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

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Enhanced ELKH Cloud Infrastructure
Inauguration Ceremony

February 15, 2022

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**.
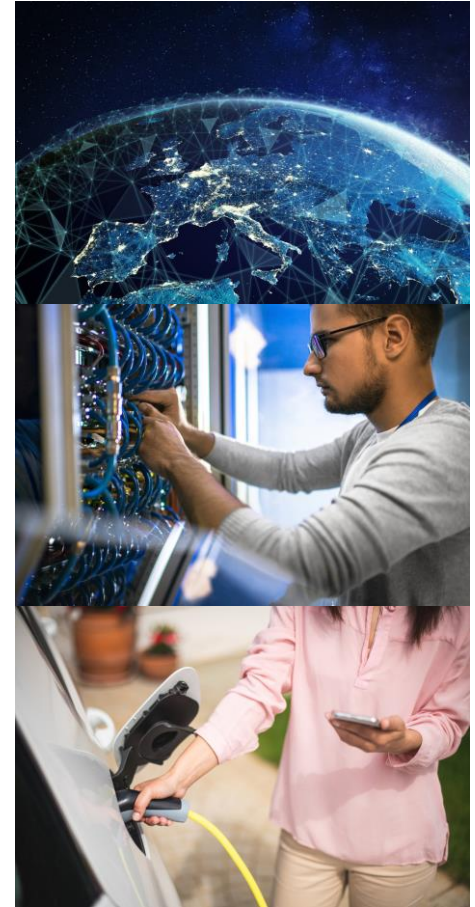
US, China & EU initiatives

- **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

The European ESFRI framework

European Strategy Forum on Research Infrastructures

http://www.esfri.eu/
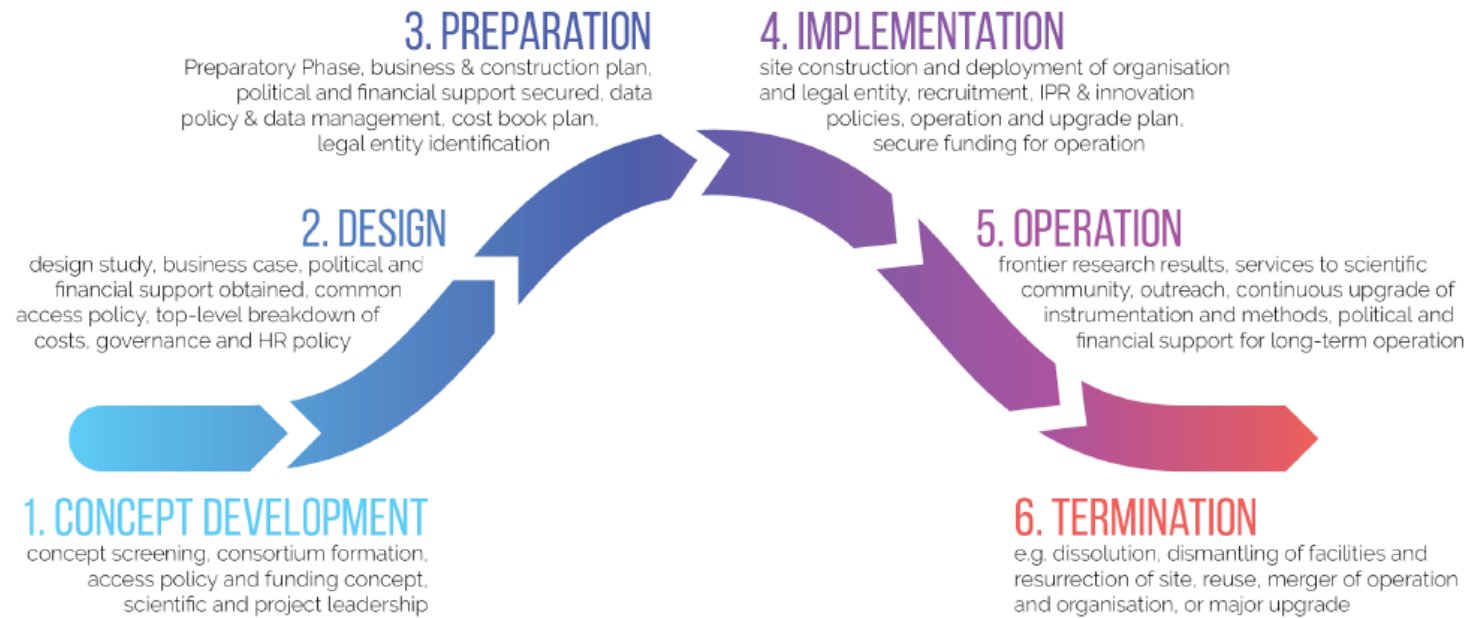
Life cycle approach of a RI

