



Scaling up: How to overcome the challenges of managing edge locations

Boosting uptime, operational efficiency and sustainability in distributed IT environments

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Executive summary

The shift to the edge is accelerating while using larger, more powerful computing capabilities. By processing and storing data closer to where it is created, edge applications are delivering on the promises of low latency, unlocking bandwidth and mitigating how much information needs to be moved around. Edge computing supports a far more agile and scalable approach to leveraging data, but these sites take more effort to manage.

With computing power distributed across many facilities, thousands of devices need to be maintained and managed. How can you make everything work as planned when you lack skilled, on-site staff at your edge facilities and your team is focused on running the core data center?

Managing and optimizing edge environments effectively and sustainably is a must, especially as companies make commitments to achieve net-zero or negative carbon emissions and regulatory pressures mount, like new mandates on power usage effectiveness (PUE) levels in data centers of all sizes—from small, remote server rooms to hyperscale environments.

Digital strategies are enabling data center and IT managers to optimize power infrastructure, maximize equipment uptime, manage multiple energy sources and get new value from existing data center software. These advancements are making it possible to manage infrastructure at the edge far more effectively.

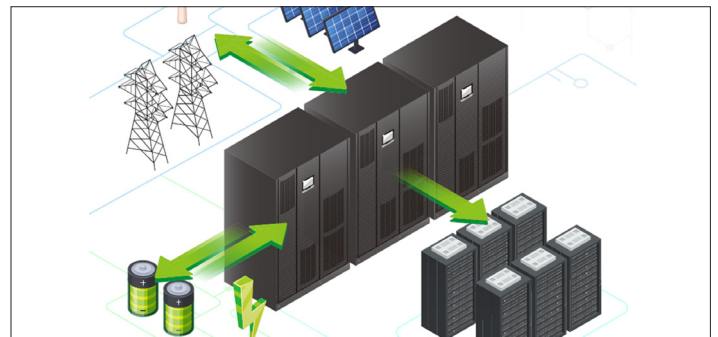
Distributed IT environments are proliferating, creating new opportunities

It's not surprising that analysts predict the amount of electricity required to manage data will continue to increase with the world's ever-increasing demand for data. Because energy requirements are nowhere near those of core data centers, distributed IT environments are in a great position to take advantage of onsite renewable and energy storage systems to help offset this increase.

Back in 2018, just [10% of enterprise-generated data](#) was created and processed in non-traditional or cloud environments. Fast-forward a few years, and [global spending on edge computing](#) is expected to reach \$317 billion by 2026 and is up 13.1% over last year.

Many organizations have accommodated this transition to the edge and adjusted their business models accordingly. Getting there has typically required a lot of temporary fixes. But today, there's a big opportunity to consider energy infrastructure holistically, especially as it interacts with IT systems, to develop more effective long-term strategies for managing distributed locations.

There are also new tools and opportunities to sustainably power edge environments. Because energy requirements are nowhere near those of core data centers, distributed IT environments are in a great position to take advantage of onsite renewable and energy storage systems.



Eaton's [EnergyAware UPS](#) can provide and receive energy from the grid to optimize utility bills and generate an additional revenue stream.



Powering Business Worldwide

How you manage power has never been more important

Outages have become more expensive, with more than [two-thirds of outages costing over \\$100,000](#). While research shows there are many contributing factors to the increasing cost of downtime, the biggest reason is the dependence of business activities on digital services. That's likely to continue as businesses (and people) rely more and more on being digitally connected. Although the cost of outages is climbing, [most operators \(78%\) see downtime as preventable](#) through better management and processes.

When it comes to distributed IT environments, maintaining equipment and managing power can be a significant challenge—especially when thousands of devices and mission-critical operations are in play and your support team is located at a core facility far away.

