

Ontology Engineering at Scale for Open City Data Sharing

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Technology Conference (JIST2018)
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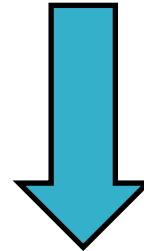
<https://www.slideshare.com/ocorcho>



Talk Objectives

- Share some experiences in the application of Open Data principles for cities (in Spain)
 - Technical challenges and opportunities
 - Barriers for adoption
 - Required organisational changes for successful Open Data strategies
- With a special focus on how ontologies (aka agreed vocabularies and shared data structures) can make a difference
 - Small bias towards how we are doing it in Spain
- And how we are adapting existing ontology engineering practices to achieve this goal

Ontology Engineering at Scale for Open City Data Sharing



Building Agreed Vocabularies and Data Structures for Successful Open City Data Sharing



Building Agreed Vocabularies and Data Structures for Successful **Open City Data** Sharing

What is Open Data?

- Open data is data that can be *freely used, re-used and redistributed* by anyone - subject only, at most, to the *requirement to attribute and sharealike*
- Key aspects:
 - **Availability and access**: the data must be available as a whole and at no more than a reasonable reproduction cost, preferably by downloading over the Internet. The data must also be available in a convenient and modifiable form.
 - **Re-use and redistribution**: the data must be provided under terms that permit re-use and redistribution including the intermixing with other datasets.
 - **Universal participation**: everyone must be able to use, re-use and redistribute - there should be no discrimination against fields of endeavour or against persons or groups

Relevant Legislation. Europe and Spain



- **Open Access Initiative (2001)**. Scientific information; > 510 orgs
- **Aarhus Convention (1998)**. Right to participate and access; 41 countries and the EU
- **PSI Directives**. PSI reuse (2003/98/EC and 2013/37/UE)
- **Convention about access to official documentation (2009)**
 - 12 countries
- **Law 37/2007**. PSI reuse (transposition of directive 2003/98/EC)
 - Modified in **law 18/2015** (BOE 10/07/2015, directive 2013/37/UE)
- **Law 11/2007**. Citizen access to public services, and rights to good quality services
- **RD 4/2010** Esquema Nacional de Interoperabilidad
 - Open standards, technology neutral, open source
- **RD 1495/2011** It develops Law 37/2007 for national agencies
- **Norma Técnica de Interoperabilidad** (19/02/2013, BOE 4/3/2013)



An Explosion of Open Data Portals

datos.gob.es
reutiliza la información pública

Mapa Web | Accesibilidad | Síguenos en: [Twitter](#) [LinkedIn](#)

BETA Área de gestión

[INICIO](#) [CATÁLOGO DE DATOS](#) [APLICACIONES](#) [SABER MÁS](#) [ACTUALIDAD](#) [SUGERENCIAS](#)

ARAGÓN OPEN DATA ARAGÓN OPEN DATA BUSCA DATOS

DATOS ARAGOPEDIA SOCIAL DATA COLABORA APLICACIONES INFO OPEN DATA

Datos

BUSCAR DATOS

DATOS SOBRE Todos los temas DEL TIPO Todos los tipos Tema y tipo

2.439 CONJUNTOS DE DATOS ENCONTRADOS

	Nº ACCESOS	FECHA (ACT)
Calendario de festivos en comunidad de Aragón 2016	15	19.05.2015
Calendario de festivos en comunidad de Aragón 2015	267	19.05.2015
Cuenta de redistribución de la renta en especie. Aragón	38	15.05.2015
Cuenta de distribución secundaria de la renta. Aragón	45	15.05.2015
Cuenta de asignación de la renta primaria. Aragón	32	15.05.2015
Renta disponible bruta per cápita de los hogares por comunidades autónomas	144	15.05.2015
Renta disponible bruta de los hogares por comunidades autónomas	98	15.05.2015
Empleo total y asalariado. Huesca, Teruel y Zaragoza.	8	15.05.2015
Producto interior bruto a precios de mercado y valor añadido bruto a precios ...	18	15.05.2015

INSTITUTO NACIONAL DE ESTADÍSTICA

El INE ha creado el espacio Datos abiertos para incluir en él los recursos de información pública que se generen. El catálogo de información reutilizable es accesible tanto a través de la web del INE [www.ine.es/datosabiertos](#), como a través del portal [datos.gob.es](#).

Puntos de atención al público
El IPC en un clic
Información estadística
Información estadística europea
Publicaciones
Biblioteca
Datos abiertos
Catálogo de servicios
Precios productos difusión

01 03 05 07 09
02 04 06 08 10
06 08 10 12 14
INEbase Productos y servicios
Censo electoral Sede electrónica

Catálogo de datos abiertos

Conjuntos de datos	Acceso al recurso	Descripción en datos.gob
Inventario de Operaciones Estadísticas. IOE	Link	Link
Información estadística elaborada por el INE y publicada en INEbase	Link	Link
Microdatos anónimizados de encuestas	Link	Link
Calígero de censo electoral	Link	Link

Aplicaciones

Aplicaciones	Acceso al recurso	Descripción en datos.gob
Actualización de rentas con el IPC	Link	Link
Cálculo de variaciones del IPC	Link	Link
Nombres más frecuentes	Link	Link
Apellidos más frecuentes	Link	Link

European Commission eurostat Your key to European statistics

Welcome to the Eurostat Press centre, which is especially dedicated to journalists. Eurostat offers the following services for the media:

- News releases covering the euro-indicators (GDP, inflation, unemployment etc.) and other statistical themes (agriculture, environment, social topics, regions, research and development etc.). You will also find a release calendar covering the main statistical publications of the Eurostat euro-indicators and of the statistical agencies of the EU Member States. Published each Friday, this weekly calendar contains confirmed dates of publication of the Eurostat euro-indicators and of the statistical publications of the EU Member States. It also contains the dates of publication of the statistical news releases calendars of all the 27 National Statistical Offices in the EU, as well as to those in the Candidate and EFTA countries. Should you wish to obtain, at the day of publication, our News Releases or our weekly release calendar by e-mail in English, French or German, please contact us at:

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Fax: (352) 4301 33249
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- Should you need tailor-made extractions of statistical data or if you have other questions on statistics not covered in our News releases, please contact our Media Support, which is a part of the Press office. We do our very best to answer your requests as quickly as possible in order for you to keep your deadlines. You can reach us at:

Tel: (352) 4301 33408
Fax: (352) 4301 33549
eurostat-mediasupport@ec.europa.eu

Other services

Ontology Engineering Group

Open Data and how to publish it

In a posterboard

- For those with a lot of free time available
- Or those who happen to be there at the right time



Principle	Description	Link
1.1	Principle of Transparency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle1
1.2	Principle of Decentralization	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle2
1.3	Principle of Interoperability	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle3
1.4	Principle of Semantics	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle4
1.5	Principle of Reusability	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle5
1.6	Principle of Evolvability	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle6
1.7	Principle of Persistence	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle7
1.8	Principle of Openness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle8
1.9	Principle of Accessibility	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle9
1.10	Principle of Composability	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle10
1.11	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle11
1.12	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle12
1.13	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle13
1.14	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle14
1.15	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle15
1.16	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle16
1.17	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle17
1.18	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle18
1.19	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle19
1.20	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle20
1.21	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle21
1.22	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle22
1.23	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle23
1.24	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle24
1.25	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle25
1.26	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle26
1.27	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle27
1.28	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle28
1.29	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle29
1.30	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle30
1.31	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle31
1.32	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle32
1.33	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle33
1.34	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle34
1.35	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle35
1.36	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle36
1.37	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle37
1.38	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle38
1.39	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle39
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1.41	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle41
1.42	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle42
1.43	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle43
1.44	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle44
1.45	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle45
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1.48	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle48
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1.51	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle51
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1.53	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle53
1.54	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle54
1.55	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle55
1.56	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle56
1.57	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle57
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1.60	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle60
1.61	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle61
1.62	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle62
1.63	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle63
1.64	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle64
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1.66	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle66
1.67	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle67
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1.69	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle69
1.70	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle70
1.71	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle71
1.72	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle72
1.73	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle73
1.74	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle74
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1.88	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle88
1.89	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle89
1.90	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle90
1.91	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle91
1.92	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle92
1.93	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle93
1.94	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle94
1.95	Principle of Consistency	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle95
1.96	Principle of Integrity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle96
1.97	Principle of Non-exclusivity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle97
1.98	Principle of Completeness	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle98
1.99	Principle of Fidelity	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle99
1.100	Principle of Accuracy	http://www.w3.org/2009/08/LinkedDataPrinciples.html#Principle100

Open Data and how to publish it

On a Web page or mobile app (for human consumption)

Kedes de transportes

www.crtm.es/servlet/CalctinerarioServlet?xh_ACCION=0&POPUP=1&xh_TIPO=25&xh_PAGINA=9&CODPANTALLA=11&xh_C

→ Esquema y Horario de Ida

IMPRIMIR CERRAR VENTANA

196 Madrid (Plaza Castilla)-La Acebeda

ALTOZO, Plaza de Castilla, Alcalá, La Cuesta, Avenida de la Fuerza Aérea, Avenida de Colón, S-1 del Guadarrama, El Molinar, Villaviciosa, Cuchillana, La Serna, La Cebada, El Bernardo, Colindres, Lozoya, Paseo de la Castilla, PLAZA DE CASTILLA, ALCOBendas, S.S. INFANTAS, INFANTA SOFIA, VINTANCA, CAMILLAS, LA CABEZA, EL BERNARDO, LOZOYA, PUENTES REALES

B1 B3 C1 45 60 75

Tempo estimado de recorrido

HORARIOS DE SALIDA DE (Intercambiador de Plaza de Castilla)	06:13
Lunes a viernes laborables	Esta Línea NO tiene servicio directo de lunes a viernes. Los servicios se realizan con la línea 191 desde Madrid (Plaza de Castilla) continuando con las líneas:
- 191E Butragueño - Cervera (Puentes Viejas).	
- 191C Butragueño - Montejo (Gandulias).	
- 191B Butragueño - Somosierra (Píñuelas, Madarcos).	
Sábados laborables, domingos y festivos	A 9:05
ALSA	ALSA, Avda. de América, 9-A. (Intercambiador de Avenida de América), 28002 MAD

CERRAR VENTANA

Adapted from: Antonio Rodríguez Pascual (IGN)



Open Data and how to publish it

On a Web page or mobile app (for human consumption)

- Generated from structured formats (e.g., GTFS)

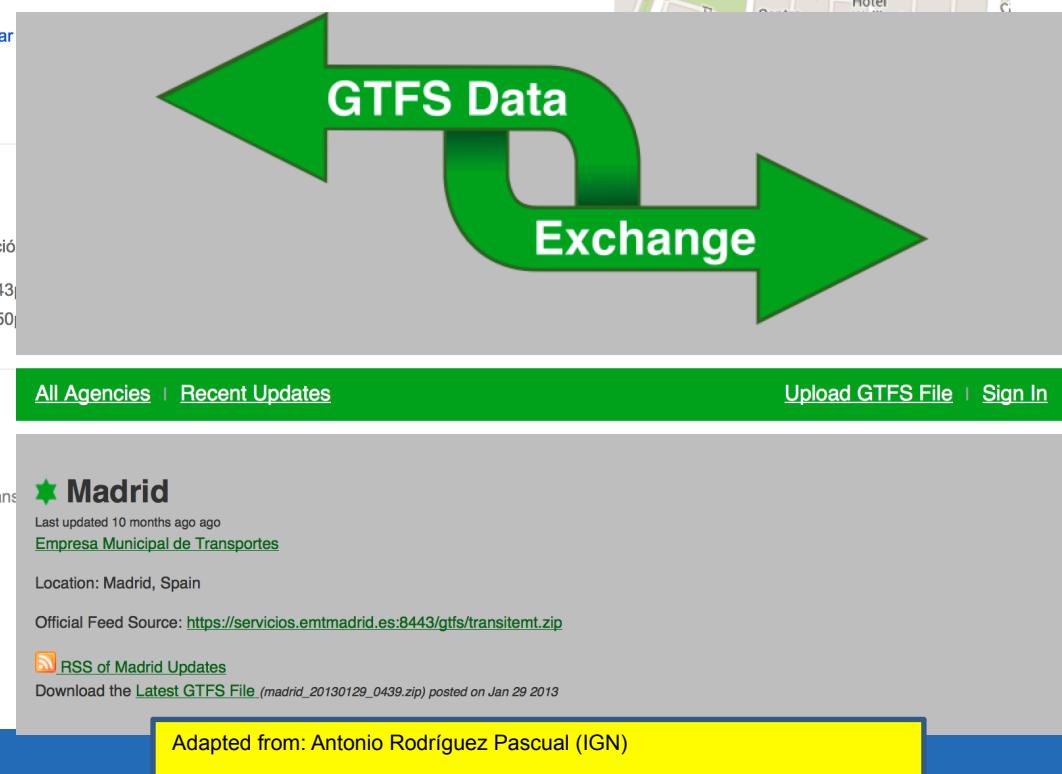
Retiro más datos

Líneas de metro con salida en esta estación:

- 2 Las Rosas
- Cuatro Caminos

crtm.es

Cómo llegar Buscar en alrededor



Adapted from: Antonio Rodríguez Pascual (IGN)

Open Data and how to publish it

In files

- These can be loaded in information systems (XML, HTML, CSV, GTFS, etc.)
- Luckily, not scanned PDFs

The screenshot shows the Madrid Metro website's accessibility section. It includes a logo, a navigation bar with links like 'INICIO', 'CONÓCENOS', 'VIAJA EN METR', 'ACCESIBILIDAD', and 'INFO'. A red banner at the top indicates the user is on the 'accesibilidad > plano de metro' page. On the left, a sidebar lists links such as 'Accesibilidad en Metro de Madrid', 'Estaciones accesibles', 'Líneas de Metro en Mp3', 'Plano de Metro', and 'Accesibilidad Web'. The main content area displays 'Líneas de Metro y enlaces entre estaciones' and a 'Versión sólo texto' section for 'Línea 1: Pinar de Chamartín - Valdecarros'. To the right, there's a map of Madrid with a red circle highlighting the 'Descargar un fichero Excel' button. Above the map, there's a section titled 'Paradas de metro ligero del transporte público' with a table showing data from 2007 to 2011 for various regions. The table is as follows:

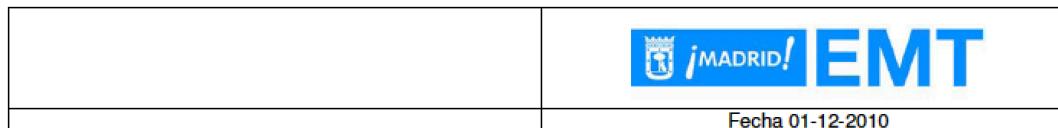
	2007	2008	2009	2010	2011
Comunidad de Madrid	46	46	46	56	56
Zonas Estadísticas					
Municipio de Madrid	10	10	10	10	10
Norte Metropolitano	0	0	0	0	0
Este Metropolitano	0	0	0	0	0
Sur Metropolitano	11	11	11	21	21
Oeste Metropolitano	25	25	25	25	25
Sierra Norte	0	0	0	0	0
Nordeste Comunidad	0	0	0	0	0
Sudeste Comunidad	0	0	0	0	0
Sudoeste Comunidad	0	0	0	0	0
Sierra Sur	0	0	0	0	0
Sierra Central	0	0	0	0	0
Municipios					
Acebeda (La)					
Ajalvir					
Alameda del Valle					

At the bottom, a yellow bar states 'Adapted from: Antonio Rodríguez Pascual (IGN)'. The top right corner features a white mug with 'LINKED DATA' and other text, with a red box highlighting the 'Machine-readable' and 'Non-proprietary format' text.

