metaphacts

A part of DIGITAL science

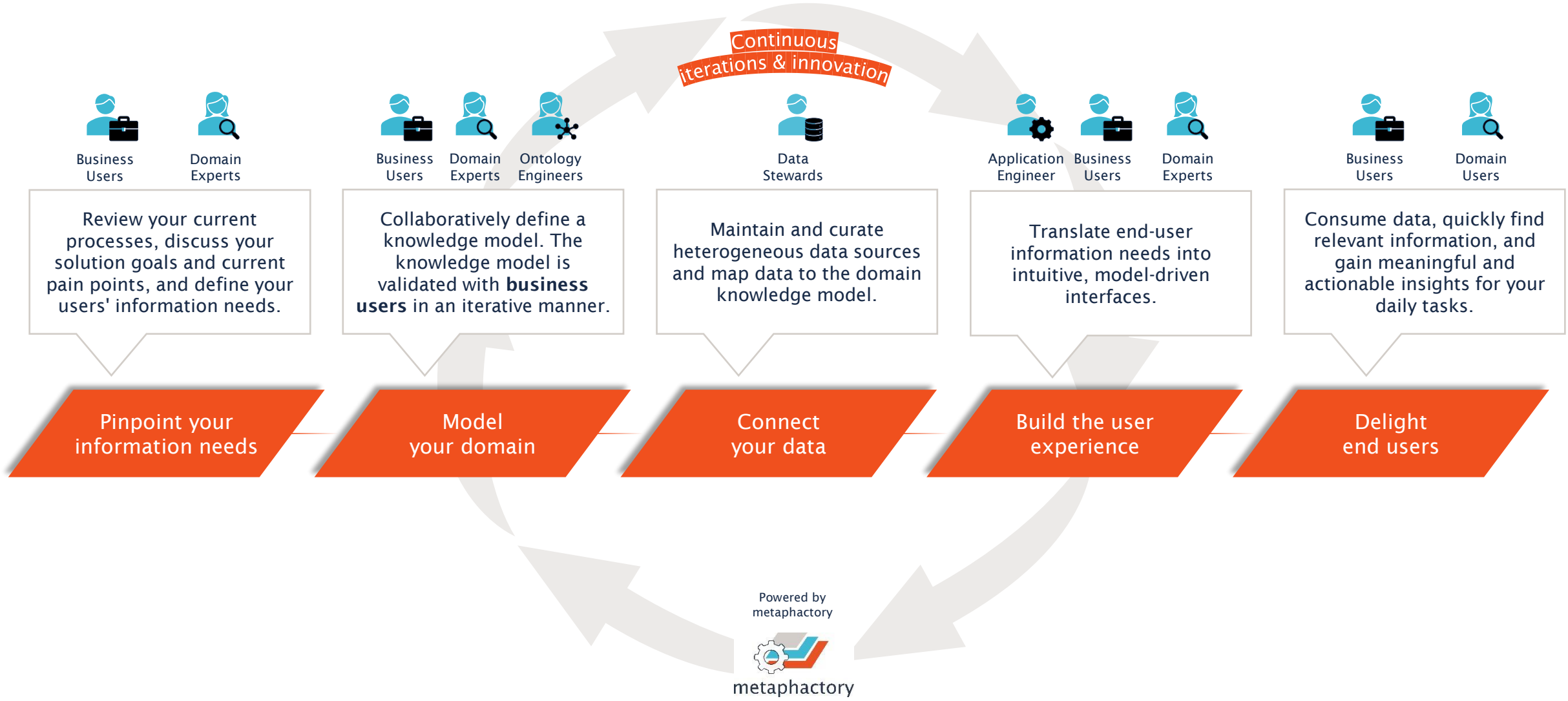
Semantic Knowledge Modeling

