

Open Source Community Day

23 - 24 September



Co-located with
AIOTI Days 2025



HEDGE-IoT

HEDGE-IoT Project

Focus: Semantic interoperability enabler

Léo Cornec (Trialog)

Laura Daniele (TNO)





Holistic Approach towards Empowerment of the DiGitalization of the Energy Ecosystem through adoption of IoT solutions

Call

HORIZON-CL5-2023-D3-01-15 Supporting the green and digital transformation of the energy ecosystem and enhancing its resilience through the development and piloting of AI-IoT Edge-cloud and platform solutions

Project Grant Agreement: No. 101136216

Project Coordinator: European Dynamics Luxembourg SA

Budget: 21.9 M Euro

Grant: 17.9 M Euro

Duration: 42 months

Start Date: 1st January 2024

Number of pilots: 6

Vision

HEDGE-IoT will:

- **deploy IoT assets at different levels of the energy system** (from behind-the-meter, up to the TSO level)
- **add intelligence to the edge and cloud layers**
- **bridge the cloud/edge continuum** introducing federated applications governed by advanced computational orchestration solutions.

Smart Energy

Domain

Grid management/optimization

Semantic interoperability

Flexibility

AI

Energy community

Main components

Dataspace

App Store

Computational
orchestration

Edge-Cloud services

AI/ML-based energy services

Project objectives

- To **add local/distributed intelligence leveraging IoT solutions at the edge/fog/cloud layers** establishing the edge/cloud continuum through computational orchestration
- To **design AI/ML tools for edge/fog/cloud services for increased flexibility, resilience and observability**
- To **enable extended service and semantical/ontological interoperability and interconnectivity** among distributed open platforms, systems and edge devices through a decentralized IDS-compliant Interoperability Framework
- To **demonstrate, validate the HEEDGE-IoT solutions and frameworks** in 6 Demonstrators
- To **apply and extend open standards for IoT, interoperability, grid and market related data exchanges** and to create a set of commonly accepted standards
- To **facilitate the market uptake of the proposed solutions**

Anomaly detection and
fault forecasting

Flexibility management

Energy forecasting and
critical grid events prevention

Predictive and real-time
congestion
management

Energy flow
optimisation with
dynamic grid limits

Use cases
examples

Maximizing asset
capacity for
increased lifetime
grid equipment

Enhanced
Network
Manageability
and
Observability

Harnessing the
potential of **energy**
communities

- 🎯 **Build on open-source tools, technology building blocks, and platforms** to facilitate legacy and proprietary energy and beyond data hubs/platforms to be federated with a minimal effort.

- 🎯 HEDGE-IoT **data interoperability is the main open source focus** of the project.
We build open source for interoperability also on proprietary interfaces (e.g., via data space connectors and also via semantic adapters)

- 🎯 **Develop and extend open-source tools and building blocks:**
 - Semantic enablers
 - Computational orchestrator integrated with the energy data space
 - AI systems

🎯 **Objective:** To apply and extend open standards for IoT, interoperability, grid and market related data exchanges and to create a set of commonly accepted standards.

🎯 **Main HEDGE-IoT standardisation targets for contribution:**

- Standards related to **dataspace, IoT, interoperability, digital twin, edge/cloud continuum, trustworthiness and AI**
- Standards related to **semantic interoperability**, including SAREF and its extensions
- Standards related to **smart energy/smart grid domain**

🎯 **Examples of HEDGE-IoT active participation to standards:**

- **SAREF**
 - Contribution to the new major SAREF release (SAREF 4.1.1)
 - Continuous reflection SAREF governance, semantic interoperability and JRC CoC ESA
 - Contribution to SAREF suite of ontologies and SAREF-related applications
- **Standardisation Request European Trusted Data Framework** - Article 33 of the EU Data Act - Data Catalogue Framework (Deliverable 4) and Semantic Assets Implementation (Deliverable 5)
- **ISO/IEC 21823-1** Internet of Things (IoT) - Interoperability for IoT systems - Part 1: Framework
- **ISO/IEC 21823-5** Behavioural and policy interoperability
- **ISO/IEC AWI 30152** Guidance on the integration of IoT and digital twins in data spaces
- **IEC 63417** Guidance and plan to develop smart energy ontologies
- **ISO/IEC JTC1/SC38 20151** Information technology — Cloud computing and distributed platforms — Dataspace concepts and characteristics
- **CEN/CLC JTC21/WG3 AI** - Engineering aspects technical reports
- **JRC CoC Energy Smart Appliances (ESA)** (voluntary initiatives)

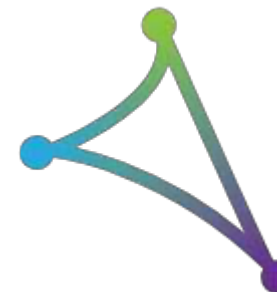


- HEDGE-IoT is built on:
 - **Data interoperability** [Dataspace]
 - **Computational interoperability** [Computational Orchestrator]
 - **Functional interoperability** [App Store]
- HEDGE-IoT includes an **open-source dataspace component** to foster a sovereign data sharing.

