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WHITE PAPER

The Next Evolution in Storage Virtualization Management

Global Storage Virtualization Simplifies Management, Lowers
Operational Costs

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Executive Summary

Businesses today are virtualizing their storage due to growing capacity demands, the difficulties of managing siloed and mixed-vendor storage systems, and the need to rein in costs. Storage virtualization reduces capital costs, improves storage usage rates, enables data migrations and reconfiguring without downtime, and much more. But as the demands placed on today's data centers continue to grow, traditional storage virtualization solutions are reaching their limits while becoming too complex and expensive to manage.

As enterprises have added, and virtualized, more storage systems, they have run into the same "virtualization management gap" that IDC identified¹ as a problem in server virtualization deployments. Without a single, centralized storage management solution for their physical and virtualized storage solutions, enterprises are now spending too much time and money managing their virtualized storage infrastructures.

We believe there's a better way forward through "global storage virtualization" that leverages virtual storage machines to create an advanced level of storage virtualization. Global storage virtualization extends virtualization across physical and virtualized storage platforms enabling the pooling, abstraction and mobilization of storage resources across the storage infrastructure. When combined with fully integrated management software, global storage virtualization enables enterprise IT to manage larger and more complex storage environments with greater efficiency, less risk and lower operational costs.

As a critical element in the industry-leading Hitachi storage portfolio, global storage virtualization can give enterprises the agility and control they need. Enterprises can build global storage virtualization solutions that are ready to meet today's storage challenges as well as the challenges in the years to come.

¹ Michelle Bailey, Rob Brothers and Katherine Broderick. "The Value of Smarter Datacenter Services," IDC, May 2011.

Introduction

In recent years, many enterprises have virtualized their networked storage to meet growing capacity demands, answer difficulties of managing siloed and mixed-vendor storage systems, and rein in costs. Although storage virtualization has delivered on many of its promised benefits, it also has its limitations and has presented its own set of management challenges.

As enterprises have added, and virtualized, more and more storage systems, they have run into the same “virtualization management gap” that IDC identified² as a problem in server virtualization deployments. Without a single, centralized storage management solution for their physical and virtualized storage solutions, enterprises are now spending too much time and money managing their virtualized storage infrastructures.

In this paper, we highlight the challenges that today’s storage virtualization solutions present. Then, we present a better way forward through “global storage virtualization”: Leverage virtual storage machines to create an advanced level of storage virtualization. This approach provides a new virtual storage abstraction of disk, cache, front end ports, and so forth, across a common storage resource pool within a physical storage system or across physical storage systems. It is seen and managed by attached hosts and servers as a single device. This helps enterprises achieve the full promise of storage virtualization, even as budgets remain flat and demands for storage capacity continues to soar.

Storage Virtualization Solves Problems, But Has Its Limits

Siloed storage environments proliferated in the past decade, as enterprises responded to growing demands for capacity in what seemed like a cost-effective and incremental manner. Need a little more storage capacity? Add another storage system. And then another. This approach enabled enterprises to meet their immediate storage demands, but it failed to provide a unified, efficient foundation on which companies could meet their future storage needs.

A limitation of siloed environments is that the disparate storage resources cannot be efficiently pooled, shared and managed. That’s because each silo is typically composed of differing storage systems from various vendors involving incompatible storage technologies and more importantly requires their own management solution. This difficulty leads to multiple storage management solutions (each requiring separate training and dedicated IT time) and increased costs to fully manage the complete storage infrastructure across both structured and unstructured data. And it means that each storage system is usually operating well below optimal capacity utilization.

As enterprises have continued to add a wider variety of devices, data sources and applications to run their businesses, these issues of rising complexity and inefficiency have resulted in unsustainable costs. As a result, many enterprises have moved to new storage technologies, such as storage virtualization.

Benefits of Storage Virtualization

In effect, storage virtualization hides the complexity of networked storage by pooling multiple storage devices so they appear to be a single storage device that can improve utilization and be centrally managed. This enables data to be accessed more easily.

By creating a more flexible and available storage environment, storage virtualization makes it easier for IT to respond to the rapid-fire changes taking place in today’s storage networks. Storage virtualization provides abstraction of the host server and application from the actual storage physical location. Therefore, actual data can be moved to another physical location without affecting the I/O operation of the application since it only knows the logical disk location.

² Michelle Bailey, Rob Brothers and Katherine Broderick. “The Value of Smarter Datacenter Services,” IDC, May 2011.

In addition to consolidating storage resources, other top use cases for storage virtualization include:

- Efficiently scale the storage environment while leveraging existing storage assets.
- Streamline technology refreshes and improve storage utilization.
- Simplify management needs, particularly across multivendor storage resources.
- Reduce complexities of data migrations and risks to bolster business continuity.

