

The Italian HPC and AI infrastructure for Science and Innovation integrated into the European HPC system

CONSORTIUM NO PROFIT



120 Members

2 Ministries, 71 University
47 Research institutions



6 Point of Presence

Bologna, Milano, Roma, Napoli, Chieti, Palermo



≈ 1000

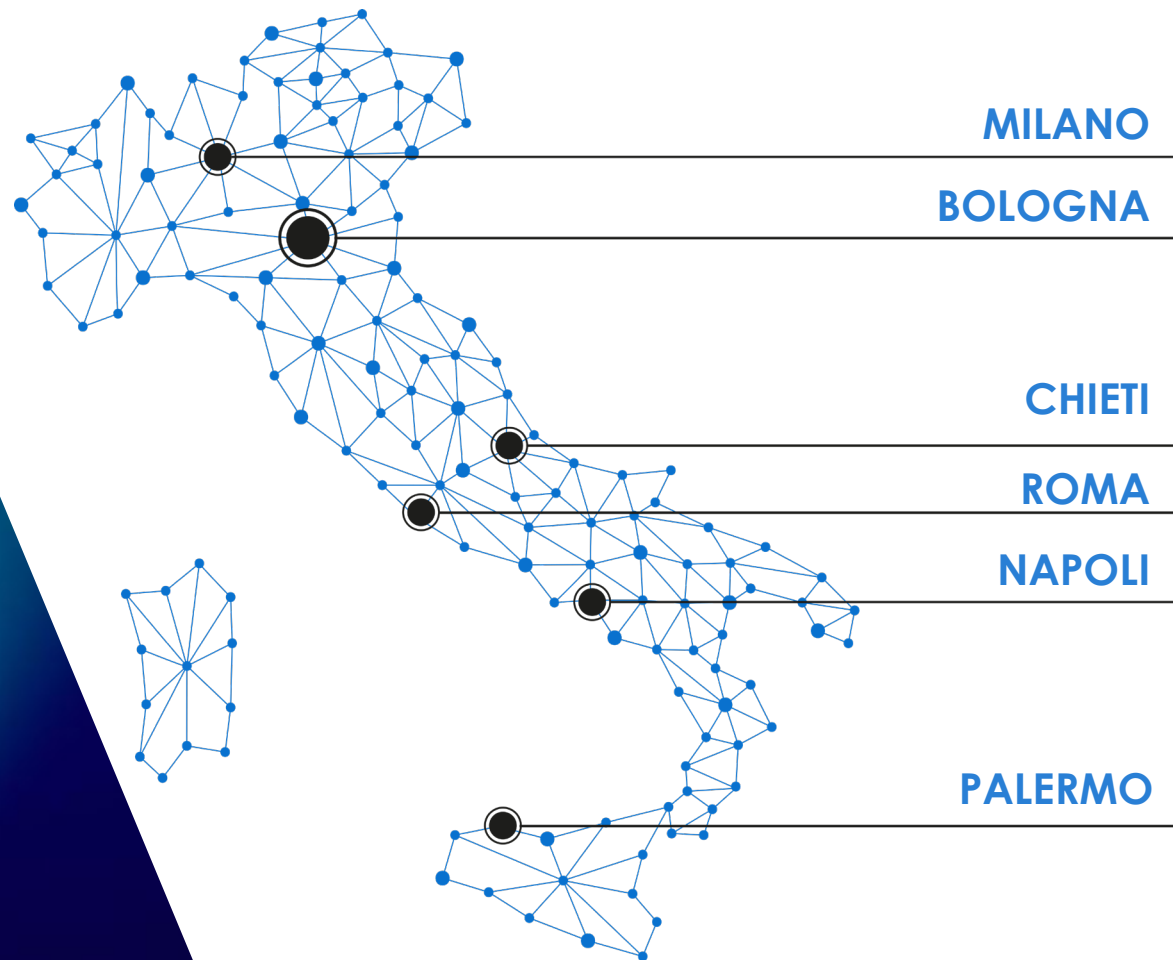
Employees



≈ € 130M

Annual Budget

CINECA



The engagement in a few points

- EuroHPC Pre-exascale Hosting Entity
- EUROfusion HPC Service provider
- Eni Applications dev-ops and HPC System and Production mgmt.
- Management of 2 systems in the top 10 of the Top500
- Leader of the spoke infrastructure (Research Network; HPC, Big Data and AI; QC) of the National HPC Center
- Hosting and coordinating Entity of the AI Factory IT4LIA action

CINECA



EuroHPC
Joint Undertaking





Drivers

Driver #1 - as per institutional mission

SUSTAINABLE DEVELOPMENT GOALS





Driver #2: EuroHPC

CINECA



**European Declaration on High Performance Computing,
Declaration signed in Rome 23/03/2017 by:
Italy, France, Germany, Luxembourg, Netherland, Portugal, Spain**

34 participating countries

The European Union
(represented by the
European Commission)

Private partners
(represented by industry
associations)

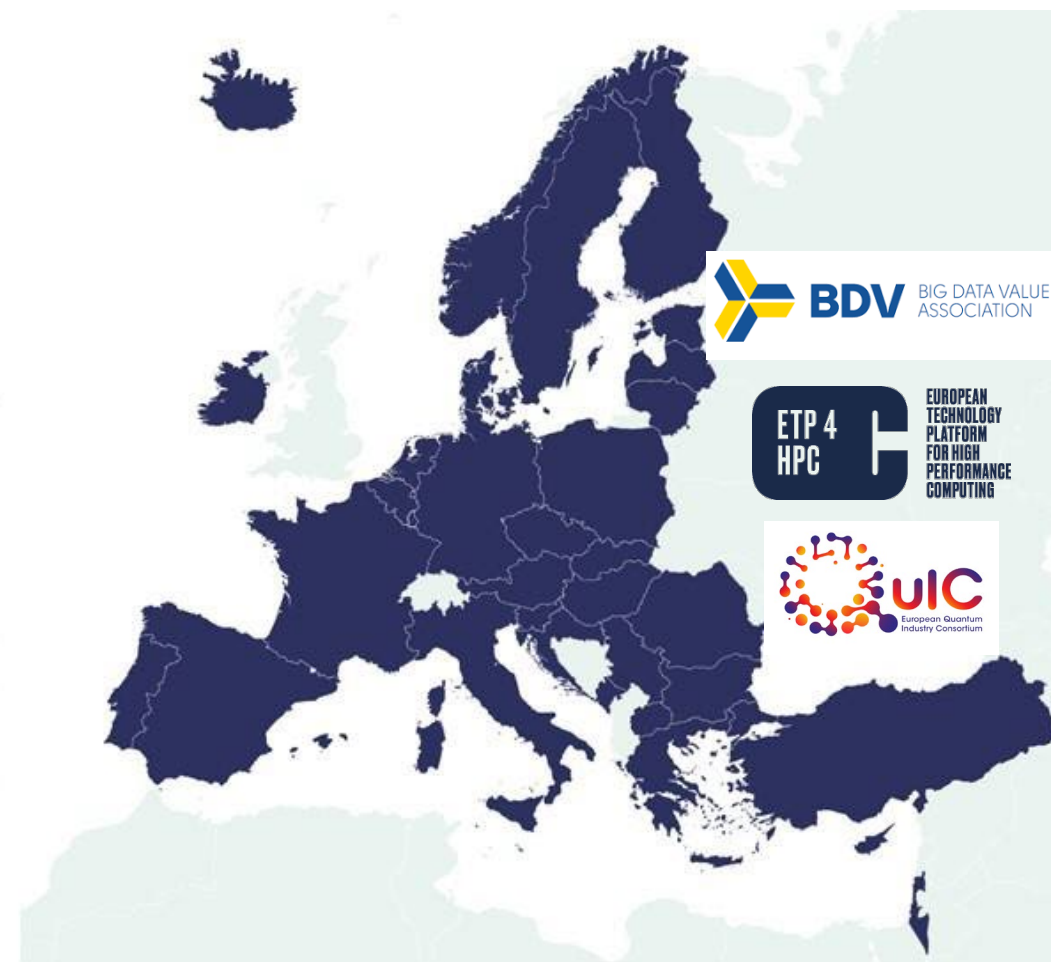
#EuroHPC Joint Undertaking

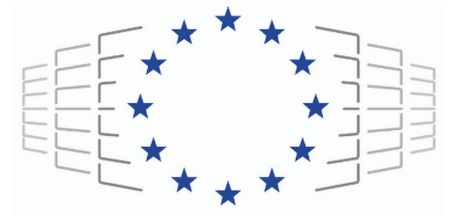
The European High Performance Computing Joint Undertaking (EuroHPC JU) will pool European resources to develop top-of-the-range exascale supercomputers for processing big data, based on competitive European technology.

Member countries are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, the Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden and Turkey.



EuroHPC
Joint Undertaking

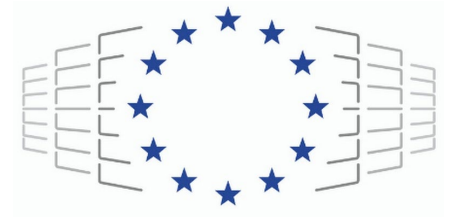




Infrastructures

- Extend HPC infrastructure with **upgrades** of the older **mid-range** and **petascale** systems, **deploy two exascale** systems
- **Deploy** the selected **QC systems** and **plan for next generation by 2027**
 - Access the latest QC technologies including error correction and fault tolerance
- Tighten **connection between HPC, AI, and QC** infrastructures
 - Federation and middleware solutions, especially for HPC-QC coupling
- **Standardisation, benchmarking, certification, and validation** activities for **QC**
- Prepare **post-exascale: Roadmap** based on Science and Industry use cases.

