

# Methodological Guidelines for Publishing Government Linked Data

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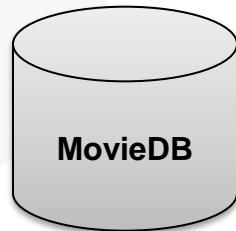
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**Slides available at: <http://www.slideshare.net/boricles/>  
Credits to the OEG members involved in LD Initiatives**

Universidad Rey Juan Carlos  
September, 2011

- Introduction to Linked Data
- Guidelines for Publishing Government Linked Data
- Demo

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A screenshot of the IMDb website showing the movie "Even the Rain" (2010). The page includes the movie poster, title, rating (7.3/10), plot summary, director, writer, stars, and links to watch the trailer and add it to a watchlist. A blue callout box overlaid on the page contains the text: "Data exposed to the Web via HTML, pdf, etc.".



A screenshot of the CIA World Factbook website showing information about Bolivia. It includes a map of South America with Bolivia highlighted, a flag of Bolivia, and a detailed map of Bolivia with its capital La Paz and other cities like Sucre, Potosi, and Tarija. A sidebar on the right lists CIA initiatives like "CIA Open Initiative" and "World Leaders".



industry production index in Cochabamba Bolivia

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[PDF An Emerging Logic of Urban Water Management, Cochabamba, Bolivia](#)

File Format: PDF/Adobe Acrobat - Quick View

by S Marvin - 1999 - Cited by 33 - Related articles

case study of water privatisation in the city of **Cochabamba, Bolivia**, .... the production and transmission of potable water and a negligence of maintenance, .... cond **industrial city** of Santa Cruz and the third city **Cochabamba** ...

[www.ag.unr.edu/swrf/readings/marvin.pdf](http://www.ag.unr.edu/swrf/readings/marvin.pdf)

[Economy of Bolivia - Wikipedia, the free encyclopedia](#)

Gini index, 59.2 (2006). Labour force, 4,532 million (2009 est.) ... to privatize the water utility in the city of **Cochabamba** led to nationwide disturbances. ... Agricultural production in **Bolivia** is complicated by both the country's topography and climate. .... **Industrial production** growth rate: 7.4% (2008 est.) ...

[en.wikipedia.org/wiki/Economy\\_of\\_Bolivia](http://en.wikipedia.org/wiki/Economy_of_Bolivia) - Cached - Similar

[Bolivia Economy](#)

Industrial production growth rate: 4% (1995 est.) Electricity—capacity: 786000 kW (1995) ... Bus: La Paz to Cochabamba \$12 USD, La Paz to Santa Cruz \$24 USD

[www.worldb6.com/southamerica/bolivia/economy](http://www.worldb6.com/southamerica/bolivia/economy) - Cached - Similar

[Bolivia-Military Schools](#)

Bolivia-Military Schools. **Bolivia Index**. Bolivia's military schools. The principal officer school complex was located in **Cochabamba** ...

production growth rate(%), 10.6% (2008 est.) ...

[www.mongabay.com/history/bolivia/bolivia-military\\_schools.htm](http://www.mongabay.com/history/bolivia/bolivia-military_schools.htm)



**Even the Rain (2010)**  
También la lluvia (original title)  
103 min - History - 5 January 2011 (Spain)

★★★★★ 7.3/10  
Users: (647 votes) 4 reviews | Critics: 43 reviews  
Metascore: 68/100 (based on 18 reviews from Metacritic.com)

As a director and his crew shoot a controversial film about Christopher Columbus in Cochabamba, Bolivia, local people rise up against plans to privatize the water supply.

Director: Icíar Bollaín  
Writer: Paul Laverty  
Stars: Gael García Bernal, Luis Tosar and Karra Elejalde

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6 photos | 3 videos | 18 news articles | full cast and crew »

Actualizado a las 21h42 (Gmt -4)

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# Los Tiempos.com

Cochabamba, Viernes 06 de mayo del 2011

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Política. DENUNCIAN MANIPULACIÓN DEL PRESIDENTE DE LA ASAMBLEA LEGISLATIVA  
La oposición abandona mesa de concertación sobre reglamento para elecciones judiciales

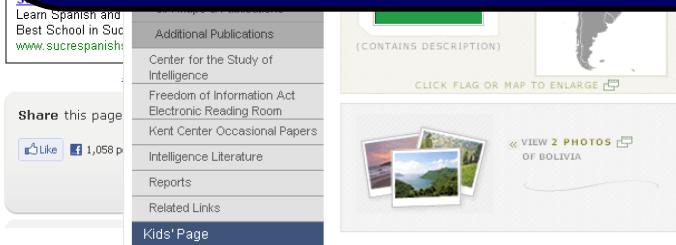


La Bancada de PPB-Convergencia Nacional en la Asamblea Legislativa, decidió este jueves abandonar la mesa de concertación encargada de la redacción del Reglamento para las elecciones en el Órgano Judicial, debido a que no se logró acuerdo en el tratamiento de esta norma que protege a los candidatos afines al MAS y coarta la libertad

El vicepresidente de Bolivia, Álvaro García Linera, y el presidente de la Asamblea Legislativa (4/V/11).

El vicepresidente, el diputado opositor Bernardo Gutiérrez-Rodríguez, y el presidente de la Comisión de Asamblea Legislativa (4/V/11).

Complex queries over *multiple* pages / data sources?



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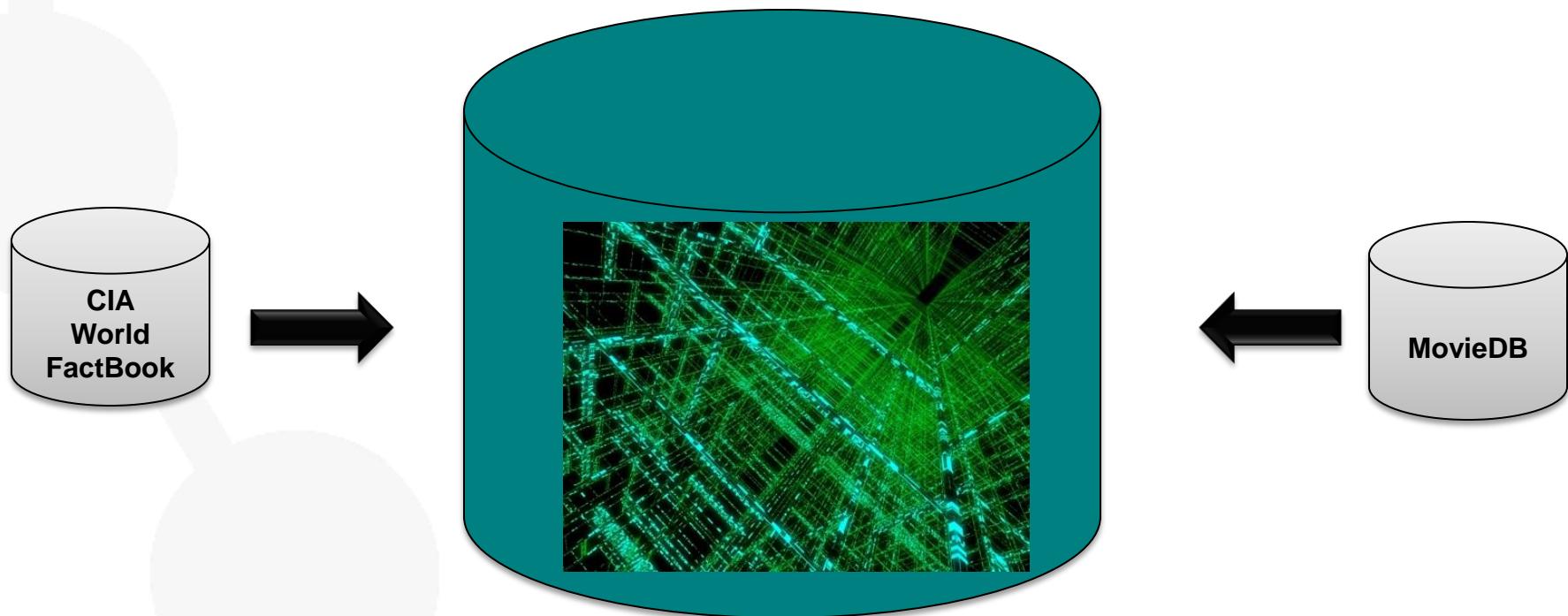
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# What do we actually want?

- Use the Web like a single global database



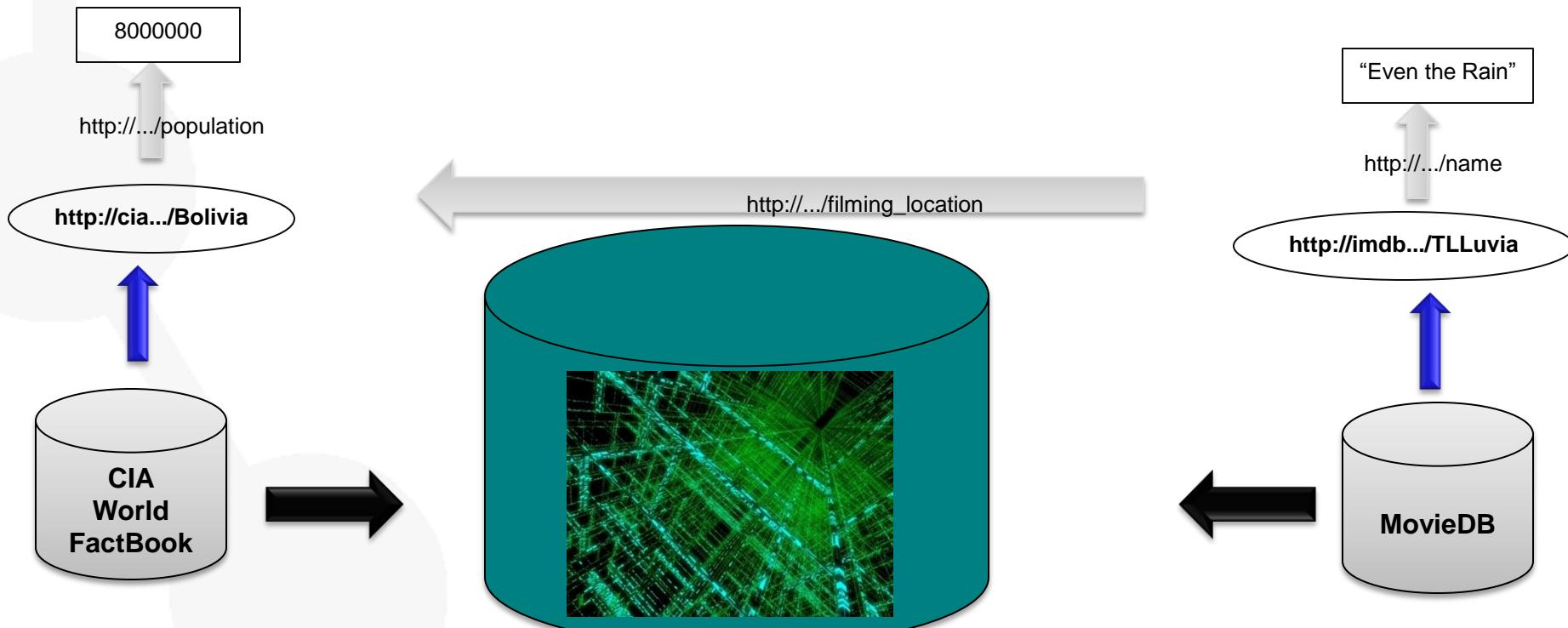
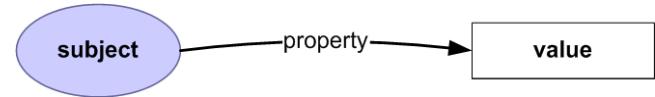
# Linked Data enables such Web of Data

**Global Identifier:** **URI** (Uniform Resource Identifier), which is a string of characters used to identify a name or a resource on the Internet.

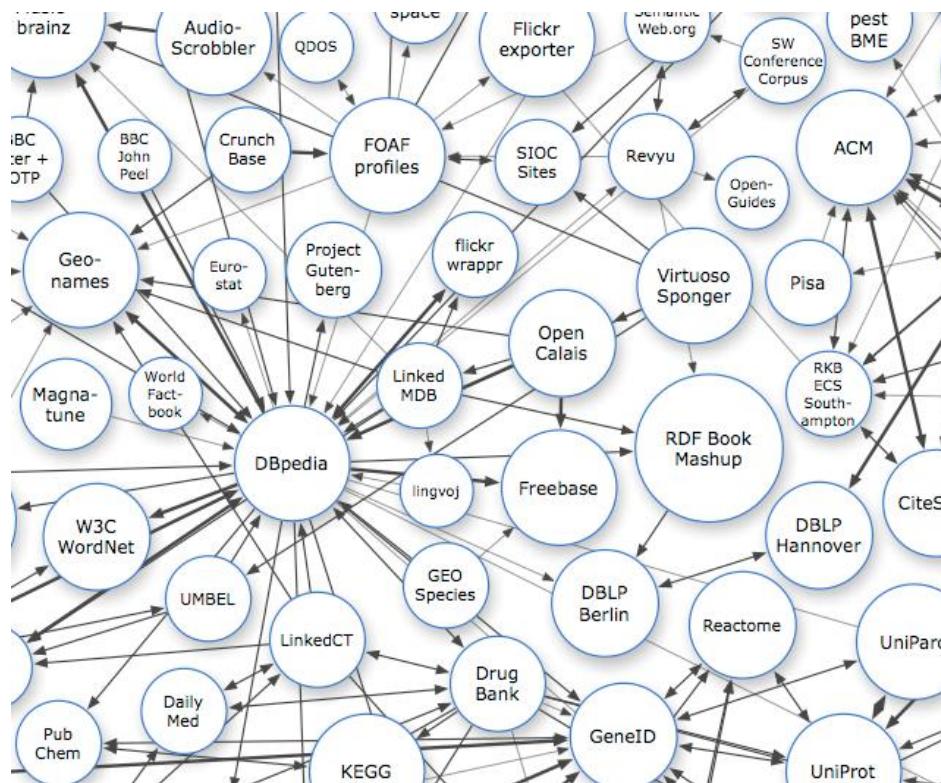
**Data Model:** **RDF** (Resource Description Framework), which is a standard model for data interchange on the Web

**Access Mechanism:** **HTTP**

**Connection:** **Typed Links**



- An extension of the current Web...
  - ... where **data** are given **well-defined** and **explicitly represented meaning**, ...
  - ... so that it can be **shared** and used by **humans and machines**, ...
  - ... better enabling them to work in cooperation
- How?
  - Promoting information exchange by **tagging web content** with machine processable descriptions of its meaning.
  - And **technologies** and **infrastructure** to do this
    - And **clear principles** on how to publish data

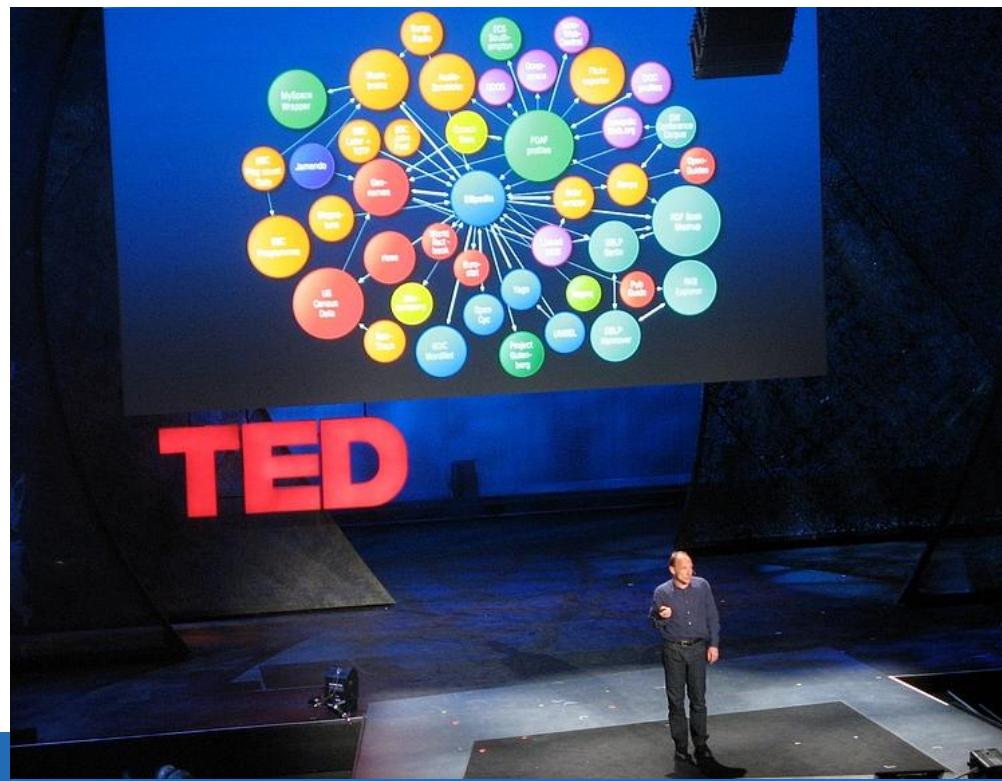


# The four principles (Tim Berners Lee, 2006)

1. Use URIs as names for things
2. Use HTTP URIs so that people can look up those names.
3. When someone looks up a URI, provide useful information, using the standards (RDF\*, SPARQL)
4. Include links to other URIs, so that they can discover more things.

