

Enterprise Automates Utility Demand Response

NetApp uses the Network Building Mediator to collect energy usage data over the IP network and automatically shed load.

EXECUTIVE SUMMARY
<p>NETAPP</p> <ul style="list-style-type: none"> • Manufacturer • Sunnyvale, California USA • 8000 Employees
<p>BUSINESS CHALLENGE</p> <ul style="list-style-type: none"> • Take full advantage of utility's Demand Response program. • Reduce energy consumption.
<p>NETWORK SOLUTION</p> <ul style="list-style-type: none"> • Connected Cisco Network Building Mediators to building systems and PG&E's Demand Response Automation Server. • Automatically adjusts building, labs, and data center temperatures and lighting in response to information from multiple systems.
<p>BUSINESS RESULTS</p> <ul style="list-style-type: none"> • Shed 1.1 megawatts in 20 minutes during demand-response events • Received US\$3000 to \$5000 for each event



Business Challenge

A global company headquartered in Sunnyvale, California, NetApp creates innovative storage and data management solutions. The company is committed to protecting and preserving the environment, both by creating energy-efficient products and by practicing good environmental stewardship. Part of the company's motivation is sustainability: "The U.S. Department of Energy is projecting that energy demands will soon exceed capacity if we don't reduce our loads," says David Shroyer, controls engineer, NetApp.

NetApp saw an opportunity to significantly reduce energy consumption at its headquarters, which has 1.2 million square feet of space in 10 buildings. Headquarters uses 54 million kilowatt hours annually, with a peak demand of 7.6 megawatts. In 2008, NetApp's annual utility bill was US\$7.7 million, 89 percent of that for electricity.

Energy-efficient equipment is only part of the solution. "You also need to make intelligent decisions about equipment settings, and that requires gathering and analyzing information from disparate building systems, including metering systems and PDUs [power distribution units]," says Shroyer. NetApp also wanted to participate in the Pacific Gas & Electric Company (PG&E) Demand Response program, which offers financial incentives for reducing energy consumption on high-demand days.

NetApp began looking for a platform that would tie together all of its building systems over the IP network. The platform had to be:

- **Open.** The company wanted to aggregate information from any existing or future building system.
- **Proven.** Other companies had to have successfully deployed the solution.
- **Easy to Maintain.** NetApp wanted to manage and maintain the system using internal resources.

Solution

After evaluating solutions from seven vendors, NetApp selected the Cisco Network Building Mediator. “Only two solutions met the criteria, and the other vendor’s solution would be difficult to integrate with our existing building systems,” Shroyer says.

Cisco Network Building Mediator aggregates information from all of NetApp’s building systems, including lighting, heating, ventilation, air conditioning, temperature sensors, and PDUs, from multiple vendors. Building engineers and facilities personnel can control systems in any building using a web-based interface. What’s more, the Cisco Network Building Mediator can automatically adjust building systems in response to the data it collects—for example, by reducing lighting, changing temperature settings, or turning rack PDUs on or off.

So far, NetApp has deployed 19 Cisco Network Building Mediators in four sites in the United States, Europe, and India. They are used for automated demand response, reducing energy consumption in the data center, and centralizing temperature monitoring in global wiring closets.

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—David Shroyer, Controls Engineer, NetApp

Automated Demand Response

When energy demand is high and supply is short, PG&E offers financial incentives to companies that reduce their load in response to a request. NetApp enrolled in the Demand Bidding Program: PG&E pays NetApp \$0.50/kWh when the request is made the day before and \$0.60/kWh if the request is made the same day. (See “Cost Savings.”)

The first year, NetApp manually adjusted its lighting and temperature controls, which took four people two hours for each building. In 2007, NetApp automated the process by integrating Cisco Network Building Mediator with the PG&E Demand Response Automation Server. After receiving the signal from PG&E, the Cisco Network Building Mediator automatically:

- Sends an email to notify the appropriate people when the demand response will take effect.
- Adjusts the loads according to predefined rules. “Within 20 minutes of the demand-response signal from the utility, the Cisco Network Building Mediator reduces lighting by 50 percent and raises the temperature set point by four degrees, shedding 1.1 megawatts,” says Shroyer. “All of this happens without any manual intervention.”
- Records energy usage before and during the event so that the company can verify the utility’s data.
- Transmits the information to PG&E for settlement.

