Simplified Management With Hitachi Command Suite

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Contents

Executive Summary .................................................................................................................. 2

Introduction .......................................................................................................................... 3

Hitachi Command Suite v8: Key Highlights ........................................................................ 4
  Global Storage Virtualization Management ........................................................................ 4
  Integrated Management Operations .................................................................................... 4
  Storage Reporting Extensibility ......................................................................................... 5
  Storage Service Level Objective Profiles ......................................................................... 5
  Enhanced Performance Monitoring for Hitachi NAS Platform ........................................... 5
  Automated Storage Provisioning ......................................................................................... 5

Key Hitachi Command Suite Management Use Cases ...................................................... 5
  Centralized Management .................................................................................................. 5
  Unified Management Operations ....................................................................................... 7
  Integrated Data Mobility .................................................................................................... 7
  Automated Tiered Storage Management .......................................................................... 7
  Automated Storage Provisioning ....................................................................................... 8
  Service Level Management ............................................................................................... 10
  Integrated Storage Performance Analytics ..................................................................... 10

Summary .............................................................................................................................. 13
Executive Summary

Today’s data center has seen its responsibilities evolve from the storage of data to the management of information. As the requirements for more flexible, efficient information management have grown, Hitachi Data Systems has transformed its storage management products to meet those needs. Hitachi Command Suite (HCS) is a critical component of Hitachi Data Systems solution for integrated management of a global storage virtualization environment. It provides a comprehensive set of tools for IT and storage administrators to manage their infrastructure, their storage, their applications and their information.

While data centers have become increasingly complex and IT is looking for new ways to lower costs, HCS continues to enable simplified administrative practices. It improves storage management efficiency and productivity while enabling management automation. By providing a common set of management tools for administrators, HCS provides an integrated management framework for Hitachi virtualized storage and server environments. It unifies management across all Hitachi storage systems and data types. This capability combined with Hitachi Virtual Storage Platform (VSP) family systems (including VSP, VSP G1000, VSP midrange) and Hitachi Storage Virtualization Operating System (SVOS) enables IT organizations to build a software-defined infrastructure. This infrastructure helps them manage their growing storage needs and is always agile, available and automated.

Hitachi Command Suite empowers organizations to align business applications to the required data storage resources according to business-related objectives. Such objectives may include application quality of service, shared resource optimization and just-in-time delivery. HCS provides the necessary tools to properly provision and configure the storage environment with visibility all along the path from application through to the logical storage resources for true end-to-end monitoring. HCS effectively replaces manual procedures with unifying administrative operations and automation, leveraging a common management framework.

Simplification helps administrators manage their storage more effectively and reduce operational costs. HCS consolidates core storage administrative operations, combines best practice workflows with built-in intelligence, and facilitates automation of common management tasks. This approach reduces management complexity to simplify storage administration and eliminates the potential for errors.

Hitachi Automation Director software enables storage infrastructure self-service with intelligent workflows that incorporate best practices to automate repetitive administrative tasks such as storage provisioning. Through infrastructure abstraction, common and repeatable storage management tasks can be simplified, improving reliability and helping to deliver new IT services quickly.

Advanced Hitachi Dynamic Tiering software may do the most toward simplifying tiered storage management. Within Dynamic Tiering, many of the underlying technologies for tiered storage management have been automated and thus significantly reduce the need for information life-cycle management.

Hitachi Command Suite provides significant advantages in flexibility to speed deployment of and simplify IT management operations that complement the advanced capabilities of Hitachi storage systems. This approach helps to drive IT data center transformation, resulting in a software-defined management solution that can manage the data center of today and tomorrow.
Introduction

Hitachi Command Suite is an integrated software management framework that simplifies management operations and enables organizations to take full control of their storage infrastructure. HCS consolidates management across all Hitachi storage systems and data types to easily align storage to changing business application needs. At the same time, it centralizes administration for device configuration, data mobility, application service levels, storage performance optimization, replication and automation.

