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**Veritas**  
**CommandCentral™ Storage**  
An Integrated Approach to  
Storage Resource Management

*July 2007*



# Veritas CommandCentral™ Storage

## An Integrated Approach to Storage Resource Management

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# Veritas CommandCentral™ Storage

## An Integrated Approach to Storage Resource Management

### **Executive summary**

One of the most perplexing challenges facing data centers today is that of storage management. The challenge of storage management has increased exponentially as information has become more valuable, computing environments have become more complex, and the cost to manage this growth has continued to spiral out of control. IT organizations are struggling to deal with the compounded growth of storage—estimated to be 55% for the average company—and the scalability and manageability issues caused by this growth. Storage growth is forcing IT organizations to look for better alternatives to help with the challenge of managing these vast resources while controlling the associated costs.

To reduce the cost of ownership for stored data of this massive scale and complexity, companies have already begun implementing technologies such as network-attached storage, storage area networks, and other tools that will allow them to manage this ever-growing environment, efficiently. Additionally, it is of paramount importance to IT executives to find a means of maximizing the utility of existing resources while allowing for flexible and cost-effective deployment of new storage. Symantec believes that a software-centric approach to managing a storage infrastructure offers the only hope of boosting administrator productivity, capping management costs, and providing a solid foundation for managing future enterprise storage growth.

Veritas CommandCentral™ Storage from Symantec is a comprehensive software solution that seamlessly integrates storage resource management, performance and policy management, storage provisioning, and management capabilities to keep infrastructure running as efficiently as possible. The active management of storage resources drives service-level agreements (SLAs), maintaining optimal performance and availability of business-critical applications by managing the entire data path, from application to array—and everything in between. If your desire is to enable IT to deliver storage services to the business that are measurable, accountable, and tightly integrated with business objectives, this paper describes a storage resource management (SRM) suite that can provide the tools you will need.

### **Veritas CommandCentral Storage—an integrated storage resource management suite**

An SRM solution should be a single solution that bridges the physical network and virtual resources with the logical data (applications and file data), providing a single, holistic view into

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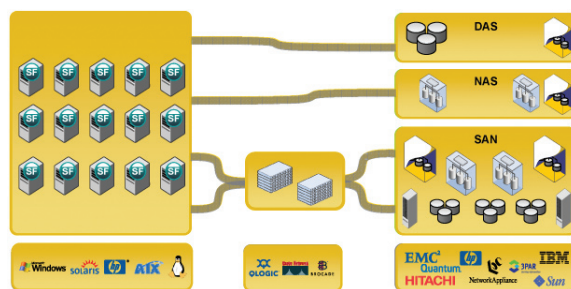
the storage environment. Veritas CommandCentral Storage allows users to manage the physical, virtual, logical, and business components of the storage environment.

Integration between Veritas CommandCentral Storage and Veritas Process Automation Manager™ will empower users to define and deliver comprehensive workflow methodologies, and to define and automate detailed process automation with the flexibility users demand to meet the needs of various departments or lines of business—vs. trying to conform to a one-model-fits-all concept.

### ***Discovery and visualization***

The base feature of any SRM solution should be the ability to automatically discover and visualize all storage assets and be able to report against those assets. Veritas CommandCentral Storage enables the automated discovery of elements and can take a user from no visibility to a full supply-chain view within a couple of days. Specifically, it provides:

- Auto-discovery and enclosure of arrays, LUNs, disks, Fibre Channel ports, and controllers
- Auto-discovery of switches and switch port mapping
- Auto-discovery and correlation of host bus adapters (HBA) to hosts
- Auto-discovery and resource correlation of databases and applications
- Auto-discovery of tape arrays and internal tape drives
- Auto-discovery of virtual servers and array virtualizers
- Customization of the topology layout (circular, fan, hierarchical, and network)
- View of assets' attributes (serial number, firmware, driver, WWN, etc.)
- Support for custom grouping of devices and applications
- Ability to define additional, unlimited attributes for any discovered object



**Figure 1. CommandCentral Storage supports heterogeneous systems and platforms in the data center**

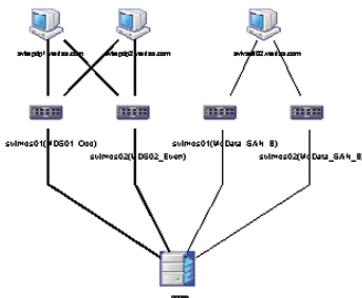
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### ***Dynamic mapping of physical devices to logical and virtual resources***