Open Data and how to publish it

Using Web Services or REST APIs

- Useful for developers
- Ease of integration in the application logic



</REG>
</TABLA>

GetRouteLines

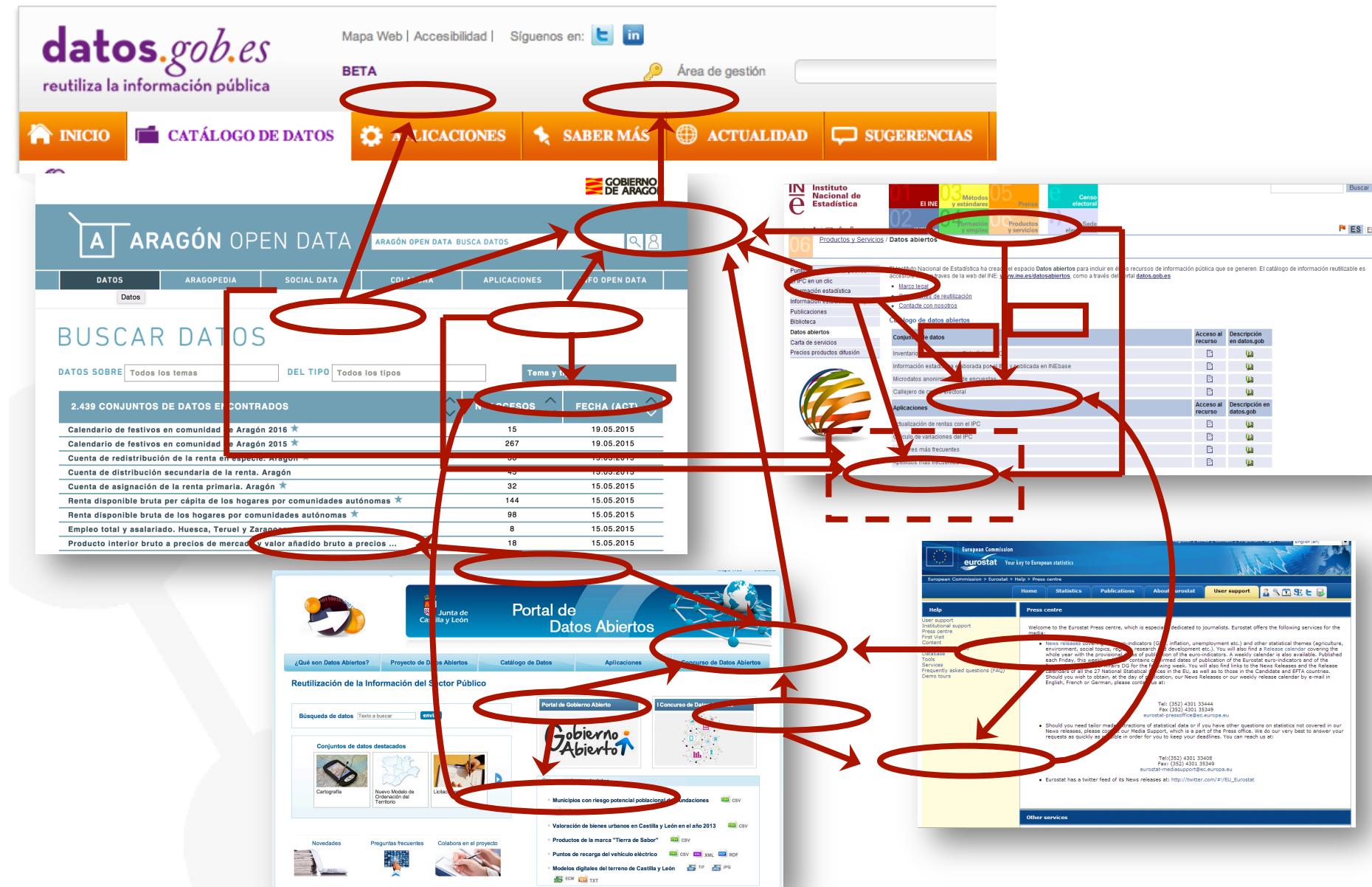
Se obtiene el itinerario de una línea (o varias líneas separadas por el carácter pipe(|), con los vértices para construir las rectas del recorrido y las coordenadas UTM de los ejes viales y los códigos de parada.

DECLARACIÓN DE LOS PARÁMETROS DE ENTRADA

```
POST /bus/servicebus.asmx HTTP/1.1
Host: servicios.emtmadrid.es
Content-Type: text/xml; charset=utf-8
Content-Length: length
SOAPAction: "http://tempuri.org/GetNodesLines"
```

Adapted from: Antonio Rodríguez Pascual (IGN)

All together..., Shaken, not stirred...



Open Data and how to publish it

Using semantically-enhanced and linked APIs

- Also useful for developers
- Standardised formats (JSON, JSON-LD, RDF)
- Standardised models (vocabularies, ontologies)



Screenshot of the LocalData Developer Beta API documentation page.

The page header includes the Zaragoza logo, the text "ARAGÓN OPEN DATA", and navigation links: Inicio, API Key, Documentación, API, Test de API, Geomarketing, Fuentes, Foro.

The main content area is titled "Listados Disponibles" and lists various datasets:

- Local Comercial
- Agrupación Comercial
- Distritos
- Barrios
- Secciones
- Portal
- Municipios
- Código Postal
- Catastro - Fincas
- Catastro - Direcciones
- Actividad Económica - CNAE
- Actividad Económica - MAE

Below this, there's a section titled "Vistas Disponibles" with options: ampliada, coordenadas, simple, tabla.

To the right, there's a sidebar titled "API" with descriptive text and a "Listados Disponibles" section.

The "Local Comercial" section shows three API endpoints:

- 1 **Búsqueda de locales comerciales por su provincia, su municipio y por su código**
HTTP://datos.localdata.com/recurso/comercio/Provincia/{Parámetro 1}/Municipio/{Parámetro 2}/Local/{Parámetro 3}?api_key={tu API KEY}
- 2 **Búsqueda de locales comerciales por su provincia, municipio y su nombre**
HTTP://datos.localdata.com/recurso/comercio/Provincia/{Parámetro 1}/Municipio/{Parámetro 2}/Local/Label/{Parámetro 3}?api_key={tu API KEY}
- 3 **Búsqueda de locales comerciales por su provincia, municipio y su dirección principal**
HTTP://datos.localdata.com/recurso/comercio/Provincia/{Parámetro 1}/Municipio/{Parámetro 2}/Local/DireccionPrincipal/{Parámetro 3}?api_key={tu API KEY}

At the bottom left, there's a logo for "Ontology Engineering Group".

Data representation formats



Presupuesto 2010

Non reusable



2012. Presupuesto de gastos. Resumen por capítulos

Reusable.
 Not open



2012. Presupuesto de gastos. Resumen por capítulos

Reusable, open.
 Incomplete



2012. Presupuesto de gastos. Detalle

Reusable, open,
complete
 Not linked



2012. Presupuesto de gastos. Detalle

Reusable, open,
complete, linked

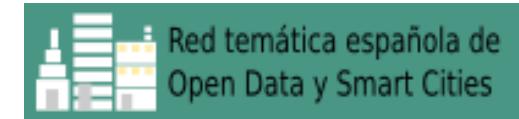
And many more: JSON, JSON-LD, Marc21, Shapefiles, KMZ,
KML, PC-Axis, etc.



Building Agreed Vocabularies and Data Structures for Successful **Open City Data Sharing**

Why our interest in cities

- Regional and national datasets are useful to provide indicators, comparisons across countries, etc.
- However, local datasets are usually better for the generation of economical and/or social value
 - Closer to people
 - Closer to businesses
 - Closer to developers



Why our interest in cities

- Node of the Open Data Institute for Madrid 
- Spin-off focused on providing open data support to municipalities 
- Involved in:
 - Leaders of the Spanish thematic network on Open Data for Smart Cities
 - Leaders of the UNE178301:2015 technical norm on Open Data for Smart Cities
 - Core team members of the FEMP (Spanish Federation of Municipalities and Provinces) working group on Open Data
 - Technical and innovation support for local open data initiatives (Zaragoza, Madrid, Alcobendas, Rivas-Vaciamadrid, Arganda del Rey)
 - Also national (<http://datos.gob.es/>) and regional (Aragón, Comunidad de Madrid, CRTM)

Project Ciudades Abiertas (funded by red.es)

July 2018 – June 2020

**INICIATIVA PLATAFORMA DE GOBIERNO ABIERTO,
COLABORATIVA E INTEROPERABLE (121/17-SP)**



CIUDADES ABIERTAS



red.es



UNIÓN EUROPEA

Fondo Europeo de Desarrollo Regional
"Una manera de hacer Europa"



