



Decrease Costs and Gain a Competitive Advantage By Improving Data Center Infrastructure Management

Data Center Infrastructure Management (DCIM) software will give companies the visibility, control and insight to leverage IT assets to align with business goals.

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Executive Summary

For any organization to be successful in the technology-driven 21st century, its IT arm must align with business objectives and deliver applications efficiently and effectively to better service its customers and employees. And, at the heart of all IT operations is the data center with its complex infrastructure – space, power, cooling, cables, servers, storage and communications. It is capital intensive, energy intensive and technology intensive.

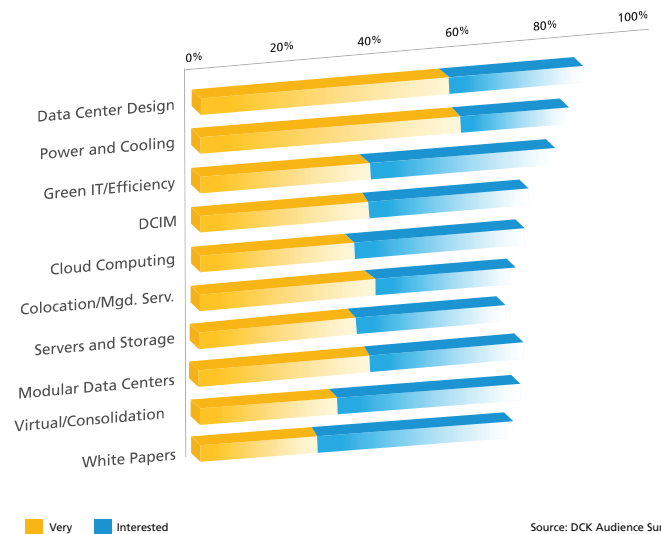
The challenges for both the data center operations management and the organization's executive management responsible for the IT function come from all directions:

- ▶ Minimize risk of downtime
- ▶ Satisfy demand for new applications to facilitate business/revenue growth
- ▶ Satisfy internal user needs as overall organization grows and changes
- ▶ Comply with audits, both internal and government regulatory
- ▶ Reduce/control energy usage/costs
- ▶ Maximize utilization of current resources
- ▶ Improve staff productivity
- ▶ Incorporate processes to address green initiatives
- ▶ Deal with the rate of technological change
- ▶ Live within tighter budget constraints
- ▶ Finance major capital investments

Simply stated, the challenge is to properly align the IT function operation with the organization's overall business plan and operational requirements.

How does the data center operations manager control expense, improve productivity, support new applications, provide reliable service and project future infrastructure needs? How does the organization's executive management set realistic objectives, provide useful guidance and make informed budget and capital expenditure decisions?

Key Topics of Interest to Data Center Managers



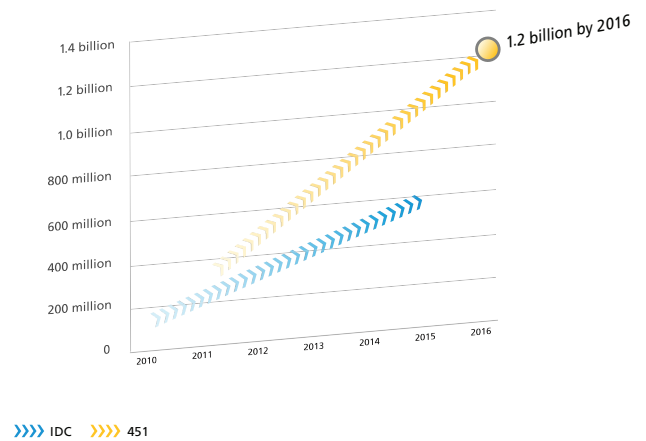
Source: DCK Audience Survey 8/11

DCIM monitors, measures, manages and/or controls data center performance, utilization and energy consumption of all IT-related equipment AND infrastructure components.

