

SLICES

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

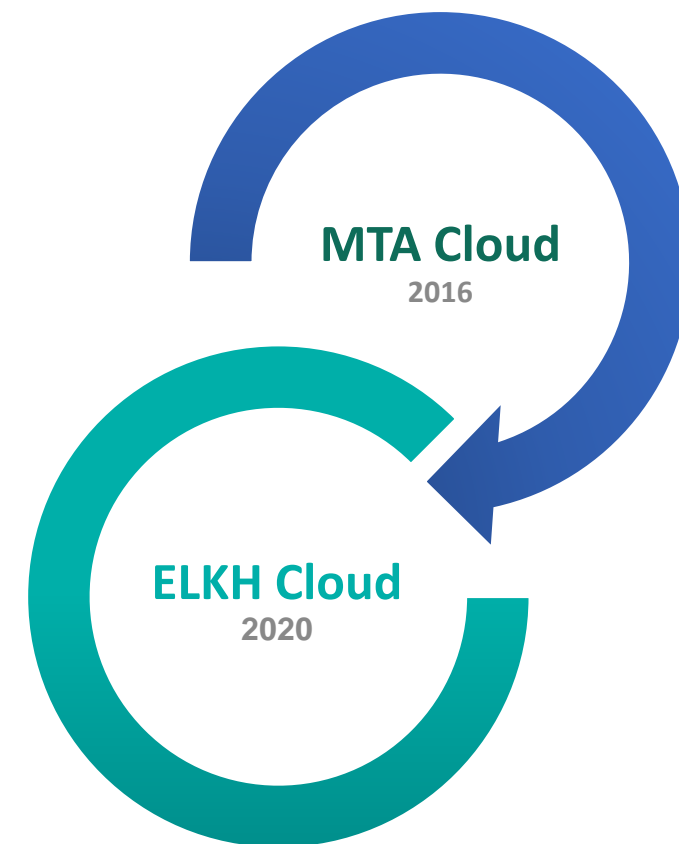
Peter Kacsuk

SZTAKI

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Prepared with the help of the SLICES community

- Az ELKH Cloud projekt a következő főbb célokkal indult el:
 - Európai színvonalú és kapacitású számítási infrastruktúra biztosítása
 - Nem csak az ELKH tagintézmények számára, hanem a teljes magyar kutatói közösség felé nyitni
 - Kiemelten támogatni a mesterséges intelligencia kutatásokat
 - Terjeszteni a felhő alkalmazásának kultúráját a hazai kutatók körében
 - Támogatni a kutatókat alkalmazásaik felhőre történő adaptálásában
 - **Bekapcsolódni az európai informatikai infrastruktúra-fejlesztések ökoszisztémájába**



Az ELKH Cloud projekt eredményei számokban



- Az ELKH Cloud projekt eredményeinek legfontosabb mérőszámai:
 - **Az ELKH Cloud kapacitásának bővülése**
 - A projektek száma (138+125=263)
 - A szolgáltatás kihasználtsága

	MTA Cloud	ELKH Cloud
vCPU	1356 db	5900 db
vGPU	12 db	512 db*
RAM	3.25 TB	28 TB
SSD	0 TB	338 TB
HDD	527 TB	1250 TB
Hálózati kapacitás	10 GBPS	100 Gbps

