Virtualization with iSCSI

WHITE PAPER

Understanding the Storage Needs of Virtualized Environments

Overland STORAGE®

Introduction

Although virtualization is not entirely new, many businesses are just now starting out with virtualization. Evaluations are currently underway to see if the promises of consolidation and efficiency will indeed benefit operational environments and budgets. Once convinced that virtualization can indeed be implemented and the benefits are attainable, IT then begins the process of actually deploying virtualization – now armed with the expectation of consolidating several of their physical servers and operating system platforms into new virtual servers. They also have an eye to the future as easing scalability is a key objective. Regardless of which virtual server technology is chosen, proactively planning for scalability of the virtualization server is actually a fairly straightforward task. Common sense considerations, such as leaving head room in the server hardware for more CPU and RAM, generally satisfies future growth requirements. In addition, there's comfort in knowing there are software tools that enable the movement of Virtual Machines (VM's) to different physical servers when performance challenges dictate such a move. So, for servers, planning for scalability is actually quite simple. This is, after all, one of the greatest benefits of virtualization. Conversely, planning for the scalability of the storage infrastructure is a considerably more challenging task.

Storage Considerations for Virtualization Checklist

- **Virtualization Platform Certifications**
- **Integrated Management**
  - ✓ Utilizes Virtualization Management Interface
  - ✓ No Additional Tools or Training Required
  - ✓ Integrated Data Protection (ex: Replication, Mirroring)
- **Independent Capacity & Performance Scaling**
  - ✓ Allows for JBOD Expansion
  - ✓ Supports/Intermix of Capacity & Performance Drives
  - ✓ Ability to Expand Network Performance
- **Advanced Features**
  - ✓ Advanced Provisioning (Automated, Just-in-Time Expansion)
  - ✓ High Availability
  - ✓ CDP/Near CDP
- **Affordability Considerations**
  - ✓ Capital Equipment Pricing Model
  - ✓ Deployment, management Maintenance
  - ✓ TCO: Ongoing Management, Support, Maintenance, Power/Cooling
  - ✓ Scale-out Costing Model

Workloads are vastly different in virtual environments and more difficult to plan for. In the physical world, if you have a critical application that demands performance, you often dedicate computer and storage resources to ensure adequate IOPS and throughput performance. This provides confidence that neither the server nor storage will create a bottleneck, while applications run without interruption. But, let's remember, this is the approach that created the vast amounts of under-utilized hardware that you are attempting to now consolidate with virtualization. In the virtual world, a physical server can house small or large numbers of applications running concurrently. It is often difficult to predict the workload demands of this blended application I/O to the storage system at any given point in time. While there are plenty of tools designed to help track physical server and virtual machine performance – and even to dynamically move virtual machines to servers to ensure adequate performance in real-time – the storage environment is considerably less visible and subject to becoming a bottleneck when over-utilized.

Since storage architecture is such a critical component to successfully implementing a virtual environment, it's important that administrators carefully consider storage's role and capabilities when architecting their virtual environment. Bringing storage planning into the fold from the beginning provides a sound plan for deploying your new environment and longer term abilities to scale, as growth and requirements change. Performance and capacity requirements are obvious items to consider, but also planning just how backup jobs will be supported, recoverability and even high availability requirements are also critical criteria. Capital expense, total cost of ownership and optimizing the economies of scale for the entire virtualization ecosystem will help ensure the economic benefits of using virtualization are, indeed realized.

Starting down the virtual path generally begins with non-production test deployments of virtualization. Here it's quite common to simply use the server's internal drives or direct-attached storage, as a simple and economical approach for quickly testing or "trying out" virtualization. However, when it's time to actually deploy virtualization for production use, it has become a common practice to utilize a Storage Area Network (SAN) as a shared and flexible storage platform. Fibre Channel (FC) SAN's are generally the first to come to mind when most people think about a SAN deployment. But, in the past couple of years, many organizations have realized and leveraged the economics and ease-of-use benefits when SAN's are deployed utilizing the existing, ubiquitous Ethernet infrastructure and iSCSI protocol. While FC SAN's require specialized FC switches, cables, and training, the more practical and economical alternative is an iSCSI SAN deployment which allows administrators to leverage existing equipment, cabling, and knowledge.

