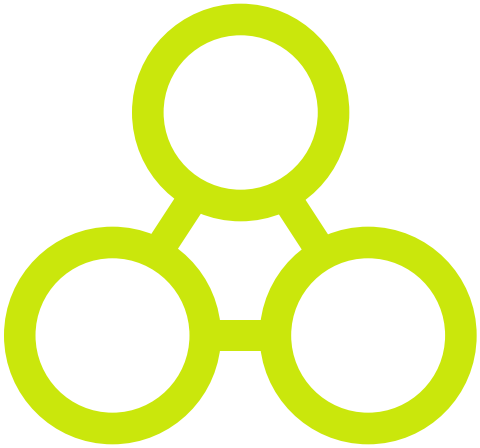
Foundational Ontology, Conceptual Modeling and Data Semantics



nemo

ontology & conceptual modeling research group

GT OntoGOV (W3C Brazil),
São Paulo, Brazil

Giancarlo Guizzardi
gguizzardi@acm.org
http://nemo.inf.ufes.br
Computer Science Department
Federal University of
Espírito Santo (UFES),
Brazil

Português

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ontologies & conceptual modeling research group (nemo)

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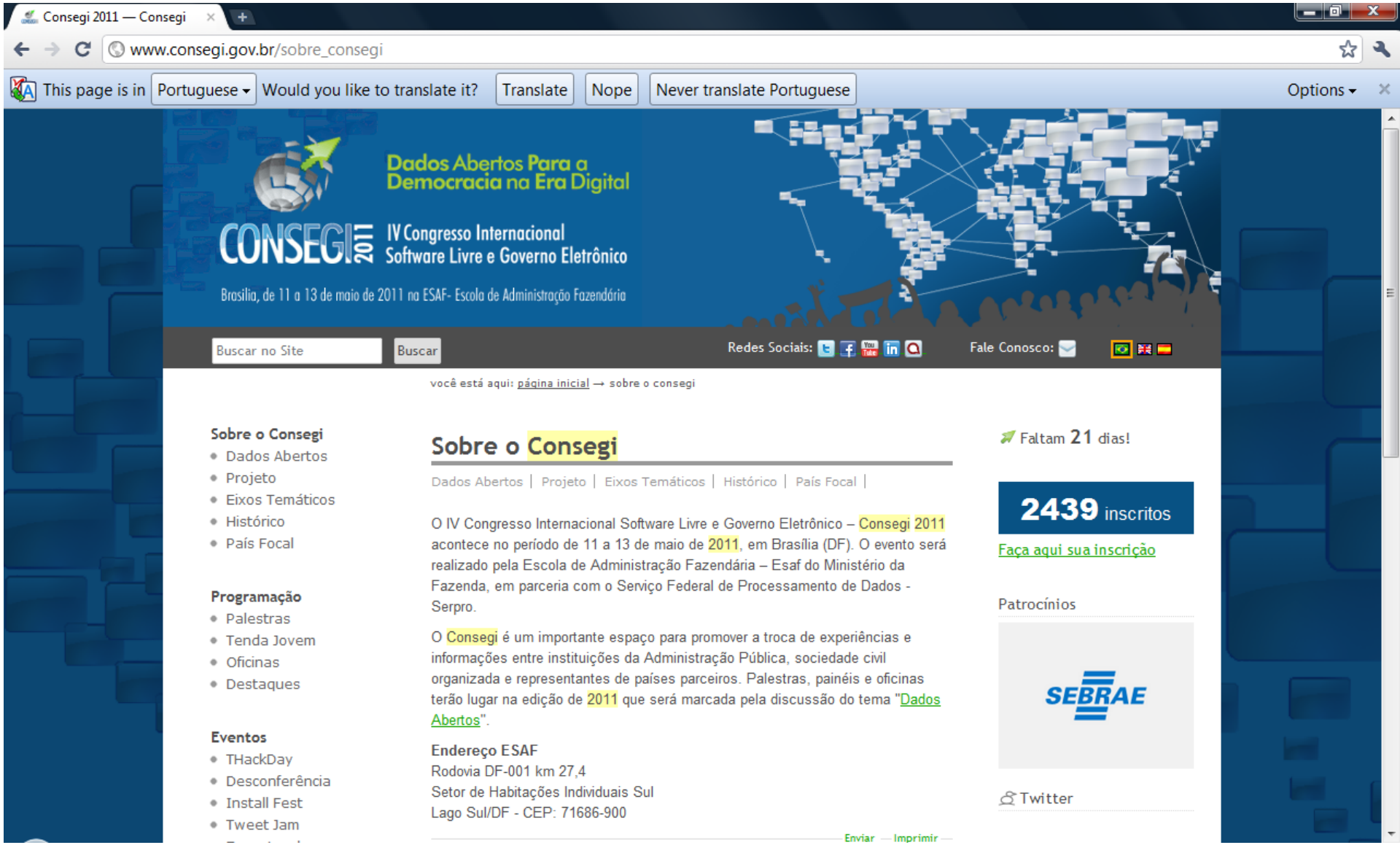
About

Created in 2006, NEMO (Núcleo de Estudos em Modelagem Conceitual e Ontologias) is a research group devoted to investigating the application of domain and foundational ontologies as well as ontology-based techniques in various aspects of conceptual modeling such as information modeling, enterprise modeling, agent-based systems and semantic web. We have been establishing a productive partnership with industry regarding the application of ontologies in sectors such as domain engineering, software engineering and Energy (Petroleum and Gas). Moreover, in the past three years, NEMO members have been actively participating in the consolidation of the Brazilian Ontology Community by carrying out activities such as the organization of some the first scientific events devoted to ontologies in Brazil.

NEMO has integrated the former LABES (Software Engineering Research Laboratory). LABES was funded in 1999 with the prominent purpose of investigating the application of ontology-based techniques in Software Engineering. In this area, one the key projects conducted inside this laboratory was the ODE (Ontology-Based Development Environment Project). This project investigated the use of domain ontologies for domain engineering and for the systematic development of semantically-aware object-oriented frameworks. This project resulted in a number of formal ontologies for several software engineering sub-domains (e.g., software requirements, software process, software quality, risk analysis, etc.). Once produced, these domain ontologies have been employed for the production of reusable frameworks for each of these domains. Finally, these frameworks were used for the production of a process-centered semantic software engineering integrated environment. Since 2003, the laboratory has also been involved in the development of projects in the use of ontologies (both as a reference framework as a knowledge representation artifact) for providing intelligent support in software engineering knowledge management. Since 2006, the LABES has been integrated to the recently created NEMO (Ontology and Conceptual Modeling Research Group).

Senior members:
Dr. Giancarlo Guizzardi (Foundational Ontologies, Conceptual Modeling)
Dr. João Paulo Andrade Almeida (Architectural Design, Enterprise Architecture, Enterprise Modeling, Business Process Modeling)
Dr. Renata Silva Souza Guizzardi (Multi-Agent Systems, Constructivist Knowledge Management, Goal-Based Modeling)
Dr. Ricardo de Almeida Falbo (Ontologies in Software Engineering, Ontological Engineering, Software Process and Quality)

http://nemo.inf.ufes.br/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www.consegi.gov.br/sobre_consegi
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Dados Abertos Para a Democracia na Era Digital
CONSEGI 2011 IV Congresso Internacional Software Livre e Governo Eletrônico
Brasília, de 11 a 13 de maio de 2011 na ESAF- Escola de Administração Fazendária
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Destaques
Eventos
THackDay
Desconferência
Install Fest
Tweet Jam
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Dados Abertos | Projeto | Eixos Temáticos | Histórico | País Focal |
O IV Congresso Internacional Software Livre e Governo Eletrônico – Consegi 2011 acontece no período de 11 a 13 de maio de 2011, em Brasília (DF). O evento será realizado pela Escola de Administração Fazendária – Esaf do Ministério da Fazenda, em parceria com o Serviço Federal de Processamento de Dados - Serpro.
O Consegi é um importante espaço para promover a troca de experiências e informações entre instituições da Administração Pública, sociedade civil organizada e representantes de países parceiros. Palestras, painéis e oficinas terão lugar na edição de 2011 que será marcada pela discussão do tema "Dados Abertos".
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SBBD & WebMedia 2011 ... | Call for papers

www.sbbd-webmedia2011.inf.ufsc.br/sbbd/index.php/chamadadetrabalhos/chamadadoeventoprincipal?lang=pt-BR

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XXVI SBBD

03 a 06 de outubro de 2011

Florianópolis - SC

Menu

- Apresentação
- Local
- Chamada de trabalhos
  - Full and Short papers
  - Minicursos
  - Sessão de Demos
  - WTDBD
- Comitês
- Artigos Aceitos
- Programação
- Palestras
- Tutoriais
- Minicursos
- Oficinas
- Inscrições
- Contato

Call for papers

(only in English)

Overview

SBBD is the official database event of the Brazilian Computer Society (SBC). It is the largest venue in Latin America for presenting and discussing of research results in the database domain as well in other related areas such as information retrieval, digital libraries, knowledge discovery and data mining. In its 26th edition, the symposium will be held in the city of Florianópolis, Santa Catarina, on October 03-06, 2011. SBBD aggregates researchers, students and practitioners, from Brazil and abroad, for presenting and discussing recent research results related to the main topics in modern database technologies.

Traditionally, SBBD gathers nearly 500 attendees. Besides the technical sessions, the symposium also includes invited talks and tutorials given by distinguished speakers from the international research community. Additionally, SBBD comprises a Thesis Workshop, a Demos Session, a Poster Session and several workshops co-organized with other co-located events. This year, the co-located event will be 17th Brazilian Symposium on Multimedia and the Web - WebMedia.

Important Dates

- **May 01, 2011** - Paper Registration

Nós temos 2 visitantes online

Últimos Tweets...

SBBD Deadline: 01-05-2011!!!!!!! http://www.sbbd-webmedia2011.inf.ufsc.br/sbbd/

Workshop de Teses e Dissertação de BD: data de submissão até 30 de junho!!!

Sessão de Demos - Chamada de Trabalhos: submissão até 10 de junho!!!

Chamada de minicursos. Submissão: 16/05 - http://www.sbbd-webmedia2011.inf.ufsc.br/sbbd/

In the context of the Cita 2011, we are organizing an

Iberoamerican Meeting on Ontological Research

This event is to be organized in the context of the International Outreach program of the **International Association for Ontologies and Applications** (IAOA). The idea of the event is to promote a scientific gathering for the different groups doing research related to Ontological Engineering and Applications of Ontology in Iberoamerica.
This initiative, in turn, serves the short term goal of increasing the community self-awareness as well as providing a forum for exploring collaboration opportunities.
Moreover, it serves the long term goal of fomenting the creation of a de facto Iberoamerican Community on the topic with its own scientific forums and agenda.
Instead of organizing a regular workshop with the submission of regular scientific papers, we aim with this opportunity to stimulate the submission of position papers that describe the research program of the several iberoamerican groups in the aforementioned areas.
These research papers shall be published in Workshop proceedings via the indexed CEUR system and we envisage the possibility of writing a post-workshop collective journal paper detailing a roadmap with the state of the iberoamerican ontology community at hand.

The CITA conference will take place between 16 and 18 May and the workshop will be held in one of the days of that conference (to be defined).

If you are interested in participating in such an event, please send an intention to submit before March, 7th.
The deadline for submitting the position papers themselves is March, 31st.
The intention to submit should contain only the name of the research group, the group´s complete affiliation, and a list of the research topics pursued by the group in the aforementioned areas.
The group´s research statement (position paper) should have no more than 6 pages (LNCS format) and should contain the following information:

(a) Research Statement (the group's view and focus on the general area of ontologies);
(b) Main areas of research;
(c) History of the Group and Members.

Both papers should be submitted directly to gguizzardi@inf.ufes.br and can be written in English, Portuguese or Spanish.

Dates Summary:

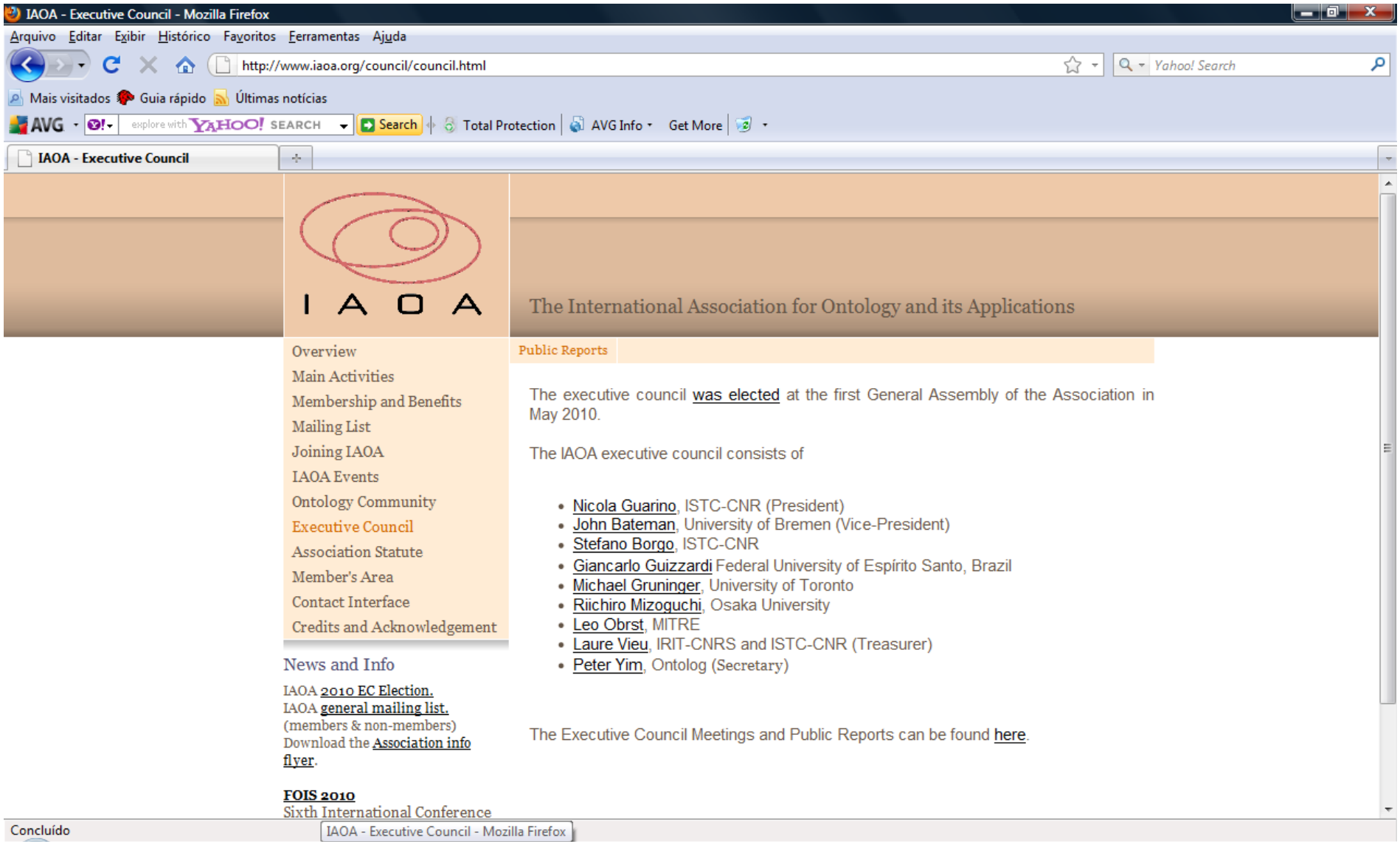
- Deadline for Abstracts (Intention to Submit): March, 07th
- Position Papers: March, 31st
- Notification: April, 20th

Organization:

- Dr. Giancarlo Guizzardi
  Ontology and Conceptual Modeling Research Group (NEMO)
  Member of the Executive Council of the International Association for Ontologies and Applications (IAOA)
  Co-Chair of the IAOA International Outreach Subcommittee
- Dr. José Palazzo M. de Oliveira , Federal University of Rio Grande do Sul (UFRGS), Brazil

http://www.inf.ufrgs.br/cita2011/

http://www.inf.ufrgs.br/ontobras-most2011/



http://iaoa.org/

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Dr. George O. Strawn
Director

Dr. George O. Strawn is the Director of the National Coordination Office (NCO) for the Federal government's multiagency Networking and Information Technology Research and Development (NITRD) Program. He also serves as the Co-Chair of the NITRD Subcommittee of the National Science and Technology Council. The NCO reports to the Office of Science and Technology Policy (OSTP) within the Executive Office of the President.

Dr. Strawn is on assignment to the NCO from the National Science Foundation (NSF), where he most recently served as Chief Information Officer (CIO). As the CIO for NSF, he guided the agency in the development and design of innovative information technology, working to enable the NSF staff and the international community of scientists, engineers, and educators to improve

OntologWiki: Ontology S...

ontolog.cim3.net/cgi-bin/wiki.pl?OntologySummit2011

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OntologySummit2011

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Ontology Summit 2011: Making the Case for Ontology

(2JZ8)

6th in the series of a 3-month open annual event, by and for the Ontology Community. This Summit is co-organized by Ontolog, NIST, NCOR, NCBO, IAOA & NCO_NITRD (2JZ9)

ref. **OntologySummit** & **OntologySummit2011_Communique** (2JZD)

- **Focus and Objectives** (2SEU)
- **Process, Organization & Workspace** (2SET)
- **The Team** (2SEV)
- **Calendar & Events** (2SEW)
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2010-30905

FR Doc 2010-30905[Federal Register: December 9, 2010 (Volume 75, Number 236)]

[Notices]

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[DOCID:fr09de10-38]

COMMODITY FUTURES TRADING COMMISSION

SECURITIES AND EXCHANGE COMMISSION

[Release No. 34-63423; File No. 4-620]

Acceptance of Public Submissions on a Study Mandated by the Dodd-Frank Wall Street Reform and Consumer Protection Act, Section 719(b)

AGENCY: Commodity Futures Trading Commission; Securities and Exchange Commission.

ACTION: Request for Comments.

SUMMARY: The Dodd-Frank Wall Street Reform and Consumer Protection Act (``Dodd-Frank Act'') was enacted on July 21, 2010. The Dodd-Frank Act, among other things, mandates that the Commodity Futures Trading Commission (``CFTC'') and the Securities and Exchange Commission

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The Dodd-Frank Wall Street Reform and Consumer Protection Act (``Dodd-Frank Act'') was enacted on **July 21, 2010**. The Dodd-Frank Act, among other things, mandates that the Commodity Futures Trading Commission (``CFTC'') and the Securities and Exchange Commission (``SEC'') conduct a study on ``**the feasibility of requiring the derivatives industry to adopt standardized computer-readable algorithmic descriptions which may be used to describe complex and standardized financial derivatives.**'' **These algorithmic descriptions should be designed to ``facilitate computerized analysis of individual derivative contracts and to calculate net exposures to complex derivatives**.'' The study also must consider the extent to which the algorithmic description, ``**together with standardized and extensible legal definitions, may serve as the binding legal definition of derivative contracts**.''

7. Do you rely on a discrete set of computer-readable descriptions (``**ontologies**'') to define and describe derivatives transactions and positions? If yes, what computer language do you use?

8. If you use one or more **ontologies** to define derivatives transactions and positions, are they proprietary or open to the public? Are they used by your counterparties and others in the derivatives industry?

9. How do you maintain and extend the **ontologies** that you use to define derivatives data to cover new financial derivative products? How frequently are new terms, concepts and definitions added?

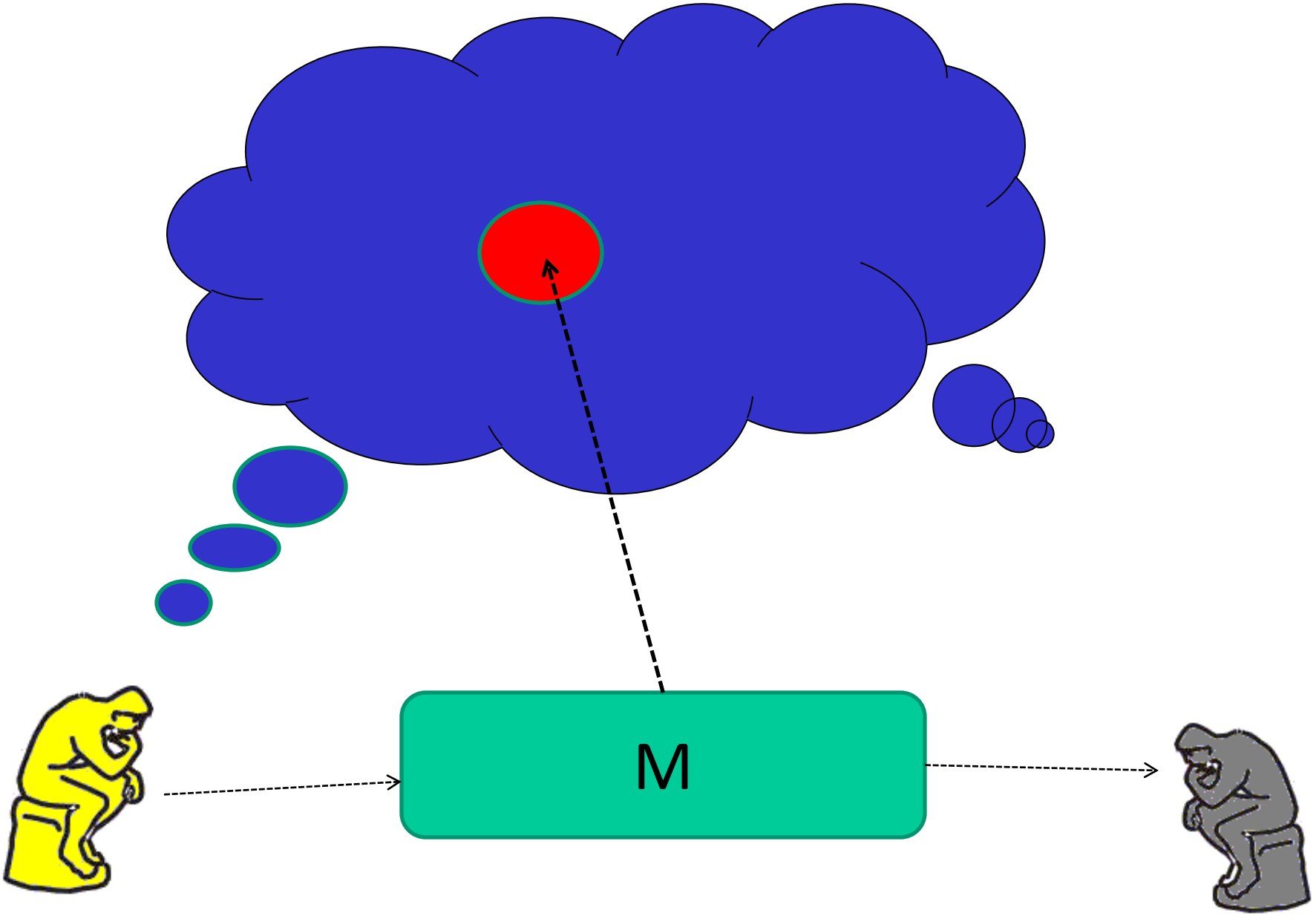
10. What is the scope and variety of derivatives and their positions covered by the **ontologies** that you use? What do they describe well, and what are their limitations?

.

SEMANTIC INTEROPERABILITY: THE PROBLEM

“What are ontologies and why we need them?”