Beyond 2027: define and apply **metrics reflecting the real-world impact** of EuroHPC activities (e.g. application-based benchmarks, scientific publications, or patents), **so that position in Top500 is not the main goal** in infrastructure procurements



AI Factories

- **Implement all selected AIFs** in a coherent way
 - Ensure diversity of solutions and phased deployments
- **Develop specific access policies** fitting the needs of AIFs users (especially industry and SMEs)
 - allow differentiated access policies per AIF
- Enable **mentoring and benchmarking** of first AIFs
- Support development of **novel AI-optimised architectures and services**
- Establish and **reinforce technology watch**,
 - monitor the rapid changes in AI applications, models and technologies
 - catch up and keep at the forefront of AI developments

Beyond 2027: evolution of the AI Factories into the next EuroHPC phase, learning from first AIFs and Gigafactories, with high **focus on applications and skills**

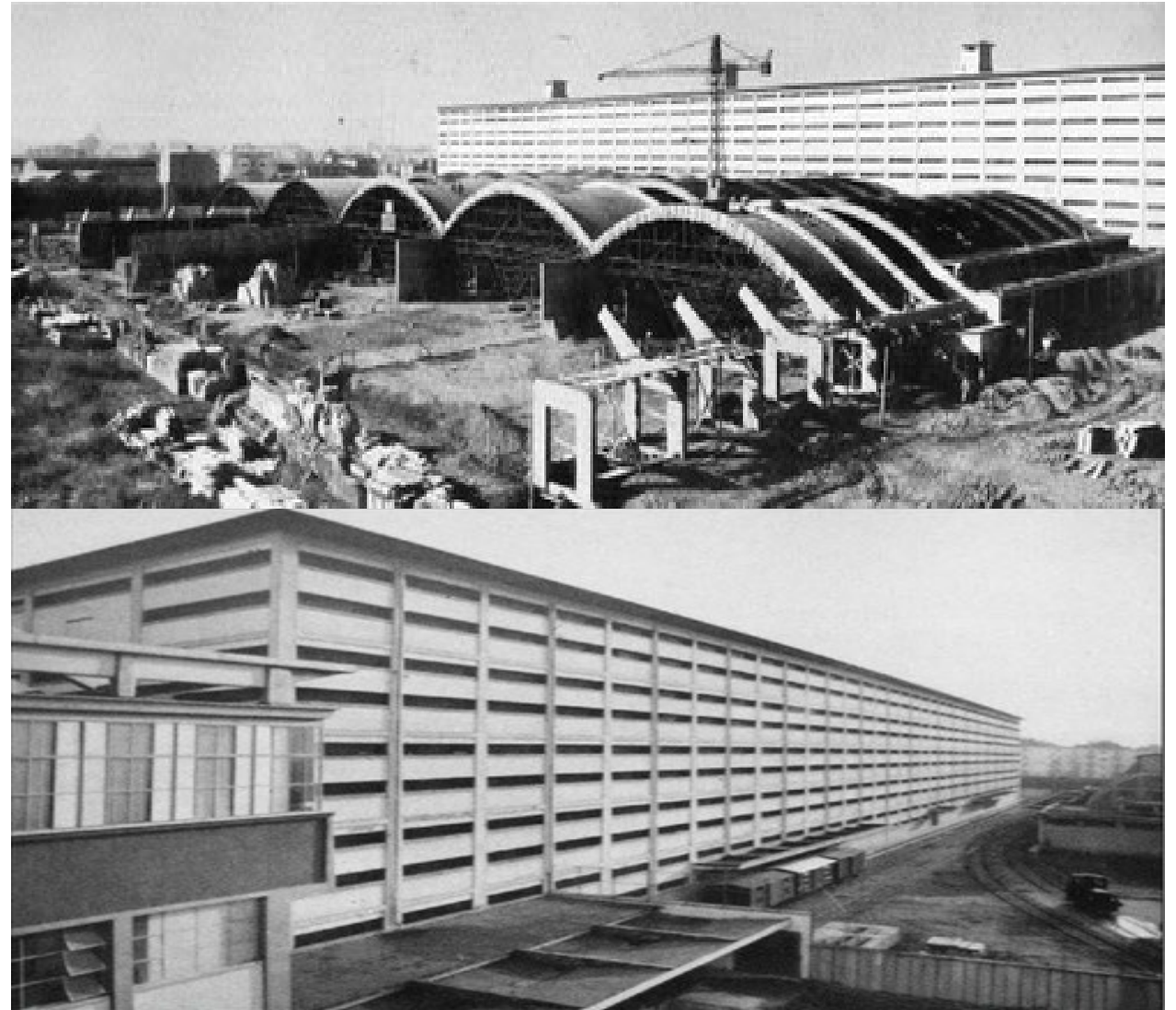
Driver #3: Tecnopolo di Bologna

CINECA



Designed in 1952 by Pier Luigi Nervi (1891 - 1979) for State Monopolies, the Tobacco Factory is a masterpiece of industrial architecture of 100,000 sqm.

Closed in 2004, after a period of abandonment it was acquired by the Emilia Romagna Region and in 2016 dedicated to Big Data AI Factory



From...

A FORMER TOBACCO FACTORY



A masterpiece of industrial architecture of 100,000 sqm - Pier Luigi Nervi 1952

Data and AI Factory

CINECA



**Innovation Gate
for privates and
Industries**

**Innovation Gate
for public
institutions**

AI Factory

**LEONARDO &
LISA
GAIA Cloud
Marcopolo AIM
QC Pasqal & IQM**

**One of the largest
concentration of
HPC systems in the
world**

**INFN WLCG
The largest HPTC
System in Europe**

ECMWF

**VISITOR
CENTER**

INFN

CINECA

The Data AI and Factory Ecosystem

CINECA



EuroHPC
Joint Undertaking



UNITED NATIONS
UNIVERSITY



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



SERVIZIO SANITARIO REGIONALE
EMILIA - ROMAGNA
Istituto Ortopedico Rizzoli di Bologna
Istituto di Ricovero e Cura a Carattere Scientifico



