

EuroCC2 Multi-GPU Programming Bootcamp

Welcome

Claudia Blaas-Schenner
ASC Research Center, TU Wien and EuroCC Austria

Multi-GPU Programming Bootcamp

Agenda

17 June	09:00–09:15	Welcome to the EuroCC 2 Bootcamp (Moderator)
	09:15–09:40	Introduction to Nsight Systems and GPU Computing (Lecture and Read-Only Lab)
	09:40–10:30	Overview of a Single GPU Code
	10:30–10:45	<i>Break</i>
	10:45–12:30	Parallelizing a Single GPU Code using CUDA memcpy, Streams, and Introduction to Single Node Multi-GPU (P2P) (Lecture and Lab)
	12:30–13:00	<i>Lunch</i>
	13:00–15:00	Introduction to Multi-Node Multi-GPU (GPU Direct) programming (Lecture and Lab)

13:00 Group Photo

18 June	09:00–10:55	Introduction to NVIDIA Collectives Communications Library (NCCL) (Lecture and Lab)
	10:55–11:10	<i>Break</i>
	11:10–13:00	Introduction to NVSHMEM (Lecture and Lab)
	13:00–13:30	Demo of the Nsight Systems Profiler Report for a Multi-Node Application

Zoom

NO Zoom chat → Slack

Housekeeping

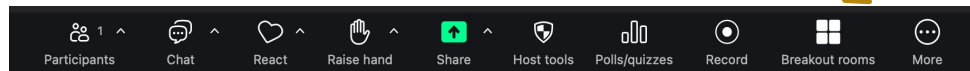
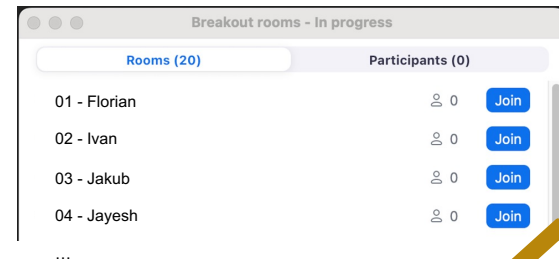
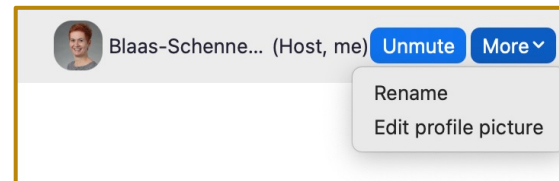
- All **hands-on exercises** will be done in groups, guided by **experienced teaching assistants (TAs)**:
 - Please rename yourself in Zoom, we'll assign you and track attendance for the certificates:

First name Last name

- **Teaching Assistants** please rename yourself:

TA First name Last name

- You can also **self-select a room**:
 - click on the “**Breakout rooms**” button at the bottom of the Zoom window, then select your preferred room.



Slack

Channels → Manage → Browse channels

Our main communication channel 

#announcements - Keep an eye on this channel for all important information, messages, and links



#cluster-support - Use this channel to ask any questions you have on the cluster/issues you encounter



#general - Use this channel to ask any general questions you may have



#lab-questions - Ask any questions you have on the labs in this channel



#lecture-questions - Ask any questions you have on the lectures in this channel



#materials - Find all slides, supporting materials, and links to the recordings in this channel



#introduce-yourself - Don't forget to tell us a bit about yourself and introduce yourself to the other participants!



