



# Hitachi Virtual Storage Platform: The Economic Evolution of Enterprise Storage

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## Executive Summary

Global economic circumstances are affecting how organizations are looking at the IT environment. A tougher business climate, aggravated by volatility, increased competition and smaller or thriftier customer budgets means more than just making do with less. In a time when everything seems like a top IT priority, enterprises need significantly better cost-efficiencies in the data center, as well as alignment with changing business, environmental and regulatory requirements. At the same time, organizations must still meet application demands for performance, scalability, security and availability.

With the Hitachi Virtual Storage Platform comes a big, evolutionary stride in economically superior storage designed to swiftly address mounting data challenges and changing business demands. The Virtual Storage Platform is a single platform for managing all data across even the largest or most complex of IT infrastructures. With three dimensional (3D) scaling and Hitachi Dynamic Tiering software, the Virtual Storage Platform lets IT leaders dynamically scale up, scale out and scale deep. They can dynamically move data throughout virtual tiered storage for block, file and content data. For efficiency, the platform exploits the best available performance and capacity with the lowest power and cooling requirements. Combined with Hitachi Command Suite to deliver three dimensions of management, the Virtual Storage Platform unifies and simplifies administrative tasks for greater cost-efficiencies.

This paper examines the exceptional Storage Economics principles built into the Virtual Storage Platform. It delineates how it helps enterprises reduce capital and operating expenditures, garner a greater return on existing storage assets and ultimately lower the total cost of ownership (TCO).

## Introduction

The need for radical improvements over status quo storage solutions has never been greater. With most data centers in a continual state of flux, IT leaders are tackling extensive data growth issues and ever-decreasing budgets to address business goals and lower TCO. With flat budgets and rising storage demands, it has become essential for administrators to identify, measure and reduce the unit cost of IT resources (storage as one example). Organizations are taking a deeper look at:

- How best to optimize current storage assets
- How to extend automation, simplicity and visibility across the IT infrastructure for improved data access and delivery
- How to reduce operating expenditures (OPEX)

In tandem, IT administrators are tasked with mitigating business risks. They are challenged to safeguard information and privacy, and support 24/7 operations even while performing updates and tech refreshes and ensuring cost-efficient downtime. With adoption of more emerging technologies and practices, such as cloud computing, organizations clamor for extensive business agility and predictability to rapidly respond to business needs, improve forecasting and stay competitive.

For the enterprise IT organization, immediate results cannot come fast enough. Hitachi Data Systems has a long history and solid record of solving the enterprise data center's most difficult challenges with innovative, cost-efficient storage platforms. With highly effective technologies, such as controller-based storage virtualization, dynamic (thin) provisioning and unified single-pane-of-glass management, Hitachi Data Systems helps organizations address larger-than-life business issues with indispensable TCO-reducing storage architectures. Better savings, higher performance and fewer complexities are the very building blocks used to create every Hitachi product.

Across the industry, every so often a storage product is able to raise the bar for innovation, tout cost-effective performance or promise to lower TCO. The Hitachi Virtual Storage Platform accomplishes all three. The Virtual Storage Platform is the only 3D scaling storage platform designed for all data types. It flexibly adapts for performance, capacity and multivendor storage assets. Unique dynamic tiering and 3D management software enable dynamic and cost-effective mobility of block, file and content data across storage tiers. With a highly efficient, sustainable design, Virtual Storage Platform delivers best performance and capacity levels combined with lowest power and lower cooling requirements. The Virtual Storage Platform makes good on its pledge to transform the data center, facilitating enterprise storage infrastructures that are more agile and cost-efficient.

## Hitachi Data Systems Storage Economics

To appreciate the intrinsic value the Virtual Storage Platform brings to the bottom line, a heightened understanding of Storage Economics is necessary. At Hitachi Data Systems, Storage Economics helps IT leaders recognize the total cost of ownership (TCO) of storage. It provides a framework for realizing the impact of hard and soft costs on the long-term value of the storage purchase. Storage Economics is important for the enterprise, because it can quickly zero in on the cost efficiencies and best ways to optimize data operations. Using financial metrics and measurable techniques, Storage Economics can illustrate the accurate expenditures of storage decisions and help IT leaders systematically reduce these costs over time.

