



Environments for collaborative ontology mapping

Álvaro Sicilia

ARC Enginyeria i Arquitectura La Salle (FUNITEC)

ENVIRONMENT FOR COLLABORATIVE ONTOLOGY MAPPING

An environment has been developed to be used in the semantic integration processes which will lead to the creation of the **Semantic Energy Information Framework (SEIF)**.

It consists of two tools: 1. an **OWL mapping extractor** and 2. an **Ontology mapping collaborative web environment**.

These tools will help different users –domain experts, data owners, and ontology engineers– to integrate data in a collaborative way using standard semantic technologies. The tools also automate parts of the semantic integration process.

In particular, with these tools it is possible:

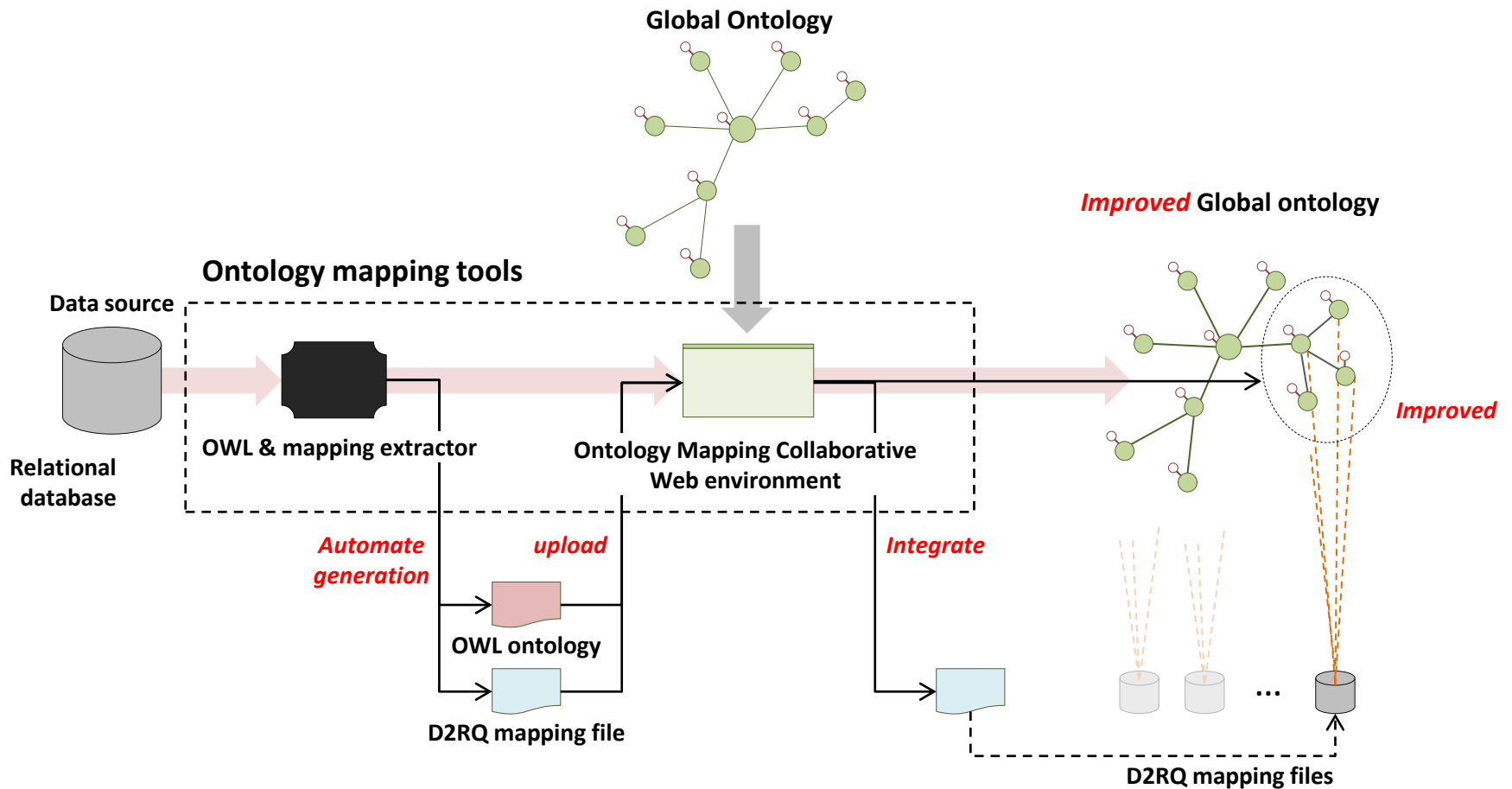
- 1. To generate an OWL ontology from a schema database (almost all data sources exist as databases).
- 2. To translate relational data stored in tables and columns to RDF format according the local ontology previously generated.
- 3. To provide an environment where users can easily map a local ontology to a global ontology according to their knowledge.

