Semantic in SimDB

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I Applying semantic concepts in SimDB
II Creating and editing vocabularies
III Concepts identification
IV An example of implementation
V Evolutions

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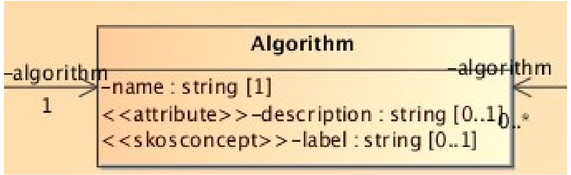
Applying semantic concepts in SimDB

- SimDM allows to tag data with semantic concepts to help the user searching DB


-algorithm
1
Algorithm
-algorithm
-name : string [1]
<<attribute>>-description : string [0..1]
0..*
<<skosconcept>>-label : string [0..1]

-Taggable classes are :

Protocol package : Physics, Algorithm, InputParameter, ParameterGroup,
RepresentationObjectType
Experiment package : TargetProcess, TargetObjectType
Object package : Property, PropertyGroup

- There are currently 7 vocabularies :
Algorithms
AstronomicalObjectTypes
JournalKeywords
PhysicalProcesses
Properties
RepresentationObjects
ProductType

- Following Semantic WG recommendations, vocabularies use the Simple Knowledge Organization System (SKOS)

- Normalized by W3C, common data model for sharing and linking knowledge organization systems via the Web

A vocabulary is a list of concepts

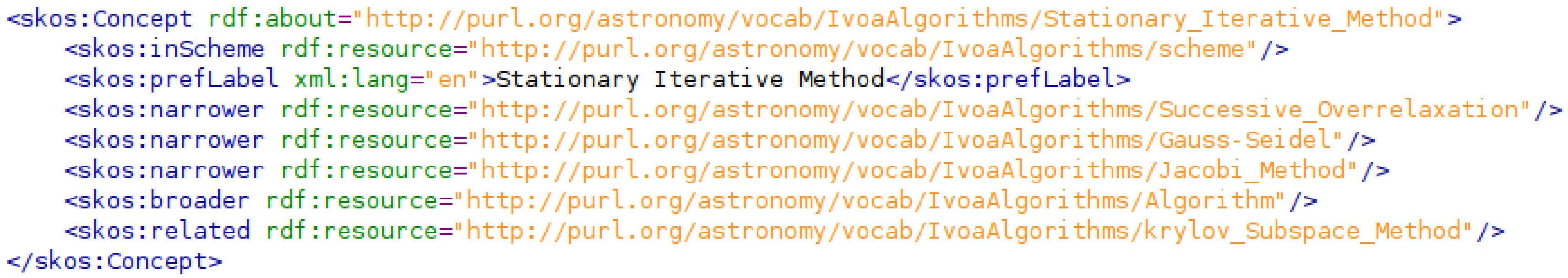
Each concept has :

An identifier (a single URI mainly for use by computers)
A single prefered label in each supported language
Zero or more altLabel (simple synonyms or commonly-used aliases)
A description

Concepts are linked by a limited set of relations :

“broader”, “narrower” or simply “related”

Example :



```
<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>
```

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Creating and editing vocabularies : PoolParty

