White Paper

Getting Real About Virtual Platform Management

Virtual Platform Management: CA's Solution to Manage Complex Infrastructures

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Real Management of Virtual Platform Environments

CA's vision is to unify and simplify the management of enterprise-wide IT. The rapidly growing use of virtualization and clustering in enterprise infrastructures provides a rich environment for increasing complexity. Unlike physically bounded infrastructures, the logical entities in virtualized and clustered environments are not visually apparent. Nevertheless, you need to know what resources you have and if you are using those resources to their fullest capacity. In your server consolidation initiatives you need to ensure you are making efficient use of resources. In your virtualized environments you need to ensure critical applications receive the right allocation of shared resources. In your clustered environments you need to simplify the management of these critical multi vendor assets. In delivering on Service Level Agreements you need to ensure the services you provide and support are not interrupted and that they meet internal and external customer expectations. In the realm of virtualization this means optimizing the existing IT server investments so that they are service driven, integrated, modular and open. These needs call for a comprehensive management solution.

This paper will briefly discuss the technical management challenges inherent in these complex infrastructures including centralizing management of virtual, physical and clustered environments, virtual sprawl, honoring service level agreements, resource allocation and the prioritization of resources. Then it will demonstrate how CA Virtual Platform Management addresses the specific requirements of these environments, making it possible for you to view and manage logical entities as easily and as well as physical entities.

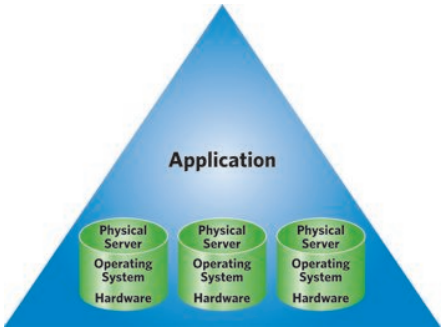
Management Challenges in Virtual Environments

Heterogeneity adds a great deal of complexity to IT infrastructures and IT infrastructures have diversity on many counts—vendors, software systems, hardware platforms, operating system virtualization, server virtualization and clustering. As time goes on, vendors will likely consolidate and standards will form, causing some organizations to shift purchasing decisions. Choosing a management platform that can support this diversity and flexibility is important.

Virtualization and clustering create unique management challenges, particularly when combined. Hardware no longer defines a logical entity, since a single server can host many virtual machines. Mapping virtual entities—whether multiple, physical machines are operating as one machine or multiple, virtual machines are operating independently on a single physical machine—to physical entities is a must. Not only must they be mapped but they must also be depicted in some visually intuitive fashion. Without this capability you can easily become a victim of the "law of unintended consequences." While server consolidation may have driven the initial use of virtualized server platforms, in practice there may be some unexpected results. For example, consider an organization that wants to reduce their server deployment from 300 to 30, where each server hosts 10 virtual machines. Virtualization makes it easy to configure additional virtual machines. The result can be that virtual machines begin to proliferate, resulting in what is often referred to as "virtual sprawl". As a result, IT organizations find it difficult, if not impossible, to keep track of all of these virtual machines as they continue to propagate, so that 300 virtual machines on 30 servers turn into 450 virtual machines on 30 servers.

Operating System Virtualization
Virtualized operating systems run on a server with a single host operating system. Multiple operating systems are not supported but overhead is reduced.

Server Virtualization
Virtualized hardware runs multiple guest operating systems. The server does not have a host operating system. Multiple types of operating systems are allowed but overhead is increased.



Clustering
Several locally-attached physical machines provide distributed processing power, while appearing as a single processing resource. It becomes more complicated when:

- multiple vendor technologies are used
- clustering is used within a virtualized environment

Resource optimization is one of the primary reasons people decide to incorporate virtualization, but resources are not automatically optimized without management. In fact, with the ease of creating virtual machines already discussed and without a carefully considered management solution, resources can become scattered. Inactive virtual machines "disappear" taking their resources with them. Allocated resources must be "retrieved" so they can be reallocated, if the promise of virtualization is to be achieved. Enough resources must be conserved so the hypervisor, the software that makes virtualization possible, and other essential processes have the CPU and memory resources required to run. While trying to avoid over-utilization, organizations can fall back into under-utilization—just the problem they were trying to correct.

To keep up with constantly shifting business requirements, automated resource allocation is essential. Adding intelligence to automated resource optimization lets you optimize resources within the virtual machines, within the host machines and across machines. It also enables policy control over how and where resources are allocated, ensuring that critical processes never are deprived of resources. Intelligent resource optimization results in greater value of the virtualized environment.

