

## Managing the Virtualized Data Center

AVOCENT'S ROLE IN VMWARE-ENABLED ENVIRONMENTS



### OVERVIEW

*Virtualization is steadily gaining ground in the marketplace. Many IT organizations are, to varying degrees, implementing VMware technology to create multiple virtual servers on selected physical servers. Use of these virtual servers provides a variety of benefits – including reduced capital spending on hardware, reduced demands on power and cooling capacity, and more flexible allocation of processing capacity.*

The introduction of virtualization, however, creates many new management challenges for IT organizations. These new challenges arise from two basic causes:

1. Virtual servers by their very nature must be managed differently from physical servers – especially given the current limitations of VMware's tools.
2. Data centers are only partially virtualized. That is, servers *may* be physical machines or they *may* be virtual machines residing on physical machines with other virtual servers.

This mix of virtual and physical servers adds a new level of complexity to management operations. As a result, IT organizations must re-think the way they manage their increasingly dynamic mix of virtual and physical servers.

Avocent's management solutions are ideal for managing this emerging virtualized server environment. With Avocent solutions, customers can:

- Access virtual and physical servers from a single interface
- Access virtual servers distributed across multiple VMware VirtualCenters from a single interface
- Consolidate events and alerts from both physical and virtual servers
- Granularly control access rights to both virtual and physical servers in a common manner
- Maintain management assignments for virtual servers even as they are moved from one physical machine to another
- Granularly audit management operations performed on both virtual and physical servers

**The above are all essential management capabilities that VMware alone does not provide.**

Few, if any, IT organizations fully understand how virtualization will impact their management operations. This document will help you educate your customers about that impact. It also helps you explain how Avocent can play a key role in ensuring that their transition to a virtualized IT environment is a successful one.

### **WHY VIRTUALIZATION?**

IT organizations are under constant pressure to do more with less. They are constantly being asked to roll out more applications, support more users, deliver higher service levels, and handle more intense processing workloads. And their budgets are rarely increased proportionally to these escalating demands.

Virtualization offers relief from these demands in several ways:

#### **More efficient, “multiplexed” use of server hardware**

Instead of having to devote individual servers to each application, virtualization allows multiple applications to be run on a single server – as long as those applications only utilize a relatively small percentage of the physical server's resources. This ability to run multiple applications on a single server can substantially reduce capital spending on server hardware. Lifetime ownership costs may also be lower for a single large server than they are for multiple 1U rack units.

### Respite from the physical limitations of the data center

Many IT organizations have maxed out the physical capacity of their existing data centers in terms of floor space, cooling capacity and/or power utilization. They would therefore not be able to add more servers without expanding or moving their data centers – which would be prohibitively expensive. Virtualization lets them postpone such a painful undertaking by allowing them to load more applications onto the server infrastructure they already have in place.

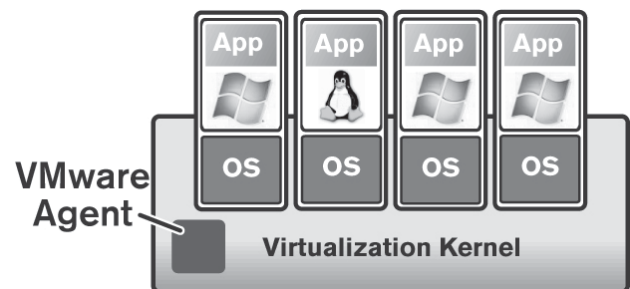
### Cost-effective provisioning of high availability

With virtualization, IT organizations can provision failover servers far less expensively than they can with actual physical machines. Virtualization can also make it economically feasible for them to provision secondary servers so that they don't have to interrupt critical services while they perform maintenance or backup tasks on their primary servers.

### Greater flexibility for meeting production and development requirements

IT organizations are often called upon to quickly provide servers in order to handle spiking workloads or support development projects. Doing this with physical servers can be expensive and slow – and fairly wasteful if the server is only needed for a limited amount of time. Virtualization, on the other hand, theoretically allows them to respond to these needs almost immediately without any incremental hardware cost.

These are just some of the reasons that IT organizations are introducing virtual servers into their data center environments. Some are actually using virtual servers as managed desktops that users access from PCs that only run thin clients. Others are using virtualization as a means of “cloning” configurations across departments and locations.



