Sun in Research

Clemson University Computational Center for Mobility Systems: University provides world-class service with Sun High Performance Computing Cluster

Customer Success Story

Industry

- Education

Customer challenges

- Offer more compute power to broaden customer base
- Provide stable infrastructure
- Build high compute density in limited floor space

Solution

Clemson University implemented a Sun High Performance Computing (HPC) Cluster that includes blade servers, storage systems, software, and services — it chose a factory-integrated solution for faster deployment.

Business results

- Increased compute power from 7 teraFLOPS to 35 teraFLOPS
- In November 2008, it ranked #99 on the TOP500, for stability and performance in LINPACK benchmarks
- Gained multifold performance without increasing floor space

Products and services

- Sun Blade™ 6000 modular system chassis
- Sun Blade X6250 server module
- Sun SPARC Enterprise® T5220 server
- Sun Fire™ X4150 server
- Sun StorageTek™ 6540 Array
- Sun StorageTek L700 Tape Library[1]
- Sun StorageTek QFS software
- Sun™ xVM Ops Center
- Enterprise Installation Services
- Solaris™ 10 Operating System
- SunSpectrum℠ Support

URL reference

sun.com/customers

[1]This product has reached end of life and is no longer orderable. It is superseded by the next-generation Sun StorageTek SL3000 Modular Library System.

As one of the top 22 public universities in the country, Clemson University, located in Clemson, South Carolina, is a vibrant academic community of 17,585 students and 1,223 full-time faculty members. Clemson's five academic divisions reflect a strong commitment to teaching, research, and service, with a focus on engineering and technology. The university's research facilities include the Clemson University Computational Center for Mobility Systems (CU-CCMS), an HPC center that serves multiple industries as well as government agencies and academia.

In 2005, Clemson began building a new 250-acre research campus, the Clemson University International Center for Automotive Research (CU-ICAR) to foster innovation and expand the economy of South Carolina. At the same time, one of the university's academic research labs, the Advanced Computational Research Laboratory (ACRL), led by Dr. James Leylek, was working on ideas to extend the benefits of its leading research beyond the academic community. "I started thinking about creating a powerful magnet for industries in the form of a one-stop-shopping type of computational engineering center," he says. Engineers from many disciplines would be available onsite, "so that a company from the mobility industry could show up with a project, and we would take care of it."

With approval from Clemson's board of trustees, Leylek and his team began to build a new computational facility on the CU-ICAR campus. The CU-CCMS would offer a unique combination of benefits: a multidisciplinary team of experienced, career engineers capable of generating results within budget and the timescale used in the private sector; a dedicated massive computational infrastructure; and innovative mathematical models developed by CU-CCMS.

CU-CCMS issued an RFP in 2006 to multiple computer hardware vendors including Sun. Sun submitted the winning proposal, which included an HPC infrastructure, installation, and support services. Leylek, who had been working with Sun products for approximately 15 years, wasn't surprised that Sun offered the best solution. "Over the years with Sun, we saw reliable products and incredibly good service and support."

In July 2008, a Sun℠ Customer Ready program HPC Cluster was delivered and installed at CU-CCMS with help from Sun Enterprise Installation Services. The factory-integrated system, including servers, networking, interconnects, and software, was deployed and ready for tests in two weeks. The cluster, connected by a 20 GB/sec InfiniBand network, delivers up to 35 teraFLOPS (theoretical) of compute power as well as exceptional stability. CU-CCMS demonstrated those qualities by running the entire grid nonstop for 130 hours of back-to-back LINPACK benchmark tests. The results ranked CU-CCMS #99 in the TOP500, a list of the top 500 computer systems worldwide.

The grid is based on 43 Sun Blade 6000 modular systems with a Sun Blade 6000 chassis, and 10 Sun Blade X6250 server modules per chassis managed by Sun xVM Ops Center software. The Sun Blade servers were chosen for their efficient design as well as for performance and reliability. "They are compact and provide incredible compute power for their footprint," says Leylek. "We had a fixed amount of square footage, yet we wanted a significant increase in compute power. By using Sun Blade 6000 modular systems, we kept the square footage the same and went from 7 to 35 teraFLOPS."

CU-CCMS also installed Sun Fire servers with UltraSPARC® IV+ processors, Sun SPARC Enterprise servers with chip multithreading (CMT) technology, Sun StorageTek systems, the Solaris 10 Operating System, and a variety of specialized applications. The StorageTek systems include a 4,800 GB StorageTek 6540 array used for home directory and project data storage, and a 690-slot StorageTek L700 Tape Library[2] used for backup and archiving, including 16 Linear Tape-Open (LTO) drives.

With its dedicated HPC resource, CU-CCMS delivers more power per user than other, much larger systems. The larger systems are typically open to many researchers working in academia as well as in government and corporate labs. In contrast, the CU-CCMS cluster is configured to deliver timely solutions to customers by limiting cluster access to a small number of Clemson researchers and faculty members. For example, Leylek points out that a leading HPC center that documented over 500 teraFLOPS currently has 1,500 users, averaging 0.4 teraFLOPS of compute power per person. In contrast, CU-CCMS, with only a handful of its engineers using their dedicated system, provides 20 times more power, with an average of over 8.0 teraFLOPS available per user.

CU-CCMS expects that its compute power and unique capabilities will appeal to customers beyond the automotive sector CU-ICAR serves. "We're now starting to expand operations into aerospace, aviation, and energy industries. One specific area of emphasis is gas turbines for jet propulsion, and ground-based turbines for electric power generation," Leylek says. "We've just started talking to some of the global powerhouse companies, and you would be amazed at how impressed they are with the Sun HPC infrastructure here."

[2] This product has reached end of life and is no longer orderable. It is superseded by the next-generation Sun StorageTek SL3000 Modular Library System.

"Sun xVM Ops Center has provided us with a robust solution to quickly and cost-effectively patch and provision our servers. Sun xVM Ops Center is completely automated, and as such, it saved us several weeks managing our datacenter environment."

Dr. James Leylek
Executive Director, Clemson University Computational Center for Mobility Systems (CU-CCMS)

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