FIGURE 1: LIFECYCLE APPROACH OF A RESEARCH INFRASTRUCTURE

STRATEGY WORKING GROUPS

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...

Data, Computing and Digital Research Infrastructures
As novel proposals with a dominant, or substantial, digital research infrastructure character have more...

Created in 2018

slicesRI

February 15, 2022

The SLICES initiative
now on the ESFRI Roadmap

A European Scientific Instrument
for Digital Infrastructures

http://slices-ri.eu/

"The Network is the Computer"

John Gage, Sun Microsystems, 1984

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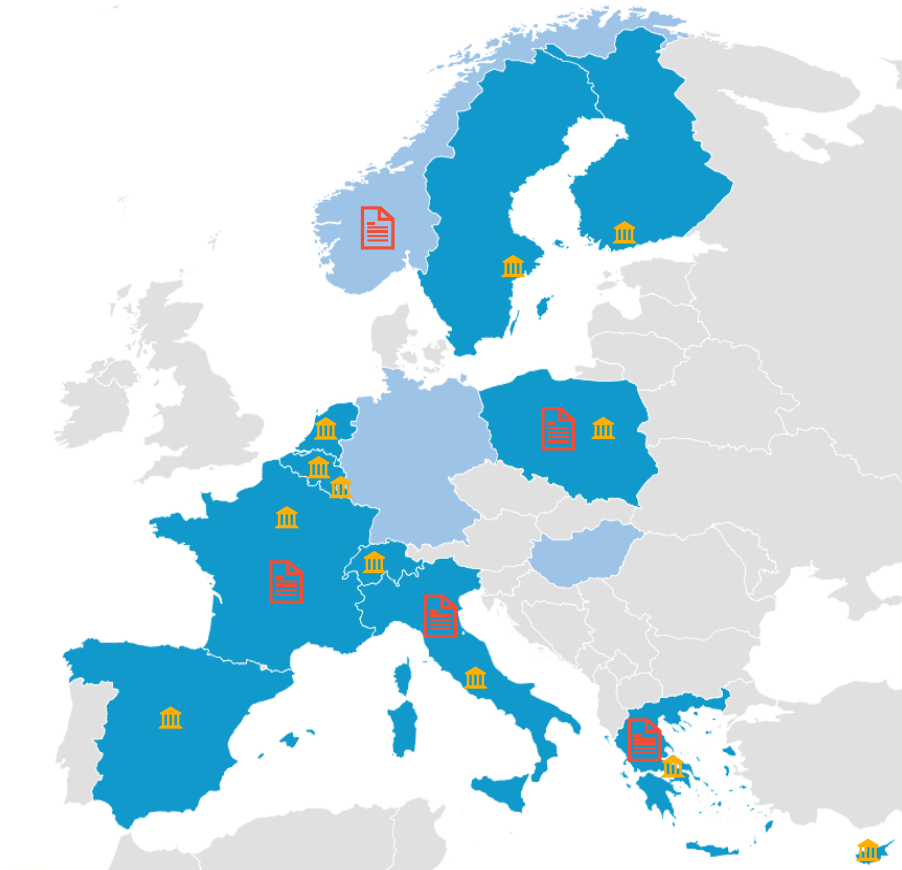"We will no longer think in terms of protocols. Instead, we will think in terms of software.

