

IBM SmartCloud Virtual Storage Center Solution

IBM Redbooks Solution Guide

With data growth showing no signs of slowing, it is imperative that organizations improve their storage efficiency and reduce administration complexity. The need for economic and operational efficiencies is common to all organizations. Commercial businesses, non-profits, government departments, and large and small enterprises are all striving to make the most of what they have. This IBM® Redbooks® Solution Guide describes how to use the IBM SmartCloud® Virtual Storage Center (VSC) to integrate your existing storage technologies into a virtual storage center.

The IBM SmartCloud Virtual Storage Center provides a cost-effective method to integrate existing storage technologies into a storage cloud. The IBM SmartCloud Virtual Storage Center has three central characteristics that are key to harnessing today's massive volumes of data for business insight and success. It is efficient by design, self-optimizing, and cloud agile, as depicted in Figure 1 and described in this guide.

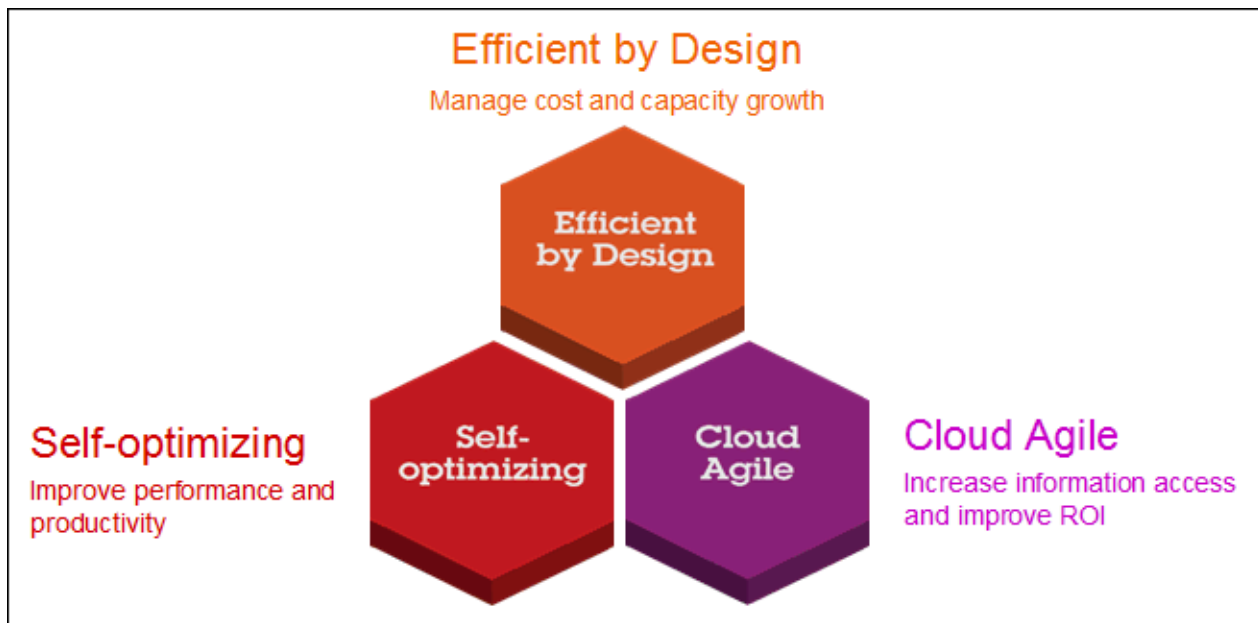


Figure 1. The characteristics of IBM SmartCloud Virtual Storage Center

Did you know?

With the SmartCloud Virtual Storage Center solution, you can realize all of the following benefits without a disruptive "remove and replace" of existing storage systems:

- Turn storage into an agile cloud-based storage environment and manage it effectively without having to replace existing storage systems.

- Greatly reduce your cost of storage with advanced analytics.
- Balance workload and dramatically improve data center performance.
- Implement the complete set of advanced functions available in the IBM Tivoli® Storage Productivity Center, IBM SAN Volume Controller (SVC), and IBM Tivoli Storage FlashCopy® Manager under one license.

