

Contextualising the Exchange of Data on the Web

Beatriz Esteves
August 5th, 2025

Beatriz is 31 years-old

Beatriz is 31 years-old

Beatriz is 32 years-old

Beatriz is 31 years-old

Beatriz is 32 years-old

Beatriz is 33 years-old

Without context
Data is Valueless

Age Verification

**Personal data is used to prove that
Beatriz is over 18**

Contextualising the Exchange of Data on the Web

Why does our data need context?

Trust envelopes as vehicles of contextualised data

How are we building trust envelopes?

Where we are and where we want to go

Contextualising the Exchange of Data on the Web

Why does our data need context?

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Where we are and where we want to go

p→purpose
lb→legal basis

Uses age
to personalise
products
lb = consent

Uses age
to personalise
products
lb = consent

Uses age
to personalise
products
lb = consent

Uses age
to personalise
products
lb = consent



I want to share
my age
p = personalisation

I consent

I consent

I consent

I consent

Regulations

Regulations



Regulations



Regulations

Case law

Guidelines

Regulations

Case law

Guidelines

Compliance

Regulations

Case law

Guidelines

Compliance

Automation

Insights

Personalisation

Regulations

Case law

Guidelines



Compliance

Automation

Insights

Personalisation

GDPR Legal Bases (Art. 6)



CONSENT

The data subject has given consent to the processing of his or her personal data for one or more specific purposes



VITAL INTERESTS

Processing is necessary in order to protect the vital interests of the data subject or of another natural person



CONTRACT

Processing is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract



PUBLIC INTEREST

Processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller



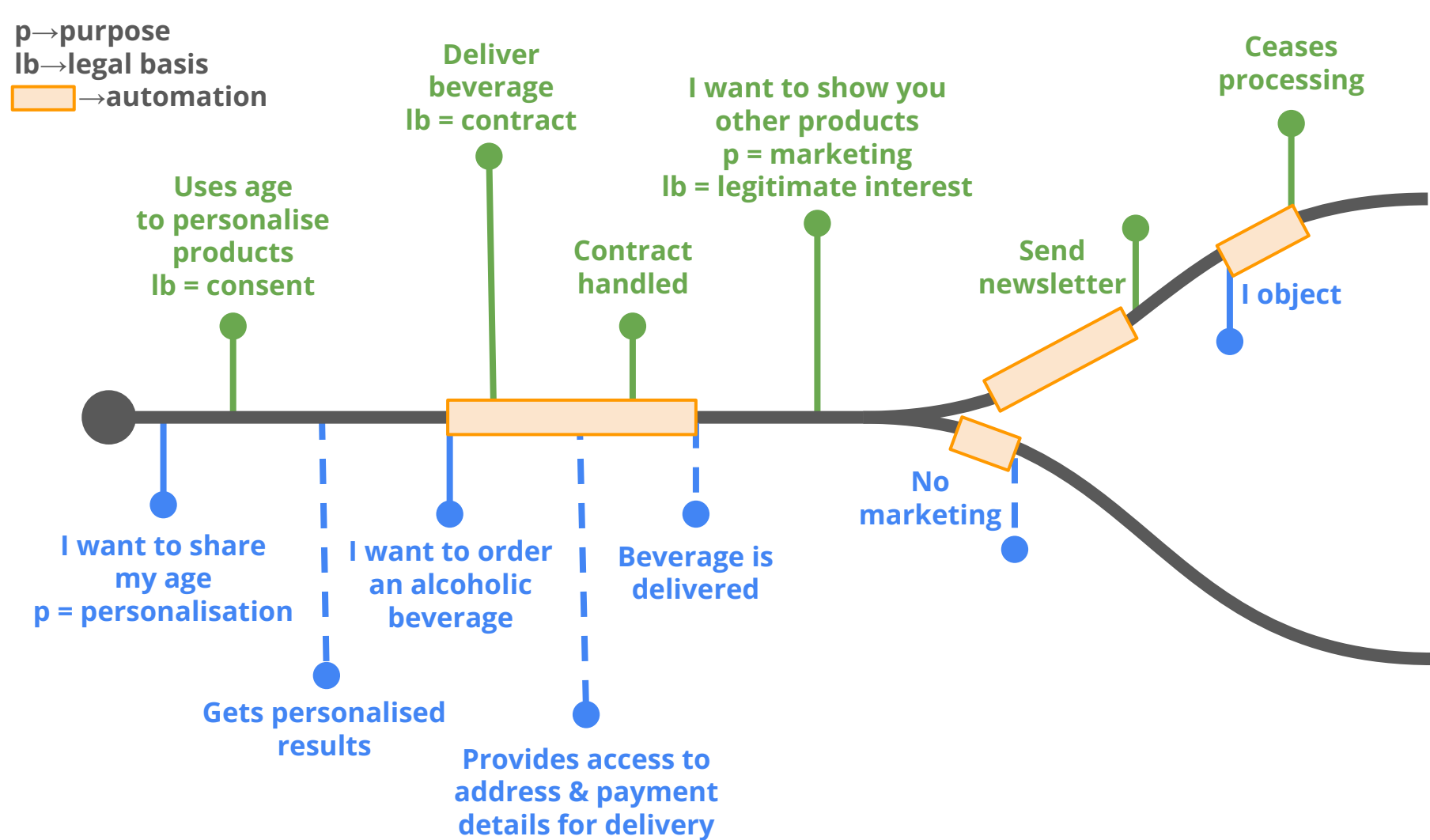
LEGAL OBLIGATION

Processing is necessary for compliance with a legal obligation to which the controller is subject



LEGITIMATE INTEREST

Processing is necessary for the purposes of the legitimate interests pursued by the controller or by a third party, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data, in particular where the data subject is a child



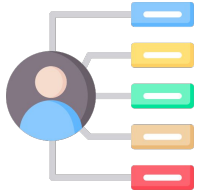
Contextualising the Exchange of Data on the Web

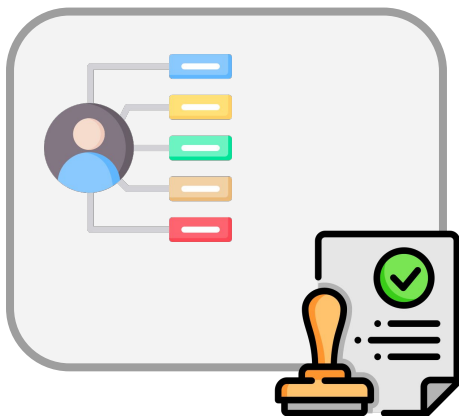
Why does our data need context?

Trust envelopes as vehicles of contextualised data

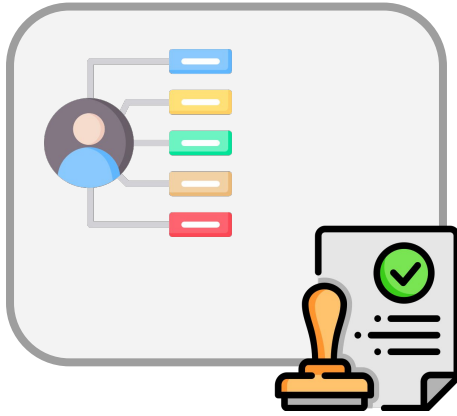
How are we building trust envelopes?