By providing an integrated set of management tools for administrators, HCS establishes common management practices for Hitachi virtualized storage and server environments. It enables IT organizations to build a software-defined infrastructure that is always agile, available and automated. With simplified, unified management of software defined storage virtualization, organizations can establish efficient data infrastructures. They can maximize use of existing storage assets and lower their ongoing operational costs.

Hitachi Command Suite provides an integrated management framework that encompasses the following six strategic management areas:

- **Control.** Simplifies management complexities while unifying management across all Hitachi storage systems, data types, servers and virtualized storage environments to facilitate agile deployments.

- **Analyze.** Helps users to gain key insights to improve storage performance and utilization, and avoid problems.

- **Optimize.** Increases return on investment (ROI) and efficiency by properly aligning business applications to the appropriate tiered storage resources.

- **Intelligence.** Enables intelligent business application views across virtualized storage infrastructures to ensure application-specific storage service level objectives are being met.

- **Protect.** Improves business continuity and high availability while reducing risks.

- **Automate.** Provides automated storage provisioning to increase reliability and lower management operational costs.
Hitachi Command Suite v8: Key Highlights

Global Storage Virtualization Management

Global storage virtualization is an advanced storage virtualization technology that provides new levels of abstraction of physical storage system resources to form new virtual storage machines. These virtual storage machines provide a complete separation between server and storage. They are independent of system, connectivity, location or vendor that attached servers or hosts see and manage as a single device.

Hitachi Command Suite is fully integrated with the Hitachi Virtual Storage Platform family and its Hitachi Storage Virtualization Operating System. Together, they create enterprise storage that redefines mission-critical storage virtualization. Powered with global storage virtualization, VSP G1000 provides the always-available, agile and automated foundation needed for a continuous cloud infrastructure.

SVOS is the software foundation for global storage virtualization. SVOS provides software-defined storage virtualization that elevates unified management across the new virtual storage machines. Virtual storage machines can enable a spanned virtualized volume or a global-active device across VSP G1000 or VSP midrange¹ systems (VSP G200, VSP G400, VSP G600 and VSP G800) that can be located up to 100km apart. This capability provides continuous access to an application that extends beyond the bounds of a single physical storage system. In addition, SVOS supports customer-driven nondisruptive migration between storage tiers and between physical VSP G1000 storage systems providing true workload mobility.

HCS integrates global storage virtualization management into its existing management framework to enable administrators to fully leverage and deploy global storage virtualization into their environment. The suite incorporates management practices to easily define the physical storage resources (storage system, parity groups, logical storage devices, storage ports and host groups) to create virtual storage machines and provision or allocate this new virtual storage resource to servers and applications within the IT infrastructure. Utilizing the same graphical user interface that can manage all Hitachi storage systems, HCS simplifies storage management operations for all Hitachi and 3rd-party virtualized storage resources under a centralized management framework.

Hitachi Command Suite addresses the dynamic nature of global storage virtualization, providing the visibility and monitoring required to optimize virtual storage machines. Hitachi Tuning Manager monitors and correlates all networked storage resources on the application’s data path from hosts through the SAN to the virtual storage machines. It works with key storage performance and latency indicators to properly conduct performance analytics for virtual storage machines. Its integrated storage performance troubleshooting aids facilitate quickly identifying and analyzing application performance bottlenecks to determine if storage is at fault. Hitachi Command Director provides storage service level management for virtual storage machines that enable the proper monitoring of application-based storage service levels. It improves application availability and helps you quickly identify any applications at risk.

Integrated Management Operations

Core storage management operations continue to be centralized and integrated within Hitachi Command Suite. Element manager functions from Hitachi Device Manager and Hitachi Storage Navigator are merged and consolidated under the HCS management console. Thus, user resource management and task operations can be combined, reducing complexity and improving storage configuration synchronization. By consolidating basic management tasks within HCS, improved operational efficiency can be achieved that further simplify administration, reduce administrator training and lower the operational costs of managing storage.

