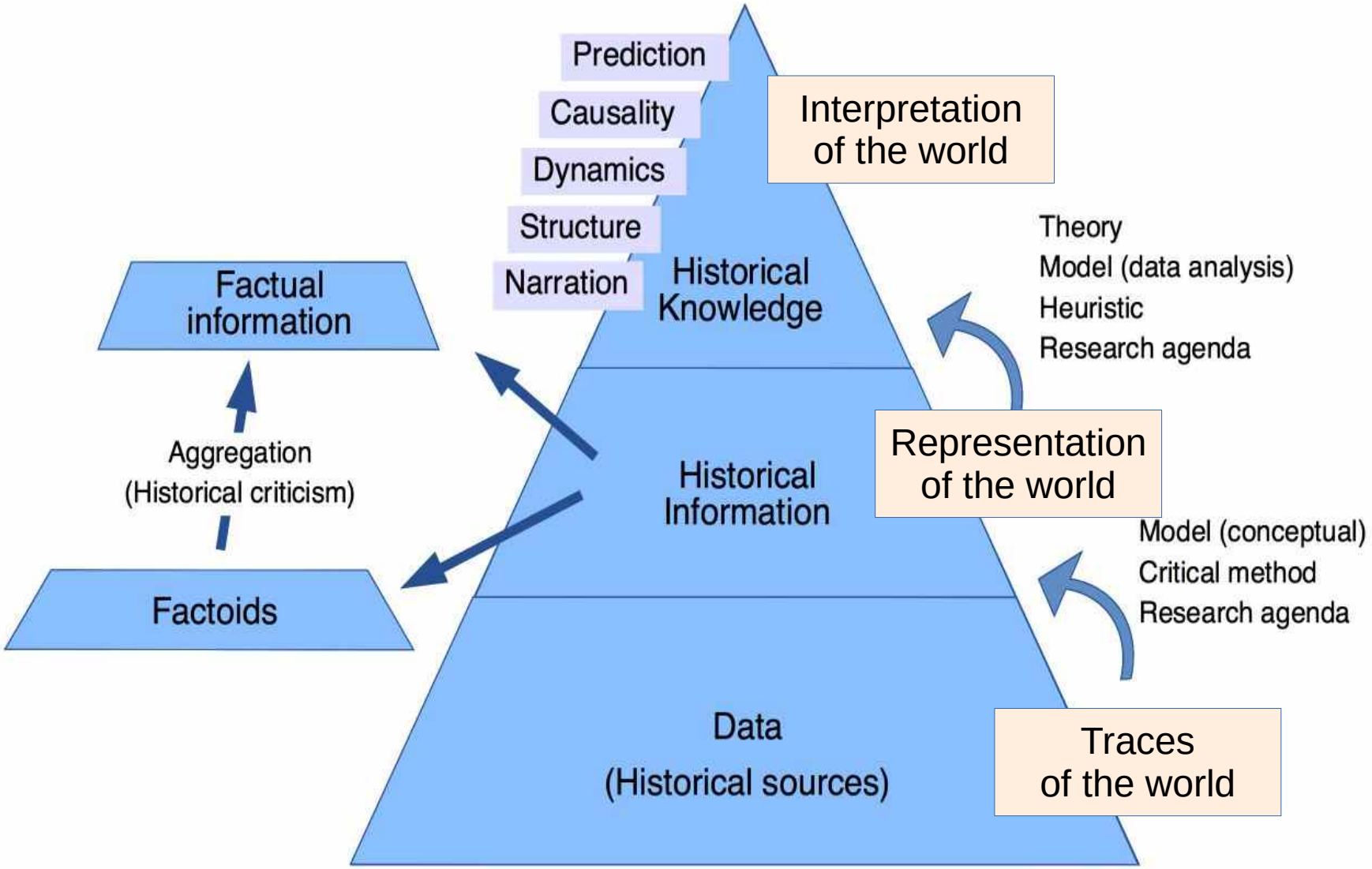
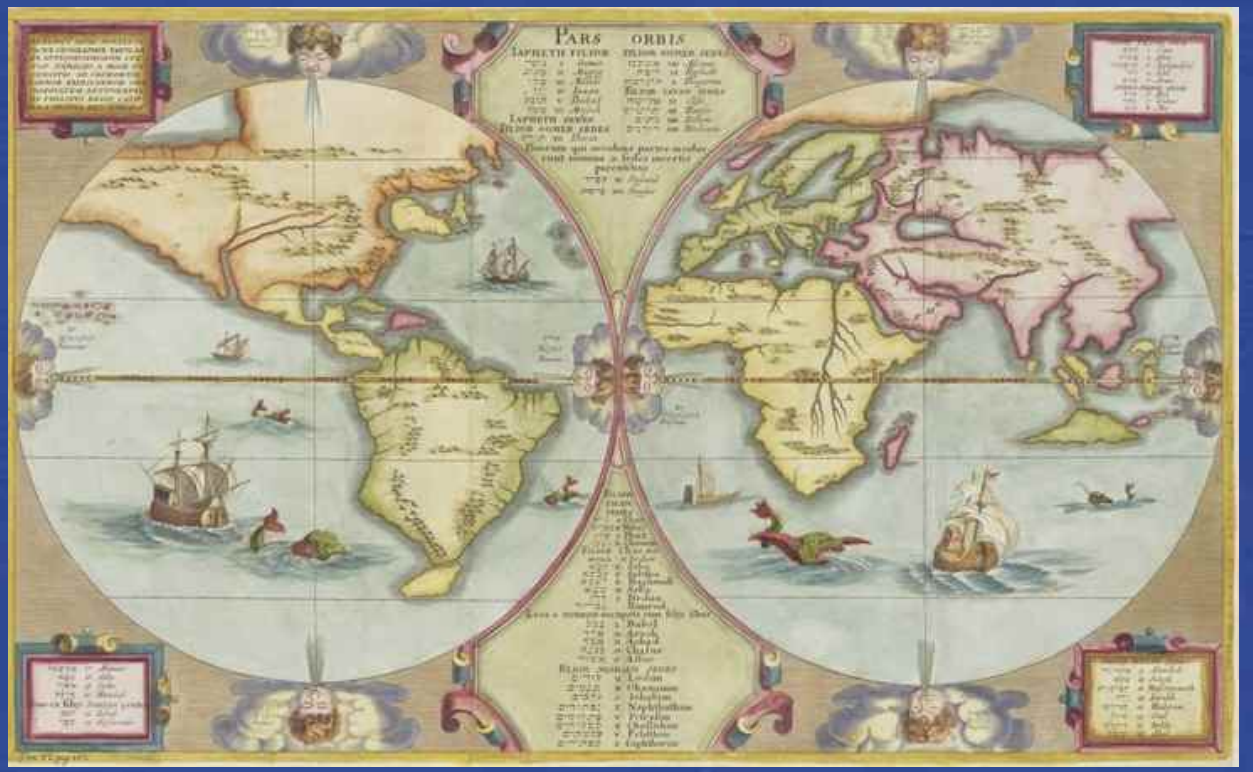
Francesco Beretta
(CNRS UMR5190 LARHRA – Université de Lyon)

La conceptualisation de l'information factuelle

Université de Neuchâtel
Novembre 2023
(version 3.3)

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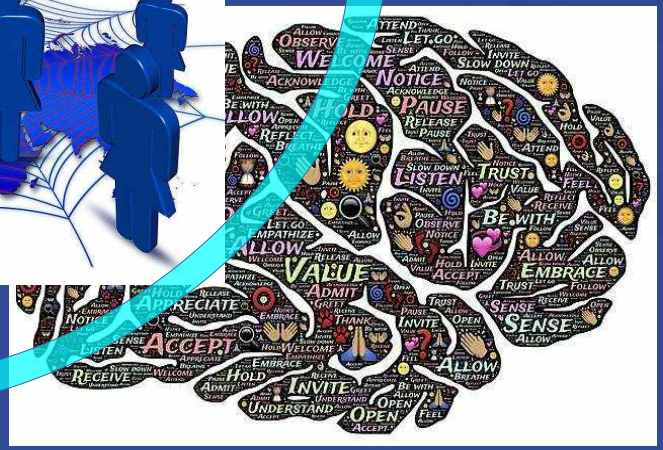
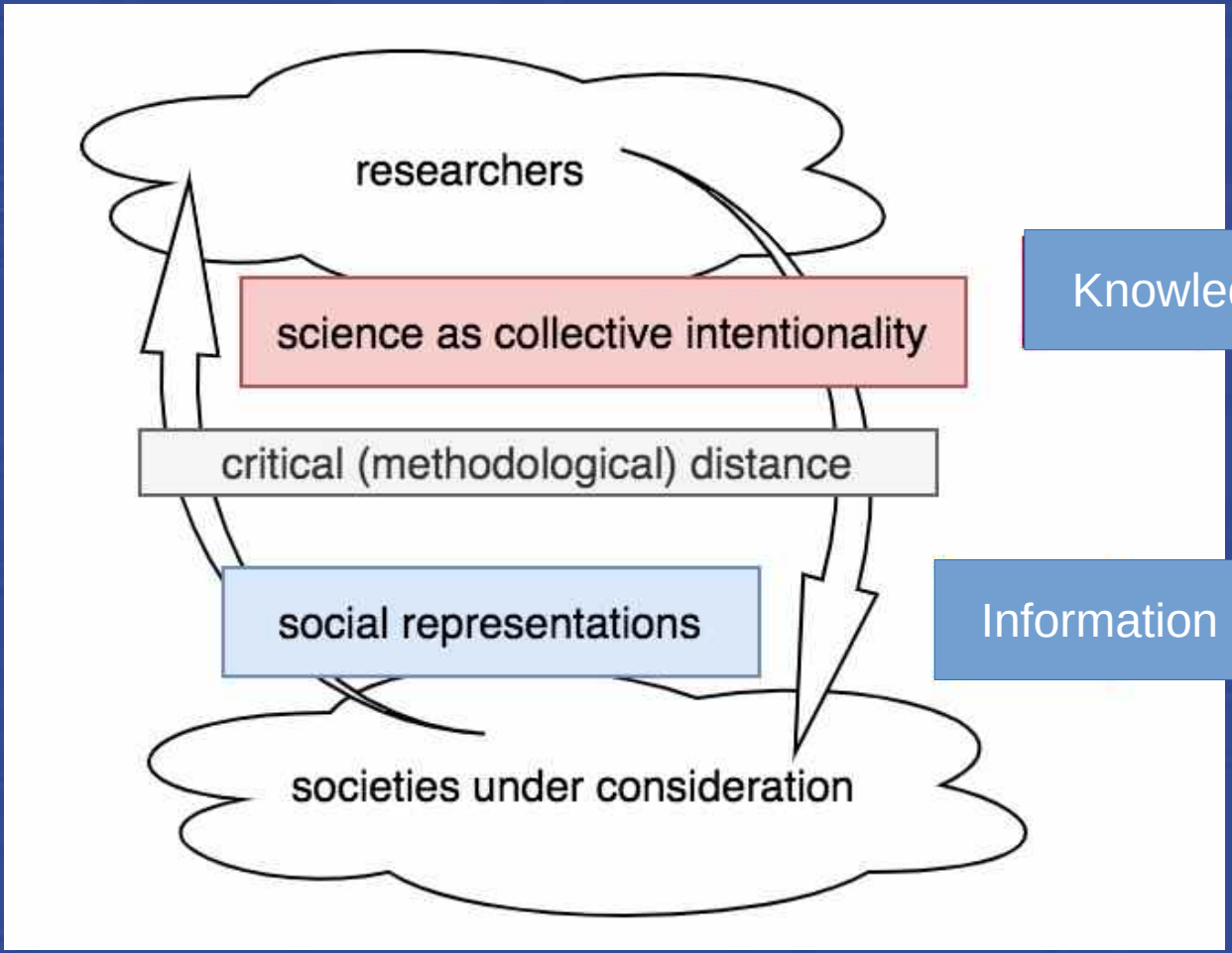

OBSERVE
LET GO
WELCOME
NOTICE
ACKNOWLEDGE
SLOW DOWN
PAUSE
RELEASE
LISTEN
TRUST
BE WITH
EMPATHIZE
ALLOW
VALUE
ADMIT
EMBRACE
APPRECIATE
THANK
SENSE
ACCEPT
RECEIVE
INVITE
HOLD
UNDERSTAND
OPEN
FEEL

CC 0

Information as **representation** of the world :

- representation of the **objects** in the world
- of their **properties**
- of their **relationships**

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



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Expression of an opinion

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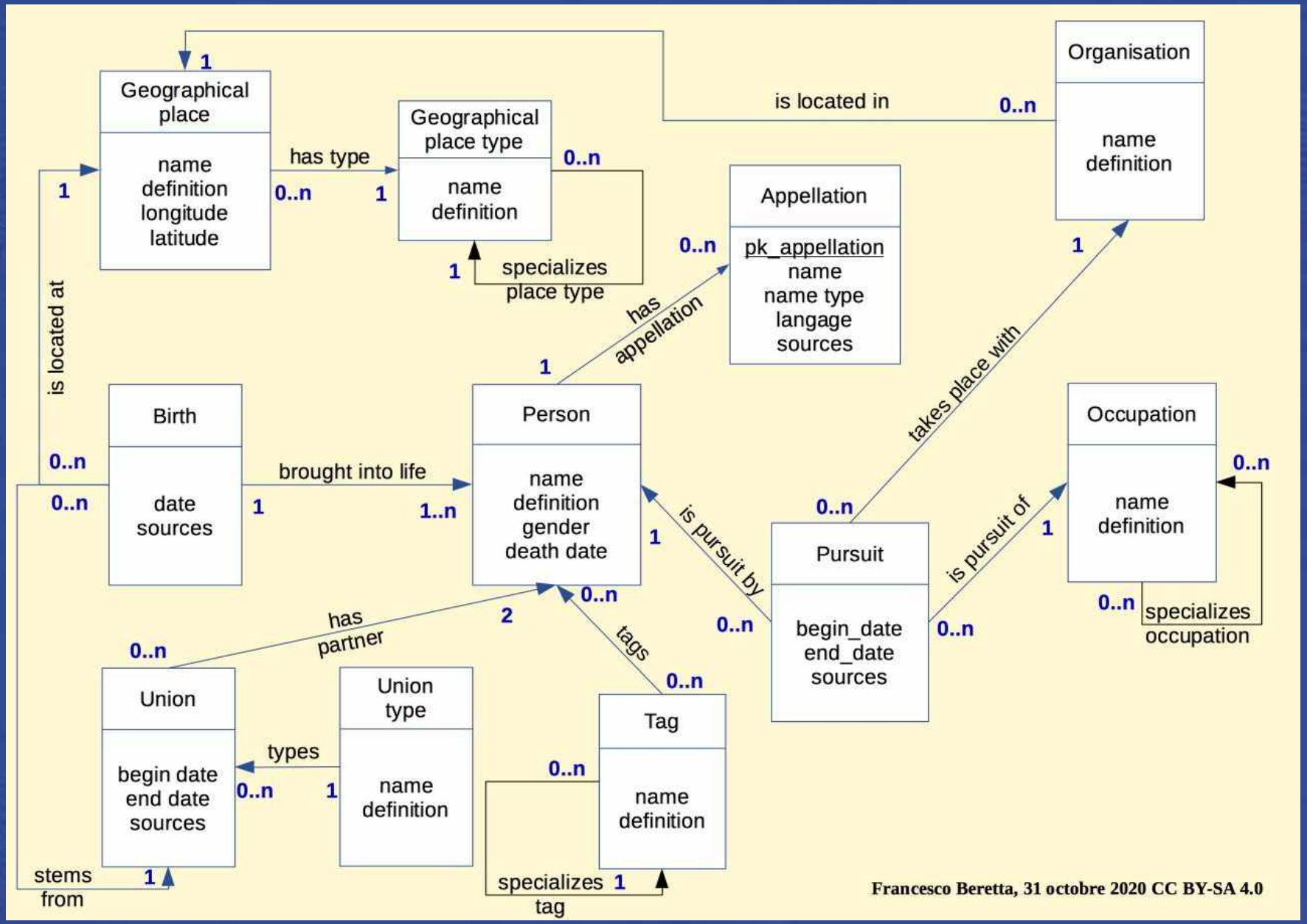

Geographical place
name
definition
longitude
latitude
has type
Geographical place type
name
definition
specializes place type
is located at
Organisation
name
definition
is located in
Appellation
pk_appellation
name
name type
langage
sources
has appellation
Birth
date
sources
brought into life
Person
name
definition
gender
death date
takes place with
Occupation
name
definition
specializes occupation
is pursuit by
Pursuit
begin_date
end_date
sources
is pursuit of
has partner
Union
begin date
end date
sources
Union type
name
definition
types
tags
Tag
name
definition
specializes tag
stems from
Francesco Beretta, 31 octobre 2020 CC BY-SA 4.0

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 et al. 2011, p. 510-511]

OntoClean

N. Guarino/C. A. Welty, « An Overview of OntoClean », in Steffen Staab, ed., Handbook on ontologies, 2nd ed. Berlin: Springer, 2009.

OntoClean (Wikipedia)

- Rigidity (Essence -> substance and accidents)
- Identity (Properties allowing to distinguish between individuals, e.g. events)
- Unity (Parthood : water, oceans)

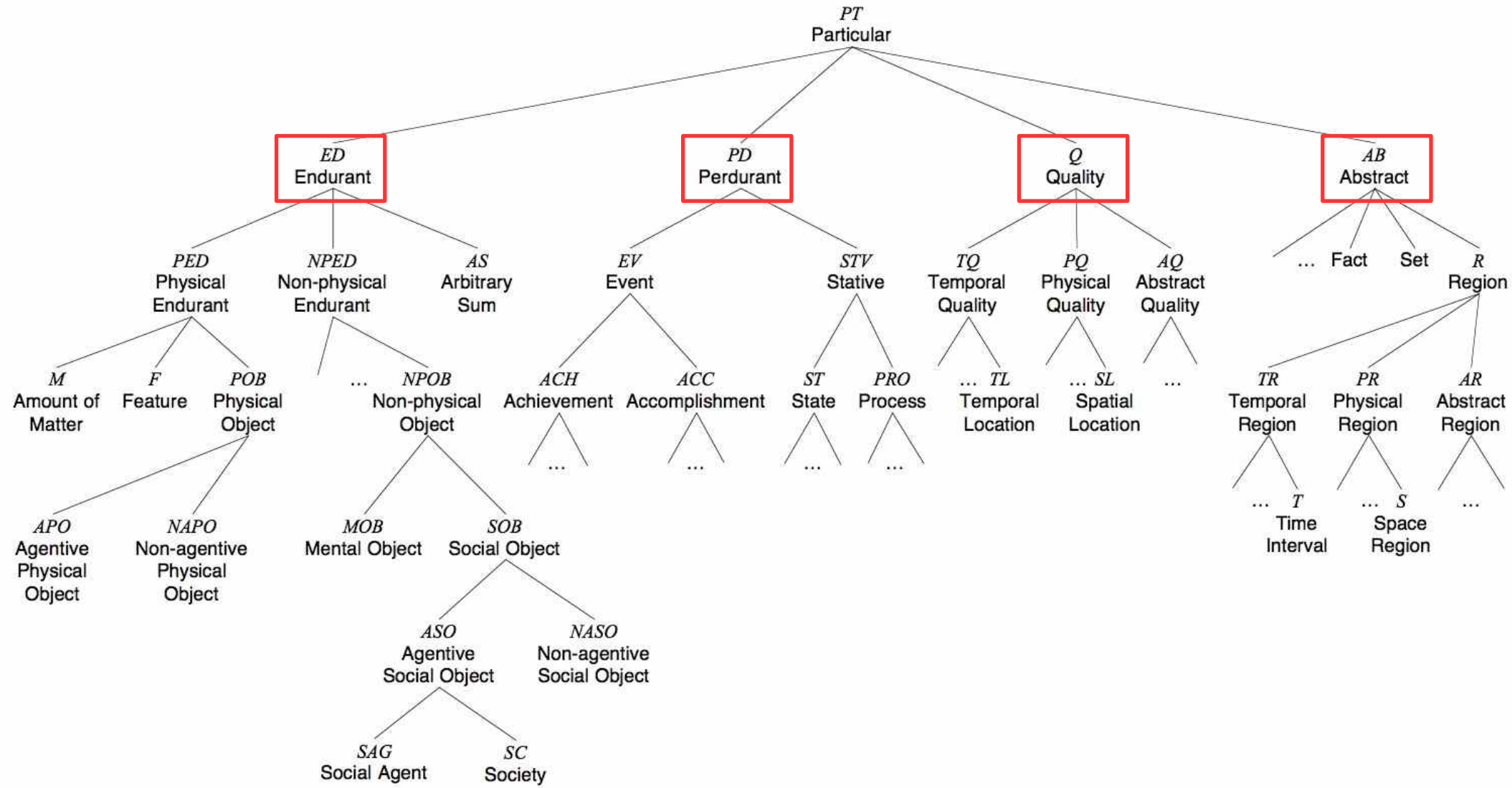
A ‘student’ : not a class but a time-indexed property of a person.

Modelling Best Practices

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

The issue of a suitable conceptualization :

Foundational ontologies
were developed to support the
verification and improvement
of the **conceptualization** of a **domain of discourse.**



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

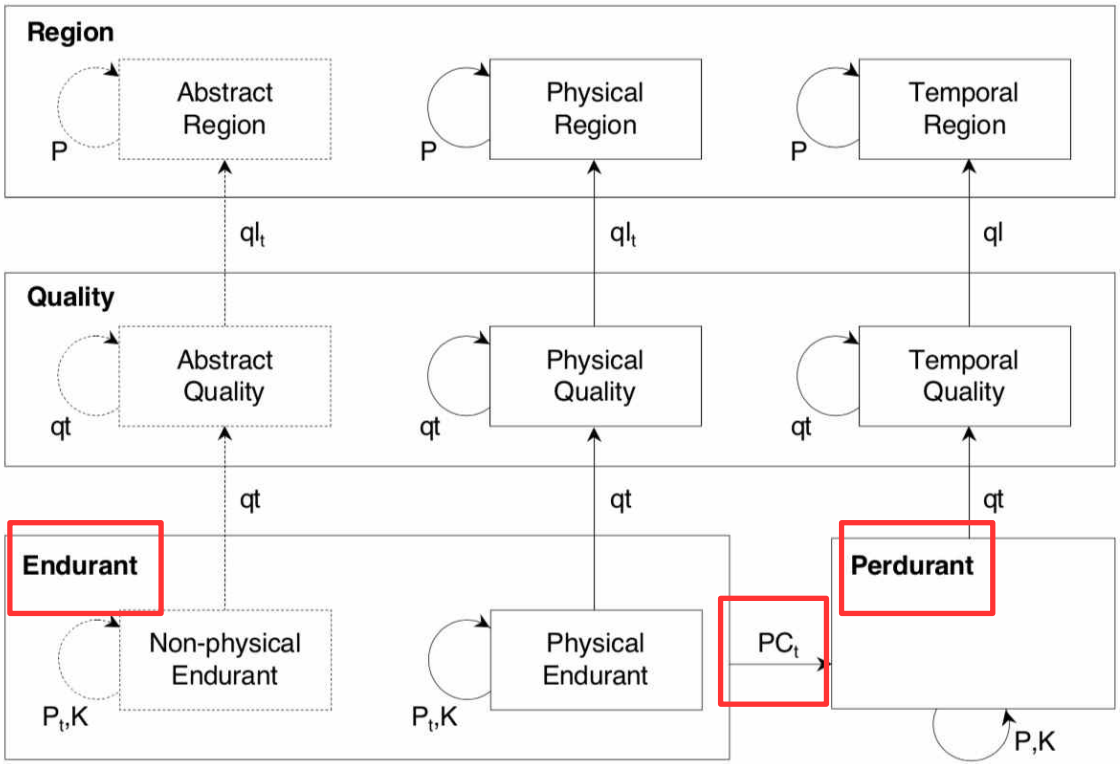


Figure 4: Primitive relations between basic categories (the dotted lines to the left indicate that we are less confident with what concerns non-physical endurants.

4.2.7 Participation

(Dd63) $\mathsf{PC}_C(x,y) \triangleq \exists t(\mathsf{PRE}(y,t)) \wedge \forall t(\mathsf{PRE}(y,t) \rightarrow \mathsf{PC}(x,y,t))$ (*Const. Participation*)

(Dd64) $\mathsf{PC}_T(x,y,t) \triangleq PD(y) \wedge \forall z((\mathsf{P}(z,y) \wedge \mathsf{PRE}(z,t)) \rightarrow \mathsf{PC}(x,z,t))$ (*Temporary Total Participation*)

(Dd65) $\mathsf{PC}_T(x,y) \triangleq \exists t(\mathsf{ql}_T(t,y) \wedge \mathsf{PC}_T(x,y,t))$ (*Total Participation*)

(Dd66) $\mathsf{mpc}(x,y) \triangleq x = \sigma_t z(\mathsf{PC}_T(z,y))$ (*Maximal Participant*)

(Dd67) $\mathsf{mppc}(x,y) \triangleq x = \sigma_t z(\mathsf{PC}_T(z,y) \wedge PED(z))$ (*Maximal Physical Participant*)

(Dd68) $\mathsf{lf}(x,y) \triangleq x = \sigma z(\mathsf{PC}_T(y,z))$ (*Life*)

