Achieving a New Level of Data Center Performance

Optimizing Availability, Capacity and Efficiency with Emerson Network Power's DCIM Solution

NER DATA CORPORATION

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888.637.3282   www.nerdata.com

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Executive Summary

The Business Issue

Enterprises require high-performance data centers to ensure that critical business applications are available around the clock. But as data centers have increased in their complexity and density in order to accommodate growing business requirements, tools for monitoring, measuring and enhancing data center performance have not kept up. Isolated and fragmented, these tools do not provide real-time data, nor make clear the relationships and dependencies between devices. IT and facilities staffs are forced to rely on time-consuming manual calculations or cumbersome integrations between monitoring systems to determine the health of the data center and make decisions—all of which adds up to more errors, inefficiency, downtime and wasted capacity.

The Solution

In the last five years, data center infrastructure management (DCIM) has emerged as a discipline for managing critical infrastructure. DCIM promotes centralized data collection in order to gain a single source of truth for planning and management in the data center. The goal is to aid the decision-making process by providing accurate, real-time information in a useful and meaningful way. DCIM offers a route to integrating facilities and IT operations, enabling communication and collaboration between these organizations that lead to optimized performance, capacity and availability.

In response to the need for a robust DCIM solution, Emerson Network Power has introduced the *Trellis™* real-time infrastructure optimization platform. Uniquely, this platform offers unprecedented, real-time visibility into the entire infrastructure, providing context for all the information collected so that data centers gain an accurate understanding of performance. The *Trellis* platform gathers and aggregates millions of data points for every infrastructure device, filtering and presenting relevant and meaningful data in ways best suited to the individual data center user.

The Benefits

Forrester has cited Emerson Network Power as one of the two dominant suppliers in the DCIM market.[i] With the *Trellis* platform, organizations gain a single, comprehensive solution for unified management of their infrastructure that enables IT and facilities organizations to:

• Maintain high availability with the ability to recognize dependencies and understand performance in real time, predict the impact of change and automate complex event management and alarm notifications.

• Maximize efficiency with a comprehensive inventory of every asset's floor or rack position, role-based user interfaces that simplify the use of detailed data and a unified view of the data center that facilitates collaborative planning.

• Optimize capacity with accurate insight into current usage, real-time, trend and historical change tracking and the ability to preview the impact of change before it is made.

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Introduction

For most enterprises, the performance of the data center is now mission critical. Business operations—and the success and competitiveness of the organization—depend on 24/7 availability of applications and systems. To support the increasing demands of the enterprise, data centers have become denser and more complex. Combined with the critical importance of availability, this complexity and density has had two important effects on data center operations:

- Time is of the essence. There is less time for data centers to react when problems occur as essential business operations can be brought to a halt whenever an application or system goes down. High density increases the risk, since an outage in one rack with clusters of virtual machines may impact several critical applications. Change planning is equally time-pressured with changes needing to be made as fast as possible in order to minimize disruption.

- Understanding the complex relationship between physical and virtual assets has become more difficult, making it harder to diagnose and fix problems. Adoption of virtualization, cloud computing and automation at the IT level means that IT and facilities not only need to effectively monitor and control their respective data center assets, but also coordinate their actions so as not to adversely impact each other.