Some of the key benefits of storage virtualization include:

- Lower capital costs.
- Improved storage utilization rates.
- Lower power and cooling costs.
- Cost-effective repurposing of existing multivendor storage resources.
- Enhanced storage scalability.
- Common management practices applied across storage assets.

Because storage virtualization makes it easier to manage mixed, heterogeneous storage environments, it was intended to reduce operational costs. Instead of having to manage each vendor's storage system with separate management applications, IT can aggregate capacity from multiple storage systems. IT can pool them together as a single, shared pool or resource that can be centrally managed. That's supposed to lead to lower administrative overhead and reduced training requirements, at least in theory.

Challenges of Storage Virtualization

In reality, storage management and administrative costs continue to rise, despite the steady migration to storage virtualization solutions. One reason for this continued rise in costs is that the storage demands placed on enterprises are greater than in any other time in recent memory. Cloud computing, big data, mobile computing and other mega-trends are dramatically increasing demands for storage capacity. As data flows from mobile devices, Web applications, machine-generated data and dozens of other sources, enterprises have more data and data sources, to store, move and manage than ever before.

Still, storage virtualization was supposed to address these challenges: And it has, to some extent. But as enterprises further expand their storage infrastructure to support their expanding range of applications and their accompanying data, the complexity of the infrastructure continues to grow exponentially. And ongoing operating costs grow as well. Even with the advantages of storage virtualization, managing, monitoring and optimizing these immense environments is difficult, time-consuming and increasingly expensive.

A key limitation of current storage virtualization management solutions is that they are unable to effectively manage centrally all storage resources from multiple vendors across distributed environments. Without such a centralized management solution, enterprises lack the visibility they need across both physical and virtual storage assets. That visibility is vital to ensure that each application is adequately provisioned and service levels are met for every application.

Without an end-to-end management solution that works across virtualized storage platforms, storage virtualization can end up adding complexity and inhibiting performance. Ultimately it can increase costs, precisely the opposite of what it was intended to accomplish.

Advantages of Global Storage Virtualization

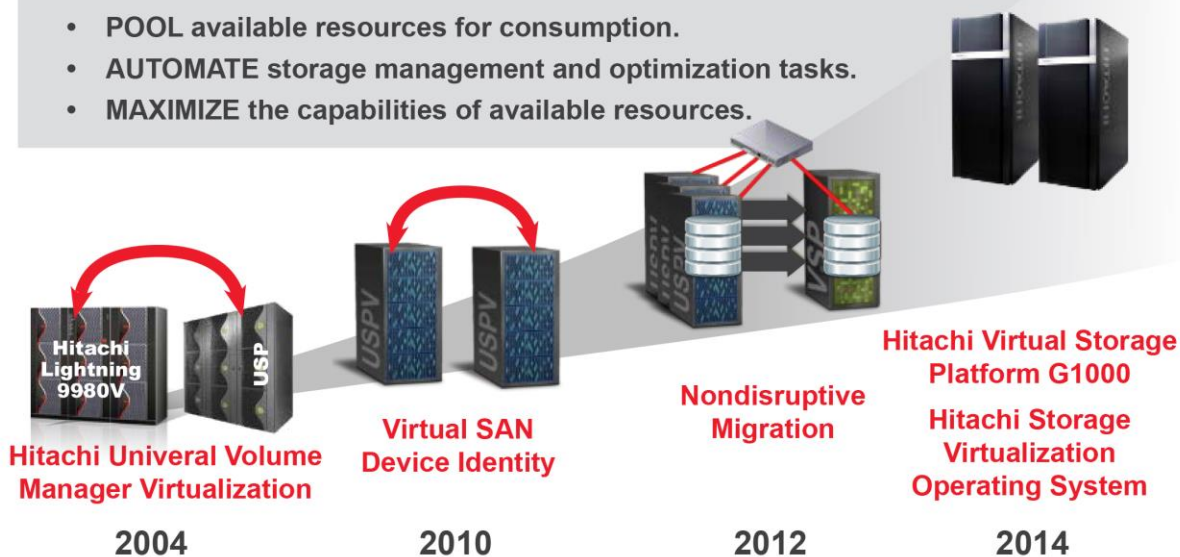
Global storage virtualization is an advanced storage virtualization technology that uses virtual storage machines to provide new levels of abstraction across physical storage systems. This infrastructure can eliminate isolated, vendor-agnostic data silos with spanned virtualized volumes. These volumes provide a complete separation between host and storage, independent of system, connectivity, location or vendor. Attached hosts and servers see and manage this abstraction as a single device, enabling storage extensibility of virtualized storage volumes across storage systems. Global storage virtualization can efficiently be deployed with workload mobility that extends virtualized storage platform limits and could be managed centrally for operational simplicity.

