ADVANCED COMPUTING AUSTRIA

universität wien

TU WIEN TECHNISCHE UNIVERSITÄT WIEN

BOKU UNIVERSITY

VSC VIENNA SCIENTIFIC CLUSTER

INiTS Vienna's High-Tech Incubator

# EuroCC Austria

National Competence Centre for Supercomputing,
Big Data and Artificial Intelligence

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## EuroHPC Joint Undertaking

- Initiative that builds a world-class **High-Performance Computing (HPC)** ecosystem in Europe, supports HPC access and education
- EuroHPC supercomputers are now among the fastest in the world –> more computing power for research and innovation

eurohpc-ju.europa.eu

## EuroCC

- EU-funded project that supports the uptake of HPC in Europe
- Network of National Competence Centres (NCCs) in 32 European countries

eurocc-access.eu

## EuroCC Austria

- Competence centre for HPC, High-Performance Data Analytics and Artificial Intelligence in Austria
- Provides know-how and access to supercomputers

eurocc-austria.at

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# European Supercomputing


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## Consulting & project support

- Consulting & support for HPC / Big Data / AI projects
- Link to experts
- Free Proof of Concept (PoC)
- Securing state funding
- Help with finding project partners
- Business plan development

## Training with VSC

- Parallel programming
- Machine learning, deep learning
- Data analysis & preparation for ML
- GPU programming
- Python for HPC
- Best practices for better code performance

## HPC infrastructure

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

- Vienna Scientific Cluster (Austria)
- Leonardo (Italy, co-financed with Austria)
- Other EuroHPC Systems

# Butterfly Recognition at UIBK

Automatic recognition of butterflies on images using neural networks.

The project on image based butterfly recognition is part of the Viel-Falter butterfly monitoring program (www.viel-falter.at) in cooperation with the “Stiftung Blühendes Österreich”. Blühendes Österreich has a butterfly recording app and provides the large dataset of expert-labelled butterfly images.


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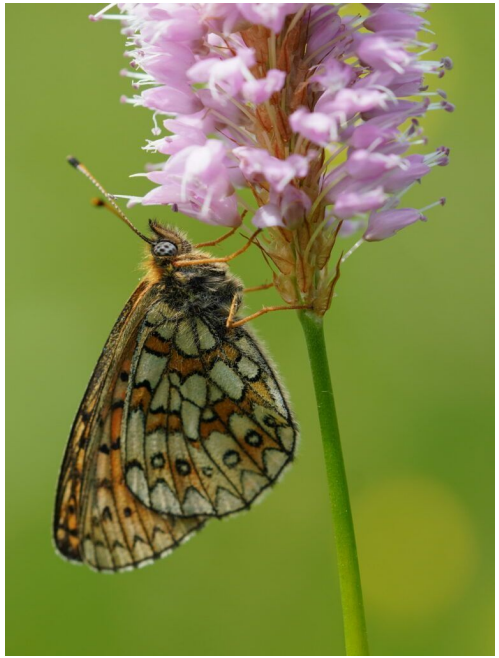
More than 500,000 expert-labelled images of butterflies of about 180 different species in Austria

- A unique and invaluable dataset
- Yet heavily imbalanced, requiring special evaluations
- Rare species with less than 50 examples had to be thrown out, thus about 160 classes remain

Goal for ecology as a whole: automating biodiversity monitoring



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# ACHIEVEMENTS ON LEO5 AND OUTLOOK TO LEONARDO

1

## Data-parallelism implemented by EuroCC Austria to speed up training

- Reducing epoch time from initial two hours for a specific model to less than twelve minutes using four GPUs while at the same time using more CPU cores per GPU to feed the data to the GPUs (improving single GPU utilization)
- Using more than 8 GPUs is not beneficial (too large total or too small individual batch sizes)

2

## Training a number of the well known convolutional neural network architectures, like ResNets, RegNets, DenseNets, etc.

