



## 4<sup>th</sup> Stakeholder Group Meeting September 2025

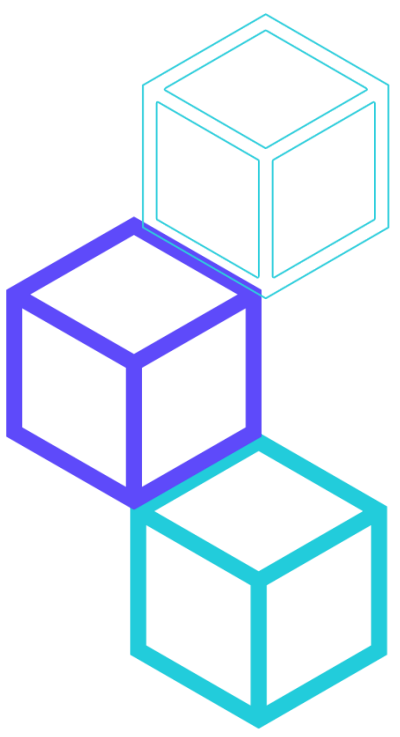
Online (MS Teams), 15/09/2025

Alexandre Lucas, INESC TEC



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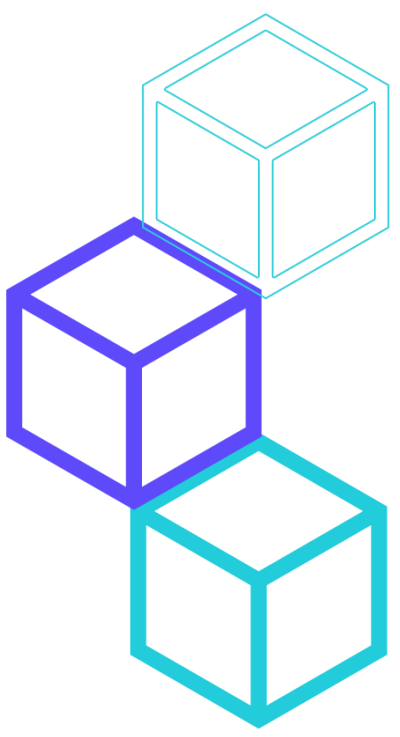
# Agenda



- ❖ Overview of where we are in the project
- ❖ The latest versions of LPC/UI Config File tool
- ❖ Use Cases and the different architectures
- ❖ Lessons learnt
- ❖ Data Space Connector developments
- ❖ Open Mic session
- ❖ Closing



# Overview

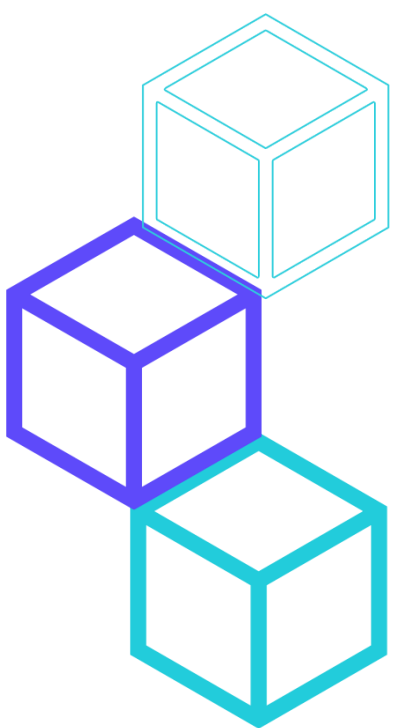


Throughout the project we have output several open source tools with the guidance of the stakeholders group namely:

- ❖ 0 LPC IEEE2030.5 over NATS
- ❖ A client/server library for NATS communication
- ❖ Testing procedures
- ❖ A storage sizing Hybridization tool
- ❖ UI for the DS connector
- ❖ 4 DS Valorization cases



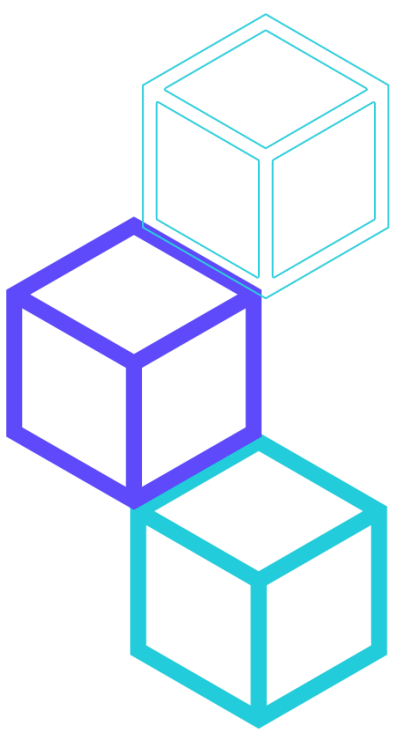
# Overview



In 2025 Disseminated of our work in different conferences, fairs including:

Type of Event	Event name	Nbr of events
<b>Fairs</b>	Hyvolution Paris 2025 – Hydrogen industry exhibition; Hannover Messe 2025 – Major industrial technology trade fair; ESS Europe – Exhibition for batteries and energy storage; The smarter E Europe – Integrated energy exhibition platform; EM-Power Europe – Exhibition focused on smart energy solutions; Battery Show Stuttgart 2025 – Trade fair for advanced battery technology; Lisbon Energy Summit and Exhibition 2025 – Exhibition & conference; Battery Recycling Expo 2025 – Exhibition dedicated to recycling technologies	<b>8</b>
<b>Conferences*</b>	ICSEE 2025 – International Conference on Sustainable Energy Engineering; World Sustainable Energy Days Battery Recycling Europe; FEV’s Zero CO2 Mobility and Energy Conference; Wind Europe Annual Event (has exhibition elements too, but primarily a conference); Energy Tech Summit 2025; RE-BATTERY 2025 Raw Materials Summit;19th International Conference on Compatibility, Power Electronics, and Power Engineering (CPE-POWERENG 2025); ICSMARTGRID 2025 Conference; IEEE PowerTech 2025; SPE Conference (Society of Petroleum Engineers); AABC – Advanced Automotive Battery Conference; Energy Storage Global Conference	<b>15</b>
<b>Policy related events</b>	RTR Conference (organised by BEPA) – Research & innovation policy dialogue; EARPA Spring Meeting – Policy & automotive research associations; BRIDGE General Assembly – EU-funded projects and policy exchange; EUSEW 2025 (European Sustainable Energy Week) – EU institutional policy event	<b>4</b>
<b>Others</b>	All Electric Society –Vision-driven initiative, not a formal fair or conference (context needed, but likely falls under "conceptual event").	<b>1</b>

\*More than a dozen publications

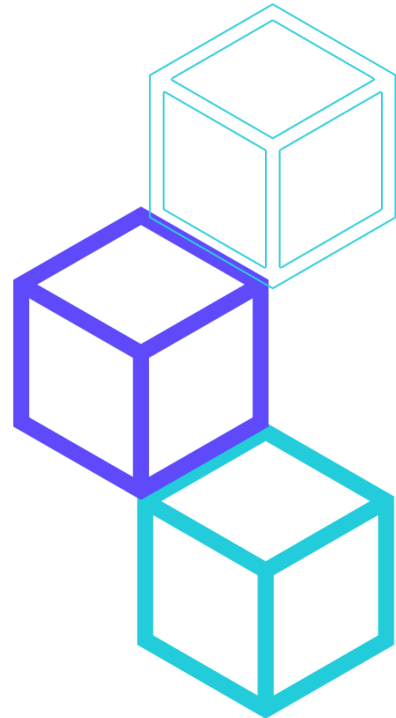


# InterSTORE overview & Implementation scope

- ❖ At this point we have the following updated version:
  - Version 1.5 of the LPC,
  - version 1.3.2 of the UI Data Space connector
  
- ❖ Since our last meeting, we have run the demos and concluded most of the works targeting 9 UC
  - Monitoring
  - Control
  - LPC and native libraries
  - Both EMS (platforms) and devices have deployed the tools
  - Performance under lab conditions using RTDS



# Engagement numbers



Only on Dockerhub:

- ❖LPC - >1100 downloads
- ❖DS connector UI – 400 downloads
- ❖Local API service . – 150
- ❖DS Fiware data app + Blockchain notarization – > 350 downloads

hub

Search Docker Hub

CtrlK

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I

Horizont Europe Interstore

Community User

RepositoriesStarred

Search by repository name

Displaying 1 to 11 of 11 repositories

IMAGE

interstore/legacy-prot...

interstore

Legacy Protocol Converter is a framework designed to convert...

Pulls

1.0K

Stars

0

IMAGE

interstore/data-space-

interstore

NATS Subscriber for Energy Data Space Framework

Pulls

49

Stars

0

IMAGE

interstore/data-space-

interstore

Energy Data Space Connector UI

Pulls

392

Stars

0

IMAGE

interstore/testapp-back

interstore

Pulls

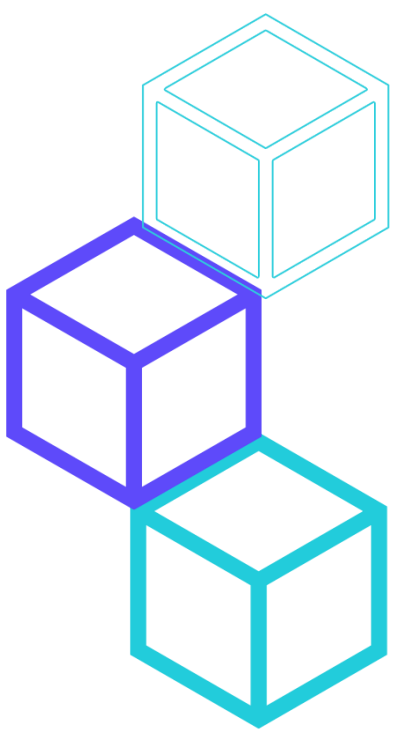
66

Stars

0

<https://hub.docker.com/u/interstore>





# InterSTORE main results

## Main Performance indicators:

Indicator	Value reached
❖ IEEE2030.5 NATS Communication speed	under 100 ms
❖ Number of different DER devices successfully tested and demonstrated	32
❖ Number of assets monitored by the EMS solutions	37
❖ Number of different DER devices and EMS successfully tested with the IEEE2030.5 and demonstrated in real-life pilots	21
❖ Nbr. Of shared services/files subscribed and published	over 3000
❖ Integrated power of the HESS within the project demos	over 4MW



# InterSTORE highlights

- ❖ InterSTORE White paper available on our Webpage
- ❖ Policy recommendation
- ❖ Comparison with other standards/protocols
- ❖ Towards adoption

Scan a QR code to download our White paper



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## THE ROLE OF THE IEEE 2030.5 INTEROPERABILITY STANDARD IN DISTRIBUTED ENERGY RESOURCES INTEGRATION

White Paper

15 January 2025

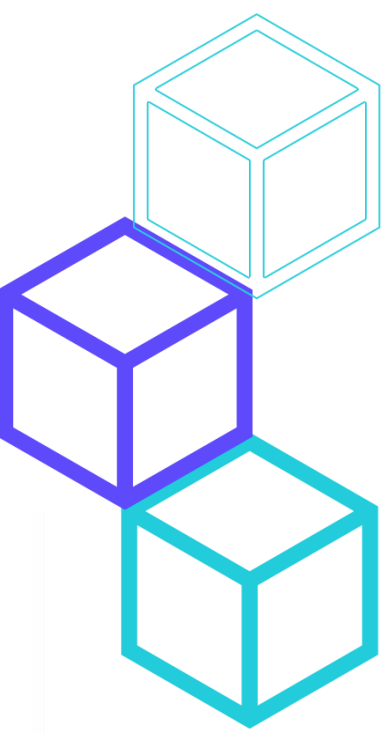


MAIN AUTHORS

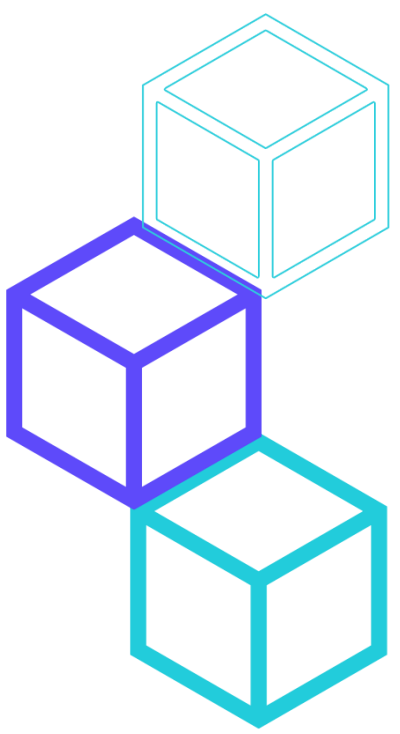
Alexandre Lucas, Peter Nemcek, Matjaz B. Juric, Nikolaj Candellari, Jawad Younus, Ferdinando Bosco, Yashvi Baria, Marcantonio La Franca

EDITOR

Elizaveta Kuzmina







# Overview and looking at the Future

- Linux Foundation for Energy under the name CUPID, to which I ask you to follow, engage and contribute, as this will be the future stage for the project developments.

<https://github.com/cupid-project>

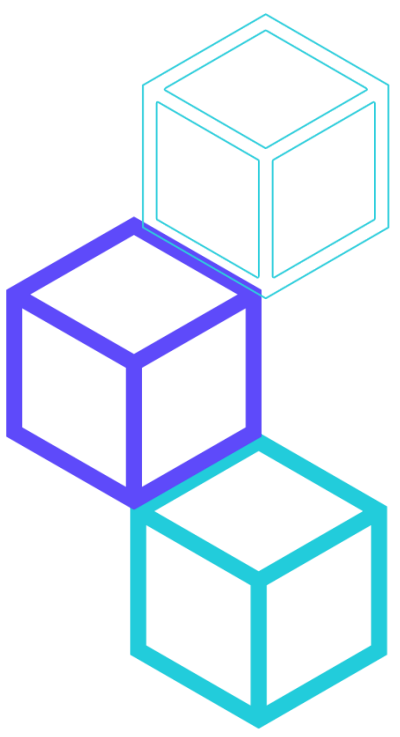


The screenshot shows the GitHub organization page for 'cupid-project'. The header includes the organization name, a search bar, and navigation tabs for Overview, Repositories (3), Projects, Packages, and People. The main content area displays the organization's profile with a purple and white logo, an 'Unfollow' button, and a section for 'Popular repositories'. Three repositories are listed: 'Legacy-Protocol-Converter', 'interoperability-common', and 'Client-Server', all marked as 'Public' and 'Java'. A 'Report abuse' link is visible at the bottom right.

Repository Name	Visibility	Language
Legacy-Protocol-Converter	Public	Java
interoperability-common	Public	Java
Client-Server	Public	Java



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# How can you as a Stakeholder contribute

We invite you to:

- ❖ Engage with the Cupid project. Further developments are welcome.
- ❖ Adopt in real life in your assets and infrastructure.
- ❖ Propose in other projects and implement in other use cases.
- ❖ Engage with InterSTORE partners for knowledge transfer.
- ❖ Share experience from your own projects and implementation.
- ❖ Work still needs to be done, but that's why we need community engagement.



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# Final Event

Date: 25 November 2025

Hybrid event: [Double Tree by Hilton Brussels City, Rue Gineste 3, 1210 Brussels and online](#)

For more information, go to our website:  
[InterSTORE Final event | interstore](#)

And register for the event here:  
[InterSTORE Final event – EASE](#)



The poster features a background image of a speaker at a podium addressing an audience in a conference hall. The 'interstore' logo, consisting of three stacked cubes, is in the top right corner. A purple banner across the middle contains the text 'INTERSTORE' in white. Below this, the words 'FINAL EVENT' are written in large, bold, white letters. To the left of the date, the text 'Learn about our project results.' is written in a light blue, italicized font. On the right, the date '25 November 2025' is shown with a calendar icon, followed by the time '8:30 AM - 4:30 PM'. Below the time, a location pin icon is followed by the text 'DoubleTree by Hilton Brussels City and Online'. At the bottom left, the European Union flag is displayed next to the text 'Funded by the European Union'.

interstore

**INTERSTORE**

**FINAL EVENT**

*Learn about our project results.*

 25 November 2025  
**8:30 AM - 4:30 PM**

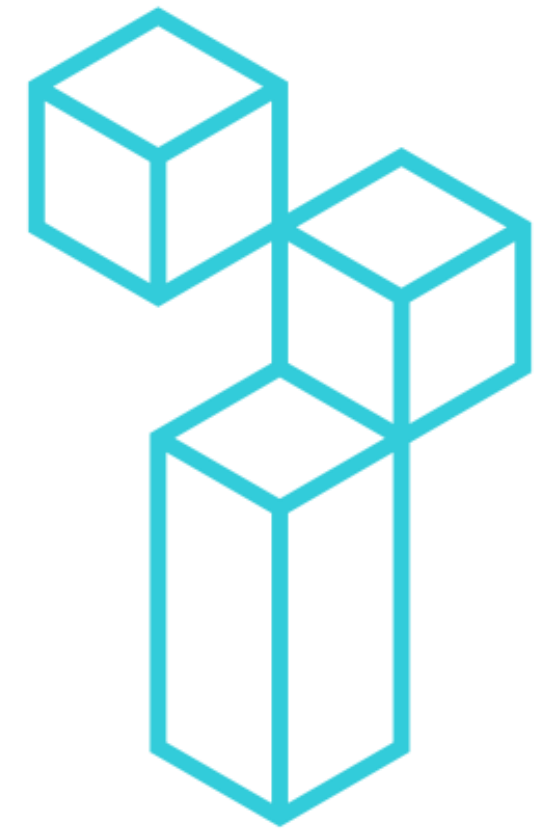
 DoubleTree by Hilton Brussels City and Online

 Funded by the European Union



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# interstore

# THANK YOU!



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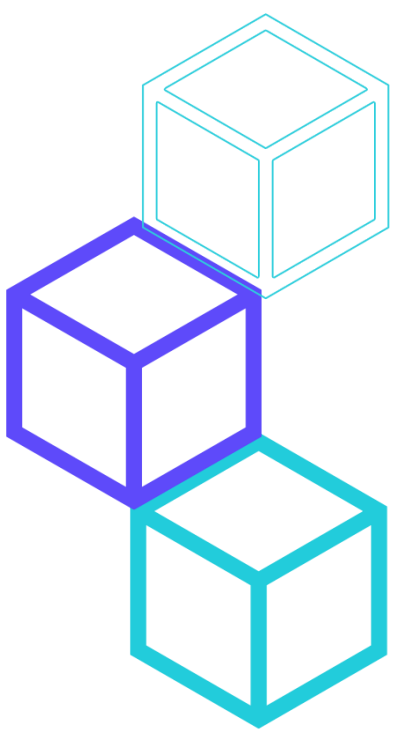
The latest versions of the LPC/UI Config File tool

Matjaz Juric, SUNESIS



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# Legacy Systems Protocol Converter

## Legacy Systems Protocol Converter (LPC)

- Provides simple and configurable transformation between legacy protocols and IEEE 2030.5

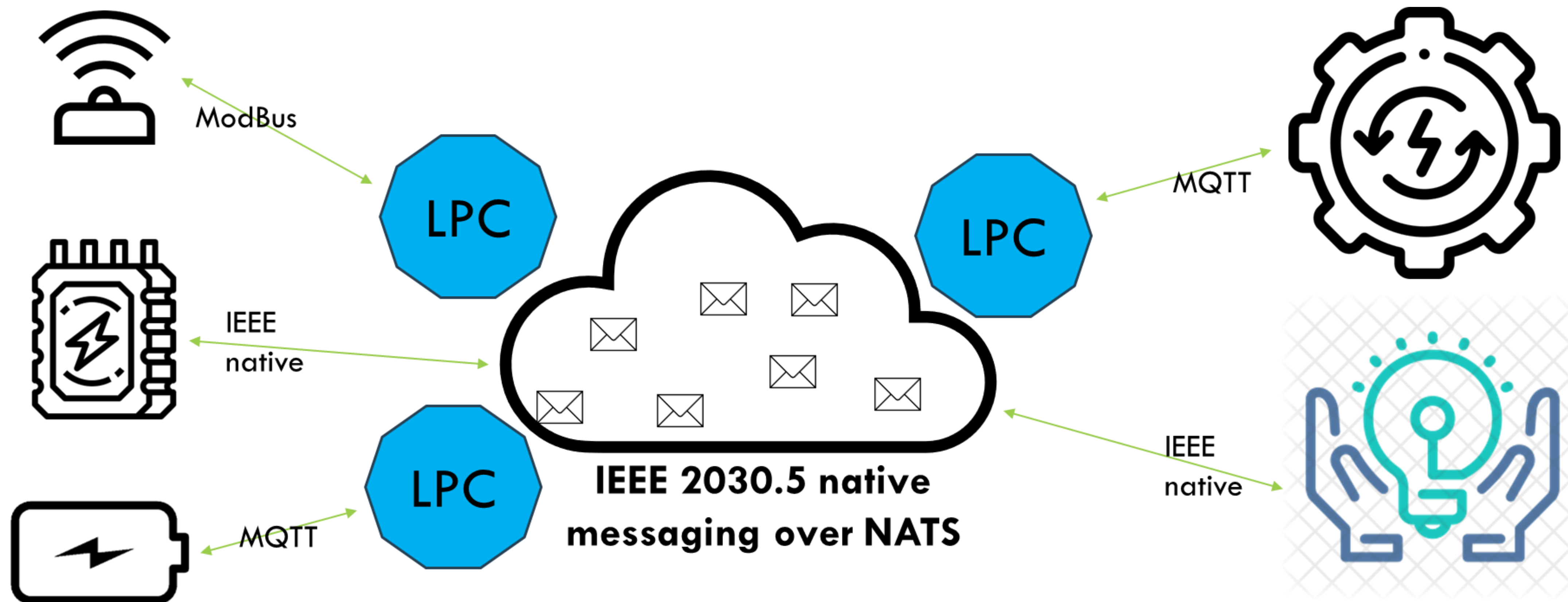
## Supported protocols:

- ModBus (serial and TCP)
- MQTT
- RabbitMQ
- NATS (for IEEE 2030.5)

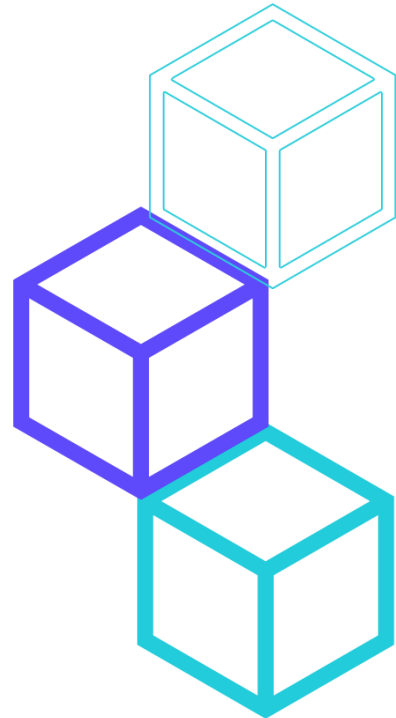
## Supported IEEE 2030.5 formats

- XML
- JSON
- All 321 IEEE 2030.5 elements are supported





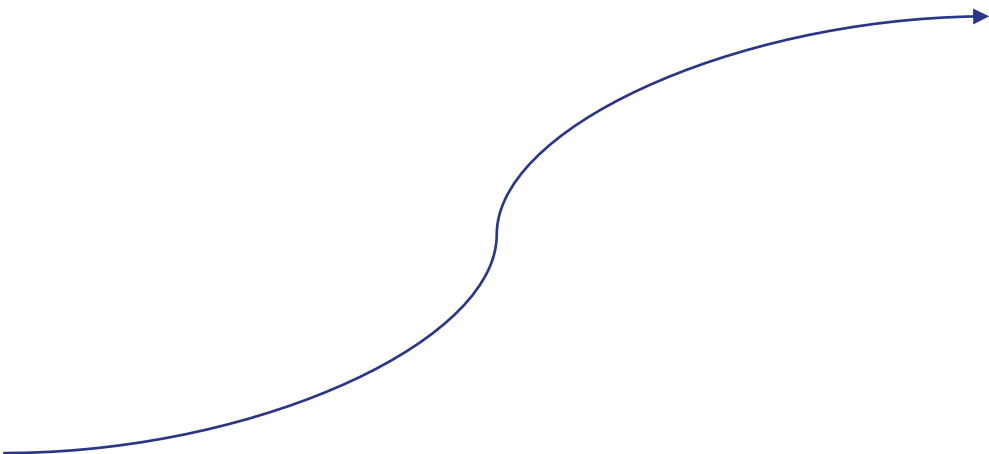
# Legacy Systems Protocol Converter



```
{
  "datetime": "28-08-2023 12:00:35",
  "status": "active",
  "start": "28-08-2023",
  "duration": 900
}
```



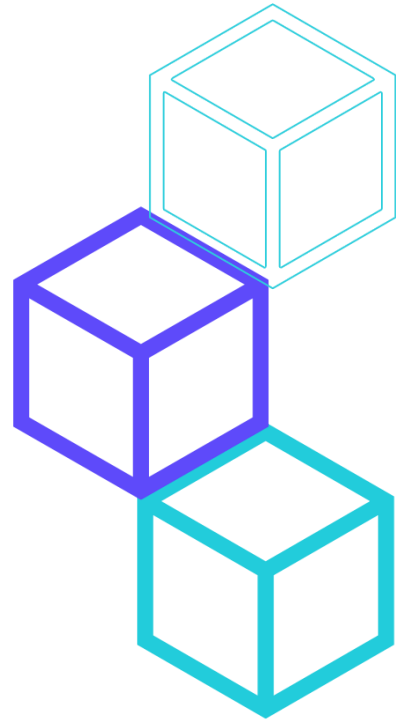
```
<Event>
  <creationTime>1702909917932</creationTime>
  <EventStatus>
    <currentStatus>1</currentStatus>
    <dateTime>1693216835000</dateTime>
    <potentiallySuperseded>>false</potentiallySuperseded>
  </EventStatus>
  <interval>
    <duration>900</duration>
    <start>1693216835000</start>
  </interval>
</Event>
```




```
transformations:
- name: JSON IncomingEvent to XML IEEE2030.5 Event
  description: Example showing transformation of messages from JSON to XML
  connections:
    incoming-connection:
      - MQTT-connection
    incoming-topic: topic1
    incoming-format: JSON
    outgoing-connection:
      - NATS-connection
    outgoing-topic: event/myevent
    outgoing-format: XML
  to-outgoing:
    '<Event>
      <creationTime>${timestamp}</creationTime>
      <EventStatus>
        <currentStatus>
          <lpc:mapping>
            <path type="integer">/status</path>
            <values>["scheduled", "active", "cancelled", "cancelled_with_r", "superseded"]</values>
          </lpc:mapping>
        </currentStatus>
        <dateTime>
```



# LPC UI for Simplifying Configuration



- <https://sunesis.si/interstore/lpc/>



Quick nav

Connections

Transformations

Registration

Back

modbus1

NATS

nats1

Define mapping from modbus1 to nats1

Outgoing format \* JSON

Retry count

To topic \* enel2

Message \*

```
{  "dERSettings": {    "modeEnabled": {      "value": [        {          "lpc:mapping": {            "path": "/IncomingEvent/duration",            "type": "integer",            "pattern": "date-pattern",            "values": []          }        }      ]    }  }
```

Insert LPC mapping

Format JSON

Define mapping from modbus1 to nats1

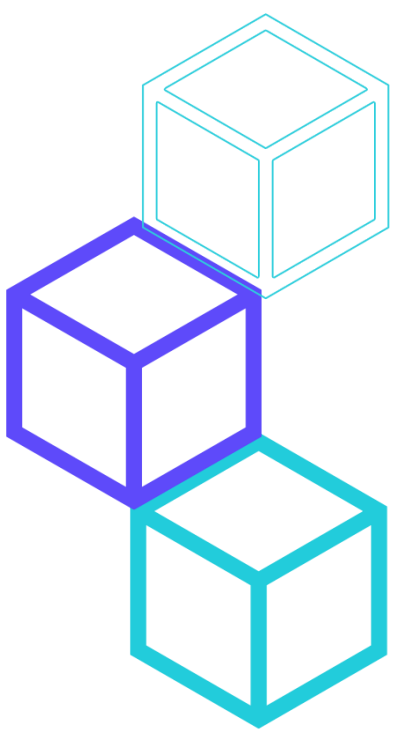
Incoming format JSON

Retry count

Download

Continue





# New Features in LPC

Latest version is Version 1.5 (Sep 12, 2025)

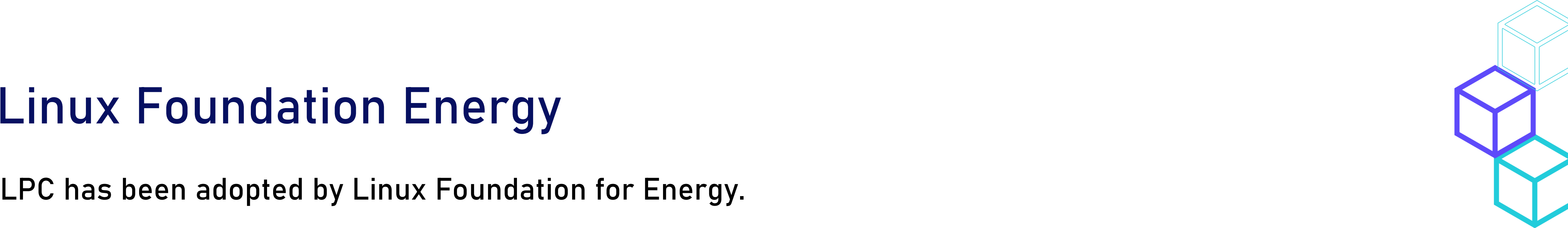
New features:

- RabbitMQ support with flexible queue/topic mappings
- Cron-based interval request scheduling
- Synchronization with NTP server supported for interval requests
- New validation flag for IEEE2030.5 messages
- Option to use the pymodbus library with Modbus TCP
- Support for unsigned and signed integers when using Modbus connections
- Configuration of logs inside the configuration of LPC
- Option of message validation for compliance with IEEE 2030.5 schema
- Several performance and scalability improvements



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# Linux Foundation Energy

LPC has been adopted by Linux Foundation for Energy.

LPC can now be found in Linux Foundation hosted repo on GitHub – CUPID:

<https://github.com/cupid-project/Legacy-Protocol-Converter>

CUPID code is currently mirrored with original Interstore repository <https://github.com/Horizont-Europe-Interstore/Legacy-Protocol-Converter>

CUPID will move to the Linux Foundation Energy GitHub org by the end of the year.

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cupid-project / Legacy-Protocol-Converter

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master 1 Branch 5 Tags

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Code

divjad--- Merge pull request #6 from Horizont-Europe-Interstore/feature 0ce99b8 · 3 months ago 42 Commits

config-examples	Updated Readme.md and sample configuration file	5 months ago
docs	Add files via upload	4 months ago
log-config	Logging supported in configuration. Modbus supports uint ...	7 months ago
transformation-framework	Added NTP server synchronization and cron based start of in...	3 months ago
.gitignore	Added dynamic reloading of configuration files.	last year
Dockerfile	Code refactoring, adding comments and pymodbus library o...	5 months ago
LICENSE	Create LICENSE	last year
Readme.md	Merge pull request #6 from Horizont-Europe-Interstore/feat...	3 months ago
legacy-protocol-converter.jar	Code refactoring, adding comments and pymodbus library o...	5 months ago
pom.xml	Added NTP server synchronization and cron based start of in...	3 months ago
pymodbus_script.py	Code refactoring, adding comments and pymodbus library o...	5 months ago

README MIT license

### Legacy Systems Protocol Converter for IEEE2030.5

The Legacy Systems Protocol Converter (LPC), initially developed within the Horizon Europe Interstore project, acts as a middleware, allowing devices that use different communication protocols to exchange data with EMS systems that use the IEEE2030.5 standard. It supports:

- IEEE2030.5 communication: This is the primary function of the Legacy Protocol Converter. It can handle IEEE2030.5 messages in both JSON and XML formats.
- Next-generation NATS messaging: This is a new messaging protocol that the converter uses to communicate with devices and EMS systems. It is designed to be more efficient and scalable than traditional protocols like

About

No description, website, or topics provided.

Readme MIT license Activity Custom properties 0 stars 1 watching 0 forks Report repository

Releases

5 tags

Packages

No packages published

Contributors 2

divjad--- David Trafela MBJuric Matjaz B. Juric

Languages

Java 96.0% Python 3.6% Dockerfile 0.4%

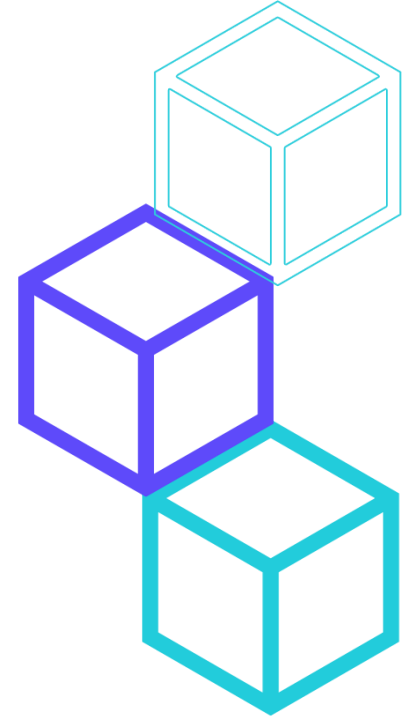

# Docker Hub


LPC has pre-build images on Docker Hub:  
<https://hub.docker.com/u/interstore>

Using Docker Hub images is the fastest way to start using LPC. It only requires one command:

```
docker pull interstore/legacy-protocol-converter
```


Note: You also need to define the mapping, as shown before.




hub

CtrlK

?






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[Explore](#) / [interstore](#) / legacy-protocol-converter



interstore/legacy-protocol-converter

By [interstore](#) · Updated 2 months ago

Legacy Protocol Converter is a framework designed to convert messages from one protocol to another.

IMAGE

☆0

↓1.0K

Overview

Tags

Legacy Protocol Converter

The Legacy Systems Protocol Converter, initially developed within the Horizon Europe Interstore project, acts as a middleware, allowing devices that use different communication protocols to exchange data with EMS systems that use the IEEE2030.5 standard. It supports:

- IEEE2030.5 communication: This is the primary function of the Legacy Protocol Converter. It can handle IEEE2030.5 messages in both JSON and XML formats.
- Next-generation NATS messaging: This is a new messaging protocol that the converter uses to communicate with devices and EMS systems. It is designed to be more efficient and scalable than traditional protocols like REST over HTTP.
- MQTT and Modbus protocols: These are common protocols used by many devices. The Legacy Protocol Converter can translate messages from these protocols into the IEEE2030.5 format for use with EMS systems.

Key features of Legacy Protocol Converter:

- Built-in transformation framework: This framework allows users to define how incoming messages should be transformed into the outgoing IEEE2030.5 format. This is important because different devices and systems may use different message formats.
- Configuration file: The converter uses a configuration file to specify connection details for NATS, MQTT, and Modbus devices. Users can also define transformations within the configuration file.
- Flexibility: The converter can support multiple transformations, each with different incoming and outgoing connections, message formats, and structures. This allows for a high degree of

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docker pull interstore/legacy-protocol-converter



# interstore

# THANK YOU!



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## Use Cases and the different architectures

Daniele Carta, Forschungszentrum Jülich



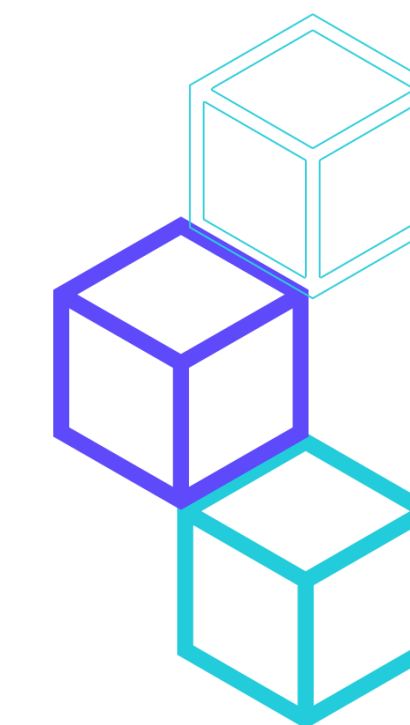
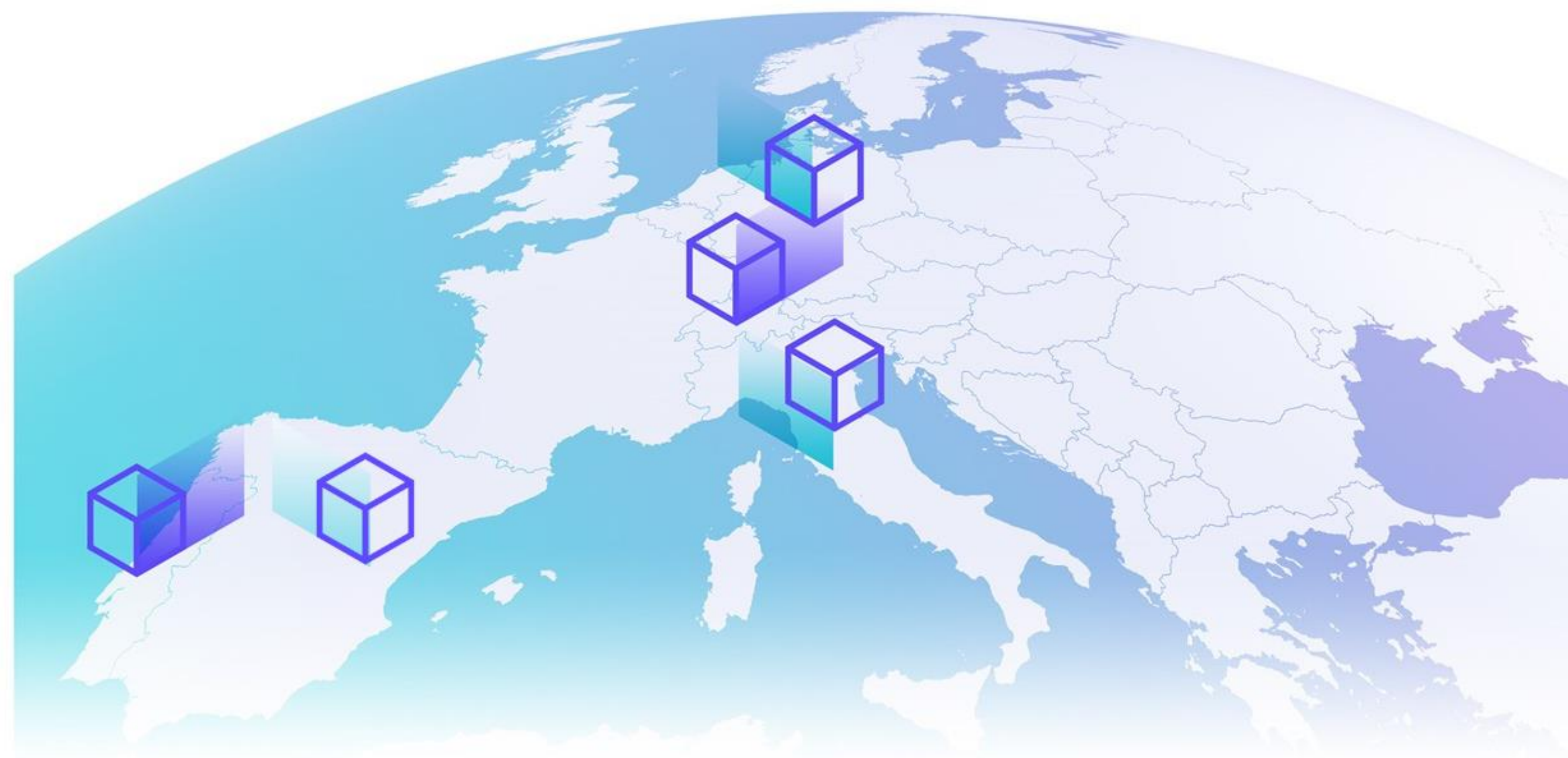
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# Pilot sites

## Overview

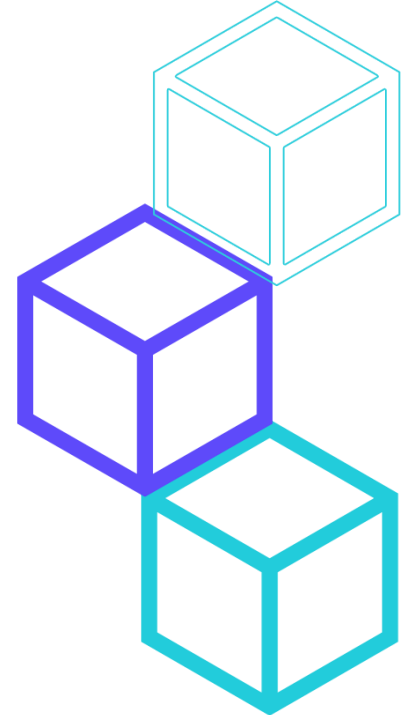
- ❖ Austria – Residential flexibility pilot
- ❖ Italy – E-mobility flexibility pilot
- ❖ Germany – Commercial flexibility pilot
- ❖ Portugal – Industrial flexibility pilot
- ❖ Spain – Laboratory test bed














