ONTO COMMONS
ONTOLOGY-DRIVEN DATA DOCUMENTATION FOR INDUSTRY COMMONS

Webinar and Tutorial on Domain Ontology Alignment and Practical Use

OntoCommons “Ontology-driven data documentation for Industry Commons” has received funding from the European Union’s Horizon Programme call H2020 -NMBP-TO-IND-2020-singlestage, Grant Agreement number 958371

Agenda

Session	Time (CET and PM)	Time	Speaker
Introduction to OCES ontology stack for cross-domain interoperability	02:10 - 02:40	30 min	Lan Yang
Q&A		10 min	
Introduction to alignment of ontologies through bridge concepts	02:50 - 03:20	30 min	Francesco Antonio Zaccarini
Q&A		10 min	
Hands on using OCES ontology stack for your application	03:30 - 04:10	40 min	Arkopaul Sarkar
Q&A		10 min	
Requirement collection for further development and refinement for OCES domain-level ontologies and bridge concepts	04:20 - 04:40	20 min	Arkopaul Sarkar
Q&A		10 min	

ONTO COMMONS
ONTOLOGY-DRIVEN DATA DOCUMENTATION FOR INDUSTRY COMMONS

Session 1
Introduction to OCES ontology stack for cross-domain interoperability

Lan Yang / University of Galway

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Outline

1. **Domain-level ontology harmonisation**
   - Domain coverage analysis in five focus areas
   - Bridge concept engineering for domain concept alignment
2. **Industry Portal**
   - What can you find
   - How to use
3. **Other resources in OCES ontology stack**
   - OntoCommons TRO and MRO repository
   - OntoCommons domain ontology catalogue