3

## A ResNet152 achieved 97,17 % overall accuracy

- Mean accuracy of all classes: 92,57 %
- Top-3 overall accuracy: 99.2 %; mean accuracy of all classes: 97,2 %.
- Top-5 accuracy of all classes: 99.5 %; mean of all classes: 98,0 %

4

## Many and long trainings possible on LEONARDO

- plus some models that do not fit on an A30 GPU
- Test also Vision Transformers

# STAY IN TOUCH

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# THANK YOU



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VIENNA SCIENTIFIC CLUSTER

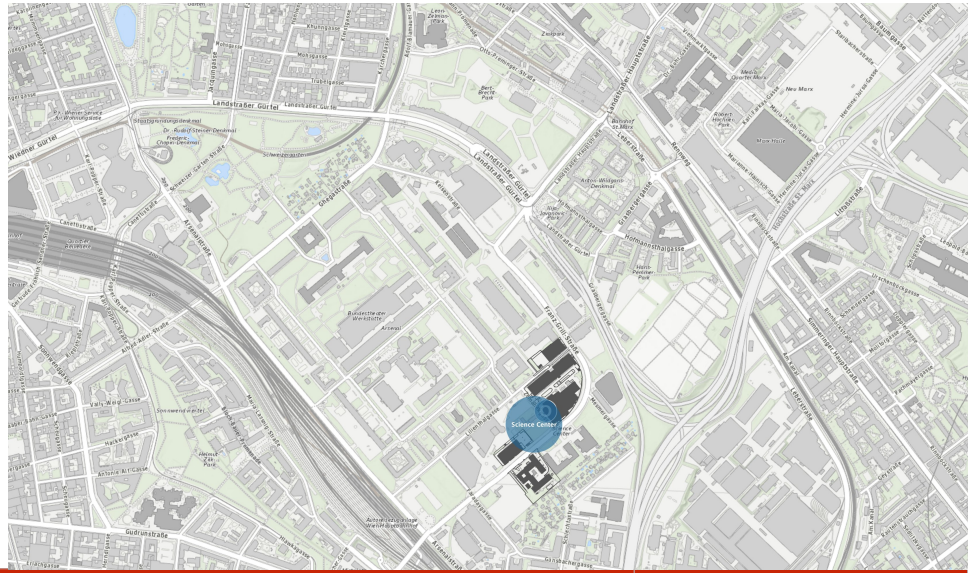
# Vienna Scientific Cluster (VSC)
# An Overview

*VSC Research Center, TU Wien*

# Vienna Scientific Cluster (VSC)

## What it is:

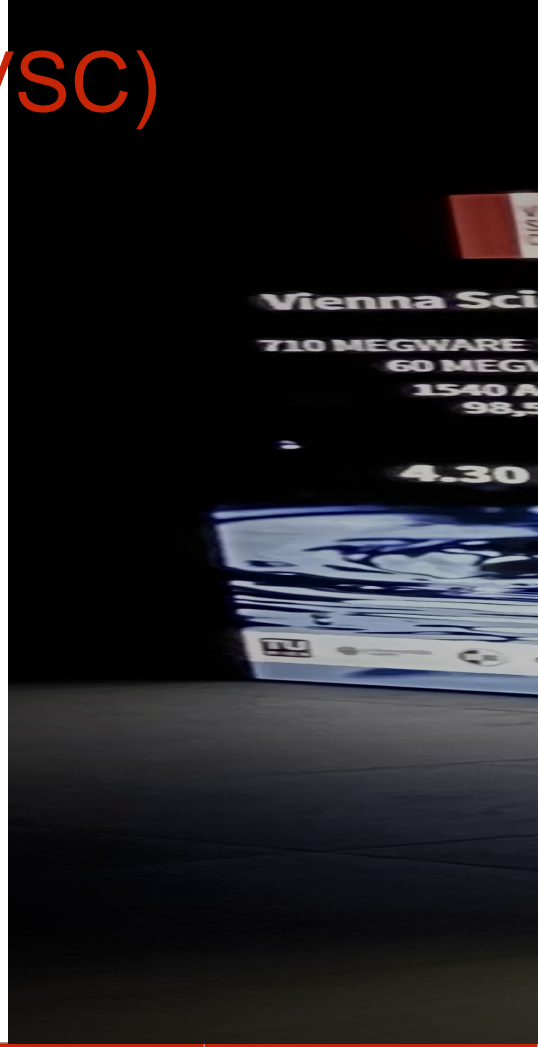
- Common High Performance Computing (HPC) infrastructure of several major Austrian universities.
- Initiated in 2009 (VSC-1)
- Current systems located at TU Wien Science Center Arsenal



