



Control room convergence

Merging industrial monitoring and control systems with data center operations

MARINA THIRY, ERIC OLSON, BOB FESMIRE – Few industrial sectors have grown as rapidly as the data center business. From mere “computer rooms” 20 years ago, data centers have become sophisticated, highly specialized, standalone installations. This growth is driven by society’s seemingly inexhaustible desire to produce data and has led to data centers becoming major consumers of power. New, showcase data centers are highly engineered and designed to be energy efficient, but for every one of these there are hundreds of average data centers that face challenges – sometimes across multiple sites. Often, the tools being used to manage these facilities are not up to the demands being placed on them. There is a universally recognized need for a unified monitoring and management system for data centers. Decathlon, ABB’s data center infrastructure management solution, is just such a system.



The growth in the size, number and sophistication of data centers over the past two decades has been staggering and there is now a robust industry dedicated to serving this sector.

Twenty years ago, data centers were known simply as “computer rooms.” The growth in the size, number and sophistication of data centers over the past two decades has been staggering and there is now a robust industry dedicated to serving this sector → 1. Much attention has been given to top-tier players such as Google, Apple and Facebook who invest hundreds of millions of dollars in purpose-built, highly engineered facilities. But for every one of these flagship installations there are hundreds, if not thousands, of average data centers that face difficult challenges, such as the need to reduce operating costs, manage an ever-expanding inventory of equipment and monitor multisite operations.

Evolution of the data center

In the early days of the Internet, data centers had little or no unified monitoring capability. There was no way to know how much energy was being used by the facility, much less by a given piece of equipment. Server utilization rates were equally unknown. In fact, there was no pressing need to know – energy was cheap and capacity was not an issue.

The surge in IT and the growth of the Web has caused an exponential rise in data storage and a similar rise in energy consumption: Just five years ago, typical servers drew around 2.5kW per rack, but today, servers consume between 8kW and 30kW per rack – posing a huge cooling challenge.

In response, many data centers have implemented hot aisle/cold aisle schemes, for example. These manage air flow to avoid hot and cold air mixing. However, this type of solution is passive. When it comes to active monitoring and control, the systems in place today are often inad-

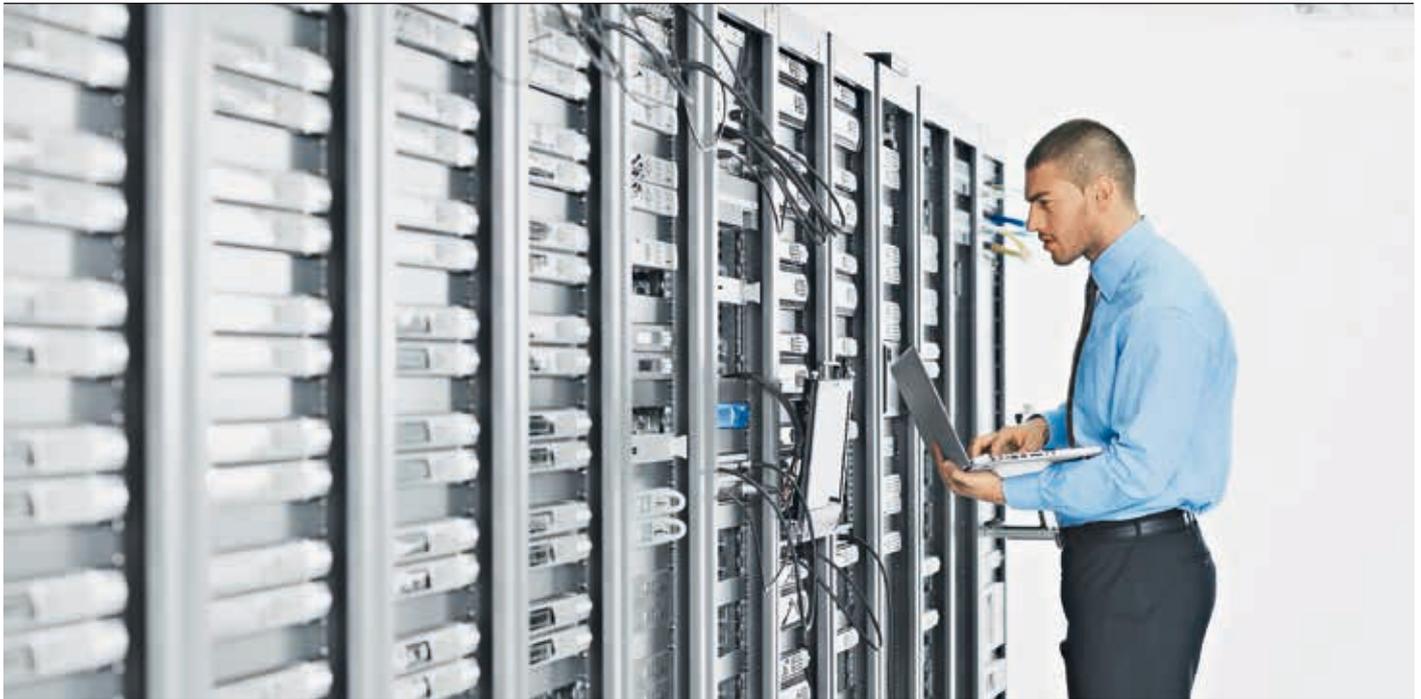
equate. Point solutions are available, for example to manage server virtualization or monitor energy use on a facility-wide basis, but, importantly, these systems are not integrated, thus adding complexity and introducing information gaps.

