

# The Multiple Facets of Data Center Transformation

Key enabling technologies that transform raw data into valuable information

*By Hitachi Data Systems*

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## Executive Summary

Among today's most pressing IT challenges is the need to reenergize the data center to readily accommodate changing business requirements and demands for always-accessible information. But with an erratic economic climate and escalating IT costs, the data center has become a ticking time bomb. To solve the dilemma of swiftly meeting both data growth and budgetary ultimatums, IT must be agile.

Hitachi Data Systems is focused on building this agility into the data center architecture to rapidly address both current and future needs dictated by change. Using a whole-systems approach to achieving agility, Hitachi helps enterprise organizations transform their data centers, optimize a return on assets and align infrastructure performance with business objectives.

This paper examines the four rubrics of data center transformation: virtualization, automation, cloud-readiness and sustainability. It illustrates how Hitachi technologies, services and solutions facilitate the agility required to achieve it.

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## Introduction

Data drives our world. We send it, receive it, store it, manage it, process it, protect it and use it. While the words data and information might seem interchangeable, data is in essence the raw input that is processed or arranged to become meaningful output or information. In the modern data center, both input and output are critical to running the business. As expected, storage plays a critical role in data center transformation. How data is stored can either enable or inhibit data center transformation efforts. As the amount of data supporting mission critical applications continues to exponentially multiply and its underlying IT infrastructure ages, the need for a fundamental transformation of the data center is vital.

Data center transformation, like so many topics in the enterprise space, has many definitions and conjures up endless ideas. Hitachi Data Systems recognizes that virtualization, automation, consolidation, tiering and other technologies are critical to renovating IT infrastructure to meet urgent demands. However, we consider transforming the data center to be more about designing flexibility, and consequently efficiency, into the architecture. How else can the enterprise address data growth and management challenges while ensuring the infrastructure is easily extendable to embrace whatever the future business requirements may be? No single technology is capable of enabling IT to achieve the kind of flexibility required to ensure immediate and pervasive responsiveness, performance, security, scalability, availability...the list goes on.

Hitachi Data Systems has proven best practices and methodologies to help rapidly and successfully transition organizations to new data center architectures and environments with lower costs and risk. These services leverage comprehensive capabilities to optimize virtualized, tiered architectures that are high performing, more flexible and more tightly aligned to the business.

Using flexibility and efficiency as the guiding principles for data center transformation, it's no wonder that Hitachi Data Systems is a natural leader for providing that guidance. With a long and proven history of helping organizations meet their toughest IT challenges with a cohesive and complete portfolio of technologies, tools and services, Hitachi Data Systems is at the forefront of solutions designed to deliver that elusive panacea, agility.

## Changes and Challenges of the Modern Data Center

Before delving further into how to transform the data center, it is important to understand why. In its simplest form, the data center is almost a living organism that is born out of the need to support a business. It grows and morphs to adapt to its surroundings. In many cases it must support changing business requirements and circumstances beyond control, such as regulatory and environmental mandates. While the original data center design may have been well forecasted and funded, that is quickly outstripped by the challenges involved with running it.

When it comes to IT, challenges are inherent because change is inevitable. The incoming data companies have to manage is nonstop and ever increasing in volume. The pressure for IT to provide the ability to access and make sense of that data at a moment's notice as well as accommodate erratic transactional rhythms is ubiquitous.

The right resources, skills and knowledge on how to adapt to change are not always available, causing an unintended build-up of equipment and complexity. Bolted-on capacity and utilization

work-arounds, ad hoc storage purchases and mounting infrastructure inefficiencies are byproducts of unpredictable data growth and thinning IT budgets. Aging IT systems and infrastructure are more difficult and costly to maintain. And the incoming data onslaught is only temporarily plugged by adding more and more capacity. The cost and availability of power to manage it all are recurring issues, and regulatory compliance and risk mitigation are ever-present. From high end data encryption to legacy power-hungry systems, data centers are running the gamut of operations to keep business moving.

With so many urgencies facing today's IT leaders, the topic of data center transformation has become a priority call to action. While transformation of the data center will not happen overnight, it is important to take the right steps to achieving agility and business-oriented change capability.