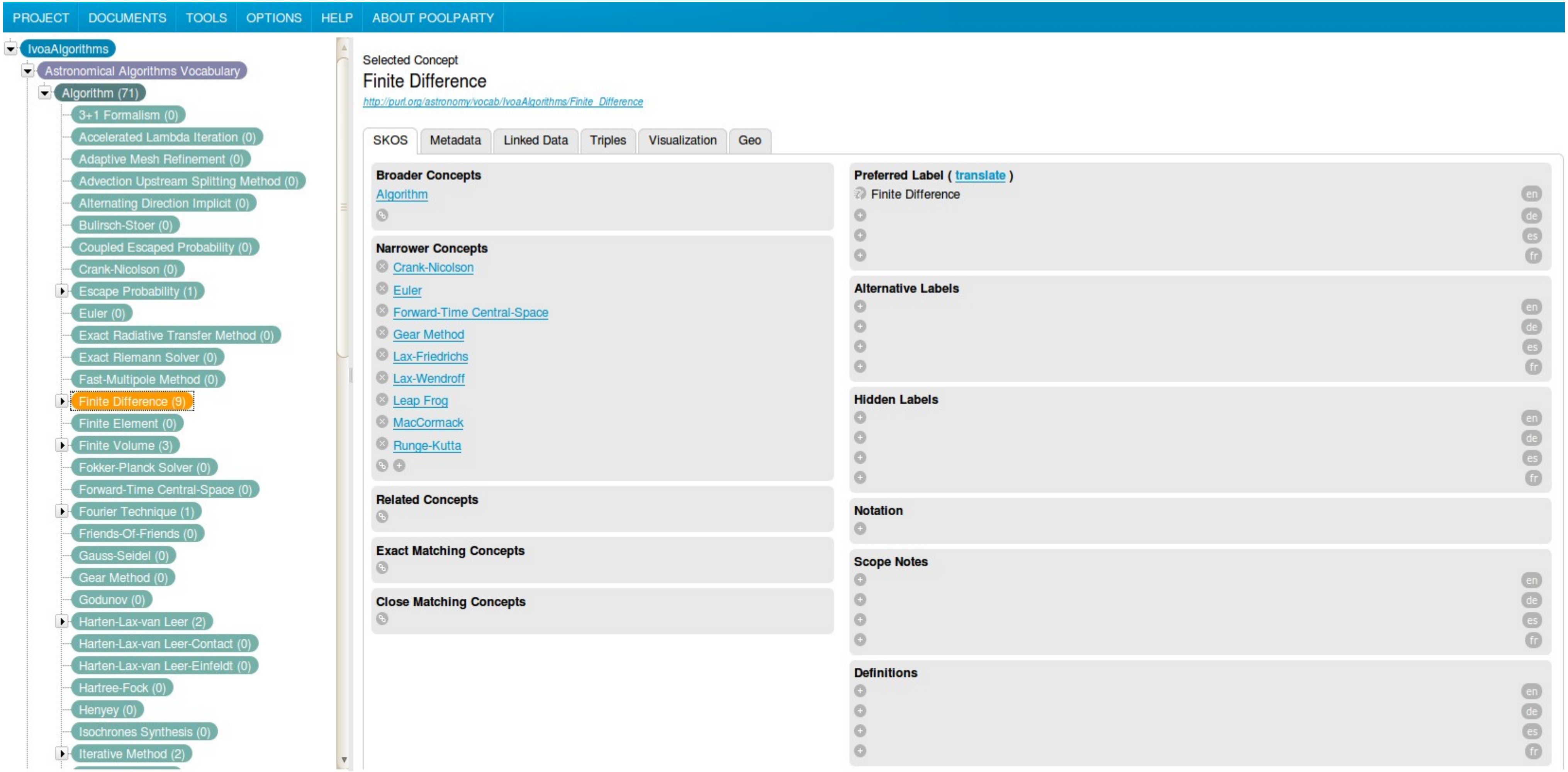
- SKOS vocabularies can be written in XML
- However creation/maintenance is not user friendly

-PoolParty is a commercial web application allowing :

  - creation and edition of vocabularies
  - a wiki frontend for public access
  - a clear graphical interface to browse and edit them in admin mode
  - import/export utilities
  - vocabulary validation tools
  - programmatic access through SPARQL endpoint and HTTP web services :
    getSemanticRelations
    getThesauri
    getConcepts
    ...

- Fortunately we got an academic licence

Poolparty interface



IvoaAlgorithms
- Astronomical Algorithms Vocabulary
  - Algorithm (71)
    - 3+1 Formalism (0)
    - Accelerated Lambda Iteration (0)
    - Adaptive Mesh Refinement (0)
    - Advection Upstream Splitting Method (0)
    - Alternating Direction Implicit (0)
    - Bulirsch-Stoer (0)
    - Coupled Escaped Probability (0)
    - Crank-Nicolson (0)
    - Escape Probability (1)
    - Euler (0)
    - Exact Radiative Transfer Method (0)
    - Exact Riemann Solver (0)
    - Fast-Multipole Method (0)
    - Finite Difference (9)
    - Finite Element (0)
    - Finite Volume (3)
    - Fokker-Planck Solver (0)
    - Forward-Time Central-Space (0)
    - Fourier Technique (1)
    - Friends-Of-Friends (0)
    - Gauss-Seidel (0)
    - Gear Method (0)
    - Godunov (0)
    - Harten-Lax-van Leer (2)
    - Harten-Lax-van Leer-Contact (0)
    - Harten-Lax-van Leer-Einfeldt (0)
    - Hartree-Fock (0)
    - Henyey (0)
    - Isochrones Synthesis (0)
    - Iterative Method (2)

Selected Concept

Finite Difference

http://purl.org/astronomy/vocab/IvoaAlgorithms/Finite_Difference

Broader Concepts

Algorithm

Narrower Concepts

Crank-Nicolson
Euler
Forward-Time Central-Space
Gear Method
Lax-Friedrichs
Lax-Wendroff
Leap Frog
MacCormack
Runge-Kutta