In other areas, data centers still lag other industries by a wide margin. Asset management, for example, is generally understood to mean the systematic monitoring of equipment status and performance in order to better manage maintenance and optimize the operations and maintenance budget across the entire equipment fleet. In the data center world, asset management has historically meant simply keeping track of the purchase date and physical location of equipment.

ABB estimates that only around 5 to 10 percent of data centers have monitoring and control systems in place for server operations, energy consumption and environmental control. Another 20 to 40 percent have some monitoring and con-

Title picture

Many data centers employ state-of-the-art data storage technology but are let down badly by their management and monitoring systems. How is ABB's Decathlon ABB's data center infrastructure management solution solving this?



DCIM systems must be highly reliable and also offer asset management capabilities that go well beyond simply keeping track of servers.

control capability — usually around server operations — and the remaining 40 to 65 percent have little or none. This is because many older facilities were treated as just another commercial office space, albeit with some unusual electricity requirements, and had to make do with the already-installed conventional building management systems to control temperature and humidity.

Enter data center infrastructure management

There is, then, a need for a unified monitoring and management system for data centers. It should have a single user interface that reduces the complexity of burgeoning point solution interfaces. It should also manage server operations as well as cooling, environmental controls and energy use. The good news is that process industries have already tackled many of the same issues, so the data center industry is in a position to leverage those mission-critical systems in building its own. This field of technology development has been labeled data center infrastructure management (DCIM).

From a strategic standpoint, DCIM is about aligning the data center with business goals and realizing greater value from it through:

- energy and performance information
- operational decisions supporting business initiatives

- delivery of new apps and web services in the most reliable and efficient way possible.

DCIM characteristics

Several characteristics are essential in a DCIM. Uptime is the most critical parameter for the data center industry, so DCIM systems must be highly reliable. DCIM systems must also offer asset management capabilities that go well beyond simply keeping track of servers: Condition-based maintenance and diagnostic tools (eg, to identify servers running in a loop) will bring asset management in the industry into line with other equipment-intensive businesses. As more and more operators manage multiple data centers, computer rooms and server closets, multisite visibility becomes another must-have for DCIM.

Ultimately, DCIM provides the visibility, decision support and control technologies to better manage data center operations, enterprise-wide, through a unified view that spans mechanical, electrical and IT systems. DCIM systems promise to deliver actionable information to data center operators so they can maximize capacity, optimize their operations and reduce cost and risk. Decathlon, ABB's DCIM solution, takes up this challenge and offers a significant improvement over the status quo:

Data centers will instantly shift “production” from one location to another to exploit differences in energy prices.

