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Research

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DCIM: Going Beyond IT

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Infrastructure and operations (I&O) leaders must now go beyond performance management of IT equipment and begin to manage the entire data center infrastructure. Tools for data center infrastructure management (DCIM) will provide detailed monitoring and measurement of data center performance, utilization and energy consumption, supporting more-efficient, cost-effective and greener environments.

Key Findings

- Regulatory requirements developed by the European Union (EU), e.g., Code of Conduct, and the U.S. Environmental Protection Agency (EPA), including Energy Star for Data Centers, will soon drive IT organizations to monitor and measure energy utilization in data centers.
- Energy savings from well-managed data centers can reduce operating expenses by as much as 20%.
- The integration of key building management and IT management disciplines will enable DCIM.
- Facilities and IT departments will benefit from DCIM through improved resource and facilities management.

Recommendations

- Begin monitoring overall energy consumption in the data center, either manually or with metering and intelligent power strips, even if you can get only a macro view.
- Evaluate DCIM products now, with a focused evaluation, prior to full-fledged adoption.
- Partner with your facilities team to ensure that data center and facilities energy management initiatives don't overlap.
- Begin looking at the cascade effects of change management on the infrastructure, rather than just the change itself.

STRATEGIC PLANNING ASSUMPTION(S)

DCIM tools and processes will become mainstream in data centers, growing from 1% penetration in 2010 to 60% in 2014.

ANALYSIS

This document was revised on 29 March 2010. For more information, see the Corrections page.

What is DCIM?

A great deal is happening in data centers. Consolidation efforts are major projects in most enterprises, and many of these consolidation projects have made managers realize that, although the underlying data center infrastructure may be adequate for the short term, long-term growth will demand fundamental changes in the way computing resources are delivered to the business. The data center infrastructure is not just traditional IT equipment and networks, it also includes power systems, air conditioning, uninterrupted power supplies and generators, and the associated switching equipment. These components are part of an ecosystem, and any change to one component can have detrimental or unintended impacts on other components.

Data center managers and senior IT leaders have realized that the underlying operating costs for these infrastructures are not as clearly understood as once thought, especially when energy consumption is brought into the equation. In data centers of 8,000 square feet, we have seen energy costs exceed $1.6 million/year in North America, and these were not high-density environments. Those that have drilled down to understand the true cost of operations have quickly realized that there are potentially ongoing savings of 20% to 30% and operational benefits to be attained through more-rigorous management of the physical environment.

Not surprisingly, the vendor community has realized this too, and we are beginning to see a new market emerge, which we refer to as DCIM. In some respects, DCIM can be viewed as a juxtaposition of two other markets — systems performance management and building management systems. Although it will not replace either, DCIM will take facets of each and apply them to data center infrastructures, eventually affecting everything from inventory and change management to capacity planning and carbon footprint reporting.

Data center managers must have the information they need to make informed decisions for effective planning and management of data center assets and physical infrastructure to ensure the service levels the company expects. They also must have the insight needed to properly plan and forecast future data center capacities, including space, power, cooling and network connection. Leading-edge data centers have realized that true capacity planning is not about the placement of equipment or the management of assets, it's about understanding well in advance the cascade effects that every change will have on the environment.

DCIM provides insights and drives performance throughout the data center, including data center assets and physical infrastructure. It enables the monitoring and collection of low-level infrastructure data to enable intelligent analysis by individuals with domain expertise (e.g., capacity planners and facilities planners), as well as holistic analysis of the overall infrastructure. DCIM tools integrate facets of system management with building management and energy management, with a focus on IT assets and the physical infrastructure needed to support them.

Why Now?

A series of factors have moved the market toward DCIM during the past few years. Consolidation efforts in many enterprises highlighted the fact that energy consumption and space planning were becoming critical success factors in IT. These consolidation efforts brought power and cooling issues to the surface in many data centers, which, in turn, forced IT managers to focus more closely on energy consumption and the efficiency of their facilities. Green IT also was a factor, but for an unforeseen reason. Green technologies haven't had the impact expected, but the awareness of green IT and the rising costs of energy have brought these issues to the executive level, which has renewed the focus on IT efficiency. In addition, the increased attention on IT's energy consumption by the European Union and the U.S. Environmental Protection Agency have given notice to enterprise IT leaders that effective energy management may become the new key performance indicator for CIOs of public companies.

The EU announced a Code of Conduct for Data Centers in December 2008 that recommended that energy-efficient data centers should attain a power usage effectiveness (PUE; see Note 1) of 2.0 as an average target. It is expected that the EPA will initiate a similar initiative with an Energy Star recommendation for data centers during the next year (again, with a PUE of 2.0). This average PUE should not be considered an optimal target, as it implies that the power brought into the building is twice the power required by IT. Enterprises with strong corporate social responsibility programs or robust green initiatives should target a PUE closer to 1.6.

This attention on energy efficiency will increase public awareness of the issue. Subsequently, it will force many public companies to show how efficient they are relative to competitors in their market, as well as to begin to show incremental improvements.

What are the trends?

