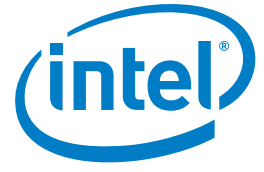CASE STUDY
Intel® Xeon® Processor 5500 Series
High Performance Computing:
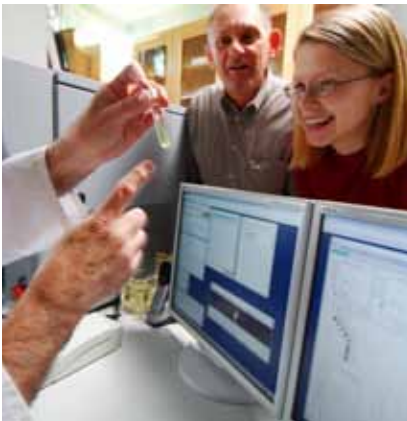Energy Efficiency, Environment, and Performance

(intel®)

Raising Green Awareness

University at Buffalo cuts annual energy costs by USD 80,000 while increasing performance 50 percent

The Center for Computational Research (CCR) at the University at Buffalo (UB) wanted to increase high performance computing (HPC) capacity and reduce energy consumption. After evaluating the available solutions for power utilization and system performance, it chose a cluster based on the Intel® Xeon® processor 5500 series. Demonstrating the impact of replacing old servers with newer, more power-savvy ones, CCR says that the system is helping it reduce yearly carbon dioxide emissions by 150 to 190 metric tons, save USD 80,000 on annual energy costs, and empower researchers with 50 percent more computing capacity.

> "The Intel Xeon processor 5500 series was a clear winner on both performance and power consumption. In the end, it was an easy decision, and one we were even more pleased with when the new system was brought online."
>
> – Thomas Furlani, Ph.D.
> Director
> Center for Computational Research
> University at Buffalo

CHALLENGES

- **Support leading-edge research.** With heavily burdened computing resources, CCR needed more performance to support its HPC researchers.
- **Inspire energy-saving action.** UB and the New York State Energy Research and Development Authority (NYSERDA) teamed up to demonstrate that new server technologies can significantly reduce energy consumption and meet rising performance needs.

SOLUTIONS

- **A server refresh with the Intel Xeon processor 5500 series.** CCR replaced servers based on five-year-old, single-core processors with a new green system powered by the Intel Xeon processor 5500 series.

IMPACT

- **150 to 190 fewer metric tons of CO2 emissions.** According to CCR calculations, the Intel Xeon processor is helping the center avoid 150 to 190 metric tons of carbon dioxide emissions each year and cut its overall energy use by 10 percent or more.
- **USD 80,000 savings in annual energy costs.** UB enjoys a healthy discount on electricity. Even so, CCR says the new system reduces energy costs by USD 80,000 per year.
- **50 percent more horsepower.** CCR and NYSERDA say the system's nine teraflops of peak performance increase CCR's total operational computing capacity by 50 percent, bringing scientists closer to breakthroughs on their biggest research challenges.

Data Center-Driven Economy

From Wall Street to pharmaceutical labs, New York State's economy is powered by information technology. Data centers are so critical to the state's financial underpinnings that they account for an estimated three percent of the electricity consumed within the state—roughly double the national average.

Making New York's data centers greener is an important part of New York's economic development plan. So when CCR needed to expand its computing capacity, it joined forces with NYSERDA, which offers incentives to promote energy efficiency and economic development across the state. The resulting system meets the objectives of both organizations—and highlights the intelligent performance of the Intel Xeon processor 5500 series.

NYSERDA has contributed USD 300,000 of funding and intends the data center to provide a model for other data centers to control high energy use. "The University

The system showcases the benefits of server refresh: higher performance, and lower emissions and energy costs.

at Buffalo's data center will be a model of energy efficiency," said Francis J. Murray, president and CEO of NYSERDA. "NYSERDA applauds SUNY's leadership for committing to investments in energy conservation, and partnering with the private sector to develop new approaches to managing energy use and building a clean energy economy."

Greening—and Consolidating— the HPC Data Center

CCR is retiring 256 two-way servers based on 2005-era, single-core Intel Xeon processors comprising approximately one-fourth of its previous systems and a total of 512 cores. Replacing them is a dense, Intel Xeon processor 5500 series-based system with 128 servers and 1,024 cores and over nine teraflops of peak performance.

"Server operations can contribute to substantial savings in the data center and can be readily implemented in existing data centers," says CCR's director, Dr. Thomas Furlani. "For many data centers, the energy savings that can be realized by installing new servers based on the low-voltage Intel Xeon processor 5500 series are dramatic, easily recouping the initial investment cost in a very short period of time."

More Science per Kilowatt-Hour

Housed at UB's New York State Center of Excellence in Bioinformatics and Life Sciences, the CCR system enables scientists from UB, Roswell Park Cancer Institute, the Hauptman-Woodward Medical Research Institute, and other institutions to analyze larger data sets in greater detail and receive results sooner. Researchers in fields such as biomedicine, aerospace engineering, combustion modeling, and chemical engineering are currently using the system. Dr. Furlani says the new supercomputer will also promote economic development through technology transfer activities with private-sector partners, and by drawing federal dollars to research projects utilizing the system.

NYSERDA is highlighting the system's energy efficiency to New York's academic, business, and government IT leaders. A ticker on CCR's website displays a running tally of energy savings to date. The energy reduction is consistent with UB President John B. Simpson's signing of the American College and University Presidents' Climate Commitment, a national program in which college and university presidents commit their institutions to achieving "climate neutrality."
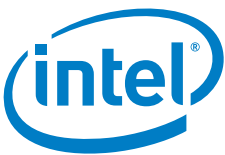
"This system shows that the savings that can be realized by employing the latest in green IT technologies are dramatic," says Dr. Furlani. "Given IT's crucial role in research, product development, medicine, and commerce, addressing the need to reduce data center energy costs is of critical importance to the U.S. and its citizens."

Energy Efficiency, Environment, and Performance. Lower energy and cooling costs, while keeping mobile users going, through more environmentally friendly computing.

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