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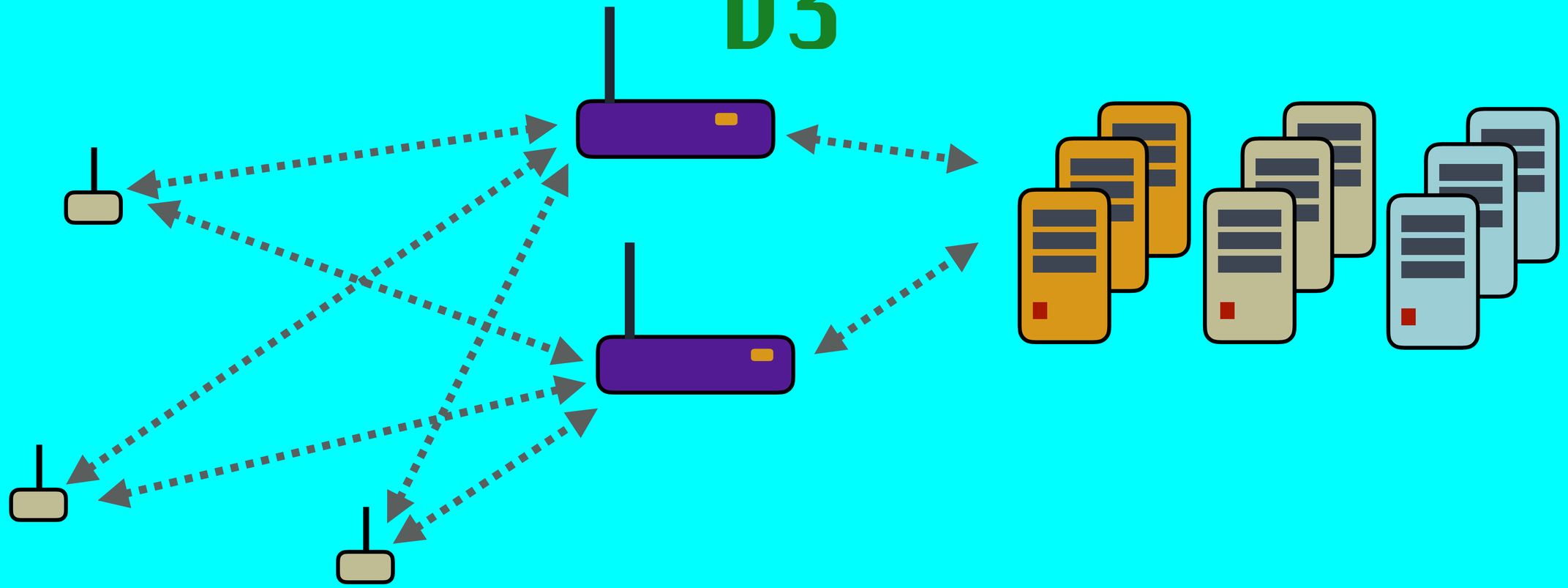
LORA / LORAWAN TUTORIAL 52

The Things Stack Community Edition

V3



v1.0.0

INTRO

- In this tutorial I will explain what the Things Stack Community Edition is.

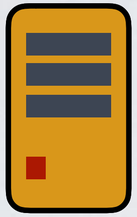
PRESENTATION

- This presentation can be found at:
  https://www.mobilefish.com/download/lora/lora_part52.pdf

- All my LoRa/LoRaWAN tutorials and presentations can be found at:
  https://www.mobilefish.com/developer/lorawan/lorawan_quickguide_tutorial.html

THE THINGS STACK

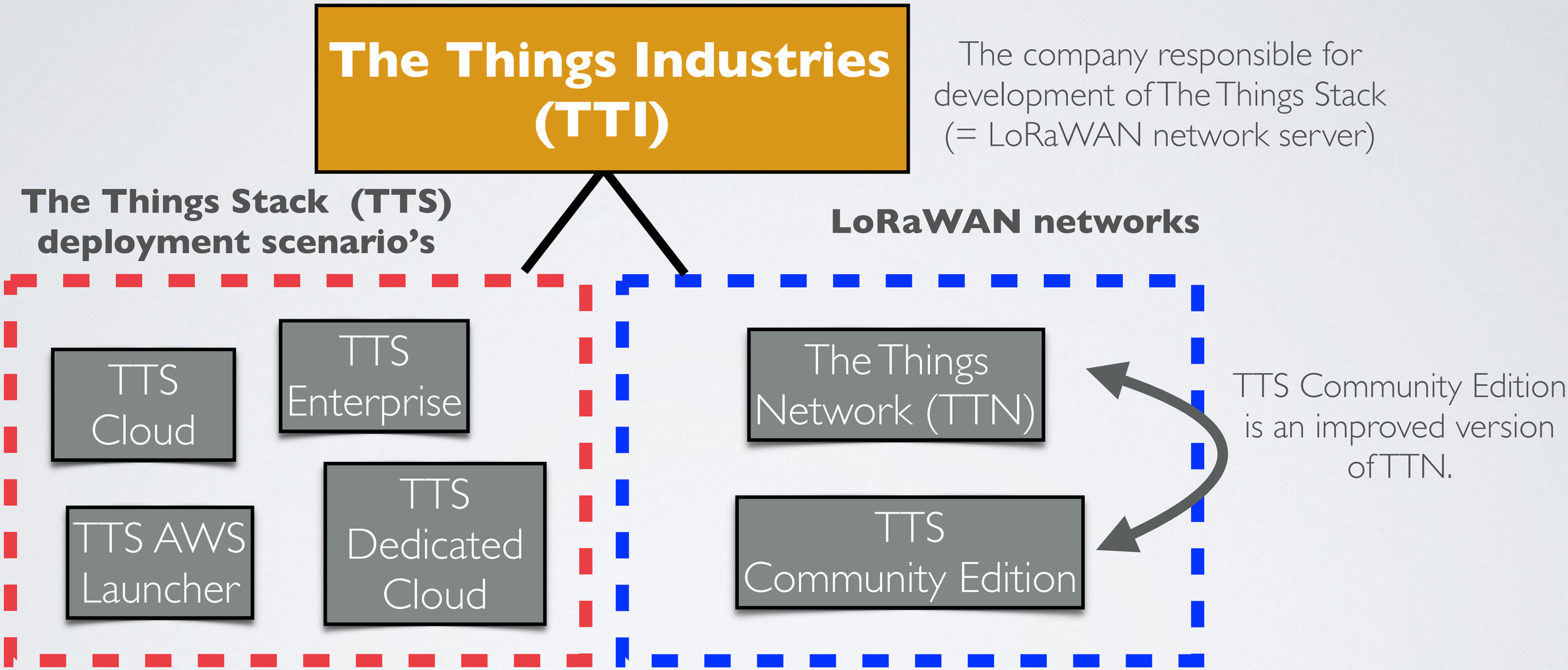
- The Things Stack is an enterprise grade LoRaWAN network server, built on an open source core.