For example, the total cost of acquiring hardware equipment or infrastructure typically comprises only 17 to 22 percent of the total cost of owning that asset. The remaining bulk of costs associated with that purchase might include items such as the sum of floor space expenses, power and cooling usage, costs to migrate, backup and recover data, and a variety of other direct or indirect expenditures. In fact, Storage Economics has characterized 33 different types of costs that are used to aid organizations with calculating the TCO. These cost categories are helpful in assessing the impact of a proposed storage purchase. If all elements in the Storage Economics equation are not taken into account, the real cost of a purchasing decision can be decidedly different than intended.

In a fickle worldwide economy that brings new financial pressures to the IT home front, justifying large storage expenditures has become increasingly difficult. Storage Economics helps ease these burdens by delivering the following cost-efficiency benefits:

- Prioritizes cost dimensions most relevant to the business and the budget
- Employs business case and payback methodologies to help with justification of investments
- Recognizes key elements (people, processes, technologies) that can be directly applied to orchestrate economically superior architectures
- Improves return on assets (ROA) with greater utilization and lower IT spending for existing systems
- Emphasizes better productivity and environmental efficiencies to reduce the need for physical resources and help lower OPEX
- Helps reduce both capital expenditure (CAPEX) and OPEX to lower TCO for storage assets
- Facilitates nondisruptive data mobility initiatives to reduce impacts on business operations
- Enables strategic planning and phased implementations of cost-reducing technology
- Improves business agility to better manage growth and support change

### Understanding Key Terms

Hitachi Data Systems provides the following Storage Economics definitions:

- **Total Cost of Ownership (TCO)** — A method for calculating all costs that will be incurred over the asset's useful life. TCO analysis is used when expansion is anticipated and the financial benefits of two or more proposed solutions must be assessed. The analysis places the total lifetime operating and purchasing costs of the assets side by side for comparison.
- **Return on Investment (ROI)** — A method for calculating the benefits of a particular investment. ROI is effective when challenging the status quo with a proposition to replace an existing solution by analyzing financial pros and cons of a purchasing decision. The ROI analysis would illustrate how much is to be invested, how quickly the investment is to be recouped and what net savings are to be expected.
- **Return on Assets (ROA)** — A method for calculating how profitable an organization is relative to its total assets or how an individual asset impacts profitability. ROA can be a key metric to justify investments that improve aggregate utilization of IT assets in general, and storage specifically, even beyond the depreciation life of those assets.
- **Capital Expenditure (CAPEX)** — The cost of purchasing or extending the useful life of a fixed or physical asset such as equipment or property.

- **Operating Expenditure (OPEX)** — The ongoing expenses for managing, supporting, maintaining and upgrading a system over its lifespan, such as electricity to power it and administrative labor-related day-to-day costs incurred by the system to support the business.

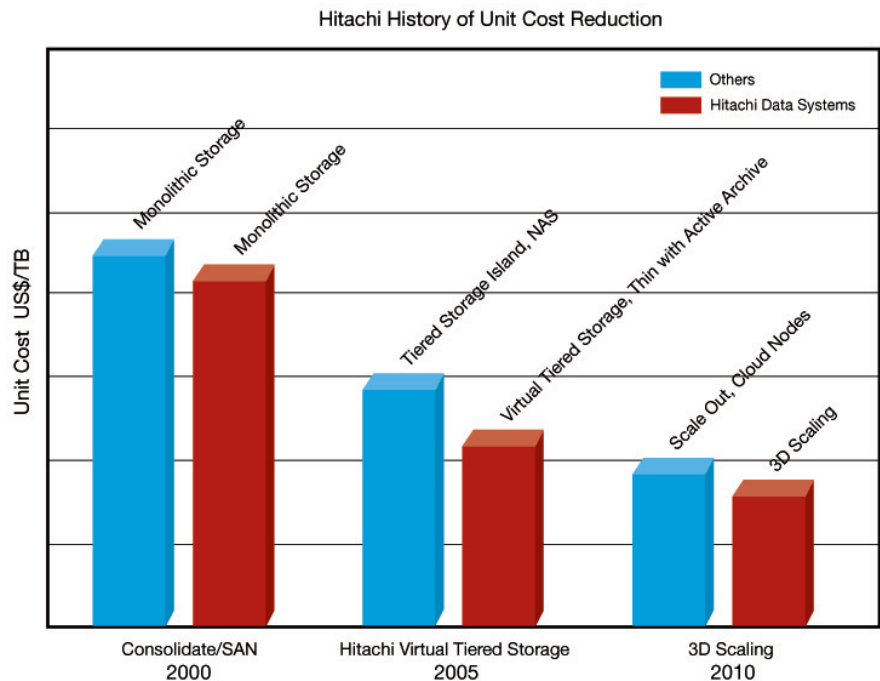
## The Evolution of Economically Superior Storage

