THE BOTTOM LINE ON VIRTUALIZATION

What SMEs Need to Know to Improve Disaster Recovery & Business Continuity

Prepared for VMware by:

INFO~TECH INDABA

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EXECUTIVE SUMMARY

Large enterprises virtualize to achieve the cost savings associated with server consolidation. However, the disaster recovery and high availability benefits of the technology are increasingly being built into virtualization's value proposition. The technology's ability to reduce the downtime of a company's IT assets and improve the speed with which they can recover from a failover are important to companies of all sizes, not just those with large server farms. Info-Tech Research Group believes the stage is now set for greater adoption of virtualization among SMEs.

- Cost-savings from server consolidation are the most obvious benefit of virtualization — many companies are trying to improve the efficiency – and centralize the management – of their server farms.

Without compromising performance, virtualization gives enterprises a way to solve their server sprawl issues. They can save money on the purchase of hardware and the energy required to maintain that hardware.

- More companies are aware of the strategic benefits of virtualization and these benefits increasingly make their way into the business case for virtualizing.

A number of recent surveys and interviews conducted by Info-Tech Research Group indicate that companies are achieving higher-level, strategic benefits as well as the tactical benefits mentioned above. Particularly among SMEs, virtualization is being used to enable high-availability for business-critical applications. The technology is a low-cost way for SMEs to enhance their business continuity and disaster recovery strategies.

- The low cost and ease of implementation of iSCSI Storage Area Networks (SANs) makes server virtualization possible for even the smallest enterprises.

Up until recently, building out the storage infrastructure to support and enable virtual servers added considerable expense to a virtualization project. SMEs, which did not previously have a SAN have been turning to iSCSI solutions — which are more affordable and easier to manage than Fibre Channel SANs and more flexible than direct-attached storage.

Vendors realize that SMEs stand to gain tremendous benefits from virtualizing their IT infrastructure. They are set to ramp up their courting of SMEs by offering robust products that promote high availability and disaster recovery benefits in addition to traditional server consolidation benefits.

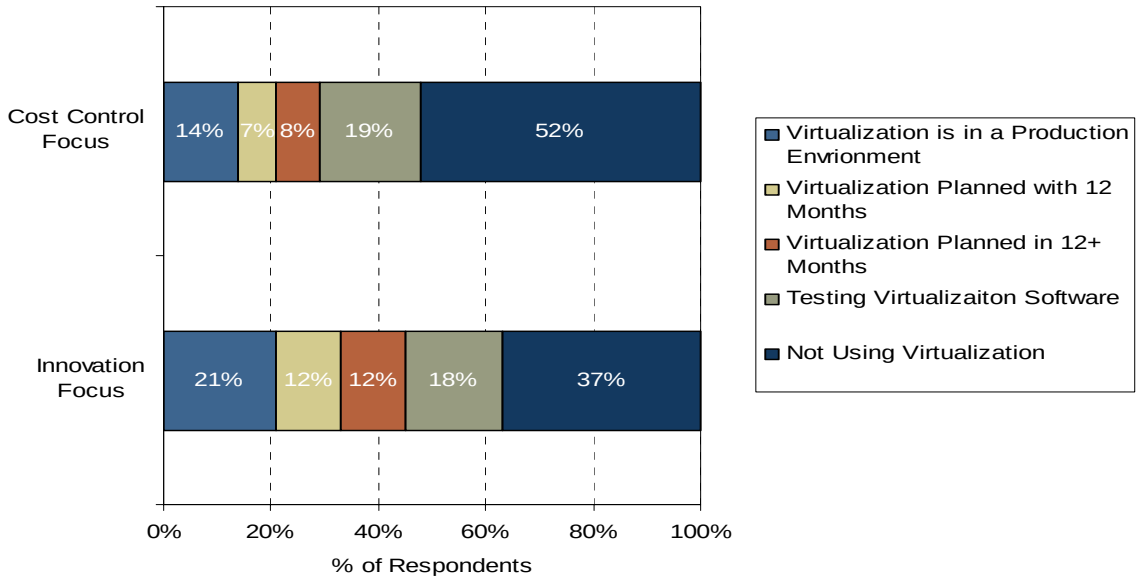
THE VIRTUAL LANDSCAPE

The market for virtualization products has matured because the technology has proven itself as an avenue to reduce equipment and energy costs. Now, new drivers – improved backup, disaster recovery and business continuity – are making virtualization an attractive option for SMEs. These SMEs view virtualization as a way to achieve strategic advantage, more so than as a way to reduce costs, although the ability to reduce costs is always perceived as a bonus by organizations of all sizes.

