

Francesco Beretta

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**Modelling Social Life:
an Extension of CIDOC CRM**

(sdhss.org Project)

Data for History Lectures

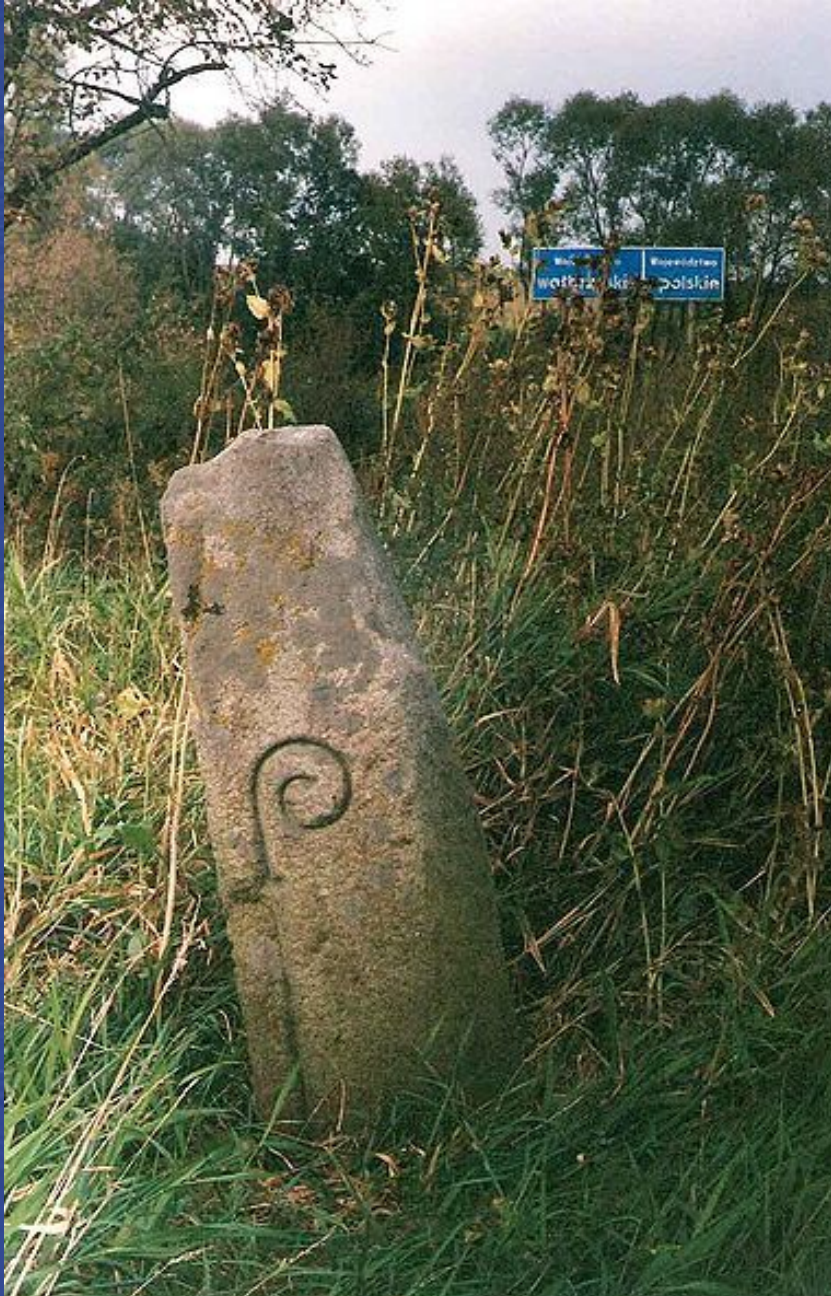
Digital History - Offenes Forschungskolloquium

Berlin (online), 18 May 2022

What is social life ?

Some examples

A social object : a border stone that defines a boundary



Border stone from c. 1280 on the border of the lands of the Wrocław bishops.

In the background the contemporary road sign marking the border between Opole and Wałbrzych voivodships.

Photo: Władysław Łoś (CC By SA 3.0)

The physical object, the notion of border, the symbol of the episcopal crozier, the function of bishop.

The bio-physical world, the social world

A social role: the rite that establishes the function



A social event: different perspectives on a forbidden car race



Sports car photo created by azerbaijan_stockers - www.freepik.com

Where can I find an ontology,
i.e. a standard conceptualisation of social life ?

CIDOC CRM

DUL
(DOLCE ULTRA LIGHT)

schema.org

?

Research agenda

Research specific data model

Research data

“An ontology is
a formal explicit specification
of a shared conceptualization
of a domain of interest”

- « Formality – ... a knowledge representation language that is based on the grounds of **formal semantics**. »
- « Consensus – ... an agreement on a domain conceptualization among people in a community. »
- « Conceptuality – ... in terms of conceptual symbols that can be intuitively grasped by humans, as they correspond to the elements in their **mental models**. »
- « Domain Specificity – ... limited to knowledge about a particular **domain of interest**. »

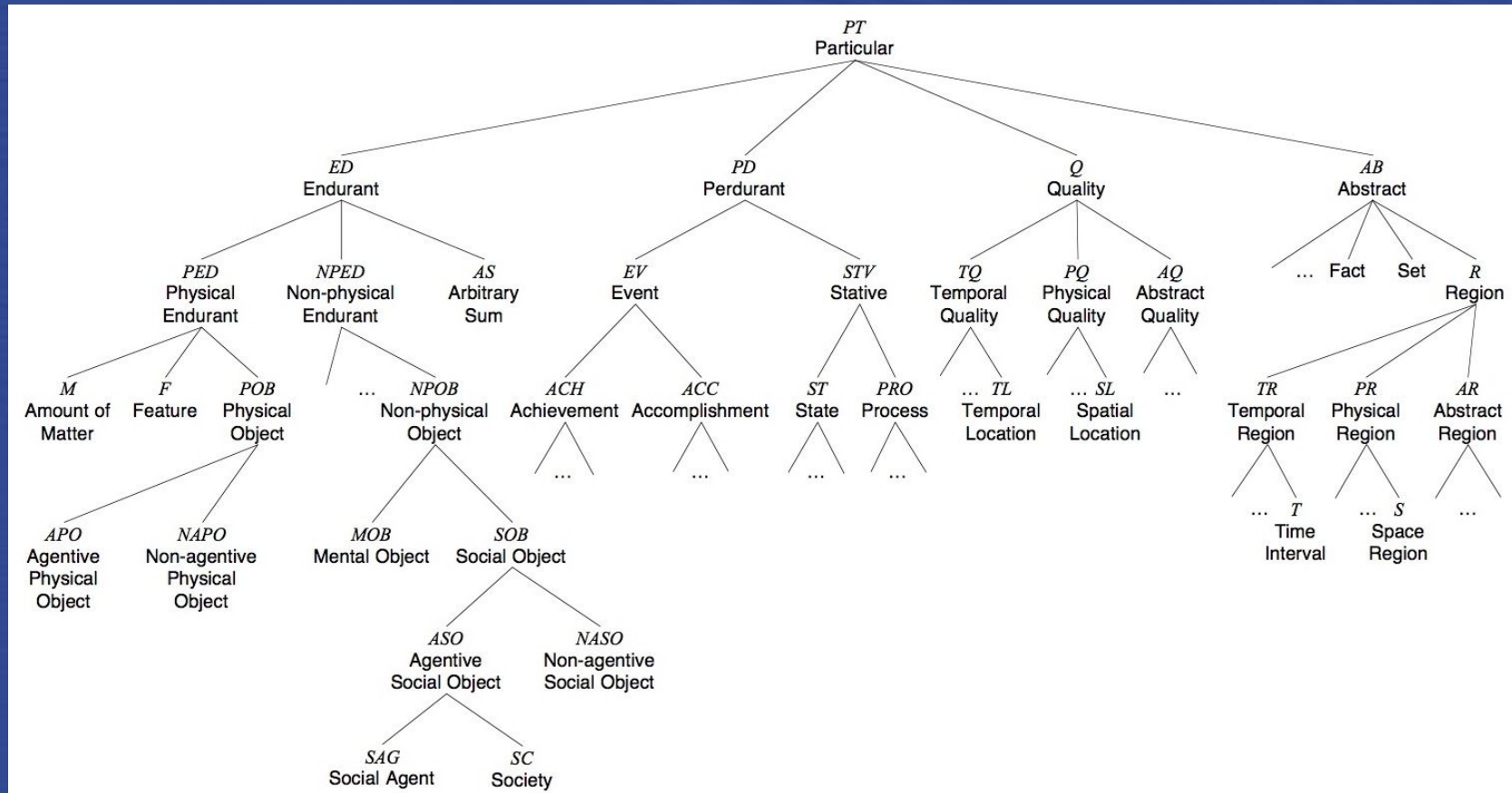
Domingue, John, Dieter Fensel, et James A. Hendler, eds. Handbook of semantic web technologies. Berlin: Springer, 2011, p. 510-511.

Foundational ontologies
& modelling best practices

Research specific data model

Research data

DOLCE



Descriptive Ontology for Linguistic and Cognitive Engineering (DOLCE) – a foundational ontology designed in 2002 in the context of the WonderWeb EU project, developed by Nicola Guarino and his associates at the Laboratory for Applied Ontology (LOA) – WonderWeb Deliverable D18, p.14

« As a foundational ontology, DOLCE provides **general categories and relations** that can be reused in different application scenarios by specializing them to the **specific domains** to be modeled. [...]

The analysis underlying the formalization of DOLCE leverages the techniques of ontological engineering and the study of classes' meta-properties of the **OntoClean methodology**. [...] »

Borgo Stefano et al., « DOLCE: A descriptive ontology for linguistic and cognitive engineering1 », Applied Ontology, 18.11.2021, pp. 1-25.

OntoClean

- N. Guarino/C. A. Welty, « An Overview of OntoClean », in Steffen Staab, ed., Handbook on ontologies, 2nd ed. Berlin: Springer, 2009.
- OntoClean (Wikipedia)
- Identity (terms and classes)
 - A map vs an information object of type 'map'
- Unity (parthood)
 - A crowd of humans vs a group having a plan
- Rigidity (time-indexed qualities or classifications)
 - A 'student' : not a class but a time-indexed property of a person
- Dependence (one instance implies the existence of another one)
 - No human without a brain, no human without a birth

Modelling Best Practices

- Instances (research related, detailed) and Classes (few and cleanly defined)
- Controlled Vocabularies (researchers) and Ontologies (semantic engineers)
- Property Inheritance, quantifiers

« Foundational ontologies are not directly used for applications; rather, they provide **conceptual handles** to solve cases of misunderstandings due to the limitations of expressiveness of the application languages. [...]

DOLCE has remained fixed over the years fulfilling the purpose of top-level ontologies to provide **a solid and stable basis for modeling different domains**, in this way **ensuring interoperability of reference and domain ontologies** that use DOLCE. »

Borgo Stefano et al., « DOLCE: A descriptive ontology for linguistic and cognitive engineering1 », Applied Ontology, 18.11.2021, pp. 1-25.

« In order to rely on well-established modeling principles and theoretical bases, it is a common practice for the categories and relations of **foundational ontologies** to be **philosophically grounded**.

[...] **ontological analysis preceding modeling is of paramount importance**. A careful choice and characterization of categories and relations produces indeed ontologies that have higher chances of being **interoperable**, or at least of understanding potential obstacles to interoperability.

From a philosophical perspective, DOLCE adopts a **descriptive** (rather than referentialist) **metaphysics**, as its main purpose is to make explicit **already existing conceptualizations** through the use of categories whose structure is influenced by **natural language, the makeup of human cognition, and social practices**. »

Borgo Stefano et al., « DOLCE: A descriptive ontology for linguistic and cognitive engineering », Applied Ontology, 18.11.2021, pp. 1-25.

Case 2: (Section 3.2. Roles)

“Mr. Potter is the teacher of class 2C at Shapism School and resigns at the beginning of the spring break. After the spring break, Mrs. Bumblebee replaces Mr. Potter as the teacher of 2C. Also, student Mary left the class at the beginning of the break and a new student, John, joins in when the break ends.”

GOAL: The example aims to show if and how the ontology models the relationships between roles, players and organisations.

FOCUS: The change of roles/players; the vacancy of the teaching position; persistence of the class while students come and go.

Case 4: (Section 3.4. Event change)

“A man is walking to the station, but before he gets there, he turns around and goes home.”

GOAL: The example aims to show if and how the ontology models change in goal-directed activities.

FOCUS: An activity/event is not completed and another activity/event is completed instead.

Borgo Stefano, Galton Antony et Kutz Oliver, « Foundational ontologies in action », Applied Ontology Preprint (Preprint), 01.01.2022, pp. 1-16. <
<https://doi.org/10.3233/AO-220265>>.

