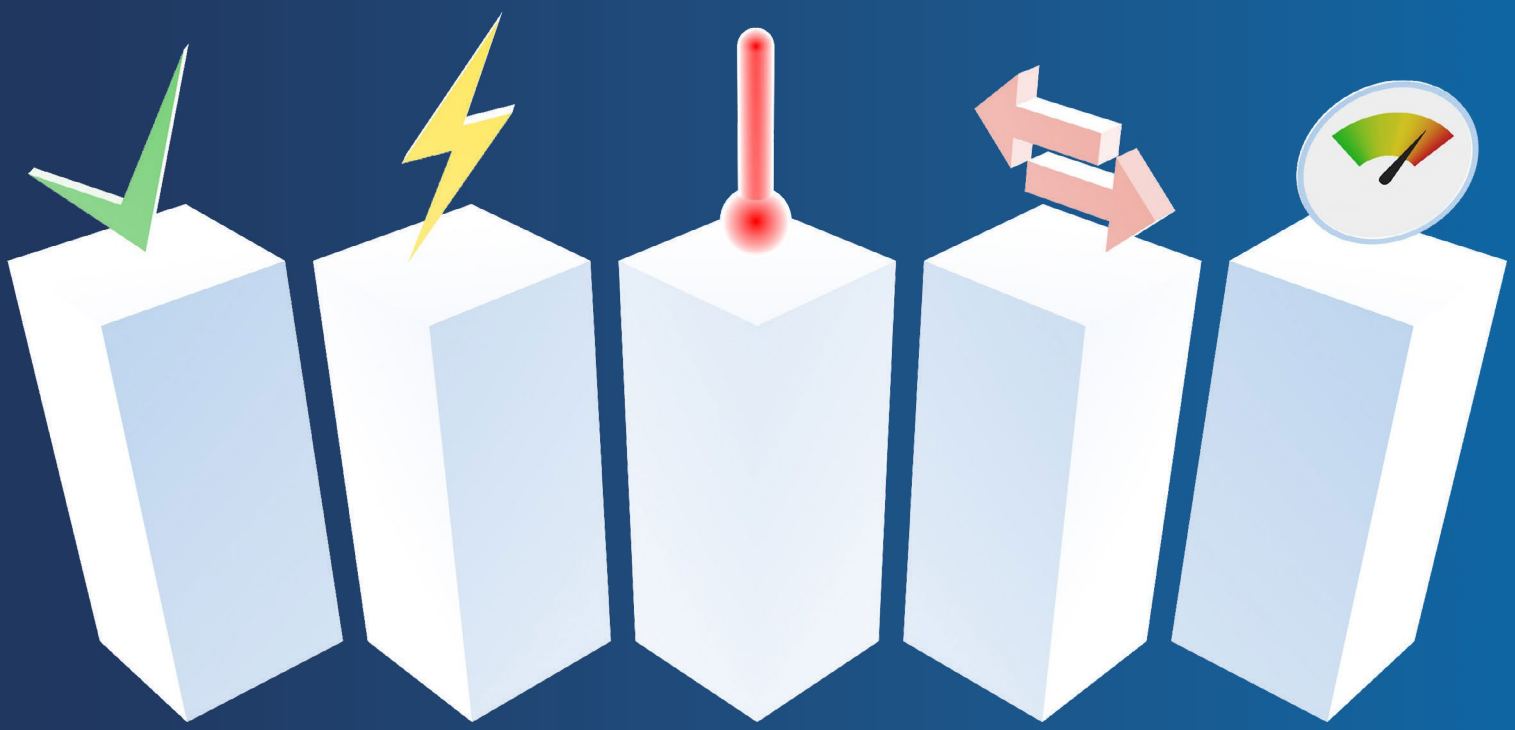
DCD INTELLIGENCE

ANIXTER

GLOBAL TECHNOLOGY BRIEFING

DCIM ENABLEMENT BEST PRACTICES



CONTENTS

FIGURE INDEX

EXECUTIVE SUMMARY

In the IT universe, “get more from less” is a common mantra. Usually, this mandate comes from the executive suite and applies to the IT budget, staff, and other resources. However, when it comes to a data center’s infrastructure — power, cooling and space — how can more efficiency and lower costs be achieved while maintaining availability? Is there a way to effectively manage a data center’s infrastructure in a way that makes sense to the IT team and fosters collaboration with facilities to achieve the goals of the business?

Data center infrastructure management (DCIM) can hold the answers to those questions and more with one caveat — the data center team must understand which pieces of DCIM will solve their business challenges and which can be readily integrated with existing technologies. It is critical that organizations looking at such solutions need to be ready for DCIM by defining a scope that will solve the most pressing challenges while making sure that it is focused enough to be achievable.

DCIM is still a relatively new and evolving area and is subject to industrywide confusion. With barriers to adoption and common industry challenges, it’s important to create a plan for the selection and preparation of a DCIM solution. This is why Anixter created the five senses of DCIM — a thorough treatment of key areas that data center managers should know as they seek to implement a solution.

INTRODUCTION

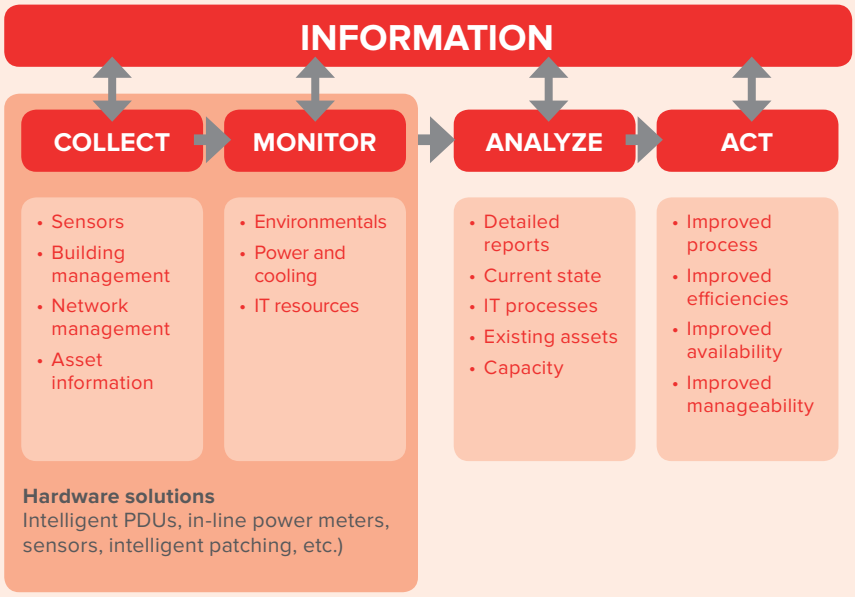
DEFINING DCIM

Although some stand-alone infrastructure management products were being used in larger data centers more than a decade ago, DCIM was first widely used in 2007. At the time, existing data center infrastructure management products focused mainly on power monitoring and environmental conditions. Products that addressed asset management and mapped IT processes for managing move, add, and change work were less common.

During this time, the facilities management team almost exclusively monitored and managed data center power and cooling systems. By 2010, the continued growth of data centers made understanding the performance and capacity of these functions critical for IT teams. This was especially true with the largest enterprises, which were experiencing subpar efficiency in power, cooling and physical space usage, resulting in thousands or even hundreds of thousands of dollars in energy and resource waste and gaps.

Throughout its short history, DCIM has often been defined by individual manufacturers and suppliers, often with a bias that tilted its functionality in a certain direction. However, most industry experts agree on a broad definition of DCIM as a solution that helps data center managers track and analyze information about their facilities' operational status, assets and resource use, such as space, power and cooling.

Figure 1: The Flow of Information Management



Gartner defines DCIM as "tools that monitor, measure, manage, and/or control data center use and energy consumption of all IT-related equipment (such as servers, storage, and network switches), and facilities infrastructure components (such as power distribution units [PDUs] and computer room air conditioners [CRACs])."

A more aspirational and forward-thinking view of DCIM is one that positions it as a way to gain a complete picture of the current state of the data center, providing actionable and intelligent insight that drives energy efficiency and strategically plans for future capacities, including space, power and cooling resources.

A comprehensive and well-integrated DCIM solution will collect and monitor a data center's assets, resource use and operational status, capturing thousands of data points. This data can then be analyzed and acted on by staff to meet business and service-oriented goals as well as maximize performance.

DCIM systems can help data center managers:

- Execute technical and business goals and changes
- Reduce waste and unnecessary over-provisioning
- Plan for new data center capacity through forecasting
- Decrease downtime risks
- Increase energy efficiency.

DCIM DRIVERS

MODERN DATA CENTER COMPLEXITY

With thousands of IT assets under their supervision, data center managers are constantly under pressure to deliver results. To deliver those results, they need tools that can transform the inherent complexity of running a data center into information and insight they can act on. The increased complexity of the data center architecture, including higher densities and virtualization, has exceeded the capabilities of managing through the use of traditional means, such as simple spreadsheets.

Today's data center managers need to see, understand and optimize the complex interrelationships that drive the modern data center, arguably one of the most complex types of facilities in the world. Existing management systems and techniques often have limited capabilities, and data center managers need to understand what is happening in the data center. IT asset management systems fall short of showing the interrelationship of data center assets. In addition, ad hoc monitoring and reporting is growing increasingly unwieldy as data centers grow.

In short, those charged with running and managing complex data centers need a holistic and transparent view of their entire IT infrastructure that outputs meaningful and actionable data instantly in real time and with accuracy.

Those charged with running and managing complex data centers need a holistic and transparent view of their entire IT infrastructure that outputs meaningful and actionable data instantly in real time and with accuracy.

INTERNET OF THINGS

In addition, the trend toward the Internet of Things (IoT) has added to data center management complexity with the sheer amount of data that needs to be analyzed and used. In fact, Gartner estimates that by 2020, the IoT will grow to 26 billion units, creating enormous challenges and even greater complexity for data centers.[1] These IoT deployments will generate a tremendous amount of data that will require processing and analyzing in real time.

Today's data center managers need to be more forward-looking with capacity management tools at their disposal, such as DCIM, to be able to actively meet the business priorities associated with IoT.

1 Gartner – Gartner Says the Internet of Things Will Transform the Data Center, 2014

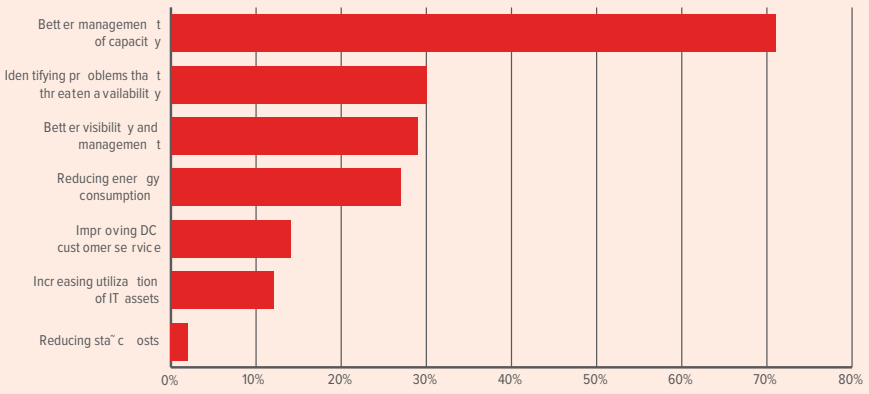
CAPACITY PLANNING TOP-OF-MIND

On the surface, it may seem pretty straightforward that the top driver for DCIM is energy efficiency. After all, there are financial pressures, particularly when it comes to the need to decrease energy costs. The drive toward higher efficiency is also being pushed through legislation and industry standards, including the EPA ENERGY STAR program for data centers and the European Union Code of Conduct.