## Delivering on a Vision for Data Center Transformation

“One of the primary objectives that I teach our storage economic consultants is to identify the inflection point, or the cross over point — the point in time and costs where the fundamental parameters and results change. In economics, this is the point where the status quo is no longer sustainable. The point where business as usual will create unusual costs.”

*David Merrell  
Chief Economist,  
Hitachi Data Systems*

Perhaps the most common threads running throughout every industry are the value and importance of data, and by extension, information. Building an agile architecture with the priority of managing and storing data enables the enterprise organization to better respond to changes and conditions affecting the business. Transformation of the data center is not just about adding storage and compute capacity. It is about marrying a complete economic view of IT and the data center - from servers to storage to applications - with technology, people and processes to deliver a comprehensive solution for responding to the ever-changing business environment. By melding together innovative thinking, storage technology and IT economics, the enterprise is better prepared to respond to changes caused by fluctuations in the global, economic or business climate.

Complete transformation of the data center can only be achieved when the infrastructure fosters cooperation between server, network and storage assets, relies on a single platform for all data and delivers application transparency so that it can be synchronized with business objectives. Hitachi Data Systems understands the direct link between increasing business agility and decreasing business risk in an unpredictable business world, and approaches data center transformation with this as a starting point.

Hitachi Data Systems has comprehensive capabilities to optimize your new virtualized, tiered data center. Our approach spans from discovery to design to implementation and to ongoing operations. To ensure a successful transformation where the organization realizes the benefits of the new data center, we focus on all aspects of the transformation, including operations, business and technology.

### Our Approach: A Common Virtualized Platform for All Data

According to many industry experts, keeping up with data growth is the top challenge of IT managers. An unprecedented upsurge in new unstructured data types, such as rich media, PACs and eDiscovery documents, and their storage requirements are buckling the data center's ability to maintain control. Without all-encompassing agility built into the IT infrastructure, organizations will not be able to keep up.

Having one platform for all data helps IT leaders satisfy the data center's voracity for generating,

sharing, retaining and accessing important information. At the heart of the Hitachi Data Systems strategy for transforming the data center is a common virtualized platform for all data, structured and unstructured. The strategy includes the ability to manage multivendor environments for open systems and mainframe platforms and their corresponding workloads. Instead of separate storage silos for enterprise, midrange, filers, virtual tape libraries, content archives, thin provisioning or cloud, Hitachi Data Systems provides a common storage platform with common management, common protection and common search. This platform supports any vendor's storage that connects through standard Fibre Channel on the back end and any vendor's file or content gateway that connects through Fibre Channel on the front end. As Hitachi Data Systems continues to execute on its strategy and evolve its expansive product portfolio to transform the enterprise data center, the enterprise can gain a solid foothold on the precipice of control over seemingly uncontrollable data center demands.

The Hitachi virtualized platforms work with a common set of management tools across all multivendor storage assets. By using unified, virtualized and scalable data management architecture across all heterogeneous environments, IT organizations can expect to realize the following benefits:

- Lower operating costs and TCO
- Less administrative effort to manage more data
- Higher return on storage assets
- Efficient deployment of storage capacity
- Reduced power, cooling and space requirements
- Simpler, cohesive management and security of systems
- Extensive data mobility

## Building Blocks of the Next Generation Data Center Now

Upon the solid foundation of a single platform for all data are the four building blocks of data center transformation. These enabling technologies work together to orchestrate the serious level of agility necessary for winning the data growth and management contest. While some point products on the market may provide one or even two of these enabling technologies, only Hitachi products infuse all four pillars. These building blocks are virtualization, automation, cloud-readiness and sustainability.

## Building Block One: Transformation through Virtualization

While virtualization is a key building block for data center transformation, this enabling technology has also undergone its own transition. Once reserved for test and development, virtualization is now used to enhance the agility of mission critical applications and is the foundation for cloud implementations. Virtualization is entering a new phase, transitioning from consolidation and cost savings to exploiting new opportunities through increased agility and coordination between server and storage virtualization. Firmly a stronghold in the IT industry, virtualization helps organizations to better reclaim, utilize and optimize multivendor, multiplatform assets. The benefits are usually greater cost efficiency and enhanced performance, availability and manageability across the virtualized infrastructure.

