LodLive, exploring the Web of Data

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ABSTRACT

LodLive project, http://en.lodlive.it/, provides a demonstration of the use of Linked Data standard (RDF, SPARQL) to browse RDF resources. The application aims to spread linked data principles with a simple and friendly interface and reusable techniques. In this report we present an overview of the potential of *LodLive*, mentioning tools and methodologies that were used to create it.

Categories and Subject Descriptors

E.1 **[Data Structures]**: Distributed data structures – Graphs and networks

E.2 **[Data Storage Representations]**: Linked representations – Object representation

General Terms

Management, Documentation, Design, Experimentation, Standardization, Theory, Verification.

Keywords

Linked Open Data, RDF, SPARQL, graph, visualization.

1. INTRODUCTION

In the last years there have been a lot of linked data projects and hundreds of thousands triples have been stored in *triplestores*, but on the other hand it's difficult to find visualization and browsing tools really based on RDF standards and able to demonstrate the effectiveness of these standards.
We developed *LodLive* in order to:

- browse RDF resources using a dynamic visual graph
- link resources stored in different endpoints, discovering unexpected connections
- browse inverse relations even between different endpoints
- spread linked data standards and principles
- offer a tool which is ready "out of the box" and easy for anyone to use
- collect and show images linked in the browsed resources
- show browsed resources on a map

LodLive may be a useful tool to explain and spread Web of Data principles. It can also be used to verify the consistency and efficacy of ontology descriptions and the integrity of the URIs.

2. ABOUT LODLIVE

At this time *LodLive* presents fifteen different "ready to use" SPARQL endpoints; you can add or remove endpoints from the configuration JSON map, you can also customize the interface changing the "look and feel" and increase navigation efficiency throughout the data by specifying the most appropriate SPARQL queries for the datasets you want to explore. LodLive is able to guide you through different endpoints if you configure any that contain resources connected by *owl:sameAs* properties. During the navigations *LodLive* collects the images provided by the opened resources showing them in a gallery. It also collects the geospatial information and shows them on a map.

LodLive, using the Sesame Framework, can parse RDF resources even if they are not stored in a SPARQL endpoint. In that case *LodLive* generates a graph on the fly storing the requested resource temporarily and makes queries on it. The generated endpoint contains just one resource so *LodLive* is not able to calculate inverse relations but can anyway show Data Properties like titles, dates or descriptions. It can also show object properties so the user who is browsing may continue "jumping" to other resources one by one.

The basic idea underlying *LodLive* is to prove that resources published according to the W3C standards for semantic web are easy to reach and understand. We hope that the *LodLive* approach can stimulate Public Administrations and big data owners to add their resources to the LOD and share them.

After some experimentation we noticed that *LodLive* can be used as an RDF/ontology checker very helpful in the early phases of ontology definition, the graphical representation of a semantic *Graph* being the best way to prove the goodness of a RDF schema and to chose "visually" between different solutions. *LodLive* doesn't provide any specific validation tools but it makes the user able to literally "visualize" an ontology and evaluate the goodness of the representation choices he has made by checking *Classes* and *Properties*.

The main innovation of *LodLive* is the capacity to browse a SPARQL endpoint directly by using a JavaScript application layer without any application Server being needed. *LodLive* simply makes JSONP calls to the configured endpoints retrieving results serialized in the JSON format, then parses them in JavaScript and represents the resources and their properties in an HTML5 web page. This new way of browsing resources wants to demonstrate the importance of the use of SPARQL endpoints (because of their capacity to show inverse relations as well as direct) and encourage

the use of triplestore to improve federated queries, showing that Linked Open Data are superior to (just) Open Data.

