SearchServerVirtualization.com E-Guide

Virtualization for Disaster Recovery

The use of server virtualization for your disaster recovery (DR) plan is not a "slam dunk" by any means—it can certainly simplify the DR process, but it also poses its own unique set of challenges. In order to use this technology for a sound DR process, you need to exploit virtualization's hardware transparency, system mobility and automation benefits.

This expert E-Guide can help. Read it for insight on the biggest benefits and challenges to virtualized DR, including suggestions to overcome common set-backs. Review the six essential requirements for DR in virtual environments, and learn about a real-life example of an organization that streamlined their infrastructure and DR plan with blade servers.

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Disaster recovery preparedness in virtual environments

By Chris Wolf, Site Contributor

Saying that virtualization makes disaster recovery (DR) less complex is easy. It does. But using virtualization to eliminate traditional stumbling blocks isn't. A well-devised disaster recovery strategy in a virtual environment means you need a plan that exploits virtualization's hardware transparency, system mobility and automation benefits.

Organizations' disaster recovery plans and tests vary. Some IT shops fully test DR plans on a quarterly basis by validating all steps in a plan, while for others the test consists of reading the plan but not acting on it.

DR can be a complex undertaking, and when you face differing hardware between production and recovery sites, recovering critical systems is often fraught with numerous roadblocks. Most of these problems result from differing hardware and, hence, differing firmware and device driver requirements for production versus disaster recovery sites.

Why do some organizations restrict disaster recovery testing? Here's my favorite reply—and one that I've heard more than once: "Because they are bad for morale."

Why do IT shops believe disaster recovery testing is bad for morale? Often a DR test takes days to com plete and can set an IT staff pretty far back in terms of its "real work."

But beware of the time-sink excuse. DR is a serious issue, and any organization that doesn't have confidence in its disaster recovery plan is taking a serious gamble. That's why virtualization is so important. The hardware abstraction of virtualization platforms makes it relatively easy to overcome differences in hardware between production and recovery sites.

Virtualization reduces hardware needs

Virtualization changes how we plan for and execute a disaster recovery strategy. With virtualization, you can reduce the number of disaster recovery site hardware requirements—assuming that you're preparing for the loss of only a single site. The hardware abstraction afforded by virtualization removes the need for duplicate hardware between production sites and the recovery site.

When it comes to disaster recovery, data center managers have plenty to worry about. For organizations that virtualize production resources, they will likely need to adjust disaster recovery plans after a server virtualization migration. How does virtualization change things? What should you do differently? The six items below are considered requirements for disaster recovery in virtual environments:

- Hypervisor configuration settings
- VM configuration settings

- Shared I/O
- Virtual machine (VM) snapshots
- Data staging at the DR facility
- Disaster recovery automation

Hypervisor configuration settings

Hypervisors such as VMware ESX Server and Citrix Systems Inc.'s XenServer store configuration settings locally on their physical host system. Configuration settings determine how the hypervisor accesses compute, storage and network resources and also dictate how shared resources are presented to VMs.

In virtual environments, two of the most critical configuration settings are the virtual network and storage configurations. Many organizations have scripts in place that can recreate critical hypervisor configuration settings; however, in the absence of configuration scripts, you need to ensure that all configuration settings are regularly backed up. There are two common techniques for doing so:

- Installing a backup agent on the hypervisor console.
- Exporting the hypervisor configuration settings to a network share (such as an Network File System mount) and then backing up the settings from the share.

How you back up copies of the hypervisor settings isn't important; backing them up on a regular basis is.

Virtual machine configuration settings

VM configuration settings define a VM's virtual hardware settings and include the following:
Virtual network interface settings such as MAC addresses

- Virtual switch association settings
- Storage configuration
- Virtual CPU configuration

Many organizations back up VMs by installing backup agents inside each virtual machine's guest operating system. While backup agents inside a VM's guest OS secure copies of the VM's data quite well, agents won't back up the configuration data that is external to the VM's guest OS. VM configuration data is stored in each VM's associated configuration file (such as a .vmx file with VMware or a .vmc file with Microsoft).

Again, back up VM configuration files on a regular basis, which can be done with the same methods you use to back up hypervisor configuration settings.

Virtual machine snapshots

Most virtualization platforms include features that enable you to create live snapshots of running virtual machines. Depending on your storage architecture, live snapshot may be integral to your backup and recovery processes.

