on365 Guide to **DCIM**

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Overview

Today's datacentres are more complex, more interdependent and more critical than ever before. Datacentres have always used massive amounts of energy but predicted price rises of over 20% per annum combined with expanding infrastructure, rapid change, more focus on operations and in depth scrutiny of return against investment require IT managers to go beyond performance management of IT equipment to manage the entire datacentre infrastructure.

With intense budgetary pressure IT Managers must now do more with less, drive increased efficiency in the datacentre and provide meaningful and reliable information on performance and costs. IT and business executives have realised that hundreds of thousands in energy and operational costs can be saved by improved physical infrastructure planning, by minor system reconfiguration and by small process changes. Not only that but IT staff are now also being challenged to convert datacentres from cost centres into producers of business value.

However, you cannot manage what you do not measure and you cannot save money until you understand where it is being spent. Legacy reporting systems, designed to support traditional datacentres, are no longer adequate for new "agile" datacentres that need to be proactive rather than reactive managing constant capacity changes and dynamic loads. In addition, the first generation physical infrastructure management tools were limited in scope and involved considerable human intervention

As a result this has led to the need for more intelligent and automated IT infrastructure management. DCIM is the superset of infrastructure monitoring tools which provide visibility into the datacentre physical infrastructure within and across both the IT and facility domains enabling the datacentre team to effectively and efficiently operate this complex environment optimising datacentre resource utilisation, efficiency and availability.

DCIM includes management of the datacentre infrastructure layer (power, cooling and the physical space), the IT infrastructure layer (compute, storage and communications equipment) and the gap between the two layers.

Today's DCIM tools are designed to identify and resolve issues with a minimum amount of human intervention. By correlating power, cooling and space resources to individual servers, DCIM tools today can proactively inform IT management systems of potential physical infrastructure problems and how they might impact specific IT loads. Particularly in a highly virtualised and dynamic cloud environment, this real-time awareness of constantly changing power and cooling capacities is important for safe server placement.

These more intelligent tools also enable IT to inform the lines of business of the consequences of their actions before server provisioning decisions are made. Business decisions that result in higher energy consumption in the datacentre, for example, will impact carbon footprint and carbon tax. Charge backs for energy consumption are also possible with these new tools and can alter the way decisions are made by aligning energy usage to business outcomes.

Newer planning software tools illustrate, through a graphical user interface, the current physical state of the datacentre and simulate the effect of future physical equipment adds, moves, and changes. This capability provides answers to some common planning questions.

Why do I need DCIM?

DCIM provides IT Managers with full knowledge-driven control of their datacentre and gives the insight required to drive performance throughout it including datacentre assets and physical infrastructure.

With effective DCIM implementation IT Managers can plan, monitor and execute datacentre management strategies which improve financial and operational performance through the most efficient use of power, cooling and space achieved by optimal placement of datacentre assets.

DCIM tools graphically display a complete inventory of the datacentre's physical and logical assets. Effective DCIM provides not only full access, control and management of these devices in the physical infrastructure but also a true insight into how that equipment is being utilised, what capacity is available, where it's residing and how much power is being used.

DCIM deploys and leverages measurement, intelligent controls and centralised monitoring and management of the following key areas;

1. Sensing temperatures
2. Monitoring power
3. Monitoring rack conditions
4. Detecting fluid leaks
5. Intelligent control of precision cooling
6. Intelligent control of critical power
7. Managing alerts and alarms
8. Monitoring energy efficiency
9. Monitoring and managing remotely
10. Monitoring batteries

DCIM also provides the ability to test scenarios prior to change which can optimise performance and reduce the risk associated with managing high-density infrastructure. IT managers can model any move, add or change by creating sophisticated "what if" scenarios before implementing changes and can look to the past and the future, using historical data to report and track trends and forecast or predict future requirements for power, cooling and space.

Summary of Key Benefits of DCIM
- Access to accurate, actionable data about the current state and future needs of the datacentre
- Standard procedures for equipment changes
- Single source of truth for asset management
- Better predictability for space, power and cooling capacity means increased time to plan
- Enhanced understanding of the present state of the power and cooling infrastructure and environment increases the overall availability of the datacentre
- Reduced operating cost from energy usage effectiveness and efficiency

DCIM provides the ability to answer questions such as the following:

1. Where is my datacentre asset located?
2. Where is the best place to place a new physical or virtual server?
3. Do I have sufficient space, power, cooling and network connectivity to provide my needs for the next 6 months? Next year? Next five years?
4. An event occurred in the datacentre - what happened, what services are impacted, where should the technicians go to resolve the issue?
5. Do I have underutilised resources in my datacentre?
6. Will I have enough power or cooling redundancy under fault or maintenance conditions?
7. Do I need to spread out my blade servers to get reliable operations?
8. Does the existing power and cooling equipment have the capacity to accommodate new technologies?