# Use cases

## Overview



	UC #	Use Case name	HESS performance	Monetisation	Connected Data Spaces	Flexibility/ Consumer engagement	IEEE2030.5	2nd Life Batteries	EV Battery support
	1	DES Flexibility Market Monetisation	✓	✓	✓	✓	✓		
	2	Energy community DES utilisation	✓	✓	✓	✓	✓		
	3	Grid supporting BESS	✓		✓	✓	✓		
	4	Innovative Frequency services	✓				✓		
	5	Hybrid floating storage flexibility monitoring	✓			✓	✓	✓	
	6	Management of battery systems for Node capacity increase				✓			✓
	7	Adaptive BESS management for autonomous grid operation	✓		✓	✓	✓		
	8	Multiphysics flexibility Optimization for Home Management Systems and their global integration	✓		✓	✓	✓		
	9	Management of EV charging clusters as HESS			✓		✓		✓



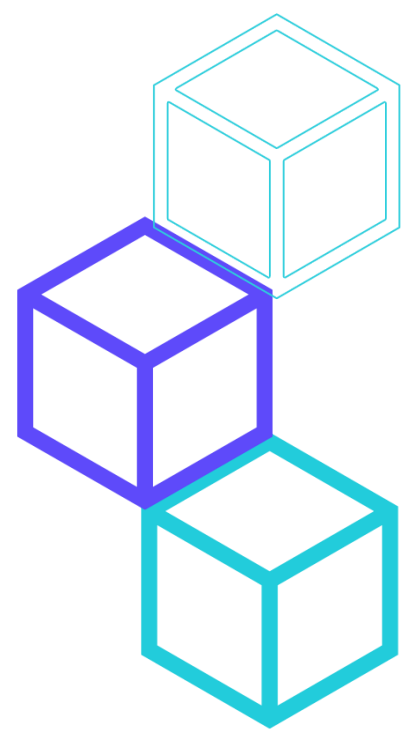
# Austrian pilot

## Overview of the Energy community in Dietach

- ❖ UC1: DES Flexibility Market Monetisation
- ❖ UC2: Energy community DES utilisation

### Key aspects:

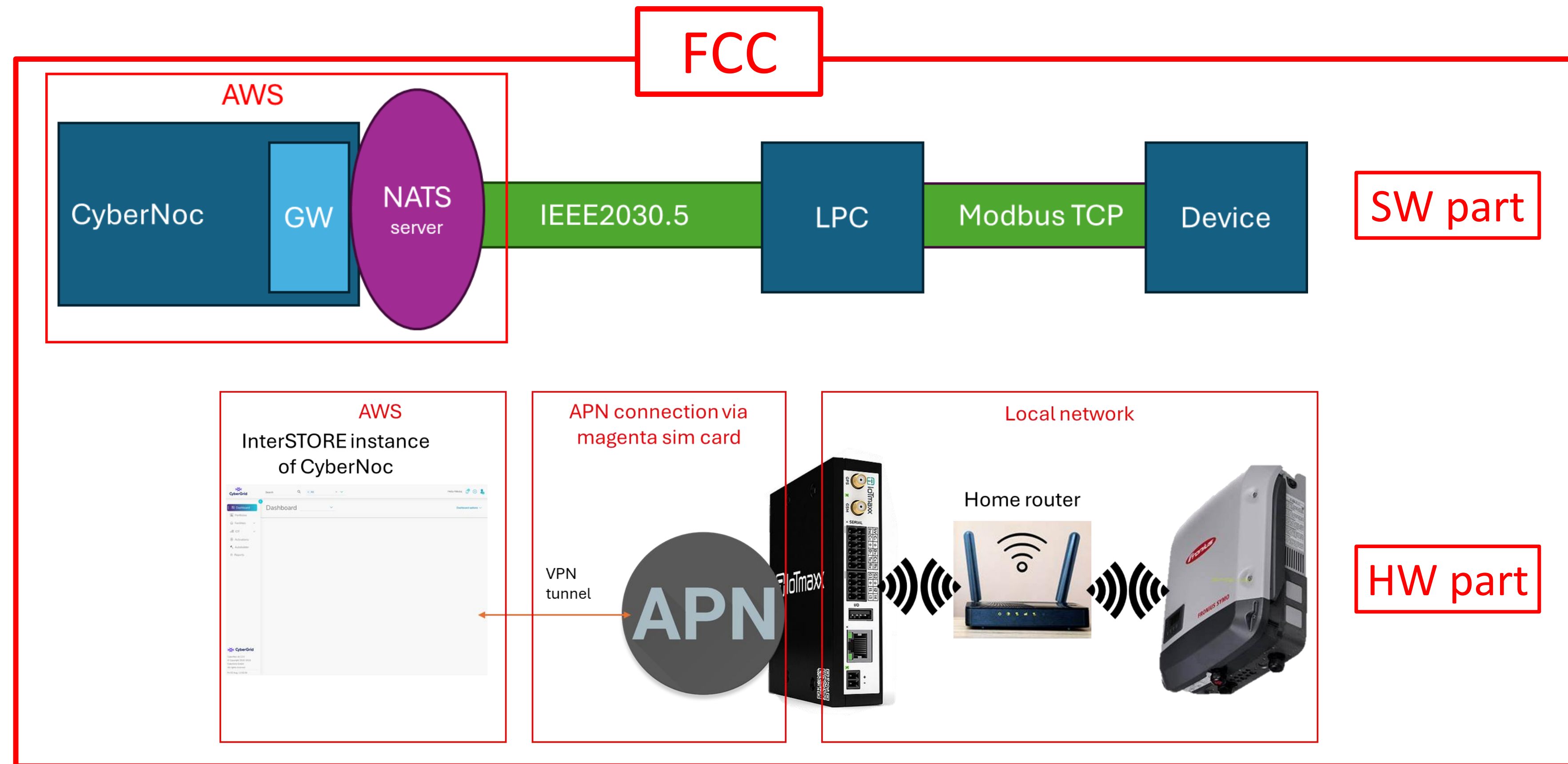
- ✓ Local energy community
- ✓ Monitoring and control
- ✓ Inverters from various manufacturers
- ✓ Communication via cellular network





# Austrian pilot

## Overview of the architecture



# Austrian pilot

## Overview of the inverters

Due to all the different scenarios in the community, the Austrian pilot target primally Fronius inverters (50% of cases) with a plan to expand to others.

Manufacturer	Type	Asset type
Fronius	Symo 10, Symo 8.2	PV
Fronius	Symo Gen24 Plus	PV
Fronius	SymoHybrid 5.0	BESS
Huawei	SUN2000, Solar Inverter	PV
SolarEdge	SE9K	PV
Solax	X3-HYBRID-15.0-D G4.2	PV
Huawei	LUNA2000	BESS
Varta	Pulse neo	BESS
BYD	HVM	BESS





# German Pilot

## Use cases

- ❖ UC3: Grid supporting BESS
- ❖ UC8: Multiphysics flexibility optimization for Home Management Systems and their global integration

### Key aspects:

- ✓ Multi-physics system
- ✓ Monitoring and control
- ✓ LPC Implementation on low-cost hardware
- ✓ Analysis of deployment times

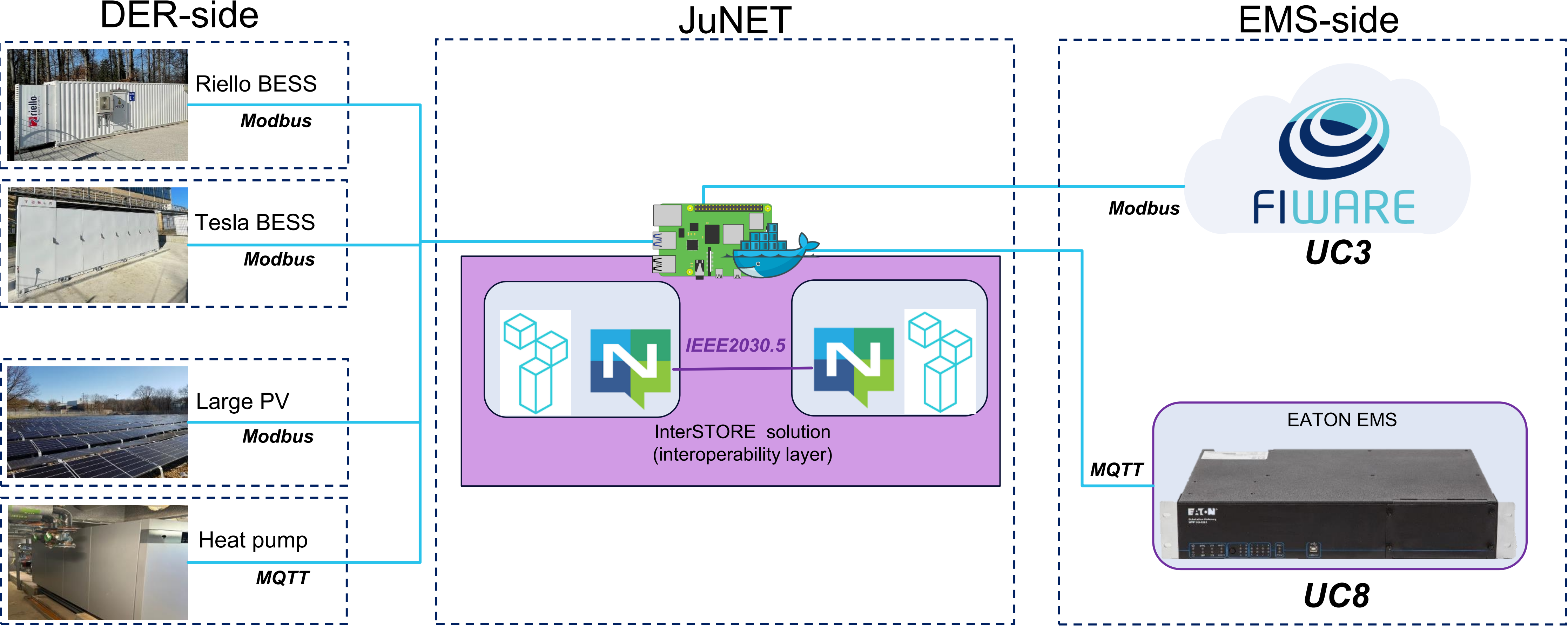
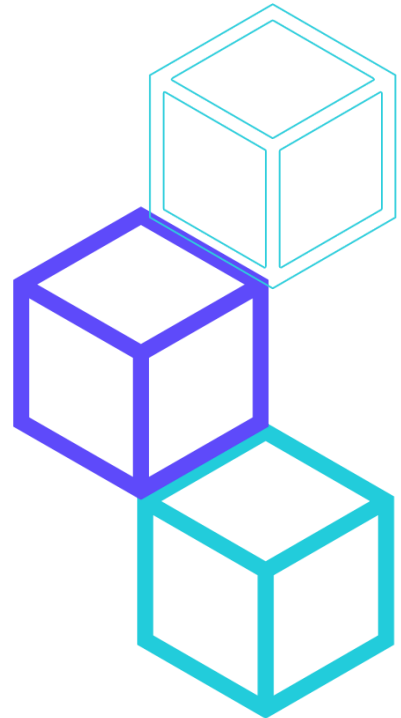


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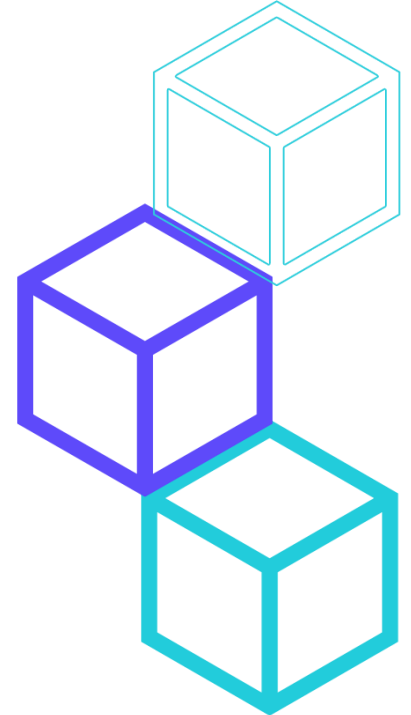
# German Pilot

## Overview of the architecture



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# German Pilot – UC3: Grid supporting BESS



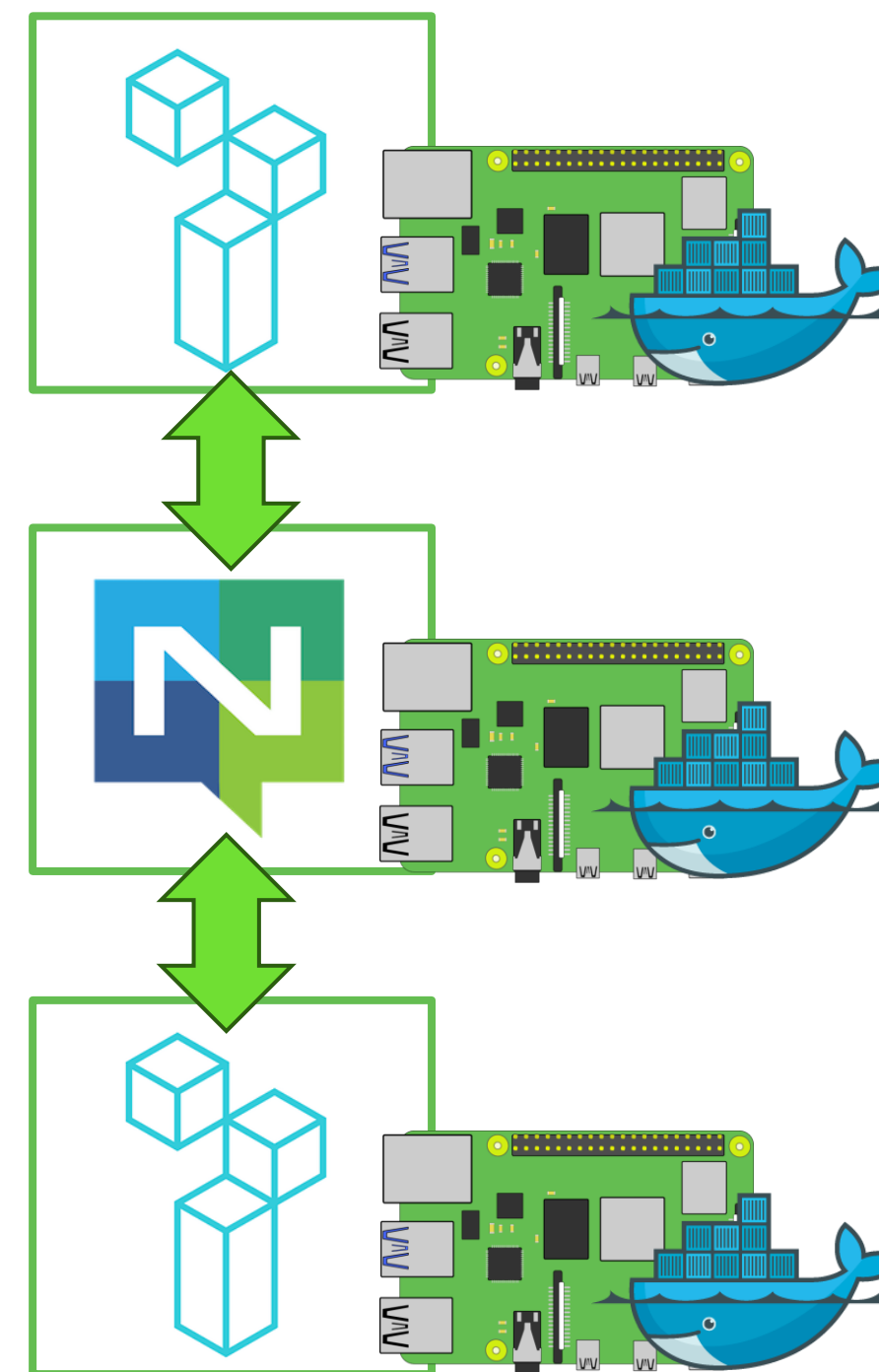
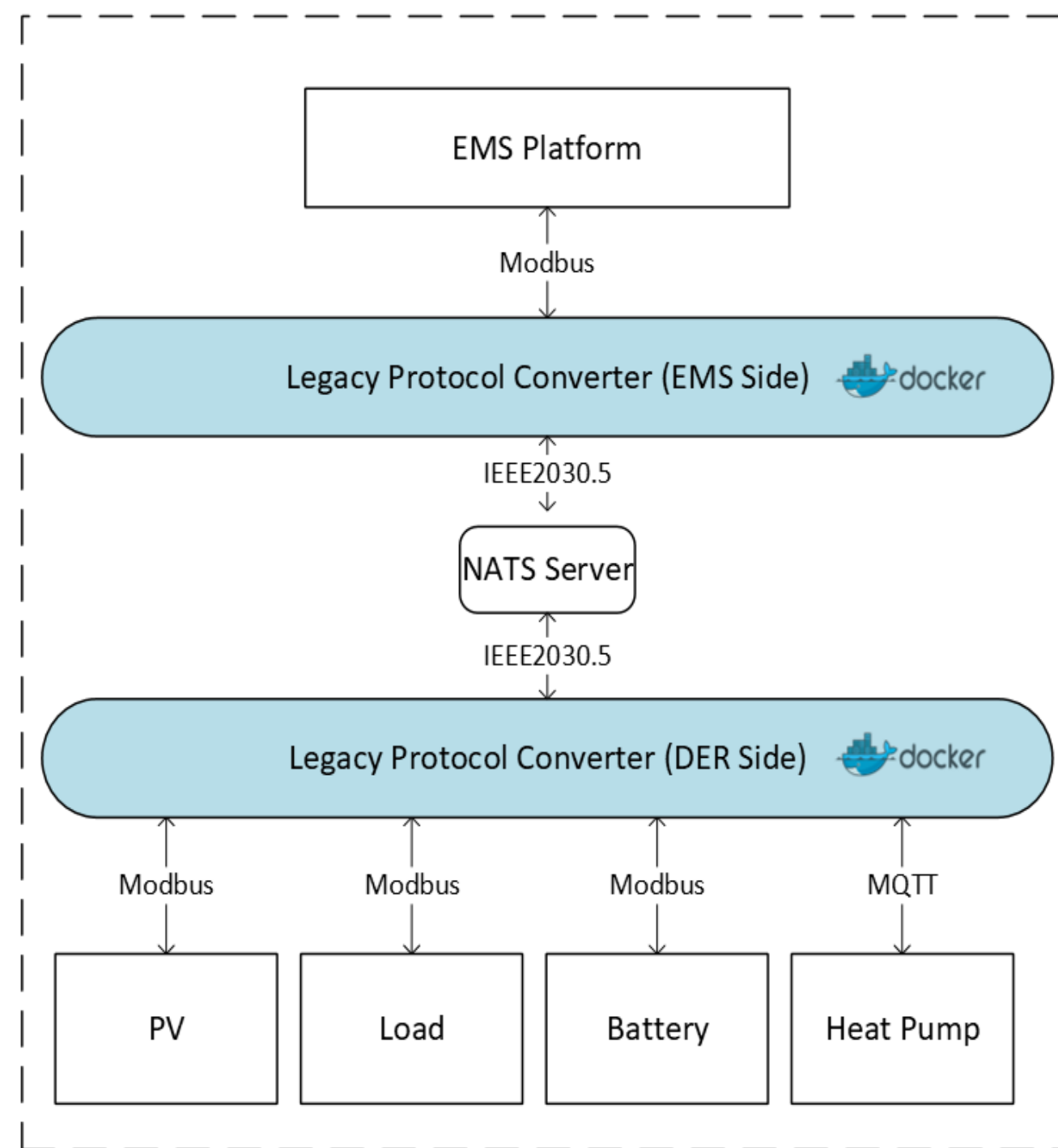
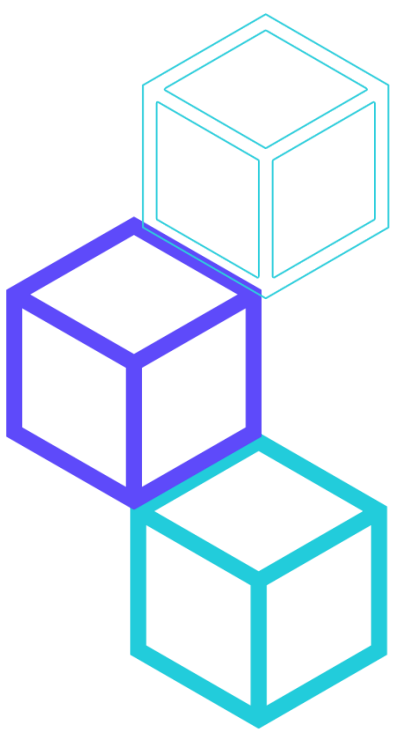
## Overview of deployment time (KPI9)

