The Four Trends Driving the Future of Data Center Infrastructure Design and Management

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Introduction

Throughout the first decade of the 21st century, countless new technologies, unprecedented business demands, and expanding IT budgets created the modern data center. On the cusp of this century's second decade, the data center finds itself balancing efficiency and availability while computing demand and energy costs are increasing and IT budgets are contracting. Looking ahead to the next 10 years, the companies emerging as leaders will be the ones that are able to maintain or improve availability while implementing technologies and services that reduce costs by improving design, management and operating efficiency. This paper reviews four trends that will drive these changes.

The data center as we know it today started to take shape as the dot-com bubble expanded in the late 1990s. Growth slowed when the bubble burst, but by 2003 the pace of change was accelerating again. Server shipments in the fourth quarter of 2003 were 25 percent higher than the fourth quarter of 2002 and continued to grow at a double-digit rate the next two years as IT organizations scrambled to meet the nearly insatiable demand for computing and expectations for 24x7 availability. In the absence of management tools to help predict future capacity, data centers routinely were built to handle capacities two to three times the initial requirements. It wasn't only the number of servers that was growing but the density and power consumption of those servers. Server density rose rapidly between 2000 and 2005, allowing more computing power to be packaged in smaller enclosures. Racks that once had held 8 or 12 servers were being packed with as many as 48 servers. The industry responded with next-generation UPS and density-specific cooling technologies, along with more advanced monitoring and management systems, to address the reliability issues facing high-density data centers.

But the pace of change and inability to forecast future demand remained a challenge. This challenge was increasingly being met by new infrastructure solutions that could more efficiently adapt to short- and long-term change.

At the same time, a new issue was emerging: energy consumption. According to a 2008 Digital Realty Trust survey of senior data center decision-makers, power usage of data centers (average kW use per rack) jumped 12 percent from 2007 to 2008. Looking back further, the Uptime Institute reports data center energy use doubled between 2000 and 2006 and predicts it will double again by 2012. With this in mind, the industry started to turn its attention to reducing data center energy consumption.

Those efforts ramped up in the second half of 2008 as the U.S. economy entered a deep recession and companies were forced to find ways to reduce spending. IT organizations began to look seriously at energy efficiency in terms of cost savings as well as environmental responsibility. This is reflected in survey data compiled by the Data Center Users' Group (DCUG). DCUG members surveyed in 2005 did not include energy efficiency in their top five data center concerns. In spring of 2008, efficiency made the list at No. 5. In spring of 2009, efficiency had moved to the second position

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