The Strategic Attitude of Adopters

Even in 2006, Info-Tech research indicated that virtualization adoption was much higher among IT departments that focus on innovation for strategic advantage than those that focus solely on cost control – somewhat surprising given that a major short-term benefit is a reduction in hardware costs.

Figure 1. Innovators Are More Likely to Adopt Virtualization



Source: Info-Tech Research Group, Fifteen Servers Marks the Virtualization Tipping Point

Though virtualization by itself is not a strategic differentiator, Info-Tech sees virtualization as a critical component of building an agile and responsive utility infrastructure. In a utility infrastructure, IT departments have an improved capacity to be innovative. Virtualization is used to abstract processing and storage from the underlying hardware and allocated to applications as required. This flexible and dynamic structure improves IT agility by allowing for the quick provisioning of resources to business initiatives when and where they are needed – even during and after disasters.

In the following pages, we examine how SMEs are leveraging virtualization to achieve cost savings and improve their disaster recovery and business continuity objectives.

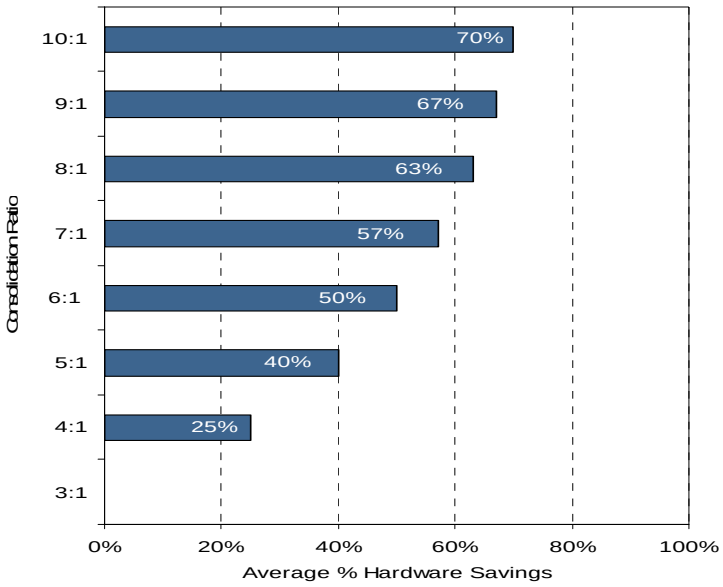
IMMEDIATE AND ONGOING SAVINGS

Historically, the business case for virtualization has been rooted in cost savings, including those associated with hardware acquisition, power consumption and ongoing maintenance.

According to surveys and interviews conducted by Info-Tech Research Group, virtualization can yield as much as a 40% reduction in both server asset requirements (through more efficient utilization) and administrative support. If, for example, an enterprise spends $50,000 in new server acquisitions each year, the enterprise can reduce this amount to $30,000. If an enterprise were to reduce IT infrastructure operational overhead from 10 staff to six, it could realize annual savings of up to $400,000.

Info-Tech's research indicates that using virtualization to consolidate servers results in hardware savings when as few as four servers are consolidated on a virtual host machine.

Figure 2. Effect of Server Consolidation on Hardware Cost



Source: Info-Tech Research Group, Impact Research Report on Virtualization

Ongoing Cost Avoidance

The potential to achieve ongoing cost savings is also a key purchase trigger for companies that are considering virtualization. A reduction in the number of physical servers results in ongoing savings in power consumption and cooling costs. A reduction in the number of physical servers also leads to decreased hardware maintenance costs and an increase in the amount of workspace available. Many clients interviewed realized ongoing savings of 30-50%.

Intangible benefits arise from virtualization as well. For example:

- With a virtual server infrastructure, a new server instance can be created from a standardized template. Project timelines shorten as testing and programming occurs in virtual instances, rather than on dedicated hardware — weeks of development time can be collapsed into minutes.

- Virtualization provides useful scalability. When excess capacity is available, virtual instances are added on the fly to run applications for additional production capacity.

