

LOT4KG: A Joint Methodology for the Ontology and Knowledge Graph Lifecycle

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with the contributions of: Maria Poveda-Villalón, Diego Conde,
Lise Stork and Romana Pernisch



Singular Research Center on
Intelligent technologies



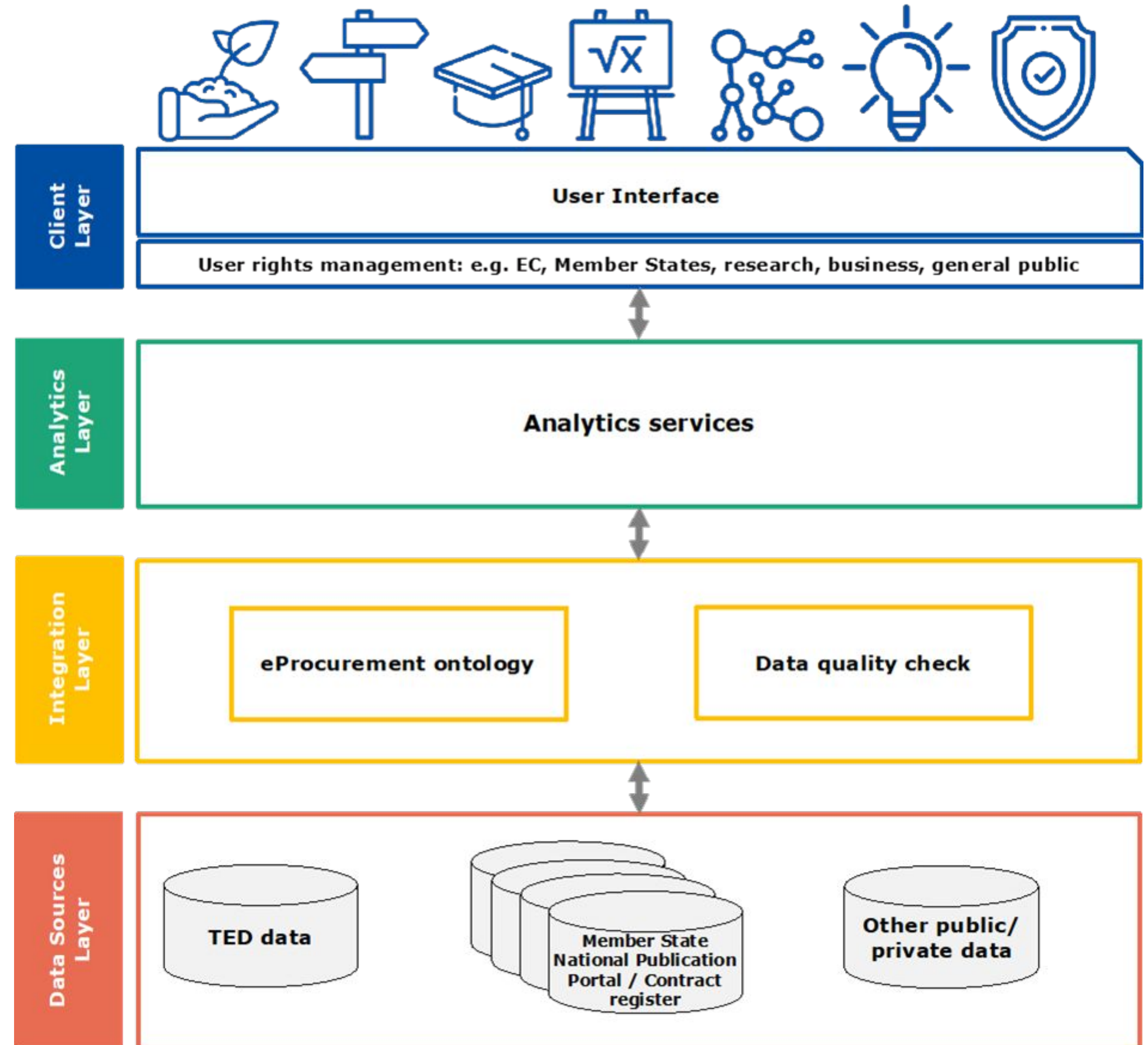
The EU Public Procurement Data Space

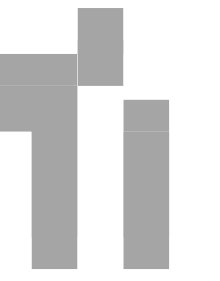
Homogenize the access to all public procurement data across Europe

Calculate standard transparency indicators for each member state

Researching on:

- vocabularies,
- **resources maintainability,**
- federated query processing,
- **semantic data ingestion,**
- query performance/scalability...





The scenario: Nothing under your control

The e-Procurement Ontology (ePO)

- Developed and maintained by the EU Publication Office
- Not 100% stable (releases every ~6 months)
- Partial support for transformation from TED (XML) to RDF using RML
- Complex workflows for generating the ontology and shapes (from UML...)