A critical component of the discovery and visualization capability is the mapping of physical resources to their associated logical and virtual components. Understanding resource dependencies from one end of the data path to the other—and everything in between that may impact critical user operations—is crucial in keeping data available. Veritas CommandCentral Storage mapping capabilities include:

- Auto-discovery of physical and virtual hosts running a given application and its storage resources
- Automatically created application group with associated resources down to spindle, including hosts, HBA(s), DMP, switch(es), zones, storage arrays (port, controller, disk), LUNs, maskings, and bindings
- Dynamically updated status of links and devices in the current view



**Figure 2. Dynamic topology view**

### ***Reporting***

Once the infrastructure has been discovered, Veritas CommandCentral Storage automates the collection and correlation of data, enabling users to move from manual tracking of assets on spreadsheets to a capacity management model with trending and forecasting capabilities. Veritas CommandCentral Storage provides predefined reports that enable users to analyze their storage network and associated resources. Using these reports, users can visualize the available storage

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and how it is allocated, monitor activity on the network, and make decisions about the best way to use storage resources. Comprehensive reporting categories include:

- **Online storage capacity**—analyze how storage is distributed among arrays and other devices and how it is allocated among hosts
- **Storage consumption**—analyze how storage is being consumed by hosts, volumes, and filesystems
- **Storage array replication capacity**—analyze how replicated storage, such as mirrors and clones, are allocated and used
- **Users**—analyze storage usage by users and user groups
- **Application growth**—analyze how storage is growing for applications and databases
- **File and directory aging**—monitor file & directory aging and identify the patterns with which users are accessing and updating files
- **File and directory usage**—analyze the most common file types; monitor the files and directories that use the most storage
- **File usage by user and domain**—analyze storage usage by users, groups, and domains
- **Duplicate and stale files**—monitor files that may not be needed because they are duplicated elsewhere in the enterprise or are not being used.
- **Potentially wasted space**—monitor problems with files and identify instances in which storage might be wasted
- **Physical inventory**—display an inventory of hardware objects such as arrays, hosts, and host bus adapters (HBAs)
- **Switch port usage**—analyze the usage of switch ports and director ports
- **Software inventory**—display an inventory of databases, host clusters, and applications
- **Switch port performance**—monitor traffic, performance, and error trends for the network
- **Array performance**—monitor performance trends for LUNs, physical disks, controllers, adapters, and cache in arrays
- **Host performance**—analyze read and write operations occurring between hosts and storage
- **Alerts**—analyze the incidence and severity of alerts for storage network objects
- **Global history**—monitor all alerts, changes, and change requests in the storage network
- **Change history**—analyze the history of changes in status and other characteristics for managed objects
- **Audit history**—analyze requests by users to change objects in the storage network

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- **Hardware inventory comparison**—compare hardware inventory and port usage data at two different times
- **Software inventory comparison**—compare usage and capacity data for databases and applications at two different times
- **VMware ESX server**—displays host and guest OS associations, storage allocations, and capacity utilization

Additionally, users may change the scope of selected reports to create customized reports that meet the unique needs of their environment.

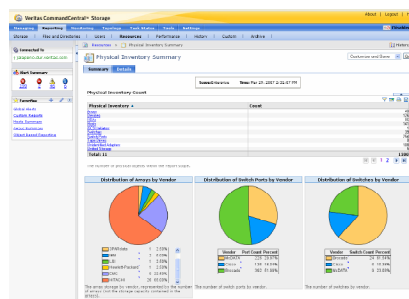


Figure 3. Storage capacity reports

### Central health monitoring and policy management

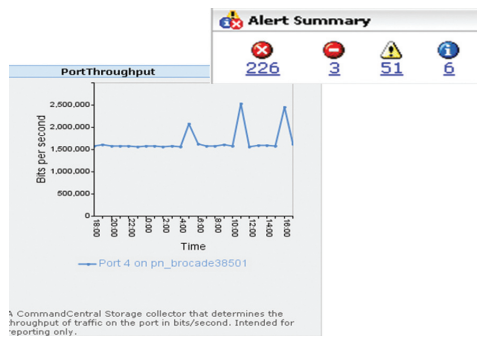
If storage and data are to remain highly available, users must be able to recognize and respond to problems on the storage network. Using information displayed on the Veritas CommandCentral Storage console monitoring tab, users can spot potential problems quickly and easily, enabling them to promptly (or automatically) initiate the necessary recovery actions. As it monitors activity on your network, Veritas CommandCentral Storage will perform actions in response to predefined conditions. These actions are performed via a mechanism known as a policy. Policy-based monitoring in Veritas CommandCentral Storage enables users to monitor conditions on the storage network and respond quickly when problems occur. The monitored conditions encompass several different categories, corresponding to the kinds of questions storage administrators typically ask:

- What is the traffic on my storage network?
- What is the environment status of hosts, switches, and disk arrays?