Where we are and where we want to go





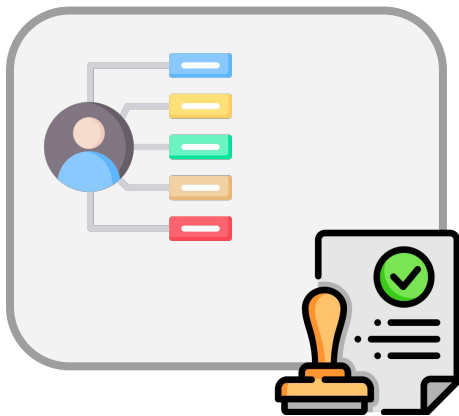
Verifiable data



Verifiable data



Data Provenance



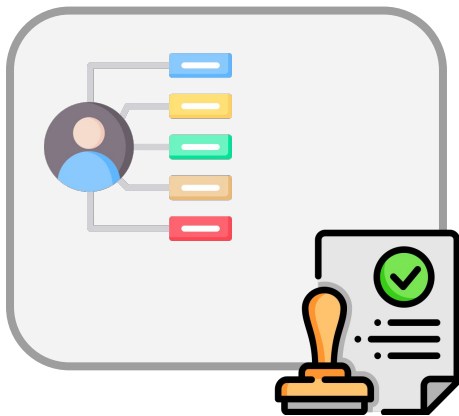
Verifiable data



Instantiated policy



Data Provenance



Verifiable data



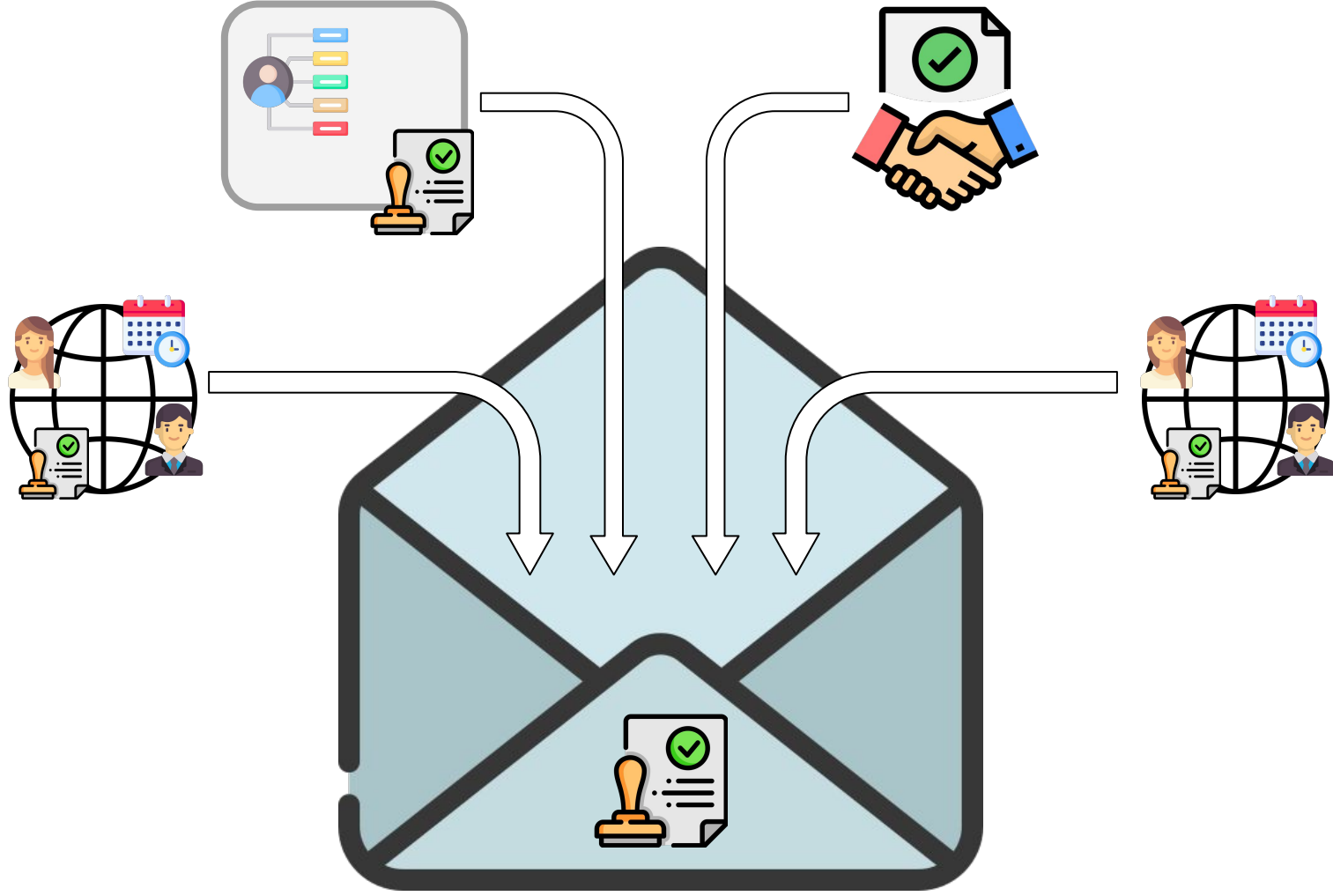
Instantiated policy



Data Provenance



Policy Provenance



Contextualising the Exchange of Data on the Web

Why does our data need context?

Trust envelopes as vehicles of contextualised data

How are we building trust envelopes?

Where we are and where we want to go

Regulations

Case law

Guidelines



Compliance

Automation

Insights

Personalisation

Standards

Regulations

Case law

Guidelines

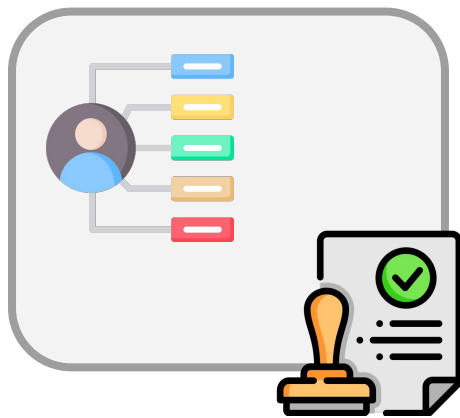


Compliance

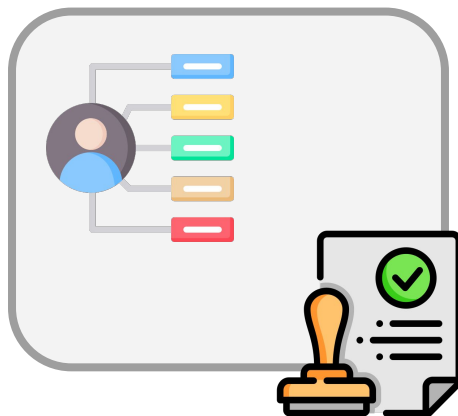
Automation

Insights

Personalisation



Verifiable data



Verifiable data

<https://www.w3.org/TR/vc-data-model-2.0/>

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Verifiable Credentials Data Model v2.0