Unfortunately, IT and facilities organizations are struggling to effectively and efficiently manage complex data centers because typical monitoring and management tools are isolated and fragmented. Consequently, data centers do not have access to the detailed, holistic data they need to understand the relationships and dependencies between assets. Nor do these tools provide real-time data that shows how assets are actually functioning.
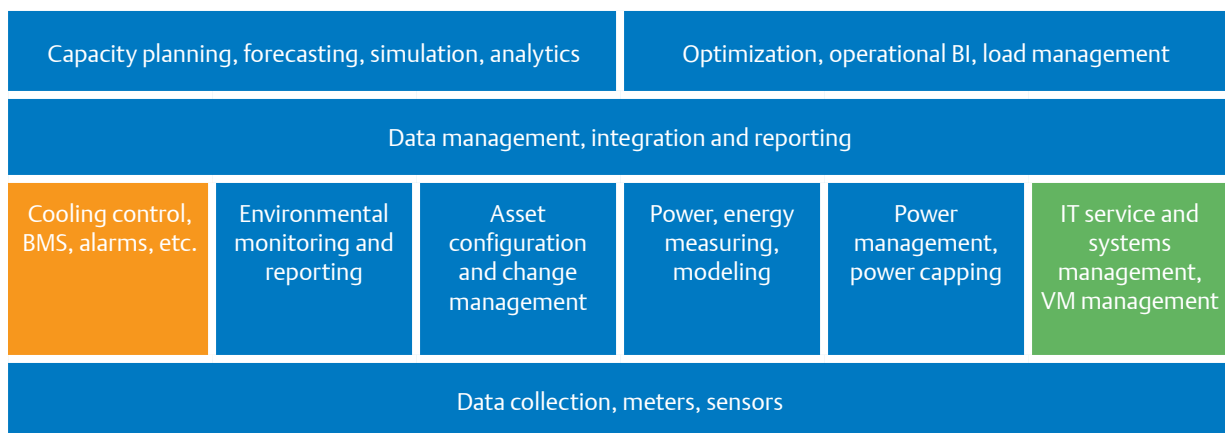
> "At a typical cost in the range of several hundred thousand dollars, it is likely that DCIM will pay for itself in about two years for a 5,000-square-foot data center—given its potential to reduce energy and other operational costs."
>
> "More than Half of Data Center Managers Polled Will Likely Be Using DCIM Tools in 2013," Gartner, 3/12

To compensate for these gaps, IT and facilities staffs are forced to sift through bits of data manually or engage in cumbersome integrations; either way, the propensity for errors, inaccuracy, downtime and wasted capacity increases substantially.

The Emerging Discipline of DCIM

In the last three years, forward-thinking IT organizations have recognized the need to view data center infrastructure as an ecosystem of interconnected parts. They have realized that without complete and accurate information about the physical infrastructure (such as performance, component dependencies and capacities), planned initiatives cannot be executed efficiently and sustained over time.

Capacity planning, forecasting, simulation, analytics		Optimization, operational BI, load management			
Data management, integration and reporting					
Cooling control, BMS, alarms, etc.	Environmental monitoring and reporting	Asset configuration and change management	Power, energy measuring, modeling	Power management, power capping	IT service and systems management, VM management
Data collection, meters, sensors					

In response, DCIM has emerged as a discipline for managing critical infrastructure. DCIM centralizes the collection of infrastructure data in order to deliver a single source of truth for planning and management. According to Forrester Research, "[DCIM] offers data center operators the ability to take a holistic look at their entire physical data center environment and to not only understand what is happening in real time but also make intelligent decisions about future changes and investments." Similarly, Gartner sees DCIM as central to data center operations, predicting DCIM tools will become "a key part of the data center manager's arsenal during the next few years."[ii]

While there is not a universally agreed upon definition of what DCIM tools need to deliver, the 451 Group has developed a well-regarded reference stack that outlines the capabilities needed for a robust solution.[iii]

This framework integrates facilities and IT operations, enabling a cross-domain management strategy that is built on a foundation of intelligent infrastructure, is run by performance metrics and is tightly integrated with IT operations. By operating within this framework, organizations can maintain high availability and control costs in distributed, traditional and hybrid data centers.

Holistic, Real-Time Data Center Management with the *Trellis™* Real-Time Infrastructure Optimization Platform

Emerson Network Power has designed the *Trellis* real-time infrastructure optimization platform as a DCIM solution that mirrors how data centers actually work, rather than merely forcing change to compensate for the gaps created by managing with multiple point products. True to the principles of DCIM, the *Trellis* platform provides a single solution for unified management of IT and facilities infrastructure. The *Trellis* platform combines both hardware and software in order to gather data from every infrastructure device including Windows, Linux and UNIX servers, storage and serial devices, service processors, rack/environmental sensors, data center power units, cooling units and power distribution units (PDUs).

However, the *Trellis* platform is not simply a mechanism for collecting data. The platform provides three unique capabilities that enable IT and facilities to take action based on real-time information in order to maintain high levels of availability and optimize capacity, while operating at the lowest possible cost.

Real-Time Data

Typically, data center managers are forced to make decisions on historical data. But, as the well-known adage for the stock market goes, past performance is no predictor of future results. The same

> *"Over the past decade, data centers have been mostly managed using a loose collection of proprietary monitoring systems, custom-built software and simple productivity tools. Emerson's Trellis hardware and software platform has a uniquely integrated approach, providing visibility across all IT and facilities systems and enabling managers to optimize their performance while delivering enterprise-class scalability and performance."*
>
> – Andy Lawrence, Research Director, The 451 Group

is true for data centers. Instead of integrating with other monitoring or polling equipment to gather historical data, the *Trellis* platform collects, aggregates and analyzes data in seconds by connecting natively to each device. With real-time performance data, IT and facilities can know exactly what is taking place at any given moment and can model the impact of planned change to understand the consequences immediately.