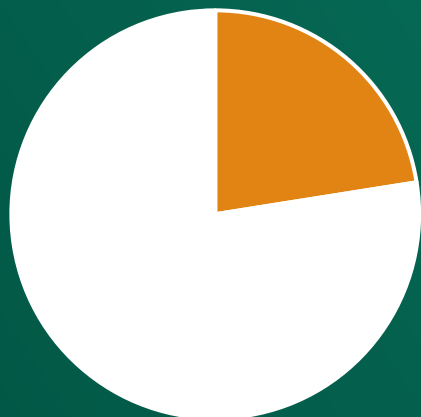
* elméleti maximum 2060 db

GPU virtuális gépek kihasználtsága a SZTAKI infrastruktúrán

Típusonkénti eloszlásban

g2.large

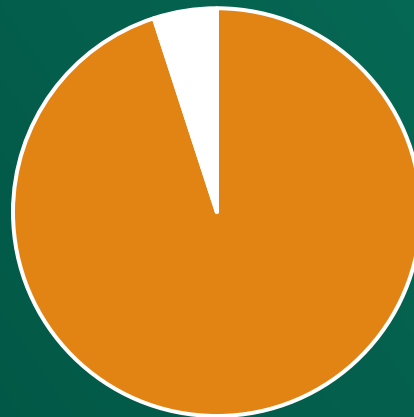
vCPU	RAM	GPU RAM
4 db	16 GB	8 GB



28% foglalt

g2.xlarge

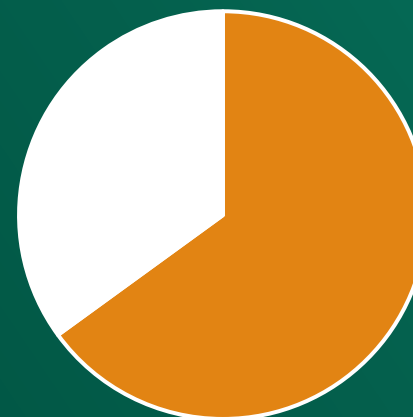
vCPU	RAM	GPU RAM
8 db	32 GB	16 GB



95% foglalt

g2.2xlarge

vCPU	RAM	GPU RAM
16 db	64 GB	32 GB

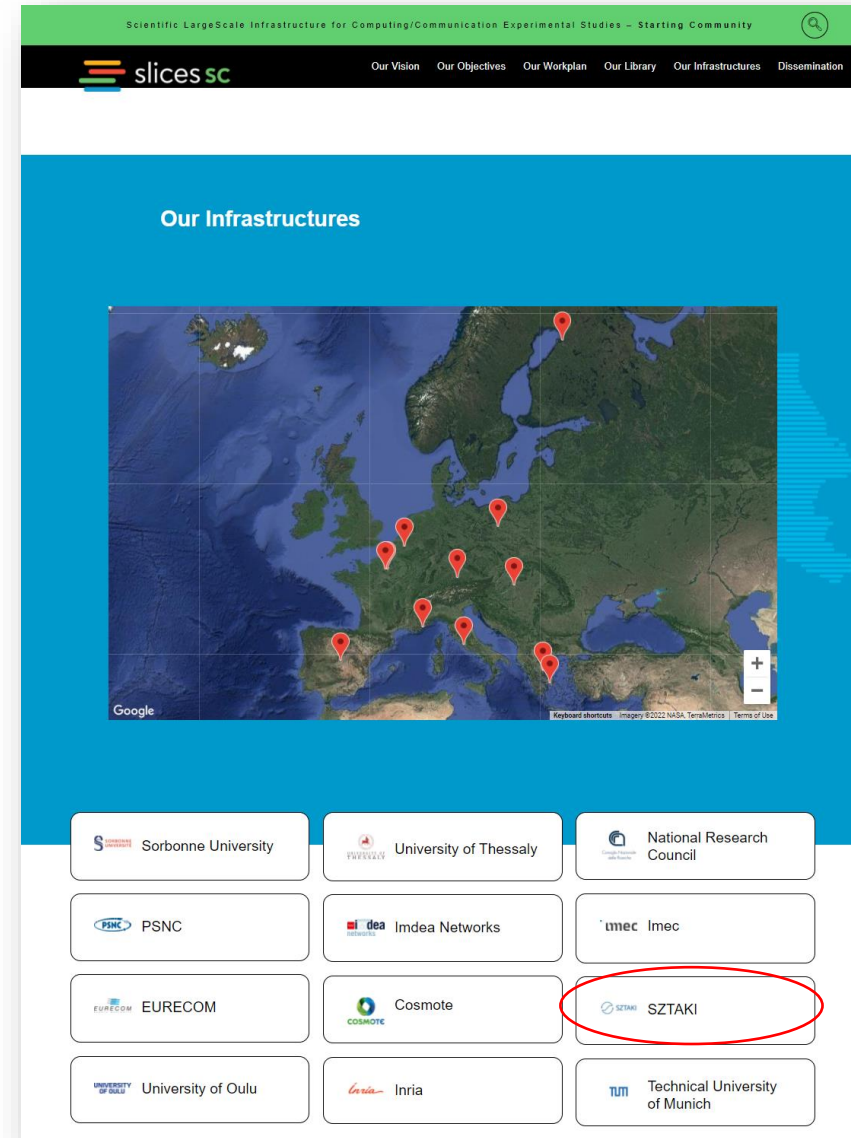


75% foglalt

- Az ELKH (SZTAKI) Cloud 2020-ban felkerült a ***Kutatási Infrastruktúrák Európai Stratégiai Fórumának*** (ESFRI) legújabb, 25 éves időtávot átölelő roadmap-jére,
- hogy a SLICES kezdeményezésben
- a digitális tudományokhoz biztosítson páneurópai, kísérleti célú infrastruktúrát
- a jövő Internetének kidolgozásához.