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- What errors is the storage network generating?
- Which ports and switches are unavailable on my fabric?
- How much space remains available in file systems on the storage network?



**Figure 4. Health check port throughput performance metrics**

Veritas CommandCentral Storage provides a number of out-of-the-box policies (more than 200) to help you streamline the management of your network immediately. You can also create and configure your own. By default, all policies shipped with Veritas CommandCentral Storage send alerts to the CommandCentral Storage console. Policy-based management and monitoring include features such as:

- Centralized policy management, ability to set alert policies on connectivity, capacity, performance, application status, etc.
- Ability to set multiple threshold levels on a given alert
- Ability to respond automatically to the severity of an alert
- Ability to take corrective action by sending an alert, SNMP trap, or e-mail; running a script; provisioning storage; or generating reports
- Ability to monitor events in real time
- Ability to monitor performance in real time and historically
- Ability to monitor capacity at a point in time and historically

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### Active device management

In the management section of the Veritas CommandCentral Storage console, users can view detailed information about storage resources and their relationships to each other, in a variety of formats. Users may also manage resources (for example, by defining attributes or by organizing them into groups and zones) and monitor alerts associated with common capabilities. For example:

- The ability to collect asset information (firmware, model, driver, manufacture, WWN)
- The ability to view storage resources that an HBA has access to
- The ability to set persistent HBA bindings

Major device management features include:

- **Switch**—configure zones (hard and soft) with change preview, zone sets (view, create, delete, modify, activate, or deactivate), and aliases, and enable or disable switch ports
- **Storage**—array management, support for LUN decomposition to disk(s), LUN masking and binding, ability to perform masking and binding across multiple LUNs, LUN binding to array port groups, LUN masking to array port groups, LUN creation, LUN creation from disk, LUN creation from existing LUNs, LUN deletion, and LUN expansion

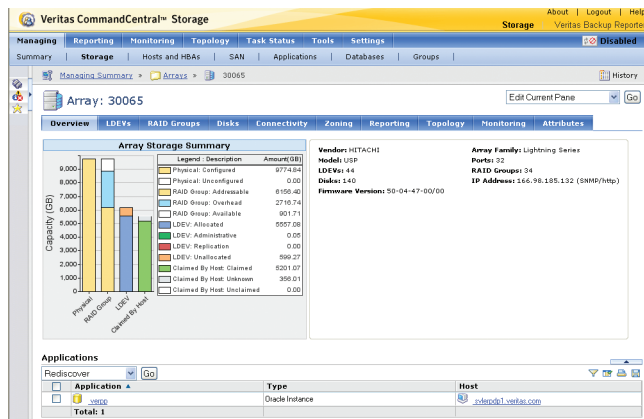


Figure 5. Array management

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### Storage provisioning

Storage provisioning is the term used to describe various operations that make storage array resources available to hosts on the storage network. Just as fabric zoning enables users to control the set of generic storage objects on the network that a host can access, storage provisioning provides granular control over host access to individual LUNs within an array.

Veritas CommandCentral Storage provides the following storage provisioning capabilities:

- **Power-assisted provisioning**—provides a single solution for end-to-end provisioning with support for querying the SAN for appropriate LUN(s); creation and deletion of array volumes; LUN masking and binding; creation, editing, saving, and deleting of array port host groups; creation, editing, saving, and deleting of fabric zone sets; zones; and scheduling of provisioning tasks at specific dates and times (LUNs are identified as reserved until the actual provisioning task completes)
- **Automated provisioning**—provides support for integrated workflow; selection of storage based on level of service requested; LUN creation; and LUN binding, masking, and zoning to host(s)

