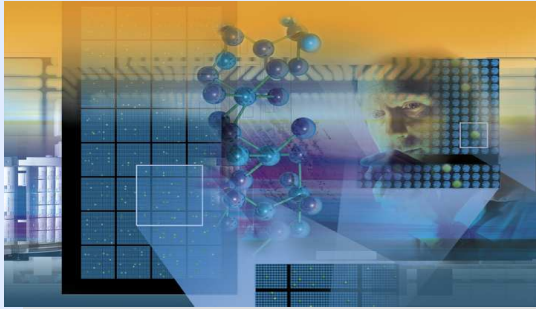


Case Study

Simulation Software Provider Leverages Voltaire Technology

Application Acceleration and Tuning For Maximum Performance Across InfiniBand Technology



SIMULIA Background

Advancements in simulation technology and computer hardware are leading product development into an era of realistic simulation in which all product behavior can be tested 'virtually.' In 2005, Dassault Systèmes acquired ABAQUS, Inc. and announced SIMULIA, the brand that encompasses all DS simulation solutions, including ABAQUS and CATIA analysis applications. SIMULIA's mission is to provide a scalable portfolio of simulation solutions, as well as an open platform to support integration of multidisciplinary analysis. The ABAQUS product suite provides a powerful solution for both routine and sophisticated linear and nonlinear engineering problems. Key industries targeted by the company include automotive, aerospace, defense, consumer electronics, manufacturing, medical and rubber/sealing.

The Challenge

As an independent software vendor (ISV), market conditions required SIMULIA to explore how they could improve their ABAQUS software in a clustered environment. "The demand for cluster hardware was increasing as confidence in these computing environments began to grow," said Matt Dunbar, manager of platform specialist group for SIMULIA. "The confidence was gained as CFD codes and other codes showed out-of-the-box performance improvements in clustered environments. We needed to move in this direction to take advantage of the market shift."

SIMULIA also constantly strives to tune its software to take advantage of the latest technologies. This approach ensures ABAQUS software performs at the highest levels possible. In 2005, the company began to search for a cluster solution that included a high-speed interconnect so that it could test the performance of its software on clusters that can leverage the high-bandwidths and low latencies of InfiniBand.

"Up until that time, most of our customers were running our software on SMP servers," Dunbar said. "But as they shifted to cluster environments, we needed our solutions to work just as well on clusters so that our customers had the full range of system choices on where to run ABAQUS."

SIMULIA specifically wanted to increase the efficiency of ABAQUS/Standard, which enables a wide range of linear and non-linear engineering simulations to run efficiently, accurately, and reliably. The SIMULIA team sought to tune ABAQUS/Standard so that it would work in parallel across 16 or 32 CPUs. "Up until this time, our software could run optimally with 8 CPUs," Dunbar stated. "But to keep pace with our client demands, we also had to ensure the software would excel on 16 and 32 CPU systems."

Key Performance Results For the ABAQUS Software Test-System Powered by a Voltaire GridSwitch™ InfiniBand Solution

- ▶ Allows for fine-tuning of software so that performance can continue to scale for systems using more CPUs.
- ▶ Faster throughput helps accelerate the software testing cycle and bring new software products to market faster.
- ▶ Throughput rates provide room for future expansion of software performance capabilities.
- ▶ Customer engineering-analysis report-times projected to decrease to 1/10 of the time, from as long as 5-10 days down to as little as one day.

Integrated Applications and Hardware Components on the ABAQUS Cluster - Powered By Voltaire and Hewlett-Packard:

- ▶ Linux
- ▶ HP-MPI
- ▶ ABAQUS Standard – for linear and nonlinear engineering simulations
- ▶ ABAQUS Explicit – for simulation of dynamic and quasi-static events.
- ▶ HP Cluster Platform 4000 with XC System Software
- ▶ Number of Nodes: 16
- ▶ 64 AMD Opteron Cores

With the previous internal test environment, SIMULIA tested software across a gigabit Ethernet connection, but Dunbar realized this would not be sufficient for tuning the software to work at maximum performance levels. "To scale to 16 and 32 CPU systems with ABAQUS/Standard, we needed to move data in quantities that push the limits of gigabit Ethernet, and our future development will rely more and more heavily on moving data quickly between nodes," Dunbar said.

