

WHITE PAPER

**THE NEED FOR CONNECTIVITY MANAGEMENT
AS PART OF A DCIM ENVIRONMENT**

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Several new dynamics are affecting the management of enterprise datacenters. One is the increased requirement for energy efficiency. Another is the need to optimize the investment in infrastructure. The third is the revolution in data center architecture brought about by virtualization and its cousin, cloud computing. Overseeing these dynamics is an innovative discipline called Data Center Infrastructure Management or “DCIM.” DCIM is often aimed at controlling the physical facilities: power, cooling, racks and space. But DCIM is also a comprehensive repository for information and a logical means to manage other key pieces of data center infrastructure, including the cabling that interconnects servers, storage, switches, routers, firewalls, etc. This paper explains that by including structured cabling within DCIM, holistic and proactive data center infrastructure management can be achieved.

DCIM Essentials

DCIM is application software that inventories data center facility and IT assets and merges physical layer data with monitoring data collected from those assets. DCIM may include hardware, although ideally no *new* hardware should be required by a DCIM solution to manage existing assets.



Figure 1. Logical diagram of DCIM

Due to ongoing advances in the DCIM industry any definition risks becoming obsolete. As an aspiration if not a definition, DCIM performs the following functions:

- Tracks the entirety of a data center’s infrastructure, assets and connectivity
- Provides a consolidated view of the physical and queried data while assuring data accuracy
- Allows facility managers and IT managers to collaborate and plan the future of the data center
- Provides a closed loop process for executing planned change

DCIM removes the need to keep infrastructure records in tedious-to-update, error-prone files such as spreadsheets, drawing tools and home-grown databases on network shares. CIO’s embrace DCIM for their data center operations because it is more comprehensive, more accurate and faster than logbooks, desktop software and dedicated local databases. As data centers respond to interest in green computing and adopt virtualized servers en masse, complexities arise that tax the capacity of anyone without a DCIM tool.

There are many vendors of DCIM. Manufacturers of data center hardware such as power systems, racks and cooling offer DCIM as an accessory. Some DCIM vendors are software specialists whose products are hardware-independent. System management companies also offer DCIM modules for their operations

management software. Lack of options is not a challenge for prospective DCIM users, though choosing the best option may be.

Requirements for DCIM

A number of points should be considered when selecting a DCIM product. A few critical ones are:

- Are the advantages in a hardware-based solution salient or do I want hardware-independence?
- How easy is it to import inventory data into my DCIM candidates and then audit it for accuracy?
- How should I weigh the relative importance of information management, information reporting, operations optimization and long-term planning?
- Who in your organization will own DCIM: Facilities management? I.T. management? Both?
- What is the Total Cost of Ownership? Take into consideration employees' new process-learning time as well as updating/documenting Moves/Adds/Changes (MACs) moving forward.
- Are connections and links for both power and data encompassed by the DCIM system?
- Will the selected solution capture moves, adds and changes when they occur, where they occur? Or will I need to wait until I have access to a PC to enter data?
- Is the system extendable to store the data I want to store about my data center?
- Is DCIM a core business or a sideline product for the vendor/developer and how long has the solution been around?
- Can I easily visualize cabinet and room layout changes in the DCIM system?
- Can I see in one place key environmental and statistical information (temperature, available RU space, actual and derated power, etc.)?

A comprehensive list of evaluation questions is included in the Appendix to this article.

Adopting DCIM may be complex. Flowcharting the milestones will markedly increase the chances of success. A template flowchart is shown below for a new data center before commissioning.