1. Domain-level ontology harmonisation: domain coverage analysis

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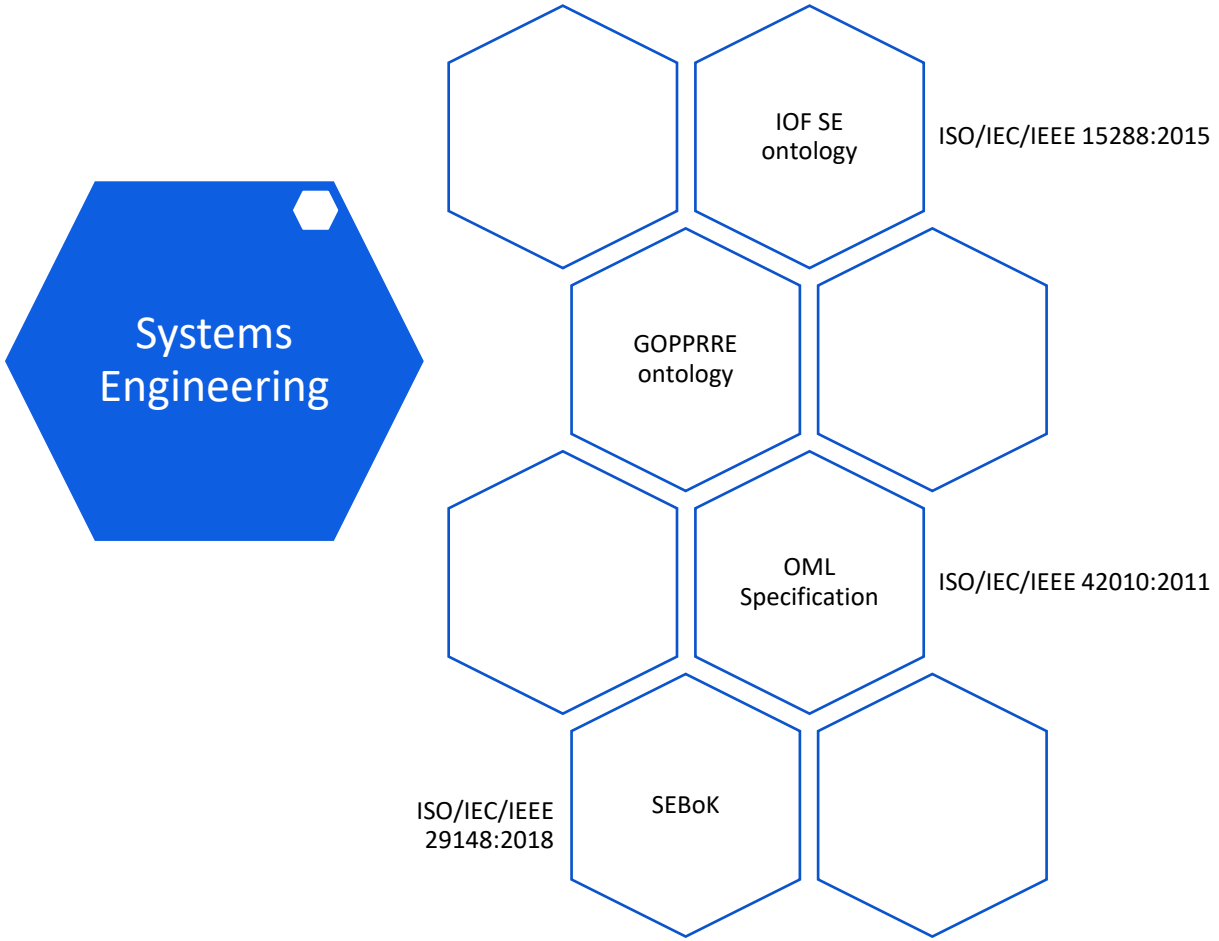
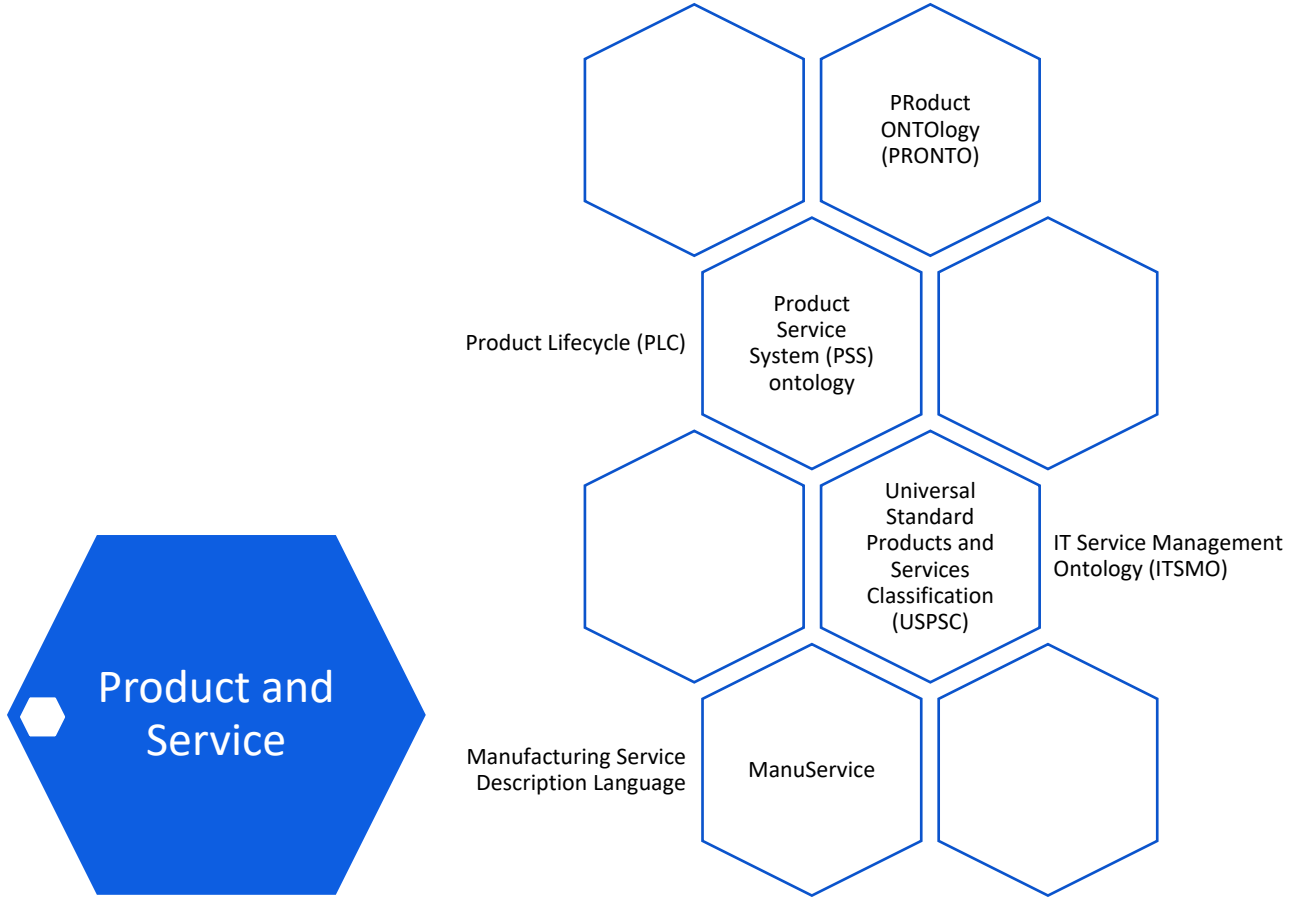