Related Concepts

Exact Matching Concepts

Close Matching Concepts

Preferred Label (translate)

Finite Difference

Alternative Labels

Hidden Labels

Notation

Scope Notes

Definitions

- A Poolparty instance has been created for us
- No access to the server

How do we use it :

- We have to stay independant from the application
- The aim is to simplify the creation and update of vocabularies
- Eventually they will be exported and stored elsewhere

Demo

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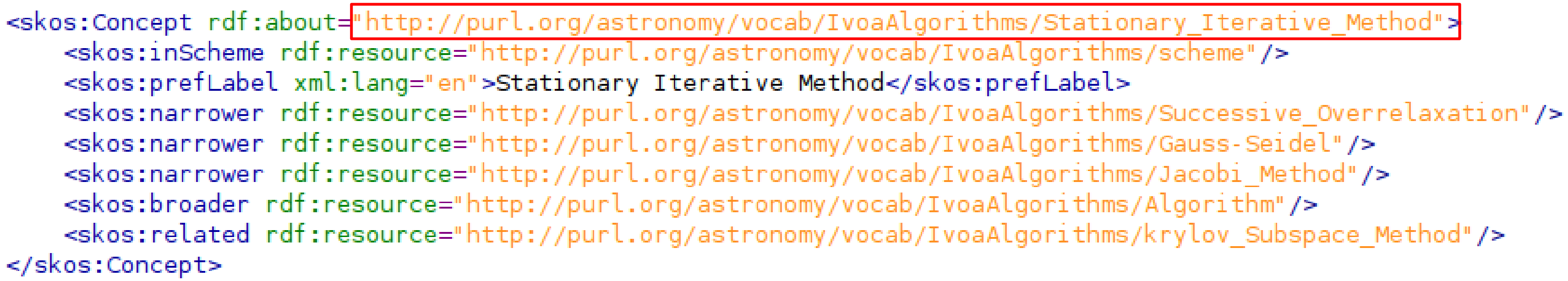
Concepts identification : purl

- Each SKOS concept has a unique identifier
- We use it in simDB to assign a concept to an object



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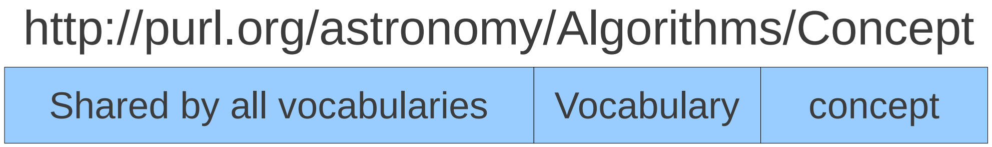


