

ENERGY EFFICIENCY

The Green Tide Is Coming: Pressure Builds for an Energy-Efficient Data Center

It's safe to say that most companies, if presented with hard numbers on their energy consumption and efficiency, would be surprised and maybe even shocked to discover what they spend on energy, including how much they waste and the impact of overuse of the environment.

But in fact, many companies don't know how much they spend on energy and have no idea of their level of efficiency or how to begin an energy assessment. Often, even who pays the utility bills is a mystery.

One group that is keeping track of data center energy use and spending is the Environmental Protection Agency, which in August estimated that U.S. corporations and public agencies spent \$4.5 billion to power their data centers in 2006, a figure that is expected to grow to \$7.4 billion by 2011.

IT executives may not be fully aware of the numbers, but they do know that, as business needs force the expansion of their data centers, they need to expand more cost-effectively and efficiently. That means minimizing space requirements, improving power, heating and cooling, and replacing older, inefficient systems with dense, energy-efficient or virtualized systems.

According to a new survey by IDG Research, only 20 percent of companies describe their energy usage as very efficient or efficient, while 26 percent rate the importance of monitoring the cost of energy as a 4 or 5 (out of a possible 5). These figures suggest that many companies are at the very early stages of assessing their energy consumption and

its impact on the environment and the bottom line.

Indeed, in just the past year, a change has occurred in the way companies acquire enterprise systems and expand their data centers, and a new checklist item has emerged for technology providers. That is, they need to produce energy-efficient systems, help customers reduce their power consumption, and improve the efficiency of their costly data centers.

Jim Hirsch, CIO of the Plano Independent School District in Texas, is a case in point. "We're planning a new disaster recovery solution, and we're asking [our providers] if there are ways to deploy services without bringing in another piece of hardware. It's now becoming part of the purchasing decision."



Data Center Dichotomy

Data centers are the hub of an organization, giving the company the tools and competitive weapons it needs to run the business effectively. But it can also be an Achilles' heel because of the inefficient way many data centers are designed, populated and run. Additionally, power surges and shortages can affect business operations as applications can slow down or stop responding altogether.

The digital economy is adding to

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the burden. Some companies are adding thousands of users each year, compounding the need for more servers and storage. But it's incredibly inefficient growth, since many businesses don't make full use of the systems they already have. Data centers grow in size and cost, resulting in "server sprawl" that only gets more difficult to contain and manage, not to mention more expensive to power and cool.

"We told our server vendor we need a more efficient way to deploy applications, as opposed to just putting in another box and buying another rack and buying more power supplies," says David Moore, CIO of Spectrum Laboratory, which is experiencing growth of 20 to 25 percent annually. "We need to become smarter about how we deploy software."

Reducing energy consumption and improving the efficiency of data centers have become more important because it's good for the environment and the wallet. IDG Research shows that cost savings is an important driver behind the implementation of energy-efficiency strategies, followed by a desire to be seen as a good corporate citizen and, just as important, to facilitate server consolidation initiatives.

The Role of Virtualization

Server replacement and consolidation are logical first steps toward another initiative that has tremendous potential to improve the overall efficiency of data centers: virtualization.

The majority of survey respondents plan to consolidate servers and implement virtualization technologies to increase utilization rates, reduce data center space requirements, and have the flexibility to dynamically shift workloads for added redundancy and reliability.

Often, the desire to "go green" is not what drives energy-efficiency initiatives. For many IT executives, such efforts are the result of significant growth and the recognition of the opportunity that growth presents to the organization.

"We have to roll out a new array of databases," says

Roger Jackson, director of information services at Nortech Systems Inc. "And rather than do what we might have a year ago, which is bring up another server, we're actually going to take the time to analyze all the spare cycles we have sitting around, and through virtualization, roll out multiple environments on one set of hardware."

Virtualization, where a system is partitioned so that it can run multiple applications and operating systems at the same time, can boost utilization up to 85 percent. This enables companies to use fewer servers (consuming less power) and take up less physical space in the data center.

"We have a number of applications that can be hosted virtually, so that has allowed us to avoid expanding our data center, which means we can get more done with less power, less heat, less footprint," says Moore.

That virtualization improves server utilization and efficiency is, by now, common knowledge. But virtualiza-

tion has many ancillary benefits (some of them unexpected), and is being implemented to increase reliability, redundancy, scalability, and to increase disaster recovery capabilities.

But while virtualization can help improve efficiencies and redefine the economics of the data center, it is not without challenges. Many independent software vendors will not support enterprise applications in a virtual environment, which naturally wearies corporate customers. There's also a lack of management tools that can help comprehensively manage and automate virtual data centers at both the virtual and physical layers.

Organizationally, some IT departments find it difficult to get departmental commitments to virtualize applications. That's because some users fear losing control of and access to their applications, since the software is not tied to a dedicated server.

It's clear that corporate customers need help in addressing these issues. Sixty-two percent of survey respondents say they're likely to turn to technology providers for

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—DAVID MOORE, CIO,
SPECTRUM LABORATORY

help. Sun Microsystems has a range of energy-efficient systems and components—such as storage, networking and virtualization management software—that bind disparate pieces, enabling end-to-end virtualization from the desktop to the data center.