1. Domain-level ontology harmonisation: domain coverage analysis



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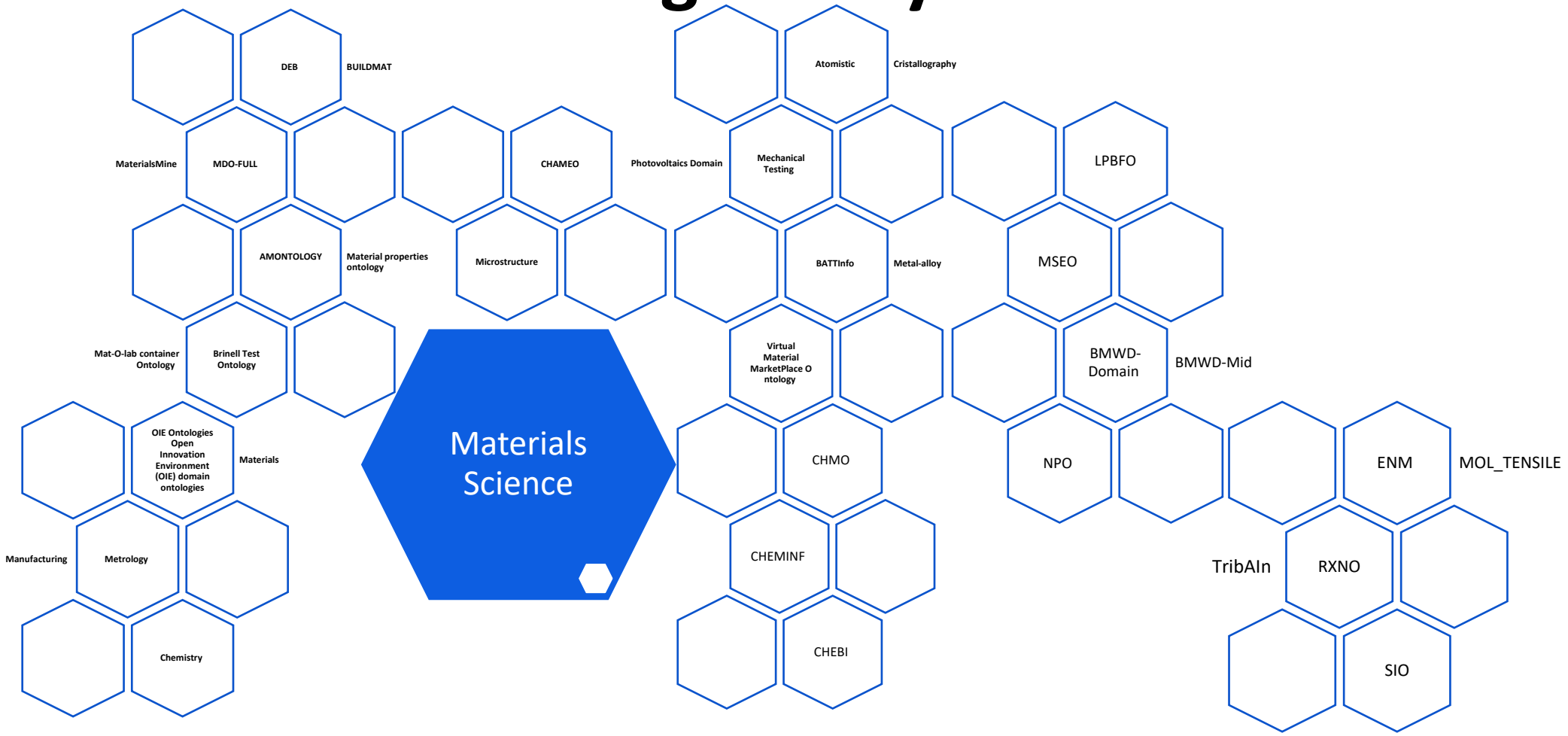

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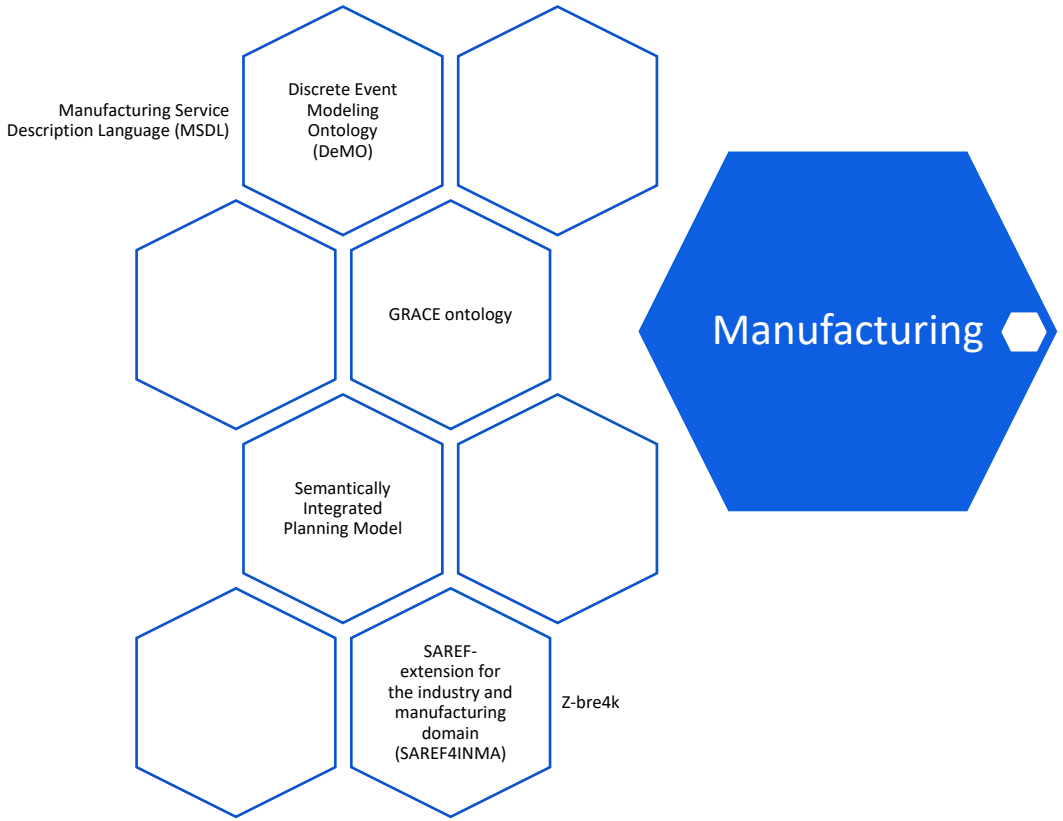

