interstore

Interoperable opeN-source Tools to Enable hybRidisation, utiliSation, and moneTisation of stORage flExibility

INTRODUCING CUPID

Controllable Unit Protocol Interface for DER

Prof. Antonello Monti (RWTH)

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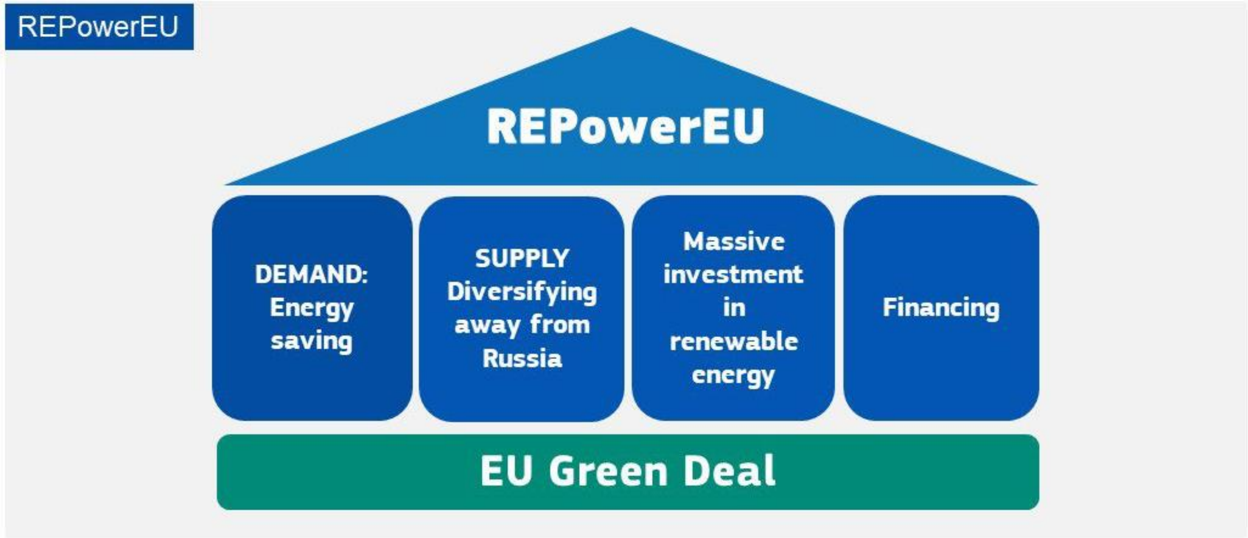
Interstore context

The **goal** of the **Interstore project** is to **prepare** the **European market** and **inverter manufacturer** for the **adoption** of the **2030.5 standard** for interoperability

The **EU Repower Plan aims** to **identify new financing tools** to **address energy independence** due to of current issues such as war in Ukraine, climate change, lack of raw materials ...



European Commission

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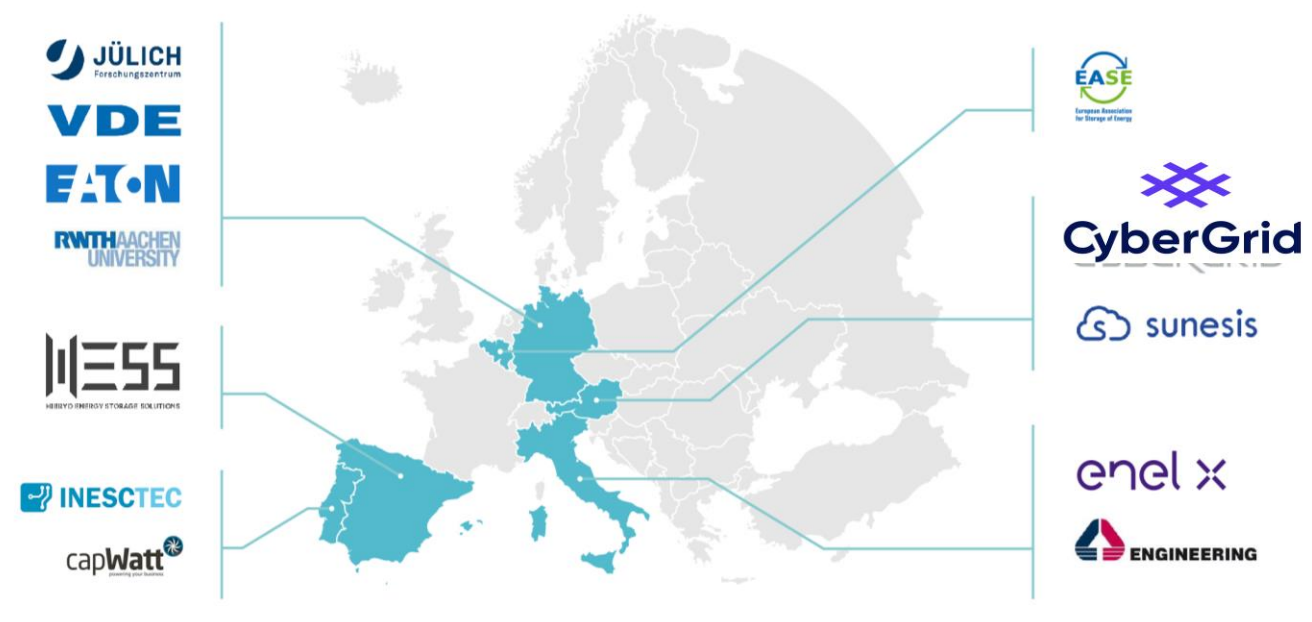
Project information and partner

Project acronym: InterSTORE – Interoperable opeN-source Tools to Enable hybRidisation, utiliSation, and moneTisation of stORage flExibility

