	Uplink ↗	2	Sep 19, 2022 10:53:08.421 PM
+ ▲ 1	Uplink ↗	1	Sep 19, 2022 10:52:06.073 PM
+ ▲ 0	Uplink ↗	4	Sep 19, 2022 10:51:03.715 PM
+ ✓ 0	Join Accept	1	Sep 19, 2022 10:51:00.615 PM
+ ▼ 0	Join Request	5	Sep 19, 2022 10:50:58.614 PM

+

3

氦气控制台



https://explorer.helium.com/

The screenshot shows the helium.com explorer interface. On the left, there's a sidebar with a logo, a progress bar, signal strength (1.2 dBi), and a location (0 m). Below that are tabs for 'Statistics' and 'Activity'. The 'Statistics' tab is active, showing 'Data-Only Hotspot' earnings (0) over the last 24 hours. The 'Recent Activity' section lists mining rewards and packet transfers from the last 3 months. The main area features a map with a large green polygon overlay, likely indicating a coverage or hotspot area. The map includes a scale bar (100 m) and a compass rose. The bottom right corner has a small yellow cube icon.

IOT (Coming Soon) MOBILE Validators Market Tools 🔍 🔔 Search...

IOT | [redacted]

1.2 dBi | 0 m

Statistics Activity

Data-Only Hotspot Details ▾

Earnings (UTC)

0 \$0.00

24H 7D 14D 30D

Recent Activity

- Received Mining Rewards about 9 hours ago
- Transferred Packets about 10 hours ago
- Received Mining Rewards 3 months ago
- Transferred Packets 3 months ago
- Received Mining Rewards 3 months ago

mapbox

100 m

© Mapbox © OpenStreetMap Improve this map © Maxar



https://explorer.helium.com/

IOT (Coming Soon) MOBILE Validators Market Tools 🔍 🔔 Search...

IOT | [REDACTED]

1.2 dBi | 0 m

Statistics Activity

Data-Only Hotspot

Earnings (UTC)

0 \$0.00

24H 7D 14D 30D

Recent Activity

- Received Mining Rewards about 9 hours ago
- Transferred Packets about 10 hours ago
- Received Mining Rewards 3 months ago
- Transferred Packets 3 months ago
- Received Mining Rewards 3 months ago

mapbox

100 m

© Mapbox © OpenStreetMap Improve this map © Maxar



basicstation by Xose Pérez - Basic Station

https://hub.balena.io/organizations/xoseperez/apps/basicstation

balenaHub

What is balenaHub? Contribute Community

Organizations xoseperez Apps basicstation

Summary Releases

← Back to Apps

basicstation by Xose Pérez

Description Deploy a LoRaWAN gateway with LoRa Basics™ Station Packet Forward protocol on SX1301, SX1302, SX1303 or SX1308 LoRa concentrators.

Works With

Version v2.4.0+rev1 View code | 140 MB | last updated at: 19 Sep 2022

Deploy Report issue

For detailed instructions on how to use/configure your LoRaWAN gateway check out the [readme here](#).

Release notes

v2.4.0+rev1 | 19 Sep 2022

No release notes

More from Xose Pérez

2g4-udp-packet-forwarder

by Xose Pérez

This project deploys a LoRaWAN gateway with UDP Packet Forwarder protocol using Docker for 2.4GHz LoRaWAN Gateways. It runs on an amd64 PC, Raspberry Pi 3/4, Compute Module 3/4 or...

WORKS WITH

v1.0.1

standalone-lorawan-gw

by Xose Pérez

Deploys TTS Stack, BasicStation and other tools for a standalone LoRaWAN network solution.

