



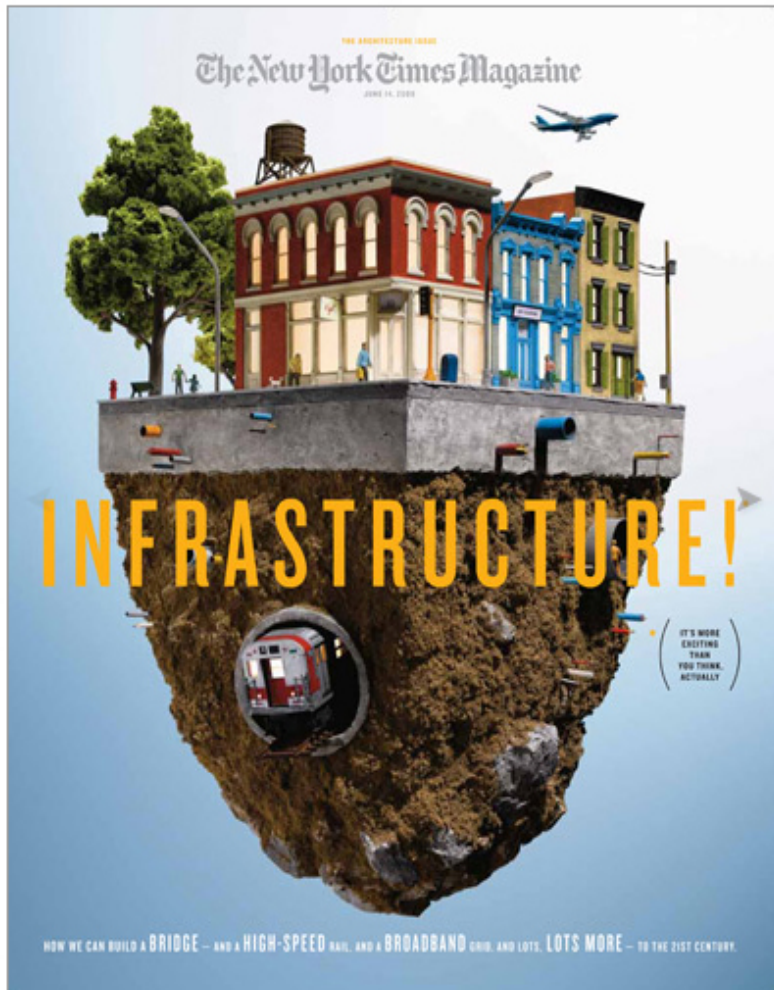
Utility Opportunities for IT Energy -Efficiency Programs: Beyond Power Management

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Data Center Overload

The NY Times Magazine - June 14, 2009



DATATECTURE

Flickr: HighSpace, iStock.com, Getty Images
In our hyperconnected, superfast age, how can the Internet data centers we've built keep up?
BY TOM VERHAEGHE

IT'S MORE EXISTING THAN YOU THINK, ACTUALLY.

THE RISE OF THE MEGA-DATA CENTER
Data centers were not always unmade, unassuming and lightly touched places. In the 1960s, in fact, huge E.B. White computers commanded pride of place in corporate landscapes. "You could get the question," says Kenneth Bell, founder of the Uptime Institute, a data-center research and consulting group. "It was located near the executive suite. Here you'd spend \$5 to \$10 million on this thing — the executive wants to show it off."
Over the past few decades, Bell says, there has been an oscillation between using centralized IT resources and using more dispersed computing power — a battle between mainframes and desktop computers. The latest decision is what's called the thin client: the use of centralized servers rather than the software and operating systems of desktops to perform the bulk of computing needs. But business in the office has come with increased thickness elsewhere: more servers in ever-larger data centers.
In his book "The Big Switch," Nicholas Carr draws an analogy between the rise of thin-client centers and the industrial revolution. Just as massive industries, once powered by water wheels, were by the 20th century able to "run their machines with electric current generated in distant power plants," advances in technology and transmission speeds are permitting computing to function like a utility, a dense but ever-accessible cloud of services.
This has sweeping implications for business and society. Instead of

your domain unless you were one of the largest companies in the world. There are three archaic uses available for anybody to really attack these massive-scale kinds of problems."
And while most companies still maintain their own data centers, the premise is that instead of making only investments in individual IT hardware, more and more companies will use into the utility computing grid, piggybacking on the infrastructure of others. Already, Amazon Web Services makes available, for a fee, the company's enormous computing power to outside customers. The division already uses more bandwidth than Amazon's extensive retailing operations, while its Simple Storage Service holds some 52 billion virtual objects. "We used to think that scaling factors was an important piece of a business's value," says Brent Chen, the chief technology officer of Service, which provides IT infrastructure and what the company calls "Virtualized utility services" for companies like Hallmark. "That we realized that owning what the factory produces is more important."

