Viridity Software Brings Much-Needed Power-Efficiency Monitoring and Management to Data Centers

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Management Summary

Viridity Software of Burlington, Mass., recently introduced *EnergyCenter*, a new software tool for power efficiency management in the data center. It tracks power consumed by individual IT devices as well as server utilization, and creates power-utilization profiles with actionable insight into how to reduce energy consumption and IT costs.

Read on for details about why enterprises need to be proactive about power efficiency management and how Viridity Software's EnergyCenter can assist.

The Need for Data Center Power Management

Power management has become a primary concern for enterprise data centers. Electricity – like oil, iron ore, timber, or any other commodity – is a scarce and valuable resource. Supply is limited and data centers are charged for every kilowatt-hour used. Electricity is also the fuel that drives IT equipment, runs applications, cools data centers, and supports all aspects of modern business.

It used to be that power consumption was an afterthought. Compared to the cost of building data centers and buying and maintaining IT equipment, the cost of power was considered inconsequential. Facilities paid the bill while the IT department was concerned with running the IT infrastructure.

For six reasons, this is no longer the case.

1. **Power densities have increased substantially** – Moore's Law and the steady rise of processing power, multi-core processors, and server consolidation and virtualization have driven a tremendous increase in the energy consumed per square foot in data centers. According to the U.S. Environmental Protection Agency[1], data center power consumption more than doubled from 2000 to 2006, reaching 61.4 billion kilowatt-hours and 1.5% of total U.S. electricity consumption. This is the equivalent of 5.8 million households. The EPA expects power consumption to nearly double again by 2011 unless data centers adopt energy-efficiency strategies.

2. **Power used by IT equipment has a multiplier effect on the power bill** – The power consumed by IT equipment (i.e., servers, storage, networking equipment) is dissipated into the data center as heat. Data centers use cooling systems to remove the excess heat from the air. These cooling systems consume a significant amount of additional power, though some data centers also employ sophisticated techniques like hot aisle/cold aisle configurations and venting with outside air to minimize cooling. On average, data

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[1] See *Report to Congress on Server and Data Center Energy Efficiency* dated August 2, 2007, and available at http://www.energystar.gov/ia/partners/prod_development/downloads/EPA_Datacenter_Report_Congress_Final1.pdf.

center uses two watts of power total for every watt consumed directly by IT equipment.[2]

3. **Power is now a major data center cost** – Power is the largest or second largest operating cost in data centers, as well as the fastest growing. Thanks to increasing power densities, the industry is now at the point where energy costs of a server over its lifetime are approximately equal to the acquisition cost of the hardware. Furthermore, electricity prices have increased 50% over the last decade, and it will only become dearer in the future. The data center power bill is no longer an afterthought; it is a major line item in the CIO's budget.

4. **More data centers are power constrained** – When the power load in a data center becomes so great that it is unable to draw more power from the grid and/or cannot supply more to IT equipment, it is said to be power constrained and can no longer accommodate IT growth.[3] This situation is becoming more common, especially in urban areas where the power grid capacity is maximized. When this occurs, an enterprise must either build new data center space or improve the energy efficiency of the existing infrastructure.

5. **Data center expansion is expensive** – The cost of new construction for tier-one data center space is as much as $1,000 per square foot. For example, adding 10,000 square feet of data center space to accommodate growth can amount to a $10 million capital investment. Therefore, finding ways to do more with existing infrastructure and avoiding or deferring expansion can save an enormous amount of money.

6. **Corporate environmental initiatives** – Many corporations are actively taking steps to mitigate environmental impact. Reducing energy consumption is a part of this effort, and data centers are a key area for efficiency gains. And, in some cases, credits from government entities or electric companies (e.g., Pacific Gas & Electric in California) are available to offset the cost of projects that reduce data center power consumption.

These trends around data center power consumption, costs and constraints are leading more enterprises to improve the energy efficiency of their data centers and find smart ways to do more with their existing infrastructure. Like trading in a Hummer for a hybrid car, power efficiency management delivers lower energy costs on an ongoing basis and helps meet corporate environmental objectives. It also defers or avoids very large capital expenditures for those facing data center expansion.

Power Efficiency Techniques

Here are some common techniques for improving power efficiency.

