CASE STUDY

Intel® Xeon® processor 5500 and 5600 series

Performance:
Data-Intensive Computing
Support the most demanding business data processing and computationally-intense graphics

Wind over vegetation

EPHYSE in INRA Bordeaux uses complex atmospheric models in order to simulate wind flow at vegetation scale for environmental applications

Institute National Research Agronomy (INRA) is a French government-owned laboratory service. INRA's Functional Ecology and Environmental Physics unit (EPHYSE) carries out research that relies on wind flow modeling for environmental applications such as tree vulnerability to wind load or pollen dispersal. To achieve its research aims EPHYSE modified the Advanced Regional Prediction System* (ARPS*), developed by the Center for Analysis and Prediction of Storms (CAPS) at the University of Oklahoma, to take account of vegetation canopies and to simulate instantaneous wind flow at the vegetation scale. To improve the computational time of this model and so increase the resolution or domain size, EPHYSE implemented eight Dell PowerEdge* M610 blade servers powered by Intel® Xeon® processor 5500 series.

INRA
ALIMENTATION
AGRICULTURE
ENVIRONNEMENT

CHALLENGES

- **Wind turbulence over heterogeneous landscape.** EPHYSE wanted to improve the computational time of its wind flow models over complex vegetation and terrain landscapes

SOLUTIONS

- **Testing.** Benchmarked Dell PowerEdge* M610 blade servers powered by Intel® Xeon® processor 5500 series against its existing server cluster
- **The future.** Also tested Intel® Xeon® processor 5600 series to evaluate future potential

IMPACT

- **Performance leap.** The server cluster powered by Intel Xeon processor 5500 series revealed that the time required to run a typical weather simulation fell from 60 hours to 10 hours
- **Energy savings.** Power required for Dell PowerEdge M610 blade server cluster powered by the Intel Xeon processor 5500 series was 2,210 watts compared to 8,500 watts for previous server cluster
- **Looking ahead.** Intel Xeon processor 5600 series also delivers 20 per cent more performance with the same power consumption on the same Dell* platform

"The new Dell server cluster we now have, powered by the Intel® Xeon® processor 5500 series, ensures we can obtain simulation results at faster speeds. Given the nature of the work we are engaged in, this is of huge importance."

Lionel Millions,
IT Manager, INRA Bordeaux

Higher performance, lower power consumption

Crop gathering

The EPHYSE (Functional Ecology and Environmental Physics) unit at the Institute National Research Agronomy (INRA) Bordeaux uses state-of-the-art of meteorological models in order to simulate, at a very fine scale (a few metres), micrometeorological fields. Modelling micrometeorological fields is important for many environmental applications such as tree vulnerability to wind load, carbon exchange between the terrestrial biosphere and the atmosphere in relation to climate change studies, environmental dissemination of pollens from genetically modified organisms (GMO), and propagation of forest fires.

Modeling micrometeorological fields at this scale has remained until now limited because of the complexity of accounting for airflow models across surface heterogeneities such as the presence of clearings, roads, forest patches of various heights and so on, as well as the terrain's topography. As a result, such simulations require a large computational domain with a fine grid mesh.

INRA EPHYSE uses a modified version of the atmospheric model ARPS (Advanced Regional Prediction System), developed by the Center for Analysis and Prediction of Storms at the University of Oklahoma. In order to perform such detailed simulations, EPHYSE invested recently in an eight blade server powered by non-Intel processor technology.

Critical benchmark

INRA EPHYSE decided to benchmark this existing server cluster against Dell PowerEdge* M610 servers powered by the Intel® Xeon® processor 5500 series. The benchmarking test, running ARPS on Linux*, revealed a dramatic increase in performance over the existing system.

A task that previously took 24 hours was carried out in only 4 hours on the server cluster powered by the Intel Xeon processor 5500 series. INRA EPHYSE also noted a significant decrease in power consumption.

As a result, EPHYSE implemented eight Dell PowerEdge M610 servers powered by the Intel Xeon processor 5500 series, replacing its previous 16-server cluster. EPHYSE observed a high performance gain. For example, with ARPS running on six of the eight Dell PowerEdge M610 servers, a numerical simulation that previously took 60 hours was reduced to 10 hours. Furthermore, energy consumption fell from 8,500 watts with the former cluster to 2,210 watts for the Intel Xeon processor 5500 series-powered cluster.

Future generations

INRA EPHYSE also assessed the next-generation Intel® Xeon® processor 5600 series and discovered that for the same ARPS version, it could gain 20 per cent more performance with the same power consumption.

Spotlight on INRA Ephyse (Environmental Fluid Mechanics team).

Institute National Research Agronomy (INRA) Bordeaux is a French government-owned laboratory service. Its research focuses on agricultural surveys relating to commercial cultivations of agricultural products, plant food quality safety, and plant integrative biology. Functional Ecology and Environmental Physics (EPHYSE) is a unit of INRA Bordeaux which carries out wind flow modeling for environmental applications such as tree vulnerability to wind load or pollen dispersal. To this end, INRA EPHYSE uses the Advanced Regional Prediction System (ARPS) developed by the Center for Analysis and Prediction of Storms (CAPS) at the University of Oklahoma, in order to simulate instantaneous wind flow at vegetation scale. Its research results are published in international scientific papers and contribute also to propose guidelines for improving environmental issues in agricultural practices.

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