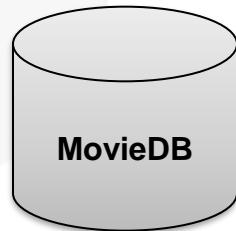


- Introduction to Linked Data
- Guidelines for Publishing Government Linked Data
- Demo

- Introduction to Linked Data
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- Demo



A screenshot of the IMDB website showing the movie "Even the Rain" (2010). The page includes the movie poster, title, release year, user rating (7.3/10), director (Icíar Bollaín), writer (Paul Laverty), stars (Gael García Bernal, Luis Tosar, Karra Elejalde), and plot summary. A large blue callout box over the page contains the text: "Data exposed to the Web via HTML, pdf, etc.".



A screenshot of the CIA World FactBook page for Bolivia. It features a map of South America with Bolivia highlighted, a flag of Bolivia, and a detailed map of Bolivia's terrain, rivers, and cities like La Paz, Sucre, and Potosí. A sidebar on the right lists CIA initiatives.



industry production index in Cochabamba Bolivia

Search

About 5,550 results (0.11 seconds)

- Everything
- Images
- Videos
- News
- Shopping
- More

- All results
- Related searches
- Timeline
- More search tools

[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/swwf/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 - 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.worldbank.org/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



Search All

Movies TV News Videos Community

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](#)

[Watch Trailer](#) Add to Watchlist



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

Complex queries over *multiple* pages / data sources?

Actualizado a las 21h42 (Gmt -4)

Cbba: ☀ 13 °C Ver más

Venta: \$us 6.99 Compra: \$us 6.89

Los Tiempos.com

Cochabamba, Viernes 06 de mayo del 2011

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[Edición Digital](#) [Edición Impresa](#) [Últimas noticias](#) [Noticias más leídas](#)

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 un 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

Lea Legislativa (4/V/11).

El presidente opositor Bernard Gutiérrez-

Lea Legislativa (4/V/11).

Lea Legislativa (4/V/11).

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Kids' Page

(CONTAINS DESCRIPTION)

CLICK FLAG OR MAP TO ENLARGE



VIEW 2 PHOTOS
OF BOLIVIA

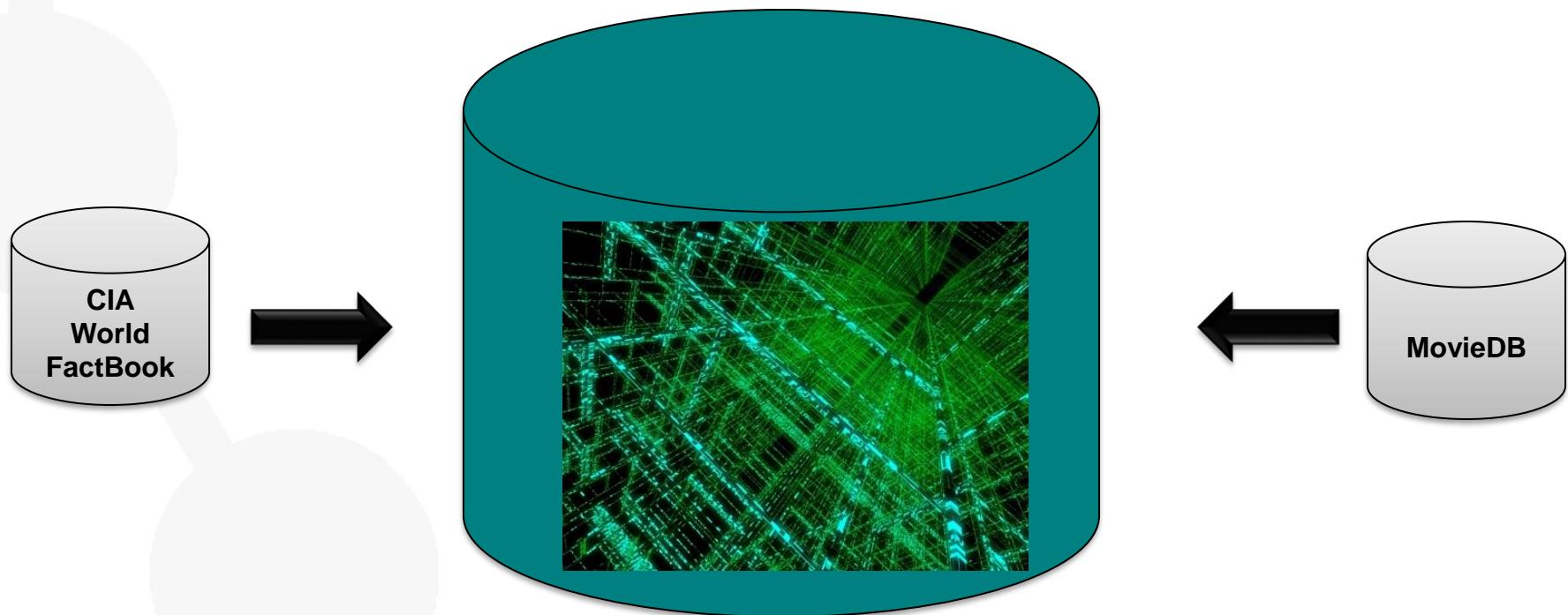


CLICK MAP TO ENLARGE

EXPAND ALL | COLLAPSE ALL

What do we actually want?

- Use the Web like a single global database



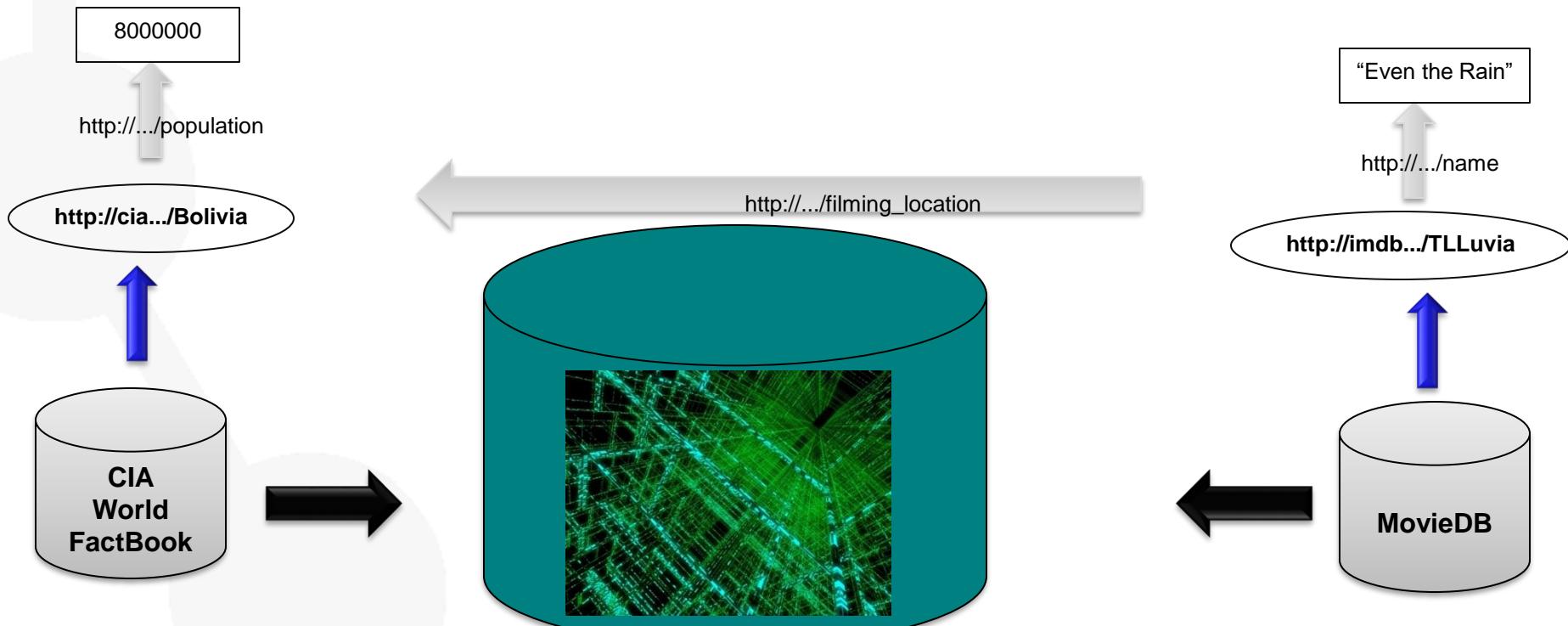
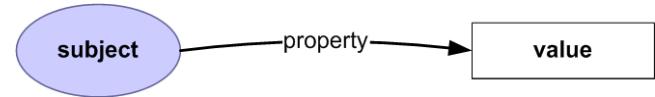
Linked Data enables such Web of Data

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

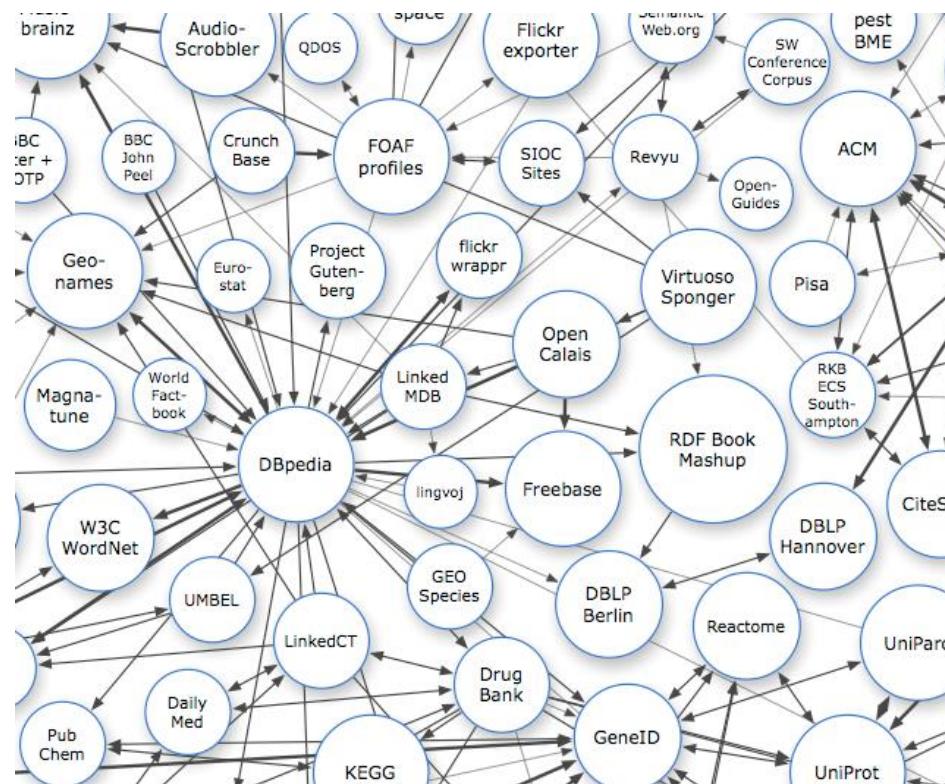
Data Model: **RDF** (Resource Description Framework), which is a standard model for data interchange on the Web

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

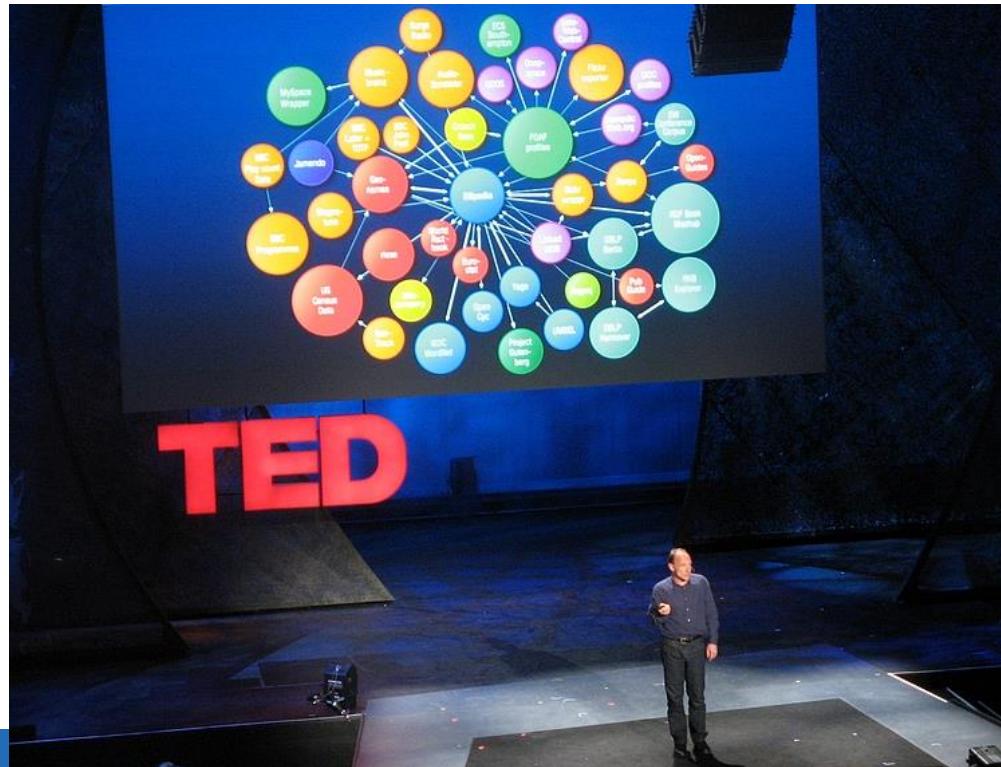


The four principles (Tim Berners Lee, 2006)

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.