WonderWeb Deliverable D18, p.30

Foundational ontologies
& modelling best practices

Research agenda

Research specific data model

Research data

Foundational ontologies
& modelling best practices

DOLCE + Descriptions and Situations
& object-oriented modelling principles

Research agenda

Research specific data model

Research data

Foundational ontologies
& modelling best practices

Generic, **domain related** core ontology

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CIDOC CRM

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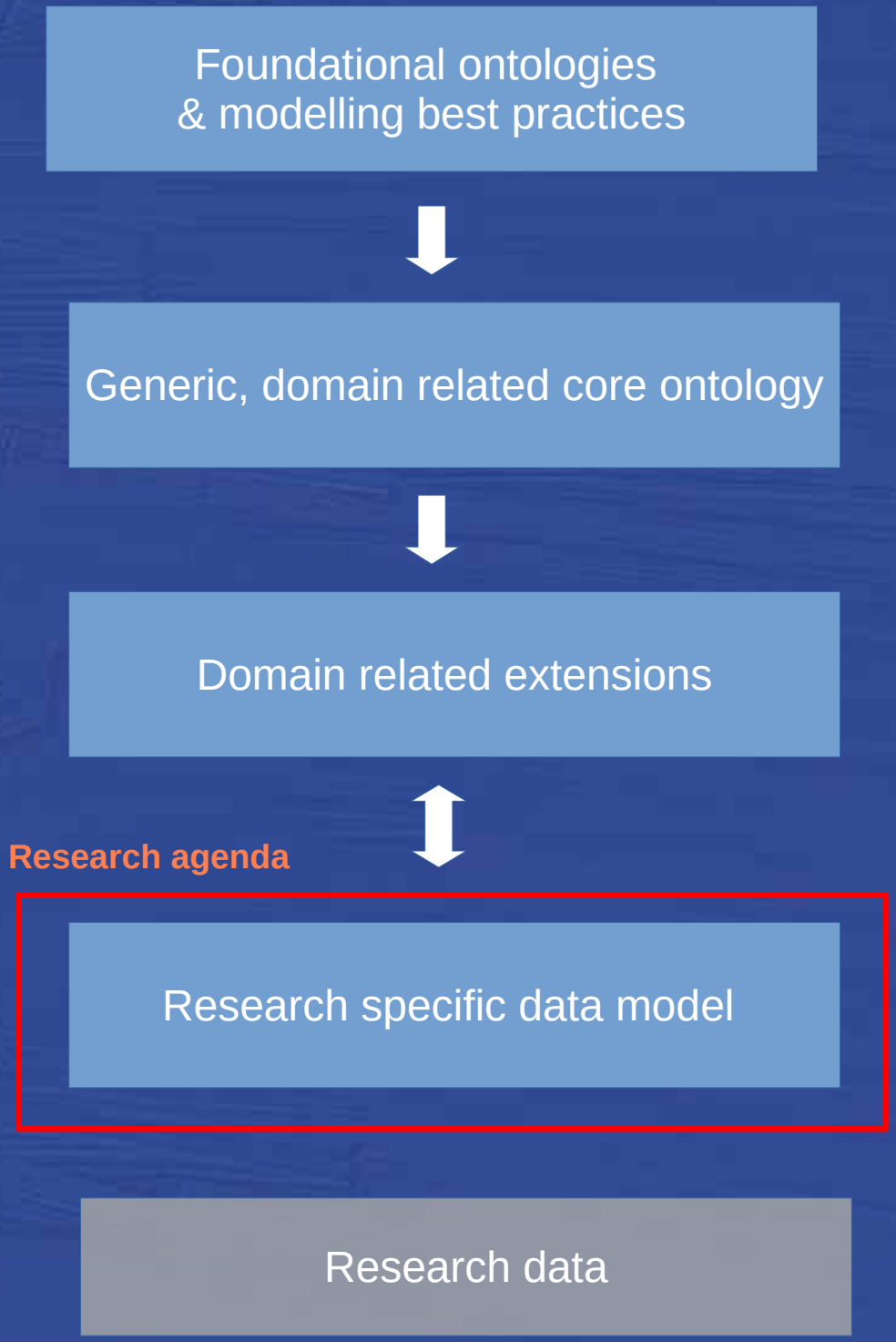
Research data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Generic, domain related core ontology
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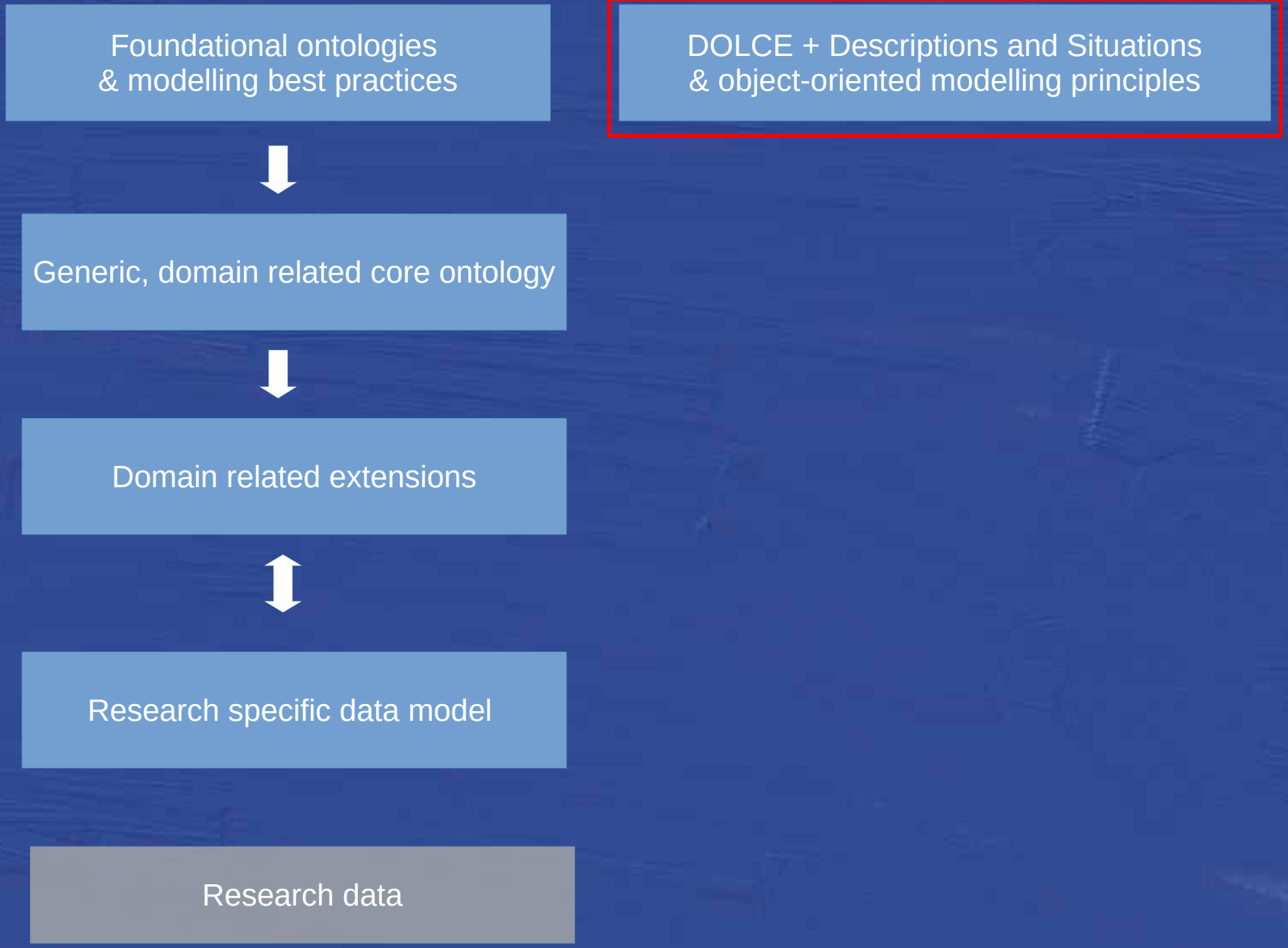
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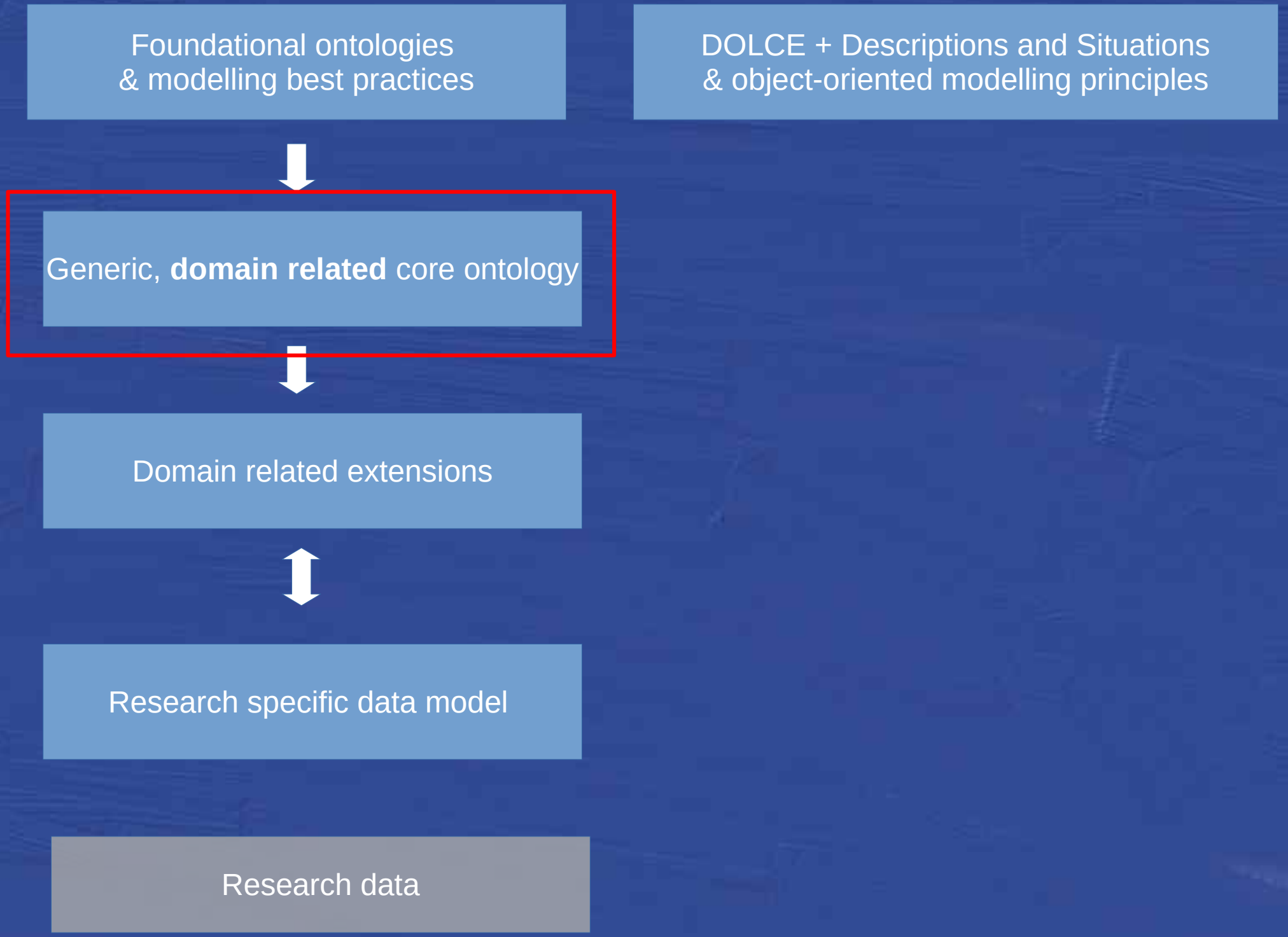
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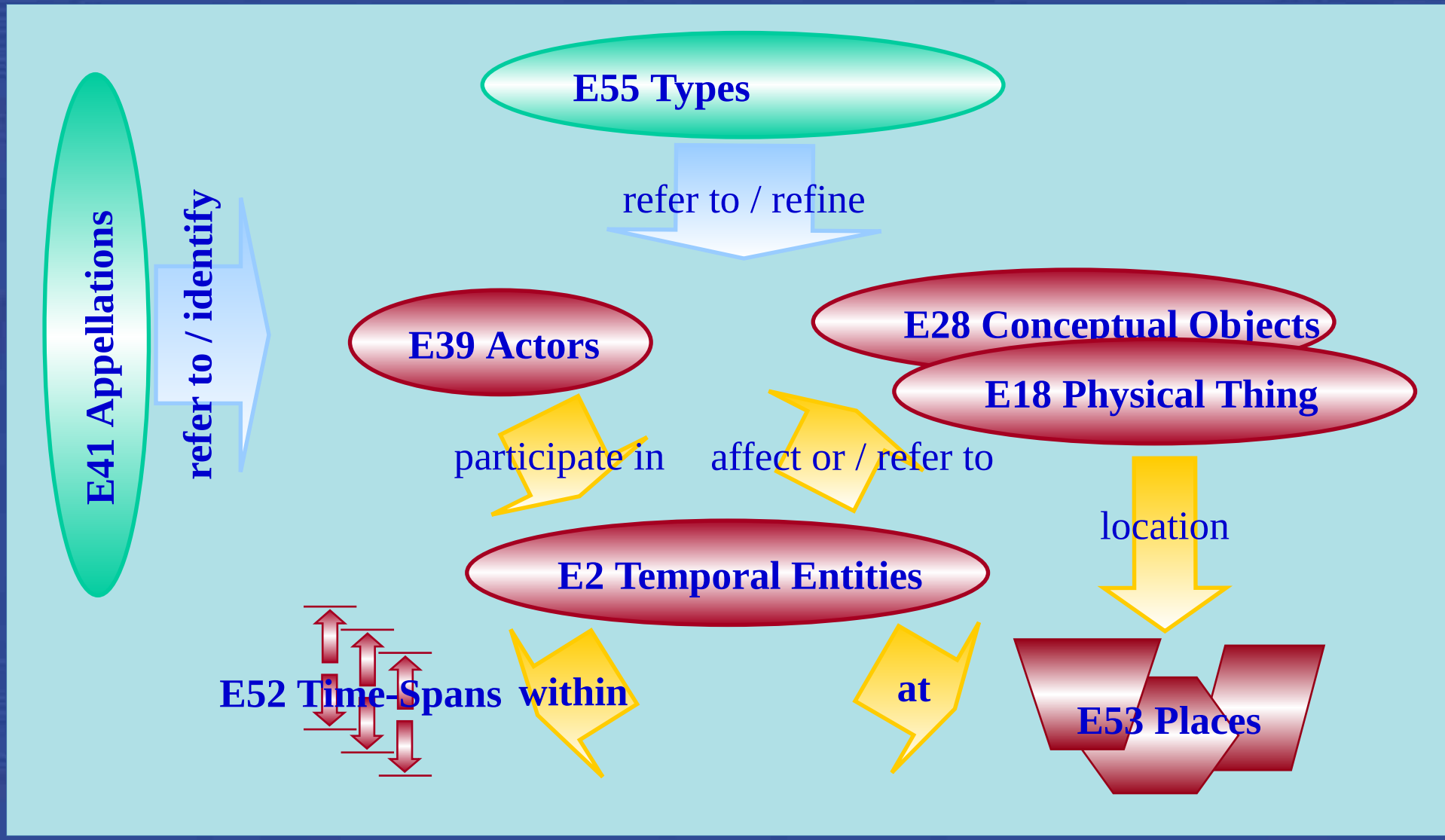
The CIDOC CRM (ISO21127:2006)
A semantic framework that provides *interoperability* between different sources of **cultural heritage information**



Stephen Stead (2008)

Persistent items

Person

Group

« In 1592, he [Galileo Galilei] moved to the University of Padua where he taught geometry, mechanics, and astronomy until 1610»

Geographical place

Conceptual object

Conceptual object

[https://en.wikipedia.org/wiki/Galileo_Galilei#CITEREFSharratt-1994]

Person

Person

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Person

Person

Conceptual object

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Conceptual object

Person

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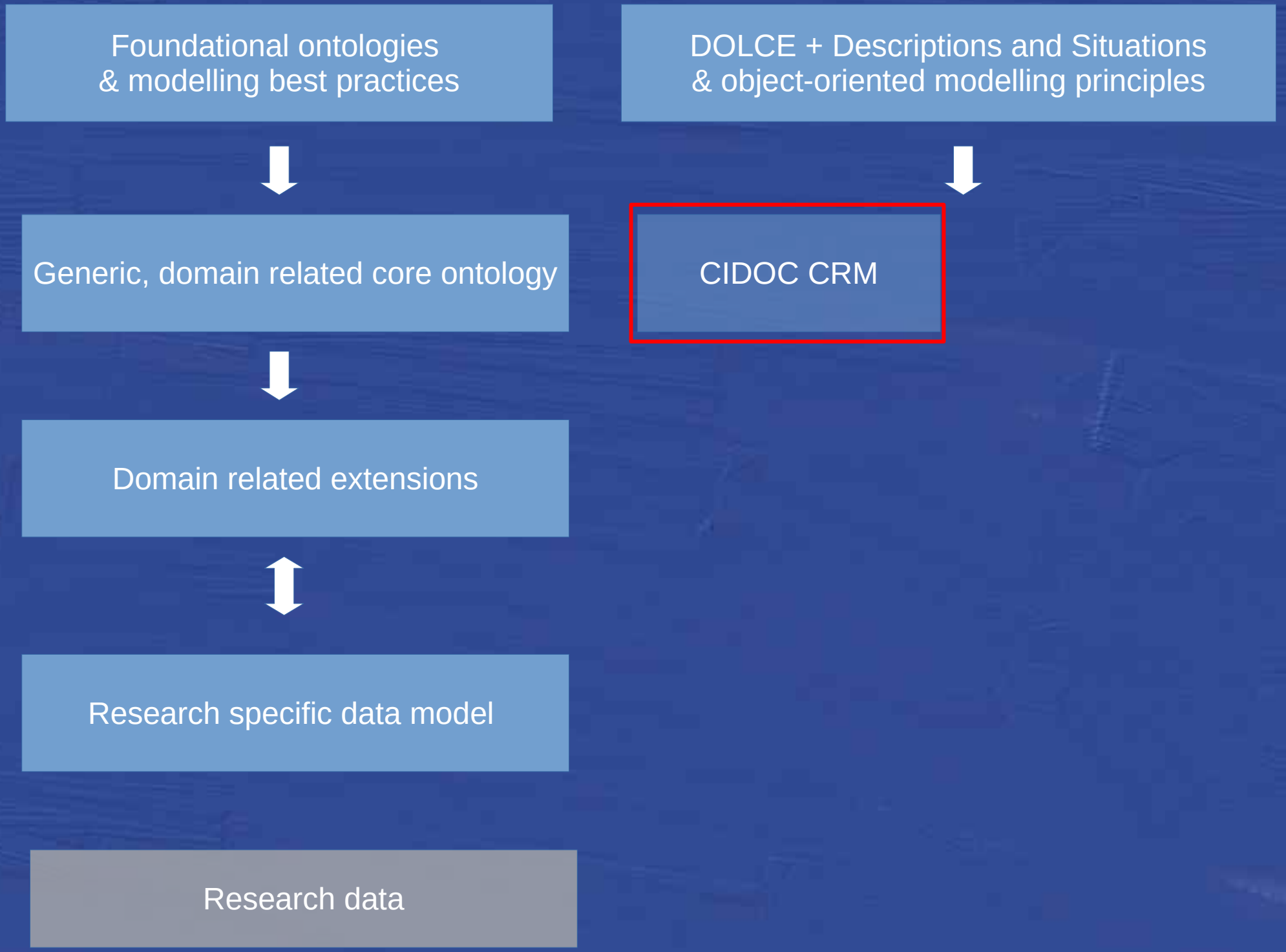
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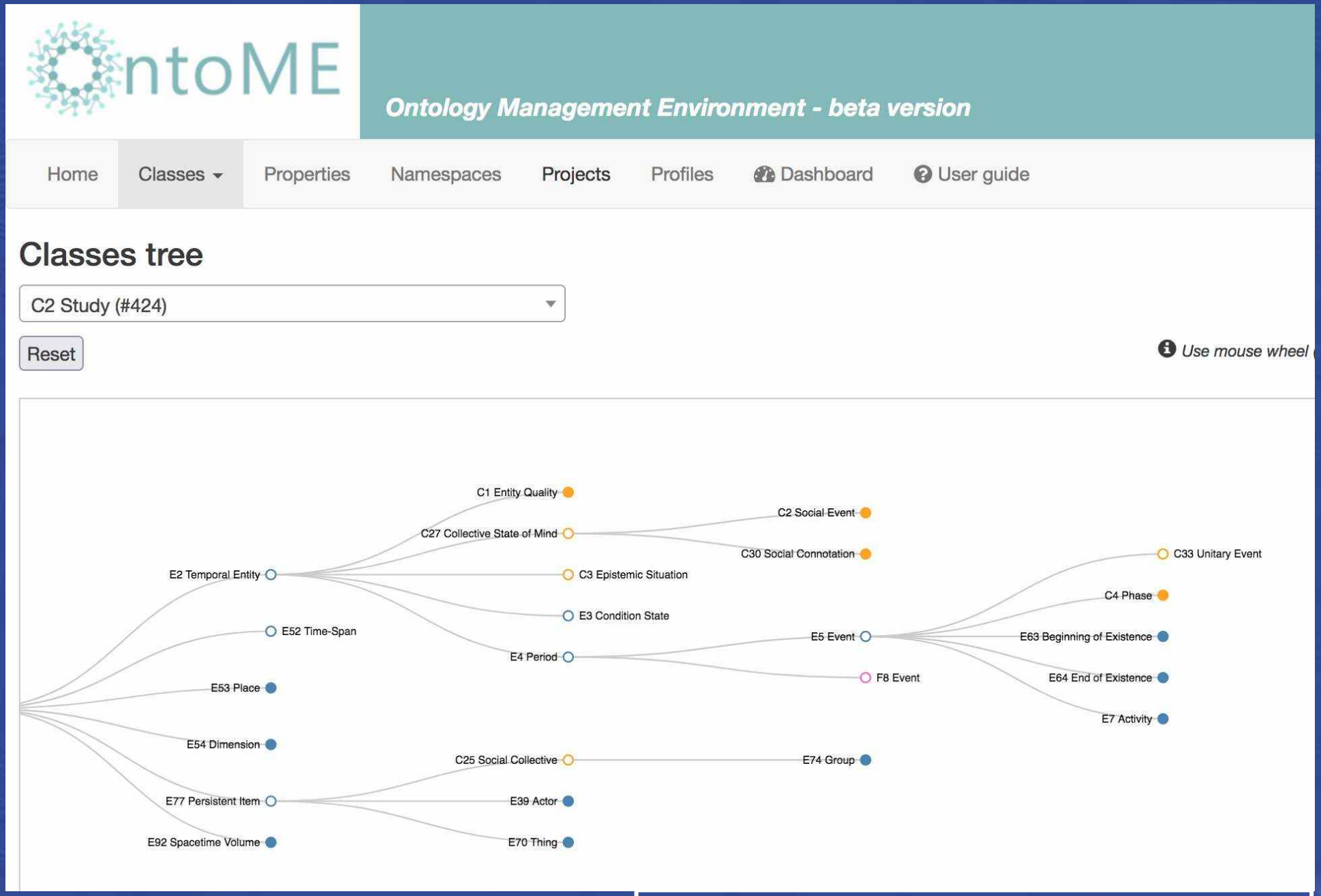
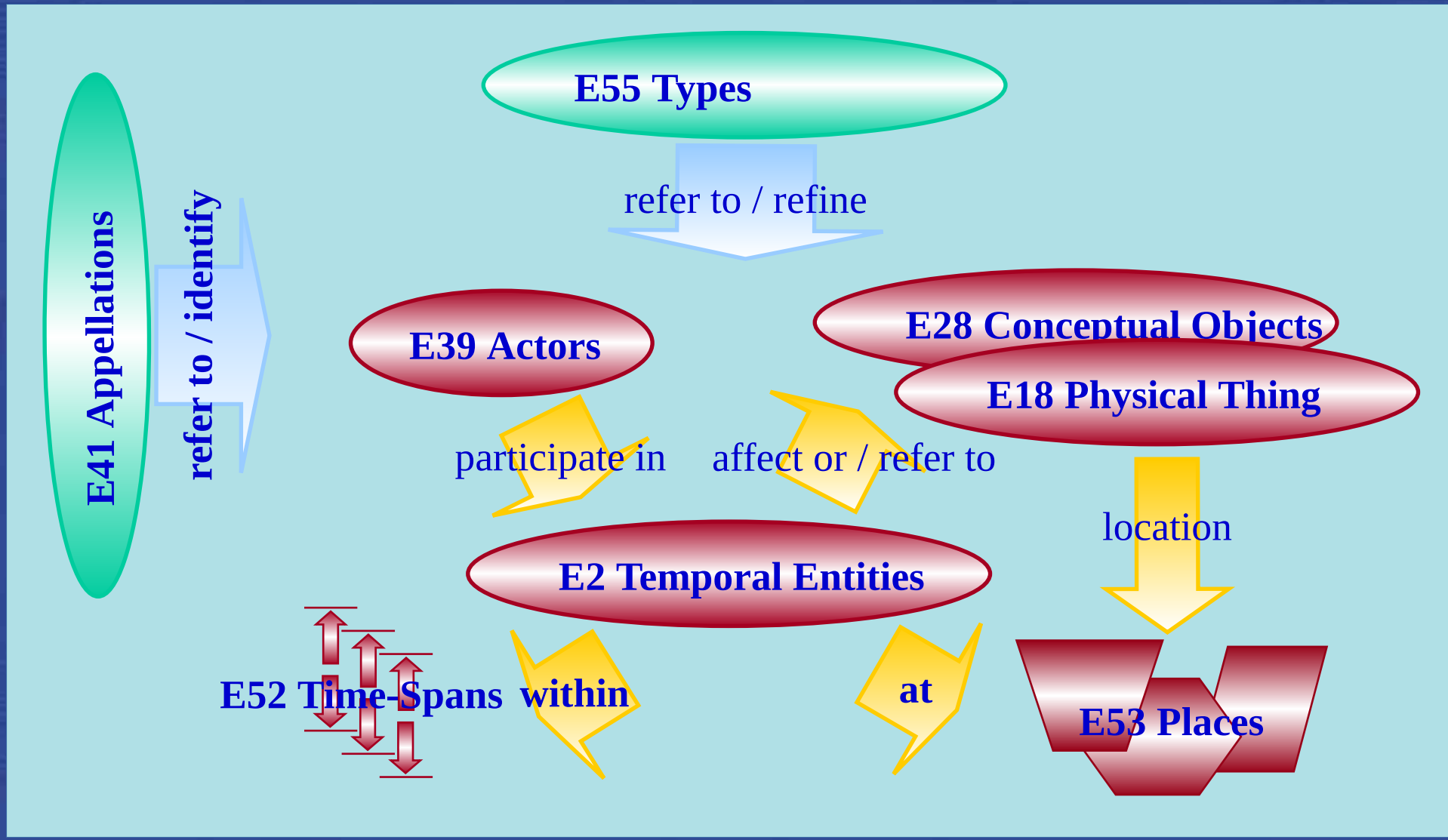

OntoME
Ontology Management Environment - beta version
Home
Classes
Properties
Namespaces
Projects
Profiles
Dashboard
User guide
Classes tree
C2 Study (#424)
Reset
Use mouse wheel
C1 Entity Quality
C27 Collective State of Mind
C2 Social Event
C30 Social Connotation
C33 Unitary Event
E2 Temporal Entity
C3 Epistemic Situation
C4 Phase
E3 Condition State
E52 Time-Span
E5 Event
E63 Beginning of Existence
E4 Period
F8 Event
E64 End of Existence
E53 Place
E7 Activity
E54 Dimension
C25 Social Collective
E74 Group
E77 Persistent Item
E39 Actor
E92 Spacetime Volume
E70 Thing

ontome.net

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



Stephen Stead (2008)

Temporal entities

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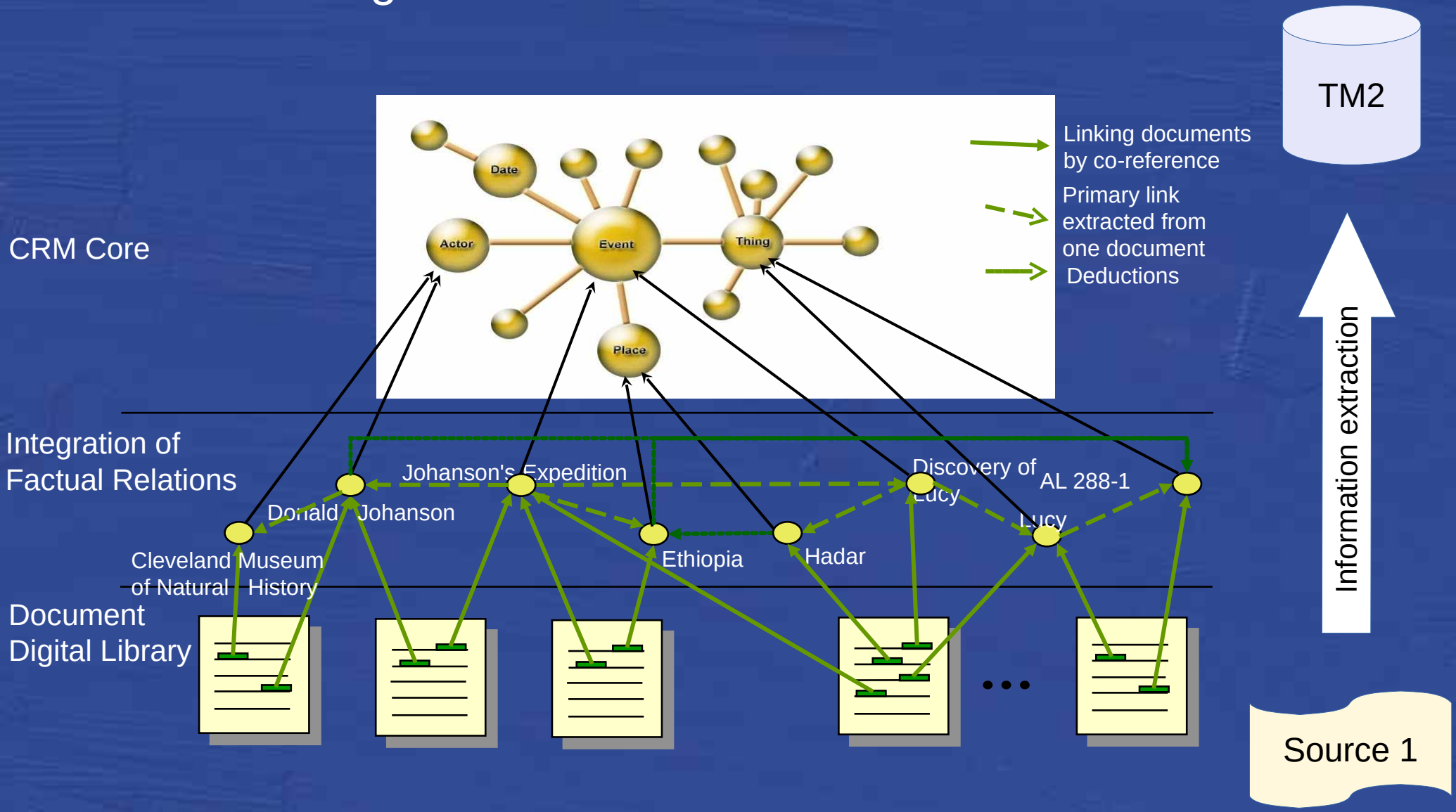
Integration of information extracted from documents using the CIDOC CRM and its extensions