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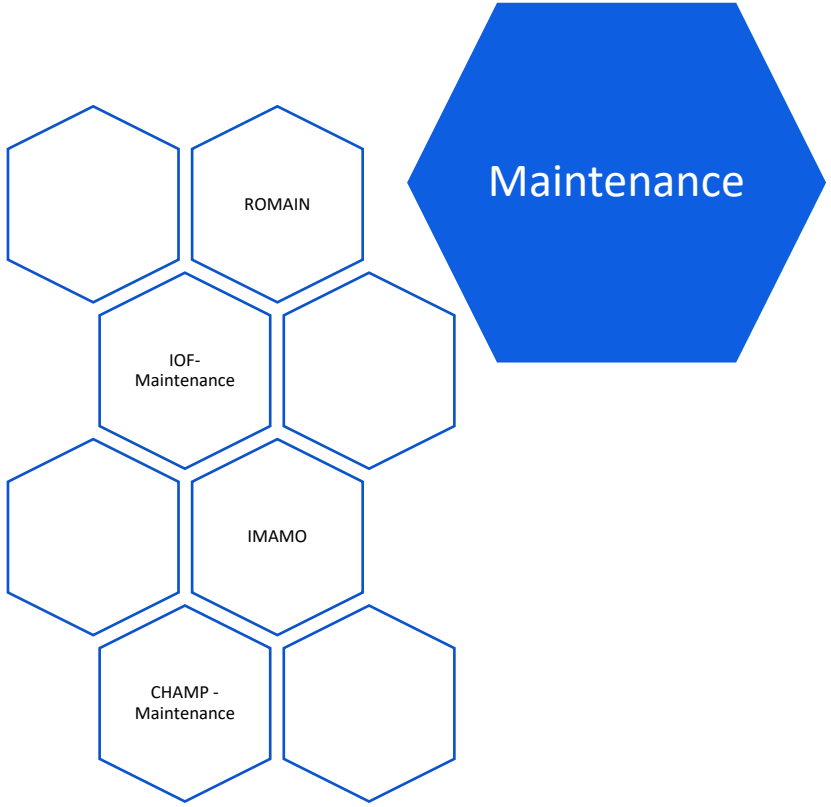

1. Domain-level ontology harmonisation: domain coverage analysis

D3.6 - First report on harmonized and developed ontologies

1. Domain-level ontology harmonisation: Bridge concept engineering

NEW CONCEPT NAME

(use the preferred label, or IRI name, provided in the first table as title)

General Concept Info:

IRI:	*Suggested entity new IRI.*
OWL Type:	*Class|ObjectProperty|Individual.*
Concept Elucidation:	*Natural language definition of the concept (elucidation).* *Here the concept that we want to introduce is expressed as precisely as possible, making references to knowledge domain resources, including instance and usage examples when relevant.*
Labels:	*Labels used to address the concept, ordered as:* *i) preferred (one) (the label to primarily used to shortly refer to the concept)* *ii) alternative (multiple) (labels that are commonly used to address the concept in practice, even if they are used with narrower of wider sense)* *iii) deprecated (multiple) (labels that are misleading with respect to the concept, because of misuse, ambiguity or too wide meaning).*

Knowledge Domain Resources:

Related Domain Resources:	*Existing domain resources (e.g. standards, books, articles, dictionaries) that defines or are related to the concept (provide reference to the resource and quote the relevant informational content).* *More than one resource can be reported.* *These resources are aimed to support the choice of the above concept choice and elucidation.*
Comments:	*Explain the motivations behind the concept definition with reference to the domain resources, underlying similarities and differences.*

Alignments To Existing Ontologies: *(1: vertical, MLOs/TLOs; 2: horizontal, DLOs)*

1: Vertical Alignments

Target Ontology:	*Existing IRI of the ontology that will express the concept according to its logical framework (concept alignment).*
Related Ontology Entities:	*List of terms and IRIs of the Target Ontology entities that are relevant for the concept (documentation is supposed to be accessible through the target ontology).*
Mapping Elucidation:	*Natural language description of the mapping choice and motivations.*
Semantic Relation Level:	*The level of semantic relationship between the Concept and the Target Ontology entities:* • *Equivalence (strong mapping) (e.g. owl:equivalentClass, owl:equivalentProperty)* • *Strong Hierarchical (e.g. rdfs:subClassOf, rdfs:subPropertyOf)* • *Weak Hierarchical (e.g. skos:narrower, skos:broader)* • *Similarity (e.g. skos:related).*
Mapping Axioms:	*Proposed mapping axiom (or axioms) between the Concept entity and the Target Ontology entities in a OWL2 compliant syntax (e.g. Turtle, Manchester, RDF/XML, Functional-Style, OWL/XML).*