The tools are being validated through their application in the ontology building process leading to the SEIF. However, the tools are generic enough to be applied to other projects dealing with building ontologies. The tools will be made available to the scientific and academic communities after being validated through their application in the SEMANCO project.

SEMANTIC INTEGRATION PROCESS

In the SEMANCO project, a semantic integration process will be carried out to incorporate data sources into SEIF which contains a global ontology embracing all the terms which the tools need to interact with the SEIF. The set of ontology mapping tools we have developed enable users to follow the steps of the integration process.

The process starts by generating a local ontology based on the structure of the data source using the OWL & mapping extractor tool. Then, the users –domain experts, data owners, and ontology engineers– map the local ontology to the global ontology already defined in the SEIF using the ontology mapping collaborative web environment. Finally, the data is published by the D2RQ platform with a mapping file which is generated by the web mapping environment.



ONTOLOGY MAPPING TOOLS

```

C:\WINDOWS\system32\cmd.exe

D:\ARC\Proyectos\Semanco\WP4\OWL\N3Extractor>java -jar owl3extractor.jar -db jdbc
c:mysql://localhost/manresabills -driver net.sourceforge.jtds.jdbc.Driver
e -p "" -n ManresaBills -o ManresaBills
SEMANCO: OWL & N3 extractor Tool @ 2012

Configuration:
- Database URL: jdbc:mysql://localhost/manresabill
- Dabase driver: net.sourceforge.jtds.jdbc.Driver
- Database username: root
- Database password:
- Ontology name: ManresaBills
- Output files: ManresaBills.owl and ManresaBills..

Starting extraction...

List of tables:
>> TABLE: electricbills -->
  columns-----
>> COL:Energypriceplan
>> COL:Reactiveenergyprice000
>> COL:Cosinus
>> COL:Reactiveenergyconsumedpeakperiod
>> COL:Powercontracted
>> COL:Powercontracted03
>> COL:Powercontracted02
>> COL:Powerpricepeak
>> COL:Numberdaysconsumption
>> COL:Energypricevalley
>> COL:Monthlytepentingcost
>> COL:Totalreactiveenergyconsumedallperiods
>> COL:Monthlyreactiveenergycost
>> COL:Enddateconsumtion
>> COL:Buildingname
>> COL:Powerpriceplan
>> COL:Taxcost
>> COL:Energyconsumedp6
>> COL:Energyconsumedpeakperiod
>> COL:Billdate
>> COL:Energyconsumedplanperiod
>> COL:Energyconsumedp5

```

SEMANCO: Ontology Mapping Collaborative Web Environment

Home | Data sources | Energy Model | Prefixes | Admin

Tool description

The purpose of this environment is to help domain experts and ontology engineers to redefine the data source ontology. It tooks the files (OWL, ontology), OWL & N3 extractor tool allowing the users to map each concept to the energy model already defined.