When dealing with customers, it is therefore important to first understand the motivation and objectives that underlie their virtualization strategy. Key questions to ask include:

- *What primary benefits are driving your VMware implementation? Reduced hardware costs? Faster response to business needs? Provisioning of high availability? Some other reason? A combination of reasons?*

- *Are you trying to reduce server hardware purchases by a specific amount this year?*
- *Do you have a specific set of applications that you are initially targeting for virtualization?*
- *How long are you hoping virtualization will enable you to defer expansion or relocation of your data center?*

## THE REALITY

As appealing as virtualization may be, IT organizations are introducing it into their environments with varying degrees of caution. Some are only starting to experiment with virtualization solutions in the lab. Others have begun to roll virtual servers out into production. But even the most enthusiastic early adopters of virtualization are only applying it to a certain percentage of their new production machines. And no one is overhauling their entire IT environment to make it entirely virtual.

In fact, for many applications – especially high I/O ones like email – virtualization is neither practical nor advisable. No data center will, therefore, ever be fully “virtualized.”

That’s why, when the topic of virtualization comes up, it’s far more accurate to speak to customers in terms of “partial virtualization” or “limited virtualization.” IT organizations will always have to deal with a mix of physical and virtual server resources for many reuses.

- **Investments in physical servers are significant.** Companies have spent years buying server hardware, integrating those servers into their environments, and fine-tuning those servers to optimize application performance. They will not scrap those investments any time soon.
- **IT organizations are still figuring out how and when to implement virtualization.** As they complete pilot projects, IT professionals are finding out that they have a lot to learn about virtualization technology. They’re discovering that virtualization can cost them more CPU overhead than they expected. They’re discovering that application I/O can limit their ability to run multiple virtual servers on a single physical machine. These discoveries are causing them to be more disciplined and methodical in their roll-outs of virtual server technology.
- **They’re running into management problems.** Most of the business case for virtualization revolves around deploying infrastructure. But IT organizations spend significant percentage of their budgets keeping infrastructure up and running. As

IT organizations encounter first-hand the unique problems associated with managing virtual servers, they will have to figure out how to overcome those problems – and then re-consider the role virtualization will play in their long-term data center optimization strategies.

- **Adoption rates depend on many non-technical factors.** Even if virtualization could fully live up to its hype – which it cannot – many other factors will slow adoption. Customers still have to come to terms with vendors. Potential investment in virtualization has to compete with other items on the IT to-do list. Application vendors have to deliver appropriate support for virtualization. And IT organizations may find other ways to overcome resource constraints, including open source and on-demand software.

For these reasons and others, virtualization must always be discussed in the context of phased implementation occurring in an environment that is either partially or – as is more likely – mostly physical. There are not now and there will be no 100% virtualized data centers. There will only be virtual servers that must be managed in conjunction with their still-physical counterparts.

In addition to understanding the motivations and objectives behind a customer's virtualization plans, it is therefore also important to discover the factors that are inhibiting their implementation. Key questions to ask include:

- *What percentage of your servers are virtual today? What percentage do you believe will be virtual a year from now?*
- *What percentage of all new servers being rolled out are now virtual? What percentage do you believe will be virtual a year from now?*
- *What is preventing you from rolling out virtual servers more aggressively?*
- *Are you concerned about how Microsoft's future virtualization moves may affect your company's long-term virtualization strategy?*
- *What is your biggest fear about virtualization?*
- *What technical issues have you run into in your initial implementations of virtual server technology?*
- *What other technologies are you considering to help you with your cost and flexibility issues?*
- *Have your experiences dealing with VMware been generally positive or negative?*
- *Have you run into any technical or logistical issues managing your virtual servers?*

## **THE IMPACT ON SERVER MANAGEMENT**

Virtual server technology can help IT organizations significantly improve the economics of data center infrastructure. However, virtual server technology also introduces new complexities and challenges when it comes to managing that infrastructure. Some of these challenges arise from the nature of virtual server technology itself. Some of them arise from the fact that virtual servers must be managed in conjunction with all the servers in the data center that remain “unvirtualized.” Together, these two sets of challenges significantly impact the way IT organizations must operate.