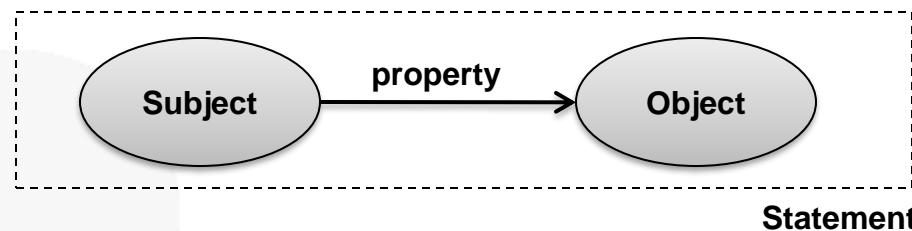
- <http://www.w3.org/DesignIssues/LinkedData.html>

http://www.ted.com/talks/tim_berners_lee_on_the_next_web.html

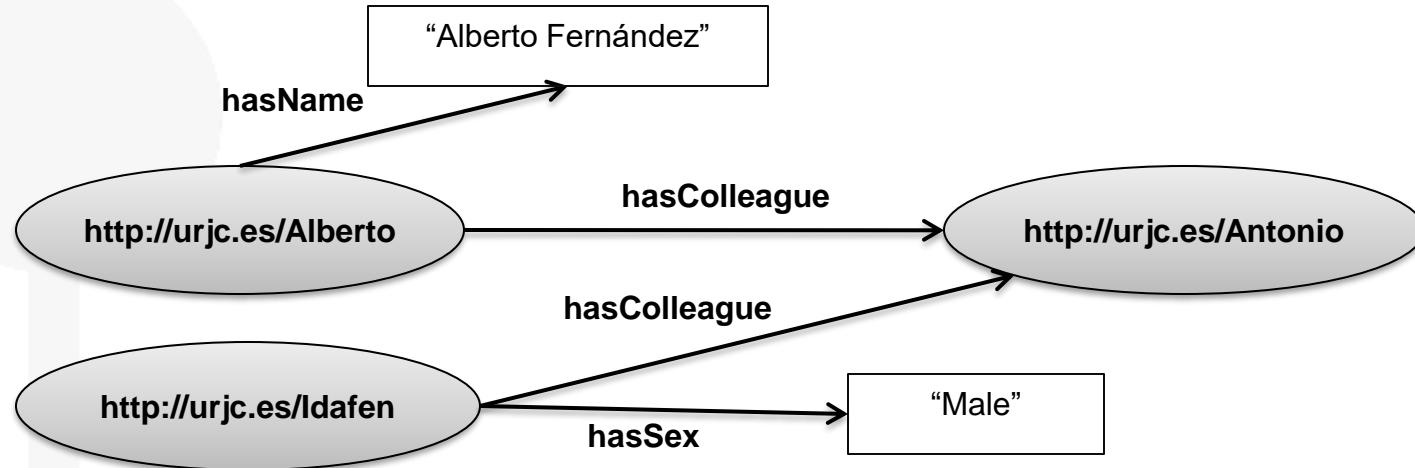


RDF – Resource Description Framework

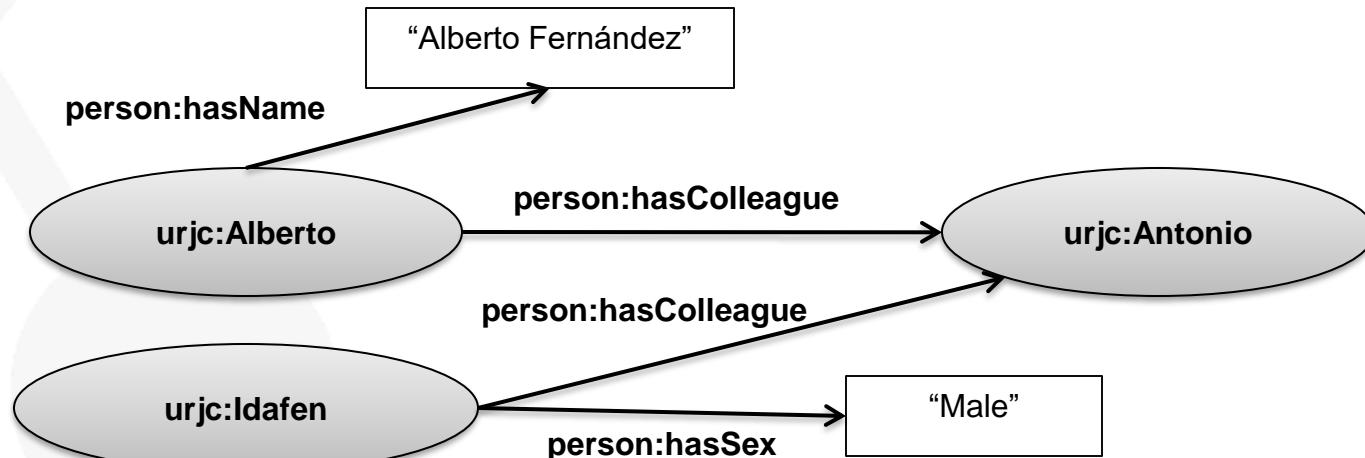
- W3C recommendation
- RDF is a basic KR language based on semantic networks
 - Useful to represent metadata and describe any type of information in a machine-accessible way (aka data model)
 - Resources are described in terms of properties and property values using RDF statement
 - Statements are represented as triples, consisting of a subject, predicate, and object [S,P,O]

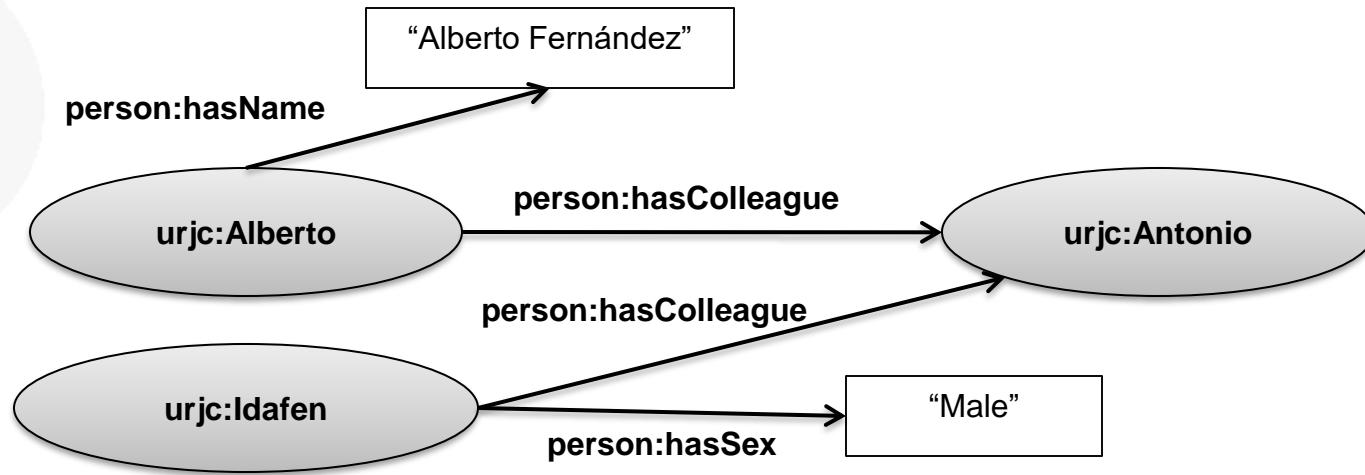


RDF - Example



- For practical purposes, specially if handwritten, URIs are shortened using XML namespaces
 - `xmlns:urjc="http://urjc.es/"`
 - `urjc:Alberto` is equivalent to `http://urjc.es/Alberto`
 - RDF serializations: XML, N3, N-Triple





- Query: “Tell me who are the persons who have Antonio as colleague”



- Result: **urjc:Alberto** and **urjc:Idafen**
- SPARQL query language for RDF. W3C recommendation

```

SELECT ?s
WHERE { ?s person:hasColleague urjc:Antonio.}
  
```

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

- But, why?



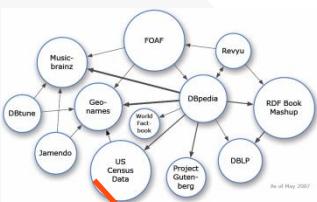
- What was your incentive to publish an HTML page in 1990?
 - Share data in documents and because your neighbor was doing it
- So, why should we publish Linked Data in 2011?
 - Share data as data and because your neighbor is doing it

And guess who is starting to publish Linked Data now?

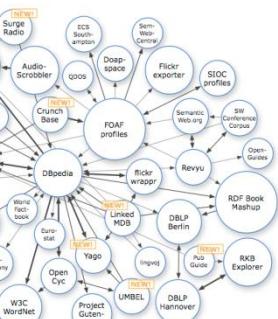
- UK Government
- US Government
- BBC
- Open Calais
- Freebase
- NY Times
- CNET
- Dbpedia
-