Nick McKeown, ONF Connect, 2020

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

SLICES governance

SLICES is a distributed RI

Joint investment strategy

Decisions on new nodes

Decisions on core functions and data centre

Centralised governance

Supervisory Board

CMO

Management Committee

Distributed Infrastructure

Central Hub

Node

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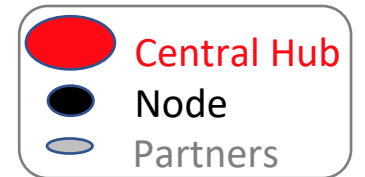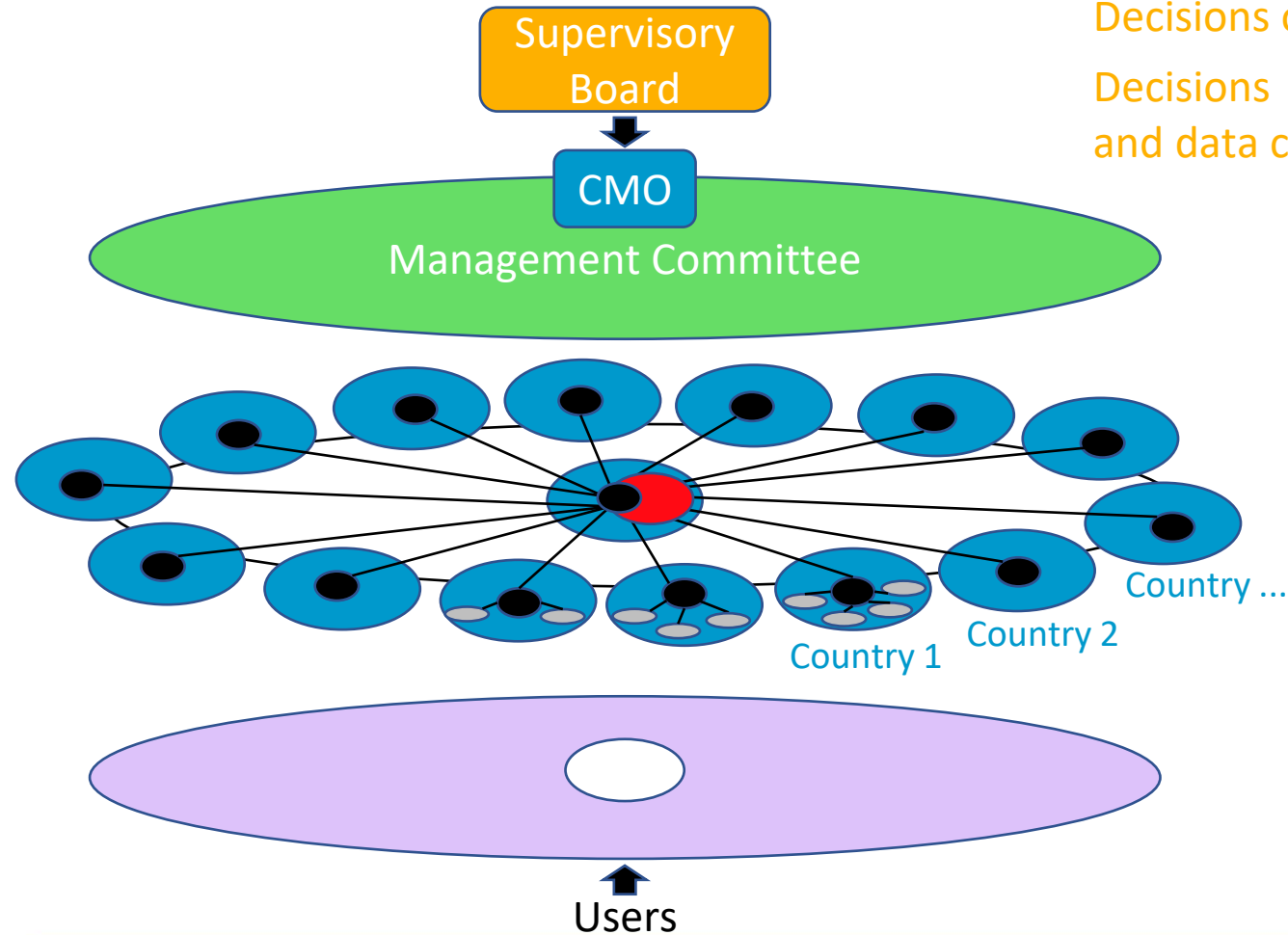
Optimize the distribution of resources according to needs and competences: control plane, edge computing and slicing, terahertz, MIMO, ...

