SLOVAK CENTRE OF SCIENTIFIC AND TECHNICAL INFORMATION (CVTI SR)

Project Charter

(Draft version 2025.09.25)

Building the national EOSC Node Slovakia

1. Project Summary [1]

The Slovak Centre of Scientific and Technical Information (CVTI SR) with selected national stakeholders aims to establish national EOSC node Slovakia, enabling seamless access to national research data, computing resources, and specialized services. With a history spanning over 86 years as Slovakia's national information centre for science, technology, innovation, and education, CVTI SR with the network of national stakeholders brings stability, sustainability, and experience in data management and technical infrastructure to the EOSC ecosystem.

As the main Datacentre for research and development in Slovakia, the National EOSC SK Secretariat and National Office for Open Science, CVTI SR will leverage its substantial infrastructure (Data repositories, computing resources and analytical capabilities) to contribute to the EOSC Federation's objective of enabling open science and FAIR data practices across Europe. The project's scope includes integrating CVTI SR's systems with the EOSC Federation through our Interoperable Platform (KOMIS), which will connect multiple research organizations, universities, and data repositories in Slovakia. EOSC node | Slovakia geographic focus is primarily Slovakia and the Central European region, but through our services it will be available to all EOSC users. Our key contributions will include data hosting and provision, technical infrastructure support, resource allocation systems for researchers, and contributing in cross-border research collaboration.

Initial steps in the first 6-9 months will lead to onboarding selected Slovak research resources to the EOSC EU Node (onboarding stream). Parallel activities with an expected duration of 2 years will lead to establishing the proper national EOSC Node | Slovakia (enrolling stream), followed by continuous expansion and development (scaling stream).

2. Value Proposition[1]

- **Main Goal (long-term):** Establish integral National EOSC Node | Slovakia that enhances Slovakia's research capabilities while contributing significant resources and expertise to the European research data ecosystem.
- **Goal (short-term):** Onboard selected Slovak data sources to the EOSC EU node and conduct comprehensive analysis of multiple cross-node use cases to effectively validate the functional significance and positioning of Slovak research role within the European research ecosystem.
- **Needs addressed:**
    - *fragmentation of Slovak research data* by resolving the dispersion of research data across Slovak institutions, enabling unified access within the European research ecosystem.
    - *Interoperability limitations* by enhancing connectivity between Slovak and European research infrastructures with implementing standardized protocols and interfaces that facilitate cross-border and interdisciplinary research.
    - *Data accessibility barriers* by improving cross-border access to specialized Slovak research datasets that were previously isolated or difficult to discover.
- **Key Benefits:**
    - *Integration of Slovak research repositories and data systems* into the European ecosystem and enhance discoverability of Slovak research outputs through standardized methods.
    - *Expanded infrastructure resources* for storage and computing capacity for European researchers: CVTI SR with national stakeholders will contribute significant storage and computing capacity to support data-intensive research.

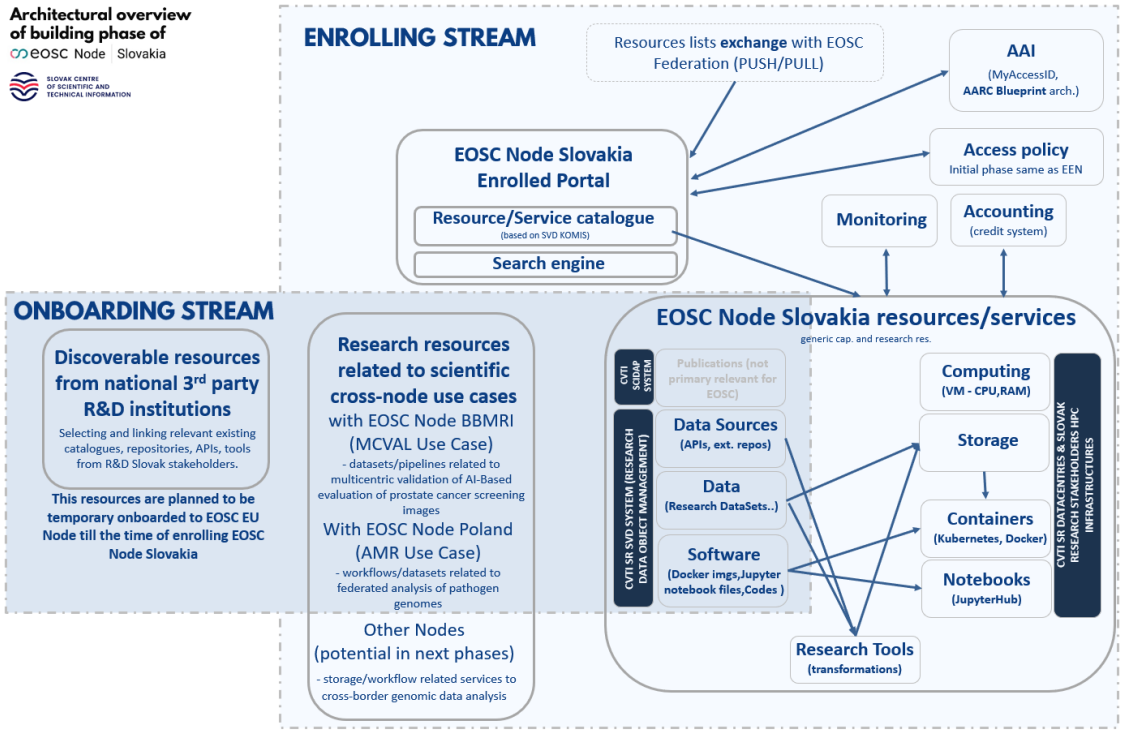
([1]) Refer to Guidance Material Page 3

- *Enhanced data interoperability* via unified standards for research data management and exchange, increasing FAIR compliance across Slovak research repositories.
- *Regional integration expertise* by bridging Central European research infrastructures with the broader European research ecosystem, providing regional integration knowledge and connections.