Business value

IBM SmartCloud Virtual Storage Center is focused on client value, helping our clients achieve better business outcomes by:

- Offering clients a holistic approach to information storage that addresses all aspects of the challenge and offers multiple starting points
- Leading the industry in storage efficiency and ease of use by integrating efficiency technologies and automation into our offerings
- Transforming innovation into practical benefits for our clients by turning IBM Research breakthroughs into commercial products

IBM offers a solution to smooth this transition from traditional to virtual storage while ensuring the safety of the organization's data in this new environment. VSC provides efficient virtualization management and data protection for heterogeneous storage environments. It also facilitates ease of use, expanded flexibility, and automated data protection.

There can be significant costs associated with the data that your business relies on. Virtual Storage Center software includes the following capabilities to help you manage that expense:

- Balance workload, manage lease termination, and improve data center performance.
- Optimize your people resources for the challenges of day-to-day operations.
- Dramatically improve utilization of your physical assets with pooled physical resources from virtually any disk array vendor or tier. See Figure 2 for a view of a customer environment as displayed in the Tivoli Storage Productivity Center GUI.
- Free IT from the cost and complexity of legacy data management products.
- Get ahead of runaway data growth and Big Data.
- Be online quicker and access clones faster.
- Transform your backup infrastructure into a service. The data backup and restore component in the VSC provides fast application-aware backups and restores, leveraging advanced snapshot technologies available with the IBM storage systems.

Solution overview

The IBM SmartCloud Virtual Storage Center is both a storage virtualization platform and a storage management solution. And it provides much more than just improved efficiency and data mobility.

In addition to the powerful features of the VSC, which removes the physicality of storage and the complexity associated with managing multi-vendor infrastructures, this solution provides a simpler licensing model and the synergy you gain from running these products together. The storage hypervisor technology provides increased flexibility and improved utilization of physical assets, and can be used to help reduce reliance on tier 1 storage.

SmartCloud Virtual Storage Center storage analytics engine functions

Included in this solution is a storage analytics engine that provides data management with file system and database scanning and analysis, data placement, and user quotas. The storage analytics functions include the following capabilities:

- Storage functions
 - Configuration preferred practices
 - Configuration history (change management)
 - SAN planner (path, zone, volume, and replication planners)
 - Storage optimizer
 - Tiered storage optimizer
- Data-related functions
 - NAS discovery
 - Policy management (quotas based on profiles)
 - Server probes and roll-up reports
 - File system scans for data analysis and wasted space reports
 - Tivoli Storage Manager interface for files not backed up
 - Data Manager for databases

IBM SmartCloud Virtual Storage Center enables all three smarter storage characteristics for your existing storage infrastructure. It is efficient by design, self-optimizing, and cloud agile.

Efficient by design

IBM SmartCloud Virtual Storage Center has built-in efficiency features that help users avoid the need to purchase add-ons or additional licenses, or to deal with complicated integration issues. The advanced efficiency features include:

- Storage virtualization
- Advanced, easy-to-use GUI
- Thin provisioning
- Efficient remote mirroring

Storage virtualization using VSC allows you to virtualize storage resources from multiple arrays and vendors. Pooling storage devices allows you to access capacity from any storage system, a significant advantage over the limitations inherent in traditional storage.

Self-optimizing

Self-optimizing storage adapts automatically to workload changes to optimize application performance, eliminating most manual tuning efforts. The self-optimizing features of IBM SmartCloud Virtual Storage Center include:

- **IBM Storage Analytics Engine**. IBM SmartCloud Virtual Storage Center uses performance metrics and advanced analytics to make storage tier recommendations. It enables storage tiering decisions to be made based on actual usage patterns, rather than on predictions. Data migration is simple and does not disrupt users or applications. This technology can reduce the unit cost of storage by as much as 50 percent, based on deployment in a large IBM data center.
- **IBM System Storage® Easy Tier®**. IBM SmartCloud Virtual Storage Center implements flash optimization with this premier technology for automated tiering of critical data. Easy Tier helps make the best use of available storage resources by automatically moving the most active data to the fastest storage tier, which helps applications and virtual desktop environments run up to three times faster.

