Data Space Protocol in Energy, Smart Industry and Healthcare

Ir. Erik Cornelisse

Senior Project Manager & Architect at TNO

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Presentation objectives

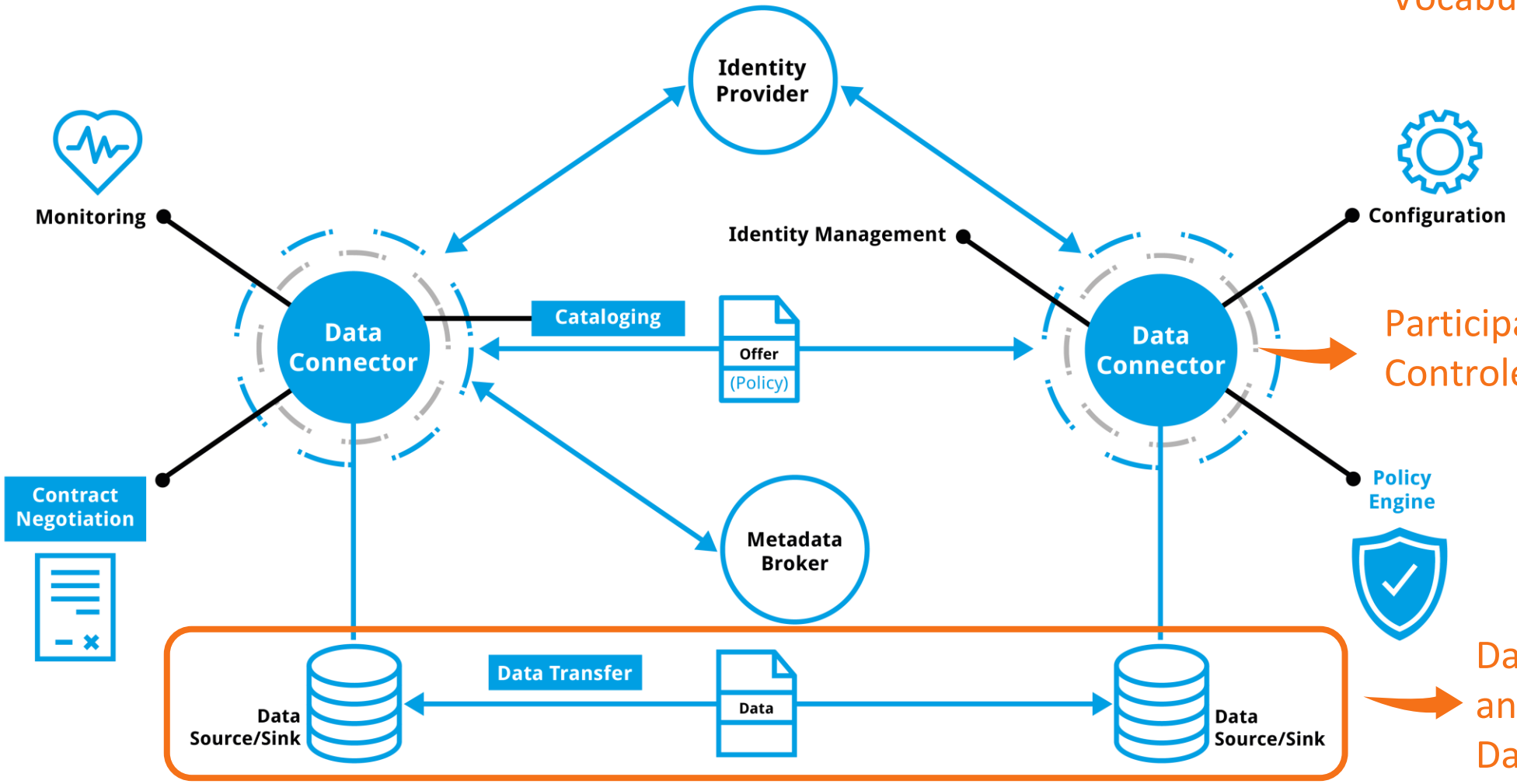
To explain how the Data Space protocol is being used in several projects and to give a brief outline what is required as next steps.

This presentation does not explain the Data Space Protocol because that can be found here: Dataspace Protocol 2024-1 | IDS Knowledge Base

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

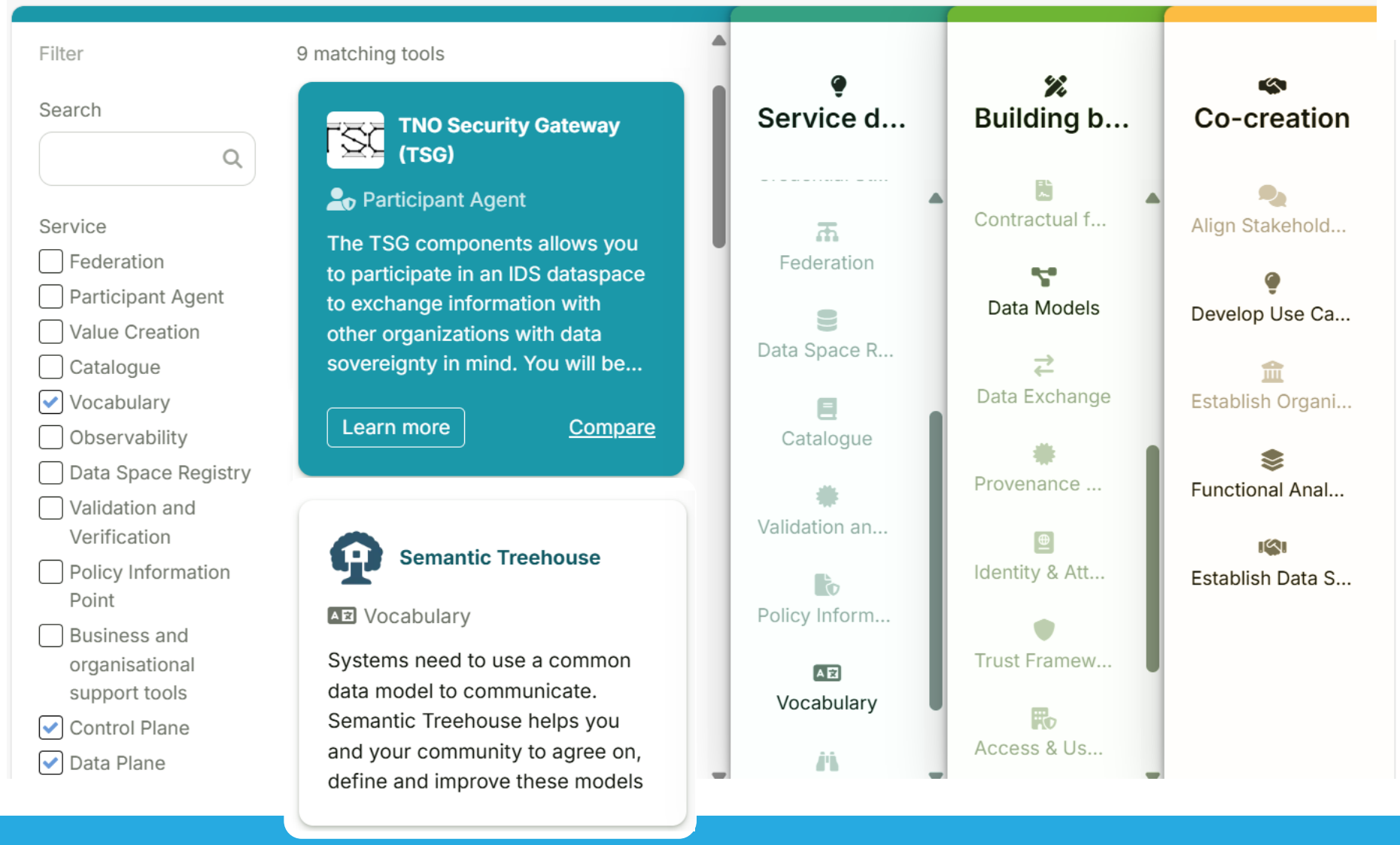
Dataspace Protocol 2024-1 | IDS Knowledge Base

Vocabulary Hub ?