Ayuntamiento de A Coruña
Concello da Coruña



MADRID



CONCELLO DE SANTIAGO



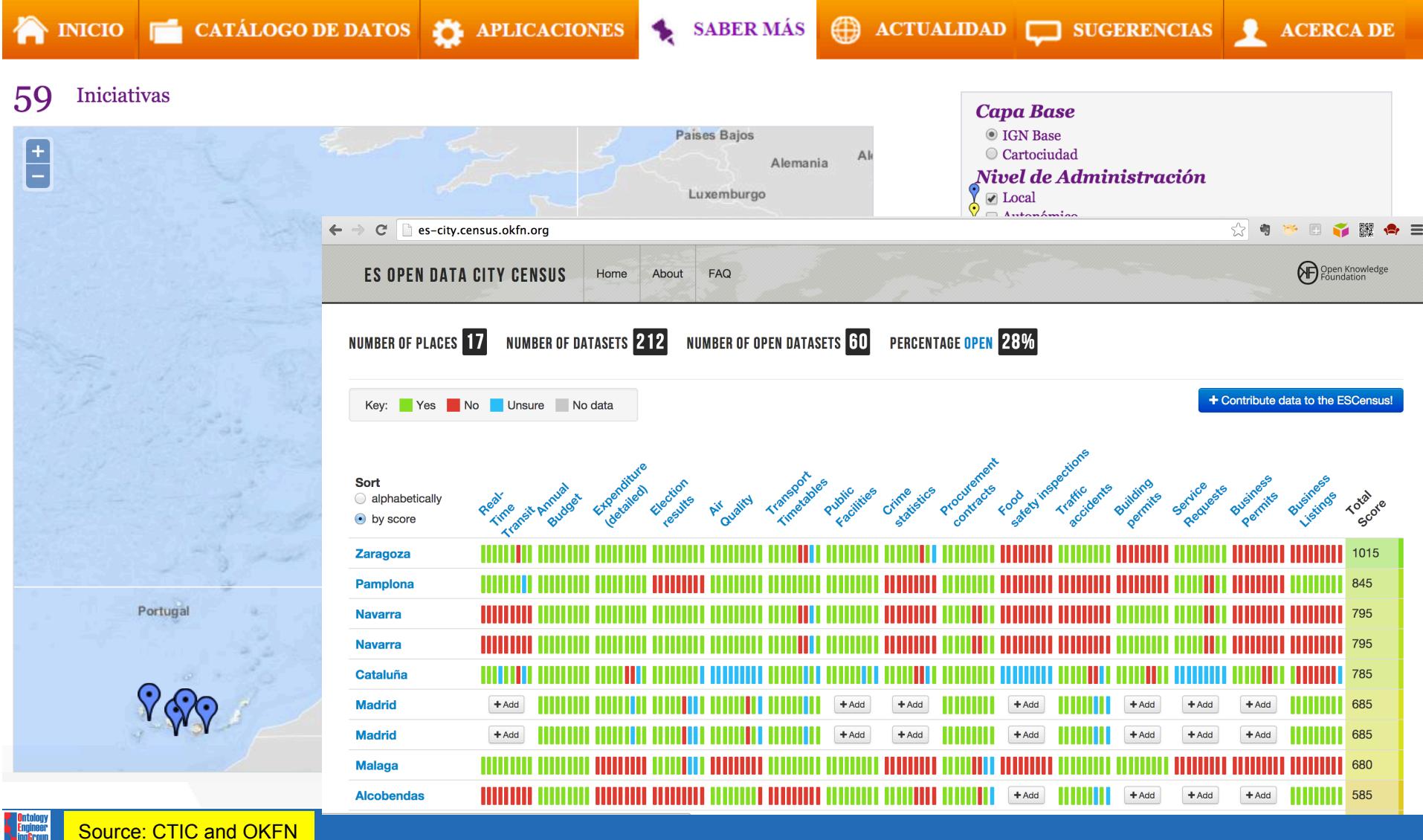
Zaragoza
AYUNTAMIENTO

More details soon at <http://www.ciudadesabiertas.es/>

The current status of Open City Data in Spain

datos.gob.es
reutiliza la información pública

Mapa de caracterización de iniciativas
de Datos Abiertos en España



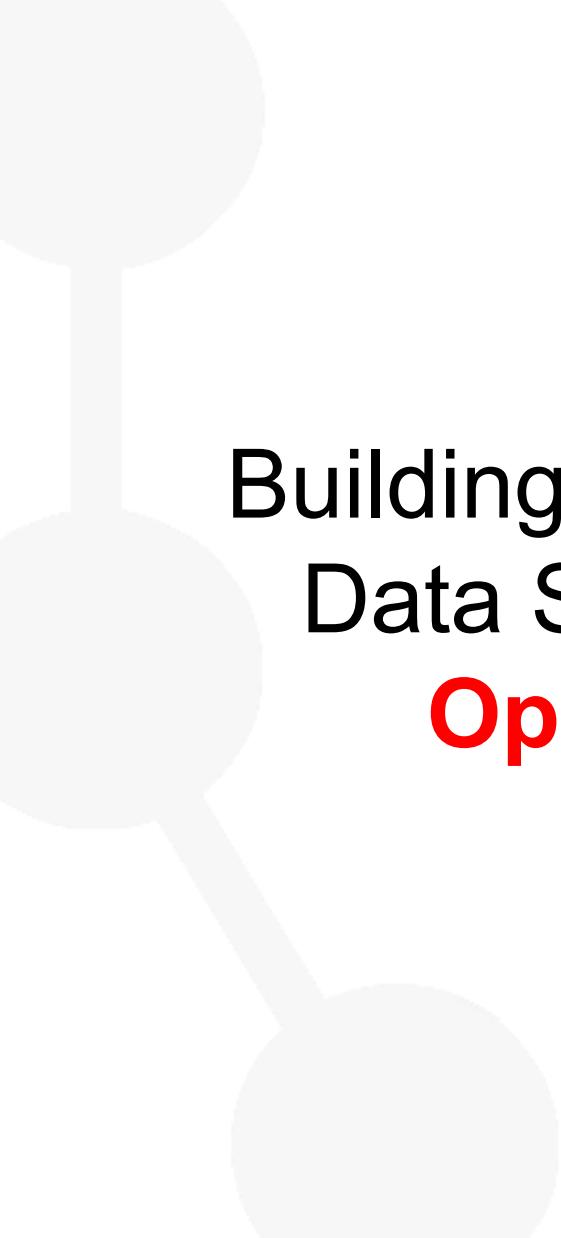
Open Data Portals in Spain

- Around 60 open data portals for Spanish cities (and growing)
 - Gijón, Santander, Bilbao, Azkoitia, Azpeitia, San Sebastián, Pamplona, Zaragoza, Lleida, Manresa, Barcelona, Badalona, El Prat, Cornellá, Viladecans, Gavá (and a few more in Barcelona's province), Tarragona, Valladolid, Alcobendas, Madrid, Cáceres, Valencia, Lorca, Málaga, Arona, etc.
- Also regional open data portals
 - Many of which aggregate local data
 - Cabildo de Tenerife, Diputación de Málaga, Gobierno de Aragón, etc.
- And national institutions, public companies, etc.

Relevant legislation for cities

- City Ordinances on Transparency, Access and Reuse of Information
 - Zaragoza:
http://www.zaragoza.es/ciudadania/gobierno-aberto/participar/detalle_Normativa?id=3983
 - Initial draft (25/06/2012)
 - Final approval (01/04/2014)
 - Template from the Spanish Federation of Municipalities and Provinces - FEMP (may 2014)
 - <http://www.femp.es/files/11-5133-fichero/Ordenanza%20Transparencia,%20Acceso%20y%20Reutilizaci%C3%B3n%20de%20la%20informaci%C3%B3n.pdf>
- 2015. UNE 178301. Ciudades Inteligentes. Datos abiertos (Open Data). MINETUR Y AENOR
 - More about this to come later in this presentation

- Ad-hoc developments over CMSs
 - Zaragoza (<http://datos.zaragoza.es/>)
 - Madrid (<http://datos.madrid.es/>)
 - Gijón (<http://datos.gijon.es/>)
 - <http://datos.gob.es>
- CKAN
 - The most recent ones, in general (e.g.,
<http://opendata.aragon.es>, <http://datos.alcobendas.org/>)
- Socrata
 - Rubí, Gavà, etc.
- More details (in Spanish) at
 - http://datos.gob.es/sites/default/files/informe-herramientas-publicacion-od_vfinal.pdf



Building Agreed Vocabularies and Data Structures for Successful **Open City Data Sharing**



Building Agreed Vocabularies and Data Structures for **Successful** Open City Data Sharing

Main challenges for success

- Many efforts so far focused on setting up the technology infrastructure
 - That's ok, but content is probably more important
- Heterogeneity on the selection of datasets, their formats and granularity
 - Build an app, deploy everywhere
- Open data portals are at the end of the data production chain
 - They are not an integral part of data management inside cities
- *Note: the following slides are based on my Semantics 2015 dinner speech on “Slow-cooked data and APIs”*

Rule 1.
Chop your onions
appropriately



Rule 1. Chop your onions appropriately

- Take care about the number of datasets that you produce
 - There's still a silly competition about "my open data portal has more datasets than yours"
 - This provokes, sometimes, over-segmentation of data
- Main question: What makes a dataset useful and which datasets should I publish?



Rule 1. Chop your onions appropriately

- UNE 178301:2015
 - Norm on Open Data for Smart Cities
- Organised by



AENOR

- AENOR CTN 178 group
 - Government and Mobility
 - Government
 - Open Data (led by Localidata)
- Formed by
 - Several cities
 - Private companies
 - Nation-wide organisations



El Papel de las **Normas**
en las **Ciudades Inteligentes**
Informes de Normalización

Rule 1. Chop your onions appropriately

- 11 datasets selected
 - Based on frequency of requests from reusers
- Slow but steady adoption for 2015 and 2016

Datasets
Cultural Agenda
Traffic
Population
Streets
Public Transport
Touristic Places and POIs
Budget
Shop Census
Air Quality
Contracts
Parkings

- And now working on extending it to 100 datasets
 - With an additional group of people



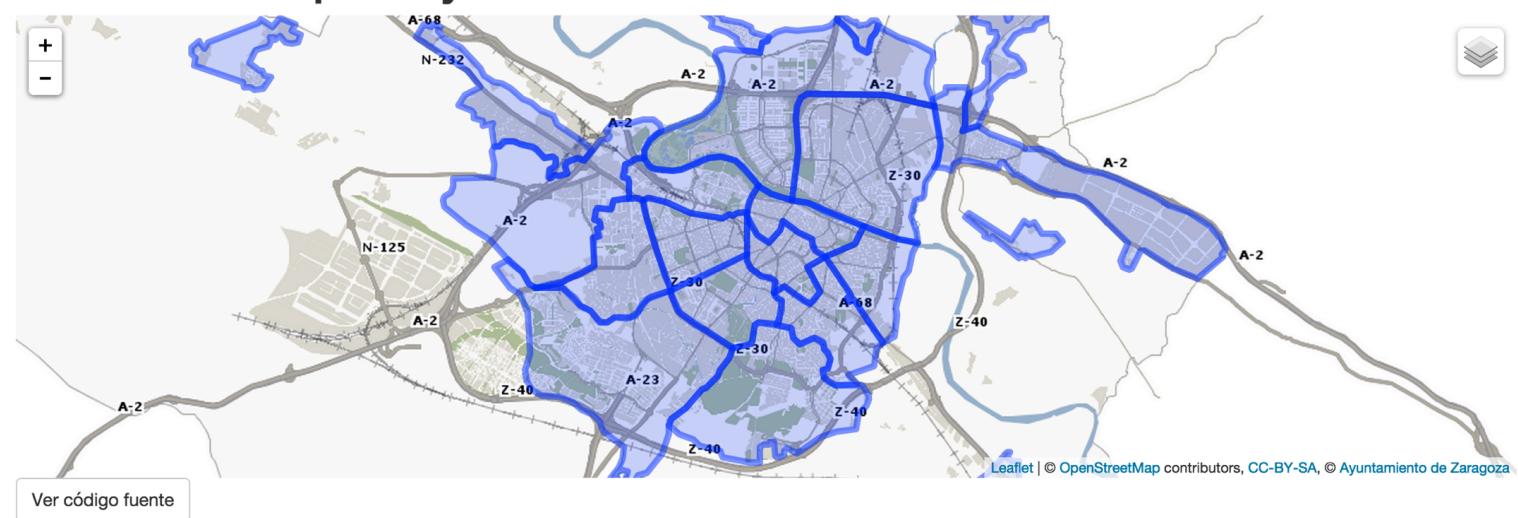
Rule 2.
Add some spices,
but not too many



Rule 2. Add some spices, but not too many

- Annotate (semantically) your data, so that others can understand what you produce
 - And produce examples for consumers to understand them

Juntas Municipales y Vecinales



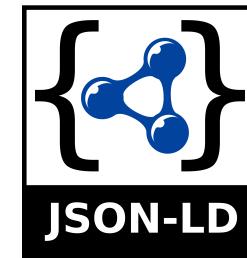
- Don't wait until all schema.org properties are settled
- Generate SKOS thesauri for your own classifications
 - e.g., for groups of citizens (young, elderly, etc.), for types of events (cultural, children, music, etc.)

Rule 3. Try different ways of plating up your food



Rule 3. Try different ways of plating up your food

- Produce your data in different formats
 - Agreed-upon JSONs
 - JSON-LD
 - RDF
 - Agreed-upon CSVs
 - CSV on the Web



{ JSON }

- But don't get crazy at offering all options
 - The ones that get finally used are more than enough

Rule 4. Let children appreciate (and cook) open data



Rule 4. Let children appreciate (and cook) open data



Let children understand the benefits of open data (and Citizen Science)
and how they can contribute to improving the data of their city

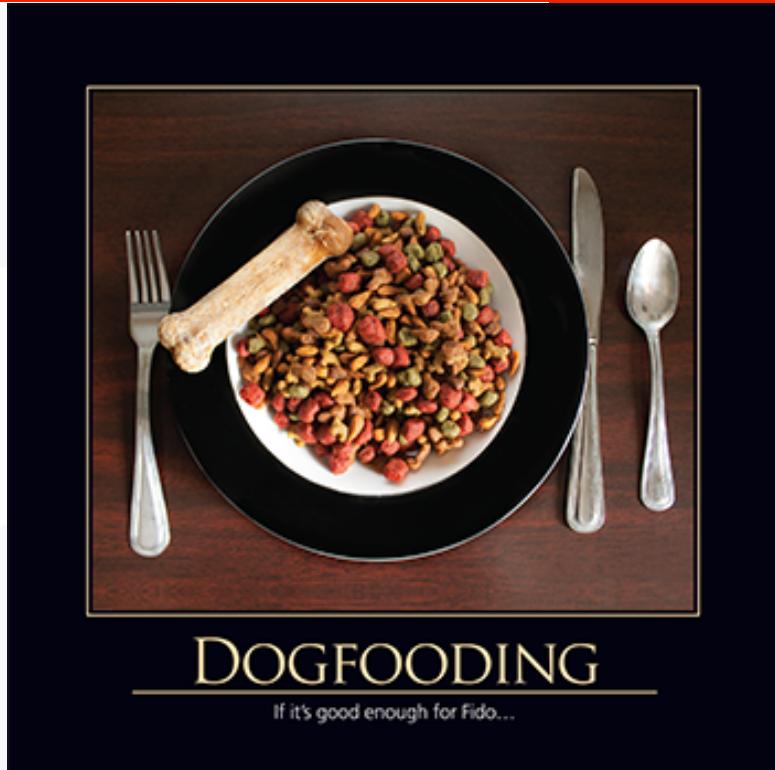


A screenshot of a mobile application interface. At the top is a circular profile picture of a person working at a desk. Below it, the letters "BNE" are displayed. The main screen shows a list of users with their names, scores, and profile icons:

Usuario	Puntos
grup004	350
grup008	299
grup006	260
4	120
5	83
6	82

At the bottom of the screen, there is text: "Ontology Engineering Group", "Biblioteca Nacional de España", "Researc...", and "DataLab".





Rule 5....
Eat your own dog food



Eating Your Own
Dog Food

Let's better say...