Without the information provided by DCIM, these questions become much more difficult to answer.

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DCIM Functionality
DCIM tools perform the following functions:

- Provide graphical representations of IT equipment and its location in the rack *(This frees the operator from having to either analyse spreadsheets to find this information or to physically have to be present in the datacentre.)*

- Visually display the impact of pending moves and changes on power capacity and cooling distribution *(This spares the operator from having to engage in complex mathematical calculations and from potentially committing some serious errors that result in unanticipated downtime.)*

- Simulate the consequences of power and cooling device failure on IT equipment for identification of critical business application impacts *(This provides an up- front assessment of risk, based on scientific calculation, rather than by making decisions based only on "gut feel".)*

- Proactively manage within rack and floor tile weight limits *(This avoids the disruptive situation of compromised rack integrity or having a rack crash through a stressed out raised floor.)*

- Simulate cooling scenarios in the datacentre with CFD approximation *(This produces an airflow analysis much faster than a traditional CFD study.)*

- Generate recommended installation locations for rack-mount IT equipment. The location selection is based on available power, cooling, space capacity, and network ports. *(This helps to avoid the problem of overloaded branch circuits or hot spots.)*

How does DCIM help?

In Design
DCIM provides key information for the design of a proper infrastructure. Power, cooling and network data at the rack level help to determine the optimum placement of new servers. Without this information, datacentre managers have to rely on guesswork to make key decisions on how much equipment can be placed into a rack. Too little equipment strands valuable datacentre resources (space, power and cooling). Too much equipment increases the risk of shutdown due to exceeding the available resources.

In Operations
Datacentre personnel have the visibility and control to optimise performance while maintaining or improving availability. With this level of progression, datacentre management becomes truly proactive as personnel can anticipate potential failures and automatically shift compute and physical resources to eliminate downtime while increasing resource utilisation to optimise efficiency across the datacentre.

DCIM can help to enforce standard processes for operating the datacentre. These consistent, repeatable processes reduce operator errors which can account for as much as 80% of system outages.

In Monitoring
DCIM provides operational data, including environmental data (temperature,humidity, air flow), power data (at the device, rack, zone and datacentre level) and cooling data. In addition, DCIM may also provide IT data such as server resources (CPU, memory, disk, network). This data can be used to react quickly to potential problems in the datacentre and improve management such as alerting management when thresholds are exceeded, reducing the mean time to repair and increasing availability. With monitoring and access, datacentre personnel have visibility into equipment operating status and receive real-time alerts and alarms to notify them of potential equipment operating problems. Remote access can also speed the response to equipment problems while real-time monitoring data can be used to populate planning tools with actual performance data.

How does DCIM help?

In Predictive Analysis

Datacentre personnel have the ability to respond more quickly to changes in the infrastructure and manage more efficiently. Operating data available through monitoring and data capture initiatives can be used to extend the life of the datacentre, reduce mean-time-to-repair, synchronise infrastructure with virtualisation automation and analyse performance against SLAs.

DCIM analyses the key performance indicators from the monitoring phase as key input into the planning phase. Capacity planning decisions are made based during this phase. Tracking the usage of key resources over time, for example, can provide valuable input to the decision on when to purchase new power or cooling equipment.
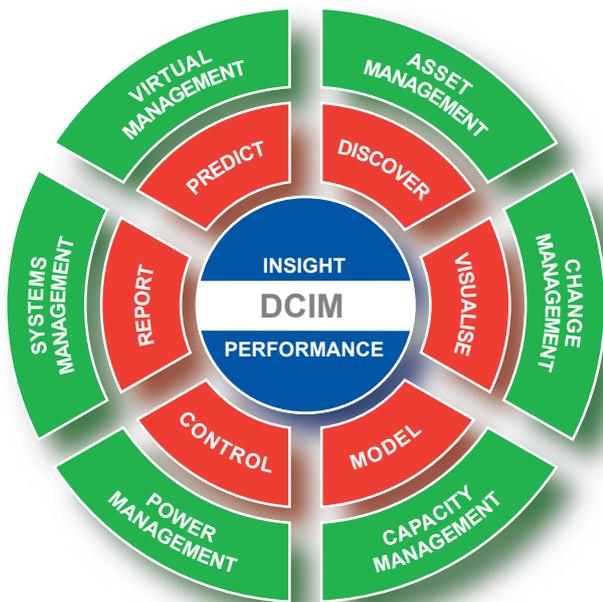
In Planning

Datacentre personnel have the ability to automatically collect data about what assets are in the datacentre and where they are located, as well as how they are interconnected. This data can be used to address key planning issues including, is there enough space, power and cooling to meet future needs and how can equipment be commissioned and decommissioned more efficiently.

