

IBM Tivoli Storage Productivity Center V5.2 **Release Guide**



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IBM Tivoli Storage Productivity Center V5.2 Release Guide

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Note: Before using this information and the product it supports, read the information in "Notices" on page ix.

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Preface

IBM® Tivoli® Storage Productivity Center V5.2 is a feature-rich storage management software suite. The integrated suite provides detailed monitoring, reporting, and management within a single console. In addition, implementing the IBM SmartCloud® Virtual Storage Center (VSC) license with Tivoli Storage Productivity Center addresses new workloads that require massive scale and rapid pace, and accelerates business insight, by adding advanced analytics functions such as storage optimization, provisioning, and transformation.

This IBM Redbooks® publication is intended for storage administrators and users who are installing and using the features and functions in IBM Tivoli Storage Productivity Center V5.2. The information in this Redbooks publication can be used to plan for, install, and customize the components of Tivoli Storage Productivity Center in your storage infrastructure.

Note: This IBM Redbooks publication is written and based on Tivoli Storage Productivity Center V5.2.2.

Sections in this book that pertain to advanced analytics, including cloud configuration, provisioning, transforming volumes, and storage optimization all require the IBM SmartCloud Virtual Storage Center license to be installed.

Authors

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1

Tivoli Storage Productivity Center V5.2 overview

IBM Tivoli Storage Productivity Center V5.2 provides a set of tools for managing storage capacity, availability, events, performance, and resources. It can reduce the complexity of managing a storage environment by centralizing, simplifying, and optimizing storage tasks that are associated with storage systems, storage networks, replication services, and capacity management.

Use this chapter to learn about new and enhanced features in Tivoli Storage Productivity Center V5.2, including the latest updates to the cloud configuration and provisioning functions. The chapter also highlights the differences and changes from the Tivoli Storage Productivity Center V5.1 release.

Note: This IBM Redbooks publication is written and based on Tivoli Storage Productivity Center V5.2.2.

1.1 Licensing

The Tivoli Storage Productivity Center V5.2 and Tivoli Storage Productivity Center Select Edition V5.2. licenses are the same as in Tivoli Storage Productivity Center V5.1.

The following are supporting programs licensed with Tivoli Storage Productivity Center V5.2 and Tivoli Storage Productivity Center Select Edition V5.2:

- ► IBM DB2® Enterprise Server Edition Version 10.1 Fix Pack 3a (64-bit)
- IBM Tivoli Monitoring 6.3 Server
- ► IBM Jazz[™] for Service Management 1.1.0.3

1.1.1 IBM SmartCloud Virtual Storage Center Storage license

With Tivoli Storage Productivity Center V5.2, the license that was previously called IBM Tivoli Storage Productivity Center Advanced is now the IBM SmartCloud Virtual Storage Center (VSC) license.

The IBM SmartCloud Virtual Storage Center license contains everything in the IBM Tivoli Storage Productivity Center license, and also includes advanced analytical functions. Note that the Tivoli Storage Productivity Center user interfaces and messages still refer to this license as IBM Tivoli Storage Productivity Center Advanced.

The new name of this license reflects its inclusion in the Virtual Storage Center solution, which bundles Tivoli Storage Productivity Center with IBM System Storage® SAN Volume Controller and IBM Tivoli Storage FlashCopy® Manager. By bundling these separate products, Virtual Storage Center provides a combined storage virtualization platform and storage management solution.

Virtual Storage Center provides the advanced capabilities of Tivoli Storage Productivity Center, such as storage tier optimization and volume workload distribution. The Virtual Storage Center license is only available as part of the Virtual Storage Center solution.

The complete IBM SmartCloud Virtual Storage Center V5.2 solution bundles Tivoli Storage Productivity Center with IBM System Storage SAN Volume Controller and Tivoli Storage FlashCopy Manager. In the solution, System Storage SAN Volume Controller provides a virtualization platform and remote replication functions, and the Tivoli Storage FlashCopy Manager provides data backup and restore capabilities.

The following are supporting programs licensed with the IBM SmartCloud Virtual Storage Center V5.2:

- Tivoli Storage Productivity Center V5.2
- IBM Storwize® Family SAN Volume Controller Software V7.2
- IBM Tivoli Storage FlashCopy Manager 4.1

Web-based GUI advanced analytical functions

In addition to the Tivoli Storage Productivity Center functions, the following advanced analytical functions are available in the web-based GUI:

- Optimize storage tiering by using the Analyze Tiering wizard.
- Distribute the workload of volumes across pools on the same tier by using the Balance Pools wizard.

- Provision block storage by using the Provision Storage wizard.
- Enable automatic zoning to create zones during block storage provisioning to connect a server to a storage system.

Stand-alone GUI functions

In the stand-alone GUI, the following functions are available:

- Alert configuration
- Scans
- Constraint violation report
- Data Manager functions

1.2 Software components

The software download for Tivoli Storage Productivity Center V5.2 requires the installation of the following software:

- IBM DB2 Enterprise Server Edition Version 10.1 Fix Pack 3a (64-bit)
- Tivoli Storage Productivity Center server V5.2
- JazzSM Launchpad 1.1.0.3 brings together the Open Services for Lifecycle Collaboration used for linking data and other shared integration services
- Websphere Application Server 8.5.0.1 used to provide a flexible Java application server runtime environment
- Tivoli Common Reporting 3.1.0.1 and Tivoli Common Reporting 3.1.0.2 is a reporting feature available to users of Tivoli products and provides a consistent approach to viewing and administering reports

Note: IBM Tivoli Integrated Portal, which was embedded in the Tivoli Storage Productivity Center V5.1 release, is no longer used.

For documents that list hardware, product, and platform support for Tivoli Storage Productivity Center, refer to the following website:

http://www.ibm.com/support/docview.wss?&uid=swg21386446

1.3 Web-based GUI enhancements

Tivoli Storage Productivity Center V5.2 is a major release providing improvements to the web-based GUI interface that is designed to offer ease of use access to your storage environment. It provides a common look and feel that is based on the current user interfaces for IBM XIV® Storage System, IBM Storwize V7000, and IBM System Storage SAN Volume Controller.

You can now use the web-based GUI to complete many administrative tasks for resources that are monitored by Tivoli Storage Productivity Center. These tasks include setting up data collection (probes and performance monitors), administering Storage Resource agents, testing connections, viewing logs, opening management GUIs, updating user credentials, and removing resources from Tivoli Storage Productivity Center.

The web-based GUI now runs on the embedded IBM WebSphere® Application Server, instead of Tivoli Integrated Portal. This new server is called the *web server*.

Many of the functions for monitoring and managing storage were moved from the stand-alone GUI to the web-based GUI. With this migration, you can now complete the following storage-management tasks in the web-based GUI:

- Adding resources for monitoring
- Monitoring the performance of resources, including server-centric monitoring of SAN resources without requiring an agent
- Monitoring violations of performance thresholds
- Implementing policy-based provisioning
- Identifying hot spots on storage virtualizers
- Balancing the workload of volumes across storage tiers
- Retiering volumes automatically or using criteria such as file usage to place volumes on storage tiers
- Transforming storage by moving volumes between pools, converting volumes to thin-provisioned volumes, and converting volumes to compressed volumes
- Adding servers with Storage Resource agents
- Provisioning storage to stand-alone or to a clustered environment
- Completing data collection actions for multiple resources
- Web-based GUI reporting enhancements
- Enhancements to performance resources troubleshooting
- Viewing information about IBM Easy Tier® on IBM DS8000® storage systems
- Viewing information about volumes in copy pairs/mirrored relationships
- Adding Hitachi Data Systems Virtual Storage Platform for monitoring
- Viewing information about NPIV connections for switch ports in a fabric
- Identifying Internet Small Computer System Interface (iSCSI) ports
- Viewing information about Virtual Machine Disks (VMDKs)
- Allowing Tivoli Storage Productivity Center to work on OpenStack via the Cinder driver
- Adding customized test to the logon page
- Checking the status of Tivoli Storage Productivity Center
- Maintaining and improving the performance of the Tivoli Storage Productivity Center database

1.3.1 Add resources for monitoring

Tivoli Storage Productivity Center Release V5.2 provides wizards in the web-based GUI that guide you through the steps for discovering resources, adding resources for monitoring, and scheduling data collection. You can add the following resources for monitoring:

- Storage systems including:
 - IBM Storage Subsystems using native API such as the SAN Volume Controller and the IBM Storwize family
 - IBM Scale Out Network Attached Storage (SONAS) storage systems

- DS8000 Easy Tier
- Storage Resource agents (SRAs)
- Agentless servers
- Hypervisors including VMDKs
- Switches and Fabrics
 - SNMP management
 - Viewing NPIV port connection information
 - Includes iSCSI ports

1.3.2 Monitoring the performance of resources in the web-based GUI

You can use the web-based GUI to monitor and troubleshoot the performance of monitored storage systems and switches. You can also:

- Schedule performance monitors to collect key performance metrics and notifications of threshold violations. Metrics can help you measure, identify, and troubleshoot performance issues and bottlenecks in your storage. Threshold violations alert you when the performance of a monitored resource falls outside of a specified range.
- Customize views of performance so that you can analyze specific resources and metrics during time ranges that you specify.
- View performance information in a chart or table format to help you quickly identify where and when performance issues are occurring. The chart is a visual representation of how the performance of resources trend over time.
- Drill down into resources to view detailed information about the performance of internal and related resources. For example, if a SAN Volume Controller is shown in the chart, you can quickly view and compare the performance of its internal and related resources, such as disks, volumes, ports, managed disks, and back-end storage.
- Implement server-centric monitoring of SAN resources without requiring a Storage Resource agent.

1.3.3 Cloud configuration in the web-based GUI

For the web-based GUI, you can now create service classes and capacity pools to classify and separate storage resources. You create service classes to describe capabilities and characteristics of storage resources for future provisioning requests.

You create capacity pools to optionally divide storage resources in the way that is appropriate for your environment or your business needs. For example, storage resources for different departments within an organization can be separated into different capacity pools. Future provisioning and optimization requests can be restricted to storage within a capacity pool.

To work with service classes and capacity pools, from the navigation pane in the web-based GUI, select Advanced Analytics \rightarrow Cloud Configuration.

For more information about this topic, refer to Chapter 7, "Cloud configuration and provisioning" on page 147.

1.3.4 Provisioning in the web-based GUI

As of Tivoli Storage Productivity Center V5.2, you can provision storage by using the web-based GUI. You use the Provision Storage wizard to assign storage to servers and hypervisors. The wizard guides you through the steps for provisioning volumes or shares.

Using the wizard, you request the amount of storage you need and a service class. The service class acts as a set of requirements for the placement of the volume or share. Tivoli Storage Productivity Center identifies the storage resources that can provide the requested capacity and that can also satisfy the requirements of the service class. From the storage resources that can provide the capacity and the service class, Tivoli Storage Productivity Center creates a recommendation for storage placement that is based on storage system free space and performance data. You can choose whether to continue provisioning according to the recommendation.

Use the web-based GUI to manage tasks that are created by the Provision Storage wizard. For example, you can start a provisioning task or schedule a provisioning task to run at a specified date and time.

1.3.5 Identifying hot spots in the web-based GUI

The utilization value for each pool is provided on the Pools page in the web-based GUI. The utilization value is an estimate of the average daily utilization of the physical resources such as controllers, disks, ports, and nodes that are associated with the pool. The value is calculated based on the performance data that was collected for the pool on the previous day.

By scanning the utilization values for pools on a storage virtualizer, such as SAN Volume Controller, you can identify the hot spots or the pools that have high utilization values on the storage virtualizer. You can also determine the course of action that you take. For example, if some of the pools on a tier have high utilization values and some have low utilization values, you can use the Balance Pools wizard to redistribute volumes across the storage tier. However, if all of the pools on a tier have high utilization values, you can use the Analyze Tiering wizard to balance the pools by retiering the most active volumes.

1.3.6 Retiering volumes in the web-based GUI

With the Analyze Tiering wizard, you tier volumes automatically or based on the criteria that you set in tiering policies. For example, you can tier volumes based on the volume workload or on file usage, or both.

Depending on the conditions that are set in the tiering policy, recommendations are generated. You can reduce storage costs by moving volumes, for example, with low workloads to lower or less expensive tiers. You can also improve performance and use storage more efficiently by moving volumes with heavy workloads to the tiers that best meet their workload requirements.

Use the web-based GUI to manage tasks that are created by the Analyze Tiering wizard. For example, you can schedule tiering analysis and execution tasks, implement tiering recommendations, and pause or resume tiering execution tasks. More information about analyzing tiering is available in the web-based GUI online help. See 1.3.13, "Help function" on page 9 for how to use the help function.

1.3.7 Balancing pools in the web-based GUI

With the Balance Pools Analysis wizard, you can balance the workload of volumes across pools on the same tier. The pools are analyzed and recommendations are generated to move volumes from pools with high utilization values to pools with low utilization values.

Use the web-based GUI to manage tasks that are created by the Balance Pools Analysis wizard. More information about balancing pools is available in the web-based GUI online help.

Additional information about balancing pools can be found in Chapter 9, "Storage optimization" on page 207.

