



## pour la gestion des ontologies ?

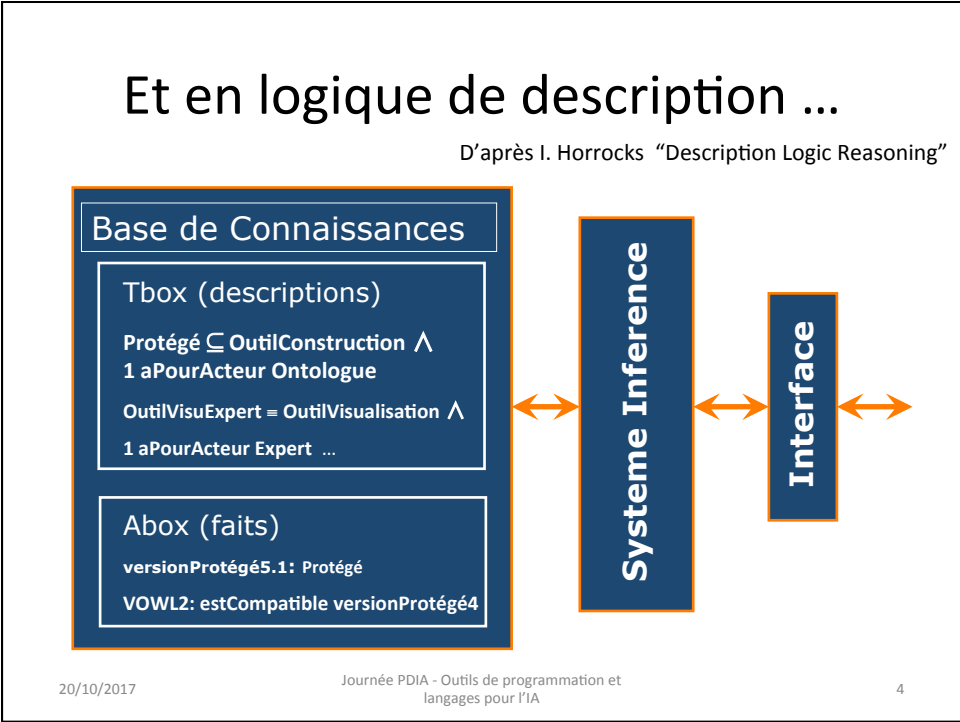
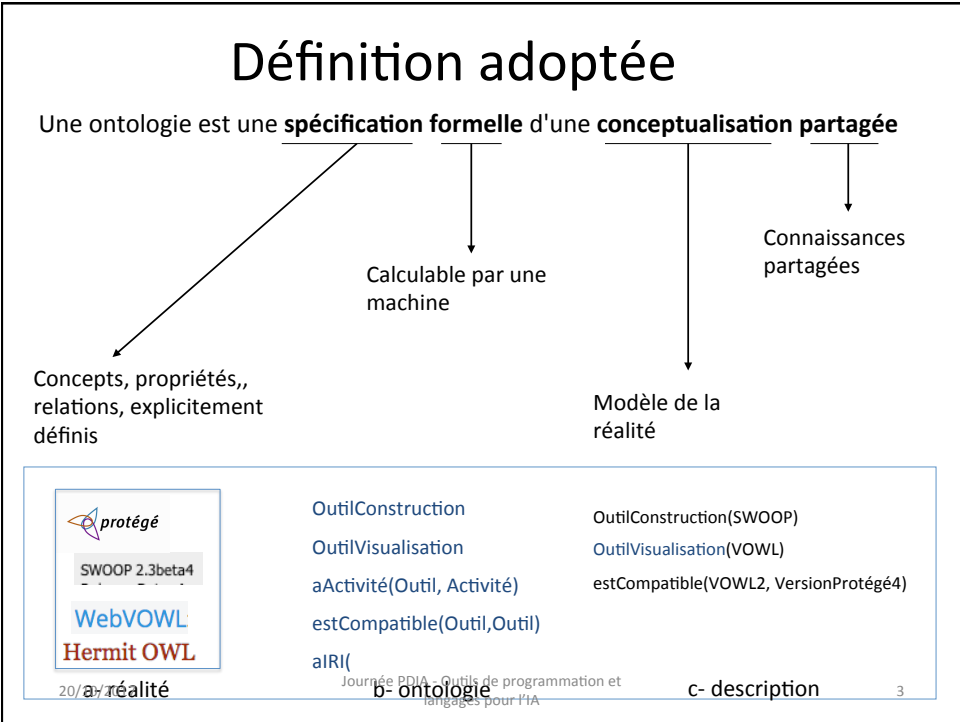
Sylvie DESPRES

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## Définitions

- **Gruber 1993**  
Une ontologie est une spécification explicite d'une conceptualisation
- **Borst 1997**  
Une ontologie est une spécification formelle d'une conceptualisation partagée
- **Studer, Benjamin et Fensel 1998**  
Une ontologie est une spécification formelle et explicite d'une conceptualisation partagée



