by Jill Barson Gilbert

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High-Tech Industry Heats Up Efforts to Lessen Climate Change

IT Insight by Jill Barson Gilbert

Computers and the networks they access daily come with an environmental cost—including increased energy consumption and an expanding carbon footprint measured in greenhouse gas (GHG) emissions—that go beyond the impacts that occur throughout the supply chain. Is the use of computers and enterprise data centers at odds with corporate "green" priorities to reduce GHGs and energy consumption? Would our lives be lacking without access to e-mail, databases, and the Internet? The short answers are: No and Yes. This column considers the impact of personal computers and servers on climate change and a few of the high-tech innovations that can help reduce their environmental footprint.

Energy Challenges

Growth in global energy demand and increasing computer power generation are resulting in rising energy costs and greater GHG emissions. Computers and enterprise data servers pose a huge energy demand, much of it wasted. For example, the average desktop personal computer wastes nearly one half of its power, while the average server wastes one third.

Imagine standing inside a data center at eBay, the world's largest virtual garage sale, or Google, the world's largest search engine. These enterprise data centers—with rows upon rows of server racks, high-voltage switching equipment, backup power generators, uninterruptible power supplies, and high-capacity air conditioning units—create enormous power demands. It's estimated that U.S. energy use by data centers doubled from 12 billion to 23 billion kilowatt hours from 2000 to 2005 (see "Lean & Green—Taming the Data Center Colossus," Business Process Management Forum, 2008). Last year, increased data center energy use caused many IT organizations to run out of space, power, or cooling capacity (see Millard, E. "Green Computing: Hype Cycle or Actual Trend," *Baseline Magazine*, April 23, 2008).

Data center energy consumption is so critical an issue that the U.S. Congress passed a law requiring the U.S. Environmental Protection Agency (EPA) to study energy impacts on and from data centers, identify energy efficiency opportunities, and recommend strategies to drive the market for efficiency (Public Law 109-341). The EPA study found that data networks and storage devices accounted for approximately 1.5% of the total power consumed in the United States in 2006 and were projected to consume approximately 2.5% by 2011. The study also estimated that energy-saving strategies in use at the time could reduce data center power consumption by 10%; simple management improvements could result in a 20% reduction; and best practices, a 50% reduction (see "EPA Report to Congress on Server and Data Center Efficiency," August 2, 2007).

While IT organizations believe that environmentally responsible operations are a priority, they lack the resources to control their energy consumption. Even with newer, energy-efficient servers, business justification is difficult. The immediate energy cost-savings are small when compared to server costs. Most data centers will become "greener" as they apply server virtualization strategies, retire unneeded equipment, and phase in newer, more energy-efficient, servers.

Corporate Social Responsibility

Today, companies are judged not only on financial results, but also on corporate social responsibility. In high-tech manufacturing firms, environmental or "green" initiatives go beyond emissions management, waste recycling, and sustainable operations. Semiconductor manufacturers identify several initiatives within their own operations:

- microarchitecture changes to boost product energy efficiency;
- lead-free and halogen-free products;
- environmental requirements for product packaging; and
- product sustainability—requirements for batteries, plastic marking, and recyclability.

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"The entire semiconductor industry is struggling with the heat of chips, which increases exponentially as the number of transistors increase," says Intel (see www.intel.com/technology/silicon/high-k.htm). The good news is that chip manufacturers have found how to pack more transistors into a smaller space, while generating less heat. The latest computer processors and chipsets have the smallest footprints and lowest-energy requirements ever. The new 45nm silicon technology, for example, includes twice as many transistors in the same space as the older 65nm technology. Dual-core and quad-core architecture increase performance-per-watt efficiencies without increasing power requirements.

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Server manufacturers such as Sun Microsystems, HP, IBM, and Dell offer a portfolio of high-performance, sustainable servers. According to Jeff Johnson of Dell, innovations in server design, with a 25% reduction in energy demand, will allow data centers to expand and get twice the capacity in a given space (see "The Power Smackdown in the Data Center," April 2, 2008; http://jeffatdell.wordpress.com).

To complement their hardware, server vendors offer a range of services to help customers optimize server space and energy usage. Virtualization, a relatively new concept, is a set of practices and software utilities that help IT organizations consolidate underutilized servers and optimize server workloads.

Green Partnerships

Energy Star (www.energystar.gov), a joint program led by the U.S. Department of Energy and EPA, is aimed at protecting the environment through energy-efficient products and practices. Energy Star works with public- and private-sector organizations to set energy efficiency standards for products, homes, and businesses. In August 2007, Energy Star released a report to Congress on server and data center efficiency. The report outlined an EPA initiative to develop a new product specification for enterprise servers (see "Enterprise Server and Data Center Energy Efficiency Initiatives" www.energystar.gov/index.cfm?c=prod_development.server_efficiency).

Also in 2007, a group of electronics manufacturers, corporate consumers, utility companies, government agencies, and environmental stakeholders formed the Climate Savers Computing Initiative (www.ClimateSaversComputing.org). Members of the Initiative commit to produce and purchase energy-efficient products. The goal is to reduce global carbon dioxide emissions from the operation of computers by 54 million tons per year by 2010, equivalent to the annual output of 11 million cars or 10–20 coal-fired power plants, which will lead to a 50% reduction in power consumption by computers and a collective cost-savings of US$5.5 billion in energy costs.

It's hard to imagine life without personal computers, enterprise networks, or 24/7 Internet access. However, computers and enterprise servers pose significant energy demands. Realizing the potential impacts on limited energy resources, as well as on global climate change, high-tech manufacturers, alone and in partnership with other stakeholders, are investing significant resources in research and development to find solutions—and they are making progress. Under the umbrella of corporate social responsibility programs, computer and component manufacturers are committing to producing energy-efficient, environmentally responsible products; corporate consumers are committing to buying power-efficient computing products to save energy and reduce GHG emissions; and organizations are finding ways to better utilize existing IT equipment until it can be replaced with more energy-efficient hardware. **em**

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