Finanziato dall'Unione europea
NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani
PIANO NAZIONALE DI RIPRESA E RESILIENZA
ICSC
Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing

ICSC
Centro Nazionale di Ricerca in HPC,
Big Data and Quantum Computing

ICSC: Present and Future

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3/12/2025, Bologna

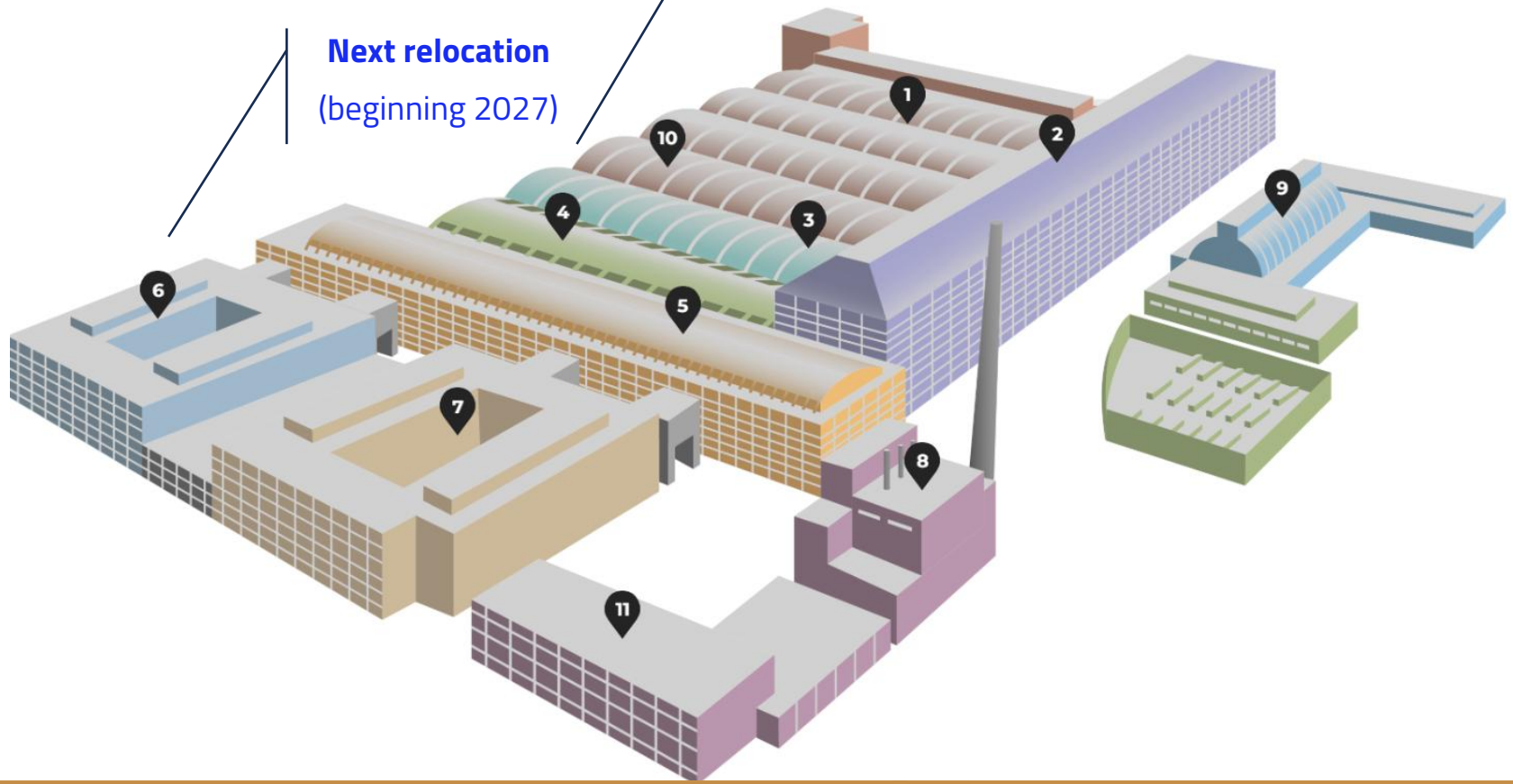
DAMA TECNOPOLO DATA MANIFATTURA EMILIA-ROMAGNA

New operational headquarters

(September 2025)

Next relocation

(beginning 2027)



