Data Center Design Trends

As Technologies Change, So Do The Buildings That House Them

by Robyn Weisman

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IN THE RECENT PAST, data centers were often built with the future in mind—and that future usually included the notion that they would grow bigger and bigger until they were the size of a small town. But planners failed to take into account such technological advances as server consolidation through virtualization and also the increased power and cooling requirements denser servers would need.

As a result, many data centers built as recently as five years ago have been abandoned for newer facilities, even though the previous facility was only half-populated with physical equipment, says Kris Domich, principal consultant of data center and storage solutions at Dimension Data. "There has

been a big disconnect in how a lot of these [earlier] data centers were planned, given the high-density potential we have in today's equipment, and future business strategies will drive space, power, and cooling plans," Domich says. "You may be low or medium density today, but if you're moving to high density, what will you need from an underlying infrastructures standpoint to be able to scale?"

Dealing With Increased Power

Increasingly, data centers no longer can get away with traditional power requirements. Because servers themselves are becoming denser, both by nature of the equipment itself and the growing adoption of virtualization, higher power loads are needed to run

this hardware. "You can run into problems in overtaxing the data center on the power and cooling side because you are cramming more into a smaller space," says Dennis Julian, principal and engineer at data center architecture and engineering firm Integrated Design Group (www.idgroupae.com).

Julian recommends switching to equipment that uses a higher voltage distribution, which in many cases only requires a change in the plug at the back of the server. "When you go to higher voltage, you end up with less current, which ends up being more energy-efficient and makes for smaller wiring sizes," Julian says. "It saves both on installation and energy costs."

The Need For High-Density Racks

According to Domich, high-density racks become a necessity when dealing with more powerful servers as more SMEs switch over to high-density computing platforms, such as blade servers. "I'm now seeing blades used in shops with as few as three to four racks, especially where virtualization has been highly adopted [or] where plans to vigorously adopt it in the next year to 18 months are already in place," Domich says. "But delivering 50kW of power to 10 racks averaging 5kW per rack is a completely different animal than providing 25kW to two racks."

High-density enclosures are able to handle the higher voltages and subsequent cooling requirements that powerful servers need to work properly and can do so using a smaller footprint than traditional racks. However, introducing a high-density rack into an environment that was designed for standard-density racks will force you to rethink your power and cooling strategy. "You're now going to be delivering 60 or more amps of power where you used to deliver 30 amps, which will mean you're removing two to four times more heat from the same physical space," Domich says. "So that will necessitate different physical plant considerations."

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> *- Integrated Design Group's Dennis Julian*

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Action Plan

1. Figure out your organization's strategic objectives over the next five to seven years and translate those needs into an appropriate space, power, and cooling plan for your data center.

2. Keep in mind that the increased power and cooling demands of servers, particularly blade servers and servers consolidated through the use of virtualization, will most likely necessitate different amperage and voltage requirements than are available in your current data center facility.

3. Oftentimes the best solution for meeting and leveraging these new trends are modular data centers. Just make sure that these prepackaged solutions match up with your data center needs and provide you with the flexibility to maintain your system at the end.

Taking Out Hot & Cold Aisles

Even today, many server rooms are set up "classroom style," where all servers face in the same direction. "Because most equipment pulls cold air in the front and blows hot air out the back, that classroom configuration means that row one is blowing hot air into row two, and as you come down the rows, the air is getting warmer and warmer, which tends to overheat the equipment," Julian says.

He explains that in a cold aisle/hot aisle setup, rows of equipment face each other, so cold aisles are alternated with hot ones. "The whole trick to energy efficiency is controlling the direction of your hot and cold air movement in the room," Julian says. "By segregating hot and cold air, you make it so that hot air runs directly back into the air conditioner, making the air conditioner more efficient and keeping the coldest air going directly to your equipment, which is where you want it to go."

Going Modular

Given the complex requirements of the new data center, it is easy to make the mistake of building out more than you need. Therefore, modular data centers, where everything for the most part is designed and built offsite, can be an ideal solution for data centers looking either to expand or remodel. "Sometimes you can't easily expand your space without a lot of rework, but a containerized solution is repeatable, can be brought to market fast, and does not put your data center at risk during that expansion," says Tuan Hoang, director of mechanical engineering at Lee Technologies (www.leetechnologies.com).

Modular data centers can take on most major infrastructure pieces, such as the appropriate servers and high-density racks, as well as the increased power generation and cooling requirements that go along with them, and put them into a prepackaged solution that is built and tested in a controlled environment. "When you receive it, you have a solution that is pretested in a factory-controlled environment, fully functional, and only requires you to make the final connections that minimizes the impact and downtime on the existing data center," says Mike Hagan, executive vice president of marketing at Lee Technologies. ◙