POWER ASSURE

The Power to Extend the Life of the Data Center

A Power Assure White Paper

The Power to Extend the Life of the Data Center

Outgrowing a data center tops the list of worries that haunt a CIO. The worst case scenario is where there is simply no longer sufficient space to accommodate the equipment necessary. With today's high-density and virtualized servers and storage systems, such a situation is fairly rare. A far more likely scenario is that the data center will exceed the total available power, forcing a very costly upgrade.

For this reason, CIOs and facility managers are now paying close attention to power in the data center. And the industry has responded by creating both the metrics and the tools needed to improve how organizations assess and manage power consumption. Improving power efficiency can extend the life of most data centers, often indefinitely. But there is a problem with some of the metrics being used. To paraphrase in the 21ST century what 19TH century British Prime Minister Benjamin Disraeli said: There are lies, damned lies and energy efficiency ratings.

This white paper is intended help CIOs and facility managers understand how best to employ these new metrics and tools to manage power consumption and improve energy efficiency. But as the old saying goes: You can't manage what you can't measure. So the effort must begin by taking a baseline measurement. And you also can't manage the same way you did before as Albert Einstein noted when he observed, "We can't solve problems by using the same kind of thinking we used when we created them."

The Baseline: Understanding Existing Power Consumption

A worthy goal today is considered to be achieving a Power Usage Effectiveness (PUE) rating of 1.1 to 1.4 in the data center. PUE, created by the Green Grid, is the ratio of total power consumed and the power used by the IT equipment. Today's typical rating of 2.0 signifies that half of the power being consumed is going to the data center's servers, storage and networking equipment; the rest is required for cooling, lights and the inherent inefficiencies in any power distribution system. The Data Center Infrastructure Efficiency (DCIE) rating is the reciprocal of PUE; that is, it's the ratio of the power used by the IT equipment and total power consumed.

A more revealing result is provided by McKinsey's Corporate Average Datacenter Efficiency rating system because CADE also takes into account the biggest source of waste in data centers today: poor server utilization. CADE is the product of Facility Efficiency (similar to DCIE) and the IT Asset Efficiency, the latter being a measure of server utilization. Organizations that have consolidated and virtualized servers (a current best practice) achieve a much better CADE rating.

This reveals the first flaw in the current approach to power management: The popular PUE and DCIE ratings fail to take into account the efficiency of the IT equipment itself. These ratings give high marks when power is being used by IT equipment, but too much of the power being consumed by underutilized servers is not actually being put to work. Ironically, the use of very efficient IT equipment increases PUE, while the use of older, less efficient equipment reduces PUE. This is completely counter to the goal of PUE, which is to achieve a more energy efficient data center.

The second flaw is how most data center managers measure power consumption: They don't. And for good reason: It's not easy. So the IT or facility manager calculates the load based on nameplate ratings or datasheet specifications. But these always-conservative numbers are incapable of revealing actual power

consumption, and, therefore, inflate PUE/DCIE ratings. Worse yet is that such practices can strand power in the data center, leaving it unavailable where needed.

Fortunately, there are now tools available for accurately measuring actual power consumption—down to the individual plug or server. The more robust of these so-called data center infrastructure management (DCIM) solutions support both the industry standard and popular proprietary protocols used to measure power consumption, which means there are no special agents to install or no extra wires to run. The better DCIM solutions make the implementation even easier with advanced capabilities like auto-discovery, capacity planning, building energy management system integration, sophisticated yet intuitive dashboards, comprehensive reporting, and more.

The best DCIM solutions also offer dynamic data center optimization (DDCO) to achieve peak energy efficiency by migrating from today's "always on" practice of operating servers to an "on demand" approach. DDCO solutions work in cooperation with load-balancing or virtualization systems to continuously match server capacity with demand. The result is far better energy efficiency with no adverse impact on performance. (See the Technical Brief titled Optimization: The Next Step for Server Consolidation/Virtualization for more details.)

With DCIM, there is simply no longer any good excuse for not measuring power consumption, and for not taking advantage of this powerful tool to improve energy efficiency throughout the data center.

Improving Power Efficiency End-to-End

The better data center infrastructure management systems offer several ways to manage power more effectively and, thereby, extend the life of the data center. One of the most beneficial is the elimination of stranded power. Stranded power exists wherever power distribution is matched incorrectly with actual power consumption. Some racks have capacity that remains unused or stranded, while other racks may not have enough, causing circuit breakers to trip. By knowing precisely the average and peak power consumed by all equipment, systems can be configured to match the power distribution in all rows and racks.

Another important consideration for equipment placement is cooling. While this topic is beyond the scope of this paper, the same DCIM modeling tools used to minimize stranded power can also play a critical role in optimizing the placement of systems in suitable hot/cold aisles and even within the individual rack. What-if analysis allows the various permutations and combinations of power and cooling considerations to be evaluated easily and accurately to achieve the most efficient result. Today, most data centers remain way too cold and not anywhere near to the 80°F (27°C) cold isle temperature that ASHREA recommends. The reason is fear of hot spots. Taking constant and accurate measurements of the server inlet temperature can minimize this risk, and the use of dynamic data center optimization can shift capacity before any such problems arise.

Performance improvements based on Moore's Law make it prudent to replace servers, storage and networking systems on a periodic basis. Sometimes the change is driven by new features, or as part of a major consolidation and virtualization initiative. But determining the optimal time to refresh servers is not so straightforward. The new servers may offer better price/performance, but can their total cost of ownership (including power consumption as a major operating expense) be justified? And if so, which old servers should be replaced first, and by which model of new servers?

To help IT managers make such choices more wisely, the EPA created an EnergyStar rating system for servers and other IT equipment. But there is a fundamental flaw here, too: EnergyStar does not factor in the age of the equipment, and with a two-times improvement in performance every two years, this is a serious shortcoming. So like PUE and DCIM, an EnergyStar rating provides no means to assess the energy efficiency of the server itself. In addition, because EnergyStar ratings are given only to the "best" 25% of the servers tested, vendors can submit products to intentionally skew the results. To make a fully-informed decision about a server refresh, IT managers are, therefore, forced to make estimates based on performance specifications. As noted above, however, the use of specifications can produce inaccurate and misleading results.

To address this shortcoming, Underwriters Laboratories is pursuing a new method for calculating energy efficiency: the Power Assure Rating system. PAR4 produces both absolute and normalized over time energy efficiency ratings for both new and existing equipment on a transaction-per-kilowatt-hour (kWh) basis. The "4" in PAR4 indicates that four such measurements are made: power-on spike, wave form, boot cycle and 100% load. This provides an accurate means for IT managers to compare legacy servers with newer models, and newer models with one another. PAR4 ratings are particularly useful for determining the most power-efficient choice of server(s) during benchmark testing of actual applications.

Conclusion

Power is the limiting factor in most data centers today. Extending the life of most data centers, therefore, involves managing power more effectively. But you can't manage what you can't measure, and that requires use of a DCIM or DDCO solution. These tools empower IT and facility managers with the actionable information they need to make optimal choices about equipment, its placement and its use to improve energy efficiency and, ultimately, postpone (perhaps indefinitely) a costly data center upgrade.

To learn more about how your organization can benefit from dynamic data center optimization as a means to improve energy efficiency and reduce operating costs, visit Power Assure's Resource Center on the Web at www.powerassure.com.

Contact Power Assure to get started

Let us demonstrate how Power Assure can help you reduce your energy costs. Contact us at sales@powerassure.com

www.powerassure.com