



# SLICES-RI: Scientific Large-Scale Infrastructure for Computing / Communication Experimental Studies

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RAFFAELE BRUNO- CNR (ITALY)

[raffaele.bruno@iit.cnr.it](mailto:raffaele.bruno@iit.cnr.it)

<https://www.slices-ri.eu>



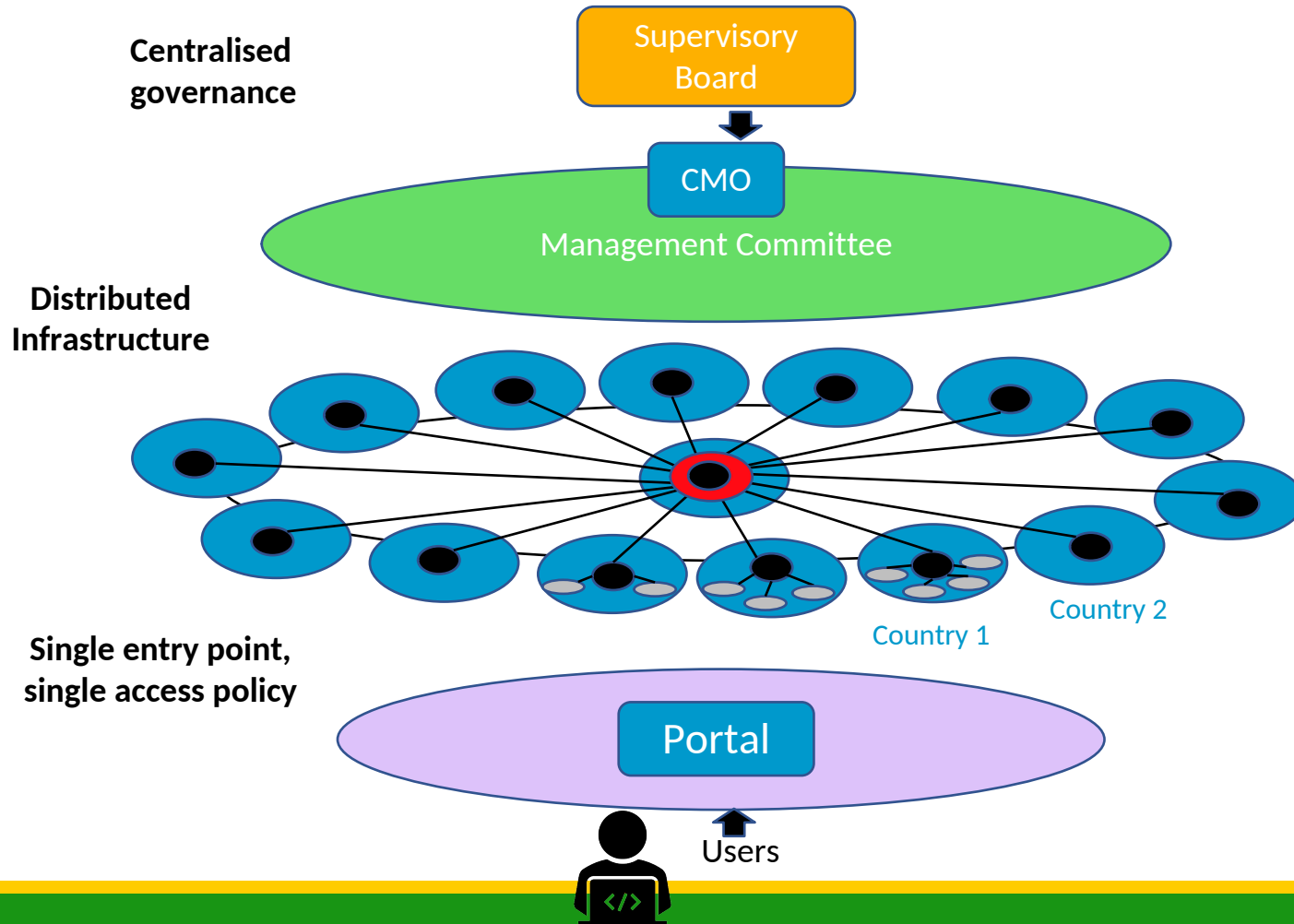
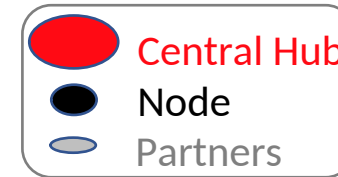
Funded by  
the European Union

DIGITAfrica project has received funding from the EU Horizon Europe research and innovation Programme and Switzerland under Grant Agreement No. 101187966. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them.





# SLICES-RI Overview



SLICES-RI is a **European Research Infrastructure** designed to enable large-scale, **reproducible** experimentation on **next-generation Internet** and **digital systems**. It provides an integrated, **distributed platform** combining advanced **computing, networking, wireless** technologies, and **data** resources, allowing researchers to design, deploy, and validate complex experiments under realistic conditions. Key distinguish features of SLICES-RI are strong emphasis on **FAIR data management** and rigorous **experiment lifecycle management**.



# *Why SLICES-RI is needed?*



Square Kilometre Array (SKA)

# *Research Infrastructures as a Scientific Instrument*

## MAKING SCIENCE HAPPEN

A new ambition for Research Infrastructures in the European Research Area



Large Hadron Collider (LHC)



DOI:10.1145/2812803

To encourage repeatable research, fund  
repeatability engineering and reward  
commitments to sharing research artifacts.

