Role of **services and infrastructure** in advancing science and research

3rd Mini workshop on Open Science

University of Nova Gorica

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arnes

About Arnes

1: Introduction to ARNES

- Established in 1992 in Slovenia
- Supports research, education, and cultural institutions
- Pioneered internet connectivity in Slovenia

2: Core Mission

- Facilitate collaboration and use of new technologies
- Provide foundational internet services in Slovenia
- Support digital transformation in public sectors

3: Key Infrastructure and Services …

- Established in 1992 in Slovenia
- Supports research, education, and cultural institutions
- Pioneered internet connectivity in Slovenia

4: Nationwide Connectivity

- Connects 1,700+ organizations:
  - Universities, schools, libraries, research labs, museums, health institutes
- Over 300,000 users across Slovenia

About Arnes

5: High-Speed Networks and GÉANT

- Connects to the pan-European GÉANT network
- High-speed optical links
- Provides institutional internet, supercomputer access, and cloud services

6: Global Integration

- Member of the global research and education community
- Access to eduroam in over 100 countries
- Promotes international collaboration and mobility

7: Commitment to ICT and Security

- Promotes uniform technology and security standards
- Builds integrated national network infrastructure
- Supports digital education initiatives

8: International Cooperation

- Collaborates with networks and organizations including:
  - GÉANT, Internet2, RIPE, EURid, ICANN, ENISA, EOSC, and more
  - Active in projects for computer networks and information society

About Arnes

9: Supporting Research and Bridging Gaps

- Enables cutting-edge research in medicine, physics, environment, etc.
- Reduces digital divide in education
- Provides access to online learning and lifelong education

10: Future starts in 1992

- ARNES as a backbone of digital Slovenia
- Strategic role in advancing science, education, and innovation
- Looking forward: expanding services and global engagement
- New data centers
- SLAIF
- Repositories for long term data storage
- EOSC National Node
- Quantum Hyperconnectivity

About Arnes

Arnes x Slovenia

- SIX.si
- Register.SI
- SI-CERT
- Awareness-raising (Varninainternetu, SAFE.SI)
- NRENs (National Research and Education Network)
- Maintain and upgrade a powerful network for science and education
- Coordinates services at European level:
  - AAI
  - Eduroam for wireless access
- Connects with similar networks around the world

