



Semantic for VO-Theory

Franck Le Petit
Nicolas Moreau
Fabrice Roy

Development of vocabularies :

- Follow Semantic W.G. recommendation
- SKOS / RDF

A vocabulary is a list of concepts :

Each concept has :

- An identifier (a single **URI** mainly for use by computers)
- A single **preferred label**
- Zero or more **altLabel** (simple synonyms or commonly-used aliases)
- A **description**

Concepts are linked by a limited set of relations :

- **broader**
- **narrower**
- **related** (simple relation)

```
<skos:Concept rdf:about="http://purl.org/astronomy/vocab/IvoaAlgorithms/Stationary_Iterative_Method">
  <skos:inScheme rdf:resource="http://purl.org/astronomy/vocab/IvoaAlgorithms/scheme" />
  <skos:prefLabel xml:lang="en">Stationary Iterative Method</skos:prefLabel>
  <skos:narrower rdf:resource="http://purl.org/astronomy/vocab/IvoaAlgorithms/Successive_Overrelaxation" />
  <skos:narrower rdf:resource="http://purl.org/astronomy/vocab/IvoaAlgorithms/Gauss-Seidel" />
  <skos:narrower rdf:resource="http://purl.org/astronomy/vocab/IvoaAlgorithms/Jacobi_Method" />
  <skos:broader rdf:resource="http://purl.org/astronomy/vocab/IvoaAlgorithms/Algorithm" />
  <skos:related rdf:resource="http://purl.org/astronomy/vocab/IvoaAlgorithms/krylov_Subspace_Method" />
</skos:Concept>
```

Status for VO-Theory vocabularies

- 7 «main» vocabularies.
- IvoaPhysicalProcesses : used for Physics and Target Process

Classes	Vocabulary	Nber of concepts
Physics	IvoaPhysicalProcesses	79
Algorithms	IvoaAlgorithms	89
InputParameters / ParameterGroup	IvoaInputParameters	30
Representation Object Type	IvoaRepresentationObject	10
Property	IvoaProperties	49
Target Object Type	IvoaAstronomicalObjectTypes	306
Target Process	IvoaPhysicalProcesses	79
Product	IvoaProductTypes	4

Development of the vocabularies

Development using Poolparty

- wiki semantics :
 - collaborative work
 - Facilitate development / management of vocabularies (relationships between concepts)
 - Export in SKOS / RDF



<http://poolparty.punkt.at/>

The screenshot shows the Poolparty web interface. On the left is a tree view of concepts under 'Physical process (66)'. The 'Cooling Processes (4)' category is expanded, showing sub-concepts: Atomic Cooling (0), Line cooling (0), Lyman Alpha Cooling (0), and Molecular Cooling (0). The main panel displays the 'Selected Concept' 'Cooling Processes' with a URL. Below this are tabs for 'SKOS', 'Metadata', 'Linked Data', 'Triples', 'Visualization', and 'Geo'. The 'SKOS' tab is active, showing sections for 'Broader Concepts' (Physical process), 'Narrower Concepts' (Atomic Cooling, Line cooling, Lyman Alpha Cooling, Molecular Cooling), 'Related Concepts', 'Exact Matching Concepts', and 'Close Matching Concepts'. On the right side, there are fields for 'Preferred Label (translate)' (Cooling Processes), 'Alternative Labels', 'Hidden Labels', 'Notation', 'Scope Notes', and 'Definitions', each with a small 'en' icon.

Each SKOS concept is identified by a URI

- We plan to use PURL (Persistent Uniform Resource Locators) :
 - acts as permanent identifiers
- URI can point towards a page with the description of the concept

Example for the main vocabularies

http://purl.org/astronomy/Algorithms/Finite_Difference

Persistent address	Vocabulary	Concept
--------------------	------------	---------

Question : which syntax do we adopt ?

- Persistent address ?
<http://purl.org/astronomy> or something else ?
- Concepts : for blanks should we have «_» or « « ?

Example :

Finite Differences : <http://purl.org/astronomy/Algorithms/FiniteDifference>

Finite_Differences : http://purl.org/astronomy/Algorithms/Finite_Difference

Physical Properties vocabulary

- How this vocabulary will be used ?
 - just discovery ?
 - «full» interoperability ?
Example : Line **intensity** of **CO**, transition **2 -> 1**
- UCDs are sometimes more precise

How to deal with personal vocabularies ?