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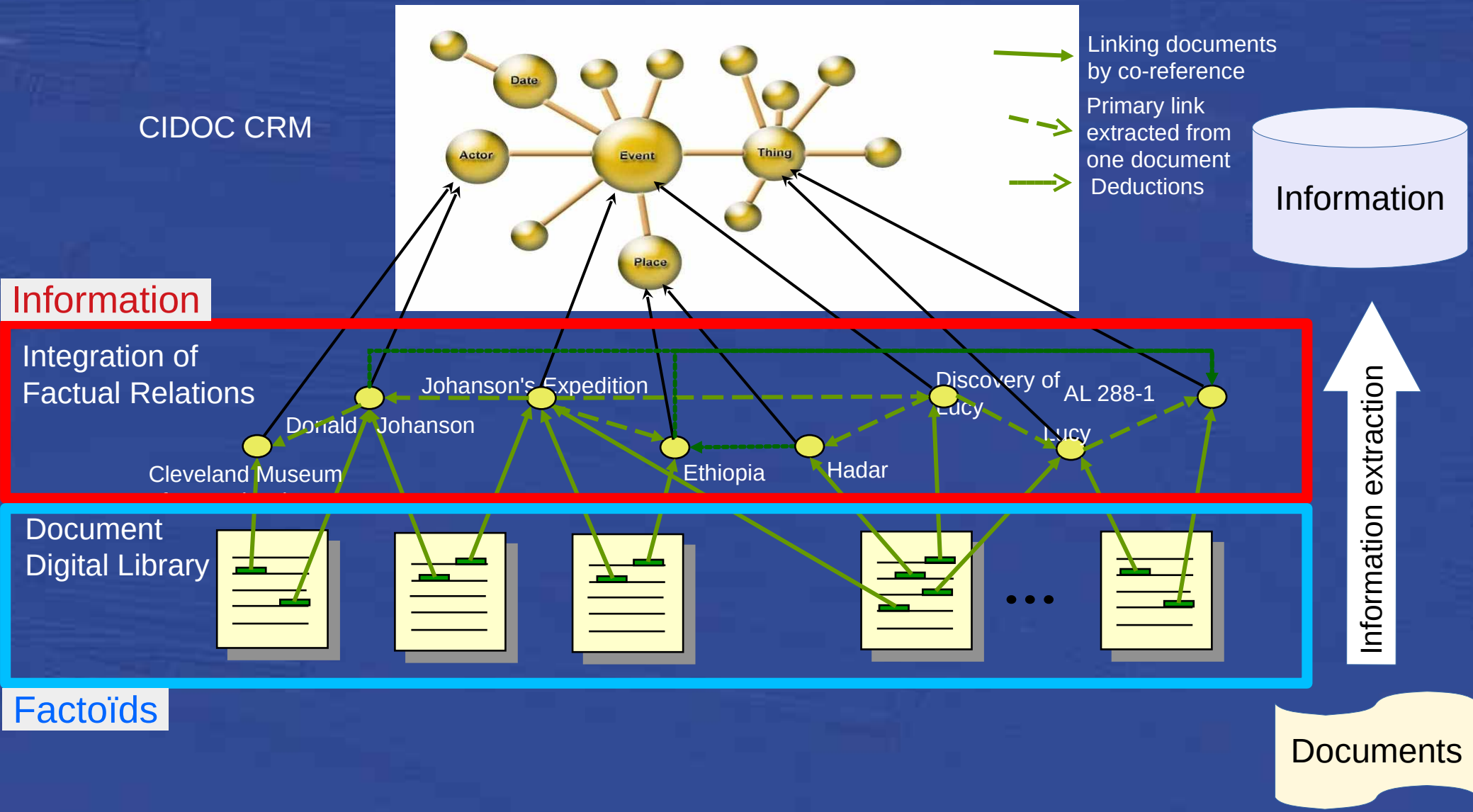
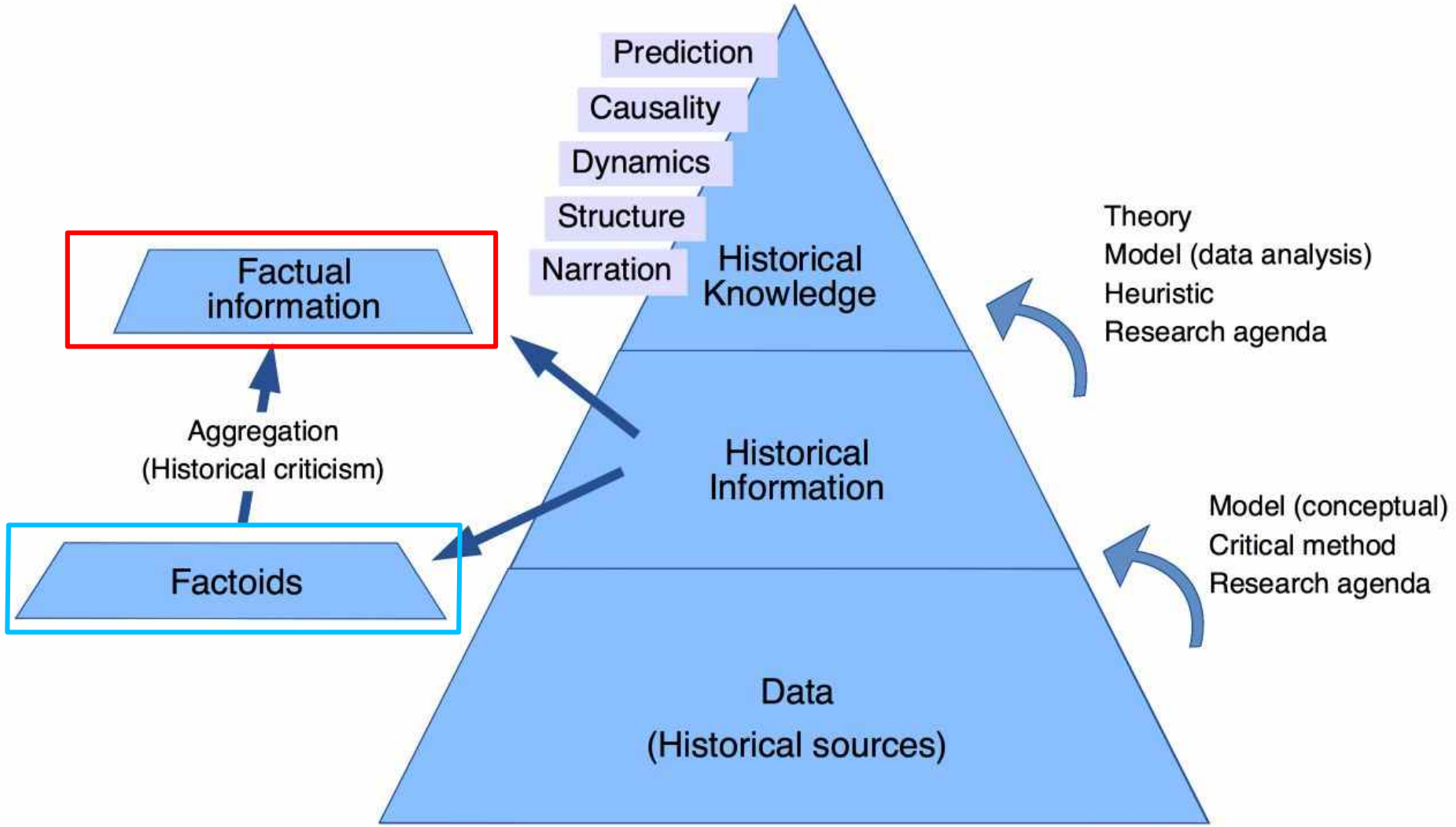
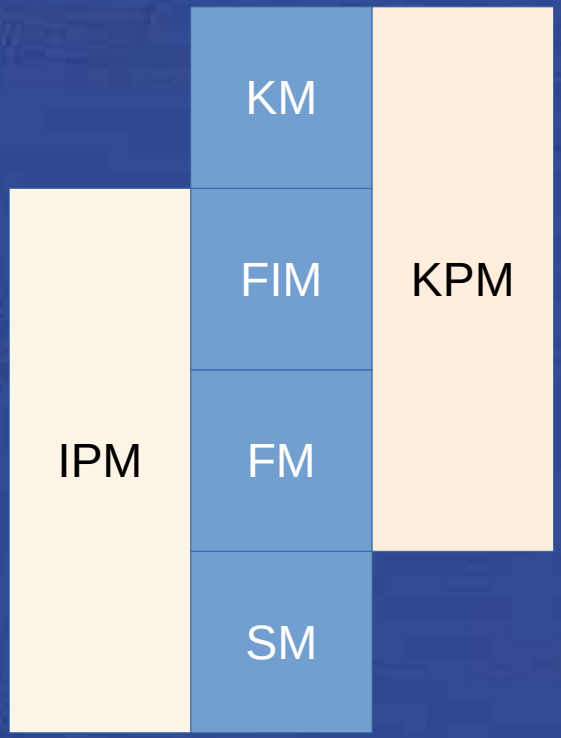
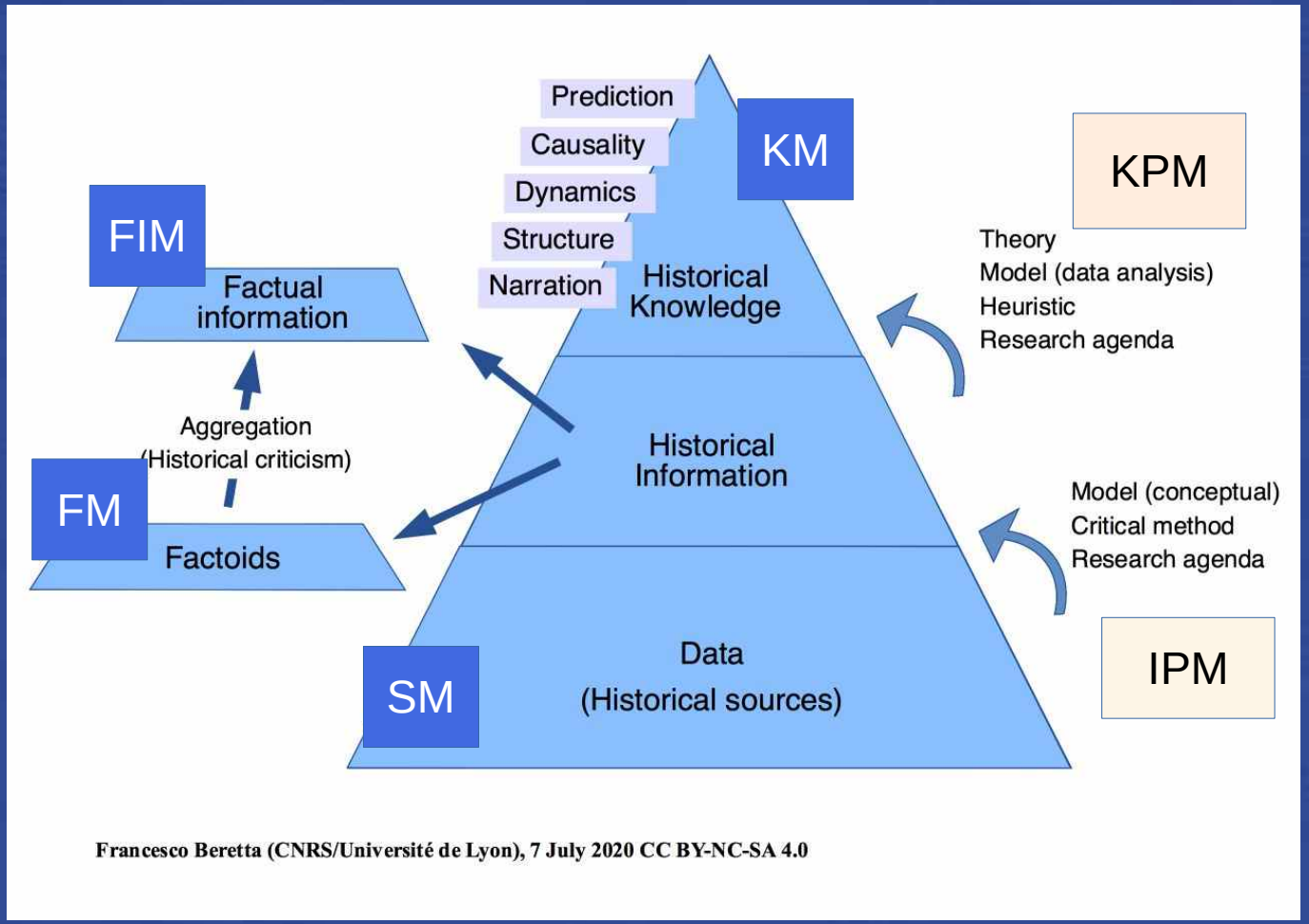


Information is not knowledge : DIK(W) pyramid



Different models for different aspects of historical knowledge production





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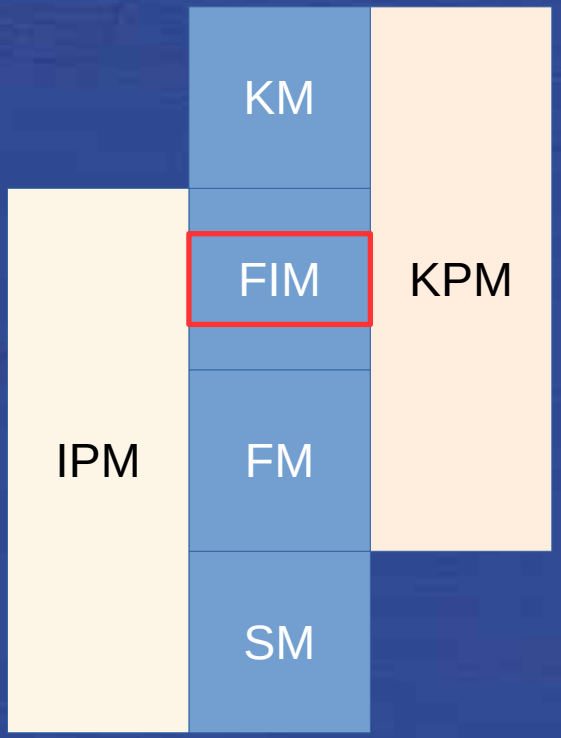
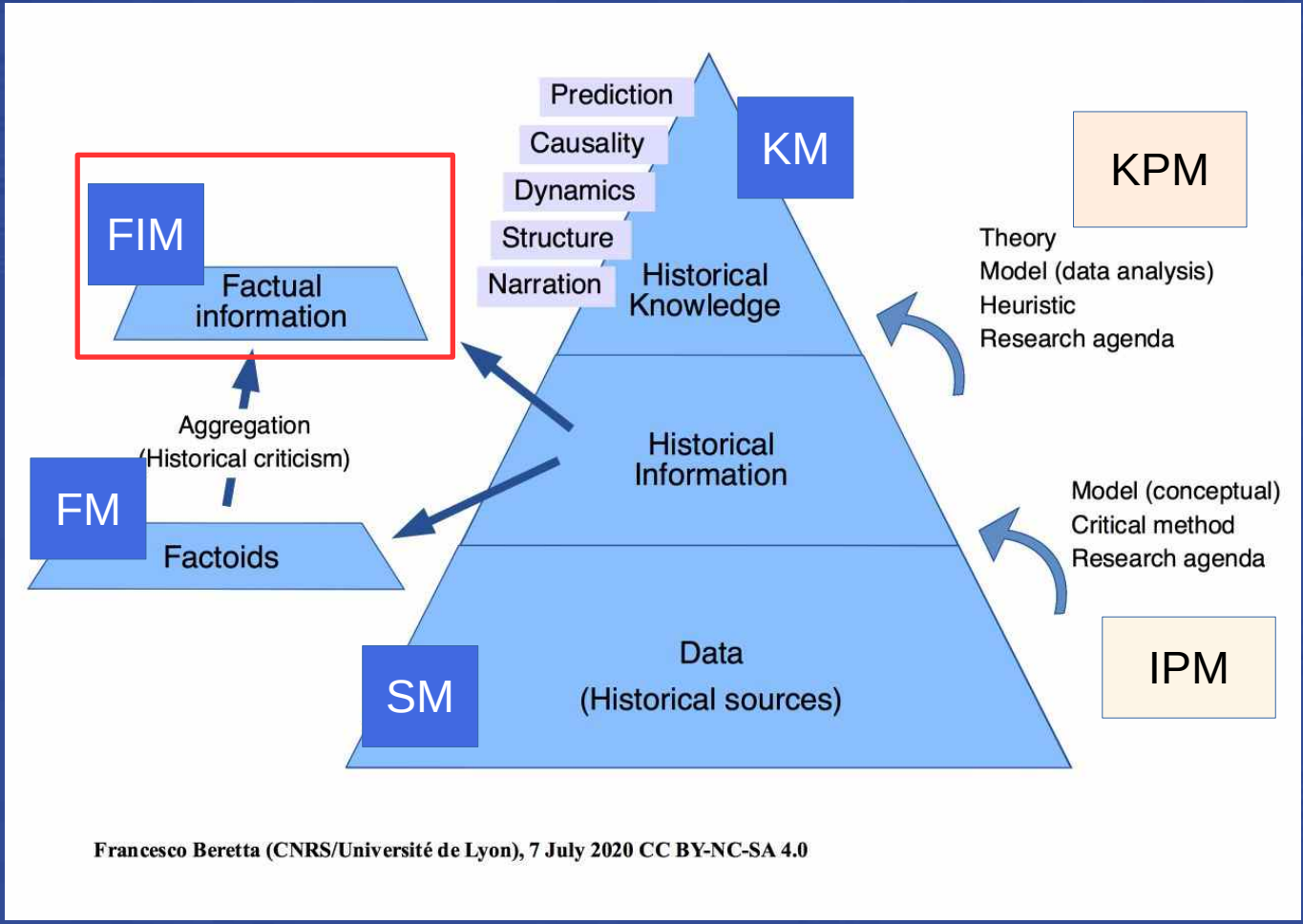




CIDOC CRM

DBpedia Ontology

SDHSS

schema.org

DUL

KM

FIM

KPM

IPM

FM

SM

HiCO

PROV

Web Annotation Data Model

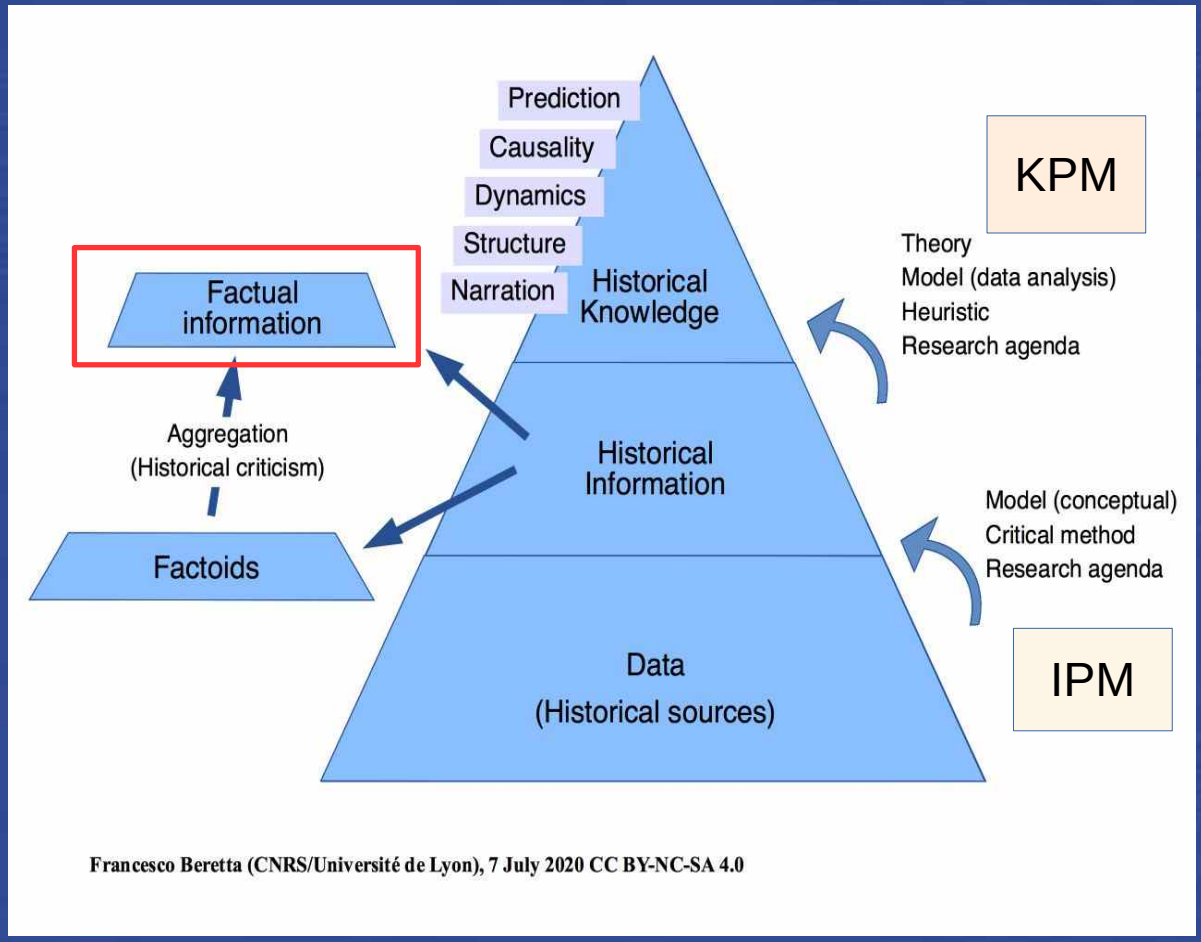
EAD

FRBRoo LRMoo

TEI

RiC

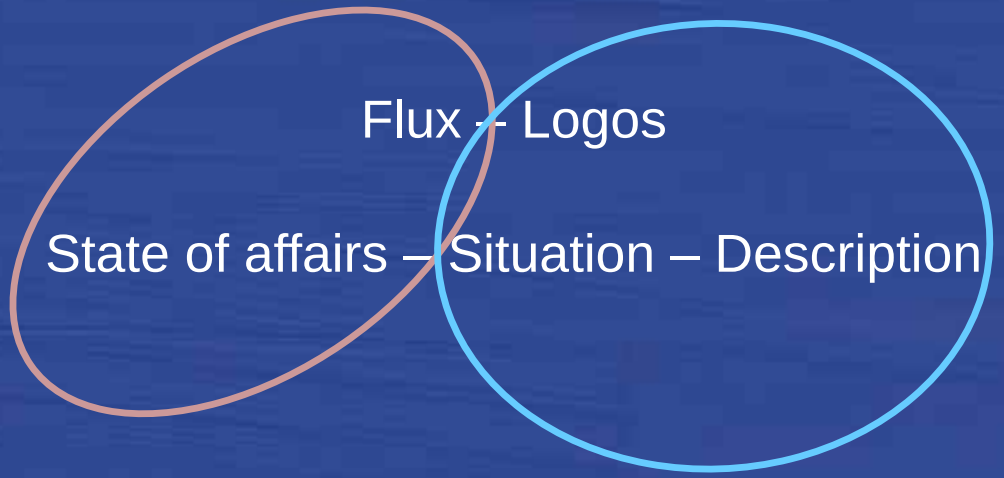
DCMI



DOLCE Lite Plus, CIDOC CRM, SDHSS

Foundation ontologies in support of data interoperability in the humanities and social sciences

Descriptions and Situations (DnS)



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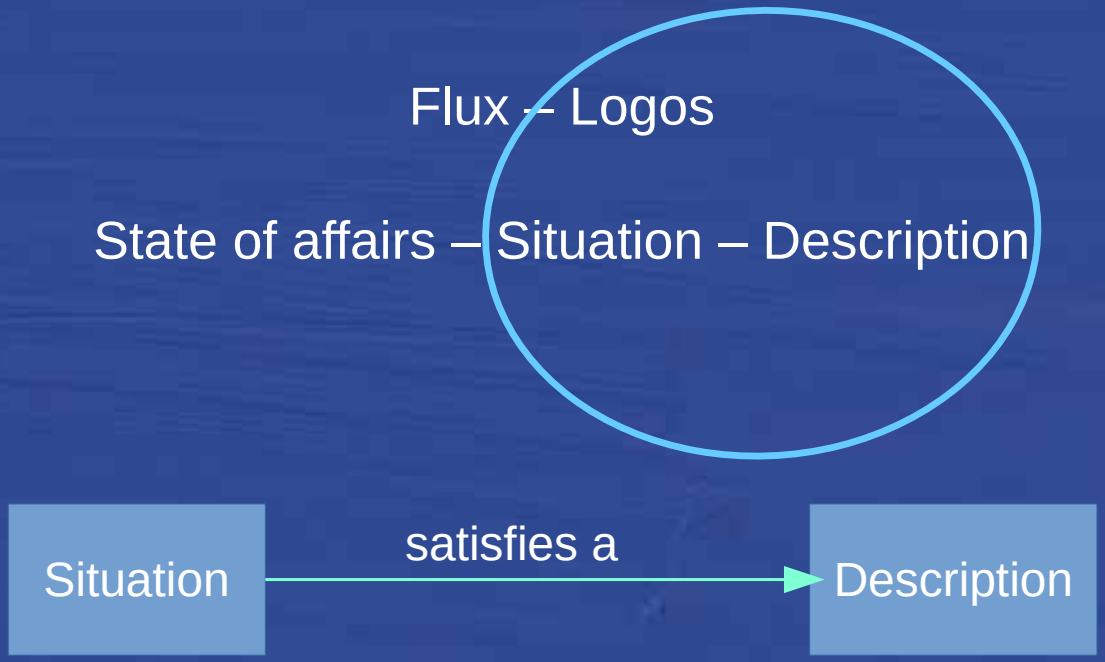
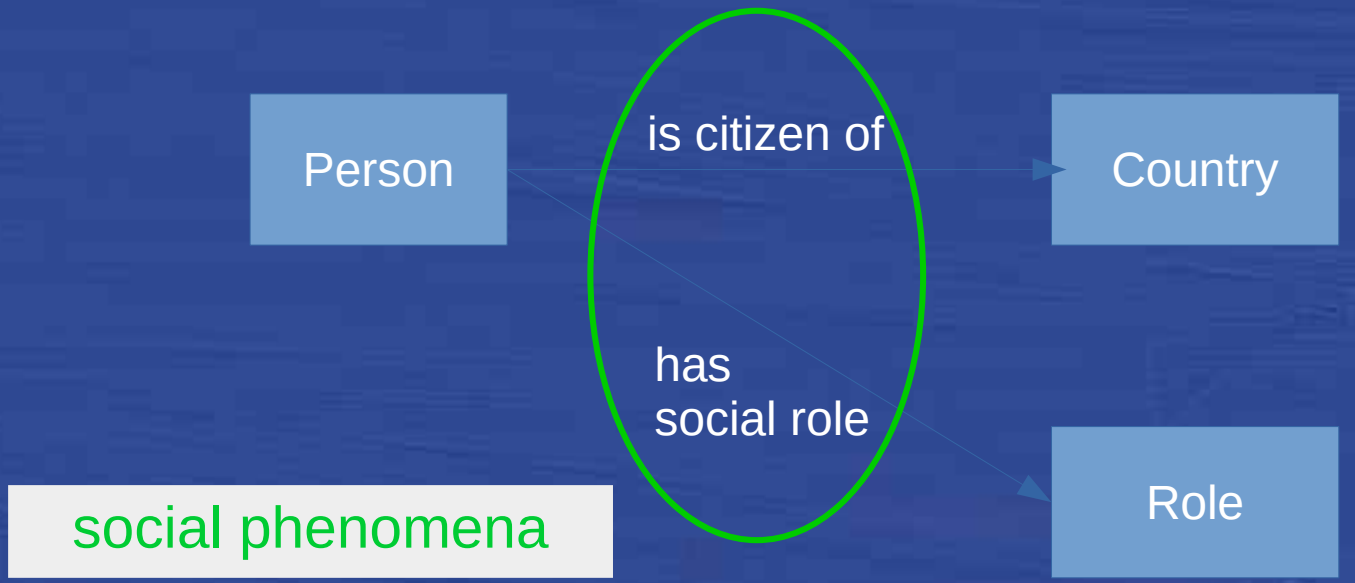


Descriptions and Situations – DnS



social phenomena

physical or biological phenomena

DOLCE

Descriptions and Situations – DnS

DOLCE

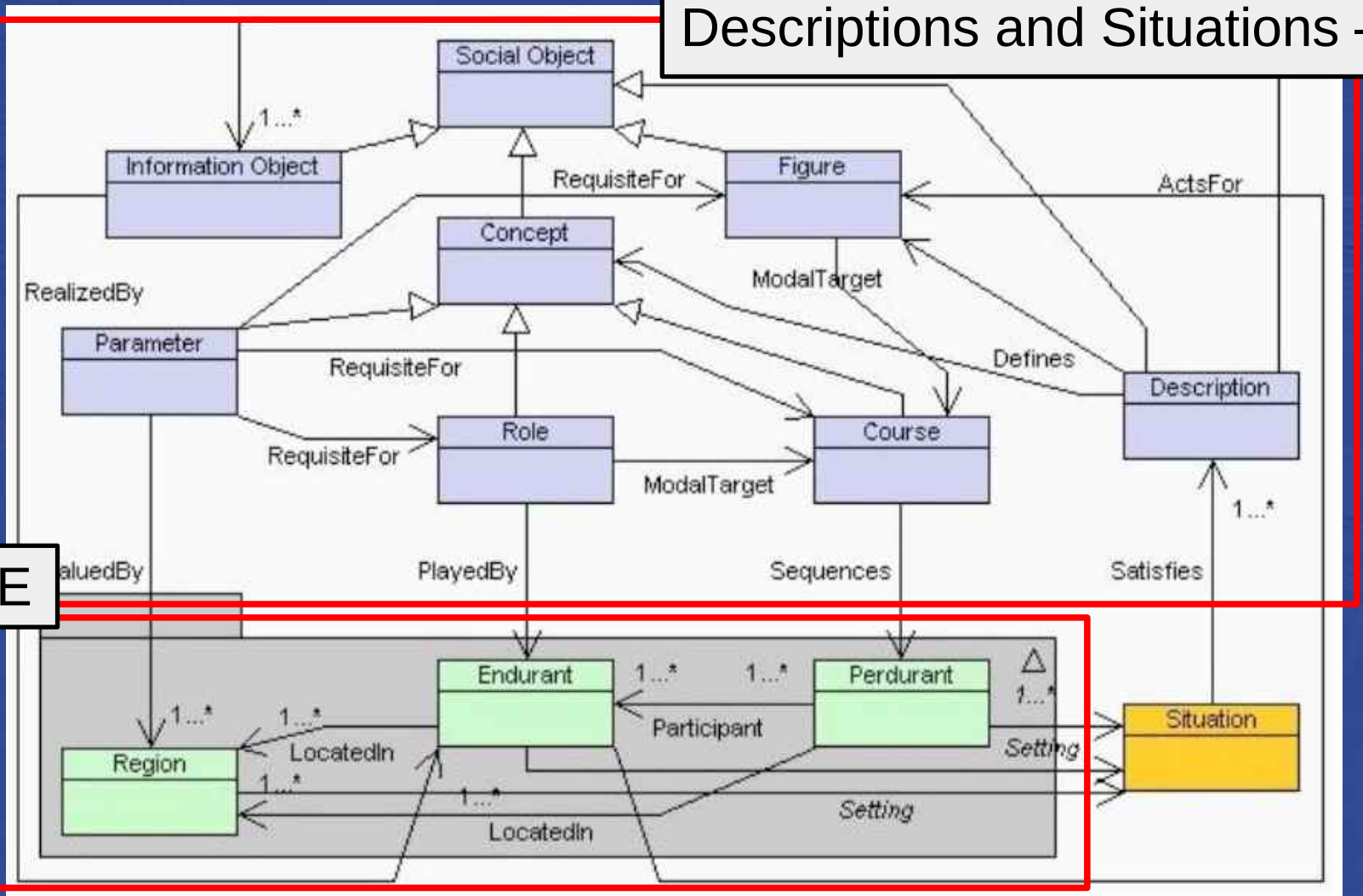
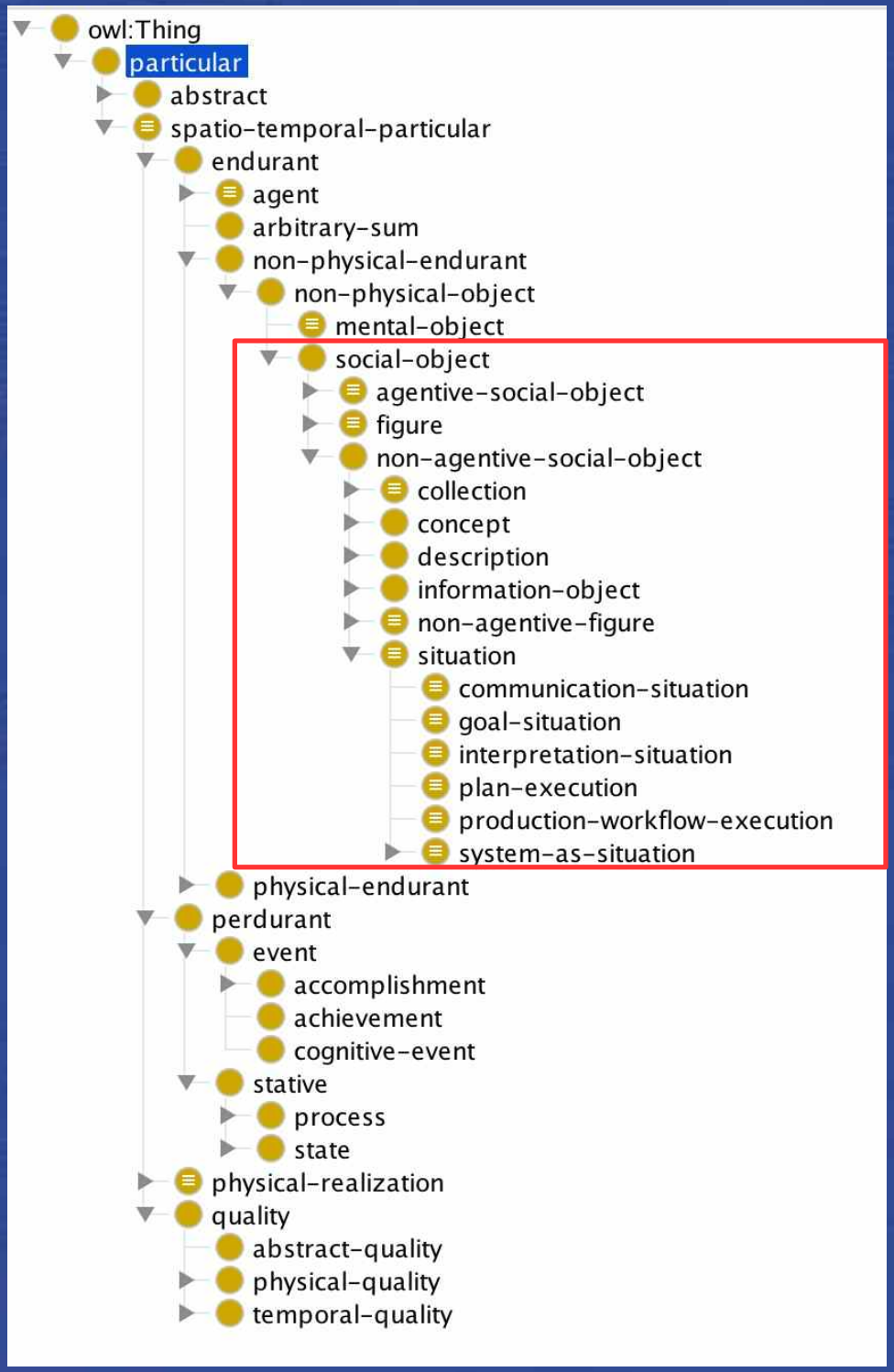


Fig. 2. A UML class diagram for D&S. The lower part of the pattern (within the grey package) is called the *ground ontology*, the higher is called the *descriptive ontology*; a situation satisfies a description if the two parts match according to the axioms specified for the concepts defined by the description.