About the data centre Maribor

About the data centre Maribor

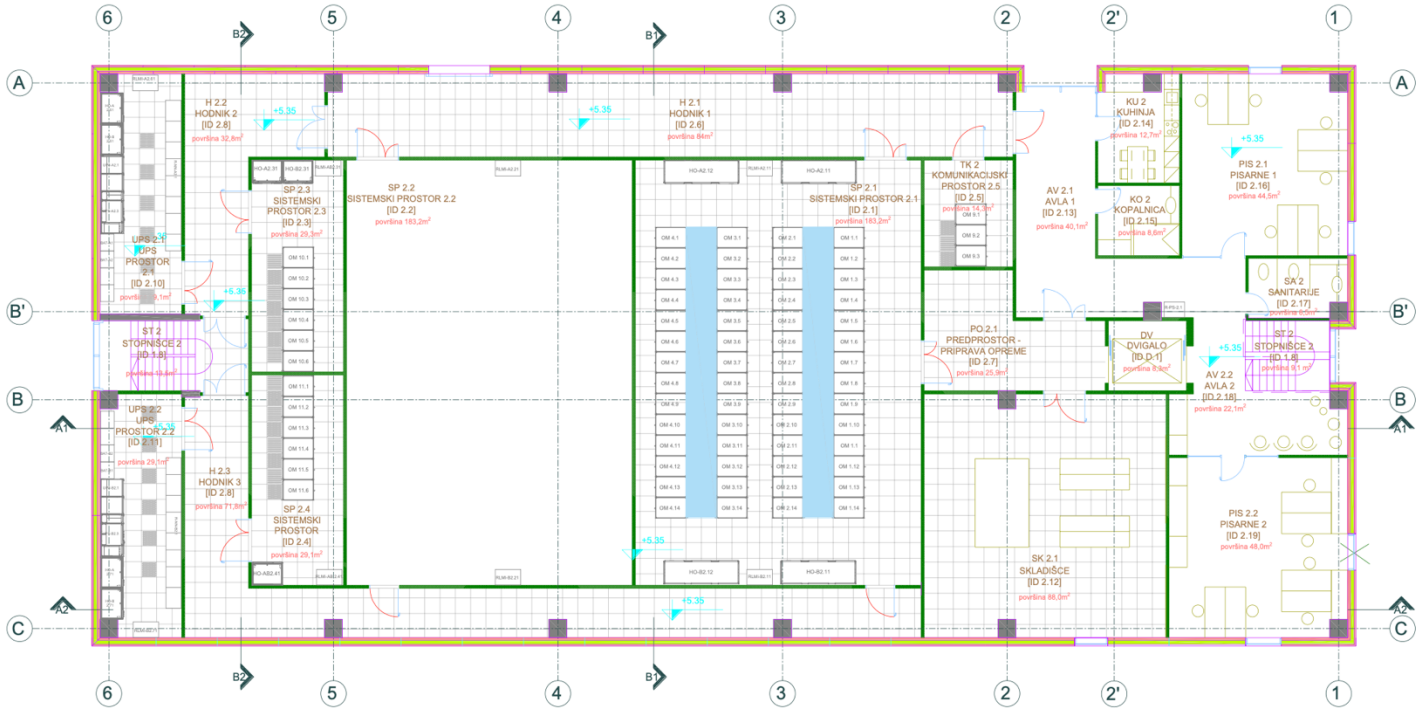
The option to host your organisation's servers in our racks, either the entire rack or individual server units.

Flexible solutions for all needs, from small to large loads.

- Our data centre will host your organisation's infrastructure in our dedicated racks.
- You will be able to host entire server racks or individual server units.
- Ideal for organisations that want to take advantage of advanced infrastructure without the need to build and maintain it themselves.

The Data Centre will be created to address the need for a national infrastructure for open science and to address the challenge of long-term preservation of research data. This will provide Arnes with an infrastructural and, in the future, a practical platform to contribute to ensuring the implementation of the FAIR principles. Access to world-class international research infrastructure is crucial for the advancement of science and to meet the requirements of the European Open Science Cloud (EOSC), and the Arnes data centre facilities will play a leading role in this. The data centre will form an important link to the Open Science and Supercomputing infrastructure, where we at Arnes have upgraded the fibre backbone over the past years, enabling the data centre to serve even the most demanding organisations.

About the data centre Maribor



- Phased construction
- Two floors
  - Ground floor:
    Future supercomputer (HPC)
  - First floor:
    - Arnes data centre
    - Hosting
  - Console space with workstations for support staff