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



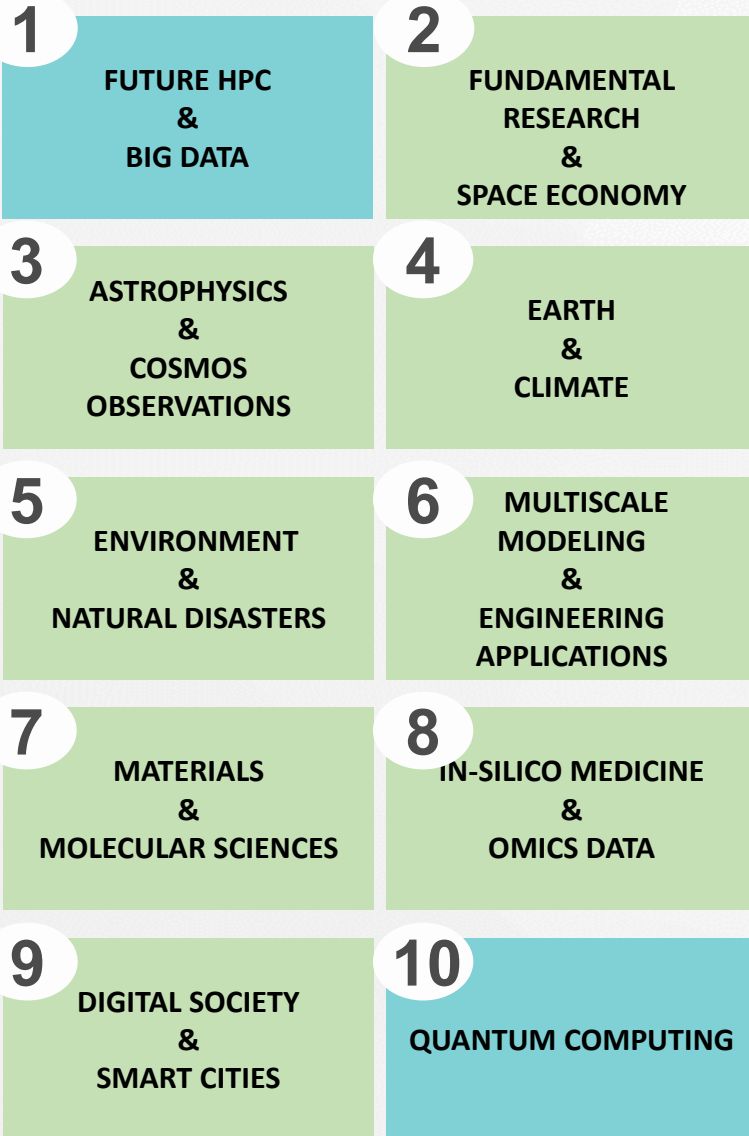
Comune
di Bologna



Regione Emilia-Romagna

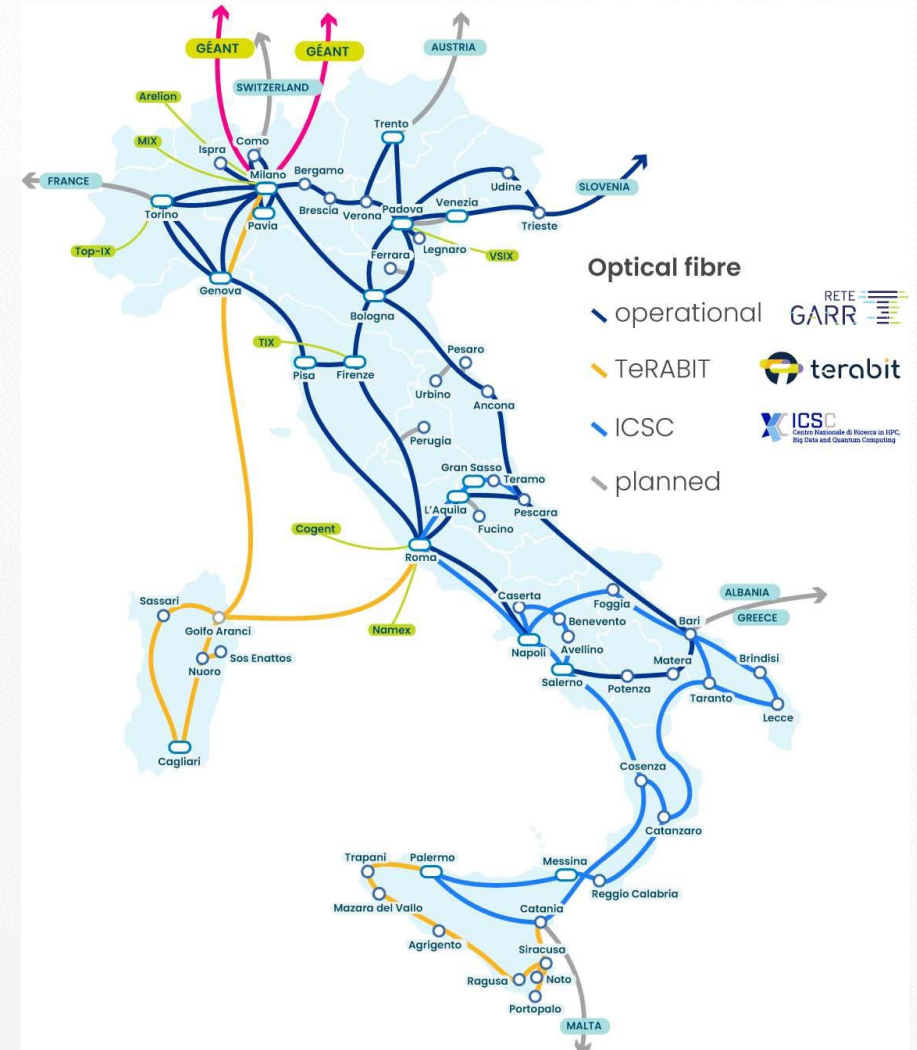
Driver #4: National Centre for HPC Big data and Quantum Computing

EDUCATION & TRAINING, ENTREPRENEURSHIP, KNOWLEDGE TRANSFER, POLICY,
OUTREACH



0
SUPERCOMPUTING CLOUD AND NETWORK INFRASTRUCTURE

Lead by CINECA



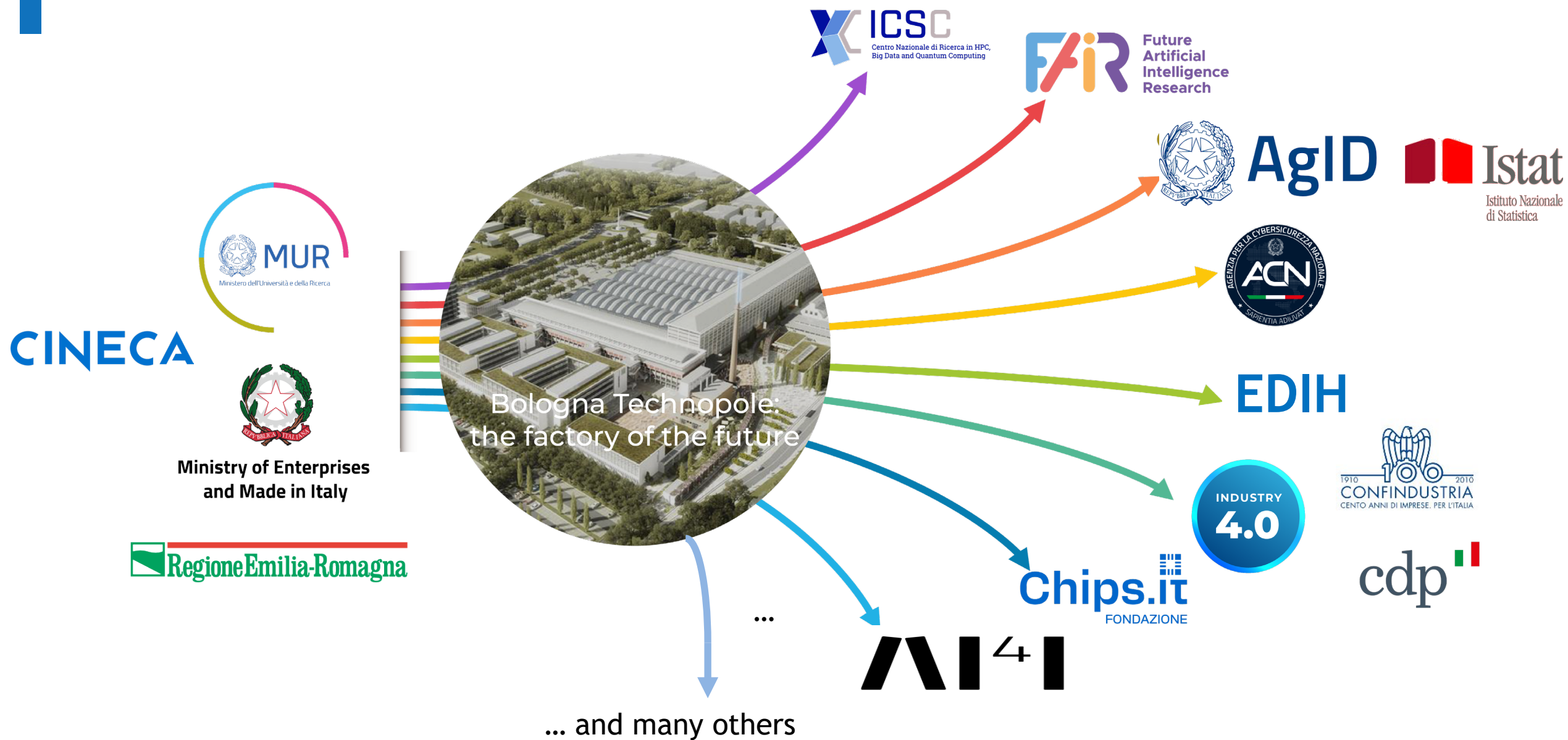
52
PARTNERS



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



Driver #5: National vision for HPC, Big Data, AI, QC CINECA





Infrastructures



Economic mobilization in millions of Euros

THE MAIN ACTIONS

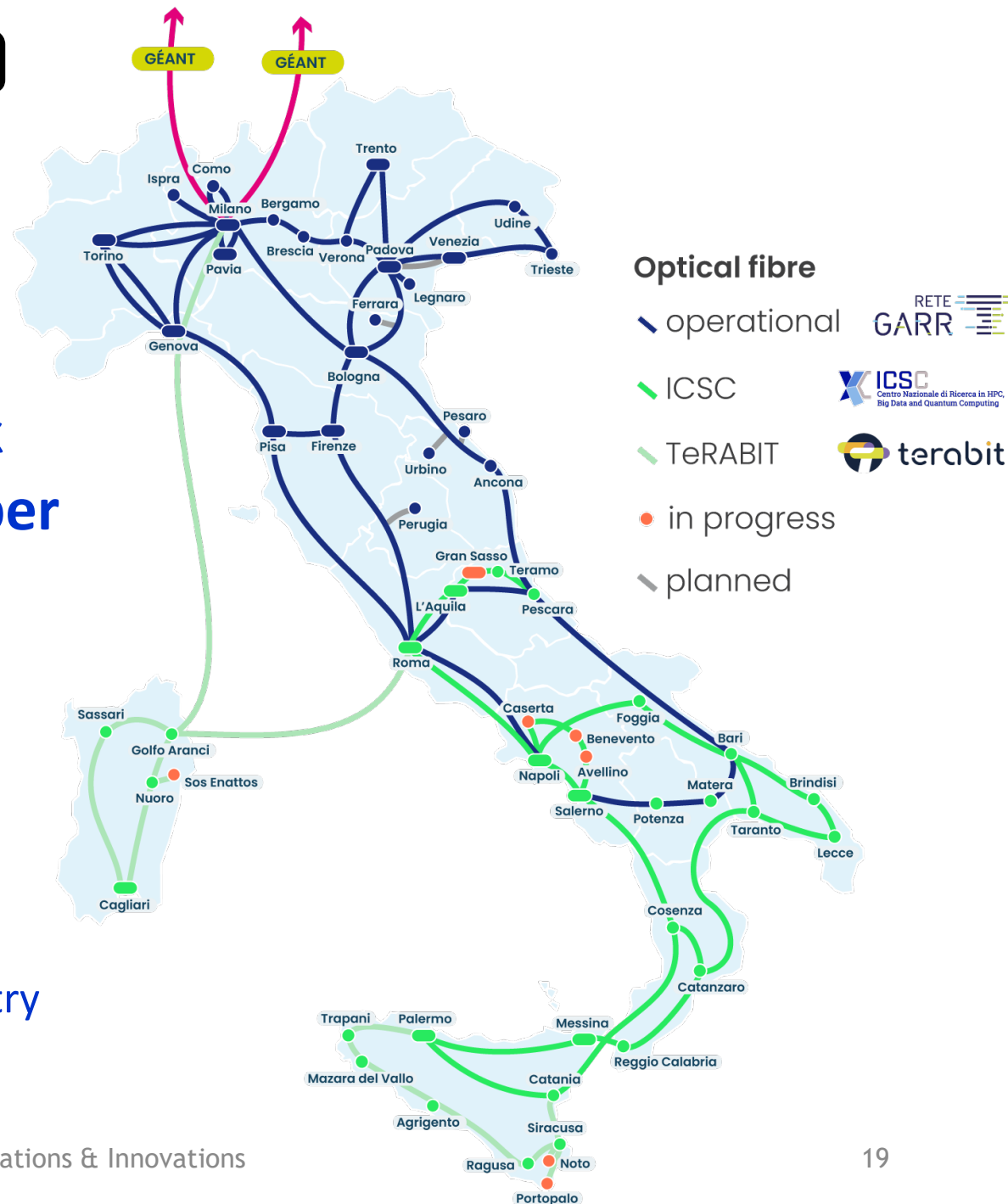


GARR-T PNRR projects (2023-2025)