The Things Stack == LoRaWAN network server

- The open source core can be found at: https://github.com/TheThingsNetwork/lorawan-stack

THE THINGS STACK



https://www.thethingsindustries.com/docs/getting-started/

TTN & THE THINGS STACK COMMUNITY EDITION

- In 2021 the Things Industries maintains two LoRaWAN networks:
  - The Things Network (TTN)
  - The Things Stack (TTS) Community Edition

- The LoRaWAN Network Servers in The Things Network (TTN) uses software which can be found at:
  https://github.com/TheThingsNetwork/ttn

- The LoRaWAN Network Servers in The Things Stack Community Edition uses software which can be found at:
  https://github.com/TheThingsNetwork/lorawan-stack

TTN & THE THINGS STACK COMMUNITY EDITION

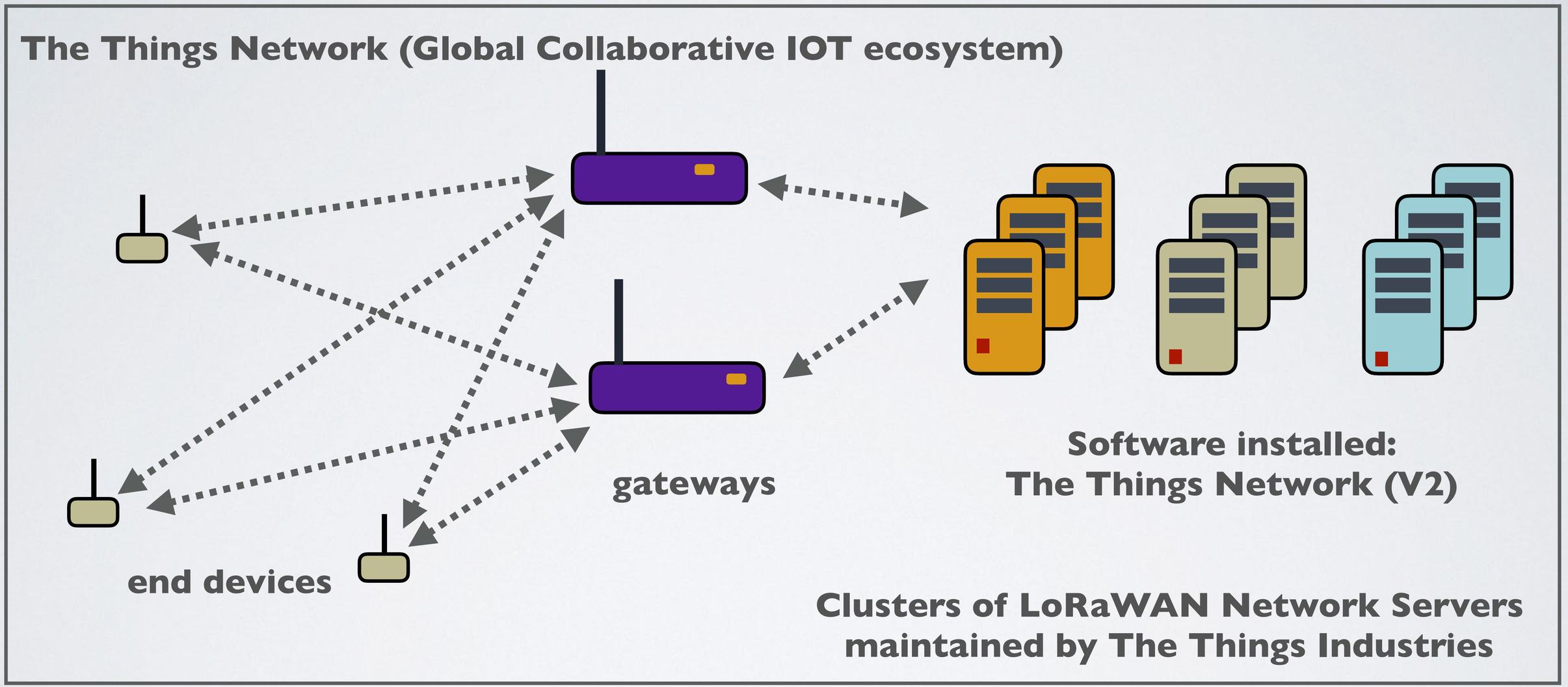
- The Things Stack Community Edition (V3), compared to The Things Network (V2), is more scalable and more secure.

- It supports all LoRaWAN classes (A, B, C) and multicast device groups, all existing LoRaWAN versions (including v1.0.4 and v1.1) and all regional parameters as defined by the LoRa Alliance (https://lora-alliance.org/).

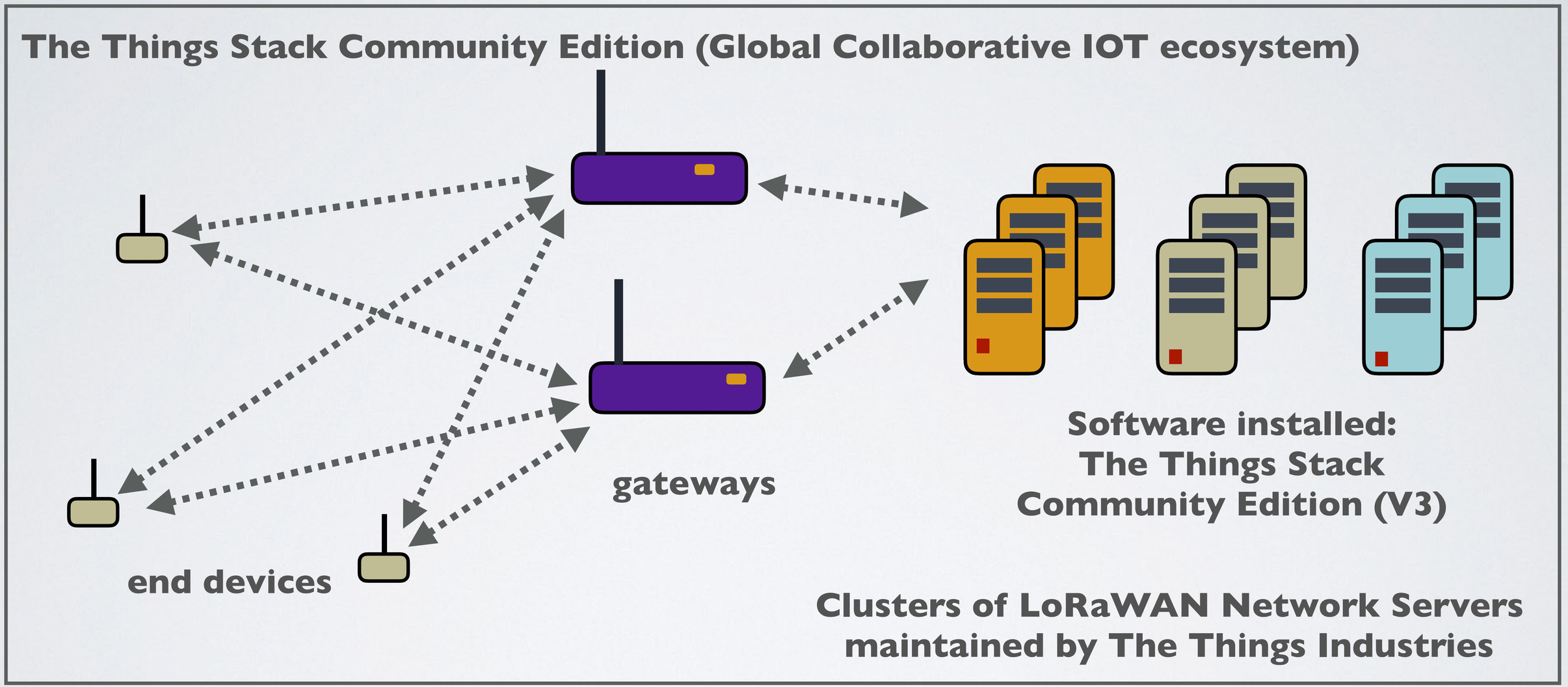
- For more differences between V2 and V3, see: https://www.thethingsindustries.com/docs/getting-started/migrating/major-changes/

- The Things Network (V2) will no longer be actively maintained by The Things Industries and the cluster of LoRaWAN Network Servers are going to be shut down by the end of 2021.