Detailed Data in Context

The *Trellis* platform gathers and aggregates millions of data points from distributed environments and heterogeneous equipment. To make this level of detail useful and meaningful, it places the data in context so that the real performance can be understood.

For example, in addition to configuration and inventory data, the platform maintains performance data for each asset. Using this information, it applies rules to discern previously undetected patterns and trends and presents the information in context. This context allows IT and facilities to immediately grasp the true health of the infrastructure, what impact proposed changes will have on performance and how to fine tune components and zones to maximize efficiency. Once decisions have been made, a user can then execute an action from the *Trellis* platform interface and view the impact of those changes in real time.

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Usability

Emerson Network Power has specifically designed the *Trellis™* platform with the user's experience in mind. Because the platform's design is based on uses cases and interviews with real data center operators, managers and executives, the interface filters and presents information to support each role as illustrated in the following table.
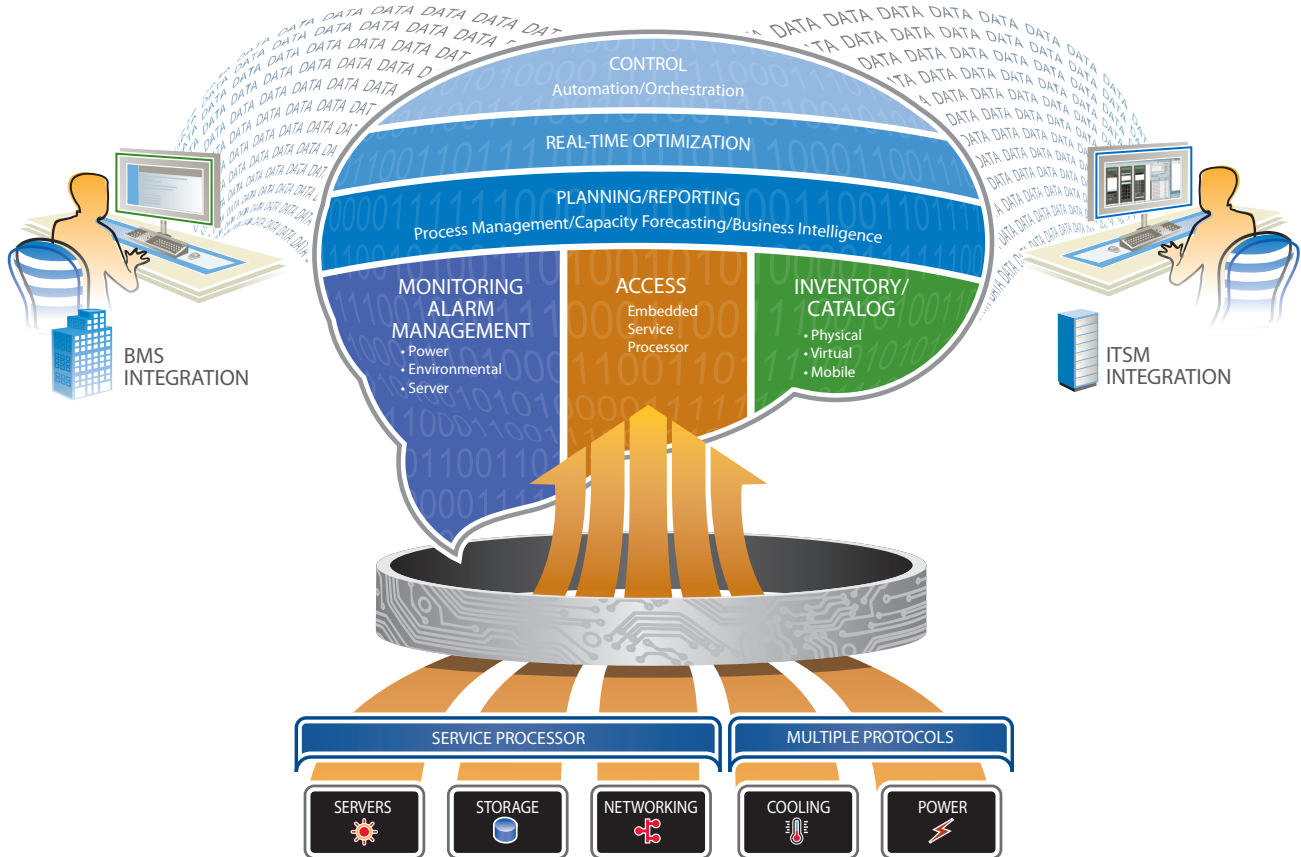
Data Center Role	*Trellis* Platform Capability
Facilities managers need power and cooling data in order to maintain uptime and forestall outages.	The *Trellis* platform provides access to real-time monitoring data as well as a graphic visualization of where alarms are occurring. Remote access to any device, including server consoles and PDUs, enables faster response to overheating or power failures.
Network and security administrators strive to prevent network or WAN outages.	With the complete data center inventory within the *Trellis* platform, administrators can quickly generate and review network usage reports to know where servers are located and to recommend changes. User-defined automated alarms provide immediate knowledge of any security issues.
Lab administrators use many different types of hardware and appliances and must react quickly to get products delivered on time.	The *Trellis* platform provides a single application for accessing and controlling all devices, which makes it easy to locate servers, check the status of lab equipment and provide multiple users with access rights to consoles.
Data center managers need a greater ability to understand the impact of change and how to optimize space usage.	With the capacity planning capabilities of the *Trellis* platform, managers can quickly map and monitor devices, streamline the process of predicting placement, visualize how space reservation will impact capacity on a specific rack and share plans with both IT and facilities staff to avoid collisions.
Data center executives need to align initiatives with business goals, exert greater control over operations and maintain uptime.	The *Trellis* dashboard provides a real-time, global view of all data centers, while capacity roll-up reporting helps executives quickly identify areas requiring attention or where expansion is likely to be needed.