2: Horizontal Alignments

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1. Domain-level ontology harmonisation: Bridge concept engineering

ONTO COMMONS
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- FG1 Systems Engineering - Stakeholder.docx
- FG1 Systems Engineering - System.docx
- FG2 Product and Service - Product Specification.docx
- FG3 Material Science - (Material) Component.docx
- FG4 Manufacturing - Assembly.docx
- FG4 Manufacturing - Assembly (Process).docx
- FG4 Manufacturing - Engineering Feature.docx
- FG4 Manufacturing - Operator (Machine Operator).docx
- FG4 Manufacturing - Part (Manufactured Material Item).docx
- FG4 Manufacturing - Plan (that is produced by planning).docx
- FG4 Manufacturing - Product Design (Specification of Material Product).docx
- FG8 Maintenance - Event.docx

Part (manufactured material item)

General Concept Info:

IRI:	*Suggested entity new IRI.*
OWL Type:	*Class*
Concept Elucidation:	A separate manufactured material item that is used as a component to make up an assembly or product in combination with other items but is not a combination of other items.
Labels:	*Labels used to address the concept, ordered as:* *skos:prefLabel: part* *skos:altLabel: component, item ,* *skos:hiddenLabel: spare part, service part, piece, product*

Knowledge Domain Resources:

Related Domain Resources:	***Part*** *[ASCM former APICS]: Generally, a material item that is used as a component and is not an assembly, subassembly, blend, intermediate, etc.* *[Britannica]: 1) one of the pieces, sections, qualities, etc., that make or form something; 2) one of the pieces that are put together to form a machine.* *[Wordnet]: Portion, component part, component, constituent (something determined in relation to something that includes it).* *[Cambridge dictionary]: A separate piece of something, or a piece that combines with other pieces to form the whole of something:* *[Wordreference]: A separate or distinct portion of a whole.* *[Oxford] An amount or section which, when combined with others, makes up the whole of something* ***Component*** *[ASCM former APICS]: The raw material, part or subassembly that goes into a higher-level assembly, compound, or other item. This term may also include packaging materials for finished items.* *[ISO/TR 10949:2002]: Part, assembly, or collection of parts that performs a function in a fluid power system* *[ISO 18413:2015]: General term to cover a part, a component, a sub-assembly, or a part assembly used in a hydraulic system* *[ISO/TR 19972-1:2009]: Individual unit (e.g. cylinder, motor, valve, filter, but excluding piping) comprising one or more parts designed to be a functional part of a fluid power system.* *[ISO 6016:2008]: Part, or assembly of parts, of a base machine, equipment or attachment*

- FG1 Systems Engineering - Stakeholder.docx
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[ISO 7186:2011], [ISO 2531:2009],Any product defined as an element of a pipeline, such as a pipe, fitting or accessory

[ISO/TS 15874-7:2018], [ISO/TS 23818-2:2021]. Product manufactured out of a specific compound brought to the market as part of another product or as a spare part.

[Britannica]: One of the parts of something (such as a system or mixture).

[WordNet]: Constituent, element (an artifact that is one of the individual parts of which a composite entity is made up; especially a part that can be separated from or attached to a system) "spare components for cars"; "a component or constituent element of a system".

[Wordreference] A basic or fundamental part from which something is made a part of a mechanical or electrical system.

[Cambridge] A part that combines with other parts to form something bigger:

[Oxford] A part or element of a larger whole, especially a part of a machine or vehicle.

Item

[ASCM former APICS]: Any unique manufactured or purchased part, material, intermediate, subassembly or product

[Britannica]: 1) an individual thing : 2) a separate part or thing.

[Wordnet]: 1) a distinct part that can be specified separately in a group of things that could be enumerated on a list) ; 2) a small part that can be considered separately from the whole) "it was perfect in all details"

[Wordreference] A separate thing or particular article:

[Cambridge] Something that is part of a list or group of things:

[Oxford] An individual article or unit, especially one that is part of a list, collection, or set.

Spare part

[ASCM former APICS]: Synonym of Service Parts.

Service part

[ASCM former APICS]: Synonym of Service Parts. Those modules, components, and elements that are planned to be used without modification to replace an original part.

Piece

[Britannica]: One of the parts that form a complete thing when they are put together

[Wordnet]: A separate part of a whole.

[Wordreference] A portion or quantity of something:

[Cambridge] Something that is part of a list or group of things:

[Oxford]: An individual article or unit, especially one that is part of a list, collection, or set.