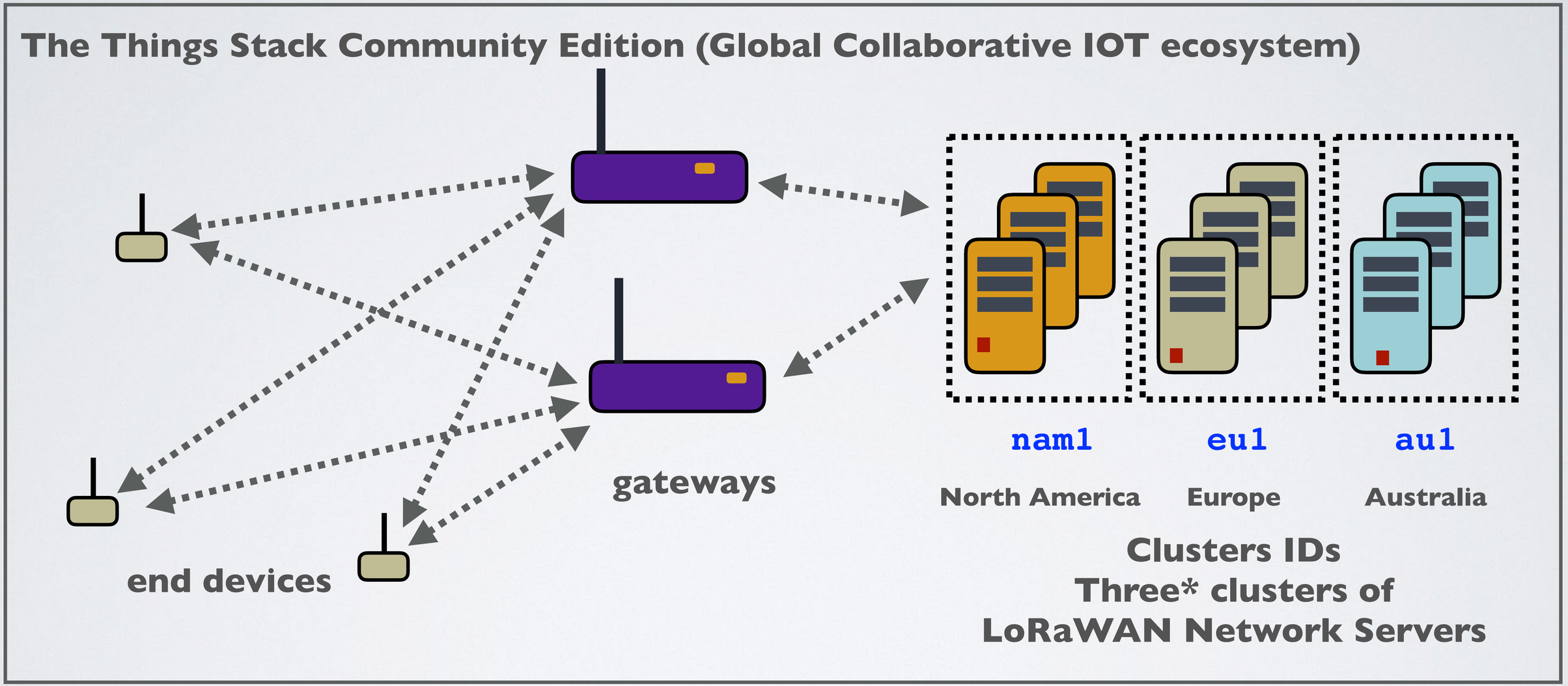
THE THINGS NETWORK



THE THINGS STACK COMMUNITY EDITION



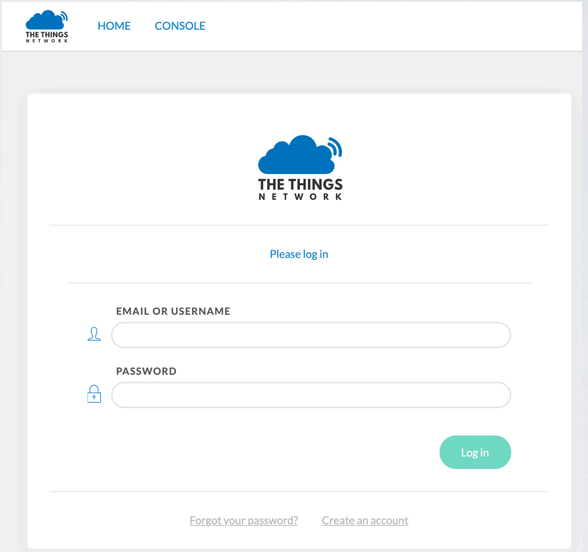
THE THINGS STACK COMMUNITY EDITION CLUSTER IDS



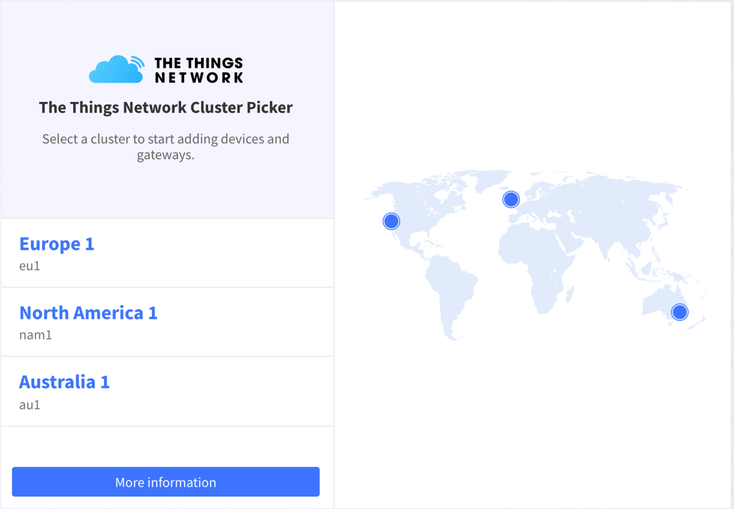
* As of May 2021

CONSOLE LINKS

- The console for The Things Network (V2) (Shutdown by the end of 2021): https://console.thethingsnetwork.org/



- The console for The Things Stack Community Edition (V3): https://console.cloud.thethings.network/



TTS COMMUNITY EDITION CONSOLE & API ENDPOINTS

- The Things Stack (TTS) Community Edition direct console links:
  North America: https://nam1.cloud.thethings.network/console
  Europe: https://eu1.cloud.thethings.network/console
  Australia: https://au1.cloud.thethings.network/console

- More information:
  https://www.thethingsindustries.com/docs/getting-started/ttn/addresses/

MORE INFORMATION

- More information about
  - Frequency Plans
  - LoRaWAN Specification and Regional Parameters
  - Data Formats
  - ID and EUI Constraints
  - …and more, see:
  https://www.thethingsindustries.com/docs/reference/

- Status page:
  https://status.thethings.network/

MIGRATE FROM THINGS NETWORK V2 TO V3

- General information about migrating from V2 to V3, see:
  https://www.thethingsindustries.com/docs/getting-started/migrating/

- Migrate few end devices with The Things Stack Community Edition Console, see:
  https://www.thethingsindustries.com/docs/getting-started/migrating/migrating-from-v2/migrate-using-console/

- Migrating many end devices using the migration tool:
  https://www.thethingsindustries.com/docs/getting-started/migrating/migration-tool/

- Migrate gateway, see:
  https://www.thethingsindustries.com/docs/getting-started/migrating/gateway-migration/

MIGRATE END DEVICE

PROCEDURE MIGRATE DEVICE FROM V2 TO V3

1. Select Over The Air Activation (OTAA). Note: I will not demonstrate ABP.
2. Choose LoRaWAN version MAC V1.0.2 (this is the version used in V2)
3. Create an End device ID (does not have to match the Device ID in V2)
4. Copy end device's AppEUI and DevEUI (these have to be the same as the ones in V2)
5. Select your Frequency plan
6. Select Regional Parameters version PHY V1.0.2 REV B (this is the version used in V2)

