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Academic and Research Network of Slovenia

Tehnološki park 18, SI-1000 Ljubljana, Slovenia

Project Charter
Slovenian EOSC Node

Last update: 10/18/2025

1. PROJECT SUMMARY

Slovenia has adopted the Action Plan for Open Science (2023–2030), defining national measures for Open Science legislation and workflows, professional data stewardship (employment and training), researcher training, and the development of new services and infrastructure. This provides a stable framework for aligning the national Open Science ecosystem with EOSC practices and timelines.

The Slovenian EOSC Node will expand federated services and repositories by onboarding mature, sustainable national repositories and services into the EOSC Federation, delivering the remaining upgrades needed for full EOSC interoperability, and deploying new services to further strengthen and broaden the national contribution to the EOSC ecosystem. It is jointly anchored in ARNES and IZUM as core national e-infrastructure providers, building on experience in federated delivery and trust frameworks (including GÉANT) and competence-centre activities such as SLING, as well as support for ESFRI research infrastructures. Community and repository partners – especially SSOZ and key disciplinary infrastructures – add expertise in FAIR-aligned operations, licensing and access conditions, training, researcher support, and data stewardship. Participation in EOSC Task Forces, Opportunity Areas, projects, and clusters will ensure timely alignment with EOSC-level decisions and consistent implementation of agreed policies, standards, and interoperability frameworks.

The Node will serve researchers, data stewards and support staff, repositories and service providers, institutions and funders. Core services include federated AAI, Nextcloud, FileSender, Jupyter, scalable storage, containerised research environments, and HPC integration (EuroHPC Vega new national supercomputer). It will also strengthen cross-border collaboration with Croatia, and Slovakia–Poland on REANA-based reproducible analysis workflows, complemented by Open Science training and capacity building through national initiatives (e.g., SPOZNAJ, EOSC Information and Support Point building, and ARNES Helpdesk).

Over 36 months, Slovenia will deliver validated use cases and contribute reusable documentation and proven integration patterns to the Federation, supporting FAIR interoperability, secure collaboration, and sustainable scaling beyond the project period.

2. VALUE PROPOSITION

The Slovenian EOSC Node translates European Open Science direction and FAIR principles into **sustainable national operational capabilities**, aligned with the needs of researchers, institutions, and service providers. Building on long-standing investments in e-infrastructure and Open Science coordination, it provides a **stable, trusted national entry point** for Slovenia into the EOSC Federation.

Contribution to the EOSC ecosystem

The Node strengthens EOSC by delivering national-level support, coordination, and reusable implementation models that:

- **Reduce fragmentation** by integrating collaboration, data transfer, containerised environments, analysis environments, scalable storage, and repositories into coherent national workflows and end-to-end user journeys.
- **Accelerate EOSC adoption** through structured onboarding, practical guidance, and reference implementations for repositories and service providers to meet EOSC interoperability requirements with less duplicated effort.
- **Improve access to data- and compute-intensive resources** by connecting national services with EOSC-aligned approaches, including scalable storage and high-performance computing (Vega, and the newly procured national supercomputer), enabling interoperable access models.
- **Build skills and capacity** via coordinated training and support (SPOZNAJ, EuroCC, SLAIF and related initiatives, and institutional trainings), strengthening data stewardship, FAIR practices, and advanced computational skills.

Beneficiaries

Beneficiaries include **researchers**, **universities and research institutions**, **research infrastructures**, **libraries/repositories/data centres**, **funders and policymakers**, and **society**, through simplified access to integrated services, reduced organisational and technical overhead, improved data quality and reuse, stronger compliance support, and greater openness and impact of publicly funded research.

Differentiating capabilities

The Node combines:

- **Mature national e-infrastructure** operated by ARNES and IZUM (networking, federated identity, scalable storage, HPC).
- **Trusted FAIR-aligned repositories and open access infrastructure** with strong disciplinary coverage.
- **Federation and interoperability readiness**, leveraging ARNES' experience (GÉANT, national AAI) and existing federated access patterns in the national supercomputing ecosystem.
- **Advanced computing and analytical environments** (interactive/virtualised/containerised platforms, HPC integration, AI/ML support), including secure and controlled-access options for sensitive data where required.
- **Integrated national coordination and support**, linking libraries, data stewards, HPC competence centres, and a national helpdesk, reinforced through SPOZNAJ, EuroCC, SLAIF, and community governance via SSOZ and expert bodies, aligned with national and European digital strategies.

Added value within the EOSC Federation

The Slovenian EOSC Node contributes **validated national solutions, documented practices, and transferable models** that other Nodes can reuse, supporting EOSC interoperability, scalability, and sustainability. By embedding functions in permanent institutions and routine operations, it provides **long-term reliability** to a resilient and inclusive European Open Science ecosystem.

3. REPOSITORIES AND SERVICES DELIVERED

The Slovenian EOSC Node will expose a portfolio of **nationally established repositories and services in active production use (TRL ≥ 8; mostly TRL 9)**. During the build-up phase, these resources will be further **aligned and integrated** to enable seamless participation in the EOSC Federation. The Node delivers national core functions across the full research life-cycle (collaboration, transfer, analysis, storage, publication, training, support). **Metadata are open and EOSC-discoverable; content access follows repository/service policies and national mandates**, while federation enables cross-border discovery and reuse.

