

Pragmatic Approach to Data Center Management – Control and Manageability

An ENTERPRISE MANAGEMENT ASSOCIATES® (EMATM) White Paper
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Executive Summary

A flood of IT innovations such as data center virtualization, optimization and automation, while greatly beneficial, have also brought diverse solutions and physical and virtual challenges to today's data center infrastructure. The best response to these new challenges is effective IT management. Effective IT management requires a vendor-independent platform and centralized data center management capability. ENTERPRISE MANAGEMENT ASSOCIATES® (EMA™) analysts explore a pragmatic view of data center management in order to deliver the best practices in real-world data centers for over-arching management solutions. This will enable interoperability of managed entities across physical and virtual boundaries and help IT to control costs and manage diverse, complex technology environments while achieving core objectives for availability and security.

Pragmatic Data Center: Findings and Challenges

Complexity of Data Center Management

Based on recent research, EMA found that the typical data center is highly heterogeneous, running a mix of operating systems, hardware, storage, network devices and applications, sometimes in multiple geographic locations. It often runs more than 300 servers in each of two to three data centers globally, supporting more than 5000 desktops, and is supported by approximately 11 IT staff in total just to manage day-to-day data center operations. This complexity creates challenges in managing infrastructure access and control of the data center, resulting in operation and management concerns in availability and security. Data Center Pulse (DCP) (www.datacenterpulse.org), an organization of IT practitioners, created a practical model for a standardized data center stack framework, representing common building blocks that make up typical data centers in real world. It was developed as a common approach to unite IT administrators, facilities managers and service providers on how to address the complexity of data centers.

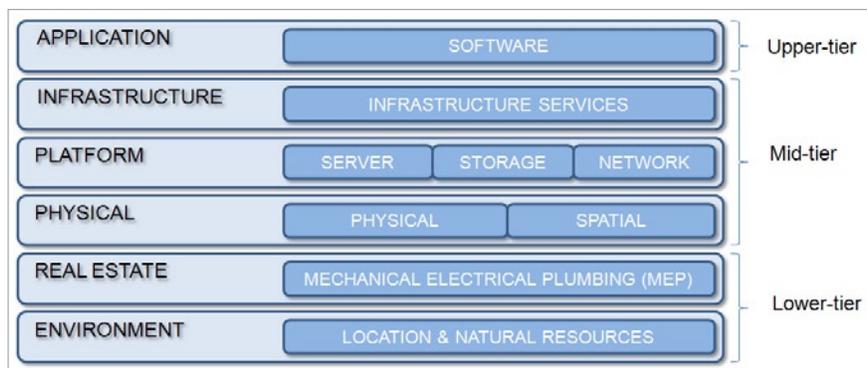


Figure 1: DCP stack

Using the DCP stack like a map (see Figure 1), all changes in the data center can be viewed and used to identify interdependencies for effective management. For example, new IT equipment needs less power but more cooling so it has to be placed in an area that can handle more floor tiles (server/physical/MEP). If the new equipment is multiple virtual machines on multiple physical servers, then they

will connect to a Storage Area Network (SAN) switch and storage arrays (server/storage/spatial). The network needs to be configured so those multiple virtual machines can act independently and applications can communicate between those virtual machines (software/server/network). All these complexities of interdependencies in data center management can be identified over the stack and be analyzed to pinpoint those pains in real-world data center management.

Findings – Data Center Management Key Performance Indicators (KPIs) and Data Center Standardized Stack

