



### How to Increase VMware Application Availability with Shared Storage

The Essential Guide to Using Shared Storage with VMware to Achieve High Availability While Reducing Operating Costs



### INTRODUCTION

### The newest SAN technology is robust, powerful and very easy to install

It's 2010 and today server virtualization has become indispensable for almost every IT environment, growing at a projected rate of over 100% per year, according to a recent IDC study. This growth is attributed to the fact that server virtualization improves IT management, reduces expenses and improves server utilization. But probably the key reason that server virtualization is expanding so rapidly is that it considerably increases application and data availability. Ensuring that data and applications are continuously available and operating even in the event of failure, disaster or human error is driving the growth of server virtualization initiatives in IT departments around the world. This increase in application and data availability is generally referred to as High Availability or HA.

At the foundation of each successful virtualized IT environment is a centralized, networked storage. This "shared storage" also referred to as a Storage Area Network (SAN), is required to enable VMware administrators to provision virtual machines and to move them between physical hosts for workload balancing and to restart unresponsive VMs from a different host in the case of failure, which enables the high availability of the virtual machines. Basically, VMware vSphere environments can take advantage of the high availability and business continuity features such as VMotion, VMware HA, Distributed Resource Scheduler (DRS) and VMware Consolidated Backup (VCB), all of which depend on a centralized, networked storage to work.

Traditionally, shared storage has been too expensive and too complex to manage for most organizations. But the latest SAN software (also known as Storage Virtualization software) technology changes all that, easily and inexpensively allowing you to turn any industry-standard x86 or x64 server into shared storage on your existing IP network that uses standard networking cables to transfer storage data from your VMware servers to the centralized storage. This SAN software technology works like "storage firmware" that runs on top of an industry-standard server with hard drives and operates it like an intelligent block-level storage device, or a SAN, making it very reliable, robust, powerful and very easy to install and manage.

StarWind Software started in 2003 and developed a powerful SAN software product that would help customers eliminate the expenses and complexities of the traditional, proprietary SANs that were available at the time only from big storage vendors. StarWind developed a solution which turns a standard, Intel-architecture server into a highly reliable and highly available, fault-tolerant SAN. Today, StarWind is used to build shared storage appliances for VMware and this combination of StarWind and VMware creates a powerful virtual infrastructure that is highly available, easy to protect and simple to manage. There is proven synergy between StarWind and VMware with over 30,000 users in over 100 countries. Combined, the two can:

- Transform a standard, Intel-architecture server into a fault-tolerant SAN with High Availability
- Take advantage of VMotion, VMware HA, DRS, and VCB features
- Build a high-end SAN without the high costs associated with proprietary vendor products
- Ensure Business Continuity with Synchronous Mirroring, Remote Replication and CDP/Snapshots of the Virtual Machines

In this paper, we will show you how SAN software empowers the VMware administrator to use high availability storage with the high availability features of VMware and we'll illustrate how StarWind Software delivers the most advanced and cost-effective "shared storage" for VMware on the market. You will also learn how to use your existing Ethernet network to implement a shared storage solution without the costs of purchasing new equipment or investing in Fibre Channel. Finally, VMware professionals will learn about the flagship StarWind storage virtualization solution, which is the most cost-effective storage alternative on the market combined with rock solid reliability, scalability and performance.

### SAN SOFTWARE IS STORAGE VIRTUALIZATION

SAN Software is, at a basic level, a storage virtualization technology that virtualizes a standard, off-the-shelf Intel-architecture server and allows discrete disk drives to operate as a single shared storage resource. Similar to server virtualization technology, storage virtualization creates an abstraction layer between the actual storage hardware and logical data volumes.

Storage Virtualization combines well with VMware's server virtualization capabilities. Server Virtualization with Storage Virtualization work together to improve overall infrastructure efficiency both on server and storage sides. Storage Virtualization allows data volumes to be located and striped across multiple (and diverse) physical storage resources, including storage systems, RAID groups, disk types, and controllers. This enables higher performance and scalability than is possible with server virtualization alone. It also allows data volumes to be transparently moved from one set of resources to another without disrupting operating systems and applications that use data. It enables an administrator to create a scalable, highly resilient and flexible storage environment. The result: higher storage utilization rates and reduced operating costs. Storage virtualization simplifies provisioning and storage management, increases storage utilization, provides flexibility and scalability in capacity and performance, enables simple migration of VMDK files and facilitates load balancing. All in all, it significantly simplifies vour virtualized IT environment.