- **Who Benefits:**
  - *Research Community:* Slovak and European researchers across disciplines gain seamless access to previously fragmented datasets and computing resources.
  - *Academic Institutions:* Universities and research organizations throughout Slovakia and the EU benefit from cost-effective resource sharing through our federated infrastructure.
  - *Public Sector Bodies:* Government agencies requiring scientific information for evidence-based policymaking access standardized research outputs.
  - *Industry Partners and research infrastructure operators:* Private sector entities engaged in research and innovation activities benefit from standardized interfaces to research innovations.
  - *Citizens and Society:* The broader public gains through enhanced open science practices, improved transparency, and more accessible research processes.

3. Use Case(s) [1]

Depicted architectural overview demonstrates the planned evolution of Slovakia's EOSC participation related to use cases - from initial temporary onboarding with the EOSC EU Node to the establishment of a fully functional national EOSC Node Slovakia during the proposed streams and timelines:



Use Cases are divided into 3 streams:

3.1 Onboarding stream (Initial pilot phase in first 6-9 months – highest priority first):		
Use Case ID	***Use Case Description***	***Federation Contributions & Value to Users***
o-UC1 (MCVAL SK part)	***Multicentric Validation of AI-Based Tumor Tissue Characterization: A Cross-Node Collaboration Between EOSC Node Slovakia and EOSC Node BBMRI*** ***(Related to multi-node use-case: MCVAL: A prostate cancer screening tool that employs multi-centric validation of AI models)*** *(scientific use case)* ***Description****: This use case contributes to validation of AI-based system (EOSC Node BBMRI) for tumour tissue characterization in pathology images, in initial phase specifically focusing on prostate tissue slides. The system analyses medical images to identify and distinguish tumor regions from healthy tissue, potentially providing information about tumor stage and appropriate treatment options. The collaboration connects EOSC Node BBMRI's established AI characterization method with datasets from other EOSC nodes (including Slovak) to enable robust multicentric validation. The workflow involves EOSC Node Slovakia maintaining a FAIR-compliant repository of anonymized tissue images contributed by affiliated medical institutions (In first phase cooperation between CVTI SR and Faculty of Medicine – Comenius University Bratislava). These images will be distributed and processed through BBMRI's AI characterization service, with results subsequently evaluated by medical professionals at EOSC Node Slovakia. This creates a validation feedback loop where BBMRI receives validation metrics while participating doctors gain access to AI-assisted image analysis.* ***Access Policy:*** *This cross-node AI-based tumor characterization use case will implement a tiered access structure mirroring the EOSC EU Node access policy, with the initial phase considering utilizing only non-sensitive, anonymized prostate tissue slide images and in the next phase dealing with the DPA and restricted access only for relevant parties. This approach ensures appropriate data governance and resource allocation while demonstrating how cross-node collaboration can maintain data sovereignty and enable effective multicentric validation of AI methodologies.*	***Federation Contributions:*** *This cross-node collaboration exemplifies EOSC's federation model by integrating specialized capabilities from different nodes—BBMRI's AI expertise and CVTI SR's data management infrastructure. By implementing a tiered access structure mirroring the EOSC EU Node access policy, the use case demonstrates practical application of EOSC governance principles while facilitating secure cross-border data sharing. This use case establishes a replicable pattern for multicentric validation methodologies that can be applied beyond biomedical domains, addressing the broader challenge of validation across heterogeneous datasets from multiple sources—a fundamental requirement for scientific reproducibility in EOSC Federation.* ***Value to Users:*** *For medical researchers and clinicians, this use case delivers validated AI-assisted tumor characterization tools that have been rigorously tested across multiple centers, enhancing confidence in diagnostic applications. Participating doctors receive advanced image evaluation capabilities without needing AI expertise, potentially improving diagnostic accuracy and treatment selection. For data providers and medical institutions, the platform offers a structured framework to contribute to and benefit from collective validation efforts while maintaining appropriate data governance. The broader research community gains a practical model for implementing multicentric validation protocols that can strengthen the robustness of computational methods across domains. By demonstrating how cross-node collaboration enables systematic validation of AI methodologies, this use case addresses a critical challenge for EU research groups: finding and utilizing diverse datasets for thorough validation, ultimately accelerating the responsible implementation of AI in healthcare and beyond.*