1. *Reference Model of Consensus* to support different types of *Semantic Interoperability* Tasks
2. Explicit, declarative and machine processable artifact coding a domain model to enable efficient automated reasoning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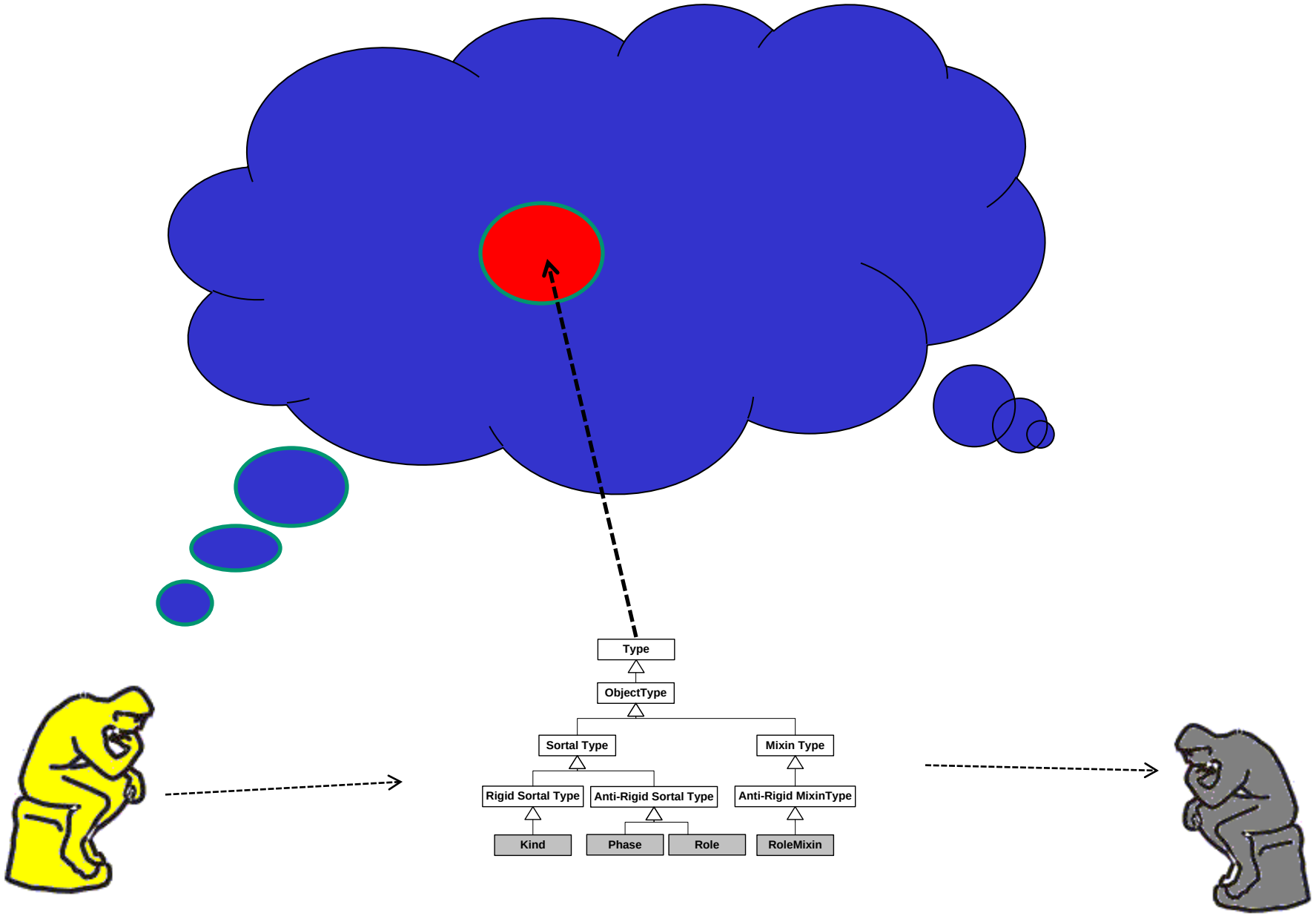
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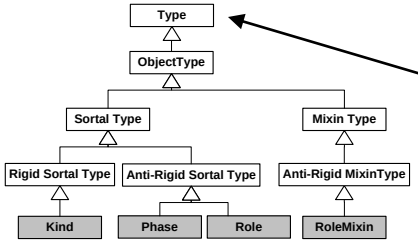
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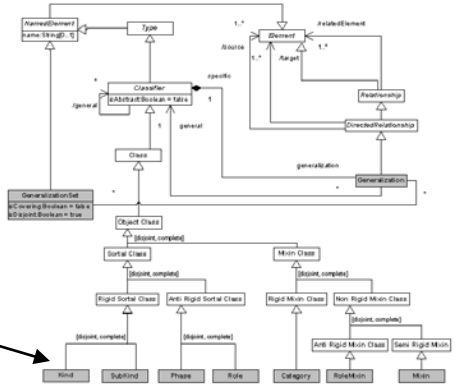

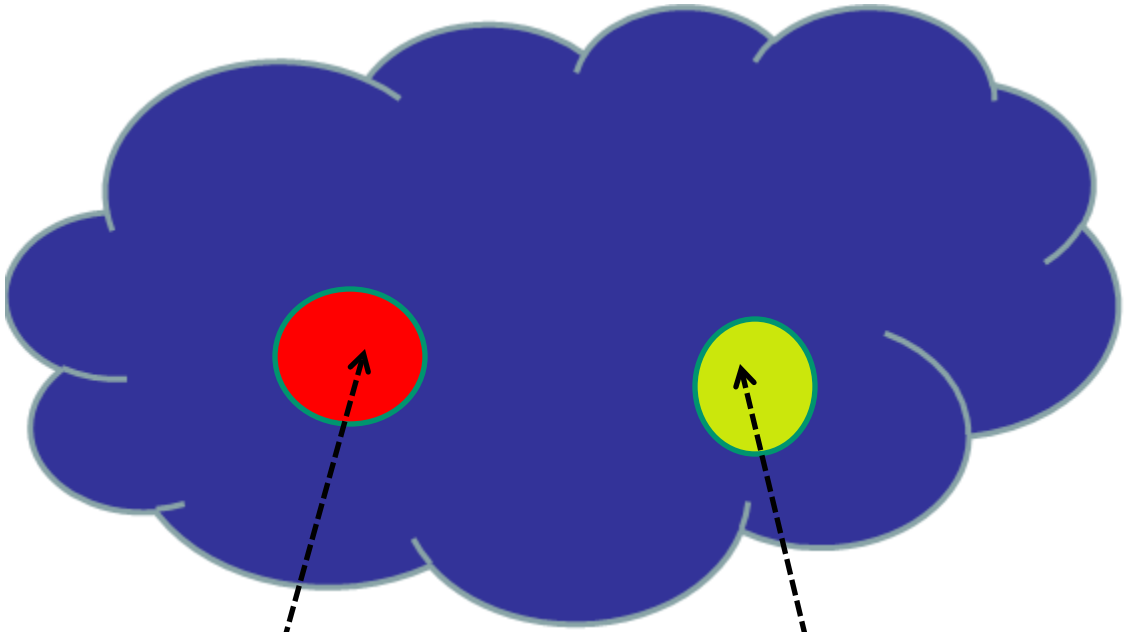

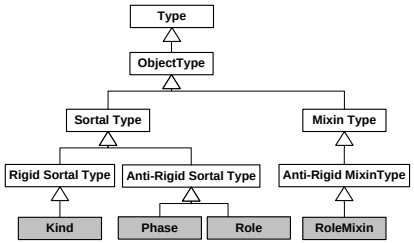
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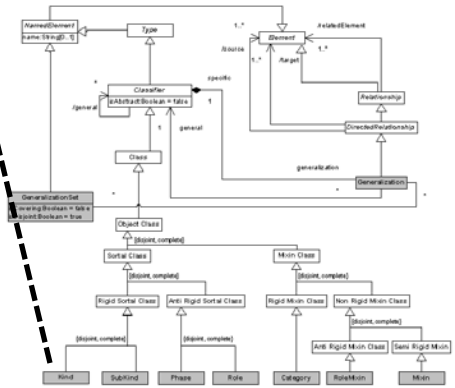

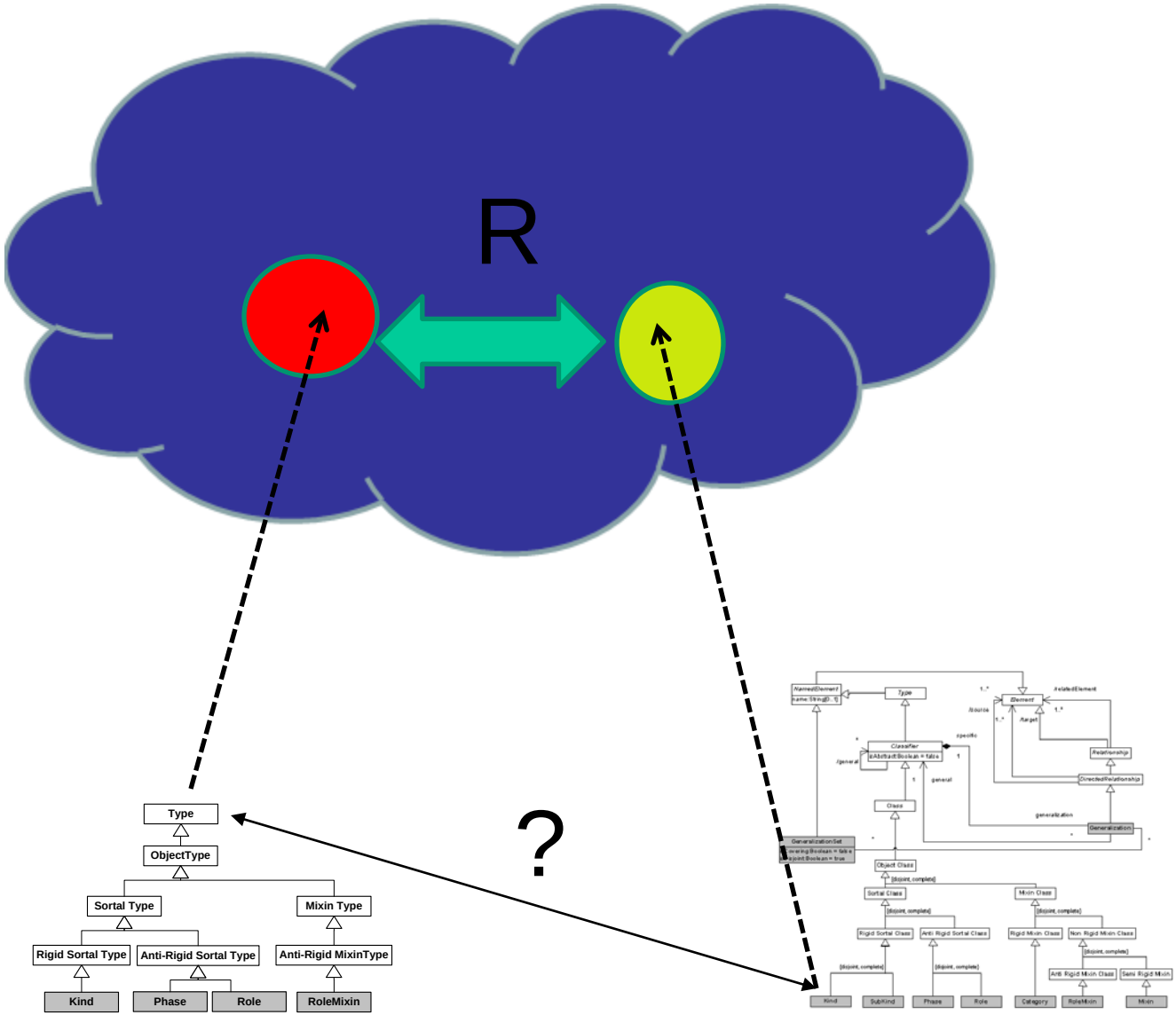
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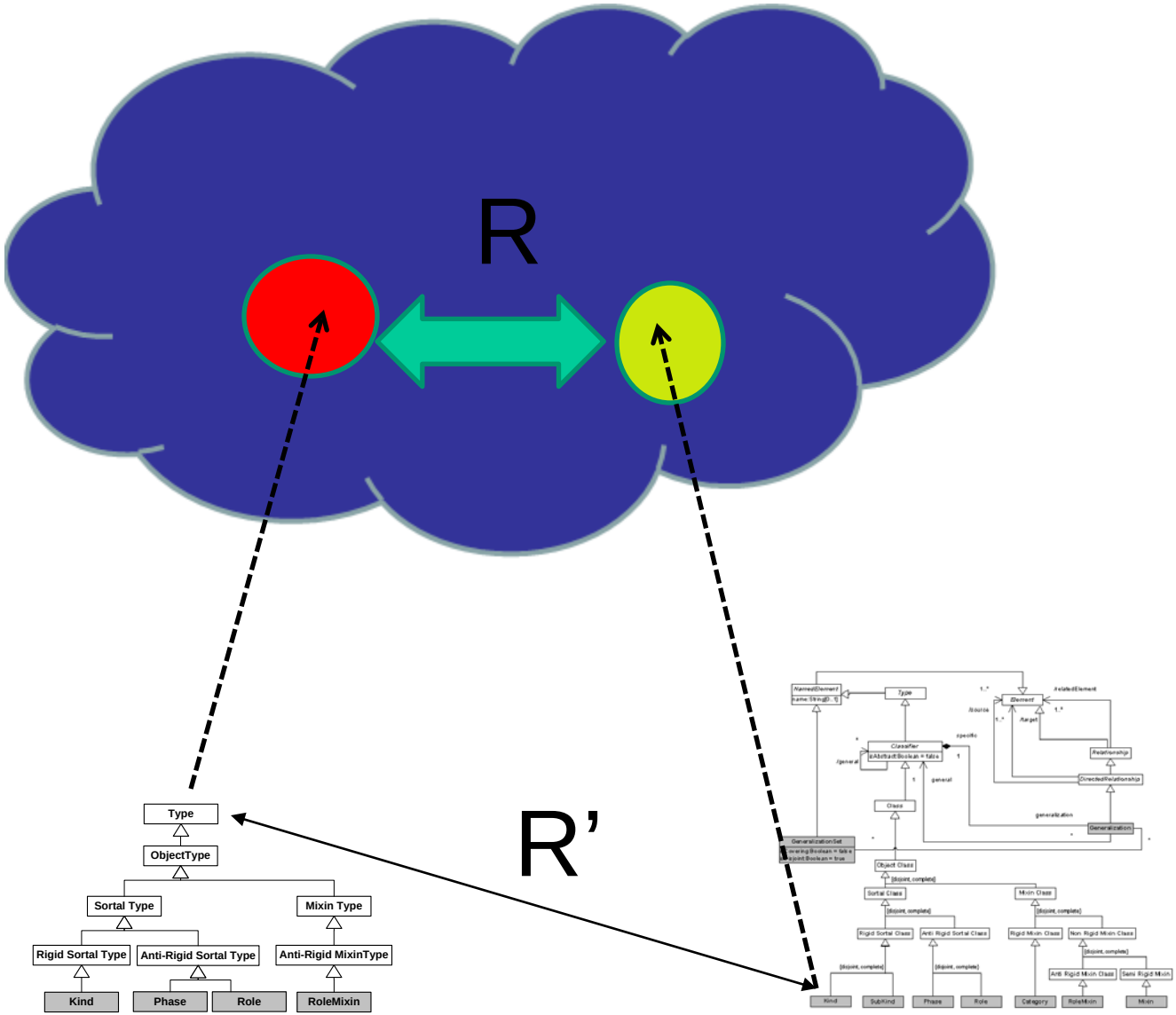
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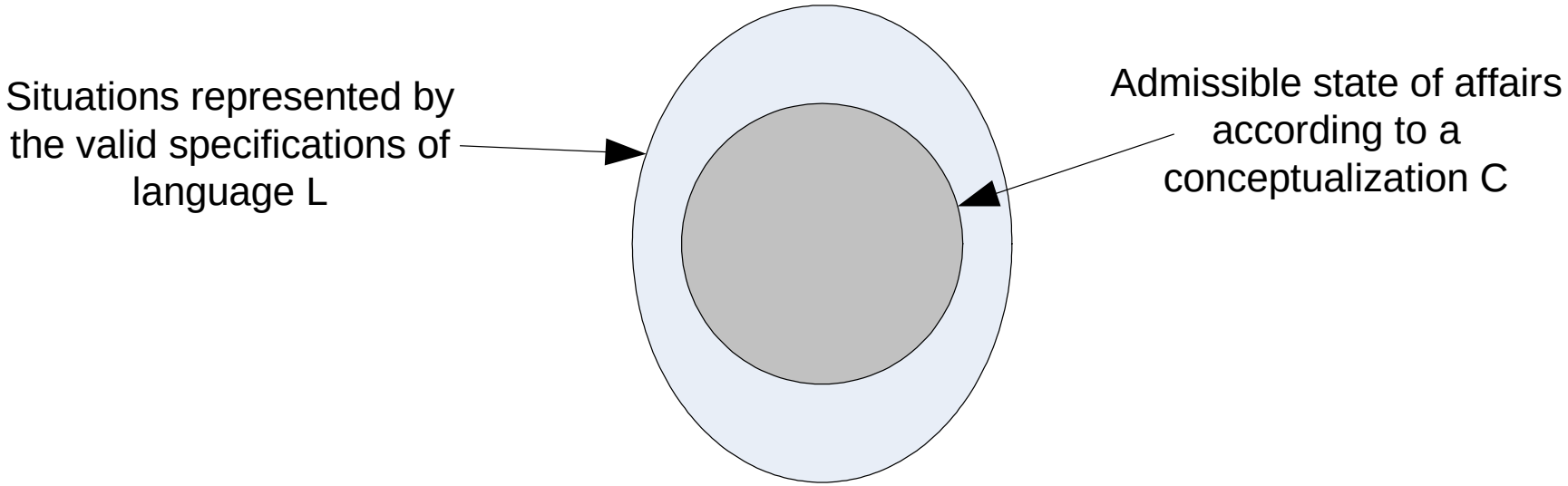
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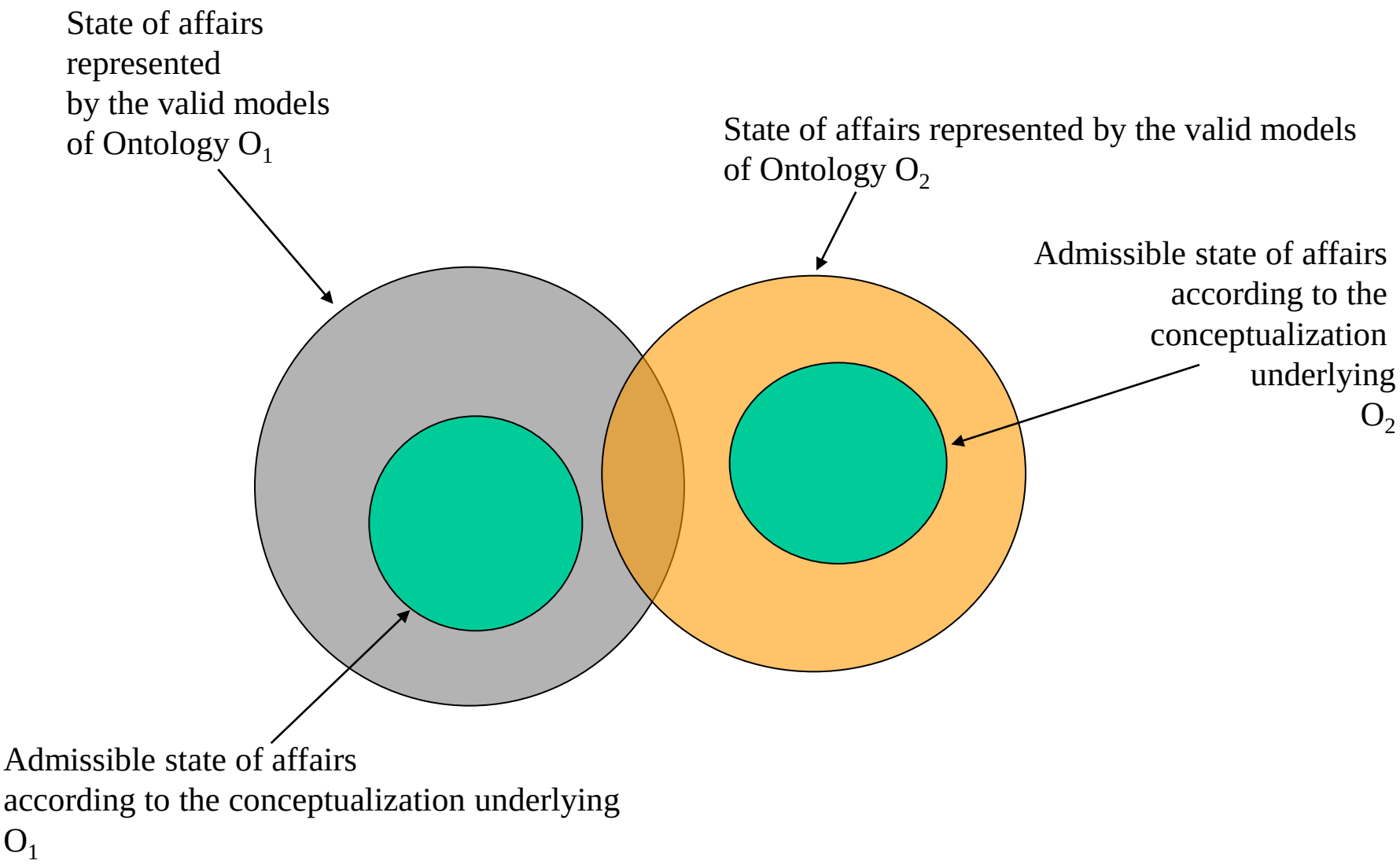
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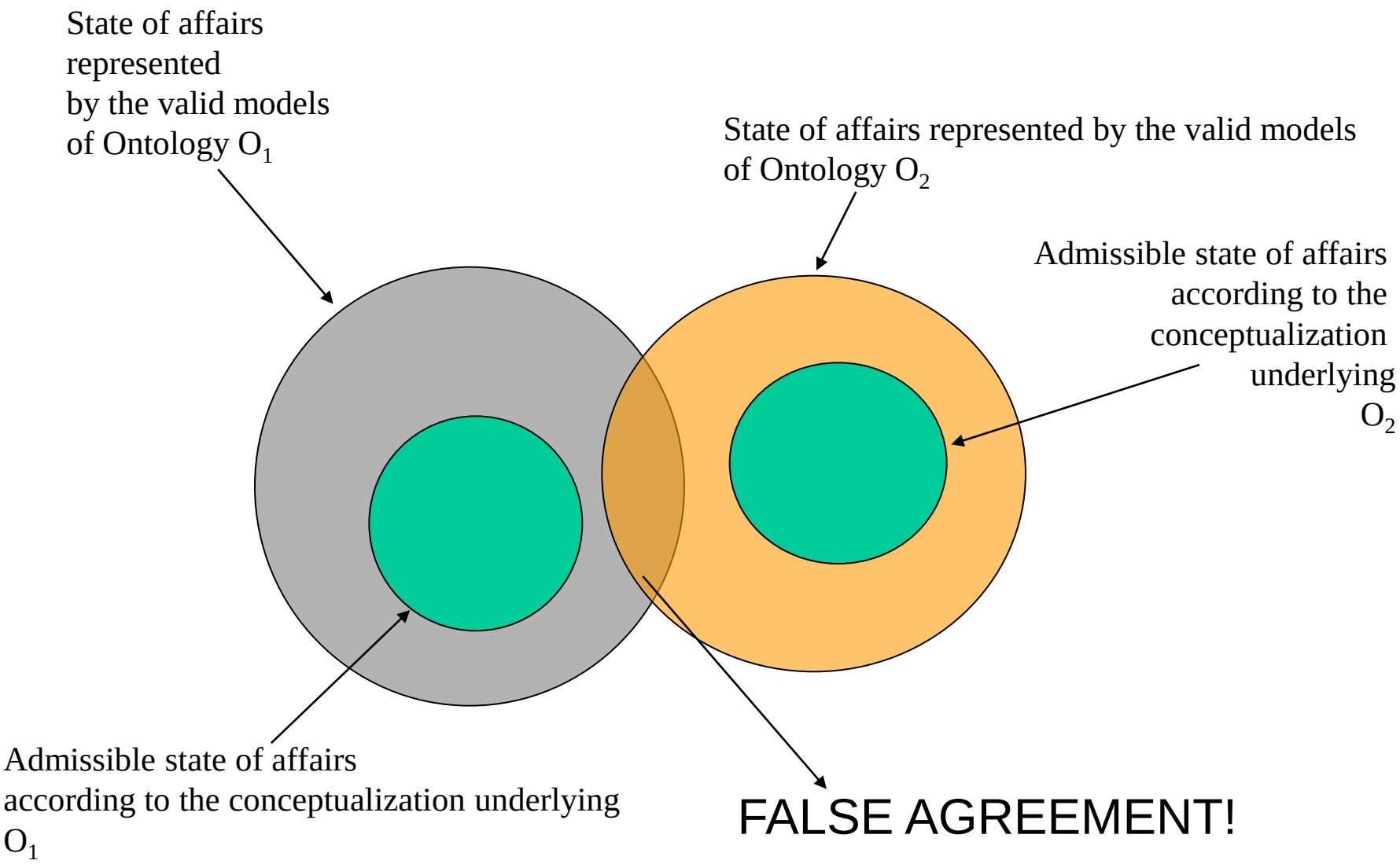
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according to the
conceptualization
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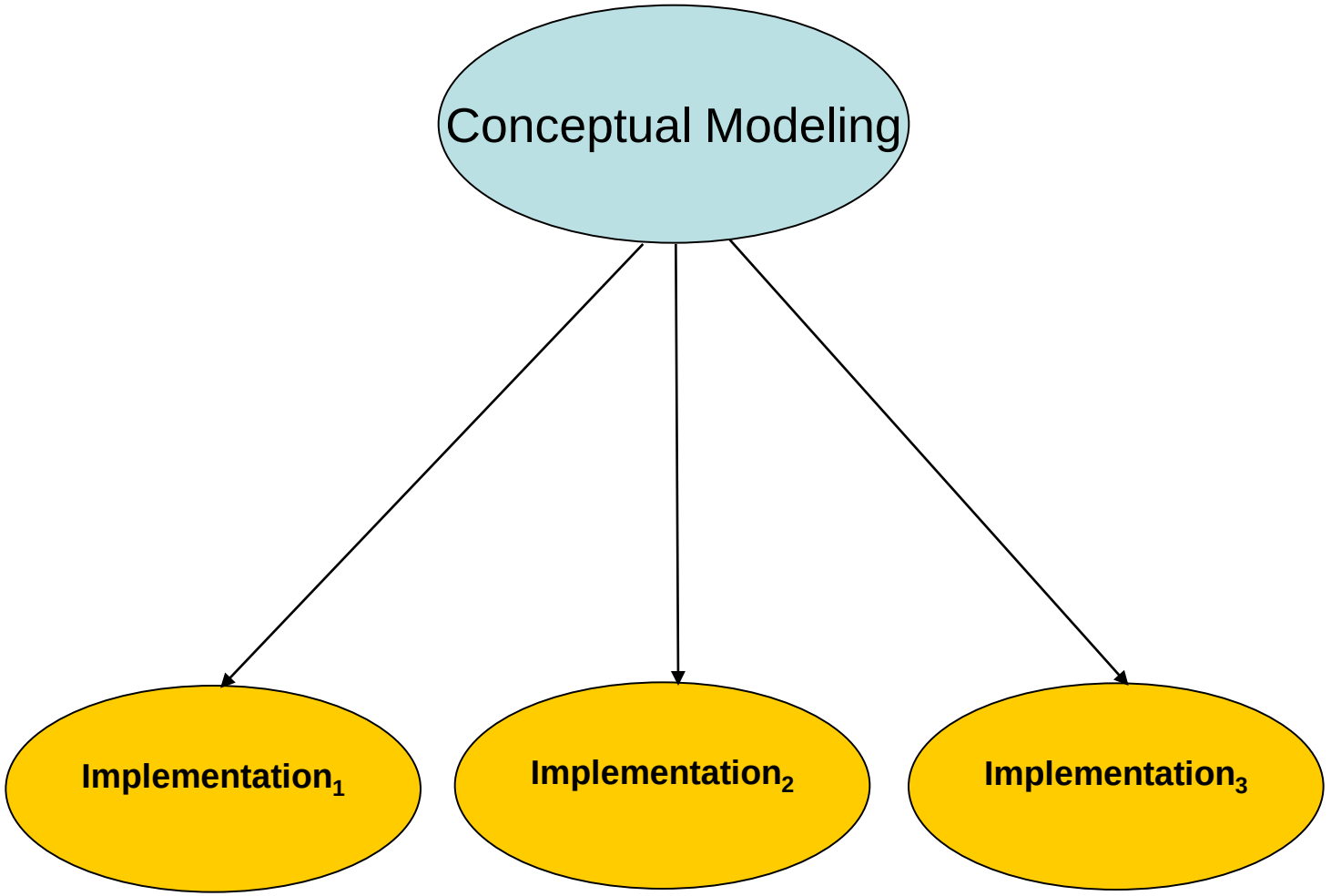
O_2
Admissible state of affairs
according to the conceptualization underlying
O_1
FALSE AGREEMENT!

