ONTO COMMONS
ONTOLOGY-DRIVEN DATA DOCUMENTATION FOR INDUSTRY COMMONS

OntoCommons Project

OntoCommons Ecosystem (OCES)

Arkopaul Sarkar (ENIT)

OntoCommons Member and WP3 Lead

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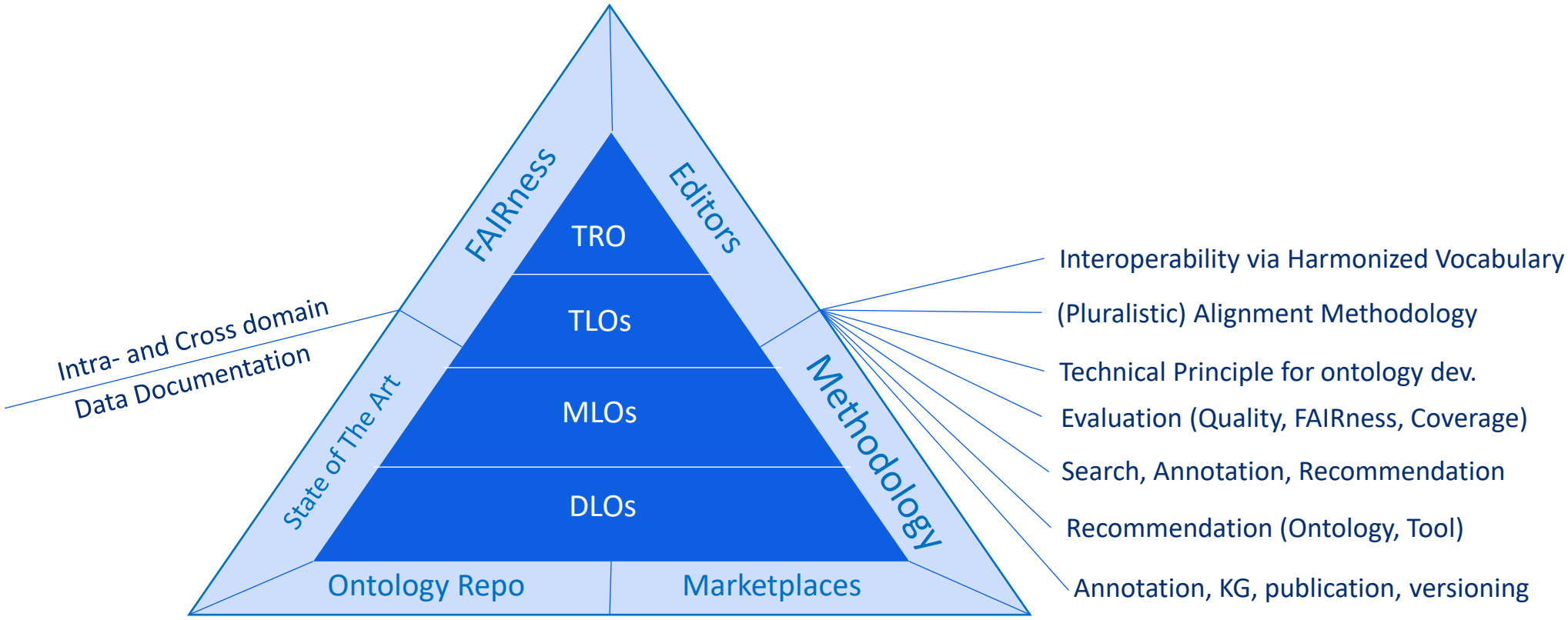
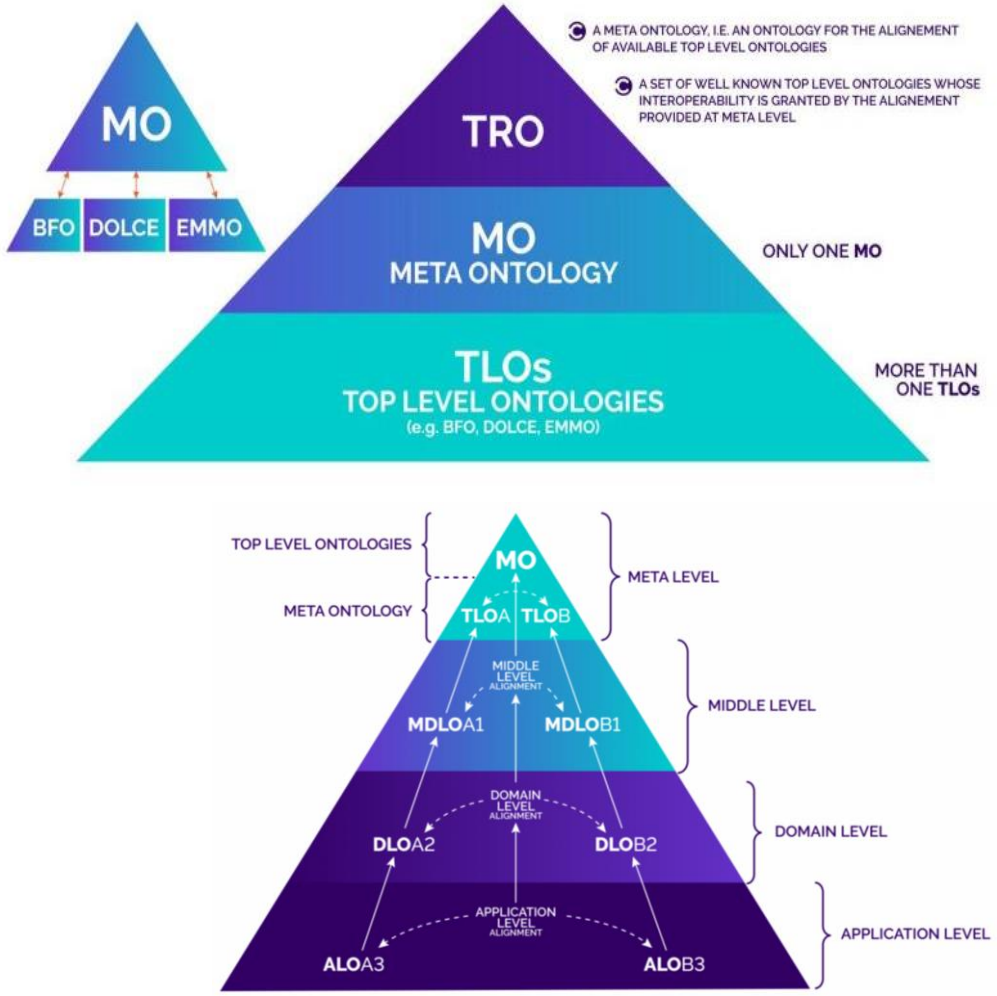
The most tangible outcome – OntoCommons Ecosystem