# Vienna Scientific Cluster (VSC)

## Delivers HPC resources for:

- Most academic institutions in Austria
  - Direct members: Uni Wien, TU Wien, BOKU, TU Graz, UIBK, JKU
  - Participating: Uni Graz, MedUni Wien, MedUni Graz, MedUni Innsbruck, Vetmed, MUL,…
- Comet Centers
  - e.g. MCL, AC2T, Virtual Vehicle, SCCH, VASCage,…
- Others:
  - EODC, AIT, ISTA,…
- SMEs

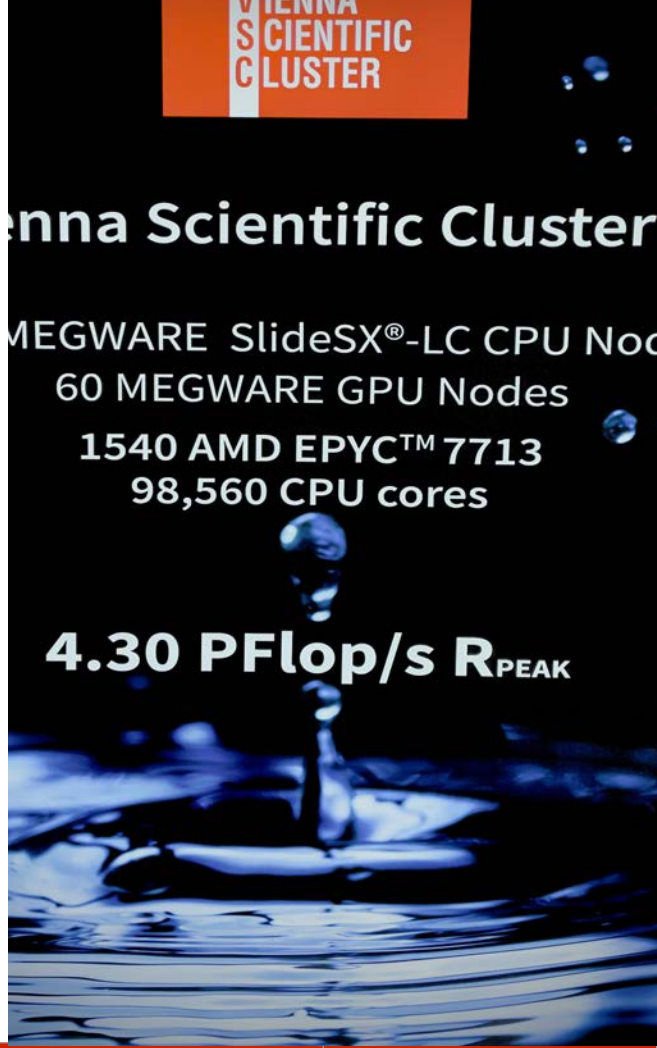


# VSC-4

- 792 compute nodes
- Total # of CPU cores: 38016
- RAM capacity: 107TB
- Storage: 5PB
- Node-h/year: ~7M (~336M Core-h/year)

# VSC-5

- 798 CPU compute nodes
- 105 GPU compute nodes
- Total # of CPU cores: 103888
  - 99280 AMD cores
  - 4608 Intel cores
- # of GPUs: 210
  - 90 Nvidia A40
  - 120 Nvidia A100
- RAM capacity: 600TB
- Storage: 5PB
- Node-h/year: ~7.5M (~1B Core-h/year)



