The past 10 years have been full of exciting and demanding challenges for IT and the office of the CIO. The next 10 years will be full of further opportunities for creating business value, innovating in the datacenter, and becoming increasingly flexible to respond to ever-changing business needs. The datacenter and the IT organization will be critical to the business’ success in the coming decade.

Datacenter managers will need to balance availability and uptime with meeting the needs of the business and simultaneously embracing new technologies. Chief among these concerns is the availability of both IT itself and the facilities that support it. On the facilities side, power availability and capacity planning around cooling and electricity are essential ingredients for success. To continue to add incremental business value to the organization, the IT and facilities organizations will need to grow closer and more coordinated in their efforts. IDC believes that CIOs, IT managers, and facilities managers need to consider a few key points over the coming years, including:

- The advent of recent technologies such as virtualization, cloud computing, and modular computing has led to increased concerns around the availability of IT and facilities.

- These recent technological advances require IT to think about the datacenter more strategically. The need for on-demand computing and shorter deployment times means more advanced capacity analysis and longer-term planning. These strategies need to incorporate facilities concerns around power and cooling.

- Given the large penetration of virtualization (IDC estimates that over 19% of physical servers shipped in 4Q10 were virtualized) and how many IT organizations are performing trials with public and private clouds, it is imperative for facilities to get on board. This journey will require both IT and facilities to be present and constantly aligned.

- One way that datacenter managers can bring together IT and facilities to enable the business is through the use and deployment of datacenter infrastructure management (DCIM) software. Today’s best DCIM software brings together various IT and facilities systems, including generators and servers, to perform power usage effectiveness (PUE) reporting, datacenter visualization, dashboard reporting, what-if scenarios, and, ultimately, control to improve the datacenter’s performance and efficiency.
IN THIS WHITE PAPER

This white paper provides an overview of how facilities and IT organizations can add incremental value to the business throughout the next decade. Opportunities explored include virtualization, power and cooling, and cloud computing, with a strong focus on DCIM.

SITUATION OVERVIEW

In the past 10 years, virtualization gradually became the "killer app" in the datacenter. As of CY 4Q10, over 19% of physical servers shipped were virtualized. These virtualized servers represent the majority of new workloads deployed due to higher virtual densities than purely physical environments. This increased virtualization has led to automation, self-service catalogs, and an overall increase in flexibility on the IT side. While these deployment models are just being put into production on the IT side of the datacenter, the facilities side typically lags behind. IDC has met with some facilities organizations that are in sync with IT’s latest technological deployments. These organizations do exist, and should be applauded, but they are not typical. Virtualization, consolidation, automation, and cloud all rely on the power and cooling backbone of the datacenter to keep IT up and running. As IT evolves, many facilities organizations will need to develop as well.

Virtualization: The Foundation for Cloud Computing

The ability to divide a physical system into multiple logical or virtual systems allows IT to completely change its deployment and usage models. On the deployment side, instead of running a single application per physical server at a very low utilization level, IT can consolidate multiple virtual machines (VMs) onto fewer physical systems at a higher utilization level. This rather basic action causes reverberating effects that are felt across the datacenter.

Once server virtualization allows for consolidation and increased utilization, keeping track of the now invisible, mobile virtual servers becomes a challenge. In addition, on the facilities side of the datacenter, these massive consolidations create hotspots, the need for higher-density cooling, and more variable power and cooling management systems.

Cloud Computing: The Ultimate in IT Flexibility and Automation

To address the challenge of managing highly virtualized datacenters, cloud computing arrived in the enterprise two to three years ago. The biggest driver to make any change in the datacenter is to decrease the likelihood of downtime. Saving money is a close second, but to most datacenter managers, if the datacenter goes down, their job is on the line. Therefore, to keep the facilities and IT, virtual and physical, and process-oriented and system-oriented aspects of the datacenter aligned, many IT managers are turning to the cloud. The transition from a highly virtualized environment to one that is truly a private or public cloud, with automation
and self-service provisioning, will take time. Figure 1 depicts these stages and where most datacenters and IT organizations fit today along their journey toward the private cloud. The stages are:

- **Pilot.** A full 15% of datacenter managers are in the stage of testing virtualization. Less than 10% of their servers are virtualized, and they are not familiar with disconnects that arise due to virtual machine sprawl and the lack of communication between IT and facilities.