Source: Gartner, Jay Pultz, "DCIM: New Tools to Monitor, Manage and Control Power" – 2011

Many organizations have already responded by replacing homegrown tools based on spreadsheets and diagramming software with comprehensive Data Center Infrastructure Management (DCIM) software. A complete DCIM solution collects and maintains accurate data of the data center's assets and provides clear information and reports to manage capacity and help streamline moves, adds and changes. DCIM makes it possible for executive and data center management to set and meet data center performance objectives that support the organization's overall operations. With DCIM software, data center operations managers can clearly identify, locate, visualize and manage all physical data center assets – racks/cabinets, servers, storage, network devices, power and cooling – as well as their connectivity. With the help of DCIM software, they can simply provision new equipment, measure and reduce energy costs, improve productivity and confidently plan capacity for future growth.

DCIM Growth



The 451 Group, an industry market research firm, says, "As data centers become bigger, denser and more complex, it is clear that the most adaptable, economically sustainable and eco-efficient facilities will be those using advanced infrastructure management software. The DCIM market is worth roughly \$240m in 2011, and will grow to \$1.2b in 2016."¹

This projected growth is no surprise. Early DCIM adopters claim a competitive advantage in delivering applications and services to its customers and employees more efficiently and effectively to support business objectives, and others will quickly follow. Furthermore, it is clear that DCIM software can be just as valuable for organizations with mid-size data centers with as few as 25 racks, where accurate, up-to-date information from DCIM reports and power/capacity projections can compensate for their lack of technical resources normally available to those with larger data centers.

1. The 451 Group – Datacenter Infrastructure Management Software: Monitoring, Managing and Optimizing the Datacenter, May, 2011

Data Center: Most Critical Component of 21st Century Organization

The data center has become the metaphorical heart of any 21st century organization. The modern data center provides the basic infrastructure to deliver all IT applications and services to customers and employees. While some industries and organizations are more dependent on automation than others, the fact remains that without an effective and efficient data center, no organization today can survive, let alone successfully compete.

In all organizations, the data center is responsible for some combination of:

- a. Directly generating revenue,
- b. Delivering the applications to customers that generate the revenue, and
- c. Providing the services to employees that drive the organization.

It is impossible to overstate how essential the data center is to the well-being of any company today. Just consider the cost, the loss of revenue, the internal dislocation, not to mention the damage to customer relationships and corporate image that 60 minutes of outage would create. Typical estimates are \$1,000,000/hour, far more costly than a similar outage occurring in any other operating function. Those organizations that can maintain maximum data center availability and improve the effectiveness and efficiency of the basic data center infrastructure will have a competitive advantage.

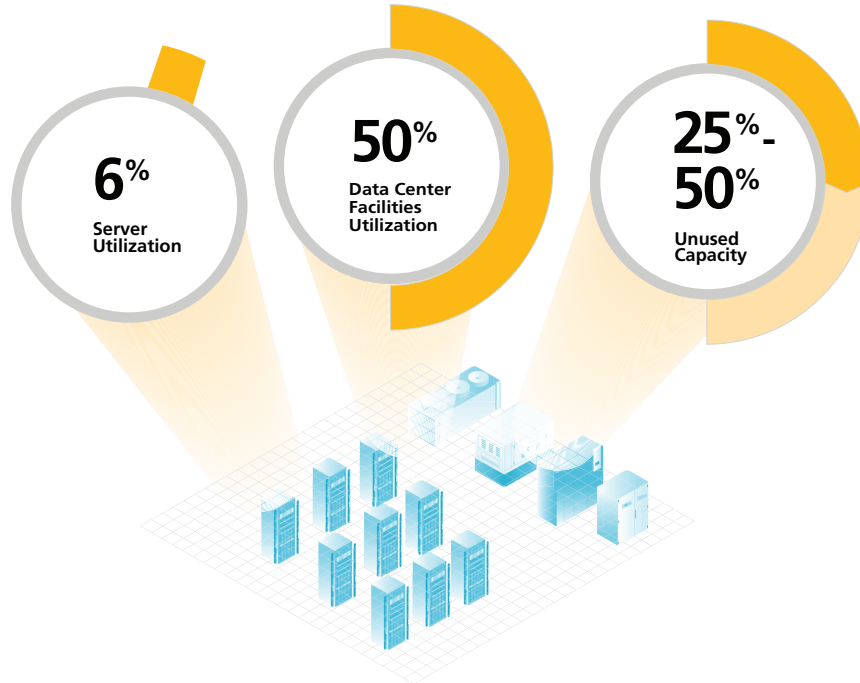
Challenge for IT and Executive Management

The data center is a highly technical, complex and relatively new component of the organizational structure. As a result, the responsible corporate executive may not have the experience, tools and information to provide necessary controls and direction. In fact, most other corporate functions are managed with the help of timely, accurate reports on operational status and performance. They are also measured against established baseline metrics and objectives using standard processes (consider manufacturing, sales or distribution). However, this has not generally been true of the data center.