Evolution of the national research network towards a bandwidth capacity of terabits per second

- Reach new areas: Sardinia and Abruzzo
- Upgrade and integrate network in the South of Italy
- Scale-up performance for HPC
- GARR-T can reach the goal to become a fully unified and pervasive network for R&E community in the whole country





Upgrade of INFN computing centres

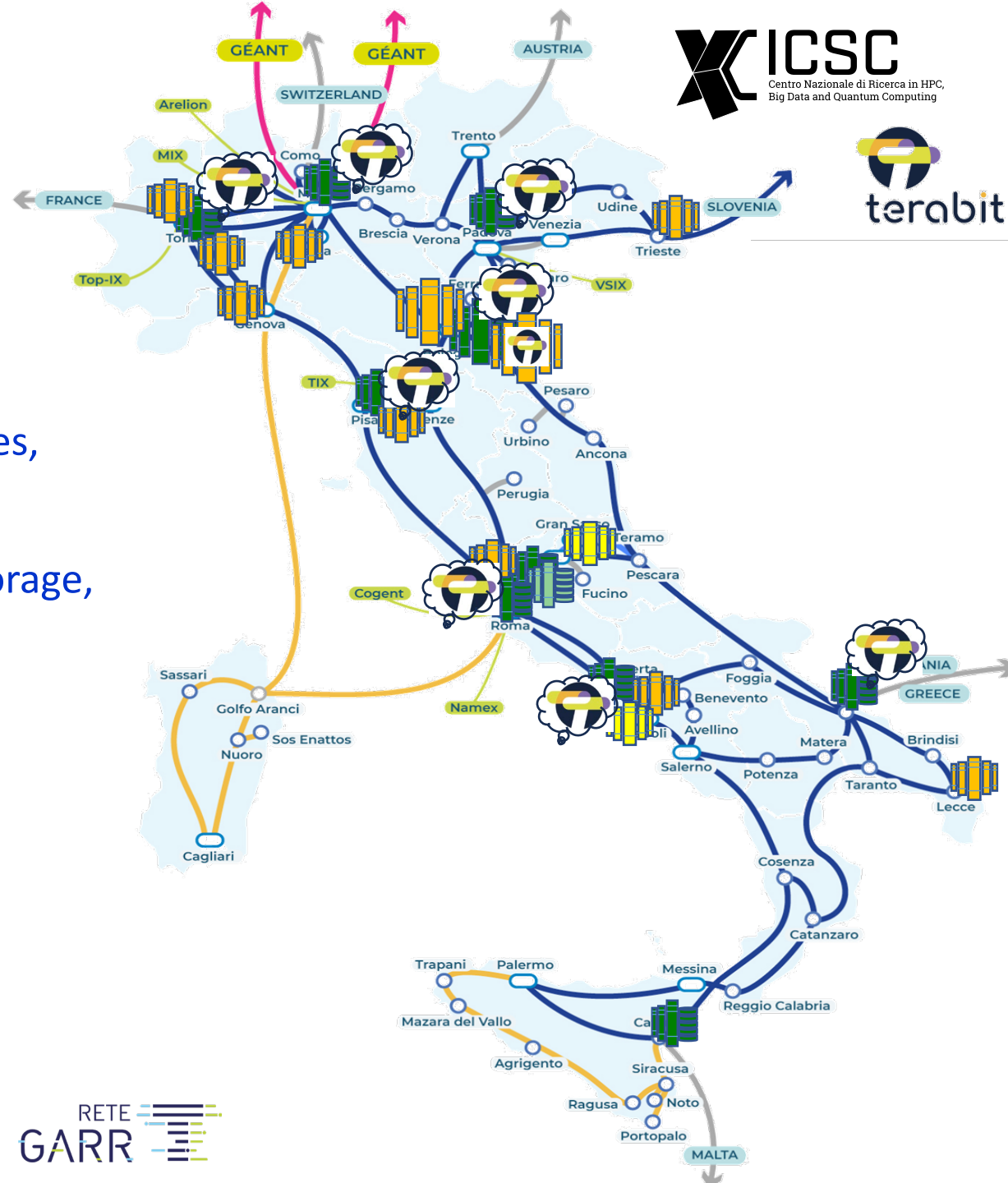
Expansion and modernization of data centres (spaces, power, cooling)

Bari, Frascati, Napoli, Legnaro

Resource acquisition: network, CPU, GPU, FPGA, storage, tape (also at Tier-1)

About 80K core of federated configuration

In excess of 200 Petabyte of storage capacity





- Bologna Tecnopolo Data Center
- Tier0: **LEONARDO + LISA**
- Tier1 **MARCOPOLO**: CNR / INAF / AIM
- Tier1 cloud: **GAIA**
- Tier1 **EuroHPC Industrial Grade**
- QC NA **Pasqal**
- QC Superconducting **IQM**

Napoli San Giovanni a T. Data Center
NAPOLI1: CNR / ACN

Data Center Uni Palermo
Tier2: University of Palermo

Towards AI Factory

CINECA

TECNOPOLO BOLOGNA

MARCO POLO

10 Pflops
FP64
30 Pbyte
HPC System

GAIA

130K core
160 GPU
Cloud system

GARDA- B(ologna)

50 Pbyte flash
memory
DataLake

LEONARDO

250 Pflops FP64 -14K GPU
100 Pbyte
HPC System

LISA AI

5 Exaflops FP8
AI System

QC

PASQAL
150 Qbit
Neutral
atoms

QC

IQM
54 Qbit
Super
conducting

IT4LIA AI FACTORY

>50 Exaflops FP8
>100 Pbyte
HPC AI optimized

Industry
Grade
Cloud
partition

Industry
Grade
AI
partition

CASALECCHIO

PITAGORA
30 +15 Pflops FP64
20 Pbyte
HPC System

NAPOLI

GARDA-N(apoli)
50 Pbyte flash
memory
DataLake

MEGARIDE
40kcore
100 GPU
Cloud
partition

MEGARIDE
3 Exaflops
FP8
AI partition

QC
PARTENOPE
150 Qbit
Super
conducting

PPP

EuroHPC /
Private
partner
AI GIGA
FACTORY

Production startup Scheduling

Technical specificatios	Tender publication	Contract	Implementation	Preproduction	Production		
						LEONARDO	2023
						PITAGORA	2024
					Nov. 2025	GAIA Cloud	
				Nov. 2025	Dec. 2025	MEGARIDE	2025
				Nov. 2025	Dec. 2025	QC IQM	
			Oct. 2025	Dec. 2025	Feb. 2026	MARCOPOLO	
			Oct. 2025	Dec. 2025	Feb. 2026	LISA	
			Dec. 2025	Apr.. 2025	June. 2026	QC PASCAL	2026
	Sept. 2025	Jan. 2026	June 2026	Sept. 2026	Nov. 2026	AI FACTORY	
Oct. 2025	Nov. 2025	Feb. 2026	July 2026	Oct. 2026	Dec. 2026	INNOVATE	

Cloud Sw stack

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The **cineca-ai** modules: ready-to-use environments always up to date, optimised for the GPUs of LEONARDO and prepared by CINECA experts.

<https://gitlab.hpc.cineca.it/cineca-ai/cineca-ai>



Wiki Cineca-AI

CINECA-AI versions

- CINECA-AI 2.0.2
- CINECA-AI 3.0.0
- CINECA-AI 3.0.1
- CINECA-AI 4.0.0
- CINECA-AI 4.1.0
- CINECA-AI 4.1.1
- CINECA-AI 4.3.0

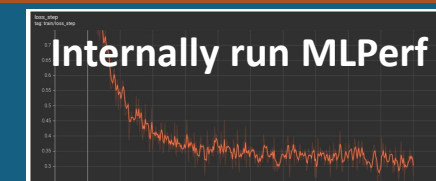
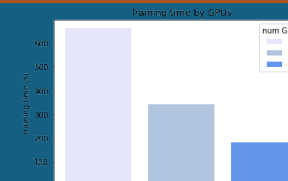
CINECA-AI 4.3.0

Package	Version
absl-py	2.1.0
accelerate	0.27.0
aiohttp	3.9.3
aiosignal	1.3.1
alabaster	0.7.16
annotated-types	0.6.0
anyio	4.3.0
apex	0.1
appdirs	1.4.4
argon2-cffi	23.1.0
argon2-cffi-bindings	21.2.0
arrow	1.3.0
asgiref	3.8.1
asttokens	2.4.1

Transfer hundreds of TBs of data!

Datamovers: dedicated nodes on each HPC cluster that are designed for transferring data FROM/TO a cluster. Available transfer protocols: **rsync, scp, sftp, wget, curl.**

Our experience on the infrastructure!