- OCES is a combination of fully harmonized ontology artifacts (from top to domain) and associated tools and methodologies for building upon existing and creating future ontologies. The complementary components of **OCES therefore provide a complete solution for data documentation in the NMBP domains.**



Ontologies harmonisation

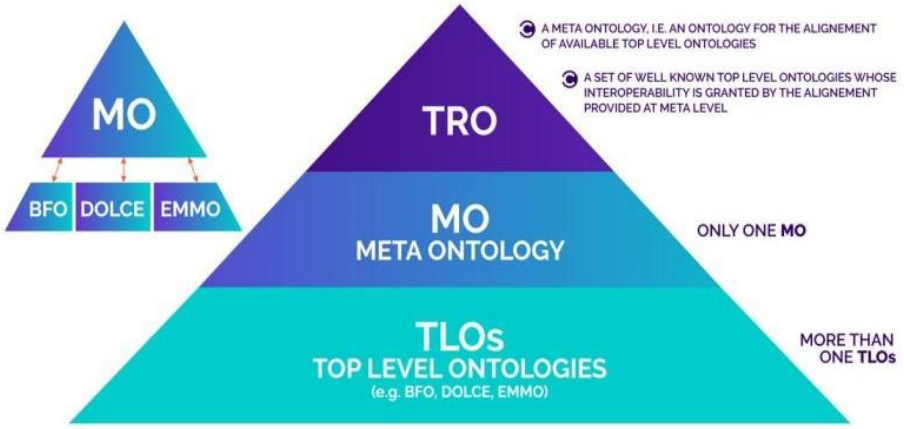


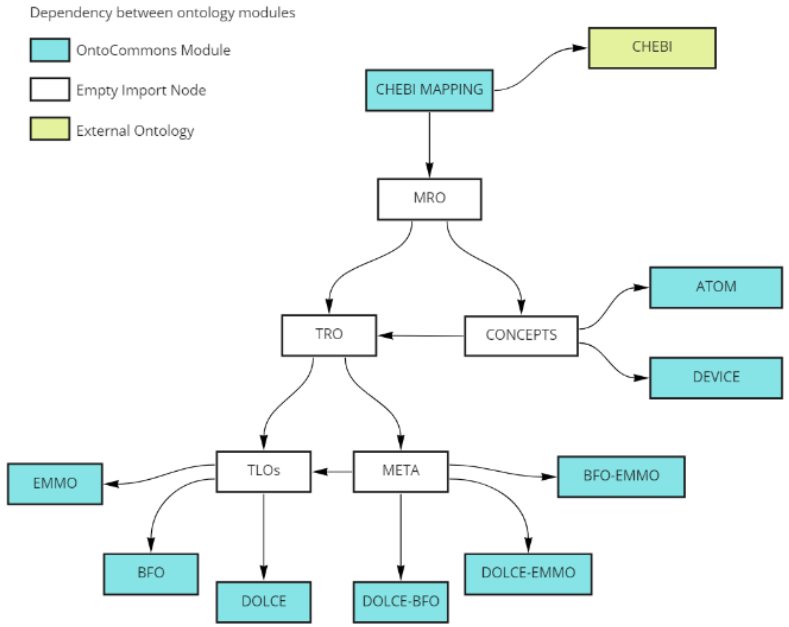
OntoCommons will provide harmonisation between ontologies, through Top Reference Ontology through a multilevel alignement:

- ***Syntactic*** alignment (OWL, FOL, etc.) for all the ontologies that will be part of the OES.
- **Terminological** alignment enabling a minimum taxonomical interoperability between ontologies, by pasting a sub-branch of one ontology under another ontology.
- **Semantic** alignment will be targeted primarily by OntoCommons only within TLO branches,.
- **Formatting** alignment including e.g. labelling of classes, the definition of terms and the annotations.

The OCES will adopt a pluralist approach for the ontological representation of a domain of interest, meaning that more than one upper ontology may be adopted.