PROCEDURE MIGRATE DEVICE FROM V2 TO V3

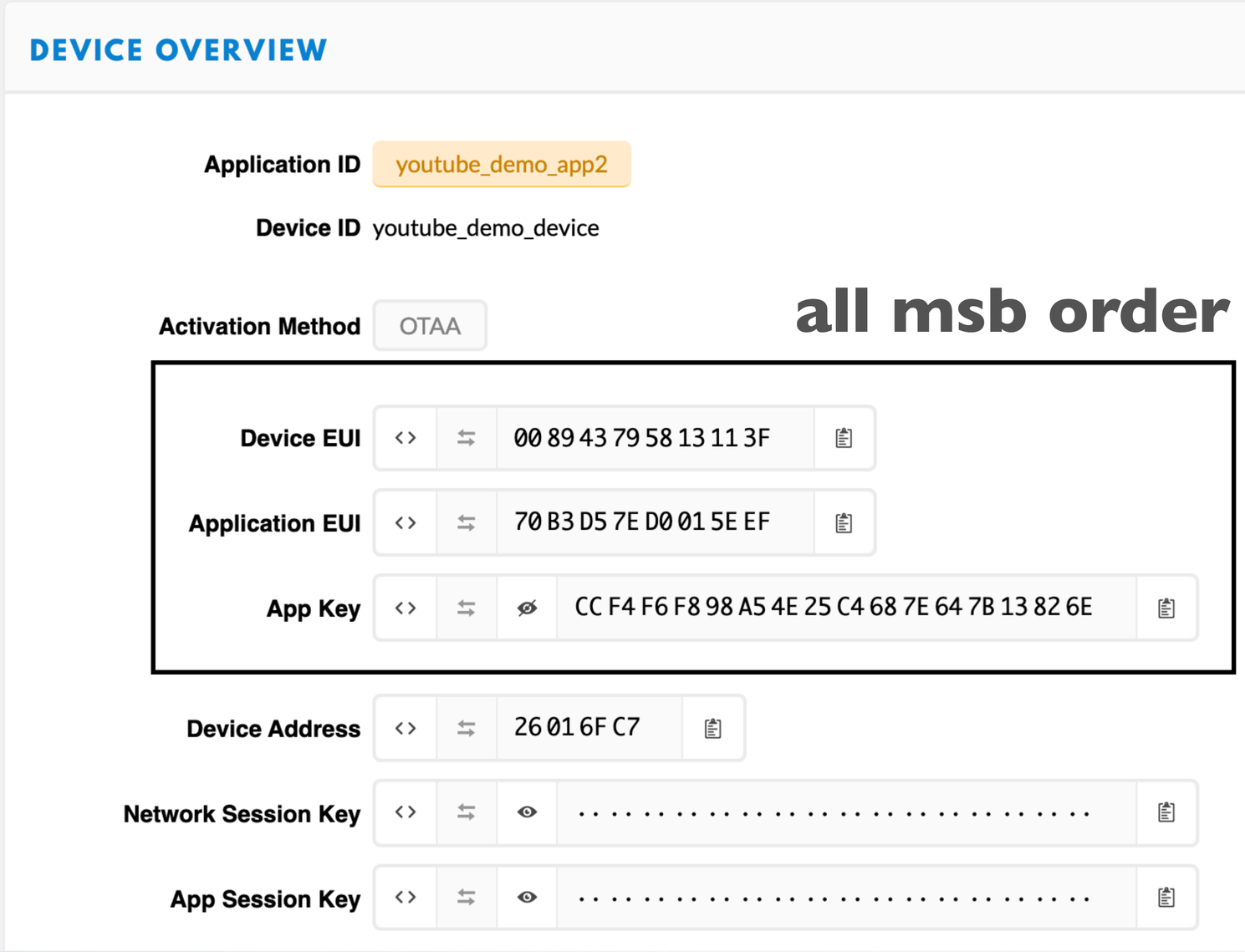
7. Keep the default Advanced settings as OTAA devices commonly negotiate about these with The Things Stack Network Server

8. Copy your end device's AppKey (has to match the one in V2)

9. Change the AppKey in V2 (To prevent OTAA device from re-joining V2 network).

10. If applicable copy and modify your payload formatters.

DEVICE OVERVIEW (THE THINGS NETWORK V2)



Only these 3 values needs to be migrated.

After the 3 values are migrated the App Key must be changed, eg:
00000000xxxxxxxx
xxxxxxxx00000000

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REGISTER END DEVICE (TTS COMMUNITY EDITION V3)

Register end device

From The LoRaWAN Device Repository | Manually

1 **Basic settings** — End device ID's, Name and Description
2 Network layer settings — Frequency plan, regional parameters, end device class and session keys.
3 Join settings — Root keys, NetID and kek labels.

End device ID *
my-new-device

AppEUI *
•• •• •• •• •• •• •• •• 00

From V2

DevEUI *
•• •• •• •• •• •• •• ••

From V2

End device name
My new end device

End device description
Description for my new end device

Optional end device description; can also be used to save notes about the end device

Network layer settings >

Register end device

From The LoRaWAN Device Repository | Manually

✓ Basic settings — End device ID's, Name and Description
2 **Network layer settings** — Frequency plan, regional parameters, end device class and session keys.
3 Join settings — Root keys, NetID and kek labels.

Frequency plan *
Select...

LoRaWAN version *
MAC V1.0.2

Regional Parameters version *
Select...

LoRaWAN class capabilities
- [ ] Supports class B
- [ ] Supports class C

Advanced settings

< Basic settings | Join settings >

Register end device

From The LoRaWAN Device Repository | Manually

✓ Basic settings — End device ID's, Name and Description
✓ Network layer settings — Frequency plan, regional parameters, end device class and session keys.
3 **Join settings** — Root keys, NetID and kek labels.

Root keys

AppKey *
•• •• •• •• •• •• •• •• •• •• •• •• •• •• •• •• ••

From V2

Advanced settings

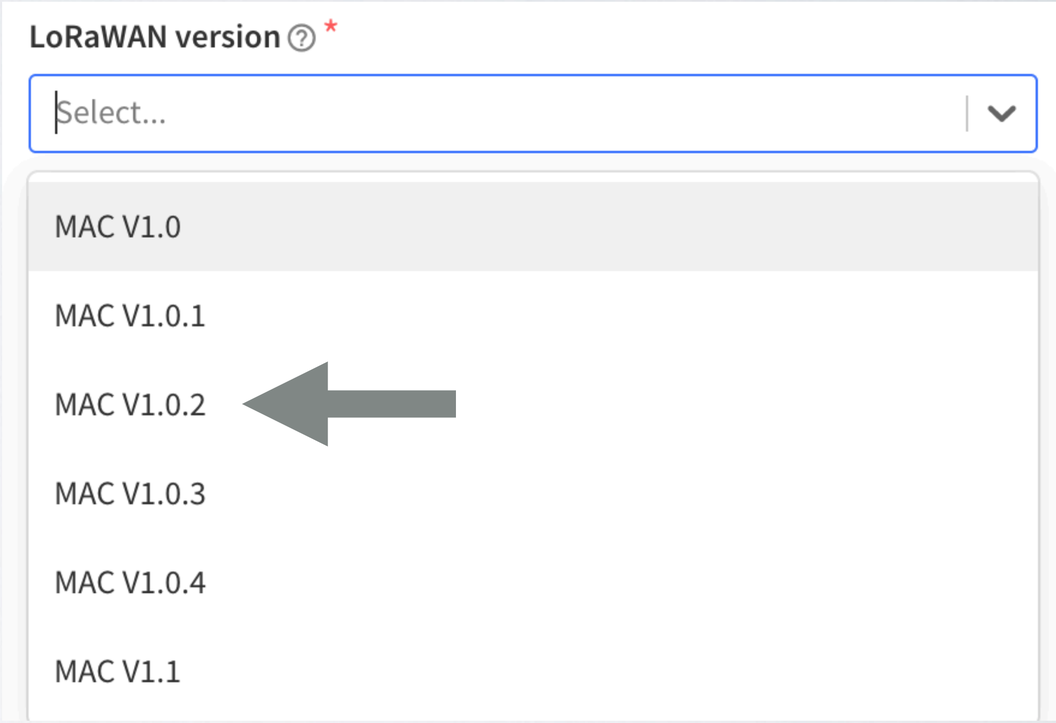
< Network layer settings | Add end device

LORAWAN VERSION

- The LoRaWAN version is the LoRa Alliance LoRaWAN specification your device conforms to, which defines which Media Access Control features it supports. The LoRaWAN version for your device should be provided by the manufacturer in a datasheet as LoRaWAN version or LoRaWAN specification.