1.3.8 Transforming storage in the web-based GUI

With the Transform Storage wizard, you can complete the following tasks for one or more volumes in storage virtualizer pools:

- Move volumes from one storage virtualizer pool to another pool in the same storage virtualizer pool
- Move volumes in a storage virtualizer pool to an IBM Easy Tier enabled pool
- Convert fully allocated volumes to thin provisioned volumes and convert thin provisioned volumes to fully allocated volumes
- Convert fully allocated volumes to compressed volumes and convert compressed volumes to fully allocated volumes
- The pools are analyzed, for example, to ensure that there is sufficient space in the pool to convert volumes or add volumes, and recommendations are generated.

Use the web-based GUI to manage tasks that are created by the Transform Storage wizard. More information about transforming storage is available in the web-based GUI online help.

Additional information about transforming storage can be found in Chapter 8, "Transforming volumes" on page 189.

1.3.9 Managing data collection jobs in the web-based GUI

Use the web-based GUI to schedule one or multiple data collection jobs such as probes and performance monitors to collect key data and metrics about monitored resources. You can also schedule the upgrade of a Storage Resource agent for a server. Scan jobs for servers are still managed in the stand-alone GUI. In Tivoli Storage Productivity Center V5.2, you can complete the following data collection jobs by using the web-based GUI:

- Schedule probes and performance monitors.
- View performance monitor and probe logs.
- Start a probe run.
- Start or stop a performance monitor run.
- Schedule deployment and upgrade of Storage Resource agents.

When you upgrade Tivoli Storage Productivity Center from a version that is earlier than V5.2, the existing probe and performance monitor jobs are automatically migrated.

1.3.10 Reports in the web-based GUI

The following features are new for reports that are in the web-based GUI:

Performance troubleshooting reports

You can now view reports to analyze the performance of resources and to troubleshoot performance issues. For example, to compare up to four performance metrics for multiple switches over time, you can view the Compare Performance of Multiple Switches report. To compare one performance metric on one pool over two time periods, you can view the Compare Performance of One Pool over Time Ranges report.

You can also now view reports about the capacity of hypervisors and reports that show the most active servers and hypervisors. You can also use the Performance Data Export report to export the performance metrics data for one or more resources on a storage system. The data is exported to a spreadsheet file in Microsoft Excel file format.

The storage virtualizer part of the Performance package has been removed. The Performance package now treats all systems as storage systems, even if they are configured as storage virtualizers.

Scheduling and distributing reports

You can schedule reports and specify to create the report output in HTML, PDF, and other formats. You can also configure reports to save the report output to your local file system, and to send reports as email attachments.

Reorganization of reports folders

The predefined reports are now organized by resource. For example, to access reports about storage system pools, go to IBM Tivoli Storage Productivity Center Predefined Reports \rightarrow Storage Systems \rightarrow Pools.

Each report and folder has hover help and a description that is displayed in the Details View of Tivoli Common Reporting.

► Changes to report style

The visual appearance of all predefined reports was changed to match more closely the appearance of the web-based GUI. You can customize the report templates to change the logo that is displayed in the output of all reports. You can also change the title that is displayed in the output of a report.

1.3.11 Tivoli Storage Productivity Center maintenance

You can check overall status of Tivoli Storage Productivity Center by using the new System Management page in the web-based GUI. The following tasks includes:

- Maintaining system components such as the Data server, Device server, and DB2 database
- ► Maintaining and improving DB2 performance via DB2 runstats
- ► Troubleshooting and gathering system log files for IBM Software Support

Additionally, login status is fully customizable on a per user basis.

1.3.12 Tivoli Storage Productivity Center Cinder driver

If you run IBM SmartCloud Virtual Storage Center and host a cloud environment based on OpenStack, you can use the Tivoli Storage Productivity Center Cinder driver to manage block storage and service classes.

See the following link for more information about the Cinder driver:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.2/com.ibm.tpc_V522.doc/fqz0_ c_sds_openstack.html?lang=en

1.3.13 Help function

In the web-based GUI, there is help available for all windows and functions. Instead of only providing a comprehensive help function in which to search, the help function directs you to the information needed for the function or window currently in focus.

For example, when you are in the main window (Dashboard), click the question mark "?" in the upper right corner, marked with "1", as shown in Figure 1-1.



Figure 1-1 Dashboard help

You see the help function marked with "2", which is called "Dashboard". Clicking that opens a new window in your browser, which provides you help about how to navigate and use the Dashboard by taking you directly to that item in the help menu (Figure 1-2 on page 10).



There is a similar help function if you are in the "Advanced Analytics" menu and have selected "Optimization". Clicking the help icon in the upper right corner provides you with help about "Optimization". See Figure 1-3.



Figure 1-3 Help optimization

From the help menu shown in Figure 1-2, it is possible to search for any word that you might have question about. Simply enter the word in the search field upper left corner, and click "Go".

1.4 Installation changes

IBM Tivoli Integrated Portal and IBM Tivoli Common Reporting components are no longer embedded in the Tivoli Storage Productivity Center installation software. To run Tivoli Storage Productivity Center reports, you must install Jazz for Service Management Version 1.1.0.3, Websphere Application Server 8.5.0.1, Tivoli Common Reporting Version 3.1.0.1, and Tivoli Common Reporting Version 3.1.0.2.

You must install Jazz for Service Management from the Tivoli Storage Productivity Center installation program. For more information about installing Tivoli Storage Productivity Center, see Chapter 2, "Installation and upgrade checklist and considerations" on page 15.

1.5 VMware

Tivoli Storage Productivity Center V5.2 supports the vSphere Web Client extension, and vSphere Storage APIs for Storage Awareness (VASA) Provider features support vSphere 5.1/5.5 and provides better integration. With the vSphere Web Client extension and the VASA Provider, you can complete the following tasks:

- Provision storage capacity by using service classes and capacity pools.
- ► Additionally, you can choose to create data stores on your storage volumes.
- View mapping of your virtual storage resources to storage systems monitored by Tivoli Storage Productivity Center.
- View metrics for your storage systems.
- View information about the fabric that is connected to a storage adapter.
- Share certain Tivoli Storage Productivity Center alerts to be displayed as events or alarms in vCenter.
- When a locale does not have a translated version, the vSphere Web Client extension is displayed in English, which is the default language.

Note: There is a new Application role that enables users of other applications to use the provisioning capability of Tivoli Storage Productivity Center to provision storage. For example, a VMware user with this role can provision storage in the vSphere GUI by using the vSphere Web Client extension for Tivoli Storage Productivity Center.

1.5.1 Tivoli Storage Productivity Center VASA Provider

Tivoli Storage Productivity Center VASA Provider enables the Tivoli Storage Productivity Center administrator to bring visibility of Tivoli Storage Productivity Center managed storage resources to a vCenter server administrator. vSphere Storage APIs – Storage Awareness, is commonly referred to as *VASA*. For VMware vSphere users, the Tivoli Storage Productivity Center VASA Provider improves the ability to monitor and automate storage-related operations in VMware environments.

The Tivoli Storage Productivity Center storage administrator can share certain Tivoli Storage Productivity Center alerts and storage capabilities for resources that are mapped to a vCenter server. The Tivoli Storage Productivity Center VASA Provider provides the underlying connectivity, and is automatically deployed and running after a Tivoli Storage Productivity Center installation. You must register a Tivoli Storage Productivity Center server to view its information in vCenter storage reports and views. For more details about the Tivoli Storage Productivity Center VASA Provider, see 10.6, "Tivoli Storage Productivity Center VASA Provider" on page 260.

1.6 Agentless server management

The agentless server is a new server definition available with Tivoli Storage Productivity Center V5.2, in addition to the Tivoli Storage Productivity Center Storage Resource agent (SRA).

An agentless server gives you the chance to model a host server, either a physical server or virtual machine, in Tivoli Storage Productivity Center without deploying an SRA. This is really useful in those situations where you cannot or do not want to deploy an SRA (either for security restrictions in providing administration credentials or simply to avoid loading a production server with agent code).

In Tivoli Storage Productivity Center V5.2 and later, you can add servers without deploying Storage Resource agents and still view the overall connectivity and capacity of those servers.

An agentless server is a server or virtual machine that is monitored by Tivoli Storage Productivity Center but does not have a Storage Resource agent deployed to it. In Tivoli Storage Productivity Center, you can view the connectivity of all your top-level resources in a SAN environment. These resources include servers, hypervisors, fabrics, switches, and storage systems. In previous releases, to get a complete view of the connectivity between servers and other top-level resources, you were required to deploy Storage Resource agents on all of those servers.

For details about agentless servers and how to deploy them, refer to Chapter 4, "Server Resource Management" on page 61.

1.7 Cognos reporting

You can view predefined reports and create custom reports about Tivoli Storage Productivity Center in Tivoli Common Reporting. You access reports from the Tivoli Storage Productivity Center web-based GUI, and work with the reports in Tivoli Common Reporting. Tivoli Common Reporting provides the reporting service for Tivoli Storage Productivity Center reports. Tivoli Common Reporting includes IBM Cognos® reporting software. For a complete list of performance reports in Tivoli Common Reporting/Cognos see page 145.

You can view over 70 predefined reports about the capacity and performance of your resources in Tivoli Common Reporting. Charts are automatically generated for most of the predefined reports. Depending on the type of resource, the charts show statistics for space usage, workload activity, bandwidth percentage, and other statistics. You can schedule reports and specify to create the report output in HTML, PDF, and other formats. You can also configure reports to save the report output to your local file system, and to send reports as mail attachments.

With the proper security authorization you can view the following types of predefined reports:

- Reports about the capacity and relationships of your resources
- Reports about performance
- Reports about historical capacity
- Reports about storage tiering

1.8 Tivoli Storage Productivity Center for Replication

The Tivoli Storage Productivity Center for Replication GUI updates were implemented with the goal to move Tivoli Storage Productivity Center for Replication closer to the Unified user interface without forcing existing users to learn a new interface without major code changes.

The updates include:

- ► Login page
- Dashboard
- Create Session wizard
- Session manipulation
- Page containers
- Status icons
- ► Table color schemes
- ► The Add Subsystem wizard was updated to use an icon-based menu

Use this information to learn about new features and enhancements in IBM Tivoli Storage Productivity Center for Replication Version 5.2.2. This information highlights the changes since the last release of Tivoli Storage Productivity Center for Replication.

For more information about Tivoli Storage Productivity Center for replication for open systems, V5.2, see *Tivoli Storage Productivity Center for Replication for Open Systems*, SG24-8149.

1.8.1 New session type for IBM System Storage SAN Volume Controller and IBM Storwize

The Global Mirror fail-over/fail-back with change volumes session is available for SAN Volume Controller and Storwize storage systems that use change volumes. Change volumes contain point-in-time images that are copied from the host and target volumes. The host change volume stores changes from the host volume. These changes are sent from the host change volume to the target volume, and then to the target change volume.

The use of change volumes can significantly reduce replication traffic because only data that was changed is replicated.

The Device server and Replication server now run on WebSphere Application Server Liberty Profile, instead of the embedded WebSphere Application Server.

The ability to open pages in the Tivoli Storage Productivity Center for Replication GUI from the Replication Management node in the stand-alone GUI is no longer available. In Tivoli Storage Productivity Center V5.2 and later, you must start the Tivoli Storage Productivity Center for Replication GUI as a stand-alone application in a web browser.

1.9 Tivoli Storage Productivity Center Service Management Community

Connect, learn, and share with Service Management professionals: product support technical experts who provide their perspectives and expertise. Access Service Management Connect at the following web page:

https://www.ibm.com/developerworks/servicemanagement

Use Service Management Connect in the following ways:

- Become involved with transparent development, an ongoing, open engagement between other users and IBM developers of Tivoli products. You can access early designs, sprint demonstrations, product roadmaps, and prerelease code.
- Read blogs to benefit from the expertise and experience of others.
- Use wikis and forums to collaborate with the broader user community.

2

Installation and upgrade checklist and considerations

In this chapter, we look at a Tivoli Storage Productivity Center V5.2 installation, and at upgrading an existing Tivoli Storage Productivity Center instance. The focus of this chapter is to provide guidelines to help you through the installation or upgrade. We refer to the Tivoli Storage Productivity Center documentation, providing additional hints and tips we discovered while creating our environment.

Note: For our Tivoli Storage Productivity Center installation and upgrade, we installed V5.2.2.

2.1 Obtaining the Tivoli Storage Productivity Center V5.2 code

Whether you want to do a fresh installation or upgrade your existing Tivoli Storage Productivity Center installation, obtaining the code is done in the same way. We have written this section before the installation and upgrade section because it applies to both.

The Tivoli Storage Productivity Center code is only available as a download for registered users. A refresh pack code is available on the IBM Fix Central support website here:

http://www-933.ibm.com/support/fixcentral

Depending on if you are a client, an IBM Business Partner, or working for IBM, there are different ways to obtain the code. Typically, you will use IBM Passport Advantage® or PartnerWorld. For detailed information about how to download the installation images for IBM Tivoli Storage Productivity Center V5.2.2 using the Passport Advantage Online website, visit the following site:

http://www.ibm.com/support/docview.wss?&uid=swg24037338

2.1.1 Code package download

Several packages can be downloaded; however, following are the three major parts:

- Tivoli Storage Productivity Center
- IBM DB2 Enterprise Server Edition
- Optionally:
 - Tivoli Common Reporting/Cognos
 - Jazz for Service Management (JazzSM)
 - WebSphere Application Server

Use the search text and download the files listed in Table 2-1 (in our case we installed V5.2.2 code).