1. **ECMWF**
2. **Research and Entrepreneurship Hub**
3. **Data Center INFN-CNAF**
4. **Data Center CINECA**
5. **ENEA**
6. **International Research Area**
   International research activities: United Nations University Institute on Big Data and Artificial Intelligence, Sensible City Lab, INFN, CINECA, ICSC, and UN Collaborative Centre for Coastal Resilience
7. **Landing spot for companies and research activities**
8. **Services area**
9. **The Salt Warehouse**
10. **Botte B4**
    Conference area and event space of the Emilia-Romagna Region
11. **Citizen Science**

ICSC : Background

- As part of the **Italian National Recovery and Resilience Plan**, the Ministry of University and Research in 2022 funded with €320M the constitution of the

National Research Center on HPC, Big Data and Quantum Computing (in short, **ICSC**)

- The Ministerial main goal is to sustain research so that innovative, low TRL research outputs may be brought to a ready-to-market state, through direct involvement of public and private institutions:

From Research to Business

ICSC: a national infrastructure with a Hub & Spoke model

- More than 50 partners – private and public
  - Overall coordination by the ICSC Foundation (the “Hub”)
- Thematic areas and infrastructure
  - ICSC covers several thematic areas, such as computational medicine, digital society, multiscale engineering, space economy, quantum computing, and other, with 10 *thematic spokes* and one *infrastructural spoke*.
- HPC, Cloud and Quantum infrastructure
  - It includes supercomputers, high-performance /high-throughput data centers, and edge nodes, connected by high-capacity networks to support research and innovation.
- European participation
  - ICSC is the national node of the European Open Science Cloud (EOSC) and an active participant in EuroHPC initiatives for European collaboration.

ICSC, the National Center for HPC, Big Data and Quantum Computing

National Research Institutes

12 Research Institutes

INFN Istituto Nazionale di Fisica Nucleare · CINECA · ENEA · Consiglio Nazionale delle Ricerche · INAF Istituto Nazionale di Astrofisica · Istituto Nazionale di Geofisica e Vulcanologia · Consortium GARR

HUB

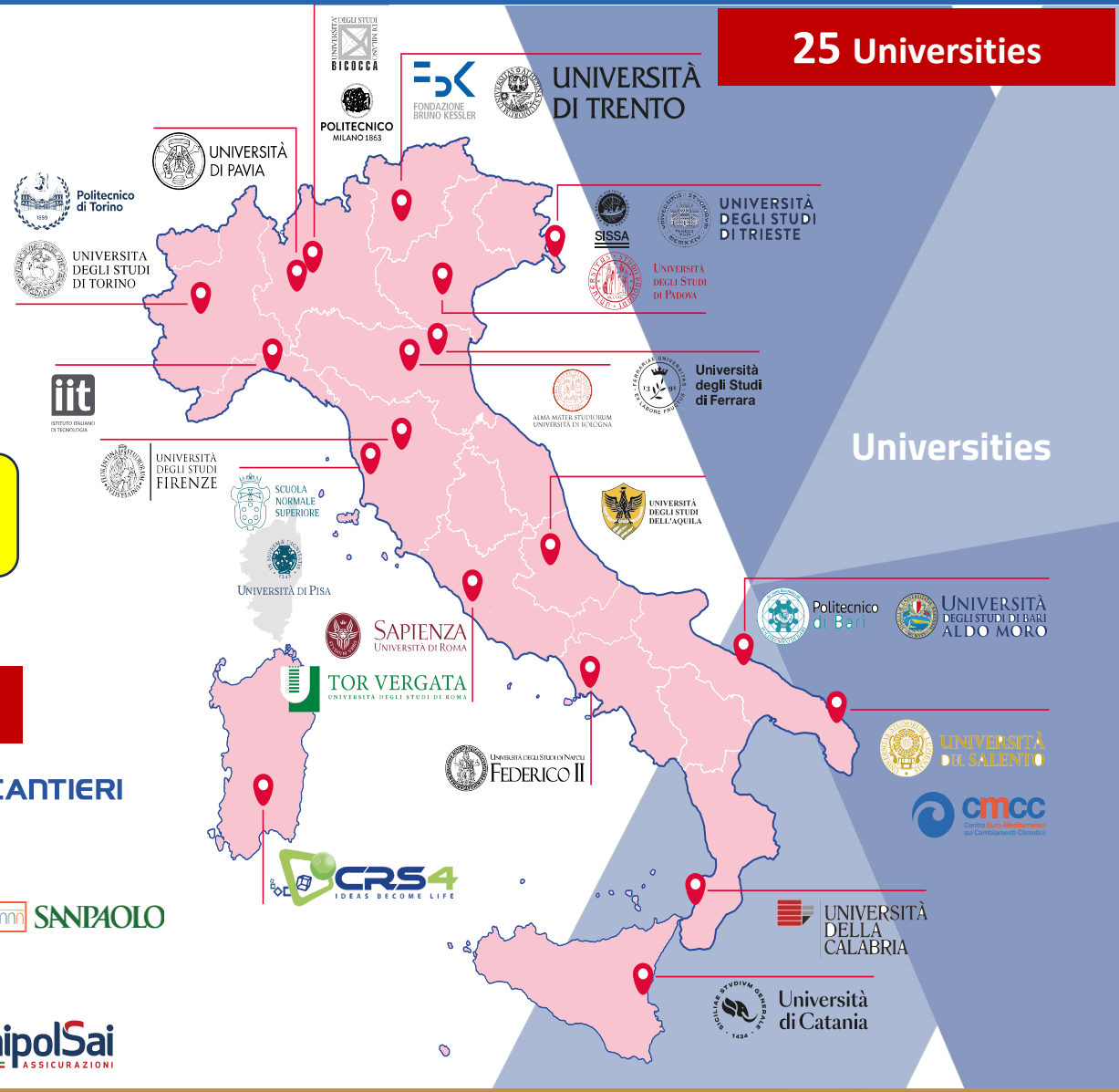
UNIMORE Università degli Studi di Modena e Reggio Emilia · Università di Parma · OGS