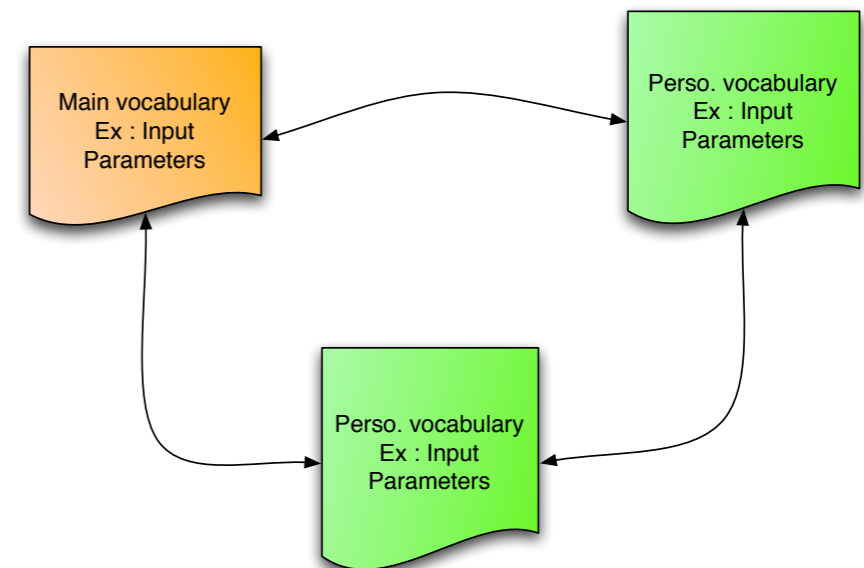
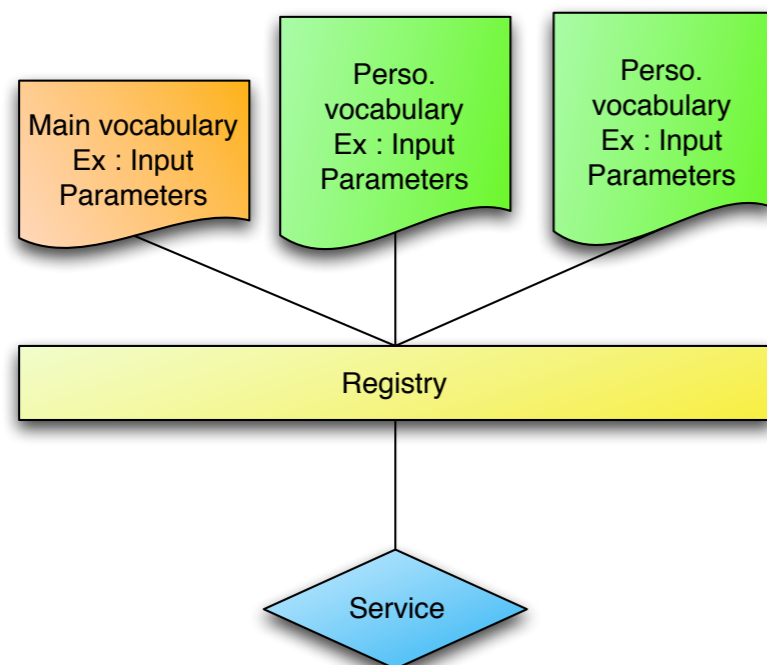
Strasbourg meeting (2009 ?) - we may need specific / personal vocabularies :

- some publishers may need very specific concepts
- we may wish to standardize some definitions (community specific)

=> development of specific vocabularies to provide definitions of these concepts

Personal vocabularies have to be registered to be discovered by services.

How to do the relationships between concepts of different vocabularies ?