For organizations with large server farms, the savings in acquisition and ongoing maintenance costs will make an investment in virtualization worthwhile. For SMEs, with only a few physical servers, the technology's capacity to improve disaster recovery planning (DRP) and business continuity (BC) are the true benefits.

"Going the virtual route was a tactical decision. Little did we know that it was going to have strategic benefits as well."

Director of Technology, Mid-sized Health Care Company

DISASTER RECOVERY & BUSINESS CONTINUITY

Disaster recovery planning (DRP) ensures organizations have the capability to continue essential functions across a wide range of situations that could disrupt normal operations. However, Info-Tech research indicates that there is still a distinct lack of awareness of DRP benefits, or a lack of buy-in from executive management. Forty percent of SMEs are working without a formal DRP and may find it beneficial to instead create a lightweight application failover plan using existing infrastructure and virtualization technology.

In a classic failover scenario, a server is backed up to storage that is physically separate from the server. If a server machine becomes inoperative, the image and data is manually loaded on a backup machine that picks up where the damaged server left off. This approach to disaster recovery can be slow and makes it difficult for companies to meet their recovery time and recovery-point objectives. In addition to being slow, manual recovery processes are prone to errors and result in frequent failures.

Cost Effective DRP and BC

From a purely physical perspective, continuity planning requires that redundant hardware be configured and standing by to replace each production server. Smaller enterprises, struggling to maintain an infrastructure of a few dozen servers, find it cost-prohibitive to build and maintain redundant standby servers for disaster recovery. With virtualization, hardware costs are cut down significantly because of the ability to host several machines on one server. All that is required is a second host for the virtual servers. If the original host goes down, the virtual servers will failover to the secondary host automatically.

"Disaster recovery was always a concern with us and having two big servers for every application just costs way too much."

Vice-President of IT, Mid-sized Financial Institution

With virtual failover servers:

- The cost of physical backup hardware can be greatly reduced as fewer physical machines need to be configured and maintained.
- The backup server machine can also be repurposed for other non-production tasks, such as application development, when not being used for disaster recovery.
- Testing can occur more frequently than with physical servers. Server failure can be simulated just by having a virtual server shut down – eliminating the need for remote hardware access to power down.
- Outsourcing relationships for continuity planning are simplified. A company can contact an outsourcer to provide a required level of processing power instead of a full standby physical infrastructure. The processing power required can also be more flexibly scaled up or down depending on the situation.

Simply put, virtualization can reduce the amount of hardware required at a disaster recovery site and simplify recovery operations. However, companies must be aware that virtualization does not take into account other DR procedures such as recovery of the original site and that a formal DRP should contain some documentation surrounding crucial business-oriented processes such as risk assessment and asset management.

"It was common for us to be down for anywhere between four to 24 hours anytime a server failed. Now, five minutes later, the application resurfaces on a virtual server."

IT Executive, Mid-sized manufacturer

BUILDING BULLET-PROOF DISASTER RECOVERY

This section of the report describes how the use of direct-attached storage (DAS) is ineffective in virtualized environments, and outlines how to build a low-cost SAN so that the data on a virtual machine is duplicated and, in the event of a disaster, recovered.

DAS – Crippling Organizational Flexibility

When creating virtualized computing environments, all data, both operating system and application, should be located on a SAN. In DAS architectures the storage system and server are directly attached. SANs reduce the interdependence between the physical processor and the physical storage. They provide the high availability and dynamic provisioning required by virtual servers and, as such, SANs eliminate the limitations of DAS:

- **Single point of failure.** If the processor fails, then all data on that unit is unavailable until the processor is replaced.
- **Backup of the DAS.** Since the only access to the storage device in a DAS environment is through the attached processor, any backup or restore operations must be performed by that processor.
- **Limited expandability.** Tower or rack-mount processors, with external I/O ports, can have additional external DAS attached. However, the number of external units and the amount of storage that those units can support is limited.