Yet not all virtualization products are the same. Hitachi virtualization is controller-based and enables a central point of control under a common management umbrella to reduce costs while boosting asset utilization at the organization's pace. Controller-based virtualization was pioneered by Hitachi Data Systems to separate storage controllers from the storage media in any type of environment.

How does it work? External storage is attached to the Hitachi storage controller, where a universal volume manager discovers the volumes on the external storage. Then, the volumes are presented through the cache of the Hitachi storage controller as though they are native volumes so they can be put back on the external storage or moved without disruption to the application. This simple approach to storage virtualization does not require the remapping of storage volumes, additional SAN ports and SAN zoning, or another layer of management complexity. In this way, impact to the SAN or the application interface port processor is alleviated. The heterogeneous storage assets can be efficiently pooled and controlled through a single pane of glass.

By having an open approach to virtualization, Hitachi platforms allow IT administrators to automate the most labor-intensive data management and data protection operations and quickly deliver capacity and compute resources. The economic value of Hitachi virtualization is seen in the:

- Leveraging of virtualized assets
- Simpler management across the virtualized infrastructure for improved scalability, migration, replication and provisioning tasks
- Reduction of operating and capital expenditures and TCO spending

To understand how Hitachi virtualization drives agility for data center transformation, this paper examines server virtualization, storage virtualization and thin provisioning capabilities, which are provided by Hitachi Dynamic Provisioning software. Together, virtualization and Dynamic Provisioning deliver a level of agility in the data center that eradicates the need for standby storage and all of the OPEX associated with it.

## Server Virtualization

As a leader in storage virtualization, Hitachi Data Systems has gathered comprehensive best practices to help plan, design, implement, manage and optimize virtualized environments. Our focus is on helping organizations deploy virtualization successfully and realize the expected benefits from the newly transformed data center.

Server sprawl is not uncommon in an organization that has matured over time due to mergers, branch offices and just plain business growth. With virtual servers comes a great way to clean up configurations and consolidate system proliferation, and expedite an on-demand deployment of new servers when needed. The typical data center probably has more virtual servers than physical servers. Virtual servers have a dramatic impact on storage through a concentration of I/O and randomizing of I/O across many virtual machines.

For virtual servers to help with transformation efforts, the storage back end must also be capable of handling I/O offload demands and assisting with scaling beyond the server's limitations. The concentration of I/O requires a storage system that can scale dynamically as additional virtual machines are spun up. The randomness of I/O requires a fast back end, which can mean expensive flash drives, wide striping across many disk drives or both through automated tiering.

VMware realizes the need to exploit the capabilities of storage systems to scale beyond its current limitation through open APIs for storage system integration. Hitachi Data Systems uses these APIs to support indispensable functionality, including:

- Hardware-assisted locking between VMware ESX hosts sharing a virtual machine file system (VMFS) volume
- Full copies within the storage system without the ESX Server reading or writing the data
- Block zeroing to recover storage space after a file is deleted

Why is this important? These useful functions help remove bottlenecks that prevent the scaling of workloads among applications, servers and storage. Once these bottlenecks are removed, Hitachi storage systems have the additional capability to scale beyond the limitations of other storage systems and are able to scale to hundreds of times the workload to accommodate these virtual server clusters. When organizations use intelligent storage platforms to eliminate virtual server buildup and create a centralized end-to-end (server to storage) virtualization environment, data centers can be better protected and controlled under unified management. When servers and storage are aligned to meet higher-level business objectives and reduce complexities, IT organizations are one step closer to data center transformation.

## Storage Virtualization

Data center transformation efforts can be weighed down when data is continually being generated and then subjected to migration, movement, provisioning and security measures. Unlike processing power and network bandwidth, which are considered stateless and can be consumed like electricity, data storage is stateful. Consequently, whenever changes are made to the data, there is movement, which can become disruptive as the volume of data escalates. Applications, as well, are always bellowing for access to the data. Storage virtualization masks the disruption of moving data and making changes and is a critical component to the transformation endeavor.

