An Introduction to Data Center Infrastructure Management

Overview

Worldwide demand for new and more powerful IT-based applications, combined with the economic benefits of consolidation of physical assets, has led to an unprecedented expansion of data centers in both size and density. Limitations of space and power, along with the enormous complexity of managing a large data center, have given rise to a category of tools with integrated processes – Data Center Infrastructure Management (DCIM).

Once properly deployed, a comprehensive DCIM solution provides data center operations managers with clear visibility of all data center assets along with their connectivity and relationships to support infrastructure – networks, copper and fiber cable plants, power chains and cooling systems. DCIM tools provide data center operations managers with the ability to identify, locate, visualize and manage all physical data center assets, simply provision new equipment and confidently plan capacity for future growth and/or consolidation. These tools can also help control energy costs and increase operational efficiency. Gartner once predicted that DCIM tools would soon become the mainstream in data centers, growing from 1% penetration in 2010 to 60% in 2014.

This document will discuss some important data center infrastructure management issues. We'll also take a look at how a DCIM product can provide data center managers with the insight, information and tools they need to simplify and streamline operations, automate data center asset management, optimize the use of all resources – system, space, power, cooling and staff – reduce costs, project data center capacities to support future requirements and even extend data center life.

Why DCIM?

The trend for consolidation and construction of ever larger data centers has been basically driven by economy-of-scale benefits. This trend has been accelerated and facilitated by technological advances such as Web-based applications, system virtualization, more powerful servers delivered in a smaller footprint and an overabundance of low-cost bandwidth.

Not many years ago, most computer sites were sufficiently small so that the local, dedicated IT and facilities staff could reasonably manage most everything with manual processes and tools such as spreadsheets and Visio diagrams. It has now become painfully clear that IT and facilities professionals need better tools and processes to effectively manage the enormous inventory of physical assets and the complexity of the modern data center infrastructure. Experience shows that once a data center approaches 50-75 racks, management via spreadsheets and Visio becomes unwieldy and ineffective.

In addition, the outward expansion and increasing rack density of modern data centers have created serious space and energy consumption concerns, prompting both corporate as well as government regulatory attention and action. IDC forecasted that data center power and cooling costs should rise from $25 billion in 2005 to almost $45 billion in 2010. Moreover, in a Data Center Dynamics research study, U.S. and European data center managers stated that their three largest concerns were increasing rack densities, proper cooling and power consumption. Seemingly overnight, the need for data center infrastructure and asset management tools has now become an overwhelming, high-priority challenge for IT and facilities management.

At the highest level, the enterprise data center should be organized and operated to deliver quality service reliably, securely and economically to support the corporate mission. However, the natural evolution of roles and responsibilities among three principal groups within the data center – facilities, networking and systems – has in itself made this objective less achievable. Responsibilities have historically been distributed based on specific expertise relating to the physical layers of the infrastructure:

■ Facilities: Physical space, power and cooling

■ Networking: Fiber optic and copper cable plants, LANs, SANs and WANs

■ Systems: Mainframes, servers, virtual servers and storage

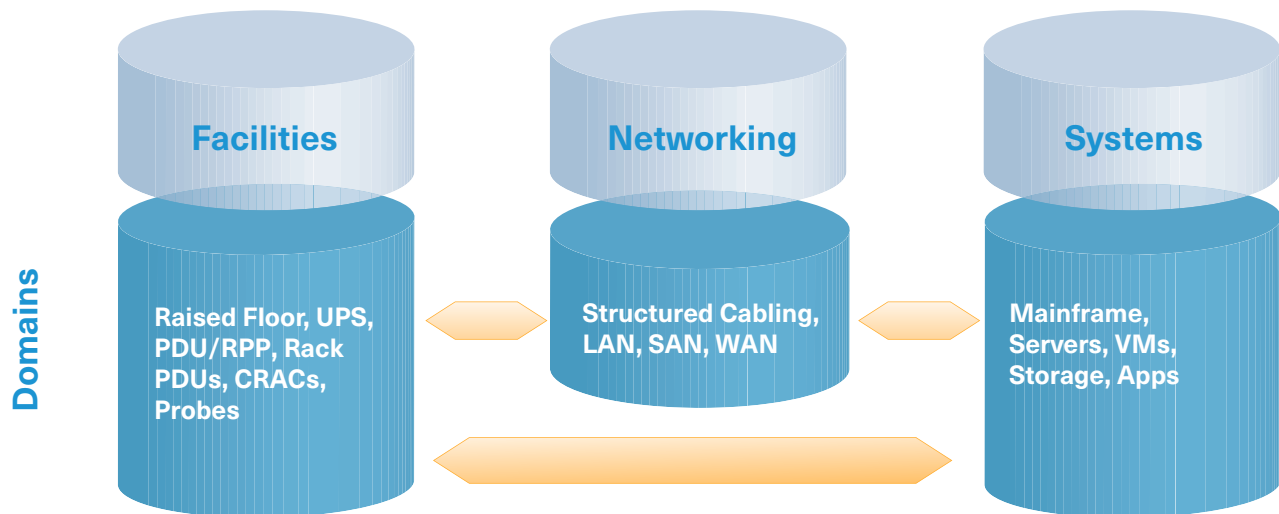# An Introduction to Data Center Infrastructure Management

Domains

Facilities	Networking	Systems
Raised Floor, UPS, PDU/RPP, Rack PDUs, CRACs, Probes	Structured Cabling, LAN, SAN, WAN	Mainframe, Servers, VMs, Storage, Apps

Clearly one major challenge is bridging the responsibilities and activities among various data center functions to minimize the delays, waste and potential operational confusion that can easily arise due to each group's well-defined, specific roles.

What Is DCIM?

Basic DCIM components and functions include:

- **A Single Repository:** One accurate, authoritative database to house all data from across all data centers and sites of all physical assets, including data center layout, with detailed data for IT, power and HVAC equipment

- **Asset Discovery and Asset Tracking:** Tools to capture assets, their details, relationships and interdependencies.

- **Visualization:** Graphical visualization, tracking and management of all data center assets and their related physical and logical attributes – servers, structured cable plants, networks, power infrastructure and cooling equipment.

- **Provisioning New Equipment:** Automated tools to support prompt and reliable deployment of new systems and all their related physical and logical resources.

- **Real-Time Data Collection:** Integration with real-time monitoring systems to collect actual power usage/environmental data to optimize capacity management, allowing review of real-time data vs. assumptions around nameplate data.

- **Process-Driven Structure:** Change management workflow procedures to ensure complete and accurate adds, changes and moves.

- **Capacity Planning:** Capacity planning tools to determine requirements for future floor and rack space, power, cooling expansion, what-if analysis and modeling.

- **Reporting:** Simplified reporting to set operational goals, measure performance and drive improvement.

- **A Holistic Approach:** Bridge across organizational domains – facilities, networking and systems, filling all functional gaps; used by all data center domains and groups regardless of hierarchy, including managers, system administrators and technicians.

Sunbird

An Introduction to Data Center Infrastructure Management

A comprehensive DCIM solution will directly address the major issues of asset management, system provisioning, space and resource utilization and future capacity planning. Most importantly, it will provide an effective bridge to support the operational responsibilities and dependencies between facilities and IT personnel to eliminate the potential silos.

DCIM at Work in Your Data Center

DCIM at work to help you with daily operations

Perhaps the easiest way to appreciate the value that DCIM can deliver to your data center is to first consider a few simple questions that come up daily in a typical data center. Then ask yourself, how you would answer them and how quickly:


With Sunbird's dcTrack software, your data center floor map can be linked in real-time to an AutoCAD® or Visio floor plan. Any changes made to the CAD background are immediately visible and recog-nized as new objects.

- What servers do we have, where are they and what is their function? How much of their capacity is utilized, what applications run on them and who owns them?