- The most commonly used LoRaWAN versions are v1.0.2 and v1.0.3.

- **The Things Network V2 uses v1.0.2 by default.**

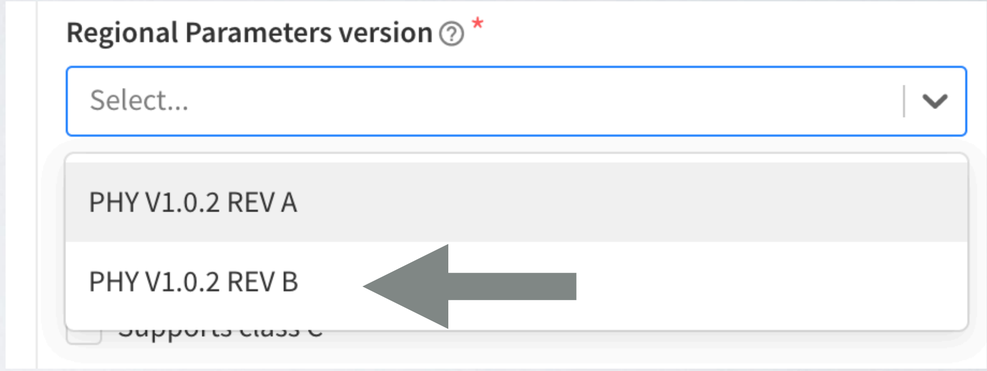


REGIONAL PARAMETERS VERSION

- The Things Network V2 uses Physical Layer (PHY) v1.0.2 Rev B

- More information about regional parameters, see: https://lora-alliance.org/resource-hub/

- LoRaWAN Regional Parameters v1.0.2rB: https://lora-alliance.org/wp-content/uploads/2020/11/lorawan_regional_parameters_v1.0.2_final_1944_1.pdf

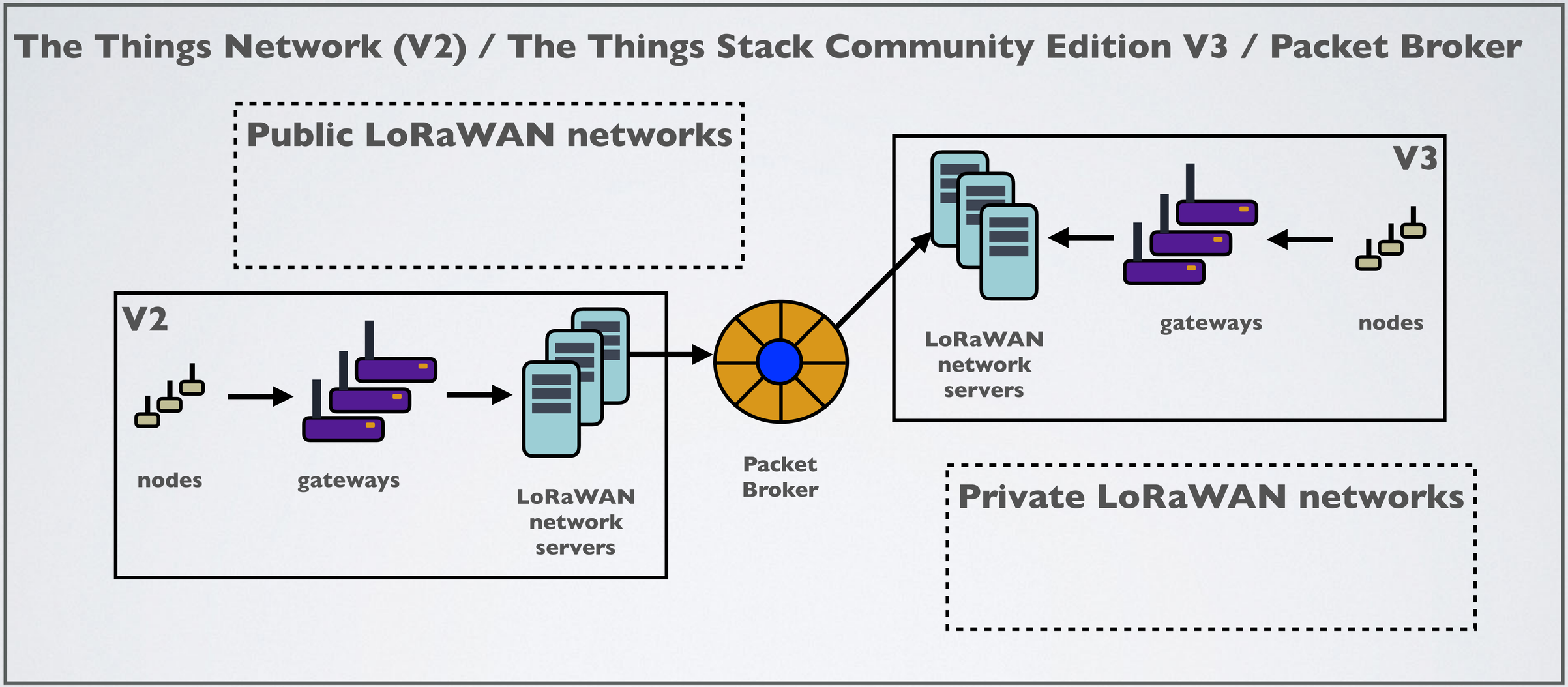


PACKET BROKER

PACKET BROKER

- The Packet Broker is a service which allows LoRaWAN networks to exchange traffic.
- It is run by an independent and neutral organisation.
- More information:
  https://packetbroker.net/
  https://www.thethingsindustries.com/docs/reference/packet-broker/

MIGRATE FROM THINGS NETWORK V2 TO V3



MIGRATE GATEWAY

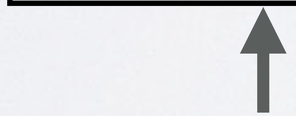
PROCEDURE MIGRATE GATEWAY FROM V2 TO V3

1. Change the server address on the gateway itself (eg: global_conf.json)
2. In the V3 console, select Add gateway
3. Create an Gateway ID (does not have to match the Gateway ID in V2)
4. Enter Gateway EUI (If your gateway has a gateway eui)
5. Select your Frequency plan

RAK7244C (WISGATE DEVELOPER D4+)

- To find the gateway EUI on the RAK7244C
  - Log into the gateway
  - Type: **sudo gateway-version**

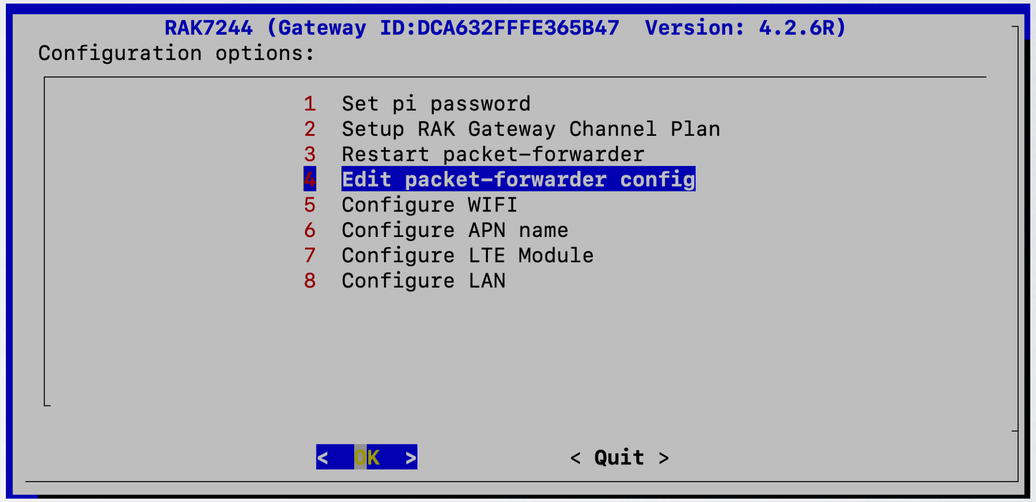
```
pi@rak-gateway:~ $ sudo gateway-version
/bin/bash: warning: setlocale: LC_ALL: cannot change locale (en_US.UTF-8)
Raspberry Pi 4 Model B Rev 1.1, OS "10 (buster)", 5.4.79-v7l+.
RAKWireless gateway RAK7244 with LTE version 4.2.6R install from firmware.
Gateway ID: DCA632FFFE365B47.
```