o-UC2 ***(AMR SK part)***	***Cross-Border Federated analysis of pathogen genomes Through EOSC Node Slovakia and EOSC Node Poland*** ***(Related to multi-node use case : AMR: Federated analysis of pathogen genomes)*** *(scientific use case)* ***Description****: This use case establishes a collaborative framework for genomic sequence analysis of antimicrobial resistant (AMR) pathogens between EOSC Node Slovakia and EOSC Node Poland with potential of expanding to other EOSC Node. The initiative combines resources and expertise of both parties with relevant research and technological stakeholders or research stakeholders (Slovak – National Centre for Bioinformatics CVTI SR and University Science Park of Comenius University Bratislava, Poland – Cyfronet AGH and National Science Centre) to create a cross-border federated analysis system for AMR research. The workflow involves collecting, processing, and analysing genomic sequences from various AMR pathogens to identify resistance patterns, track their spread of human pathogens across sectors and national borders* *EOSC Node Slovakia will provide:* • *Specialized tools for genomic data management and Slovak AMR genomic datasets* • *Publicly available genomic data, including AMR bacteria, Salmonella strains, Campylobacter strains and respiratory viruses* • *Bioinformatics workflows for genotyping and characterizing respiratory viruses and AMR bacteria, currently utilized in Slovakia* • *Providing storage resources via OneProvider to Poland data space on OneData solution (Cyfronet PL)* • *Mounting combined SK-PL data spaces from OneData solution via OneClient to external SK systems with AMR running workflows.* *EOSC Node Poland will contribute:* • *By facilitating access to Polish AMR genomic datasets through their national biobank network and bringing expertise in bioinformatics algorithms for resistance gene identification.* • *By providing support for utilization of opensource OneData solution created by PL Cyfronet.*	***Federation Contributions:*** *Cross-node collaboration exemplifies the EOSC federation model by integrating complementary capacities from different European research nodes, contributing their extensive collection of genomic sequences from clinical isolates, and sharing specialized bioinformatic workflows developed by EOSC researchers. This collaborative, multinational analysis of pathogens demonstrates how the EOSC federation can address transnational public health challenges that require coordinated actions and data sharing across borders and multiple research infrastructures. This demonstration of EOSC potential could facilitate more formal agreements with national public authorities, which would be necessary to expand the range of exchanged data. Technical details regarding optimal methods for sharing and exchanging data, workflows, and infrastructure will be addressed in later development stages.* ***Value to Users:*** *For microbiologists and infectious disease researchers, this use case provides unprecedented access to diverse AMR genomic datasets spanning multiple neighbouring European regions, enabling more comprehensive analysis of resistance patterns and evolutionary trends. Healthcare institutions benefit from improved federated analysis capabilities and early warning systems for emerging resistant pathogens, potentially informing more effective infection control strategies. Public health authorities gain valuable cross-border insights into AMR transmission dynamics that transcend national boundaries, supporting evidence-based policy decisions. For bioinformaticians, the platform offers standardized workflows and valuable AMR related datasets.*

	• *In case of sensitive national PL data creating scenario of running SK AMR workflows on PL infrastructure with PL data* *The system will combine cross-border AMR genomic dataset with cross-validation and incorporate prediction models to identify novel resistance mechanisms and correlate genomic markers with clinical outcomes.* ***Access Policy:*** *cross-node AMR genomic analysis use case will implement a tiered access structure aligned with the EOSC EU Node access policy, with the initial phase utilizing de-identified pathogen genomic sequences with minimal epidemiological metadata. Access to the collaborative analysis platform will be structured according to EOSC principles, with primary non-sensitive genomic datasets assigned to Access Group AP-A (Insider View) with access to aggregated resistance patterns and anonymized genomic markers. Workflows related resources will be added to AP-A1 (Institutional View) group.*	
o-UC3	***Onboarding of selected catalogues of research resources (SVD KOMIS) into EOSC EU Node: API Harmonization and Metadata Standardization*** ***Description:*** *This use case focuses on onboarding selected catalogues of research resources in subsystems of CVTI SR's KOMIS (Comprehensive Research Information Management System) to the EOSC EU Node, establishing a temporary connection between Slovak research outputs and the European research ecosystem till the time of building functional enrolled SK Node. The initiative will primarily integrate one critical KOMIS subsystem: SVD (Research Data Objects Repository), making their rich content discoverable and accessible through EOSC EU Node. The core technical objective involves harmonizing the existing APIs of these subsystems with EOSC standards through the development of adapter layers and data transformation pipeline and ensuring the compatibility with OAI-PMH and it's validation with OpenAIRE. This process will include enhancements in standardizing metadata schemas to align with EOSC guidelines, enhancements in implementation of persistent identifier (PID) systems compliant with global standards (DOI, ORCID, ROR). Beyond CVTI SR resources, the use case will bring external catalogues from multiple Slovak research institutions and citizen science initiatives as recognizable sources within the EOSC EU Node. This initial integration serves as a foundation for a future, more comprehensive use case (in the*	***Federation Contributions:*** *This approach strengthens the EOSC federation by integrating Slovak research resources that were previously isolated within national information systems. By harmonizing KOMIS subsystem APIs with EOSC standards, the initiative creates interoperable pathways for initial research data discovery from Slovak repositories. The metadata standardization efforts contribute to EOSC's goal of creating consistent, machine-actionable research descriptions across Europe. The implementation of globally recognized PID systems enhances the discoverability and citability of Slovak research outputs within international contexts. By establishing methodologies for external catalogue integration, this use case creates a growing initiative for incorporating diverse research resources from regional institutions and citizen science initiatives into EOSC, extending beyond major national repositories. The three-phase/stream approach—beginning with EU Node integration before transitioning to a national node and scaling—provides a pragmatic model for other new potential nodes from smaller countries with developing research infrastructures to progressively engage with EOSC while building local capacity.* ***Value to Users:*** *For researchers across Europe, this use case unlocks access to previously difficult-to-discover Slovak research publications and data objects directly via EOSC EU Node, enriching the pool of available scientific resources and enabling new collaborative possibilities. Slovak researchers benefit from dramatically increased visibility of their work within the European research community, potentially leading to more citations,*

	parallel second stream) that will transition these resources to a standalone enrolled national EOSC Node Slovakia built upon an enhanced KOMIS architecture. ***Access Policy:*** *This KOMIS resource integration use case will implement an open access structure fully aligned with EOSC EU Node principles, with all onboarded resources assigned to Access Group AP-0 (Public View) during the initial phase. Selected research data objects from SVD will be in this phase made openly discoverable and accessible without authentication requirements, promoting maximum visibility of Slovak research outputs throughout the European research community. Metadata catalogues and access endpoints will be publicly available through standard EOSC interfaces, supporting unrestricted programmatic and user-interface access. This open approach ensures Slovak research contributions are immediately findable and reusable within the broader EOSC ecosystem while establishing foundational infrastructure for more complex access management in future phases when additional resources with varying sensitivity or high resource consumption levels may be integrated into the national EOSC Node Slovakia.*	*collaborations, and funding opportunities. Citizen scientists and smaller research institutions gain a pathway to make their contributions discoverable within the European research ecosystem through the external catalogue integration mechanisms. The open access approach in this initial phase ensures that socioeconomic barriers to information access are minimized, democratizing knowledge availability.*