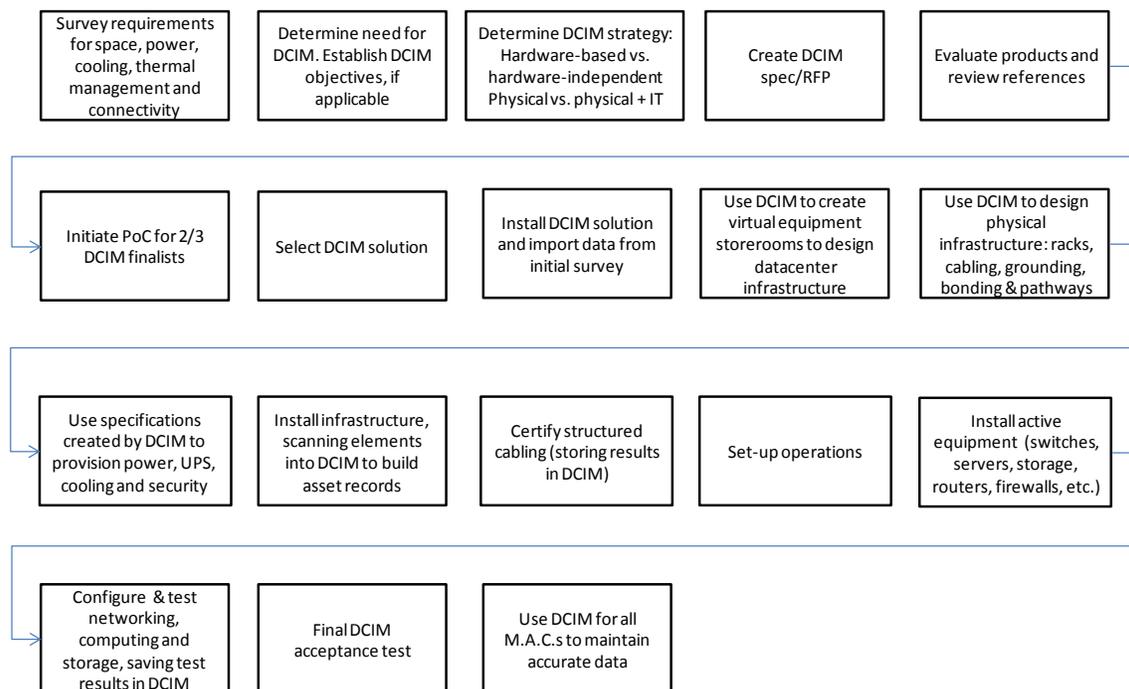


Figure 2. DCIM Deployment Flowchart

Your DCIM flowchart should include as much detail as necessary to define, evaluate, select and install the system.

The Who, What and Why of DCIM

There are several stakeholders in a DCIM implementation. Four key ones with their areas of focus and corresponding objectives are shown below.

Stakeholder	Focus	Objectives
CIO	Asset efficiency	Optimize data center ROI
CFO	Asset lifecycle management	Optimize data center ROI
Facility Manager	Room, Power, cooling, pathways	Reduce energy use, increase efficiency
Data Center I.T. Manager	Racks & equipment	Improve space utilization, asset management, flexibility
Network Manager	Installation & operation	Effective design, accurate records
Network Designer	Structured cabling, connectivity	Reliable links that support future needs
Server Manager	Servers, applications and data	Improve utilization and performance

Figure 3. Stakeholder Interest Map

While the Data Center IT Manager is traditionally tasked with improving the efficiency of data center infrastructure management and is often the first point of contact for DCIM, DCIM benefits all of the stakeholders by answering questions such as:

- What do I own?
- Where is it?
- When was it installed?
- What did I pay for it?
- What revision of software is it running?
- If I have to move an asset, where will it fit?
- Which ports connect to what?
- How are devices/ports connected?

When the features of DCIM are understood, the I.T. and facilities teams interact to discover how it will increase the efficiency of both teams, reduce energy cost and achieve a better Power Utilization Efficiency ratio and/or DCIE rating. DCIM is a “single pane of glass” that turns disparate data into focused, actionable information.

A network manager is asked to prove the network infrastructure can support the rollout of 500 VM servers. By using connectivity plus DCIM data he can confirm that the physical cabling infrastructure (often referred to as ITS – Information Transport Systems - by BICSI) will support the network traffic, then view and plan network port capacity to the individual racks.

Network managers also play a crucial role in defining the physical connections between active network devices, servers and storage. These connections are the ITS (structured copper and fiber cabling) that must support an evolving range of traffic types and speeds. Network managers have an interest in DCIM because it will give them an accurate and comprehensive catalog of network links. This is especially important as increasing bandwidth demands pose questions about the need to upgrade or replace. In addition the recently

ratified TIA/EIA 606B standard makes specific reference to electronic management of connectivity records and a good DCIM solution will provide this management.

Cabling and DCIM

Cabling is a sizable investment in data center infrastructure. It is also a highly leveraged asset in that poorly managed structured cable inhibits flexibility while well-managed cabling facilitates growth. And one cannot forget Moves/Adds/Changes: a data center constant to which cabling must conform. Unlike power supplies, chillers, racks, servers and switches, structured cabling is a nearly-invisible piece of data center infrastructure. Cabling is expected to work and it usually does. But when it doesn't or when faced with changes, not having a complete history of the structured cabling may lead to unnecessary field queries, retesting, recabling or delays in service deployment.

As we know, data centers are subject to technology shifts. While many are independent of the infrastructure, three current shifts could affect data center cabling.

Technology	Impact	Cabling Challenge
Virtualized Servers	Top-of-Rack switches become commonplace	Higher bitrate uplinks with large-scale in-rack patching
Parallel Optics	Defined standard for 10Gbps+ datacenter fiber	Ensuring adequacy of infrastructure.
Single-Tier Switch Fabrics	3-tier switching is replaced Fiber displaces copper	Providing a future-ready fiber plant

Figure 4. Technologies and Infrastructure

Where discrete servers used 1Gbps links to switches, dense virtualized servers make that technology passé. Parallel optics, also called “MPO” fiber, will be de rigueur in datacenters for storage and high-speed networking. Switch fabrics are the most advanced technology as they allow single-hop connectivity between any data center asset. Their 40Gbps and 100Gbps interfaces necessitate adoption of the highest bandwidth fiber technologies.

Integrating cable management into DCIM will make daily work and supporting the future far more tractable. Utilizing flowcharting again, the process described below creates a base of knowledge from which I.T. management can effectively act and react.

