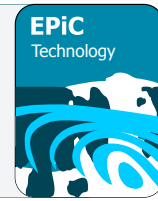




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OSIRIS as an Open, Flexible CRIS for Distributed Scientific Infrastructures: Insights from its Deployment in the German Network for Bioinformatics Infrastructure (de.NBI)

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Abstract

OSIRIS is an open-source Current Research Information System (CRIS) created to support research organisations whose activities include more than traditional publication outputs, e.g. conference posters, events or teaching. Its core mission is to offer a configurable, sustainable, and highly adaptable alternative to conventional CRIS solutions that are frequently designed around the needs of universities or institutes. Scientific consortia and distributed infrastructures often produce software releases, datasets, workflows, training events, and community-building activities that do not fit neatly into rigid, publication-centric systems. OSIRIS was developed precisely to address challenges like this and was successfully implemented at several scientific institutes in Germany. The German Network for Bioinformatics Infrastructure (de.NBI) provides an ideal example of a modern, distributed research environment where OSIRIS can unfold its full potential. As a nationwide consortium that coordinates bioinformatics services across eight service centres including 24 institutes, de.NBI requires a CRIS that can adequately capture the diversity of its scientific, technical, and community-oriented contributions. The deployment of OSIRIS within de.NBI demonstrates how a flexible and open-source system can empower a large infrastructure to communicate its outputs effectively, reduce reporting burdens, and improve internal communication and cooperation. This contribution presents OSIRIS through its system perspective and highlights the lessons learned from its adoption in the de.NBI network.

1 Introduction

The systematic collection, management, and use of research information are becoming increasingly important for research institutions, funding organizations, and political decision-makers. Research information is understood to comprise all structured data that represent scientific activities and their contextual conditions -ranging from publications, projects, and third-party funding to research infrastructures as well as personnel and collaborative structures. It therefore constitutes metadata from across the entire research lifecycle (Ebert, 2016; Fante, 2022).

This information forms the basis for internal governance, external evaluation, and science policy decision-making processes. In the context of the Barcelona Declaration (Kramer, 2024), the value of open research information for Open Science has also been increasingly emphasized (Biesenbender et al., 2019).

To ensure comparability, transparency, and traceability, the Core Dataset for Research (Kerndatensatz Forschung, KDSF) was developed in Germany to serve as a national metadata standard for research information. With the release of version 2.0 in early 2025, the KDSF has undergone substantial further development. The standard, which previously focused primarily on defining aggregated reporting data, has been expanded into a modular core data model. This model enables institutions to record their research activities at the object level - such as projects, persons, or publications - in a structured manner and to flexibly interlink these objects (Kommission für Forschungsinformationen in Deutschland, 2024). In this context, research information systems (RIS/CRIS) can support the structured collection, management, analysis, and provision of data on research activities for internal governance processes as well as for external reporting (Angulo-Osorio et al., 2025; Azeroual, 2021; Biesenbender et al., 2019; Nabavi, 2016; Zendulková et al., 2025).

This paper reports on an early-stage case study of OSIRIS implementation within a distributed scientific infrastructure and aims to document the initial design considerations, organisational requirements, and implementation experiences that emerged during the early deployment phase of OSIRIS within de.NBI. In doing so, it seeks to contribute practical insights to ongoing discussions about adaptable and open research information infrastructures.

2 Positioning OSIRIS within the CRIS Landscape

Within the German CRIS landscape, institutions currently employ a heterogeneous mix of commercial and open-source systems. Commercial platforms such as Pure (Goossens, 2013) and Converis (Maier, 2012) are widely used at universities and large research organisations, particularly where standardized reporting and enterprise integration are priorities. At the same time, open-source approaches such as VIVO and DSpace-CRIS have gained increasing attention in the context of Open Science, interoperability, and community-driven development.

VIVO (Börner et al., 2012) follows a semantic-web-oriented approach and represents research information as a knowledge graph based on a rich ontology. This architecture facilitates interoperability, linked open data, and integration with external information sources, making VIVO particularly attractive for institutions pursuing open and machine-readable research information infrastructures. However, the flexibility and expressiveness of the underlying semantic technologies often come with increased implementation complexity and a higher demand for technical expertise.

