



Virtualization and Data Center Management:

Managing the complexities of virtualization and legacy technologies with a unified access, power control and auditing platform.



Overview

Virtualization has emerged as a tremendous solution for many of the challenges that IT organizations face today. However, it also represents yet another form of infrastructure that IT managers must be able to access and manage – along with existing servers.

Indeed, the need to incorporate efficient IT management solutions has never been greater:

- ▶ The rapid move to virtualized servers negatively affected server sales in 2009; however, the trend toward cloud computing and replacement of older, less-performing equipment is revitalizing the server market once again.
- ▶ According to Gartner, 2010 server sales are trending significantly higher, compared to the recession-induced results of 2009. 2011/2012 are expected to continue to ramp up. As a result, power management needs are also increasing.
- ▶ Energy costs represent the second highest operating cost (behind labor) in 70 percent of data center facilities worldwide (Gartner).
- ▶ IT managers are tasked with efficiently managing servers (virtual and legacy physical machines), power delivery equipment and network infrastructure.

Implementing virtualization introduces major process and management complexities. As a result, IT executives are facing fundamental struggles in their efforts to deliver on its full benefits: increased efficiencies, greater flexibility and faster provisioning.

This white paper highlights best-practice methodologies that help IT professionals tackle challenges in data centers where a multitude of server types, intelligent power systems and network infrastructure can also mean increased management complexities. We explore an approach to consolidating all elements of the data center – into a single, audited solution that helps administrators know more and manage smarter. We also pose some key questions to consider when evaluating a consolidated physical and virtual management solution.

The Drive to Virtualization

Today's servers can provide enough computing power to enable the virtualization paradigm to deliver enormous benefits.

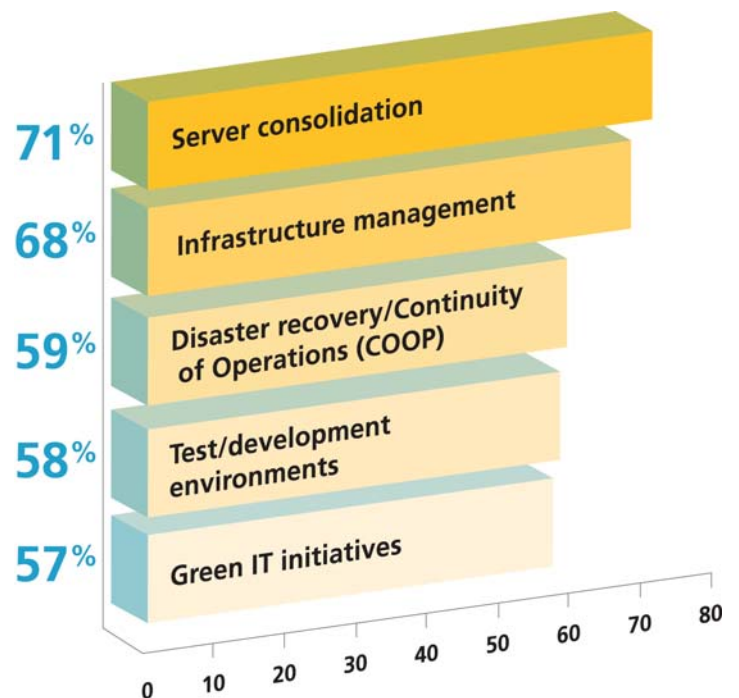
By migrating applications from multiple, underutilized servers to dramatically fewer, optimally-utilized physical servers, IT managers are significantly reducing hardware costs and related expenses (rack space, network ports, etc.).

Simplified Disaster Recovery Efforts

Virtualization can simplify disaster recovery strategies.

Instead of paying for a remote, one-to-one data center, for example, virtualization allows application environments to be recreated on fewer off-site servers. As an added benefit, virtualized images initially used to create virtual servers can be easily reapplied to recover quickly from a terminal event.

Business Drivers of Server Virtualization



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And since each virtual machine runs in a separate environment, a problem with one operating system or application will not affect others running on the same physical host, as long as the host itself is healthy.