Product

[ASCM former APICS]: Any good or service produced for sale, barter or internal use,

[Britannica]: Something that is made or grown to be sold or used

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	[Cambridge] Something that is part of a list or group of things: *[Oxford]: An individual article or unit, especially one that is part of a list, collection, or set.* ***Product*** *[ASCM former APICS]: Any good or service produced for sale, barter or internal use,* *[Britannica]: Something that is made or grown to be sold or used* *[ISO/TS 15876-7:2018], [ISO/TS 15874-7:2018]: Pipe, fitting, or valve of a clearly identified type intended to be a part of a piping system which the manufacturer puts on the market* *[Wordnet] 1) an artifact that has been created by someone or some process ; 2) Commodities offered for sale.* *[Wordreference]: All the goods or services that a company produces:* *[Cambridge] Something that is made to be sold, usually something that is produced by an industrial process or, less commonly, something that is grown or obtained through farming:* *[Oxford] Anything that can be offered to a market for attention, acquisition, use, or consumption that might satisfy a need. It includes physical objects and services.*
Comments:	*In some cases, the concepts Part and Component are considered synonymous and used interchangeably but there is a distinctive difference. Component is broader as it can refer to either an individual part or a sub-assembly, while Part is a material item that cannot be an assembly [ASCM former APICS].* *The same applies to Part and Item as an Item can refer to material, intermediate, subassembly or product. In that case Item and Component have some overlapping but can be considered distinctive as a Component has to be part of a higher-level assembly, compound, or other item while an Item has not [ASCM former APICS].* *Part and Piece are overlapping concepts. However, Part is more used in the manufacturing domain (e.g., the concept Piece is not considered in a domain specific dictionary as ASCM former APICS).* *Part and Product also have some overlapping as a Product refers to a good or service produced for sale, barter or internal use [ASCM former APICS]. In that sense Product is broader that Part as it can refer to an immaterial item while Part refers to a material one. however, a Part could be considered as a Product depending on the specific context (e.g. the same item can be a product for one manufacturer and a part or component for another).* *Finally, Spare Parts are specific types of part that can be used to replace another one with the same characteristics.* *Traits* 1. *A constituent piece of an assembly or a product.* 2. *Cannot be disassembled in other pieces.* 3. *Can be disassembled from an assembly or product* 4. *Typically made of a single material.* 5. *Results from a production process* 6. *Identified by a manufacturer part number.* 7. *Produced or assembled by a company.*

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Alignments To Existing Ontologies: *(1: vertical, MLOs/TLOs; 2: horizontal, DLOs)*

1: Vertical Alignments

Target Ontology:	*Commercial Product Class - Bridge Concept IRI*
Related Ontology Entities:	*Commercial Product*
Mapping Elucidation:	*A Commercial Product is something which is explicitly offered on the market for purchase or barter.* *The context in which a part entity is used needs to be considered. The same item can be a product (i.e., resulting from a manufacturing process and offered to the market) for one manufacturer and a component of a larger assembly or product for another.*
Semantic Relation Level:	*The level of semantic relationship between the Concept and the Target Bridge Concept is :* *Part skos:narrower Commercial Product*[9]
Mapping Axioms:	

2: Horizontal Alignments

ExtruOnt

Target Ontology:	*http://siul02.si.ehu.es/bdi/ontologies/ExtruOnt/ExtruOnt.owl*
Related Ontology Entities:	*Item, https://w3id.org/def/saref4inma#Item* *It uses the concept from the SAREF4INMA ontology.*
Mapping Elucidation:	*The class is defined as: "A tangible object which can be unique identified, for example, with a GTIN in the form of a barcode/QR/RFID tag. An item product can be the result of the organization's production process (i.e. outflow of objects/goods) or can be uniquely identifiable material (i.e. inflow of objects/supplies). Each item is part of exactly one ItemBatch, whereas each ItemBatch contains only Items which have similar properties. An item can consist of multiple Batches and other Items (i.e. subassemblies)."* *On the one hand, this class has in common with the proposed definition of Part that it is "A tangible object which can be unique identified, [...] An item product can be the result of the organization's production process". But on the other hand, it differs from it the fact that the class Item is also defined as "An item can consist of multiple Batches and other Items" while the proposed definition states that a Part cannot be an assembly or subassembly*
Semantic Relation Level:	*The level of semantic relationship between the Concept and the Target Ontology entity is* *Part rdfs:subClassOf Item*
Mapping Axioms:	

ManuService

Target Ontology:	*ManuService Ontology (auckland.ac.nz)*

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MASON

Target Ontology:	*http://www.owl-ontologies.com/mason.owl*
Related Ontology Entities:	*Part, http://www.owl-ontologies.com/mason.owl#Part*
Mapping Elucidation:	*The class is not described but it is defined a Subclass of Assembly . It differs from the proposed definition in the fact that the Part cannot be an Assembly*
Semantic Relation Level:	*The level of semantic relationship between the Concept and the Target Ontology entity should be Part skos:narrower MASON: Part.* *Note: In the case we were referring to a Component level of semantic relationship between the Concept (Component) and the Target Ontology entity (Part) should be rdfs:subClassOf .*
Mapping Axioms:	*TBD*

MSDL (Manufacturing Service Description Language)

Target Ontology:	*http://data.industryportal.enit.fr/ontologies/MSDL/submissions/1/download?apikey=019adb70-1d64-41b7-8f6e-8f7e5eb54942*
Related Ontology Entities:	*Component, part, http://infoneer.txstate.edu/ontology/MSDL_0000027.*
Mapping Elucidation:	*The class is not described but it is defined a Subclass of engineered artifact. and both components and part are identified as potential labels. However, there is not enough information to decide if it refers to the same concept.*
Semantic Relation Level:	*The level of semantic relationship between the Concept and the Target Ontology entity is Part rdfs:subClassOf Component.*
Mapping Axioms:	*TBD*

