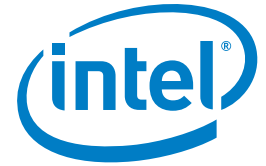


CASE STUDY

Intel® Xeon® processor 5500 series

High-Performance Computing

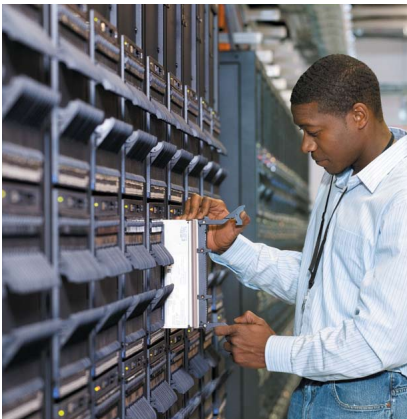
Energy-Efficient Performance



Breakthrough Performance for HPC

The new Intel® architecture helps R Systems increase a customer's application performance by 200 percent while using half as many nodes

R Systems prides itself on providing government agencies, academic researchers, and commercial enterprises fast access to high-performance computing (HPC) resources. To accommodate two client requests in a short time frame, R Systems worked with Intel and Dell to upgrade a 288-node HPC cluster by deploying new customized Dell servers equipped with the Intel® Xeon® processor 5500 series. The upgraded cluster helped a customer increase aggregate application performance by 200 percent while providing the density and energy efficiency to enable R Systems to further expand HPC resources.



CHALLENGES

- **Deliver fast access to HPC resources.** Accommodate two customer requests for large-scale HPC resources within a tight time frame.
- **Ensure application stability.** Adopt an industry-standard processing platform that can provide reliable application performance.
- **Reduce power and real estate.** Control energy consumption and data center space to facilitate future expansion.

SOLUTION

- **HPC cluster featuring Intel® Xeon® processors.** With help from Intel and the Dell Data Center Solutions (DCS) Division, R Systems upgraded a 288-node HPC cluster by deploying 288 new nodes in compact, customized Dell servers equipped with the high-performance, energy-efficient Intel Xeon processor 5500 series.

IMPACT

- **Accommodated two customers—on time and on budget.** R Systems met the needs of two customers by upgrading a 288-node cluster to the latest Intel architecture and freeing up resources on the 576-node R Smarr supercomputer.
- **Increased performance.** The upgraded 288-node cluster has increased the customer's overall application performance by 200 percent while R Systems uses half as many nodes.
- **Reduced power and real estate.** The upgraded cluster takes up less than half the space of R Smarr, and each node draws approximately 20 percent less power than nodes using the previous Intel Xeon processor 5400 series.



"With the new Intel® Xeon® processor 5500 series, we have seen a 400 percent increase in performance per node for our customer's code compared with the previous architecture. That customer now has the power to complete much more work in the same amount of time as before."

– Greg Keller,
Principal,
R Systems



“Using an Intel® architecture helps give us and our customers the confidence that code will run reliably on our HPC clusters.”

Brian Kucic, Vice President of Business Development, R Systems



When Wolfram Research asked R Systems to use the 576-node, Intel® processor-based R Smarr HPC cluster for the launch of its Wolfram|Alpha* computational knowledge engine, there was just one problem: R Smarr was reserved for another customer. In fact, R Smarr had been designed and deployed one year earlier with assistance from Intel and Dell to address that customer’s needs for outstanding compute performance and memory bandwidth. Named after HPC pioneer and National Center for Supercomputing Applications (NCSA) founder Larry Smarr, the cluster features custom-built Dell servers, each equipped with two processors from the Intel® Xeon® processor 5400 series. R Smarr is among the world’s top 500 supercomputers.¹

“The prospect of hosting the launch of Wolfram|Alpha on R Smarr was a tremendous opportunity for us,” says Brian Kucic, vice president of business development at R Systems. “We had to find a way to accommodate Wolfram while still honoring our ongoing commitment to the other client. And we needed a solution quickly. The Wolfram request came just eight weeks before the launch.”

To complicate matters, the client that was using R Smarr needed to expand its HPC workloads within the same time frame. “We had to provide even greater capacity than R Smarr alone could deliver,” says

Greg Keller, principal at R Systems. “Adding HPC resources was an option, as long as we could ensure the utmost reliability and stability of the new system. And, of course, new HPC resources would also have to provide sufficient density and energy efficiency to keep our costs under control.”