### WHY SHARED STORAGE OR SAN?

Enterprise-class storage is at the foundation of any successful virtualized IT infrastructure. Many of the key benefits of server virtualization require networked storage in order to reduce the effort ordinarily required to move VMs between physical servers for load balancing, to achieve high availability of applications running in VMs and to ensure maximum use of resources when deploying virtual machines.

Centralized networked storage is a key requirement for successfully harnessing high availability and business continuity features such as VMotion, VMware HA, Distributed Resource Scheduler (DRS) and VMware Consolidated Backup (VCB). And ultimately, there is more redundancy when placing your VMDK files on a SAN.

A shared storage, or a SAN, will help a VMware vSphere to access any VMDK because it is stored centrally on the network. It permits simple re-hosting of the virtual machine

### TOP 5 BENEFITS OF STORAGE VIRTUALIZATION

- Fully protects your VMware systems in the event of a major failure, minimizing downtime and ensuring continuous application availability
- Accelerates hardware upgrades, data migrations, and load balancing
- Speeds disaster recovery more capable of restoring business operations rapidly using replication and snapshot capabilities
- Simplifies storage management for VMware
- Improves hardware utilization

and eliminates copying individual virtual machine files, applications, and data from one server to another. A SAN enables you to use advanced VMware features like VMotion, HA, VCB and DRS. SANs also offer key benefits such as improved availability and reliability and they help you keep pace with data growth by being simple and inexpensive to expand storage capacity (hard disks) as well as memory, 10 GigE NIC cards and other hardware.

As companies create vast volumes of information, IT managers are forced to begin consolidating storage to get the most out of each storage system. What was once only affordable to large companies is now readily available for small and midsize companies: highly reliable, highly available, high performance storage at a truly affordable cost.



### Direct Attached Storage

### **iSCSI SAN**

- Storage managed individually through server •
- Adding capacity / scaling requires downtime •
- Results in duplicated overhead information •
- Inefficient provisioning

- Higher application and data availability •
- **Disaster Recovery with CDP/Snapshots** •
- Remote Replication across a WAN •
- . Easy-to-manage centralized console
- Scalability without downtime •
- Utilizes existing Ethernet •
- No learning curve •

### VMware ESX and StarWind iSCSI Shared Storage Unlocking enterprise features without the enterprise costs



### Virtualization Layer

VMotion Storage Vmotion High Avaliability DRS VCB

#### User Layer

Improved Application availability More efficient use of IT Budget No loss in application perfromance

### Why iSCSI SAN?

### Lower Cost and Reduced Complexity

Volume Snapshot / CDP

Network Based Mirror

SCSI (Small Computer Systems Interface) has been a standard client-server protocol for decades, used to enable computers to communicate with storage devices. As system interconnects move from the classical bus structure to a network structure, SCSI has to be mapped to network transport protocols.

Today's IP networks meet the performance requirements of server applications and can seamlessly carry SCSI commands. The iSCSI protocol enables the transfer of SCSI packets over TCP/IP or an Ethernet network. It uses the existing Internet infrastructure and addresses distance limitations. With it, the disk drives in your SAN are presented over your existing Ethernet network to any server application as a local disk. In 2003, the Internet Engineering Task Force (IETF) ratified the iSCSI protocol to allow the use of an ubiquitous IP network instead of proprietary protocols requiring separate networks and connections.

The legacy alternative to iSCSI is Fibre Channel. But Fibre Channel is very expensive and complex. Large companies could afford it and justify it for its high performance, but SMBs could not, as it required expensive training and maintenance and it involved the acquisition of costly, proprietary platforms. But with iSCSI, SMBs can acquire a virtualized storage solution at a fraction of the cost of Fibre Channel, while gaining even higher performance.

**Off-the-shelf solutions for lower cost.** iSCSI reflects the inevitable trend toward solving network problems with industry standard, off-the-shelf hardware and Ethernet networking gear. This results in lower-cost, easier-to-manage networking platforms. And, because they use familiar hardware rather than proprietary hardware, they require much less training to operate.

Fibre Channel SANs are inflexible by comparison. They are hard to configure and manage because data paths between hosts on the storage array are statically set when the host is added to the SAN. The topology for a Fibre Channel SAN is hard coded, making changes within the infrastructure difficult and forcing downtime while changes are made. iSCSI SANs, on the other hand, are highly flexible because:

- TCP/IP supports virtual addressing and dynamic routing and
- Paths through the network are not statically defined.

StarWind uses iSCSI protocol to carry storage data. It provides all the functionality of any legacy FC SAN, but eliminates an FC SAN's traditional complexities including a steep learning curve and the need for expensive new networking gear. It is only with the iSCSI technology that substantial cost reductions and simplified management are possible. In fact, iSCSI technology achieves a much lower TCO than can be achieved with Fibre Channel because it uses existing Ethernet networks to store data.