BY CHRISTIAN COLLBERG AND TODD A. PROEBSTING

## Repeatability in Computer Systems Research

# Scientific instruments are key for credibility and innovation

- Over 90% of scientific papers published in the past decade involved the use of advanced scientific instruments and thought experiments.
- Without advanced instruments, the rate of scientific progress and depth of understanding would be significantly diminished
- Without trustable and shared research infrastructure, credibility of networking research is at risk
  - When Something *Looks too Good to be True, it Usually is!* AI is Causing a Credibility Crisis in Networking
    - Walter Willinger et al.
    - ACM SIGCOMM Computer Communication Review, Volume 55, Issue 1, January 2025
  - 10,000 maniacs and *AI is destroying Computer Science*, one topic at a time....
    - Jon Crowcroft
    - <https://paravirtualization.blogspot.com/2024/06/10000-manacs-and-ai-is-destroying.html>



# Impactful research needs large-scale research infrastructures

## ACM Sigcomm 2025 edition

Number of papers: 68

Almost **60%** of the papers from large industry

Often a large number of authors

- US tech: 14
- China Tech: 25
  - Alibaba: 11
  - Bytedance: 11

**Risk  
For Academia**





# *How to build a sustainable, large-scale RI?*

# From mid-Scale (~100M€) to Large-Scale (~B€)



## MAKING SCIENCE HAPPEN

A new ambition for Research Infrastructures in the European Research Area



## The European ESFRI framework

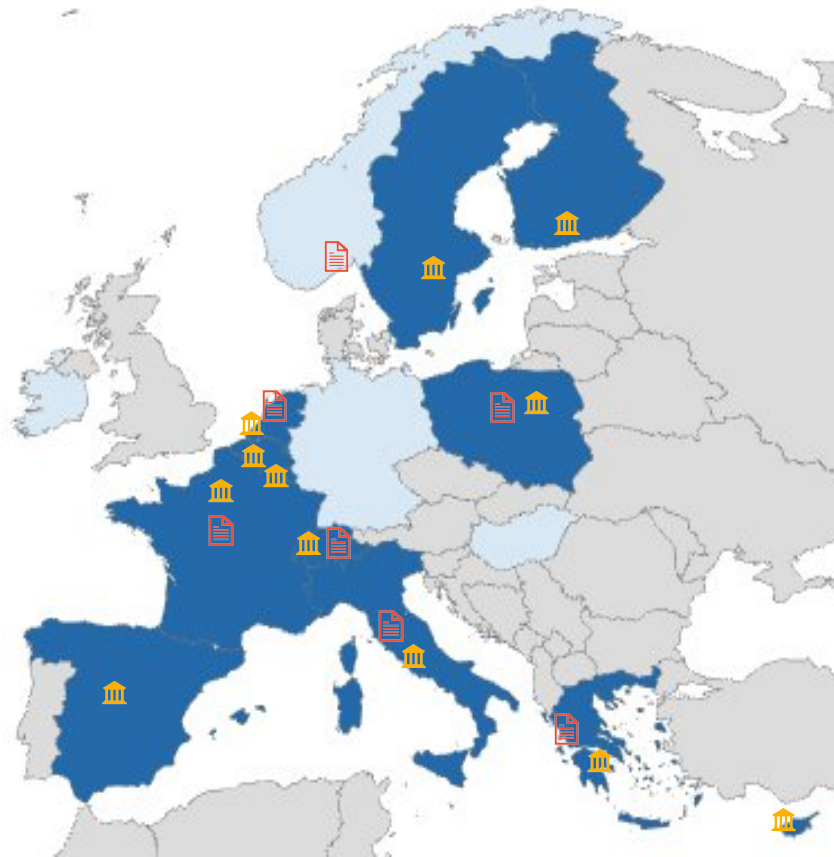
European Strategy Forum on Research Infrastructures

