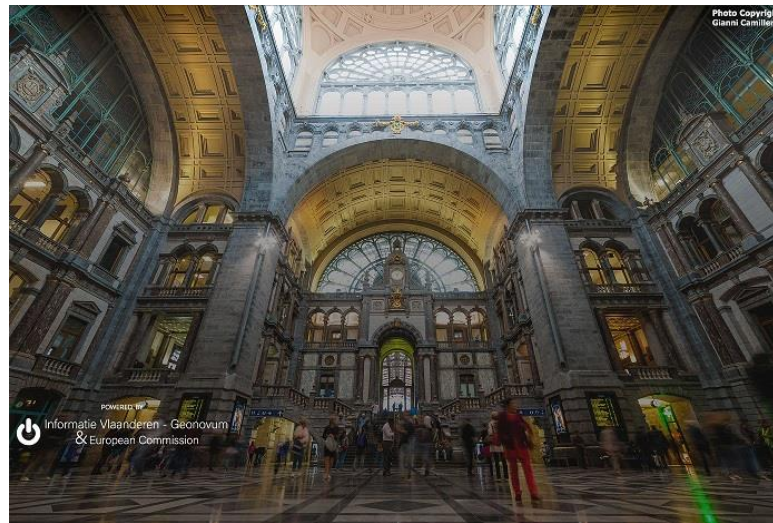




INSPIRE Conference 2018

Inspire Users: Make it work together



CNIG (IGN)
www.ign.es

An Experience of Transforming INSPIRE Compliant Data into Linked Data



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«All scents and sounds and colors meet as one»

Correspondences (Ch. Baudelaire, 1857)





❖ Summary

- **Justification and purpose**
- **Background and state of the art**
- **Methodology**
- **Results**
- **Conclusions**





❖ Justification and purpose

- **Linked data is the ongoing trend in the geospatial community**
 - ISO/TS 19150-1:2012 Geographic Information – Ontology – Part 1: Framework
 - ISO 19150-2:2015 Geographic Information – Ontology – Part 2: Rules for developing ontologies in OWL
 - ARE3NA activity for INSPIRE Linked Data
- **Data interoperable with heterogeneous data sources**
- **Transformation of spatial themes**
 - Assess technology requirements
 - Develop a methodological approach





❖ Background and state of the art

■ Resource Description Framework (RDF)

- Language by World Wide Web Consortium
- Standard for Semantic Web and Linked Data
- Capability of sharing vocabularies



■ GeoSPARQL

- Language for geospatial queries in RDF datasets
- Developed by OGC
- Some datastores for RDF triples are implementing this language





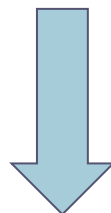
❖ Methodology

- Define between INSPIRE themes XML namespaces, and RDF ontology
 - Using ontology from ARE3NA activity
 - Implemented in RML language
 - Administrative Units and Geographical Names
- Software process to execute RML mapping
 - Over WFS datasets from CNIG
 - Generation of RDF triples
- Publish triples through a SPARQL endpoint
 - Parliament as datastore that supports GeoSPARQL
- Query another service (DBPedia) for linking INSPIRE data to external statistics





```
<wfs:member>
<au:AdministrativeUnit xmlns:au="http://inspire.ec.europa.eu/schemas/au/4.0" gml:id="AU_ADMINISTRATIVEUNIT_34053800000">
  <gml:identifier codeSpace="http://www.opengis.net/gml/3.2">379677</gml:identifier>
  <au:geometry>
    <!--Inlined geometry 'AU_ADMINISTRATIVEUNIT_34053800000_AU_GEOMETRY'-->
    <gml:MultiSurface gml:id="AU_ADMINISTRATIVEUNIT_34053800000_AU_GEOMETRY" srsName="urn:ogc:def:crs:EPSG::4258">
      <gml:surfaceMember>
        <gml:Polygon gml:id="GEOMETRY_9a81ce17-ec70-44aa-af15-6ce5ec44130d" srsName="urn:ogc:def:crs:EPSG::4258">
          <gml:exterior>
            <gml:LinearRing>
              <gml:posList>27.718804 -18.161140 27.718815 -18.161212 27.718841 -18.161261 27.718885 -18.161300 27.718940 -18.161310
                27.718987 -18.161272 27.718995 -18.161154 27.718986 -18.161089 27.718912 -18.161002 27.718883 -18.161002 27.718824
                -18.161085 27.718804 -18.161140</gml:posList>
            </gml:LinearRing>
          </gml:exterior>
        </gml:Polygon>
      </gml:surfaceMember>
    </gml:MultiSurface>
  </au:geometry>
</au:AdministrativeUnit>
```