THE ANNILATION OF SPACE BY TIME
For companies like Google, Yahoo and, increasingly, Microsoft, the data center is the factory. What these companies produce are services, it is the increasing "utility of a service-based model," as Ray Oetzi, now the chief software architect at Microsoft, told me in 2008 — perhaps justifiably by Google and its ever-growing network of data centers — that at Microsoft on its huge data-center effort: "If people no longer needed desktop software, they would no longer need Microsoft." This realization brought new precision to the barely infinitesimal layer of the data center, an aspect of the business that at Microsoft, as at most such companies, typically escaped notice — unless it wasn't working. Data centers have now become, as Denis Chagny of Microsoft puts it, a "new differentiator."
Indeed, the number of servers in the United States nearly quadrupled from 1997 to 2003. (Recent tallies of the United States count that the mega-data centers of Google and its ilk account for only an estimated 5 percent of the total market.) The expansion of internet-driven business models, along with the data retention and compliance requirements of a variety of tighter accounting standards and other financial regulations, has

New McKinsey Report

- Unlocking Energy Efficiency in the U.S. Economy - released July 2009
- Notes EPA's projection of data center energy use growth by 9.6% /year through 2020
- 60% of the data center opportunity is in small to medium sized businesses
- Message – efficiency is a significant energy resource – abating as much as 1.1 giga-tons of CO₂ by 2020 - but accessible only if a national policy can be crafted to unlock it
- www.mckinsey.com/USenergyefficiency

McKinsey&Company

McKinsey Global Energy and Materials

Unlocking Energy Efficiency in the U.S. Economy



ENERGY STAR Strategy: From the Desktop to the Data Center

- Computers
 - Version 5.0 now in effect
 - Active mode efficiency is the future goal
- Computer Servers
 - Tier 1 now in effect
 - Tier 2 being developed
- Data Center Storage (Tier 1 being developed)
- Data Center Facility Benchmark (preliminary meeting occurred 9-29-2009)
- Data Center Network Equipment /Uninterruptible Power Supplies (Next in Line)



ENERGY STAR Computers: Pushing Efficiency at Hi-Tech Speed

- Version 4.0 of spec (effective July 2007)
 - Average ENERGY STAR qualified computer uses 67 watts
- Version 5.0 of spec (effective July 2009)
 - Average ENERGY STAR qualified computer uses 46 watts
- In two years, ENERGY STAR partners decreased computer energy use by 30% on qualified computers
- Savings are considerable with new ENERGY STAR qualified computers compared to computers in stock



Annual Savings with ES Version 5.0 Computer

- New 5.0 PC delivers substantial savings vs. typical stock PC

| Computer Use Assumption | Annual Savings at... | |
|--|--|---|
| | \$ 0.11 / kWh (Nat'l avg commercial rate) | \$ 0.18 / kWh (Avg residential rate in NE) |
| CPM not utilized, PCs left on at night | \$ 32 | \$52 |
| CPM not utilized, but PCs turned off every night | \$13 | \$22 |
| New PC uses CPM, old doesn't, left on at night | \$71 | \$116 |

Assumptions: old PC burned 79 watts on average, new PC burns 46 watts on average



Lifetime Savings with ES Version 5.0 Computer

- Energy savings can approach 50-100% of the cost of a new PC – around \$400!

| Assumption | Lifetime savings (4 yrs) at... | |
|--|--|---|
| | \$ 0.11 / kWh (Nat'l avg commercial rate) | \$ 0.18 / kWh (Avg residential rate in NE) |
| CPM not utilized, PCs left on at night | \$ 127 | \$207 |
| CPM not utilized, but PCs turned off every night | \$53 | \$87 |
| New PC uses CPM, old doesn't, left on at night | \$282 | \$462 |

New Business-Class OptiPlex™ PCs start at \$432 as of 9/17/09.)



ENERGY STAR Server Specification - Highlights

- Requirements:
 - Power supply efficiency targets that scale with size
 - Maximum idle power consumption levels set by category & also scale
 - Server must have the ability to measure & report its power, temperature & processor utilization
 - Each server must have its own Power & Performance Data Sheet
 - Blade servers will be covered soon - timing depends ability to determine approach for Idle measurement
- Timeline
 - Tier 1 effective on May 1, 2009 and will be in place 12 to 24 months
 - Tier 2 framework document coming soon



ENERGY STAR Server Specification – Savings

- Standard computer servers can consume between 1,200 to 8,600 kWh annually.
- ENERGY STAR qualified servers could save as much as 1,000 kWh per server annually.
- Over a five-year lifetime, companies could save as much as \$500 for each server they install.
- If all servers sold in the United States meet the ENERGY STAR requirements, the savings in energy costs will grow to \$790 million each year, equivalent to the greenhouse gas emissions from over one million vehicles.



Future Initiatives

- Data Center Storage
 - Plan to adopt a taxonomy to segment the market, explore hardware & software strategies, identify efficiency metrics, review existing benchmarks & test procedures
 - A specification framework was distributed for comment on June 4, 2009 -- get involved! email storage@energystar.gov
- Data Centers
 - Build on existing ENERGY STAR buildings platform
 - Applies to both stand-alone DCs & those in an office or other building
 - **Assess performance at the building level -- how a building performs not why**
 - Point users to additional unbiased resources to help pursue a tailored strategic energy management plan based on business goals and available resources



References and Resources

- Andrew Fanara: Fanara.andrew@epa.gov
- ENERGY STAR Computers and Servers: energystar.gov/products
- ENERGY STAR Data Center Initiatives: energystar.gov/datacenters