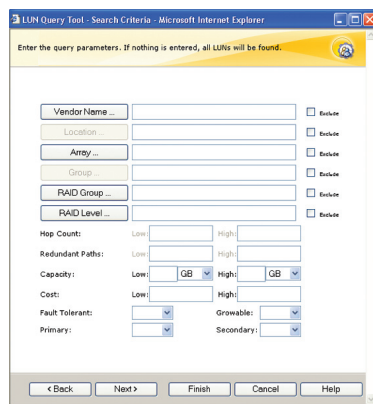


Figure 6. Provisioning wizard

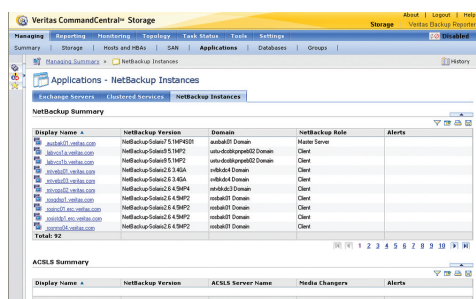
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### Application support

Applications are the most critical consumer of storage resources. Veritas CommandCentral Storage provides capabilities and support for applications as listed below:

- Automatic discovery of supported applications and their dependent resources
- Dynamic updating of application and dependent resources
- Ability to set thresholds against application and resources
- Notifications tied back to the affected application, host, etc.
- View of resources and dependencies from any point in the SAN
- Host, application, file system, volume, HBA, switch, array, LUN, disk
- Application support, including Oracle® (autodiscovery of IBM® DB2 instances and DB2 ESE support), Microsoft® SQL Server (discovery and management of Microsoft SQL Server instances, databases, file groups, and files), Sybase (discovery and management of Sybase Adaptive Servers, databases, segments, and Sybase logical devices), Microsoft® Exchange, Veritas™ Volume Manager, Veritas NetBackup™
- Auto-discovery of cluster status and associated resources with the ability to not double-count storage in a cluster environment
- Cluster support, including Microsoft Cluster, Veritas™ Cluster Server (identification of service groups and storage resources used by the cluster and correlation of service groups with DB2 and Sybase application instances and storage resources)
- Volume manager support, including Veritas™ Volume Manager (monitoring of state, performance [display of Volume Manager state and performance statistics, use of those statistics for policy setting and reporting]), HP®, AIX®, Windows®, Linux® native volume manager
- Support for VMware ESX (autodiscovery of ESX server configurations and storage allocation/ consumption)
- Multi-pathing support—Veritas Dynamic Multi Pathing and EMC Power Path (monitoring of path status, state setting)



The screenshot shows the Veritas CommandCentral Storage interface. The main window displays a table titled "NetBackup Summary" under the "Applications - NetBackup Instances" section. The table lists various NetBackup instances with columns for Display Name, NetBackup Version, Domain, NetBackup Role, and Alerts. Below the table, there is an "ACSL Summary" section with a similar table structure.

Display Name	NetBackup Version	Domain	NetBackup Role	Alerts
nsb011.veritas.com	NetBackup-5.0.0-15149-001	nsb0101 Domain	Master Server	
nsb012.veritas.com	NetBackup-5.0.0-15149-001	nsb0102 Domain	Client	
nsb013.veritas.com	NetBackup-5.0.0-15149-001	nsb0103 Domain	Client	
nsb014.veritas.com	NetBackup-5.0.0-15149-001	nsb0104 Domain	Client	
nsb015.veritas.com	NetBackup-5.0.0-15149-001	nsb0105 Domain	Client	
nsb016.veritas.com	NetBackup-5.0.0-15149-001	nsb0106 Domain	Client	
nsb017.veritas.com	NetBackup-5.0.0-15149-001	nsb0107 Domain	Client	
nsb018.veritas.com	NetBackup-5.0.0-15149-001	nsb0108 Domain	Client	
nsb019.veritas.com	NetBackup-5.0.0-15149-001	nsb0109 Domain	Client	
nsb020.veritas.com	NetBackup-5.0.0-15149-001	nsb0101 Domain	Client	
Total: 92				

Display Name	NetBackup Version	ACSL Server Name	Media Changers	Alerts
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Figure 7. NetBackup application reporting example

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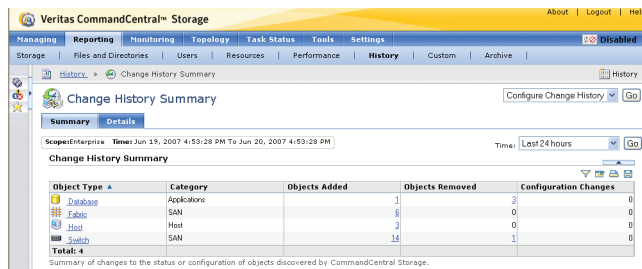
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### Audit tracking and change control

The audit tracking capability of Veritas CommandCentral Storage lists all user-initiated requests to change the status or configuration of objects in the network, including description, time, domain origin, user, and status. An example of when to use the audit tracking feature is to differentiate between hardware failures or user errors. Change control delivers the following functionality to aid in understanding changes occurring in the storage environment, to identify who is attempting to change a device's configuration, and to track changes with logging enabled.

