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The Internet Of Things

Introduction to what is the Internet of Things, why does it change the world where we live, what are the technologies behind the scene ?
How des it apply to your domain ?

**Helium is a blockchain for LoRaWan Distributed
Global crowdsourced IoT Network**

Helium is a blockchain for LoRaWan Distributed Global crowdsourced IoT Network

Coverage is provided by a community of people instead of a company. Like TheThingsNetwork

**Helium is a blockchain for LoRaWan Distributed
Global crowdsourced IoT Network**

Investment on hardware is rewarded by a crypto token. Blockchain's rules pilot the deployment and supports the main telecom industry processes.

Helium is a blockchain for LoRaWan Distributed Global crowdsourced IoT Network

The network is global, it has started in North America, now covering Europe quickly and start in Asia.

Helium is a blockchain for LoRaWan **Distributed** Global crowdsourced IoT Network

The network supports multiple LoRa Network Servers (Routers) as private networks on top of the Gateways (Hotspot) public infrastructure.

Hotspot Lookup

12477

 Hotspots

VALLEJO, CA

Tart Spruce Blackbird

 13Ze3yH7LReAPFVSekJUVTWNNWyeqzLsenFhK6WrLJVyH6muiMZ

ALDIE, VA

Rapid Scarlet Badger

 14cnnmnX6P461rKXLzKWKGUN2JDvqBSQvFatG25xz1yVJEMCELV


BOYNTON BEACH, FL

Witty Pink Dolphin

 13V2swEFJVpQ1rV9dHgNjUYAy12e1gNPpDAsBcTDbzpWwmNYyNf

LONDON, ENGLAND

Dry Vanilla Blackbird

 14UuVEF8P7xoMdji1q1LP19UQR7VjAt9wi8GJjmotA9iAa72MQg

MTAMT, FL

HELIUM

Hotspot Map  Block Explorer

Is also crowdsourced IoT network, but it targets a different category of people to deploy the network. Instead of tech passionate, it target crypto investors.

Helium is an IoT network managed with a blockchain. Helium contributor are mining HNT tokens against coverage. Communication are billable with a flat and low price.

Basically, it is UBER + BITCOIN for Telecom industry

May	2020	3.025 HS
Nov	2020	12.477 HS
Feb	2021	18.700 HS
July	2021	77.100 HS
August	2021	100.000 HS
October	2021	220.000 HS
Nov.	2021	320.000 HS
Sept.	2022	954.940 HS
Feb.	2023	986.820 HS

July 2023 Status

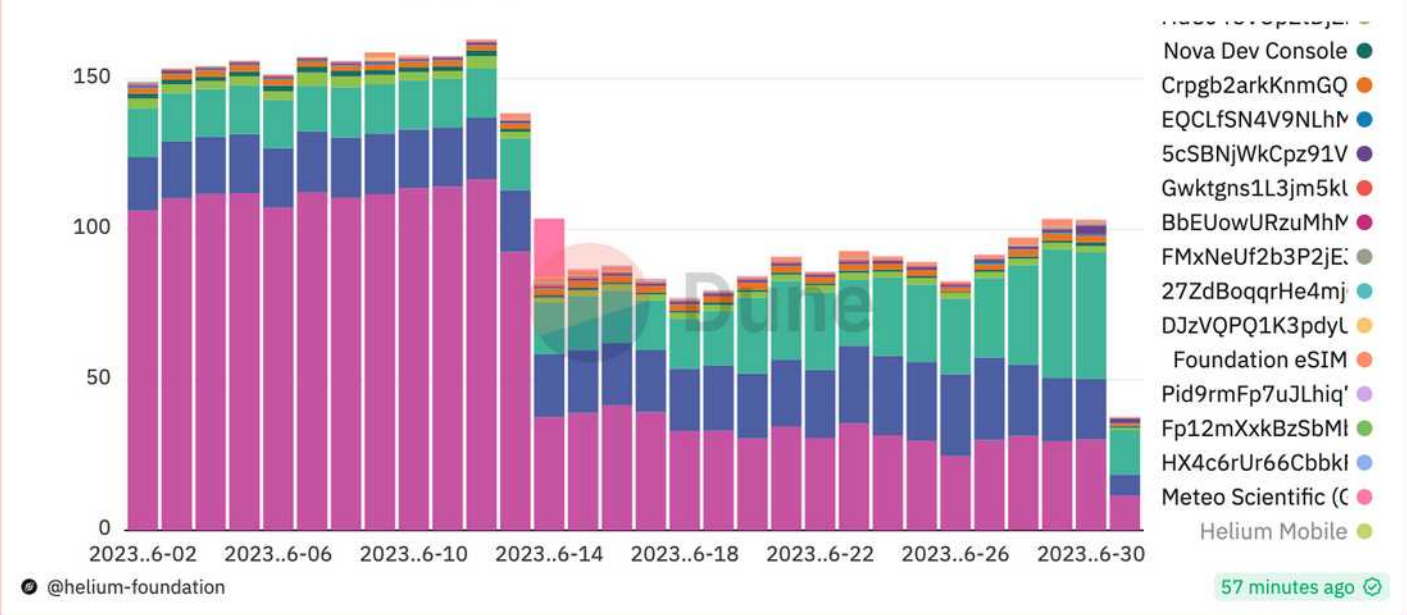
> 420K active hotspot in month, globally stable on the last 6 months.

