CASE STUDY
Intel® Xeon® processor 7500 series and 5600 series
Enterprise Server
High-Performance Computing
Virtualization: Dynamic Resource Management

Accelerating Innovation and Savings with R&D Cloud

Using Intel® Xeon® processor 7560, DuPont targets 20x speed-ups versus legacy systems and reduced capital expenditures

DuPont is one of the world's premier science companies. Its Central Research & Development (CR&D) IT leaders wanted to provide the company's scientists with the power and flexibility of cloud-enhanced computing for its scientific application portfolio. DuPont CR&D chose the Intel® Xeon® processor 7500 series as the foundation of its science-focused high-performance computing (HPC) cloud. Now the processor's performance, memory capacity, and virtualization capabilities are providing up to a 20x speed-up for critical applications compared to legacy systems. This enhanced capability helps DuPont to create a more dynamic research environment which, in the words of Tim Mueller, CIO for CR&D, "is transformational."

"What Intel has done with the Intel® Xeon® processor 7500 series will change forever how we look at scientific computing within Central Research & Development. The huge performance gains allow us to think about doing computing differently and begin to build the private cloud. This is transformational."

– Tim Mueller, Ph.D.
Director of Information & Computing Technologies
CIO, DuPont Central Research & Development

CHALLENGES

- **Using technology to advance science.** High-performance computing provides greater predictive capability across many scientific domains and is essential to DuPont's vision of being the world's most dynamic science company. New, on-demand models of HPC capability are required to meet the diverse and (often) unpredictable nature of critical research projects. Historically, finding flexible and cost-effective solutions has been problematic.
- **Virtualizing without sacrifices.** DuPont CR&D wanted virtualization's flexibility and cost savings without sacrificing the performance required for its most demanding HPC applications.

SOLUTION

- **Intel® Xeon® processor-based cloud.** DuPont's internal R&D cloud uses 32-core Dell PowerEdge* R910 servers based on the quad-socket Intel Xeon processor 7500 series as its virtualization workhorse. Intel® Xeon® processor 5600 series-based Dell PowerEdge* R710 servers also are included as dedicated computer servers for specific applications.

IMPACT

- **Breakthrough power for market-driven science.** DuPont reports an average 10x increase in HPC application performance and as much as a 20x increase compared to a range of previous legacy platforms. Scientists can tackle larger problems, get results faster, and advance progress in technical domains ranging from advanced material design to modeling novel biological processes.
- **Innovation on demand.** CR&D IT can provision servers in an hour rather than the previous average of three to six weeks. The agile cloud empowers DuPont CR&D with modeling and simulation to accelerate the innovation process across basic research and throughout the product lifecycle.

DuPont CR&D expects the cloud's on-demand resources to accelerate innovation and reduce costs

Science for a Changing World

At DuPont, science is the engine of innovation and product differentiation, helping to solve global problems. Whether the goal is to reduce dependence on fossil fuels or increase food production, DuPont scientists are tackling the challenges—using high-performance computing to help them come up with solutions. And while the world economy slowed in recent years, DuPont's commitment to innovation remained high. The company filed more than 2,000 U.S. patents in 2009 and brought more than 1,400 new products to the marketplace—a 60 percent increase from the previous year.[1]

To help sustain that level of innovation, DuPont's CR&D IT group provides infrastructure and application support for 8,500 scientists and engineers around the world. Working across the spectrum of HPC applications, these R&D teams are constantly looking to increase the business value of modeling and simulation by delivering solutions that align with the dynamic needs of the research community.

With an R&D cloud powered by the Intel Xeon processor 7500 series, DuPont CR&D has a scalable solution that will allow it to stay ahead of tomorrow's computer requirements. "This processor gives us a totally new paradigm," said Hai Zhu, manager of computational science and applied technology for DuPont CR&D. "It allows us to create a shared, dynamic environment that provides our scientists needed resources at lower cost, helping to return greater value to our corporate stakeholders."

Performance and Capabilities for the New Paradigm

The processor's record-breaking performance[2] and expanded memory capacity, along with Intel® Virtualization Technology (Intel® VT), are key factors in enabling the new paradigm, according to Zhu.

Zhu typically allocates one or two cores of a 32-core system to static tasks and says applications running on the remaining cores generally experience little or no slow-down from virtualization. The DuPont cloud uses both open source and proprietary technologies to provision, manage, and provide HPC resources across the cloud environment.

Zhu points to other aspects of the Intel Xeon processor 7500 series that increase productivity. The processor's reliability enhancements improve execution of large-scale simulations that take months to complete, and Intel® Virtualization Technology FlexMigration capability enables server migration for some long-running applications without the overhead of checkpointing. The servers use Intel® 82599 10 Gigabit Ethernet controllers to further increase performance.

SPOTLIGHT ON DUPONT

DuPont puts science to work by creating sustainable solutions essential to a better, safer, healthier life for people everywhere. Founded in 1802, the company innovates in fields including agriculture, nutrition, electronics, communications, safety and protection, home and construction, transportation, and apparel. The company has 75 R&D and customer service labs in 12 countries around the world.

DuPont CR&D's science-focused cloud also uses the Intel Xeon processor 5600 series for CPU-intensive applications.

The cloud is currently geographically centered, but Zhu expects the capability to eventually support DuPont scientists worldwide. "We believe this cloud will ultimately cut the costs of product development and provide a more dynamic environment for scientists and engineers to do their work," he said. "It will allow our scientists to deliver the next generation of science at DuPont with greater efficiency and lower cost."

Virtualization: Dynamic resource management. Optimize server utilization and increase agility through virtualization and dynamic policy-based resource management.

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

1. 2009 DuPont Annual Review.

2. For performance data, see www.intel.com/performance/server/xeon_mp/summary.htm.

Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM), and, for some uses, certain computer system software enabled for it. Functionality, performance, or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.
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