Hitachi Data Systems is focused on providing a sound strategy and guidance for its enterprise customers, and end-to-end solutions that foster value, ease of deployment and triumph over the typically stressed enterprise data center. What makes Hitachi Data Systems uniquely qualified to deliver on its promises to solve data growth challenges? Simply put, the answers lie in Hitachi architectures, frameworks and proven results.

### Architectural Details

The Hitachi storage architectures are widely known for their economic superiority and quality. For more than a decade, Hitachi has been steadily evolving innovative storage platforms that map to the most pressing enterprise needs (see Figure 1). The economic benefits of these storage architectures include lower TCO, better utilization and productivity, and less impact on business operations and the environment.

**Figure 1. Hitachi Data Systems is continually enhancing storage architectures to reduce unit costs while improving bandwidth, connectivity and scalability.**



Building economically superior storage architecture starts with technologies that maximize value from current storage investments to better handle data growth, possibly slowing the need to purchase additional assets. These technologies include storage virtualization, dynamic "thin" provisioning, dynamically tiered storage, data de-duplication, storage consolidation and integrated archiving. An important tenet of the economically superior Hitachi storage architecture is ensuring a foundation for high performance and scalability.

### Proof Points

Hitachi remains a renowned thought leader in storage industry progress and is diligent in aligning its architectures to future roadmaps and technological standards. This is evidenced through a comprehensive framework that enables Hitachi to systematically educate IT leaders on how best to assess TCO, to create a roadmap for capitalizing on existing assets, and to build agility into their storage infrastructures. The results for the enterprise organization are investment protection, reduced costs and operational excellence.

With more than 12,000 virtualization-enabled controllers in the marketplace, Hitachi Data Systems has a healthy margin over other leading vendors of storage virtualization. And for Hitachi, success comes in the form of helping more than 800 customers worldwide to benchmark true costs and deliver sustainable and economically effective results. By leveraging Hitachi storage virtualization technology and dynamic provisioning tools, IT leaders can enable pervasive data mobility, business continuity, scalability and performance across internal and external storage assets.

To date, one of the most validated storage solutions in the market is the Hitachi Universal Storage Platform® V. Earning industry accolades and fostering customer success stories, the Universal Storage Platform V extends its longevity as a reliable and superbly performing storage virtualization platform. A recent independent, third-party survey of customers who purchased products or solutions from Hitachi Data Systems<sup>1</sup> revealed that 86 percent of Hitachi Universal Storage Platform V or VM customers have increased performance between 10 and 25 percent compared to other enterprise storage systems in their prior environment. Of customers surveyed, 78 percent have seen a payback on their virtualization technology investments as early as 6 months; and 28 percent of IT organizations reduced their storage provisioning time by 50 percent or more. These milestones underscore the fact that as organizations seek real answers to their data challenges, Hitachi Data Systems continues to deliver pioneering storage solutions that assist customers in:

- **Reducing TCO** — enables significant CAPEX and OPEX savings with economically superior technology
- **Improving ROA** — enables higher utilization rates of storage assets in reduced IT spending
- **Improving productivity** — provides a single access point for the storage environment, resulting in higher productivity and operational savings

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<sup>1</sup> TechValidate survey, 2009, <http://www.hds.com/corporate/press-analyst-center/press-releases/gl100225.html>. TechValidate, an independent research organization, conducted the study of Hitachi Data Systems customers to collect financial and operational data about several Hitachi storage solutions. Hitachi Data Systems technologies and solutions surveyed include Hitachi Universal Storage Platform V and VM, Hitachi High-performance NAS (renamed Hitachi NAS Platform, powered by BlueArc®), Hitachi Data Protection Suite, Hitachi Storage Command Suite (renamed Hitachi Command Suite), Hitachi Adaptable Modular Storage family and Hitachi Content Archive Platform (renamed Hitachi Content Platform).

