



## A. JAMES CLARK SCHOOL OF ENGINEERING

### A. James Clark School of Engineering at the University of Maryland

Comprised of more than 4,500 students and nearly 200 faculty members, the A. James Clark School of Engineering at the University of Maryland's College Park campus consistently ranks among the Top 20 engineering programs in the United States. The school, which offers 13 graduate programs and 12 undergraduate programs, also is home to one of the most robust and thriving research programs in the country.

## Background

The Clark School of Engineering, situated on the rolling, 1,500-acre University of Maryland campus in College Park, Md., is one of the premier engineering schools in the U.S., with graduate and undergraduate education programs ranked in or near the Top 20. The Clark School garnered research awards of \$171 million in the last year. With emphasis in key areas such as energy, nanotechnology and materials, bioengineering, robotics, communications and networking, life cycle and reliability engineering, project management, intelligent transportation systems and aerospace, the Clark School is leading the way toward the next generations of engineering advances.

## Case Summary

**Location:** College Park, Maryland, USA

### Products/Services:

- Comprehensive Thermal Assessment with Computational Fluid Dynamics (CFD) Modeling
- SmartAisle™ technologies, including Liebert CRV Row-Based Precision Cooling Solution with Liebert iCOM Controls and remote monitoring facilitated by Liebert's Virtual Ntegrity Gateway (VNG)

**Critical Need:** Optimize an existing data center infrastructure for efficiency, availability and space-utilization to promote availability and accommodate future IT growth

## Results

- Doubled cooling capacity and physical capacity of data center
- Optimized server configuration and airflow for maximum efficiency and IT availability
- Improved Power Usage Effectiveness (PUE) by 5.5 percent



***“Emerson Network Power was able to help the University of Maryland achieve Efficiency Without Compromise in revamping a 25-year-old data center into a modern infrastructure that is very efficient and will meet our growing capacity needs for the future.”***

Jim Zahniser, Executive Director of Information Technology, A. James Clark School of Engineering at the University of Maryland

## The Situation

Managing a data center designed to support the needs of more than 4,500 students and staff, the IT staff at the University of Maryland’s A. James Clark School of Engineering is charged with integrating the university’s enterprise IT infrastructure with the school’s unique, engineering-focused IT needs. The 25-year-old data center also is used to provide redundant web service for university websites and back-up services for several departmental groups, making IT system availability critical to these applications.

In recent years the data center had been tasked with accommodating a number of resource-intensive IT applications, including media streaming, advanced life-cycle engineering and mobile Web. As these IT needs increased, the college added servers for greater capacity.

“As new needs came, those needs were met in an incremental way,” said Jim Zahniser, executive director of information technology for the A. James Clark School of Engineering. “We did not have a master plan for laying out the data center; it just evolved over time. When we needed to put up a new rack, we found a space and put up a new rack.”

By 2009, the college had begun to surpass the compute capacity of its servers and had run out of space to expand, making it difficult to accommodate growing computing needs.

“We have a very diverse data center, backed primarily by Dell IT equipment, with web servers, login servers, DNS, domain controllers, file storage, backend networks, video recording gear—every sort of server that the University has—and the data center was close to physical capacity,” said Omar Siddique, technology officer for the A. James Clark School of Engineering. “We had run out of space to place another physical rack. There were wires and cables everywhere, and it had become nearly impossible to add or remove machines.”

## The Solution

When the team realized they lacked the time or budget for a costly facility build-out, they turned to experts from Emerson Network Power for a data center assessment. To begin the process, Emerson first conducted an advanced airflow and cooling assessment that identified hot spots within the racks that were adversely impacting IT availability.

The assessment also uncovered a number of additional design considerations that would enable the school to increase efficiency and availability. These actions included isolating the room above the ceiling and below the floor, installing block-out panels in partially full racks, repositioning perforated floor tiles into the cold aisle, removing obstructions from beneath the raised floor space and streamlining the cabling of IT equipment for increased airflow and easier maintenance.

“The assessments provided us with detailed modeling that showed us exactly where the hot and cold air were flowing in the room, essentially enabling us to capture the potential efficiencies we weren’t taking advantage of,” Siddique said. “We reorganized our IT equipment to increase the efficiency of our data center, and at the same time consolidated equipment to make the best use of our space and our new cooling capacity.”

Based on data uncovered by the thermal assessment, Emerson recommended a higher density configuration of the existing Dell equipment. This would enable the school to free up substantial space for future growth—enough to accommodate up to six additional racks of IT equipment—and to optimize for capacity, cost and availability.