# Et maintenant

[https://baojiebaojie.files.wordpress.com/2011/04/semantic\\_web\\_technology\\_stack.png](https://baojiebaojie.files.wordpress.com/2011/04/semantic_web_technology_stack.png)

**DL Expressivity**  
*ALCHO(D)*

Symbol key

Attributive language. This is the base language which allows:

- Atomic negation (negation of concepts that do not appear on the left hand side of axioms)
- Concept intersection
- Universal restrictions
- Limited existential quantification (restrictions that only have fillers of Thing)

**AL**

**FL<sup>-</sup>** A sub-language of AL, which is obtained by disallowing atomic negation

**FL<sub>o</sub>** A sub-language of FL<sup>-</sup>, which is obtained by disallowing limited existential quantification

**C** Complex concept negation

**S** An abbreviation for AL and C with transitive properties

**H** Role hierarchy (subproperties - rdfs.subPropertyOf)

**O** Nominals. (Enumerated classes or object value restrictions - owl.oneOf, owl.hasValue)

**I** Inverse properties

**N** Cardinality restrictions (owl.Cardinality, owl.minCardinality, owl.maxCardinality)

**Q** Qualified cardinality restrictions (available in OWL 1.1)

**F** Functional properties

**E** Full existential quantification (Existential restrictions that have fillers other than owl:Thing)

**U** Concept union

**(D)** Use of datatype properties, data values or datatypes

The Semantic Web Technology Stack (not a piece of cake...)

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5

# Méthodologie Neon

Suárez-Figueroa M.C., Gómez-Pérez A., Fernández-López M. (2012)

20/10/2017

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6

### Activités afférentes la construction d'ontologies

**Development**

- O. Translation
- O. Restructuring
- O. Reuse
- O. Reengineering
- O. Customization
- O. Aligning
- O. Annotation
- O. Update
- O. Localization
- O. Merging
- O. Formalization
- O. Implementation
- O. Integration
- O. Modularization
- O. Modification

**Support**


- Knowledge Acquisition
- O. Documentation
- O. Summarization
- O. Evaluation (V&V)
- O. Assessment
- O. Configuration Management

**Post-Development**

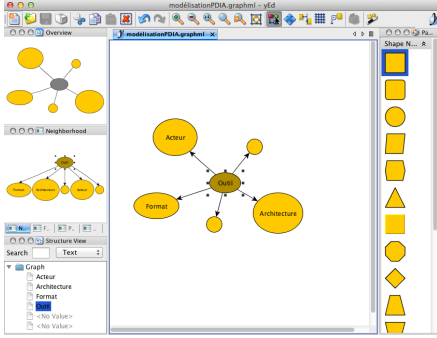
- O. Upgrade
- O. Versioning
- O. Evolution


[d'après Gomez Perez ]  
20/10/2017

### Outils de modélisation

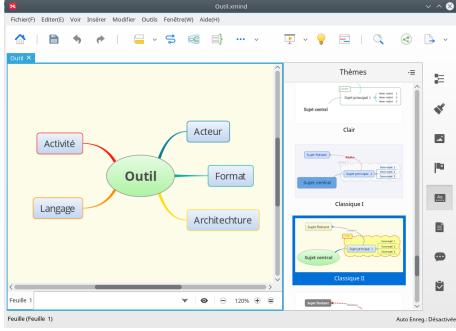


Yed





XMind



20/10/2017

## Outil sélectionné

The screenshot shows the CmapTools application window with a sidebar for 'Mes Cmaps' and a main workspace. The conceptual diagram illustrates the relationships between various elements:

- Outil** (Tool) is the central node, connected to:
  - Acteur** (Actor) via 'est utilisé par' (used by)
  - Langage** (Language) via 'est supporté par' (supported by)
  - Format** (Format) via 'est exploité selon' (exploited according to)
  - Architecture** (Architecture) via 'est développé selon' (developed according to)
- Activité** (Activity) is connected to:
  - Aquisition de connaissance** (Knowledge acquisition)
  - Evaluation** (Evaluation)
  - Evolution** (Evolution)
  - Visualisation** (Visualization)
  - Raisonnement** (Reasoning)
  - Réutilisation** (Reuse)
  - Appariement** (Matching)
  - Modularisation** (Modularization)
  - Documentation** (Documentation)
  - Annotation** (Annotation)
- Acteur** (Actor) is connected to:
  - Développeur** (Developer)
  - Expert** (Expert)
  - Ontologue** (Ontologist)

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## Modélisation

The diagram maps various tools to functional categories in ontology modeling:

- Outil de construction** (Construction tool): Includes WebProtege, NeonToolkit, Protege, EditionStandard, EditionMaestro, EditionFree, TopBraidComposer, and SWOOP.
- Outil d'exploration** (Exploration tool): Includes OntoFox, SWOOGLE, and WATSON.
- Outil de visualisation** (Visualization tool): Includes OutiVisuOntologie, OutiVisuExpert, OWLViz, and VOWL.
- Outil de mise à disposition** (Availability tool): Includes BioPortal and SIFR Bioportal.
- Outil de validation** (Validation tool): Includes Oops ! and OntoCheck.
- Outil de modélisation** (Modeling tool): Includes XMind, CmapTools, and Yed.