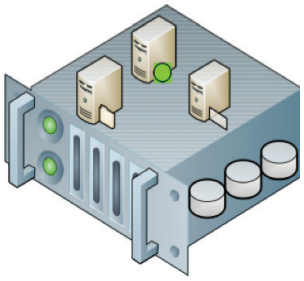

Figure 1

To maximize the flexibility and scalability of disk-based storage for virtualization, it is common practice to utilize networked storage solutions over the alternative internal server drives or captive direct attached storage approaches (*Figure 1).*

The networked options that are generally usable range from file-based NFS protocol connections over Ethernet to block-based iSCSI or FC connections. NFS connections, although very simple to deploy, don't offer the same robust performance and scalability as iSCSI and FC SAN offerings. This is why the SAN-based solution is the most chosen storage architecture for virtualization (*Figure 2).*

Deployments of virtualization technologies promise to maximize and consolidate resources as economically as possible, without adding additional complexities or requiring more expertise than is already needed to manage a virtualized data center. With this in mind, the practical realities of deploying and managing a FC-based SAN to support new virtual server deployments can be daunting, and in many cases, simply too difficult. For organizations that already deploy FC SAN's and have in-house FC experts, this may not appear to be an issue. Conversely, deploying an iSCSI SAN makes the most economical sense, allowing most organizations to leverage both existing networking equipment and well established Ethernet skill sets. With the proliferation of embedded software initiators for most popular operating systems, the need to purchase special network adapters is not a requirement of the iSCSI-based SAN.

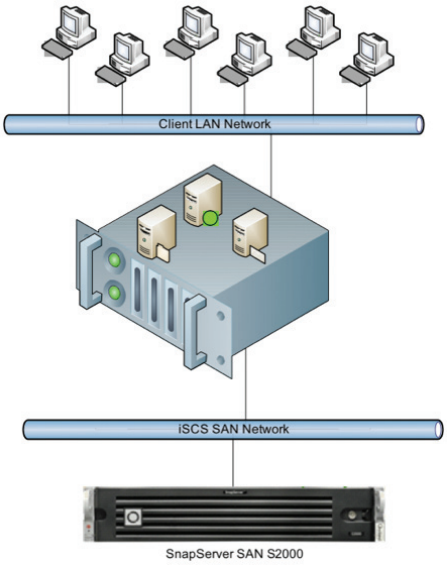

Figure 2

Sadly, it's a fact that for many administrators there is rarely any adequate budget allocated for storage when deploying new computer hardware. Although better understood today, and generally less costly than in the past, storage is still commonly an afterthought and one key area that tends to not be adequately budgeted. Asked to do more with less, when administrators begin to look at name-brand, high-end iSCSI offerings for supporting their virtualization deployments, they often discover that most of these high-end iSCSI offerings are competing directly with FC solutions. Though they come well equipped, with many advanced features, what these high-end iSCSI solutions lack is delivering on the expectation of price advantage. They tend to be just as costly as comparable FC offerings – especially when utilizing a 10 Gigabit Ethernet (10GbE) connectivity option. This realization can result in a sense of disillusionment regarding iSCSI-based solutions as being the economic storage platform for virtualization. The truth of the matter is that for most virtualization deployments, deciding upon a more mainstream and cost-effective iSCSI offering—without the use of 10GbE—will be more than adequate for their needs.

After deciding on a SAN deployment and considering the combined storage requirements for virtualization, administrators typically only take into account the consolidated capacity they will need to support their virtual servers. However, more often than not, due to the shared nature of SAN-based storage, some of the storage capacity is purposely kept isolated for business critical applications that will not be virtualized because of higher I/O requirements and that can't afford any potential data access latency that may occur in a shared, virtualized data set.

Ease of Use

With all of the potential complexities surrounding the deployment of a virtualization infrastructure for production use, it's important that the storage infrastructure be simple to implement, manage, and maintain. When deploying virtualization technologies, managing for future scalability is critical as evolving requirements and growth are inevitable. Understanding the scaling capabilities and pricing models required to increase capacity and performance will help you identify the right storage platform for your business and budget. Since storage and capacity are typically 'set-and-forget' configurations—only revisited when necessary, it's important that the initial setup be simple. Future capacity growth should strive to be seamless and intuitive, requiring minimal administrative intervention while still offering the flexibility of customization and a set of advanced tools for configuration, management and data protection operations.

iSCSI Deployment Considerations:

When deploying an iSCSI solution for virtualization, there are some key things that need to be considered as the search for the correct combination of hardware and software solutions begin. The following will give guidance on those key considerations:

- ✓ Ease of use
- ✓ Integration
- ✓ Performance
- ✓ Capacity and Provisioning
- ✓ Network
- ✓ Data Protection

Performance

It's critical to have a basic understanding of the performance requirements and any Service Level Agreements that will be in place for the specific VM's and for the overall virtualized environment. iSCSI target performance can be affected by a number of things, including: the network architecture and interfaces, the number and types of hard disk drives, their spindle speed, as well as the RAID configuration selected.

Since every business's needs are unique, determining the performance requirements for the virtual servers will be specific to that business' goals and objectives. In general, administrators should analyze and monitor the performance usage of the existing environment to get a good understanding of the virtual environment's requirements.