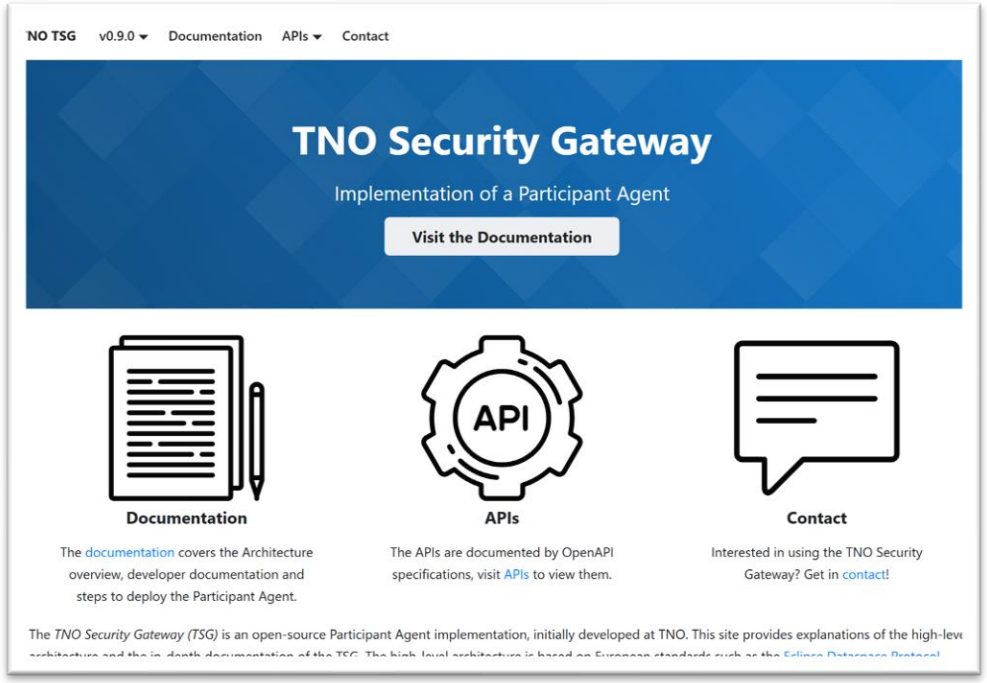
Data models and formats Data exchange

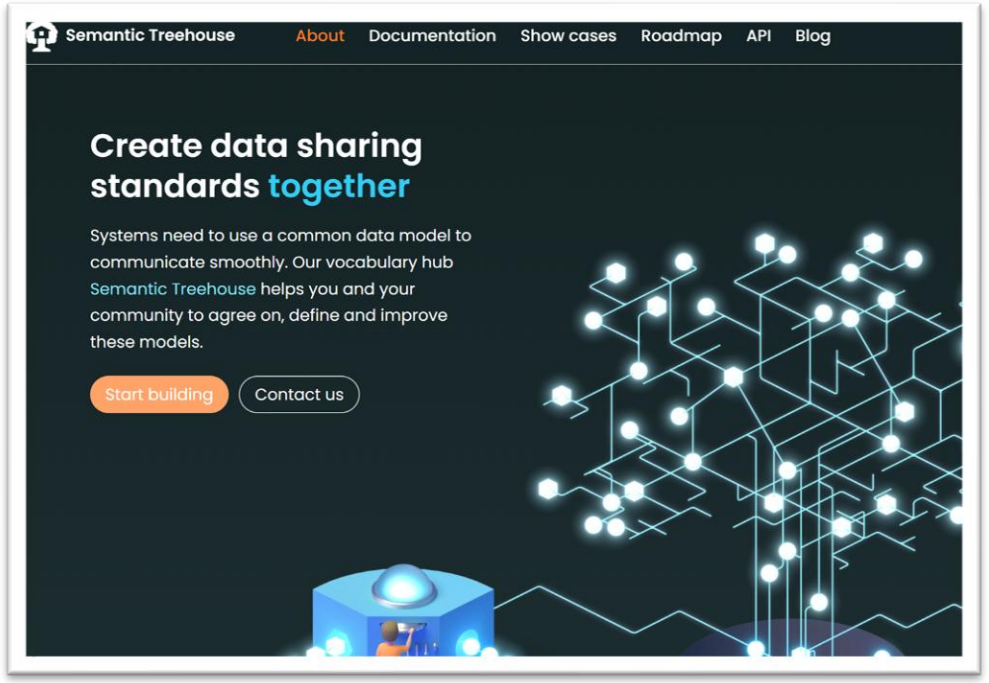
DSSC Toolbox (https://toolbox.dssc.eu/)



TNO Open Source (including documentation how to install)