- **Type of Action:** IA
- **GA N°:** 101096511
- **Call & Topic:** HORIZON-CL5-2022-D3-01-10: 24 proposals submitted: 3 funded (us, PARMENIDES (AIT), FlexCHESS (UNIVERSITE D'AIX MARSEILLE)
- **Starting date:** 01.01.2023
- **Duration:** 36 M
- **Budget:** 4,355,197.5 €
- **EU contribution:** 3,498,630.75 €
- **Project Coordination:** Prof. Antonello Monti (RWTH)
- **Project Officer:** Antonios Marinopoulos (CINEA)
- **Project manager/Technical coordinator:** Francesco Guaraldi (ENEL X)



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Objective: Project pillars

InterStore objective

Interoperable DES to enable the seamless utilization and monetization of storage flexibility within a real-life environment

Pillar	Pillar	Pillar	Pillar
Open-Source Interoperability Software toolkit	New generation Energy & Flexibility Management systems	Open Data Space	Flexibility hybridization & monetization

Four pilots with various use cases

Societal impact through SSH approach, demonstrating GDPR compliance, liability and security

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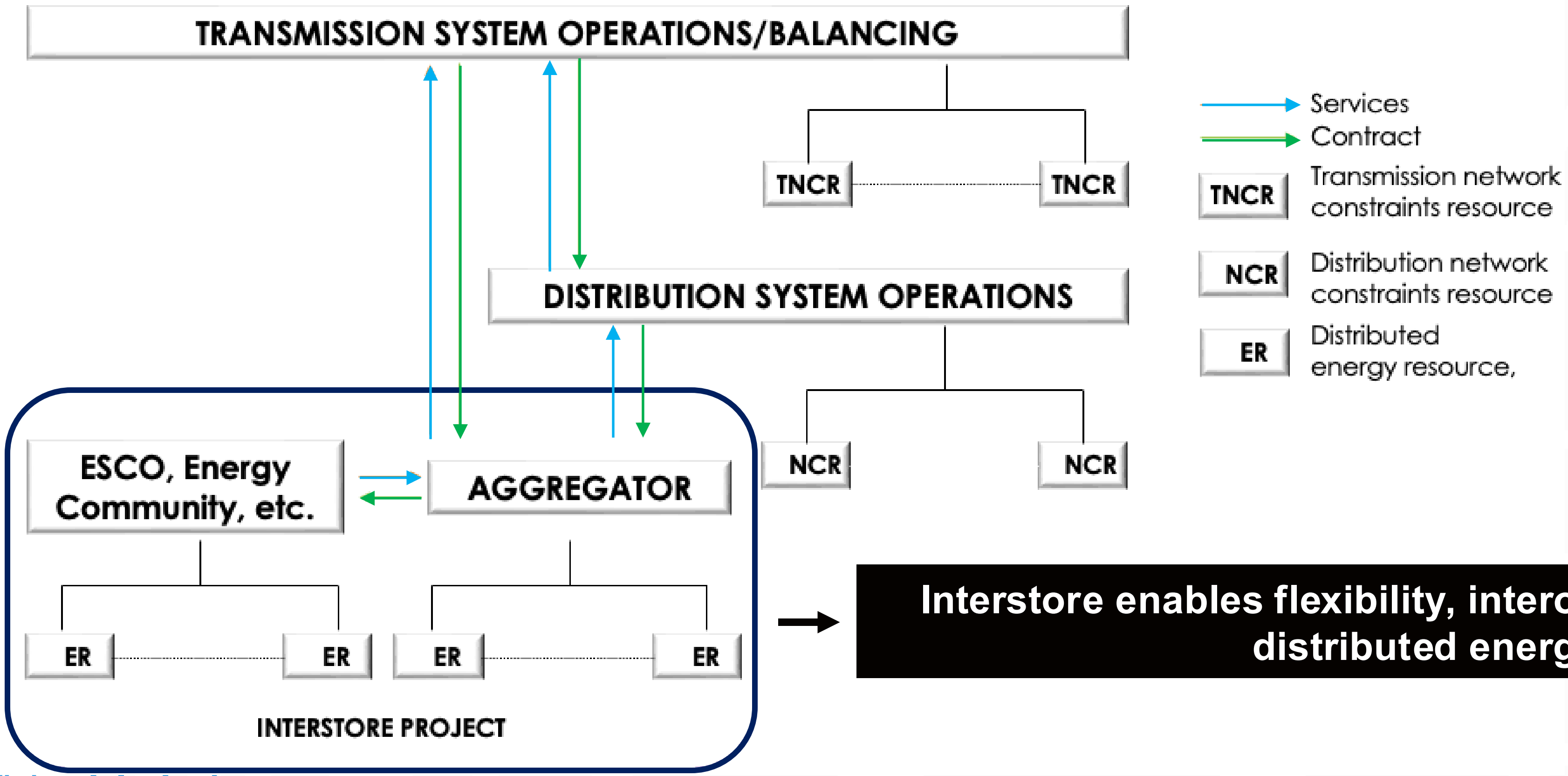
Flexibility services



Interstore enables flexibility, interoperability, and aggregation of distributed energy resources

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A Middleware allowing Interoperability data exchange