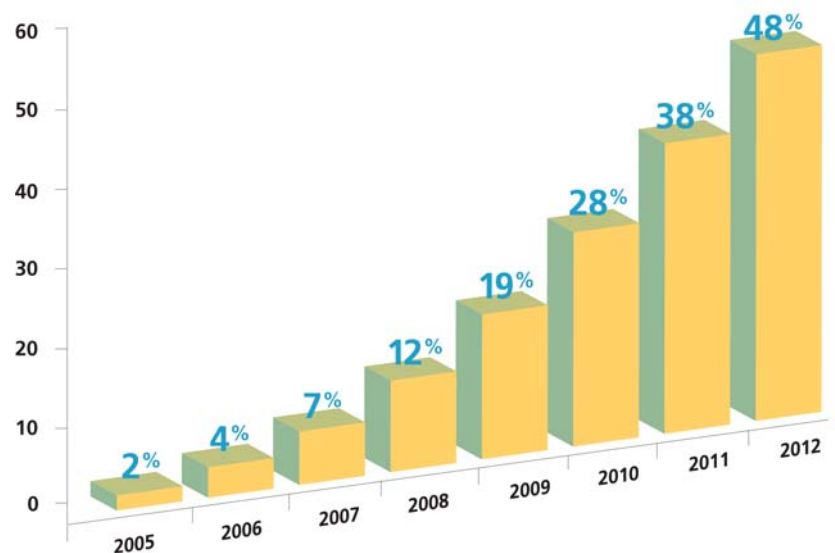
Easier Deployment and Provisioning

The ability to deploy new systems rapidly without ordering new hardware, building and/or installing the server and updating firmware can save immense amounts of system administrators' time. In fact, with preconfigured base operating system images, a new virtual server can be deployed literally in an instant.

Reduced Power Consumption and Cooling Needs

Server power consumption (and by extension, cooling requirements) does not scale linearly with CPU utilization because an idle or near-idle server platform still consumes a significant "base" amount of power. A single system, therefore, running at 50 percent utilization, consumes far less power than five systems running at 10 percent utilization. Thus, consolidating multiple low-load systems into one produces dramatically less heat and demands far less power overall.

Percentage of x86 Server Architecture Workloads That Are Running in Virtual Machines



Source: Gartner (October 2009)

Challenges Arise with Increased Complexity

Because it offers such tremendous benefits for some of the most pressing concerns facing data centers today, virtualization adoption has skyrocketed in recent years. But as users deploy the technology, they soon find that virtualization adoption violates a key maxim of data center best practices: avoiding heterogeneity whenever possible.

For this reason, most production environments standardize on a handful of hardware platforms in their data centers to maximize the efficiencies of scale related to hardware and tool expertise.

But virtualization, by its very nature, complicates things. From an infrastructure point of view, users must treat virtualized servers differently from nonvirtualized servers. On the surface, this is a good thing: virtualization provides a rich set of new deployment and management capabilities for virtual machines. But this new architecture also requires different tools than those currently used with nonvirtual servers. And when it comes to managing complexity, *different* is *difficult*, even when "different" provides significant benefits in other ways.

So why does management of virtualized environments pose such a challenge, when virtual machines should be easier to administer?

The answer, in short, is because virtualized servers coexist with non-virtualized ones, effectively doubling the tools and efforts relevant to data center administration. These include:

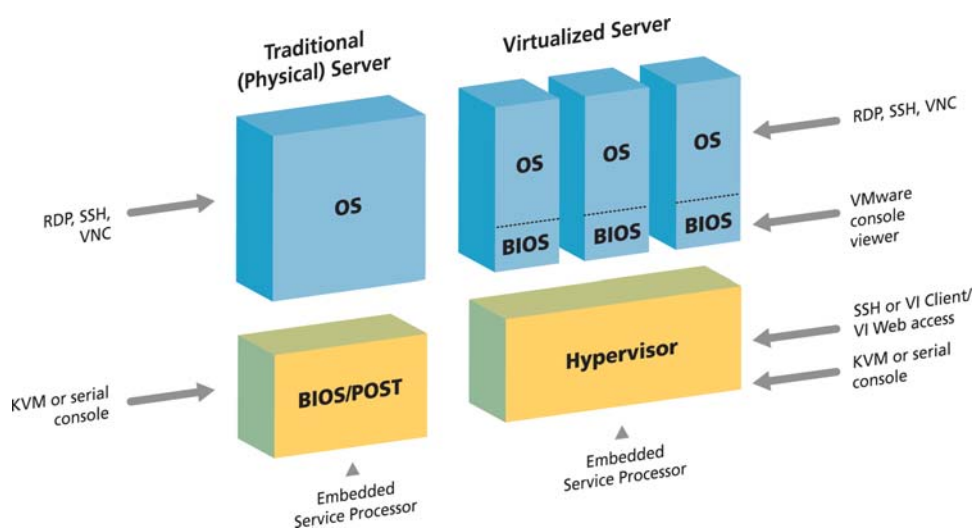
- ▶ **An additional layer of administration for virtual machines and VirtualCenters.** All virtualized solutions provide a form of management application to centralize major virtual machine administration activities (setup and configuration, deployment, moves, pause/resume, permission management, etc.).

