

Integrating UFZ Spatial Data Infrastructure Into Global Research Ecosystems

Johann Wurz¹  0000-0002-8921-8342

Stanislav Malinovschii⁴  0009-0002-9792-6768

Jan Bumberger¹  0000-0003-3780-8663

Andrea Pörsch²  0000-0003-4502-6223

Sören Lorenz⁴  0000-0001-8577-6614

Emanuel Söding⁴  0000-0002-4467-642X

Dorothee Kottmeier³  0000-0002-4263-4234

Thomas Schnicke¹  0000-0001-9868-4671

¹ Helmholtz Centre for Environmental Research  000h6jb29

² GFZ Helmholtz Centre for Geosciences  04z8jg394

³ Alfred Wegener Institute for Polar and Marine Research  032e6b942

⁴ GEOMAR Helmholtz Centre for Ocean Research Kiel  02h2x0161

The Helmholtz FAIR Data Space

The vision of the HMC Hub Earth and Environment is to create a Helmholtz data space unifying Earth and Environmental Centers and infrastructures, powering a new wave of large-scale, globally oriented, data-driven research. The Helmholtz FAIR Data Space shall be a “decentralized infrastructure for trustworthy data sharing and exchange in data ecosystems based on commonly agreed principles”¹.

The Hub's mission is to federate the (meta)data systems of Earth and Environment Centers and infrastructures throughout the Helmholtz Association, continuously aligning Helmholtz capacities to global norms and developments.

¹ Nagel, L., Lycklama, D. (2022). How to Build, Run, and Govern Data Spaces. In: Otto, B., ten Hompel, M., Wrobel, S. (eds) Designing Data Spaces. Springer, Cham. https://doi.org/10.1007/978-3-030-93975-5_2

spatial.IO

FROST
Server

GeoServer

GeoNetwork
opensource

spatial.IO is a cloud-ready geospatial data management system to store, process, manage, provide and display vector-/raster- and time-series data providing OGC interfaces and a WebGIS. It is developed by and deployed at the **Helmholtz Centre for Environmental Research (UFZ)**. UFZ data can be connected to other data infrastructure via its metadata catalogue feature.