3.2 Enrolling stream (parallel to Onboarding stream with 2 years of duration):		
Use Case ID	***Use Case Description***	***Federation Contributions & Value to Users***
e-UC1	***Enrolling the EOSC Node Slovakia: Transformation KOMIS systems to a federated national node*** ***Description:*** *Use case outlines the comprehensive transformation of existing CVTI SR's KOMIS solution into Slovakia's official National EOSC Node Slovakia (EOSC SK). The initiative involves enhancing all major KOMIS components to meet EOSC compliance standards: the central KOMIS framework (research management backbone), SVD (research data objects repository), SCIDAP (scientific publications repository), SK CRIS (Current Research Information System tracking projects, organizations, and researchers), and discovery service layer. Technical enhancements will include implementing IDM integrating with the EOSC AAI, developing standardized API gateways for all subsystems, establishing automated metadata harvesting pipelines (OAI-PMH compatibility), and altering a robust PID*	***Federation Contributions:*** *It will strengthen the EOSC federation by establishing a fully operational national node for Slovakia, extending EOSC's geographical coverage and research domain diversity. By transforming KOMIS into an EOSC Node Slovakia, the initiative creates bidirectional pathways for data and service exchange between Slovak research resources and the broader European ecosystem. The comprehensive integration of multiple information systems (mainly SVD) under a unified framework demonstrates how complex national research landscapes can be harmonized with EOSC standards while maintaining local governance. The use case expands EOSC's service portfolio by making Slovak-specific research tools and datasets discoverable and accessible through the federation.* ***Value to Users:*** *For researchers, this transformed infrastructure eliminates*

	management system supporting multiple identifier schemas. The transformed infrastructure will serve as a centralized environment for managing data exchanges between various national information systems while federating with EOSC core services. A key architectural advancement involves creating interoperable connections between Slovak national repositories, allowing researchers to discover and access resources through a unified interface regardless of their affiliation. The transformation will implement automated data flows between all subsystems, eliminating manual interventions and ensuring real-time synchronization of research information, while providing native EOSC connectivity through standardized protocols. ***Access Policy:*** *EOSC node Slovakia establishment use case will implement an open access structure for the initial phase, with all core metadata records and public research outputs accessible through Access Group AP-0 (Public View) without authentication requirements. The transformed KOMIS ecosystem will provide unrestricted discovery of Slovak research outputs through standardized EOSC interfaces while preparing the technical infrastructure for future implementation of more nuanced access controls. This open-first approach ensures maximum visibility and reusability of Slovak research contributions within the European Open Science landscape while building technical capacity for handling sensitive data and restricted resources in subsequent phases, all aligned with EOSC EU Node access principles.*	*fragmentation by providing a unified entry point to Slovak national and European research resources, dramatically simplifying data discovery and access through integration with the discovery service. The automated data flows between systems reduce administrative burden, allowing researchers to focus on science rather than data management tasks. European researchers gain streamlined access to previously isolated Slovak research outputs through familiar EOSC interfaces, enabling new collaborative opportunities. Policy makers receive improved visibility into national research activities and their integration with European initiatives, supporting strategic alignment of national and EU priorities. Industry partners gain easier discovery of potential academic collaborators and innovations through the unified system.*
e-UC2	***Integration of computing resources of CVTI SR and Slovak research stakeholders into EOSC Node Slovakia: Federated access to national HPC and data infrastructure*** ***Description:*** *This use case focuses on the comprehensive integration of CVTI SR's computing infrastructure—specifically the Datacentre for Research and Development (DCVaV II and the potentially DCVaV III) and HPC resources from Slovak research stakeholders into the enrolled EOSC Node Slovakia, creating a seamless pathway for Slovak and European researchers to access high-performance computing and storage resources. The initiative will develop a sophisticated web-based user interface embedded within the EOSC SK portal (transformed from KOMIS solution), enabling researchers to discover, request, allocate, and manage computing resources through standardized workflows. The technical implementation will establish infrastructure management systems, with real-time synchronization of resource availability, allocation status, and usage metrics.*	***Federation Contributions:*** *This use case substantially enhances the EOSC federation by integrating Slovak national computing resources (DCVaV II and potentially upcoming DCVaV III) into the European research infrastructure ecosystem, increasing the overall computational capacity available to European researchers. By implementing standardized interfaces and protocols, the initiative ensures that CVTI SR's resources can be discovered, requested, and accessed through consistent EOSC mechanisms regardless of researchers' geographical location. The containerization and notebook support strengthens the federation's capacity for reproducible research by enabling standardized deployment of scientific applications across distributed infrastructure.* ***Value to Users:*** *For Slovak researchers, this integration eliminates procedural barriers to accessing advanced computing infrastructure, with the web-based UI providing intuitive resource request workflows and transparent allocation status tracking. Researchers from*

