The Organizational Benefits & Technical Capabilities of Next Generation Intelligent DCIM
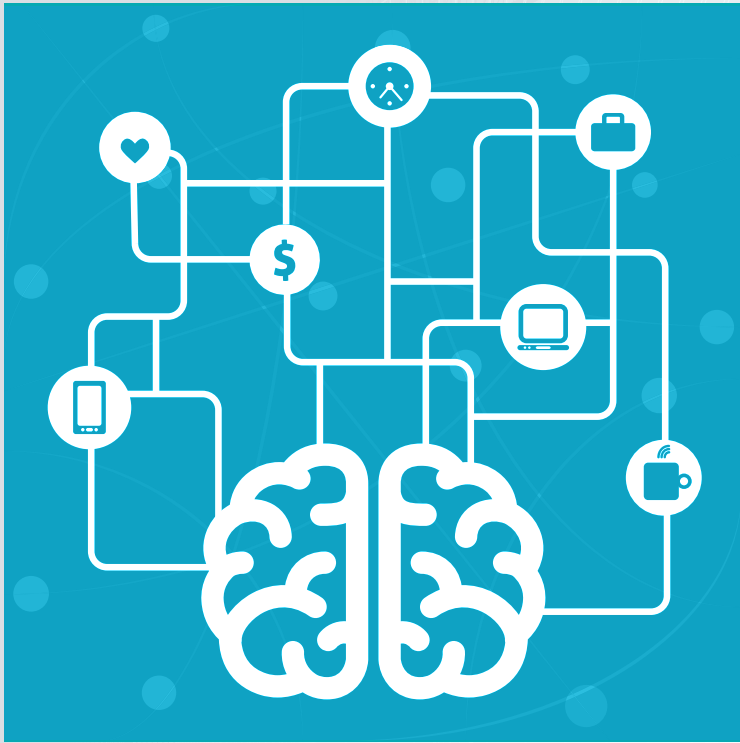
The Need for Intelligent DCIM

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The data center is truly the heart and soul of nearly every organization. Today's organizations are driven and defined by the information that is used to operate the business and steer decisions about future direction. So there is an increased need for highly reliable, incredibly efficient data centers that provide the optimal support to the organization. To achieve this, many current data centers will need to become more flexible, responsive, dependable, and, of course, less costly to operate.

The only way to substantially improve the ability of the data center to support the organization is to increase the amount of information that data center operations has about the data center itself. This is why the need to deploy state-of-the-art intelligent data center infrastructure management (DCIM) has become so important. Intelligent DCIM is defined as a system that provides real-time, detailed information about power usage, cooling, connectivity, asset tracking, and all pertinent aspects of the racks, cabling, air quality, bandwidth, and power delivery systems used in the data center. Because there are substantial variations among DCIM products, it is critical to find best-in-class solutions that provide the capabilities discussed in this eBook.

The majority of data centers are too complex to manage "by feel". Further, organizations have little tolerance for high costs, downtime, and slow changes in the data center. Data centers that have a comprehensive, intelligent DCIM solution in place provide a competitive edge and a strong operational advantage for their organizations.

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Added intelligence from leading-edge DCIM solutions drives numerous aspects of data center operations and organizational support. These include:

- The ability to add new hardware quickly and with confidence – New hardware is constantly being incorporated into the data center. The ability to locate new devices where there is sufficient power, cooling, bandwidth, and space is critical to quick and successful deployment.

- Lower costs – There are two types of expense that can be reduced through increased data center intelligence: capital and operational. Removing obsolete equipment, saving on power and cooling, and precluding data center changes or redesigns are key cost reduction steps.

- Faster cycle time/increased flexibility – In today's high-speed business world, waiting for IT infrastructure to respond to business needs is not acceptable. Intelligent data centers can move with the speed and flexibility required to enable business success.