CA's Approach for Comprehensive Management of Virtual Platform Environments

CA's solution thoroughly addresses the management challenges of virtualization. More importantly, CA simplifies the management capabilities, making them both visual and intuitive, so benefits resulting from virtualization are not wiped out by requirements for additional IT staff. CA Unicenter® Advanced Systems Management (Unicenter ASM) is a keystone product within the CA Virtual Platform Management solution and extends the system management capabilities embodied in Unicenter® Network and Systems Management (Unicenter NSM) to virtual platforms. For example, the Unicenter NSM Management Command Center feature (MCC) in Unicenter NSM acts as a single point of control for detailed system management as well as for enterprise-wide events. The Unicenter ASM Systems Command Center (SCC) extends those same capabilities to the virtual environment, providing the level of detailed visualization needed to manage virtual environments equally well as the MCC portrays details of the physical environment.

Heterogeneity. Central to CA's approach to management of virtual environments is that it is platform-neutral. CA does not develop and sell virtual platforms, so it does not have a vested interest in spotlighting a particular virtual platform. This means that CA's solution provides broad platform support for the platform you have installed today or the one you want to deploy in the future. The typical enterprise has multiple platforms installed and CA's approach will provide support across multiple virtual platforms, unlike solutions that favor a particular platform and offer superior management features solely for that platform.

CA's commitment to broad platform support begins from the moment management data is obtained from the various platforms and is carried through to advanced visualization on the management console. All data obtained is normalized so that management is equally comprehensive across platforms. Normalization is invaluable when virtual platforms from multiple vendors come into play. A normalized view of the infrastructure is like a single pane of glass, depicting all virtual and physical elements equally. The result for your IT staff is reduced complexity, a minimized learning curve and accelerated problem understanding and resolution. The normalized data is maintained in a single database, CA's Management Database (MDB). The MDB is a common schema and shared asset-centric management database so that collective knowledge can be mined and acted upon by various management specialties. Finally, CA provides full visualization for all supported platforms on a single console, the Systems Command Center (SCC), as shown in Figure 1.

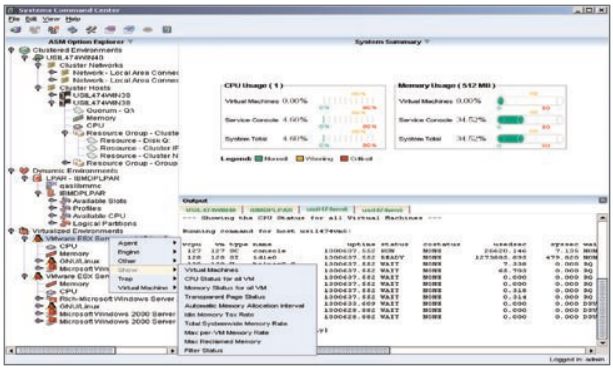


Figure 1. The benefits of normalization are shown here with a list of the information you can see for any virtual, physical or cluster server in your environment.

Supported virtual platforms include:

- VMware ESX, GSX and VI3
- Microsoft Virtual Server
- Microsoft Cluster for Windows 2000 Advanced Server
- Microsoft Cluster for Windows 2003 Enterprise Edition
- Red Hat Linux Advanced Server Cluster
- Red Hat Linux Enterprise Server Cluster
- IBM pSeries P4 & P5 eServer LPAR
- SunFire Midrange Servers capable of Dynamic Reconfiguration
- SunFire High-End Servers capable of Dynamic Reconfiguration
- Veritas Cluster on Windows, Sun Solaris and Linux
- Sun Cluster
- HP MC/ServiceGuard
- IBM HACMP

Managing Virtual and Clustered Environments. Organizations need the same management capabilities for their virtual elements as for their physical elements, but it is trickier to provide these capabilities for virtual elements and many traditional management tools cannot support them. Some of the management capabilities that are particularly important in virtual and clustered environments are:

Discovery: All elements must be discovered, automatically and continuously, both to reduce the impact on IT and to keep an accurate, up-to-date map of the infrastructure. This is very important in virtual environments where machines can't be tracked visually and the usual method of assimilating new machines, ordering and installing, is non-existent. Unicenter ASM Advanced Platform Discovery discovers and monitors every aspect of the virtual host and sessions in real-time, including the relationships between the elements, as shown in figure 2. This capability is critical when you take into account that virtualization technology hides the physical characteristics of computing resources from the way in which other systems, applications or end users interact with those resources. Showing component relationships and how they align to business processes is the icing on the cake. Knowing which elements are critical to the delivery of key business processes makes it possible to accurately prioritize network and system issues and prioritize resources.