Supporting a scientific methodology

<http://www.esfri.eu/>





# SLICES-RI is first one in digital sciences to enter the ESFRI Roadmap in 2021



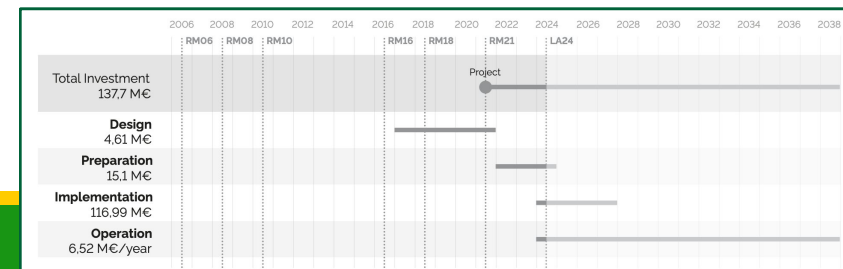
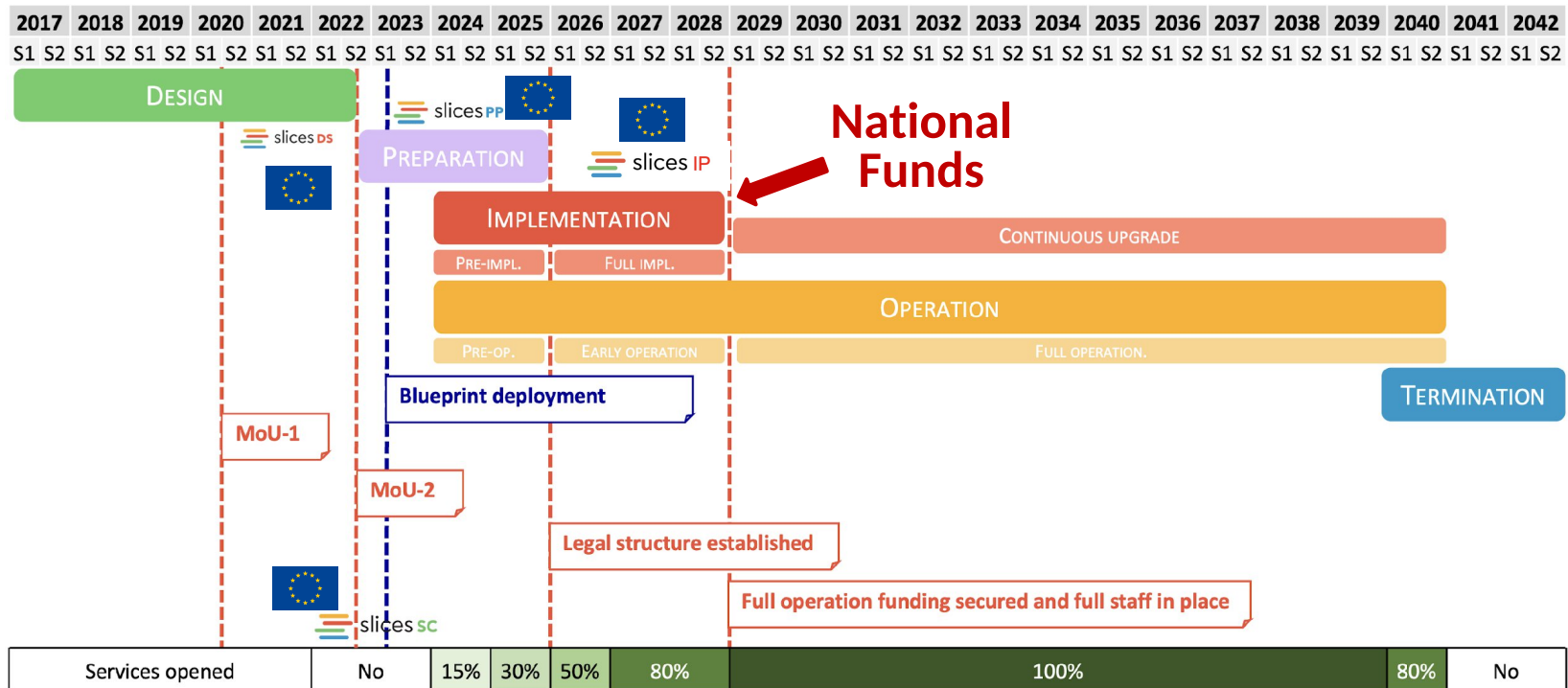
Initiated in 2017, entered the roadmap in 2021:

**16 EU countries engaged:**

- **12 political support** from National Ministries 
- included in **8 national roadmaps** 



