DATAWEEK
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ENERSHARE - Main achievements towards AI

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Enershare

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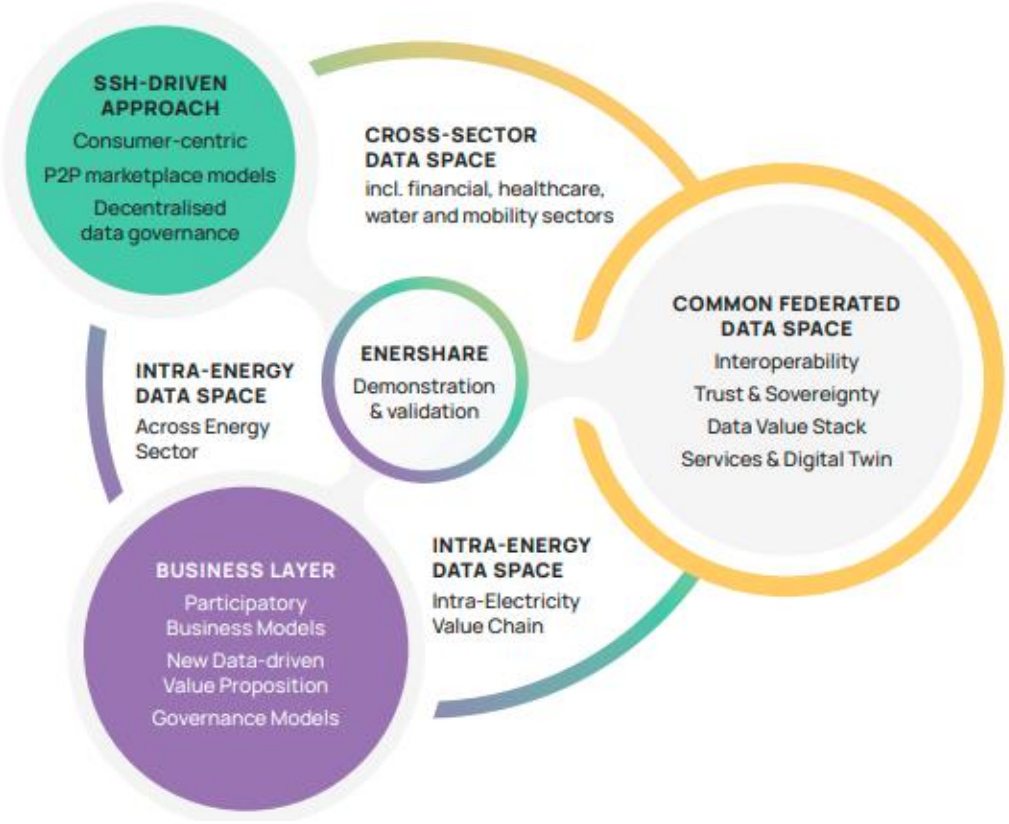
Vision

- to enable the **European Common Energy Data Space** which will deploy an **'intra-energy'** and **'cross-sector' interoperable and trusted Energy Data Ecosystem** where…

- …private consumers, business (energy and non-energy) stakeholders and regulated operators will be able **to access, share and reuse**, based upon voluntary agreements (or legal obligations where such obligations are in force):
  - Large sources of currently fragmented and dispersed data;
  - Data-driven cross-value chain (energy and non-energy) services and Digital Twins for various purposes.



Major Achievements related to AI

- Energy Data Space IDSA-compliant Tech Building Blocks federated environment as **enabler and facilitator of Cross-stakeholder sovereignty-preserving Data Sharing to reduce/overcome reluctance of energy value chain stakeholders to make them available their data**

- New **AI data-driven value added cross-value chain (energy and non-energy) services** and Digital Twins for various purposes.

ENERSHARE as enabler of AI services – 1/2

- First-of-its-kind **Reference Implementation (RI)** for **European Energy Data Space**, which includes a number of Technological and standardizable Building Blocks, while leveraging on and aligning with a number of leading edge **initiatives** (IDSA, GAIA-X, FIWARE, DSSC) and **projects** (CEEDS HE projects via IntNet project, INTERCONNECT, BD4NRG, OneNet, TwinEU, INSIEME, among the others)

- **Use cases- based extended "across-energy" and "cross-sector" interoperability**, while aligning with SGAM and IEC families of standards, as well as on SAREF and other IoT ontologies

- **Trust Building Blocks which include use-cases/pilot-based adaptation and validation of existing Usage Access Control Tech components, including 2 data space connector implementation (TSG by TNO and TRUE by ENG) and an identity provider**
  - **aimed to provide data owner with full control over their data**

ENERSHARE as enabler of AI services– 2 of 2

- Combining **SSH approaches** with **sharing economy and cross-value chain business models** to bring the **consumer perspective** center stage and deploy **blockchain based marketplaces** enabling P2P tokenized energy (EV recharging prioritization, home security, assets maintenance,…) versus data assets/services (data models, datasets, computing resources) exchange and reciprocal beyond-financial compensation

- New business models able to capture, share and effectively propagate the **value of energy data sharing** along all the **energy AND data value chain stakeholders**

AI data-driven cross-value chain services

- AI data-driven **across-energy** and **cross-sector services** enabled by and deployed on the top of the ENERSHARE Data Space

