National research e-infrastructure landscape and trends

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CRIS 2022 Conference „Linking research information across data spaces”
Dubrovnik, May 14th 2022
A new environment for Science and Higher Education

- Big data and IoT in science
- Advanced Computing Models & Services
- Stronger application of e-infrastructure in Science and Education
- Digital skills and competences
- International and Inter-Institutional Cooperation
- Flexibility in work of students, teachers and researchers
- Open Science and Open Education
- Digital and Green Transformation
Research e-Infrastructures

- Research e-Infrastructures are facilities that provide resources and services for the research communities to conduct research and foster innovation in their fields.
- e-Infrastructure encompasses the integration and interconnection of computational hardware and software technology, data resources and services, communications protocols and networks, as well as the human resources and organisational structures required to support modern, internationally leading collaborative research.

https://ec.europa.eu
e-IRG e-Infrastructure Commons


The e-Infrastructure Commons can be defined as the integrated living ecosystem of resources and services (along with its policies and governance) that is open, user friendly and accessible to European researchers and scientists, and continuously adapts to the changing requirements of research and science.

Recommendations:

• **embrace e-Infrastructure coordination at the national level** and build strong national e-Infrastructure building blocks, enabling coherent and efficient participation in European efforts, especially in alignment with the FAIR principles concerning data and services

• **together analyze and evaluate their national e-Infrastructure funding and governance mechanisms, identify best practices, and provide input to the development of the European e-Infrastructure landscape**
A new landscape of National e-Infrastructure

New environment requires a new principle of action at the national level:

- Coordination
- Consolidation
- Availability
- Openness
- Gathering
- Collaboration

COMMUNITY INVOLVEMENT

NATIONAL E-INFRASTRUCTURE
SRCE – TOWARD A VISION OF E-INFRASTRUCTURE

INFORMATION SYSTEMS AND SERVICES
(collaboration and groupware systems, information systems, Internet applications, public registries, CRIS systems, library systems, e-learning platforms, ERP, CRM, DMIs, …)

DATA LAYER
(digital archives, digital repositories, dana collections, portals, …)

MIDDLEWARE LAYER
(authentication and authorization systems, monitoring, security, accounting, …)

COMPUTING SYSTEMS AND STORAGE RESOURCES
(physical or virtual servers, clusters, labs, Parks, HPC, HTO systems, supercomputers, dana storage, backup systems, …)

DATA CENTERS
(national and university data centers, computer rooms, …)

NETWORKS AND NETWORKING SERVICES
(international and national networks, MAN, LAN, WLAN, …)

TEAMS OF PROFESSIONALS TO DEVELOP, MAINTAIN AND SUPPORT USAGE OF E-INFRASTRUCTURE

ORGANIZATIONAL AND GOVERNANCE FRAMEWORK OF E-INFRASTRUCTURE

IT AND INFORMATION SERVICES TO USERS

227 R & HE institutions

131 HE institutions
of which 106 public
(159,000 + students)

25 public scientific institutes
(20,000 + scientists)

71 other legal entities
that registered scientific activity
(National and University Library,
Croatian Academy of Sciences and Arts,
hospitals, archives…)

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SRCE...

... Builds national e-infrastructure, from data centers, through network, computer and storage resources, all the way to information services.

... Provides digital services, education of users and advanced user support.

... Builds bridges to international infrastructures and initiatives.

... Is a synonym for a digital transformation of science and higher education system.

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Computing & Storage Infrastructure

**SRCE Computing & Storage Infrastructure**
- Cloud IaaS VMware
  - 350 / 750 VMs
  - 1+ PB used storage
  - 800+ TB backup
  - 1200 TB archives (tapes)
- HTC Cloud
  - 600 CPUs
  - 2,400 virtual CPUs
  - 150 TB HDD
  - 70 users
  - 22 projects

**HR-ZOO Croatian Scientific and Educational Cloud**
- Cloud IaaS
  - 340 / 400 VPS
  - 400 VCL

Other services and features include:
- HPC
  - 140 TFLOPs
  - 3,100 CPUs
  - 12 GPUs
  - 350 users
  - 140 projects
  - 266 scientific works
- HTC Cloud
  - 600 CPUs
- 2,400 virtual CPUs
- 150 TB HDD
- 70 users
- 22 projects
- Cloud IaaS VMware
  - 350 / 750 VMs
- 1+ PB used storage
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Croatian Scientific and Educational Cloud (HR-ZOO)

Strategic project by Ministry of Science and Education of the Republic of Croatia

- National e-infrastructure that provides the Croatian scientific and academic community with long-term advanced computing, storage resources and network connectivity, necessary for modern and multidisciplinary science and education.

Coordinator: SRCE
Reference No: KK.01.1.1.08.0001
Project value: 196,802,438.11 HRK
EU contribution: 167,282,072.40 HRK
National share: 29,520,365.71 HRK

https://www.srce.hr/hr-zoo/en/

Project is co-funded by European Union from European Regional Development Fund

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New generation of national e-infrastructure HR-ZOO

5 Data Centres

HR-ZOO Service Catalogue

Virtual Data Centers

Storage

Scientific Software

High Performance Computing

Elastic Cloud Computing

Collocation of ICT equipment

Specialized support to researchers
HR HPC CC established within the project EuroCC as part of a network of national competence centres for HPC in 33 member states of the European High-Performance Computing Joint Undertaking (EuroHPC JU).

