YOUR POWER STRATEGY EXPERTS

Industry Brief: Higher Education

INDUSTRY BRIEF | APRIL 2017

EXECUTIVE SUMMARY

State of the Industry

Server Technology's Power Experts have been involved in a number of data center projects in the education market over the past ten years. These projects start with consolidation and end with energy efficient design. In all cases, the effort has resulted in a reduction in computing and operating costs and an improvement in the school's ability to conduct research and compete. Is a campus-wide, system-wide, or multi-organizational consolidation in the future for you? Here is what we have learned from participating in educational consolidation projects.

Introduction

With ever-tightening budgets and increased demands on the system, today's colleges and universities have struggled to respond to the fast-changing world of data and computing. What's more, academic institutions must deal with a variety of computing types and associated data – from sophisticated, high performance computing in its research departments to mundane point-of-sale systems operating in cafeterias and bookstores.

In fact, the typical campus is a microcosm of the world of computing and faces real-world problems like staffing, budget shortages, security, and obsolescence. Add to this the crowded marketplace in which universities compete and the increased pressure to make college affordable, and you've got a real set of challenges on your hands.

The Collegiate Ecosystem

In the data center world, the college campus is unique in the variety of IT and departmental systems it must support and the financial challenges it faces. Adtditionally, universities have a dilemma in the sheer number of separate locations from which they operate, from stand-alone data center facilities to racks of equipment housed in makeshift IT closets. But most schools have taken a cue from the broader data center industry and adopted a now tried-and-true strategy for tackling these problems: data center consolidation.

But the university community has taken consolidation to the next level, utilizing a strategy that is somewhat unknown in the world of private enterprise – joining forces with their own peers and, more interestingly, their competitors. These projects are not only a guide for how to get along, but a roadmap for overcoming seemingly insurmountable security, logistical, and financial obstacles.

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YOUR NEW COLO PARTNER: THE STATE?

In several notable university data center consolidations, the new data center partner turned out to be a neighboring State agency. In Hawaii, both the University of Hawaii and the State of Hawaii had complementary initiatives. The University needed a new 8,000 square foot data center facility, and the State needed a site to host its disaster recovery capabilities.

In Ohio, there is a similar story. In addition to public colocation companies, the Ohio State University reached out to the state government, which operates a large facility in close proximity to its campus. The two became colocation partners in 2015.

Places to explore opportunities:

- Neighboring govt. facilities
- Public/private ventures
- Multi-campus consolidations
- Multi-university joint initiatives
- Local data center design firms
- Data center equipment manufacturers

The Case for Server Round Up

University departments and colleges are known for their individuality and competitive natures. Often forced to vie for limited financial resources, these departments become fiefdoms that survive by allowing politics to reign. The unintended consequence of this approach is the inefficiency of unshared resources – server and storage capacity procured individually that could potentially be pooled. This is where the consolidation process begins.

Departmental servers are often configured separately, housed alone, and are supported by aging mechanical and electrical systems that are not duty-rated for high loads and 7x24 operation. They are also housed in areas that could be utilized to check off the goals of the institution, such as more labs, library space, storage, or at the top of the list, reconverted classrooms.

Streamlining Security and Compliance

Another consequence of these server and storage resources hidden away in various locations across campus? The task of maintaining security standards for compliance becomes much tougher. It is far more difficult to keep track of data when it is spread across the campus.

At a recent project at the University of Illinois Urbana-Champaign, a survey was sent to campus data center managers to determine what facilities were there. This turned up more than 150 computer rooms occupying over 75,000 square feet. Of those, 80 percent were less than 500 square feet each, including some that were no more than offices with servers piled on desks.[1] In a situation like that, it is easy to imagine the security and management headaches a data center consolidation could cure.

1- Gabriel, Anne R. "The Skinny on Data Center Consolidation." EdTech Magazine. CDW. 4 Nov 2012. Web. 16 Mar 2017.

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TOP DRIVERS FOR CAMPUS DATA CENTER CONSOLIDATION:

- Improved energy efficiency
- Operating cost reductions
- Security and compliance
- Aging infrastructure/obsolescence
- Green initiatives
- State grant and incentive programs
- Space-savings
- High performance compute
- Computational research
- Collaboration —
  - Between departments
  - Between universities
  - Between countries

Energy Efficiency

The major goal and largest benefit of these projects is energy efficiency. Consolidation projects are often made possible by financing that is offset by the substantial reduction in the number of kilowatt hours consumed by the departments individually, and the university collectively. Purdue University's consolidation project yielded over $1MM in energy savings in the first four years alone, with another $500,000 annually in avoided costs for the life of the facility.