  - **10 Data-driven energy services**, including energy community sizing, flexibility modelling of thermoelectric water heaters, community market pool for internal transactions, and failure detection algorithms for wind turbine components
  - **7 Data-driven cross-sector services**, including multi-energy flexibility potential assessment and emissions/ecological footprint calculation, smart EV charging while optimizing flexibility to the grid, energy efficienct building financial risk management and assessment, power2
  - **3 Digital Twins**

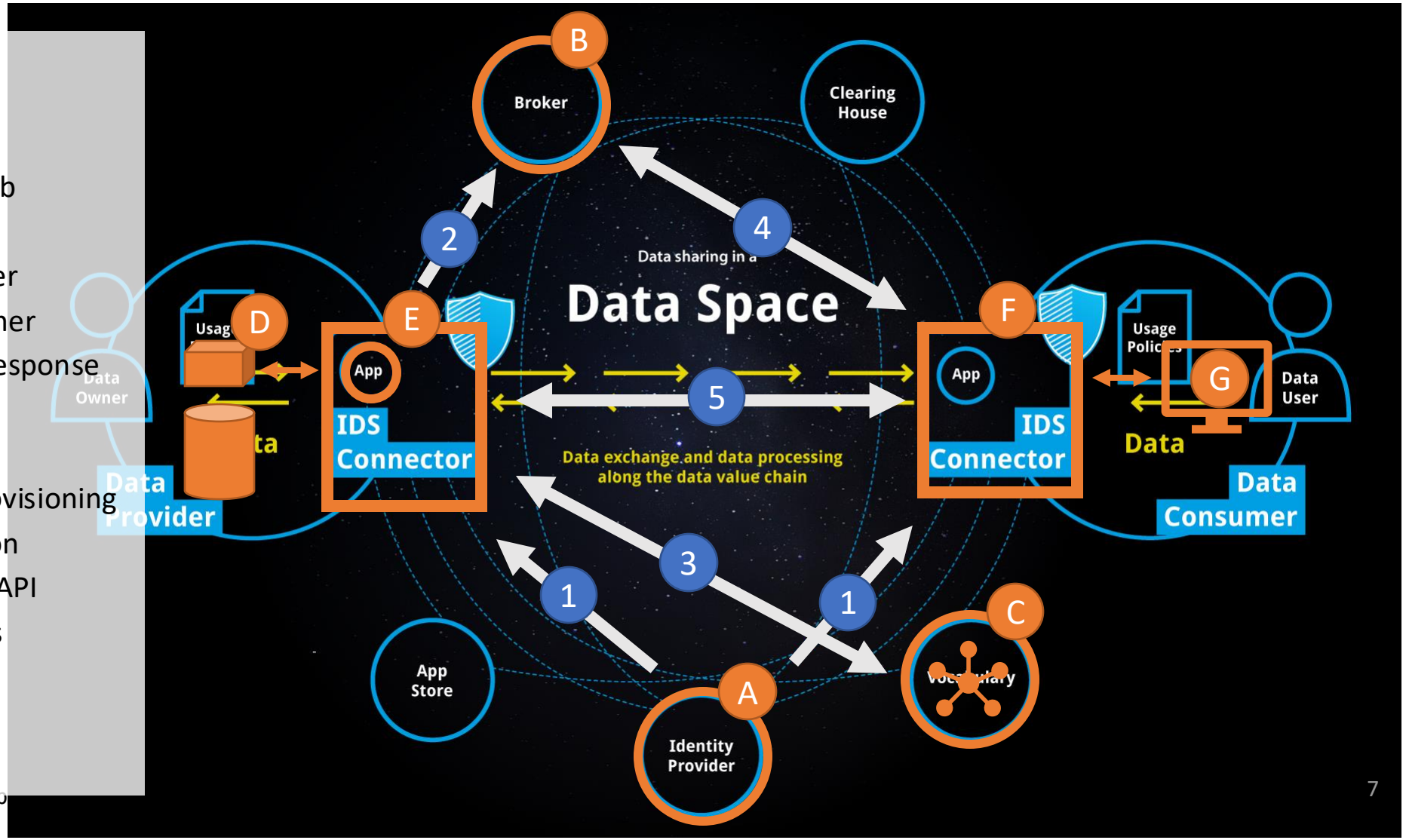
Architectural overview of MVP 1.5

Components:

- A: Identity provider
- B: Metadata broker
- C: Ontology + vocabulary hub
- D: Data set + service
- E: Connector of data provider
- F: Connector of data consumer
- G: UI to show data service response