With global storage virtualization, enterprises can manage virtualized storage resources from different vendors and across storage platforms and distributed data centers. Such centralized, end-to-end management is a critical part of minimizing the out-of-control complexity that now plagues most enterprise storage environments. It is vital in the effort to control escalating operating costs. See Figure 1.

STORAGE VIRTUALIZATION INNOVATION

Global Storage Virtualization

- ABSTRACT information from devices.
- POOL available resources for consumption.
- AUTOMATE storage management and optimization tasks.
- MAXIMIZE the capabilities of available resources.



USP = Hitachi Universal Storage Platform

Figure 1. Hitachi has been a leading innovator in storage virtualization technologies for the past decade. Global storage virtualization is the next step, providing enterprise-ready, multisystem storage solutions that deliver new levels of availability, extensibility and cost savings.

The capabilities of global storage virtualization management include:

- **Centralized management.** Manage all virtualized storage resources, physical and logical storage assets, and virtual storage machines, across multiple storage systems from a centralized management console.
- **Unified management.** Consolidate storage provisioning for unified management across both structured and unstructured data. Optimize the efficient use of shared storage pools without labor-intensive, storage provisioning and capacity planning to enable faster application deployments.
- **Nondisruptive data migration.** Move application workloads across virtualized storage tiers and resources with zero application downtime.
- **Automated data mobility.** Place data efficiently for higher performance and lower cost. Data is automatically placed in the right storage tier at the right time, without affecting application availability and performance degradation.
- **Maximized performance:** Optimize storage system and virtual storage machine performance while improving application service levels with a comprehensive analytics solution.
- **Shared resource optimization:** Resolve shared storage resource contention with comprehensive health monitoring and troubleshooting.

As with all storage virtualization deployments, the success of global storage virtualization, and its ability to keep operational costs under control, depends on a comprehensive management solution. From configuration and mobility to replication management, the management solution has to handle all key administrative functions. And it must do so cost-effectively, no matter how large and complex the enterprise virtualized storage environment becomes.

Benefits of Global Storage Virtualization Management

Business Benefits

- Lower capital and operational costs.
- Greater storage visibility with centralized management.
- Increased storage utilization.
- Higher availability and data mobility with fewer application service interruptions.
- Improved alignment of storage infrastructure with business requirements.

Technical Benefits

- Integrated management operations with simpler storage provisioning.
- Precise storage service level management for business applications.
- Nondisruptive data migration.
- Automated tiered storage performance optimization.
- Virtual storage machines with multitenancy capabilities.

Hitachi Command Suite: Integrated Management Solution For Global Storage Virtualization

Hitachi Data Systems has transformed its storage management products to meet the needs of today's enterprises. Those needs include building secure, scalable private clouds that leverage a software-defined, virtualized storage environment. These private clouds provide maximum agility, 24/7 availability and streamlined management that reduces business risks and costs.

The foundation of the Hitachi vision for the private cloud involves global storage virtualization. This advanced storage virtualization with its additional layer of abstraction adds new management challenges in terms of configuration, visibility, mobility and complexity. The dynamic changes in the environment with new virtual storage machines need to be properly administered and monitored. IT must ensure application service levels are being met while efficiently planning for future growth.

Hitachi Command Suite (HCS) is the centralized management solution at the heart of global storage virtualization to address these management challenges. HCS is a data management framework that improves storage operations, provisioning, optimization, mobility and resilience for Hitachi global storage virtualization environments. It creates a reliable and easy-to-manage global storage virtualization solution that is enterprise ready today.

Hitachi Command Suite is fully integrated with Hitachi Virtual Storage Platform G1000 (VSP G1000) and its Hitachi Storage Virtualization Operating System (SVOS). This next-generation of enterprise storage from Hitachi redefines mission-critical storage virtualization. VSP G1000 delivers enterprise-ready, software-defined storage, advanced storage virtualization, and efficient, scalable, high-performance hardware. Powered with Hitachi global storage virtualization, VSP G1000 provides the always-available, agile and automated foundation needed for a trusted continuous cloud infrastructure.

Hitachi Storage Virtualization Operating System is the software foundation for Hitachi global storage virtualization. SVOS provides software-defined storage management and global storage virtualization by elevating unified management across new virtual storage machines. Virtual storage machines can enable a global-active device providing a virtual abstraction of physical storage system resources across multiple storage systems that can be located up to 100km apart. SVOS supports user-defined workflows for nondisruptive data migration³ between storage tiers and between virtualized physical systems and across datacenters for true workload mobility. This mobility reduces the cost of management, improves performance, and enables seamless fault-tolerant availability of the virtual storage machine.