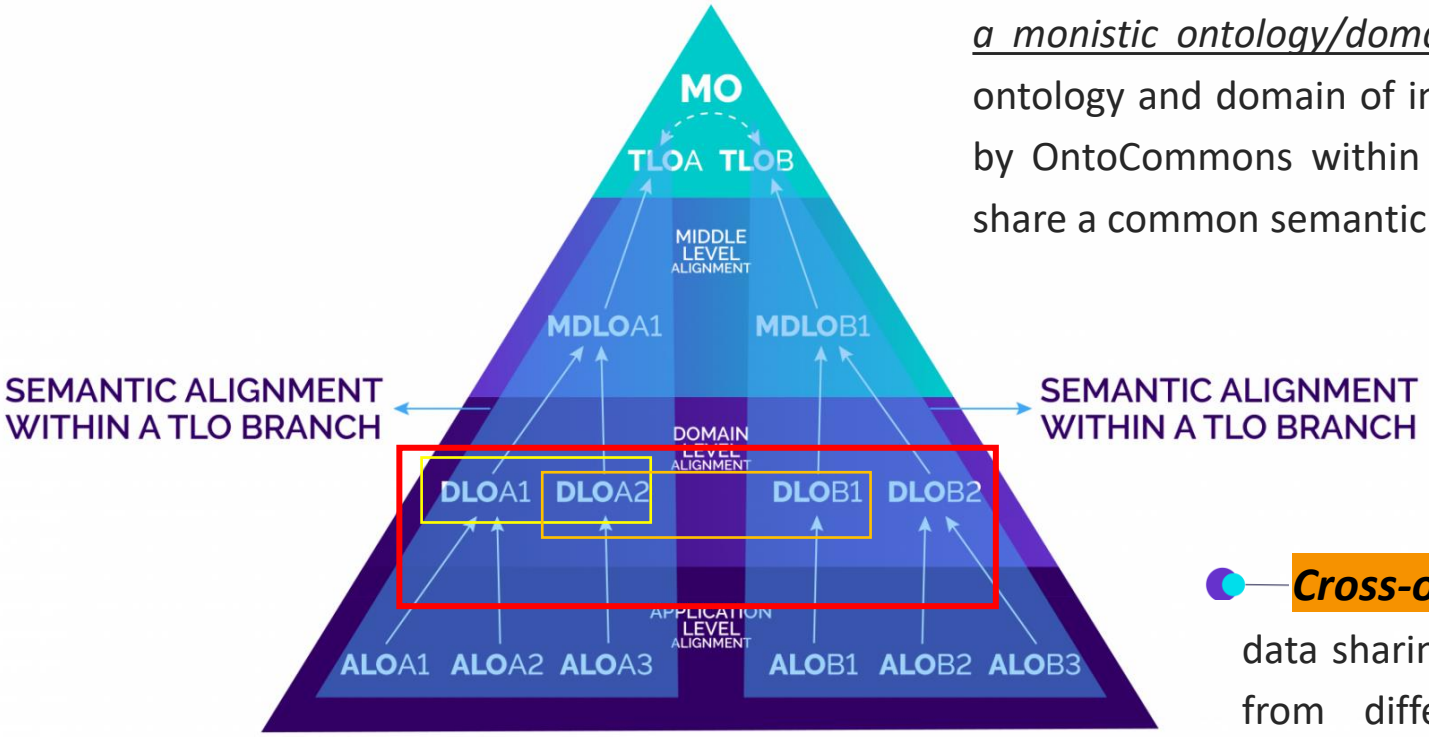
OntoCommons Top Reference Ontology





- The TRO will enable a common foundation for data interoperability between TLOs and lower level ontologies.
- The TRO will consist of
  - a **Meta Ontology (MO)** and
  - **a set of selected TLOs** (i.e. BFO, DOLCE, EMMO).
- The **Meta Ontology (MO)** will be developed by *OntoCommons* and will be the **foundation for comparison and interoperability between available state of the art TLOs.**

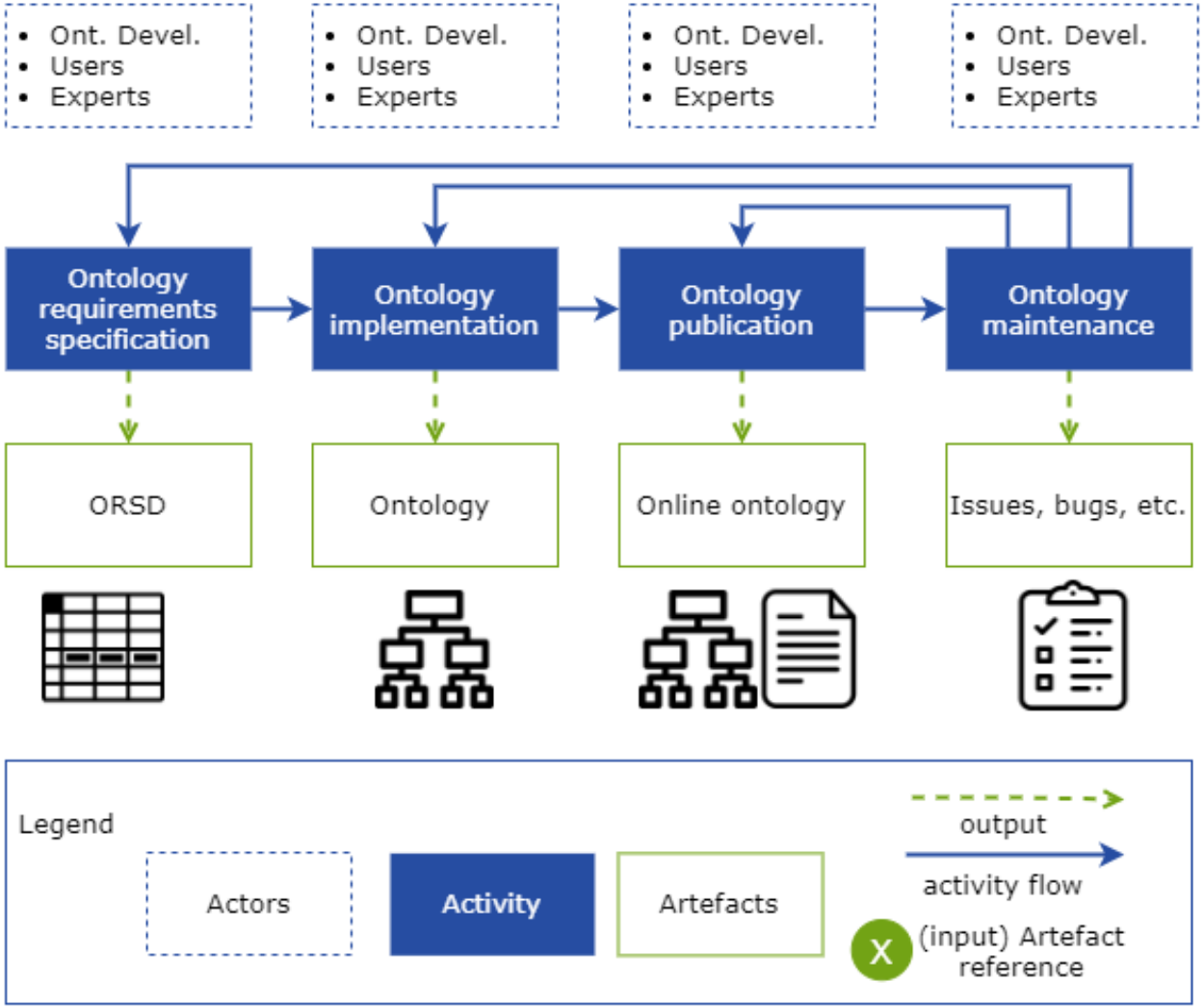
Intra and Cross-ontology interoperability



