CLAIX-2025 – A New Supercomputer at University of Aachen for HPC and A.I.

RWTH Aachen University (in German Rheinisch-Westfälische Technische Hochschule Aachen – RWTH) is a public Research University located in Aachen, in North-Rhine Westphalia, Germany. With more than 44,300 students enrolled in 144 study programs, is one of the leading universities of science and technology. RWTH Aachen has repeatedly been part of the federal and state excellence initiative from 2007 until now. RWTH Aachen is a founding member of the CESAER association of universities of science and technology in Europe, and IDEA League, a strategic alliance of five leading universities of technology in Europe.

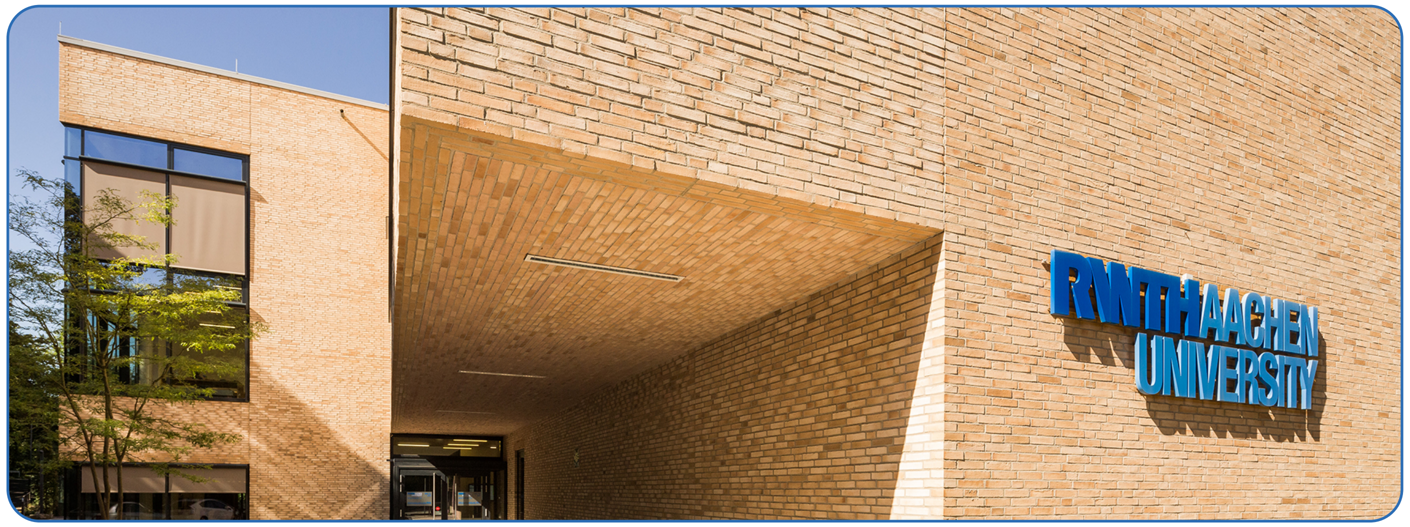
The IT Center is the central IT facility of RWTH and is responsible for IT support of university-wide processes. As an integral part of a technical university with a focus on teaching, research and infrastructure, the IT Center ensures the effective, efficient and secure operation of its IT infrastructure, pursuing a particularly high quality standard. The users of the (IT) services of the IT Center include not only the students, employees and institutions of RWTH Aachen University, but also other universities as well as external research institutions and companies.

The new high-performance computer CLAIX-2025, hosted at the IT Center of RWTH Aachen University, succeeds CLAIX-2023 and offers a substantial performance boost. The modern system has been made available to researchers at RWTH and all German universities nationwide.

The Customer's Requirements:

The requirements RWTH Aachen described in the public tender from mid-2025 all revolved around minimizing a Total Cost of Ownership (TCO), according to RWTH's proprietary and well-defined TCO benchmark, which takes into account the computational capacity, but also energy efficiency. An important boundary condition was to maximize the number of compute nodes available to the users, given a fixed budget.

Images: Martin Braun - RWTH Aachen



The Solution:

NEC has deployed the new supercomputer in mid-2026. The main computational workhorse for the classical HPC segment of CLAIX-2025 contains 421 standard nodes KAYTUS K24V2, each equipped with 2x AMD Genoa 9654, 384 GB DDR5 main memory (4800 MHz), and a 1.6 TB NVMe SSD (3DPWD).