Slovenia's Open Science infrastructure builds on a mature national ecosystem: university and national repositories and portals (incl. aggregation and discovery), **COBISS** (bibliography) and **SICRIS** (CRIS), a storage for large datasets, and links to national supercomputing network SLING. **ARNES** provides networking, AAI/eduroam and core digital services for development/coordination of the national Open Science infrastructure; **IZUM** operates COBISS/SICRIS and **Vega** HPC; **UM FERI** leads repository development (TRL 9). The **Open Science Monitor** measures openness of Slovenian research outputs. **Service maturity & evolution:** All services are operational (TRL≥8). During build-up the Node will (1) comply with EOSC participation and cybersecurity requirements, (2) strengthen interoperability (AAI, metadata exposure, onboarding), (3) deliver integration components/reference implementations and documentation, and (4) validate via national and cross-border use cases. Operations continue beyond the 3-year build-up within ARNES/partners' regular activities.

Service ID	Repositories included	Description	Access policies	Federation contribution & value to users	TRL
R1	**RUL, DKUM, DiRROS, RUNG, RUP, REVIS, ARNES**	Institutional and national repositories for publications, datasets, and other research outputs.	Open metadata; content access according to OA/licensing and repository-specific policies (open and/or controlled access depending on content).	Increases EOSC-accessible Slovenian research outputs; supports FAIR discovery and reuse; strengthens integration with EU/EOSC and national data spaces.	**8–9**
R2	**ADP – Slovenian Social Science Data Archives**	Domain-specific social science data repository providing curated datasets.	Open metadata; controlled access for sensitive data.	Enables EOSC access to curated, high-quality social science datasets; supports cross-institutional reuse.	**9**
R3	**CLARIN.SI repositoriy**	Repository of language resources and tools.	Open metadata; access according to CLARIN policies.	Contributes specialised disciplinary resources and tools to EOSC; enables reuse within the language technology and SSH communities.	**9**
R4	**COBISS**; **dLib.si** ; **SICRS**	National research discovery and information services: bibliographic catalogue (COBISS), digitised cultural and scientific heritage repository (dLib.si), and CRIS (SICRIS).	Open metadata; access to content according to service-specific policies.	Improves discovery and contextualisation of Slovenian research outputs (links between publications, authors, projects, and heritage objects); increases visibility and reuse via EOSC.	**9**

Service ID	Services included	Description	Access policies	Federation contribution & value to users	TRL
S1	**Federated AAI (ARNES AAI)**	Federated identity and access management for research and education (AAI), integrated with international federations.	Access for eligible users via their home institutions.	Enables federated, cross-border access to services and dataspaces (single sign-on; scalable onboarding).	**9**
S2	**Nextcloud** ; **FileSender**	National collaboration and data exchange services: file sync & share workspaces and secure transfer of large files.	Access for Slovenian R&E users; federated sharing for pilots; R&E user access according to institutional policies.	Supports collaborative research workflows and efficient data exchange across institutions and borders (incl. pilot cross-border collaboration).	**9**
S3	**Galaxy / Jupyter environments** ; **REANA**	Interactive and reproducible research environments: notebooks/analysis platforms and containerised workflow execution (common workflow languages).	Access via institutional affiliation and project policies; approved research projects from Slovenia and other EU/EOSC countries.	Enables reproducible analysis and tools-to-data workflows; interoperable workflow execution; integration pathways to Kubernetes/HPC.	**8–9**
S4	**HPC access (Vega and new national supercomputer)**	Compute-intensive execution via Slurm and HPC services.	Access via project allocation and national policies.	Enables EOSC-aligned, compute-intensive workflows and large-scale processing.	**9**
S5	**National storage services (Ceph, data centre infrastructure)**	Object and file storage services for data-intensive research (data lifecycle support).	Access based on project and institutional policies.	Supports storage for large-scale datasets and data lifecycle management across services and workflows.	**8–9**
S6	**VMs compute service (OpenStack)** ; **Kubernetes**	Federated cloud execution platforms: VM-based compute (OpenStack) and container orchestration (Kubernetes), integrated with federated AAI.	Approved research projects; availability for national institutions/service operators; coordination with EOSC EU Node where relevant; capacity subject to national provisioning.	Provides scalable execution for approved users; supports portable, automated, reproducible, containerised workflows across projects/institutions and EOSC countries.	**8**
S7	**GitLab & Container Registry**	Collaborative software development and secure container image registry for research projects.	Approved research projects from Slovenia and other EOSC countries.	Supports collaborative development, CI/CD automation, and preservation/portability of computational environments for transparent and reproducible research.	**8**
S8	**Training services (SPOZNAJ, EuroCC 3, SLAIF)** ; **National EOSC Information and Support Point / Helpdesk**	User enablement: training/capacity building plus onboarding, guidance, and issue resolution.	Open or targeted access depending on programme; helpdesk access for Slovenian research community.	Builds user capacity and improves usability/onboarding, increasing sustainable uptake of EOSC services and practices.	**8–9**(training) / **9**(helpdesk)

4. USE CASES

The Slovenian EOSC Node will implement complementary use cases that collectively address the full national Open Science support cycle: from end-to-end research workflows along with data- and compute-intensive services, to training, dissemination, user support, and cross-border collaboration

All use cases are conceived as national-level pilots, starting with prototyping and iterative refinement, with a strong emphasis on knowledge transfer, documentation, and reuse of solutions. Where relevant, use cases demonstrate possible federation value by sharing validated approaches, integration patterns, and operational guidance with the wider EOSC community.