The *Trellis™* Platform Intelligent Architecture

The common platform services lie at the heart of the *Trellis* platform. These services provide the functional intelligence of the platform, enabling communication between hardware and software. Combined with the Avocent® Universal Management Gateway appliance (see Scalable Infrastructure Monitoring with the Avocent® Universal Management Gateway section below), the services facilitate real-time and intelligent communications within the entire infrastructure in order to provide meaningful business intelligence about the data center's performance.

The common platform services include three key components:

- *Platform Engine* – Delivered through the Avocent® Universal Management Gateway appliance, the engine is responsible for polling and collecting data from all the managed elements in a data center. The engine eliminates the need to use multiple, disconnected monitoring systems as it provides a single point for monitoring every data center asset.

- *Event-Driven Processing* – Collects, aggregates and stores the real-time data, sending data to the platform's software application as requested. Event processing alleviates the need to manually monitor or correlate data in order to know when an action is necessary. Staff can set up conditions for automatic actions, such as asking for a notification or automatically taking a specified action whenever a series of events occurs. With event-driven processing, the *Trellis* platform can even predict events before they occur and take corrective action.

- *Platform Services* – These web services pass the data to the *Trellis* platform's database. However, this is not simply an indiscriminate "data dump." These intelligent services filter the data, determining how a specific piece of information from a device should be used and by whom. For example, the services can determine that specific data is critical enough to warrant an alarm or that it simply needs to be sent to a repository for later reporting. As a result, the services deliver the right data at the right time to the right resource, while providing confidence that all the data is available for use at any time.

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Trellis™ Software Components

The *Trellis* platform includes a suite of components that helps IT and facilities meet the critical need to maintain availability, maximize efficiency and optimize capacity as follows:

Inventory Manager

Provides an accurate and complete model of data centers, the knowledge of where devices and equipment are located, the relationship between components and how many resources are being taken up by data center equipment.

Benefits:
- Improve personnel efficiency, device planning and management with a single source of truth.
- Quickly determine how much capacity (power, cooling, weight and space) is available and consumed at any point in the data center.
- Match available resources with device requirements and calculate the impact of placement on underlying resources to ensure capacity thresholds are not exceeded.
- Reduce risk with mapping and visualization of critical power/data connection paths that highlight dependencies.

Change Planner

Ensures installs, moves and decommissions are planned, tracked and communicated to team members in a consistent manner.

