Linux Networx Cluster Improves Iceland's Weather Geothermal Modeling

OVERVIEW

The Icelandic Energy Authority (IEA) in conjunction with Iceland's Institute for Meteorological Research (IMR) needed a supercomputing solution that could produce 3D simulations of geothermal reservoirs and weather events. The IEA and IMR were limited in the types of problems they could solve unless a powerful, cost-effective computing solution was found. After investigating several supercomputing options, the Icelandic agencies decided to deploy a Linux Networx cluster solution because of its powerful computing capabilities, significant price to performance ratio, and ICE cluster management tools for ease of use and improved system reliability. With its new supercomputing solution in place, the IEA and IMR can complete 3D simulations and make important decisions concerning Iceland's energy resources and weather predictions that were not previously possible.

CHALLENGE

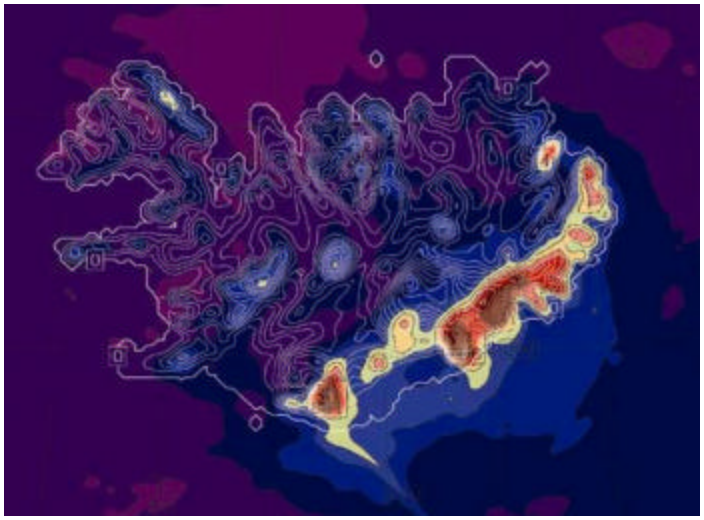
Iceland has the unique distinction of being the only country in the world that uses geothermal energy as its main energy resource for everything from central heating to growing bananas. With more than 50% of the primary energy production in Iceland coming from geothermal energy, the study of geothermal reservoirs is a top priority for the IEA. By simulating the behavior of geothermal reservoirs, the IEA can determine where the best location would be to build geothermal power plants to optimize energy production.

In addition to reservoir simulations, the IMR needed a supercomputing solution to simulate atmospheric conditions in Iceland that trigger such things as heavy precipitation and strong windstorms. With these simulations, the IMR can determine weather patterns between observations sites and predict how the local climate will behave in the future.

"Simulations are imperative to better understanding the cause for weather events," said Olafur Rögnvaldsson, CEO of IMR. "A powerful supercomputing solution was needed that could produce high quality simulations quickly, be easy-to-manage and cost effective."

SOLUTION

The IEA and IMR investigated several supercomputing options and decided the best solution was an Intel®-based Linux Networx cluster. With the Linux Networx cluster, the Icelandic agencies can produce 3D simulations quickly and solve problems that were otherwise not possible. Using Clusterworx® and ICE Box™, advanced management tools from Linux Networx, the IMR and IEA monitor how the cluster is functioning and can solve problems before they become critical.



A simulation of accumulated precipitation in Iceland over one month

"With the Clusterworx cluster management software, managing the cluster has not been a problem at all," said Rögnvaldsson. "The remote power-up has been the most useful function for us and the temperature logs have also provided valuable information to ensure cluster health and efficiency."

Clusterworx and ICE Box are the only cluster management tools implemented at both the software and hardware levels to be the most comprehensive, architecture-independent cluster management system available.

RESULTS

Since implementing the Linux Netwox cluster, the IEA and IMR are able to produce geothermal reservoir and weather simulations to undertake problems that would otherwise be unsolvable. The cluster can interpret information about geothermal reservoirs from electrical resistivity measurements and boreholes drilled into the ground better than was ever possible in the past. As a result, the 3D simulations are clearer and more detailed, allowing the IEA to more completely understand the characteristics of geothermal reservoirs and where to build geothermal power plants for maximum productivity.

Similarly, the 3D weather simulations are helping the IMR understand how Icelandic terrain is contributing to extreme weather events and predict future weather conditions.

"The cluster is able to tackle computational problems that have only been previously solvable on expensive, large shared-memory supercomputers." said Rögnvaldsson. "The 3D simulations of geothermal reservoirs and weather events provide invaluable information about Icelandic energy resources and weather conditions that will eventually have far-reaching benefits for the whole country."