Table 2-1 Tivoli Storage Productivity Center download files for Windows

	Tivoli Storage Productivity	Tivoli Storage Productivity	IBM SmartCloud Virtual
	Center Select Edition	Center	Storage Center Storage
Search text	Tivoli Storage Productivity Center Select Edition V5.2.2	Tivoli Storage Productivity Center V5.2.2	Virtual Storage Center 5.2.2
Part 1 of 2	IBM Tivoli Storage	IBM Tivoli Storage	IBM Tivoli Storage
	Productivity Center Select	Productivity Center V5.2.2	Productivity Center
	Edition V5.2.2 Windows 1 of	Windows 1 of 2, Multilingual	Advanced V5.2.2 Windows 1
	2, Multilingual (CIZJ7ML)	(CIZI3ML)	of 2, Multilingual (CIZK0ML)
File name:	TSPC_SEL_EDITION_V5.2.	TSPC_V5.2.2_WINDOWS_	TPC_ADVANCED_V5.2.2_
	2_WIN_1_OF_2.zip	1_OF_2.zip	WINDOWS_1_OF_2.zip
Part 2 of 2	IBM Tivoli Storage	IBM Tivoli Storage	IBM Tivoli Storage
	Productivity Center V5.2.2	Productivity Center V5.2.2	Productivity Center V5.2.2
	Windows 2 of 2, Multilingual	Windows 2 of 2, Multilingual	Windows 2 of 2, Multilingual
	(CIZI6ML)	(CIZI6ML)	(CIZI6ML)
File name:	TSPC_V5.2.2_WINDOWS_2	TSPC_V5.2.2_WINDOWS_	TSPC_V5.2.2_WINDOWS_
	_OF_2.zip	2_OF_2.zip	2_OF_2.zip

As you can see, only the name of the first .zip file is different for each of the three licenses.

Regardless of the Tivoli Storage Productivity Center license that you have, you will also need to download the DB2 database file:

 IBM DB2 Enterprise Server Edition V10.1 Fix Pack 3a Windows AMD64 & Intel EM64T (X64) for Tivoli Storage Productivity Center V5.2.2.0, Multilingual (CIZJ2ML)

If you install the reporting solution, you will need the following images:

 Jazz for Service Management 1.1.0.3 for Windows Multilingual (Launchpad, PRS, Jazz Repository, Tivoli Directory Integrator) (CIXA4ML)

The .zip file name is JAZZ_FOR_SM_1.1.0.3_FOR_WIN.zip

 IBM WebSphere Application Server V8.5.0.1 for Jazz for Service Management for Windows Multilingual (CIFS5ML)

The .zip file name is WAS_V8.5.0.1_FOR_JAZZSM_WIN_ML.zip

- IBM Tivoli Common Reporting V3.1.0.1 for Windows Multilingual (CIN3KML) The .zip file name is ITCR_3.1.0.1_FOR_WINS.zip
- IBM Tivoli Common Reporting V3.1.0.2 for Windows Multilingual (CIXA8ML) The .zip file name is ITCR_3.1.0.2_FOR_WINS.zip

2.1.2 Extracting the source files

After you have downloaded the code, you need to extract the compressed files before beginning the installation.

Tivoli Storage Productivity Center

In our scenario, we install the Tivoli Storage Productivity Center V5.2.2 code for Windows. The two installation image files must be extracted into the same directory. In our environment, we extracted the files into the c:\install\TPC_5.2.2.0_windows_disk1 directory.

Note: If the installation images are downloaded to a Windows directory that has spaces or unusual special characters in the name, Tivoli Storage Productivity Center does not install correctly.

While you extract the files, if you are prompted to merge (or replace) folders or files with the same name, select Merge/Replace.

The file names for the Windows install images are:

- TSPC_V5.2.2_WINDOWS_1_OF_2.zip
- TSPC_V5.2.2_WINDOWS_2_OF_2.zip

IBM DB2 Enterprise Server Edition Version 10.1 Fix Pack 3a

Run the self extracting DB2 executable files. By default, the files are extracted to a temporary location deep in the hierarchy. Therefore, we specified the c: $\install\db2$ directory.

The file name for the DB2 image is:

DB2ESE10.1FP3aWA64IEM64TX64TSPC5.2.2.exe

Tivoli Storage Productivity Center reports

To run Tivoli Storage Productivity Center reports, you must install Jazz for Service Management and Tivoli Common Reporting from the Tivoli Storage Productivity Center installation program. You can install Tivoli Storage Productivity Center without reports and then later install Jazz for Service Management and the Tivoli Storage Productivity Center reports.

Extract Jazz for Service Management, IBM WebSphere Application Server for Jazz for Service Management, and IBM Tivoli Common Reporting into one directory. In our environment, we used the c:\install\jazzsm directory.

The file names for the Windows install images are:

- ► JAZZ_FOR_SM_1.1.0.3_FOR_WIN.zip
- WAS_V8.5.0.1_FOR_JAZZSM_WIN_ML.zip
- ► ITCR_3.1.0.1_FOR_WINS.zip
- ► ITCR_3.1.0.2_FOR_WINS.zip

2.1.3 Installing or upgrading considerations

You can download and extract the compressed installation files on any system. However, it is a requirement to have the installation files locally on the server on which you are going to install Tivoli Storage Productivity Center V5.2.x, or upgrade the existing Tivoli Storage Productivity Center. If you mount a network drive with the Tivoli Storage Productivity Center installation files and try to run the setup from there, it simply will not work.

2.2 Installation outline

This section is intended to provide a checklist for a fresh Tivoli Storage Productivity Center V5.2.2 installation to help you through all the installation phases and steps.

2.2.1 Planning phase checklist

In this section, we document the tasks that are part of planning a Tivoli Storage Productivity Center installation. Refer to *IBM Tivoli Storage Productivity Center Installation and Configuration Guide*, SC27-4058 for details about each listed item:

1. Select the Tivoli Storage Productivity Center license.

The first task is to choose the required Tivoli Storage Productivity Center license, based on your environment and requirements. The available Tivoli Storage Productivity Center licenses and related functions are summarized in Table 2-2.

License name	Pricing	Available functions	
IBM Tivoli Storage Productivity Center	By capacity	 Basic functions of Data, Disk, Fabric, and Performance management 	
IBM Tivoli Storage Productivity Center Select Edition	By enclosure	 Device support Full Tivoli Storage Productivity Center for Replication functionality File Shares provisioning 	

Table 2-2 Tivoli Storage Productivity Center functions by license

License name	Pricing	Available functions	
IBM SmartCloud Virtual Storage Center Storage	By capacity	 Same basic functions as Tivoli Storage Productivity Center or Tivoli Storage Productivity Center Select Edition 	
		 Plus: Storage tiering optimization Volume workload distribution across pools in the same tier Files Shares and Block storage provisioning Automatic zoning configuration to create zones during block storage provisioning to connect a server to a storage system Configuration analysis and history Policy management Server probes and scans Profiles Database scanning and analysis Chargeback 	

2. Choose the Tivoli Storage Productivity Center installation environment: single-server or multiple-server.

A multiple-server environment may be suitable for large storage environments, where one server is not sufficient to manage the Tivoli Storage Productivity Center components. Other considerations are customer policies on server location and database placement.

Note: Performance testing has indicated that a local Tivoli Storage Productivity Center database repository works best for reporting with Cognos.

Table 2-3 summarizes the available Tivoli Storage Productivity Center installation types and scenarios.

Installation Type	Components installed on Server A	Components installed on Server B
Single Server install	 Pre-requisites: DB2 JazzSM Installed: Tivoli Storage Productivity Center database repository Tivoli Storage Productivity Center server (Data, Device, and Replication) Tivoli Storage Productivity Center Storage Resource agent Tivoli Storage Productivity Center stand-alone GUI Tivoli Storage Productivity Center web-based GUI (web server) Tivoli Storage Productivity Center cLI Tivoli Storage Productivity Center reports 	n/a

 Table 2-3
 Tivoli Storage Productivity Center installation types and scenarios

Installation Type	Components installed on Server A	Components installed on Server B	
Multiple Server Install Scenario # 1	 Pre-requisite: DB2 Installed: Tivoli Storage Productivity Center database repository Tivoli Storage Productivity Center server (Data, Device, and Replication) Tivoli Storage Productivity Center Storage Resource agent Tivoli Storage Productivity Center stand-alone GUI Tivoli Storage Productivity Center web-based GUI (web server) Tivoli Storage Productivity Center CLI 	 Pre-requisite: DB2 JazzSM (*) Installed: Tivoli Storage Productivity Center reports 	
Multiple Server Install Scenario # 2	 Pre-requisite: DB2 Installed: Tivoli Storage Productivity Center database repository 	 Pre-requisite: n/a Installed: Tivoli Storage Productivity Center server (Data, Device, and Replication) Tivoli Storage Productivity Center Storage Resource agent Tivoli Storage Productivity Center stand-alone GUI Tivoli Storage Productivity Center web-based GUI (web server) Tivoli Storage Productivity Center CLI 	
Multiple Server Install Scenario # 3	 Pre-requisite: DB2 Installed: Tivoli Storage Productivity Center database repository 	 Pre-requisite: DB2 JazzSM (*) Installed: Tivoli Storage Productivity Center server (Data, Device, and Replication) Tivoli Storage Productivity Center Storage Resource agent Tivoli Storage Productivity Center stand-alone GUI Tivoli Storage Productivity Center web-based GUI (web server) Tivoli Storage Productivity Center CLI Tivoli Storage Productivity Center reports 	

You will notice in Table 2-3 on page 19 that for multi-server installations two DB2 databases are required. The reason is that, currently, JazzSM/Tivoli Common Reporting always requires a local DB2 installation. We have indicated that with (*).
Note: We recommend the single-server installation where possible for several reasons:

- The complexity of the installation and future upgrades is far less in a single-server environment.
- The service.bat/sh tool runs on the server where Tivoli Storage Productivity Center is installed. Therefore, in a multiple-server environment troubleshooting might not be as easy as if Tivoli Storage Productivity Center is running on a single server, and the service.bat/sh tool can collect all of the log files.
- Backing up a Tivoli Storage Productivity Center environment is much simpler if you have to back up only one server.
- 3. Verify system requirements.

For information about the capacity for Tivoli Storage Productivity Center V5.2.x, refer to the capacity guidelines here:

http://www.ibm.com/support/docview.wss?uid=swg27039550

Memory requirements and installation notes:

The minimum memory requirement for Tivoli Storage Productivity Center V5.2 is 12 GB. The 8 GB RAM is just for evaluation environments. These requirements are minimum requirements, so for optimal performance from your Tivoli Storage Productivity Center server you might want to have additional RAM and CPUs.

Installation notes

In our Windows environment, we successfully installed Tivoli Storage Productivity Center on the C: drive of the server. Tivoli Storage Productivity Center, DB2, and JazzSM can be installed on drives other than the default C drive for Windows (or / "root" for AIX®). The following benefits and considerations for not installing on the C drive are:

- By installing Tivoli Storage Productivity Center, DB2, and JazzSM on a drive other than the C drive, we are not using space assigned for the operating system.
- Running out of space on the C drive can cause performance degradation due to a lack of swap space. This can result in Windows being unable to write to log and temporary files, which could possibly lead to an operating system crash.

Recommendation: Either have sufficient space on the C drive, or install on another drive, for example E. If installed on a drive with insufficient space for DB2, refer to: *Tivoli Storage Productivity Center Advanced Topics*, SG24-8236, Chapter 3, Database and server considerations.

JazzSM

There are two choices you can make when installing JazzSM:

- Install JazzSM on your C drive. If you choose to do this, you will need an additional 11 GB. This requirement is in addition to the 12 GB required for Tivoli Storage Productivity Center.
- Install JazzSM on a drive other than C, your "E" drive for example.

Note: If you choose to install JazzSM on a drive other than your C drive, in addition to the 11 GB of available space on your other drive, you will still need to have 5 GB of free space available on your C drive for temporary files.

The 5 GB of temporary space can be pointed to another location by changing the TMP and TEMP location for: \$USER\Application\data\ from your Windows environment as shown in the following steps:

a. From Control Panel → System and Security → System, click Advanced system settings as shown in Figure 2-1.

2 System				
🕜 💮 🖳 🕈 Control Panel 🗸	System and Security 👻 System	•	Search Control Panel	
Control Panel Home Device Manager Remote settings Control system settings	View basic information about your computer Windows edition Windows Server 2008 R2 Standard Copyright © 2009 Microsoft Corporation. All rights reserved. Service Pack 1			
	System			
	Processor:	Intel(R) Xeon(R) CPU	X7460 @ 2.66GHz 2.67 GH	z
	Installed memory (RAM):	8,00 GB		
	System type:	64-bit Operating System		
	Pen and Touch:	No Pen or Touch Input is	available for this Display	

Figure 2-1 System properties

b. Then, click Environment Variables as shown in Figure 2-2.

System Properties	×
Computer Name Hardware Advanced Remote	
You must be logged on as an Administrator to make most of these changes.	
Performance Visual effects, processor scheduling, memory usage, and virtual memory	
Settings	
User Profiles	
Desktop settings related to your logon	
Settings	
Startup and Recovery	
System startup, system failure, and debugging information	
Settings	
Environment Variables	
OK Cancel Apply	

Figure 2-2 Environment variables

c. You can now change the TMP and TEMP location for the user that is installing Tivoli Storage Productivity Center Application. In this example, the user is dk021887 and TEMP and TMP need to be changed to **E:\temp**. We click the line with TMP marked "1", and then **Edit**, marked "2" as shown in Figure 2-3 on page 23.