Challenges that arise from the nature of virtual server technology itself include:

### **Giving specific IT staff appropriate privileges for specific virtual machines**

It can already be somewhat complicated to give the specific IT staff access and appropriate operational privileges for specific physical servers. Authorized systems administrators, for example, may have to be given root access – while application specialists are only given access to the software running on the OS.

When multiple virtual servers are running on individual physical machines, the administration of these rights becomes even more complex. To provide an application specialist with access to just one of the ten virtual servers running on a given physical machine, for example, an IT manager has to administer appropriate privileges on that physical machine’s ESX Service Console – which is the management gateway for both the VMware virtualization layer and the individual virtual servers running on the physical machine.

Matters get even more complicated as IT organizations implement more virtual servers. That’s because they have to implement VMware’s VirtualCenter to manage multiple ESX servers. However, most IT managers don’t want to give their systems administrators and application specialists access to VirtualCenter, because such access would potentially give them inappropriate control over the data center’s virtual infrastructure. So, instead, they manually provide their technical staffs with the IP addresses and/or management URLs of the specific virtual machines for which they are responsible.

### **Maintaining management assignments as virtual servers move from one physical machine to another**

This manual approach to the distribution of IP addresses and/or management URLs can create problems if and when virtual servers are moved from one physical machine

to another. A company's VMware manager, for example, may choose to shift virtual servers between physical machines in order to balance workloads or handle utilization spikes. However, this may leave application specialists temporarily in the dark until they can be provided with the new location of the virtual servers for which they are responsible. Even worse, VirtualCenter can be set up to automatically move virtual servers based on pre-defined business rules. If such an automatic move occurs without corresponding notification to all affected IT staff, technicians who don't have direct access to VirtualCenter may not be able to find their servers at all.

### **Accessing multiple virtual servers connected to different Virtual Centers**

At this time, VMware doesn't enable IT staff to unify their views of multiple virtual servers residing on different physical machines, if the ESX Service Consoles of those different physical machines are connected to different VirtualCenters. VMware claims that each VirtualCenter can manage hundreds of physical servers. However, customers often choose to deploy multiple VirtualCenters before they reach that threshold in order to segment their virtual environments by platform or location. So, if virtual servers in two locations support a single application, the application specialists in charge of that application can't view both servers from a "single pane of glass."

### **Protecting many virtual servers from component failure in a single physical server**

With physical servers, there is a one-to-one relationship between component failure and application outage. When multiple applications are running on that same server, the stakes go up. Virtualization theoretically insulates applications and services from component failure by enabling IT organizations to run mirrored virtual servers and/or to quickly migrate virtual servers from one physical machine to another. But not all IT organizations have sufficient idle capacity on their other VMware-enabled servers to handle the workloads that would result from the simultaneous loss of twenty or more virtual machines due to the failure of a single physical machine. So IT organizations implementing VMware have to be particularly sensitive about the vulnerabilities created by multiplexing large numbers of virtual servers onto a single physical machine – and must be sure they have the out-of-band access to those physical machines necessary to address BIOS- and hardware-level issues.

### **Exclusive use of Microsoft Active Directory**

VMware uses Microsoft Active Directory exclusively to administer management rights and permissions. This can potentially be problematic for IT organizations that need to drive management access using technologies such as LDAP, RADIUS and single sign-on in order to support their broader infrastructure management architecture.

Challenges that arise from the fact that virtual servers must be managed in conjunction with all the servers in the data center that remain “unvirtualized.” include:

#### **Managing physical and virtual servers in a common manner**

For virtualization to be truly transparent to the IT organization, virtual servers and physical servers must be managed in a common manner. That is, systems administrators, application specialists and others should not need to specifically know whether the server they have to manage is virtual or not. They shouldn't have to use an entirely different piece of software to access each type of machine. However, if they use VMware's tools alone, this is exactly what will happen. The VMware Remote Console is actually a client-side executable that responds to files with the .vxml file extension. So users will view the virtual servers for which they have management permission through the VMware Remote Console client, while they will use some other management application for their “regular” servers.

#### **Consolidating events and alerts from both physical and virtual servers**

In addition to accessing physical and virtual servers themselves in a common manner, technicians need to view management events from both set of resources on a “single pane of glass.” This is important for ensuring that all events are responded to in a timely manner and that multiple alerts stemming from a single root cause aren't handled in a fragmented manner. By itself, VMware only displays events from virtual servers and the physical servers that host them.