- Selected connector: **Eclipse Dataspace Components (EDC)**

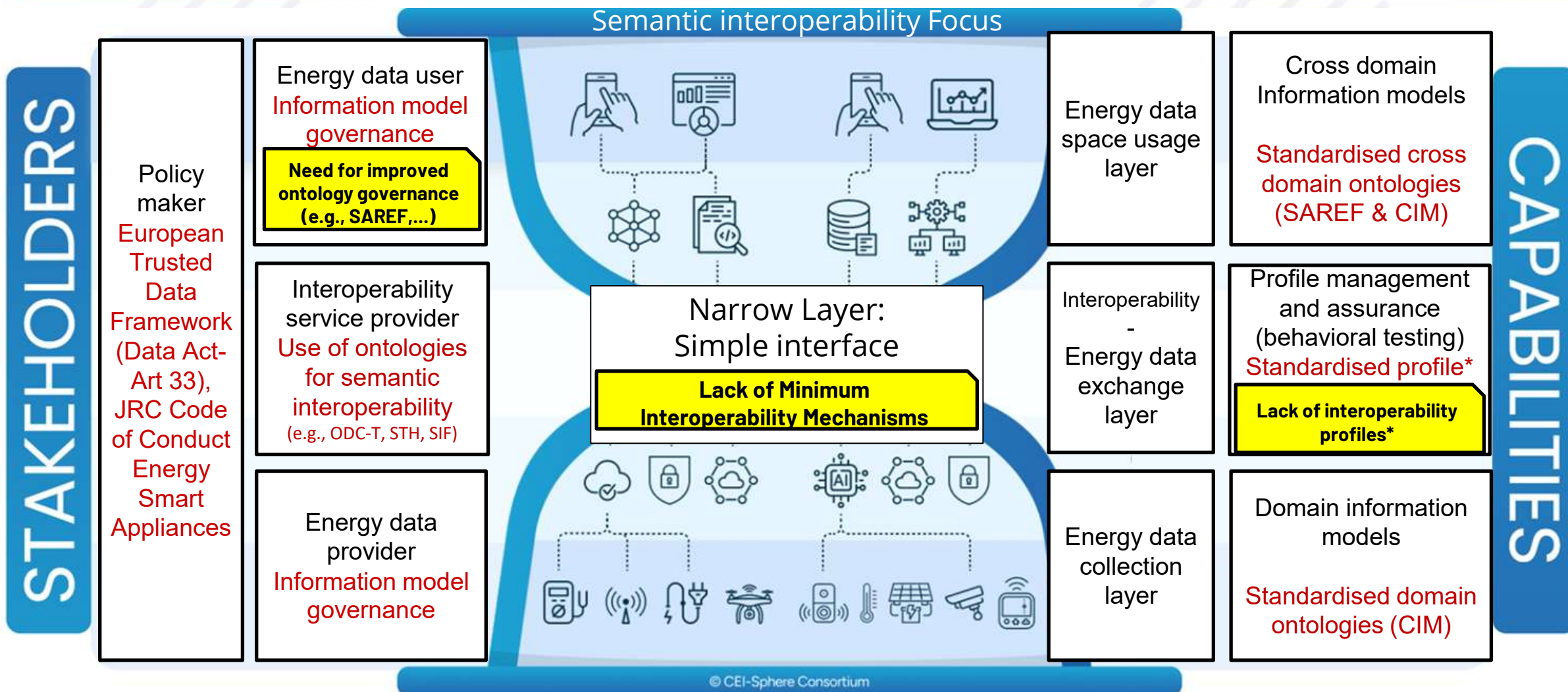
The Eclipse Dataspace Components (EDC) is a comprehensive framework (concept, architecture, code, samples) providing a basic set of features (functional and non-functional) that dataspace implementations can re-use and customize by leveraging the framework's defined APIs and ensure interoperability by design.

- **IDSA compliance** – aligned with European dataspace standards and Dataspace protocol.
 - **Open-source and community-driven** – ensuring transparency and sustainability
 - **Actively maintained** – continuous updates and improvements
 - **Flexibility** – easily extensible to adapt to energy-specific requirements
 - **Strong ecosystem** – wide adoption across other EU projects
- Selected EDC distribution: **Minimum Viable Dataspace (MVD)**
 - Most actively supported distribution
 - Most up-to-date documentation
 - Widely used in the EDC community → knowledge sharing & sustainability



Features:

- Monitor data assets
- Manage contracts & policies
- Explore the federated catalog
- Track data transfers



*: A profile is a standards writing concept defined in ISO/IEC TR 10000-1:1998. In essence, a profile is a named set of requirements on an object of conformity assessment.



Project Approved
Research Programme of the
Department of Energy Engineering
University of the Aegean



Project Approved
Research Programme of the
Department of Energy Engineering
University of the Aegean

Thank you



Project Approved
Research Programme of the
Department of Energy Engineering
University of the Aegean



<https://www.trialog.com/fr/accueil/>



<https://www.tno.nl/en/>

<https://hedgeiot.eu/>