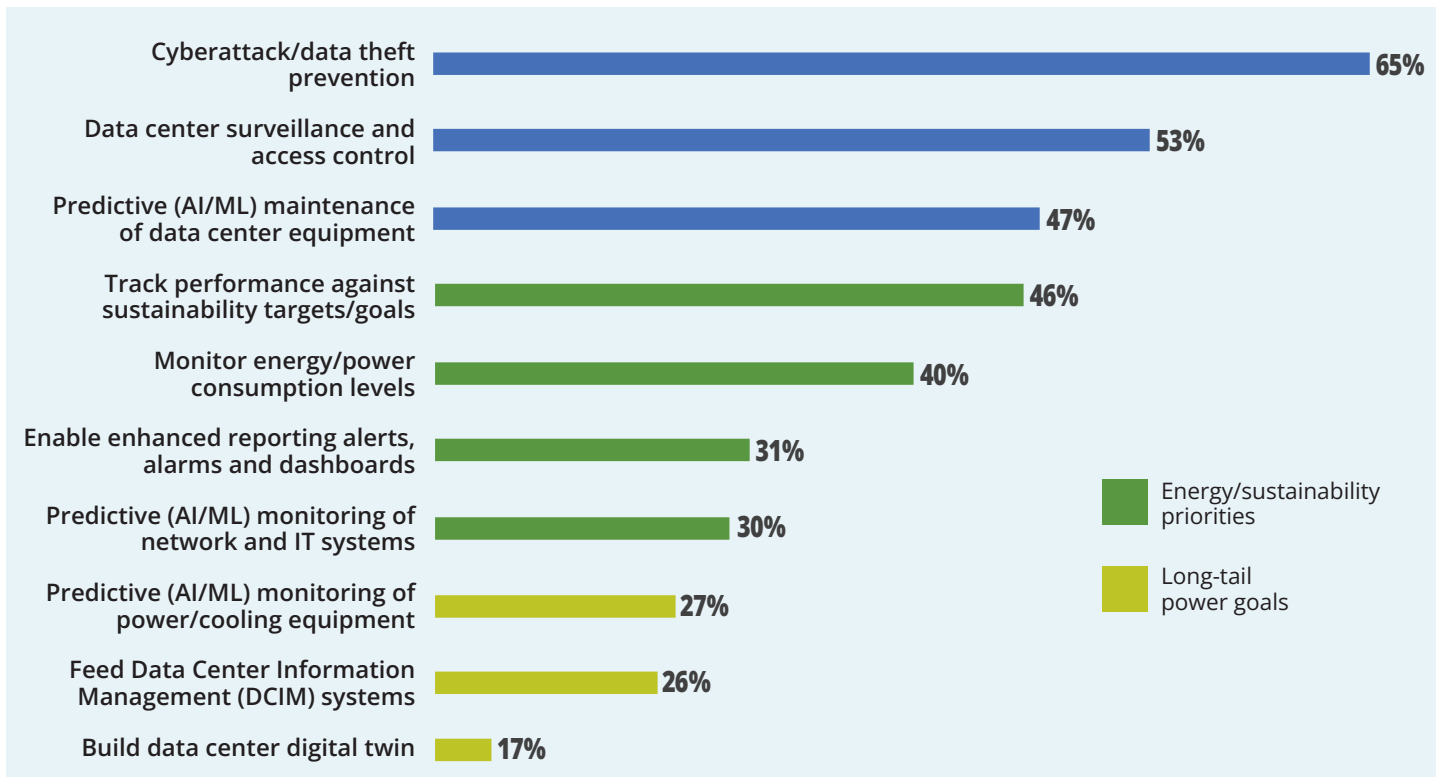
For example, a regional healthcare provider with a dozen hospital campuses and hundreds of clinics has a complex logistical challenge. What happens when the local compute or IT infrastructure in one of those clinics goes down? The data is mission critical.

For edge facilities to become more manageable, infrastructure must be digitally connected and remotely controllable. Operating edge facilities with clear visibility into highly distributed locations requires the right information to be available to the right people so they can make the right decisions. This means digitalizing, automating and better maintaining the electrical infrastructure that supports edge computing environments so you can manage edge locations remotely.

Going back to our example, if a healthcare provider experiences a localized problem at one of their clinics, the power infrastructure needs to help automate reactions. Any potential problem in a clinic's infrastructure should be predicted and proactively averted, or at the very least, able to be managed remotely.

Further, mandatory sustainability reporting is coming. Yet just [37% of data center operators collect and report on carbon emissions data](#). As data center [digital priorities focus on increasing renewables](#) (to the tune of 50% of data center operators), more visibility and reporting from edge environments is essential.

Digitally-enabled data center management use cases



Question: Which of the following digitally-enabled data center management use cases has your organization deployed or plan to deploy in the next 12 months to improve how it operates its data centers?

Base: Data center operators (n = 250)

Source: 451 Research and Eaton custom survey

Eaton research report, [“The intersection of digital transformation and the energy transition,”](#) finds energy-centric digital use cases vie for data center attention.

Practical and proven strategies to better manage power at the edge

There's often a gap between the information people need to make the right decision and what's available. The good news is IT teams and data center operators can take some important steps to enhance edge operational efficiency and incorporate more sustainable energy sources.

Step 1

Identify and replace old equipment that isn't digitally enabled

Whether you're trying to deploy a new business process technology or improve efficiency at the edge, intelligent power infrastructure is essential because it enables remote control and data-driven analytics to help minimize the impact of an issue before it has an opportunity to take hold—often eliminating it all together.

When deploying new IT technology to innovative business processes at edge locations, it's a great time to refresh the power infrastructure at those sites. This can enable new mechanisms to monitor what's happening at distributed locations, along with remote control and commands. Digitalizing power infrastructure is required to improve operational efficiency.