CIOs like Gene Doody of the City of Richmond say they're happy to emulate the success of IT providers that have done it themselves. "I want my vendors to tell me what to do, because they're probably going through the same process and they should be able to give us some type of blueprint," he says. "Why try to figure out something that somebody's already solved?"

Getting Started

For some IT departments, data center efficiency programs dovetail with broader corporate green programs that include basics like recycling and energy-efficient lighting. In both cases, before implementing an energy-efficiency plan, it's necessary to get a handle on usage. That can be challenging, especially for larger companies with data centers or other facilities spread out across the U.S. or internationally. But it is being done with increasing frequency. Seventy-two percent of companies surveyed said they plan to track their monthly utility bills to monitor usage; 46 percent say they will use an electrical meter to measure usage of systems and devices; and 41 percent plan to use software to manage and monitor server power usage.

But measuring data center power consumption can be time-consuming, costly and challenging because data centers are in a constant state of flux. Workloads change depending on sales cycles and even the time of day. IT organizations are therefore challenged to accurately measure power consumption to reflect efficiency improvements as well as ensure that the information gathered is timely and actionable.

Sun Microsystems redesigned its own data centers after discovering the high costs and inefficiency of its old setup. New airflow, power, cooling and heating layouts and sys-

tems, along with consolidated and virtualized systems, dramatically improved its efficiency and cut costs.

The metric is the ratio of IT equipment load to total power utility. In a typical data center this ratio is 0.3, meaning that only about 30 percent of total utility draw powers servers. Another third is used to remove server-generated heat, and another third is consumed by power conversions in uninterruptible power supplies and power distribution units (PDU).

Companies can simply and quickly cut energy costs by reducing their IT load, which is easily accomplished by replacing older, less efficient systems with more efficient ones powered by newer energy-saving processors such as Sun's UltraSPARC T2.

Sun's approach for measuring data center power consumption begins with aggregate measurements at the PDU level, where software or manual methods can track consumption for all

IT devices over long periods of time. This yields more accurate power measurements, since they are taken over multiple business cycles. This approach is part of Sun's Eco Innovation initiative, which helps customers assess, optimize and virtualize their data centers.

The Benefits

Once energy use has been assessed, IT departments have determined which servers can be consolidated and which applications can be virtualized, and conservation plans put in place, the next step is measuring success. Eighty percent of companies surveyed say decreasing energy costs is an important measure of success in becoming more energy-efficient. Of those respondents with a formal energy-efficiency plan, 54 percent have experienced a decrease in energy costs, with an average reduction of 14 percent.

Other major benefits include better system performance and a reduction in data center space consumption, which lowers operating costs.

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The CIO of Bowdoin College, for example, says her organization eliminated one-third of its servers through consolidation and virtualization programs and saved \$300,000, even as its need for more servers and processing power was dramatically increasing.

Other benefits cited by survey respondents include lower total cost of ownership and meeting regulatory and compliance requirements.

To be sure, many companies are at the early stages of their energy-efficiency initiatives. Part of the reason may be that more than one-quarter of respondents say there are no specific corporate incentives for IT departments to meet energy-efficiency goals. However, 27 percent cite communication and cooperation with executives as the most common

incentive to meet energy reduction targets. This is evidence that business and IT are slowly aligning their individual goals for the sake of a common one.

When the time comes to expand the data center, will you fall back on old ways or look for opportunities to do things differently? The truth is that it's not difficult to begin an energy initiative in your data center. Simply replacing older systems with energy-efficient ones can yield quick cost savings. From there, it's a snowball effect: virtualizing your environment reduces the number of systems you need, which minimizes data center space and power requirements, which lowers operating costs.

It's a powerful one-two punch: save money and the environment at the same time.

Energy Efficiency: CIOs Speak Out

IDG Research Services asked CIOs for advice and strategy for optimizing energy efficiency. Highlighted below are a few examples of initiatives being implemented in the public and private sectors.

Beyond virtualization

"Our key area of focus is on backup and recovery. Virtualization has allowed us capabilities of recovery that are much more efficient and is making the possibility of a hot site more feasible."

Steve Reneker, CIO
City of Riverside

Energy evaluation

"Probably the first thing that we did is look at the data center and say, 'OK, what sources of heat generation and power consumption do we really not need? Do we need to expand our cooling capabilities and expand our energy usage to support the business? Or, can we do a more efficient job?'"

Roger Jackson, Dir. of Information Services
Nortech Systems Inc.

Server strategy

"I'm not sure that in my view the storage is the key in the green environment as much as it is the servers. What I'm doing is putting in a blade that generates more heat and requires more energy than a server, but I can virtualize more servers on an individual blade. So the fact that I'm implementing fewer blade servers reduces my costs."

Gene Doody, CIO
City of Richmond

Power usage inventory

"Within our recently acquired organization, we don't have a breakout of the power costs of the server rooms specifically, since they are lumped with overall building usage, but we maintain an ongoing inventory of power requirements in all major server rooms. I think this is becoming an increasingly high priority for all IT organizations, although perhaps not as much as here."

Paul Massie, Senior Director of IT & Facilities
Genesis Microchip, a recently acquired,
wholly owned subsidiary of STMicroelectronics