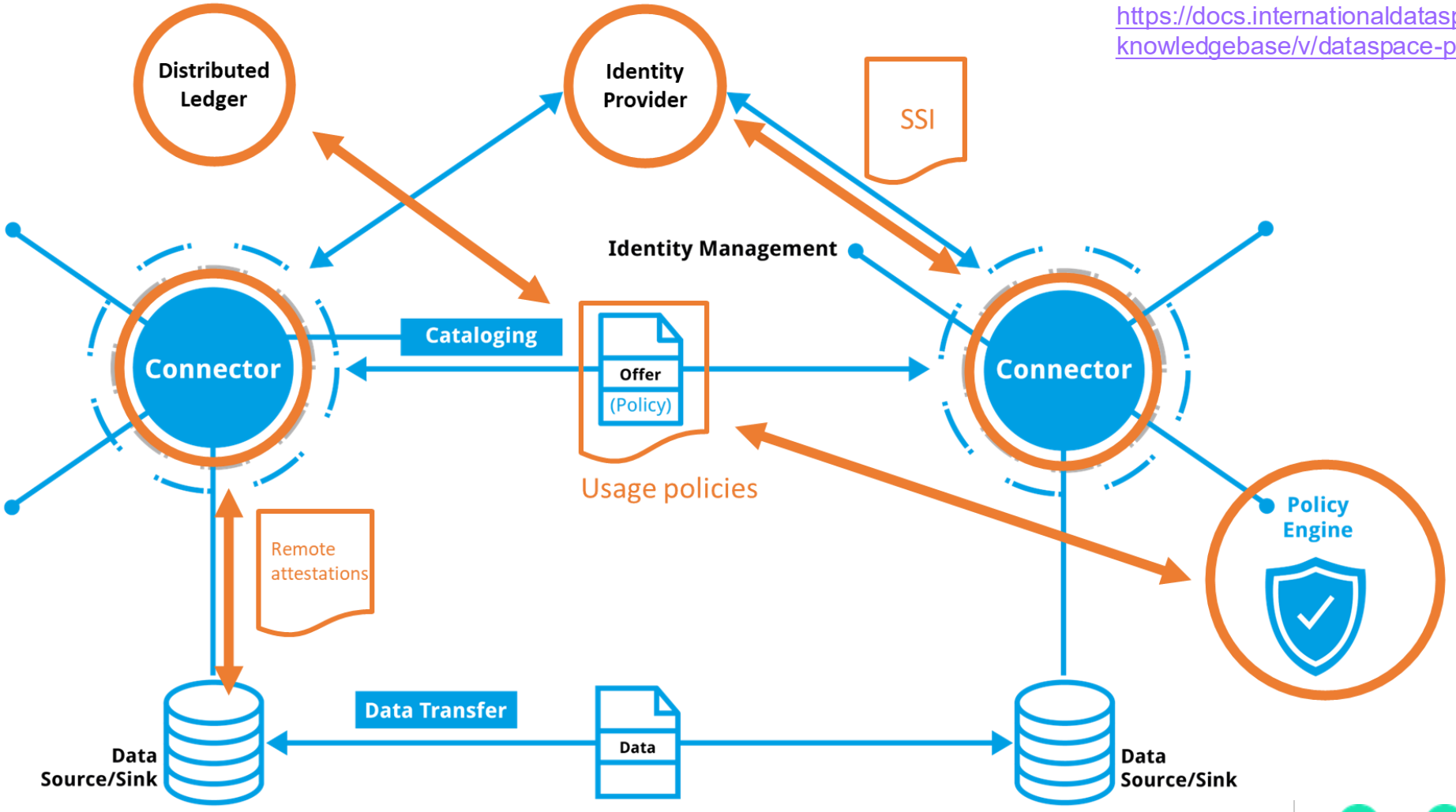
Processes:

- 1: Onboarding + identity provisioning
- 2: Self description publication
- 3: Schema wizard to design API
- 4: Discovery of data services
- 5: Data exchange