W3C Recommendation 15 May 2025

▼ More details about this document

This version:
<https://www.w3.org/TR/2025/REC-vc-data-model-2.0-20250515/>

Latest published version:
<https://www.w3.org/TR/vc-data-model-2.0/>

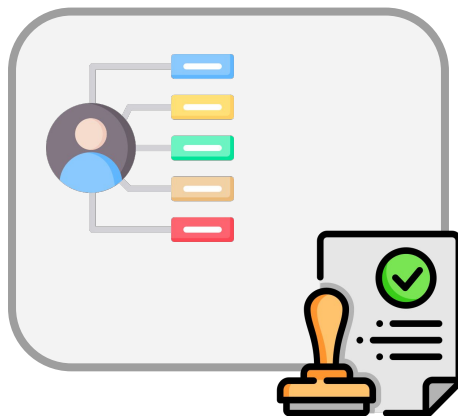
Latest editor's draft:
<https://w3c.github.io/vc-data-model/>

History:
<https://www.w3.org/standards/history/vc-data-model-2.0/>
[Commit history](#)

Implementation report:
<https://w3c.github.io/vc-data-model-2.0-test-suite/>

Editors:
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Verifiable data

<https://www.w3.org/TR/vc-data-model-2.0/>

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[Kyle Den Hartog](#) (MATTR) (v1.1)

Verifiable Credential

Credential Metadata

Claim(s)

Proof(s)

Verifiable Presentation

Presentation Metadata

Verifiable Credential(s)

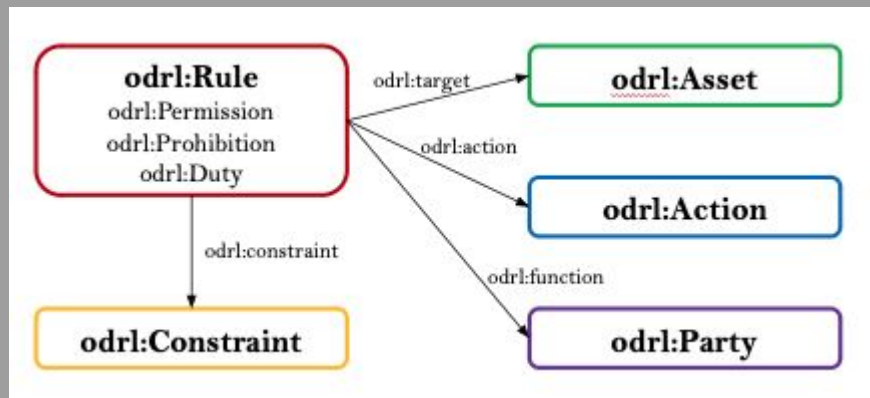
Proof(s)



Instantiated policy



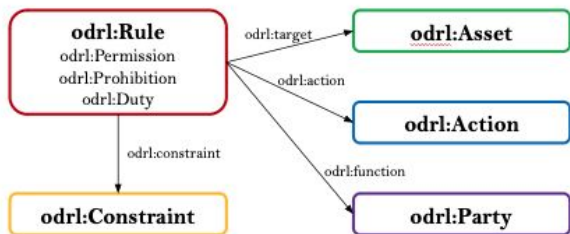
Instantiated policy



Who [can | cannot | must] act what
in which resource how



Instantiated policy



Who [can | cannot | must] act what
in which resource how

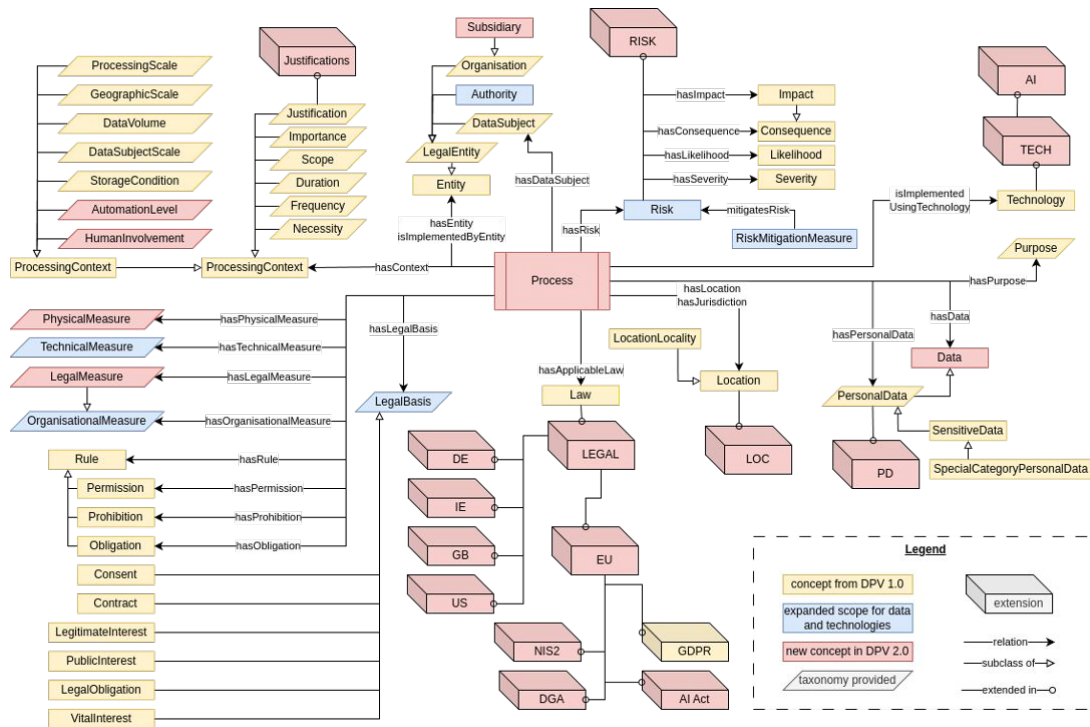
- W3C Recommendation
- Maintained by the W3C ODRL Community Group
- Composed by several specifications
 - ODRL Information Model – W3C Recommendation
 - ODRL Core Vocabulary – W3C Recommendation
 - ODRL Implementation Best Practices
 - ODRL Profile Best Practices
 - ODRL Formal Semantics [Under development]
- Easily extendable through the use of ODRL profiles

- Developed by the **W3C** Data Privacy Vocabularies and Controls Community Group (**DPVCG**)
- Defines a **jurisdiction-agnostic** ontology for expressing metadata about the processing of personal data
- Provides **hierarchical taxonomies**, from abstract to more specific concepts, to instantiate specific concepts in practical use-cases
- Has **law-specific extensions**