- **Consolidation.** The majority of datacenters are in the consolidation phase. These IT and facilities organizations have experience with virtualization now and are seeing savings in terms of physical server cost, power, cooling, and space. Despite their production environment running on virtual IT assets, only ad hoc policies are in place for management. These organizations are starting to see increased virtual machine deployments and increased management costs.

- **Assured computing.** One in four facilities and IT staffs is in the assured computing stage. The problem of management and visibility has been recognized and is starting to be addressed. The IT processes and policies are partially integrated and standardized, and their VMs are becoming more mobile and reliable. Production-level, mission-critical workloads are being run in this virtual environment. At this stage, with VMs moving around the datacenter on their own, it is critical to get facilities on board. The possibility of a VM moving between racks and tripping a breaker, overheating the server, or moving without awareness of a service-level agreement (SLA) is too great.

- **Private cloud.** Processes, policies, and automation tools are in place to make administering a virtual server less cumbersome than managing a physical one. Only 5% of CIOs are in this position, but many are headed in this direction.
While IT has undergone this dramatic transformation over the past 10 years or so and continues down the path to cloud, facilities have been making small, incremental advances. By and large, datacenters are still monolithic buildings or closets with static power and cooling. With all of these virtual machines and automation happening in real time, it is essential for power and cooling to be looped in. The major concern on the part of datacenter managers and the business as a whole is availability. For example, when a VM moves from one rack to another, before that VM is moved, management software must ensure that there is adequate CPU, memory, network, storage, and power and cooling in the rack.

**Datacenter Infrastructure Management: Facilities' Cloud Computing**

Datacenter infrastructure management, or DCIM, is facilities and IT software that addresses the problem of facilities usually remaining static while IT has radically evolved. Some facilities organizations have kept in step with IT as technology evolved and requirements altered; however, these cases are few and far between. DCIM can provide increased availability stemming from the least instrumented, least paid-attention-to part of the datacenter: facilities. In addition to increasing the reliability of
the datacenter and, in turn, the business, DCIM can save IT and facilities money and energy. Availability and cost savings are the two largest drivers of organizations deploying DCIM software. There are many other ancillary benefits, including:

- **Reducing carbon emissions.** In many regions, Western Europe in particular, this is no small benefit. Carbon taxes, capping, and regulations are no longer a concern for the future. These legislative efforts are well under way in some European countries.

- **Automated energy sourcing.** This capability will make utilities' lives easier by reducing the possibility of brownouts and blackouts. This puts the datacenter in a more favorable position with local utilities by helping to solve the problem of limited energy.

IDC's official definition of DCIM is provided in the following section. It includes both services and software, although IDC has found that the market is much more focused on software than services. The only services included are those that facilitate the implementation of DCIM software.

### Definition

Datacenter infrastructure management includes planning, management, and optimization software and services for space, power, and cooling within the datacenter. The software and services typically focus on the intersection of facilities and IT systems to create a datacenterwide view. For a product to be considered DCIM, it must see at least one component on the IT side (virtual machine, server, storage, network equipment) and one component on the facilities side (cooling, power distribution unit [PDU], uninterruptable power supply [UPS], sensors, generators), although it may see many more than one on each side. This market does not include proprietary software with the singular goal of monitoring a single product.

### DCIM's Role in the Datacenter

Figure 2 depicts how good DCIM software takes both the IT and facilities systems' metrics and statistics and then performs all of the following functions:

- **Control.** Only a few DCIM vendors can actually alter the state of the datacenter without feeding data into another management console. These DCIM products actively change the facilities or IT environment automatically without human intervention based on preset thresholds. Many DCIM products can send out work orders to decrease cooling or increase power to a rack, but very few can automatically take that action without human support. IDC believes that few datacenter managers are interested in DCIM automation at this early stage, but many more will be interested in one to three years.
**PUE reporting.** PUE is the de facto measure of efficiency in the datacenter. This measure is not perfect for all occasions, but it is a great way to see datacenter efficiency within one datacenter over time. Good DCIM software products come, out of the box, with the ability to measure PUE and report on it in real time. Many datacenter managers are looking to find out what their PUE is and report it up the food chain as a show of progress or financial rationale for a particular project.