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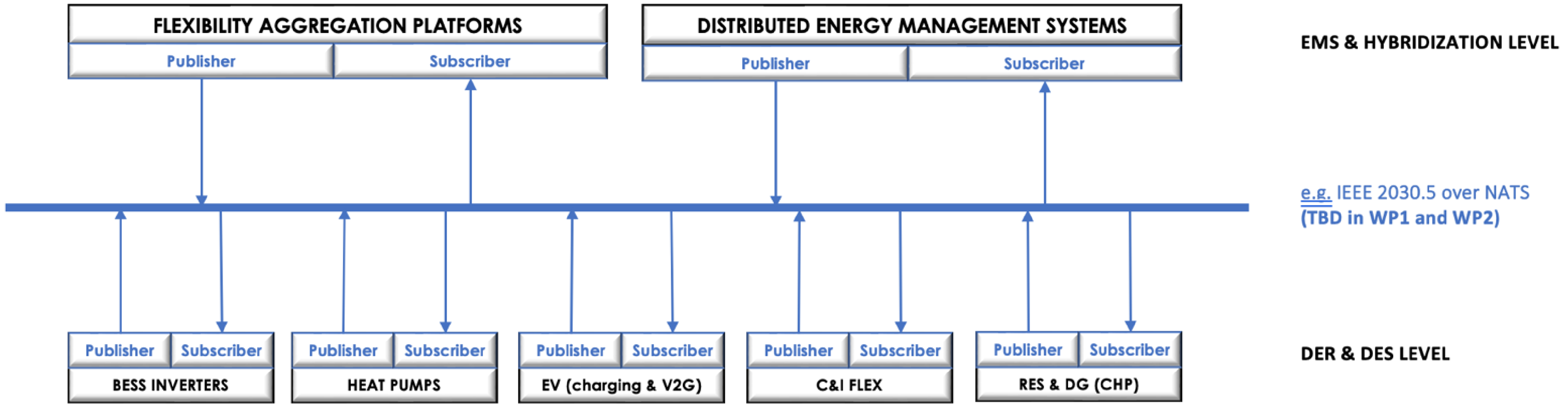

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A Middleware allowing Interoperability data exchange

Storage Applications & Service

- Flexibility Aggregations Services/Platforms
- Distributed Energy Management Systems
- Open APIs

Cross—Sector Storage Data Sharing & Governance

- Data Management/Sharing
- Data User Access Control Brokerage
- Data Fusion & Integration
- Cyber security
- Privacy

Extended Interoperability/Data Integration and Homogenization

- IEEE 2030.5 over NATS
- GAIA-X/IDSA
- Common Information model/ SGAM (IEC based) models
- Connectors IoT protocols/ SAREF, web-APIs

Storage Data Assets/Platforms

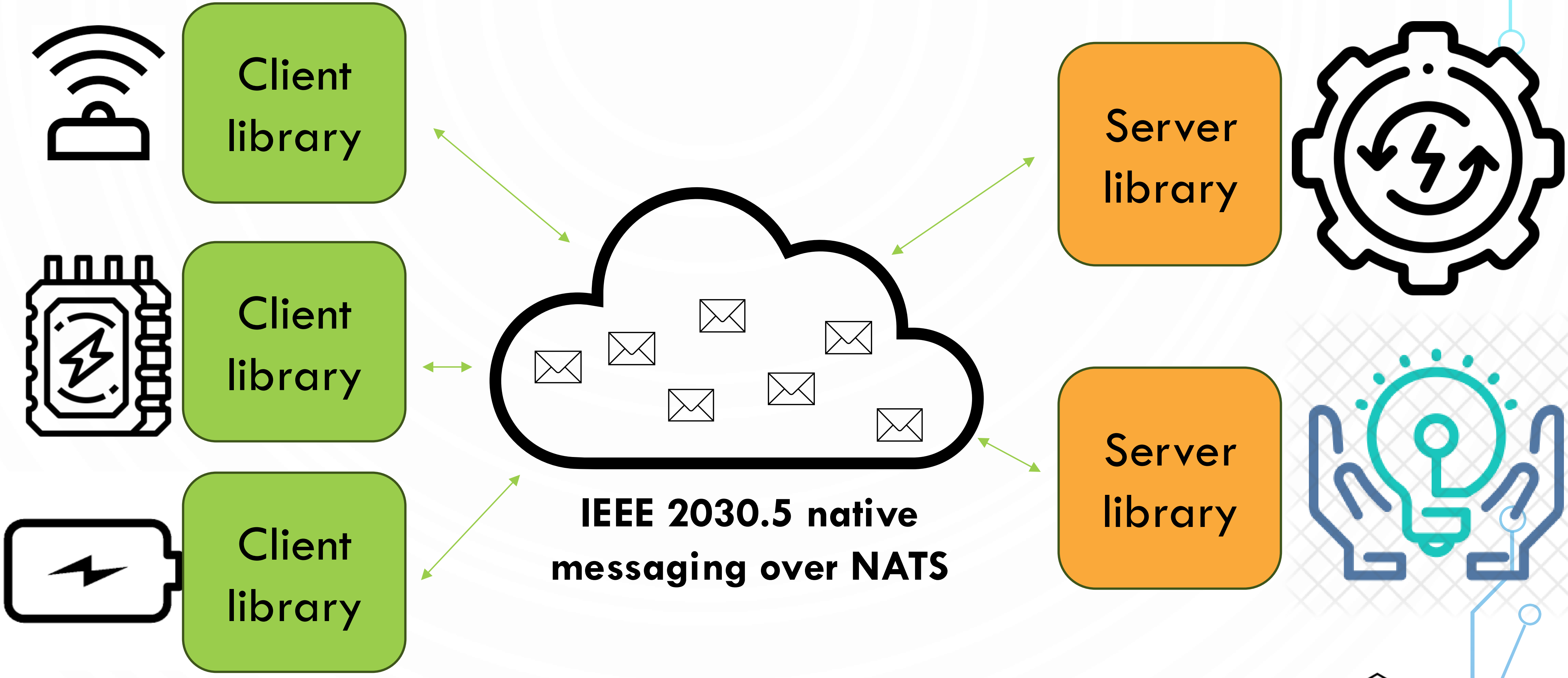
BESS Inverters	Heat Pumps/BMS	EV Charging & V2G	RES & DG (CHP)	Hybrid Storage Systems	ESCOs, Storage Providers	Open/ Third party Data Hubs (Weather)
Data Hub 1…N	Data Hub 1…N	Data Hub 1…N	Data Hub 1…N	Data Set 1…N	Data Set 1…N	Data Set 1…N