The following specific capabilities are included in Veritas CommandCentral Storage:

- Change control management
- Reports on changes between current and past SAN configurations
- Change impact analysis
- The ability to analyze changes to storage resource accessibility or availability that may need to be modified
- Change log to allow archiving of change log reports and saving of filter settings for change log reports



The screenshot shows the 'Change History Summary' page in the Veritas CommandCentral Storage interface. The page displays a table with columns for Object Type, Category, Objects Added, Objects Removed, and Configuration Changes. The data is filtered for the time period from Jun 19, 2007 4:53:28 PM to Jun 20, 2007 4:53:28 PM. The table shows 1 Database object added, 3 Applications objects removed, 5 Fibre objects removed, 3 Host objects removed, and 14 Switch objects removed. A total of 4 objects were changed.

Object Type	Category	Objects Added	Objects Removed	Configuration Changes
Database	Applications	1	3	0
Fibre	SAN	0	0	0
Host	Host	0	0	0
Switch	SAN	0	14	0
<b>Total:</b>		<b>4</b>		

Figure 8. Change history summary

### Security

SANs allow any connected server to access any connected storage device. While this is extremely powerful and cost-effective, it also presents the risk of illegal access to data or accidental corruption or a complete loss of data. The Veritas CommandCentral Storage solution implements a common set of policies and processes to protect both information within a SAN and the availability of that information. From a common GUI across all SAN hardware, Veritas

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CommandCentral Storage empowers IT to manage the complex security of the SAN configuration by meeting all security service levels with:

- Storage array volume access control
  - Switch and fabric-based zoning
  - LUN management and port zoning at the storage subsystem
  - LUN masking at the server
- Volume access control on the host—provides direction on storage provisioning to maintain storage access rights of the volume manager on the host
- Device configuration access control—enables security through one management interface for every component type, regardless of the manufacturer
- Storage management software access—multiple layers of security for assigning administrative roles to appropriate storage and systems administration personnel; login and password-protected security levels to enable administrative classes to define the “span of control” of a given administrator or group
- Proactive detection and notification of access violations, auditing, and logging—provides proactive monitoring, auditing, and logging of significant event and alarm conditions; continuously monitors storage network for security violations and attempted violations; allows policies to be set to notify enterprise level IT management systems with alerts, e-mails, pages, or other means if there is a problem; logs all changes to security levels and SAN configuration and makes them available for auditing purposes

Through a single sign-on and sophisticated security model for storage management, malicious behavior (both internal and external) can be prevented or reduced by having a fully implemented roles-based security model that provides for authentication, authorization, and access control.

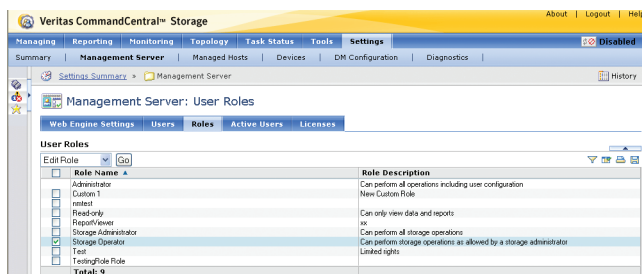
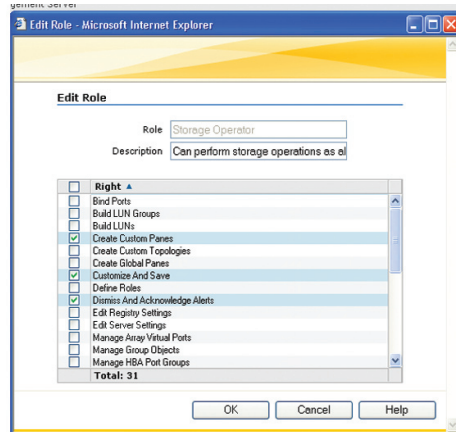