You can start your navigation querying the endpoint for a specific resource or start from one of the provided URI examples, then you can follow the direct and inverse connections provided by the resource moving freely from one "circle" to another. Every new pop-open resource will guide the user to those relating to it, automatically connecting the new "circle" to the ones they have already opened. A big circle represents a *class* identified by a color and a label, the small circles surrounding it represent the object properties: the full ones represent *direct relations*, the empty ones represent *inverse relations,* the black ones represent *owl:sameAs* properties. When you on a small circle a new big circle is opened and labeled lines are automatically drowned between any connected opened resources. Every time an *owl:sameAs* property is reached throughout the course of navigation, *LodLive* will connect to the related endpoint, enabling the user to move to the new available resources within the same navigation environment thus showing the user the potential of the LOD cloud.

LodLive is able to discriminate *Datatype Properties* from *Object Properties* and web URLs, images and even geographical chords among these, presenting them in a descriptive area, in a gallery and in a map. *LodLive,* making further queries, will also show *Blank Nodes* inner values in the descriptive area.

LodLive is licensed under the MIT license, and it can be used skipping the home page to access its graphic navigation module by simply adding the URI of the needed resource after a ? (question mark) in the URL of the application, which makes it easy to re-use by linking and adding it on other web sites or applications.

LodLive is composed of:

- a jQuery plug-in (named LodLive-core)
- a JSON configuration map (named LodLive-profile)
- an HTML5 page
- some images (sprites)
- some other jQuery public plugins

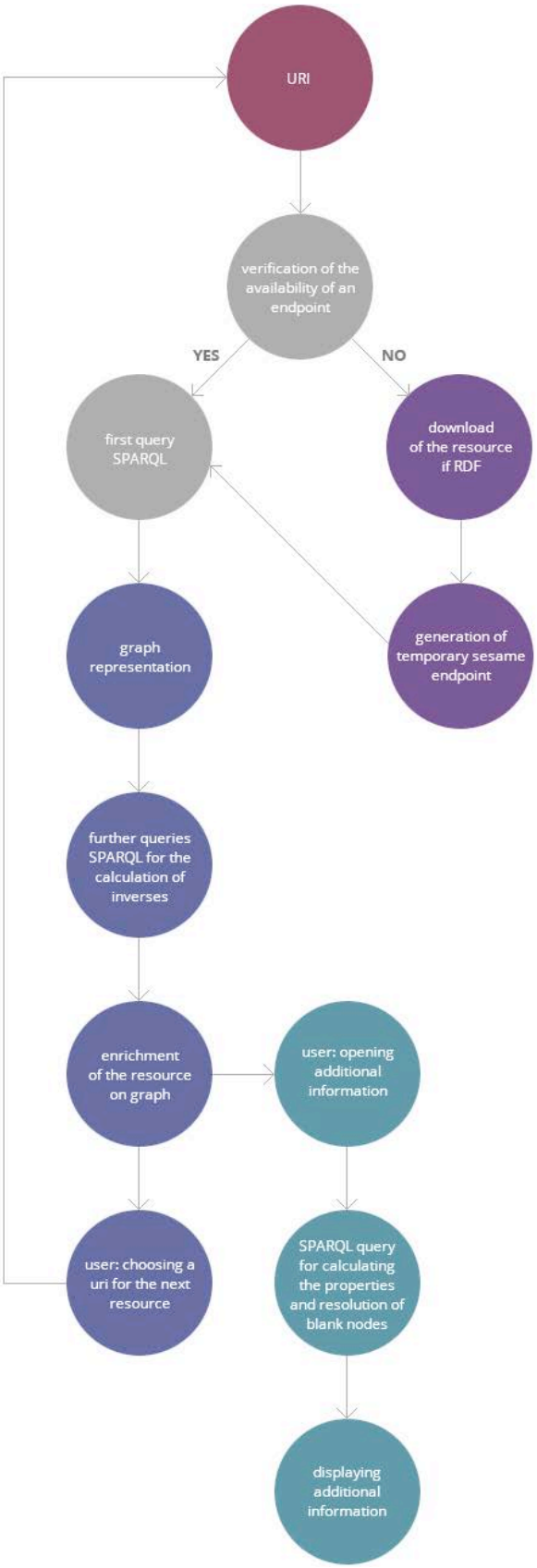

Figure 1 - LodLive working schema

3. USING LODLIVE STEP BY STEP

3.1 choosing a URI

First of all, choose a URI using the provided tools or call the *LodLive* URL adding ?http://your-resource.com/id. Using the endpoint access panel you can make simple queries on the datasets, choosing a *Class* and adding some keyword. You can even choose among some preconfigured example URI's or add you own new ones.