DATA SPACES SUPPORT CENTRE





Control Plane

Data Plane

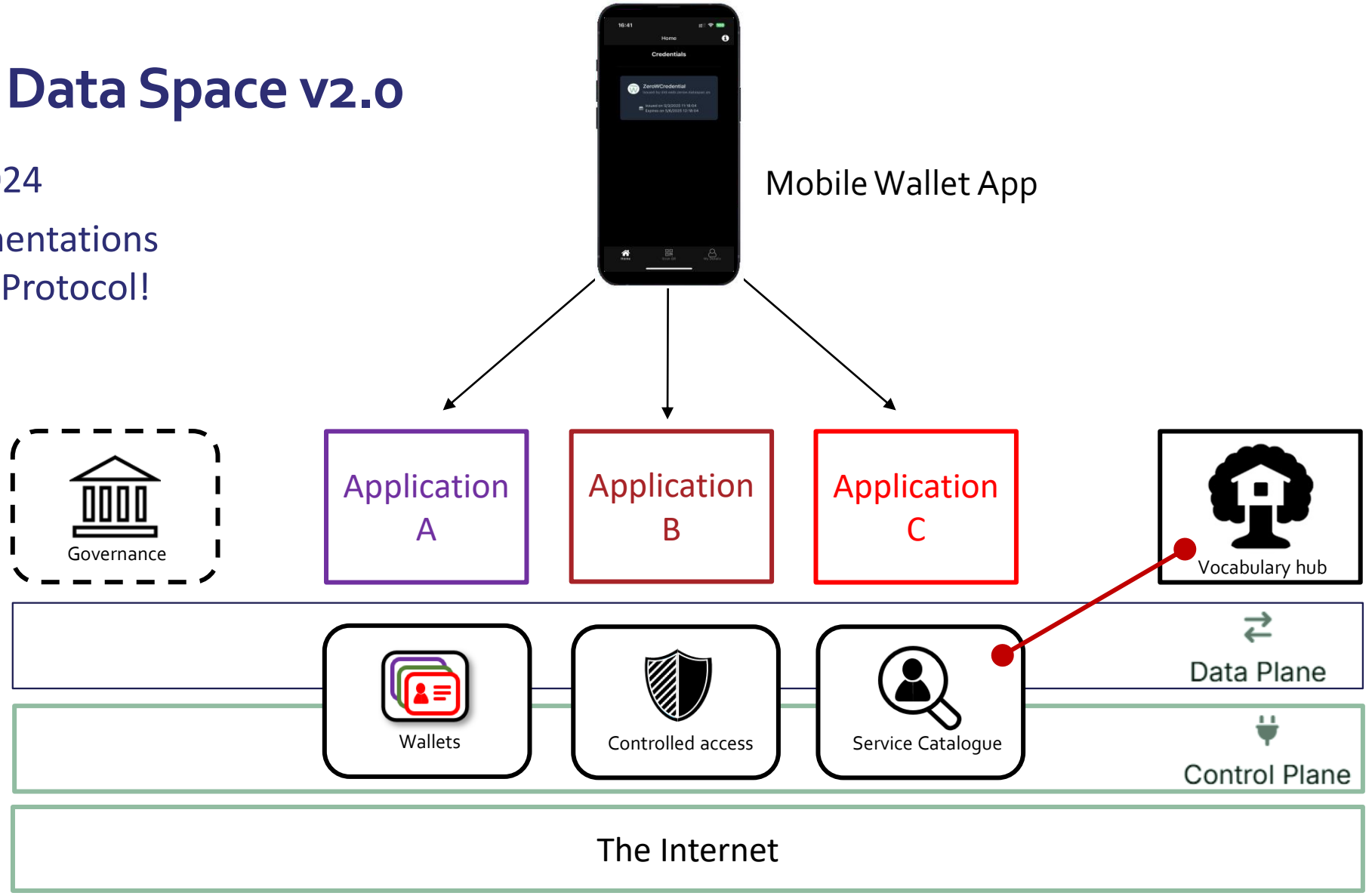
Catalogue

Vocabulary

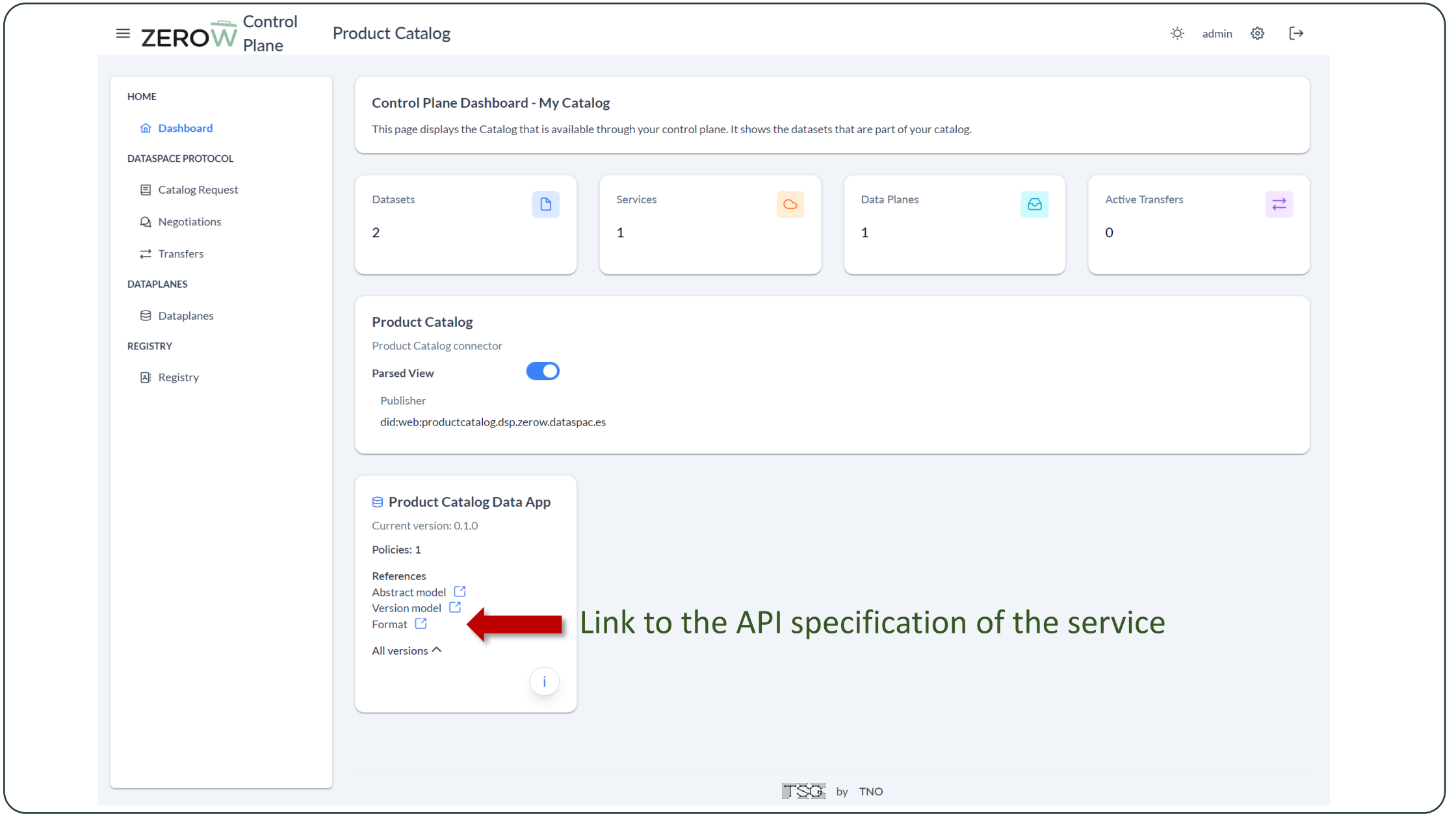
The ZEROW Data Space v2.0

Introduced Summer 2024

One of the first implementations of the new Data Space Protocol!

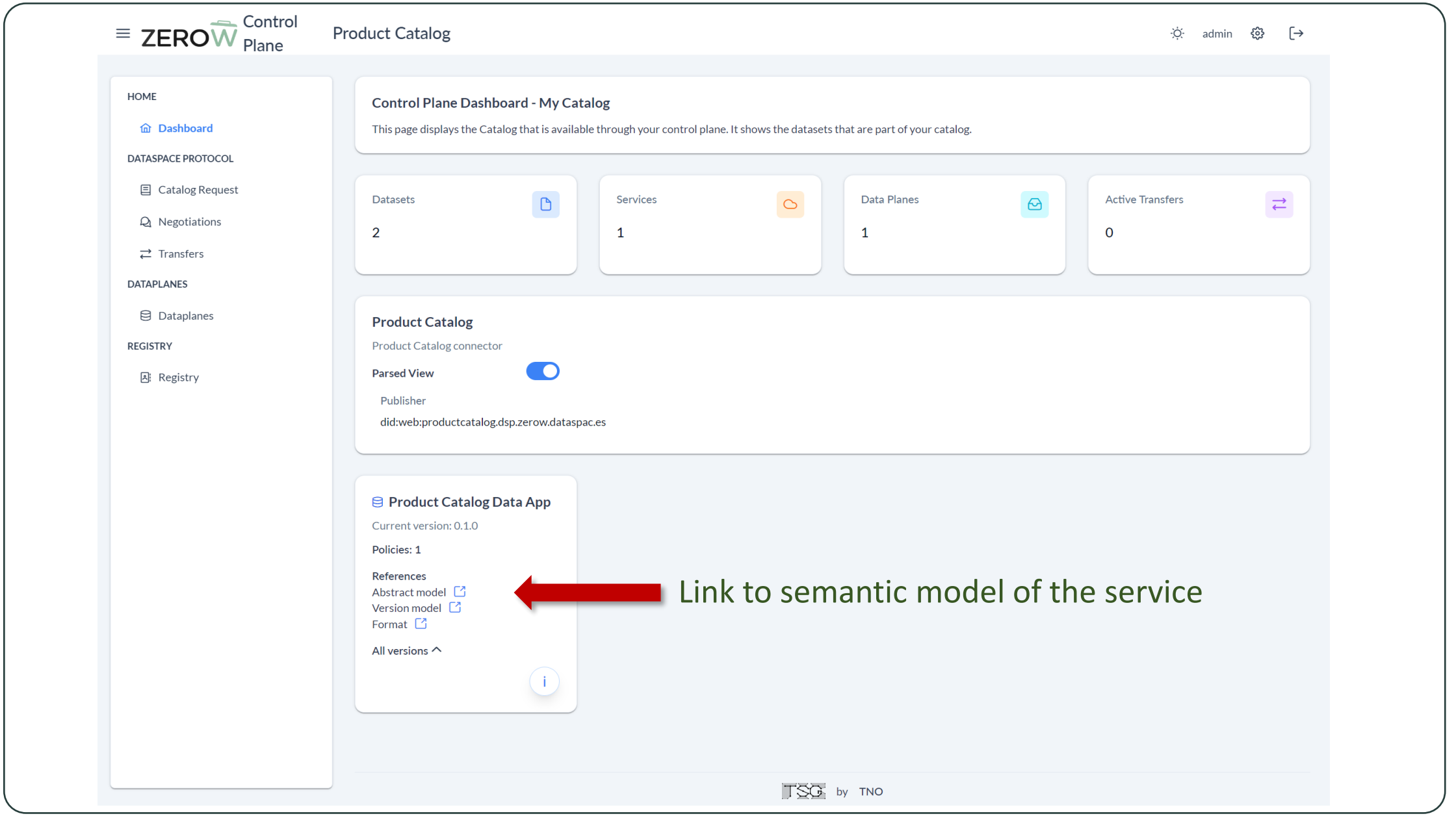


More standardized, means a more sustainable solution


ZERO Control Plane
Product Catalog
admin
HOME
Dashboard
DATASPACE PROTOCOL
Catalog Request
Negotiations
Transfers
DATAPLANES
Dataplanes
REGISTRY
Registry
Control Plane Dashboard - My Catalog
This page displays the Catalog that is available through your control plane. It shows the datasets that are part of your catalog.
Datasets
2
Services
1
Data Planes
1
Active Transfers
0
Product Catalog
Product Catalog connector
Parsed View
Publisher
did:web:productcatalog.dsp.zerow.dataspac.es
Product Catalog Data App
Current version: 0.1.0
Policies: 1
References
Abstract model
Version model
Format
All versions
Link to the API specification of the service
by TNO

```
{
    "openapi": "3.0.0",
    "paths": {
        "/": {
            "get": {
                "operationId": "AppController_getHello",
                "parameters": [],
                "responses": {
                    "200": {
                        "description": ""
                    }
                }
            }
        },
        "/product": {
            "post": {
                "operationId": "ProductController_create",
                "parameters": [],
                "requestBody": {
                    "required": true,
                    "content": {
                        "application/json": {
                            "schema": {
                                "$ref": "#/components/schemas/CreateProductDto"
                            }
                        }
                    }
                },
                "responses": {
                    "201": {
                        "description": ""
                    }
                },
                "tags": [
                    "Products"
                ]
            },
            "get": {
                "operationId": "ProductController_findAll",
                "parameters": [
                    {
                        "name": "page",
                        "required": false,
                        "in": "query",
                        "schema": {
                            "minimum": 1,
                            "default": 1,
                            "type": "number"
                        }
                    },
                    {
                        "name": "take",
                        "required": false,
                        "in": "query",
                        "schema": {
                            "minimum": 1,
                            "maximum": 50,
                            "default": 10,
                            "type": "number"
```