Obviously, these activities add to the regular server administration activities that one would perform on the virtual machine itself. Additionally, it is typical that virtualization environments contain multiple VirtualCenters (for example: production and test). These multiple VirtualCenters may be maintained and managed separately. This practice represents yet another set of challenges in terms of managing access and control activities.

- ▶ **Challenges caused by proliferation of access methods.** Any server can be accessed using software tools such as RDP (Remote Desktop Protocol), VNC or SSH. But in order for these tools to be useful, the operating system must be running. Before an OS becomes fully available, however, access methods vary. For physical (nonvirtualized servers), an out-of-band technology must be employed – most typically, a KVM or serial console switch. For virtual machines, the console tools within each virtualization vendor’s management interface typically provide the best pre-OS access to the virtual machine’s emulated BIOS. Complicating matters further, multiple methods exist to access the virtual host itself: assuming no problems with the hypervisor layer, one typically launches a Web or installed access client (e.g., VMware® Virtual Infrastructure Client), or uses SSH; but if true bare-metal access is required (e.g., if the hypervisor has problems), again an out-of-band technology must be used.

The result of access method proliferation can manifest itself in a variety of ways that may be specific to organizations or scenarios. There may be conflicts in access and resolution between multiple access methods or different users of these different methods. Identifying where the problem occurs may be difficult because of the multiple unrelated records related to the problem. Finally, the uncoordinated access methods may create network density of access using one or more methods that are not necessarily the desired ones from network, procedural or logging perspectives.

Proliferation of Server Access Methods in Physical and Virtual Servers



- ▶ **Multiple potential authorization/permission and audit/log sources.** For each possible access tool described above, infrastructure administrators must manage a now substantial number of authorization and audit sources. This issue can be compounded when moving applications from one physical server to another, a very typical task when implementing virtualization. At the very least, one must determine a strategy of synchronizing these authorization and audit sources – an additional implementation burden many do not anticipate.

These challenges pose a major concern, because a key promise of virtualization is flexibility and ease of new server deployment. If the resulting management complexities are not properly addressed, they can threaten the successful deployment of this revolutionary technology.

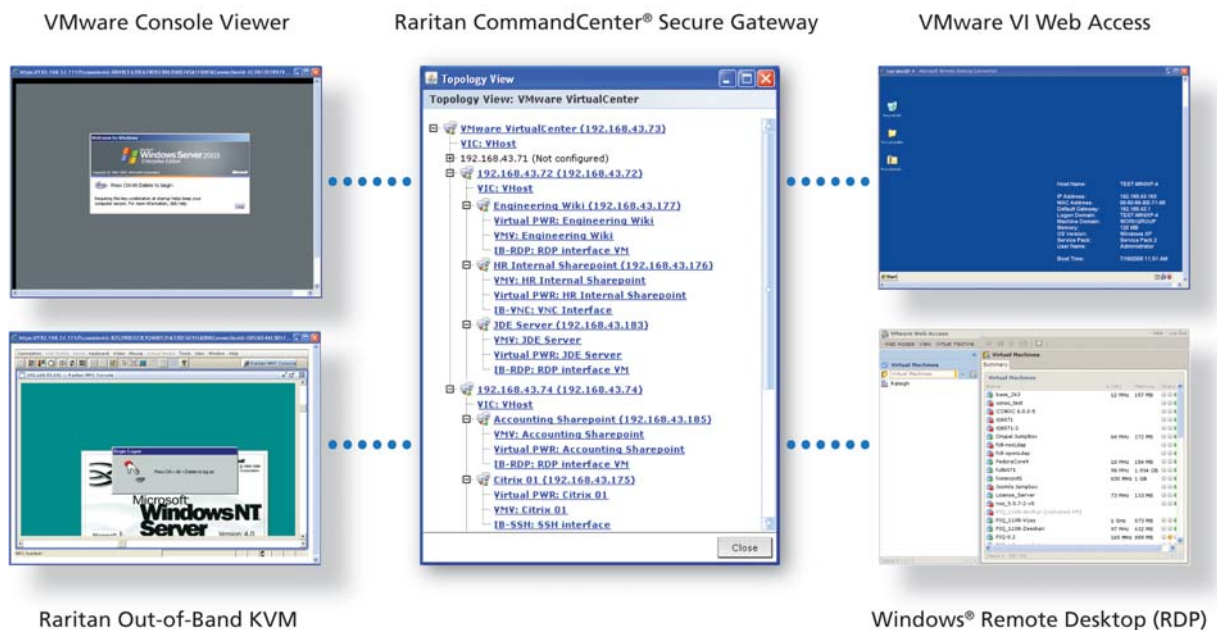
Ideally, a new technology can be deployed transparently to “casual users.” Administrators responsible for the virtualized server will still interact daily with tools such as VMware’s VirtualCenter, but an application administrator should not need to know whether his or her application exists on a virtual or physical server. It should be completely transparent.