- How are these servers powered and how much power do they use? How are they connected to which networks?

- Are any servers approaching power or heat thresholds that could cause them to fail?

- Do we have a current map of the power chain, network and server dependencies that would tell us what systems or power resources are impacted if a server or circuit fails or a UPS has upcoming scheduled maintenance?

- Do we have sufficient power and network connections to add additional servers in this rack?

- Where do we have sufficient space, power and cooling capacity in the data center today to support new servers/racks required for a new, critical application?

Think about the specific steps you will need to take with your current processes in order to answer each of those questions:

- What data will you need to collect?

- How much time will it take?

- What resources will be required to assemble it?

- How many people will need to be involved, from how many organizational groups? How do youcommunicate with them and coordinate their activities?

- How many trips into the data center will be necessary to validate recorded data and collect additional data?

- Once you have all available data, what additional analysis will be necessary and how much confidence will you have in the accuracy to act upon it?

An Introduction to Data Center Infrastructure Management

With a properly deployed DCIM, you will be able to visualize the entire data center instantly and drill down to any desired level of granularity to answer these and many other questions with just a few clicks of a mouse.
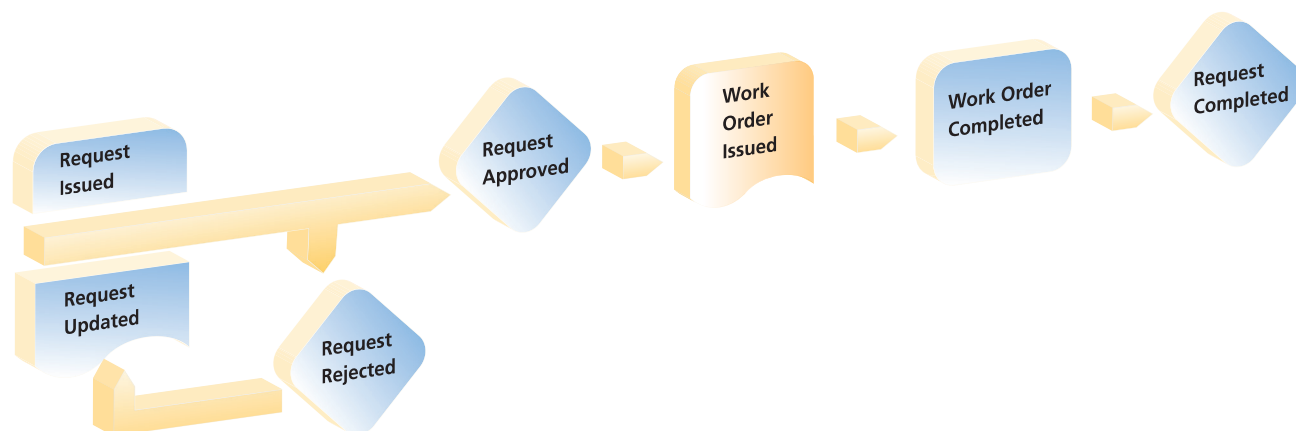
Furthermore, your DCIM can provide you with the automated tools and what-if models to simplify any required system moves or new system provisioning, while taking maximum advantage of existing space, power and cooling capacity.

DCIM at work to help you plan for a better tomorrow
Beyond dealing with the daily tasks and problems, every data center manager has a host of opportunities to improve overall performance, reduce costs and optimize the use of existing resources by means of proactive analysis, planning, action and management. Again, consider a few more questions that, when answered, can lead to operational improvements:

- How can we provision new systems to optimize the use of existing space, power and cooling already in place before incurring major capital expenses for additional expansion?

- Are we basing our power and cooling requirements on de-rated nameplate specs or actual data?

- Do we risk running out of space, power, cooling in the near future or is our power and/or cooling infrastructure over-provisioned and overkill?

- Do we have complete visibility into the entire power chain when we provision additional servers or dowe only see power availability at the rack?

