

Tech & Trends

March 12, 2010 • Vol.32 Issue 6

High-Density Data Centers

A Look At What's Behind The Trend

by Phil Britt

Increasing capacity needs and the evolution of underlying technology are pushing more enterprises to consider the concept of high-density data centers.

The trend toward higher-density systems is evident. Ron Bednar, manager of marketing and customer insight for Emerson Network Power (www.emerson.com), says the average data center ran 6kw per rack in 2006 and 8kw per rack in 2009. That figure is expected to grow to 17kw per rack within the next 10 years.

"In all of our engagements, density is one of the hottest topics," says Ted Streck, senior practice director of the infrastructure practice for EMC Consulting (www.emc.com).

Driving Trends

A few different trends are driving the move to higher-density data centers, according to Bednar. Consolidation and virtualization are causing servers to run at higher capacities than in the past. The move to blade servers also requires higher density, particularly as more blades are added. Higher-density systems can also result in lower cooling and operational costs.

According to Emerson, by building a data center with 2,500 square feet of raised floor space operating at 20kw per rack vs. a data center with 10,000 square feet of raised floor space at 5kw per rack, the capital savings could reach between \$1 million and \$3 million. Emerson also touts the operational savings, saying that cooling costs for a high-density facility are 35% lower.

Although large enterprises were the first to move to higher-density data centers, now more medium-sized facilities are also considering high-density solutions, Bednar says.

Key Points

- More enterprises are choosing high-density data centers or high-density zones within existing data centers.
- Cooling is a more critical issue for high-density data centers. Because equipment runs hotter, fail-safe for cooling is more critical.
- Higher initial capital costs, as well as legacy equipment and infrastructure, may make high-density solutions impractical for some enterprises.



“A lot of data centers are running out of capacity—it’s not because of floor space, it’s because of lack of cooling capacity,” says Dave Cappuccio, chief of research for the infrastructure group at Gartner. “A lot of the companies that are starting to retrofit are turning to high-density zones.”

For years companies have built data centers for horizontal scalability, Cappuccio says. “That’s the most inefficient way to design a data center that there is. People have been building data centers with the idea that they have a life cycle of 15 to 20 years.”

Typically, though, the data centers run into capacity issues much sooner than that because demand outstrips projections, power availability fails to keep up with demand, or some combination of factors. Some data centers will attempt to retrofit, but many have to move to new facilities in order to add high-density capabilities. Some existing data centers don’t have the necessary infrastructure to add high-capacity zones. There may be no room for additional cooling equipment, or the existing electrical and mechanical infrastructure may not support high-density data equipment and may be too costly to replace.

Higher-density data centers have their own cooling issues, Bednar admits. “There can be more hot spots. Airflow management is a bigger issue.” The type of cooling used depends on the facility, according to Streck. “There is no ‘one-size-fits-all’ solution.”

Controlling Costs

Though high density is a hot topic in most of EMC Consulting’s initial data center discussions, many firms back off “when they understand what’s under the covers,” Streck says. The initial capital outlay is high, and some companies have too much invested in legacy equipment that won’t provide any additional benefits in a high-density environment.

Most companies adding data centers are choosing a mix of high- and low-density zones, with scalability for future expansion, says Dave Atwood, general manager for Integrated Interiors at Work (www.iiawne.com), a firm that provides construction services for data center environments.

According to Cappuccio, a company can design a facility for 20kw racks, running 500 watts per square foot and a total of 5,000 square feet, at a cost of \$37.6 million. Such a data center would also require a 7-megawatt power supply. The same size facility can be built for about half the price by mixing high-, medium-, and low-density equipment in different zones.

“High-density data centers can cost you a fortune, or they can save you money,” Cappuccio says. “Sixty percent of the initial cost of a data center is electrical and mechanical expenses,” he says. Major additional expenses come in power distribution and installing larger breakers and higher-performance cooling equipment. Because the equipment runs hotter, the fail-safe for cooling becomes more critical.

“While increasing density is important, it does not immediately equate to savings unless the data center is properly zoned to group equipment with similar power, cooling, and business needs,” Streck says. “We advise our clients that the best grouping strategy (hot/cold aisle, chimneying, zone cooling, etc.) is one that maximizes the energy cost savings of these groupings. As organizations begin to plan for fully virtualized



data centers that provide dynamic pools of compute, network, and storage resources, high-density data centers should be considered as an option that will enable the organization to control its facilities costs."

Three-Stage Approach

Cappuccio recommends taking a three-stage approach to building the data center. Select a site with space to build out in three different phases. Build each phase as needed, filling 90% of the available space. If all three phases are in a single building, the company can use drywall or some other type of partitioning to seal off the unused portions. After eight to 10 years, the second section should be built out with newer equipment. In another six to eight years, the firm should build out the last portion. The next step would be to retrofit the first section, then the second, then the third.

This way, Cappuccio says, a data center has a life span of closer to 60 to 80 years, or the life of the exterior concrete.

Not For Everyone

Companies that will get the most benefit out of a high-density data center are ones that have fairly uniform equipment (e.g., all newer servers from the same manufacturer), says Ted Streck, senior practice director of the infrastructure practice for EMC Consulting (www.emc.com). He adds that the expected capital, cooling, and operational savings might be only half of the \$1 million to \$3 million Emerson predicts, because the projections assume the latest equipment, which might not be practical for all companies.

For companies with smaller data needs now and in the future, a high-density data center is overkill, says Kirk Warden, senior vice president and partner at Clayco (www.claycorp.com), a building contractor with experience building data centers.