- Better support for moves/adds/changes – The data center is constantly evolving. As such, the ability to move or redeploy equipment quickly and without causing downtime from making mistakes is an essential skill in the data center. Intelligence is the key to doing these activities more effectively.

- Elimination of downtime or outages – Many outages are due to mistakes or bad choices made in managing the cooling or power distribution to IT equipment. Intelligent data centers have all of the critical information to prevent overheating and power-related downtime that can negatively impact the business.

The five chapters in this eBook detail the most important benefits and capabilities of intelligent DCIM: next-generation management tools, optimizing capacity, driving efficiency, automating administrative and management tasks, and new technologies and processes for highly intelligent DCIM. ■

Next-Generation Management Tools

Michael Dell is famous for saying, "If you can't measure it, you can't manage it." Data centers are becoming more complex and fluid, and older approaches to data center management cannot keep pace with a dynamic cloud- and virtualization-oriented IT environment. IT needs management tools that are as modern as the hardware and applications that are running in the data center. Among their capabilities, next-generation management tools are defined by features that enable real-time, data-based management of the data center and its infrastructure.

The starting point for next-generation management tools is to build from a broad range of actual hard data that derives from many different elements of the data center. However, not all "data" is the same. The information that is used to drive state-of-the-art management tools must be gathered with regularity and consistency. That nearly always necessitates the use of instrumentation that provides specific data points that are collected the same way every time. The use of instruments or sensors to collect information is the preferred approach. Automation eliminates human errors or inconsistent actions that corrupt the input data for management tools. Also, the data collected must provide a comprehensive view of the entire data center and its infrastructure, not just select pieces. The lack of a comprehensive view is the most common shortcoming in many current data center information gathering systems. An incomplete picture has the potential to drive incorrect decisions. Ensuring that your data collection covers all the pertinent aspects of your data center is essential to success with new management tools.

A key capability that next-generation DCIM tools will provide to your organization
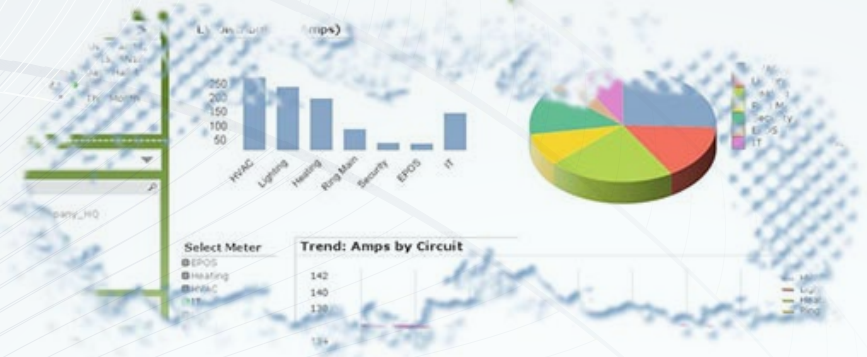
is the ability to make decisions more quickly, implement the decisions faster, and provide more flexibility or options for changes in the data center. One way to speed changes in the data center is to have more frequent data collection cycles; this will provide trending and specific information with less elapsed time. More frequent data is also very useful in augmenting human judgment, improving the overall decision process. Further, the new data-infused management tools help drive IT's responsiveness to the business by substantially reducing the cycle time for adding or deploying infrastructure. Next-generation tools not only monitor ongoing operations, but they also provide critical data for locating new hardware so that it can be deployed more quickly and with greater certainty.

Another benefit of next-generation DCIM tools is the ability to improve the process for moves/adds/changes. As IT adopts more cloud- and virtualization-focused infrastructure, and pooling/sharing hardware resources increases, the ability to move devices and have certainty

that there will not be an issue with power, cooling, or space is critical to effective data center management. This functionality must be part of your data center management tools. Older processes that are driven by intuition and the availability of rack space aren't an option for the vast majority of data centers. Next-generation intelligent management tools provide clear data on rack capacity to facilitate locating new hardware or relocating existing hardware. Further, these activities are now based on known and documented metrics so that consistency of your move/add/change process is increased.