Variable	Value
TEMP	%USERPROFILE%\AppData\Local\Temp
TMP	%USERPROFILE%\AppData\Local\Temp
	Nou Edit Dolot
/stem variables =	New Edit Delet
/stem variables == Variable	New Edit Delet
/stem variables == Variable CLASSPATH	New Edit Delet 2 Value .;E:\PROGRA~2\IBM\SQLLIB\java\db2j
/stem variables – Variable CLASSPATH ComSpec	New Edit Delet 2 Value .;E:\PROGRA~2\IBM\SQLLIB\java\db2j C:\Windows\system32\cmd.exe
ystem variables – Variable CLASSPATH ComSpec DB2INSTANCE	New Edit Delet 2 Value .;E:\PROGRA~2\IBM\SQLLIB\java\db2j C:\Windows\system32\cmd.exe DB2
vstem variables – Variable CLASSPATH ComSpec DB2INSTANCE FP_NO_HOST_C	New Edit Delet 2 Value .;E:\PROGRA~2\IBM\SQLLIB\java\db2j C:\Windows\system32\cmd.exe DB2 . NO

Figure 2-3 TEMP environment variables

4. Plan the installation method in a Windows domain.

Choose between using local user accounts or domain user accounts for the Tivoli Storage Productivity Center Common User and the Tivoli Storage Productivity Center database user.

Note: We do not suggest using a mix of local and domain IDs for a single Tivoli Storage Productivity Center server. We suggest using local accounts where possible, as this has no effect on the type of user IDs that can log in to Tivoli Storage Productivity Center. Using domain IDs for users of Tivoli Storage Productivity Center is still possible when you install Tivoli Storage Productivity Center with local IDs for the technical user IDs.

For more details about using local or domain user IDs for the installation or on using an external authentication server, see Chapter 5, "Configuration and administration tasks" on page 85.

5. Plan for Tivoli Storage Productivity Center for Replication implementation.

In a disaster recovery scenario, ensure that your Tivoli Storage Productivity Center for Replication is accessible if a disaster occurs.

6. Verify user names and passwords requirements and define users.

A useful worksheet to document the user names and password is provided in *IBM Tivoli Storage Productivity Center Installation and Configuration Guide*, SC27-4058.

Note: Here are the special characters allowed. Because you can use separate users for WebSphere and DB2, we show the allowed characters by application:

WebSphere password: '[', ']', '?', '`', '~', '!', '(', ')', '-', '_', and '.'

DB2 password: '\$', '~', '@', '#', '(', ')', '-', '_', '{', '}', and '.'

If you are using the same password for DB2 and WebSphere, the special character needs to be supported by both. Therefore, for example the Tivoli Storage Productivity Center common user password should only contain these special characters:

Tivoli Storage Productivity Center common user: '~', '(', ')', '-', '_', and '.'

7. Plan the role definition for Tivoli Storage Productivity Center users.

In Tivoli Storage Productivity Center V5.2.2, the roles that were defined in previous versions have been consolidated into a set of three roles, as described in Table 2-4.

Roles in previous versions	Roles in Tivoli Storage Productivity Center 5.2.2
Superuser	Administrator
Productivity Center administrator	
Disk administrator	
Fabric administrator	
Data administrator	
Tape administrator	
Disk operator	Monitor
Fabric operator	
Data operator	
Tape operator	
This role did not exist in versions 5.1 or earlier	External Application

Table 2-4 Previous product versions roles mapping in V5.2.2

Refer to *IBM Tivoli Storage Productivity Center Installation and Configuration Guide*, SC27-4058 for details about Tivoli Storage Productivity Center V5.2 roles and role to group mapping.

8. Plan for managing and monitoring resources including storage systems, hypervisors, file systems, and switches with Tivoli Storage Productivity Center.

Assess the scope of your environment, based on the managing and monitoring needs, in order to:

Define the communication methods (native API, SNMP protocol, SRA agent, SMI-S agent).

- Verify if the interoperability requirements are met. You can find the Supported Hardware, Products and Platforms Interoperability Matrix Links technote here:

http://www.ibm.com/support/docview.wss?&uid=swg21386446&

 Plan and implement all the possibly required actions to meet the interoperability requirements (for example, SAN switches or storage devices firmware update, device driver update).

Important: A CIM agent is required to implement performance monitoring on:

- IBM DS3000/4000/5000/6000
- SAN switch (some metrics can be collected using SNMP)
- Non-IBM storage subsystem

For some vendors, a licensed version of the CIM agent is required.

9. Plan for Data Path Explorer.

Note: Data Path Explorer visualization though web-based GUI requires Flash Player to be installed on the server from where the web-based GUI is executed.

2.2.2 Installation

The intent of this section is to give a checklist of the actions needed for a correct Tivoli Storage Productivity Center V5.2.2 fresh installation, pointing out the differences with previous Tivoli Storage Productivity Center versions and specific points of attention.

We refer to the installation scenario we have implemented in our test environment, consisting of an IBM VSC license installation on a Windows system, single-server installation type.

For detailed information about how to download the installation images for IBM Tivoli Storage Productivity Center V5.2 using the Passport Advantage Online website, go to the following link:

http://www.ibm.com/support/docview.wss?&uid=swg24037338

For a detailed description of each installation step, refer to the *IBM Tivoli Storage Productivity Center Installation and Configuration Guide*, SC27-4058.

Changes in Tivoli Storage Productivity Center V5.2.2 installation process

The following list is an overview of the changes in Tivoli Storage Productivity Center V5.2.2 installer:

- Jazz for Service Management 1.1.0.3, WebSphere Application Server 8.5.0.1, Tivoli Common Reporting 3.1.0.1, and Tivoli Common Reporting 3.1.0.2:
 - Needed for Tivoli Storage Productivity Center Cognos based reports.
 - Tivoli Storage Productivity Center installer will launch the JazzSM Installer. You can choose to install all Tivoli Storage Productivity Center components except Tivoli Storage Productivity Center reports, and at a later time, install JazzSM and Tivoli Storage Productivity Center report.

Note: The Tivoli Storage Productivity Center installer will have to install the Tivoli Storage Productivity Center specific reports into the JazzSM/Tivoli Common Reporting solution in any case. We suggest to first start the Tivoli Storage Productivity Center installer and select to install the reporting from there. This has the advantage that you can open the "Learn how to install.." page (an example can be seen in Figure 2-4 on page 29). In addition, the Tivoli Storage Productivity Center will create a Windows service to start the reporting after a reboot.

- ► Tivoli Integrated Portal is no longer used by Tivoli Storage Productivity Center.
 - Tivoli Storage Productivity Center web-based GUI is now hosted on the embedded WebSphere Application Server.
- Device and Replication Servers hosted on WebSphere Application Server Liberty profile.
 - WebSphere Application Server Liberty profile is a lightweight web server with a very small footprint. It is a replacement for Embedded WebSphere Application Server.
 - Windows scheduled tasks are used to restart these servers on windows platforms.
- ▶ Web server hosted on WebSphere Application Server 8.5.0.1.
 - Web-based GUI, Storage Management API for Cloud (SMAC), and Vsphere plug-in applications are running on this server.
 - It will serve as the main authentication server for Tivoli Storage Productivity Center.
 - WebSphere Application Server Administrative Console added to manage user authentication and configure Tivoli Storage Productivity Center with LDAP.
- Consolidated the Tivoli Storage Productivity Center server start and stop scripts.
 - Available in <TPC_Install_Dir>/scripts directory (Example: Data Server startTPCData.bat|sh and stopTPCData.bat|sh).

Pre-installation steps

Before starting the installation of Tivoli Storage Productivity Center, complete the following steps:

 Verify that Tivoli Storage Productivity Center server is defined in the domain name system (DNS) Server.

Important: We strongly recommend the use of DNS. Tivoli Storage Productivity Center always uses a fully qualified name, thus if Tivoli Storage Productivity Center is not defined to a DNS Server, you will have problems when navigating through the Tivoli Storage Productivity Center panes and pop-up windows.

Verify or edit the etc/hosts file.

JazzSM requires the entry **localhost** in etc/hosts file. Typically, in Windows the file contains the entry **"127.0.0.1 localhost**" commented out.

Open the file C:\Windows\System32\drivers\etc\hosts using notepad and verify that the line localhost is uncommented as shown in Example 2-1.

Example 2-1 hosts file

```
# localhost name resolution is handled within DNS itself.
127.0.0.1 localhost
```

Note: Make sure that you start the notepad application as Administrator. We have seen situations where you could edit and save the file, but changes were not written into the same location, so the changes did not have any effect. Open the file after your changes to verify that the changes have been saved.

Verify the language settings.

Often, your operating system is installed and the interface is using one language, but when you install additional software it uses a different language because there are several ways to detect the language of the system, and if you have not set all settings to the same language, you can end up having mixed languages.

The Tivoli Storage Productivity Center web-based GUI will use the language setting of your browser. We suggest you set the rest of Tivoli Storage Productivity Center to use the English language because that will also determine how logs are written. This affects how a problem can be handled by IBM support.

Here is a link to a whitepaper on how to set the language for all components when Tivoli Storage Productivity Center runs on a Windows server:

http://www.ibm.com/support/docview.wss?uid=swg27038231

Even though it was written for Tivoli Storage Productivity Center 5.1, it remains valid for Tivoli Storage Productivity Center 5.2.x.

Install DB2.

The DB2 Windows version shipped in the product package is DB2 10.1 Fix Pack 3a for Windows (64-bit).

Execute the v10.1fp3a_ntx64_server.exe file and install the product following the detailed instructions provided in *IBM Tivoli Storage Productivity Center Installation and Configuration Guide*, SC27-4058.

Note: The DB2 Control Center is no longer available as of DB2 10. To administer your database, you can use IBM Data Studio. IBM Data Studio installation is included with the DB2 version 10.1 product installation. The DB2 Setup wizard provides an option to install Data Studio components.

Tip: If you do not want to create the Tivoli Storage Productivity Center database and the Tivoli Common Reporting database on the Windows C: drive, you should now change the DB2 default database location setting. To do this, use the **update dbm config using dftdbpath <drive>:** command.

 Extract the Tivoli Storage Productivity Center installation packages (see section 2.1, "Obtaining the Tivoli Storage Productivity Center V5.2 code" on page 16 for more details).

In our installation scenario, we chose to install JazzSM at the same time of Tivoli Storage Productivity Center installation in order to exploit the Tivoli Storage Productivity Center reporting capabilities.

Note: If you do not need to implement Tivoli Storage Productivity Center reports, you can choose not to install JazzSM and install only Tivoli Storage Productivity Center.

In any case, you can decide to install JazzSM at any time after the Tivoli Storage Productivity Center installation.

 Extract all the TPC disk1 parts in the same folder. We used the C:\install\TPC_5.2.2.0_windows_disk1 folder.

Important: If the installation images are downloaded to a Windows directory that has spaces or unusual special characters in the name, Tivoli Storage Productivity Center does not install correctly.

The distribution code is composed of several files that refer to different parts of the Tivoli Storage Productivity Center code. The part1 file differs depending on the license, as shown in the following example list for Windows:

- TSPC_V5.2.2_WINDOWS_1_0F_2.zip for Tivoli Storage Productivity Center license (formerly Tivoli Storage Productivity Center Basic Edition).
- TSPC_SEL_EDITION_V5.2.2_WIN_1_0F_2.zip for Tivoli Storage Productivity Center Select Edition license.
- TPC_ADVANCED_V5.2.2_WINDOWS_1_OF_2.zip for Tivoli Storage Productivity Center Advanced Edition (VSC) license.

The remaining parts are the same for all the Tivoli Storage Productivity Center licenses.

The files that we downloaded and installed were related to the VSC license:

- TPC_5.2.2.0_AE_windows_disk1_part1.zip
- TPC_5.2.2.0_windows_disk1_part2.zip

Note: Future Tivoli Storage Productivity Center program temporary fix (PTF) levels could present more parts for the disk1 file. Make sure that all the parts are downloaded and extracted in the same folder.

- Extract the following files in a new folder. We used the C:\install\jazzsm folder.
 - JazzSM file: IBM-jazzsm-launchpad-1.1.0.3-windows64.zip
 - WebSphere Application Server file: IBM-was-8.5.0.1-windows64.zip
 - Common Reporting file:

1.1.0-TIV-JazzSM-TCR-WIN64-MR001.zip 1.1.0-TIV-JazzSM-TCR-WIN64-FP002.zip

Note: In the file list, you might also see a Tivoli Common Reporting package containing the CFN acronym. This package is the Cognos Framework Manager Development Tool and is not required.

Installation steps

1. Launch the Tivoli Storage Productivity Center installation program. In our scenario, it is located in: C:\install\TPC_5.2.2.0_windows_disk1\TPC\setup

Note: Run the installation program as Administrator: right-click **setup** and select **Run** as administrator.

- 2. Select a language and click OK.
- Read the program license agreement and click I accept both the IBM and the non-IBM terms.

4. In the **Before You Begin: Prerequisites** panel, we chose to install the optional reporting features, JazzSM, and Tivoli Common Reporting, by clicking **Install now** (Figure 2-4).