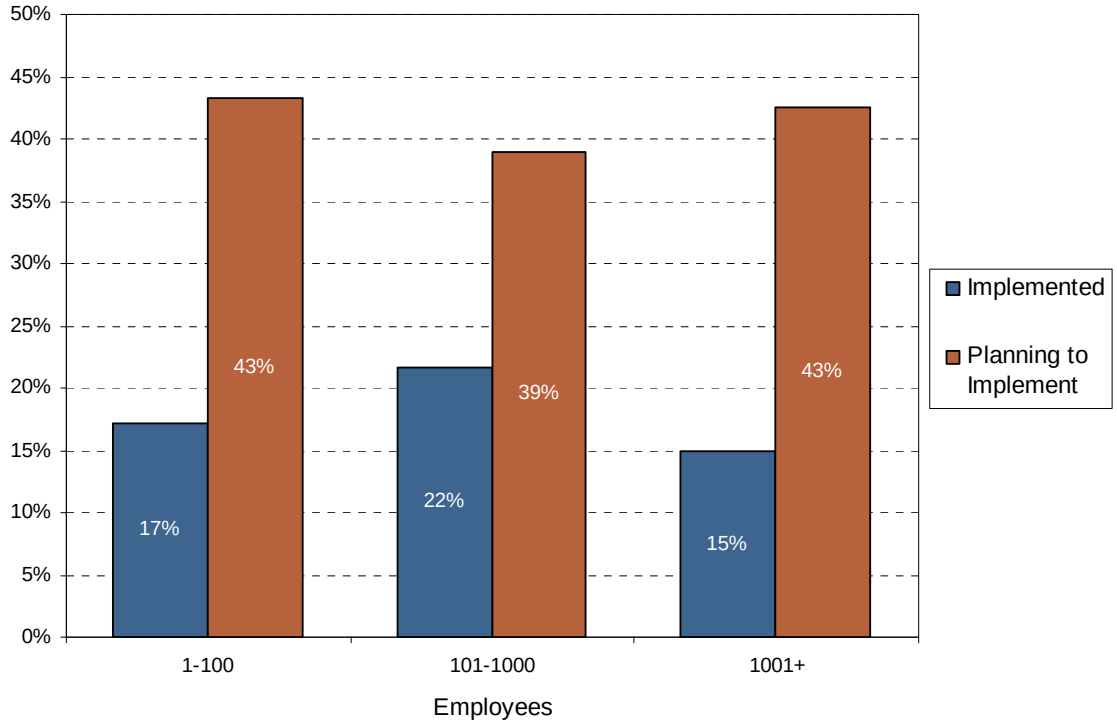
The Emergence of IP SANs

Info-Tech has found that SANs based on iSCSI have emerged as a legitimate alternative to Fibre Channel (FC) SANs across all enterprises. The scaling costs of an iSCSI-based solution that uses industry standard Ethernet remain lower than Fibre Channel. Also, while price is a significant driver of iSCSI adoption, so too is ease of implementation and operation. A smaller IT department can leverage existing Ethernet skills, whereas Fibre Channel requires an entirely different network infrastructure.

For smaller enterprises, SAN implementations can be costly, but there is some good news. The same technology that virtualizes servers can also be used to virtualize storage networks. Though a virtual SAN is not likely to be as robust or scalable as a real networked SAN array, it could provide "good enough" performance for SMEs. The following section provides a more detailed look at trends towards iSCSI based SAN solutions and how the traditional SAN and virtual SAN scenarios work.

Server virtualization and iSCSI SANs both have a sweet spot in enterprises of 100 to 1,000 employees. It should not be a surprise then that a growing number of iSCSI-based network storage solutions are supporting server virtualization projects.