Planning tools improve datacentre operational efficiency and create an environment for process improvements. DCIM can be used to analyse "what if" scenarios such as server refreshes, impact of virtualisation, and equipment moves, adds and changes.

Discover:	DCIM enables automatic search for IT assets, collection of important data to speed implementation and keep up-to-date records.
Visualise:	DCIM maps the logical data collected and creates a virtual model of the entire datacentre infrastructure.
Model:	DCIM provides the ability to manipulate a virtual model of the datacentre creating sophisticated "what if" scenarios.
Control:	DCIM provides the ability to define and control the execution of service request processes, using graphical workflow and automated execution resulting in improved service delivery and reduced server deployment time.
Report:	DCIM supports the real-time collection of data specific to power and environmental metrics and provides business intelligence tools to deliver this information to management for review.
Predict:	DCIM uses historical data to track trends and forecast future space, cooling and power requirements.

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How does DCIM help?

Asset/Change/Configuration Management

Asset management is a key component of DCIM. A datacentre can contain thousands of assets, from servers, storage and network devices to power and cooling infrastructure equipment. Tracking these assets is an ongoing and often monumental task. The inability to locate equipment in the datacentre increases the mean-time-to-repair (MTTR) for the equipment and decreases the overall availability.

But asset management encompasses much more than simply locating a datacentre asset. It also involves knowing detailed information about the asset's configuration. eg a server may be powered by one or more rack power strips. Disconnecting these power sources will shut down the server. The server may be connected to one or more switches or routers. Rerouting these network devices may make the server unreachable. The server may host multiple virtual machines. Shutting down the server will disable these virtual machines. Without knowing the details of the server configuration, it is very difficult to make intelligent decisions concerning that server and its supporting infrastructure. Changes to any part of the configuration may render the server and its associated services unusable.

In order to accurately manage assets and their detailed configurations, change must also be managed. It is estimated that change is often the cause of as much as 80% of system downtime and that 80% of mean time to repair (MTTR) is used trying to determine what changed. Change management is therefore an important part of a DCIM solution. The ability to track both authorised changes and detected changes is key DCIM functionality which can reduce MTTR and increase overall system availability.

Real time monitoring

There are three categories of real-time monitoring systems in the datacentre:

Building Management System (BMS)

A BMS is typically a hardware-based system utilising Modbus, BACnet, OPC, LonWorks or Simple Network Management Protocol (SNMP) to monitor and control the building mechanical and electrical equipment. These are often custom-built systems priced on the number of individual data points being monitored (a data point might be the output load on a UPS or the return temperature on a computer room air conditioner unit). In some cases, the BMS system is extended into the datacentre to monitor and control power and cooling equipment.

Network Management System (NMS)

An NMS is typically a software-based system utilising SNMP to monitor the network devices in the datacentre. Network devices can usually be auto-discovered, so installation can be automated to some degree.

Datacentre Monitoring System (DCMS)

A DCMS can be hardware-based and/or software-based and is used to monitor a datacentre or computer room. Device communication is typically done using SNMP, although some datacentre monitoring systems can also communicate using Modbus, IPMI or other protocols.

Workflow

Many datacentres have implemented at least some level of ITIL-like processes. A DCIM solution can help to orchestrate these processes. eg the installation of a new server typically has multiple steps, some of which may be performed by different groups within the datacentre.

DCIM solution enables tracking of the various steps, with different groups able to report status of their individual tasks in order to verify that all required steps have been completed. In this particular example, workflow functionality will coordinate the server installation steps so that all preparatory work been completed before the technician installs the server in the rack, thereby streamlining the entire process.

How does DCIM help?

Analytics & Reporting

Another important capability of a DCIM solution is data analysis and reporting. With thousands of devices in the datacentre each reporting multiple measurements, the amount of data collected can quickly become overwhelming.

It is imperative that the DCIM tool can quickly sort through this data and provide actionable recommendations for the management team. These recommendations can be presented in the form of alarm messaging, graphing of historical data to show changes over time, dashboards and reports. The DCIM tools normally come with pre-defined reports but should also support ad hoc reporting based on user-selectable parameters.

Visualisation of the Physical & Virtual Infrastructure

One important component of a DCIM solution is the ability to view the physical and virtual infrastructure. Most of the current solutions provide top down views, some also provide 3D views with the ability to 'fly though' the datacentre. Many solutions provide various layered views of the datacentre with the ability to view various parameters such as temperature, rack utilisation, power and so on.