> Some mee-too blockchains try to take a part of it with Y connectors

> Some big players leaves the game like bobcat

> Hotspot have been made simpler, less need for maintenance, good stability.

Helium DC Burned for Network Usage by Organization



Helium BUSINESS Usage per day in \$ (\$1 = 100k messages eq or 24Bytes)

Main console filtered due to gaming past month (add \$50)
(drop due to normal packet purchasing (duplicates evolution))

About 10M packets processes per day for business applications
As part of it 60% is roaming packets for Telcos

Helium is high density LoRaWan

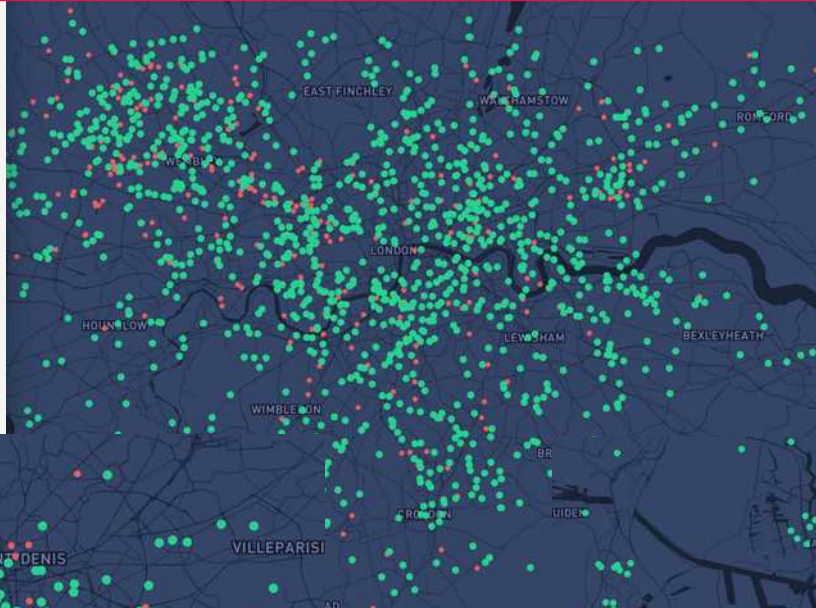


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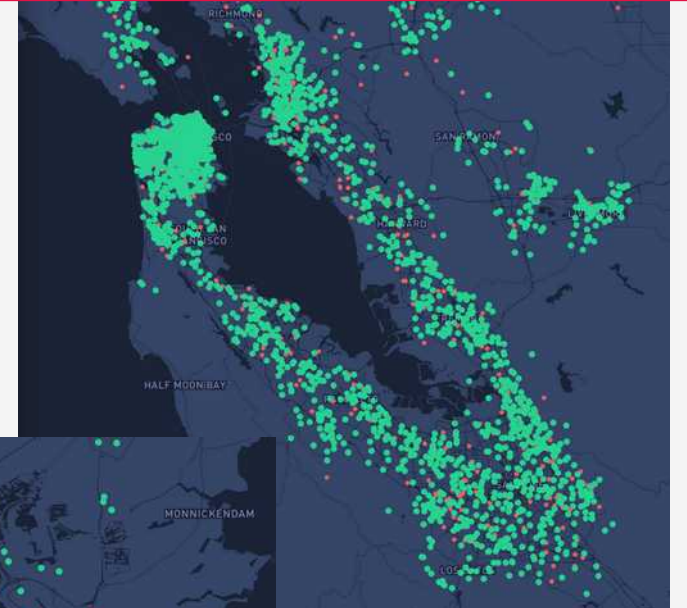
New York



