# Table of Contents

Evaluation Guide Overview ........................................................................................................... 2  
What is SAN Virtualization........................................................................................................... 2  
Why Storage Virtualization ........................................................................................................... 3  
Relationship between Storage Virtualization and Server Virtualization ................................. 5  
When to Consider Storage Virtualization ..................................................................................... 6  
SAN Virtualization Alternatives .................................................................................................... 8  
Where Storage Virtualization Can Reside ..................................................................................... 8  
  Host Based Virtualization ......................................................................................................... 9  
  SAN or Network Based Virtualization ..................................................................................... 10  
  Array Based Virtualization ....................................................................................................... 10  
Types of SAN Network Virtualization .......................................................................................... 12  
  In-Band – Symmetric Virtualization ....................................................................................... 13  
  Out-of-band – Asymmetric Virtualization ............................................................................... 14  
Establishing Requirements ........................................................................................................... 15  
SAN Virtualization Features ........................................................................................................ 16  
Evaluation Questions .................................................................................................................... 17  
Summary .................................................................................................................................... 18
Evaluation Guide Overview

Evaluator Group’s SAN Virtualization Evaluation Guide is part of a series of guides designed to help IT professionals evaluate storage technology alternatives. This Evaluation Guide and the accompanying workbook are designed to assist potential buyers understand the options and products available and to help match requirements to the available technology choices. A list of the features covered in the workbook is also listed in the Evaluation guide.

What sets Evaluator Group’s Evaluation Guide series apart from other analyst firms or vendor sponsored whitepapers is the lack of vendor bias. Our Evaluation Guides are not sponsored by vendors and are written for IT managers seeking a vendor neutral discussion of the design considerations behind new products, technologies, and trends.

What is SAN Virtualization

With the successes of server virtualization, storage virtualization is once again popular. Storage administrators understand that it can make sense to couple virtualized storage with a virtualized server instance. However, there are many issues to consider before plunging into a storage virtualization deployment. This guide serves as an overview of the technology, the choices and is accompanied by a workbook detailing the specific features of the options available.

At its most basic level, virtualization is a mapping of resources. Memory was one of the first resources to become virtualized on computer systems, followed later by storage. Virtualization also helps to provide a higher level of control by allowing complicated processes or devices be managed by a few relatively simple interfaces. For this reason, virtualization is a very powerful tool that has been exploited by the IT industry for several decades.

In its simplest form, storage virtualization hides the physical characteristics of a storage device and presents a logical view of the underlying device. It is possible to have multiple layers of virtualization or mappings; with each layer independent from the other layers. Storage has been virtualized at some level for several decades with disk drives and external storage arrays providing a logical view of storage that is different from the actual physical resources.

SAN storage virtualization is a specific type of virtualization. This evaluation guide will not cover other storage virtualization topics or categories, which include tape virtualization (VTL) and file virtualization. Instead, the focus will be on virtualization of block storage, accessible over SAN network protocols. Throughout this guide the terms “virtualization” or “storage virtualization” are used synonymously with SAN storage virtualization.

SAN virtualization provides block storage access to systems and applications using protocols commonly transported over a storage area network or SAN. The majority of SAN virtualization products in existence support open systems storage; however, two array based SAN virtualization products also support mainframe environments.
Virtualization is a powerful feature that plays a role in the current success of storage arrays. By design, virtualization manages where data is located and controls access to data for users and applications. The value of storage has moved from disk drives to the array controller as more features and data protection capabilities have been added over time. SAN virtualization may once again move the value of storage, this time from the array to the point of virtualization.

Why Storage Virtualization

Server virtualization has proven value in helping to increase utilization and allow dynamic IT resource allocation. With that success, IT administrators are looking at storage virtualization to provide some of these same benefits to storage.

Some of the specific reasons for deploying storage virtualization include:

- Increased storage resource utilization
- Storage consolidation and centralized management
- Non-disruptive data migrations
- Dynamic tiered storage infrastructures
- Rapid application recovery
- Cost effective disaster recovery
Storage virtualization is a high priority as storage administrators seek ways to lower storage costs while providing high availability and reliability. Virtualization is recognized as one key piece of technology that can enable storage IT departments to build a reliable infrastructure that is scalable and delivers lower total costs.