Activity log

- 2012-09-29 A. Sicilia has edited **Electricbills** mapping
- 2012-09-29 A. Sicilia has edited **Electricbills** mapping
- 2012-09-29 A. Sicilia on **ManresaBills**. This is a comment...
- 2012-09-29 A. Sicilia has update the mapping options of the **GasbillsMonthlybimonthlygasasociconsumption3Attribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:EnergyBillByGasValue** of **GasbillsMonthlybimonthlygasasociconsumption3Attribute** mapping
- 2012-09-29 A. Sicilia has edited **GasbillsMonthlybimonthlygasasociconsumption3Attribute** mapping
- 2012-09-29 A. Sicilia has update the mapping options of the **GasbillsEnergypriceAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:intValue** of **GasbillsEnergypriceAttribute** mapping
- 2012-09-29 A. Sicilia has added **semanco:CostAttribute** suppler class to **GasbillsEnergypriceAttribute** mapping
- 2012-09-29 A. Sicilia has update the mapping options of the **GasbillsEnergypriceAttribute** mapping
- 2012-09-29 A. Sicilia has edited **GasbillsEnergypriceAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping
- 2012-09-29 A. Sicilia has modified data type **semanco:name** of **GasbillsBuildingnameAttribute** mapping

Recent development changes

- 29/09/2012, datatypes, unit measure, and inferred s...
- 16/09/2012, D2RQ N3 (mapping file) generation full
- 09/09/2012, Ontology prefixes editable colors added
- 14/03/2012, Ontology graphical module added
- 13/03/2012, Message and activity log modules added
- 13/03/2012, First version.

ManresaBills (http://www.repener.org/ontologies/ManresaBills.owl) - [C:\Documents and Settings\usuari\Escritorio\ManresaBills.owl]

ManresaBills (http://www.repener.org/ontologies/ManresaBills.owl)

Active Ontology | Entities | Classes | Object Properties | Data Properties | Individuals | OWL Viz | DL Query | OWL2Query Tab | OntoGraf

Class Hierarchy: **Building**

- ElectricbillsPowerp
- ElectricbillsPowerp
- ElectricbillsReactiv
- ElectricbillsReactiv
- ElectricbillsReactiv
- ElectricbillsReactiv
- ElectricbillsReactiv
- ElectricbillsReactiv
- ElectricbillsReactiv
- ElectricbillsReactiv
- ElectricbillsReactiv
- ElectricbillsRealea
- ElectricbillsStartda
- ElectricbillsTaxcost
- ElectricbillsTaxcost
- ElectricbillsTaxcost
- ElectricbillsTotalre
- ElectricbillsTotalre
- ElectricbillsVat_mu
- ElectricbillsVat_util
- ElectricbillsVatcost
- Entity
- Abstract
- Building
- Electricbills

Data property hierarchy: **Individuals by B...**

Data property hierarchy:

topDataProperty

- intValue
- realValue
- stringValue

Description of http://localhost:2020/

Resource URI: http://localhost:2020/re

Home | All map_5886_sumo_Object All map_5886_sumo_Physical All map_5886_sumo_Artifact All map_5886_sumo_CorpuscularObject All map_5891 All map_5885_sumo_StationaryArtifact

Property	Value
sumo:hasCity	<http://localhost:2020/resource/city/>
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/1226->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/1560->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/1728->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/2024->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/2121->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/2163->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/2293->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/2846->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/5539->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/6967->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/7361->
semanco:hasEnergyBillByGas	<http://localhost:2020/resource/energy/billbygas/8496->
semanco:hasEnergyPrice	<http://localhost:2020/resource/energy/price/0>
semanco:name	CONGOST NOU (xsd:string)
rdf:type	sumo:Artifact
rdf:type	sumo:Building
rdf:type	sumo:CorpuscularObject
rdf:type	sumo:Entity
rdf:type	sumo:Object
rdf:type	sumo:Physical
rdf:type	sumo:SelfConnectedObject
rdf:type	sumo:StationaryArtifact

1 SEMANTICS EXTRACTION

2 MAPPING TO A GLOBAL ONTOLOGY

3 SEMANTIC DATA PUBLISHING

The tools developed in the SEMANCO project help non-technician users to carry out a data integration process applying semantic techniques.