Average time “LPC” = 86% faster

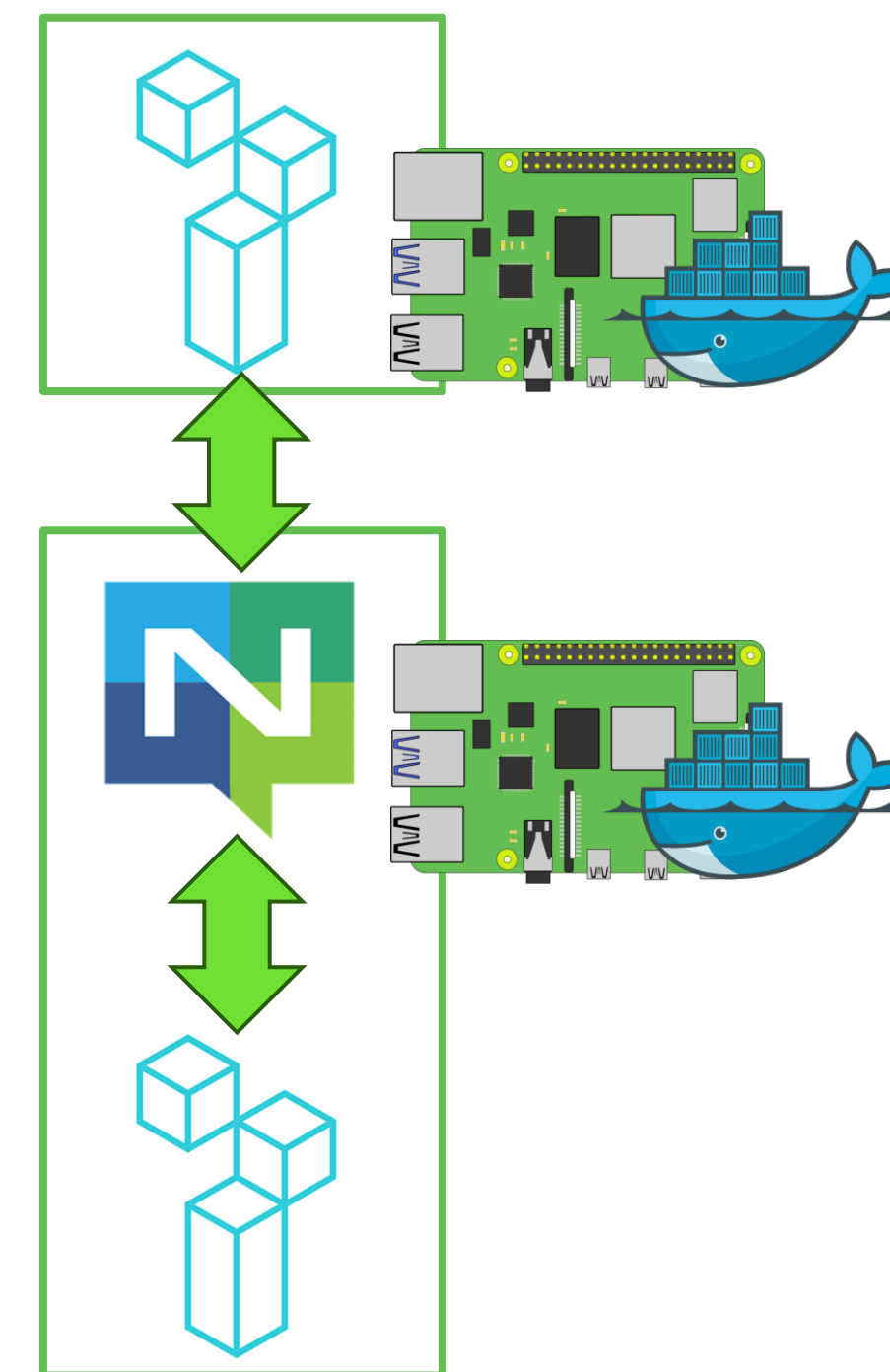
User ID	Time LPC integration [hours]				Time “traditional” integration [hours]			
	Riello	Tesla	PQI	Janitza	Riello	Tesla	PQI	Janitza
SD_1	5.37	4.56	4.50	4.05	46.25	37.00	30.83	27.75
SD_2	11.87	9.26	8.63	8.48	50.00	40.00	33.33	30.00
SD_3	5.49	4.41	4.52	4.52	40.00	32.00	26.67	24.00
SD_4	6.05	4.61	4.26	3.82	47.33	37.87	31.56	28.40
SD_5	7.57	6.22	5.68	5.25	43.67	34.93	29.11	26.20
PhD_1	3.85	3.61	3.50	3.17	50.00	50.00	28.33	25.50
PhD_2	3.10	2.84	2.58	2.48	50.00	50.00	28.24	25.41
PhD_3	10.97	8.62	7.50	6.75	50.00	50.00	31.23	28.11
PhD_4	4.47	3.67	3.33	3.22	50.00	50.00	32.75	29.48
Postdoc_1	8.03	7.27	6.58	6.17	50.00	50.00	33.30	29.97
Postdoc_2	2.76	2.49	2.33	2.26	50.00	50.00	30.23	27.20
Postdoc_3	1.72	1.66	1.50	1.37	50.00	50.00	30.67	27.60

# German Pilot – UC8: Multiphysics flexibility optimization for Home Management Systems and their global integration

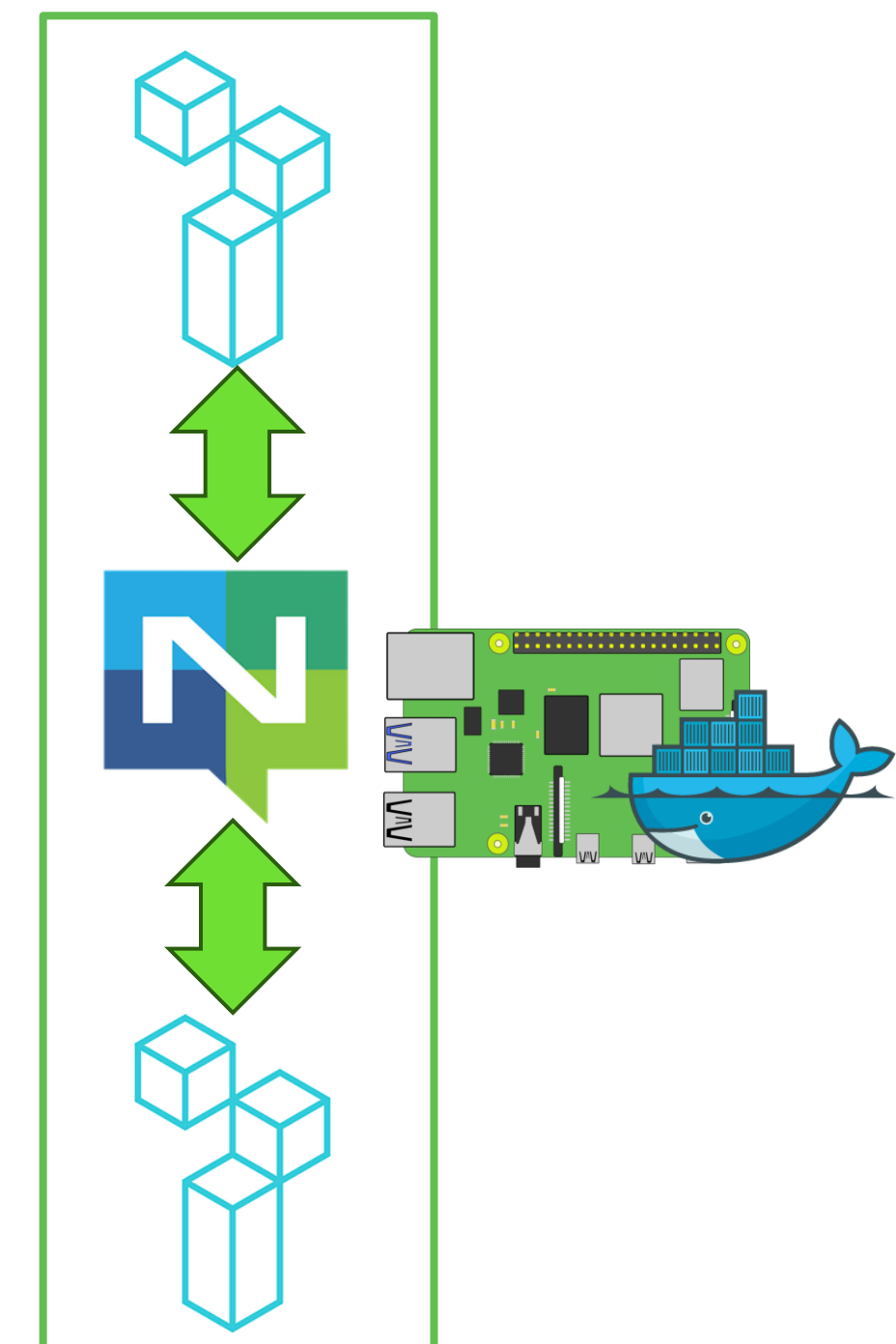
## Overview of activities and developments



**Solution 1**



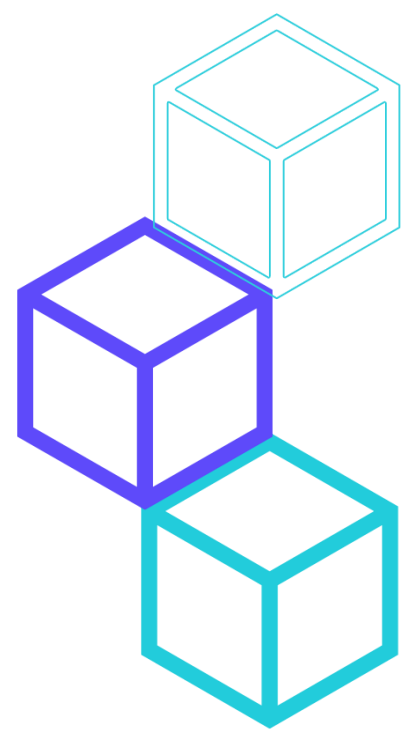
**Solution 2**



**Solution 3**  
**OUR**  
**CHOICE**

# German Pilot – UC8: Multiphysics flexibility optimization for Home Management Systems and their global integration

## Overview of activities and developments – Resource usage



**Resource usage LPC**  
<25%



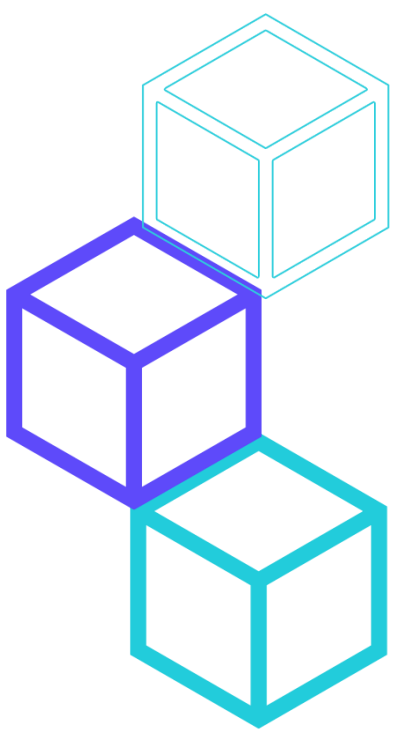
**Resource usage NATS**  
<0.2%



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# Italian Pilot

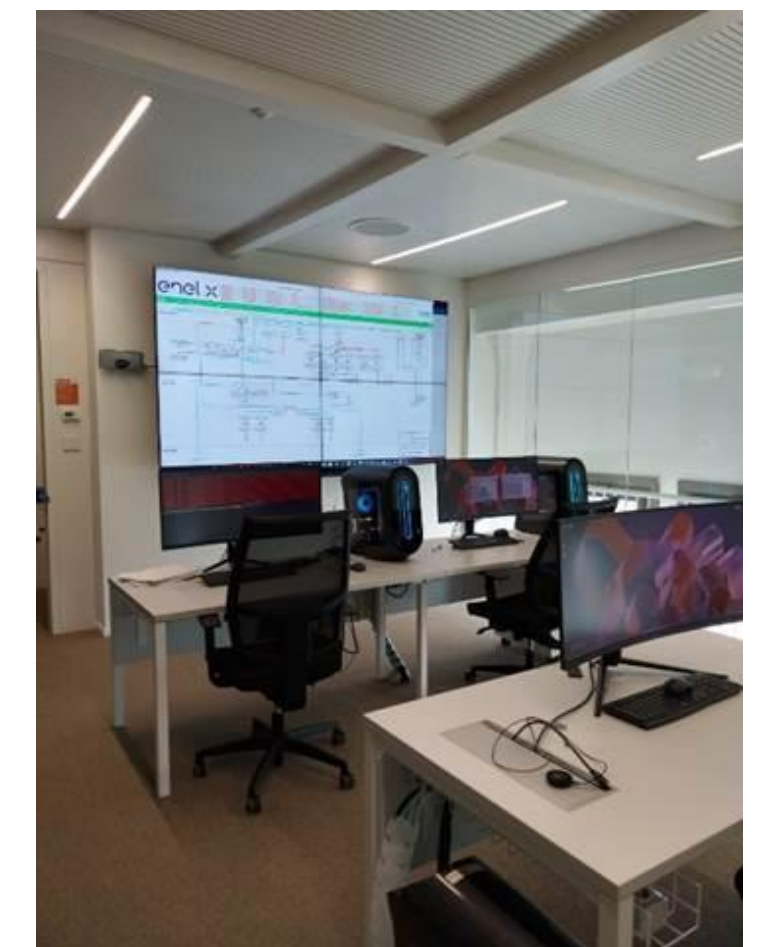


## Overview of activities and developments – MQTT broker and InfluxDB

### ❖ UC9: Management of EV charging clusters as HESS

#### Key aspects:

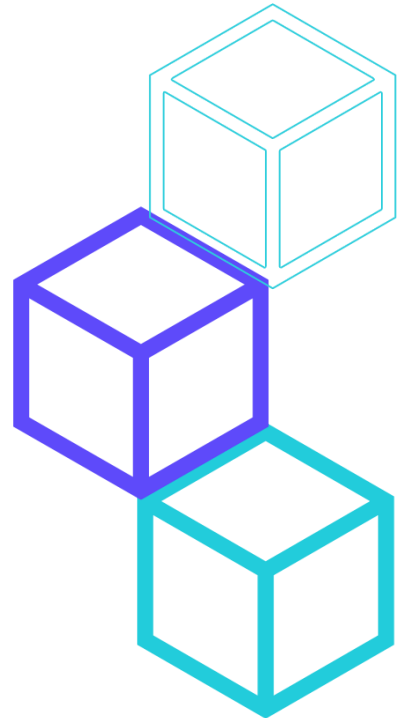
- ✓ Test of local ancillary services for DSO
- ✓ EV chargers, batteries, supercap, PV system
- ✓ Monitoring and control
- ✓ Native integration of IEEE2030.5



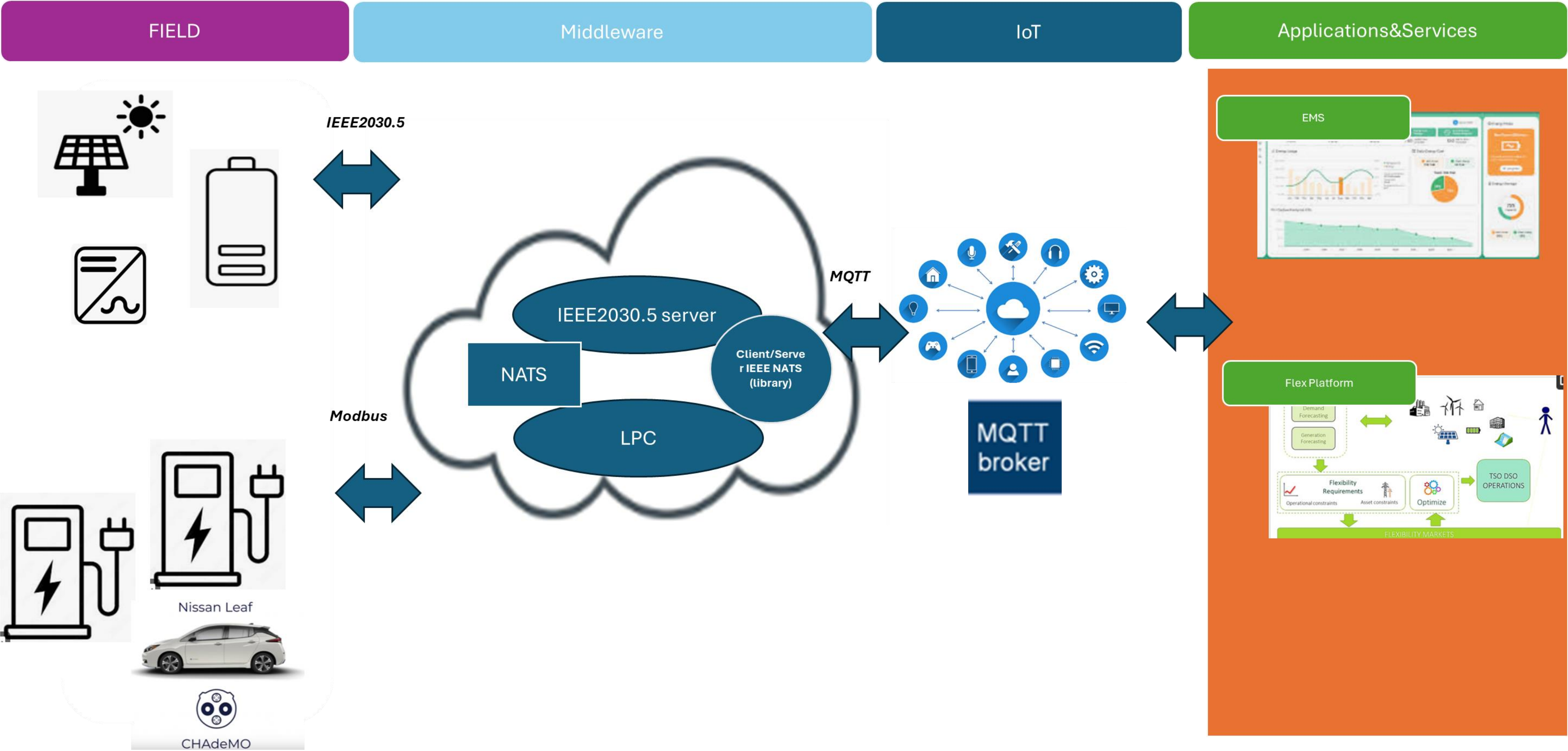
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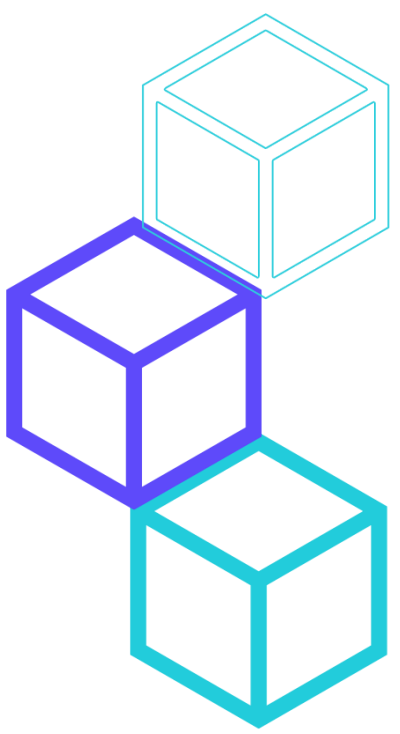


