Moving the data center from reactive to proactive

In the hit movie *Moneyball*, General Manager Billy Beane (played by Brad Pitt) overcomes the high cost of baseball talent by reinventing the way data is used to evaluate players. His effort to reengineer a century's worth of baseball tradition is, predictably, met with skepticism and derision – until it works.

Every industry goes through a similar change at some point – shifting from art to science as it matures.

If it's not surprising that history-steeped baseball took so long, it's equally unsurprising that the evolution of data center management – steeped in the science of information – has occurred so quickly.

Only 20 years ago, data centers were essentially large closets in ordinary commercial office buildings – a necessary corporate expense driven largely by a single KPI (key performance indicator): uptime.

Today, data centers are recognized as the heartbeat of an enterprise – not only necessary, but capable of delivering levels of competitive advantage that justify the outsized investments they require.

But the ability of a data center to deliver such value depends on its management moving well beyond yesterday's uptime imperative to provide efficiency, flexibility, speed and creativity. It's a need that has been identified as a high priority by the industry itself.

For example, The Green Grid is a global consortium of companies and institutions focused on advancing energy efficiency in data centers. It developed a Data Center Maturity Model as "a comprehensive model of what could and should be done over time throughout the data center to improve overall energy efficiency and sustainability."

Organizations at the low end of the model are seen as managing by crisis, while those at the high end are flexible, proactive and visionary. Moving up through this cycle requires improved technology and management systems in all areas of data center operation: power, cooling, other facility infrastructure, management, compute, storage, network, and other IT.

Taken together, these systems are often lumped under the term DCIM – Data Center Infrastructure Management. The term itself implies integration of the varied systems that a data center relies on to function.

But not all DCIM systems deliver true integration – in which data from disparate subsystems is presented through a single interface in a uniform format. Further, while DCIM systems

will necessarily generate increasing streams of data, not all of them provide the sophisticated ability to analyze that data, act on it automatically whenever possible, and present real knowledge for people to use in decision making.

Without this extra ability, the people who run a data center will be overrun with information they don't have time to digest and use.

But with this ability, DCIM has transformative value, which can be divided into three categories, according to a 2011 report from The 451 Group, an independent analyst company that focuses on enterprise IT. They are:

1. Economic: DCIM can deliver meaningful savings by cutting energy and other operating costs; and optimizing/extending capacity with respect to servers, cooling systems and power systems.

2. Availability: DCIM can improve reliability by increasing the collection and application of critical status data to provide timely alerts, operating benchmarks, improved modeling capabilities, and increased visibility into asset status and maintenance requirements.

3. Manageability: While initial DCIM products focused on technical management, there is an emerging emphasis on business management as well – from long-term forecasting to energy contract management to carbon footprint reporting.

But if the value of integration is easy to describe, the work of integration is not always so easy to achieve.

"When I visit data centers, I notice they may have anywhere from four to eight different software packages handling various aspects of operations," says Mark Reed, Director of the Data Center Initiative at ABB, which has developed the Decathlon™ DCIM (Data Center Infrastructure Management) system.

In addition to the expected Building Management System to oversee cooling, power, lights and the like, Reed expects to find systems to monitor paralleling gear, power usage, generator settings and IT assets, among others. Typically, they all operate independently, each presenting data in its own way on a dedicated interface. "In one case, I walked into a data center where two of the packages were from the same vendor – and even those didn't communicate with each other," he says.

Often, they also don't do everything that needs to be done. "I was asked to visit one company that had spent a hundred thousand dollars to install temperature monitoring in their IT room," Reed recalls. "At that price, I assumed it provided feedback control to the air-conditioners. But they said no, it doesn't do that. They spent all that money just on monitoring."

This situation is common among data centers today, and it used to be just as common in other industries. But Reed points out that ABB is an example of a company that has provided control systems for a variety of process industries – from power generation, transmission and distribution to oil production to chemical and pharmaceutical manufacturing.

"The starting point for process control systems in the early 1980s – just as it was for Data Centers more recently – was redundancy," Reed says. "They needed to make sure the system wouldn't fail. Since then, capabilities have only increased – algorithms, information management, alarm management and the ability to interface with a multitude of standalone systems. Today, most industrial systems act as integration platforms."

By contrast, the Building Management Systems (BMS) that are the backbone of many DCIMs were originally designed to control the air-conditioning and the lights –"And that's still primarily what they do."

That's why Reed likes to talk about ABB's Decathlon™ system which comprises these systems:

- Security
- Alarm management
- Remote monitoring
- Energy management
- Change management
- Enterprise data historian
- Server optimization
- Maintenance management
- Asset management
- Building management
- Power management
- Load management

Recognizing that data center management has become far more complicated than the range of issues addressed by BMS, Decathlon™ is based on the discipline of process control and process automation.

"The data center has its own unique needs," Reed says, "but it's like all other industries in one respect: If you want to deliver a high level of value, you can't spend all your time managing the basics, like temperature control and energy consumption and asset monitoring. All of these things can be automated at a very high level.

"What we're talking about is bringing that level of automation to data centers, so people can stop spending all their time on keeping them running, and spend more time on running them exceptionally well."

Here are some examples of how such automation can deliver value in data centers:

- It's possible to pull temperature data directly from servers without adding additional sensors – and to use that data in control algorithms to automatically manage the air-conditioning in small zones.
- Stranded power within a facility can be identified, effectively increasing electrical capacity without additional investment or disruption.
- Excess server capacity can be identified and configured to allow increased utilization of existing equipment – delaying investment in new servers and the infrastructure to support them.
- Power usage can be modeled and managed based on information from IT load patterns, weather forecasts, time of day and week, and contract and utility data.
- Advanced asset monitoring can help to transition from a preventive maintenance program to a condition-based program – which reduces scheduled work on equipment that is functioning well, while providing faster attention to equipment that is approaching failure in between scheduled maintenance periods.

"The next frontier is having control not only in your data center facility, but in multiple data centers across the enterprise," Reed continues. "That's why we've started talking about DCIM."

To illustrate its value, Reed offers this scenario: At 3 p.m. on an August weekday in Texas, electricity demand will be at its peak. Depending on the data center's electricity contract, it may incur a peak load penalty or even a service curtailment unless it reduces consumption at that time.

One way to deal with this is to power up diesel generators – which are expensive to run and have a large carbon footprint.

"But if you're working in the cloud and able to shift applications from one location to another, you can shift traffic to a center located in a cooler location or a different time zone and then power down parts of the Texas data center," Reed says.

This level of mastery can require significant investment in systems and training. But return on investment can often be achieved in six to 18 months based on:

- Energy savings;
- Improved asset utilization;
- Reduced capital expense;
- Increased safety through standardization of operating procedures and remote diagnostics;
- Reduced engineering costs;
- Improved operator effectiveness, due to the use of a single interface rather than multiple systems.

Most important, according to Reed, is added reliability. "This isn't the same as redundancy," he notes. "It's not a matter of whether the data center is on or off; it's whether it can run at a reduced rate when there is a problem, and whether it can adapt quickly to changing business needs."

Reed concedes that right now, an integrated data center running at a high level of automation is a novel concept in the industry.

Then again, *Moneyball* used to be a novel idea too.

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