Figure 3. Implementing vs. Planning to Implement iSCSI Solutions



Source: Info-Tech Research Group, Virtualization Trends in 2009 and Beyond

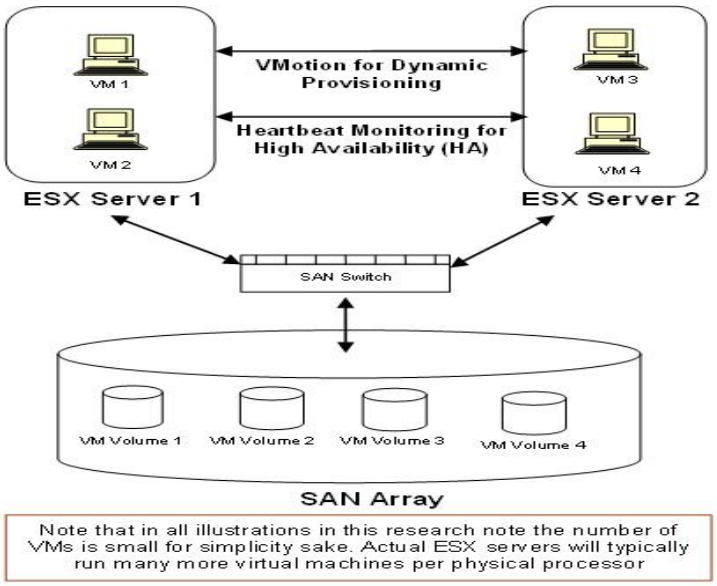
"Prior to virtualizing we were using a FC SAN. Once we understood the differences between iSCSI and FC we realized that we didn't need a complex, costly, FC SAN. iSCSI was cheaper and easier to manage."

IT Director at a Private Healthcare Clinic

Traditional Scenario: Hypervisored Servers Share a SAN Array

In a typical scenario for SAN enabled virtual computing, two or more physical servers — each running a virtual machine hypervisor such as VMWare's ESX Server — will share a storage array across a SAN. That network can be either a Fibre Channel network or (increasingly) an iSCSI SAN. By sharing the same storage, the hypervisored servers can move a running instance of a virtual machine from one to another without interruption. In VMware, this is called VMotion. The hypervisored servers can also heartbeat monitor each other so if one goes down, the hosted VMs can be automatically restarted on another physical host.

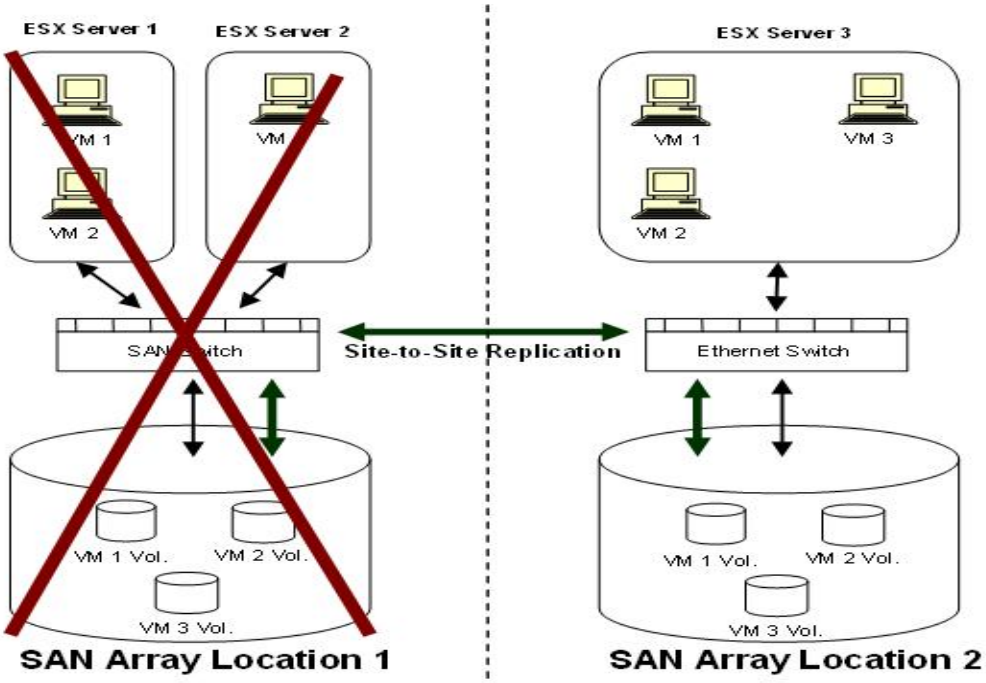
Figure 4. VMware ESX Servers Sharing a SAN



Source: Info-Tech Research Group, Use a Virtual SAN to Reduce Sticker Shock

For further disaster recovery protection, the shared SAN array can also be replicated to another location. If the primary location is brought down, critical VMs stored on the SAN can be re-started at the remote location.

Figure 5. DR Provided by Site-to-Site Replication



Source: Info-Tech Research Group, Use a Virtual SAN to Reduce Sticker Shock

To create the above configurations, the enterprise will need to invest in a SAN array as well as network cabling and switches for the SAN. For the site-to-site DR capability, a second array is needed and the SAN management software must also support remote data replication from one array to another.

