Operational systems | Pre-exascale

LUMI Consortium (Coordinator CSC)
Kayaani, Finland

Leonardo Consortium (Coordinator CINECA)
Bologna, Italy

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)

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

Intel/Nvidia platform
• CPU: Intel Sapphire Rapids
• GPU: Nvidia custom Ambere (A100)
### 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
Access to EuroHPC Supercomputers

WHO IS ELIGIBLE?

Industrial enterprises and SMEs
Academic and research institutions (public and private)
Public sector organisations
Open to all fields of research

WHICH TYPES OF ACCESS EXIST?

Test and Benchmark Access
Development Access
Regular Access
Extreme 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
## GPU Node Hours Provided per Call type

<table>
<thead>
<tr>
<th>Access type</th>
<th>GPU Node hours*</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchmark access</td>
<td>Between 400 to 3000</td>
<td>3 months</td>
</tr>
<tr>
<td>Development access</td>
<td>Between 1000 and 10 000</td>
<td>6 or 12 months</td>
</tr>
<tr>
<td>Regular access</td>
<td>Up to 730 000</td>
<td>12 months</td>
</tr>
<tr>
<td>Extreme access</td>
<td>Up to 7.7 million</td>
<td>12 or 24 months</td>
</tr>
</tbody>
</table>

Node hours = Number of Nodes x Number of Cores per Node

Documentation on Current systems with GPU partitions

- [https://doc.vega.izum.si/](https://doc.vega.izum.si/) - VEGA
- [https://docs.it4i.cz/karolina/hardware-overview/](https://docs.it4i.cz/karolina/hardware-overview/) - Karolina
- [https://docs.lxp.lu/](https://docs.lxp.lu/) - Meluxina
- [https://docs.lumi-supercomputer.eu/](https://docs.lumi-supercomputer.eu/) - Lumi
- [https://leonardo-supercomputer.cineca.eu/hpc-system/](https://leonardo-supercomputer.cineca.eu/hpc-system/) - Leonardo
The European High Performance Computing Joint Undertaking (EuroHPC JU)

Access to Our Supercomputers

EuroHPC Access Calls
List of EuroHPC calls for proposals for access to compute time on EuroHPC supercomputers.

Access Policy and FAQ
How to access our supercomputers?

Awarded Projects
List of projects which have been awarded computing time on the EuroHPC supercomputers.

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https://eurohpc-ju.europa.eu/access-our-supercomputers/eurohpc-access-calls_en
AI Applications per System by August 2023

(42 of 119 are LLM applications)
Expert Support

EuroHPC JU Hosting Entities

IZUM
Institut informacijskih znanosti, Maribor

VSB TECHNICAL UNIVERSITY OF OSTRAVA

ITAINNOVATIONS
NATIONAL SUPERCOMPUTING CENTER

LUX PROVIDE
high performance computing society

CSC

SOFIA TECHPARK

CINECA

MACC
Minho Advanced Computing Center

BSC

And more....

33 EuroCC National Competence Centres across Europe

And more....
## Support @ EuroHPC JU Hosting Entities

<table>
<thead>
<tr>
<th>Centre</th>
<th>Projects</th>
<th>FTEs</th>
<th>Software &amp; Tools</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT4I</td>
<td>99</td>
<td>10</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>CSC</td>
<td>14</td>
<td>3</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Support @ your country by EuroCC NCCs

- [https://www.eurocc-access.eu/about-us/meet-the-nccs/](https://www.eurocc-access.eu/about-us/meet-the-nccs/)

![Bar chart showing AI projects supported by EuroCC NCCs in their countries]
EuroCC Training on AI

✓ High Performance Data Analytics in Python
✓ Data Analysis and Plotting in Python with Pandas
✓ Advanced Deep Learning with Transformers
✓ Megatron Bootcamp
✓ Training on HPDA for climate data with the Ophidia framework
✓ Upscaling AI with Containers
✓ Applications of AI for Predictive Maintenance
✓ Applications of AI for Anomaly Detection
✓ Fundamentals of Deep Learning for Multi-GPUs
✓ Efficient multi-GPU and multi-node execution of AI applications and frameworks
✓ AI for Industry
✓ AI on Supercomputers
✓ AI for Industry: Advance level

✓ AI basics
✓ Practical Deep Learning workshop
✓ “AI for Science” NVIDIA Bootcamp
✓ Workshop on High-performance Data Analytics
✓ AI as a Tool for Change
✓ Advanced Deep Learning with Transformers
✓ Introduction to Deep-Learning
✓ Creative AI Webinar

https://www.eurocc-access.eu/services/training/
Glass beads are among the most common grave goods in the early Middle Ages, and their number can be estimated in the millions. The colour, size, shape, production technique and decoration of the beads that are discovered in burial sites contain much information that is relevant for historians regarding social customs, trade routes and production networks.

A research group from the University of Vienna sought to improve and validate the accuracy of existing deep embedded non-redundant clustering methods to find different informative ways to categorise the glass beads.
A research group from the University of Gothenburg wanted to better understand the distribution of global poverty historically and geographically. To do this, they set out to train deep-learning models to predict health and living conditions using satellite images.

The research group used TensorFlow on the EuroHPC JU Karolina supercomputer in the Czech Republic to address their project and successfully implement their observations.

The new data gathered will allow scholars to examine the causal effects of foreign aid on the likelihood of impoverished communities overcoming poverty. This, in turn, will enhance the alignment of development and aid initiatives with the challenges they aim to address.
Using EuroHPC Vega System by the Swedish National Archives

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 through 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.

Adapting AI-technology for use in archives

- Image segmentation models
- Text-recognition

Make scanned images searchable

384 000 GPU core hours
(Development Access, VEGA)

The Property Record Indexing Pipeline

1. Input Images
2. OCR:
   - Font Segmentation
   - ICNN Script classification
3. SATRN:
   - Handwritten Text detection
4. SATRN:
   - Handwritten Word segmentation
5. Indexing:
   - Indexing:
     - Link against validation database
6. Database

Riksarkivet
Thank you!

Questions?

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