

# The simple, Web-based tool for visualization and sharing of semantic data and ontologies

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**Abstract.** We present a live demo of a practical, easy-to-use Web tool for quick visualization of RDF datasets and OWL ontologies and for sharing the visualized graphs with others over the Internet. We demonstrate the approach for automatic generation of interactive diagrams based on data provided by a user and a set of tools for diagram modification as well as for diagram publication and sharing. For user data handling we used Apache Jena that provides API to RDF and OWL raw data. For data visualization we applied combination of D3 and JointJS libraries. The diagrams created in our service can be embedded in any user Web site and access to them can be issued to a particular email address. Our work can be reached at: [www.ontodia.org](http://www.ontodia.org)

**Keywords:** semantic data visualization, semantic data diagram, RDF dataset visualization, ontology visualization.

## 1 Introduction

This submitted demo is the initial result of our vision of a Web-based visual ontology authoring tool. The motivation behind the idea is derived from our experience. We have faced the absence of an effective and quick solution for data visualization that could be able to present an ontology to our customer.

In general, ontology visualization plays a great role in presenting the research results achieved with the use of semantic data to the unprepared audience and drives Open Science movement but the tools for this task in most cases require a certain level of technical experience. Ontodia, even in its present state, bridges this gap by establishing a vivid connection between the contents of the ontology and its visualization. Leveraging such a connection the user can build numerous views or diagrams to present the ontology data from different viewpoints. The views are formed by SPARQL-query filters. We are planning to implement a two-way editing mechanism between our graphical user interface and the ontology allowing one to change the content of the ontology directly from the user

interface by editing respective graphical entities. The user actions then will be interpreted into SPARQL update queries and executed over the data. This approach tremendously broadens the access to Semantic Web and semantic technologies for a wide range of users and domain experts and has a potential to become a standard for working with ontologies presented as interactive graphs.

The diagram and data source sharing features lay the foundation for collaborative work enabling multiple users to construct the views based on common data together and in future elaborate the contents of ontology in group working sessions.

The customizable visualization templates (diversity of shapes, colors and types of graphics: images, animations and so on) assigned to classes and groups of instances, which is being realized at this moment, should unleash the creation of rich and unique user environments suited best for easier knowledge consumption and propagation.

As for current usage, Ontodia is included in the set of tools at Information Science and Semantic Technologies Lab of ITMO University and its researchers use it for data visualization in their projects. Also Ontodia was put on trial during ESWC 2015 Conference when it was offered as a service at the Minute Madness session. Also CIDOC-CRM community evaluated the service and invited the Ontodia team to speak at the 34th joint meeting of CIDOC-CRM SIG on Crete this year. The feedback acquired from these sources revealed a strong demand for the easy-to-use and programming-free visualization tool for ontologies and semantic datasets. It encourages us to improve the tool further.

## 2 Related work

For the purpose of short evaluation of our service we compare Ontodia with two other widespread tools: WebProtege and TopBraid Composer.

### *Brief Comparison with WebProtege*

WebProtege is a Web-based service [2], and it is designed for semantic data authoring and ontology construction. WebProtege is focused only on data authoring tasks and provides only the class tree view while not allowing the user to see the relations between instances on the graph. On the contrary, Ontodia can illustrate the co-relations between Classes, Properties, Instances enabling both visual data exploration and visual data model discovery.

### *Brief comparison with TopBraid Composer*

The second most acknowledged tool for working with semantic data and ontologies is TopBraid Composer. TopBraid Composer full version is sold for \$3000, while Ontodia is a free service and it could be a decisive factor for researchers. Composer, similar to WebProtege, is designed mainly for ontology editing and its visualization being a side feature is not particularly convenient to use for simple tasks for a number of reasons. Moreover TopBraid exists in Eclipse environment [1], which is not comfortable for non-programmers, while Ontodia is deliberately designed for the users that do not programme. Sharing in TopBraid is possible

only on the level of TopBraid project - to modify shared diagram one needs to install another instance of TopBraid.

### **3 Features of the End-user Applications**

The use-case for our service naturally can be divided into 3 simple steps discussed in details below.

1. Uploading user files or configuring SPARQL endpoint for data acquisition.
2. Modifying diagrams and preparing them for publication.
3. Saving and sharing diagrams.