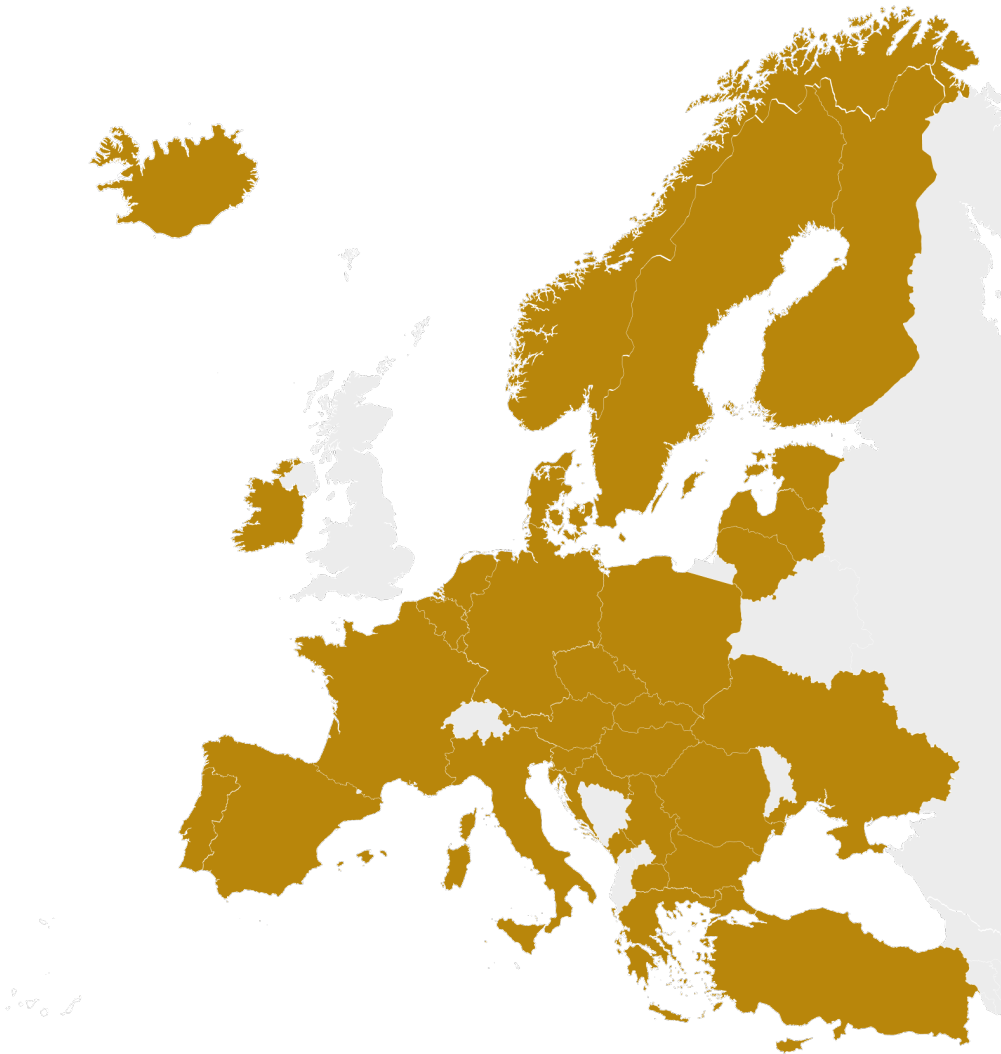
Please add after your **name (akronym of your institution, country)** - you'll see it will get crowded here



Welcome

EuroCC & EuroCC 2

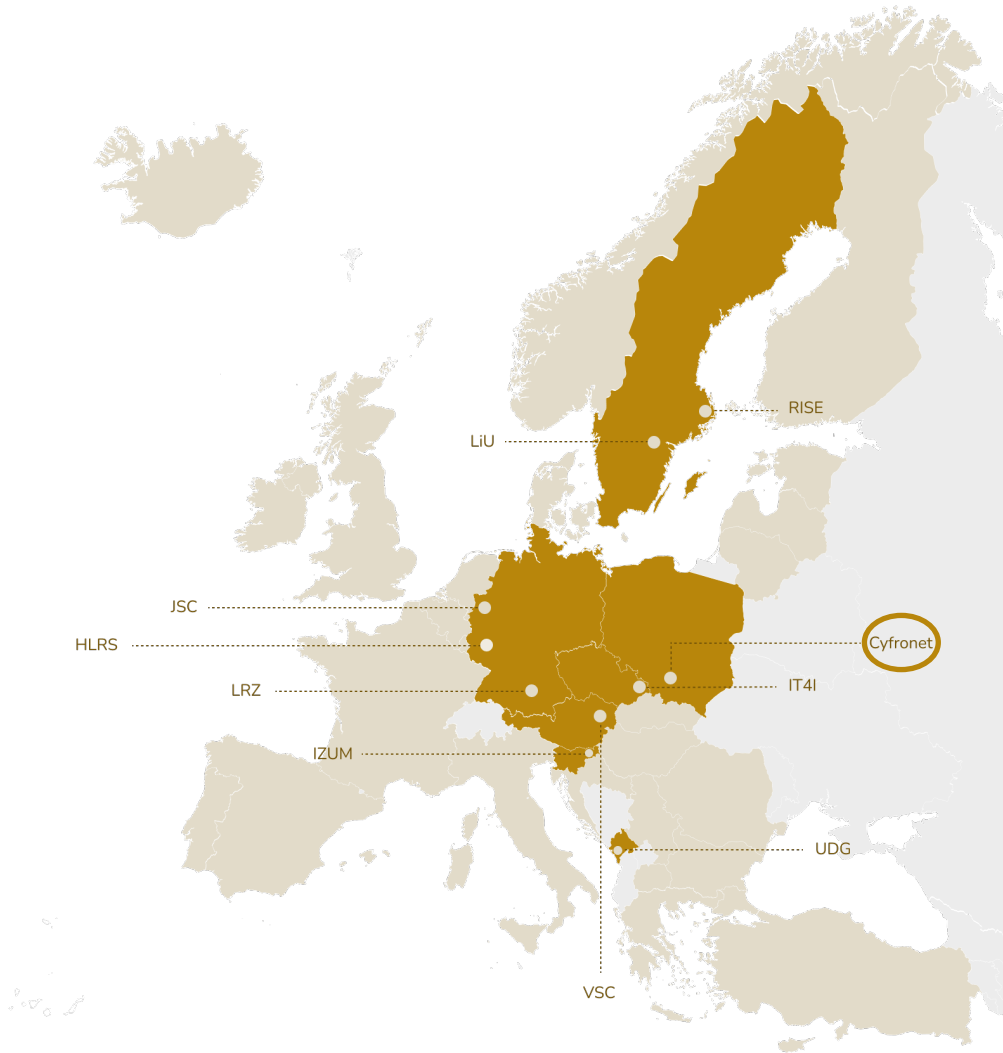
- National Competence Centres (NCCs) for HPC/HPDA/AI