Figure 9. Access control for users

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**Figure 10. Edit administrative roles**

### Standard-based

To accelerate the emergence of SANs in the market, the industry required a standard management interface that would allow different classes of hardware and software products supplied by multiple vendors to reliably and seamlessly interoperate for the purpose of monitoring and controlling resources. As part of this effort, The Storage Networking Industry Association (SNIA) created the Storage Management Initiative Specification (SMI-S) to develop and standardize interoperable storage management technologies and aggressively promote them to the storage, networking, and end-user communities. This standard provides for heterogeneous, functionally rich, reliable, and secure monitoring and control of mission-critical global resources in complex and potentially broadly distributed multivendor SAN topologies.

SMI-S is based on the Web Based Enterprise Management (WBEM) architecture and the Common Information Model (CIM). It was pioneered by the Distributed Management Task Force (DMTF). Symantec has actively participated in the development of SMI-S and remains committed to the success of the project. Veritas CommandCentral Storage uses SMI-S as the primary means to identify, classify, monitor, and control physical and logical resources in a SAN. In addition to SMI-S Veritas CommandCentral Storage also supports the following industry-based standards: MS/CT, GS-3, GS-4, CIM, SNMP, Fibre Alliance MIB, ANSI T11. By adhering to industry standards, Veritas CommandCentral Storage overcomes the deficiencies associated with legacy management tools. This adherence to standards means that an investment in Veritas CommandCentral Storage

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will continue to be worthwhile, even in the face of unanticipated SAN changes and expansion through purchases, redeployments, and acquisitions—and that it will avoid the proprietary vendor lock-in common to most storage management tools on the market today.

### **Practical applications of Veritas CommandCentral Storage**

#### **Controlling the cost of storage using Veritas CommandCentral Storage**

To gain control of huge expenditures on disk, IT departments should be able to commoditize storage and be free to choose among vendors. Veritas CommandCentral Storage provides a solution for organizations with heterogeneous environments by allowing them to select the “best of breed” hardware for the most cost-effective pricing. With unmatched reporting capabilities and support for heterogeneous environments, Veritas CommandCentral Storage helps organizations to:

- Reduce operational and capital costs by providing common interface and same look-and-feel for management of multivendor devices and by reporting on total capacity vs. actual utilization of storage across the enterprise to help in reclaiming over-provisioned, wasted, or underutilized storage
- Reduce the amount of time and money spent managing large-scale storage networks by employing a more efficient, automated solution
- Increase price leverage with strategic storage hardware vendors by using a standards-based, heterogeneous management solution that helps prevent vendor lock-in
- Maximize return on storage investments by increasing utilization on existing storage infrastructure
- Improve ability to accurately forecast new capital investments in storage infrastructure
- Identify unused or wasted storage capacity that can be re-allocated to defer additional capital investments
- Align storage resource needs with revenue objectives by charging back departments for storage allocated or used

#### **Reducing time to provision, errors, and downtime with Veritas CommandCentral Storage**

Correct and complete provisioning has become more important as the number of change tasks continues to increase. Due to the complexity of SANs, a simple error in LUN masking can cause application downtime if provisioning is not performed with a high degree of knowledge about the

## Veritas CommandCentral™ Storage An Integrated Approach to Storage Resource Management

environment. Veritas CommandCentral Storage allows the user to complete more provisioning tasks per day, per storage administrator, while maintaining the highest level of accuracy through near-real-time monitoring. Veritas CommandCentral Storage helps to:

- Increase the number of provisioning tasks by quickly navigating through intuitive wizards
- Reduce human errors by guiding the user through the provisioning process
- Stage provisioning tasks to occur in the future such that manual input in provisioning work can take place during peak hours while the action itself takes place outside the critical window
- Filter storage selections presenting just the storage that is appropriate for the provisioning task
- Provide flexible provisioning at every level of the SAN: hosts, fabric, and storage
- View the storage network end to end to determine the effect of provisioning operation on the production applications

### **Enable storage tiers through Veritas CommandCentral Storage**

Users who are implementing a tiered storage strategy soon realize that spreading the data across different tiers of storage introduces several challenges. It is common practice to introduce two or three storage vendors, and that means using several different tools to manage specific storage devices. Veritas CommandCentral Storage addresses these challenges by:

- Providing heterogeneous storage management capability
- Visualizing applications and their dependencies
- Customizing reports on the metrics that are critical to the business
- Trending analysis to forecast purchases and growth
- Providing intelligence about the data to enable better decision-making on the appropriate class of storage