According to an Uptime Institute survey,[2] capacity planning is the main reason many organizations are adopting a DCIM solution. However, it is important to point out that capacity planning is really the goal for DCIM, not a starting point. DCIM generally starts with better monitoring and management of power, cooling and IT assets.

To fully understand capacity, data center managers need to know how much power and cooling they are consuming out of the total available, as well as asset utilization. As a byproduct of better capacity planning, a data center manager will better understand how to maximize physical space (asset utilization), power and cooling systems (energy efficiency and reduce operational expenses [OPEX]) and reduce risk (minimize outages).

Figure 2: DCIM Adoption Drivers[3]



2 Uptime Institute Global Datacenter Annual Survey, 2013
3 DCD Intelligence, 2015

LACK OF ADOPTION

Data center complexity, Internet of Things and the need for capacity planning are at the top of the list to make DCIM deployment a priority. Yet, despite all the evidence that makes the business case for DCIM seem pretty strong, there are still challenges.

DCIM MISUNDERSTANDING

Throughout the industry, there is a prevalent lack of understanding on what exactly constitutes a DCIM solution as well as its functionality. Adding to the confusion are differing views on DCIM models. Multiple DCIM models have been put forth by analyst firms such as Gartner, Forrester and the 451 Group. Even though they are similar in many respects, there are subtle differences between the various views of DCIM.

Part of the misunderstanding surrounding DCIM is the fact that it has often been (and still is) a very broad term. It is often promised by less credible suppliers and manufacturers to do more than its current capabilities allow.

COST A TOP BARRIER TO ADOPTION

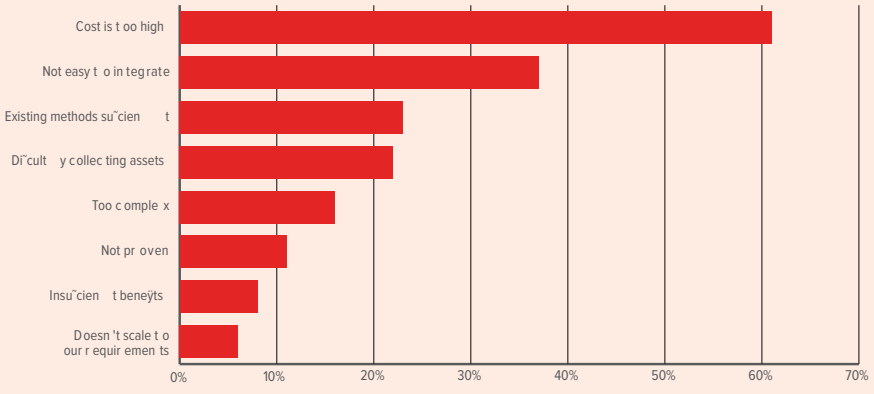
An Uptime Institute survey found that more than 60 percent of respondents cited cost as the chief barrier to DCIM adoption. Although there is a wide variance in the cost of DCIM solutions, many budgets don't account for this expense.

Another barrier as it relates to cost is implementation. These differ from the cost of the product, yet are as much of an obstacle for DCIM deployment as any initial product investment. Facility managers need to consider the "costs" beyond deployment such as:

- Time
- Dedicated internal resources
- Education
- Installation
- Integration.

IT and facility team collaboration (or lack thereof) can have an impact on moving forward with DCIM. That's because getting the budget finalized for such a large purchase could mean competing interests and priorities. Although DCIM's functionality hopefully bridges the gap between these traditionally siloed groups — IT and facilities — sourcing funding from these two groups can be problematic.

Figure 3: DCIM Barriers to Adoption[4]



4 DCD Intelligence, 2015

DIFFICULTY PROVING RETURN ON INVESTMENT

DCIM return on investment (ROI) is achieved through decreased downtime, eased management, increased flexibility and improved transparency. However, measuring these changes is not always easy, which makes proving the rationale for purchasing DCIM to the executive suite and purchasing decision makers difficult.

In general, proving ROI figures is tricky, especially with something like DCIM. When businesses try to bring everything under one centralized solution, and try to take on all issues at once, it makes proving ROI even more difficult. Sometimes the best approach is to find small wins or to solve one particular challenge first. Once the challenge is identified along with an estimate of how much it costs the business, facility managers can also calculate how DCIM would help the business fix the problem. Those can be hard numbers (e.g., inefficient cooling systems tied to electricity costs) or they can be softer numbers (e.g., productivity gains from better business processes gained from the insight that DCIM offers).

Sometimes the best approach is to find small wins or to solve one particular challenge that has been the biggest issue first.

Calculating ROI definitely depends on the issues that need to be solved. For example, ROI can be calculated by looking at better asset management practices:

- How difficult is it to maintain current asset inventory?
- How accurate is the asset information currently?
- Have there been outages associated with not knowing asset information?
- How long does it take on average to find a particular asset in the data center?
- Is there an asset inventory process? If so, how long does it take to complete?

ROI AND GETTING APPROVAL FROM FINANCE

There are some key lessons that can help gain approval for DCIM:[5]

- Understanding common, costly data center problems that can be fixed with DCIM
- Identifying the high-value problems inside a data center
- Measuring what these problems actually cost
- Learning to align the DCIM project to corporate objectives
- Building, identifying and selling an ROI model to the decision makers

5 Data Center Knowledge – How to Develop ROI for DCIM Projects – Bill Kleyman

IT PROCESSES SLOW TO CATCH UP

In order to gain the full benefit of DCIM, previously stand-alone IT processes such as asset provision need to be fully integrated.

Integration requires effort, particularly in bridging protocols. For example, IT systems move information in a digital format and rely on the TCP/IP protocol, while building systems communicate using analog network protocols, such as BACnet and LonWorks. In order for DCIM to bring differing systems together, bridges need to be built between the two protocols, starting at the network layer.[6] The good news is that there are top-tier DCIM manufacturers and suppliers with tools and solutions that address these integration issues.

This is why working with a trusted partner is paramount for those evaluating DCIM.

FLASH POINT: OVERPROMISING AND UNDERDELIVERING

As mentioned briefly, an unfortunate issue that often surfaces with a young and still-evolving technology platform is the pervasiveness of manufacturers and suppliers that make inflated claims of the advantages of DCIM. Suppliers that fail to deliver on their promises are damaging this fast growing market.

With more than 70 suppliers that claim to have a DCIM solution,[7] no industrywide standards and a lack of a formalized open-architecture approach, this will likely continue to be an issue. As the DCIM market gains traction and grows in maturity, the truly credible and reliable DCIM providers will stand out.

This is why working with a trusted partner is paramount for those evaluating DCIM. Because DCIM is such a significant investment of time and resources, it's important to work with an established and reputable partner that can map a company's challenges into the right solution agnostically with no product bias, inflated claims, or empty promises.

6 Data Center Knowledge - How to Develop ROI for DCIM Projects – Bill Kleyman
7 TechTarget – DCIM Vendor's Promises vs. Data Center Realities – Paul Korzeniowski, 2014

THE CHALLENGES OF SELECTING A DCIM SOLUTION

When selecting a DCIM solution for a data center, there are a number of challenges that may arise. Through years of experience in working with customers as well as collaborating with industry experts, these are some of the most common issues that surface in the process of choosing the right DCIM solution.

LACK OF PRODUCT EVALUATION TOOLS

With an estimated 70 suppliers in the market who say they have some form of a DCIM solution in their portfolio,[8] it's hard to decipher the real and credible solutions from the rest. Additionally, there aren't any standards developed around DCIM, which makes evaluating the different solutions difficult.

UNDERSTANDING IMPLEMENTATION COSTS

Fully understanding all the implementation costs so they can be integrated within the IT budget (the most likely source of the purchase dollars) and properly presented to the purchasing decision makers can be a hefty task. Of course, it's important to factor in the effort and cost of implementation when looking at the overall cost of a DCIM solution.

INTEGRATION WITH OTHER SYSTEMS

Selecting the right DCIM solution relies heavily on how well the technology integrates with existing and future systems. Determining integration capabilities can be an obstacle because there are many different ways to implement DCIM. Some argue in favor of a loose framework of best-of-breed components, others for tighter solutions from a single supplier. In the same vein, there are many approaches to integrating DCIM tools into the wider digital infrastructure, and the degrees of integration can vary widely.

8 451 Research - The DCIM Market is Still Open to New Entrants – Rhonda Ascierto, 2015

INTEGRATING SOFTWARE AS PART OF DAY-TO-DAY BUSINESS PROCESS

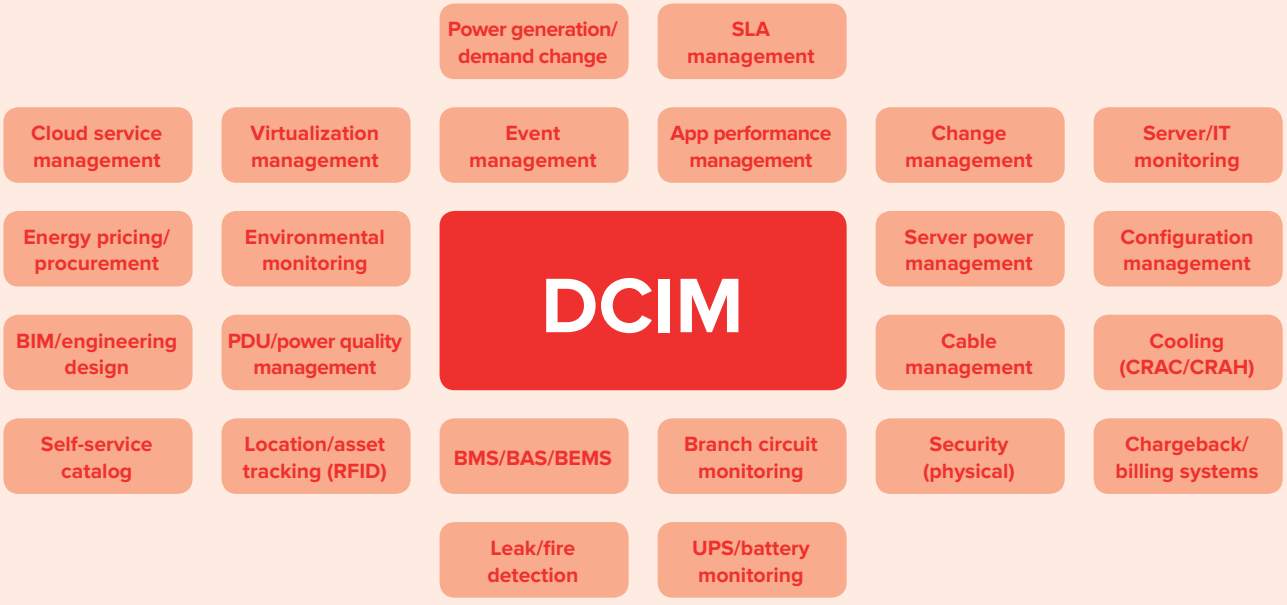
As the software component of DCIM continues to develop, data center operators committed to using it to manage their facility effectively will have to address the many processes this new technology touches on a day-to-day basis. DCIM is only as good as the action taken to improve discovered inefficiencies in power, cooling, asset utilization and workflow. To take action, processes need to be carried out. Ideally, these processes are discussed on the front end prior to searching for the right DCIM solution so the solution can be built around the business process versus building the process around the solution, which can lead to a lower adoption rate.