- **Supporting 24/7 operations** — provides seamless, scalable infrastructure growth without business impact
- **Initiating eco-friendly solutions** — optimizes and reduces required physical resources

### Besting the Competition

The Universal Storage Platform V continues to own a majority lead in the enterprise virtualization market. So how can Hitachi Data Systems improve on this lead? An old adage states that to compete with oneself is to guarantee improvement. And the Universal Storage Platform V is the very competition that the Virtual Storage Platform has bested. With the Virtual Storage Platform comes a foundation for economically superior storage architectures.

## Hitachi Virtual Storage Platform: Lower TCO, Better ROA

The Virtual Storage Platform aims to extend the evolution of economically superior storage architectures available for the enterprise organization. As a platform for cost-efficient growth, Virtual Storage Platform forges the IT organization's ability to:

- Scale performance and capacity based on business need
- Reduce administrative costs with simplified management
- Move and tier data based on information value
- Migrate in and out of new and existing platforms with ease
- Do it all faster, cheaper and easier than with other products

Almost every facet of the Virtual Storage Platform deliberately refines the "must have" mainstays of storage technology. The system provides three dimensions of extensive scalability, virtual tiered storage, a cohesive management interface, end-to-end virtualization capabilities, seamless migration and easier provisioning. The result is a single storage platform that can effectively manage all types of data across the IT infrastructure to unequivocally reduce TCO and improve ROA.

### One Platform for All Data

Imagine being able to manage all types of storage media and data regardless of classification or file type, from solid state disks, serial-attached SCSI and SATA drives to block, file and content. Then imagine having a nimble storage platform that enables efficient nondisruptive movement of all that data, across internal and externally attached multivendor assets, through one manageable and virtualized pool of storage, no matter the usage, no matter the vendor. Now picture improving storage management, scalability and performance capabilities while reducing costs. Hitachi Data Systems already has: the Virtual Storage Platform makes possible the mantra "one platform for all data."

Because data is what runs the business, being able to control that data cost-effectively is a vital contribution to the well-being and bottom line of the business. Having one platform for all data helps IT leaders satisfy the data center's ravenous appetite for generating, sharing, retaining and accessing important information. All forms of data and their corresponding workload demands can then be unified and controlled, enabling:



- Improved ROA
- Efficient deployment of storage capacity
- Automated movement of data to correspond with business value
- Nondisruptive technology refreshes and upgrades
- Lower space, power and cooling costs
- More extensive use of virtualization, provisioning and migration capabilities
- Administrative productivity for lower OPEX

As a result of these cost advantages, the IT organization can more quickly realize lower TCO.

## Up, Out and Deep with 3D Scaling

The enterprise can reduce CAPEX, OPEX and ultimately TCO in the data center, as well as the equipment footprint, by enabling optimal infrastructure growth in all dimensions. With 3D scaling, the Hitachi Virtual Storage Platform allows IT architects to:

- **Scale up** — to improve performance, throughput and connectivity for open and mainframe environments
- **Scale out** — to accommodate and adapt to evolving data capacity and processing needs
- **Scale deep** — with flexible storage tiering and virtualization to 255PB of externally attached multivendor assets

3D scaling creates and dynamically shares one global cache across all storage and all data types: block, file and content. Its global architecture transparently distributes uneven and unplanned workload demands of mixed I/O across system resources. It eliminates poor response time and predictability issues.

**Scaling up** is all about improving performance, throughput, capacity and connectivity. Typically, loosely coupled storage systems limit the number of ports, cache and disks. In contrast, Virtual Storage Platform tightly couples storage resources to form a single global cache. This means that processors, connectivity and capacity can be dynamically added, and that all resources are unified and managed as one system. Whether the IT department needs to grow server farms or consolidate them, Virtual Storage Platform reduces storage bottlenecks without fragmenting systems or sacrificing performance. As a result, additional server purchases can be deferred and existing resources previously plagued by bottlenecks can now be reclaimed as productive resources. Additionally, administrators can opt to deploy more virtual machines per physical server. This provides for greater, more efficient scale and improved ROA.

**Scaling out** addresses the need for greater capacity and can increase asset utilization. Rather than making new purchases, Virtual Storage Platform allows for "building out" as well as repurposing existing assets. Because virtualized storage systems can be dynamically allocated, these nodes no longer need to be managed individually. The results are fewer ports to manage, unified cache and up to 20 percent less OPEX due to reduced power and cooling requirements. The Virtual Storage Platform carries more than twice the capacity in nearly half the footprint of comparable systems.