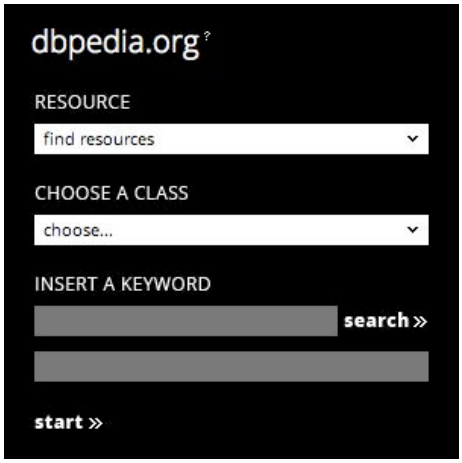

Figure 2 - single endpoint access panel

3.2 showing resources

LodLive makes his first JSONP call and represents the requested resource on a circle surrounded by many smaller ones (*Object Properties*). The smaller circles are divided in different colors and shapes to suggest the type of relation. The "flowers" represent a group of identical relation and, if clicked, they will "explode" into more small circles. The colored circles are *direct relations* and the white ones are *inverse relations*. The circles and the "flowers" marked with a small "s" letter are *owl:sameAs* properties.

Figure 3 - a resource (big circle) and his object properties (small circles and "flowers")

3.3 browsing datatype properties

You can access to the *Dataype Properties* of a resource clicking on the "additional information" button ☰ located on the resource circle. A panel on the right will be shown containing the requested information even if they are stored in *Blank Nodes*.

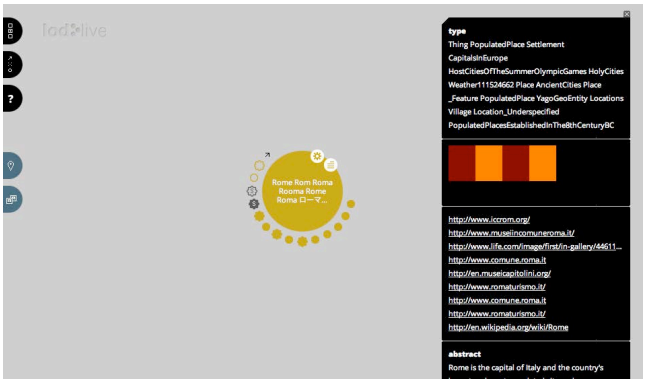

Figure 4 - additional information right panel

3.4 browsing object properties

You can expand *Object Properties* and open other circles representing more resources. Every new resource will be connected to the others through arrows. Every arrow represent the "direction" of the relation and is labeled with the name of the property. Sometimes one or more properties connect the same resources so more than one label can happen to be shown on the arrows.

