

"There's no simple path to green computing, but there are some low-hanging fruit," Curtis notes in "Green: The New Computing Coat of Arms?", a paper he co-authored with Joseph Williams, the CTO of WW Enterprise Sales at Microsoft. "You can spin the dial on some straightforward actions, such as orienting racks of servers in a data center to exhaust their heat in a uniform direction, thus reducing overall cooling costs.... A comprehensive plan for achieving green computing really does require an architectural approach."

David Wang, the data center architect for Teradata, has specialized in thermal management solutions for the Miamisburg, OH-based data warehousing company since 1996. "I've raised the issue [of green computing] because, for me, it's both a business question and an ethical question," Wang says. "Look at the basic fact, the one that has to be addressed: Power consumption at the server level has increased along with performance increase, and business needs have grown even faster."

More attention must be devoted to data centers' ever-increasing power density and heat removal, Wang says. "In the past, the sole focus was on IT equipment processing power and associated equipment spending. The infrastructure—power, cooling, data center space—was always assumed to be available and affordable," he says. "Now the infrastructure is becoming a limiting factor."

Microsoft, Google, and Yahoo are addressing the environmental concerns about their data centers' carbon footprint, the measure of the environmental impact of an individual or organization's lifestyle or operation, measured

Google uses customized evaporative cooling to significantly reduce its data centers' energy consumption.

in units of carbon dioxide produced.

In recent years, Microsoft and other companies have built data centers in central Washington to take advantage of the hydroelectric power produced by two dams in the region. The Microsoft facility, which consumes up to 27 megawatts of energy at any given time, is powered by hydroelectricity.

"This way, because we're so close to the source, we're not losing any energy and the energy we do use is pure and clean," says Francois Ajanta, Microsoft's director of environmental strategy.

Another Microsoft data center, located in Dublin, Ireland, is expected to become operational in 2009 and, thanks to Ireland's moderate climate, the 51,000-square-meter facility will be air cooled, making it 50% more energy-efficient than other comparably sized data centers.

Google "has committed to being carbon-neutral for 2007 and beyond," says Bill Weihl, Google's director of energy strategy. "Our carbon footprint is calculated globally and includes our direct fuel use, purchased electricity, and business travel—as well as estimates for employee commuting, construction,

and server manufacturing at our facilities around the world."

According to Google, its data centers use half the industry's average amount of power. Google attributes this improved energy usage to the cooling technologies, such as ultra-efficient evaporative cooling, that the company has customized for itself.

Yahoo's data centers also went carbon-neutral last year, in part because of its use of carbon offsets.

Government regulations and industry initiatives are also tackling data centers' energy usage. The U.S. Environmental Protection Agency (EPA), for instance, should have its phase-one version of Energy Star standards for servers ready by year's end. Eventually, the server rating will measure energy use at peak demand, but for the purpose of getting an Energy Star rating under way, the EPA will first release a Tier 1 standard, which will measure the efficiency of the server's power supply and its energy consumption while idle.

Meanwhile, a global consortium of computer companies, including AMD, Dell, IBM, Sun Microsystems, and VMware, organized The Green Grid in 2007, with the goal of improving energy efficiency in data centers and business computing systems. To achieve that goal, The Green Grid collaborates with individual companies, government agencies, and industry groups to provide recommendations on best practices, metrics, and technologies that will improve data centers' energy efficiency.

Earth-Friendly Computers

As with any evolving idea, people will need to think differently and more deeply when it comes to green comput-

Data Mining

Consumers' Invisible Profiles

Health and life insurance companies in the U.S. are increasingly using consumers' prescription drug data to determine what type of coverage, if any, to offer applicants, the *Washington Post* reports.

The insurance companies hire health information services companies—such as

Ingenix, which had \$1.3 billion in sales last year—to help create consumer profiles. The health information services companies mine the databases of prescription drug histories that are kept by pharmacy benefit managers (PBMs), which help insurers to process drug claims. (Ingenix even has its

own servers located in some PBM data centers.) The health information services companies also access patient databases held by clinical and pathological laboratories.

The health information services companies say that consumers have authorized the release of their records

and that their approach saves insurance companies money and time. Privacy advocates note that consumers do sign consent forms authorizing the release of data, but they have to if they want insurance, and that many people are unaware of the existence of health information services companies.