Success Story: Eaton Corporation

Market Served
Data Centers and IT

Building Next-Generation Data Centers

Location:
Cleveland, Ohio

Segment:
Data center power quality

Problem:
Replace two aging data centers with state-of-the-art facilities employing the latest availability, efficiency and sustainability strategies.

Solution:
Two cutting-edge data centers outside Louisville, Ky., capable of supporting the company's needs reliably and cost-effectively for the next 20+ years.

Results:
Eaton's new data centers are:

- LEED Gold certified
- Projected to deliver $23 million in energy savings over two decades
- Expected to achieve a Power Usage Effectiveness (PUE) rating of 1.5 or less
- Equipped to handle power densities of up to 180 watts per square foot and rack-level electrical loads of up to 8Kw

"Project BlueGrass vividly demonstrates how companies that take a disciplined approach to designing, building and equipping new data centers can deliver IT services reliably, cost-effectively and sustainably."

Rob Agar, Vice President, Enterprise Infrastructure Services

Helping companies efficiently plan, design, operate and eventually refresh or repurpose their data centers is a core part of Eaton's mission. So, too, is doing business in ecologically sustainable ways. Not surprisingly, then, when Eaton embarked on Project BlueGrass, a strategic effort to construct next-generation data centers, it employed today's most sophisticated tools, techniques and design methods in a manner that carefully balanced business priorities with environmental responsibility. The result is a set of state-of-the-art computing facilities that will reliably support Eaton's IT needs for the next two decades and deliver a projected $23 million in energy savings along the way.

This case study provides an introduction to the Project BlueGrass data centers, as well as an overview of the strategy, best practices and technologies that will enable them to deliver industry-leading sustainability, efficiency and availability.

Background

Eaton currently houses most of its server, storage and network infrastructure in two data centers near Cleveland, Ohio. However, one of those facilities is 43 years old, and the second is a third-party leased facility; both are beginning to run short of space and power.

In 2005, IT leaders at Eaton commenced work on a strategic effort to design and build new data centers capable of supporting the company's needs reliably and cost-effectively for the next 20+ years. As sustainability is one of Eaton's core values, the project also aspired to lead the industry in environmental responsibility by achieving gold status under the Leadership in Energy & Environmental Design (LEED) certification process.

Realizing the vision

By the end of 2007, following 20 months of careful study, Eaton had developed a strategic plan of action. The company would construct two redundant data centers within 20 miles of each other. A third facility at least 250 miles away would provide out-of-

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Eaton Corporation is a diversified power management company ranked among the largest Fortune 500 companies. Eaton is a global leader in electrical components and systems for power quality, distribution and control; hydraulics components, systems and services for industrial and mobile equipment; aerospace fuel, hydraulics and pneumatic systems for commercial and military use; and truck and automotive drivetrain and powertrain systems for performance, fuel economy and safety. Eaton has approximately 73,000 employees and sells products to customers in more than 150 countries. www.eaton.com

region disaster recovery support in the event that the primary facilities became inoperable for an extended period.

Eaton then spent 20 months carefully evaluating and selecting best-of-breed companies for its project team in specialties such as project management, engineering, architecture, commissioning and construction.

Next, Eaton employed a rigorous, risk tolerance-based selection process to identify ideal sites for the two core data centers. Based on our chosen networking provider's global footprint, project leaders narrowed their list of options to locations in the U.S. Then they looked for regions inside the U.S. with a low historical incidence of natural and man-made disasters. A review of disaster data from the federal government led them to 15 specific metropolitan areas. Each of those areas was then checked against a list of additional requirements, including access to adequate energy supplies at competitive rates and the availability of financial incentives from county and state governments.

In the end, the project team identified the corridor between Louisville and Lexington, Ky., as the area that best met Eaton's site selection criteria, and ultimately purchased two pieces of real estate east of Louisville and approximately 14 miles apart from one another.

