



MODERATE

Marketable Open Data Solution for Optimized Building-related Energy Services

Watt's Up?

Hacking for Energy Efficiency



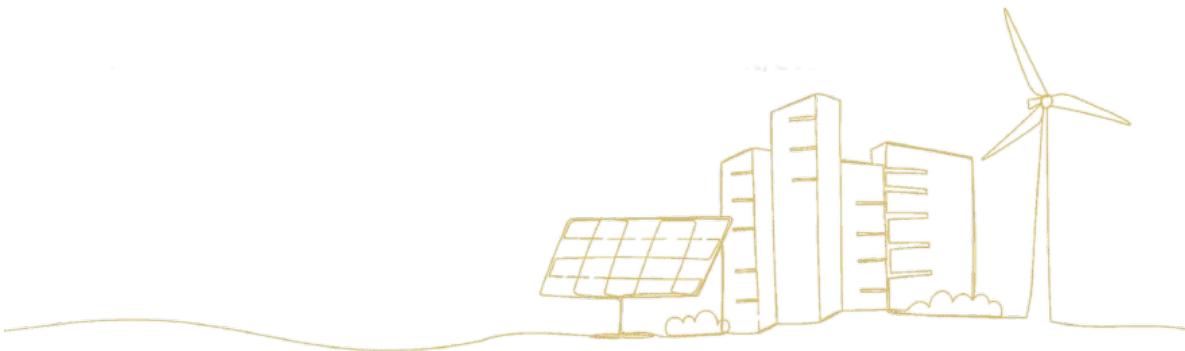
22-23 February 2025

Watt's Up Hackathon

Agenda

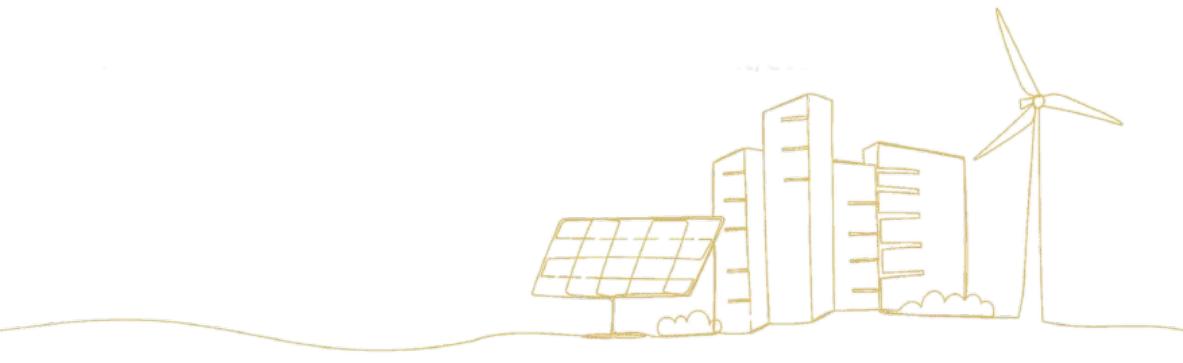
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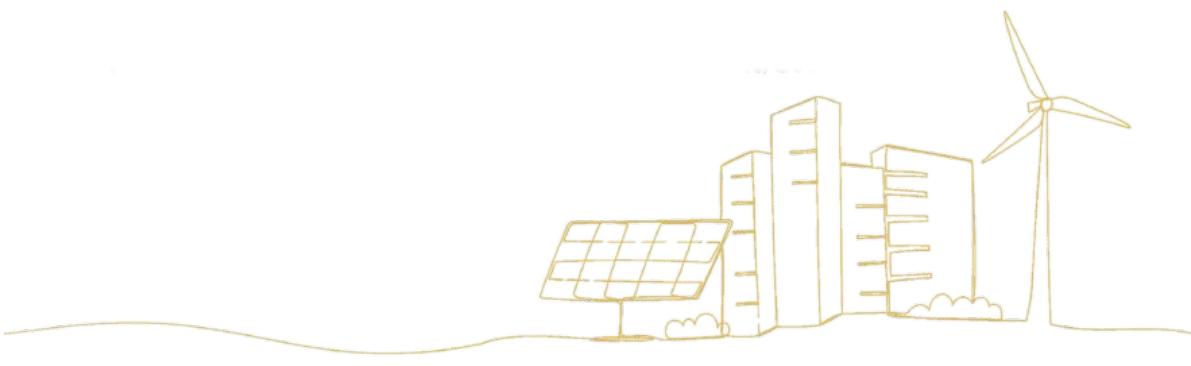
Day 1 – Saturday

- 09:00 Check-in
- 10:00 Welcome and participants pitching
- 11:00 Form groups and present the challenge
- 11:30 Setting up users for GPU access
- 13:00 Lunch
- 17:00 Coffee break
- 19:30 Dinner



Day 2

- 07:00 Breakfast and 2nd presentation round
- 11:30 Time ends and project presentation time
- 12:30 Lunch
- 14:00 Winner proclamation
- 15:00 End**



MODERATE project

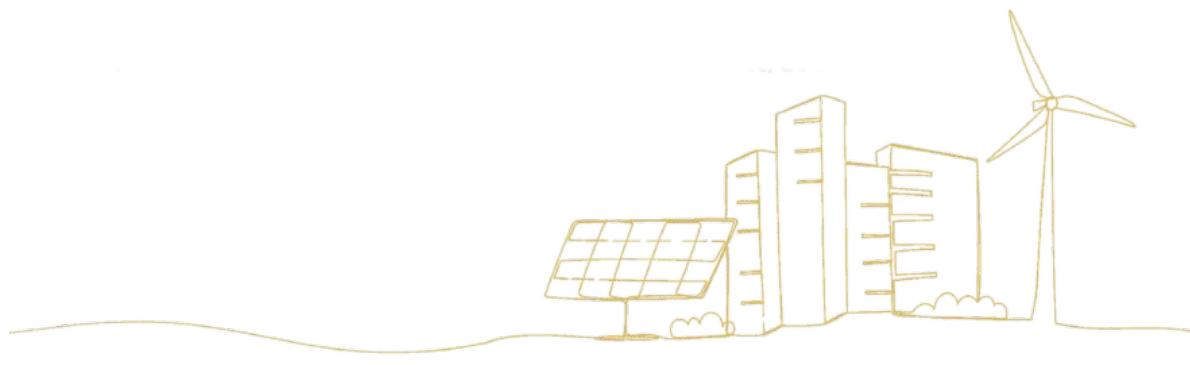


Funded by
the European Union

MODERATE project received funding from the European Union's Horizon Europe programme under the Grant Agreement No 101069834.

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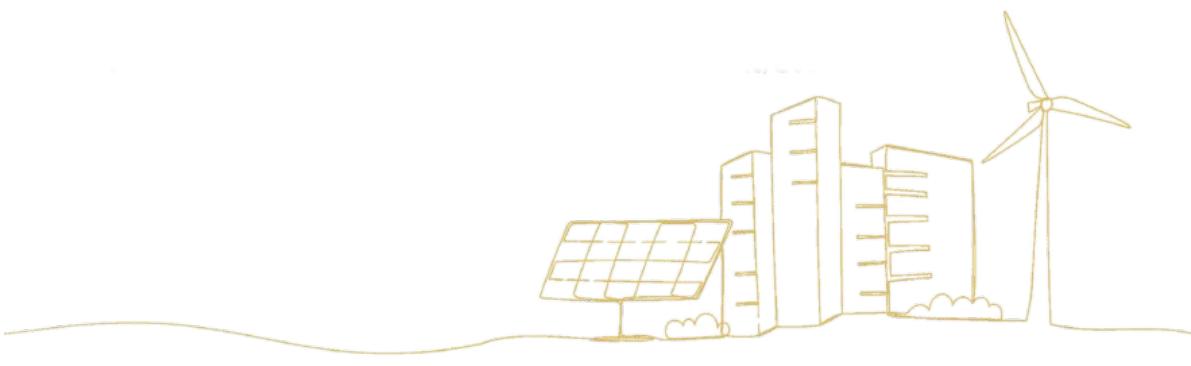
The project in a nutshell

Objective: Marketable Open Data Solutions for Optimized Building-Related Energy Services

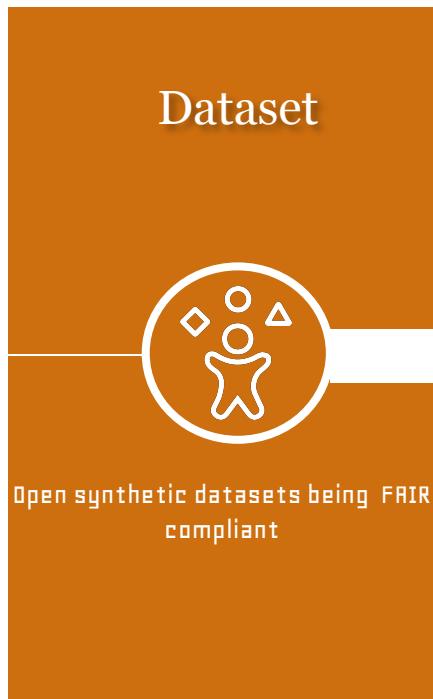
EURAC Research (coordinator)