Table 1: SAN Virtualization Overview

**SAN Virtualization Pros:**

- Enables transparent movement of data between tiers of storage systems
- Supports data movement for technology refresh or array upgrades
- Can provide a central point of management for storage provisioning and data protection
- Helps provide both capacity and performance scale beyond a single array
- Can reduce storage vendor lock-in

**SAN Virtualization Cons:**

- Can add latency to I/O operations, resulting in reduced transaction processing rates
- Adds another layer into storage environment, requiring more elements to manage
- May be difficult to remove if LUN’s do not map directly to underlying storage
- Vendor lock-in is not eliminated, it just moves to the point of SAN virtualization

The practice of moving data to another class or tier of storage was known by the name Hierarchical Storage Management (HSM). More recently, it has been termed Information Lifecycle Management or ILM. The ability to deliver ILM, storage tiering, and other data migration is facilitated with a storage virtualization solution.

The technology industry tends to move from one buzzword to the next, often without thoroughly explaining the rationale or reasoning behind using the technology to begin with. Virtualization was one such effort that seemed to catch on around 2003 and then faded as other priorities gained attention. However, the real benefits of using virtualization are being realized by customers who are deploying proven SAN virtualization products in an effort to deliver the level of storage availability, performance and costs businesses require. For this reason, storage virtualization is, and will remain a critical aspect of the recent trends toward Cloud Storage, ITaaS and other efforts.

*Evaluator Group Comment: It is important to remember that storage virtualization is a means to an end; virtualization itself should not be the goal. That is, SAN virtualization should be used as a tool to enable other goals such as providing highly reliable storage or lowering costs. Virtualization can help to enable greater...*
availability and reliability and help enable effective use of storage tiers. Virtualization plays a key role in enabling non-disruptive movement of data from one type of storage device to another. SAN virtualization is a tool that allows non-disruptive data movement, which in turn enables tiered storage and information lifecycle management (ILM).

Relationship between Storage Virtualization and Server Virtualization

Server virtualization has been very successfully applied for Information Technology. The reasons or value for server virtualization are generally seen to provide:

- Server consolidation with greater resource utilization
- Significantly improved application availability
- Faster and simpler Business Continuity / Disaster Recovery
- Simplified server management

Server virtualization is independent of storage virtualization. They can be deployed independently with each providing their own value. However, when combined – meaning that both server virtualization and storage virtualization are both deployed in an IT environment – there are considerations to be made:

- The combined potential for resource utilization are additive. This means the economic savings for each can be realized.
- The improvements in availability and BC/DR can be seen with a combined improvement albeit independent.
- The faster provisioning and simplified management for servers and for storage are still realized but will be independent – there is no tie between them for a greater gain.
- There is the potential for additional complexity in that there is another virtualized environment to understand when resolving problems.

Storage in a VMware virtualized server environment has three options: Raw device mapping within a SAN, VMFS shared blocks in a DAS or SAN, and Shared NFS in a NAS environment. For SAN virtualization where LUNs containing blocks are virtualized, only the first two are useful for discussion. There is no special consideration between the raw device mapping and VMFS shared blocks when it comes whether the storage is virtualized or on non-virtualized storage systems. There are specific storage features enabled with VMware that apply equally between virtualized and non-virtualized storage. In either case, it is important to know whether the SAN virtualization solution or the non-virtualized storage system supports the features enabled with VMware server virtualization. VMware uses the name vSphere for
both application services and infrastructures services. vSphere for Storage is part of the infrastructure services and contains some key features for storage:

- **Thin provisioning** – Virtual disks can be thinly provisioned across the different storage systems. LUN oversubscription is supported and monitored.
- **VMFS** – The Virtual Machine File System is a file system that is across attached storage where the virtual machine VMDK files are stored. The provisioning of storage for VMFS is a manual process.
- **Storage I/O Control** – Allows an administrator to assign a QoS prioritization in a virtual machine.