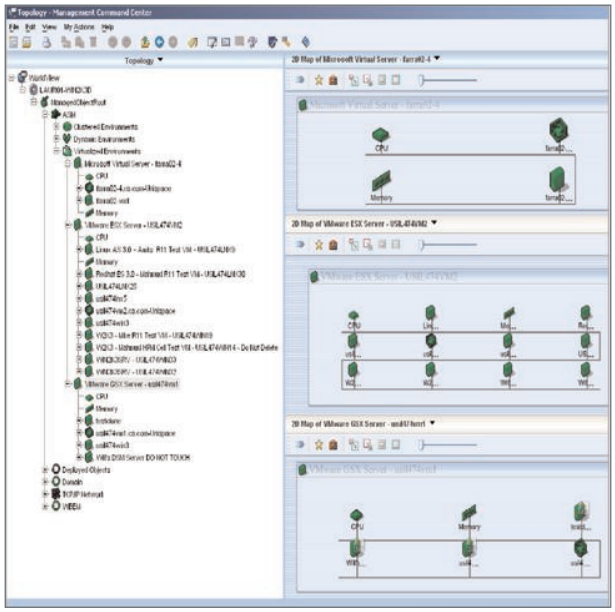


Figure 2. Using the advanced discovery capabilities of Unicenter ASM, administrators are not only able to view the individual virtual elements running in their environments but, more importantly, the relationships between the elements and this helps to decrease mean-time-to-repair (MTTR). Without this feature, administrators would only be able to discover the IP address of the individual virtual elements, inhibiting their ability to maximize the management of their environment and to ensure the continuous availability of the business processes.

Visualization: A map of the infrastructure, updated with discovered elements, significantly simplifies and enhances management of the infrastructure. Correlating information from multiple sources is time consuming and error prone. A single console that shows a normalized, unified view of the entire infrastructure, reflecting both virtual and physical elements on a variety of platforms, is invaluable in ensuring maximum utilization and prioritization of resources. The SCC is the focal point of Unicenter ASM monitoring and control.

Unicenter ASM enables unified cluster management and virtualized server management through the SCC, simplifying management through a unified approach and a normalized view. Managing clustered environments is not a simple task and it is only further complicated when you add multiple vendor cluster technologies to the environment. Unicenter ASM is the only solution that creates a consolidated, normalized view of an entire multi-vendor cluster environment. By providing a common interface across multi-vendor technologies, organizations are able to reduce training costs and simplify the management of these complex environments. By automatically discovering every aspect of clustered environments, including resource groups, Unicenter ASM enables an aggregated view of performance and availability. This allows administrators to set rules based on definable resource groups and shared disks that can suggest, for example, when to move a process to another resource in a cluster, ensuring continuous availability and delivery of services. Figures 3 and 4 provide examples of the cluster visualization capabilities of the SCC.

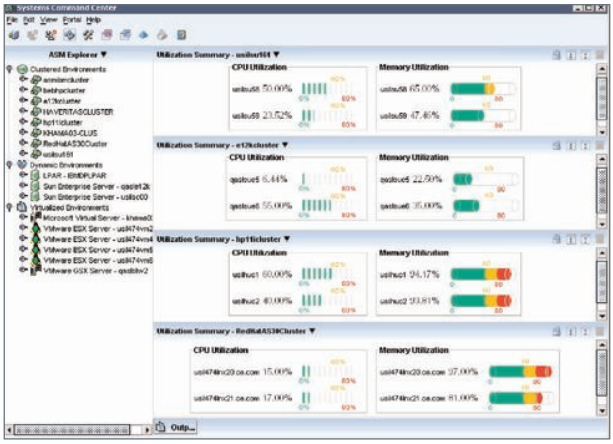


Figure 3. Heterogeneous, clustered services are administered and monitored in a normalized central console. Regardless of platform, you quickly view the performance and capacity of the Nodes, VMs or LPARs in these complex environments.