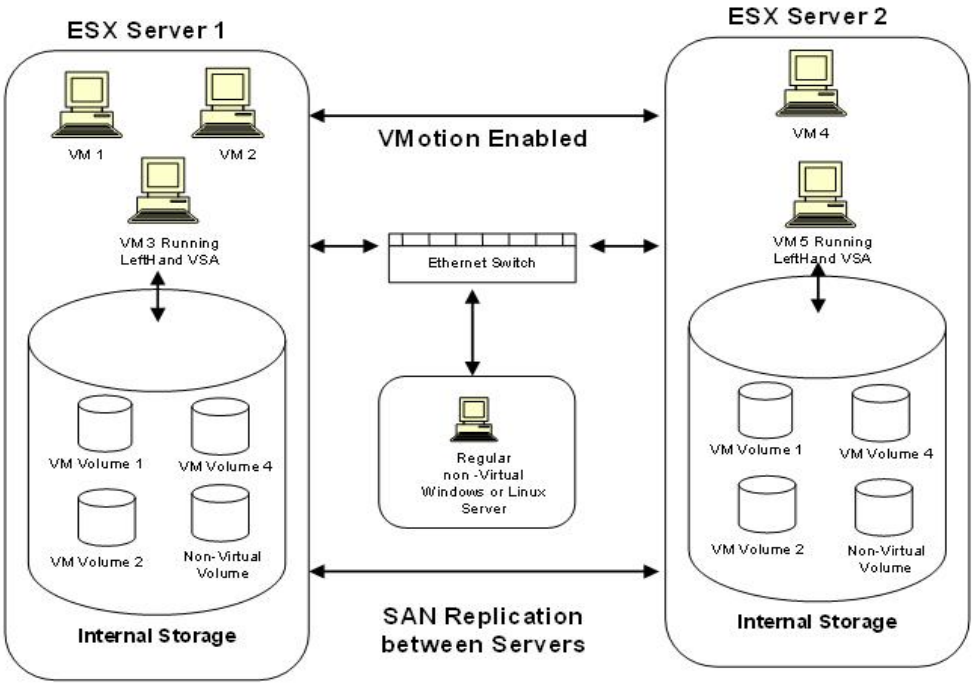
Building out this storage infrastructure to support and enable the virtual server infrastructure can add considerably to the overall cost of virtualization. Because of this potential for storage sticker shock many SMEs, which did not previously have a SAN have been looking at iSCSI solutions.

In addition to having lower costs (due to their use of Ethernet over the more complex Fibre Channel) solutions such as LeftHand Networks and EqualLogic also have built in functionality for data snapshots and site-to-site replication as well as thin provisioning for better disk utilization. No additional expenditure is necessary to use these features.

Virtual SAN Scenario: Using LeftHand's Virtual SAN Appliance (VSA)

Consider the scenario of an enterprise that owns two powerful multiprocessor servers. Each of these servers is populated with 2TB of storage on internal SCSI (ISCSI) drives. Using ESX server on each box, plus LeftHand's VSA software, the two servers could form the foundation of a SAN supported virtual server infrastructure without the need for an external SAN array.