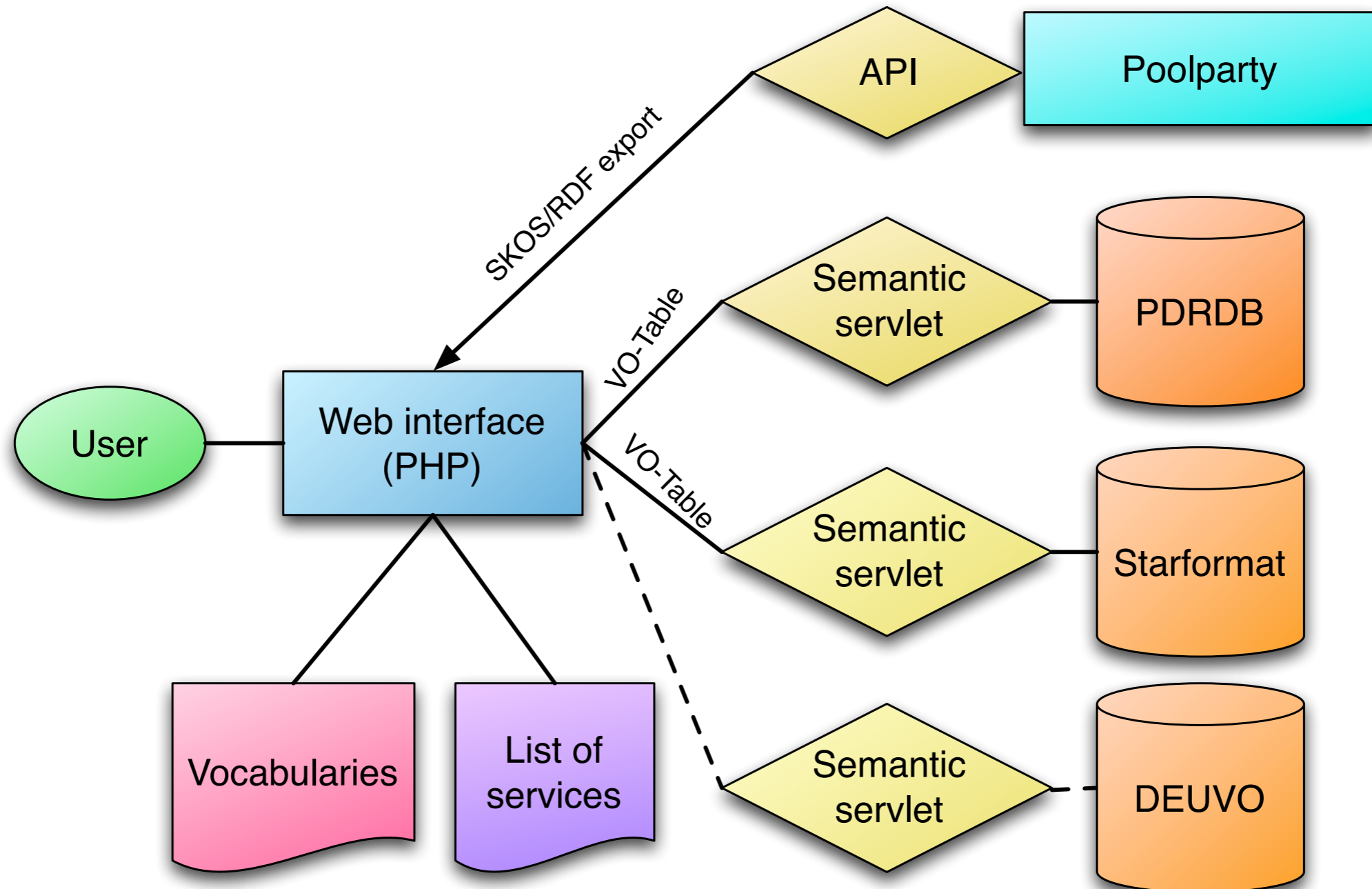


Minimal solution :

* personal vocab. **MUST** be narrower to an official vocabulary

* is it enough or personal vocabularies are they a pain for interoperability ?

Implementation (in development)



VO-Theory Semantic services

Three services

1 - Discovery of VO-Theory services using common concepts

- codes (protocols)
- projects

We can discover services using «common» concepts :
=> transparency of the VO !

Search Simulations Search Concepts Web services Admin

SEARCH A SIMULATION

Algorithm

Physical process

Astrophysical object

Physical quantity *

Result type *

Enter keywords to discover VO-Theory services. Services include data bases of simulations, public codes, ...
Recognized keywords are those defined in VO-Theory vocabularies and correspond to concepts commonly used in the community.

For example, entering, «Radiative transfer» as physical process will present all services relative to radiative transfer.

