The European High Performance Computing Joint Undertaking

LEADING THE WAY IN EUROPEAN SUPERCOMPUTING

Klara Mestrovic | 8 November 2023 | Dan Hrvatskog centra kompetencija za HPC

WHO ARE WE?

- An EU body & a legal and funding entity
- Created in 2018 and autonomous since September 2020
- Based in Luxembourg
- A team of 35 employees, still in the process of recruiting additional employees

OUR MISSION

The EuroHPC JU pools together the resources of its members to:

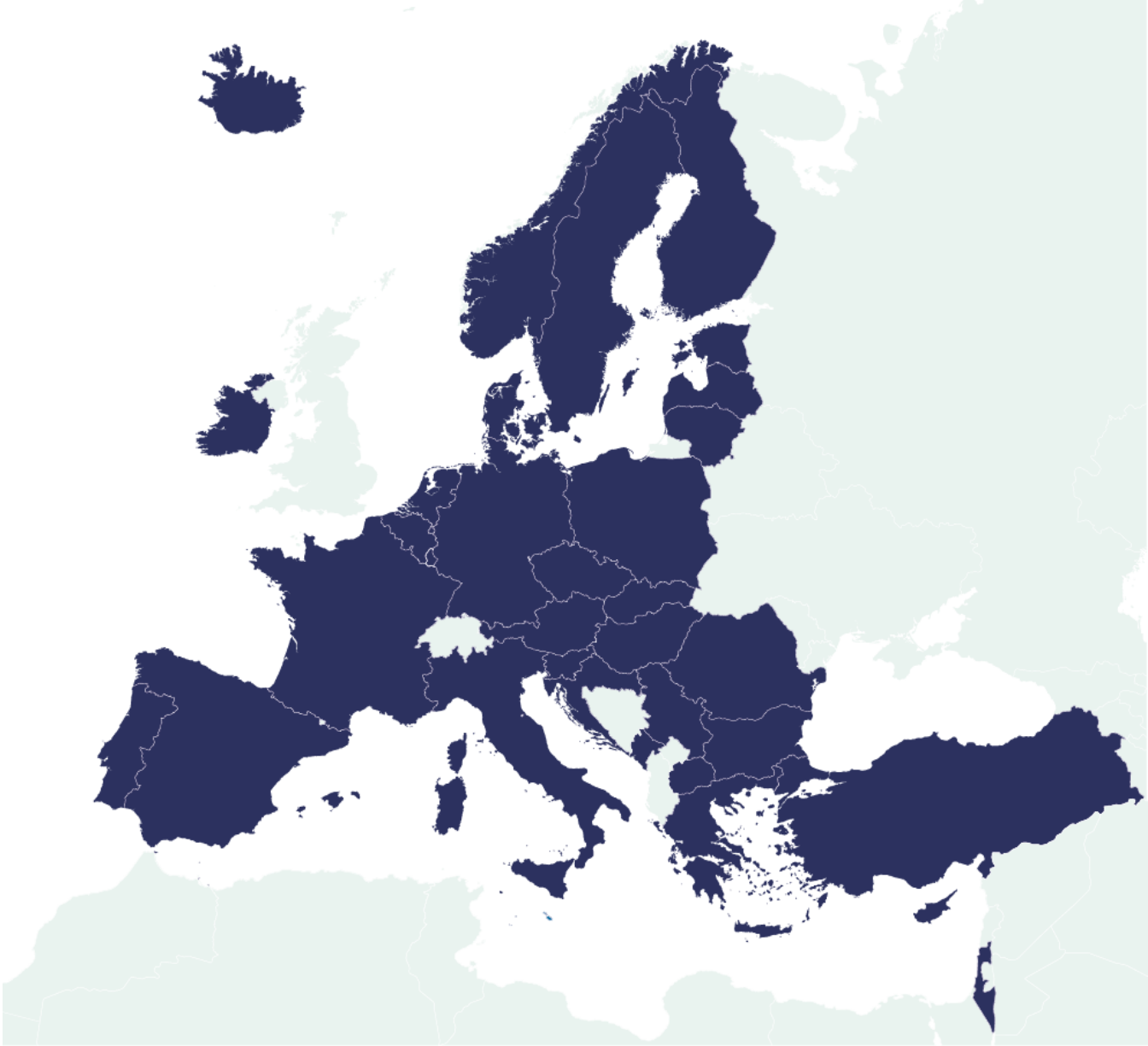
- Develop, deploy, extend & maintain a world-leading supercomputing, quantum computing, service & data infrastructure ecosystem in Europe
- Support the development of innovative supercomputing components, technologies, knowledge & applications to underpin a competitive European supply chain
- Widen the use of HPC & quantum infrastructures to a large number of public & private users wherever they are located in Europe and supporting the development of key HPC skills for European science and industry