Use case overview

Use Case ID	Use Case Description	Possible Federation Value	Participating organisations (Slovenia)	Other Nodes involved	Timeline
UC-01	End-to-end Open Science workflow (collaboration → analysis → publication)	Transferable workflow patterns, onboarding documentation, reusable integration templates	ARNES; IZUM; RUL; UKM; DiRROS; JSI; CLARIN.SI;INZ; ADP ; UM FERI	EOSC EU Node (alignment)	0–36 months
UC-02	Data-intensive services and federated storage	Shared national models for large-scale storage, data lifecycle practices, and policy alignment	ARNES; IZUM; JSI; UM FERI; repository operators	—	0–30 months
UC-03	Compute-intensive workflows (Jupyter → HPC)	Reusable patterns for cloud-to-HPC workflows and national HPC integration	ARNES; IZUM (Vega & new HPC); JSI; UM FERI	—	10–36 months
UC-04	Training and skills development (SPOZNAJ, EuroCC 3, SLAIF)	Transfer of training curricula, materials, and national capacity-building models	ARNES; CTK and SPOZNAJ partners;SLAIF, EuroCC 3 partners; JSI; UM FERI; NUK; ADP	—	0–36 months
UC-05	Dissemination and federated user support (helpdesk)	Shareable models for national EOSC entry points, helpdesk workflows, and community engagement	ARNES Helpdesk; SSOZ; SLING; NUK; repositories	EOSC EU Node (alignment)	0–36 months
UC-06	Cross-border SI–HR collaboration via federated Nextcloud	Documented cross-border File Sync & Share integration pattern	ARNES; Slovenian pilot research groups	Croatian National EOSC Node (SRCE)	6–24 months
UC-07	Federated discovery, software platforms, and containerised research environments	Federation-ready integration of repositories, GitLab and Kubernetes; reusable HPC-enabled workflows; trusted containers; and harmonised cross-domain discovery	ARNES; IZUM; JSI; UM FERI; repository operators	-	0-36 months
UC-08	Cross border SI–SK–PL: Reproducible analysis workflows using REANA	Federated workflow execution	ARNES; Slovenian pilot research groups; IZUM	EOSC Node Slovakia, EOSC Node Poland	12-34 months

Use case description

UC-01: End-to-end Open Science workflow (collaboration → analysis → publication)
This use case validates a complete national research workflow by integrating widely used services into one EOSC-aligned process: collaborative workspaces (Nextcloud), large file exchange (FileSender), analysis environments (e.g. Jupyter), dissemination (e.g., WordPress), and deposition of results into national and institutional repositories. The emphasis is on **service integration and documented patterns**.
Deliverable: D2 End-to-end research workflow reference package.
Federation value: reusable workflow patterns for other Nodes; shared onboarding documentation/checklists; lessons learned contributed to EOSC knowledge base.
Timeline (36 months): 0–16 prototyping & pilot selection; 17–24 community validation, documentation, refinement; 25–36 replication across institutions and consolidation as a national reference model.

UC-02: Data-intensive services and federated storage
This use case targets data-intensive research by validating scalable national storage and data-management services for large datasets (e.g., Ceph-based object storage, tiered storage such as BIM/DIAMOND) and their integration into workflows, repositories, and operations. The focus is on **data lifecycle management**, operational policies, and sustainable national practices, including protected handling of sensitive data and preservation.
Deliverables: D3 services integration & operations guide; D9 national data spaces for data sovereignty; D10 secure storage for sensitive data; D11 secure processing environment for sensitive data; D12 digital preservation service for research outputs.
Federation value: transferable approaches for large-scale data handling; operational/policy practices for sustainable data infrastructure; input to EOSC discussions on data-intensive services.
Timeline (36 months): 0–16 prototyping & pilot dataset selection; 16–24 validation & operational documentation; 24–30 consolidation and dissemination.

UC-03: Compute-intensive workflows (Jupyter → HPC)
This use case demonstrates EOSC-aligned integration of interactive environments (Jupyter) with batch execution on national HPC systems (Vega and the newly procured national supercomputer). The goal is to validate **integration and access models**, not to add capacity.
Deliverables: D2 end-to-end workflow reference package; D11 secure processing environment for sensitive data (where applicable).
Federation value: patterns for integrating HPC into EOSC (including alignment with SLAIF); documented cloud-to-HPC execution models; shared experience relevant for other HPC providers.
Timeline (aligned to 36-month programme): 10–16 prototyping & pilot workflows; 17–24 validation, documentation, refinement; 25–36 replication and consolidation.

UC-04: Training and skills development (SPOZNAJ, EuroCC 3, SLAIF)
This use case ensures that EOSC participation is matched with skills development. It builds on national programmes—SPOZNAJ (data professionals, FAIR data, repositories) and EuroCC 3 (HPC users and support staff)—and links training directly to the services and workflows developed in UC-01–UC-03, UC-07.
Deliverable: D4 national training and capacity-building package.
Federation value: transferable training models and materials; contribution to EOSC Academy/shared training practices; stronger human capacity for long-term EOSC sustainability.
Timeline (36 months): 0–6 curriculum alignment and planning; 6–30 continuous delivery and refinement; 30–36 consolidation and publication of materials.

UC-05: Dissemination and federated user support (helpdesk)
This use case establishes a national EOSC entry point through coordinated dissemination and user support, building on ARNES Helpdesk, SPOZNAJ dissemination channels, the Slovenian Open Science Community, and SLING/SLAIF communities. It focuses on **guidance, onboarding, and knowledge sharing**, complementing (not replacing) EOSC-level support.
Deliverable: D5 dissemination, community engagement, and helpdesk model.
Federation value: shareable national support models; best practices for helpdesk integration and community engagement; contribution to federated support discussions.
Timeline (36 months): 0–6 setup, prototyping; 6–24 operational use, refinement; 24–36 consolidation.