* : not yet queryable in simdbs

Request : physicalProcesses = Radiative transfer

Codes Projects

PDR

NAME	DESCRIPTION	OWNER	NUMBER OF SIMULATIONS	DATES
PDR 1.4 Chimie08.chi	PDR 1.4 : The 1.4 version corresponds to the PDR code described in Gonzalez Garcia M. et al. (2008, A&A, 485, 127). It includes a new radiative transfer method computing in details I.R. ... [more]	Franck Le Petit	120	Created : 2010-05-12 Updated : 2010-05-12
PDR 1.4 Drcnosd.chi	PDR 1.4 : The 1.4 version corresponds to the PDR code described in Gonzalez Garcia M. et al. (2008, A&A, 485, 127). It includes a new radiative transfer method computing in details I.R. ... [more]	Franck Le Petit	225	Created : 2010-05-12 Updated : 2010-05-12
PDR 1.4 rev 345 Drcnosd.chi	PDR 1.4 : The 1.4 version corresponds to the PDR code described in Gonzalez Garcia M. et al. (2008, A&A, 485, 127). It includes a new radiative transfer method computing in details I.R. ... [more]	Franck Le Petit	72	Created : 2010-05-12 Updated : 2010-05-12
PDR 1.4 Demo	Test demo	Franck Le Petit	2	Created : 2010-05-12 Updated : 2010-05-12

2 - Discovery of VO-Theory Semantics URIs

- browse vocabularies
- get the URIs to register simulations in SimDBs
- Suggest new concepts : mailing list

Search Simulations Search Concepts Web services Admin

BROWSE SEMANTIC TERMS

Presentation

This service is dedicated to scientists who wish to publish VO-Theory services. It aims at discovering the semantics URIs required to register a VO-Theory service / simulations.

As described in the IVOA standard, Simulation Data Model, to register a VO-Theory service, publishers have to provide several URIs corresponding to semantics keywords that describe their services / simulations. Semantics URIs have to be provided for : Algorithms, Target Object Types, Physical Process, Input parameters, Product types, Properties, Representation object types.

Example of a VO-Theory URIs : <http://purl.org/Algorithms/GaussSeidel> VO-Theory concepts follow a SKOS description as recommended by the IVOA Semantic Working Group. Navigate through the broader, narrower, related terms to discover the most precise concept you wish.

To suggest new concepts or corrections, contact : VOTheory.semantics@obspm.fr.

Request

Choose a vocabulary Search a concept

All concepts

- [3+1 Formalism](#)
- [Accelerated Lambda Iteration](#)
- [Adaptive Mesh Refinement](#)
- [Advection Upstream Splitting Method](#)
- [Algorithm](#)
- [Alternating Direction Implicit](#)
- [BiConjugate Gradient](#)
- [BiConjugate Gradient Stabilized](#)
- [Bulirsch-Stoer](#)
- [Chebyshev Iteration](#)
- [Conjugate Gradient Method](#)
- [Conjugate Gradient Squared Method](#)
- [Coupled Escaped Probability](#)
- [Crank-Nicolson](#)
- [Discontinuous Galerkin methods](#)
- [Escape Probability](#)
- [Euler](#)
- [Exact Radiative Transfer Method](#)
- [Exact Riemann Solver](#)
- [Extended Finite Element Method](#)

Finite Difference

URI : http://purl.org/Algorithms/Finite_Difference

Narrower terms :

- [CrankNicolson](#)
- [Euler](#)
- [Leap Frog](#)
- [RungeKutta](#)
- [ForwardTime CentralSpace](#)
- [Gear Method](#)
- [LaxFriedrichs](#)
- [LaxWendroff](#)
- [MacCormack](#)

Narrower transitive terms :

- [CrankNicolson](#)

MacCormack

URI : <http://purl.org/Algorithms/MacCormack>

Broader terms :


- [Algorithm](#)
- [Finite Difference](#)

Broader transitive terms :

