EuroHPC JU Infrastructures and Their Usage

Dr. Lilit Axner

Programme Officer at EuroHPC JU

EuroHPC
Joint Undertaking

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

- 33 participating countries
- The European Union (represented by the European Commission)
- 3 private partners

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

QIC European Quantum Industry Consortium

ETP 4 HPC EUROPEAN TECHNOLOGY PLATFORM FOR HIGH PERFORMANCE COMPUTING

Industrial and Scientific Advisory Board

The two advisory groups provide advice on R&I and Infrastructure, drawing up draft multiannual strategic agendas to guide the activities of EuroHPC in these areas.

INFRAG

The Infrastructure Advisory Group (INFRAG)

- Provides advice on the acquisition and operation of the supercomputers;
- Issues recommendations on the federation and interconnection of the EuroHPC infrastructure;
- Advises on training activities for end-users and opportunities for promoting take-up and use of European technology solutions notably by the national HPC Competence Centres;
- Consults with public and private stakeholders to inform them and collect feedback.

Chaired by Sinead Ryan

RIAG

The Research and Innovation Advisory Group (RIAG)

- Provides advice on potential international cooperation activities;
- Issues recommendations for training and education priorities addressing key competences in HPC;
- Consults with public and private stakeholders to inform them and collect feedback.

Chaired by Jean-Philippe Nominé

LEVEL AND SOURCES OF EU FUNDING 2021-2027

Digital Europe Program

1.98B Eur

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

Horizon Europe Program

900M Eur

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

Connecting Europe Facility

200M Eur

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

*Member states to match this with national contributions

THE EUROHPC SUPERCOMPUTERS

EuroHPC Joint Undertaking

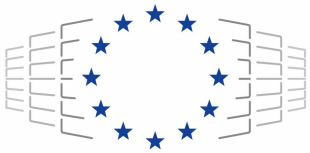
6 operational systems, all ranking among the world's most powerful supercomputers:

- Vega in Slovenia
- Karolina in Czechia
- Discoverer in Bulgaria
- Meluxina in Luxembourg
- Lumi in Finland
- Leonardo in Italy

4 systems underway:

- MareNostrum5, a pre-exascale system in Spain
- Deucalion, a petascale system in Portugal
- Daedalus, a petascale system in Greece
- JUPITER, the 1st European Exascale supercomputer in Germany

Global Standing OF EuroHPC Supercomputers



JUNE 2022	TOP500	Green500
LUMI	#3	#7
LEONARDO	#4	#15
MELUXINA	#57	# 26
KAROLINA	#95	#24
DISCOVERER	#134	#219
VEGA	#166	#255

Operational systems | Pre-exascale

LUMI Consortium (Coordinator CSC)
Kayaani, Finland

Cray EX, Hewlett Packard Enterprise
#3 Top500 (Nov 2023): **309.1** PFlops (LUMI-G)

AMD platform
- CPU: 64-core next-generation AMD EPYC™
- GPU: AMD Instinct™ (MI250X),

Leonardo Consortium (Coordinator CINECA)
Bologna, Italy

Atos BullSequana XH2000
#4 Top500 (Nov 2022): **238.7** PFlops (BOOSTER)

Intel/NVidia platform
- CPU: Intel Sapphire Rapids
- GPU: Nvidia custom Ambere (A100)

Operational systems | Petascale

Vega

Sustained performance:	**6,9 petaflops**
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
TOP500 ranking:	#32 in EU; #106 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	IZUM, Maribor, Slovenia

MeluXina

Sustained performance:	**12,8 petaflops**
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
TOP500 ranking:	#10 in EU; #36 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	LuxProvide, Bissen, Luxembourg

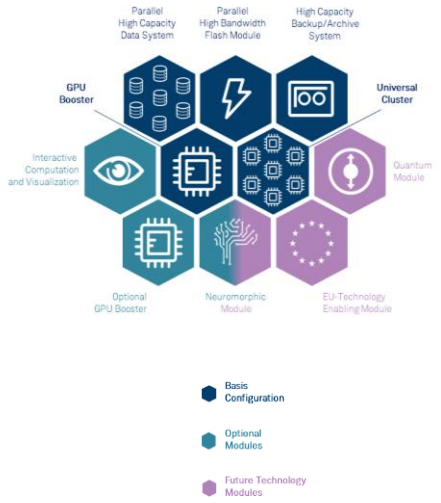
Karolina

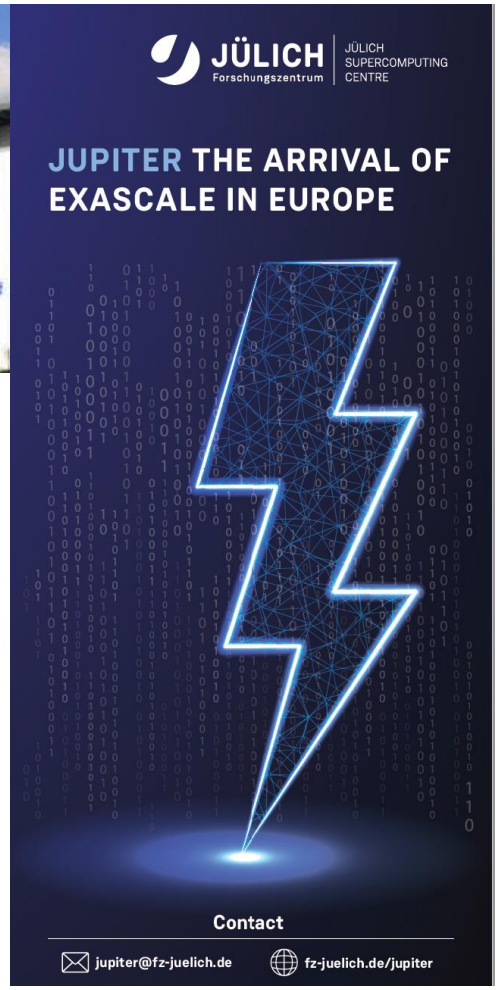
Sustained performance:	**9,13 petaflops**
CPU:	AMD Epyc Rome
GPU:	Nvidia A100
TOP500 ranking:	#20 in EU; #69 globally (June 2021)
Vendor/model	HPE Apollo 2000Gen10 Plus and Apollo 6500
Operated by	IT4I, Ostrava, Czech Republic