Workflow and Data Management in progress



CINECA AI Academy

HPC Courses Catalogue

23
HPC and general computing courses

15
AI, machine and deep learning focused courses

14
HPC, coding and domain-specific schools

Application software, math libraries, development tools...

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Applications



⋮



78

Compilers



⋮



9

Libraries

2decomp fft

⋮



72

Tools



⋮

VTune



48

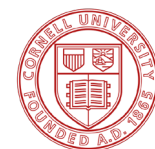
Quantum Simulators

Cirq



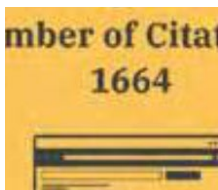
⋮

Quantum-suite



9

Production (2H24 - 1H25)



All Users	16.890
HPC Users	13.419
Technical Users	747
Personal Users	13.054
Active personal Users	6.925
Closed personal Users	5.518

- ✓ **H-Index 16**
- ✓ **1084 results**
- ✓ **2391 citations**
- ✓ **2.21 average citations per items**



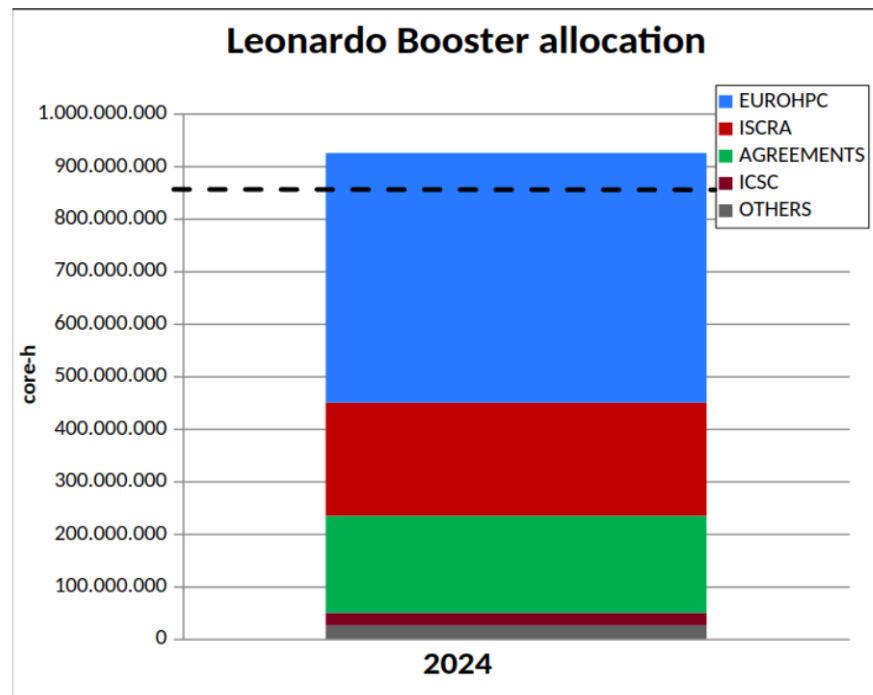


Production (2H24 - 1H25)

Production (2024)

In core hours

Classe progetti	Leonardo Booster	Leonardo DCGP	Galileo100	Marconi	Totale	%
AGREEMENTS	184.791.477	29.080.070	17.849.841	8.670.583	240.391.972	19,3 %
EUROFUSION	23.528.448	-	-	156.231.757	179.760.205	14,4 %
EUROHPC	475.218.591	14.637.707	-	-	489.856.298	39,3 %
ICSC	23.466.207	5.654.850	-	-	29.121.057	2,3 %
ISCRA	215.248.997	8.210.563	34.632.859	-	258.092.419	20,7 %
OTHERS	26.289.688	550.299	3.648.658	215.860	30.704.504	2,5 %
OTHERS RESERVED	-	-	17.484.171	-	17.484.171	1,4 %
TOTAL	948.543.408	58.133.490	75.736.862	194.113.067	1.245.410.627	100,0 %



Number of projects

Classe progetti	Leonardo Booster	Leonardo DCGP	Galileo100	Marconi	Totale
AGREEMENTS	226	59	281	67	681
EUROHPC	268	51	-	-	319
ICSC	64	59	-	-	139
ISCRA	900	164	764	-	1.888
OTHERS	161	61	103	18	434
TOTAL	1.619	394	1.148	67	3.461

HPC Activities and services



Excellence in Science

Open Access Peer review
EuroHPC
ICSC - ISCRA

Research & Development

Regional, National and EU funded projects

Innovation & technology transfer

Added value service and support for innovation



Excellence in science

Excellence in science



The background is a solid blue color. On the left side, there is a series of bright blue light streaks and dots that appear to be moving towards the center, creating a sense of depth and motion. The streaks are composed of many small dots, and the overall effect is reminiscent of a digital or technological environment.

Research and Development

Next GENEU – PNRR Projects

ICSC - National Centre for HPC, Big Data and Quantum Computing

Ministry of Culture – Digital Library

Consorzio BioDiversità - National Biodiversity Future Centre

GRINS - Growing Resilient, INclusive and Sustainable

TERABIT - Terabit Network for Research and Academic Big data in Italy

D3-4-Health - Digital Driven Diagnostics, Prognostics and Therapeutics for sustainable Health care

ECOSISTER - Ecosystem for Sustainable Transition in Emilia-Romagna

CNR / E-BRAINS – European Human Brain

Actual EU Horizon Europe and EuroHPC RIA

AARC TREE n. 101131237	EUROQHPC-I
AI-BOOST n. 101135737	EUSAiR
BIREX ++ CUP B37H24001040006 servizi	EXCELLERAT P2 n. 101092621
BIREX++ CUP B37H24001020004 animazione polo innova	EXPECT n. 101137656
Blue-Cloud 2026 n. 101094227	FAIR-EASE n. 101058785
CASTIEL 2 n. 101102047	Ffplus n. 101163317
CHEESE 2P n. 101093038	GANANA
CTE COBO CUP F39I22001840004	Gemello Digitale
DAMAS - animazione polo innovazione	Geo-INQUIRE n. 101058518
DAMAS - servizi	GRAPH-MASSIVIZER n. 101093202
DARE-SGA1	HANAMI n. 101136269
DATAMITE n. 101092989	HPCQS n. 101018180
DT-GEO n. 101058129	HPCTRAIN n.101136896
EBRAINS 2.0 n. 101147319	MaX n. 101093374
EDITO-Model Lab n. 101093293	MINERVA
EO4EU n. 101060784	NET n. 101162609
EPI-SGA2 n. 101036168	NET4EXA
EPICURE n. 101139786	OpenEuroLLM
Er2Digit CUP B37H22007070001 servizi	OptimESM n. 101081193
ER2Digit n.10108366	RESILIENCE PPP n.101079792
EUMaster4HPC n. 101051997	Sci-Fi-Turbo n. 101138080
EUPEX n. 101033975	SEANERGY
EUROCC 2 n. 101101903	SPACE n. 101093441
EUROFUSION (Marconi)	SPECTRUM n. 101131550
EUROFUSION (Pitagora)	TELETHON GSP23001D - progetto STOP