Figure 2-4 Before You Begin: Prerequisites panel

Note: If you click the **Learn how to install these components** link, you will have access to the JazzSM installation using the launchpad on Windows document.

Important: We suggest you install JazzSM using the Tivoli Storage Productivity Center installer because this is the only way the JazzSM windows services are created. The service will not be created if the JazzSM installer is launched stand-alone.

If you decide to install the reporting later, be sure to use the Tivoli Storage Productivity Center installer.

The following steps are specifically for the JazzSM installation:

- a. In the **Install Jazz for Service Management** panel, specify the location of the JazzSM installation file, that in our installation scenario is C:\install\jazzsm.
- b. In the Welcome to Jazz for Service Management 1.1.0.3 panel, choose Custom Installation (Figure 2-5 on page 30).

Welcome	
Full Custom Tools Exit	Welcome to Jazz for Service Management 1.1.0.3 Jazz for Service Management provides the following integration services: Administration Services, IBM Dashboard Application Services IBM Tivol Common Reporting, Registry Services, and Security Services. Use the launchpad to guide you through performing either a full or custom installation. For links to the latest release and support information, expand Release Information. Click one of the following links to guide you through installing Jazz for Service Management: • Eull Use full installation for evaluation or development purposes. After you provide information, server on a single server. • Eustom Use full installation for evaluation or development purposes. After you provide information, Server on a single server. • Eustom Use the custom workflow to install and update specific Jazz for Service Management integration components and supporting middleware. • Lools Use Tools to run the following tools from the launchpad: 1BM DB2 Setup Launchpad, IBM Installation Manager, IBM Prerequisite Scanner, and IBM Tivoli Common Reporting installation program.
	Release Information
	Jazz for Service Management Launchpad - 20140314-0113

Figure 2-5 Welcome to Jazz for Service Management 1.1.0.3

- c. In the **Custom Workflow** panel, a summary of the available JazzSM services and supporting middleware that can be installed is shown. Click **Next**.
- d. In the **Specify Jazz for Service Management Home Location** click **Next**. The empty **Existing environment** field means that you do not have an existing Jazz for Service Management installation (Figure 2-6 on page 31).

azz for Service Manage	ment 1.1.0.3 Select a language: English	
 Welcome Full Custom Home Location Source Locations Operations Installation Locations Credentials Tasks Results Tools Exit 	Select a language: English Specify Jazz for Service Management Home Location Existing environment Existing Jazz for Service Management home location: Browse	
PM	Back	Next

Figure 2-6 Specify Jazz for Service Management Home Location panel

- e. In the Specify Source Location panel, leave the prefilled values and click Next.
- f. In the Select Operations panel, choose to install only Reporting Services and IBM WebSphere Application Server, as shown in Figure 2-7 on page 32. As you can see, the IBM DB2 Enterprise Server Edition entry is disabled because we have already installed DB2. The DB2 installation files have not been added to the JazzSM installation folder.

Jazz for Service Management 1.1.0.3 Image: Select a language: English Jok				
Welcome	Select Operations			
Custom Home Location	For each component, select the operation to run. Select None if you do not want to run an operation for a specific component.			
Source Locations	Component	Current	Target	Operation
Operations	Administration Services			
License Agreements	Service provider	-	1.1.0.3	None
Installation Locations	User Interface	-	1.1.0.3	None 👻
Credentials	Registry Services	-	1.1.0.3	None 👻
 Tasks Results 	Reporting Services	-	3.1.0.2	Install 🗸
> Tools	Security Services	-	1.1.0.3	None 👻
⊳ Exit	Visualization Services	-	3.1.0.3	None 👻
	IBM DB2 Enterprise Server Edition	10.1.200.238	-	None 👻
	IBM WebSphere Application Server	-	8.5.0.1	Install 👻
	-			
IBM.				Back Next

Figure 2-7 Select Operations panel

Important: If you plan to configure Lightweight Directory Access Protocol (LDAP) authentication by using IBM System Storage DS8000 Storage Manager or IBM System Storage SAN Volume Controller, you must install Security Services.

- g. In the license agreement panel, select I accept the terms in the license agreement and click Next.
- h. In the Specify Installation Locations panel, you can specify an installation location or leave the predefined paths. We suggest that you use the predefined paths as shown in Figure 2-8 on page 33. The DB2 installation location entry is disabled because we have already installed DB2.

) Jazz for Service Management 1.1.0.3				_ 🗆 X
Jazz for Service Managen	nent 1.1.0.3 Select a langu	age: English	•	ОК
Welcome				
⊳ Full	Specify Installation Locations			
Custom	* Jazz for Service Management integration components installation location:			
Home Location	C:\Program Files\IBM\JazzSM	Browse		
Source Locations	* WebSphere Application Server installation location:			
Operations	C:\Program Files\IBM\WebSphere\AppServer	Browse		
Installation Locations	* DB2 installation location:			
Credentials	C:\Program Files\IBM\SQLLIB	Browse		
Tasks				
Results				
> Tools				
⊳ Exit				
IBM.		Back	Next	

Figure 2-8 Specify Installation Locations

i. In the **Specify Credentials** panel, complete the credential entries for WebSphere Application Server administrator and DB2, as shown in Figure 2-9 on page 34.

Jazz for Service Management 1.1.0.3					
Jazz for Service Management 1.1.0.3 Select a language:					▼ OK
Welcome Full Custom Home Location Source Locations Operations Installation Locations Credentials Tasks Results Tools Exit	Specify Credentials WebSphere Application Server Pro Administrator name: smad Administrator password:	file Imin			
IBM.				Back	Vext

Figure 2-9 Specify Credentials panel

Notes:

WebSphere Application Server user:

The WebSphere Application Server administrator is a new user, and you can change the predefined name and set the password. This new user is not a user in the local operating system. It will be created in the WebSphere file repository, and it will be the only user that can access the reporting part of Tivoli Storage Productivity Center after the installation. You can change the WebSphere configuration at a later date to be able to use the operating system users. You can also enable LDAP or Active Directory servers for the reporting.

Connecting to DB2:

To allow Tivoli Storage Productivity Center access to the TPCDB database, you must specify a user with administrative role to DB2 and to the operating system.

For example, change the user **smadmin**, which is pre-filled and is the default value, to **db2admin** to match the DB2 administrator credentials created during the DB2 installation.

Important: Be sure to assign different user IDs for the WebSphere Application Server administrator and to the DB2 administrator, otherwise Tivoli Storage Productivity Center will have problems later on.

In the **Run Tasks** panel, review the tasks sequence marked with "1" and click **Run**, marked with "2". See Figure 2-10.

Jazz for Service Management 1.1.0.3	
Jazz for Service Management Litus Jazz for Service Management Litus Welcome Full Custom Home Location Source Locations Operations Installation Locations Credentials Tasks Results Results Tools Exit	ement 1.1.0.3 Select a language: English C
IBM.	2 Run

Figure 2-10 Review tasks and start install

j. You can view status and details, marked with "1", of each task as it completes. See Figure 2-11. By clicking the corresponding View Details button in the Review Results panel, you can get more details about that task. When all tasks complete, click Exit in the left navigation tree.

🙆 Jazz for Service Management 1.1.0.3					
Jazz for Service Management 1.1.0.3 Select a language: English					
Welcome					
⊳ Full	Review Results	Review Results			
2 Custom	Task 1	Status			
Home Location	Check task dependencies	A Warning	View Details		
Source Locations	Objects weather and within	A	View Details		
Operations	Check system prerequisites	∞ wanning	View Decails		
Installation Locations	Install IBM WebSphere Application Server 8.5.0.1	Complete	View Details		
Credentials	Install Jazz for Service Management extension for IBM WebSphere 8.5 1.1.0.2	Complete	View Details		
Tasks					
Results	Install Reporting Services 3.1.0.2	Running	View Details		
> Tools					
▷ Exit					

Figure 2-11 Installation progress

k. If any task fails, click the "View Details" button and search for FAIL in the text file. An example of an error during installation is shown in Example 2-2 on page 36. When the error is corrected, simply click "Custom" marked with a "2" in Figure 2-11 to restart

installation. All entered and selected options are remembered, making a retry very simple.

Example 2-2 Install error

 Return to the Install Jazz for Service Management panel, either by clicking the "Done" button in lower right corner, or "Exit" in the menu to the left (shown in Figure 2-11 on page 35). Notice that this time Install now is disabled. See Figure 2-12.



Figure 2-12 Cognos installation complete

The JazzSM installation is complete. You can proceed with Tivoli Storage Productivity Center installation by clicking **OK**.

 In the Choose Installation Location and Type panel, select the installation location or accept the defaults and choose Single server as Installation Type. See Figure 2-13 on page 37.

3	IBM Tivoli Storage Productivity	Center Installation	
			Choose Installation Location and Type
	 License Agreement Before You Begin Installation Location Preinstallation Validation Preinstallation Summary 	Installation location: Installation Type:	ChProgram Files\IBM\TPC Browse
	 Installing Installation Completed 	Single server	Install all components on one server.
		 Multiple servers 	Install selected components on two servers.
		O License upgrade	✓ Interview ✓ Interview ✓ Interview ✓ Interview ✓ Interview × Interview × Interview
	installAnywhere <u>H</u> elp		<u>P</u> revious <u>N</u> ext

Figure 2-13 Installation location

6. In the **Single Server Installation Information** panel, enter the DB2 administrator credentials that you defined during the DB2 installation. See Figure 2-14 on page 38.

IBM Tivoli Storage Productivity	Center Installation Single Server Installation Information
 License Agreement Before You Begin Installation Location Preinstallation Validation Preinstallation Summary Installing Installation Completed 	Server Information Host name: tpc.tcr.local Ports: 9549 to 9569 Verify port availability Common User Name and Password Specify a user name and password to configure all components. User name: db2admin Password:
nstallAnywhere	Advanced Customization Configure Database repository Configure Jazz for Service Management and Tivoli Common Reporting
Cancel <u>H</u> elp	Previous Next

Figure 2-14 Enter DB2 credentials

Note: If you plan to install Tivoli Storage Productivity Center in a large environment, you should consider changing the default location of the Tivoli Storage Productivity Center database and store it on fast disks (typically SAN logical unit numbers (LUNs)). In addition, consider using separate disks for the DB2 redo logs, as for any other large database installation.

7. In the **Configure Jazz for Service Management and Tivoli Common Reporting** panel, enter the JazzSM credentials that you defined during the JazzSM installation (Figure 2-19 on page 45). See Figure 2-15 for an example.

उ IBM Tivoli Storage Productivity Cor	Center Installation Ifigure Jazz for Serv	ice Management and Tiv	oli Commo	<mark>₋ □ ×</mark> n Reporting
 ✓ License Agreement ✓ Before You Begin ✓ Installation Location ▶ Preinstallation Validation 	Specify the authenticatio location for Jazz for Servi Reporting.	n credentials and installation ice Management and Tivoli Comm	ion	
 Preinstallation Summary Installing Installation Completed 	Authentication Informat User name: Password: Installation location:	ion smadmin •••••••	3 Browse	
InstallAnywhere Cancel <u>H</u> elp			<u>P</u> revious	ок

Figure 2-15 JazzSM credentials

- 8. In the **Preinstallation Summary** panel, review the installation information and click **Install**. The installation takes about 1 hour, depending on your server hardware configuration.
- 9. When the installation is complete, in the **Installation Completed** panel, the links to connect to Tivoli Storage Productivity Center and Tivoli Storage Productivity Center for Replication web user interfaces are shown. Click **Done** to close the wizard.

2.2.3 Post-installation tasks

After the Tivoli Storage Productivity Center installation, you should perform all or some of the following post-installation tasks, depending on your environment:

- Verify the Tivoli Storage Productivity Center installation, as detailed in *IBM Tivoli Storage* Productivity Center Installation Guide, SC27-4058.
- Configure Tivoli Storage Productivity Center to send mail notifications from the Alert Notifications panel available in the web-based GUI.
- Configure Tivoli Storage Productivity Center to send SNMP traps to an SNMP Manager from the Alert Notifications panel available in the web-based GUI.
- Configure LDAP environment.
- ► If required, implement Role to Group Mapping for Tivoli Storage Productivity Center users.

In order to monitor and administer a DB2 environment, download and install IBM Data Studio V 3.2 or later. Downloadable file and installation instructions are available at the following web address:

http://www.ibm.com/support/docview.wss?uid=swg24033663

- ► Setting up your browser to use the Tivoli Storage Productivity Center web-based GUI:
 - Check that your browser is supported.
 - Adjust the firewall so that the Tivoli Storage Productivity Center web-based GUI can be reached from other systems.
 - Adjust your browser's software to block pop-up ad windows.
 - For the data path viewer, you need Adobe FlashPlayer.

Proceed with the Tivoli Storage Productivity Center configuration tasks, as detailed in Chapter 5, "Configuration and administration tasks" on page 85.

2.3 Upgrade summary

You can upgrade from Tivoli Storage Productivity Center Version 4.2.2 (or later) or Version 5.1 (or later) to Tivoli Storage Productivity Center Version 5.2. In this section, we upgraded to Version 5.2.2.

2.3.1 Planning considerations

In the following sections, planning considerations for Tivoli Storage Productivity Center upgrades are discussed.