**Dashboards.** The more advanced products have multiple dashboards, depending on the user profile of the person logged in (this is a sign of enterprise-ready DCIM software that uses user-aware security).

**Integrated tool management.** For many DCIM vendors, one goal is to be able to integrate seamlessly into existing environments. The idea is to be able to double-click through software packages and not even know that the user switched products. In some cases, the DCIM software is not visible and feeds information, analytics, and data to other programs for potential intervention (such as feeding power and cooling data to virtualization management software to possibly move a VM to a different rack).

**Scenario analysis.** These what-if scenarios can be very useful for potential changes to the datacenter floor. Some DCIM products offer suggestions for where best to place a new rack in terms of space, weight on the floor, power availability, and other factors. These types of potential alterations can bring down a whole datacenter; so before the move or change is made, it is valuable to have some data to back up the decision.

**Datacenter visualization.** These software packages show the physical layout of the datacenter with racks, cooling, power, IT systems, and the connections between each. Some can see computer room air conditioner (CRAC) zones, temperature, airflow movement, pressure, humidity, and many other factors. These maps are useful for finding previously undiscovered space or capacity and prolonging the life of the datacenter.
DCIM represents an opportunity for facilities to catch up to IT's progress from the past decade and enable IT and the business into the future. To garner all the benefits of a properly deployed DCIM package, datacenter managers should consider the following aspects of both the product and the vendor.

Integration with Solutions, People, and Processes

Datacenters are very complex buildings or giant computers, depending on how one thinks about them. For one solution to effectively integrate power, cooling (facilities), and IT, the software must be capable of integrating across vendor, technology (new and legacy), and business groups (facilities and IT). The following are a few of the connections IDC considers to be key:

- Building management systems (BMS). DCIM solutions have to integrate with building management systems that work toward managing the entire building, including lighting, ventilation, power, and security. Vendors in this space include Siemens, Schneider Electric, and Johnson Controls. A great DCIM solution will integrate seamlessly with them all.
**Capacity management.** DCIM tools should be able to integrate with capacity management tools in two ways. First, they need to bring the best parts of IT capacity management to the facilities side of the datacenter. This includes things like the IT Infrastructure Library (ITIL) and enables the facilities group to begin thinking of power and cooling capacity the same way that IT does today. This first point of integration enables the two groups to start communicating and streamlines processes. The second point of integration for DCIM is to actually connect and share data with existing capacity management tools.

**Incident and problem management (service desk)**. Great DCIM tools enable intelligent alerting and, where appropriate, manage the escalation process. Again, these solutions actually integrate on the back end as well, following routing rules shared with IT.

**Change management.** This integration is usually key for datacenter managers because it directly decreases the likelihood of downtime. DCIM connecting with change management enables power and cooling factors to be considered before actual changes are made. This action decreases the likelihood of inadequate power or cooling for a newly installed server or wasting power and cooling on orphaned or decommissioned IT hardware.

**Configuration management database (CMDB).** DCIM makes integrating facilities and IT in terms of people and processes much easier. Many DCIM tools self-discover new equipment and their configurations and dependencies. This affects procedures and, again, decreases the likelihood of downtime in the datacenter by facilitating communication across facilities and IT.

**Security/user administration.** IDC often is asked if DCIM is “enterprise ready.” The answer is that some DCIM platforms are, and some are not. One key aspect IDC considers is if the DCIM solution integrates with security and user administration. DCIM needs to include role-based secure access and integration with Lightweight Directory Access Protocol (LDAP) for Active Directory or Solaris and work with existing security software.