	Authentication and authorization will be fully integrated with EOSC's federated AAI. The computing environment will support contemporary scientific computing paradigms, including containerized applications with full Docker compatibility and interactive computing through Jupyter notebooks with specialized domain libraries. Resource allocation mechanisms will include both automated approval paths for standard configurations and managed workflows for specialized or large-scale requirements. Monitoring and accounting systems will track resource utilization while integrating with the broader EOSC accounting framework, ensuring sustainable resource sharing across institutional and national boundaries. ***Access Policy:*** *Basic Jupyter notebook environments for educational purposes will be assigned to Access Group AP-A1 (Institutional View), enabling broad awareness and skills development. Standard computing resources for non-sensitive research workloads will be available through Access Group AP-B (Researcher View) for authenticated researchers from Slovak and partnering European institutions. This multi-tiered approach similar as EOSC EU node allows CVTI SR's significant computing infrastructure to support diverse research needs while maintaining appropriate security and sustainability.*	*across Europe gain visibility into and potential access to CVTI SR's computing capabilities, expanding their options for resource-intensive computational tasks. The containerization compatibility enables researchers to develop applications in familiar environments before deploying them on high-performance infrastructure, significantly reducing technical complexity. Jupyter notebook integration provides an accessible entry point for researchers with varying levels of programming expertise, democratizing access to computational methods.*
e-UC3	***Cross-Node Genomic Data Analysis: Integrating CVTI SR Bioinformatics with European Research Infrastructures*** *(scientific use case)* ***Description:*** *Use case connects CVTI SR's bioinformatics infrastructure and resources with resources and workflows from potential biomedical data processing related nodes such as Elixir, EUDAT through standardized EOSC interfaces. The implementation builds on existing CVTI SR's partnerships with EMBL, ELIXIR, and the 1+ Million Genomes Initiative to establish data exchange protocols that transform national capabilities into components of European-scale infrastructure.* ***Access Policy****: It implements tiered access controls across the EOSC policy spectrum: public bioinformatics workflows and standard non-sensitive data analysis resources under AP-A1, but sensitive biomedical data processing tools will be handled under additional layer with authorized/restricted policy in agreement with relevant data owners.*	***Federation Contributions:*** *It demonstrates EOSC federation principles by connecting specialized resources from multiple European centers through standardized interfaces, expanding collective genomic analysis capabilities. It builds upon CVTI SR's existing European partnerships while implementing EOSC technical standards. The multi-tiered access model showcases appropriate management of sensitive biological data within the federation context while maintaining necessary protections.* ***Value to Users:*** *Researchers gain seamless access to distributed European bioinformatics resources without technical barriers. The containerized environment ensures computational reproducibility across infrastructure components. Specialized tools and reference datasets maintained by expert communities become available without duplicating resources. Jupyter notebook integration supports both novice and advanced users through scalable computing backends, enabling more sophisticated genomic analyses.*

3.3 Scaling stream (Future plan after node Enrolling 2027+):		
Use Case ID	***Use Case Description***	***Federation Contributions & Value to Users***
s-UC1	***EOSC Node Slovakia Expansion: Onboarding additional Slovak R&D Institutions in to enrolled SK Node and Resource Harmonization*** ***Description:*** *This use case establishes standardized procedures for integrating external Slovak R&D institutions and stakeholders into enrolled EOSC node Slovakia. CVTI SR will work with stakeholders to implement onboarding tools with metadata converters, API harmonization layers, and validation services. The process accommodates diverse institutional repositories, infrastructural resources, and datasets while ensuring EOSC compatibility through consistent metadata schemas and PID implementation.* ***Access Policy****: The onboarding framework supports all EOSC access tiers. Resource owners define applicable access policies during onboarding while benefiting from standardized authentication mechanisms through the federated EOSC SK identity system.*	***Federation Contributions:*** *Mentioned expansion strengthens the EOSC ecosystem by incorporating diverse Slovak research assets through a coordinated national approach. By harmonizing resources from universities, research institutes, and specialized facilities, this use case demonstrates how national nodes can aggregate distributed resources while preserving institutional autonomy.* ***Value to Users:*** *Smaller Slovak institutions and R&D stakeholders gain visibility in the European research ecosystem without developing independent EOSC-compliant infrastructure. Researchers access a comprehensive national research portfolio through consistent interfaces regardless of institutional boundaries. Resource providers maintain governance control while benefiting from wider usage and recognition.*
s-UC2	***Enhanced Research Tools Integration: Bridging KOMIS Data Management and Datacentre Infrastructure*** ***Description:*** *Use case establishes a research tools integration layer within the EOSC Node Slovakia connecting KOMIS research data management subsystems (SVD) with CVTI SR datacentre infrastructure (DCVaV) and infrastructures of Slovak research stakeholders. The framework implements containerized research applications, workflow orchestration tools, and domain-specific analysis platforms accessible through standardized APIs. This middleware layer with option services like data transition, APIfication, labelling etc. enables seamless data flow from repositories to computational resources with automated provenance tracking and results storage.* ***Access Policy****: The integration layer supports diverse access controls across EOSC tiers, with common research tools available under AP-A1 and Access Group AP-B, but sensitive data processing tools will be handled under additional institutional related layer with authorized/restricted policy.*	***Federation Contributions:*** *Proposed interconnection layer demonstrates practical EOSC interoperability by bridging previously isolated national research data and computing resources. By implementing standardized research tool interfaces aligned with European best practices, the use case establishes a reusable pattern for other EOSC nodes.* ***Value to Users:*** *Researchers gain unified access to transitional and analytical tools that seamlessly connect data repositories with computing resources, eliminating manual data transfer and environment configuration. The integrated environment supports full research lifecycles from data discovery through analysis to results publication with consistent interfaces. Domain scientists can deploy specialized tools through standardized containers while benefiting from scalable infrastructure without managing technical complexity.*

s-UC3	***Cross-Node Research Tools: Enabling Multi-National Infrastructure and Resources Integration*** ***Description:*** *This type of use case establishes an enhanced research tools framework enabling seamless workflows across multiple EOSC nodes, connecting data resources from the Slovak node with computing infrastructure from partner countries or vice versa. The implementation provides federated discovery services, standardized data transfer protocols, and containerized analytical environments that operate consistently across distributed infrastructure. Researchers will be able to construct workflows combining datasets, storage, and computing resources from different nodes providers through unified interfaces with automated resource orchestration.* ***Access Policy****: Access tiers from AP-A1 through AP-B are mapped between participating nodes with policy translation layers ensuring consistent governance while respecting local requirements. Cross-node usage agreements establish clear responsibilities for each participating infrastructure (considering specific additional layer with authorized/restricted policy).*	***Federation Contributions:*** *Cross-node initiative directly advances and generalise EOSC's core mission by demonstrating practical federated operations beyond single-node boundaries. The standardized interfaces and authentication mechanisms provide a generalised template for expanding cross-node integration throughout the EOSC ecosystem.* ***Value to Users:*** *Researchers gain unprecedented ability to construct complex workflows incorporating the best-suited resources regardless of geographical location or administrative domain and combining it with Slovak data or infrastructural resources. Data-intensive research becomes more efficient through optimized placement of computation near relevant datasets while maintaining seamless workflow integration. The framework enables European-scale research approaches previously constrained by infrastructure fragmentation.*