Considerations applicable to both Tivoli Storage Productivity Center 4.2.x and Tivoli Storage Productivity Center 5.1.x upgrades

The following list is a summary of the considerations for upgrading your Tivoli Storage Productivity Center from a prior version to V5.2.2:

- Windows 2003 and Windows 2008 32-bit environments are no longer supported by Tivoli Storage Productivity Center V5.2.2. In order to upgrade older Tivoli Storage Productivity Center installations, the operating system must be migrated to a Windows 64-bit environment first.
- The new Tivoli Storage Productivity Center V5.2.2 minimum memory requirement is 12 GB. Verify if additional memory is required for your Tivoli Storage Productivity Center server.
- DB2 9.7 32-bit version is not supported in Tivoli Storage Productivity Center V5.2. DB2 must be upgraded to the 64-bit version first. Refer to the IBM Tivoli Storage Productivity Center Installation Guide, SC27-4058 for details about the DB2 upgrade.
- In Tivoli Storage Productivity Center V5.2.2 Tivoli Integrated Portal (TIP) is no longer used. During the Tivoli Storage Productivity Center upgrade process, you can choose to preserve the old TIP instance, for example, if it is being shared with another product. Otherwise, we suggest you uninstall TIP in order to preserve system resources.
- The LDAP configuration settings are not migrated from TIP to JazzSM. You have to manually configure the JazzSM with LDAP repository using the WebSphere Application Server Administrative Console. Refer to the IBM Tivoli Storage Productivity Center

Installation Guide, SC27-4058 for details about JazzSM configuration with LDAP repository.

Important: If your DS8000 or SAN Volume Controller (SVC) storage system is configured to use Single Sign On with Tivoli Storage Productivity Center, the DS8000 or SVC has the TIP information stored in their configuration. This must be switched back to local authentication during the upgrade of Tivoli Storage Productivity Center because TIP will no longer be used and should be uninstalled.

Just to be on the safe side, you might want to revert to OS authentication for Tivoli Storage Productivity Center itself as well during the upgrade. In addition, check your documentation on the values you need for re-enabling LDAP and Active Directory at a later time.

- The roles that were previously defined in Tivoli Storage Productivity Center were consolidated in two roles (see Table 2-4 on page 24).
- TIP data is not migrated. You need to manually migrate the Tivoli Common Reporting reports and any custom Tivoli Common Reporting reports:
 - If you had configured Tivoli Common Reporting Version 2.1.1 by using the internal content store, go to the following link for detailed migration steps:

http://www.ibm.com/support/knowledgecenter/SSEKCU_1.1.0/com.ibm.psc.doc_1.1.
0/tcr_original/ttcr_upgrading.html

 If you had configured Tivoli Common Reporting Version 2.1.1 by using an external content store such as DB2 and Oracle, go to the following link for detailed migration steps:

http://www.ibm.com/support/knowledgecenter/SSEKCU_1.1.0/com.ibm.psc.doc_1.1.
0/tcr_original/ttcr_upgrading_external.html

The migration procedures will migrate the existing default reports definitions; they will not be overwritten by the new definitions. Therefore, reports with duplicated names will be shown.

After extracting reports from Tivoli Common Reporting 2.1.1 and importing to TCR 3.1.0.2, Cognos Public Folders will look as shown in Figure 2-16. The highlighted packages are from Tivoli Storage Productivity Center 5.1.x.



Figure 2-16 Cognos Public Folder

Note: Refer to the IBM Redbooks publication *IBM Tivoli Storage Productivity Center V5.1 Technical Guide*, SG24-8053 for details about how to customize the export of reports from Tivoli Storage Productivity Center V5.1.

 Refer to the *Tivoli Common Reporter User Guide*, SC14-7613 for details about exporting BIRT reports.

Considerations for Tivoli Storage Productivity Center 5.1.x upgrades

Tivoli Common Reporting 3.1.0.1 uses DB2 as the external content store. Tivoli Common Reporting 2.1.1 uses Derby as the external content store by default. However, some of the Tivoli Storage Productivity Center users have configured Tivoli Common Reporting 2.1.1 to use DB2 as the content store after installation. These users need to follow a special procedure documented in the JazzSM IBM Knowledge Center in order to install Tivoli Common Reporting 3.1.0.1 reusing the Tivoli Common Reporting 2.1.1 external content store. The procedure is available at the following web address:

http://www-01.ibm.com/support/knowledgecenter/SSEKCU_1.1.0/com.ibm.psc.doc_1.1.
0/tcr_original/ttcr_upgrading_external.html

Considerations for Tivoli Storage Productivity Center 4.2.x upgrades

- Tivoli Storage Productivity Center V5 does not support CAS-based Data or Fabric agents. You need to migrate these agents to Storage Resource agents (SRAs). This can be done before migration (recommended) or after migration as well. Refer to *IBM Tivoli Storage Productivity Center Version 5.1 Installation and Configuration Guid*e, SC27-4058 for further details.
- The Tivoli Storage Productivity Center V5 database schema has changed for performance and configuration history functions. Depending upon on the amount of history data you have, it could take from a few minutes to several hours for the installer to transform this data. The installer provides a time estimate. You can choose to drop the history data during the installation.

2.3.2 Pre-upgrade steps

Before we list the general upgrade steps, we need to make one important suggestion.

Important: If you are using the default probe jobs for the scheduling of data collection for your devices, you should move all those devices to a user-defined probe job. During this project, we realized that while the upgrade will work, you will not be able to change the alert configuration of default probe jobs after the upgrade. If you had defined your own jobs before the upgrade, you do not need to define new jobs. We only could verify that when upgrading from Tivoli Storage Productivity Center V5.1. We cannot say if this problem exists or if this solution works when you upgrade from other versions.

The pre-upgrade steps are listed here:

- Back up the Tivoli Storage Productivity Center database and Tivoli Storage Productivity Center server (machine backup) to provide a point of restore if the upgrade fails. Instructions for backing up the Tivoli Storage Productivity Center database using DB2 backup CLI command is provided in our documentation. Refer to *IBM Tivoli Storage Productivity Center Version 5.2 Installation Guide*, SC27-4058 for further details about DB2 backup.
- 2. If you have any BIRT reports, extract the BIRT reports from TIP.
- 3. If you have created any custom Tivoli Common Reporting reports, extract the Tivoli Common Reporting reports from Tivoli Common Reporting 2.1.1.
- 4. If you have a standby server configured for the Tivoli Storage Productivity Center for Replication server, make the Tivoli Storage Productivity Center for Replication instance on

the stand-by server active. Make the Tivoli Storage Productivity Center for Replication server you are upgrading the standby server.

- 5. If you have CAS-based Data or Fabric Agents, migrate these agents to SRA agents. This can be done before migration (recommended) or after migration as well.
- 6. Upgrade the DB2 version to the level supported by Tivoli Storage Productivity Center V5.2.2.

2.3.3 Upgrade steps

The upgrade steps are similar to installation steps described in "Pre-installation steps" on page 26, except for the DB2 installation step that has to be skipped because you already have DB2 installed:

- 1. Verify or edit the etc/hosts file (see "Pre-installation steps" on page 26).
- 2. Extract the installation packages (see the extraction steps in "Pre-installation steps" on page 26).
- 3. Launch the Tivoli Storage Productivity Center installation program (see "Installation steps" on page 28) and follow the same steps as for a fresh installation. During Tivoli Storage Productivity Center installation steps, the following additional panels (not present during a fresh installation) are displayed:
 - Migrate Data Agents and Fabric Agents panel. The panel shown in Figure 2-17 is displayed only if, in a Tivoli Storage Productivity Center 4.2.x upgrade scenario, the wizard detects CAS agents (Data Agents or Fabric Agents) in your environment.



Figure 2-17 Migrate Data Agents and Fabric Agents panel

Note: If you select the **Migrate the Data and Fabric agents before upgrading** option, the panel presents a **Quit** button. The **Quit** button closes the installation wizard or gives you the option to update the Agent.

 Migrate Performance and Configuration History Data panel. This panel is displayed in a Tivoli Storage Productivity Center 4.2.x upgrade scenario. It gives you the possibility to migrate or discard this data, as shown in Figure 2-18.



Figure 2-18 Migrate Performance and Configuration History Data

 Uninstall Tivoli Integrated Portal panel. This panel is displayed in both Tivoli Storage Productivity Center V4.2.x and Tivoli Storage Productivity Center V5.1.x upgrade scenarios, as shown in Figure 2-19.



Figure 2-19 Uninstall Tivoli Integrated Portal panel

Note: You should choose to preserve the old TIP instance only if it is being shared with another product. Otherwise, uninstall it to reclaim system resources.

2.3.4 Post-upgrade tasks

After the Tivoli Storage Productivity Center migration is complete, verify the correct upgrade of your Tivoli Storage Productivity Center environment by implementing verification steps, using as a guideline the checklist provided in section 2.2.3, "Post-installation tasks" on page 39.

In addition, you must verify that all the tasks and schedules defined in the former Tivoli Storage Productivity Center environment (performance monitoring jobs, reporting jobs) are correctly redefined and active in your new Tivoli Storage Productivity Center V5.2 environment.

2.4 Installing Reporting at a later date

If you did not install the Reporting component, when you click the Reporting icon in the web-based GUI you will see the message stating that reporting is not installed, and a link to install information. See Figure 2-20.



Figure 2-20 Tivoli Storage Productivity Center web-based GUI when Reporting is not installed

Note: Although the Learn how documentation can help you with installing JazzSM, we strongly recommend starting one step earlier with using the Tivoli Storage Productivity Center installer to install JazzSM for a more simple workflow of the installation.

Follow the steps listed below to install JazzSM using the Tivoli Storage Productivity Center installer:

- 1. Download and extract the code (see 2.1, "Obtaining the Tivoli Storage Productivity Center V5.2 code" on page 16).
- 2. Verify or edit the etc/hosts file (see"Pre-installation steps" on page 26).
- 3. Start the Tivoli Storage Productivity Center installer.

In the **Before You Begin: Prerequisites** panel, choose to install the optional Reporting features, JazzSM and Tivoli Common Reporting, by clicking **Install now**, as shown in Figure 2-21 on page 47.



Figure 2-21 Before You Begin: Prerequisites panel

Note: If you click the **Learn how to install these components** link, you have access to the JazzSM installation by using launchpad on Windows guide.

- 4. Continue the installation steps of the JazzSM component as described in step a on page 29 through step k on page 35.
- 5. Continue the installation steps in the Tivoli Storage Productivity Center installer to install the Tivoli Storage Productivity Center specific reports in the Reporting environment.
- 6. Restart the Tivoli Storage Productivity Center web-based GUI using the following service on Windows:

IBM WebSphere Application Server V8.0 - TPCWebServer

3

Setting up authentication

With the introduction of the web-based GUI, the desire to use external authentication servers is growing. Tivoli Storage Productivity Center supports using Lightweight Directory Access Protocol (LDAP) or Active Directory (AD) as authentication methods.

In this chapter, we explain how you can use Tivoli Storage Productivity Center together with external authentication services and what you need to understand in order to configure this correctly.

We sometimes use the term *external authentication server* and sometimes *directory server* in this chapter. Both terms mean the same here, but there are times we want to emphasize one or the other characteristic, so we use both terms. Specifically, we discuss Tivoli Storage Productivity Center user roles and Cognos authentication. A more complete guide to setting up authentication can be found in the IBM Redbooks publication *IBM Tivoli Storage Productivity Center: Beyond the Basics*, SG24-8236.

3.1 User roles in Tivoli Storage Productivity Center V5.2.2

The user role concept has changed in Tivoli Storage Productivity Center V5.2.2. We discuss the changes in this section.

3.1.1 Assigned roles

The number of roles have been reduced. There are now only the three roles available as listed in Table 3-1.

Role	Users that are assigned this role
Administrator	Can use every function in Tivoli Storage Productivity Center and by default, the following groups are assigned the Administrator role: • Windows: Administrators • Linux: root • AIX: system
External Application	 Cannot log in to the Tivoli Storage Productivity Center GUI. This role should be used for external applications that use the Tivoli Storage Productivity Center provisioning functions, such as: vSphere Web Client Extension for Tivoli Storage Productivity Center IBM SmartCloud Storage Access
Monitor	 Can log in to Tivoli Storage Productivity Center but cannot execute any function. A user with this role will still be able to see all information and open log files, but the only actions that this person can do are: Acknowledge Alerts Acknowledge a non-normal status Set the tier level of a storage pool

Table 3-1 New roles in Tivoli Storage Productivity Center V5.2.2

The basic concept is still the same: You assign a role to a group of users so all users in that group can perform certain actions in Tivoli Storage Productivity Center.

If you had Tivoli Storage Productivity Center V5.1 or earlier running, the existing roles will be mapped to the new roles as described in Table 2-4 on page 24.

With Tivoli Storage Productivity Center V5.2.2, the role to group mapping has been migrated to the web-based GUI. You will find a new icon on the bar on the left under **Settings** \rightarrow **User Management**, as shown in Figure 3-1 on page 51.

合 Settings	• User Management	Tivoli Storage Productivly Center	TPC\\Administrator 👘 📀
Home	User Man Modify authenticatio	agement	
Storage Resources	Add Group I≡ Actions ▼		🔍 🔻 [Filter]
Server Resources	Name All Role	or	
Network Resources			
Advanced Analytics			
Reporting			
Settings	User Management		
	Showing 1 item Selected 0 items		Refreshed a few moments ago

Figure 3-1 Tivoli Storage Productivity Center User Management

From this panel, you can also directly launch into the WebSphere Integrated Solutions Console. That is where you configure the authentication mechanism like Active Directory and LDAP.