UC-06: Cross-border SI–HR collaboration via federated Nextcloud
This use case demonstrates cross-border collaboration through federated Nextcloud integration between Slovenia (ARNES) and Croatia (SRCE), enabling bilateral research projects.
Deliverable: D6 cross-border SI–HR federation report.
Federation value: reusable pattern for cross-border file sync & share federation; documented trust and access models; contribution to regional federation knowledge within EOSC.
Timeline (25 months): 6–12 prototyping & pilot definition; 13–18 operational pilot and validation; 19–24 documentation and dissemination.

UC-07: Federated discovery, software platforms, and containerised research environments
This use case integrates (1) federated discovery of research outputs, (2) collaborative software development, and (3) portable containerised execution environments.It targets data- and compute-

intensive domains (e.g., life sciences imaging/time-series, numerical modelling, molecular simulations, protein structure prediction, quantum chemistry/materials modelling, GPU-enabled visualisation, and automated laboratory data flows). National GitLab and container registries integrated with Federated AAI provide trusted environments for code collaboration and sharing certified container images. Repositories and metadata services operated by ARNES, IZUM, JSI, UM FERI and other national operators expose datasets, software artefacts and workflows to EOSC catalogues for cross-Node discovery and reuse.
Deliverables: D2 end-to-end workflow reference package; D10 secure storage for sensitive data; D11 secure processing environment for sensitive data.
Federation value: transferable integration models for repositories + software platforms + container orchestration; reusable Kubernetes/HPC-enabled workflows; best practices for container governance (licensing, provenance); harmonised metadata and discovery for datasets/software/workflows; domain-driven examples accelerating EOSC uptake across scientific communities.
Timeline (36 months): 0–16 prototyping & pilot workflows; 17–24 validation, documentation, refinement; 25–36 replication and consolidation.

UC-08: Cross-border SI–SK–PL reproducible analysis workflows using REANA
Piloting REANA across Slovenian, Slovak and EOSC Node Poland Nodes, enabling reproducible analyses through federated AAI, storage and container registries, and connecting to Kubernetes and HPC backends to validate cross-border portability within the EOSC Federation.
Deliverable: D9 cross-border SI–SK–PL federation report.
Federation value: reusable patterns for multi-Node reproducible pipelines; FAIR workflow publication and provenance practices; integration templates linking identity, storage and registries; domain-driven examples strengthening EOSC support for reproducible science.
Timeline (25 months): 12–16 prototyping & pilot definition; 17–30 operational pilot and validation; 30–34 documentation and dissemination.

5. COMPLIANCE WITH TECHNICAL REQUIREMENTS¶

The Slovenian EOSC Node confirms its full commitment to comply with all mandatory technical specifications required for integration into the EOSC Federation, including integration with the EOSC Federated Authentication and Authorisation Infrastructure (AAI), exposure of resources through the EOSC Catalogue and Exchange, and implementation of EOSC Node Core Capabilities as defined in the EOSC Federation Handbook, with an additional focus on establishing a helpdesk, service monitoring in service management system (FitSM).

Governance and technical readiness

The Slovenian EOSC Node is operated by ARNES as the coordinating organisation and a consortium of partners providing core infrastructure and onboarded resources. ARNES and IZUM are Slovenia's core national e-infrastructure providers, established to run mission-critical, production-grade digital services for research and education. They bring long-standing experience in operating secure and scalable infrastructures at a national and European level (GÉANT, EGI, EuroHPC, a number of EOSC-related initiatives and support to national ESFRI nodes). Both organisations have long established collaborations and an excellent track record at providing critical,high availability services to scientific and academic communities.

Governance and technical responsibilities are organised through a clear national structure with well-defined coordination roles and permanent consultation mechanisms. ARNES has been designated as Slovenian Mandated Organization within EOSC Association and is the coordinating organisation of the Slovenian EOSC Node consortium, consolidating national coordination and representation. The consortium will formalise roles, obligations, and financial arrangements through a Memorandum of Understanding where responsibility for individual deliverables, delivery of specific services, integration work, documentation, training, and community engagement targets along expected timelines will be established.

Strategic and community-facing governance is anchored in the SSOZ and the SLING that provide a stable national multi-stakeholder framework. Within SSOZ, the Node is supported by dedicated working groups for EOSC and for Open Science infrastructure, bringing together universities, research institutes, disciplinary infrastructures, libraries, data centres, ministries, funders, and other stakeholders. These bodies act as the permanent national mechanism for consultation and co-design: collecting community requirements, validating Node priorities and onboarding decisions, identifying policy constraints, and ensuring alignment with national Open Science policies. Within SLING, the stakeholders in computing and data infrastructure are coordinating with user communities and funding agencies, as well as building international frameworks for collaborative infrastructure building and utilisation.

Technical implementation and day-to-day operations are handled by dedicated operational teams within the core national e-infrastructure providers, with agreed-upon interfaces to community-facing partners for onboarding support, FAIR practices, licensing and access guidance, and user training. This governance setup ensures clear accountability, coordinated national decision-making, and resilient, continuous operation during the build-up phase and beyond as part of routine national activities.

Technical compliance will be ensured by designing and operating the Node in line with the EOSC Interoperability Framework and the EOSC policies and rules of participation, including requirements for onboarding, service description and catalogue exposure, monitoring, user support, and security/incident handling.

Integration with Federated AAI

The Node will integrate national services with the Federated AAI, enabling researchers to access services using their home institution credentials. ARNES operates the national identity federation and has extensive experience with federated identity, attribute exchange, and trust frameworks.

AAI integration supports authentication via institutional identities. AAI functionality will be validated through multiple use cases, including repository access, collaborative services, analysis environments, and HPC access, as well as cross-border pilots.