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



DOLCE + DnS

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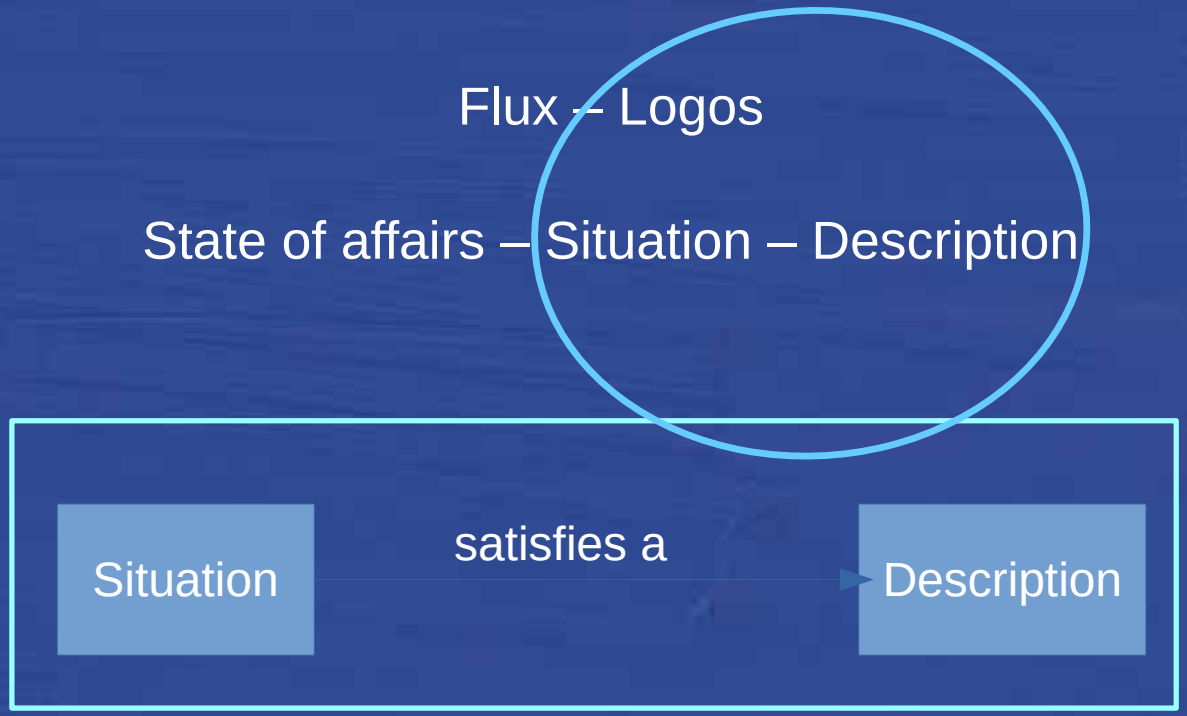
DOLCE Lite PLUS

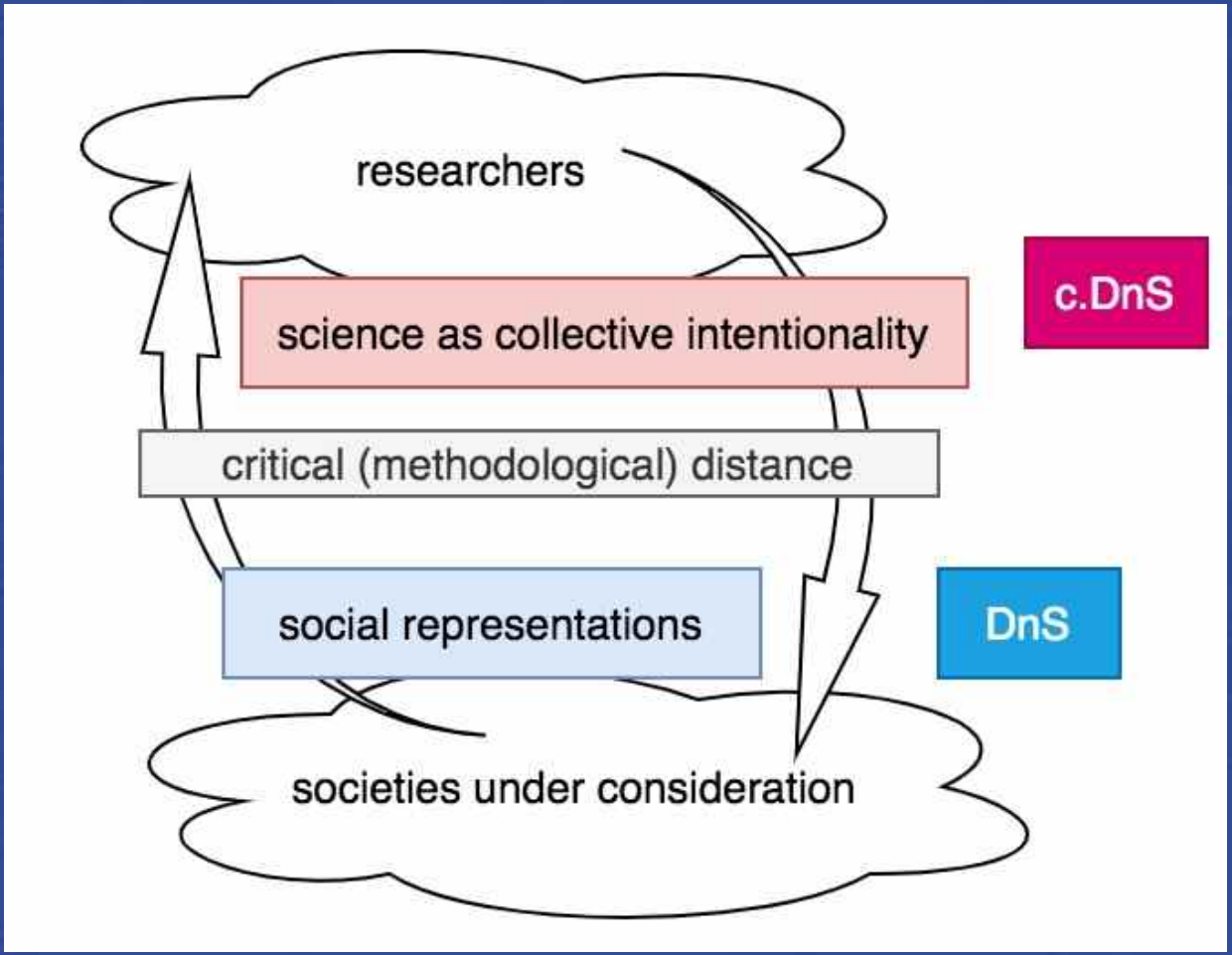
Descriptions and Situations (DnS)

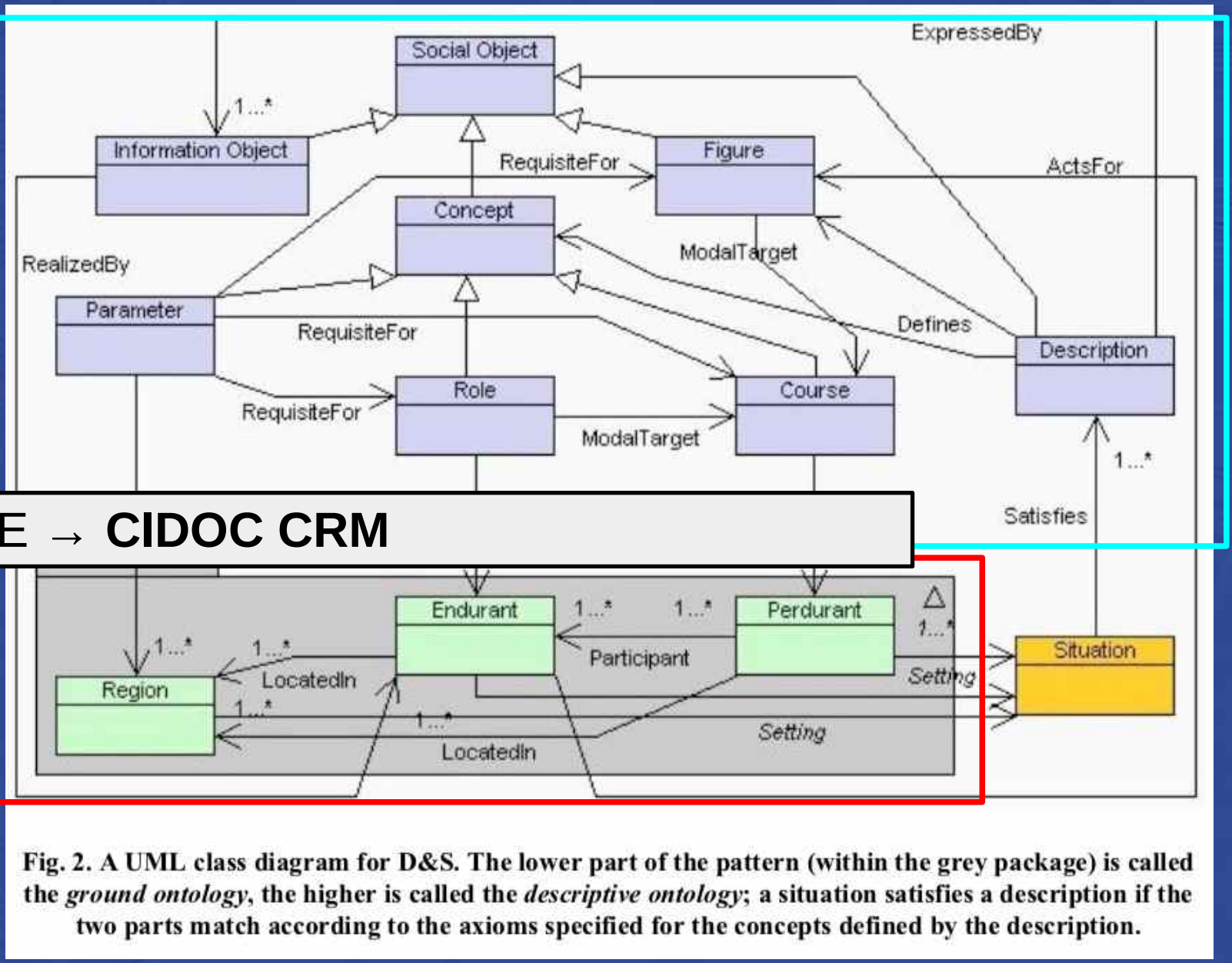


Social ontology

Social representations

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





DOLCE → **CIDOC CRM**

?

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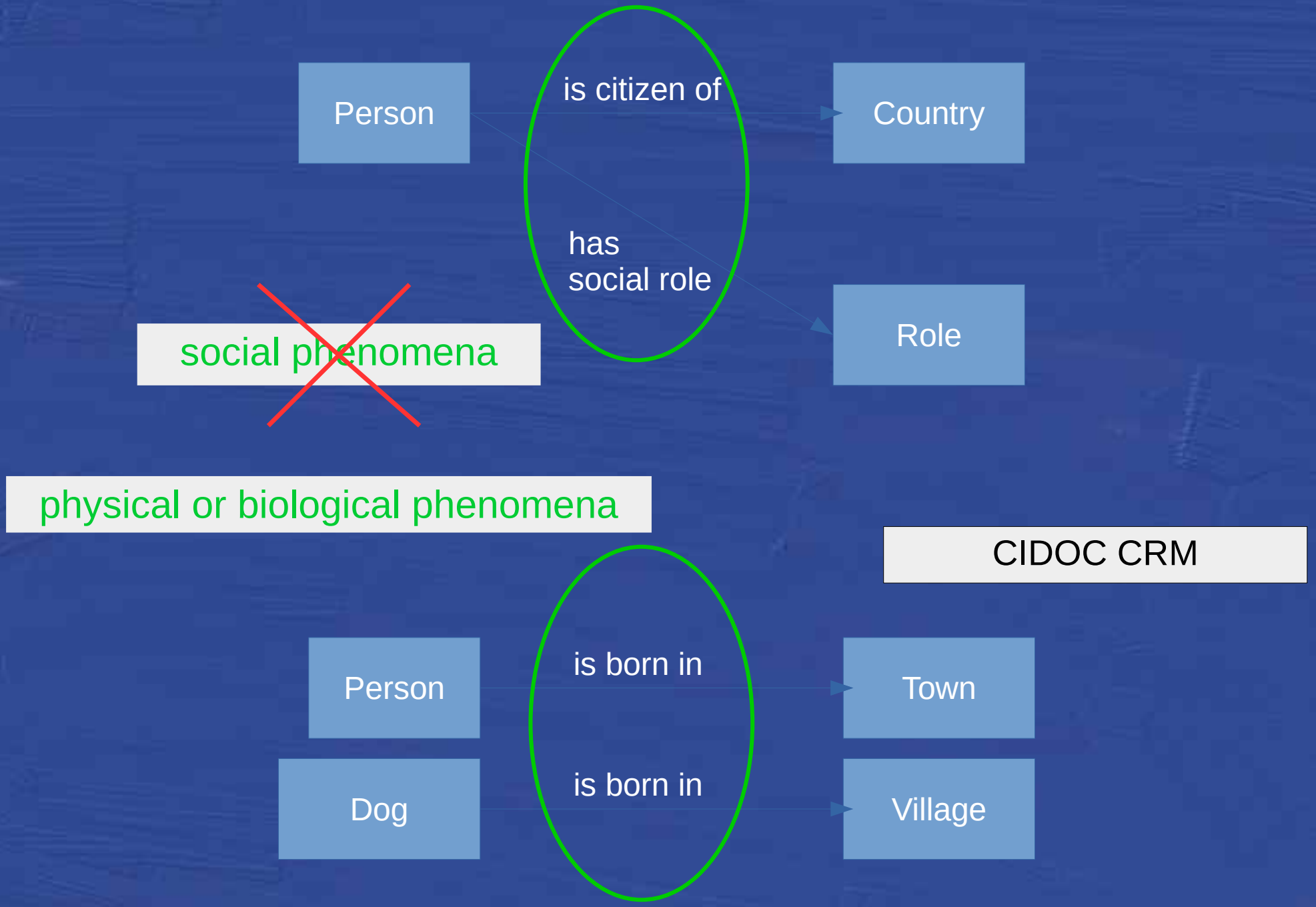
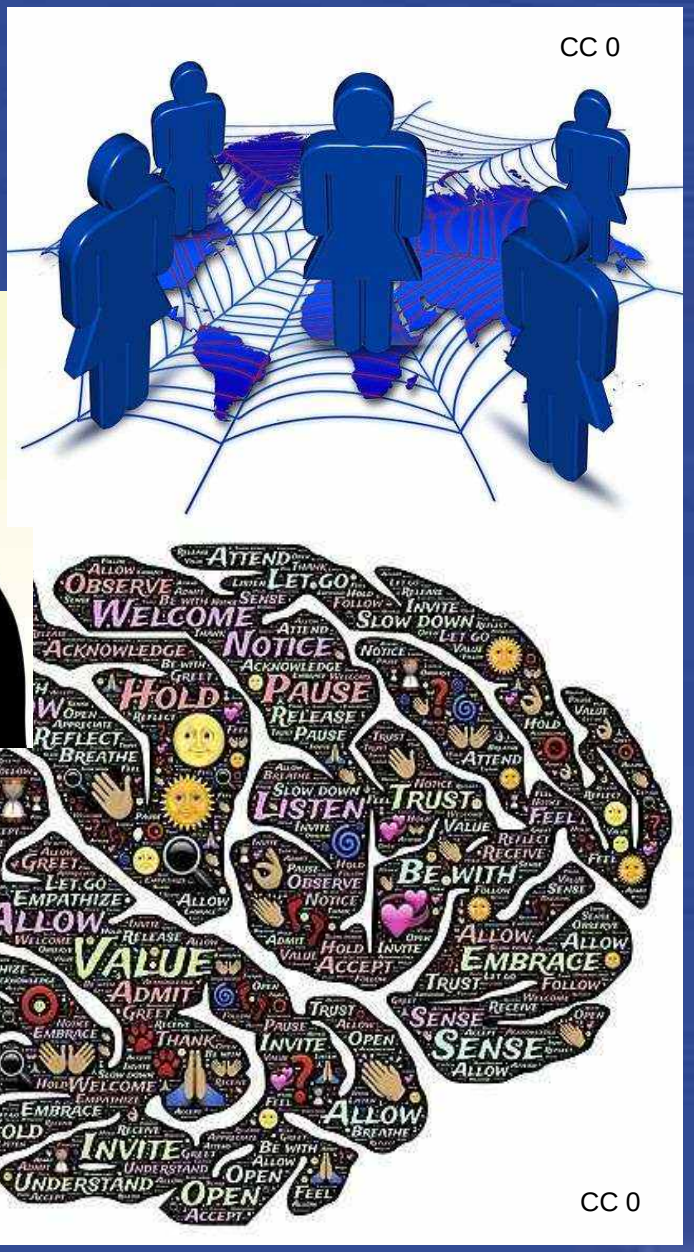
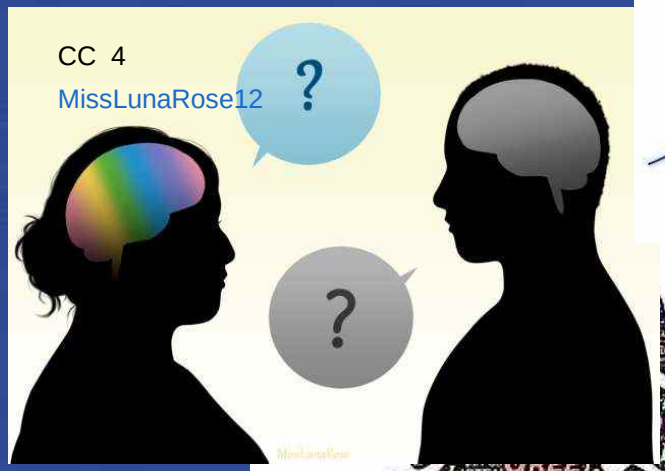

Person
is citizen of
Country
has
social role
Role
social phenomena
physical or biological phenomena
CIDOC CRM
Person
is born in
Town
Dog
is born in
Village

Social reality

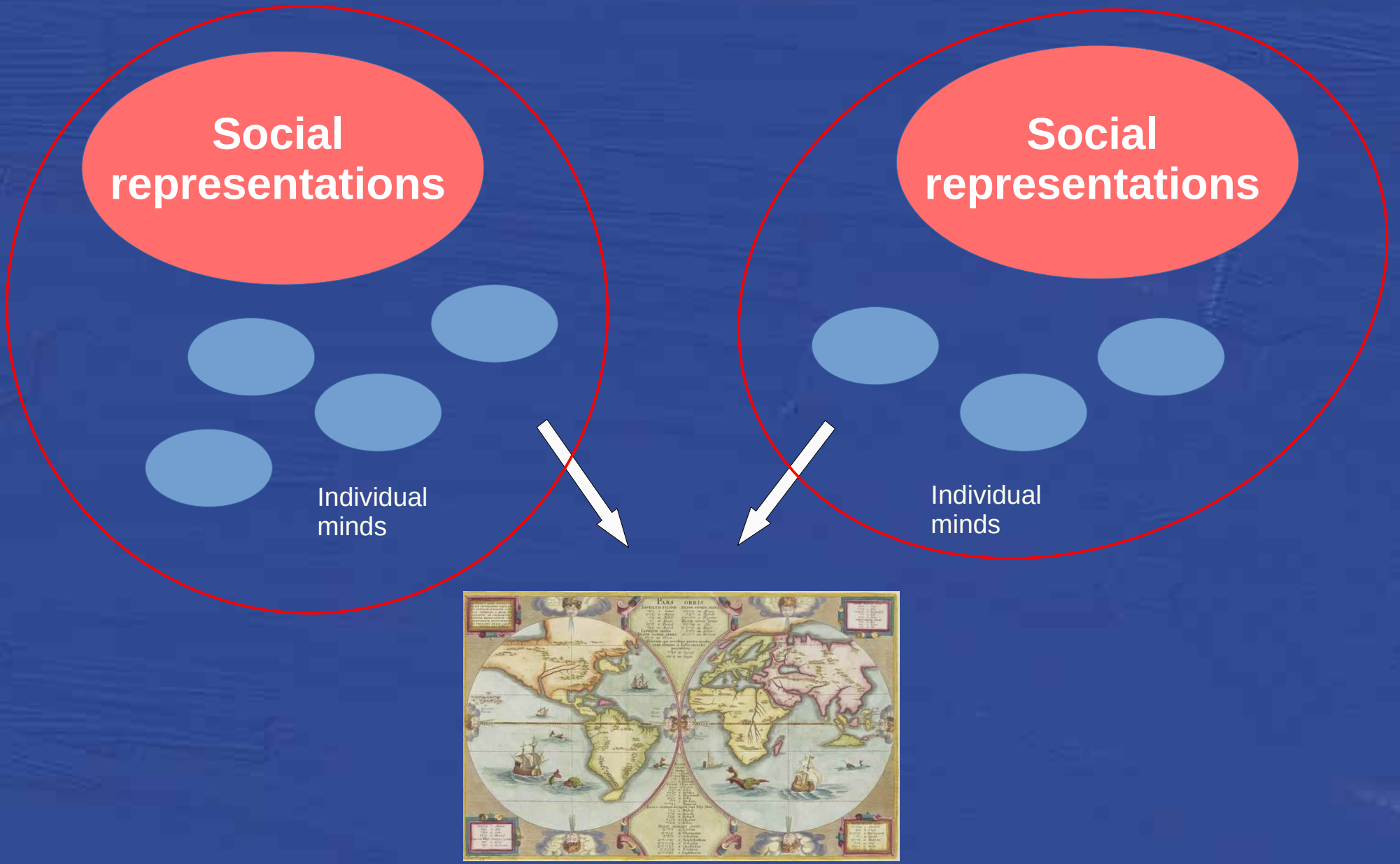
Mental reality

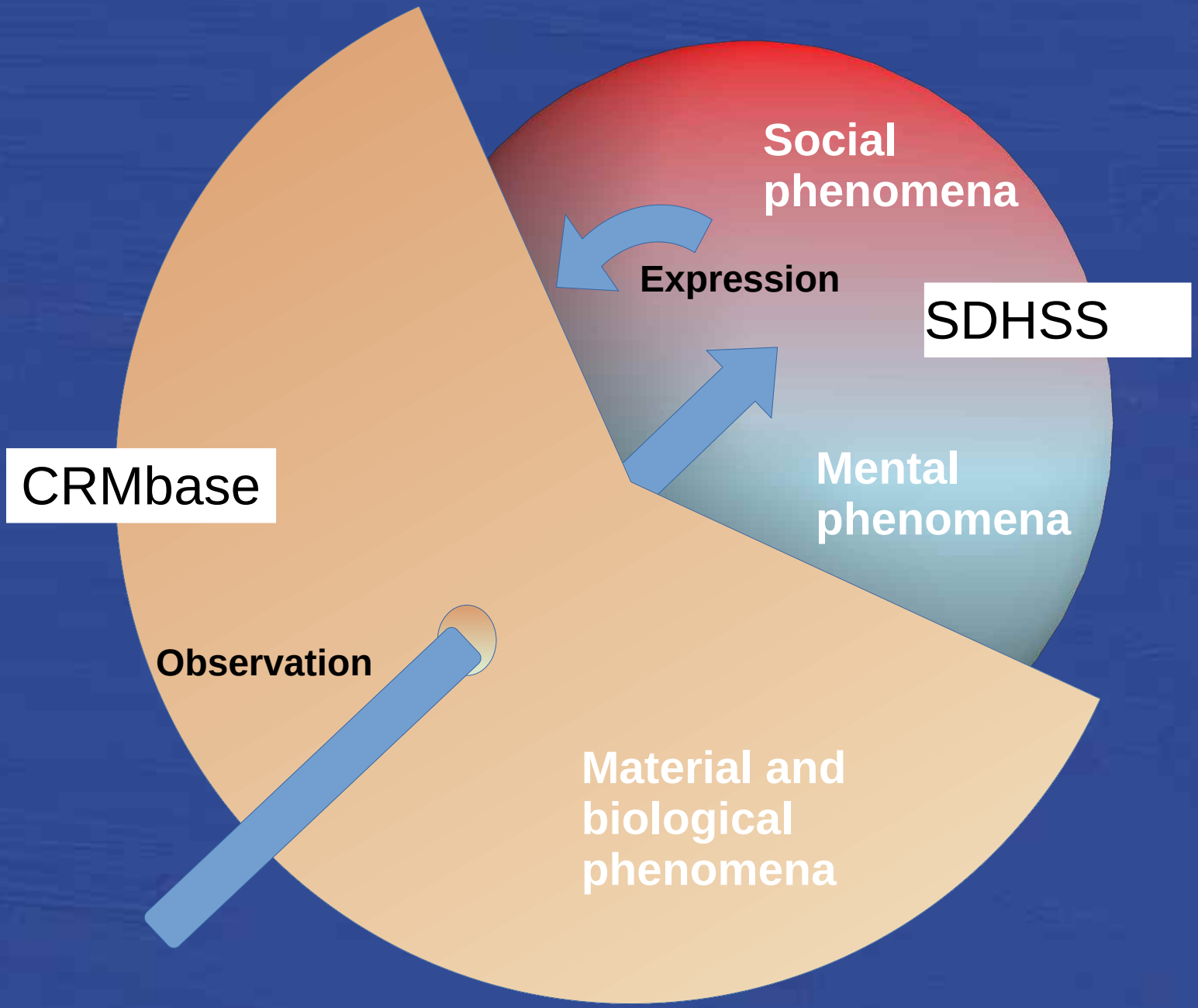
Material and biological world





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




Social phenomena
Expression
SDHSS
Mental phenomena
CRMbase
Observation
Material and biological phenomena

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:

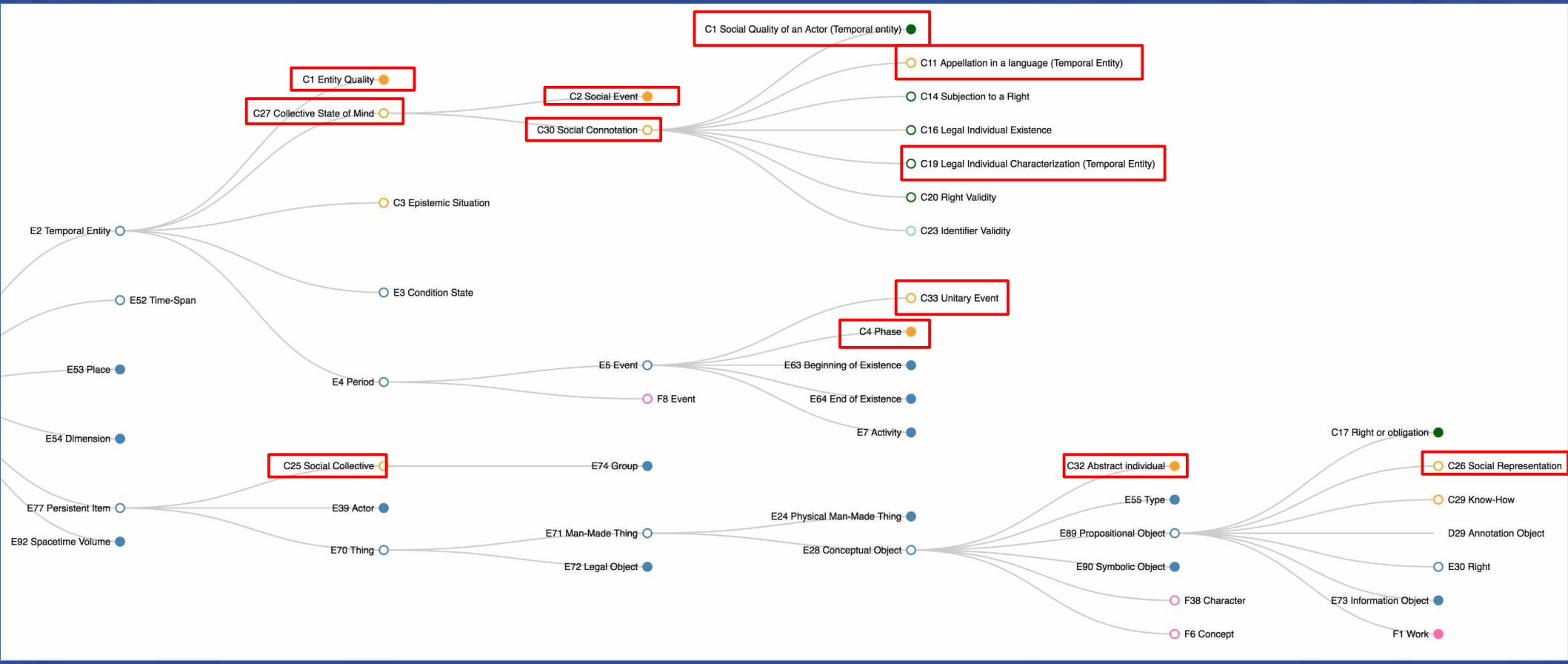
Published by Francesco Beretta (CNRS/Université de Lyon), 7 December 2020. Last revised on March 30 2021. (CC BY-SA 4.0)

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

SDHSS and extension for social life



ontome.net/namespace/11

SDHSS – ontome.net/namespace/11

CIDOC CRM

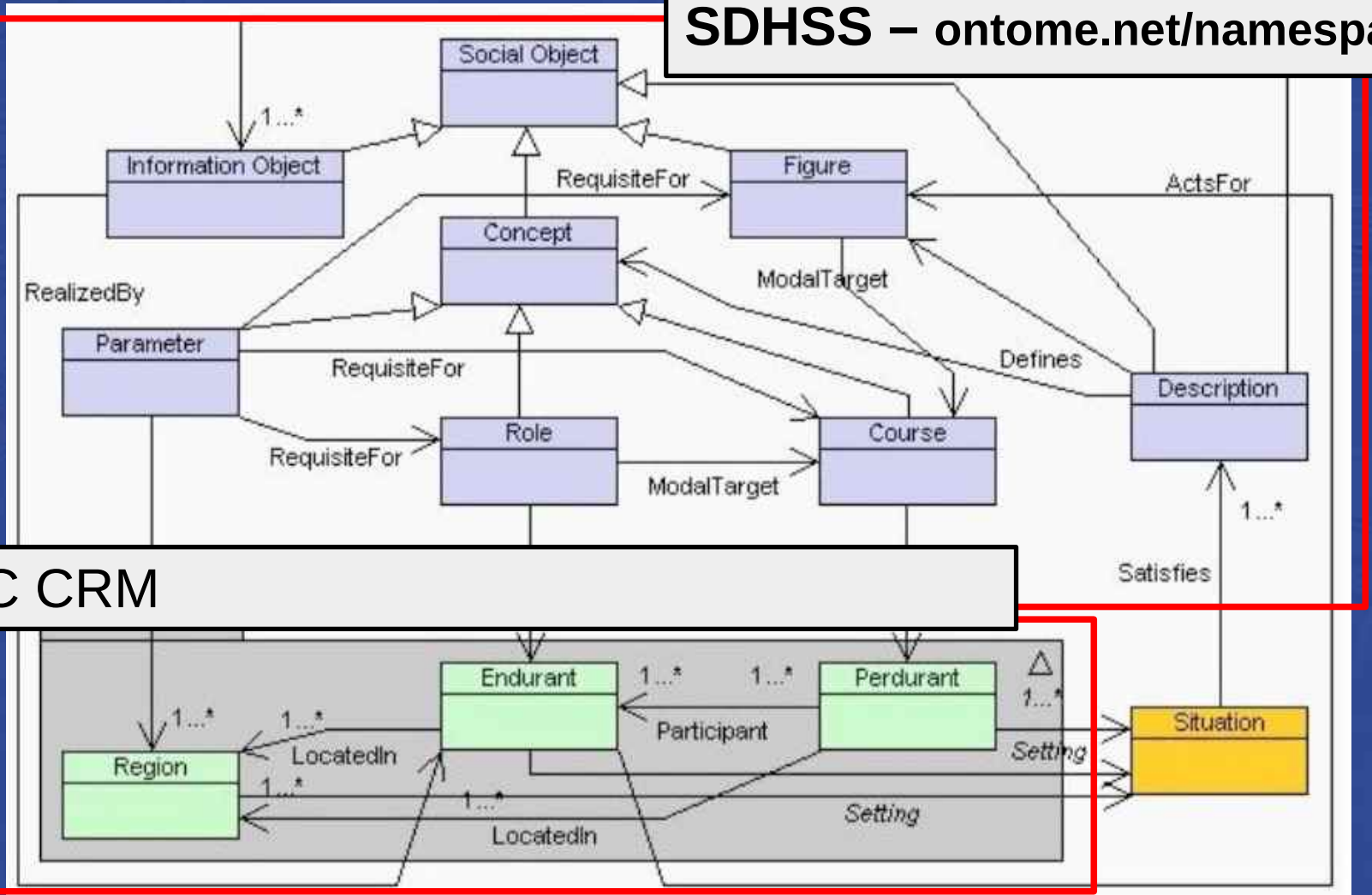


Fig. 2. A UML class diagram for D&S. The lower part of the pattern (within the grey package) is called the *ground ontology*, the higher is called the *descriptive ontology*; a situation satisfies a description if the two parts match according to the axioms specified for the concepts defined by the description.