# Italian Pilot - UC9: Management of EV charging clusters as HESS



## Overview of the architecture







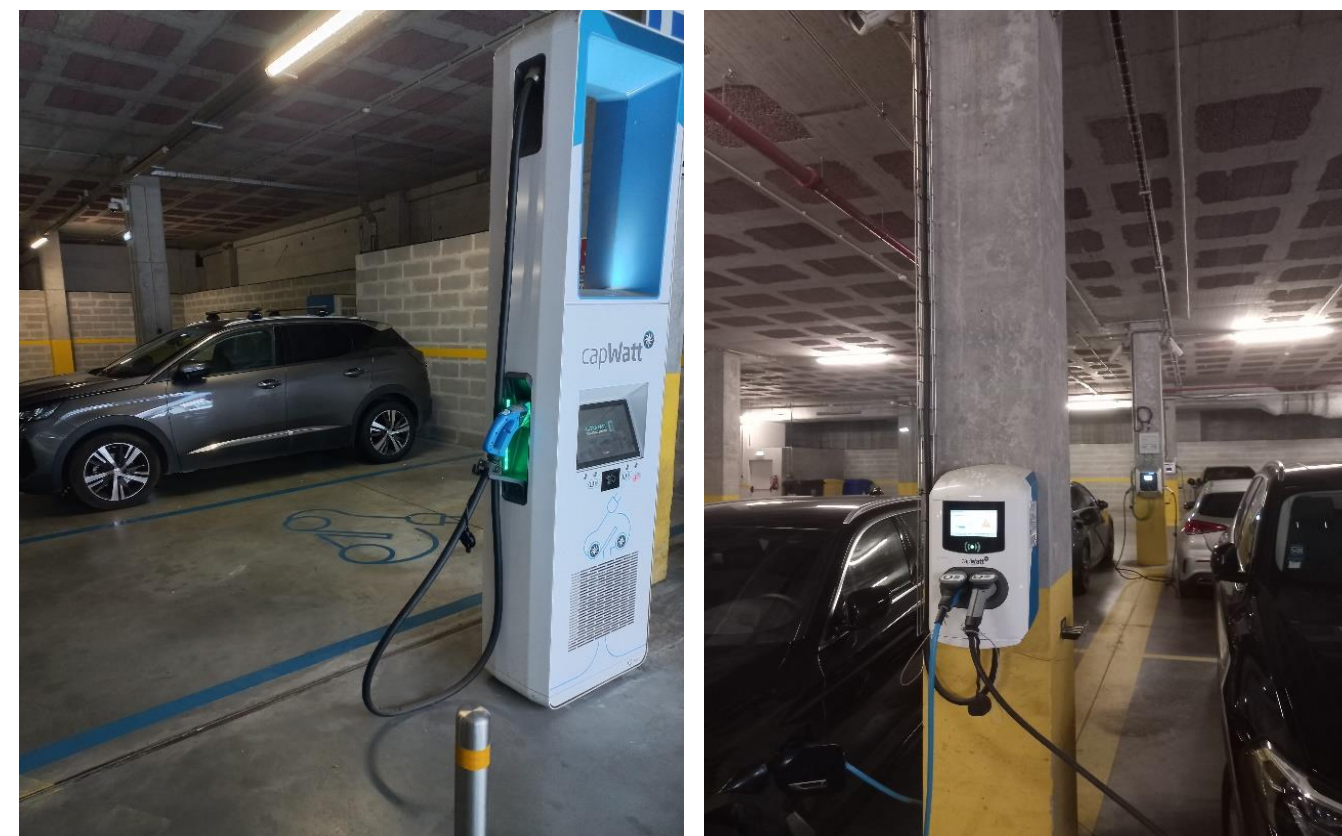
# Portuguese Pilot

## Use cases

- ❖ UC5: Hybrid storage higher performance and flexibility provision
- ❖ UC6: Management of battery system for Node capacity increase and user DR

### Key aspects:

- ✓ EV driver engagement
- ✓ Hybrid battery systems
- ✓ Monitoring via LPC
- ✓ Control via LabVIEW

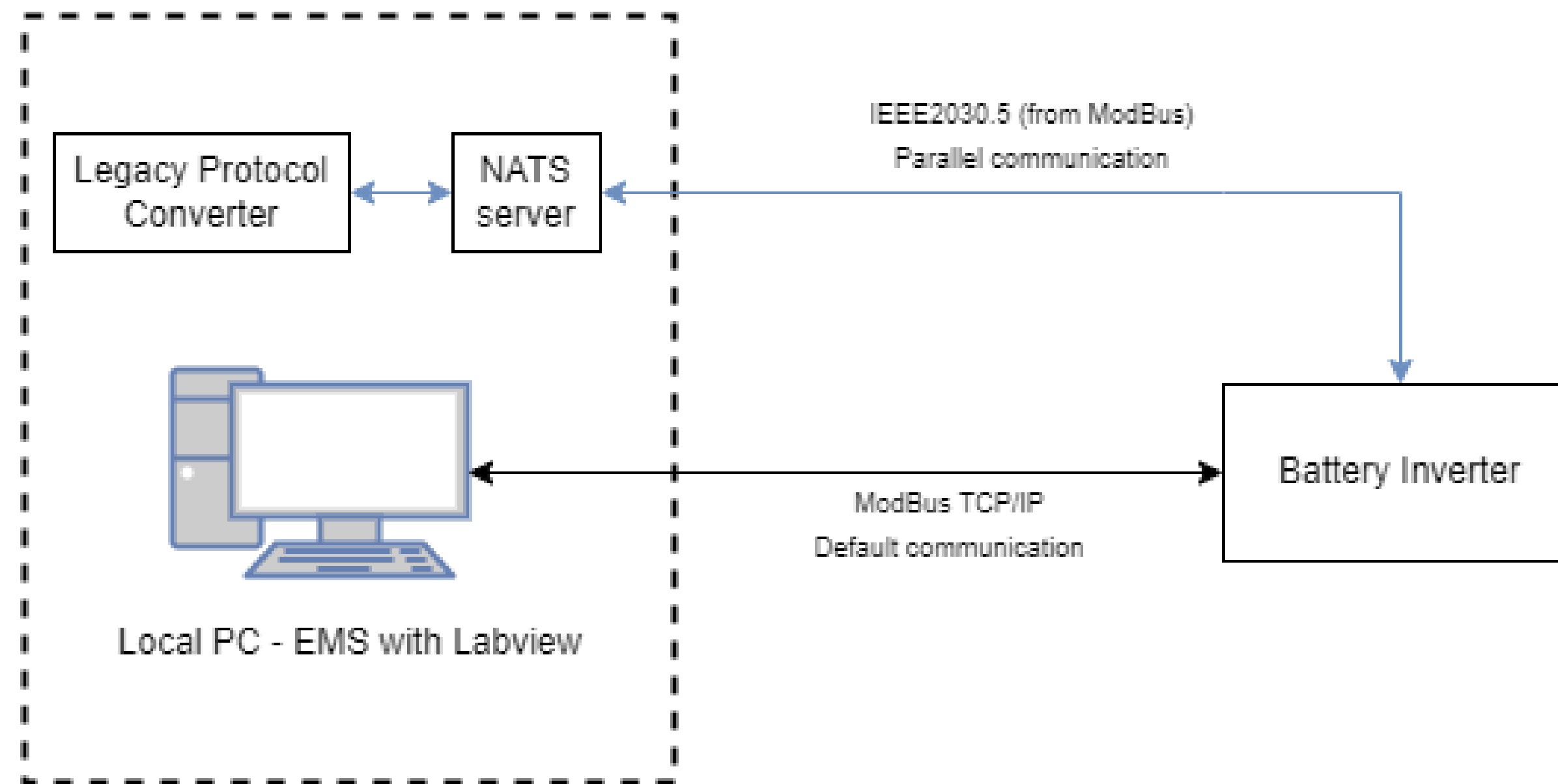
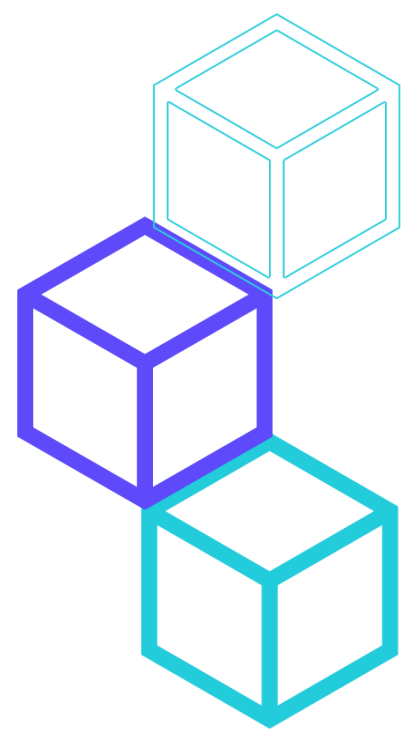


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# Portuguese Pilot – UC5: Hybrid storage higher performance and flexibility provision

## Overview of architecture

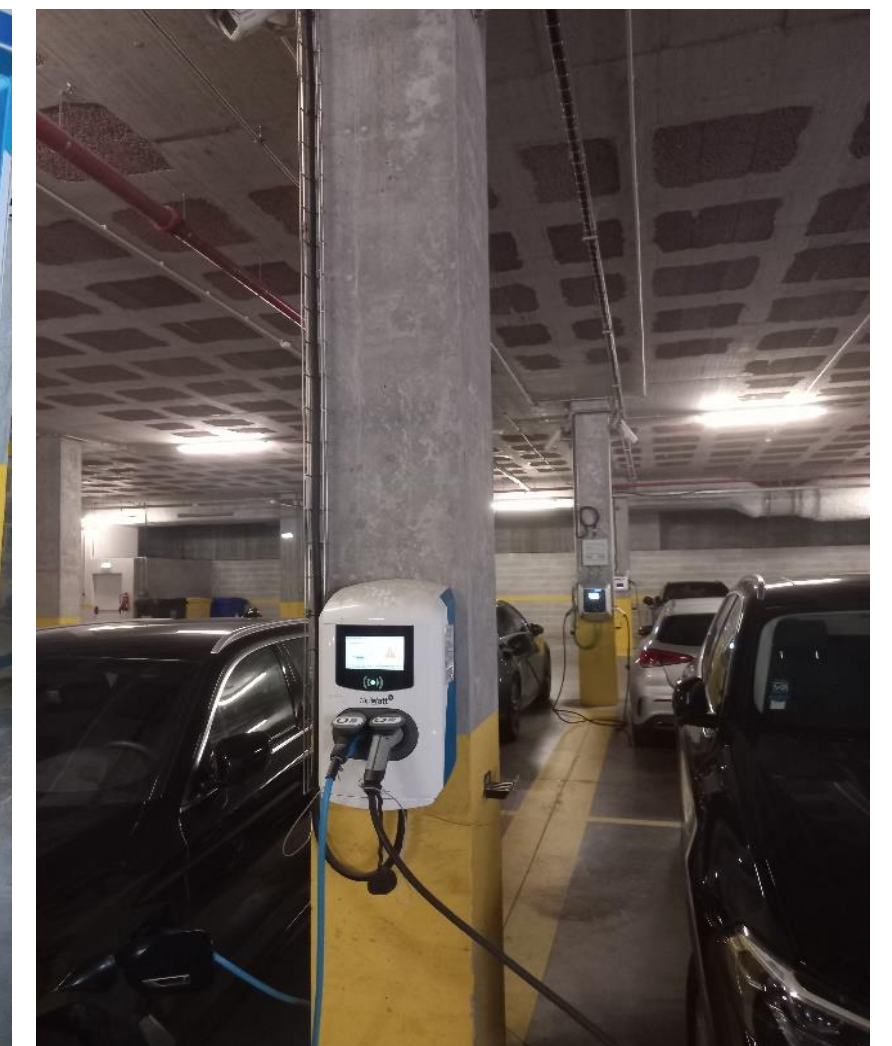
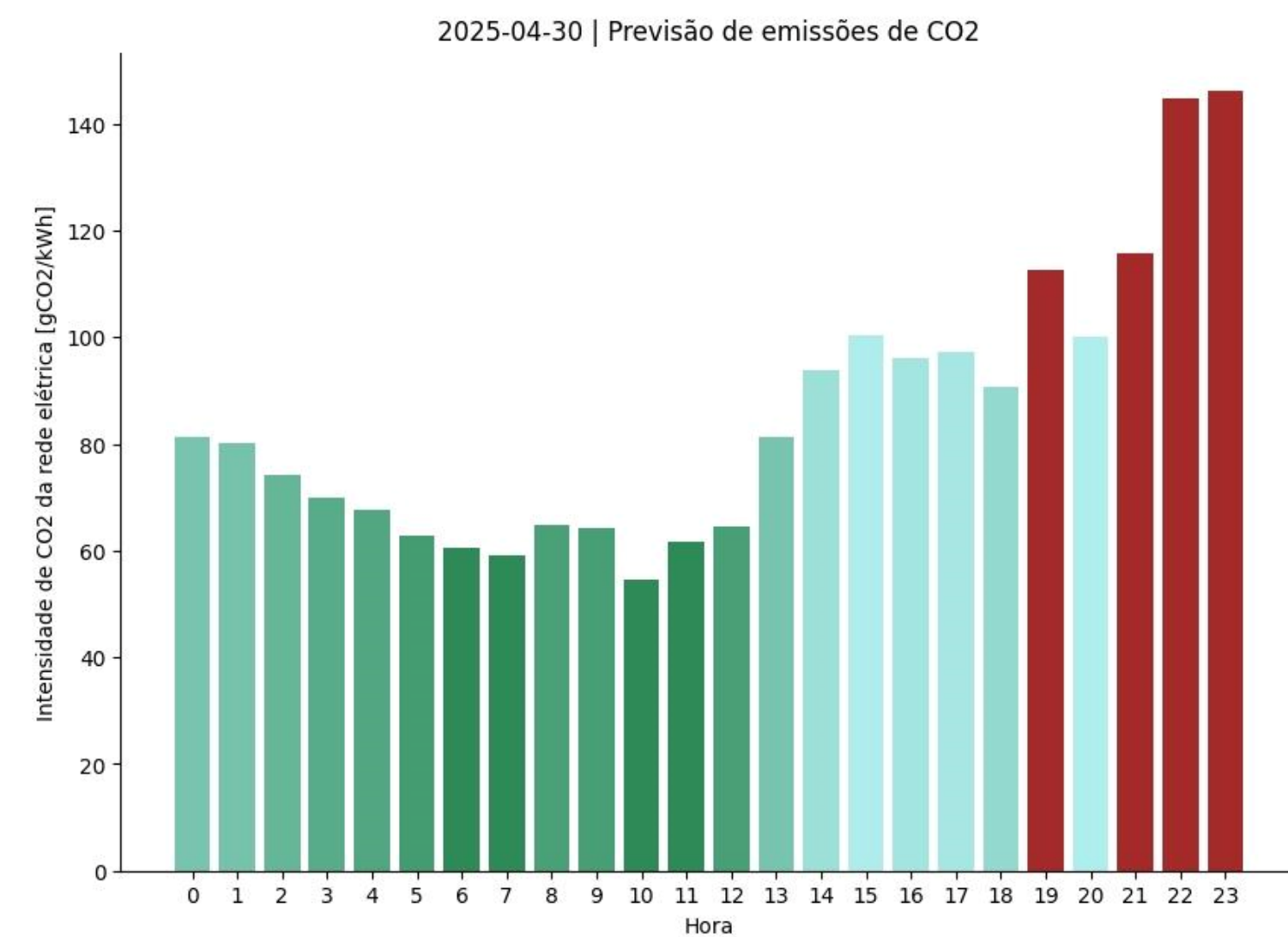
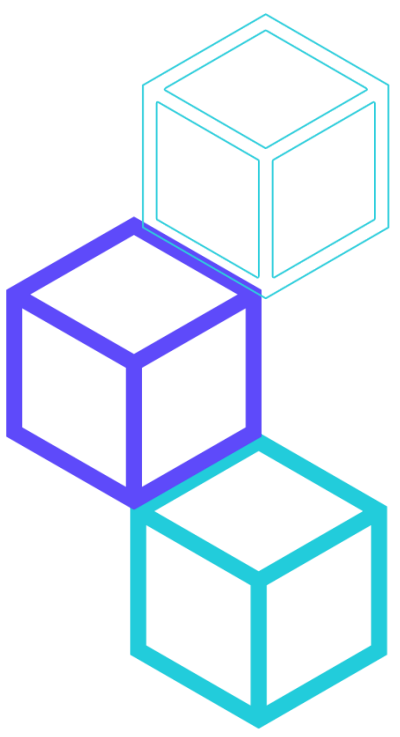


- ❖ Vanadium redox flow, with 10kW and 40kWh
- ❖ Second-life lithium batteries with 100kW and 92 kWh



# Portuguese Pilot – UC6: Management of battery system for Node capacity increase and user DR

## Overview of activities and developments

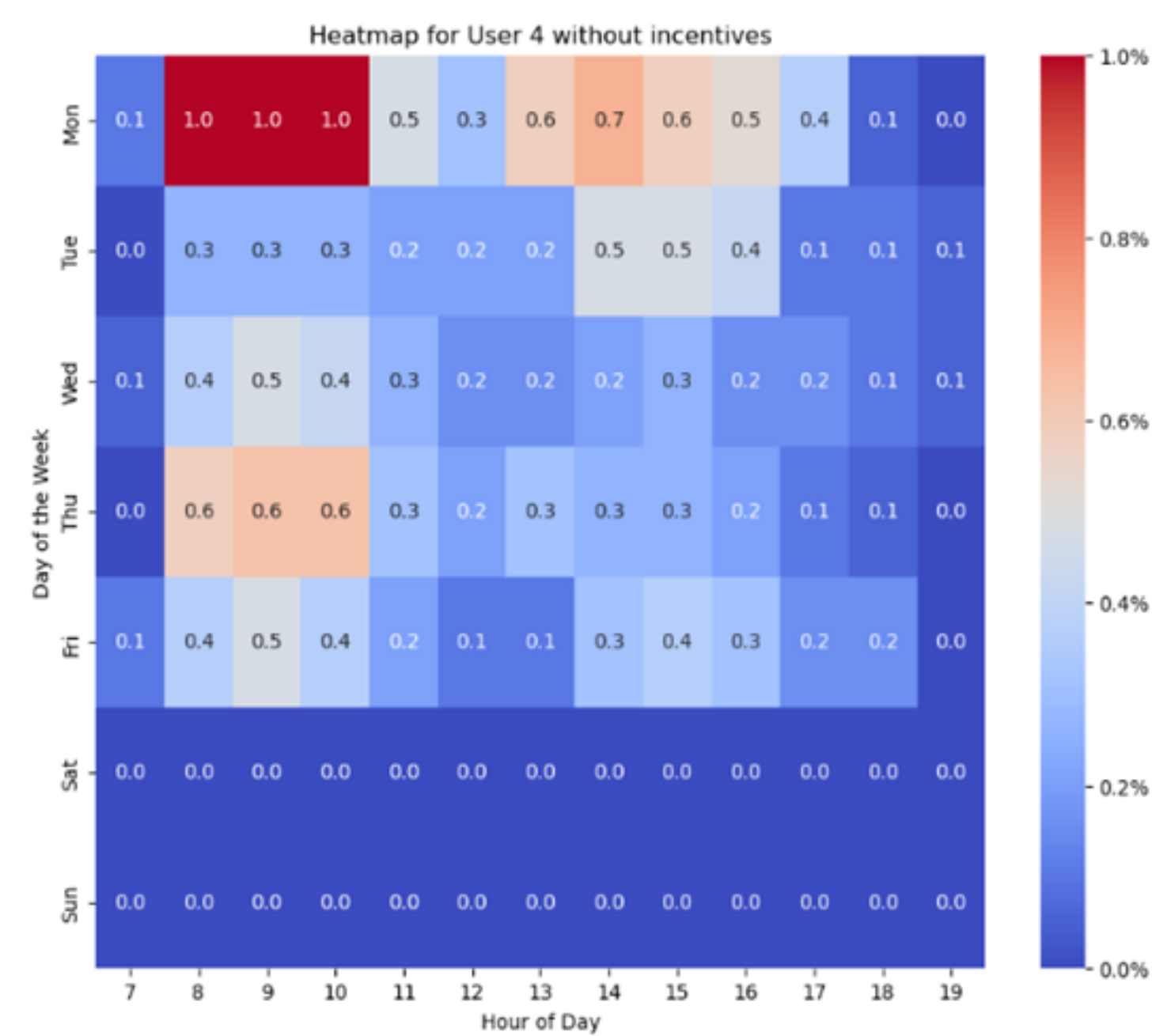
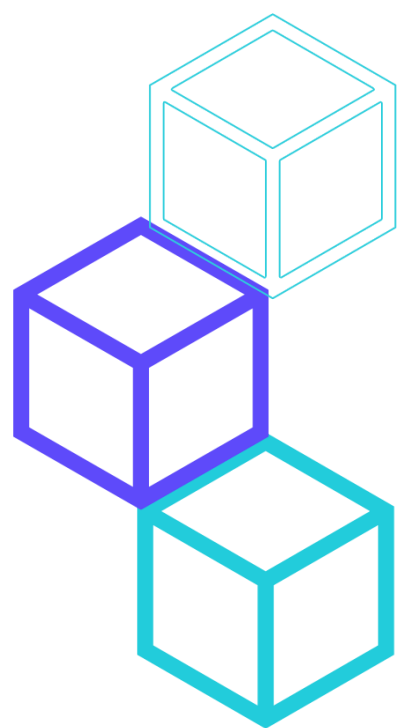