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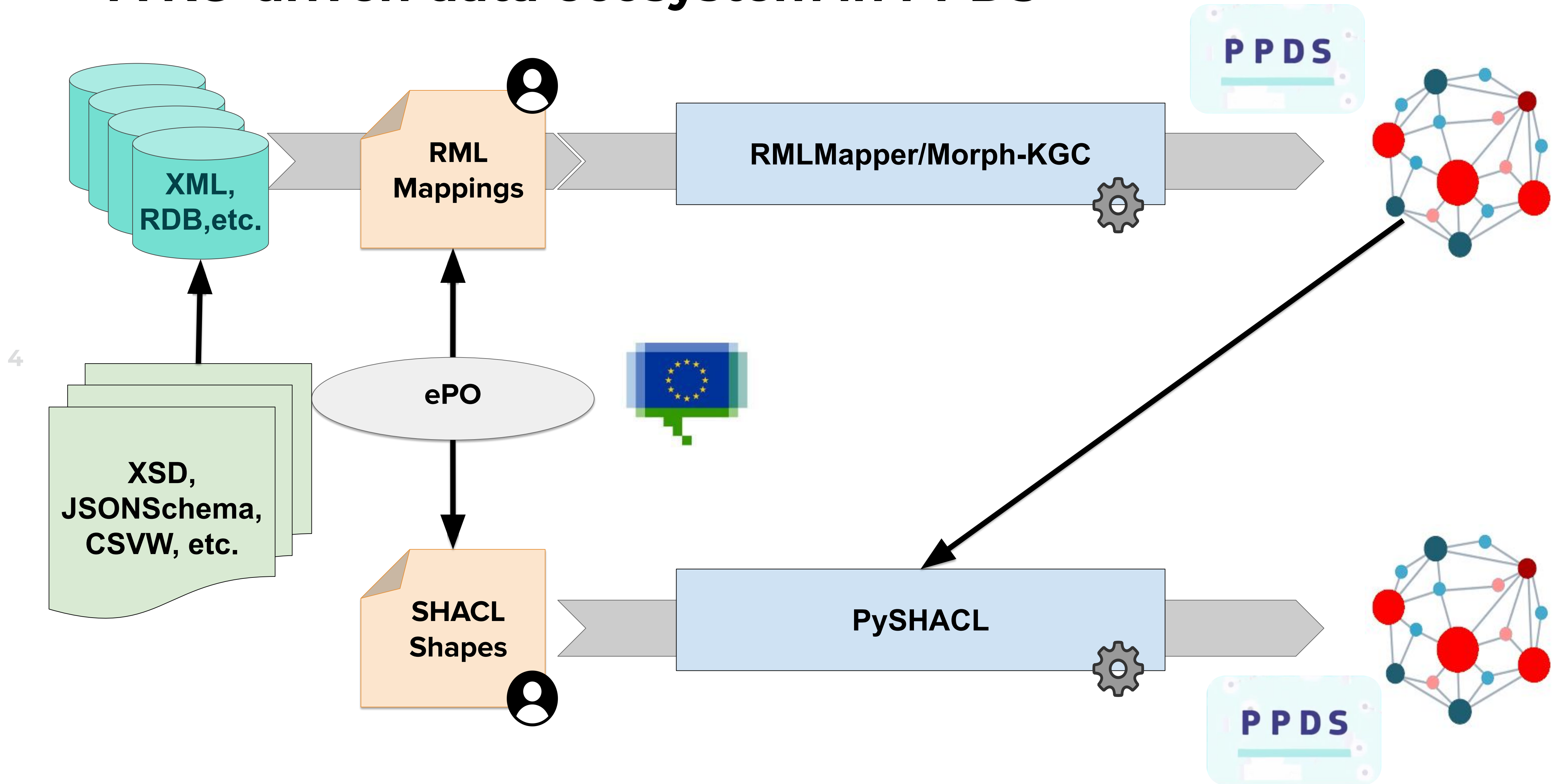
The EU Public Procurement Data Space:

- Reuse the e-Procurement Ontology
- Support to all EU member states to make data compliant with ePO (RML)
- Ensure long term maintenance for all involved assets
- Ensuring efficient construction of knowledge graphs



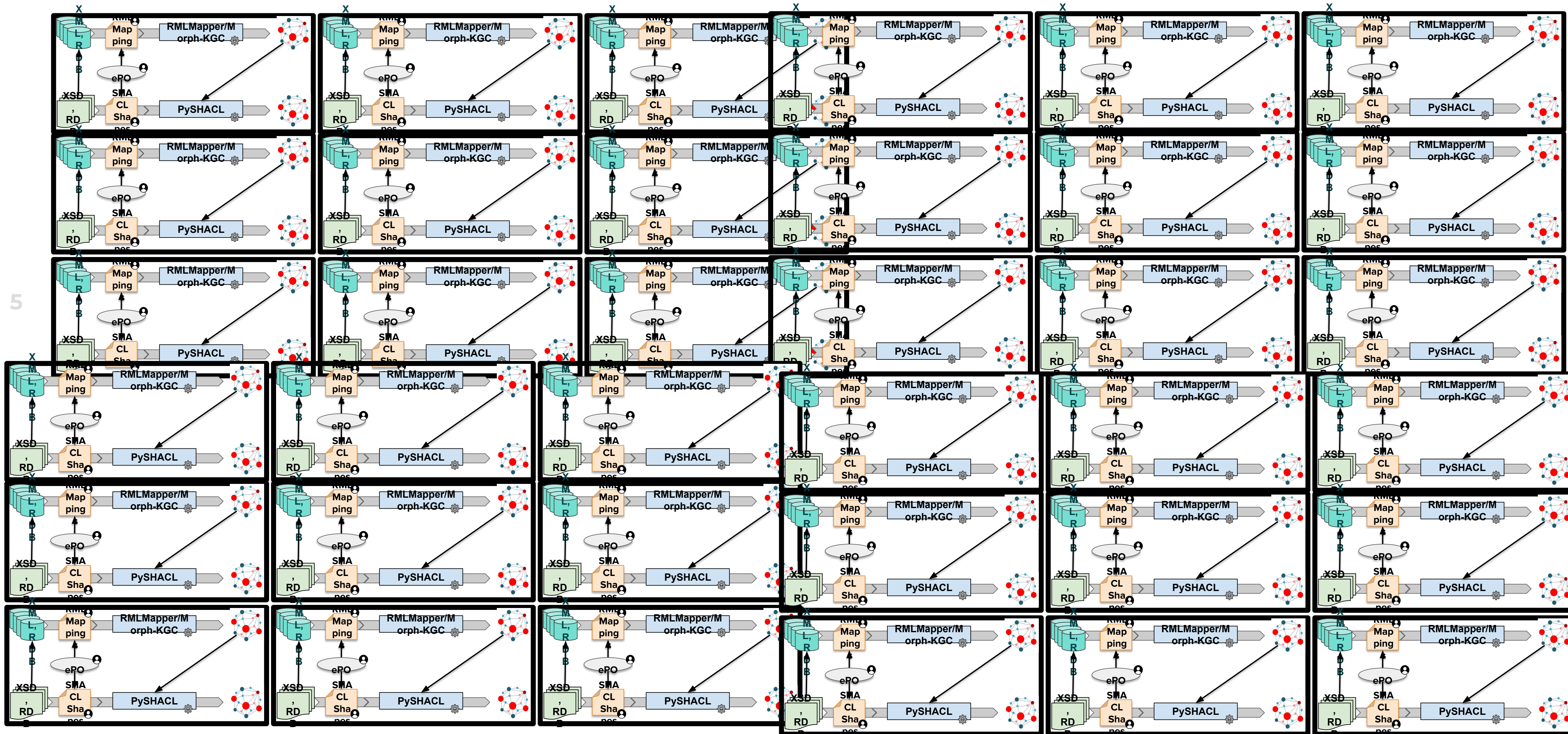
Guasch, C., Lodi, G., & Dooren, S. V. (2022, October). Semantic knowledge graphs for distributed data spaces: The public procurement pilot experience. In *International Semantic Web Conference* (pp. 753-769). Cham: Springer International Publishing.