Discoverer

Sustained performance:	**4,45 petaflops**
CPU:	AMD Epyc Rome
GPU:	-
TOP500 ranking:	#27 in EU; #91 globally (June 2021)
Vendor/model	Atos BullSequana XH2000
Operated by	PSB consortium, Sofia, Bulgaria

COMING SOON: JUPITER, THE FIRST EUROPEAN EXASCALE





- The first European supercomputer capable of **one trillion calculations per second**
- Based on a **modular supercomputing architecture**
- Designed to be green, **powered by green electricity**, with water cooling system and plans for intelligent use of its waste heat
- JUPITER will help to solve questions regarding climate change, pandemics, sustainable energy production as well as enabling the use of AI and data science on a large scale
- Will be installed on the campus of Forschungszentrum Julich in 2023 and operated by the Jülich Supercomputing Centre

Purcuing Energy Efficient Computing

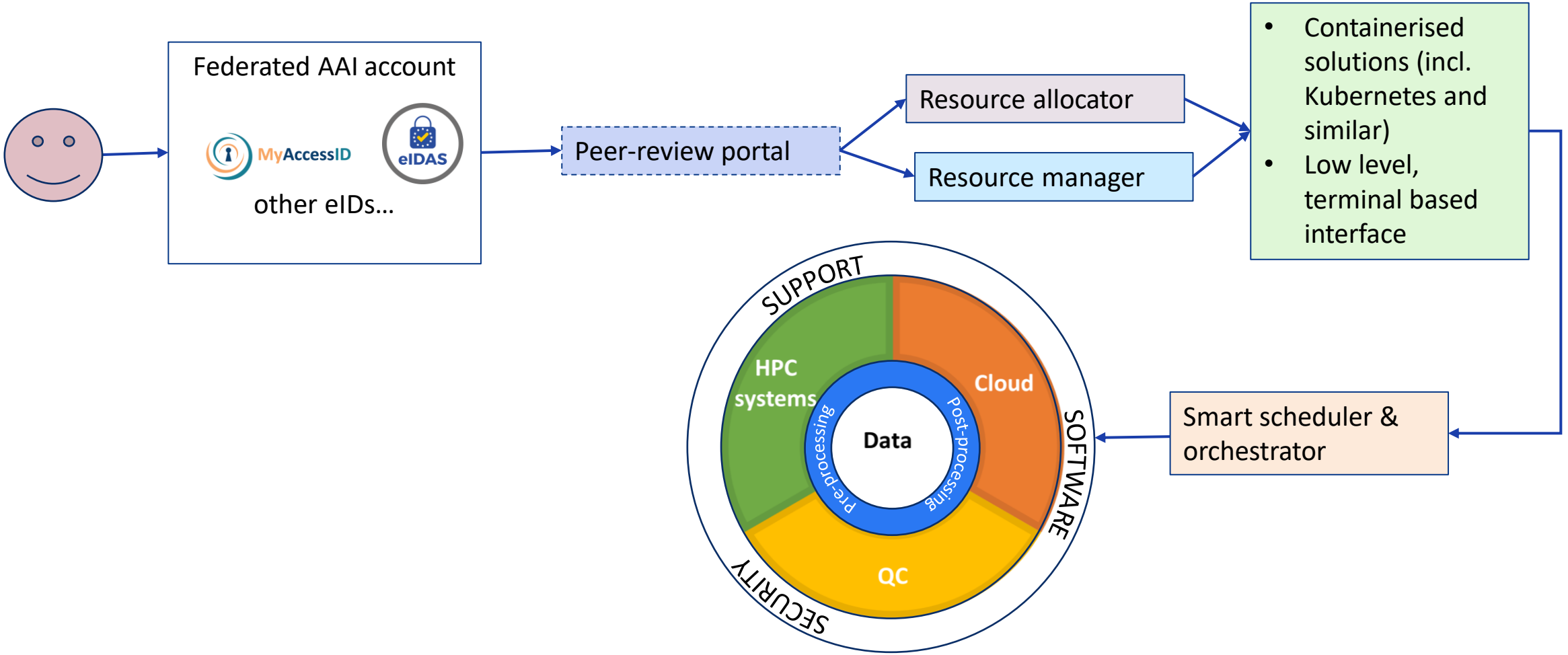
The EuroHPC JU is committed to building supercomputers which are both **powerful** and **eco-efficient** by:

- Procuring **energy efficient systems**, with low requirements for cooling. All our systems are **water cooled**, removing the requirement of high operational costs of air-cooled systems and in parallel reducing the energy footprint.
- Investing in the development of **next generation "green" microprocessors** that rely on energy efficient architectures.
- Developing awareness of **Users** towards energy efficien computing

Green and sustainable technologies are a priority for the JU, as part of the European Green Deal's aim to make Europe climate neutral by 2050