Benefits:
- Eliminate costly rework by seeing the impact of proposed changes before committing resources.
- Defer capital expenditures by loading infrastructure based on actual loads as opposed to modeled values.
- Comply with auditing requirements with a detailed record of changes made and the owner for each change.

Site Manager

Reports on the health of the infrastructure, enabling data center staff to recognize and resolve conditions that impact availability and system performance including power, cooling, temperature, humidity, airflow and leaks.

Benefits:
- Reduce the risk of unplanned downtime with user-determined thresholds that focus only on those alarms that need attention.
- Improve accuracy and speed of decisions with data normalization that eliminates manual aggregation and interpretation of data from different devices.
- Proactively resolve complex issues, before alarms are generated, with comprehensive historical trending that shows performance data in the context of the operation.
- Improve mean time to repair (MTTR) with a graphical representation of where an alarm is being generated.

Energy Insight

Provides visibility into the energy consumption and operating efficiencies via a visual dashboard.

Benefits:
- Accurately calculate consumption and costs with current and historical efficiency metrics.
- Maximize energy usage, reduce utility costs and support green initiatives with configurable data collected continuously, daily or monthly.
- Rapidly understand power usage effectiveness and data center infrastructure efficiency with visual graphics.
- Streamline maintenance by adding and removing equipment from a single interface.

Scalable Infrastructure Monitoring with the Avocent® Universal Management Gateway Appliance

The *Trellis™* platform is complemented by the Avocent Universal Management Gateway appliance which provides an intelligent communication portal to all the devices in a data center. This single appliance eliminates the need to maintain multiple types of monitoring systems. It fills the role of five separate products and uniquely provides features of KVM, serial console, embedded service processor, device data collection/monitoring, physical environmental and sensors/security. These capabilities simplify overall monitoring and management tasks, streamlining the process through one convenient, easy-to-use device.

One of the distinctive capabilities of the Avocent Universal Management Gateway appliance is its *Trellis* intelligence engine, which means that all the data gathering and processing takes place within the appliance. Placed strategically in data center racks, the appliance processes and communicates natively with the devices on the same subnet. As a result, it uses significantly less bandwidth to gather and transmit data, enabling efficient scaling to manage rapid growth in devices and data collection.

The built-in intelligence also facilitates remote access and control. The appliance provides secure, out-of-band access to connected devices, regardless of the operational state of the device's networking or operating system. Simple, browser-based sessions provide connection to an end device with appropriate tools for triage. Because the Avocent Universal Management Gateway appliance provides the connections and administrative capabilities to set up, maintain and monitor multiple data center environments located anywhere in the world, IT organizations can increase productivity, reduce MTTR and eliminate the need to maintain staff in disaster recovery locations.

Conclusion

Forrester states that Emerson Network Power is currently one of two dominant suppliers in the DCIM market.[iv] There is good reason for this. Through its decades of leadership in solutions for asset, power, cooling, infrastructure management and embedded firmware, Emerson Network Power has leveraged a wealth of expertise and understanding about data center management to build the *Trellis* platform.

To realize the value of the DCIM discipline, data centers need a solution that goes far beyond just an easy way to collect data from the infrastructure. By delivering complete, real-time data in context, the *Trellis* platform offers the reliable and consistent insight needed to drive high efficiency and capacity without compromising availability. No other DCIM solution on the market today offers this level of performance in a single intelligent platform.

[i] Market Overview: Data Center Infrastructure Management Solutions, Richard Fichera, Forrester

[ii] "DCIM: Going Beyond IT", Gartner

[iii] "DCIM: Monitoring, Managing and Optimizing the Datacenter", 450 Group, 5/11

[iv] Market Overview: Data Center Infrastructure Management Solutions, Richard Fichera, Forrester

About Emerson Network Power

Emerson Network Power, a business of Emerson (NYSE:EMR), is the global leader in enabling Business-Critical Continuity™ from grid to chip for telecommunication networks, data centers, healthcare and industrial facilities. Emerson Network Power provides innovative solutions and expertise in areas including AC and DC power and precision cooling systems, embedded computing and power, integrated racks and enclosures, power switching and controls, infrastructure management and connectivity. All solutions are supported globally by local Emerson Network Power service technicians. Aperture® and Avocent® solutions from Emerson Network Power simplify data center infrastructure management by maximizing computing capacity and lowering costs while enabling the data center to operate at peak performance. For more information, visit **www.Aperture.com, www.Avocent.com** or **www.EmersonNetworkPower.com.**

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