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## Outil de construction

- [https://www.w3.org/wiki/Ontology\\_editors](https://www.w3.org/wiki/Ontology_editors)
  - <http://protege.stanford.edu/>
  - <http://neon-toolkit.org/>
  - <http://www.mindswap.org/2004/SWOOP/>
  - [http://www.topquadrant.com/products/TB\\_Composer.html](http://www.topquadrant.com/products/TB_Composer.html)

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11

## SWOOP 2.3 Beta 4

The screenshot shows the SWOOP 2.3 Beta 4 interface. The main window displays the 'OWL Ontology: POIA2017' with the following statistics:

- Total Number of Classes: 73 (Defined: 73, Imported: 0)
- Total Number of Datatype Properties: 4 (Defined: 4, Imported: 0)
- Total Number of Object Properties: 14 (Defined: 14, Imported: 0)
- Total Number of Annotation Properties: 1 (Defined: 1, Imported: 0)
- Total Number of Individuals: 138 (Defined: 138, Imported: 0)

The 'Advanced Ontology Statistics' section is also visible, showing a table with columns for General Statistics, Property Tree Statistics, and Satisfiable Class Tree Statistics.

The 'New Entity' dialog box for adding an OWL Property. The 'Property Type' is set to 'OWL Object Property'. The 'subProperty of' is set to 'None'. The 'Logical URI' is 'http://www.semanticweb.org/POIA2017#'. The 'Label' field is empty.

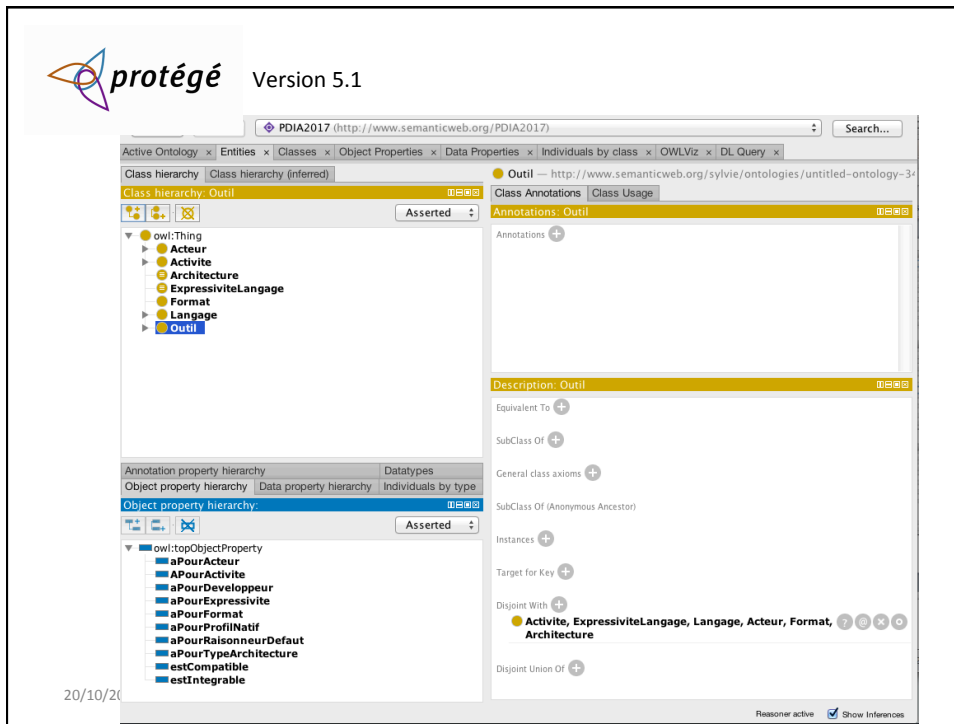
The 'New Entity' dialog box for adding an OWL Individual. The 'Instance of' is set to 'owl:Thing'. The 'Logical URI' is 'http://www.semanticweb.org/POIA2017#'. The 'Label' field is empty.

The 'New Entity' dialog box for adding an OWL Class. The 'subClass of' is set to 'owl:Thing'. The 'Logical URI' is 'http://www.semanticweb.org/POIA2017#'. The 'Label' field is empty.