IANOS

BD4NRG
Big Data for Next Generation Energy

Platone
PLATFORM FOR OPERATION OF DISTRIBUTION NETWORKS

TOOL 1: INTEROPERABLE CLIENT/SERVER FOR DISTRIBUTED ENERGY STORAGE



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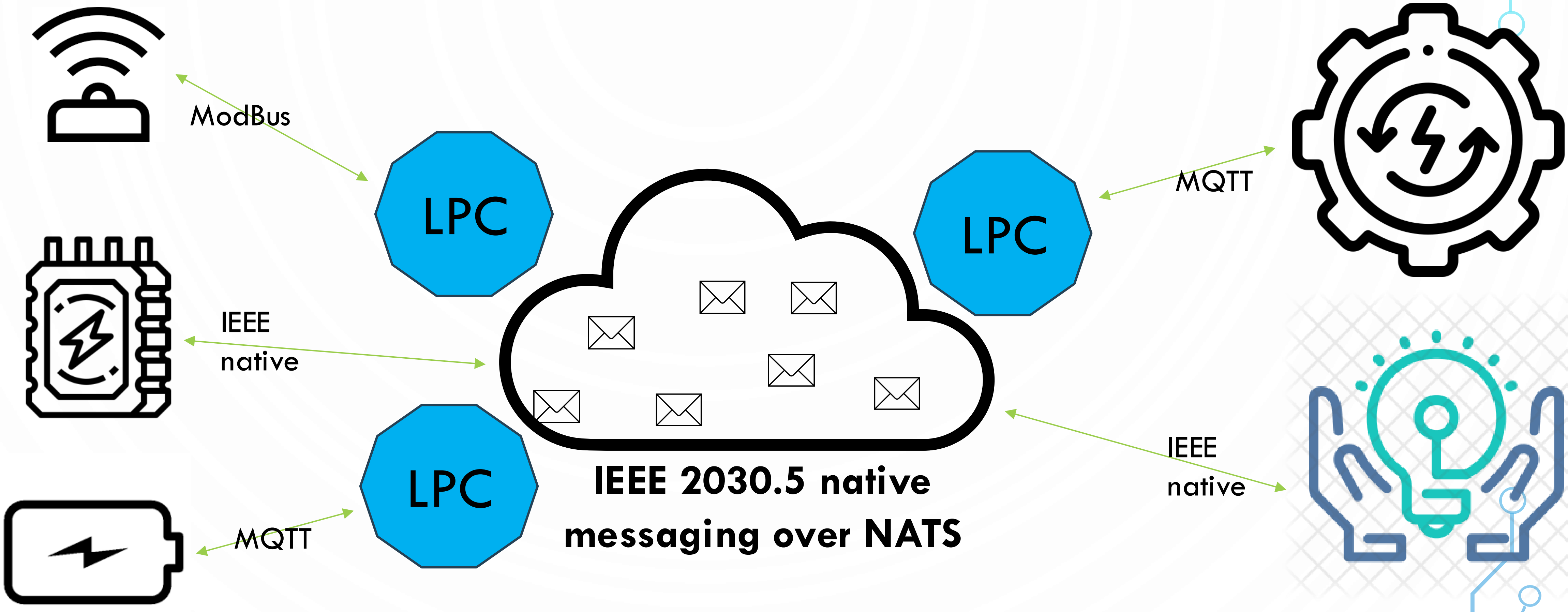
TOOL 2: LEGACY SYSTEMS PROTOCOL CONVERTER



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TOOL 2: LEGACY SYSTEMS PROTOCOL CONVERTER