Exposure of resources through the EOSC Catalogue and Exchange

Repositories and services delivered by the Slovenian EOSC Node will be described, onboarded, and maintained in the EOSC Catalogue in line with EOSC onboarding and metadata requirements. This includes standardised service descriptions, access and usage policies, maturity information, and support contacts.

For the onboarding of new services and repositories into the Slovenian EOSC node, we will establish processes that will ensure their validation in terms of quality, security, availability, documentation, and the integration into EOSC Federation. A phased onboarding approach is applied:

- Initial prototyping and validation,
- Formal catalogue registration,
- Regular updates reflecting service evolution.

This ensures accuracy, transparency, and reliability for EOSC users and service providers.

Implementation of EOSC Node Core Capabilities

The Slovenian EOSC Node will implement all required Node Core Capabilities, using existing national operational processes complemented by targeted enhancements where required:

- Identity and Access Management – integrated with Federated AAI;
- Service onboarding and lifecycle management – supporting repositories and services entering EOSC Federation;
- User support and helpdesk – provided through a national EOSC Information and Support Point building on the ARNES Helpdesk;
- Monitoring and service accounting – ensuring operational oversight and service reliability;
- Service management system – establishing processes for efficient service management within the EOSC Federation, powered by FitSM;
- Security and incident management – aligned with national and European standards.

Core capabilities are continuously validated through national and cross-border use cases and documented for reuse.

Interoperability and FAIR compliance

All repositories and services exposed through the Node adhere to FAIR principles and relevant interoperability standards, including:

- Persistent identifiers and standard metadata schemas,
- Machine-readable metadata and APIs,
- Alignment with OpenAIRE and EOSC discovery mechanisms,
- Documented licensing and access conditions.

Interoperability is demonstrated through integrated workflows, combining multiple services, and validated in practical use cases.

Security, data protection, and compliance

Security and data protection are integral to Node operation. ARNES and IZUM operate under established security frameworks covering risk assessment, incident response, and compliance with applicable data protection legislation.

Sensitive or access-controlled data scenarios are handled through clearly defined access models, legal checks during onboarding, and controlled service configurations. Security considerations are embedded throughout service design, onboarding, and operation.

Validation and continuous improvement

Technical compliance is validated incrementally through phased prototyping, pilot use cases, and milestone-based reviews. Feedback from users, service providers, and EOSC coordination bodies is systematically incorporated into service refinement, documentation, and operational practices.

This adaptive approach ensures that the Slovenian EOSC Node remains compliant with evolving EOSC requirements while maintaining high service quality, resilience, and long-term sustainability as part of regular national operations.

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6. EXTERNAL DEPENDENCIES & KEY RISKS

The build-up and consolidation of the Slovenian EOSC Node are influenced by a number of external dependencies and risk factors related to European-level EOSC developments, national organisational capacities, infrastructure readiness, and community engagement. The following table identifies the key dependencies and risks that may affect delivery during the 36-month build-up phase, together with planned mitigation measures and indicative deadlines.
Risk management follows a phased and adaptive approach, starting with prototyping and early validation, supported by clear documentation, distribution of responsibilities across permanent national institutions, and integration of Node activities into regular operational planning. This approach is designed to ensure resilience, continuity, and sustainable operation beyond the project period.

Risk management within the Slovenian EOSC Node will be proactive, structured, and continuous throughout the 36-month build-up phase. Potential risks will be identified early through regular coordination among technical, organisational, legal, and community-facing stakeholders and reviewed at defined project milestones.
Risks will be addressed through anticipation and prevention wherever possible, including phased prototyping, early validation of technical and organisational solutions, and clear documentation of roles, processes, and dependencies. Where risks cannot be fully avoided, mitigation and remediation measures will be applied, supported by iterative refinement of services, reallocation of resources if needed, and escalation through established governance and coordination structures. Lessons learned from risk events and mitigation actions will be documented and used to continuously improve Node operation and resilience, ensuring stable and sustainable participation in the EOSC Federation beyond the project period.

External Dependencies & Risks	Actions / mitigation measures	Deadline
Evolution of EOSC Federation governance, legal, and technical specifications	Phased implementation starting with prototyping; modular integration layers decoupling national services from EOSC-facing interfaces; continuous monitoring through EOSC coordination and peer exchange	Continuous (0–36)
Availability and maturity of EOSC EU Node services (catalogue, onboarding, helpdesk coordination)	Early alignment and interface testing; separation of national service operation from EOSC integration layers; fallback to uninterrupted national operation if EOSC-level components change	6–24
Insufficient manpower availability and continuity across the 36-month period	Distribution of responsibilities across ARNES, IZUM, libraries, and research partners; documentation-first approach to reduce dependency on individuals; integration of Node tasks into regular job roles	Continuous (0–36)
Infrastructure readiness and capacity (data centres, storage, HPC systems)	Phased rollout aligned with infrastructure availability; prioritisation of validated services; coordination with ongoing national investments (data centre expansion, new supercomputer procurement)	Validation by 12–24; consolidation by 36
Technical implementation complexity and integration effort	Incremental prototyping; use of reference implementations and pilot environments; reuse of existing tools and standards; systematic documentation of integration patterns	Initial validation by 12; ongoing refinement
Onboarding of new use cases and service providers	Structured onboarding pathway including readiness assessment, technical and organisational guidance, and legal/policy checks; gradual onboarding based on capacity	Initial onboarding framework by 12; ongoing
Cross-border partner readiness for the SICRO Nextcloud federation pilot	Early bilateral scoping with SRCE; phased pilot approach (prototype → validation → documentation); formal agreements defining scope and responsibilities	Pilot launch by 18; completion by 36
Regulatory and legal constraints (data protection, licensing, access conditions)	Legal review embedded in onboarding workflows; clear guidance on access and licensing; coordination with national legal and policy bodies	Continuous (0–36)
Limited community uptake in early phases	Early engagement via SSOZ expert bodies, libraries, and repositories; targeted training (national and EU funded projects); user-centric pilots and iterative refinement	Initial mitigation by 12; ongoing
Sustainability beyond the three-year build-up phase	Explicit transition to routine operation; integration of Node services and coordination into ARNES's standard service portfolio; reliance on stable national mandates and funding	Transition confirmed by 36

