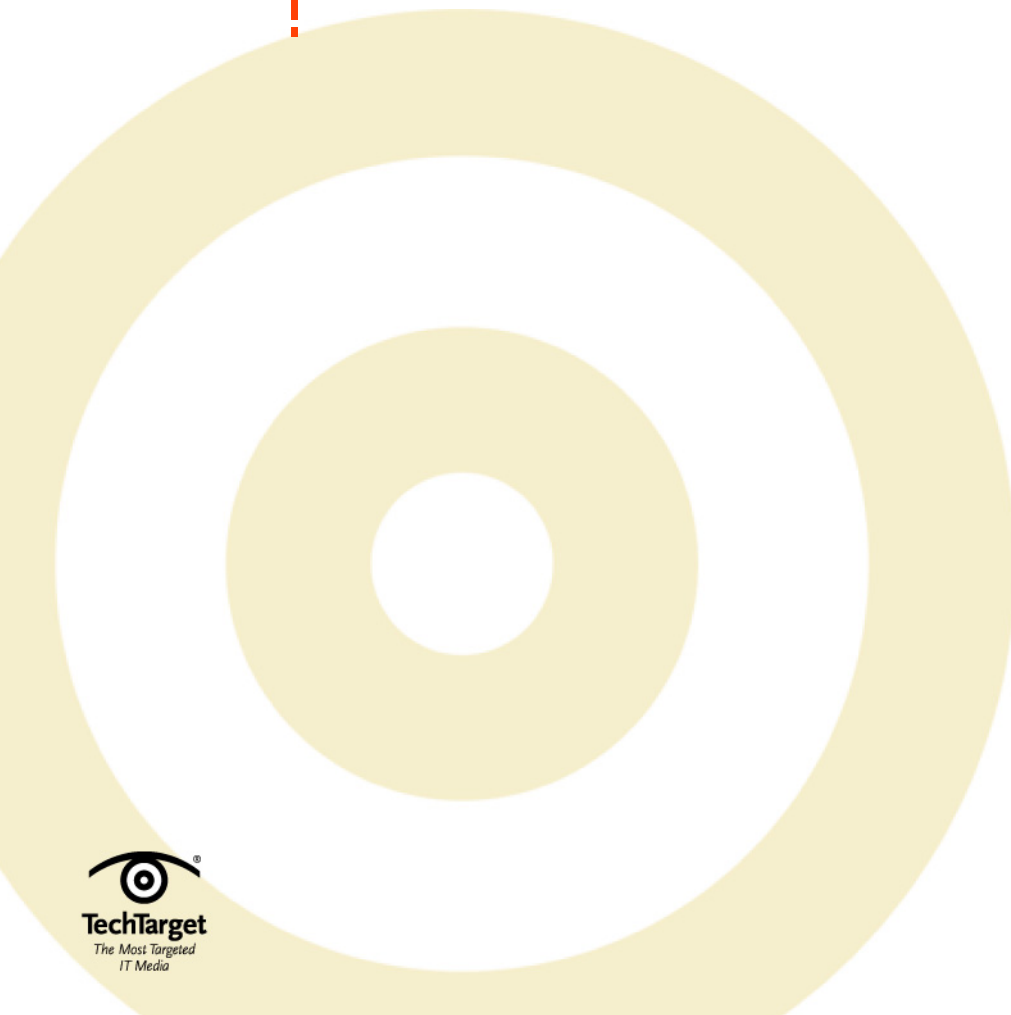


An IT Briefing produced by



Green Computing Beyond the Data Center



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Green Computing Beyond the Data Center

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BIO

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Green Computing Beyond the Data Center

Introduction

This document explains “green” computing. First, it explains briefly the traditional area where energy conservation, pollution reduction, and green issues are being addressed: the data center. Then it describes the aspects of green computing that go beyond the data center. For organizations that have never considered the consumption of resources driven by decentralized computing, this information could come as a surprise.

Data Centers: Some Surprising Statistics

Data centers consume 1.5% of the total electricity used on the planet, and this amount is expected to grow unless organizations begin addressing the issue now. Consider these statistics:

The U.S. Environmental Protection Agency estimates that centralized computing infrastructures—also known as data centers—currently use 7 gigawatts of electricity during peak loads. This translates into about 61 billion kilowatt hours of electricity used in the past year. By the EPA's estimates, power-hungry data centers consume the annual output of 15 average-sized power plants.