A KG-driven data ecosystem in PPDS



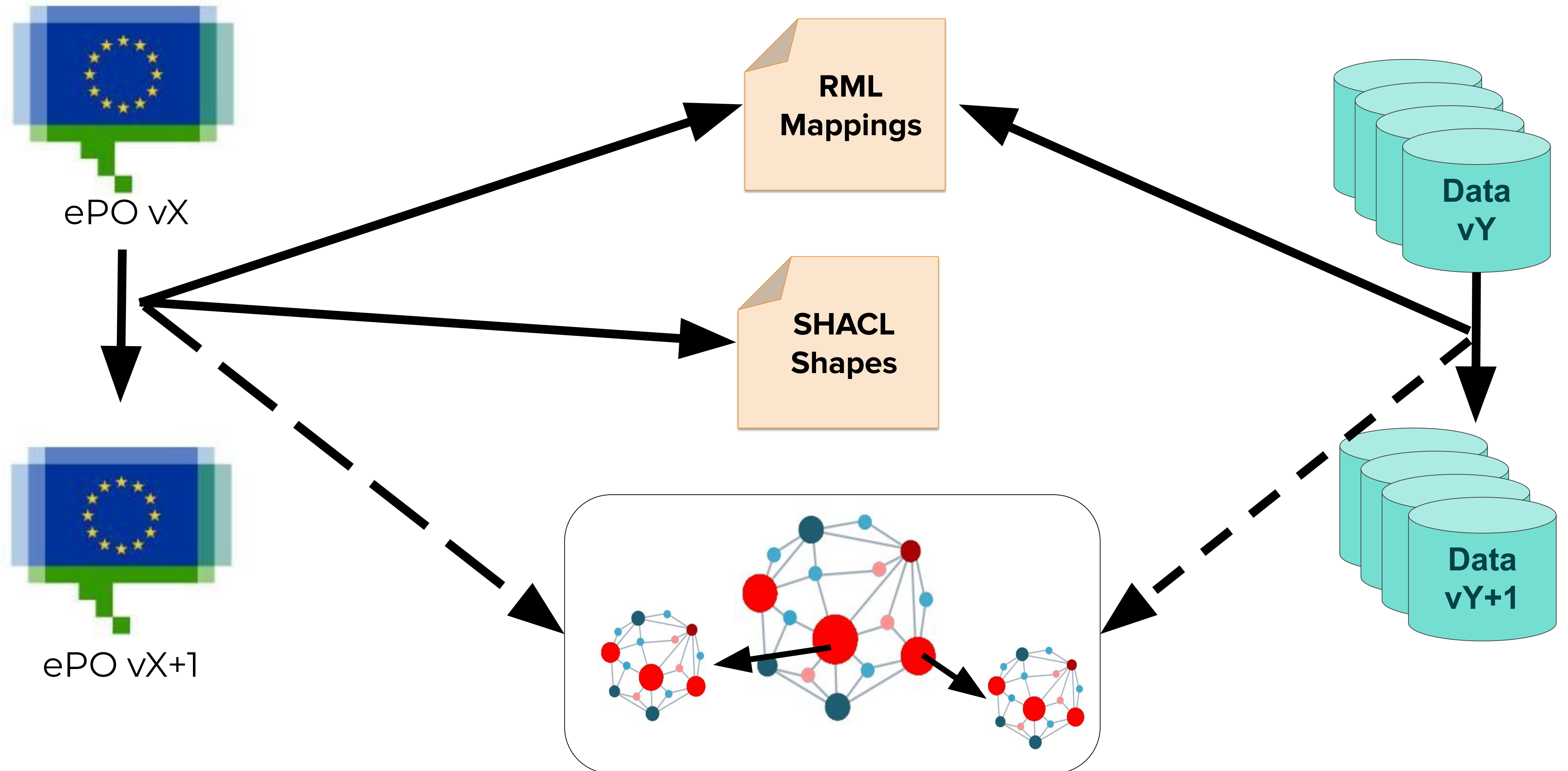


A KG-driven data ecosystem in PPDS (27 workflows)



How to manage changes? Ontology, data, metadata

6



Open questions...

Can we minimize the impact (w.r.t. the decentralized KG) of

- generation of data constraints?
- change of metadata representation model?
- the ontology changes?

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Duan, X., Chaves-Fraga, D., & Dimou, A. (2023). XSD2SHACL: Capturing RDF Constraints from XML Schema. *In International Conference on Knowledge Capture (K-CAP)*. Code available at <https://github.com/dtai-kg/XSD2SHACL>



Duan, X., Chaves-Fraga, D., Derom, O., & Dimou, A. (2024). SCOOP all the Constraints' Flavours for your Knowledge Graph. *In Extended Semantic Web Conference (K-CAP)*. Live demo available at <https://demos.citius.usc.es/scoop>



Iglesias Molina, A., Toledo, J., Corcho, O., & Chaves Fraga, D. (2023). Re-Construction Impact on Metadata Representation Models. *In International Conference on Knowledge Capture (K-CAP)*.



Pernisch, R., Poveda-Villalón, M., Conde-Herreros, D., Chaves-Fraga, D., & Stork, L (2024). When Ontologies met Knowledge Graphs: Tale of a Methodology. *Extended Semantic Web Conference - Posters&Demos*.



Conde-Herreros, D., Stork, L., Poveda-Villalón, M., Pernisch, R., Corcho, O., & Chaves-Fraga, D. (2024). Propagating Ontology Changes to Declarative Mappings in Construction of Knowledge Graphs. *In Fifth International Workshop on Knowledge Graph Construction@ ESWC2024*.



Open questions...

Can we minimize the impact (w.r.t. the decentralized KG) of

- generation of data constraints?
- change of metadata representation model?
- **the ontology changes?**