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# MUSICA

## MUlti SIte Computer Austria

272 GPU Nodes
168 CPU Nodes

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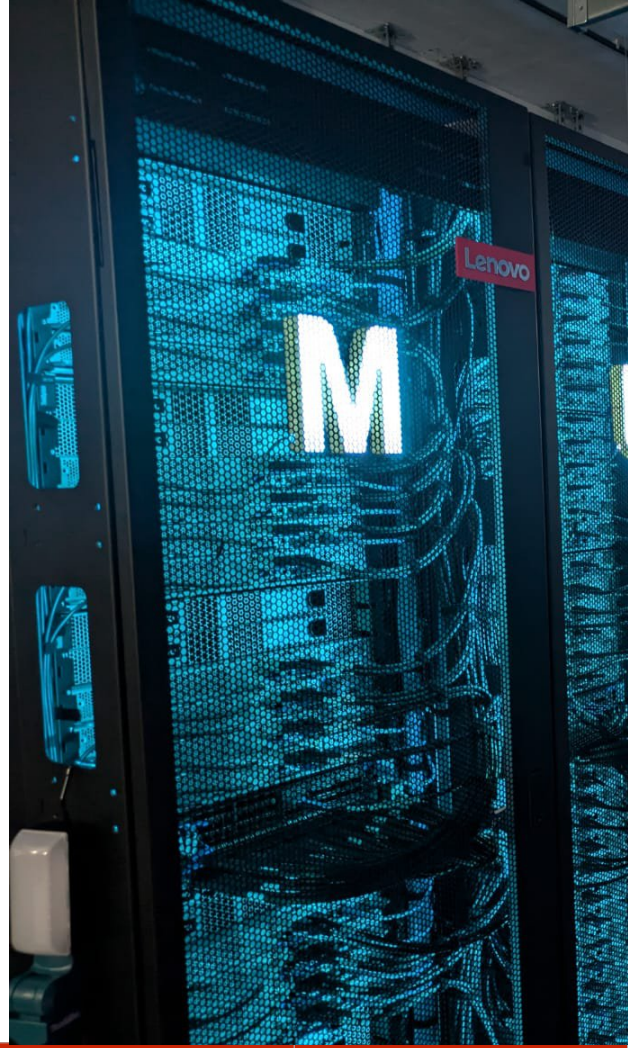
80 GPU
48 CPU

JKU JOHANNES KEPLER UNIVERSITÄT LINZ

80 GPU
48 CPU

TU WIEN TECHNISCHE UNIVERSITÄT WIEN

112 GPU
72 CPU



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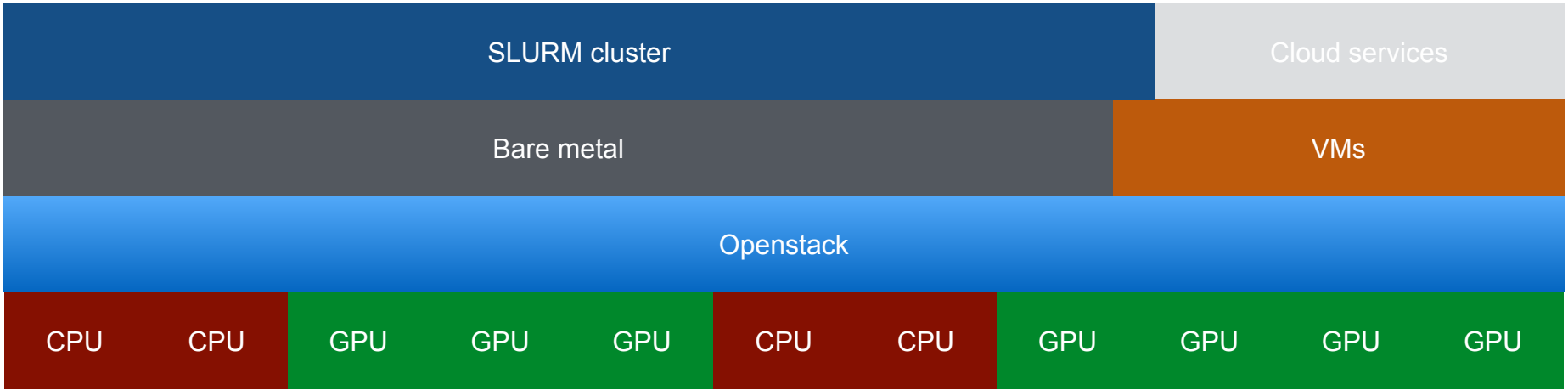
# MUSICA