→ <http://slices-sc.eu>

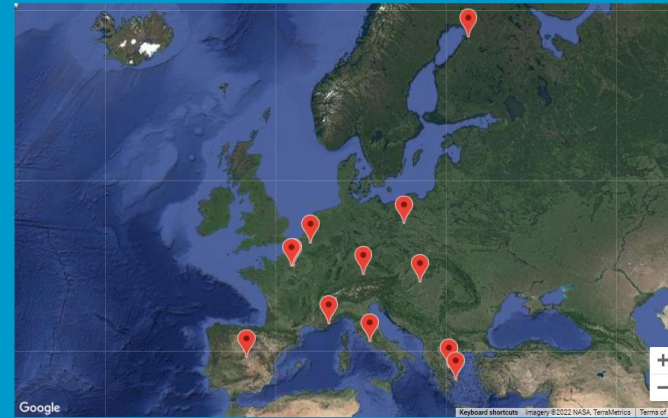


Scientific LargeScale Infrastructure for Computing/Communication Experimental Studies - Starting Community













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Our Vision Our Objectives Our Workplan Our Library Our Infrastructures Dissemination

Our Infrastructures



Google

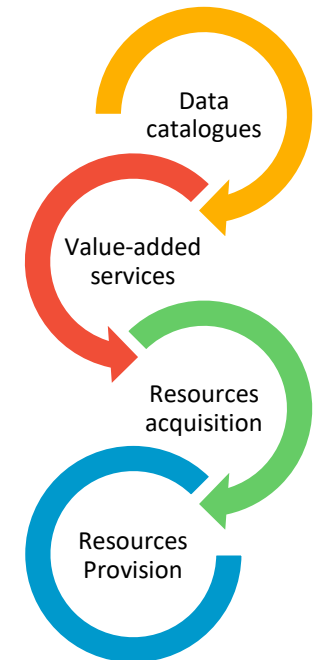
 Sorbonne University	 University of Thessaly	 National Research Council
 PSNC	 Imdea Networks	 Imec
 EURECOM	 Cosmote	 SZTAKI
 University of Oulu	 Inria	 Technical University of Munich