Virtualization storage I/O access patterns are different (more random) and less predictable than traditional server hosts, since there are multiple guest operating systems leveraging common storage. Since performance requirements can vary by application and time of day, it's important to understand these dynamics and balance the load appropriately. For each individual VM's storage, that may mean utilizing monitoring and analytics native to the virtualization management tools to identify "hot spots" and potentially to migrate VM's as appropriate and keep the virtual servers balanced.

The network configuration is the easiest way to effect performance on virtual servers. Utilizing the appropriate Ethernet hardware (1GbE or 10GbE) is the first step to making sure that VM's have enough bandwidth to support the data access needs. Furthermore, using multiple connections to increase performance to the hosts and iSCSI target provides more bandwidth. Multipathing iSCSI connections allows for load balancing which enhances performance as well as enabling failover capabilities.

As mentioned above, the storage performance needs of each VM will most likely be different, so it may be necessary to deploy VM's onto different disk technologies. You may have a capacity hungry application with minimal performance requirements that can use slower performing SATA drives, or you may have a database that requires higher performance that the much faster SAS drives deliver. Some deployments may even be able to leverage the performance characteristics of Solid State Drives (SSD's).

In addition, administrators will also have to determine where to physically store their VM's. They may choose to store VM's on virtual disks, managed by the hypervisor, where the back-end disk technology is abstracted from the operating system. They can alternatively choose to store a VM requiring higher performance on raw or pass-through disks that allow for direct access from the guest operating systems to the disk volumes or RAID array.

Capacity and Provisioning

Current and future capacity requirements must also be included in the analysis process. This will ensure that what is purchased initially will be able to scale to the expected future capacity requirements. Important considerations when choosing a storage platform include: the ability to scale performance and/or capacity as needed, maintaining application performance consistency, space/energy efficiency, the costs of scaling, and the ease of deploying and managing growth.

There are different types of provisioning techniques that can be used for virtualization. Depending on the virtual server vendor implementation options, administrators usually have the option to either choose to thinly provision a virtual disk or thickly provision the anticipated capacity of the volume. Thin provisioning offers the single advantage of only allocating physical storage as needed. Growing capacities under this approach often result in a potential performance hit each time new capacity is being allocated. Thick provisioning will not cause degraded performance, but in this approach volumes will have to be monitored more closely to extend capacity when data growth occurs.

Network

General networking best practices relative to physical cabling and logical configurations are well known. Beyond these best practices, administrators must also consider how they will configure the virtual networking configuration as well as the physical iSCSI connections.

It is important to make sure that the iSCSI traffic is isolated from other VM traffic. This can be accomplished in a few ways depending on experience and expertise. Network traffic can be separated physically (via separate switches), logically (with switches using VLAN's), or by using the virtual switching mechanisms on the virtual servers. To avoid burdening virtual servers with that level of access control, it is often a better practice to handle this at the switch level, either by physically separating the networks or by using VLAN's. That said, physically separating network and storage traffic is the most secure and best way to ensure optimal performance.

Utilizing Multipath I/O (MPIO) is a common technique used to load balance and provide network failover support. MPIO leverages the use of multiple Ethernet ports, aggregated together, to provide better performance and/or failover. Depending on the hypervisor being used, configuring MPIO differs. The key is to utilize MPIO techniques for your iSCSI SAN targets to ensure optimal performance and data availability.

Beyond using MPIO to aggregate physical connections, administrators can also choose to use faster networks. While 10GbE is the inevitable future of Ethernet infrastructures, cost and connectivity options are still not at the market acceptance level that will make 10GbE deployments mainstream. Moving to a 10GbE network may be a more expensive proposition than expected. This makes understanding the real costs associated with the hardware component the most critical element of 10GbE deployments, as the expertise required in managing Ethernet infrastructures is well understood. Administrators will need to decide on the cable technology and connectivity that makes the most sense for their environment.

Data Protection

One of the most often neglected considerations is how data in the virtualized environment will actually be protected. This is often illuminated when going through the exercise of determining the Recovery Point Objectives (RPO's) and Recovery Time Objective's (RTO's) for each guest OS and for the virtualization ecosystem as a whole. Administrators must take a holistic approach to data protection and look at protection techniques beyond RAID and other hardware redundancies. Available options include protecting data at the file level, application level, VM level for the guest OS, virtual disk level and at the volume/disk level (within the datacenter and offsite).

Understanding critical thresholds, like how much data is acceptable to lose (RPO) and how long the business can afford data to be unavailable (RTO), should make it clear as to what level of data protection needs to be implemented. In some cases, the use of multiple techniques may be necessary in order to meet the business's data availability objectives. Budget limits will also dictate what level of protection can be afforded.

There are essentially three levels of granularity of data protection. The least granular would maintain a complete image of a data set or operating system. The next level of granularity would give the ability to backup files with individual file recoverability. For the most granular data protection, administrators will backup at the application level, which in some cases offers the opportunity to recover individual data elements. These different levels of granularity can be mixed and matched depending on the data protection goals.

