The Strategic Guide to
STORAGE MANAGEMENT

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Data is continuing to grow at a rapid rate which increases storage consumption, and more storage means more capital and personnel costs needed to manage this volume. You may already be managing applications that access data on this storage in the virtual and physical infrastructures in your data center, and your customers are demanding access to their data when and where they need it. Thankfully, there are many techniques in the industry that help minimize the capital and operating expenses associated with storage.

This guide explores storage management strategies to minimize the complexity in your rapidly-growing heterogeneous storage environment so you can optimize and reduce your capital and operational expenditures.

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Management Is Key

The only way to contain the complexity and cost that exist in today's IT environments is to manage all of the key components of the data center most efficiently and centrally. Unfortunately, many strategies actually drain productivity because they focus on single systems, do not cross silo operations, and make it more difficult or even impossible to manage heterogeneous environments. Fortunately, storage management strategies that not only contain costs, but reduce them, do exist. The right strategies focus on the data—the way you store, manage, and access your data—and the first step is effectively managing the storage that lies beneath it all.

Let's explore some market trends that drive storage management strategies today:

Storage consumption is increasing faster than the unit cost for storage is decreasing

Although disk prices are declining about 30% per year, when consumption is growing at an exponential rate, your storage costs still prove to be a significant percentage in your overall IT budget. In fact, according to the latest edition of Storage Magazine's Purchasing Intentions Survey, even though organizations are tightening their belts, the average disk hardware budget reported by respondents is around 40-42% — still the biggest chunk of their budget.[1] This makes storage optimization, resource management, and the use of multiple "tiers" of cost-differentiated storage critical elements in your storage management strategy.

The personnel cost of storage management is going to continue to be an increasing component of data center budgets over time

Some of the line-items in an IT budget may stay the same while others fall over time, but personnel costs are guaranteed to rise over time. Storage management is personnel-intensive: hardware must be inventoried, repaired when it breaks, and periodically replaced with newer models. Raw disk capacity must be configured and provisioned to application servers (which are also growing in number) and the "right" data must be placed on the "right" type of storage devices. But most importantly, data must be protected against a variety of threats to loss or destruction. This is costly, and therefore it is critical that your highly trained and skilled storage management professionals do more with less by using centralized management and automation tools.

Standardizing infrastructure at the software layer saves more money and delivers capabilities that would not otherwise be possible

Most customers realize that single hardware vendor strategies inevitably lead to increased costs for both server and storage hardware and limit flexibility for technology adoption in the long run. Instead, to get competitive hardware pricing, more and more data centers have been supporting multi-vendor hardware in their environment. This further reinforces the need for software solutions that provide a consistent way to centrally track and manage these heterogeneous environments—including heterogeneous hardware or heterogeneous architectures (such as x86, virtual, or physical environments).

"Storage management software plays an important role in today's busy data centers. It merges the management of storage with the management of the storage area network (SAN) through which most storage is attached to its servers," said James Baker, research manager in IDC's Storage Software program. "…Users will be demanding integrated product suites that include storage management software with intuitive interfaces to manage all the storage now inbound for the ever-growing digital infrastructure of our Web-based world."[2]

Did you know?

- According to a recent McKinsey study, demand for data storage has grown by 53% or more every year even though the unit cost of storage has dropped. [3]
- According to IDC, the amount of storage used versus the amount that is physically present has been as low as 30–35%. [4]
- Organizations pursuing a dual-vendor strategy can lower storage acquisition costs by 25% or more, as compared with organizations maintaining a single-source storage infrastructure, according to a Gartner analysis. [5]

[1]Storage Magazine, "Economy and Capacity at Odds," by Rich Castagna. October 2008.

[2]IDC, "Worldwide Storage Management Software 2008-2012 Forecast: Balanced Growth Throughout the Segment," by James Baker; July 2008.

[3] McKinsey Quarterly, "Meeting the Demand for Data Storage," by James M. Kaplan, Rishi Roy, and Rajesh Srinivasaraghavan, mckinseyquarterly.com; June 2008.

[4]Ibid.

[5]Gartner, Inc. ,"Toolkit Decision Framework: Viability of Pursuing a Dual-Vendor Disk Strategy," by Stanley Zaffos, Adam W. Couture, and Stewart Buchanan; , April 2007.