SLICES dióhéjban

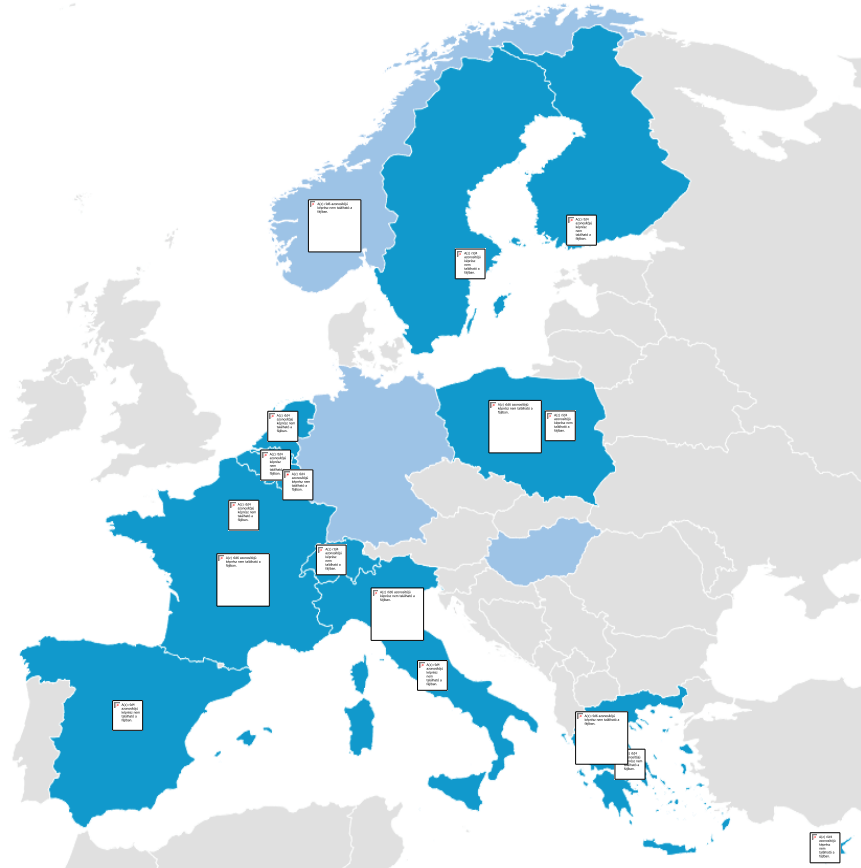


- 2017-ben indult program
- A **SLICES** egy **RI** (kutatási infrastruktúra) azzal a céllal, hogy az akadémiai és ipari kutatói közösséget támogassa a **következő generációs digitális infrastruktúrák** tervezésében, fejlesztésében és megvalósításában:
 - A **SLICES-RI** egy **elosztott RI**, ami számos specializált eszközt biztosít a digitális infrastruktúrák kihívást jelentő kutatási területein, a hálózati, számítási és tárolási erőforrások országok, és telephelyek közötti aggregálásával
 - **Tudományos területek:** hálózati protokollok, rádiótechnológiák, szolgáltatások, adatgyűjtés, párhuzamos és elosztott számítástechnika és különösen felhőalapú és edge computing alapú számítástechnikai architektúrák és szolgáltatások

what we offer



SLICES a digitális infrastruktúra kutatások támogatására



25 partner 15 országból:

- **12 politikai támogatás** Nemzeti Minisztériumokból
- **5 nemzeti roadmap**



The SLICES ESFRI program

- What is ESFRI?
- ESFRI, **the European Strategy Forum on Research Infrastructures**, is a strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach.
- SLICES is the first ESFRI program in the field of information technology



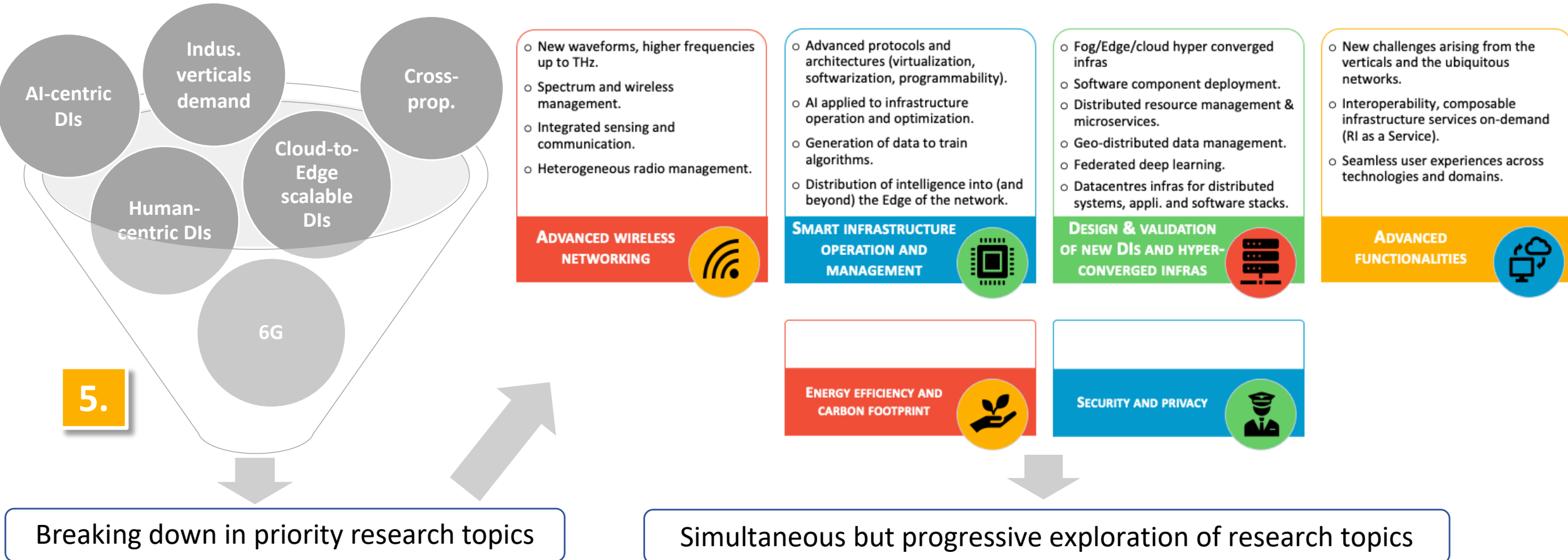
Fully Controllable, programmable Virtualized Digital Infrastructure Test Platform



- SLICES will be a highly **distributed infrastructure**
- The environments we aim to study are themselves distributed, e.g., Fog/Edge computing
- Goal is to support a large variety of viable topologies in distributed computing systems.
- SLICES will provide a fully programmable, remotely accessible infrastructure
- The software architecture of SLICES will organize the different geographically dispersed site facilities in a single pan-European facility

Prioritisation of research topics

What's the methodology behind it?