From a SAN storage virtualization standpoint, the support for features such as VAAI (vStorage API’s for Array Integration) within a storage virtualization solution is no different than if it is supported in a non-virtualized storage system.

### When to Consider Storage Virtualization

The requirement by IT organizations to provide both higher levels of service and improved storage efficiency are driving a re-architecture of IT environments. One of the ways IT organizations seek to deliver the appropriate service levels for applications, while decreasing costs is to utilize multiple types and price points of storage.

Evaluator Group has found that return on investment (ROI) calculations are difficult to obtain with SAN virtualization projects because they are typically accompanied by other projects. SAN virtualization usually entails the deployment of tiered storage along with rudimentary ILM in order to realize cost savings. Moreover, the actual savings come from implementing dynamic ILM rather than SAN virtualization. However, SAN virtualization is often required to enable non-disruptive data movement due to the potential application disruption without its use.

There are two primary methods of delivering increased capacity and performance: scale-up to larger systems or scale-out to a greater number of systems. The IT industry is once again in a transition, moving from scale-up to scale-out. While large systems provide a high degree of scalability, per system limitations still exist.

The question of which architectural choices will deliver better storage efficiency is at the core of the question of scale-up versus scale-out. Data center consolidation was popular for several years as IT departments consolidated servers and storage systems onto larger more powerful systems.

More recently, as the processors power in computers has grown faster than some individual applications require, the trend has been to scale out computing and to scale out to an even larger degree through server virtualization.

The key to server virtualization’s efficiency is the ability to pool resources and then provision and manage server instances through a common centralized interface. This allows administrators to move applications dynamically to the most appropriate set of resources. Storage virtualization offers a similar
value proposition in that multiple physical systems are provisioned and managed from one central interface that can pool storage resources.
SAN Virtualization Alternatives

There are several alternatives for implementing SAN virtualization, which should be considered prior to deploying a virtualization solution. Each type has different requirements and potential gains.

Table 2: Comparing SAN Virtualization Options

**SAN Virtualization:** Can reduce the reliance on a single vendor for storage and enable administrators to pool storage from multiple vendors. SAN virtualization can provide high levels of availability and enable transparent data migration from one tier of storage to another, thereby lowering the total cost for storage.

**Virtualization Alternatives:** Alternatives to SAN virtualization include implementing large scale-up storage systems that support tiering within the system. Data migration may be accomplished with service engagements or with host / appliance based replication products that support transparent data migrations.

There are also disadvantages to SAN virtualization. Analysis of the objectives, the relative costs, and benefits should be performed before deciding the best option. For more information on SAN virtualization options, readers are encouraged to reference the Evaluator Group SAN Virtualization workbook.

Where Storage Virtualization Can Reside

There is no single best answer for every scenario. The wide variety of products available reflects the storage industry’s attempt to solve multiple different problems in different ways. As with any set of technology decisions, having alternatives allows IT organizations to utilize the most appropriate type of product for their environment. This guide helps to provide the decision points in order to find the best location and type of SAN virtualization solution to deploy.

Storage or SAN virtualization can essentially reside in one of three locations:

1. On the host computer system
2. Within the network (or SAN)
3. Within the storage system
Figure 2: SAN Virtualization Locations

Here, we examine the details of SAN storage virtualization. At a high level, there are three locations to deliver storage virtualization. These answer the question of “Where should I virtualize my storage?” Additionally, there are two primary architectures for delivering SAN virtualization, which is the “How should I virtualize storage?”

**Host Based Virtualization**

Virtualization of block storage devices began within servers or host system several decades ago. Host based storage virtualization is still the most widely deployed method of delivering storage virtualization. Host based volume managers and volume managers included within virtual OS environments are common examples.