Welcome

EuroCC & EuroCC 2

- National Competence Centres (NCCs) for HPC/HPDA/AI
 - Multi-GPU Programming Bootcamp
 - EuroCC Austria
 - EuroCC Czechia
 - EuroCC@GCS (Germany)
 - EuroCC Montenegro
 - EuroCC Poland
 - EuroCC Slovenia
 - ENCCS (Sweden)
- 7 NCCs
- 10 HPC centres
- 1 HPC system
- + NVIDIA & OpenHackathons



Welcome

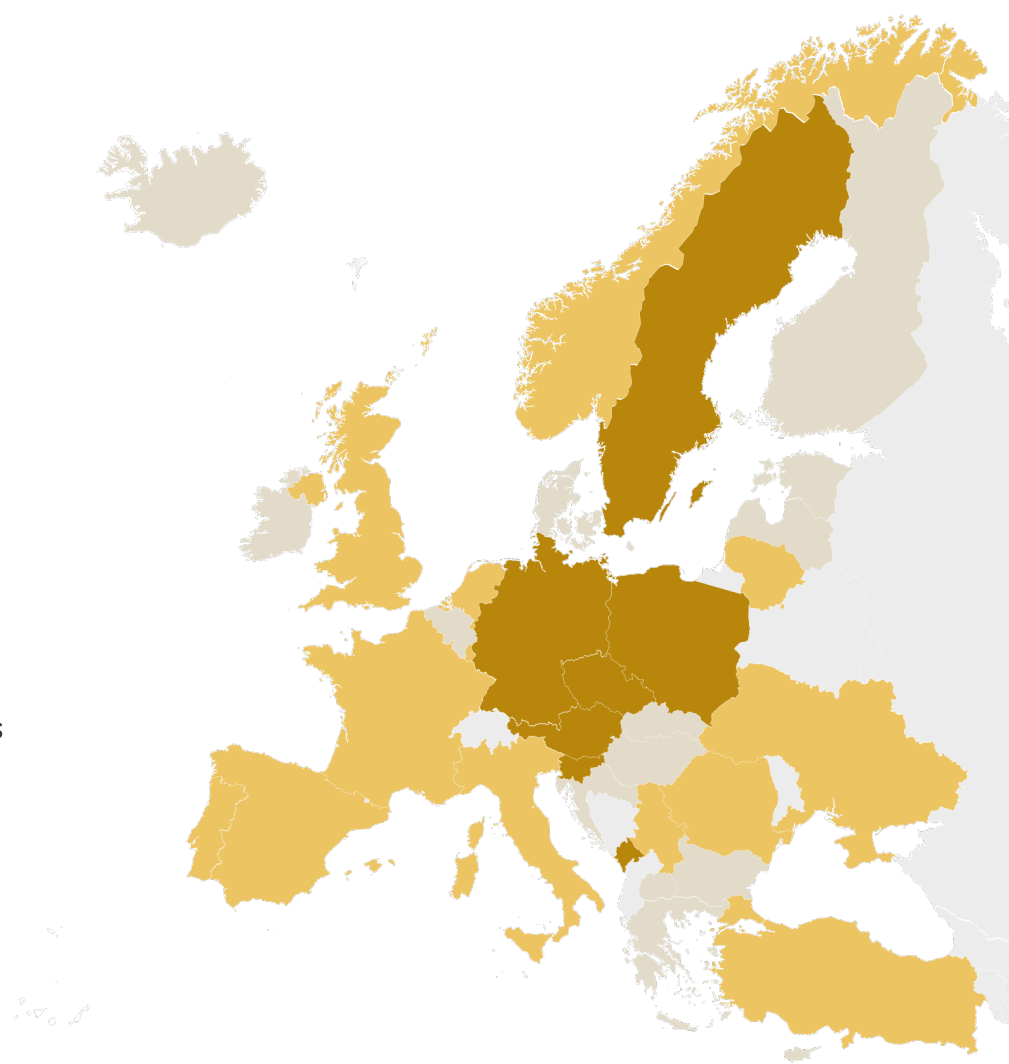
EuroCC & EuroCC 2

- National Competence Centres (NCCs) for HPC/HPDA/AI
- Multi-GPU Programming Bootcamp
 - EuroCC Austria
 - EuroCC Czechia
 - EuroCC@GCS (Germany)
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7 NCCs

10 HPC centres

1 HPC system
- + NVIDIA & OpenHackathons
- 150 participants from all over Europe



Multi-GPU Programming Bootcamp

Helping you to exploit multiple GPUs

Paul Graham (NVIDIA; instructor)

Claudia Blaas-Schenner (ASC; welcome)

Lucie Kavka (IT4I; moderator)

Klemens Noga (Cyfronet; cluster support)

Teaching Assistants:

Ivan Vialov (ASC)
Moritz Siegel (ASC)

Florian Kasper (LRZ)