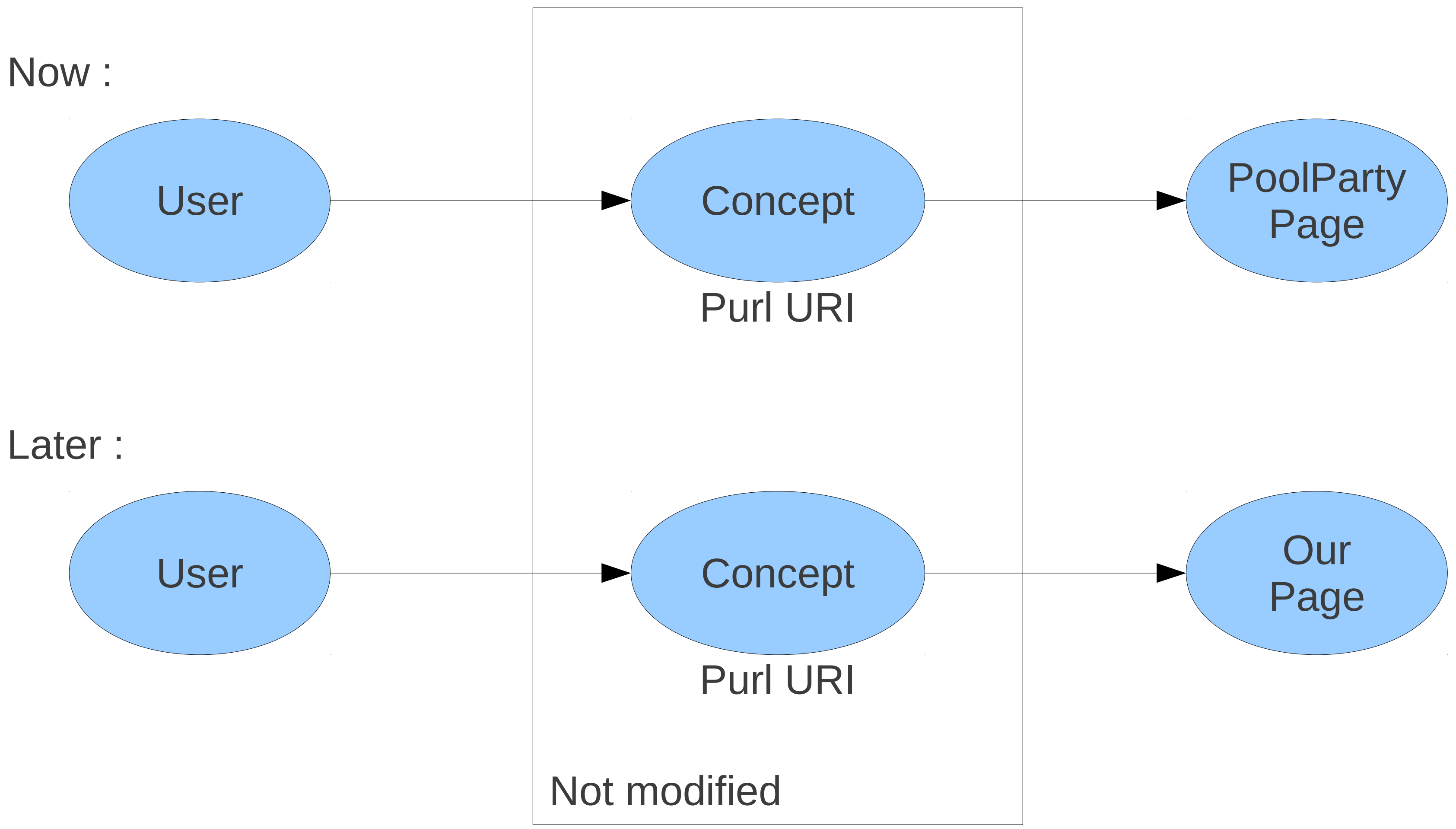
http://purl.org/astronomy/Algorithms/Concept

Shared by all vocabularies | Vocabulary | concept

Vocabulary : always plural, starts with an uppercase
Concept : prefLabel with blank replaced by undescores

- It can provide a link to a page describing the concept
- If the uri follows the default Poolparty pattern : http://prod.poolparty.punkt.at/myconcept a HTML page is automatically created for each concept but we are tied to the application
- They told us that they can create this page even with another uri
- We uses PURLs (Persistent Uniform Resource Locators) that are Web addresses acting as permanent identifiers and redirecting to a page that can be modified

Moving a description



Now :

User

Concept

Purl URI

PoolParty Page

Later :

User

Concept

Purl URI

Our Page

Not modified

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An example of implementation

- We inserted some concepts in 2 databases : PDR and Starformat
- Concerned classes are :
  - Physics
  - Algorithms
  - TargetObjectTypes

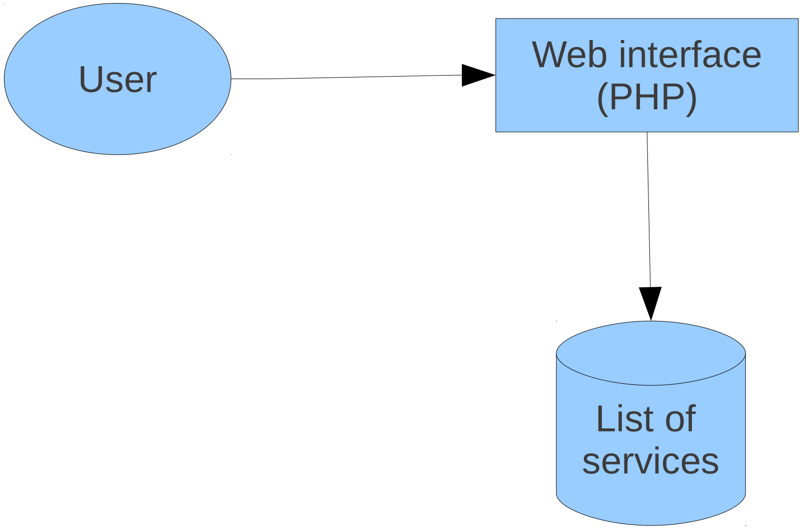
The aim is to find Protocol/Projects according to those concepts

For now, basic use case :

A user chooses one or several concepts in one or several vocabularies
The choice is done among prefLabels/altLabels
He got a list of protocols and a list of projects (both with a number of experiments) matching the criteria in the databases