In the world of virtualization there exists the ability to backup, copy and even move entire VM guest operating systems. Native tools are included as part of the major virtualization vendors' management suites. It's important to understand any additional storage requirements that may exist to utilize these tools. Shared iSCSI SAN storage is ideal for affordably enabling these resident VM movement tools.

The logical virtual disks that are created—and where one or more VM's are stored—can also be moved and backed up. This activity is typically not a live migration task and requires for all of the VM's to be shutdown prior to moving or backing up the data.

For local backups of virtual disks, many virtual server architectures include snapshot technology for doing point-in-time local backups. These snapshots can then be leveraged for backing up offsite.

Outside of the native virtualization tools, many iSCSI SAN products have tools to integrate with the virtualization infrastructure. These tools support the scheduled, asynchronous replication of volumes/disks to another storage device in the SAN. This approach works well for customers who need to protect entire volumes, without the requirement to directly tie to the guest OS's themselves. Administrators will gain the capability to perform complete volume recoverability offsite for the entire SAN volume. Careful planning is required to ensure that the data is consistent and usable for the individual VM's when it's time to recover. More often than not, administrators will choose to deploy operating system specific replication techniques to guarantee that the data is usable in the event of a disaster.

For the ultimate in availability with iSCSI, SAN storage administrators can leverage synchronous, real-time, Active-Active mirroring technologies that were developed and designed specifically for use with virtualization. This can give administrators the ability to leverage all of the aforementioned backup and movement techniques for individual VM's and guest OS's, while ensuring absolute High Availability for the virtual world.

The Overland Storage SnapServer SAN S2000

The key to successfully deploying an iSCSI SAN with virtualization is to find a solution that supports the features, performance and capacity required - without eviscerating the project budget. The platform's design must allow for future scalability of both performance and capacity independently. Scaling should not require you to spend the same amount of money (each time you grow) as you did on the original investment. Finally, scaling certainly should not force a complete rip-and-replace of the existing storage deployment.

Leveraging over 29 years of experience in data storage, Overland's engineering team created the SnapServer SAN S2000 which allows businesses to implement simple and affordable storage for their virtualized environment. The S2000 is a 2U iSCSI SAN appliance designed specifically for businesses with growing storage needs but realize they have limited resources available to manage their end-to-end storage strategy. Built on the Overland Storage vision of "effortless data," the S2000 offers an intuitive, simplified management console with guided wizards that make installation and maintenance simple. In addition, the S2000 provides an ideal mix of enterprise features including auto provisioning, mirroring for high availability, as well as replication and snapshots for data protection. The S2000 simultaneously lowers ongoing operational expenditures and total cost of ownership (TCO), without compromising on the required features businesses need to succeed.

When it comes to deploying an iSCSI SAN for virtualization, the S2000 is an affordable, feature rich iSCSI appliance designed with virtualization in mind. Whether you are using VMware for your virtualization or Microsoft's Hyper-V, the S2000 has been thoughtfully optimized to integrate tightly with virtualization platforms. With integrated software for managing the SnapServer SAN's targets directly from within the native virtualization environments, administrators no longer have to learn, utilize and maintain multiple tools for managing their virtual server storage.

Management

Management of the S2000 is extremely flexible and can be performed in a number of ways, depending on the specific environment and requirements. There are options to monitor an entire Overland Storage ecosystem, perform general S2000 administration, and leverage specific tools provided for both Windows and VMware deployments. For overall status monitoring of all SnapServer SAN, NAS and REO VTL products, the SnapServer Manager Java-based tool can be used

- For general administration of the S2000, the SnapServer SAN Web Manager can be used from any supported web browser to conduct management activities either locally or remotely
- The Windows-based SAN Manager provides specific tools for Windows management which enhance the ease of use and deployment of the S2000 for Windows environments. These include managing the optional Replication and Mirroring features for Windows environments as well as tools for managing the entire iSCSI SAN

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Fully Integrated SnapServer SAN Wizards

Creating storage for your virtualization environment may be complicated today. With the SnapServer SAN's integrated management interfaces, Wizards are there to guide you through every aspect of creating and managing your storage. This deep level of integration means you're no longer burdened with the multi-step, manual complexities of creating your virtual machine storage or managing your mirroring or replication tasks.