The data center was reconfigured into a single row of high-density server racks housing a total of 18.6 kW of IT equipment in a hot-aisle/cold-aisle configuration. These were supported by a new Liebert CRV row-based precision cooling system with Liebert iCOM controls. The Liebert CRV uses energy-efficient variable-speed fans and variable-speed compressors, while Liebert iCOM controls continuously match cooling and airflow to changing rack loads. The Liebert CRV also provides cooling redundancy, in addition to increasing the data center's capacity, availability and efficiency.

“Adding redundancy to our cooling infrastructure means that our operations continue unaffected, even if there is a hardware failure,” Siddique explained. “We previously did not have any sort of redundancy and when there was an HVAC issue, we essentially had to shut our servers down—interrupting service and access to critical systems—or damage them by running them out of spec with essentially superheated air cooling them, putting our systems at increased risk of catastrophic failure and extended downtime.”

Because the Liebert CRV is row-based, cooling is delivered closer to the heat load, increasing efficiency. The Liebert CRV's digital scroll compressor and variable-speed EC fans—which consume up to 50 percent less power compared to traditional perimeter cooling technologies—also provide higher efficiency.

“Our department is very interested in power saving and various green technologies,” Siddique said. “This is an appealing way to advance both our tech and our green credentials.”

Equipped with Liebert iCOM controls, the Liebert CRV also gave the school's IT staff the ability to leverage a solution capable of precisely adapting to changing room and rack conditions – granting a level of cooling agility and scalability previously unseen. Sensors installed within the racks enable cooling to be continuously scaled to rack loads.

“The University of Maryland chose the Liebert CRV because of its efficiency, flexibility and adaptability,” Zahniser said. “We never know when we are going to get a large research grant to do something where we're going to have to quickly ramp-up what we need to do in our servers, and the Liebert CRV allows us to dynamically and efficiently scale as-needed.”



***“The Liebert CRV is a major leap forward from our original cooling solution. It's smaller, it's quieter, it's much more energy efficient. It's also easier for us to work with. With the digital controls and web interface, we're able to monitor it without having to go inspect it personally. Essentially it's a huge leap forward in this very basic but essential part of data center operations.”***

Omar Siddique, Technology Officer, A. James Clark School of Engineering at the University of Maryland

The Liebert iCOM controls also provided the school's IT staff with enhanced visibility into the cooling infrastructure, with the addition of remote monitoring capabilities made possible by the Liebert Virtual Ntegrity Gateway (VNG).

“Historically we only had a single control point on our cooling system that allowed us to just know when we hit a threshold and sent out alerts that way,” Zahniser said. “The Liebert CRV provides a great deal more in terms of monitoring for the room, real-time reporting as well as multiple points of input.”

“The university is becoming a 24/7 operation, but we're not staffed to be here 24/7,” Zahniser continued. “The automatic alerts and remote monitoring capabilities available with the Liebert CRV's intelligent controls enable us to monitor the status of our data center 24/7 and provide support without any dependencies on the local infrastructure.”

## The Results

By using the Liebert CRV and reorganizing its server infrastructure, the college has nearly doubled the data center's available space and it now has enough cooling capacity to double its server capacity without compromising efficiency and availability. The installation of the Liebert CRV also led to notable gains in efficiency, with a 5.5 percent improvement in the data center's Power Usage Effectiveness (PUE).

"The Liebert CRV is running at approximately 40 percent capacity, so we now could easily double the number of machines we have without doing anything else from a cooling perspective," Siddique said. "Essentially we've gotten a great deal more capacity and flexibility with a single standalone unit."

"We've gone from squeezing things into corners and spots in the existing racks to having the ability to build out the entire additional equivalent of our infrastructure again, essentially by optimizing our server configuration and deploying the Liebert CRV," Siddique continued. "As a university, we have budget constraints and we're expected to lead by example, and we've been able to do that by demonstrating that an old space can be made much more efficient and much cheaper to run. And we are extraordinarily pleased with the results."

For more information on Emerson Network Power and Liebert solutions, visit: [www.liebert.com](http://www.liebert.com)

For more information on Maryland's School of Engineering, visit: [www.eng.umd.edu](http://www.eng.umd.edu)



***By reconfiguring the data center's existing IT infrastructure and replacing traditional perimeter cooling with a row-based solution, the A. James Clark School of Engineering at the University of Maryland doubled its capacity, increased the availability of critical systems and enhanced the data center's overall efficiency.***

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