Linked Open Data evolution

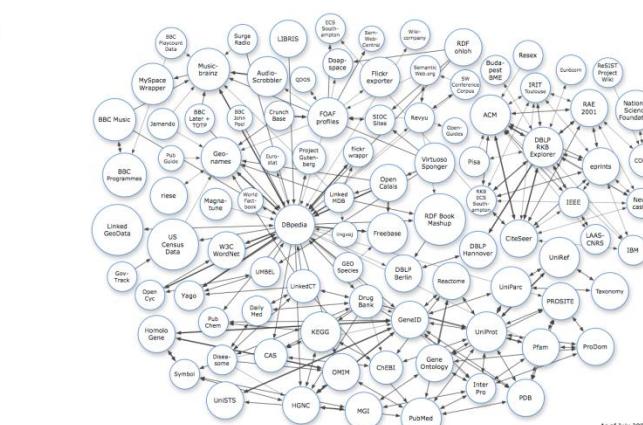
■ 2007



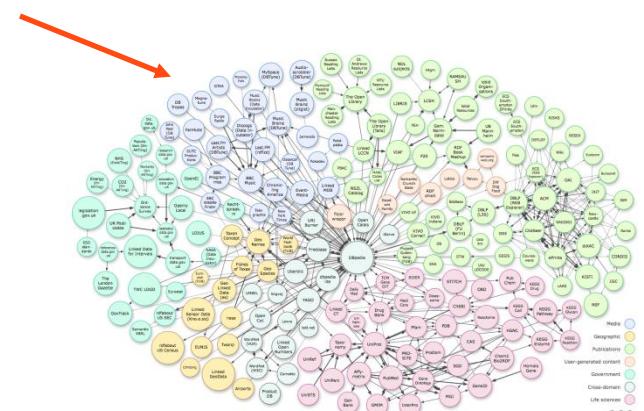
■ 2008



■ 2009

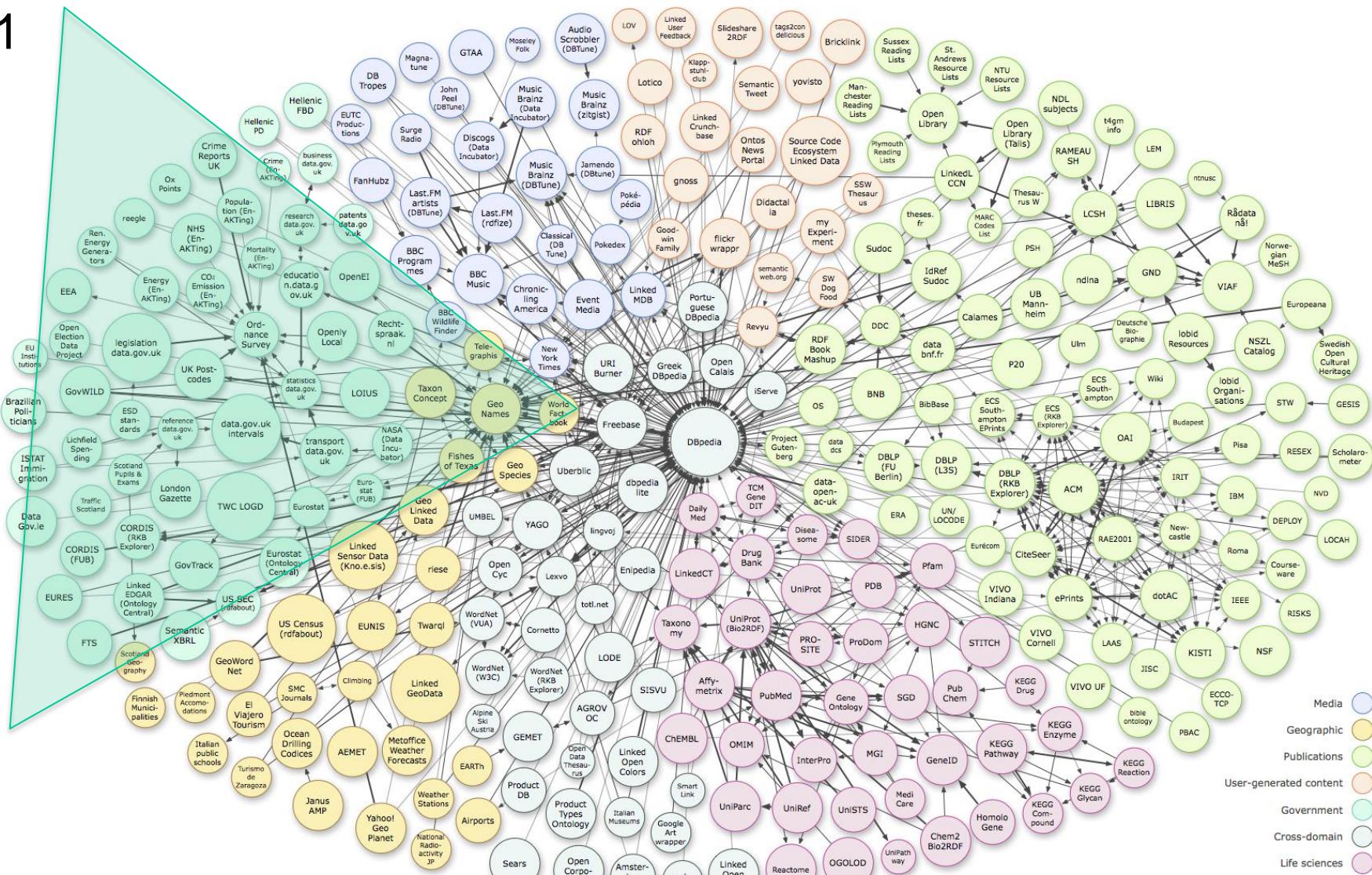


■ 2010



Linked Open Data

2011



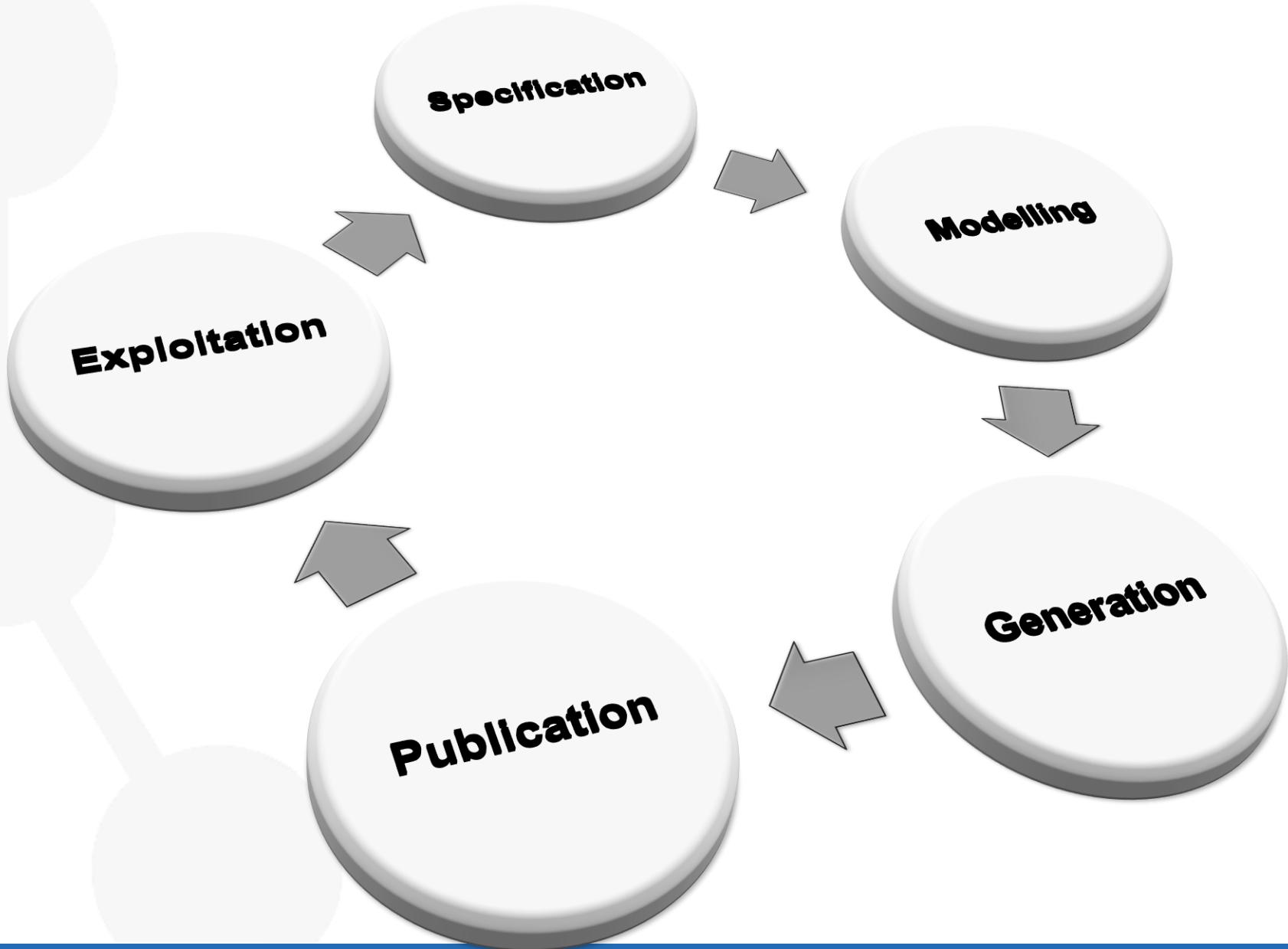
Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. <http://lod-cloud.net/>

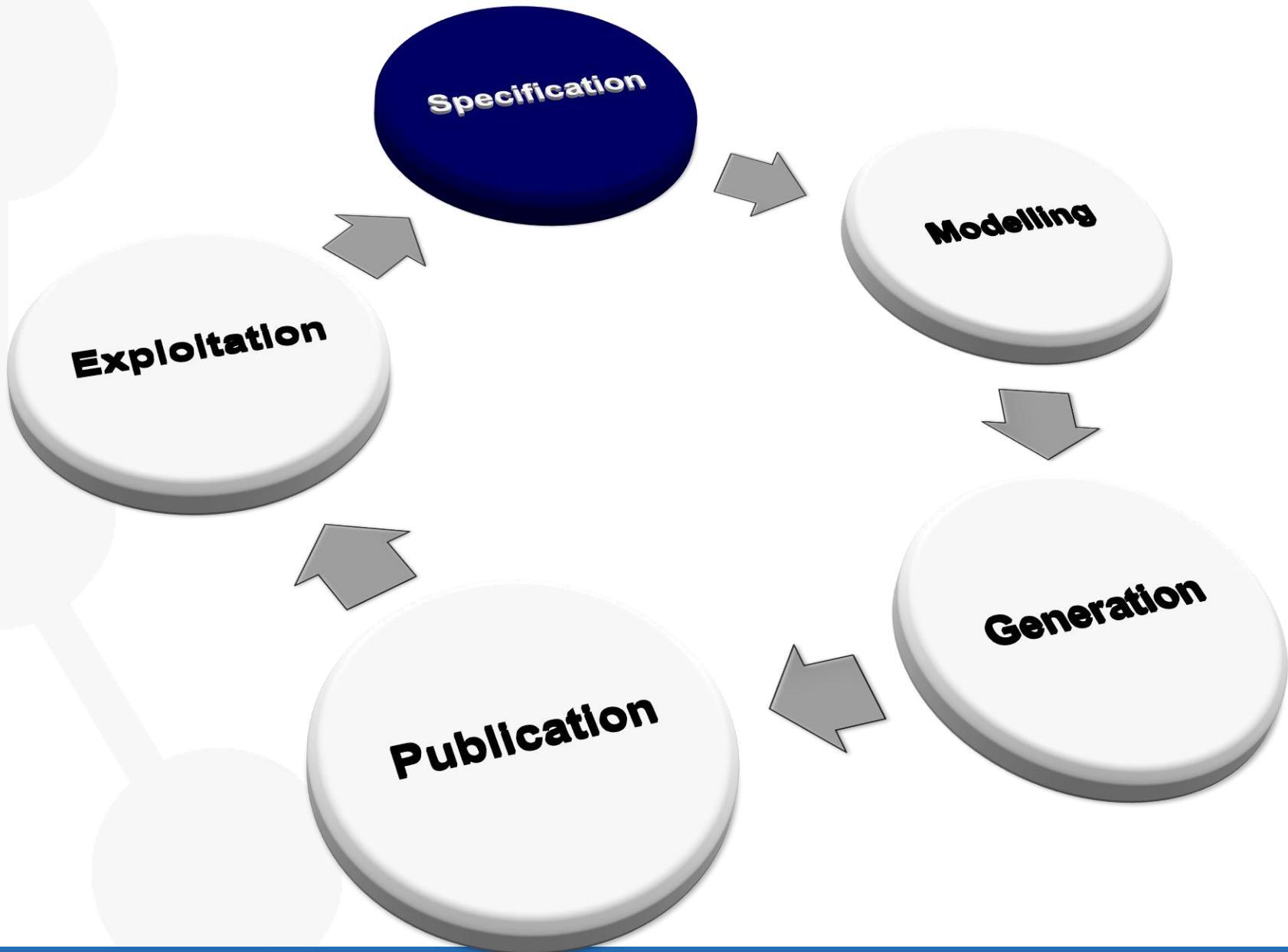
- W3C eGovernment Activity
 - Improving Access to Government through Better Use of the Web
 - Publishing Open Government Data
 - W3C Government Linked Data WG
- Open Knowledge Foundation
 - Open Data Manual
- 5-star deployment scheme for Linked Open Data
 - ★ make your stuff available on the Web (whatever format) under an open license ¹
 - ★★ make it available as structured data (e.g., Excel instead of image scan of a table) ²
 - ★★★ use non-proprietary formats (e.g., CSV instead of Excel) ³
 - ★★★★ use URIs to identify things, so that people can point at your stuff ⁴
 - ★★★★★ link your data to other data to provide context ⁵

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

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

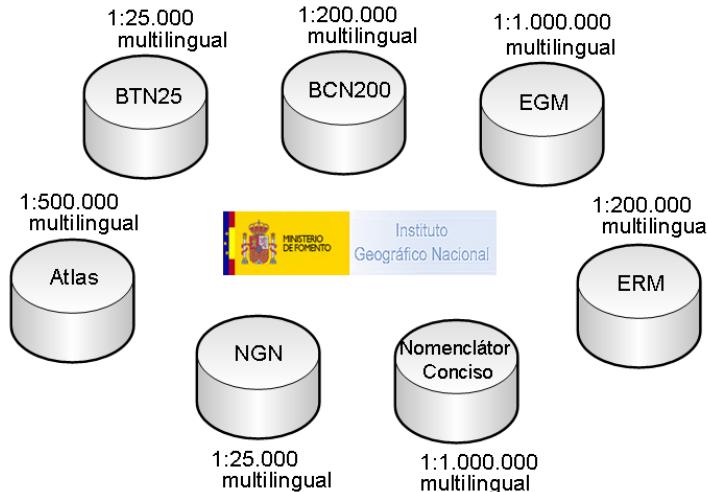
- Search and compile all the available data and documentation about those resources
- Identify the schema of those resources including conceptual components and their relationships
- Identify the items in the domain, i.e., things whose properties and relations are described in the data sources

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	74809	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`

- 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`

Definition of the license

- Several possibilities
 - The UK Open Government License
 - Open Database License
 - Public Domain Dedication and License
 - Open Data Commons Attribution License
 - The Creative Commons Licenses

It is also possible to reuse and apply an existing license of the government data sources.

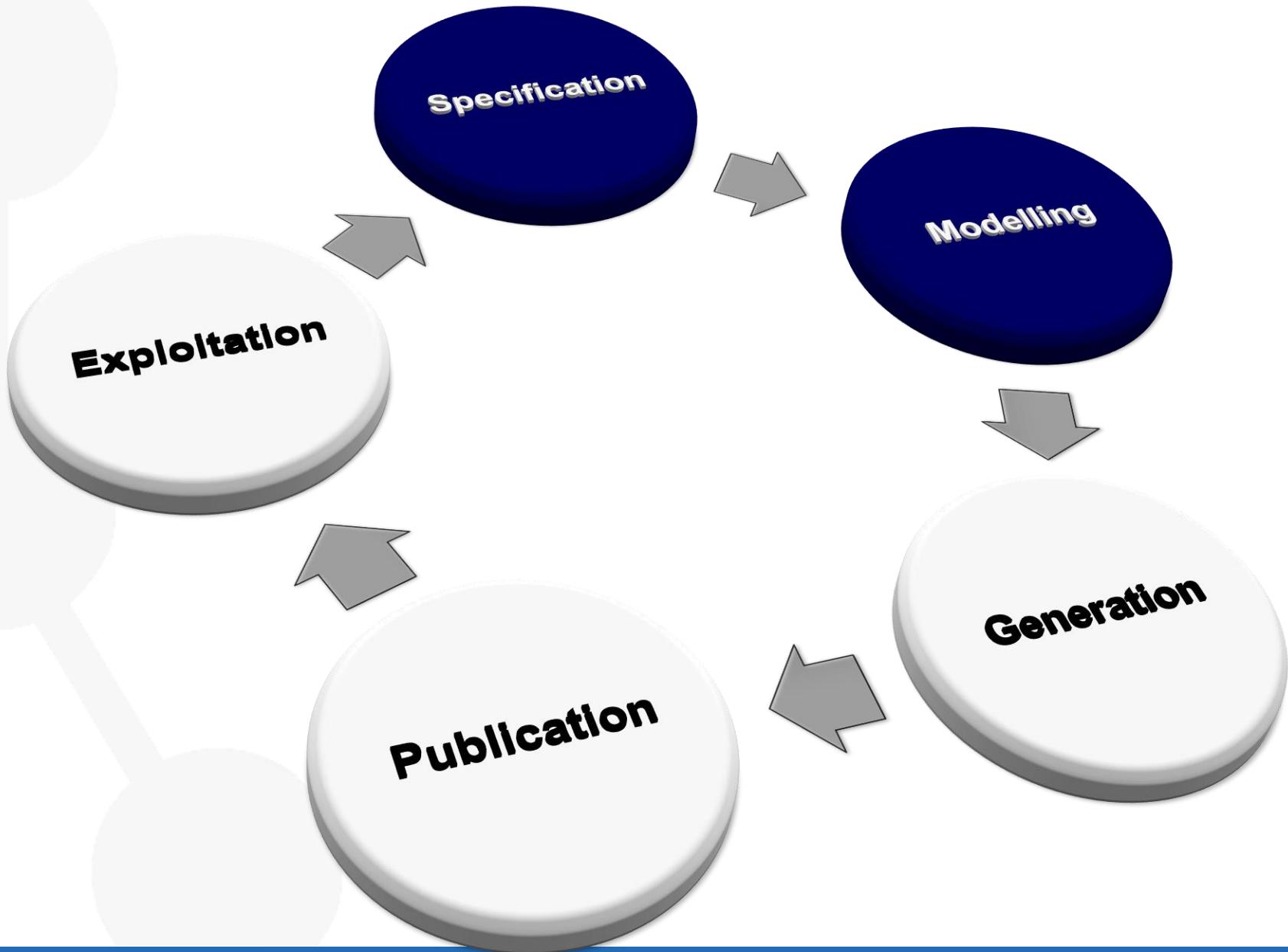
GeoLinkedData - Definition of the license

- Reusing the original license of the government data sources. IGN and INE data sources have their own license, similar to Attribution-Share Alike 2.5 Generic License



<http://creativecommons.org/licenses/by-sa/2.5/>



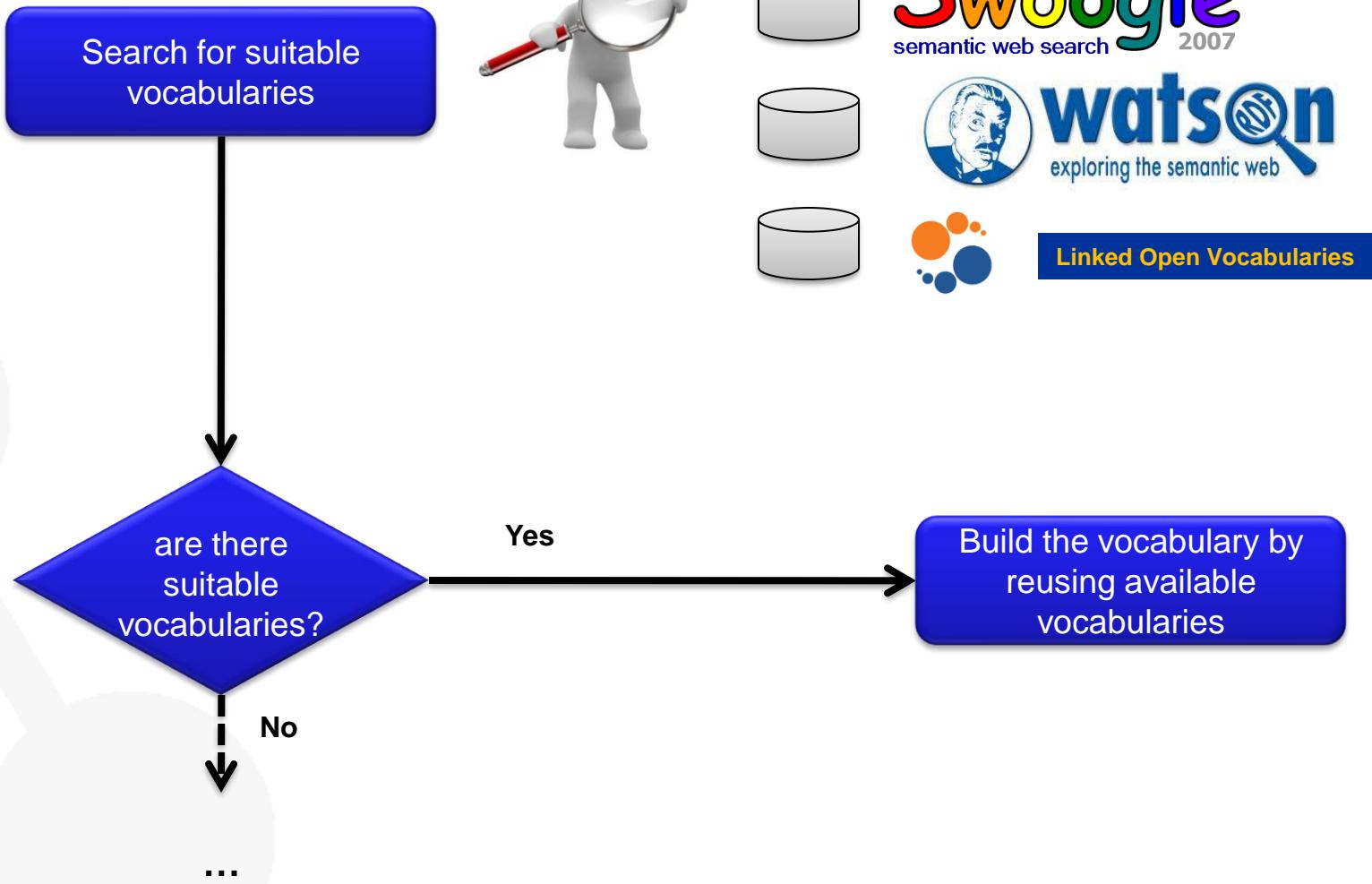


- An ontology is an engineering artifact, which provides:
 - A set of terms
 - A set of explicit assumptions regarding the intended meaning of the terms.
 - Almost always including concepts and their classification
 - Almost always including properties between concepts