Foundational ontologies
& modelling best practices



Generic, domain related core ontology

Research specific data model

Research data

Foundational ontologies
& modelling best practices



Generic, domain related core ontology



Domain related extensions



Research specific data model

Research data

Foundational ontologies
& modelling best practices



Generic, domain related core ontology



Domain related extensions



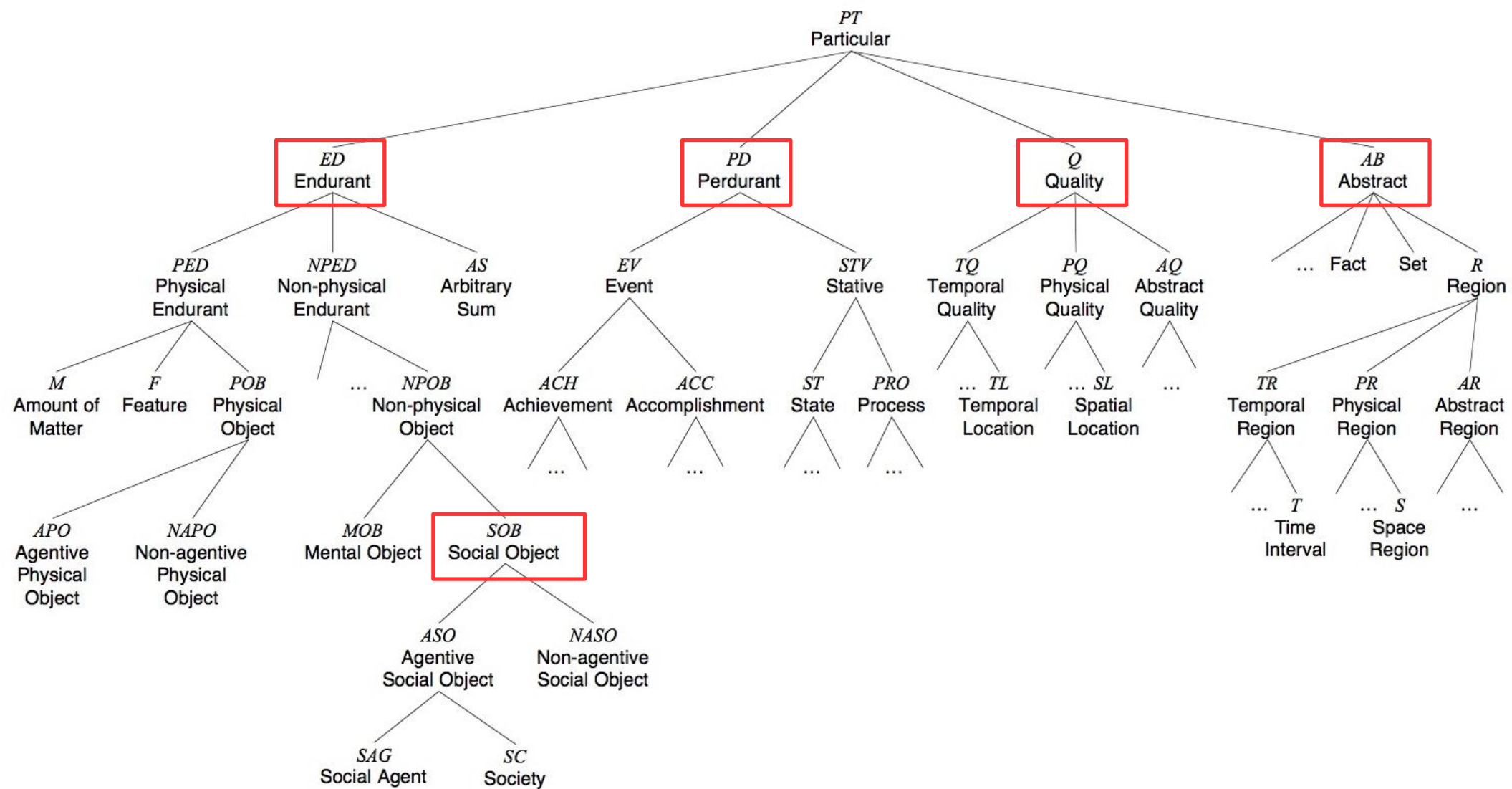
Research specific data model

Research data

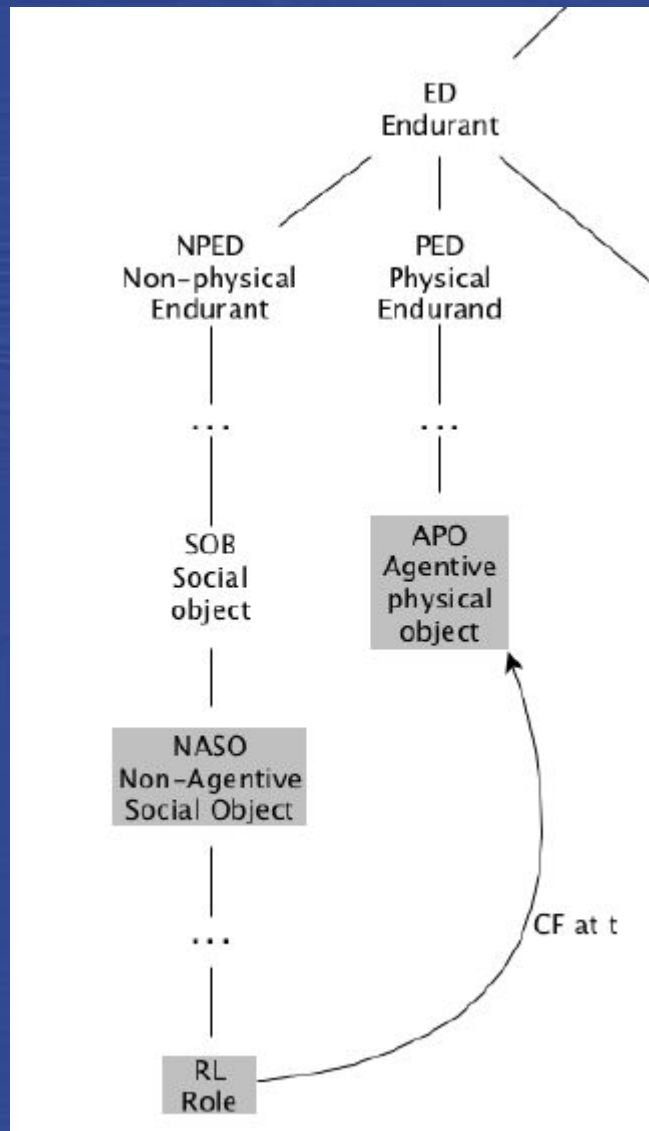
DOLCE + Descriptions and Situations
& object-oriented modelling principles

DOLCE and social life

Some aspects



Descriptive Ontology for Linguistic and Cognitive Engineering (DOLCE) – a foundational ontology designed in 2002 in the context of the WonderWeb EU project, developed by Nicola Guarino and his associates at the Laboratory for Applied Ontology (LOA) – WonderWeb Deliverable D18, 2003, p.14



$\forall x \neg CF(x, 2 \text{ CT eacher}, t2) \wedge$
 $CF(\text{Potter}, 2 \text{ CTeacher}, t1) \wedge$
 $CF(\text{Bumblebee}, 2 \text{ CTeacher}, t3)$

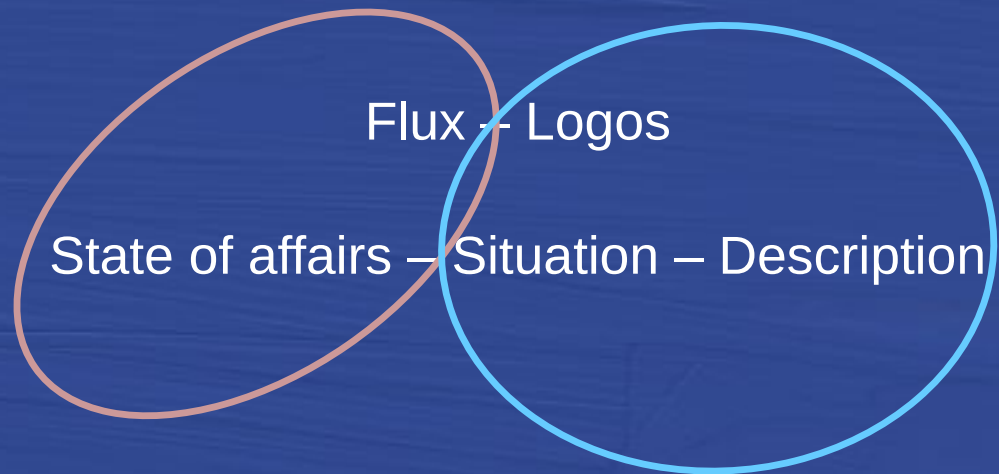
$CF(\text{Mary}, 2 \text{ CStudent}, t1)$

Borgo Stefano et al., « DOLCE: A descriptive ontology for linguistic and cognitive engineering », Applied Ontology, 18.11.2021, pp. 1-25.

A social role: the rite that establishes the function



Descriptions and Situations (DnS)



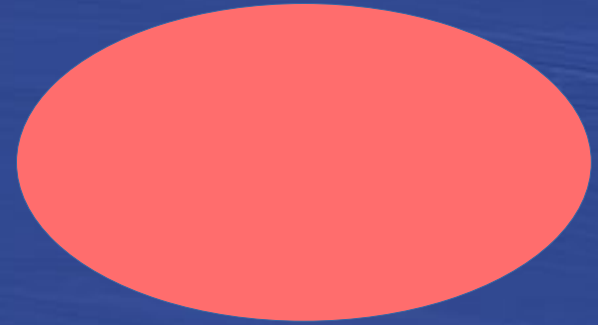
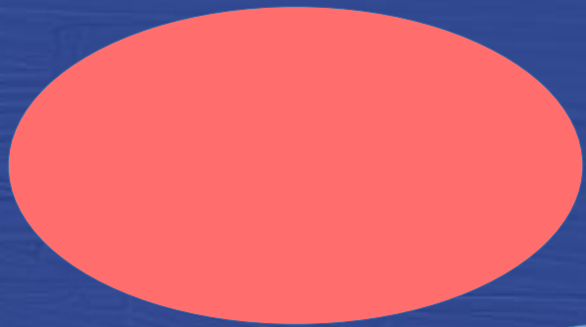
Descriptions and Situations (DnS)



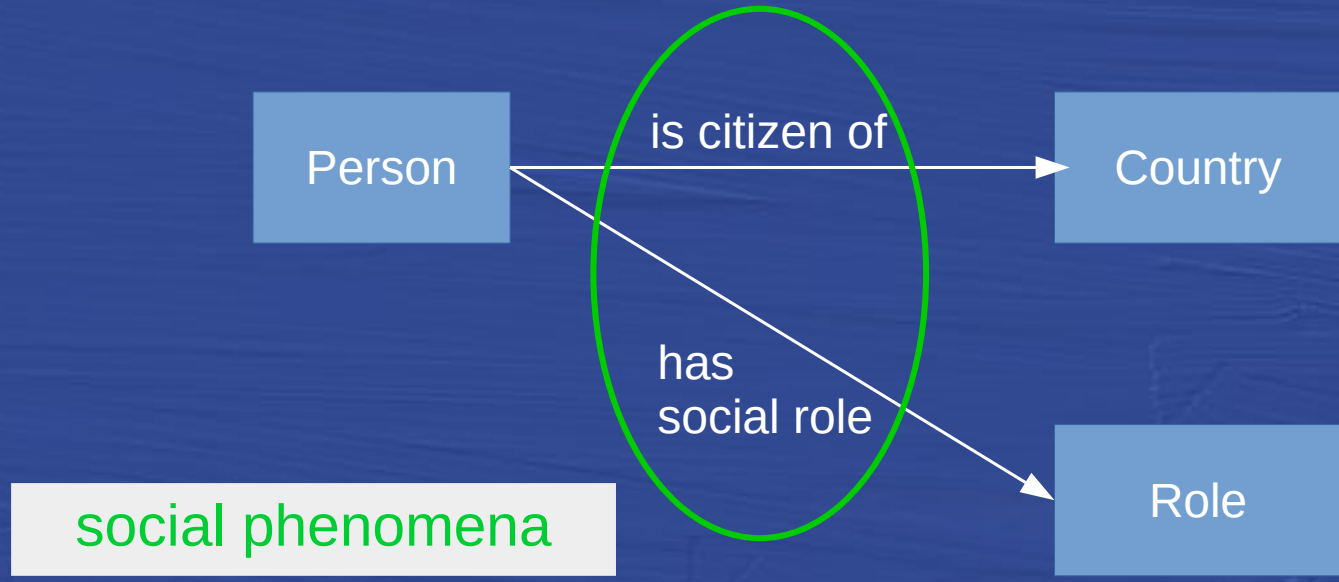
A social event: different perspectives on a forbidden car race