¹ Global-active device on Hitachi Virtual Storage Platform midrange family systems is a separately licensed feature available after initial release. Ask your HDS representative or partner for more information.
Storage Reporting Extensibility

A new standardized Hitachi Command Suite application programming interface (API) is available to improve performance data sharing and integration with existing management reporting systems. This Web-based API (also referred to as REST API) is platform and language independent that leverage standard HTTP based commands, such as GET, PUT, POST, and so forth. This interface enables enhanced data queries from HCS products. In particular it enables performance and capacity statistics from Hitachi Tuning Manager and Hitachi Command Director to be easily extracted and used with other management reporting systems.

Storage Service Level Objective Profiles

Hitachi Command Director incorporates new aids to help users to define storage service level objectives for different business applications. In addition to providing predefined service level objective (SLO) profiles for common business applications, Command Director can baseline historical performance of applications and their respective storage devices. This capability provides recommended SLOs that can be applied to an application. It simplifies the analysis required to properly define storage SLOs and the establishment of storage service level agreements for mission-critical business applications.

Enhanced Performance Monitoring for Hitachi NAS Platform

Hitachi Tuning Manager adds new monitoring features for Hitachi NAS Platform (HNAS) file storage to its existing end-to-end storage performance management capabilities. Tuning Manager provides accurate reporting of detailed file system storage performance. It covers key performance statistics of storage system component resources (such as CPU, controller, cache, ports), storage protocol operations (such as NFS, SMB, iSCSI or FTP) and latencies (read and write). As a result, it provides accurate performance reporting and troubleshooting for file servers. Tuning Manager simplifies performance analysis across a unified management infrastructure, covering both block- or file-based data that improves performance and availability for both file servers and business applications.

Automated Storage Provisioning

Hitachi Automation Director software provides automated management workflows that incorporate administrative best practices for storage provisioning. It provides intelligent storage analysis of your environment and recommended storage system configurations for leading business applications and hypervisors, such as Oracle databases, Microsoft® Exchange, Microsoft SQL Server®, Microsoft Hyper-V® and VMware. Thus, Automation Director can help to automatically determine the optimal location to allocate capacity for new storage requests and streamline storage provisioning processes and operations.

Key Hitachi Command Suite Management Use Cases

Centralized Management

As data continues its current growth trends, most application data sits in various silos within the infrastructure that is not easily inventoried or tracked. Hitachi Command Suite provides centralized management to discover and manage all virtualized storage resources using a common set of management tools. This capability enables administrators to centrally measure storage usage and capacity trends to maximize asset utilization. By consolidating storage asset management and operations across all virtualized storage resources, you can increase operational efficiency and reduce ongoing operational costs.

HCS leverages a common shared architecture that integrates the management products of the suite from the bottom up. Instead of separate products linked together, the software products in HCS use a common code base and a common database of shared configuration information. HCS software products all use the same graphical user interface, common user experience and share a common dashboard (see Figure 1). The transition from product to product is virtually
transparent to the administrator, who can simply click on a task function in a common menu instead of having to know which product within the suite is being accessed (such as Hitachi Device Manager or Hitachi Tiered Storage Manager software). All configuration and storage tier information is combined and synchronized in one database accessed by multiple products, rather than on separate databases requiring larger data repositories that could be subject to inconsistencies. This design improves the efficiency and reliability of storage management information, and it provides a consistent and more flexible user interface, as well.

Logical group constructs and logical storage device (LDEV) labels provide the ability to logically group related storage resources and apply meaningful labels to logical storage devices. The importance of this lies in the ability of logical groups and LDEV labels to be shared among many of the components of Hitachi Command Suite. As a result, these labels expose one of the key integration points of the suite as a whole. Use of logical groups and LDEV labels provides an enhanced organizational aspect to managing LDEVs that makes their reporting and provisioning easier.

For example, an administrator can define logical groups of storage resources according to how a company runs its business (by department and application). This action simplifies "application" mobility as it relates to application in-system and remote replication and application migration between storage tiers. The same logical group and LDEV label filters can be used as selection criterion by Hitachi Tiered Storage Manager to define migration operations or by Hitachi Replication Manager to build an application set of PVOLs in order to form a copy group. The combination of using logical groups and LDEV labels enables administrative scalability for organizations to centrally manage more storage with existing IT staff resources.