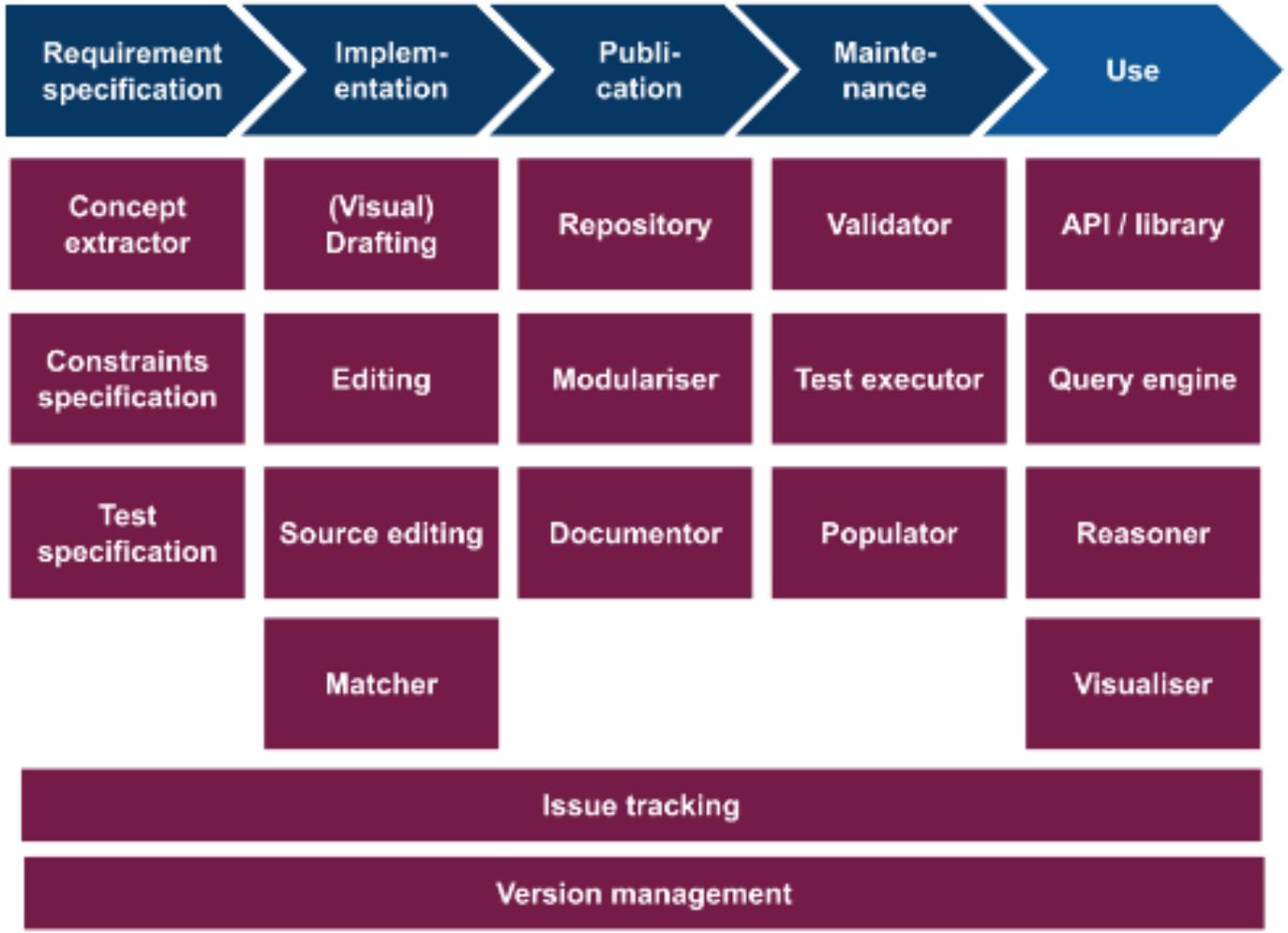
Intra-ontology interoperability **:** The capability to enable data sharing between a single semantic representation of data from TLO to ALO coming from *a monistic ontology/domain approach* (one-to-one exclusive relation between ontology and domain of interest). This type of interoperability will be addressed by OntoCommons within a TLO ontology branch whose lower ontology levels share a common semantic framework.

Cross-ontology interoperability the capability to enable data sharing between different semantic representations of data from different TLOs branches coming from a *pluralistic ontology/domain approach*.

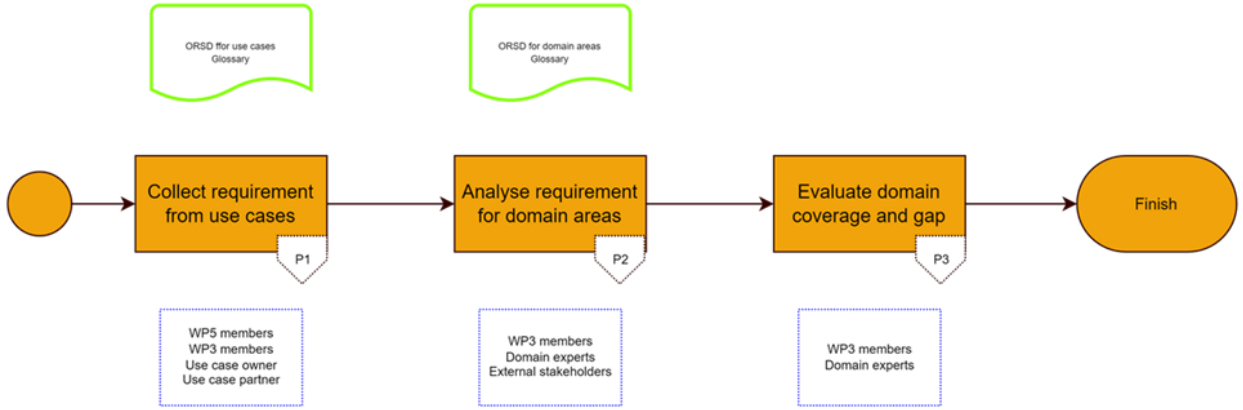
LOT Methodology



Components of the ontology ecosystem toolkit



Requirement Engineering (methodology, Competency Questions, ORSD)