Prioritisation of research topics

- New waveforms, higher frequencies up to THz.
- Spectrum and wireless management.
- Integrated sensing and communication.
- Heterogeneous radio management.

ADVANCED WIRELESS NETWORKING



- Advanced protocols and architectures (virtualization, softwarization, programmability).
- AI applied to infrastructure operation and optimization.
- Generation of data to train algorithms.
- Distribution of intelligence into (and beyond) the Edge of the network.

SMART INFRASTRUCTURE OPERATION AND MANAGEMENT



- Fog/Edge/cloud hyper converged infras
- Software component deployment.
- Distributed resource management & microservices.
- Geo-distributed data management.
- Federated deep learning.
- Datacentres infras for distributed systems, appli. and software stacks.

DESIGN & VALIDATION OF NEW DIS AND HYPER-CONVERGED INFRAS



- New challenges arising from the verticals and the ubiquitous networks.
- Interoperability, composable infrastructure services on-demand (RI as a Service).
- Seamless user experiences across technologies and domains.

ADVANCED FUNCTIONALITIES



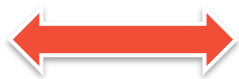
ENERGY EFFICIENCY AND CARBON FOOTPRINT



SECURITY AND PRIVACY



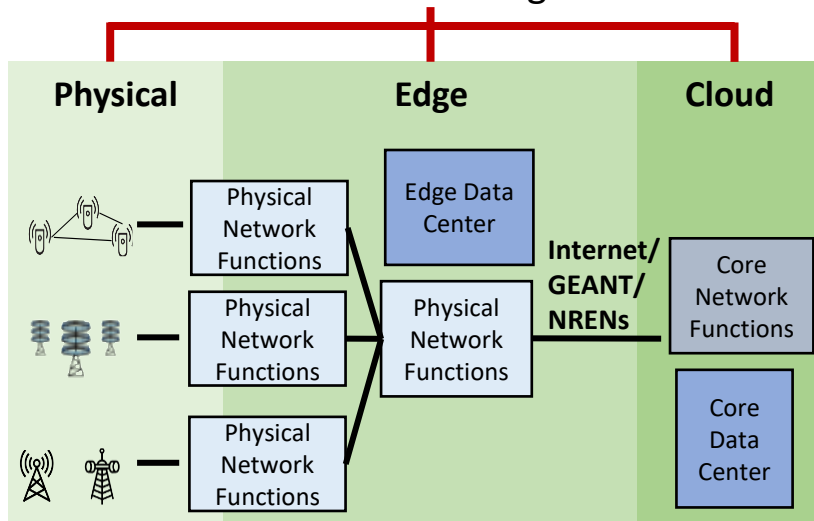
SLICES contribution to the development of the EOSC



EUROPEAN OPEN
SCIENCE CLOUD

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

#1 Enable experimentation at multiple network levels through SLICES RI



Allow experimentation with future/emerging digital, IT and network technologies (e.g., 6G, IoT, Edge, AI, hyper-converged infrastructure).

#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.



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.