# SLICES-RI: a long journey

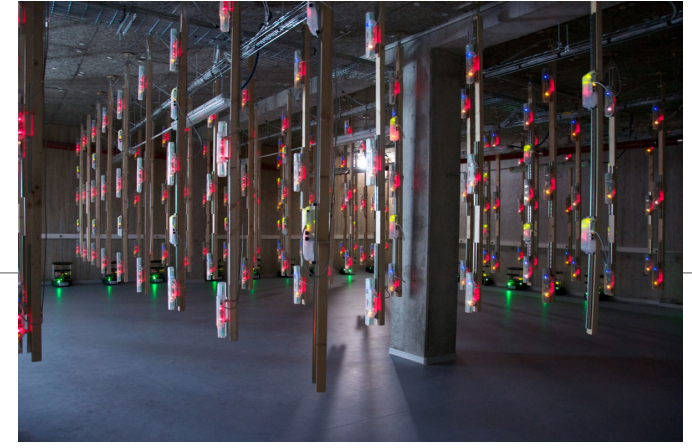




# *What does SLICES-RI offer?*



IoT



# SLICES-RI resources

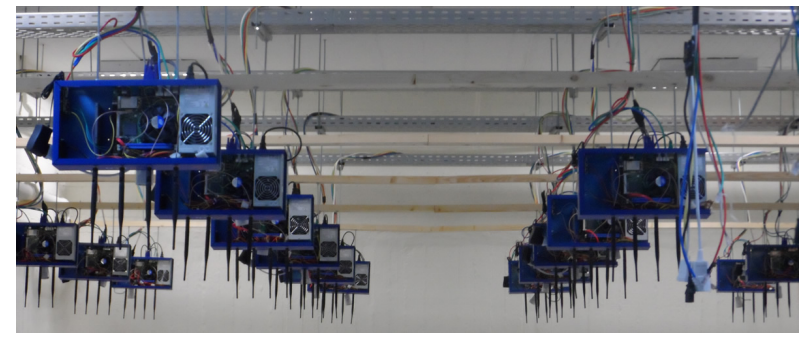
QKD



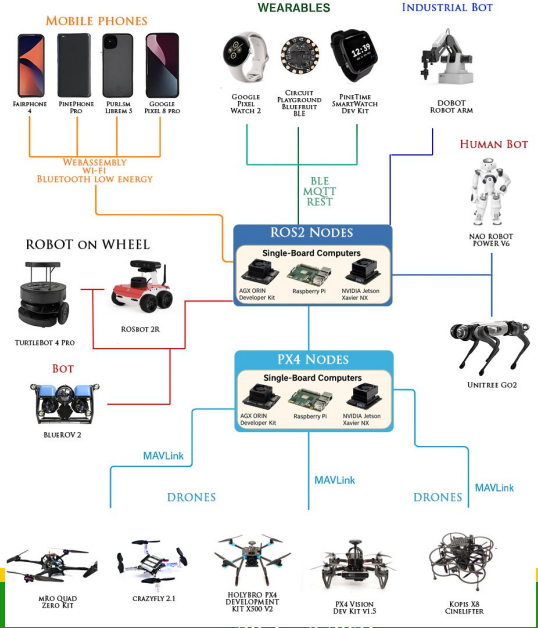
CPU/GPU

Physical/virtual resources that are programmatically offered to RI users

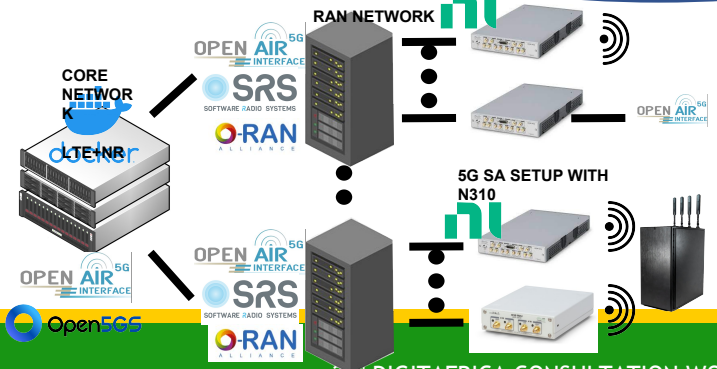
wireless experimentation



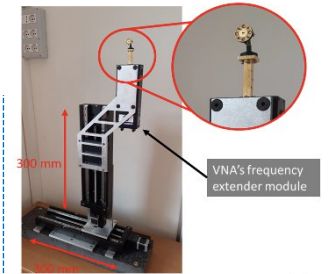
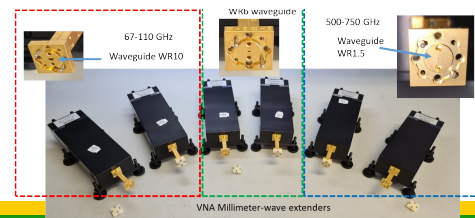
Drones



B5G/6G



mmWave/ISAC

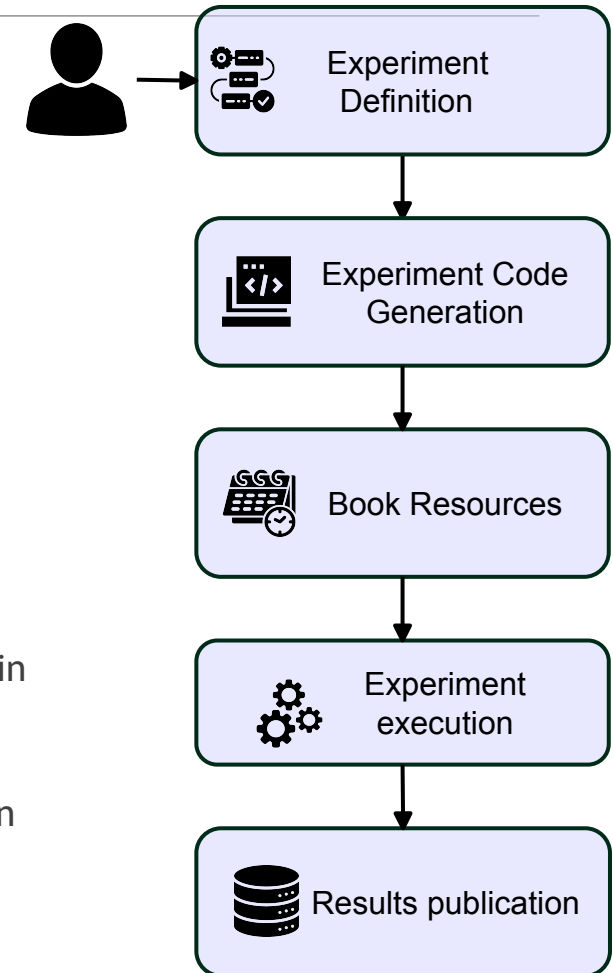


28 April 2026



# SLICES-RI methodology: an intent-based approach to produce *Blueprints*

- High-level specification of the **scientific objectives**, constraints and expected system behaviour
- This intent is expressed declaratively, abstracting the underlying resources, software and configurations
- From this intent, a **Blueprint** is generated: a structured, machine-readable description of the “**reference**” test platform that captures both the **logical topology** and the **experimental workflow**
  - same experiment can be **deployed identically across sites** or reproduced **at a later time**
  - A blueprint integrate experiment description, orchestration, and data collection within a **single lifecycle**.
  - technically, the reference implementation provides a **replicable set of software, hardware and methodologies** for conducting experimental research in a given domain





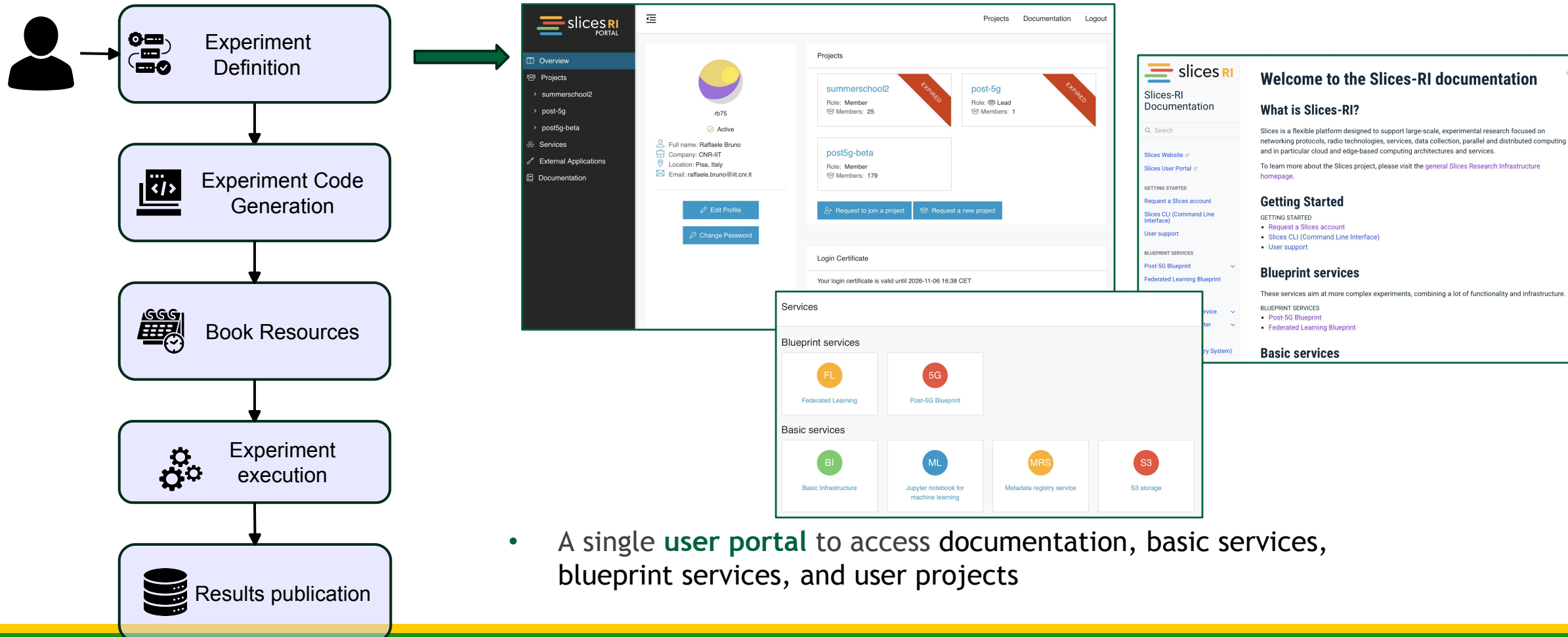
# Documented and with reference implementation