Through controller-based storage virtualization, older machines and multivendor equipment inherit all the front end capabilities of the storage controller. This in itself bleeds out so much of an IT infrastructure's widespread complexity and inefficiency. It helps to improve OPEX costs, scalability and resource utilization. Storage virtualization separates the application and server view of data from the physical infrastructure, allowing changes to be made to the physical system without disrupting applications. With Hitachi controller-based storage virtualization, applications are redirected to virtual ports for uninterrupted access to volumes through high performance global cache located in the virtualization engine. This technology paves the way for thin provisioning to reclaim storage overallocation "waste." It leverages high speed distance replication for better business continuity, dynamically tiers storage to manage the information lifecycle, and supports many other essential-to-agility features.

Storage virtualization gives the IT administrator choice in such areas as how to dynamically configure, move, leverage, safeguard and grow the IT infrastructure. These are enablers of data center transformation. They allow IT to consolidate resources, technologies and applications while simplifying the way data is handled, and resultantly improving TCO.

## REQUIREMENTS FOR STORAGE VIRTUALIZATION

According to Hu Yoshida, vice president and chief technology officer at Hitachi Data Systems, there are five “must have” ingredients for storage virtualization to support agility:

- Is easy to implement
- Enhances whatever storage is virtualized with tier 1 functionality
- Scales up and out dynamically, and extends to externally attached storage
- Provides built-in security measures, such as multitenancy partitioning, separate address spaces for virtual and physical ports and encryption for data at rest
- Supports transparency that enables applications to view, monitor and track virtual infrastructure and underlying physical components

## Hitachi Dynamic Provisioning Software

If Hitachi Dynamic Provisioning software were to have a mantra, it might be “done in a matter of minutes.” It is far cry from lengthy conventional provisioning methods, which consumed the entire amount of space assigned to a volume. Dynamic Provisioning is able to provision a virtual volume in just moments to dramatically improve capacity utilization and maximize performance.

Unlike traditional provisioning, Dynamic Provisioning is able to address the allocated but unused space that is copied over many times, and it provisions only what is used. In turn, capacity is only used when required by applications. Storage is assigned virtually but not physically spent until a user begins writing to the allocation. Unlike thin provisioning-only products that are limited in their granularity, Dynamic Provisioning is able to allocate storage a page at a time from a common pool of pages, for deeper granularity of the data. Each page is then striped across the width of the provisioning pool. This automatically wide stripes the data and initiates the maximum number of spindles to work on each I/O request. Using this technique allows much more pervasive flexibility for provisioning storage for new application requirements.

Why is Dynamic Provisioning important to data center transformation? Dynamic Provisioning boosts responsiveness to new storage demands without the typical downtime for lower TCO, and aids organizations with the deferment or elimination of storage capacity upgrades by aligning with actual business usage. The environmental costs associated with spinning unused disk capacity are also reduced. This just-in-time provisioning capability allows the IT administrator to quickly ramp up storage to meet unexpected server and application demands. Dynamic Provisioning leverages a zero-page reclaim to retrieve wasted allocation from existing storage, automates wide striping for better performance and tuning, and enables thin copies and thin moves to reduce OPEX.

## Building Block Two: Transformation through Automation

It is usually a lack of agility that is the root cause of increasing OPEX, which can register as more than 65 percent of the total cost of storage. As organizations dig deeper for how best to optimize storage assets, improve visibility and simplicity across the IT infrastructure for better data access and delivery, automation arises as a very critical component. Being able to reduce operational risk, achieve business continuity goals and improve data mobility are top priorities in moving closer to that agile data center.

What role does automation play in data center transformation? Automation focuses on integrated or built-in software tools that ensure highly automated, reliable, repeatable and scalable processes designed to diminish OPEX associated with manual steps and human interaction. Furthermore, by automating time consuming operations, enterprise IT is able to deploy new applications and business systems into production quicker and with less cost. The at-a-glance benefits of automation across the data center include:

- Enables continuous operations while reducing CAPEX wasted on underutilized storage capacity
- Increases IT staff productivity while maintaining or improving data access, security and OPEX
- Aligns business objectives and the IT infrastructure's ability to react to those objectives

While controller-based virtualization and Dynamic Provisioning significantly demonstrate how automation is hard at work to transform the data center, there are other examples worth visiting. A good way to illustrate how automation fosters the agility most IT organizations are seeking is to highlight technology and software that automates tedious and in some cases arduous tasks.