Country ...

Country 1

Country 2

Single entry point, single access policy

Users

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End Design & Preparation - Q1 2022
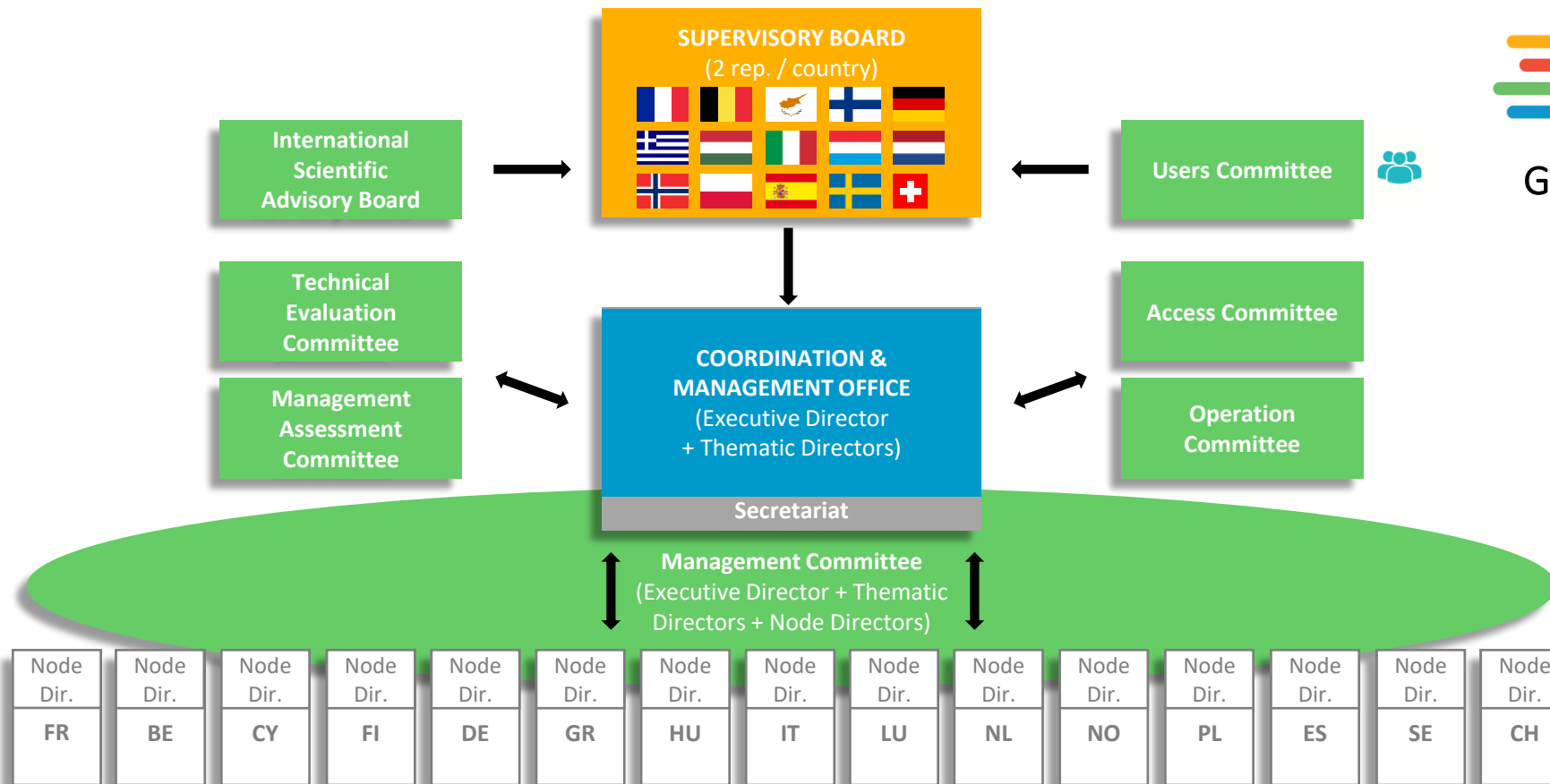
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Governance structure

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/Management 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