#### **Administering access rights across both virtual and physical servers**

The administration of access rights to physical data center assets is already a fairly complex affair. And, as noted above, the administration of access rights to virtualized server resources is itself likely to become increasingly complicated. If these two administrative tasks have to be performed entirely independently of one another, the overall complexity of access privileges will be overwhelming. It is therefore essential for IT organizations to come up with a single, streamlined method for authorizing, modifying and withdrawing access privileges on a granular basis across all physical and virtual resources.

#### **Auditing management operations performed on both virtual and physical servers**

As compliance pressures mount, IT organizations must be increasingly diligent about auditing staff access to servers that handle critical and/or security-sensitive data. They also have to be sure they can respond to inquiries from internal and external auditors. These auditors expect all management operations relating to a given business function



or application to be maintained in a single log. In fact, in some instances, the use of multiple audit logs may violate standard compliance practices. It is therefore essential for IT organizations to implement a common auditing mechanism for work performed on both virtual and physical servers.

The above are some of the initial management challenges that early adopters of VMware and other virtualization solutions are discovering as they begin to roll out virtual servers in their data centers. There are likely to be others as well. The main point is that the emerging “virtualized” data center is even more complex to manage than conventional environments – and that VMware’s native management tools are insufficient for addressing this complexity.

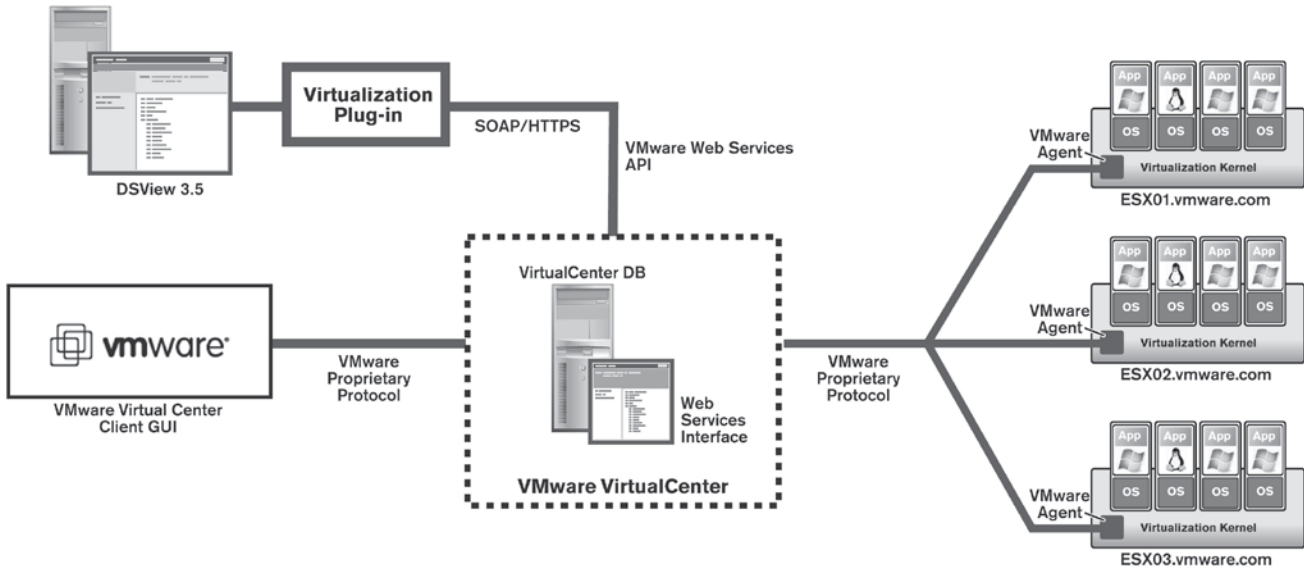
Not all VMware customers are fully aware of all of these potential management issues. It is therefore important to find out which of these issues they’ve already discovered, which ones they haven’t yet considered, and which ones they may have already overcome in some way. Key questions to ask include:

- *How are you authorizing your staff to access virtual servers? How do you authenticate them at the server?*
- *What’s your change process for both moving virtual servers and ensuring that the right people can still access that server once it’s been moved?*
- *Have you implemented VirtualCenter? Are you giving everyone access to VirtualCenter?*
- *Have you implemented multiple VirtualCenters? Have you encountered any issues trying to manage resources across multiple VirtualCenters?*
- *How are you protecting your multiple virtual servers from failure of their shared underlying physical server? Are there specific virtual servers for which this is a greater concern than others?*
- *Are you using Active Directory across all of your management tools? If not, how are you going to integrate your Active Directory for VMware into the rest of your management environment?*
- *Are you going to set up separate management teams for your virtual and physical environments? If not, is your goal to manage both in a common manner? What is your timeline for doing so?*
- *Do you want to collect events and alerts from both virtual servers and physical servers in a “single pane of glass?” How do you plan on doing this?*
- *Are you going to maintain separate audit trails for physical and virtual servers? If so, have you verified with your compliance managers that this is OK? If not, how are you planning to achieve audit consolidation?*

### AVOCENT'S VIRTUALIZATION STRATEGY

Avocent can play a central role in enabling customers to meet the management challenges posed by data center environments that are partially virtualized. Avocent is doing this by:

1. Continuing to deliver the out-of-band remote management capabilities customers need to maintain the health of their underlying physical server infrastructure – regardless of whether or not that physical infrastructure is hosting multiple virtual servers, and...
2. Integrating DSView<sup>®</sup> 3 management software with VMware's management tools so that IT staff can access virtual and non-virtual resources in a unified way

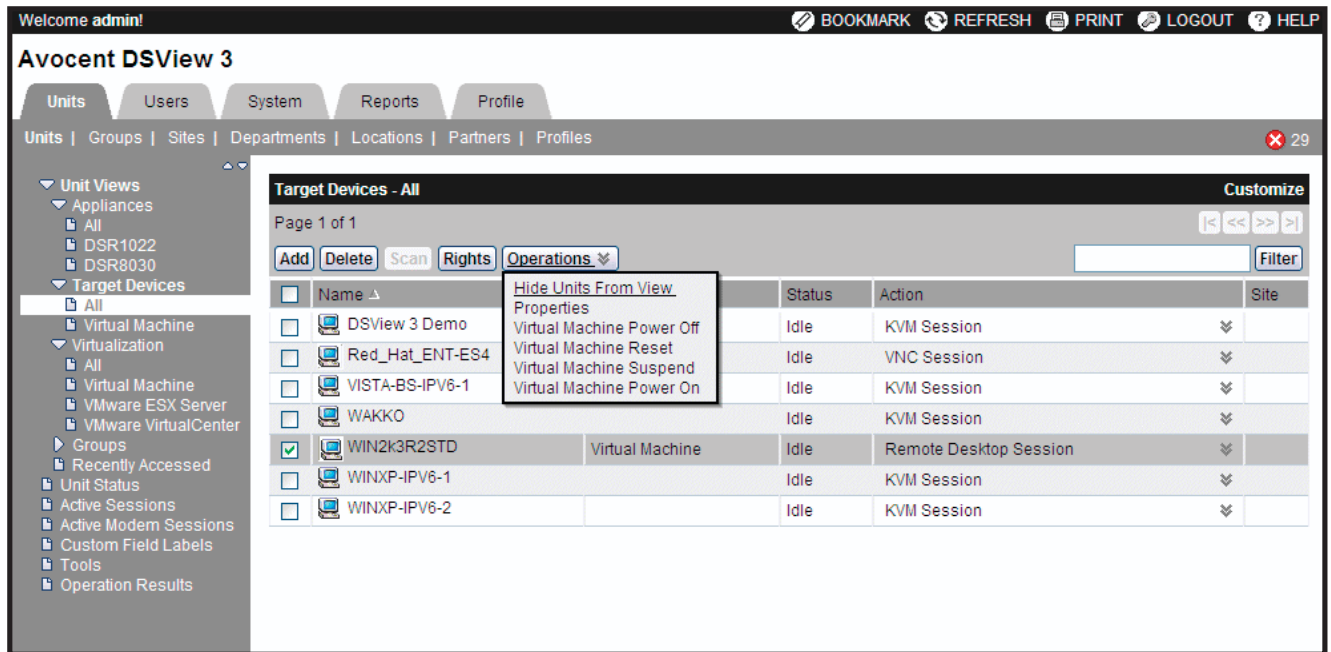


Initial integration with VMware is slated for 3Q07. Specific functionality slated for this release includes:

- *The ability to discover Virtual Centers, VMware ESX Servers and the virtual servers they support*
- *The inclusion of these virtual servers as Target Devices*
- *The ongoing synchronization/updating of the Target Device list as virtual machines are created, torn down or moved*
- *The ability to access virtual servers via the VMware Remote Console, a Web browser or RDP, and the Virtual Infrastructure Web Access of the VirtualCenter server associated with the ESX Server hosting the virtual server*

- The ability to granularly administer management rights for virtual servers in a common manner with other Target Devices from the DSView 3 administration console
- The inclusion of events and alarms from VirtualCenter Management Servers and VMware ESX Servers in the DSView 3 Event Log for display and associated actions
- The capture of all management operations performed on virtual servers in the DSView 3 audit log

These new capabilities will provide customers with several critical advantages as they move forward with their virtualization plans, including:



**The ability to access physical and virtual servers from a single management application.** IT staff will not have to know whether the device they need to access is physical or virtual. They will be able to pick any managed server from a single list of Target Devices.

**The ability to access virtual servers from a single “pick list” regardless of which VirtualCenter it is associated with.** IT staff won’t have to search multiple instances of the VMware VirtualCenter management application to find a particular virtual machine. Also, virtual machines associated with any VirtualCenter can be included in the same “pick list” as physical servers anywhere across the enterprise – providing IT organizations with complete flexibility in assigning management responsibilities to technical staff.

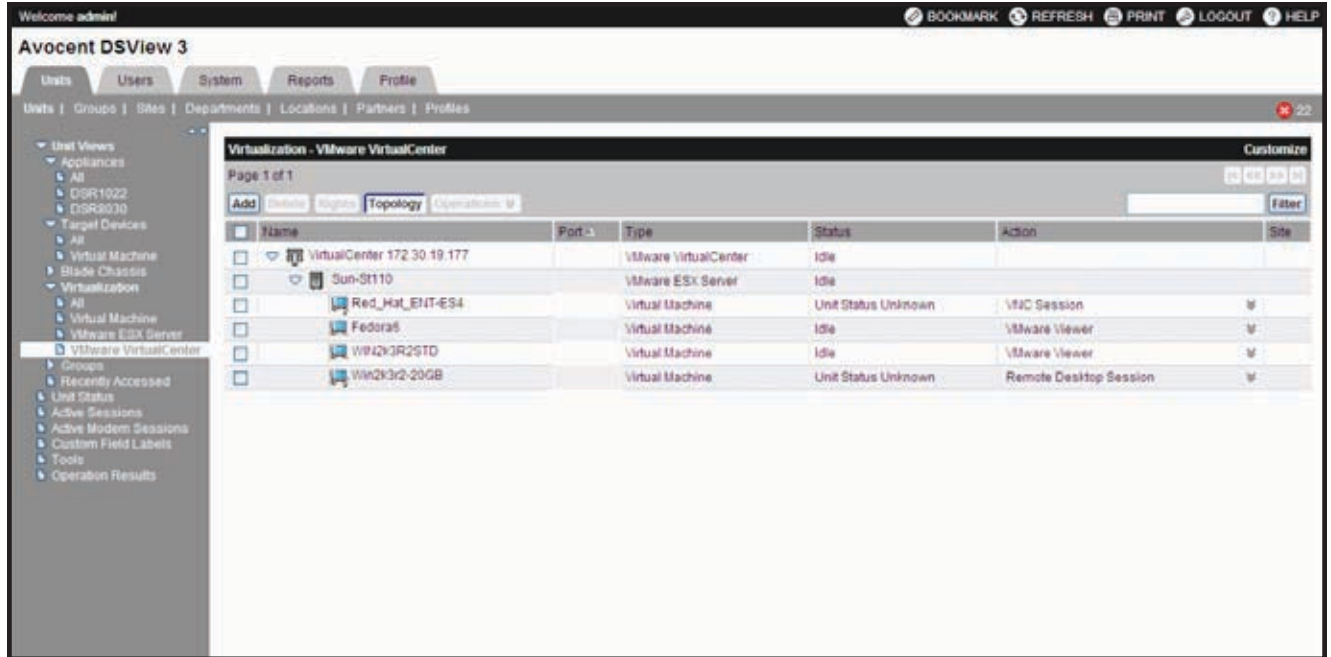
The screenshot displays the Avocent DSView 3 interface. At the top, there is a navigation bar with 'Welcome admin!' and utility buttons: BOOKMARK, REFRESH, PRINT, LOGOUT, and HELP. Below this are tabs for Units, Users, System, Reports, and Profile. The main area is titled 'Event Log - All' and shows a table of log entries. The table has columns for Severity, Date-Time, and Description. The entries include various system events such as task completion, VM power on, task starting, unit addition, authentication, and server startup. A sidebar on the left provides navigation for 'Event Log Views' with options like All, Severity Level, Event Category, etc.