Mares Barekzai (LRZ)

Jayesh Badwaik (JSC)
Kaveh Haghighi Mood (JSC)

Siegfried Höfner (ASC)
Jakub Homola (IT4I)

Momme Allalen (LRZ)
Saheed Bolarinwa (LRZ)

Tobias Haas (HLRS)
Wei Li (LiU)



Paul



Claudia



Lucie



Klemens



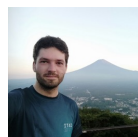
Ivan



Moritz



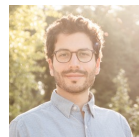
Siegfried



Jakub



Florian



Mares



Momme



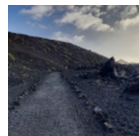
Saheed



Jayesh



Kaveh



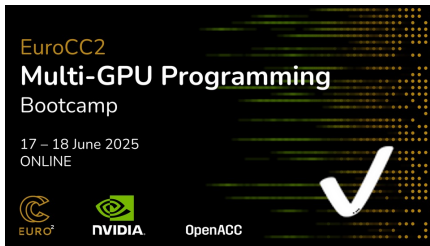
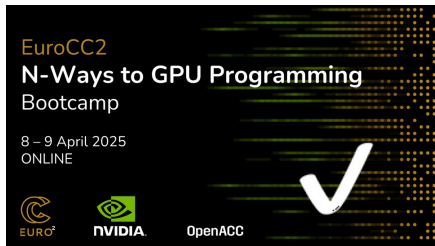
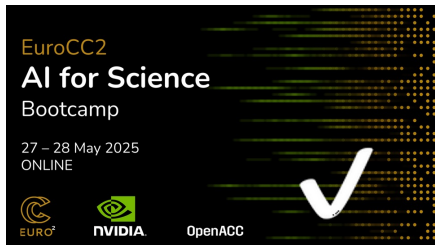
Tobias



Wei

Bootcamps & Hackathons

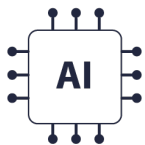
<https://www.openhackathons.org/s/upcoming-events>



<https://vsc.ac.at/training>

<https://events.plgrid.pl/event/78/>

EuroHPC Key Facts & Figures



13

AI Factories



12

Supercomputers



10

Quantum Computers



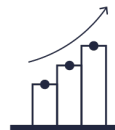
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R & I Projects