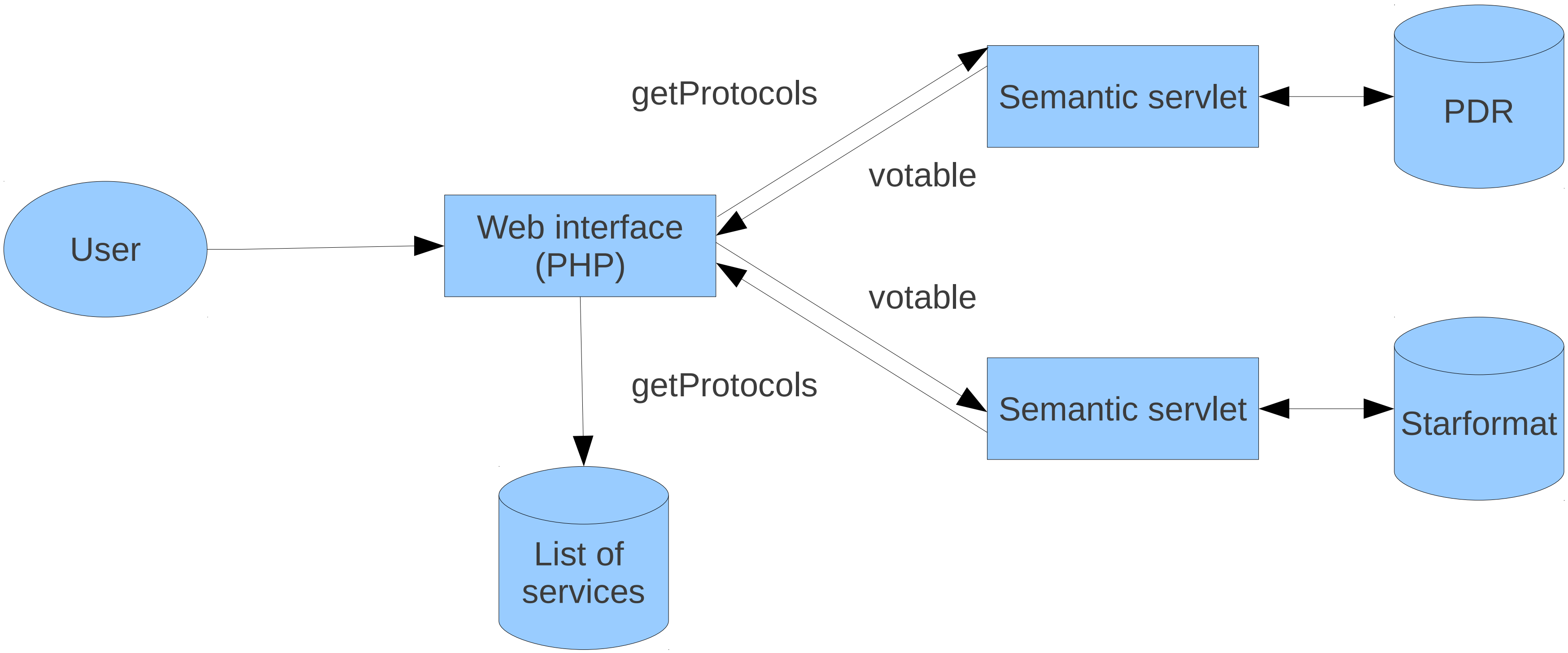
Relations between concepts are not used yet in this example.

Architecture



1. User select some terms
2. A request to get the protocols is sent to all services contained in the list
3. A request to get the projects is sent to all services contained in the list
4. VOTables are displayed