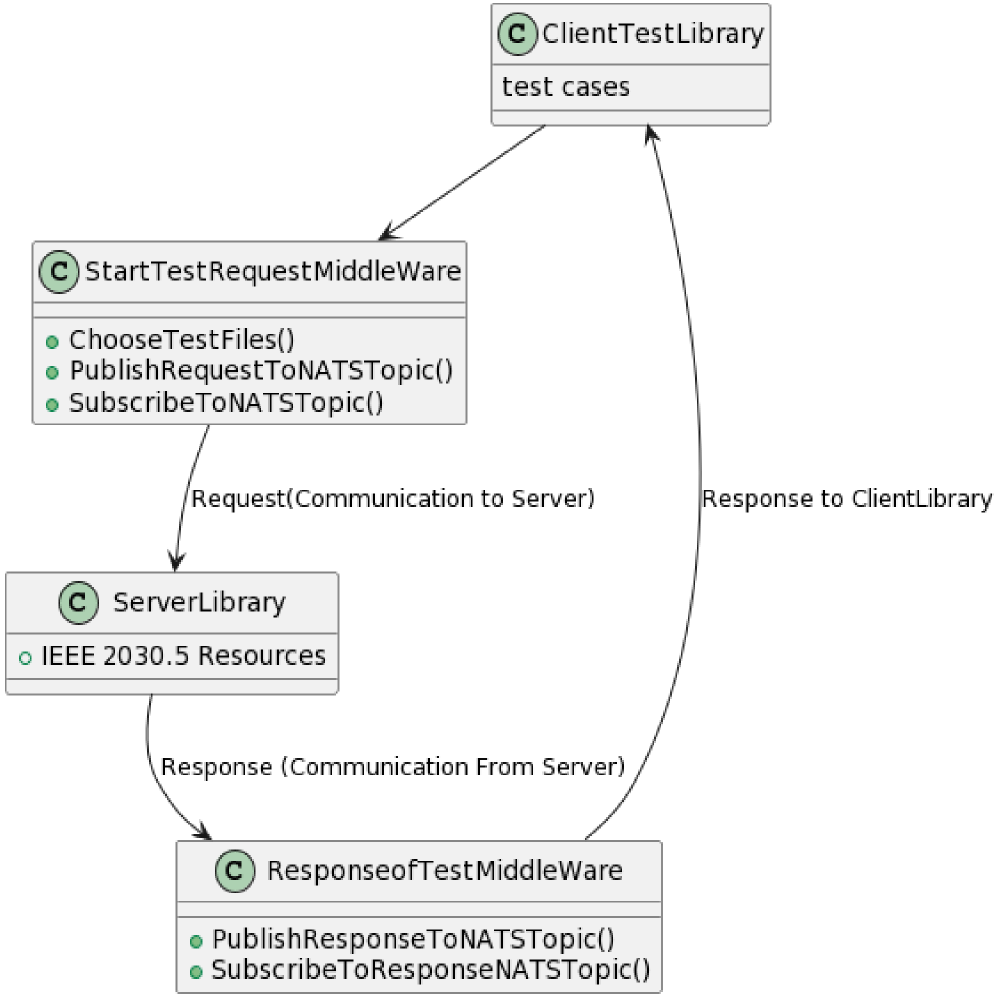

```json
{
  "datetime": "28-08-2023 12:00:35",
  "status": "active",
  "start": "28-08-2023",
  "duration": 900
}
```


```yaml
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>
```


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

TOOL 3: TESTING PROCEDURE AND SOFTWARE TOOL

- Testing Procedures Based on Sunspec's "Common Smart Inverter Profile (CSIP) Conformance Test Procedures"
- Automated Testing
- A Middleware facilitates the communication from client to server



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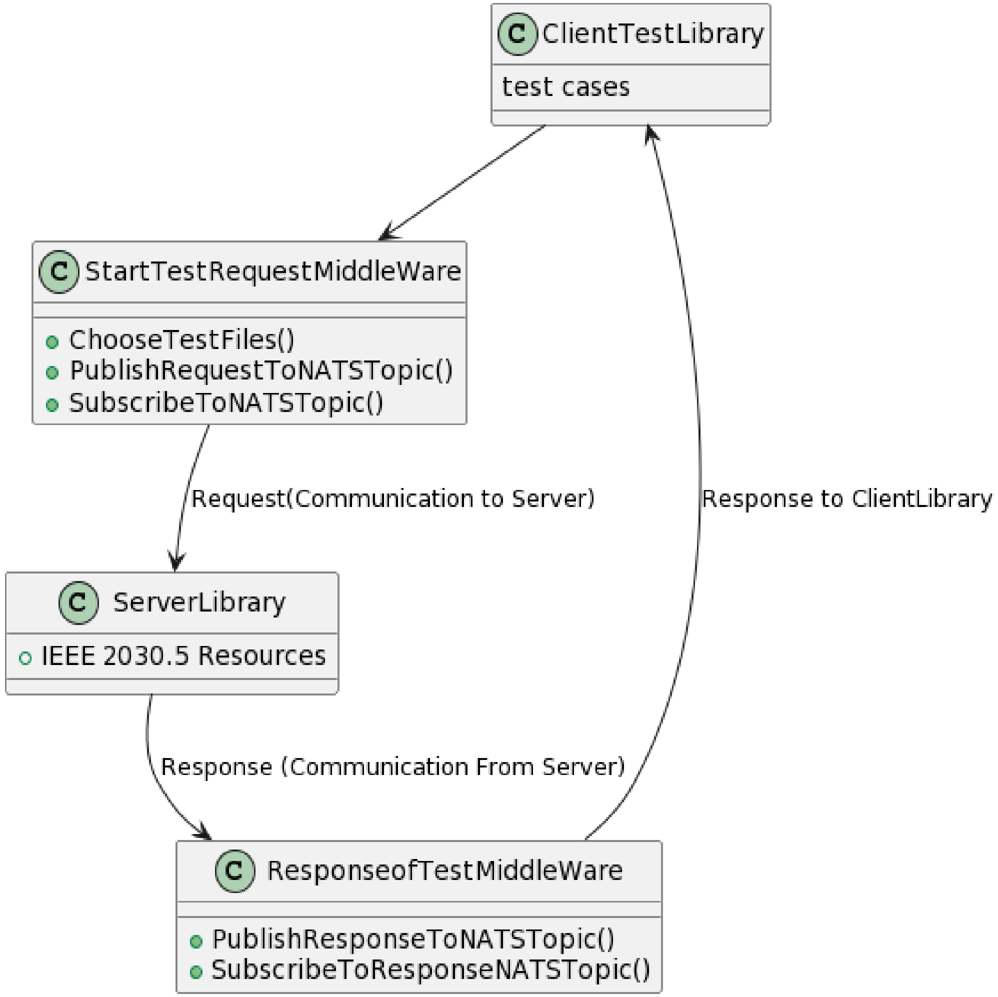
TOOL 3: Overview of Testing Schematic

- The Client Test Library comprises Standard test cases
- Middleware is the part doing the communication using NATS
- Middleware initiates the test by accessing client test library
- Server Library is made of IEEE 2030.5 Resources
- Response of the test is transported through Middleware to client test library