DCIM is only as good as the action taken to improve discovered inefficiencies in power, cooling, asset utilization and workflow.

INTERDEPARTMENTAL CONFLICT

The ideal DCIM solution represents a true convergence between IT, facilities, and their corresponding management systems. This approach allows the teams to work together to meet organizational objectives. Unfortunately, this convergence doesn't always readily translate into the human equation, as the potential (and common) interdepartmental conflicts may occur between IT and facilities teams.

Figure 4: Data Center Systems That Can Integrate With DCIM[9]



9 451 Research – Next Generation DataCenter Management, 2014

IMPORTANCE OF INFORMATION MANAGEMENT

The core goal of DCIM is useful information, in other words, actionable data. Data center managers are under pressure to run a more efficient operation and doing more with less, and, as the old adage states, you can't manage what you don't know.

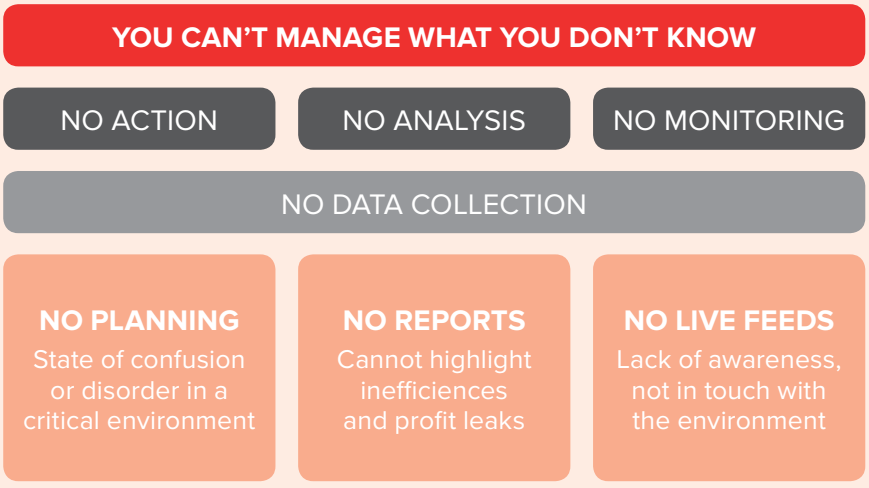
THE RISK OF A PARALYZED OPERATION

Collecting and analyzing data center infrastructure information is critical to the decision making process. Not doing so can enhance the risk of data center paralysis, which means it becomes difficult to:

- Make predictive decisions
- Plan for the future
- Have an understanding of the data center's current state.

For example, without collecting and monitoring the right information, there can be no basis for current and future planning, which can potentially lead to a state of confusion or disorder in a critical environment. Without timely and comprehensive reports, it's difficult to highlight inefficiencies that are costing the business. Without live feeds, there is an overall lack of awareness, keeping the team out of touch with its environment.

Figure 5: Risk of Data Center Paralysis



IS THE DATA CENTER READY FOR DCIM?

Before implementing DCIM, it's best to prepare operations in a few key areas. Doing so will help establish a more cost-effective and smooth deployment as well as reap rewards on an ongoing basis.

OPEN THE LINES OF COMMUNICATION BETWEEN IT AND FACILITIES

DCIM holds the promise to open the lines of communication between the IT and facilities groups. However, IT will need to take certain steps in order for DCIM to translate into better data center efficiency.

IT and facilities teams don't always make talking and working from common data sources a priority. When DCIM is determined to be the way forward, it should be integrated into existing systems so duplication of functionality doesn't occur, which could potentially create a whole new set of data silos.

As both the IT and facilities teams embrace DCIM together, these separate visions should become simply one lens by which everyone will view the data center.

Of course, facilities, and IT systems merging does potentially create new managerial issues. Typically, the building management group and the data center department have worked separately, and often at an arm's length. In order to prepare an organization for DCIM, there has to be some internal effort for the two teams to work better and more closely together.

It's worth noting that the DCIM solution itself may help mend the fences between IT and facilities groups. Facilities management teams often see the data center as just another building to be managed. The IT team tends to see the data center as the entire universe of its professional life. As a result of these differing perspectives and values around the data center, one group's priorities may not match the other's. The language that each group speaks can also be subtly — sometimes not so subtly — different. As both the IT and facilities teams embrace DCIM together, these separate visions should become simply one lens by which everyone will view the data center.

A UNITER, NOT A DIVIDER

A good DCIM solution should give all teams the opportunity to collaborate and work toward a common goal of optimum data center efficiency.[10]

For example, DCIM solutions have the capability to monitor various alerts and alarms, bringing building management and even the security team together. Even though these teams may not have DCIM training in particular, it's a solution that can potentially benefit everyone.

DEPLOY INTELLIGENT HARDWARE

In order for most DCIM tools to work properly and at their maximum potential, the current data center must feature at least a baseline foundation of intelligent hardware that will collect data at the level of granularity required to solve the business' specific challenges.

For example, if the DCIM software can't communicate with a particular cooling unit or UPS, it will be unable to determine accurate capacities or their current status, which makes planning impossible in real time. Without the intelligent hardware that communicates with the DCIM solutions, answering important questions critical to data center operations will be challenging. These questions could include:[11]

- Where should I place the next server?
- When will my cooling capacity be exhausted?
- Where am I losing power efficiency?
- What is the impact of this particular change I'm thinking of making?

Reporting and dashboard functionality can also be gravely hampered if inputs are missing or are wrong. For example, a data center's PUE metrics, which are often reported through a DCIM dashboard, rely almost entirely on the collection and understanding of the connections of many lower-level sensor readings. If the system is unable to communicate with all of the necessary sensors, the PUE metrics reported would be incorrect. Not having a clear picture of power, cooling and environmental conditions at the rack leads to an inaccurate picture of infrastructure capacity and status upon which the DCIM software will make erroneous assumptions, calculations and recommendations.

It's crucial that a data center makes the investment in physical infrastructure devices and intelligent hardware that can feed the DCIM solution what it needs.

It's crucial that a data center makes the investment in physical infrastructure devices and intelligent hardware that can feed the DCIM solution what it needs.

The most effective DCIM solutions work off the continuous input of live data from the physical infrastructure devices and other management systems. These may include intelligent hardware pieces that could communicate to the DCIM server on an on-going basis in order to effectively monitor and plan:

- UPSs
- PDUs
- Power meters
- Environmental sensors and probes
- Security cameras
- Cooling units
- Flow meters
- BMSs
- CMDBs.

At a minimum, UPSs, cooling units, rack PDUs, temperature and humidity sensors should be enabled for network communication.

10 TechTarget – Data centers define DCIM, not the other way around – Robert McFarlane, 2015
11 Avoiding Common Pitfalls of Evaluating and Implementing DCIM Solutions – Patrick Donovan, 2012

DETERMINE AND APPORTION STAFF LEVELS FOR DCIM DEPLOYMENT AND UTILIZATION

It's paramount for all stakeholders, including management, to agree and commit the necessary resources to implement and operate the solution. All of this upfront discussion and buy-in allows for ongoing cooperation and participation well beyond the implementation phase.

Also, owners for the tools and their associated processes should be explicitly named before the system is implemented. This may be tricky because facilities personnel may be unfamiliar with IT systems while IT personnel may have little knowledge of power and cooling. For this reason among others, it is recommended that evaluation and operation teams include people from both sides to help close any knowledge gaps.

Working close with manufacturers to understand staffing and workforce requirements will help to make the system work effectively. This information will help the evaluation team decide what level of manufacturer (or consultant) -provided training and support might be needed.

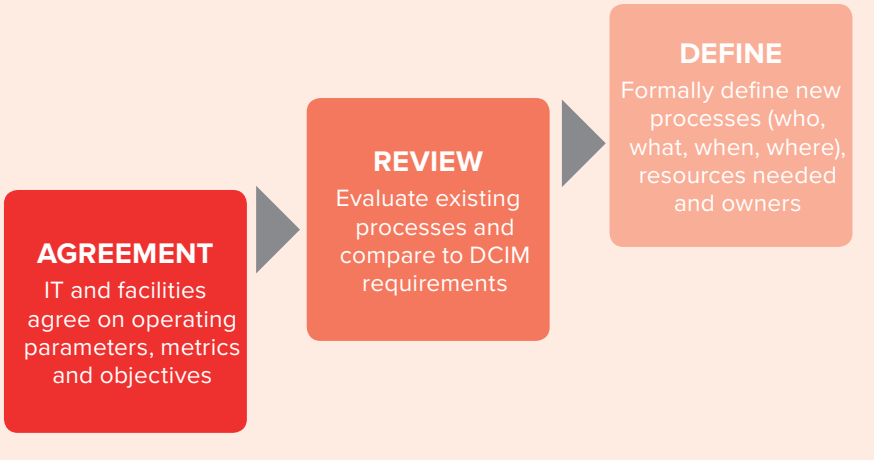
DEFINE ACTIONABLE DCIM BUSINESS PROCESSES

Having business processes in place to take action on the gathered intelligence is important. Without processes and a plan to act on the information, all that is left is data — good data, albeit, but no clear path and resources in place to use that data to solve problems and increase efficiency.

DCIM solutions, in themselves, are a good way to fill gaps in operational processes. A credible DCIM solution can help streamline, facilitate and provide a clear dashboard of IT and facilities systems, transforming a complex and disparate environment into something much more cohesive and manageable. However, such a crystallized vision still relies on business processes to implement, operate and maintain the DCIM solution.

A DCIM-ready business process should be addressed in a manageable way, perhaps starting out with core functions and features that are most important, as opposed to attempting to address all processes at once, which will have an impact on the chosen solution. Choosing solutions that are modular will allow the data center team to address what it needs currently and scale later as required.

Figure 6: Turning Information Into Action



CONSIDERATIONS FOR DCIM SELECTION

DEVELOP INDIVIDUAL GOALS

DCIM is about data. So, what sort of data is needed to meet team goals for managing a data center effectively and efficiently? If the goals are defined, diving deeper and answering much more specific questions should naturally lead to a list of individual objectives needed from a product choice.

That being said, there are several considerations that a data center manager should think about before even looking at specific DCIM solutions. Those considerations are as follows:

- What problems are trying to be solved?
- Of these problems, which are particularly the most pressing issues?
- Why are the current methodologies not working?
- What is the desired end state?

As these questions are answered, the scope of DCIM requirements will be defined. This requirements list should focus on the information needed to manage a data center based on set goals. Use these requirements and goals as a starting point to evaluate DCIM solutions.

CONSIDER OTHER STAKEHOLDERS' GOALS

It is important for facilities, IT and management teams to work together early on and come to an agreement on the adoption and use of DCIM tools in conjunction with their existing tools.

It is important for facilities, IT and management teams to work together early on and come to an agreement on the adoption and use of DCIM tools in conjunction with their existing tools.