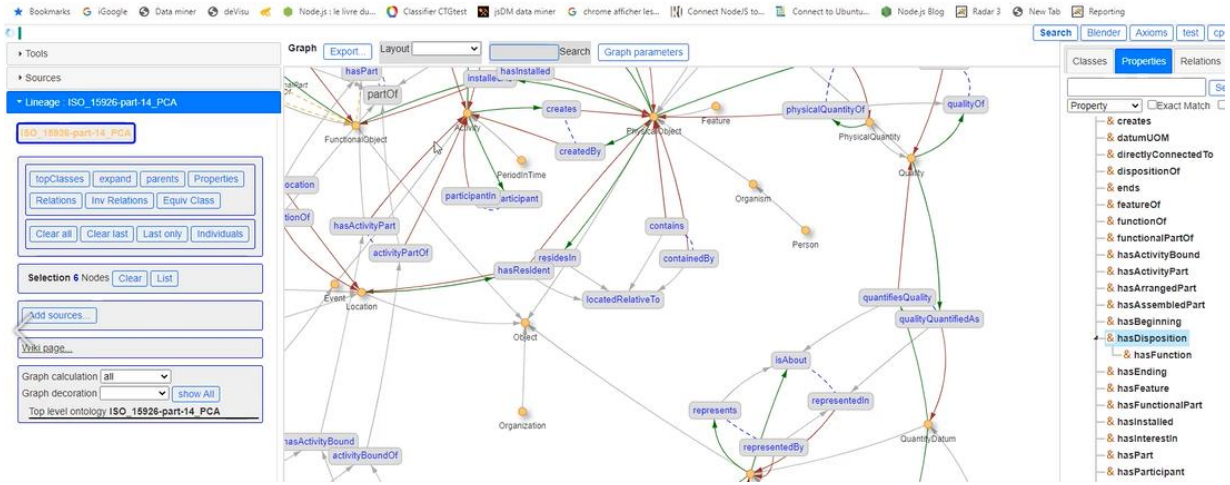
Identifier (domain+id)	Sprint	Competency Question / Natural language sentence (fact)	Answer	Status (Proposed, Accepted, Rejected, Pending, Deprecated)
UC1-1	UC interview	What are the types of resource?	Human resource, intangible resource, material resource	Accepted
UC1-2	UC interview	What are the types of manufactring ressource?	Equipment, facilities	Accepted
UC1-3	UC interview	What are the types of equipment?	Drilling adapter, drilling template, measuring equipment, robot, fastener, wedge	Accepted
UC1-4	UC interview	What are the types of materials?	Manufacturing material, raw material, assembly	Accepted
UC1-5	UC interview	What are the component of an assembly?	None.	Accepted
UC1-6	UC interview	What are the types of assembly?	Front fuselage, rear fuselage	Accepted
UC1-7	UC interview	What are the types of part?	Buttsrap, fastener, frame, stabiliser, stringer	Accepted
UC1-8	UC interview	What are the functions for different resources?		Accepted
UC1-9	UC interview	What are the qualities of different resources?		Accepted
UC1-10	UC interview	What are the qualities of different materials?		Accepted
UC1-11	UC interview	What are the qualities of different processes?		Accepted
UC1-12	UC interview	What are the types of processes?	Boring, cleaning, deburring, drilling, fastening, fixing, insert, inspection, installation	Accepted
UC1-13	UC interview	What are the functions that are realized by different processes?		Accepted
UC1-14	UC interview	What are the required resources of different processes?		Accepted
UC1-15	UC interview	What are the required materials of different processes?		Accepted
UC1-16	UC interview	What are the information for a system requirement?	Design criteria, design rule, TLR	Accepted
UC1-17	UC interview	What are the types of system model?		Accepted
UC1-18	UC interview	What are the compoment of a system model?		Accepted
UC1-19	UC interview	What are the sub-processes of a design process?		Accepted
UC1-20	UC interview	What are the information for a process plan?		Accepted
UC1-21	UC interview	What are the information for system design?		Accepted

Ontology Requirements Specification Document	
1	**Purpose (mandatory)**
	The use case aims to demonstrate: - decreased development time via automatized decision making and improved re-usability, - improved reliability via traceability, - improved communication between product, assembly and industrial system experts via data integration and increased domain knowledge interoperability.
2	**Scope (mandatory)**
	Increase the interoperability and improve the communication between aircraft design, assembly design and the industrial system design
3	**Implementation Language (optional)**
4	**Intended End-Users (optional)**
	1) Knowledge scientist 2) System engineering expert 3) Assembly process engineer 4) Simulation engineer
5	**Intended Uses**
	The system is expected to support decision-making during aircraft industrial system design. Some expected benefits include: 1) Predict behavior, explore architectural alternatives early in the development process, and perform trade studies to assess which design choices make the most sense for manufacturing performance. 2) Develop a cognitive twin based on captured domain knowledge, models and simulations. 3) Perform a Business transformation that includes new organizations and new roles to develop the models and to perform manufacturing engineering activities.
6	**Ontology Requirements**
	1. **Non-Functional Requirements**
	This use case will be based on the output of a relevant project (QU4LITY) pilot. Another objective is to improve the interoperability by aligning the application ontology to the top level ontology or top reference ontology which are expected output of OntoCommons.
	1. **Functional Requirements: Lists or tables of requirements written as Competency Questions and sentences**
7	**Pre-Glossary of Terms (optional)**
	1. **Terms from Competency Questions**
	1. **Terms from Answers**
	1. **Objects**

Deliverable D3.4 contains detailed requirement for NMBP domains based on 11 use cases and stakeholder's input

Ontology Editing (and data documentation)

- Two primary editors (completely free, natively hosted) are recommended.
- Currently being integrated to the ecosystem platform (IndustryPortal)