One of the top constraints to increasing computing power, besides the ability to cool, is simply delivering enough power to a given physical space. In fact, for this very reason, computer and Internet giants Microsoft, Google, and Yahoo are building their new data centers on the Columbia River, where there is access to both hydroelectric power and a ready-made source of cooling.

Power Usage: 2007

As the power bill for data centers rises, organizations are seeing their growing appetite for energy affect their bottom line. \$4.5 billion of electricity was purchased by corporations and government agencies last year to feed the expanding demands of heat-generating centralized processing. In an interesting

comparison, the current annual power consumed by data centers would be sufficient to desalinate enough water to cover the entire land mass of Australia at a rate of 300 liters per square meter.

Projected Power Usage: 2011

Looking ahead, the growth curve in power consumption and CO² production is on pace to nearly double by 2011. By the EPA's estimates, data center power consumption during peak loads will grow by over 70%, to 12 gigawatts. If this projection holds, data centers will consume the output of 25 power plants and receive a \$7.4 billion electric bill in 2011. The environmental footprint left by such consumption is significant. Data center activities will release a projected 62 million metric tons of CO² emissions into the atmosphere.

While the U.S. government, including the military, is estimated to be responsible for some 10% of the total consumption, the government—to its credit—is taking the lead in curbing the growth of energy consumption.

Beyond the Data Center: “Desktop Warming”

However, the problem is actually greater than the growth in power consumption by data centers. When a computing organization considers that the processing that happens in the data center represents only a fraction of its total information processing *and* energy consumption, it is faced with some frightening statistics.

For every data center processor, there can be 10 times as many departmental and rack servers. For every data center machine, there can be from 50 to more than 250 end-user computers. The average active, powered-on desktop computer consumes 100 to 300 watts of electricity. Much of the electricity that comes through the power cord of the computer is turned into heat and power conversion waste through the PC power supply.

One hundred million workers use PCs every day in the United States and Western Europe alone. Each of these PCs draws 100 watts of power, by a conservative estimate, and some PCs have speaker systems that draw additional power. Based on this conservative figure, PCs draw a collective total of 10 gigawatts of power from the world power grid. Keep in mind that this estimate does not count China, India, the Middle East, and Eastern Europe, where usage rates are increasing dramatically.

Simply stated, desktops, during their hours of utilization, consume more power and produce more pollution than data centers. Imagine, for a moment, how much CO² is being produced by PCs right now, and you can begin to sense the magnitude of the problem. “Desktop warming” is well underway.

Actions to Take to Combat Desktop Warming

So, what can organizations do to combat desktop warming? Here are seven actions that can be taken now to begin to address the problem:

- Measure your organization's power usage.
- Be ENERGY STAR® compliant.
- Educate end users.
- Let PCs sleep.
- Set energy reduction goals.
- Report back on energy-saving measures.
- Use the resources that are available to combat desktop warming.

Measure Power Usage

Management guru Peter Drucker stated it well with this adage: “That which gets measured gets managed.” If we think about the things we measure—fuel consumption and speed in our cars, bank account balances, the size of our retirement accounts, sales and expenses, the number of employees in our organizations, it is clear that these things get managed.

Energy consumption by desktop computers can be measured, too. For instance, one of the easier things to measure is the number of PCs in your organization and the age of these machines. An obvious fact, but one worth mentioning, is that there is a direct correlation between the number of PCs and the amount of power consumed. Measuring the actual number of

PCs in an organization is not always easy. SMS, ITIL, CMDB, or other asset management tools can assist you in getting an approximate count.

If you have the ability to isolate power consumption outside the data center, the next step is to measure it. The bulk of the electricity used on any given floor of an organization's physical space is consumed by office equipment such as PCs, copiers, and printers. If this consumption can be measured, it will affect the way the office equipment is used.

For the present, organizations generally have to rely on approximation to calculate their energy usage. However, some tools, such as one provided by Faronics, do offer some capability to approximate energy usage.

Become ENERGY STAR-Compliant

Most businesses in the U.S. are familiar with the EPA's ENERGY STAR program. Introduced in the 1990s, ENERGY STAR is a standard that helps homes and businesses focus on the wise usage of energy. An updated compliance standard, ENERGY STAR 4.0, was released in July 2007.

The new ENERGY STAR standard is two-tiered. For Tier 1 compliance (the lower standard), PCs, including laptops, must convert at least 80% of the power coming through the power cord into usable energy. In effect, this is a power-supply conversion efficiency standard, and the most specific compliance standard to date. A laptop achieves ENERGY STAR compliance if it uses 14 watts or less when idle. A desktop PC achieves compliance certification if it uses less than 50 watts of power at idle.