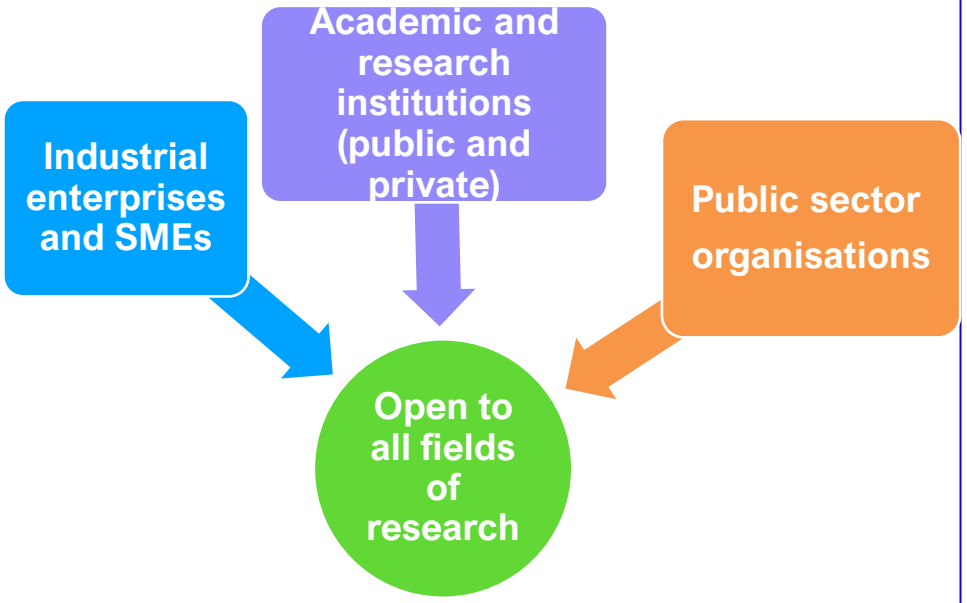
Federation of Supercomputing Services

Draft concept

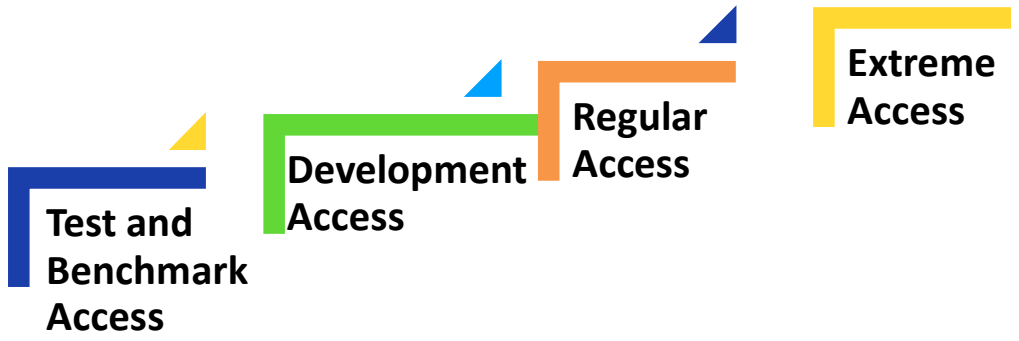


Access to EuroHPC Supercomputers

WHO IS ELIGIBLE?



WHICH TYPES OF ACCESS EXIST?



- 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

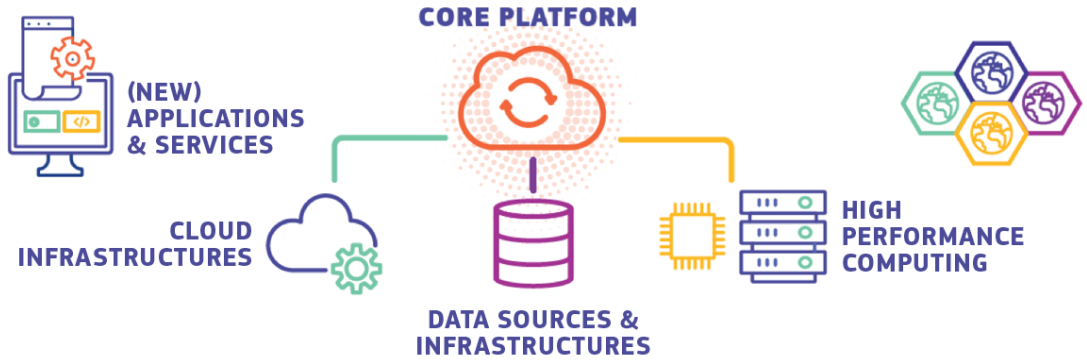
More information on EuroHPC access calls available at: https://eurohpc-ju.europa.eu/