OUR MEMBERS

- 34 participating countries
- The European Union (represented by the European Commission)
- 3 private partners – ETP4HPC, BDVA & QuIC

Each of our members is represented in the EuroHPC JU's Governing Board

The Governing Board also takes advice from the EuroHPC **Industrial and Scientific Advisory Board** (INFRAG & RIAG)



BDV BIG DATA VALUE ASSOCIATION

QUIC European Quantum Industry Consortium

ETP 4 HPC EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

LEVEL AND SOURCES OF EU FUNDING 2021-2027

Digital Europe Programme

1.98B Eur

- **Infrastructure**
- **Federation of supercomputing services**
- **Widening usage and skills**

Horizon Europe Programme

900M Eur

- **Technology**
- **Application**
- **International Cooperation**

Connecting Europe Facility

200M Eur

- **Hyperconnectivity**
- **Data connectivity**

THE EUROHPC SUPERCOMPUTERS

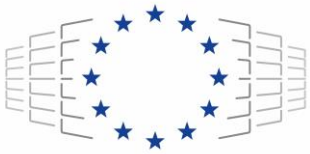
7 operational systems, all ranking among the world's most powerful supercomputers:

- Vega in Slovenia
- Karolina in Czech Republic
- Discoverer in Bulgaria
- MeluXina in Luxembourg
- LUMI in Finland
- Leonardo in Italy
- Deucalion in Portugal

3 systems underway:

- MareNostrum5, a pre-exascale system in Spain
- Jupiter, the 1st European Exascale supercomputer in Germany
- Daedalus, a mid-range system in Greece

GLOBAL STANDING OF EUROHPC SUPERCOMPUTERS



JUNE 2023	TOP500	Green500
LUMI	#3	#7
LEONARDO	#4	#15
MELUXINA	#57	#26
KAROLINA	#95	#24
DISCOVERER	#134	#247
VEGA	#166	#266

* As of the June 2023 Edition of the TOP500 and Green500 lists

- Located at and operated by the **Jülich Supercomputing Centre** and supplied by a consortium composed of Eviden and ParTec AG
- The first European supercomputer capable of **1 exaflop,** or one billion billion (10^{18}) calculations per second
- A **modular supercomputing architecture**, comprised of a Booster Module (GPU accelerated) and a Cluster Module (general-purpose, high memory bandwidth)
- The Cluster Module will utilize the **Rhea processor,** developed in the framework of the European Processor Initiative
- Designed to tackle the **most demanding simulations and compute-intensive AI applications in science and industry**, including:

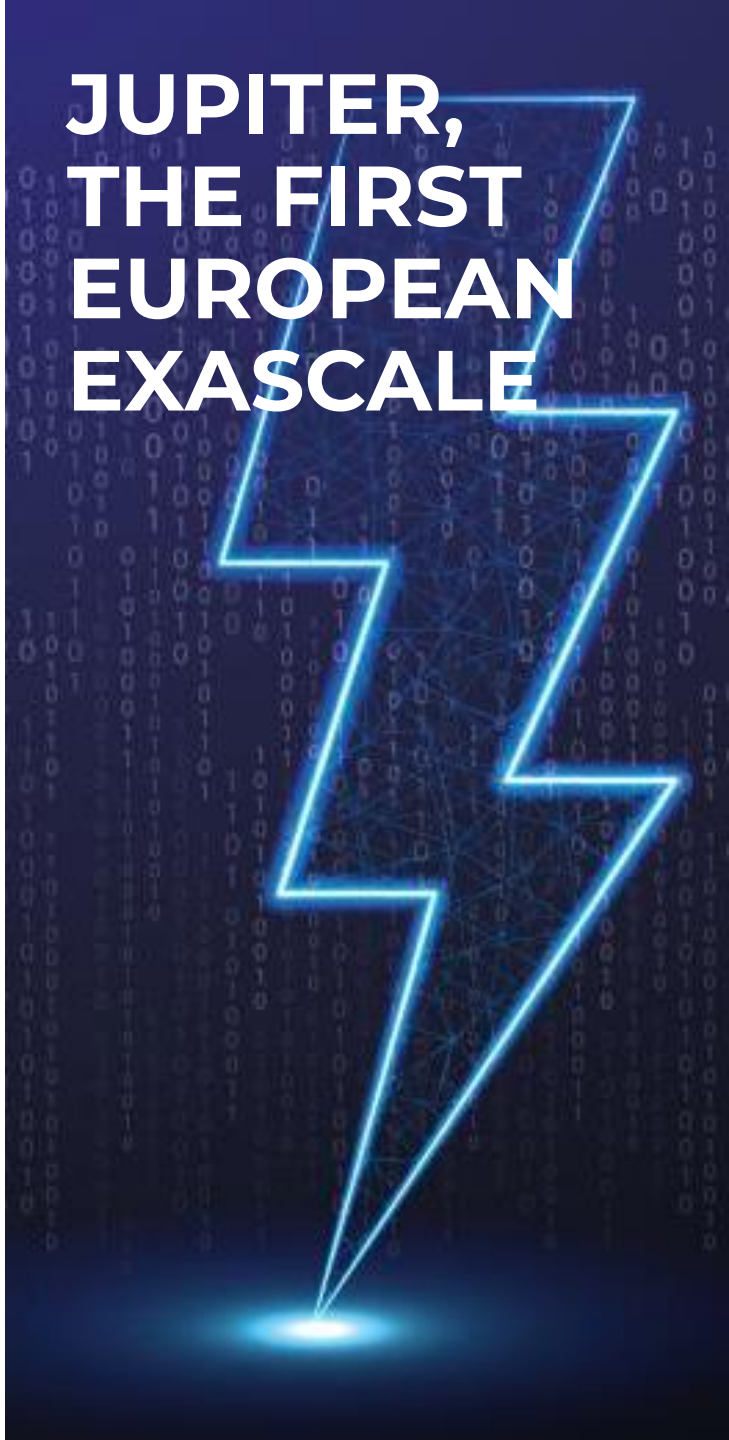
large neural networks

simulations for developing functional materials

digital twins of the human heart or brain for medical purposes

validating quantum computers

high-resolution simulations of climate



EUROHPC QUANTUM COMPUTERS

- **Six Hosting Entities**

In June 2023, the EuroHPC JU signed hosting agreements with six sites across Europe to host & operate EuroHPC quantum computers.

- **EuroQCS-Poland**

A call for tender has now been launched for the installation of EuroQCS-Poland.

  - Located at Poznan Supercomputing and Networking Center (PSNC)
  - A digital, gate-based quantum computer based on trapped-ions and offering 20-plus physical qubits.

- Further procurements to be launched soon

ACCESS TO THE EUROHPC SUPERCOMPUTERS

WHO IS ELIGIBLE?

- Academic and research institutions (public and private)
- Public sector organizations
- Industrial enterprises and SMEs

- **Principal Investigators and Team Members affiliated with institutions that are associated to Horizon 2020**
  → Open to all fields of research

WHICH TYPES OF ACCESS EXIST?

- **Extreme Scale Access**
- **Regular Access**
- **Benchmark Access**
- **Development Access**
- **Special Access**

WHAT ARE THE CONDITIONS FOR ACCESS?

Access is free of charge. Participation conditions depend on the specific access call that a research group has applied to.
In general users of EuroHPC systems commit to:

- acknowledge the use of the resources in their related publications
- contribute to dissemination events
- produce and submit a report after completion of a resource allocation

More information on EuroHPC access calls available at: Access to Our Supercomputers (europa.eu)

ACCESS TO THE EUROHPC SUPERCOMPUTERS - CUT-OFFS TIMELINE

REGULAR ACCESS:

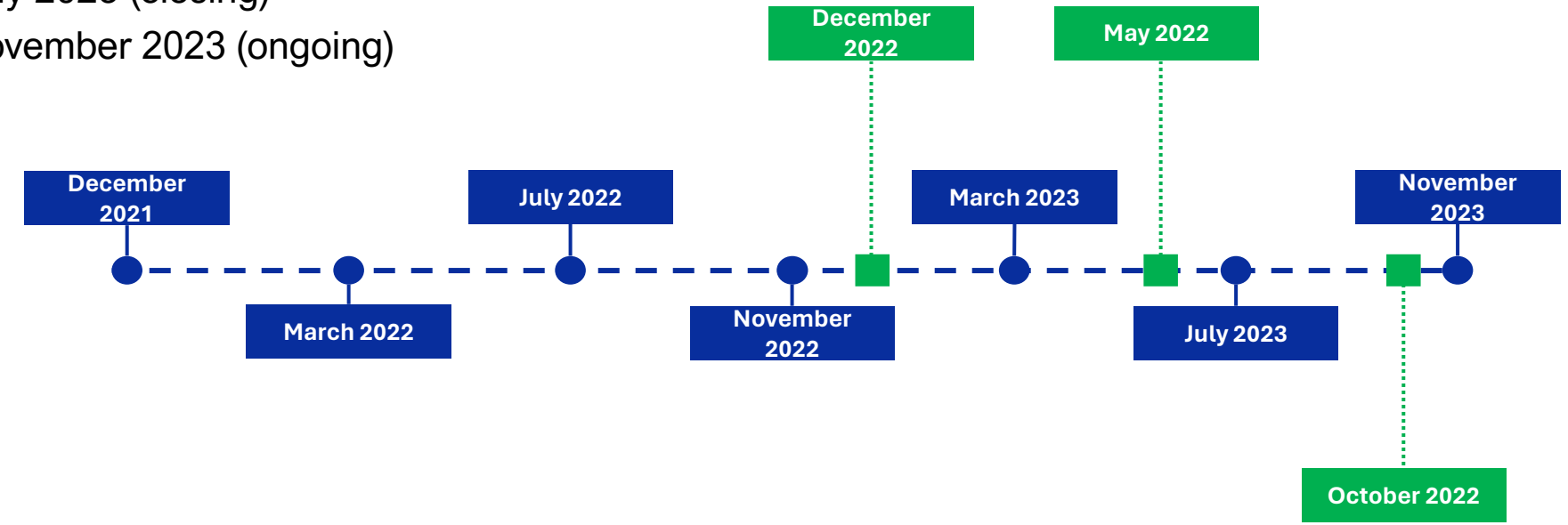
- December 2021
- March 2022
- July 2022
- November 2022
- March 2023
- July 2023 (closing)
- November 2023 (ongoing)

EXTREME SCALE ACCESS:

- December 2022
- May 2023
- October 2023 (ongoing)

BENCHMARK AND DEVELOPMENT ACCESS:

- Monthly cut-offs (12 per year)



ACCESS TO EUROHPC SUPERCOMPUTERS IN NUMBERS

REGULAR ACCESS

CORE HOURS AWARDED FOR REGULAR ACCESS

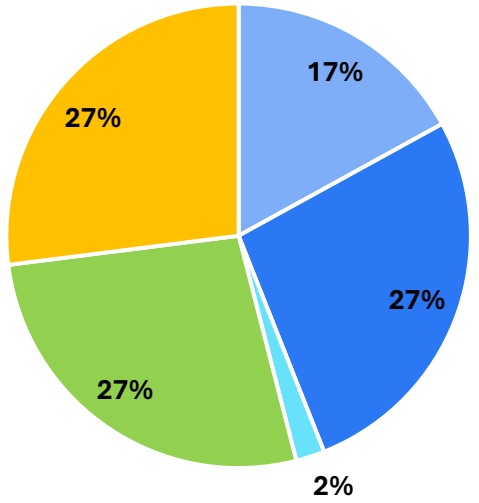
(across all cut-offs, up to March 23)

VEGA	481,117,087
KAROLINA	206,900,667
DISCOVERER CPU	278,031,306
MELUXINA	192,458,296
LUMI-C	765,204,976

Total core hours awarded across all systems:
1,923,712,332

RESEARCH DOMAINS DISTRIBUTION FOR AWARDED PROJECTS

(across all Regular Access cut-offs)