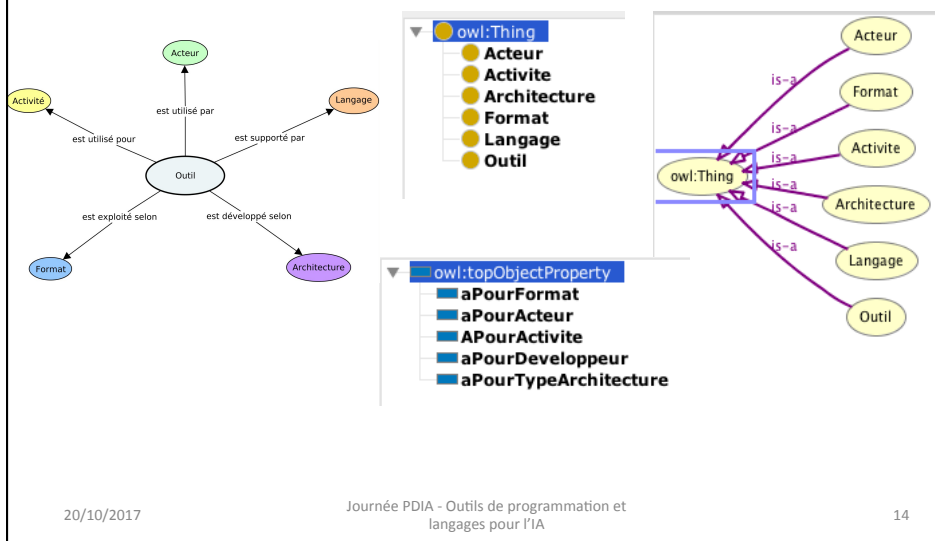
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12



## Modélisation -> Formalisation



**Class hierarchy:** Asserted

- owl:Thing
  - Acteur
    - Developpeur
    - Expert
    - Ontologue
  - Activite
    - AcquisitionConnaissance
    - Annotation
    - Appariement
    - Documentation
    - Edition
    - Evaluation
    - Evolution
    - Modelisation
    - Modularisation
    - Raisonnement
    - Representation
    - Reutilisation
    - Visualisation
  - Architecture
  - ExpressiviteLangage
  - Format
  - Langage
    - OWL
    - OWL2
  - Outil
    - OutilAlignement
    - OutilConstruction
    - OutilExploration
    - OutilIntegrable
    - OutilMiseADisposition
    - OutilRaisonnement
    - OutilStanford
    - OutilSupport
    - OutilValidation
    - OutilVisualisation

**owl:topDataProperty**

- aIRI
- aSupportRegle
- aUpdate
- aVerifABox

**owl:topObjectProperty**

- aPourActeur
- APourActivite
- aPourDeveloppeur
- aPourExpressivite
- aPourFormat
- aPourProfilNatif
- aPourRaisonneurDefaut
- aPourTypeArchitecture
- estCompatible
- estIntegrable

**Individuals: XML**

- ArchitectureClient
- ArchitectureMixte
- ArchitectureServeur
- EL+
- NeonFoundation
- OBO
- OWL
- RDF\_S
- SROIQ
- SROIQV
- StanfordUniversity
- TopQuadrant
- UniversityOfMaryland
- version2\_3beta4
- VersionAPI4\_9
- VersionProtege4
- VersionProtege51
- VOWL2
- WebOWL
- XML

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**Architecture**  
Description: Architecture

Equivalent To +

{ArchitectureClient, ArchitectureMixte, ArchitectureServeur}

SubClass Of +

General class axioms +

SubClass Of (Anonymous Ancestor)

Instances +

- ArchitectureClient
- ArchitectureMixte
- ArchitectureServeur

Target for Key +

Disjoint With +

Activite, ExpressiviteLangage, Langage, Outil, Acteur, Format

---

**OutilAlignement**  
Description: AligementAPI

Equivalent To +

SubClass Of +

OutilAlignement

General class axioms +

SubClass Of (Anonymous Ancestor)

APourActivite some Appariement

Instances +

- VersionAPI4\_9

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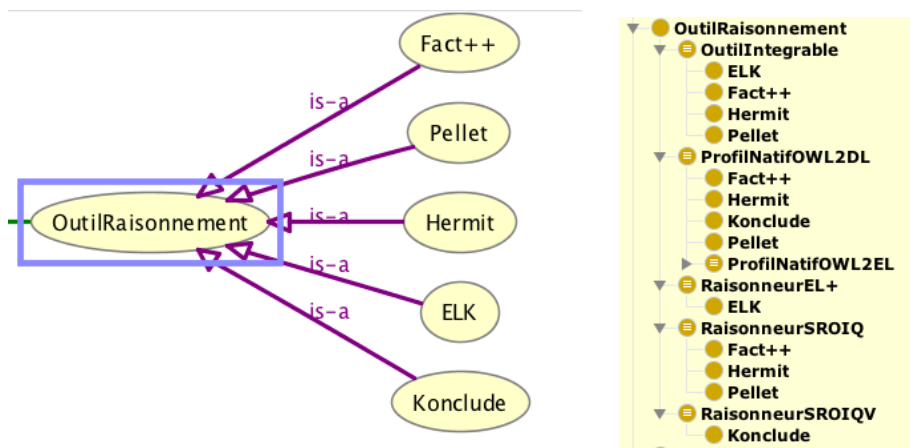
## En OWL 2 ...