- **In-scope:**
  - **Data Management Systems and Services:**
    - Integrated system (KOMIS) for acquisition, processing, storage and access to research data
    - Network of repositories including:
      - Discovery System for Electronic Information Resources
      - Central Repository for Research Data Management (SVD)
      - Central Repository for Scientific and Professional Publications Management (SCIDAP)
      - Current Research Information System for R&D (SK CRIS)
  - **Integration and Interoperability:**
    - Open APIs and OAI-PHM compatibility for selected data provided from CVTI SR subsystems
    - Implementation of AAI and accounting
    - Alignment with EOSC's interoperability frameworks
    - Interoperable platform connecting multiple national information systems
  - **Core Infrastructure and Resources:**
    - National data infrastructure with continuous maintenance and development
    - HPC infrastructure of CVTI SR and selected Slovak research stakeholders for R&D data processing, aggregation, visualization, and retrieval

        - Allocation of partial CVTI SR Datacentre capacity specifically for EOSC users (approximately RAM: 16 TB, CPU: 1,600 cores, Storage: 1,650 TB with potential to significant increase in the future projects)
        - Resource allocation portal for dynamic infrastructure resource management
        - Technical expertise with dedicated CVTI SR staff (IT, data processing and management)
    - **Bioinformatics Software and Computing Resources:**
        - Specialized bioinformatics software environment and complex computational infrastructure for biomedical data analysis
        - Secure storage, management, and access systems for large-scale genomic data within EOSC Federation
        - Integration of CVTI SR's bioinformatics tools with EOSC computational services
    - **Stakeholder Support:**
        - Support for and from Slovak universities and R&D institutions
        - Facilitation of data sharing across the European Research Area
        - Active campaign to encourage participation of relevant institutions in EOSC Federation and connecting researchers and research data through the interoperable platform
        - Connection to European research initiatives
    - **Knowledge Transfer and Capacity Building:**
        - Training resources and workshops related to open-science and specialised topics such as biomedical data processing

- **Out of scope:**
    - Resource Limitations:
        - Unlimited computing resources or storage for individual research projects or provision of unlimited storage for raw genomic sequences
    - Geographic and Institutional Boundaries:
        - Primary support will focus on Slovak research communities with increasing scope for direct support to research entities in the Central Europe region and in Europe.
    - Technical Constraints:
        - Development of custom solutions for individual research groups that fall outside the interoperability framework
        - Maintenance of legacy systems not compatible with EOSC standards
        - Implementation of services requiring technologies beyond CVTI SR's expertise areas
    - Financial Boundaries:
        - Commercial services beyond those necessary for sustainable operation
        - Initiatives requiring significant investment beyond the planned infrastructure investment
    - Dependencies on External Partners:
        - Implementation of services that require expertise or infrastructure not available within CVTI SR
        - Direct provision of domain-specific research tools outside CVTI SR's core competencies

4. External Dependencies & Key Risks[2]

4.1 Onboarding stream (Initial pilot phase in first **6-9 months**):

External Dependencies & Risks	Actions
Governance Alignment: Need to align CVTI SR governance structures with EOSC governance framework	Establish a dedicated EOSC coordination team within CVTI SR to ensure alignment and representation in relevant EOSC governance bodies
Stakeholder Engagement: Potential resistance or low participation from Slovak research institutions	Implement targeted communication strategy and conduct workshops to demonstrate benefits of EOSC participation
Technical Integration Challenges with onboarding: Potential interoperability issues between existing CVTI SR services and APIs and EOSC technical requirements with onboarding process to EOSC EU Node	Conduct comprehensive gap analysis and develop a phased technical integration roadmap with clear milestones
Metadata Standardization Challenges: Existing repositories may use different metadata standards than EOSC requirements	Conduct metadata mapping exercises and implement standardization procedures
Intellectual Property and Licensing Issues: Ensuring proper rights management for shared resources	Develop comprehensive IP policy for EOSC-shared resources and provide training to stakeholders
Language and Cultural Barriers: Multi-language support needs for integration in European context	Implement multi-language support for key services and documentation

4.2 Enrolling stream (parallel to Onboarding stream with **2 years** of duration):

External Dependencies & Risks	Actions
Technical Integration Challenges with enrolling: Potential interoperability issues between existing CVTI SR systems and EOSC technical requirements with enrolling process as national node	Conduct comprehensive gap analysis and develop a phased technical integration roadmap with clear milestones
Resource Allocation Conflicts: Competition between national priorities and EOSC commitments for limited infrastructure resources	Develop and implement transparent resource allocation policies with dedicated quotas for EOSC activities
Data Protection and GDPR Compliance: Ensuring cross-border data sharing adheres to EU and national regulations	Conduct legal assessment and develop data management protocols aligned with GDPR and national legislation
Cybersecurity Vulnerabilities: Increased attack surface due to federation with external systems	Implement enhanced security framework with regular penetration testing and security audits
Skills and Expertise Gap: Limited specialized personnel for managing advanced EOSC services	Develop training program for staff and initiate targeted recruitment for critical roles
Dependency on National IT Projects related to enhancing KOMIS or Datacentres: Central elements of contribution can be partially tied to successful implementation of projects of proposal or approval status.	Establish project interdependency mapping and contingency plans for potential delays