Perhaps the most important benefit of next-generation DCIM tools is to prevent outages and ensure uptime. These tools not only monitor and track operations, but they proactively identify any situation that is outside normal operating bounds and may hold the potential for an outage. This is not just focused on power or cooling, but must also include network access. The fact that these situations are identified in real-time dramatically

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increases the ability of the data center operations team to take palliative actions and prevent downtime. This ability to act is enhanced by management tools that enable IT to drill down to more granular data to find the cause of the potential problem and then identify options to remediate the situation. The reality is that data center operations can no longer rely on human observations and readings as a viable approach to operational management. Inconsistency, inaccuracy, and limited perspectives are common in human-based systems and are not acceptable for even smaller data centers.

As the data center becomes more integrated and the interdependencies increase, a comprehensive data center information collection system is one of the best ways to prevent mistakes that can cause downtime. It can help you evaluate planned changes prior to implementation to understand if there will be problems during the actual deployment. The ability to do what-if analysis is a key capability that must be in your intelligent DCIM tools. Outages caused by poorly planned moves or changes are

also more serious than in the past, as today's data centers will often experience a domino effect from a single device outage in some cases. An important part of developing a holistic view is to choose management tools that can integrate data from existing management systems and sensors where it is necessary. This is not only far more cost efficient, but it provides a known and documented data source for the expanded management system. ■

Optimizing Capacity

Most organizations are focused on maximizing the return and utilization of core assets. The data center is one of those core assets. When coupled with the high cost of modification and change, maximizing the existing data center by optimizing its capacity or IT equipment is very important. One of the benefits of a truly intelligent data center is the ability to do just that. Intelligent DCIM will often find hidden or less obvious methods of adding capacity to your existing data center.

In addition to extending capacity, intelligent DCIM can help optimize your current data center operations where there is overcapacity. There is a hard-dollar cost for stranded capacity, such as supplying power and cooling to the racks when it is not needed. This unnecessary cost occurs every week, every month, and every year. Yet, it is often quite difficult to "uninstall" this power and cooling on a rack or even row level. Without a comprehensive view of how to optimize the data center, rescuing stranded capacity is just too difficult. But with intelligent DCIM you can develop an overall perspective of the data center and optimize the physical layout to rescue stranded environmental capacity, reducing some of these ongoing costs. This scenario doesn't always demand decommissioning power or cooling capacity; in many cases, areas of the data center that are "overbuilt" can be leveraged going forward to house new devices.

From the perspective of the finance group, it is important to gain the best return on investment in a data center and maximize its useful life. This issue has a number of permutations. One of the most common problems is unnecessary modification or re-architecting of the data center. Without intelligent DCIM, the information to maximize data center capacity is not available. As a result, many data center operations teams may decide to invest substantial capital in changing the data center, even when it may not be necessary. The fear of being "stuck" in a data center without enough available capacity is a powerful motivator, and without the hard data from intelligent DCIM, the decision to rebuild is often made too early.
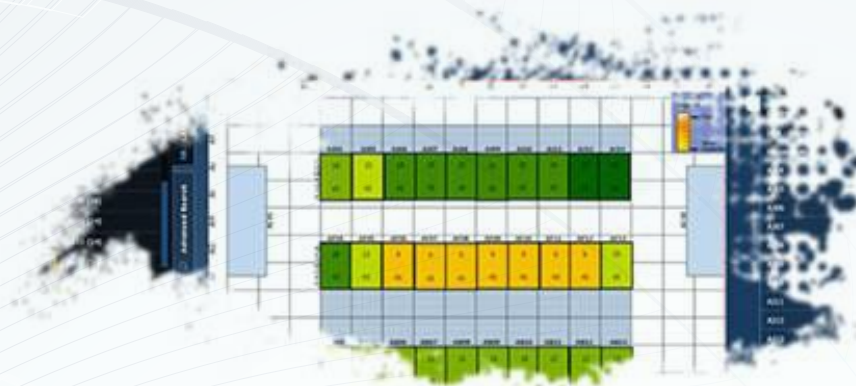
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Intelligent DCIM provides the facts and data to ensure any changes made to your data center are necessary. This information also helps IT justify the capital request to finance and management. Further, many intelligent DCIM systems will provide alternatives to a rebuild, such as reconfiguring racks, cooling, power, or network resources. Many organizations have found that taking a fresh look at the existing data center provides the foundation for making changes that preclude substantial redesign.

