



SLICES

European Scientific Large-Scale Infrastructure for Computing/Communication Experimental Studies



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Scientific challenges on Digital Infrastructures

- Digital Infrastructures (DIs) are at the heart of our society for our daily life, work, and business.
- DIs are **highly complex**, diverse and sophisticated systems, integrating advanced technologies and software components.
- DIs involve a large research community (networking protocols, radio technologies, parallel and distributed computing and in particular cloud and edge-based computing architectures and services).
- Need to complement other European initiatives in the Digital sector, and strengthen the position of Europe in the race started by international competitors and the tech giants.
- SLICES aims to become the first large-scale European experimental research infrastructure for Digital Sciences.





US, China & EU initiatives

• NSF PAWR (Platforms for Advanced Wireless Research): NSF + Industry, 100M€, 2017-2022

• **NSF Fabric**: 20 M€, 2019-2023

• **NSF Bridges**: 2.5M€ 2020-2023

Colosseum: NSF-DARPA

• China CENI (Chinese Experimental National Infrastructure): 2018-2022: 190 M€

• EU ICT 17/19 although more pilot than research: 2018-2020: 152M€











Actors of growing importance



Large Scale Infrastructures as a support to the design and validation of systems

- ACM SigComm scientific publications
- See Facebook Terragraph Lab













MAKING SCIENCE HAPPEN

A new ambition for Research Infrastructures in the European Research Area

The European ESFRI framework

European Strategy Forum on Research Infrastructures

http://www.esfri.eu/

Life cycle approach of a RI

3. PREPARATION

Preparatory Phase, business & construction plan, political and financial support secured, data policy & data management, cost book plan, legal entity identification

2. DESIGN

design study, business case, political and financial support obtained, common access policy, top-level breakdown of costs, governance and HR policy



concept screening, consortium formation, access policy and funding concept, scientific and project leadership

4. IMPLEMENTATION

site construction and deployment of organisation and legal entity, recruitment, IPR & innovation policies, operation and upgrade plan, secure funding for operation

5. OPERATION

frontier research results, services to scientific community, outreach, continuous upgrade of instrumentation and methods, political and financial support for long-term operation

6. TERMINATION

e.g. dissolution, dismantling of facilities and resurrection of site, reuse, merger of operation and organisation, or major upgrade

FIGURE 1: LIFECYCLE APPROACH OF A RESEARCH INFRASTRUCTURE





Energy

The Energy SWG monitors and assesses the implementation of existing Energy Research Infrastructures more...



Health and Food

The Health and Food SWG monitors and assesses the implementation of existing Health and Food RIs, more...



Environment

The Environment SWG follows up the scientific developments and initiatives in the field of the more...



Social and Cultural Innovation

The Social and Cultural Innovation SWG monitors and assesses the implementation of existing Social more...



Physical Sciences and Engineering

The Physical Sciences and Engineering SWG monitors and assesses the implementation of existing more...



Created in 2018

Data, Computing and Digital Research Infrastructures

As novel proposals with a dominant, or substantial, digital research infrastructure character have more...





The SLICES initiative now on the ESFRI Roadmap

A European Scientific Instrument for Digital Infrastructures

http://slices-ri.eu/

"The Network is the Computer"

Nick McKeown, ONF Connect, 2020

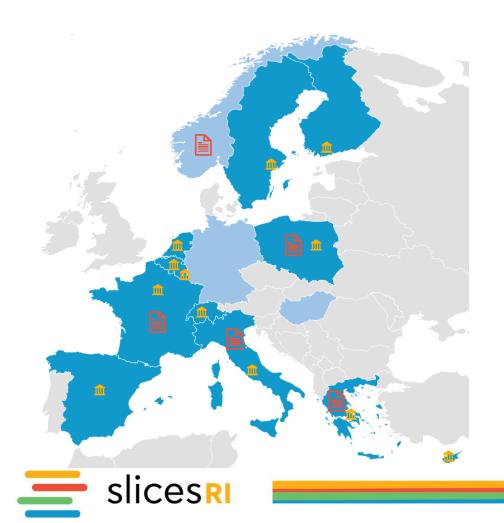
John Gage, Sun Microsystems, 1984

"We will think of a network as a programmable platform" ...
"We will no longer think in terms of protocols. Instead, we will think in terms of software.