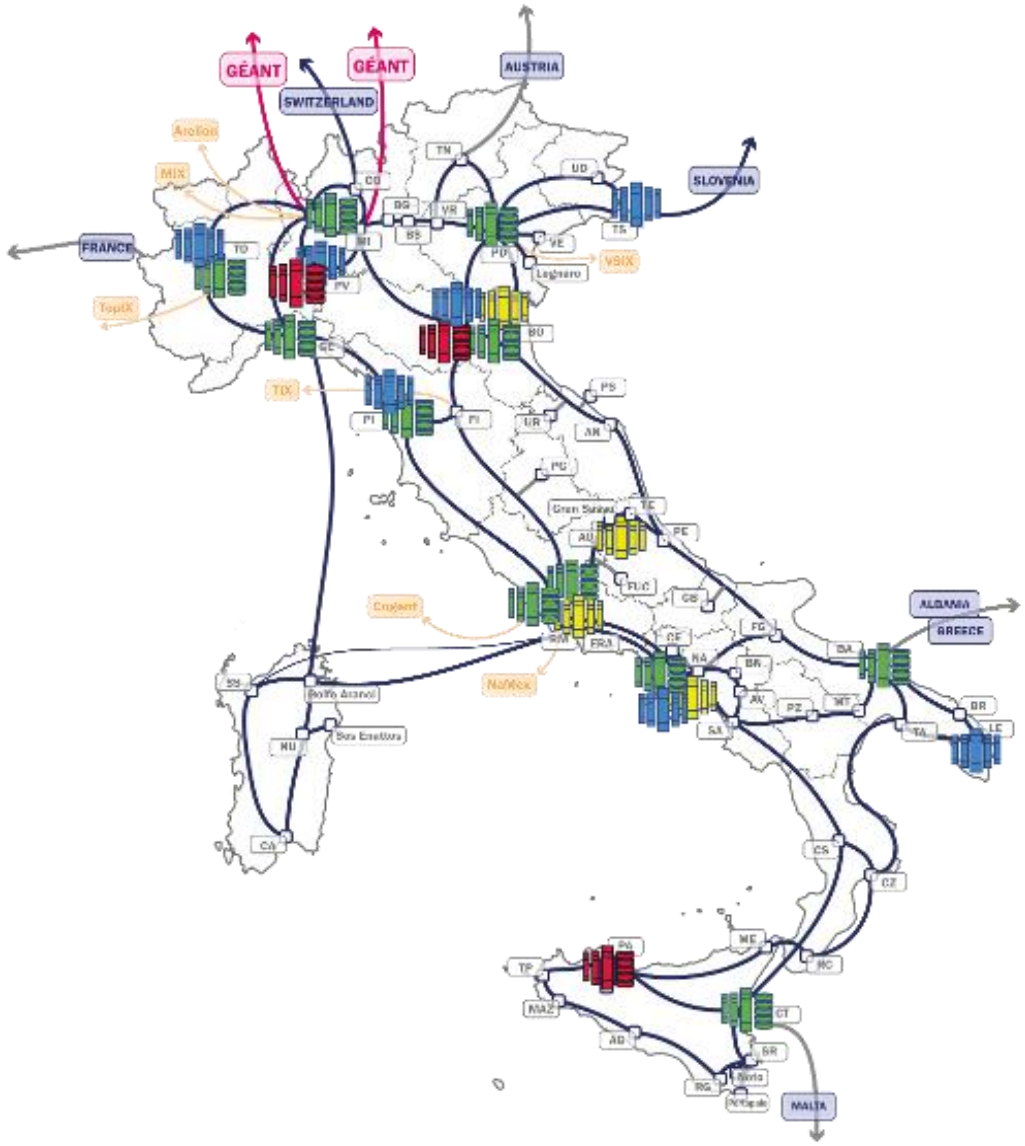
TODAY

Private partners

14 Private Companies

Engineering The Digital Transformation Company · eni · Ferrovie dello Stato Italiane · Fincantieri · fondazione innovazione urbana · autostrade per l'italia · Humanitas Research Hospital · iFAB International Foundation Big Data and Artificial Intelligence for Human Development · Intesa Sanpaolo · Leonardo · Sogei · ThalesAlenia Space · Terna Driving Energy · UnipolSai Assicurazioni





1 FUTURE HPC & BIG DATA

2 FUNDAMENTAL RESEARCH & SPACE ECONOMY

3 ASTROPHYSICS & COSMOS OBSERVATIONS

4 EARTH & CLIMATE