This visual view is typically extended down to the rack level, with DCIM tools providing a visual view of the devices in the rack. This view shows the actual location of a device within a rack and also serves to provide additional data such as the temperature in the rack at various points and the power usage within the rack.

User Interface

If DCIM is essentially information, a good DCIM user interface basically comes down to providing that information in such a way as to allow the user to make informed decisions. Like the visualisation component, DCIM user interfaces vary widely in both their look and feel and their overall capabilities. While most DCIM products are web-based, allowing access to the data from anywhere, the user interfaces can take many forms, including dashboards, touch screen technology, and application support for hand-held devices such as iPads and smart phones.

Capacity Planning

One of the primary uses for the data collected by DCIM applications is to provide information for capacity planning. Datacentres operate most efficiently when they maximise the use of key resources, particularly power and cooling. By storing the resource consumption over time and analysing growth patterns, datacentre managers can more accurately predict when a given resource will be exhausted. Through the use of DCIM tools, datacentre builds can frequently be postponed due to more effective management of key resources.

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Getting Started with DCIM

Although similar in many respects, every datacentre is unique. In choosing a DCIM solution, datacentre managers will choose different solutions based on their needs. Before choosing a DCIM solution, it is important to first know what it is you want to receive from the solution.

It is also important to remember that DCIM cannot singlehandedly do the job of datacentre management. It is only part of the overall management solution. While the DCIM tools, or sometimes a suite of tools working together, are a valuable component, a complete management solution must also incorporate procedures which allow the DCIM tools to be effectively used.

Implementing DCIM

There are two primary efforts involved with implementing a DCIM tool:

Collecting asset information
What is often lost amidst the "bells and whistles" of DCIM solutions is the cost of collecting and maintaining the asset information. People are often surprised to learn that the cost of gathering the asset data is often as much as or even more than the cost of the management system itself.

Datacentres can contain thousands of servers, power and cooling devices, and storage and network devices as well as a myriad of other equipment. It can be a very daunting task to collect data about each asset, particularly when starting from scratch.

Accuracy is another key factor to consider when manually collecting asset data. In a datacentre with 8,000 assets, a 10% error rate would mean that as many as 800 could have inaccurately recorded data.

Configuring real-time monitoring
The real-time monitoring components provided by many DCIM solutions also require configuration before they can begin to collect data. It is important to remember that all monitoring systems require some method of communicating with a device in order to retrieve data. While most new datacentre equipment should provide some means of retrieving data and alarms, some legacy equipment may not. Even new equipment may not provide the data communication components as a standard, which means you may need to purchase additional components in order to monitor the equipment.

You should look for a DCIM solution that will work with a wide variety of hardware types (power, cooling, servers, etc.) from a range of manufacturers. A DCIM solution should provide a single pane of glass view of the datacentre, so avoid tools that only monitor one vendor's specific hardware. As with asset management, some DCIM solutions support auto-discovery of devices, providing a faster, easier installation with support for new devices as they are installed in the datacentre.

DCIM ROI

As with any investment in the datacentre, the question of the return on the investment should be raised before purchasing a DCIM solution.

There are three primary methods in which DCIM provides ROI:

- Improved Energy Efficiency
- Improved Availability
- Improved Manageability

Gartner reports that DCIM has already been proven to reduce operating expenses by as much as 20%. Other research has shown that DCIM solutions can reduce the time to deploy new servers by up to 50% and extend the life of a datacentre by up to five years.

In the APC by Schneider Electric White Paper 'How Data Centre Infrastructure Management Software Improves Planning & Cuts Operational Costs' the authors highlight the savings from a DCIM solution. They state that, "The deployment of modern planning tools can result in hundreds of man hours saved per year and thousands of dollars saved in averted downtime costs."

Summary

DCIM will not transform your datacentre over¬night, but it will begin the process. DCIM solutions have proven themselves to be very effective tools in more effectively managing the datacentre. DCIM provides a complete picture of the current state of the datacentre and, as importantly, allows you to plan future datacentre capacities, including space, power and cooling resources. DCIM can manage power and cooling consumption and drive energy efficiency in the datacentre.

As DCIM continues to mature and the cost to build and operate a datacentre increase, the ROI for these products will continue to improve. Get started by putting together a detailed list of requirements.

For further information on how DCIM could help your organisation:

Visit our website at **www.on365.co.uk**

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Call us on **01509 261100** or to speak to one of our **DCIM Software Team** directly please call **07584 086419**

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