**Scaling deep** takes efficiency even further. Using unique virtualization scaling capabilities, Virtual Storage Platform extends the life and value of externally attached multivendor storage. This deep penetration to existing assets allows enterprise organizations to improve data center agility, increase

ROA by repurposing rather than retiring incumbent systems, and reduce OPEX through one common virtual search engine and unified management.

## Page-based Dynamic Tiering

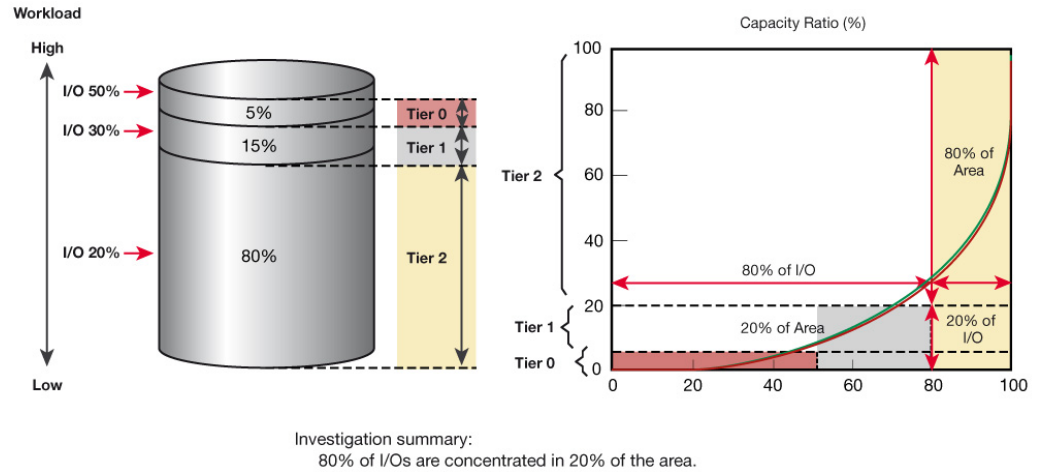
Another vital component of the Virtual Storage Platform is Hitachi Dynamic Tiering software. This technology evolves thin provisioning and tiered storage to a better level of automation and performance. Dynamic tiering capabilities allow the storage infrastructure to be much more fluid, creating what is known as "altitude," to automate and eliminate the complexities with efficient use of tiered storage.

Dynamic Tiering combines tiered storage and Hitachi Dynamic Provisioning software for controller-based automation and single, self-managed pooling that automatically matches the business value of data to the cost of storing it. Unrelated storage resources are managed as a whole without host-level involvement or front end scripting or complex supervision over multiple storage tiers and service level agreements (SLA). This summit of agile, intelligent self-tiering simplifies operations, lowers overall storage costs, improves performance and boosts administrative productivity.

Creating altitude with Dynamic Tiering means that information does not have to flow from top to bottom. Instead, it can determine the right place to start and moves to the appropriate tier as needed. Using unique page-based dynamic tiering that automates both internal and external storage, Dynamic Tiering moves data from the sub-LUN level, or page level, within Dynamic Provisioning virtual volumes to the most appropriate media, based on workload and usage prescriptions. By placing active data on the right tier of storage, IT administrators eliminate unnecessary data movement and other complexities.

Dynamic Tiering exemplifies the economic efficiency of the 80/20 rule of storage. The industry recognizes that 20 percent of data volume is high activity data and tends to command 80 percent of the physical I/O (see Figure 2). Dynamic Tiering allows the movement of more active data up to a higher performance tier using solid state disk flash drives, and less active data down to a lower cost SATA tier, for example. In turn, IT departments can use expensive disk space for top tier data while saving costs on less frequently accessed data.

Figure 2. Top tiers tend to have high activity data, commanding the majority of I/O traffic.



Other benefits of Dynamic Tiering are simplicity of provisioning and lifecycle classification; flexibility to add or remove capacity to any tier at any time; granularity beyond the tiers to view block or page levels; and self-adjusting, self-healing automation to ensure that SLAs can be met.