7. CONTRIBUTIONS [DELIVERABLES (INCLUDING DOCUMENTATION)]

The Slovenian EOSC Node will deliver a coherent, phased set of contributions that support the **build-up, validation, and consolidation** of national EOSC capabilities over a **36-month period**. Deliverables are aligned with the Use Cases prioritise: **national capacity building, knowledge transfer and reuse, documentation of validated solutions, and long-term sustainability**. The Node is designed for continuity: services, coordination mechanisms, and support functions developed or enhanced during the project will continue beyond the three-year period as part of **ARNES's regular operations**, backed by national mandates, stable funding, and established institutional responsibilities. This ensures the Node functions as a **sustained national capability** and maintains active participation in the EOSC Federation after the initial build-up phase.

Overview of deliverables

Deliverable ID	Deliverable Name	Responsible organisations	Deadline
D1	National EOSC Node governance and operational framework	ARNES (lead), IZUM	Month 6
D2	End-to-end research workflow reference package	ARNES (lead); IZUM; RUL; UKM; DiRROS; JSI; CLARIN.SI; Institute of Contemporary History; ADP ; UM FERI	Month 36
D3	Services integration and operations guide	ARNES (lead); IZUM; JSI; UM FERI	Month 12
D4	National training and capacity-building package	ARNES (lead); Central Technical Library UL; NUK; UKM; ADP; SLING (EuroCC 3 partners); SLAIF; JSI; UM FERI	Month 36
D5	Dissemination, community engagement, and helpdesk model	ARNES (lead); ARNES Helpdesk; Slovenian Open Science Community; CTK; NUK; UKM; ADP; SLING; SLAIF; repository operators	Month 36
D6	Cross-border SI–HR federation report	ARNES (lead); SRCE (HR)	Month 24
D7	Consolidated national EOSC Node knowledge base and final report	ARNES (lead), all contributing partners	Month 36
D8	Cross-border SI–SK–PL federation report	ARNES (lead); Slovak EOSC Node (cvtisr.sk)	Month 34
D9	Establishment of data spaces in the national open science infrastructure to ensure data sovereignty	UM FERI (Lead), ARNES, IZUM	Month 36
D10	Establishment of secure storage for sensitive data	UM FERI (Lead), ARNES, IZUM	Month 36
D11	Establishment of a secure processing environment for sensitive data	UM FERI (Lead), IZUM	Month 36
D12	Establishment of a service for the digital preservation of digital research outputs	UM FERI (Lead), ARNES	Month 12

Description of key deliverables

D1 — Governance and operational framework (M6)

Defines the organisational foundation of the Node: governance structure, partner coordination, responsibilities, and interfaces to EOSC bodies. Establishes operational readiness and an enduring national coordination model.

D2 — End-to-end workflow reference package (M36)

Delivers a fully documented, reproducible national workflow (UC-01) linking collaboration and transfer (e.g., Nextcloud, FileSender), analysis (Jupyter), dissemination, and deposition into national/institutional repositories. Includes user guidance, onboarding templates, replication recommendations, and—where needed—lightweight integration components (e.g., connectors or workflow templates).

D3 — Services integration and operations guide (M12)

Documents the integrated operational model of the Node across AAI, storage, collaboration platforms, container registries, Kubernetes, VMs, REANA, and HPC (Vega and new national resources). Covers

architecture patterns, service interconnections, access policies, operational and security procedures, monitoring, and lifecycle integration from collaboration to publication and preservation. Designed as a transferable model for other Nodes.

D4 — Training and capacity-building package (M36)
Consolidates SPOZNAJ, EuroCC 3, and SLAIF activities into a coherent national training package aligned with EOSC practices. Provides curricula, reusable materials, and train-the-trainer resources for data professionals, repository staff, researchers, and HPC users, including new content reflecting the validated national workflows.

D5 — Dissemination, engagement, and helpdesk model (M36)
Establishes a national EOSC entry point combining dissemination, onboarding guidance, and operational support, building on the ARNES Helpdesk and library/repository networks. Includes a curated knowledge base and support assets such as structured onboarding pathways and EOSC-aligned ticket categorisation and guidance.

D6 — SI–HR federation report (M24)
Captures the Slovenia–Croatia federated Nextcloud pilot: technical integration, trust/access models, organisational coordination, and legal considerations, with guidance for replication in other bilateral or regional contexts.

D7 — Consolidated knowledge base and final report (M36)
Synthesises results from all use cases into a reusable national package (templates, workflows, training materials, support processes), summarising validated practices, lessons learned, and recommendations for long-term operation and further federation.

D8 — SI–SK–PL federation report (M34)
Documents the cross-border REANA pilot across Nodes, including integration with federated AAI, storage, registries, Kubernetes and HPC backends, plus operational and policy frameworks. Emphasises workflow portability, provenance tracking, and FAIR workflow publication practices demonstrated in selected scientific domains.