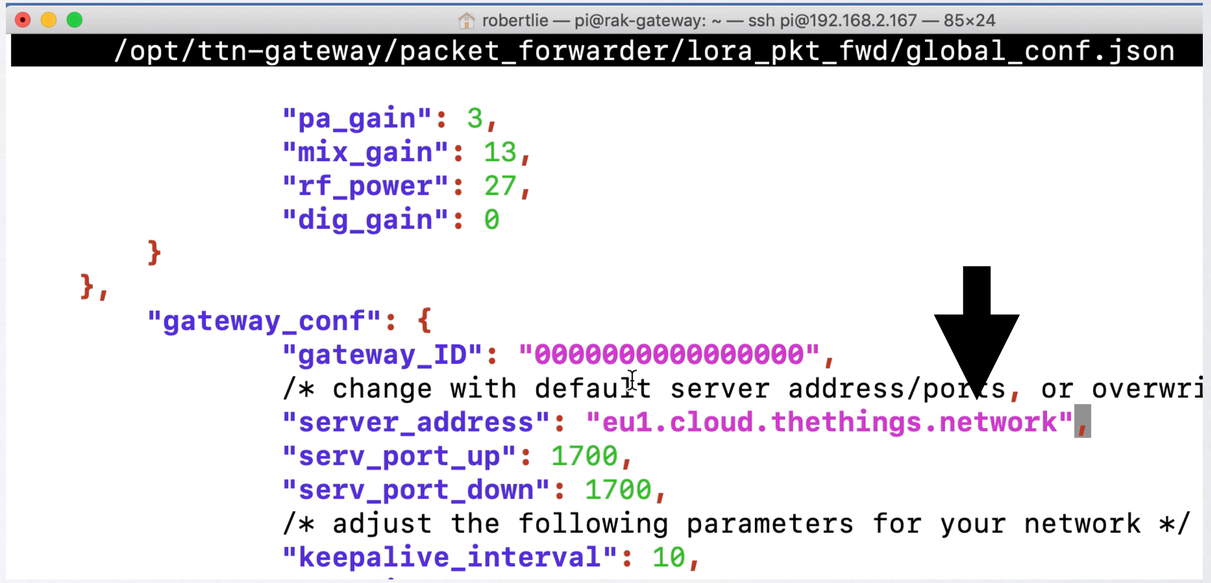


This in MY gateway EUI

RAK7244C (WISGATE DEVELOPER D4+)

- To change the server address on the RAK7244C
  - Log into the gateway
  - Type: **sudo gateway-config**
  - Select option:
    Edit packet-forwarder config
  - Change the server address





TTN GATEWAY SERVER ADDRESSES

TTN (V2) Gateway Server Addresses (Often used in global_conf.json)

Region	Server Address	Up Port	Down Port
India	router.as.thethings.network	1700	1700
Asia	router.as1.thethings.network	1700	1700
Asia	router.as2.thethings.network	1700	1700
Australia	router.au.thethings.network	1700	1700
China	router.cn.thethings.network	1700	1700
Europe	router.eu.thethings.network	1700	1700
Korea	router.kr.thethings.network	1700	1700
Russia	router.ru.thethings.network	1700	1700

Source: https://github.com/TheThingsNetwork/gateway-conf

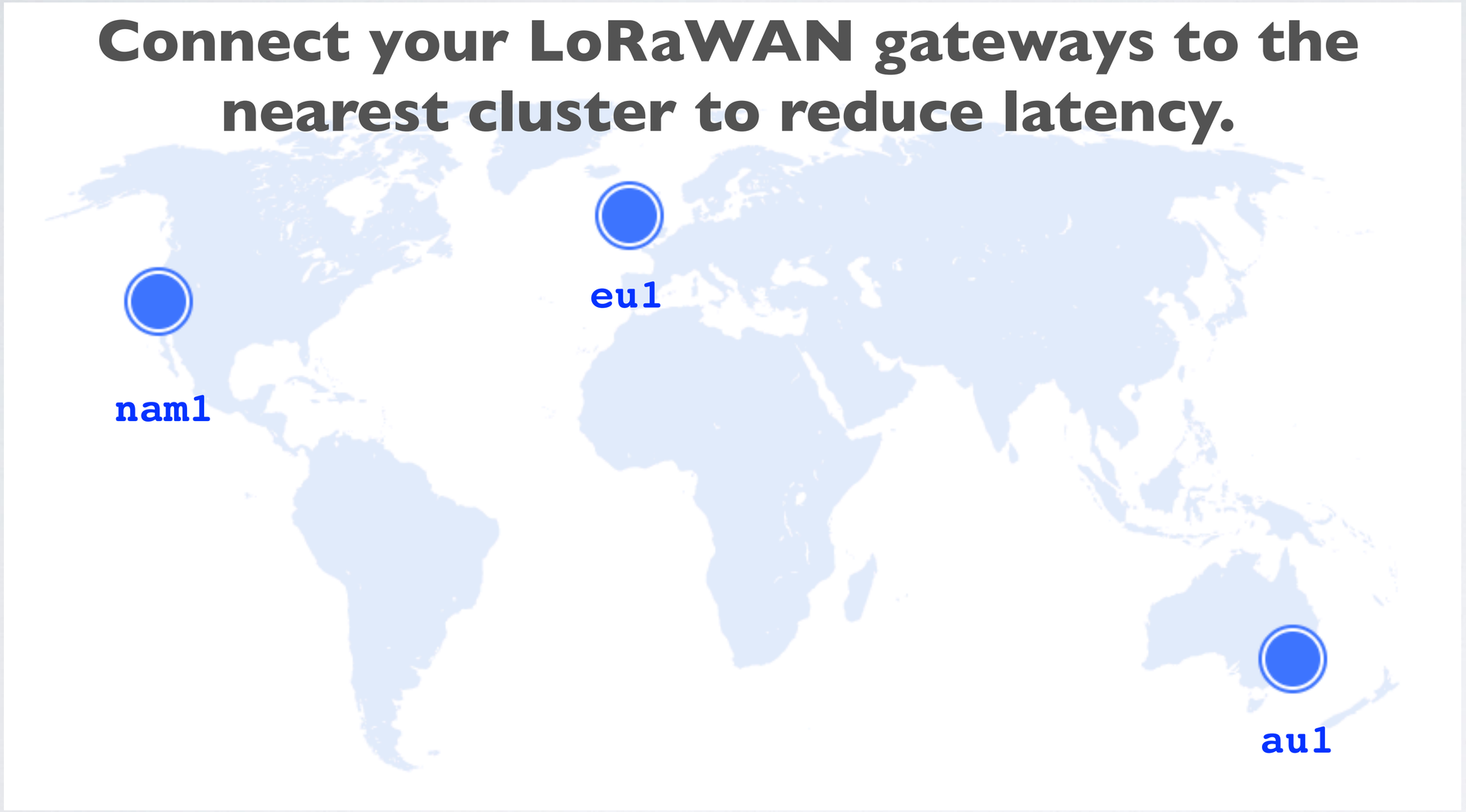
TTS COMMUNITY EDITION GATEWAY SERVER ADDRESSES

TTS Community Edition Gateway Server Addresses (V3)
(Often used in global_conf.json)

Region	Server Address	Up Port	Down Port
Australia	au1.cloud.thethings.network	1700	1700
Europe	eu1.cloud.thethings.network	1700	1700
North America	nam1.cloud.thethings.network	1700	1700