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Pernisch, R
Methodolog

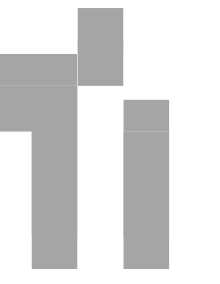


Conde-Herre
Declarative

DISCLAIMER:
THIS IS ONGOING WORK

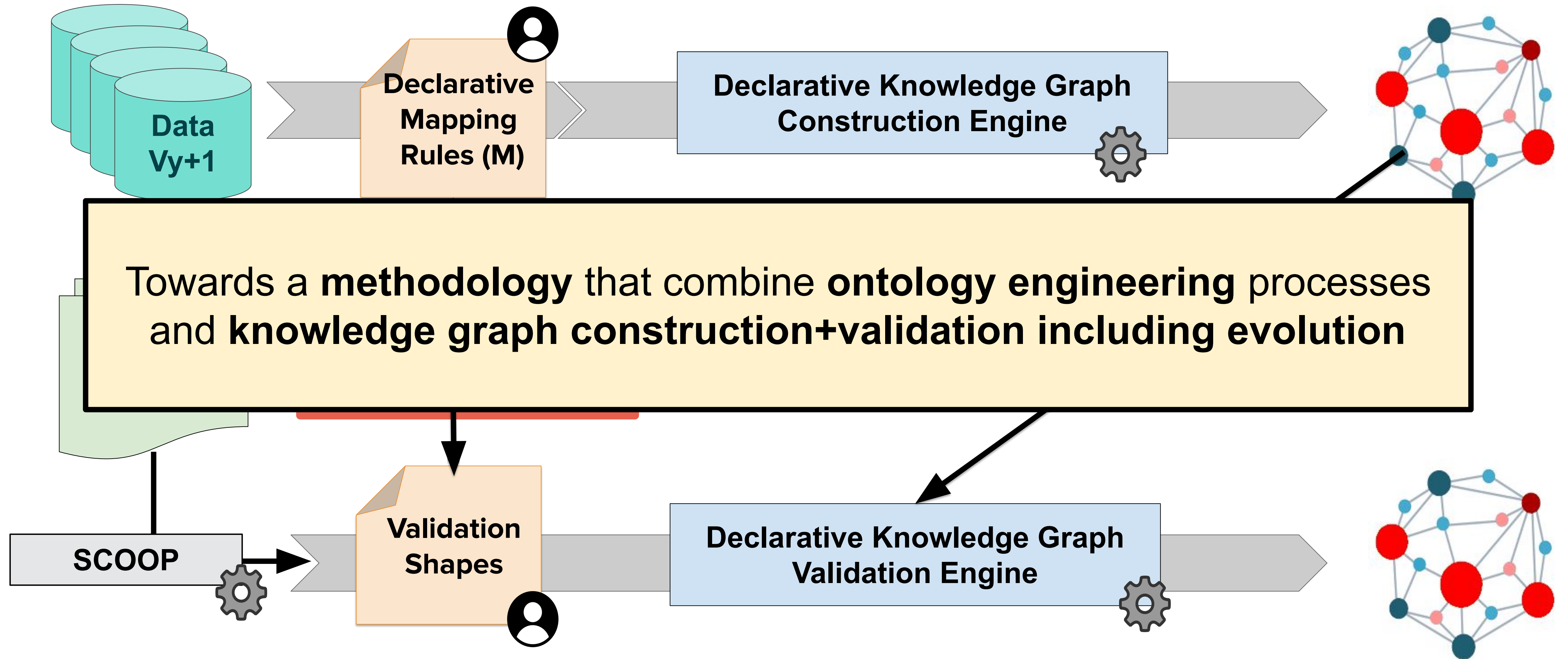
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ESWC2024.

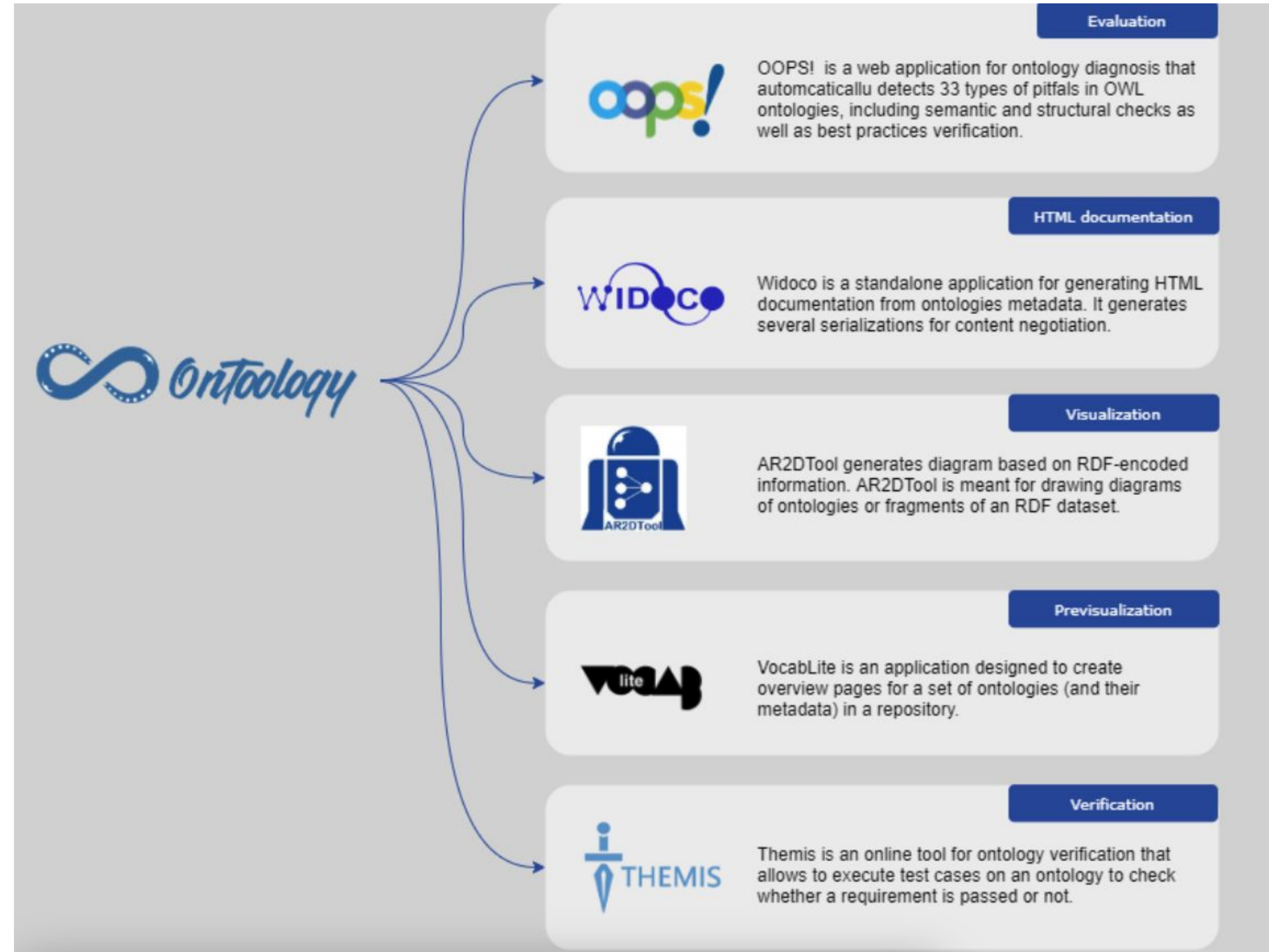
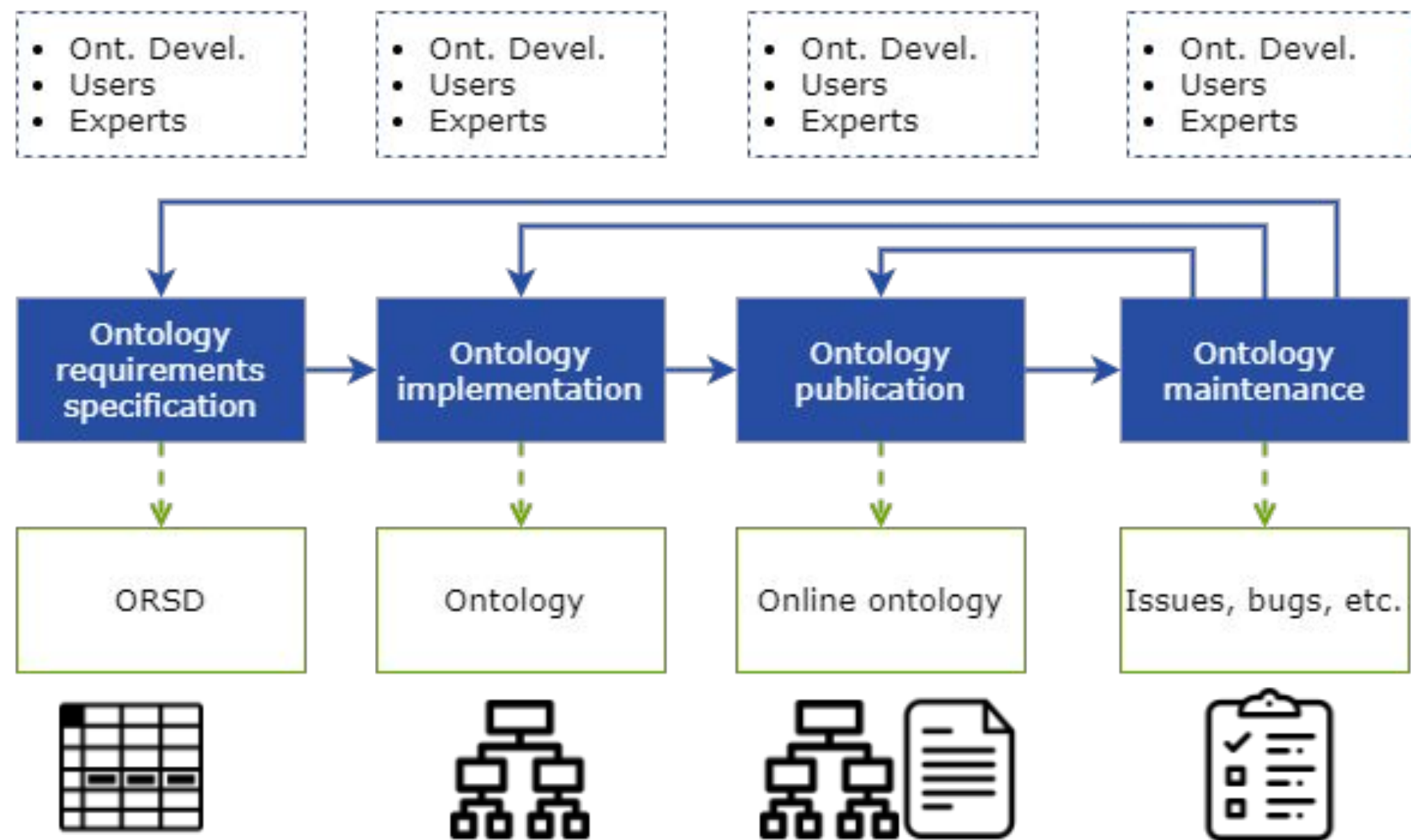


