

# COMPUTING INFRASTRUCTURE



## EMPOWERING INNOVATIONS WITH SUPERCOMPUTERS AND QUANTUM COMPUTER

IT4Innovations National Supercomputing Center at VSB – Technical University of Ostrava is a leading research, development, and innovation centre active in the fields of High-Performance Computing (HPC), Data Analysis (HPDA), Quantum Computing (QC), and Artificial Intelligence (AI) and their application to other scientific fields, industry, and society. IT4Innovations operates the most powerful supercomputing systems in the Czech Republic, which are provided to Czech and foreign research teams from both academia and industry. Together with the CESNET and CERIT-SC institutions, IT4Innovations constitutes e-INFRA CZ, a strategic research infrastructure of the Czech Republic.

IT4Innovations currently operates two supercomputers, Barbora (849 TFlop/s) and Karolina (15.7 PFlop/s), as well as smaller complementary systems that provide users with access to emerging, non-traditional or highly specialized hardware architectures.

Czech research communities also have access to the LUMI supercomputer thanks to IT4Innovations' membership in the LUMI consortium. LUMI has a peak theoretical performance of 531.5 PFlop/s and is located in Kajaani, Finland. IT4Innovations also participates in its operation.

The LUMI-Q consortium's VLQ quantum computer, based on 24 supercomputing qubits and with a unique star topology, will be installed at IT4Innovations in 2025.

## Computational Resources Allocation

The computational resources of IT4Innovations are dedicated to solving problems from research and development done by academic and research institutions. Part of the capacity is dedicated to development of collaboration between academia and industry, or for the industry itself.

**Open Access** – this category of access aims to allocate computational resources to the research community in the Czech Republic based on scientific excellence, computational competence and readiness, and anticipated benefits to society and the economy. Eligible applicants are research organisations located in the Czech Republic or their employees. The largest share of the computational resources is distributed within the framework of Open Access Grant Competitions.

**Access for Thematic HPC Resource Utilisation** – allocations for socially important tasks, teaching and educational activities, commercial activities (contract research), and in-house infrastructure research. Submissions at any time.

Access to IT4Innovations computational resources can also be gained through **EuroHPC JU Grant Competitions** announced by the EuroHPC JU.

IT4Innovations is a proud member of



# TECHNICAL SPECIFICATIONS SUPERCOMPUTERS

Specifications	BARBORA	KAROLINA	LUMI
Put into operation	Autumn 2019	Summer 2021	Winter 2023
Theoretical peak performance	849 TFlop/s	15.7 PFlop/s	531,5 PFlop/s
Operating system	RHEL 8	Rocky Linux 8.x	HPE Cray OS
Compute nodes	201	831	5,042
Types of compute nodes	<p><b>192 CPU nodes</b> 2x Intel Cascade Lake 6240, 18-core, 2.6 GHz, 192 GB RAM</p> <p><b>8 GPU nodes</b> 2x Intel Skylake 6126, 12-core, 2.6 GHz, 192 GB RAM, 4x NVIDIA Tesla V100, 16 GB HBM2</p> <p><b>1 data analytics node</b> 8x Intel Xeon 8153, 16-core, 2.0 GHz, 6 TB RAM</p>	<p><b>756 CPU nodes</b> 2x AMD EPYC 7h12, 64-core, 2.6 GHz, 256 GB RAM</p> <p><b>72 GPU nodes</b> 2x AMD EPYC 7763, 64-core, 2.45 GHz, 1 TB RAM, 8x NVIDIA A100, 40 GB HBM2</p> <p><b>1 data analytics node</b> 32x Intel Xeon-SC 8628, 24-core, 2.9 GHz, 24 TB RAM</p> <p><b>2 visualisation nodes</b> 2x AMD EPYC 7452, 32-core, 2.35 GHz, 256 GB RAM, 1x NVIDIA RTX 6000 GPU</p>	<p><b>2,048 CPU nodes</b> 2x AMD EPYC 7763, 64-core, 2.45 GHz, 256-1024 GB RAM</p> <p><b>2,978 GPU nodes</b> 1x AMD EPYC 7A53, 64-core, 2.45 GHz, 512 GB RAM, 4x AMD Instinct MI250X GPUs, 128 GB HBM2e</p> <p><b>8 data analytics nodes</b> 2x AMD EPYC 7742, 64-core, 2.25 GHz, 4 TB RAM</p> <p><b>8 visualisation nodes</b> 2x AMD EPYC 7742, 64-core, 2.25 GHz, 2 TB RAM, 8x NVIDIA A40 GPU</p>
Accelerators in total	32x NVIDIA Tesla V100	576x NVIDIA Tesla A100, 2x NVIDIA RTX 6000	11,912x AMD Instinct MI250X, 8x NVIDIA A40
CPU cores in total	7,232	106,880	454,784
Storage	29 TB / home, 310 TB / scratch (28 GB/s)	30 TB / home, 1,275 TB / scratch (NVMe, 730 GB/s sequential write performance, 1,198 GB/s sequential read performance)	81 PB / (home + project + scratch) (240 GB/s)
Interconnection	Infiniband HDR 200 Gb/s	Infiniband HDR 200 Gb/s	Slingshot-11 200 Gb/s