ONE-STOP-SHOP FOR HPC

- support users in the use of HPC resources
- development of new competencies in the HPC field
- cooperation between the academic community and industry
- building the European HPC ecosystem

https://www.hpc-cc.hr/
T&I... enabling mobility

AAI@EduHr
Authentication and Authorisation Infrastructure of science and higher education in Croatia

eduroam
safe, easy to use and, for the end user, completely free Internet access service in Croatia

<table>
<thead>
<tr>
<th>945,786</th>
<th>233 institutions (identity providers)</th>
<th>Security Trust Reliability</th>
<th>worldwide 32,000+ locations 106 countries</th>
<th>Croatia 1,149 locations 407 cities / places</th>
</tr>
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<tbody>
<tr>
<td>e-identity (users)</td>
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Data Infrastructure and Services

**CROATIAN OA JOURNALS**
- Since February 2006
- 511 scientific & professional journals (395 active)
- 246,000 + OA articles
- 65,000+ visits daily

**PRESERVATION & DISEMINATION**
- 16 types of digital objects
- 150 digital repositories of research & HE institutions
- 170,000 digital objects

**(TEMPORARY) STORAGE & SHARING SERVICE**
- 430+ researchers & lecturers
- 200 GB (default)
Information and collaboration systems

ISVU
Information System of Higher Education Institutions
110+ HE institutions, 140,000+ students, 1,700,000+ exams/ac.year

ISSP
Information System of Student Rights
115+ HE institutions, 159,000+ students

ISAK
Information System of Academic (student) Cards

MOZVAG
Information System for Accreditation of HE institutions and Study Programs
110+ HE institutions, 1,900+ study programs

ISRHKO
Information System of Croatian Qualifications Framework

CroRIS
Croatian Research Information System (in development)

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Support in Monitoring and Policy making

Policies and decisions (MSE, university, institution)

Data analysis

Information and Data Infrastructure

SKILL
- application

KNOWLEDGE
- analysis

INFORMATION
- organize

DATA
- collect

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Croatian Research Information System – CroRIS

As a part of project Scientific and Technological Forecasting lead by Ministry of Science and Education of the Republic of Croatia

- New national Research Information System of the Republic of Croatia, gradually being put in production
- Information and processes about institutions, researches, projects, publications, equipment, patents, services, events and much more
- Integration with many national systems and international platforms, such as ORCID, OpenAire, WoS, Scopus

- Promote open science
- Provide information reliability
- Ensures openness and interoperability
- Support decision making

Project is co-funded by European Union from European Regional Development Fund

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SRCE e-Learning Centre

Distance learning system
State-of-the-art e-learning system tailored to user needs

E-portfolio
for personal use, for presentations or as a teaching activity

Webinar system
for online lectures, presentations, seminars, consultations
Adobe ConnectEdumeeet

e-Course Catalogue
HE institutions a central place for all e-courses

Open access and open educational materials
SRCE’s educational materials are made in open access and available in the Open Education Portal

Software for Plagiarism Detection
a tool used by teachers, researchers and students for seminars, final and doctoral thesis

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Virtual Learning Environment – Merlin

http://merlin.srce.hr

1 Moodle installation
94 institutions on Merlin
Support to Researchers

COMPUTING
Advanced Computing & Cloud Services

DATA SERVICES
during all phases of research process

Research Data Management and Data Management Plan (DMP)

- PLAN
- COLLECT
- PROCESS
- SHARE
- PRESERVE
- RE-USE

Scientific papers publication
Permanent storage and research results sharing
Data storage during research process

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Data Services and Open Science

**SRCE services supporting Open Science**
- *hrčak*
- *dabar*
- *puh*
- *KIS*

**Education and networking with the European and global research community**
- *RDA*

**National Open Science Cloud**
- Croatian Open Science Cloud (HR-OOZ) Initiative
- National Open Science Plan
- HR-OOZ Catalogue of services, tools and resources
Croatian Open Science Cloud (HR-OOZ) Initiative

GOALS

National Open Science Cloud (HR-OOZ)

National Open Science Plan

https://www.srce.unizg.hr/en/hr-ooz

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“We are creating a European Open Science Cloud now. It is a trusted space for researchers to store their data and to access data from researchers from all other disciplines. We will create a pool of interlinked information, a ‘web of research data’. Every researcher will be able to better use not only their own data, but also those of others”

Ursula von der Leyen, President of the European Commission
CroRIS – as a Service Catalogue of HR-OOZ

- Projects
- Journals
- Register of Scientists
- Register of Sc. Inst.
- Register of HE Inst.
- Science Fields and Areas
- Patents and Products
- Publications
- Citations
- Events
- Financing
- Equipment and Services
Using EU funds in building a National e-Infrastructure

- Building research and innovation capacity
- The digital transformation of higher education
Digital bridges to ERA /EHEA

National components of e-Infrastructure are connected with the similar European ones.
The key to Success

TECHNOLOGY
TALENTS
TOLERANCE

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E-INFRASTRUCTURE IS A SOLUTION IF IT IS STRATEGICALLY WELL PLANNED!
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Thank you!

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