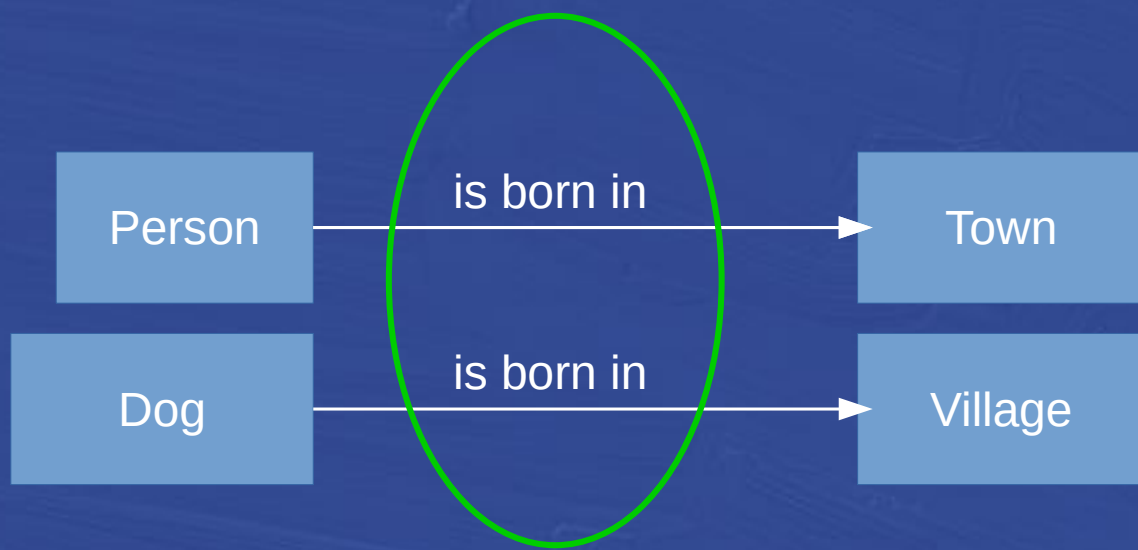
Sports car photo created by azerbaijan_stockers - www.freepik.com



Material reality



physical or biological phenomena



Descriptions and Situations (DnS)

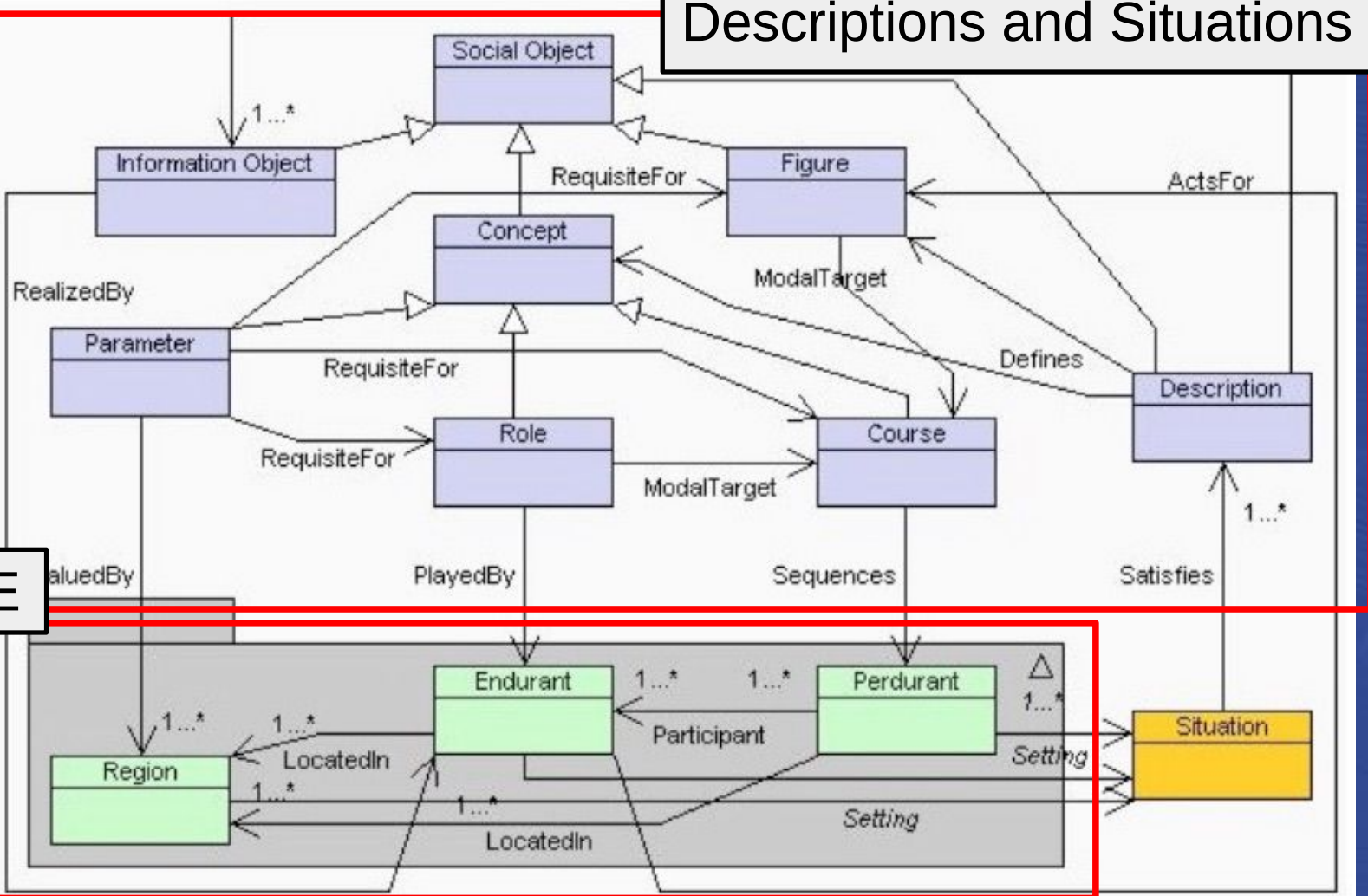
Flux – Logos
State of affairs – Situation – Description



Social ontology

Social representations





DOLCE

Fig. 2. A UML class diagram for D&S. The lower part of the pattern (within the grey package) is called the *ground ontology*, the higher is called the *descriptive ontology*; a situation satisfies a description if the two parts match according to the axioms specified for the concepts defined by the description.

Bottazzi E., Catenacci C., Gangemi A., Lehmann J.(2006) (from pre-print, not in published version)

A social event: different perspectives on a forbidden car race



Sports car photo created by azerbaijan_stockers - www.freepik.com

An extension of CIDOC CRM for social life ?

Foundational ontologies
& modelling best practices



Generic, domain related core ontology



Domain related extensions



Research specific data model

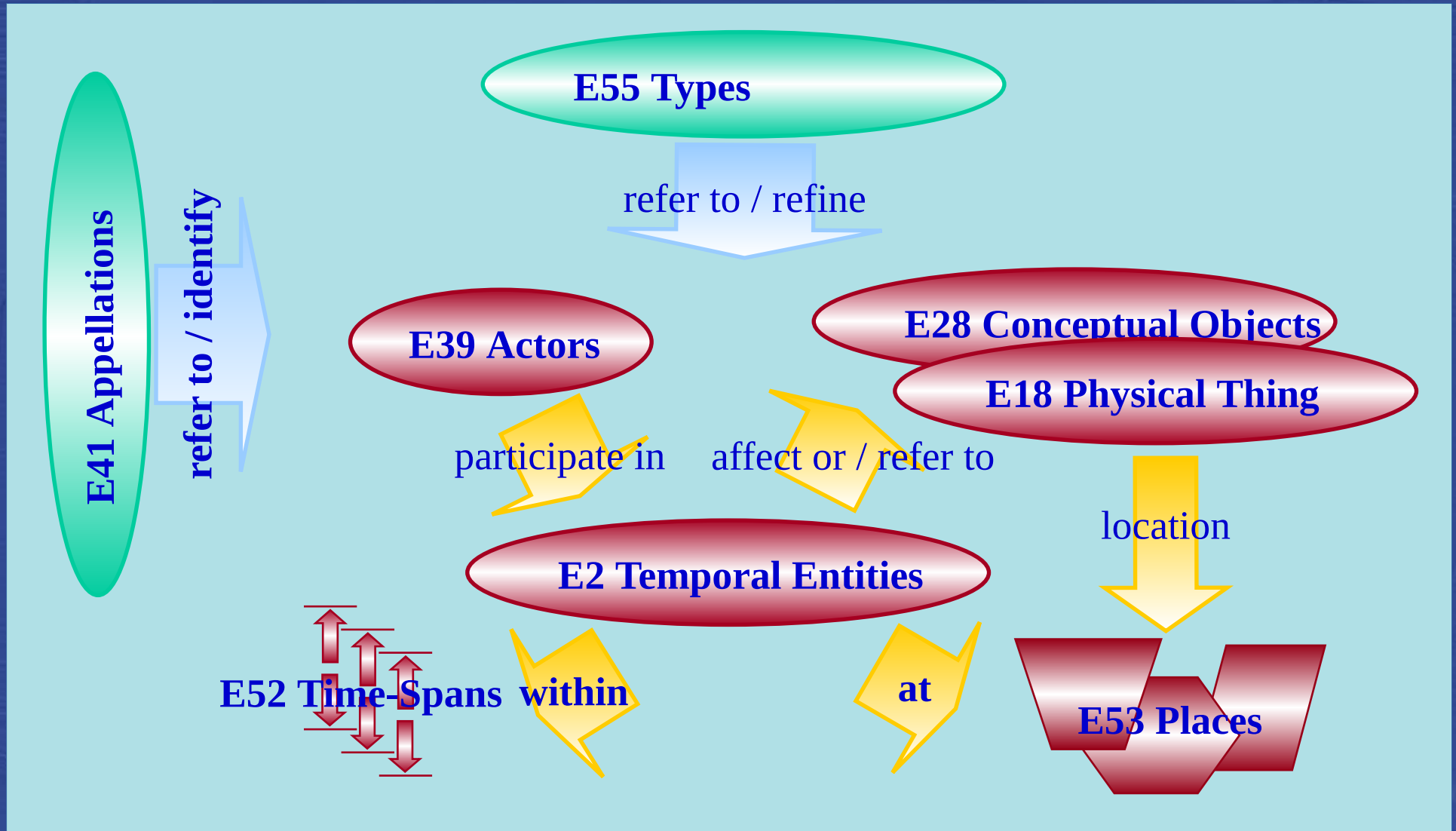
Research data

DOLCE + Descriptions and Situations
& object-oriented modelling principles



CIDOC CRM

The CIDOC CRM (ISO21127:2006)
A semantic framework that provides *interoperability*
between different sources of **cultural heritage information**



Stephen Stead (2008)

Modelling principles in CRMbase: Reality, Knowledge Bases and CIDOC CRM

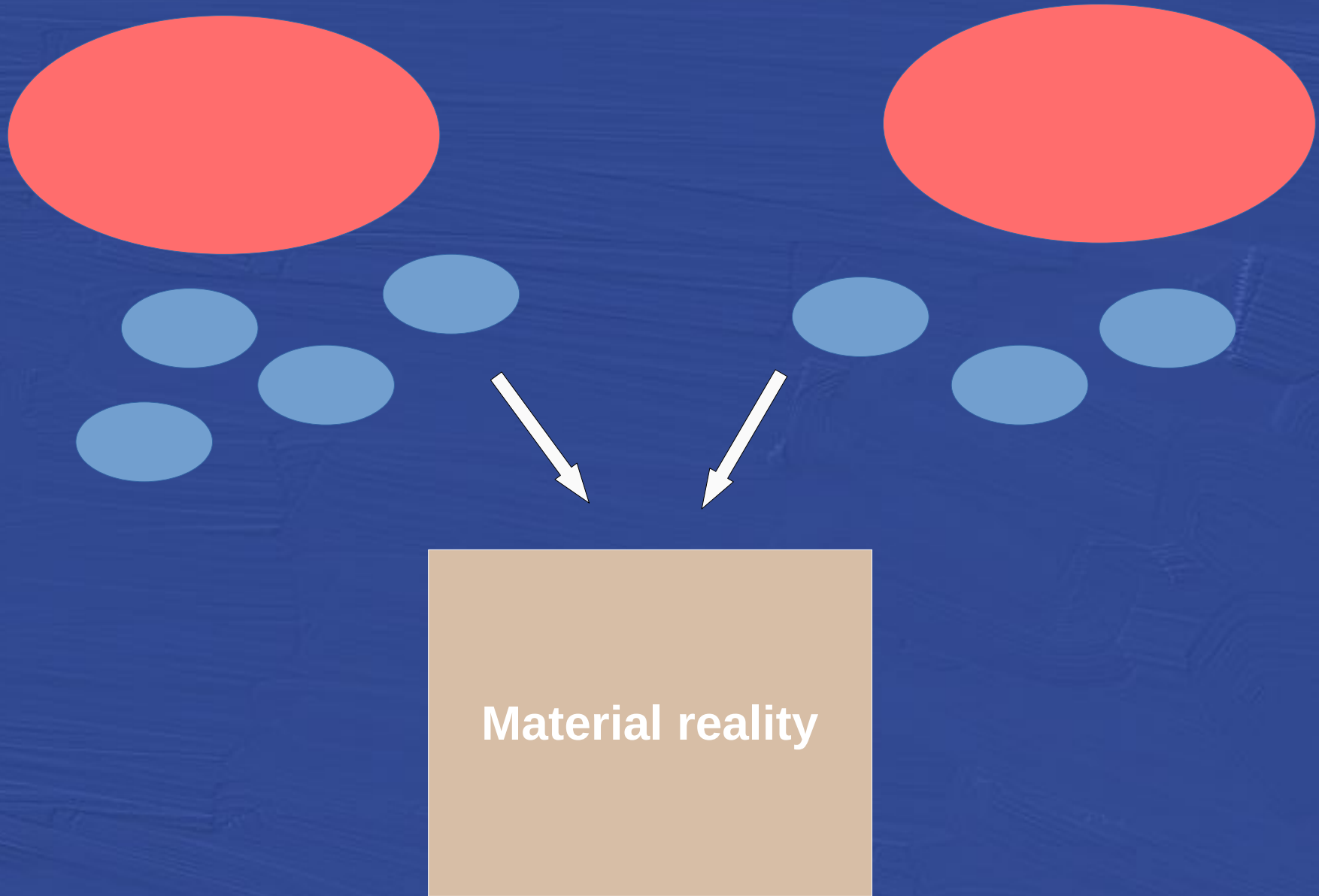
(Definition of the CIDOC Conceptual Reference Model, Version 7.1.1, April 2021)

“The material reality.

