

# Map4rdf - Faceted Browser for Geospatial Datasets

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**Abstract.** Recently we have seen a large increase in the amount of geospatial data that is being published using RDF and Linked Data principles. Efforts such as the W3C Geo XG, and most recently the GeoSPARQL initiative are providing the necessary vocabularies to publish this kind of information on the Web of Data. In this context it is necessary to develop applications that consume and take advantage of these geospatial datasets. In this paper we present map4rdf, a faceted browsing tool for exploring and visualizing RDF datasets enhanced with geospatial information.

**Key words:** Linked Open Data, RDF Dataset, Geospatial

## 1 Introduction and Motivation

Electronic Government (e-Gov) is an important application field [2] for the transformations that governments are undergoing and will continue to undergo in the following decades. Moreover, currently there is a trend to transform the e-Gov into the e-Governance<sup>3</sup>, by means of opening government data to the public.

Open Government Data initiatives across the world are making large amounts of raw governmental data available to the public on the Web. Opening this data to citizens enables transparency, delivers more public services, and encourages greater public and commercial use and re-use of governmental information. Some governments have even created catalogs or portals, such as the United States<sup>4</sup> and the United Kingdom<sup>5</sup> governments, to make it easy for the public to find and use this data [4], which are available in a range of formats, e.g., spreadsheets,

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<sup>3</sup>e-Governance is the application of Information and Communication Technology (ICT) for delivering government Services, exchange of information communication transactions, integration various stand-one systems and services between Government-to-citizens (G2C), Government-to-Business (G2B), Government-to-Government (G2G) as well as back office processes and interactions within the entire government framework [2].

<sup>4</sup><http://www.data.gov/>

<sup>5</sup><http://data.gov.uk/>

relational database dumps, RDF; and span through a wide range of domains, e.g., geospatial, statistics, transport. In this context, the application of Linked Data principles to government datasets brings enormous potential.

So far, Linked Data principles and practices are being adopted by an increasing number of data providers, getting as result a global data space on the Web containing hundreds of LOD datasets [1]. Moreover, the amount of data with an inherent spatial context is also increasing. Currently, publishers that deliver RDF datasets, that include geospatial information, rely on available vocabularies such as GeoSPARQL Ontology<sup>6</sup>, NeoGeo Vocabulary<sup>7</sup>, and Basic Geo Vocabulary<sup>8</sup> among others for modelling the geospatial information. Therefore, we can assume that geospatial information is also present in most of the government linked datasets.

The final goal of opening government data (legacy data, streaming data, and services), is to enable transparency, deliver more public applications, and encourage public and commercial use and re-use of the governmental information. Therefore, we have to develop applications on top of the Linked Open Government Data that exploit these data and provide rich graphical user interfaces to the citizens [3].

In this paper we introduce map4rdf<sup>9</sup>, a faceted browsing tool for exploring and visualizing RDF datasets enhanced with geospatial information. Section 2 presents an overview of the architecture, the main functionalities, and section 3 describes the conclusions and future work.

## 2 Map4rdf Overview

In this section we provide a high level overview of map4rdf and its main functionalities. Figure 1 depicts the main components of map4rdf.

In a nutshell the *DAO component* connects to a given *triplestore* through the *SPARQL endpoint* for retrieving the facets. Then, the *faceted browsing interface* gets the list of facets and visualizes them. Next, the user selects a particular facet, and the *DAO component* queries the *triplestore*, always through the *SPARQL endpoint*, for getting the instances of the selected facet including the geospatial information for each instance. The *faceted browsing interface* gathers all this information and provides a nice map-based visualization.

