



## NEC SX-9 SUPERCOMPUTER USED FOR OPERATIONAL WEATHER FORECASTS AT DEUTSCHER WETTERDIENST

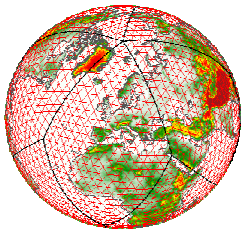


*Deutscher Wetterdienst, Offenbach*



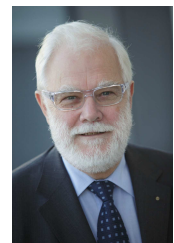
*Machine hall with NEC SX-9 Supercomputer*

Germany's National Meteorological Service called Deutscher Wetterdienst (DWD) based in Offenbach provides its customers in Germany and abroad with forecasts and weather warnings every day. These services are essential to guarantee e.g. secure road transport and air traffic.

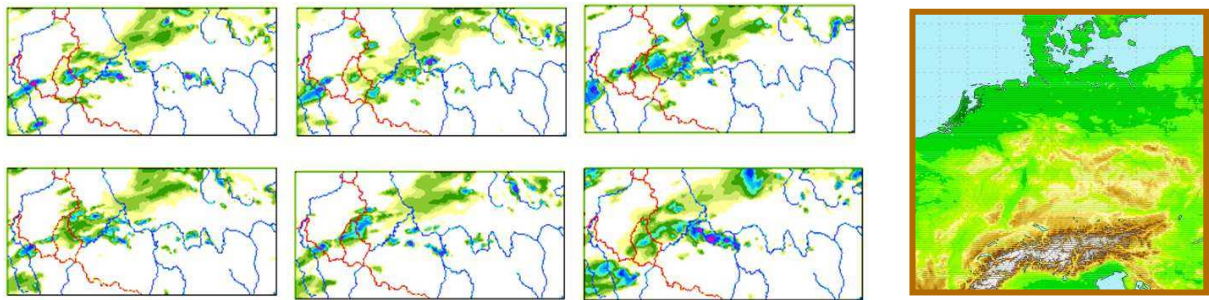


In 2008 DWD took steps for further improvement of weather forecasts. The strategy includes a higher spatial resolution of the forecast models, a introduction of more complex algorithms of physical processes in the atmosphere as well as the deployment of ensemble forecasting for the short range weather forecast.

„Using this advanced technique we are able to describe the most likely course of the weather and can thus improve the reliability of weather forecasts and storm warnings“ explains Visiting Prof. (UK) Geerd-Rüdiger Hoffmann, board member of DWD and responsible for the technical infrastructure of DWD.



As a consequence the required computing resources are stressed. In 2010 the compute performance will increase by a factor 45 compared to the previous capacity at DWD.



Since December 2008 the complete operational forecast suite is running on NEC SX Systems. The forecast suite includes numerical models for the global weather forecast, Europe and Germany. By applying very high spatial resolution of 2,8 km for the short range weather forecast, it is possible to simulate atmospheric processes which couldn't be captured by the coarse resolution of the former forecasts.



A further improvement is expected by the deployment of ensemble forecasting. Numerical predictions are conducted using slightly different conditions such as different initial values. DWD will run at least 20 copies of the weather forecast on its systems every three hours. In addition the weather forecast models have been enhanced to process data from radar and satellite observations.

The NEC SX-9 Supercomputer with the world's most powerful vector processor with more than 100 Gflops and the ultrahigh memory bandwidth of 4TB/s per node make it possible, to run several copies of the short range weather forecast within a single SX-9 node in less than 25 minutes.



The whole forecasting system at DWD consists of two completely independent clusters of NEC SX-9 in two machine halls. All users have access to the NEC gStorageFS global filesystem. Database Servers and a cluster of standard servers provide sufficient capacity for post- and preprocessing and archiving of the model results. The redundant layout of the total solution guarantees the highest availability.



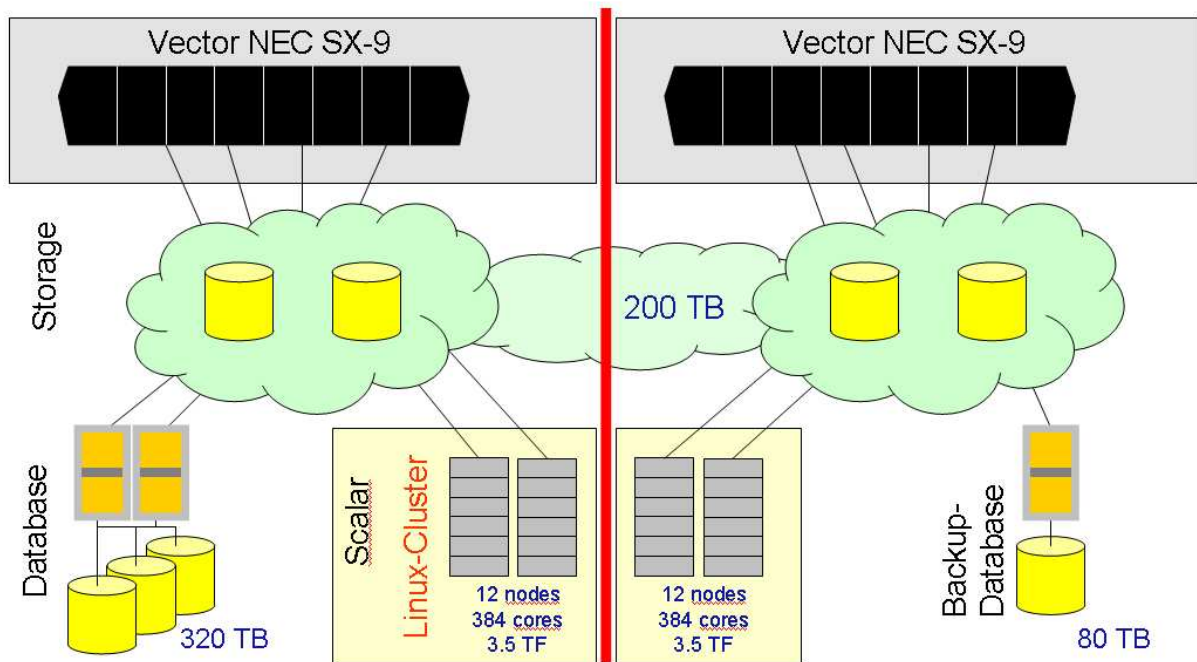
Each NEC SX-9 Cluster provides 4.5 Tflops sustained application performance. During routine operation one NEC SX-9 cluster is used for the daily weather forecast, the other cluster is dedicated to general development efforts.



“The complexity of numerical weather forecast is continuously increasing and creates numerous challenges to the hardware and software as well the overall system design. NEC developed in cooperation with DWD a highly reliable and very efficient system design according to the time critical requirements. The solution consists of a cluster of powerful vector compute nodes, scalar servers, database servers and storage systems integrated in a complex network.

NEC as general contractor again demonstrated in this project its extensive experience with large scale compute and data centers in the area of Meteorology and Climatology and its expertise in the selection, installation and integration of NEC products and products from third party suppliers.”

- Ulrich M. Michaelis, Sales Manager for HPC Solutions, NEC Deutschland GmbH -



Schematic View of the overall infrastructure at DWD in Offenbach



NEC thanks DWD (Mr. Jonas a.o.) for supplying the images