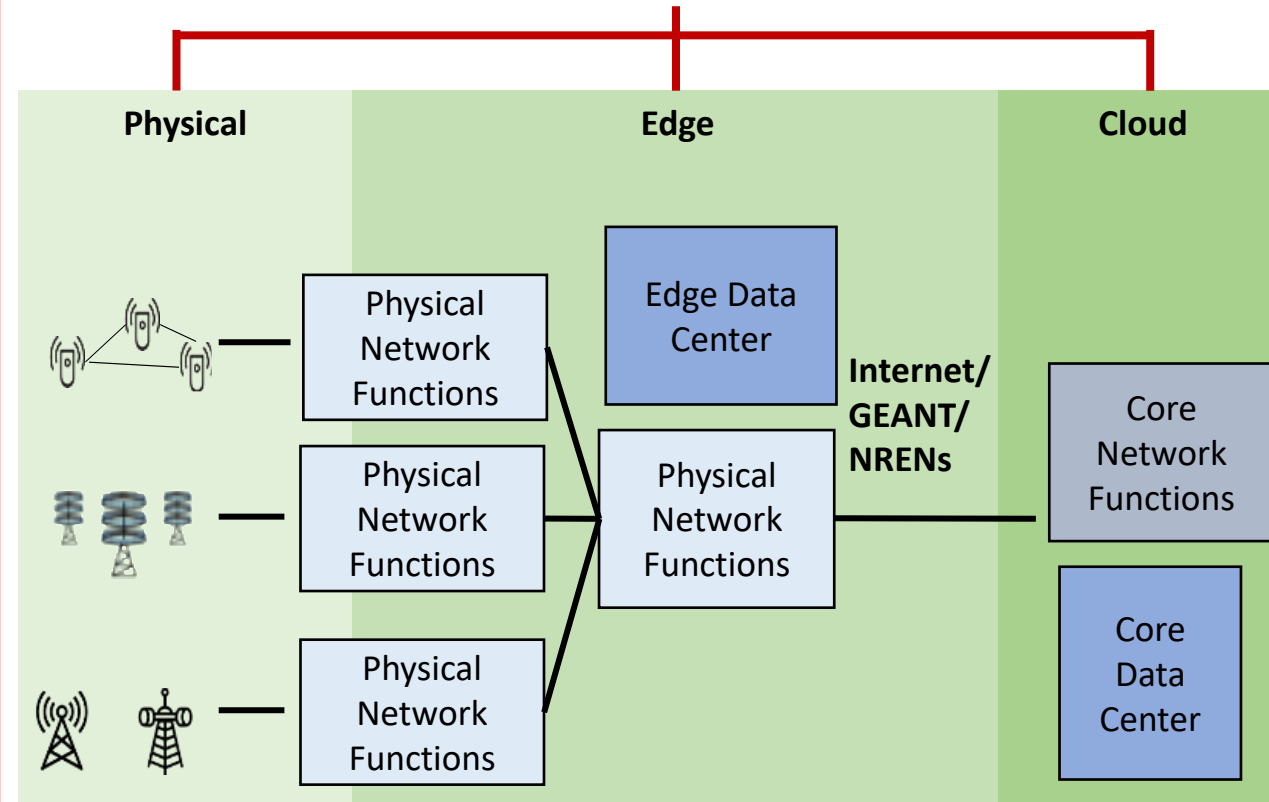
#4 Integration of the SLICES communities to EOSC

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



#1

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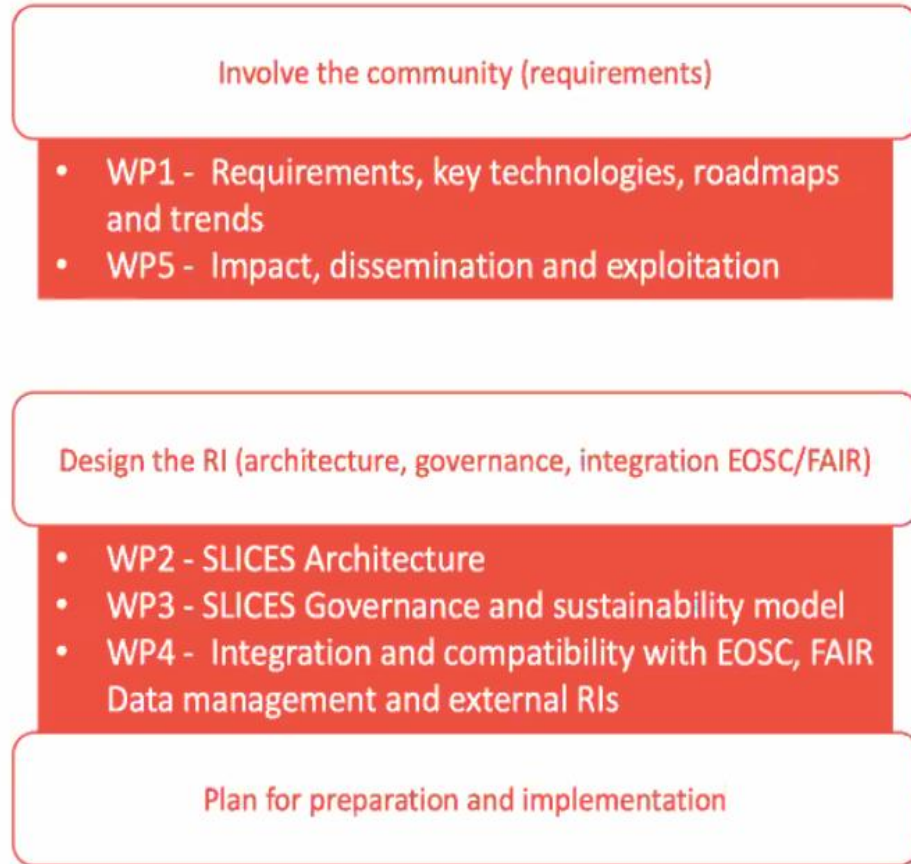
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links