The image is a collage of several screenshots related to the SLICES project:

- Top Left:** The 'slices' logo, consisting of three horizontal bars in orange, yellow, and green.
- Top Center:** A screenshot of a documentation page titled 'Slices-RI Documentation'. It contains text about resource usage: 'To make the usage of resources even better, the CU can be controlled by the control plane which have lower requirements in terms of resources. The figure below, extracted from [1] shows the details of the CU requirements for 7-2x.' There is a search bar and a navigation menu on the left.
- Top Right:** A screenshot of a GitHub repository for 'ansible' playbooks. The repository name is 'SLICES / sopnode / ansible'. The description states: 'This repository provides Ansible playbooks and roles to automate the deployment of a Fabric-TNA environment on SophiaNode'. A section titled 'Setup automation environment' provides instructions on using Ansible 2.13 or higher on GNU/Linux Ubuntu 20.04. A file browser shows folders for '.devcontainer', 'Automation', 'SONIC', and 'docs'.
- Center:** A screenshot of the 'Slices Academy Courses' website. The header includes the 'slicesRI' logo and navigation links: Home, Dashboard, Courses, Events, Search Courses, Slices-RI, Available Courses, and Networking. The main content area features three large orange buttons: 'Testbed Developer', 'Experimental Researcher', and 'Industrial Engineer'. Below these are several smaller orange buttons representing course categories: Networking, Cybersecurity, Internet of Things, Programming, Infrastructure Automation, OS & IT, Packet Tracer, and Data. There is also a 'Site announcements' section and a 'Courses' section with a 'Networking' sub-section.
- Right Side:** A screenshot of the 'SophiaNode' documentation page. It discusses the use of Ansible collections and provides examples of requirements files. It mentions collections like 'ansible.posix', 'community.kubernetes', 'community.crypto', 'community.general', 'netaddr', 'pynetworking', 'PyYAML', and 'requests'. It also mentions 'sshpass' for authentication.

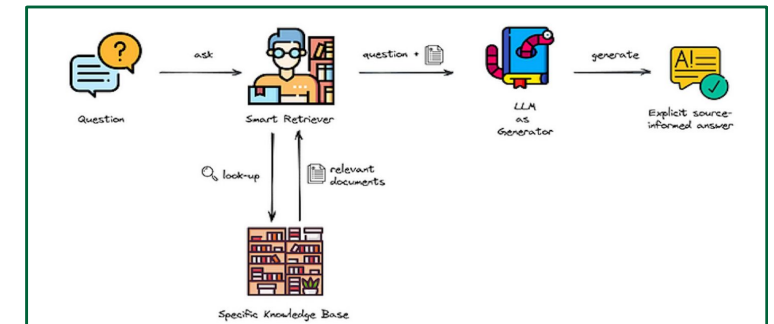
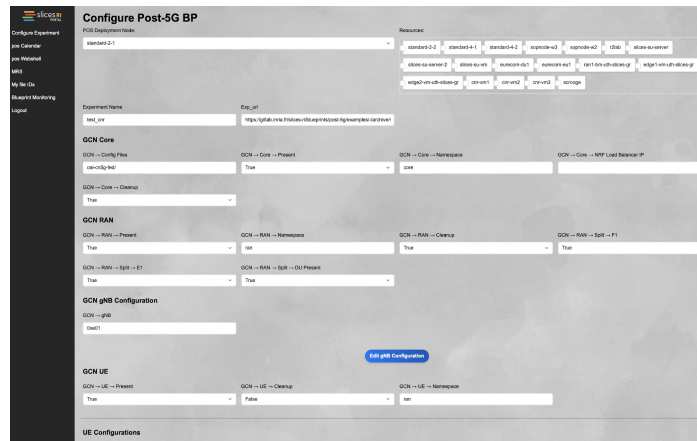
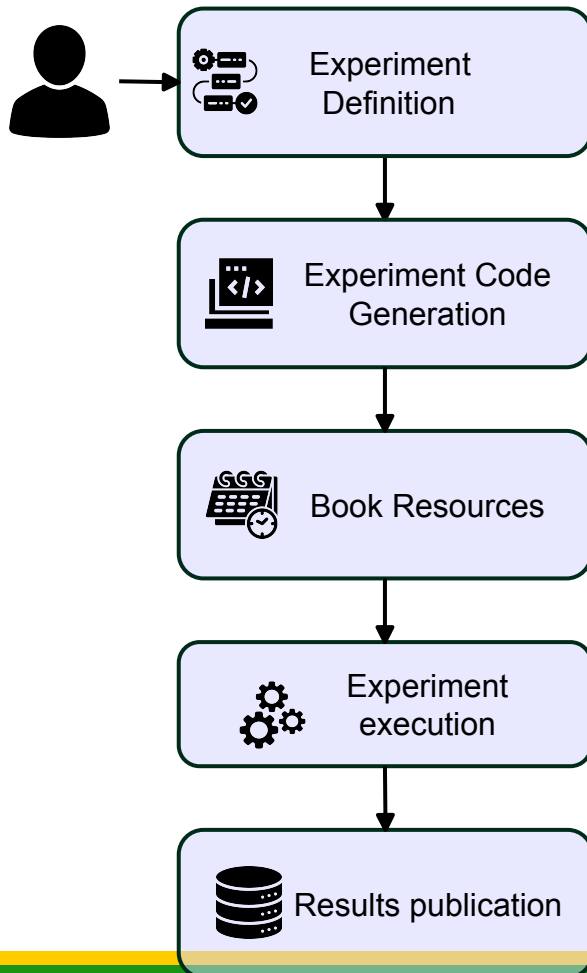