20/10/2017

17

## Outil de raisonnement

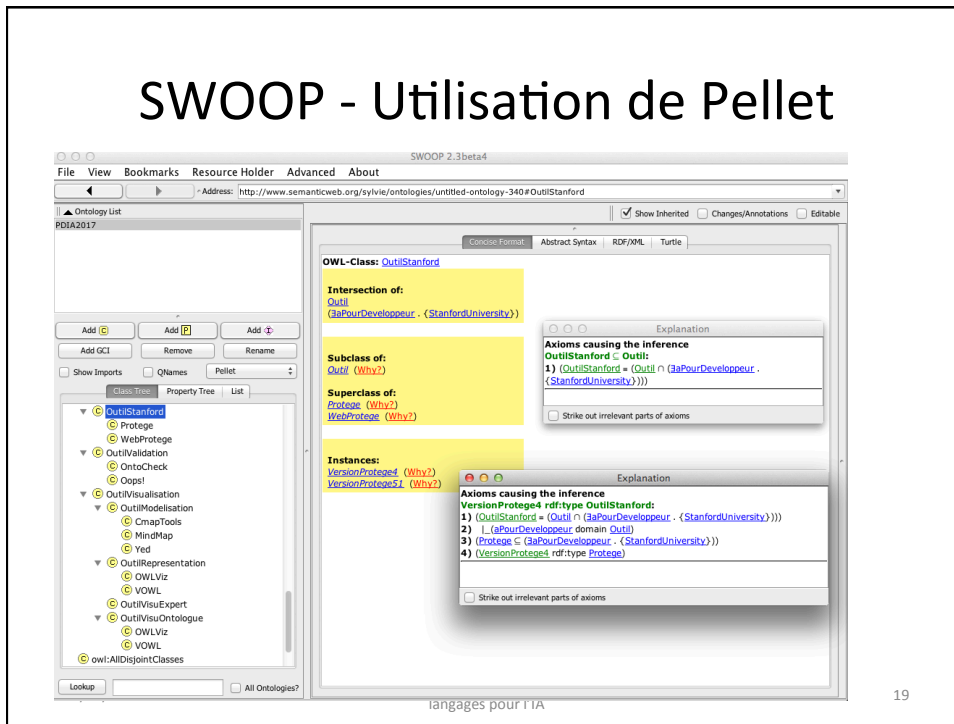


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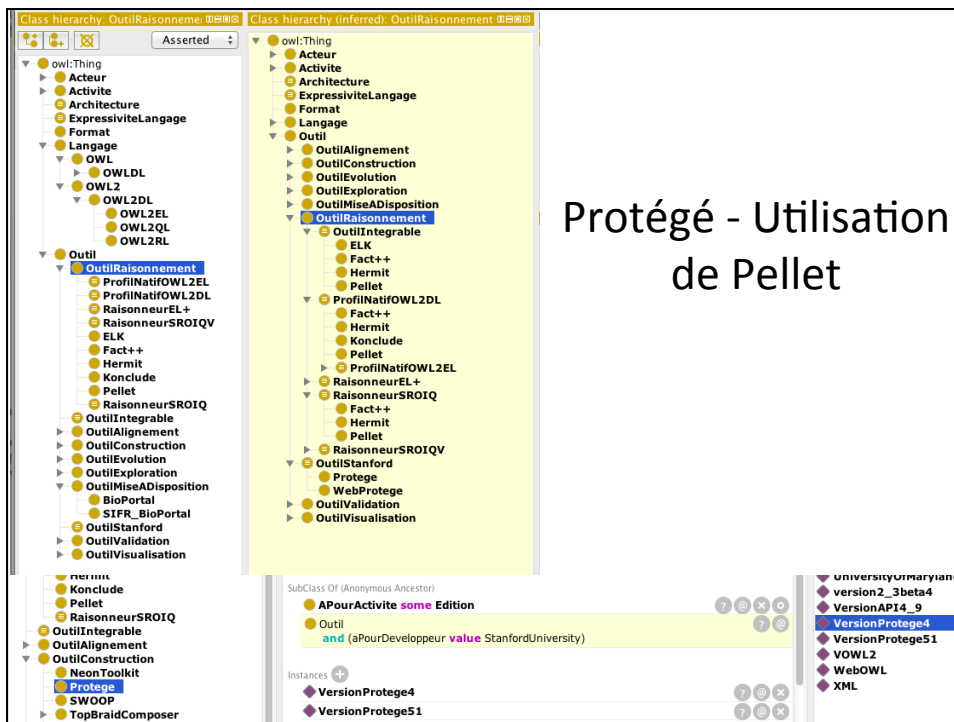
18