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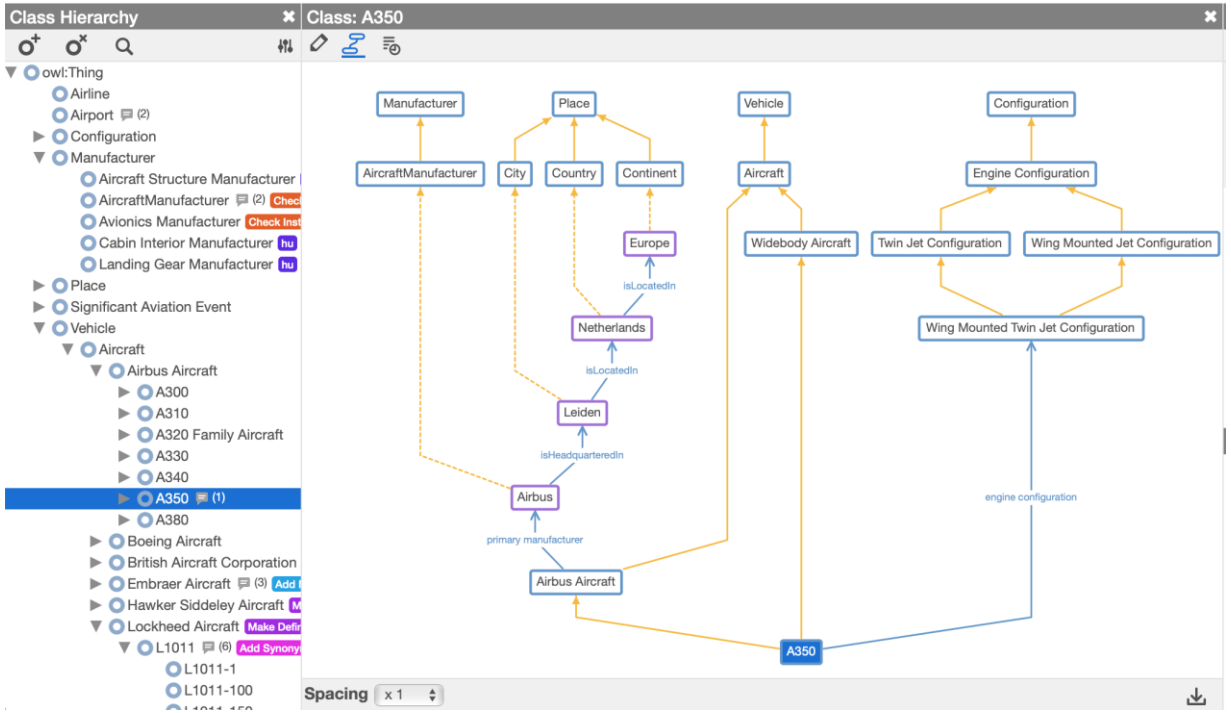
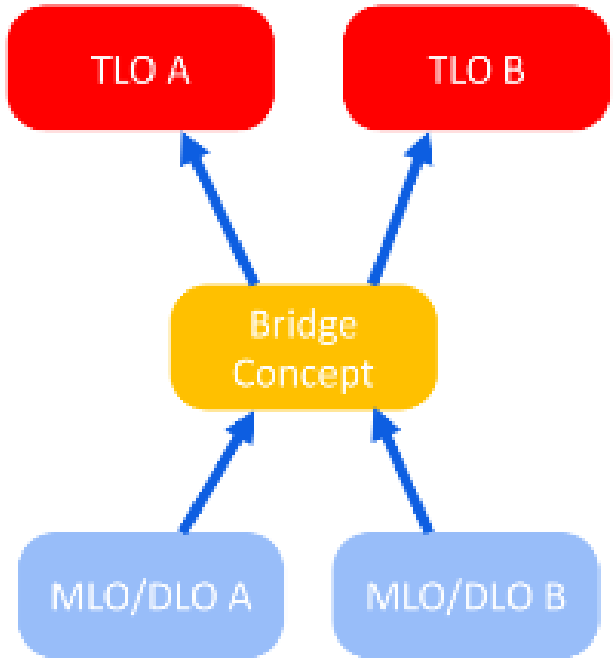


OCEAN (Web-Protégé)

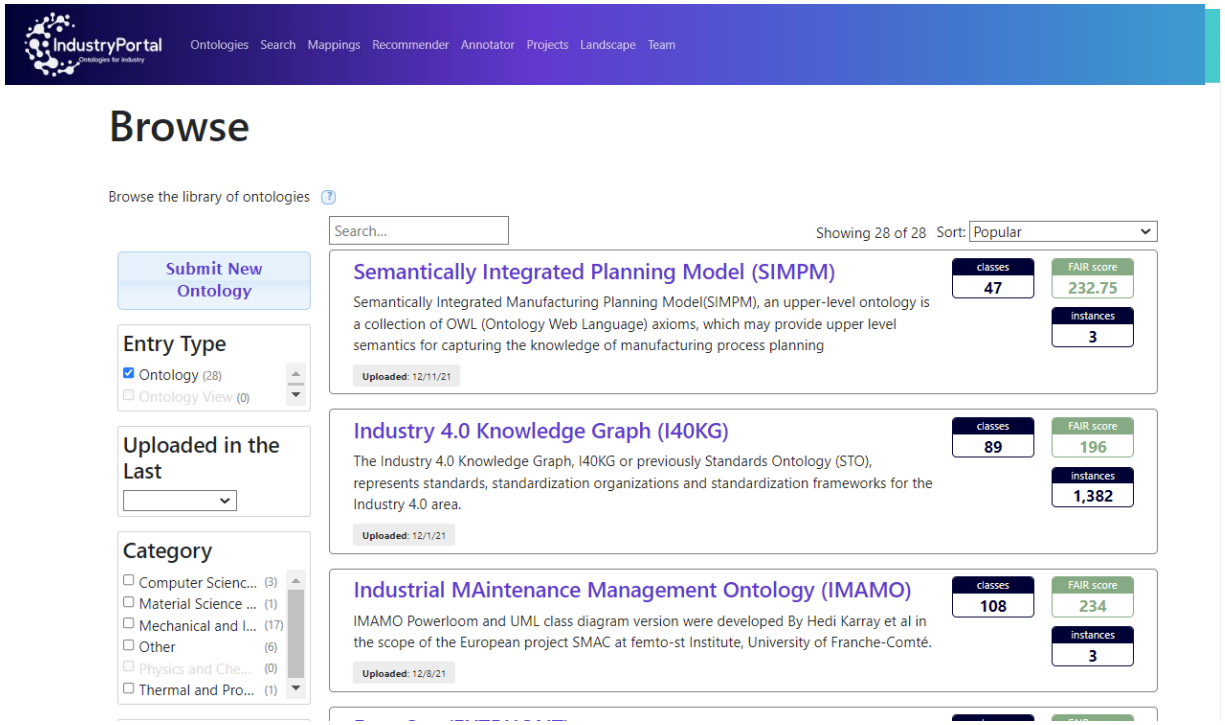
Pluralistic alignment using Bridge Concept