- <http://www.w3.org/DesignIssues/LinkedData.html>

[http://www.ted.com/talks/tim\\_berners\\_lee\\_on\\_the\\_next\\_web.html](http://www.ted.com/talks/tim_berners_lee_on_the_next_web.html)



# So does that mean I have to publish my data as Linked Data, now?

- But, why?

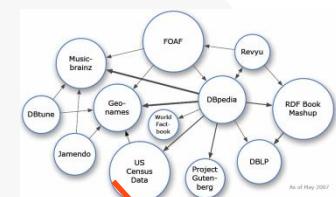


- What was your incentive to publish an HTML page in 1990?
  - Share data in documents and because your neighbor was doing it
- So, why should we publish Linked Data in 2011?
  - Share data as data and because your neighbor is doing it

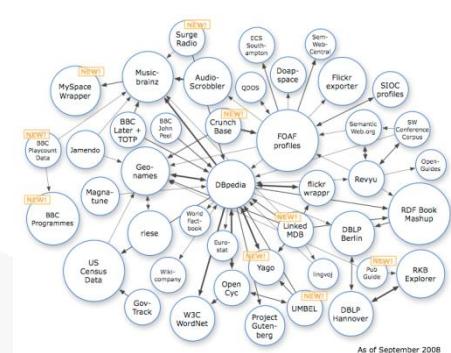
# And guess who is starting to publish Linked Data now?

- UK Government
- US Government
- BBC
- Open Calais
- Freebase
- NY Times
- CNET
- Dbpedia
- ....

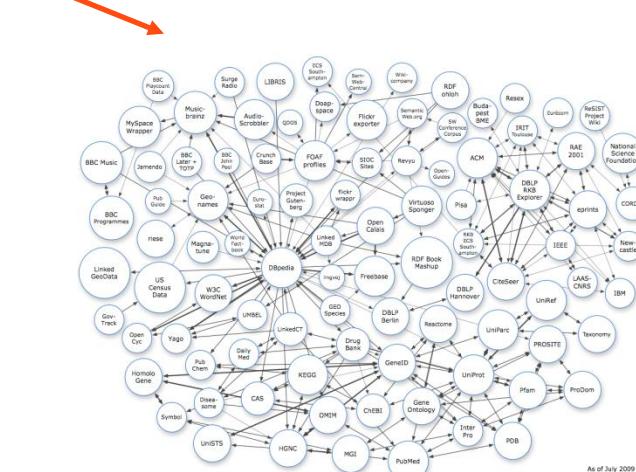
# Linked Open Data evolution



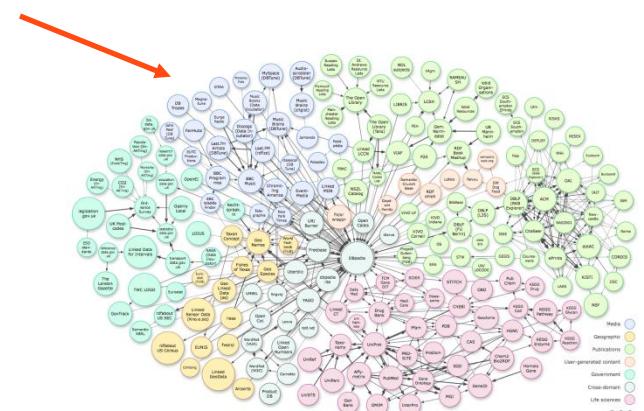
■ 2007



2008



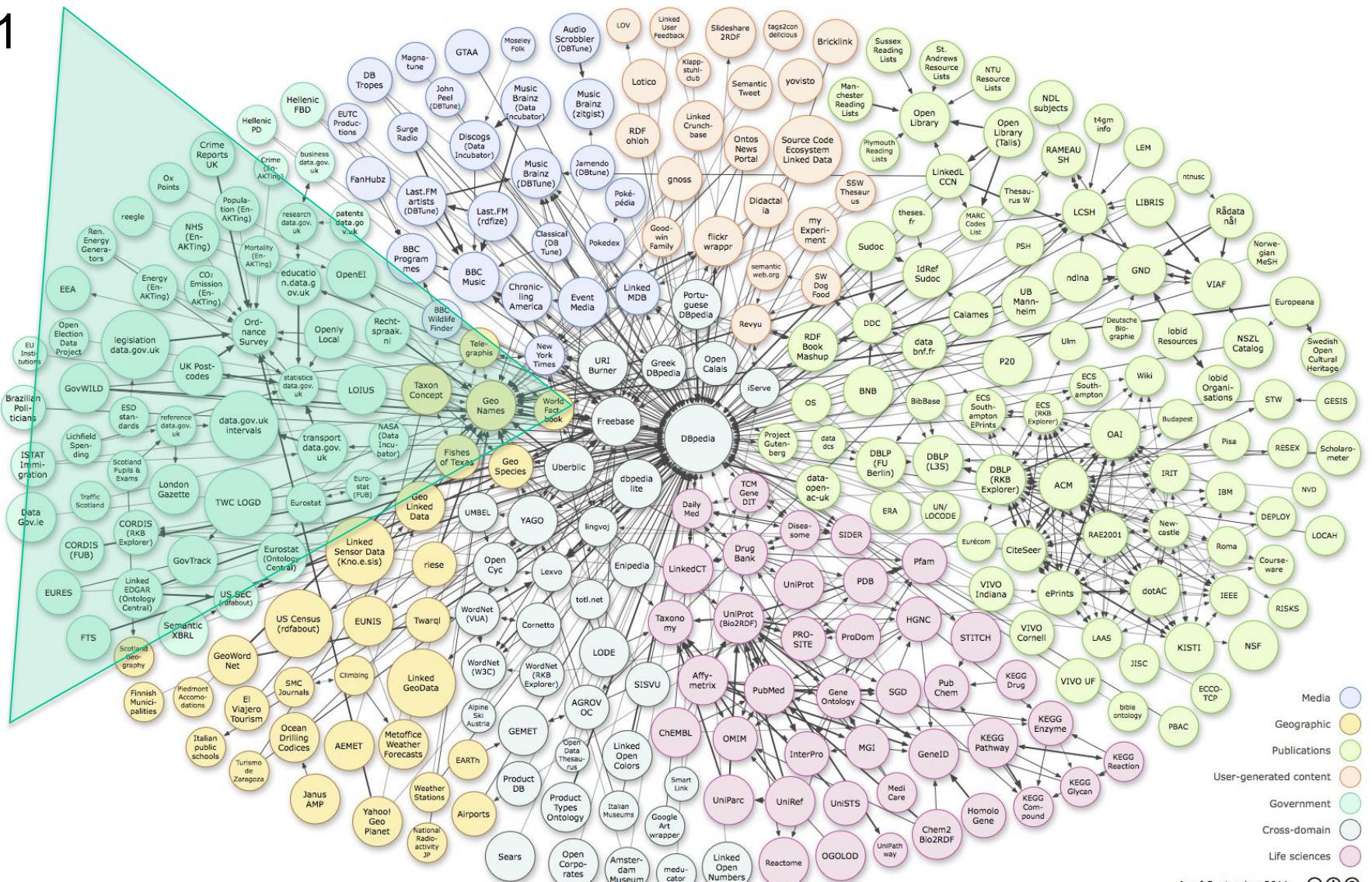
2009



2010

# Linked Open Data

2011

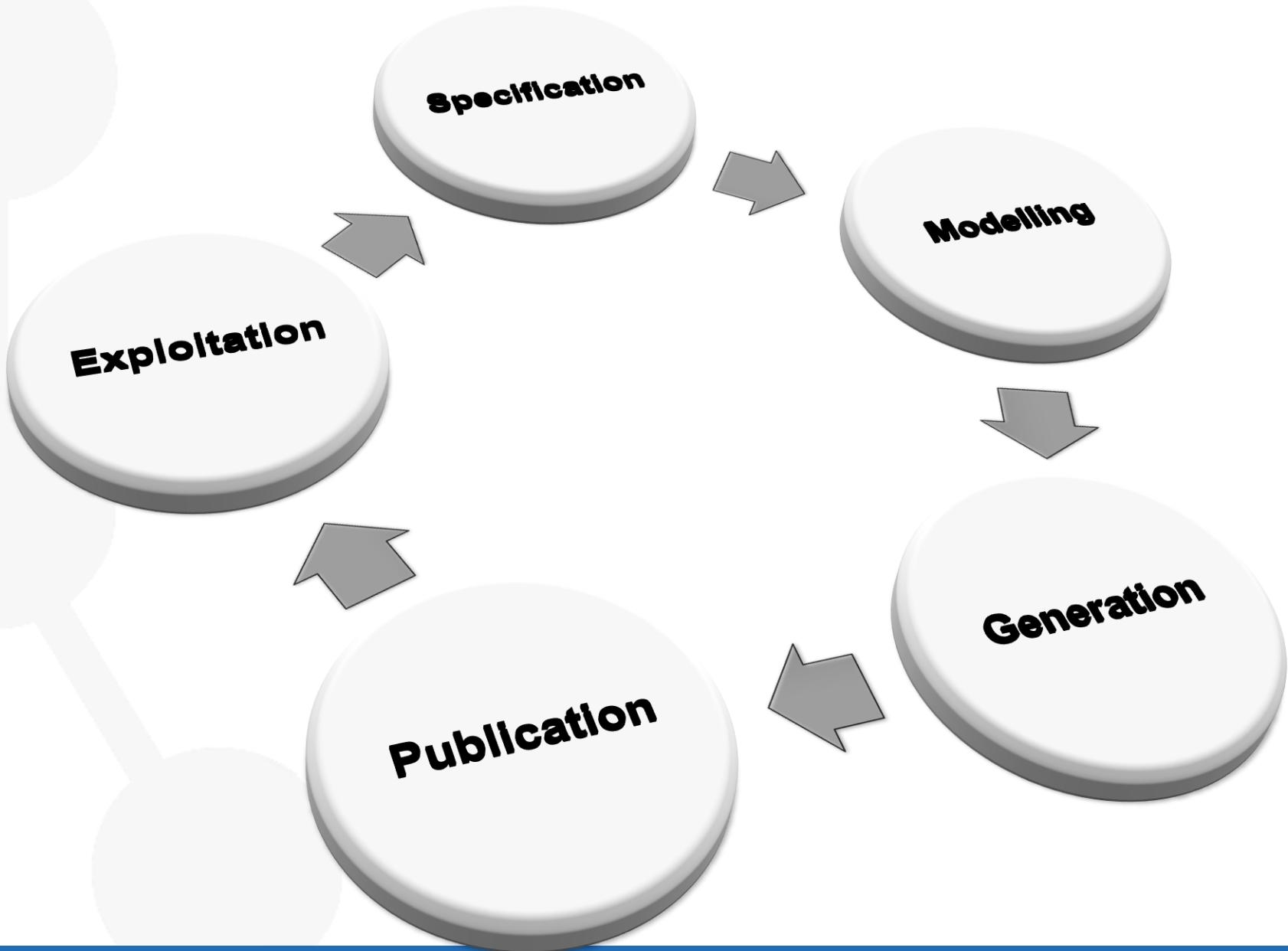


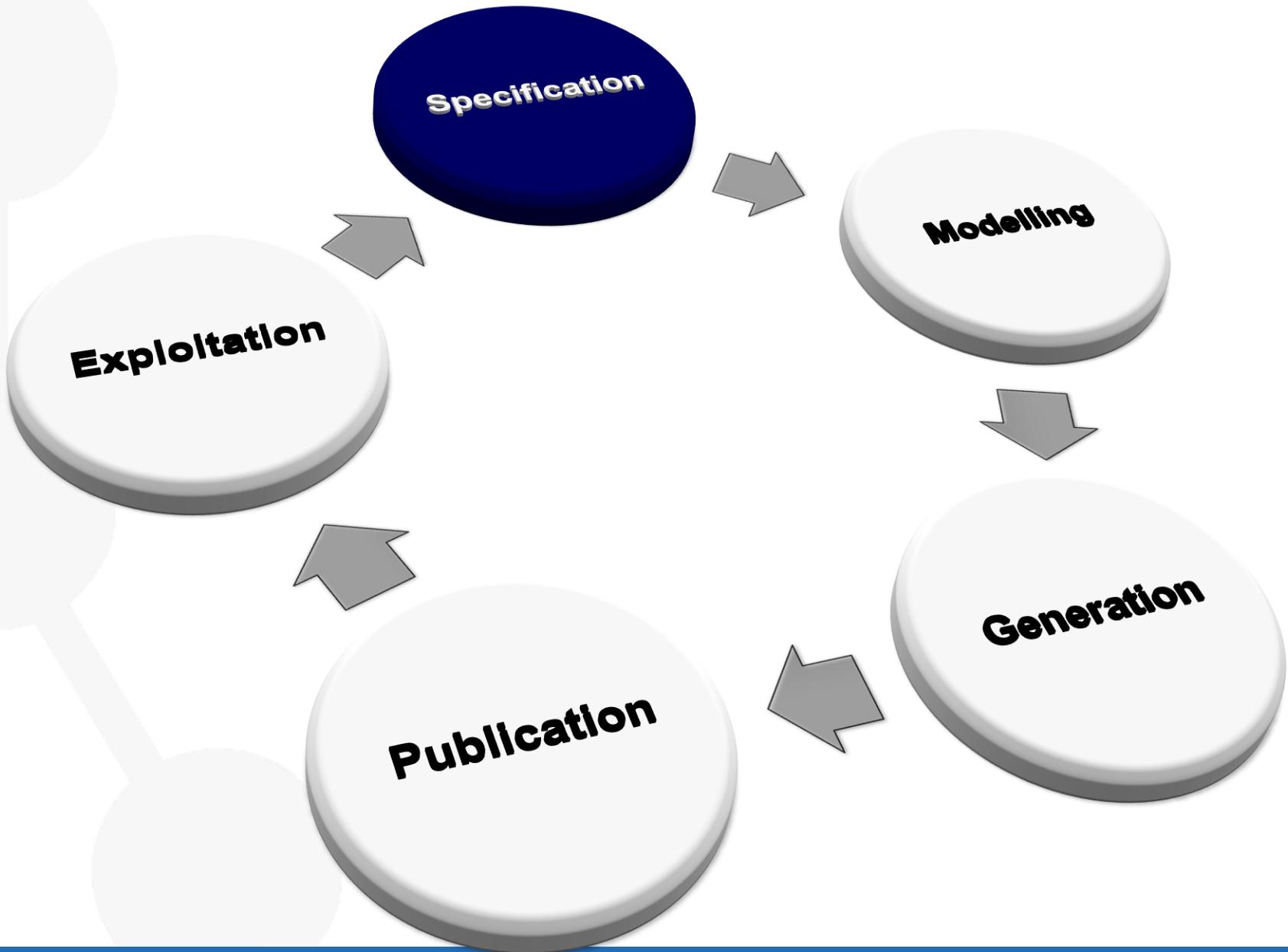
Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. <http://lod-cloud.net/>

- Introduction to Linked Data
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# Guidelines for Publishing Government Linked Data

- The process of publishing Government Linked Data has an iterative incremental life cycle model.
- Based on our experience in the production of Linked Data in several Governmental Contexts, have been applied in real case government scenarios.





