3rd FAIR Digital Objects Conference

TIBconferencesession

TIB-OP_will_set_DOI

Published: 1970-01-01

Implementation of FAIR Digital Objects in Research Data Management

Poster Submission

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Abstract. At the FDOF Summit 2024 we proposed a platform where research data are represented by FAIR Digital Objects (FDO) in two senses: The first is based on the Kernel Information Profile recommendations by the RDA [1]. The second is based on the synthesis of data and descriptive, associated metadata (MD) to form an FDO centered around the digital object as data that can be accessed and processed digitally. We have now implemented this approach in the collaborative research data management platform Coscine. We propose a poster describing the concrete implementation, the challenges encountered, and follow-up objectives.

Keywords: FAIR Digital Object, Research Data Management

1. First section

1.1 FDOs in Coscine

Coscine aims to FAIRify the research landscape by providing research data storage options and creating a research data knowledge graph [2]. The platform enables the storing of data in heterogeneous data stores. Associated MD describe the data itself and the access methods to them. Sensitivity in research data and findability concerns in FAIR research data management impose opposing requirements concerning the degree of public availability of data and MD. Coscine reconciles these requirements in a three-pronged approach:

1.1.1 Data Stores

Coscine aims to provide interfaces for interacting with a heterogeneous set of data stores. The location of the digital objects in the data store is ultimately the digital representation of the object that can be accessed and processed. The MD should clearly indicate how to access the data, as well as how to navigate complex data structures within the data store. Access to the data must be negotiated with the store itself.

1.1.2 Digital Object Hierarchy

Resources are organized in a tree-like hierarchy, with Coscine projects at the root, branching out into Coscine resources in an intermediate layer and non-RDF resources as leaves. This hierarchical structure represents the containerized resource architecture of the Linked Data Platform [3]. Each node is a digital object composed of an MD record and either a container of nested digital objects or a non-RDF resource. Access can be restricted at a project level and inherited throughout the project.

1.1.3 Fair Digital Object via Landing Page and Kernel Information Profile

Each digital object is identified by a persistent identifier (PID) and described by a minimal MD set, included as a Coscine Kernel Information Profile (KIP) [4]. This KIP is accessible via a human-interpretable landing page or an HTTP request to the PID handle service. A PURL[5] resolves the PID to the landing page. The KIP links to the digital object identified by the PID. The referenced MD record must implement a domain-specific MD schema, whereas the KIP is uniform across all Coscine projects or Coscine resources. In terms of the FDO Forum Configuration Types, we believe this structure to be somewhere in-between type 2 and type 7 FDOs, with the main deviation from type 7 being that the PID and PID record are shared between the metadata and the non-RDF resource [6].

1.2 Challenges

With the current implementation, we encounter the following problems: 1. Restricted access to MD hinders findability. 2. Collaborative research projects impose complex configurations on data and metadata access. 3. Interpretations and implementations of FAIR principles differ among existing FAIR evaluation tools. They often focus on landing pages and fail to interpret metadata that accessible by PID resolution [7]. This hinders the use of such tools to encourage the creation of FDOs. Our plans for tackling these problems are: 1. Exposing subgraphs based on Coscine projects as FAIR Data Points and connecting them in a SPARQL federation. 2. Implementing data connector standards, such as Eclipse Data Spaces [8], at the level of FDOs. 3. Cooperating with EDEN FIDELIS to extend their fair evaluation tool [7] according to our FDO requirements.

2. Second section

Data availability statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Underlying and related material

The code for Coscine is available as open source project at https://git.rwth-aachen.de/coscine.
Coscine as a service implementing FDOs can be accessed at https://about.coscine.de/.
The Coscine Kernel Information Profile is registered and is published at https://dtr-test.pidconsortium.net/#objects/21.T11148/8882327b7c25331e3cdd.

Author contributions

David Schimmel: Conceptualization, Software, Writing – original draft
Sirieam Hunke: Conceptualization, Investigation, Software
Marius Politze: Conceptualization, Funding acquisition, Supervision, Software, Writing – review & editing

Competing interests

The authors declare that they have no competing interests.

Funding

The work was supported with resources granted by NFDI-MatWerk, funded by Deutsche Forschungsgemeinschaft (DFG) with project number 460247524 and NFDI4ING, funded by Deutsche Forschungsgemeinschaft (DFG) with project number 442146713.

Acknowledgements

We thank Dr. Benedikt Heinrichs for previous work on the design of the Coscine FDO structure.

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