Source: https://www.thethingsindustries.com/docs/getting-started/ttn/addresses/

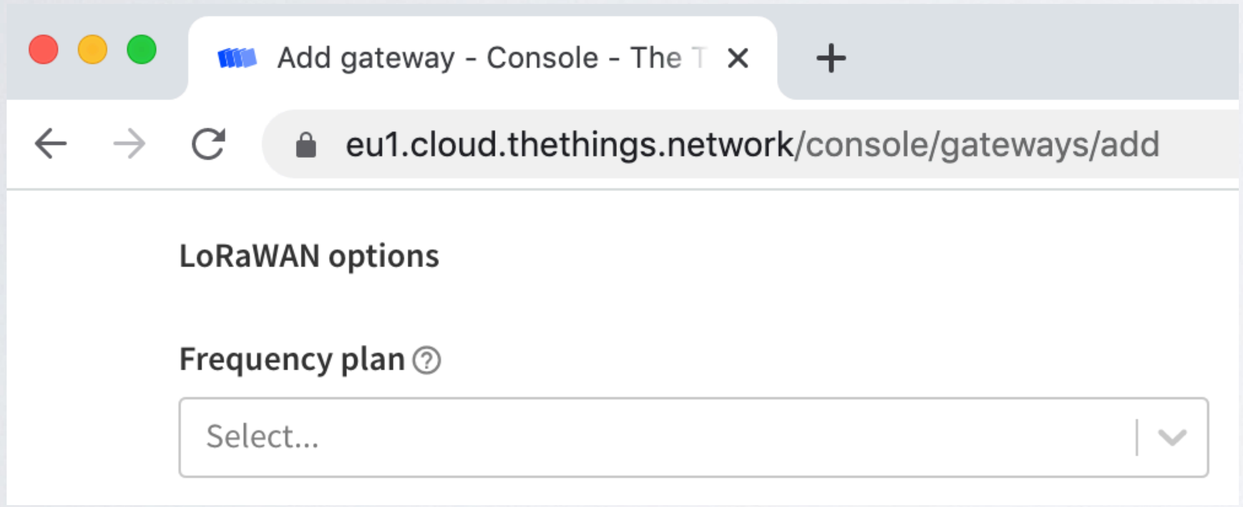
THE THINGS STACK COMMUNITY EDITION CLUSTER IDS

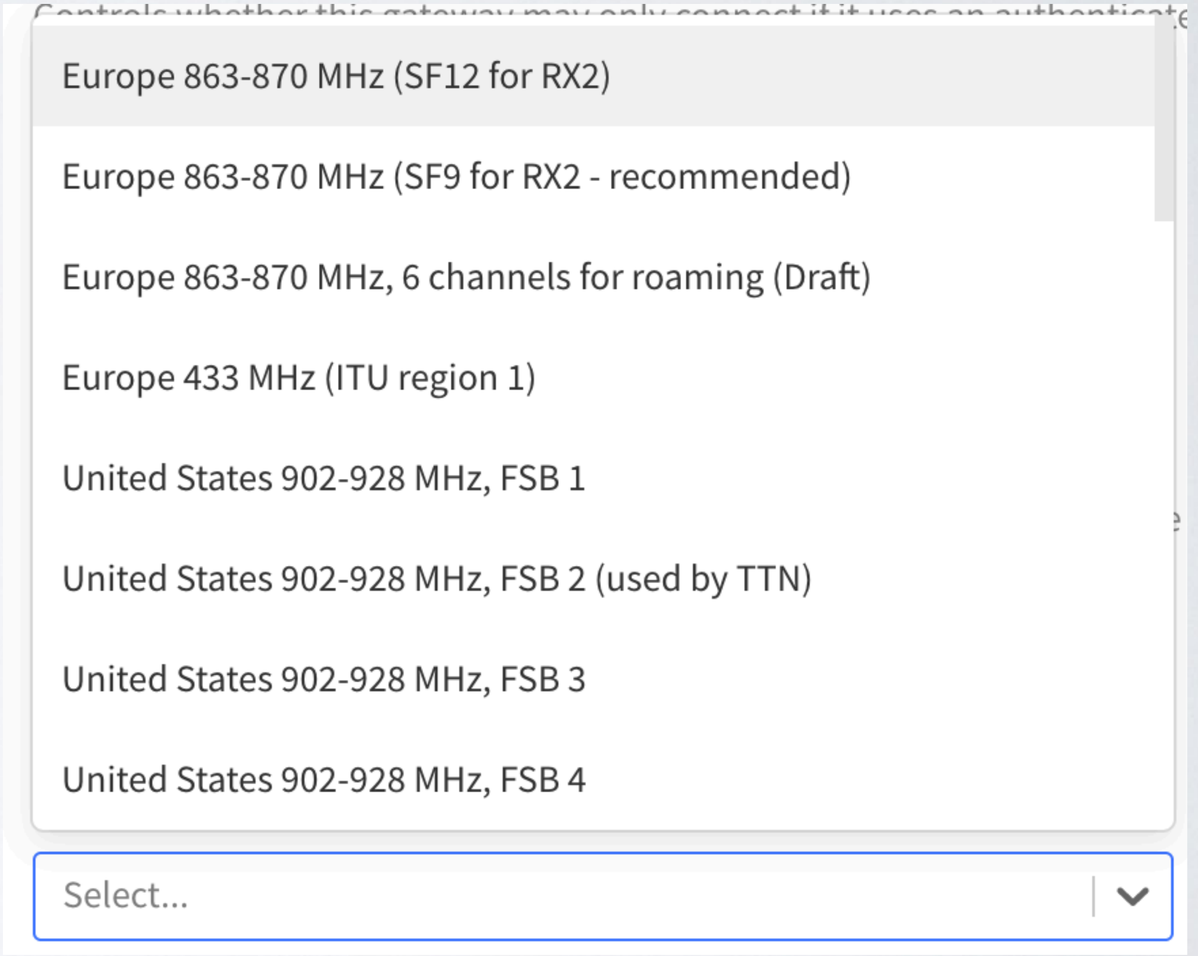


FREQUENCY PLANS

THE THINGS STACK FREQUENCY PLANS

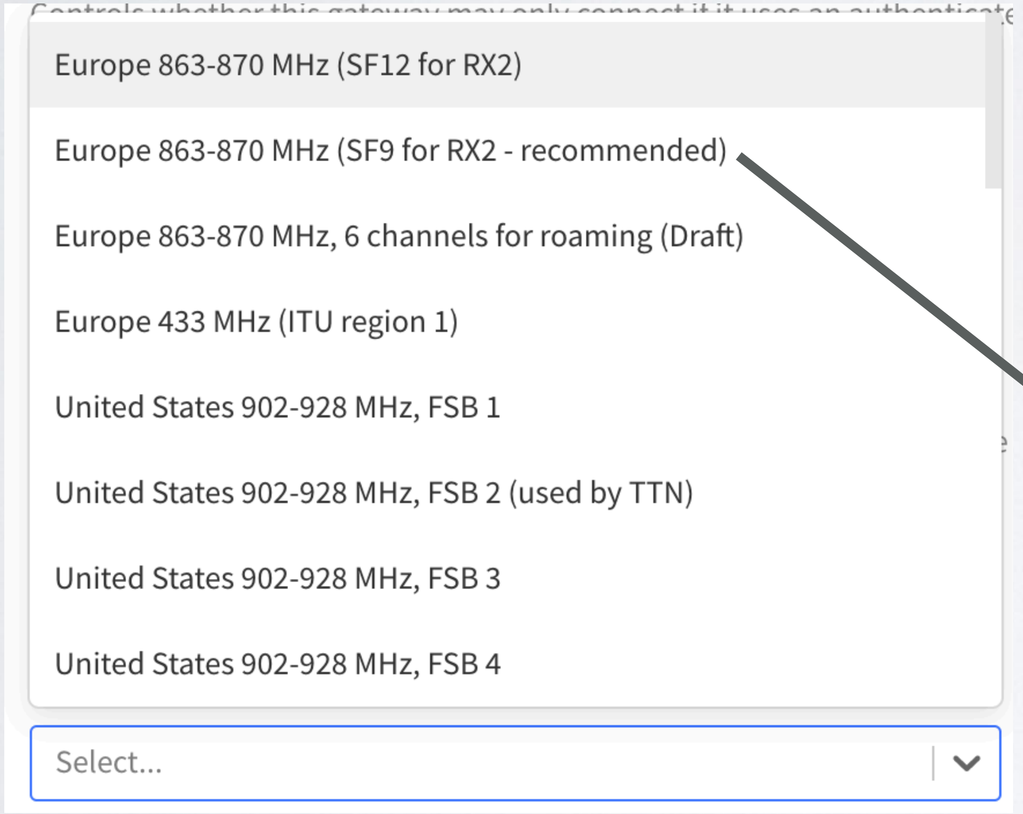
- When adding a gateway in your console you will see the "Frequency plan" options.