The typical data center will encompass multiple locations, heterogeneous devices and technologies, remote/local staffing and processes, and need to conform to regulatory compliancy. These factors add significant architectural complexity with different operational and performance profiles, thus requiring more complex configurations. Therefore, the primary goal of such data center management is to govern these complexities at multiple physical and virtual levels where traditional processes and tools simply fail to execute. The latest EMA research analyzed overall data center operational Key Performance Indicators (KPIs) [the total of 58 KPI categories with 244 average monthly incidents over a six-month period], in order to view these complexities, challenges and contributing factors in data center operation and management. The data (Figure 2) depicted hardware/component failures (45%) were the most frequent contributing factors to operational performance, followed by vendor/remote related (23%) and change related (15%). These top three KPIs were then applied to the DCP stack to view common areas of failures for data center operations and management. As it is revealed in the diagram, physical layer (42%) showed the most KPI contributing factors related to data center management performance (see Figure 3). Combining together with the platform and infrastructure layers, the mid-tier was the majority (72%) of the contributing factors to data center performance measurement. That is, the majority of the data center management challenges are caused by complexities in the mid-tier, spanning from spatial, power and cooling (in the physical layer), to network, storage and servers (in the platform layer), to services and hosting (in the infrastructure services layer). These areas are where IT management needs to look to improve data center management.