### Current Roadblocks to Integration

Through studying this market for the past couple of years, IDC has noticed a few key areas of integration and accurate monitoring that datacenter managers should ask about. These commonly overlooked areas of the datacenter may not be necessary to monitor in real time for all datacenters. However, for the purposes of clear communication, it is important for datacenter managers to inquire about these coverage areas. The points of integration include:

**Integrating facilities and IT.** By IDC’s definition, DCIM software must see at least one element from facilities (UPS, PDU, cooling, generators, chillers, or racks) and one element from IT (servers, storage, or networking). It is clear that the more equipment and processes a DCIM product can accurately monitor across the datacenter floor, the better the product is.
Cooling. Due to outdated, proprietary protocols, many DCIM products cannot monitor, manage, or control cooling in the datacenter. This is unfortunate because cooling is very important to a well-functioning datacenter. Undercooled areas of the datacenter may overheat, and overcooled areas waste precious budget. This problem is addressable with sensors or protocol access and variable frequency drives (VFDs) that control fan speeds on datacenter cooling systems.

Cross-vendor. Some DCIM vendors can see only certain vendors' cooling or virtualization management platforms. Datacenter managers need to be sure that the DCIM solution monitors the vendors' equipment that they want to monitor. For example, if a given datacenter has Liebert cooling installed, and a datacenter operator wants its DCIM tool to monitor and manage its cooling systems, it is imperative to find a DCIM vendor that integrates with Liebert.

Mainframe/distributed. A common misconception IDC comes across is that DCIM can monitor only x86-based servers. Several DCIM vendors operate across platforms and even perform energy monitoring for mainframes.

 Legacy equipment. Datacenter retrofits and brownfield deployments are just as common today as greenfield deployments. DCIM players need to be capable of monitoring legacy equipment in a given environment without replacing old hardware or building a whole new datacenter.

CA ecoMeter: An Advanced DCIM Product

CA Technologies has all of the integration points across people, processes, and tools and has overcome many of the roadblocks to integration in the datacenter. CA ecoMeter is an enterprise-class product that is part of the CA ecoSoftware solution from CA Technologies. Its DCIM tool, CA ecoMeter, integrates with BMS, capacity management, service desk, change management, CMDB, content management system (CMS), and security software. In addition, its software suite sees across facilities and IT, vendors, old and new equipment, and mainframe and distributed servers. This software enables facilities to help, not hinder, IT's journey to the cloud and ensures less downtime along the way. Although CA Technologies is historically an IT firm, it has developed impressive capabilities on the facilities side to bring CA ecoMeter to market. Key capabilities of the software include:

Visualization. There are a few ways to save precious budget when deploying DCIM software, and saving money on the monthly utility bill is only one of them. A second, sometimes larger area of savings is deferring the building of a new datacenter. Many times, the visualization capabilities in CA ecoMeter can provide places where the datacenter can be expanded within its current footprint through virtualization, consolidation (of both IT and facilities systems), and a comprehensive view of capacity available.

Evolution of metrics. There are dozens of recognized key performance indicators (KPIs) for datacenters. In addition, there are many custom metrics that should be measured given the uniqueness of many brick and mortar datacenters. Through its Calculation Engine, analyzing custom KPIs, analytics, and thresholds proves simple. The Calculation Engine is also easy to change given current priorities in the datacenter.
**Efficiency surprises.** CA ecoMeter dispels the myth of the “datacenter whisperer.” CA ecoMeter’s real-time analytics and accurate monitoring enable informed decisions and a true reality check versus what many datacenter managers believe about how their datacenter operates today and how it could operate tomorrow.

**Continuous measurement.** CA ecoMeter replaces a once-a-day measurement of datacenter behavior with continuous, real-time measurement when integrated with IT data points. This type of analysis enables datacenter managers to see the impacts of time-of-day variations (night versus day) and, when integrated with IT data points, enables them to do event-based analysis (migrating workloads, virtualization and consolidation, downtime).

**Control (virtual and physical).** CA ecoMeter is one of the very few DCIM products on the market today that integrate at a virtual level with IT. Given this integration and its familiarity with the facilities side of the house, CA Technologies can actually alter or automate certain actions within the datacenter based on preset user-set thresholds. For example, if a large workload moves to a different CRAC zone on the datacenter floor, CA ecoMeter can automatically work with the VFD in that CRAC to turn up the fan and not overheat the zone.