GML to RDF translation from IGN WFS

```
<http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/ES.IGN.SIGLIM.34053800000> a <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit> ;
<http://inspire.ec.europa.eu/ont/au#AdministrativeUnit.geometry> <http://inspire.ec.europa.eu/ont/au#Geometry/ES.IGN.SIGLIM.34053800000> ;
<http://inspire.ec.europa.eu/ont/au#AdministrativeUnit.upperLevelUnit> <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/
ES.IGN.SIGLIM.34050000000> ;
<http://inspire.ec.europa.eu/ont/au#AdministrativeUnit.nationalCode> "34053800000" ;
<http://inspire.ec.europa.eu/ont/au#AdministrativeUnit.name> <http://inspire.ec.europa.eu/ont/gn#GeographicalName/
ES.IGN.SIGLIM.34053800000> ;
<http://inspire.ec.europa.eu/ont/au#AdministrativeUnit.lowerLevelUnit> <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/
ES.IGN.SIGLIM.34053838039> , <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/ES.IGN.SIGLIM.34053838035> , <
http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/ES.IGN.SIGLIM.34053838002> , <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/
ES.IGN.SIGLIM.34053838038> , <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/ES.IGN.SIGLIM.34053838052> , <
http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/ES.IGN.SIGLIM.34053838026> , <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/
ES.IGN.SIGLIM.34053838001> , <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/ES.IGN.SIGLIM.34053838031> , <
http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/ES.IGN.SIGLIM.34053838036> . <http://inspire.ec.europa.eu/ont/au#AdministrativeUnit/
```



Example Query

SELECT or CONSTRUCT query

```

PREFIX au: <http://inspire.ec.europa.eu/ont/au#>
PREFIX gn: <http://inspire.ec.europa.eu/ont/gn#>
PREFIX geo: <http://www.opengis.net/ont/geosparql#>
PREFIX geof: <http://www.opengis.net/def/function/geosparql/>
PREFIX geow3: <https://www.w3.org/2003/01/geo/wgs84_pos#>

SELECT ?label ?point ?population WHERE {

    ?province a au:AdministrativeUnit.
    ?province au:AdministrativeUnit.nationalLevel <http://inspire.ec.europa.eu
/codelist/AdministrativeHierarchyLevel/3rdOrder>.
    ?province au:AdministrativeUnit.name ?geoname.
    ?geoname gn:GeographicalName.spelling ?spelling.
    ?spelling gn:SpellingOfName.text "Sevilla".
    ?province au:AdministrativeUnit.geometry ?geometry.
    ?geometry geo:asGML ?gml.

    SERVICE <http://dbpedia.org/sparql> {
        SELECT ?label ?geow ?population WHERE{
            ?Concept rdf:type <http://dbpedia.org/class/yago/Municipality108626283>.
            ?Concept dbo:country dbr:Spain.
            ?Concept rdfs:label ?label.
            ?Concept <http://www.w3.org/2003/01/geo/wgs84_pos#geometry> ?geow.
            ?Concept dbo:populationTotal ?population.
            FILTER(lang(?label)='es').
        } LIMIT 10000
    }
    bind(STRDT(str(?geow), geo:wktLiteral) as ?point).
    FILTER geof:sfWithin(?point,?gml)
} ORDER BY ?label
    
```

If SELECT query, display as:

- HTML table
- Count only
- CSV

Cities contained within geometry of 3rd level AU “Seville”, with their corresponding location and population, extracting info from Dbpedia endpoint





Query result

label	point	population
"Alanís" @es	"POINT(-5.713611125946 38.037971496582)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"1858" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Algámitas" @es	"POINT(-5.1500000953674 37.016666412354)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"1363" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Aznalcázar" @es	"POINT(-6.2483334541321 37.299999237061)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"4260" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Aznalcázar" @es	"POINT(-6.2483334541321 37.305278778076)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"4260" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Aznalcázar" @es	"POINT(-6.25 37.299999237061)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"4260" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Aznalcázar" @es	"POINT(-6.25 37.305278778076)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"4260" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Aznalcóllar" @es	"POINT(-6.2666668891907 37.516666412354)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"6185" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Badolatosa" @es	"POINT(-4.6666665077209 37.299999237061)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"3198" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Benacazón" @es	"POINT(-6.1833333969116 37.349998474121)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"6431" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Bollullos de la Mitación" @es	"POINT(-6.1333332061768 37.333332061768)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"7084" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Bormujos" @es	"POINT(-6.066666030884 37.366664886475)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"15741" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Brenes" @es	"POINT(-5.8666667938232 37.549999237061)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"12737" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Camas" @es	"POINT(-6.0333333015442 37.400001525879)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"25706" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Cantillana" @es	"POINT(-5.8166666030884 37.599998474121)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"10463" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Carrión de los Céspedes" @es	"POINT(-6.3166666030884 37.366664886475)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"2487" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Casariche" @es	"POINT(-4.75 37.283332824707)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"5414" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Castilblanco de los Arroyos" @es	"POINT(-5.9833331108093 37.666667938232)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"4870" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Castilleja de Guzmán" @es	"POINT(-6.0500001907349 37.400001525879)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"2409" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>
"Castilleja del Campo" @es	"POINT(-6.2333334023701 37.283332824707)" ^^<http://www.opengis.net/ont/geosparql#wktLiteral>	"651" ^^<http://www.w3.org/2001/XMLSchema#nonNegativeInteger>





❖ Conclusions

- **Prototype pipeline for Linked Data publishing that can lead to a production environment**
- **Geographical Name and Administrative Units WFS from CNIG completely translated**
- **SPARQL Endpoint successfully connected to external service**





❖ Next steps 2018-2019

- Extend the process to the rest of INSPIRE themes
- Improve the endpoint performance
- Make links with DBPedia and geonames
- Links between INSPIRE themes (HY & GN, AU & TN...)
- Create a more usable interface





Thanks a lot for your attention!

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