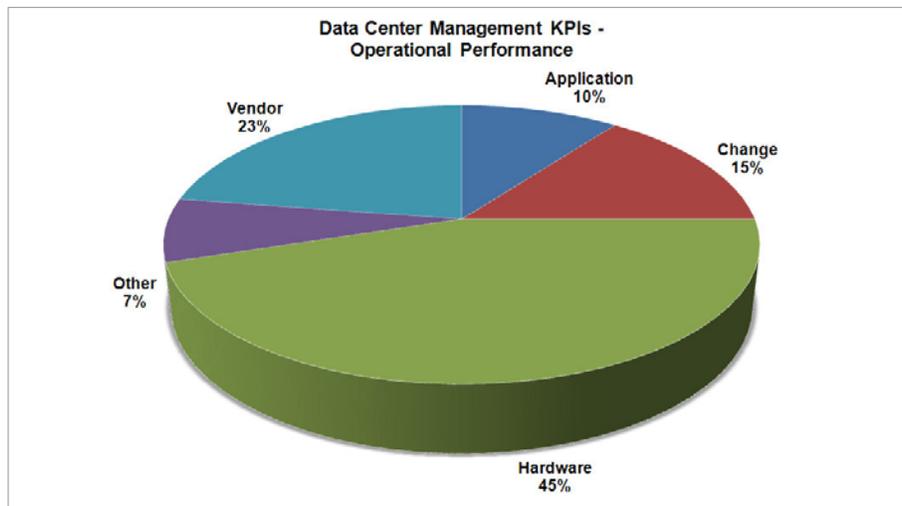


Figure 2: DC Management KPIs

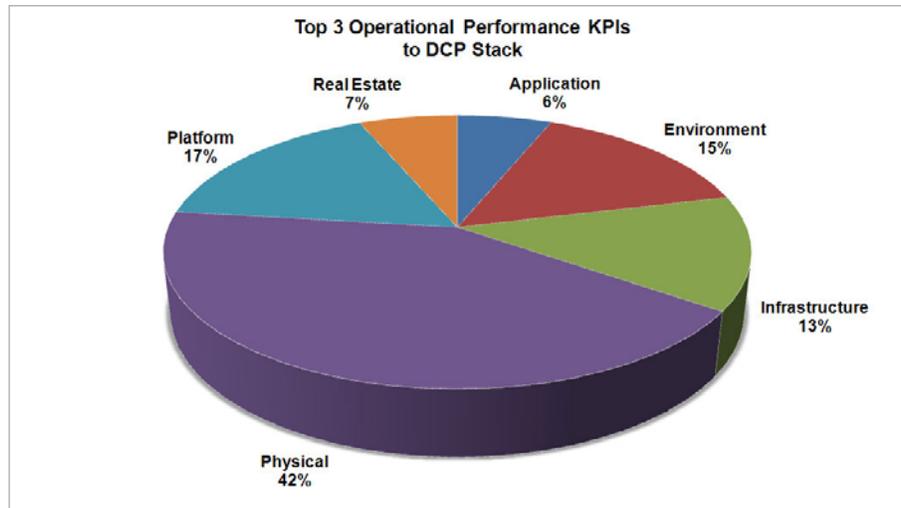


Figure 3: Top 3 KPIs to DCP Stack

Challenges in Data Center Management

EMA Data Center Automation research¹ shows that remote control/out-of-band is one of most important disciplines (80% of respondents rated this as above average importance) in data center management. In most data centers, this discipline is applied widely for accessing and managing not just remote servers, but also network equipment, power management and other data center and NOC equipment that do not always have direct access. The ability to access server and administration consoles remotely is essential, especially in large enterprise, multi-site data centers or in any data center that has deployed headless blade servers, in-band and out-of-band tools, and power control devices. Direct access to the infrastructure equipment provides complete functionality of the equipment but it is not necessarily the answer. There are security exposures that are a result of direct access to the data center equipment. Remote access and control solutions provide physical security that overcomes these issues and more.

Out-of-band management, like KVM and serial over IP, operates with hardware resources and components that are independent of the operating system. These resources are dedicated to systems management and allow management of system hardware components independent of their state. They are available even when the operating system is not available and still able to interact with the data center equipment – including routers, switches, firewalls and gateways; power systems (uninterruptible power supplies, power generators); telephony systems (switches, PBX systems); and environmental control systems (sensors, HVAC, alarms and actuators). Therefore, having a management solution which can remotely access and control not only the servers but all data center rack equipment is crucial to providing continuous availability and security.

The geographic complexity of the data center brings further challenges to data center management. For example, high personnel costs create limited on-site staffing at each remote location which limits the expertise at each location. The inefficiency of travel time and the high cost of visiting staff to such

¹ *Data Center Automation: Delivering Fast, Efficient, and Reliable IT Services*, EMA Research Report, October 2007, <http://www.enterprisemanagement.com/research/asset.php?id=613>

locations further limit the effectiveness. All of these issues can be resolved with the right data center remote management solution.

The top three KPIs which were shown to fall into the mid-tier DCP stack were further analyzed against data center management key metrics (availability, security, efficiency, support and service). The data revealed the top three metrics (78%) for IT management to meet higher business demands and quality of services on data center operation and management were availability, security and efficiency (see Figure 4). These three metrics should be considered at all times when IT is looking for designs and solutions in data center management. In order to address these key metrics, Avocent has created the control and manageability solution. These two practical discipline areas (control and management) can be implemented to overcome the complexities and challenges that lead to high availability, increased efficiency and security.

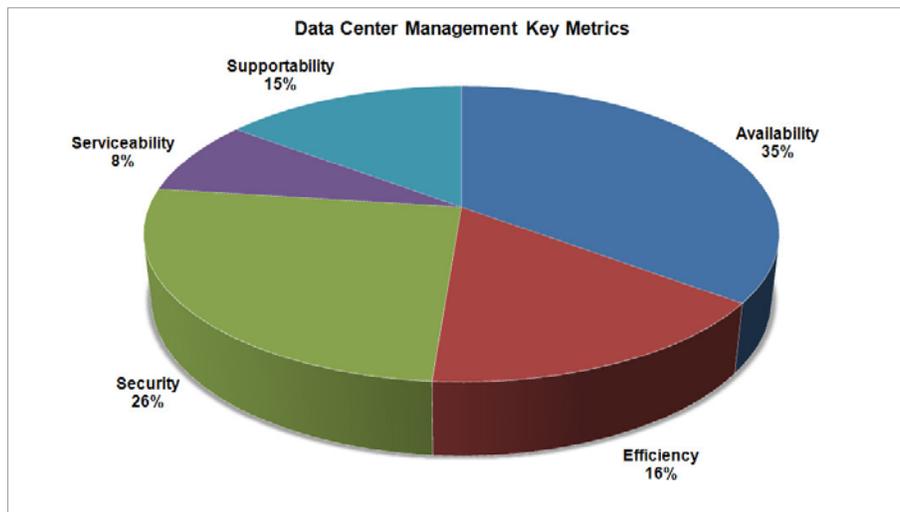


Figure 4: Data Center Management Key Metrics

Data Center Control and Management

Today's data centers are diverse environments where effective IT management plays a crucial role in controlling availability, security and efficiency. IT's need to streamline processes and deliver business value has become a key requirement. With important initiatives such as data center globalization, virtualization and cloud computing underway at many organizations, a vendor-independent platform for data center management has become a necessity. Effective data center control and management is critical to deliver:

- Reduction in downtime caused by failures by improving response and restore capabilities
- Reduction in inefficiency in maintaining the remote equipment and staff
- Reduction in costs through centralized access and control of physical and human assets
- Improvement in security of physical and virtual environments

Data center management is often comprised of a rich and varied set of tools and applications that administrators can utilize to control their environments. In many cases, these tools are specialized and adapted to each individual environment, installation and equipment in the data center. Such

customized and specialized tools create their own management challenges, adding new complexity to the effort of managing the data center. Management can be more effective with tools that provide a common view of all the diverse systems and their required specialized tools, reducing the complexity of management tasks.

Best Practices in Data Center Control and Management

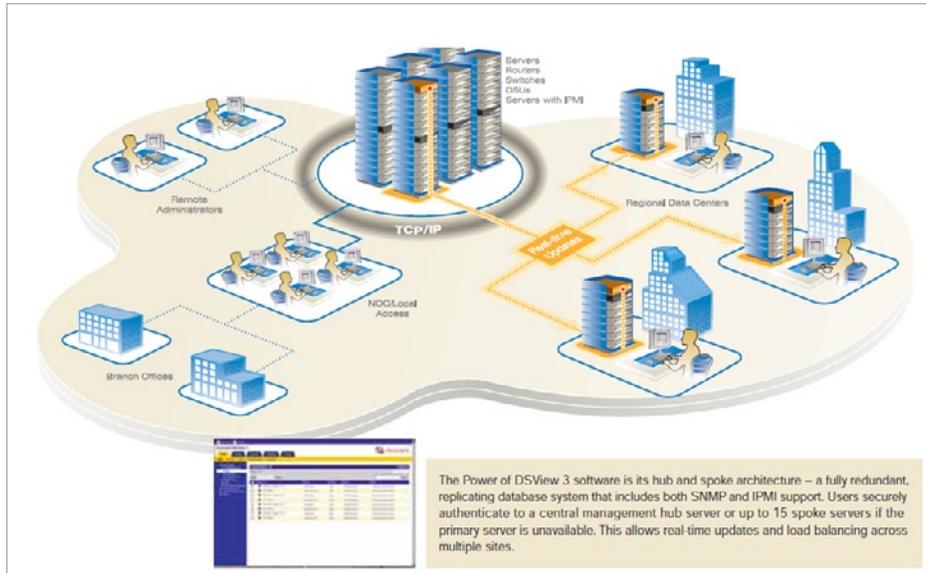
Centralized Manageability Best Practice

EMA Data Center Automation research covers a wide range of core disciplines in the broad categories of data center management. This includes capacity management, event management/console automation, change management, compliance auditing and performance and availability monitoring. Most of these data center management practices operate independently with the support of their own management architecture. A centralized management solution allows IT to control and manage these architecture components securely and effectively. With centralized management, IT staff can control multiple servers, network, power systems and environment control systems using in-band and out-of-band management from a single and centralized location. The centralized management will allow IT not only to administer more efficiently but also to automate any administrative tasks. When considering a centralized management system, one should look for it to be able to handle the out-of band management services in conjunction with in-band management services. It should be easily accessible over the network, using non-proprietary technologies such as remote authentication and security encryption. Finally, a centralized management system needs to be designed for multi-platform servers, devices, operating systems and locations.