The marriage of iSCSI SANs and VMware server virtualization was made when VMware, with the introduction of ESX 3, added native iSCSI support to its vSphere hypervisor. Hyper-V and XenServer now do the same.

### Build a SAN on Industry-Standard Hardware

StarWind SAN software runs on standard enterprise-class Intel-architecture x86 or x64 storage servers - from blades to rack servers. This allows customers to choose from any standard hardware that meets performance, scalability and budget requirements. More importantly, the use of standard servers makes it easy to upgrade to new hardware, faster memory, Nehalem processors, PCI Express RAID controllers or 10 GigE networking that will all improve the performance of the storage appliance built with StarWind.

Standard enterprise-class servers with full redundancy and hot-swappable components that are supported by StarWind 5.0 include Dell, HP and IBM. This freedom to choose from open standards is important to small and midsize companies who want to deploy networked storage cost-effectively and easily without any interoperability issues and the high prices of proprietary storage solutions from traditional vendors.

# Using StarWind and VMware - the Best of Both Worlds

The combination of StarWind and VMware delivers higher availability, flexibility and substantially lowers the cost of shared storage. Server virtualization and storage virtualization go hand-in-hand. Many VMware administrators have already deployed a storage virtualization solution in a virtual server environment. VMware virtual machines running on iSCSI SAN represent a 'best practices' solution.

StarWind software creates a "Virtual SAN" that can be installed on existing industry-standard servers without additional infrastructure investments. A virtual SAN is ideal for SMBs, or remote offices of large companies, which may have budget limitations and physical space constraints, but which have performance requirements that can only be satisfied by a high-performance SAN.

Companies can realize all of VMware's server virtualization benefits with an iSCSI SAN. StarWind provides all SAN services for storage provisioning, data protection and ease of use with enterprise-class features as well as clustering for effective disaster recovery, higher data availability and reliability results. With a StarWind SAN, you access unlimited terabytes of storage through the purchase of downloadable software that can be installed on any x86 Server and existing network infrastructure in less than 30 minutes. StarWind is simple, reliable and scales rapidly to growing demands.

By creating networked storage with an iSCSI SAN, separate

from the server that runs your virtual servers on VMware, you avoid creating a single point of failure that can bring down all your Virtual Machines at once. Storage virtualization provides further protection against failures by extending full hardware independence from the server to the storage.

**Primary benefits.** Server virtualization is well known for its ability to simplify administration, lower cost, improve utilization, carry out non-disruptive upgrades and provide increased availability. Storage virtualization provides the same benefits. StarWind has a set of tools that enhances data protection in VMware environments like mirroring, replication and CDP/snapshot capabilities. VMware ESX and vSphere can also be turned into a Virtual SAN Appliance (VSA) – a server's internal disk can be transformed into an iSCSI SAN environment that multiple servers share. Capacity is easily added without additional license purchases because StarWind is a software-only solution, installable on any industry-standard server with easily expanded drive bays.

Companies of every size are experiencing high storage growth between 50% and 60% a year, according to a late 2008 statement by the Enterprise Storage Group (ESG). Managing storage efficiently and cost-effectively is just as challenging as it was to manage servers prior to the introduction of the hypervisor. Storage virtualization does exactly the same thing for your storage environment, leading to these benefits:

- Take advantage of VMotion, VMware HA, DRS and VCB features, which all require the use of the shared storage or a SAN, which you can build by using StarWind
- Non-disruptive migration of VMs and loads balancing helps use storage capacity more efficiently via a StarWind SAN, without the downtime
- Better disaster recovery of VMs with CDP and snapshots, mirroring and replication
- No need to invest in new hardware you can use standard, Intel-architecture servers from HP, Dell, IBM or any other vendors without purchasing expensive, proprietary vendor storage products

Shared iSCSI-based storage appeals to SMBs over Fibre Channel because it enables small and medium businesses running VMware to reap the benefits of enterprise level storage options without the initial expense of implementation and the ongoing expenses of training personnel. iSCSI storage also installs on industry-standard x86 architecture servers, allowing you to pick the servers and hard disks that meet your needs without investing in costly proprietary hardware. StarWind's iSCSI software goes hand in hand with VMware virtualized environments and it is an ideal solution for SMBs. When you choose StarWind as storage for a VMware environment, you will see several benefits:

- Enterprise-class VMware data storage solution
- Costs a fraction of any FC SAN and, incidentally, less than competing iSCSI solutions
- Installs on any standard off-the-shelf 64-bit or 32-bit Windows server
- Runs over an existing Ethernet network
- Requires no specialized training or equipment
- Simple to maintain with a powerful, yet easy-to-use GUI

Fibre Channel power without its headaches. StarWind's networked storage solution for VMware vSphere server environments has all the power of Fibre Channel without its many headaches. Any Windows Server can be converted into a scalable, high-performance VMware SAN in less than 30 minutes over existing CAT5 Ethernet cables. Using an existing Ethernet or IP network avoids the need for creating complex new networks, specialized proprietary platforms and the specialized training needed to run them. There is no need to purchase proprietary servers, storage or costly networking gear. With StarWind, your shared storage can be virtualized, consolidated and centrally managed with an enterprise-class feature set for SMBs. And you will be able to fully protect your VMware environment in the event of a failure.

Now you can enjoy the same high availability and disaster recovery you'd demand from an expensive SAN, but at a price any small or medium-size business can aspire to.

### STARWIND FEATURES

StarWind's approach is to offer a software-only solution that doesn't force IT managers to buy proprietary hardware, but instead uses existing Windows servers. The result is a high performance solution that gives up nothing to proprietary, high-cost storage systems, offering all the benefits of those solutions but at a low TCO, which is ideal for SMBs.

## StarWind features include CDP and Snapshots, Mirroring and Replication, Thin Provisioning:

- Synchronous Data Mirroring: real-time data mirroring across a 2 node storage cluster
- High Availability / Automatic Failover: fault tolerant technology eliminates single point of failure
- Failback with Fast Synchronization: failback to an original system after an automatic failover
- Remote / Asynchronous Replication: replicates your storage to a remote site across a WAN

- CDP & Snapshots: captures point-in-time snapshots with unlimited rollback points
- Server Clustering: provides shared storage for High Availability server clustering
- Thin Provisioning: allocates space dynamically for highly efficient disk utilization

Taken together, these features provide a full range of SAN services for provisioning networked storage, reducing vulnerability to system failures and protecting data. Microsoft VSS (Volume Shadow Copy Services) compatibility, dynamic point-in-time volume snapshots and automatic incremental backups make quick work of backups and recoveries. StarWind's snapshot technology, with its ability to operate in continuous data protection mode, means that if you suffer a failure, you can easily go back to a specific point of time and recover. It offers fault tolerant shared storage, disaster recovery and seamless failover. If you have 30 virtual machines on a single server, it's critical to place VMware data files elsewhere, since you can't safely collocate the servers and VMware data files on the same host (the equivalent of putting all your 'eggs' in one basket). In such a scenario, one physical machine suffering a hard disk failure can bring all 30 virtual machines down instantly.

Administrators can also replicate virtual machines to a remote disaster recovery site over IP connections for complete business continuity in the face of a failure. StarWind's reliability, scalability and dynamic performance, coupled with unlimited terabytes of VMware virtualized storage (on all major storage platforms) provides an excellent solution that supports the needs of medium-size companies and remote office/branch offices.

### ENABLE ADVANCED VMWARE FEATURES

Several VMware features are substantially enhanced with the introduction of StarWind virtual storage:

### VMotion

VMotion enables the live migration of running virtual machines from one physical host to another without any downtime. With VMotion, the server administrator can:

- Perform live migrations of running VMs on the fly, without any downtime
- Improve availability by performing maintenance without disrupting operations
- Load balance by moving running VMs away from underperforming servers

VMotion works because the entire VM is stored on iSCSI

shared storage and VMware VMFS allowing multiple installations of VMware to access the same VM file concurrently.

When used outside of DRS, VMotion allows the VMware vSphere administrator to seamlessly move VMs from one host to another with zero downtime. This gives the administrator flexibility around things like host maintenance, and controls which VMs run on a given host with no impact to the end user. VMotion cannot be implemented with Direct Attached Storage DAS and requires shared storage such as the one provided by StarWind.

### VMware High Availability (HA)

VMware HA technology is a tool which continuously monitors all physical VMware servers and provides high availability for all applications that run inside VMs. So in the event of physical server failure, the affected VMs are automatically restarted on a different production server and, in the case of OS failure, VMware HA restarts the affected VM on the same physical server.

VMware HA leverages iSCSI SAN shared storage. When all of your virtual servers are stored on shared storage that is built with StarWind, VMware HA will launch the VMs (that were previously hosted on the unresponsive, failed server) from a functioning vSphere server. The combination of StarWind shared storage and VMware HA will ensure a uniform high application and data availability across your entire virtualized IT environment thus helping you meet the baseline level of availability for all your applications in your organization and ensure that your company's service level agreements (SLAs) are met.

