Conference on Research Data Infrastructure

RDM Infrastructures

KGI4NFDI and TS4NFDI

A natural fit for applying semantic web technologies in practice

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Abstract

Knowledge graphs (KG) and terminologies are closely related, as both are used to structure and represent knowledge within a certain scope. However, a more nuanced approach suggests a division into standard ontologies and vocabularies (Tbox) and specific (meta)data instances (Abox) [1]. A Tbox comprises expressions that contain universal statements about classes, while an Abox contains assertions about instances [2]. In essence, terminologies offer standardized vocabularies, comprising concepts, definitions, and relationships, which form the basis for constructing KGs. These KGs, in turn, organize terminologies into semantic layers interconnecting networks of data / knowledge, and thereby enabling semantic reasoning and data integration. By leveraging terminologies, KGs ensure consistency and interoperability across various applications, such as AI-assisted tools, information search, and data analytics.

KGI4NFDI [3] advocates for a domain-independent, reusable Knowledge Graph Infrastructure (KGI) to enhance interoperability across diverse research domains and support the objectives of the NFDI. KGI4NFDI provides a KG Registry enabling discovery and federation across KGs in the NFDI, and empowers research communities to create decentralised KG instances using standardised approaches, technologies, and expertise. In a complementary manner, TS4NFDI [4] is a cross-domain service for the provision, curation, development, harmonization and mapping

of terminologies. It aims to facilitate consensus-building and interoperability of research data services and achieve a shared knowledge representation and knowledge engineering framework. Both Base services contribute to the “One NFDI” vision and deliver concrete applications of the FAIR data principles on national and international level, through future integration with EOSC.

In this presentation, we will showcase initial prototypes integrating the two services and extending their functionalities in delivering FAIR data infrastructure for the NFDI. A first goal is to integrate the Terminology Service Suite (TSS) widgets into the contribution workflow for new entries into the KG Registry. By using an ontology provided by TS4NFDI (e.g., NFDI Core Ontology [5]) a complete registration form can be generated based on a selection of required entities and relations. In addition, TSS widgets can allow users to choose metadata on e.g. domain subjects from a controlled vocabulary such as the DFG Classification of Subject Areas Ontology [6]. Alongside these prototypes, the presentation will outline a vision of how KGI4NFDI and TS4NFDI could be a natural fit for enhancing the added value of applying Semantic Web technologies in NFDI. In the future, cross-domain ontology mappings provided by TS4NFDI could expand the functionality of the KG Registry. Such mappings, paired with corresponding TSS widget implementation on the user interface level, could facilitate user interactions with cross-domain data retrieval and analysis, in particular the construction of federated SPARQL queries across heterogeneous resources. This enhancement would increase accessibility and discovery across all communities represented by NFDI consortia, potentially leading to new research discoveries. An example from BERD@NFDI already points to the benefits of combining TS with KGI services - the BERD terminology service [7], which is based on the TSS widgets, is used to enrich the BERD KG with references to external ontologies and vocabularies.

Keywords: Knowledge graphs, terminologies, semantic web

Author contributions

All authors contributed to the conceptualization and writing of the manuscript.

Competing interests

The authors declare that they have no competing interests.

Funding

The base services KGI4NFDI and TS4NFDI are funded under TUD DFG grant number 521466146.

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