Since data center availability is critical to the organization's success, the common commandment from upper management is, "We want 100% availability." So, with little reliable data to act upon, the typical approach to data center "management" has been over-provisioning of resources – servers, storage, power, cooling, with redundancy of 50% above peak capacity requirement. This represents not only an enormous and unnecessary waste of resources and money, but also results in unacceptable inertia which discourages improvement – after all, the outside world is being served and not complaining. Even worse, when it appears that present data center capacity will soon reach its limit, companies may elect to finance a multimillion dollar capital investment to expand, build or acquire additional capacity, often unaware that the existing data center holds an additional 25-50% of unused capacity. In fact a report by McKinsey & Company concluded that most servers are used at just 6% of their capacity, and data center facilities as a whole are used at 50% of their capacity.²

2. McKinsey & Company – Revolutionizing Data Center Efficiency, 2008

The Underutilization of Resources in Data Centers



The above issues are further complicated by internal audit requirements, regulatory legislation regarding energy/carbon reporting and compliance, rising energy costs, ongoing technological innovations such as blade servers, high-density racks, virtualization and dynamic provisioning, not to mention the practical task of integration/communication of/between IT and facilities functions.

So the challenge for both data center operations management as well as corporate management is how to set and measure performance objectives, deliver quality service, plan and support future growth and deal with new technology and regulations, while at the same time controlling costs by improving productivity, reducing energy usage and getting the most out of existing resources.

Successful Companies Meet the Challenge with DCIM

IT management has long recognized the need for a way to keep track of data center assets and most have developed homegrown, manual tools using software like Excel® and Visio®. However once the data center grows beyond 25 racks, the use of these tools becomes increasingly unwieldy and problematic. A few years ago, data center professionals, understanding what was needed to manage a complex data center, began to develop a comprehensive set of tools and processes that have evolved into today's DCIM products.

A modern DCIM solution is comprised of a data base, which becomes the single, trusted repository of all assets, their attributes and their relationships plus the software tools to discover, document, visualize and report on physical and virtual data center assets – e.g., floor space, racks, servers, PDUs, UPS, panels, storage, network equipment and cables. Most DCIM products will include automated functions to facilitate building and maintaining

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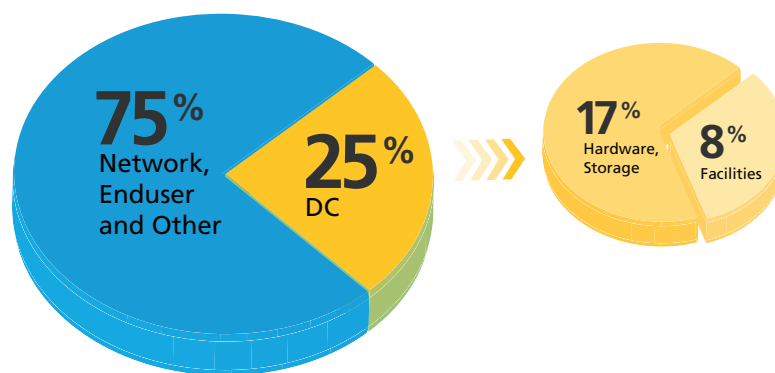
the data base. They will also provide automated processes for all users to manage the entire cycle of all changes with complete audit trails to ensure the continued accuracy of the data base. In addition, most DCIM products will interface with monitoring tools to collect data on power usage to ensure that conditions for potential system failures (e.g., overloading power circuits) are avoided.