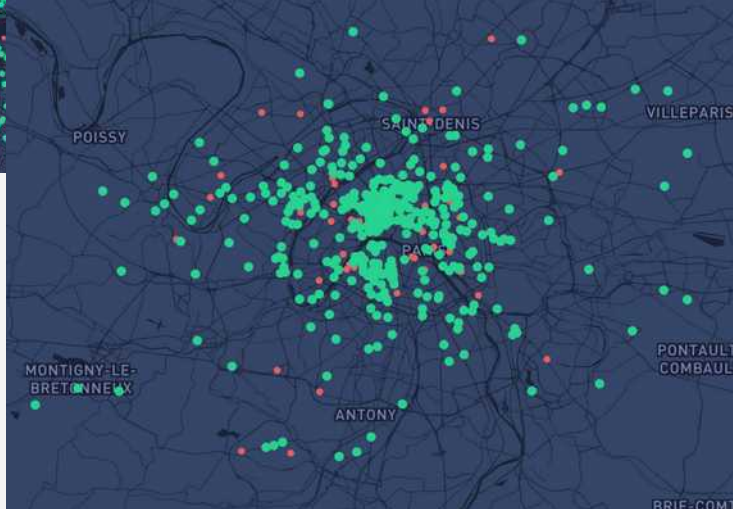
London



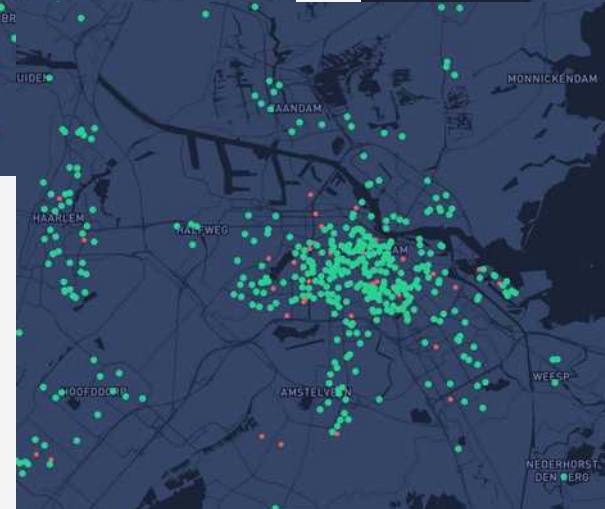
San Francisco



Paris



Amsterdam



Helium at Clermont-Ferrand

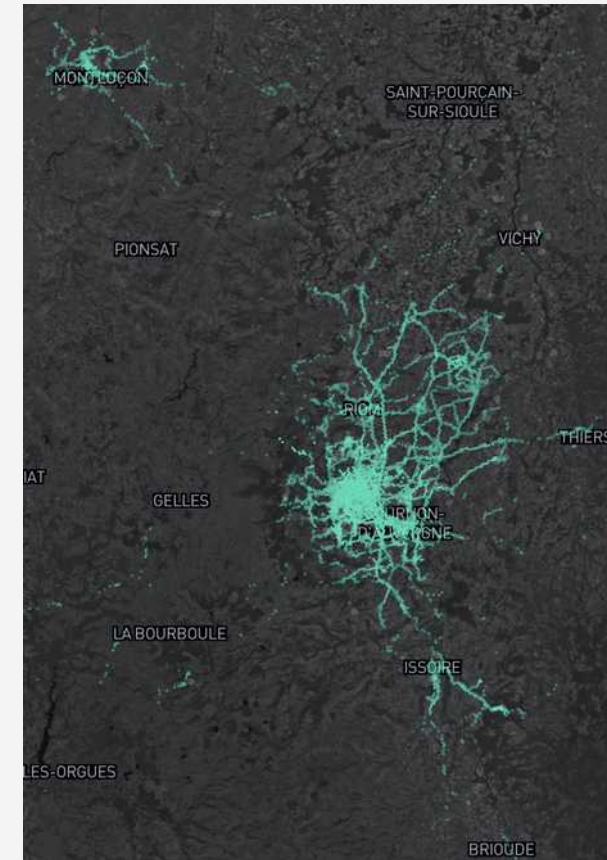
EUROPE CONTEXT



CLERMONT-FD

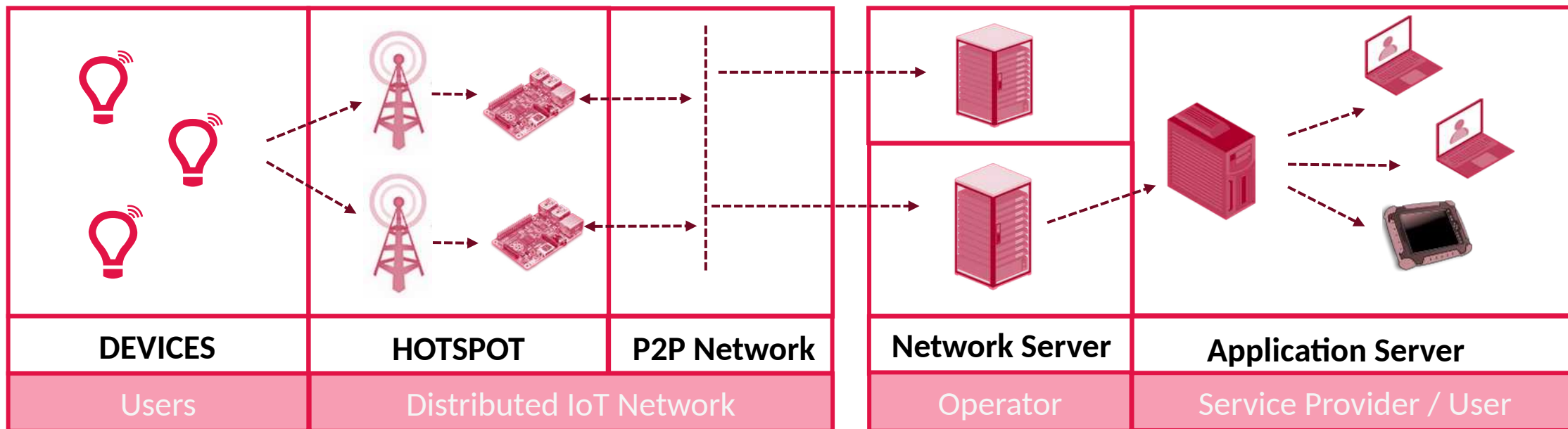


COVERAGE MAP