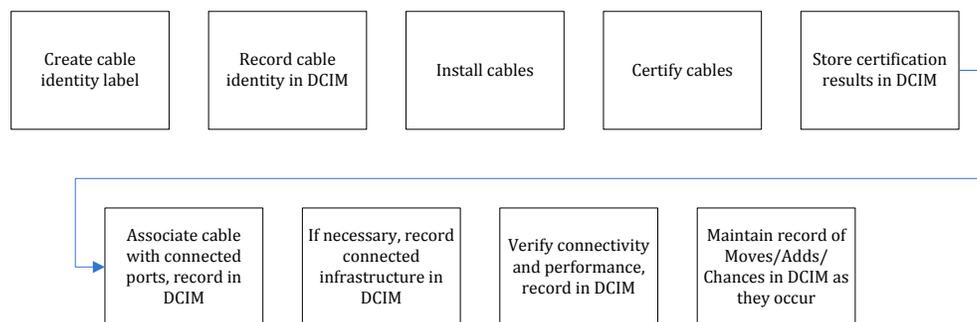


Figure 5. Cable-DCIM Integration Flowchart

A DCIM implementation that follows this process enhances its worth from the IT and facility assets to encompass a critical part of the infrastructure – the aforementioned Information Transport System (ITS). It provides a view of limitations, potential problems and potential growth because certification yields a wealth of data. One can answer questions such as:

- Will the twisted-pair link between Rack 34 to Rack 18 support 10Gbps traffic?
- Was the optical interface on Port 6 of my SAN switch clean?
- Was the fiber link from a Top-of-Rack Switch to the Aggregation Switch tested for loss?
- Is there reflectance in a fiber link that is robbing me of bandwidth?
- Are my garden-variety patchcords really suitable for virtualized application server connections?
- Will my stranded fiber trunk migrate from 10Gbps to 40Gbps? To100Gbps?
- Can I change a cable without risking an inadvertent disconnect of a service?
- And more...

Some DCIM solutions today include structured cabling under their umbrella of managed assets. When you assess your needs and options, consider a DCIM solution that does.

Authors

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Appendix: Evaluation Questions for Prospective DCIM Vendors and Products

Ask the Vendor

1. How many years has the vendor been selling the solution, is this a new entry or a well-established solution?
2. Does the vendor really manufacture and sell the solution to encourage you to become locked into their other equipment or are they truly independent of influence?
3. What success has the vendor has across industries?
4. If the vendor also sells hardware, have they sold to customers that do not use their hardware?
5. Does the system provide scalability & flexibility; will it meet your needs in three years' time?
6. Is it easy to document/retrofit to existing installations?
7. What kind of maintenance/skills/training does the system require?
8. Does the vendor support the system in all countries your company operates in?
9. How much does the system cost? What is the ROI (Return on Investment)?
10. What future enhancement does the vendor plan for the product?
11. What level of self-discovery does the system have? Can it automatically discover network changes?

Solution Implementation

12. Does the solution come with a broad, multi-manufacturer set of equipment templates?
13. Will the system let you configure the information elements you want to store or are you limited to a fixed or limited configuration set supplied by the vendor?
14. Does the system support AutoCAD, Visio and picture format import of floor plans?
15. Is there full support for XL, CSV format import and export of data?
16. Is the system flexible enough to support your preferred process and work practices?
17. Will the solution manage any type of IT equipment and in fact non IT equipment if required?
18. Is the solution locked into managing one type of environment (e.g. the data center) or can it manage work-areas and campus environments as well?
19. Does it manage every aspect of the IT environment including power and data connectivity, all equipment, locations, spaces, racks, desks, conduits, loads and capacities?
20. Are all aspects of the system user configurable, or does it require the vendor to make the change?
21. Does the solution support an inbuilt scripting language (at no extra cost) to allow you to extent the systems abilities yourself?
22. Does the system support a user configurable MIB database and full read/write SNMP/WMI scripting (at no extra cost)?
23. What level of self-discovery does the system have? Can it automatically discover network changes?

Using the System

24. Does the system have an intuitive GUI for normal users who will be using the system infrequently?
25. Is the user interface easy to navigate? Is the information shown logically laid out and complete without being confusing? Does the system show the infrastructure in a clear logical way?
26. Who within the organization will benefit from the installation? Does the system have features that will be useful to multiple departments, not just IT, including finance and facilities management?
27. Will the system be able to assist with your organization green activities?
28. Does the system have an open Web services XML API?
29. Can the system store historical data both from SNMP/WMI and internal values?
30. Does the system include (a no extra cost) a customer report builder?
31. Can custom reports be scheduled and e-mailed directly users?

Keeping the System Up-To-Date - Trust in Data

32. Does the solution support a portable handheld that allows complete add/update/read of all data stored in the system?
33. Does the handheld need Wi-Fi or does it work off line so information can be accessed anywhere?
34. Does the handheld work with barcodes to make equipment identification as easy as a scan of a serial number?
35. Does the handheld system support inventory management functions for areas such as store rooms?
36. Does the handheld system support graphical rack and floor plan views?
37. Does the handheld system have full audit capabilities so that audit assurance of data is possible?
38. Does the system still require paper to be printed for change orders, etc. or are they fully supported by the handheld?