- Biochemistry, Bioinformatics, Life Sciences, Physiology and Medicine
- Chemical Sciences and Materials, Solid State Physics
- Earth System Sciences
- Computational Physics: Universe Sciences, Fundamental Constituents of Matter
- Engineering, Mathematics and Computer Sciences

ACCESS TO EUROHPC SUPERCOMPUTERS IN NUMBERS

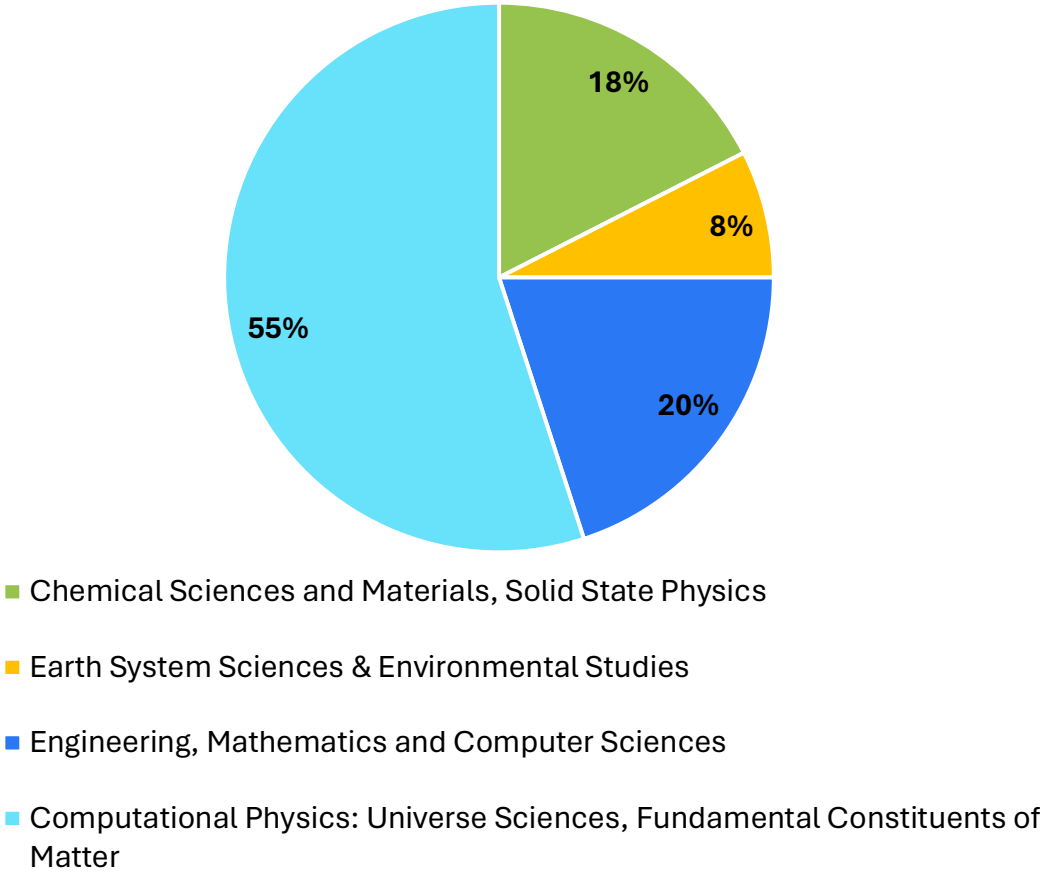
EXTREME SCALE ACCESS

CORE HOURS AWARDED FOR EXTREME SCALE ACCESS
(across all cut-offs)

LEONARDO	344,659,008
LUMI	2,457,391,904
MARENOSTRUM5	83,740,000

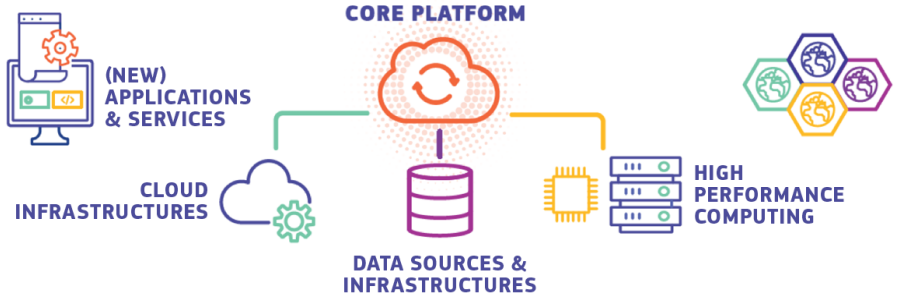
Total core hours awarded across all systems:
2,885,790,912