Industry Ontology Foundry - CORE (IOF-CORE)

Target Ontology:	*https://purl.industrialontologies.org/ontology/core/Core*
Related Ontology Entities:	*material component. https://purl.industrialontologies.org/ontology/core/Core/MaterialComponent*
Mapping Elucidation:	*The term is described as:.* • *1.- A raw material, part, or subassembly that goes into a higher level assembly, compound, or the final product. This term may also include packaging materials for finished items [APICS]. 2. An individual piece used in the assembly of a single unit of equipment [ISO 13533:2001]* • *MaterialEntity(x) ∧∃y (MaterialEntity(y) ∧ componentPartOfAtAllTimes(x,y)) → MaterialComponent(x) 1. Assemblies that are components for one manufacturer may be final products for another (e.g., the selling of diesel engines is a primary product line of Cummins diesel engine yet a component assembly for its customers, Freightliner Trucks). The context in which a material entity is used needs to be considered to whether it bears the component º. 2. In most manufacturing use cases material components will be subclass of Material Artifact*

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Welcome to IndustryPortal, a common ontology portal for industry and related domains

Search for a class

Enter a class, e.g. Melanoma

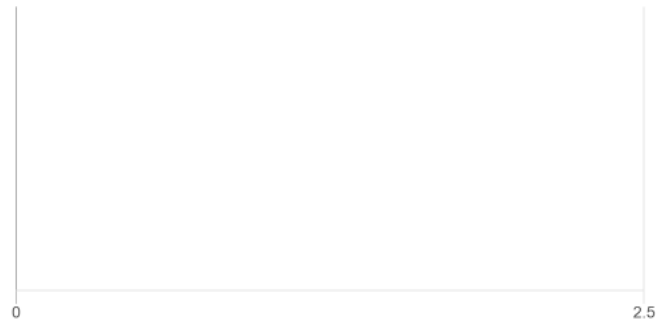
Advanced Search

Find an ontology

Start typing ontology name, then choose from list

Browse Ontologies

Ontology Visits (January 2023)



More

IndustryPortal Statistics

Ontologies	83
Classes	32,136
Individuals	24,237
Projects	9
Users	38

FAIR Scores beta

Average 199.08 (41%) Min 131 (27.4%) Max 272.13 (56.93%) Median 192 (40.16%)

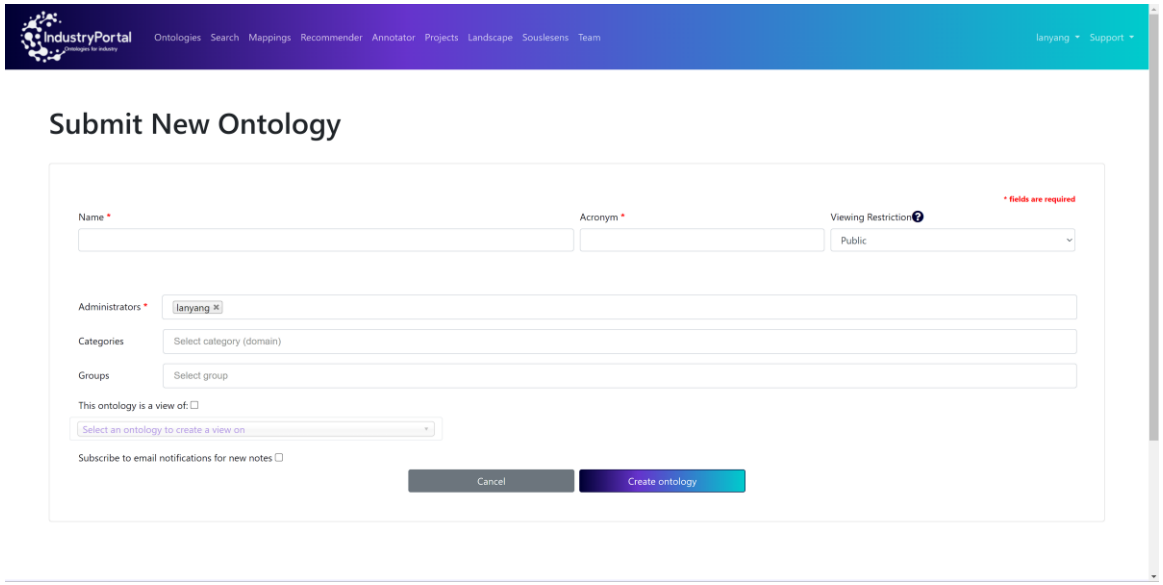
Start typing to select ontologies or leave blank to use all

Industry Portal

* **Browse** Tab: find a particular ontology quickly
* **Search** Tab: find a term in any ontology
* **Mappings** Tab: browse mappings for an ontology
* **Recommender** Tab: takes as input a text and suggests appropriate ontologies for it
* **Annotator** Tab: generate annotations for text
* **Projects** Tab: shows projects that make use of Industry Portal
* **Landscape** Tab: visualize data retrieved from the ontologies stored in the portal
* **Souslesens** Tab: supports graph visualization and interaction
* **Team** Tab: shows contact