- First floor
  - Arnes Data Centre status after Phase 1 and Phase 2

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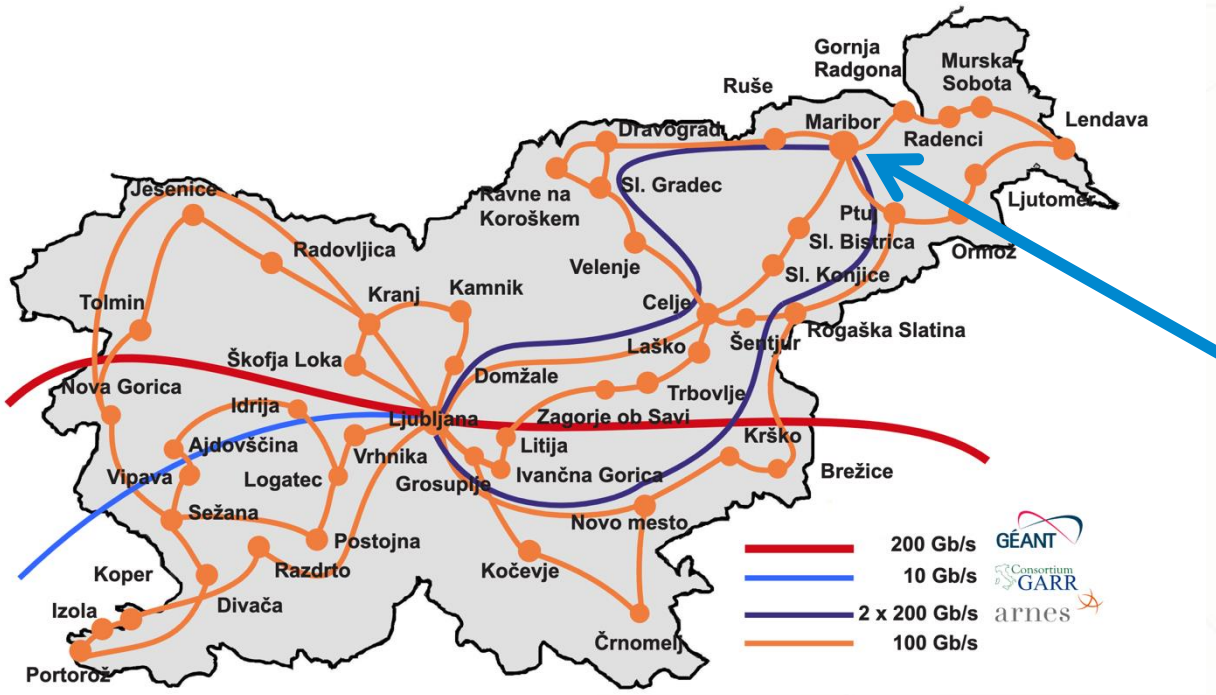
Connectivity to the ARNES network



- The data centre will be provided with redundant connectivity to other nodes in the ARNES network, connectivity to the GEANT network and the possibility of separate connectivity for other demanding projects.
- This will make the data centre resilient to potential interruptions of individual long-distance links.

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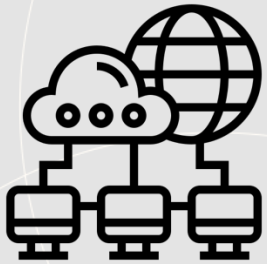


Connectivity to the ARNES network

Reliable connectivity (from 100 Gbps to 1Tbps) and access to the GEANT network.

A high-performance network infrastructure suitable for demanding research projects as well as quantum applications.

- Our infrastructure provides reliable redundant connectivity and access to other scientific research networks via the GÉANT network.
- We provide the high-performance and reliable connections needed for the successful execution of international research projects or simply for the connectivity of primary or secondary backup sites.

Primary or Secondary? You Win Either Way.

Establishing a new primary location for your IT infrastructure.

Setting up a new secondary location for your IT infrastructure (*disaster recovery site*).

- The new data centre is the ideal choice for hosting your infrastructure (servers), offering the security of a second seismic zone and a geographically separated location, ensuring you are protected even in the event of natural disasters.
- The new data centre can become the main location for your IT infrastructure, while you keep only a secondary or backup location.

Rack Hosting
Physical Infrastructure

The option to host your organisation's servers in our racks, either the entire rack or individual server units.

Flexible solutions for all needs, from small to large capacity.

- Our data centre will host your organisation's servers in our dedicated racks.
- Hosting of entire racks or individual server units is available, allowing flexibility to meet your specific needs.
- Ideal for organisations that want to take advantage of advanced infrastructure without the need to build and maintain it themselves.

Virtual Server Hosting in the Arnes Cloud

A custom server allows you to host a virtual server in the Arnes Cloud.

The server allows you to customise and control its operation.

- You can choose the operating system and different capacities.
- The use is for installing web and other applications.
- You can also get free authenticated digital certificates for your servers, allowing secure data transfer between servers and users.
- Use Arnes Storage to expand your disk space.