Policies, APIs, Standards

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EXTERNAL CLOUDS

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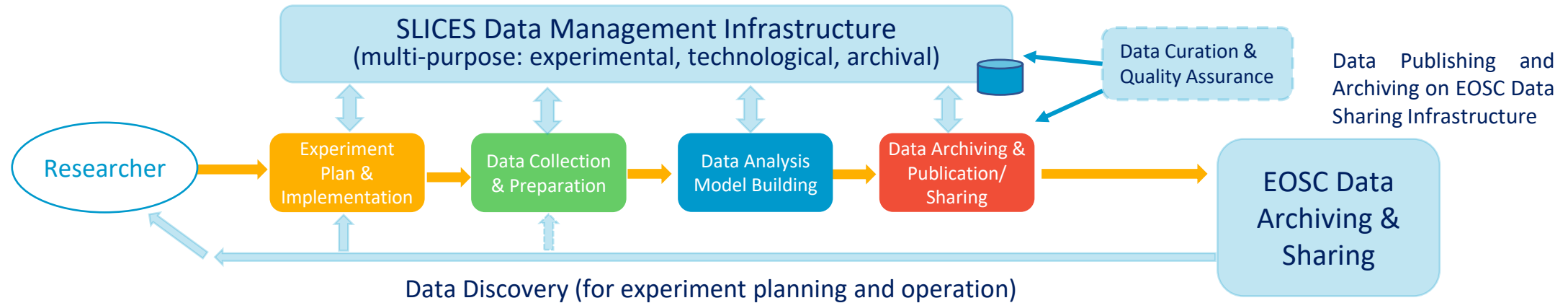- Hosting basic services

LOCATION

GLOBAL AVAILABILITY

SLICES RI

Third-party providers

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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);
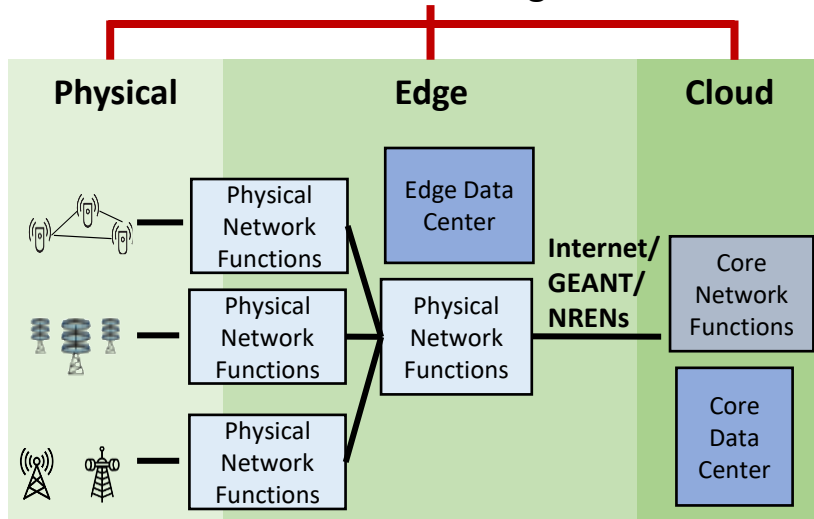 - Expected lifetime: long-term preservation of data / archiving.

SLICES contribution to the development of the EOSC

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

Physical	Edge	Cloud

- Edge Data Center
- Physical Network Functions
- Core Network Functions
- Core Data Center

Internet/ GEANT/ NRENs

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

ELKH and SLICES

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
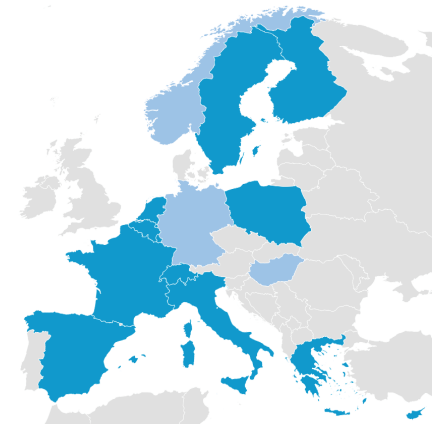
Thank you

www.slices-ri.eu

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