metaphactory Perspective

May 6-10, 2024
New York

Peter Haase
CSO, metaphacts

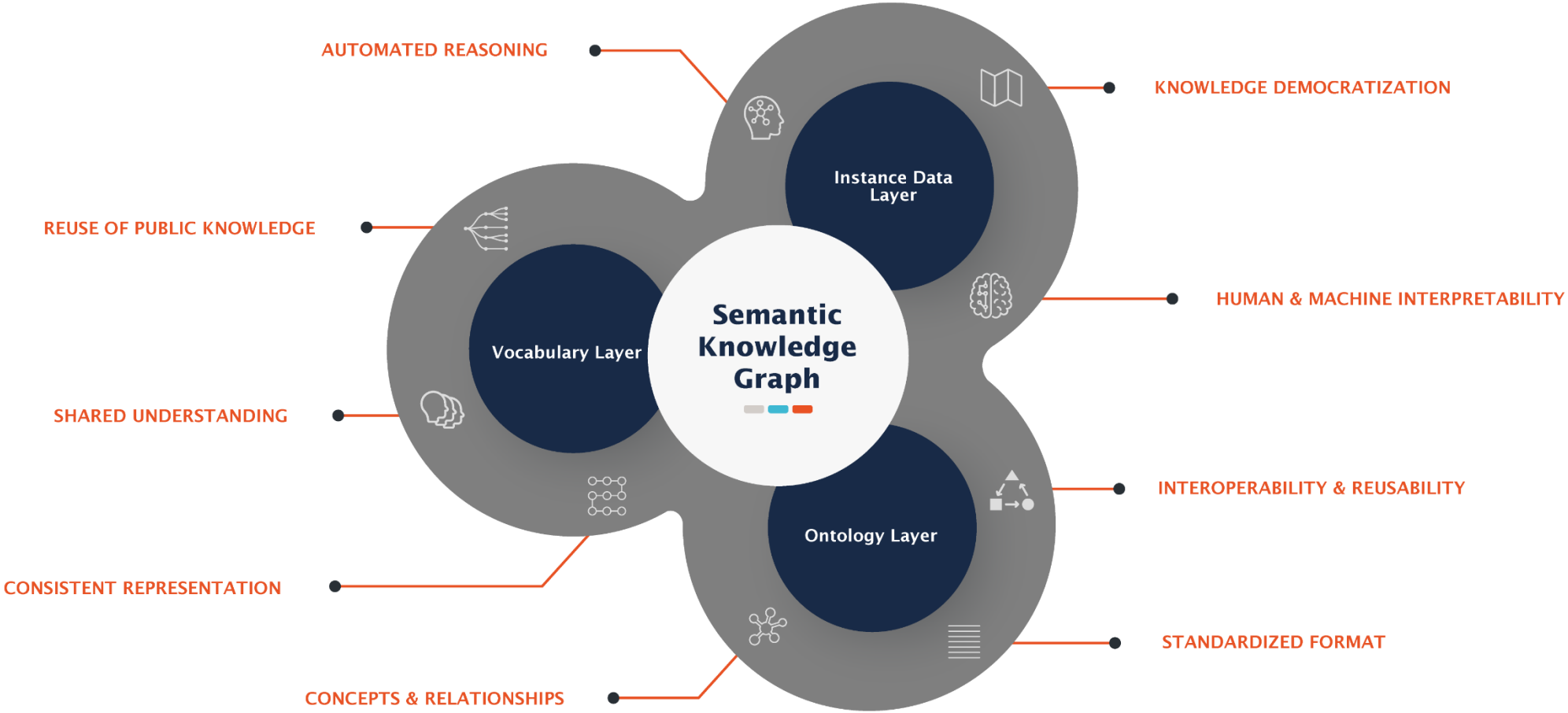
