

PASSING THE TEST

Dell PowerEdge R900 servers give the Cornell Institute for Social and Economic Research (CISER) a 400-percent boost in processing capacity



How can we make our food safer? Improve smoking cessation programs? Or help people recover more quickly from natural disasters? Scientists look for answers to these and many other compelling questions by studying the vast data archive at the Cornell Institute for Social and Economic Research (CISER). The archive contains information ranging from census data of the 1800s to the latest U.S. health statistics.

SOLUTIONS

• MANAGEMENT/UTILITIES

CUSTOMER PROFILE

COUNTRY: United States

INDUSTRY: Science, Education

FOUNDED: 1981

NUMBER OF EMPLOYEES: 11

WEB ADDRESS: <http://ciser.cornell.edu>

CHALLENGE

With data sets becoming larger and more scientists working concurrently, CISER's high-performance computing cluster was no longer able to keep up with the demands of advanced social and economic research.

SOLUTION

Dell™ PowerEdge™ R900 servers with the Intel® Xeon® processor 7300 series enable CISER to increase processing capacity while staying within the space and cooling constraints of the data center facility.

BENEFITS

Get IT Faster

- A Dell PowerEdge R900 test unit enables the CISER team to quickly evaluate the new server before making a purchase decision

Run IT Better

- The Dell servers run research jobs approximately 80 percent faster than previous servers
- Dell OpenManage™ and Dell Remote Access Controller technologies help reduce server management time by 40 percent

Grow IT Smarter

- Dell PowerEdge R900 servers provide four times the processing capacity of CISER's previous servers in half the space
 - CISER can eliminate five racks of older servers, creating room for future growth
 - The energy-efficient Dell servers help reduce data center heat by approximately 7 percent





HOW IT WORKS

HARDWARE

- Dell™PowerEdge™ R900 servers with Intel® Xeon®7300 series quad-core processors
- Dell Remote Access Controller interface cards

SOFTWARE

- Dell OpenManage™ Systems Management Suite
- Microsoft® x64 Windows® Data Center 2003 R2 SP2

SERVICES

- Dell Advanced Solutions Group

“DELL ADVANCED SOLUTIONS GROUP HELPED US SELECT SYSTEMS THAT WOULD MEET OUR CONSTANTLY GROWING RESEARCH NEEDS FOR SEVERAL YEARS TO COME.”

Kim Burlingame, senior system administrator, Cornell Institute for Social and Economic Research

Research scientists use the high-performance computing cluster at CISER to analyze archived and other data. Some studies utilize data sets as large as 75 GB, while others may require over a terabyte of disk space for a single project. The computing cluster is available to departments across the university, as well as to other institutions collaborating with Cornell scientists. Cornell researchers conducting field studies around the world can even access the computing facilities remotely to load data and run their applications.

RESEARCH GROWTH BEGINS TO OVERWHELM THE INSTITUTE'S COMPUTING RESOURCES

With dozens of research projects sharing the CISER computing resources, and with research growing ever more complex and compute-intensive, the institute's computer facilities could no longer keep up with demand. “We had to limit the number of concurrent users and also the amount of memory that we could allocate to any one researcher,” says Janet Heslop, IT associate director at CISER. “That created roadblocks for some of the projects because scientists had to break down their research into smaller parts or allow far more time—days instead of hours—to process a job.”

The delays had the potential to limit future research funding. “Grant requests typically include an assessment of the computing resources available and whether they are capable of meeting the required deadlines,” says Heslop. “If scientists can't complete research quickly, that can limit their grant opportunities.”

LACK OF SERVER STANDARDIZATION INCREASES THE IT STAFF BURDEN

Another challenge was lack of standardization in the institute's server infrastructure. Over the years, as the institute moved from RISC-based servers to Microsoft® Windows®-based systems, the environment had become more heterogeneous. “We were using several different makes and models of servers, and staying current on all those systems took a lot of our time,” explains Kim Burlingame, senior system administrator. “We recognized that standardizing on fewer vendors could reduce the amount of time the IT staff was spending on training and administration, allowing them to spend more time assisting researchers.”

Funding was made available for the CISER IT team to upgrade to new, more powerful servers, but the team still faced space and cooling constraints.

“Our servers are located in a machine room that is shared by most of the university's IT equipment, and our portion of the space could not increase,” says Burlingame. “Also, the temperature in the room was reaching 90 degrees at times, so we needed energy-efficient servers that would not generate a lot of heat.”

THE CISER TEAM CHOOSES DELL TO UPGRADE ITS CLUSTER

CISER had compared servers from multiple vendors as it gradually replaced its RISC-based systems. With funding in hand, the IT team decided to standardize on Dell. “When you experience the performance and dependability that we did with our previous Dell servers over several years, it's easy to make a decision,” says Burlingame. “Our Dell account executive understood our requirements here at the university and brought in a consulting engineer to talk with us. Dell Advanced Solutions Group helped us select systems that would meet our constantly growing research needs for several years to come.”

The Dell team recommended the Dell PowerEdge R900 server and provided a test unit to CISER so that the IT team could quickly determine if it was the right choice. “The PowerEdge R900 was the

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Janet Heslop, IT associate director, Cornell Institute for Social and Economic Research

logical choice because it can expand to 256 GB of RAM,” says Burlingame. “With the large data sets used by our researchers, the extra memory would help us avoid bottlenecks. But the real test was the CPU performance because it had the greatest potential to improve our research capabilities.”