# SWOOP - Utilisation de Pellet



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19



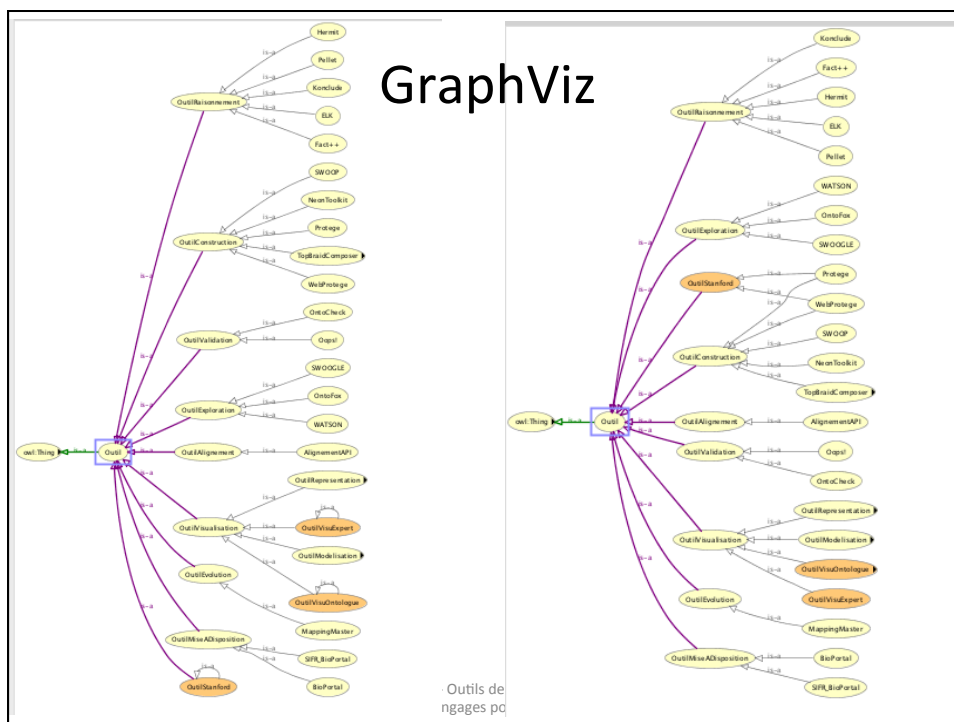
## Visualisation d'ontologies

- GraphViz
  - Plugin éditeur
  - Dédié ontologue utilisable pour dialoguer avec l'expert
- WebVOWL
  - <http://visualdataweb.de/webvowl/#ontovibe>
  - Dédié ontologue

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21



# Property Matrix

Object property matrix | Data property matrix

Object property matrix:

Fit columns to content | Fit columns to window

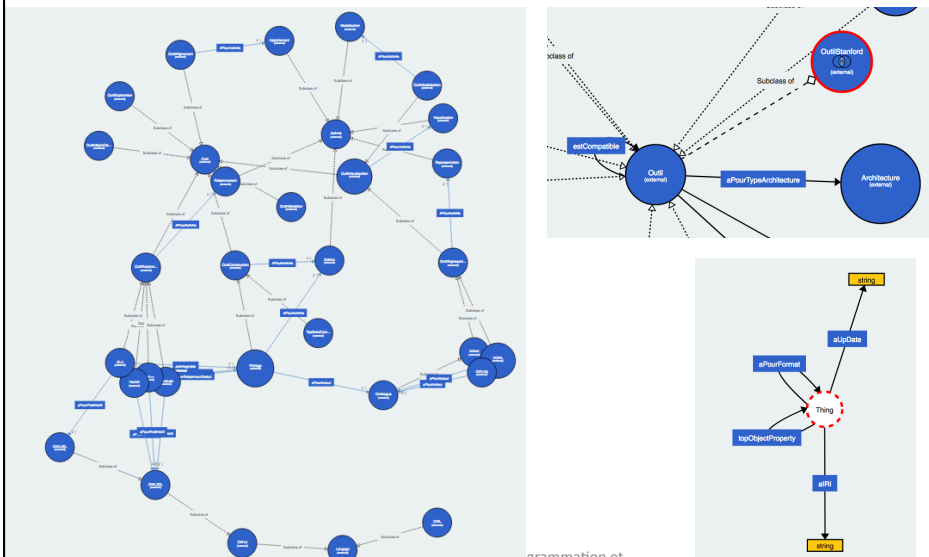
Object Property	Func	Sym	Inv Func	Trans	ASym	RefI	IrrefI	Domain	Range	Inverse
owl:topObjectProperty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
aPourRaisonneurDefault	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OutilConst...	OutilRaiso...	estIntegra...
aPourFormat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Outil	Architecture	
aPourTypeArchitecture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OutilRaiso...	Langage	
aPourProfInatif	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OutilRaiso...	Expressivi...	
aPourExpressivite	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Outil	Developp...	
aPourDeveloppeur	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Outil	Acteur	
aPourActeur	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Outil	Outil	
estCompatible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Outil	Activate	aPourRais...
APourActive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
estIntegrable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