Once DCIM software is properly deployed, data center operations managers can work confidently and efficiently to maintain a reliable and cost-effective infrastructure, as well as project future capacity and resource needs. At the same time, DCIM software provides accurate and timely reports on data center assets and activity, allows for prompt compliance to internal audits and governmental regulations and supports “what-if” analysis to properly plan for future data center projects. Equally important is that executive management will have an objective means to set benchmarks and establish repeatable processes for objectively measuring data center performance.

How DCIM Software Can Make a Difference – ROI and More

McKinsey & Company has estimated that operation of the corporate data center consumes 25% of the IT budget,³ (plus an additional 15% for network LAN/WAN making it an obvious target for improved efficiency and cost reduction). As we have already seen, reliable operation of the data center is vital to the success of any organization, but achieving a cost-effective result requires the use of sophisticated tools to deal with its complexity, just as we do in all other areas of the business. A robust DCIM product will satisfy most data center management requirements, and its positive ROI impact will be both immediate and long term. Below we briefly discuss just a few key DCIM applications and the immediate direct and indirect cost benefits that users have experienced.

Data Center Expenditures Are Typically a Quarter or More of Total IT Costs for Large Enterprises



3. McKinsey & Company – Revolutionizing Data Center Efficiency, 2008

Asset Management

For each of the hundreds and likely thousands of physical assets in your data center, there are many pieces of information you need to know – exactly what is this physical asset, where is it, what is it doing, how often, how many ports does it have, what are they connected to, how much power does it draw, from where, and much more. Until the advent of DCIM, this data was typically stored and maintained manually in an Excel spreadsheet and managed with some homegrown applications. There have been many studies showing that at any given point in time, almost 75%⁴ of manually-managed data is inaccurate. Further, at most data centers there could be hundreds of equipment changes a month, further affecting the accuracy of this data. This situation alone creates a host of unnecessary costs, inefficiencies, productivity losses and potential downtime risks that a DCIM solution will eliminate.

Data Center Audits – Whether complying with regulations such as Sarbanes-Oxley, HIPA and CFR-11, or organizational procedures, IT equipment audits are required at least annually and usually more often. When a DCIM solution with its complete, single repository and controlled processes replaces a homegrown system based on spreadsheets and manual processes, there is complete confidence in the accuracy of the data. Physical IT equipment audits which in the past would have entailed man-weeks of labor costing \$30,000 for a 200 server data center (average cost for recording minimum asset data is \$15/server) will be performed automatically and routinely in minutes.

Change Management

Your DCIM system will control, track and document the entire change cycle from initial request to final deployment for all users to both ensure the accuracy of the data and also optimize the performance of the change. DCIM can identify the best choices for available rack space, power and cooling to facilitate provisioning new systems, as well as potential impact on related systems – and eliminate most of the time and cost associated with the manual process of physically finding, verifying, approving and documenting the proper location for new systems and all of their connections. Automation of the change process will save hundreds, even thousands of dollars for each of the data center's changes.

New Application Rollout. Beyond the scores of monthly change requests, data centers will occasionally be challenged with a critical deadline for supporting the launch of a new organizational revenue-generating or service application, requiring the addition of dozens of servers, network equipment, power, etc. DCIM can reduce the overall time for accurate provisioning of these new systems from months to days.

Increased Availability (Reduced Downtime/MTTR). Data center downtime has been estimated to cost an average of \$1,000,000/hour in lost revenue and productivity. It is estimated that 80% of outages are due to changes and that 80% of MTTR is tracking exactly what was changed and the overall impact; then once the cause of any failure is identified, every minute spent locating the physical problem device can cost tens of thousands of dollars. DCIM's change management processes will eliminate many of the change-creating failures and its change audit trail can dramatically reduce the time to diagnose and identify the root cause of the failure. Moreover, technicians using DCIM can immediately visualize not only the actual device location, but all the related cabling, PDUs and systems that may be affected. This clear picture can guide technicians to a prompt and reliable resolution of the problem in a fraction of the time of the previous manual system saving hundreds of thousands or dollars.