<https://w3id.org/dpv>

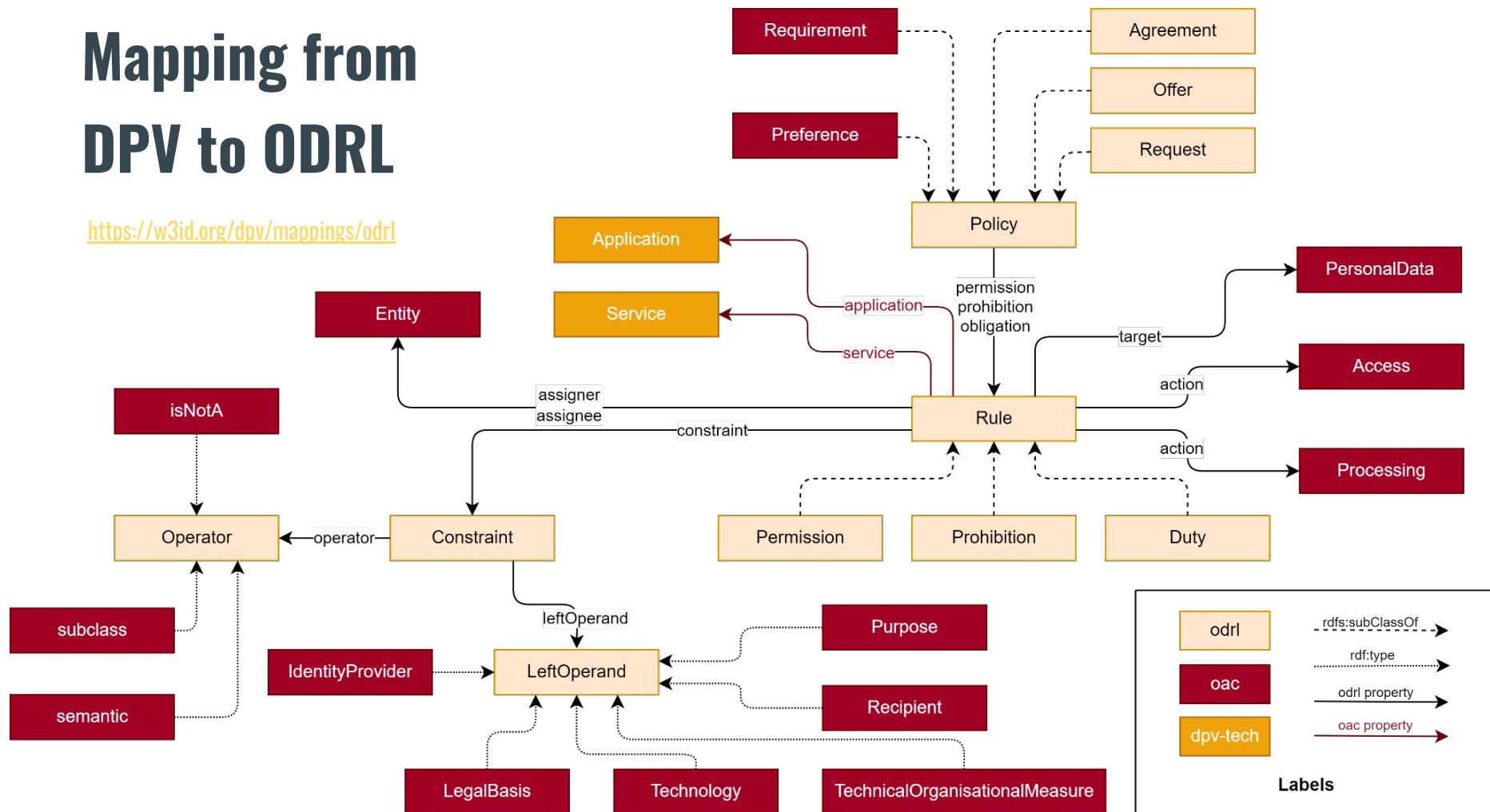
<https://w3id.org/dpv/primer>

Data Privacy Vocabulary (DPV)



Mapping from DPV to ODRL

<https://w3id.org/dpv/mappings/odrl>




```
ex:age-request a odrl:Set ;
  odrl:uid ex:age-request ;
  dct:terms:description "Beatriz allows her age data to be read for age verification." ;
  odrl:permission [
    odrl:action odrl:read ;
    odrl:target ex:age-data ;
    odrl:assigner ex:beatriz ;
    odrl:constraint [
      odrl:leftOperand dpv-odrl:Purpose ;
      odrl:operator odrl:eq ;
      odrl:rightOperand dpv:AgeVerification ] ] .
```

```
ex:age-request a odrl:Request ;
  odrl:uid ex:age-request ;
  dcterms:description "Drinks & Co. requests to read age data for age verification." ;
  odrl:permission [
    odrl:action odrl:read ;
    odrl:target ex:age-data ;
    odrl:assignee ex:beatriz ;
    odrl:constraint [
      odrl:leftOperand dpv-odrl:Purpose ;
      odrl:operator odrl:eq ;
      odrl:rightOperand dpv:AgeVerification ], [
      odrl:leftOperand dpv-odrl:LegalBasis ;
      odrl:operator odrl:eq ;
      odrl:rightOperand eu-gdpr:A6-1-a ] ] .
```

Interoperable Interpretation and Evaluation of ODRL Policies

Interoperable Interpretation and Evaluation of ODRL Policies



W3C Community Group
Draft Report

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 - 2.2 Evaluation Request
 - 2.3 Evaluation Report
- 3. Semantics of Policies**
 - 3.1 General semantics of Rules
- 4. Semantics of Permissions**
 - 4.1 Evaluation of Constraints
 - 4.2 Evaluation of Refinements
 - 4.3 Evaluation of Conditions (Duties)
- 5. Semantics of Prohibitions**
 - 5.1 Evaluation of a prohibition with constraints

ODRL Formal Semantics

Draft Community Group Report 01 August 2025

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<https://www.w3.org/formal-semantics/>

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[Yassir Sellami](#) (Gaia-X)

Feedback:
[GitHub w3c/odrl](#) (pull requests, new issue, open issues)
public-odrl@w3.org with subject line `[[formal-semantics]] - message topic -` (archives)

Copyright © 2025 the Contributors to the ODRL Formal Semantics Specification, published by the ODRL Community Group under the [W3C Community Contributor License Agreement \(CLA\)](#). A human-readable [summary](#) is available.