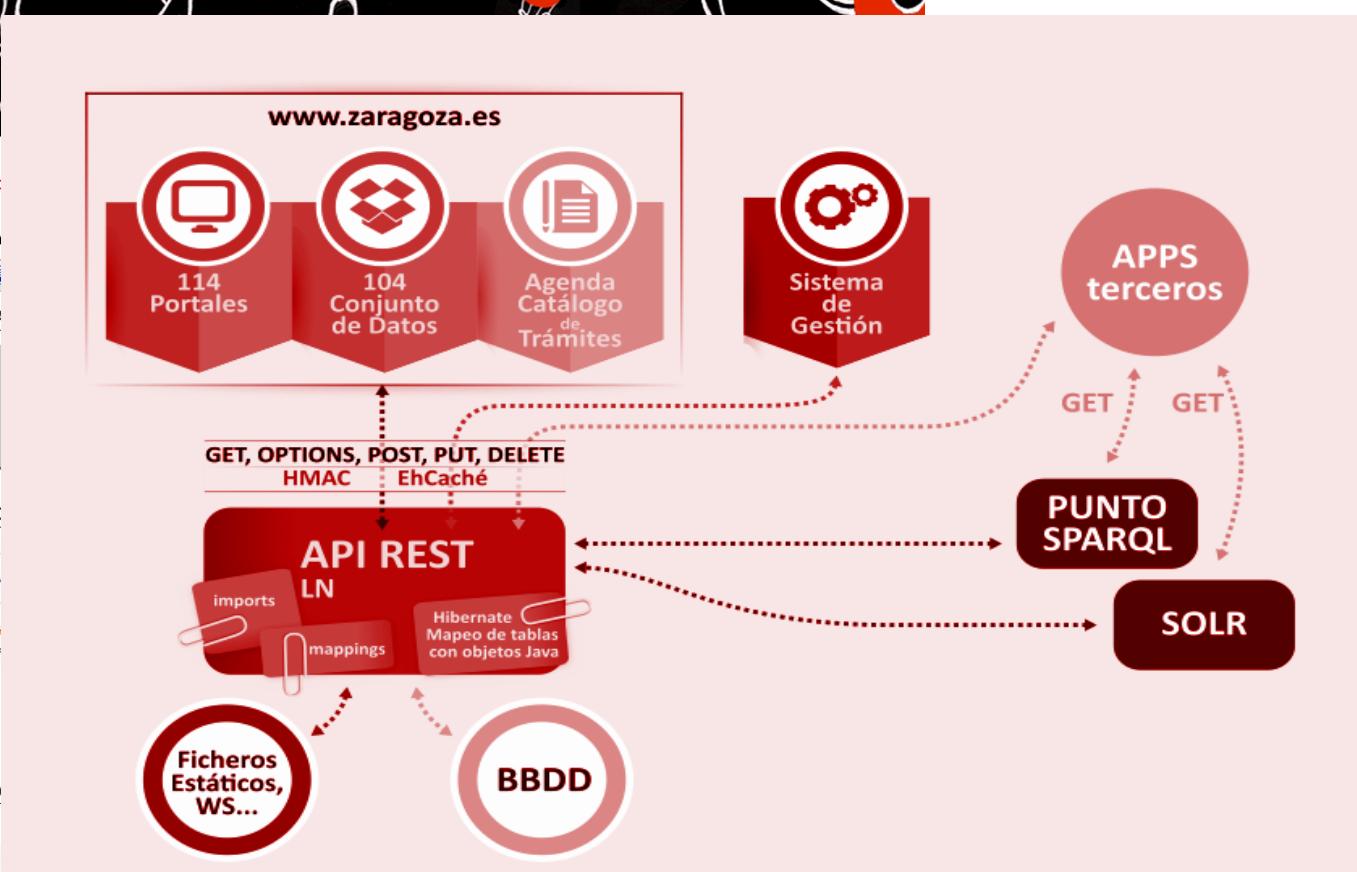
Rule 5.
Try it out yourself first...

**... Before giving your
food to your customers**

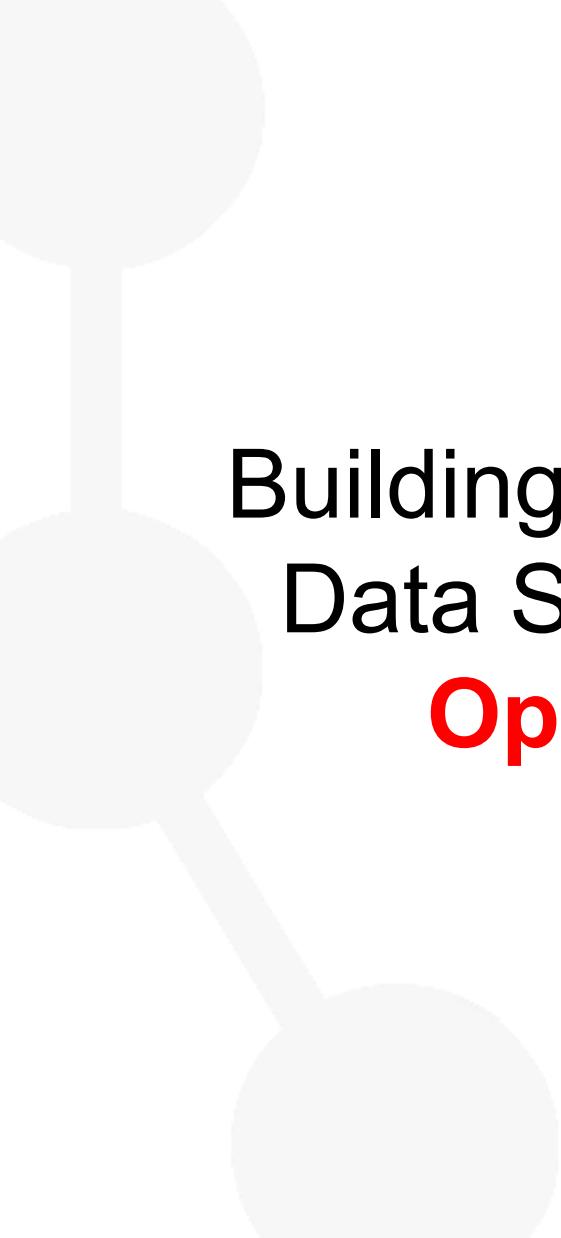
Rule 5. Try it out yourself first...

- Open data by default
 - So that your applications are also based on open data

The screenshot shows the official website for Zaragoza's API. At the top, there is a logo for "Zaragoza" and "AYUNTAMIENTO". Below the logo, the page title is "API Zaragoza". A sidebar on the left lists various categories such as "Adopción de mascotas", "Agenda Zaragoza", "Anuncios para jóvenes", "Ayuntamiento: Ayuda", "Ayuntamiento: Cita", "Ayuntamiento: Normativa", "Ayuntamiento: Ofertas", and "Ayuntamiento: Organizaciones". The main content area contains a section titled "Contacta:" with links to "Correo electrónico" and "Condiciones de uso". There is also a "Presentación" section with links to "Catálogo", "Formatos", "Servicio SPARQL", "Servicio API", and "Casos de uso".



Source: Los Datos Abiertos como Eje Central del desarrollo de la Plataforma de Gobierno Abierto. M.J. Fernández-Ruiz, V. Morlán



Building Agreed Vocabularies and Data Structures for **Successful** **Open City Data Sharing**



Building Agreed Vocabularies and Data Structures for Successful Open City Data Sharing

**Whom of you has never ever eaten a burger in his/her life?
Well, if you are vegetarian, we can think of something else**



Rule 6.
Fast food has its value
as well, why not...

You go anywhere in the world and know how
McDonald's burgers are...

So let's only learn this from fast food..

Rule 6. Fast food has its value as well, why not...

- When we open our data, let's use at least the same data structures

I want to publish my data



I am using GTFS



I am using my own CSV structure



I provide it as a Web service

_id	stop_id	stop_code	stop_na...	lat	lon	stop_order
1	101	101	Alameda	36.716872	-4.42	
	GroupNumber	DateFirst	DateEnd	Line	Label	
	110	21/11/2014	31/12/2999	001	1	

```
link: "http://www.urbanosdezaragoza.es/frm_esquemaparadatime.php?poste=1",
title: "(1) Principio de Línea Líneas: 501",
icon: "//www.zaragoza.es/contenidos/iconos/bus.png",
geometry: {
  type: "Point",
  coordinates: [
    675945,
    4613286
  ]
}
```

Write an app and deploy everywhere

Rule 6. Fast food has its value as well, why not...

ub, Inc. [US] <https://github.com/opencitydata/vocabularios-datos-abiertos>

This repository Search Pull requests Issues Gist

Unwatch 7 Star 2 Fork

opencitydata / **vocabularios-datos-abiertos**

En este repositorio se almacenan los vocabularios de datos abiertos que se están definiendo en el contexto del grupo de trabajo de datos abiertos de AENOR, y que se publican en <http://vocab.linkeddata.es/datosabiertos/>

— Edit

69 commits 1 branch 0 releases 3 contributors

Merge pull request #40 from datosgob/patch-1 ...

ocorcho authored on 7 Aug latest commit 8da750c1aa

Author	Commit Message	Date
OnToology	automated change	2 months ago
cultura-ocio/agenda	automated change	3 months ago
external	Adding qb.json to the list of external vocabularies. Generated using h...	a month ago
hacienda	Se ha añadido la propiedad provision presupuestaria definitiva, como ...	2 months ago
sector-publico	Update organizacion.owl	a month ago
transporte/trafico	automated change	2 months ago
turismo	automated change	3 months ago
urbanismo-infraestructuras	Añadido el contexto JSON para el callejero. Se ha creado con la herra...	a month ago

Code Boards Burndown Issues Pull requests Wiki Pulse Graphs Settings

HTTPS clone URL <https://github.com/>

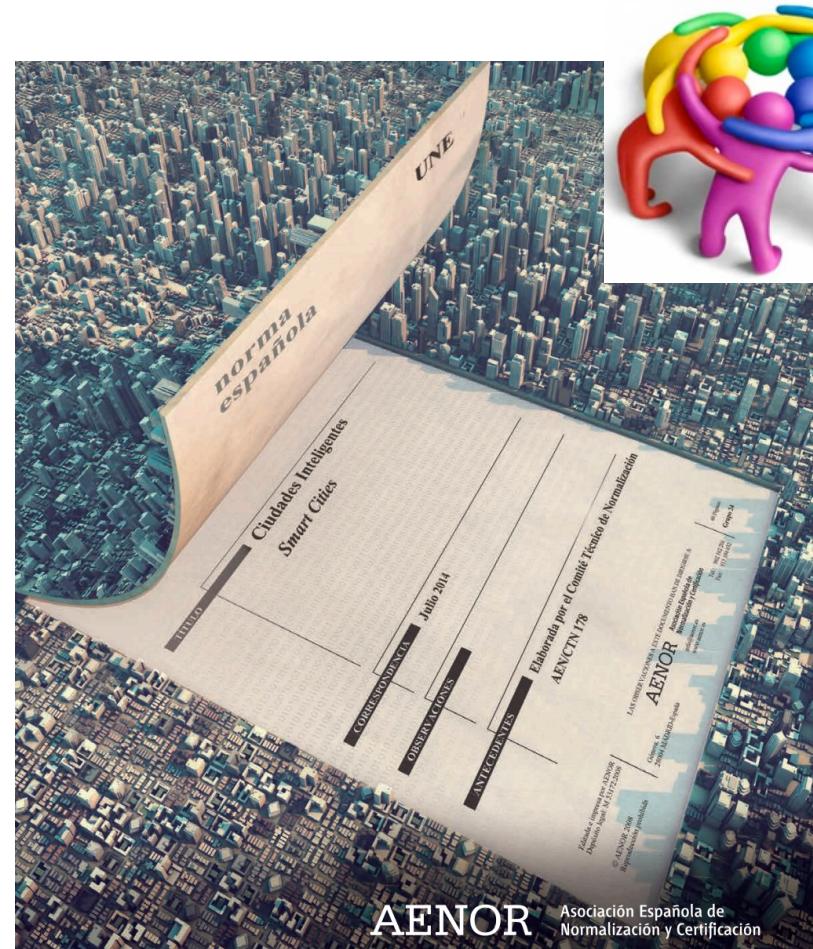
UNE 178301:2015. Context

- UNE 178301:2015
 - Norm on Open Data for Smart Cities
- Organised by



AENOR

- AENOR CTN 178 group
 - Government and Mobility
 - Government
 - Open Data (led by Localidata)
- Formed by
 - Several cities
 - Private companies
 - Nation-wide organisations



El Papel de las **Normas**
en las **Ciudades Inteligentes**
Informes de Normalización

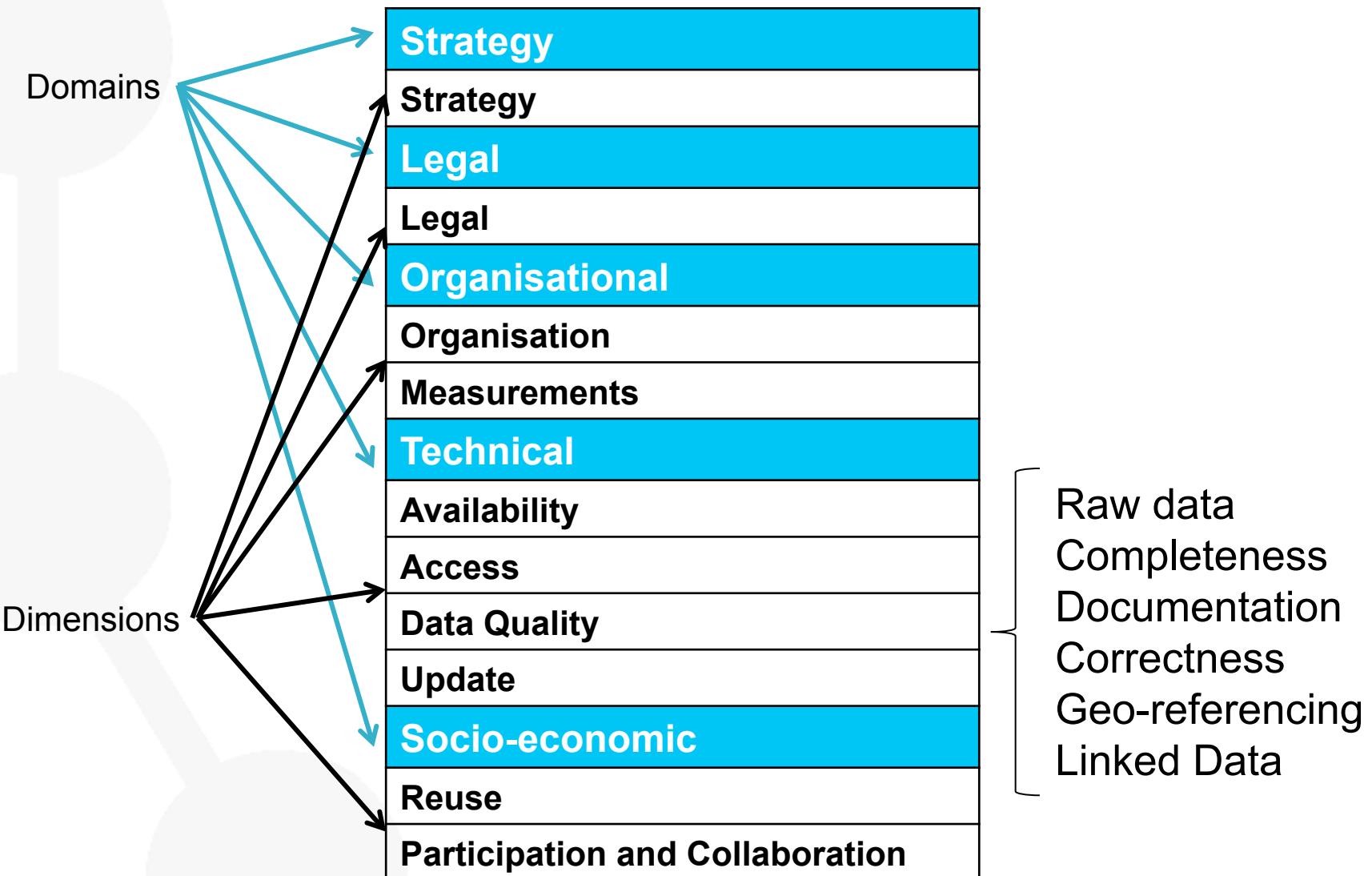
UNE 178301:2015. Objectives

- Establish **metrics and indicators** that allow evaluating the **degree of maturity** of open data elaborated or curated by the public sector...
- ... so that we can **facilitate reuse**,
- ...
- ... and define a minimal list of **datasets** that should be published by all open city data initiatives, together with their **associated vocabularies**