17 partners

Horizon Europe project - 4 years

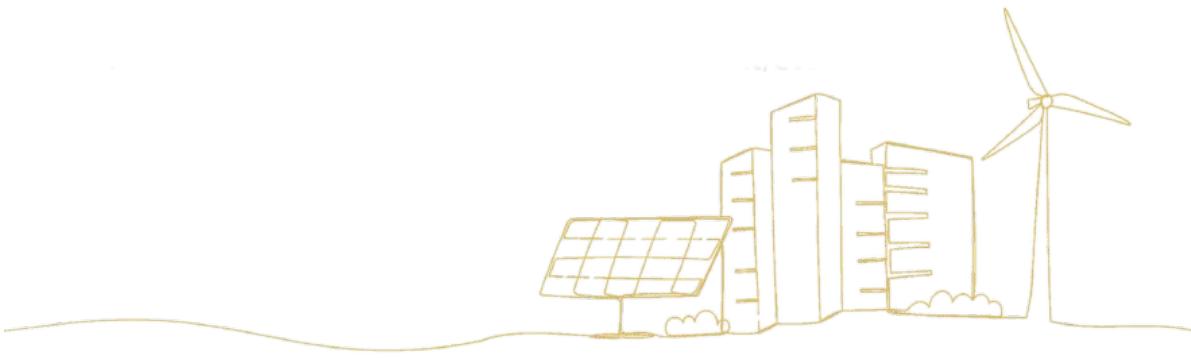


Outcome



Needs and barriers

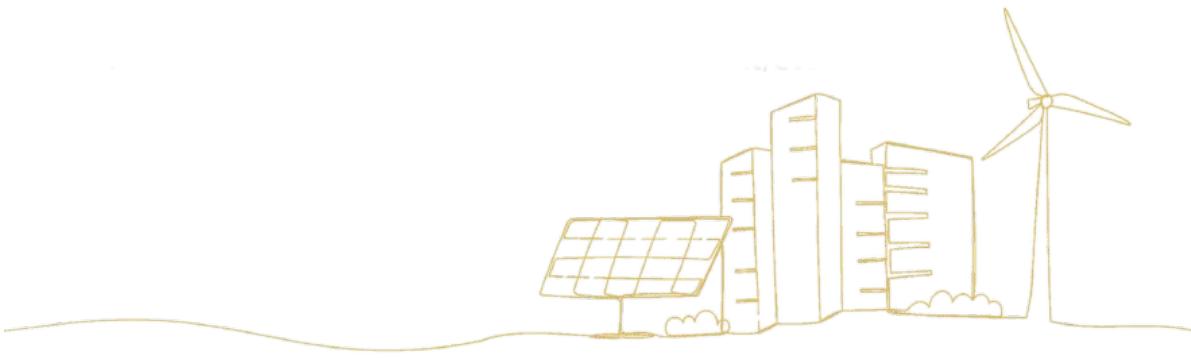
- Need for overcoming data confidentiality limitations
- Need for complete, **trusted** high **quality** datasets
- Increase **reliability** of data-driven services



VSC & EuroCC Austria

22-23 February 2025

Watt's Up Hackathon



Vienna Scientific Cluster (VSC)

Simeon Harrison

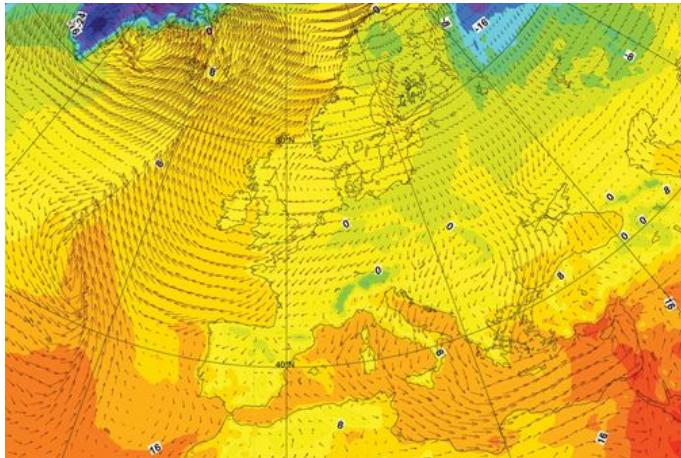
VSC Research Center, TU Wien



HPC ↔ Science



recurring core part of Nobel Prizes in Physics & Chemistry



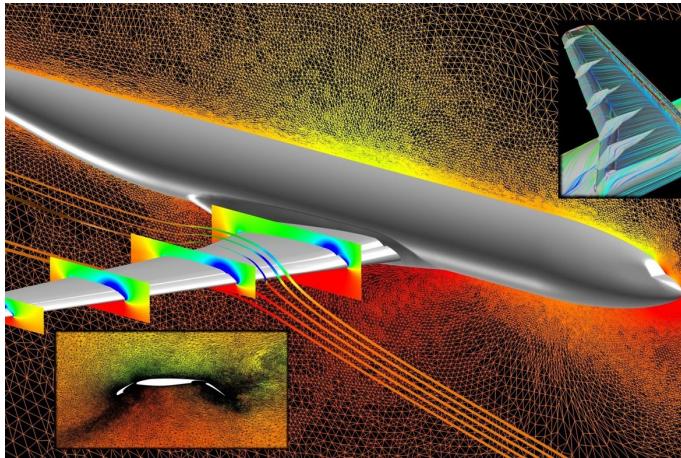
saving billions with better weather forecasting



improving human health with genomics, personalized medicine



better efficiency of wind turbines every year



design of future materials, ...



artificial intelligence, machine learning, sensors, open data

Source: prace-ri.eu

VSC – Vienna Scientific Cluster

VSC is a joint high performance computing (HPC) facility of **Austrian universities**.

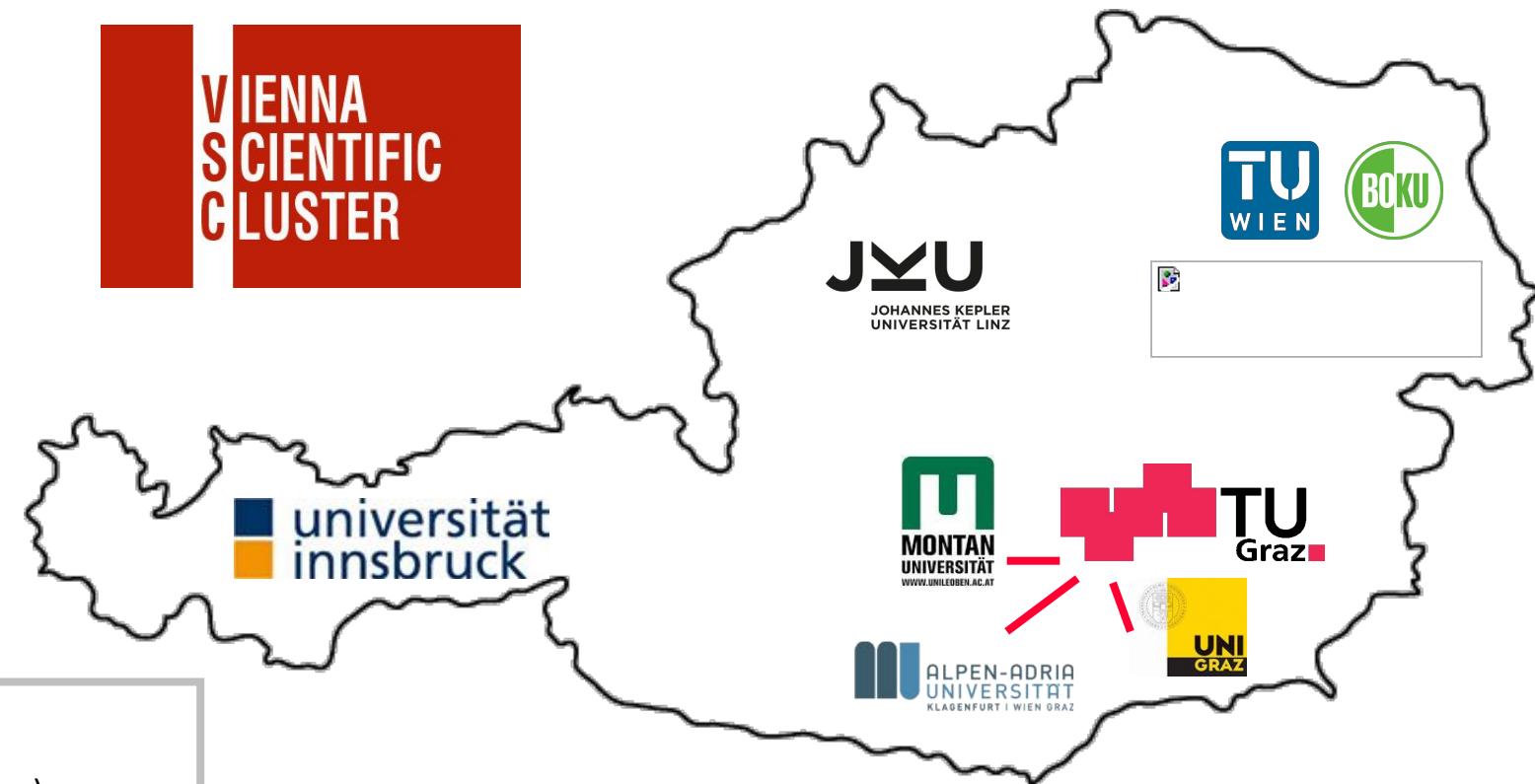
- vsc.ac.at
- vsc.ac.at/access
- vsc.ac.at/training



VSC is primarily devoted to research.