D9 — National data spaces for data sovereignty (M36)
Establishes a decentralised model where data remains under provider control while being discoverable across the federation, supported by standard connectors and usage-control mechanisms that reduce lock-in and prevent unauthorised exploitation.

D10 — Secure storage for sensitive data (M36)
Creates specialised storage tiers for highly sensitive datasets (e.g., health, genomics, proprietary industrial data, and selected SSH datasets), applying strong encryption, MFA, and domain-specific safeguards where required, under a professional custodian model to reduce burden on researchers.

D11 — Secure processing environment / TRE (M36)
Provides a Trusted Research Environment enabling analysis of sensitive data without leaving the secure perimeter, with controlled workspaces, strong isolation, logging/auditing, and export controls limited to approved outputs (e.g., aggregates), supporting strict legal and ethical compliance.

D12 — Digital preservation service (M12)
Implements long-term stewardship of research outputs beyond backups, including active preservation measures (e.g., format management), PID support, and metadata harvesting to maintain accessibility and integrity over decades, aligned with FAIR and Open Science principles.

8. COMMUNITY ENGAGEMENT

The Slovenian EOSC Node will act as Slovenia's **national entry point and primary contact** for researchers and organisations engaging with the EOSC Federation. It will facilitate two-way communication between national stakeholders and EOSC bodies, ensuring that Slovenian needs and priorities are represented at European level, while promoting EOSC principles and services through coordinated outreach (e.g., workshops, webinars) and clear user guidance. The Node will work closely with national service providers, SLAIF, repository operators and other stakeholders, support alignment with national regulations and Open Science strategies, and systematically collect user/provider feedback to address gaps and, where relevant, communicate them to the EOSC Federation. It will also contribute to competence centres developed by science-clusters and collaborate with the EOSC EU Node, including active participation in EOSC Winter School and related capacity-building activities.
The consortium confirms it has (and will further strengthen during the build-up phase) the **organisational capacity** required to enable broad national participation. This capacity is embedded in permanent institutions: **ARNES and IZUM** as core e-infrastructure providers, and community-facing organisations including **NUK, CTK, UKM, and ADP**. National coordination is anchored in the **Slovenian Open Science Community (SSOZ)**—coordinated by UKM with 47 member organisations—providing a stable multi-stakeholder framework aligned with national Open Science policies and the Slovenian Action Plan for Open Science. An EOSC expert body within SSOZ, coordinated with the Open Science infrastructure expert group, serves as a standing consultation mechanism to gather requirements, validate priorities, manage legal and organisational constraints, and feed structured input into EOSC governance and the wider ecosystem.

Inclusive engagement beyond ICT-focused infrastructures is a priority. Through national library and repository networks (NUK, CTK, UKM, ADP), the Node will reach smaller organisations, early-career researchers and research support professionals. CTK also extends outreach beyond universities through its national role in citizen science, coordinating the Slovenian Citizen Science Network (75 partner organisations) and maintaining the national catalogue of citizen science projects, enabling civil society research initiatives to connect to EOSC.

During the build-up phase, the Node will establish a **structured onboarding pathway** for third-party repositories and services, including readiness assessment, technical and organisational guidance, metadata alignment, policy/legal checks, and exposure through EOSC federated catalogues and the EOSC Exchange. Technical onboarding will rely on ARNES and IZUM, while NUK, CTK, UKM and ADP will provide community-facing support on repository practices, FAIR data management, licensing/access conditions, and Open Science compliance consistent with the EOSC Federation Handbook.

Community engagement and capacity building will build on national assets such as **SPOZNAJ** and the **Odprta knjižnica (Open Library)** initiative, serving as a training and support gateway for researchers and research support staff. The Node will integrate SPOZNAJ's national data stewardship network into EOSC-related workflows and reuse proven formats from SPOZNAJ, Odprta knjižnica and **RDA Node Slovenia** (operated by ADP), aligning materials with EOSC-level initiatives (including the EOSC Academy) and prioritising reusable Slovenian-language resources and train-the-trainer approaches. Advanced skills development will be reinforced through **NCC SLING** and **SLAIF** for HPC- and AI-enabled research.

Finally, the Node will coordinate a national **EOSC Information and Support function** building on existing institutional services, providing guidance on onboarding, service discovery, Open Science and Horizon Europe compliance, open access workflows and FAIR stewardship. Sustainability is ensured through permanent institutional structures and routine operations (SSOZ expert bodies, national library/repository networks, and ARNES/IZUM support functions), enabling continued engagement and onboarding beyond the project lifetime.

9. TIMING AND MILESTONES

The build-up of the Slovenian EOSC Node is planned over a 36-month period and follows a phased approach: (Phase 1) prototyping and setup, (Phase 2) validation and scaling, and (Phase 3) consolidation and transition to routine operation. Milestones reflect both technical and organisational progress and are aligned with the delivery of the use cases and contributions described in Sections 4 and 7.

Where relevant, milestones also indicate when user-facing documentation and guidance will be made available following service deployment or validation.

Project phases

- Phase 1: Prototyping and setup (Months 0–6)
  Establishment of governance and coordination structures, initial technical prototyping, definition of reference workflows, and preparation of training, dissemination, and support mechanisms.
- Phase 2: Validation and scaling (Months 6–24)
  Progressive validation of end-to-end workflows, data- and compute-intensive services, training programmes, and onboarding pathways with selected research communities and service providers.
- Phase 3: Consolidation and transition to routine operation (Months 24–36)
  Consolidation of validated solutions, documentation of national practices, cross-border pilot completion, and a seamless transition of the Node into regular operational activities.