4. Rick Schuknecht, The 451 Group Uptime Institute, June 2011

Capacity Management and Planning

With the costs for raised floor data center space ranging from \$1,000-\$2,000/sq. ft., a new 25,000 sq. ft. data center represents a \$25-\$50 million+ capital investment. That's the bad news, but there is some good news. Most every data center is concealing almost as much capacity – rack space, servers, power, HVAC – as is being used. This is no surprise since most data centers have expanded, in some cases chaotically, to support increased user demand without the benefit of sophisticated tools like DCIM to manage the growth. This has resulted in considerable excess capacity just waiting to be reclaimed. The goal, of course, is to uncover and use that capacity efficiently without creating potential problems.

Data Center Visualization, Reports – Reclaiming Capacity. For all new DCIM users, for the first time they will be able to have point-and-click access to visualize and identify every physical asset in the entire data center; i.e., where each rack is located, what device is installed in each rack elevation, how each device is powered and connected in the network. This visualization alone offers managers a new perspective and confidence to understand what they have and what low hanging fruit is available for improvement – empty open rack space, excess PDU capacity and network connections. DCIM tools will also enable you to “drag and drop” servers into empty rack space and quickly search for necessary power, HVAC and network resources that are available and avoid possible circuit overloading. Detailed reports provide information on all items present in racks, cabinets and ports with exact information about capacity that will help avoid over or under utilization.

Power Consumption/Reduction. All server manufacturers provide nameplate information on peak power load, a conservative number which will be far greater than actual power requirements. Many data center managers, without automated tools like DCIM, will use this nameplate data as a guide for server-PDU connection and therefore minimize the number of servers supported within a rack and a PDU, resulting in a significant, unnecessary waste of money and energy. Merely adopting an industry-accepted standard of de-rating nameplate power by 30% and using DCIM to measure and manage the effect will increase the number of servers supported by a PDU by 37% with corresponding savings in floor, rack and PDU costs while maintaining quality service levels.

Data Center Expansion, Consolidation Modeling – Once you have a complete, accurate representation of all data center physical assets, both IT and executive management will have the confidence to establish operational benchmarks, performance goals and procedures for measuring improvements towards maximizing the use of existing data center capacity. Ongoing DCIM controls and reports will facilitate the alignment of the IT function with the organization's overall business plan, which may result in data center expansion and/or consolidation. DCIM modeling tools with sophisticated “what-if” scenarios enable IT management to “build and layout” the entire data center and then work with executive management to smoothly plan, finance, manage and complete the project.

Advanced (Integrated) Energy Monitoring and Management

There are constant reminders how data center growth and increasing floor/rack density are creating energy-related issues both in the US and globally:

- ▶ Data centers consume 1.5%⁵ of the total power usage in the United States and the lack of power generation capability in many urban areas is limiting IT and business expansion, even causing companies to relocate data centers.
- ▶ A survey of 525 data center owners and operators in the US indicated that 97% surveyed consider energy efficiency to be a priority.⁶
- ▶ A medium-size data center can generate 10,000 metric tons of carbon per year due to the power it uses, adding to worldwide concerns about pollution and global warming.
- ▶ Cooling systems now represent 50% of data center total power and for many industries is impacting the overall business model.⁷
- ▶ In 2010, energy costs associated with operating an 8,000 square foot data center were \$1.6 million/year in North America.⁸
- ▶ The annual cost for powering and cooling the average server now exceeds the original server cost and that server will emit several tons of greenhouse gasses each year.

Obviously, governments along with corporate and IT management have a common interest in controlling data center energy usage and costs. Not surprisingly, a recent Gartner study identified *energy efficiency and monitoring* as the #3 IT trend for 2012.⁹ Government regulations, corporate initiatives and focused IT projects have all had varying degrees of success, but real progress has been hampered by the lack of an integrated set of tools and processes to measure and manage all energy usage and confidently take the necessary steps to make a significant impact.

Advanced (or Integrated) Energy Monitoring and Management. Major data center power distribution and HVAC equipment have always been equipped with manually read or even computer accessible usage meters. As discussed above, all DCIM products will use this static data along with de-rated server manufacturer nameplate data to help IT managers make realistic judgments in provisioning power. This is a good first step in an iterative process, but only in recent years has there been a confluence of the necessary technologies to efficiently and reliably measure, manage and control energy usage. IT managers now have the benefit of intelligent PDUs, which power, control and monitor the connected end-point equipment like servers and network components, software to collect and consolidate energy usage over all components of the entire power chain – and advanced DCIM products that can capture this data and integrate it with its data center asset data base for visualization, reporting and analysis.