- + VSC
- + INITS (business incubator)
- + ACA (Advanced Computing Austria)



VSC – mission

Within the limits of available resources we satisfy the **HPC needs of our users**.

Provide and maintain the **hardware** & all **services** that are needed to use it.

- VSC-1 (2009) – 35 TFlop/s – #156 (11/2009) – #1: 1.8 PFlop/s
- VSC-2 (2011) – 135 TFlop/s – #56 (06/2011) – #1: 8 PFlop/s
- VSC-3 (2014) – 596 TFlop/s – #85 (11/2014) – #1: 33 PFlop/s
- **VSC-4 (2019)** – 2.7 PFlop/s – #82 (06/2019) – #1: 148 PFlop/s → **#396 (11/2024)**
- **VSC-5 CPU (2022)** – 2.3 PFlop/s – #301 (06/2022) – #1: 1.1 EFlop/s → **#499 (11/2024)**
- LEONARDO (2022) – 241.2 Pflop/s – #4 (11/2022) – #1: 1.1 EFlop/s → #9 (11/2024)
- **MUSICA PARTL (2024)** – 24.2 PFlop/s – **#50 (11/2024)** – #1: 1.7 EFlop/s → **#50 (11/2024)**

Y

VSC – access & important links

- **Who can use VSC?**

Scientific personnel of the partner universities, see: <https://vsc.ac.at/access>

VSC is open to users from other Austrian academic and research institutions.

- **Projects** (test, funded, ...):

Access to VSC is granted on the basis of **peer-reviewed projects**.

- **Project Manager** (= usually your supervisor):

Project application, extensions, creates user accounts, ...

- **Publications:**

Please acknowledge VSC and add publications ➡ visible on VSC homepage

- | | |
|---|--|
| ➡ https://vsc.ac.at | ➡ VSC homepage (general info) |
| ➡ https://service.vsc.ac.at | ➡ VSC service website (application) |
| ➡ https://docs.vsc.ac.at | ➡ VSC user documentation |
| ➡ support@vsc.ac.at | ➡ VSC user support & contact |
| ➡ https://vsc.ac.at/training | ➡ VSC training (VSC-Linux, VSC-Intro, latest version of slides) |

VSC – skills development, training and education

Only informed users can use HPC resources efficiently.

VSC Training and Education (2024):

- 42 training events/year
 - 80 training days/year
 - 1800 participants/year

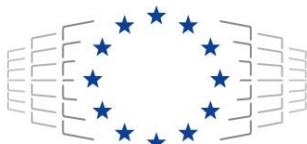


VSC Training: <https://vsc.ac.at/training>

PRACE Training Centre (PTC)



EuroHPC → partner @ LEONARDO (EuroHPC pre-exascale system)
→ access to EuroHPC systems
→ EuroCC+ CASTIEL



EuroHPC
Joint Undertaking



EUMaster4HPC

EVITA

15

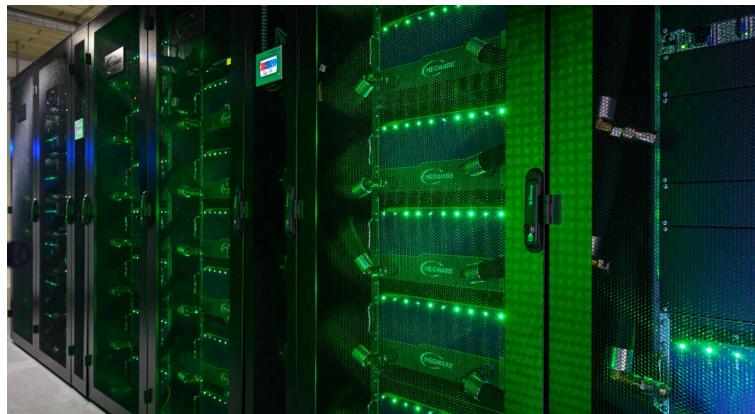
VSC – systems



VSC-4 (2019 → ...)

790 nodes
2 x Intel **Skylake** Platinum CPUs
2 x 24 cores/CPU
96 GB/node (384 GB / 768 GB)

48 nodes (2022 @VSC-5)
2 x Intel **Cascadelake** CPUs
2 x 48 cores/CPU
384 GB/node



VSC-5 (2022 → ...)

770 nodes
2 x AMD EPYC Milan (**Zen3**)
2 x 64 cores/CPU
512 GB/node (1 TB / 2 TB)

60 GPU nodes 2 x NVIDIA **A100** (Zen3)
40 GPU nodes 2 x NVIDIA **A40** (Zen2)



MUSICA (2024 → ...)

Vienna – 112 GPU + 72 CPU nodes
Innsbruck – 80 GPU + 48 CPU nodes
Linz – 80 GPU + 48 CPU nodes