20/10/2017

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23

# WebVOWL 1.0.4



20/10/2017

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24

## Outil de validation

- OOPS! - Ontology Pitfall Scanner !
  - Poveda-Villalón, M., Suárez-Figueroa, M. C., et Gómez-Pérez, A. (2012)
  - Outil indépendant de tout éditeur d'ontologies
  - Utilisation en ligne uniquement

**Ontology Pitfall Scanner**

OOPS! (Ontology Pitfall Scanner) helps you to detect some of the most common pitfalls appearing when developing ontologies. To try it, enter a URI or paste an OWL document into the text field above. A list of pitfalls and the elements of your ontology where they appear will be displayed.

Scanner by URI:  Scanner by URI

Example: [http://data.semanticweb.org/ns/swc/swc\\_2009-05-09.rdf](http://data.semanticweb.org/ns/swc/swc_2009-05-09.rdf)

Scanner by direct input:  Scanner by RDF

```
<?xml version="1.0"?>
<rdf:RDF xmlns="http://www.semanticweb.org/PDIA2017#"
  xml:base="http://www.semanticweb.org/PDIA2017#"
  xmlns:untitled-ontology-340="http://www.semanticweb.org/sylvie/ontologies/untitled-ontology-340#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:xml="http://www.w3.org/XML/1998/namespace"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  <owl:Ontology rdf:about="http://www.semanticweb.org/PDIA2017">
```

Uncheck this checkbox if you don't want us to keep a copy of your ontology. [Go to advanced evaluation](#)

## Validation d'ontologies

**Ontology Pitfall Scanner**

OOPS! (Ontology Pitfall Scanner) helps you to detect some of the most common pitfalls appearing when developing ontologies. To try it, enter a URI or paste an OWL document into the text field above. A list of pitfalls and the elements of your ontology where they appear will be displayed.

Scanner by URI:  Scanner by URI

Example: [http://data.semanticweb.org/ns/swc/swc\\_2009-05-09.rdf](http://data.semanticweb.org/ns/swc/swc_2009-05-09.rdf)

Scanner by direct input:  Scanner by RDF

```
<?xml version="1.0"?>
<rdf:RDF xmlns="http://www.semanticweb.org/PDIA2017#"
  xml:base="http://www.semanticweb.org/PDIA2017#"
  xmlns:untitled-ontology-340="http://www.semanticweb.org/sylvie/ontologies/untitled-ontology-340#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:xml="http://www.w3.org/XML/1998/namespace"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  <owl:Ontology rdf:about="http://www.semanticweb.org/PDIA2017">
```

Uncheck this checkbox if you don't want us to keep a copy of your ontology. [Go to advanced evaluation](#)

**Evaluation results**

It is obvious that not all the pitfalls are equally important; their impact in the ontology will depend on multiple factors. For this reason, each pitfall has an importance level attached indicating how important it is. We have identified three levels:

- **Critical** (C): it is crucial to correct the pitfall. Otherwise, it could affect the ontology consistency, reasoning, applicability, etc.
- **Important** (I): though not critical for the ontology function, it is important to correct this type of pitfall.
- **Minor** (M): it is not really a problem, but by correcting it we will make the ontology nicer.

(Detailed list) | [Collapse all](#)

Results for P04: Creating unconnected ontology elements.	1 case   Minor
Results for P08: Missing annotations.	91 cases   Minor
Results for P11: Missing domain or range in properties.	4 cases   Important
Results for P13: Inverse relationships not explicitly declared.	8 cases   Minor
<b>SUGGESTION: symmetric or transitive object properties.</b>	1 case

**Want to help?**

- Suggest new pitfalls
- Provide feedback

**Documentation:**

- Pitfall catalogue
- User guide
- Technical report

**Related papers:**

**Results for P11: Missing domain or range in properties.** 4 cases | Important

Object and/or datatype properties without domain or range (or none of them) are included in the ontology.

- This pitfall appears in the following elements:
  - > <http://www.semanticweb.org/sylvie/ontologies/untitled-ontology-340#estIntegrable>
  - > <http://www.semanticweb.org/sylvie/ontologies/untitled-ontology-340#aPouFormat>
  - > <http://www.semanticweb.org/sylvie/ontologies/untitled-ontology-340#aIRI>
  - > <http://www.semanticweb.org/sylvie/ontologies/untitled-ontology-340#aUpDate>
- **Tip:** Solving this pitfall may lead to new results for other pitfalls and suggestions. We encourage you to solve all cases when needed and see what else you can get from OOPS!