Figure 6. Two ESX Servers Share a Virtual SAN

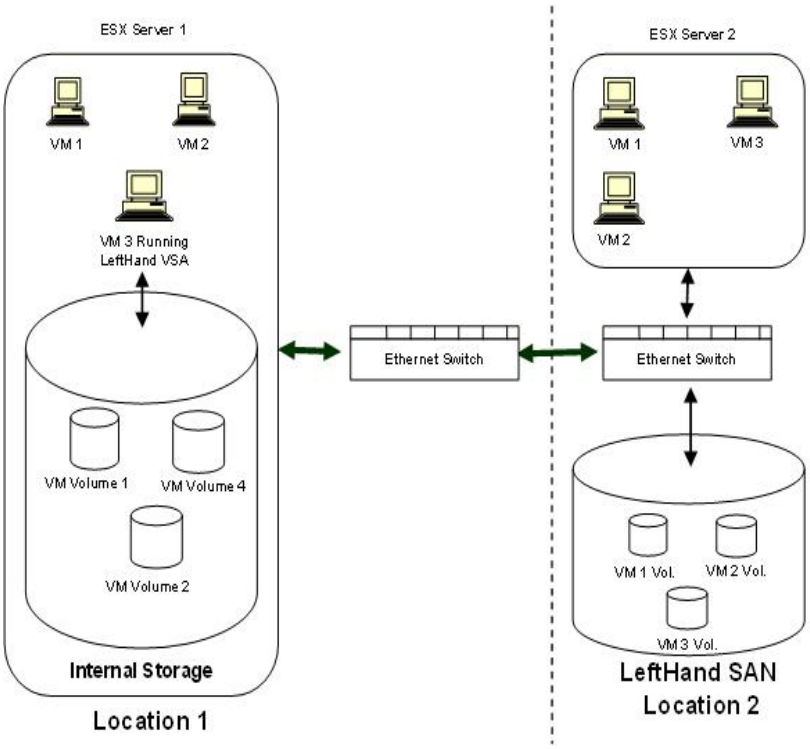


Source: Info-Tech Research Group, Use a Virtual SAN to Reduce Sticker Shock

In the figure above, all the VMs on both ESX Servers are sharing the storage on ESX Server 1 as an iSCSI SAN array. In addition, any non virtual server connected to ESX Server 1 via Ethernet can also use the virtual SAN appliance as if it were a physical iSCSI SAN array.

The virtual array on ESX Server 1 is also being replicated to ESX Server 2. The virtual SAN contained within the ESX server can replicate its contents to another virtual SAN appliance but also to physical LeftHand networks storage array. For example, a virtual SAN at a branch office can replicate its storage volumes to a regular SAN at the head office.

Figure 7. Virtual SAN Appliance Site-to-Site



Source: Info-Tech Research Group, Use a Virtual SAN to Reduce Sticker Shock

CASE STUDIES

Critical Application Server Failover at a Healthcare Communications Company

At a state-of-the-art call center in California, healthcare professionals provide 24-hour nurse advice. The company's nurse triage and advice line provides immediate access to nurse telephone counseling, health advice, and referral to the appropriate clinical setting. The company's employees rely on the stability of the IT infrastructure to ensure that end-users get the information they require in critical instances.

"Going the virtual route was a tactical decision. Little did we know that it was going to have strategic benefits as well," says the company's director of technology.

Four years ago, as part of a server refresh, executives decided to deploy virtualization. At the time, it was an operational decision that would eliminate the need to purchase some physical servers and save the company money. Using VMware Server they virtualized a total of 10 servers and achieved a 5:1 consolidation ratio.

As expected, the company realized hardware savings and reduced cooling costs. However, the full impact of virtualization didn't reveal itself until one year ago when the hardware dedicated to one critical application failed. The company's director of technology says that instead of suffering a lengthy system outage, the application was very rapidly restored to a virtual machine and the company's operations went on with minimal interruption.

"We have a disaster recovery plan but it needs to be better and we believe virtualization can play a bigger part in improving our organization's business continuity."

The plan going forward is to virtualize all servers unless there is a compelling reason not to. The company is currently looking at migrating to a more robust virtualization product with more functionality — VMWare ESX. The company's Director of Technology admits that their DRP needs to be better and that virtualization will be a key part of improving both the DRP and BC strategies.

Healthcare Firm – At a Glance

Employees	IT Staff	Technology Adoption Strategy
280	7	Leading Edge

Virtualization and DRP at a Mid-sized Financial Institution

In 2005, the IT department at a mid-sized financial institution, decided to consolidate their servers. In 8 short months the company was able to use VMware's ESX 3.0 to eliminate 32 of 52 physical boxes from their primary and DR sites. The results were everything that the Vice President of IT was expecting – more rack space, a reduction in energy costs, timelier provisioning of servers, and streamlined management of the data centre. In three years, the company has saved over $100,000 from the number of servers they have not had to purchase.

"Back then we'd have to go get that $5000 or $6000 server plus license plus everything else plus find space for it," says the company's VP of IT. "Now we can just mount the applications on a virtual box and be done with it. Disaster Recovery was always a concern with us and having two big servers for every application just costs way too much."