SEMANCO: Ontology Mapping Collaborative Web Environment
Alvaro Sicilia [logout](#)

Home
Data sources
Energy Model
Prefixes
Admin

Manresabills (CIMNE) Catalonia, Spain
Electric and Gas bills
 Scale: **Micro**
 Status: **Revision**
 Modified: 2012-06-29

ManresaBills.owl: [Input](#), [Output](#)
 ManresaBills.n3: [Input](#), [Output](#), [Edit header](#)

[Export](#)

Mappings This list contains Concepts retrieved from the input OWL file

Name	Classname	Selected	New	Date modified
Entity	:	<input type="checkbox"/>	...	0000-00-00
Attribute	:	<input type="checkbox"/>	...	0000-00-00
Abstract	:	<input type="checkbox"/>	...	0000-00-00
Electricbills	semanco:EnergyPerformance	<input checked="" type="checkbox"/>	...	2012-06-29
ElectricbillsEnergypriceplanAttribute	:	<input type="checkbox"/>	...	0000-00-00
ElectricbillsEnergypriceplanAttribute	size080A	<input type="checkbox"/>	...	0000-00-00
ElectricbillsCosinusAttribute	:	<input type="checkbox"/>	...	0000-00-00

Original name of the concept

New name taken from the global ontology

Comments

Comment

2012-06-29 A. Sicilia This is a comment ✖

Users can comment

The export option generates a new **OWL** and **D2RQ** mapping file which contain the mappings created by the users.

This list contains Concepts retrieved from the input OWL file

Original name of the concept

New name taken from the global ontology

Users can comment

The purpose of this environment is to help domain experts and ontology engineers to redefine the data source ontology. Users register a data source in the environment by uploading the files generated by the extractor tool. Afterwards, they can view a list of mappings. Users can also comment their actions. When the user exports the mappings the environment generates an ontology in *OWL DL lite_A* format and a mapping file valid for D2RQ platform.

Manresabills (CIMNE) Catalonia, Spain
Electric and Gas bills
Scale: [Micro](#)
Status: Revision
Modified: 2012-06-29

ManresaBills.owl: [Input](#), [Output](#)
ManresaBills.n3: [Input](#), [Output](#), [Edit header](#)

[Export](#)

manresabills:GasbillsMunicipalitynameAttribute

null

Datatypes

Name	Energy Model	xsd Type	Date modified
stringValue	stringValue	xsd:string	2012-06-28

Energy Model class: [sumo:City](#)

Mapping options

Generate inferred superclasses mappings: **Yes**
Unit measure class: **Meter**
Database column for mapping: **gasbills.Municipalityname**

Users also can map the source data types to the global ontology data types.

Users can customize the mapping generation with different options.

Log

2012-06-29 A. Sicilia has update the mapping options of the [GasbillsMunicipalitynameAttribute](#) mapping
2012-06-28 A. Sicilia has update the mapping options of the [GasbillsMunicipalitynameAttribute](#) mapping
2012-06-28 A. Sicilia has update the column to gasbills.Municipalityname of the [GasbillsMunicipalitynameAttribute](#) mapping
2012-06-28 A. Sicilia has update the column to gasbills.Municipalityname of the [GasbillsMunicipalitynameAttribute](#) mapping
2012-06-28 A. Sicilia has update the column to gasbills.Municipalityname of the [GasbillsMunicipalitynameAttribute](#) mapping
2012-06-28 A. Sicilia has update the column to gasbills.Municipalityname of the [GasbillsMunicipalitynameAttribute](#) mapping

Comments

[Comment](#)

The activity of the users is registered in order to help other users to understand the changes.

