

Hyper-efficient conversion of power to data



Deep into the Industrial Revolution, British economist William Stanley Jevons identified an irony: Innovations that were making steam engines more efficient didn't reduce consumption of coal as expected; they had the opposite effect – broadening and accelerating the application of steam power.

Nearly 150 years later, the Jevons Paradox is playing out in data centers around the world as they seek to improve efficiency through application of high-density computing.

High density data centers use electricity more efficiently, but they also tend to be busier – increasing total electric consumption.

Further, according to Jim Shanahan, head of ABB's Global Data Center business, as density increases, so do energy costs as a percentage of operating expense. With worldwide electrical costs up 80 percent over the past decade, that has eye-opening consequences.

“At the most basic level, a data center is a system that converts power into data,” Shanahan says. “If the unit cost of power is going up, and power represents a larger piece of total system costs, energy efficiency is a top concern.”

Many data center managers are beginning to confront this reality, as reflected by industry-wide discussion of abstraction, virtualization and decoupling. But few are comfortable they really know how to get there.

Here, according to Shanahan, are the four steps – admittedly much-simplified – to achieve hyper-efficiency in converting power to data.

Step 1: Implement the one-off improvements.

There are some one-time efficiency gains that every data center must achieve, which Shanahan calls Efficiency 1.0. These are things like installation of higher-efficiency equipment, improved aisle containment and careful management of higher cold-aisle temperatures. “These give you a big payback. They're important and they can keep you busy for quite some time,” Shanahan says. “But once they're done, they're done. This is only an early step in the path to hyper-efficiency.”

Step 2: Run the data center like a profit center.

Any profit center is understood by the CFO and COO through key performance indicators (KPIs) that not only measure the health of operations, but also serve as levers to manage its impact on the enterprise.

Data centers, too, should be managed with functional KPIs, such as Workload/kWh and Cost/kW, Shanahan says.

“When the CIO says he needs 10,000 new servers, the CFO often doesn’t have the tools to measure or even rationalize that request. In any other department such an investment would be expected to result in a specific increase in revenue or decrease in costs,” he says. “Too often, data centers still don’t run this way. But getting there is the first step to efficiency as a core competency.”

Step 3: Chase every watt.

The next step – and where most data centers are beginning to find themselves – is systematic use of metering, measurement and analysis to really understand and manage costs. Shanahan refers to it as Efficiency 2.0 or “chasing every watt.”

“Most centers have some metering in place, but very little in the way of analytics,” he says. “They have some idea of how much power they’re using, but they can’t yet say where every watt is going or whether it is doing anything useful.”

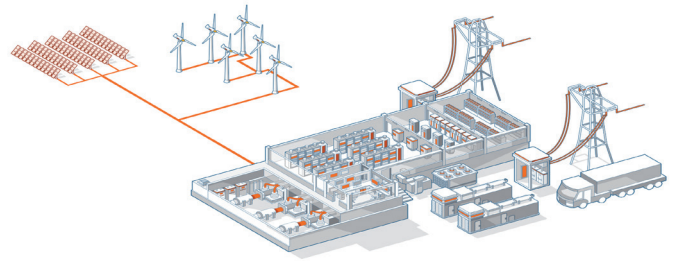
“When you know how much power any given transaction requires, and the price of the next watt – both supplied and demanded,” he continues, “then you can start pursuing every watt in the data center. This is when you can start talking about energy decoupling.”

Step 4: Virtualize

Hyper-efficiency begins when a data center’s work is abstracted from the assets it uses – accomplished through virtualization of servers, networks and storage.

“If you have two data centers in different parts of the world and you simultaneously know what the next watt is worth – or costs – at both points, you can begin making real-time decisions which location is the best to use,” Shanahan says. “Operating at this level helps you save money by shifting load to one facility. But it also opens the possibility of selling excess power at the other facility back to the grid.”

Achieving this level of maturity in managing the data center takes time, commitment and investment. But Shanahan can cite examples where it’s being done.



Even then, he assures the job still won’t be complete. Further gains can be achieved through such disciplines as predictive maintenance, control-room design and other innovations that will allow more processing with less power, less space and with more efficient human intervention.

“That’s the beautiful thing about optimization: You’re never done – even when you’re hyper-efficient,” Shanahan says. “But most organizations are closer to the beginning, and we want them to know there’s help available to undertake this process.”

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