API specification,
required for integration


ZERO Control Plane
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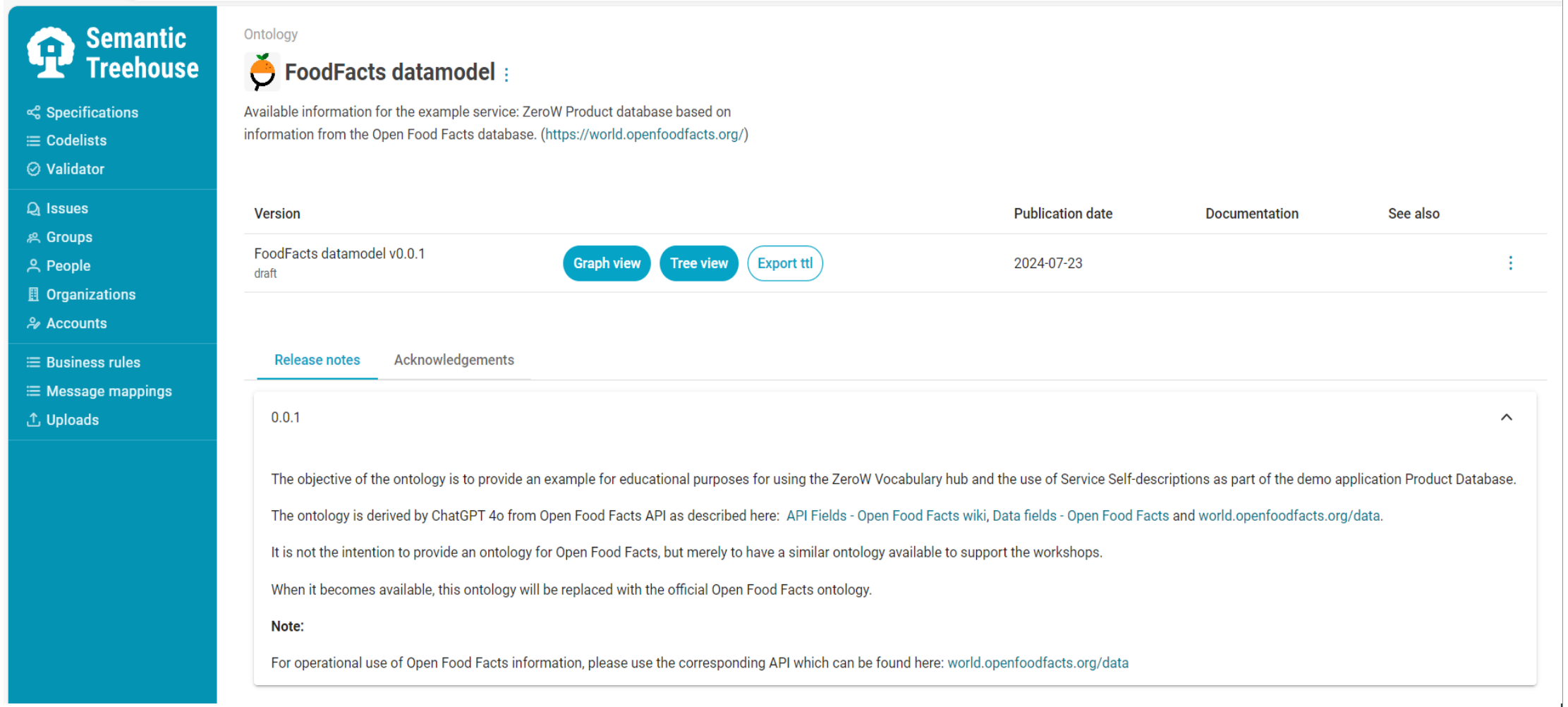
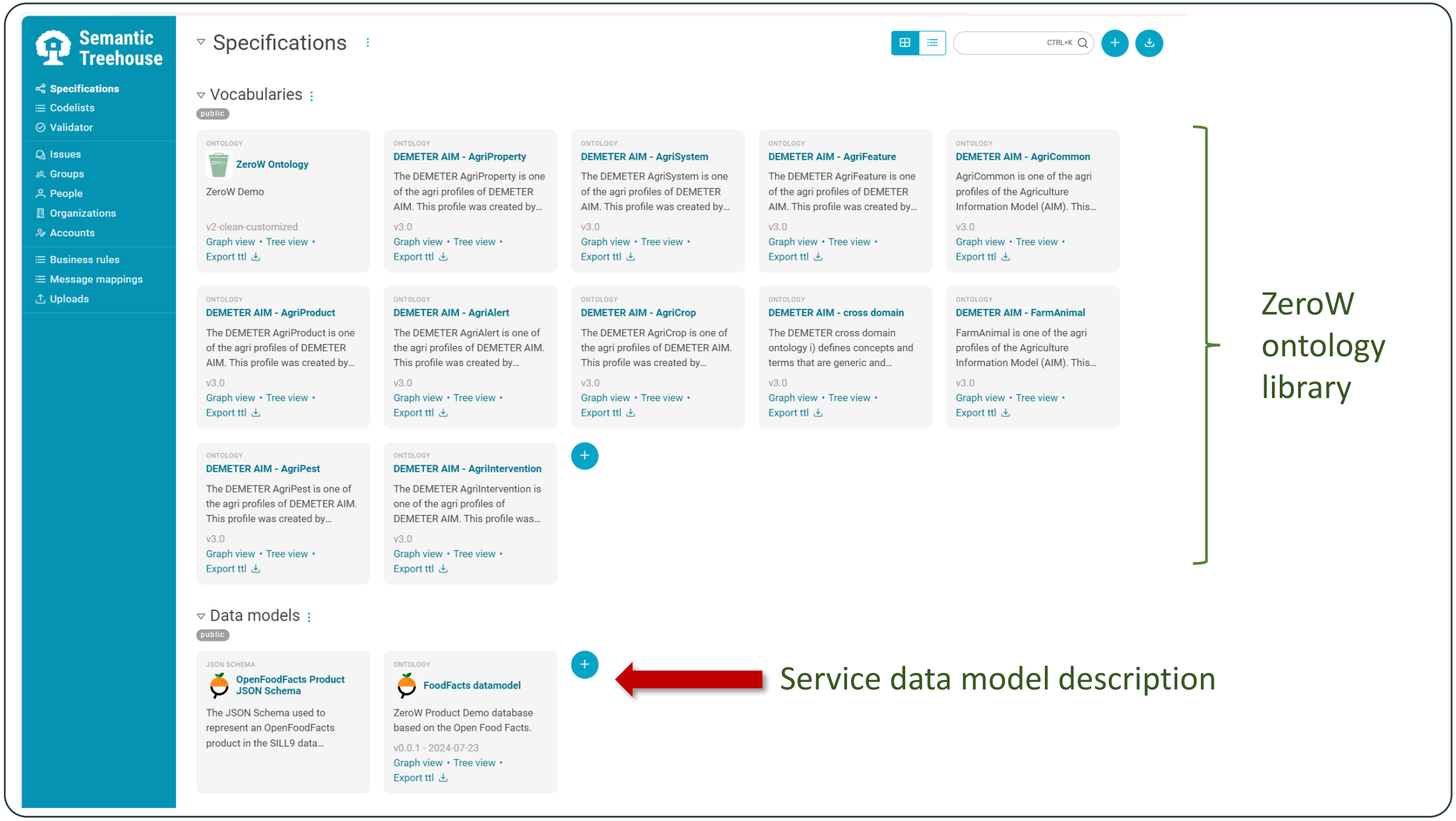
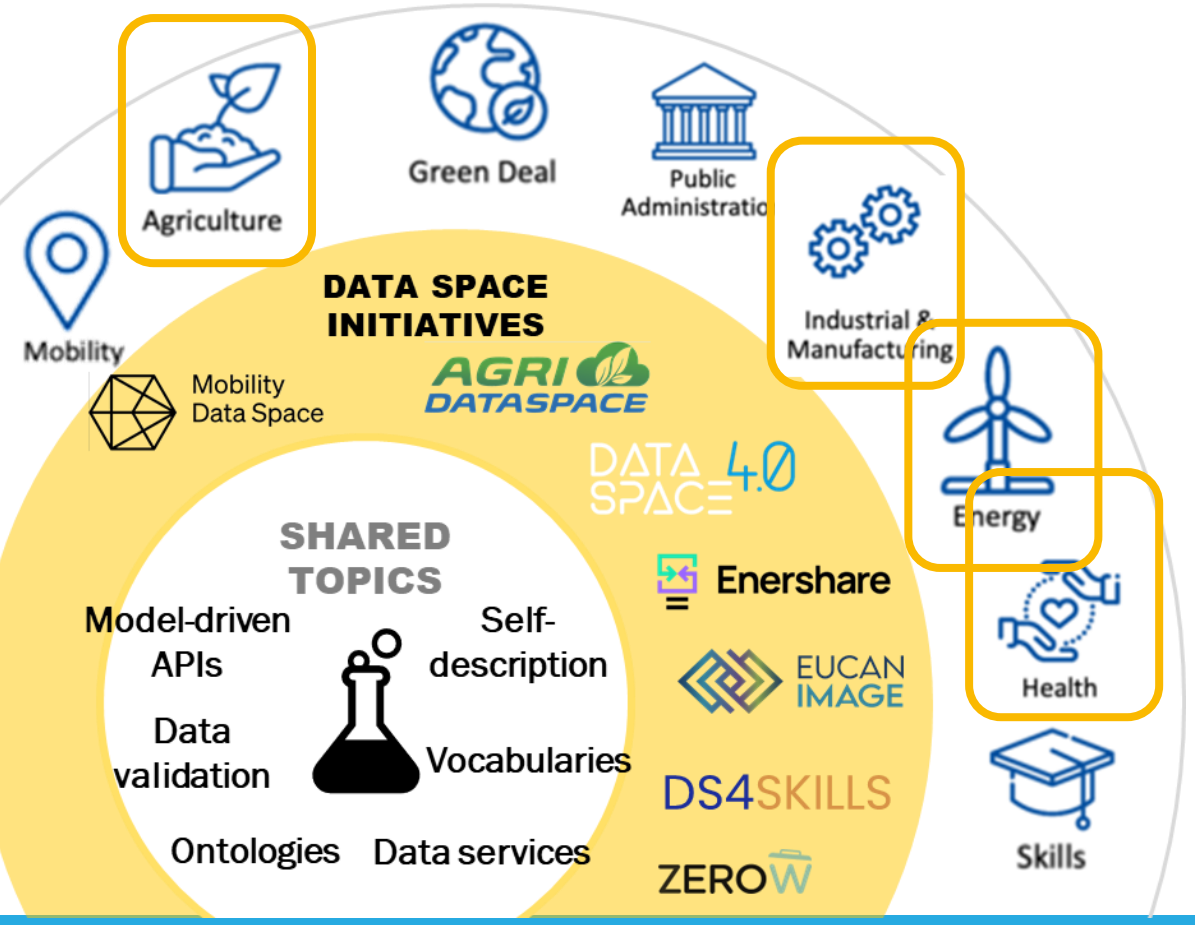
did:web:productcatalog.dsp.zerow.dataspac.es
Product Catalog Data App
Current version: 0.1.0
Policies: 1
References
Abstract model
Version model
Format
All versions
Link to semantic model of the service
by TNO