Architecture



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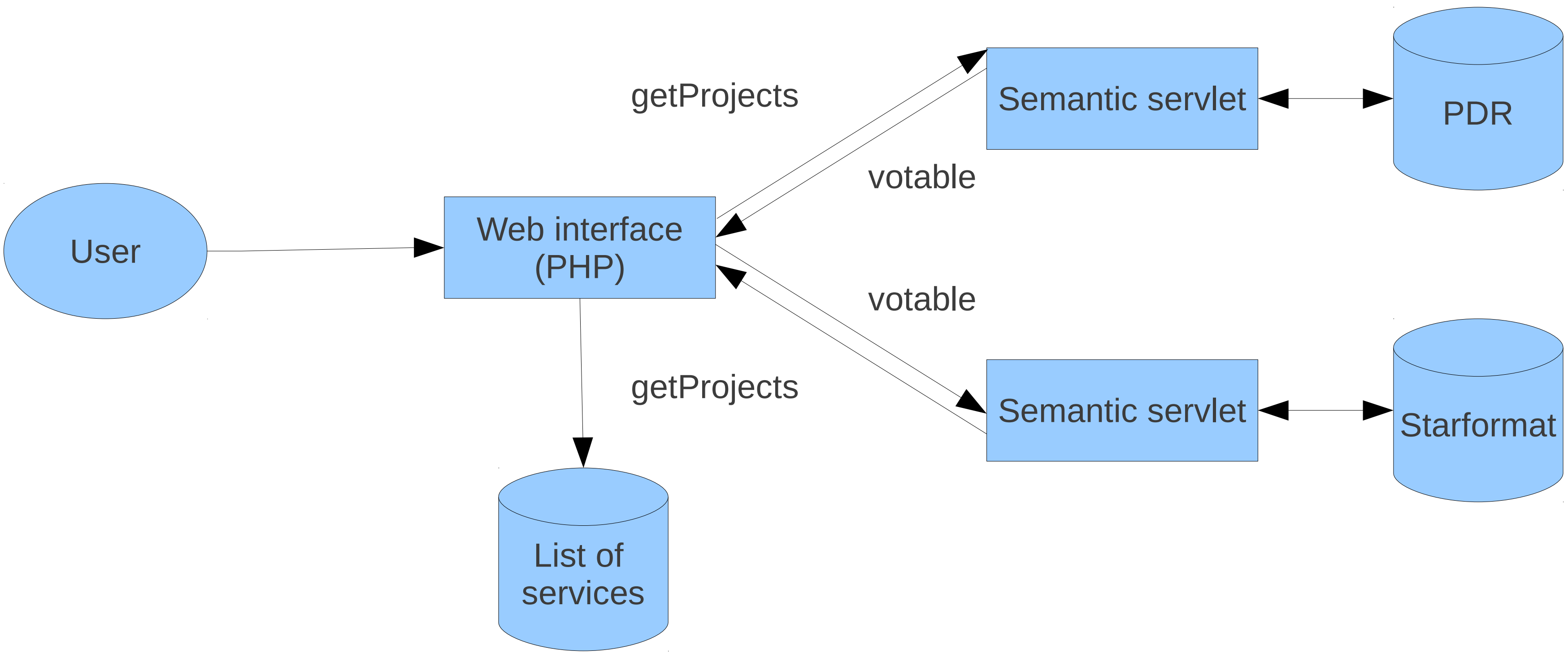

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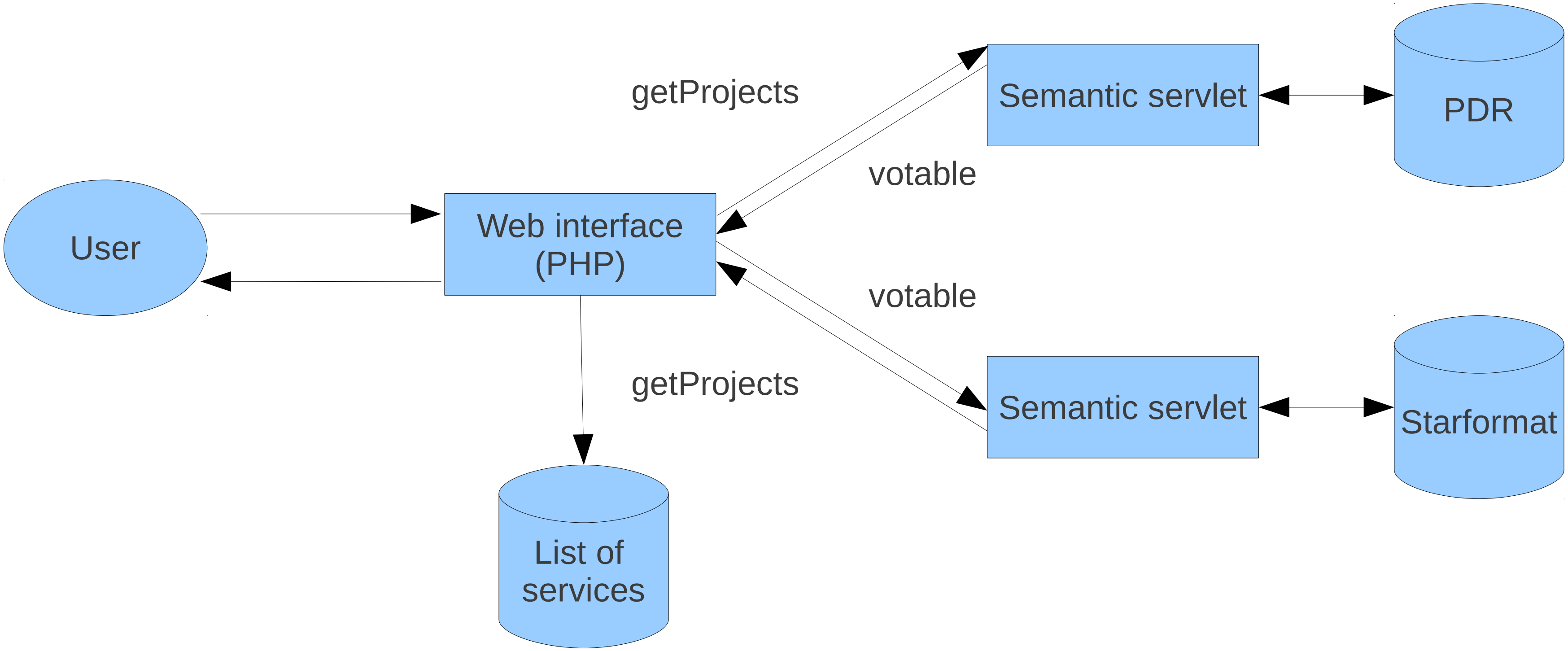