GPU

4 x Nvidia **H100** 94 GB + NVLINK

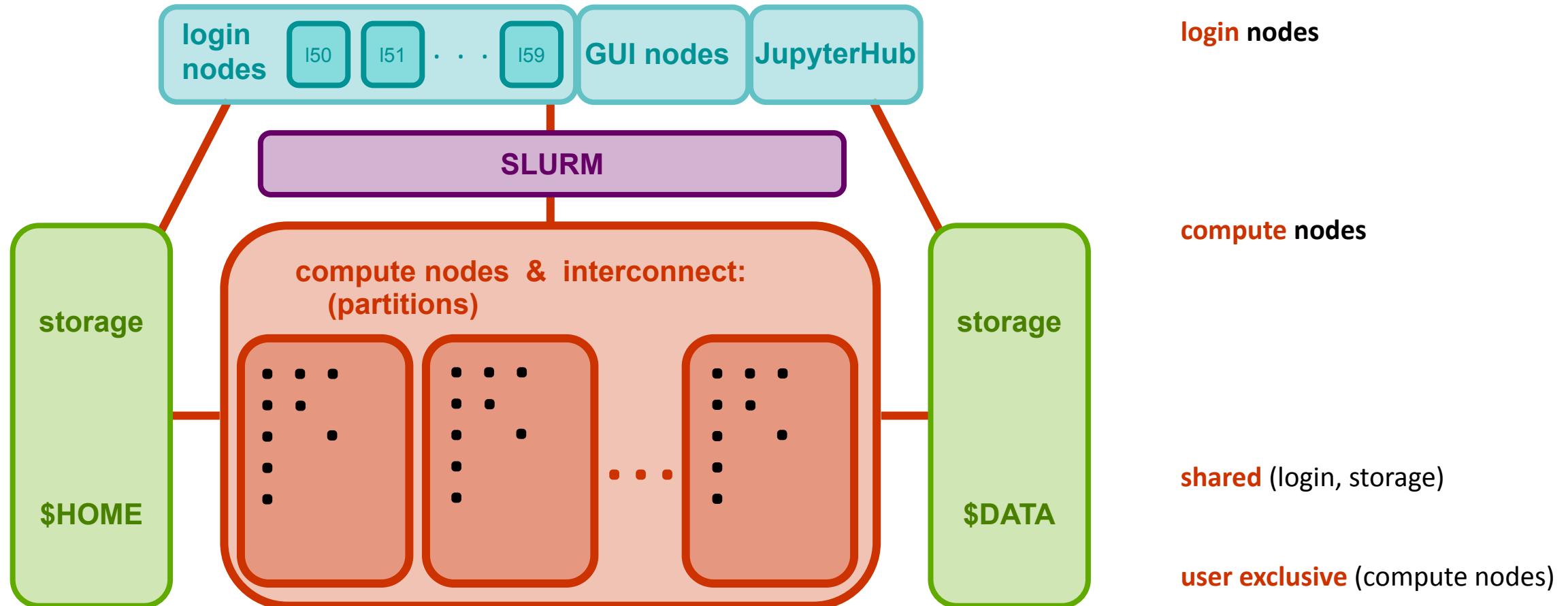
CPU

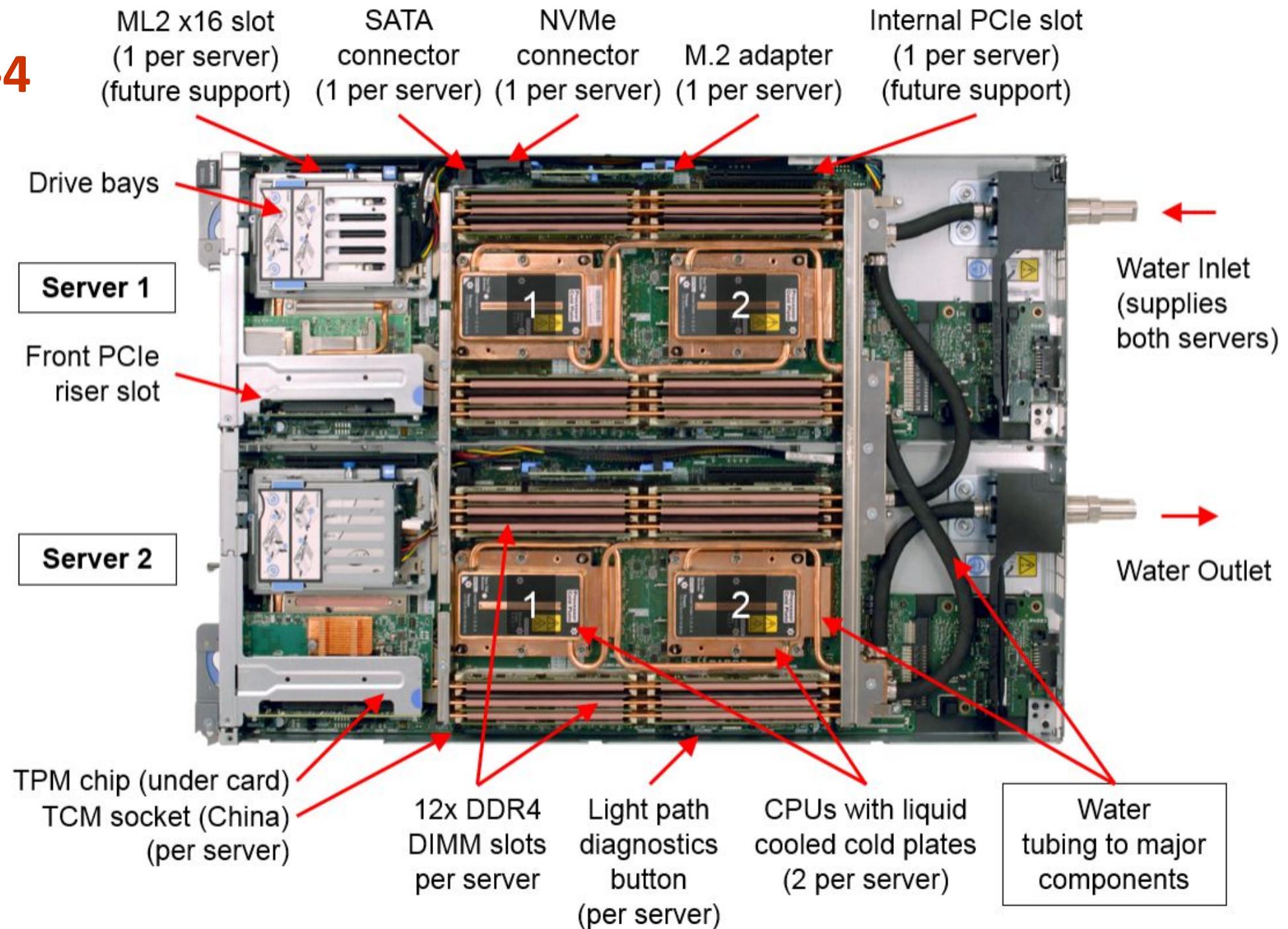
2 x AMD EPYC 9654

2 x 96 cores/CPU

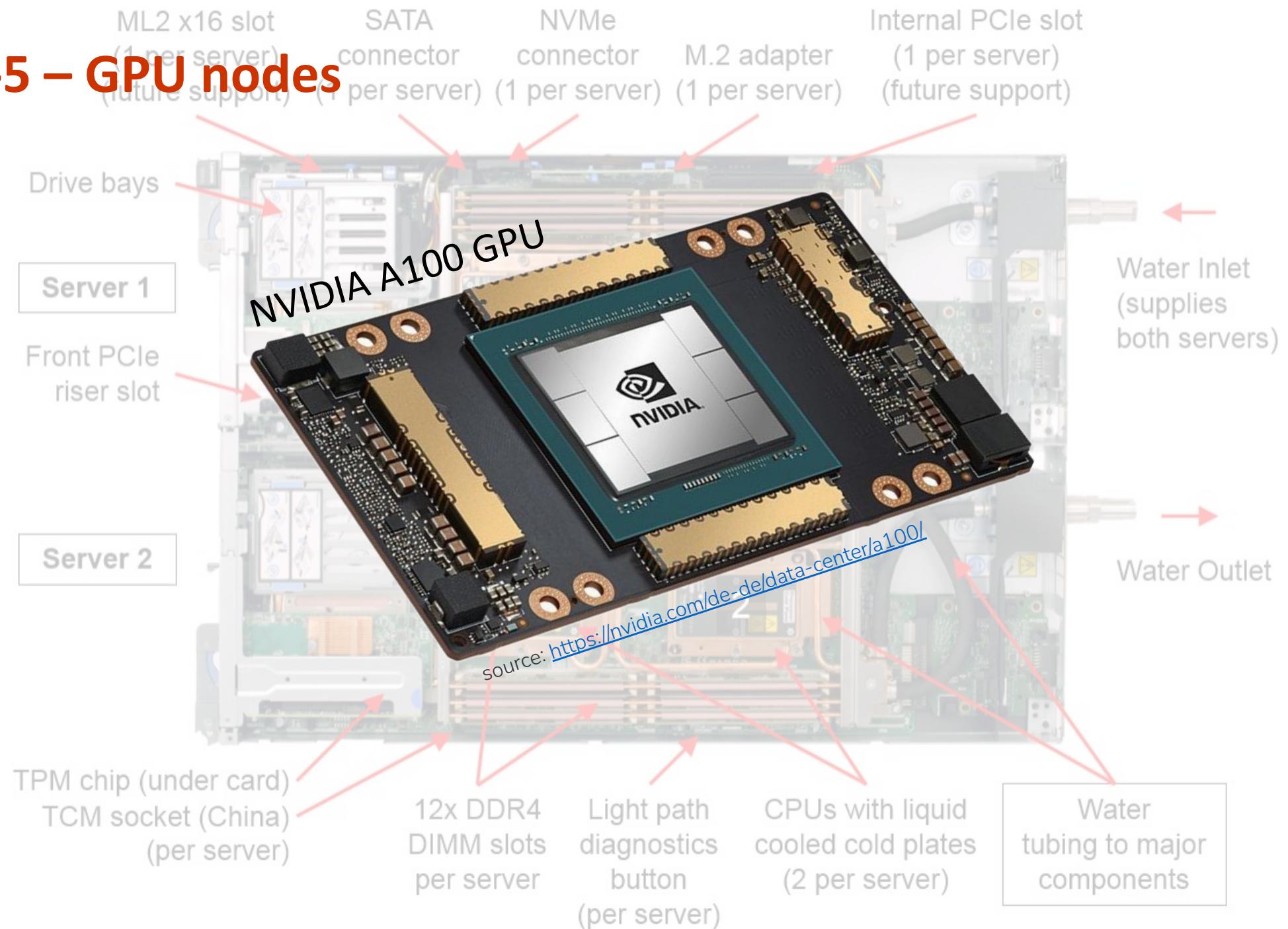
768 GB/node

VSC-5 – components of a supercomputer





VSC-5 – GPU nodes



EuroCC Austria

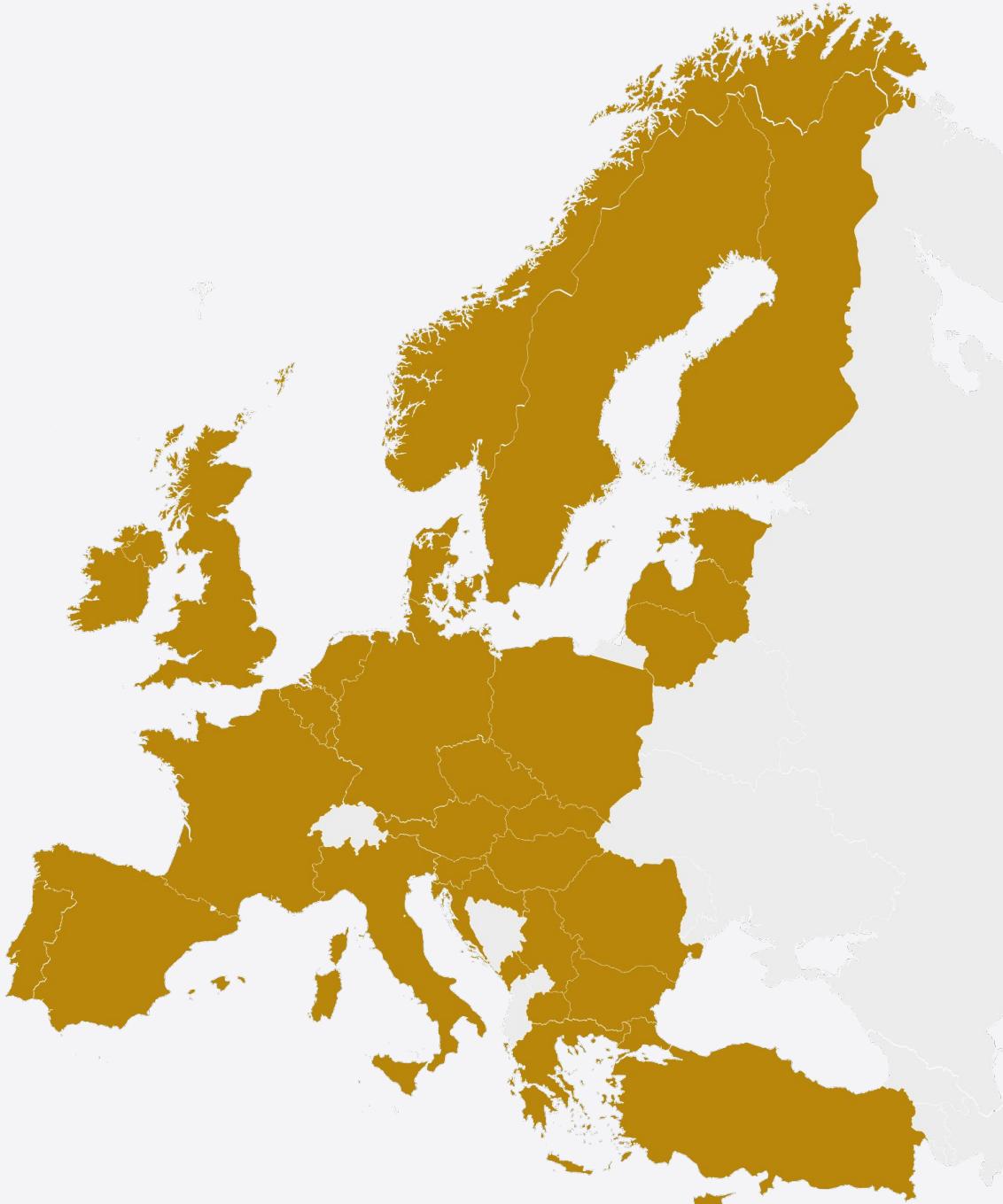
National Competence Center for HPC/HPDA & AI

Simeon Harrison (VSC Research Center, TU Wien)

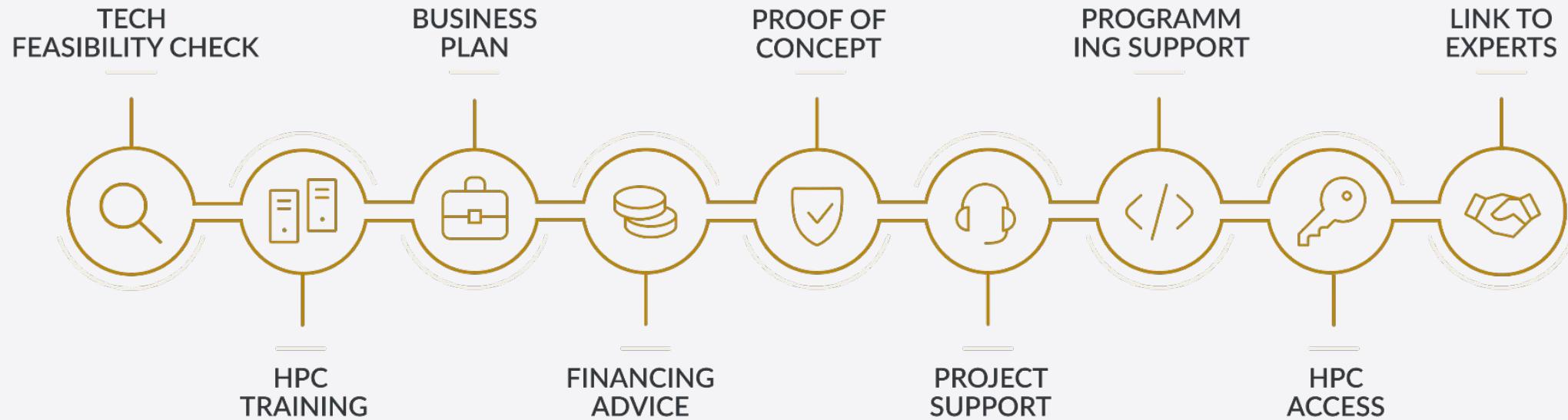
EuroCC

Fully funded EU project

- EuroCC is EU and nationally funded (50/50) international initiative aimed to support the uptake of AI and High-Performance Computing (HPC) in Europe
- Set up of 32 National Competence Centres (NCCs) across Europe
- EuroCC Austria is one of them
- Service Provider for AI, HPC and HPDA



EuroCC Austria's Services



CONSULTING – TRAINING - INFRASTRUCTURE

Need More Compute-Power?

LUMI

- Third most powerful supercomputer in Europe and the 8th globally (Nov 2024)
- Sustained computing power (HPL) is 380 petaflops
- Over 262 000 AMD EPYC CPU cores
- Equipped with AMD Radeon Instinct MI250X GPUs

<https://www.lumi-supercomputer.eu/>

Leonardo