5 ENVIRONMENT & NATURAL DISASTERS

6 MULTISCALE MODELING & ENGINEERING APPLICATIONS

7 MATERIALS & MOLECULAR SCIENCES

8 IN-SILICO MEDICINE & OMICS DATA

9 DIGITAL SOCIETY & SMART CITIES

10 QUANTUM COMPUTING

+

SII SOCIETAL IMPLICATIONS AND IMPACT

#Tier1

Inaugurated on May 10, 2024

CINECA

#Leonardo

n. 10 Top500 supercomputer in the world

MUR
CINECA
ICSC
OGS

#Gaia

Cloud infrastructure

STARTING THE QUANTUM PHASE: IQM Radiance

ICSC
CINECA

54 Superconducting QPU

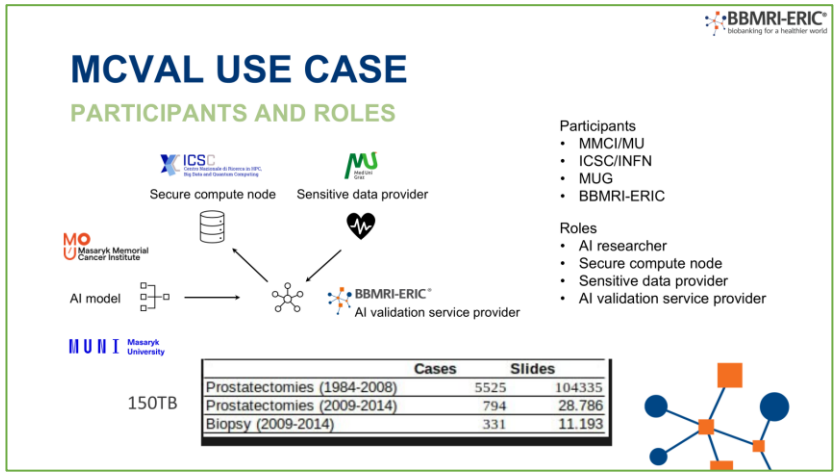
The IQM QC will be followed in 2026 by a PASQAL 150-200 qbit QC based on neutral atoms technology

