Semantic Tool Hub: Towards A Sustainable Community-Driven Documentation of Semantic Web Tools

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Abstract. The semantic web community has developed and still is developing a tremendous number of tools and software. While the activity underlines the continuous importance of the field and the commitment of its members, it also poses a challenge, especially for people entering the field. It is increasingly hard to identify the right tools for one's use case. A lot of software is no longer actively maintained, and going through all publications and source repositories to find the software with the right set of functions is tedious. In this poster, we propose a workflow and an initial Wikidata-based toolkit to support knowledge engineers and developers in documenting and finding the right tools. We categorized existing tools into a pre-defined taxonomy and integrated them with GitHub metadata about their recent developments when applicable. The condensed information with the new taxonomy is integrated into Wikidata, ready for further use.

Keywords: Semantic Web, Knowledge Graph, Software, Tools

1 Introduction

From 2010 to 2023, more than 2,400 papers were presented and published alone at the Extended and International Semantic Web Conferences (e.g., ESWC and ISWC). Moreover, there are many more additional journals, conferences, and workshops (e.g., SWJ, KEOD, LDAC). We develop countless knowledge graph construction, querying, and storing approaches, often supported by or implemented in software. While that is, in some respect, a sign of a healthy research community, it also poses a challenge, especially for people entering the field.

Currently, documenting and searching for the right Semantic Web (SW) software for a given practical problem is tedious: (1.) There is no common repository for documenting SW software (for example, similar to LOV for vocabularies) and relevant information is scattered throughout the various research outlets. (2.) There is no standardized semantics and taxonomy to describe the SW tools. Additionally, many tools and frameworks cover more than one element of the

knowledge graph (KG) development toolchain. For example, Apache Jena is mainly regarded as a Java framework. However, it also integrates a triple store with a reasoning engine and allows the validation of incoming data for conformance based on SHACL shapes.

Many SW researchers and practitioners acknowledge these challenges and try to address them in many forms. The Awesome Semantic Web initiative[4] provides a GitHub repository to collect and report SW-tools. The page contains more than 100 software tools related to SW. However, it contains many outdated software and does not provide information beyond categories and descriptions. A recent technical report from the OntoCommons [1] contains a collection of tools metadata, including description, homepage, code repository, documentation page, and related publications from more than 60 tools based on a survey. The report, however, is only available as a PDF and not as a machine-readable resource. Existing Knowledge Graphs, such as Wikidata and DBPedia, contain information about traditional and popular software, such as Protégé [5]. However, these pages typically are typically missing for newer or less popular software –albeit potentially of similar or higher importance– such as Chowlk [2] for ontology creation or Widoco [3] for ontology documentation. Furthermore, there is currently no dedicated visualization page to render their sub-graphs on SW software.

The Semantic Tool Hub targets to ease these challenges: it aims to bring the scattered knowledge on the SW software tools into Wikidata –an open and community-driven Knowledge Graph– according to a predefined taxonomy representing the semantic artifact development process. The data is further enriched with metadata from their GitHub repositories (if applicable) to identify recent activity. In the rest of the paper, we will describe the proposed methodology and our initial toolkit to support the documentation and retrieval process of the SW software centered around Wikidata.

2 The Semantic Tool Hub

The main idea behind the Semantic Tool Hub is to develop a Wikidata-based solution towards a sustainable community-driven documentation and retrieval of SW-tools. In this work, we defined our scope only to include tools that specifically target RDF-based technologies. To this end, we propose a workflow (cf. Fig. 1) consisting of the following steps:

Taxonomy Development. At the beginning of our research, we realized there is a strong need for a solid categorization of the tool. To this end, we combine the existing categorization tool from OntoCommons report [1] and the semantic web lifecycle [4] to develop our SW software taxonomy, shown in Fig. 2.

[4] `https://github.com/semantalytics/awesome-semantic-web`

[5] `https://dbpedia.org/page/Protege_(software)`; `https://www.wikidata.org/wiki/Q2066865`

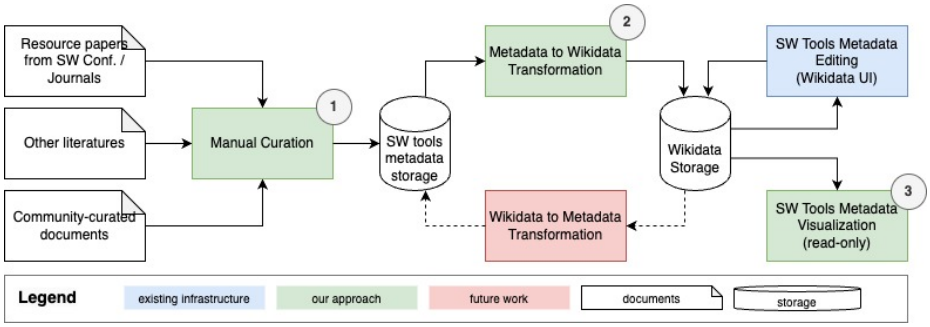

Fig. 1. The Semantic Tool Hub Workflow

Step 1. Manual Data Curation. Next, we collected and manually curated existing literature, both from scientific communities (e.g., SW conferences and journals) and other sources (e.g., awesome SW initiative) to gather metadata about tools. The goal of this step was to ensure the distributed information about software tools that are currently scattered among different sources can be collected and structured according to the taxonomy developed previously.