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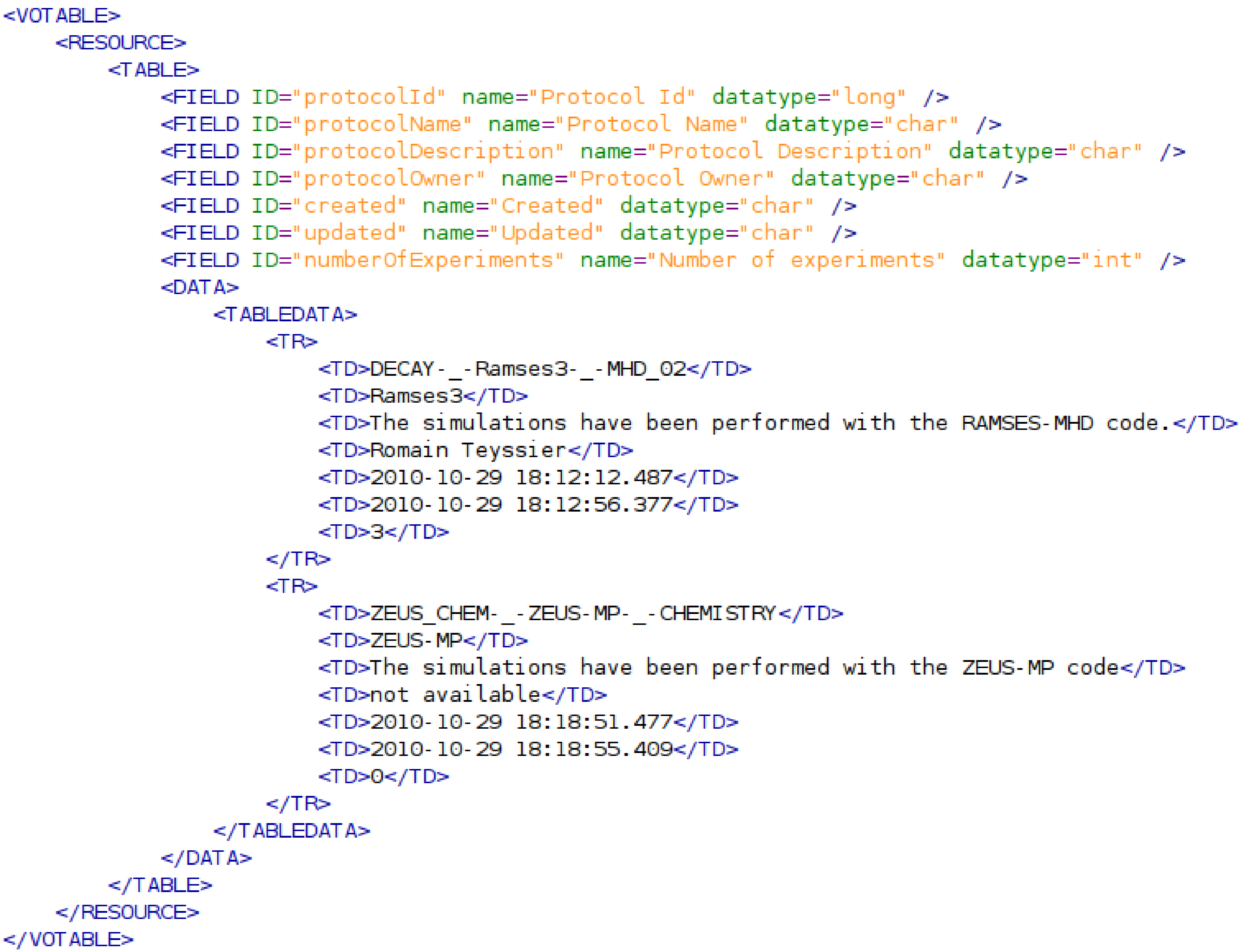
Output example



```
<VOTABLE>
    <RESOURCE>
        <TABLE>
            <FIELD ID="protocolId" name="Protocol Id" datatype="long" />
            <FIELD ID="protocolName" name="Protocol Name" datatype="char" />
            <FIELD ID="protocolDescription" name="Protocol Description" datatype="char" />
            <FIELD ID="protocolOwner" name="Protocol Owner" datatype="char" />
            <FIELD ID="created" name="Created" datatype="char" />
            <FIELD ID="updated" name="Updated" datatype="char" />
            <FIELD ID="numberOfExperiments" name="Number of experiments" datatype="int" />
            <DATA>
                <TABLEDATA>
                    <TR>
                        <TD>DECAY-_-Ramses3-_-MHD_02</TD>
                        <TD>Ramses3</TD>
                        <TD>The simulations have been performed with the RAMSES-MHD code.</TD>
                        <TD>Romain Teyssier</TD>
                        <TD>2010-10-29 18:12:12.487</TD>
                        <TD>2010-10-29 18:12:56.377</TD>
                        <TD>3</TD>
                    </TR>
                    <TR>
                        <TD>ZEUS_CHEM-_-ZEUS-MP-_-CHEMISTRY</TD>
                        <TD>ZEUS-MP</TD>
                        <TD>The simulations have been performed with the ZEUS-MP code</TD>
                        <TD>not available</TD>
                        <TD>2010-10-29 18:18:51.477</TD>
                        <TD>2010-10-29 18:18:55.409</TD>
                        <TD>0</TD>
                    </TR>
                </TABLEDATA>
            </DATA>
        </TABLE>
    </RESOURCE>
</VOTABLE>
```