Prior to migrating to a virtual environment, the company had to decide which critical applications would have a dedicated back-up server. Now, each critical application has its own dedicated server at the company's disaster recovery site. End-users are no longer impacted by system outages due to VMware's High Availability functionality. As a result, business continuity is significantly improved.

"We didn't have as many VM servers then as we do now, so after explaining to the execs what we had to do to protect the data going with a virtual server wasn't an issue."

When Hurricane Rita hit Louisiana in September 2005 IT staff scrambled to put their DRP into action. In order to ensure data was safe, tape back-ups were made and servers were physically moved into the company vault. The payroll and benefits server was put in one employee's car and he was told to "drive North." The nerve-wracking experience was enough to convince company executives that even more virtual servers should be purchased for DRP purposes.

Financial Firm – At a Glance

Employees	Revenue	Virtualization Cost Savings
450	$350 million	$100,000 +

Prescription for DRP a Success at Healthcare Clinic

In October of 2007 a specialty healthcare clinic in the Southern United States decided to implement VMware Infrastructure Enterprise. Although the small clinic only consolidated 12 servers onto three, the business case for virtualization was built on projected cost savings from server consolidation, server management, and reduced power and cooling. At the outset, improvements to the company's disaster recovery strategy were not considered.

"When trying to get buy-in for virtualization, I emphasized the benefits of server consolidation and reduced server management time," says the company's director of IT. "Now I realize that one of the greatest benefits of virtualization is that it makes disaster recovery very easy."

Since implementation, however, IT staff has come to appreciate the dramatic improvements in business continuity afforded by virtualization.

"It's embarrassing to talk about," says the IT director. "Our DR process was a nightmare. It was literally restored from the files backed up on tape and (we were able) to recover the information that we needed."

Prior to virtualization, the clinic's DRP strategy was slow, unreliable, and expensive. In the event of a disaster, IT staff was responsible for picking up the tapes from an offsite vendor, procuring new hardware, installing an operating system, and installing backup software. The team then crossed their fingers and hoped that they could recover the necessary files from backup tapes. Now, the company can load and run its critical applications, hosted virtually from the hardware located at the co-location site, in a few hours.

"For transactional businesses that lose dollars every minute they're down, I think you can sell virtualization on its disaster recovery merits alone."

The company has been so impressed by improvements to its disaster recovery strategy that next year's budget includes funds to purchase a VMware ESX Server for the co-location site. This will enable automatic failover and reduce the RTO, from several days prior to virtualization, to twenty minutes.

Healthcare Clinic – At a Glance

Employees	IT Staff	Virtualization Cost Savings
380	4	$100,000

THE FUTURE OF VIRTUALIZATION

Going forward, Info-Tech predicts several trends will emerge:

1. Although the consolidation of servers will continue to be a key driver for implementing virtualization, the benefits of high availability and low cost failover will be more publicized and increasingly integrated in the cost-benefit analysis for virtualizing. These benefits will be especially appealing to SMEs who are looking to develop and enhance their disaster recovery plans.

2. iSCSI SANs are an enabler for implementing DRP using virtualization. At the end of 2008, more than half of iSCSI SAN deployments in SMEs will support virtual infrastructures.

3. As organizations realize that virtualization improves the agility of their IT operations, desktop virtualization will be implemented to enhance DRP and business continuity.

4. Virtualization vendors will step up their courting of SMEs. VMware but also competing solutions from Microsoft, Citrix Xen, and other smaller vendors such as Virtual Iron will continue to vigorously pursue the SME focusing not only on consolidation but improved availability/recoverability features.

5. Storage vendors will highlight virtualization support to SMEs. Storage vendors will also be pursuing SMEs that will need networked – in most cases iSCSI-based – storage to support virtual infrastructures. Storage vendors will highlight how their products can enable improved availability and recovery of virtual infrastructures. This will include direct partnerships with virtualization software vendors.

ABOUT INDABA

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Visit us online at:

www.infotech.com/indaba

Info-Tech Research Group – Indaba Division

43 Front Street East,
Toronto ON Canada
M5E 1B3
1.888.670.8889 ext. 3009
pmacinnis@infotech.com

Tel: 888-670-8889 ext. 3002
www.infotech.com/indaba

Info-Tech Research Group - Indaba Division
43 Front Street East,
Toronto, Ontario, Canada
M5E 1B3