In addition, 108 large-memory nodes, each containing 768 GB DDR5 main memory, provide the capability to run memory-intense applications on a large scale.

Moreover, an ML segment, consisting of 21 GPU nodes (GigaComputing G363-ZR0) each equipped with 2x AMD EPYC 9535, 768 GB DDR5 main memory (5600 MHz), and a 1.6 TB NVMe SSD (3DPWD), and each containing an NVIDIA Redstone board with 4x NVIDIA H100-GPUs 80GB SXM5, provides a large pool of powerful GPU-accelerated computational resources for artificial intelligence and machine learning.

A third, interactive segment, comprising 4 login nodes KR1280-E2-C0-R0-00 Gen5, each equipped with 2 x AMD Genoa 9654, 768 GB DDR5 main memory (5600MHz), and 2x 3.2TB NVMe SSDs (3DWPD) facilitate interactive use of CLAIX-2025.

A Cornelis OmniPath (OPA) CN5000 high-speed interconnect provides a ultra-high bandwidth and extremely low latency network for MPI jobs, as well as connectivity to the existing HPC storage system.

For energy efficiency and with the aim of re-using the waste heat, all of CLAIX-2025 runs direct-liquid cooled (DLC), including the Cornelis OPA leaf switches. This is facilitated by a CoolIT CHx1000 Cooling Distribution Unit (CDU), the latest and most powerful CDU model from CoolIT available to date, with a maximum cooling power of 1 MW. All nodes are equipped with Titanium-level PSUs for highest energy efficiency.

Also, CLAIX-2025 is being operated by RWTH alongside the existing CLAIX-2023 HPC cluster, which is mainly based on Intel Xeon 8468 Sapphire Rapid and NVIDIA H100 GPUs, and which had been deployed by NEC in early 2024. As of November 2025, the ML and the HPC segments of CLAIX-2023 rank #70 and #174 in the TOP 500 list.

A total of 8 gateway nodes KAYTUS KR2280-E2-C0-R0-00 Gen5, consisting of 2 x AMD EPYC 9124, 192 G DDR5 main memory (5600 MHz), and a 1.92 TB NVMe SSD, provide the connectivity to the CLAIX-2023 NVIDIA NDR InfiniBand network and to two separate HPC storage systems: one 24 PB DDN EXAScaler Lustre storage system, and one 3.5 PB DDN storage system powered by IBM Storage Scale.

New HPC Power for Leading-Edge Research

CLAIX is used extensively by numerous institutes and research groups at RWTH, but also serves as a computational capacity pool for researchers and scientists across all of Germany. The primary focus of CLAIX-2025 is on numerical simulations in the Engineering Sciences: In the Mechanical Engineering Department, for example, CLAIX-2025 is used in fluid mechanics and structural mechanics, energy and process engineering, technical combustion, production engineering, and mobility and propulsion systems.

In addition, researchers from Electrical Engineering, Computer Sciences, Physics, Chemistry, Materials Sciences, and Computational Engineering Sciences use the cluster for high-performance simulations and method development, for example in Particle and Astrophysics, as part of the Alpha Magnetic Spectrometer (AMS) experiment on the International Space Station (ISS).

CLAIX-2025 is also used by the Departments of Life Sciences and of Medical Studies, for molecular simulations and image processing, as well as for data-intensive methods such as artificial intelligence and machine learning, which are specifically supported within the framework of WestAI, one of the four AI Service Centers funded by the Federal Ministry of Research, Technology and Space (BMFTR).

Moreover, interdisciplinary DFG collaborative projects draw on the cluster—including Collaborative Research Centers (SFBs) and Transregional Research Networks (TRRs).

“We are very happy with the performance of CLAIX-2025, and we are glad to have NEC as a reliable and well-proven partner at our side, especially in times when the market situation poses severe challenges to researchers in HPC,” says Professor Dr. Matthias Müller, Director IT Center at RWTH Aachen.

“RWTH Aachen is a long-standing customer to NEC. We are honoured and proud that one of the largest and most renowned technical universities in Germany has decided to put their trust into NEC for the deployment of this new machine,” Noritaka Hoshi, Managing Director of NEC Deutschland GmbH, adds.

A selection of current projects underway at CLAIX is featured on the NHR4CES website: https://www.nhr4ces.de/projekte/.