# Specification

- Identification and analysis of the government data sources
- URI design
- Definition of the license

# Identification and analysis of the government data sources

We have to distinguish

- Open and publish data that government agencies have not yet opened up and published
  - Task that may require contacting to specific government data owners to get access to their legacy data
- Reuse and leverage on data already opened up and published by government agencies
  - Task to look for these data in public government catalogs
    - Open Government Data
    - datacatalogs.org
    - Open Government Catalog

# Identification and analysis of the government data sources

After we have identified and selected the government data sources

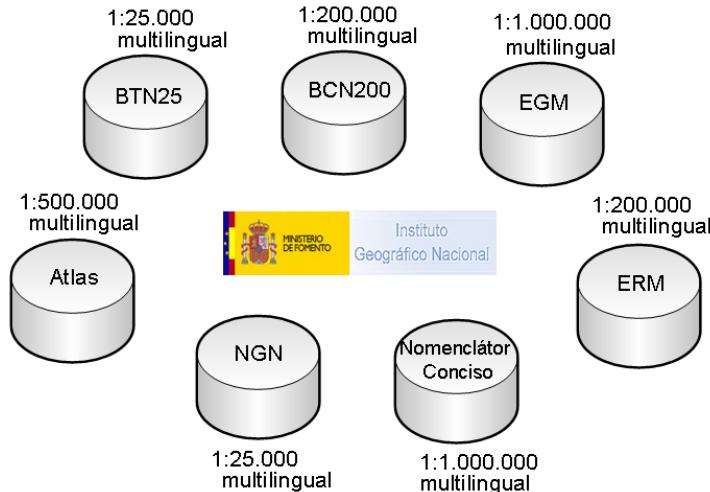
- Search and compile all the available data and documentation about those resources
- Identify the schema of those resources including conceptual components and their relationships
- Identify the items in the domain, i.e., things whose properties and relations are described in the data sources

# GeoLinkedData – Identification of the data sources

**IGN**

National Geographic Institute of Spain

Oracle & MySQL



Agreement with the IGN

**INE**

National Statistic Institute of Spain



Population



Industry



Instituto  
Nacional de  
Estadística



Building  
trade



Unemployment

Data sources available  
in a public data catalog

# GeoLinkedData – Analysis of the data sources

NOMBRE	ENTIDAD	COMPROV	CODINE	XUTM	YUTM	HUSO	HOJA25	LongitudG	LatitudG	LongitudGMS	LatitudGMS
Abejuela, Olivar de / Oli	Lugar/Paraje	0 02	02042	584300	246500	30	0867-3	-2,03512445814873	38,3620693572292	-02°02'06.44	38°21'43
Abejuela, Rambla de	Corriente fluvial	0 04	04053	597560	152000	30	0974-4	-1,89618811907142	37,509177056304	-01°53'46.27	37°30'33
Abejuela, Rambla de la	Corriente fluvial	1 46	46262	579190	123000	30	0638-2	-0,90285531710738	39,9374839997029	-00°54'10.27	39°56'14
Abejuela, Rambla de la	Corriente fluvial	1 44	44002	578800	124000	30	0638-2	-0,907142388290964	39,9465700679236	-00°54'25.71	39°56'47
Abelá, A	Población	0 27	27025	521500	336500	29	0003-3	-7,49293473672413	43,670782491816	-07°29'34.56	43°40'14
Abeladoira	Población	0 27	27039	522000	374030	29	0073-1	-7,50066276897865	43,1084031553505	-07°30'02.38	43°06'30
Abeladoira	Lugar/Paraje	0 27	27039	521550	374200	29	0073-1	-7,50615404547912	43,1100057447368	-07°30'22.15	43°06'36
Abelaedo	Lugar/Paraje	0 27	27005	548100	321300	29	0010-3	-7,16730269277051	43,5291689758955	-07°10'02.28	43°31'45
Abelaedo, Chao do	Llanura/Raso	0 27	27013	525500	330200	29	0009-1	-7,4448008623332	43,613414717808	-07°26'41.28	43°36'48
Abelaedo, Monte do	Lugar/Paraje	0 27	27064	509000	341000	29	0002-4	-7,6470271512085	43,7132267731492	-07°38'49.29	43°42'47
Abelaedo, O	Población	0 27	27064	508500	340500	29	0002-4	-7,65333254552948	43,708799463333	-07°39'11.99	43°42'31
Abelaedo, Rego do	Corriente fluvial	0 27	27064	509000	340540	29	0002-4	-7,64712030731384	43,7090862344245	-07°38'49.63	43°42'32

Year

Province

	2009	2008	2007	2006	2005	2004	2003
Total Nacional	3355830	3422239	3336657	3174393	3064129	2942583	2813159
Alava	21988	22318	20676	20349	19838	19779	19538
Albacete	27380	27647	27068	25531	24685	23550	22547
Alicante	136239	142307	140145	133016	123333	113852	111805
Almería	43501	45130	43970	40871	38766	36260	33947
Asturias	71853	73124	72276	70115	68175	67039	65062
Avila	11455	11708	11434	10900	10611	10319	10211
Badajoz	40874	41358	40168	38045	37052	34972	34866
Illes Balears	91826	93335	91254	88027	87024	85425	75951
Barcelona	467385	477942	469432	444410	436294	417425	397693
Burgos	25567	25891	25372	24504	23733	22882	22159
Cáceres	26307	26494	26064	25039	24846	20596	23440
Cádiz	62817	64505	63338	61691	58986	57136	54462
Cantabria	39611	40393	39560	37694	36561	35641	34017
Castellón	42122	43855	42476	39749	37865	37214	34213
Ciudad Real	32046	33011	31881	30446	29521	29011	26778
Córdoba	48979	50057	49302	47155	45405	43394	41964
Coruña, A	83748	84220	82873	79170	77023	74806	71748
Cuenca	14747	14928	14741	13822	13336	12829	12546
Girona	58404	51457	50108	47169	46827	45145	52482
Granada	60016	62269	61055	57223	54341	50508	49662
Guadalajara	13507	13735	12874	11825	10438	10120	9422
Guipúzcoa	62034	63569	59546	58466	57193	56498	55983
Huelva	26783	27463	27063	25487	24777	24270	22547
Huesca	16837	17109	16994	16025	15390	15078	14283
Jaén	36557	37368	36962	35383	34675	33157	32444
León	33564	34012	33563	32359	31664	30992	30256
Leida	36920	37638	36065	33958	32739	31516	29605
Lugo	24861	25035	24609	23780	23122	22479	22396
Madrid	511804	519307	503000	478202	456175	436074	407655
Málaga	113362	116683	114547	108713	102382	96587	88257
Murcia	95636	100075	97374	90698	85110	82484	75973
Navarra	43282	43847	43142	41083	40730	39679	38936
Ourense	23304	23711	23520	22843	22452	22118	21560
Palencia	51063	51114	51080	49604	47675	41742	

Industry Production Index

- Use meaningful URIs, instead of opaque URIs, when possible
- Separate TBox (ontology model) from ABox (instances) URIs.
  - Base URI
    - `http://data.gov.bo/`
    - `http://health.data.gov.bo/`
  - TBox URIs
    - `http://data.gov.bo/ontology/{class|property}`
  - ABox URIs
    - `http://data.gov.bo/resource/`
    - `http://data.gov.bo/resource/province/Tiraque`

# GeoLinkedData - URI design

- Base URI

`http://linkeddata.es/`

`http://geo.linkeddata.es/`

- TBox URIs

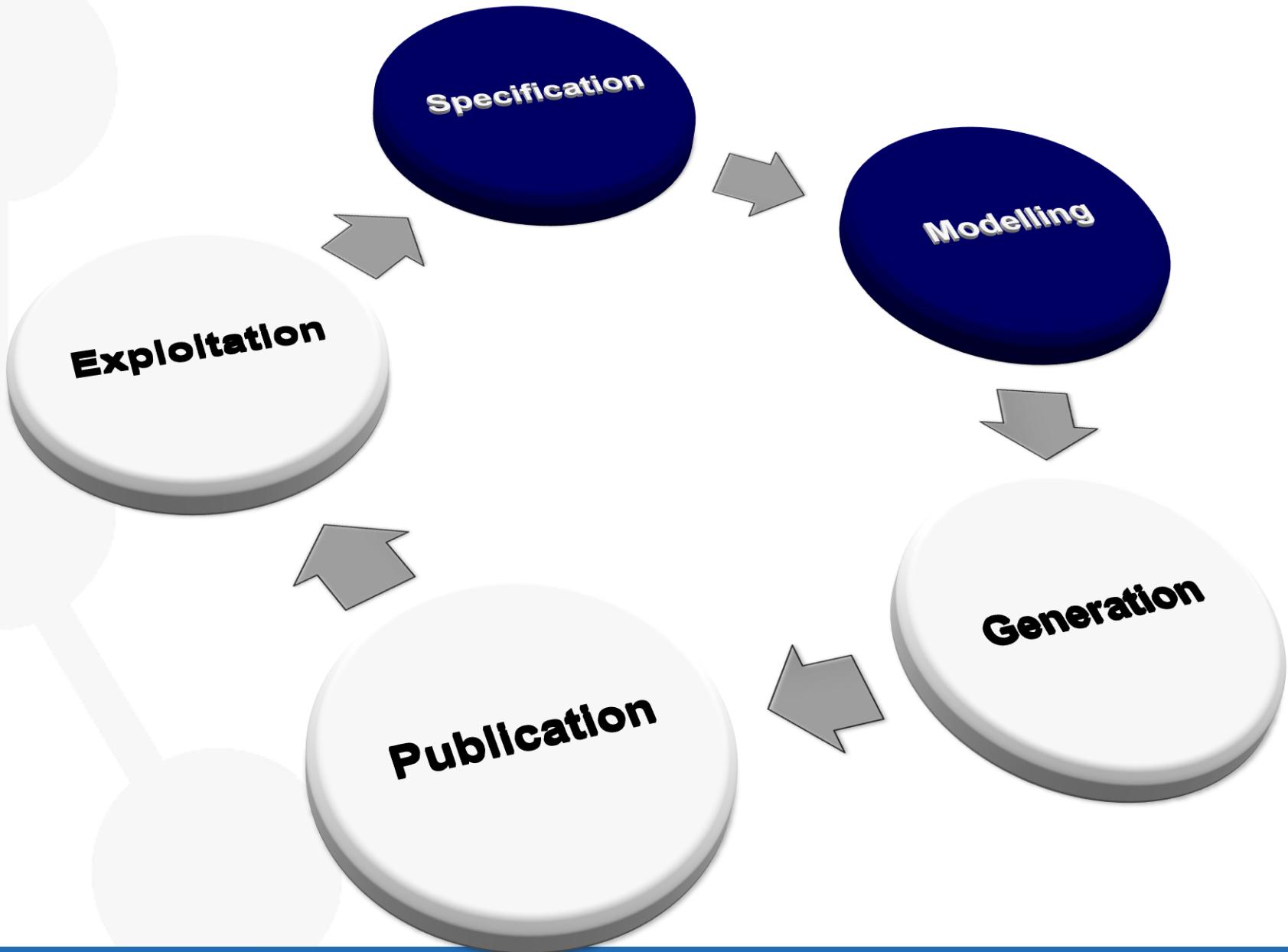
`http://geo.linkeddata.es/ontology/{concept|property}`

`http://geo.linkeddata.es/ontology/Provincia`

- ABox URIs

`http://geo.linkeddata.es/resource/{r. type}/{r. name}`

`http://geo.linkeddata.es/resource/Provincia/Madrid`



- An ontology is an engineering artifact, which provides:
  - A set of terms
  - A set of explicit assumptions regarding the intended meaning of the terms.
    - Almost always including concepts and their classification
    - Almost always including properties between concepts



- Shared understanding of a domain of interest
- Ontologies expressed in OWL or RDF(S), both based on RDF

## 2. Vocabulary development

<http://www4.wiwiss.fu-berlin.de/bizer/pub/LinkedDataTutorial/#whichvocabs>

### 4. Which vocabularies should I use to represent information?

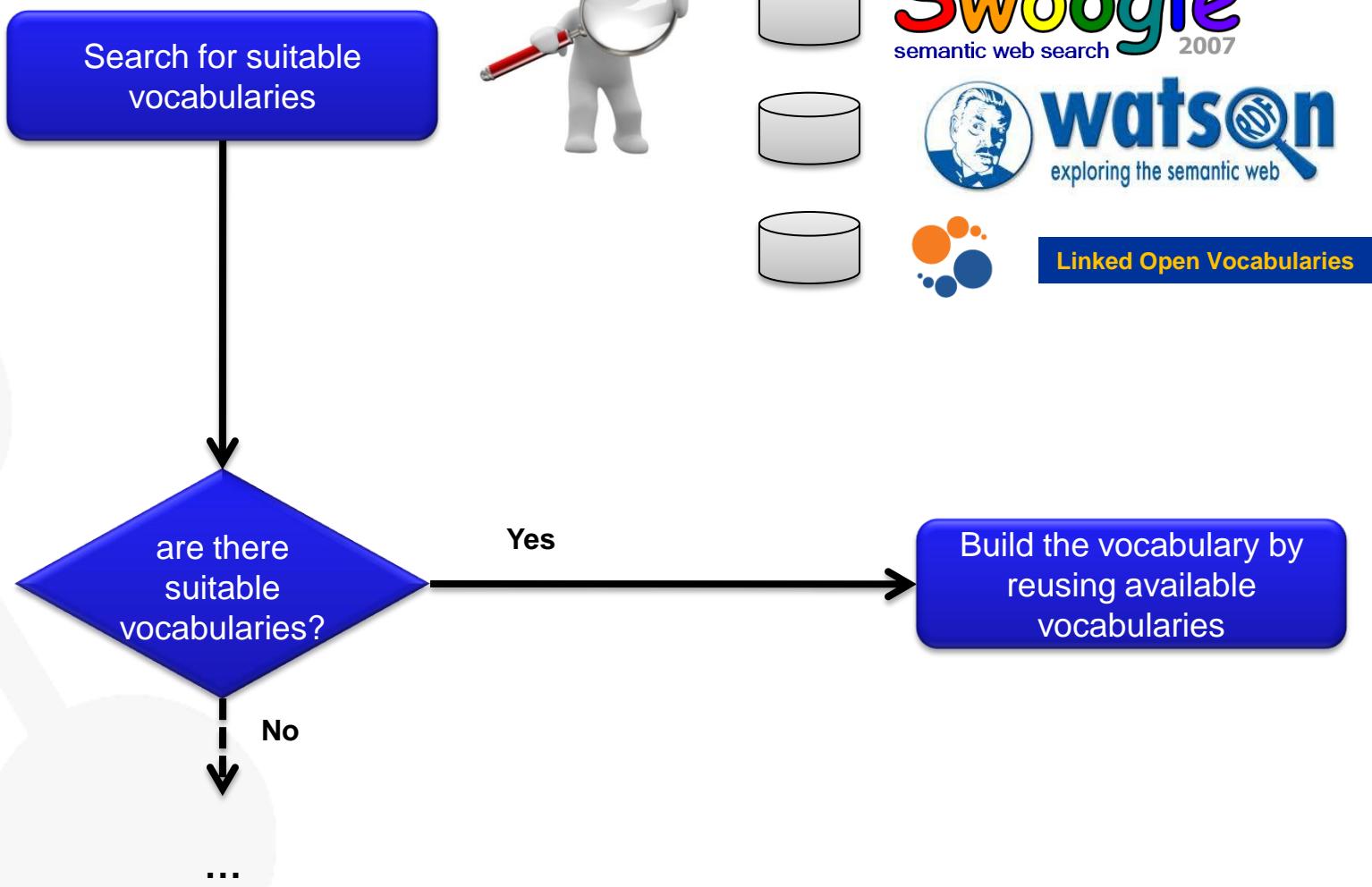
In order to make it as easy as possible for client applications to process your data, you should reuse terms: only define new terms yourself if you can not find required terms in existing vocabularies.