Conversely, it's a mistake for management to decide to use a DCIM system without the buy-in from those who will be required to implement and operate it. All sides should be involved in the early evaluation phase to make certain everyone's needs and expectations are met. Not only will this secure the right selection for the entire facility, but it's also a positive step in nurturing collaboration with other stakeholders and teams.

ESTABLISH SOME BASELINE CRITERIA

No matter what solution is selected, DCIM tools should have certain "must-have" attributes in order to be prepared for the future and be effective today:[12]

- Scalable, modular, flexible system
- Open communication architecture
- Standardized, pre-engineered design
- Active manufacturer support structure

Using these four characteristics as a high-level baseline for evaluating DCIM tools may certify that the business' processes, data and methods will be in line with expectations moving forward.

12 Avoiding Common Pitfalls of Evaluating and Implementing DCIM Solutions – Patrick Donovan, 2012

DETERMINE INTEGRATION NEEDS

When selecting a DCIM solution, a key consideration is how this integration will be achieved and how will it be supplied. It is important to highlight that the more systems that need to be integrated, the more expensive and complex a project becomes and the longer the project will take to implement.

DON'T EVALUATE IN A VACUUM – OTHER STAKEHOLDERS SHOULD PROVIDE INPUT

It is important to involve the facility team in all aspects of DCIM deployment and management going forward. This applies directly to the evaluation and selection process because these initial stages will help provide strong buy-in from facilities counterparts.

Consider involving all stakeholders in the selection process:

- Infrastructure and operations
- Facilities (data center and corporate)
- IT architecture
- Business and technology analysts
- CSR
- Finance (IT and corporate)

Involving all potential stakeholders can lead to a strong consensus on the value of DCIM which helps in funding the investment.

START WITH THE BASICS, THEN MOVE FORWARD

A lot of DCIM implementations become stalled because businesses try to take on too much at once. They attempt to pull everything together under one system in a short time, but find the difficulties of such an endeavor overwhelming. This can lead to frustration and a lack of clear wins along the way, causing the deployment to stall or stop entirely.

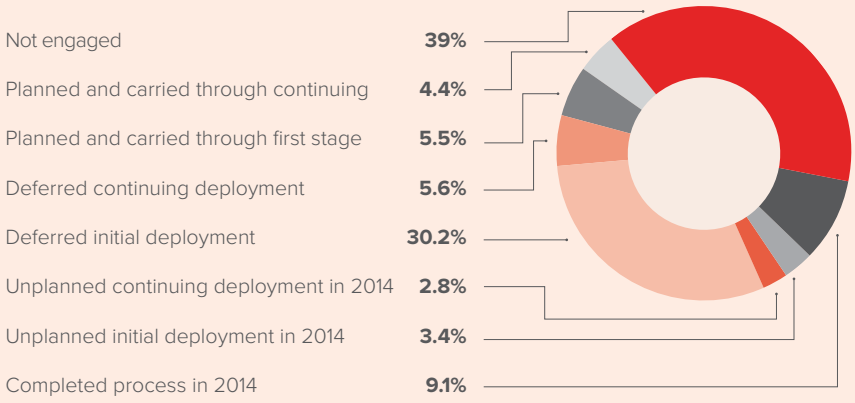
According to a DCD intelligence survey, over 35 percent of those who planned to deploy DCIM in 2013 stopped in 2014.[13]

Regardless of the scope of the DCIM solution – comprehensive or on a smaller scale to address a specific issue – it's important to start with the most essential elements that are the highest priorities for an organization. Ideally, any DCIM solution should be modular, so it's relatively easy to accomplish the most basic integrations in a sequential manner, building upon successes one step at a time.

As the solution is evaluated, consider the most important dashboards that are a priority for the different stakeholders that were involved in the selection process.

Taking a more simplified, realistic and pragmatic approach will help avoid overwhelming an organization – both in terms of costs and workforce hours – as well as prevent information overkill and project fatigue.

Figure 7: How 2013 Intentions Toward DCIM Panned Out in 2014: Percent Census Samples 2013 and 2014

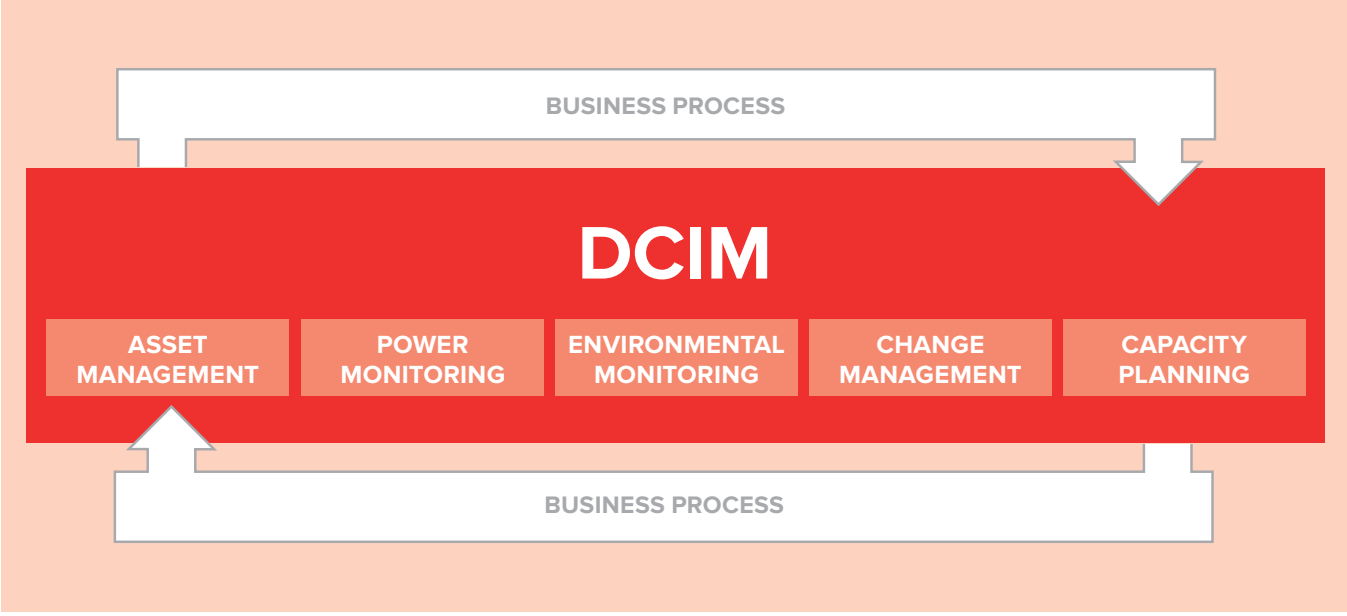


13 DCD Intelligence – 2013 – 2014 Census Survey

THE FIVE SENSES OF DCIM

In the same way humans have a variety of senses, DCIM can be looked at similarly: information is collected and interpreted to solve specific business challenges. Anixter has defined five senses of DCIM, each one solving a particular business challenge:

- Asset management
- Power monitoring
- Environmental monitoring
- Change management
- Capacity planning



THE FIVE SENSES OF DCIM 1 OF 5

ASSET MANAGEMENT

1

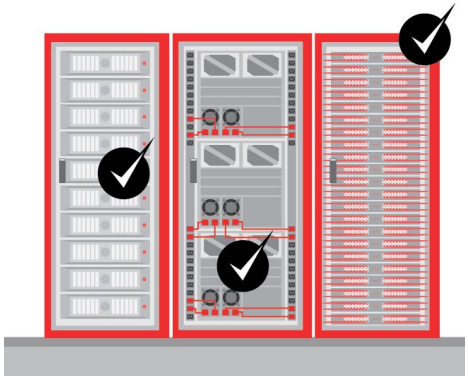
Asset management is a broad topic, but for the purpose of this paper, it will focus on the assets that are generally governed by a DCIM tool, which are the hardware assets throughout the data center. IT asset management (ITAM) entails collecting inventory, financial and contractual data to manage the IT assets throughout their life cycle. ITAM depends on robust processes with tools to automate manual processes.[14]

Having and maintaining an accurate asset database is critical to the data center. Arguably, asset management is the most important function of all of the five senses of DCIM. Not having a clear understanding of where IT assets are located throughout the data center can negatively impact the daily operations of the facility.

CONSEQUENCES OF POOR ASSET MANAGEMENT

INCREASED DURATION OF IT HARDWARE DOWNTIME	Hardware downtime is inevitable; it is going to happen. However, the ultimate goal is to alleviate the problem as quickly as possible. Not knowing for sure where a potential server or piece of IT hardware is physically located can increase the time it takes to diagnose and fix the outage.
INCREASED TIME TO DEPLOY NEW EQUIPMENT	When deploying new IT equipment, an operator needs to understand the ideal place to put it. If a physical walkthrough is necessary to determine available rack space, network connectivity and available power, it increases the amount of time it takes to deploy the equipment.
INCREASED FINANCIAL RISK	Asset management goes beyond just physical locations of devices. Not knowing what an asset is, who it belongs to and what the impact of losing that particular asset has on the business can pose a significant financial risk.
INEFFICIENT USE OF AVAILABLE CAPACITY	In the data center, capacity is everything. Once that capacity runs out, a new data center needs to be built. Not knowing what is in the environment, how it is interconnected, how much power and cooling it consumes, and how much physical space it takes up makes planning for the future almost impossible.

ASSET MANAGEMENT



14 Gartner IT Glossary

IT ASSET MANAGEMENT GOALS

It is important to define your objectives when looking for the right asset management solution for the data center. Many DCIM solutions have asset management capabilities, but some are more robust than others. Generally, the main goal for most data centers in regard to asset management is to have a single source of truth for all hardware within the server room. The other aim is to build a virtual model of that data. That virtual model helps a user make decisions on new and existing assets faster.

What is going to be different, depending on the goal of the business and individual, is how much information is required per asset. Table 1 breaks down the areas asset management can define into three main categories: physical location, asset configuration and asset ownership.

Generally, the main goal for most data centers in regard to asset management is to have a single source of truth for all hardware within the server room.

Table 1: What Asset Management Can Help Define

PHYSICAL LOCATION	ASSET CONFIGURATION	ASSET OWNERSHIP
Room name and location	Power connections	Purchase date
Rack name and location	Network connections	Purchase price
Rack unit number	Unit size and weight	Supplier purchased from
	Virtual hosts	Department owner
		End of life date
		End of lease date

ASSET MANAGEMENT BEST PRACTICES

Once it has been agreed that a centralized database is required to monitor all IT and facilities assets, the first thing that needs to be determined is what the process is going to be to track current and future equipment. Without having a solid process in place and mandating that the process be followed, maintaining the data integrity of a future asset management solution becomes difficult.

Some things to consider when building the asset management process:

- Having a process review to uncover gaps
- Restricting entry into the data center
- Dedicating centralized resources to keep asset information up to date by maintaining records
- Mapping out desired future state – what it will look like after the tool is implemented

Once the process for current and future asset management has been discussed and agreed upon by all involved parties, the next step is to implement that process. It's best to start small, which could mean one location or several new IT equipment orders. This is also a good time to determine if there are existing tools in place today that are being used by different departments to maintain and track assets and how those tools should interface with the new tool being looked at.

Next, a complete asset inventory is required to make sure that all asset information is as accurate as possible and in a format that it can be easily imported into the new tool. Many times, asset software will provide templates of the necessary information needed. Additionally, many manufacturers will offer asset management services to perform this task if it cannot be completed by the data center staff.