Severity	Date-Time	Description
Information	6/12/07 3:15:40 PM	Task completed successfully
Information	6/12/07 3:15:39 PM	Virtual machine power on command issued for WIN2k3R2STD
Information	6/12/07 3:15:39 PM	Task started
Information	6/12/07 3:15:39 PM	Task added
Information	6/12/07 3:14:49 PM	Unit added
Information	6/12/07 3:14:49 PM	Unit added
Information	6/12/07 3:14:49 PM	Unit added
Information	6/12/07 3:14:49 PM	Unit added
Information	6/12/07 3:13:13 PM	Authentication successful
Information	6/12/07 3:13:01 PM	DSView server SUN-JObandoD620 started successfully
Information	6/12/07 3:13:01 PM	Task completed successfully
Information	6/12/07 3:13:00 PM	Task started
Information	6/11/07 5:23:27 PM	DSView server SUN-JObandoD620 started successfully
Information	6/11/07 4:51:26 PM	DSView server SUN-JObandoD620 started successfully
Information	6/11/07 4:10:08 PM	DSView server SUN-JObandoD620 started successfully
Information	6/11/07 3:36:13 PM	Logout successful

**A unified view of all server events and alarms, regardless of their source.** By using DSView 3 software to consolidate data collected from virtual and physical servers, IT organizations can eliminate the need to “toggle” between multiple applications.

**The ability to granularly assign management rights to technical staff across virtual and physical servers using any single directory solution-of-choice.** DSView 3 software eliminates the use of separate administrative silos by allowing IT managers to allocate access and specific permissions for all servers across the “virtualized” environment from a single console.

**A unified audit trails for all server management.** By using DSView 3 software to access both virtual and physical servers, IT organizations will generate a single log for all remote management activity.



**Simplified change management.** Instead of having to manually re-distribute IP addresses or management URLs every time a virtual server is moved from one physical machine to another, DSVIEW 3 software will automatically discover such moves – even if they occur across multiple VirtualCenters – and thereby keep IT staff’s authorizations and individual “pick lists” up-to-date.

**Enhanced security.** DSVIEW 3 software supports Active Directory for seamless integration with VMWare and offers additional authentication and encryption services including LDAP, NT Domain, TACACS+, RADIUS and RSA SecurID for added flexibility and support.

These additional new capabilities are, of course, in addition to the current remote management functionality that DSVIEW 3 software and Avocent KVM switching solutions provide – which continue to be essential for streamlining data center operations. In fact, those capabilities may be even more important now that the health and availability of multiple applications may now depend on the health and availability of a single physical server.

Because customers may not yet have decided on a long-term strategy for managing their “virtualized” data center environments, it’s a good idea to get them thinking about some of these issues. Key questions to ask them regarding Avocent’s role in their virtualization strategy are similar to those at the end of the previous section.

## **AVOCENT: UNIQUE SUPPORT FOR VIRTUALIZED DATA CENTERS**

The previous section described the specific technical advantages Avocent solutions offer customers implementing VMware virtualization technology. However, it's important to understand how those advantages actually benefit both IT organizations and the businesses they support.

In reviewing these benefits, it is important to maintain a good historical perspective on the introduction of new technologies into the enterprise. When PCs were first introduced into the corporate world, for example, they offered users the ability to be much more productive and to perform a wide range of new tasks. But they also had notoriously high total ownership costs, which ultimately undermined real ROI. That's why LANs and PC management tools became so important in the late 80's. Internet and desktop browsers also offered enormous potential in the late 90's. But IT also had to move quickly to standardize browser versions, to limit non-legitimate web browsing, and to protect the enterprise from the flood of malicious code that Internet connectivity exposed it to.