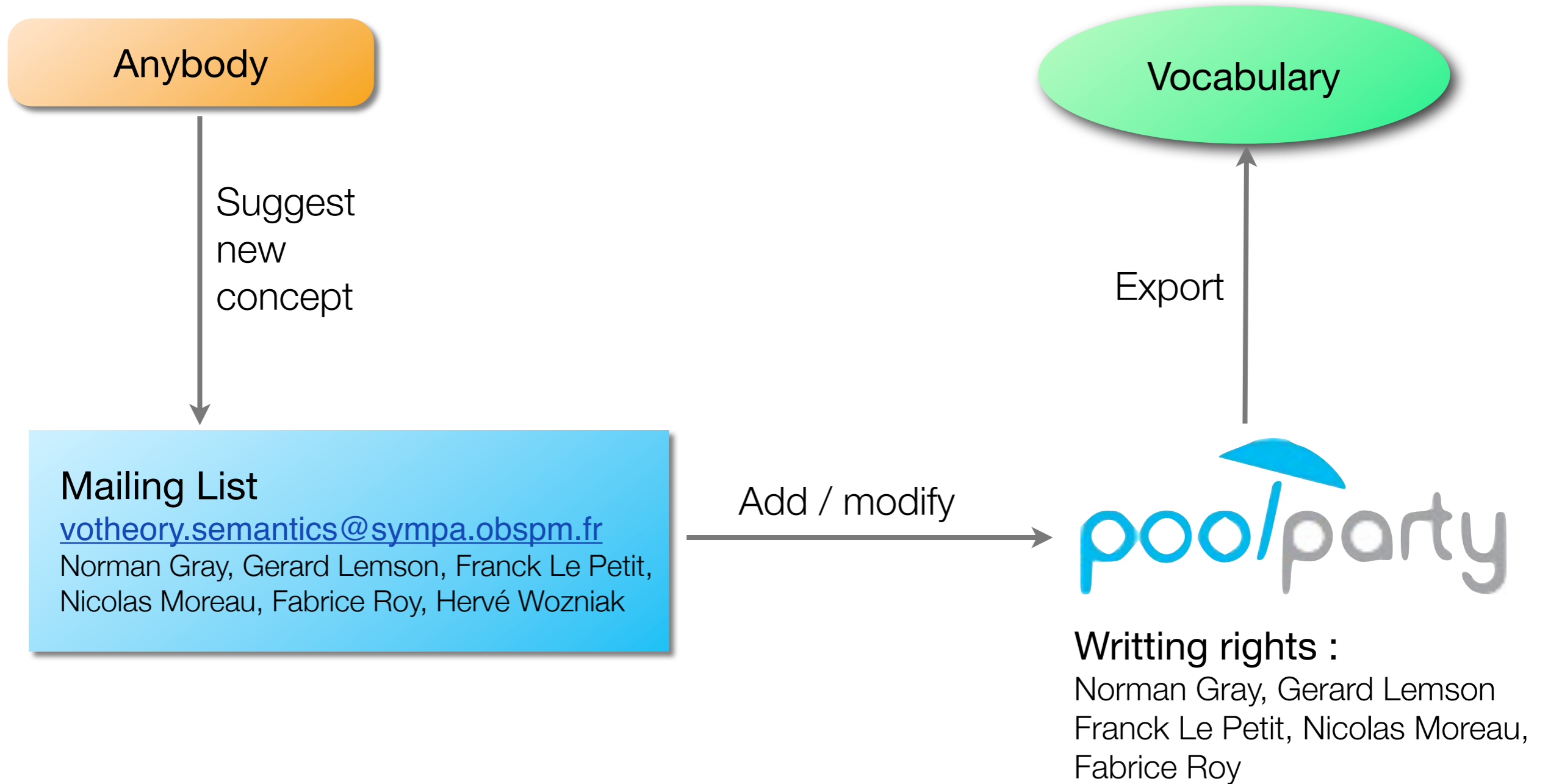
- [Algorithm](#)
- [Finite Difference](#)

Poolparty

The development of the VO-Theory vocabularies rely on Poolparty, a thesaurus management system and a SKOS editor developed by punkt.netServices.