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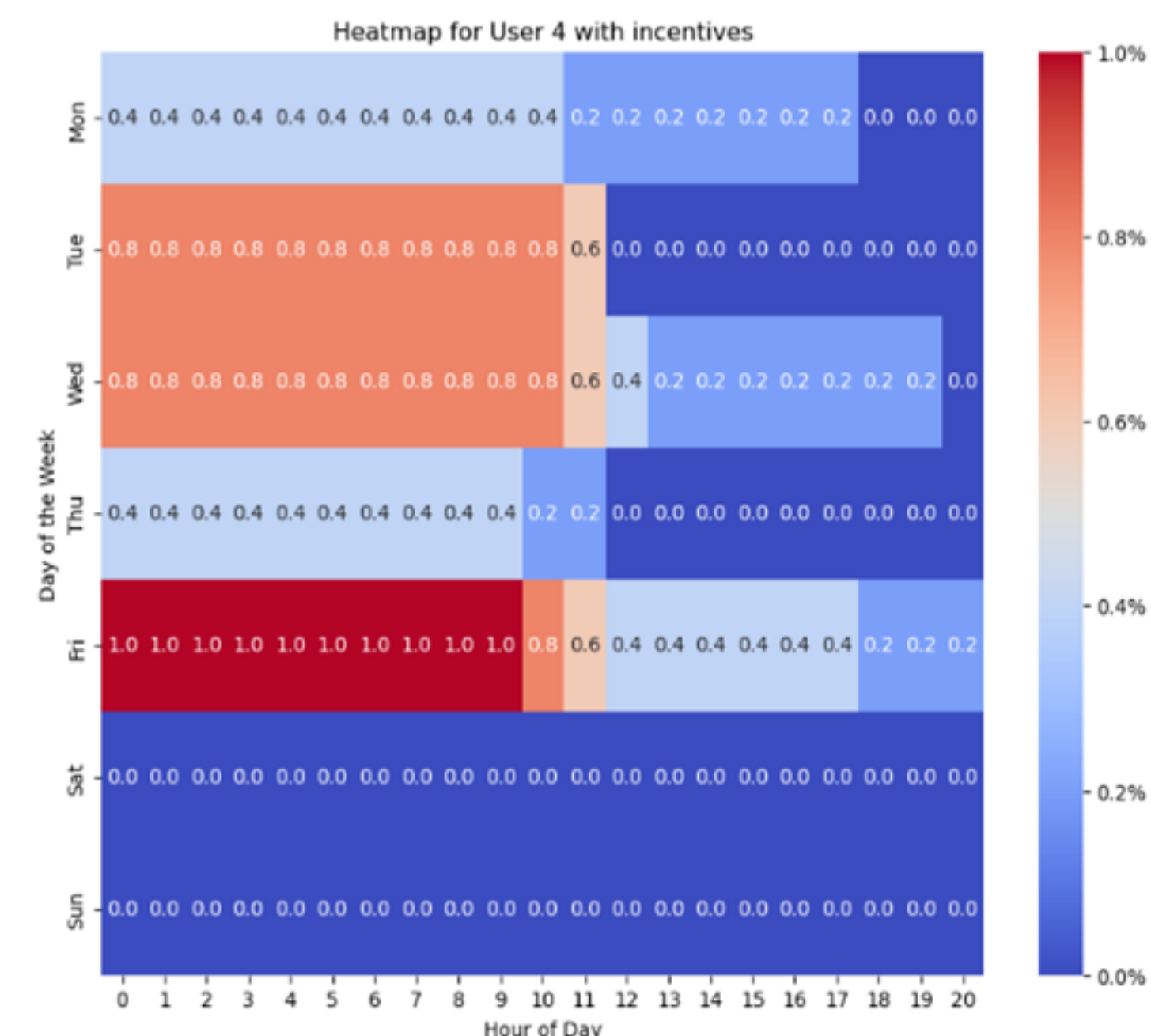


# Portuguese Pilot – UC6: Management of battery system for Node capacity increase and user DR

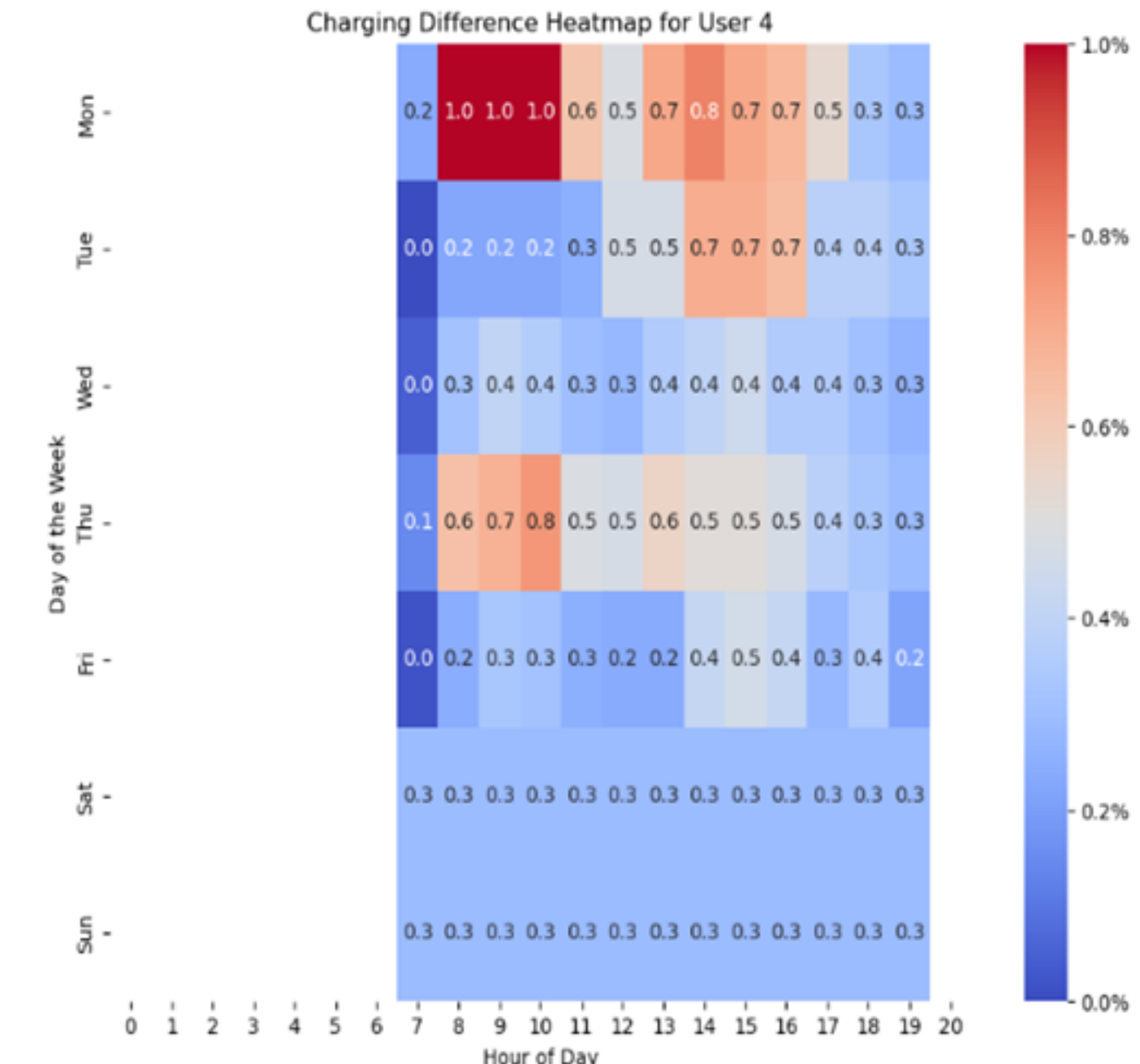
## Changes in the user behavior



Without incentives



With incentives

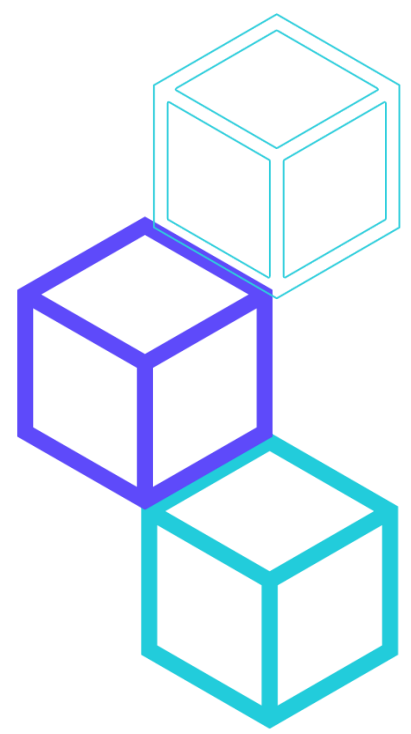


Difference



# Spanish Lab

## HESStec Lab facilities in Valencia



- ❖ UC4: Innovative Frequency services
- ❖ UC7: Adaptive BESS management for autonomous grid operation



### Key aspects:

- ✓ Fast frequency services
- ✓ Autonomous grid operation
- ✓ Analysis of LPC response time
- ✓ Monitoring and control



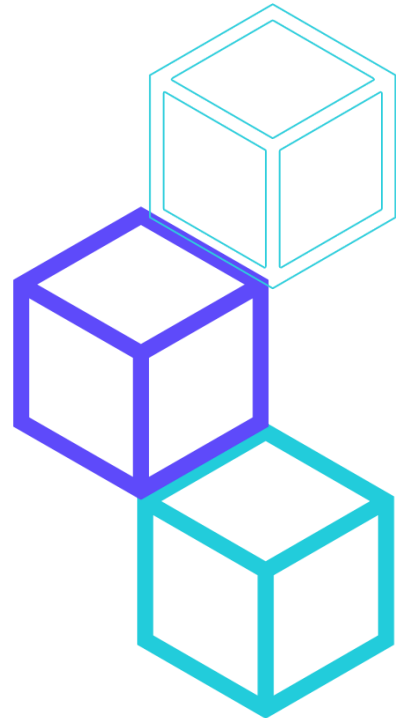
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## Three isometric cubes are arranged in a triangular pattern. The top cube is blue, the bottom-left cube is green, and the bottom-right cube is red. All cubes are outlined with thick lines and have no faces filled with color.

Figure 1 illustrates the Local Server Architecture. The system is connected to a LAN (LOCAL AREA NETWORK). The Local Server contains a CONVERTER (DANFOS), a LEGACY PROTOCOL CONVERTER, and an EMS (INMS). The CONVERTER (DANFOS) communicates with the LEGACY PROTOCOL CONVERTER using CUSTOM PROTOCOL and MODBUS TCP. The LEGACY PROTOCOL CONVERTER communicates with the NATS message broker using IEEE2030.5 and TCP NATS. The NATS message broker communicates with the EMS (INMS) using IEEE2030.5 and TCP NATS. A VM (Virtual Machine) is also shown running on the NATS message broker.

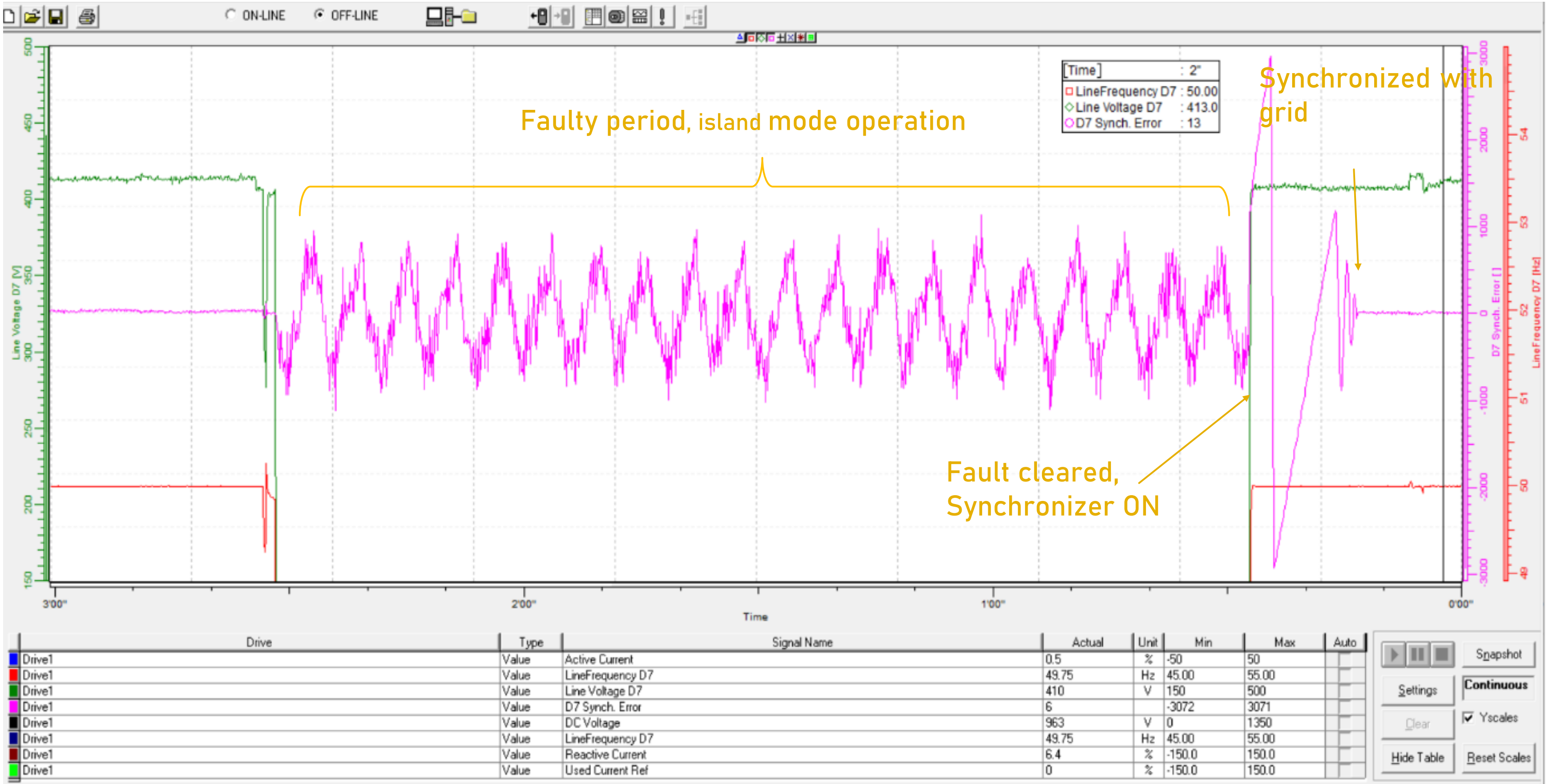




## Example of voltage-dip tests

### Phases:

- a) island operation
- b) synchronization after clearing the fault
- c) grid connection





# interstore

## THANK YOU!

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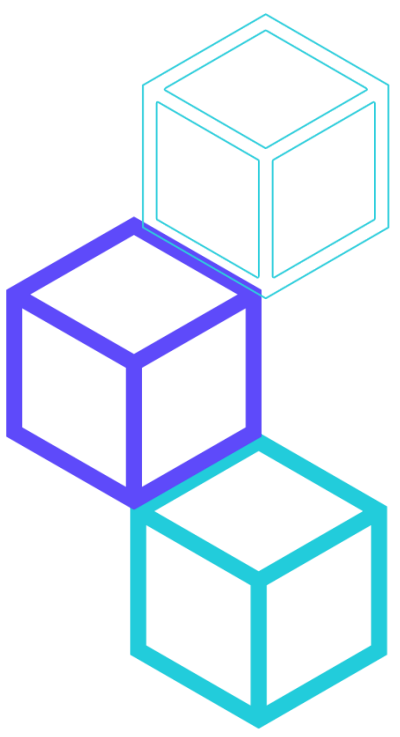
# interstore

## Lessons Learnt

Daniele Carta, Forschungszentrum Jülich



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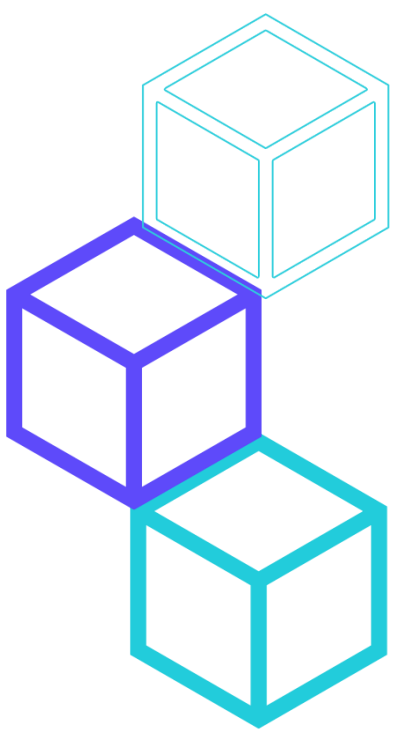


# Lessons learned

## LPC deployment

- ❖ Due to the low computational burden, LPC can be deployed on low-cost solutions such as SBC
  - ❖ Low resource usage even in the presence of a large number of integrations
- ❖ Depending on the logging level, and the data exchange, hard drives can be filled up quickly
  - ❖ It can be easily avoided using the proper logging settings
- ❖ Config files can be created quickly, reducing deployment times
  - ❖ The IEEE2030.5 scheme must be known in advance
- ❖ Config files can be updated/added while the LPC is running
  - ❖ Avoids downtimes from due to stop and re-start





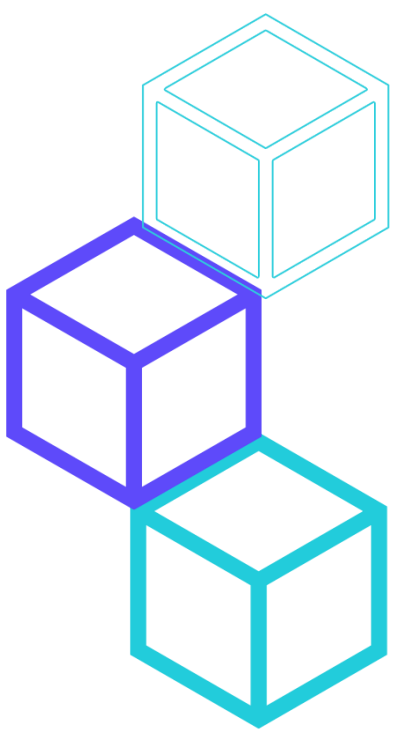
# Lessons learned

## Assets integration

- ❖ Full integration with Modbus and MQTT-based devices
  - ❖ Synchronization issues can be solved with NTP server (can be indicated in the config file)
- ❖ Suitable for monitoring and control
  - ❖ Certain assets can be controlled only with one specific library (can be selected in the config file)
  - ❖ 100 ms seems to be the best trade-off, between latency and performance, for Modbus polling interval
- ❖ Hybrid integration
  - ❖ Various types of batteries, charging stations, PV systems, and inverters from different manufacturers
  - ❖ Multi-physics integrations require adaptation of IEEE2030.5 model (e.g., for thermal storage)







# Lessons learned

## User engagement

- ❖ Challenges during deployment within households -> need to inform and instruct owners
  - ❖ Need to investigate IP addresses
  - ❖ Limit discomfort for users (downtimes, technicians presence, and so on)
  - ❖ Concerns on status of private assets -> “Don’t destroy my battery”
  
- ❖ 1/3 of EV drivers reported user behavior
  - ❖ Limited number of charging stations with respect to EV drivers
  - ❖ 100% of users are willing to change their behavior, depending on the incentive
  - ❖ Need to find a suitable means of communication/tool to interact with users





# interstore

## THANK YOU!

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## Data Space Connector

Marcantonio La Franca, Engineering

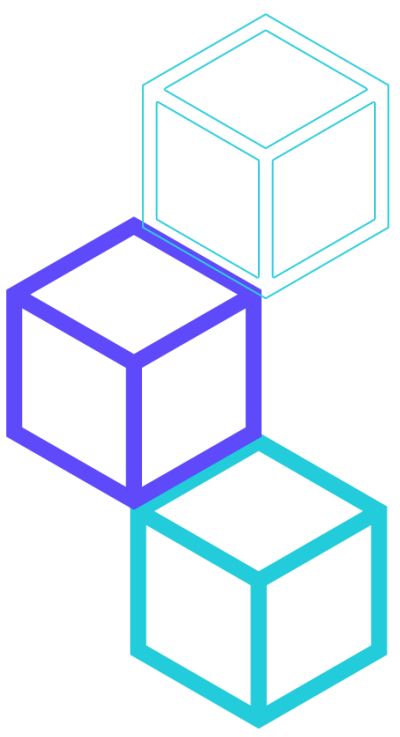


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# OneNet Data space Framework

## Agenda

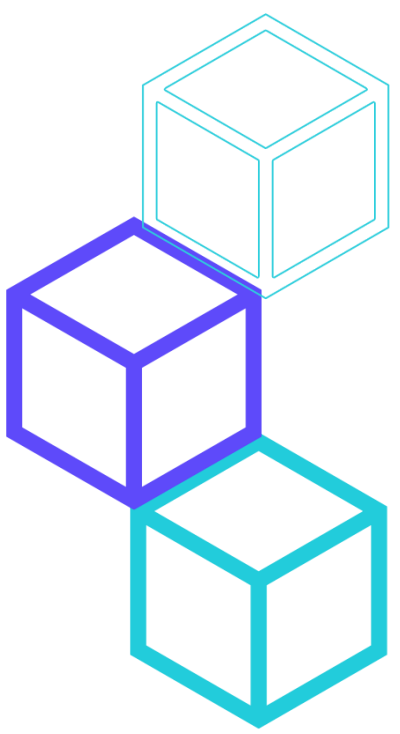
- Development Timeline
- Latest Features
  - Push mechanism flow (external service integration)
  - NATS integration
- Live Demo (latest version)
- Data space Roadmap & Next Steps