helium Network Architecture (before HIP 71)



Helium distributed architecture

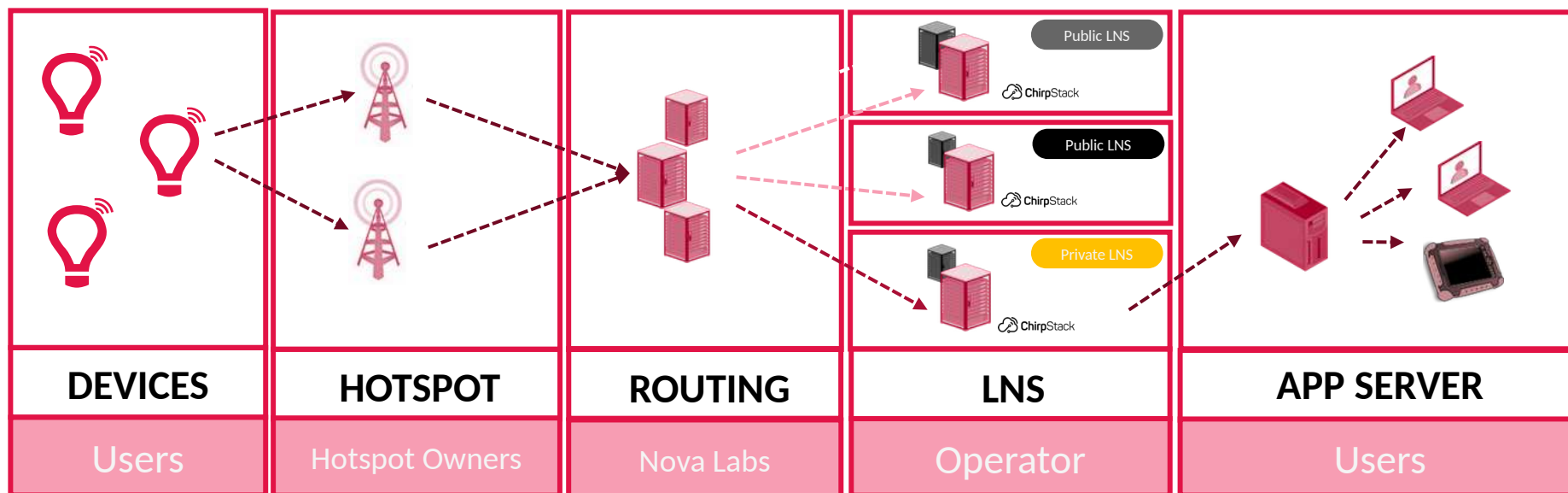
The HELIUM network is composed by hotspots. A Hotspot is a LoRaWan gateway associated to a Miner. A miner is lightweight and can run on a raspberry Pi. It is running in a docker container.