Facility management

Monitoring and control over facility systems, such as air conditioning, air handling and mechanical and electrical equipment.

Maintenance management

Shifting from time-based to condition-based maintenance using automated prognostics and diagnostics to identify and resolve issues before they become problems.

Power management

Monitoring and control of devices, power systems and meters, including the substation, microgrid and on-site power generation, to ensure safe and reliable power distribution and consumption.

Energy management

Combining real-time energy consumption data with energy contract information, real-time pricing and demand response for energy cost optimization.

Resource forecasting and energy planning

Services from third parties provide additional value by optimizing the energy value chain and allowing participation in energy markets. For example, a data center service called Global Energy Intelligence® by Power Assure is a subscription service embedded in Decathlon that delivers server metrics, IT analytics and forecasting, worldwide energy market integration, demand response, ancillary services, energy pricing and forecasts.

Asset and capacity planning

Nlyte Software's DCIM suite has been embedded in Decathlon. It can optimize space, power and cooling capacity through intelligent placement of IT assets. It also models what-if scenarios and automates and manages workflow processes.

Troubleshooting

Root-cause analysis and alarm management – providing granular performance detail for the entire data center operation.

Control and automation

Enabling facility and IT performance optimization at a device and system level.

Remote monitoring

Real-time monitoring of all assets and environmental conditions.

The case for DCIM

The need for visibility, decision support and control technologies for rapid response in data centers is clear and DCIM offers a solution to the patchwork of point solutions that many facilities rely on today. DCIM is still new, but a few overarching concepts have emerged that are likely to guide the development of these systems:

Visibility and better control

The essence of the DCIM business case is to establish a realistic baseline of data center energy use through real-time, comprehensive monitoring, so operators know when, where and at what rate energy is being consumed. Armed with that information, they can then take tactical measures to optimize resources and forecast energy requirements.

Resource consolidation

DCIM systems leverage increased visibility along with powerful analytics to consolidate resources and eliminate waste, thus maximizing existing capacity. This leads to hardware savings (eg, fewer servers), data center savings (eg, power, cooling and space) and reduced environmental impact.

Performance optimization

DCIM uncovers the true state of data center operations with better visibility and control to improve availability; maximize capacity of power, cooling and space; streamline operations; and reduce risk across the enterprise.

Facility and IT automation

DCIM systems can assist with tasks like load shifting and temperature and humidity control, as well as tracking other parameters, such as vibration in HVAC units, so as to pre-empt failures.

What comes next?

For the vast majority of facilities that do not enjoy the advantages of cutting-edge systems and design, a step-wise approach to improving data center operations is advisable.

A site evaluation is always a good first step as it reveals where the most immediate gains can be made (eg, in energy savings). Also, the eventual introduction of a DCIM system is made easier if the operators know what they want from it.

Retrofits should begin with simple initiatives with quick payback (ie, less than one year). These might include increasing room temperature or installing variable speed fans in the cooling system.

One example of where DCIM is headed lies in the potential for data centers to shift workload from one location to another to exploit differences in energy prices. This instant shifting of “production” is something of which “old economy” businesses can only dream. Ideas such as these will drive further refinement of DCIM systems and will play a central role in such products realizing their full potential and becoming an integral part of every data center in the industry.

Marina Thiry

ABB Inc
Menlo Park, CA, United States
marina.thiry@us.abb.com

Eric Olson

ABB Inc
Warminster, PA, United States
eric.olson@us.abb.com

Bob Fesmire

ABB Inc
Cary, NC, United States
bob.fesmire@us.abb.com

Reference

- [1] Datacenter Dynamics Inc (2012, July). Datacenter Dynamics Global Industry Census 2012 [Online]. Available: <http://www.datacenterdynamics.com/focus/archive/2012/07/datacenterdynamics-industry-census-data-center-industry-robust>