Figure 1. Hitachi Command Suite Dashboard
Unified Management Operations

Hitachi Command Suite enables unified management operations for advanced data and storage administration across all Hitachi storage environments and data types. By unifying block and file management capabilities, HCS delivers efficient management practices for Hitachi Unified Storage. It covers key administrative functions of device configuration, provisioning, system monitoring and service level management. Independent of storage configurations, HCS shares the same levels of consolidated operations, usability, task management and scalability. It helps IT organizations take full advantage of leading Hitachi storage technologies to address all their data type needs.

Integrated Data Mobility

Hitachi Command Suite provides integrated data mobility with Hitachi Tiered Storage Manager. This mobility simplifies the process of defining and managing storage tiers and policies while enabling volume-based movement of data between storage tiers. As data storage requirements change over time, volume migration tasks across virtualized storage tiers required for data life-cycle management can be performed non-disruptively, without interrupting business application operations.

By easily defining storage tier and custom data management policies, administrators can achieve maximum performance of application workloads in shared storage pools. With user-defined policies, application data can be moved automatically to the optimal storage tier to properly align with business application needs and increase storage utilization.

Hitachi Command Suite facilitates the administration of self-service, non-disruptive data migration workflows between storage tiers, virtualized storage systems and across data centers. It enables seamless data migration without the need for dedicated professional services. This approach enhances a global storage virtualization environment with advanced levels of workload mobility that greatly reduces the complexities associated with data migrations for storage resource consolidation or technology refresh projects.

Automated Tiered Storage Management

With Hitachi Dynamic Tiering, Hitachi Command Suite enables efficient, automated tiered storage management with page-based data mobility based on an I/O heat index. Data is dynamically moved to the appropriate tier based on its usage. The most frequently accessed data is moved to the top tier and less frequently accessed data is placed in a lower tier (see Figure 2). Dynamic Tiering leverages the technology used in Dynamic Provisioning to create a pool consisting of multiple tiers.

Hitachi Command Suite enables storage administrators to take full advantage of the capabilities and benefits of Dynamic Tiering without manual management of storage tiers, manual data classification or data migration. Data stored in a Dynamic Tiering volume is automatically moved to the most appropriate storage tier: The most critical, most frequently accessed data is stored on the highest performing tier, such as flash or solid state disk (SSD). Infrequently accessed data is moved to a lower tier reducing costs by taking advantage of less expensive disks, such as SATA. A new active flash mode feature of Hitachi Dynamic Tiering further improves performance with automated, fine-grained data movement. It provides subsecond, auto-tiering cycle times for rapidly active data instead of cycle times in seconds for continued lower response times. All movement is accomplished non-disruptively to the application and without causing any performance degradation. Just as with Dynamic Provisioning, only pages with data written to them take up physical disk space, improving capacity utilization and reducing waste. Data is dynamically allocated across each tier, taking advantage of wide striping and load balancing for optimal performance.

2 Active flash mode feature for Hitachi Dynamic Tiering will be available after initial release. Ask your HDS representative or partner for more information.
Automated Storage Provisioning

Hitachi Automation Director facilitates management automation for Hitachi Command Suite. It automates one of the more complicated storage management tasks of provisioning by abstracting both the storage service request and service fulfillment processes. With predefined service templates of storage provisioning workflows for common business applications, Automation Director enables the creation of a service template catalog to simplify and standardize new storage capacity requests (see Figure 3). With advanced infrastructure abstraction of virtualized storage resources, Automation Director enables the easy establishment of standard storage classes simplifying the service fulfillment of tiered storage resources.

These service templates can streamline storage provisioning (see Figure 4) tasks for business applications by leveraging existing best practices. For example, an Oracle service template may define requirements of high-performing Tier 1 storage for the application database while defining lower performing Tier 2 storage for the database logs. For service template customization, Automation Director includes an integrated service builder capability to facilitate modifying a template for specific user requirements or to add new management functions to an existing template. In addition, service template input fields can be further restricted to minimize the required input, thus allowing various administrators to use the template depending on their particular expertise.