It might make financial sense to have the asset collection performed by a third party. The typical cost to collect "readily visible" data (manufacturer, model, location, serial number and device name) is 15 USD per device. Figure 8 illustrates example costs of a data center with 8,000 assets.[15]

Figure 8: Data Center Asset Collection Costs in an 8,000 Asset Data Center

MANUFACTURER COST	DOING IT YOURSELF
Initial collection of basic device information could cost $120,000.	Collecting basic device information would require 40 weeks of effort from a workforce.
Including detailed system data, it could drive the data collection cost to $600,000 or more.	Collecting detailed system data would require 200 weeks of effort.

15 Data Center Knowledge – Data Center Infrastructure Management, David Cole

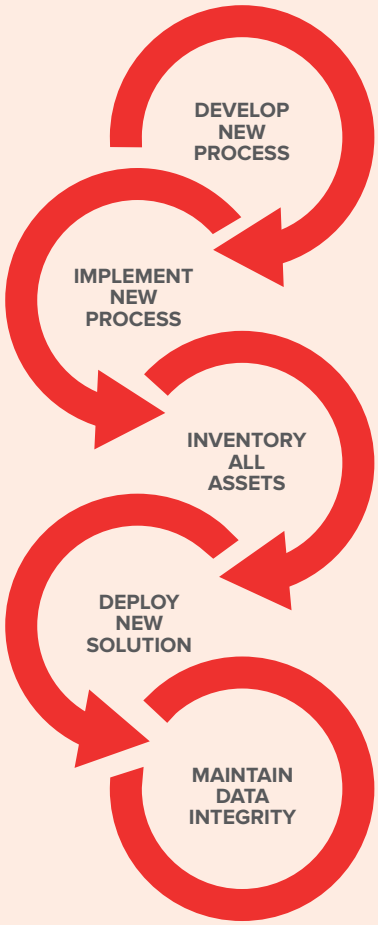
Once the asset inventory is complete, deployment of the new tool should happen quickly. The reason for this is to maintain asset integrity; that way it is as close to 100 percent accurate once cutover to the new tool happens. It will be important at this time to train anyone who needs to have access to the tool. To make sure that the new tool is being used properly, spot checks on inventory could be performed after the first month or quarter of use.

Finally, to be successful it is critical to maintain asset integrity. This can be done by performing, at a minimum, annual asset audits. To make the inventory process faster, assets should have some type of bar code (asset tag) or even RFID (radio frequency identification).

BENEFITS OF RFID

- Automates asset moves, adds and changes
- Decreases risk of physical asset theft
- Speeds up physical inventory audits

Figure 9: Asset Management Best Practices



THE FIVE SENSES OF DCIM 2 OF 5

POWER MONITORING

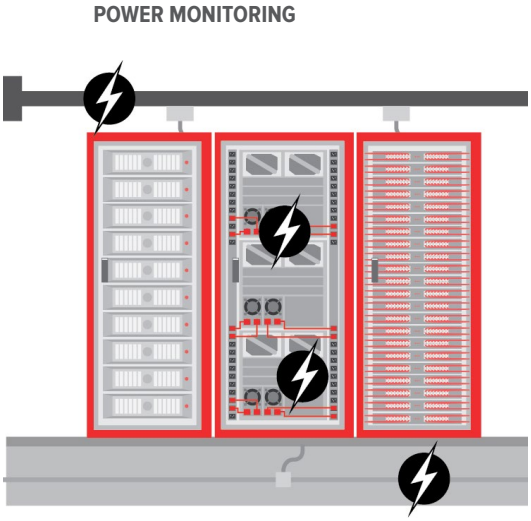
2

Monitoring facility power systems has been around for quite some time. However, what is changing is the desire to monitor closer to the IT equipment to get a better understanding of how power is being consumed at the cabinet. This drive to take a more holistic approach to monitoring the entire power chain can be seen by an increase in adoption of intelligent cabinet PDUs. Today's data center is consuming more power per square foot than it ever has in the past,[16] which is being driven due to an increase in IT hardware demands. This increase in IT demand while using the same amount of physical space has led to an increase in the cost of an outage. In a 2013 survey conducted by the Ponemon Institute, it was found that the cost of outages ranged from 45 to 95 USD per square foot[17] which was a 41 percent increase from 2010.

This sharp increase in the cost of a data center outage as well as the increasing demands to reduce operational expenses are major influencers in a facilities manager's decision to invest in power monitoring solutions in the data center. In fact, according to DCD Intelligence, the number one DCIM capability investment that data centers were making was in real-time monitoring.

Figure 10: Cost of Data Center Outages

SURVEY OF 67 INDEPENDENT DATA CENTERS		
Facility manager	CIO	DC manager
CTO	IT compliance	Security officer
The cost per square foot of data center outages now ranges from 45 to 95 USD	Minimum cost of 74,223 USD to a maximum of 1,734,433 USD	



16 DCD Intelligence
17 Ponemon Institute – Cost of Data Center Outage, 2013

POWER MONITORING GOALS

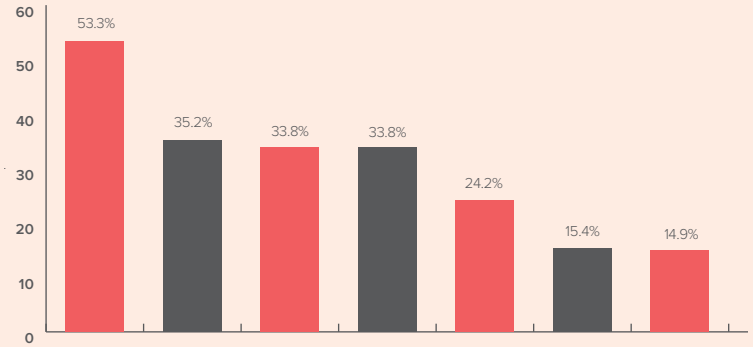
Prior to implementing a power monitoring solution, it is important to understand the business' goals. Some of the goals that can be accomplished through following power monitoring best practices are:

- Increasing energy efficiency, thereby reducing operational expenses
- Deferring capital costs on new equipment by maximizing available power capacity
- Reducing the amount and duration of future outages.

CONSEQUENCES OF NOT MONITORING

DIFFICULT TO UNDERSTAND CAPACITY NEEDS	Measurement of the available capacity throughout the power distribution system is vital to make certain that there is room to support future IT needs. Not planning for the future can lead to outages and delays in deploying new business applications.
POOR VISIBILITY INTO POWER SYSTEMS	Having visibility into the entire power chain, and all systems which support it, is important to make sure the system is being run as efficiently as possible. According to The Green Grid Association, to have full insight into an infrastructure's energy efficiency, multiple components from the utility entrance through the IT equipment should be monitored. This gives facilities and IT the full picture to make better deployment decisions supporting future projects.
INCREASED RISK OF UNPLANNED OUTAGES	Better measurement and data can aid an IT or facilities manager in understanding what caused an outage and potentially prevent an outage from happening in the future. Not having this information can paralyze decision making due to a lack of visibility into what is happening real time.

Figure 11: Investment in Specific DCIM Capabilities – Percent of 2013 Census Respondents[18]



18 DCD Intelligence – 2013 – 2014 Census Survey

It is also imperative to define who owns different aspects of the power chain. For example, if the data center is in a co-location facility then the delivery of power from the entrance of the building to the data hall generally falls to the owner of the co-location, and the responsibility of the enterprise inhabitant is usually within the IT cabinet itself. The power chain can be monitored at multiple points, which are:

- Entrance feed
- UPS systems
- Room distribution
- Cabinet distribution
- IT equipment.

Establishing organizational goals versus individual goals is important to gain acceptance across multiple departments of a potential new power monitoring solution.

In order to meet the business' goals, it is important to know how these systems are currently being monitored, and if they are being monitored, it is important to aggregate the data into one centralized tool.

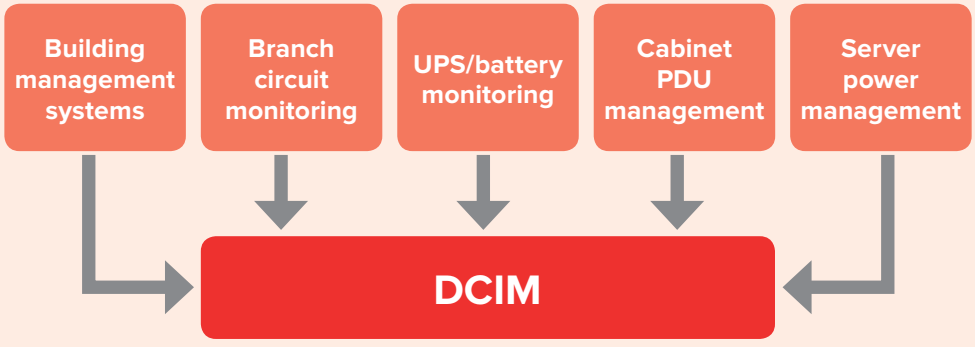
Lastly, establishing organizational goals versus individual goals is important to gain acceptance across multiple departments of a potential new power monitoring solution. For example, if the individual goal is to reduce the need to send IT staff to remote locations to troubleshoot single phase UPS failures, what would that mean for other departments? Perhaps those remote locations support important financial data for accounting, which would make the IT solution beneficial for them as well.

POWER MONITORING BEST PRACTICES

Once goals have been established, it becomes important to assess the data center's current situation:

- Current hardware — can it collect the required information needed to meet the organization's targets?
- Current monitoring tools — what methods are already being used? To what extent should these tools integrate into the proposed power monitoring solution?
- Top power related challenges — target the problems that are causing the most issues first.
- Power chain connectivity map — is there one in place today? Is it accurate? Having this information is critical to understanding the impact of changes to the entire power chain.

Figure 12: Power Management Software Systems That Can Integrate With DCIM[19]



19 451 Research – Next Generation DataCenter Management, 2014

Using the agreed-upon business objectives, the scope for the power monitoring application should be constructed to clearly highlight the purpose of power monitoring to all stakeholders. Having a narrow scope will allow the business to get faster returns on the initial investment, which can make a stronger case for deeper integration later. Once the scope has been established, acceptance criteria should be defined to measure success against. Next, a deployment schedule is required to identify who owns the completion of each project stage.

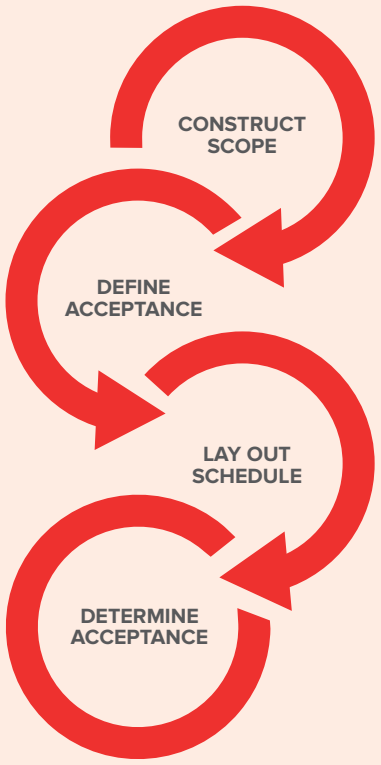
Having a narrow scope will allow the business to get faster returns, which can make a stronger case for deeper integration later.