The Changing Landscape of the Data Center

Heterogeneity is the norm

The landscape of today's data center is constantly changing, with many positive innovations. The adoption of new and different technologies, however, has led to heterogeneity at all levels. Over time—either by design, business needs, budgetary requirements, or market trends—you have implemented storage and server platforms running many operating environments such as Unix, Linux, and Windows. In addition, you may have implemented hardware from multiple vendors, which may save you money by keeping your hardware pricing competitive, but can add more complexity and interoperability challenges. All of these choices have left you with a customized environment that has been created to meet your business requirements, but is complex and potentially more expensive to manage. The introduction of new technologies such as Unix/Linux server virtualization and thin storage may have helped you to reduce costs, but they also added on another degree of complexity to be managed.

Manage complexity before it manages you

Ultimately IT organizations are responsible for making all of the "components" in a heterogeneous environment work together to deliver a service to the business. Implementing a common storage management solution that provides a seamless experience in managing the full IT environment is critical for meeting IT and business requirements while realizing the greatest ROI on your storage acquisitions.

Drive out costs with the right storage management solution

IT organizations are actively looking for ways to improve utilization, reduce overall hardware spend and streamline operations. An effective storage management strategy should enable you to improve overall manageability across your heterogeneous environment without causing additional limitations.

Best Practices

When choosing the right elements for your storage management strategy, make sure that the people making your technology decisions are making them with your business recovery point objectives (RPOs), and recovery time objectives (RTOs) in mind. The management solutions that you implement should serve as a common platform across heterogeneous storage, server, and application environments. Since the future guarantees innovation, this will ensure that your chosen solutions will not lock you into only one particular hardware platform or architecture, thus enabling your company to remain flexible, maintain freedom of choice, and ensure that what you have today will work with what you acquire in the future.

Top ten benefits from a hardware independent storage management strategy

1. Improve your current storage utilization
2. Reclaim unused storage
3. Manage heterogeneous storage resources centrally and efficiently
4. Enable efficient planning for storage growth and capacity management
5. Secure competitive pricing on storage hardware
6. Drive greater productivity from the same amount of personnel
7. Reduce, if not eliminate, storage related application downtime
8. Manage current and future storage growth
9. Enable the flexibility to meet changing business requirements
10. Deliver consistent storage operations across physical and virtual server environments

Optimize ROIs through Increased Storage Utilization

Regardless of the falling disk prices, as you know too well, storage isn't free—not even close. As your data volume continues to grow exponentially, you cannot avoid the inevitable need for more storage. You can, however, follow best practices and implement technologies that will help you to better use what you already have, predict when and how much more you need to defer capital spending, and attain better pricing when you need to purchase more. Here's how to improve utilization rates.

Reclaim unused storage through storage resource management

Do you know what applications are using what storage, where it is located and how it is being used? This is a must if you want to increase you current utilization rates and reclaim unused storage. Storage resource management tools will discover all of your storage assets and correlate them in an end-to-end view. This will give you an understanding of the storage consumption supply chain all the way from raw storage to when it is consumed by an application, and find wasted storage along the way so that you can reclaim it. The benefits don't just stop at being able to more efficiently use your storage and defer other capital expenditures, but as we will discuss later, it can also be used to increase the productivity of your storage management personnel.

Archive old or infrequently accessed data

Storage dedicated to old or infrequently accessed data not only wastes precious and expensive space, but it also costs time and money to manage, maintain, and back up. To free up some storage space, centralize on an integrated content archiving solution that pulls unstructured information from multiple sources, including your mail, database and file servers, and consolidates it into a single repository that's simple to manage and allows you to enforce storage policies across the board. Your archiving solution should also be able to block and eliminate unwanted or inappropriate information, in turn freeing up space on servers, reducing overall storage requirements, and keeping all content fully searchable and instantly accessible.

Implement deduplication to reduce redundant use of storage

As the amount of data to be backed up continues to grow rapidly, your backup approaches are a major culprit to the rapid storage growth across the enterprise, both inside and outside the data center. A new disk-based backup technology, called data deduplication, looks for redundant instances of backup data at a sub-file or block level across all backup data and locations. This allows you to significantly reduce storage and bandwidth consumed from backups, which also helps you more easily meet compliance and service-level requirements for data recovery.