For the purpose of the CIDOC CRM, *material reality* is regarded as whatever has substance that can be perceived with senses or instruments. Examples are [...]. It is constrained to space and time.

What goes on in our minds or is produced by our minds is also regarded as part of the material reality, as *it becomes materially evident to other people* at least by our utterances, behavior and products. ”

[Example Group]



Material reality

Material reality

Social reality

Mental reality

Material reality



CRMbase

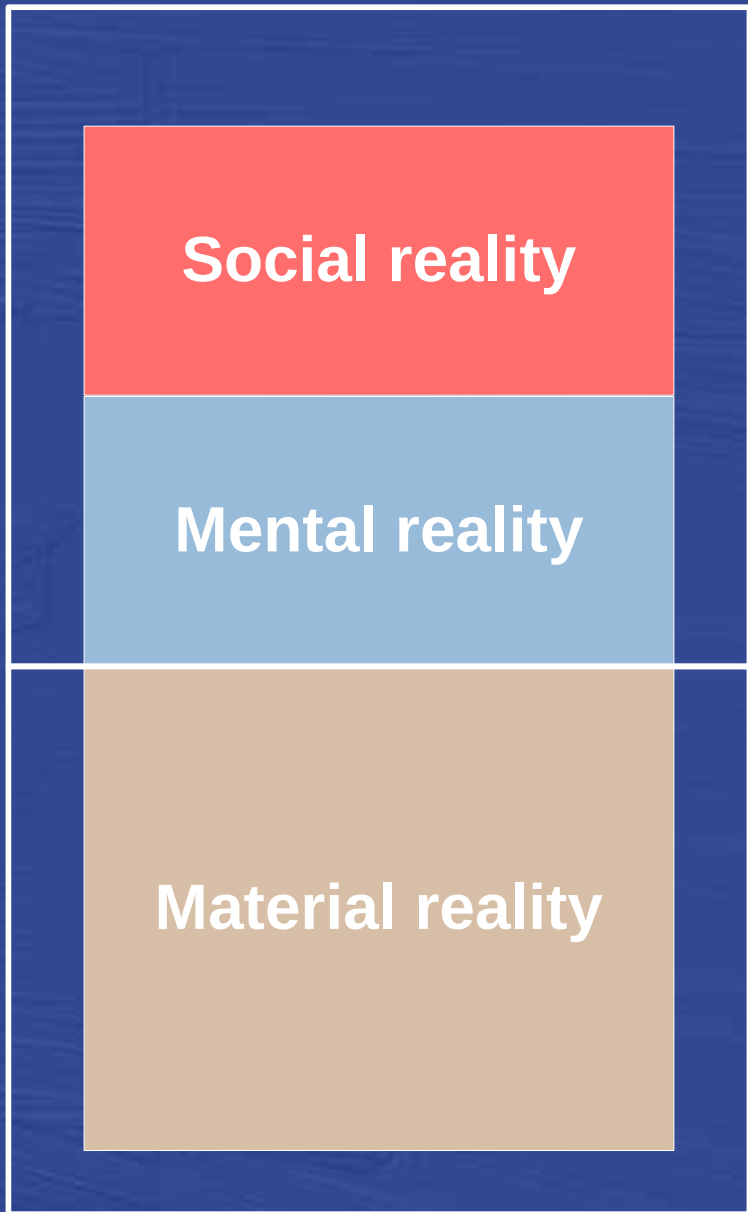
Social reality

Mental reality

Material reality



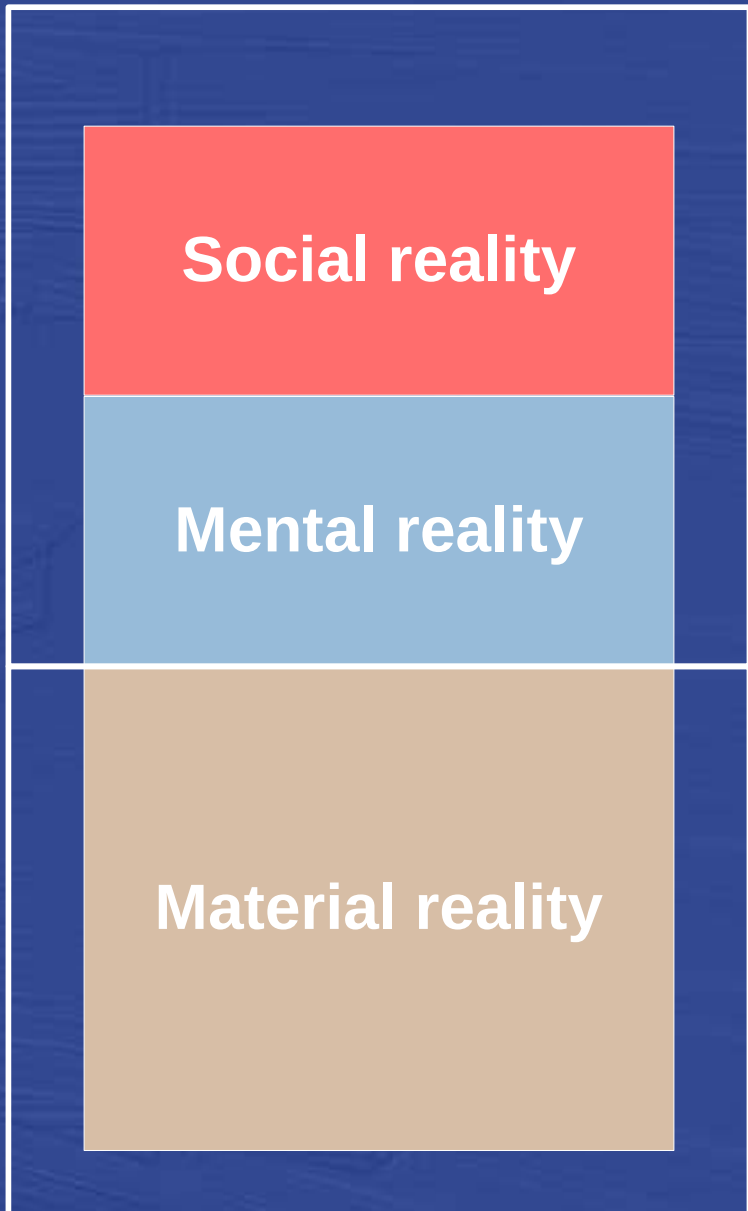
CRMbase (& family)



CRMsoc



CRMbase (& family)



CRMsoc (& family)



CRMbase (& family)

[screenshot family]

[screenshot social]

ontome.net relevant namespaces:

- CRMsoc
- artandarthist
- CIDOC CRM Extension for Humanities and Social sciences (SDH SS)

Foundational ontologies
& modelling best practices



Generic, domain related core ontology



Domain related extensions



Research specific data model

Research data

DOLCE + Descriptions and Situations
& object-oriented modelling principles



CIDOC CRM

SDHSS



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CIDOC CRM

SDHSS



CRM
Archaeo

FRBRoo

CRMsoc

CRMgeo

Foundational ontologies
& modelling best practices



Generic, domain related core ontology



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CIDOC CRM

SDHSS



CRM
Archaeo

FRBRoo

Society
& Law
(SDHSS)

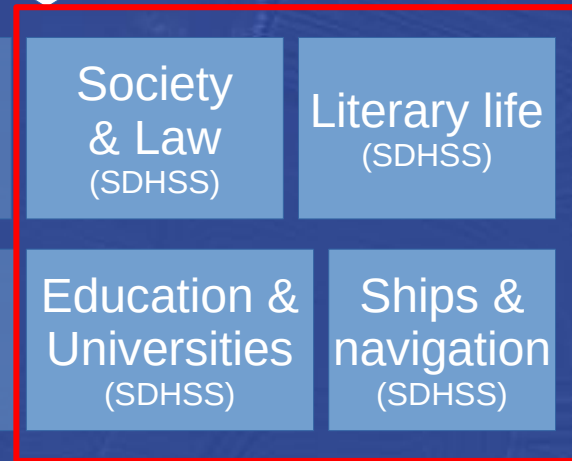
Literary life
(SDHSS)

CRMsoc

CRMgeo

Education &
Universities
(SDHSS)

Ships &
navigation
(SDHSS)



Foundational ontologies
& modelling best practices



Generic, domain related core ontology



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DOLCE + Descriptions and Situations
& object-oriented modelling principles



CIDOC CRM

SDHSS



CRM
Archaeo

FRBRoo

Society
& Law
(SDHSS)

Literary life
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CRMsoc

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Education &
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Ships &
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Projects' research specific extensions

Foundational ontologies
& modelling best practices

DOLCE + Descriptions and Situations
& object-oriented modelling principles

Generic, domain related core ontology

CIDOC CRM

SDHSS

Domain related extensions

Research agenda

CRM
Archaeo

FRBRoo

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(SDHSS)

Literary life
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Research specific data model

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Application profiles

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Interoperable research data

How to conceptualize
observable mental and social phenomena ?

How to conceptualize observable mental and social phenomena ?

« In philosophy, *intentionality* is the *power of minds and mental states to be about, to represent, or to stand for, things*, properties and states of affairs. To say of an individual's mental states that they have intentionality is to say that they are mental representations or that they have contents. »

<https://plato.stanford.edu/entries/intentionality/>

How to conceptualize observable mental and social phenomena ?

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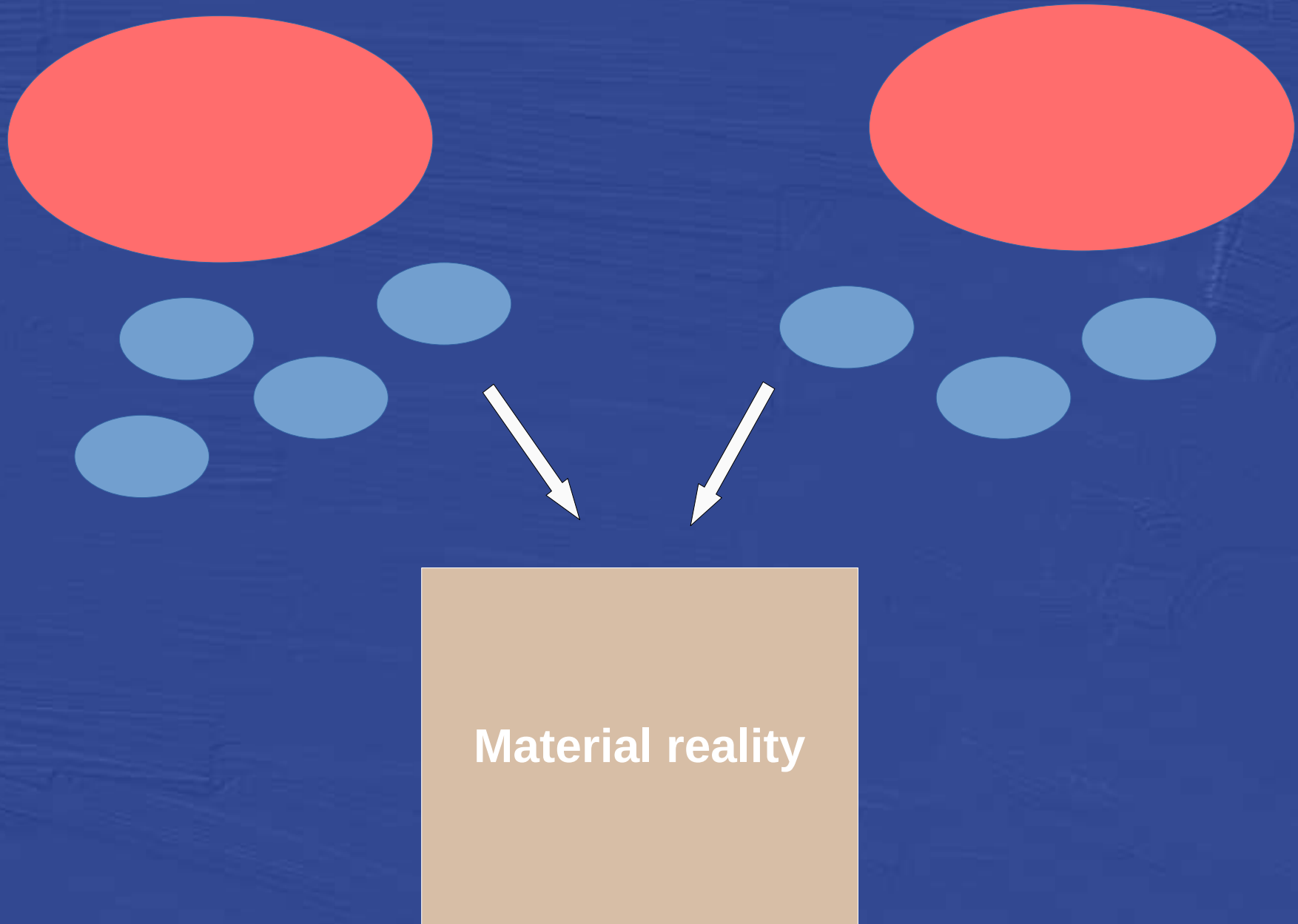
<https://plato.stanford.edu/entries/intentionality/>

« *Collective intentionality* is the *power of minds to be jointly directed at objects*, matters of fact, states of affairs, goals, or values. [...] Collective intentional attitudes permeate our everyday lives, for instance when two or more agents look after or raise a child, grieve the loss of a loved one, campaign for a political party, or cheer for a sports team.