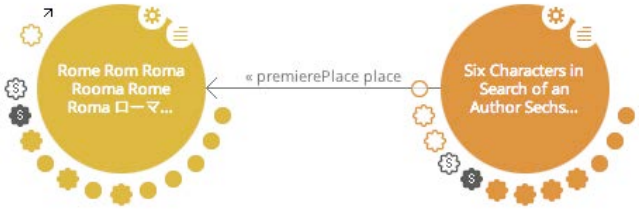

Figure 5 - two connected resources

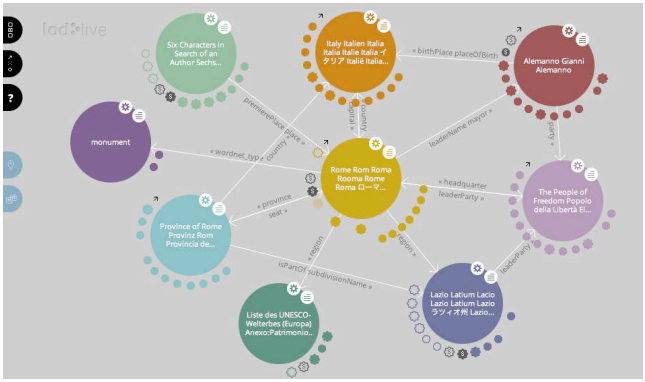

Figure 6 - some "exploded" *Object Properties* connecting different resources

3.5 view images

You can see all the images collected from the opened resources by clicking on the "images button" located on a separate panel on the left of the page. Every time you open a resource *LodLive* analyzes his properties by filtering the images, then it adds the collected images on a panel, skipping the ones that are not currently available.

Figure 6 - left image gallery panel

3.6 geolocalizing resources

By clicking on the "map button" located on the left of the page you'll open the map panel and see where the resources are located across the world. *LodLive* collects the properties it recognizes as geographical chords during the resource browsing and shows them on a map.

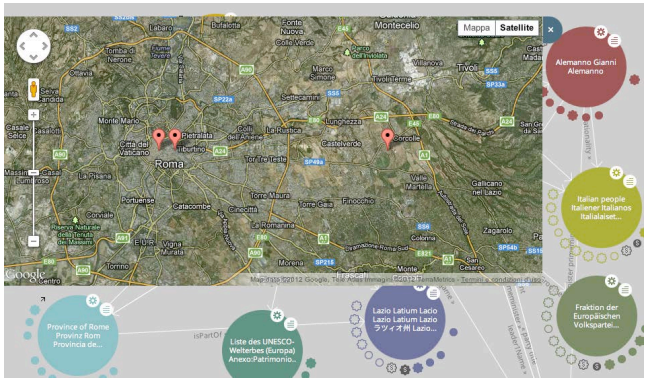

Figure 7 - left map panel

4. REFERENCES

[1] Alexander, K., Cyganiak, R., Hausenblas, M., Zhao, J. (2009). *Describing Linked Datasets*. Proceedings of the 2nd Workshop on Linked Data on the Web (LDOW2009).

[2] Auer, S., et al. (2009). *Triplify – Light-Weight Linked Data Publication from Relational Databases*. Proceedings of the 18th World Wide Web Conference (WWW2009).

[3] Berners-Lee,T., *Linked Data - Design Issues*, 2006, http://www.w3.org/DesignIssues/LinkedData.html

[4] Beckett, D. (2004). *RDF/XML Syntax Specification* (Revised) - W3C Recommendation. http://www.w3.org/TR/rdf-syntax-grammar/

[5] Cyganiak, R., Bizer, C. (2008). *Pubby - A Linked Data Frontend for SPARQL Endpoints*. http://www4.wiwiss.fu-berlin.de/pubby/

[6] Heath, T., Bizer, C. (2011) *Linked Data: Evolving the Web into a Global Data Space* (1st edition). Synthesis Lectures on the Semantic Web: Theory and Technology, 1:1, 1-136. Morgan & Claypool.

[7] Heath, T., Hepp, M., and Bizer, C. (eds.). Special Issue on Linked Data, International Journal on Semantic Web and Information Systems (IJSWIS). http://linkeddata.org/docs/ijswis-special-issue

[8] McGuinness, D., van Harmelen, F. (2004). *OWL Web Ontology Language* - W3C Recommendation. http://www.w3.org/TR/owl-features/

[9] Prud'hommeaux, E., Seaborne, A., *SPARQL Query Language for RDF*, http://www.w3.org/TR/2004/WD-rdf-sparql-query-20041012/

[10] Quilitz, B., Leser, U. (2008). *Querying distributed RDF data sources with SPARQL*. Proceedings of the 5th European Semantic Web Conference (ESWC2008).

[11] Sauermann, L., Cyganiak, R. (2008): Cool URIs for the Semantic Web. W3C Interest Group Note. http://www.w3.org/TR/cooluris/