Scalable Disk Space and Backup Options

Data storage tailored to your needs.

Backups for worry-free working.

- Arnes Storage allows Arnes researchers to get disk space that can be used for data storage or backup storage.
- Connect your server to a remote drive via S3 protocol or access your data via the web interface.
- **High speed data storage solutions in 2025!**

Long-Term Research Data Storage

Advanced long-term data storage.

The highest level of security is provided by storing data in different seismic zones.

- Efficient storage, management and sharing of large volumes of research data up to "peta-scale".
- Remote access to data storage capacity in the Arnes cloud.
- Using the S3-protocol.

Arnes Computing Cluster

The Arnes supercomputer is the second most powerful in Slovenia.

The only cluster that serves the purpose of learning how to use HPC.

- The Arnes supercomputer supports educational use.
- Most users from the following areas:
  - artificial intelligence and knowledge technologies
  - theoretical and particle physics,
  - in genomics,
  - computational chemistry
  - and in wholesale data processing…

Slovenian National Supercomputing Network

A consortium of partners working to develop the field.

Ensuring a sustainable national infrastructure of supercomputing systems and their integration into an advanced network infrastructure.

- Setting up knowledge centres:
  - user education
  - access to shared national, international and European capacities.
- The consortium is led by Arnes, which represents Slovenia on behalf of SLING in European and global organisations and supports the consortium's activities.

EuroCC 2 project

Key role in coordinating activities related to the promotion and support of the use of HPC.

Training and advice on access to computing resources.

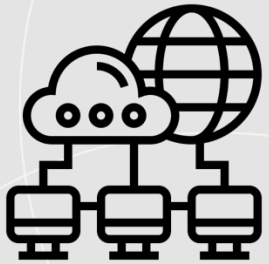
- The EuroCC 2 project (EuroHPC JU), implemented under the Digital Europe programme of the European Union.
- The project focuses on monitoring the progress of the National Competence Centres and supporting their development and the establishment of operational frameworks.
- The main point of contact for users with:
  - scientific,
  - academic and
  - industrial sector,
  - for supercomputing professionals, and
  - the general public.

SLAIF

Slovenian AI Factory (SLAIF)

Building Slovenia’s AI Ecosystem

- EU-funded AI Factory: Selected by EuroHPC JU on March 12, 2025
- AI-optimized supercomputer: Co-funded by Slovenia and EU (EuroHPC, ministries)
- New data center: Built by Arnes at Drava Hydropower Plant site in Maribor
- Led by national consortium: Jožef Stefan Institute, IZUM, Arnes, major universities, and industry partners
- Replaces Vega by 2027: Ensures continued HPC and big data capabilities
- 10 exaflops (AI) / 100 petaflops (HPC): Powered by green hydro energy
- Cloud-ready + phase 2 upgrade: IaaS integration and system expansion in 2028–2029