The Voltaire Solution

To build a new cluster with a high-speed interconnect, SIMULIA turned to Hewlett-Packard, a long-time trusted partner. Hewlett-Packard recommended an HP Cluster Platform 4000, with an integrated storage solution and a Voltaire™ Grid Switch® 9024 ISR to transport data among the servers and the storage units. Leveraging the performance of InfiniBand technology, the ISR 9024 is a high-performance, low-latency, non-blocking switch for high performance computing clusters and grids. The device offers bandwidth up to 960 Gbps with twenty-four 20 or 10 Gbps ports in a 1U chassis.

HP XC System Software provides a comprehensive, Linux-based cluster management and job environment, and a standard implementation that can be deployed and supported worldwide. The XC software includes HP-MPI, a high-performance implementation of the Message-Passing Interface (MPI) standard that supports multiple interconnects, allowing ISVs to build a single application executable that can be deployed across different cluster configurations.

"Voltaire is our preferred supplier for InfiniBand technology in our HP Cluster Platforms," said Ed Turkel, Manager Product and Technology Marketing for Hewlett-Packard. "Through our partnership with Voltaire, we are able to provide a wide range of solutions across our extensive product family, providing industry-leading performance for our customers' most challenging science, engineering and analysis problems."

SIMULIA also felt comfortable with HP's recommendation to go with a Voltaire solution because so many of their customers already use Voltaire InfiniBand technology.

Dunbar added that Voltaire proved to be an invaluable partner on the project, helping to configure the InfiniBand technology to work optimally within the HP cluster. "The Voltaire support team was very responsive to questions that came up following the deployment," Dunbar said. "Due to their efforts, we now have an internal environment that allows us to test our software performance on the type of scale we want to use: 16-32 CPUs."

The Voltaire ISR 9024 GridSwitch interconnect also helps SIMULIA fine-tune another application, ABAQUS/Explicit, which provides finite element solution techniques to simulate a wide variety of dynamic and quasi-static events, such as crash and drop tests, in an accurate, robust, and efficient manner. "We found that ABAQUS/Explicit runs better beyond 16 processors if a high-speed interconnect is used compared to running the software on gigabit Ethernet," Dunbar said. "We need a testing system using the HP/Voltaire combination so we can make sure Explicit performs to peak levels."

The Results

SIMULIA has now utilized the Voltaire ISR 9024 GridSwitch for internal testing for a year, and it has played a key role in helping the company bring a new version of ABAQUS/Standard to market. "The release date would not have occurred as quickly if we did not have the Voltaire switch to test and fine-tune the application," Dunbar said. "But even more importantly, because we now have software that can run on a cluster, the overall solutions we deploy will become less expensive for our customers."

Helping SIMULIA create more cost-effective solutions for its customers is the ultimate benefit delivered by the Voltaire technology. "We're trying to propel our customers to the point where they can run our applications on up to 32 CPUs to generate analysis reports as fast as possible," Dunbar said. "In relying on how well our software performs on Voltaire technology, our customers are trying to do the exact same thing as we are: resolve engineering challenges faster so that products improve and become available more quickly to end-user customers."

With the enhancement that SIMULIA has made to ABAQUS/Standard by testing the software on the HP/Voltaire system, the company estimates that customers will be able to reduce run-times of certain complex analysis from as much as 5-10 days down to one day. "And in addition to helping us improve performance capabilities, having the Voltaire switch as part of our internal environment helps us support our customers more efficiently. We can now simulate their environments properly to troubleshoot issues" Dunbar said. "

But that's not where the help from Voltaire ends. "As one of Voltaire's ISVs, they provide very strong, on-going technical support to our company," Dunbar said. "They help us improve our products and get new releases ready for availability. That's very important for an ISV tackling a new technology."

Voltaire technology also provides room for future ABAQUS improvements. "Voltaire's InfiniBand capabilities are advanced the point where we can enhance the performance of our software even further," Dunbar concluded. "We will try to double our CPU range capabilities with each new release of ABAQUS/Standard during the next few years, and Voltaire gives us that capacity."