As regulatory pressure mounts to achieve PUE targets beyond core data centers, measuring power draw will become ever more important at the edge. Monitoring software is essential, and digitalized power infrastructure is a must to provide data.

Further, opportunities exist to expand the capabilities of under-used assets. Intelligent uninterruptible power supplies (UPSs), for example, provide vital data at the edge and can support green data center design for edge data center locations, like a one-megawatt containerized data center attached to a cell tower.

There is also an opportunity to offset utility costs with renewables. Digitally-enabled UPSs can help determine when to use renewables, utility power or energy storage to manage the optimal flow of energy. Not only can these UPSs help optimize energy usage and reduce the cost of energy through demand-response activities, but they can become an active participant in achieving sustainability targets.



Know your power, space and cooling usage with Eaton's [Brightlayer™ Data Centers suite](#).

Step 2

Growth through software

The maxim "if you can't measure it, you can't manage it" holds true, especially since most edge locations are not managed by onsite staff. Once you've digitalized, you can use your digital footprint to see what's going on at the edge.

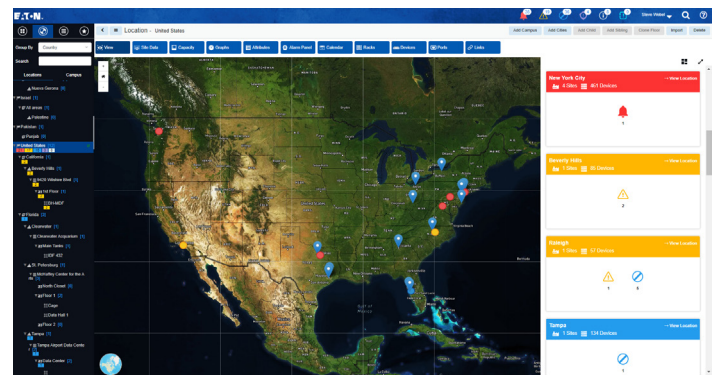
A powerful key to unlocking new value from data lies in multi-system integration. Traditionally, data is held in various and discrete silos, such as information technology service management (ITSM), building management system (BMS), [data center infrastructure management](#) (DCIM), enterprise resource planning (ERP) and [electrical power monitoring system](#) (EPMS) solutions.

When selecting software, make sure it provides the capabilities you need today and can scale to meet your future needs. Deploy a software package that allows you to unlock new modules or capabilities as you need them, rather than deploying new software packages each time.

For example, when it comes to IT equipment like racks and network closets, the DCIM software that helps manage and improve operational efficiency in enterprise and colocation data centers can also provide fleet management with monitoring and asset tracking capabilities for edge environments. And when DCIM and EPMS capabilities are used together, you can gain insight into your electrical system and an understanding of a facility's total carbon footprint via a single application.

The vision is to eliminate traditional software silos with integration so your systems can talk to each other and ultimately provide you with deeper insights into what's happening across the facilities you manage. Start where you know you can scale up and expand as necessary. When evaluating new software, make sure the vendor can support this level of expandability and interoperability via an application programming interface (API) or other intelligent integration.

No matter what, your software is essential to support automation at the edge. By creating automation policy in a centralized software and pushing it to the edge, you can de-risk the execution of that policy. And by managing your power infrastructure centrally, you can push new firmware, configurations, graceful shutdown policies and more to the edge automatically.



Know what's happening at your edge sites with the Brightlayer Data Centers suite.

Step 3

Managing lifecycle

Managing assets at the edge is a significant challenge. Sending someone from your team to check equipment status is hardly a value-add activity.

Asset lifecycle and fleet management requires more than an alarm. It entails:

- 1 **Knowing what you have (where it is, when the warranty runs out and when it was last maintained) is essential.**
- 2 **Being able to receive data, interact with devices and get the right information from them to feed your analytics.**
- 3 **Taking action via your software, so you can prevent or reduce the likelihood of a truck roll.**

In other words, the core value of asset management is not about equipment alarms at the edge. It's about knowing when equipment was purchased and its operating conditions, so you can evaluate risk and better understand when it needs to be replaced or maintained. Only then will you be able to improve your operational efficiency and extend the life of your assets.