For external management application integration, Automation Director also provides a standard REST-based API to easily integrate and execute Hitachi specific storage provisioning functions from within an existing IT management operation workflow.
Figure 3. Hitachi Automation Director Storage Service Template Catalog

Figure 4. Hitachi Automation Director Storage Provisioning Workflow
Service Level Management

Hitachi Command Director software centralizes service level management for Hitachi Command Suite by consolidating storage configuration, tier, capacity and performance data to enable informed management decisions. By providing a business-oriented view into the storage environment, Command Director simplifies application-to-storage reporting across block, file and unified storage environments. At the same time, it enables the implementation of application-based storage service levels.

From a global dashboard of the storage environment (see Figure 5), an administrator can quickly organize storage assets with specific service level objectives by application and monitor capacity and performance based service levels to ensure they are being met. Application storage service level recommendations simplify the creation of custom storage SLOs for business applications. By accurately monitoring key capacity and performance statistics provided to critical business applications and file servers, compliance to application service levels can be properly monitored and enforced.

Figure 5. Hitachi Command Director Global Dashboard

Integrated Storage Performance Analytics

Hitachi Command Suite provides integrated performance analytics with Hitachi Tuning Manager to quickly identify, isolate and find possible causes of storage performance bottlenecks. Tuning Manager maps, monitors and analyzes performance of network resources from the application, server through the SAN to the Hitachi storage system. It monitors all storage network resources, including hosts, file systems, databases, SAN switches, physical and logical storage devices, and
virtual storage machines. Tuning Manager provides the necessary visibility for performance optimization and management of the entire virtualized storage environment.

Integrated storage performance analytics (see Figure 6) within Hitachi Command Suite provides performance first aid to quickly identify and isolate whether an application performance issue is storage related and to help diagnose any storage performance bottlenecks. If additional performance details or diagnosis is required, Tuning Manager includes a Web-based reporting interface (see Figure 7). It provides deeper performance monitoring across a comprehensive range of performance and capacity metrics incorporating trending and custom reporting capabilities.

If advanced historical performance analysis and trending is required, Hitachi Data Center Analytics enables a highly scalable analytics solution. It provides fast discovery and analysis of multiple data management statistics across the entire data center, which complement the end-to-end monitoring capabilities of Hitachi Tuning Manager. The collected statistics are stored in an optimized Data Center Analytics database with comprehensive analytic reporting capabilities.

As server and storage virtualization grows more prevalent across the data center, storage capacity and performance planning becomes increasingly more challenging. Shared storage resources can easily become overtaxed, requiring lengthy workload analysis to determine the origin of the stress. Tuning Manager provides broad infrastructure monitoring and deep storage system analysis required to establish performance and capacity baselines as well as storage health checks. With informative reports and forecasting tools to eliminate the guesswork, you can easily optimize both capacity and performance planning within global storage virtualization environments. You can efficiently increase utilization of existing storage resources and plan for future growth.

Figure 6. Hitachi Command Suite: Integrated Storage Performance Analytics
Figure 7. Hitachi Tuning Manager Performance Reporter
Summary

Hitachi Command Suite helps to establish the automated management required for all Hitachi storage systems and accelerates delivery of global storage virtualization. This approach drives the Hitachi Data Systems vision of IT that is software-defined, automated, cloud-ready and sustainable: IT that transforms data centers into information centers. Hitachi Command Suite raises the bar in integration, simplification and centralized management. The capabilities of each product in the suite have been enhanced to support the latest advanced Hitachi storage technologies, particularly in the area of global storage virtualization.

The built-in intelligence in Hitachi Command Suite not only simplifies administrative tasks, but also helps users leverage existing Hitachi best practices in storage management. Combined with Hitachi Storage Virtualization Operating System, Hitachi Dynamic Tiering and Hitachi Automation Director, these practices dramatically increase the level of automated management and self-optimization in Hitachi storage solutions. Administrators can focus on fine-tuning, monitoring and managing the exceptions in their storage environment.

With Hitachi Command Suite, you can leverage existing IT investments longer, reduce management operational costs without added complexity, and increase storage asset utilization and efficiency. Hitachi Command Suite enables your organization to properly align the management practices needed today for your unique infrastructure environment while appropriately planning for future growth.