"one of the main reasons that so many online market makers have foundered [is that] the transactions they had viewed as simple and routine actually involved *many subtle distinctions in terminology and meaning"*

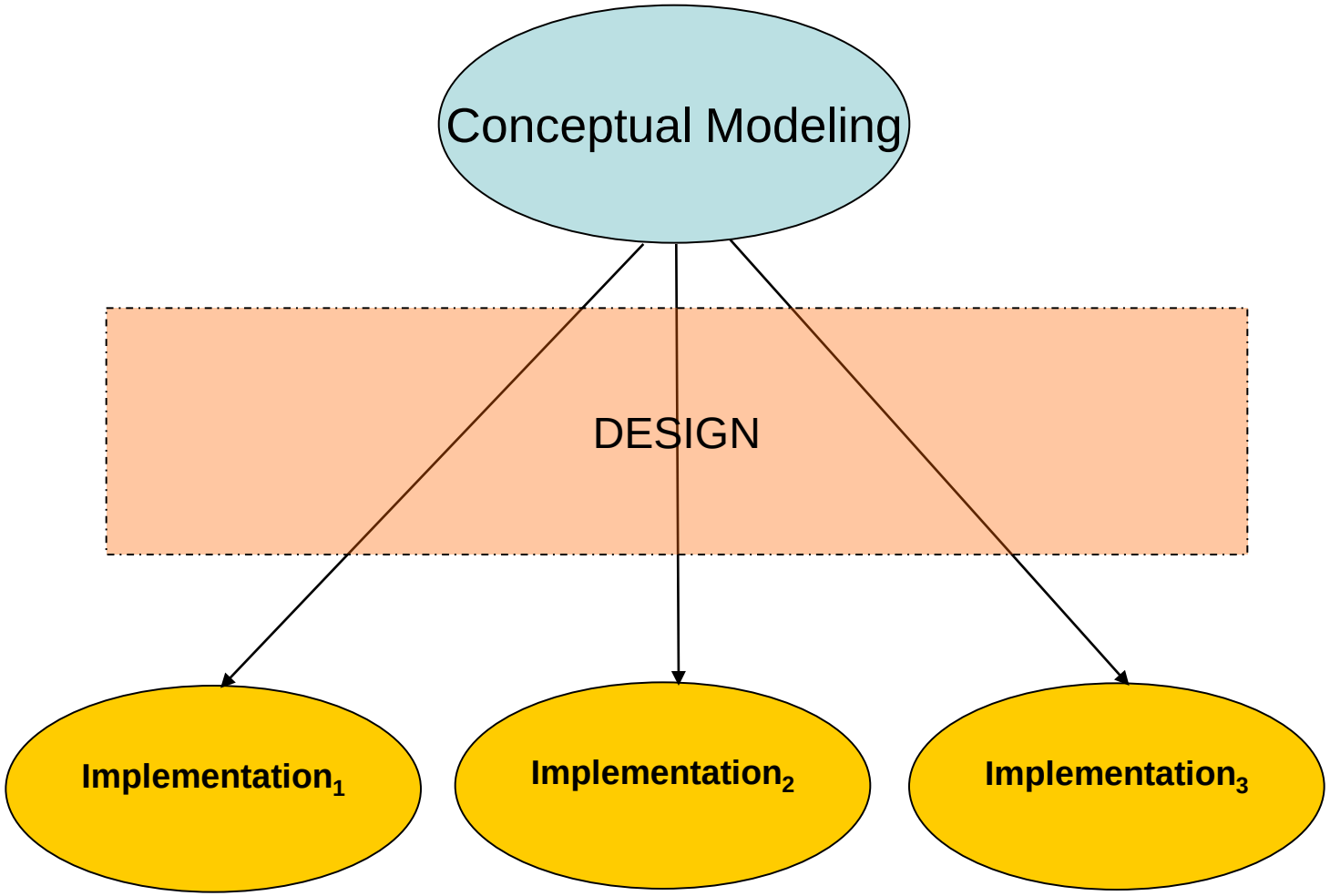
(Harvard Business Review)

1. We need to recognize that *There is not Silver Bullet!* and start seing ontology engineering from an engineering perspective

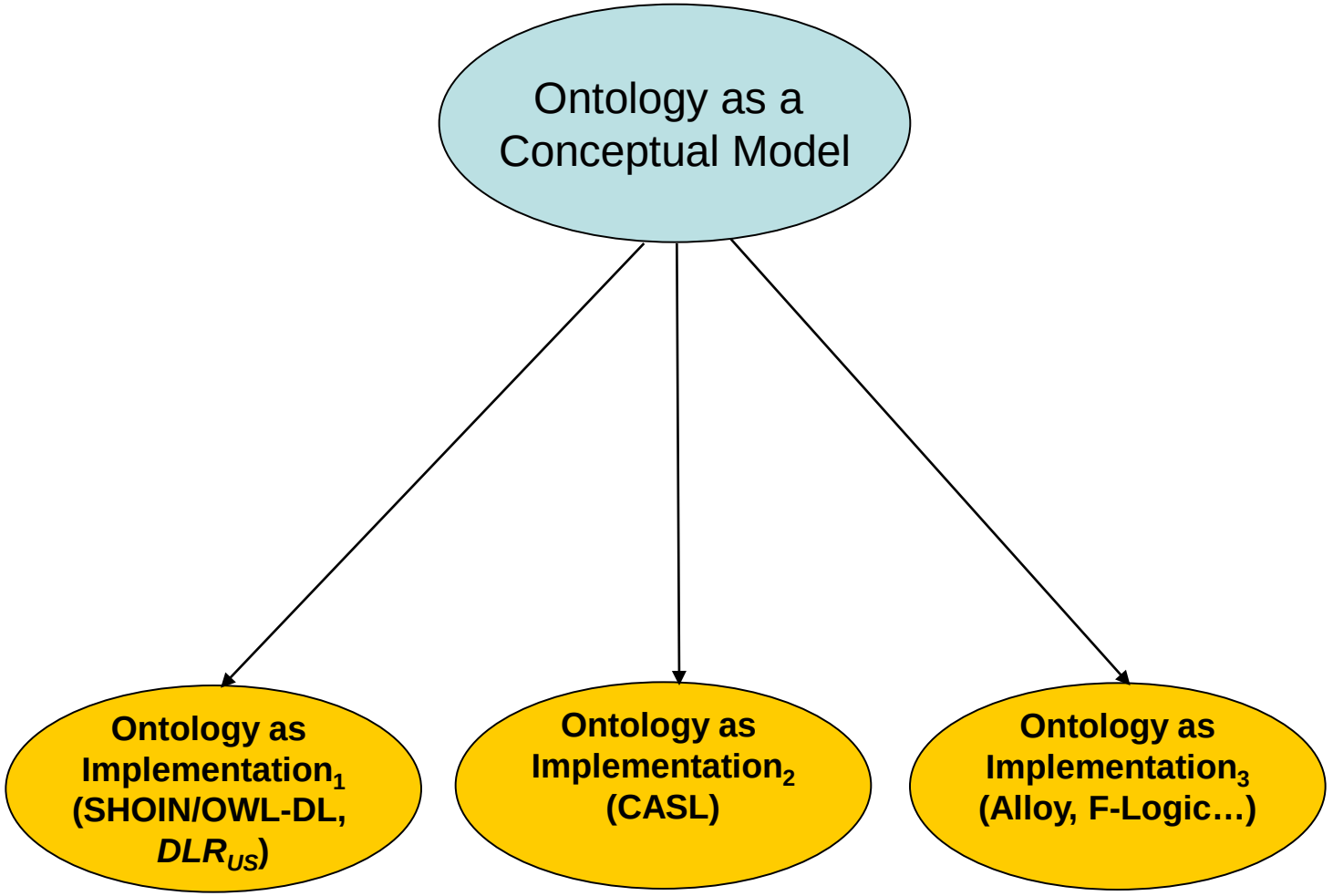
A Software Engineering view…



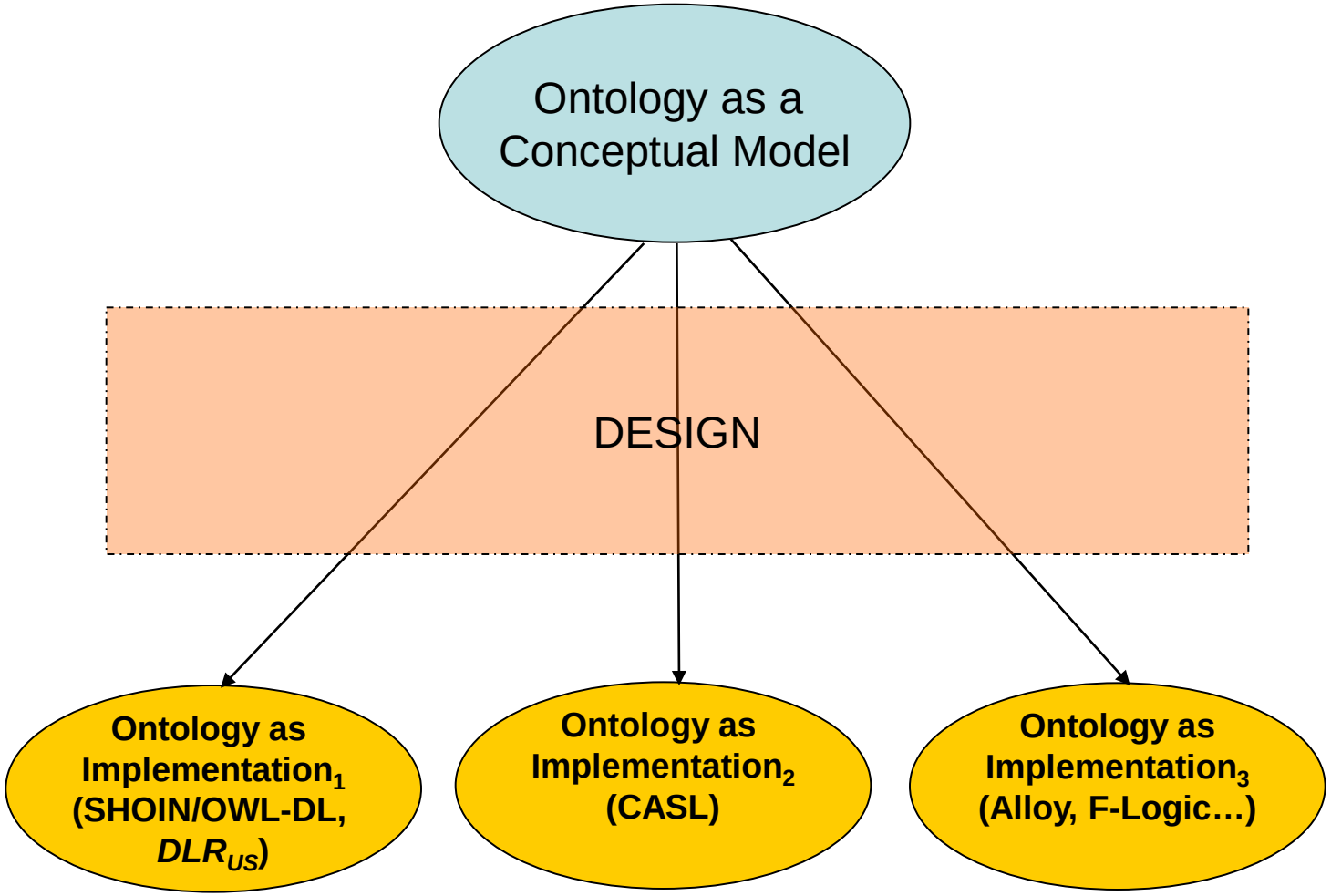
A Software Engineering view…



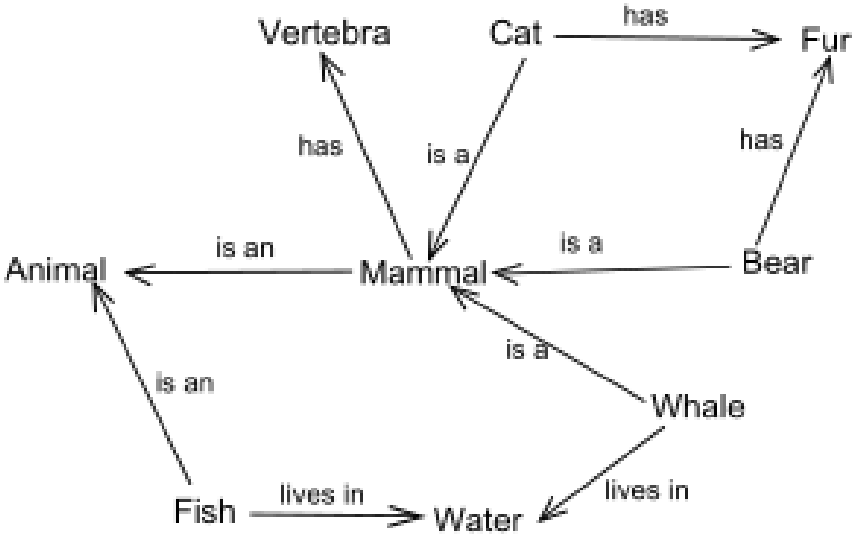
…transported to Ontological Engineering

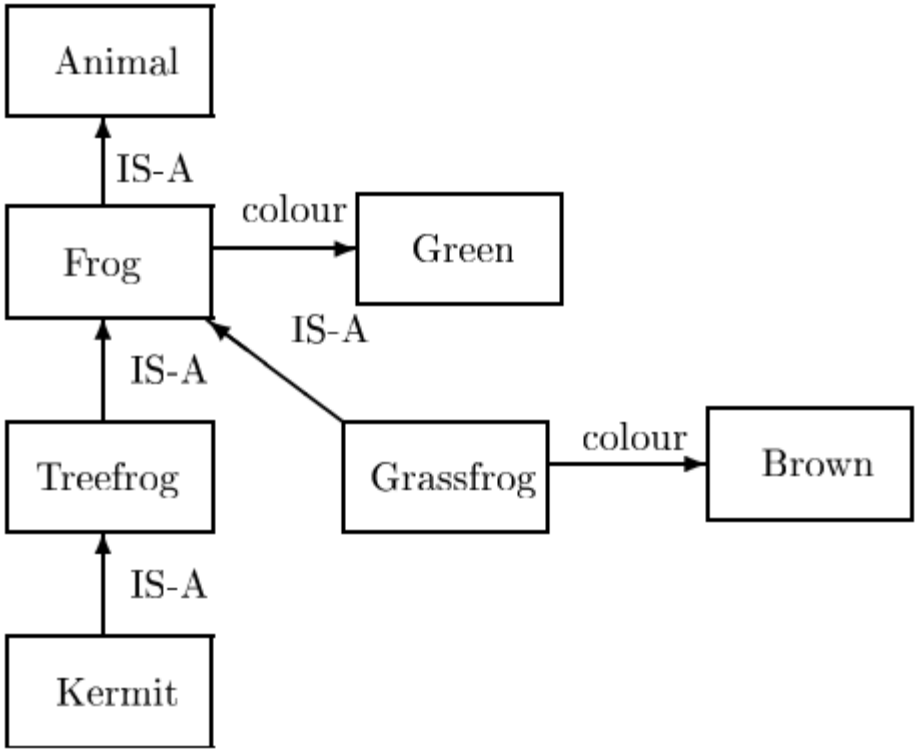


…transported to Ontological Engineering

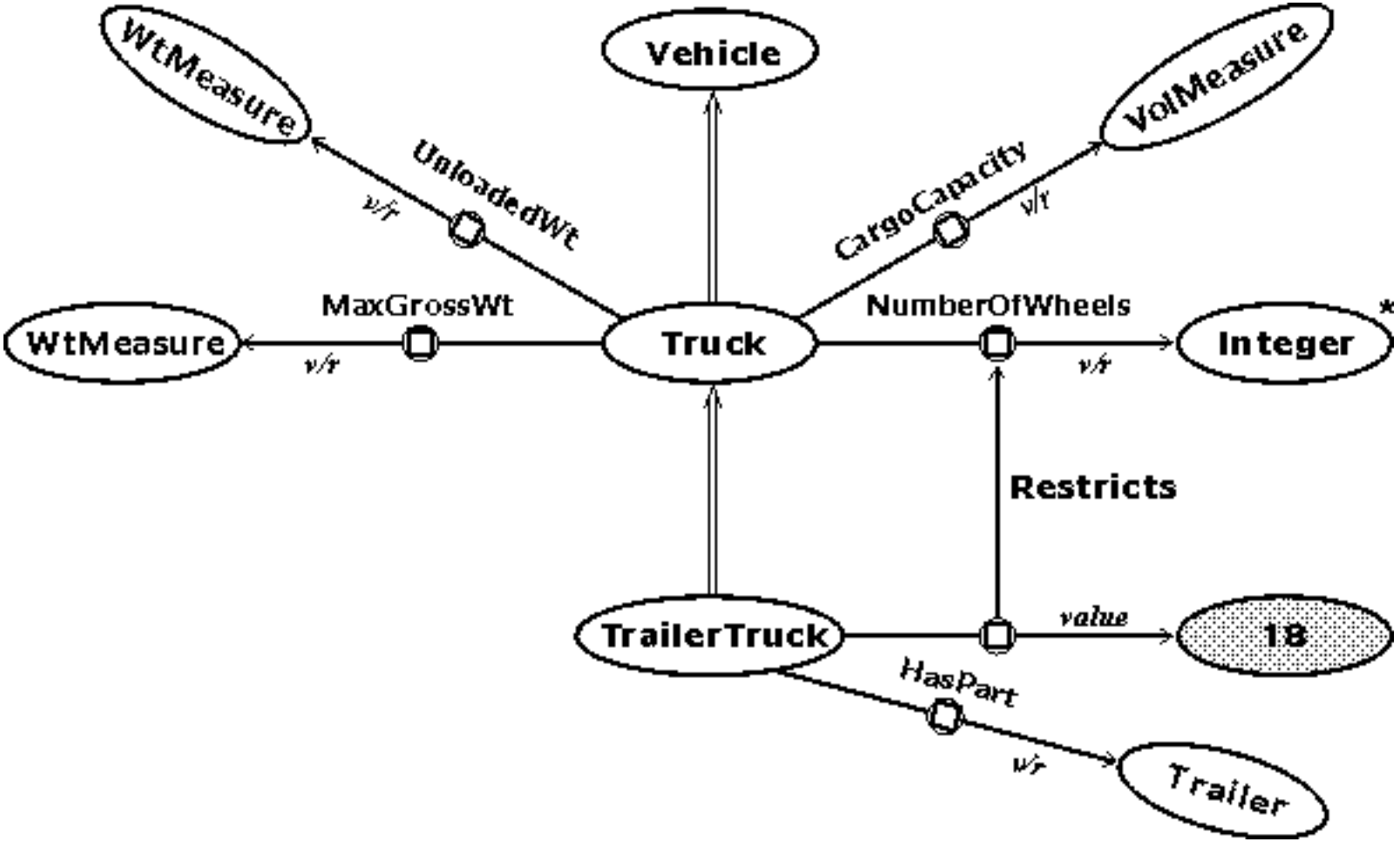


Semantic Networks (Collins & Quillian, 1967)





KL-ONE (Brachman, 1979)



The Logical Level

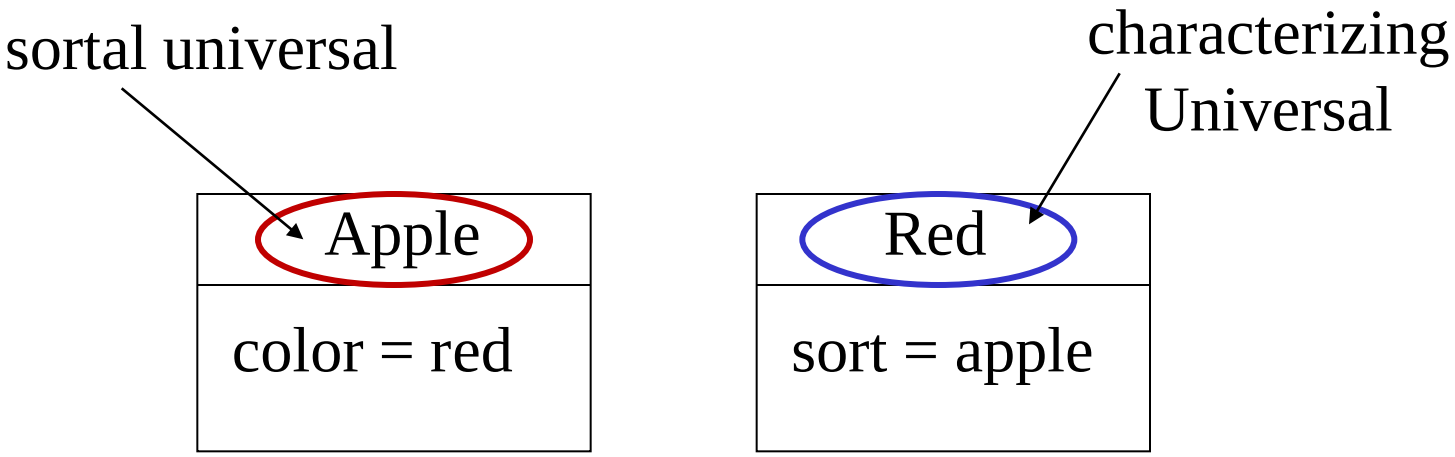
$\exists x\ \text{Apple}(x) \wedge \text{Red}(x)$

The Epistemological Level

Apple
color = red

Red
sort = apple

The Ontological Level

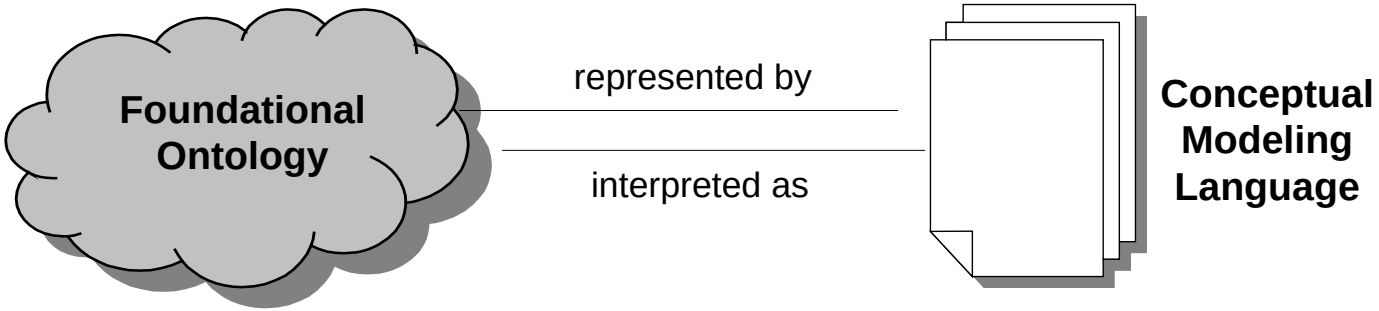


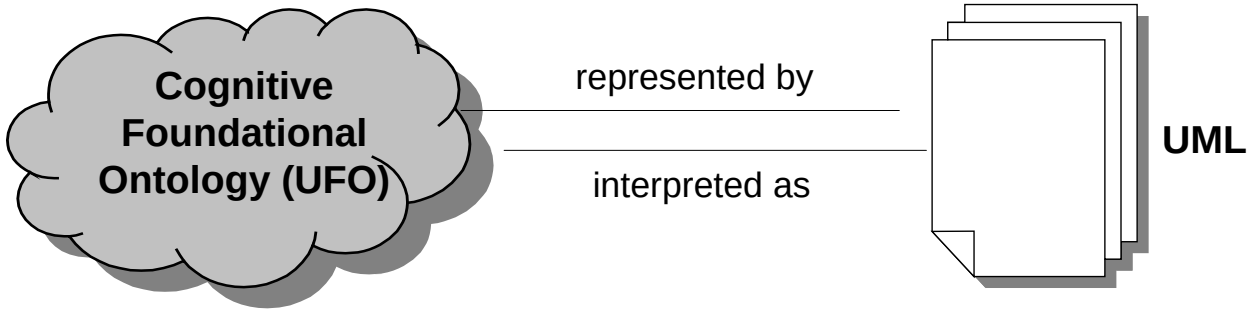
Formal Ontology

- To uncover and analyze the general categories and principles that describe reality is the very business of philosophical Formal Ontology
- Formal Ontology (Husserl): a discipline that deals with formal ontological structures (e.g. theory of parts, theory of wholes, types and instantiation, identity, dependence, unity) which apply to all material domains in reality.

