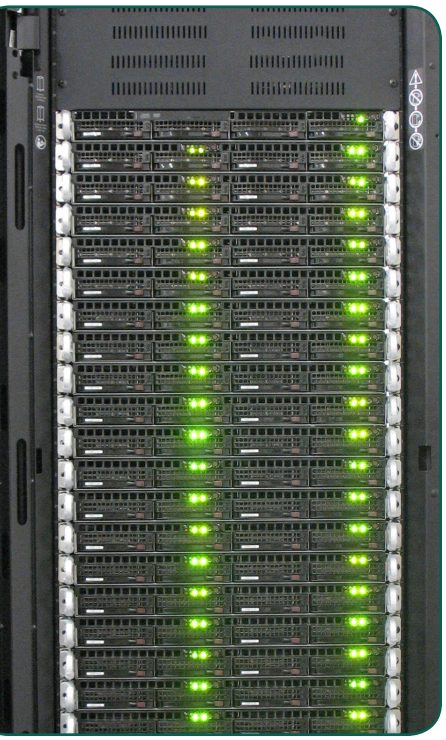
CASE STUDY

Nor-Tech HPC Clusters™

Nor-Tech cluster helps keep energy researchers from tilting at windmills



Nor-Tech's cluster boasts 64 compute nodes and 512 compute cores. Using AMD Shanghai processors allowed for more nodes, providing a higher performance per dollar.

The Challenge

When it comes to the challenge of developing viable renewable energy solutions, the answers may be blowing in the wind. Wind energy is set to be a major contributor in attaining the president's goal of generating 10 percent of the nation's electricity from renewable sources by 2012. Unfortunately, on wind farms across the country, the output of wind turbines is slightly below projections, thanks to a phenomenon called "wake turbulence". Wake turbulence is caused by a turbine's typically 300-foot long blades which create large wakes that disrupt the flow of air to other turbines.

On a 100-megawatt wind farm, a drop in output of even just a few percentage points, can result in the loss of hundreds of thousands of dollars. Understanding the effects of wake turbulence and how it relates to the discrepancy between projections and actual performance is critical to improving the efficiency of wind farms.

Researchers working on the project at a major Midwestern university are using multi-scale modeling to study wind patterns and atmospheric turbulence. Model wind farms of various sizes and layouts are used to determine which patterns will result in the least interference. Modelers must include extremely complex atmospheric data as well as detailed topographic information, in order to consider all of the variables at play in a real-world scenario. This sort of high-resolution modeling calls for some serious computing power.

The Solution

In order to meet the university's computing requirements, Nor-Tech developed a 64-compute node cluster, with 512 compute cores, specifically tailored to computational fluid dynamics (CFD) services.

The CFD Cluster uses constant bisectional bandwidth Infiniband and a fat tree network with OFED stack. The cluster also takes advantage of the Lightweight Directory Access Protocol (LDAP) for authentication.

Testing proved the customer's code ran very well using AMD Shanghai processors. Additionally, the AMD solution allowed for more nodes, providing higher performance per dollar.

The cluster uses a Linux OS called CentOS, which is part of the Rocks Cluster suite. Nor-Tech assisted the customer in improving their code scaling to make full use of the new hardware in this cluster.
Both OpenMPI and MVAPICH were used for handling MPI traffic. IPMI was used for complete remote control and monitoring capability.

The cluster will also be used in other renewable energy related projects at the university, including computational modeling for a Dept. of Energy funded project to generate clean energy for New York City by analyzing the design and enhancing the environmental compatibility of other turbine systems.

AMD Phenom X3 64 | Mellanox Technologies

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