Demo

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Evolutions

- Adding SimDBs into registries (to replace local list of services)
- Using relations between terms in the services

- Defining vocabularies creation and update processes

How will they be created :

For now, several big vocabularies
Other projects will have specific needs

2 Solutions:

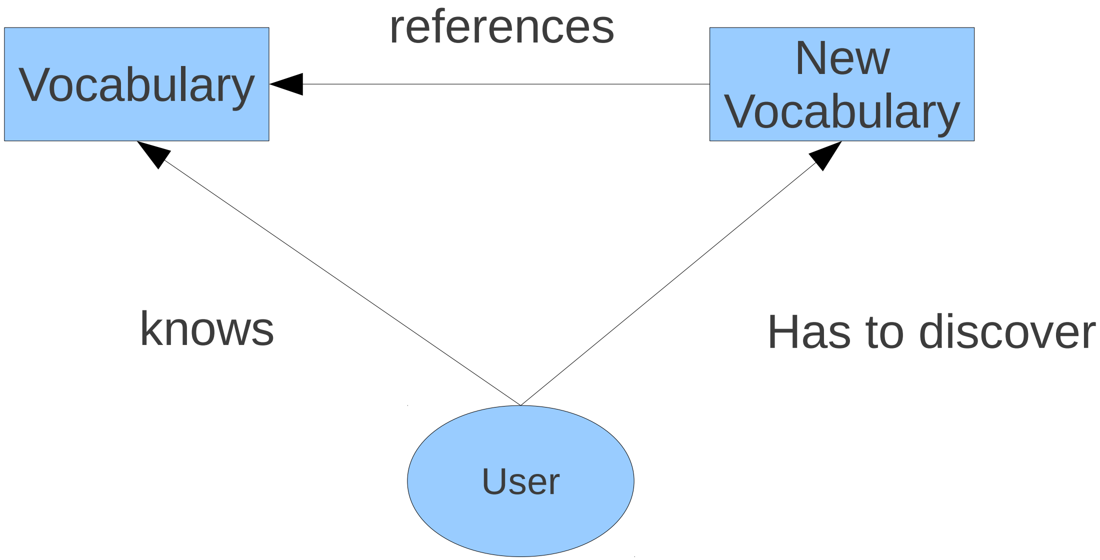
Centralized architecture :

Adding terms in global vocabularies
People ask for one/several terms, an authority decide to add them
Who will host the vocabularies, who will maintain them

Evolutions

Distributed architecture:

New projects can create new vocabularies referencing previous ones



How can applications know where the new vocabulary is located ?
If a query is done on the referenced vocabulary, how does it know he is referenced ?