Daily or weekly status reports help to keep the project moving and all the stakeholders informed. Some of the questions that might come up while planning the deployment of the system are:

- Does intelligent hardware (e.g., metered cabinet PDUs) need to be installed prior to deployment?
- Will deployment affect any production systems?
- What other departments need to be involved throughout deployment?

Finally, the last step is to examine the ROI by determining if the acceptance criteria have been met and if the DCIM solution was worth the investment.

Figure 13: Power Monitoring Best Practices



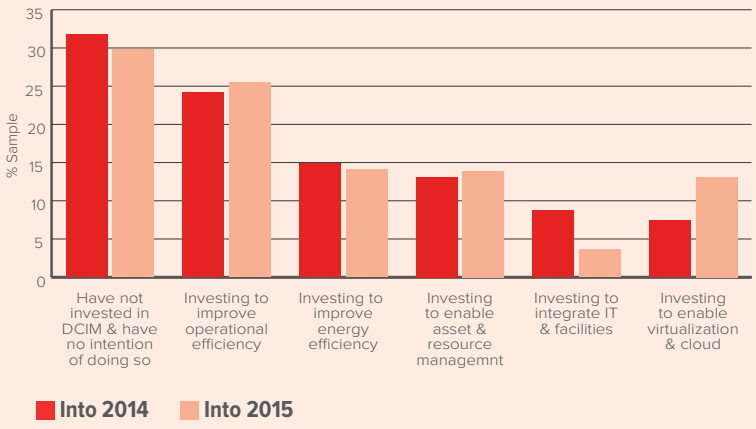
THE FIVE SENSES OF DCIM 3 OF 5

ENVIRONMENTAL MONITORING

3

In a 2014 report titled “Trends in Data Centers”, more than 220 professionals were asked to describe one area they would change about their data centers. 19 percent of them stated that they would like to make their data center more efficient.[20] Additionally, in a census study performed by DCD Intelligence, the two largest drivers associated with the adoption of DCIM were investing to improve energy efficiency and investing to improve operational efficiency.

Figure 14: Investment Drivers Associated With DCIM: Percent Census Samples 2013 and 2014[21]

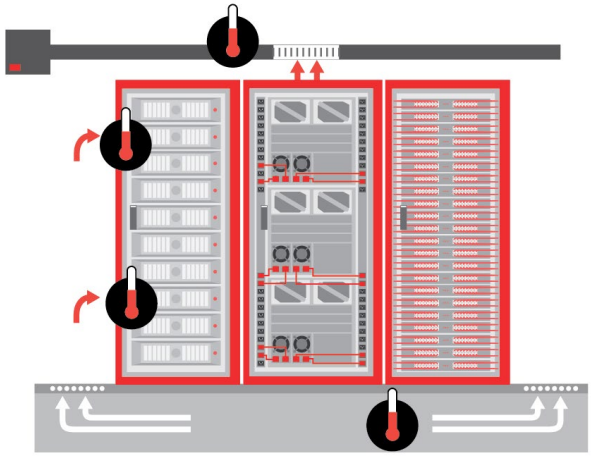


The approach to environmental monitoring in the data center is holistic, and each individual area is inextricably interrelated to another separate area. Much like power monitoring, the areas that are owned by the business should be looked at as a whole to get a complete picture. Making adjustments to one part of the system can have a major impact on other areas throughout the data center.

There are several factors that make thermal monitoring a high priority in any data center:

- In legacy data centers, the cooling system consumes a large amount of energy.
- Increasing rack densities can create unique thermal management challenges.
- Constantly changing IT requirements require cooling to be available on demand.
- High-availability environments need well-controlled temperature ranges for reliable performance.

ENVIRONMENTAL MONITORING



20 Mortensen – Insights Into What’s Next: Trends in Data Centers, 2014
21 DCD Intelligence – 2013 – 2014 Census Survey

CONSEQUENCES OF NOT MONITORING

INCREASED OPERATIONAL EXPENSES	The cost of cooling the data center can be greater than 30 percent of the total energy consumed by the facility.[22] Poor thermal management practices mean an increase in energy consumption by the cooling equipment.
INCREASED CAPITAL EXPENSES	In a 2013 study performed by Upsite Technologies, an average of 48 percent of supply air is bypass airflow.[23] Bypass airflow is cool, conditioned air that never reaches the IT equipment, and if undetected, it can lead data center managers into believing their room requires additional cooling units to meet the needs of the IT load.
INCREASED RISK OF EQUIPMENT FAILURE	IT equipment requires a consistent temperature to secure reliability. Not monitoring the environment throughout the data center can lead to imbalanced temperatures. Temperature fluctuation at an IT equipment rack is airflow recirculation. Airflow recirculation can be defined as hot exhaust air that passes through the IT equipment multiple times before it travels back to the cooling system. It can be detected through temperature deltas from the bottom of the rack to the top of greater than five degrees Fahrenheit.

Figure 15: Imbalanced Supply Temperature[24]

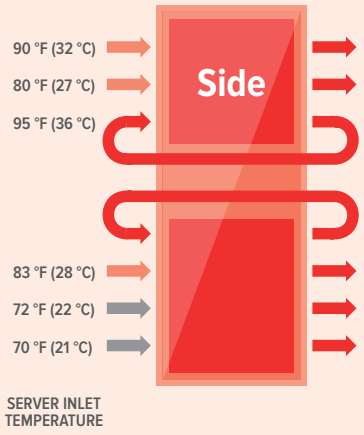


Table 2: The State of Airflow Management

2011 CLASSES	2008 CLASSES	APPLICATIONS	IT EQUIPMENT	ENVIRONMENTAL CONTROL
A1	1	Data center	Enterprise servers, storage products	Tightly controlled
A2	2		Volume servers, storage products, personal computers, workstations	Some control
A3	NA		Volume servers, storage products, personal computers, workstations	Some control
A4	NA		Volume servers, storage products, personal computers, workstations	Some control
B	3	Office, home, transportable environment, etc.	Personal computers, workstations, laptops and printers	Minimal control
C	4	Point-of-sale, industrial, factory, etc.	Point-of-sale equipment, ruggedized controllers, or computers and PDAs	No control

22 Data Center Alliance Project
23 Upsite Technologies – The State of Airflow Management, 2015
24 ENERGY STAR – Properly Deployed Airflow Management Devices

ENVIRONMENTAL MONITORING GOALS

The purpose of a data center's thermal management strategy is to make sure the room that the equipment resides in is at a temperature that is within range of the required operating temperatures specified by the equipment manufacturer.

The traditional method of doing this was to flood the room with cold air, and if the room became too hot, add more perforated tiles, lower the temperature set points and finally add additional cooling capacity until the desired temperature is achieved.

The purpose of a data center's thermal management strategy is to make sure the room that the equipment resides in is at a temperature that is within range of the required operating temperatures specified by the equipment manufacturer.

Conditional environmental control is the process of delivering the exact amount of supply air at an ideal temperature and moisture content to maximize the cooling system's efficiency and improve equipment uptime. The only way to truly gain insight into the thermal environment is to monitor different points in the cooling system.

There are five areas that should be monitored to achieve an ideal thermal environment in the data center:

- Supply airflow pressure
- Supply airflow volume
- Supply airflow temperature
- Bypass airflow
- Airflow recirculation

Figure 16: Bypass Airflow[25]

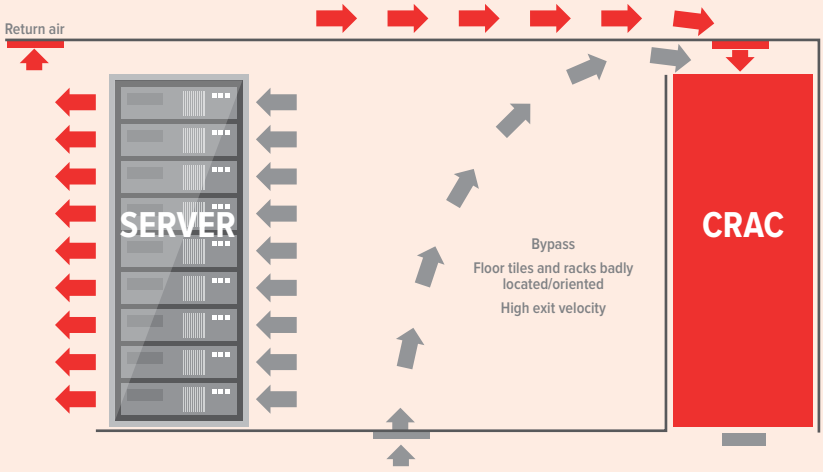
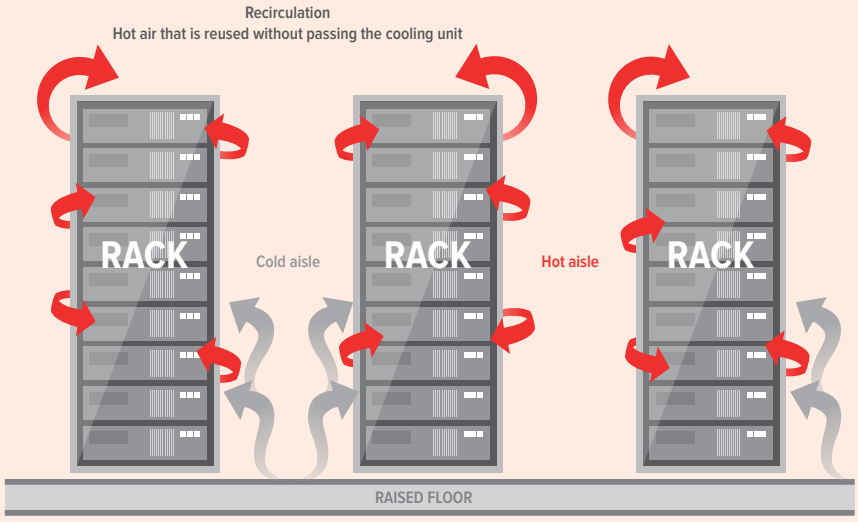


Figure 17: Airflow Recirculation[26]



25 Improving Data Center Air Management – Munther Salim and Robert Tozer, 2010
26 Open Data Center Measure of Efficiency – Paul Poetsma

A data center manager knows when they have achieved an optimized thermal environment when:

- Bypass airflow is less than 10 percent
- The temperature measured at top and bottom of the IT equipment cabinet has a delta of less than 5 degrees Fahrenheit
- The temperature at the hottest point in the data center falls within 60.4 and 80.6 degrees Fahrenheit (18 and 27 degrees Celsius)

Figure 18: Properly Balanced Supply Side Temperature

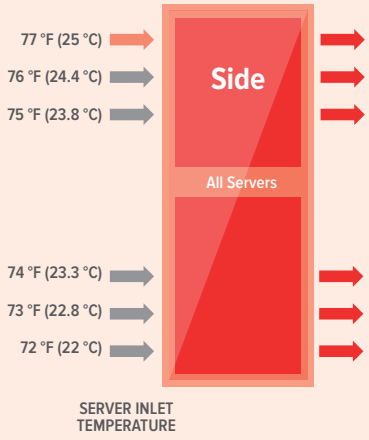
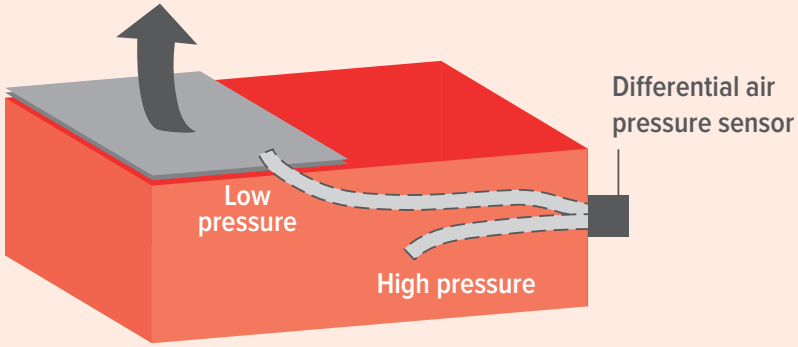


Figure 19: Differential Sensor Placement in a Raised-Floor Environment



ENVIRONMENTAL MONITORING BEST PRACTICES

Environmental monitoring can range from understanding why certain cabinets are experiencing higher temperatures to reducing operational costs across the facility by 10 percent. Again, a larger goal could require integration with existing systems. Additionally, because power and environmental monitoring are generally part of the same software package, it will be important to map in those business goals that help with the software selection process.

