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Going to the cloud might make a lot of sense for your organization — but only if you choose a secure, reliable data center that can handle your needs. Erik Eckel runs through 10 essential criteria for data center evaluation. This download is also available as an entry in our 10 Things blog. In the past, companies built data centers like parents buy clothes for their children: Buy big and wait for the kids to grow into them. However, companies that designed spacious data centers ended up wasting a lot of money, powering unnecessary infrastructure. Today’s data-center design decisions all pivot around maximizing efficiency, while giving companies a path for future growth, says Steve Sams, VP of global site and facilities services for IBM. “We see our customers make very different design decisions than they used to,” Sams says. “And the end result is that they are saving 30 percent in operational costs over the lifetime of the data center.” About four years ago, IBM did an extensive study of contemporary data center designs and found that the three questions that drove design decisions—how reliable, how big and how to satisfy those requirements at the lowest cost—were not enough. IBM, which is building out 200 to 300 data centers every year, observed five other key trends driving design decisions today.1. Energy costs outweigh capital costsIBM’s study of its customers’ data centers revealed that the costs to run a data center quickly outstrip the original outlay for designing and creating the facility. Assuming a conservatively low 10 percent increase in energy costs, IBM estimates that the average data center will cost five times more to run over 20 years than it cost to build. The lesson: Build only what you need to now, so you can save money on capital costs. “The most energy efficient data centers in the world are the ones that are operating at 100-percent capacity,” IBM’s Sams says. About 60 percent of data center costs are actual physical components. Buying only what you needs saves the cost of the unnecessary components, but also multiplies that savings by eliminating the energy usage of unnecessary components. Following its study, IBM has seen energy costs rise more than it had originally estimated. One financial customer in South Africa saw its energy costs rise 28 percent last year and 33 percent so far this year, Sams says.2. Modularity mattersThe key to data centers that are neither too big nor too small, but just right, is taking a modular approach. (As its needs have grown, file-transfer service YouSendIt has created a modular data-center infrastructure that grows with demand for the company’s services. “It’s an ongoing evolution,” says Gary Chevsky, VP of operations for YouSendIt. “We are constantly striving for that modularity and flexibility.” The company, which allows people to transfer large data files to others, has invested heavily in building out a storage architecture that can adapt quickly to its growing customer base and their demands and provide services efficiently. “We constantly look at costs,” Chevsky says. IBM has seen this trend writ large. About 60 to 70 percent of the data centers it currently builds are modular in design, says IBM’s Sams. 3. Cooling is keyFive years ago, customers were installing 500 watts of servers on each rack; now, a rack of servers frequently consumes 20,000 watts, says IBM’s Sams. With greater energy consumption, of course, comes greater heat, which makes cooling technologies that much more important. The size of the data center is a key factor in determining which cooling option would be best. “What worked for large data centers did not necessarily work well for small data centers,” Sams says. In small data centers, putting the cooling devices as close as possible to the server racks mattered most. In larger data centers, traditionally raised flooring and perimeter chillers are most efficient, he says. When looking at cooling options, technology makes a big cost difference. The operational costs of the worst cooling systems were two-and-a-half times worse than the best systems, Sams says. 4. Virtualized everything Virtualization has a lot of benefits for corporate IT, from greater flexibility to more efficient use of resources. Servers are not the only component in the data center that can be virtualized, of course. For YouSendIt, virtualizing its storage was the next step for the company on its growth path. Many companies will try to do their own storage infrastructure and then outsource it. Finally, those companies — like YouSendIt — for whom storage is a large part of their business, will often bring storage back inside and use a virtual infrastructure to run storage clusters most efficiently. “The ability to tune and monitor and scale is much greater,” Chevsky says. The company’s data center consists of racks of blade servers that satisfy different tiers of customers: some are dedicated, others are virtualized. “We have quite a few different clusters ... that do different levels of processing,” Chevsky says.5. Self-diagnosing data centersDue to needs around virtualization, real-time heat monitoring and redundancy, IT managers are increasingly looking for data centers with more smarts. A key question that IBM asks its clients is how smart do they want their data center to be. Common requests are for real-time monitoring of heat and server and disk events that could signal an impending failure. The intelligence built into a data center will be the aspect of design that will likely change the most over time, says IBM’s Sams. “The whole marketplace is on a really steep innovation curve right now,” he says. “We expect a lot of interesting things to happen in the next three to five years.” Hewlett-Packard shared this peek at 3 of its own data centers and four customer data centers that break the mold. Shown here, HP’s next generation Wynyard data center, located in northeast England, uses a progressive free-air cooling technology and an energy-efficient and sustainable design that incorporates recycled materials and harvested rainwater. The facility is designed to operate without chillers for 98 percent of the year, and achieves an average annual PUE (Power Usage Effectiveness) rating of less than 1.2. Slideshow: The World’s Coolest Data Centers HP’s Tulsa, Okla. data center uses a reflective roofing system and an innovative water cooling system that will save several million dollars in costs, while maintaining the capacity to withstand a force five tornado. Tulsa’s 800,000-gallon chilled-water storage tank enables the facility to operate for up to eight hours without using a chiller/cooling plant. Slideshow: 5 Tools to Prevent Energy Waste in the Data Center HP’s next generation data center in Colorado Springs, Colo., was built as a high power density facility (200+ watts/sq ft). The average yearly temperature in Colorado Springs is 48 degrees, which allows economizer mode use (no chiller) for more than 50 percent of the year, for reduced energy consumption. Purdue University deployed an HP Performance Optimized Data Center, or POD, to enhance research efforts while also addressing the space, power and budget constraints faced within its on-campus data center. By implementing the HP POD, Purdue estimates it can expand its research capabilities by 50 percent within a matter of months for less than one-third the cost of building a new data center. The portability of the HP POD enabled the university to place it in front of a power plant, eliminating the possibility of power transfer and capacity issues. Citigroup opened the first newly-constructed data center to earn LEED Gold certification, working with the HP Critical Facilities Services (CFS) team. The HP CFS team supported Citi primarily with the electrical and mechanical systems that power the Central Texas facility. An energy-efficiency dashboard alerts operators when mechanical or electrical units run below peak efficiency. The concrete-encased cooling towers can withstand winds of up to 175 mph, and landscaping with native plantings means the site uses 50 percent less water than conventionally designed grounds. Power Loft is a developer of high-efficiency, high-density and high-security data centers. Designed with the help of HP Critical Facilities Services (CFS), Power Loft’s Virginia facility uses high-efficiency commercial air handlers rather than traditional computer room air conditioning units (CRACs). Six 180-ton air handlers (shown here) have variable-frequency drives and perform the work of nine 20-ton CRACs. These are rated as 25 percent more energy efficient than the traditional solution, but Power Loft says that in operation they’re 40 percent more efficient. Roswell Park Cancer Institute provides comprehensive cancer care and fundamental contributions to cancer research. Facing an increasingly expanding system, Roswell consolidated 200 of the institute’s physical servers into 174 virtual machines. All but three of Roswell’s server cabinets (shown here) will be removed when the data center consolidates onto the HP BladeSystem Matrix. The center expects the consolidated environment to reduce overhead costs by an estimated \$2 million, including reduced costs for system administrative, maintenance and power and cooling. About the authors: From Hewlett-Packard, Rob Taylor is a VP of Data Center Services, Enterprise Services; Bill Kosik is a Principal Data Center Energy Technologist, Technology Services; and Doug Oathout is a VP of Marketing, Converged Infrastructure.

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