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The complexities introduced by virtualization threaten this ideal in a typical data center because each server layer could potentially employ a different access tool, each with different authorization, audit and administration layers.

A Proposed Solution

Virtualization vendors understand that virtual machine proliferation can get out of control without consolidated access. For this reason, tools like VMware's VirtualCenter can provide a single point of access to all VMware access methods. Unfortunately, these tools, while extremely robust for addressing all virtual machines, do not fully address the realities of a production data center. Specifically, they do not consolidate all relevant tools – across multiple vendors and multiple technology layers, for both virtual and physical servers.



One Click, Multiple Tools After logging into a management appliance (in this case, Raritan's CommandCenter Secure Gateway), a server administrator can instantaneously launch all relevant tools for this VMware host and all its virtual machines. Here you can see VirtualCenter, RDP, SSH and out-of-band KVM switching all coexisting.

Today, access tool aggregation platforms exist to meet this challenge. Like VirtualCenter, they offer a constant, updated view of virtual machines even when applications are moved from one ESX server to another. But moreover, they combine this capability with interfaces to remote control software (RDP, VNC, SSH); out-of-band console hardware (KVM switches and serial console servers); as well as vendor-proprietary baseboard management controllers (HP iLO/iLO2, IBM® RSA, Dell® DRAC); and others. In effect, this provides a unified access portal to every layer of every server type, whether physical or virtual.

While virtualization experts will certainly continue to use specialized tools such as VMware's VirtualCenter to administer their environments, all other server administrators do not need to meddle with that layer of complexity on a daily basis. Instead, most administrators can simply access one aggregation platform to attain access with a single login to all relevant interfaces for all devices in the data center. And this doesn't just mean servers. A robust management platform also addresses intelligent power systems, network devices, storage infrastructure and more.

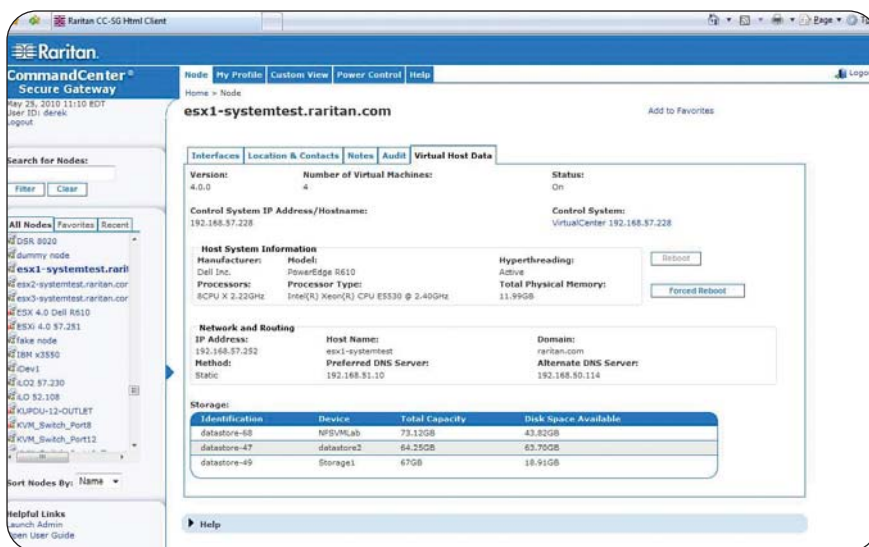
The aggregation platform can securely handle all authorization, auditing and session handoffs in a much more easily managed package, making life for the IT manager simpler and more productive.

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Desirable Attributes of an Access Consolidation Solution

A number of devices now exist to address the basic needs of an IT organization facing the complexities of a mixed environment comprising both virtualized and nonvirtualized servers. By aggregating software, hardware and virtualization management tools in a single consolidated platform, access consolidation solutions serve a critical function in delivering on the true benefits promised by virtualization. By their very nature, access consolidation solutions come from third-party vendors such as Raritan (under the brand name CommandCenter Secure Gateway), because these products must – by definition – be cross-platform and multivendor.