Ontology changes impact over the KGs

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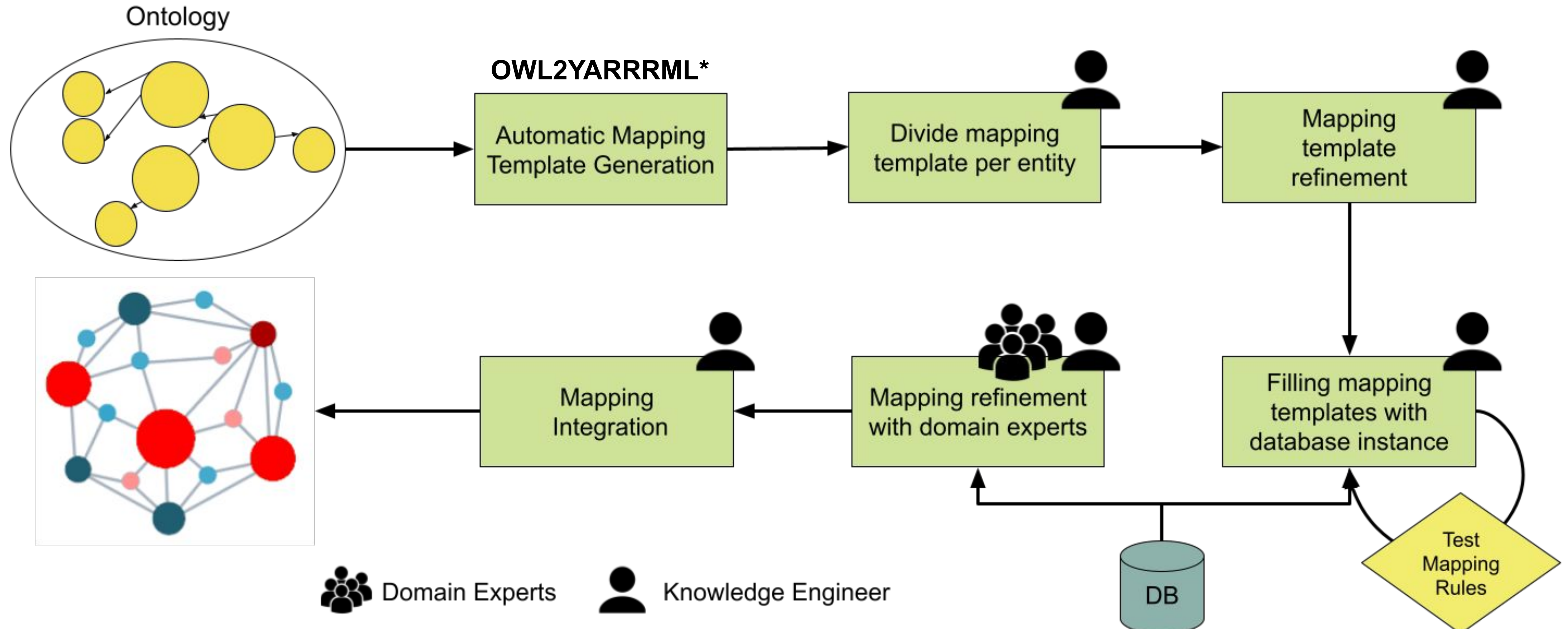
LOT: Linked Open Terms Methodology



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First naïve approach...