Row Limit		10000	Date Range	2023-04-04 - 2023-04-04					
Sort By		Device Group							
Texas Medical Center East									
Type	Manufacturer	Model	Device Name	Output Load (%)	Seconds On Battery (sec)	Last Replace Date	Battery Time Remaining (sec)	Serial Number	Temperature (°F)
UPS - Rackmount	Eaton	SP1000R	Rack UPS Office 09 - SP1000	66	1362	2021-03-21 19:00:00 EDT	1681	G33483982	79
UPS - Rackmount	Eaton	SP1000R	Rack UPS Office 02 - SP1000	24	1010	2022-06-14 19:00:00 EDT	1663	G33483975	69
UPS - Rackmount	Eaton	SP1000R	Rack UPS - SP1000 -19	48	1571	2021-03-21 19:00:00 EDT	1548	G33483992	81
UPS - Rackmount	Eaton	SP1000R	Rack UPS Office 07 - SP1000	64	1678	2021-03-21 19:00:00 EDT	1544	G33483980	70
Public, Texas Medical Center West									
Type	Manufacturer	Model	Device Name	Output Load (%)	Seconds On Battery (sec)	Last Replace Date	Battery Time Remaining (sec)	Serial Number	Temperature (°F)

Check the status of your UPS batteries with the Brightlayer Data Centers suite.

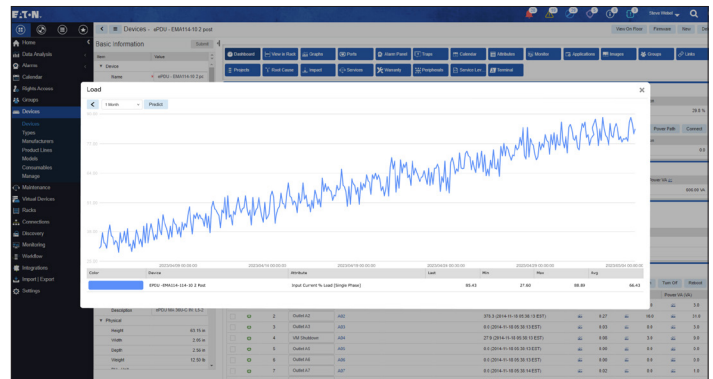
Step 4

Interacting with equipment remotely

How can you hit the reset button on equipment without being there? Digital equipment and software provide the remote control and automation to turn things on and off from anywhere.

For example, if the capacitors in your UPS are under performing, you can determine that they need to be replaced without an emergency event. Instead of waking up at 2 a.m. on a Saturday due to an outage, you can plan maintenance, and have the right technician and parts on hand—saving time and money, and keeping your operations on.

Equipment predictive health monitoring makes intelligent decisions about lifecycle management based on data. By understanding equipment health, you can make an informed decision on when to replace a UPS or its batteries, reducing waste and costs in the process. You can also avoid replacing equipment that can operate for another year or more, so proactive maintenance is less of a distraction for your operation. Predictive health monitoring reduces downtime and costs, and helps keep IT teams focused on what they need to accomplish.



View the predictive device health report available in Brightlayer Data Centers suite software so you can proactively address degrading performance and mitigate unexpected downtime.

SOFTWARE FOR MANAGING THE EDGE

Deep intelligence into network-connected UPSs and power distribution units (PDUs)—regardless of manufacturer or location—can be a gamechanger for enhancing uptime in distributed IT environments. Eaton's [Brightlayer Data Centers suite](#) software provides critical power system insights and flexibility so you can:

- Know what's happening across your UPSs and PDUs.
- Quickly troubleshoot and resolve potential equipment issues.
- Remotely push Eaton firmware updates or configuration changes in bulk.
- Remotely control your infrastructure without needing to roll trucks to distant sites.
- Optimize your operations using detailed reporting and accurate visibility.
- Create automations that solve problems at the edge.
- Scale as your needs change in the future.



Conclusion

There is no better time to improve how you manage power, especially as energy costs climb, electricity consumption and regulations increase, and computing power moves further away from the staff that can fix problems in real time. And as the adoption of edge computing environments continues to rise, low PUE across facilities compounds, which means you're carrying more energy overhead than necessary.

Digitally-enabled hardware and software are enabling far more effective ways to manage electricity consumption while allowing you to add renewables to your energy mix, and reduce the frequency and impact of outages.

Building trust in data-enabled decision-making is paramount to knowing when to accelerate, and when not to. Get it right and your business will be prepared for whatever the future holds. Get it wrong and you could be left behind.

By carefully assessing, maintaining, optimizing and integrating data center and distributed IT assets—and remaining mindful of what might lie ahead—you can ensure you are moving in the right direction for greater efficiency, effectiveness and sustainability.

About the author

Mike Jackson is the director of product for data center software at Eaton. In this role, he leads the global software product management, marketing and commercial operations team responsible for the development and go-to-market strategy for data center and distributed IT software applications, and digital services.

Jackson joined Eaton in 2007 and has held various roles in product leadership, marketing, sales and operations. He earned a bachelor's degree in mechanical engineering from the University of Dayton and an a Master of Business Administration from North Carolina State University.

For more information, visit
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