Industry Portal

* Common Tasks
    * Submitting an ontology
        * Updating an existing ontology submission
        * Updating metadata for your submission
        * Updating ontology settings
    * Viewing and editing mappings
    * Viewing and editing notes
    * Viewing and editing reviews
    * Visualizing concepts and mappings



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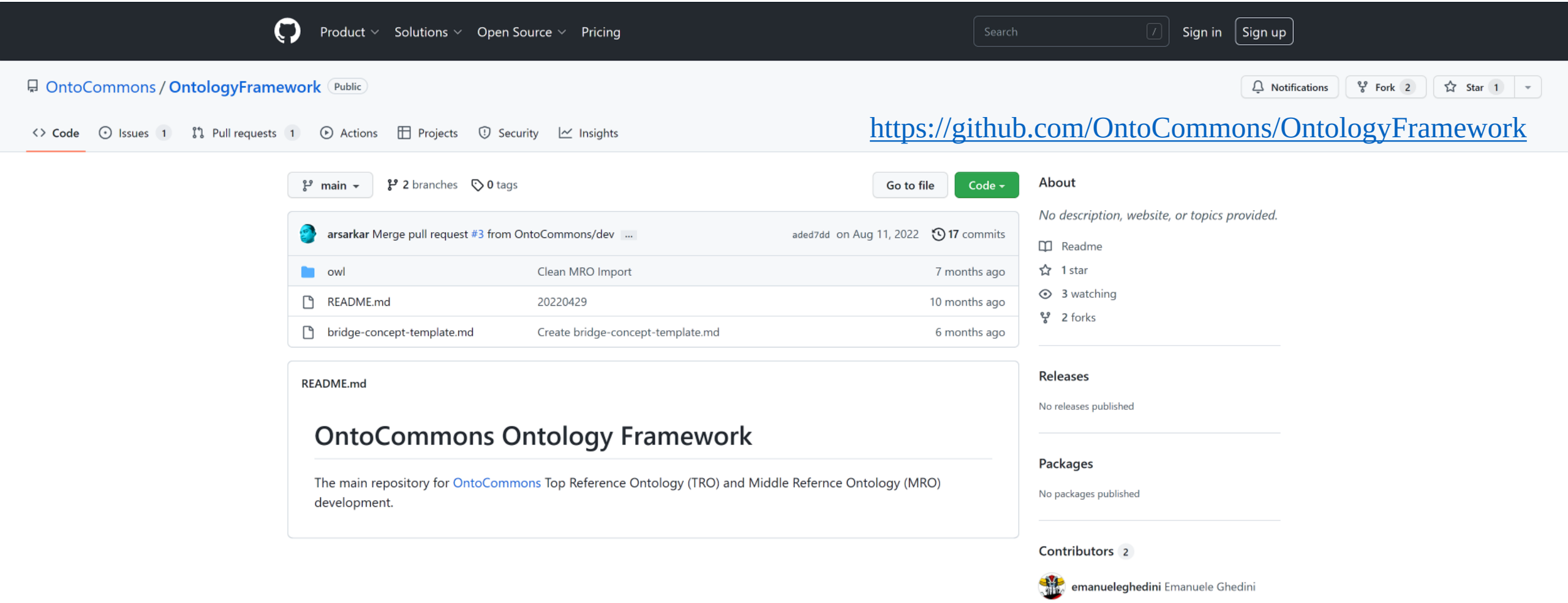
3. Other resources in OCES ontology stack

TRO and MRO repository

https://github.com/OntoCommons/OntologyFramework



3. Other resources in OCES ontology stack

Domain ontology catalogue

Home | SPARQL

https://data.ontocommons.linkeddata.es/index

OntoCommons ontology catalogue

On the Semantic Web, ontologies define the concepts and relationships used to describe a given domain and annotate data about it. In the OntoCommons Horizon CSA we are collecting ontologies about materials, construction, manufacturing and other industries. Here you can find the list of ontologies we have identified so far. You can also propose ontologies to be included in the catalogue by filling in the form.

Ontology catalogue overview

Ontology	URI link	Licensed?	Ontology Language	Syntax	Domain	Natural Language
Battery INterFace Ontology (BattINFO)		CC0 1.0 Universal	OWL	Turtle	Battery, Electrochemistry, Electrode, Electrolyte	eng
Battery Value Chain Ontology (BVCO)		CC-BY	OWL	RDF/XML, Turtle	BatteryValueChain, MiningOfBatteryMaterials, RefiningOfBatteryMaterials, BatteryManufacturing, BatteryRecycling	eng
Building ontology		CC-BY	OWL	Turtle	Construction, Renovation	eng
CIF-Ontology		CC-BY	OWL	Turtle	Materials Science, Chemistry, Physics, Crystallography	eng
Collaborative Manufacturing Services Ontology		MIT	OWL	RDF/XML	ManufacturingAndSupplyChainDomains	eng

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Thank you very much for your attention!

Questions

Follow us on

Contact

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