metaphacts Knowledge Graph Approach



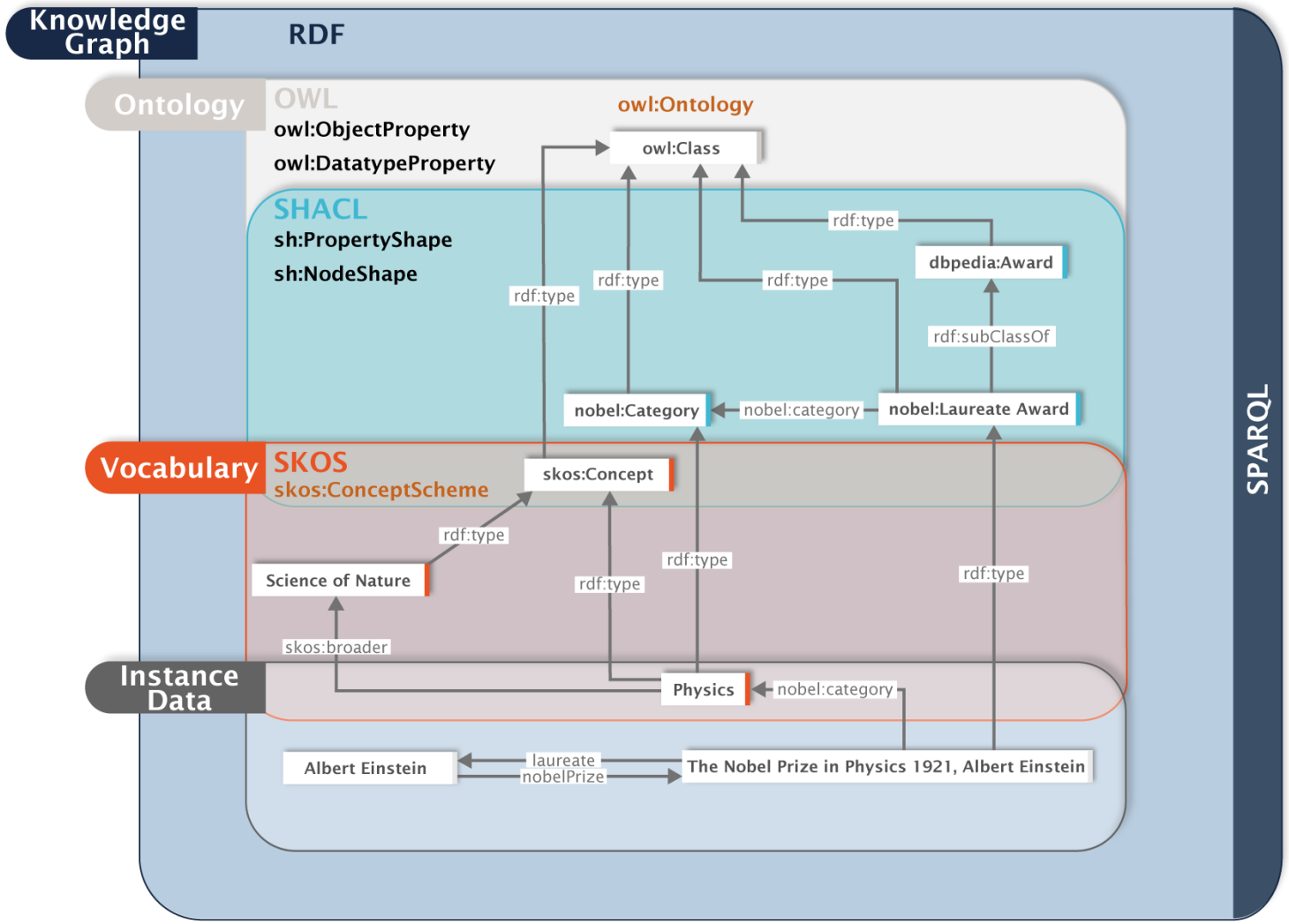
The three layers of a semantic knowledge graph