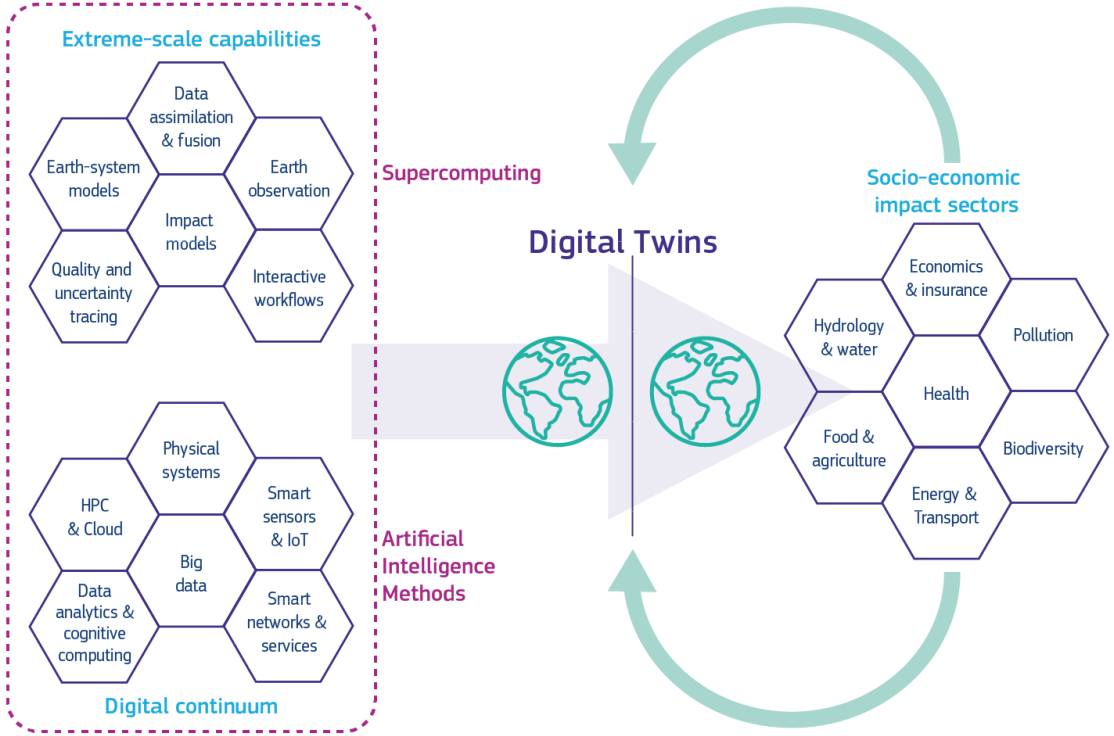
Special Access– DESTINATION EARTH

- 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

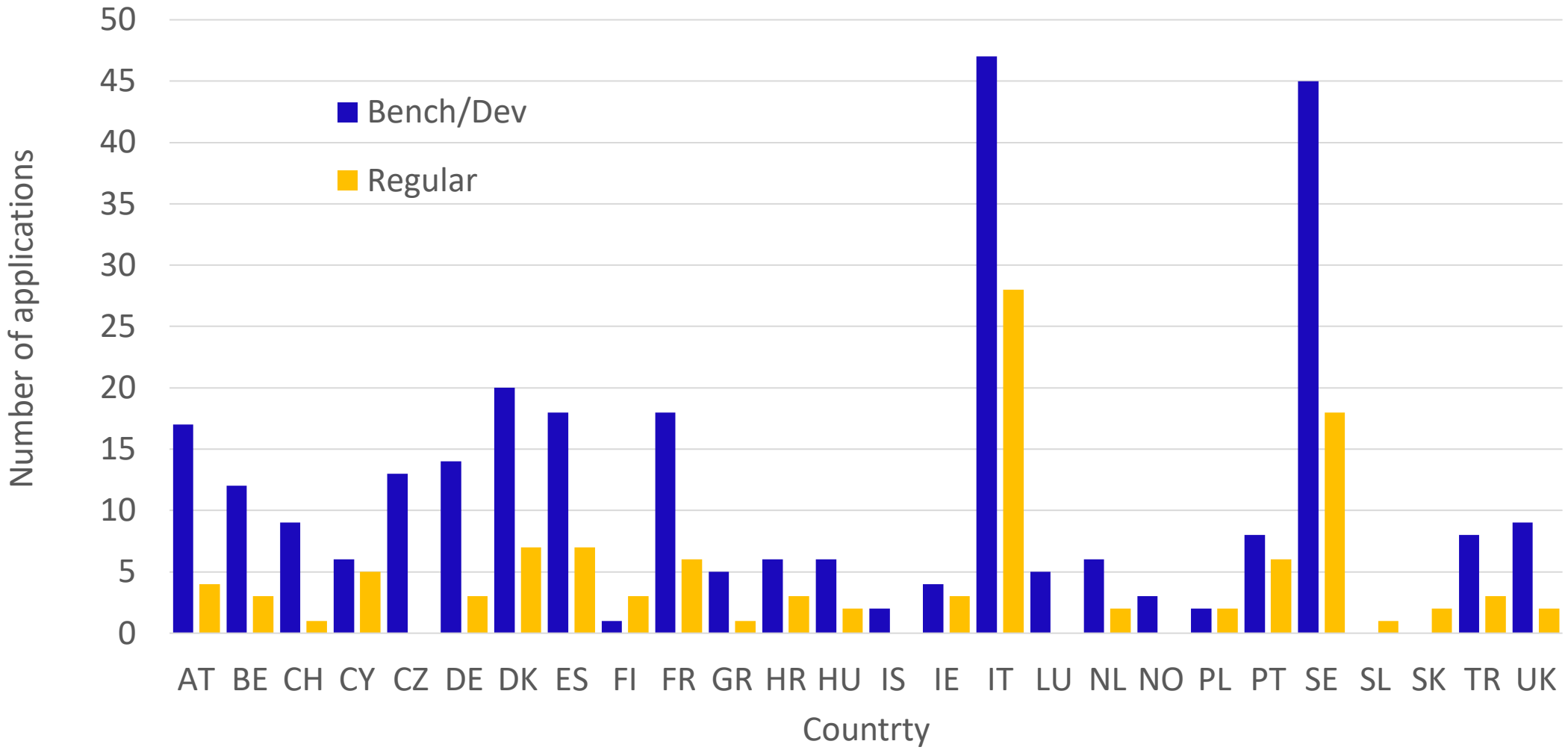
- The Destination Earth initiative has been granted **Special Access** to EuroHPC supercomputers