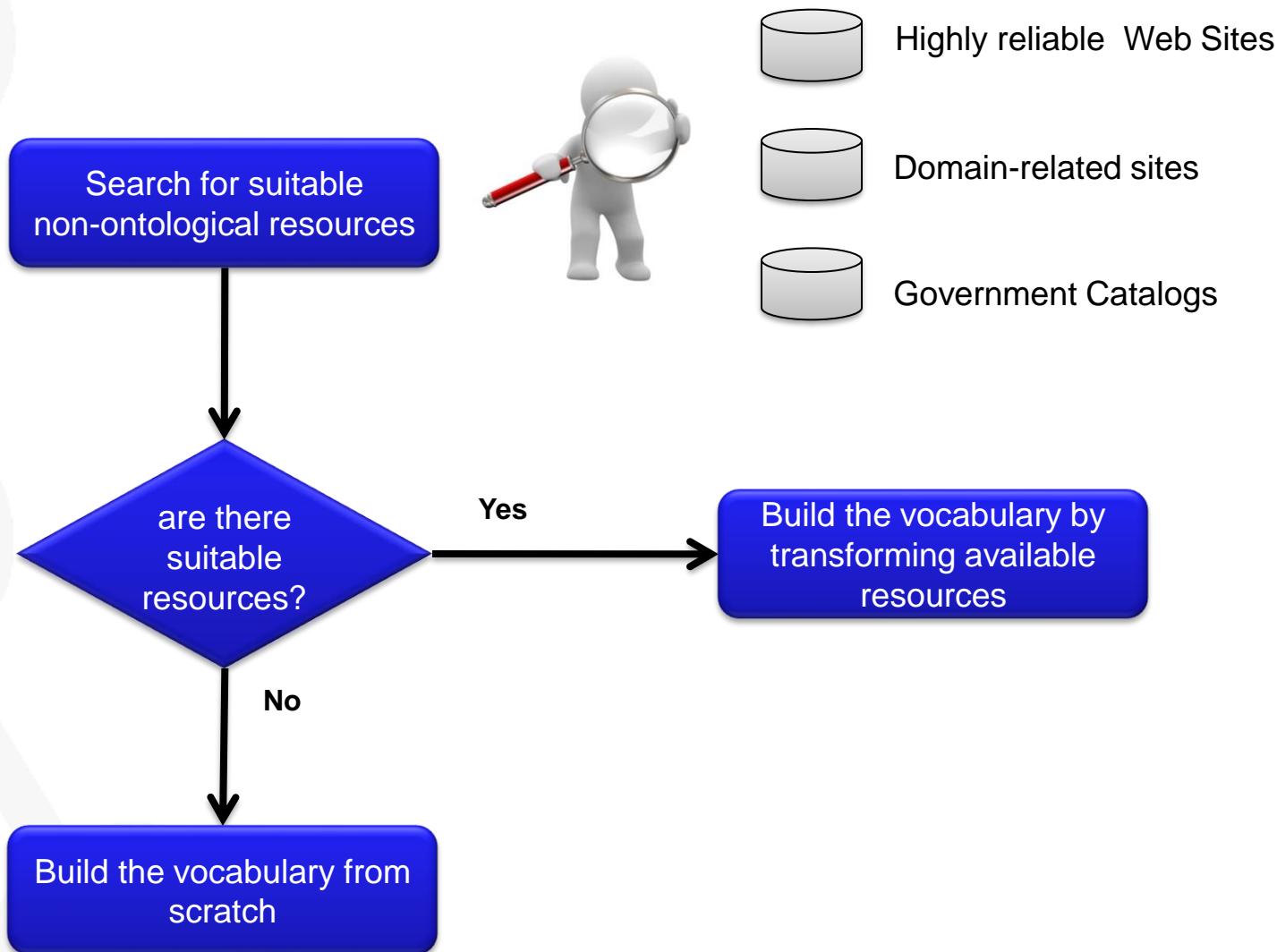


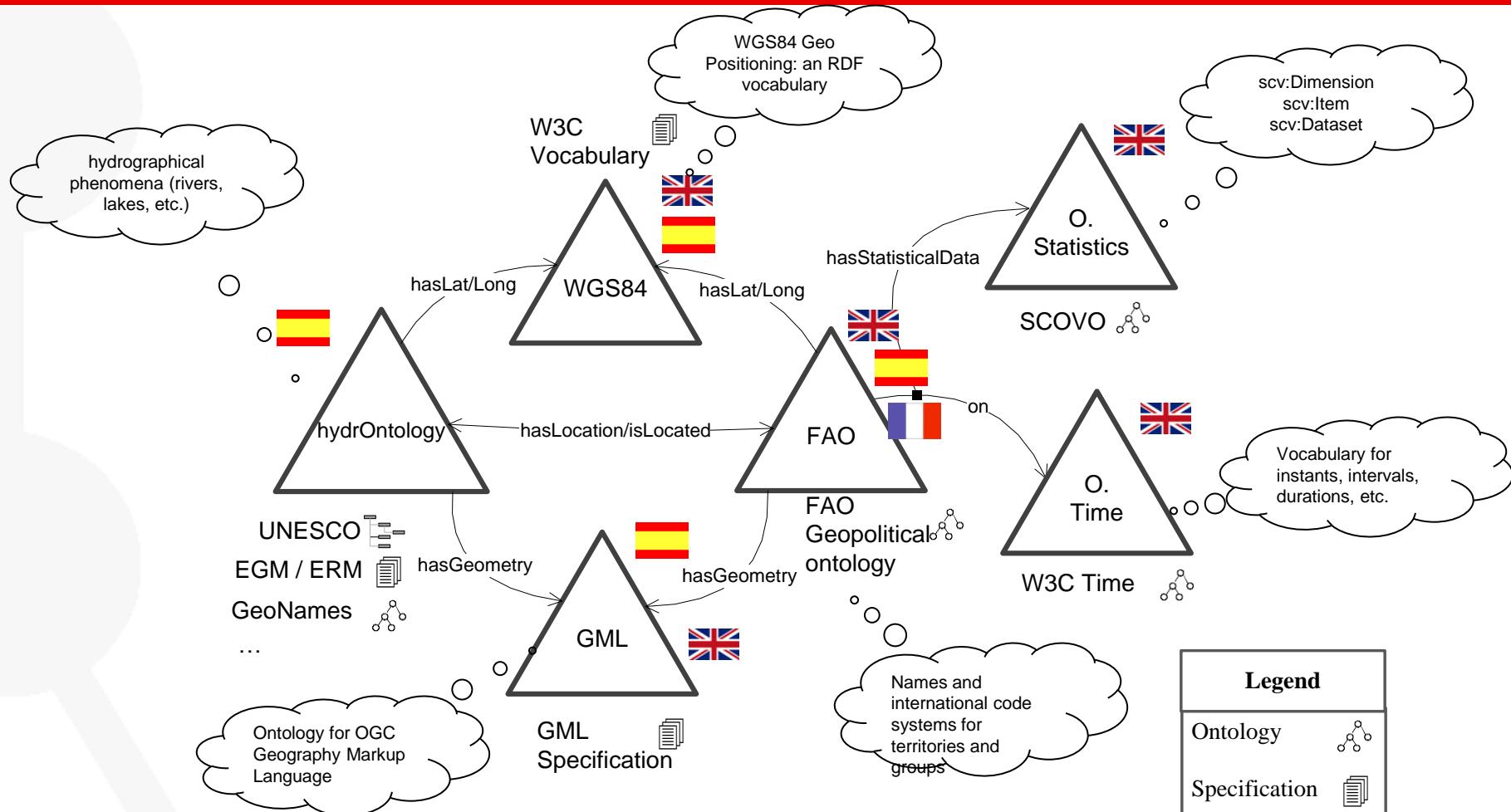
- Shared understanding of a domain of interest
- Ontologies expressed in OWL or RDF(S), both based on RDF

Reuse available vocabularies



Reuse available non-ontological resources



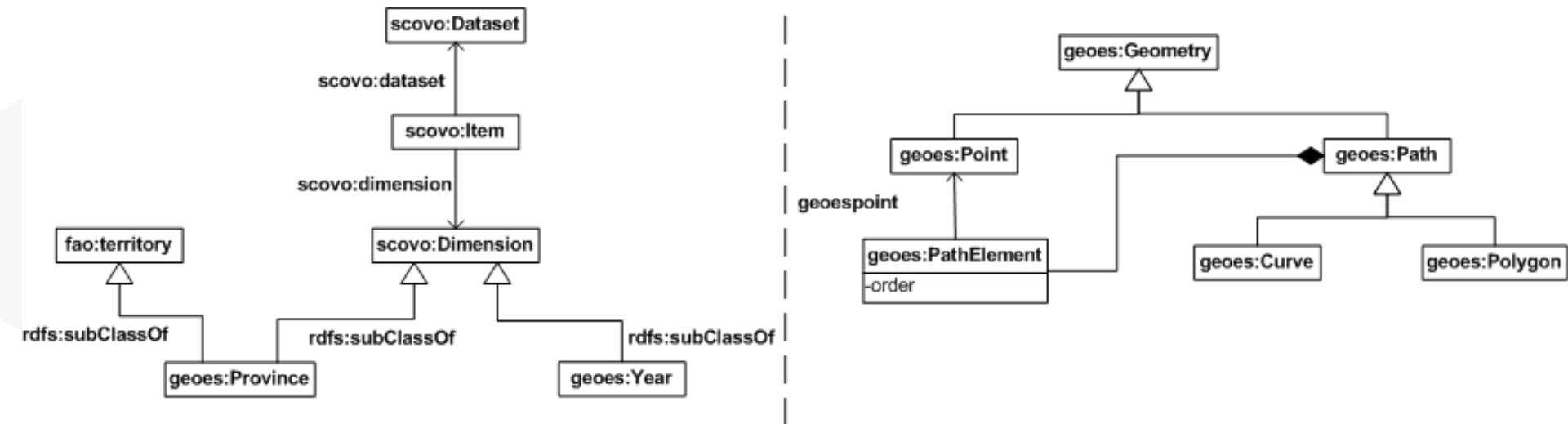


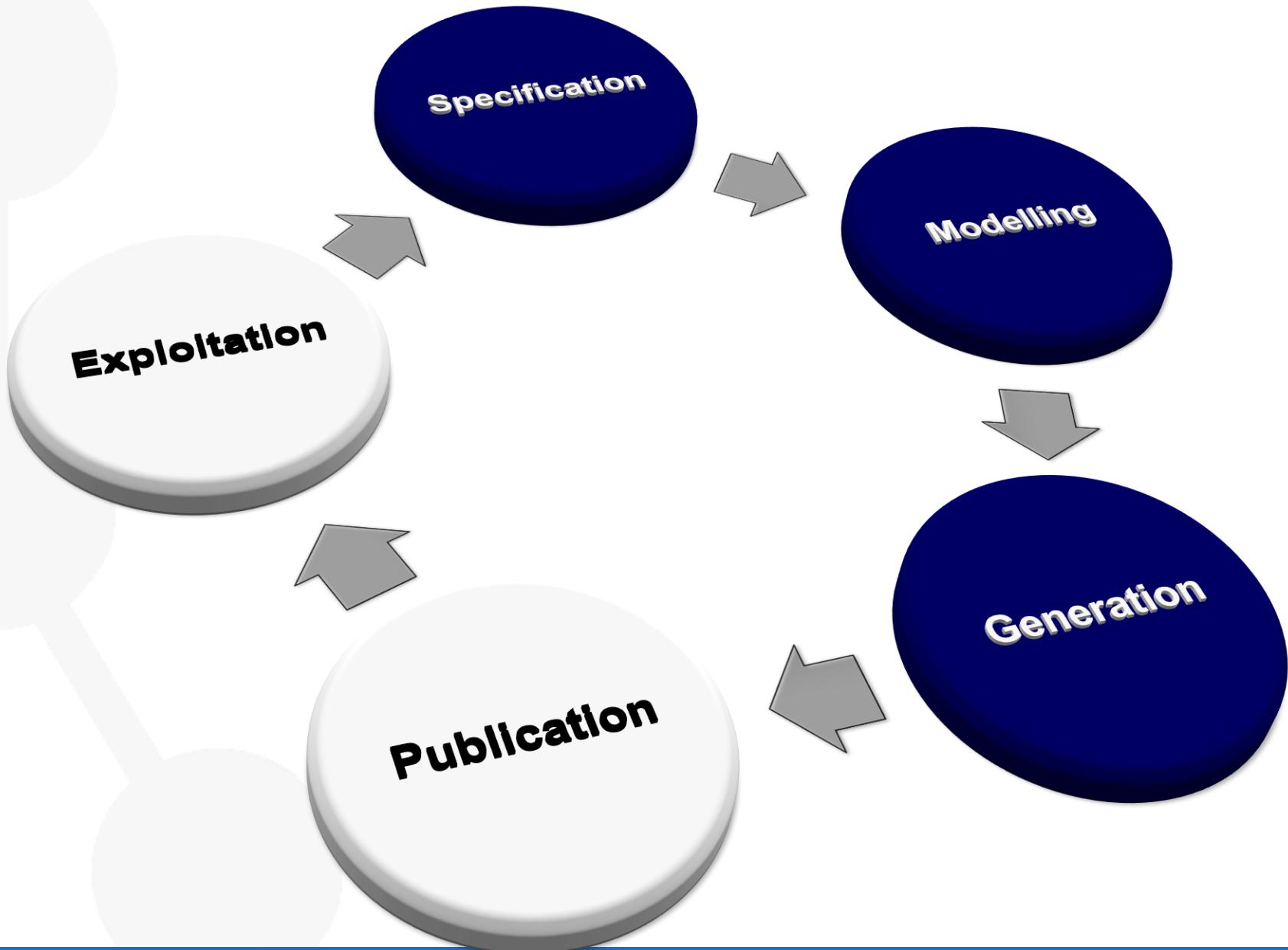
Classes	33	33
Object Properties	44	44
Data Properties	318	318