Microsoft Specific Features

The SAN Manager software for Windows is a single interface designed to radically simplify and automate all of the tedious steps required to create an iSCSI disk for a Windows host Figure 3. Instead of using multiple interfaces to create the target LUN, connect to the target, and partition and format the target; the Windows SAN Manager tool does all this for you in one simple setup screen. With Windows deployments in mind, the S2000 has a strong list of supported features designed with the single goal of simplifying iSCSI SAN deployments for Windows administrators (*Figure 3).*

- "Single-Click" Volume Creation – Create the target; Connect the iSCSI Initiator and Create the Windows Volume… all in one click of the mouse. Compare that to doing each step manually
- Automated Capacity Expansion – No more worrying about running out of capacity or having to "guess" at how much capacity you "might" need in the future. Simply set the policy for automatically extending your Windows Volume and our intelligent expansion feature handles all those tricky diskpart commands for you (*Figure 4).*
- A single pane of glass – This full management interface for the entire SnapServer SAN environment provides full support for Microsoft VDS and VSS.
- Supports the Hyper-V VSS Writer directly for replication and backup jobs
- Supports Application Consistency utilizing VSS for replication and backup

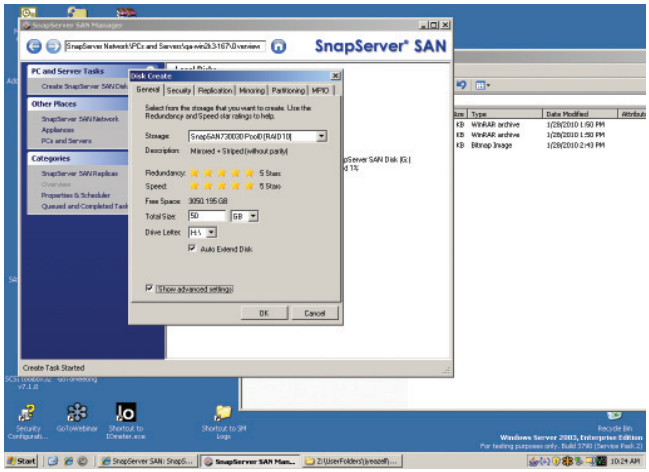

Figure 3 - SnapServer SAN Manager Windows application

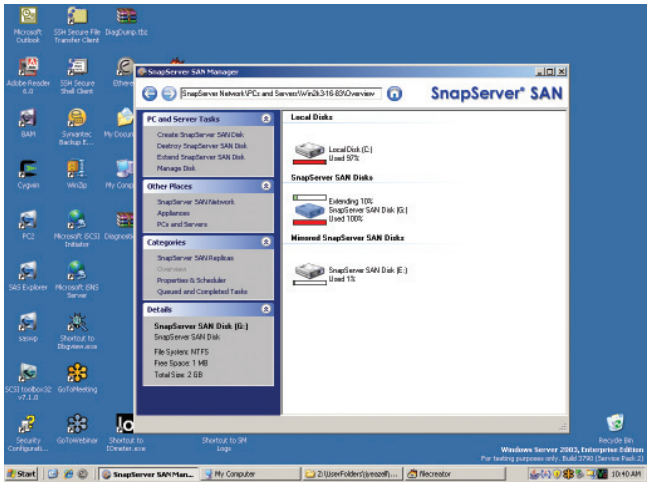

Figure 4 - Expanding a Windows Volume with SnapServer SAN Manager

- For VMware users, the S2000's specific tasks can be managed natively with VMware tools. Utilizing Overland's VMware vCenter plugin (which installs directly on the vCenter server), a new SnapServer SAN tab is created right inside VMware's management console
- Supports access for guest VM's directly to iSCSI targets, without having to expose and virtualize the iSCSI LUN's through the Hyper-V host
- Active-Active Failover supported for clustered Hyper-V Servers

VMware Specific Features

- The SnapServer SAN plugin for VMware vCenter integrates directly within the VMware management console and includes datastore creation wizards and configuration tools for the S2000's optional Mirroring software. Fully featured and optimized for VMware, the S2000 has all of the essential features required for simple and rapid iSCSI SAN deployments.
- SnapServer SAN VMware vSphere Plugin – Creates a new tab within vCenter allowing administrators to manage their ESX environment natively right inside their VMware vCenter Server (*Figure 5).*

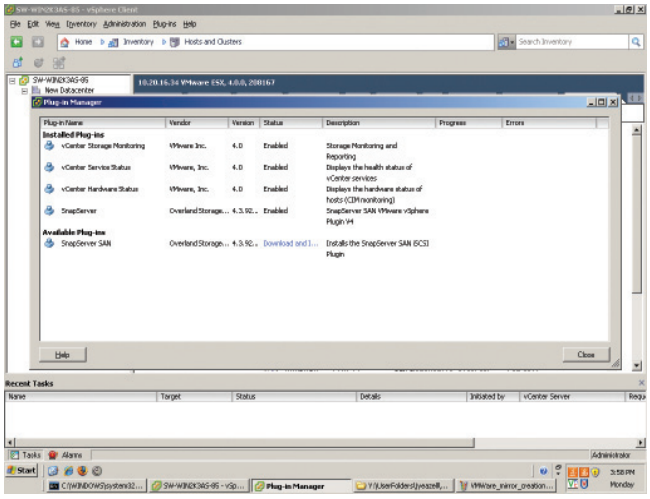

Figure 5 - SnapServer SAN VMware vSphere Plugin

- SnapServer SAN wizards integrate with the vSphere management console for creating targets and Datastores in a just a few mouse clicks compared to doing each step separately
- Supports Active-Active Failover for ESX Datastores
- Enables single interface configuration for S2000 targets, VMware Datastores and VMware High Availability options, such as: DRS, HA, VMotion, and Fault Tolerance (*Figure 6).*