#### 4.1 Reusing existing terms

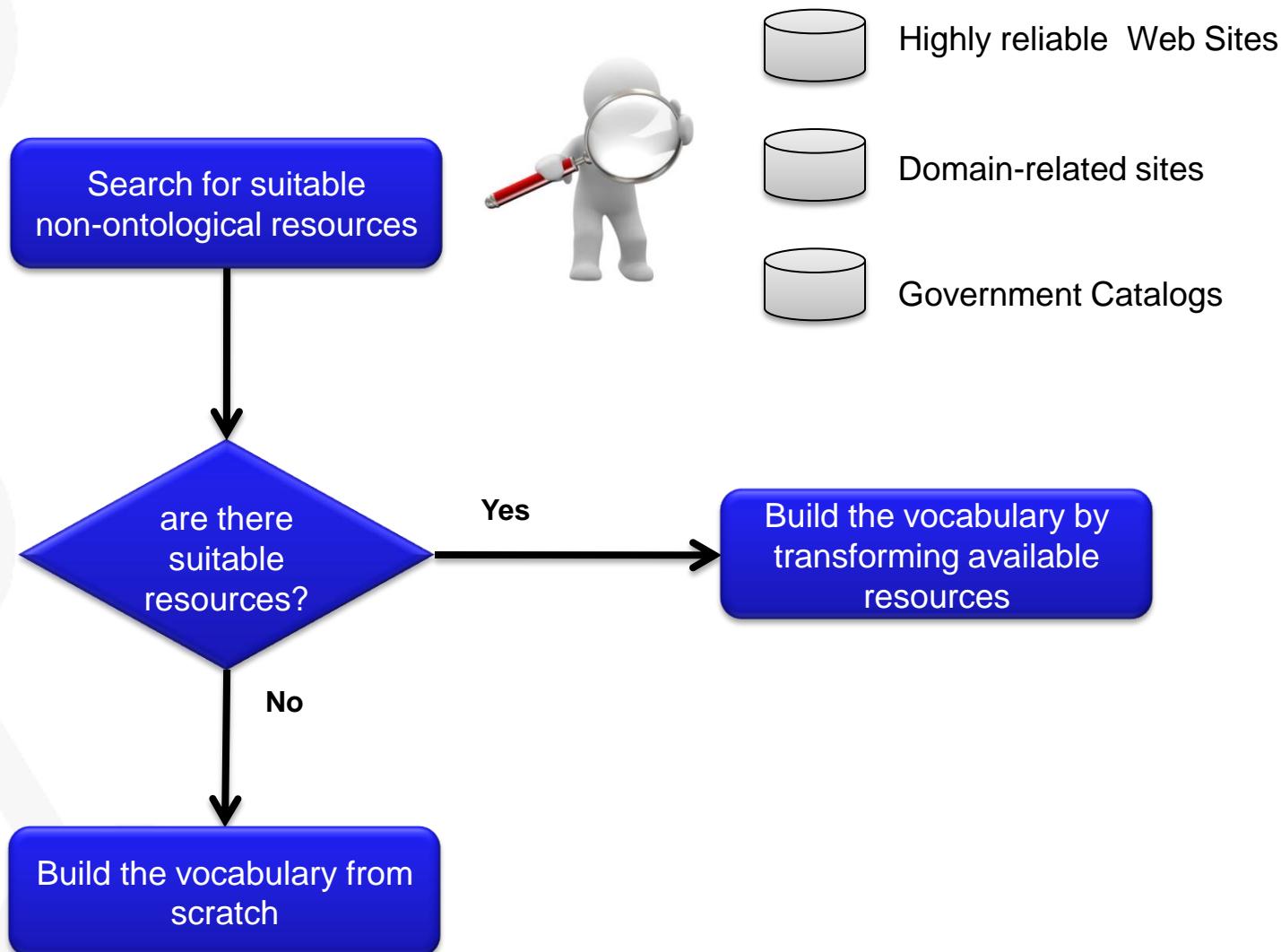
A set of well-known vocabularies has evolved in the Semantic Web community. Please check whether you before defining any new terms:

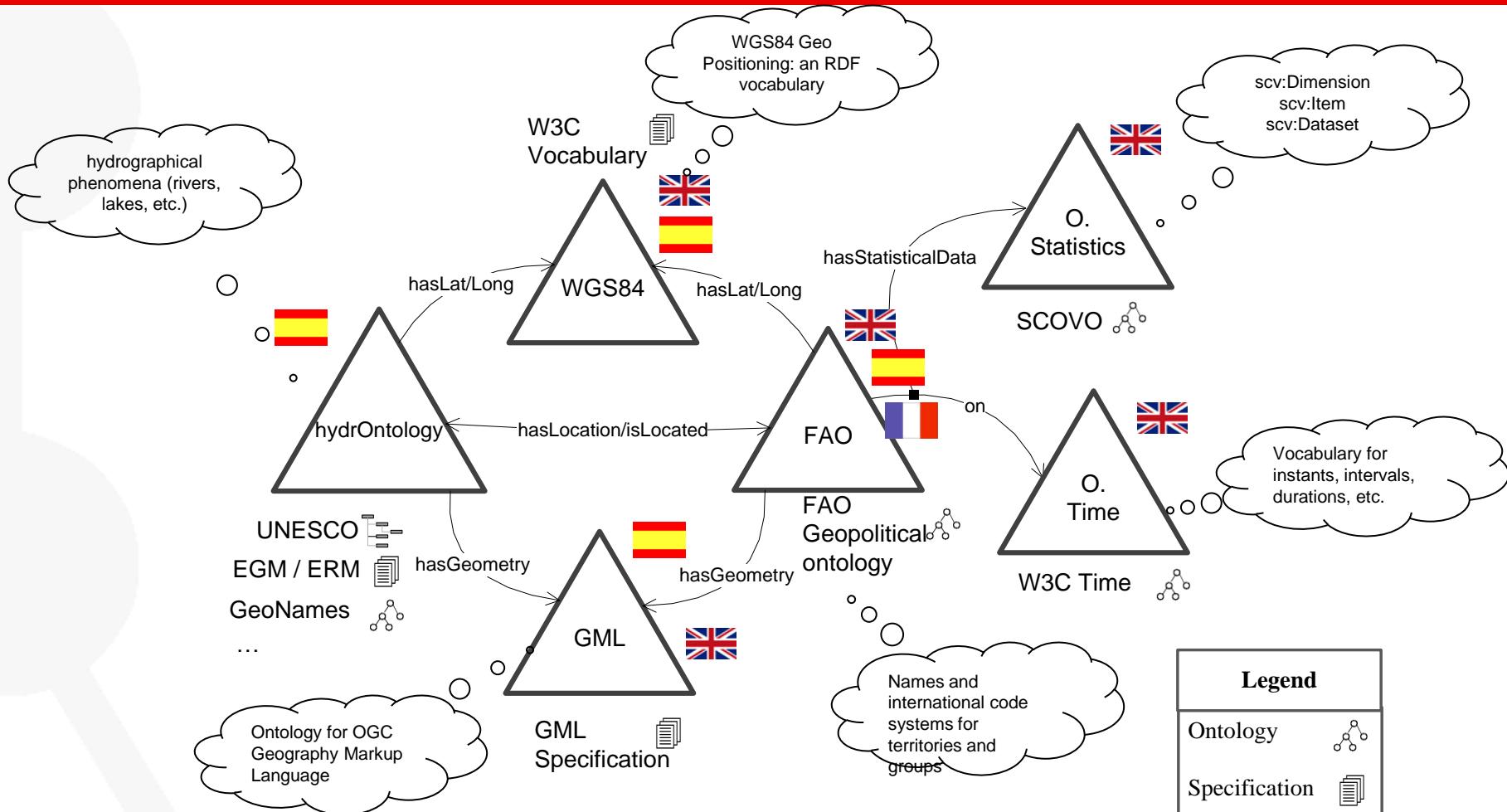
- [Friend-of-a-Friend \(FOAF\)](#), vocabulary for describing people.
- [Dublin Core \(DC\)](#) defines general metadata attributes. See also their new [domains and ranges draft](#).
- [Semantically-Interlinked Online Communities \(SIOC\)](#), vocabulary for representing online communities.
- [Description of a Project \(DOAP\)](#), vocabulary for describing projects.
- [Simple Knowledge Organization System \(SKOS\)](#), vocabulary for representing taxonomies and lists.
- [Music Ontology](#) provides terms for describing artists, albums and tracks.
- [Review Vocabulary](#), vocabulary for representing reviews.
- [Creative Commons \(CC\)](#), vocabulary for describing license terms.