Cloud agile

Cloud computing is all about agility. Storage for clouds must be as flexible and service-oriented as the applications it supports. IBM SmartCloud Virtual Storage Center can turn your existing storage into a private storage cloud with no “rip and replace” required. The solution enables you to adapt to the dynamic storage needs of cloud applications by providing storage virtualization, automation, and integration for cloud environments. The following features make this agility and adaptability possible:

- **OpenStack cloud application provisioning** . SmartCloud Virtual Storage Center includes an OpenStack Nova-volume driver that enables automated provisioning using any of the storage systems controlled by IBM SmartCloud Virtual Storage Center. OpenStack cloud applications can gain access to multiple storage tiers and services, without added complexity.
- **Self-service portal**. SmartCloud Virtual Storage Center can provide provisioning automation for self-service storage portals. This enables immediate responses to service requests while eliminating manual administration tasks.
- **Pay-per-use invoicing**. SmartCloud Virtual Storage Center integrates with SmartCloud Cost Manager, which is an optional chargeable product, and other chargeback systems to enable flexible usage accounting for storage resources. VSC can become the single source for usage metrics across SAN storage systems, network-attached storage, and direct-attached storage.

Advanced graphical user interface (GUI)

The IBM SmartCloud Virtual Storage Center uses the IBM Tivoli Storage Productivity Center GUI, which helps to reduce administration complexity and the time required to manage storage. With this single interface, administrators can perform configuration, management, and service tasks in a consistent manner across multiple storage systems, even from different vendors. The GUI also includes built-in IBM recommendations to help simplify storage provisioning so that new users can get started quickly. IBM Tivoli Storage Productivity Center provides *visualization* of what is in the environment, including storage, servers, and switches. In addition, IBM Tivoli Storage Productivity Center is targeted towards management of storage service levels such as *provisioning* and *optimization*. *Monitoring* is done from a storage services perspective rather than from a hardware perspective.

Figure 2 shows the IBM Tivoli Storage Productivity Center GUI.

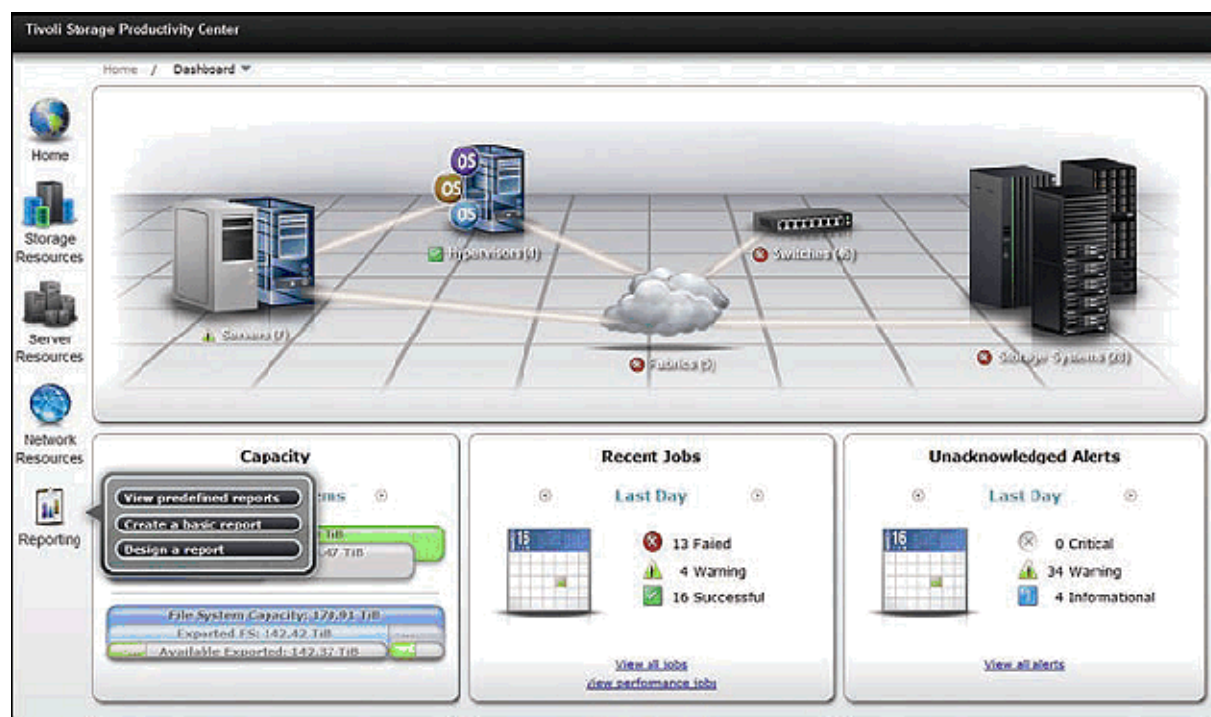


Figure 2. IBM SmartCloud Virtual Storage Center GUI

Storage hypervisor

Server hypervisor has a well understood value connotation, which can be summarized as follows:

- Pooled physical resources are consumed by virtual machines, resulting in high asset utilization.
- Virtual machines are mobile, giving CIOs their choice of physical server device.
- A common set of value capabilities and centralized management are provided for virtual machines, regardless of what physical server they are sitting on, which results in cost savings and flexibility.