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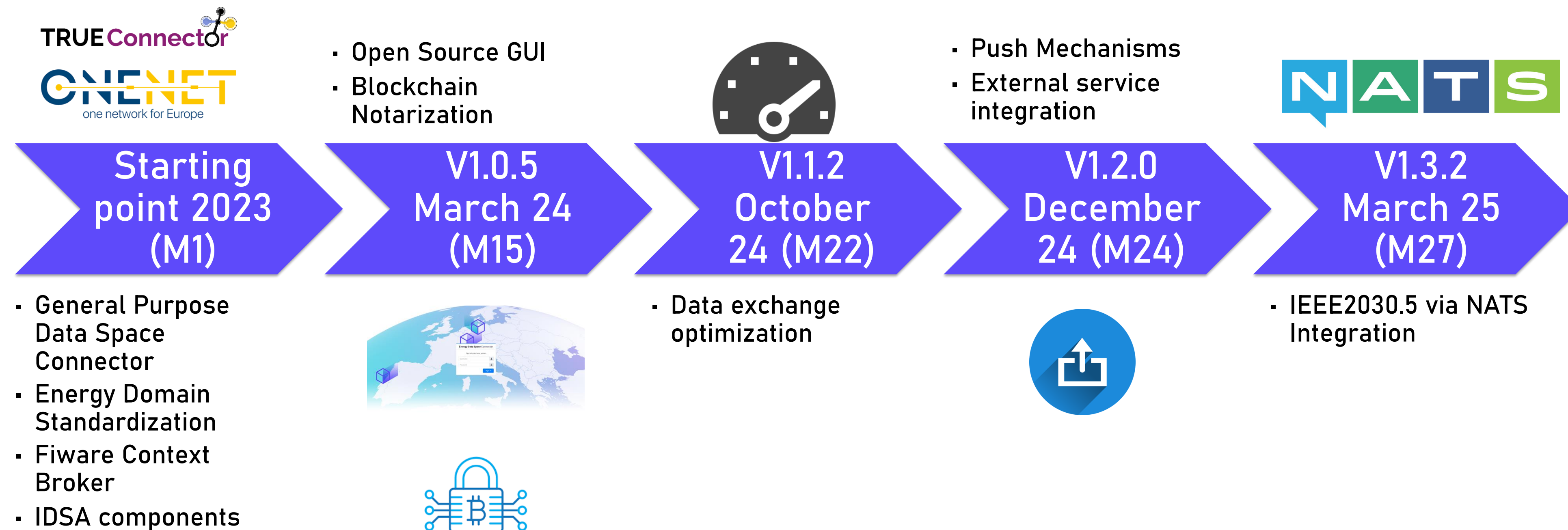






# OneNet Data space Framework

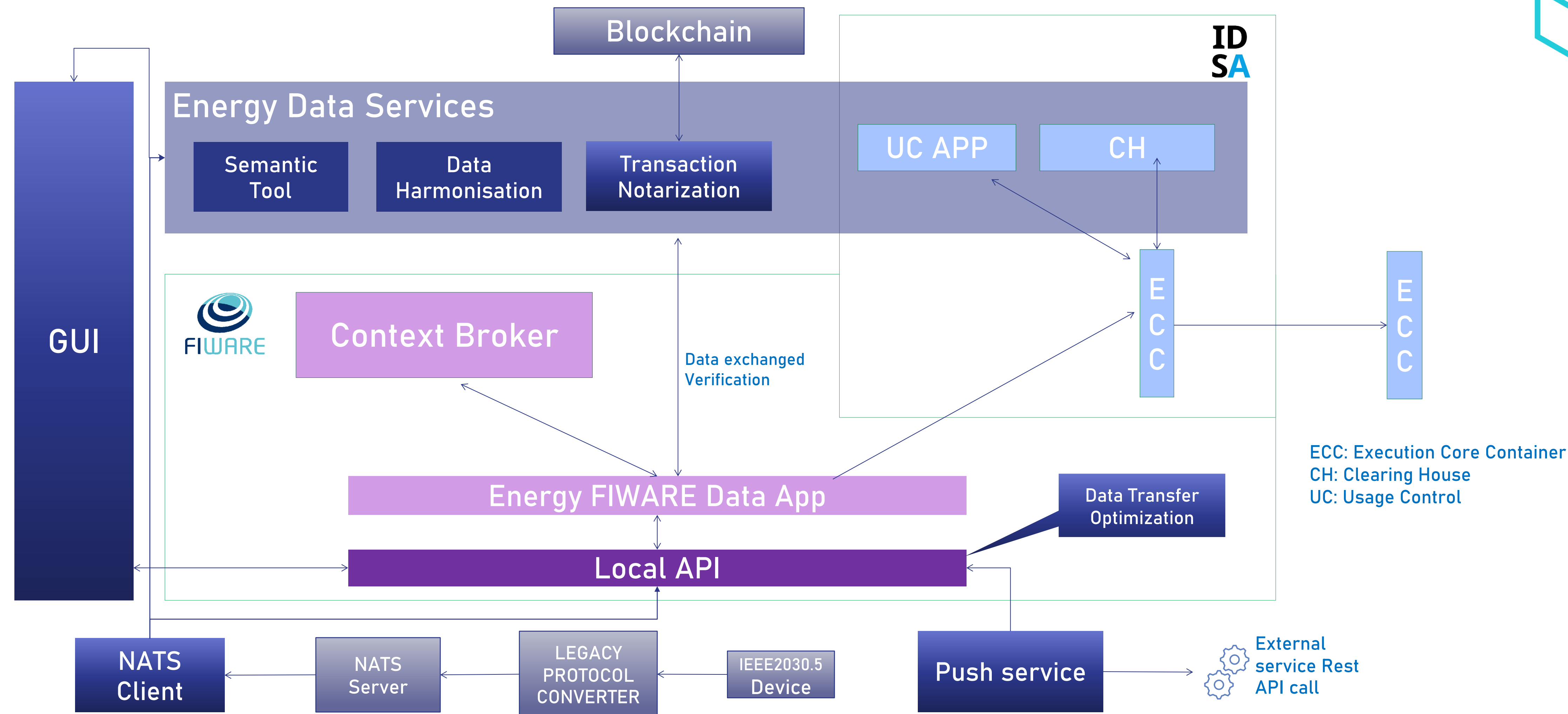
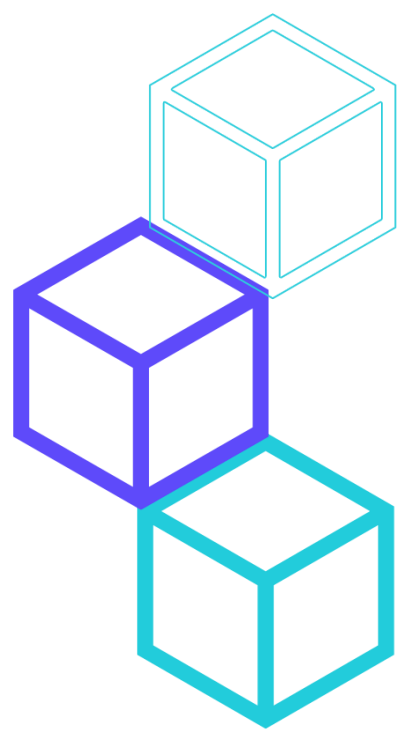
## Development Timeline in the InterSTORE project (WP2 – T2.4)



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# OneNet Data space Framework

## Block diagram architecture – Latest Version



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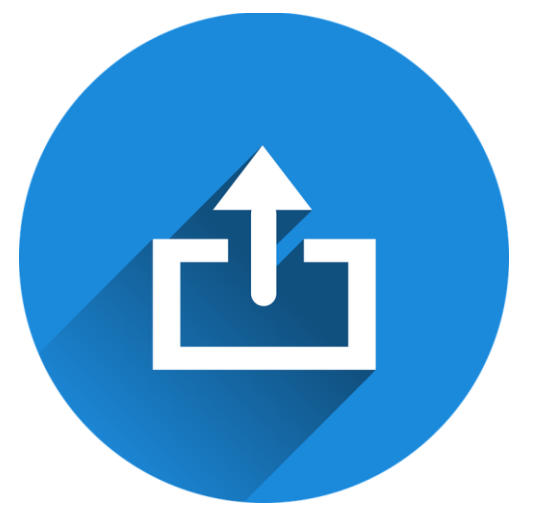
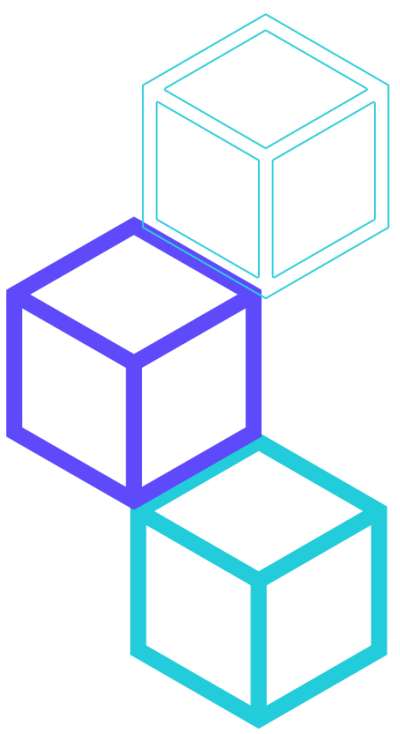
# OneNet Data space Framework

## Why a push mechanism in energy data space?

The standard flow in a data space (consumer request data to provider), is effective for most energy scenarios, but it has reduced flexibility for use cases where data needs to be uploaded and sent efficiently and in real-time.

The push flow mechanism overcomes these limitations by offering:

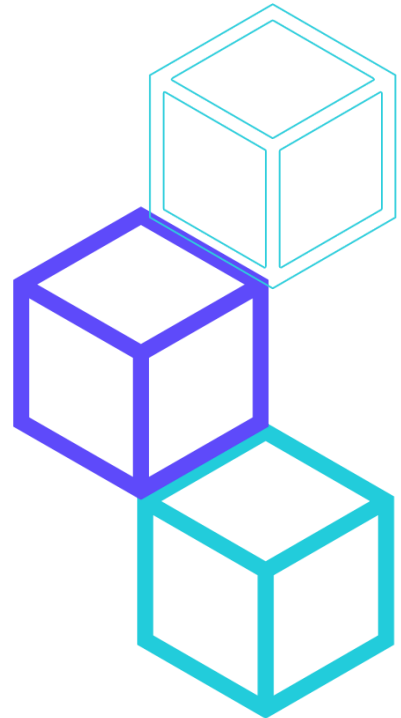
- External service integration (Rest API)
- (near) Real-Time Data Delivery (instant access to data)
- Reduced Latency (vs pull mechanism)
- Efficient Resource Utilization (avoid constant polling)
- Support for Event-Driven Use Cases (immediate data actions)
- Proactive Stakeholder Actions (decisions based on the most current data)



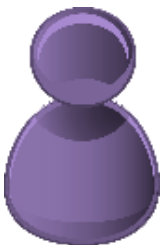
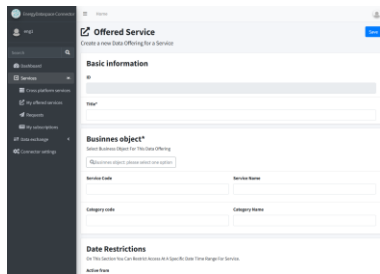


# OneNet Data space Framework

## Push mechanism overview

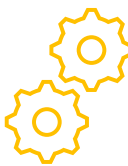


1 – Service creation and Configuration

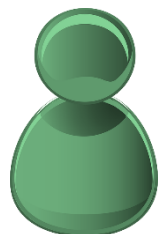


Service Provider

3 – Web Service call to send data



2 – Subscription Flow and Pushing Data



Data Provider

4 – Get Response

2XX OK  
5XX KO

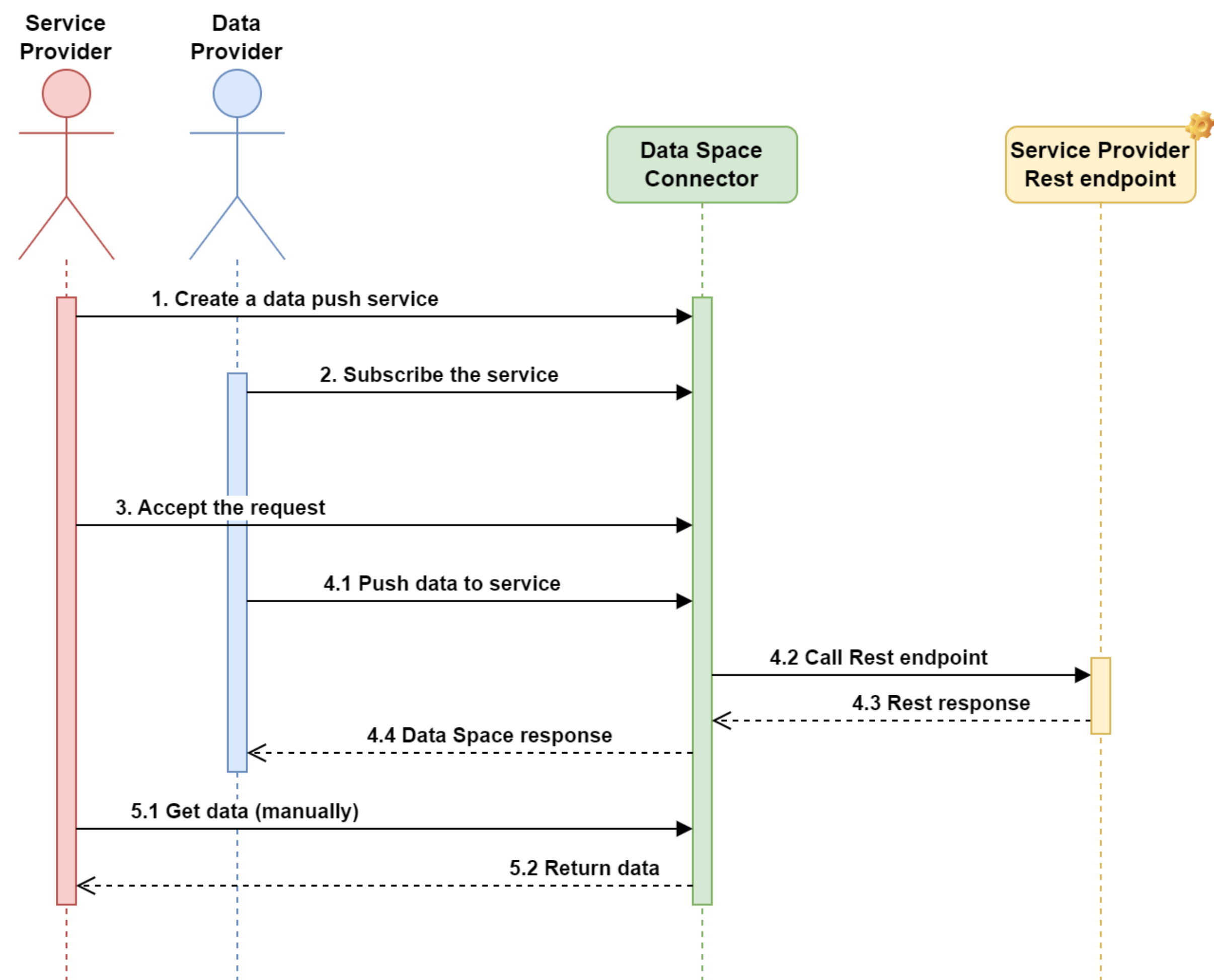
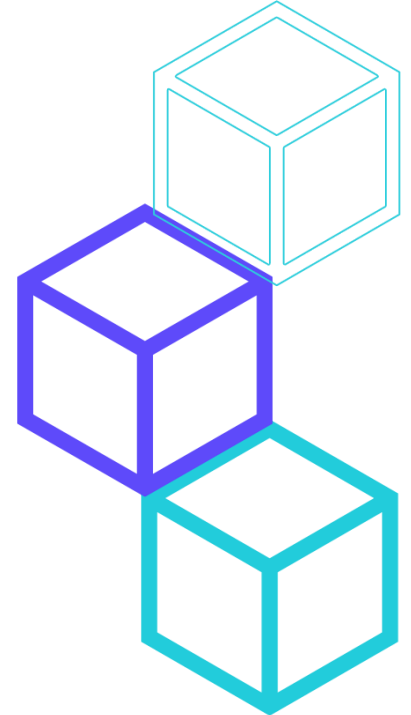


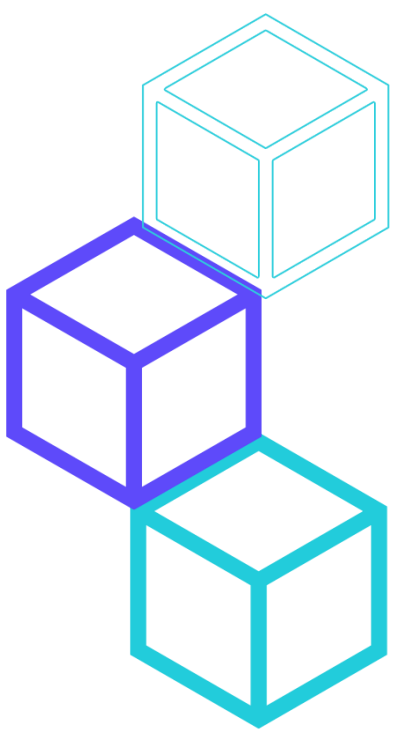
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# OneNet Data space Framework

## Push mechanism Sequence Diagram





# OneNet Data space Framework

## IEEE2030.5 integration via NATS opportunities

The integration of Data Space with NATS creates numerous opportunities to advance the digitalization of the energy sector and enhance the integration of Distributed Energy Resources (DERs).

### Key Benefits

- Enhanced Interoperability
- DER Optimization
- Data-Driven Decision Making
- Privacy and Security Management
- Integration with Smart Cities and IoT
- Improved Customer Engagement and Energy Efficiency



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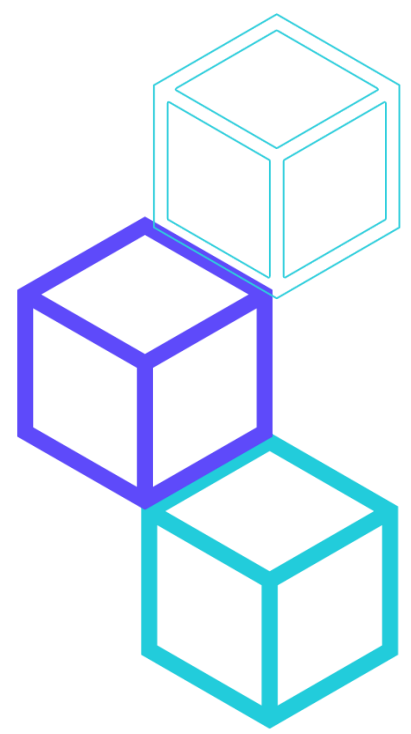
# OneNet Data space Framework

## IEEE2030.5 integration via NATS - use cases examples

- Microgrid Management
- Electric Vehicle (EV) Integration
- Dynamic Pricing and Demand Response



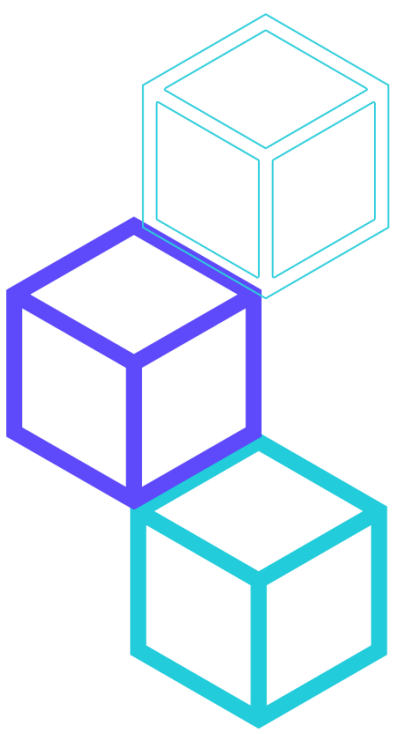
The integration opens up a world of possibilities for secure, interoperable, and intelligent energy management. By leveraging the benefits of both technologies, utilities, grid operators, and consumers can achieve higher efficiency, better grid stability, and a more sustainable energy future.