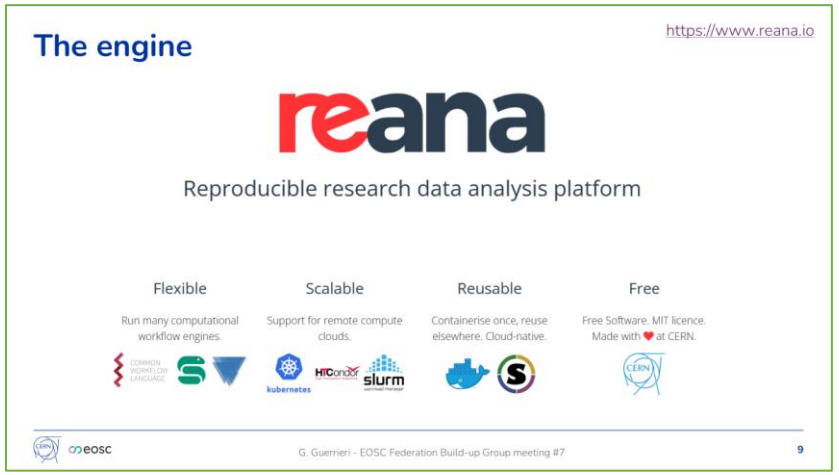
From Hardware to Value

ICSC: EOSC National Node

EOSC Node | Italy

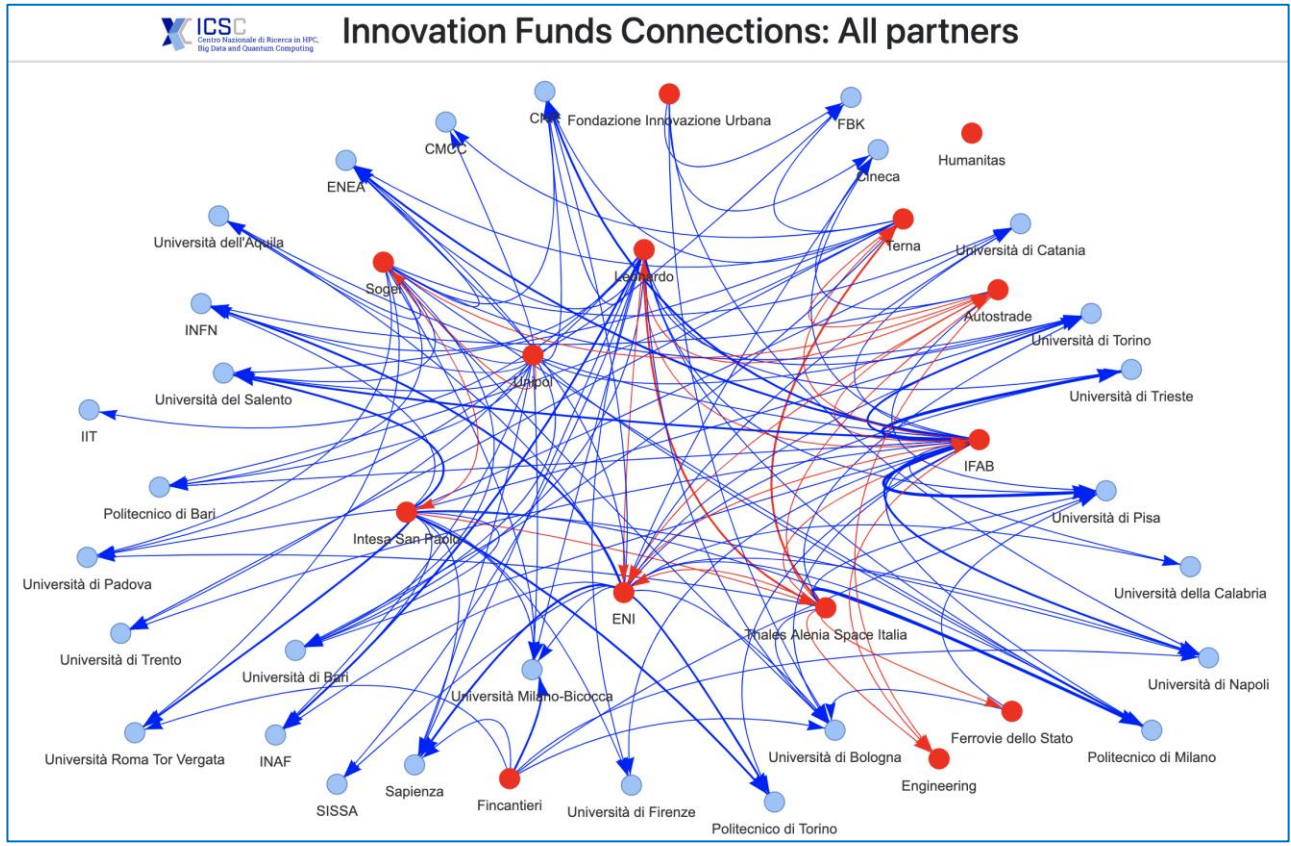
EOSC: an architecture conceived as a **Federation of Nodes**: interconnected *thematic* and *national* systems, using common technological concepts to support the implementation of the FAIR principles of Open Science