Among the most important processes for extending the life of your data center and forestalling expensive reconfigurations is to support higher rack density. Intelligent, hard data can pinpoint underutilized racks, or show how relocating devices can result in a net gain of space for new devices. This type of project is typically known as a consolidation effort, where existing devices, or even racks, are consolidated to regain lost capacity. However, without a truly capable intelligent DCIM system

in place, the data to drive an effective consolidation that will result in "hot spots," network bottlenecks, or other operating problems is possible. In some cases, a data center consolidation project will more than pay for the intelligent DCIM system by itself. The cost of major data center redesigns can run from $300,000 to well over $1 million plus. It is also important to note that consolidation projects can identify problem areas of your existing data center, and help improve resiliency and uptime in addition to providing new data center capacity. ■

Improving Data Center
Efficiency Every Day

Data centers run all day, every day. The costs of running them accrue all day, every day as well. Inefficiency often results in tens or hundreds of thousands of dollars in electricity and cooling costs, along with staffing and contractor salaries. Running a data center, even a smaller one, is clearly an expensive endeavor. That's why improving efficiency and lowering costs have become important drivers for IT operations. Intelligent DCIM solutions are the foundation for helping your organization make changes that will result in lower ongoing data center costs.

An important attribute of today's best-of-breed intelligent DCIM solutions is the ability to provide numerous sources of real-time data, offering you a comprehensive perspective of what is going on in the data center, and how cooling, power, and assets and connectivity are being used. This data is used to set a base level of operational cost. A key element of this data collection is that it occurs in real-time and is done regularly. This approach is essential, as there may be "flash" changes in the operating parameters of the data center that must be included in any cost and capacity analysis. Data centers have become highly dynamic, and new features such as Intel's processor throttling capability can result in very fluid changes to power or cooling demands. The potential for "spikes" is much greater than it has been in the past, and real-time data collection helps to identify them.

In addition to real-time data, there is also a strong need for highly granular data. Measuring temperature at a handful of locations in the data center used to be sufficient. That's not acceptable today. Measurements at the rack level are a minimum, and many data centers are gathering information at the device level to fully understand data center operations. This granularity helps identify specific areas where savings can be achieved.

Combining this information provides a complete view of the data center's need for power and cooling. This allows operations management to make changes to reduce underutilized resources, and to move equipment to mitigate hot spots or racks where there is insufficient power or cooling. The value of the information is that it identifies where the legacy design is no longer

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efficient and where environmental cost reductions can be made without negatively impacting operations. Many of the best intelligent DCIM solutions now use GUI interfaces to make data analysis much quicker and to highlight potential issues faster, both of which increase your efficiency.

Intelligent DCIM provides additional capabilities to reduce costs, such as automating asset tracking and disposition. Having a full, complete, and accurate inventory of the data center is essential given the dynamics of the environment. Using automated approaches will result in far more accurate data than traditional manual inventory systems. Automated asset tracking also saves money. First, it eliminates the need for data center audits. A typical audit costs somewhere around $40,000; mitigating this expense is one clear way to save money. Second, automated asset tracking saves staff costs currently spent building manual tracking systems. Intelligent DCIM also saves time and money when it comes to supporting compliance demands that are focused on the data center, specifically in cases where individual devices must be tracked and their workload documented.