The benefits include:

- Ability to support a wide variety of storage array products
- System administrator familiarity with tools, no storage administrator required
- Relatively low cost if there are few server instances
The criticisms are:

- No consistent view of storage volumes between hosts
- Requires host processing overhead for all volume and data protection operations
- High cost for licensed software with many server instances (particularly with VM’s)
- Inability to utilize array based data protection features for application integrity

Host based storage virtualization is by definition in the data path and thus a symmetric in-band approach to deploying storage virtualization.

**SAN or Network Based Virtualization**

Placing virtualization within the storage network or SAN is a logical choice for many IT architects and engineers who design SAN virtualization products. Network based virtualization of storage products account for many of the products in existence and is the second most popular architecture in terms of number of deployments. To a degree, array based virtualization is actually network based virtualization within a private enclosed SAN environment.

The benefits of network-based virtualization include:

- Consistent view of storage volumes across multiple hosts
- Ability to support a wide variety of storage array products
- Potential to scale performance by scaling the number of virtualization devices

The criticisms are:

- Need to use new set of management and data protection products
- Increased latency, resulting in reduced performance
- Inability to utilize array based data protection features

**Array Based Virtualization**

This method is by definition in-band or symmetric virtualization, since the array controller sits in the data path. Array based virtualization is a logical location for virtualization, since it leverages the array controllers existing ability to virtualize storage, and the ability to protect data with the vendors array based data protection software offerings.

The benefits include:

- Consistent view of storage volumes across multiple hosts
- Familiarity with storage management tools
- Familiarity with data protection products and tools
The criticisms are:

- Locks users into a storage scale-up architecture
- High degree of vendor lock-in
- Limited performance capabilities for external storage
- All data management and data protection requires use of the controlling array’s products

Currently there are only a few vendors shipping array based virtualization products, although in theory many vendors could do so. All array controllers already deliver some degree of virtualization. The feature that determines whether an array provides storage virtualization is the support for connecting external third party storage.
Table 3: Comparing SAN Virtualization Options

<table>
<thead>
<tr>
<th>Metrics</th>
<th>Host Based</th>
<th>Network Based</th>
<th>Array Based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment cost</td>
<td>Low – High (Depends on # of hosts)</td>
<td>Moderate</td>
<td>Low (if using array)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High (if not using array)</td>
</tr>
<tr>
<td>Support for heterogeneous hosts</td>
<td>Low (Host OS dependent)</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Ability to migrate data between arrays</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Ability to Migrate data between hosts</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Ability to lower total storage costs</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Degree of virtualization vendor lock-in</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Storage management procedure changes</td>
<td>Moderate</td>
<td>High</td>
<td>Low (if using array)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High (if not using array)</td>
</tr>
<tr>
<td>Data protection procedure changes</td>
<td>Moderate</td>
<td>High</td>
<td>Low (if using array)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High (if not using array)</td>
</tr>
</tbody>
</table>

Types of SAN Network Virtualization

Claims of architectural superiority are made by vendors delivering both types of network virtualization. However, a claim of superiority in a vendor sponsored whitepaper has little validity in real world settings.

Where virtualization is delivered, host, network, or array does have a significant impact on how the virtualization solution will impact the storage environment. However, the type or architecture of the virtualization product has very little effect on the storage environment. Therefore, the arguments for in-band versus out-of-band should have little impact on the decision of what product to choose.

Potential storage virtualization customers should be less concerned with how the virtualization is accomplished than with how well a particular vendor’s SAN virtualization products work. The number of installations, industry specific solutions, and verifiable references are a far more important measure of a systems success than the architecture used to implement the product.
However, it is necessary to understand the architecture of storage virtualization solutions so that marketing claims either for or against specific implementations may be analyzed fairly.

Both host and array based SAN virtualization is accomplished by residing in the data path. Host based storage virtualization uses techniques similar to memory virtualization, which is a large mapping table. Host based virtualization is commonly associated with logical block management. The most widely deployed commercial product is Symantec’s VERITAS volume manager, VxVM, although other volume managers have some virtualization features as well.