R Systems upgrades to the latest Intel® architecture

The R Systems team was already considering integrating a new Intel® architecture into its offerings. “Intel provided us early access to Intel® HPC clusters using the Intel Xeon processor 5500 series months before the Wolfram request,” says Kucic. “We subsequently received Dell servers equipped with the prerelease Intel architecture so we could test our customers’ code. We evaluated the performance, energy efficiency, and stability of the new architecture, and we were very impressed with the results.”

The R Systems team saw that the new architecture could deliver the reliability its customers required. “By working closely with software vendors before each hardware release, Intel helps to ensure the stability of operating systems and applications on the new architecture,” says Kucic. “Using an Intel architecture helps give us and our customers the confidence that code will run reliably on our HPC clusters.”

“With the new Intel® Xeon® processor 5500 series, the Dell servers use approximately 20 percent less power per node than our previous servers. Those savings enable us to add more HPC resources without increasing our infrastructure costs.”

Greg Keller, Principal, R Systems

R Systems deploys new servers within two months

To accommodate both of its customers' requests in a short time frame, the R Systems team decided to upgrade an existing 288-node cluster based on the Intel Xeon processor 5400 series. They planned to leave the cluster's fabric and power intact but install new servers equipped with the Intel® Xeon® processor 5500 series. R Systems would move the existing R Smarr customer to the upgraded cluster, allowing Wolfram to use R Smarr for the Wolfram|Alpha launch.

The Dell DCS group designed and produced customized servers for the cluster. Each server includes two processors from the Intel Xeon processor 5500 series plus 24 GB of DDR3 memory. With a compact design, each server fits four HPC nodes into 2U of rack space.

R Systems was able to deploy the new servers within eight weeks of receiving the original Wolfram request. “With help from Intel and Dell, we hosted a successful launch of Wolfram|Alpha on R Smarr, and our other customer gained access to powerful new resources to meet the need for expanded capacity,” says Kucic.

New architecture delivers 200 percent better performance in less than half the space

The increased memory bandwidth of the Intel Xeon processor 5500 series helped dramatically improve application performance without using additional data center space. R Systems has been able to deliver a 200 percent aggregate performance increase for the customer while using half as many nodes in less than half the rack space as R Smarr. “With the new Intel Xeon processor 5500 series, we have seen a 400 percent increase in performance per node for our customer's code compared with the previous architecture,” says Keller. “That customer now has the power to complete much more work in the same amount of time as before.”

Energy-efficient servers help reduce power consumption by 20 percent

The upgraded cluster is also delivering excellent energy efficiency. “Each new generation of the Intel architecture has produced significant reductions in power consumption and heat emissions,” says Keller. “With the new Intel Xeon processor 5500 series, the Dell servers use approximately 20 percent less power per node than our previous servers. Those savings enable us to add more HPC resources without increasing our infrastructure costs.”

SPOTLIGHT ON R SYSTEMS NA, INC.

Founded in 2006, R Systems enables government, commercial, and academic organizations to access world-class computing systems without the burdens and costs of other supercomputing resources.

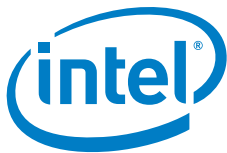
R Systems is already capitalizing on that expansion opportunity. “We were able to redeploy 100 of the older servers from the 288-node cluster so we can accommodate more customers and more services,” says Keller. “It's life cycle management at its best.”

R Systems looks ahead with Intel and Dell

After the success of this recent project, the R Systems team is looking ahead to future initiatives with Intel. “Within the next 12 months, we plan to upgrade our existing clusters and expand our capacity further,” says Keller. “By combining innovative technologies with deep engineering expertise and extensive support, the teams at Dell and Intel are helping us sustain our competitive advantage in the marketplace. And, in turn, we are helping organizations conduct groundbreaking research.”

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

Find a business solution that is right for your company. Contact your Intel representative or visit the Reference Room at www.intel.com/references.



¹Top 500 Supercomputer Sites, June 2009, www.top500.org/list/2009/06/100.

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