**Integrated tool management.** Given all the points of integration previously highlighted, CA ecoMeter operates smoothly across all of those currently disparate systems. In addition, CA ecoMeter can monitor power (UPS, PDU), cooling (chillers, CRACs), generators, servers, and sensors using multiple protocols (BACnet, Modbus, SNMP). While CA ecoMeter is not aiming to replace capacity management, change management, or security software, it can work with what is in place to intelligently increase uptime and efficiency in the datacenter.

**FUTURE OUTLOOK**

The DCIM software market is set to grow for the foreseeable future. As more and more IT organizations virtualize, consolidate, and “cloudify,” integration with facilities will be required to prevent downtime. Many of the world’s leading service providers for hosting and cloud either have already created their own DCIM tools or are working with DCIM vendors today. Bringing in DCIM software has the power to prevent downtime and improve efficiency (its intended function) and to change how IT and facilities work together in the datacenter, creating beneficial organizational changes for years to come.

IDC sees the opportunity for IT to become more responsive to the business, prevent downtime, and save money by deploying DCIM software. For DCIM software vendors, the key to success is integration across facilities and IT, people and processes, and old and new infrastructures.
CHALLENGES AND OPPORTUNITIES

Challenges

Because DCIM is relatively new software (roughly one to two years old), deploying and using the software may require additional services. These services include datacenter audits, installing supporting sensors and software, or work creating custom reports. As time goes on, IDC sees this problem diminishing as services templates and experience increase.

Due to the fact that DCIM is a new software innovation, there may be substantial internal work required to enable ongoing, effective use, such as training and even just encouraging use of reports with actionable information. IDC recommends that this step be taken, no matter how long or expensive, because the ROI is much higher for software that is actually used.

IDC believes that for DCIM to really get off the ground in some organizations, a lot of work will be necessary to determine who is in charge of the implementation (facilities or IT), who is in charge of the ongoing maintenance, and who gets the credit for or responsibility of ushering DCIM through procurement. In some cases, this may mean shifting which group (IT or facilities or another group) is responsible for the power and cooling bills of the datacenter. An internal sponsor may need to put its neck on the line to usher through a DCIM implementation. When a DCIM implementation is done right, IDC believes that the high risks undertaken by IT and facilities organizations can yield the rewards mentioned in the following section.

Opportunities

There are upsides to DCIM being so new. One of these positives is that larger customers have the ability, in some cases, to influence product road maps. These new, relatively small software vendors and larger companies with smaller business units focused on DCIM are listening to their customers and prospects, looking for insight into the evolution of the product and future strategy. When the DCIM vendor is part of a larger organization, IDC has noticed a certain level of autonomy and start-up mentality. This works out well for the customer because whether the vendor is a small company or a small business unit as part of a larger organization, the customer has more of a say in terms of feature sets, services rendered, and future plans.

DCIM adopters can gain all of the positives mentioned throughout this paper, including increased IT and facility-level availability, decreased utility bills, and proof of compliance (both regulatory and corporate reporting purposes). Chief among these benefits, for most datacenter managers, are availability and decreased likelihood of unplanned downtime.

The organizational shifts that may be necessary for DCIM adoption (changing who is responsible for utility bills, bringing together facilities and IT, etc.) are long-term net gains for the business. Whether DCIM is the impetus for these changes or not, these are best practices of a well-functioning datacenter operation. IDC recommends that IT and facilities organizations look upon these internal hurdles as opportunities to improve now before a problem pops up later.
CONCLUSION

Today’s datacenters are fast approaching private and public clouds. With all of this automated provisioning on the horizon, it is imperative for facilities to have a seat at the table. Risks from not involving facilities include downtime, lost savings potential, unnecessary new datacenters, increased carbon emissions, and noncompliance. Many datacenter managers are not yet aware of DCIM software and therefore are not considering the facilities part of the journey to the cloud.

CA ecoMeter can help. The software brings together facilities, IT, people, processes, legacy, and new systems to create an accurate, live, and controllable view of the datacenter. Dozens of DCIM vendors are in the market today, but CA Technologies is one of the few that can integrate across disparate systems and groups to provide visualization, what-if scenario planning, control, and visibility in the virtual layer.

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