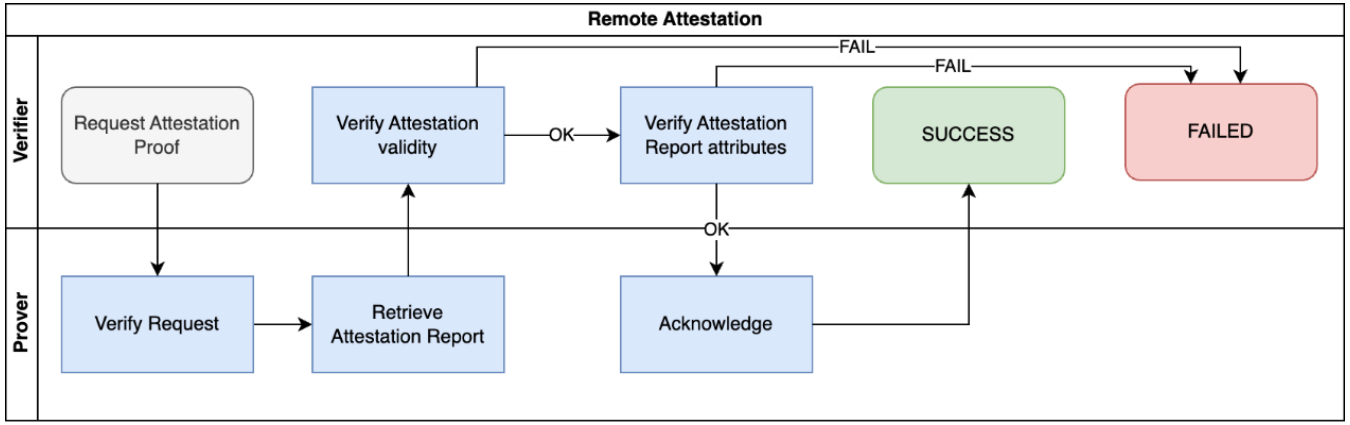


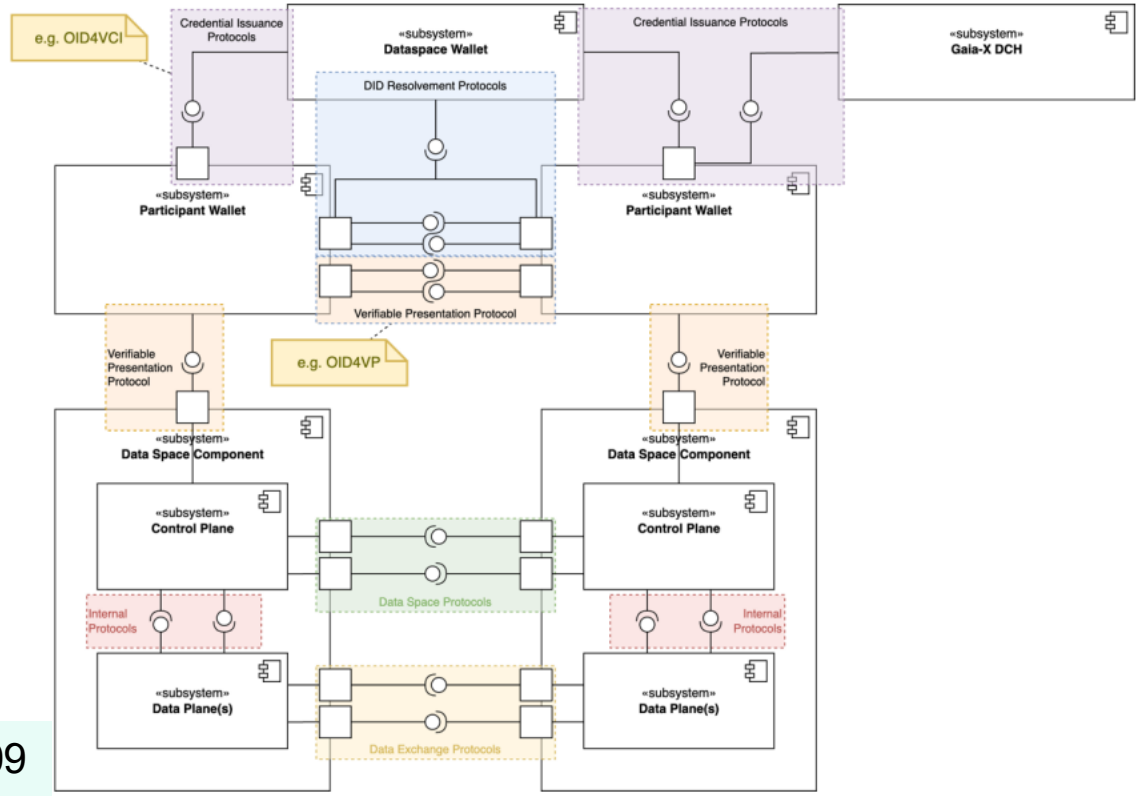
Trust and sovereignty

https://docs.internationaldataspaces.org/ids-knowledgebase/v/dataspace-protocol



Full stack integrity & Identity Managemrent

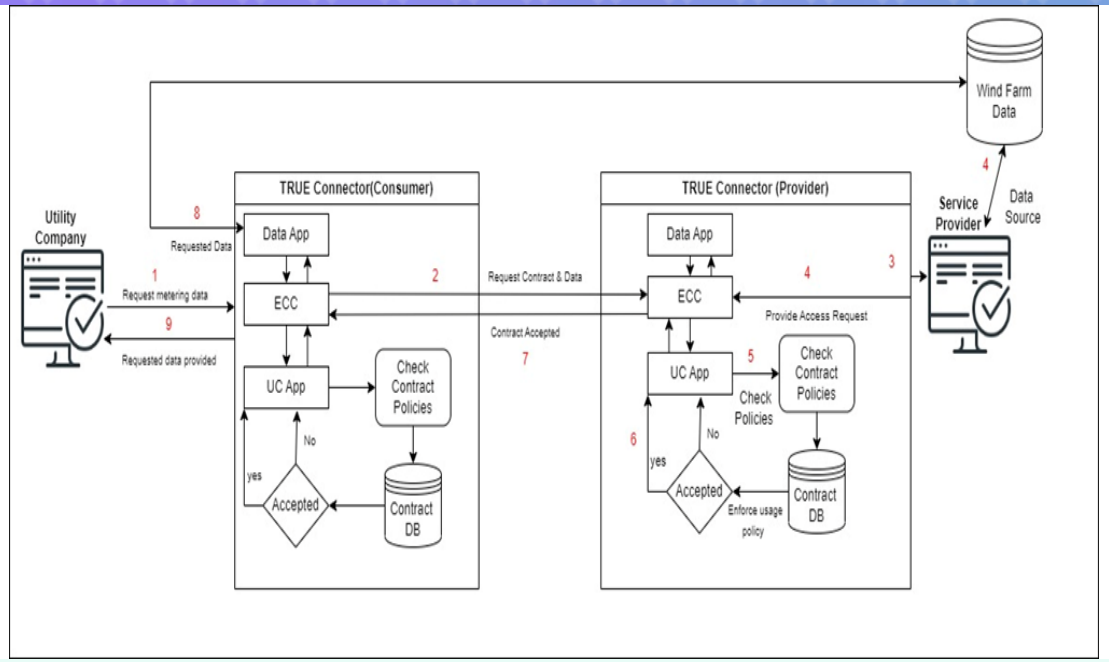




- Design for remote attestation to support full stack integrity
- Virtual machine-based full stack integrity demonstration

- Deployment of Identity Provider (CA+DAPS) that uses x509 certificates.
- Alignment with Energy Cluster projects on SUC1 - Onboarding