### **Using Veritas CommandCentral Storage for data profiling and ILM**

Many organizations are currently considering or implementing information lifecycle management (ILM) strategies across their storage environment. Key to the ILM planning process is to have access to a clear, accurate, and consistent data profile. Veritas CommandCentral Storage can provide critical information to an ILM project so that the architecture selected and the policies implemented can be both targeted and optimized to deliver the maximum benefits to the organization. Veritas CommandCentral Storage fosters the best ILM strategy, as it provides:

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- Consistent information on unstructured data across all major operating systems and the leading NAS systems
- Continuous automated collection, not sporadic manual processes
- Centralized management and reporting, even in globally distributed storage environments
- Trending and comparison of results over significant time periods to measure success and allow tuning
- Fully automated correlation between file- and directory-level SRM and array and SAN infrastructure information, making calculation of return on investment and enterprise efficiency possible

#### Support for ITIL frameworks through Veritas CommandCentral Storage

Information Technology Infrastructure Library (ITIL) is intended to assist organizations in developing a framework for IT service management. With Veritas CommandCentral Storage providing the technical foundation for a comprehensive management model such as ITIL, storage can be delivered as a service, incorporating the company's best practices and mapping service directly to the IT organization that provides the service. Veritas CommandCentral Storage can support an ITIL framework in the following areas of IT service management:

- **Configuration management**—provides a logical model of the physical infrastructure and storage services to identify, control, maintain, and verify managed storage elements
- **Incident management**—helps identify failure points so that service can be restored as quickly as possible. This minimizes the adverse impact of incidents on business operations and helps to ensure that the best possible levels of service quality and availability are maintained
- **Problem management**—helps to get at the root cause of incidents and can initiate actions to improve or correct the situation. It can also help to avoid errors within the storage infrastructure by enabling IT to capture best practices into single, repeatable, and automated processes
- **Change management**—minimizes the impact of change-related incidents upon service quality by helping to ensure that standardized methods and procedures are used for efficient and prompt handling of all changes. This will improve day-to-day operations of the organization
- **Release management**—reports against the rollout of software and related hardware in the storage infrastructure and track those changes

## Veritas CommandCentral™ Storage An Integrated Approach to Storage Resource Management

- **Service-level management**—helps maintain and improve storage service quality through a constant cycle of monitoring and reporting upon storage service achievements—eventually improving the relationship between IT and its users
- **Financial management for IT services**—provides a mechanism for a full accounting of storage services expenditures by directly relating costs to the services delivered to the business—for cost-effective stewardship of storage assets and resources used in providing services
- **Availability management**—optimizes the capabilities of the storage infrastructure and services and thus helps to deliver a cost-effective and sustained level of availability that enables the business to satisfy its business objectives.
- **Security management**—implements a common set of policies and processes to protect the information and the availability of the information within a storage infrastructure by assigning specific roles to users and associating those roles with specific permissions
- **Capacity management**—helps to ensure that cost-justifiable storage capacity always exists and that it is matched to the current and future identified needs of the business.

### Conclusion

In the recent past storage, management tools have been compared on equal footing with the point tools provided by hardware vendors. These hardware management tools typically did one or two operations well, but had to be used with other point tools on other hardware to perform a storage management function.

With the advent of Veritas CommandCentral Storage, this is no longer the case. A single software platform can be used to complete an entire storage management function (reporting on storage utilization across different array types, for example, or complete provisioning from spindle to host LUN). With budgets decreasing, storage requirements increasing, and a continuing shortage of skilled individuals to manage storage infrastructures, the need for better storage management is upon us.

## About Symantec

Symantec is a global leader in infrastructure software, enabling businesses and consumers to have confidence in a connected world.

The company helps customers protect their infrastructure, information, and interactions by delivering software and services that address risks to security, availability, compliance, and performance. Headquartered in Cupertino, Calif., Symantec has operations in 40 countries.

More information is available at [www.symantec.com](http://www.symantec.com).

For specific country offices and contact numbers, please visit our Web site. For product information in the U.S., call toll-free 1 (800) 745 6054.

Symantec Corporation  
World Headquarters  
20330 Stevens Creek Boulevard  
Cupertino, CA 95014 USA  
+1 (408) 517 8000  
1 (800) 721 3934  
[www.symantec.com](http://www.symantec.com)

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