Foundational Ontology

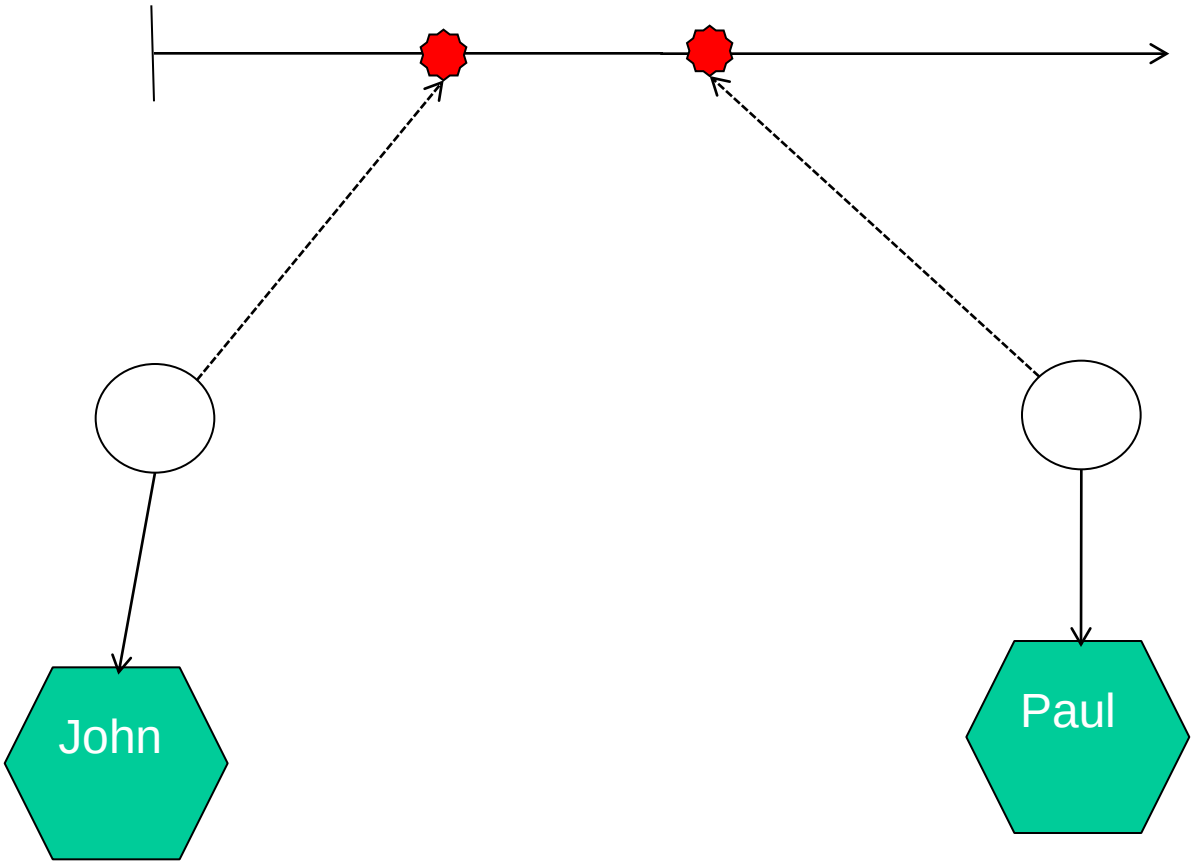
- We name a foundational ontology the product of the discipline of formal ontology in philosophy
- A foundational ontology is a formal framework of generic (i.e. domain independent) real-world concepts that can be used to talk about material domains.


Foundational Ontology
represented by
interpreted as
Conceptual Modeling Language

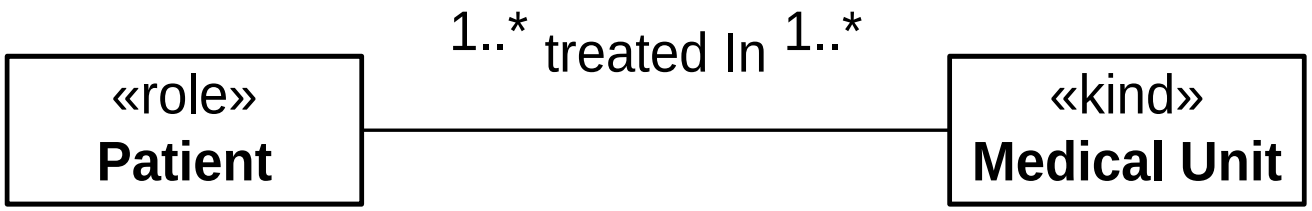

Cognitive Foundational Ontology (UFO)
represented by
interpreted as
UML

2. We need ontology representations languages which are based on *Truly Ontological Distinctions*

Formal Relations



Material Relations

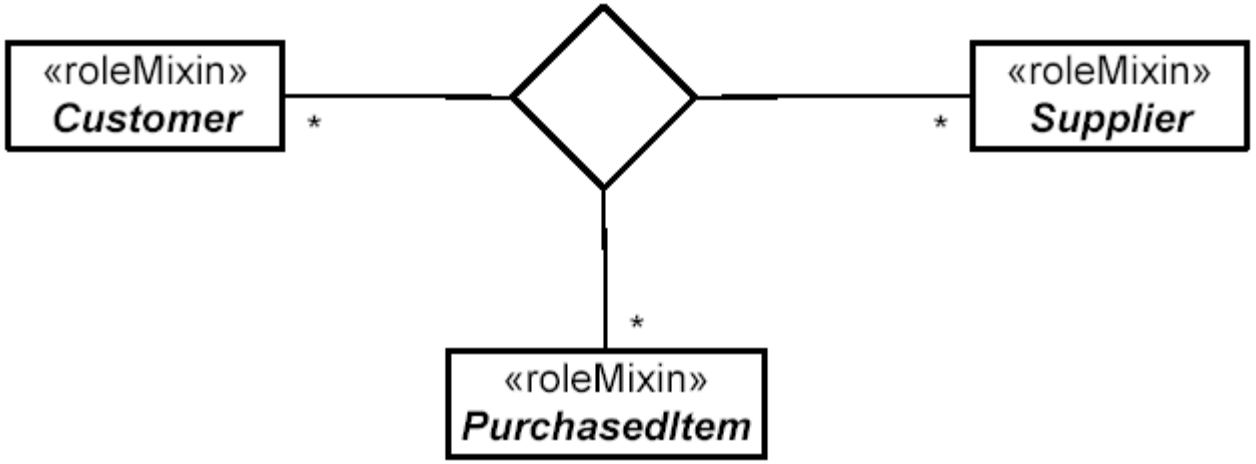


Material Relations

How are these cardinality constraints to be interpreted ?

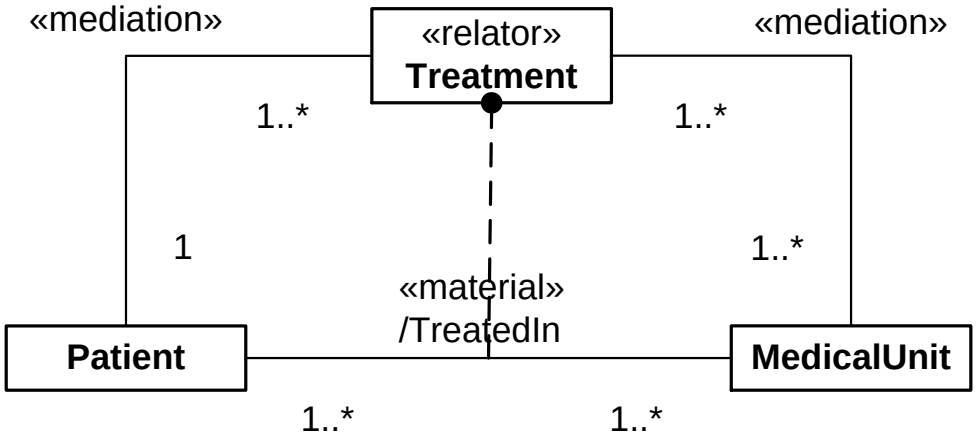
- In a treatment, a patient is treated by several medical units, and a patient can participate in many treatments
- In a treatment, a patient is treated by several medical units, but a patient can only participate in one treatment
- In a treatment, several patients can be treated by one medical unit, and a medical unit can participate in many treatments
- In a treatment, a patient is treated by one medical unit, and a patient can participate in many treatments
- ...

The problem is even worse in n-ary associations (with n > 2)



- In a given purchase, a Customer participates by buying many items from many Suppliers and a customer can participate in several purchases;
- In a given purchase, many Customers participate by buying many items from many Suppliers, and a customer can participate in only one purchase;
- In given purchase, a Customer participates by buying many items from a Supplier, and a customer can participate in several purchases;
- In given purchase, many Customers participate by buying many items from a Supplier, and a customer can participate in several purchases;

Explicit Representation for Material Relations



Material Relations

As seen before from a relator and mediation relation we can derive several material relations

Asides from all the benefits previously mentioned, perhaps the most important contribution of explicitly considering relations is to force the modeler to answer the fundamental question of what is *truthmaker* of that relation

Material Relations

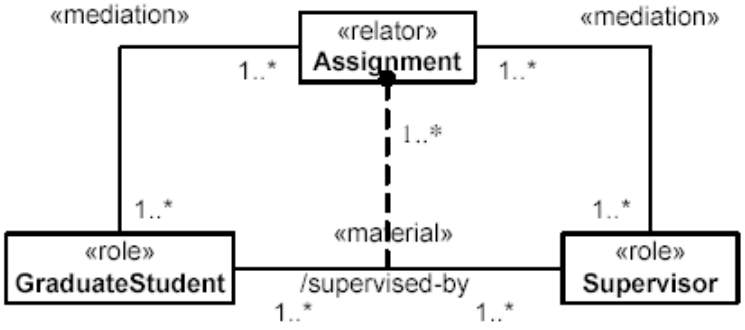
Yet another example:

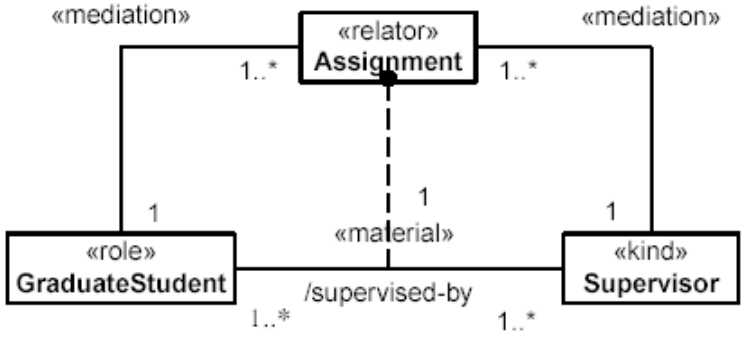
Modeling that a graduate student have one or more supervisors and a supervisor can supervise one or more students

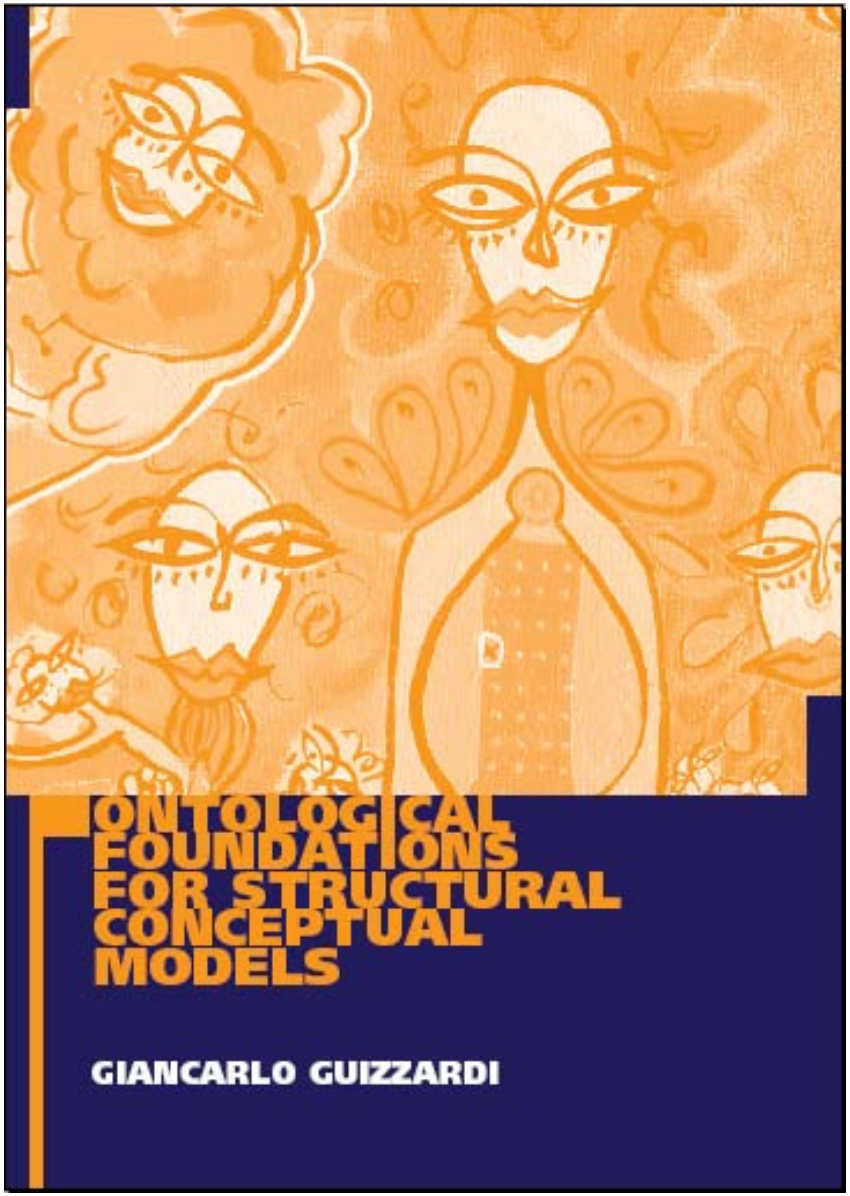
Material Relations

Yet another example:

Modeling that a graduate student have one or more supervisors and a supervisor can supervise one or more students






ONTOLOGICAL
FOUNDATIONS
FOR STRUCTURAL
CONCEPTUAL
MODELS
GIANCARLO GUIZZARDI

Unified Foundational Ontology (UFO)

UFO-C (SOCIAL ASPECTS)
(Agents, Intentional States, Goals, Actions,
Norms, Social Commitments/Claims, Social Dependency Relations…)

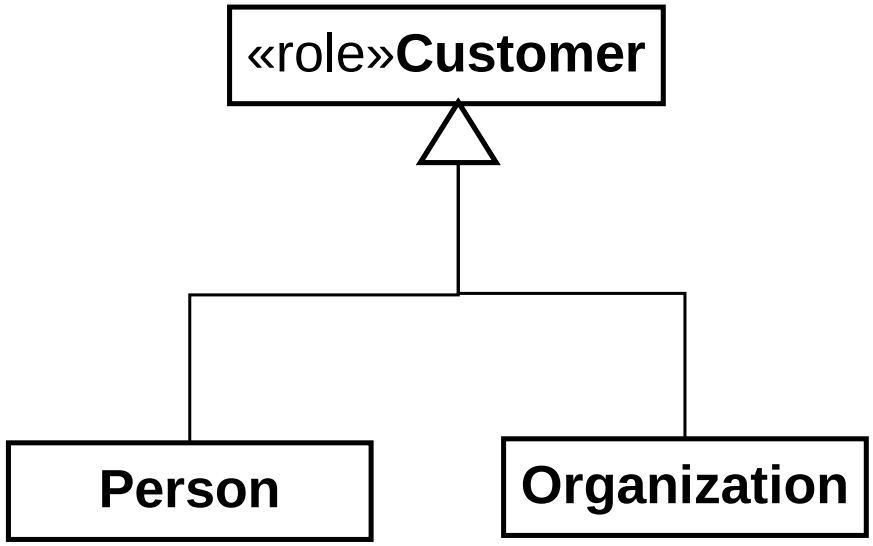
UFO-A (STRUCTURAL ASPECTS)
(Objects, their types, their parts/wholes,
the roles they play,
their intrinsic and relational properties
Property value spaces…)

UFO-B (DYNAMIC ASPECTS)
(Events and their parts,
Relations between events,
Object participation in events,
Temporal properties of entities, Time…)

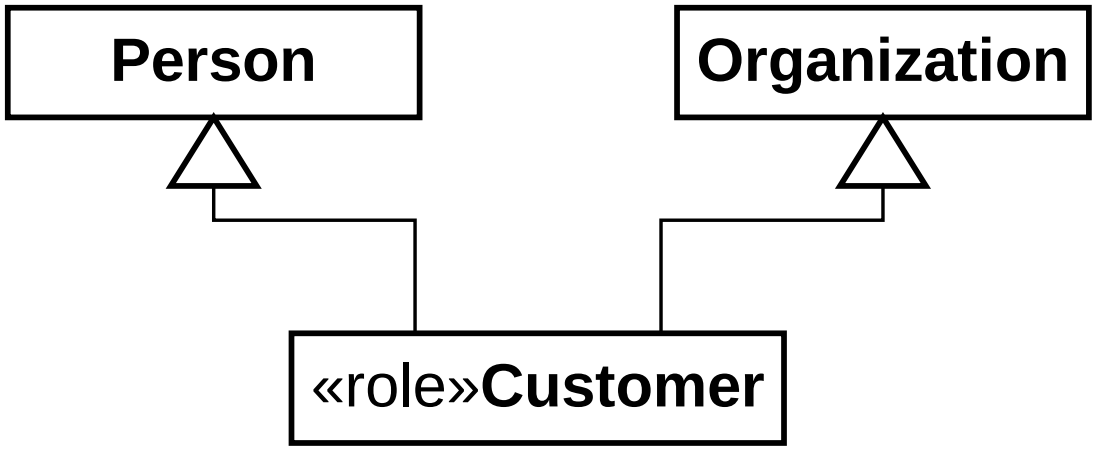
3. We need Patterns

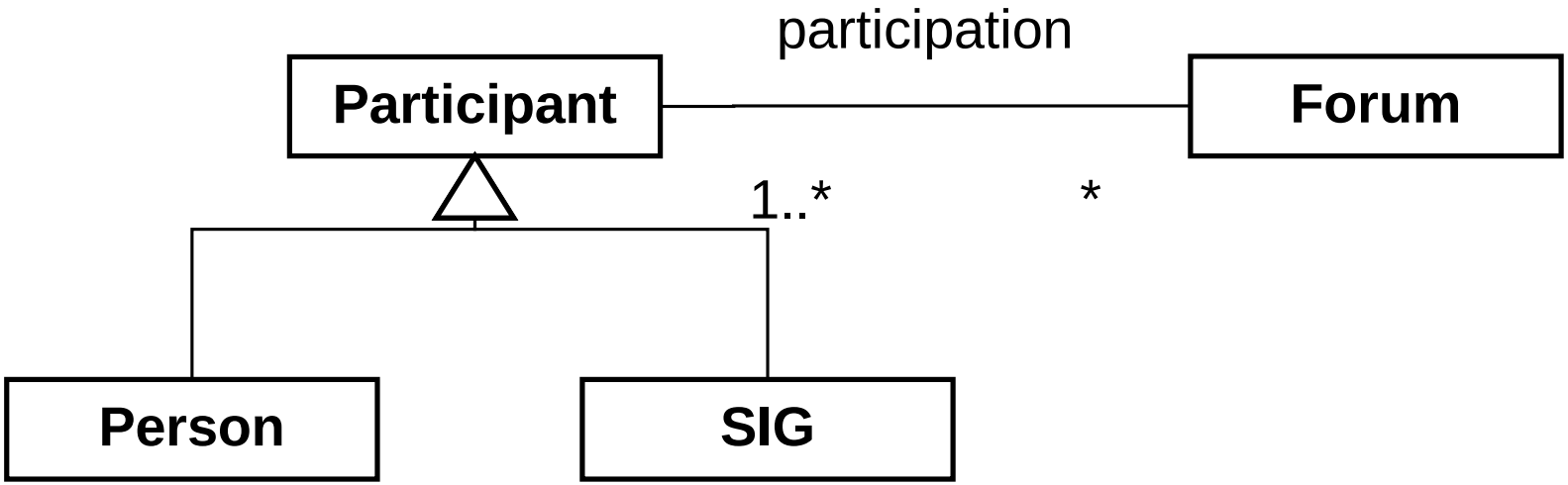
- *Design Patterns*
- *Analysis Patterns*
- *Transformation Patterns*
- *Patterns Languages*