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

geoes: <http://geo.linkeddata.es/ontology/>
 scovo: <http://purl.org/NET/scovo#>
 fao: <http://aims.fao.org/aos/geopolitical.owl#>
 rdfs: <http://www.w3.org/2000/01/rdf-schema#>



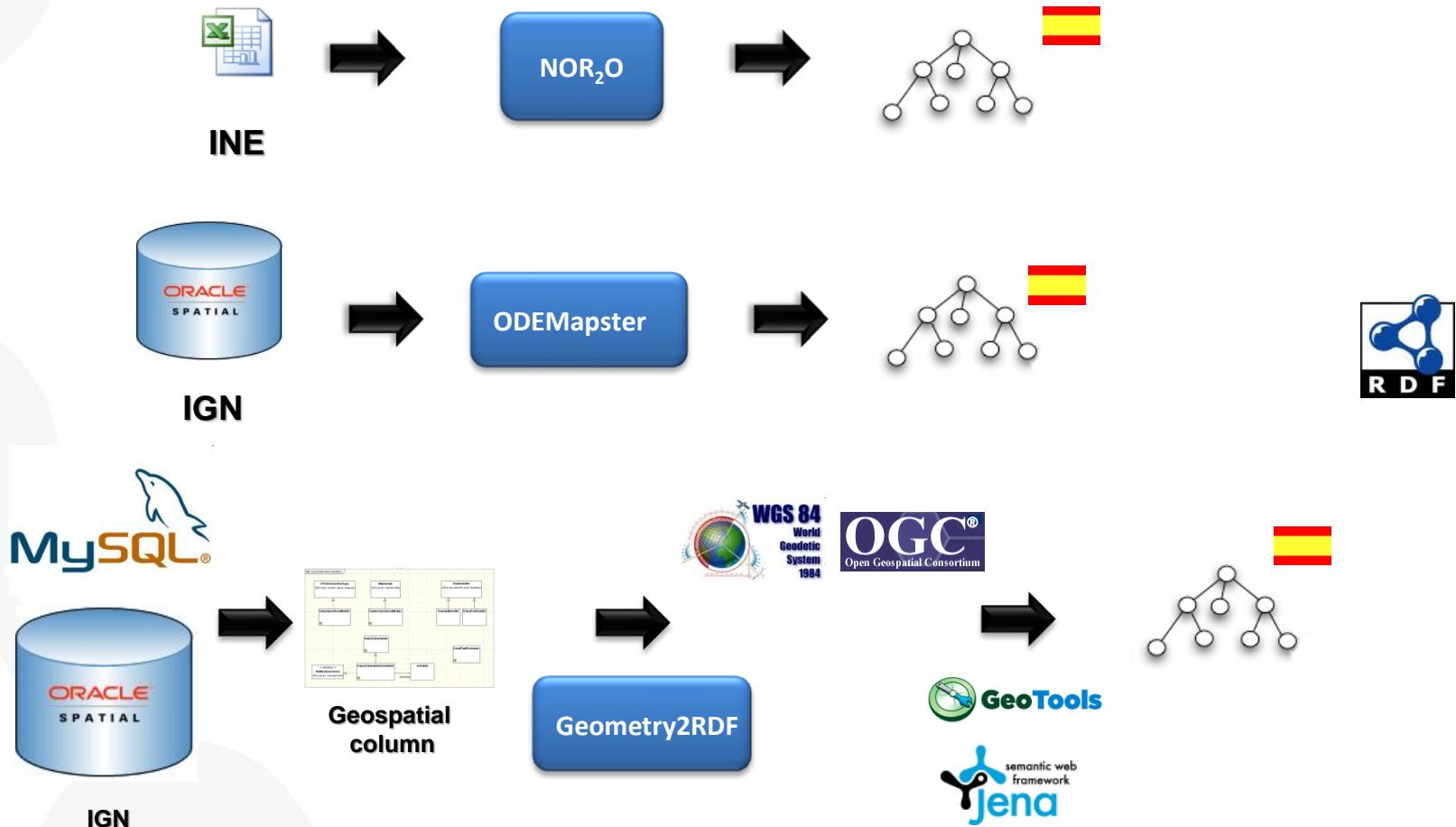


Generation

- 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, NOR₂O
 - RDB
 - D2R Server, ODEMapster, W3C RDB2RDF WG – R2RML
 - XML
 - GRDDL, ReDeFer

GeoLinkedData - Transformation



GeoLinkedData - Transformation

Industry Production Index

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Total Nacional	3355830	3422299	3336657	3174393	3064129	2942593	2815159
Alava	21988	22318	20673	19838	19779	19538	
Albacete	27380	27647	27068	25531	24795	23550	22547
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Almería	43501	45100	43970	40871	38766	32620	33947
Asierias	71853	73124	72276	70115	68175	67049	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	25667	25881	25372	24504	23733	22882	21559
Cáceres	73307	26494	26064	25039	24846	20596	23440
Cádiz	62817	64505	63338	61691	58996	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	49661
Guadalajara	13507	13735	12874	11825	10438	10120	9421
Guipúzcoa	62034	63569	59546	58486	57193	56498	55943
Huelva	5783	27463	27063	25487	24777	24270	22547
Huesca	11837	17109	16694	16025	15390	15078	14833
Jaén	36157	37368	36962	35383	34675	33157	32444
Léon	33561	34012	33563	32359	31664	30992	30256
Lugo	36920	37638	36065	33956	32739	31515	29605
Madrid	24861	25035	24609	23780	23122	22479	22396
Málaga	511804	519307	503000	478202	456175	43607	407655
Malaga	113362	117333	114547	108713	102382	96887	88257
Murcia	95636	100073	97374	90698	85110	82484	75973
Navarra	43282	43847	43142	41083	40739	39679	38936
Ourense	23304	23711	23526	22843	22452	22118	21560
Palencia	10964	11411	11060	10694	10575	10390	10297

Province

GeoLinkedData - Transformation

```

<?xml version="1.0" encoding="UTF-8"?>
<!--<nor xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="GenericSpreadSheet.xsd">
| <Nor 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>
|     </SchemaEntities>
|     <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>
|   </Schema>
|   <DataModel>
|     <GenericDataManager/>
|   </DataModel>
|   <Implementation>
|     <Spreadsheet type="ms" file="Empresas.xls"/>
|   </Implementation>
</Nor>

```

NOR₂O

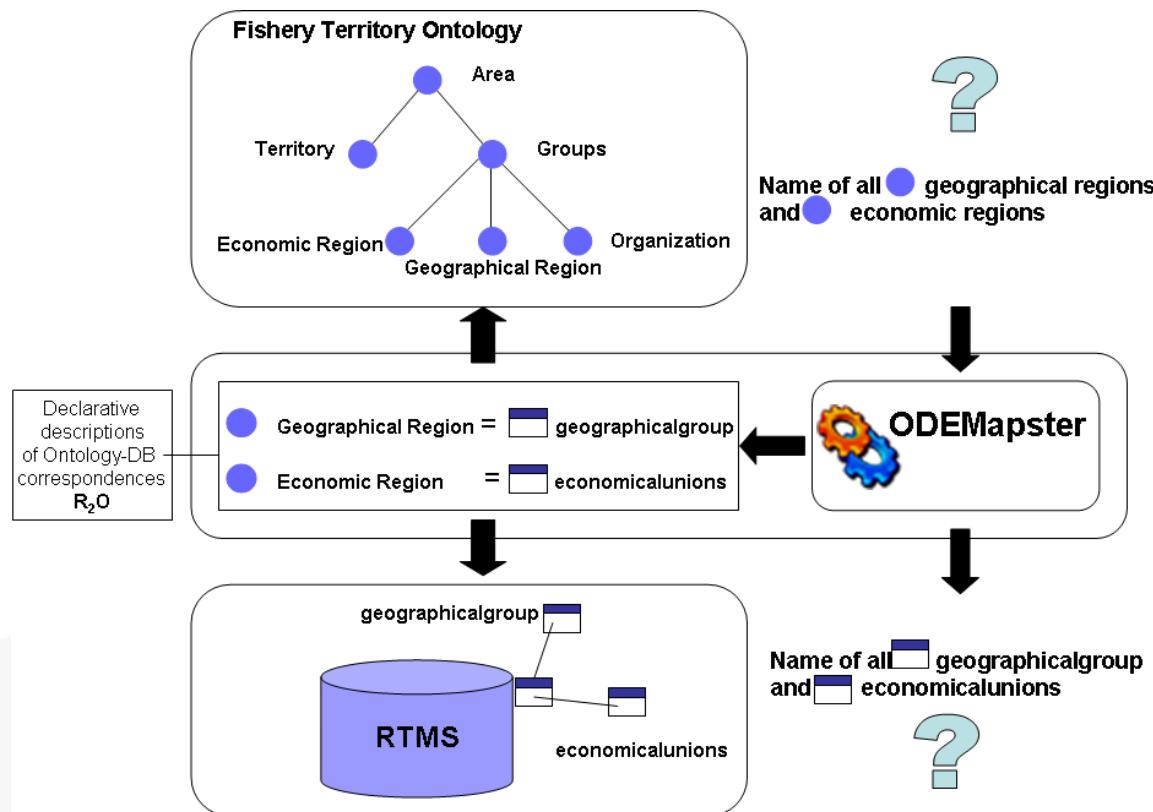
```

<!-- 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">indice 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">indice 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>