- Coordinator
 - Esther Minguela (Localidata)
 - Oscar Corcho (OEG-UPM and Localidata)
- 35 members who belong to...
 - Medium&Large Cities (10) – mostly City Information Managers
 - Private companies working for the public sector (6)
 - Regions (3) – mostly Region Information Managers
 - Ministries or alike (3)
 - Geographic sector (3)
- The core of the work done over a period of 6 months

UNE 178301:2015. The team

- Coordinators
 - Localidata. Esther Minguela y Oscar Corcho
- Participants
 1. Animsa. Iñigo Sanciñena
 2. Animsa. Jesús Vera
 3. Ayuntamiento de Albacete. Manuel Tobarra
 4. Ayuntamiento de Bilbao. Teresa Alba
 5. Ayuntamiento de Bilbao. Josu Santacruz
 6. Ayuntamiento de Burgos. José María Diez
 7. Ayuntamiento de Madrid. Enrique Crespo
 8. Ayuntamiento de Madrid. José Luis Cano
 9. Ayuntamiento de Rivas. Jesús García
 10. Ayuntamiento de Segovia. Alberto Gómez
 11. Ayuntamiento de Zaragoza. María Jesús Fernández
 12. Comunidad de Madrid. Inmaculada Sánchez
 13. Comunidad de Madrid. Concepción García
 14. IGN. Antonio Rodríguez
 15. IGN. Celia Sevilla
 16. COIT. Jorge Díaz
 17. CRTM. Concha Chapa
 18. CRTM. José Antonio Cascales
 19. Etra. Vicente Sebastián
 20. FEMP. Pablo Bárcenas
 21. Geoactio. Pello Gámez
 22. Gmv. Antonio Velasco
 23. Indra. Elisabet Terrades
 24. Indra. Jordi Marín
 25. Junta de Castilla y León. Antonio Ibáñez
 26. MINETUR. Ana Pérez
 27. MINETUR. Javier García
 28. MINHAP. Aleida Alcaide
 29. Proconsi. Constantino Lázaro
 30. Red.es. José Ignacio Sánchez
 31. Red.es. Sonia Castro
 32. SEGITTUR. Calixto Mellen
 33. SEGITTUR. Enrique Lancis
 34. SEGITTUR. Rosa Muñoz
 35. SEGITTUR. Susana García
 36. Universidad de Zaragoza. Javier López



4.3.1.4 Priority

The responsible unit shall set the priority level for the publication of data collected in the inventory.

The prioritisation method shall be documented.

The priority level shall be defined based on the following criteria:

- Relevance.
- Demand.
- Quality.
- Etc.

Levels

- **Level 0: Non-existent results**

The entity has not made an analysis of data priority for publication.

- **Level 1: Incipient results (informal)**

The entity has begun an analysis of data priority for publication.

- **Level 2: Existential results**

The entity has completed an analysis of data priority for publication based on an analysis using only internal opinions.

- **Level 3: Advanced results**

The entity has completed an analysis of data priority for publication based on an analysis using both internal opinions from within the entity and external opinions (mainly from the reuse sector), either collected by specific requests, top-rated data sets, surveys, etc.

UNE178301:2015. High-Priority Datasets

- Listing based on the current inventories from all cities (and regions)
- Harmonisation
- Votes according to PSI-reuse requests

Datasets
Cultural Agenda
Traffic
Population
Streets
Public Transport
Touristic Places and POIs
Budget
Shop Census
Air Quality
Contracts
Parkings

UNE 178301:2015. Vocabularies

Dataset	Vocabulary
General – shared across datasets	Postal address: http://vocab.linkeddata.es/datosabiertos/def/urbanismo-infraestructuras/direccionPostal Administrative units: http://vocab.linkeddata.es/datosabiertos/def/sector-publico/territorio
Streets	Vocabulary: http://vocab.linkeddata.es/datosabiertos/def/urbanismo-infraestructuras/callejero SKOS: http://vocab.linkeddata.es/datosabiertos/kos/urbanismo-infraestructuras/tipo-via
Tourism	Vocabulary: http://vocab.linkeddata.es/datosabiertos/def/turismo/lugar
Cultural agenda	Vocabulary: http://vocab.linkeddata.es/datosabiertos/def/cultura-ocio/agenda
Shop census	Vocabulary: http://vocab.linkeddata.es/datosabiertos/def/comercio/tejidoComercial SKOS: http://vocab.linkeddata.es/page/datosabiertos/kos/comercio/cnae
Population	Vocabulary: http://www.w3.org/TR/vocab-data-cube/ SKOS Codelists <ul style="list-style-type: none">○ Age: http://eurostat.linked-statistics.org/dic/age.rdf○ Gender: http://eurostat.linked-statistics.org/dic/sex.rdf○ Geo: http://eurostat.linked-statistics.org/dic/geo.rdf
Budget	Vocabulary: http://vocab.linkeddata.es/datosabiertos/def/hacienda/presupuesto
Public tendering	Vocabulary: http://contsem.unizar.es/def/sector-publico/pproc
Air quality	Vocabulary: http://www.w3.org/2005/Incubator/ssn:ssnx:ssn
Traffic	Vocabulary: http://vocab.linkeddata.es/datosabiertos/def/transporte/trafico
Public transport	Vocabulary: http://vocab.linkeddata.es/datosabiertos/def/transporte/transportePublico
Parking	Vocabulary: http://vocab.linkeddata.es/datosabiertos/def/urbanismo-infraestructuras/aparcamiento

- <http://ojoaldata100.okfn.es/>

#OJOALDATA100

IDENTIFICANDO LOS 100 JUEGOS DE DATOS LOCALES MÁS IMPORTANTES PARA SU PUBLICACION

[HOME](#)[COMPETENCIA CIUDADES](#)[GLOSSARIO O.D.](#)[PRIMER LISTADO](#)[VOCABULARIOS](#)

PRIMER LISTADO

A continuación se refleja el primer listado de datasets propuestos. Puede tambien ver el mismo en Google Docs:

<https://docs.google.com/spreadsheets/d/17nit9LWyqNdzv7tVRU7I7Gy6EXK4TnLSN71OxCeKDfs/edit#gid=0>

<u>Conjunto de datos</u>	<u>Clasificación NTI</u>	<u>Clasificación NTI (Descripción)</u>
Accidentalidad del tráfico (coches, motos, bicis, heridos, muertos,)	Transporte	Comunicaciones, Tráfico
Actividad inspectora. (se puede publicar la actividad inspectora, pero no así la sancionadora)	Hacienda	Impuestos
Actos en vía pública	Sociedad y bienestar	Participación ciudadana, Marginación, Envejecimiento, Activo Autonomía personal y Dependencia, Invalidez, Jubilación, Seguros y Pensiones, Prestaciones y Subvenciones

SUSCRIBETE PARA ESTAR INFORMADO



Which are our main challenges?



- What should we publish?
 - Added value for cities
 - Added value for reusers
 - Available legislation

- How should we publish it?
 - In which format(s)?
 - With which level of detail?



Our decision



Let's work towards creating a rich catalogue of datasets (around 100), with a wide range of stakeholders and following a bottom-up approach

Thanks to...

**MEDIALAB
PRADO**

Acknowledgements



Olga Quirós

Esther Minguela



Antonio Ibáñez

**MEDIALAB
PRADO**



Guadalupe Miñana
Victoria López

Santiago Mota

Eva Méndez

Nancy Gómez

Alberto Abella

Enrique Crespo

Andrés Recio



Oscar Corcho



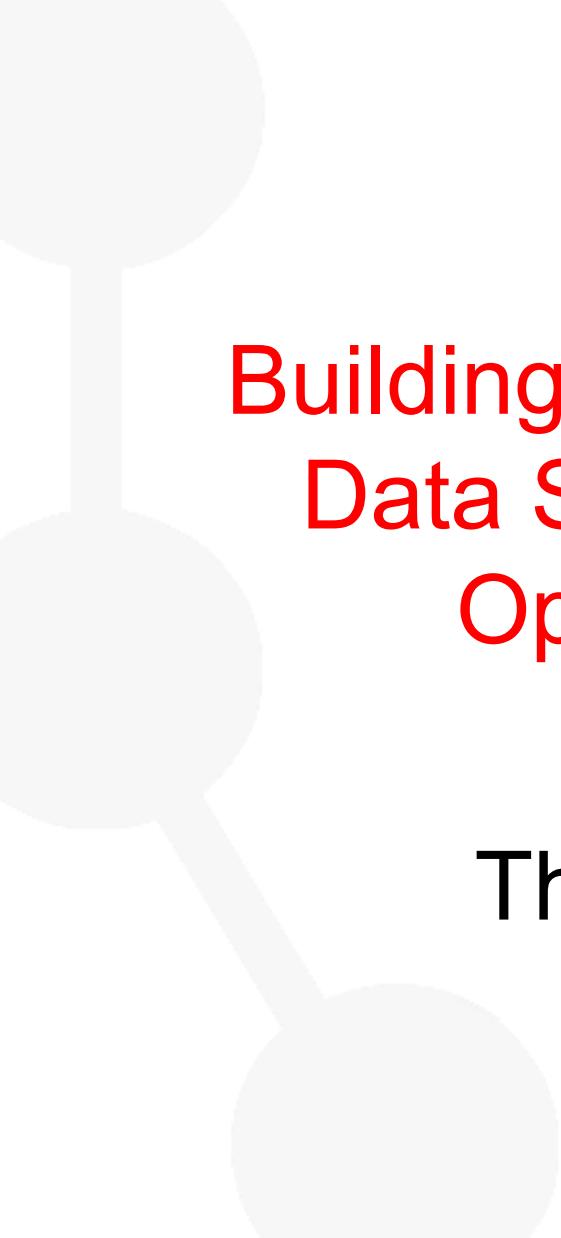
*... And all those who participated
in the UNE178301 technical norm*

DATOS ABIERTOS

Guía estratégica para su puesta en marcha
Conjuntos de datos mínimos a publicar



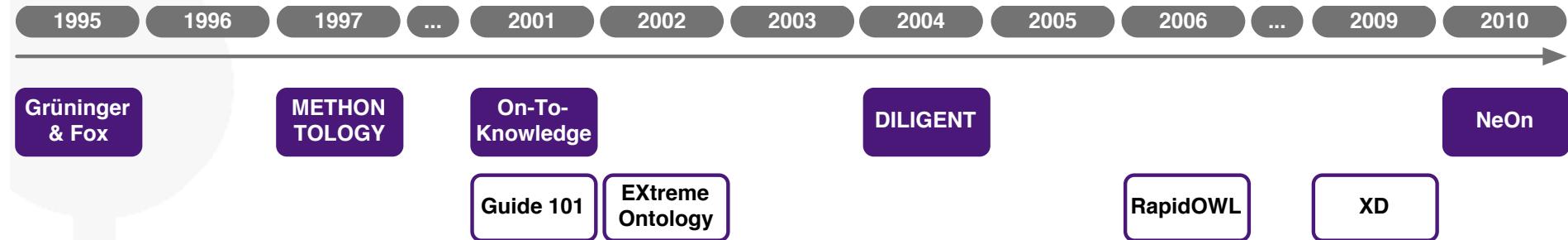
<http://datos.gob.es/es/noticia/la-femp-elabora-una-guia-de-datos-abiertos-para-ayuntamientos-y-entidades-locales>



Building Agreed Vocabularies and Data Structures for Successful Open City Data Sharing

The need to scale up...