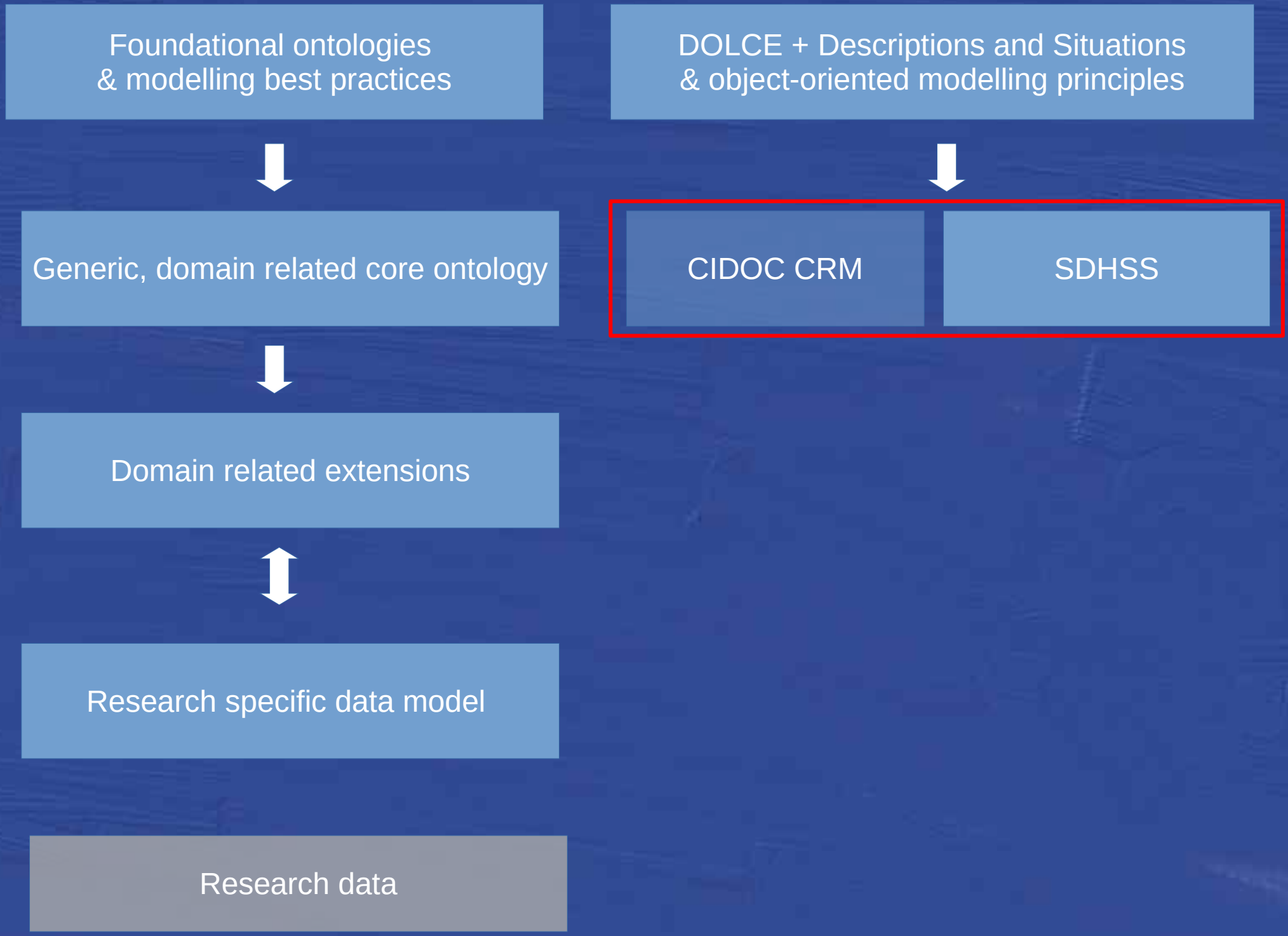
Bottazzi E., Catenacci C., Gangemi A., Lehmann J.(2006) (from pre-print, not in published version)

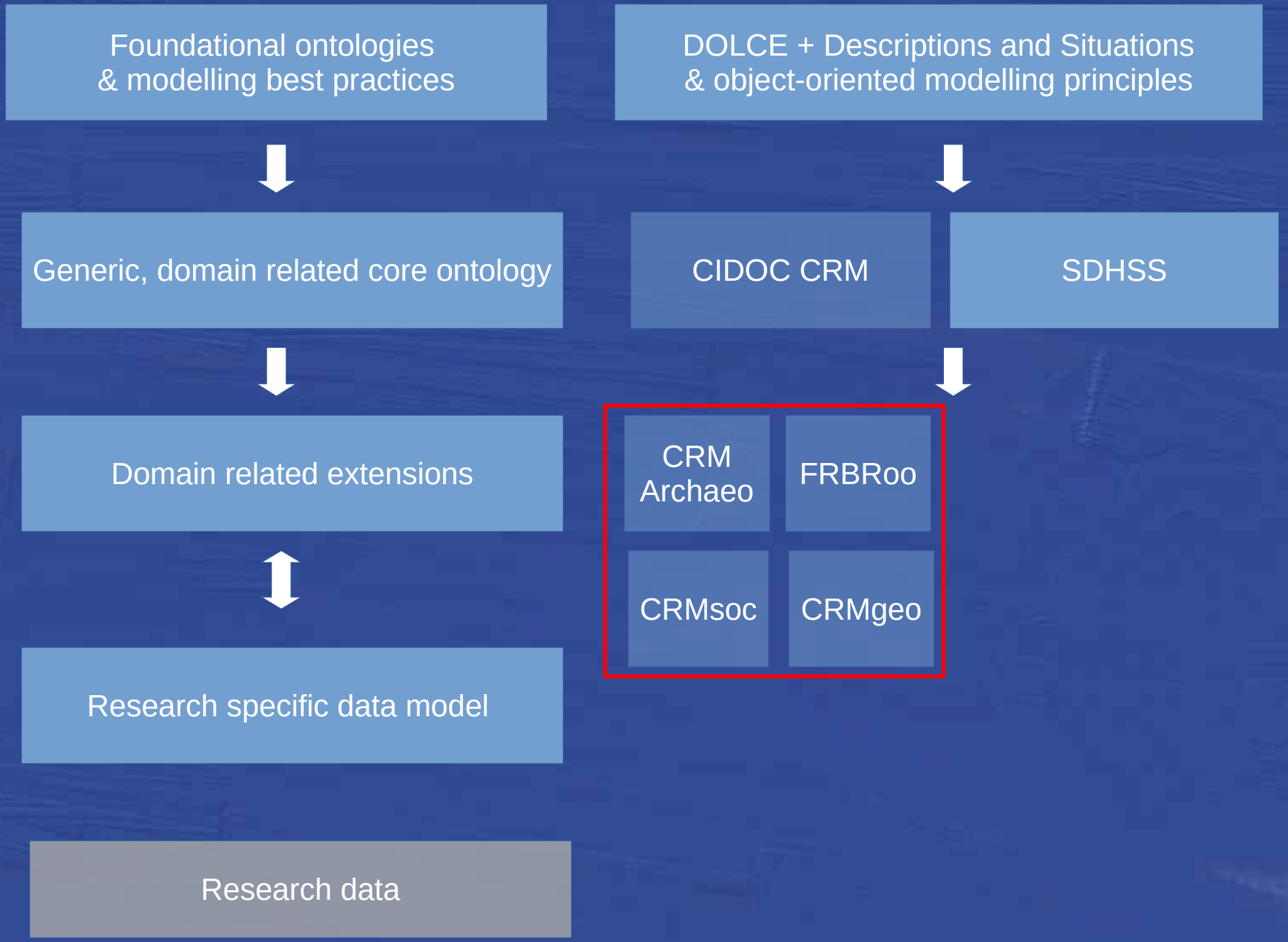
Persistent items (Endurants)

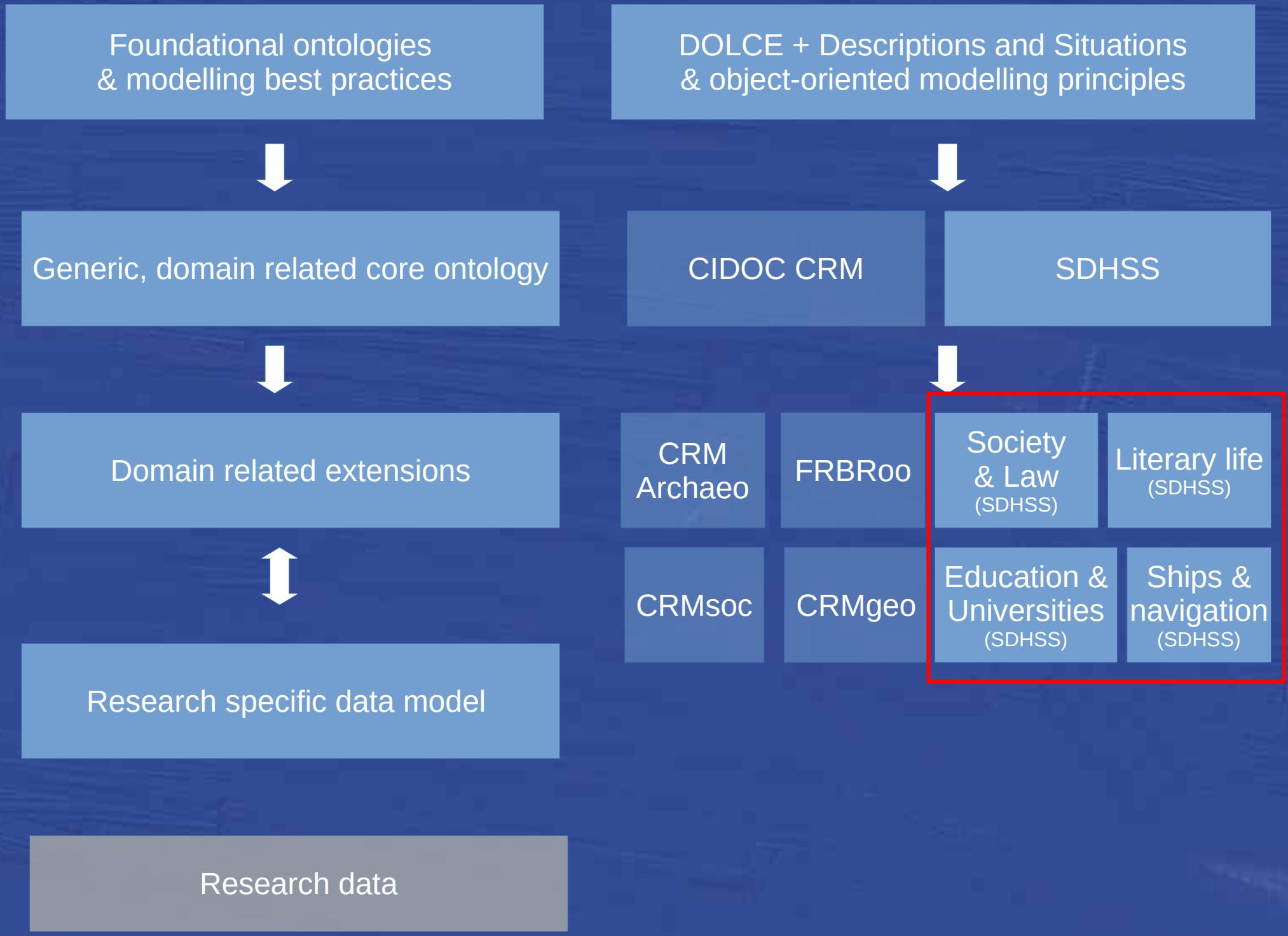
- crm:E21 Person
- crm:E74 Group
- Natural Physical Thing
- crm:E24 Human-Made Physical Thing
- Geographical Place
- Construction
- Concept (Type)
- Propositional object
- Symbolic Object
- Information Object

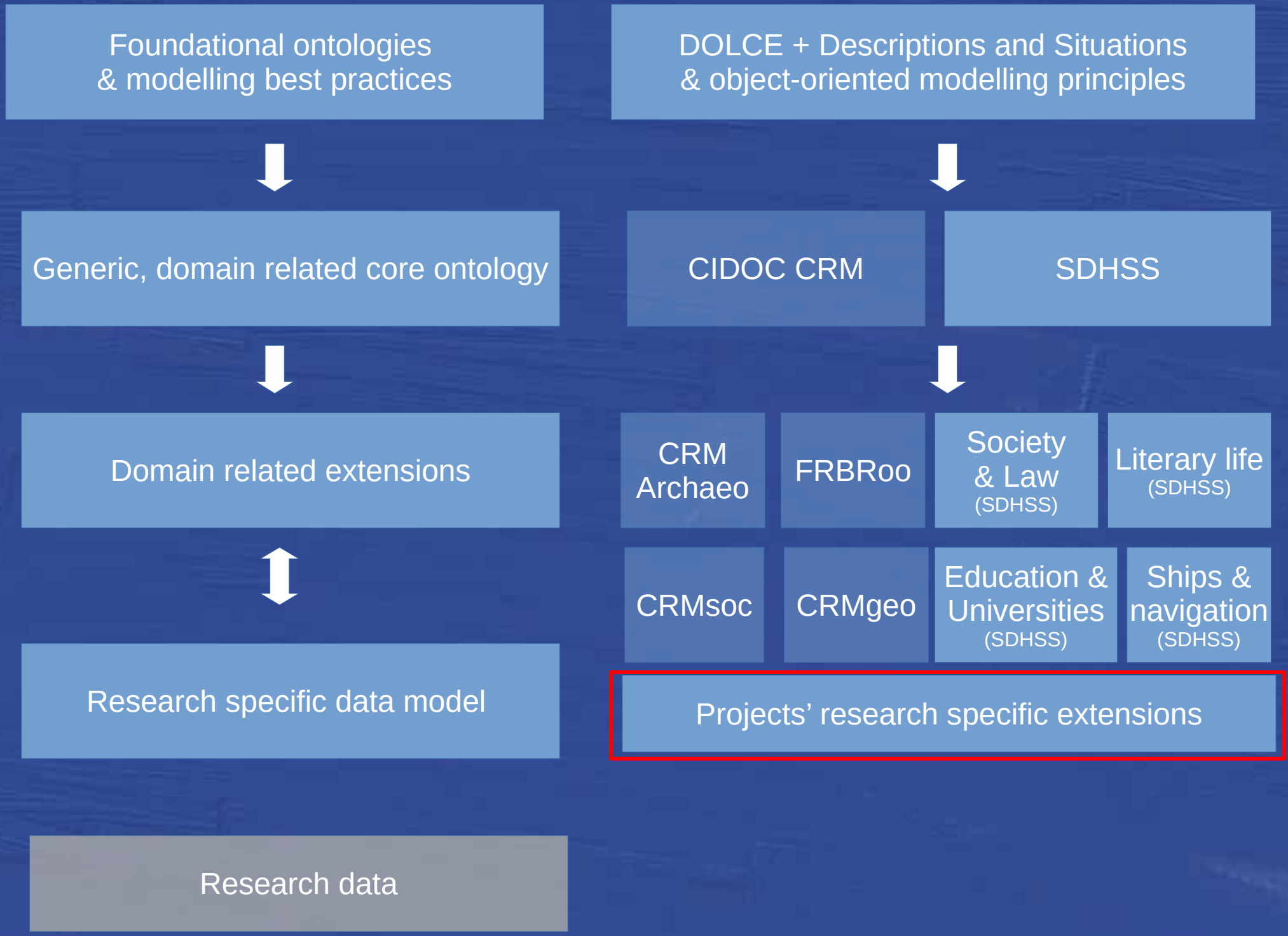
Temporal Entities (Perdurants)

- Event
- Quality
- Intentional Event
- Intentional State
- Epistemic Situation
- Period
- Connotation / Classification
- Social Relationship
- Persons’ Interaction


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 specific data model
Research data


Foundational ontologies
& modelling best practices
DOLCE + Descriptions and Situations
& object-oriented modelling principles
Generic, domain related core ontology
CIDOC CRM
SDHSS
Domain related extensions
CRM
Archaeo
FRBRoo
CRMsoc
CRMgeo
Research specific data model
Research data


Foundational ontologies
& modelling best practices
DOLCE + Descriptions and Situations
& object-oriented modelling principles
Generic, domain related core ontology
CIDOC CRM
SDHSS
Domain related extensions
CRM
Archaeo
FRBRoo
Society
& Law
(SDHSS)
Literary life
(SDHSS)
CRMsoc
CRMgeo
Education &
Universities
(SDHSS)
Ships &
navigation
(SDHSS)
Research specific data model
Research data


Foundational ontologies
& modelling best practices
DOLCE + Descriptions and Situations
& object-oriented modelling principles
Generic, domain related core ontology
CIDOC CRM
SDHSS
Domain related extensions
CRM
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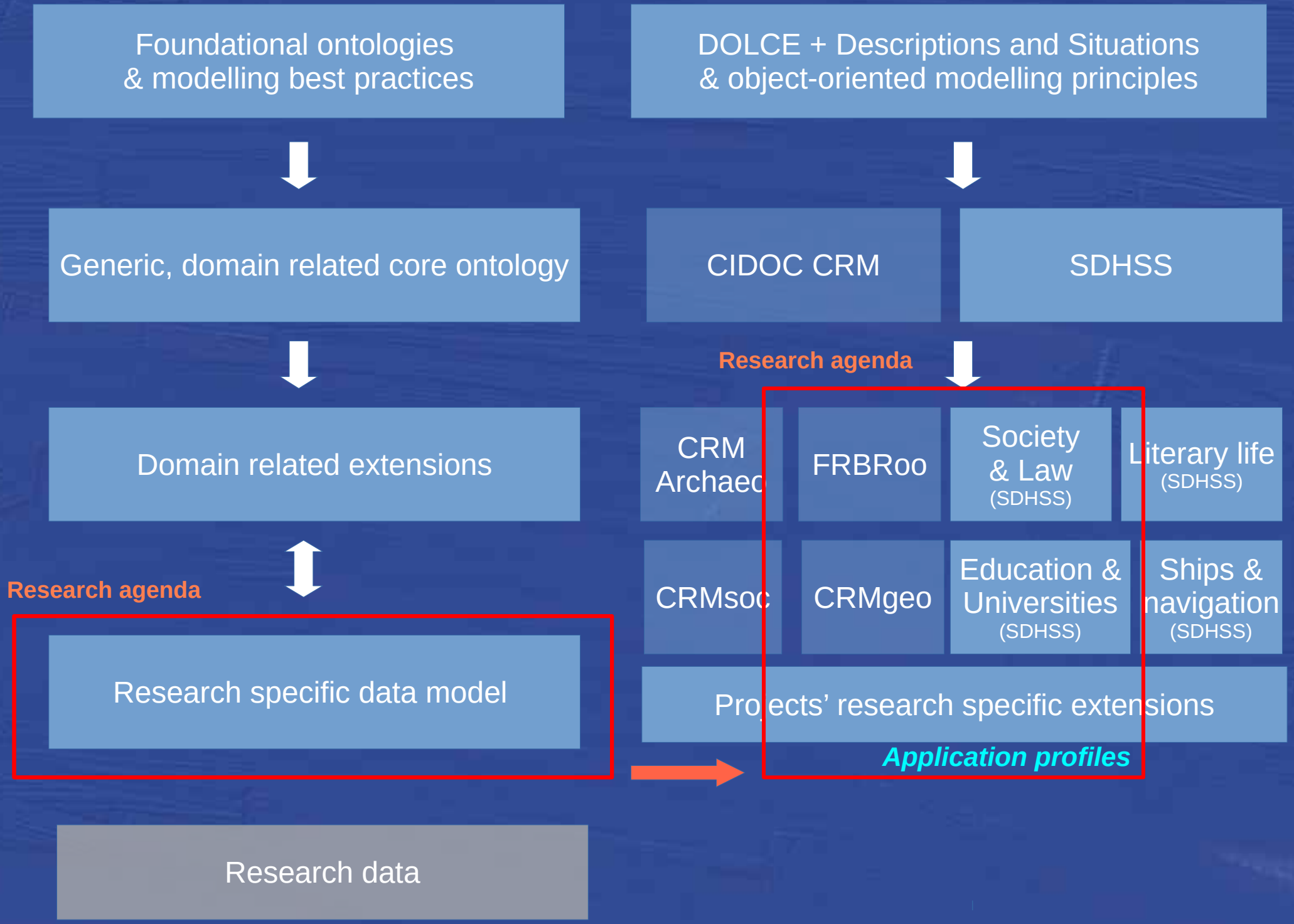
CRMsoc
CRMgeo
Education &
Universities
(SDHSS)
Ships &
navigation
(SDHSS)
Research specific data model
Projects' research specific extensions
Research data


Foundational ontologies
& modelling best practices
DOLCE + Descriptions and Situations
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Generic, domain related core ontology
CIDOC CRM
SDHSS
Research agenda
Domain related extensions
CRM Archaeo
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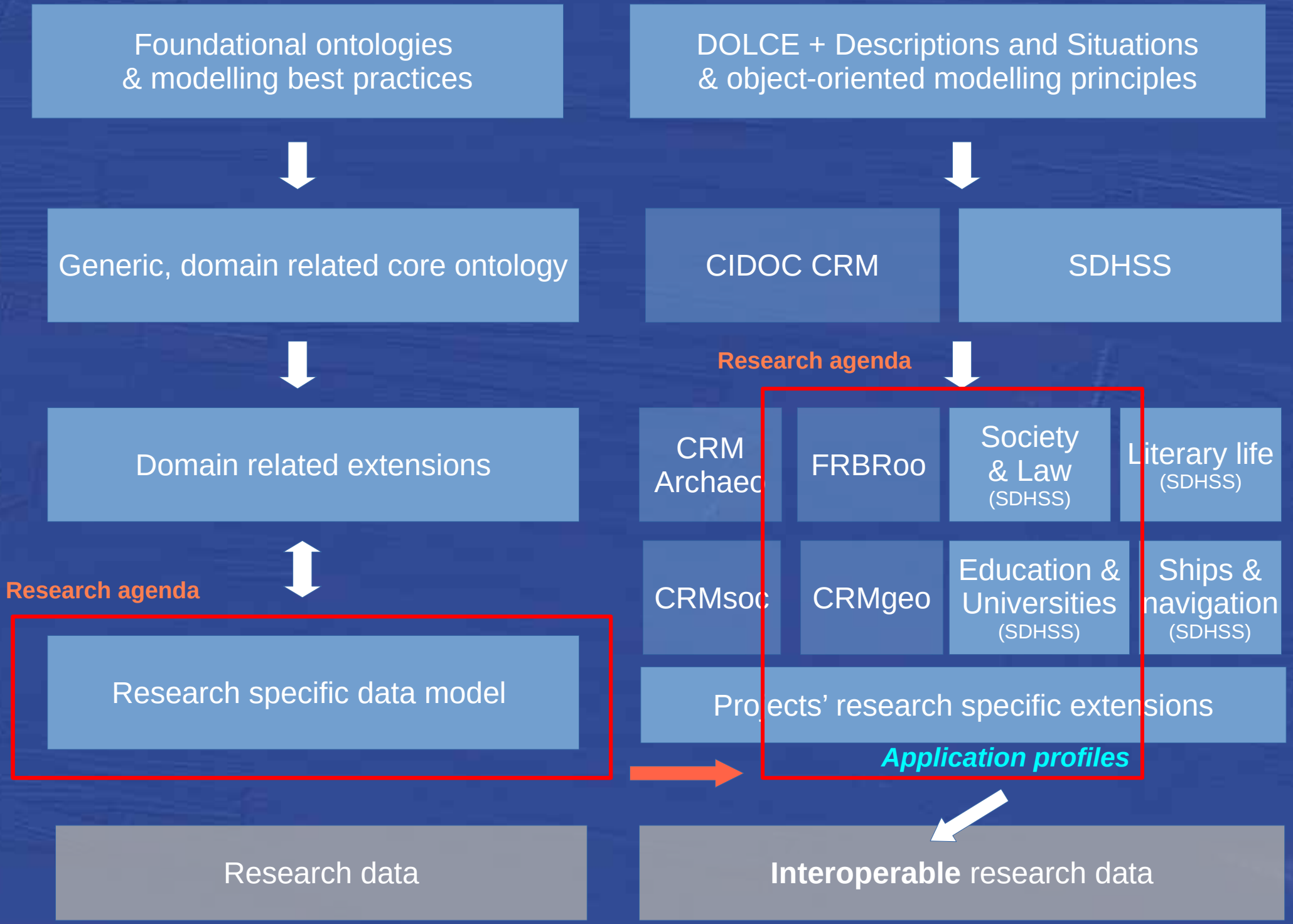
Research agenda
CRMsoc
CRMgeo
Education & Universities (SDHSS)
Ships & navigation (SDHSS)
Research specific data model
Projects' research specific extensions
Application profiles
Research data

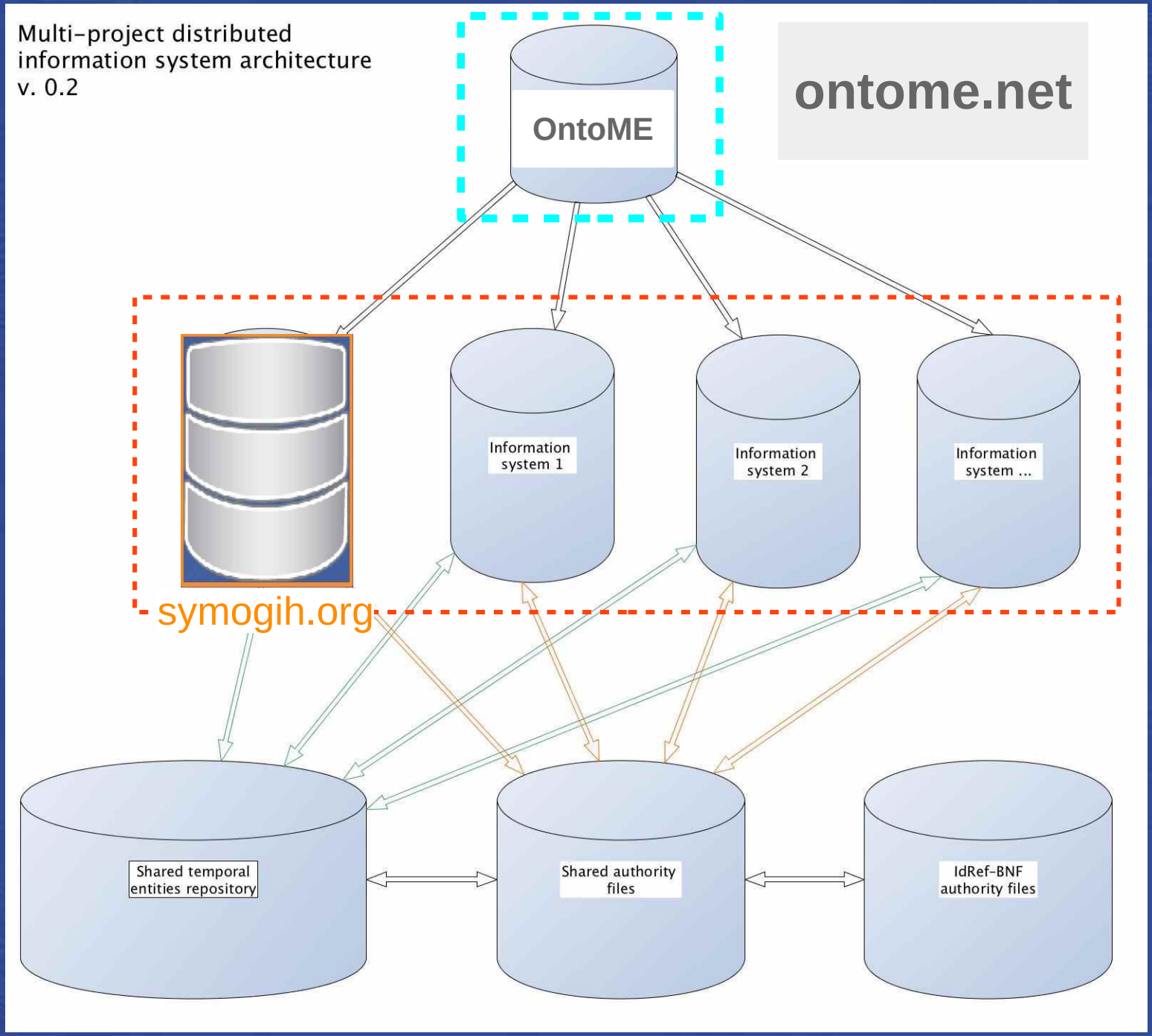

Foundational ontologies
& modelling best practices
DOLCE + Descriptions and Situations
& object-oriented modelling principles
Generic, domain related core ontology
CIDOC CRM
SDHSS
Research agenda
Domain related extensions
CRM Archaeo
FRBRoo
Society & Law (SDHSS)
Literary life (SDHSS)
CRMsoc
CRMgeo
Education & Universities (SDHSS)
Ships & navigation (SDHSS)
Research agenda
Research specific data model
Projects' research specific extensions
Application profiles
Research data
Interoperable research data

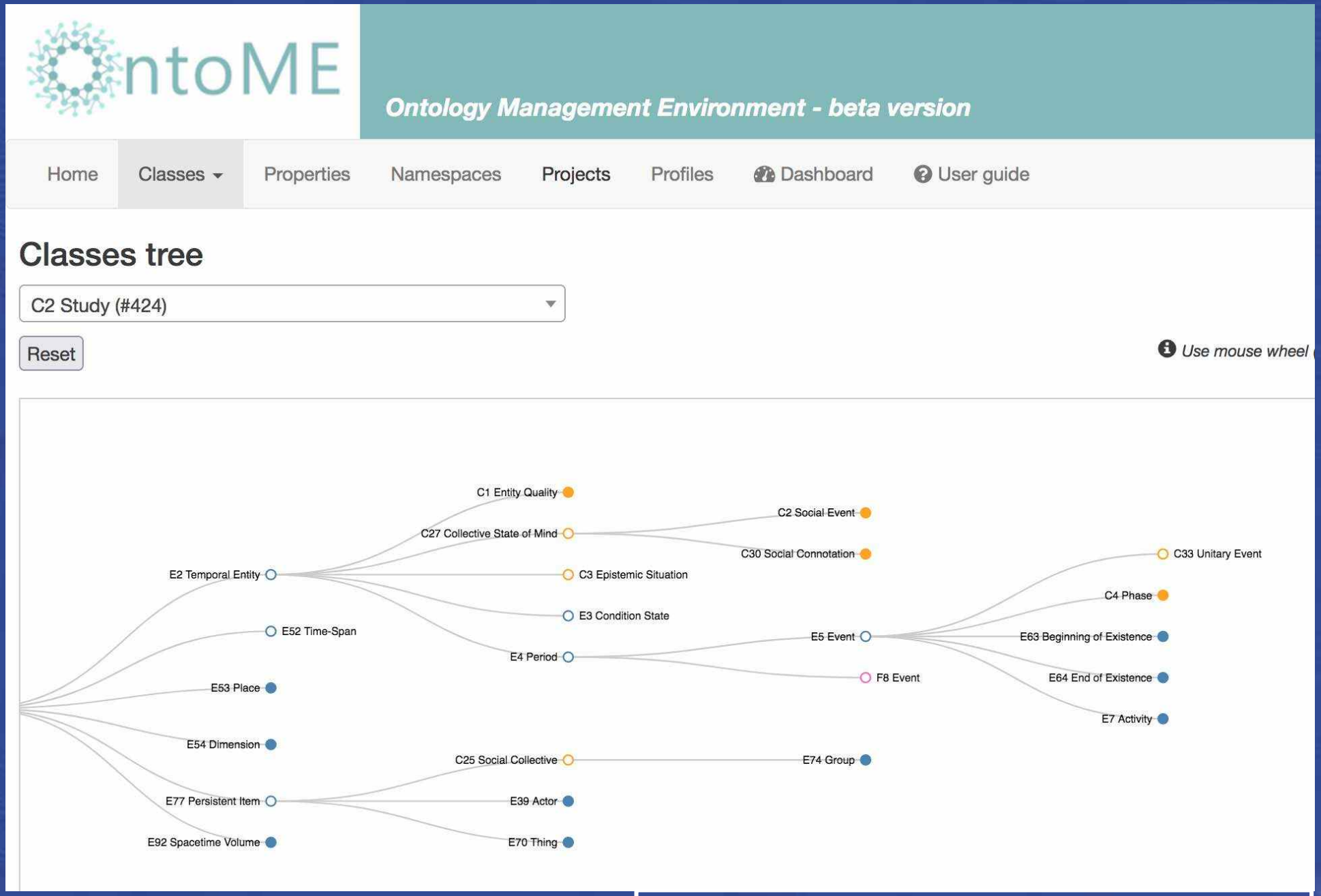
5.