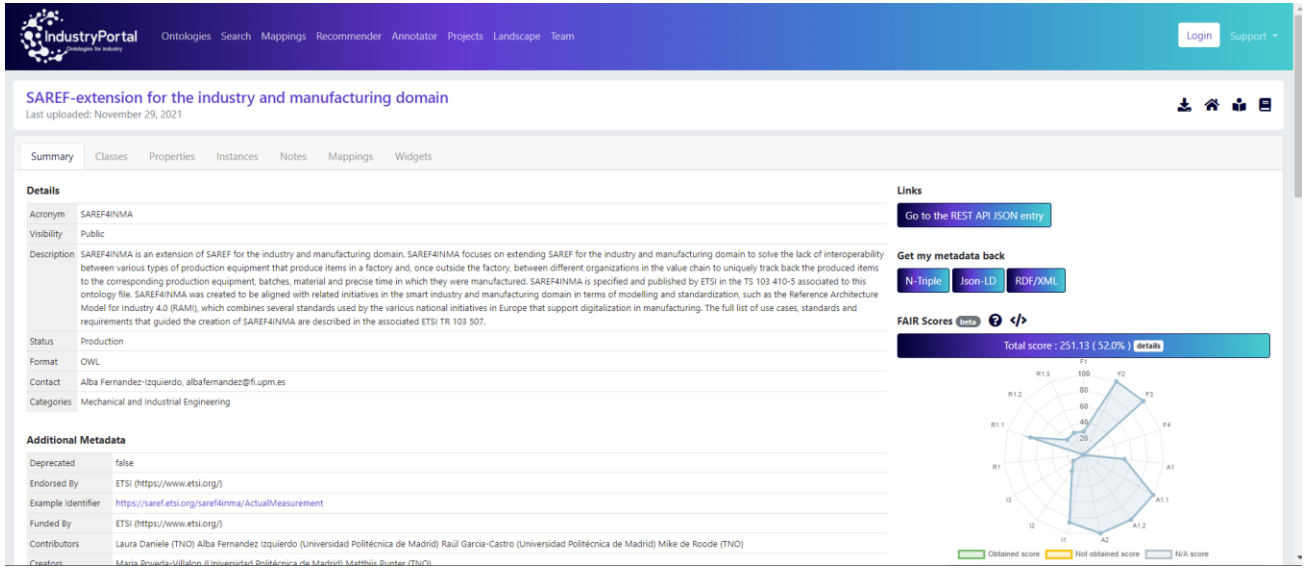
- Being an integral part of such methodology, the bridge concept templates provide a way to define concepts that can bridge middle-level and domain ontologies to existing top-level ontologies.
- The template guides the domain experts with targeted questions to provide any necessary information about the new concepts and reach consensus in a collaborative manner to enable alignment between ontologies.
- The newly introduced concept is linked to both upward (multiple upper level TLOs or MLOs) and downward (multiple DLOs) to harmonize intra and cross domain ontologies in the interoperable ontology stack