Ontology Development Methods and Methodologies



- Towards lightweight and agile processes
- Inspiration from software development practices
- Coupling Software and ontology development

Ontology engineering tools @OEG-UPM

■ Ontology evaluation

- OOPS! OntOlogy Pitfall Scanner
<http://oops.linkeddata.es/>



■ Vocabulary documentation

- HTML: Widoco
<https://github.com/dgarijo/Widoco/>
- Diagrams: AR2DTool
<http://ar2dtool.linkeddata.es/>



○ Vocabulary registry

- OEG vocabularies
<http://vocab.linkeddata.es/>
- Smart Cities: <http://smartcity.linkeddata.es/>
- Open Data:
<http://vocab.linkeddata.es/datosabiertos/>

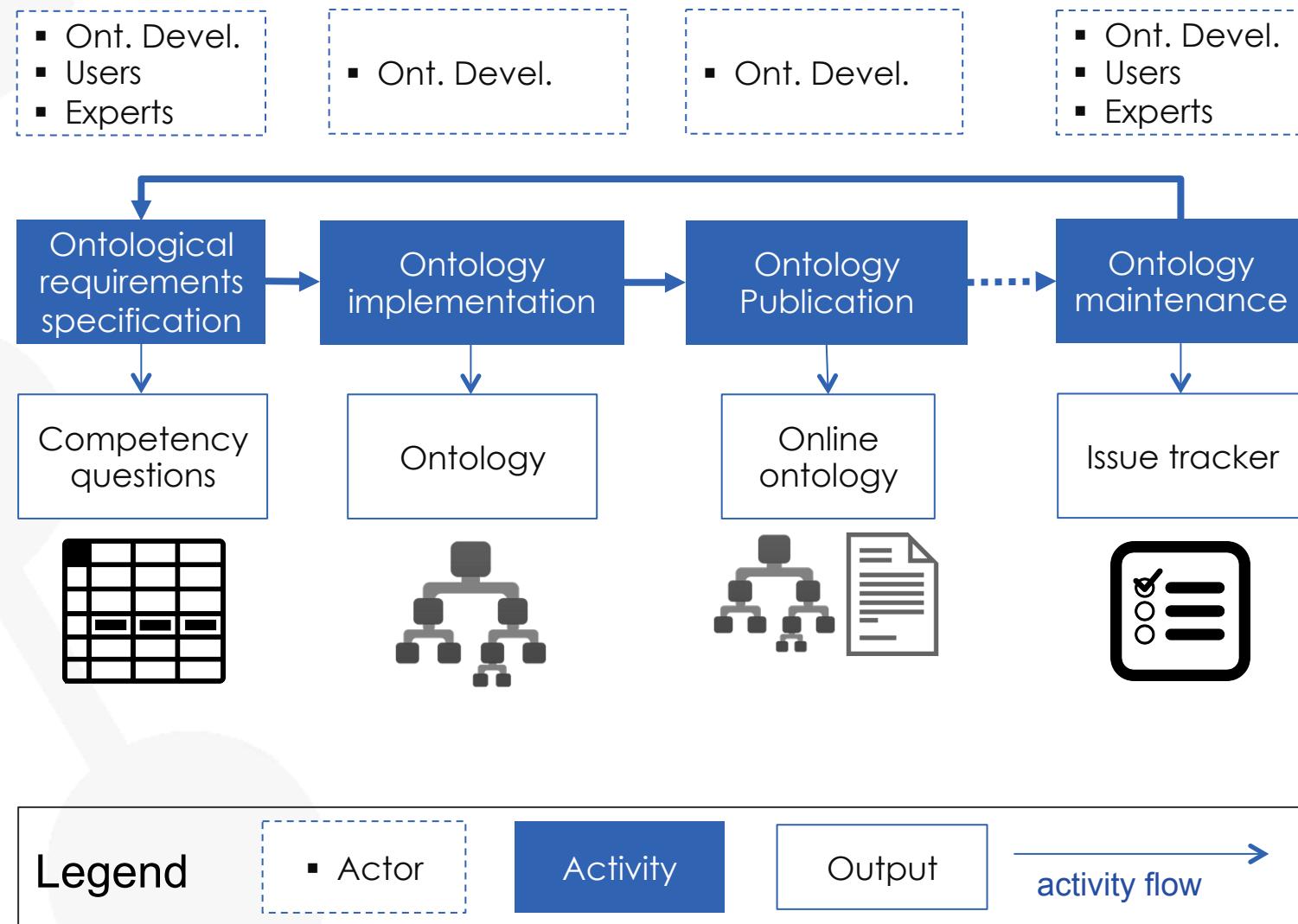


○ Vocabulary distributed development

- OnToology <http://ontoology.linkeddata.es/>



Ontology development process overview



Requirement specification

Requirement specification

■ Ont. Devel.
■ Users
■ Experts

Use case specification → Use cases

■ Users
■ Experts

Data exchange identification → Domain documentation

Requirement specification (Unofficial Draft)

TABLE OF CONTENTS

1. Introduction
- 1.1 Vision
- 1.2 How to get started
2. Terminology
3. Concepts & Building Blocks
- 3.1 WoT Interface
 - 3.1.1 Resource Model and URIs
 - 3.1.2 Protocol Bindings
 - 3.1.3 Security Mechanisms

3.2 Thing Description

The WoT Thing Description (TD) provides the WoT Interface. For this, it relies on the Relying data model. For now, JSON-LD is used as a vocabulary to express the capabilities of and Events. In addition, the TD provides mediaTypes (e.g., "application/json", "text/plain", etc.), mediaTypes (e.g., "application/json", "text/plain", etc.). Fig. 3 Concepts of the Thing Description TD.

<http://w3c.github.io/wot/current-practices/wot-practices>

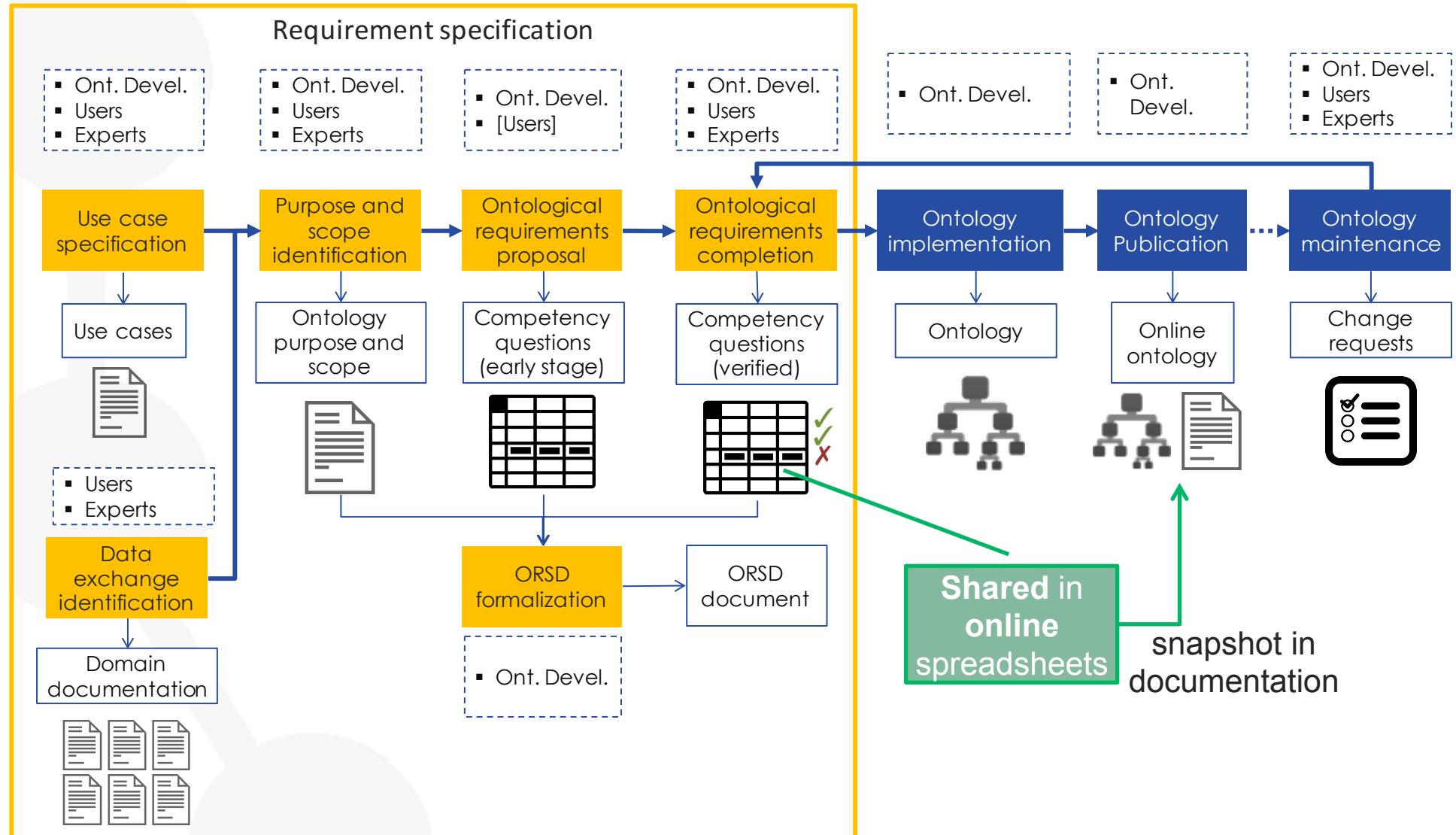
EXAMPLE 3: More Capabilities

```
{
  "@context": [
    "http://w3c.github.io/wot/w3c-wot-td-context.jsonld",
    { "actuator": "http://example.org/actuator#" }
  ],
  "@type": "Thing",
  "name": "MyLEDThing",
  "base": "coap://myled.example.com:5683/",
  "security": {
    "cat": "token:jwt",
    "alg": "HS256",
    "as": "https://authority-issuing.example.org"
  },
  "interactions": [
    {
      "@type": ["Property", "actuator:onOffStatus"],
      "name": "status",
      "outputData": { "valueType": { "type": "boolean" } },
      "writable": true,
      "links": [
        {
          "href": "pwr",
          "mediaType": "application/exi"
        }
      ],
      "href": "http://mytemp.example.com:8080/status",
      "mediaType": "application/json"
    },
    {
      "@type": ["Action", "actuator:fadeIn"],
      "name": "fadeIn",
      "inputData": {
        "valueType": { "type": "integer" },
        "actuator:unit": "actuator:ms"
      },
      "links": [
        {
          "href": "in",
          "mediaType": "application/exi"
        }
      ],
      "href": "http://mytemp.example.com:8080/in",
      "mediaType": "application/json"
    }
  ]
}
```

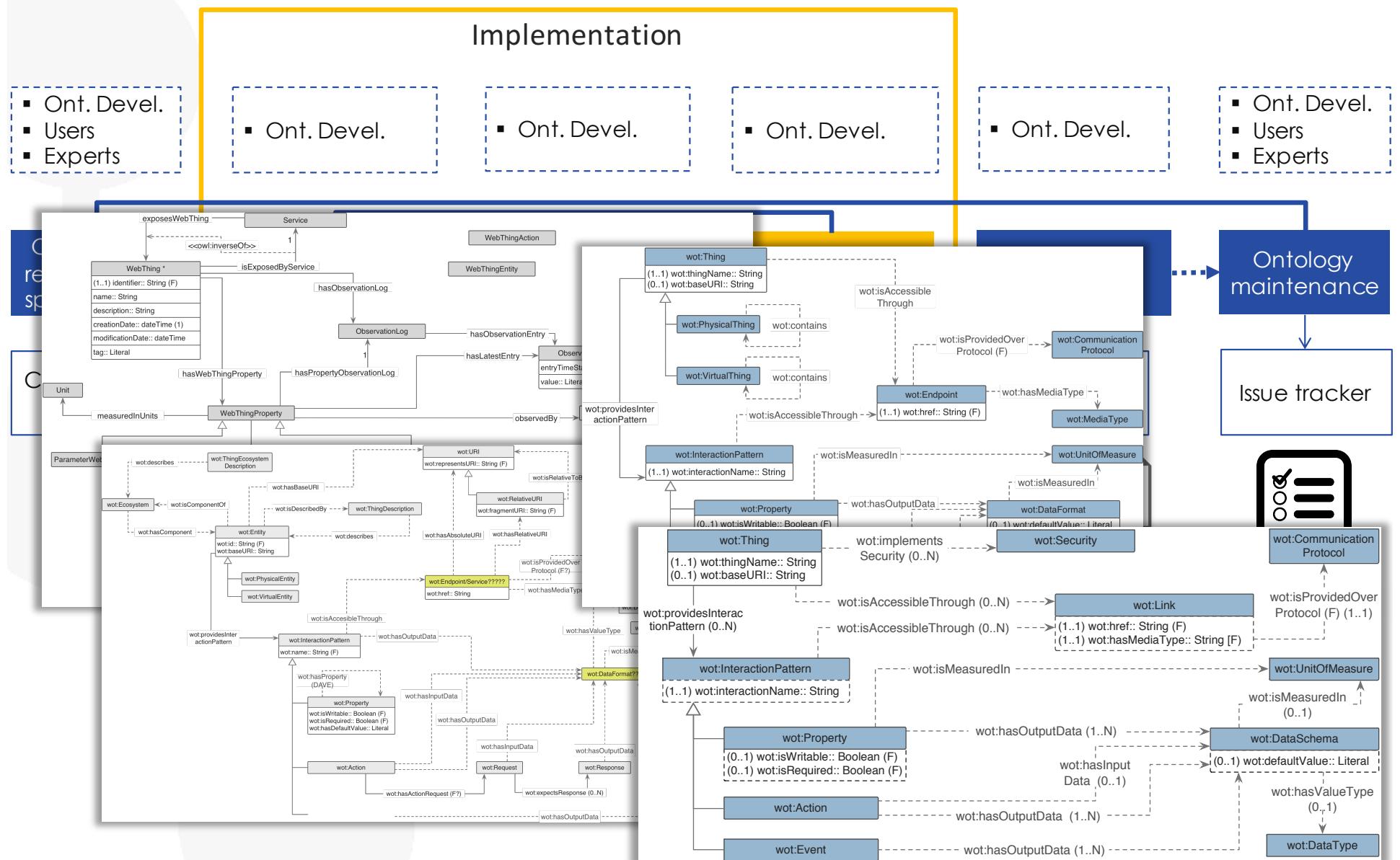
Fig. 3 Concepts of the Thing Description TD