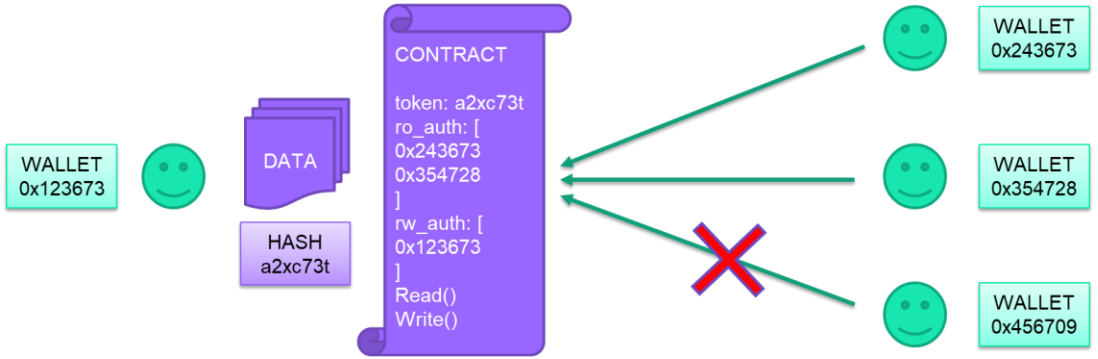
Usage control and DLTs



- Development of usage control policies for TRUE Connector (i.e connector restricted & security level restriction).
- integration of DLT notarization services of usage contract in TRUE connector.
- Different versions of PoE smart contract to fit requirements
- Setup of a private chain, then fully dockerized for easy dist
- Provisioning of REST API to easily exploit PoE functionality

DAC smart contract

1. Data Access Control directly made on chain
2. DAP associated to data hashes and authorized wallets
3. Less expressivity than off chain tools (e.g., PDP like AuthZforce)



Tokenized marketplace for heterogenous assets sharing and beyond financial compensation

- Design of digital **blockchain/DLT-based data-centred marketplace** where different types of energy and non-energy resources, tangible, and intangible assets, ranging from RES and energy consumption data models, grid operation, green hydrogen production, to social assistance or care services to more vulnerable people.

- **Tokens** utilised as a **rewarding mechanism** for services offering, while also allowing to exchange reciprocal surplus of heterogeneous intangible and tangible resources.

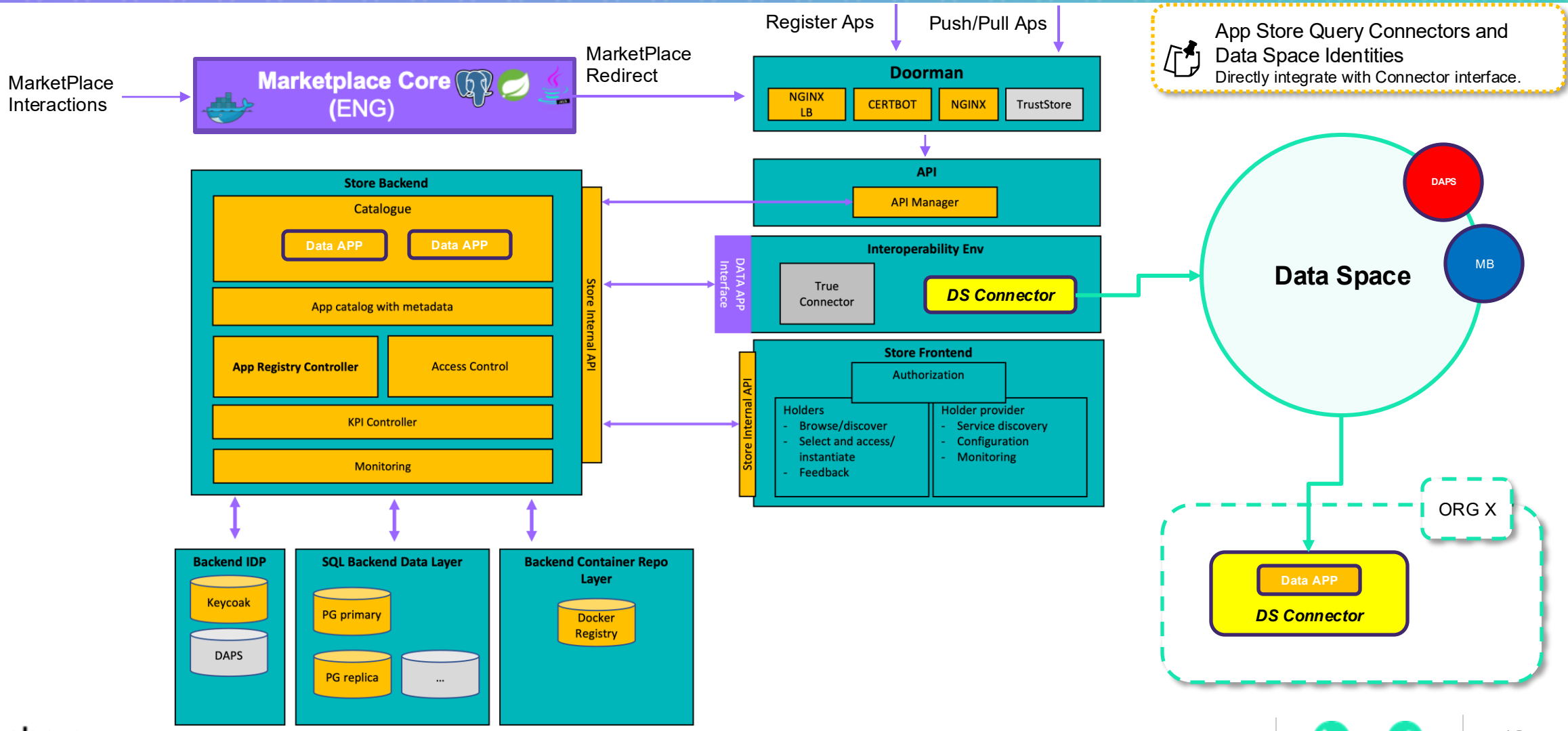
- Implementation of **trustable and secure mechanisms**.