Enable thin provisioning for optimization

IT is using "thin provisioning" to simplify storage management, increase utilization and reduce costs. A number of storage array vendors offer this feature to eliminate over-provisioning, allowing actual storage demand to be determined and consumed rather than storage claimed by certain applications that is not necessarily needed or used. The process is transparent to applications and servers; however, the reverse is not true -

introducing thin storage in a SAN puts new requirements on the file system and volume manager of all connected hosts in the data center. The adoption of thin storage itself can be a challenge as it makes migrating from your existing storage to thin storage and reclaiming previously unused space without requiring downtime to make the transition difficult. Therefore, if you want to improve storage utilization by making thin storage successful, make sure your storage management strategy is thin storage aware and thin storage friendly.

Best Practices

- Make sure you have comprehensive breadth and depth of support for heterogeneous hardware, operating systems, and applications as well as both SMI-S standard and vendor specific APIs/CLIs.
- Storage resource management capabilities should not impose limitations (e.g., numbers of servers or storage capacity) on the size of environment that can be discovered and managed.
- Deduplication that integrates into your existing backup infrastructure and includes web-based administration and data recovery capabilities is critical to allowing flexible administration from any location as well as drag-and-drop recovery of files.
- Employ tools that can migrate data from legacy storage to thin provisioning storage and reclaim unused volume capacity, versus traditional migration tools that copy both data and empty space, resulting in a “thin” provisioning system that uses just as much storage as the legacy system.
- Implement a cross-platform file system that is thin provisioning aware to enable heterogeneous migration into a thin provisioned environment.
- Implement an archive solution that reduces data redundancy and saves storage costs by moving old or infrequently accessed data to cost-effective storage without impacting the end-user.
- Look for a solution that allows storage to stay ‘thin’ over time by triggering few ‘grow’ events on the storage array, resulting in better storage utilization, less allocated but unused storage, and lower costs.
- Automate the process of reclaiming storage capacity as applications delete information over time so thin storage stays thin.

Align Storage Resources to Business Needs

One would think that the IT projects we embark on and the technologies we implement enable us to achieve key business initiatives. Sometimes, however, when a particular technology is implemented to solve certain pain points, it potentially decreases certain efficiencies or productivity or creates others. That's why your storage management strategy should include capabilities that will enable you to better align your storage resources to your business needs.

Implement storage tiering

Deploying multiple tiers of storage is effective at reducing overall cost, but only if you have a storage management solution that can rapidly respond to changing business needs by dynamically moving files and point-in-time copies to different tiers of storage. For example, if most of a data center's online data can justifiably be kept on non-mirrored storage and low-cost "second-tier" disk drives can be phased in to store less-critical data, overall storage cost can be significantly reduced. But in achieving these cost savings, you must ensure that critical data is placed on redundant storage devices and frequently-accessed data is placed on high-performing devices.

The same is true with point-in-time copies, where you should be able to have your full data snapshots sit on a lower tier while the application is on a higher tier. With millions of files in hundreds of file systems serving dozens of applications, and with the value of individual files constantly changing, using storage tiers effectively becomes a challenge. The process of dynamically moving data based on policies can be automated and managed as part of your storage management architecture.

Leverage archiving to optimize storage tiers

With unstructured information consuming a large percentage of corporate storage, it is important to classify this data, including information from messaging, file servers and collaborative systems, onto different tiers of cost-effective storage and eventually into an archive. Archiving is critical to any storage tiering practice because it allows you to move less-frequently used information from high-cost disk and archive that information to lower cost storage while maintaining accessibility. For example, you can dedicate primary storage to dynamic and transactional data while older or less-frequently accessed content can be moved to a secondary or tertiary storage device.

Did you know?

"Carefully aligning storage volumes to requirements can result in 30 to 40 percent of volumes being moved to lower cost storage options. Increasingly, leveraging storage virtualization—software that makes it easier to manage storage across individual frames—is a key element in making better use of available storage." [6]

[6] McKinsey Quarterly, "Meeting the Demand for Data Storage," by James M. Kaplan, Rishi Roy, and Rajesh Srinivasaraghavan, mckinseyquarterly.com, June 2008

Make accurate decisions with capacity planning

If you really want to make the best decisions for your business and your budget, you need to know how much storage you have, how much of it is being used, when you will need more and how much of it. It seems pretty straightforward, but believe it or not, many organizations have a difficult time having that data available when they need it. This is where the storage resource management component of your storage management strategy is critical. It should give you up-to-date information to help you understand the current state of your storage infrastructure from application to spindle. Once you have this accurate consumption analysis, you can then implement practical storage capacity management practices that can follow pre-defined policies to align storage operations with business objectives.