- 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

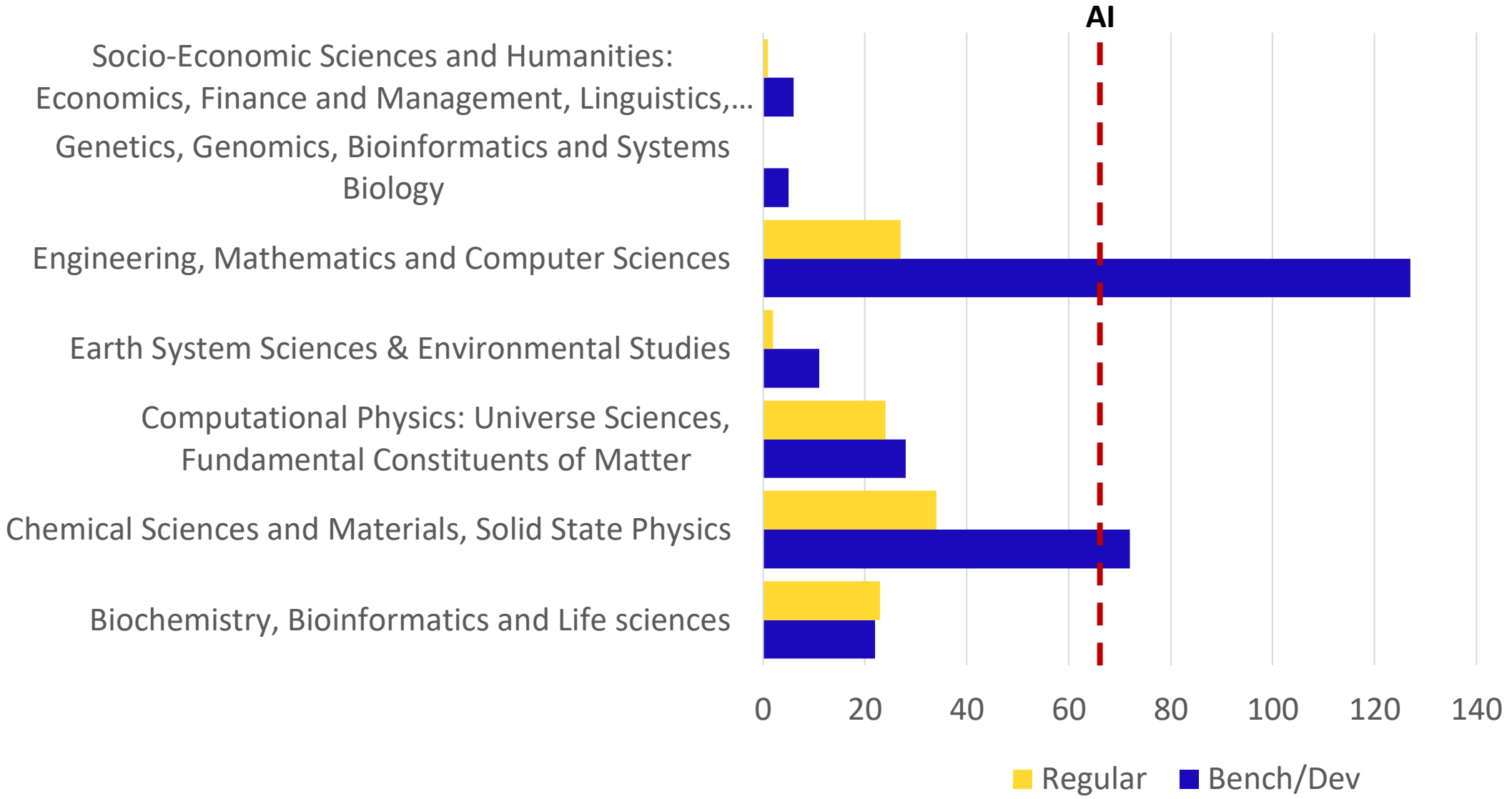




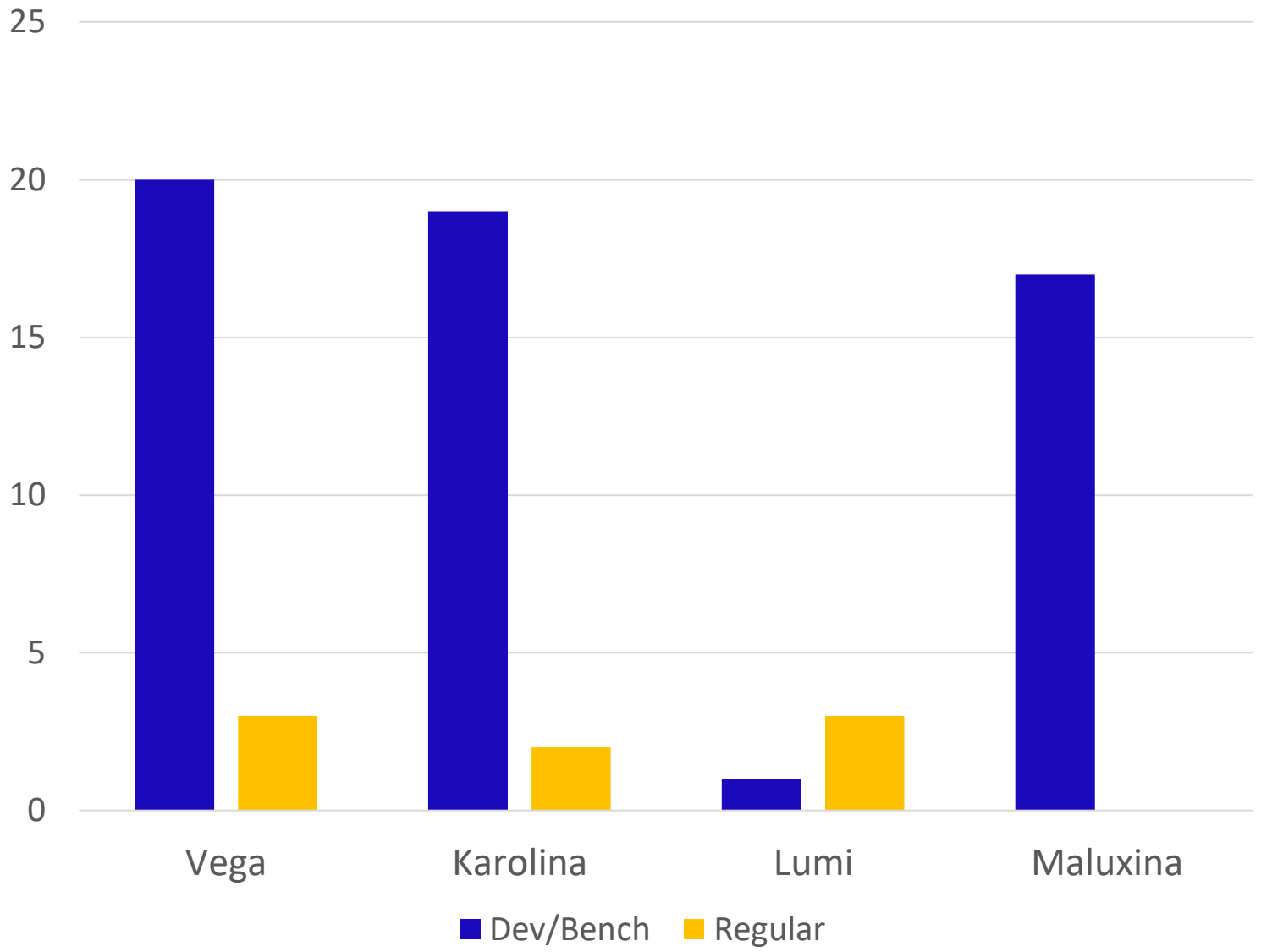
Number of Applications per Country by December 2022



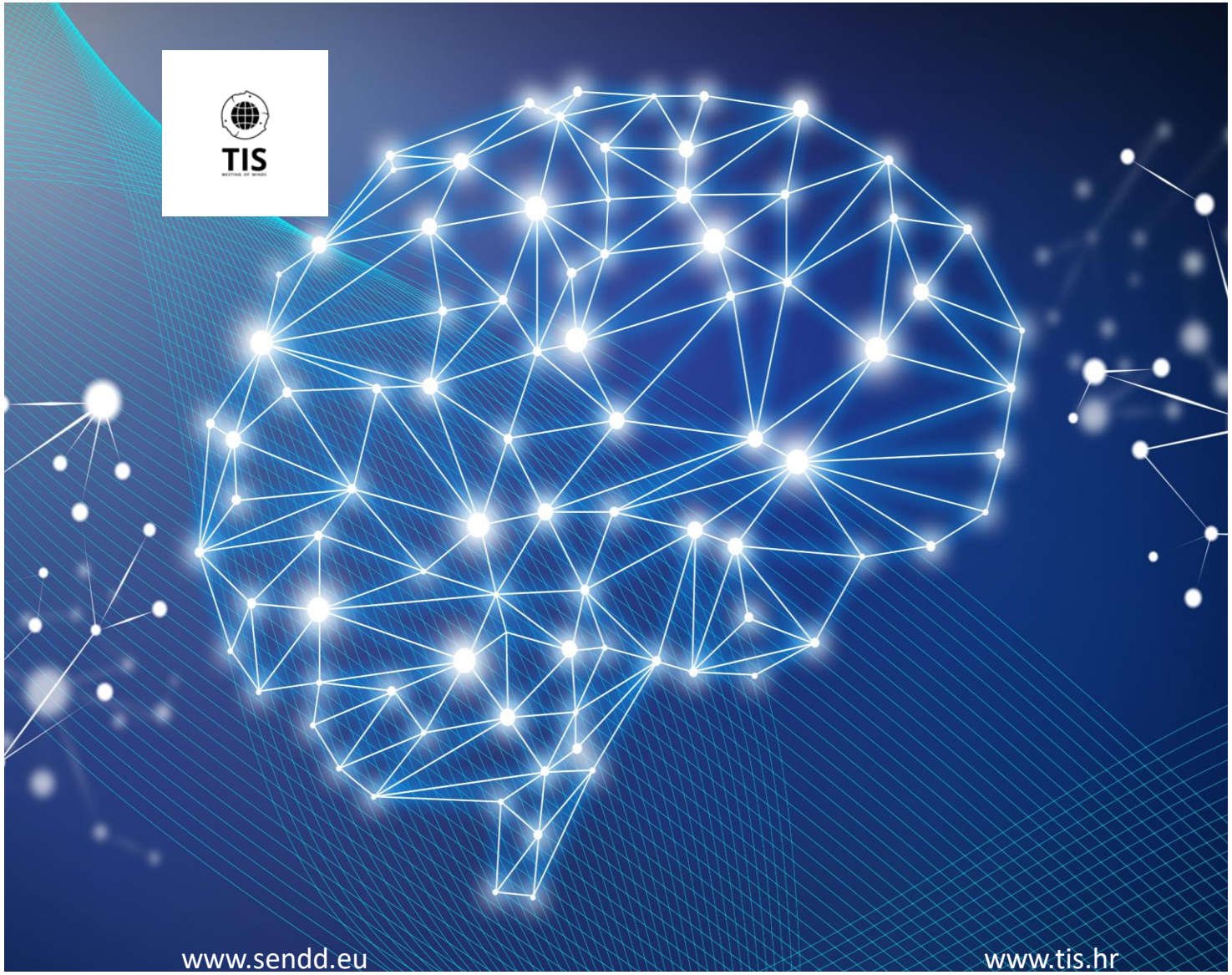
Number of Applications per Discipline by December 2022



AI Applications per System by December 2022



Using EuroHPC JU Vega System by the Croatian SME Called TIS



System for Early Neurological Deviation Detection

A unique **AI** solution for assessing the quality of spontaneous movements (fidgeting).