# The SLICES-RI experiment journey





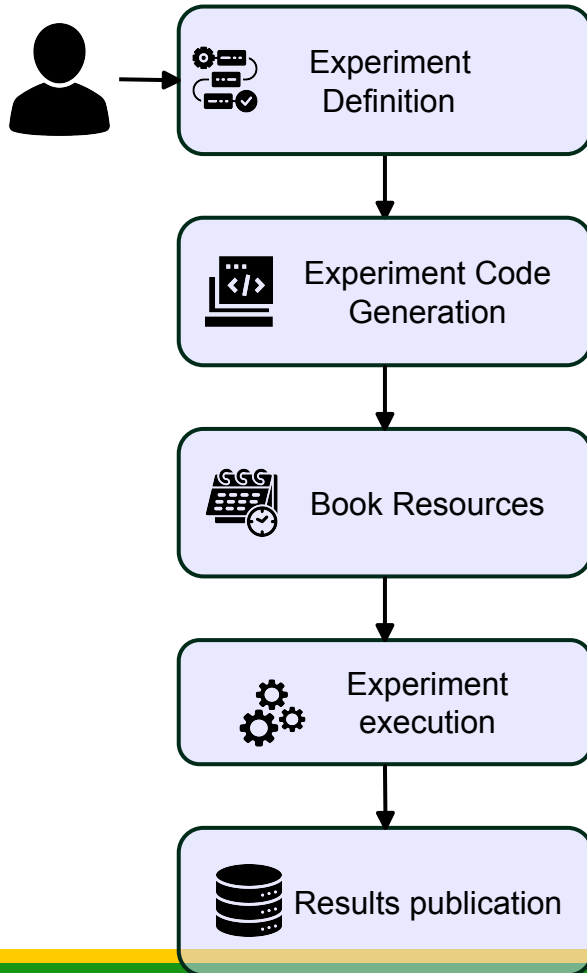
# The SLICES-RI experiment journey



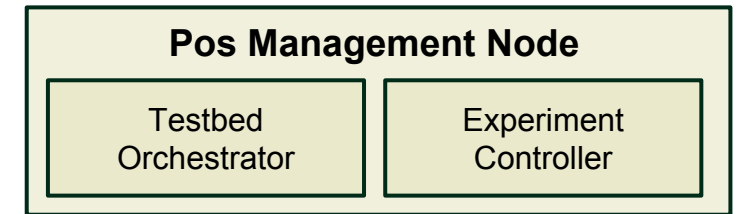
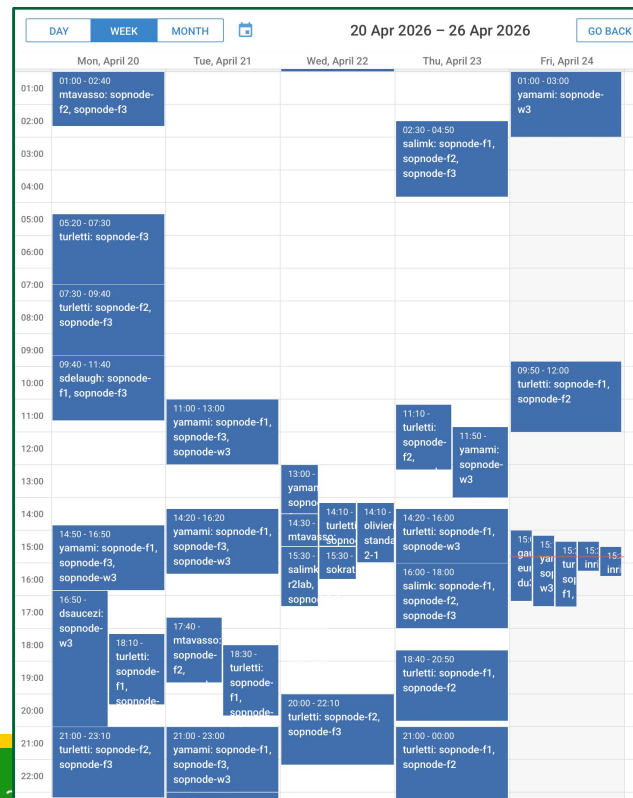
- A **static experiment dashboard** to generate experiment code for the blueprint reference test platform. It is being enhanced by a LLM Chatbot to simplify this task