## Accelerating Efficiency

Attaining greater efficiencies in the data center tops the list for ways to cut IT costs and meet business goals. Achieving a higher level of cost-efficiency must be balanced with performance and capacity needs. The Virtual Storage Platform supplies superior business value and breakthrough efficiencies to lower TCO and improve the return on incumbent storage assets while providing a foundation for exceptional performance and more scalable infrastructures, with:

- **Higher throughput** — faster processors, high speed memory, large cache, fast connections mean lower costs per IOPS
- **Greater density** — 40 percent higher terabytes per square foot/meter, better utilization of virtualized tiered assets, and a 4x increase in addressable capacity per storage system
- **Efficient design** — lower kVA per square foot, blades architecture, less power per terabyte
- **Simplified management** — easier to use, configure, optimize with improved GUI, CLI and automation policies, as well as 50 percent fewer steps to perform common tasks

These characteristics translate to greater data center efficiencies, such as:

- **More storage efficiency** — per square foot or square meter with high density architecture
- **Lower power consumption** — per floor space and per capacity utilized

- **More workload efficiency** — with 3D scaling, automated self tiering, higher IOPS per square foot and end-to-end virtualization
- **Balancing service levels with cost** — ensuring that data is in the right place on the right type of storage

### Side-by-side Efficiency Gains: Virtual Storage Platform versus Universal Storage Platform V

One way to quickly illustrate the efficiency gains of the Virtual Storage Platform is through comparison to its popular industry-leading predecessor, the Universal Storage Platform V (see Table 1).

Performance	<ul style="list-style-type: none"> <li>• 105% more IOPS per square foot</li> <li>• 79% higher bandwidth</li> <li>• More than twice the performance</li> <li>• 127% more IOPS per watt</li> </ul>
Power	<ul style="list-style-type: none"> <li>• 44% lower kVA per terabyte</li> <li>• 40% less power per terabyte</li> <li>• 77% more terabytes per watt</li> </ul>
Space	<ul style="list-style-type: none"> <li>• 40% more terabytes per square foot – nearly half the space</li> <li>• 2.5in. drives replace 3.5in. drives for up to 78% more disks</li> </ul>
Cooling	<ul style="list-style-type: none"> <li>• 15% lower BTU per square foot</li> </ul>
Connectivity	<ul style="list-style-type: none"> <li>• 1.7 more connectivity with 192 8Gb/sec Fibre Channel, 192 FICON, 96 Fibre Channel over Ethernet host ports</li> </ul>

Alongside performance and capacity related efficiencies, the Virtual Storage Platform exploits the progressive software technologies found in Hitachi Command Suite.

### 3D Management Platform

3D management is enabled by Hitachi Command Suite with efficient storage management that lowers costs and properly manages all data types.

- **Manage up** capabilities unify management and scale to the largest infrastructure deployments.
- **Manage out** features deliver a single management framework with the breadth to manage storage, servers and the IT infrastructure.
- **Manage deep** with Hitachi Virtual Storage Platform integration for the highest level of operational efficiency and up to 50 percent time savings for essential storage management tasks.

By **managing up** with Hitachi Command Suite, the IT administrator is able to increase utilization by 50 percent, and manage up to 5 million logical objects and 255PB of virtualized capacity, all

from a common interface that tightly integrates virtual tiered storage and server environments. The outcomes are alignment of business application needs and costs, along with significant CAPEX and OPEX savings.

By **managing out** with Hitachi Command Suite, the IT administrator is able to unify block, file and content data across all Hitachi storage and manage all virtualized heterogeneous storage assets. Hitachi Command Suite facilitates end-to-end visibility and enables the administrator to correlate applications, virtual machines, virtual servers and logical storage devices for traditional and VMware environments — inside one management framework. The software suite works with Hitachi Dynamic Provisioning software to allow capacity to be added when needed, rather than overprovisioning storage. The enterprise organization is then better positioned to monitor and plan resource needs for virtual server farms, consolidate multivendor storage management tools, and to rapidly reduce complexities and costs in the data center.

Hitachi Command Suite **manages deep** to help IT staff adeptly manage the complexities of the modern data center and improve business agility with integration between the various levels of software and improved usability. This, in turn, allows for consistent implementation of management operations helping to reduce human error. A common GUI and data repository facilitate easier operation between activities while improving task workflows. In addition, fewer management steps, faster provisioning and administrative modes for both novice and advanced users simplify operations and reduce deployment times. In fact, command line interface (CLI) control is now 30 percent faster. The advanced management software works in harmony with all previous software versions for consistency in operations while unifying visibility and manageability across virtualized environments.