35

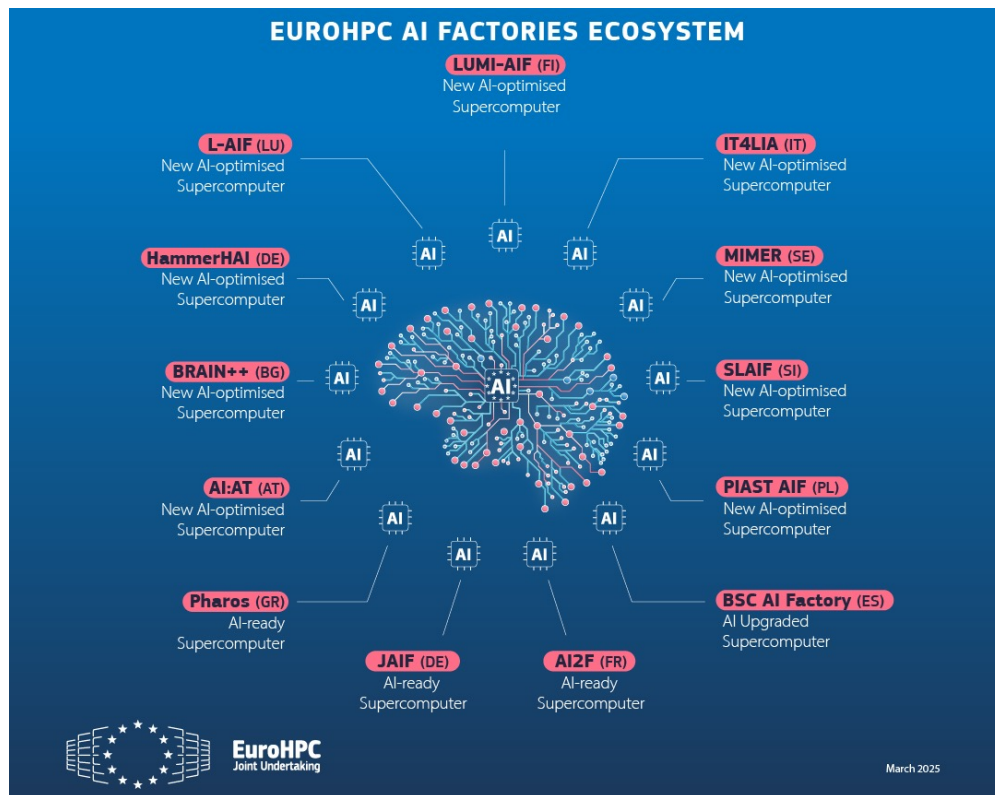
Participating States



7

Billion EUR Total Budget

EuroHPC AI Factories



EuroHPC Supercomputers

Get access to CPUs and GPUs



1(+1) exascale systems

JUPITER, (ALICE RECOQUE)



