

The Czech Hydrometeorological Institute (CHMI) put an NEC SX-Aurora TSUBASA supercomputer into service

The Czech Hydrometeorological Institute (CHMI) is a partly state-funded organisation and part of the critical infrastructure of the state established in 1953. It consists of three main divisions: Meteorology and Climatology, Hydrology, and Air Quality. One of the important cross-cutting purpose is regional weather modelling and the operational numerical weather prediction.

The CHMI put a new NEC SX-Aurora TSUBASA supercomputer into service which is used for high-resolution regional climate modelling. The system is also simulating future climate, and how its changes will manifest themselves. For example, it helps to predict the future frequency and intensity of draught periods, and the change of extremity of weather phenomena like flash floods and strong winds. The ultimate goal is therefore to help prepare for adaptation measures, mitigating the impacts of the changing climate. In addition, it acts as a development system for the adaptation and optimization of certain meteorological codes and climate applications that benefit greatly from the vectorization on SX-Aurora TSUBASA.

The Requirements:

The primary goal of the CHMI was to find an HPC system which suits the limitation of space, electric power and cooling possibilities on site. The system should also perform at a maximal computing performance measured by the applicative benchmark of the ALADIN NWP. As the system is also used to predict weather forecasts, which is a time critical task, there was a wall-clock time limit in which the benchmark has to be completed and how many compute nodes are required to do so. For that reason the CHMI created a combined performance gain factor. The CHMI was also interested in getting as much as possible simultaneous and timely running copies on the system. As this is an important task the system has a specific requirement on high availability.

"It is an honor for us that CHMI has selected NEC for the delivery of our latest HPC solution, which clearly guides the way into the future of climate modelling and weather forecasting. CHMI is a very important customer for us, and we are happy to provide our strongest support not only for smooth operations, but also by performance that optimizes the climate applications in use."

Yuichi Kojima, Managing Director of NEC Deutschland GmbH and Vice President HPC



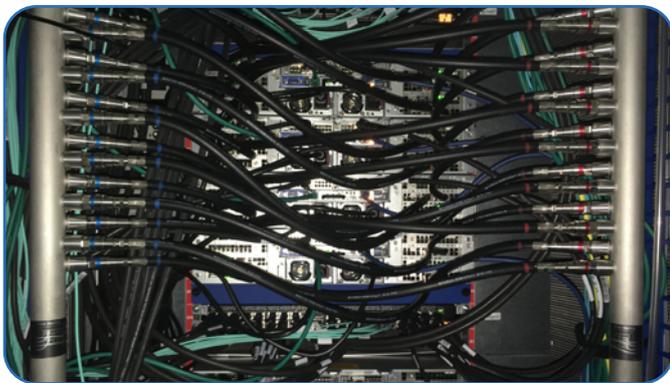


The Solution:

NEC offered the best solution in regards to price/performance selection criteria matching the given infrastructure limit and NEC had the best score calculated from the selection criteria. The SX-Aurora TSUBASA supercomputer was delivered by NEC Deutschland GmbH in September 2020 and operational readiness was declared in December 2020.

At the heart of the solution are 48 vector hosts containing 384 vector engine cards of type VE 20B in a directly liquid-cooled (DLC) environment, together with a fully non-blocking high-speed interconnect based on Mellanox HDR InfiniBand network technology, and a total of 18 Terabytes of HBM2 high-speed memory, and 24 Terabytes of DDR4 main memory. In addition, an HPC parallel storage solution on the basis of the NEC LxFS-z Storage Appliance with a usable capacity of more than 2 Petabyte was deployed.

NEC has realized a highly efficient DLC concept with cold water by combining leading-edge DLC and side cooler technology to avoid any leakage of waste heat into the computer room, which allows the complete system and the environment to operate without any additional air-conditioning in place. In total, the complete solution even shows a much better power efficiency than originally defined by the tender requirements.



First impressions of the running system:

As the system is in place for a couple of months the first impressions of the system shows the technology advance compared to the previous system. Under given wall-clock timings of the forecast completion, four times less power was needed to do the calculation compared to the older Intel Broadwell solution. The DLC solution has also quite lower running cost. At the example of the atmospheric radiative transfer, the most expensive computation in the forecast, the Aurora system shows a higher efficiency compared to the x86 system.

"We are very happy to bring the new NEC SX-Aurora TSUBASA into operation. For us, NEC's vector technology that SX-Aurora TSUBASA provides represent a highly attractive alternative to competing HPC technologies, especially since we do not need to rewrite the majority of our productive codes. Another great advantage is the excellent ratio between the applicative performance gain factor and power consumption,"

Dr. Radmila Brožková, Head of the CHMI Numerical Weather Prediction department