Storage hypervisor is a rapidly emerging way of describing the same value points in a storage context. IBM leads the way in virtualized storage infrastructures, as the following highlights show:

- Like VMware vSphere Hypervisor for servers. the IBM Storage Hypervisor comes in both midrange (Storwize® V7000) and enterprise (SAN Volume Controller) packages.
- Like VMware vCenter Server for servers. IBM Tivoli Storage Productivity Center unifies and simplifies virtual storage management.

Solution architecture

SmartCloud Virtual Storage Center offers both a storage virtualization platform and capabilities for storage virtualization management. Under one licensed, cost-effective software product, SmartCloud VSC V5.1 delivers to customers the complete set of advanced functions available in IBM Storage Productivity Center, all the functions available with the virtualization, remote-mirroring, and FlashCopy capabilities of IBM System Storage SAN Volume Controller (SVC), and all of the capabilities of IBM Tivoli Storage FlashCopy Manager.

Figure 3 provides a high-level overview of the entities that make up the IBM SmartCloud Virtual Storage Center, which are built on IBM's Virtualized Storage foundation.

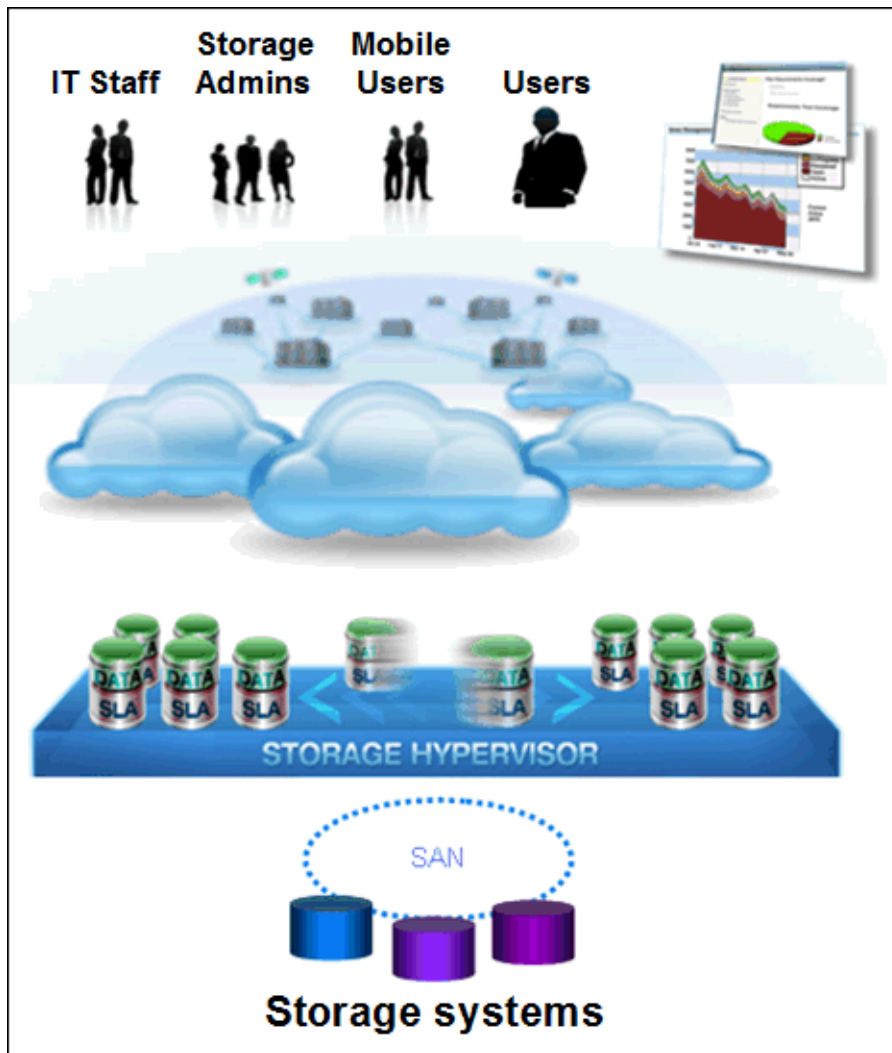


Figure 3. High-level architectural overview of IBM SmartCloud Virtual Storage Center