Storage controller based data protection such as point in time copies and replication is typically not useful when used with host-based virtualization. It is possible to utilize array data protection if the host-based virtualization provides no caching and there is a direct, one-to-one mapping between a LUN on the storage array, and the virtual LUN presented to a host. However, there are few advantages to using host-based virtualization if LUN’s are passed through without remapping. Thus, for all types of virtualization, array based data protection becomes less useful.

Array controllers are a special type of virtualization having some aspects of network-based virtualization in addition to array based virtualization. Presently, all array controllers virtualize the storage resources they deliver. What classifies a storage array as delivering virtualization is the support for external, third party storage. Array based virtualization uses a private network to connect external storage, which is then virtualized by in-band virtualization that already resides within the array controller. There are several vendors offering array based virtualization. HP and HDS provide systems from Hitachi while IBM and NetApp have their own systems.

Network based storage virtualization can reside either in the data path (in-band) or outside of the data path (out-of-band). The out-of-band method is also known as asymmetric virtualization, with in-band also referred to as symmetric virtualization. Technically, out-of-band virtualization can also rely on some components residing on a host, thus in some cases asymmetric virtualization is not always entirely network based.

**In-Band - Symmetric Virtualization**

Conceptually, in-band virtualization is the easiest to understand. The virtualization sits logically and physically between the resources providing storage and the applications or users who consume the storage. As discussed previously, this can occur as a software layer within a host operating system, within the storage network or SAN, and even on a storage array controller.

These products are called “in-band” because they sit in the data path; as a result, all data must flow through the device or software. The term symmetric is used to describe these types of products since the connectivity is the same regardless of the direction or whether it is data or command and control information. That is, all data and commands flow through the same path.

An in-band virtualization device or software layer serves as both a termination point for requests and a source of requests. Thus, from a host or server’s perspective, the storage virtualization layer appears to
be a storage device. Read and write requests are accepted by the virtualization layer, which then re-issues these commands to underlying storage residing on external storage devices. From the storage devices perspective, the virtualization layer appears to be a host; issuing storage read and write requests.

The architecture of many in-band virtualization appliances is similar to that of a NAS controller. A special embedded application runs on industry standard hardware, which controls the mapping of data between the host and the storage. The front-end ports deliver block storage to hosts, with the back-end ports used to store data on other block storage devices.

The most common issue cited by critics of this approach is the delay or latency that is added to data I/O processing. The amount of delay varies depending on whether the request is a read or a write operation and whether the requested data is cached by the virtualization device. Typically, a delay is added to every I/O request processed in order to terminate and then re-issue the I/O request.

Some in-band virtualization products utilize read cache and some utilize both read and write cache in order to overcome the delays. Caching has benefits and may create problems as well. Just as with array systems, any write data that is cached must be maintained in a way so that it can be stored on non-volatile media in the event of connection, power or other problems. Another problem that can arise is in maintaining cache consistency between multiple nodes of an in-band virtualization solution. Carefully consider the architecture of devices that cache any write data and ensure that the device has a method to ensure that all data is stored safely.

In practice, in-band virtualization products are able to achieve I/O rates comparable to those of directly connected storage systems without virtualization, in particular when a large number of I/O’s are issued to the system.

**Out-of-band - Asymmetric Virtualization**

The ideas behind out-of-band virtualization are compelling, although to date the market adoption of these systems has been lower than that of in-band virtualization. There are pure asymmetric out-of-band architectures and a hybrid approach known as “split-path”.

Technically, there are two types of out-of-band SAN virtualization:

1. Fast Path / Split Path out-of-band
2. Out-of-band Asymmetric

There are no mainstream products currently shipping that utilize a pure asymmetric out-of-band architecture.
The out-of-band split-path approach to virtualization has a great deal of appeal from a technical point of view. It separates command from data, providing the ability to minimize delays and maximize scale through SAN switches.

The idea behind split path is to separate the configuration and management of storage virtualization from the actual implementation. In this architecture, management is handled by software or appliances that are not in the data path. The appliances that actually implement the virtualization mapping reside in the data path but receive the configuration information from the out-of-band management appliances.

With the split-path approach, there are two types of appliances required: configuration and virtualization. Thus, a total of four appliances are required for high availability configurations: two management appliances and two switch or data path modules.