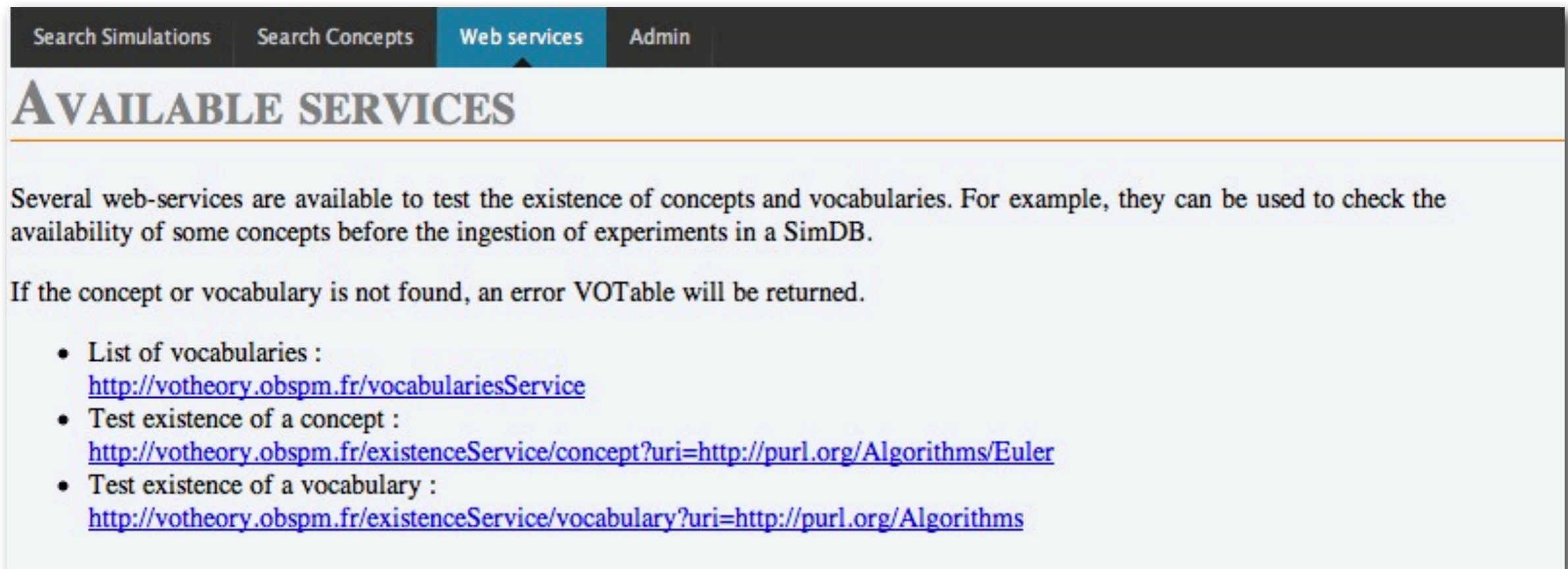


Development of the 7 main vocabularies



Web-services to check URIs before ingestion of ressources in SimDBs

- Returns a list of vocabularies (returns a votable) :
<http://votheory.obspm.fr/vocabulariesService>
- Checks if a concept exist (returns the skos declaration of the element or an error votable) :
<http://votheory.obspm.fr/existenceService/concept?uri=http://purl.org/Algorithms/Euler>
- Checks if a vocabulary exists (returns the complete vocabulary file or an error votable) :
<http://votheory.obspm.fr/existenceService/vocabulary?uri=http://purl.org/Algorithms>



The screenshot shows a navigation bar with four items: 'Search Simulations', 'Search Concepts', 'Web services' (which is highlighted in blue), and 'Admin'. Below the navigation bar is a section titled 'AVAILABLE SERVICES' in a large, bold, serif font. The text below the title explains that several web-services are available to test the existence of concepts and vocabularies before ingestion into a SimDB. It also notes that an error VOTable will be returned if the concept or vocabulary is not found. A bulleted list follows, providing the same three URLs as the main text above.

Search Simulations Search Concepts **Web services** Admin

AVAILABLE SERVICES

Several web-services are available to test the existence of concepts and vocabularies. For example, they can be used to check the availability of some concepts before the ingestion of experiments in a SimDB.

If the concept or vocabulary is not found, an error VOTable will be returned.

- List of vocabularies :
<http://votheory.obspm.fr/vocabulariesService>
- Test existence of a concept :
<http://votheory.obspm.fr/existenceService/concept?uri=http://purl.org/Algorithms/Euler>
- Test existence of a vocabulary :
<http://votheory.obspm.fr/existenceService/vocabulary?uri=http://purl.org/Algorithms>

Questions :

- * Syntax for blanks : finite_difference or FiniteDifference in URIs ?
- * How to deal with personal vocabularies ?
- * What to do with UCDs ? Another vocabulary ?
- * Technical problem of long URIs in Poolparty
- * How to build detailed concepts for interoperability ?
Examples :
 - * **Abundance** of **H2** in **level v = 0, J = 0**
 - * Is combination of vocabularies possible ?