This architecture produces the following benefits:

- Physical resources from multiple arrays, vendors, and data centers are pooled together and can be accessed anywhere.
- Common capabilities are delivered regardless of storage class or vendor.
- Storage volumes can be moved on the fly based on workload balancing policies, without disrupting service.
- Centralized management frees your people for the challenges of day-to-day operations.
- With pay-per-use storage resources, end users are aware of the impact of their consumption and service level choices.

Whether you are on the path to building your own storage cloud solution or you want a complete solution immediately, IBM SmartCloud Virtual Storage Center can fulfill that need. Figure 4 illustrates the set of

functions with SAN and Storage Management provided by Tivoli Storage Productivity Manager. External storage virtualization is provided by SVC, and snapshot management and remote-mirroring capabilities are provided by IBM Tivoli Storage FlashCopy Manager.

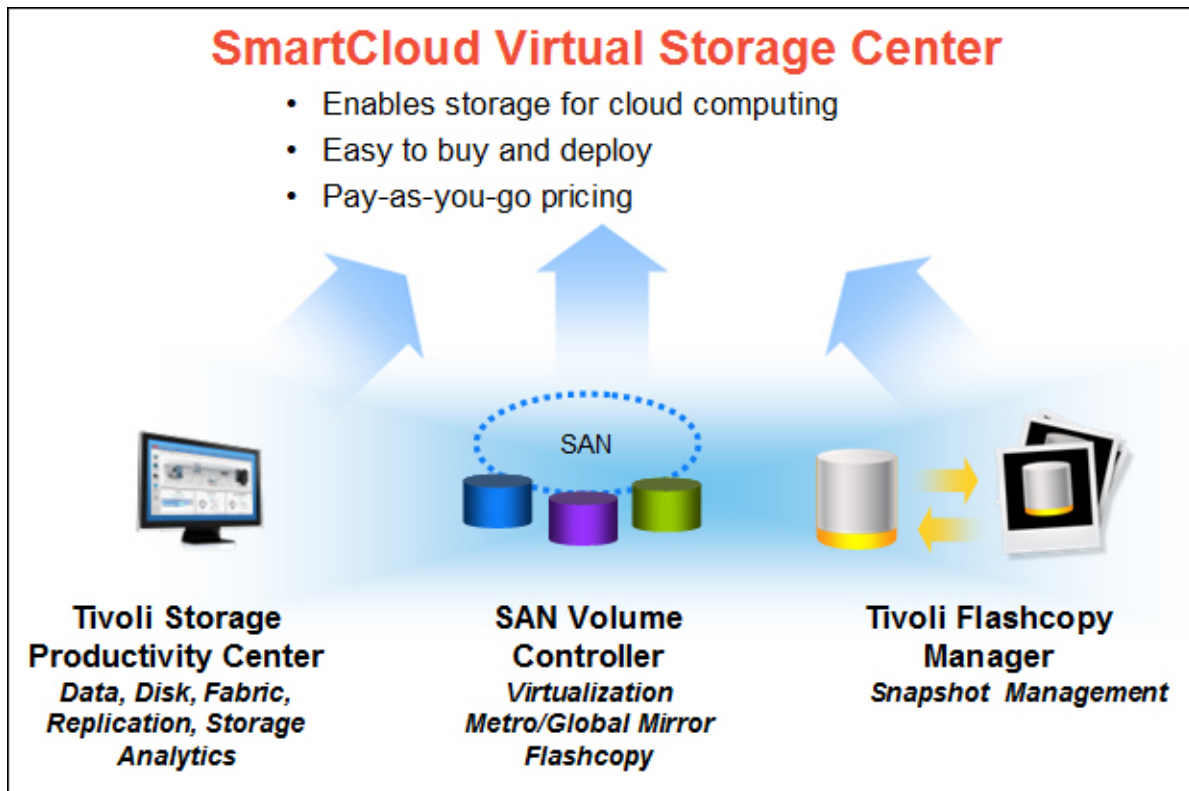


Figure 4. IBM SmartCloud Virtual Storage Center software solution components

The components of the SmartCloud Virtual Storage Center that provide the functionality depicted in Figure 4 are described in the following sections.