# Reuse available vocabularies



# Reuse available non-ontological resources



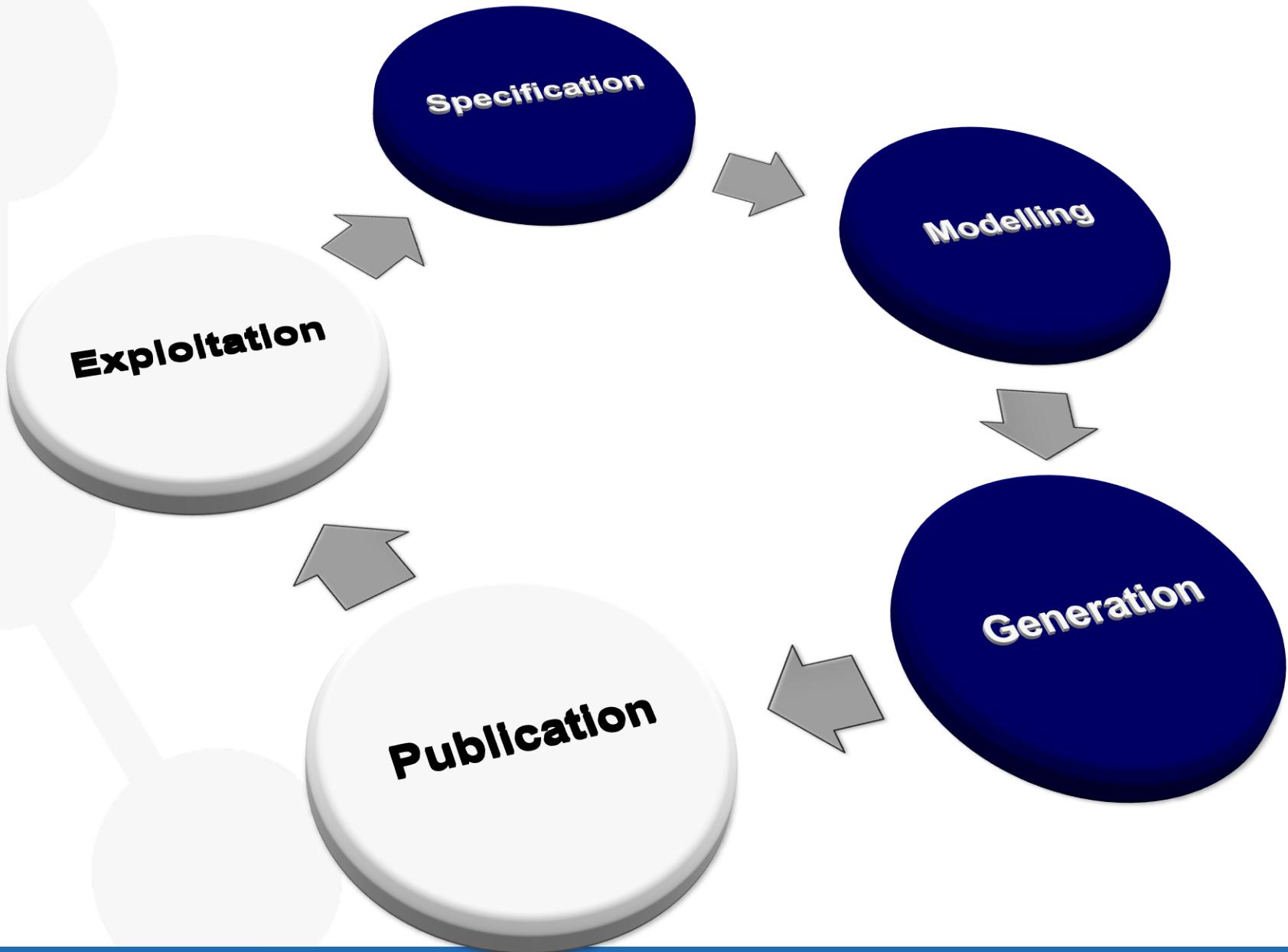


Classes	33	33
Object Properties	44	44
Data Properties	318	318



<http://neon-toolkit.org/>

Legend	
Ontology	○○○
Specification	□
Thesaurus	□□□

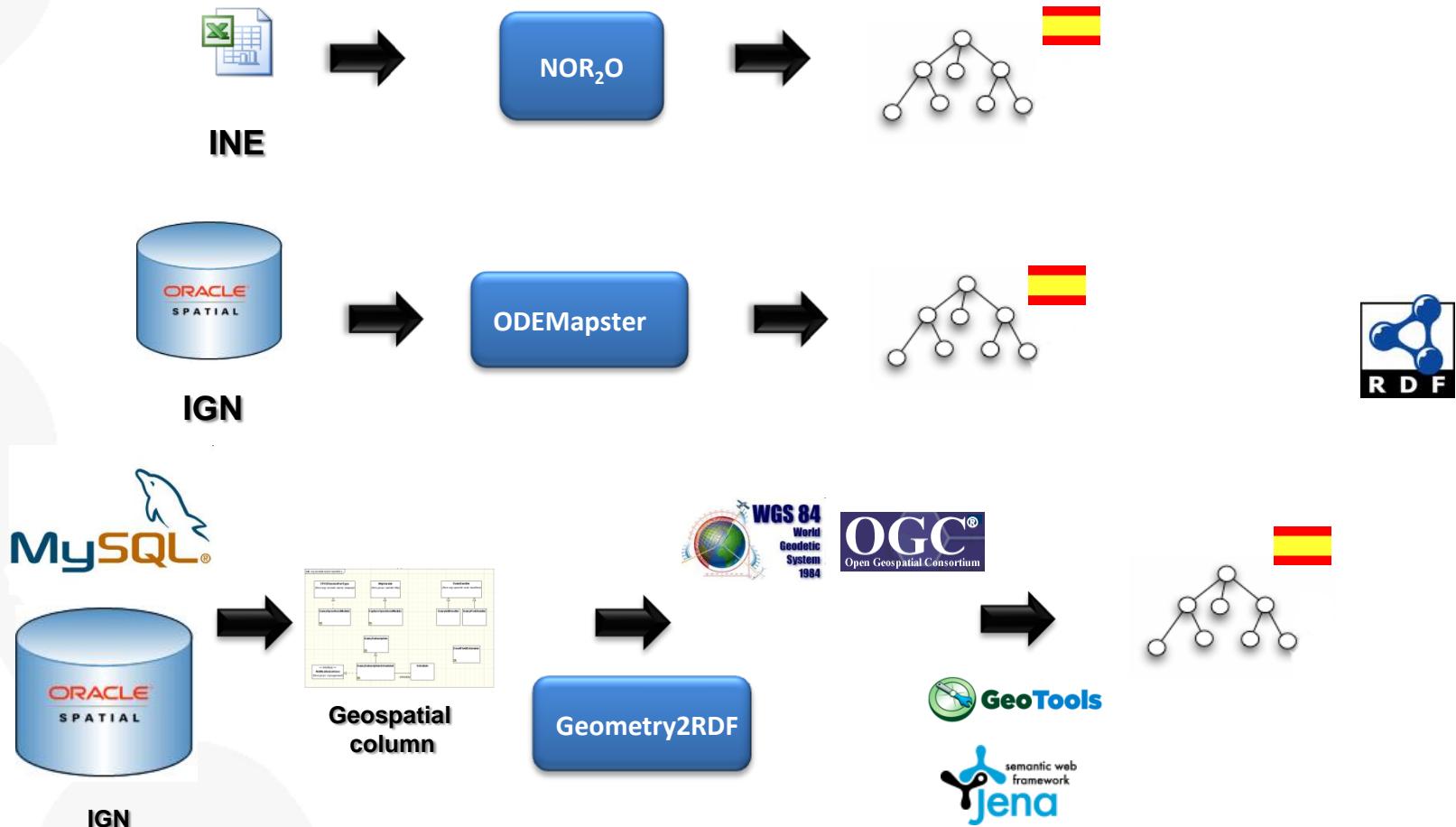


# Generation

- Transformation
- Data cleansing
- Linking

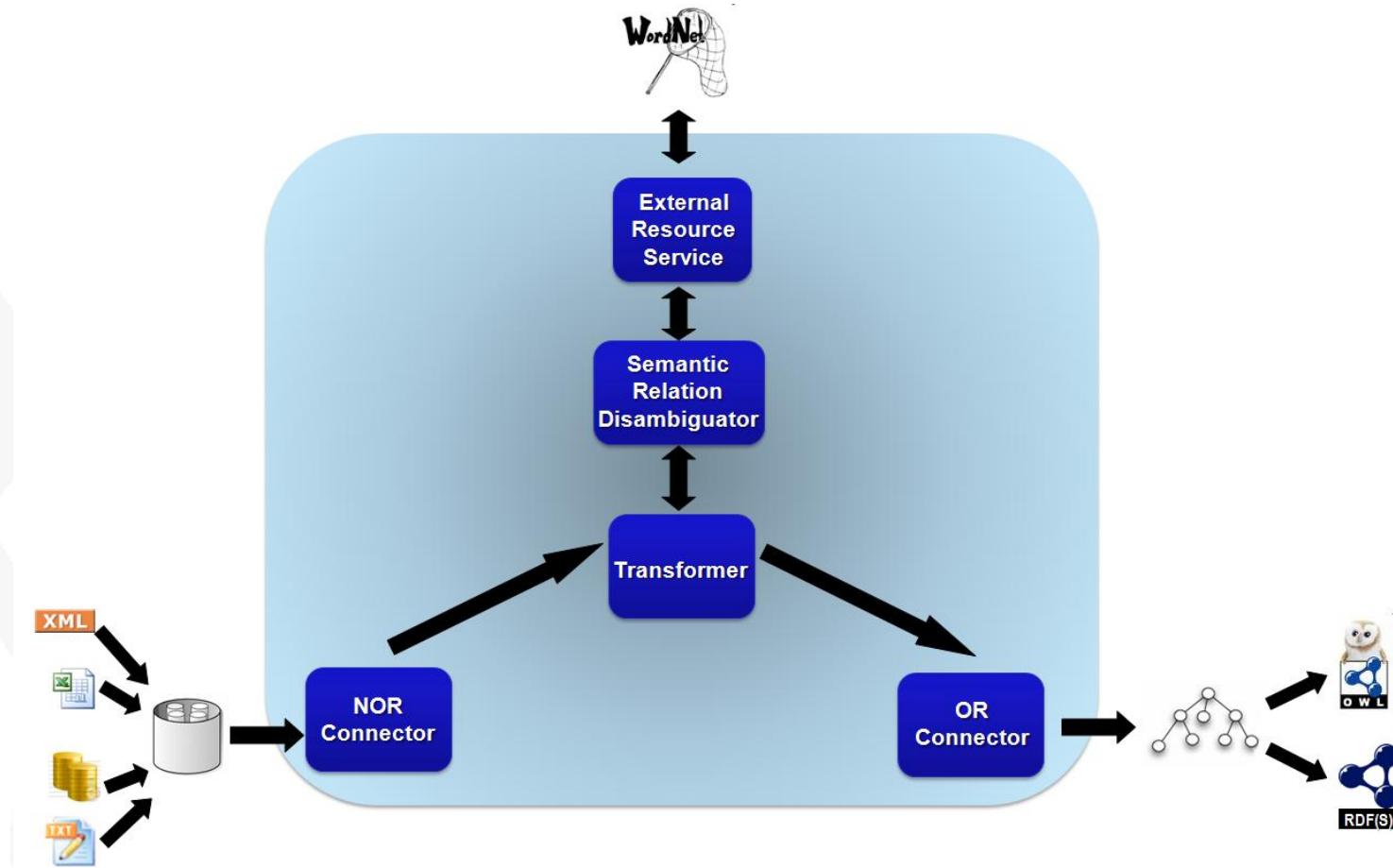
- Take the data sources selected in the specification activity and transform them to RDF according to the vocabulary created in the modelling activity
- Some tools
  - CSV and spreadsheets
    - RDF extension of Google Refine, XLWrap, RDF123, NOR<sub>2</sub>O
  - RDB
    - D2R Server, ODEMapster, W3C RDB2RDF WG – R2RML
  - XML
    - GRDDL, ReDeFer

# GeoLinkedData - Transformation





- NOR<sub>2</sub>O is a software library for transforming non-ontological resources to ontologies.



- Non-Ontological Resources
  - Classification Schemes
    - Path Enumeration
    - Adjacency List
    - Snowflake
    - Flattened
  - Thesauri
    - Record based
    - Relation based
  - Lexicons
    - Record based
    - Relation based

The software library needs three configuration files:

1. **nor.xml** that contains the description of the non-ontological resource and includes:
  - The schema entities of the resource and the relationships among the entities are described in the **Schema section**.
  - The descriptions of the resource's internal data model are included in the **DataModel section**.
  - The information needed to physically access the resource is defined in the **Implementation section**.

2. **prnor.xml** for describing the transformation between the NOR elements and the ontology elements. It has only one section
  - PRNOR section, that includes the **description of the transformations** from the NOR schema components (e.g., schema entities, attributes and relations) into ontology elements (e.g., classes, object properties, datatype properties, and individuals). Additionally it indicates the **transformation approach**, e.g., TBox, ABox, or Population.

### 3. **or.xml** for describing the ontology to be generated.

- OR section, which includes the **name, URI, file and implementation language** of the ontology.

Additionally, this section indicates if the ontology already exists, in the case we want to populate an existing ontology.

- You can find the lastest version at:
  - <http://mccarthy.dia.fi.upm.es/nor2o/>

- There are 3 configuration files:
  - nor.xml, for describing the non-ontological resource.
  - prnor.xml, for describing the pattern for re-engineering.
  - or.xml, for describing the ontology generated.
- There is a batch file
  - nor2o.bat, for performing the transformation
- Requirements
  - Java runtime environment (tested in 1.5)
  - You should set the JAVA\_HOME to the location of the installation directory.

# Example 1: Transforming the ASFA thesaurus

- non-ontological resource: asfa

- Type: term-based thesaurus
- Datamodel: record-based
- Implementation: XML



asfa\_xml\_20060522.xml

2.780.181 21/10/2009 01:36

```
<THESaurus>
<TERM>
<NON-DESCRIPTOR>AAS</NON-DESCRIPTOR>
<USE>Absorption spectroscopy</USE>
<STA>Approved</STA>
<TYP>Non-descriptor</TYP>
<INP>2006-05-22</INP>
<UPD>2006-05-22</UPD>

</TERM>

<TERM>
<NON-DESCRIPTOR>Abalone fisheries</NON-DESCRIPTOR>
<USE>Gastropod fisheries</USE>
<STA>Approved</STA>
<TYP>Non-descriptor</TYP>
<INP>2006-05-22</INP>
<UPD>2006-05-22</UPD>

</TERM>

<TERM>
<DESCRIPTOR>Abdomen</DESCRIPTOR>
<UF>Peritoneum</UF>
<BT>Body regions</BT>
<RT>Digestive system</RT>
<STA>Approved</STA>
<TYP>Descriptor</TYP>
<INP>2006-05-22</INP>
<UPD>2006-05-22</UPD>
|
</TERM>
```

## Example 1: Transforming the ASFA thesaurus

- nor.xml, description of the non-ontological resource

```
<Nor type="Thesaurus" name="ASFA">
  <Schema>
    <SchemaEntities>
      <SchemaEntity name="Term">
        <Attribute name="Identifier" valueFrom="DESCRIPTOR" type="string"/>
        <Relation name="NT" using="RecordBased" valueId="NT" destination="Term"/>
        <Relation name="BT" using="RecordBased" valueId="BT" destination="Term"/>
        <Relation name="RT" using="RecordBased" valueId="RT" destination="Term"/>
        <Relation name="UF" using="RecordBased" valueId="UF" destination="NonPreferredTerm"/>
      </SchemaEntity>
      <SchemaEntity name="NonPreferredTerm">
        <Attribute name="Identifier" valueFrom="NON-DESCRIPTOR" type="string"/>
      </SchemaEntity>
    </SchemaEntities>
  </Schema>
  <DataModel>
    <RecordBased>
      <Entity>TERM</Entity>
    </RecordBased>
  </DataModel>
  <Implementation>
    <Xml xmlFile="nors/thesauri/recordbased/asfa_xml_20060522.xml" xsdFile="nors/thesauri/recordbased/asfa.xsd"/>
  </Implementation>
</Nor>
```

## Example 1: Transforming the ASFA thesaurus

- prnor.xml, description of the pattern
  - Transformation approach: TBox
    - Term -> Class

```
<Prnor identifier="PR-NOR-CLLO-10" transformationApproach="TBox">
  <Class from="Term" identifier="[Identifier]">
    <ObjectProperty from="RT" to="relatedTerm"/>
    <ObjectProperty from="BT" to="subClassOf"/>
    <ObjectProperty from="UF" to="rdfs:label"/>
  </Class>
</Prnor>
```

- or.xml, description of the ontology generated

```
<Or name="asfa ontology" ontologyURI="http://droz.dia.fi.upm.es/ontologies/asfa.owl"
  ontologyFile="asfa.owl" implementation="OWL" alreadyExist="no">
</Or>
```

## Example 1: Transforming the ASFA thesaurus

- Run the transformation
  - Execute the nor2o.bat
- Wait until it finishes, and check the ontology.



**owl**

**3.170.728 03/11/2009 00:05a--**

```
<!-- http://droz.dia.fi.ump.es/ontologies/asfa.owl#Absorption_spectroscopy -->
<owl:Class rdf:about="#Absorption_spectroscopy"/>
<!-- http://droz.dia.fi.ump.es/ontologies/asfa.owl#Abalone_fisheries -->
<owl:Class rdf:about="#Abalone_fisheries"/>
<!-- http://droz.dia.fi.ump.es/ontologies/asfa.owl#Abdomen -->
<owl:Class rdf:about="#Abdomen"/>
<!-- http://droz.dia.fi.ump.es/ontologies/asfa.owl#Enzymes -->
<owl:Class rdf:about="#Enzymes"/>
```

# Example 2: Industry Production Index, Spreadsheet

## Industry Production Index

	2009	2008	2007	2006	2005	2004	2003
Total Nacional	3355830	342229	333657	3174393	3064129	2942500	2915159
Alava	21988	22318	20678	19838	19779	19638	
Albacete	27380	27647	27088	25531	24795	23550	22547
Alicante	136239	142307	140145	133016	123333	113852	111805
Almería	43501	45100	43970	40871	36766	32620	33947
Asierias	71853	7124	72276	70115	68175	67048	65062
Valladolid	11455	11708	11434	10900	10611	10319	10211
Badajoz	40874	41358	40168	38045	37052	34972	34866
Illes Balears	9182	93335	91254	88027	87024	85425	75951
Barcelona	467365	477942	469432	444410	436294	417425	37693
Burgos	29567	25891	25372	24504	23733	22882	21519
Cáceres	5307	26494	26064	25039	24846	20596	23440
Cádiz	62817	64505	63338	61691	58986	57138	54422
Cantabria	39611	40393	39560	37690	36561	35649	34011
Castellón	42122	43855	42476	39749	37865	37214	34211
Ciudad Real	32046	33011	31881	30446	29521	29011	26775
Córdoba	48979	50057	49302	47155	45405	43394	41964
Coruña, A	83748	84220	82873	79170	77023	74809	71748
Cuenca	14747	14928	14741	13822	13336	12829	12546
Girona	58404	51467	50108	47169	46827	45145	52482
Granada	60016	62269	61055	57223	54341	50508	49662
Guadalajara	13507	13735	12874	11825	10438	10120	9422
Guipúzcoa	62034	63569	59546	58486	57193	56498	55913
Huelva	3783	27463	27063	25487	24777	24270	22477
Huesca	11837	17109	16694	16025	15390	15078	14283
Jaén	36157	37368	36962	35383	34675	33157	32444
Léon	33561	34012	33563	32359	31664	30992	30256
Lugo	36920	37638	36065	33956	32739	31515	29605
Lugo	24861	25035	24609	23780	23122	22479	22396
Madrid	511804	519307	503000	476202	456175	43607	407655
Málaga	113362	117833	114547	108713	102382	95387	88257
Murcia	95636	100075	97374	90698	85110	82484	75973
Navarra	43282	43847	43124	41083	40721	39679	38936
Ourense	23304	23711	23520	22942	22452	22118	21560
Palencia	10964	11111	11060	10694	10575	10380	10297

```

<?xml version="1.0" encoding="UTF-8"?>
<!-- <nor xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="GenericSpreadSheet.xsd" type="GenericSpreadSheet" name="Spanish Employment">
  <Schema>
    <SchemaEntities>
      <SchemaEntity name="Location">
        <Attribute name="Name" valueFrom="pcaxis.[A11:A62]" type="string"/>
      </SchemaEntity>
      <SchemaEntity name="Dataset">
        <Attribute name="Name" valueFrom="pcaxis.[B6:H6]" type="string"/>
      </SchemaEntity>
      <SchemaEntity name="Year">
        <Attribute name="Name" valueFrom="pcaxis.[B9:H9]" type="string"/>
      </SchemaEntity>
    </Schema>
    <SchemaEntity name="IndustryProductionIndex" type="Nary">
      <Attribute name="hasValue" valueFrom="pcaxis.[B10:H62]" type="string"/>
      <Relation name="inArea" usingSpreadSheetColumn="A" destination="Location"/>
      <Relation name="inPeriod" usingSpreadSheetRow="9" destination="Year"/>
      <Relation name="dataset" usingSpreadSheetRow="6" destination="dataset"/>
    </SchemaEntity>
  </SchemaEntities>
</Schema>
<DataModel>
  <GenericDataModel/>
</DataModel>
<Implementation>
  <Spreadsheet type="ms" file="Empresas.xls"/>
</Implementation>
</Nor>

```



```

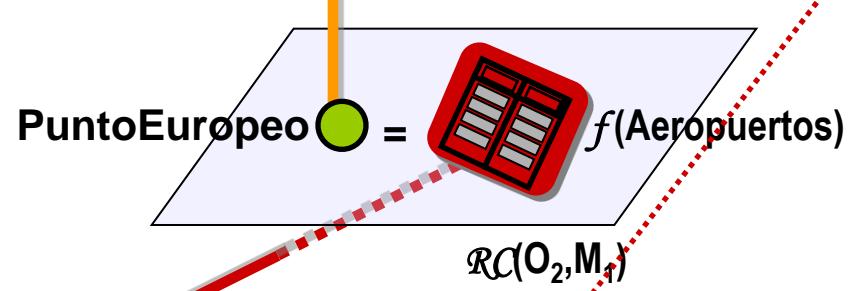
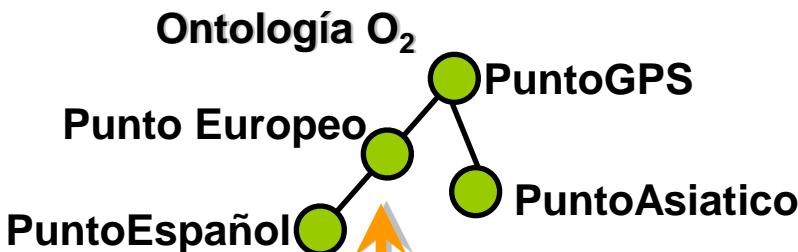
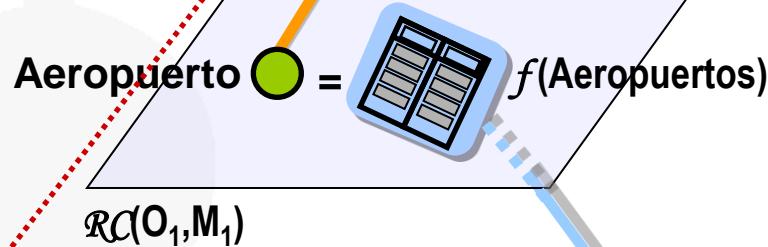
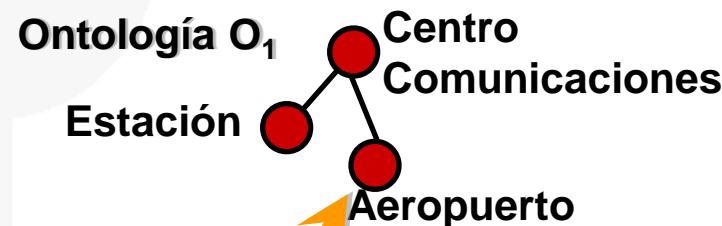
<!-- http://geo.linkeddata.es/resource/Estad%C3%ADstica/Madrid_ipi_2003 -->
<scv:Item rdf:about="Estad%C3%ADstica/Madrid_ipi_2003">
  <rdfs:label xml:lang="es">Índice de Producción Industrial de Madrid en el año 2003</rdfs:label>
  <rdf:value rdf:datatype="&xsd;double">407655.0</rdf:value>
  <scv:dimension rdf:resource="A%C3%B1o/2003"/>
  <scv:dataset rdf:resource="Estad%C3%ADstica/%25C3%258DndiceDeProducci%25C3%25B3nIndustrial"/>
  <onto:inProvincia rdf:resource="Provincia/Madrid"/>
</scv:Item>
<!-- http://geo.linkeddata.es/resource/Estad%C3%ADstica/Madrid_ipi_2004 -->
<scv:Item rdf:about="Estad%C3%ADstica/Madrid_ipi_2004">
  <rdfs:label xml:lang="es">Índice de Producción Industrial de Madrid en el año 2004</rdfs:label>
  <rdf:value rdf:datatype="&xsd;double">436074.0</rdf:value>
  <scv:dimension rdf:resource="A%C3%B1o/2004"/>
  <scv:dataset rdf:resource="Estad%C3%ADstica/%25C3%258DndiceDeProducci%25C3%25B3nIndustrial"/>
  <onto:inProvincia rdf:resource="Provincia/Madrid"/>
</scv:Item>