Semantic Treehouse
Specifications
Codelists
Validator
Issues
Groups
People
Organizations
Accounts
Business rules
Message mappings
Uploads
Ontology
FoodFacts datamodel
Available information for the example service: ZeroW Product database based on information from the Open Food Facts database. (https://world.openfoodfacts.org/)
Version
Publication date
Documentation
See also
FoodFacts datamodel v0.0.1
draft
Graph view
Tree view
Export ttl
2024-07-23
Release notes
Acknowledgements
0.0.1
The objective of the ontology is to provide an example for educational purposes for using the ZeroW Vocabulary hub and the use of Service Self-descriptions as part of the demo application Product Database.
The ontology is derived by ChatGPT 4o from Open Food Facts API as described here: API Fields - Open Food Facts wiki, Data fields - Open Food Facts and world.openfoodfacts.org/data.
It is not the intention to provide an ontology for Open Food Facts, but merely to have a similar ontology available to support the workshops.
When it becomes available, this ontology will be replaced with the official Open Food Facts ontology.
Note:
For operational use of Open Food Facts information, please use the corresponding API which can be found here: world.openfoodfacts.org/data


Semantic Treehouse
Specifications
Codelists
Validator
Issues
Groups
People
Organizations
Accounts
Business rules
Message mappings
Uploads
Specifications
CTRL+K
Vocabularies
public
ONTOLOGY
ZeroW Ontology
ZeroW Demo
v2-clean-customized
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriProperty
The DEMETER AgriProperty is one of the agri profiles of DEMETER AIM. This profile was created by...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriSystem
The DEMETER AgriSystem is one of the agri profiles of DEMETER AIM. This profile was created by...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriFeature
The DEMETER AgriFeature is one of the agri profiles of DEMETER AIM. This profile was created by...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriCommon
AgriCommon is one of the agri profiles of the Agriculture Information Model (AIM). This...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriProduct
The DEMETER AgriProduct is one of the agri profiles of DEMETER AIM. This profile was created by...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriAlert
The DEMETER AgriAlert is one of the agri profiles of DEMETER AIM. This profile was created by...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriCrop
The DEMETER AgriCrop is one of the agri profiles of DEMETER AIM. This profile was created by...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - cross domain
The DEMETER cross domain ontology i) defines concepts and terms that are generic and...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - FarmAnimal
FarmAnimal is one of the agri profiles of the Agriculture Information Model (AIM). This...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriPest
The DEMETER AgriPest is one of the agri profiles of DEMETER AIM. This profile was created by...
v3.0
Graph view • Tree view •
Export ttl
ONTOLOGY
DEMETER AIM - AgriIntervention
The DEMETER AgriIntervention is one of the agri profiles of DEMETER AIM. This profile was...
v3.0
Graph view • Tree view •
Export ttl
ZeroW ontology library
Data models
public
JSON SCHEMA
OpenFoodFacts Product JSON Schema
The JSON Schema used to represent an OpenFoodFacts product in the SILL9 data...
ONTOLOGY
FoodFacts datamodel
ZeroW Product Demo database based on the Open Food Facts.
v0.0.1 - 2024-07-23
Graph view • Tree view •
Export ttl
Service data model description

Data spaces require solutions for semantic interoperability



DATA SPACES SUPPORT CENTRE

Business & Organisational Building Blocks

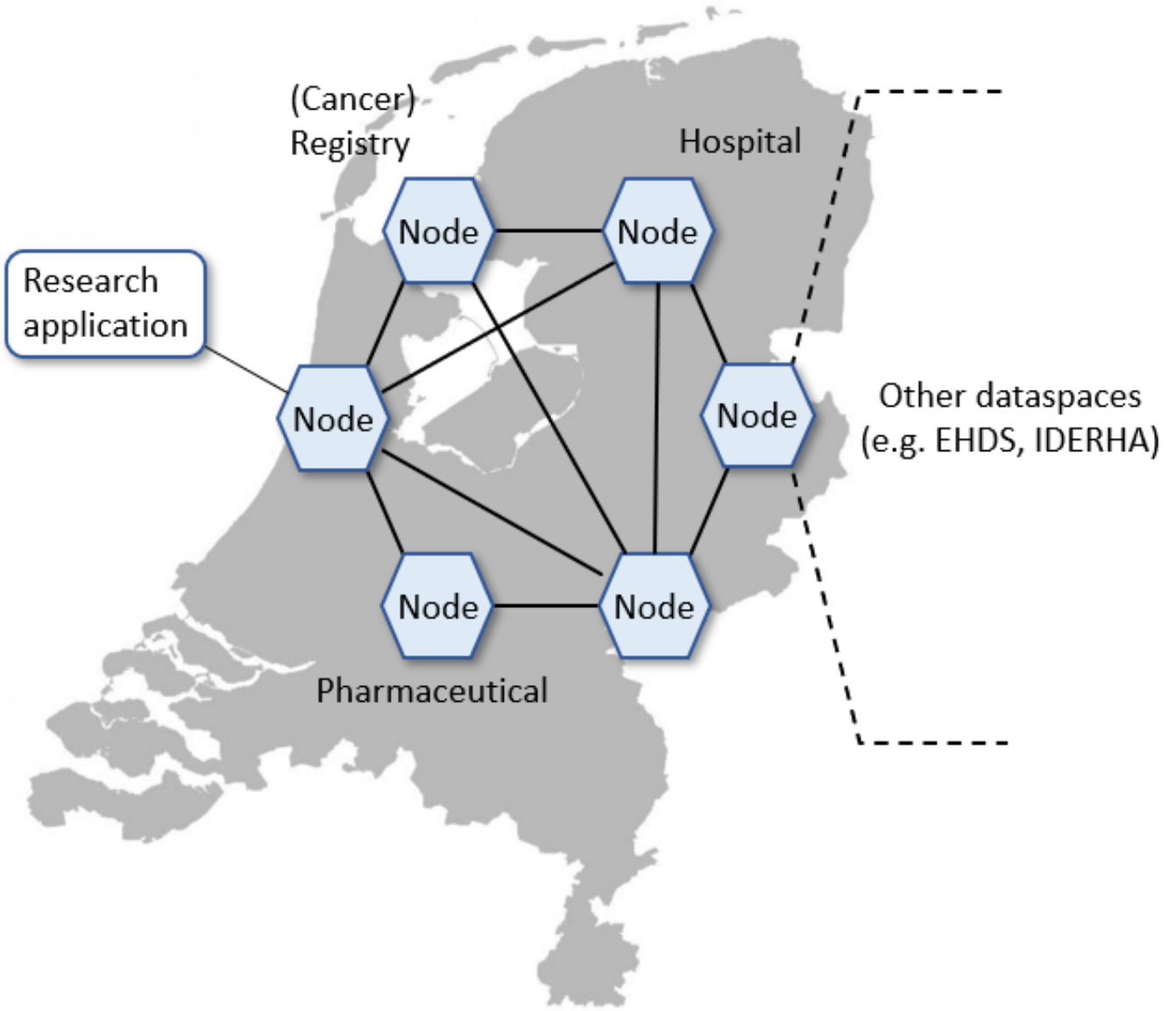
Business	*Governance*	*Legal*
Business model development	Organisational form & governance authority	Regulatory compliance
Use case development	Participation management	Contractual framework
Data product development		
Data space intermediary		