IBM SAN Volume Controller

IBM System Storage SAN Volume Controller (SVC) V6.4, the virtualization platform component in SmartCloud Virtual Storage Center, is designed to deliver storage virtualization in environments from large enterprises to small and mid-size organizations. It can help meet storage requirements that tend to grow at a fast rate and reduce the cost of managing the storage requirements that are taking over many IT budgets.

Using the Metro Mirror and Global Mirror remote replication functions, SVC helps administrators balance network bandwidth requirements and recovery point objectives for applications, thus reduce operating costs for disaster recovery solutions.

IBM Tivoli Storage Productivity Center

Tivoli Storage Productivity Center Standard Edition V5.1, the management component in SmartCloud Virtual Storage Center V5.1, provides advanced storage infrastructure and data management capabilities. The Tivoli Storage Productivity Center management component is the central GUI from which you can launch the Element Managers (for example, SVC or switches). In addition to these features, the SmartCloud VSC provides a storage analytics engine that provides data management with file system and database scanning and analysis, data placement, user quotas, and a Tivoli Storage Manager interface.

IBM Tivoli Storage FlashCopy Manager

Tivoli Storage FlashCopy Manager V3.2, the data backup and restore component in SmartCloud Virtual Storage Center V5.1, provides fast, application-aware backups and restores by exploiting the advanced snapshot technologies that are available with IBM storage systems. The benefits of this solution include:

- Application-consistent backups can be performed in minutes without taking the application off line.
- Restores can be performed in just a few minutes instead of hours.

Usage scenarios

SmartCloud Virtual Storage Center helps customers easily migrate their storage to a virtual environment and manage storage efficiently. SmartCloud Virtual Storage Center is a cross-industry offering, appealing to many industries, including data-intensive sectors such as banking, insurance, healthcare, media and entertainment, and telecommunications. SmartCloud VSC licensing charges are based on managed capacity. This contrasts with SAN Volume Controller, where FlashCopy and metro/global mirror are licensed on virtual capacity. The managed capacity model avoids over-provisioning, which can become expensive with SVC.

The following sections present overviews of actual experiences from customers who have made the switch to a software-defined storage infrastructure and have achieved some amazing results.

Usage Scenario 1 - Streamlining infrastructure

A large telecommunications company has low utilization of existing assets due to the lengthy time needed to phase in new and phase out old storage systems. driving significant capital costs with heavy reliance on Tier 1 storage.

The solution is to streamline their Infrastructure with storage efficiency by implementing the IBM SmartCloud Virtual Storage Center. By leveraging storage efficiency features to apply a combination of storage virtualization, storage resource management, and snapshot management, the process of phase in/phase out is faster with SVC, so new storage can be purchased later and migration is faster.

Implementing a virtual storage infrastructure and exploiting storage efficiency features enabled this company to:

- Provide thin provisioning
- More than double the utilization of their storage footprint, from 35% to 78%
- Reduce reliance on high cost Tier 1 storage, from 70% to 30%

Usage Scenario 2 - Managing growth

A large office equipment manufacturing company needs to accommodate growing storage needs and increasing backup requirements without interrupting availability or spending a great deal of money.

The company implemented an IBM SmartCloud Virtual Storage Center solution to provide:

- Storage virtualization
- Storage resource management
- SVC Flash copy and Tivoli Storage FlashCopy Manager

The IBM virtualized storage solution provides efficient, cost-effective storage for the data center, enabling:

- Better management of the storage environment
- Reduced hardware footprint

Usage Scenario 3 - Reducing reliance on Tier 1 storage

The IBM CIO office seeks a solution to lower costs associated with internal storage, deploy smarter storage management, and begin migration to next-generation data center and cloud.

This IBM solution was implemented:

- Storage virtualization
- Tiered storage optimization
- Storage resource management

The solution provides the following benefits:

- Migrating inactive data to lower-cost storage frees up primary storage and its associated costs.
- Automating tiering and migration reduces administrator tasks and risks.
- Unit cost is reduced by 50%.
- The projected savings on infrastructure costs over the next three years is \$13M.

