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Extended Abstracts

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FAIR Digital Objects Summit Berlin Talks

Units of Measurement in FAIR Digital Objects and the Fast-Changing Landscape of Data Infrastructures and the Work in the United States

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Abstract. The paper contains the core content of two presentations given at the FDO Summit Berlin 2024. While the first presentation focuses on theoretical aspects of standardization and representation of units of measurement in the context of FDOs, the second addresses the empirical development of FDO-related data infrastructures in the United States.

Keywords: FAIR Digital Objects, Units of Measurement, FDO Landscape USA

1. Units of Measurement in FAIR Digital Objects

In the evolving landscape of digital data management, the standardization and representation of units of measurement remain a complex challenge, especially within the realm of FAIR Digital Objects (FDOs). Work done under the aegis of the CODATA Task Group, Digital Representation of Units of Measurement (DRUM) [1], addresses the urgent need for machines to unambiguously identify and utilize units of measurement to achieve true interoperability of data. Despite the common presumption of resolution, units designed for human interpretation fall short in machine contexts, underscoring the critical reliance of data interoperability on units and related metrological concepts like uncertainty.

A diverse array of current implementations exists, ranging from recommendations and encodings to ontologies and software tools, with no less than 60 different systems in use across various disciplines, including astronomy, biology, and international trade. The DRUM Task Group advocates for the harmonization of these disparate systems through the aggregation and evaluation of resources, aiming to produce FAIR-compliant specifications, annotation guidelines, and best practices. Educational outreach on metrology and the establishment of a Units of Measurement Interoperability Service hosted by NIST [2] will help to underpin these efforts.

We recommend that FDOs incorporate community-recognized units representation systems, clearly stated within their metadata, allowing for translation of units into other systems upon request. This approach is complemented by a call to reference authoritative sources such as the SI Reference Point at BIPM [3] for definitions and accepted values, fostering a more coherent and reliable scientific exchange. Unambiguous digital representation of units in FDOs is essential for enhancing the precision, utility, and interoperability of digital research data.

2. The Fast-Changing Landscape of Data Infrastructures and the Work in the United States

As the landscape of data infrastructure rapidly evolves, the United States is taking steps towards constructing an open research commons (Science). Given global advancements, there is a pressing need for the U.S. to accelerate its efforts. The Office of Science and Technology Policy (OSTP) [4] plays a pivotal role, with its Subcommittee on Open Science fostering some 30 federal agencies to develop guidelines for data repositories and to support open access and data sharing initiatives. Further strengthening the nation's position, the National Artificial Intelligence Research Resource (NAIRR) [5] concept has emerged to bridge the gap in AI research, ensuring equitable access to resources while upholding privacy and civil liberties. Although the NAIRR pilot commenced in January 2024 with substantial federal and private sector participation, dedicated funding is yet to be approved. Concurrently, a restart of the Research Data Alliance (US) aims to revitalize U.S. involvement through new working groups focused on FAIR.

The creation of the NIST Research Data Framework [6] underscores the benefits of enhancing research integrity, cost-efficiency, and innovation through the FAIR principles. The Forum: Metrology and Digitalization, established by the CIPM [7] and hosting its first meeting in Paris, is advancing discussions on data quality, digital calibration, secure AI, and the advocacy for FAIR Digital Objects. These collective efforts, though characterized by a patient and slow process similar to the adoption of standards in the Virtual Observatory, lay the groundwork for a robust, interoperable, and future-proof open science infrastructure. We urge the research community to engage with these initiatives and contribute to the sustainable development of next-generation data infrastructures. The U.S. not only needs to catch up but also needs to lead in the establishment of an open science framework conducive to modern research and innovation.

Data availability statement

n.a.

Underlying and related material

n.a.

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Competing interests

The authors declare that they have no competing interests.

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