(2) Refer to Guidance Material Page 4

4.3 Scaling stream (Future plan after node Enrolling):

External Dependencies & Risks	Actions
Technical Integration Challenges with cross-node pairing data resources with infrastructure: Potential interoperability issues between existing CVTI SR resources/infrastructures and other nodes resources/infrastructure in creating heterogeneous pairs of cross-node services.	Conduct comprehensive gap analysis and develop a phased technical integration roadmap with clear milestones
Environmental and Energy Constraints: Growing energy requirements for expanded datacentre operations	Develop and implement green computing strategy aligned with EU sustainability goals
EU Funding Dependency: Reliance on EU funds for infrastructure development and EOSC integration	Develop a mixed funding strategy incorporating national budget allocation and explore sustainable funding models

5. Contributions[3]

- **Role in Project:** Infrastructure & Data provider
- **Contributions and resources Provided:**
  - 11+ members of national EOSC node | Slovakia team
  - **KOMIS integrated solution** for acquisition, processing, storage and access to research data repositories and information systems
  - Direct infrastructural contribution with sustainable infrastructure:
    - **Datacentre of CVTI SR** and relevant computing infrastructure (app. 1,600+ CPU cores, 16+ TB RAM, 1,650+ TB storage)
    - **HPC resources** of selected Slovak research stakeholders
  - Related **integration projects** of enhancing Datacentre and KOMIS subsystems
  - Dedicated facility space and networking infrastructure
  - Training programs related to open science or specific topics such as biomedical data processing and storing
  - Services related to intellectual property protection and technology transfer
  - National-wide popularization of EOSC Federation and fortify involvements in EOSC in central Europe R&D with potential future bridge to Ukraine (involve R&D resources related to relocated Ukrainian scientist and projects residing temporary in Slovakia)
- **Main Cooperations:**
  - **Onboarding stream (Initial pilot phase in 6-9 months):**
    - Cooperation EOSC Node Slovakia & **EOSC Node BBMRI-ERIC**
      - Building cross-node scientific use case with research data exchange for AI classification of tumour tissue images (initially tested with Prostate Tissue Slides) with multicentric validation.
    - Cooperation EOSC Node Slovakia & **EOSC Node Poland**
      - Building cross-node use case with leveraging multi-node datasets of pathogens and workflows to research Antimicrobial Resistance (AMR) phenomenon and demonstrating technical feasibility of federated analysis of genomic data.

(3) Refer to Guidance Material Page 5

- **Enrolling stream (parallel with 2 years of duration):**
  - Enhancing cooperation with ELIXIR
    - Related to genomic data processing
    - CVTI SR (currently observer) in process of establishing the national ELIXIR node
  - Fostering the cooperations of Slovak research stakeholders involved in INFRAEOSC projects (f.e. Slovak Academy of Sciences) with relevant EOSC nodes (f.e. NFDI)

- **Deliverables[2]:**

Onboarding stream (Initial pilot phase in first **6 months**):

ID	Deliverable Name	Deliverable Description	Deliverable Owner (the partner within the organisation responsible for producing the deliverable, if applicable)
o-d1	***Deployment strategies for onboarding to EOSC EU NODE*** ***[COMPLETED]***	*Integration plans, configuration plans for EOSC Federation services*	*IT Team of CVTI SR*
o-d2	***Stakeholders and community engagement strategy*** ***[COMPLETED]***	*Communications Plan; training materials; user guides; helpdesk setup*	*EOSC SK Secretariat*
o-d3	***Interoperable API with OAI-PMH standards for selected Data Repository*** ***[COMPLETED]***	*Web service APIs in compliance with EOSC EU Node for existing components of KOMIS systems (mainly SVD module); ensuring OAI-PMH compatibility*	*IT Team of CVTI SR*
o-d4	***Selected Collections of Data Repository Connected*** ***[WORK IN PROGRESS EXPECTED 10/25]***	*Integration of selected repositories (SVD or external); metadata harvesting validated by OpenAIRE.*	*IT Team / Data Management Team of CVTI SR*
o-d4	***Cross-node data-exchange mechanisms relevant to Use Cases AMR and MCVAL*** ***[WORK IN PROGRESS EXPECTED 10/25]***	*Integration of data exchange mechanisms related to initial use cases demonstrations with BBMRI and EOSC Poland (Based on OneData solution for AMR UC data exchange or testing environment fro MCVAL UC)*	*IT Team of CVTI SR*

Enrolling stream (parallel to Onboarding stream with **2 years** of duration):

ID	Deliverable Name	Deliverable Description	Deliverable Owner (the partner within the organisation responsible for producing the deliverable, if applicable)
e-d1	***IT Governance documentation*** ***[WORK IN PROGRESS]***	*Architecture design plan, security model, disaster recovery plan, service interoperability plan*	*IT Team of CVTI SR*
e-d2	***Data protection policies*** ***[WORK IN PROGRESS]***	*GDPR compliance documentation, data processing agreements, risk registry*	*Open Science Department and Legal Department of CVTI SR*
e-d3	***Deployment strategies for enrolling national EOSC Node Slovakia*** ***[WORK IN PROGRESS]***	*Integration plans, configuration plans for EOSC Federation services*	*IT Team of CVTI SR*
e-d4	***Operational quality plans***	*Capacity Plan; Testing Plan; Operations Plan; Incident Reporting workflow;*	*IT Team of CVTI SR*
e-d6	***AAI Integration Framework*** ***[WORK IN PROGRESS]***	*Identity management system; role-based access components; authentication services*	*IT Team of CVTI SR*
e-d7	***Computing Resource Allocation Components in SK NODE portal***	*User interface; resource management backend; monitoring dashboard; allocation workflows*	*IT Team of CVTI SR*
e-d8	***Production service components and relevant data exchange API of interoperable platform***	*Web service APIs, integrated service components, Integration specifications; data exchange protocols, Transforming KOMIS solution as national EOSC Node Slovakia one-stop portal*	*IT Team of CVTI SR*