### Three Ways to Scale

The Hitachi Virtual Storage Platform is an excellent example of how extensive scalability can be automated to facilitate data center transformation. Using three dimensions of scalability, the Virtual Storage Platform allows IT architects to:

- **Scale up** — to improve performance, throughput and connectivity for both 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

#### Hitachi 3D Scaling

Hitachi 3D Scaling allows for the creation and dynamic sharing of one global cache across all storage and all data types, including block, file and content. Its global architecture automatically and transparently distributes uneven and unplanned mixed I/O workload demand across system resources and eliminates poor response time and predictability issues.

Scaling up is all about improving performance, throughput, capacity and connectivity. Whereas typically loosely coupled storage systems limit the number of ports, cache and disks, Virtual

Storage Platform tightly couples storage resources to form a single global cache. The value here is that processors, connectivity and capacity can be added dynamically and resources are unified and managed as one system.

When scaling up, resources are dynamically added to the system to address growth in data, in the number of server applications, and in the workload generated. Performance, capacity and connectivity are increased by adding cache, processors, connections and disks to the base system. Host servers that access the storage system can utilize all these resources, which act as one system managed as a common pool of resources. The result is decreased response time to requests for information, consolidation of more data and greater automation of administration.

Scaling deep further exploits the unique virtualization scaling capabilities of the Virtual Storage Platform to extend 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 unified management.

## Manage, Move and Migrate

The IT organization's success relies on being able to provide an uninterrupted flow of information. Tiered storage and data management tools can be extremely helpful in optimizing that flow while improving administrative productivity and application performance. Tiered storage is often an effective approach to managing data. By assigning different values to each level, or tier, within a storage infrastructure, the IT administrator is able to match application requirements to storage system attributes, such as high performance solid state disk or lower cost SATA drives. Also, there is better control over movement and access to the data on those tiers.

Hitachi Data Systems Global Solution Services (GSS) organization has highly trained, knowledgeable and experienced migration consultants, who have migrated thousands of enterprise systems for our customers. Over the years, GSS has developed heterogeneous storage migration consulting expertise, as well as methodology and best practices that reduce migration risk and minimize impact to the business.

### Tiered Storage Manager

In conjunction with controller-based storage virtualization, Hitachi Tiered Storage Manager automatically moves data between different tiers of storage without disruption to applications.

This allows IT to transparently and interactively migrate data between internal and externally attached heterogeneous storage tiers for optimal performance and availability. This dynamic movement between tiers is automated through user-defined policies, is triggered by time or events, and can perform migration in a live system.

### Page-based Dynamic Tiering

The Virtual Storage Platform takes automation a leap forward with Hitachi Dynamic Tiering, technology that evolves thin provisioning and tiered storage to a new level of automation and performance. New dynamic tiering capabilities allow the storage infrastructure to be much more fluid, to automate and eliminate the complexities with more efficient use of tiered storage.

Hitachi Dynamic Tiering software takes the automation of tiered storage to a new level. It enables the management of multiple storage tiers as a single entity. It presents a new kind of virtual volume with embedded smart tiering that monitors access and moves data at the fine grain page level. It breaks the volume into pages and automatically promotes the pages that are being referenced frequently, avoiding the time and storage space to move the entire data set or file. It provides the facility to have the right data in the right place at the right time by self-optimizing for high performance and space efficiency.

### 3D Management Platform

The Hitachi Command Suite is an excellent example of comprehensive management software that lets the enterprise further align storage according to business-related metrics such as quality of service, recovery time objectives, recovery point objectives and service level agreements. Hitachi Command Suite auto-discovers the storage environment and provides visibility along the path from each application through the network to the storage system for end-to-end management automation. This discovery process helps the IT administrator quickly locate all available assets, regardless of vendor, effectively usurping manual procedures and unifying management tasks from a centralized standards-based platform.