Each concept extracted from the structure of a database can be mapped to a concept from a global ontology. If the source concept cannot be mapped to any concept from the global ontology, then a new concept can be created, and should be connected to the global ontology by defining its super-concepts. Also, the user can map the source data types (columns) to a global ontology data type.

ONTOLOGY MAPPING COLLABORATIVE WEB ENVIRONMENT

SEMANCO: Ontology Mapping Collaborative Web Environment

Alvaro Sicilia [logout](#)

Home Data s

Modify mapping: manresabills:GasbillsMunicipalitynameAttribute

Integrate?

New class name:



or, use an energy

model class:

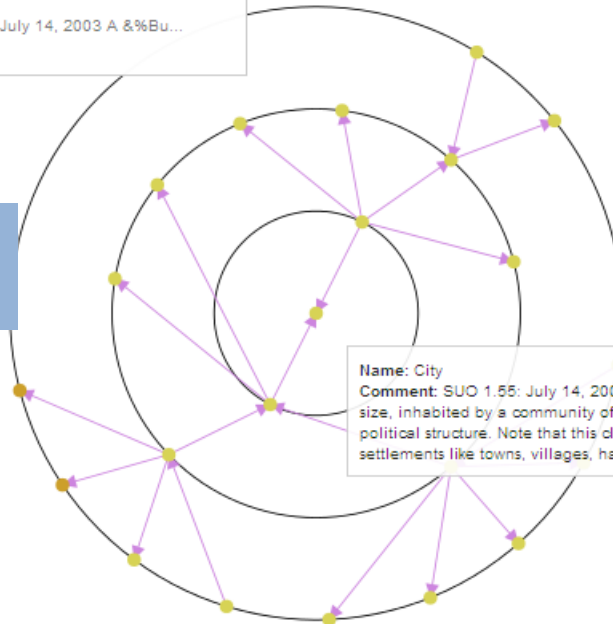
Users can define a new concept or can use a concept from the global ontology.

Hotel -SUO 1.55: July 14, 2003 A &&Re...

ResidentialBuilding -SUO 1.55: July 14, 2003 A &&Bu...

A graphical interface helps users to understand the global ontology enabling them to search concepts.

The radial graph allow users to navigate through the global ontology jumping from one concept to other bringing concept descriptions.



In order to enhance the interface usability, a graphical ontology representation has been implemented. It is based on radial graph visualization where the central node is an ontology class. The edges between nodes are relations between ontology classes. Each circle hosts the ontology classes which are related to the root class. This kind of representation enables users to explore the classes and properties of a local ontology as well as the global ontology which implements the energy model.

“OWL & mapping extractor” tool has been developed in JAVA. With the appropriate driver can read any data base provider. It has been tested with MySQL and SQLServer.

“Collaborative ontology mapping web environment” has been developed in PHP using the framework Code Igniter. The graphical ontology representation has been implement using the JavaScript InfoVis toolkit and ARC to parse RDF files. The ontology generated is written in OWL DL-Lite_A formalism and the mapping file is written in the D2RQ Mapping Language.

- CodeIgniter, Open source PHP web application framework – <http://codeigniter.com>
- JavaScript InfoVis Toolkit, Create Interactive Data Visualizations for the Web - <http://thejit.org>
- ARC, Appmosphere RDF classes - <https://github.com/semsol/arc2/wiki>
- D2RQ platform, Accessing Relational Databases as Virtual RDF Graphs - <http://d2rq.org>

SEMANCO web site:

www.semanco-project.eu

Lead partner:

ARC Enginyeria i Arquitectura La Salle (FUNITEC)

www.salleurl.edu/arc

Technical contact:

Álvaro Sicilia (asicilia@salleurl.edu)



SEMANCO is being carried out with the support of the European Union's FP7 Programme "ICT for Energy Systems" 2011-2014, under the grant agreement number 287534 .