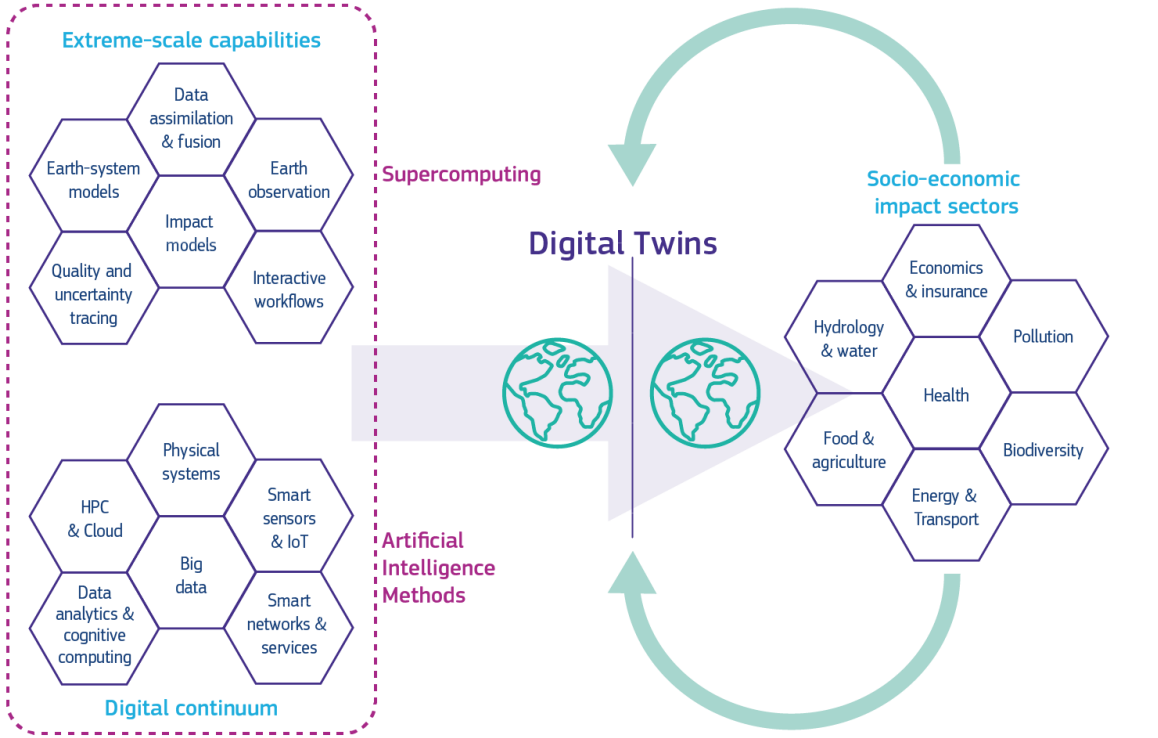
RESEARCH DOMAINS DISTRIBUTION FOR AWARDED PROJECTS
(across all Extreme Scale Access cut-offs)



SPECIAL ACCESS – DESTINATION EARTH

- The EuroHPC JU can grant special access to **strategic European Union initiatives** considered to be **essential** for the public good, or in emergency and crisis management situations
- The Destination Earth initiative has been granted **Special Access** to EuroHPC supercomputers
- The project aims to develop a highly accurate digital model of the Earth - **a 'digital twin'** - to monitor and predict environmental change and human impact to support sustainable development
- Users will have cloud–based access to DestinE models, algorithms, applications and natural and socioeconomic data to exploit and test their own models. The overall system and its components (open core platform, digital twins, and services) will be user-friendly and flexible to adapt to a wide spectrum of user needs and scenarios





RESEARCH & INNOVATION

- EuroHPC JU funds an R&I programme to develop a full European supercomputing ecosystem
- Aiming to support European digital autonomy and reduce Europe's dependency on foreign manufacturers
- Currently around **40** projects focusing on a number of areas including **technologies, applications and skills**