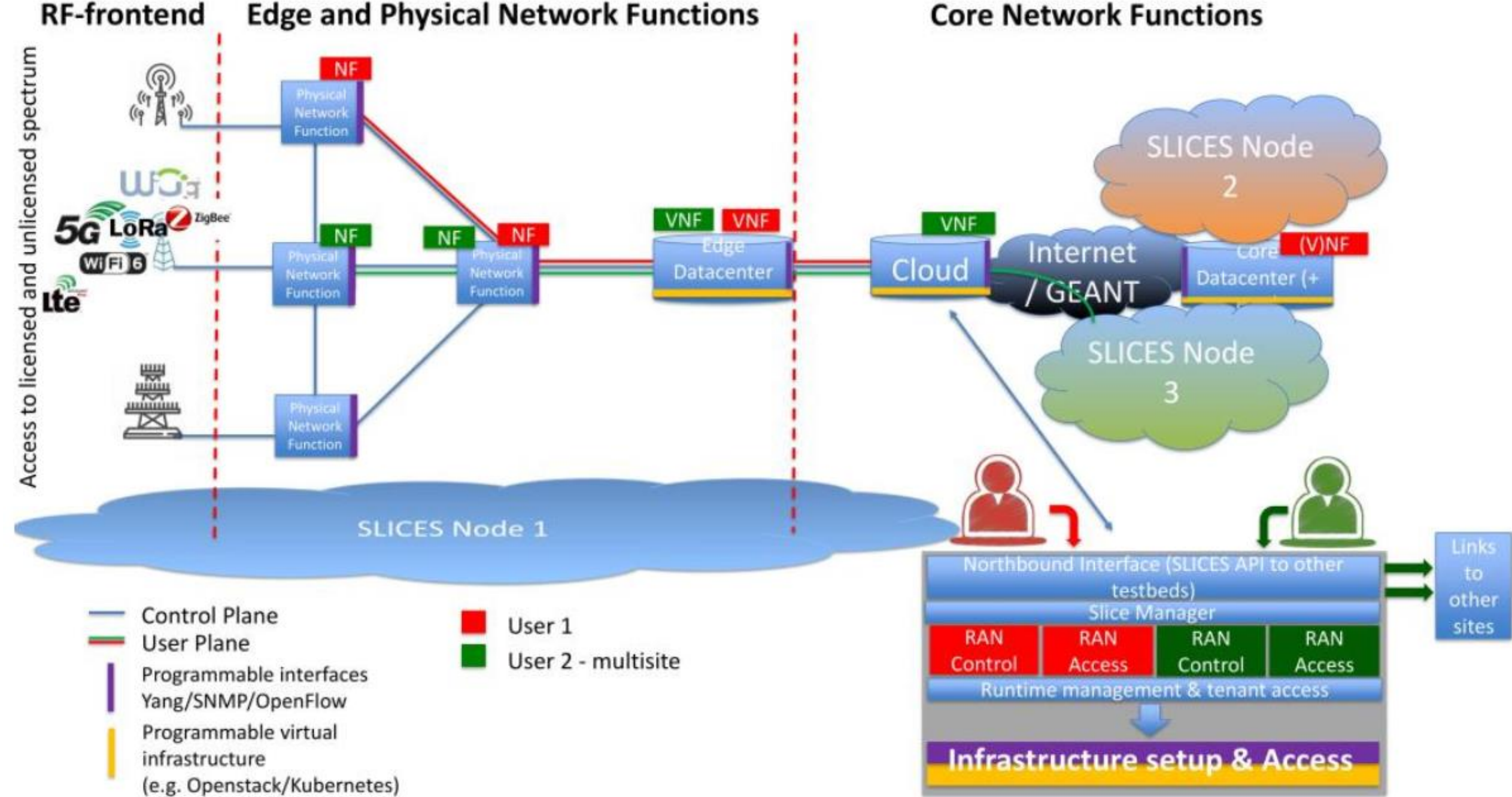


Figure 1: SLICES Architecture Layout Overview

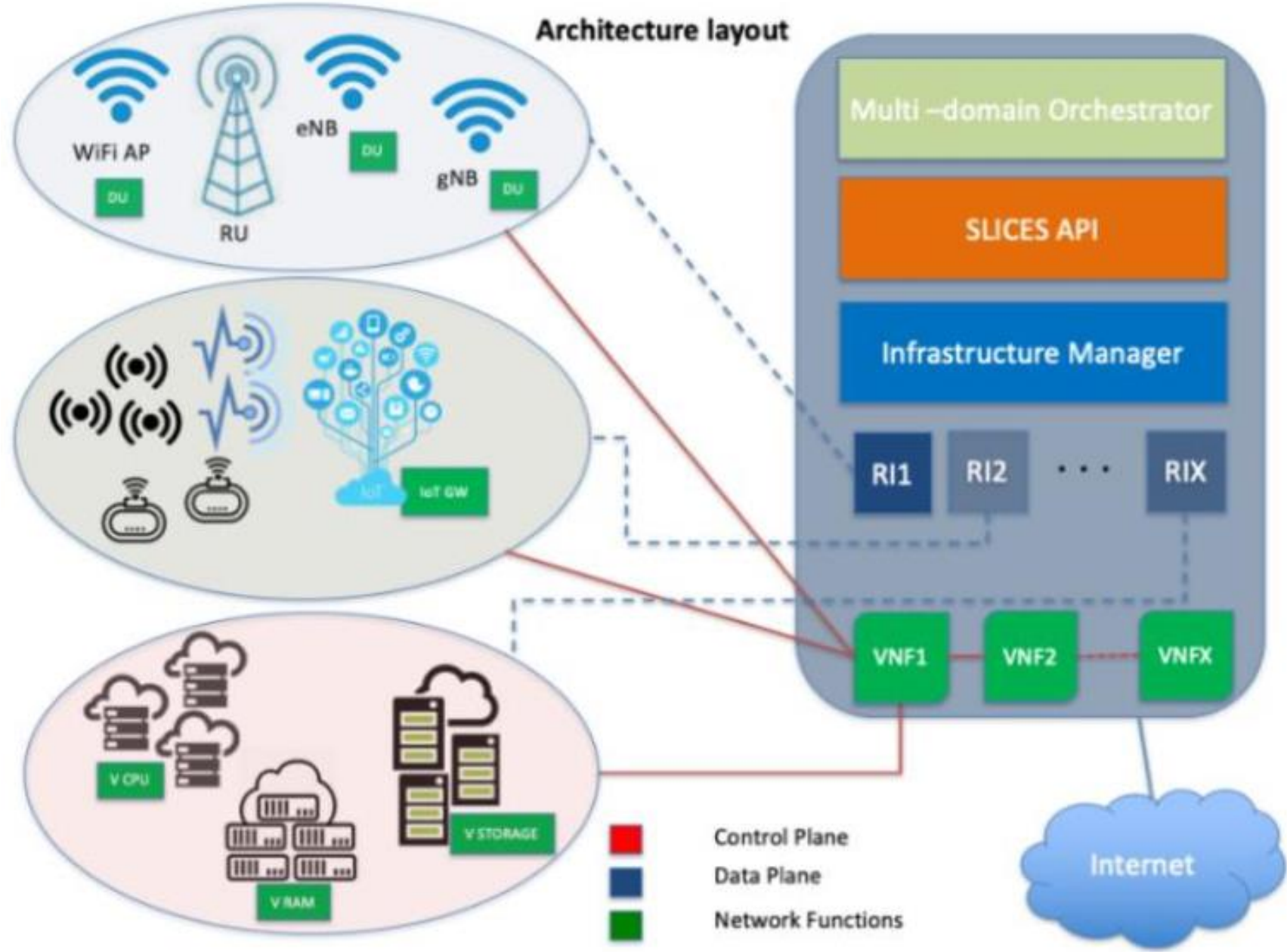


Figure 3: SLICES conceptual architecture

SLICES-SC web page: <https://slices-sc.eu/>

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Vision Open Calls Objectives ▾ News ▾ Slices Blog Library ▾ **Infrastructures** Forum theNetworkingChannel

SLICES Roadshow – Hungary – 26/1/2023



what is Slices-SC?

Today we are experiencing the digital transformation happening with an unprecedented pace, with the community constantly researching on new solutions to support this transformation with ample computational power and connectivity. Towards addressing such research efforts, Research Infrastructure (RI) specific to addressing Digital Sciences research efforts have been deployed worldwide, towards trying to address key aspects contrary to off-theshelf commercial infrastructure:

- 1) Full control over the parameters of an experiment,
- 2) Repeatable experiments regardless of the physical infrastructure,
- 3) Valid experimental results, which are easy to cross-reference and replicate.

As such, several RIs have emerged, offering experimentation services with bleeding edge resources, that otherwise are only offered only in industrial R&D laboratories, with limited functionality. Towards combating these issues. SLICES Research



SLICES Ris

<https://slices-sc.eu/infrastructures/>



Sorbonne
University



University of
Thessaly



National Research
Council



PSNC



Imdea Networks

imec Imec



EURECOM



Cosmote



SZTAKI



University of Oulu



Inria



Technical
University of
Munich

Thank you

www.slices-ri.eu

On behalf of SLICES consortium



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www.slices-ri.eu

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