Reduced Data Center Energy Consumption

Increasing data center temperature by just a few degrees results in very large energy savings. In NetApp’s Sunnyvale data center, the Cisco Network Building Mediator collects information from the rack PDUs that power each rack and from the NetApp® storage devices. The information includes kilowatts used, amperage, voltage, server temperature, and CPU utilization. Then the Cisco Network Building Mediator performs calculations to determine if the temperature can be increased safely. If so, it sends a message to the data center cooling system.

Centralized Temperature Monitoring in Wiring Closets

NetApp wanted to add a redundant temperature-sensing system to its wiring closets to prevent overheating that could ruin expensive equipment. The traditional approach is to connect sensors to a security panel that sends an alarm to an outside service provider when temperatures exceed thresholds. But this approach is unreliable, because security panels are not designed for this purpose. NetApp will use the Cisco Network Building Mediator to collect the information over the IP network so that the service provider can monitor the information in real time.

Results

By collecting data from multiple building systems and applying business rules, the Cisco Network Building Mediator enables NetApp to collaborate with PG&E to reduce energy consumption.



Cost Savings

In 2008, NetApp participated in two demand-response events. Each time, the company shed 1.1 out of 7.6 megawatts. NetApp received \$3000 to \$5000 per event. The company also received a one-time participation payment of \$130,628 in 2007. “The demand-response payments from the utility funded the Cisco Network Building Mediator and other technologies,” Shroyer says. “Our main motivation, however, is good corporate citizenship and doing our part to reduce the load on the grid.”

“In conjunction with other systems, Cisco Mediator has helped us reduce energy consumption in our Sunnyvale location by 18 million kilowatt hours in 18 months,” Shroyer says. “We have reduced our carbon footprint and have saved an estimated \$2 million in energy costs, which equates to a 25% estimated annual energy reduction.”

Reduced Data Center Energy Consumption

Larger cooling systems have an air-side economizer, which saves energy by cooling buildings with outside air rather than refrigeration equipment. Most data centers use the economizer for 2000 to 2500 hours annually, according to Shroyer. “Real-time rack power information and integration with the building automation system has enabled us to increase our usage to 6000 hours annually,” he says. “Our PUE [power usage effectiveness] ratio averages 1.36 and has been as low as 1.19, compared to an industry average of 1.5 to 2.0.” (PUE is determined by dividing the amount of power entering a data center by the power used to operate the computer infrastructure.)

Positive Employee Reaction

Contrary to the company’s expectations, NetApp employees had no complaints about the 50 percent lighting reduction and four-degree temperature reset. “They like doing their part for the environment, and we were surprised to discover they actually preferred the higher temperature,” Shroyer says.

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—David Shroyer, Controls Engineer, NetApp

Collaboration between Engineering, Facilities, and IT

For the first time, NetApp's engineering, facilities, and IT staff can share information, enabling them to collaborate in a responsible energy policy. "IT personnel manage servers and storage, and facilities personnel manage the building automation system," Shroyer says. "The Cisco Network Building Mediator sits in the middle, bringing the two groups together to meet a common goal to reduce energy consumption."

Next Steps

The U.S. Department of Energy plans to require companies to report their PUE values. NetApp has successfully completed a pilot to use the Cisco Network Building Mediator to collect PDU values from the power strips supplying data center racks. Based on this information, the system can automatically turn off the PDUs when servers and storage are not being used, and turn them back on when the capacity is needed, based on IT policies that can be included in an ADR event. NetApp's IT department will use the collected PDU values for capacity planning.

NetApp also plans to use the Cisco Network Building Mediator to control the environment of individual racks in the data center, using Simple Network Management Protocol (SNMP). "Nobody is doing this anywhere in the world," Shroyer says. The company plans to use the temperature sensors embedded in the inlet air bezel of its rack equipment to directly control the data center environment. This will enable NetApp to comply with the ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) standard for data centers, which specifies an air inlet temperature of 80 degrees Fahrenheit.

Product List

Network Systems

- Cisco Catalyst 6000 Series and 7000 Series Switches

Building Systems

- Cisco Network Building Mediator



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