Virtualization is a similar phenomenon. It offers a wide range of benefits in terms of data center economics. But, if it's not appropriately managed, it will quickly become a source of higher costs and bigger headaches.

Here, then, are key benefits that customers should consider as they decide whether or not to take advantage of DSView 3 software's integration with VMware as part of their overall data center strategies:

### **Lower cost of virtual technology ownership**

If IT organizations have to maintain a management silo for their virtual servers, the cost of owning those virtual servers will be higher than if those servers are managed in the same way as non-virtualized servers. It's also interesting to note that – because virtual servers have very low amortized hardware costs – management and administration comprise an even larger percentage of their TCO. By simplifying and unifying management of the “virtualized” data center, Avocent reduces TCO for virtual servers and therefore improves total return-on-investment for virtualization.

### **Faster responsiveness to business change**

If it's not easy for IT organizations to keep technicians connected to the virtual servers they have to manage even as those virtual servers are moved from physical machine to physical machine, then they will be inhibited from making such moves. By automating

these changes in virtual server access, DSView 3 software eliminates this inhibiting factor and ensures that IT organizations can take full advantage of the flexibility that virtualization promises.

### **Reduced risk**

There are a variety of risks associated with implementing a new technology. In the case of virtualization, these risks include unanticipated management snafus, security exposure, and compliance issues. By subsuming the management of virtual resources into a server management solution with a proven track record in terms of control, security, and auditing, DSView 3 software mitigates many of these risks.

### **The ability to more broadly deploy virtualization**

If virtualization lives up to its promises, then IT organizations will want to implement it more and more extensively. Unfortunately, those that have tried to do so start “hitting the wall” at about 1000 virtual servers – due to the limitations of VMware’s native tools. Because DSView 3 software overcomes these limitations, it allows customers to deploy as many virtual servers as they want.

Because many customers have focused up until now on simply figuring out how virtualization works from a technical point-of-view, they may not have fully considered how to optimize its impact on the business over the long term. It may therefore be a good idea to get them thinking about business case and business value. Key questions to ask include:

- *Do you know what your TCO is today for your physical servers? Have you projected your TCO for virtual servers? What percentage of this TCO is related to management and administration? Would you like to reduce this number?*
- *How long does it take you to add or shift server capacity today? How quickly do you want to be able to do so with virtual servers? What factors might limit your ability to achieve your responsiveness goals?*
- *What do you consider to be the main risks associated with your virtualization roll-out? What are you doing to mitigate those risks?*
- *What if virtualization is a success? How will you scale up your implementation?*

## **OTHER RESOURCES**

### ***Virtualization gotchas: Part 1***

[http://www.computerworld.com/action/article.do?command=viewArticleBasic&taxonomyName=servers\\_and\\_data\\_center&articleId=9013962&taxonomyId=154&intsrc=kc\\_feat](http://www.computerworld.com/action/article.do?command=viewArticleBasic&taxonomyName=servers_and_data_center&articleId=9013962&taxonomyId=154&intsrc=kc_feat)

### ***Five more ways to screw up virtualization***

[http://www.computerworld.com/action/article.do?command=viewArticleBasic&taxonomyName=Management&articleId=9014621&taxonomyId=14&intsrc=kc\\_li\\_story](http://www.computerworld.com/action/article.do?command=viewArticleBasic&taxonomyName=Management&articleId=9014621&taxonomyId=14&intsrc=kc_li_story)

### ***The virtualization drag***

<http://www.networkcomputing.com/showArticle.jhtml?articleID=198700359>

### ***The problems that virtualization doesn't cure***

<http://www.enterprisenetworksandservers.com/monthly/art.php?2547>





**Avocent**<sup>®</sup>  
The Power of Being There<sup>®</sup>

[www.avocent.com/contacts](http://www.avocent.com/contacts)

Avocent, the Avocent logo, The Power of Being There, Cyclades, DSView, Merge-Point, Secure Rack Management and SRM are registered trademarks of Avocent Corporation or its affiliates. All other marks are the property of their respective owners. Copyright (c) 2007. Avocent Corporation. All rights reserved.

0607-SVDC-WP