Semantic interoperability: What is it? Why is it needed?

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• March 5, 2024
## One DPP system, two ways to access

<table>
<thead>
<tr>
<th>Product UID</th>
<th>Finding the resolver</th>
<th>Finding the data</th>
<th>Accessing the data</th>
</tr>
</thead>
</table>
|             | DNS or ISO 15459     | Resolver         | Decentralized DPP data repositories  
|             | did:method:UID       | DID document     | Semantic Interoperability layer |

- **Product UID**: https://example.org/UID, did:method:UID
- **Finding the data**: Resolver
- **Finding the resolver**: DNS or ISO 15459, DID method (e.g. EBSI, web method)
Syntactical & Semantic Interoperability

• Semantic Interoperability is the **preservation of precise meaning**.
• Semantic interoperability is achieved when social agreements are reached on:
  • vocabularies (common specifications for naming things) and
  • structural meta data (data models/ontologies and reference data).

[Image of a Venn diagram with overlapping circles labeled "Semantic Interoperability" and "Syntactical Interoperability." The inner circle is labeled "Meaning: Vocabularies, data models/ontologies, reference data," and the outer circle is labeled "Formats and structure."]

European Commission, Semantic Interoperability Courses, Module 1 – Introduction and overview of existing initiatives, ISA Programme, Action 1.1
### Semantic interoperability vs. Unification

<table>
<thead>
<tr>
<th>Semantic Interoperability</th>
<th>vs.</th>
<th>Unification</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;oui&quot;</td>
<td>→ Maps to →</td>
<td>&quot;yes&quot;</td>
</tr>
<tr>
<td>&quot;non&quot;</td>
<td>→ Maps to →</td>
<td>&quot;no&quot;</td>
</tr>
<tr>
<td>&quot;rouge&quot;</td>
<td>→ Maps to →</td>
<td>&quot;red&quot;</td>
</tr>
</tbody>
</table>

"yes"          "no"          "red"
Semantic interoperability vs. Unification

Semantic Interoperability vs. Unification

"oui" → Maps to → "yes"
"non" → Maps to → "no"
"rouge" → Maps to → "red"

"Cherry red" Has name Is the same as "Luminous red"
"Cherry red" Has property 13-1023
"Cherry red" Has value Pantone

"Luminous red" Has name 3024
"Luminous red" Has value RAL

"yes" Unification "yes"
"no" Unification "no"
"red" Unification "red"
From data models to ontologies

• **A data model** is a collection of entities, their properties and the relationships among them, which aims at representing a domain, a concept or a real-world thing.
  • An data model contains:
    • **Classes**: the distinct types of things that exist in our data.
    • **Relationships**: properties that connect two classes.
    • **Attributes**: properties that describe an individual class.
  • Data models are typically designed for a specific application.

• **Ontologies** are formal data models designed for greater generality and expressivity. Expresses high-level relationships and entities.
  • Ontologies can also be defined as data models with a standardized technical representation
Why is semantic interoperability needed for the DPP system?

**Answer:** REUSE

<table>
<thead>
<tr>
<th>Activity</th>
<th>Effort (time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing a data model</td>
<td>++</td>
</tr>
<tr>
<td>Developing a domain ontology (concepts, relations)</td>
<td>+++</td>
</tr>
<tr>
<td>Developing dictionaries, classification systems</td>
<td>+++</td>
</tr>
<tr>
<td>Developing standards for information points (product carbon footprint, durability, ...)</td>
<td>++++</td>
</tr>
<tr>
<td>Converting the above into machine readable formats</td>
<td>+</td>
</tr>
<tr>
<td>Making machine readable data semantically interoperable</td>
<td>+</td>
</tr>
</tbody>
</table>

X “maps to” Y  
X “is the same as” Y
Ontologies & Data models for the DPP

Cross-sectoral DPP system ontology
- Small. Generic. Provides a common structure.

Sector-specific regulatory ontology
- Conversion of regulatory texts into ontology format(s)

Most Generic

Product ontology

Mandatory ontology

ESPR Delegated Act

Maps to (e.g. RDB2RDF)

Brand A product data model

Do-It-Yourself DPP
Ontologies & Data models for the DPP

Cross-sectoral DPP system ontology
- Small. Generic. Provides a common structure.

Sector-specific regulatory ontology
- Conversion of regulatory texts into ontology format(s)

Most Generic
- ESPR Delegated Act
  - Conversion of regulatory texts into ontology format(s)

Most Specific
- Industry ass. hosted DPP
  - Uploads to (e.g. RDB2RDF)

Mandatory ontology
- Uses

Product ontology
- Cross-sectoral DPP system ontology
  - Small. Generic. Provides a common structure.

Industrial domain ontology
- Aligns with

DPP-as-a-Service data model
- DPPaaS
- Maps to (e.g. RDB2RDF)

Brand A product data model
- Do-It-Yourself DPP
- Maps to

Brand B product data model
- Uploads to

Brand C product data model
- Maps to
Deploying the DPP across sectors

- Product ontology
- Event ontology
- Actors ontology
- D-SI ontology

Cross-sectoral DPP system ontologies

- Textile ontology
  - ESPR Delegated act for textiles
- Construction ontology
  - Construction Products Regulation
- Battery ontology
  - Battery Regulation

Sector-specific regulatory ontologies

- Industrial domain model 1
  - Maps to (e.g. RDB2RDF)
  - Brand A product model
  - Maps to
  - Brand B product model
- Industrial domain ontology 1
  - Maps to
  - Brand C product data model
  - Maps to
  - Brand D product model
- Industry domain ontology 2
  - Maps to
  - Brand E product model

Maps to

Uses

Uses

Uses
DPP system – Looking into the future

Cross-sectoral DPP system ontologies

- Textile ontology
  - ESPR Delegated act for textiles

- Construction ontology
  - Construction Products Regulation

- Battery ontology
  - Battery Regulation

Uses

Sector-specific regulatory ontologies

- Uses
- UNTP ontologies (PRODUCT, TRUST, ORIGIN)

Industrial domain model 1

Maps to
- Industrial domain ontology 1
- Brand A product model
- Brand B product model

Aligns with

- Brand C product data model
- Brand D product model

Industry domain ontology 1

Maps to
- Industry domain ontology 2
- Digital calibration certificates ontology
- Brand E product model

Maps to
- Industry domain ontology 2
- Digital calibration certificates ontology
- Brand E product model

Maps to
- (e.g. RDB2RDF)

Uses

Digital calibration certificates ontology

- Aligns with
- Maps to

Funded by the European Union

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Datapipe video

• Semantic interoperability in action!
Thank you!

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Contact us: info@cirpassproject.eu