# The SLICES-RI experiment journey

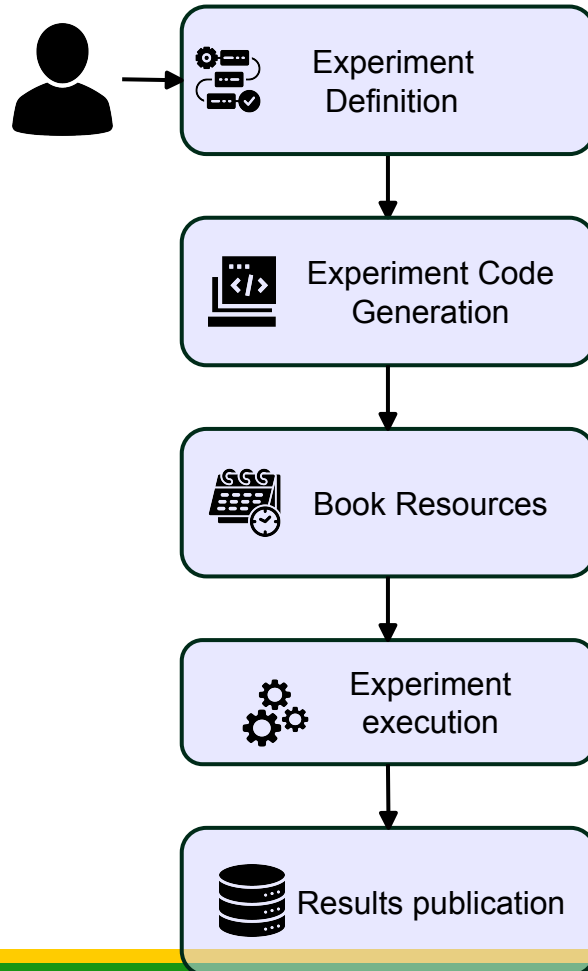


- A **testbed orchestrator**, **experiment controller**, and **management node** (the POS framework of SLICES-RI) enable the automated deployment and control of experiments across heterogeneous infrastructures

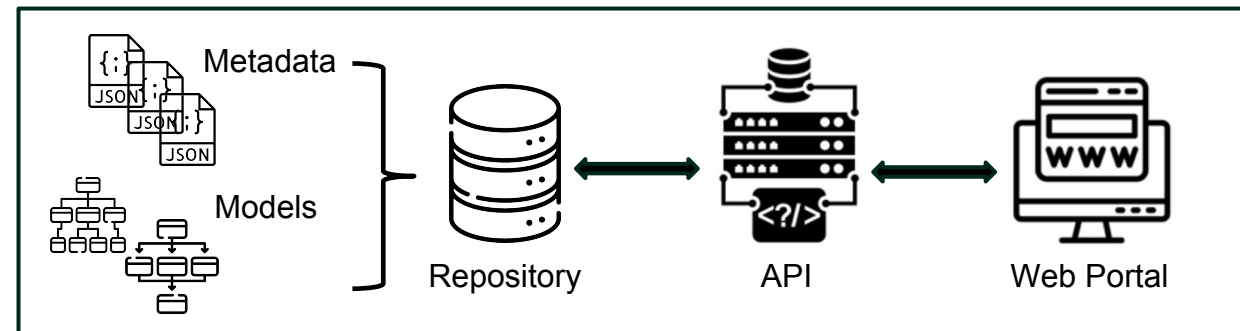




# The SLICES-RI experiment journey



- When an experiment runs, all results, configuration files, monitoring data, and provenance information are automatically **stored** and **indexed**
- **SLICES Metadata Registry System (MRS)**: acts as a centralized platform for managing and retrieving metadata on digital objects, with a focus on interoperability within and outside the SLICES network



**Data Management Infrastructure (DMI)**

<https://doc.slices-ri.eu/BasicServices/MRS/MRS.html>



# ARS: Flexible Hierarchical Metadata Model

## Level 1: Domain-agnostic

- SLICES core FAIR Digital Object, coined S-FDO
- **Primary** (e.g., persistent identification, description, resource type, creator), **Management** (e.g., version, metadata profile), **Access**(access type, access mode), **Links**, Languages, **User Information**, Rights (e.g., licence)

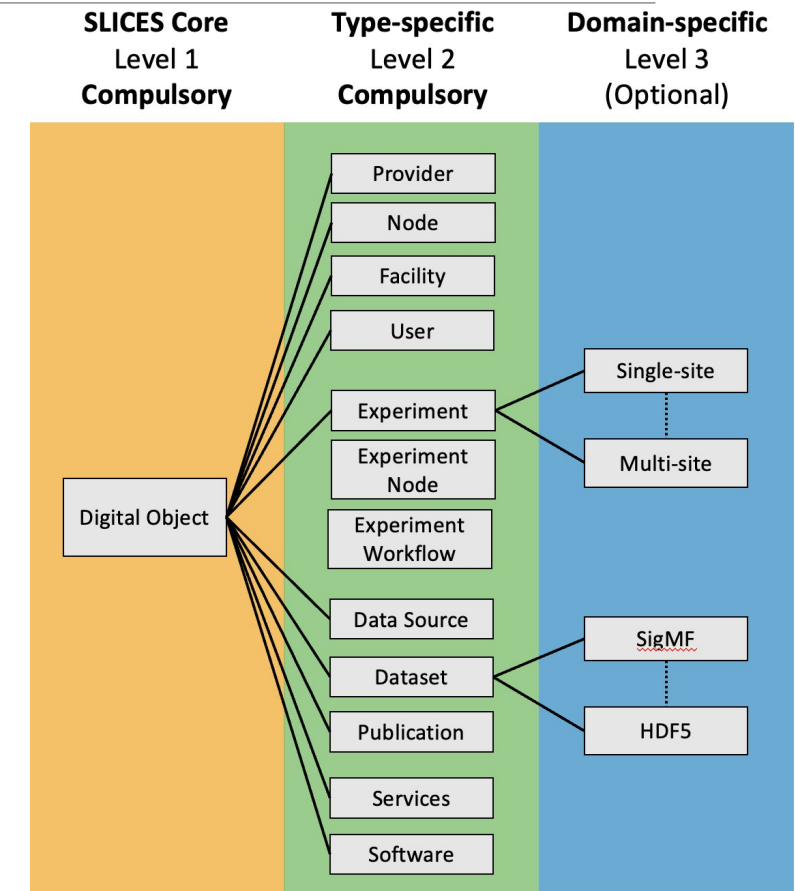
## Level 2: Type-specific

- Extends basic metadata with type specific metadata
- E.g., Datasets may have start/end date