Intelligent DCIM can help lower your data center costs by improving mean time to repair. Automated device tracking simplifies the process of finding the failed or compromised device. There are two parts to this: identifying the failed device, and finding the specific location of the device in question. This is often difficult with manual processes. It is important to realize that this benefit also extends to the network and network devices. In many data centers, the use of intelligent DCIM to provide faster recovery from network outages is more important than for other classes of data center hardware. ■
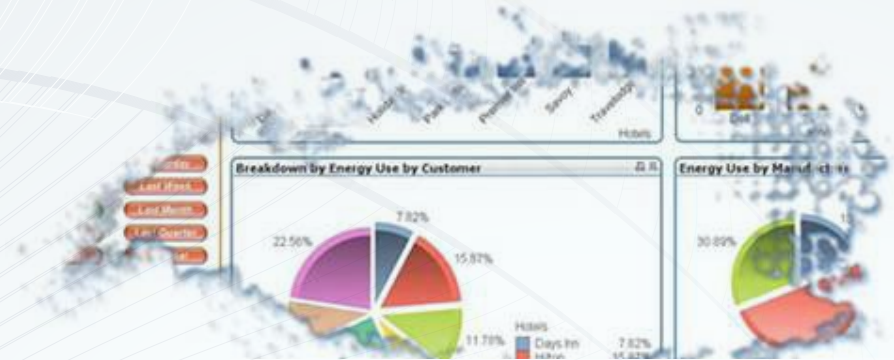
Automation of Management and Administrative Tasks

Automation has numerous benefits in any setting. Accuracy, consistency, documented processes, and cost efficiency are just some of the hallmarks. Intelligent DCIM is a platform designed to drive up the amount of automated management and administration within your data center. In light of the budget cuts and headcount reductions that have been common in the data center in the last five to 10 years, using automated tools to free up the time of the remaining staff is an essential business strategy for IT management.

Automation of data center operations tends to focus on these key aspects:

- Device management
- Environmental management
- Documentation and operational information
- Exception/out-of-bound management

The issue of device management was touched upon in Chapter 3. There are two main benefits of moving manual administrative processes to an automated platform for device management. First, automated processes are documented and deliver consistent results and data, regardless of staffing levels or individual staff performing the task. Second, because automated processes are documented, minimal training is required when there is a staffing change.

Managing the data center environment is a crucial task for IT operations. And as new IT strategies and technology change the environmental needs of the data center, older, manual approaches to managing or measuring these factors only at the data center level are no longer useful. Today's data center must measure factors like power and cooling in real-time and at a very granular level. Increasingly, sensors are being deployed all over the data center, at the rack or device level, to gather and report key data. Turning all that data into information for management purposes requires intelligent DCIM tools that can provide an integrated view. Typically the only way to digest this information is to use a GUI.

> **"** *Intelligent DCIM is the platform that can truly transform your operational approaches within the data center.* **"**

A relatively new demand on data center operations is to document data center operations at a far more detailed level. This data focuses on both operating and financial metrics. Operational efficiency metrics include power usage effectiveness (PUE) or data center infrastructure efficiency (DCiE). Calculating these measures and building a composite of where the data center stands demands consistent information that is collected regularly. This is why intelligent DCIM solutions are often used to automate the entire process of data collection and metrics preparation.

It is also necessary to develop cost savings metrics for reductions in environmental costs of data center operations. The intent is to measure change in these metrics to showcase savings or potential savings. In many cases the finance department will focus on these actual costs during reviews or budget meetings. It is much more common today for data center operations to have to justify budgets and expenditures, whereas in the past, these requests were often simply approved.

Another aspect of the relationship with finance that must be managed is to showcase savings and cost reductions from consolidation or other data center activities. Using consistent, replicable, and accurate data to document the savings helps IT gain funding for future initiatives.