## Large-scale Server Virtualization

The Virtual Storage Platform takes virtualization a leap forward with thorough and agnostic integration of leading virtual server platforms and hypervisors. The platform assists with eliminating virtual server sprawl and provides heterogeneous end-to-end server and storage virtualization. This large scale server virtualization functionality provides a central point of storage management so that everything is protected and controllable under a common management umbrella. By having an open approach to virtualization, the Virtual Storage Platform lets IT administrators mix and match technologies to better "future proof" investments and subsequently shrink complexity, as well as CAPEX and OPEX costs.

With an innovative feature set that includes multipath I/O, Dynamic Provisioning block locking and copy, clone, snapshot functionality, the Virtual Storage Platform aligns virtualization of storage and servers to higher-level business objectives. Organizations are better able to meet or exceed SLA commitments and streamline operations for better performance and optimal capacity needs.

## The Sustainability Footprint

When investigating culprits of cost inefficiencies in the data center, there are three usual suspects: power usage, cooling requirements and the floor space needed to house equipment. The Virtual Storage Platform presents an abundance of environmental benefits tailored to minimize these costs and encourage eco-friendly — also known as sustainable-storage practices. In particular, its high density design complies with governmental environmental directives and allows for more efficient

use of power, cooling and facilities. Reducing electric usage and floor space has a direct correlation to lower operating expenses, too.

Virtual Storage Platform uniquely packages best-in-class performance, scalability and capacity expansion, integrating block, file and content data services in one efficient footprint. The collective use of green Hitachi technologies, such as controller-based virtualization, virtual tiering and 3D scaling, supports the entire lifecycle of storage infrastructures, both internal and externally attached through the Virtual Storage Platform.

Sustainability characteristics of the Virtual Storage Platform that help contribute to cost savings include:

- 2.5in. small form factor disk drives results in smaller storage footprint
- Next-generation SAS hard disk drive technology
- Larger, flash-protected cache
- Faster processors and high speed memory
- Interconnected blade-based architecture
- Front-to-back airflow
- Operation report and assessment
- Enhanced CLI and user interface
- Dynamic Tiering to automate tiered storage pooling
- High density 19in. rack

## Stellar Legacy Storage Technology

While the Virtual Storage Platform has matured some of the ground-breaking technologies found in the Universal Storage Platform V, they are worth revisiting in order to demonstrate the economic merits of a holistic storage approach to managing the data center. Storage virtualization, tiered storage, Dynamic Provisioning and host-transparent migration continue to support and mature the cost-savings goals of the enterprise IT organization. Hitachi Data Systems customers are using these technologies in a variety of ways and at various stages of maturity, to simplify management, increase utilization, consolidate assets, reduce risk, lower operational costs and reduce complexity.

### Controller-based Storage Virtualization

Virtualization masks the complex inner workings of storage systems while allowing multivendor storage systems to be aggregated and managed as one resource to better reclaim, utilize and optimize storage. While there are many virtualization techniques, only Hitachi Data Systems offers controller-based storage virtualization, a technology pioneered to separate storage controllers from the storage media in any type of environment. In this way, impact to the SAN or the application interface port processor is alleviated so that heterogeneous storage assets can be efficiently pooled and controlled through a single pane of glass.

The economic value of Hitachi storage virtualization starts with extending the usefulness of virtualized assets, whether older or multivendor or both. It continues by simplifying management across the virtualized infrastructure for improved scalability, migration, replication and provisioning

tasks. The value culminates in reduced hardware costs and SAN infrastructure costs and the environmental costs mentioned in the previous section, ultimately lowering OPEX, CAPEX and TCO spending.

## Hitachi Tiered Storage Manager Software

Once storage resources are pooled, the burden of unusable storage space in standalone systems is mitigated. Hitachi Tiered Storage Manager software enables better alignment between application quality of service requirements and the heterogeneous virtualized storage assets. In conjunction with controller-based storage virtualization, Tiered Storage Manager automatically moves data between different tiers of storage without disruption to the applications.

From an economic standpoint, the inherent value of Tiered Storage Manager is that the movement of data can now be determined and easily executed, according to policy and importance, to high performance tiers or lower cost tiers. And because storage tiering in this way also capitalizes on utilization, the IT organization may also be able to defer new purchases.