Generally, in the context of a DCIM solution, environmental monitoring is deployed in the data hall itself, and then later integrated with the cooling units if the business desires real-time control. Prior to making any changes to the cooling system, it is important to make sure the proper data collection hardware is deployed throughout the data hall, which includes airflow pressure and temperature sensors.

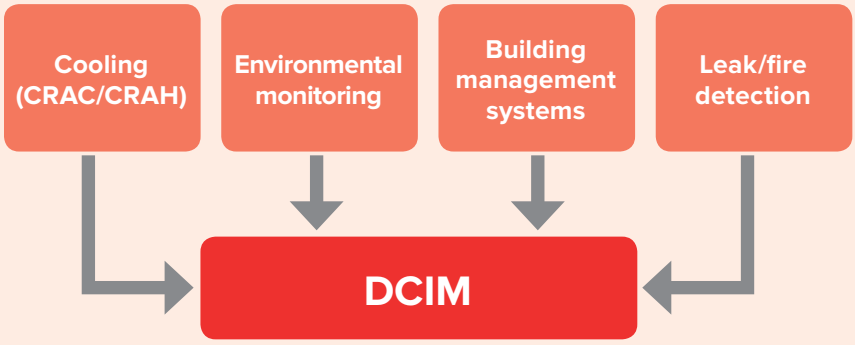
Airflow pressure sensors in a raised-floor environment should be placed every 1,000 square feet a few feet above the subfloor. The sensor tubes should be positioned in different pressure areas (e.g., above and below the raised floor and in the hot and cold aisle). Additionally, they should be installed no closer than 12 feet from a cooling unit.

Airflow temperature sensors should be deployed per ASHRAE guidelines, every third rack, at the supply side with one sensor aligned with the top U, one in the middle U and one at the bottom.

It is important to get a baseline reading throughout the facility, which will provide a roadmap to help reach the data center's thermal management objectives.

Once a hardware and software solution has been installed, it is important to get a baseline reading throughout the facility, which will provide a roadmap to help reach the data center's thermal management objectives.

Figure 20: Environmental Monitoring Software That Integrates With DCIM[27]



Airflow pressure sensors coupled with information from the cooling units will help determine if there is bypass airflow, which means the volume of air leaving the cooling units isn't reaching the intended IT load. The temperature sensors will show if there is airflow recirculation by showing the temperature delta from the bottom to the top of the cabinet.

After a baseline reading has been established, the next step is to perform a physical walkthrough to correct the airflow management problems identified by the environmental monitoring solution that was deployed.

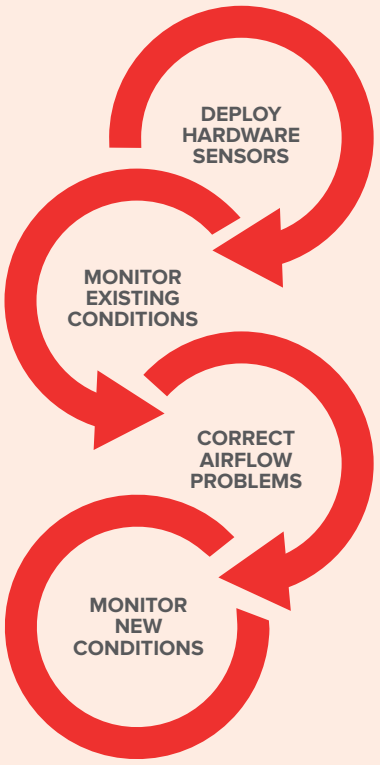
To reduce bypass airflow:

- Walk through the data center to visually identify the sources, which can include cable openings in the raised floor, unsealed holes in the perimeter walls under the raised floor and holes behind the air handling units and at the bottom of building columns.
- Seal all identified sources of bypass airflow with floor grommets or fire-rated material for holes in the perimeter walls underneath the raised floor.
- Ensure all perforated tiles are in the cold aisle; there should be none in the hot aisle.

To reduce airflow recirculation:

- Seal all gaps in the cabinets with blanking panels.
- Seal all gaps in the sides, tops and bottoms of cabinets with accessories from the cabinet manufacturer.
- Walk through the data center and look at the rear of the cabinets to see that the cables are properly dressed and do not interfere with IT exhaust vents.
- Adopt a hot- and cold-aisle layout if possible.

Figure 21: Environmental Monitoring Best Practices



Once the airflow pathway concerns have been addressed, then it is important to get another reading to see how the changes have impacted the data center. After this knowledge has been gained, then a data center manager can begin to:

- Adjust temperature set points
- Adjust chilled water temperatures
- If EC or VSD fans are installed at the cooling units, adjust the volume of supply air
- Remove or add perforated floor tiles
- Turn off cooling units.

27 451 Research – Next Generation DataCenter Management, 2014

THE FIVE SENSES OF DCIM 4 OF 5

CHANGE MANAGEMENT

4

Change management, sometimes referred to as workflow management, has two important functions in the data center: tracking any change that is made to an asset throughout the facility and providing insight in how a change to one asset affects other associated assets. The change management aspect of DCIM takes the analytical information that is gathered from asset information, power and environmental monitoring and helps to streamline the execution process.

CONSEQUENCES OF A LACK OF CHANGE MANAGEMENT

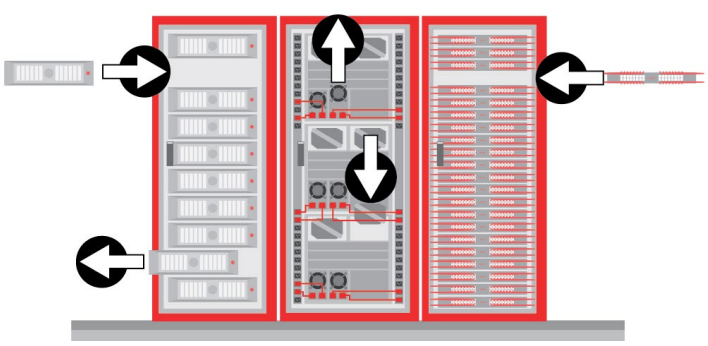
INCREASED RISK OF OUTAGES	According to the IT Process Institute's "Visible Ops Handbook", 80 percent of unplanned outages are due to ill-planned changes made by administrators (operations staff) or developers. Many of these outages are caused by a misconfiguration in a hardware installation or not understanding the impact an IT asset has on another asset.

60 PERCENT OF AVAILABILITY AND PERFORMANCE ERRORS ARE THE RESULT OF MISCONFIGURATIONS.[28]

DECREASED SPEED OF DEPLOYMENT	Not having an automated system for change requests means that tasks for different departments need to be created and managed manually. Additionally, a physical walkthrough is required to determine the ideal location to place new equipment based on power, cooling, space and network connectivity.
DECREASED STAFF PRODUCTIVITY	IT and facilities staff find it more difficult to focus on strategic initiatives as a result of needing to manually process and and update change orders before they can move on to other groups for completion.

The change management aspect of DCIM takes the analytical information that is gathered from asset information, power and environmental monitoring and helps to streamline the execution process.

CHANGE MANAGEMENT



28 Enterprise Management Association

CHANGE MANAGEMENT GOALS

According to the Information Technology Infrastructure Library (ITIL), the goal of the change management practice is to establish that standardized methods and procedures are used for efficient and prompt handling of all changes in order to minimize the impact of change-related incidents upon service quality and consequently improve the day-to-day operations of the organization.

As it relates to the data center, using a DCIM solution along with integrating into existing ticketing/change management systems should:

- Increase the productivity of IT and facilities staff
- Improve the accuracy of hardware installations
- Improve the communication and collaboration between different IT and facilities teams
- Provide better visibility into the impact of changes before they are made, thereby reducing outages
- Improve or establish a clear process for all move, add and change work.

Generally, most data centers have some form of change management system in place. Some examples would be ServiceNow and BMC Remedy. Those systems are designed for IT and service management. Being able to pull workflow information such as approvers, who is performing work for a given ticket, order and receiving statuses, and then prepopulating the asset information into the DCIM solution to automate reserving rack space, power, and network connections can decrease time to deploy and limit configuration errors.

BENEFITS OF CHANGE MANAGEMENT INTEGRATION

INCREASE THE PRODUCTIVITY OF IT AND FACILITIES STAFF

IMPROVE THE ACCURACY OF HARDWARE INSTALLATIONS

IMPROVE THE COMMUNICATION AND COLLABORATION BETWEEN DIFFERENT IT AND FACILITIES TEAMS

PROVIDE BETTER VISIBILITY INTO THE IMPACT OF CHANGES BEFORE THEY ARE MADE, THEREBY REDUCING OUTAGES

IMPROVE OR ESTABLISH A CLEAR PROCESS FOR ALL MOVE, ADD AND CHANGE WORK.

CHANGE MANAGEMENT BEST PRACTICES

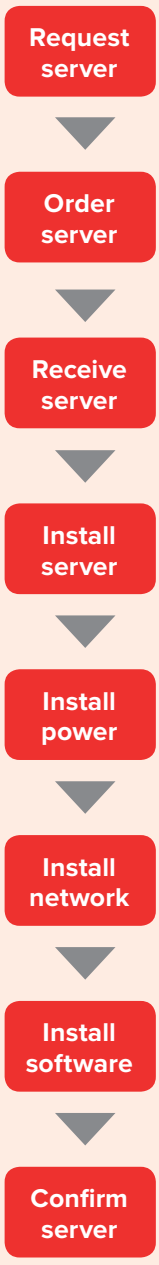
The current workflow solution deployed in the data center will help to scope what is required from a change management functionality standpoint in a DCIM solution. DCIM can either integrate with existing ticketing systems that have workflow built in or provide predefined workflow models. When looking for change management in a DCIM solution, it is important to identify solutions that meet these requirements:

Prior to implementing a change management solution, it is important that the first three senses of DCIM – asset management, power monitoring and environmental monitoring – are in place.

- Flexible – Every organization's needs are different and a predefined workflow should be tailored to support it.
- Open – In order to get the information required to manage data center workflow processes, the DCIM solution may be required to interface with ticketing systems, IT and facilities management systems, financial systems and asset management systems.
- Robust – Because change management touches so many different systems, it is important that the solution provide a robust set of integration and reporting tools to provide data center operators and management the views that they need into the status of particular projects as well as provide the data needed to improve current processes.