About 11 Ml Euro of
granted budget per year

Actually about 50
running projects

About 200K Euro of
granted budget per
project



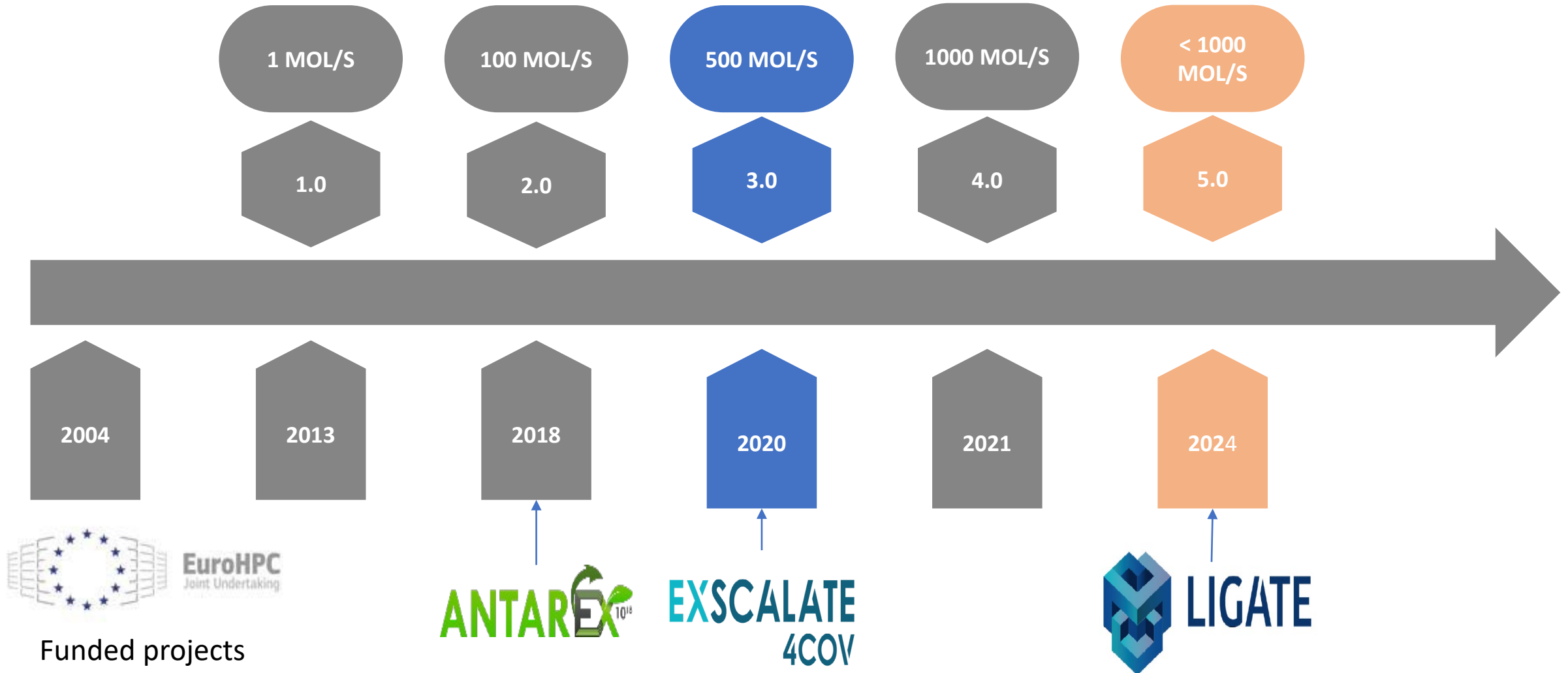
Innovation

Current collaborations with Industry and SME

- LEONARDO S.p.A.
- FONDAZIONE CIMA - Centro Internazionale in Monitoraggio Ambientale
- AGENZIA REGIONALE PER LA PROTEZIONE DELL'AMBIENTE DELL'EMILIA ROMAGNA
- ARPA PIEMONTE
- AZIMUT BENETTI SPA
- RAI - RADIOTELEVISIONE ITALIANA SPA
- ALTRAN ITALIA S.P.A.
- ELICA S.P.A.
- UNIPOLSAI ASSICURAZIONI S.P.A.
- ENI S.P.A
- OLSA S.p.A.
- AMET S.r.l.
- DOMPE' FARMACEUTICI S.P.A.
- Ferretti S.p.A.
- NEOS S.r.l.
- DAINESE S.p.A.
- Wam Industriale S.p.A.
- REMOSA S.r.l.
- ARES DESIGN MODENA SRL
- MSX Technology SRL
- TERA AUTOMATION S.r.l.
- RED (Red Engineering+Development) SpA
- Cinémathèque royale de Belgique
- OPTIMAD Engineering Srl
- Aresys (ESA)
- AVIO AEREO
- AZIENDA USL ROMA 3
- AZIENDA PROVINCIALE PER I SERVIZI SANITARI - APSS
- Azienda Ospedaliero-Universitaria Careggi 2021-23

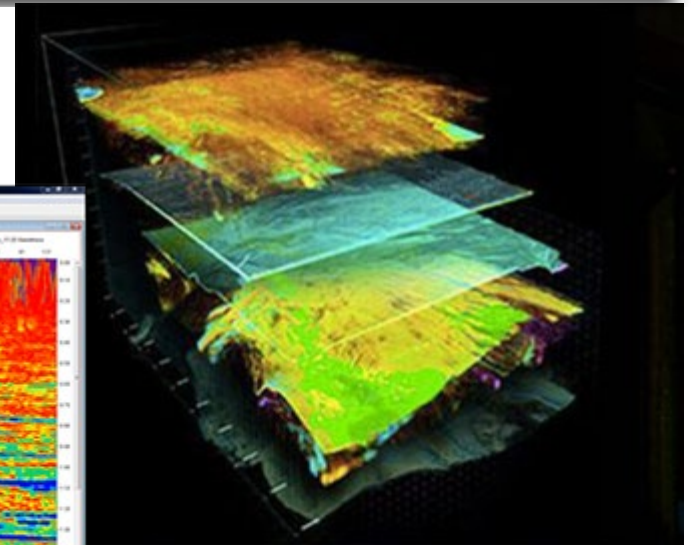
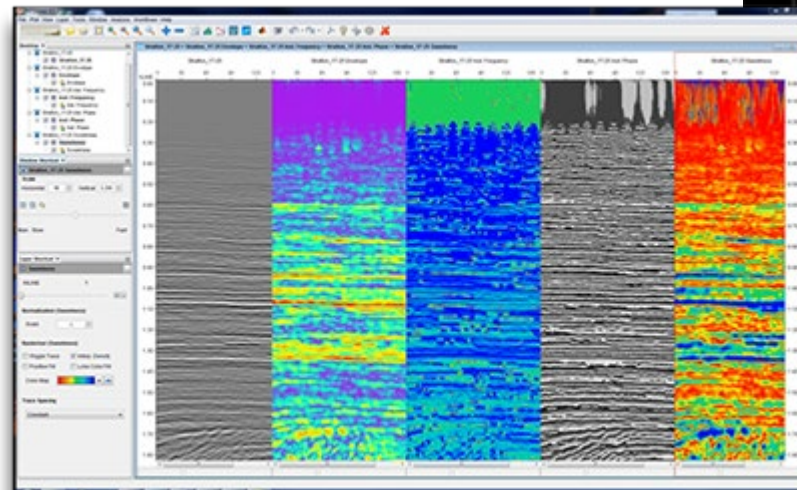
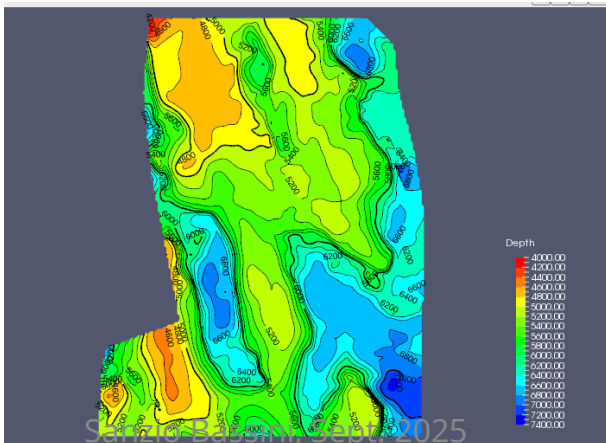
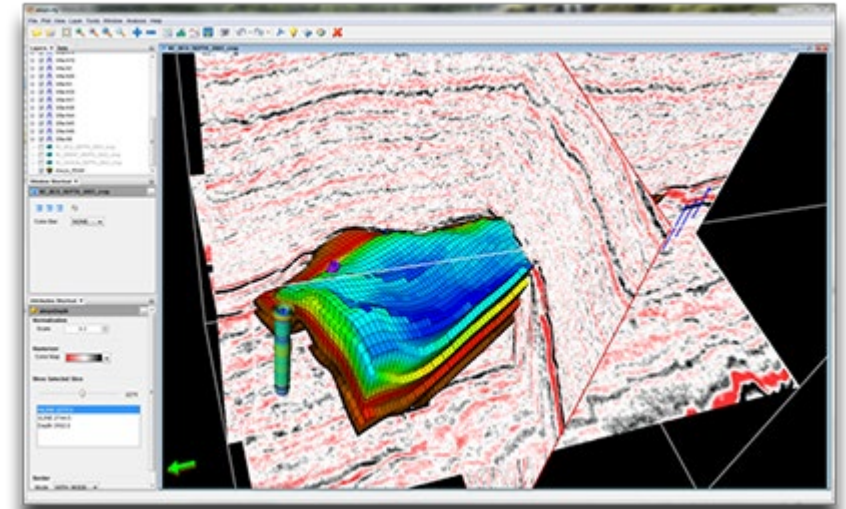
AI and HPC boost CADD