Our initial prototype collects data from three main sources: (i) recent ISWC/ESWC conferences, (ii) awesome SW initiative, and (iii) OntoCommons report. In total, we have collected almost 150 tools annotated with metadata, including their categorizations. The original annotation information is available as a spreadsheet file[6].

Step 2. Metadata to Wikidata Transformation. We decided to use Wikidata as part of our solution approach due to the flexibility, machine-readability, and the nature of crowdsourcing nature of the Wikidata content development. We believe that our decision will allow for a wider involvement of the community in documenting the available SW-tools. Furthermore, it facilitates users with an easy access for retrieving and searching for suitable SW-tools.

We are currently utilising Open Refine[7] and Wikipedia Quickstatements[8] to transform our spreadsheet data into RDF triples suitable for Wikidata.

Step 3. SW Tools Metadata Visualization Wikidata contains a large collection of knowledge on various topics and granularity, which makes it hard for users to browse for relevant information on specific topics quickly. Therefore, to help users quickly search for information about specific tools, a specific interface is needed.

In the context of this paper, we have developed a webpage[9] to visualize and search/retrieve the knowledge that we have developed to help users in searching and finding information about SW tools (cf. Fig. 2 bottom).

[6] `https://github.com/semantic-tool-hub/SW-Tool-Hub-data`
[7] `https://openrefine.org/`
[8] `https://github.com/magnusmanske/quickstatements`
[9] `https://semantic-tool-hub.github.io/`

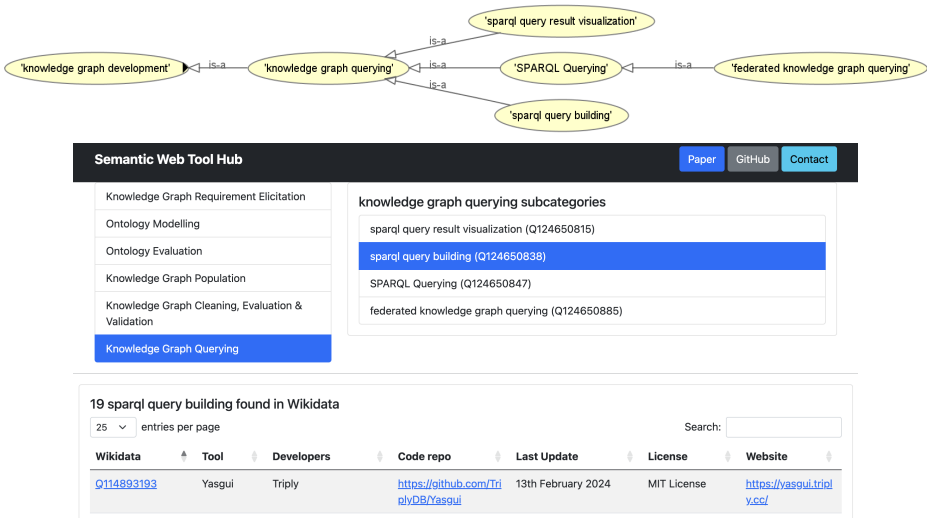

Fig. 2. An excerpt of the Semantic Tool Hub taxonomy (top) & the Semantic Tool Visualization and Search Interface (bottom)

3 Conclusion and Future Work

In this paper, we have described our approach to support a sustainable community-driven documentation and search of SW tools based on Wikidata. In the future, we plan to increase the ease of use and means for contributions, through a two-way synchronization between Wikidata storage and the metadata storage. To this end, we consider having each line of our spreadsheet file as a separate file in a GitHub repository to allow for easier management and update of SW tool documentation, in addition to the existing Wikidata editor UI.

References

[1] Martin G. Skjæveland, Laura Ann Slaughter, and Christian Kindermann. *OntoCommons D4.3 - Report on Landscape Analysis of Ontology Engineering Tools*. Apr. 2022. DOI: 10.5281/zenodo.6504670. URL: https://doi.org/10.5281/zenodo.6504670.

[2] Serge Chávez-Feria, Raúl García-Castro, and María Poveda-Villalón. "Chowlk: from UML-based ontology conceptualizations to OWL". In: *European Semantic Web Conference*. Springer. 2022, pp. 338–352.

[3] Daniel Garijo. "WIDOCO: a wizard for documenting ontologies". In: *Proceedings of the 16th International Semantic Web Conference (ISWC2017), Vienna, Austria*. Springer. 2017, pp. 94–102.

[4] Anna Breit et al. "A Lifecycle Framework for Semantic Web Machine Learning Systems". In: *International Conference on Database and Expert Systems Applications*. Springer. 2022, pp. 359–368.