The miners are connected altogether over a P2P network. They are maintaining / running the blockchain.

Device communication passes through these different layers and are routed up to their specific Network Server. The distributed network supports multiple Network Servers. (Network Servers are centralized components in this architecture). Application servers works on helium as on any other Network Server. Nothing specific. The data itself is not inside the blockchain.



helium Network Server Architecture (current)

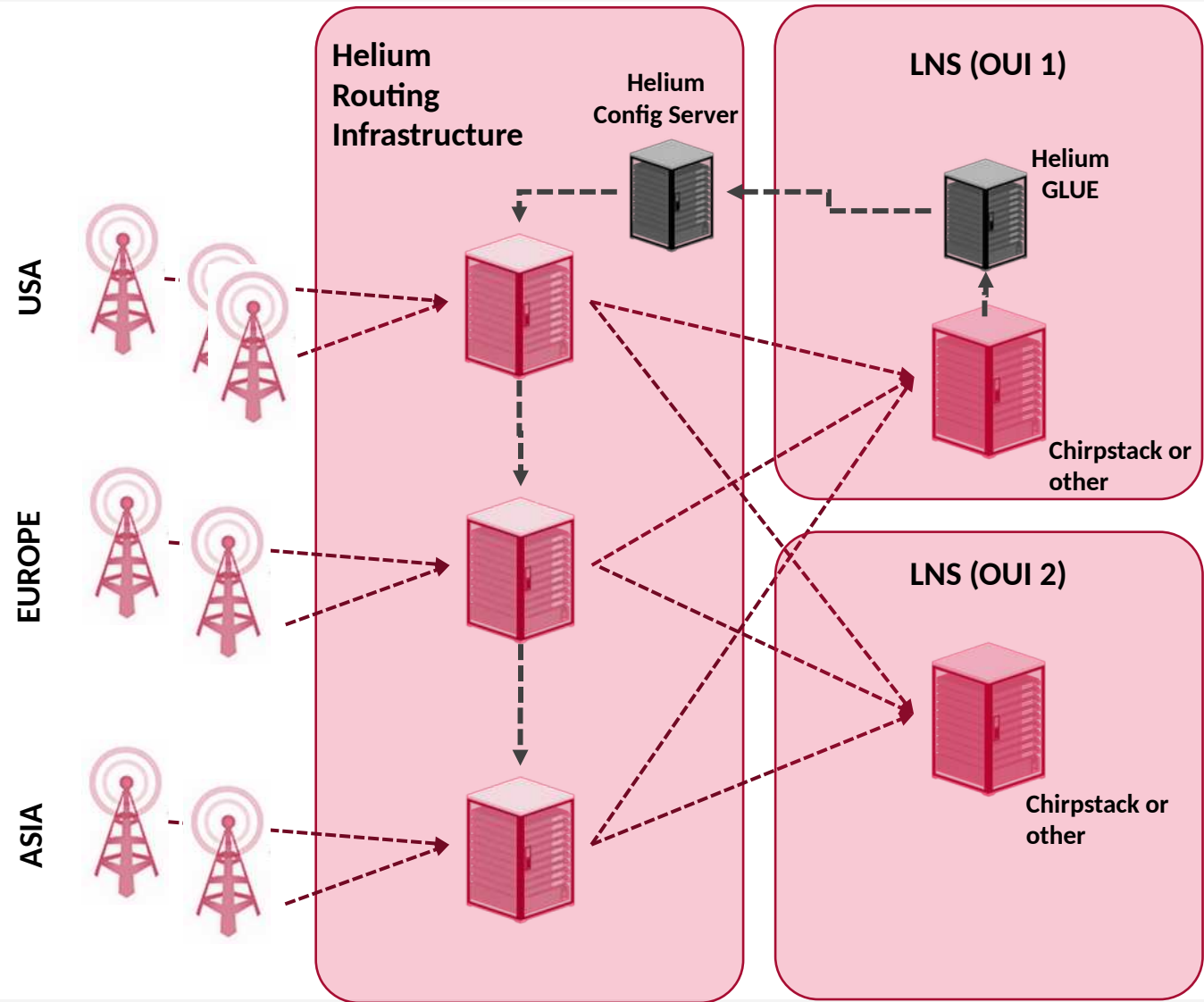


Helium Network Server Architecture

Helium have a geo-replicated routing infrastructure where all the hotspots push the received packets. This infrastructure is verifying the packet, purchase it to the hotspot and route it to the right LNS.

