

The new supercomputer in Ostrava is called Barbora

In Ostrava, on Wednesday the 2nd of October 2019, the ceremony for the new supercomputer being put into operation at IT4Innovations National Supercomputing Center at VSB - Technical University of Ostrava was held. It has expanded the family of supercomputers installed at the centre. The winning name of the competition was Barbora.

The opening ceremony on the 2nd of October was attended by Václav Snášel, Rector of VSB-TUO, Evžen Tošenovský, Chairman of the Board of VSB-TUO and IT4Innovations, Pavel Doleček, Deputy Minister of Education, Petr Očko, Deputy Minister of Industry and Trade, Roland Galharague, the French Ambassador, Erich Unterwurzacher, the Director for Central Europe at DG Regio, and Ivo Vondrák, Governor of the Moravian-Silesian Region.

Barbora, the new supercomputer, was supplied by Atos IT Solutions and Services, and is an extension of the existing Anselm supercomputer, which was commissioned in 2013. It was officially taken over by IT4Innovations National Supercomputing Center and commissioned in late September 2019. "Our goal is to regularly renew our computing resources so that our users have access to state-of-the-art computing systems, and to be able to meet their growing requirements as much as possible," says Vít Vondrák, Director of IT4Innovations National Supercomputing Center.

"We believe that the supercomputer Barbora, based on state-of-the-art technologies, will meet all IT4Innovations' expectations," says Albert Gallina, Head of Big Data & HPC Central and Eastern Europe at Atos, explaining: "Atos is Europe's leading supercomputer and artificial intelligence player, an initiative to build a pan-European infrastructure for high-end supercomputers. We are grateful for the opportunity to work with IT4Innovations again, and contribute to the development of science and research at a national and European level."

The combined theoretical computational performance of the supercomputer Barbora is 826 TFlop/s, which is almost 9 times more than the now outdated supercomputer Anselm. Salomon continues to be the most powerful IT4Innovations system at 2,000 TFlop/s. Compared to the supercomputer Anselm, Barbora has a total computing node memory capacity of 43TB (compared to the current 15TB), up to 28GB/s (up to 6GB/s) and up to 200Gb/s (up to 40Gb/s). Built on the Bull Sequana XH2000 HPC architecture, Barbora is the first ever installation of this type in the world.

"It is also worth mentioning a technological shift in some areas. The cooling of the computing nodes is done with hot water, which leads to savings in operating costs. In addition, the new system delivers hot water cooling technology at the switch and power supply level of the computing system, increasing cooling efficiency over the older Anselm and Salomon systems. A new 512-bit instruction set (AVX-512) is available on the processors. Computing node memory is 50% larger and 50% faster, networking is 2 times faster than the supercomputer Salomon. Also, file handling is sped up thanks to NVMe technology. With 32 GPU accelerators, the NVIDIA V100 delivers up to 4 PFlop/s of theoretical performance through tensor units to accelerate artificial intelligence calculations. In practice, this means 1.5 to 3 times faster routine calculations and the possibility to train even larger neural networks," said Branislav Jansík, director of IT4Innovations supercomputer services.

The state-of-the-art technology and services in the area of high-performance computing and data analysis are provided to IT4Innovations National Supercomputing Center by Czech and foreign research teams from academia and industry. The newly installed supercomputer Barbora will also contribute to this. *“The demand for computing resources in our centre currently exceeds our capacity more than once. I am therefore pleased that by installing Barbora in the next round of the grant competition we can meet more people interested in computing time and also meet their requirements for the latest technologies, such as GPU accelerators,”* adds Vondrák.

The name of the new supercomputer was selected by a panel of judges from a total of 1,237 submitted proposals (985 of which were unique names). The winning name of BARBORA appeared in the submitted proposals 14 times. Barbora refers not only to the patron saint of miners, but it was also the name of one of the mines in the Ostrava-Karviná district, as is the case with the names of the other supercomputers – Anselm and Salomon. From the proposals received, 3 winners were selected who received valuable prizes from Atos IT Solutions and Services, s.r.o. at the opening ceremony on the 2nd of October, 2019.

Technical specifications

- Computing nodes:
 - 192 standard computational nodes; each node is equipped with two 18-core Intel processors and 192 GB of RAM,
 - 8 compute nodes with GPU accelerators; Each node is equipped with two 12-core Intel processors, four NVIDIA V100 GPU accelerators with 16 GB of graphics memory and 192 GB of RAM.
 - The fat node is equipped with eight 16-core Intel processors and 6TB RAM.
- The supercomputer Barbora is built on the HPC architecture of Bull Sequana XH2000,
- Cooling of standard computational nodes uses the technology of direct cooling of components by liquid medium, and the most effective cooling by so called ‘warm water’ is used.
- The computing network is built on the latest Infiniband HDR technology.
- 310 TB SCRATCH data storage with 28 GB/s throughput using Burst Buffer acceleration.
- Data storage for NVMe over Fabric calculations with a total capacity of 22.4 TB, dynamically allocated to compute nodes.
- Bull Super Computer Suite cluster operation and management software solution, PBS Pro scheduler and resource manager.

The supercomputer Barbora was acquired as part of the OP RDE project entitled “IT4Innovations National Supercomputing Center - the way to exascale”, project registration number: CZ.02.1.01/0.0/0.0/16_013/0001791.

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IT4Innovations National Supercomputing Center provides state-of-the-art technology and services to both Czech and foreign research teams from academia and industry in the field of high-performance computing and data analysis. Currently, IT4Innovations runs four supercomputers - Anselm (installed in 2013), Salomon (installed in 2015), a special system, NVIDIA DGX-2, for artificial intelligence calculations (installed in 2019) and Barbora (installed in 2019). IT4Innovations is also a research centre with strong international links. Core IT4Innovations research topics are advanced data processing and analysis, machine learning, the development of parallel scalable algorithms, the solution of demanding engineering tasks, and modelling for nanotechnology.

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