WORKS WITH

v0.0.0+rev111

the-things-stack

by Xose Pérez

Deploys the The Things Stack LoRaWAN Network Server (Open Source Edition) on a PC, a Raspberry Pi or equivalent SBC

WORKS WITH

v1.1.1



basicstation by Xose Pérez · Basicstation · xoseperez/basicstation: Basics™

Search or jump to... Pull requests Issues Marketplace Explore

xoseperez/basicstation Public

Code Issues 1 Pull requests Actions Security Insights

master 3 branches 11 tags Go to file Add file Code

 xoseperez Update version and revert changes to docker-compose.yml file f78d3ba 2 hours ago 102 commits

 balena Update version and revert changes to docker-compose.yml file 2 hours ago

 builder Fix compatibility issue with USB Bridge firmware prior to 1.0.0 (RAK2... 4 months ago

 runner Fix README and some script outputs 3 hours ago

 .gitignore Fix compatibility issue with USB Bridge firmware prior to 1.0.0 (RAK2... 4 months ago

 CHANGELOG.md Update version and revert changes to docker-compose.yml file 2 hours ago

 Dockerfile Using gpiod instead of /sys/class/gpio to reset concentrator 7 months ago

 Dockerfile.template Fix build for Balena, enable BALENA_API_KEY by default 7 months ago

 README.md Fix README and some script outputs 3 hours ago

 build.sh Multiboard support enabled by default 8 months ago

 docker-bake.hcl Build configuration for amd64 arch 8 months ago

 docker-compose.yml Update version and revert changes to docker-compose.yml file 2 hours ago

 logo.png Update logo 4 months ago

 README.md

LoRa Basics™ Station for Docker

This project deploys a LoRaWAN gateway with Basics™ Station Packet Forward protocol using Docker or Balena.io. It runs on a PC, a Raspberry Pi 3/4, Compute Module 3/4 or balenaFin with SX1301, SX1302, SX1303 or SX1308 LoRa concentrators (e.g. RAK831, RAK833, RAK2245, RAK2247, RAK2287, RAK5146, Seeed WM1302 and IMST IC880a among others).

About

Basics™ Station Packet Forward protocol using Docker

Readme 14 stars 2 watching 4 forks

Releases 11 tags

Packages No packages published

Contributors 3

 xoseperez Xose Pérez

 FOREVERALIZE

Languages

Shell 89.0% Dockerfile 6.3% HCL 4.7%

<https://github.com/xoseperez/basicstation>



balena dashboard | shy-sky

https://dashboard.balena-cloud.com/devices/012e801cea281877752c446b9295026

90% ⚡ Getting Started Docs Forums Status Marc Pous 🌐

shy-sky

STATUS Online **UUID** 012e801
TYPE Raspberry Pi 4 (using 64bit OS)

ONLINE FOR 2 minutes **HOST OS VERSION** balenaOS 2.101.7+rev1 (development) **SUPERVISOR VERSION** 14.0.13

CURRENT RELEASE 1342e2f **TARGET RELEASE** 1342e2f

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) **PUBLIC DEVICE URL** <https://012e801cea281877752c446b9295026>

NOTES
EUI: DCA632FFFFE554B34

SERVICES

Service	Status	Release
basicstation	Running	1342e2f

CPU ~74% **Temperature** ~64C **Memory** 228 MB/3.8 GB **Storage** /dev/mmcblk0p6 1.2 GB/6.5 GB

Logs UTC Timestamps

Search entries... Add filter Views

```
19.09.22 22:20:00 (+0000) basicstation 2022-09-19 22:20:00.679 [S2E:INFO] Dev/test settings: nocca=1 nodc=1 nodwell=1
19.09.22 22:20:00 (+0000) basicstation 2022-09-19 22:20:00.679 [S2E:INFO] Beaconing every 2n8s on 869.5 25MHz(1) @ DR3 (frame layout 2/8/17)
19.09.22 22:20:00 (+0000) basicstation 2022-09-19 22:20:00.679 [S2E:INFO] Beaconing suspend - missing GPS data: time
19.09.22 22:20:42 (+0000) basicstation 2022-09-19 22:20:42.687 [SYN:INFO] MCU/SX130X drift stats: min: +6.0ppm q50: +7.1ppm q80: +9.0ppm max: -9.5ppm - threshold q99: +9.5ppm
19.09.22 22:20:42 (+0000) basicstation 2022-09-19 22:20:42.687 [SYN:INFO] Mean MCU drift vs SX130X#0: -8.2ppm
19.09.22 22:21:00 (+0000) basicstation 2022-09-19 22:21:00.540 [SYN:INFO] Time sync qualities: min=162 q90=264 max=265 (previous q90=2147483647)
```