A virtual environment for managing

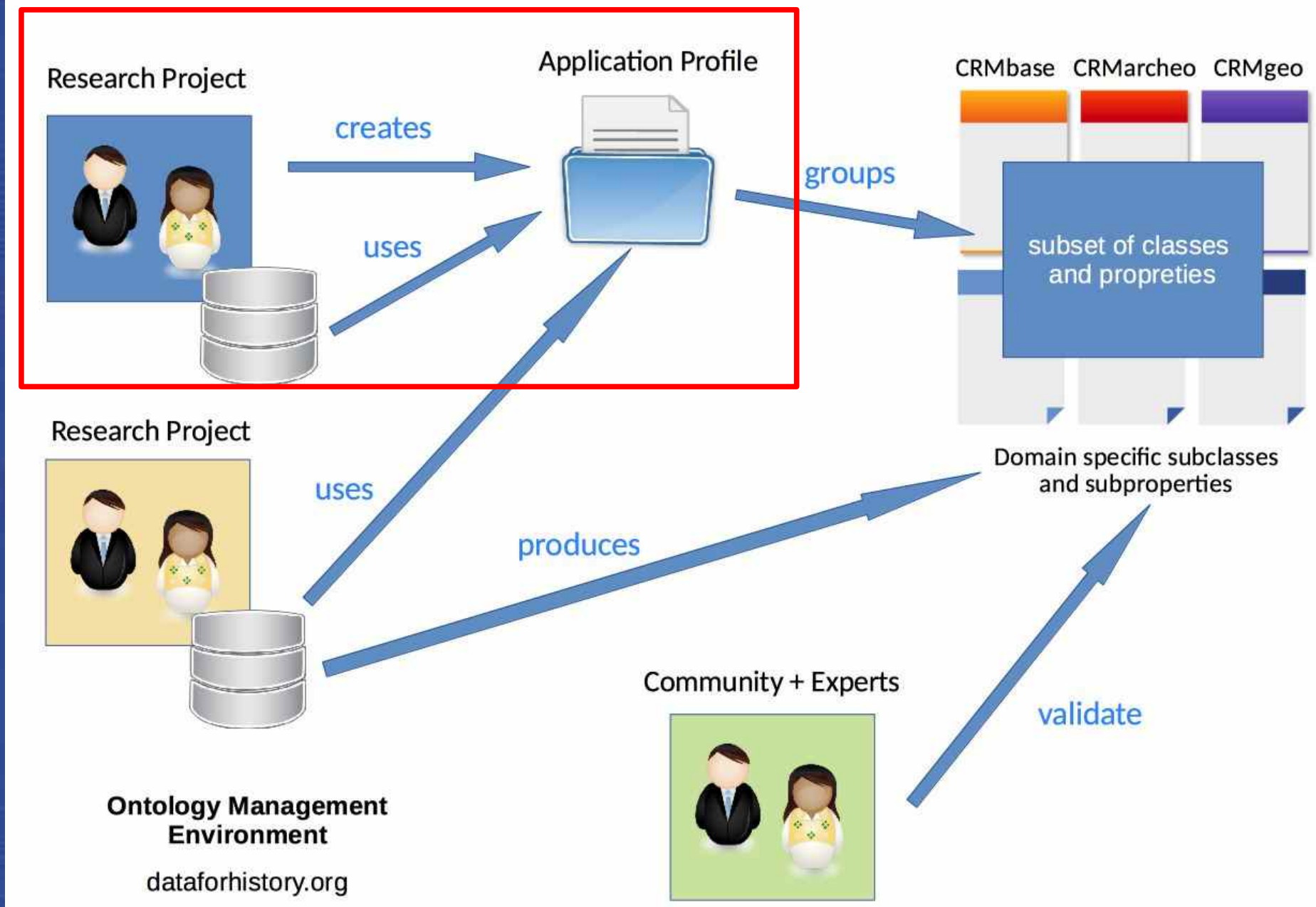
application profiles and sub-domain extensions :

ontome.net


Multi-project distributed
information system architecture
v. 0.2
OntoME
ontome.net
Information
system 1
Information
system 2
Information
system ...
symogih.org
Shared temporal
entities repository
Shared authority
files
IdRef-BNF
authority files


OntoME
Ontology Management Environment - beta version
Home
Classes
Properties
Namespaces
Projects
Profiles
Dashboard
User guide
Classes tree
C2 Study (#424)
Reset
Use mouse wheel
C1 Entity Quality
C27 Collective State of Mind
C2 Social Event
C30 Social Connotation
C33 Unitary Event
E2 Temporal Entity
C3 Epistemic Situation
C4 Phase
E3 Condition State
E52 Time-Span
E5 Event
E63 Beginning of Existence
E4 Period
F8 Event
E64 End of Existence
E53 Place
E7 Activity
E54 Dimension
C25 Social Collective
E74 Group
E77 Persistent Item
E39 Actor
E92 Spacetime Volume
E70 Thing

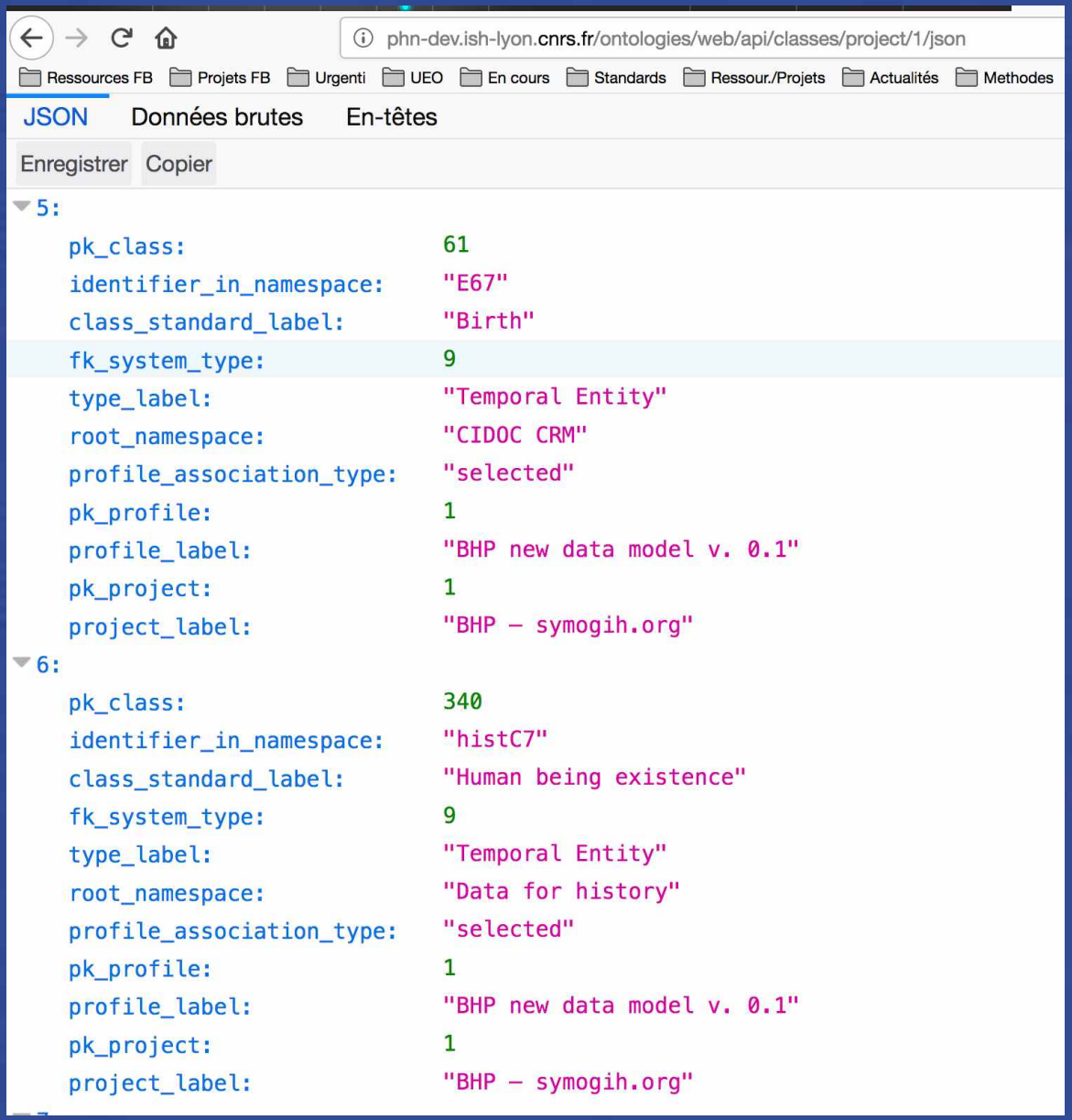
ontome.net

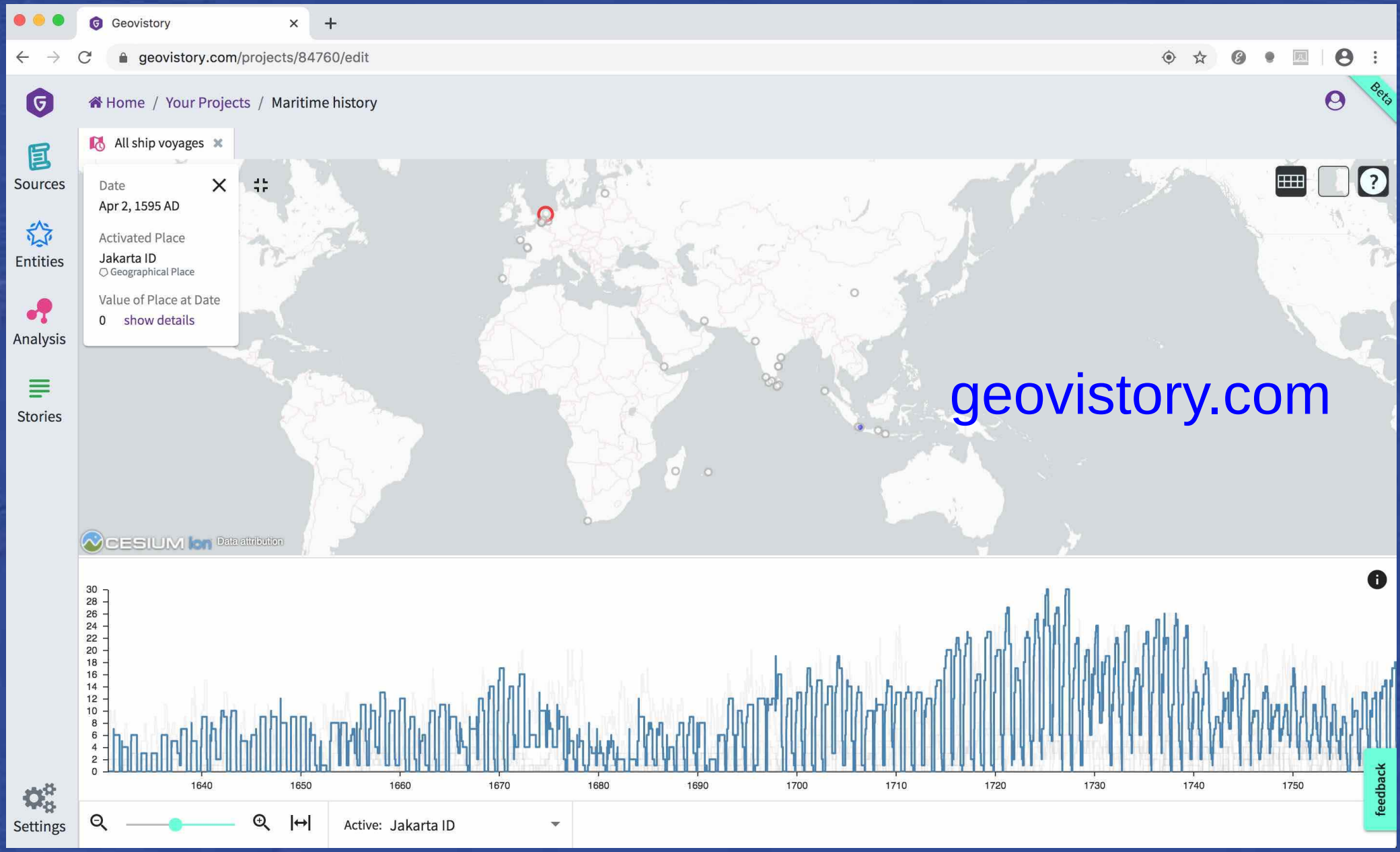

Research Project
Application Profile
creates
uses
groups
CRMbase
CRMarcheo
CRMgeo
subset of classes and propreties
Research Project
uses
produces
Domain specific subclasses and subproperties
Community + Experts
validate
Ontology Management Environment
dataforhistory.org

ontome.net

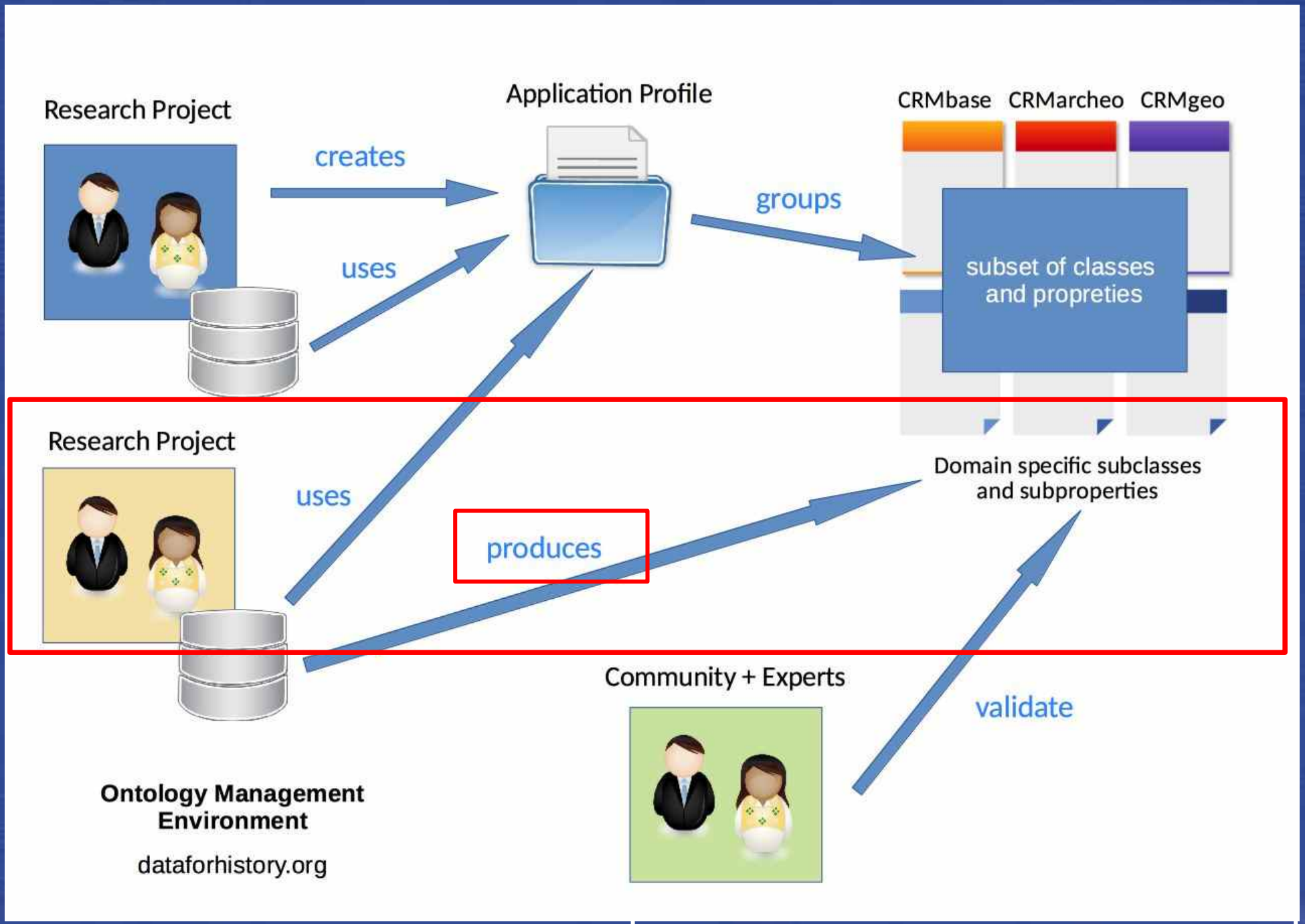
Retrieve your project's application profiles from an API

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





Geovistory : a new VRE for the symogih.org project developed by ***kleiolab.ch*** (Basel)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groups
uses
subset of classes
and propreties
Research Project
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Domain specific subclasses
and subproperties
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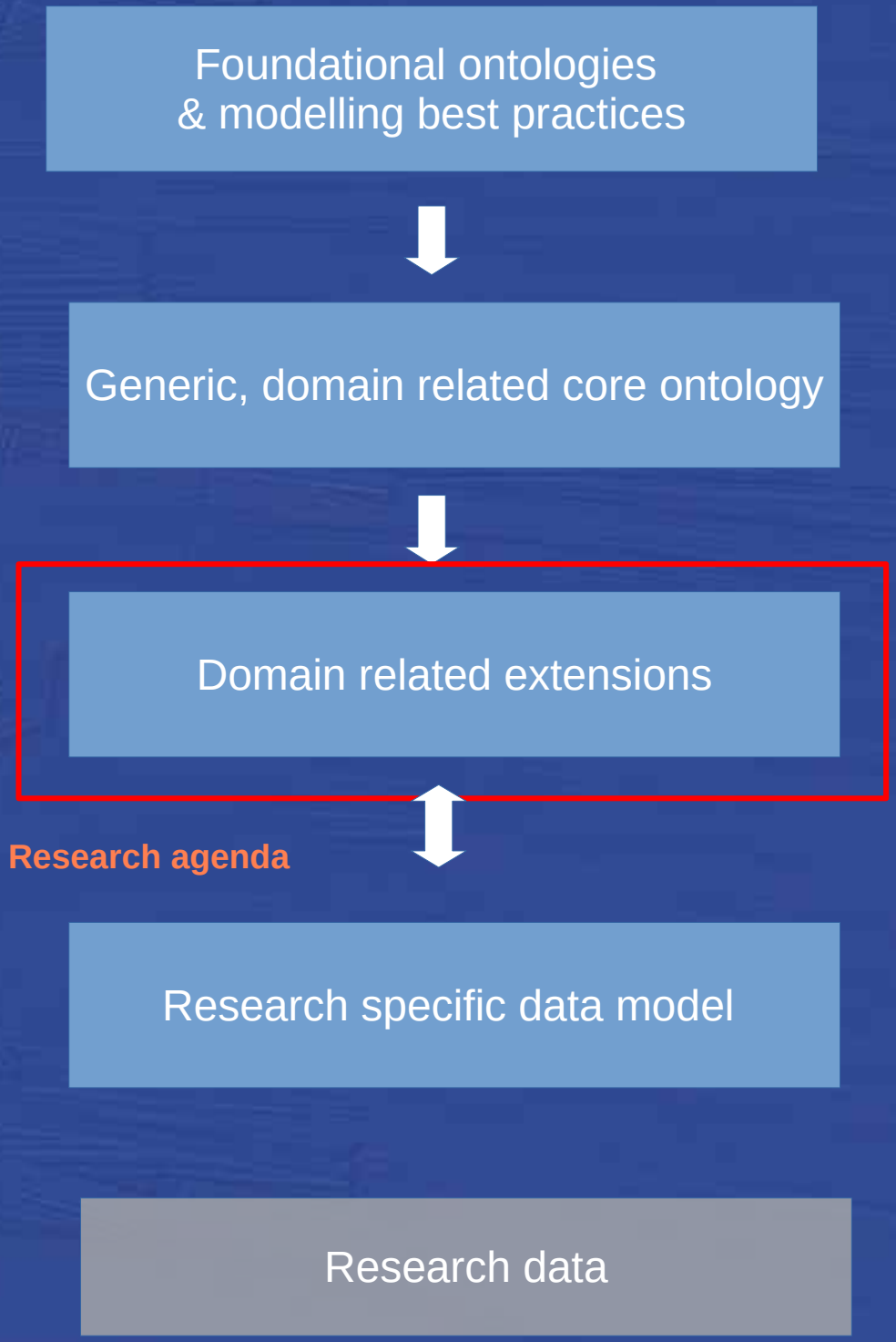
Ontology Management
Environment
dataforhistory.org

ontome.net


Foundational ontologies
& modelling best practices
Generic, domain related core ontology
Domain related extensions
Research agenda
Research specific data model
Research data

OntoME

Ontology Management Environment - beta version

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

Home | Classes | Properties | Namespaces | Projects | Profiles | Dashboard | User guide

Man-Made Object – E22

Summary | Definition | Properties | Identification | Namespace | Hierarchy | Relations | Profiles | Graph | Comments 0

OntoME

Ontology Management Environment - beta version

Data for History

Home | Classes | Properties | Namespaces | Projects | Profiles | Dashboard | User guide

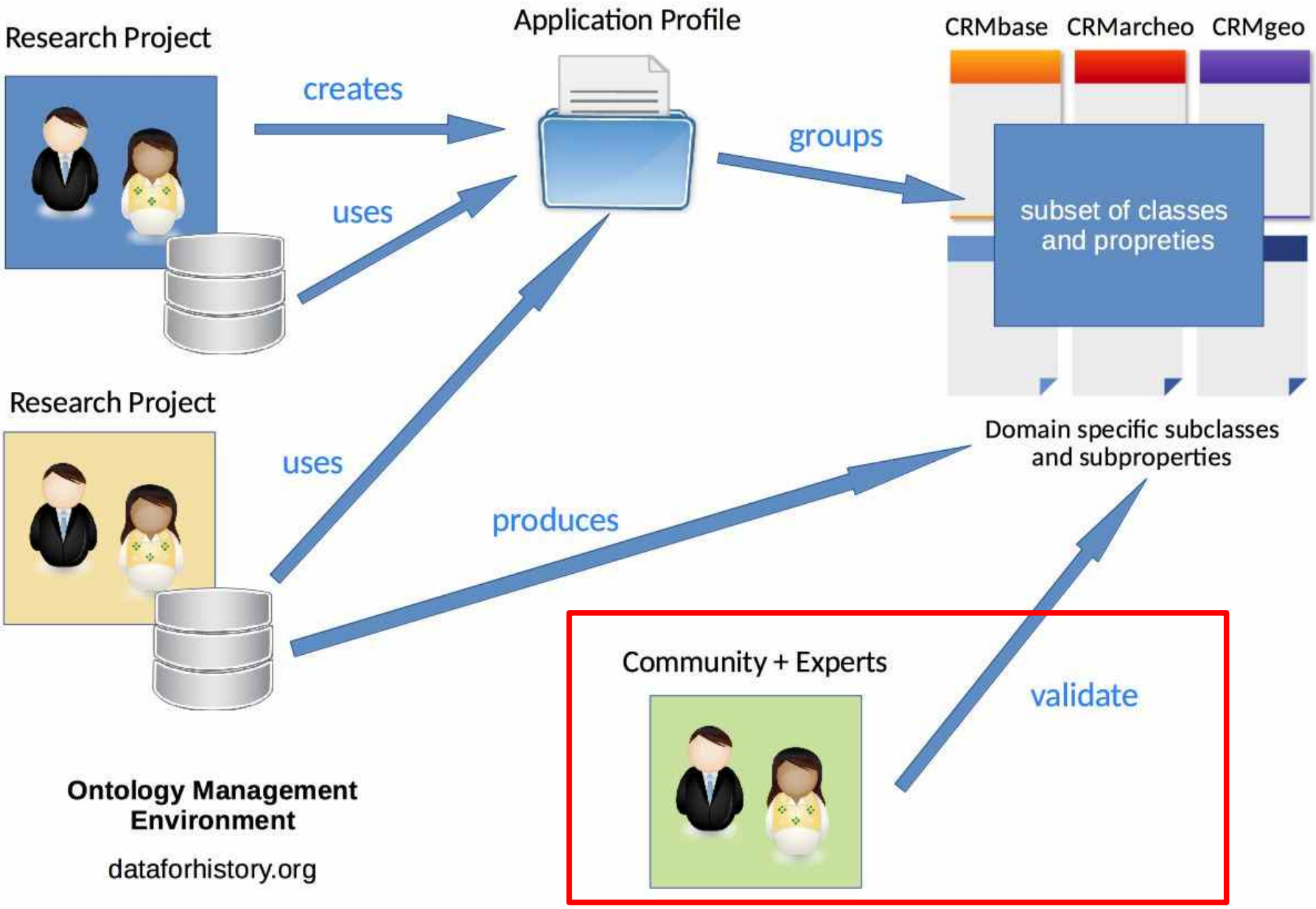
Active project : Ma

Ship – C2

Summary | Definition | Properties | Identification | Namespace | Hierarchy | Relations | Profiles | Graph | Comments 0

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) ⊃ 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