- Blockchain **smart contracts** will be exploited as a stakeholder contract handling mechanism.

Publication and data marketplace services

IDS Components

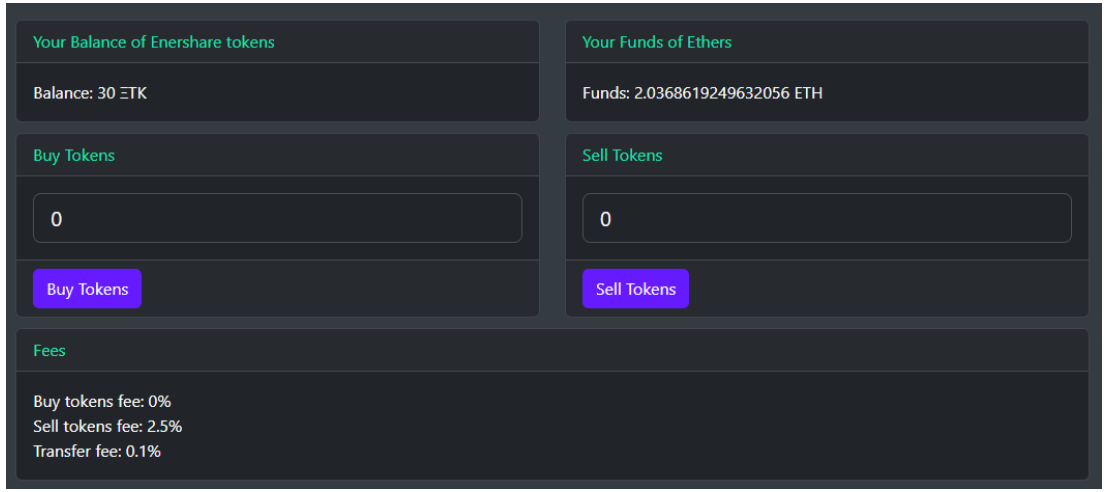
Identity Provider (DAPS) | TSG Connector | Metadata Broker (MB) | Vocabulary Hub (VH) | **App Store (AS)**

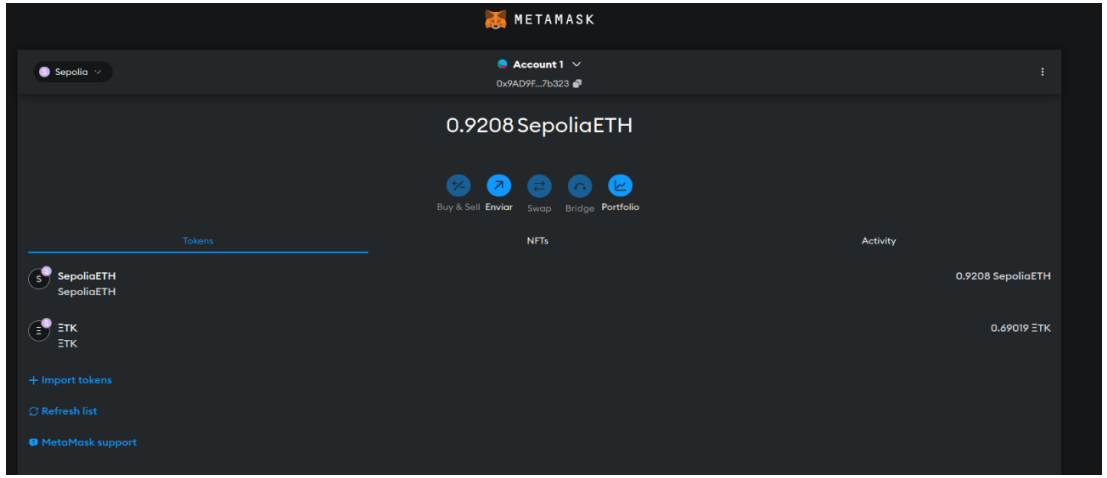


ENERSHARE Token

https://gitlab.com/dt-iot/enershare/enershare-token

- An ERC-20 smart contract, the «Enershare Token», is used as **virtual currency** inside the Marketplace.
- The token includes an **automatic remuneration** for the Marketplace owner, and its mechanism forsters the **fidelization** of the Marketplace users.
- To obtain tokens, the Marketplace user exchanges real money (Ether) with virtual tokens.
- Tokens are used to buy assets in the Marketplace:
  - every transaction includes a fixed fee (0,1%) from the seller gain rewarded to the Marketplace owner.
- Tokens can be exchanged back to real money:
  - a fixed fee (2,5%) is granted to the owner.