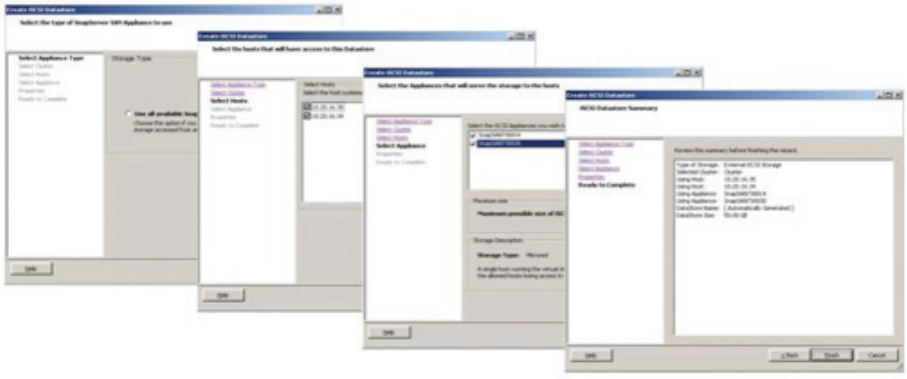

Figure 6 - SnapServer SAN Datastore Creation Wizard for VMware

Replication Feature

This asynchronous replication option allows for any target created on the S2000 to be replicated locally or remotely across a WAN. It supports hundreds of thousands of replica recovery points for remote system disaster recovery (Near-CDP). Integration with Microsoft's VSS API provides application consistent replications of data. The Replication option also supports a one-to-many paradigm allowing for multiple replica's to exist at more than one site (*Figure 7).*

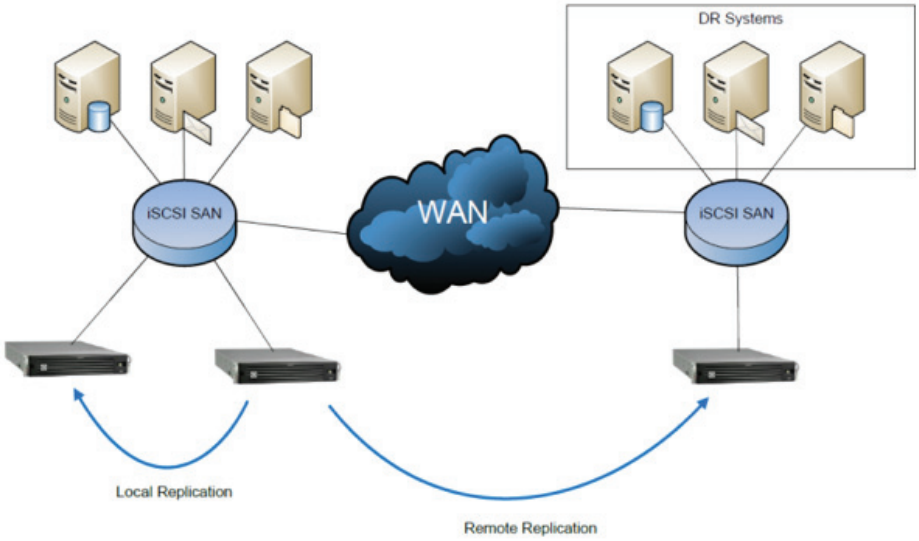

Figure 7 - **SnapServer SAN S2000's configured with Replication option**

Mirroring Feature

This synchronous mirroring option provides Active-Active failover for Microsoft Windows Servers and VMware ESX virtual servers. Mirroring integrates natively with the Microsoft and VMware environments to ensure high availability. Flexible enough to support mirroring only on the selected disk targets that need to be mirrored, this feature optimizes the performance and does not tax the system with unnecessary mirroring activity (*Figure 8).*