Integration

VSC is cloud-ready with a set of APIs that integrate with other IBM products in the SmartCloud family that can further improve the efficiency at which the storage infrastructure is running. VSC provides a broad set of integration points to help users establish a cloud strategy that leverages both block and file capabilities, either in a private or public cloud configuration.

SmartCloud VSC V5.1 has advanced capabilities and can be integrated with other IBM products and technologies, including:

- A next-generation, web-based management interface that is designed to offer ease of use. The new user interface provides quick access to key storage assets, status, and performance information, and is based on the interface in the current IBM XIV® Storage System and other IBM storage systems.
- IBM Cognos-based reporting, which helps create and integrate custom reports on capacity, performance, and utilization.
- IBM Scale Out Network (SONAS) and IBM Storwize V7000 Unified to provide the ability to perform automated discovery and provisioning of file systems.
- Optional separate licensing for the integrated IBM real-time compression capability, which enables compression for production data.

Supported platforms

For the most up-to-date information about supported hardware and platforms for the IBM SmartCloud Virtual Storage Center server and client, and associated IBM products, refer to:

<http://www.ibm.com/common/ssi/fcgi-bin/ssialias?subtype=ca&infotype=an&appname=iSource&supplier=897&letternum=ENUS213-099>

For Tivoli Storage Productivity Center V5.1 components and supported platforms:

<http://www-01.ibm.com/support/docview.wss?uid=swg27024859>

For hardware and software requirements for IBM Tivoli Storage FlashCopy Manager® V3.2:

<http://www-01.ibm.com/support/docview.wss?uid=swg21612732>

For SAN Volume Controller (SVC) 6.4 supported hardware, device drivers, firmware, and recommended software levels:

<http://www-01.ibm.com/support/docview.wss?uid=ssg1S1004111>

Ordering information

This section describes license and ordering information for the IBM SmartCloud Virtual Storage Center. Table 1 provides the ordering part numbers and feature codes.

License function title: This program is licensed under the IBM Program License Agreement (IPLA) and the associated Agreement for Acquisition of Software Maintenance, License Information Form number L-JSHW-8XNF7U, available for review on the IBM Software License Agreement website: <http://www.ibm.com/software/sla/sladb.nsf>

Product group: Tivoli Storage
Product category: Tivoli Storage Productivity Center

Table 1. Ordering part numbers and feature codes

Program name	Version	PID number
IBM SmartCloud Virtual Storage Center (for Passport Advantage®)	5.1	5725-F92
IBM SmartCloud Virtual Storage Center (For Advanced Administrative System: AAS)	5.1	5608-W08

Passport Advantage trade up: You must have previously acquired a license for the precursor product to be eligible to acquire an equivalent license of the trade-up product. For more details, see: <http://bit.ly/10Rv2sV>

Related information

For more information, see the following documents:

- IBM Offering Information page (to search on announcement letters, sales manuals, or both):
<http://www.ibm.com/common/ssi>
On this page, enter the solution name of interest (SmartCloud Virtual Storage Center, Tivoli Storage Productivity Center, and so forth), select the information type, and click **Search**. On the next page, narrow your search results by geography and language.
- IBM Redbooks document: *IBM Storage System Solutions Handbook, 10th Edition*, SG24-5250:
<http://www.redbooks.ibm.com/redpieces/abstracts/sg245250.html?Open>
- *IBM SmartCloud Virtual Storage Center: Virtual storage made simple*, whitepaper:
<http://public.dhe.ibm.com/common/ssi/ecm/en/tis14108usen/TIS14108USEN.PDF>
- IBM Software, product page for IBM SmartCloud Virtual Storage Center:
<http://www-142.ibm.com/software/products/us/en/vsc>
- IBM Offering Information page for IBM SmartCloud Virtual Storage Center V5.1 (announcement letters and sales manuals), Announcement 212-185:
<http://ibm.co/15R82NK>
- Software Announcement ZP12-0243, 04 June 2012, Tivoli Storage Productivity Center V5.1:
<http://ibm.co/10SfuW0>
- Software Announcement 212-372, 03 October 2012, Tivoli Storage FlashCopy Manager V3.2:
<http://ibm.co/156PkiM>
- Software Announcement 212-181, 04 June 2012, IBM System Storage SAN Volume Controller V6.4:
<http://ibm.co/13XOzfl>
- Software Announcement 212-180, 04 June 2012, IBM Storwize V7000 V6.4:
<http://ibm.co/WMf6uD>

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