Prior to implementing a change management solution, it is important that the first three senses of DCIM – asset management, power monitoring and environmental monitoring – are in place. Change management is the key link between organizational planning and execution. The data gathered from those three areas will provide the information needed to streamline the execution process. For example, it is difficult to do cause and effect analysis by removing a UPS from the environment without knowing what equipment is connected downstream (asset management) and how the increase in power load will affect other UPS systems (power monitoring).

Figure 22: New Server Deployment Typical Workflow[29]



29 Data Center Handbook – Hwaiyu Geng

THE FIVE SENSES OF DCIM 5 OF 5

CAPACITY PLANNING

5

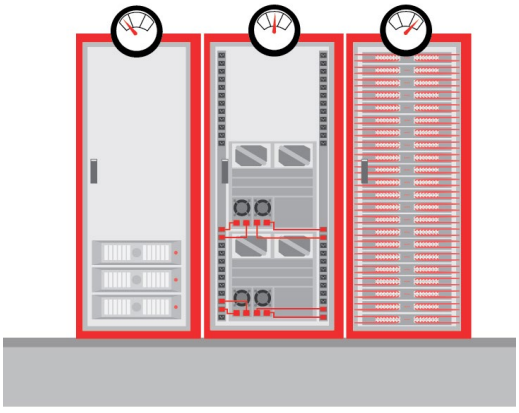
Monitoring and insight into the data center's current state is extremely important to the day-to-day operations of the facility. However, having insight into the future, understanding when a facility is going to run out of power, cooling, network connectivity, or physical space is invaluable to the business. Not only does it help with planning for the future, but having detailed knowledge of the current data center's capacity can help defer unnecessary capital costs through better understanding of how it can be reclaimed by eliminating hardware that is no longer needed and allocating that capacity to new business applications.

56 percent of manual planners need to devote more than 40 percent of their time, every month, to capacity planning and forecasting.

The majority of data centers today are estimating their capacity for new IT equipment; however, it is largely being done manually. According to a recent Intel survey of 200 data center managers across the U.S. and U.K., 43 percent rely on manual methods for planning and forecasting.[30] The problem with manual entry is the shear amount of time it takes to record and maintain the information. In the same study, Intel noted that 56 percent of manual planners need to devote more than 40 percent of their time, every month, to capacity planning and forecasting.

In order to accurately understand the capacity within a data center, the first three senses of DCIM need to be implemented to collect the necessary information required. It is impossible to report on physical space available within a given IT cabinet without knowing what is inside that cabinet, that goes the same for available power and cooling to that cabinet as well. That information needs to be gathered from asset management, power and environmental monitoring systems.

CAPACITY PLANNING



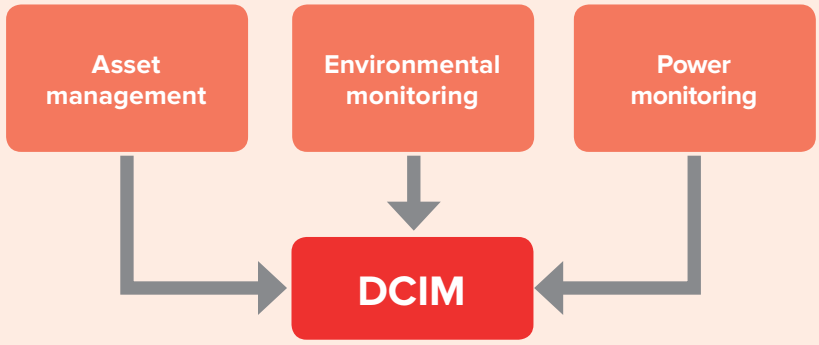
30 Intel – Inefficiencies cost data centers time and money

CAPACITY PLANNING GOALS

Capacity planning allows data center managers to plan for the future more effectively through the use of granular data on power, cooling, network connectivity and physical space. DCIM can allow for the aggregation of this information from different disparate systems to allow for more informed decisions, which will help:

- Quickly respond to changing IT demands
- Postpone new data center construction until it is required
- Understand where inefficiencies lie and where capacity can be reclaimed
- Speed up new hardware deployment
- Minimize risk of downtime by preventing future outages.

Figure 23: Senses of DCIM Required for Capacity Planning



CONSEQUENCES OF POOR CAPACITY PLANNING

UNPLANNED CAPITAL EXPENSES	Not knowing if capacity is running out and then having to react to the needs of the business can lead to unplanned hardware purchases that aren't budgeted for.
DELAYED BUSINESS GROWTH	Additional computing capacity should be available when the business needs it to spur growth. Not being able to support a new application because there isn't available capacity in the data center can negatively affect potential revenue streams.
INCREASED OPERATIONAL COSTS	Failing to understand how much power or cooling is being used at a given point means that those resources might be consumed by hardware that is no longer required to support the business. These devices are consuming available capacity that could be used for additional expansion.

CAPACITY PLANNING BEST PRACTICES

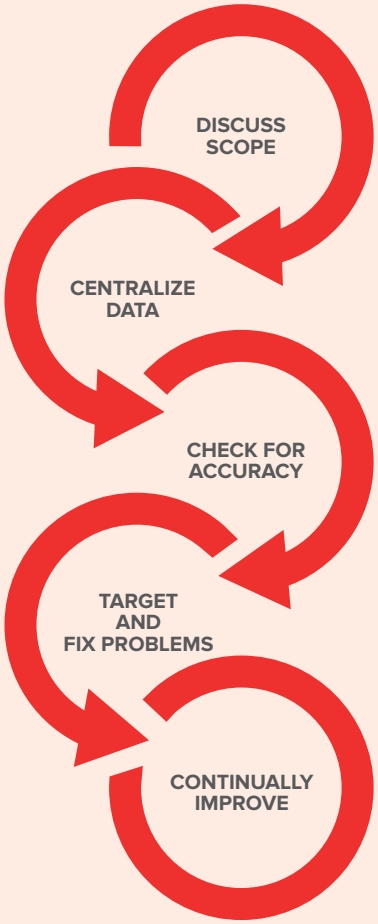
In order to have an accurate representation of capacity throughout the data center, it is important to first figure out what is most important to track. For instance, if the data center is in a co-location facility, cooling capacity might not be important to understand because it isn't being managed directly, the co-location is managing that. However, in an owner-operated data center, it is important to have visibility into the power, cooling and networking systems as well as have access to the physical asset data to be able to accurately forecast for the future.

Once there is an understanding of what is important to track, the next step is to aggregate data from various IT and facilities monitoring solutions into a centralized solution. This will help uncover any gaps in the data and also help to establish the current baseline of the facility. Also during this stage, it is critical to make sure the data that is being collected is accurate. Understanding current and planning for future capacity is only as good as the integrity of the data. If there is doubt, manual audits should be performed on the power, cooling and assets to be certain they are accurate.

After the data has been aggregated to a centralized point, then it becomes important to analyze that information to uncover some focus areas of improvement. Target improvement of the immediate business needs in order to get some wins before implementing wide scale changes.

The last step is continually improving and optimizing the data center environment. Because IT demands are always changing, it is important to continue to manage and optimize the capacity within the data center. This will allow for expansion without over-provisioning as well as provide business continuity.

Figure 24: Capacity Planning Best Practices



THE FUTURE OF DCIM

Despite the challenges and obstacles laid out, DCIM has a bright future with research analysts predicting growth as high as 60 percent penetration within a year.

72 percent of data center managers polled by Gartner responded that they would consider smaller DCIM manufacturers, especially if innovative solutions were offered.

Although the DCIM market has some large players in the space, there are a number of smaller manufacturers bringing innovative ideas and solutions to an eager customer base. In fact, 72 percent of data center managers polled by Gartner responded that they would consider smaller DCIM manufacturers, especially if innovative solutions were offered.

As DCIM continues to mature, new functionality and capabilities will inevitably come to the forefront. Some of the more promising innovations – some of which are already available in one form or another – are in the following areas:

- **Automated asset location**
  Some systems now offer automated systems and RFID tagging, eliminating manual location tracking, with new innovation likely to provide more advanced options in the future.
- **Asset auto-discovery and change management**
  Advances that allow for detailed information about an asset to be captured automatically, such as server configuration data, are continuing to become more prevalent.
- **Mobile applications and touch-based technology**
  Many DCIM manufacturers have already begun to offer tools adapted to these platforms, allowing for on-the-go monitoring and more.
- **Integration with other data center management tools**
  More and more DCIM manufacturers are beginning to open their system up to outside integration, allowing for the possibility of greater and greater options and capabilities.
- **Control loops**
  The evolution of DCIM is moving towards automated, closed-looped control systems, helping teams move from being reactive to being proactive when resolving issues.
- **“What if” scenarios**
  Planning tools that run potential scenarios help to analyze the impact of new equipment, technology refreshes, equipment failures and more, will be a growing innovation within tomorrow’s DCIM solutions.

CONCLUSION

As the complexities of running and managing a data center infrastructure continue to grow, so do the vast opportunities to enhance and improve the overall data center environment with additional efficiency.

As a relatively new technology sphere, DCIM is subject to a lack of standards and contradictory definitions which can result in varied expectations, so is critical to define and set your own companywide criteria and success metrics for a DCIM solution. Once a DCIM path is defined and implemented, the enhancement to current capabilities and future potential can far exceed the alternative of continuing with disparate and inconsistent data center management that is not aligned with company objectives.

The importance of information management, including tips on how to ready an organization for DCIM as well as some insight to the selection process is included in Anixter's five senses of DCIM, which are crucial for the core functionality and value that it provides.

DCIM can help data center managers run their facilities more effectively and efficiently, providing the process of selecting and evaluating a solution that adheres to many of the principles and guidelines outlined in this report. The right DCIM solution should be adaptable to future data center expansion, as well as a vital tool in helping achieve growth in the fastest possible way.

Contact Anixter to learn about how DCIM enablement works with the other building blocks of Anixter's Infrastructure as a Platform solution. Infrastructure as a Platform focuses on helping you create an agile and scalable data center by addressing the five key building blocks for data center interoperability:

- Risk management
- Network migration
- Power optimization
- Thermal efficiency
- DCIM enablement

For more information on how the five senses of DCIM enablement can reduce operational expenses, allow for better capacity management and reduce the risk of outages in your data center, visit anixter.com/datacenterdcd or contact your local Anixter representative.

SPONSORED BY ANIXTER'S TECHNOLOGY ALLIANCE PARTNERS

DCD
INTELLIGENCE

ANIXTER®

At Anixter, we enable the connected world. From securer facilities and communities, to more efficient networks and industrial environments, we deliver the infrastructure solutions – and intelligence – that sustain your business.

Through our unmatched global distribution network, supply chain management expertise and technical know-how, we drive efficiency and effectiveness to benefit your bottom line.

DCD

DatacenterDynamics (DCD), part of the DCD Group, is an international B2B media and publishing company. It offers a comprehensive range of products and services to assist senior professionals in the world's most ICT-dependent organizations in their risk-based infrastructure and capacity decisions.

DCD's portfolio of live events, online and print publishing, business intelligence and professional development brands are centered around the complexities of technological convergence. Accessible from over 42 countries, DCD's unique knowledge and networking platform is trusted by over 40,000 ICT, Engineering and Technology professionals worldwide.

FOR MORE INFORMATION:

+44 (0)20 7426 4813
info@dcd-intelligence.com
www.dcd-intelligence.com