One of the sites is located near the University of Louisville and was nicknamed the "Red site" in honor of the school's colors. The second site was named the "Blue site" in honor of the University of Kentucky's school colors. The overall project was then named Project BlueGrass in honor of Kentucky being known as the "Bluegrass State."Design and architectural specifics

Construction began on the Blue site in February 2010 and the Red site in June 2010. When fully operational in 2012, both data centers will be cutting-edge facilities from top to bottom.

Physical layout: Each site will initially occupy a little over 102,000 square feet of space, including:

- Two data halls of approximately 10,000 square feet each
- Approximately 35,000 square feet of electrical infrastructure space
- Approximately 14,000 square feet of mechanical (cooling) infrastructure space
- Approximately 10,000 square feet of office space
- Two 3,300 HP generators, capable of delivering 2MW of power for up to 10 days should utility power become unavailable. This is consistent with Eaton's N+1 redundancy requirements for these facilities.

Electrical systems: On day one, each data center's electrical infrastructure will support power densities of 90 watts per square foot, with upgrade steps at 120 and 180 watts per square foot.

Cooling systems: Both data centers use a computer room air handler that passes heat from the data hall over a coil containing cool water, resulting in cold air being distributed back into the room and warm water being transported to a chiller. There, after another exchange, heat is passed to the cooling towers, where it's discharged into the atmosphere.

Monitoring and management: Both new data centers will be equipped with an electrical power management system and an integrated building management system that will provide sophisticated centralized monitoring and administration capabilities. The two systems will also archive power monitoring data for future reference, so managers can generate reports on topics such as energy consumption, load capacity and power quality.

Environmental responsibility efforts

In September 2011, Eaton took pride in receiving gold certification from LEED for both of its new data centers. To earn that honor, Eaton employed a mix of traditional and cutting-edge techniques in five areas.

Sustainable sites: To limit each facility's physical footprint, Eaton chose compact power distribution units and uninterruptible power systems (UPSs). It will also operate both facilities at 400V to eliminate step-down transformers and cut space requirements by 50 to 60 percent.

Water efficiency: To reduce cooling-related water consumption, Eaton will run its data centers at a target of 74 degrees Fahrenheit/23.33 degrees Celsius rather than the traditional 65 to 68 degrees Fahrenheit/18.33 to 20 degrees Celsius. In addition, a Dolphin WaterCare system will improve the efficiency and extend the life of the facilities' cooling infrastructure by preventing corrosion and algae growth in pipes without using environmentally-harmful chemicals.

Energy and atmosphere: The Project BlueGrass data centers will employ numerous strategies and technologies to maximize energy efficiency, including server virtualization, UPS hardware that delivers up to 99 percent efficiency, energy-efficient computer racking equipment and a water-side economizer. All told, Eaton expects its design and infrastructure decisions to produce power savings of at least $23 million over 20 years, depending on how rapidly the company's IT requirements grow.

Materials and resources: Throughout the construction of its new data centers, Eaton strove to reduce consumption of natural resources and overall environmental impact. For example, so far more than 92 percent of the wood products used at the Blue and Red sites are certified as sustainably harvested by the Forest Stewardship Council.

Environmental quality: Eaton has made environmental quality as high a priority inside its new data centers as outside of them. Among other measures, we installed sensor-based lighting systems, leveraged natural light wherever possible and built a 600-square-foot fitness center for our employees.

Conclusion

Project BlueGrass vividly demonstrates how companies that take a disciplined approach to designing, building and equipping new data centers can deliver IT services reliably, cost-effectively and sustainably. Thanks to the rigor with which vendors and locations were selected, as well as the leading-edge infrastructure resources, power quality equipment and monitoring systems we chose, Eaton will soon be equipped to support at least 20 more years of IT growth while conserving water, energy and natural resources in ways that will generate tens of millions of dollars in savings. The good news for other companies is that they can achieve similar results by employing the same best practices.

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