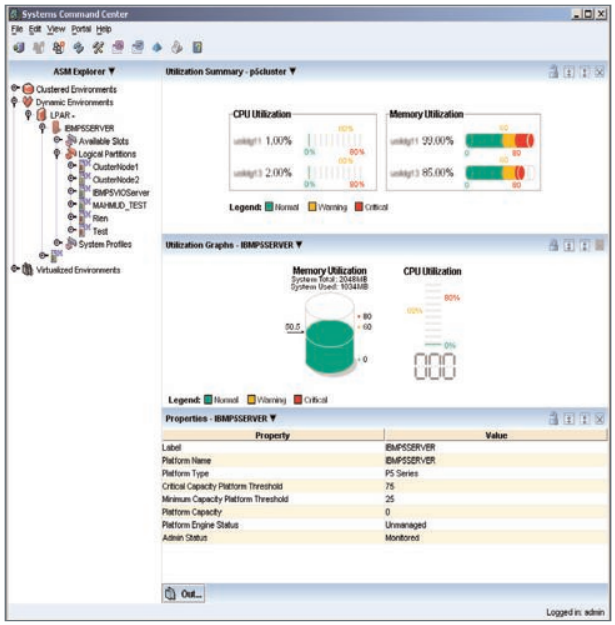


Figure 4. The SCC enables administrators to manage and view their environments with flexibility and ease. Here is a view of an IBM eServer p5 server, showing the CPU and memory utilization of two cluster nodes and the overall utilization of the server. This enables users to see the relationships of the clusters to the host machine. It also provides the ability to manage the health and availability of not just the server but the individual nodes located within it.

Virtualized server management, within Unicenter ASM, helps IT manage costs and improve operational efficiencies with secure, centralized and role-based management. It provides automated, policy-based management using preconfigured business priorities, policies and best practices. Information on VMs, their hosts and current status is easily obtained through the Web Reporting Services feature, as shown in figure 5.

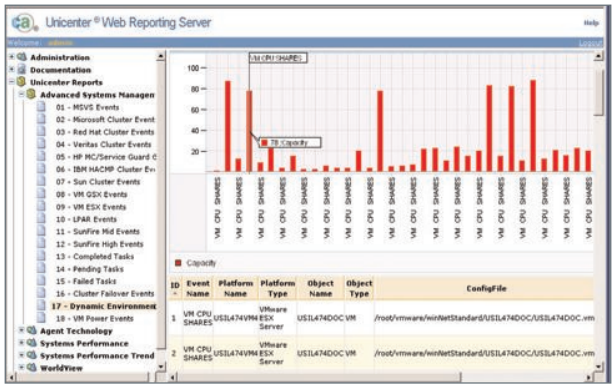


Figure 5. This screen highlights both the VM capabilities of Unicenter ASM and the types of user specific reports that can be created using Web Reporting Services. Here you see all the VMs located on one host server and the CPU usage per VM, information which can be used for trending and capacity planning.

Resource Optimization: Allocating resources within host machines to the virtual machines supporting business processes is an ongoing process. The demand for resources by business processes is constantly shifting. It can't be stressed enough that the process of resource allocation should be automated since it will need to be done all the time. Returning unnecessary resources back to the pool is equally important or, like inactive VMs, they can virtually disappear. In resource allocation it is important to remember that both CPU and memory may be needed. The ability to allocate them and reclaim them independently and automatically is critical for today's business-driven infrastructures.

Resource optimization directly addresses issues that plague IT, such as over- and under-utilized resources, ensuring the continuous availability and maximizing the return on virtualization investments. Continuously balancing system utilization solves the problem of under- and over-utilization and proactively solves real-time performance problems. Managing system resources based on business policies is an essential ingredient of resource optimization. Establishing policies and determining prioritization of the resources that support business processes, such as the hypervisor and your critical business applications, ensure those business processes never fail due to lack of resources.

Unicenter ASM addresses resource optimization, using policy-based management and prioritization, through Dynamic Resource Brokering (DRB). DRB provides real-time resource analysis, while continuously balancing system utilization. It dynamically allocates and de-allocates resources automatically and on demand, based upon business policies. In addition, role-based and rule-based management defines access privileges based on administrative roles and defines rules for groups of resources in a discovered cluster, such as failover process based on time/day or the movement of a resource to another group in the cluster. The result is optimized availability and performance of virtualized and dynamic environments that help organizations realize a high ROI.