3.1.2 Adding groups

To allow a new group of users to work with Tivoli Storage Productivity Center, they have to be a member of a group in the operating system or in the directory server. The following steps show you how you can allow all the users of the group called TPC_Admin to log in to Tivoli Storage Productivity Center with the role of administrator.

1. From Figure 3-2, click Add Group.

Add Group	
2	Search for a group name in the repository. Use * as a wild card. * Search
	OK Cancel

Figure 3-2 Add Group panel

2. Enter a search string and click **Search**.

Note: You do not need any prefix in the search string, but when you want to restrict the search to look for local OS groups, use this syntax:

<server name>\<group name>

If you use Method 2 (implicit), you can also use the following syntax to search for domain groups:

<domain name>\<group name>

3. From the results of the search, select the group or search again as shown in Figure 3-3.

Add Group	
2	Search for a group name in the repository. Use * as a wild card. *TPC* Search I= Actions * Ifeitor
	Name
	L TPC_Admins
	L TPC_Operators
	Showing 2 items Selected 1 item Refreshed a few moments ago
	Role: Administrator
	OK Cancel

Figure 3-3 Select group

- Select the Role from the Role drop-down list. It can be one of the three roles in Table 3-1 on page 50.
- 5. Click **OK** to complete the group assignment.

3.2 Authentication for Tivoli Storage Productivity Center Reporting/Cognos

As with Tivoli Storage Productivity Center, there is authentication and authorization required to be able to use the Tivoli Storage Productivity Center Reporting/Cognos.

The authentication for Tivoli Storage Productivity Center Reporting/Cognos is by default set to a single user only (typically **smadmin**) after the installation. The reason is that this component uses a separate WebSphere Application Server. If you want to use any other user ID, additional configuration is required.

Once you have adjusted the authentication settings, you can log in with a user ID from the configured repository. By default, the Tivoli Storage Productivity Center reports are available to all authenticated users. You do not have to do any kind of role to group mapping, but you can if wanted.

There is another item that you might want to configure so you do not have to reenter your user ID and password when you launch Cognos based reports from the Tivoli Storage Productivity

Center web-based GUI. To remove this additional log in panel, you can configure *Single Sign-on*. We explain how to do that later in this chapter.

3.2.1 Using external authentication for Cognos

In the previous sections we explained how you can enable a WebSphere Application Server to work with an external user directory. For details, refer to IBM Redbooks publication *Tivoli Storage Productivity Center Advanced Topics,* SG24-8236, Chapter 5.6 "Configuration of WebSphere Application Server for LDAP/Active Directory Authentication".

3.2.2 Using local OS authentication for Cognos

After the installation, Tivoli Storage Productivity Center Reporting using Cognos is set up with only a file-based user repository. During the installation only one user is created (typically the user is called **smadmin**), so only this one user can log in to Cognos.

Earlier in this chapter we briefly explained how to set up a WebSphere Application Server to use an external directory server for the authentication of users that want to work with Tivoli Storage Productivity Center.

Now we describe how you can change the configuration of the JazzSM WebSphere to use any local OS user ID. The steps for this are basically the same as adding an external directory server:

1. Back up the WebSphere configuration.

The IBM Tivoli Storage Productivity Center, Version V5.2.2 IBM Knowledge Center topic titled *Adding an LDAP repository to the federated repositories* describes the process to back up the WebSphere configuration. The topic can be found at:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.2/com.ibm.tpc_V522.doc/fq z0_t_config_ldap_active_directory.html

- 2. Start the WebSphere Application Server administration console of JazzSM.
 - Use the start menu entry in Windows and follow the path:

```
Start \rightarrow IBM WebSphere \rightarrow IBM WebSphere Application Server V8.5 \rightarrow Profiles JazzSMProfile \rightarrow Administrative Console
```

- Alternatively, you can use the following web page if you are using the default port:

http://<TPC server>:16316/ibm/console

- Log in with the smadmin user

Note: If you cannot get a web browser connection, make sure that any firewall between the browser and the Tivoli Storage Productivity Center server will allow incoming traffic to the WebSphere ports. You can also run the browser locally on the Tivoli Storage Productivity Center server. The WebSphere Application Server for JazzSM port is 16316.

3. Add the directory server to the WebSphere Application Server configuration.

Follow these steps to add the directory server as an additional repository to the configuration:

a. Open **Security** in the navigation on the left.

b. Click **Global security** and you will see the window in Figure 3-4.

WebSphere. software	Welcome smad	dmin Help Logout IBM
View: All tasks	Cell=JazzSMNode01Cell, Profile=JazzSMProfile	Close page
Velcons Velco	Clobal security Global security Due this panel to configure administration and the default application security policy. This security configuration applies to the security policy for all administrative applications. Security domains can be defined to override and customize the security policies for user application. Security Configuration Report Administrative security	Hub Hub
Busissecutivy Binvironment Bystem administration Users and Groups Management of Table	Image: Security O SWAM (degreated) in submiticated communication between servers Java 2 security Image: Security	
(6) Troubleshooting (b) Service Integration (c) UDDI	User account repository Enable Java Authentication SPI (JASPI) Palm name Oderau/WWIFFindsamdhealm Use realm-qualified user names	
	Current realm definition Federated repositories Available realm definitions Federated repositories Configure Set as current Apply Reset	

Figure 3-4 WebSphere Global security

c. From here, click **Configure** to continue. The window shown in Figure 3-5 is presented.

WebSphere. software			Welcome smadmin	Help Logout IBM
View: All tasks	Cell=JazzSMNode01Cell, Profile=JazzSMProfile			Close page
- Walance	Global security		2 =	Help 🗧
Guided Activities	<u>Global security</u> > Federated repositories			Field help
Servers	By federating repositories, identities stored in multiple repo	sitories can be managed in a single, virtual realm. Th	e realm can consist of identities in the file-based	For field help information, select a field label or list marker when the
Applications	General Properties	rnal repositories, or in both the built-in repository and	i one or more external repositories.	help cursor is displayed.
± Services	* Realm name			Page help More information about this page
* Resources	defaultWIMFileBasedRealm ×			Command Assistance
Security	* Primary administrative user name			View administrative scripting
Global security	smadmin			command for last action
Security domains Administration County	Server user identity			
SSL certificate and key management	Automatically generated server identity			
= Security auditing	 Server identity that is stored in the repository 			
Bus security				
± Environment				
± System administration				
± Users and Groups				
Monitoring and Tuning	Ignore case for authorization			
± Troubleshooting	Allow operations if some of the repositories are down			
± Service integration	Repositories in the realm;			
± UDDI	1			
	Add repositories (LDAP, custom, etc)	Use built-in repository Remove		
	Select Base Entry	Repository Identifier	Repository Type	
	You can administer the following resources:			
	o=defaultWIMFileBasedRealm	InternalFileRepository	File	
	Total 1			
		Related Items		
	Additional Properties	= Manage repositories		
	Property extension repository	= Trusted authentication rea	ilms - inbound	
	Entry mapping repository			
	Supported entity types			
	 User repository attribute mapping Outbox execution 			
	 <u>custom properties</u> 			

Figure 3-5 Global security, Federated repositories

d. You can see that there is only one repository defined, the InternalFileRepository.

If you compare that with the WebSphere Application Server of Tivoli Storage Productivity Center, the localOS repository is not listed.

This means that you can only log in to Cognos with a user ID defined within WebSphere (InternalFileRepository) which by default is the smadmin.

Click Manage repositories to continue to Figure 3-6 on page 55.

WebSphere. software			Welcome smadmin Help Logout
View: All tasks	Cell=JazzSMNode01Cell, Profile=JazzSMProfile		Close
Velcome Solided Activities Solided Activiti	Obbal security F Ederated repositories > Manage repositor Repositories that are configured in the system are listed in the folio is: Preferences Date sequences Date sequences Date sequences Date sequences Select: Repository: Select: Repository: Yes: can administer the following resources:	tes wing table. You can add or delete external repositories. Repository Type 🔿	Profile help Field help For field help
security opmains Administrative Authorization Groups ScLeartificate and key management Security auditing Bus security	InternalFileRepository Total 1	File	
Environment			
System administration Users and Groups			
Monitoring and Tuning Troubleshooting			
Service integration UDDI			

Figure 3-6 Global security \rightarrow Federated repositories \rightarrow Manage repositories

e. Click **Add** and select **Custom repository** from the drop-down list. Figure 3-7 is presented.

WebSphere. software	Welcome smadmin	Help Logout IBM.
View: All tasks	Cell=Jazz5MNode01Cell, Profile=Jazz5MProfile	Close page
	Bibbal security 2 Clobal security > Federated repositories > Manage repositories > New 3 Specifies the configuration for access to a custom repository. 3 General Properties * * Repository dentifier X * Repository adapter class name * Federated repository properties for login * Custom properties * New *	Help Help Field help Specifier a plugue destriker for the specifier and the speci
Beston Hy Houses and Groups Houses and Groups Houses House House Hy Hy	Select Hame Value Apply OK Reset Cancel	

Figure 3-7 New custom repository

f. On this panel, you must complete the information listed in Table 3-2 below and click **Apply**.

Table 3-2	Information	for localOS	repository
-----------	-------------	-------------	------------

Attribute	Value
Repository identifier	localOS
Repository adapter class name	com.ibm.ws.wim.adapter.urbridge.URBridge

You also must define the Custom properties listed in Table 3-3. After each line you must click **New** to add another line to the Custom properties table in Figure 3-7.

Table 3-3 Custom properties

Name	Value	
groupDisplayNameProperty	displayName	
userDisplayNameproperty	displayName	

Name	Value
userSecurityNameProperty	uniqueName
uniqueUserIdProperty	uniqueld
uniqueGroupIdProperty	uniqueld
groupSecurityNameProperty	uniqueName

After adding the Custom Properties, the panel will look similar to Figure 3-8.

WebSphere. software		Welcome smadmin	Help Logout IBM.
View: All tasks	Cell=Jazz5MNode01Cell, Profile=Jazz5MProfile		Close page
Welcome Welcome Goddad Activities Goddad Activities Geodesea Servers Geodesea Services Services Services Security Goddal excetty Goddal excetty Security domains	Clobal security Federated repositories > Manage repositories > New Specifies the configuration for access to a custom repository. General Properties * Repository identifier Image repositories > New * Repository identifier General Properties * Repository identifier General Properties * Repository identifier General Properties * Repository adopter class name General Properties Federated repository properties for login Federated repository properties for login		Help – Field help Value Page help More information about this page Command Assistance Yiew administrative acritising sommand for last action
Administrative Authorization Groups SSL certificate and key management Security auditing Bus security	Custom properties New Delicits		
Environment	Select Name	Value	
* System administration		displaywame	
Musers and Groups	UserUsplaywameproperty	displayname	
(#) Troubleshooting		uniqueName	
Service integration	uniqueUserIdProperty	uniqueId	
IDDI	UniqueGroupIdProperty	uniqueId ×	
	Apply OK Reset Cancel	uniqueName	

Figure 3-8 Repository information completed

g. When you are finished, click **OK**. WebSphere will exit that panel but you still must commit the changes in the next window as shown in Figure 3-9.

WebSphere. software				Welcome smadmin	Help Logout IBM.
View: All tasks	Cell=Jazz5MNode0	01Cell, Profile=JazzSMProfile			Close page
Velcome Velc	Global security Global secur Repositories Deference Add *	 Messages Changes have been made to your local configuration. You of segme directly to the master configuration. Expert directly to the master configuration. The server may need to be restarted for these changes to the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the server may need to be restarted for these changes to the set of the server may need to be restarted for these changes to the server may need to be restarted for these changes to the server may need to be restarted for t	76	Help P Field help For field help information, select a field biase if lattice information, select a field biase information about this page the selected selected biase information about this page to the selected biase and the selected biase and the selected biase about this page to the selected biase about the	
Environment	Select Ben	insitory Identifier ^	Repository Type ^		
System administration	You can adr	dminister the following resources:			
± Users and Groups	Inter	ernalFileRepository	File		
* Monitoring and Tuning			Custom		
Troubleshooting					
Service integration	Total 2				
* UDDI					

Figure 3-9 Save changes

h. In the Messages pane, click Save.

Once the changes have been saved, the Messages pane disappears; the Manage repositories panel stays open.

 Click Global security → Federated repositories to get back to Figure 3-10 on page 57.
4. Enable the new repository and specify the search/Base Entry in the directory server.

The next step is to tell WebSphere Application Server to use the new repository and specify where in the directory tree of the new repository it should look for users that attempt to log on to Tivoli Storage Productivity Center.