Monitoring energy consumption and equipment performance has been performed for many years, but almost exclusively on the facilities side of the business, and rarely on IT equipment. Building management systems monitor security, power, lighting and all facets of the day-to-day operations of the building itself, while operations technologies have been used to manage the physical equipment needed to run the business. IT equipment, on the other hand, was rarely monitored for energy consumption, but rather for performance and availability. CIOs were chartered with keeping the systems running, often at more than 99.9% availability levels; however, little attention was paid to the physical infrastructure supporting the systems and how efficiently it was running.

During the past several years, vendors have been emerging (see Table 1) that have begun to integrate some of the tools of building management systems into IT asset monitoring. By capturing environmental data at the device level (e.g., power consumed, performance levels and BTUs generated), data center managers can gain a more-detailed view of the environment and, thus, make informed decisions about equipment placement, cooling efficiency, power consumption and upgrades, and capacity planning.

Table 1. DCIM Vendors

Product	Vendor
Asset Point	Align Communications
InfraStruXure	APC
Vista 600	Aperture (Emerson-Liebert)
DSView 3	Avocent (Emerson-Liebert)
Operations Manager	HP

Product	Vendor
Maximo	IBM (with Tivoli)
Modius	Modius
nLyte Software	nLyte (formerly GDCM)
PI System	OSIsoft
Physical Infrastructure Manager	Panduit
Data Center Manager	Rackwise
dc Track	Raritan
Sentilla Energy Manager	Sentilla
Sentry Power Manager	ServerTech
Synapsense	Synapsense
Viridity	Viridity

Source: Gartner (March 2010)

Early versions of these tools were designed to capture data in a proprietary configuration management database (CMDB)-type construct (often not integrated with an existing CMDB) and to generate a detailed dashboard; however, this rarely provided an integrated (IT and facilities) or a federated view (IT or facilities) of the infrastructure. It was often a difficult sell for vendors, because their traditional buyers were facilities teams. Nonetheless, these products appealed to the IT group, which didn't have a clear idea of what was needed or what this low level of monitoring could offer them. The fundamental issue for both groups is that these tools monitor across domains — essentially reporting on performance/consumption of facilities assets, as well as IT assets — treating all equipment in the data center as a cohesive whole. This often creates organizational challenges as well, as the facilities and IT organizations attempt to determine who owns the tools (and who pays for them).

Newer versions of these tools are emerging that will integrate or supplement CMDBs or performance management databases (PMDBs). However, the challenge tool vendors and customers have implementing these products fall into three major categories:

- Creation of the baseline inventory of assets is primarily a time-consuming manual process.
- Maintaining the inventory in the midst of constant change is challenging.
- Creating reports and using analytics based on the captured data is critical, but it is mostly customer-driven.

What is in the future?

By 2014, DCIM tools and processes will become mainstream in data centers, growing from 1% penetration (in 2010) to 60%. The keys to their success will involve several factors:

- Improved reporting of the current and future (projected) environment through the use of templates, predesigned reports and improved report generation tools.
- Improved capture of the "what is" state of the infrastructure via automated methods, and the subsequent population of an asset database, as part of a PMDB or as an adjunct to

an existing database. This would include continuous updates and state change reporting.

- Consistent pricing is needed across the DCIM product landscape. Some vendors offer enterprise licenses, others per-square-foot prices, and still others per-device or node pricing. Simplified pricing is needed to increase market adoption and to enable data centers to migrate and scale into these solutions at their own pace. As an example, rack-based pricing would provide scaled implementations, while enabling a simpler method of projecting future costs based on known growth patterns.

- Historical trending and projections are needed to capture a data center's past energy usage and/or efficiency ratings, and to show future trends for the infrastructure based on captured consumption patterns. This would provide the IT and facilities departments with a clearer view of the complete infrastructure and where critical resources should be focused.

- Comprehensive asset management (age, consumption and efficiency). Although not critical in the near term, use of historical performance and consumption data will be critical to a comprehensive asset life cycle strategy. This would include IT assets, as well as those assets that support the IT infrastructure.

- The long-term benefit of DCIM will be the advent of intelligent capacity planning (ICP). With performance and consumption data captured it will become possible for a deeper level of business intelligence to be applied to IT itself. If a device's performance characteristics (e.g., performance, consumption and BTU impact) are known, it will become possible to perform predictive analysis of future changes to the environment. If a new application is nearing its production launch, ICP will show whether the space and power are available to support its components (e.g., servers, storage and networks), as well as predict accurately the potential impact of this new application on the entire infrastructure — essentially providing cascade impact analysis before the installation is executed. This functionality will become a key component of IT organizations' capabilities, if the optimal capacity, energy efficiency and computing potential of a data center are to be achieved.

Bottom Line

DCIM tools are evolving rapidly and will become a key part of a data center manager's arsenal during the next few years, providing valuable data needed to report on and improve energy efficiencies, identify potential infrastructure trouble spots and increase the effectiveness of capacity planning. To take advantage of the benefits as they evolve, I&O leaders should begin the DCIM evaluation process in 2010 and 2011.

Note 1
PUE Formula

Power Usage Effectiveness = Total Facility Power/IT Equipment Power

This research is part of a set of related research pieces. See "Sustainability for Growth: A Supply Chain and IT Transformation" for an overview.

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