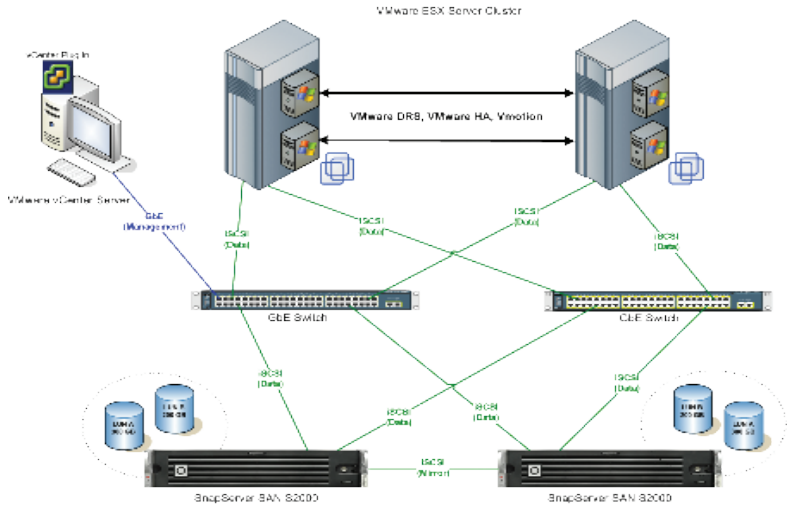

Figure 8 - Architectural Diagram of a VMware ESX Environment Configured with the SnapServer SAN S2000's for Active-Active Failover

Snapshot Feature

Protecting valuable data can take many forms. Creating local disk-based snapshots is a fast and convenient way to create another layer of data protection. With the integrated Windows Volume Shadow Copy Service (VSS) and Virtual Disk Service (VDS) Providers for the S2000, you can ensure that your VSS-aware applications (such as Microsoft SQL and Exchange) are quiesced and consistent before backing them up or replicating them offsite. This integrated VSS Provider enables the S2000 to create application consistent snapshots for replication, which extends application-aware data protection beyond just replication, to any Windows-based backup package that leverages VSS.

The use of snapshot technology provides granular point-in-time replica recovery points of volumes. Since the snapshot and replication mechanisms for the iSCSI targets are managed within the S2000, it is easy to coordinate local scripts with an appropriate replication schedule for your non-Windows hosts (such as Linux and UNIX).

Replica Recovery Points

Replica Recovery Points offer key benefits when using the S2000 with replication. In addition to recovering from a disaster, this capability also allows you to restore a file deleted in error or roll-back to a safe point in time before a virus' intrusion. When replication jobs execute from the source S2000, the destination S2000 takes the delta (changes since the last replication) and stores those changes - plus the original data volume as a recovery point. Each subsequent replication job continues this operational model which automatically stores and keeps track of hundreds of thousands of recovery points (or as many as the available capacity on the destination S2000 appliance will allow). To provide efficiency and keep capacity costs down, the S2000 allows you to store a tremendous number of recovery points without using a lot of capacity, since only the changes are stored as part of each subsequent recovery point. This model of very granular recovery points is often referred to as Near-CDP. Continuous Data Protection (CDP) recovery schemes offer an efficient model for maintaining very granular Recovery Point Objectives (RPO's) for those administrators that need the ability to recover from a very granular set of recovery points (*Figure 9).*

Hardware and Scalability

The S2000 is a highly scalable platform that allows users to scale capacity and performance independently. Unlike many vendor's iSCSI SAN storage platform designs and business models, Overland's architecture was not built to drive a new server sale each and every time your capacity outgrows the drive slots in your appliance. That's why it's so important to carefully consider all of the costs associated with scaling, including: hardware, networking, software licensing, maintenance fees and power/cooling. Our focus is on providing scalable storage systems, so we make sure our storage appliances provide strong performance and allow you to add additional capacity behind our appliances. This lowers the total cost of ownership and provides investment protection for your business.