Best Practices

- Storage tiering capabilities should dynamically move unimportant or out-of-date files to less expensive storage devices without changing the way users, applications, or databases access those files—without having to take the applications offline.
- Apply quality of service policies to the entire data path, so that files will automatically move across different classes of storage based on date created, last time accessed, owner, size, or name.
- Implement policy-based archiving to lower-cost storage while maintaining transparent accessibility to the end-user.
- Ease implementation with a solution that supports a heterogeneous server and storage infrastructure that requires no application, database, or backup/recovery policy modifications.
- Gain a global view of the storage environment through a unified user interface that allows you to view aggregated storage capacity information.
- Obtain visibility of the entire data path from the application to the spindle in physical and virtual server and storage environments to ensure optimal performance and availability of business critical applications.
- Ensure that the point-in-time copies that you are using to perform critical business processes, on or off-host, are hardware independent and can be moved between different tiers of storage.

Empower Your Staff to Do More with Less

The personnel cost of storage management is proving to be an increasing component of data center budgets over time. It is no wonder that specialized skills are needed to oversee all of the storage management related components in the data center— from storage hardware devices (disk drives and disk arrays), storage network components (switches, routers, and host bus adapters), and virtual storage, whether host, network, or disk array-based, to file systems and the files they contain. In addition, the hardware, network components, and software may be from different vendors. Then there may be an additional layer of management complexity if you have a data center that is home to two or more UNIX platforms and/or Linux and/or Windows. The only way to contain these costs is to drive greater productivity from the same amount of personnel that are already intimately knowledgeable of your business initiatives and IT landscape.

Achieve consolidation through standardization

For each specialized storage management software package in use (such as volume managers, snapshots, replication, SAN multi-pathing, etc.) you need to ensure compatibility in your environment and establish vendor relationships, service contracts, service level agreements and training—all of which consume administrative time and effort. If you standardize the components used to deliver common IT services, you will have one common tool to manage you heterogeneous platform, storage, and network operating environment. Standardization at this level also removes pain points around interoperability so that you can enjoy a plug and play type of environment where you can select heterogeneous hardware, choose the best technology over time, and perform online array migrations without disrupting the business.

Drive efficiencies with centralized management and reporting

With individual disk arrays capable of presenting more than a thousand logical units (LUNs), and with data centers consolidating many smaller servers or virtual servers onto a large number of single-application servers, tracking how storage is configured and how it is being used by applications makes the job of storage administrators even more complex. There is no question that centrally managing application, server, and storage environments and gaining a comprehensive view of your environment can lead to faster application deployment times, higher service levels, and reduced risk of human error.

Best Practices

- Ensure that management and support for every major operating system stays consistent across platforms so that the skills required to manage one platform do not change when managing another.
- Implement a modular architecture that enables you to build on volume and file management capabilities to perform multi-pathing and data replication as well as create snapshots.
- Abstract or virtualize the storage hardware layer so that you can manage everything as one large pool of data and migrate data between disparate systems.
- Manage heterogeneous storage resources centrally and efficiently from a single pane of glass view with end-to-end visibility (application to spindle).
- Identify and visualize potential problems with applications and storage resources by correlating health and status information across multiple applications, servers, storage, and replication resources for rapid problem resolution that would typically span multiple organizational structures.
- Have an accurate, up-to-the-minute picture of how all storage in the data center is deployed so that you can shift storage capacity from servers where it is in excess to others where it is needed.
- Generate reports that collect information across arrays, a single data center, or multiple data centers, and provide SAN port counts for different switches and how many copies of any application you are running and replicated locally or over a wide-area.

Be Aware of Storage Management Implications on High Availability and Disaster Recovery

Your data is the core of your business, and most IT objectives are around protecting it and keeping it available. Your storage management strategy will potentially impact the availability of your data, and needs to be in line with your high availability and disaster recovery objectives. Not only do your storage management and availability strategies have to take into account each other's requirements, but if planned right, many of the solutions for different objectives are one and the same. Implementing a modular and standardized solution can help you achieve your RPO and RTOs without breaking the bank.

Increase availability through san multi-pathing

Storage teams depend on good SAN multi-pathing software, which sits on the server and ensures that the server will always have at least one connection to the storage in an iSCSI or Fibre Channel SAN environment. By eliminating a single point of failure with multiple physical paths through the network that are used to automatically failover and failback in the event of a path outage, SAN multi-pathing should be a key feature of your storage management strategy that will increase availability. Most intelligent multi-pathing solutions will also use this feature effectively to optimize application performance by load balancing throughput via these paths.