```

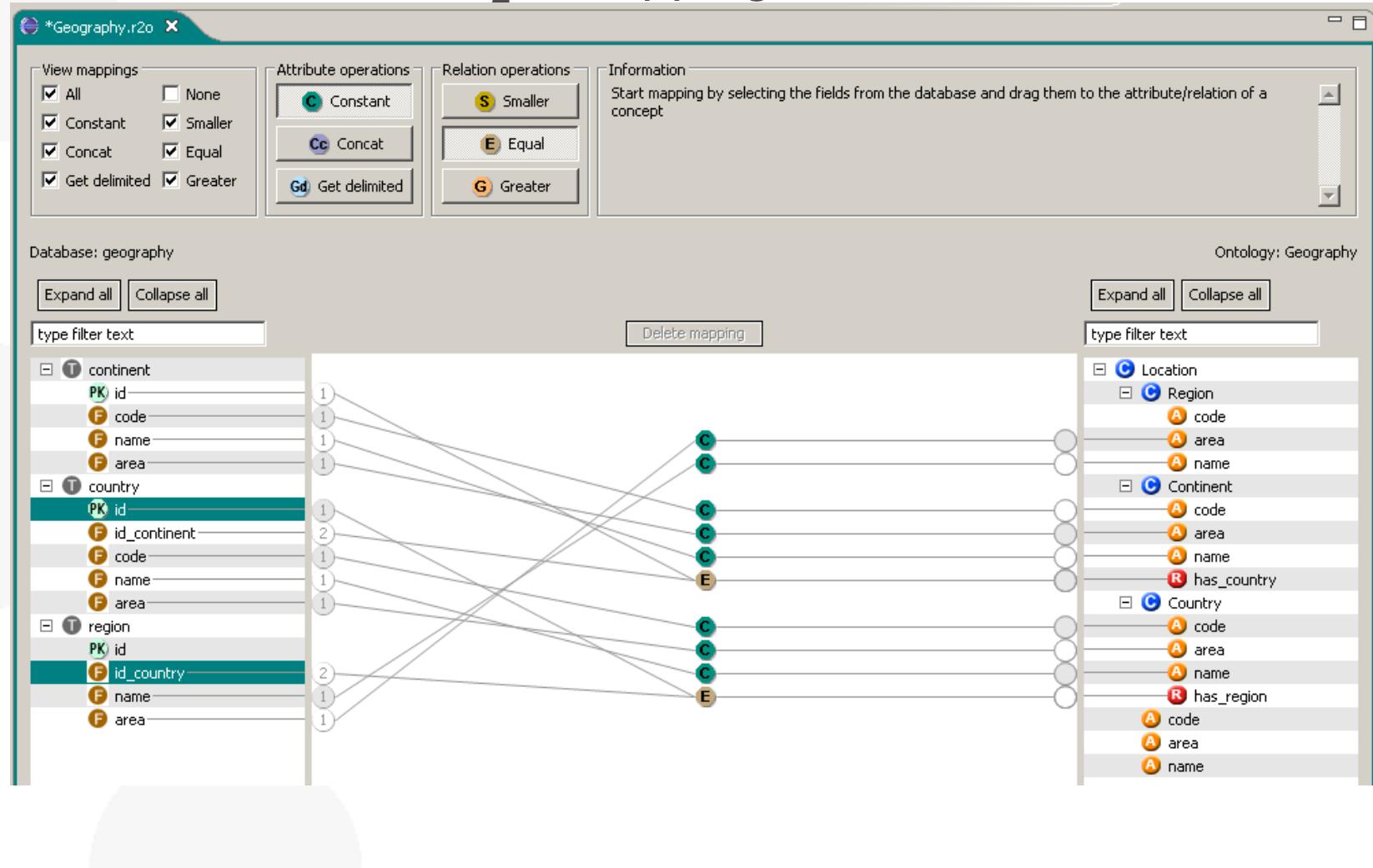
GeoLinkedData - Transformation

- R₂O 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 R₂O document



GeoLinkedData - Transformation

- Creation of the R₂O Mappings



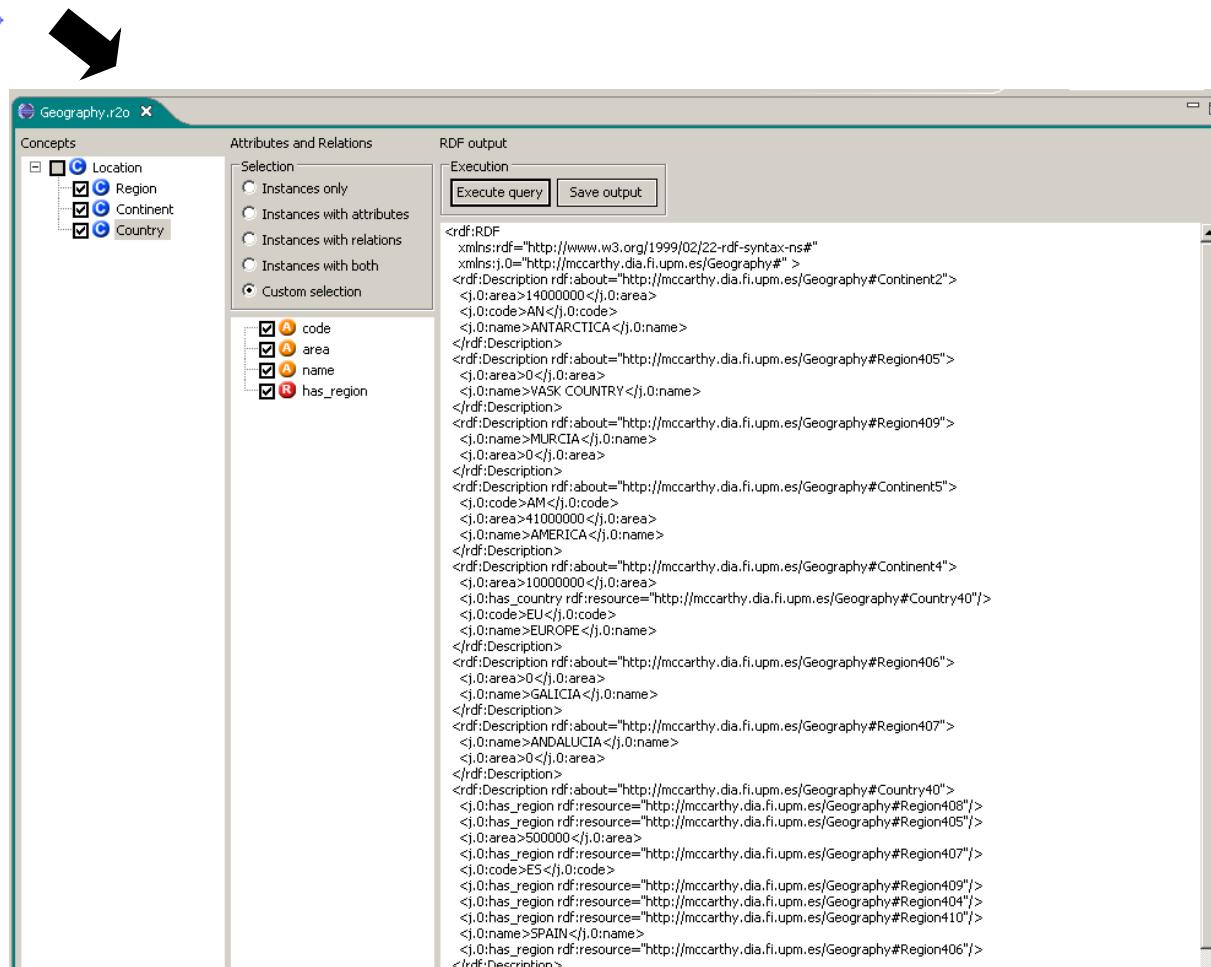
GeoLinkedData - Transformation

```

<conceptmap-def name="http://mccarthy.dia.fi.upm.es/Geography#Region">
  <uri-as>
    <operation oper-id="concat">
      <arg-restriction on-param="string1">
        <has-value>http://mccarthy.dia.fi.upm.es/Geography#Region</has-value>
      </arg-restriction>
      <arg-restriction on-param="string2">
        <has-column>region.id</has-column>
      </arg-restriction>
    </operation>
  </uri-as>
  <described-by>
</conceptmap-def>

```

Excerpt of the R₂O document



The screenshot shows the 'Geography.r2o' application window. On the left, there is a tree view under the 'Concepts' section with the following structure:

- Location (selected)
- Region (selected)
- Continent (selected)
- Country (selected)

On the right, there are three main sections:

- Attributes and Relations:**
 - Selection:
 - Instances only
 - Instances with attributes
 - Instances with relations
 - Instances with both
 - Custom selection
 - Execution:
 - Execute query
 - Save output
- RDF output:** Displays the generated RDF code.

The 'Attributes and Relations' section shows the following selected items:

- A code
- A area
- A name
- R has_region

The 'RDF output' section contains the following RDF code:

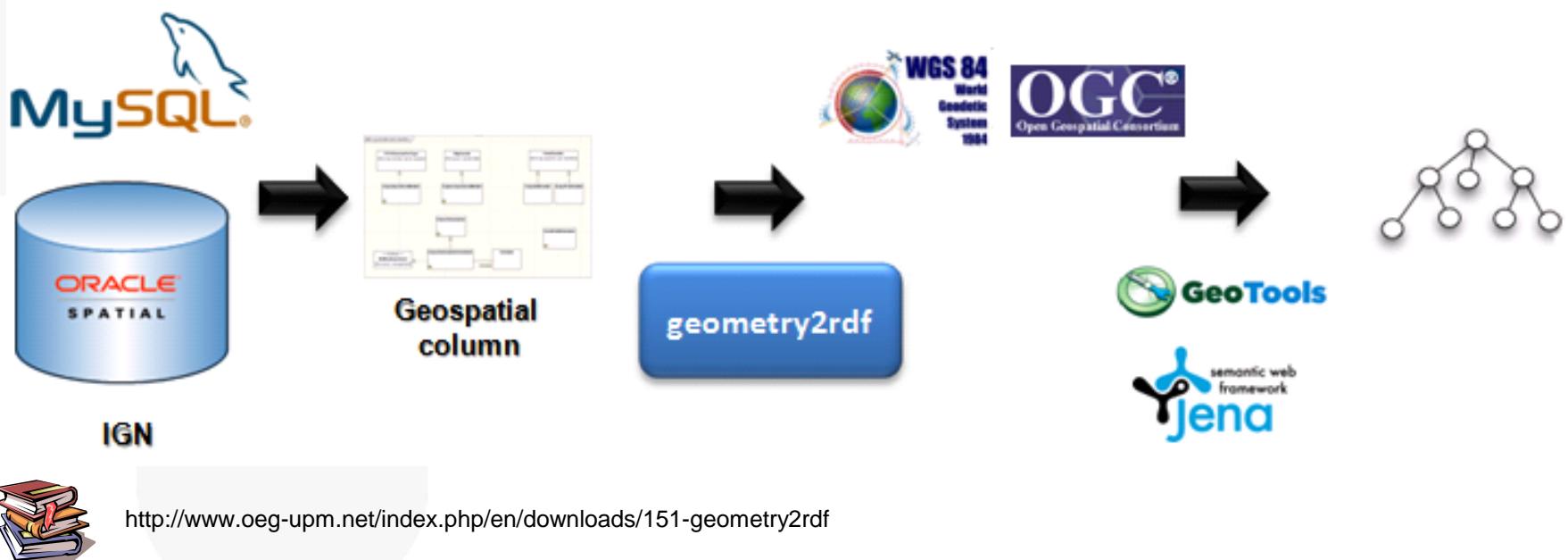
```

<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:j_0="http://mccarthy.dia.fi.upm.es/Geography#">
  <rdf:Description rdf:about="http://mccarthy.dia.fi.upm.es/Geography#Continent2">
    <j_0:area>14000000</j_0:area>
    <j_0:code>AN</j_0:code>
    <j_0:name>ANTARTICA</j_0:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://mccarthy.dia.fi.upm.es/Geography#Region405">
    <j_0:area>0</j_0:area>
    <j_0:name>VASK COUNTRY</j_0:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://mccarthy.dia.fi.upm.es/Geography#Region409">
    <j_0:area>0</j_0:area>
    <j_0:name>MURCIA</j_0:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://mccarthy.dia.fi.upm.es/Geography#Continent5">
    <j_0:code>AM</j_0:code>
    <j_0:area>41000000</j_0:area>
    <j_0:name>AMERICA</j_0:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://mccarthy.dia.fi.upm.es/Geography#Continent4">
    <j_0:code>EU</j_0:code>
    <j_0:area>10000000</j_0:area>
    <j_0:has_country rdf:resource="http://mccarthy.dia.fi.upm.es/Geography#Country40"/>
    <j_0:code>EUROPE</j_0:code>
    <j_0:name>EUROPE</j_0:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://mccarthy.dia.fi.upm.es/Geography#Region406">
    <j_0:area>0</j_0:area>
    <j_0:name>GALICIA</j_0:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://mccarthy.dia.fi.upm.es/Geography#Region407">
    <j_0:name>ANDALUCIA</j_0:name>
    <j_0:area>0</j_0:area>
  </rdf:Description>
  <rdf:Description rdf:about="http://mccarthy.dia.fi.upm.es/Geography#Country40">
    <j_0:has_region rdf:resource="http://mccarthy.dia.fi.upm.es/Geography#Region408"/>
    <j_0:has_region rdf:resource="http://mccarthy.dia.fi.upm.es/Geography#Region405"/>
    <j_0:area>5000000</j_0:area>
    <j_0:has_region rdf:resource="http://mccarthy.dia.fi.upm.es/Geography#Region407"/>
    <j_0:code>ES</j_0:code>
    <j_0:has_region rdf:resource="http://mccarthy.dia.fi.upm.es/Geography#Region409"/>
    <j_0:has_region rdf:resource="http://mccarthy.dia.fi.upm.es/Geography#Region404"/>
    <j_0:has_region rdf:resource="http://mccarthy.dia.fi.upm.es/Geography#Region410"/>
    <j_0:name>SPAIN</j_0:name>
    <j_0:has_region rdf:resource="http://mccarthy.dia.fi.upm.es/Geography#Region406"/>
  </rdf:Description>

```

GeoLinkedData - Transformation

- Tool for generating RDF from geometrical information
- The geometry could be available in GML or WKT
- The RDF generated follows our Geometry Model



GeoLinkedData - Transformation

NOMBRE	GMLGEOMETRY
Abengibre	(HUGECLOB)
Alatoz	(HUGECLOB)
Albatana	(HUGECLOB)
Balsa de Ves	(HUGECLOB)
Ballesteros, El	(HUGECLOB)
Alborea	(HUGECLOB)
Alcadozo	(HUGECLOB)
Alcalá del Júcar	(HUGECLOB)

Oracle STO UTIL package



```
SELECT TO_CHAR(SDO_UTIL.TO_GML311GEOMETRY(geometry))
      AS Gml311Geometry
  FROM "BCN200"."BCN200_0301L_RIO" c
 WHERE c.Etiqueta='Arroyo'
```

```
<?xml version="1.0" encoding="UTF-8"?>
<gml:Polygon srsName="SDO:8223" xmlns:gml="http://www.opengis.net/gml">
  <gml:outerBoundaryIs><gml:LinearRing><gml:coordinates decimal="." cs="," ts=" ">-1.48374108,39.23127677,0 -1.48404
  -1.48480765,39.22531695,0 -1.48544493,39.2231538,0 -1.4858725,39.22212319,0 -1.48608465,39.22141415,0 -1.4860584;
  -1.48421128,39.21319056,0 -1.48390698,39.21064575,0 -1.48429166,39.2094524,0 -1.48529268,39.20490629,0 -1.4925061;
  -1.49590016,39.20383639,0 -1.49905691,39.20405732,0 -1.50256876,39.20446292,0 -1.50338941,39.20453654,0 -1.504831;
  -1.51378498,39.2047147,0 -1.51398161,39.20472622,0 -1.5171434,39.20471246,0 -1.51894734,39.20373528,0 -1.5196271;
  -1.52344981,39.20108038,0 -1.52699007,39.19901681,0 -1.5284903,39.19815278,0 -1.53151867,39.19619073,0 -1.5320861;
  -1.5329951,39.19479473,0 -1.53398595,39.19503246,0 -1.53537021,39.19528414,0 -1.53607317,39.19544615,0 -1.536914;
  -1.53953498,39.19602121,0 -1.54099994,39.19629185,0 -1.54110394,39.19630216,0 -1.54231647,39.19646151,0 -1.54461;
  -1.54957924,39.19633592,0 -1.55131402,39.1964386,0 -1.55382202,39.19666799,0 -1.55798564,39.19690882,0 -1.559800;
  -1.56633376,39.19750743,0 -1.5703604,39.19765603,0 -1.57231502,39.19777011,0 -1.57278711,39.19790204,0 -1.573636;
  -1.57633787,39.19982863,0 -1.57807687,39.20087703,0 -1.57814542,39.20092292,0 -1.57871557,39.20136237,0 -1.579151;
  -1.5805024,39.20233924,0 -1.58088715,39.20278543,0 -1.58107708,39.20313014,0 -1.58122865,39.20365457,0 -1.581447;
  -1.5819531,39.20563664,0 -1.58191475,39.20581637,0 -1.58194513,39.20603299,0 -1.58285235,39.20756676,0 -1.584270;
  -1.58540016,39.21073400,0 -1.58610004,39.21007740,0 -1.58700014,39.211400,0 -1.58790000,39.214440700,0 -1.589001400;
```

GeoLinkedData - Transformation

```

<gml:Polygon srsName="SDO:8223" xmlns:gml="http://www.opengis.net/gml">
  <gml:outerBoundaryIs><gml:LinearRing><gml:coordinates decimal="." cs="" ts="">-1.48374108,39.23127677,0 -1.48404
  -1.48480765,39.22531695,0 -1.48544493,39.2231538,0 -1.4858725,39.22212319,0 -1.48608465,39.22141415,0 -1.4860584:
  -1.48421128,39.21319056,0 -1.48390698,39.21064575,0 -1.48429166,39.2094524,0 -1.48529268,39.20490629,0 -1.4925061
  -1.49590016,39.20383639,0 -1.49905691,39.20405732,0 -1.50256876,39.20446292,0 -1.50338941,39.20453654,0 -1.504831
  -1.51378498,39.2047147,0 -1.51398161,39.20472622,0 -1.5171434,39.20471246,0 -1.51894734,39.20373528,0 -1.5196271.
  -1.52344981,39.20108038,0 -1.52699007,39.19901681,0 -1.5284903,39.19815278,0 -1.53151867,39.19619073,0 -1.5320861
  -1.5329951,39.19479473,0 -1.53398595,39.19503246,0 -1.53537021,39.19528414,0 -1.53607317,39.19544615,0 -1.536914
  -1.53953498,39.19602121,0 -1.54099994,39.19629185,0 -1.54110394,39.19630216,0 -1.54231647,39.19646151,0 -1.54461!
  -1.54957924,39.19633592,0 -1.55131402,39.1964386,0 -1.55382202,39.19666799,0 -1.55798564,39.19690882,0 -1.559800:
  -1.56633376,39.19750743,0 -1.5703604,39.19765603,0 -1.57231502,39.19777011,0 -1.57278711,39.19790204,0 -1.573636
  -1.57633787,39.19982863,0 -1.57807687,39.20087703,0 -1.57814542,39.20092292,0 -1.57871557,39.20136237,0 -1.57915
  -1.5805024,39.20233924,0 -1.58088715,39.20278543,0 -1.58107708,39.20313014,0 -1.58122865,39.20365457,0 -1.581447
  -1.5819531,39.20563664,0 -1.58191475,39.20581637,0 -1.58194513,39.20603299,0 -1.58285235,39.20756676,0 -1.584270:
  ...
  