5. EPA Report on Server and Data Center Energy Efficiency, August, 2007

6. Uptime Institute, Data Center Industry Survey – June, 2011

7. Gartner: How to measure energy consumption in your data center, Sept. 2010

8. Gartner, DCIM Going Beyond IT, March, 2010

9. Gartner: 10 Key IT Trends for 2012, October, 2011

Only with actual, dynamic power usage data for each piece of data center equipment over appropriate periods of operation, is it possible to fine-tune power distribution to eliminate the risks of circuit overloads and make the changes to significantly reduce power usage. This is especially critical for data centers that employ server virtualization. An advanced DCIM product will enable you to visualize the entire power train from the rack to the primary UPS, see the usage and pinpoint potential imbalances and waste.

Since most power waste and therefore usage/cost reduction opportunities occur at the end-point server, an advanced DCIM product will help identify “ghost” servers that are turned on but are idle (an idle server will draw upward of 65% of its nameplate wattage); it will show underutilized servers that are prospects for consolidation or virtualization; servers that can be put to sleep for extended periods of inactivity and indicate inefficient servers that are best prospects for replacement with newer, high-efficiency systems. Finally, remember that for every watt of power that a server draws, more than a watt of power is consumed by the HVAC units to cool it, so that every watt of usage reduction earns a cooling reduction bonus.

Beyond this, for any IT organization that employs a chargeback, cost allocation, or incentive system for data center users, DCIM’s clear and realistic documentation and recommendations will receive the organization’s buy-in, promote accountability and reinforce the commitment to further control power usage and costs. The numbers say it all: The 2007 EPA report on data center energy use suggested that 40% improvements in energy use are possible across data centers on average and a 1MW US data center that uses management software to reduce energy consumption by 10% could save \$433,500 over five years.¹⁰

Conclusion and Next Steps

Every CEO and CFO knows that the status quo is never acceptable. If new, proven solutions are available, then both the immediate and long-term rewards will provide a competitive advantage to those to act. Data Center Infrastructure Management (DCIM) solutions are now being implemented by companies across all industries, *regardless of size*. In fact, a recent IBM survey of hundreds of mid-market companies in 20 countries worldwide reported that 75% of the surveyed companies ranked *IT infrastructure improvements* the highest, specific, critical business priority planned for 2011, while *increasing efficiency and improving productivity* were the top priority overall goals.¹¹ This is a clear pronouncement for urgency to investigate how DCIM can bring transparency, order, productivity, efficiency and ongoing quality service to your data center, maximizing the use of its resources.

As your organization begins to explore DCIM solutions, we encourage you to consider Raritan’s dcTrack® – a data center capacity, change and asset management solution. Raritan is a longtime industry leader in providing advanced technology products for data center management. Raritan’s brands include the PX® family of intelligent PDUs and the Power IQ® data center power and energy management software. Raritan’s data center capacity, change and asset management solutions include AMT, AMS and EMX and the award-winning dcTrack. Raritan’s products have always distinguished themselves as easy-to-use and best-in-class performers.

10. The 451 Group: Eco-efficient IT, June, 2009

11. IBM – Inside the Mid-Market, a 2011 perspective, Jan. 2011

About Raritan

Raritan is a proven innovator of power management, infrastructure management, KVM and serial solutions for data centers of all sizes. In more than 50,000 locations worldwide, Raritan's award-winning hardware and software solutions – including intelligent rack PDUs; energy management software; DCIM software solutions to effectively manage data center capacity, assets and change; KVM-over-IP and Serial-over-IP access products – provide IT and facility directors, managers and administrators with the control they need to increase power management efficiency, improve data center productivity and enhance branch office operations. Based in Somerset, NJ, Raritan has offices worldwide serving customers in 76 countries. Visit us at Raritan.com or follow us on the Raritan blog. Raritan is an active member of the Green Grid, Climate Savers Computing Initiative and the Leadership in Energy and Environmental Design associations. The company was recognized by the EPA for its contribution to the agency's data center initiative.