metaphacts

FAIR
Findable Accessible Interoperable Reusable



Connecting the ontologies, vocabularies & instance data

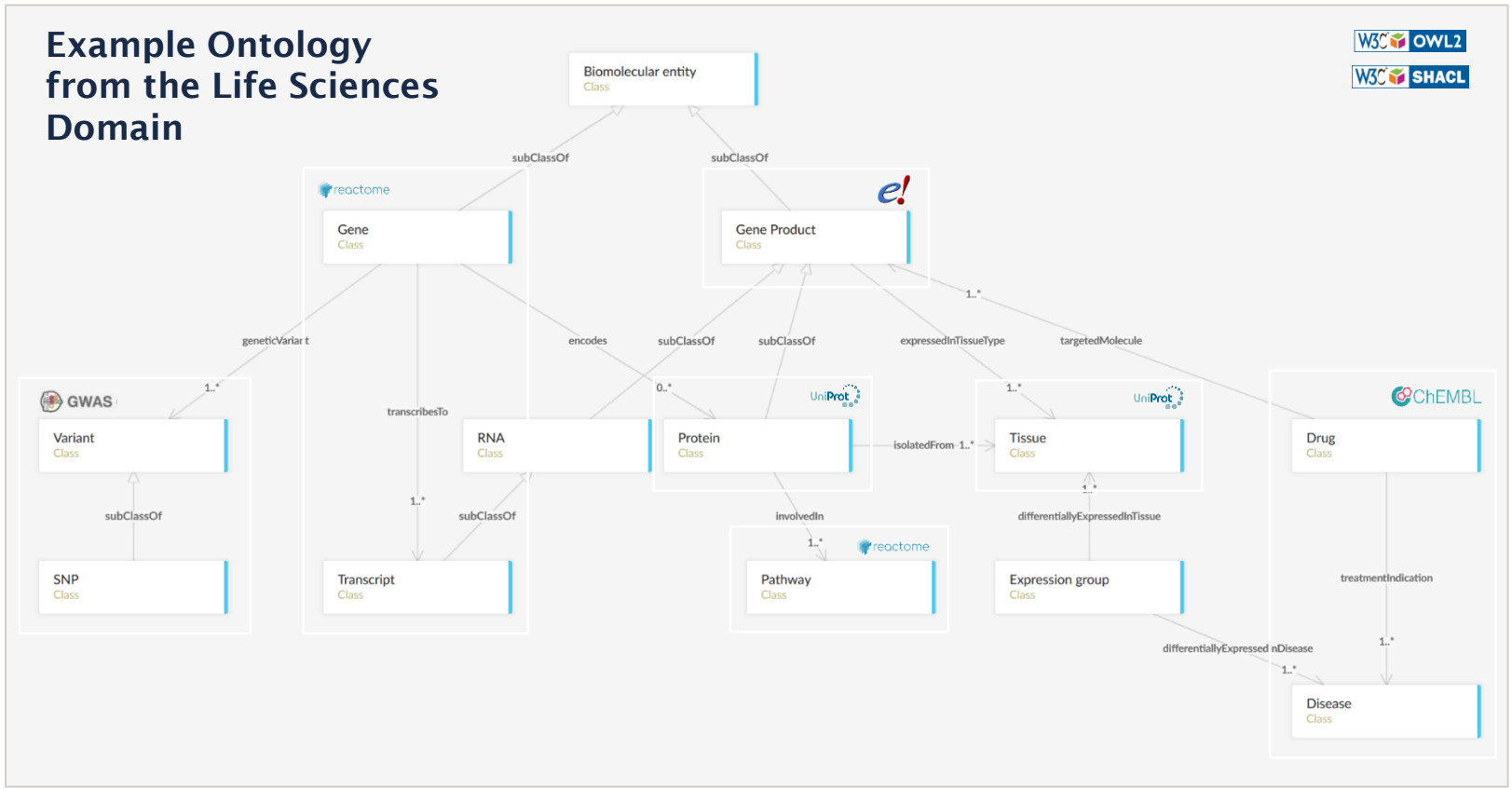


metaphactory knowledge graph approach - Layering of open W3C semantic knowledge graph standards as utilized & applied by metaphactory

Benefits

- Interlink ontologies & vocabularies to support reuse while separating management & governance tasks
- Improve stakeholder communication, asset documentation & governance
- Enable model-driven applications with e.g., auto-suggestions in semantic forms, runtime validation of user interaction, hierarchical facets in search, etc.
- Ensure data quality by running checks & validations against business logic

Building the knowledge graph



Knowledge Graph Engineer

Knowledge Steward (Domain Expert)