Specialized hardware and software stack for AI workloads



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# MUSICA

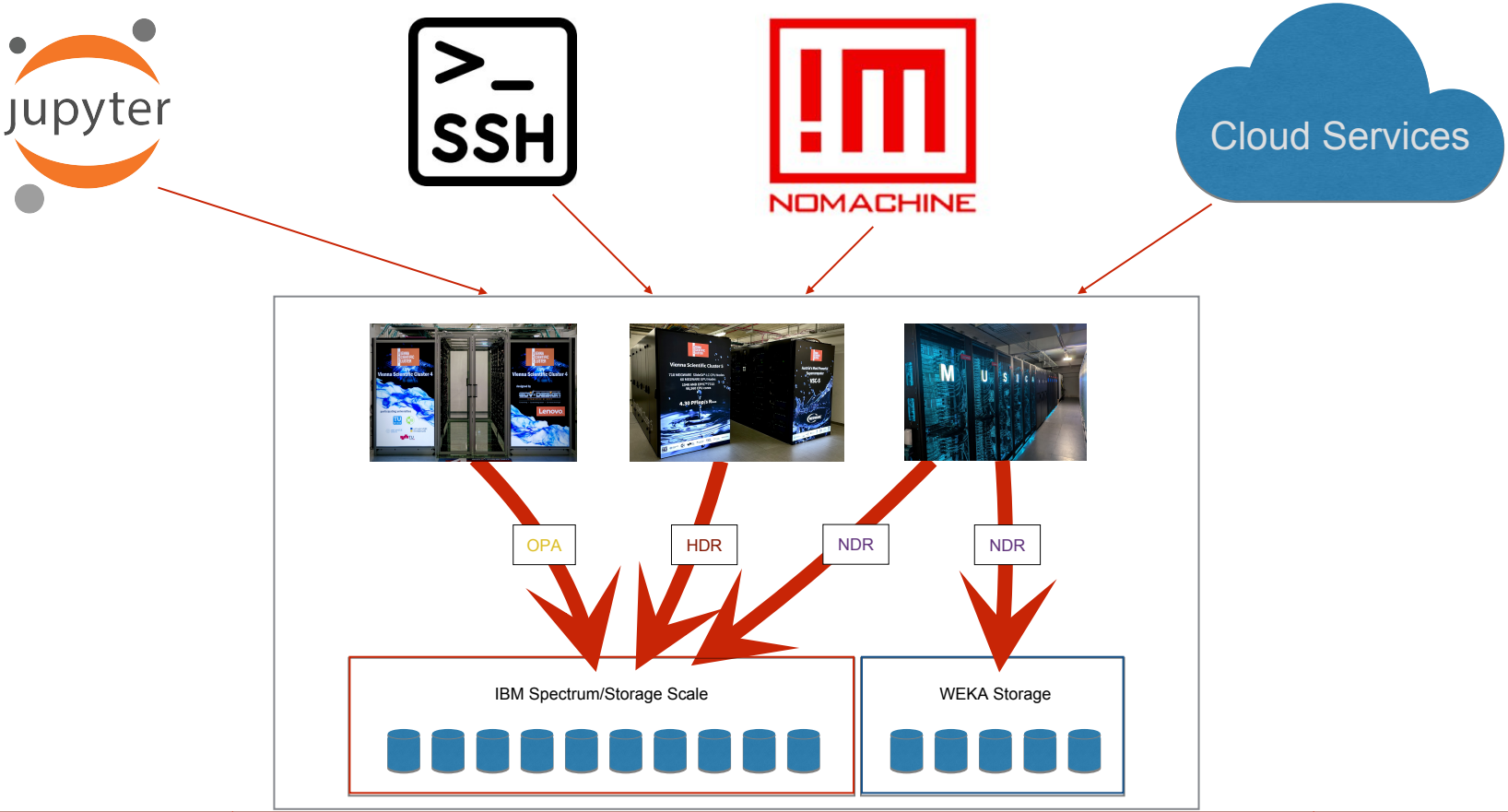
## CPU Nodes Specs:

- 2x AMD Epyc 9654, 96 Core
- 768 GB DDR5
- NDR400

## GPU Nodes Specs:

- 2x AMD Epyc 9654, 96c
- 768 GB DDR5
- 4x H100-SXM5-94G-700W
- NDR200

## Total: 1088 GPUs


jupyter
SSH
NOMACHINE
Cloud Services
OPA
HDR
NDR
NDR
IBM Spectrum/Storage Scale
WEKA Storage

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# How to get access

## Access to VSC resources:

- Test project
- Peer reviewed (funded) project
- Internal project

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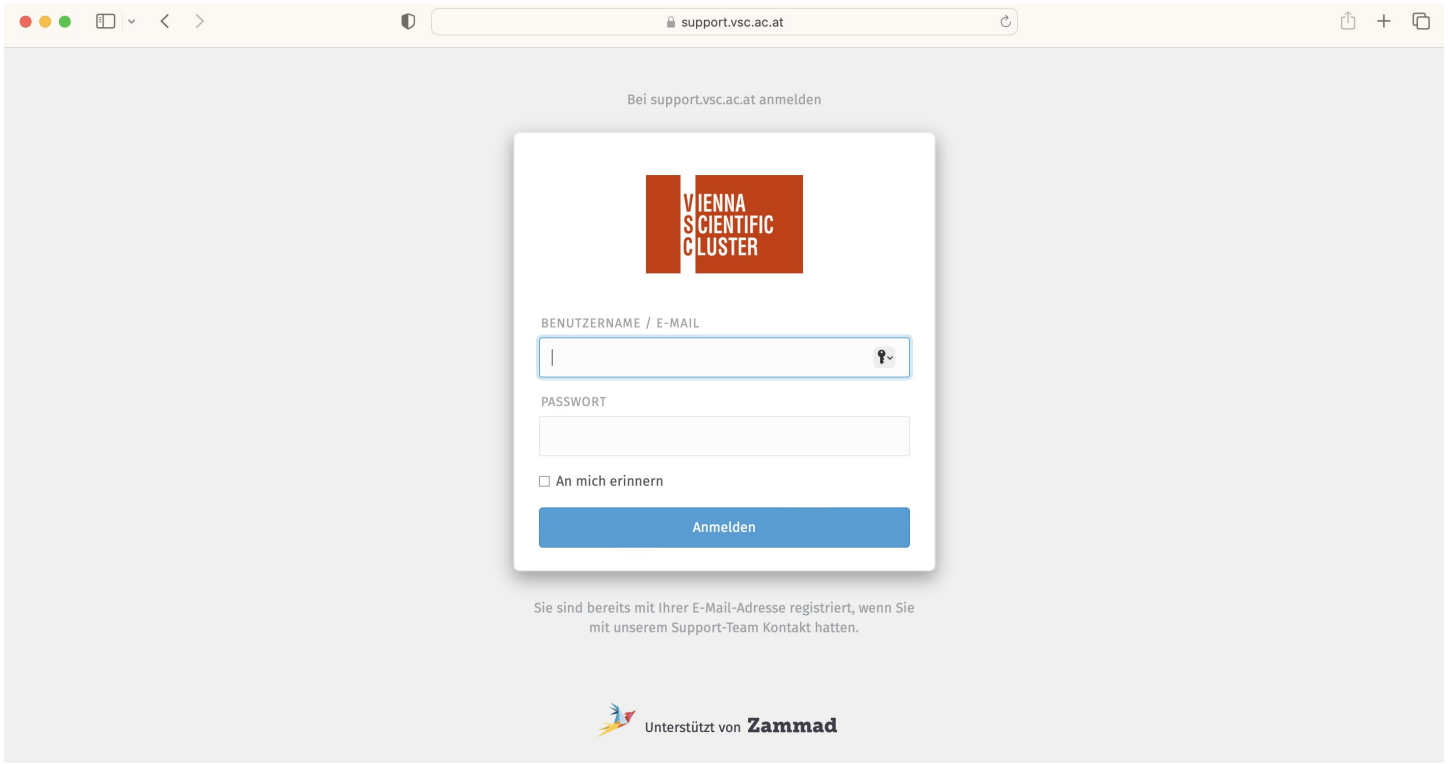
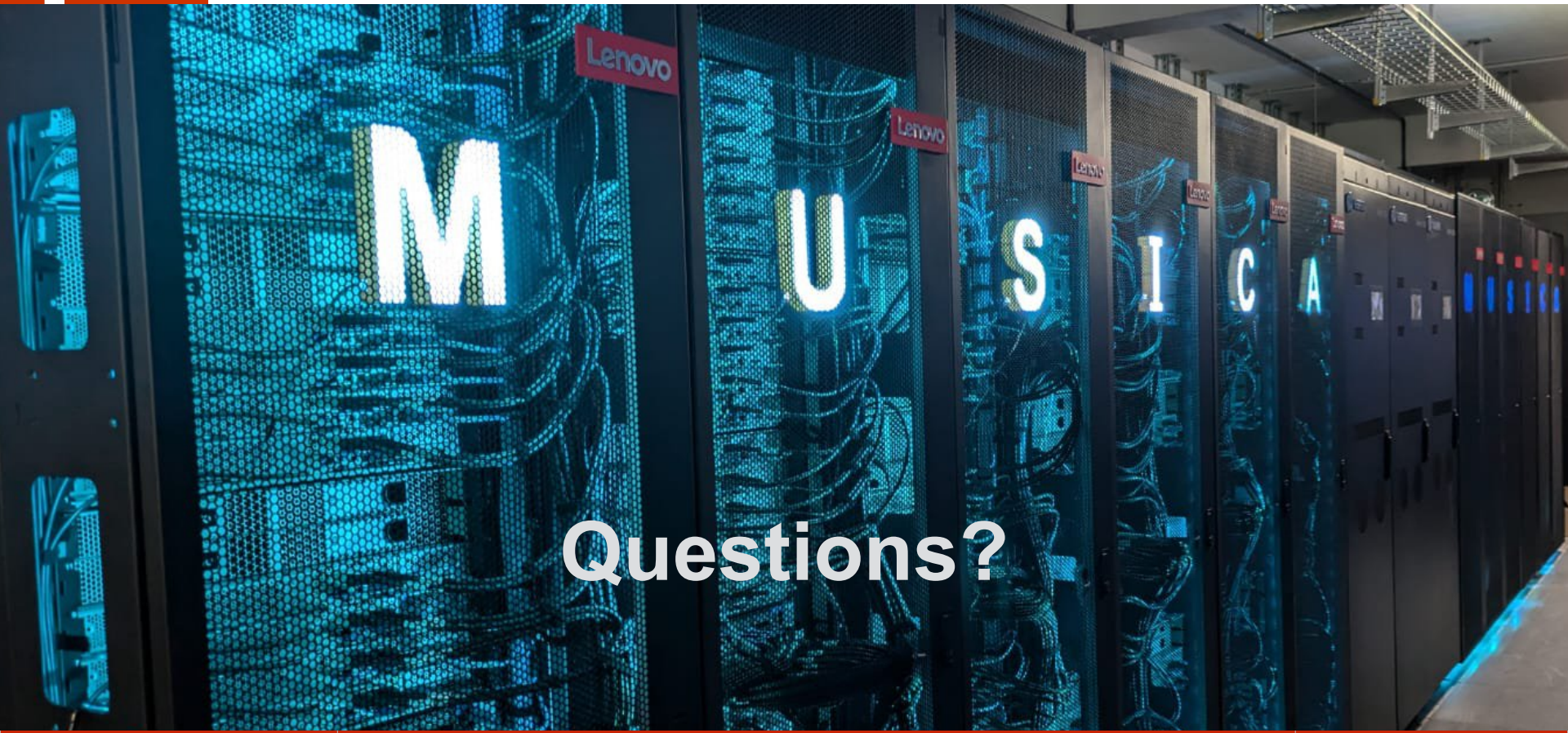
support@vsc.ac.at






# Questions?