Fully Controllable, programmable Virtualized Digital Infrastructure Test Platform Openness



SLICES for research on DIs





Initiated in 2017, **25 partners** from 15 countries:

- 12 political support from National Ministries
- 🔹 included in **5 national roadmaps** 🗎

SLICES will enable scientific excellence and breakthrough and will foster innovation in the ICT domain, strengthening the impact of European research, while contributing to European agenda to address societal challenges, and in particular, the twin transition to a sustainable and digital economy.

Current status of the partnership

	Countries	Government	Research and Academia		Industry		Clusters, networks and	NRENs	Worldwide
		National support	Partners	Support	mustry		others	MENS	support
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SLICES governance

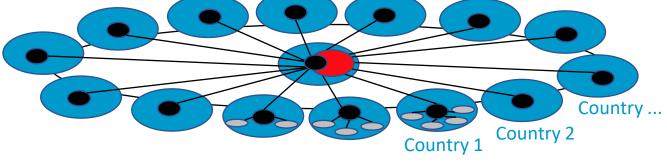
SLICES is a distributed RI

Supervisory
Board
Decisions on new nodes
Decisions on core functions
and data centre

Centralised governance

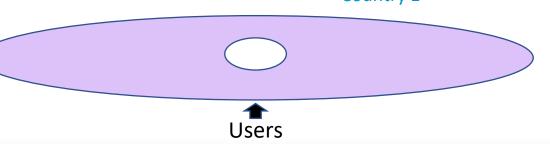
Distributed Infrastructure

Single entry point, single access policy



CMO

Management Committee

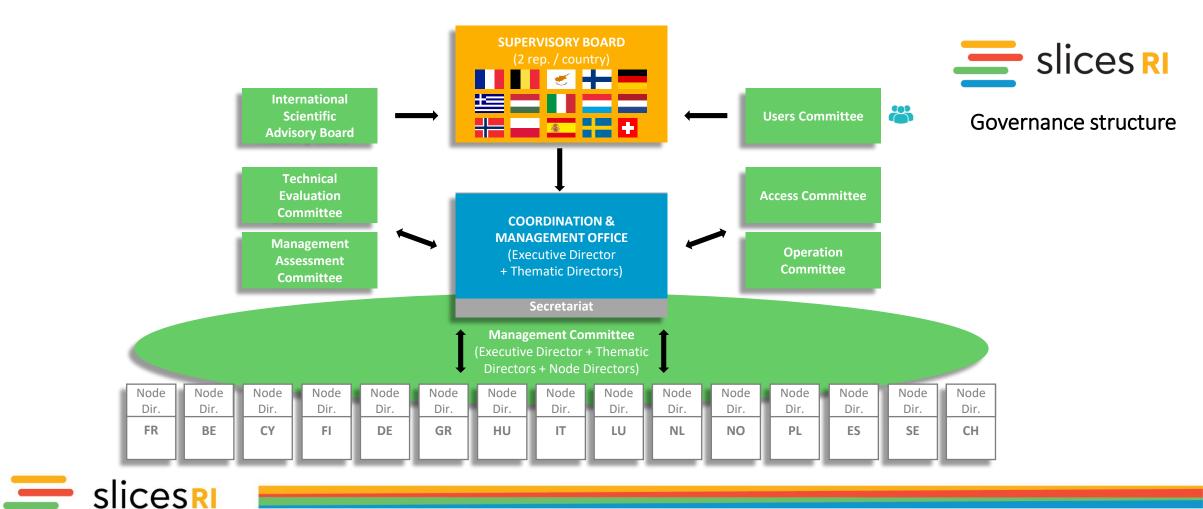




Optimize the distribution of resources according to needs and competences: control plane, edge computing and slicing, terahertz, MIMO,



End Design & Preparation - Q1 2022





SLICES and e-Infrastructures

Computing Architecture in SLICES

FAR EDGE

network, compute and storage

PURPOSE

- Intelligence at the LAN
- In-network computing
- In-situ processing
- IoT

SCIENTIFIC EXCELLENCE

- In-network computing techniques
- Algorithms on far edge equipment
- · Advanced monitoring

LOCATION

FR, BE, CY, DE, GR, IT, LU, NL, ES, SE, SU

NEAR EDGE

network, compute and storage

PURPOSE

- Computations near the edge of the network
- Aggregation and correlation of data
- Network Function Virtualization

SCIENTIFIC EXCELLENCE

- Orchestration/Control/Manag ement and Optimization
- Edge computation
- Coordination/synchronization between heterogeneous data sources
- Advanced monitoring

LOCATION

FR, BE, FI, HU, IT, NL, ES, SE, SU

NEXT GENERATION CLOUD

network, compute and storage

PURPOSE

- Advanced processing in the core of the network
- Network Function Virtualization
- 6G Core deployment

SCIENTIFIC EXCELLENCE

- Processing large datasets on specialized bare-metal hardware
- Access to advanced NFV mechanisms
- Development of 6G network control / data planes
- Advanced monitoring

LOCATION

FR, GR, PL, ES

EXTERNAL CLOUDS

PURPOSE

Policies.