Debuting in the Virtual Storage Platform is the newest major release of the Hitachi storage management software suite designed to deliver a comprehensive, unified way of managing storage resources. Hitachi Command Suite employs a 3D management platform to efficiently manage all data types and to lower CAPEX and OPEX costs for the agile data center, by:

- **Managing up** — to unify for scalability of large infrastructures and application deployments, increasing utilization and managing up to five million logical objects and 255PB of virtualized capacity
- **Managing out** — with a single framework for the breadth of storage, servers and IT infrastructure that unifies block, file and content data for end-to-end visibility
- **Managing deep** — to provide deep integration within the Hitachi Command Suite for highest levels of operational efficiency, plus a common GUI and data repository for easier operation between activities and fewer management steps

## Monitor and Diagnose

Successfully managing an IT infrastructure that is rapidly growing in size and complexity can be intimidating for any business. By understanding precisely what's happening across devices and environments, the organization can proactively manage costs, risks and assets.

### Hitachi Tuning Manager Software

Hitachi Tuning Manager software helps organizations map, monitor, analyze and review storage network resources from the application to the device. Using automated, intelligent and path-aware storage resource management software such as Tuning Manager, the IT organization is better equipped to handle issues before problems occur. A dashboard is provided to applications for transparency into the virtual infrastructure. Through the dashboard, an application can monitor its service level objective, and see the actual storage infrastructure assigned for its use, the health of resources and a utilization trend line.

### Hitachi IT Operations Analyzer Software

Another monitoring tool most helpful in getting to the root of the issue faster, easier and more thoroughly is Hitachi IT Operations Analyzer software. It is designed to monitor, diagnose and manage up to 750 heterogeneous devices from one server. To handle more devices, simply add another server. IT Operations Analyzer is loaded with automated functionality to improve productivity, enhance agility and provide insight across the data center. Automated root cause analysis quickly pinpoints the cause of errors and acknowledges downstream events to remove event paralysis and expedite mean time to diagnose. Easy-to-understand topology views provide visibility of both physical and virtualized environments, logical and physical connections, and LAN and SAN. This tool unifies a complete view through a web-based interface, enables user-defined alert thresholds and automates reporting, too.

## Building Block Three: Transformation for Cloud

As enterprise organizations in particular grapple with how to keep ahead of massive data growth and remove big spending from the data center, along comes cloud computing as a potential answer. The next question might be, so how does data center transformation get the enterprise ready for cloud computing? The reply materializes in learning what it takes to make the data center "cloud enabled."

Cloud is not a product, but instead a means to deliver IT services on a cost-per-use basis. Through cloud computing, organizations can simplify infrastructure while improving resiliency and lowering CAPEX and OPEX for both service providers and end users. Cloud delivers value to the enterprise because it facilitates the distribution of IT resources in a cost-effective and agile manner. Non-core competencies acquiesce to on-demand technology and on-demand business innovation and savings.

### Cloud Enablement

The enterprise can transform the data center using virtualization, thin provisioning, pervasive automation and other agility tools at its disposal. By doing so, it becomes well positioned to initiate a cloud computing model that is either internal (private cloud) or external (public or hybrid clouds) to its firewall.

A short list of the characteristics that are key to cloud enablement includes:

- The ability to rapidly provision or de-provision a service
  - A consumption model where users pay for what they use
  - The agility to flexibly scale — "flex up" or "flex down" — the service without extensive pre-planning
  - A secure, direct connection to the cloud without having to re-code applications
  - Multitenancy capabilities that segregate and protect the data
-

## Platforms, Services and Solutions

Hitachi Data Systems has a three-pronged approach to cloud enablement:

- Platforms that unify and manage all data types
- Comprehensive managed services
- All-inclusive solutions such as storage-as-a-service

This approach enables organizations to adopt cloud at their own pace with no need to disrupt or replace their existing infrastructure.

