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The NFDI National Node and EOSC Beyond Pilot Node in the EOSC federation

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The European Open Science Cloud (EOSC) aims to create a federated, interoperable ecosystem for research data and services, enabling seamless access and reuse across disciplines. The components of this infrastructure are the EOSC nodes: distributed, compliant, and interoperable service providers from research infrastructures that make up EOSC as a whole. This work presents the design, deployment, and operational challenges of setting up nodes compliant with the EOSC Federation Handbook.

A key initiative in this context is the EOSC Beyond project, which is currently establishing pilot nodes as technical demonstrators to validate the operational and interoperability requirements for the interoperabilty in the EOSC federation. These pilot nodes serve as prototypes for the broader ecosystem, providing a reference implementation for future candidate nodes — independent deployments currently being set up by various actors across the EOSC landscape. By addressing real-world challenges in federation, security, and service integration, the pilot nodes offer a scalable blueprint for future service providers in EOSC, ensuring consistency with it's evolving technical and governance frameworks.

The German National Research Data Infrastructure (NFDI), in collaboration with DESY (Deutsches Elektronen-Synchrotron), KIT (Karlsruhe Institute of Technology), and Forschungszentrum Jülich (FZJ), plays a central role in both the development of the pilot nodes within EOSC Beyond and the support of existing and future nodes. This collaboration leverages the partners' expertise in large-scale research data management, high-performance computing, and federated infrastructures to ensure robust, production-grade implementations. Key contributions include:

- Compliance with the EOSC Federation Handbook and its implementation,
- Standardized deployment workflows for node operators, reducing barriers to deliver services to a wide audience,
- Interoperability testing between pilot and candidate nodes to validate cross-provider functionalities and portability,
- Alignment with NFDI's domain-specific requirements, ensuring the nodes cater to diverse scientific communities (e.g., photon and neutron sciences, climate research, or particle physics).

Through this work, the project demonstrates how coordinated efforts between pan-European initiatives (EOSC Beyond) German initiatives (NFDI) and research infrastructures (DESY/KIT/FZJ) can accelerate the adoption of EOSC nodes, fostering an interoperable federation for open science. The insights gained from the pilot and candidate nodes will inform EOSC's long-term roadmap, particularly in areas such as automated compliance checking, cross-border data flows, and hybrid cloud-HPC integration — topics of direct relevance to the ISGC community.
In the talk we will present our findings with a focus on common goals for the nodes, technical and organisational obstacles and how issues are overcome. An overview of how we plan to advance the NFDI pilot and national node will conclude the presentation.

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