They are relevant for philosophers and social scientists because they play crucial roles in the constitution of the social world.

<https://plato.stanford.edu/entries/collective-intentionality/>

The observed phenomenon :
different mental and social representations
of the same material reality



How to conceptualize observable mental and social phenomena ?

* Social representations : Social psychology → social sciences

How to conceptualize observable mental and social phenomena ?

* Social representations : Social psychology → social sciences

« social identity emerges based on social representations ... Identity is a way of organizing meanings, of being constructed as a social subject »

Álvarez Bermúdez, Javier and Juana Juárez-Romero. "Identities, Memory and the Construction of Citizenship." *Papers on Social Representations* 28, no. 2 (2019).

How to conceptualize observable mental and social phenomena ?

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* Collective intentionality : Social philosophy

How to conceptualize observable mental and social phenomena ?

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* Collective intentionality : Social philosophy

« Consciousness and intentionality are caused by and realized in neurobiology. Collective intentionality is a type of intentionality, and society is created by collective intentionality. ... language enables the creation and continued existence of status functions that do not require any physical existence beyond the linguistic representations themselves. »

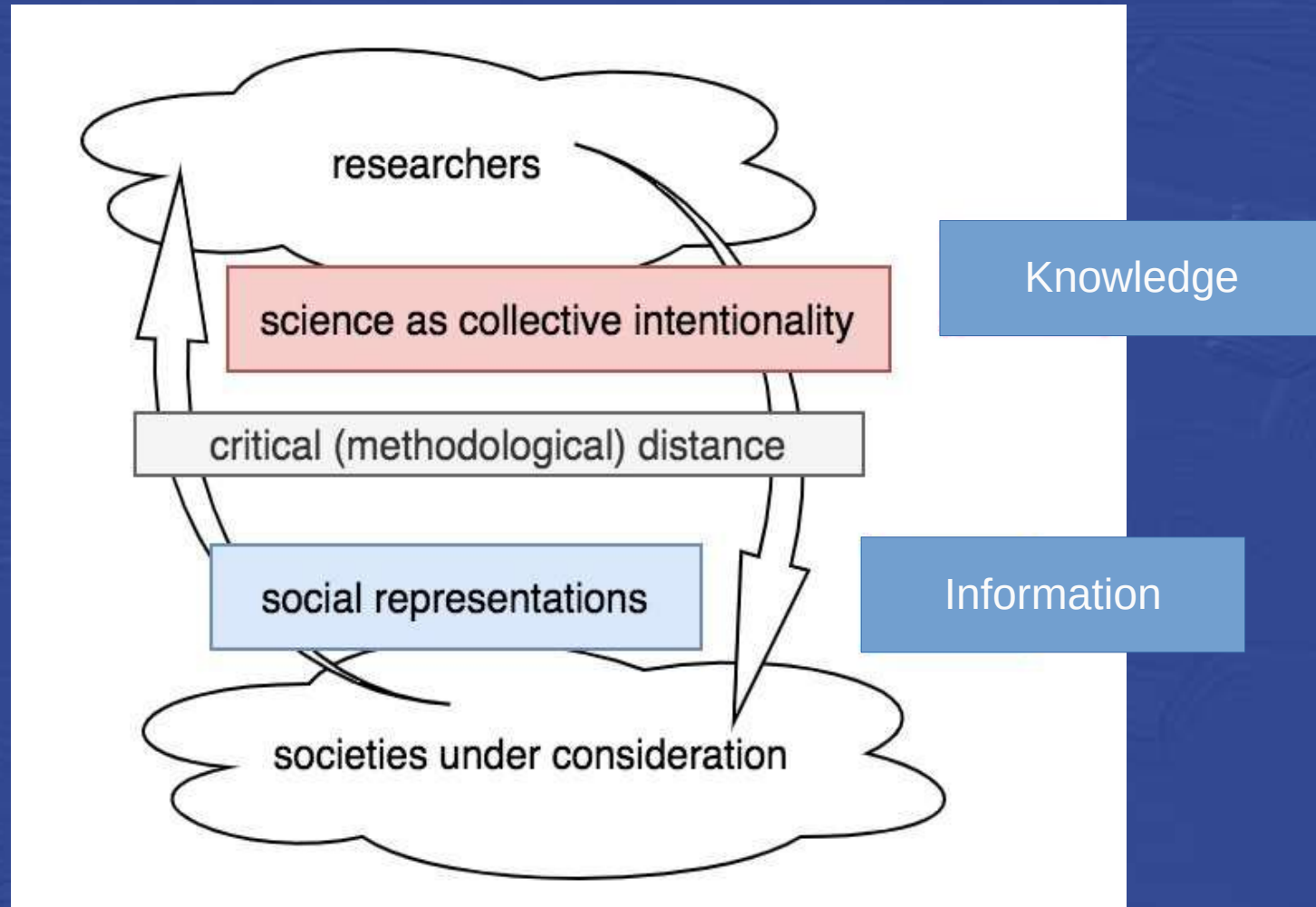
John Searle. *Making the Social World: The Structure of Human Civilization*. Oxford University Press, 2010.

Refer to standard conceptualizations of
observable mental and social phenomena
and align them with CRMbase

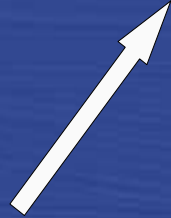
Reference literature (selection):

- * Gallotti Mattia and Michael John (éds.), *Perspectives on Social Ontology and Social Cognition*, Dordrecht, Springer Netherlands, 2014.
- * Sammut Gordon et al. (éds.), *The Cambridge Handbook of Social Representations*, Cambridge, University Press, 2015.
- * *The Stanford Encyclopedia of Philosophy* (Fall 2021 Edition), Edward N. Zalta (ed.) (online) (especially entries: Collective Intentionality, Mental Representation, Consciousness and Intentionality, Social Norms, etc.)
- * Thomas T. (ed.), *Encyclopedia of critical psychology* (New York: Springer Reference, 2014) (especially entries: Interobjectivity; Social Constructionism; Social Representations; Socialisation).

Whose collective intentionality is to be modelled? Scientific knowledge and social representations



crm:E2 Temporal Entity

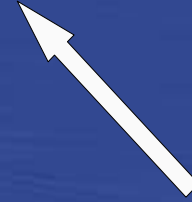
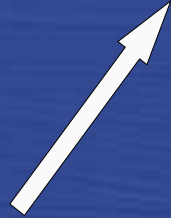


crm:E4 Period

crm:E2 Temporal Entity

crm:E4 Period

crm-soc:C2 Intention

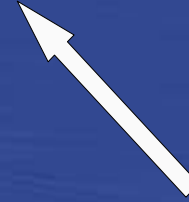
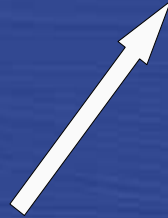


crm:E2 Temporal Entity

crm:E4 Period

crm-soc:C2 Intention

crm-soc:C4 Institutional Fact



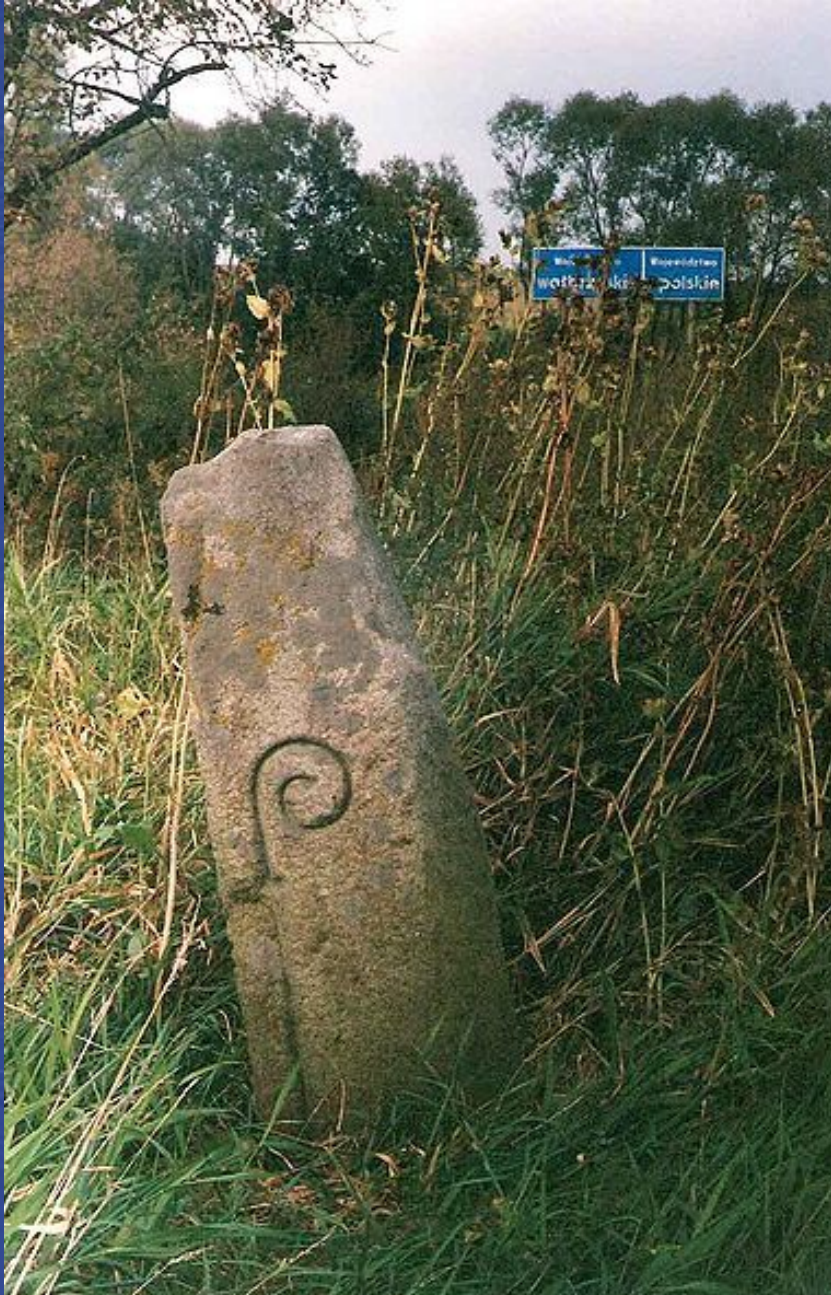
« I want to emphasize that the logical form of the transition from being a line of stones to being a boundary is that of a **Status Function Declaration**.

There need not be any specific moment at which there is a speech act of Declaring, but there must be some speech act or set of speech acts and other sorts of **representations** that constitute representing the line of stones as a boundary in a way that makes it into a boundary.

When the representations are collectively recognized or accepted, the line of stones acquires a new status: it now is a boundary. And such representations exemplify precisely the logical form of the Status Function Declaration. »

Searle J., Making the Social World: The Structure of Human Civilization, Oxford, Oxford University Press, 2010.