The management devices establish the mapping table that performs the virtualization. The mapping table is then installed either into SAN switches or data path modules (with split path) or onto the hosts themselves (with out-of-band). Thus, for high availability configurations, the split-path architecture requires a minimum of four appliances: two management and two switch/data path appliances.

Often a philosophical debate occurs between the proponents of in-band and out-of-band solutions. A marketing claim made by out-of-band advocates is that in-band virtualization requires all data protection to occur at the virtualization layer. However, this claim applies equally to both in-band and out-of-band SAN virtualization with no advantage to either method.

Another claim is that in-band virtualization cannot scale as well as out-of-band virtualization. This claim is also false as scalability may be accomplished with either method. In order to scale, both architectures must provide increased I/O throughput by adding virtualization nodes and ports. Both in-band and out-of-band SAN virtualization products have the ability to scale to many nodes and many ports.

### Establishing Requirements

Companies who want to centralize the management of storage and make more effective use of the available capacity on the storage systems are good candidates for SAN virtualization. The capabilities much easier to accomplish with storage virtualization such as migration of data and tiering between storage systems will provide additional value

**Evaluator Group recommends that any company investigating SAN virtualization first document their existing storage infrastructure and outline their business objectives. Ultimately, the rationale behind implementing virtualization should be to improve operational efficiency or lower costs.**

Prior to beginning a SAN virtualization project, the following items should be understood:

1. Establish objectives for SAN virtualization
2. Create ROI goals for the project
3. Understand relative IT maturity
4. Understand the number and type of storage devices currently in use
5. Document the storage management and data protection tools utilized.

Without clear policies, procedures and tools available to centralize management, provision storage across multiple systems, and identify data for migration to alternate tiers, SAN virtualization may not deliver the ROI benefits that vendors promise. IT organizations who have not achieved this level of operational maturity should consult with qualified third party consulting firms to help assess whether SAN virtualization will benefit their environment.

**SAN Virtualization Features**

In order to determine which type of system is best suited to meet both specific business objectives and technology requirements, the technical aspects of the SAN virtualization products should be considered.

There are many features marketed by vendors, some of which are important and others which may be less useful. It is important to determine what features support the business requirements along with the relative importance of each. The features should be prioritized, some may be critical, others are nice to have, and still others may have no benefit in the environment.

The following features are viewed as relevant for many deployment scenarios and are covered in Evaluator Group’s accompanying SAN Virtualization Evaluation Guide Workbook.

- **Physical Connectivity (Interfaces used to connect hosts to)**
  - Number and type of front-end ports (host connected ports)
  - Number and type of back-end ports (storage connected ports)
- **Protocol Support (Host connected protocols supported)**
  - FCP, iSCSI or others
- **LUN Capacities**
  - Maximum size of LUN
  - Number of LUN’s
  - Both back-end addressable LUN’s, and front-end LUN’s presented to host
- **Active / Active failover (for high availability)**
  - Provides the ability for transparent failover if a path or device fails
- **Total Capacity**
  - The raw, usable, compressed and de-duplicated capacities may be listed
- **Striping and RAID Support (Important to provide sufficient protection of data)**
  - Support for striping and mirroring at a minimum (RAID 0, 1 and 1+0)
- Striped RAID support (RAID 5 or 6) may be important for some scenarios
  - Thin provisioning of volumes
  - Data migration between volumes and systems – providing thick to thin conversion
  - Speed (Critical to meeting backup windows and SLA’s)
    - The throughput rate, often stated in MB per second
    - The I/O rate, typically listed in I/O’s per second or IOPS
  - Management
    - What management features are supported
    - Does the product support existing SRM or other storage management products deployed or planned
  - Point in Time Copy
    - Does the Virtualization product support copy on-write or other point in time copy snapshot services
    - How many PIT copies are supported
  - Replication
    - Are both Synchronous and Asynchronous replication supported
    - How many active replication sets are supported simultaneously

For each of the criteria listed in the accompanying workbook, the Evaluator Group provides a default level of importance as well as a rating of how well each vendor implements a feature. For items such as speed or connectivity, higher speed is rated better as a greater number of ports. However, it is important that potential purchasers establish their criteria first. It is imperative as outlined previously to establish your criteria first along with room for future growth. Any system that meets those requirements is satisfactory and a system with more features should not be chosen unless there is another rationale.