```

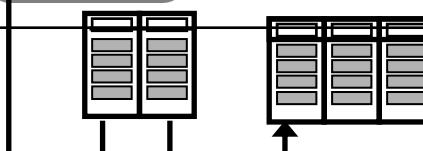
- All the resources, examples, readme file:
  - <http://mccarthy.dia.fi.upm.es/nor2o/>
- Questions to
  - bvillazon at fi dot upm dot es



# R20: Vista semántica sobre un modelo relacional



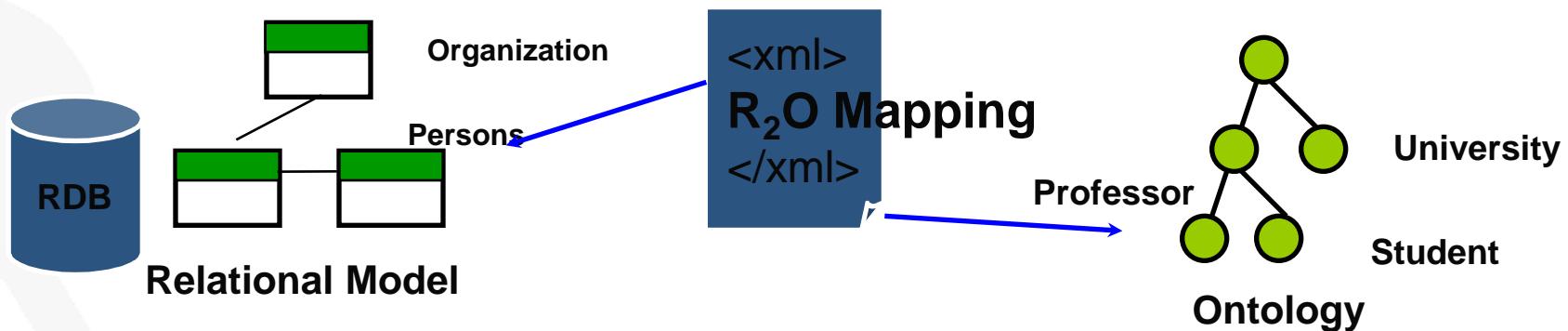
Aeropuertos



# Upgrading Database content to the semantic Web

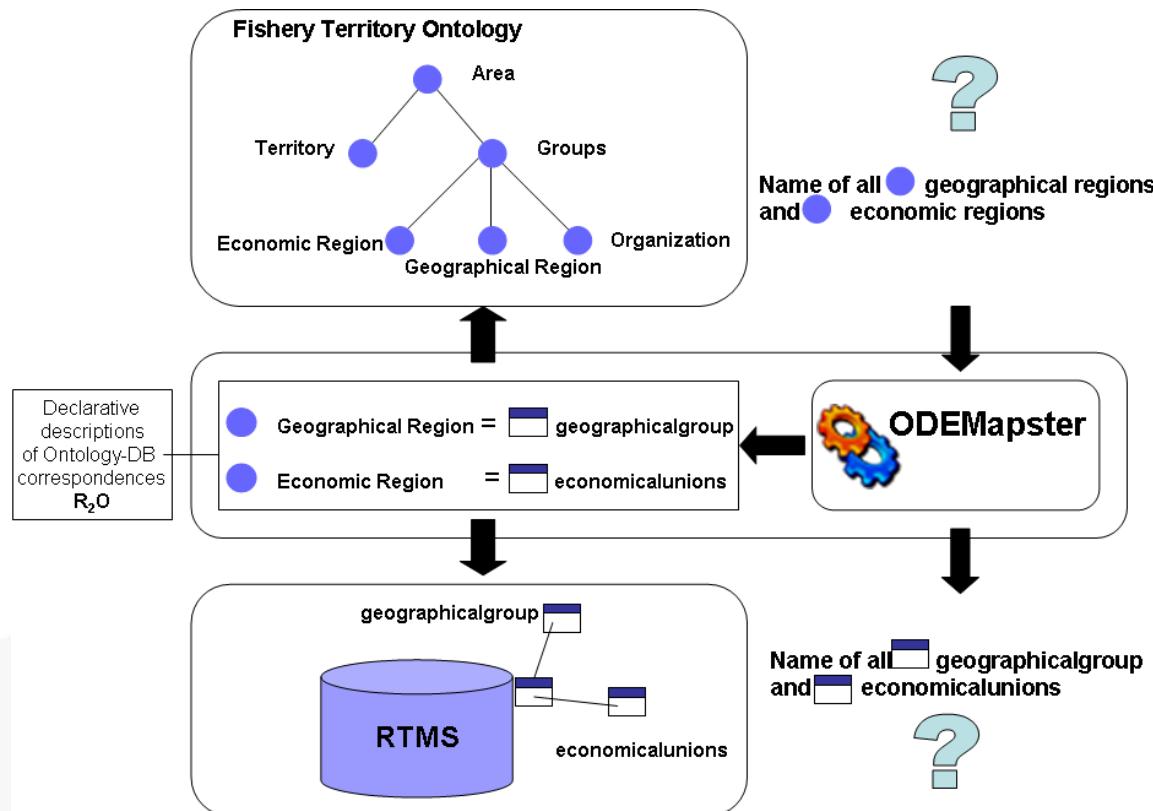
- Integrating information from different DB sources
- Reuse of legacy DBs and legacy ontologies
- R<sub>2</sub>O: Declarative Mapping description language
- ODEMMapster: Generic query processor.
  - asking queries to a relational database using ontology terms
  - On demand query answering
  - Batch ontology population
- A well defined method for upgrading and integrating content from heterogeneous sources.

- R<sub>2</sub>O es un lenguaje declarativo que describe *mappings* entre los esquemas de bases de datos relaciones y ontologías.



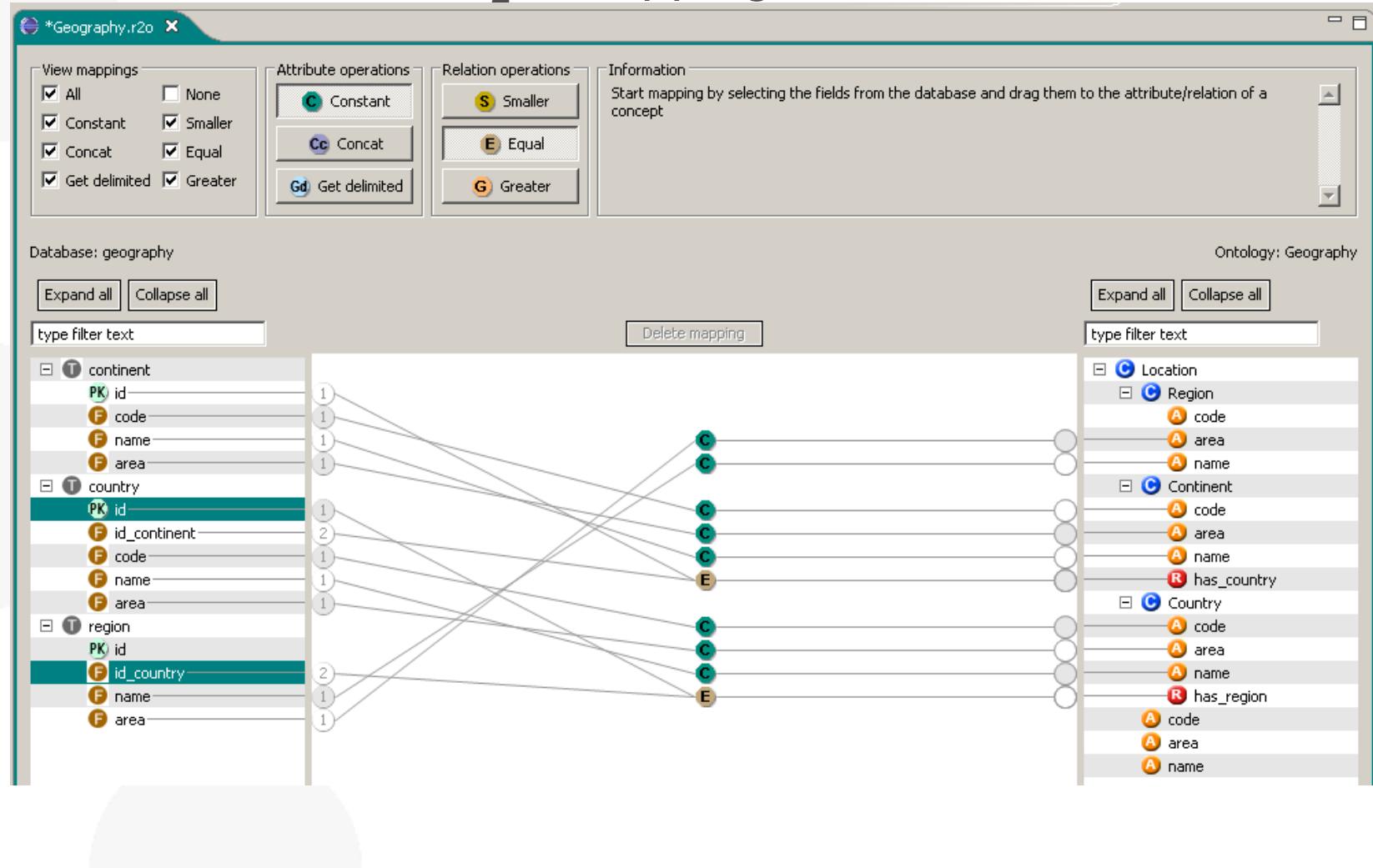
# GeoLinkedData - Transformation

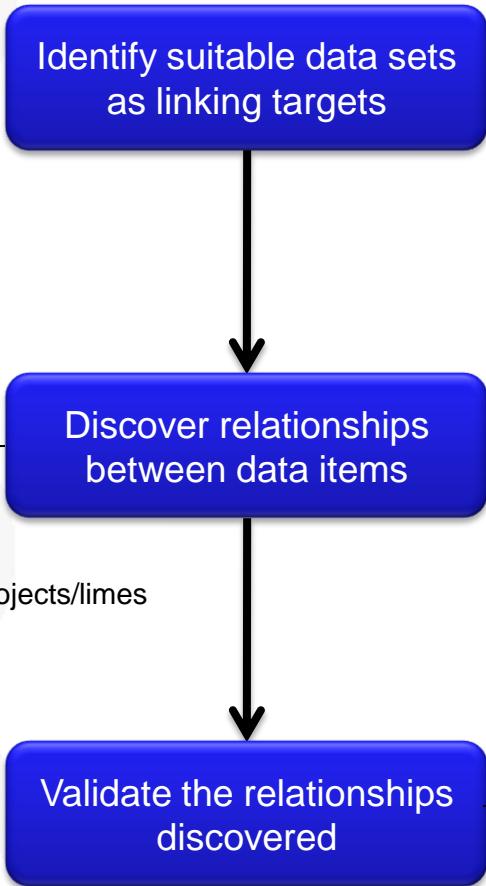
- R<sub>2</sub>O is an extensible, fully declarative language to describe mappings between relational database schemas and ontologies.
- The ODEMastster processor generates RDF instances from relational instances based on the mapping description expressed in the R<sub>2</sub>O document



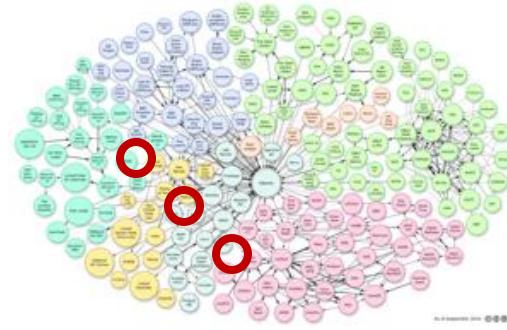
# GeoLinkedData - Transformation

- Creation of the R<sub>2</sub>O Mappings





<http://ckan.net>



LIMES

<http://aksw.org/Projects/limes>



Silk Framework

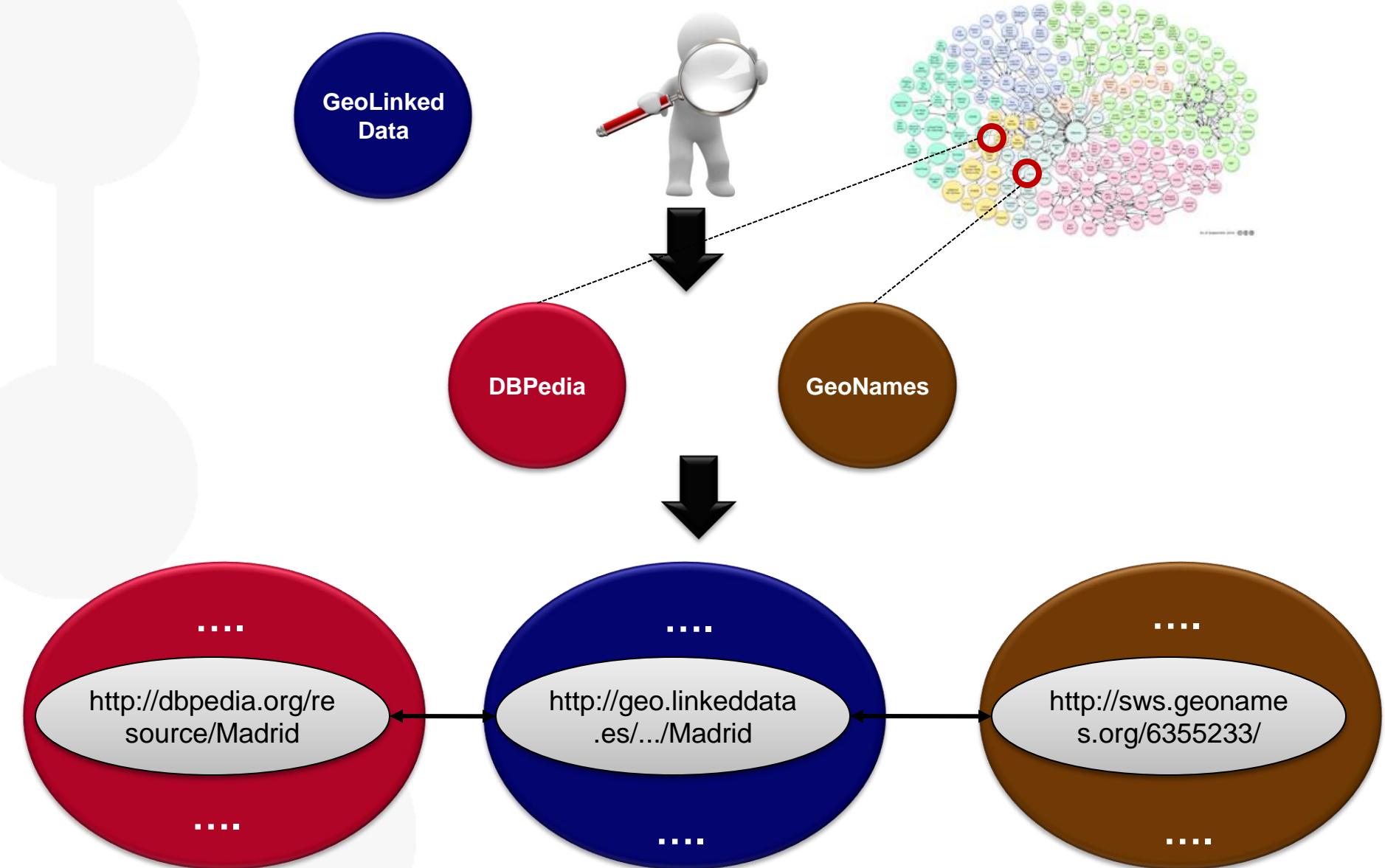
<http://www4.wiwiiss.fu-berlin.de/bizer/silk/>



sameAs Validator

<http://oegdev.dia.fi.upm.es:8080/sameAs/>

# GeoLinkedData - Linking



- Download: <http://www4.wiwiss.fu-berlin.de/bizer/silk/>
- Configuration file (xml), main sections
  - Prefixes
  - Datasources
  - Interlinks
    - Interlink
      - LinkType
      - LinkCondition
      - Filter
      - Outputs