```

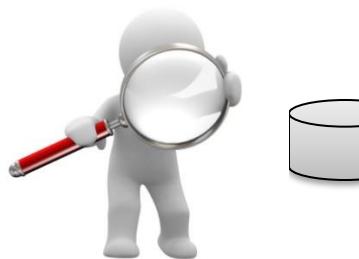
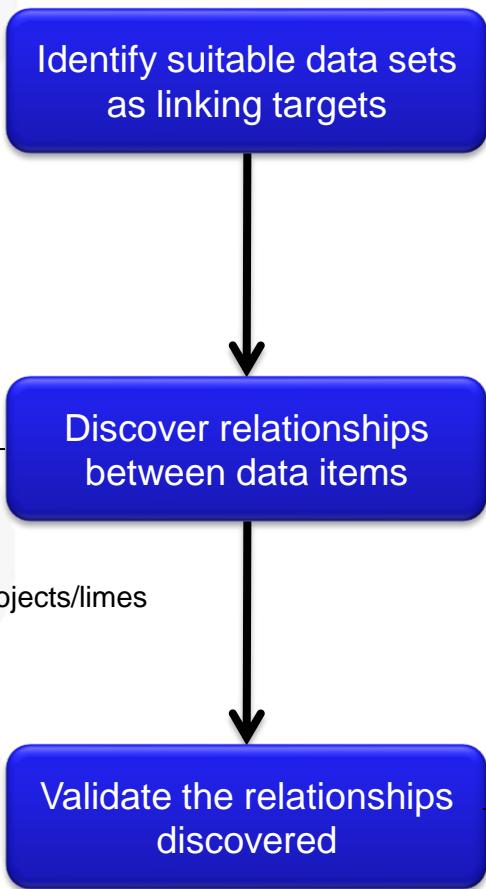


```

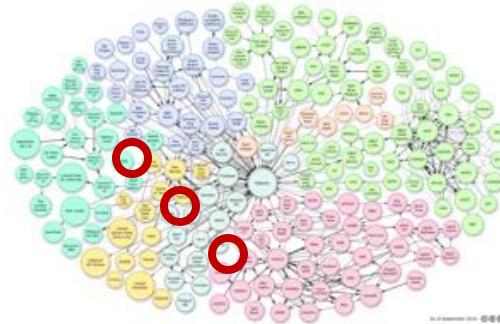
<rdf:Description rdf:about="http://geo.linkeddata.es/resource/wgs84/39.158523176194414_-1.6341427210305737">
  <geontology:order rdf:datatype="http://www.w3.org/2001/XMLSchema#int">205</geontology:order>
  <geo:long rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">-1.6341427210305737</geo:long>
  <geo:lat rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">39.158523176194414</geo:lat>
  <rdf:type rdf:resource="http://www.w3.org/2003/01/geo/wgs84_pos#Point"/>
</rdf:Description>
<rdf:Description rdf:about="http://geo.linkeddata.es/resource/wgs84/38.65501872007066_-2.6158910085778153">
  <geontology:order rdf:datatype="http://www.w3.org/2001/XMLSchema#int">6</geontology:order>
  <geo:long rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">-2.6158910085778153</geo:long>
  <geo:lat rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">38.65501872007066</geo:lat>
  <rdf:type rdf:resource="http://www.w3.org/2003/01/geo/wgs84_pos#Point"/>
</rdf:Description>
<rdf:Description rdf:about="http://geo.linkeddata.es/resource/wgs84/38.37015012539368_-1.6964507982671462">
  <geontology:order rdf:datatype="http://www.w3.org/2001/XMLSchema#int">141</geontology:order>
  <geo:long rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">-1.6964507982671462</geo:long>
  <geo:lat rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">38.37015012539368</geo:lat>
  <rdf:type rdf:resource="http://www.w3.org/2003/01/geo/wgs84_pos#Point"/>
</rdf:Description>
  
```

- To find possible errors, identified by Hogan et al.
 - http-level issues, such as accessibility and derefencability, e.g., HTTP URLs return 40x/50x errors
 - reasoning issues such as namespace without vocabulary, e.g., *rss:item* term invented
 - malformed/incompatible datatypes, e.g., “true” as xsd:int
- To fix the identified errors

- Errors
 - Some resources, with the same name, were mixed. For example, Granada municipality belongs to Granada province, and La Granada municipality belongs to Barcelona Province.
 - Autonomous communities that only have one province, e.g., Murcia Region, missed some municipalities, but their corresponding provinces, e.g., Murcia Province, have the correct number of municipalities.
 - Some hydrographical resources missed some parts of their geometrical information.



<http://ckan.net>



LIMES

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



Silk Framework

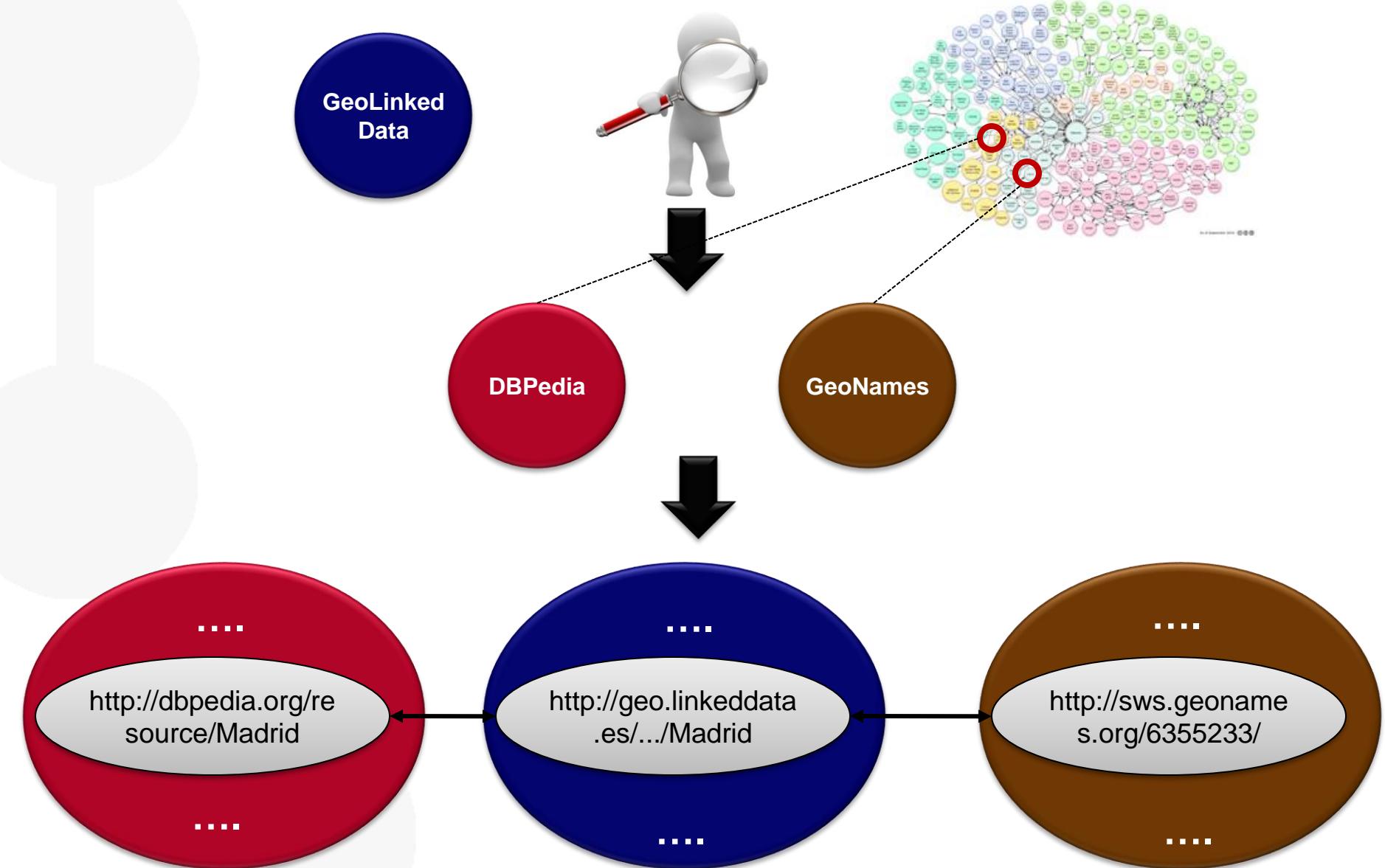
<http://www4.wiwi.fu-berlin.de/bizer/silk/>



sameAs Validator

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

GeoLinkedData - 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%A1laga

About: Province of Málaga

An Entity of Type : [Provinces of Spain](#), from Named Graph :
<http://dbpedia.org>, within Data Space : 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 km². Its population is 1,330,010 (2002), of whom two-fifths live in the capital Málaga, and its population density is 181.99/km².



Property

[dbpedia-owl:abstract](#)

Value

- Die Provinz Málaga (span. Provincia de Málaga) ist eine der si
- The Province of Málaga (Spanish Provincia de Málaga) is loca South, and by the provinces of Cádiz, Sevilla, Córdoba and Gr density is 181.99/km². Its main industry and claim to fame is i European tourists. But besides the beaches, the mountainous composer Ernesto Lecuona, "Malagueña", is named for the m Besides the capital, its main cities are Marbella, Vélez-Málag The population density surpasses both the Andalusia and Spa located in the interior. The prevailing climate is a warm Medite the Eastern coastal zone has a subtropical Mediterranean cli Continental Mediterranean climate
- La provincia de Málaga es una de las ocho provincias español las provincias de Granada, al este, y Cádiz, al oeste. Al norte 101 municipios, 9 comarcas y 11 partidos judiciales. Su pobla España por población. Quedó constituida como provincia en la Sevilla. El código postal de los municipios de Málaga empieza Málaga en su punto más cercano a la costa del océano Atlántico.



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

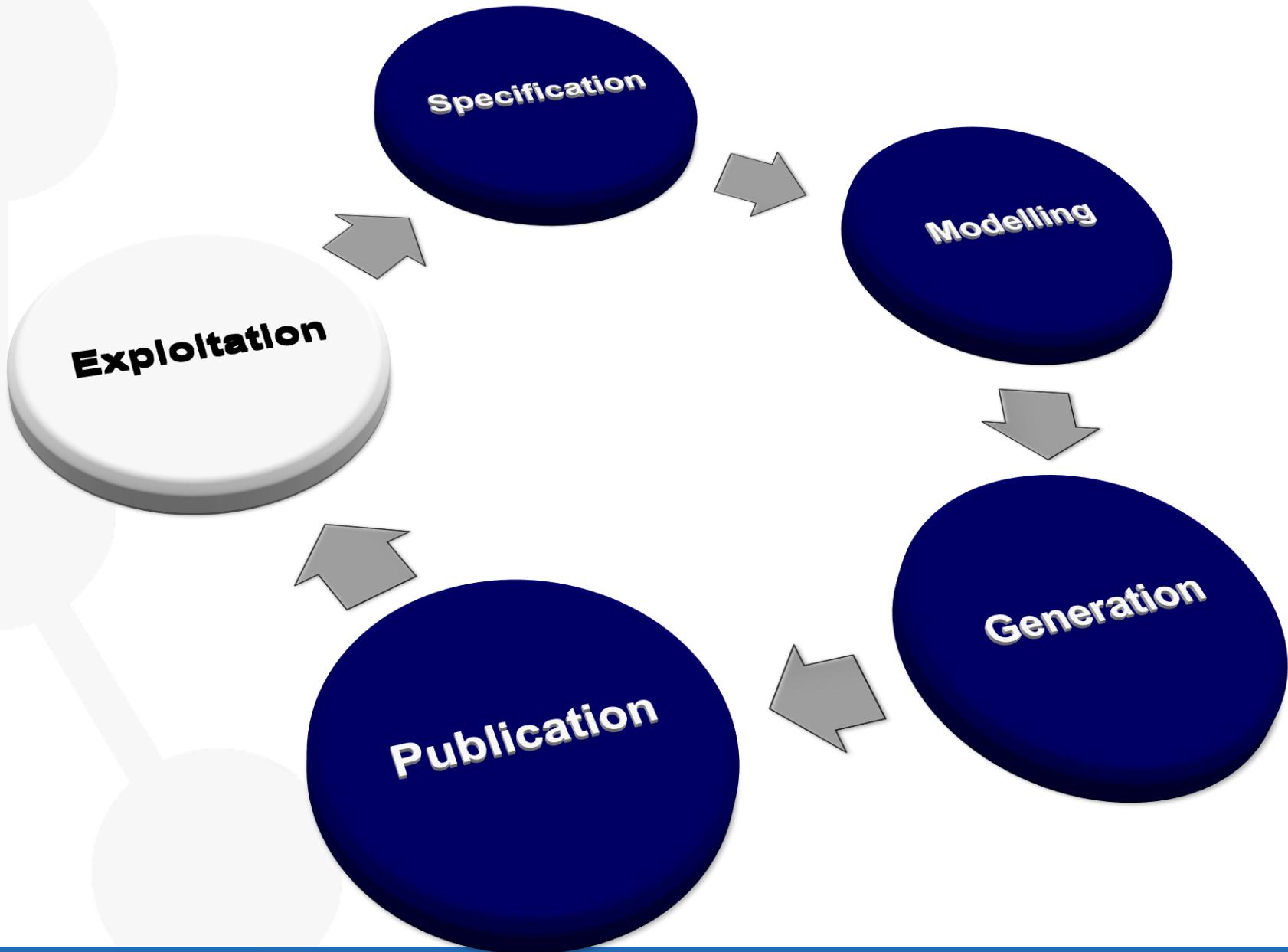
<http://geo.linkeddata.es/resource/Provincia/M%C3%A1laga>