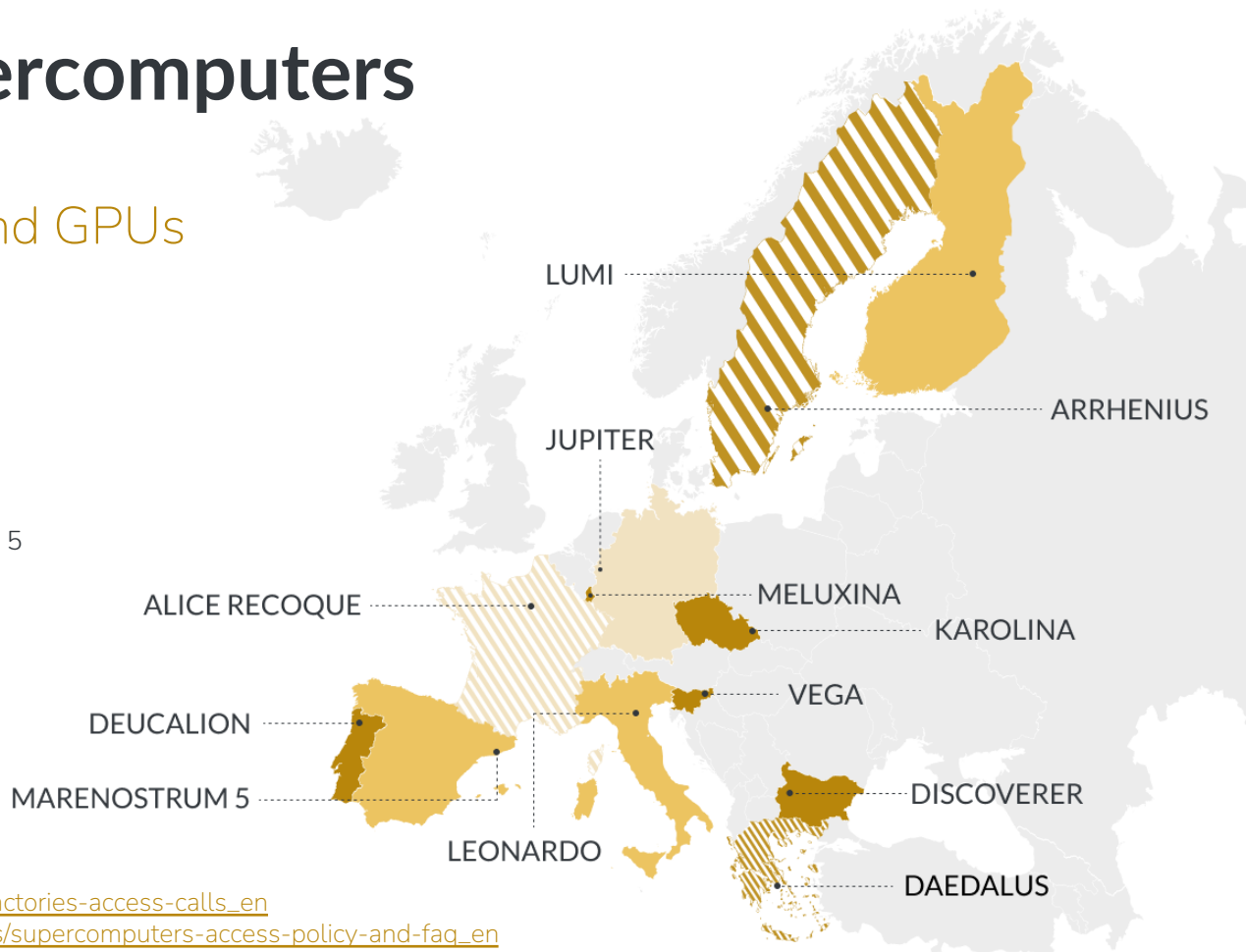
3 pre-exascale systems

LUMI, LEONARDO, MARENOSTRUM 5



5(+2) petascale systems

DEUCALION, DISCOVERER,
MELUXINA, KAROLINA,
VEGA, (DAEDALUS),
(ARRHENIUS)



https://eurohpc-ju.europa.eu/ai-factories/ai-factories-access-calls_en

https://eurohpc-ju.europa.eu/supercomputers/supercomputers-access-policy-and-faq_en

EuroCC Poland

National Competence Center in HPC

- ❑ For business entities (especially SMEs), universities, research institutes and public administration
- ❑ Expertise in all areas of HPC+ (HPC, HPDA, AI, Big Data, Data Analytics)
- ❑ Technological support and consultations
- ❑ Training
- ❑ Access to computing resources with PLGrid portal
- ❑ cc.eurohpc.pl and plgrid.pl



EuroCC Austria

National Competence Centre for Supercomputing, Big Data and AI



Consulting & project support

- ❑ Consulting & support
- ❑ Free Proof of Concept (PoC)
- ❑ Securing state funding
- ❑ Help with finding project partners & experts
- ❑ Business plan development



Training with VSC

- ❑ Parallel programming
- ❑ GPU programming
- ❑ AI / Machine learning
- ❑ Data analytics
- ❑ Python, C++, MPI, OpenMP
- ❑ Best practices for better code performance



HPC infrastructure

Access to supercomputers, including help with the application process and programming support:

- ❑ Vienna Scientific Cluster
- ❑ MUSICA, Leonardo
- ❑ Other EuroHPC Systems

STAY IN TOUCH



eurocc-austria.at



vsc.ac.at



THANK YOU



This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 101101903. The JU receives support from the Digital Europe Programme and Germany, Bulgaria, Austria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Lithuania, Latvia, Poland, Portugal, Romania, Slovenia, Spain, Sweden, France, Netherlands, Belgium, Luxembourg, Slovakia, Norway, Türkiye, Republic of North Macedonia, Iceland, Montenegro, Serbia