A social object : a border stone that defines a boundary



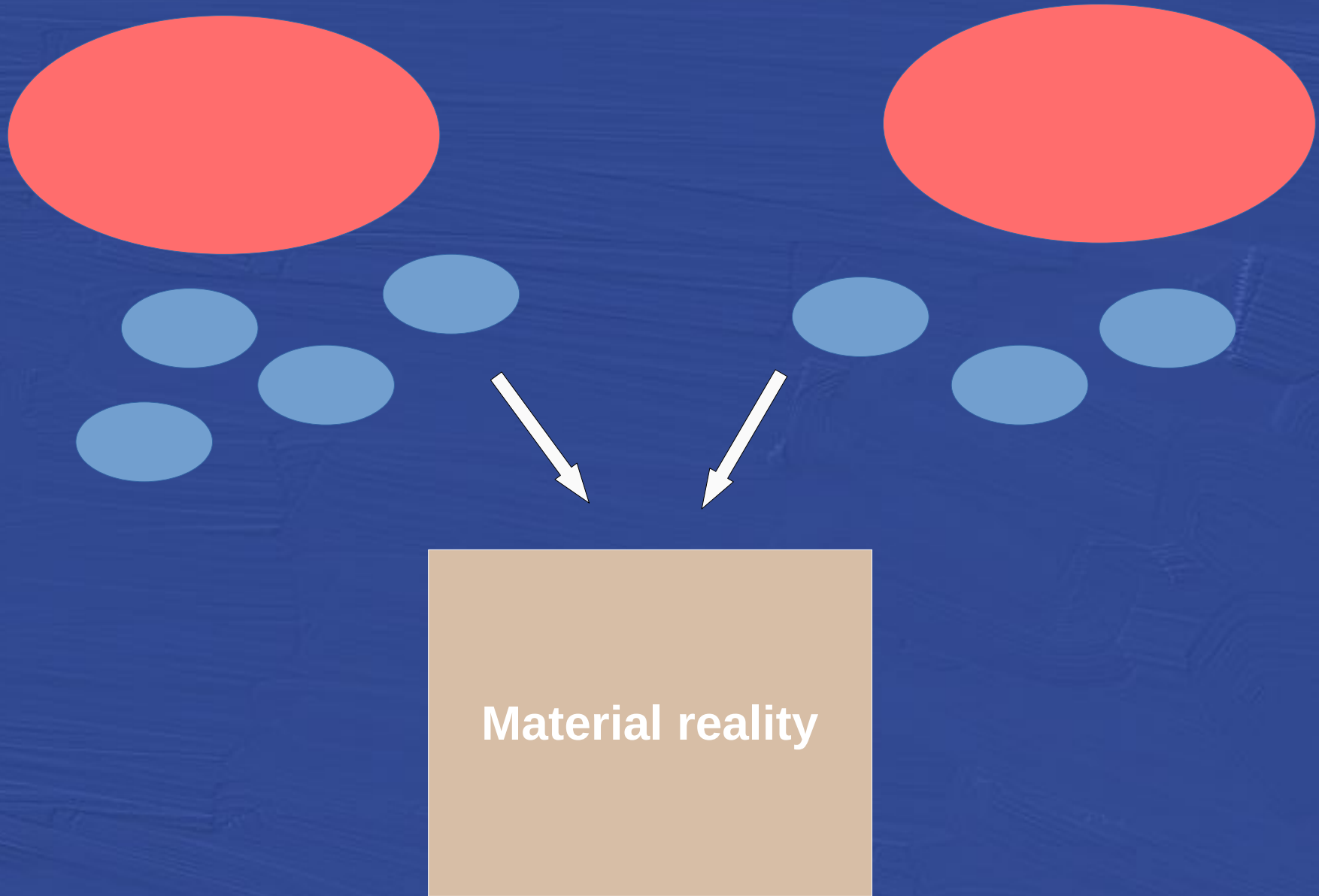
Border stone from c. 1280 on the border of the lands of the Wrocław bishops.

In the background the contemporary road sign marking the border between Opole and Wałbrzych voivodships.

Photo: Władysław Łoś (CC By SA 3.0)

The physical object, the notion of border, the symbol of the episcopal crozier, the function of bishop.

The bio-physical world, the social world



Material reality

The advantages of this conceptualization
of observable mental and social phenomena

- * High-level classes capable of expressing the complexity of individual and social intentional phenomena in a synthetic, robust way

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The advantages of this conceptualization of observable mental and social phenomena

- * High-level classes capable of expressing the complexity of individual and social intentional phenomena in a synthetic, robust way
- * Aligned with standard concepts in social sciences and social philosophy concerned with and studying the functioning of intellectual and social life
- * Avoid taking a position on the « Central Problem »:
 - Collective intentionality is no simple summation of individual intentionality (the Irreducibility Claim);
 - Collective intentionality is had by the participating individuals, and all the intentionality an individual has is their own (the Individual Ownership Claim).

(Stanford Encyclopedia of Philosophy)

Modelling Social Life:
an Extension of CIDOC CRM

in the context of the
Semantic Data for Humanities and Social Sciences Project

sdhss.org

Semantic Data for Humanities and Social Sciences (SDHSS) CIDOC CRM Top-Level Extension

Semantic Data for Humanities and Social Sciences (SDHSS) CIDOC CRM Top-Level Extension

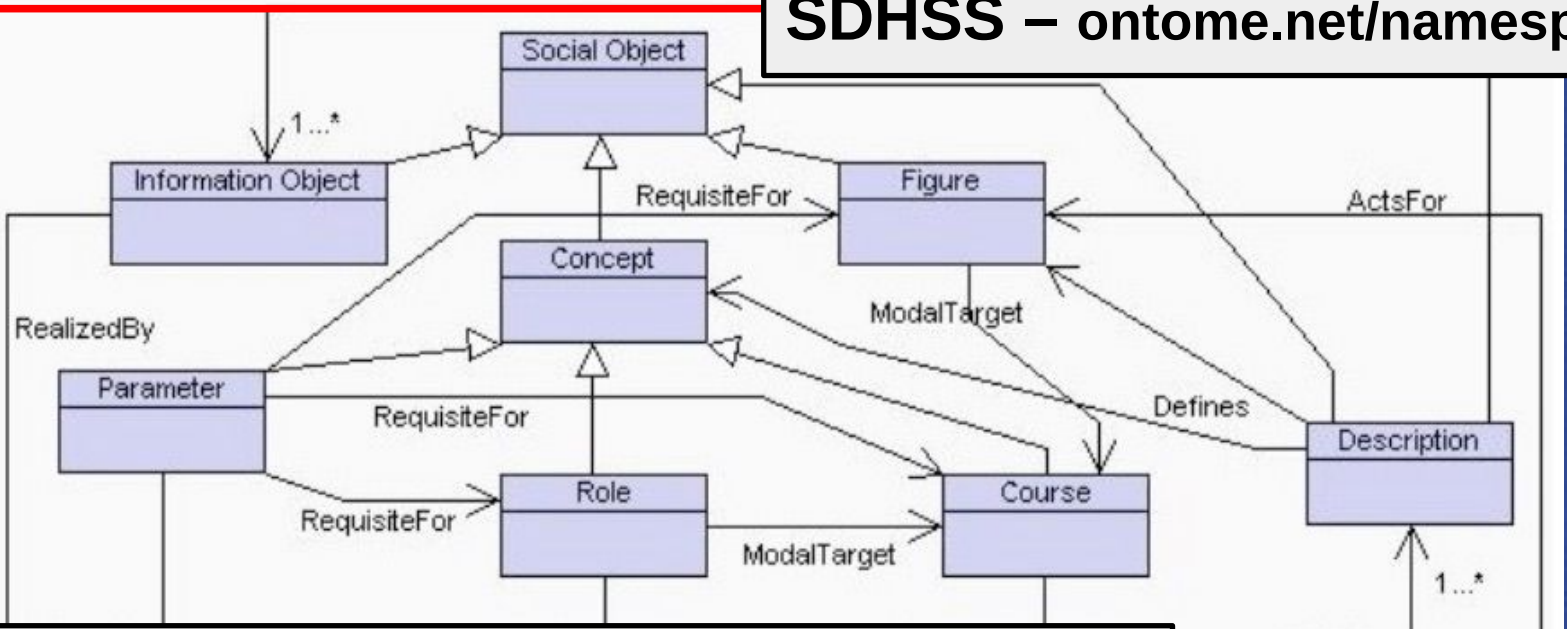
Description:

Published by Francesco Beretta (CNRS/Université de Lyon), 7 December 2020. Last revised on March 30 2021. ([CC BY-SA 4.0](#))

The extension of CIDOC CRM for semantic data for humanities and social sciences (SDHSS) stems from the need to conceptualise the reality in the world, and more specifically factual information, from the point of view of historical research. The [ontological commitment](#) is therefore related to the domain of discourse of history but insofar as history, as a discipline that studies the life of humans and societies in the past, is interested in all the different aspects of social, economic, political, religious, literary and cultural life, the scope of this extension could be defined as the whole of social and human life, apprehended from the descriptive point of view, and global approach to reality, that characterises historical research.

This definition of the scope or domain modelled is based on the conviction that in a [constructivist approach of scientific knowledge](#), a conceptualisation and data model can only be developed from the point of view of a specific discipline because *scientific objects* do not exist in the absolute but depend on the method and research agenda. They depend on the perspective or epistemic context researchers adopt in considering states of affairs: *scientific objects*, and [semantic models modelling them](#), are not declared to be the only appropriate and exclusive representation of *things* in the pre-Kantian sense but defined as *intentional objects* constructed from the point of view of a discipline and methodological approach in relation to things in the world. Scientific objects are not the things in the world themselves, even if they must necessarily refer to them by way of observation or experimentation, if a scientific and therefore realistic approach is to be maintained. This corresponds to the notion of inter-objectivity in social sciences relying on the distinction between things in themselves and things as perceived, experienced and discussed by human subjects, in their [shared intentionality](#) and in relation to their social practices and context.

ontome.net/namespace/11



CIDOC CRM

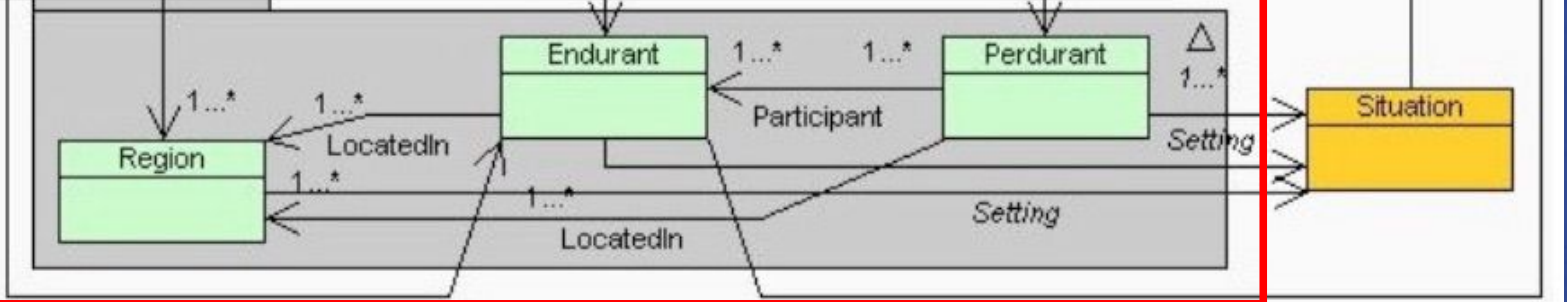
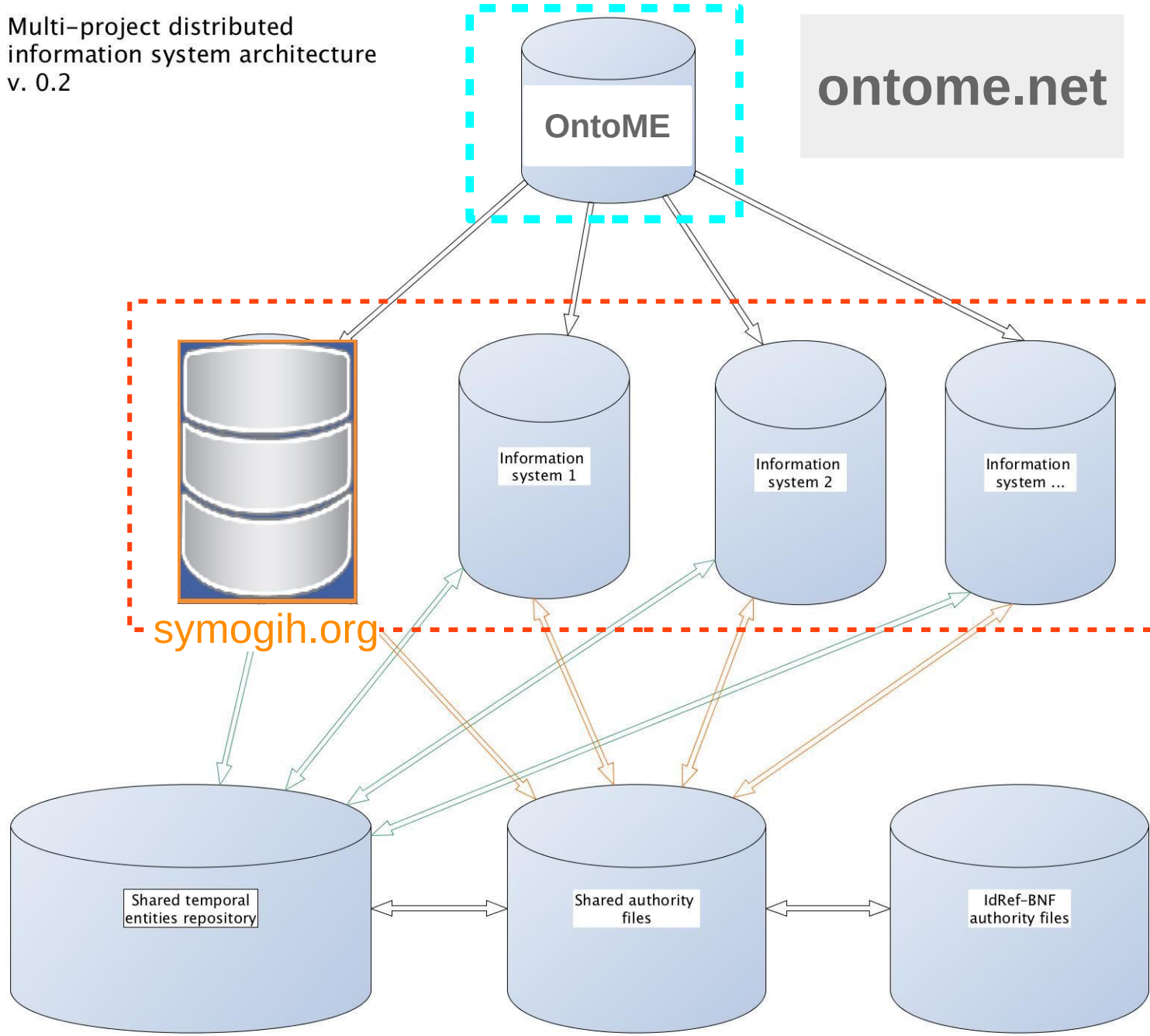


Fig. 2. A UML class diagram for D&S. The lower part of the pattern (within the grey package) is called the *ground ontology*, the higher is called the *descriptive ontology*; a situation satisfies a description if the two parts match according to the axioms specified for the concepts defined by the description.