Roles with Disjoint Allowed Types



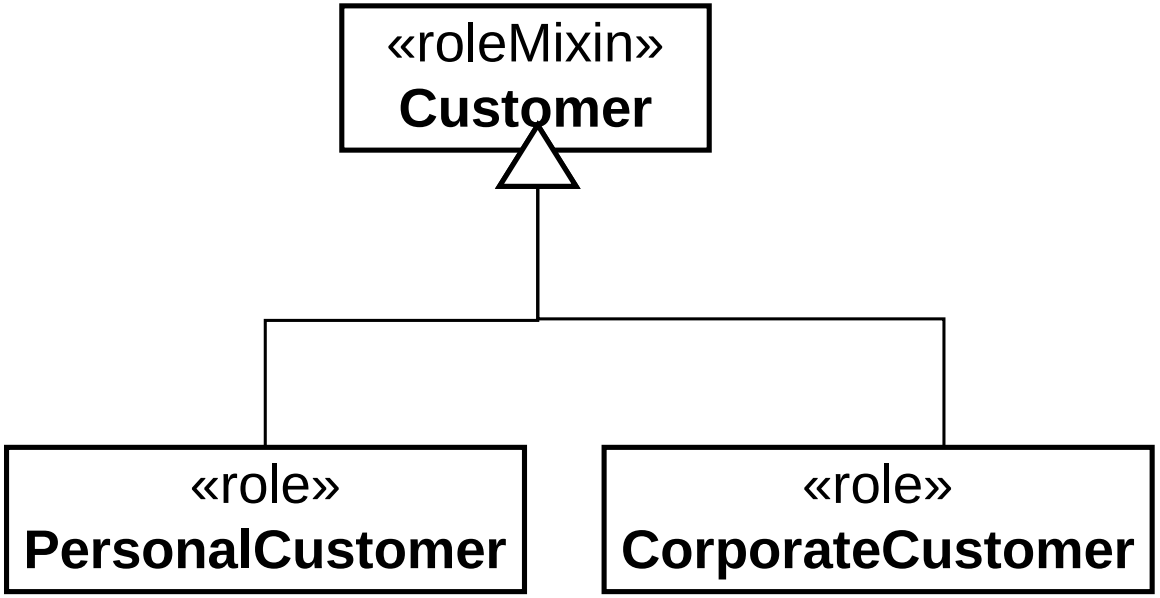
Roles with Disjoint Allowed Types



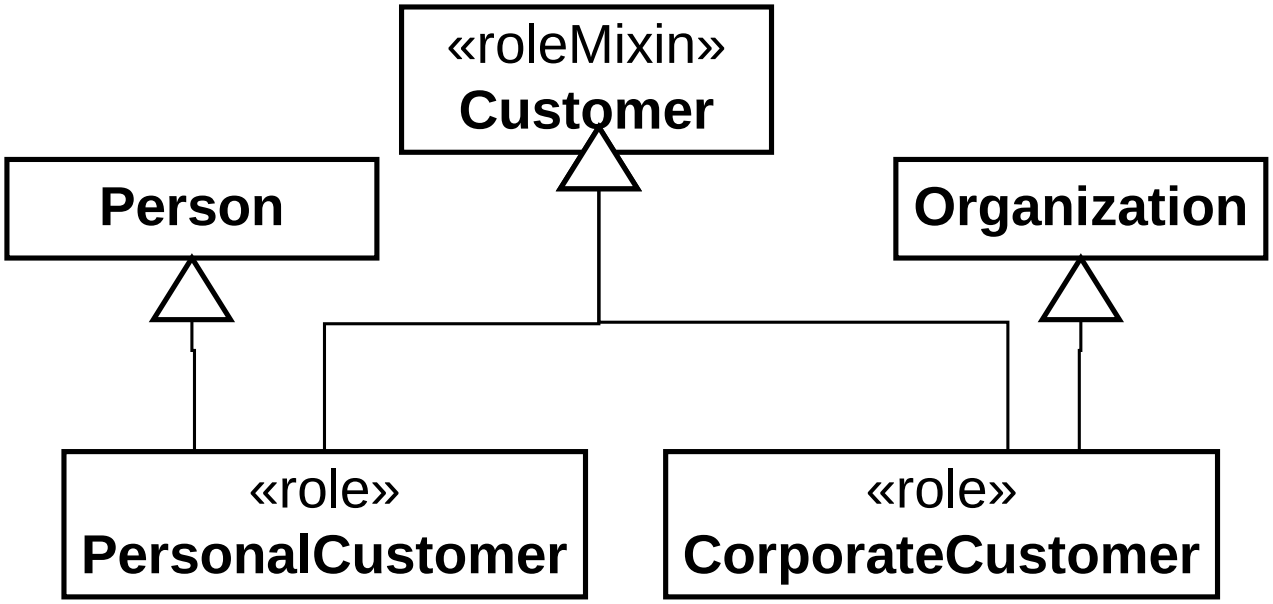

participation
Participant
Forum
1..*
*
Person
SIG

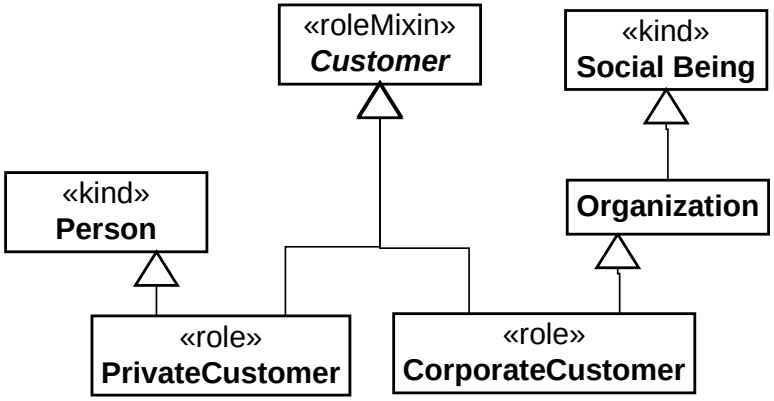
Roles with Disjoint Admissible Types

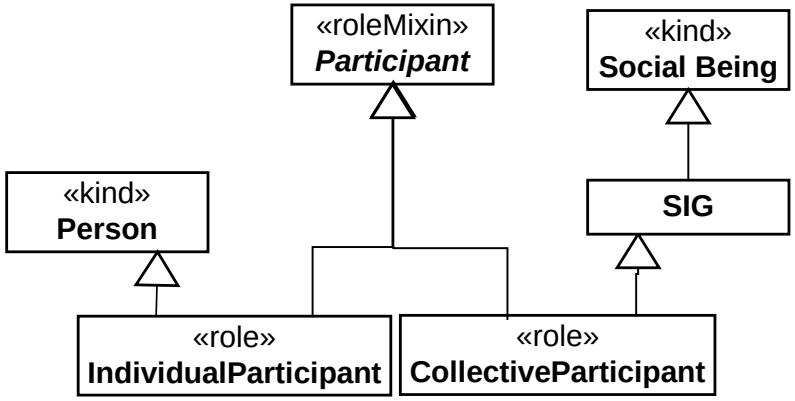
Roles with Disjoint Allowed Types



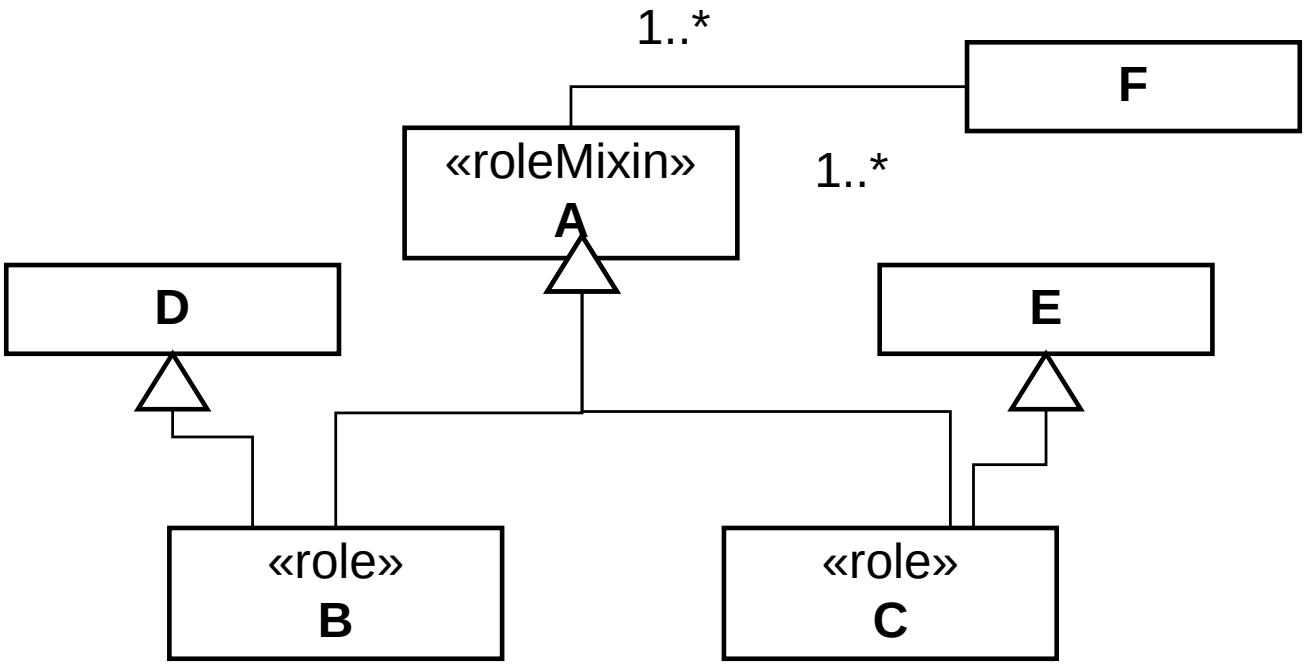
Roles with Disjoint Allowed Types



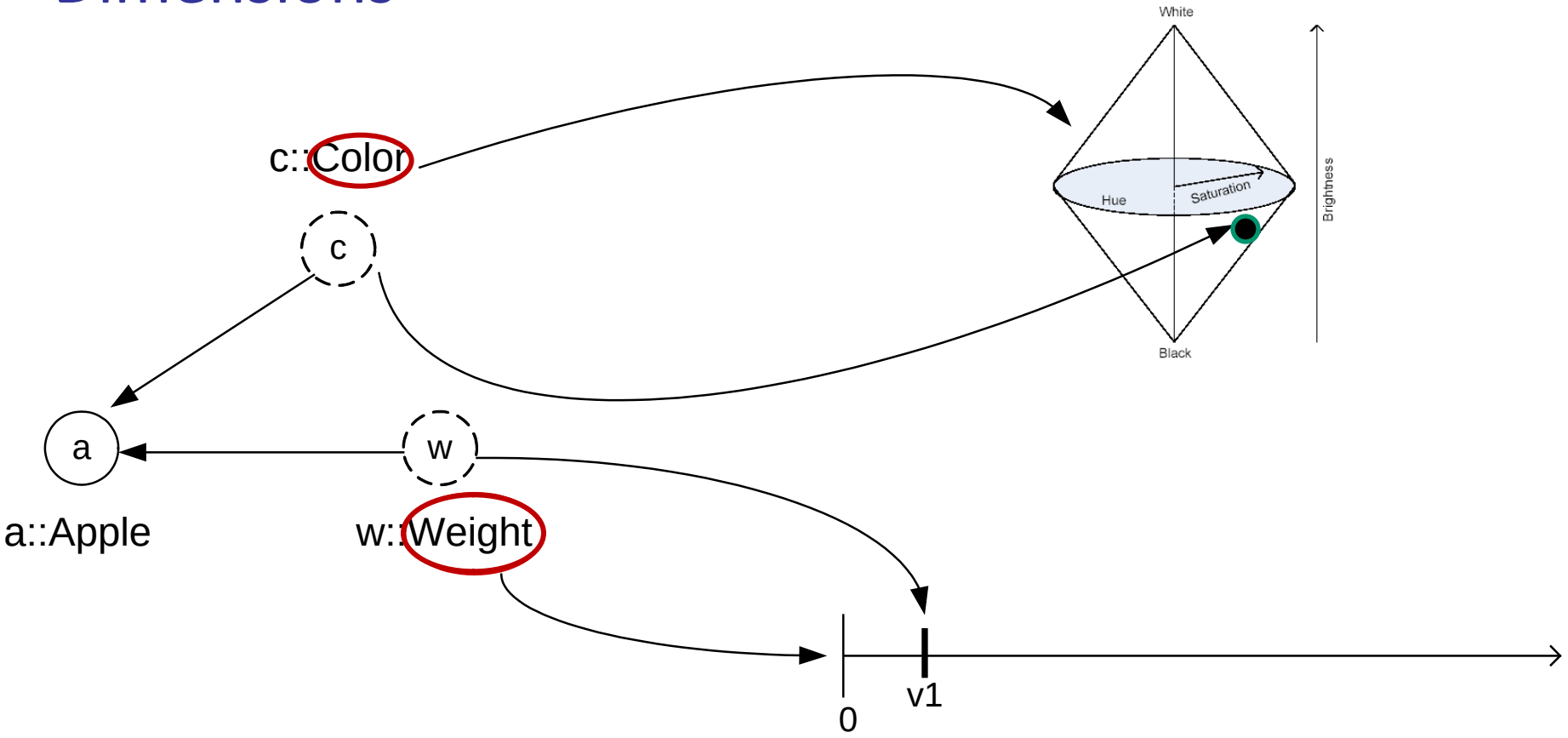

«roleMixin»
Customer
«kind»
Social Being
«kind»
Person
Organization
«role»
PrivateCustomer
«role»
CorporateCustomer


«roleMixin»
Participant
«kind»
Social Being
«kind»
Person
SIG
«role»
IndividualParticipant
«role»
CollectiveParticipant

Roles with Disjoint Admissible Types

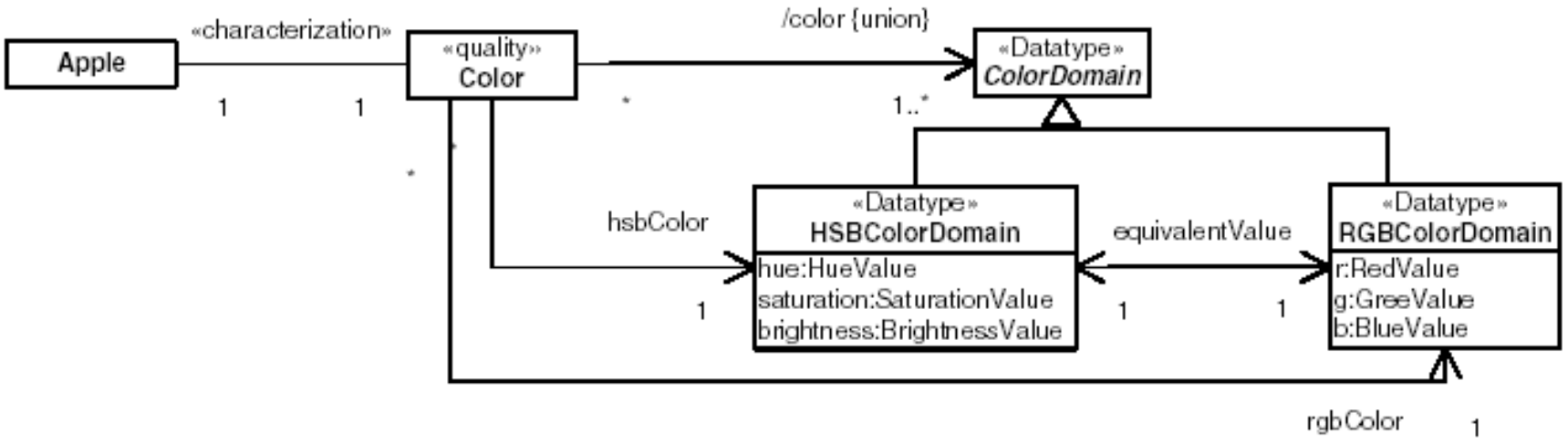


Quality, Quality Values and Quality Dimensions

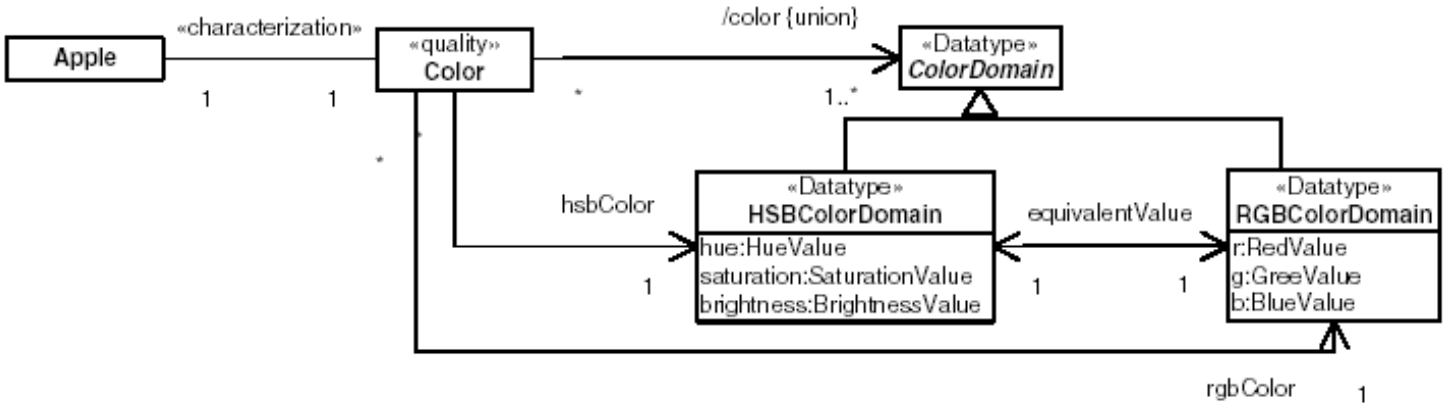


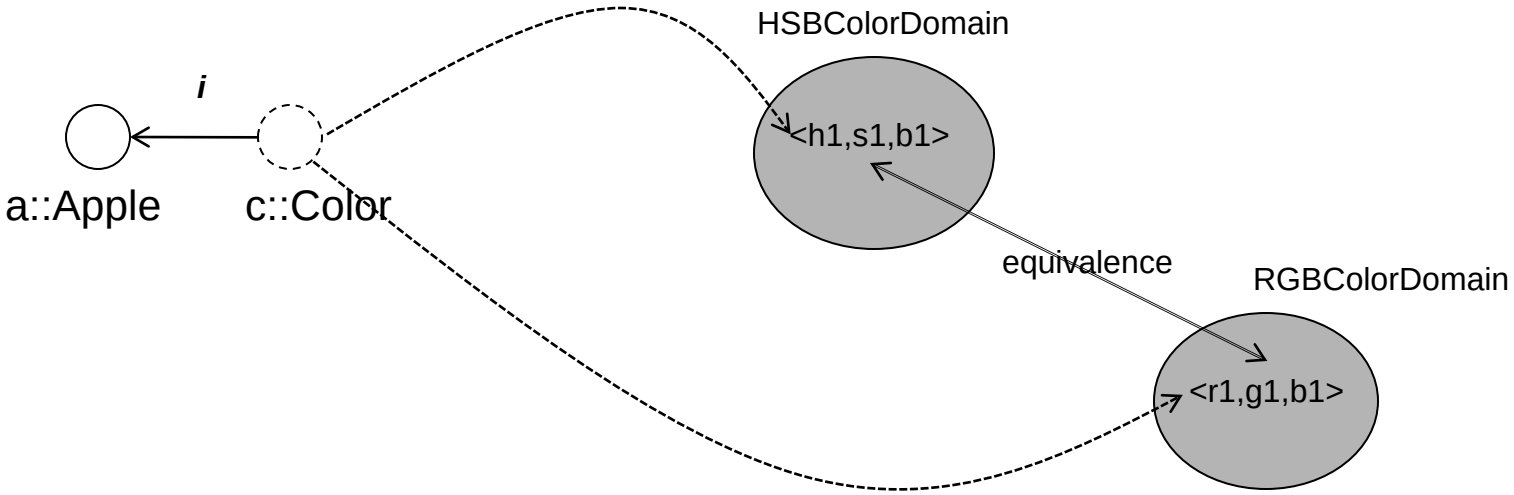
Weight Quality Space

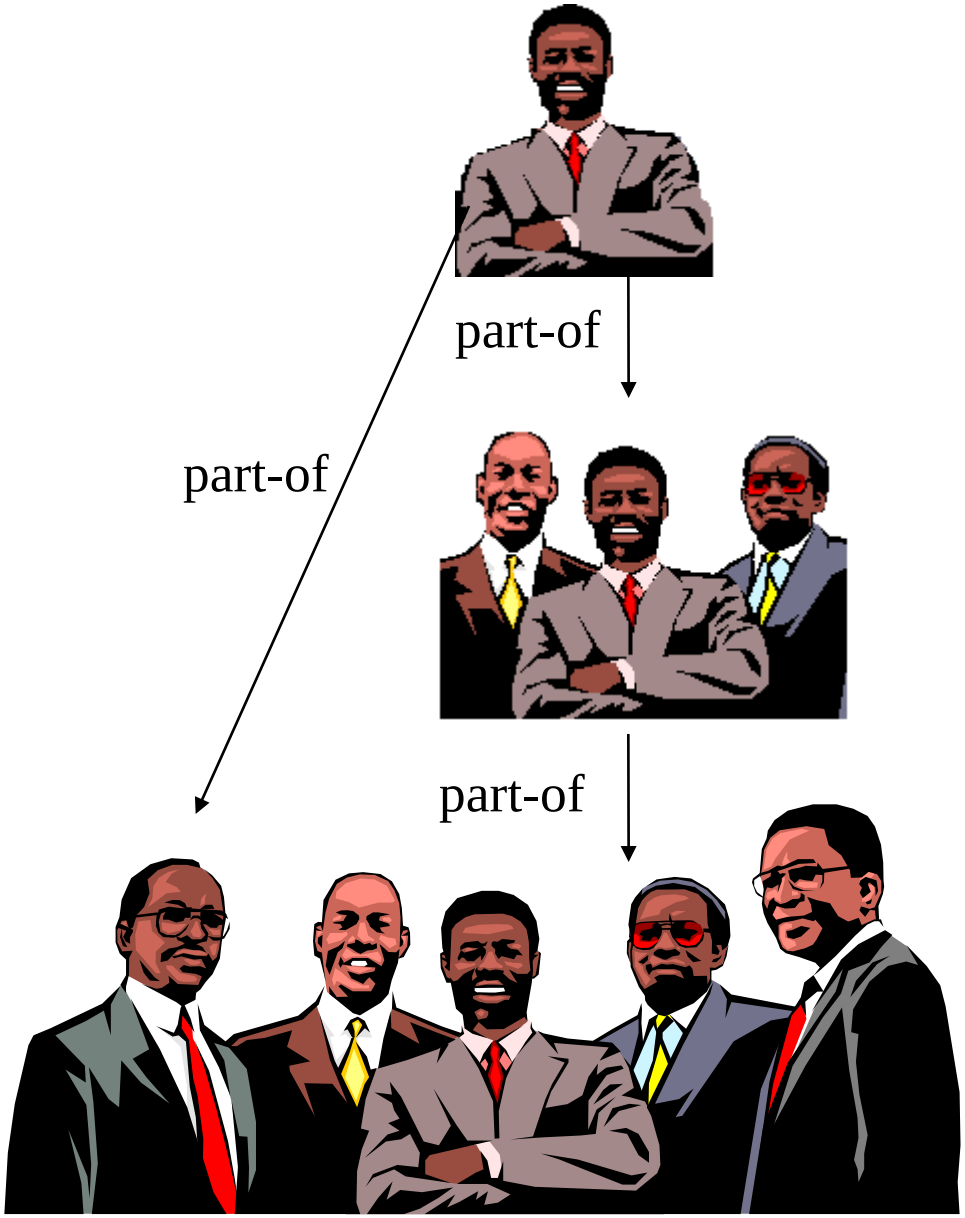
Representing Qualities and Quality Structures Explicitly



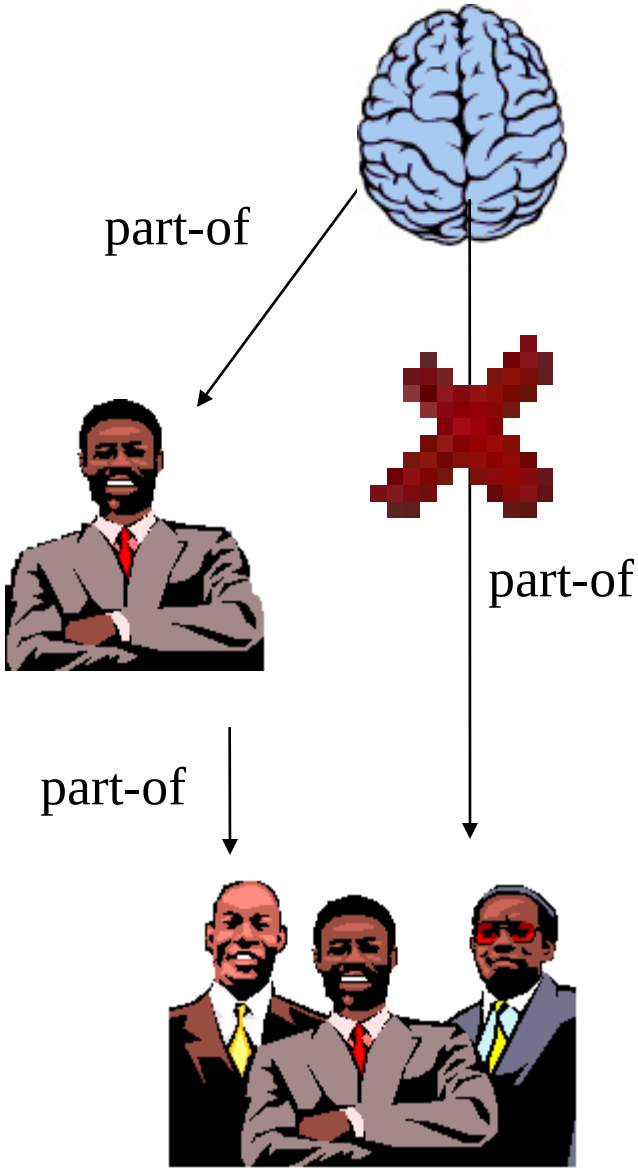
Representing Qualities and Quality Structures Explicitly





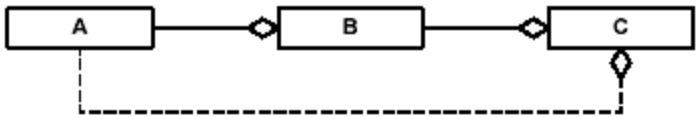


John

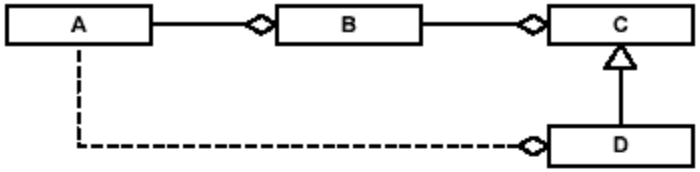


John's Brain

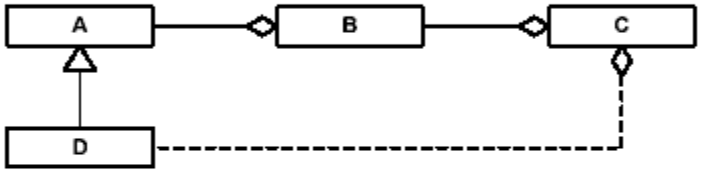
John



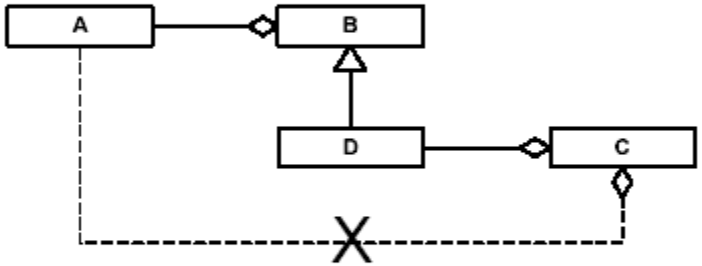
(a)



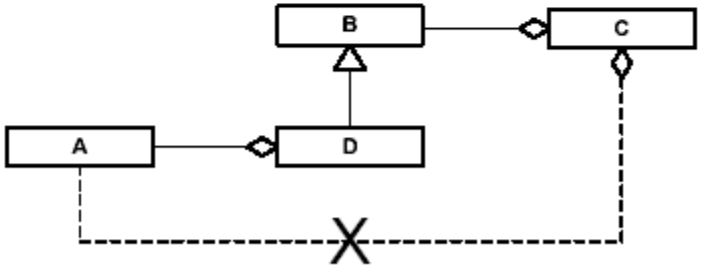
(b)