# Silk – Example : airports (geolinkeddata – dbpedia)

```
<Prefixes>
| <Prefix id="rdf" namespace="http://www.w3.org/1999/02/22-rdf-syntax-ns#" />
| <Prefix id="rdfs" namespace="http://www.w3.org/2000/01/rdf-schema#" />
| <Prefix id="owl" namespace="http://www.w3.org/2002/07/owl#" />
| <Prefix id="dbpedia" namespace="http://dbpedia.org/ontology/" />

<DataSources>
| <DataSource id="dbpedia" type="sparqlEndpoint">
| | <Param name="endpointURI" value="http://dbpedia.linkeddata.es/sparql" />
| </DataSource>
| <DataSource id="geolinkeddata" type="sparqlEndpoint">
| | <Param name="endpointURI" value="http://geo.linkeddata.es/sparql" />
| </DataSource>
| </DataSources>

<Interlinks>
| <Interlink id="airport">
| | <LinkType>owl:sameAs</LinkType>
| | <SourceDataset dataSource="dbpedia" var="a">
| | | <RestrictTo>
| | | | ?a rdf:type dbpedia:Airport
| | | </RestrictTo>
| | </SourceDataset>
| | <TargetDataset dataSource="geolinkeddata" var="b">
| | | <RestrictTo>
| | | | ?b rdf:type geoes:Aeropuerto
| | | </RestrictTo>
| | </TargetDataset>
```

# Silk – Example : airports (geolinkeddata – dbpedia)

```
<LinkCondition>
  <Aggregate type="average">
    <Aggregate type="max" required="true" >
      <Compare metric="jaro" >
        <Input path="?a/rdfs:label[@lang='es']" />
        <Input path="?b/rdfs:label[@lang='es']" />
      </Compare>
    </Aggregate>
  </LinkCondition>

  <Filter threshold="0.8" limit="1" />

<Outputs>
  <Output maxConfidence="0.9" type="file" >
    <Param name="file" value="geo_dbpedia_aeropuerto.xml"/>
    <Param name="format" value="alignment"/>
  </Output>
  <Output minConfidence="0.91" type="file">
    <Param name="file" value="geo_dbpedia_aeropuerto.nt"/>
    <Param name="format" value="ntriples"/>
  </Output>
</Outputs>
```

```
C:\Users\boricles>java -DconfigFile=dbpedia_geo.xml -jar silk.jar
```

# Silk – Example : airports (geolinkeddata – dbpedia)

## Accepted links, nt file

```
<http://geo.linkeddata.es/resource/Provincia/Tarragona> <owl:sameAs> <http://dbpedia.org/resource/Tarragona> .  
<http://geo.linkeddata.es/resource/Provincia/Sevilla> <owl:sameAs> <http://dbpedia.org/resource/Seville> .  
<http://geo.linkeddata.es/resource/Provincia/Lugo> <owl:sameAs> <http://dbpedia.org/resource/Lugo> .  
<http://geo.linkeddata.es/resource/Provincia/Teruel> <owl:sameAs> <http://dbpedia.org/resource/Teruel> .
```

## Links to verify, xml file

```
<Alignment>  
  <map>  
    <Cell>  
      <entity1 rdf:resource="http://geo.linkeddata.es/resource/Provincia/Toledo"></entity1>  
      <entity2 rdf:resource="http://dbpedia.org/resource/Teolo"></entity2>  
      <relation>http://dbpedia.org/ontology/Place</relation>  
      <measure rdf:datatype="http://www.w3.org/2001/XMLSchema#float">0.8777777777777779</measure>  
    </Cell>  
  </map>  
<map>
```

- <http://aksw.org/Projects/limes>

[Examples \(toggle\)](#)

[Drugbank](#)

[Diseases](#)

[SimCities](#)



**LIMES**

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**Source:**

Endpoint:

Var:

Pagesize:

Restriction:

Property:

**Target:**

Endpoint:

Var:

Pagesize:

Restriction:

Property:

Metric:

Exemplars:

**Acceptance:**

Threshold:

Relation:

**Review:**

Threshold:

Relation:

**Detected prefixes:**

**rdf:** <http://www.w3.org/1999/02/22-rdf-syntax-ns#> (-)

**rdfs:** <http://www.w3.org/2000/01/rdf-schema#> (-)

**owl:** <http://www.w3.org/2002/07/owl#> (-)

**linkedct:** <http://data.linkedct.org/resource/linkedct/> (-)

**dc:** <http://purl.org/dc/terms/> (-)

**meshr:** <http://bio2rdf.org/ns/mesh#> (-)

**Start Linking**

# GeoLinkedData - Linking

Are both resources equivalent?			
Yes: <input type="radio"/>	No: <input type="radio"/>	N/A: <input type="radio"/>	<input type="button" value="Submit"/>

[http://dbpedia.org/resource/Province\\_of\\_M%C3%A3oAllaga](http://dbpedia.org/resource/Province_of_M%C3%A3oAllaga)

<http://geo.linkeddata.es/resource/Provincia/M%C3%A1laga>

## About: Province of Málaga

An Entity of Type : [Provinces of Spain](#), from Named Graph : <http://dbpedia.org>, within Data Space : [dbpedia.org](http://dbpedia.org)

The Province of Málaga (Spanish Provincia de Málaga) is located on the southern coast of Spain, in the Autonomous Community of Andalusia. It is bordered by the Mediterranean Sea to the South, and by the provinces of Cádiz, Sevilla, Córdoba and Granada. Its area is 7,308 km<sup>2</sup>. Its population is 1,330,010 (2002), of whom two-fifths live in the capital Málaga, and its population density is 181.99/km<sup>2</sup>.

Property	Value
dbpedia-owl:abstract	<ul style="list-style-type: none"><li>Die Provinz Málaga (span. Provincia de Málaga) ist eine der sieben Provinzen der spanischen Region Andalusien. Sie liegt im Südwesten Spaniens an der Costa del Sol und hat eine Fläche von 7.410 km². Die Provinz hat eine Einwohnerzahl von ca. 1.600.000 Menschen. Die Hauptstadt ist Málaga. Die Provinz grenzt im Norden an die Provinz Granada, im Osten an die Provinz Sevilla, im Süden an die Provinz Cádiz und im Westen an die Provinz Huelva. Die Provinz ist in 101 Municipios unterteilt, die in 9 Comarcas und 11 Partidos judiciales eingeteilt sind. Die Provinz ist nach Madrid die bevölkerungsreichste Provinz Spaniens.</li><li>The Province of Málaga (Spanish Provincia de Málaga) is located in the south-west of Spain, by the Mediterranean Sea. It has an area of 7,410 km². The population density is 181.99/km². Its main industry and claim to fame is tourism, especially European tourists. But besides the beaches, the mountainous composer Ernesto Lecuona, "Malagueña", is named for the city. Besides the capital, its main cities are Marbella, Vélez-Málaga, Fuengirola, and Benalmádena. The population density surpasses both the Andalusia and Spain's average. Located in the interior, the prevailing climate is a warm Mediterranean climate. The Eastern coastal zone has a subtropical Mediterranean climate, while the Western coastal zone has a Continental Mediterranean climate.</li><li>La provincia de Málaga es una de las ocho provincias españolas que no tienen salida al mar. Limita al norte con la provincia de Granada, al este con la provincia de Sevilla y al oeste con la provincia de Cádiz. Al sur limita con el océano Atlántico. La provincia tiene una superficie de 7.410 km² y una población de más de 1.600.000 habitantes. La capital es Málaga. La provincia está dividida en 101 municipios, 9 comarcas y 11 partidos judiciales. Su población es la segunda más alta de España por población. Quedó constituida como provincia en 1833, tras la separación de la provincia de Sevilla. El código postal de los municipios de Málaga empieza por el número 29.</li></ul>



Málaga at geo.linkeddata.es

<http://geo.linkeddata.es/resource/Provincia/M%C3%A1laga>

Property	Value
geoes:formaParteDe	< <a href="http://geo.linkeddata.es/resource/ComunidadAut%C3%B3noma/Andaluc%C3%ADa">http://geo.linkeddata.es/resource/ComunidadAut%C3%B3noma/Andaluc%C3%ADa</a> >
geoes:formadoPor	<ul style="list-style-type: none"> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/%C3%88lora">http://geo.linkeddata.es/resource/Municipio/%C3%88lora</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/%C3%88rchez">http://geo.linkeddata.es/resource/Municipio/%C3%88rchez</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alameda">http://geo.linkeddata.es/resource/Municipio/Alameda</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alcauc%C3%AD">http://geo.linkeddata.es/resource/Municipio/Alcauc%C3%AD</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alfarante">http://geo.linkeddata.es/resource/Municipio/Alfarante</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alfarantejo">http://geo.linkeddata.es/resource/Municipio/Alfarantejo</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Algarrobo">http://geo.linkeddata.es/resource/Municipio/Algarrobo</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Algatoc%C3%AD">http://geo.linkeddata.es/resource/Municipio/Algatoc%C3%AD</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alhaur%C3%AD">http://geo.linkeddata.es/resource/Municipio/Alhaur%C3%AD</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alhaur%C3%AD">http://geo.linkeddata.es/resource/Municipio/Alhaur%C3%AD</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alm%C3%A1char">http://geo.linkeddata.es/resource/Municipio/Alm%C3%A1char</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Almargen">http://geo.linkeddata.es/resource/Municipio/Almargen</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Almog%C3%AD">http://geo.linkeddata.es/resource/Municipio/Almog%C3%AD</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alozaina">http://geo.linkeddata.es/resource/Municipio/Alozaina</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Alpandeire">http://geo.linkeddata.es/resource/Municipio/Alpandeire</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Antequera">http://geo.linkeddata.es/resource/Municipio/Antequera</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Archidona">http://geo.linkeddata.es/resource/Municipio/Archidona</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Ardales">http://geo.linkeddata.es/resource/Municipio/Ardales</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Arenas">http://geo.linkeddata.es/resource/Municipio/Arenas</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Arriate">http://geo.linkeddata.es/resource/Municipio/Arriate</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Atajate">http://geo.linkeddata.es/resource/Municipio/Atajate</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Benadalid">http://geo.linkeddata.es/resource/Municipio/Benadalid</a>&gt;</li> <li>▪ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Benahav%C3%AD">http://geo.linkeddata.es/resource/Municipio/Benahav%C3%AD</a>&gt;</li> </ul>

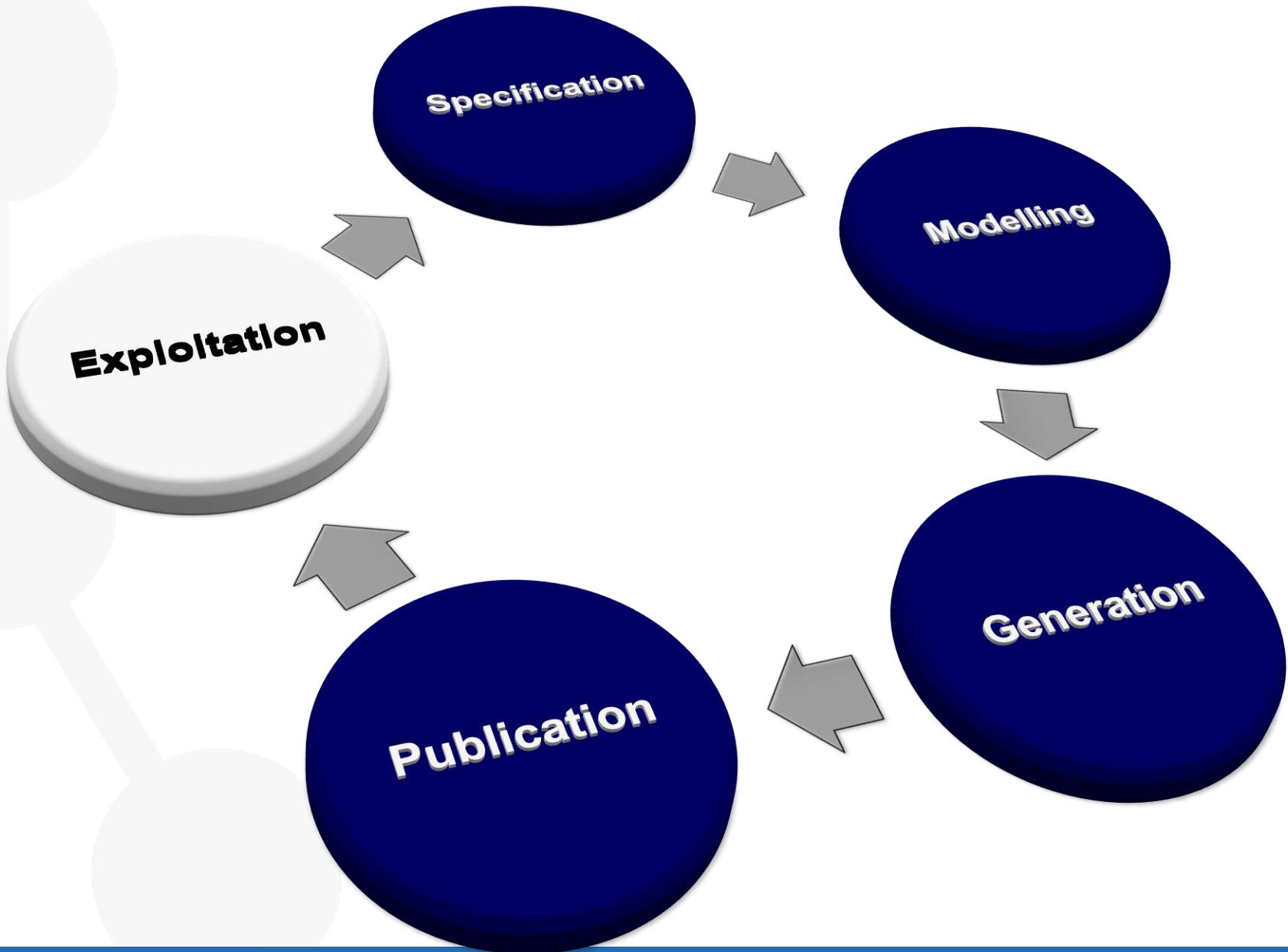


<http://oeqdev.dia.upm.es:8080/sameAs/>

## 6. Linking of the RDF Data

- <http://geo.linkeddata.es/page/Provincia/Granada>

	<ul style="list-style-type: none"><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Og%C3%ADjares">http://geo.linkeddata.es/resource/Municipio/Og%C3%ADjares</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Otura">http://geo.linkeddata.es/resource/Municipio/Otura</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Padul">http://geo.linkeddata.es/resource/Municipio/Padul</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Peligros">http://geo.linkeddata.es/resource/Municipio/Peligros</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Pinos%20Puente">http://geo.linkeddata.es/resource/Municipio/Pinos%20Puente</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Puebla%20de%20Don%20Fadrique">http://geo.linkeddata.es/resource/Municipio/Puebla%20de%20Don%20Fadrique</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Pulianas">http://geo.linkeddata.es/resource/Municipio/Pulianas</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Purullena">http://geo.linkeddata.es/resource/Municipio/Purullena</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Salar">http://geo.linkeddata.es/resource/Municipio/Salar</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Salobre%C3%B1a">http://geo.linkeddata.es/resource/Municipio/Salobre%C3%B1a</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Santa%20Fe">http://geo.linkeddata.es/resource/Municipio/Santa%20Fe</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Ug%C3%ADjar">http://geo.linkeddata.es/resource/Municipio/Ug%C3%ADjar</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/V%C3%A9lez%20de%20Benaudalla">http://geo.linkeddata.es/resource/Municipio/V%C3%A9lez%20de%20Benaudalla</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Villanueva%20Mes%C3%ADa">http://geo.linkeddata.es/resource/Municipio/Villanueva%20Mes%C3%ADa</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Z%C3%BAjar">http://geo.linkeddata.es/resource/Municipio/Z%C3%BAjar</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Zubia%2C%20La">http://geo.linkeddata.es/resource/Municipio/Zubia%2C%20La</a>&gt;</li></ul>
geo:geometry	<ul style="list-style-type: none"><li>■ &lt;<a href="http://geo.linkeddata.es/resource/wgs84/37.166666666667_-3.583333333333333">http://geo.linkeddata.es/resource/wgs84/37.166666666667_-3.583333333333333</a>&gt;</li><li>■ &lt;<a href="http://geo.linkeddata.es/resource/wgs84/37.1793252820624_-3.59704135514161">http://geo.linkeddata.es/resource/wgs84/37.1793252820624_-3.59704135514161</a>&gt;</li></ul>
rdfs:label	<ul style="list-style-type: none"><li>■ Granada (es)</li><li>■ Granada (xsd:string)</li></ul>
owl:sameAs	<ul style="list-style-type: none"><li>■ &lt;<a href="http://dbpedia.org/resource/Province_of_Granada">http://dbpedia.org/resource/Province_of_Granada</a>&gt;</li><li>■ &lt;<a href="http://sws.geonames.org/2517115/">http://sws.geonames.org/2517115/</a>&gt;</li></ul>
geoes:tieneCapital	<ul style="list-style-type: none"><li>■ &lt;<a href="http://geo.linkeddata.es/resource/Municipio/Granada">http://geo.linkeddata.es/resource/Municipio/Granada</a>&gt;</li></ul>
rdf:type	<ul style="list-style-type: none"><li>■ geoes:Provincia</li></ul>



