Developing a stronger business case with high-performance computing

World’s largest wind turbine provider enhances high-performance computing resources with the Intel® Xeon® processor X5670, strengthening energy production forecasts

To support its position as the global leader in wind turbine production, Vestas relies on a high-performance computing (HPC) platform to undertake the complex calculations involved in forecasting the future output of existing and prospective turbine sites. It recently overhauled its data center with brand new IBM iDataPlex servers powered by the Intel® Xeon® processor X5670. The deployment delivers 10 times the compute power of the previous hardware¹, significantly enhancing the accuracy and detail with which Vestas is able to forecast future weather patterns.

**CASE STUDY**

**Intel® Xeon® processor X5670**

**Energy / Utilities**

**High-Performance Computing**

**Developing a stronger business case with high-performance computing**

**CHALLENGES**

- **Platform upgrade**: Vestas wanted to upgrade its existing HPC platform to faster processing technology to enhance the quality of its weather forecasting resources
- **The right mix**: This platform needed to deliver the right mixture of processing power and memory bandwidth for optimal performance of its memory-bound weather research and forecasting (WRF) applications

**SOLUTIONS**

- **New hardware**: Vestas established its new data center platform with 1,306 IBM iDataPlex server units, with each powered by two six-core Intel Xeon processors X5670
- **Enhanced performance**: The new servers deliver 10 times greater processing capacity than the previous hardware
- **Memory bandwidth**: The Intel Xeon processor X5670 offers an optimal balance of processing power and memory, making it well suited to the high memory requirements of Vestas’ WRF applications

**IMPACT**

- **Detailed calculations**: The greater level of detail with which the new platform enables weather calculations has enabled Vestas to further enhance the competitiveness of its offering
- **Greater certainty**: With a greater understanding of atmospheric conditions at particular locations, Vestas is able to produce a stronger business case for proposed new site developments
- **Improved support**: The improvements have also allowed Vestas to enhance its ongoing support services to customers, such as helping them accurately forecast the future output of existing wind turbine installations

**A considered investment**

Headquartered in Denmark, Vestas is the largest producer of wind turbines in the world. For Vestas’ energy provider customers, the key to profitability is finding the right site for a new wind turbine installation. The ideal location offers consistent wind patterns with minimal turbulence, which can damage the workings of the turbines.

Another important consideration for energy providers is understanding how much ongoing generating capacity their wind turbine installations will contribute, to guarantee a consistent supply to the national grid. This requires accurate information about weather conditions at wind turbine sites to forecast energy output to a useful level of detail.

*The Intel® Xeon® processor X5670 enables us to offer the most complete picture of future wind turbine production using the latest modeling applications. In a sector that relies on accurate predictions of future supply, this is essential in helping our customers achieve the greatest return on their investment.*

Anders Rhod Gregersen, Senior Specialist, Wind & Site Competence Centre, Vestas
Leadership through technology

In an industry first, Vestas established an HPC platform to run advanced WRF applications used to model and predict weather conditions around the globe and the impact of these on local wind turbine installations. This information allows Vestas and its customers to make informed investment decisions based on the likely output of new and existing sites, and offers significant advantages over previous methods of determining productivity. Vestas remains unique in using cutting-edge technology to meet this fundamental challenge of wind energy production, reinforcing its leading position within the industry.

Since 2008, Vestas had used an HPC platform based on HP* servers and the Intel® Xeon® processor X5300 series to support its WRF tools. However, it was looking to upgrade this platform to the latest processor technology to develop its forecasting capacity and ensure it produced the most accurate weather predictions.

The optimal balance

Vestas profiled a range of server and processor options. Besides processing power, it was particularly interested in the memory bandwidth each processor could deliver. Since many of its WRF applications rely on memory-bound functions, the amount of free memory available to the processing cores has a significant effect on their overall performance.

Vestas decided to implement an iDataPlex dx360 M3 server solution from IBM. This consists of 1,306 servers in total, with each powered by two six-core Intel® Xeon® processors X5670, supported by a total of 2.6 petabytes of storage capacity. Compared to the previous solution, each of the new IBM server racks can deliver up to 10 times as much processing power as before.

Strength in certainty

The new platform allows Vestas to produce more complex, accurate simulations of atmospheric conditions that make use of more data points to deliver more detailed pictures of future weather patterns and their impact on specific locations.

During the exploration stage, the HPC platform uses 3D modeling technology to forecast output and the potential impact of turbulence at a particular location. This offers a marked improvement over traditional assessment methods, which rely on the time-consuming, expensive process of setting up meteorological towers in prospective new sites.

Vestas’ approach allows customers to develop a stronger, lower-risk business case for investing in a new location. The use of computer modeling to profile new sites also helps reduce subsequent operating costs for wind turbine installations. By using its HPC platform to determine the risk of turbulence in a location, Vestas can ensure that turbines are better placed so customers can avoid damage and maintenance costs.

Superior service

The HPC solution has also allowed Vestas to enhance the support it offers to customers with existing installations. This includes power generation forecasts, which allow customers to anticipate fluctuations in the output of turbines as a result of changing weather conditions, and adjust production from other sources to ensure consistent net output. It also helps Vestas deliver a more reliable ongoing maintenance service to its customers.

For modern, full-size wind turbines, regular servicing needs to be carried out during calm periods. Previously, if a scheduled maintenance visit coincided with a windy day, it would have to be postponed. Now, with the resources to accurately predict atmospheric conditions, Vestas can organize visits on days when turbines will be accessible, minimizing costs associated with redundant maintenance visits.

A dependable solution

By investing to maintain its technological advantage, Vestas has reinforced its leading role in the wind turbine industry. The insights provided by its upgraded HPC platform allow it to offer a more dependable, reliable investment than the competition, and to offer superior support to customers on an ongoing basis.

Vestas uses advanced computing technology to secure its lead over the competition

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