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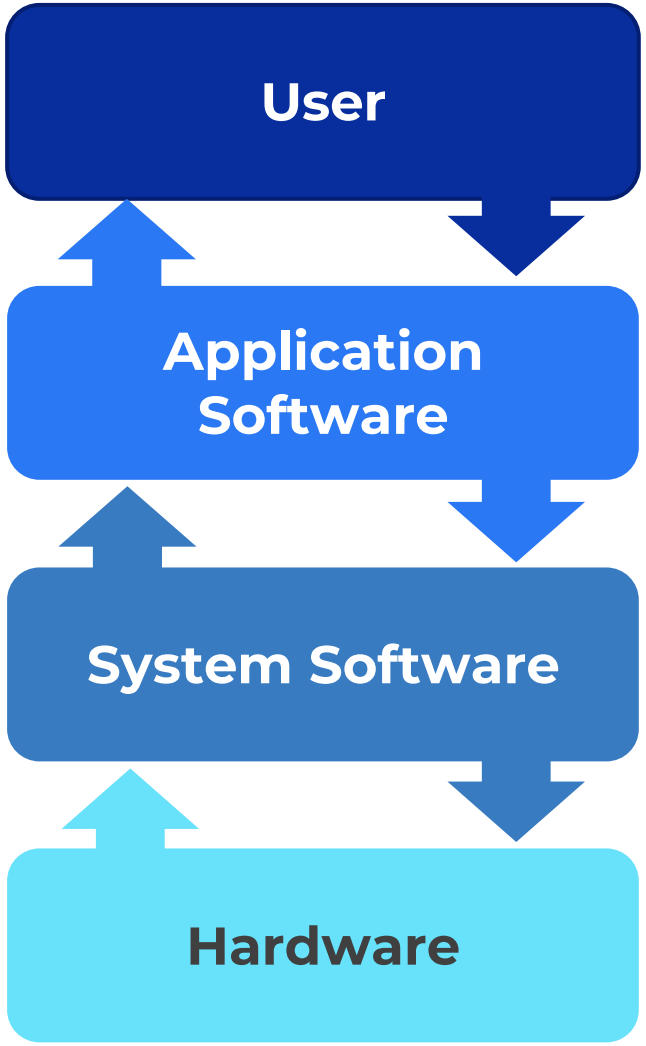
STRATEGIC R&I – INTERVENTION AREAS

Leadership in Use & Skills
Competence Centres and training programmes in HPC commensurate with the labour market.

Applications and Algorithms
Centres of Excellence for HPC Applications and new algorithms for European exascale technology.

European Software Stack
Software and algorithms, programming models and tools for exascale and post exascale systems.

European Open Hardware
Ecosystem for the low power high-end general purpose processor and accelerator.



STRATEGIC R&I – USE & SKILLS

Expertise and HPC resources

CASTIEL EURO

- European network of NCCs in 32 countries to **widen the use of HPC** in Europe.
- Support **SMEs, public services** and **private businesses**
- **Gateway for** users to access **European HPC** resources

Financial support for HPC uptake

- Boost **innovation** and **business opportunities for SMEs**
- **Solve business problems with HPC,** financial support and expertise from European HPC leaders

f4f EuroHPC

Talent development

EUMaster4HPC

- Train the **next generation of HPC experts** in Europe
- 1st **pan-European MSc** Programme in HPC including 19 countries
- **Connect academic education with HPC industry**

WHAT'S COMING NEXT?

EuroHPC Work Programme 2024

INFRASTRUCTURE

- Procurement of the second exascale hosted by the Jules Verne consortium
- Call to select a hosting entity and industrial consortium for an industrial supercomputer for AI and other applications
- Second call to select hosting entities for quantum computers.
- Call to select hosting entities for further midrange systems

RESEARCH & INNOVATION

- Second phase of the EUMaster4HPC project
- Call targeting quantum middleware
- Continuous integration and deployment platform
- Further calls for applications in areas not yet covered

CONNECTIVITY & FEDERATION

- Implementation action based on the recently procured hyperconnectivity study
- Procurement of services to deploy a platform for federating EuroHPC resources

THANK YOU

EuroHPC
Joint Undertaking

For more information, feel free to visit our website and social media:

eurohpc-ju.europa.eu @euroHPC_JU eurohpc-ju @eurohpc-ju