CISER PUTS THE DELL POWEREDGE R900 SERVER TO THE TEST

The IT team needed to know which type of server processors—dual-core or quad-core—would provide faster processing for the specific types of research CISER conducts. Using a scientific application with demanding CPU requirements and the Microsoft Windows 2003 operating system, the team compared three servers: a legacy server from another vendor with two single-core processors, a previous generation four-socket Dell server with dual-core multi-threaded processors, and a four-socket Dell PowerEdge R900 server with Intel Xeon 7300 series quad-core processors.

“It took more than three hours to run the test program on the legacy server,” says Heslop. “The dual-core server took 2 hours and 16 minutes. And the PowerEdge R900 server with four quad-core processors took only slightly more than an hour. It outperformed the multi-threaded dual-core processors by an impressive margin, running the test in half the time.”

DELL POWEREDGE R900 PROVIDES FOUR TIMES THE PROCESSING CAPACITY IN HALF THE SPACE

The IT team initially deployed four of the Dell PowerEdge R900 servers, replacing eight of its older, less powerful servers. With faster processors and twice the number of processing cores compared to the previous platforms, the new servers delivered an impressive jump in the institute’s capabilities. “The Dell PowerEdge R900

servers gave us at least four times the overall processing capacity of our previous servers in half the floor space,” says Heslop.

After the initial deployment proved successful, CISER replaced all of its previous servers with the Dell PowerEdge R900, eliminating five racks of older equipment. “We not only met our goal of staying within the original data center footprint but actually created more room for future growth,” says Heslop.

ENERGY-EFFICIENT DELL SERVERS HELP REDUCE DATA CENTER HEAT BY 7 PERCENT

The energy efficiency of the Dell PowerEdge R900 servers helped reduce heat generation in the institute’s data center. In addition to using energy-efficient Intel processors designed to boost performance per watt, the PowerEdge R900 incorporates low-flow fan technology that controls fan speed based on the thermal requirements of the system. The PowerEdge R900 also has a high-efficiency power supply that is designed to draw significantly less energy. These features help maintain cooler internal temperatures. “We’re staying within our power and cooling envelope while getting more performance,” says Heslop. “In fact, the temperature in the data center actually went down by 7 percent when we turned on the new Dell servers and shut off the older systems.”

DELL POWEREDGE R900 SERVERS RUN RESEARCH JOBS UP TO 80 PERCENT FASTER

With the Dell PowerEdge R900 servers in place, scientists can complete their research projects more quickly. Instead of dividing a project into segments and processing them one at a time, researchers can now run large data sets from beginning to end and remain confident that they

will complete the analysis in less than a day. “Jobs that were taking 12 hours on our previous servers can now be run in approximately 2 hours on the Dell PowerEdge R900 servers,” says Heslop. “That’s an improvement of approximately 80 percent.”

The Dell PowerEdge R900 servers have also enabled the IT staff to remove limits on the amount of RAM available to each researcher. “Previously, we could only let each user have between 2 GB and 4 GB, and even then we could not allow more than 20 concurrent users,” says Heslop. “Now that we have the PowerEdge R900 servers, we have lifted those restrictions. The availability of more memory has already enabled researchers to use larger data sets that can yield more fine-grained results.”

DELL OPENMANAGE AND DELL REMOTE ACCESS CONTROLLER TECHNOLOGIES HELP REDUCE SERVER MANAGEMENT TIME BY 40 PERCENT

The new Dell servers are saving management time for the CISER IT staff. The team uses Dell OpenManage Server Administrator, Dell Remote Access Controller (DRAC) Console, and Server Operating System Installation on the new servers for management. “We’re located off campus and our servers are on campus,” explains Burlingame. “In the past, we had to drive to the data center for any type of maintenance or troubleshooting. Now all I have to do is push a button—for example, I can use the DRAC card to examine and change the BIOS remotely if a machine isn’t booting. We’re able to avoid multiple half-hour trips each week to and from the data center, and we estimate that has reduced the amount of time we spend on server management by approximately 40 percent.”

STANDARDIZING ON DELL ALLOWS THE IT TEAM TO ASSIST MORE RESEARCHERS

The CISER team was able to dramatically reduce the time required for staff training by standardizing on the Dell PowerEdge R900 server. The IT staff can also prepare servers and applications for research projects more quickly. "We maintain a library of 32 software packages for researchers to use, which they select based on the analysis to be done," says Burlingame. "We often needed hours to separately load software and drivers on each machine because there were so many different server types. Now we can simply make one image and copy it to all of the nodes."

With less time spent on training and server management, the IT team has become more productive. "We are now supporting an additional group of 55 people with 40 more Dell desktop computers," says Burlingame. "Standardizing on Dell servers has increased our reach—we can extend service to more researchers."

UPGRADING TO THE DELL POWEREDGE R900 ENABLES MORE ADVANCED RESEARCH

The CISER team credits the Dell PowerEdge R900 servers with helping them conduct more advanced research. Cornell scientists can take on more challenging projects because the servers let them run research in less time and use larger data sets that yield more precise results. For example, researchers associated with the institute recently ran a data-intensive health study that CISER could not have accommodated without the new servers. "That kind of capability helps attract top researchers to our facility and makes it easier for them to obtain funding grants for advanced work," says Heslop. "Ultimately, it helps the institute do a better job of fulfilling its mission: fostering collaboration among the researchers at Cornell University and advancing the study of social and economic issues that affect our society."

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