Bottazzi E., Catenacci C., Gangemi A., Lehmann J.(2006) (from pre-print, not in published version)

ontome.net

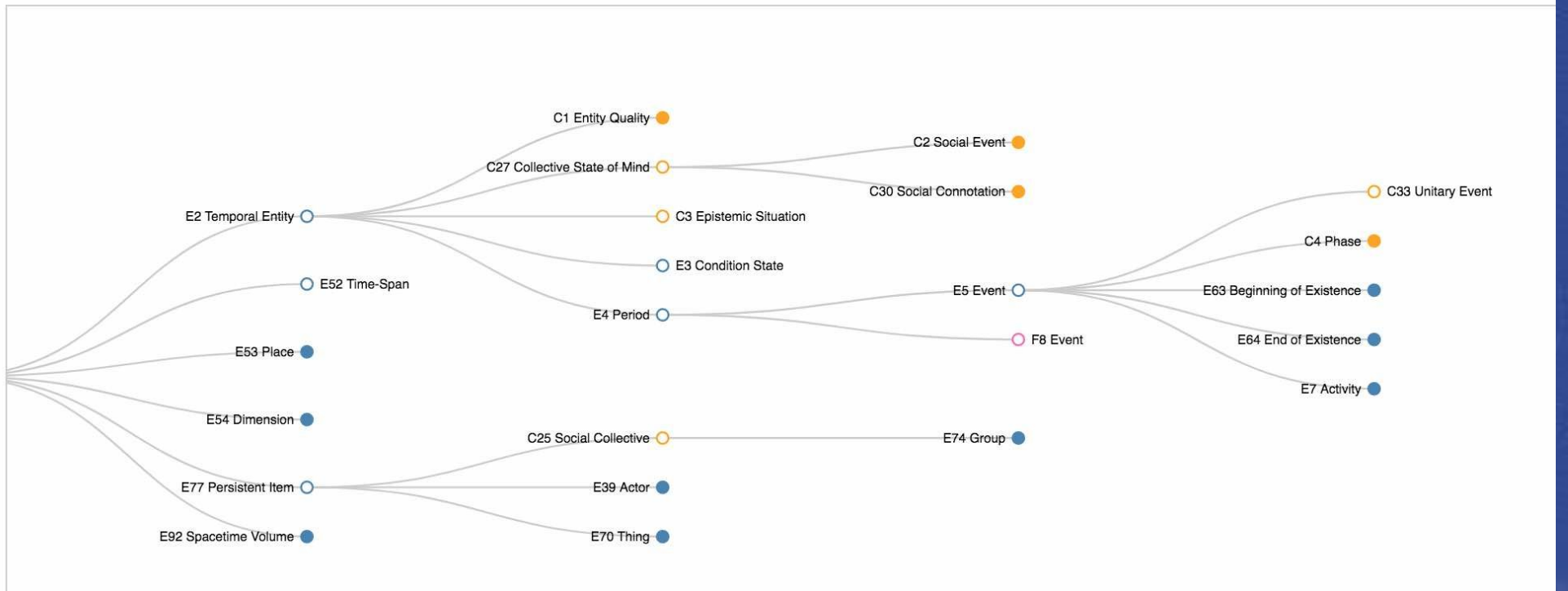


Classes tree

C2 Study (#424) ▾

Reset

 Use mouse wheel



Foundational ontologies & modelling best practices

DOLCE + Descriptions and Situations & object-oriented modelling principles

Generic, domain related core ontology

CIDOC CRM

SDHSS

Domain related extensions

Research agenda

CRM Archaeology

FRBRoo

Society & Law (SDHSS)

Literary life (SDHSS)

Research agenda

CRMsoc

CRMgeo

Education & Universities (SDHSS)

Ships & navigation (SDHSS)

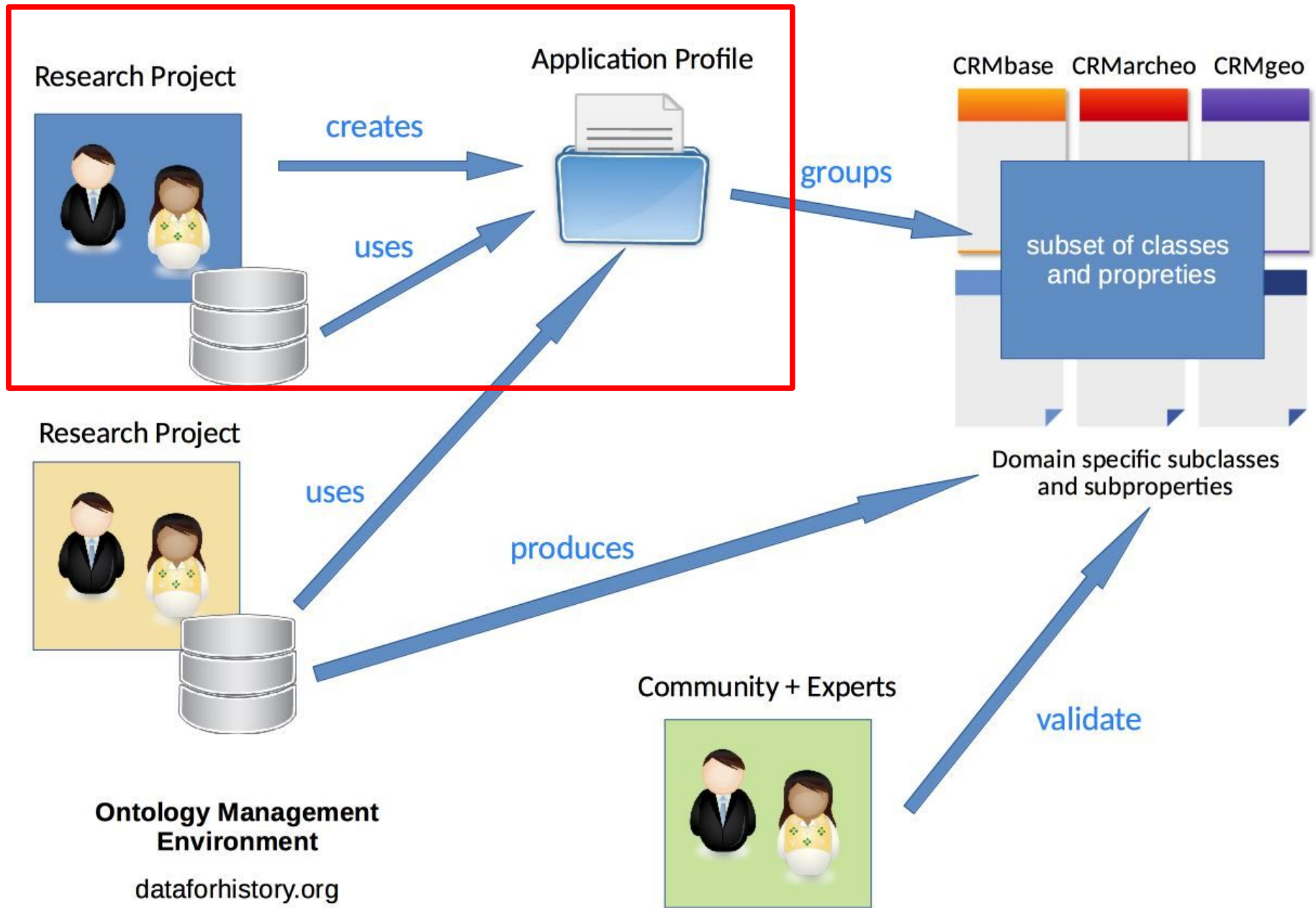
Research specific data model

Projects' research specific extensions

Application profiles

Research data

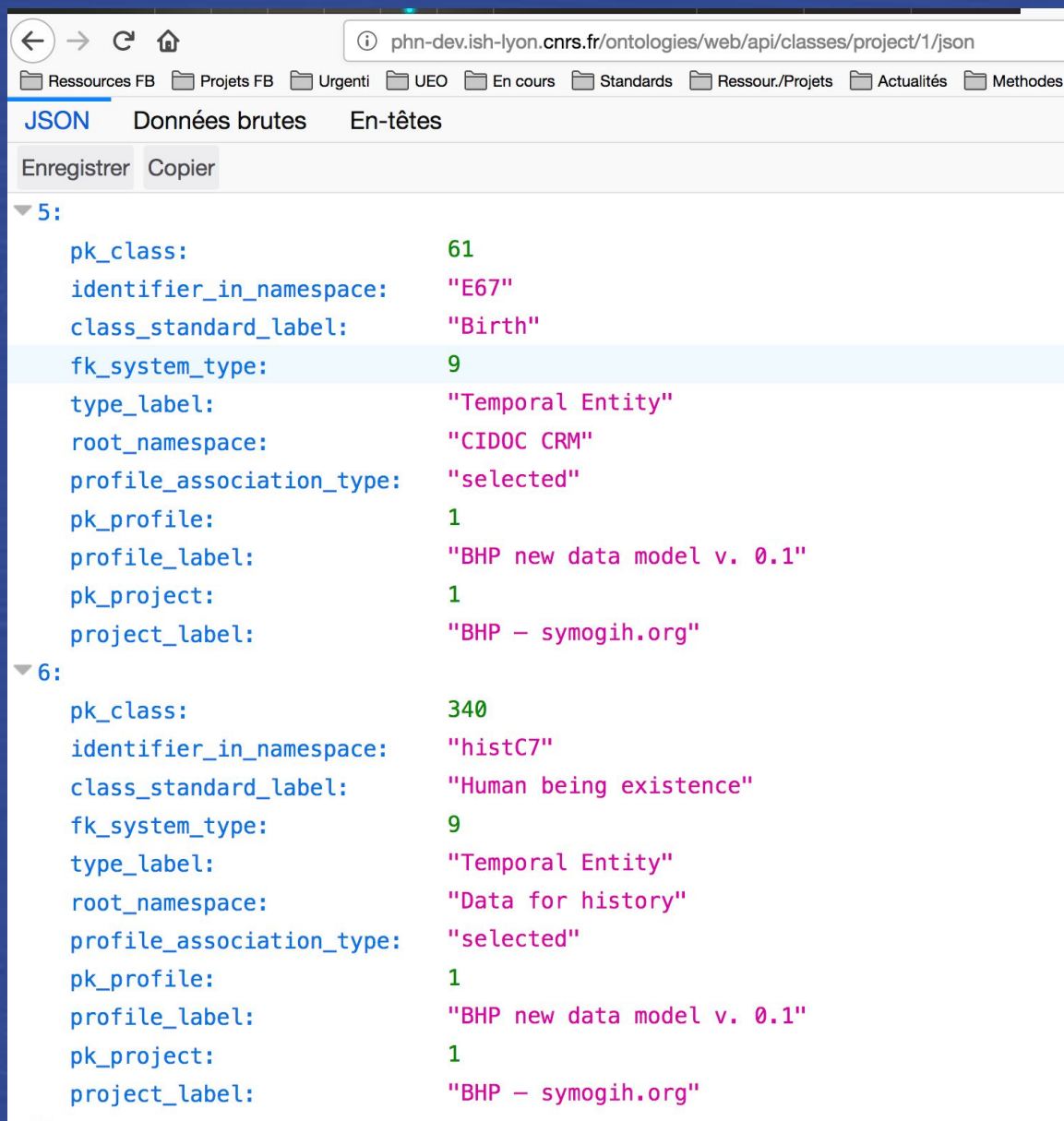
Interoperable research data



ontome.net

Retrieve your project's application profiles from an API

<https://ontome.net/api/classes-profile.json?lang=en&available-in-profile=8>



phn-dev.ish-lyon.cnrs.fr/ontologies/web/api/classes/project/1/json

Ressources FB Projets FB Urgenti UEO En cours Standards Ressour./Projets Actualités Methodes