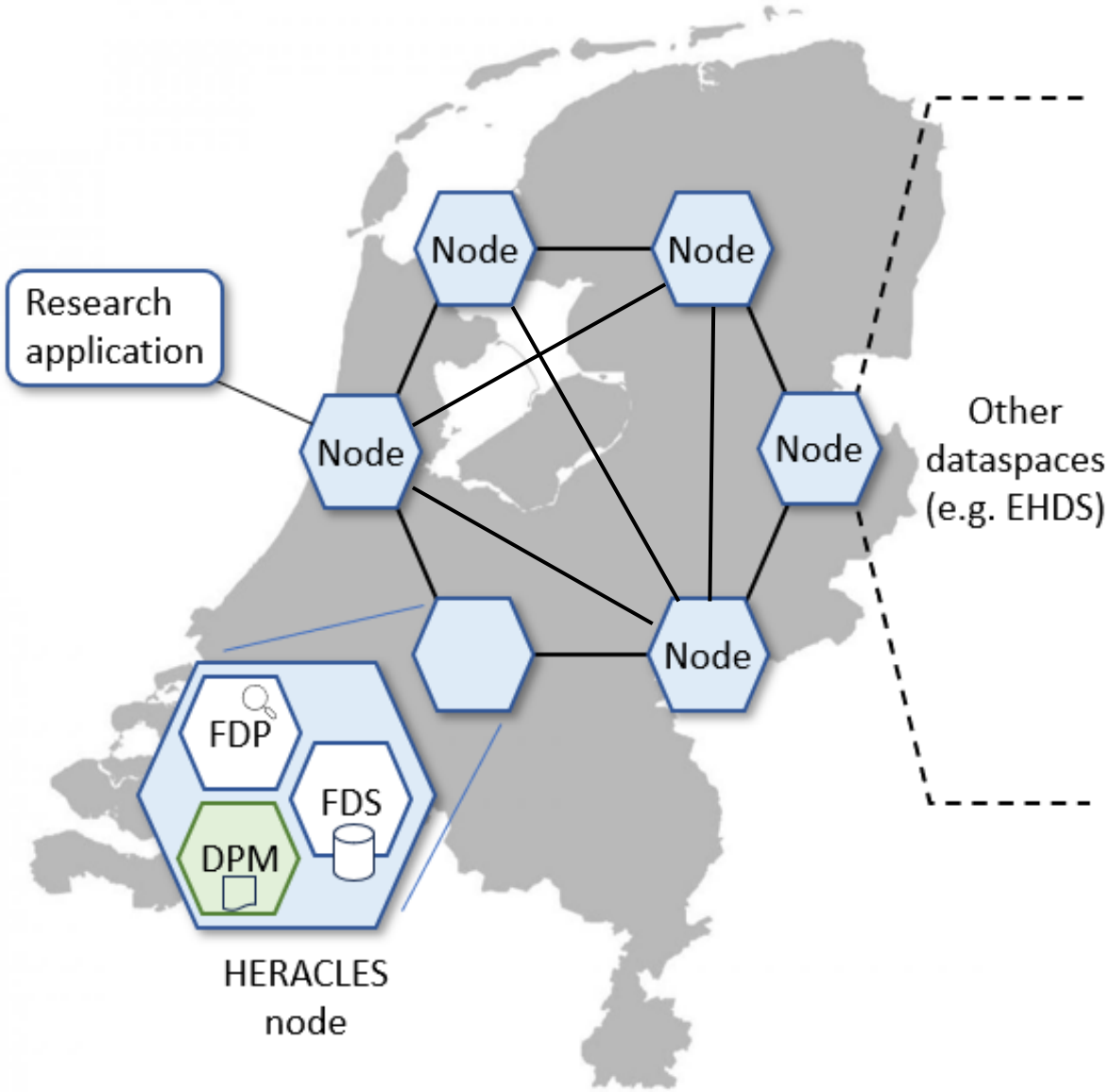
Technical Building Blocks

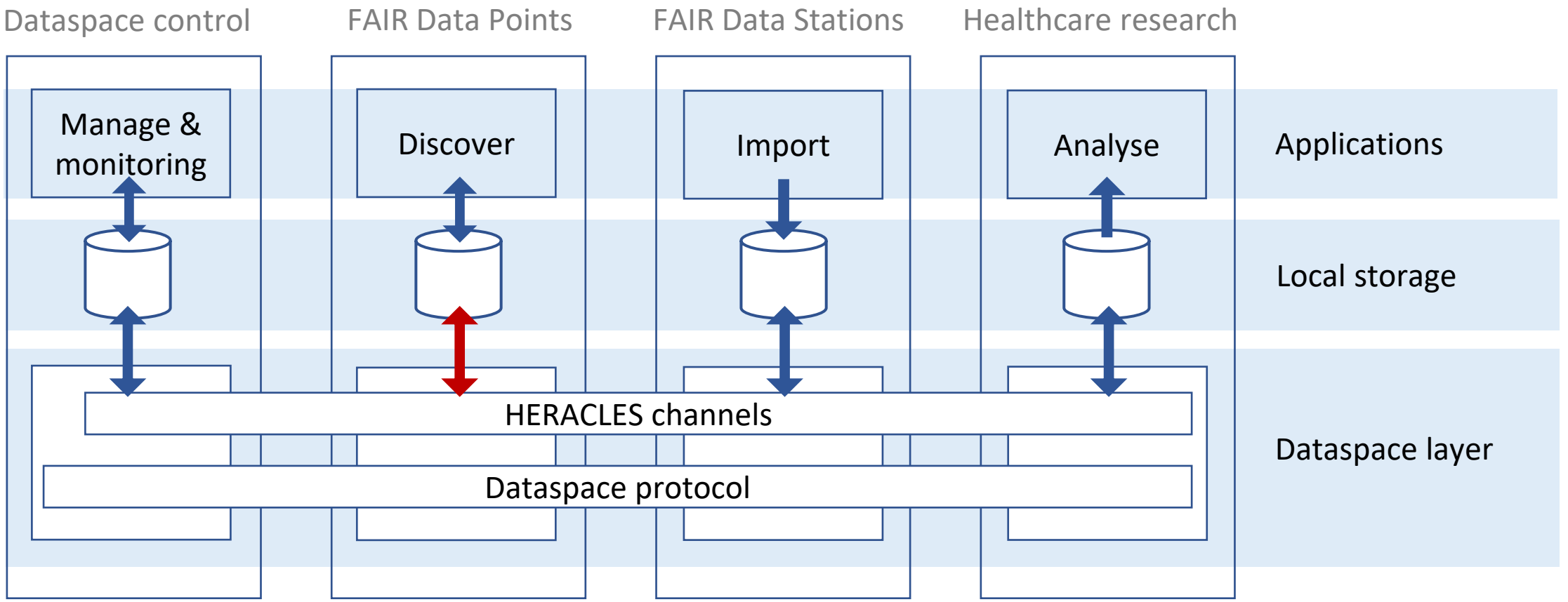
Data Interoperability	*Data Sovereignty & Trust*	*Data Value Creation Enablers*
Data models	Access & usage policies and enforcement	Data, services & offerings descriptions
Data exchange	Identity & attestation management	Publication & discovery
Provenance & traceability	Trust framework	Value added services

HERACLES

A privacy preserving dataspace for cancer research


(Cancer)
Registry
Hospital
Node
Node
Research
application
Node
Node
Other dataspaces
(e.g. EHDS, IDERHA)
Node
Node
Pharmaceutical