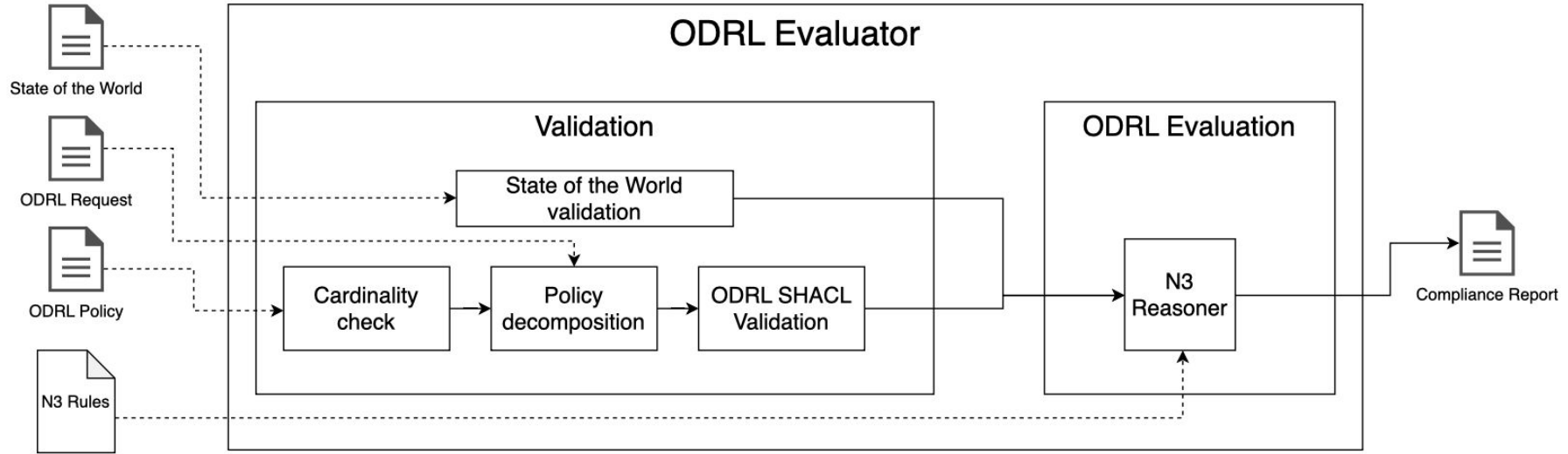
Abstract

This document specifies the expected behaviour of an ODRL Evaluator, a piece of software that performs computations based on a set of policies, a request and a certain state of the world.

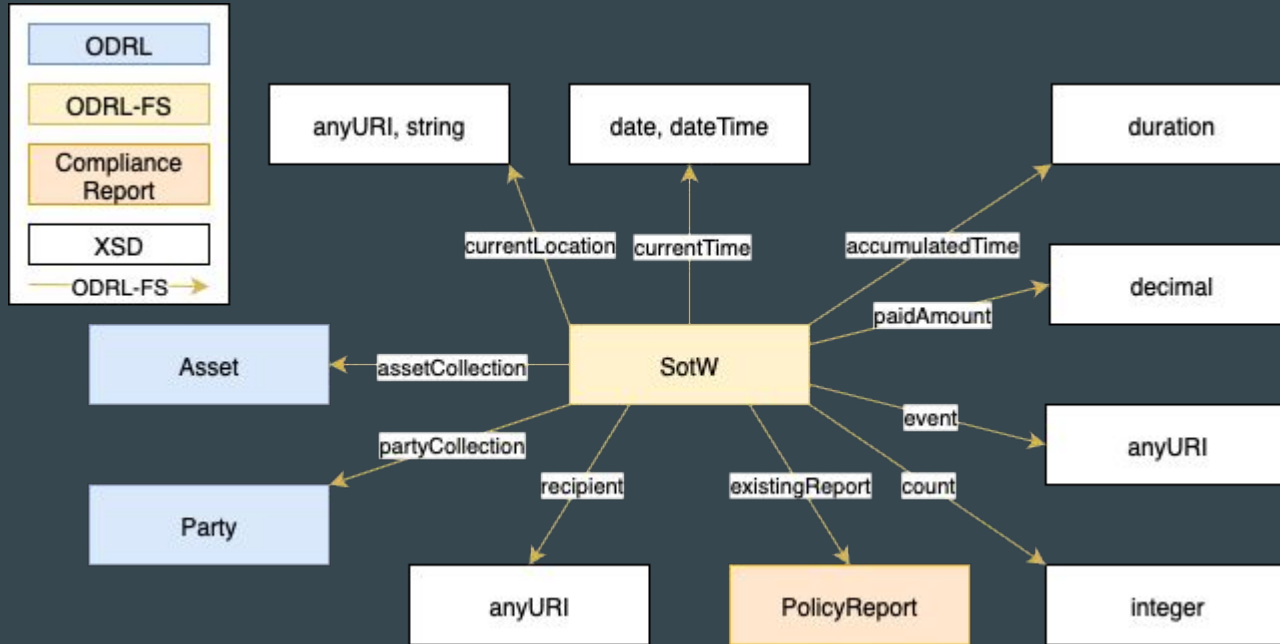
Status of This Document

<https://w3c.github.io/odrl/formal-semantics/>

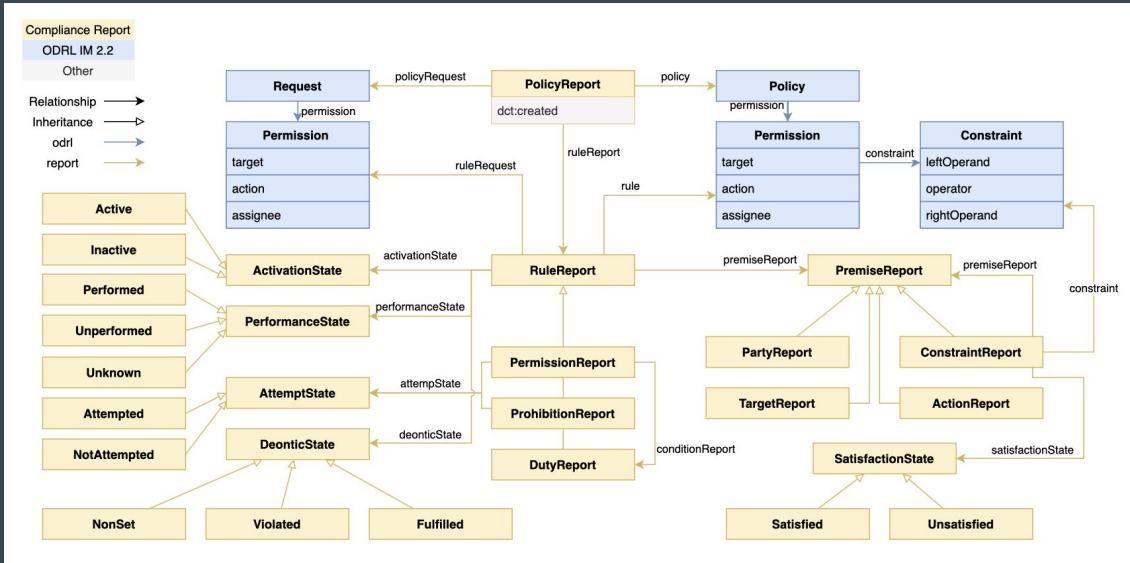
Interoperable Interpretation and Evaluation of ODRL Policies