### Distributed Resource Scheduler

VMware's Distributed Resource Scheduler is a tool for optimizing the Virtual Environment, and it works by enabling smart migration of virtual machines from one ESX host to another based on predetermined performance parameters. This makes sure that no single ESX machine is overloaded and that all Virtual Machines get the resources they need, even if the resource requirement of the VM changes. Once again, DRS relies on centralized storage that StarWind software provides and otherwise will not work with Direct Attached Storage.

### VCB

VMWare Consolidated Backup used in conjunction with Shared Storage not only removes the resource generated by traditional backup methods (shifting this to a proxy server), but also removes pressure from your network by enabling you to perform a LAN-free backup (no data moves across your production network).

### CONCLUSION

In order to take full advantage of your VMware virtualized IT environment, you must also implement highly available shared storage (i.e. a SAN with High Availability technology) to help guarantee business continuity and speed data recovery. The choice of technology for your SAN is also quite clear; an iSCSI SAN provides all the necessary performance without the high cost and labor required by legacy Fibre Channel Storage solutions.

StarWind SAN software provides all the necessary features to make a difference in any VMware vSphere installation. Users who build an iSCSI SAN can use the existing gigabit Ethernet and they will realize levels of performance that match the needs of most of today's small and medium-size businesses. And with the arrival of 10-Gigabit Ethernet, those with a serious need for speed can implement VMware virtualization that exceeds the performance of dedicated Fibre Channel solutions without breaking the bank.

StarWind SAN software also offers much faster implementations (less than an hour, rather than days!), lower training costs and drastically simplified management. Moreover, it is a portable software solution capable of surviving generations of hardware.

StarWind's key advantage is that it is designed to run on standard Intel-architecture x86 or x64 servers, which makes it easy for IT administrators to upgrade to new hardware, faster memory, Nehalem processors, PCI Express RAID controllers or 10 GigE networking that will all improve the performance of the storage appliance built with StarWind.

When customers evaluate virtualization solutions they should select technologies that have a proven track record and a clearly defined roadmap. StarWind is a member of VMware's Technology Alliance Partner Program and its proven technology is developed to seamlessly support VMware solutions.

Customers should also take into account the features enabled within the storage. A good quality SAN solution must offer data protection, disaster recovery and much more to keep your business running without interruption. StarWind excels in the number of features it offers and the high quality of its feature set. Its point-in-time snapshots or copies are critical keys to quickly recovering from failure. Also, mirroring and replication is a basic requirement of the storage infrastructure for a virtualized environment. These features make possible a quick recovery of virtual machines from failure.

The last points to consider are both the entry price and the total cost of ownership. StarWind costs you little, initially, to launch a powerful shared storage solution and costs little more in the long run to keep it running. The combination of performance, ease of use and affordability are exceptional for SMBs. This explains why StarWind iSCSI installations are so popular at VMware customer sites around the world.

StarWind offers downloadable StarWind Free software at: www.starwindsoftware.com/downloads

### ABOUT STARWIND SOFTWARE INC.

StarWind is a global leader in Storage Virtualization and iSCSI shared storage for virtualized IT environment in small and midsize companies. StarWind's flagship product is a software that turns any standard, Intel-architecture x86 or x64 Windows server into a highly reliable and highly available, fault-tolerant SAN. This SAN or shared storage is designed for use with virtual server platforms such as VMware and Hyper-V or with Windows server clusters. StarWind is focused on providing small and midsize companies with affordable high availability technology that was previously available only in high-end storage products. The advanced, enterprise-class features in StarWind include Synchronous Mirroring with Automatic Failover and Failback, Remote Replication across a WAN, CDP and Snapshots, Thin Provisioning and Virtual Tape Array (VTA).

Since 2003, StarWind has pioneered the iSCSI storage industry and has been the solution of choice for over 30,000 global users in over 100 countries, from small and midsize companies, to governments, and Fortune 1000 companies.

### **RELATED LINKS**

To download a fully functional trial or free edition of StarWind or for more information from StarWind Software about the solution outlined in this paper visit: www.starwindsoftware.com



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### ABOUT STARWIND

Since 2003, StarWind has been the storage solution of choice for thousands of global customers in over 50 countries, from SMBs, to governments, and to Fortune 1000 clients. StarWind has pioneered the iSCSI / IP SAN industry with its storage virtualization software that converts any Windows Server into a reliable and scalable shared storage.

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