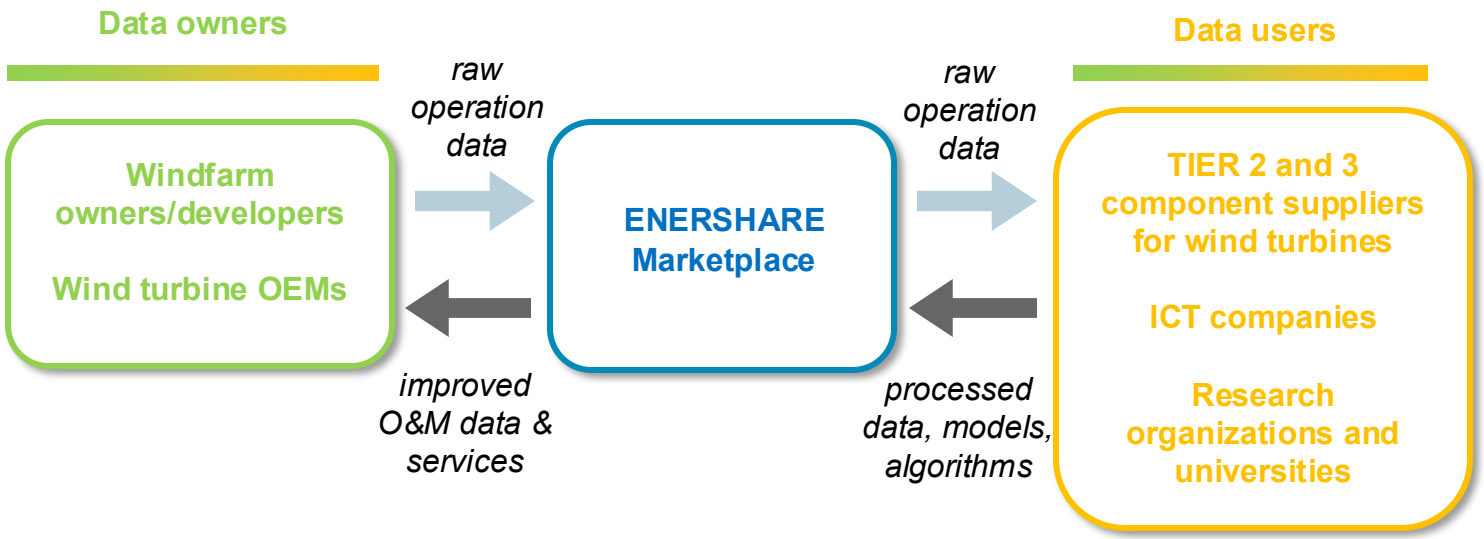
Business model: improving O&M for wind turbines

Rationale

- Reduction of OPEX costs has become a key driver in the wind energy sector
- Only windfarm developers and wind turbine OEMs have access to operation data
- Most component suppliers and ICT companies cannot access these data, missing competitiveness and market opportunities.
- Data sharing enables a win-win scenario: data users can deliver improved digitalized products and services while data owners can reduce O&M costs.

Objective

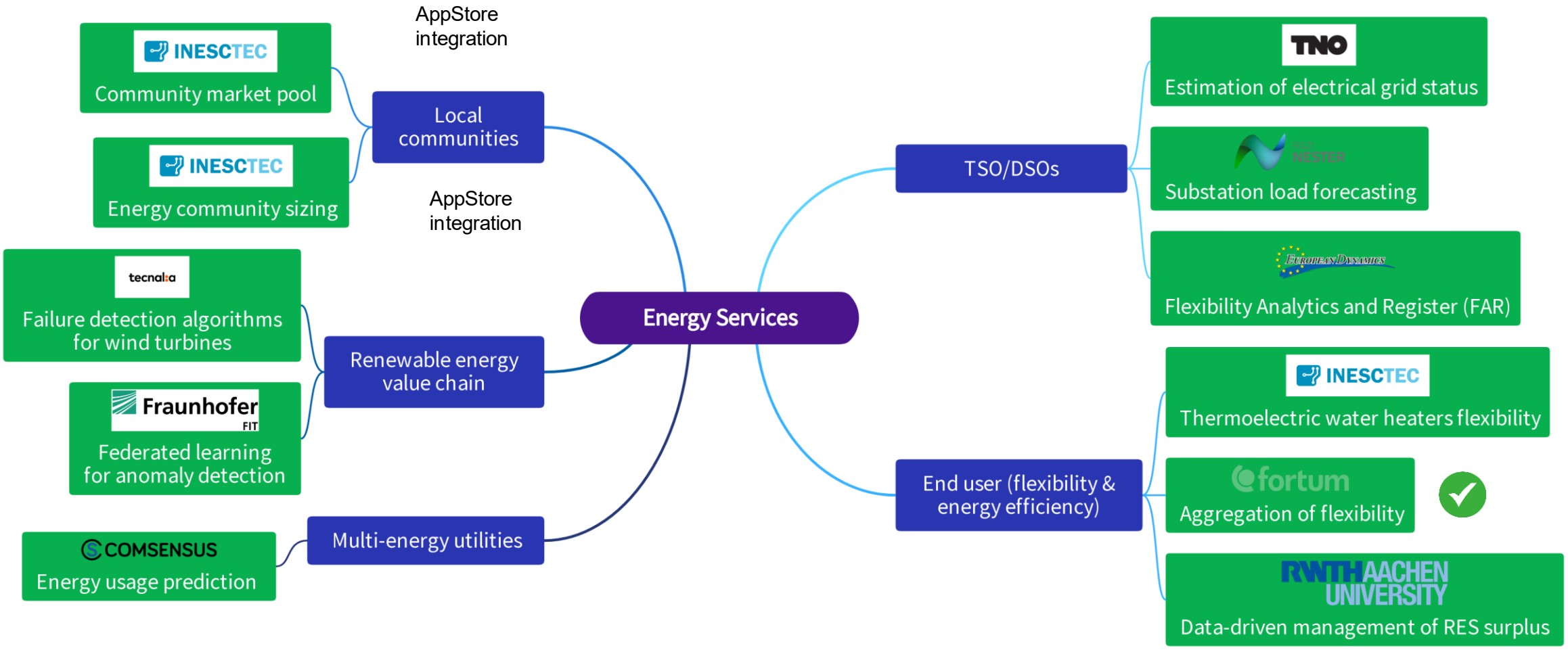
- Business model definition based on data sharing (wind turbine operation) and related service provision(failure diagnostics and predictive maintenance) among data owners and data users through ENERSHARE Marketplace.