- 4th most powerful supercomputer in Europe and the 9th globally (Nov 24)
- Sustained computing power (HPL) is 239 petaflops
- Intel new gen Sapphire Rapids 56 cores
- Equipped with custom NVIDIA A100 SXM6 64GB GPUs

<https://leonardo-supercomputer.cineca.eu/>

European HPC Landscape

EuroHPC JU systems

Different access modes:
[Calls for Proposals](#)

EuroHPC development access:
[Opportunity to test the system](#)

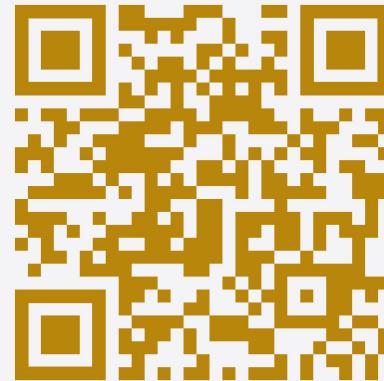
Applicants can request a small number of node hours to get acquainted with the supercomputers to further develop their software.



STAY IN TOUCH



EuroCC Austria



@eurocc_austria



eurocc-austria.at

THANK YOU

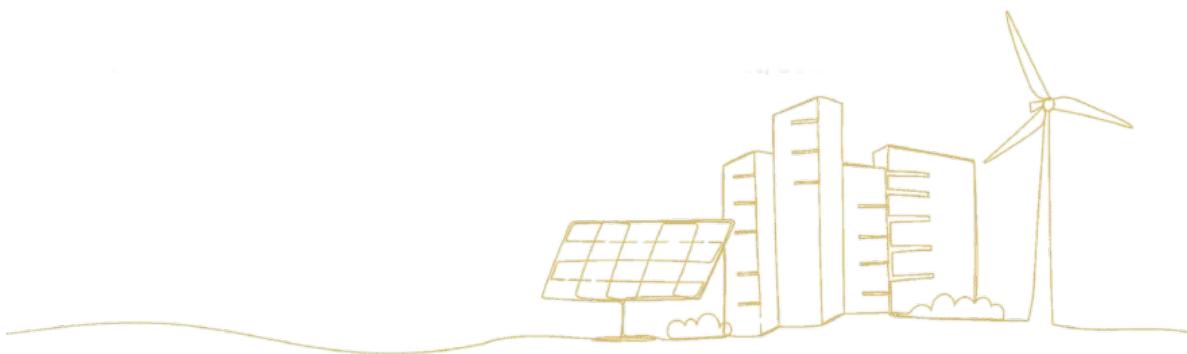


This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 101101903. The JU receives support from the Digital Europe Programme and Germany, Bulgaria, Austria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary,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





TU Wien - Energy Economic Group



Target oriented research via model based techno economic assessment from an energy systems' and energy economic perspective