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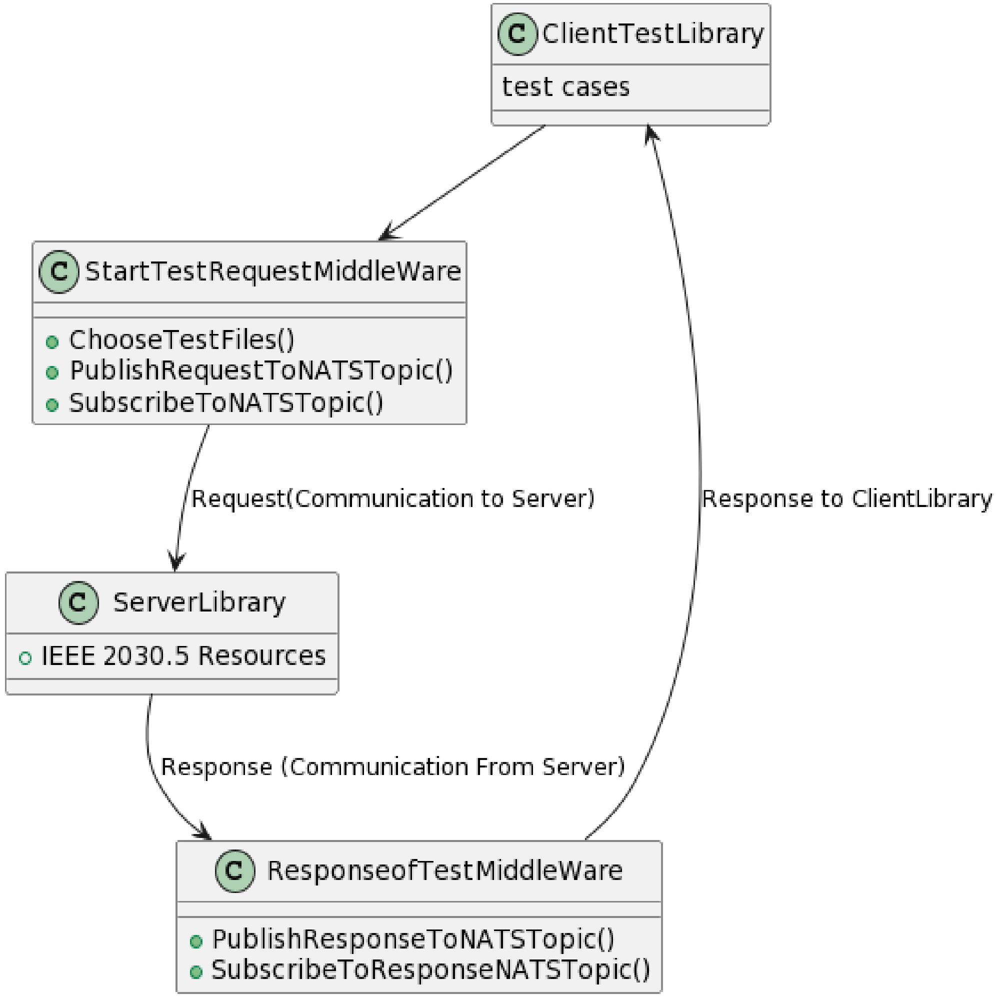
TOOL 3: Deployment and Use Case of Test Software

- For local machines and raspberry pi, docker compose will be used
- The software can also be deployed in Kubernetes
- Development based on Java
- The test software will test the partners IEEE 2030.5 Supported Devices



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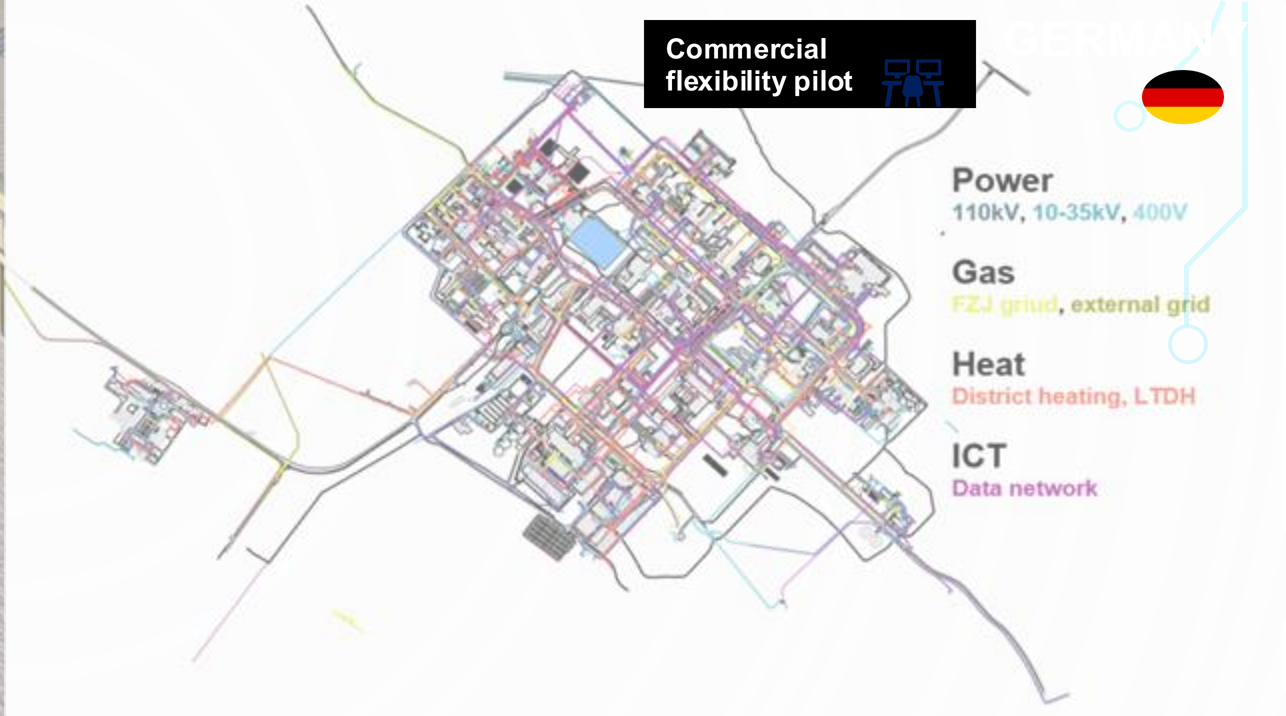
4 living labs