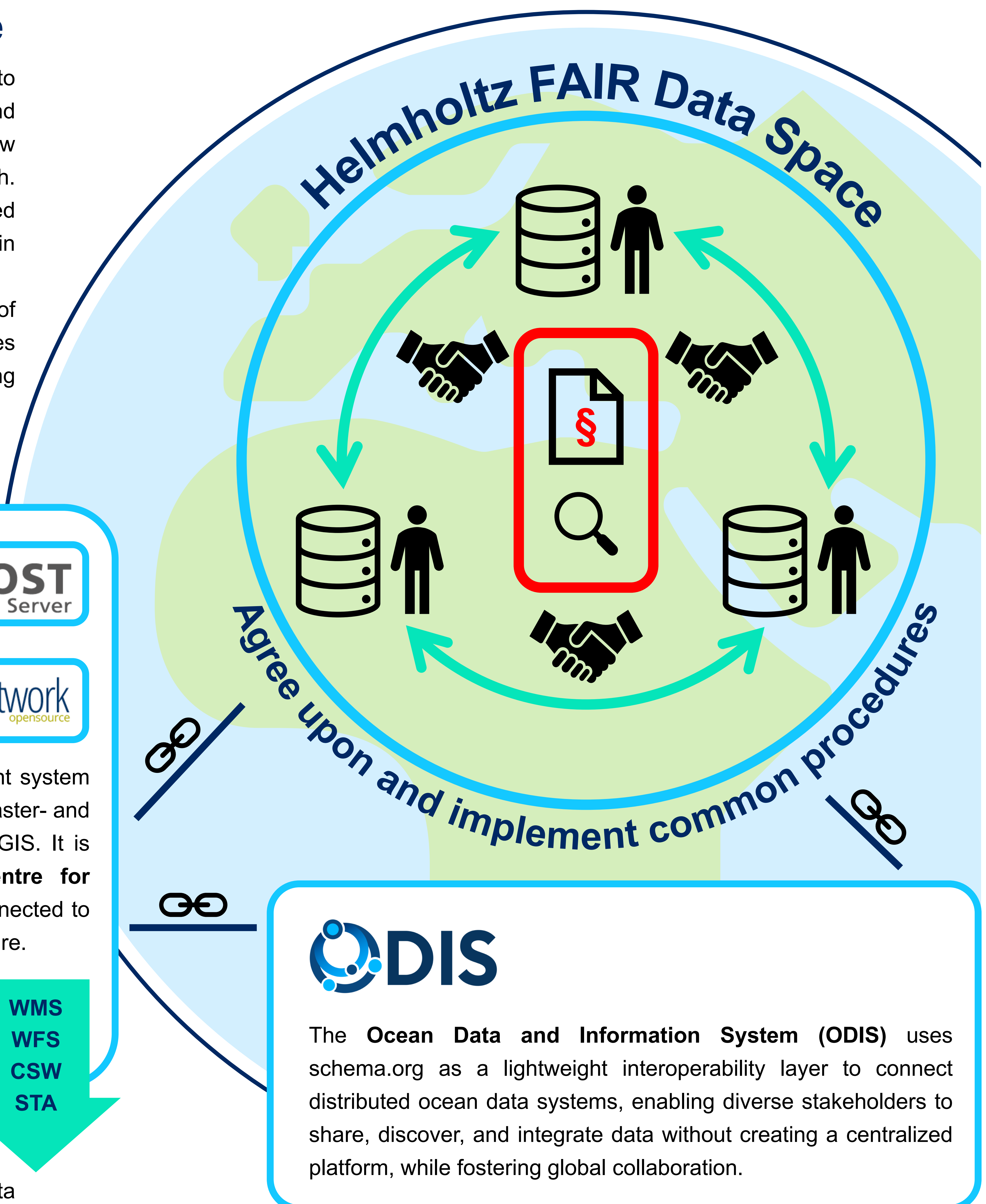
Viewer Data Publishing Metadata Catalogue

Schulz, C., Lange, R., Gonzalez Pestana, N., Panda, M., Schnicke, T., & Bumberger, J. (2025). spatial.IO - An integrated cloud-ready geospatial data management system (0.12.0). Zenodo. <https://doi.org/10.5281/zenodo.17347355>

**WMS
WFS
CSW
STA**

The Role of schema.org

In a federated data infrastructure like the Helmholtz FAIR Data Space, schema.org enables shared, machine-readable metadata across distributed systems. Driven by Science on Schema.org (SOSO) and Earth Science Information Partners (ESIP), domain extensions improve descriptions of datasets and software. Its key advantage over other standards lies in its broad adoption, simplicity, and strong support by major web platforms, making metadata easily discoverable via search engines. This lowers barriers to implementation while enhancing interoperability, allowing communities to align practices and flexibly extend schemas within a common, widely recognized framework. This is why we recommend schema.org to be implemented as the metadata standard for research data infrastructure.



ODIS

The **Ocean Data and Information System (ODIS)** uses schema.org as a lightweight interoperability layer to connect distributed ocean data systems, enabling diverse stakeholders to share, discover, and integrate data without creating a centralized platform, while fostering global collaboration.

Future and Related Work

- Possibility of the integration into other Helmholtz initiatives such as the EarthDataPortal and the Helmholtz Knowledge Graph
- Necessity for the local production of FAIR data – therefore also see:
 - Importance of PID systems and their implementation: see poster “Making PIDs work in organizations – a practical implementation plan” (E. Söding)
 - Importance of semantics for interoperability: see poster “A Community-Driven Semantic Strategy for Interoperable Earth and Environmental Data” (D. Kottmeier)
 - Reach reusability by building domain-specific knowledge graphs: see poster “Project-oriented Knowledge Graphs for Metadata Alignment Across Repositories” (S. Malinovschii)