**Evaluation Questions**

The art of creating a return on investment analysis or ROI can be complicated. IT organizations that are operated as a profit and loss center and charge for storage services will have all the cost data necessary for an ROI analysis. For other IT organizations, creating an ROI analysis will be more difficult.

There are several questions to answer including

- Will my company save money through SAN virtualization?
- Is one of my objectives to deliver a higher level of availability?
- Is my organization looking to pool storage resources and centralize administration?
- Are policies and tools in place to identify data that should be moved?
- Does my company already have multiple tiers of storage available for data migration?
- Will there be any business impacts to implementing the system?
- Is it possible to disable the virtualization system if problems arise?
- Will the system be able to support the capacity and speed needed?
- How will the virtualization systems management features integrate with existing tools?
- Will the data protection features meet my application business needs?
- Does the proposed system support my existing storage systems?
- What security processes will be affected by implementing SAN virtualization?

Look for vendors that can support the entire implementation / migration / operational process

- Will storage virtualization provide improved efficiencies in my environment?
  - By lowering the cost of storage by moving data
  - By improving availability
  - Or both
- Are clear policies established that will dictate when to move data?
- Are procedural changes required?

Summary

There are many potential benefits that can be derived by deploying SAN virtualization including higher availability, better storage utilization, centralized storage administration, and lower total storage costs. Storage virtualization is a tool that helps to enable IT organizations deliver the lower total cost storage.

The deployment of SAN virtualization can dramatically improve the ability of IT organizations to manage larger amount of capacity. It allows the pooling of storage resources across devices, resulting in less stranded capacity and delivering on the early promise of SAN’s. SAN virtualization can also help to improve availability and reduce the reliance on individual vendor’s storage systems.

Virtualization of SAN storage has been proven to deliver cost savings in many scenarios and environments. However, there are costs and risks associated with deploying SAN virtualization, which should not be overlooked. SAN virtualization is most successful when used to scale out storage environments to provide increased resource utilization with higher availability.

It is also important to remember that vendor lock-in will always occur whenever significant control and intelligence is provided by a class of products. By moving storage intelligence outside of an array to a SAN virtualization layer, vendor lock-in will also move to the SAN virtualization layer. Moreover, if the primary motivation for implementing virtualization is to remove all reliance on a vendor, SAN virtualization will likely not achieve this goal. Reliance on a vendor is not necessarily bad; although, it should be understood before implementing any solution.
By following this guide, determining your specific requirements, and then utilizing the SAN Virtualization Evaluation Guide Workbook to assist in selecting alternatives, it is possible to successfully meet all your project objectives including cost, performance, and service levels.

About Evaluator Group
Evaluator Group Inc. is dedicated to helping IT professionals and vendors create and implement strategies that make the most of the value of their storage and digital information. Evaluator Group services deliver in-depth, unbiased analysis on storage architectures, infrastructures and management for IT professionals. Since 1997 Evaluator Group has provided services for thousands of end users and vendor professionals through product and market evaluations, competitive analysis and education. www.evaluatorgroup.com Follow us on Twitter @evaluator_group

Copyright 2012 Evaluator Group, Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or stored in a database or retrieval system for any purpose without the express written consent of Evaluator Group Inc. The information contained in this document is subject to change without notice. Evaluator Group assumes no responsibility for errors or omissions. Evaluator Group makes no expressed or implied warranties in this document relating to the use or operation of the products described herein. In no event shall Evaluator Group be liable for any indirect, special, consequential or incidental damages arising out of or associated with any aspect of this publication, even if advised of the possibility of such damages. The Evaluator Series is a trademark of Evaluator Group, Inc. All other trademarks are the property of their respective companies.