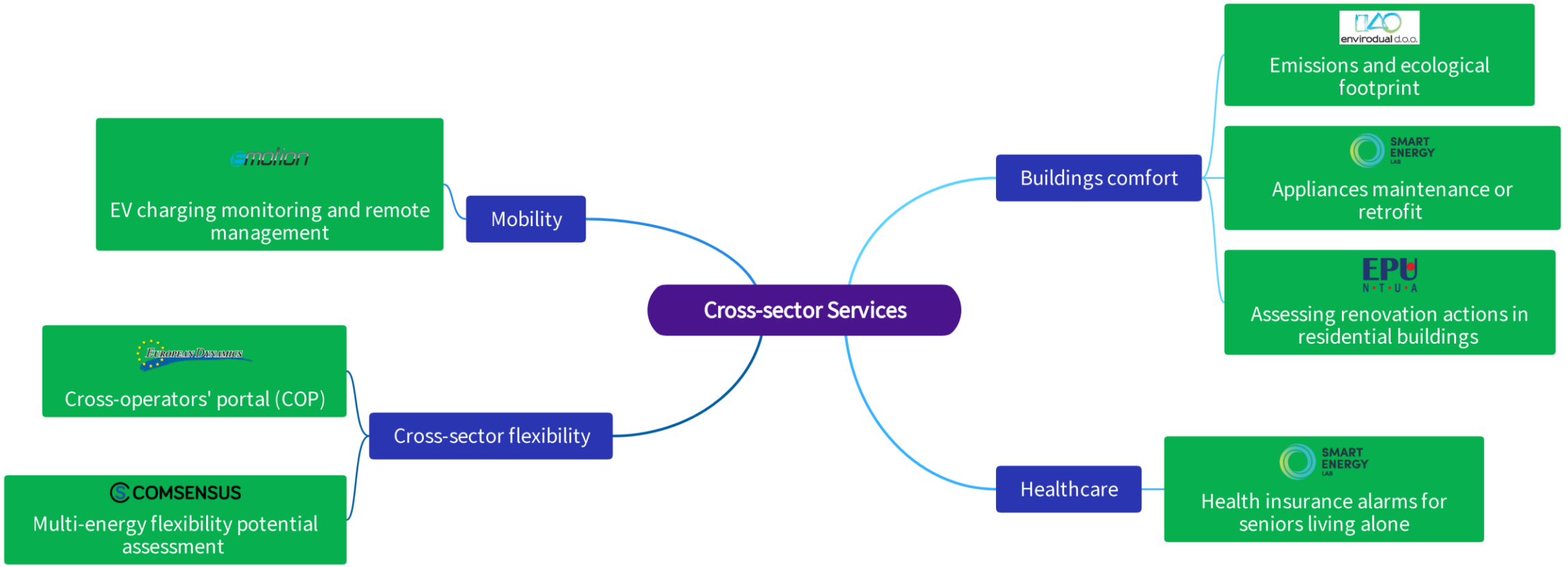
Approach

- Business model canvas methodology
- Main focus on data-by-data (or data-by-service), though some monetary compensation mechanisms can be considered (such as fee categories according to data transactions, service added value, etc.) to cover the cost structure (platform development and maintenance costs, staff, etc.).
- Business perspective from wind component manufacturer and ICT developer taken into account.

Data-driven services for intra-energy Data Space



Data-driven services for cross-sector Data Space



Main challenges & Lessons learnt

- energy in some parts of the value chain is a **regulated market/sector**, hence regulated operators cannot freely share data without a clear regulation, while end consumers are reluctant to share energy consumption data due to privacy concerns
  - sophisticated technology is there, but data are missing…-> tools and business models to overcome reluctance to share data
  - Data quality becomes of utmost importance for AI services
  - Policy-makers to be aware on the dilemma among market-based data sharing and market failure driven regulation/mandate
- focus on **simplified tools** for data sets onboarding (make life simpler for non IT people)
- **end-to-end** applications with simply design of attractive **end user interfaces**
- **business cases & models**
  - with clear **interaction among roles belonging to both energy and data value ch**ains,
  - **techno economic an**alysis of trading off additional costs for using data space onboarding tools versus expected benefits (improved BAU, new services)
  - CEEDS data space **governance**

Thank You