DSpace-CRIS (Palmer et al., 2014), in contrast, evolved from the repository domain and extends the widely adopted DSpace platform with CRIS functionality. This approach enables a close integration of institutional repositories and research information management, supporting workflows around publications, datasets, and other research outputs. At the same time, CRIS functionality is tightly coupled

to the DSpace ecosystem, and deployments often require substantial customization efforts and specialized implementation support.

Against this backdrop, OSIRIS positions itself as a flexible and lightweight alternative specifically tailored to small and medium research institutions without dedicated CRIS teams or large IT departments. Rather than emphasizing comprehensive semantic modelling or repository-centric workflows, OSIRIS focuses on usability, configurability, and rapid adoption. The system allows institutions to define their own research activities, organizational structures, workflows, and reporting requirements without requiring software development or extensive customization projects. This flexibility enables institutions to adapt the system to local needs while maintaining a low barrier to entry and minimizing long-term operational overhead.

This flexibility is particularly relevant in the context of distributed research infrastructures such as de.NBI, where scientific output extends beyond traditional research activities such as publications and grants. Research infrastructures frequently need to document and evaluate activities including training events, workshops, community engagement, service provision, software development, data resources, and collaborative network activities. Such outputs are often highly diverse, evolve over time, and may not fit neatly into predefined CRIS data models.

3 OSIRIS Design Philosophy

OSIRIS is built on the principle of flexible configuration. Instead of imposing a fixed structure, it provides a no-code customization toolbox that allows organisations to define their own activity types, categories, projects, and workflows. This enables OSIRIS to adapt to evolving scientific practices and organisational needs without requiring code changes. A second core principle is openness and interoperability: OSIRIS is fully open-source and designed to integrate seamlessly with other platforms and institutional systems.

OSIRIS also follows a lightweight deployment model. Since many research infrastructures lack the administrative or IT capacity needed for enterprise-grade CRIS solutions, the platform uses a streamlined technology stack with containerised deployment and a flexible MongoDB backend. Supporting services include managed hosting, system setup with legacy data import, user and administrator training, and the optional extensions such as the Portfolio module for public dissemination of research information. Together, these features lower adoption barriers and support sustainable long-term operation, even for large, distributed research networks.

The open-source nature of OSIRIS offers further strategic advantages. Institutions maintain transparency over data models and workflows while avoiding vendor lock-in. At the same time, the system can evolve collaboratively through community-driven contributions. These qualities are especially valuable in scientific environments where reporting requirements, metadata standards, and output types change continuously. However, open-source approaches also require sustained governance, technical expertise, and institutional commitment. The de.NBI implementation demonstrates that the sustainability of open-source CRIS platforms depends not only on technical flexibility, but also on organisational collaboration and shared stewardship.

4 Research Information in the de.NBI Network

The German Network for Bioinformatics Infrastructure (de.NBI) constitutes a distributed, nationally coordinated research infrastructure that integrates multiple service centres and partner institutions to provide bioinformatics tools, databases, cloud-based computing resources, and training for the life sciences (Tauch & Al-Dilaimi, 2019). Its activities encompass a broad and growing spectrum of pro-

jects, services, and collaborative formats, involving heterogeneous actors, funding frameworks, and scientific outputs. As the network continues to expand in scale and complexity, the amount and diversity of information generated across de.NBI are steadily increasing. At the same time, requirements for transparency, interoperability, and standardized reporting are gaining importance at national and international levels, particularly in the context of data-driven research infrastructures, Open Science, and emerging metadata standards. Against this backdrop, the coordinated and structured handling of research-related information is becoming a central cross-cutting issue for the sustainable development and governance of the de.NBI network.

5 OSIRIS as a CRIS Framework for the de.NBI Network

The adoption of OSIRIS in de.NBI vividly illustrates how these architectural ideas translate into practice. de.NBI sought a CRIS capable of capturing the full breadth of its contributions, spanning software releases, training events, materials and attendance data, publications, outreach activities, and collaborative projects. OSIRIS allows all these activity types to be modelled without changes to the system's core codebase, demonstrating the strength of its configuration-driven approach.