Computer Aided Drug Discovery Roadmap

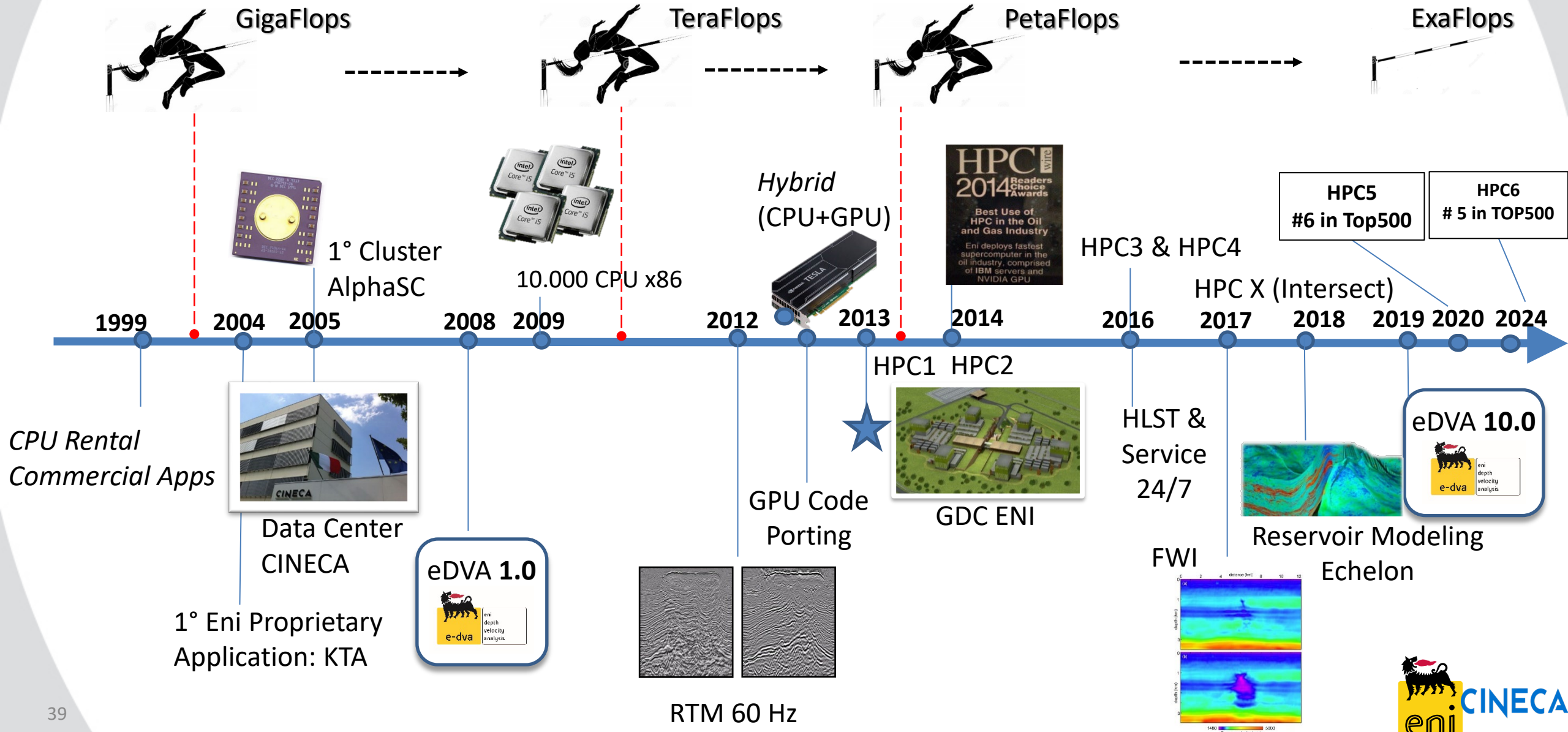


Collaboration and framework agreement with Eni

- Exploration:
 - Seismic Processing
 - Reservoir Geology
- Oilfields
- Research and Development
 - Material Science
 - Nuclear Fusion
 - Call4Innovators



Major outcomes of the Eni CINECA framework agreement





Next



Italy for Artificial Intelligence



What is IT4LIA AI Factory?

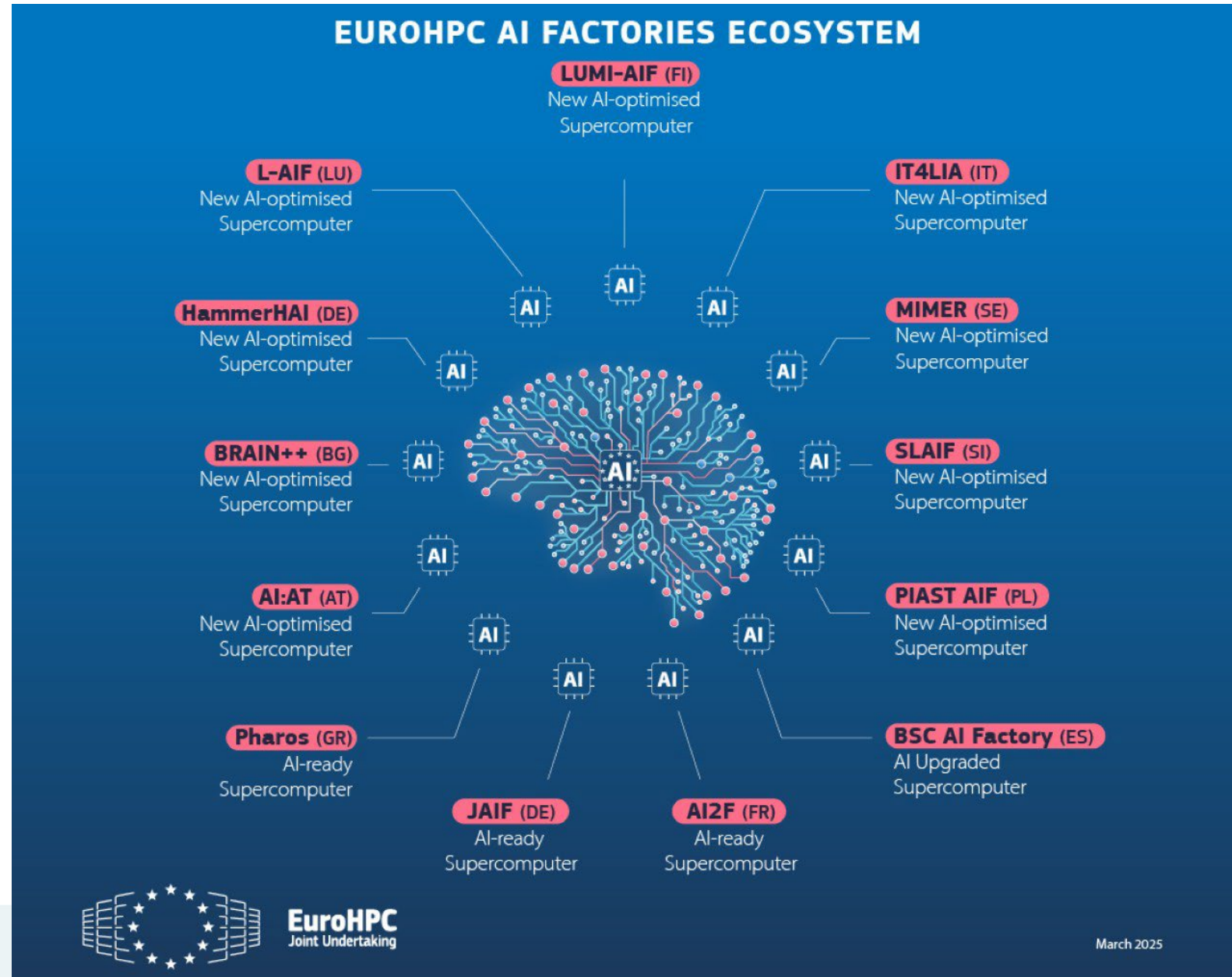
Computing resources and high level support for advanced AI

The Italian AI Factory, IT4LIA, is a strategic initiative aimed at transforming the national and European AI landscape through advanced infrastructure and a comprehensive portfolio of services available to researchers, public administrations, businesses, and startups.

The AI Factory uses a full range of computing resources to meet all AI workload requirements, including data preparation, processing, model training, and inference services.

The European AI Factories system

IT4LIA is part of the European network of "AI Factories"