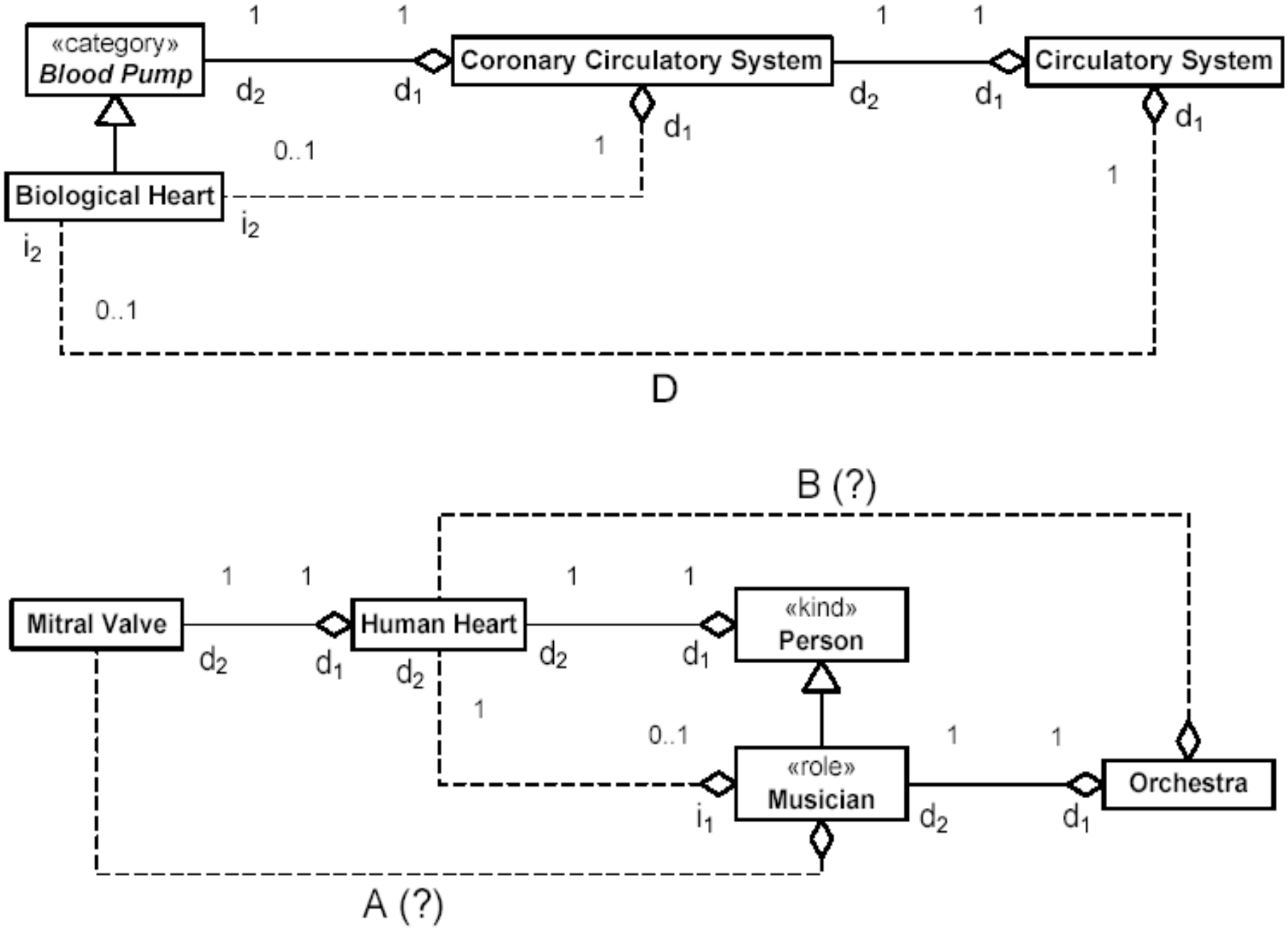
(c)

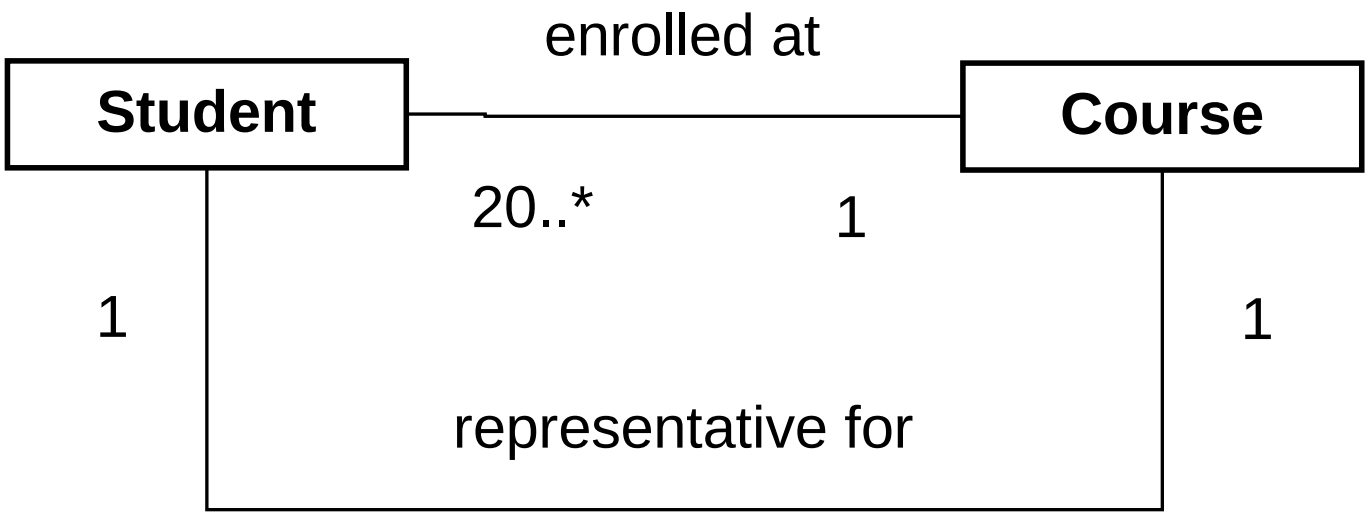


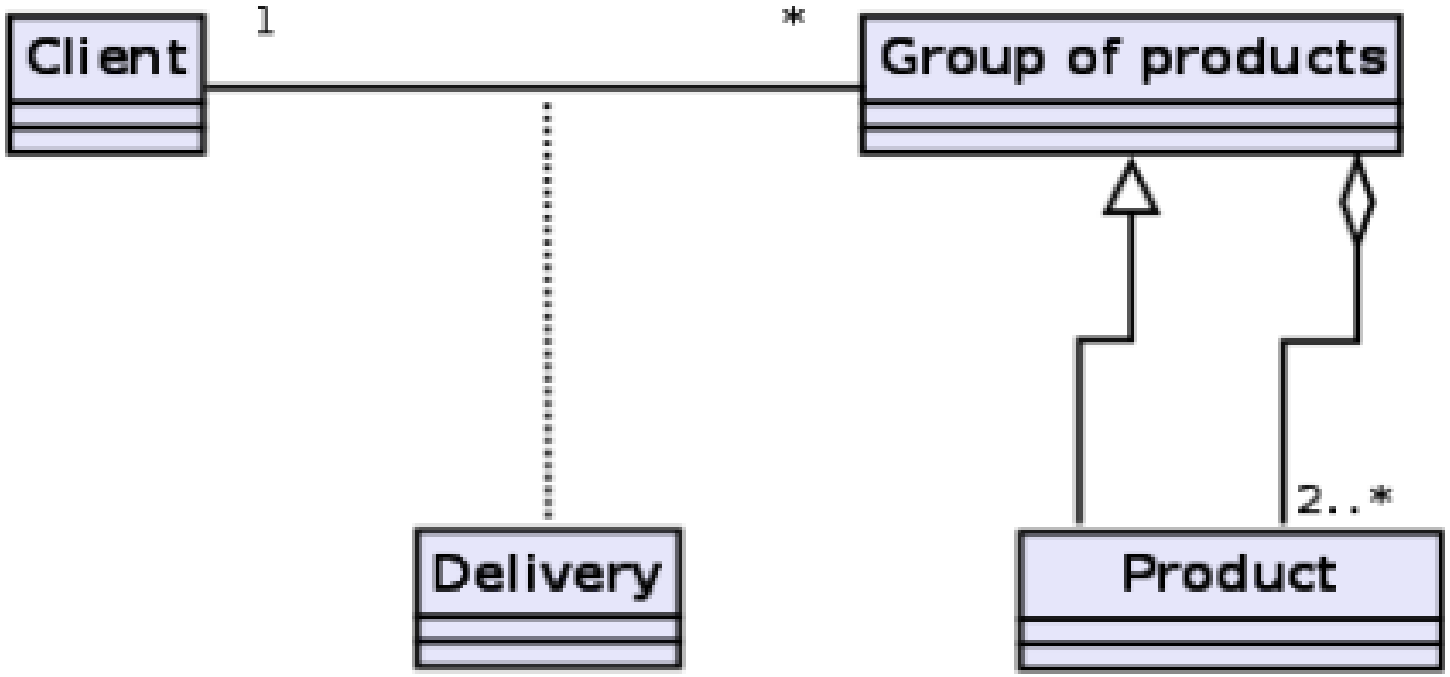
(d)



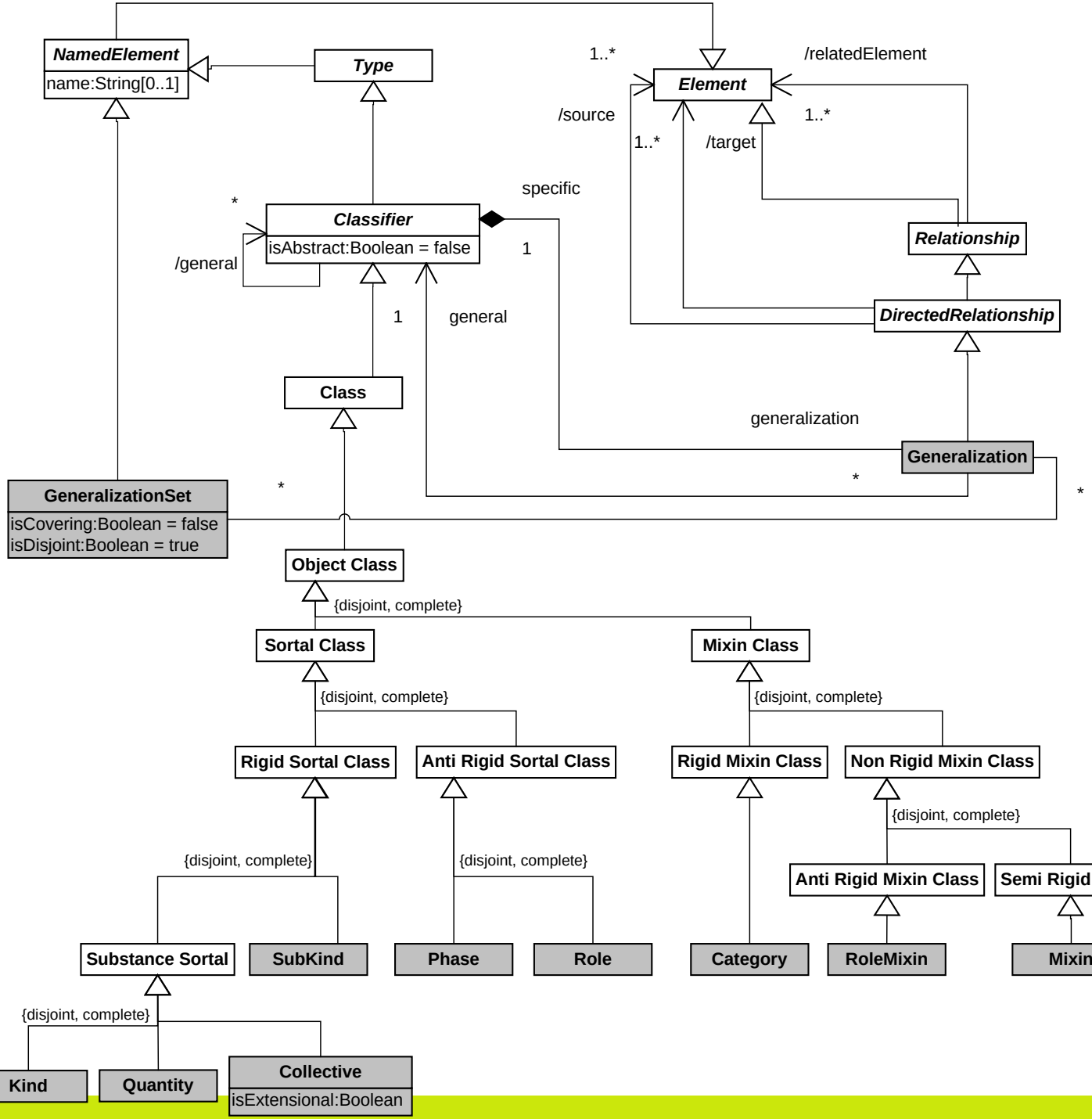
(e)

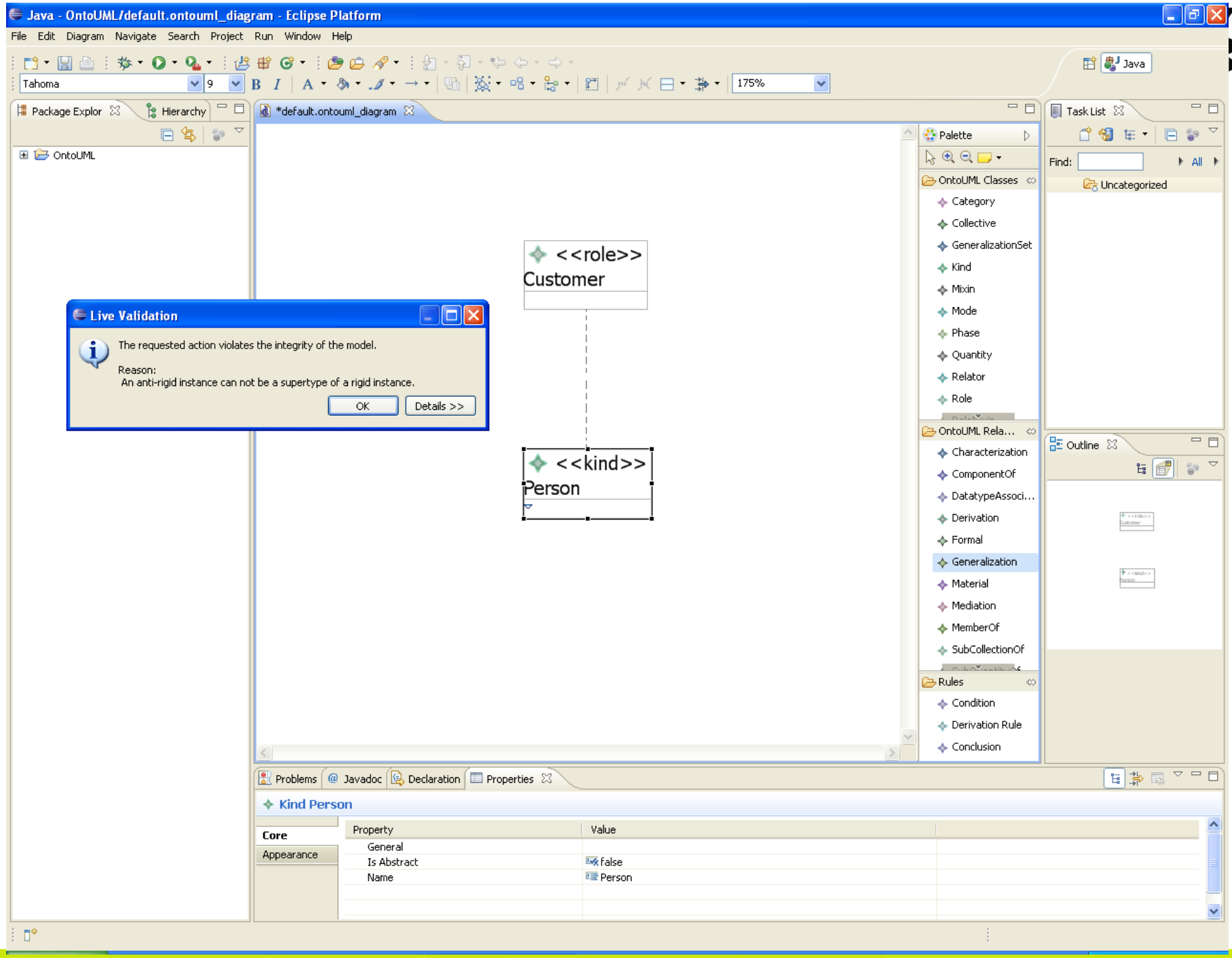

«category»
Blood Pump
Coronary Circulatory System
Circulatory System
Biological Heart
1
1
1
1
d2
d1
d2
d1
d1
d1
0..1
1
1
i2
i2
0..1
D
B (?)
Mitral Valve
Human Heart
«kind»
Person
«role»
Musician
Orchestra
1
1
1
1
d2
d1
d2
d2
d1
1
0..1
1
1
i1
d2
d1
A (?)

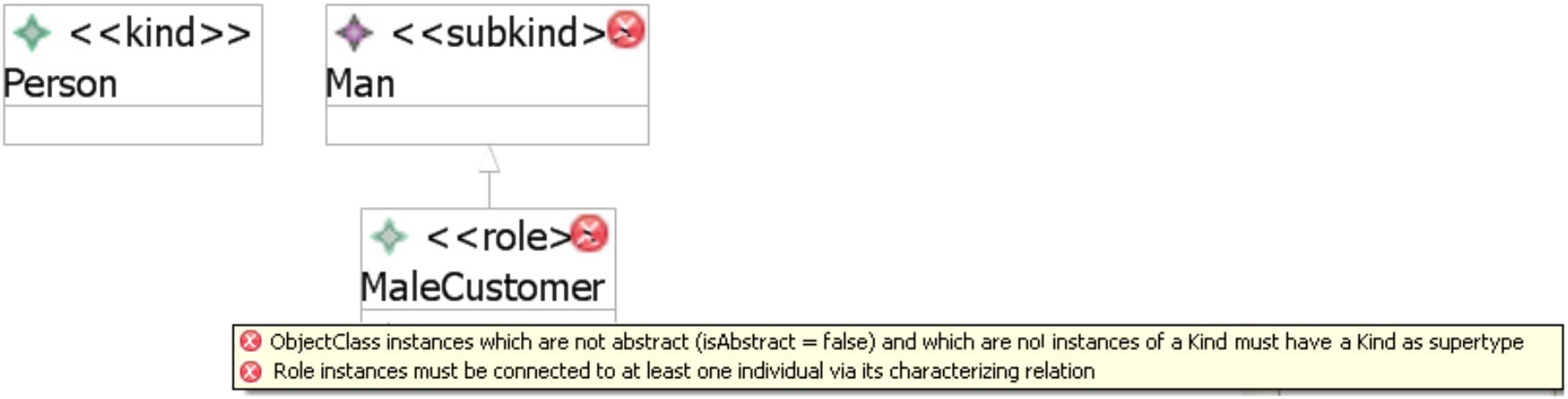

enrolled at
Student
Course
20..*
1
1
1
representative for


Client
1
*
Group of products
Delivery
2..*
Product

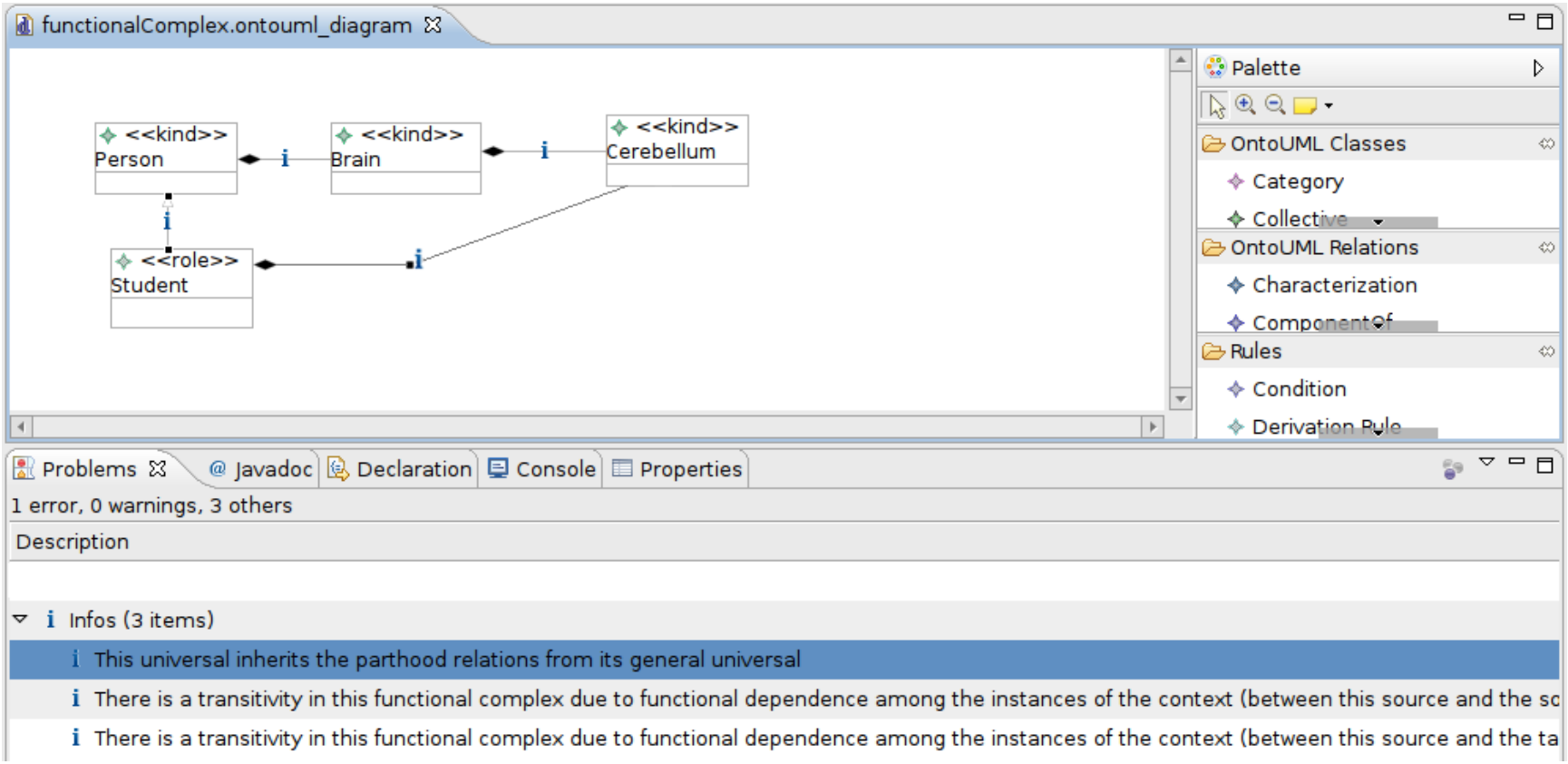
4. We need tools to create, verify, validate and handle the complexity of the produced models


NamedElement
name:String[0..1]
Type
1..*
/relatedElement
Element
/source
1..*
1..*
/target
specific
*
Classifier
isAbstract:Boolean = false
1
/general
Relationship
1
general
DirectedRelationship
Class
generalization
Generalization
*
*
*
GeneralizationSet
isCovering:Boolean = false
isDisjoint:Boolean = true
Object Class
{disjoint, complete}
Sortal Class
Mixin Class
{disjoint, complete}
{disjoint, complete}
Rigid Sortal Class
Anti Rigid Sortal Class
Rigid Mixin Class
Non Rigid Mixin Class
{disjoint, complete}
{disjoint, complete}
{disjoint, complete}
Anti Rigid Mixin Class
Semi Rigid Mixin
Substance Sortal
SubKind
Phase
Role
Category
RoleMixin
Mixin
{disjoint, complete}
Kind
Quantity
Collective
isExtensional:Boolean

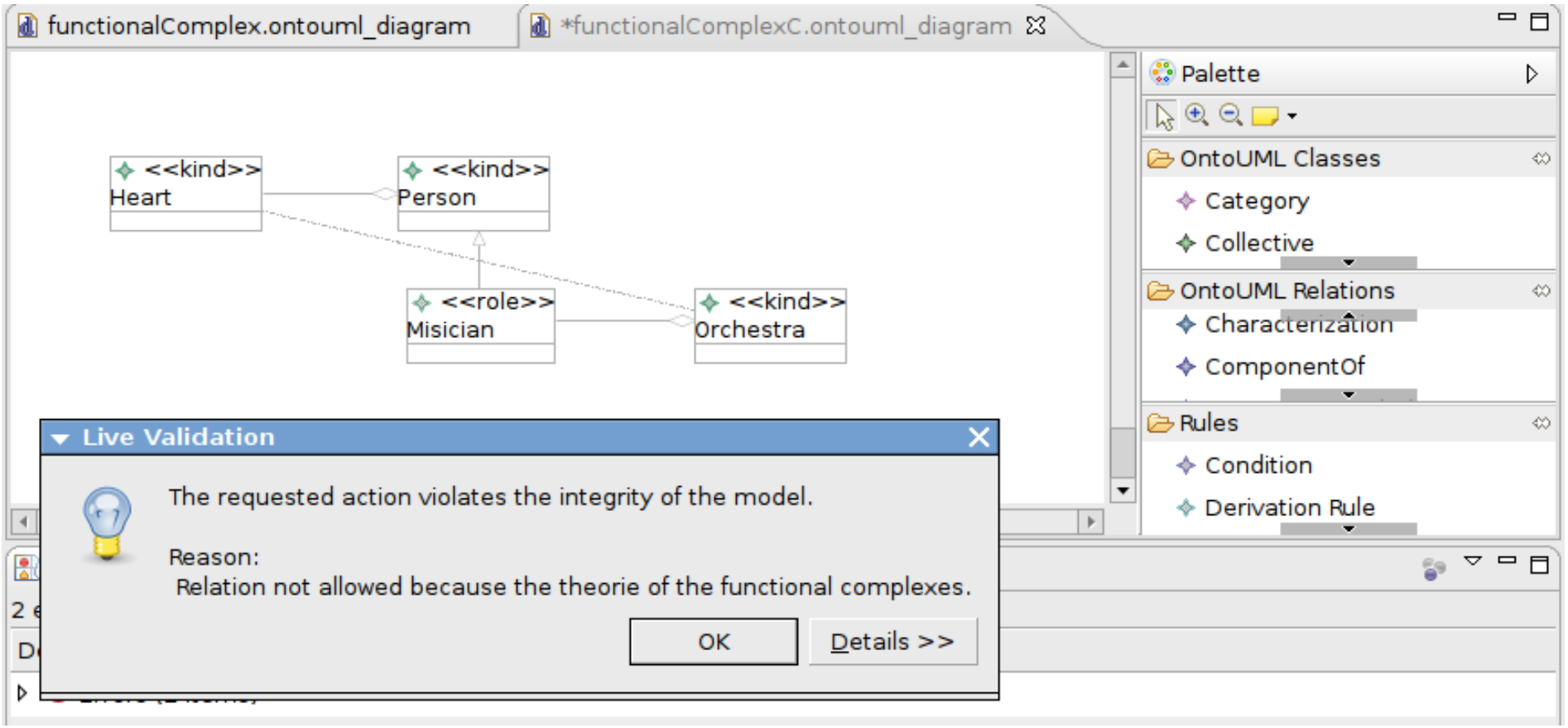

Java - OntoUML/default.ontouml_diagram - Eclipse Platform
File Edit Diagram Navigate Search Project Run Window Help
Live Validation
The requested action violates the integrity of the model.
Reason:
An anti-rigid instance can not be a supertype of a rigid instance.
OK
Details >>
<<role>>
Customer
<<kind>>
Person
Palette
OntoUML Classes
Category
Collective
GeneralizationSet
Kind
Mixin
Mode
Phase
Quantity
Relator
Role
OntoUML Rela...
Characterization
ComponentOf
DatatypeAssoci...
Derivation
Formal
Generalization
Material
Mediation
MemberOf
SubCollectionOf
Rules
Condition
Derivation Rule
Conclusion
Task List
Find:
All
Uncategorized
Outline
Problems
Javadoc
Declaration
Properties
Kind Person
Core
Appearance
Property
Value
General
Is Abstract
false
Name
Person