Terminal Select a target Start terminal session

Need help ?



balena dashboard | shy-sky Overview - Console - balena +

https://dashboard.balena-cloud.com/devices/012e801cea281877752c446b9295026/envvars 90% 🌐 ⚡ Status Marc Pous

Add variable Search entries... Add filter Views

Name	Fleet value	Device value	Service name	Actions
GW_POWER_EN_GPIO	0	override	All services	
GW_RESET_GPIO	17	override	All services	
INTERFACE	SPI	override	All services	
MODEL	RAK5146	SX1302	All services	
NETWORK_SERVER__BAND__NAME	not defined	EU868	All services	
TC_KEY	0	NNNSXS.GCERQC5SYN57RLJYLNRYZND2FSQNFTH...	All services	
TTN_REGION	eu1	override	All services	
TTS_PERSONAL_KEY	not defined	NNNSXS.47BJOKWPKWAT7VJQEQNHS5G54ICHDO3P...	All services	
TTS_USERNAME	not defined	gy4nt	All services	

1 - 9 of 9 < >

v14.0.5 Need help ?



Overview - eui-dca632ffe554b34

https://eu1.cloud.thethings.network/console/gateways/eui-dca632ffe554b34

THE THINGS STACK Community Edition

Overview Applications Gateways Organizations

EU1 Community Fair use policy applies

gy4nt

eui-dca632ffe554b34

ID: eui-dca632ffe554b34

↑ 103 ↓ 0 • Last activity 17 seconds ago

1 Collaborator 1 API key

Overview Live data Location Collaborators API keys General settings

General information

Gateway ID: eui-dca632ffe554b34

Gateway EUI: DC A6 32 FF FE 55 4B 34

Gateway description: None

Created at: Sep 19, 2022 19:51:36

Last updated at: Sep 19, 2022 19:51:36

Gateway Server address: eu1.cloud.thethings.network

LoRaWAN information

Frequency plan: EU_863_870_TTN

Global configuration: Download global_conf.json

Live data

See all activity →

↑ 14:31:48 Receive uplink message DevAddr: 00 09 48 AD FCnt: 1

↑ 14:31:28 Receive uplink message DevAddr: 00 09 48 AD FCnt: 1

↑ 14:31:08 Receive uplink message DevAddr: 00 09 48 AD FCnt: 1

↑ 14:30:48 Receive uplink message DevAddr: 00 09 48 AD FCnt: 1

↑ 14:30:28 Receive uplink message DevAddr: 00 09 48 AD FCnt: 1

✗ 22:27:08 Disconnect gateway Gateway missed too many pongs

Location Change location settings →

No location information available

< Hide sidebar

EN v3.21.2 Documentation Get support Status page



balena dashboard | shy-sky Overview - Console - balena

https://balena.eu1.cloud.thethings.industries/console/

THE THINGS STACK Cloud

Overview Applications Gateways Organizations

EU1 Cloud 99.9% SLA applies

Marc Balena

Welcome to the Console!

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

Need help? Have a look at our [Documentation](#) or [Get support](#).

Create an application

Register a gateway

Version info

Component status

Application Server

Gateway Server



Let's wrap-up!



Why do we do this?

- Unlock the promise of physical computing by reducing friction for fleet owners.
- Enable the IoT developers and professionals.
- Give a second life to useful devices.



Questions?



Give a second life to any miner and create your own LoRaWAN network

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