"Most of the Purdue data centers that have sprung up over the years were not designed with operational efficiency in mind," says Gerry McCartney, Purdue's CIO. "Because of the electrical power needed to run the servers and the need to cool the rooms around the clock to prevent overheating, data centers should be dedicated facilities that operate as efficiently as possible." [2]

Although true energy efficiency in a data center may seem like an overly ambitious goal, a consolidation project has the unique advantage of a clean-slate approach to an existing facility, often with much higher initial loads. Multi-megawatt facilities provide the opportunity to explore technologies that may not be financially feasible in smaller venues such as power cogeneration, waste heat reuse, flywheel technology, and alternate heat rejection methods.

In an existing operational datacenter, it makes little financial sense to make extensive changes to the way power is distributed, even if it would mean instant energy savings through increased efficiency. It's an expensive retrofit in which the costs wouldn't be justified. This is the thinking behind a greenfield consolidation. A net-new facility provides a chance to start from scratch with power distribution.

'A greenfield project is a fantastic opportunity to have a conversation with the owner about rethinking 208/120V power distribution,' says Patrick Braham, Regional Manager at Server Technology. 'Since they are so used to computing at those voltages, it is an eye-opener to see what is possible at 415/240V.'

2- Thomas, Andrea. "Nearly finished data center consolidation project yields over $1M in energy savings to date." ITaP News. Purdue University. 2 Feb 2016. Web. 16 Mar 2017

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ANNUAL SAVINGS FROM EFFICIENCY GAINS

IT Load (kW)	3%	5%
250	$ 6,570	$ 10,980
500	$ 13,140	$ 21,900
750	$ 19,710	$ 32,850
1,000	$ 26,280	$ 43,800
1,500	$ 39,420	$ 65,700
2,000	$ 52,560	$ 87,600

https://goo.gl/rBSsF8

This table demonstrates the annual cost savings by implementing a more energy-efficient power distribution system based on a $0.10 per kW/hr rate from the utility. Actual savings will vary based on utility rates in your region. Additionally, savings can increase based on sizing and operation of power distribution gear, which runs more efficiently in the middle of its design range.

If you would like to learn more about Server Technology's Solutions for the Higher Education Data Center Environments:

https://goo.gl/xeNlnm

To Higher Voltages and Beyond

For a large multi-university consolidation project in the Northeast, the consortium of schools involved did this kind of retooling, and settled on distributing power throughout the facility at 415V. One of the other advantages of a greenfield build is the ability of the institution to optimize the use of space within the rack. However, this often leads to another common issue in new builds – an increase in density and the amount of power required on a rack by rack basis.

As the load edges past 15 kW per rack, it becomes increasingly difficult and more expensive to provide circuits to each rack to meet demand. For example, it would take two separate 30 amp circuits at 208V to meet the load, while only one circuit would be required at the higher voltage. Double these numbers for redundant A+B power, four circuits versus two, and you can imagine the difference in cost and complexity for the project.

Another energy advantage and key cost saving is in the area of electrical losses. At the device level, computer equipment such as servers and network appliances operate from 2 to 3.5% more efficiently at 240V than 208V. And while this is significant, additional savings come through the distribution system that brings power from the entrance and ultimately to the rack. The number and degree of losses due to transformation through UPSs, PDUs, and RPPs can add an additional 2% efficiency gain to the system. All of this adds up – distribution and transformer losses alone can add up to $21,900 per year at loads of 500 kW, assuming $.10 per kWh. The savings that come from these efficiencies multiply as the total IT load increases.

Conclusion

Data center projects in higher education provide a unique opportunity for institutions to consolidate internally, or work with like-minded educational and governmental agencies externally. These collaborations often result in rethinking data center norms and delving into considerations for energy efficient design. Where this is the case, the financial argument for distributing power at 415/208V to the rack in convincing.

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Why Server Technology?

Server Technology's power strategy experts have provided power solutions for labs, data centers, and telecommunications operations for 30 years. Over 60,000 customers around the world rely on our cabinet power distribution units and award winning power management solutions to reduce downtime, facilitate capacity planning, improve energy utilization, and drive efficiency. With the best quality, best technical support and most patents, Server Technology products provide uncompromising reliability, innovation, and value for the datacenter.

Only with Server Technology will customers **Stay Powered, Be Supported & Get Ahead — www.servertech.com**

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