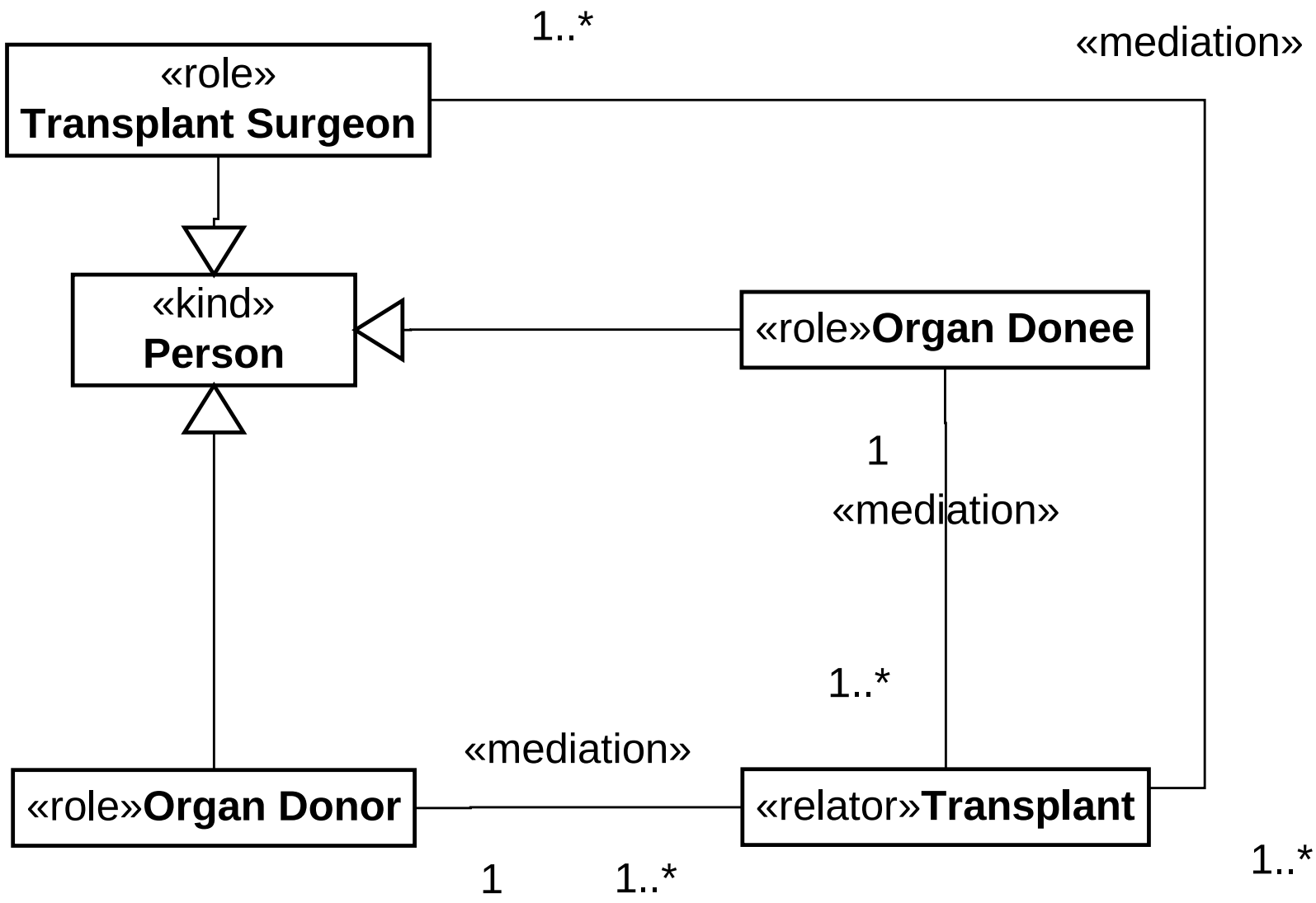

<<kind>>
Person
<<subkind>>
Man
<<role>>
MaleCustomer
ObjectClass instances which are not abstract (isAbstract = false) and which are nol instances of a Kind must have a Kind as supertype
Role instances must be connected to at least one individual via its characterizing relation

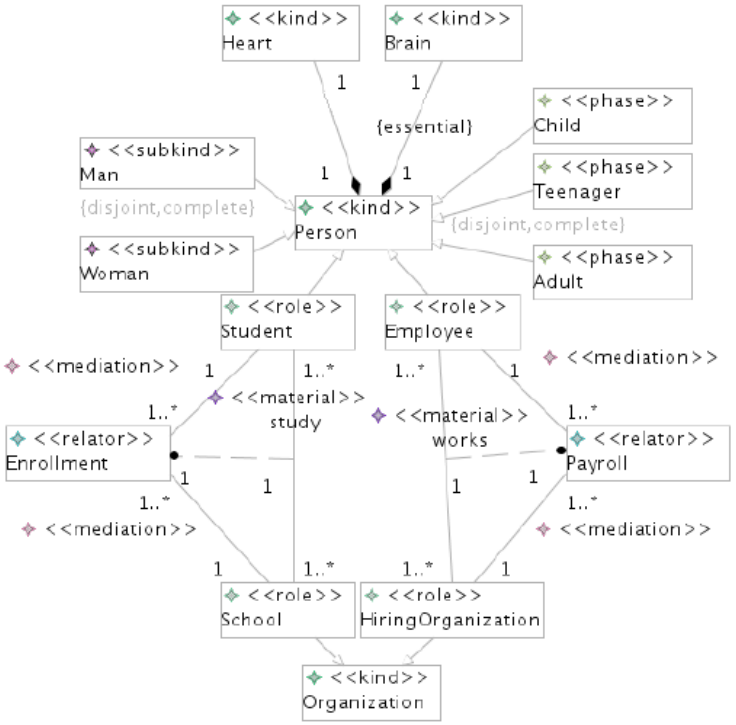
Tool Support



The underlying algorithm merely has to check structural properties of the diagram and not the content of involved nodes


functionalComplex.ontouml_diagram
*functionalComplexC.ontouml_diagram
<<kind>>
Heart
<<kind>>
Person
<<role>>
Misician
<<kind>>
Orchestra
Palette
OntoUML Classes
Category
Collective
OntoUML Relations
Characterization
ComponentOf
Rules
Condition
Derivation Rule
Live Validation
The requested action violates the integrity of the model.
Reason:
Relation not allowed because the theorie of the functional complexes.
OK
Details >>


1..*
«mediation»
«role»
Transplant Surgeon
«kind»
Person
«role»Organ Donee
1
«mediation»
1..*
«mediation»
«role»Organ Donor
«relator»Transplant
1
1..*
1..*

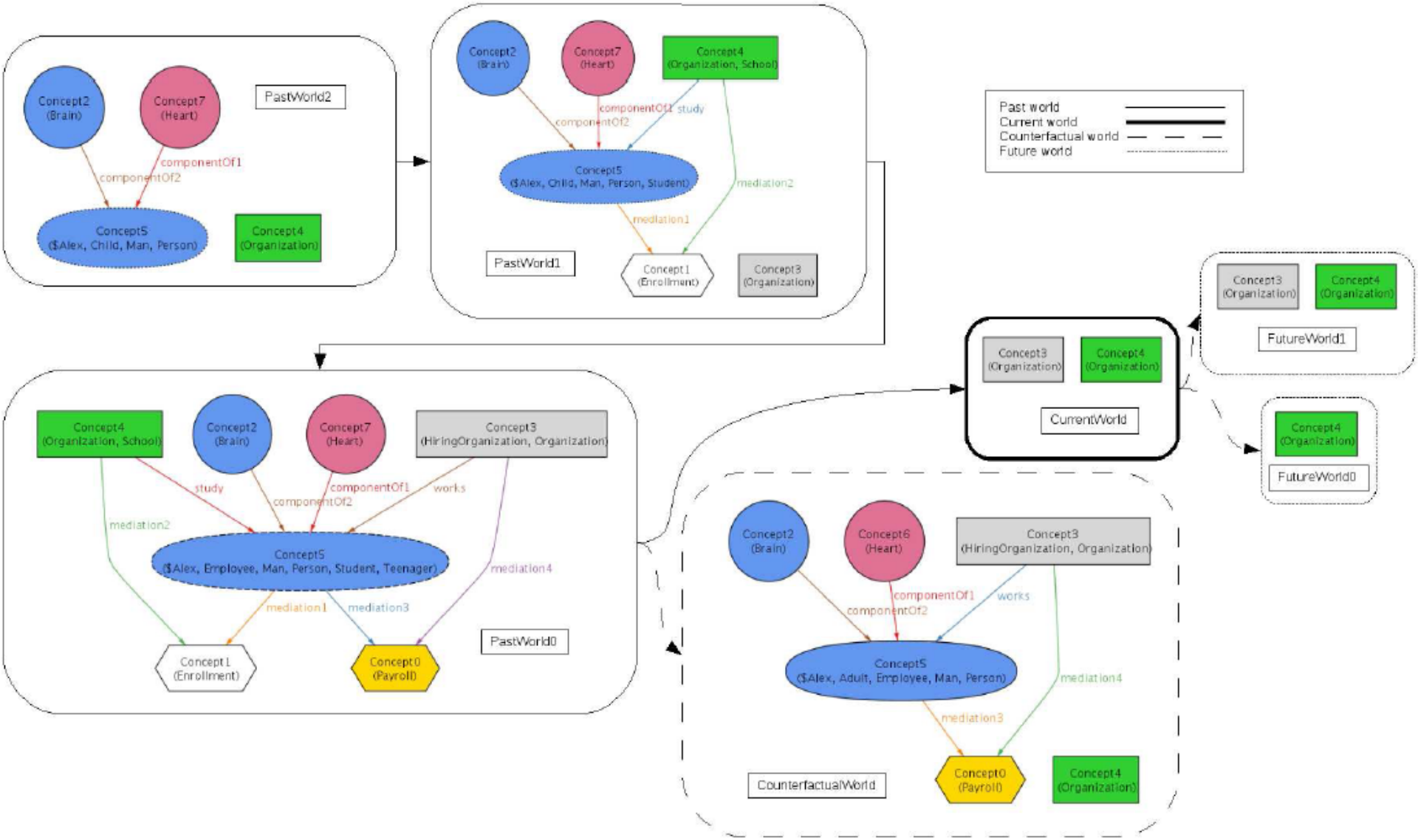


ATL Transformation

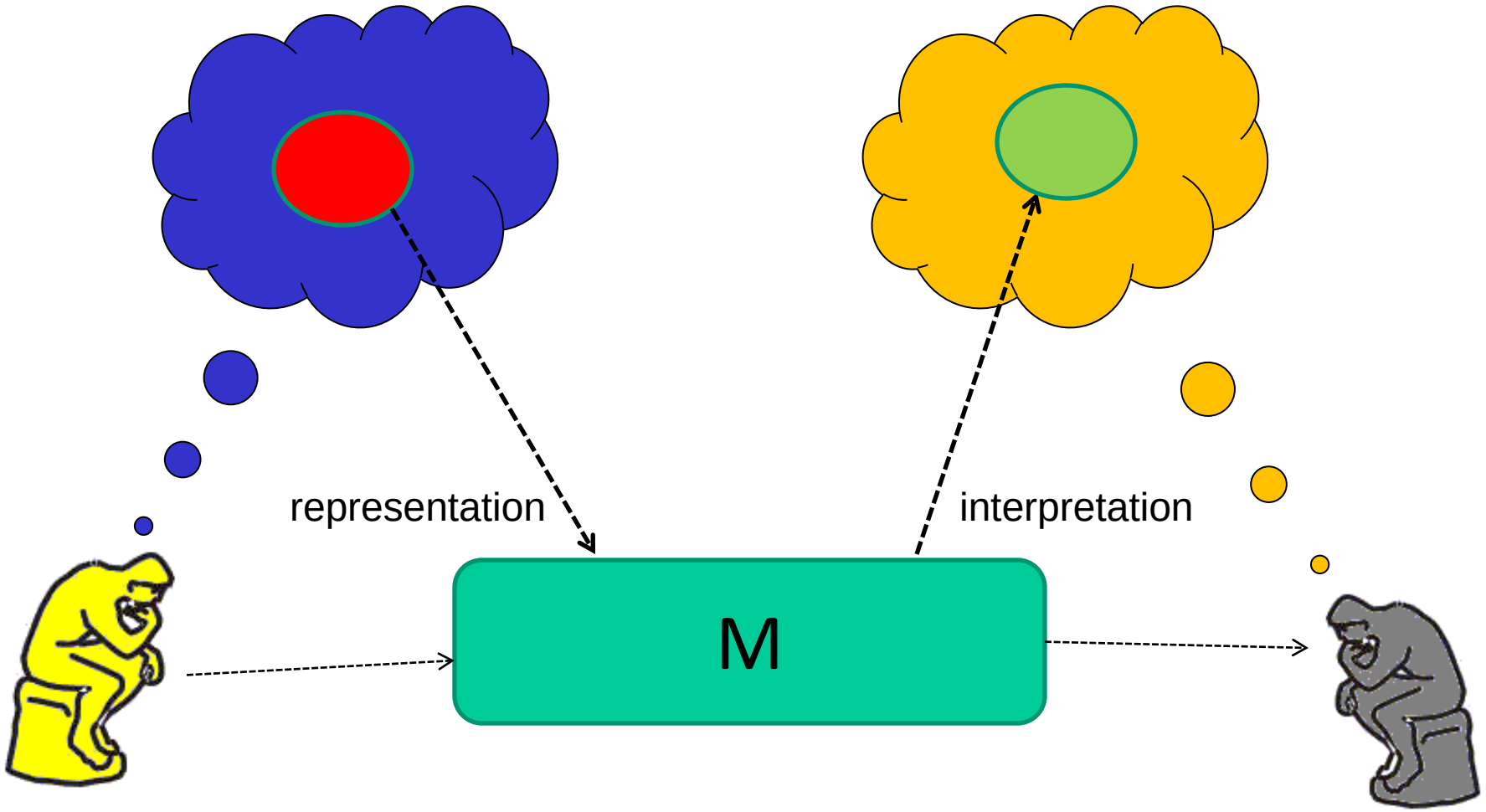
```
1 sig Person_Set in Concept { Person: some World }
2 {
3   Person in existsIn
4   all w1: World | w1 in Person => (all w2:
        w1.access | (w2 in existsIn) => (w2 in
        Person)) -- Rigidity
5   some w: World | w in this.Child -- Phase
6   some w: World | w in this.Teenager -- Phase
7   some w: World | w in this.Adult -- Phase
8   ⋮
9 }
```

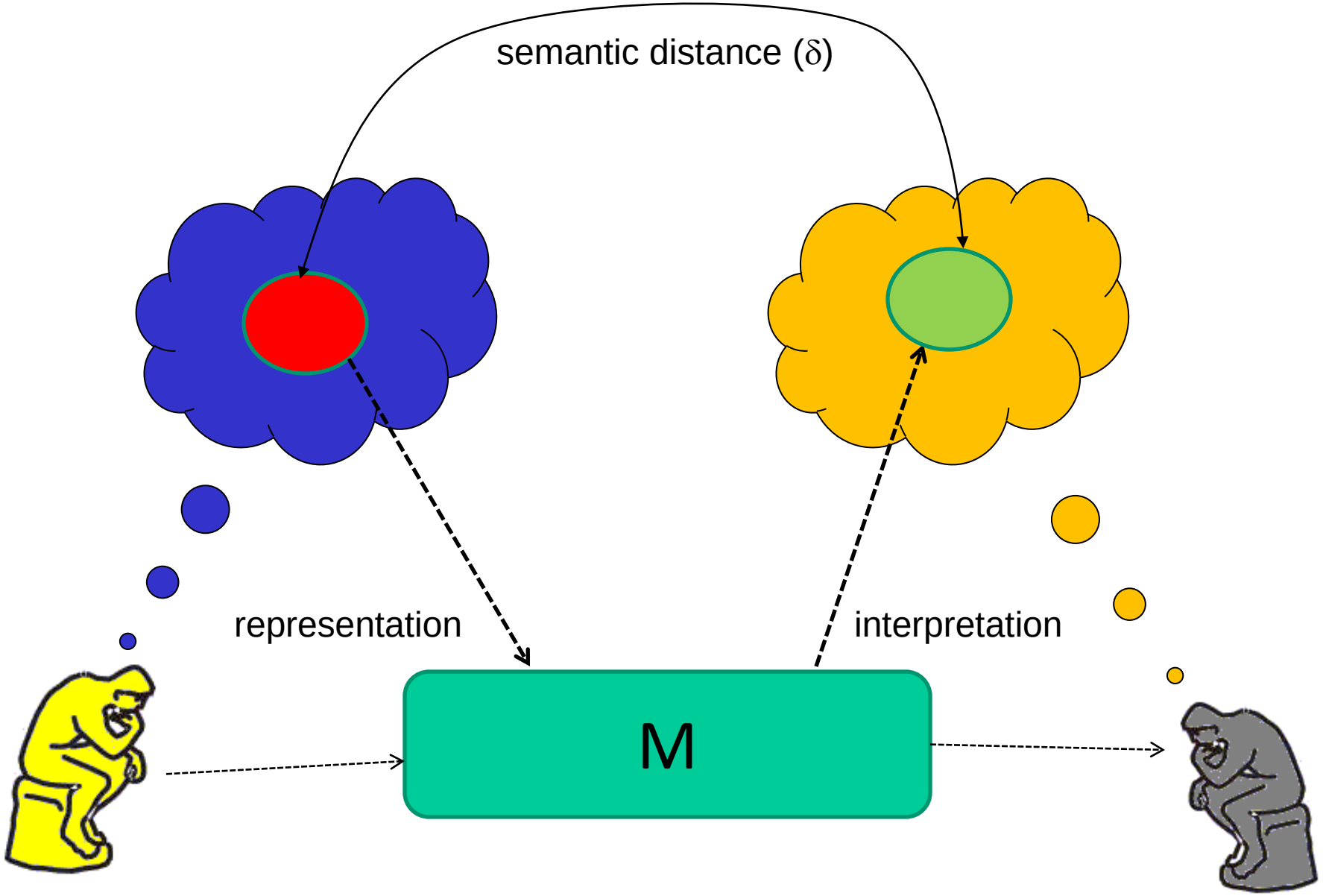
Simulation and Visualization

Alloy Analyzer + OntoUML visual Plugin

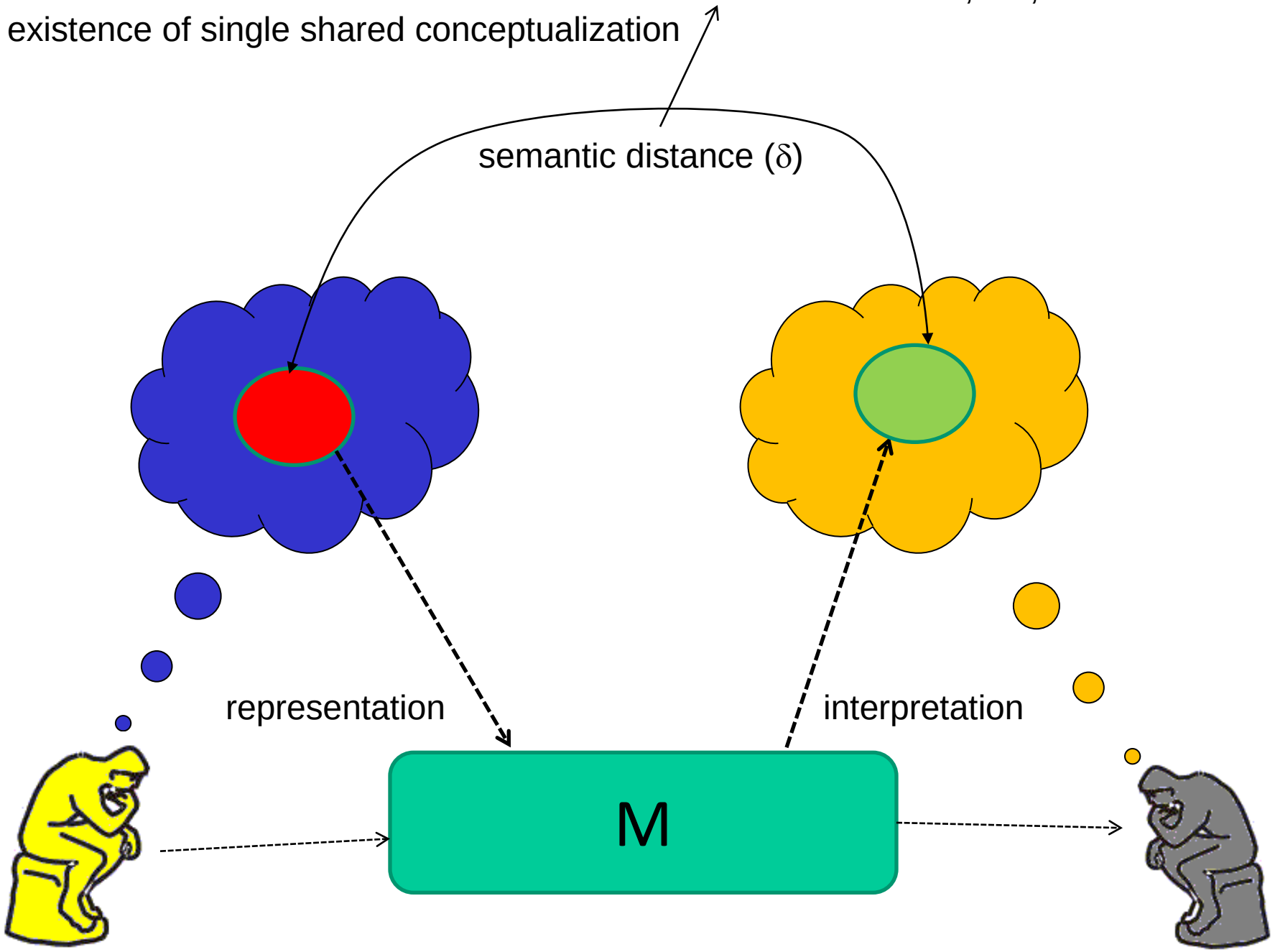

Concept2
(Brain)
Concept7
(Heart)
componentOf1
componentOf2
Concept5
($Alex, Child, Man, Person)
Concept4
(Organization)
PastWorld2
Concept2
(Brain)
Concept7
(Heart)
Concept4
(Organization, School)
componentOf1
componentOf2
study
Concept5
($Alex, Child, Man, Person, Student)
mediation2
mediation1
PastWorld1
Concept1
(Enrollment)
Concept3
(Organization)
Past world
Current world
Counterfactual world
Future world
Concept3
(Organization)
Concept4
(Organization)
FutureWorld1
Concept3
(Organization)
Concept4
(Organization)
CurrentWorld
Concept4
(Organization)
FutureWorld0
Concept4
(Organization, School)
Concept2
(Brain)
Concept7
(Heart)
Concept3
(HiringOrganization, Organization)
study
componentOf2
componentOf1
works
mediation2
Concept5
($Alex, Employee, Man, Person, Student, Teenager)
mediation4
mediation1
mediation3
PastWorld0
Concept1
(Enrollment)
Concept0
(Payroll)
Concept2
(Brain)
Concept6
(Heart)
Concept3
(HiringOrganization, Organization)
componentOf1
componentOf2
works
Concept5
($Alex, Adult, Employee, Man, Person)
mediation4
mediation3
CounterfactualWorld
Concept0
(Payroll)
Concept4
(Organization)