Eliminate storage management-related planned downtime

If you implement the right host-based storage management solution, you will be able to eliminate a significant portion of planned downtime associated with storage management tasks. Routine operations such as growing, shrinking, and defragmenting volumes and files should be performed online, without causing any interruption to applications and end-user productivity.

Enhance clustering with your storage management stack

Your storage management infrastructure can support and enhance availability of certain non-redundant and clustered applications such as Oracle RAC. Integrating your clustering solution with a clustered version of a volume manager and file system decreases the time it takes to failover and recover your applications in the event of an outage, because the data does not have to be re-mounted to the application after the failover process.

Extend storage management for disaster recovery

Your storage management solution can extend to disaster recovery as well, if it supports a modular architecture. A host-based storage management solution can enable you to use the same volume manager to replicate synchronously over 10k or less or extend that capability for synchronous or asynchronous replication over a wide-area network. The same volume management technology should also enable you to create full snapshots or space optimized snapshots to use as on-disk backup images for fast recovery or to perform off-host processing tasks. All of these capabilities from a single solution ensure interoperability of multiple hardware platforms as well as reduced personnel costs.

Best Practices

- Customize data paths between disparate storage devices and servers to eliminate single points of failure.
- Improve data availability and scalability in advanced, clustered server environments by using a host-based clustered volume manager and file system that can span many servers in a cluster.
- Implement a volume management solution that is storage hardware independent and can be extended to perform data replication with asynchronous and synchronous replication over any distance.
- Include tiered storage capabilities in your disaster recovery strategy by implementing storage-independent replication.
- Ensure database integration (including remote point-in-time copies) for complete and consistent recovery for databases and applications.

Symantec Solutions for Storage Management

Symantec software and services standardize and automate the management of heterogeneous storage platforms and related resources to maximize storage utilization, increase IT responsiveness, and lower infrastructure and operational costs.

Symantec's comprehensive products and services will help IT meet challenges around information lifecycle management, storage consolidation, storage resource and capacity management, and virtualization. Symantec's integrated storage management solution provides a software abstraction layer that can be standardized across your entire heterogeneous operating system and storage platforms environment, saving you from having to manage several point tools. This will enable you to achieve increased operational efficiency with end-to-end visibility and centralized management of applications, servers, and storage across multiple hosts. It also allows you to manage IT risk from a top-down data center perspective on your storage assets and operations.

The Building Blocks

Symantec storage management software is at the foundation of our solution offerings, including Storage Management, High Availability, Disaster Recovery, and Data Protection. The modular structure of the software allows you to build out capabilities to meet the full range of your needs, whether you have conservative or stringent RPO and RTO's.

Symantec's storage management solutions can also enable key IT projects that significantly impact the optimization and ROI of storage management, including storage consolidation, storage resource and capacity management, and storage virtualization.

Storage Consolidation:

Storage consolidation is a critical initiative that helps reduce storage costs through improved storage utilization and reduced power, space, and cooling costs in the data center. Symantec storage management solutions maximize storage utilization across islands of storage and even contain and automate the labor-intensive and often error-prone management processes associated with the storage consolidation process itself.

Storage Resource and Capacity Management:

Storage resource and capacity management are imperative if you want to reduce storage waste and costs, reclaim lost or orphaned storage, and optimize utilization and efficiency of your storage assets. Symantec's storage management solutions provide end-to-end visibility you need to map applications to the underlying server, switch, and storage infrastructure for all physical, logical, and virtual components. This will empower you with proactive monitoring and up-to-date information you need about your infrastructure to meet your service level agreements.

Storage Virtualization:

Virtualization provides logical abstraction of information from its physical location, so that storage management can be done independently of the underlying physical storage hardware. This significantly reduces the amount of complexity that needs to be managed because the numerous point tools to manage from different vendors can be eliminated. With Symantec's storage management solutions, the management of both physical and virtual environments can be achieved through a single and standardized set of tools.

About Symantec

Symantec is a global leader in providing security, storage and systems management solutions to help businesses and consumers secure and manage their information. Headquartered in Cupertino, Calif., Symantec has operations in more than 40 countries. More information is available at www.symantec.com.

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