## Hitachi Dynamic Provisioning Software

Overprovisioning storage can be an expensive venture. Hitachi Dynamic Provisioning software directly addresses the biggest problem for capacity utilization: allocated but unused space that is copied many times over. Dynamic Provisioning maximizes storage capacity and performance by provisioning only what is used and using capacity only when required by applications. Compared to traditional provisioning techniques, Dynamic Provisioning uses less space, making more available for other applications. For example, when a 2TB volume is created using conventional provisioning, the entire amount is allocated even if there are only 300GB of data. Dynamic Provisioning, in that same scenario, only consumes the 300GB for allocation, leaving 1.7TB available for use by other applications.

Dynamic Provisioning improves the responsiveness to new storage demands without downtime for lower TCO, and it aids organizations with the deferral or elimination of storage capacity upgrades by aligning with actual business usage. Environmental costs associated with spinning unused disk capacity are also diminished.

## Host-transparent Data Migration

No IT organization can afford the cost or inconvenience of encroaching outage windows, but the fact remains that data will not stay forever on its current storage medium, ultimately requiring migration, data remastering or technology refreshes. These efforts take time and money. The Virtual Storage Platform uses host-transparent storage controller-based migration to reduce outage windows for multivendor storage with 80 percent less effort and expense than the industry average. This efficient migration works across platforms, from the Virtual Storage Platform to its predecessors, the Universal Storage Platform V and the Universal Storage Platform VM, with zero impact on server performance and reduced application downtime per server.

By performing migration in this manner — in essence virtualizing the migratory activities — the process is accomplished quickly and transparently, even in heterogeneous storage environments. Data migrations can happen online while users and applications continue to access data on the platforms, easing the impact on business operations and scheduling demands. The economic

benefits included fewer tools needed, less labor involved, more application uptime and significantly better scalability.

## The Compounded Economic Impact

The Virtual Storage Platform could be likened to a successful family reunion. It ushers in the new, welcomes back the old and reaps the benefits of gathering all together in one place as one unit. The staples of cost-efficient storage, such as controller-based virtualization, Dynamic Provisioning and tiered storage, are united with the next-generation innovative technologies, including 3D scaling, Dynamic Tiering and 3D management, for a single economically superior architecture. All of the new technologies, enhancements and legacy functions work together to reduce OPEX and TCO (see Figure 3). The net result is a matrix of economic, environmental and agility benefits found only in the Virtual Storage Platform.

In summary, the Virtual Storage Platform exemplifies the Hitachi ethos of one platform for all data. It supports greater performance and capacity, lowers environmental usage costs and answers the perpetual question of how to transform the data center to meet business demands.

**Figure 3. This cross-value chart depicts the architectural capabilities and economic byproducts of the Hitachi Virtual Storage Platform.**

		Reduce CAPEX	Reduce OPEX	Improve ROA	Env. Footprint	Reduce TCO
NEW Capabilities	3D Scalability	✓	✓	✓	✓	→ ✓
	Hitachi Dynamic Tiering		✓	✓		→ ✓
Enhancements	Administration		✓			→ ✓
	Environmental		✓	✓	✓	→ ✓
	Performance		✓			→ ✓
Legacy	Capacity Efficiency	✓	✓	✓		→ ✓
	Storage Virtualization	✓	✓	✓		→ ✓
	Host Transparent Migration		✓		✓	→ ✓

Hitachi 3D scaling equips the enterprise with three ways to scale the IT infrastructure to reduce OPEX by up to 20 percent and increase ROA. This is a result of consolidating or reducing physical server farms, repurposing or extending the life of existing storage assets, and dynamically adding the appropriate storage capacity as needed. Hitachi Dynamic Tiering creates the altitude necessary



to improve the 80/20 rule of storage by combining Dynamic Provisioning and virtual tiered storage to shift data to the right cost levels. The Virtual Storage Platform also achieves its efficiency gains by design and the use of Hitachi Command Suite for three dimensions of simpler management across even very complex data centers. Mix in large scale server virtualization, sustainability characteristics and the demonstrated merits of tried-and-true legacy Hitachi technologies, and the Virtual Storage Platform offers a complete approach to solving today's most difficult data challenges and budgetary mandates.

For more information on how the Virtual Storage Platform will transform the enterprise data center, please visit [www.hds.com/go/virtualizeIT](http://www.hds.com/go/virtualizeIT).

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