Málaga at geo.linkeddata.es

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

Property

- | Property | Value |
|--------------------|--|
| geoes:formaParteDe | < http://geo.linkeddata.es/resource/ComunidadAut%C3%B3noma/Andaluc%C3%ADa > |
| geoes:formadoPor | <ul style="list-style-type: none"> ▪ <http://geo.linkeddata.es/resource/Municipio/%C3%81lora> ▪ <http://geo.linkeddata.es/resource/Municipio/%C3%88rchez> ▪ <http://geo.linkeddata.es/resource/Municipio/Alameda> ▪ <http://geo.linkeddata.es/resource/Municipio/Alcauc%C3%ADn> ▪ <http://geo.linkeddata.es/resource/Municipio/Alfarante> ▪ <http://geo.linkeddata.es/resource/Municipio/Alfarnatejo> ▪ <http://geo.linkeddata.es/resource/Municipio/Algarrobo> ▪ <http://geo.linkeddata.es/resource/Municipio/Algatoc%C3%ADn> ▪ <http://geo.linkeddata.es/resource/Municipio/Alhaur%C3%ADn> ▪ <http://geo.linkeddata.es/resource/Municipio/Alhaur%C3%ADn20de%20la%20Gra> ▪ <http://geo.linkeddata.es/resource/Municipio/Alm%C3%A1char> ▪ <http://geo.linkeddata.es/resource/Municipio/Almargen> ▪ <http://geo.linkeddata.es/resource/Municipio/Almog%C3%ADa> ▪ <http://geo.linkeddata.es/resource/Municipio/Alpujarra> ▪ <http://geo.linkeddata.es/resource/Municipio/Alzaina> ▪ <http://geo.linkeddata.es/resource/Municipio/Alpandeire> ▪ <http://geo.linkeddata.es/resource/Municipio/Antequera> ▪ <http://geo.linkeddata.es/resource/Municipio/Archidona> ▪ <http://geo.linkeddata.es/resource/Municipio/Ardales> ▪ <http://geo.linkeddata.es/resource/Municipio/Arenas> ▪ <http://geo.linkeddata.es/resource/Municipio/Arriate> ▪ <http://geo.linkeddata.es/resource/Municipio/Atajate> ▪ <http://geo.linkeddata.es/resource/Municipio/Benadalid> ▪ <http://geo.linkeddata.es/resource/Municipio/Benahav%C3%ADs> |



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:

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

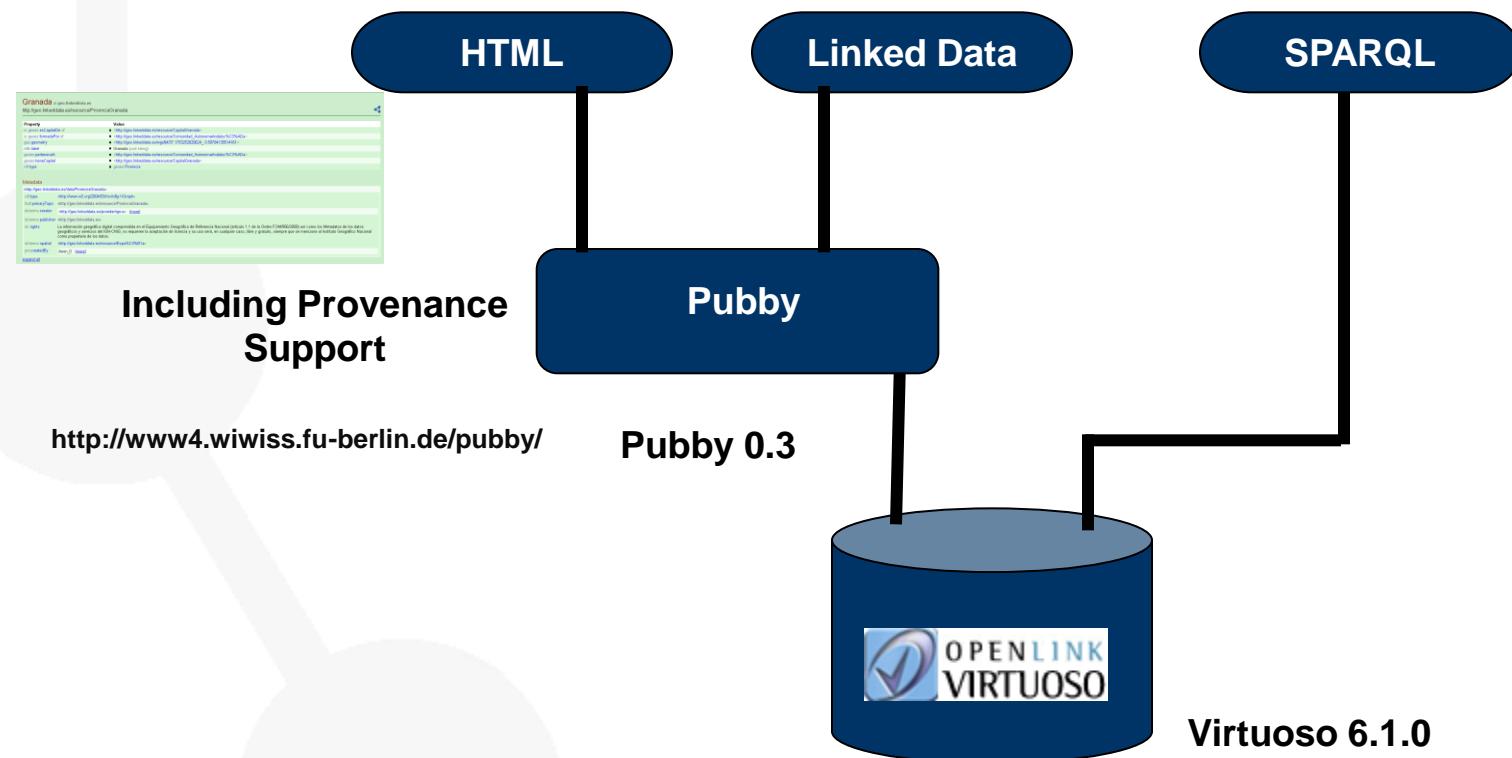
- Open Provenance Model

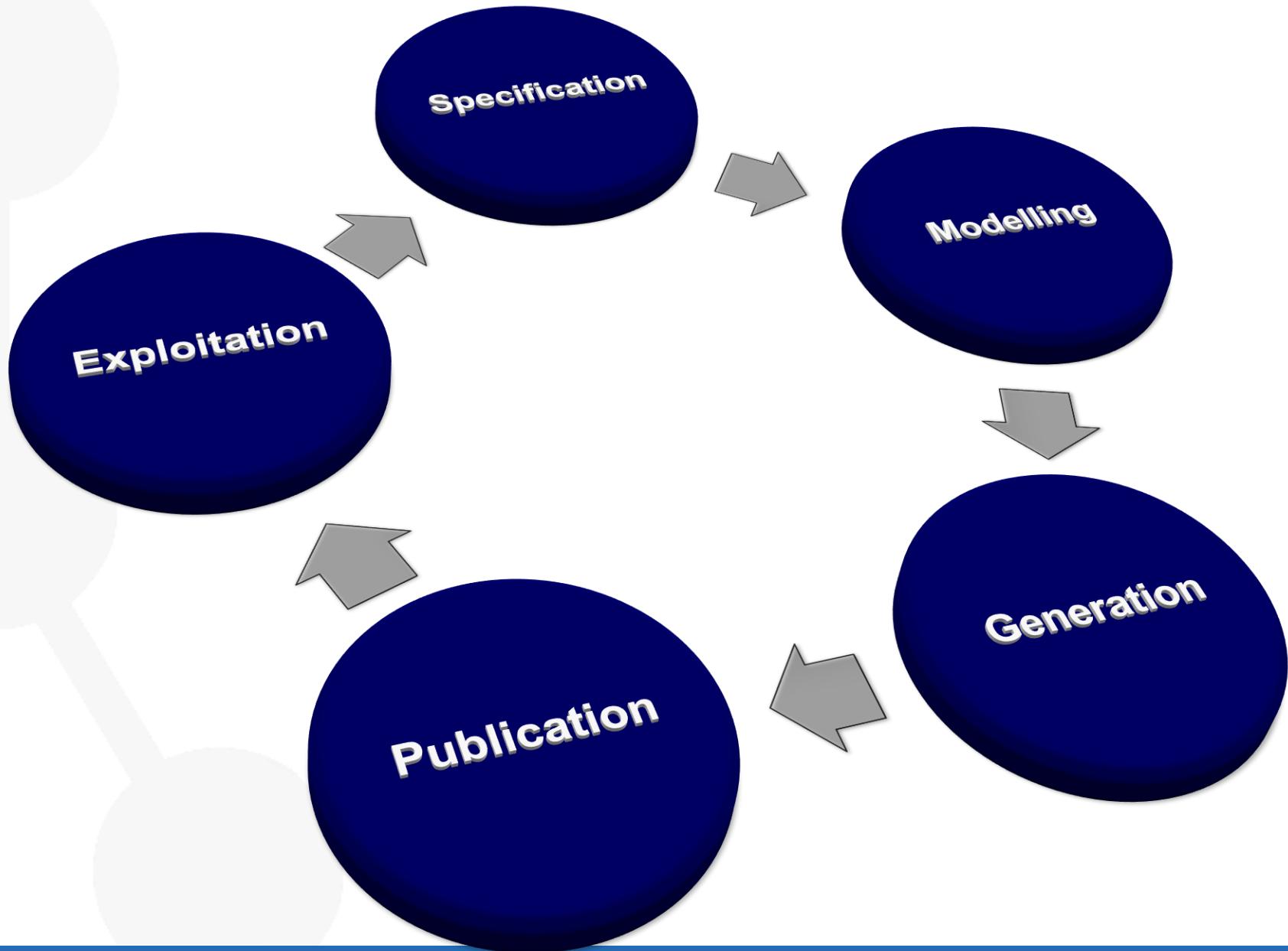


- Register the dataset into CKAN Registry
- Generate sitemap files for your dataset, by using sitemap4rdf
- Submit the sitemap location to Google and Sindice



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

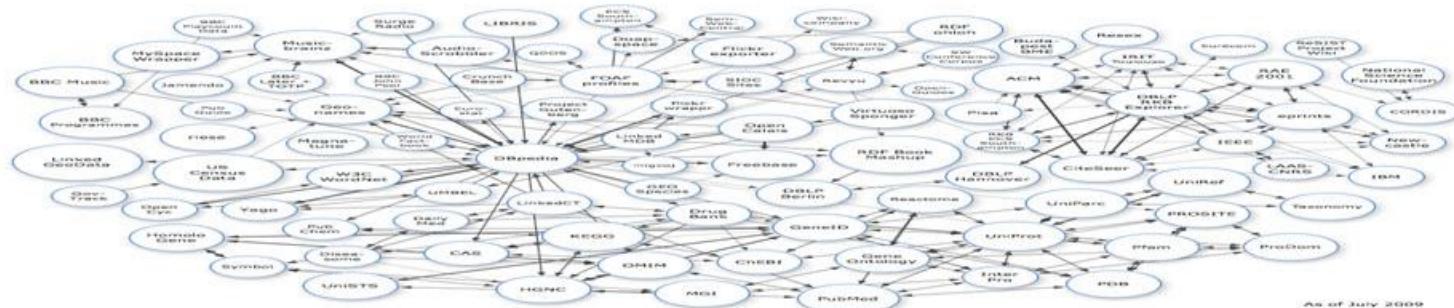




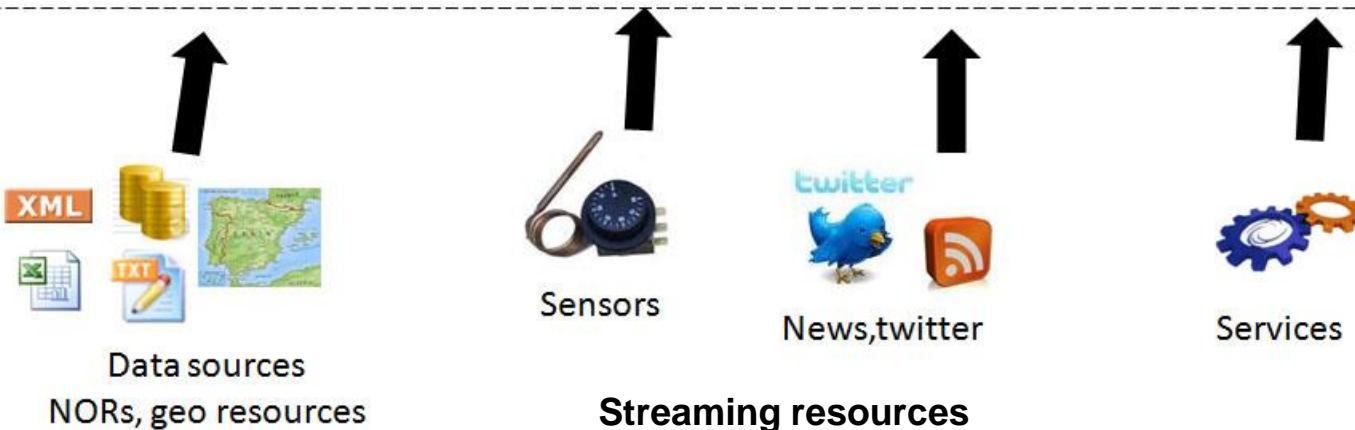


NLP + Rich client/GUI

LOD Cloud



www.w3.org/2001/XMLSchema

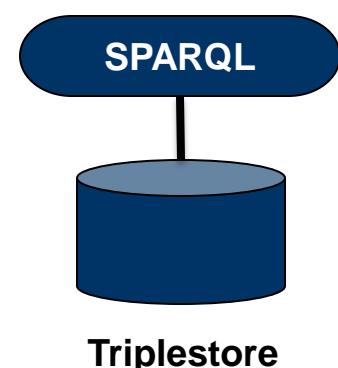
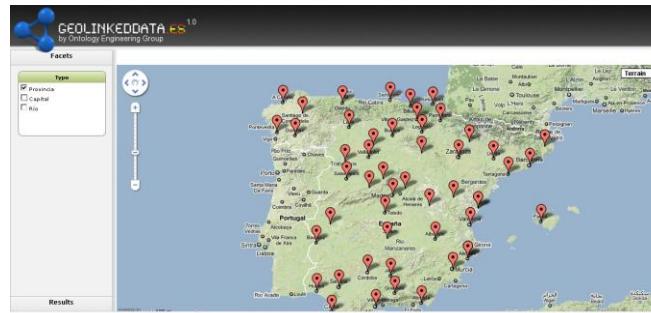




<http://oegdev.dia.fi.upm.es/projects/map4rdf/>

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

Beta



Facets

Type

- Playa
- Ponor
- Poza
- Pozo
- Provincia

Capas

Resultados



© 2010 Ontology Engineering Group

Capital of Province



Provinces – Industry Production Index



Beta



Beaches



Thank
You !!