Through Session Migration, with Unicenter ASM, CA applies intelligence to the management of resources. For example, one major difference between Unicenter ASM and other vendors' implementations of virtual technology management is in the handling of critical applications. When a critical application requires additional resources not available on the current system, many vendors will migrate the critical application to a new system with additional resources. Unicenter ASM, on the other hand, after maximizing the utilization of available resources on the host machine using DRB, will migrate the least important application, based on user policy, to a new host and reallocate the freed-up resources to the critical application, thus reducing risk. While machine migration is in theory, risk free, the reality is that there is always some risk, such as those that can be caused by network and connectivity problems. By ensuring that available resources are maximized locally and reallocated based on business demand before resorting to migration, and then targeting lowest priority processes if migration is called for, this risk can be significantly reduced. This process can also help prevent server sprawl, mentioned earlier. Figure 6 shows an SCC screen highlighting virtual and clustered entities and the ease with which current status and events can be investigated, even to the VMs on a physical host server.

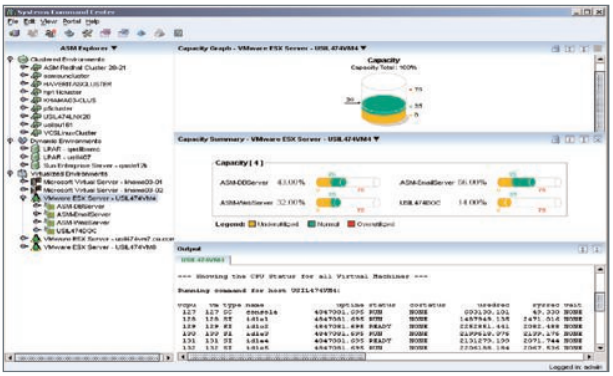


Figure 6. Dynamic Resource Brokering continually monitors the virtualized environment and automatically adjusts the virtual machine resources, such as memory and CPU, based on business criteria. This screen shows the total capacity and capacity per VM on the ESX Server USIL474VM4.

The Benefit of CA's Approach to Virtualization Challenges

CA's advanced management features for clustered and virtual environment gives IT departments the information they need to address other common problems, such as compliance with Service Level Agreements (SLAs) and problems common to virtual environments, such as server consolidation and virtual sprawl.

SLA Compliance. Organizations must have IT environments that can automatically and dynamically address changes to ensure the services they provide and support are not interrupted and that they meet internal and external customer expectations. They must also be able to report on service availability and performance relative to SLAs. Unicenter ASM ensures that critical applications are available and performing within expected SLAs by detecting and diagnosing events, reallocating resources to prevent application outages and by automatically resolving issues that, in combination, reduce MTTR and improve compliance. The Web Reporting Service (WRS) feature provides timely web-based reports that document the level of service IT is delivering. These web-based reports are crucial for effective IT management and to prove compliance to customers and users.

Data Center Automation. Data centers are changing rapidly and growing in complexity. The information collected and stored is required to support business services and processes and therefore, it is essential that data centers ensure high availability of this information to meet today's on demand needs. This requires software that will integrate seamlessly. Unicenter ASM ensures the availability of virtual server resources and optimizes current IT investments by providing real-time resource analysis while, at the same time, automatically balancing system resources. The automation of predictable events and tasks helps data centers manage risk by reducing administrative interaction, thereby reducing the chance of errors that cause outages or performance problems.

Server Consolidation. In an effort to reduce operational costs, conserve precious floor space within data centers and conserve energy as part of environmentally-conscious operations, customers have been turning towards server consolidation projects and creating virtualized environments. These server consolidation efforts force IT organizations to ensure they are making more efficient use of their resources. Unicenter ASM provides organizations with the ability to more efficiently monitor and manage the health and availability of the virtualized environments they are quickly becoming dependent upon. Organizations are able to discover and identify host servers and sessions in real time, giving them an aggregated view of the performance and availability of the server's resources. With the ability to map resources to business processes, prioritize resources based on user-defined policies and perform Dynamic Resource Brokering of these resources, Unicenter ASM is a key component of successful consolidation projects.

Virtual Sprawl. Many organizations initially turn to virtualization to address the issue of server sprawl, however, due to the ease with which organizations can build, duplicate and deploy virtual machines (VM) they are now faced with a new challenge — VM sprawl. Sprawl, whether server or VM, prevents organizations from being able to standardize their environment and adhere to best practices. The CA Virtual Platform Management solution helps organizations address the issues created by VM sprawl through the Advanced Discovery and visualization features within Unicenter ASM. It continuously discovers and creates normalized views of heterogeneous, virtualized elements running on operating systems and subnets and their relationships (VM to Host and Node to Cluster). This gives organizations an accurate picture of their environment, unifying and simplifying operational administration and helping to ensure standardization and compliance.