The target:

Children in early infancy (2-3m)

The purpose:

Detecting infants at high risk of neurodevelopmental disorders or expected normal outcome in a group of neuro risky children

Goal: AI system automatically detects neurological risk infants

Europska unija
Zajedno do fondova EU

Operativni program
KONKURENTNOST
I KOHEZIJA

EUROPSKI STRUKTURNI
I INVESTICIJSKI FONDOVI

Using EuroHPC Vega System by the Swedish National Archives

EuroHPC Joint Undertaking

Vega for training and inference

- Training the SATRN-model on Vega enabled us to increase the scale of the resized images going into the model, thereby improving accuracy for handwritten text, which generally requires more information than printed text
- Running 9 million images thorugh the pipeline on VEGA took roughly 90 node-hours
- At a hit-rate of 90% this project saves us about 700000 euros in manual labor costs, and the indexing database gets created a lot quicker

Riksarkivet

Adapting AI-technology for use in archives

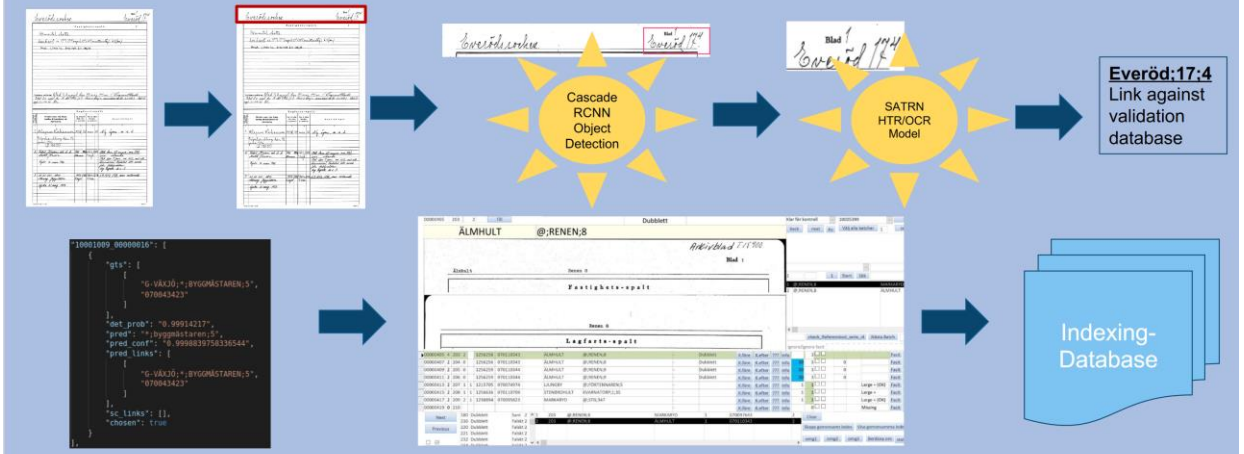
- Image segmentation models
- Text-recognition

Make scanned images searchable

384 000 GPU core hours (Development Access, VEGA)