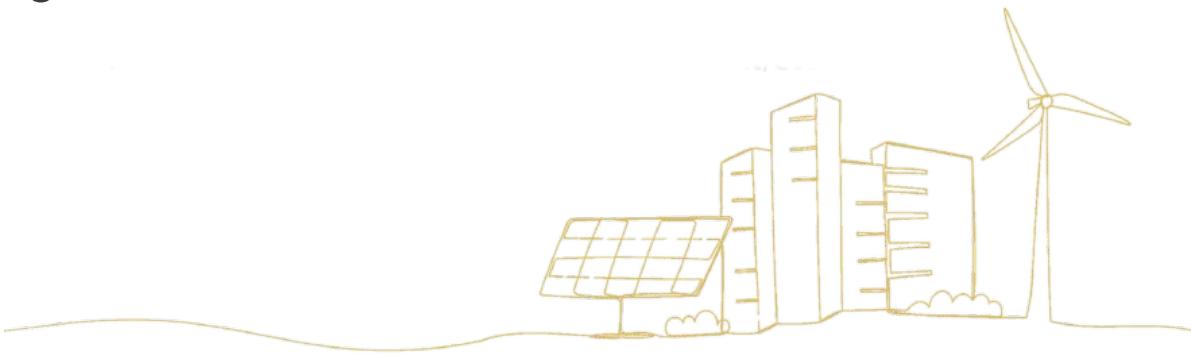
People: 2 Profs, 2 Postdocs, 1 Senior Scientist, 11 PhDs, 5 Student Researcher

1) Research topics:

- Energy demand and supply of Buildings
- District heating and Cooling
- Sector coupling heating and cooling to electricity

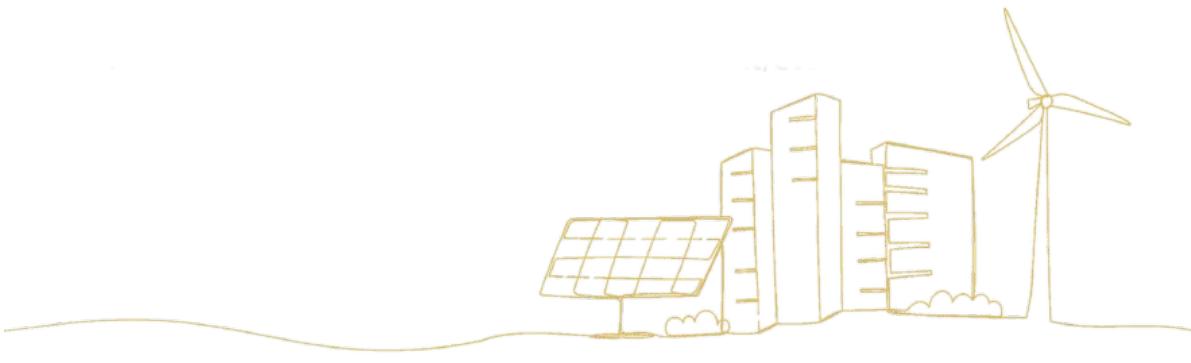
1) Teaching:

- Master program (specialty) for electrical engineers
- Energy Economics
- Optimization techniques





e-think energy research



e-think

Private research and consulting organisation

Based in Vienna

In operation since 2014

**Currently 9 people to advance low-carbon
energy transition**



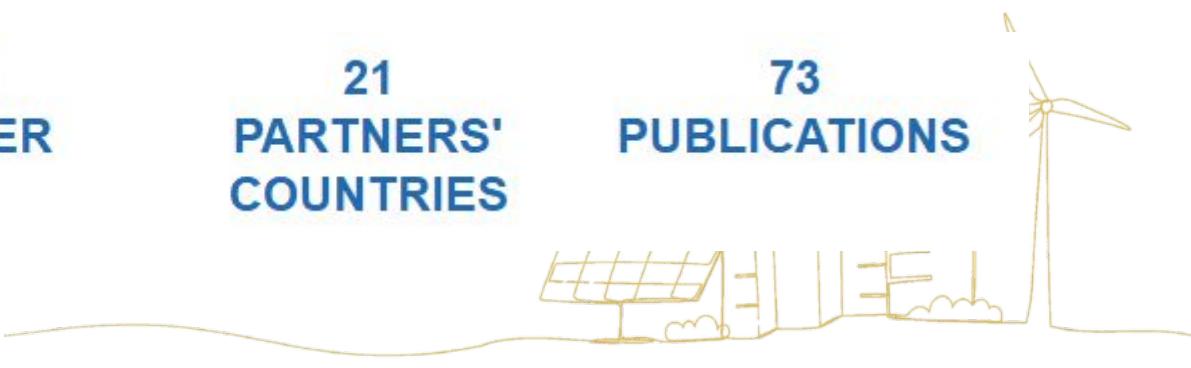
33
PROJECTS

16
CLIENTS

145
PARTNER

21
**PARTNERS'
COUNTRIES**

73
PUBLICATIONS



Core competencies

DECARBONISING THE
BUILT ENVIRONMENT



ADVANCING DATA
AND MODELLING



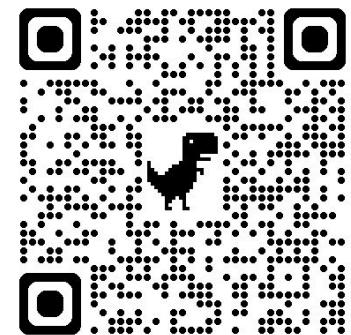
CLIMATE POLICY
AND FINANCING



HEATING AND
COOLING NETWORKS



LOCAL AND
REGIONAL ENERGY
PLANNING



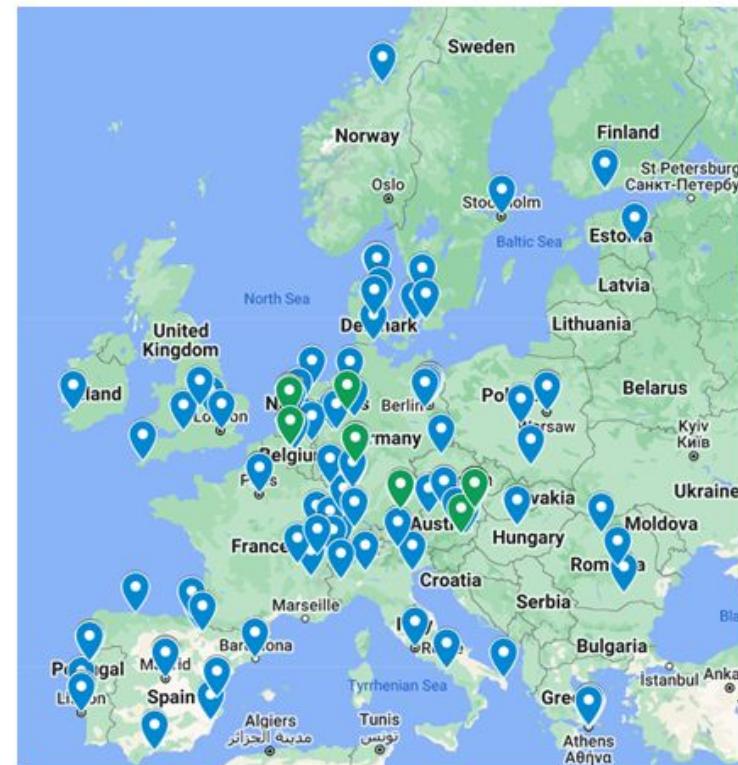
Some of our main projects:



Some of our main clients:



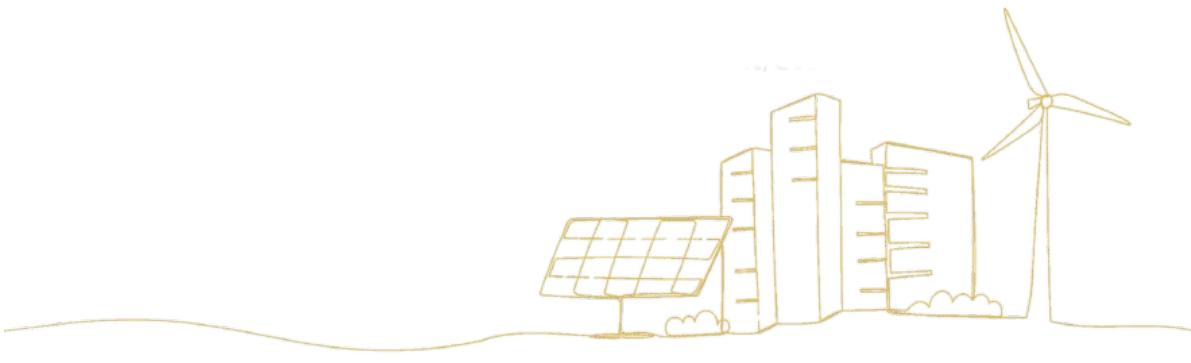
Our partners location:





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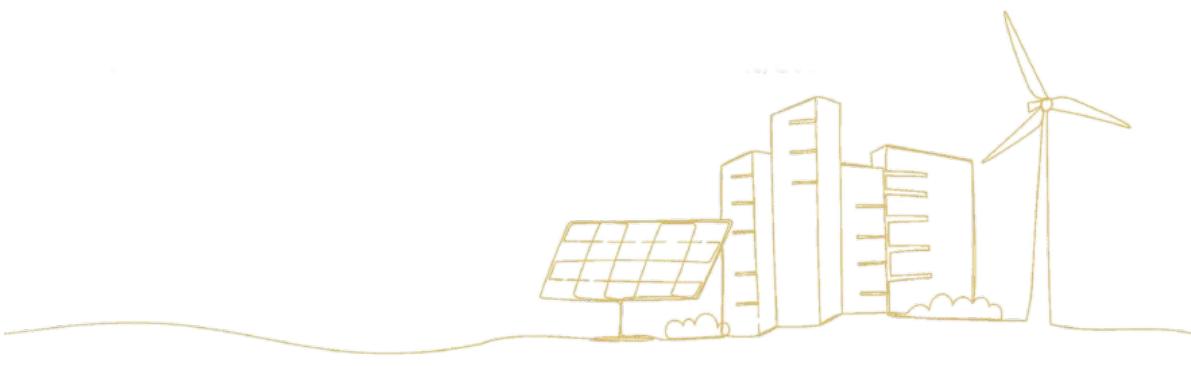


Vienna Data Science Group

We are a non-profit association promoting knowledge, educating people and caring about societal impact of data science and AI methods and techniques.