It is important to remember that most PCs spend a significant portion of their lives turned on but doing nothing greater than driving a screen saver. One way to do something meaningful for the environment is to turn off your PC when it is not in use, or better yet, to implement a tool that does it for you.

Tier 2 compliance for ENERGY STAR labeling has a release date of July 2009. The exact specifications of the Tier 2 standard are not yet available, but the government can be expected to give manufacturers enough lead time to generate products that are compliant with the new standard.

Currently, Hewlett-Packard and Intel are considered the industry leaders in energy efficiency, with the

greatest number of models that use the least amount of power. While Dell and Advanced Micro Devices are lagging somewhat in the push for energy compliance, all these manufacturers offer products today that are ENERGY STAR-compliant. Rather than changing your desktop supplier, it would be better to simply purchase new desktops from any of these manufacturers, since new models are likely to be more energy-efficient and cooler to run than earlier models.

Educate End Users

It is estimated that simply educating end users about the power consumption of PCs could result in a 10% energy savings for organizations. The University of Colorado at Boulder provides information on simple and effective ways to save energy that can be passed along to end users. Google “PC energy usage” to access the University of Colorado’s recommendations.

Let Your PC Sleep

Beyond education, another important action to take at the end-user level is to let PCs sleep by following these steps:

1. Check the power management settings on all connected PCs.
2. Use a third-party tool to assist you in changing these settings. Faronics offers a tool that you can download free of charge at www.faronics.com.
3. Adjust the group policy settings on any Windows PCs your organization owns. Some of the 1,700 different settings deal with power consumption, powering down when inactive, and so on.
4. The U.S. government, which owns 10% of the IT equipment in the country, reports that a moderate approach to power management on PCs—implementing some but not all of these recommendations—has resulted in a \$30 per PC energy savings each year. This number alone can justify the expenditures necessary to achieve energy savings. Vendors offering third-party tools claim energy savings even higher.

Set Energy Reduction Goals

Set a goal of 25% energy usage reduction by desktop PCs in year 1. While organizations might not be able to measure this immediately, other relevant metrics like “hours on” can be measured more easily.

In years 2 and beyond, set a goal of at least a 10% reduction in energy usage by PCs per employee each year. It is important to set the metric based on the number of employees, since the organization might grow.

If your organization has a PC asset management system, you should have a rough idea of the PC-to-employee ratio. In most cases, especially in larger organizations, the ratio of PCs to PC-using employees is greater than 1:1. If your organization does not have a PC asset management system or a CMDB (Configuration Management Database), make it a corporate goal to implement one. The fastest way to reduce energy consumption is to reduce the number of computing assets.

Report Back on Energy Saving Measures

To quote Thomas Monson: “When performance is measured, performance improves. When performance is measured and reported back, the rate of improvement accelerates.” Reporting back your measurements to end users and to management will result in greater compliance, greater involvement, and greater commitment to continuous improvement.

While you can tune systems for energy efficiency with a modicum of technical knowledge and common sense, measuring and reporting on these efforts cannot be done without tools. Consider purchasing a third-party tool that offers the ability to set system policies, audit their implementation on the desktop, and report back on results. Without this feedback loop, your efforts at green computing beyond the data center can be hampered.

Resources Available from Faronics Corporation and Others

The following resources are available for those who are interested in initiating green computing measures at their organizations:

Faronics tool download and ROI calculator: As noted earlier, you can download a free tool to help manage power settings on your PC (and more) at www.faronics.com. If you find it useful, you can purchase it. Also, use Faronics’ ROI calculator to see how much energy and money your organization could save if you actively managed and reported on your energy usage at the desktop level.

ENERGY STAR 4.0: Read the ENERGY STAR 4.0 specification, particularly the section that deals with PCs. The ENERGY STAR program is voluntary, and a good example of government working through encouragement rather than coercion. ENERGY STAR also offers a PC Power Management Program website with more information about how organizations can save energy on their PCs.

BusinessWeek tipsheet: Available at www.businessweek.com, the tip sheet on “energy conservation for CEOs” is a bulleted list that can help you sell the green computing idea to colleagues and management.

Summary

As this document highlights, desktops actually use more electricity than data centers. Further, the amount of electricity used by desktops and the impact this has on the global environment is significant. Energy consumption is worth managing both from an ethical, earth-friendly, and moral perspective, and from a financial perspective. With the information presented here, organizations can begin to manage desktop PC energy usage so that, together, we can all make a difference.



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