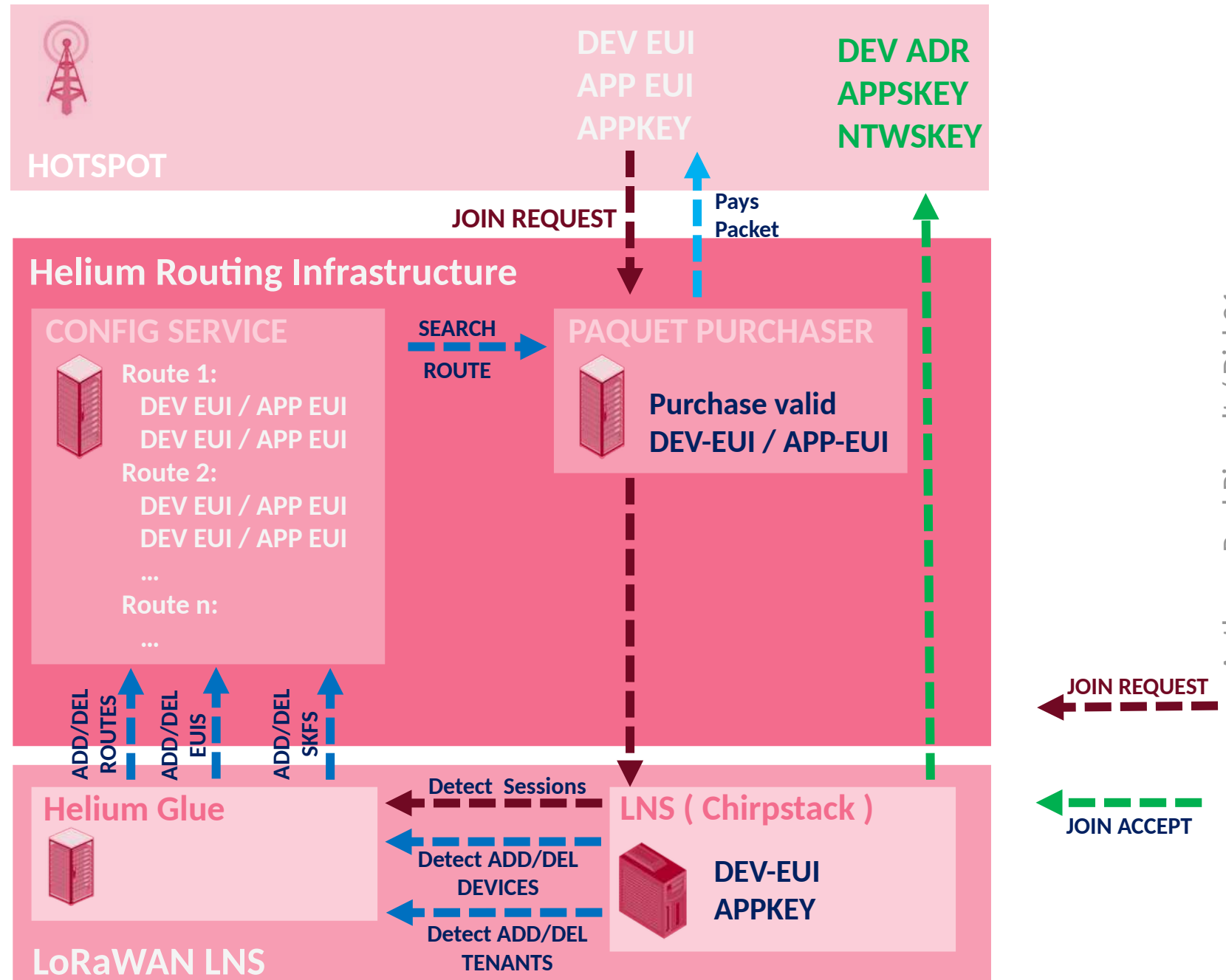
LNS are running Chirpstack, open-source agnostic LoRaWan Server.