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* <https://github.com/oeg-upm/owl2yarrml>



Chaves-Fraga, D., Corcho, O., Yedro, F., Moreno, R., Olías, J., & De La Azuela, A. (2022). Systematic construction of knowledge graphs for research-performing organizations. *Information*, 13(12), 562.

**RML
Mappings**

**SHACL
Shapes**

⋮

**And other
resources...**

Documentation

- Mapping templates? <https://github.com/oeg-upm/owl2yarrml?>
- Mapping/Shape patterns?
- How mappings are related with the ontology terms?

Validation

- Are the mapping syntactically/semantically correct?
- Provenance of data constraints?

Evaluation

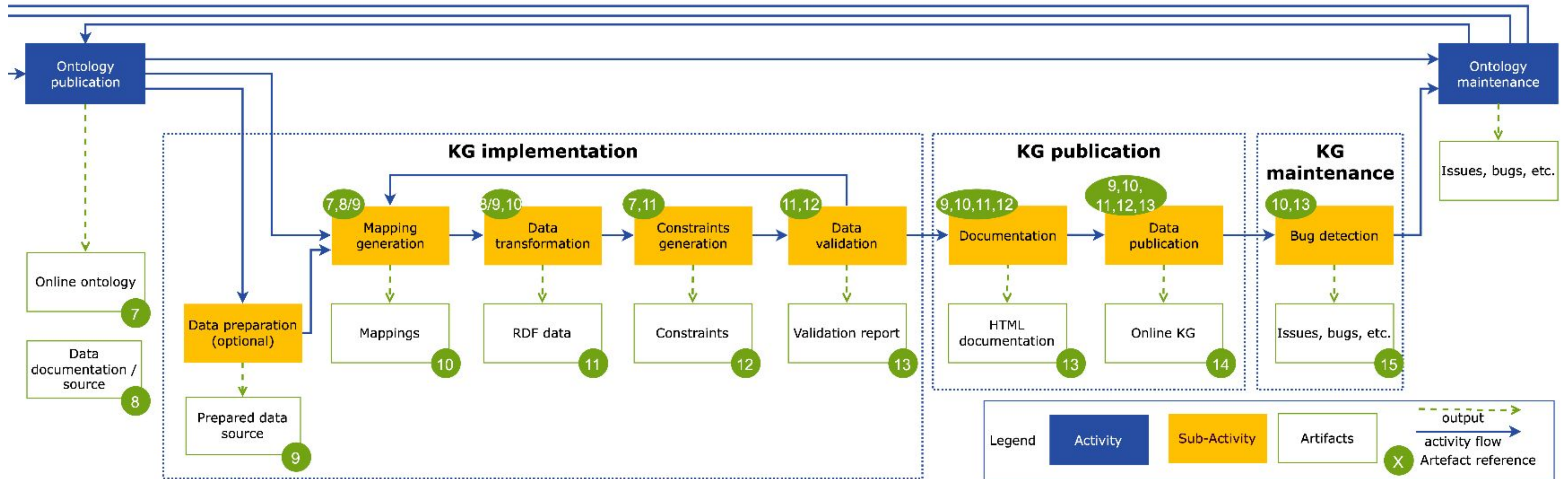
- Do we have mapping or shape pitfalls??
- F.A.I.R. mapping/shapes?

Visualization

- Human-friendly visualizations
- Mapping/shapes changes/versioning

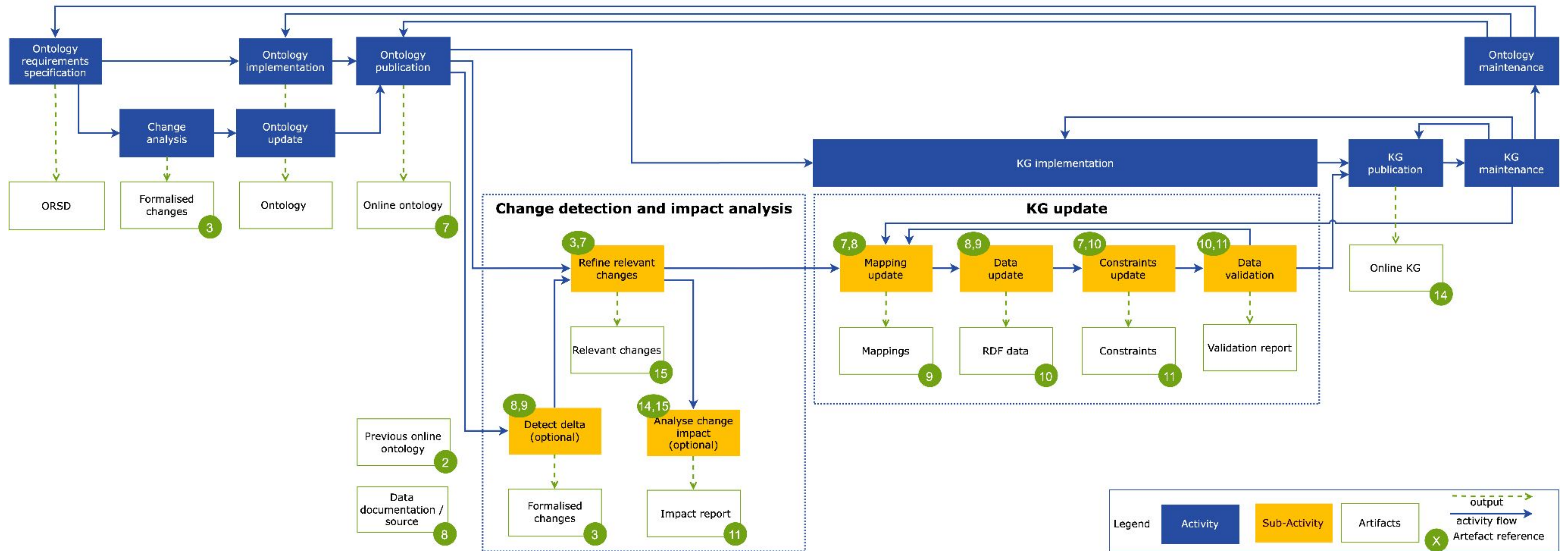
LOT4KG: Knowledge Graph Engineering Extension

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LOT4KG: Knowledge Graph Lifecycle Extension



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OCP2KG: Ontology Change Propagation