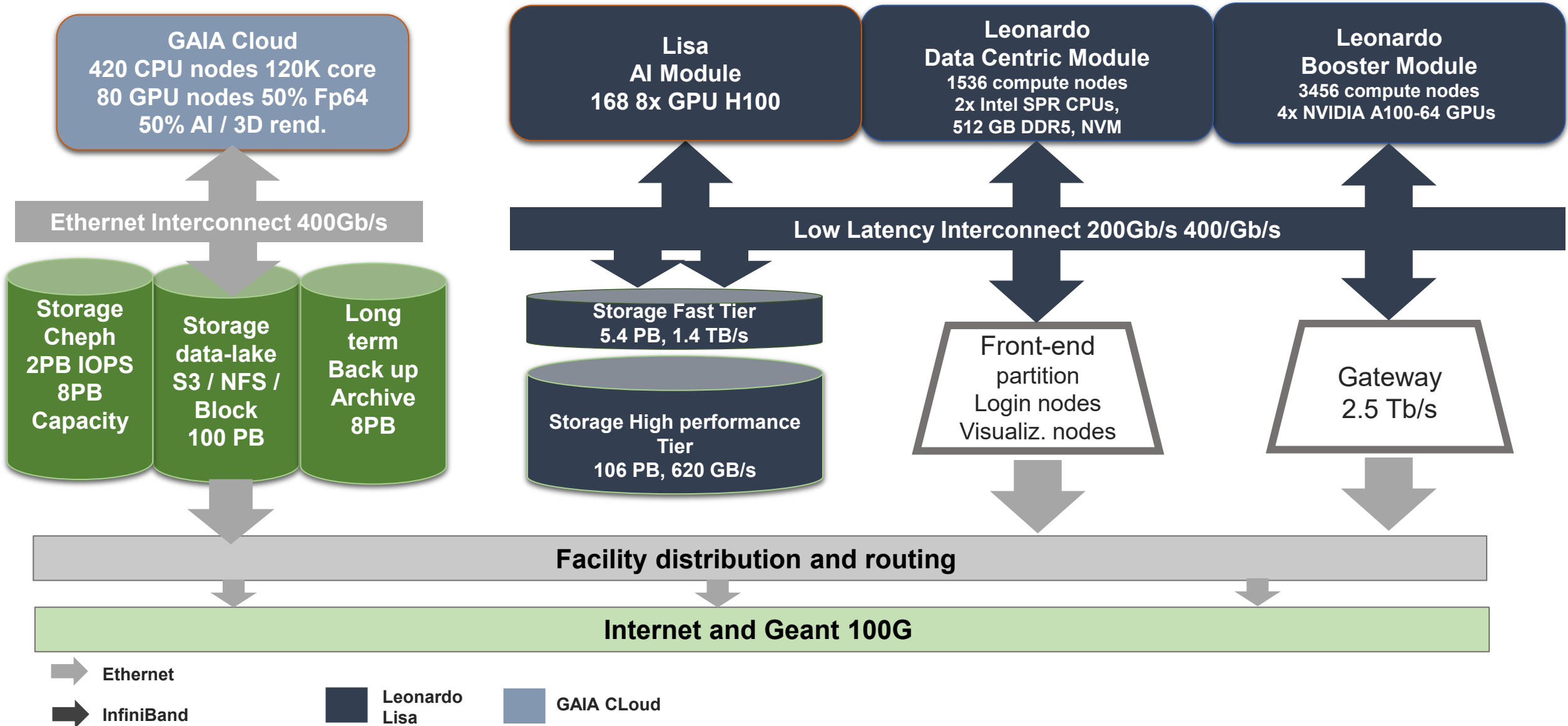


The computing infrastructure

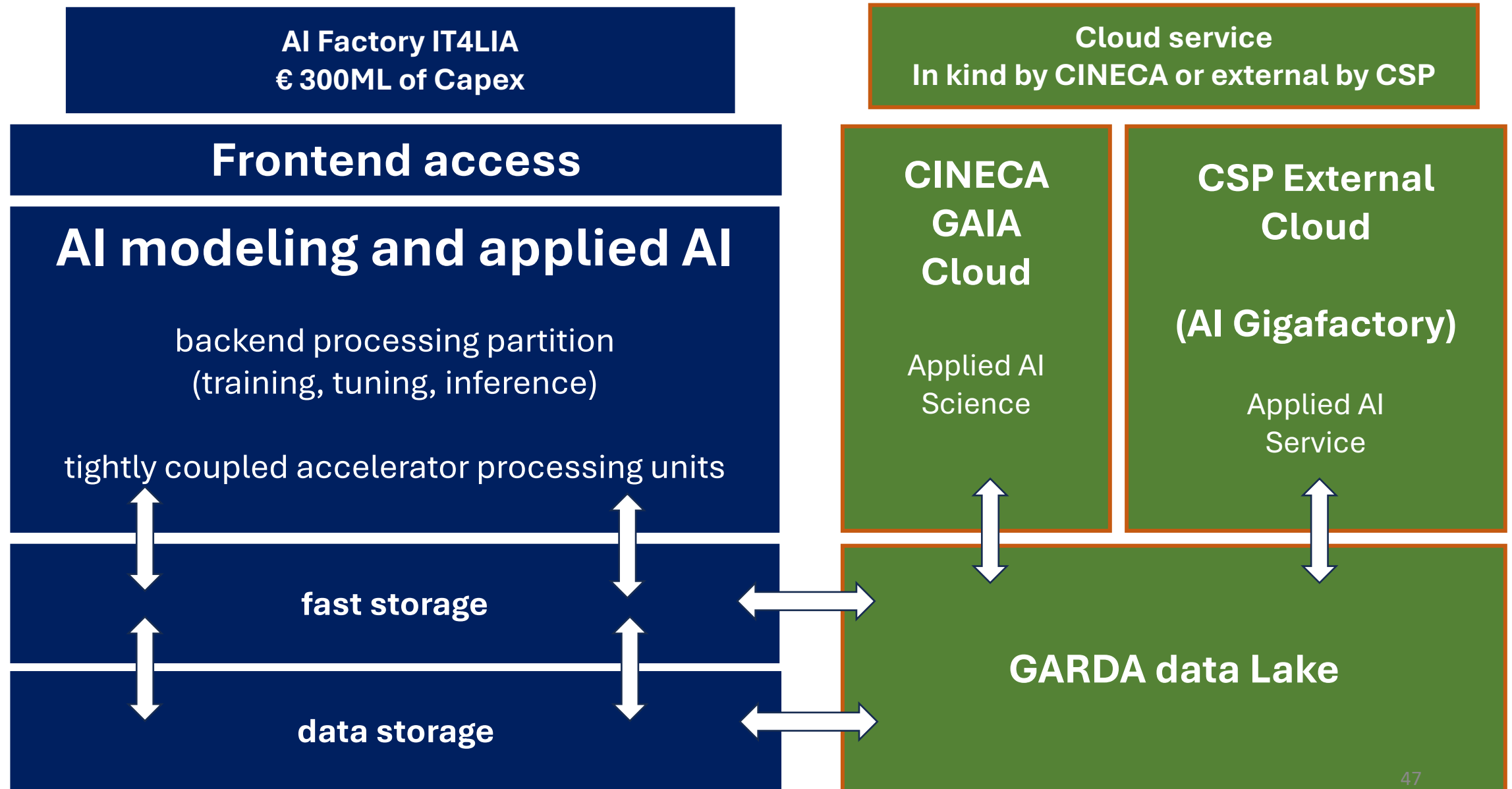
THE CINECA HPC / AI / Cloud INFRASTRUCTURE

LEONARDO + LISA + GAIA CLOUD

CINECA

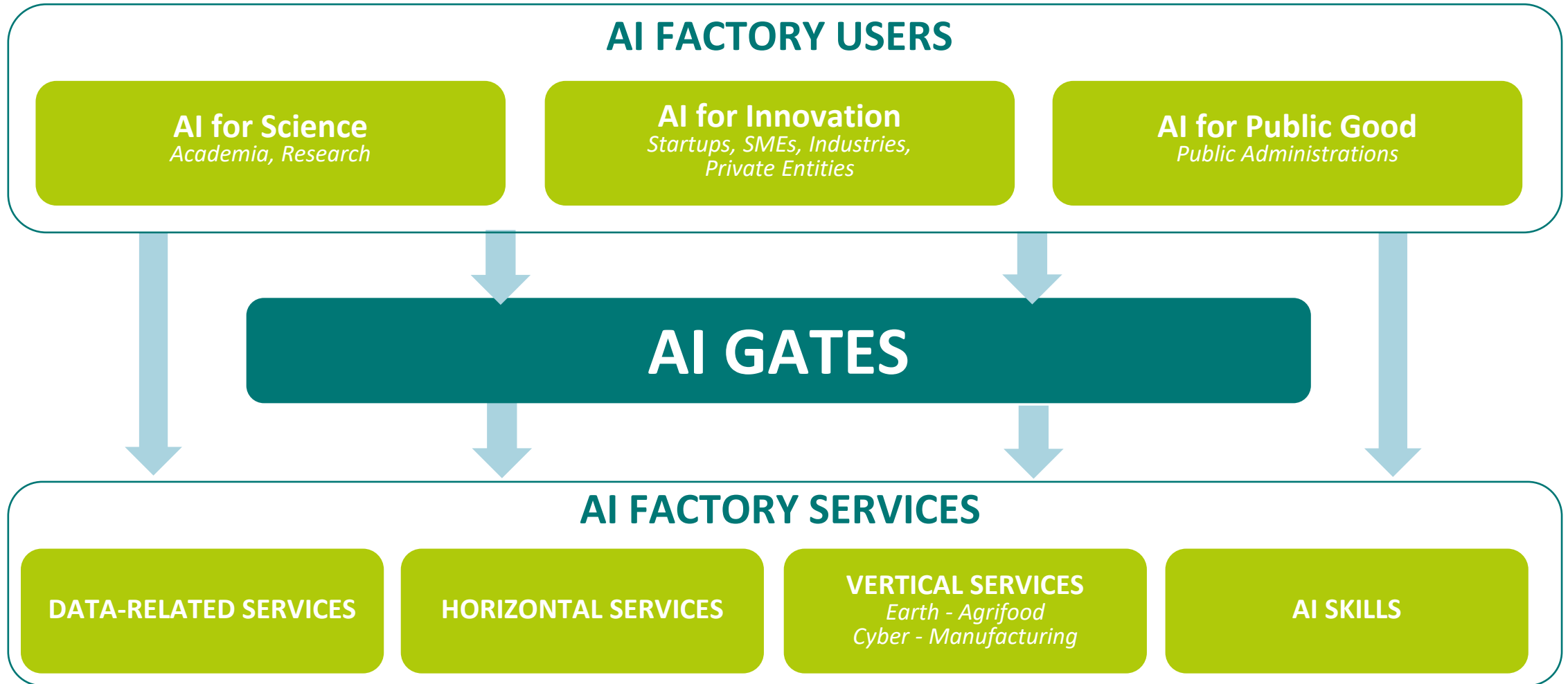


The IT4LIA AI Factory architectural overview



The services

Solutions for business, research and society



ACCESS TO AI FACTORY COMPUTE (TODAY...)

CINECA



- **Class B (Up to 250,000 GPU hours on Leonardo Booster – 12 months)**
- **Class C (Up to 10,000 GPU hours on Leonardo Booster – 9 months)**
- **Benchmark Access** → 3'500 node hours (on BOOSTER, 3 months)
- **Development Access** → 4'500 node hours (on BOOSTER, 1 year)
- **Regular Access** → 52'000-220'500 node hours (on BOOSTER, 1 year)
- **AI and Data-Intensive Applications** → 50'000 node hours (1 year)
- **Extreme Scale** → min 245'000 node hours (on BOOSTER, 1 year)

ACCESS TO AI FACTORY COMPUTE (...AND TOMORROW)



CINECA



- Class B (Up to 250,000 GPU hours on Leonardo Booster – 12 months)
- Class C (Up to 10,000 GPU hours on Leonardo Booster – 9 months)
- **Try projects accessible via easy form to request resources. Time to allocation: 2-5 days**
- **30 POCs yearly (Excellence & Technical Evaluation) --> Access to compute + expert support for development**
- **FIXED ALLOCATION FOR SMEs & startups**
- **Benchmark Access** → 3'500 node hours (on BOOSTER, 3 months)
- **Development Access** → 4'500 node hours (on BOOSTER, 1 year)
- **Regular Access** → 52'000-220'500 node hours (on BOOSTER, 1 year)
- **AI and Data-Intensive Applications** → 50'000 node hours (1 year)
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Contatti



it4lia-aifactory.eu



[IT4LIA AI Factory](#)



[info-it4lia@Cineca.it](mailto:info-it4lia@ Cineca.it)



[support-it4lia@Cineca.it](mailto:support-it4lia@ Cineca.it)



[training-it4lia@Cineca.it](mailto:training-it4lia@ Cineca.it)

Thank You