Devices and sessions needs to be declared in the Helium Routing service by the LNS. This requires API call to Helium Routing service (Config Service) on: Device Addition, Device Deletion, Device Session creation... Specific open-source project has been created to support this (see my github)



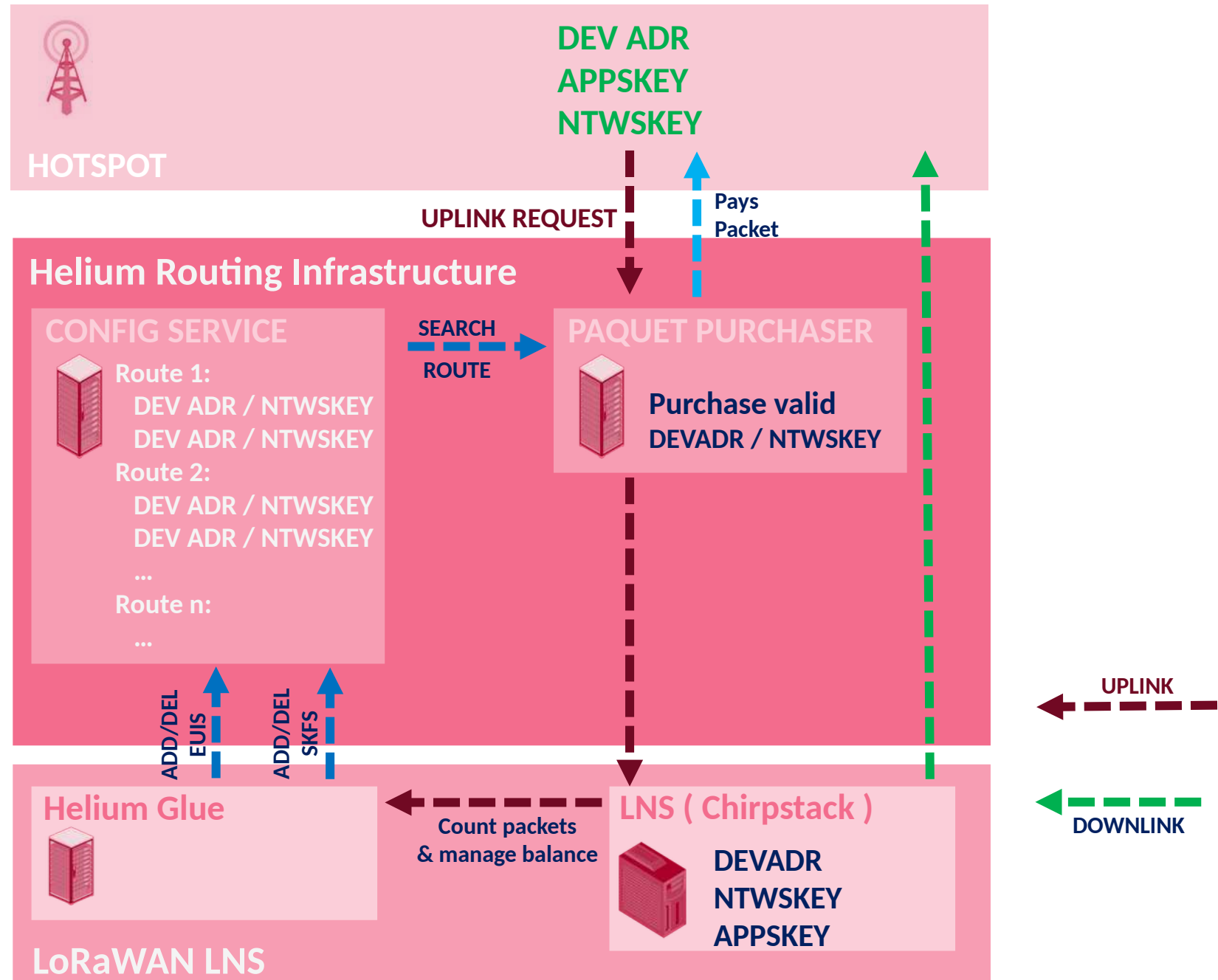
JOIN PROCESS

- > Helium router is searching for a route with a corresponding DEV-EUI / APP-EUI to accept the JOIN Request.
- > Helium Glue detects device addition & deletion to maintain the Config Service database with valid DEV-EUI/APP-EUI.
- > Helium Glue detects session creation to maintain the list of SKF (Session Key Filters) to the config Service. Basically the NTWSKEY list per DEVADR
- > Routes are managed by Helium Glue, can be global or per tenant. Route allows multiple LNS per OUI