- How do we identify servers or other data center assets out of warranty or in need of maintenance or warranty renewal?

- How do we properly plan, manage and visualize the consolidation of two or more data center sites?

- Will the data center infrastructure support increased utilization from the introduction of virtualization technologies? What alterations will be necessary to prepare for virtualization?

- Is our power and cooling properly provisioned and balanced for efficient, reliable operation?

Once again your DCIM will prove invaluable by collecting, mining and analyzing actual historic operational data. DCIM reports, what-if analysis and modeling will help identify opportunities for operational improvement and cost reduction so you can confidently plan and execute data center changes.

An Introduction to Data Center Infrastructure Management

Getting Started with DCIM

Like any other tool, the value realized from your DCIM product is directly related to the discipline with which it is used by the entire data center staff. Most critical is the initial population and ongoing maintenance of the DCIM database. Some DCIM vendors provide tools that will automate much of the initial discovery and data capture of your assets/infrastructure – physical and virtual systems, cabling and power chain. These tools can import data from your existing spreadsheets and other sources, first validating, matching and synchronizing with the discovered data.

With support from the vendor's experienced data center professionals, you will build a trusted database that becomes the single repository for all domains and levels – systems, network, facilities, managers, system administrators and technicians. This becomes the single pane of glass through which the entire data center staff will look to track and visualize assets, their relationships and performance.

Once the initial DCIM asset database is built, the entire staff must follow best practices for change management to maintain a complete and accurate repository, otherwise the DCIM's value will begin to deteriorate and the system will fall into disuse. Most DCIM vendors provide computer-based tools to facilitate and enforce these processes to expedite workflow and maintain database accuracy. A structured change and work management process can coordinate and track the efforts of the data center staff as they install, configure and provision new services. This provides the tactical "glue" to unite the various data center domains.

Results and Rewards Delivered by DCIM

The rewards for implementing a DCIM solution and establishing processes for its use can be immense. Again, consider the predictions and claims below and determine which present the most immediate opportunities (low hanging fruit) for you:

- Of the 11.8 million servers in the U.S. in 2007, most are running at 15% capacity or less. (Computerworld)

- Close to one-fifth of the servers in a data center are no longer used and should be removed. (Computer Associates)

- Average data centers are hugely energy inefficient. For every 100 watts these data centers consume, only 2.5 watts result in useful computing. (Rocky Mountain Institute)

- The volume growth of IT infrastructure will exceed the available data center floor space for most organizations. By 2011, more than 70% of U.S. enterprise data centers will face tangible disruptions related to energy consumption, floor space and/or costs. (Gartner)

- Gartner recommends raising the temperature of data centers to at least 75° F to lower cooling demands.

- Over 50% of data centers expect to be out of space by 2012. (IDC)

- From January to December 2008, Sprint retired 127 applications, decommissioned or redeployed more than 2,230 servers and freed up 291,042 gigabytes of storage. This translated into $28 million of redeployable assets, a $20 million reduction in operating costs and a reduction of data center–related carbon emissions by 10,450 metric tons. (Sprint)

The claims above highlight some of the possible opportunities for cost savings, resource optimization and facility life extension that your DCIM solution can deliver.

An Introduction to Data Center Infrastructure Management

Call 732.993.4476 or visit **SunbirdDCIM.com**

Sunbird Software is changing the way data centers are being managed. With a focus on real user scenarios for real customer problems, we help data center operators manage tasks and processes faster and more efficient than ever before, while saving costs and improving availability. We strive to eliminate the complexity they have been forced to accept from point tools and home grown applications, removing the dependency on emails and spreadsheets to transform the delivery of data center services. Sunbird delivers on this commitment with unexpected simplicity through products that are easy to find, buy, deploy, use, and maintain. Our solutions are rooted in our deep connections with our customers who share best practices and participate in our user groups and product development process.

Based in Piscataway, NJ, Sunbird serves over 1,850 DCIM customers worldwide. For more information, please visit SunbirdDCIM.com.