Mission

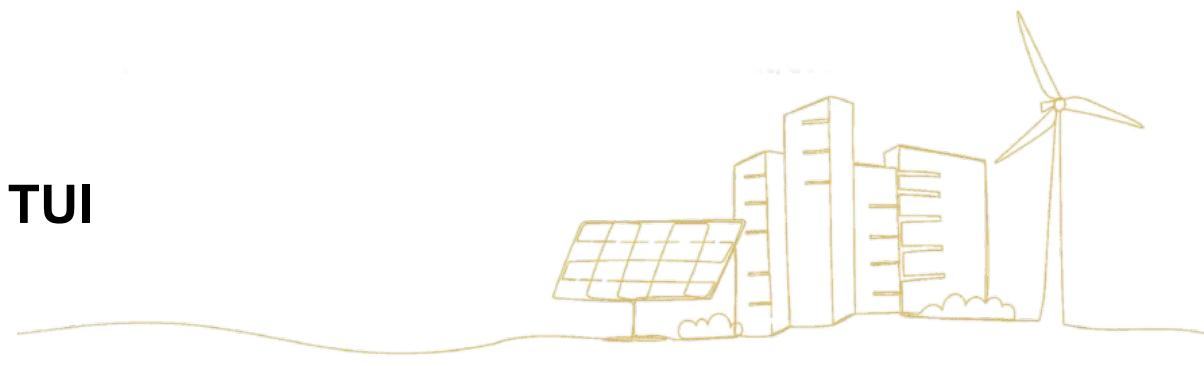
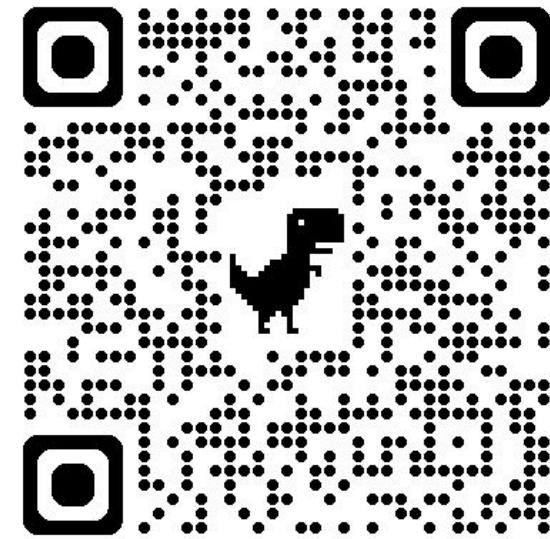
Create a vibrant, inclusive & supportive **community** of data scientists/engineers/... and all other enthusiasts.



Events

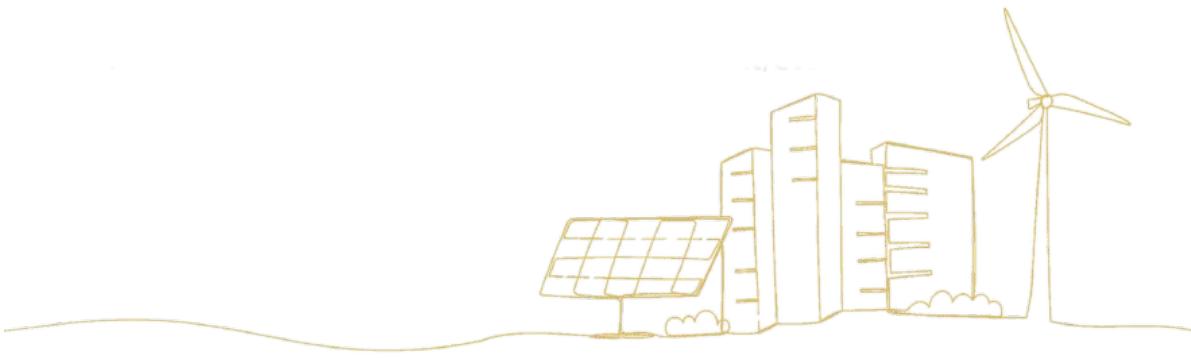
meetup

**27.03.2025
@Wiener Linien, MQ – Wiener Linien and TUI**

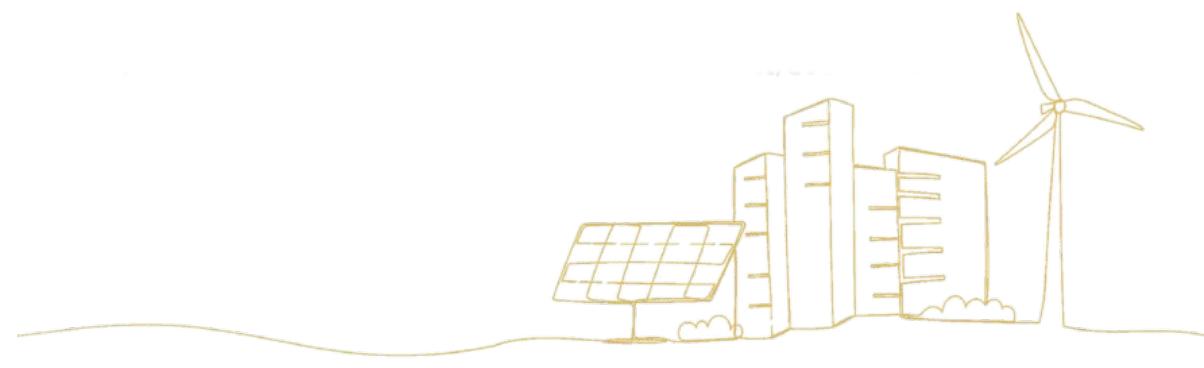


Participants

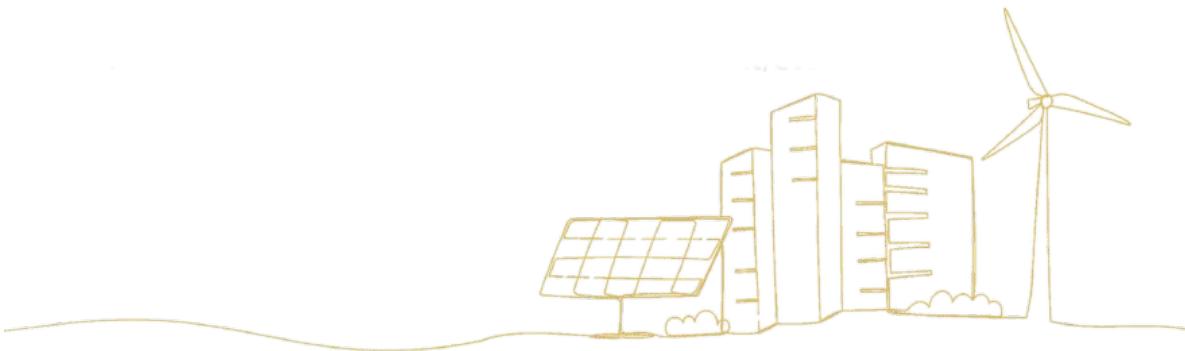
Group up



Short round of introduction



Set up GPU access



VSC & dataLAB access to GPUs

VSC: <https://jupyterhub.vsc.ac.at>

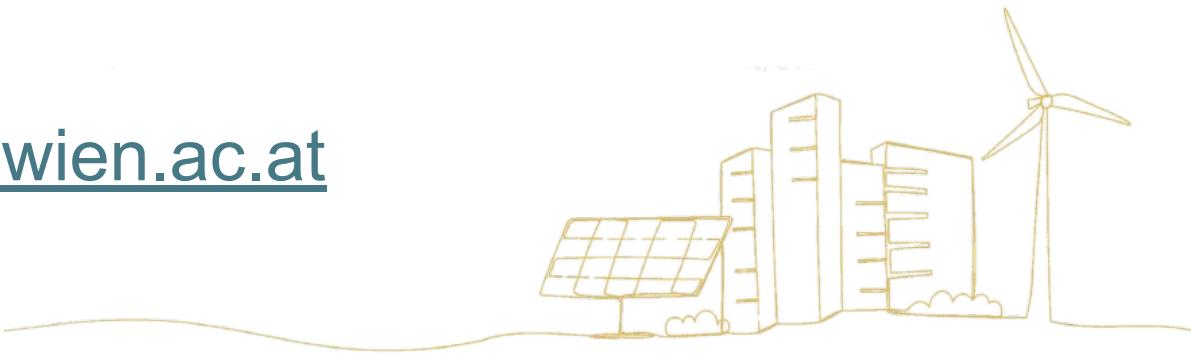
Username:

Password:

With **XX** as your user number.