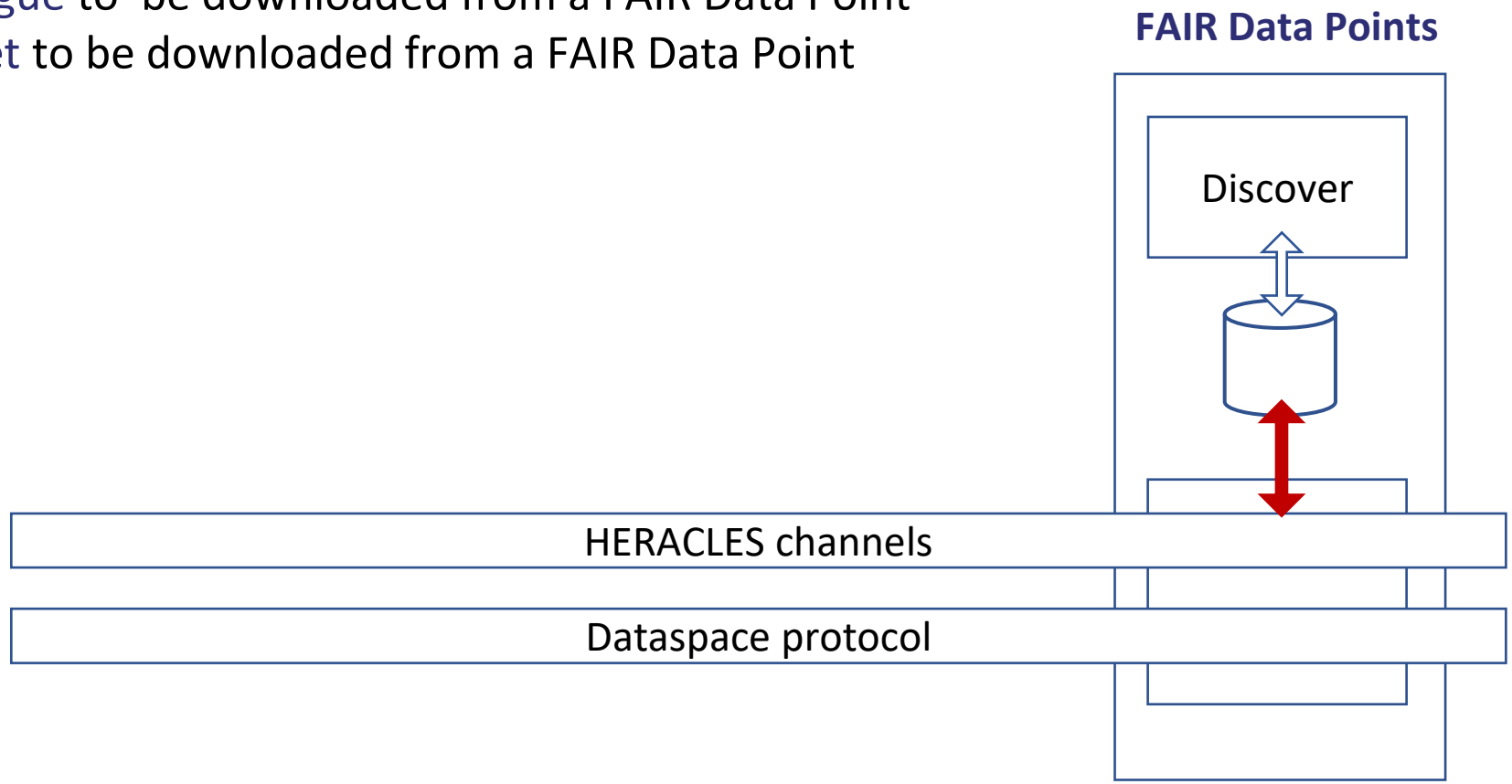

Node
Node
Research application
Node
Node
Other dataspaces (e.g. EHDS)
Node
FDP
FDS
DPM
HERACLES node


Dataspace control
FAIR Data Points
FAIR Data Stations
Healthcare research
Manage & monitoring
Discover
Import
Analyse
Applications
Local storage
HERACLES channels
Dataspace protocol
Dataspace layer

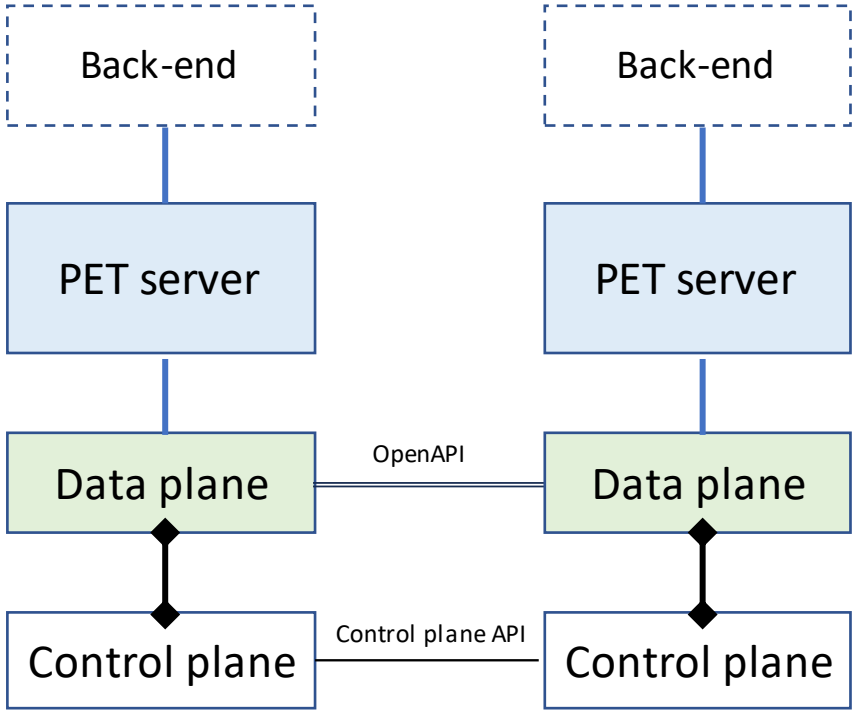
Data Space Protocol – Catalogue API

Functional requirements for a catalogue API:

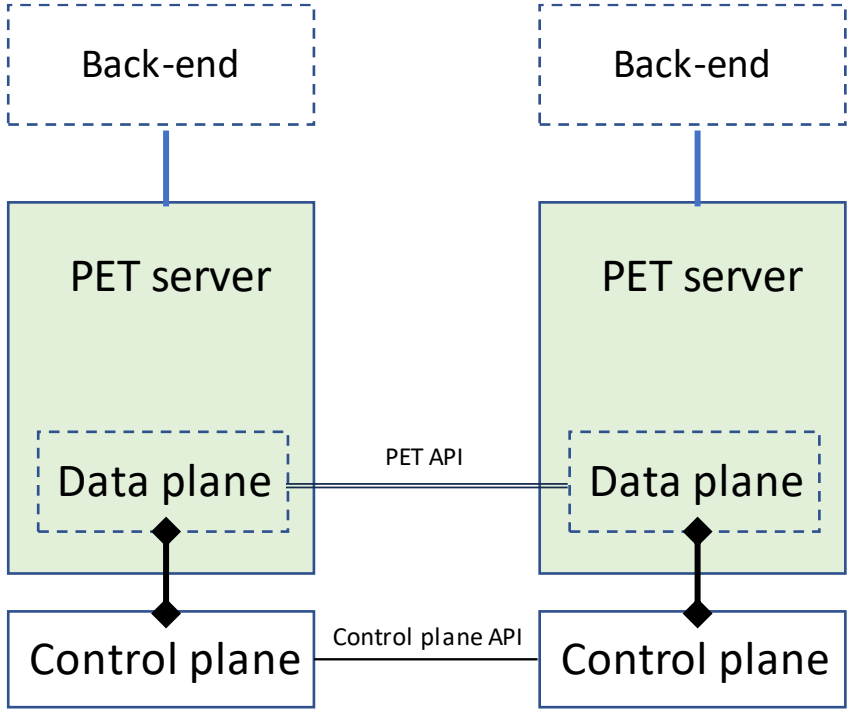
- Request a catalogue to be downloaded from a FAIR Data Point
- Request a dataset to be downloaded from a FAIR Data Point