VM snapshots should be considered a requirement for DR preparedness and should be a part of your change control processes. So each time a change occurs to a VM—as with a configuration change, patch installation or software installation—you should create a new snapshot of the VM and immediately replicate it to your DR site. VM snapshots should serve as the baseline for all disaster recovery operations. Since at a minimum the snapshot includes the VM's most recent OS and application configuration, you need to restore only the most recent data files from backup to fully recover the VM. Of course, if you're using asynchronous replication to synchronize the data between both production and DR sites, then you just have to power on each VM at your recovery site and you're all set. (For additional information on using a storage architecture to capture VM snapshots and using replication for DR preparedness see my SearchStorage.com article on using storage replication for virtual machine disaster recovery preparedness.

Data staging at a disaster recovery site

DR preparation involves more than a documented plan; you need to validate that a DR site has all the prerequisites for a successful recovery. At a minimum, successful recovery of a DR facility requires the following:

- Hardware resources to support re-staging or failover of the production site
- System-by-system hardware and software inventory
- System-by-system firmware inventory
- Backup media
- Data protection, OS, virtualization, and application software
- Recovery procedures
- Detailed network diagrams

In traditional physical server disaster recovery, detailed system configuration information—hardware requirements, storage requirements, partition configurations, etc.—is crucial in order to fully rebuild production systems. In VM recovery, VM configuration details are secured by backing up each VM's configuration files. So recovering VMs at the DR facility is much easier than recovering a physical system, especially if the hardware at the DR facility is not the same as the hardware at the production site. (For more on VM staging at a DR facility, read my SearchServerVirtualization.com article.)

Firmware documentation is an often-overlooked element of DR preparedness. Any firmware updates at a production site should also be applied to devices at the recovery site. Otherwise, differences in device drivers and firmware revisions between production and DR facilities may prevent physical host systems from successfully starting in the event of a disaster.

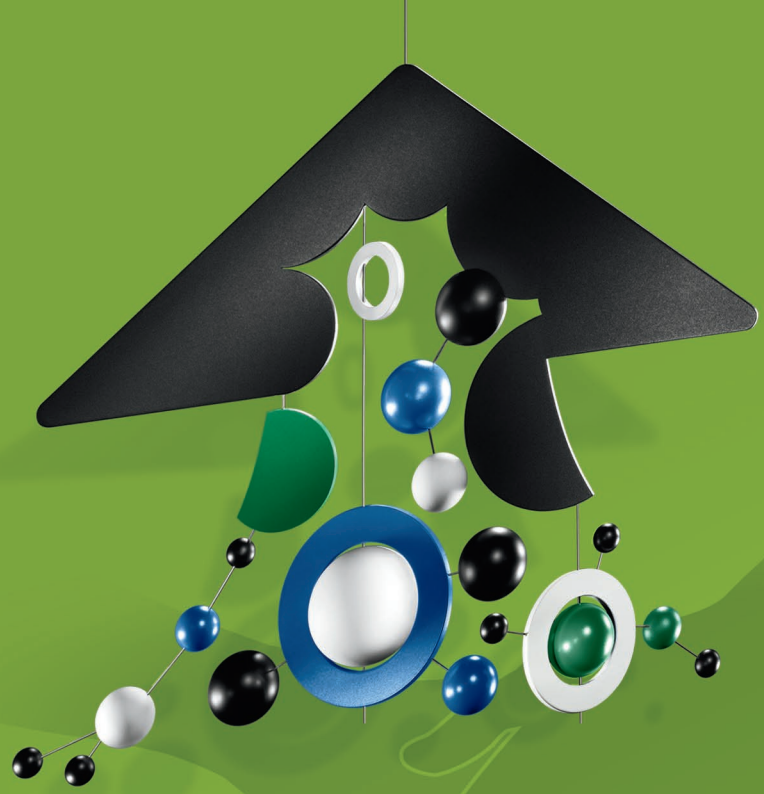
You'll want to ensure that backup media, all necessary software, detailed recovery procedures and detailed network diagrams are available at the recovery site in order for the DR facility's local staff to more easily troubleshoot any problems that occur as VMs are brought online.

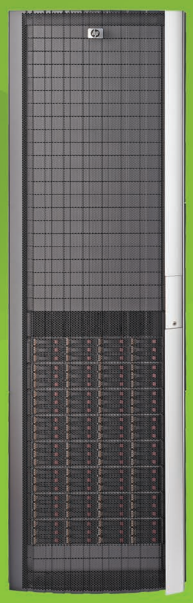
Disaster recovery automation

One of this year's major themes is data center automation, and automation tools have extended to disaster recovery procedures. If you manage VMware-based VMs, keep an eye on VMware Site Recovery Manager (SRM). With SRM, you can automate your disaster recovery plan with software, initiate that plan with a mouse click, and pre-program the sequence in which VMs are brought online at a disaster recovery site. During the course of this year, I expect other vendors to offer similar technologies as well.