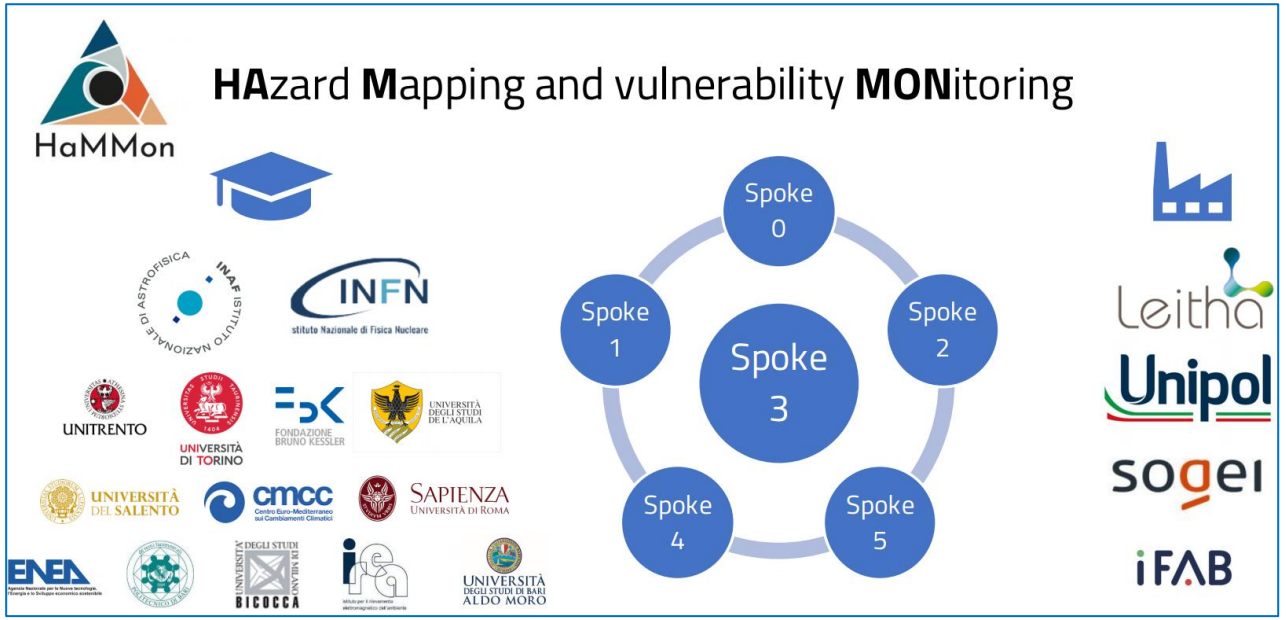
Research – Industry – PA Integration

- Move from PoC demonstrations and medium-low TRL solutions to applications and services that can also be used by industry and public administrations.
  - To this extent, ICSC funded more than 70 projects that originated from industrial use cases, and that saw the participation of both private and public entities.



An example: the HaMMon project

- **Goal: characterize risks and effects** related to **extreme natural events** (earthquakes, floods, eruptions, …)
- **Creation of versatile tools** deployable in different contexts and sectors, using advanced computing and AI technologies.
- **Fostering of strategic synergies** between research, public administrations (including Civil Protection Agencies) and Italian industries.



- Post-event analysis
- Seasonal forecasts and weather generator
- Building features extraction from images
- Vulnerability assessment
- Technological infrastructure to run and deploy the applications

https://eusair-project.eu/

EUSAiR
BRIDGING INNOVATION AND COMPLIANCE IN AI

What about the AI Act?

EUSAiR (started Dec 2024) is an EU project coordinated by ICSC that:

- **Supports AI providers** on compliance and innovation
- **Assists regulatory authorities** with harmonized supervisory systems
- **Protects human rights** in AI regulations

European Parliament

EU AI Act: first regulation on artificial intelligence

The use of artificial intelligence in the EU is regulated by the AI Act, the world's first comprehensive AI law. Find out how it protects you.