APIs,

Standards

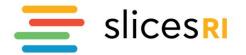
- Dedicated for compute-intense experiments
- Solving traditional computing problems on dedicated computing platforms (including public clouds and specialized RIs)
- Hosting basic services

LOCATION

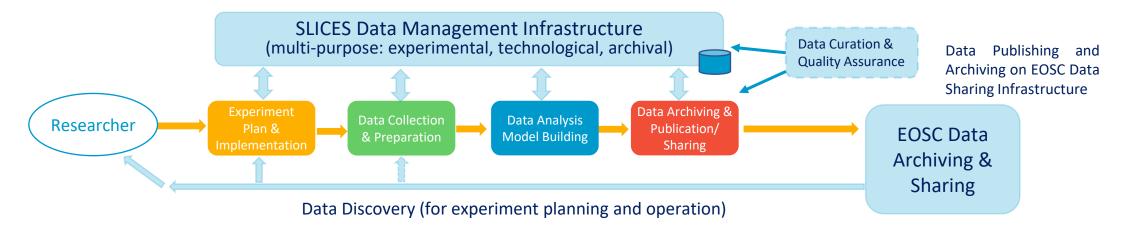
GLOBAL AVAILABILITY

Third-party providers

SLICES RI



SLICES Data Lifecycle Model and Dataflow



- SLICES maintains fast accessible **Data Management Infrastructure**:
 - Expected capacity: 14 Petabytes of cache data.
 - Expected lifetime: short-term/mid-term preservation of data.
- SLICES leverages on external Data Infrastructures, especially EOSC:
 - Expected level of contribution to EOSC: 5-10 Petabytes of data per year for the first 5 years of operation (forecasted, based on previous experiences);
 - Expected lifetime: long-term preservation of data / archiving.



SLICES contribution to the development of the EOSC

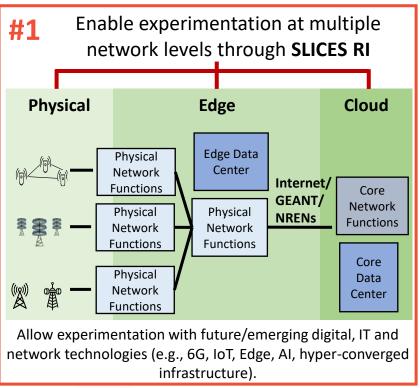






EUROPEAN OPEN SCIENCE CLOUD

Objectives: **federate existing research data infrastructures in Europe** and **realise a web of FAIR data** and **related services for science.**



#2 EU-wide availability of unique Software and App Repositories

- ICT research-related services (e.g., testing new infrastructure and network solutions);
- Applications deployed within SLICES;
- Simulation tools;
- Data analysis tools.

Published in the EOSC Catalog and Marketplace and accessible with different access options.







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open access

Orderable via provider channel

Orderable via EOSC hub

#3 Interoperability with Open and FAIR data

- Producers of unique data;
- Maximize data reuse by adopting of FAIR data principles in Data Management and Governance;
- Processing of sensitive and personal information.

#4 Integration of the SLICES communities to EOSC

- SLICES community building
 - More than 120 participants to the 1st SLICES workshop;
 - Thousands of users of existing infrastructures.
- Training services





ELKH and SLICES

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SLICES ELKH Cloud



- SLICES tightly developed as a joint investment strategy coordinated between EU and the member states:
 - SLICES-RI can leverage the overall community and infrastructure at the highest state-of-the-art
 - Includes *Capacity building* (Human resources, Education and training), *competitiveness*, *Research and innovation*.
- Welcoming the political support from Hungary
- Thanks to SZTAKI, ELKH and other Hungarian partners





Thank you

www.slices-ri.eu

On behalf of SLICES consortium





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