Virtualization really transforms how we look at disaster recovery and requires substantial modifications to a DR plan to reap the various benefits of virtualization. With tools such as PlateSpin Ltd.'s PowerConvert, you can even use virtualization to stage recovery VMs for physical production systems that have yet to be virtualized.

As a long-term strategy, use virtualization to provide a fully automated and easily testable disaster recovery plan. And soon, hopefully all organizations that abandoned DR testing because of its demoralizing effect on IT will return to the fold and fully test a DR plan. If DR falls into your area of responsibility, knowing that your DR plan actually works should allow you to sleep better at night.





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HP blades and VMware spell salvation for Catholic Charities

By Bridget Botelho, News Writer

Over the past year, Catholic Charities of Boston has transformed its data center at 75 Kneeland Street from a hodgepodge of mismatched beige server boxes on bakers' racks to a bladed, virtualized infrastructure.

Catholic Charities offers some 140 programs and services in 40 locations throughout eastern Massachusetts. To operate the technology associated with these servers, the organization has an IT staff of eight who manage a jumbled mix of Hewlett-Packard Co. and Compaq servers.

Catholic Charities' outmoded, hand-me-down tower and rack servers were difficult to manage, had almost no power redundancy and were totally power inefficient, said Eric Johnson, Catholic Charities IT project manager.

Never mind the cooling, because there was none. Unless you count opening windows and using oscillating floor fans on the high setting to circulate the air.

With network servers at only the largest sites but also with employees scattered at the organization's 40 locations, employees didn't have access to files stored at the Hub site. There was an urgent need to centralize IT operations and provide consistent access on a highly available system.

The IT staff had no experience with a storage area network (SAN), so all data was previously stored separately on individual servers, only complicating disaster recovery measures. With the addition of a SAN, new blade servers and a uniform infrastructure, Catholic Charities can now make good on the disaster recovery mandates of its state contracts.

Getting inspiration

Two years ago, the IT staff thrashed out a plan to update the organization's infrastructure and began by investigating alternate technologies. The $39 million social services organization worked with its OEM partner CBE Technologies in Boston and visited CBE's data center for ideas.

For its part, CBE had recently bladed its data center infrastructure using HP BladeSystem servers, and Catholic Charities decided to follow suit.

According to recent data, HP currently leads the blade server market segment. This past quarter, HP had the most significant increase of any vendor, shipping 73% more blade servers than it did during the same quarter last year, according to an August Gartner Worldwide Server Shipments report.

No leap of faith

Before committing to blade servers and approaching the charity organization's CFO with a $1 million request, the IT staff tested a couple blades. "We support 40 different sites and had to be sure everything would work

for us on the new systems before putting both feet in," said David Walsh, Catholic Charities CIO.

After a few months, the results were impressive enough for the charity organization to invest in 25 HP Intel dual-core processor blades and two 16-unit blade racks. The servers now run Microsoft Windows and Linux. They use Integrated Lights-Out 2 (iLO) management software, which comes standard in HP blades, to remotely manage the servers.

They also deployed 50 virtual machines on five of the physical servers using VMware Inc. to save on power and space. Despite the cautious, experimental deployment, IT nonetheless managed to finish in two days, Johnson said.

"[Virtualizing] was actually one of the easiest things I've ever had to do," Johnson said.

Over the next year, Catholic Charities' data center will relocate to a new building in nearby Braintree, Mass., so the infrastructure also had to be mobile. IT added four movable Amcor air conditioning units to the room and kept all the oscillating fans.

The price tag

With the purchase of some 25 servers, a SAN, the American Power Conversion Corp. (APC) uninterruptible power supply, new networking and switching equipment from Cisco Systems Inc., thin clients and monitors, as well as payment of various consulting fees, Catholic Charities estimates that it spent about $1.2 million to update its data center.

Because of the new air conditioning features in the data center, Catholic Charities is actually using more power than it did prior to the upgrade, though no pre-conversion load measurements were made, Johnson said.

Despite the increased power costs, Catholic Charities has drastically increased the amount of technology services it can provide to its 850 employees, Johnson said. The servers run some 30 different business applications, including accounting and fundraising databases, email, and Web services.

On the desktop side, once Catholic Charities fully migrates 500 desktops with CRT monitors to thin clients with LCDs, the organization expects to save more than $60,000 a year in direct electrical costs. This is based on estimated electricity savings of $126.25 per computer annually and does not include potential heating, ventilation, and air conditioning savings, Johnson said.