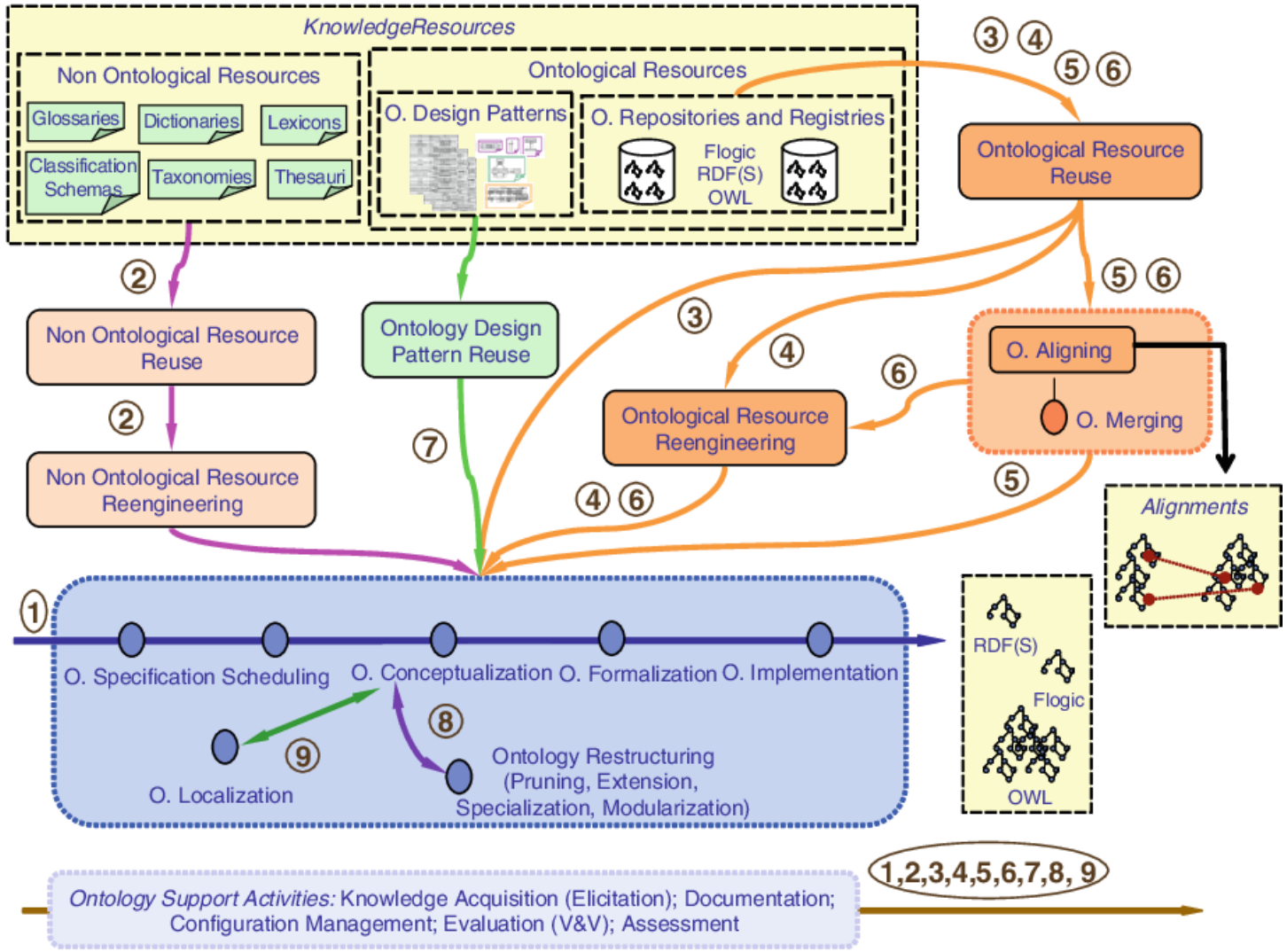
Data Steward

Visual Ontology Modeling

- All stakeholders are empowered to actively participate in the modeling process
- Agile processes for ontology design, implementation and documentation

FAIR Findable Accessible Interoperable Reusable

NeOn Methodology



metaphacts

NeOn-GPT: A Large Language Model-Powered Pipeline for Ontology Learning*

Nadeen Fathallah[1], Arunav Das[2], Stefano De Giorgis[3], Andrea Poltronieri[4], Peter Haase[5], and Liubov Kovriguina[5]

[1] Analytic Computing, Institute for Artificial Intelligence, University of Stuttgart, Germany
[2] King's College London, UK
[3] Institute of Cognitive Sciences and Technologies - National Research Council (ISTC-CNR), University of Bologna, Italy
[4] Department of Computer Science and Engineering, University of Bologna, Italy
[5] metaphacts GmbH, Walldorf, Germany

Abstract. We address the task of ontology learning by combining the structured NeOn methodology framework with Large Language Models (LLMs) for translating natural language domain descriptions into Turtle syntax ontologies. The main contribution of the paper is a prompt pipeline tailored for domain-agnostic modeling, exemplified through the application to a domain-specific case study: the wine ontology. The resulting pipeline is used to develop NeOn-GPT, a workflow for automatic ontology modeling, and its proof of concept implementation, integrated on top of the metaphactory platform. NeOn-GPT leverages the systematic approach of the NeOn methodology and LLMs' generative capabilities to facilitate a more efficient ontology development process. We evaluate the proposed approach by conducting comprehensive evaluations using the Stanford wine ontology as the gold standard. The obtained results show, that LLMs are not fully equipped to perform procedural tasks required for ontology development, and lack the reasoning skills and domain expertise needed. Overall, LLMs require integration with the workflow or trajectory tools for continuous knowledge engineering tasks. Nevertheless, LLMs can significantly alleviate the time and expertise needed. Our code base is publicly available for research and development purposes, accessible at: `https://github.com/andreamust/NEON-GPT`.