Key milestones

Milestone ID	Milestone description	Target delivery date
M1	Establishment of National EOSC Node governance, roles, and coordination framework	Month 6
M2	Initial technical prototyping of Node services and reference workflows (UC-01)	Month 6
M3	Launch of national dissemination channels and EOSC Information and Support Point	Month 6
M4	First validated end-to-end research workflow demonstrator and documentation available	Month 12
M5	Initial pilot of data-intensive storage services and lifecycle integration (UC-02)	Month 12
M6	Initial pilot of compute-intensive workflows (Jupyter → HPC) on national systems (UC-03)	Month 12
M7	Initial pilot of federated discovery, software platforms, and containerised research environments (UC-07)	Month 12
M8	Publication of onboarding guidelines for repositories and service providers	Month 18
M9	Mid-term validation of national training and capacity-building programme (UC-04)	Month 18
M10	Operational dissemination, community engagement, and helpdesk model fully in place (UC-05)	Month 18
M11	Consolidated validation of data, compute-intensive and other provided services with documentation	Month 24
M12	Cross-border SI–HR federation pilot completed and documented	Month 24
M13	Cross border SI–SK–PL federation pilot completed and documented	Month 34
M14	Consolidated national EOSC Node knowledge base and final documentation published	Month 36
M15	Transition of the Slovenian EOSC Node into routine operation	Month 36

Documentation and user guidance

For each major service or workflow milestone, user-facing documentation and guidance will be published shortly after validation. This includes:

- Onboarding and usage documentation for end-to-end workflows,
- Operational and policy guidance for data- and compute-intensive services,
- Training materials and recorded sessions,
- Helpdesk knowledge base articles and FAQs, and
- Replication and integration guidance for institutional and cross-border partners.

All documentation will be maintained as part of the National EOSC Node knowledge base and updated throughout the build-up phase to support long-term operation beyond the project period. All relevant documentation will be shared with EOSC Academy to support knowledge transfer across communities.

10. CONTACTS

The project team involves at least eleven named individuals from the participating organisations, covering coordination, operations, cybersecurity, legal compliance, communication, and technical implementation throughout the build-up phase.

ARNES acts as overall coordinator and provides the main interface to the EOSC governance structures. ARNES, IZUM, UKM, and JSI contribute technical expertise, operational input, cybersecurity oversight, and research community representation. Additional domain and stakeholder representatives support scientific alignment and community engagement.

The consortium assigns dedicated officers for all mandatory roles required by the EOSC Federation build-up phase, ensuring continuity, accountability, and effective interaction with the EOSC EU Node and other participating Nodes.

Role	Name	Email
Coordinator	Marko Drobnjak (ARNES)	marko.drobnjak@arnes.si
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Communications Officer	Brina Klemenčič (UM, SSOZ)	brina.klemencic@um.si

Abbreviations and Acronyms

AAI	Authentication and Authorisation Infrastructure
ADP	Slovenian Social Science Data Archives
AI	Artificial Intelligence
API	Application Programming Interface
ARNES	Academic and Research Network of Slovenia
Ceph	Open-source distributed storage platform
CLARIN.si	Common Language Resources and Technology Infrastructure , Slovenia (Slovene national consortium of the European research infrastructure CLARIN)
COBISS	Slovenian Co-operative Online Bibliographic System and Services
CTK	Central Technical Library of the University of Ljubljana
D	Deliverable
DiRROS	Digital Repository of Slovenian Research Organisations
DKUM	Digital Library of the University of Maribor
dLib	Digital library of Slovenia
eduroam	Education Roaming
EG	Expert Group
EGI	European Grid Infrastructure
EOSC	European Open Science Cloud
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EuroCC	European Competence Centres for High-Performance Computing
EuroHPC	European High-Performance Computing
FAIR	Findable, Accessible, Interoperable and Reusable (data principles)
FitSM	Lightweight IT Service Management standard
GÉANT	Pan-European Research and Education Network
GPU	Graphics Processing Unit
HPC	High-Performance Computing
HR	Croatia
ICT	Information and Communication Technology
ID	Identifier
INZ	Institute of Contemporary History
IZUM	Institute of Information Science
JSI	Jožef Stefan Institute
M	Milestone
ML	Machine Learning
NCC	National Competence Centre
NUK	National and University Library of Slovenia
OA	Open Access
OpenAire	Open Access Infrastructure for Research in Europe
OpenStack	Open-source cloud computing platform
PID	Persistent Identifier
PL	Poland
R	Repositories
R&E	Research and Education
RDA	Research Data Alliance

REANA	Reusable and Reproducible Research Data Analysis Platform
REVIS	Repository for Standalone Faculties (not part of Universities)
RUL	Repository of the University of Ljubljana
RUNG	Repository of the University of Nova Gorica
RUP	Repository of the University of Primorska
S	Service
SK	Slovakia
SI	Slovenia
SICRIS	Slovenian Current Research Information System
SLAIF	Slovenian AI Factory
SLING	Slovenian National Supercomputing Network
Slurm	Slurm Workload manager for High-Performance Computing clusters, formerly Simple Linux Utility for Resource Management
SPOZNAJ	Slovenian Open Science Infrastructure project
SRCE	University of Zagreb University Computing Centre
SSOZ	Slovenian Open Science Community
TRE	Trusted Research Environment
TRL	Technology Readiness Level
UC	Use Case
UKM	University of Maribor Library
UM FERI	Faculty of Electrical Engineering and Computer Science, University of Maribor
Vega	Slovenian national EuroHPC system, named after Jurij Vega
VM	Virtual Machine