State of the World Instantiation



Compliance Report Model

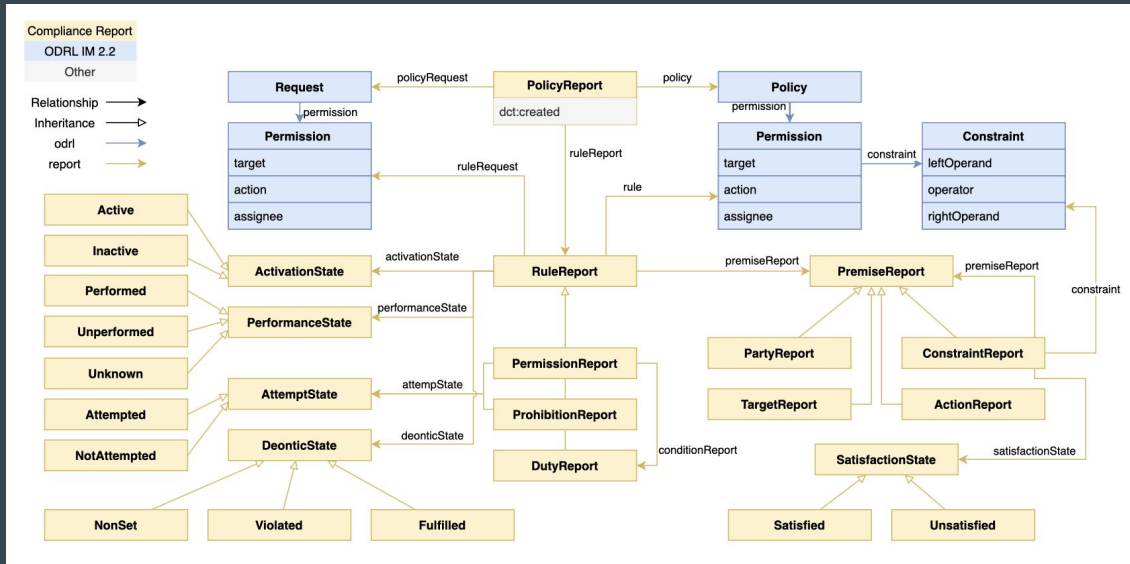


ESWC 2025

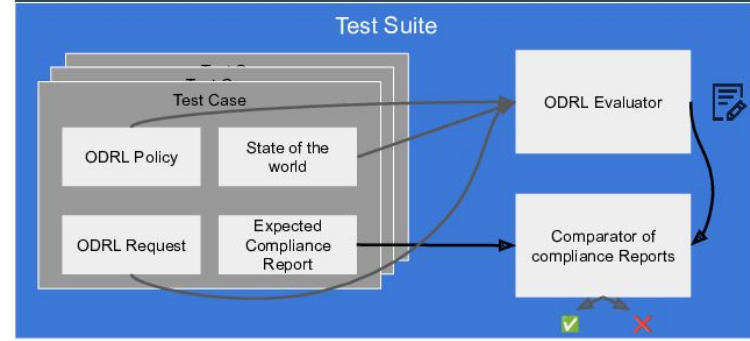
★ Best Resource Nominee

<https://w3id.org/force/compliance-report>

Interoperable Interpretation and Evaluation of ODRL Policies



<https://w3id.org/force/compliance-report>



<https://w3id.org/force/test-suite>

Agreement Instantiation

- Validate the proper modelling of the odrl:Policy, odrl:Request and SoTW information.
- Convert compact policies into their atomic equivalents.
- Evaluate policies to generate compliance reports.
- Reference the ODRL request that triggered the agreement instantiation and the policies from the data subject/holder.
- Instantiate the concrete assigner and assignee of the agreement.
- Include relevant rules with concrete actions, targets and constraints.



<https://w3id.org/force/evaluator>



<https://w3id.org/force>

Contextualising the Exchange of Data on the Web

Why does our data need context?

Trust envelopes as vehicles of contextualised data

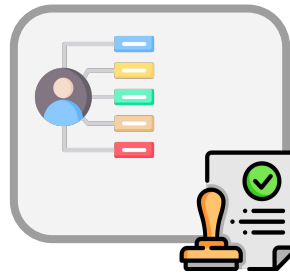
How are we building trust envelopes?

Where we are and where we want to go

Age Verification

**Personal data is used to prove that
Beatriz is over 18**

Beatriz is
over 18



Signed by PT
Government



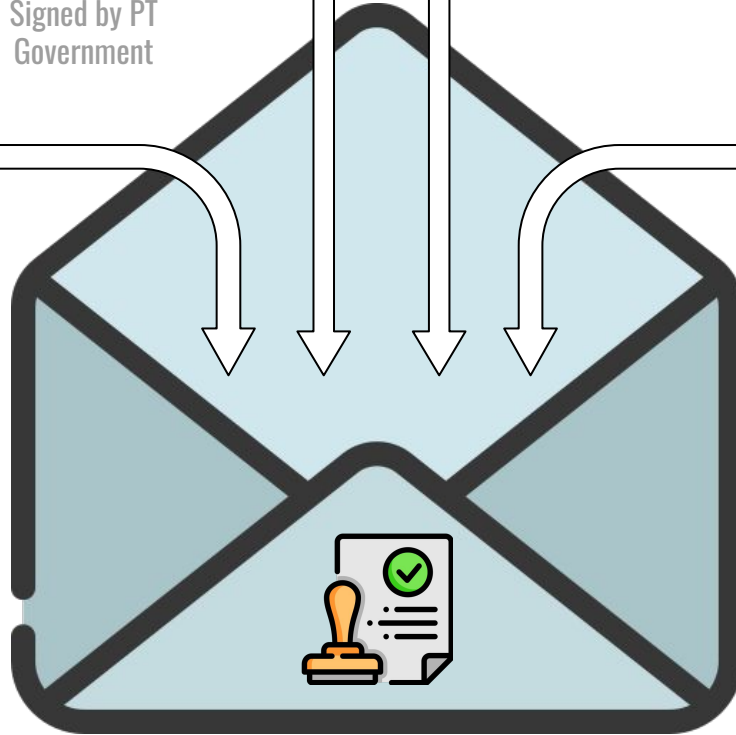
Allows usage to verify
age; valid during 2
months