<https://lists.w3.org/Archives/Public/public-wot-ig/2016Dec/0016.html>

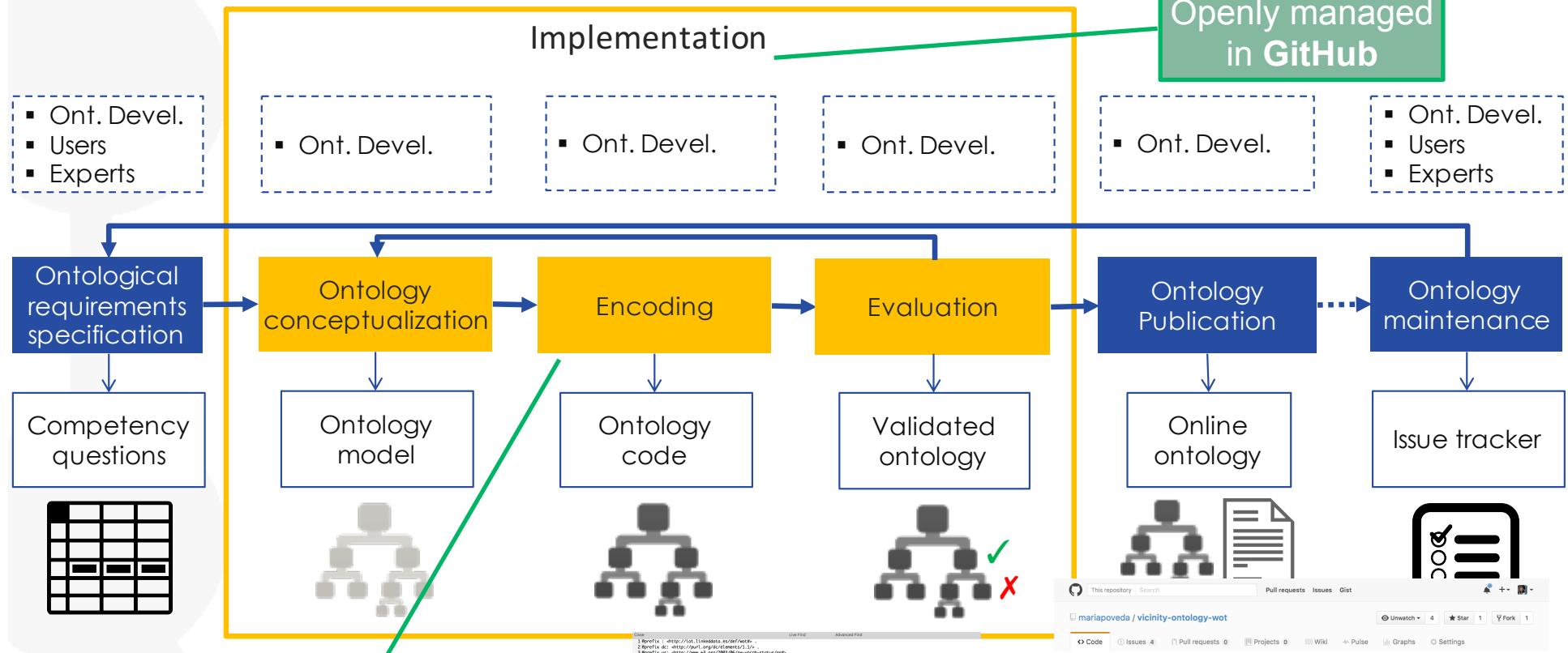
Requirement specification



Implementation - Conceptualization

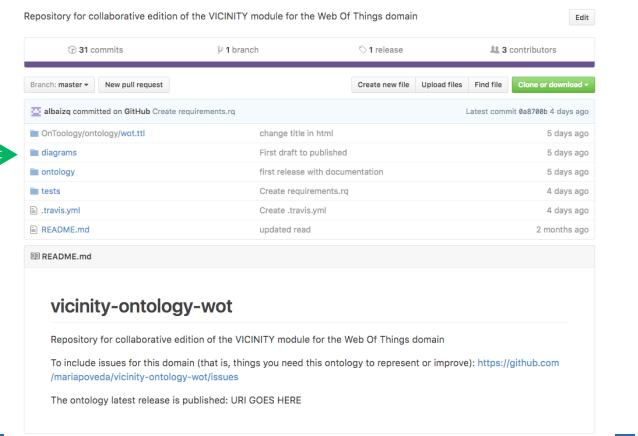


Implementation - Encoding

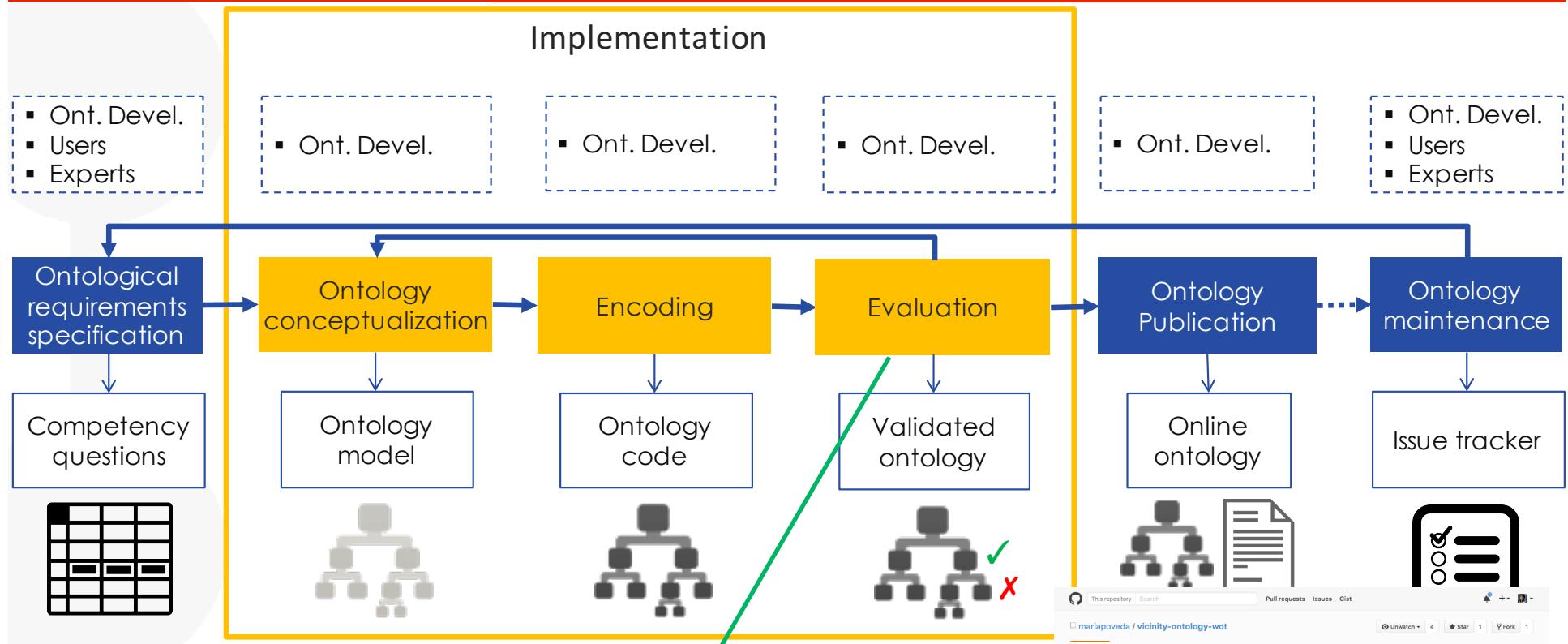


GitHub repository

<https://github.com/mariapoveda/vicinity-ontology-wot>



Implementation - Evaluation



Online and notifications in GitHub repository
<https://github.com/mariapoveda/vicinity-ontology-wot>

Ongoing work: tests from requirements

This screenshot shows the GitHub repository page for 'mariapoveda/vicinity-ontology-wot'. It includes the repository's description, a list of 31 commits, and a detailed view of the latest commit.

Repository Description: Repository for collaborative edition of the VICINITY module for the Web Of Things domain.

Commits:

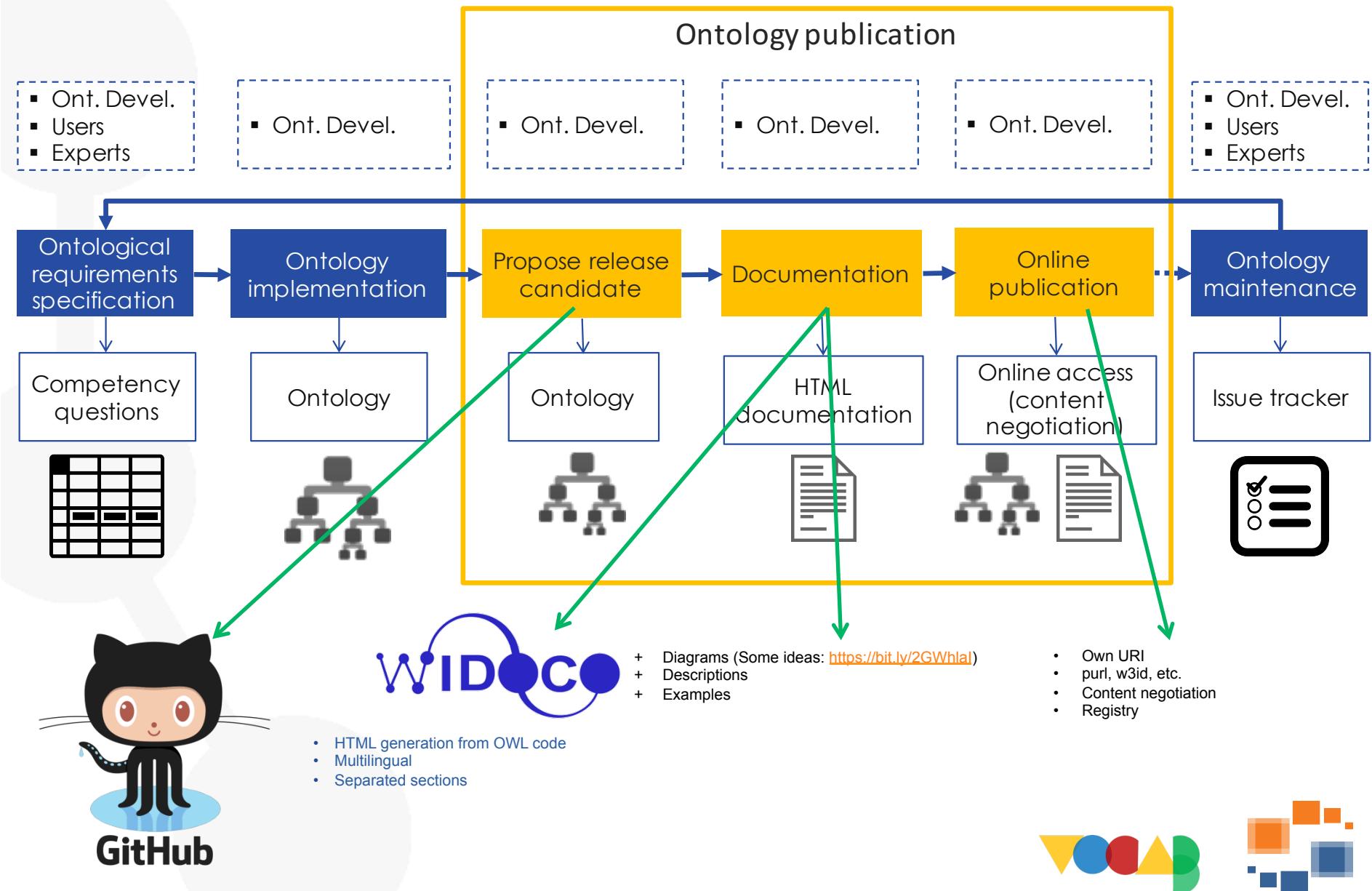
- albaizq committed on GitHub Create requirements.rq
- OnTopology/ontology/wot.ttl change title in html
- diagrams First draft to published
- ontology first release with documentation
- tests Create requirements.rq
- .travis.yml Create .travis.yml
- README.md updated read

Latest Commit: 0ea970eb 4 days ago

Issues: 4

Contributors: 3

Publication



Ontology development process overview

Erroneous domain definitions #38

Closed vcharpenay opened this issue on Jun 12, 2017 · 2 comments

vcharpenay commented on Jun 12, 2017

Some domain axioms seem erroneous:

- :providesInteractionPattern rdfs:domain :InteractionPattern . I suppose you mean rdfs:range ?
- :name rdfs:domain :Thing leads to the fact that all interaction patterns are also things, which is unwanted, I guess.

In general, are domain/range axioms supposed to remain in the ontology? Should they be removed?

mariapoveda commented on Jun 12, 2017

Thanks for the comments I'll update the ontology.
I'd rather to keep them in the ontology.

mariapoveda added a commit that referenced this issue

0.0.7 replace erroneous domains issue #38

mariapoveda commented on Jun 12, 2017

Closed in ea30b5a

mariapoveda closed this on Jun 12, 2017

Openly reported in GitHub issue tracker: new needs, bugs, etc.

- Ont. Devel.
- Users
- Experts

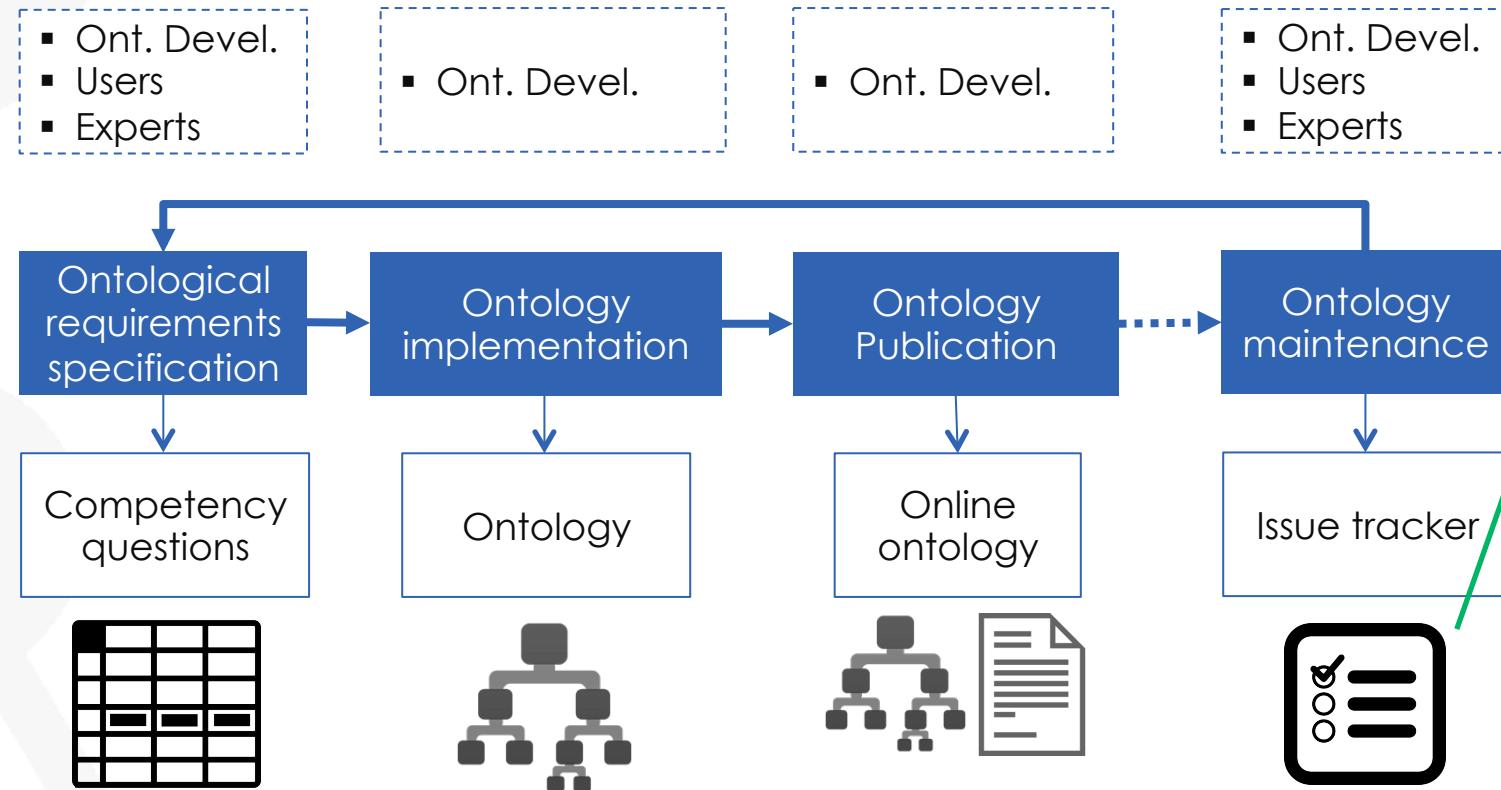
Clear current search query, filters, and sorts