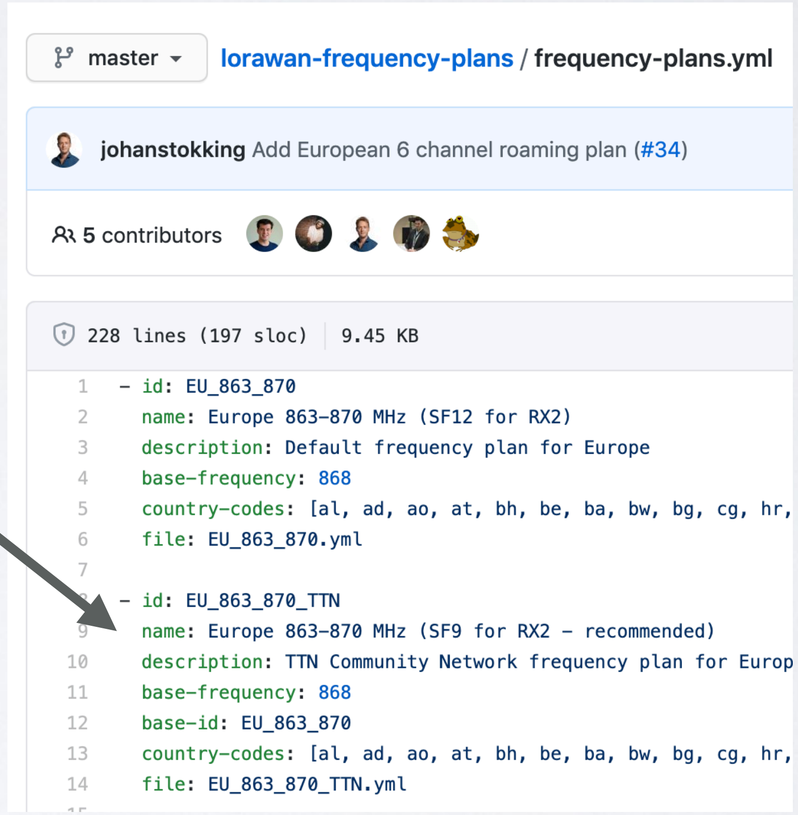




THE THINGS STACK FREQUENCY PLANS

- To find more information about these frequency plans: https://github.com/TheThingsNetwork/lorawan-frequency-plans/blob/master/frequency-plans.yml





THE THINGS STACK FREQUENCY PLANS

- To find more information about these frequency plans: https://github.com/TheThingsNetwork/lorawan-frequency-plans

EU_863_870 default

master lorawan-frequency-plans / frequency-plans.yml

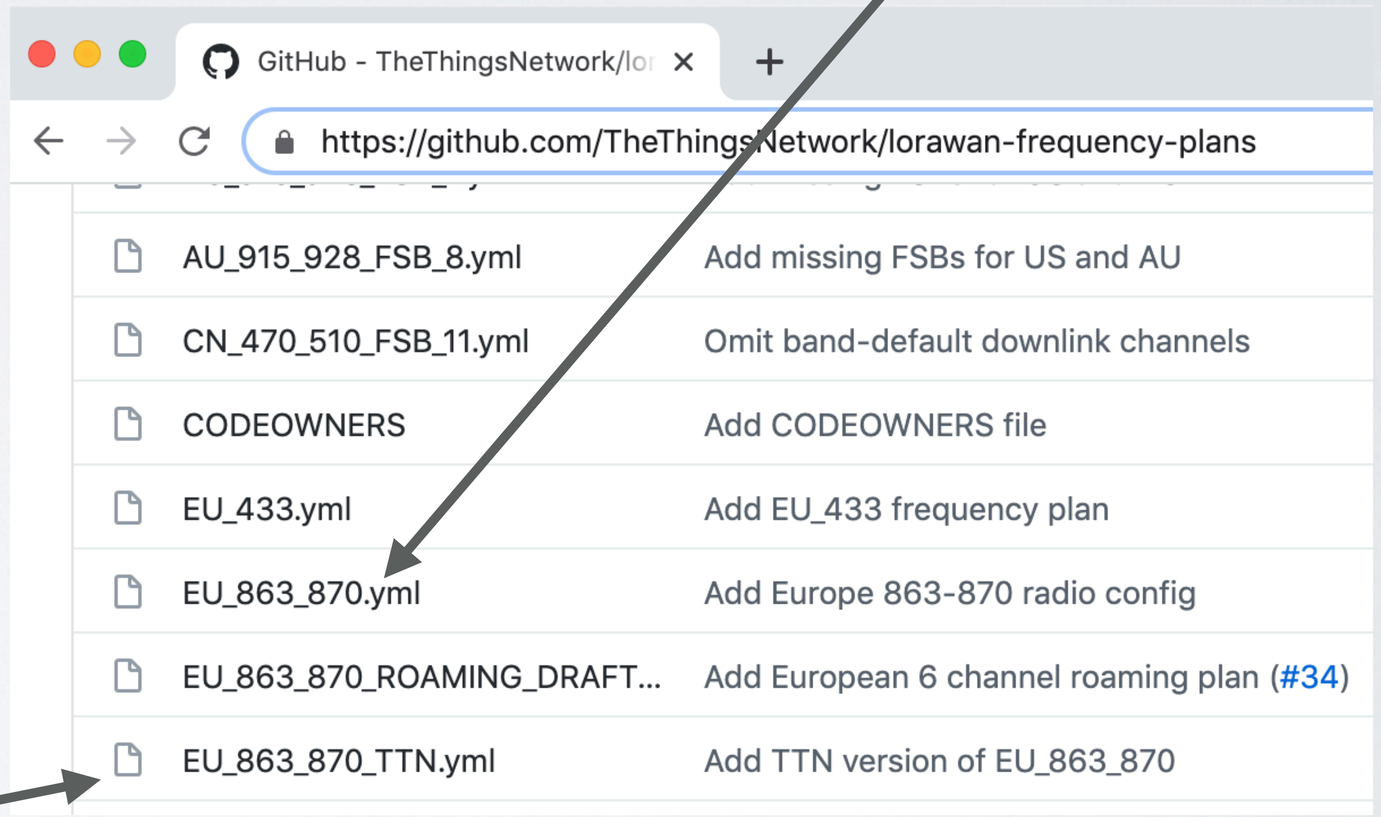
johanstokking Add European 6 channel roaming plan (#34)

5 contributors

228 lines (197 sloc) 9.45 KB

```yaml
- id: EU_863_870
  name: Europe 863-870 MHz (SF12 for RX2)
  description: Default frequency plan for Europe
  base-frequency: 868
  country-codes: [al, ad, ao, at, bh, be, ba, bw, bg, cg, hr,
  file: EU_863_870.yml

- id: EU_863_870_TTN
  name: Europe 863-870 MHz (SF9 for RX2 - recommended)
  description: TTN Community Network frequency plan for Europ
  base-frequency: 868
  base-id: EU_863_870
  country-codes: [al, ad, ao, at, bh, be, ba, bw, bg, cg, hr,
  file: EU_863_870_TTN.yml
```



THE THINGS STACK FREQUENCY PLANS

- More information:
  https://github.com/TheThingsNetwork/lorawan-stack
  Search /pkg/band/