Hitachi Command Suite provides management efficiencies to make it easy for IT organizations to fully leverage Hitachi global storage virtualization. It enables the proper management practices to configure, provision, monitor and optimize virtual storage machines. As it provides a centralized, easy-to-use graphical user interface, command line interface and best-practice wizards to automate storage management operations, Command Suite enhances usability and streamlines the overall management process.

One of the key benefits of Hitachi Command Suite is automated tiered storage management leveraging Hitachi Dynamic Tiering. This benefit enables self-managed and self-optimizing storage pools for alignment of business application data by I/O activity. Based on usage patterns, active data is automatically moved nondisruptively to the highest performing storage tier while less active data is moved to lower cost storage tiers.

This feature simplifies the process of defining storage tiers and automatically moves application data to the optimal storage tier to maximize performance. Automating data placement in this way can increase storage utilization by up to 50%, resulting in significant cost savings.

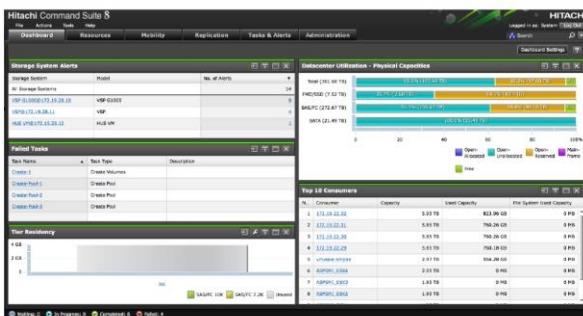
³ User-defined, nondisruptive data migration is a separately licensed feature available after initial release. Ask you HDS representative or HDS reseller partner for more details regarding restrictions and availability.

Additional products in the Command Suite include Hitachi Command Director and Hitachi Tuning Manager, which provides virtual storage machine performance management. It helps to ensure that service level agreements (SLAs) for mission-critical business applications are met. When application availability or performance problems do arise, Hitachi Tuning Manager provides end-to-end performance monitoring for virtual storage machines. It helps to fully assess application performance issues and properly identify and isolate storage related bottlenecks. See Figure 2.

Key Capabilities of Hitachi Command Suite

- Centrally manage all Hitachi storage systems and global storage virtualization environments.
- Consolidate heterogeneous storage resource management in a virtualized storage infrastructure.
- Match storage attributes to business application requirements for improved application service levels.
- Accelerate storage provisioning and reduce overprovisioning for both structured and unstructured data.
- Efficiently control storage infrastructure capital and operating costs.
- Quickly identify and troubleshoot storage performance and availability problems.
- Accurately monitor performance and capacity usage to improve storage utilization.
- Monitor central dashboards for storage system health and ensure that applications are meeting their storage service-level requirements.
- Aid future capacity planning based on in-depth reports and historical trends.
- Effectively analyze all storage-related resources by monitoring storage subsystems, SAN fabrics, servers, virtual machines and applications.

HITACHI COMMAND SUITE GLOBAL STORAGE VIRTUALIZATION MANAGEMENT



*Enterprise Storage.
Automated.*

MANAGE

with a fully integrated suite for all virtualization management operations.

ANALYZE

with comprehensive health monitoring to ensure storage environment is running at peak efficiency.

MOBILIZE

with policies to reduce costs and ensure storage ROI.

OPTIMIZE

for application based service levels to maximize business application performance.

Figure 2. Hitachi Command Suite delivers the simplified management and automation needed to quickly deploy and maintain a continuous cloud infrastructure.

Summary: Hitachi Maximizes Value With Global Storage Virtualization Management

Storage virtualization has helped enterprises overcome many of the limitations of siloed storage environments. Storage virtualization reduces capital costs, improves storage utilization rates, and much more. But as the storage demands placed on today's data centers continue to grow unabated, traditional storage virtualization solutions are reaching their limits. At the same time they are becoming increasingly complex and expensive to manage, leading to the need for global storage virtualization.



Global storage virtualization extends virtualization across physical storage platforms, enabling new levels of pooling, abstraction and mobilization of storage resources across the storage infrastructure. When combined with fully integrated management software, global storage virtualization enables enterprise IT to manage complex storage environments with greater efficiency, less risk and lower operational costs.

Hitachi Command Suite is an integrated storage management framework that can help you to properly manage and operate Hitachi and virtualized heterogeneous storage systems. When paired with Hitachi Virtual Storage Platform G1000 and the new Hitachi Storage Virtualization Operating System, HCS performs at enterprise scale and reliability. It provides a global storage virtualization solution that delivers maximum return on your storage investment.

As the centralized management framework for the industry-leading Hitachi storage portfolio, HCS gives enterprises the agility and control. With HCS, they can build global storage virtualization solutions that are ready to meet today's storage challenges as well as challenges in the years to come.



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