The configurability also extended to metadata definitions and workflows. Each de.NBI service centre had the opportunity to contribute its own requirements, which were then harmonised by the coordinating working group into a shared OSIRIS schema. We are currently in the process of integrating the system into de.NBI's broader digital ecosystem. OSIRIS supports identifier-based metadata enrichment by automatically retrieving publication and researcher information via persistent identifiers (e.g. DOI, ORCID) and is being extended to integrate with training and software infrastructures such as ELIXIR TESS. These features significantly reduce manual effort and enhance the completeness and accuracy of the research information being collected.

A particularly valued capability was OSIRIS's ability to generate public, automatically updated portfolio pages. These pages present the network's publications, software tools, training activities, and other contributions in a transparent and accessible manner. As a result, OSIRIS not only supports internal reporting and evaluation processes but also enhances the visibility of de.NBI's achievements to national and international stakeholders.

6 Impact and Lessons Learned

As an ongoing deployment, the implementation of OSIRIS within de.NBI already highlights several emerging observations regarding the use of configurable open-source CRIS platforms in distributed infrastructures. The system appears well suited to representing heterogeneous outputs and organisational structures while supporting more harmonised approaches to research information management across participating institutions. At this stage, however, the observations remain preliminary and should be interpreted as indicative rather than conclusive findings.

The deployment of OSIRIS within de.NBI highlights how powerful open-source, configurable CRIS platforms can be for distributed infrastructures. The system accommodates the network's heterogeneous outputs and provides a harmonised platform for collecting, validating, and disseminating research information. Initial experiences suggest the potential to reduce manual reporting effort and support more harmonised metadata practices. Moreover, it offered a sustainable long-term alternative to commercial systems and provided an environment that researchers and administrators could adopt with minimal friction.

At the same time, the deployment highlighted the critical importance of well-defined governance structures to maintain metadata quality, the need for targeted training across distributed organizations,

and the benefits of establishing shared practices early in the implementation process. Governance structures must clearly assign responsibilities for data entry, validation, and curation to ensure consistent metadata standards across all participating units. Training programs are essential not only to familiarize staff with the platform but also to build a shared understanding of research information workflows and reporting requirements. Establishing common practices and protocols early helps to avoid fragmentation, ensures smoother adoption across multiple sites, and fosters a culture of collaboration and data stewardship that extends beyond the technical implementation. These considerations reflect structural challenges inherent in any multi-institutional CRIS rollout rather than limitations of OSIRIS itself.

Compared to more rigid CRIS environments, the deployment highlighted the importance of configurability in distributed infrastructures where participating institutions differ substantially in workflows, reporting cultures, and output types. The case of de.NBI suggests that highly configurable CRIS frameworks may be particularly suitable for collaborative scientific networks that require local flexibility while maintaining overarching interoperability and shared reporting standards.

7 Outlook and Conclusion

The experiences gained from the de.NBI deployment is already shaping OSIRIS's developmental trajectory. At the same time, the deployment has highlighted that implementing a research information system in a large, distributed infrastructure involves significant organisational hurdles, particularly with respect to coordination across multiple institutes with heterogeneous workflows, governance models, and reporting requirements. Addressing these challenges requires not only technical flexibility but also sustained organisational alignment and clear coordination mechanisms.

Future work therefore includes deeper interoperability with European infrastructures, enhanced support for standards such as the Common European Research Information Format (CERIF; Jörg, B., 2010), expanded analytics and dashboard capabilities, and strengthened mechanisms to empower the community to actively shape and contribute to the system. OSIRIS actively incorporates lessons learned from de.NBI and other installations by engaging with participating institutes, collecting best practices, and systematically preparing guidance for future deployments. Through these developments, OSIRIS aims to become even more adaptable to the needs of diverse open-science ecosystems, including federated projects and cross-infrastructure research environments.

The ongoing deployment of OSIRIS within de.NBI illustrates the potential of open-source and highly configurable CRIS approaches for distributed scientific infrastructures. The case study demonstrates how flexible data models and interoperable system architectures can support heterogeneous research environments whose outputs extend beyond traditional publication-centric reporting. At the same time, the implementation process highlights the organisational and governance challenges inherent in multi-institutional CRIS adoption. As the deployment continues to evolve, future analyses will provide deeper insight into long-term operational impacts, metadata quality, and community-driven governance models in open research information infrastructures.

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