Research Project
creates
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CRMbase
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CRMgeo
groups
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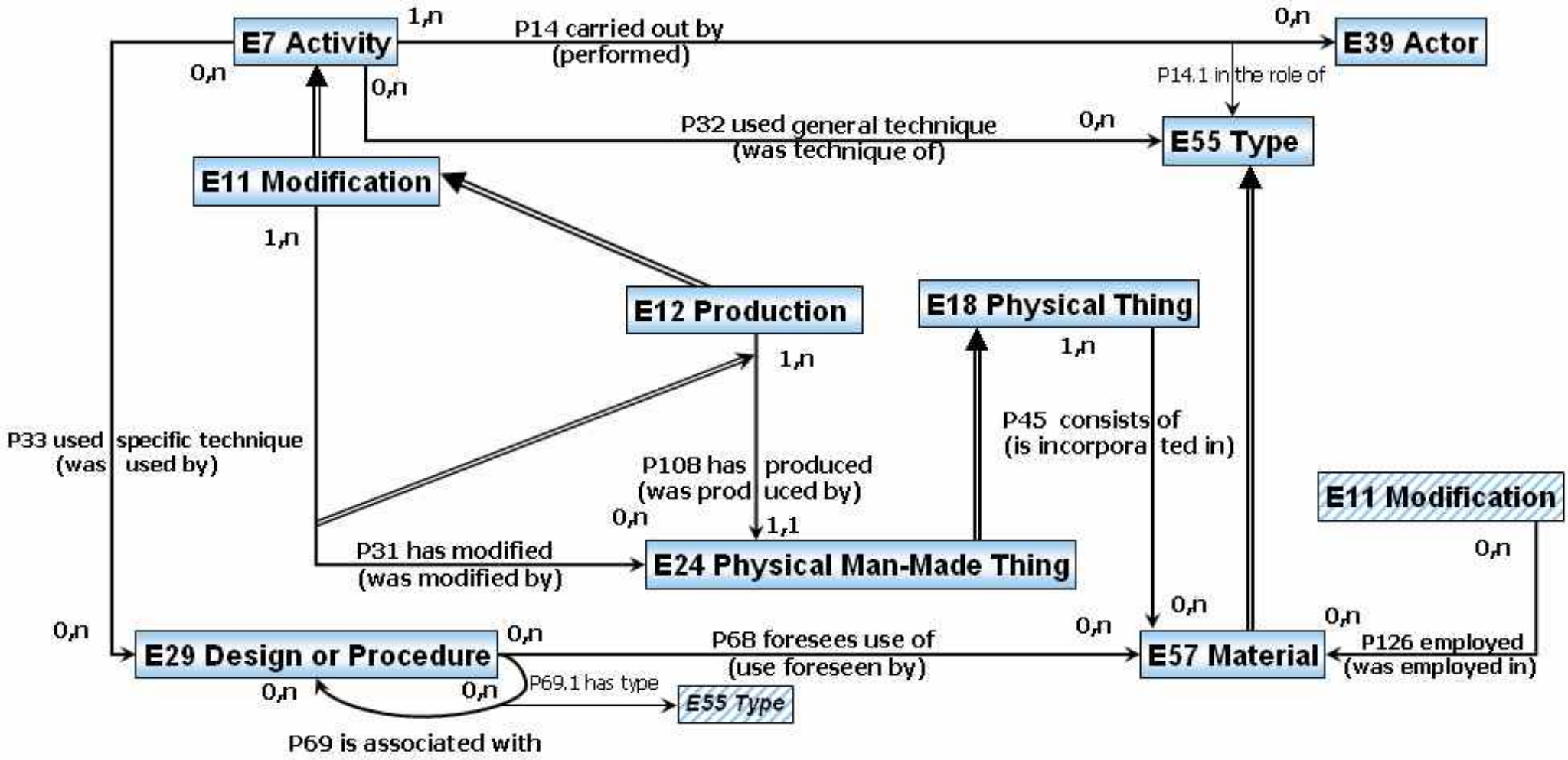
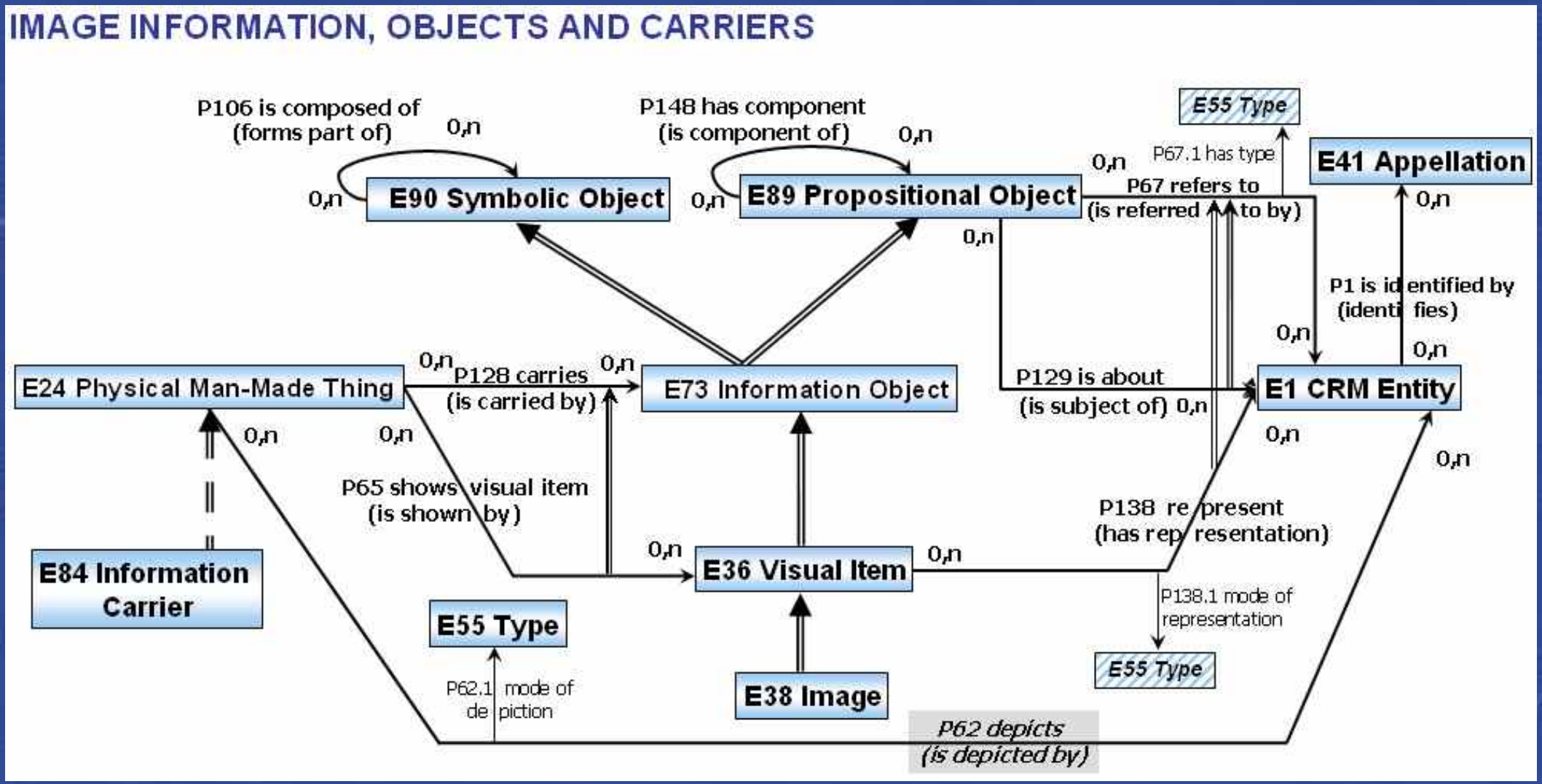
subset of classes
and propreties
Research Project
uses
Domain specific subclasses
and subproperties
produces
Community + Experts
validate
Ontology Management
Environment
dataforhistory.org

ontome.net

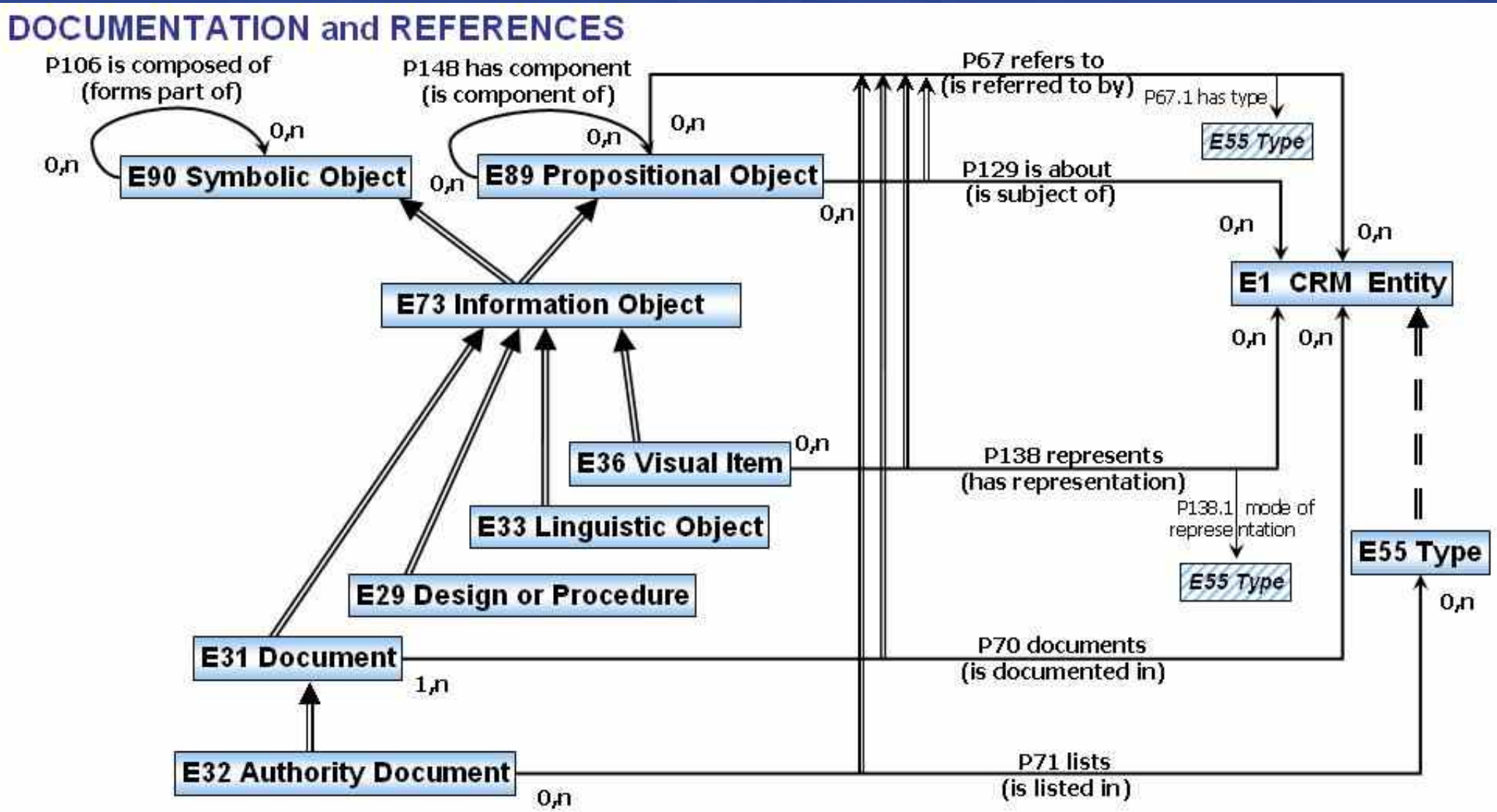
MATERIAL AND TECHNIQUE INFORMATION



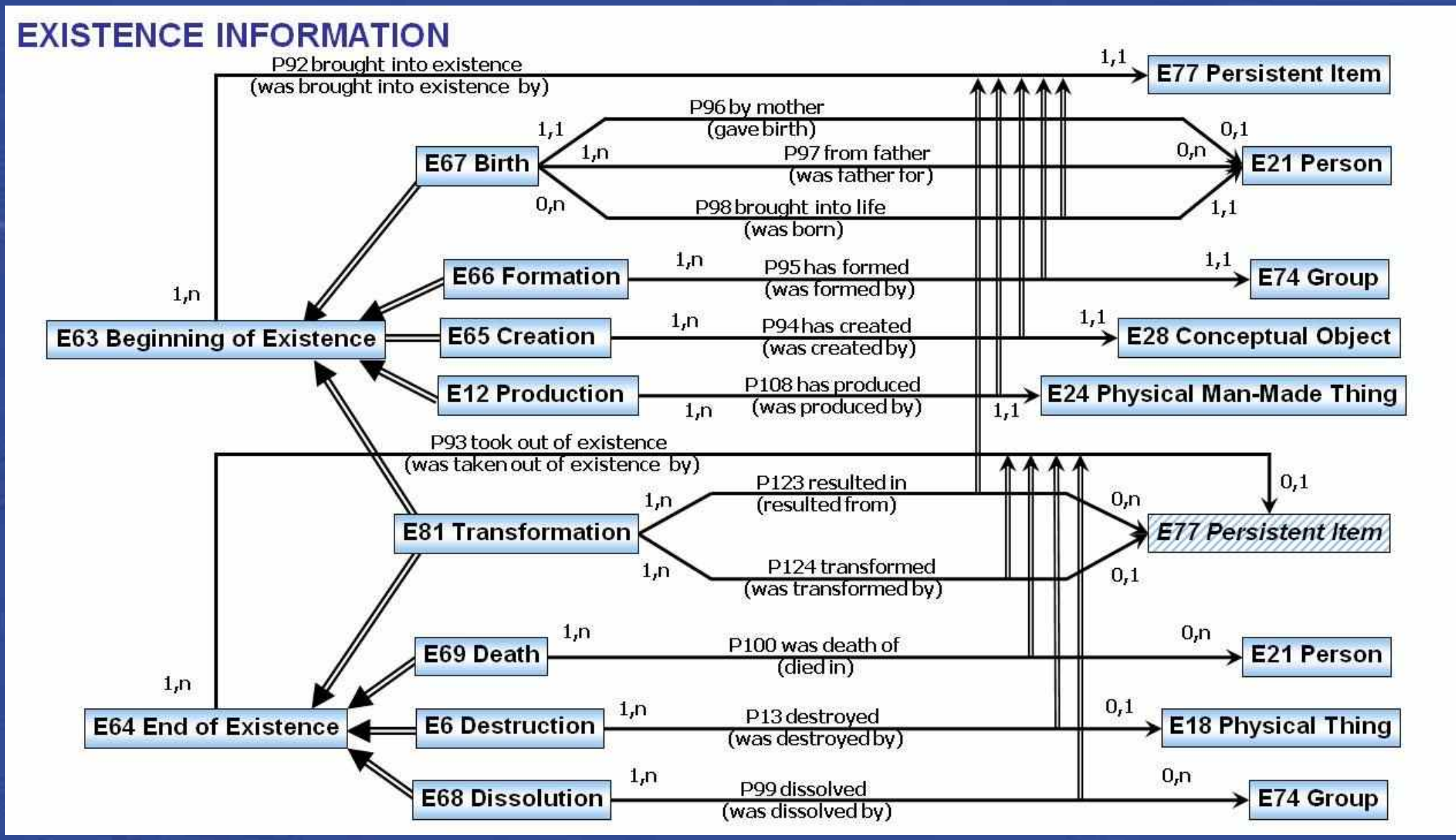
Functional overview: Material and Technique Information .



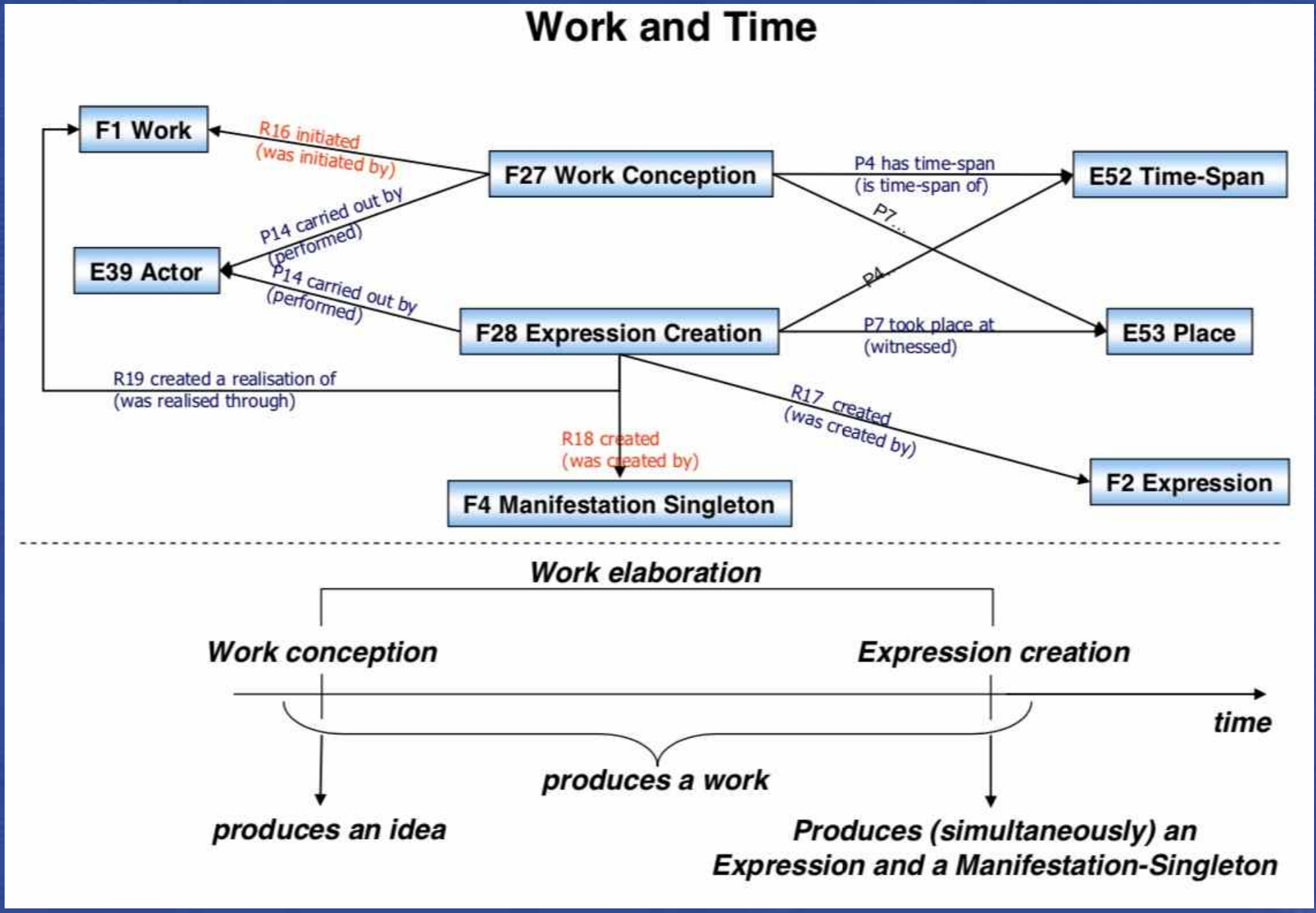
Functional overview: Image Information,Objects and Carriers .



Functional overview: Documentation and References .

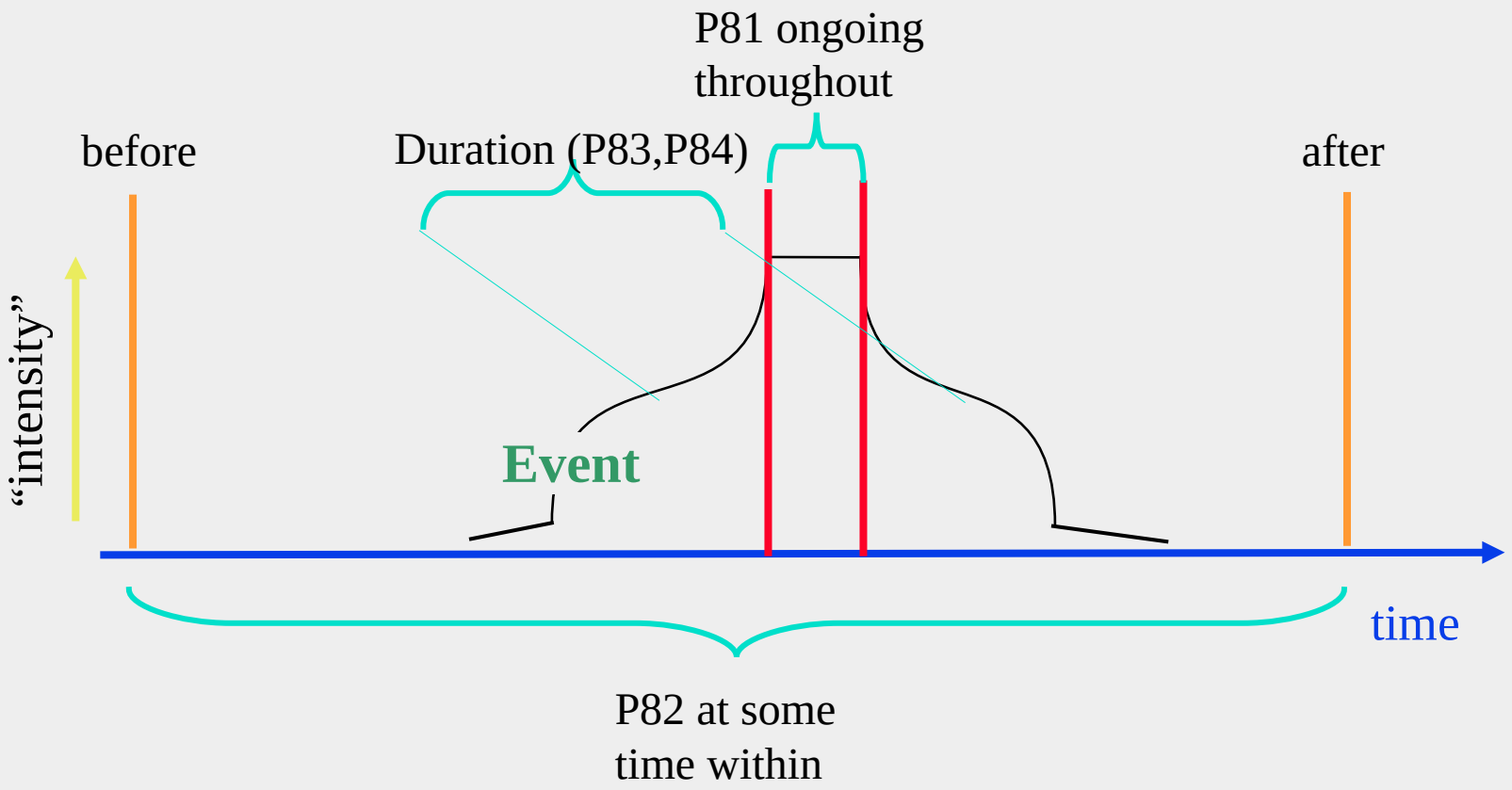


Functional overview: Existence Information .



FRBRoo 2.4, Figure 1, page 14 – Releases

The CIDOC CRM
Time Uncertainty, Certainty and Duration

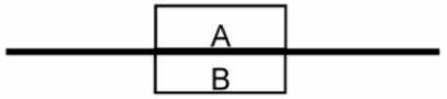


Stephen Stead (2008)

The CIDOC CRM P114-120 ‘Allen’ properties (James F. Allen)

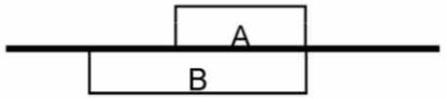
J. Holmen et Ch.-E. Ore (2010)

P114 is equal in time to



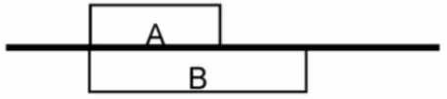
$A_s = B_s$ & $A_e = B_e$ ⇔ ($A_{ss} = B_{ss}$ & $A_{se} = B_{se}$) & ($A_{es} = B_{es}$ & $A_{ee} = B_{ee}$)

P115 finishes



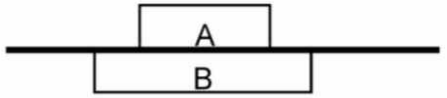
$A_s > B_s$ & $A_e = B_e$ ⇔ ($B_{ss} < A_{ss}$ & $B_{se} < A_{se}$) & ($B_{es} = A_{es}$ & $B_{ee} = A_{ee}$)

P116 starts



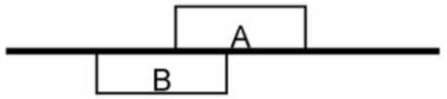
$A_e < B_e$ & $A_s = B_s$ ⇔ ($A_{ss} = B_{ss}$ & $A_{se} = B_{se}$) & ($A_{ee} < B_{ee}$ & $A_{es} < B_{es}$)

P117 occurs during



$B_s < A_s$ & $A_e < B_e$ ⇔ ($B_{ss} < A_{ss}$ & $B_{se} < A_{se}$) & ($A_{es} < B_{es}$ & $A_{ee} < B_{ee}$)

P118 overlaps

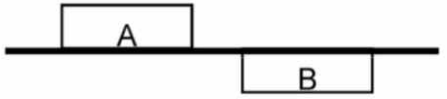


$B_s < A_s$ & $A_s < B_e$ & $B_e < A_e$ ⇔ ($B_{ss} < A_{ss}$ & $B_{se} < A_{se}$) & ($A_{ss} < B_{es}$ & $A_{se} < B_{ee}$) & ($B_{es} < A_{es}$ & $B_{ee} < A_{ee}$)

P119 meets in time with

$A_e = B_s$ ⇔ $A_{es} = B_{ss}$ & $A_{ee} = B_{se}$

P120 occurs before



$A_e < B_s$ ⇔ $A_{es} < B_{ss}$ & $A_{ee} < B_{se}$

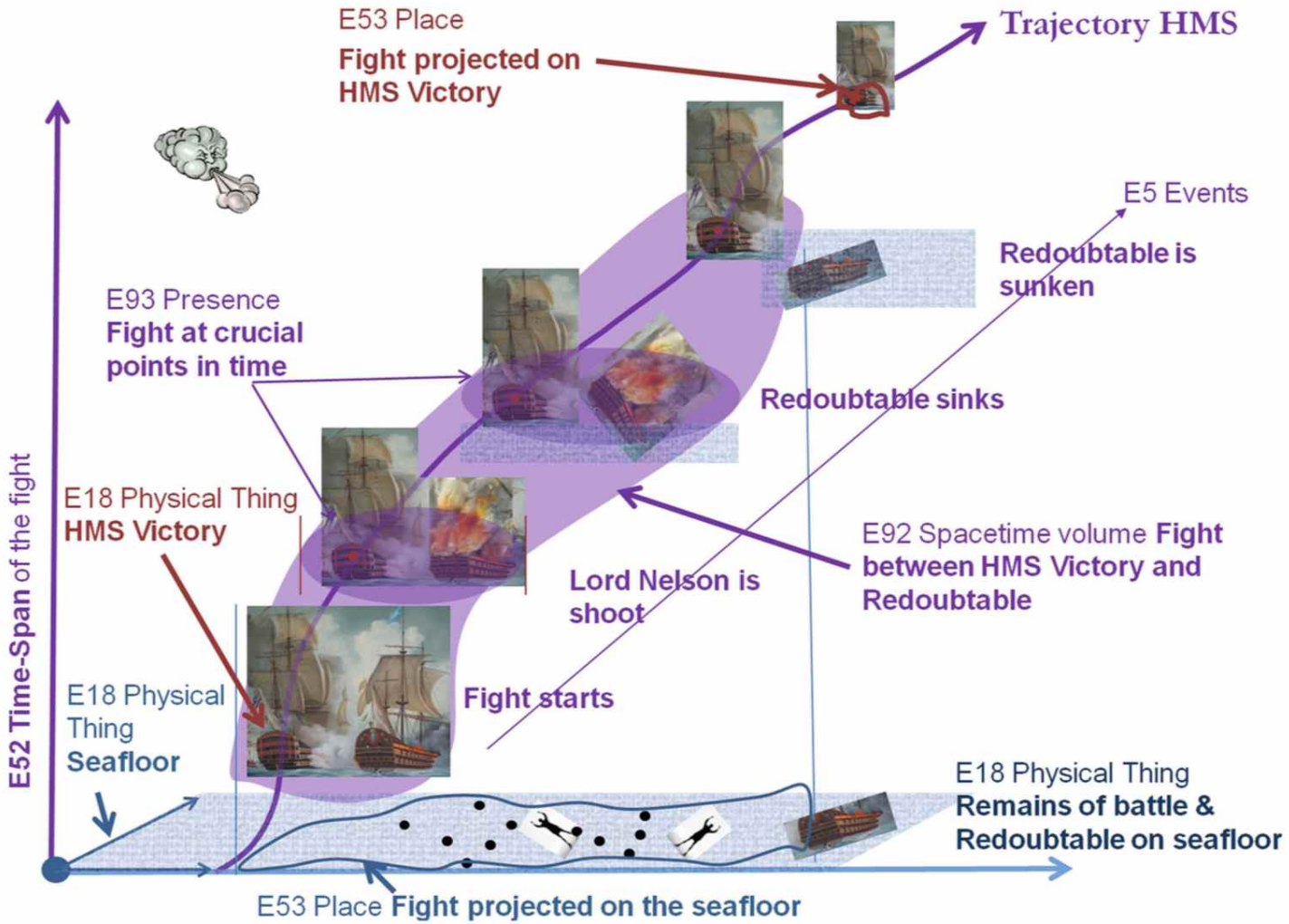
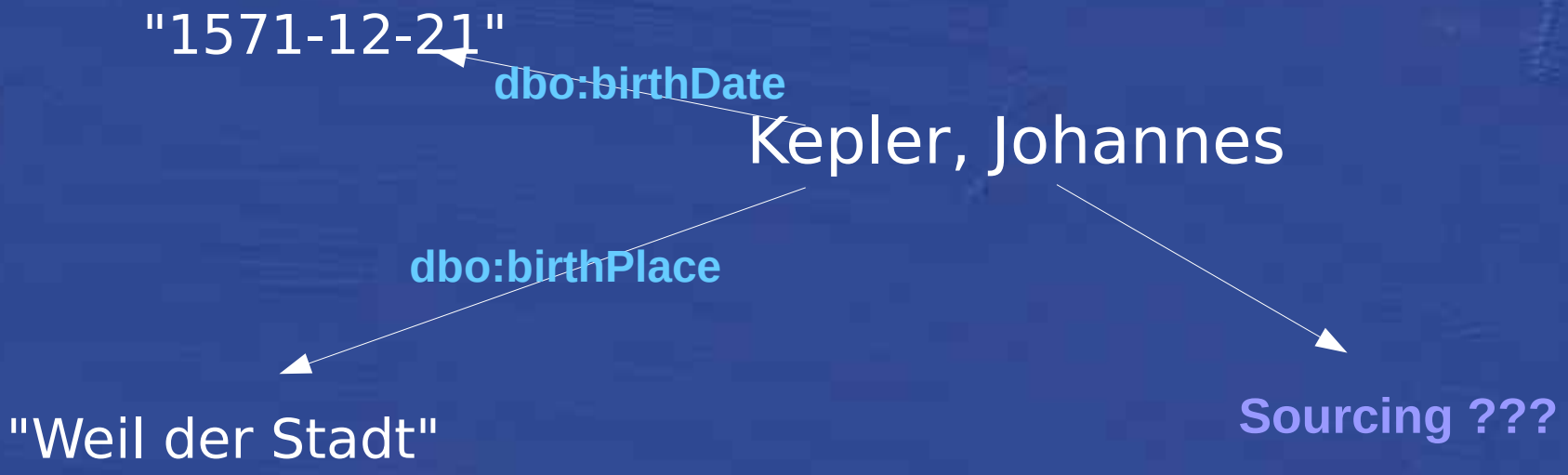


Fig. 2 The fight of the HMS Victory and the Redoubtable in the Battle of Trafalgar illustrating Spacetime volume (E92) and Presence (E93) and their projection to different Places (E53)

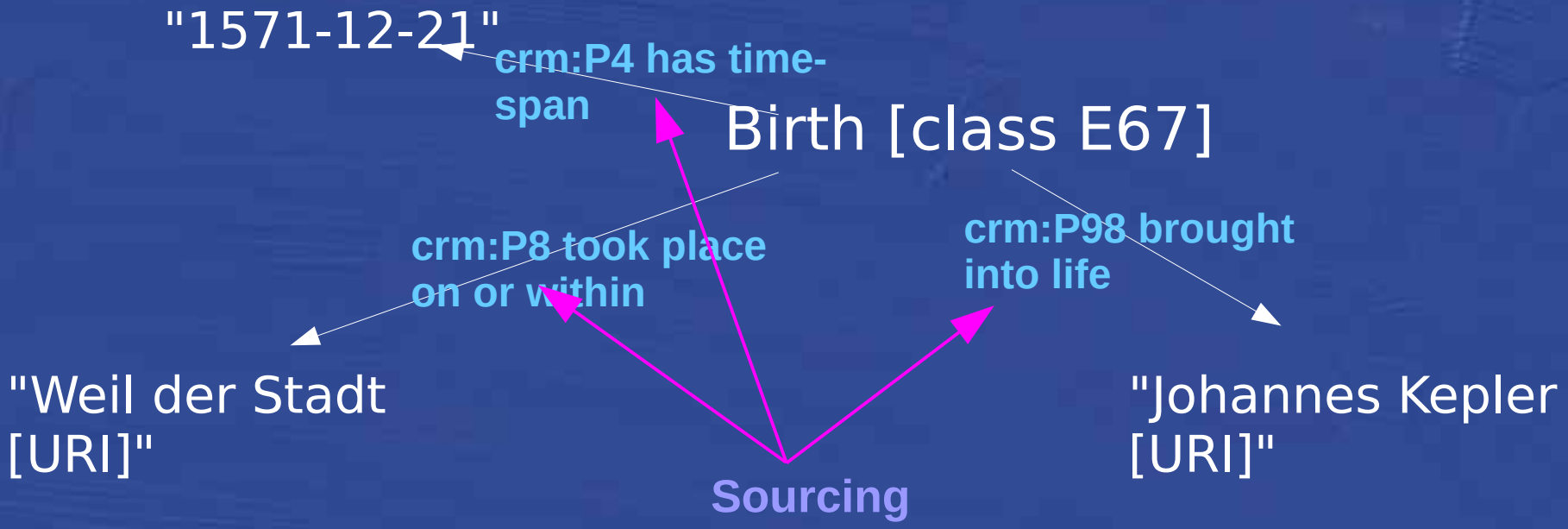
DOI 10.1007/s00799-016-0192-4

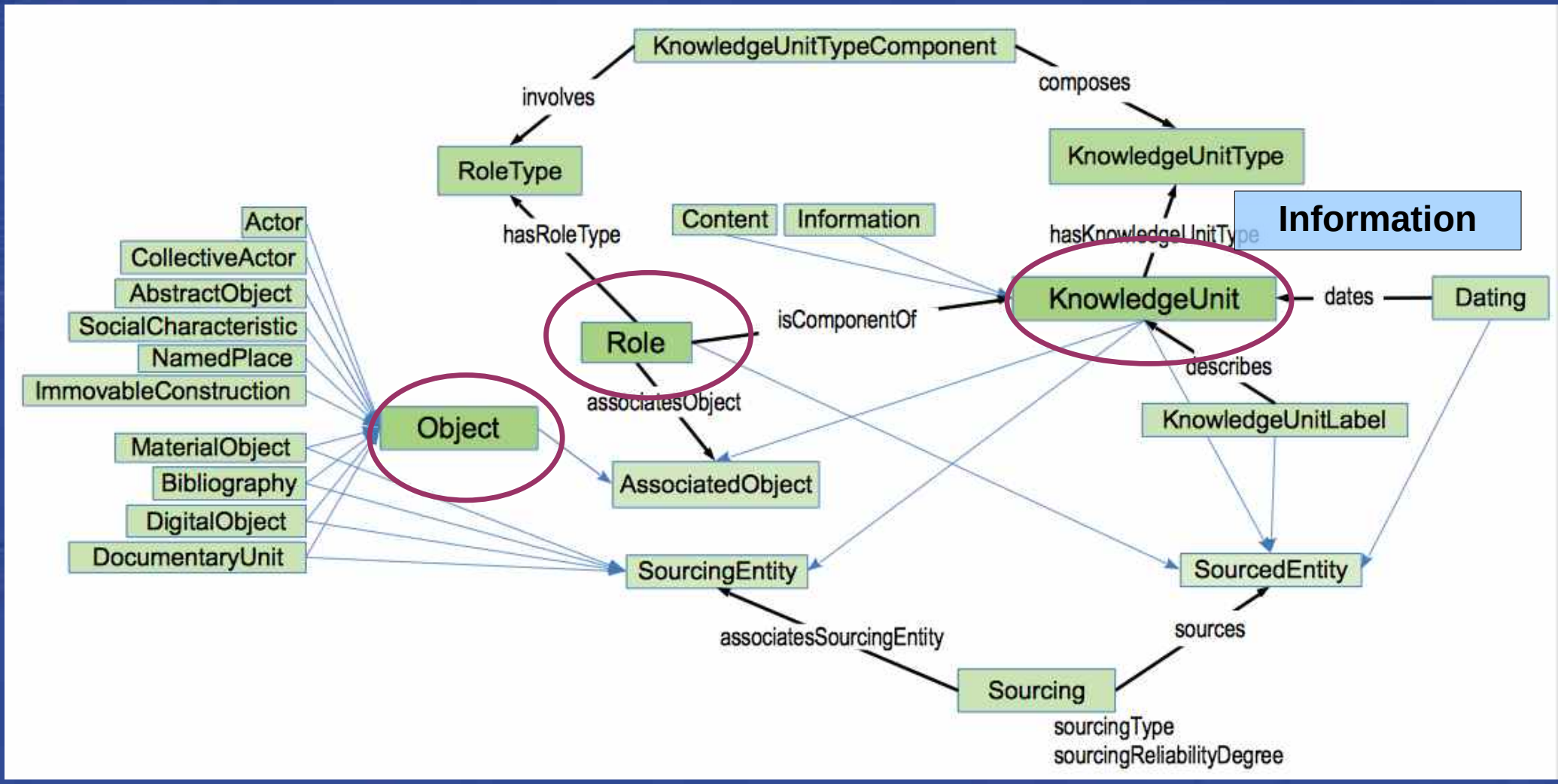
CRMgeo: A spatiotemporal extension of CIDOC-CRM Gerald Hiebel1 · Martin Doerr2 · Øyvind Eide3

Adopt a resource-centered model...