Scaling stream (Future plan after node Enrolling):

ID	Deliverable Name	Deliverable Description	Deliverable Owner
s-d1	***Deployment strategies for implementing research tools with cross-node data-resources / infrastructure pairing***	*Integration plans, configuration plans for special cases of EOSC cross-node service*	*IT Team of CVTI SR*
s-d2	***3rd party national R&D entities onboarding policies***	*data processing agreements, risk registry*	*Open Science Department and Legal Department of CVTI SR*

6. Timing and Milestones[4]

6.1 Onboarding stream (Initial pilot phase):

- **Start Date:** 2/2025
- **Expected Duration:** 6-9 months (extended)
- **Relevant use cases:** o-uc1, o-uc2, o-uc3
- **Key Milestones (short-term):**

ID	Milestone Description	Initial Target Delivery Date	Status 25.9.2025
o-1	**Project initiation and team formation**	**3/2025**	**Completed**
o-2	**Technical requirements and architecture plan completion for enhancements of current CVTI SR KOMIS subsystems SVD related to API harmonization for onboarding to EOSC EU Node**	**5/2025**	**Completed**
o-3	**Collection of selected existing open local national research data catalogues (SK universities, SK R&D institutions, citizen science…) appropriate for onboarding as discoverable resource (publishing link)**	**5/2025**	**Partially completed** – collected rUMBa repository of University of Matej Bel with OAI-PMH compatibility – aggregated with OpenAIRE. Collecting more sources with national stakeholders. **(extended to 12/2025)**
o-4	**SVD (research data objects) filled with first batch of data repositories (datasets, software…)**	**6/2025**	**Partially completed** – Only small batch of research data objects (mainly relevant to AM) were curated to SVD repository. SVD will be populated with more general research objects. **(extended to 11/2025)**
o-6	**Harmonised API and metadata of SVD (research data objects module of KOMIS), configuring OAI-PMH to be validated by OpenAIRE and to be compatible for EOSC EU Node onboarding**	**8/2025**	**Work in progress** – Working on configuration of SVD with vendors for exposing selected collections of SVD repository **(extended to 10/2025)**
o-7	**Pilot cross-node use case with BBMRI mutually tested.** (Data exchange of WSI and results demonstrated in test environment, Data Provider Agreement between BBMRI, CVTI SR and their stakeholders processed)	**9/2025**	**Work in progress** – Testing environment with data exchange in progress, DPA in phase of validating **(extended to 10/2025)**
o-8	**Pilot cross-node use case with EOSC PL mutually tested.** (OneProvider implement and combined with OneData PL solution. Data exchange of SK/PL AMR pathogen relevant datasets samples – Salmonella / Campylobacter genomic data. Workflows tested on external machines using OneClient mounting)	**9/2025**	**Work in progress** – OneProvider and OneClient mounting are working, SK AMR data collected and uploaded, results processing demonstration and result exchange still in progress **(extended to 10/2025)**
o-9	**Onboarding Catalogues of selected research data objects from SVD KOMIS and extended onboarding of selected discoverable resources of national repositories**	**9/2025**	**Not completed** – waiting for competition of o-6 **(extended to 11/2025)**

([4]) Refer to Guidance Material Page 6

6.2 Enrolling stream (parallel to Onboarding stream):

- **Start Date:** March 27, 2025
- **Expected Duration:** 2 years
- **Relevant use cases:** e-uc1, e-uc2, e-uc3
- **Key Milestones (long-term):**

ID	Milestone Description	Initial Target Delivery Date	Status 25.9.2025
e-1	Project initiation and team formation	Q1 2025	Completed
e-2	Technical requirements and architecture plan completion for enhancements of current CVTI SR - KOMIS with CVTI SR – Datacentre to EOSC National node transformation.	Q2 2025	Completed
e-3	Systems SVD (Research data object repositories) extended and broadly populated.	Q1 2026	Work in progress
e-4	AAI integration with EOSC Federation implemented and tested	Q1 2026	Work in progress (Extended to Q2 2026)
e-5	Accounting and Access Policy implemented and tested	Q2 2026	Not started (Extended to Q4 2026)
e-6	Cross-node data exchange protocols implementation integrated in SVD (Enrolling dedicated EOSC node Slovakia with selected resources for EOSC federation users)	Q3 2026	Work in progress
e-7	Infrastructural services (Storage/Containers/Notebook) resource allocation management (with UI) fully integrated and tested	Q4 2026	Not started (Extended to Q1 2027)
e-8	Enrolling a fully operational national SK Node with integrated resources/services, data exchange and working AAI	Q2 2027	Not started

6.3 Scaling stream (Future plan after node Enrolling):

- **Start Date:** Q2 2027
- **Expected Duration:** continuous development
- **Relevant use cases:** s-uc1, s-uc2, s-uc3
- **Key Milestones (long-term):**

ID	Milestone Description	Target Delivery Date
s-1	Integrating selected Research Tools (data transformation, labelling, API-fication, visualization etc…) to nation node services	2027
s-2	Enhancements for sensitive data handling and extended access policy	2027
s-3	Onboarding selected services from relevant 3rd party national R&D entities to national EOSC node Slovakia.	2027
s-4	Interconnection with Research Tools between provided resources (datasets, data sources, software) and infrastructural services	2028

	(Containers,Notebooks) – Providing research thematic pairs of infrastructure resource + data resource.	
s-5	**Cross-node interconnect with Research Tools – Providing research thematic pairs of infrastructure resources + data resources from orchestrated from different EOSC nodes**	**2029**

7. Contact & Submission[4]

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