Published: 08-06-2023
Last updated: 19-02-2025 - 17:46
7 min read

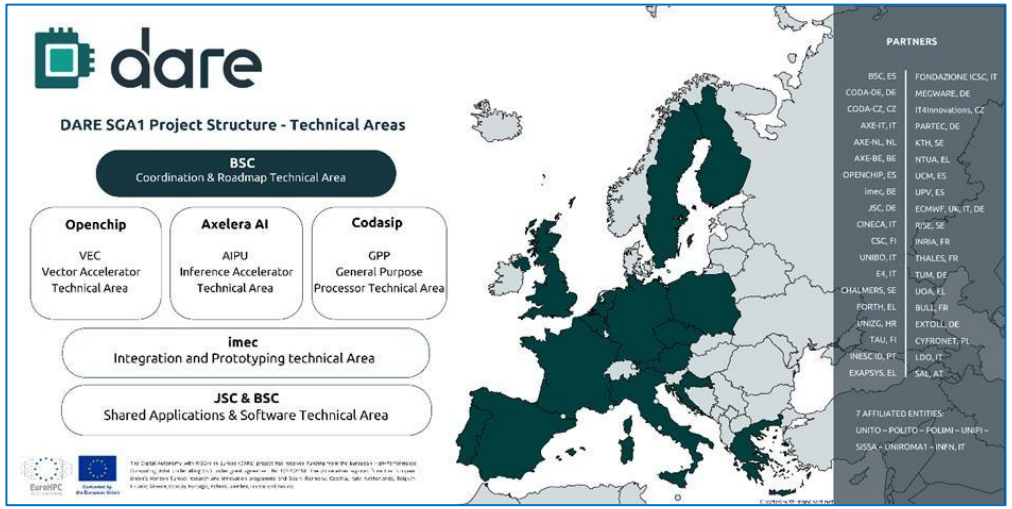
Table of contents

01. AI Providers, especially Start-ups and SMEs

How they can benefit from EUSAiR?	Expected Results
Regulatory Compliance Support They will receive guidance on complying with the AI Act, which enhances legal certainty and reduces compliance costs. **Access to Sandbox Testing** The opportunity to test AI systems in a controlled environment helps accelerate innovation and market entry.	

RISC-V

- DARE (Digital Autonomy with RISC-V in Europe)
  - Develop **next-generation European processors and computing systems**, including an optimized software ecosystem, designed for research and industry applications (https://dare-riscv.eu/home/) → started **3/2025**
- Why?
  - Open-Source disruption of proprietary models
  - Geopolitical and national security dimensions (reduce reliance on US-controlled IP)
  - Strategic role in AI and High-Performance Computing → AI accelerators
  - Strategic flexibility for industry → customization for specialized workloads



Creating the next generation of processors

Based on open source and highly adaptable tools

DARE (Digital Autonomy with RISC-V in Europe) is a groundbreaking initiative driving Europe's independence in high-performance computing and AI. By leveraging open-source technologies, DARE is **developing cutting-edge chiplet processors** — the essential building blocks for next-generation supercomputers. This effort is a critical first phase in a long-term plan to ensure **secure, efficient, and scalable computing solutions** tailored to European needs.

ICSC FOR *INNOVATECH* Innovative **N**etwork for **T**echnological **A**dvancements with **HPC**

PRESS RELEASE | 4 December 2024 | European High-Performance Computing Joint Undertaking | 2 min read

The Innovate Consortium Chosen to Host EuroHPC's First Industrial Supercomputer

The Innovate consortium, led by CINECA and including seven Italian industrial partners from diverse sectors, has been selected to host and operate the first EuroHPC industrial-grade supercomputer in Bologna, Italy.

ICSC represents the INNOVATECH partners toward the EuroHPC JU for the joint procurement and project execution

The first **industrial-grade supercomputer project,** co-funded by the EuroHPC JU and by Italian private entities (including the ICSC Foundation) → expected to start **2026Q1.**

This industrial-grade supercomputer will be reserved for the development of industrial applications. It is expected to be installed at the Bologna Technopole in the first half of 2026.

ECHO-TWIN: Edge-Cloud-HPC Optimized Twins

- Project proposal (under evaluation) in response to a call from the Italian Ministry for University and Research
  - **Goal:** Develop intelligent ecosystems integrating **digital twins**, **Edge/Cloud/HPC**, and **AI** for smart mobility, climate/space, and healthcare.
- Strategic objectives:
  - Expand the **ICSC expertise, infrastructure and product portfolio**.
  - Reduce **latency** with an Edge-Cloud-HPC continuum.
  - Use **AI for predictive and decision models**.
  - Integrate with the **Italian AI Factory** and other ICSC assets.
  - Promote **sustainability** and reduce environmental impact, especially in Southern Italy.
  - Support **industry and research** through training and new tech development.