3 Open ✓ 8 Closed

- ⚡ add a queueable attribute to action element #43 by sulfo4229 was closed 21 days ago
- ⚡ Erroneous domain definitions #38 by vcharpenay was closed on Jun 12, 2017
- ⚡ Interaction patterns cardinality #30 by mariapoveda was closed on Apr 25, 2017
- ⚡ Delete DigitalRepresentation #20 by mariapoveda was closed on Apr 5, 2017
- ⚡ WoT5 and relation with Thing #5 by mariapoveda was closed on Feb 16, 2017
- ⚡ WoT1 terminology doubt #4 by mariapoveda was closed on Mar 7, 2017
- ⚡ WoT15 #2 by mariapoveda was closed on Feb 16, 2017
- ⚡ WoT11 #1 by mariapoveda was closed on Feb 16, 2017

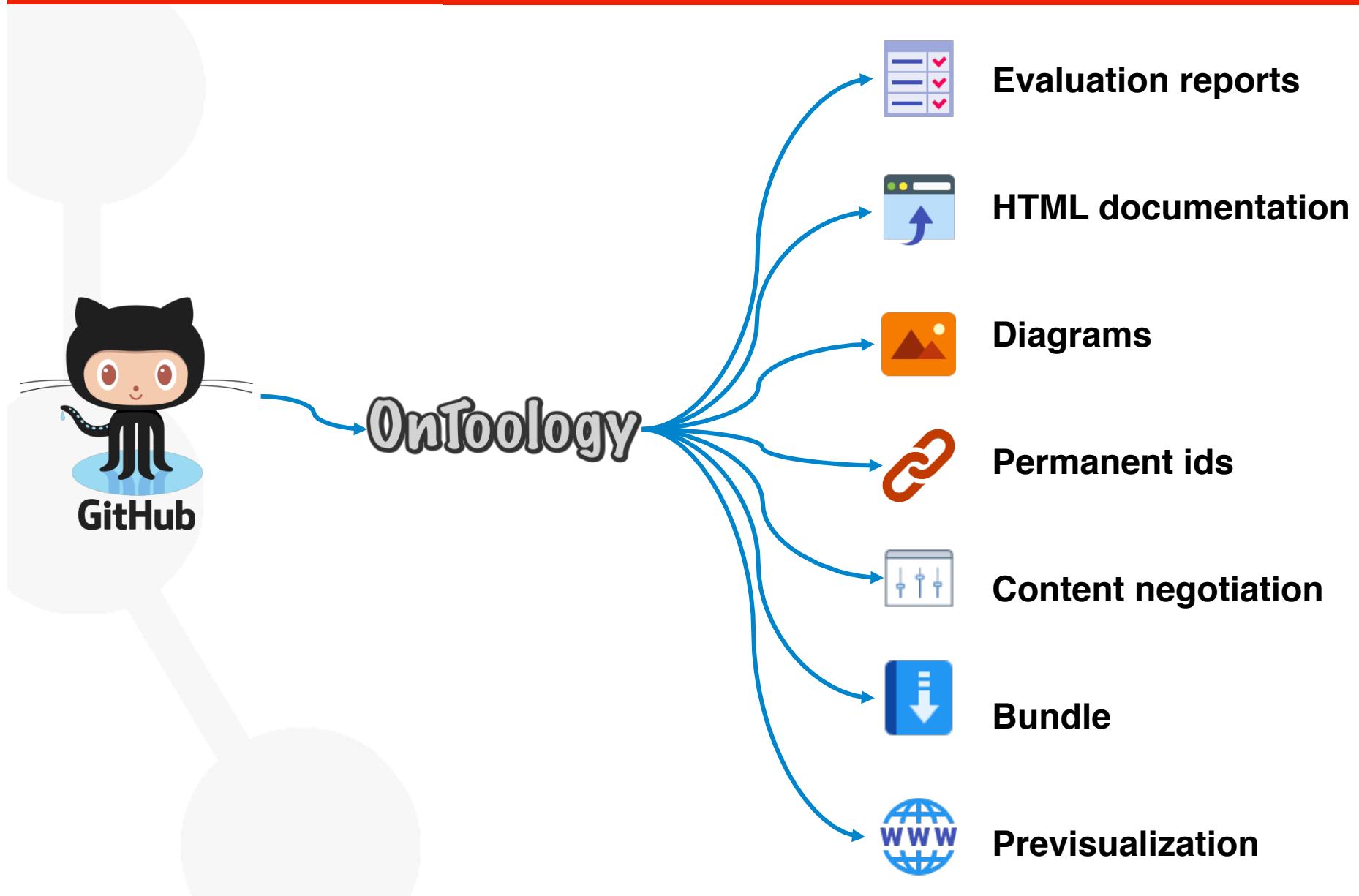
Ontology development process overview

Openly reported in
GitHub issue tracker:
new needs, bugs, etc.



Aiming at bringing all this together...

Technology support for this activity

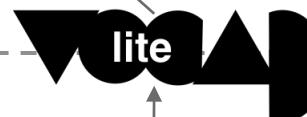


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 mariapoveda/saref-ext	Ready	100.0%	    	15-Nov-2017
 mariapoveda/vicinity-ontology-core	Ready	100.0%	   	21-Nov-2017
<hr/>				
Ontology	Diagrams	Evaluation	Documentation	Publish
ontology/core.ttl	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	 
tests/testsuite_ISOIEC30141.ttl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	 
tests/testsuite_SPRINT2.ttl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	 
Update Configuration				Stop Watching
 mariapoveda/vicinity-ontology-wot-mappings	Ready	syntax error in tests/testsuite_requirements.ttl	100.0%    	21-Nov-2017
 mariapoveda/wot-ontology	Ready	100.0%	   	20-Nov-2017
 mariapoveda/wot-thing-description	Ready	100.0%	   	27-Sep-2017
 mariapoveda/inia-ontology	Ready	100.0%	   	27-Nov-2017
 mariapoveda/vocab	Ready	100.0%	   	20-Nov-2017

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mariapoveda/saref-ext	Ready	100.0%							15-Nov-2017
mariapoveda/vicinity-ontology-c ore	Ready	100.0%							21-Nov-2017
Ontology			Diagrams	Evaluation	Documentation	Publish	Bundle		
ontology/core.ttl			<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
tests/testsuite_ISOIEC30141.ttl			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
tests/testsuite_SPRINT2.ttl			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
Update Configuration								Stop Watching	
mariapoveda/vicinity-ontology-wot-mappings	Ready	syntax error in tests/te stsuite_requirements.t tl	100.0%						21-Nov-2017
mariapoveda/wot-ontology	Ready		100.0%						20-Nov-2017
mariapoveda/wot-thing-descript ion	Ready		100.0%						27-Sep-2017
mariapoveda/inia-ontology	Ready		100.0%						27-Nov-2017
mariapoveda/vocab	Ready		100.0%						20-Nov-2017

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RDF files management by repository

Repository	Status	Last Update			
mariapoveda/vicinity-ontology-c_ore	Ready	15-Nov-2017			
ontology/core.ttl	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
tests/testsuite_ISOIEC30141.ttl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
tests/testsuite_SPRINT2.ttl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Update Configuration					
Stop Watching					
mariapoveda/vicinity-ontology-wot-mappings	Ready	syntax error in tests/testsuite_requirements.ttl	100.0%	<input type="checkbox"/>	<input type="checkbox"/>
mariapoveda/wot-ontology	Ready	100.0%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mariapoveda/wot-thing-description	Ready	100.0%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mariapoveda/inia-ontology	Ready	100.0%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mariapoveda/vocab	Ready	100.0%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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mariapoveda/vicinity-ontology-c ore	Ready	100.0%						21-Nov-2017
Ontology			Diagrams	Evaluation	Documentation			
ontology/core.ttl								
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tests/testsuite_SPRINT2.ttl								
			Update Configuration					Stop Watching
mariapoveda/vicinity-ontology- wot-mappings	Ready	syntax error in tests/te stsuite_requirements.t tl	100.0%					21-Nov-2017
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mariapoveda/wot-thing-descrip tion	Ready		100.0%					27-Sep-2017
mariapoveda/inia-ontology	Ready		100.0%					27-Nov-2017
mariapoveda/vocab	Ready							0-Nov-2017

Or when forcing the generation of resources

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Publish the ontology under a w3id URI

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mariapoveda/vicinity-ontology-c ore	Ready	100.0%		21-Nov-2017
Ontology	Diagrams	Evaluation	Documentation	
ontology/core.ttl	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
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tests/testsuite_SPRINT2.ttl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Update Configuration				Stop Watching
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mariapoveda/wot-ontology	Ready	100.0%		20-Nov-2017
mariapoveda/wot-thing-descript ion	Ready	100.0%		27-Sep-2017
mariapoveda/inia-ontology	Ready	100.0%		27-Nov-2017
mariapoveda/vocab	Ready	100.0%		20-Nov-2017

Or download the resources needed to publish it in your server

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In summary...

- Open data offers good opportunities to cities
 - For 3rd party reusers
 - For city officers
- But these efforts need to be taken seriously in order to make the most of it
- We need a principled approach to publish and exploit open data more effectively
 - Not only based on open formats and 5-star classifications
 - But also on **shared vocabularies and data structures**
 - Develop once, deploy everywhere

Next steps

- Continue improving technical infrastructure
 - Much of it available at <https://github.com/oeg-upm/>
- Create approx. 30 ontologies in the context of the “Ciudades Abiertas” (Open Cities) project



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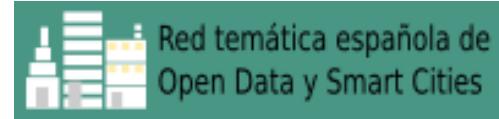
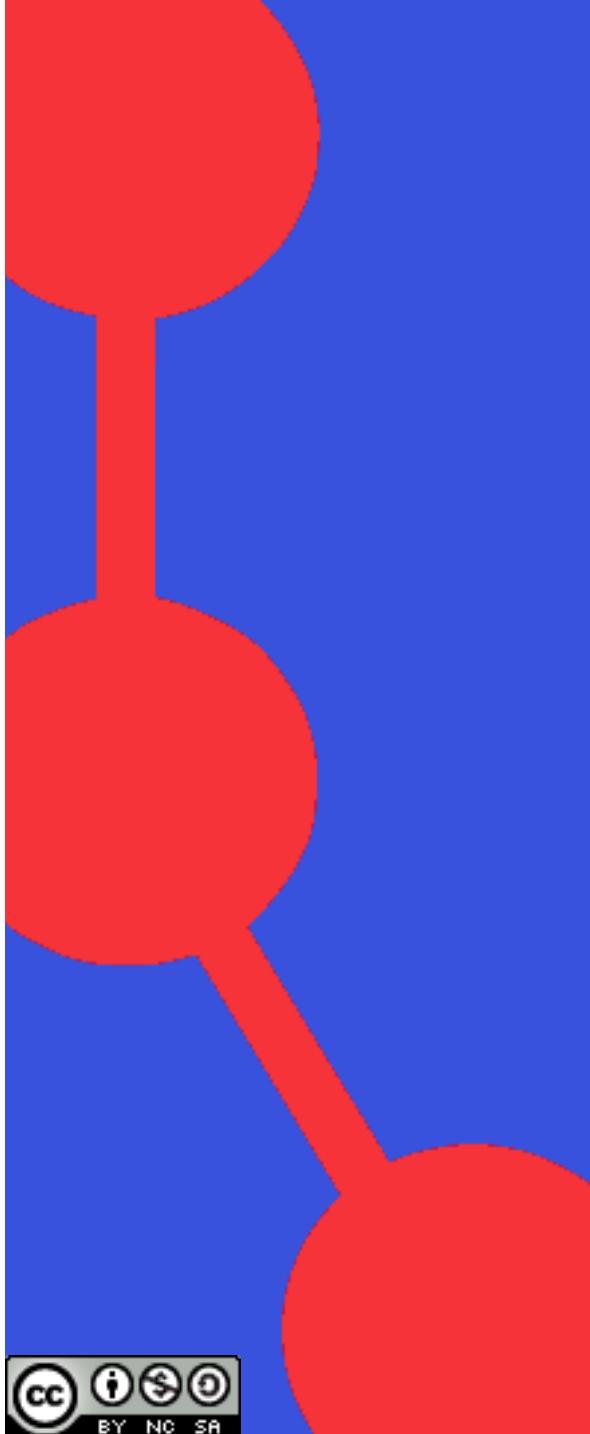


CONCELLO DE SANTIAGO



Zaragoza
AYUNTAMIENTO

- Create working groups for specific datasets with domain experts, users and ontology engineers
 - Similarly to what is being done with OpenContracting, Open311, etc.



Ontology Engineering at Scale for Open City Data Sharing

The 8th Joint International Semantic
Technology Conference (JIST2018)
Awaji City, Hyogo, Japan, 27/11/2018

*With contributions from María Poveda, Raúl García-Castro
and Paola Espinoza*

Oscar Corcho

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@ocorcho, @opencitydata_es

<https://www.slideshare.com/ocorcho>