- **Eliminate unused servers** – Many enterprises have a significant minority of servers that have outlived their useful life. These "orphans" or "ghosts" consume power but no longer do any real work. They should be removed to free up space and power. *The question is which servers are orphans?*

- **Distribute heat output in the data center** – Cooling systems operate most efficiently when heat output in the data center is evenly distributed. Otherwise, they have to work overtime to compensate for hot spots. The remedy can simply be relocating servers to different racks. *The important questions are how much heat is each of the servers generating (and when) and where are they located?*

- **Consolidate and virtualize servers** – Server consolidation and virtualization are popular strategies to boost server utilization and ease of deployment while lowering costs. Consolidation can also lower power consumption, depending on your starting and ending points and how servers will be configured and utilized. *The question is what is your server utilization right now?*

Measuring Power Consumption

As they say, *you can only manage what you can measure*. The first step toward improved power efficiency is gaining visibility into your power consumption. As electricity enters a data center, it flows through the UPS (uninterruptible power supply) and PDU (power distribution unit) and then to the cooling systems, racks and IT equipment. The faceplate values on IT devices only rate maximum possible power consumption. They are not a good proxy for actual usage and can lead to power over-provisioning. Measuring actual power usage is a better approach. A good monitoring tool should be able to measure the true power load of your IT equipment, including historical trends, current load, and future projections. Monitoring should extend down to the individual server and ideally to the applications themselves.

Since active power management is a relatively

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[2] Implies Power Usage Effectiveness (PUE) = 2.

[3] A data center can also be space or cooling constrained.

recent emphasis for data centers, many enterprises do not yet have a dynamic, granular tool for measuring power and analyzing their power profile. After observing this common problem, the startup Viridity Software decided to create a solution for it.

EnergyCenter by Viridity Software

Viridity Software recently introduced its new *EnergyCenter* software for data center power efficiency management. It is different from existing technologies that measure power *supply* to and within a data center. EnergyCenter tracks power *consumed* by individual IT devices and builds a total picture from the ground up. It also tracks utilization, correlates it with power consumption, and creates a power-utilization profile for all servers. EnergyCenter measures power consumption, models and tracks utilization and consumption, and recommends actions for improving energy efficiency in the data center.

EnergyCenter addresses four main areas.

1. **Measures power consumption down to the IT device** – EnergyCenter initially will monitor servers, PDUs, and branch circuit monitors, with UPS support coming shortly. Storage and networking support are scheduled to be a future deliverable.

2. **Models utilization and power consumption of IT equipment** – EnergyCenter uses patented techniques for tracking and correlating server utilization and power consumption. This gives administrators deeper and more actionable insight into the IT environment.

3. **Creates power-utilization profiles** – Over time, EnergyCenter builds dynamic profiles of utilization and power consumption. Its shows historical trends and active periods and lulls.

4. **Recommends actions for improving efficiency** – EnergyCenter ranks top power consumers, identifies orphan server candidates for decommissioning, and shows physical power (and heat) distribution in the data center as a basis for balancing the equipment layout.

EnergyCenter is agent-less software that runs on a dedicated server or virtual machine. Its architecture eliminates the need to deploy agents on production servers, so it does not consume processing cycles or interfere with applications.

The software consists of two main components: a database and user interface. The database keeps track of details about the data center environment. The interface is web-based and accessible from any browser supporting flash. It gathers information about device configuration, power consumption and utilization via the network using standard protocols: *WMI* (Web Management Instrumentation), *SNMP* (Simple Network Management Protocol), *SSH* (Secure Shell), and *VMware* for virtual server environments.

EnergyCenter boasts a quick time to value and return on investment. Within a few hours of deployment, it can discover devices in the data center and generate a baseline profile with useful, actionable information about the environment. Over time, it accumulates more data to illuminate trends and show historical context for deeper analysis.

Data centers can use the information Energy-Center provides to improve energy efficiency and cut costs in several ways:

- Identify target servers for consolidation
- Identify orphan servers for decommissioning
- Identify equipment for technology refresh
- Make informed decisions about if and when to expand data center space
- Reorganize room layout and equipment placement to optimize cooling

Viridity will release EnergyCenter for general availability on March 25, 2010.

Conclusion

The days of unchecked power consumption in the data center are over. Energy supply is limited and costs are rising; meanwhile, IT equipment just gets more powerful and power hungry. Enterprises need to be proactive and smart about power management in the data center.

Viridity Software launched EnergyCenter as the right tool at the right time. It is critical to have detailed metrics about data center power consumption because that is the starting point for all power efficiency projects. EnergyCenter's unique approach of creating power-utilization profiles based on the activity of individual devices yields exceptionally useful and actionable information about your data center environment.

The bottom line is: If your enterprise wants to minimize energy consumption, cut costs, do more with your infrastructure, and potentially avoid an expensive data center expansion, then consider Viridity Software's EnergyCenter as a catalyst and means to those ends.

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