## Level 3: Domain-specific

- Serves the needs of a specific community

Easily expandable with new types



# MRS

Digital objects +

rch

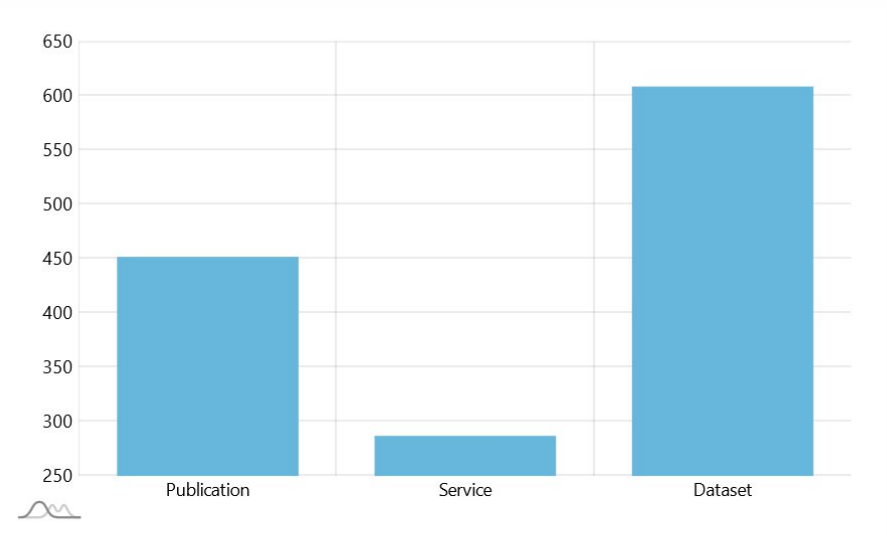
Dashboard

• Disc  
seal

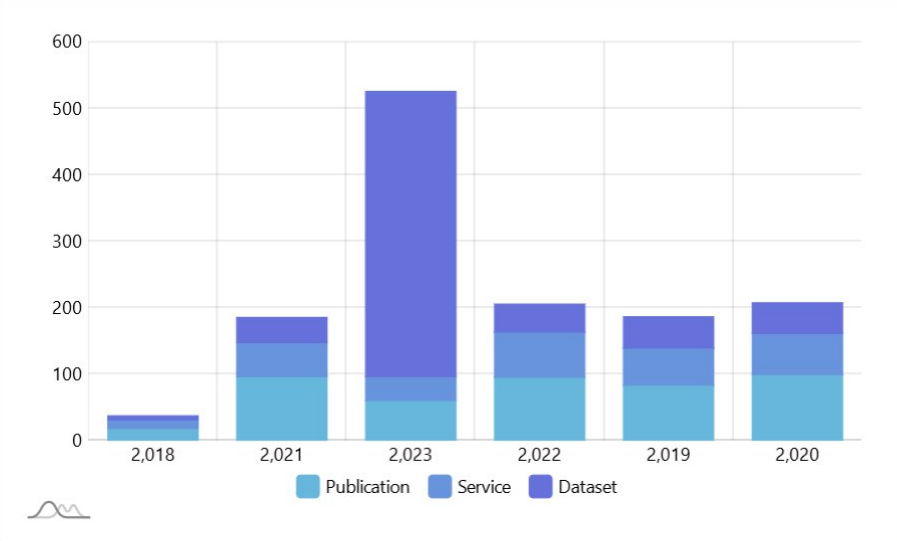
• Mar

• Mor  
requ

Objects by type



Objects by year by type





# *Building a community of SLICES-RI users*



# Training and capacity building

SLICES Academy



Courses



Training Events



Webinars



theNetworkingChannel



Code Repository

SLICES Summer school: Greece (2022), Finland (2023), Italy (2024), Portugal (2025), Spain (2026)

the**Networking**  
Channel

Follow the *NetworkingChannel*,  
brought to you by  
ESFRI SLICES, NSF PAWR and ACM Sigcomm



# Training on the SLICES 5G BluePrint



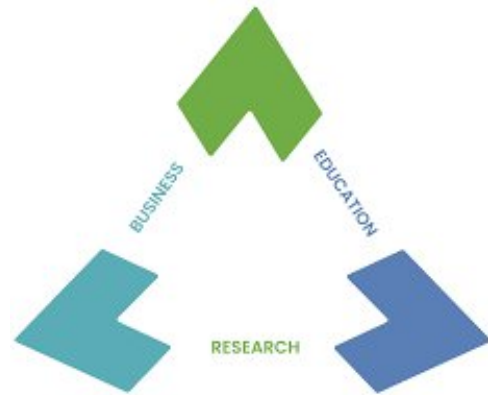
Europe +  
Chile  
Guatemala  
Kenya  
South Africa  
Tunisia  
Vietnam

201 attendees in total, 14 countries, 4 years



# SLICES-RI as a Catalyst

SUSTAINABLE



Knowledge Triangle



INCLUSIVE

Thanks for your attention  
Questions?