The Hitachi solutions are built to:

- Access all information and resources seamlessly, providing lines-of-business, customers or partners the ability to scale and provision dynamically and cost-effectively
- Optimize operations by consolidating and aggregating storage, server, networking and middleware assets through virtualization
- Enable multitenancy and SLA-oriented storage services while maintaining enterprise-class security and privacy

“With these (Hitachi) cloud solutions, we're taking the guesswork and risk out of the equation for customers looking to adopt cloud. We're really excited to help customers get there by providing a pragmatic, incremental path that doesn't disrupt their existing investments or operations while delivering real business value.”

*Miki Sandorfi  
Chief Strategist,  
File and Content Services  
Hitachi Data Systems*

## Building Block Four: Transformation for Sustainable IT

With power consumption in the data center doubling every few years just to keep pace with burgeoning storage capacity requirements, the need to control power, cooling and floor space costs has never been greater. And as enterprise IT organizations are being pushed to the limits by data growth, sustainability presents an opportunity to harness it.

Sustainable IT refers to efforts that increase the useful life and reduce environmental impacts of IT systems, and in tandem offer cost benefits to the business. At first, sustainability may not seem like a pillar for transforming the data center; however, viewing the data center from a sustainability perspective encourages IT organizations to appraise more than application requirements, performance demands and storage capacity. Sustainability practices look at components, configurations, procedures, power and cooling consumption and availability, where the inefficiencies exist, and where green technologies can solve data center challenges for the long haul.

### Harnessing Growth and Costs

Sustainable IT is critical to enhancing the enterprise's ability to manage growth and stay competitive, to lower costs and protect investments, and to enhance performance and availability while reducing the carbon footprint. Think of it as balancing the scales between uncontrolled data storage growth and its costs by implementing ecologically innovative solutions that amplify flexibility and efficiency.

Storage technology doubles capacity within the same form factor with each generation of disk technology, providing more capacity per KVA. Hitachi storage takes that to new levels by using a smaller 2.5in. form factor that uses 50 percent of the power required for traditional 3.5in. drives. Hitachi Data Systems also provides an industry-first ultra dense drive package, holding 80 of the 3.5in. drives or 128 of the smaller 2.5in. drives in a 13U high, 19in. wide rack. The value of this density is

front-to-back air flow for more efficient cooling through hot and cold aisle configurations. Also, it uses approximately six floor ties to hold 2,048 disk drives, which is less space than required by competitive systems.

Virtualization, intelligent storage tiering, thin provisioning and pervasive automation top the industry list of sustainable IT techniques. Hitachi storage virtualization provides a reduction in carbon footprint through storage consolidation. It also extends scalability with integration of server virtualization APIs to increase server virtualization and reduce physical server footprints and SAN port counts. By executing energy-efficient measures, such as server and storage consolidation to reduce the amount of equipment needed on the floor, those related energy and flooring costs can be reduced.

Services and practices that optimize new and current systems can also increase the return on assets. Streamlining business processes and supply chains, transitioning to virtual travel or meeting software, and using newer technologies to compress the space necessary to store data are among the easiest ways to strip costs while reducing carbon emissions and greening IT.

## Studying the Blueprint

Hitachi Data Systems has been integrally involved in researching and maturing sustainability practices and technologies intended to help IT organizations improve how they support business objectives, including the bottom line. By intertwining sustainability with the other pillars for data center transformation, Hitachi solutions provide IT an overarching blueprint for addressing current growth issues while honing a cost-efficient strategy primed for unknown future challenges and changes.

For the enterprise seeking to transform the data center with sustainable IT, here are some key boxes to check:

- Use virtualization to avoid data center hot spots
- Centrally manage storage across the data center
- Allocate virtual capacity without dedicating physical storage
- Tier storage to reduce the load on electrical and cooling systems
- Maximize capacity in the least amount of floor space
- Minimize use of toxic materials such as batteries
- Utilize services to help design the right infrastructure
- Select vendors with an environmentally friendly track record

Hitachi Data Systems is committed to sustainability across its many product lines and measures it against the ISO 14000 standard. Under certification, Hitachi focuses on these phases of product life cycle:

- **Development** — to ensure that every new product is more energy efficient than the prior product. (For example, the Virtual Storage Platform achieves a 40 percent reduction in power usage over the Hitachi Universal Storage Platform V.)
- **Supply chain** — to ensure that the supply chain is green and also certified under ISO 14000
- **Manufacturing** — to ensure that the manufacturing plants reduce their carbon footprint

- **Distribution** — to reduce the waste of packaging and reduce the carbon cost of transportation
- **Maintenance strategy** — to reduce the replacement of parts and ensure efficient support, as well as end of life and recycle

## Considerations for a Well-rounded Transformation

As enterprise organizations continue down the path of data center transformation, here are some helpful considerations.

### Storage Economics

Today's IT organizations are working to divest themselves of the status quo — overly complex and sluggish storage systems that drain budgets and hamper effectiveness. As they strive to reach that agile state, Storage Economics from Hitachi Data Systems can help. Storage Economics helps the enterprise quickly zero in on the cost-efficiencies and best ways to optimize data operations, even as new cost dimensions continue to emerge. Using financial metrics and measurable techniques, Storage Economics helps IT leaders recognize the true TCO of storage decisions and systematically reduce these over time. Using Storage Economics, Hitachi Data Systems is able to map its innovations and technologies such as controller-based virtualization and Dynamic Provisioning to the organization's service level objectives and business goals. This leads the way to an agile data center with lowered TCO.

### Global Solution Services

Hitachi Data Systems Global Solution Services (GSS) offers a broad spectrum of professional service and support offerings including assessments, planning and design, implementation and transition, health checks, ongoing management and operations support and education. Employing best-in-class expertise, best practices, methodologies and tools, GSS guides enterprise organizations through data center transformation to realize the value of investments. GSS aligns infrastructure strategies to business and application requirements. This end-to-end methodology is enabled through our services value chain (see Figure 1).

Figure 1: Hitachi Data Systems Global Solution Services Systematic Approach to Services



Transformation Services from GSS are designed to accelerate data center transformation and provide an actionable plan to improve operational efficiency and flexibility, including:

- **Workshop services** — to help develop a high-level roadmap and strategies
- **Planning and Design services** — to create an assessment of the current state and a detailed roadmap to implement recommendations encompassing people, process and technology

To facilitate data migration associated with data center transformation, GSS deploys the skills and expertise of highly trained migration consultants. These consultants have migrated thousands of enterprise systems for Hitachi customers and are proficient with heterogeneous storage migrations.

"Today, much of the challenge for administrators remains to simply get a handle on capacity growth and managing the infrastructure, but the focus is rapidly shifting to managing a dynamic information environment."

*Brad Nisbet  
Program Manager,  
IDC Storage and Data Management Services  
Article: "HELP - I Need Somebody!", IDC, March 2010*

## Value to the Enterprise

The "ah-ha" moment, when data center transformation materializes, comes when the unexpected suddenly occurs in the business, and IT is able to swiftly and effectively respond. This proficient level of agility is achieved by embracing the four pillars of data center transformation: virtualization, automation, cloud-readiness and sustainability. Together, these form the foundation of nimble and cost-efficient IT operations that are aligned with business objectives.

Hitachi controller-based virtualization enables cohesive and scalable orchestration across servers and storage. Dynamic Provisioning proficiently handles the dilemma of allocated but unused capacity by spinning up new servers in minutes. Together, these agility technologies help speed the time to value for the enterprise. By automating labor-intensive tasks and those prone to human error, data centers become beacons for efficiency, accuracy and better data mobility. Transforming the data center goes hand-in-hand with cloud-readiness, by providing the capabilities to secure, scale and provision "on the fly." Infusing the data center philosophy with sustainable IT practices and greener technologies fosters more centralized management to address problems quicker, reducing downtime and costs.

## For More Information

As enterprises prepare to evolve their data facilities to map to the fickle and compounding business demands, Hitachi Data Systems is able to provide the solutions and services that maximize the return on IT investments and minimize the total cost of ownership.

For more information on data center transformation with Hitachi Data Systems, please visit [www.hds.com](http://www.hds.com).

## Hitachi Data Systems Corporation

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