# Publication

- Dataset publication
- Metadata publication
- Dataset discovery

- Tools for storing RDF
  - Virtuoso Universal Server, Jena, Sesame, 4Store, YARS, OWLIM
- SPARQL endpoint and Linked Data frontend
  - Pubby, Talis Platform, Fuseki

- VoID allows to express metadata about RDF datasets



## Describing Linked Datasets with the VoID Vocabulary

W3C Interest Group Note 03 March 2011

This version:

<http://www.w3.org/TR/2011/NOTE-void-20110303/>

Latest version:

<http://www.w3.org/TR/void/>

Authors:

[Keith Alexander](#) (Talis)

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[Michael Hausenblas](#) (DERI, National University of Ireland, Galway)

[Jun Zhao](#) (University of Oxford)

- Open Provenance Model



```
<@ void:dataset@description ;  
dcterms:title "A void description of the Service Indicators of Ireland Dataset" ;  
dcterms:creator <http://asayor2.dia.fi.upm.es/oeg-upm/index.php/es/phd/39-bvillazon> ;  
foaf:primaryTopic :serviceindicatorsIE .  
  
:ServiceIndicatorIE rdf:type void:dataset ;  
foaf:homepage <http://data.gov.ie/> ;  
dcterms:title "Service Indicators of Ireland" ;  
dcterms:description "Local Government Computer Services Board" ;  
void:subset :VoID ;  
void:subset :SII .  
  
:VoID  
a sd:Graph, void:Dataset ;  
dcterms:title "SD+VoID triples" ;  
void:datasetdump <http://mccarthy.dia.fi.upm.es/data/void.ttl> ;  
void:triples $3 .  
  
:SII  
a sd:Graph, void:Dataset ;  
dcterms:title "Service Indicators of Ireland" ;  
dcterms:description "Local Government Computer Services Board (2009)" ;  
dcterms:source [ foaf:homepage <http://www.lgmb.ie/Service_Indicators_Reports.aspx> ] ;  
dcterms:publisher [ foaf:homepage <http://deri.ie/> ] ;  
dcterms:created "2011-08-08"^^xsd:date ;  
  
void:vocabulary <http://purl.org/linked-data/cube> ,  
    <http://purl.org/linked-data/sdmx> ,  
    <http://purl.org/linked-data/sdmx/2009/code> ,  
    <http://purl.org/linked-data/sdmx/2009/concept> ,  
    <http://purl.org/linked-data/sdmx/2009/dimension> ,  
    <http://purl.org/linked-data/sdmx/2009/measure> ,  
    <http://purl.org/linked-data/sdmx/2009/attribute> ,  
    <http://reference.data.gov.uk/id/year> ,  
    <http://www.w3.org/2004/02/skos/core> ;  
  
void:sparqlEndpoint <http://data.gov.ie/sparql> ;
```

- Register the dataset into CKAN Registry
- Generate sitemap files for your dataset, by using sitemap4rdf
- Submit the sitemap location to Google and Sindice

<http://h> <http://www.w3.org/wiki/TaskForces/CommunityProjects/LinkingOpenData/DataSets/CKANmetainformation>

<http://lab.linkeddata.deri.ie/2010/sitemap4rdf/>



## GeoLinkedData



GeoLinkedData (es) is an open initiative whose aim is to enrich the Web of Data with Spanish geospatial data. This initiative started off by publishing diverse information sources belonging to the National Geographic Institute of Spain. Such sources are made available as RDF (Resource Description Framework) knowledge bases according to the Linked Data principles. These data are interlinked with other knowledge bases belonging to the Linking Open Data Initiative.

### Resources

Resource	Format	Actions
SPARQL endpoint	api/sparql	
Download	application/x-ntriples	
RDF Schema	meta/rdf-schema	
Link to an example data item within the dataset (RDF/XML)	example/rdf+xml	

### Additional Information

Field	Value
links:dbpedia	51
links:geonames-semantic-web	51
namespace	http://geo.linkeddata.es/resource/
triples	21564199

First time at the Data Hub?

the Data Hub is a catalogue for data.  
[Click here to find out more ...](#)

#### Source

<http://geo.linkeddata.es/>

#### Author

Ontology Engineering Group, Facultad de Informática, Universidad Politécnica de Madrid.

#### Maintainer

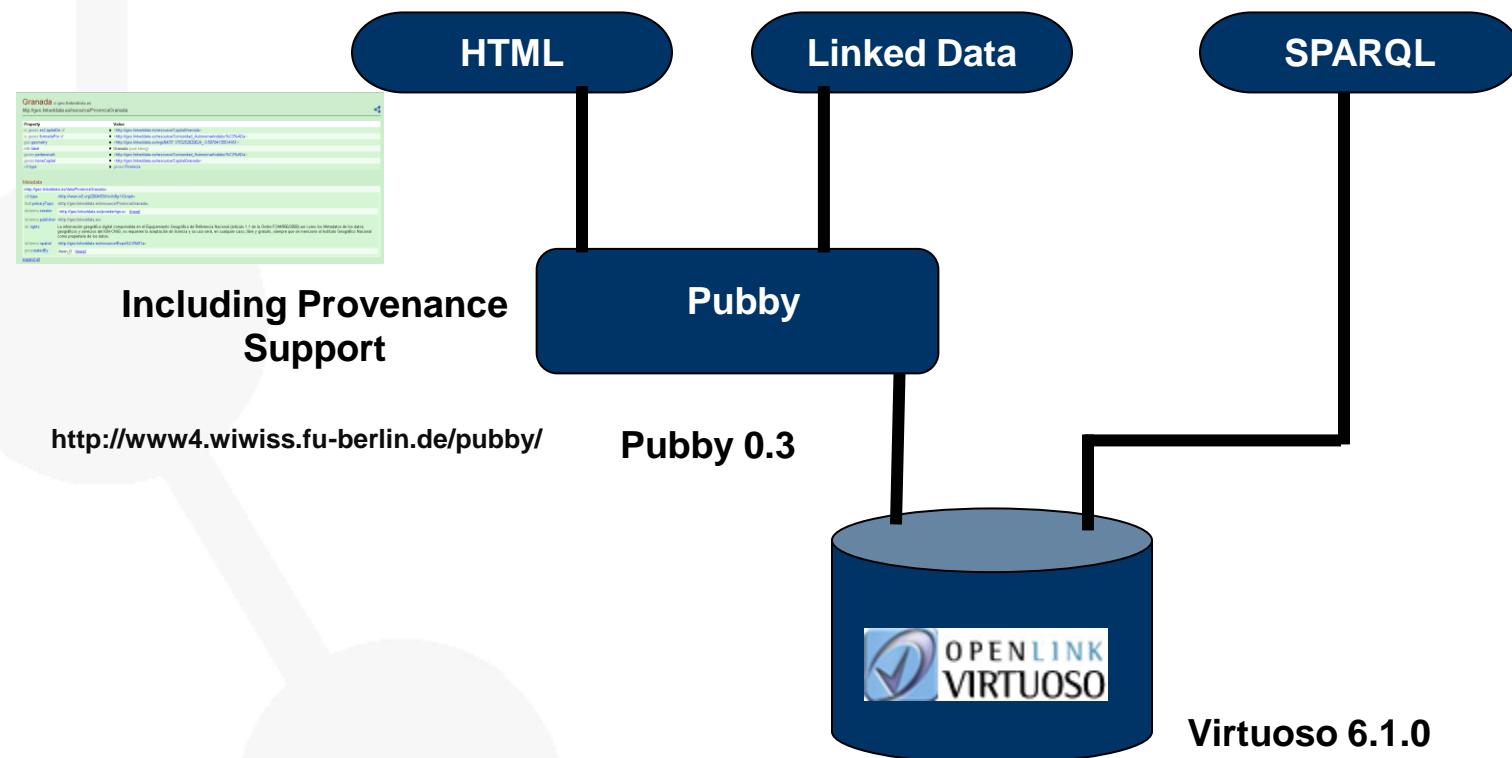
GeoLinkedData Team

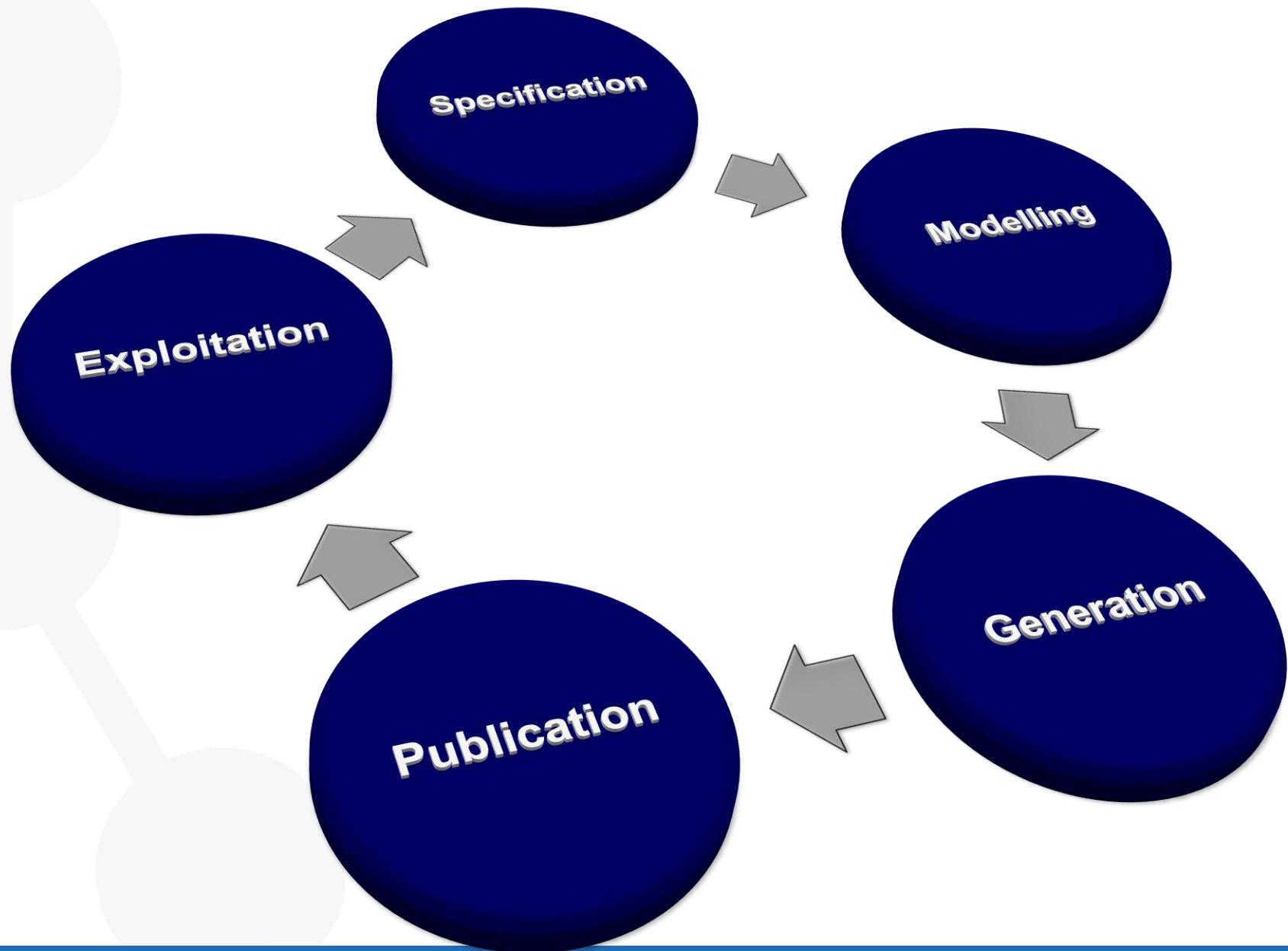
#### Version

2010-08

#### Tags

- [country-spain](#)
- [deref-vocab](#)
- [format-dc](#)
- [format-rdf](#)
- [geodata](#)
- [geographic](#)
- [government](#)
- [lod](#)
- [no-license-metadata](#)
- [no-provenance-metadata](#)

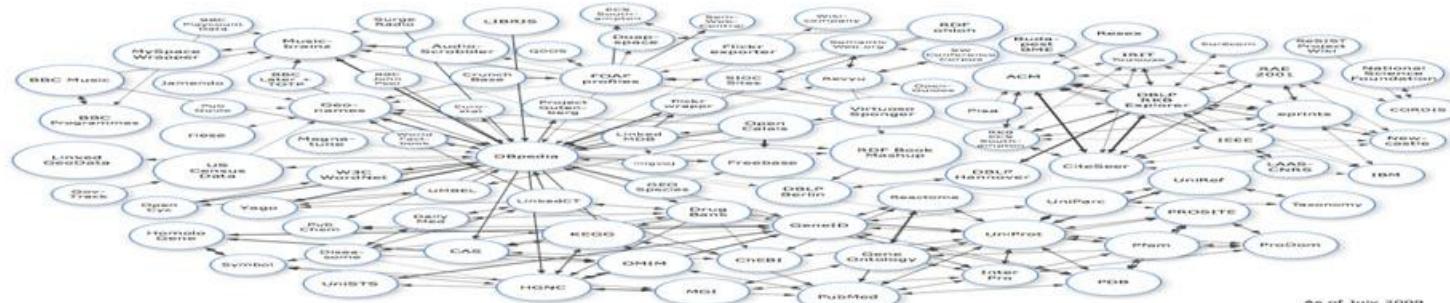




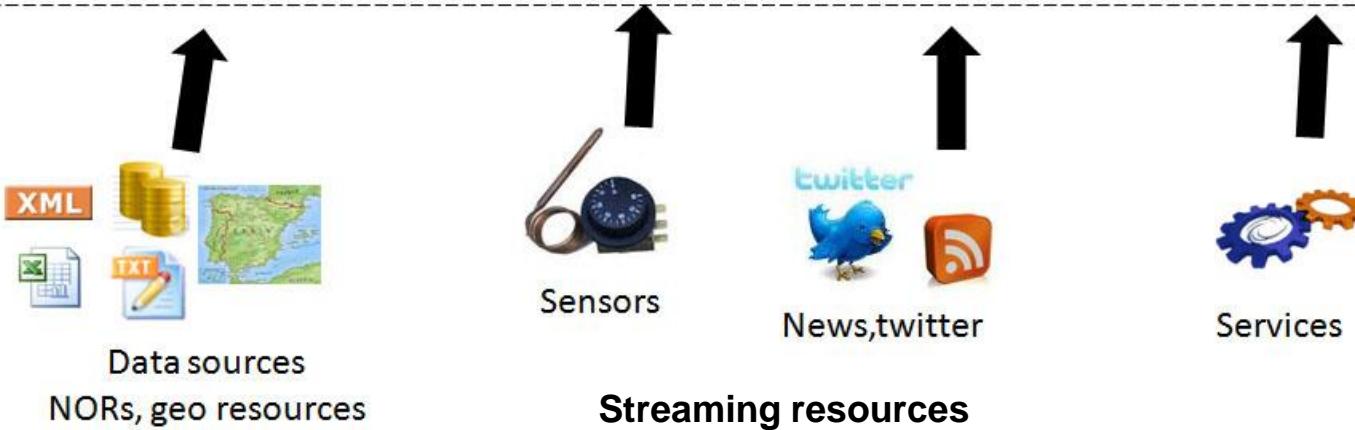


## NLP + Rich client/GUI

LOD Cloud



As of July 2009



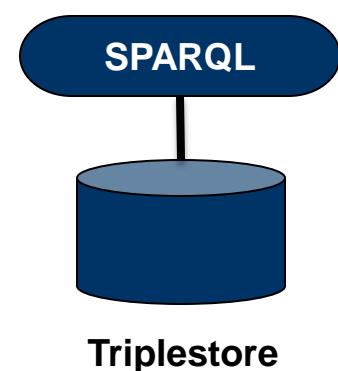
<http://oegdev.dia.fi.upm.es/projects/map4rdf/>



## map4rdf

### map4rdf:

- Google maps viewer of RDF resources
  - Resources with spatial information
- Extensible with google plugins
- Used in other applications like Aemet, Goodrelations



# DEMO

<http://geo.linkeddata.es/browser>

# Provinces



# Capital of Province



Beta



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# Provinces – Industry Production Index



Beta



# Beaches



Thank  
You !!

# Methodological Guidelines for Publishing Government Linked Data

Boris Villazón-Terrazas, Luis M. Vilches, Oscar Corcho, and  
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Slides available at: <http://www.slideshare.net/boricles/>  
Credits to the OEG members involved in LD Initiatives

Universidad Rey Juan Carlos  
September, 2011