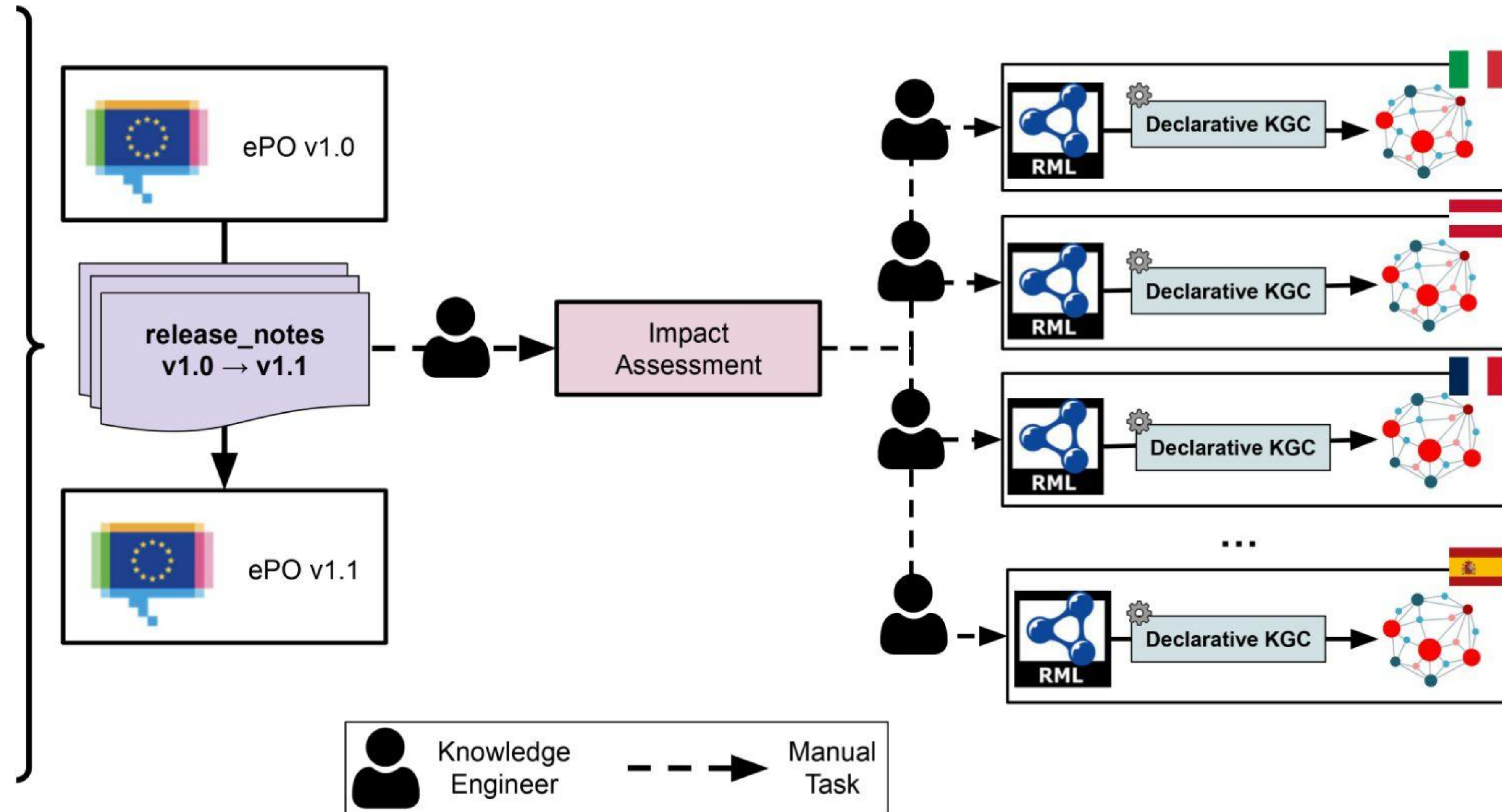
Changed classes

| class | added attributes |
|------------------------|---|
| epo:ProcurementElement | epo:hasDescription (moved from epo:ProcurementObject) |
| epo:ProcurementElement | epo:hasTitle (moved from epo:ProcurementObject) |
| epo:ProcurementObject | epo:hasAdditionalInformation (moved from epo:Lot) |

Deleted classes

ePO core

- epo:BuyerSideSignatory
- epo:ContractSignatory
- epo:ContractorSideSignatory
- epo:GroupLeader
- epo:InformationProvider
- epo:PrimaryRole
- epo:SecondaryRole
- epo:TertiaryRole