To properly consider the differences from one consolidation vendor to another in the appropriate context, one must remember the core problem to be solved: How do we preserve simplicity in an inherently complex environment without sacrificing power or control? A number of derivative questions result from this perspective:



Clear Information Enables Quick Action
Raritan's CommandCenter Secure Gateway provides all key data about each layer of a virtualized infrastructure in readily accessible tabs. From bare-metal to hypervisor to virtual machine, all critical information is available to accelerate remediation of problems.

Is the user interface easy to understand and navigate? Presenting complexity in an easily digestible form is the core problem that access consolidation solutions should solve. Some products require users to click through a multiple array of tabs – labeled identity, location, contacts, VM properties, summary, etc. – simply to obtain basic information about a virtual host or virtual machine. Instead, important information should be presented in a succinct interface that can be navigated easily and intuitively.

Does the solution provide a simple visualization of a virtualized topology? It's imperative for those utilizing the resulting infrastructure to understand quickly the virtualization layer of the data center, so IT managers should seek an easily viewed aggregation solution that provides tree representations of the entire virtualized topology. Be wary of interfaces that only allow users to expand one item of a topology tree at a time: this hinders the user's ability to quickly determine on which hypervisor or physical host server a particular virtual machine is running. With the proper interface, users should be able to see all levels of the virtualization environment with a clear indication of which virtual machine runs on which hypervisor, running on which VirtualCenter.

How easy is it to configure new virtual machines and hypervisors into the consolidated tool? Most solutions provide built-in wizards to simplify the process of adding a new host server (and its virtual machines). These "Add Unit Wizards" walk the users through multiple screens to set up a device in the access consolidation solution. But for ease of use (and to save time), consolidation solutions that require the least number of steps to perform this critical task are preferable. Again, simplicity and convenience reign.

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Can administrators configure new virtual machines and hypervisors in bulk? Virtual machines almost always share certain attributes with each other. For example, usually all Windows virtual machines will require RDP to be configured as an access option. Also, often a group of virtual machines will all be managed by the same management account. So confirm with the solution provider that the access aggregation product allows for bulk selection of applicable in-band console applications (RDP, VNC and SSH) and bulk configuration of authentication information for service accounts to virtual machines. This step alone can save hours of setup and configuration frustration.

How easy is it to combine virtualization access tools with physical, out-of-band tools? Many virtual host servers will occasionally require bare-metal, BIOS-level access and remote power control. Because hypervisors must ultimately run on physical servers, a single virtual host requires the entire gamut of access tools: all out-of-band tools relevant to a physical server, *and* all in-band and virtualization tools relevant to the hypervisor and virtual machines. These two paradigms should not reside in separate realms but should coexist, as this forms the fundamental value of an access consolidation tool. Therefore, seek products that can easily associate all methods with a single node.

Does the solution's software licensing enable or inhibit dynamic expansion? Look for a solution whose licensing structure enables flexibility in deployment. Avoid recurring licensing charges when possible, and certainly insist that licensing overage be handled gracefully. Because virtualization offers the ability to add virtual machines dynamically when needs arise, don't be constrained by software licensing from adding additional machines when the need arises.

Conclusion

Few solutions are as revolutionary for the data center manager as server virtualization. Yet it complicates major process and management functions. Therefore, a close examination of how to effectively manage the infrastructure after deployment can be just as important as the deployment itself.

A unified, out-of-band approach, therefore, promises to render the virtual and physical layers truly transparent from a management perspective, freeing IT administrators from the complexities of the heterogeneous environment from which most complications originate. By aggregating management tools into a single, consolidated platform, access consolidation solutions serve a critical function in delivering on the true benefits promised by virtualization.

Examine your options carefully. And whether you begin your research with Raritan, or end it with Raritan, we think you'll find that we offer one of the most comprehensive, capable, secure management devices in the industry.

To learn more about our solution for this complex problem, please visit www.raritan.eu/virtualization/

About Raritan

Raritan is a leading provider of secure IT infrastructure management solutions that provide IT directors, managers and administrators the information they need to manage their data centers smarter and provide the control they need to improve data center productivity, enhance branch office operations and increase overall power management efficiency. In over 50,000 locations around the world, our integrated secure in-band and out-of-band server access, control and power management products help companies better monitor and manage server access, utilization and energy consumption. Our intelligent PDUs offer remote power control and monitoring at the rack and device level, empowering data center owners with information to improve uptime and capacity planning, and efficiently utilize energy to save power and money. Raritan's OEM division provides embedded hardware and firmware for server and client management, including KVM over IP, IPMI, intelligent power management and other industry standards-based management applications.

Based in Somerset, NJ, Raritan has 38 offices worldwide, serving 76 countries. The European head office is located in The Netherlands. For more information, please visit Raritan.eu

