New Supercomputer Enhances Reliability of Weather Predictions

February 14 2005

Sweden's new supercomputer for weather forecasting will greatly improve prediction reliability. An enhanced and powerful computational package, tailored especially for the needs of the Swedish Meteorological and Hydrological Institute, SMHI, is now installed at the National Supercomputer Center, NSC, sited at Linköping University.

The new computer system, called Blixt in honor of its lightning-fast processing, employs new computational methods to forecast land and sea weather conditions. The weather observations that provide the input data for NWP, numerical weather predictions, are utilized more effectively than in the past. The forecasting model is enhanced with a time dimension factor that adjusts past and present observations to anticipate the weather situation with greater precision.

"Improved mapping is a requirement for improved predictability, especially when we are trying to anticipate the development of atmospheric depressions two days ahead", explains Lars Häggmark, meteorologist at SMHI.

Increasingly sophisticated computations demand similar clout in processing power. The weather forecasting potential is fulfilled by state-of-the art processing capability, achieved in turn through advanced hardware and software technology. The new computer system in Linköping is made up of a cluster of parallel processors. This architecture answers readily to the extreme demands for pipelining data and instructions to the computational units.

“The weather-predicting supercomputer is purpose-built. Cluster configurations have come to the fore because they provide powerful and effective processing capabilities at a relatively low price. The National Supercomputer Center is already recognized as a forerunner in cluster R&D and implementation for weather forecasting. This cutting-edge weather forecast production system is consistent with our mission to provide the meteorological community with internationally competitive solutions”, says a pleased Torgny Faxén, project manager at NSC.

The Blixt computer system was configured by NSC expertise in cooperation with SMHI. The weather-predicting supercomputer is just one example of R&D and operational collaboration between the two organizations. Climate modeling is another.

The fabrication was assigned to Linköping-based Advanced Computer Technology, the firm responsible for setting up NCSs Monolith supercomputer which until recently was Sweden’s most powerful computer system. “This new commission confirms ACTs leading position among suppliers of technically complex computer systems”, says Ramiz Zand, President at ACT.

The Blixt system is up and running in test mode on NSC premises and will shift into full operation at SMHI later this spring. Six prediction runs are made daily, four for weather and two for maritime conditions. The new weather forecasting supercomputer is sixfold faster than its predecessor, now grazing green pastures.

Engineering Data

Blixt is a Linux-cluster of 60 computational servers, each of which are equipped with two 3.2 Gigahertz Intel Xeon processors and a 2-Gigabyte main storage, which adds up to 120 parallel processors and 120-Gigabyte main storage capacity. The theoretical peak performance is 768 Gigaflop/second (0.768 trillion floating-point operations per second).

The servers are interconnected with Infiniband technology from Mellanox and Scali MPI Connect via an Intel PCI Express bus. The output data from the prediction runs is stored and post-processed on 5.6 Terabyte disk storage. Critical components are twinned to minimize risk of disruptions to the system.