E-mobility flexibility pilot

ITALY

Commercial flexibility pilot

GERMANY



Residential flexibility pilot

AUSTRIA

Industrial flexibility pilot

PORTUGAL

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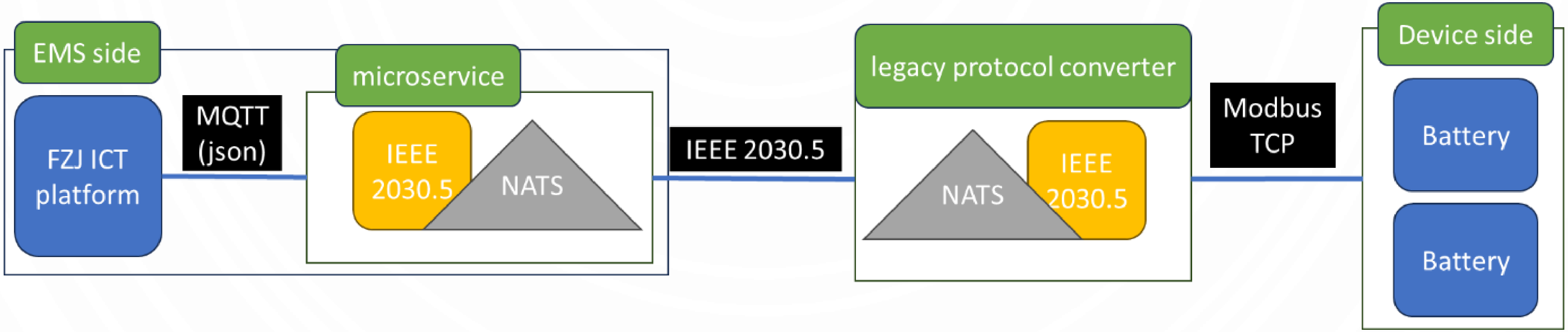
Tools adopted and use cases

USE CASE	TOOLS	USE CASES	GE	AU	IT	POR	Sim
UC1	Client/Server, Protocol Converter	**DES Flexibility Market Monetization**		x			
UC2	Client/Server, Protocol Converter	**Energy community DES utilization**		x			
UC3	Client/Server, Protocol Converter	**Grid supporting BESS**	x				
UC4	Client/Server, Protocol Converter	**Innovative Frequency services**					x
UC5	Testing procedures and software tools Legacy systems protocol converter Interoperable Data Spaces Framework	**Hybrid floating storage flexibility monitoring**				x	
UC6	Testing procedures and software tools Legacy systems protocol converter Interoperable Data Spaces Framework	**Management of battery systems for Node capacity increase in REC**				x	
UC7	Client/Server, Protocol Converter, aggregation platform	**Adaptive BESS managment for autonomous grid operation**					x
UC8	Client/Server, Protocol Converter, aggregation platform	**Home Management System**	x				
UC9	Interoperable client/Server for distributed Energy Storage Interoperable data spaces framework.	**Management of EV charging clusters as HESS**			x		

▷ USE CASES



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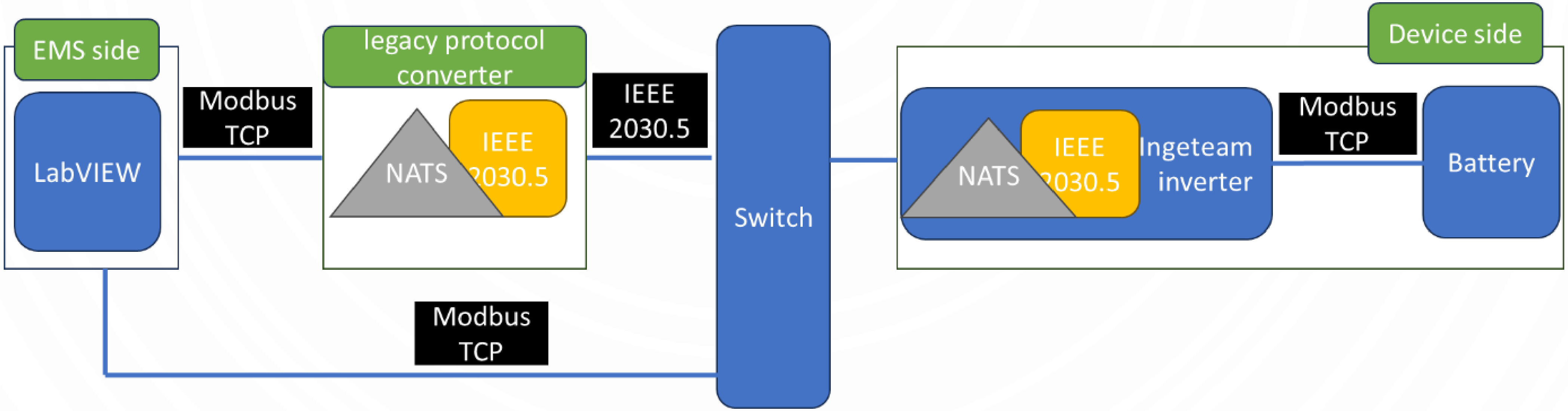