Where we are today: the "AI Factories"

PRESS RELEASE | 10 December 2024 | European High-Performance Computing Joint Undertaking | 9 min read

Selection of the First Seven AI Factories to Drive Europe's Leadership in AI

The EuroHPC Joint Undertaking (EuroHPC JU) selected the sites that will host the first European AI Factories, set to be deployed next year across Europe: in Finland, Germany, Greece, Italy, Luxembourg, Spain and Sweden.

EuroHPC JU

In December2024, the **Consorzio Minerva** won a European tender for the construction of the **Italian AI Factory:**

- €400 million for a new "exascale" supercomputer specialized in Artificial Intelligence.
- €30 million for the development of AI services and applications for research, public administrations, businesses, including start-ups and SMEs.

Public-Private Consortium

Coordinator: CINECA

Implementors: ACN – AI4I – FBK –AIM – ARTER – ICSC - IFAB

Partners: SAPIENZA, UNIBO, UNITO, UNIMORE, CONFINDUSTRIA

IT4LIA AI FACTORY

Where we shall go: the "AI Gigafactories" (no, they are not simply bigger AI Factories)

ATTUALITÀ

IA, In Italia una delle cinque Gigafactory Europee?

Pubblicato 3 giorni fail 8 Ottobre 2025
Di **Vincenzo Cacciopoli**

Non è ancora chiaro dove, ma il nostro paese sembra ormai pronto ad accogliere una delle cinque **Gigafactory** di intelligenza artificiale che l'Europa si appresta a realizzare con un investimento monstre da **20 miliardi** di euro. A confermarlo è stato ancora ieri, il ministro delle Imprese e del Made in Italy, **Adolfo Urso, presente ad un evento a Roma.**

Si tratta del grande progetto presentato dalla commissione europea lo scorso 9 aprile, un piano per divenire leader mondiale nell'intelligenza artificiale. Un obiettivo ambizioso, se si parte dal presupposto che nell'elenco dei primi trenta colossi dell'IA non figura nemmeno un'azienda europea. Ma "è vero solo in parte che gli Stati Uniti e la Cina sono più avanti di noi", sostengono fonti Ue. Bruxelles si è dotata per prima di un impianto legislativo, la cui colonna portante è l'Ai Act, e può contare su "un eccezionale bacino di talenti". Ora, **è pronta a mobilitare fino a 20 miliardi di euro per costruire cinque centri all'avanguardia** – delle *Gigafactory* – che riuniscano supercomputer, laboratori di dati, utenti e sviluppatori.

https://scenarieconomici.it/ia-in-italia-una-delle-cinque-gigafactory-europee/

DIGIBYTE | Publication 30 June 2025

Overwhelming response as 76 respondents express interest in the European AI Gigafactories initiative

https://digital-strategy.ec.europa.eu/en/news/overwhelming-response-76-respondents-express-interes

"Now what, then?"

- **ICSC**, the National Center on HPC, Big Data, AI and Quantum Computing, has established itself as an enabling platform for innovation in the country, capable of:
  - **Integrating public research and private innovation**, creating synergies that amplify the impact of available skills and resources.
  - Promoting **high-impact shared solutions**, through a strategic and coordinated vision oriented towards the sustainable and responsible development of emerging technologies.
  - Strengthening **Italy's role in the European scientific and technological landscape**, contributing to the definition of national priorities and the positioning of the country on an international scale.

Trends, #1: How to Balance Compute Power, Sustainability & Sovereignty

- Hybrid Architectures
  - HPC + AI + Cloud + Edge + Quantum → optimize workloads for efficiency
- Green Strategies
  - Mixed-precision computing, renewable-powered data centers, liquid cooling
- Policy & Governance
  - EU AI Act & Data Act → enforce transparency and interoperability
- Open Access & Federated Model
  - Democratize compute solutions for SMEs → EuroHPC AI / GigaFactories, dedicated hardware, remove silos
- Skill Development
  - Invest in HPC/AI/Quantum education to ensure autonomy

Trends, #2: Final Remarks

- Complex technology integration
  - The **integration** of HPC, Big Data, Quantum, Cloud and Edge represents a crucial technological and social challenge for the digital future.
- The role of European choices
  - **Decisions** on infrastructure, regulation and governance will define Europe's role in the global digital revolution.
- Sustainable Collaboration Model
  - ICSC represents a virtuous example of **public-private collaboration** oriented towards impact and sustainability.
- Challenge for the future
  - Balancing computational power, digital sovereignty, and environmental sustainability is essential for a **fair and innovative future**.


ICSC
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Big Data and Quantum Computing
Supercomputing shaping the future
https://www.supercomputing-icsc.it/
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