… or prefer a more robust event-centered model !





The symogih.org ontology

The definition of each instance ot the data model is publicly available

SYMOGIH

Références

http://symogih.org

Accueil | Documentation | Membres

Références

- Arborescence des classes de types d'unités de connaissances
- Types d'informations
- Types de contenus

Objets

- Acteurs
- Acteurs collectifs
- Objets abstraits
- Caractères sociaux

Classes de types d'

Chercher une classe

- Biographie
  - Enseignement -
  - Exercice d'une f
  - Fin de la vie
  - Liens acteurs - i
  - Localisation d'u
  - Rites sociaux
  - Vie militaire
  - Vie professionn

Enseignement

TyIn97

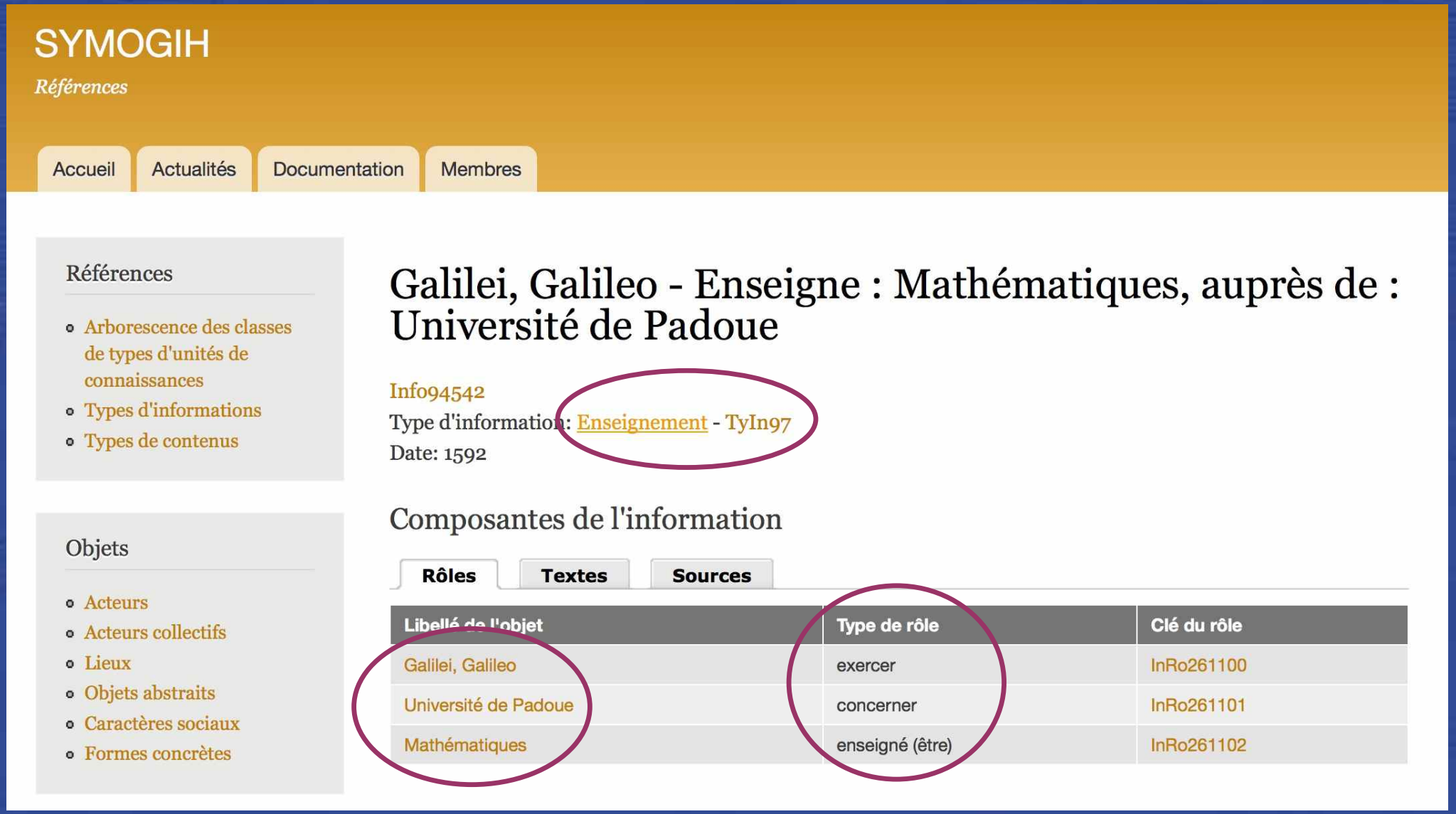
Exercer la fonction d'enseigner, avec indication de l'institution auprès de laquelle s'exerce l'enseignement et des matières enseignées.
Il s'agit d'un cas particulier du TyIn 'Exercice d'une fonction' : cf. Classe TyIn 'Exercice d'une fonction'.
Attention : ne pas renseigner le lieu si on peut localiser l'institution elle-même.

Liste des types de rôles associés

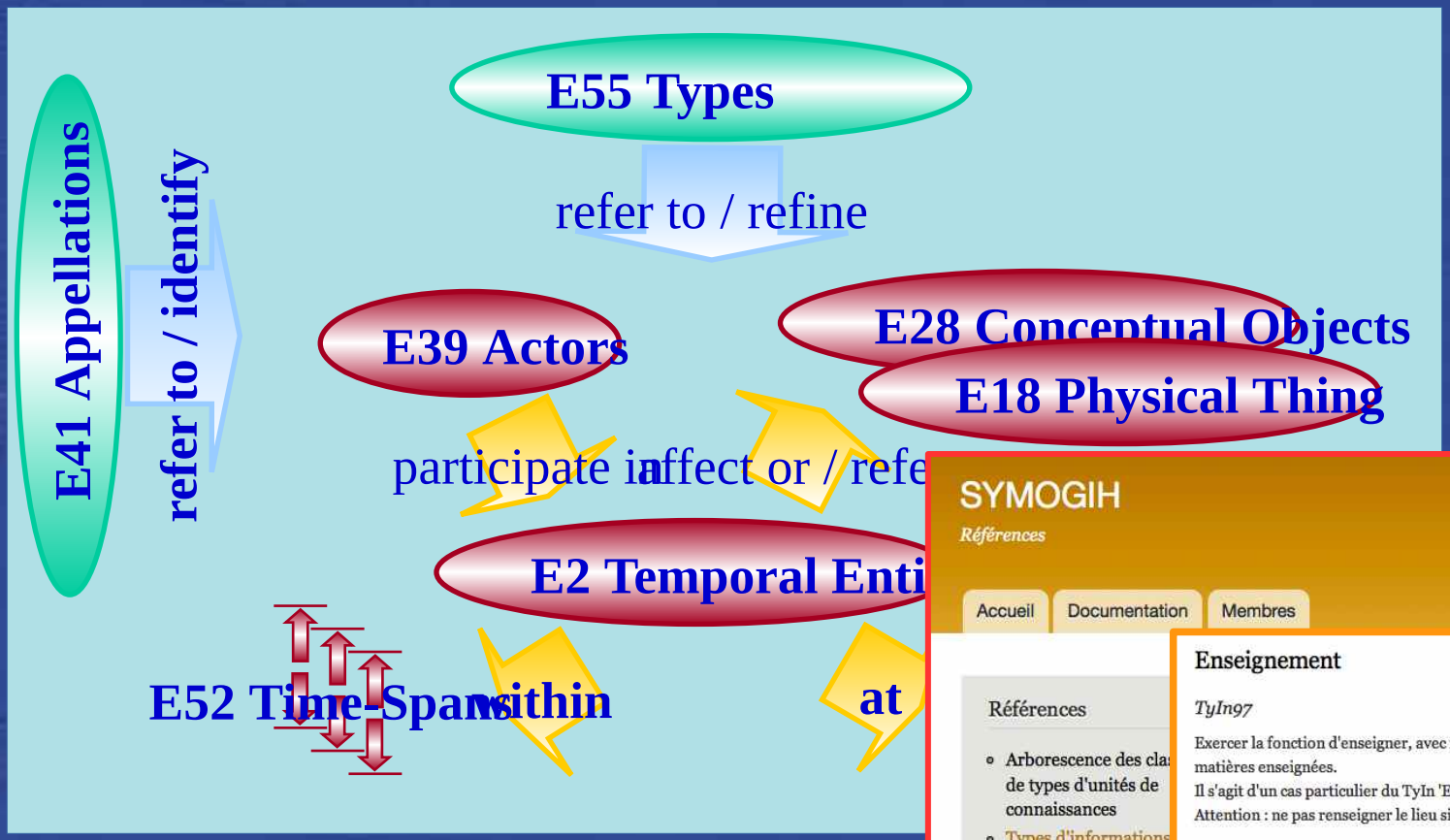
Libellé du type de rôle	Clé du TyRo	Description
concerner	TyRo21	Institution auprès de laquelle s'exerce l'enseignement. Ce rôle a été gardé pour être l'équivalent du TyIn7 : Exercice d'une fonction.
enseigné (être)	TyRo131	La matière enseignée (un objet abstrait). On peut en associer plusieurs si on enseigne en même temps plusieurs matières. En revanche, il faut créer plusieurs informations si les enseignements des différentes matières se succèdent ou si le contexte institutionnel est différent
exercé (être)	TyRo47	Qualification de l'enseignement : professeur, chargé de cours, etc. Ce rôle a été gardé pour être l'équivalent du TyIn7 : Exercice d'une fonction.
exercer	TyRo12	Ce rôle a été gardé pour être l'équivalent du TyIn7 : Exercice d'une fonction.
localiser	TyRo8	Ne pas renseigner si l'institution auprès de laquelle s'effectue l'enseignement est déjà localisée.
occasionner la fin	TyRo176	Associe l'information ou le AbOb qui explique la fin de l'enseignement
origine (être l')	TyRo16	Associe l'information (nomination, élection, ...) ou l'objet abstrait qui indiquent la cause de l'enseignement
typer	TyRo98	A utiliser dans le contexte de ce TyIn pour spécifier la nature de l'enseignement grâce à un AbOb (cours magistral, séminaire, etc.).

MCD disponible(s)

Télécharger ce MCD



Galileo Galilei taught mathematics at the University of Padua from 1592 and 1610



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exercé (être)	TyRo47	Qualification de l'enseignement : professeur, chargé de cours, etc. Ce rôle a été gardé pour être l'équivalent du TyIn7 : Exercice d'une fonction.
exercer	TyRo12	Ce rôle a été gardé pour être l'équivalent du TyIn7 : Exercice d'une fonction.
localiser	TyRo8	Ne pas renseigner si l'institution auprès de laquelle s'effectue l'enseignement est déjà localisée.
occasionner la fin	TyRo176	Associe l'information ou le AbOb qui explique la fin de l'enseignement
origine (être l')	TyRo16	Associe l'information (nomination, élection, ...) ou l'objet abstrait qui indiquent la cause de l'enseignement
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MCD disponible(s)

Télécharger ce MCD

symogih.org and the CRM :

extending the standard
for geo-historical projects'
data production

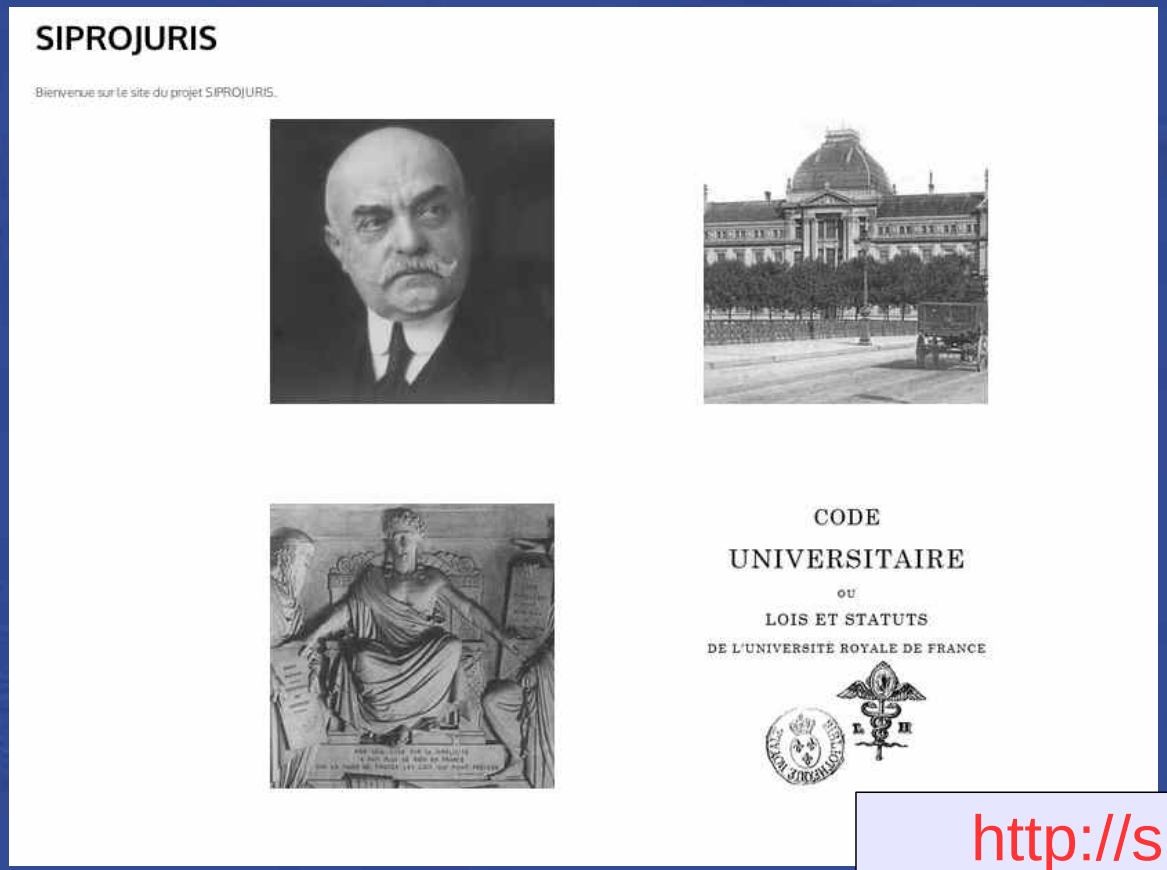
Project specific websites : Professeurs de droit

http://siprojuris.symogih.org

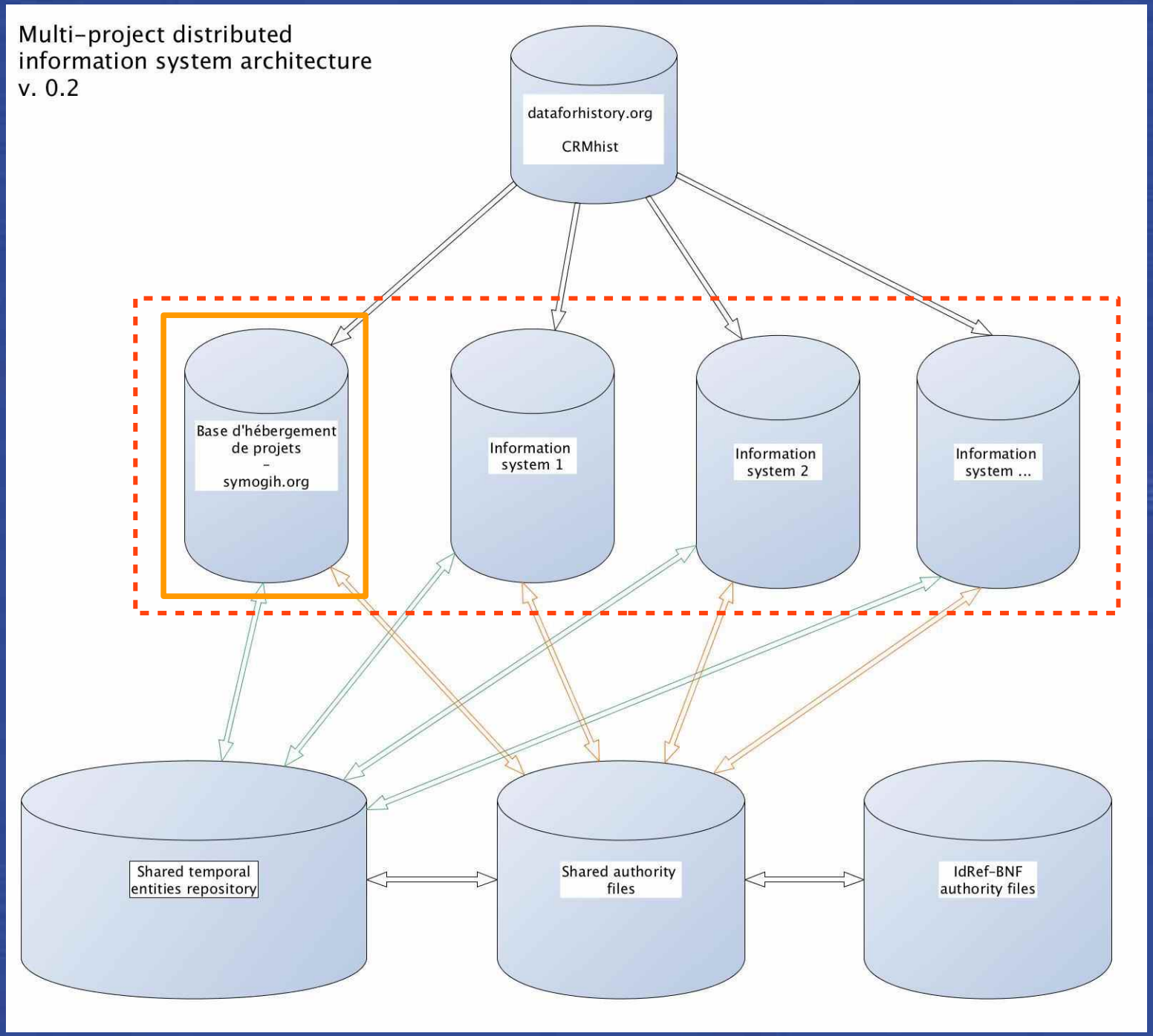
Défi données MaDICS-ADOC 2018

tinyurl.com/data-challenge-2018

Enrichir et exploiter un corpus de données historiques publiées sous forme de LOD.
Le projet *SIPROJURIS*.
Système d'information des professeurs de droit (1804-1950)



http://siprojuris.symogih.org



dataforhistory.org

Interlinking URIs of resources

Kepler, Johannes

http://symogih.org/resource/Actr195

Actr195

Année de naissance: 1571 - Année de mort: 1630

Biographie – documentation

Biographie | Informations | Contenus | Carte | Documentation | Liens

Date	Ressource
2005	Depondt, Philippe / Véricourt, Guillemette de, Kepler. L'ort Editions du Rouergue, 2005)
2003	Bucciantini, Massimo, Galileo e Keplero. Filosofia, cosmol Einaudi, 2003)
1979	Simon, Gérard, Kepler: astronome, astrologue (Paris, Galli

Affichage de 1 à 3 sur 3

Kepler, Johannes

Actr195

Année de naissance: 1571 - Année de mort: 1630

Biographie – documentation

Biographie | Informations | Contenus | Carte | Documentation | Liens

Idref – URL identifiant un objet : 026947676

Autorités BnF – identifiant pérenne : cb11909597m

DBPedia Live – URL de ressource : Johannes_Kepler

owl:sameAs

Kepler, Johannes (1571-1630)

http://www.idref.fr/autorites/autorites.html

AMELIORER la notice | SIGNALER une erreur

Précédent | Suivant

026947676

Lien permanent

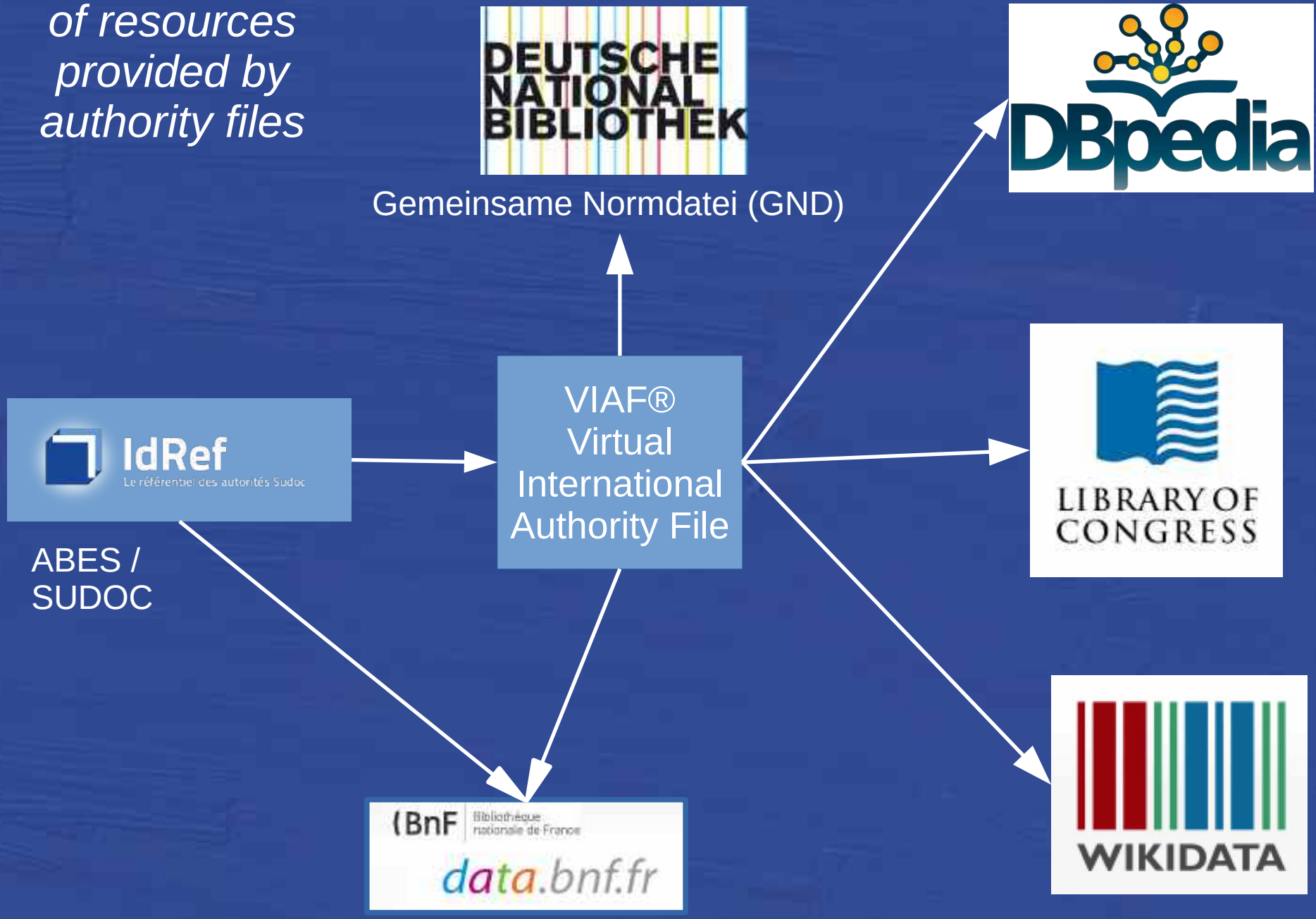
Notice de type Personne

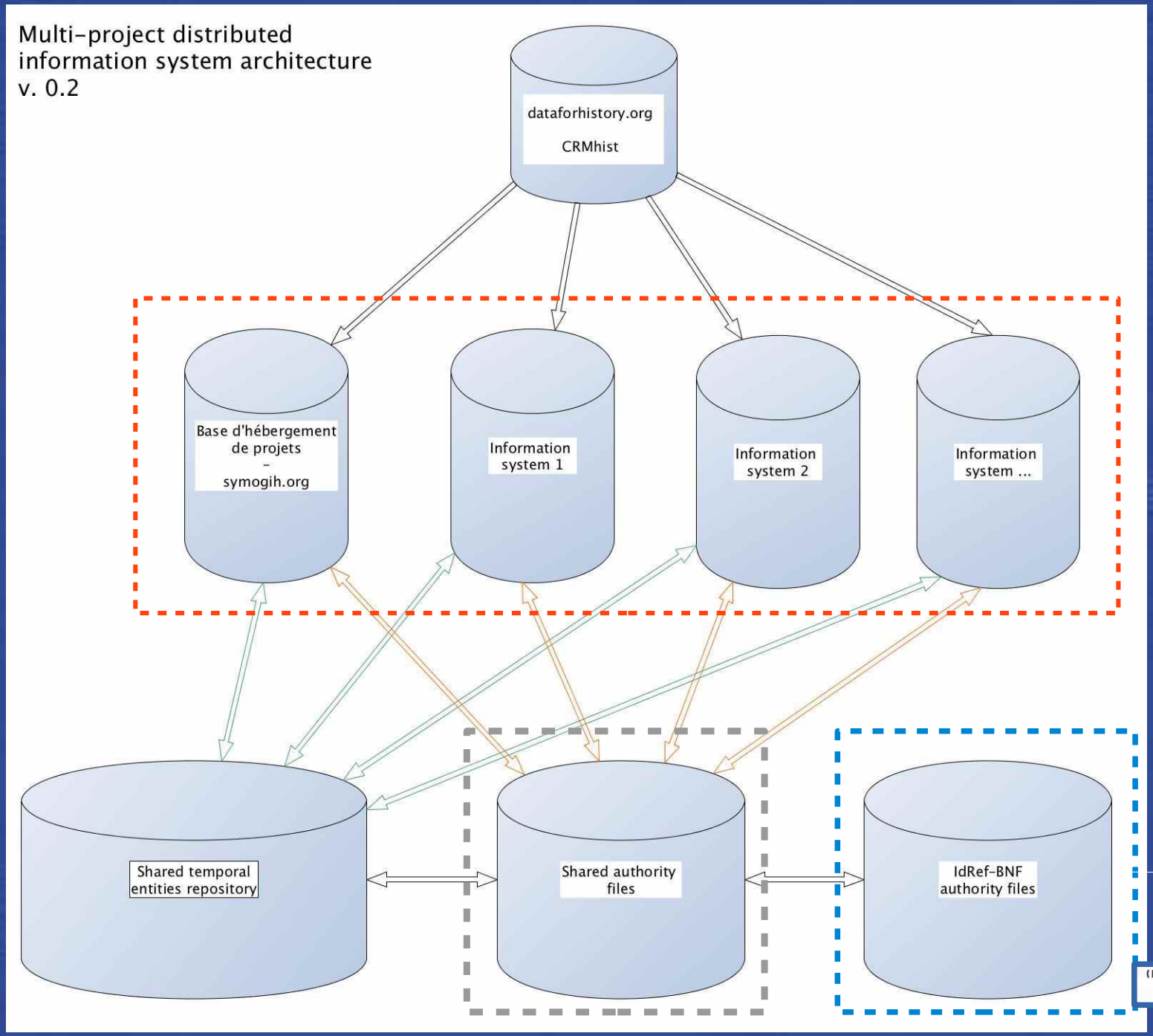
Forme retenue

Kepler, Johannes (1571-1630)

http://www.idref.fr/026947676

Interlinking the URIs of resources provided by authority files





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