Riksarkivet

The Property Record Indexing Pipeline

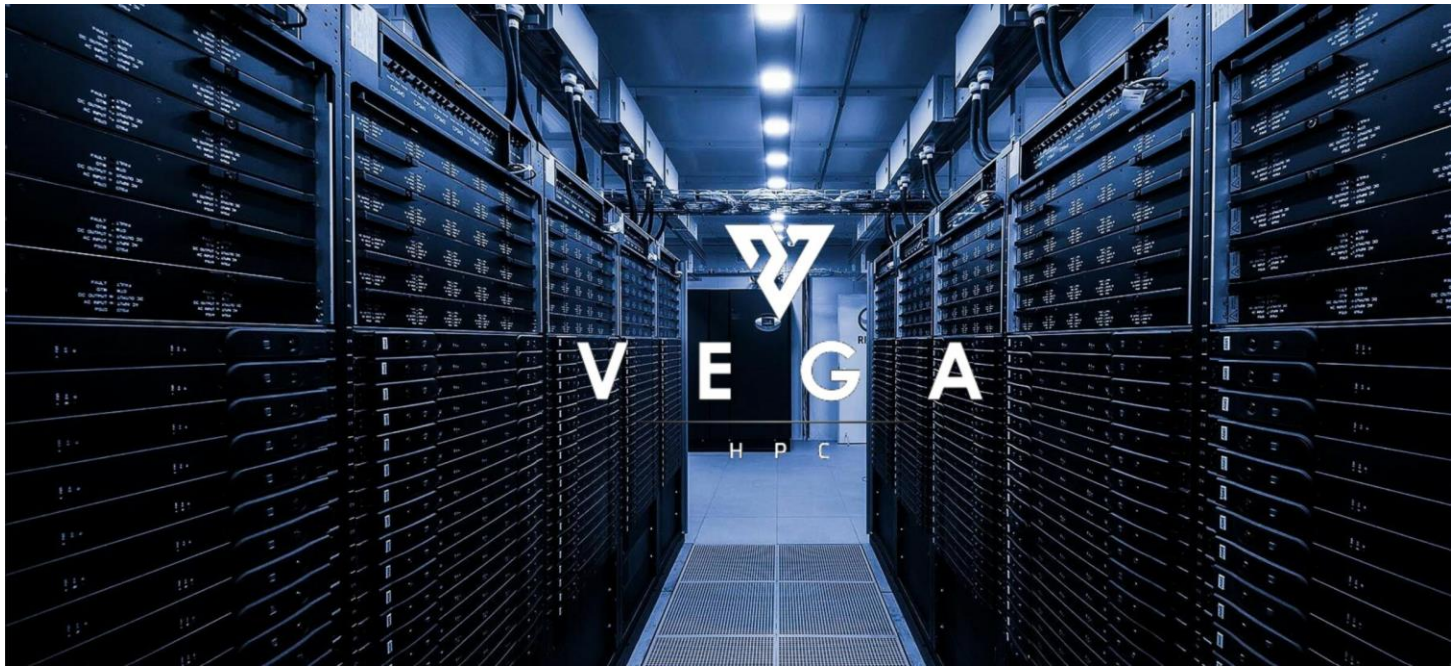


Riksarkivet

Simulations of the electrochemistry relevant for battery development

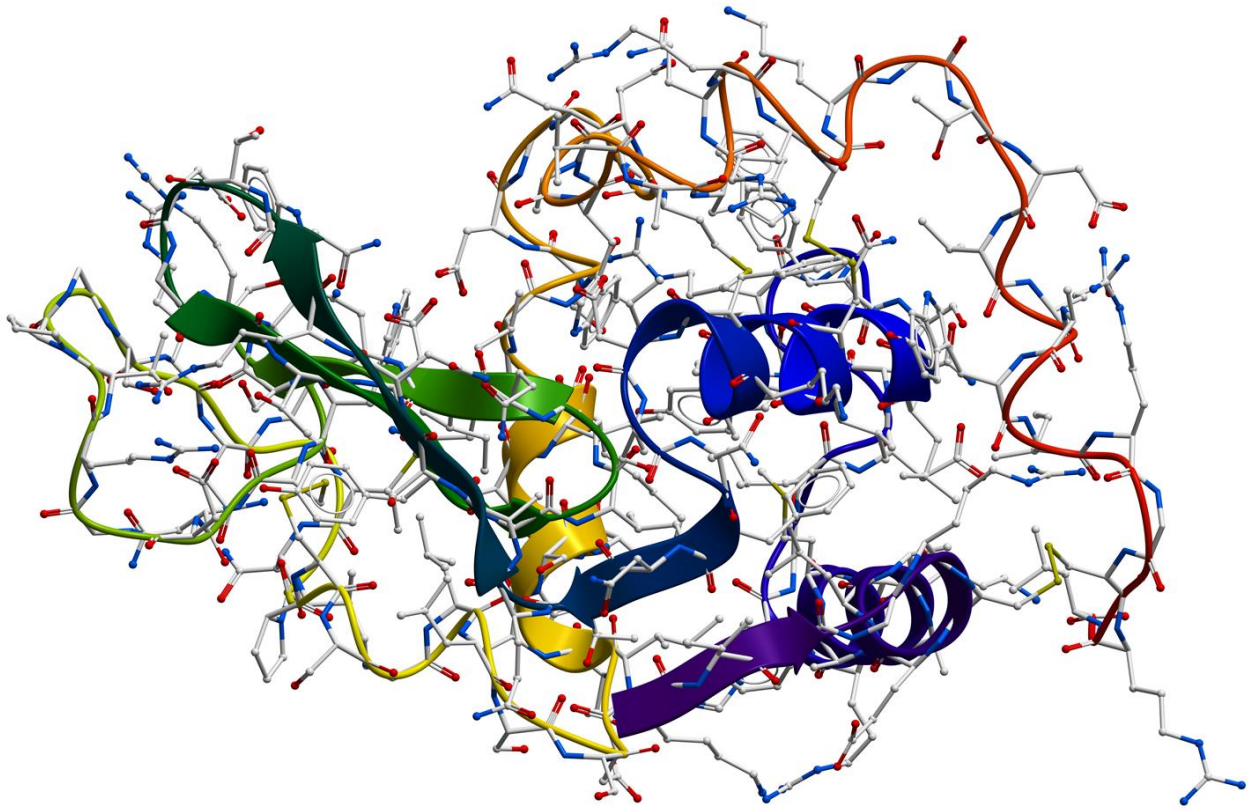
northvolt

Use of classical and reactive molecular dynamics and quantum chemical simulations to devise bottom-up design strategies for improved batteries.



ERCO PHARMA

EuroHPC Joint Undertaking



Skin permeability

- Atomistic model of the main barrier in human skin
- Predict drug permeability using molecular dynamics simulations (GROMACS)

1 920 000 CPU Core Hours

384 000 GPU Core hours

What's Next?

Upcoming EuroHPC infrastructure:

- Two recent calls for new mid-range and high-end supercomputers
- Ongoing procurement processes
- Upcoming quantum computers
- Hyperconnectivity and user requirements studies
- Federated and secure systems

Building up the EuroHPC user forum

- Establish effective feedback mechanisms between JU and users
- Support a demand-oriented and user-driven HPC ecosystem
- Ensure user requirements are met by EuroHPC infrastructure
- Include new and underrepresented user communities to address their requirements and support HPC uptake

Thank you!

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Questions?

https://eurohpc-ju.europa.eu @EuroHPC_JU EuroHPC Joint Undertaking