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# OneNet Data space Framework

## IEEE2030.5 via NATS integration overview



Integrating data space with an IEEE 2030.5 interface device is possible combining several key technologies

- **IEEE 2030.5** (the smart grid communication message standard)
- Legacy Protocol Converter (**LPC**)
- **NATS** (a high-performance messaging system)
- **InterSTORE Energy Data Space Open Framework** (for secure and scalable data sharing)

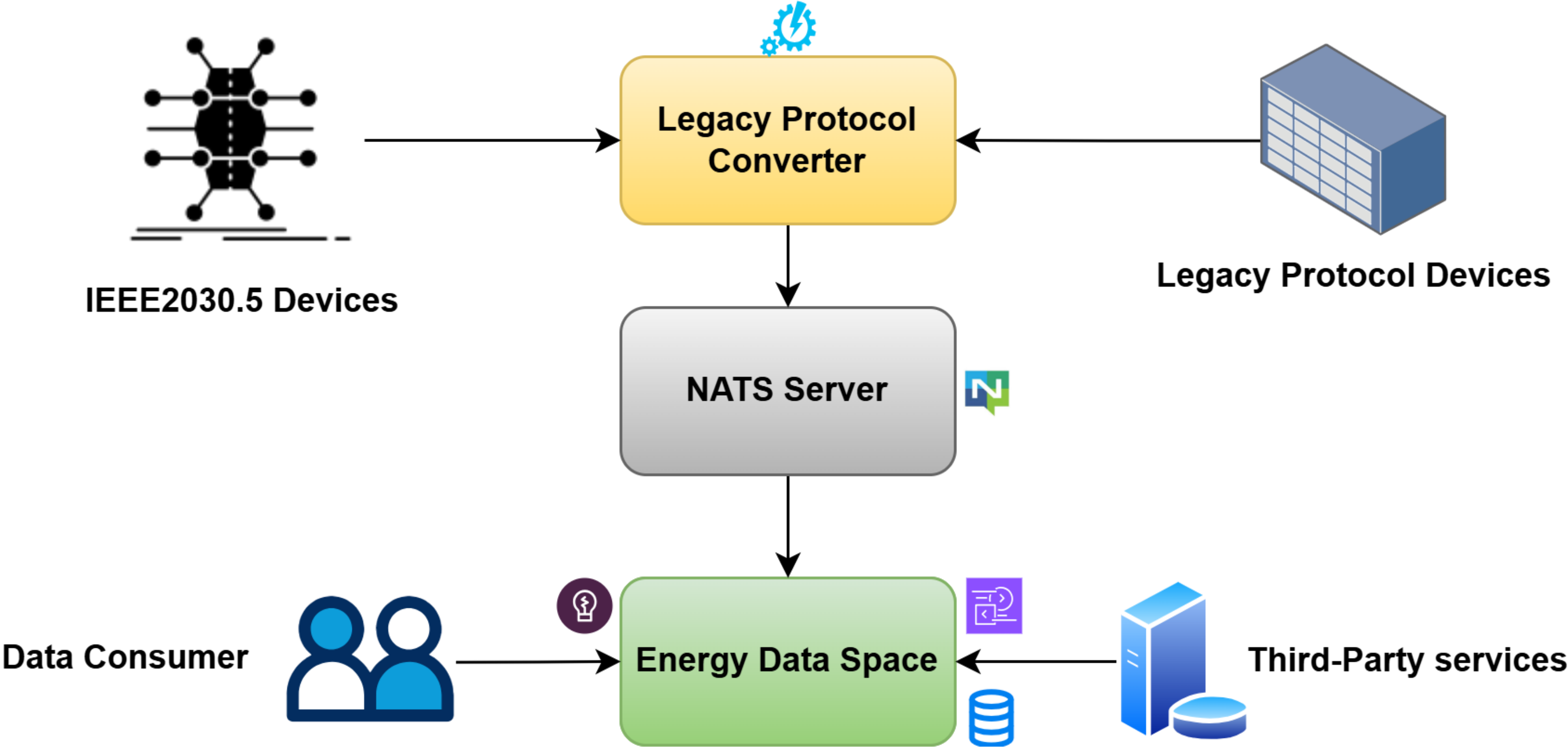
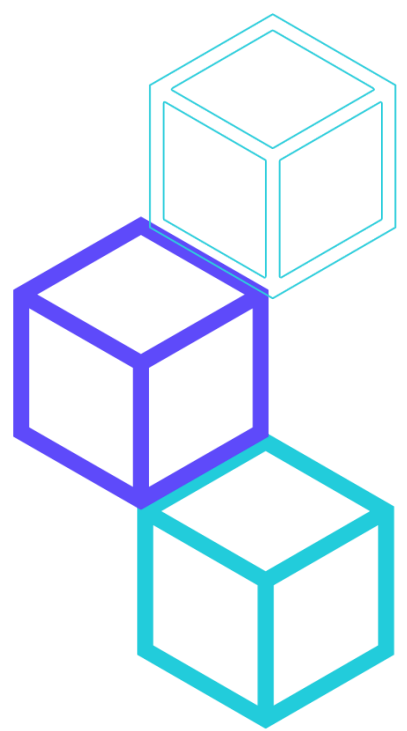


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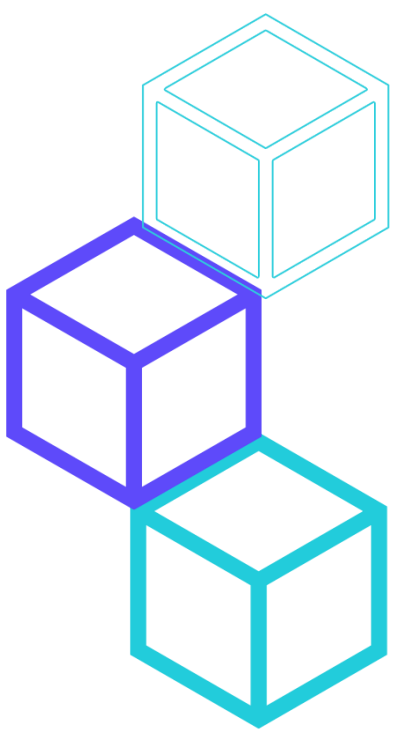
# OneNet Data space Framework

## IEEE2030.5 via NATS integration diagram



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# OneNet Data space Framework

## Roadmap & Next Steps

- **Submission under LFE (ongoing)**
  - Creation of a technical community for continuous development and maintenance
- **Technical and Semantical Interoperability**
  - Data Space Protocol implementation (ongoing)
  - Extensions of Vocabularies and Standard Data Models
- **Support for real-time communication**
  - Additional Communication protocols and mechanisms
- **Digital Twin Federation**
  - Digital Twin Model exchange
  - Data Space for Digital Twin interoperability
- **Common European Energy Data Space (CEEDS)**
  - Integration and deployment with other DS Technologies (EDDIE, AIIDA, SIMPL...)



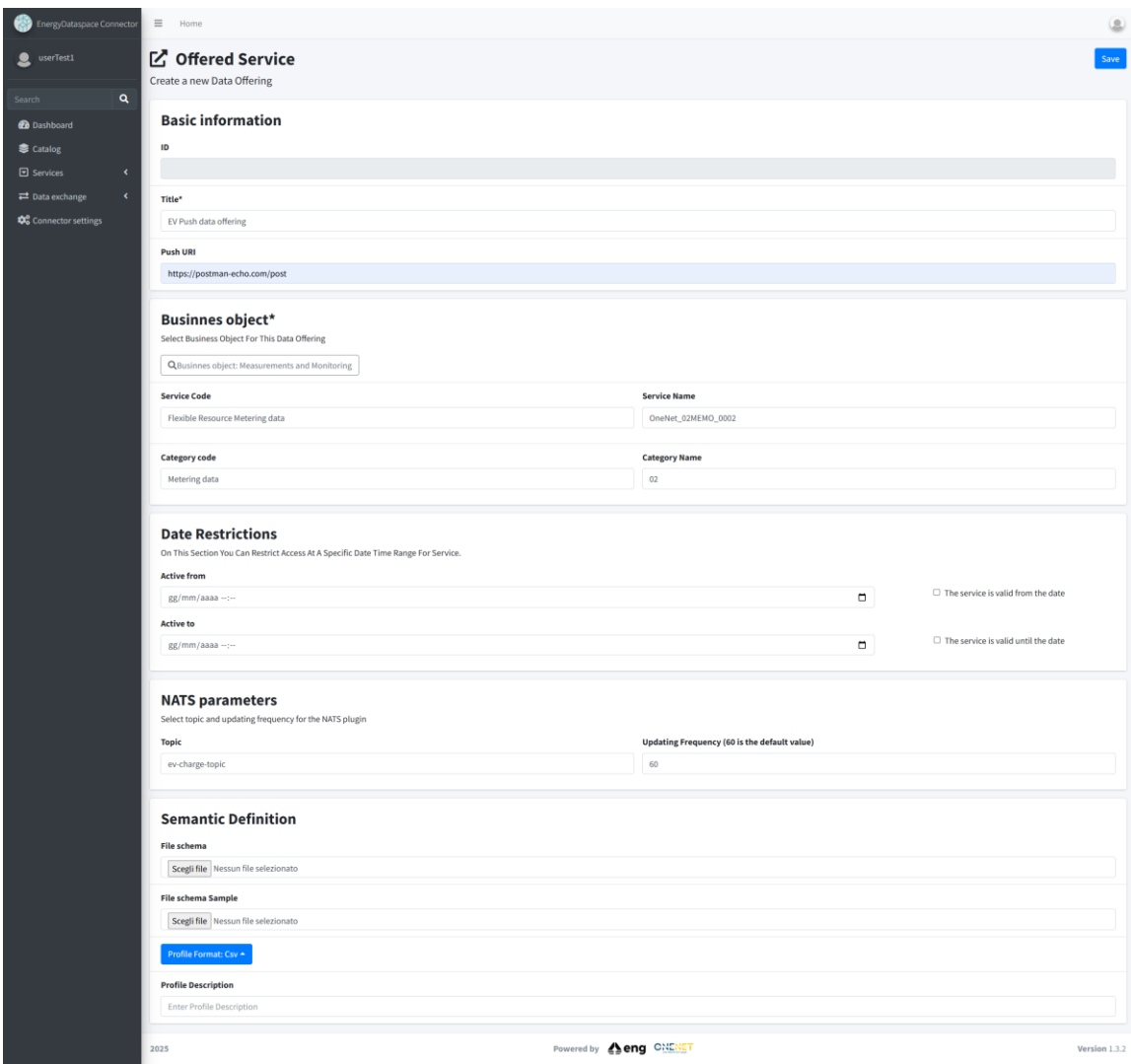
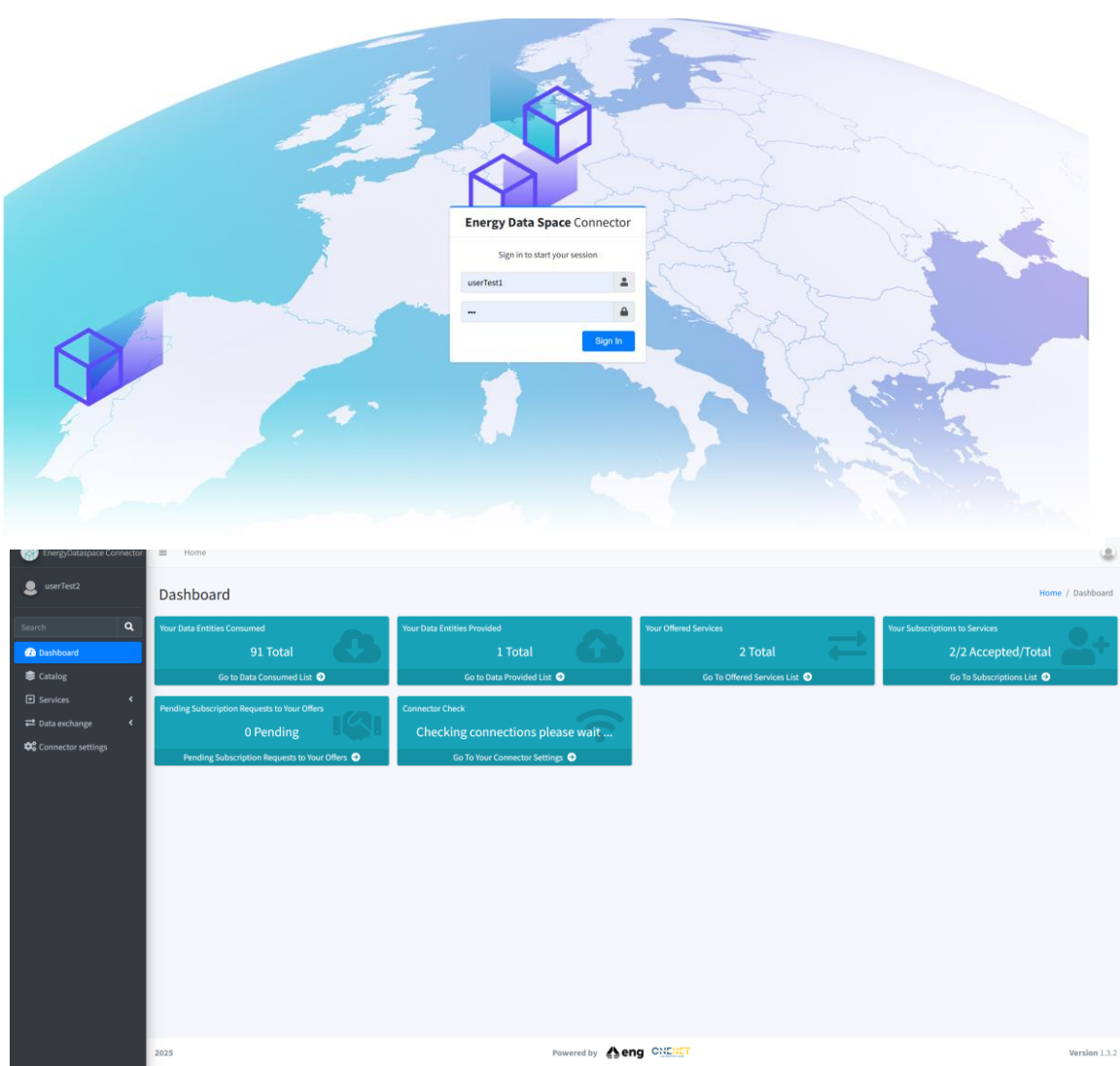
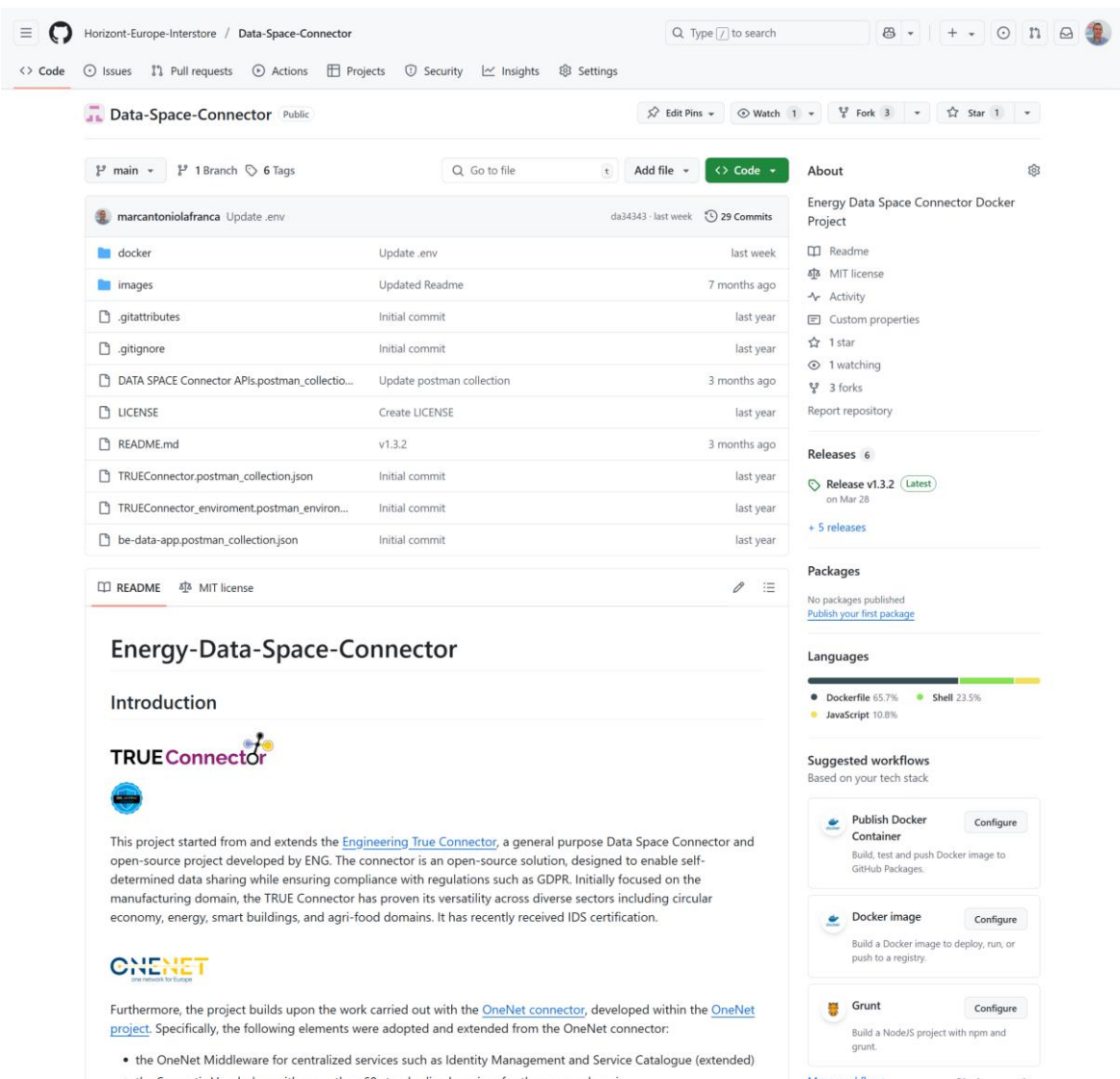
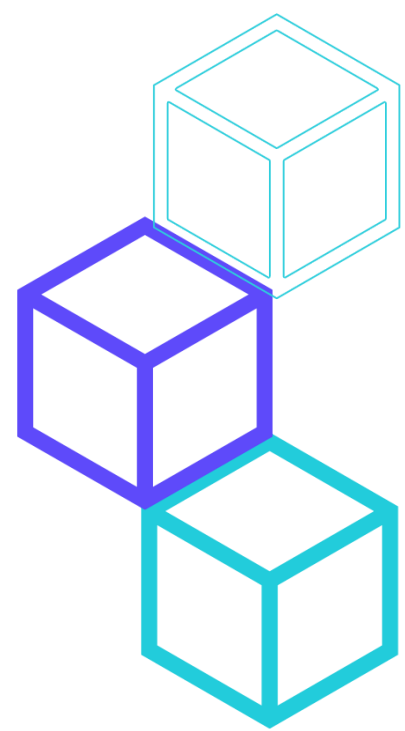
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# OneNet Data space Framework

## Latest Version (v1.3.2) Live Demo

- Improvements to the GUI (e.g. the addition of the Service Catalog, detail fields, data table filtering)
- Push Flow Mechanism (external service integration)
- NATS protocol integration





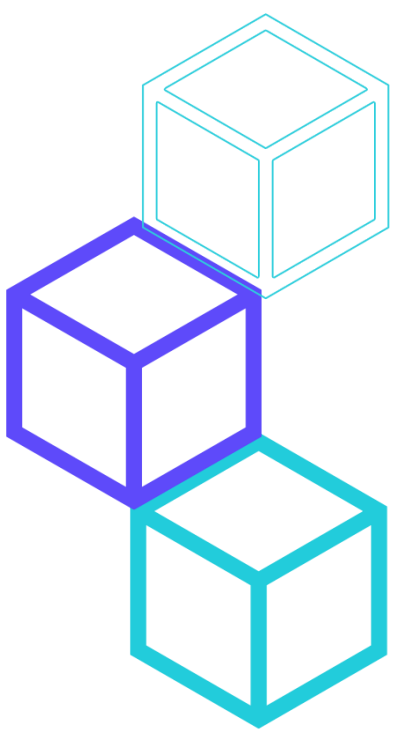
# interstore

## THANK YOU!



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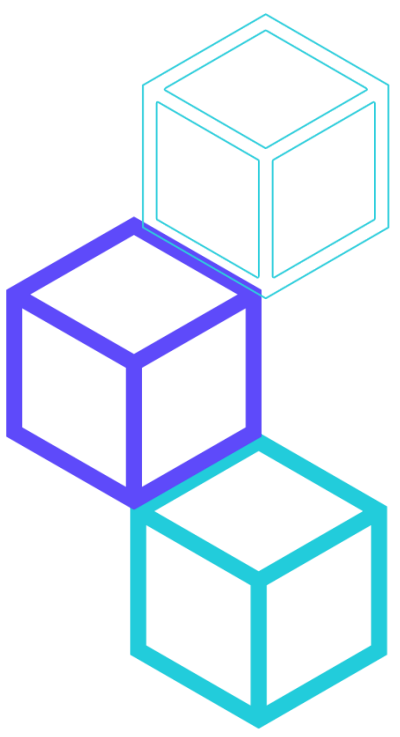




# Open Mic Session



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# Closing Remarks



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