Catholic Charities also migrated its old DOS-based applications onto a central server and deployed ProCare software, a management tool from Professional Solutions. The previous process required users to send all their data to the main office so it could be aggregated onto a database, which employees didn't have access to. Now all the data is stored on a central server using Citrix Systems Inc. software, and users in remote locations can access it.

Managing the infrastructure is a breeze now, Johnson said. "The difference," he said, "is absolutely amazing."

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Using virtualization in a disaster recovery strategy

By Scott Lowe, Site Contributor

Server virtualization is rapidly becoming a key part of many organizations' disaster recovery (DR) strategy. This is for good reason, as the properties that make server virtualization so compelling in a consolidation effort also play naturally into streamlining DR as well.

That said, the use of server virtualization for DR purposes is not a "slam dunk" by any means. While server virtualization can help, it also poses its own unique set of challenges. In this article, we'll examine some of the benefits as well as some of the drawbacks that come out of using server virtualization as part of a DR plan.

Virtual machines (VMs) intrinsically possess two qualities that are quite beneficial to DR:

- **Hardware independence:** Virtual machines are naturally isolated from the underlying physical hardware by the very operation of the server virtualization software, granting them hardware independence.
- **Encapsulation:** Virtual machines are encapsulated into discrete storage areas. Depending upon the virtualization solution, this encapsulation may be in the form of files or specific LUNs.

Similarly, the fact that VMs are neatly encapsulated into discrete storage units can simplify the manipulation of those VMs for DR purposes. Need to get the VMs to the DR site? SAN replication software can often accomplish that trick, and usually more easily for VMs than for traditional physical servers due to hardware independence and encapsulation. To do this in a physical world would require extensive use of boot from SAN, which introduces a level of complexity many organizations don't wish to support.

However, server virtualization is not the magic panacea to DR that many hope it will be. There are challenges that arise out of the use of server virtualization that may be unique to DR.

First, consider the encapsulation property we discussed earlier in this article. While storage encapsulation can, in some cases, simplify the manipulation of VMs for DR purposes, it can also introduce complexities of its own. Consider the need to carefully coordinate storage array operations with the virtualization software itself, as described in my article, Avoiding storage array snapshot pitfalls in a VMware environment. If the storage array uses snapshots to handle replication, then care must be taken to ensure that consistent snapshots are taken so that valid and usable data arrives at the DR site.

Otherwise, the DR site will be useless as it will have unusable, inconsistent, nonfunctional VM images. Note that this specific concern is more applicable in server virtualization scenarios than with physical servers attached to the SAN because of the extra layer of abstraction—the server virtualization software itself—that is involved.

Some server virtualization solutions impose certain procedural requirements that affect DR. While users may be able to replicate VM data from the production site to the DR site, will the server virtualization

automatically recognize the presence of those VMs? Or are manual steps required to tell the server virtualization software that the VM data is present, and in what locations it can be found? The answer is most likely the latter instead of the former, and this is something that must be considered when using virtualization as part of an overall DR strategy.

Finally, it's important to note that while server virtualization does abstract many things—the operating system instances from the underlying hardware, for example, and individual VMs from one another—there are other pieces that are not virtualized or abstracted. Organizations must still deal with such everyday issues like IP address assignment.

Techniques such as using DHCP reservations—a trick commonly used to control the IP addresses tha servers have between the production and DR data centers—have a ripple effect on other areas of the virtualization solution. Using DHCP reservations requires the use of static MAC addresses, and some virtualization solutions use dynamic MAC addresses by default. And this doesn't even take into consideration the management of static MAC address assignment.

Fortunately, a new crop of products, both from the server virtualization vendors themselves as well as from third-party developers, is arriving to help with these issues. Here are some examples:

- VMware recently introduced Site Recovery Manager (SRM), which provides a workflow automation tool to help with using VMware Infrastructure for DR purposes.
- A new version of Double-Take Software's Double-Take was released back in June to help address the use of Microsoft Hyper-V for DR. This new version provided the data replication necessary to create geo-clusters for DR failover.

Undoubtedly more ISVs will release products designed to further simplify and extend virtualization specifically for DR purposes as the server virtualization market continues to mature.

The key takeaway from this discussion is to remember that while server virtualization does simplify and enable some aspects of DR, it is not, in and of itself, a DR solution. Server virtualization should be considered only a part, a component, of an overall DR strategy.

Resources from HP

White Paper: Planning a VMware Infrastructure with Proliant Servers, Storage and Management

White Paper: Virtualization: It's not just for enterprises anymore

Video: HP StorageWorks EVA4400 and Vmware

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