Source: passport
Data subject: Beatriz
Issued: 10/July/2024

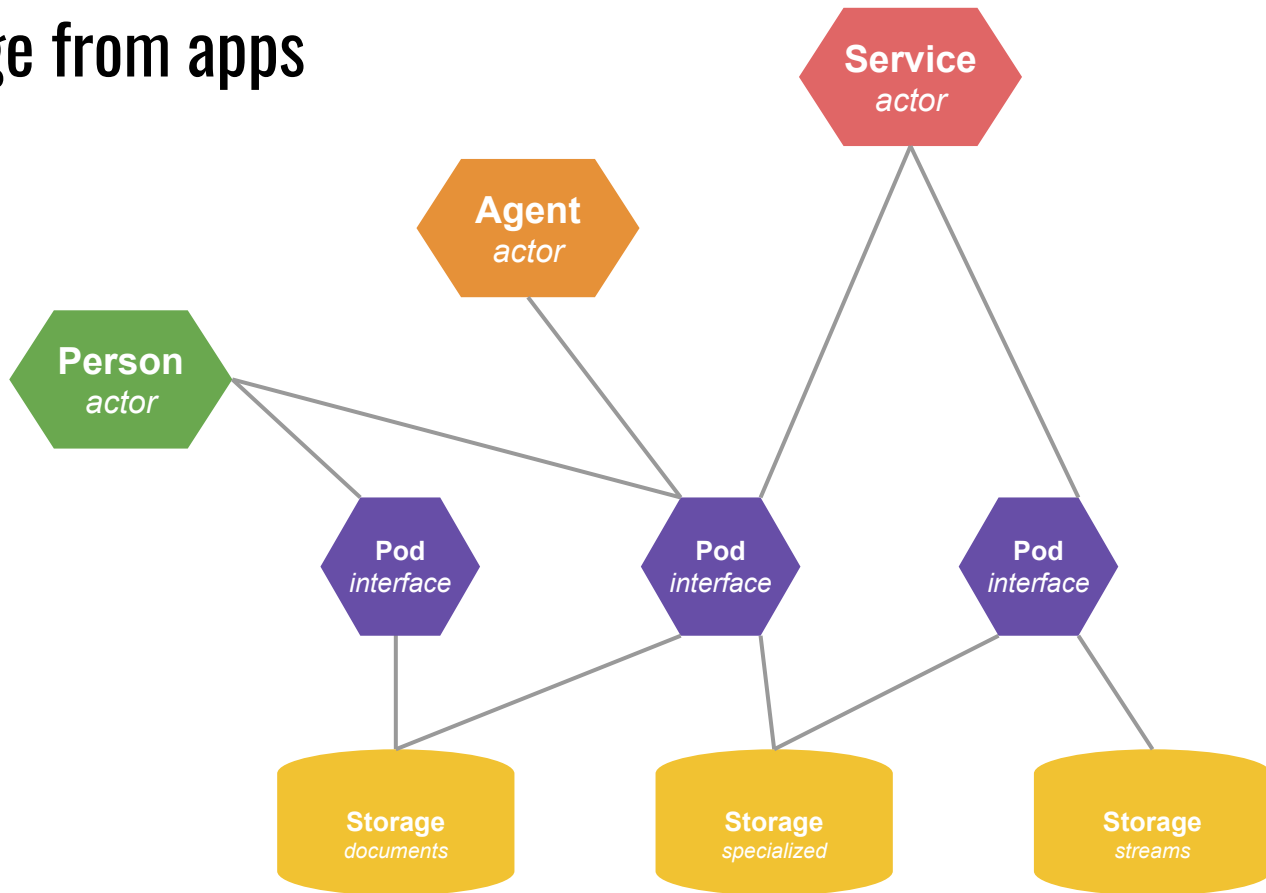


Source: Beatriz
Issued: 04/August/2025

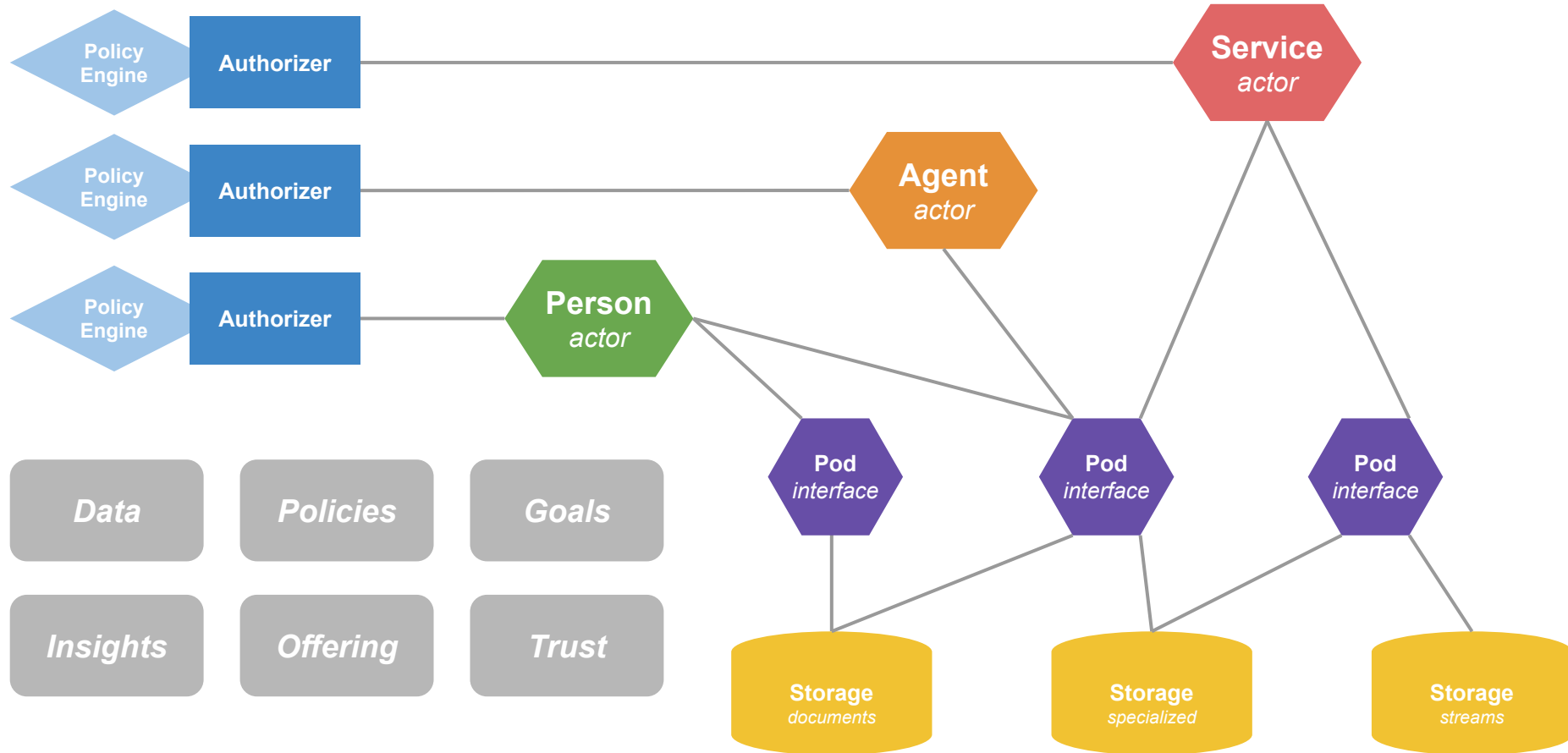


Changing the *status quo*

Solid separates storage from apps

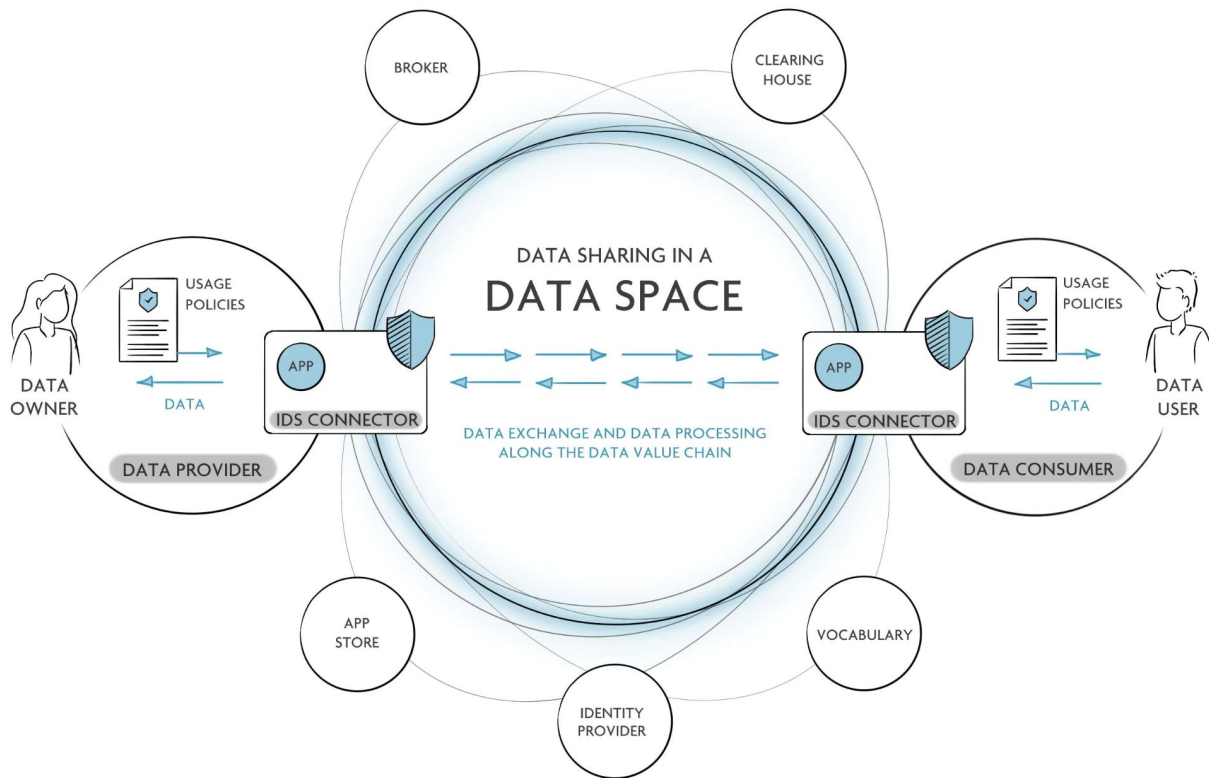


High-level ecosystem architecture – Separation of Concerns



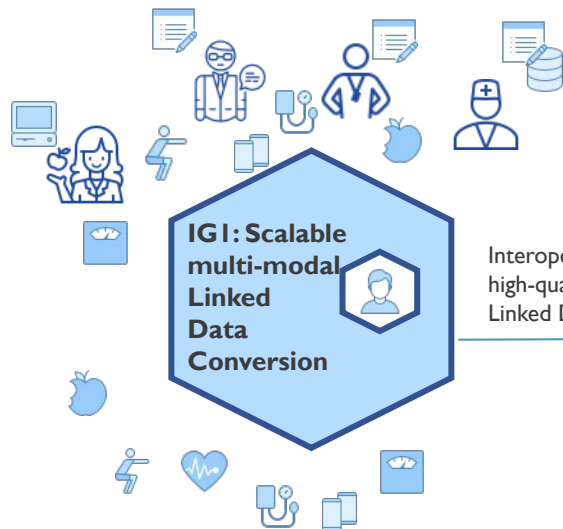
Alignment with **dataspaces**

... to automate **interoperability**, **discoverability**, and **trust**



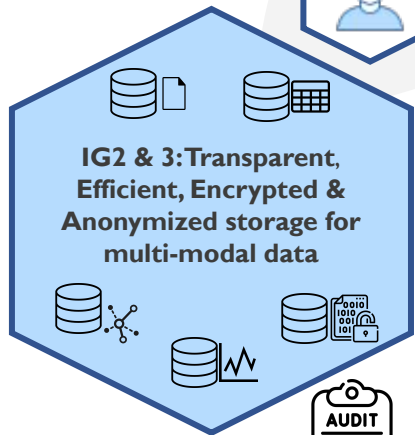
PACSOI – Showcase

Before clinical intervention