## Interrogation DL Query de l'ontologie

DL query: ⌵ ⌵ ⌵ ⌵

Query (class expression)

Outil

Query results

Instances (6 of 6)

- ◆ **VOWL2** ?
- ◆ **VersionAPI4\_9** ?
- ◆ **VersionProtege4** ?
- ◆ **VersionProtege51** ?
- ◆ **WebOWL** ?
- ◆ **version2\_3beta4** ?

Query for

- Direct superclasses
- Superclasses
- Equivalent classes
- Direct subclasses
- Subclasses
- Instances

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29

## Interrogation DL Query de l'ontologie

DL query: ⌵ ⌵ ⌵ ⌵

Query (class expression)

aPourDeveloppeur value StanfordUniversity

Query results

Instances (2 of 2)

- ◆ **VersionProtege4** ?
- ◆ **VersionProtege51** ?

Query for

- Direct superclasses
- Superclasses
- Equivalent classes
- Direct subclasses
- Subclasses
- Instances

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30

## Interrogation DL Query de l'ontologie

DL query: ⌵ ⌵ ⌵

Query (class expression)

aPourDeveloppeur **some** owl:Thing

Query results

Subclasses (10 of 10)

● <b>EditionFree</b>	?
● <b>EditionMaestro</b>	?
● <b>EditionStandard</b>	?
● <b>NeonToolkit</b>	?
⊖ <b>OutilStanford</b>	?
● <b>Protege</b>	?
● <b>SWOOP</b>	?
● <b>TopBraidComposer</b>	?
● <b>WebProtege</b>	?

**Query for**

- Direct superclasses
- Superclasses
- Equivalent classes
- Direct subclasses
- Subclasses
- Instances

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31



## Parmi les accessoires manquants?

- Outil de visualisation dédié expert
- Outil supportant l'échange entre ontologie et utilisateur

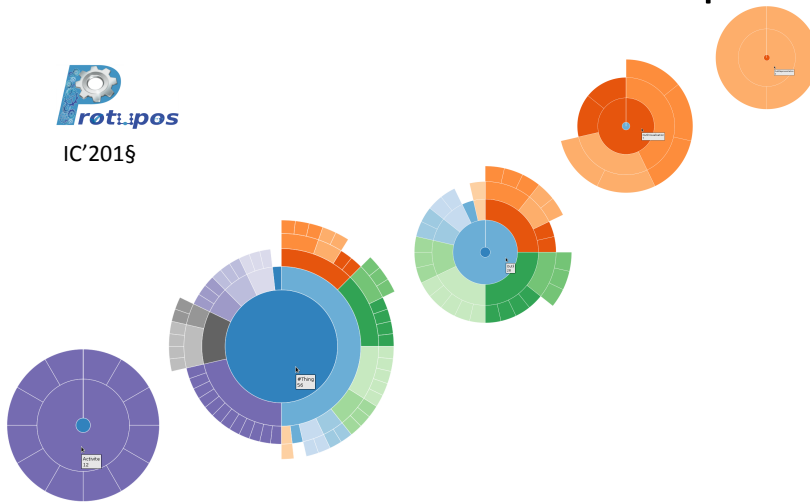
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32



# Visualisation centrée expert

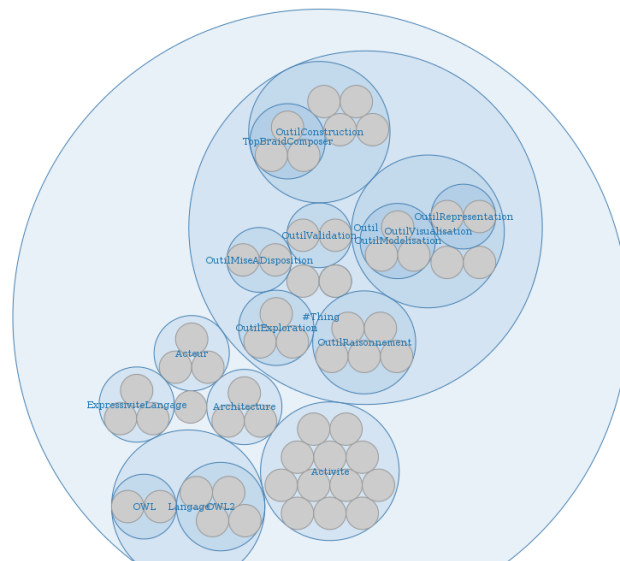


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33

# Visualisation centrée expert



20/10/2017

34



## Merci

- Aux organisateurs de cette journée
  - qui ont permis la construction d'une petite ontologie des outils qui sans eux n'aurait jamais vu le jour
  - il reste à la compléter ...
- A Rahma et Jérôme du LIMICS
  - pour leur contribution à la réalisation de ce travail

## Références bibliographiques

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