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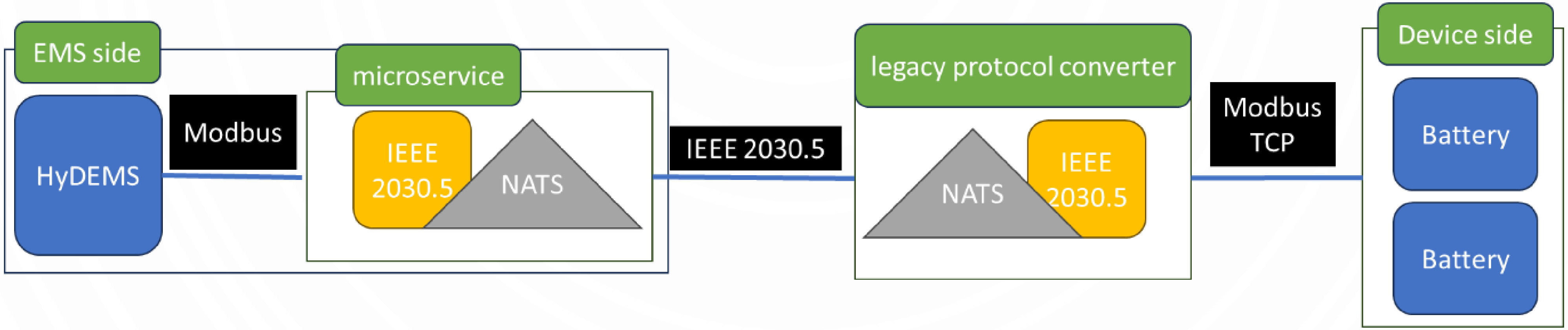

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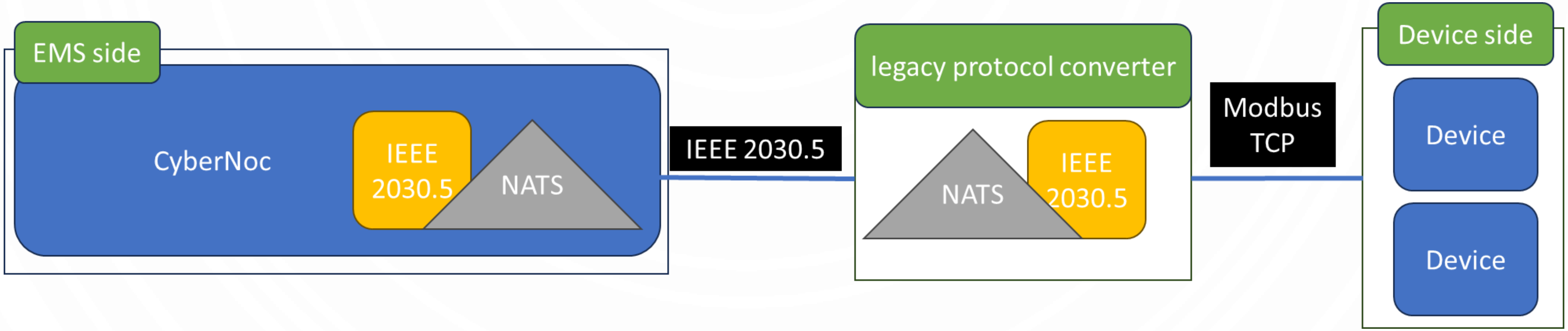

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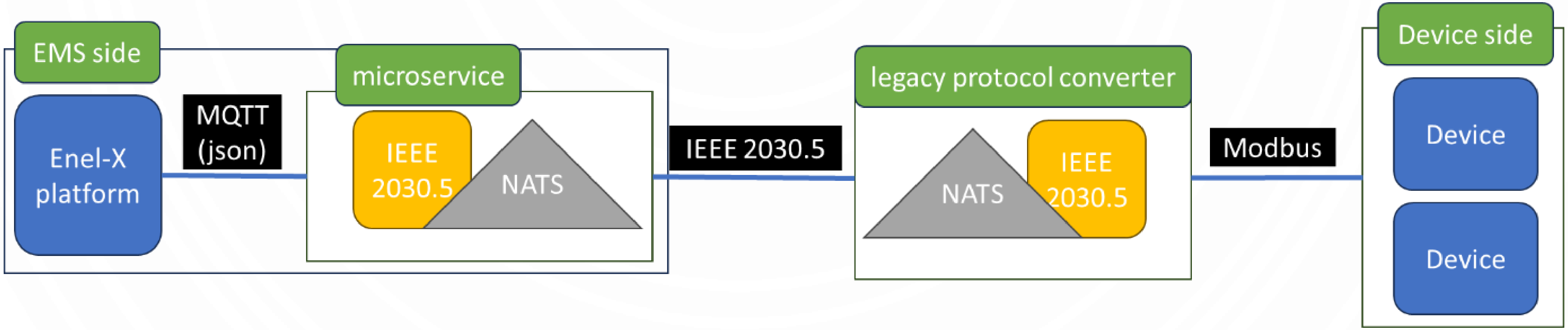
USE CASES



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Status of the development

- The 3 components have been developed and tested in the project
- InterStore is in the last year but there will be new release before the conclusion
- Partners have commercial interest in keeping the effort alive and to expand it

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CUPID Community

- RWTH Aachen University
- INESC-TEC
- CyberGrid
- Synesis

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Why LFE

- Making sure the community goes beyond the duration of the project
- Creating the conditions to promote IEEE 2030.5 as key enabler
- Linking to other similar efforts beyond Europe thanks to the global presence of LFE

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THANK YOU

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