Finally, your data center operations team needs to be able to quickly identify problems or potential problems with the physical infrastructure. Intelligent DCIM provides a number of capabilities that improve the management of out-of-bound situations. For one, consistent, historical information can help identify transient or one-time issues as opposed to a real problem in the data center. Removing "false positives" cuts the workload on data center staff and streamlines operations. This is coupled with the ability to focus on racks or locations where recent changes have been made, so that they can be monitored more closely for any potential issues. The ability to report on data center operations across both legacy and new elements of the data center is essential to ensure continuous operations. ■

Identifying Modern and Best-of-Breed Intelligent DCIM Solutions

Data center infrastructure management, or DCIM, is often described as a single category or group of solutions, but the reality is that DCIM capabilities differ widely. In fact, there are often substantial differences between truly intelligent DCIM and older or first-generation "vanilla" DCIM solutions. This chapter details the features that should be on your checklist for buying a best-of-breed, truly intelligent DCIM solution. Together, the following capabilities deliver the benefits described in the preceding chapters.

- **GUI-based Management Tools** – Intelligent DCIM delivers a great deal of information on the current and past state of the data center. Given the importance of making appropriate decisions in real-time, the data center operations team needs a graphical interface to turn the data into easily understandable and actionable information. A GUI-based interface also helps to highlight out-of-bound conditions more quickly using colors and graphics.

- **Standardized and Modular Software Platform** – Intelligent DCIM must support standards and offer modularity to support the specific needs of each individual data center. DCIM solutions that can be tailored to fit the precise needs of your environment deliver more value. Further, these solutions must also work with known and documented industry standards, so that Intelligent DCIM deployments can be integrated with other complementary solutions that are already in use, or will be soon. Intelligent DCIM solutions should enhance, rather than silo, critical information about the data center.

- **Comprehensive Data Acquisition** – One of the most important points of this eBook is that DCIM solutions that provide only a partial picture are not only less useful, but may actually result in poor decisions or mistakes due to missing information. Intelligent DCIM must provide comprehensive metrics for the devices, racks, specific spaces in the data center, the entire data center, data center incoming power, power distribution, bandwidth availability, local cooling, room-level cooling, humidity, cooling capacity, and incoming power to the building. This is a long list, but given the impact that any one of these elements may have on the operations of the data center, data from each is required.

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- **Standardized and Documented Analysis Tools** – The information gathered by an intelligent DCIM system is the key input stream for changes or modifications to the data center. Therefore, leading DCIM solutions must provide standardized analysis tools that can be put to use quickly to provide the necessary input to IT operations. These tools must also be fully documented so that IT operations can drill into the data to understand where and how it is derived.

- **Improved Sensors** – An intelligent DCIM solution starts with the data that is fed into the system, and this is why sensors are critical. A strong solution supports a broad range of sensors that will provide the different types of information listed under Comprehensive Data Acquisition. However, your solution can't stop there; a truly complete solution also provides sensors that can work with the building's power systems. Finally, wireless sensors have become a significant part of best-of-breed intelligent DCIM solutions. These sensors offer flexibility and capabilities that may be critically important in your data center.

- **Real-Time Reporting** – Within a data center that is highly virtualized or may move workloads among different devices, real-time reporting becomes a "must have". The transient nature of the workloads can result in operating parameters that change in seconds. In some cases, a "blind spot" of just minutes can result in an outage or unexpected shutdown of a device. Real-time reporting must be an innate design element of your DCIM solution if it is to provide the kind of operational support that your modern data center requires.

- **Strong Services Offering** – Intelligent DCIM is a solution that often requires the use of external experts to help with planning and deployment. Your provider of choice should have a substantial and experienced team of services staff that can be brought to bear on your specific implementation. A strong services team will not only ensure that your solution is appropriate and well suited to your needs, but that it will be deployed more quickly. A high-quality service provider will also deliver a strong "pass-off" plan to your internal staff so that the transition to internal operations is accomplished with minimal disruption. ∎