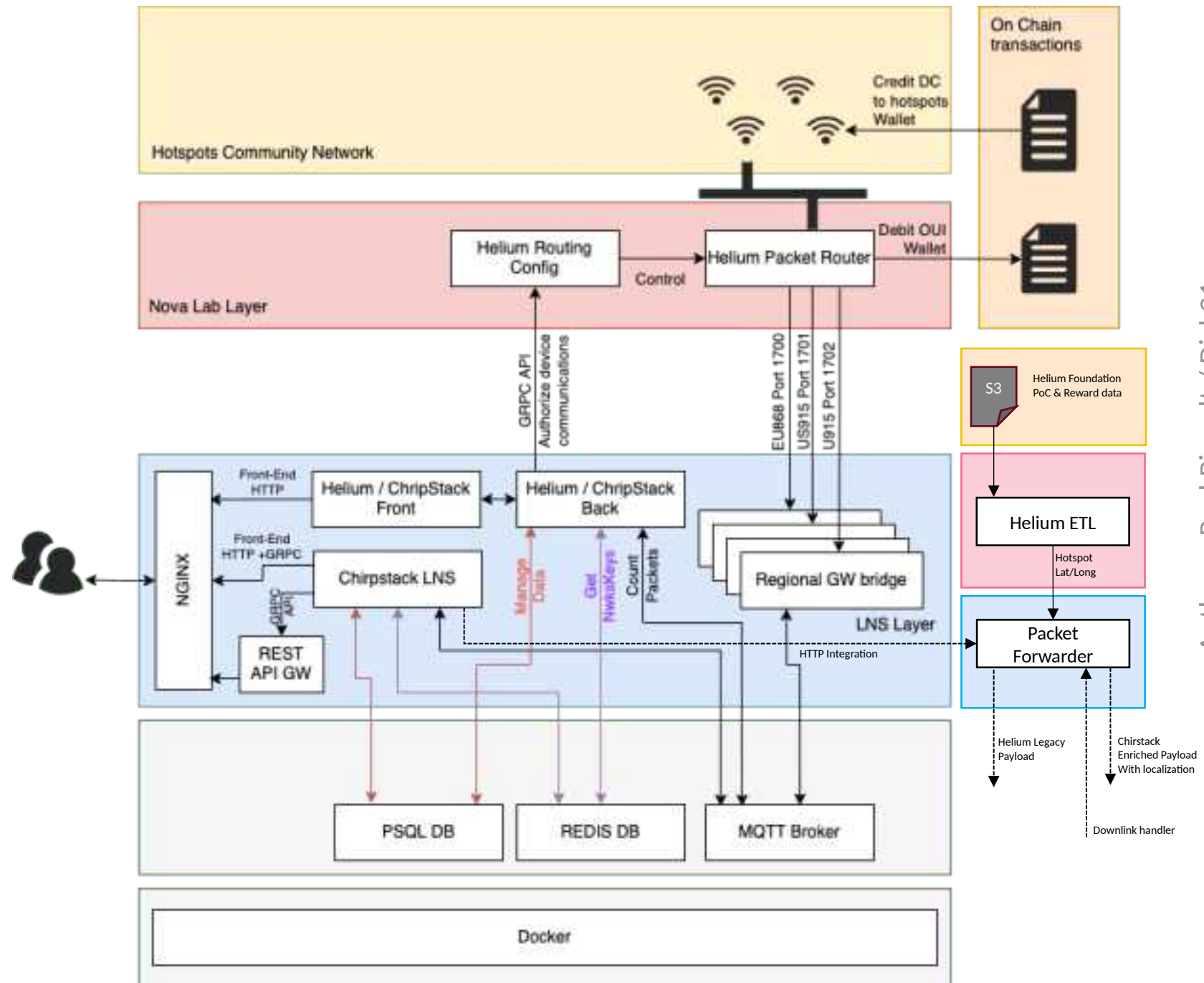
UPLINK PROCESS

- > Helium router is searching for a route with a corresponding DEV-ADR / NTWSKEY by verifying all signatures for the DEVADR.
- > Valid packets are sent to LNS and paid to hotspots. Depends on max_copy route param, one or multiple packets are paid.
- > Helium Glue, in public usage, manage per device / account, packet balance. When a balance is reaching 0, the Glue will deactivate routes in config service.
- > Downlink are free of charge.



Helium GLUE

- > Chirpstack tenant & device creation / deletion can be found in the PSQL Database.
- > Session Key are maintained in REDIS Database
- > Packet count & JOIN request can be detected with MQTT.
- > Chirpstack is per Region, not a global LNS. But we can dynamically update the region.



Content



Slide Deck



Youtube Channel



GitHub Project

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