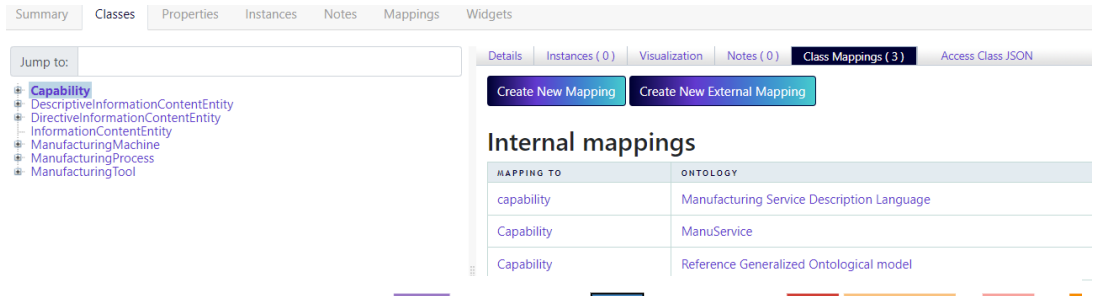


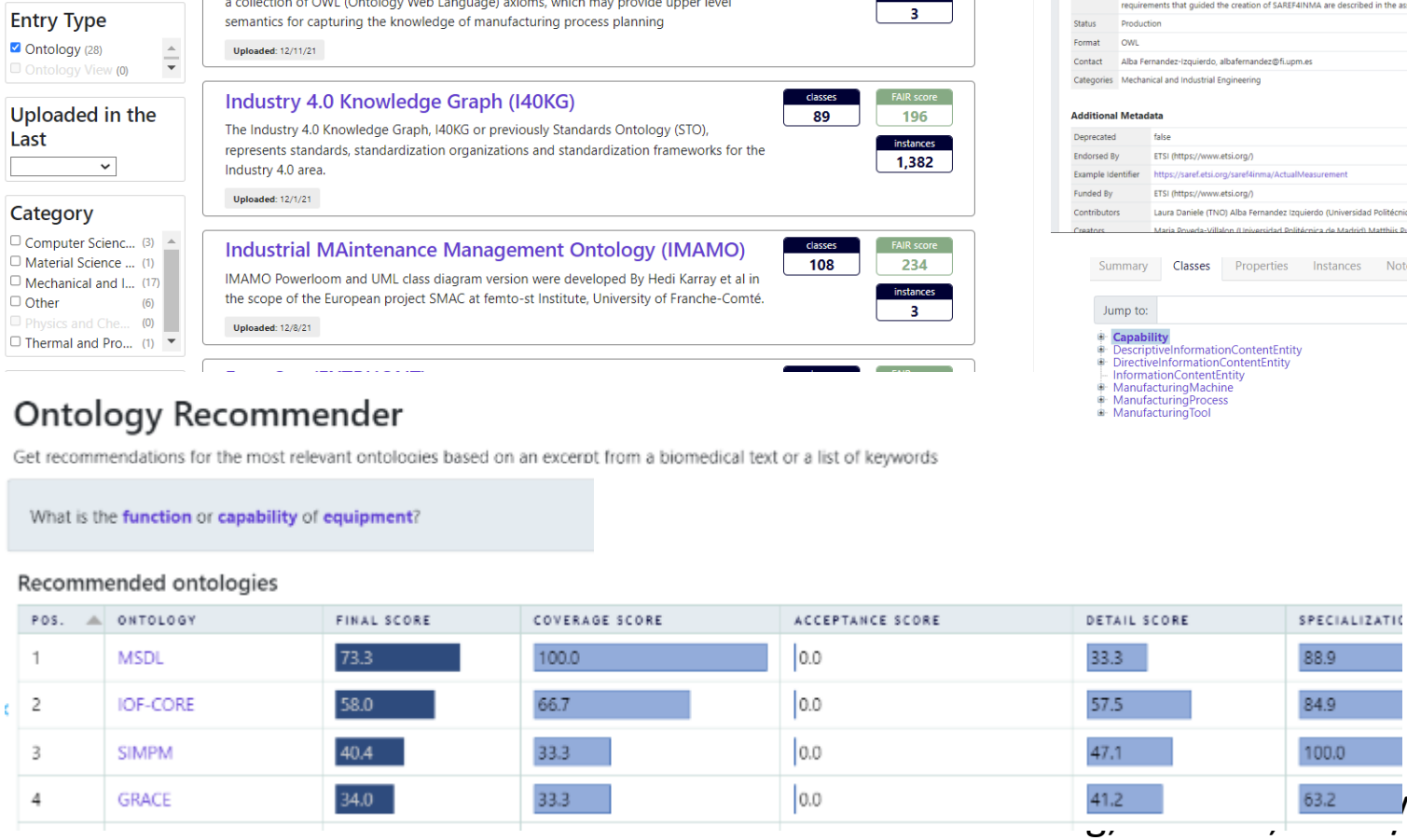
https://github.com/OntoCommons/OntologyFramework/blob/dev/bridge-concept-template.md

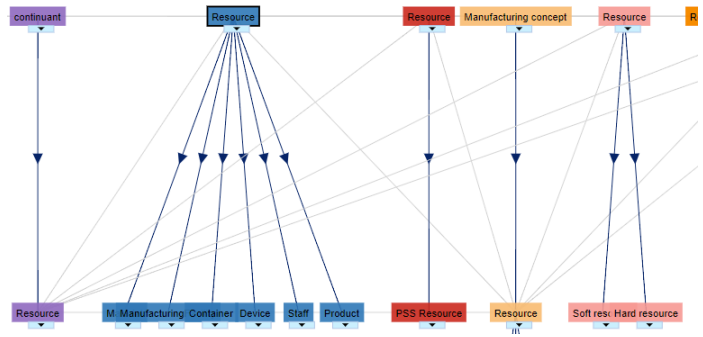
IndustryPortal http://industryportal.space/







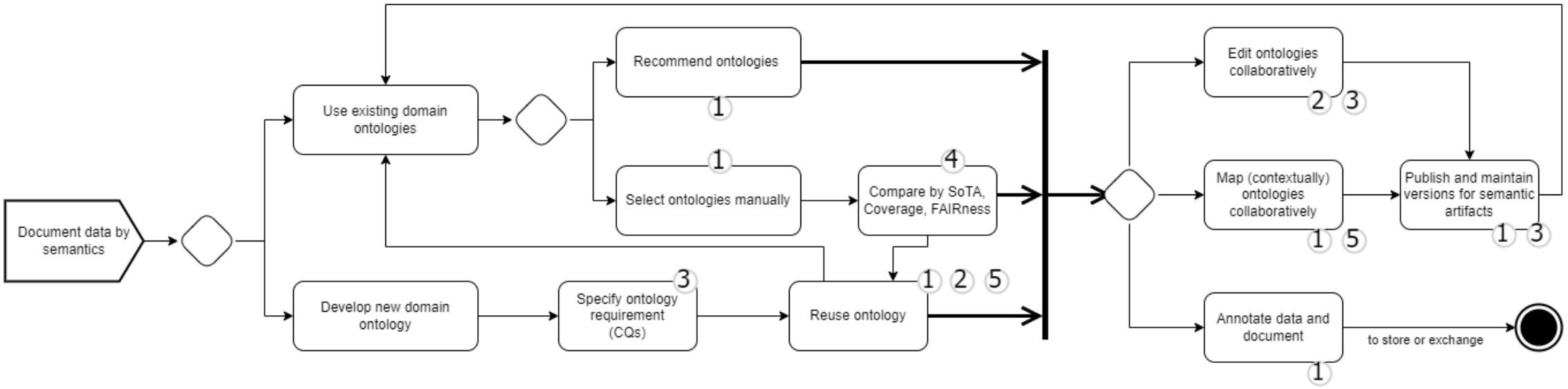




Features of IndustryPortal

- To search and browse terms across all ontologies;
- To submit a new ontology in public or private mode;
- To edit various ontology metadata (i.e., acronym, visibility, description, status, format, and contact), and other FAIR-related metadata;
- To evaluate the FAIRness of an ontology (via the O'FAIRe Web service);
- To maintain different releases of an ontology as part of version management;
- To provide ontology artifacts in different encoding formats;
- To categorize the ontology by topics for better discovery;
- To annotate a piece of text with all ontologies;
- To store and serve mappings between ontologies (inside and outside the portal).

Workflow for using OntoCommons Ecosystem



More Information and Training

- FOMI'22 (15th September 2022, Tarbes, France) - How to develop ontology following OCES methodology
  - Emanuele Ghedini, Francesco Zaccarini, Arkopaul Sarkar
  - https://youtu.be/H1FngGcTmhc?t=575
- OntoCommons Demonstrators and Use Case Workshop (Stuttgart)
  - Upcoming on 07 November 2022 to 08 November 2022
  - https://ontocommons.eu/news-events/events/ontocommons-demonstrators-and-use-case-workshop

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Thanks

Questions?

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Contact

www.ontocommons.eu

Arkopaul Sarkar, asarkar@enit.fr

Hedi Karray, mkarray@enit.fr (Technical Coordinator)

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