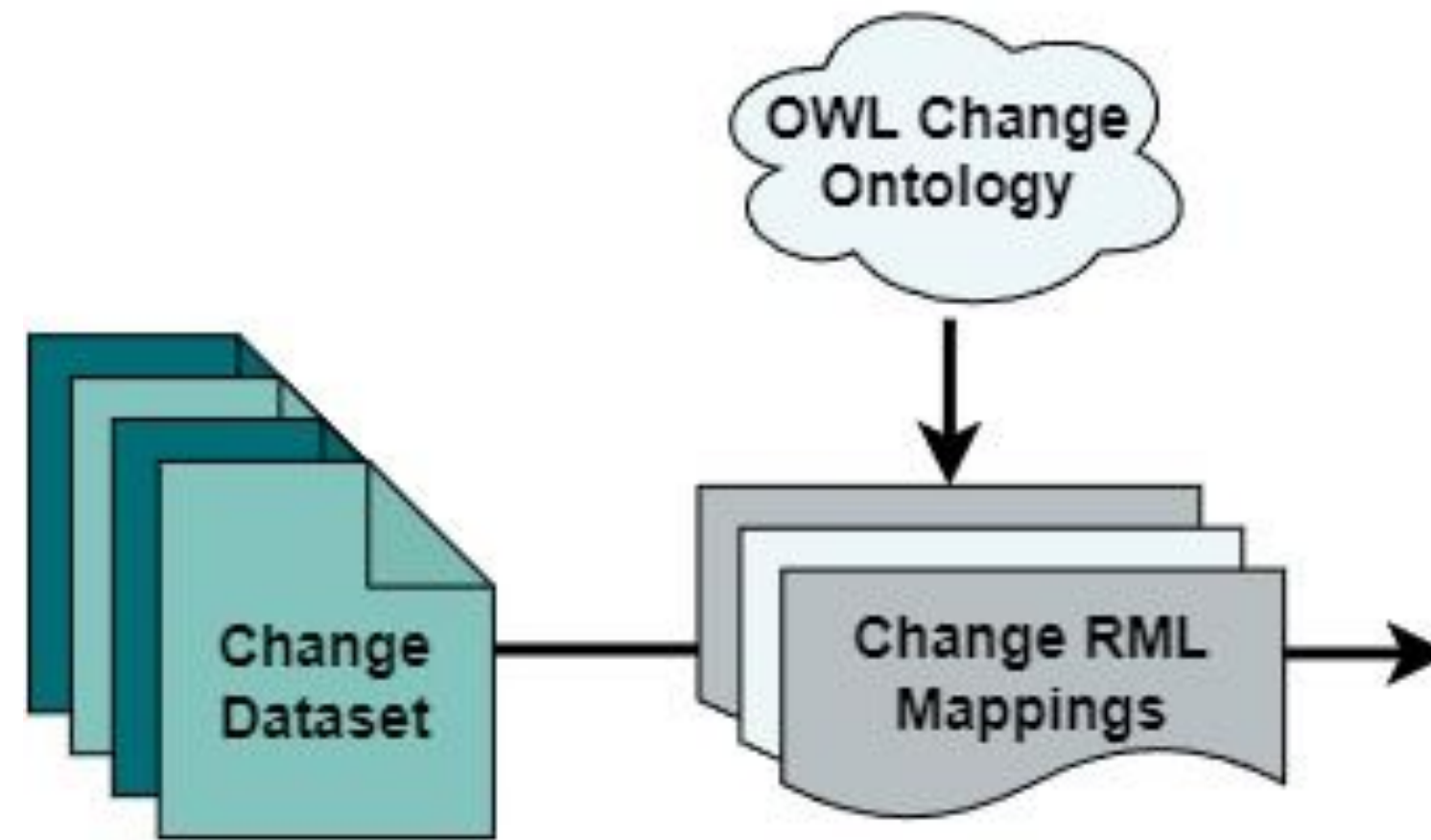


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OCP2KG: Ontology Change Propagation

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OWL Change Ontology

Release: 2024-04-17

This version:

<http://w3id.org/def/och>

Previous version:

<https://w3id.org/def/och>

Authors:

Diego Conde Herreros
Raúl Palma

Contributors:

Diego Conde Herreros
Raúl Palma

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Cite as:

Conde-Herreros, D., Stork, L., Pernisch, R., Poveda-Villalón, M., Corcho, O., & Chaves-Fraga, D. (2024). Propagating Ontology Change
[Provenance of this page](#)

ML
+1

gs

Abstract

This is a placeholder text for the abstract. The abstract should contain a couple of sentences summarizing the ontology and its purpose.



OCP2KG: Ontology Change Propagation

From the 3.0.1 changelog:

New classes

- epo:ConcessionEstimate



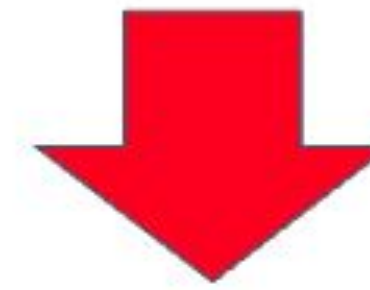
```
epochanges:ACConcessionEstimate rdf:type och:AddClass .
epochanges:ACConcessionEstimate och:addedClass epo:ConcessionEstimate .
```

```
epo:ConcessionEstimate:
  sources:
  - [XXXX~xxxx]
  s: $(XXXX)
  po:
  - [rdf:type, epo:ConcessionEstimate]
```



OCP2KG: Ontology Change Propagation

From the 3.0.1 changelog



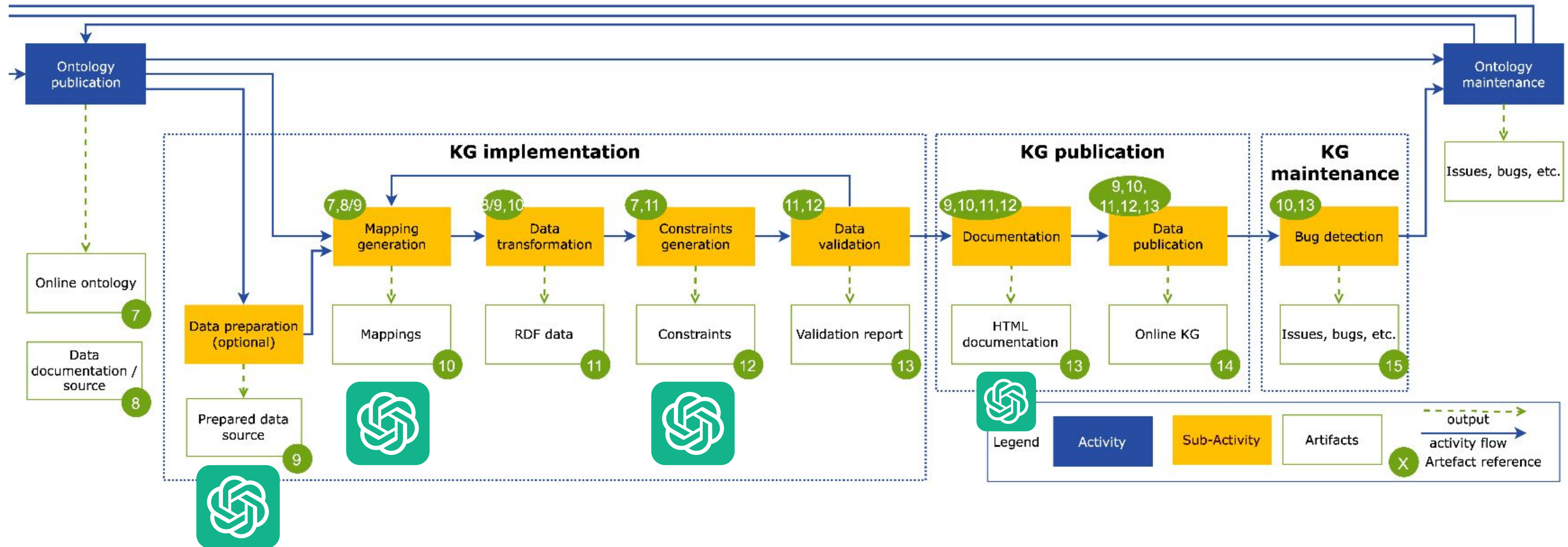
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```
epochanges:ASCProcedureSpecificTerm och:subAddSubClass epo:SubmissionTerm .
epochanges:ASCProcedureSpecificTerm rdf:type omv:AddSubClass .
epochanges:ASCProcedureSpecificTerm och:objAddSubClass epo:ProcedureSpecificTerm .
```

```
SubmissionTerm:
  sources:
  - [%1$s~xpath', /%2$s/PROCEDURE]
  s: $(if(exists(DATETIME_RECEIPT_TENDERS)
  po:
  - [rdf:type, epo:ProcedureSpecificTerm]
  - [rdf:type, epo:SubmissionTerm]
```



Next steps: Towards automation of KG lifecycle



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