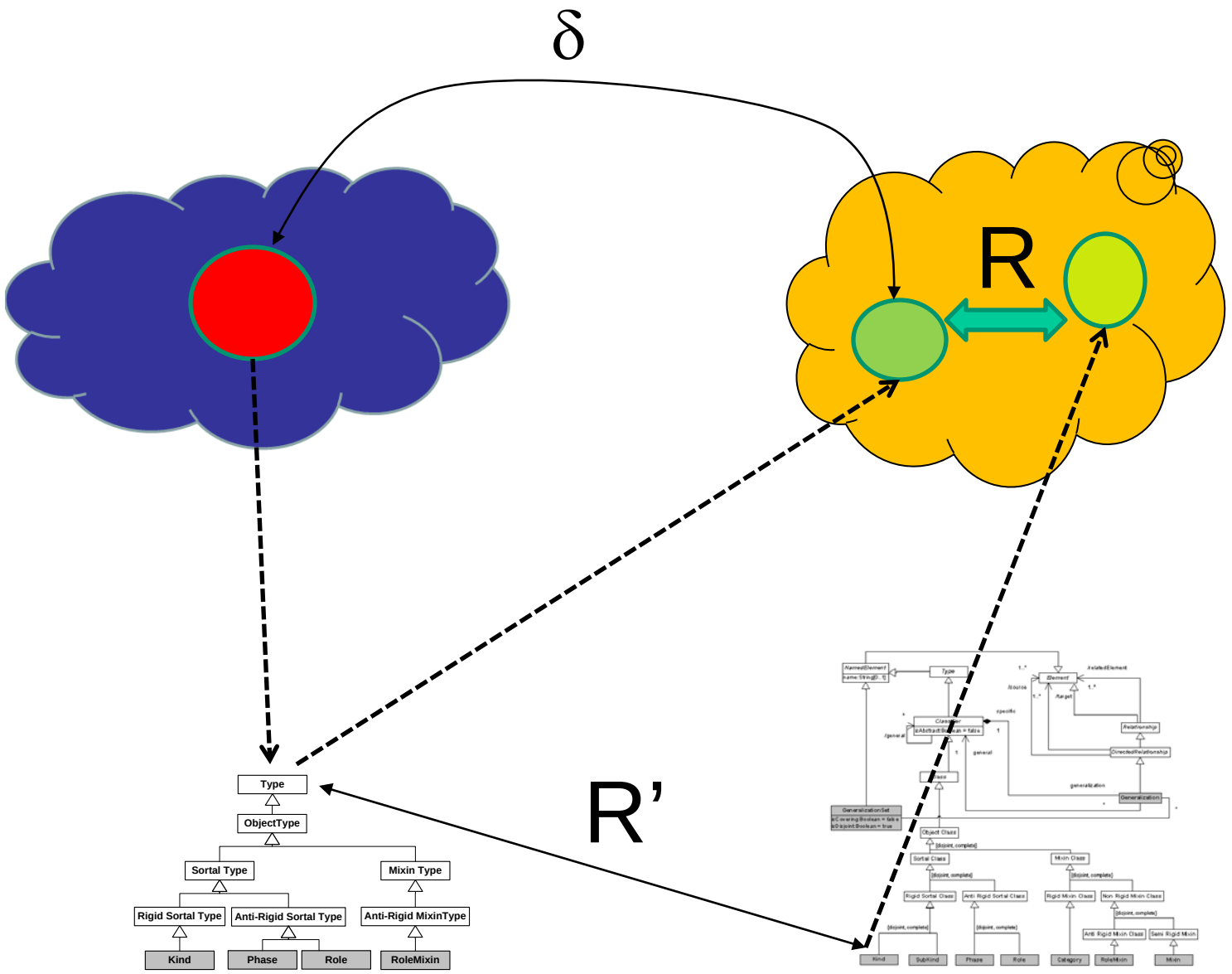
SEMANTIC INTEROPERABILITY: THE PROBLEM REVISITED

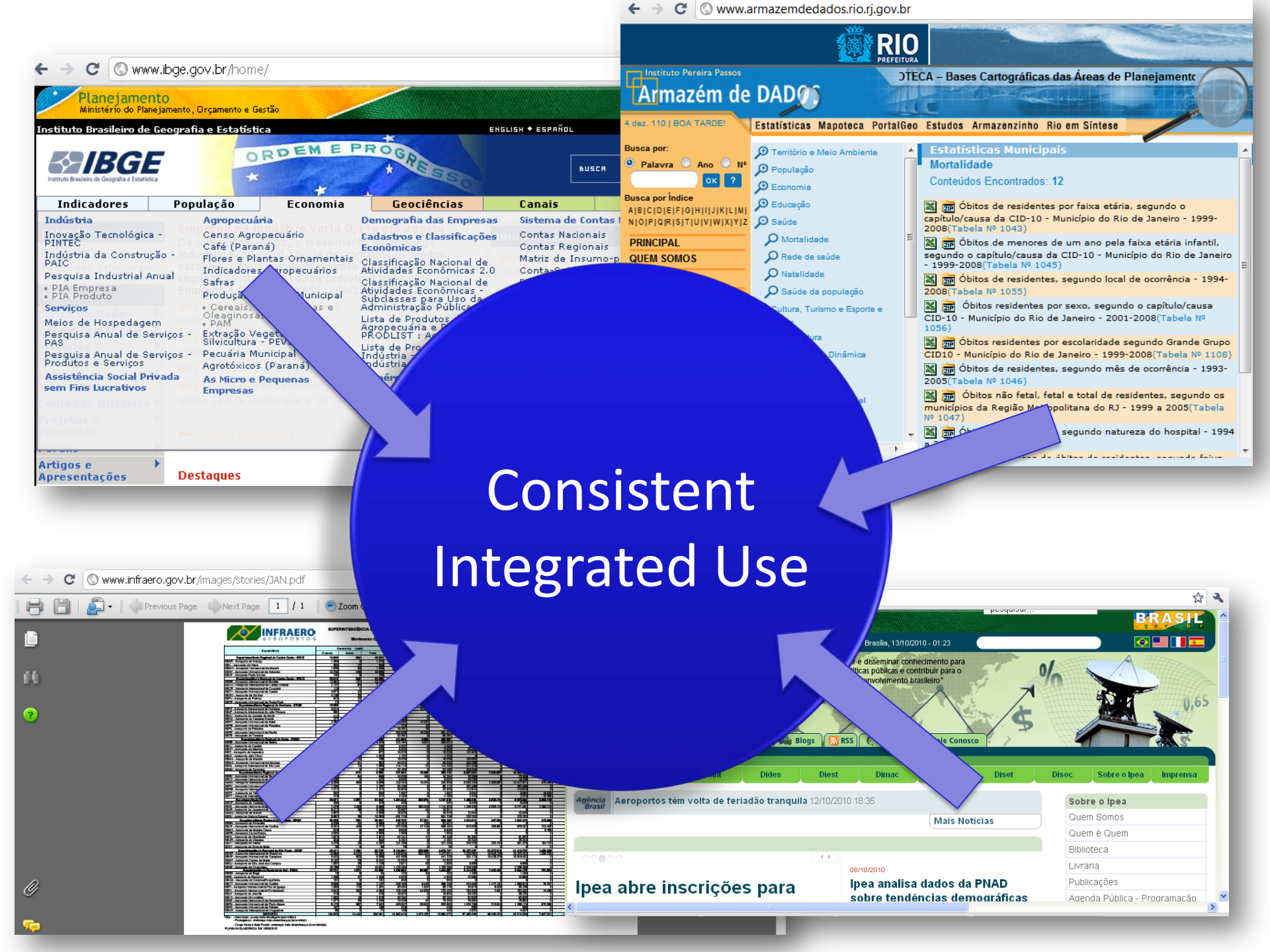

representation
interpretation
M


semantic distance (δ)
representation
interpretation
M

when $\delta < x$ then we consider the communication to be effective, i.e., we assume the existence of single shared conceptualization




δ
R
R'
Type
ObjectType
Sortal Type
Mixin Type
Rigid Sortal Type
Anti-Rigid Sortal Type
Anti-Rigid MixinType
Kind
Phase
Role
RoleMixin


www.ibge.gov.br/home/
Planejamento
Ministério do Planejamento, Orçamento e Gestão
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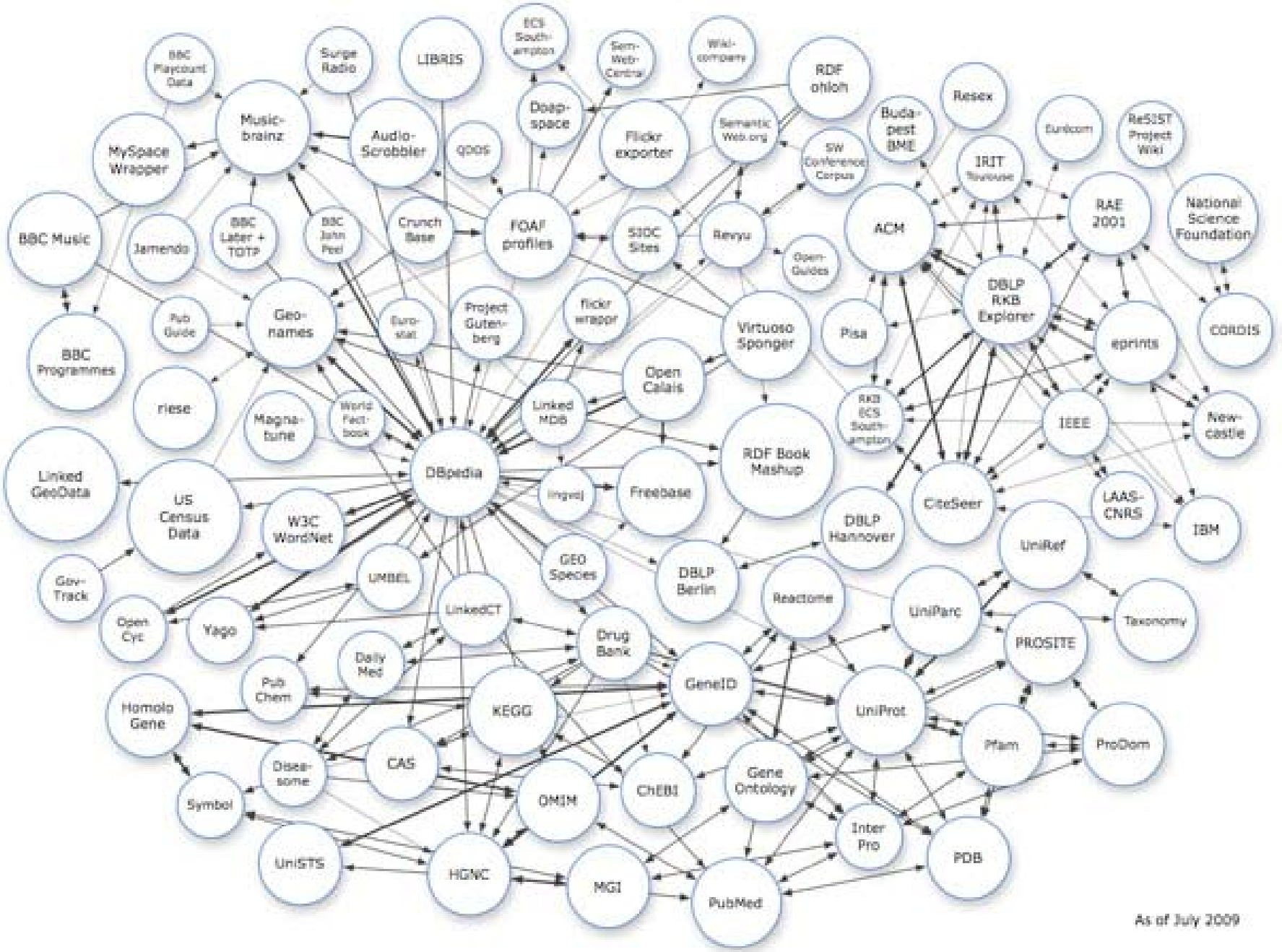
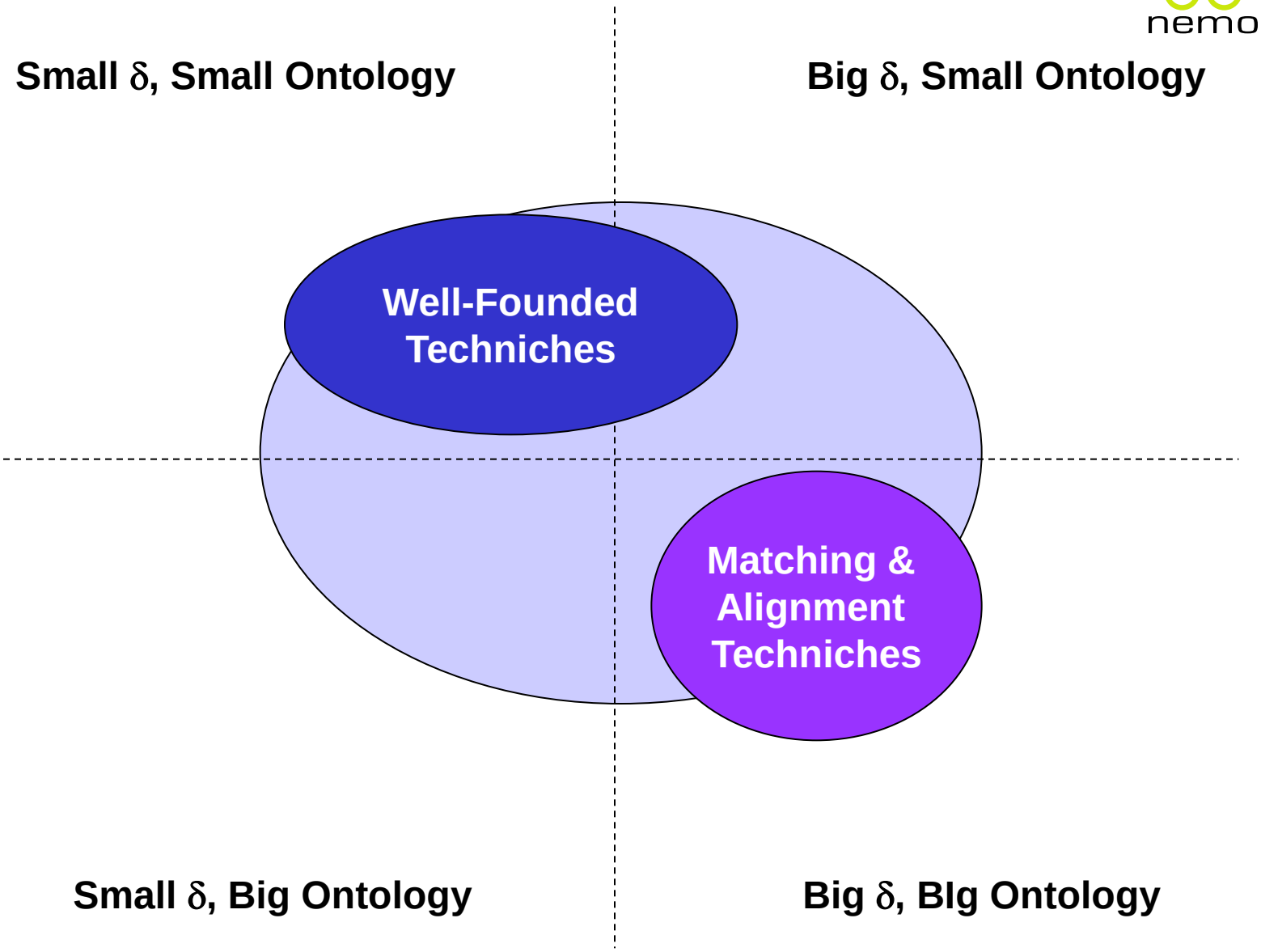
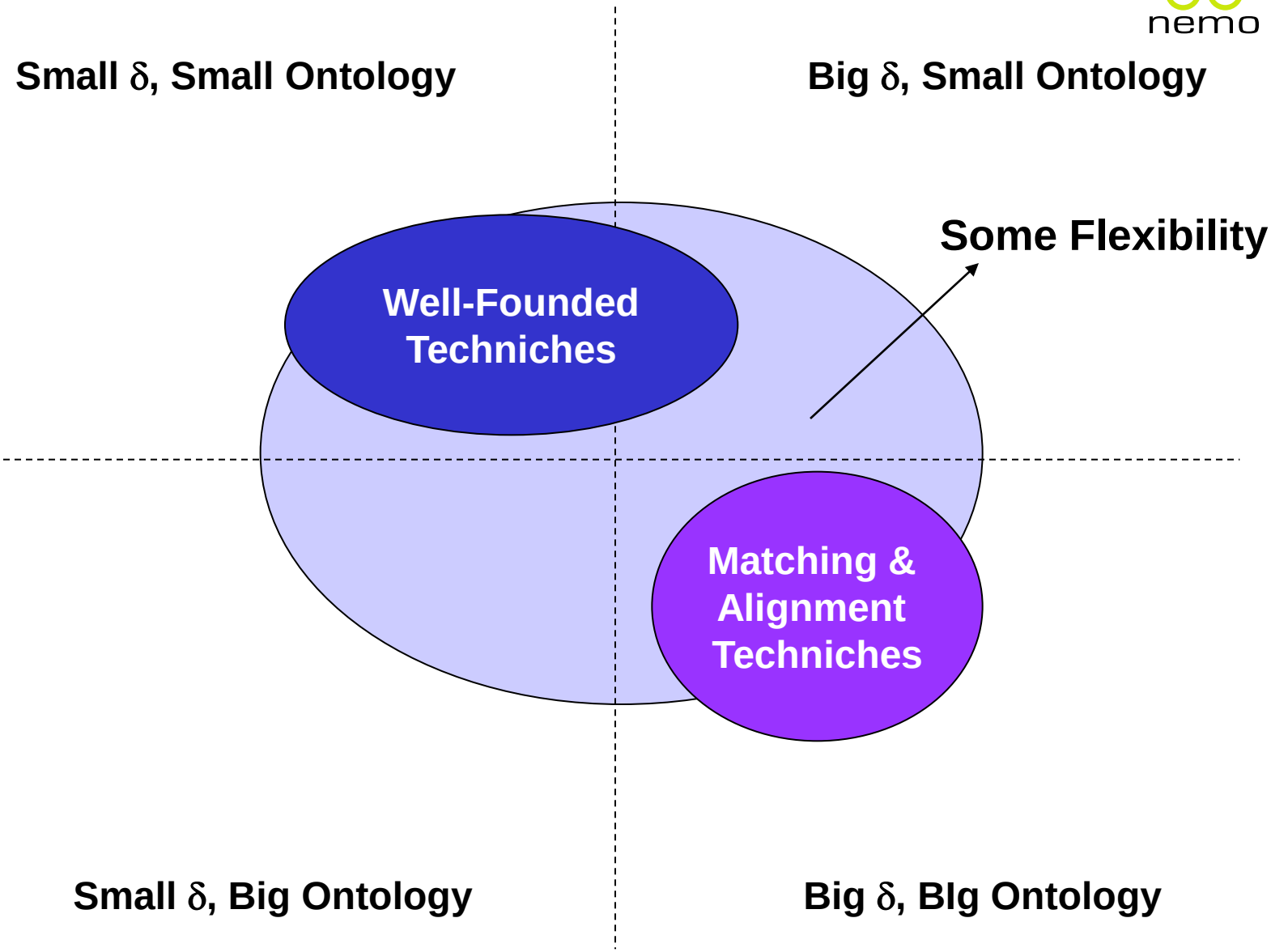
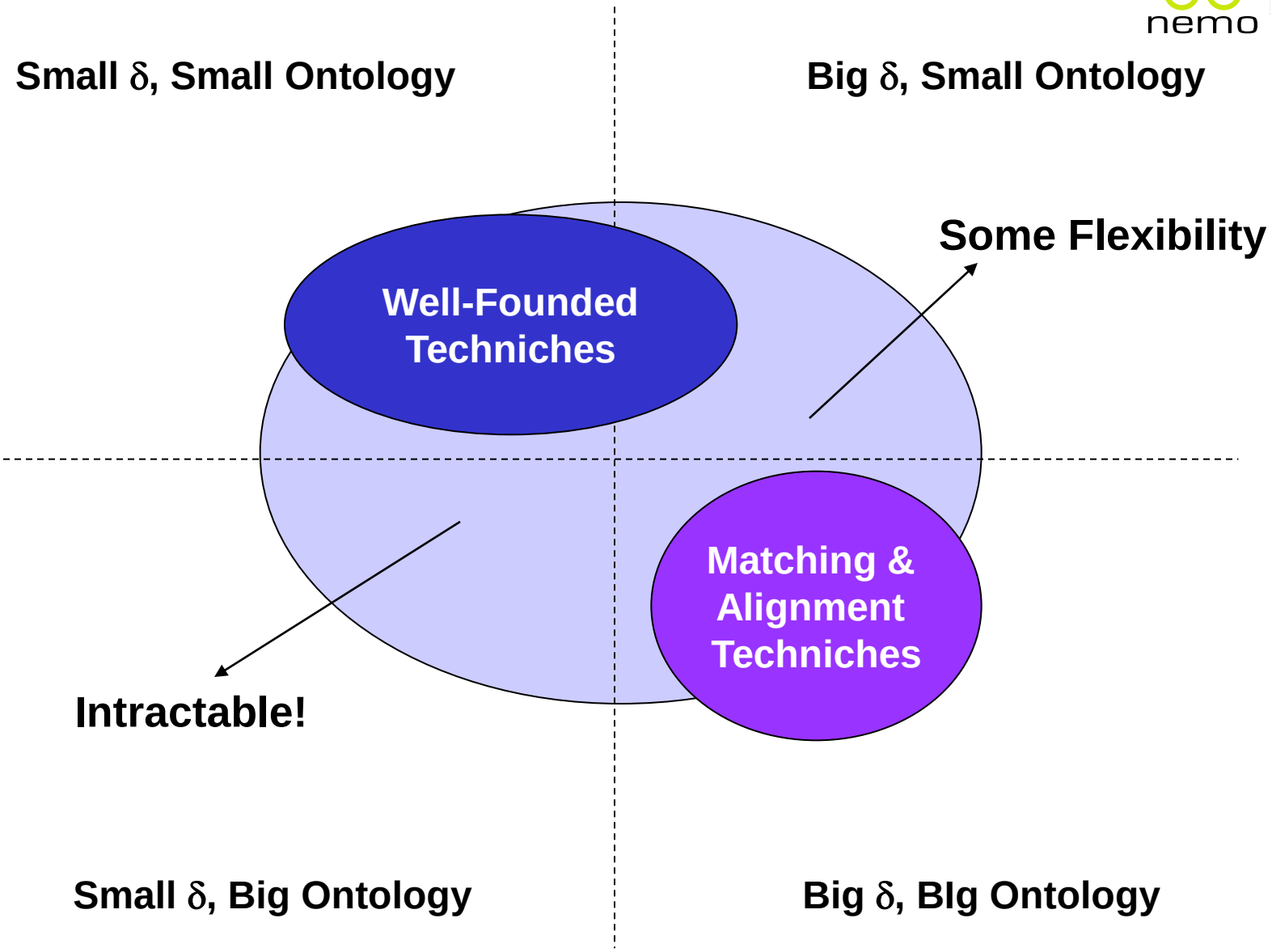


As of July 2009


Small δ, Small Ontology
Big δ, Small Ontology
Well-Founded Techniches
Matching & Alignment Techniches
Small δ, Big Ontology
Big δ, Blg Ontology

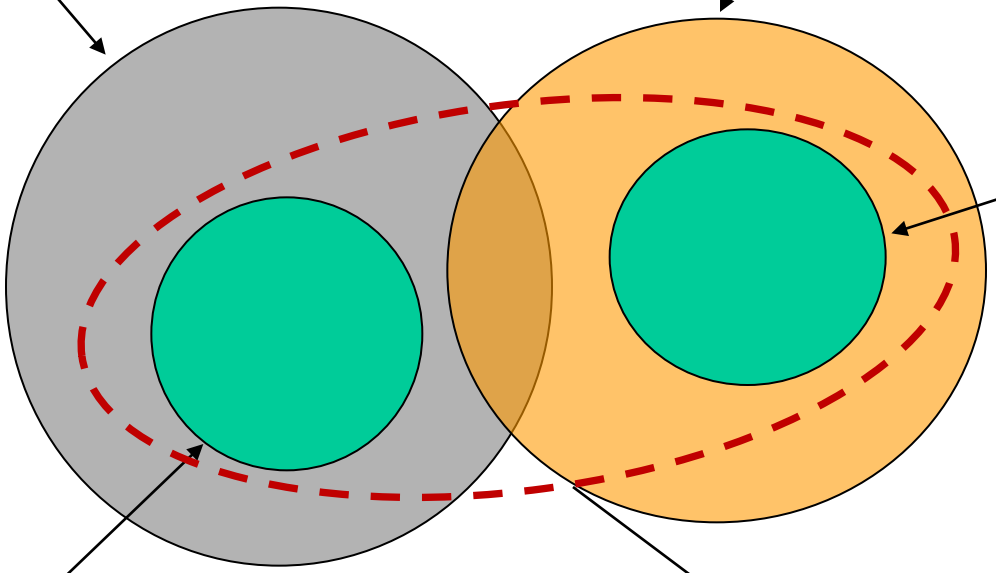

Small δ, Small Ontology
Big δ, Small Ontology
Some Flexibility
Well-Founded Techniches
Matching & Alignment Techniches
Small δ, Big Ontology
Big δ, Blg Ontology


Small δ, Small Ontology
Big δ, Small Ontology
Some Flexibility
Well-Founded Techniches
Matching & Alignment Techniches
Intractable!
Small δ, Big Ontology
Big δ, Blg Ontology

State of affairs represented by the valid models of Ontology O_1

State of affairs represented by the valid models of Ontology O_2

Admissible state of affairs according to the conceptualization underlying O_2



Admissible state of affairs according to the conceptualization underlying O_1

FOUNDATIONAL ONTOLOGY

The alternative to ontology is not “non-ontology” but bad ontology!

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