JSON Données brutes En-têtes

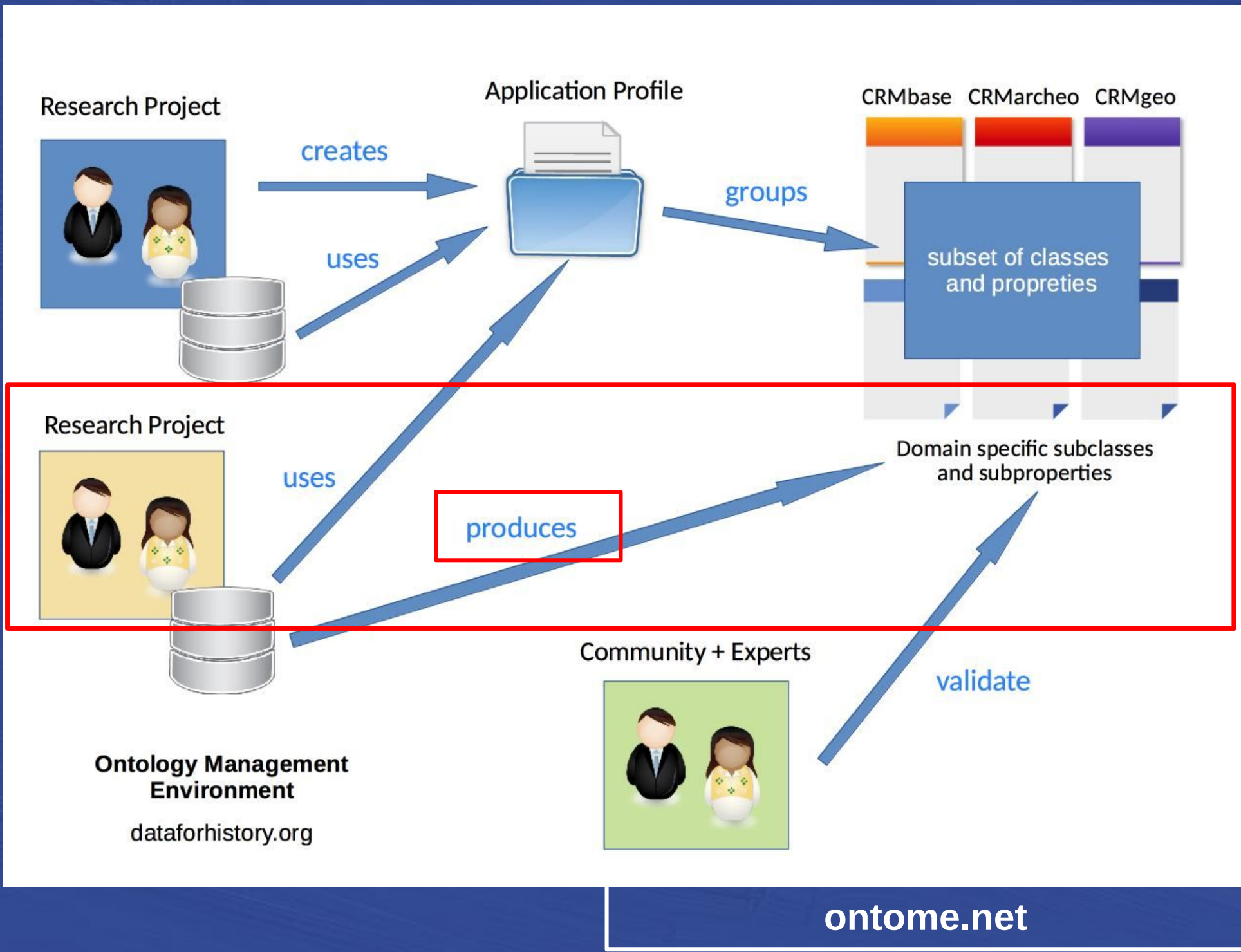
Enregistrer Copier

▼ 5:

- pk_class: 61
- identifier_in_namespace: "E67"
- class_standard_label: "Birth"
- fk_system_type: 9
- type_label: "Temporal Entity"
- root_namespace: "CIDOC CRM"
- profile_association_type: "selected"
- pk_profile: 1
- profile_label: "BHP new data model v. 0.1"
- pk_project: 1
- project_label: "BHP - symogih.org"

▼ 6:

- pk_class: 340
- identifier_in_namespace: "histC7"
- class_standard_label: "Human being existence"
- fk_system_type: 9
- type_label: "Temporal Entity"
- root_namespace: "Data for history"
- profile_association_type: "selected"
- pk_profile: 1
- profile_label: "BHP new data model v. 0.1"
- pk_project: 1
- project_label: "BHP - symogih.org"



Foundational ontologies
& modelling best practices



Generic, domain related core ontology



Domain related extensions



Research agenda

Research specific data model

Research data

Maritime History:
<https://ontome.net/namespace/66>

Man-Made Object – E22

Ship – C2

C2 Ship

Subclass of: [E22 Man-Made Object](#)

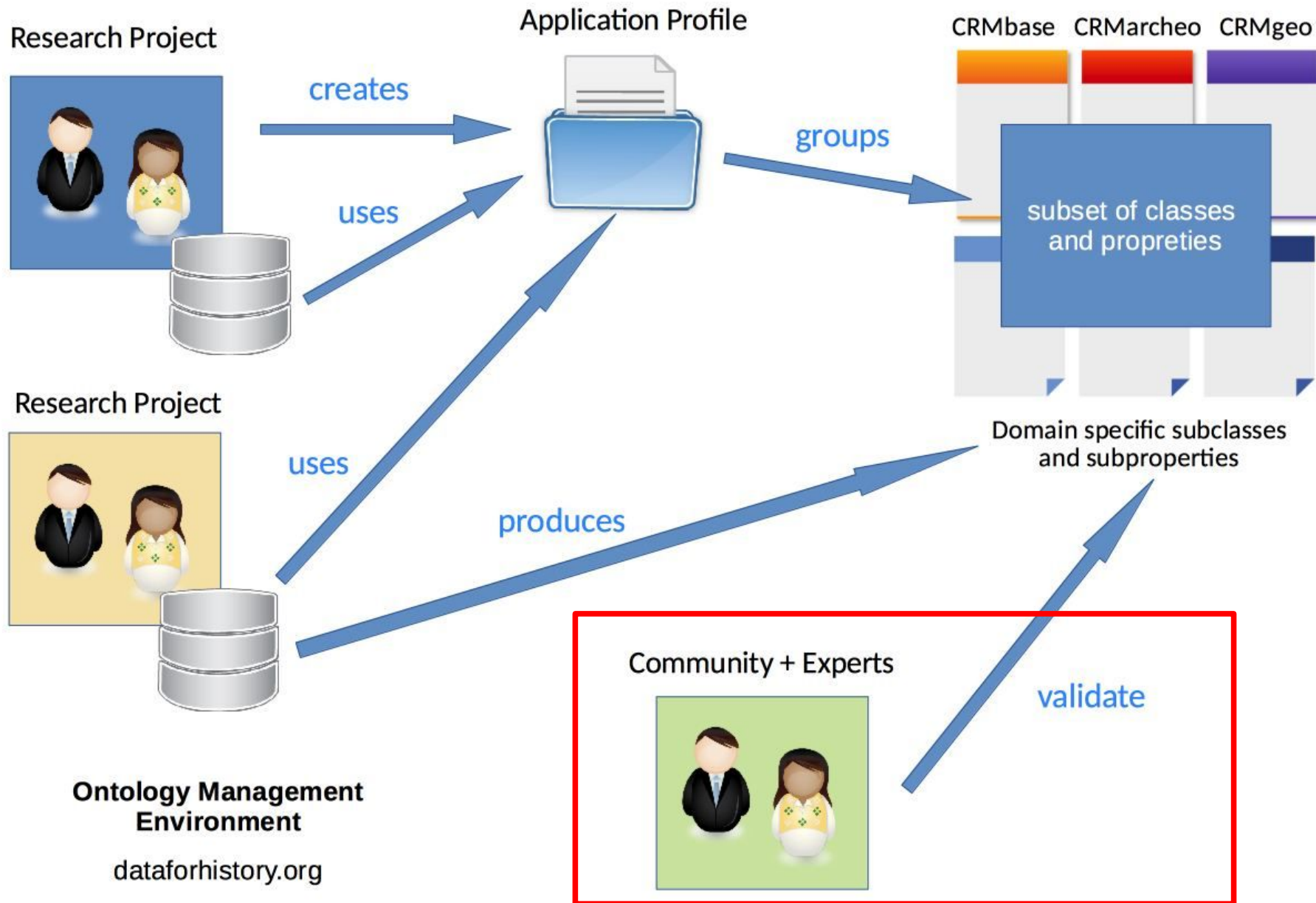
Scope note: Used to denote a watercraft that travels the world's oceans and other sufficiently deep waterways, carrying passengers or goods, or in support of specialized missions, such as defense, research and fishing.

Examples: tba

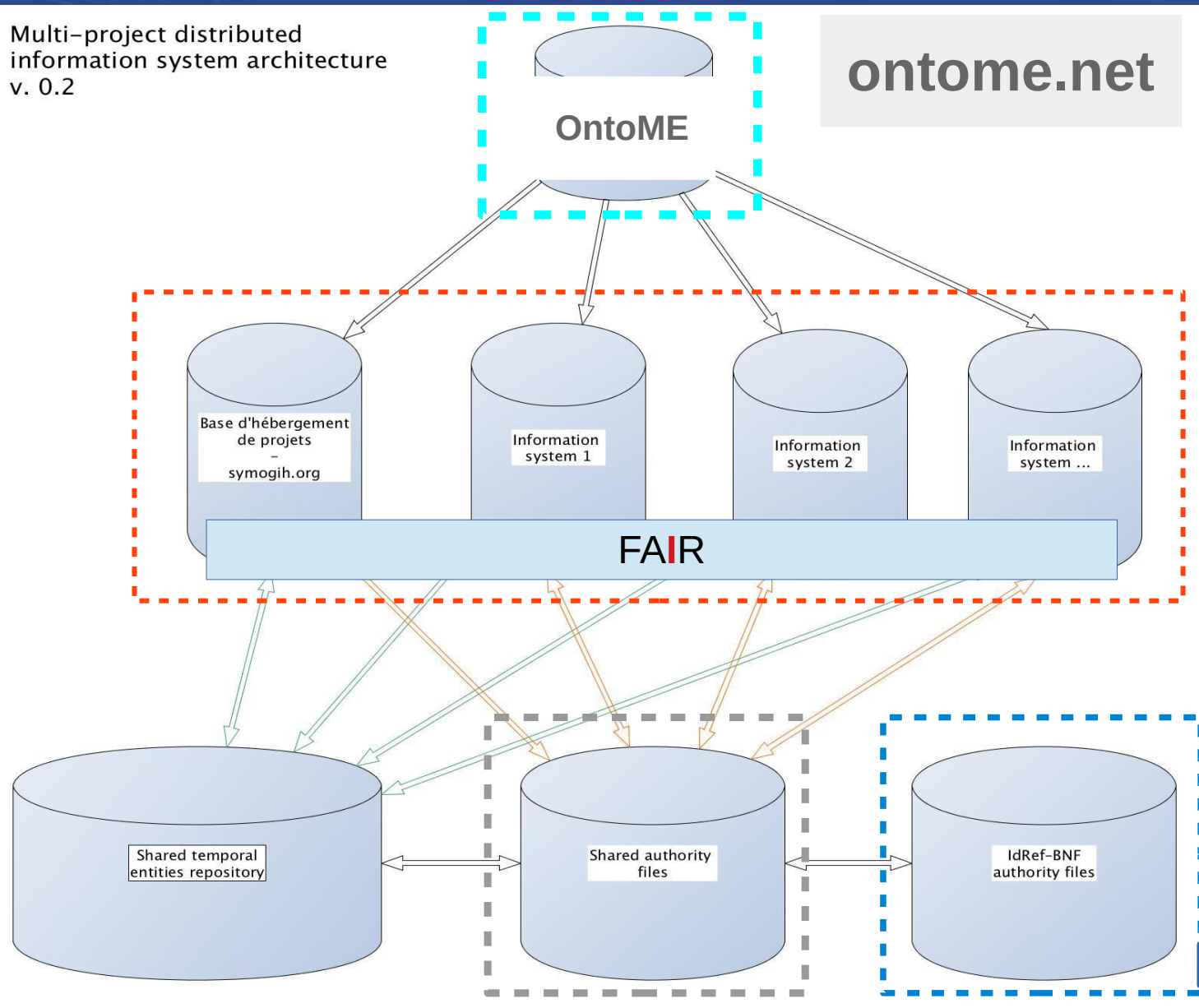
In First Order Logic: $C2(x) \supset E22(x)$

Outgoing properties: [P6 has ship type](#) → [C3 Ship type](#)

Incoming properties: [C1 Ship voyage](#) → [P3 carried out by](#)
[C12 Shipbuilding](#) → [P7 has built](#)



ontome.net



dataforhistory.org – dataforhumanities.org

Material, mental and social phenomena

Social reality

Mental reality

Material reality