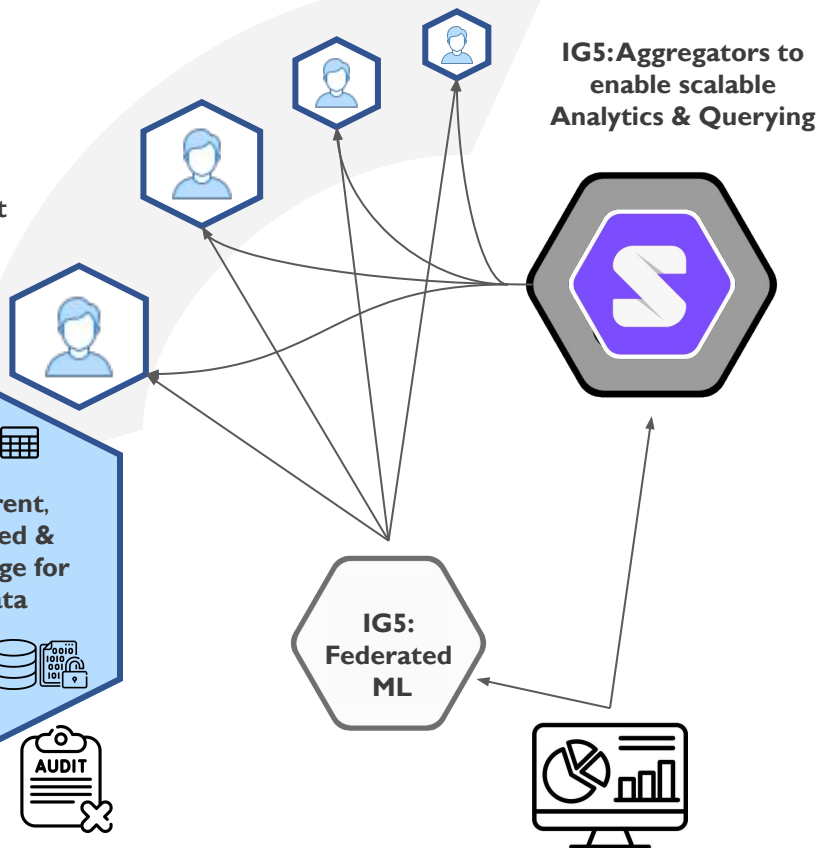


Remote monitoring
(video, streaming data, questionnaires, etc.)

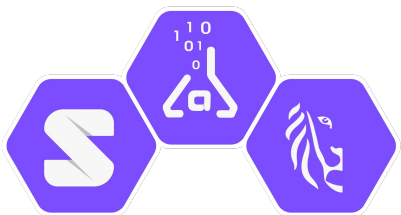
IG4: Policies enabling dynamic informed consent



IG3: Qualitative audit logs of read/write operations



**IG6: Patient journey
overviews &
population-based policy
& research insights**



IDLab
INTERNET & DATA LAB

GHENT
UNIVERSITY

umec

Contextualising the Exchange of Data on the Web

Beatriz Esteves

Workshop on Mechanisms for Governing Responsible AI and Data Science
2025



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