

IDORIS

Towards a new generation of Integrated Data Type and Operations Registries with Inheritance System

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Abstract. FAIR Digital Objects were always envisioned to be persistent and machine-actionable entities that harmonize across existing systems. Data Type Registries are an essential part of our current machine-interpretable FAIR Digital Object ecosystem as they manage the syntactic and semantic descriptions of all attributes within FAIR Digital Object records. However, the goal of realizing machine-actionability imposes new requirements on our typing infrastructure. In this lightning talk, we present IDORIS as a prototype for the next-generation of Data Type Registries that describes FAIR Digital Object Operations and Data Types in a highly reusable and technology-agnostic way.

Keywords: FAIR Digital Objects, Machine-Actionability, Interoperability, Reusability, Data Type Registry

1. Extended abstract

Our work presents a prototypical approach towards more capable Data Type Registries with a focus on FAIR Digital Object (FDO) Operations and reusability. In comparison to machine-readability and machine-interpretability, machine-actionability enables machines not only to represent information, reconstruct meaning, and validate information autonomously, but also to determine what can be done with given information and perform such actions [1].

In the past, a comprehensive typing infrastructure for FDOs has been developed [2], [3] and applied in multiple use cases in materials science [4], energy research [5], and digital humanities [6]. This infrastructure has proven to be tremendously useful in achieving machine-interpretability of FDOs. However, recent use cases have highlighted the need for FDOs to bundle meaningful domain-agnostic, domain-specific, and application-specific information [7]. This multilayered approach to FDOs shows the limitations of the current typing infrastructure, as mechanisms for reusing or combining existing profiles and data types do not yet exist.

Recently, FDO Operations have been introduced and formalized [8] together with mechanisms that associate them with FDO typing concepts to enable machine-actionability [9]. This aims to enable machine-actionability by linking the description of

information in an FDO with actions that can be performed on it. A system that facilitates this discovery of Operations requires knowledge about them and their associated Data Types. Therefore, we need to represent and manage FDO Operations as well as Data Types in an integrated system.

In this lightning talk, we give a brief overview of our prototype of an Integrated Data Type and Operations Registry with Inheritance System (IDORIS), designed for highly reusable FDO Operations. Our approach separates the description of individual Operations, the technology stacks used within them, and how these technology stacks are provided by the systems on which the Operations are executed [10]. IDORIS realizes this model, extends existing FDO typing concepts, and introduces inheritance mechanisms that improve the reuse of Data Types. Moreover, to achieve the required accuracy of its information, its validation system is more advanced than that of existing Data Type Registries. In fact, IDORIS is capable of validating not only single entities syntactically based on a JSON schema, as is the case with all current Cordra-based Data Type Registries [2], [11], [12], but can instead provide deep insights into the internal graph of Data Types and Operations. This prevents conflicts between Data Type definitions and ensures the validity of all user inputs. We also generate FDO records with meaningful information for all Data Types and Operations managed by IDORIS.

We will continue to work towards FAIR Digital Objects that are persistent, machine-actionable entities representing and harmonizing diverse information artifacts beyond the borders of data spaces. In the next step, we want to build a prototype that executes FDO Operations based on this work. Furthermore, we envision IDORIS to become a collaborative and possibly distributed system for governed Data Type and Operations Management.

Data availability statement

This work is not based on specific data, since it aims to provide a prototype of a next-generation Data Type Registry. As this work represents a software development project, its data consists of publicly available source code on GitHub (<https://github.com/kit-data-manager/idoris>).

Underlying and related material

This work is not based on specific data, since it aims to provide a prototype of a next-generation Data Type Registry. As this work represents a software development project, its data consists of publicly available source code on GitHub (<https://github.com/kit-data-manager/idoris>).

Author contributions

Maximilian Inckmann: Conceptualization, Methodology, Software Development, Writing

Nicolas Blumenröhr: Conceptualization, Methodology, Writing, Supervision, Guidance on Further Development

Rossella Aversa: Writing, Supervision, Guidance on Further Development

Competing interests

The authors declare that they have no competing interests.

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