Control and Manageability Solution from Avocent

Avocent® Corporation (a subsidiary of Emerson® Electric Co.) is a provider of data center management solutions that enable IT to more easily and effectively manage data center complexity. Avocent is an expert in data center management solutions, especially access and control, and the Avocent solutions are well in line with the best practices discussed in this paper. The Avocent products include:

1. DSView® 3 management software, which provides a centralized management solution for IT staff to view a single and centralized view of all servers, embedded technologies, network equipment and power devices
2. DSView 3, which adds power monitoring and reporting capability to the access and control functions of DSView 3 software
3. MergePoint® Service Processor Manager, which merges both proprietary (e.g., DRAC®, iLO, RAS) and other available open service management protocols, such as IPMI, onto a unified management platform
4. MergePoint Unity® KVM over IP switch and serial console switch, providing remote KVM access to servers
5. ACS 6000 Advanced Console Server, providing remote access for console management and PDUs
6. Avocent and Liebert® rack PDUs, providing single-phase and three-phase models that support strip-level metering, outlet-level metering or outlet-level metering and switching.



This unique combination of hardware and software solutions is integrated to support a broad range of data center management services. Together, these toolsets offer user automation, security management, remote access and control for better availability and efficiency. This solution targets both mid-market and enterprise data center customers.

The Avocent control and manageability solution delivers secure, automated, real-time tracking and control of all heterogeneous servers, embedded technologies, network equipment and power devices. This gives IT staff what it needs to simply manage change from any location, at any time of day or night, without regard to hardware type, operating system or network status. Its core value is to leverage all these various connections to provide IT customers a fast, direct remote connection to most IT equipment using the physical ports on the equipment (out-of-band) so it complements the other remote software tools (in-band) that IT organizations are typically using. The Avocent solution also supports several other third-party power and KVM products as well as support for virtual servers, mainly those from Citrix® and VMware®. Its management software, DSView 3 software, consolidates remote access into a central/single interface that is secure, then provides granular user access, control and reports for user and system activity.

The Avocent integrated services solution suite allows IT organizations to get a better grip on complex data center management, especially in the mid-tier layers from the DCP stack, by addressing the following key issues:

- **Centralized Management** (*infrastructure services, platform and physical layers*) – Single-rack view of all computer systems, servers, serial-based devices and power distribution products
- **Power Management** (*physical layer*) – Monitor energy consumption, costs and trends across all levels within the data center and remote locations
- **Rack Management** (*physical layer*) – Control access, power and usage; in- and out-of-band access enables remote control of devices

EMA Perspective

IT organizations struggle to control costs and to manage diverse, complex technology environments while striving to achieve core objectives for availability and security. Centralization and administrative access are crucial to IT management success. Improving data center responsiveness requires a computing infrastructure that is not only cost-effective and space-efficient, but also one that simplifies operational procedures; ensures high availability, security and performance for all applications; and is easily reconfigurable to meet new business demands. This over-arching management framework enables interoperability of managed entities across physical and virtual boundaries.

The current release of the Avocent control and manageability solution suite fits well in mid-tier management solutions – along with its historically strong presence in physical layer with these technical requirements of interoperability – and provides a central interface for coordinating all IT management processes. In addition, with leveraging Emerson’s strong expertise in lower-tier layers, the Avocent control and manageability solution suite will be an effective way for enterprises to improve access and control in order to keep up with IT’s availability requirement, augment physical and virtual security and achieve staff efficiency by saving on operational cost.

About Avocent/Emerson Network Power

Avocent Corporation is wholly owned subsidiaries of Emerson Electric Co. (NYSE:EMR) and is part of a newly formed division of Emerson Network Power that is focused on helping data center customers better manage their infrastructure. Emerson Network Power, a business of Emerson, is the global leader in enabling Business-Critical Continuity™ from grid to chip for telecommunication networks, data centers, health care 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.

About Enterprise Management Associates, Inc.

Founded in 1996, Enterprise Management Associates (EMA) is a leading industry analyst firm that specializes in going “beyond the surface” to provide deep insight across the full spectrum of IT management technologies. EMA analysts leverage a unique combination of practical experience, insight into industry best practices, and in-depth knowledge of current and planned vendor solutions to help its clients achieve their goals. Learn more about EMA research, analysis, and consulting services for enterprise IT professionals and IT vendors at www.enterprisemanagement.com or follow [EMA on Twitter](#).

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