Privacy Enhancing Technology (PET) for HealthCare domain

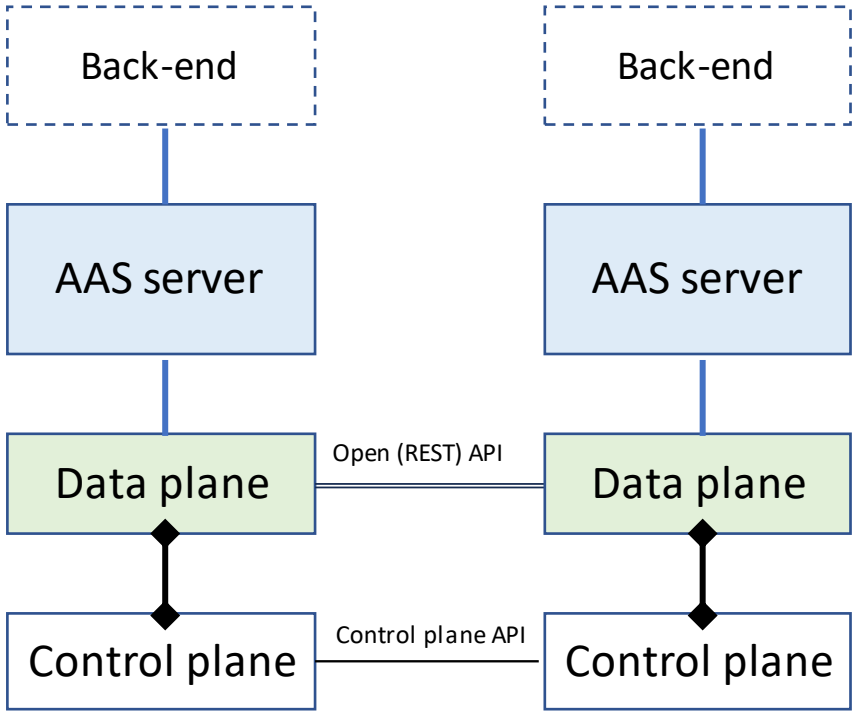


Option A: data plane as separate component

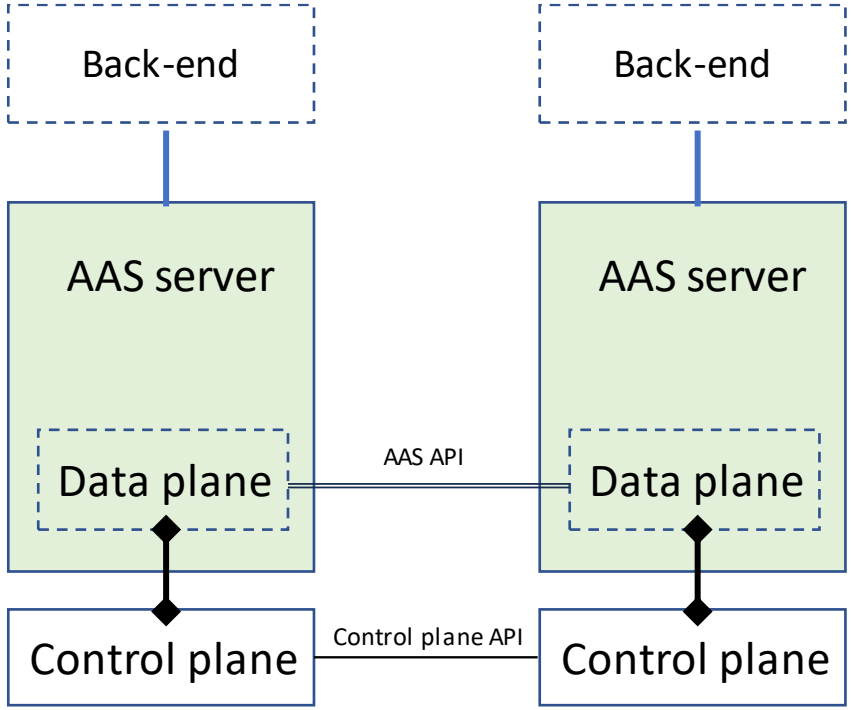


Option B: PET server connected to control plane

Asset Administration Shell (AAS) for Manufacturing Data Space

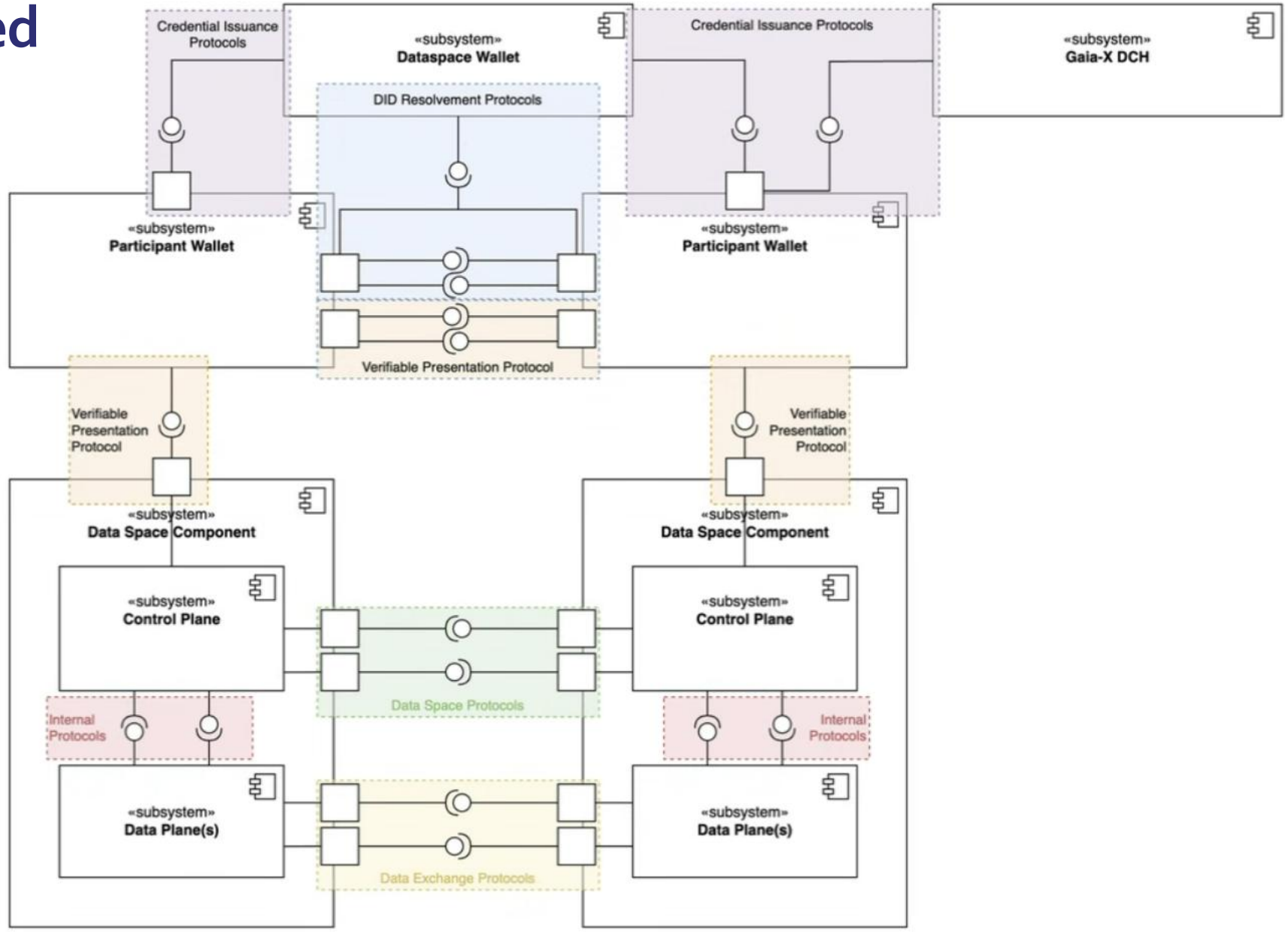


Option A: data plane as separate component



Option B: AAS server connected to control plane

Overview required interface specification standards



Conformity Assessment Policy and Credential Profile

Eclipse
Data Rights policies Protocol (DRP)

Eclipse
Decentralized Claims Protocol (DCP)

Policy & Credential Profiles
ODRL policy model, subject format VC

Proposed standard by EDWG

DID Resolve Protocol
Between Wallets and Data Space Wallet

Existing did:web standard

Credential Issuance Protocol
Between Wallets and Data Space Wallet

Proposed standard by EDWG

Verifiable Presentation Protocol
Between Wallets and Control plane

Proposed standard by EDWG

Data Space Protocol
Between Control Plane components

Data Exchange Protocols
Between Data Plane components

Questions ?

Thank you for your attention!

Any Questions?

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This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101135988

Backup slides

Global & European Standards

Foundational (global) technical standards

- W3C DCAT → for describing your datasets and services
- W3C ODRL → for defining (technical) access and usage policies
- W3C VC/VP → for the exchange of identities and attestations
- W3C RDF → for specifying semantic models

+

Protocols

- Dataspace Protocol (DCAT/ODRL)
- DCP + OID4VC (VC/VP)

(IDSA, Gaia-X, Eclipse and others)

=

Key technical specifications for data space services

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Legal requirements

- Data Act (e.g. article 33)
- eIDAS
- Data Governance Act

+

Harmonised EU Standards

- CEN/CENELEC + ETSI
- JTC25
- Data Act standardisation request

+

Domain specific choices

- Policies
- Data Models
- APIs

=

Technical rulebook for your data space initiative