2-factor authentication: You'll receive an SMS on your phone.

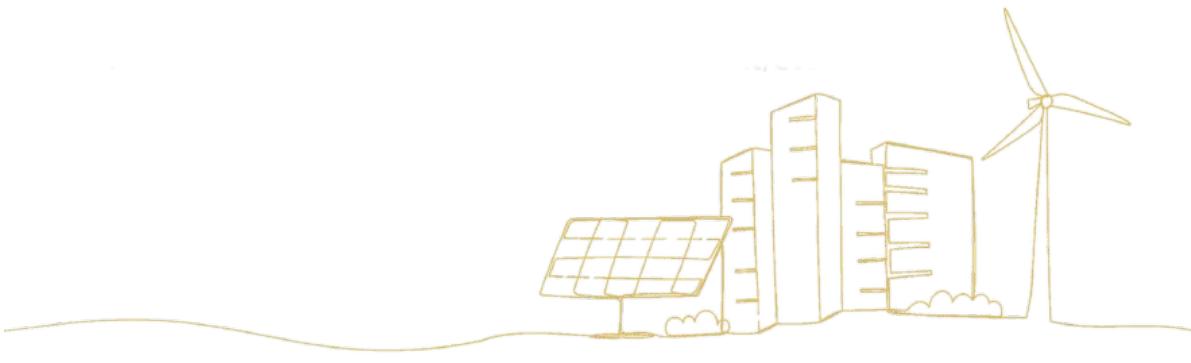
dataLAB: <https://hackathon.datalab.tuwien.ac.at>



Challenge

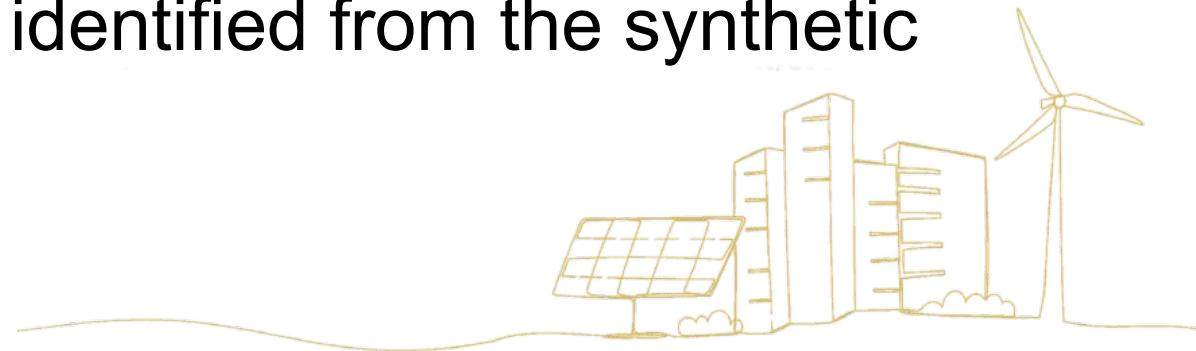
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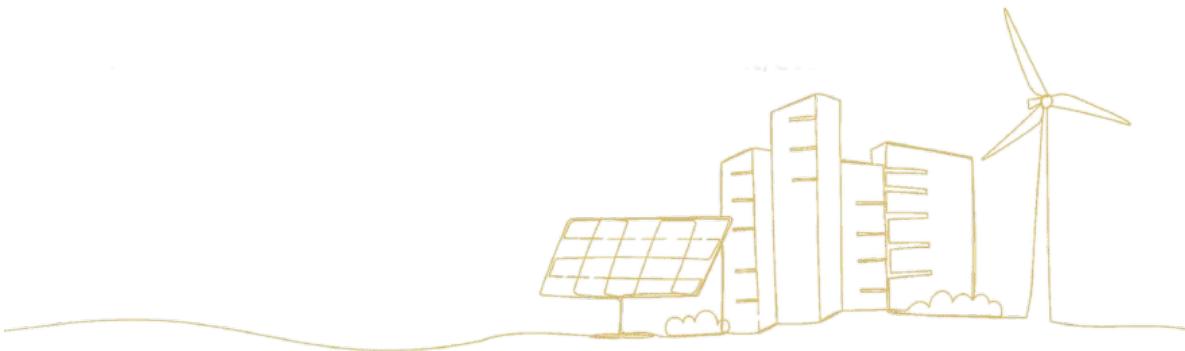
1) Synthetic smart meter data

- Times series data, even without any personal metadata or location information is considered to be personal data
- Create synthetic time series of single smart meter data (1 hour resolution) over a whole year (8760 hours)
- Synthetic profiles should resemble the real data in its statistics
- Personal information should not be able to be inferred from the synthetic data (e.g. specific household is on holidays)
- Original single profiles can not be identified from the synthetic ones



2) Trustworthiness of synthetic data

- How could one determine if synthetic data is “trustworthy”?
 - Find out if you can in fact infer any kind of personal information of the real profiles
 - Implement a validation pipeline that shows that this specific information on single profile level can not be inferred from the synthetic data



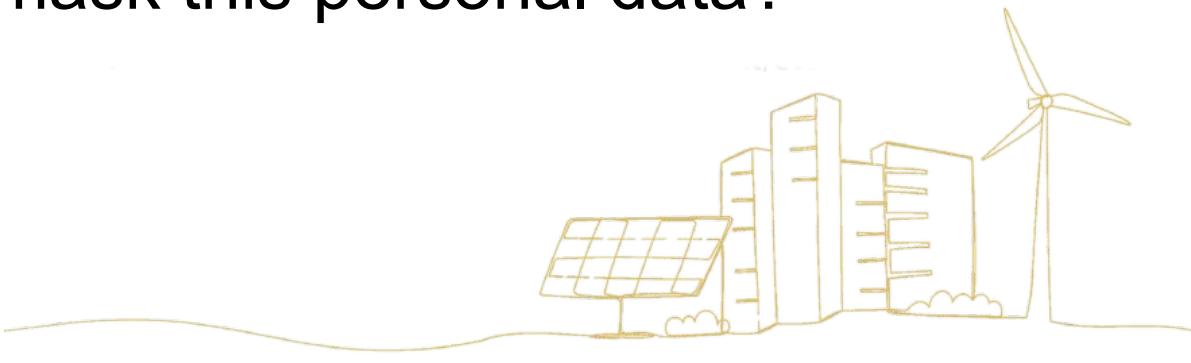
Evaluation

1. Synthetic Data:

- Statistics: hourly, daily, weekly, monthly trends
- Train a classifier and check how easy it can distinguish real from synthetic data

1. Trustworthiness:

- What personal data were you able to identify?
- Can synthetic data be used to mask this personal data?



Data and code for evaluation of results

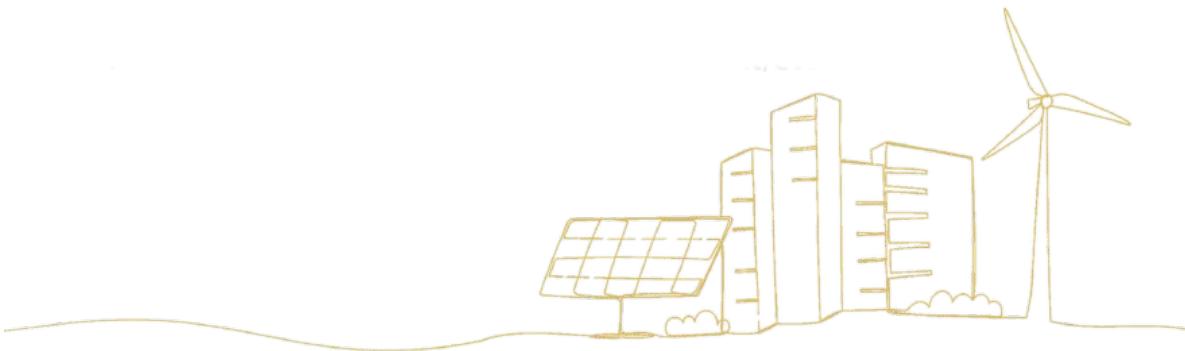
Synthetic load profiles: csv file, contains timestamp, each column is a profile with “kW” as values for each hour:

<https://1drv.ms/f/s!Auq7SOgHLJYkjrss3ZgYvTB5ugBgWw?e=axQYhu>

Some plots to visualize basic statistics for this data:

<https://github.com/dharringer/hackathon-watts-up.git>

Good luck and have fun!



Survey - please provide your feedback!

Overall experience

Organization

Content and outcome

Support

Feedback

Thank you for participating in our hackathon!