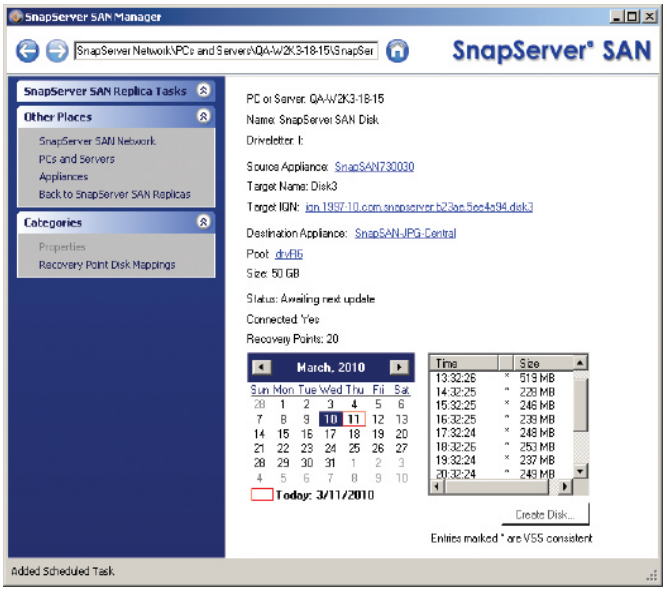

Figure 9 - SnapServer SAN Manager screenshot of Replica Recovery Point

Capacity scaling: The S2000 is a 2U appliance, with 12 drive slots which support RAID 0, 1, 5, 6, 10, 50 and 60 with Hot-Swap drives; two Hot-Swap Power Supplies and redundant cooling. Unlike other platforms that force you to purchase additional performance each time you want to scale capacity, the S2000 supports adding capacity independently with the 2U, 12 drive SnapServer E2000 expansion unit. SAS provides connectivity between the appliance and each attached E2000. The E2000 also supports Hot-Swap drives; two Hot-Swap power supplies and redundant cooling. Among the most economical of all capacity building blocks, up to 7 E2000's are supported behind a single S2000 appliance, allowing a single configuration to scale to a maximum of 192TB's of raw capacity. That's a significant amount of capacity you can add without being forced to pay unnecessary premiums for performance, software licensing, annual appliance maintenance fees and additional networking equipment.

Performance scaling: SANs provide the modularity to easily add additional appliances and share them as needed when workloads demand more performance. The S2000 provides a highly economical building block to scale performance. In addition, in this tough economy we are mindful to provide our customers with the ability to stretch their storage budget. To increase performance, there are other levers to pull that will make sure that you are getting the most out of each appliance - before you decide to add another to your environment. Simply changing the type of drives being used (i.e. going from SATA to SAS) or adding more network bandwidth to the SAN can increase storage performance greatly. Since the S2000 supports SATA and SAS drives, administrators can migrate to different disk technologies when appropriate. The S2000 starts with two 1GbE ports and supports the addition of up to two dual or quad 1GbE cards for a total of ten 1GbE ports worth of throughput when network performance needs to be scaled.

Purpose-Built for Virtualization

The SnapServer SAN S2000 is a purpose-built iSCSI appliance with the critical needs of IT professionals in mind. The S2000 accelerates virtual machine deployments and simplifies data protection. Whether you are seeking to deploy virtualization technology for the first time or increase virtualization storage capacity and improve efficiencies, this storage solution is easy to use for someone with a working knowledge of VMware or Hyper-V, but robust enough to meet the needs of the most seasoned storage administrator. Easy to install, manage and expand, Overland Storage provides deep integration with virtual platforms and is an economical building block to scale capacity and performance independently. By providing an affordable iSCSI SAN that will scale to support the ever changing performance and capacity requirements of virtualization, the S2000 is an ideal solution for any virtual server deployment.

Storage Considerations for Virtualization Checklist

S2000 Scorecard

- **Virtualization Platform Certifications**
  - ✓ VMware 4.x; Microsoft
- **Integrated Management**
  - ✓ Utilizes Virtualization Management Interface
    Right inside of vCenter and Microsoft
  - ✓ No Additional Tools or Training Required
    If you can create virtual servers in VMware or Microsoft consoles today, you can provision and manage storage on the S2000
  - ✓ Integrated Data Protection
    Replication and mirroring managed inside vCenter and Microsoft
- **Independent Capacity & Performance Scaling**
  - ✓ Allows for JBOD Expansion
    Add up to 7 JBODS (84 additional drives)
  - ✓ Supports/Intermix of Capacity & Performance Drives
    Supports SAS and SATA in same JBOD
  - ✓ Ability Expand Network Performance
    Add additional NICs
- **Advanced Features**
  - ✓ Advanced Provisioning (Automated, Just-in-Time Expansion)
    Policy-based, instant capacity expansion
  - ✓ High Availability
    Supports HA requirements
  - ✓ CDP/Near CDP
    Via S2000's replication and snapshot's 100's of 1,000's of replica recovery points
- **Affordability Considerations**
  - ✓ Capital Equipment Pricing Model
    Price/Performance value leader.
  - ✓ Deployment, Management Maintenance
    Less complexity, no Fibre Channel gear and no enterprise professional services pricing model
  - ✓ TCO: Ongoing Management, Support, Maintenance, Power/Cooling
    Fewer appliances = fewer software/maintenance licenses and less power consumption
  - ✓ Scale-out Costing Model
    Lower CapEx, TCO pricing & JBODs reduce capital spend to expand capacity vs appliance only models

About Overland Storage

Overland Storage is the trusted global provider of effortless data management and data protection solutions across the data lifecycle. By providing an integrated range of technologies and services for primary, nearline, offline, archival, and cloud data storage, Overland makes it easy and cost effective to manage different tiers of information over time. Whether distributed data is across-the-hall or across-the-globe, Overland enables companies to focus on building their business instead of worrying about data growth. Overland SnapServer®, NEO® and REO® solutions are available through a select network of value added resellers and system integrators. For more information, visit www.overlandstorage.com

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