#### **3.1 Uploading user files or configuring SPARQL endpoint for data acquisition**

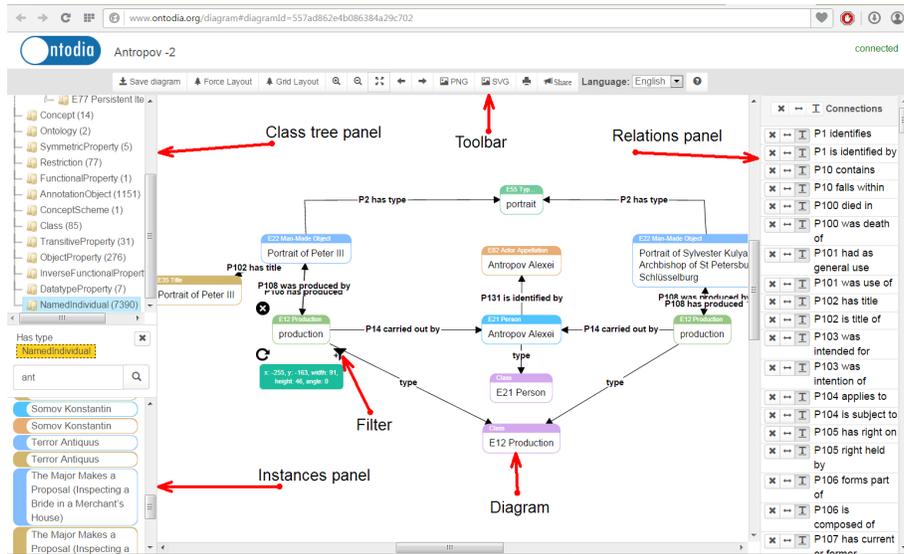
The user can upload one or several files of the following types: Turtle, RDF/XML, N-Triples, JSON-LD, RDF/JSON, TriG, N-Quads, TriX, RDF Thrift. The other option is to set up a SPARQL endpoint connection by providing its URL and access credentials. For both options users may additionally specify the SPARQL-queries that limit the entities to certain classes or restrict the visualization to some specific object properties. The support of both file uploads and SPARQL-endpoint connection provides the flexibility for the user during the setup process of data sources for visualization and at the same time does not require him to write lines of code.

#### **3.2 Modifying diagrams and preparing them for publication**

Once the data source is configured the user can generate a diagram based on it. Ontodia strives to employ the intuitive approaches to UX, so that a diagram supports the drag-and-drop feature allowing users to move the items from instances panel directly to the diagram canvas and then arrange them to fit their needs - see Fig. 1. Also we made an effort to provide users with enough awareness about the data he is working with - Ontodia allows two ways of navigating through datasets: either by exploring the class tree and instances panel or by using the filter icon located beside each diagram node - clicking it filters out all the items related to the selected diagram node into the instances panel. Auto-layout buttons (grid and force layout) exempts a user from manual arrangement of a large number of elements.

#### **3.3 Saving and sharing diagrams and data sources**

Ontodia offers sharing of data sources and diagrams with other users. Sharing is implemented similar to Google Drive functionality. The access is granted to a user with a certain email either to appoint him the owner with the full editing control or the viewer who is only able to see the diagram. The last sharing



**Fig. 1.** The screenshot of diagramming user interface - a part of CIDOC-CRM ontology

option is to publish the diagram on the Web with the unique URL, which is an equivalent to giving the viewing rights to anyone with the link. The user can download the diagram in SVG or PNG file at any time or print it out from the Web browser. Any created diagram can be embedded into a user's site with the use of Ontodia API, instructions for which are thoroughly provided at: <http://www.ontodia.org/embed>

#### 4 Future work

At the moment, Ontodia carries the features of data visualization and sharing. It does not include any capabilities of data modification. Our plans in future is to open the source codes for our Web service and to develop by joint effort of the Semantic Web community an open source on-line visual data authoring tool that requires no programming skills from a user and supports collaborative work.

#### References

1. García-Peñalvo, F.J., Colomo-Palacios, R., García, J., Therón, R.: Towards an ontology modeling tool. a validation in software engineering scenarios. *Expert Systems with Applications* 39(13), 11468–11478 (2012)
2. Tudorache, T., Nyulas, C., Noy, N.F., Musen, M.A.: Webprotégé: A collaborative ontology editor and knowledge acquisition tool for the web. *Semantic web* 4(1), 89 (2013)