EOSC EU Node

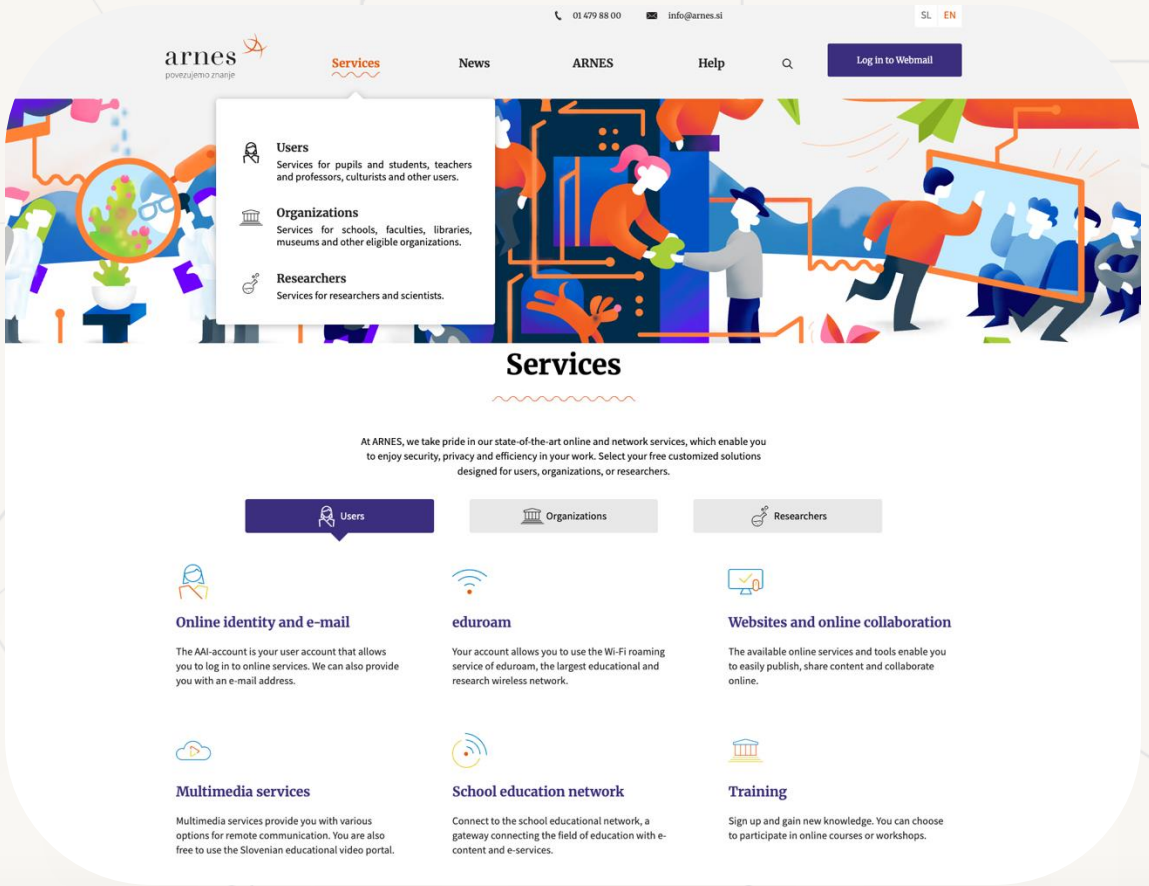
The EOSC EU Node is the first node of the EOSC Federation, serving as a model for future nodes. Its practices and lessons learned will be shared with other nodes joining the Federation, contributing to resources like the EOSC Federation Handbook.

Sara Garavelli, Member of the EOSC Association Board of Directors

EOSC EU Node acts as one of the channels to bring services, data, software, and all other kinds of research objects to the market, making them Findable, Accessible, Interoperable and Reusable for researchers.

Peter Szegedi, Policy Officer, DG CNECT, European Commision

www.arnes.si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News
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Help
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Users
Services for pupils and students, teachers and professors, culturists and other users.
Organizations
Services for schools, faculties, libraries, museums and other eligible organizations.
Researchers
Services for researchers and scientists.
Services
At ARNES, we take pride in our state-of-the-art online and network services, which enable you to enjoy security, privacy and efficiency in your work. Select your free customized solutions designed for users, organizations, or researchers.
Users
Organizations
Researchers
Online identity and e-mail
The AAI-account is your user account that allows you to log in to online services. We can also provide you with an e-mail address.
eduroam
Your account allows you to use the Wi-Fi roaming service of eduroam, the largest educational and research wireless network.
Websites and online collaboration
The available online services and tools enable you to easily publish, share content and collaborate online.
Multimedia services
Multimedia services provide you with various options for remote communication. You are also free to use the Slovenian educational video portal.
School education network
Connect to the school educational network, a gateway connecting the field of education with e-content and e-services.
Training
Sign up and gain new knowledge. You can choose to participate in online courses or workshops.

Thank you

- Follow up questionnaire …
- What should we do next?
- Jupyter Notebook
- Repositories
- Data center
- HPC

We are happy to provide further information.

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