Unicenter ASM Features by Discipline:

Discipline	Features
Unicenter ASM for Virtual Environments	**Advanced Platform Discovery.** Discovers and monitors every aspect of the virtual host and sessions **Real-time Monitoring and Representation.** Represents host server and VM instances as they exist in a real-world environment **Dynamic Resource Allocation.** Provides real-time resource analysis, while continuously balancing system utilization **VM Cloning.** Moves VMs between local and remote host machines **Policy Driven Session Migration.** Automatically migrates less critical VMs based on business policies and priorities
Unicenter ASM for Clustered Environments	**Advanced Platform Discovery.** Discovers cluster platforms and technologies otherwise concealed from traditional enterprise systems management solutions **Selective Monitoring.** Provides automated real-time status/health monitoring of software, nodes and package resource groups as well as individual resources **Desired States.** Defines the "desired state" for all monitored elements, enabling alterable statuses to be configured at the object level **Rule-based Resource Management.** Creates rules, based on definable resource groups such as suggesting the failover time and day or when to move a process from one resource to another

Discipline	Features
Unicenter ASM Dynamic Resource Brokering	**Real-time Platform Discovery.** Discovers and represents all logical and virtualized host machines in the Management Command Center feature of Unicenter® Network and Systems Management (Unicenter NSM) and the Systems Command Center feature of Unicenter ASM **Central Administration.** Monitors the environment from a central console **Secure Role-based Management.** Provides access control and assigned administrative privileges **Dynamic Reconfiguration.** Balances system utilization in real time by allocating or de-allocating resources
Unicenter ASM Universal Technologies	**Performance Management with Real-time & Historical Reporting.** Provides detailed and comprehensive performance monitoring of essential metrics **Task Automation.** Automates predictable business events, such as reserving resources **Policy-based Management with Role-based and Rule-based Management.** Ensures secure and role-based management. Policy-based management enables Unicenter ASM to automatically respond to business demands based on preconfigured business priorities, policies and best practices. It defines access privileges based on administrative roles and defines rules for groups of resources in a discovered cluster, such as failover process based on time/day or the movement of a resource to another group in the cluster **Rule-based Resource Management.** Defines rules for groups of resources in a discovered cluster, such as failover process based on time/day or the movement of a resource to another group in the cluster **Role-based Access.** Defines access privileges based on administrative roles **Integration with Web Reporting Services feature of Unicenter NSM.** Enables Web-based scheduling, execution and viewing of Unicenter reports, providing users the ability to dynamically modify report components and formats, as well as enabling drill-downs from existing reports into more detailed graphical views. **Integration with Unicenter® Management Portal feature of Unicenter NSM.** Provides intuitive access to enterprise management information with personalized secure web interface **Adaptive Dashboard Services feature of Unicenter NSM.** Enables configuration of Unicenter ASM agents from a remote location through a Web-based interface

Summary

CA Unicenter® Advanced Systems Management (Unicenter ASM) is a keystone product within the CA Virtual Platform Management solution. Unicenter ASM is unique in the marketplace based on three main factors:

- Unicenter ASM is platform-neutral, helping companies optimize the IT investments they've already made, with no vested interest in their virtual platform choices, now or in the future.
- Unicenter ASM covers the broadest cross-section of virtualization technologies, including clustered environments, from a single console.
- Unicenter ASM delivers a capability called dynamic resource brokering, which makes server resources available to applications on demand — first looking inside the virtual server, then looking across the server class and finally moving low-priority applications out of the way.

IT organizations are consistently being tasked to do more with less. Unicenter ASM helps organizations reduce IT costs by ensuring that current IT investments are fully optimized. By providing organizations with information regarding under-utilized and over-utilized resources, they can better plan future IT capacity and avoid needless spending. In addition, by providing normalized views of complex cluster and virtualized environments along with automated resource optimization procedures, Unicenter ASM helps reduce training and operational costs.

IT organizations are required to demonstrate adequate controls of the infrastructure they manage, which deliver mission critical IT services and support financial reporting systems. By automatically and dynamically addressing critical events that occur, Unicenter ASM is able to ensure the availability and reliability of these services according to governmental, fiduciary and internally mandated compliance regulations, as well as service level agreements negotiated with customers.

CA will give you the most open and comprehensive management solution available on the market for infrastructures with virtual and clustered components, maximizing your IT investment dollars and your IT productivity.

Acknowledgements:

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About the Author

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