Currently, map4rdf works with OpenLayers library<sup>10</sup>, and supports Google Maps<sup>11</sup> and OpenStreetMap<sup>12</sup>. Moreover, the tool supports simple geospatial features, i.e., points with latitude and longitude. The geospatial aspects of the data can be modelled using either the data model from W3C Geo XG<sup>13</sup> or the

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<sup>6</sup><http://oor-01.cim3.net/ontologies/10010>

<sup>7</sup><http://geovocab.org/doc/neogeo/>

<sup>8</sup><http://www.w3.org/2003/01/geo/>

<sup>9</sup><http://www.oeg-upm.net/index.php/en/technologies/172-map4rdf>

<sup>10</sup><http://openlayers.org/>

<sup>11</sup><https://developers.google.com/maps/>

<sup>12</sup><http://www.openstreetmap.org/>

<sup>13</sup><http://www.w3.org/2003/01/geo/>

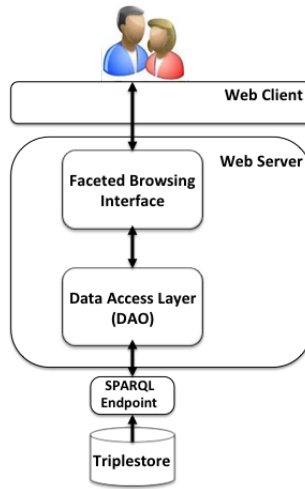


Fig. 1. map4rdf high level overview

geometrical data model proposed by GeoLinkedData<sup>14</sup>. Figure 2 presents the graphical user interface of the application, in which we have selected a particular facet, Airport, and we have selected a particular instance, Murcia Airport.

Next, we summarize the main features of map4rdf

- Faceted browser interface.

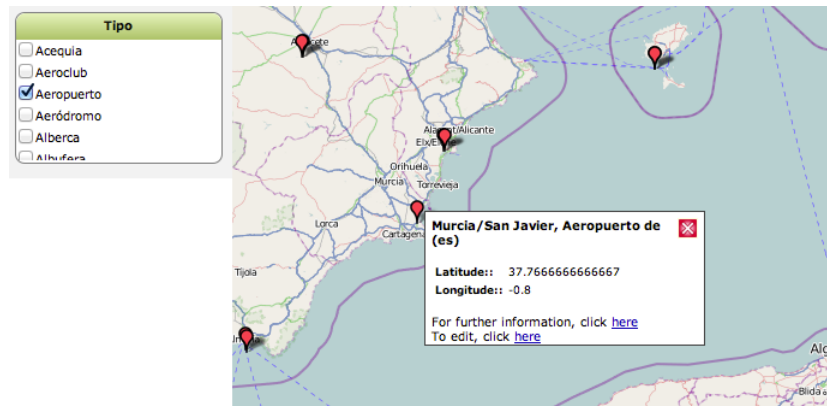


Fig. 2. map4rdf graphical user interface

<sup>14</sup><http://geo.linkeddata.es/web/guest/modelos>

- Geospatial and geometrical visualization using Google Maps and OpenStreetMap.
- Visualization of geometries (LineStrings, Polygons, etc.) when using the GeoLinkedData data model.
- Visualization of statistical data using SCOVO<sup>15</sup>, currently we are including RDF Data Cube<sup>16</sup>.
- Editing and storing displayed data in RDF data format.
- Query Filtering.
- Easy configuration via admin panel or configuration file.

### 3 Conclusions and Future Work

As we mentioned before, the final goal of opening government data is to enable transparency, deliver more public applications, and encourage public and commercial use and re-use of the governmental information. Therefore, we have to develop applications on top of the Linked Open Government Data that exploit these data and provide rich graphical user interfaces to the citizens. In this paper we have presented our faceted browser for geospatial datasets, map4rdf.

It is worth mentioning that our tool has been used and extended within several Linked Data initiatives, for instance (1) GeoLinkedData<sup>17</sup> that aims to enrich the Web of Data with Spanish geospatial data; (2) El Viajero<sup>18</sup>, an application for exploiting, managing and organizing Linked Data in the domain of news and blogs about traveling; and (3) AEMET meteorological dataset<sup>19</sup>, which makes available some data sources from the *Agencia Estatal de Meteorología* (AEMET, Spanish Meteorological Office) as Linked Data.

As future work we plan to extend the tool to include multiple SPARQL endpoints, and release a mobile version.

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<sup>15</sup>[purl.org/NET/scovo](http://purl.org/NET/scovo)

<sup>16</sup><http://www.w3.org/TR/vocab-data-cube/>

<sup>17</sup>[geo.linkeddata.es/](http://geo.linkeddata.es/)

<sup>18</sup><http://webenemasuno.linkeddata.es/>

<sup>19</sup><http://aemet.linkeddata.es/>

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