WebSphere, software		Welcome smadmin	Help Logout 🗄
View: All tasks	Cell=JazzSMNode01Cell, Profile=JazzSMProfile		Close pag
Welcome Gudde Activities Servers Applications	Global security Global security > Federated repositories By federating repositories, identities stored in multiple repositories can be managed in a single, virtual realm. The realm repository that is built into the system, in one or more external repositories, or in both the built-in repository and one or <u>General Properties</u>	can consist of identities in the file-based more external repositories.	Help Field help Specifies the name of the realm. Page help More information about this page
Service Constraint Constraint Con	Kaalm name Gafanit/WiFiReibasedRealm X Primary administrative user name smadmin Server user identity Automatically generated server identity Server identity that is stored in the repository Genere user D or administrative user on a Version 6.0.1 node		Command Assistance View administrative scripting command for last action
B. Environment 6. System administration 7. Users and Groups 6. Monitoring and Turing 6. Troubleshooting 6. Service Integration 7. Service Integration	Password Ignore case for authorization Allow operations if some of the repositories are down Repositories in the realm:		
	Add repositories (LDAP, custom, etc) Use bull+lin repository Remove Select: Base Entry Repository Identifier Repository	sitory Type	
	You can administer the following resources: o=defaultWJMFileBasedRealm InternalFileRepository File Total 1 Related Items		
	Additional Properties = Manage recositories = Eroserty extension resolitory = Tousted authentication realms - in = Entry mapping recository = Tousted authentication realms - in = Supported entity types = = User recository attribute mapping = = Custom properties =	nbeund	

Figure 3-10 Global security \rightarrow Federated repositories

a. Click Add repositories (LDAP, custom, etc.) to continue to Figure 3-11.

Note: This button is labeled differently depending on the version of WebSphere Application Server.

WebSphere. software	Welcome smadmin	Help Logout I
View: All tasks	Cell=JazzSMNodeD1Cell, Profile=JazzSMProfile	Close pag
Velcome Velco	Otbob security > Ederated repositories > Repository reference Subtrast of Mantity entries in a repository that are referenced by a base (or parent) entry into the directory information tree. If multiple respositories or multiple within the restrement in the same realm, it might be necessary to define additional distinguished names to uniquely identify this set of entries within the restrement. Repository Repository Repository Induce distinguished name of the base (or parent) entry in federated repositories Induce distinguished name of the base (or parent) entry in federated repositories	telp 2 Field help Specifies the distinguished name (DNI) of the base (or parent) entries entries in federated repositories. Page help More information about this page Command Assistance View administrative activities command for last action
BinVironment System administration Users and Groups Monitoring and Tuning Troubleshooting Service integration	Apply OK Cancel	

Figure 3-11 Add Base entry to Realm

b. As the Unique distinguished name of the base (or parent) entry in federated repositories use o=localOSAs.

When you are done, click **OK** and a confirmation dialog appears as shown in Figure 3-12.

View All tasks Weicoms Cell-Jasz5Mbddd1Cell, Profile-Jaz5MProfile * Weicoms Bornes B serves Cell-Jazz5Mbddd1Cell, Profile-Jaz5MProfile * Stress Cell-Jazz5Mbddd1Cell, Profile-Jaz5MProfile B serves Cell-Jazz5Mbddd1Cell, Profile-Jaz25MProfile B serves Cell-Jazz5Mbddd1Cell, Profile-Jaz25MProfile B serves Cell-Jazz5Mbddd1Cell, Profile-Jazz5MProfile B serves Cell-Jazz5Mbddd1Cell, Profile-Jazz5Mbdd1Cell, Profile	At itasis Coll-JazoSMitodelCall, Profile=JazoSMitodelCall, Profile=Ja	Change have been made to your local configuration. You can: Single directly to the master configuration. Single changes before awing or discarding. The server may need to be restarted for these changes to take effect. Inderepositories Gentities stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identit the system, in one or more external repositories, or in both the bulk-in repository and one or more external repositories are name	WebSphere, software		Welcome smadmin	Help Logout IB
 Welcoms Backet of the master configuration. Backet of the master configuration.<td></td><td>sages Changes have been made to your local configuration. You can: <u>Barding</u> directly to the master configuration. <u>Restring</u> changes before saving or discarding. The server may need to be restarted for these changes to take effect. ted repositories <u>dentities</u> stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identiti <u>ted repositories</u> <u>dentities</u> stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identiti <u>ted repositories</u> <u>n x</u> <u>a</u> reame</td><td>View: All tasks</td><td>=JazzSMNode01Cell, Profile=JazzSMProfile</td><td></td><td>Close page</td>		sages Changes have been made to your local configuration. You can: <u>Barding</u> directly to the master configuration. <u>Restring</u> changes before saving or discarding. The server may need to be restarted for these changes to take effect. ted repositories <u>dentities</u> stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identiti <u>ted repositories</u> <u>dentities</u> stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identiti <u>ted repositories</u> <u>n x</u> <u>a</u> reame	View: All tasks	=JazzSMNode01Cell, Profile=JazzSMProfile		Close page
Allow operations if some of the repositories are down Repositories in the realm: Add repositories (LDAP, custom, etc) Use built-in Scient Repositories (LDAP, custom, etc) Repositories (LDAP, custom, etc)	Password Password Ignore case for authorization	ted server identity .stored in the repository inistrative user on a Version 6.0.x node	WebSphare, bottware View: All tasks • WebSome Get • WebSome Get • WebSome Get • Services Get • Services Get • Collable scrity Get • Stortfortes and Kry management Get • Security adding Get • Bus security Get <td></td> <td>Welcome smadmin</td> <td>Help Logout Title Close page Close page Help Find Help Find Help For field help Information, select a help cursor is displayed. Page help More information about this page Command Assistance View administrative scription is accounted by the select and the select accounted by the select accounted b</td>		Welcome smadmin	Help Logout Title Close page Close page Help Find Help Find Help For field help Information, select a help cursor is displayed. Page help More information about this page Command Assistance View administrative scription is accounted by the select and the select accounted by the select accounted b
You can administer the following resources:	Allow operations if some of the repositories are down Repositories in the realm: Add repositories (LDAP, custom, etc) Use built-in repository Select Base Entry Repository Repository Identifier You can administer the following resources: ovideSaUKVIMFileBaseRealm InternalFileRepository ovideSaUKVIMFileBaseRealm InternalFileRepository ovideSaUKVIMFileBaseRealm InternalFileRepository	Itabion Ine of the repositories are down Internaling resources: Inte		Add repositories (LDAP, custom, etc) Use bulk-in repository Remove Select. Base Entry Repository Identifier Repository Type You can administer the following resources:		
	Allow operations if some of the repositories are down Repositories in the realm: Add repositories (LDAP, custom, etc) Use built-in repository Eabert Base Some Repositor (deatline)	Ization ne of the repositories are down s (LDAP, custom, etc) Benository Memove Remove Remove Remove		Add repositories (LDAP, custom, etc) Use built-in repository Remove Salart Base Entry Salart Base Entry Salart Base Entry Sansitory Identifiar Sansitory Identifiar Sansitory Identifiar		
			smadmin Server user identity Automatically generated server identity			
Automatically generated server identity Automatically generated server identity Server identity that is stored in the repository Server user ID or administrative user on a Version 6.0.x node Password Ignore case for authorization	rver user identity Automatically generated server identity Server identity that is stored in the repository Server user 100 variamitistrative users on a Version 6.0.x node		Rea def Prir	im name autWJMFileBasedRealm X mary adminiatrative user name admin		
Scortback and kay management Scortback and kay management Scortback and kay management Scortback and kay management Scortback and kay	Kealim name Security sudding security security security security Security MinifuldaseRealm x Primary administrative user name Immary administrefeet user name Immary administratiname Immary administrefe	n X ar name	Security Global security Security domains Administrative Authorization Groups	Global security > Federated repositories By federating repositories, identities stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identities repository that is built into the system, in one or more external repositories, or in both the built-in repository and one or more external repositori General Properties	in the file-based les.	View administrative scripting command for last action
■ Global security ■ Global security > Federated repositories ■ Global security > Federated repositories. By federating repositories. ■ Security domains By federating repositories. By federating repositories. ■ Security domains By federating repositories. By federating repositories. ■ Society sudding ■ Global security > Federated repositories. ■ Environment ■ Base main ■ ■ Browies and Funga ■ ● Primary administrative user name ● Traveleshooting ● Automatically generated server identity ● Server user identity and Tuning ● Server user identity are to a Version 6.0.x node ● Utors ● Server user for authorization	r Global security > Federated repositories al security in domains initizative Authoritation Groups controllates and ky management with audoing security and sec	ted repositories dentities stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identit the system, in one or more external repositories, or in both the built-in repository and one or more external repositor n X er name	Walcome Walcome Global Activities Global Activi	Messages McSages have been made to your local configuration. You can: Saus directly to the master configuration. Review changes before saving or discarding. Monte server may need to be restarted for these changes to take effect.	2 _	Help - Field help For field help information, select a field label or list marker when the help cursor is displayed. Page help More information about this page More information about this page Command Assistance
		Seget Charge have been made to your local configuration. You can: Sing directly to be master configuration. Envirous En	View: All tasks Cell-	=JazzSMNode01Cell, Profile=JazzSMProfile	-	Close page
Verwing (All tasks Verwing (All tasks) Workcome Global security Workcome Global security Global security Global security Global secu	All tasks Call-baseStrokede(Call, Public+StacStrokede e Global security a Call-baseStrokede(Call, Public+StacStrokede a Call-baseStrokede(Call, Public+StacStrokede a Call-baseStrokede(Call, Public+StacStrokede is Call-baseStrokede(Call, Public+StacStroked is Call-baseStrokede is Call-baseStrokede(Call, Public+StacStrokede is Call-baseStrokede is Call-baseStrokede is	segges Changes have been made to your local configuration. You can: <u>Bays</u> directly to the master configuration. <u>Review</u> changes before saving or discarding. .The server may need to be restarted for these changes to take effect. ted repositories dentities stored in multiple repositories can be managed in a single, virtual realm. The realm can consist of identit he system, in one or more external repositories, or in both the bulk-in repository and one or more external repositories are managed. a X			Welcome smadmin	Help Logout 표준도

Figure 3-12 Save the changes

- c. Enable the option "Allow operations if some of the repositories are down". In the Messages pane, click **Save** to continue.
- d. Click Save.
- 5. Optionally: Disable the implicit domain lookup through the localOS repository.

If advised by IBM support, you should disable the lookup of Active Directory user IDs through the localOS context at this point.

6. Restart the WebSphere Application Server.

This step depends on which WebSphere Application Server you have configured:

- For the WebSphere Application Server of Tivoli Storage Productivity Center, restart the IBM WebSphere Application Server V8.0 - TPCWebServer service.
- For the WebSphere Application Server of JazzSM, either restart the "IBM WebSphere Application Server V8.5 JazzSMProfile" service, or use the Windows Start menu.
 Stop IBM WebSphere → IBM WebSphere Application Server V8.5 → Profiles → JazzSMProfile and select:
 - · Stop the server
 - · Start the server

Note: Before you restart the server, make sure that WebSphere was completely stopped. See 3.3.1, "Restarting WebSphere" on page 60.

Now you are done with the basic setup in WebSphere Application Server.

Note: At this point of the configuration, you have only enabled WebSphere Application Server to accept user IDs that are defined in the local OS to authenticate. Those users do not yet have a role in the WebSphere administration console, so for example you will not be able to log on with the Windows Administrator user.

For the purpose of letting users access reports in Cognos, no further steps are required. By default, Cognos will let any authenticated user access any report. If you want to restrict user access to reports, you need to change the report properties within Cognos.

3.2.3 Restrict access to Tivoli Storage Productivity Center reports in Cognos

Sometimes it becomes necessary to restrict the access to certain reports to a specific set of users. This is very similar to granting access to files and folders in a file system.

The steps to restrict access to Cognos reports are documented in the Tivoli Storage Productivity Center IBM Knowledge Center in the topic titled *Configuring security for Tivoli Common Reporting with the default authentication configuration.*

The topic in the Tivoli Storage Productivity Center IBM Knowledge Center can be found at the following location:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.0/com.ibm.tpc_V52.doc/fqz0_t
_reports_security_configuring.html

Here is a brief outline of the steps you must complete:

1. Restrict administrative privileges for users in Tivoli Common Reporting.

By default, every authenticated user in Cognos is a member of the Cognos administrators group. This configuration is implemented to reduce complexity but that needs to be reset.

2. Specify access to reports in Tivoli Common Reporting.

Optionally, you can also restrict who has access to the Report Studio. Having access to that function means a user could open a report in the edit mode by mistake, make changes, and save the report. This might make the report unusable.

3.2.4 Single Sign-On

Even when Tivoli Common Reporting/Cognos is set up using the same authentication server that Tivoli Storage Productivity Center uses, you still must authenticate again when you launch the reporting. The reason is simple; behind the scenes the Tivoli Storage Productivity Center web-based GUI is running a different WebSphere Application Server than the Cognos component. For this reason, you need to authenticate again when you access the reports for the first time during a session.

There is a way to configure the WebSphere Application Server running Tivoli Common Reporting/Cognos to accept and use Single Sign-On tokens from the other WebSphere Application Server so that you do not need to enter a user ID and password.

During this project, we did not have the possibility to test this setup. We provide a link to the Tivoli Storage Productivity Center IBM Knowledge Center with instructions on how to configure Tivoli Storage Productivity Center so that no passwords are required when you open the Cognos web-based GUI from the Tivoli Storage Productivity Center web-based GUI.

The web page is located at:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.0/com.ibm.tpc_V52.doc/fqz0_t _config_tpc_jazzsm_sso.html

Important: This will only work if you switched from the default file repository authentication to LDAP or to a local OS in the WebSphere Application Server that Cognos is using.

3.3 Issues during our testing

In the following section, we describe the following issues encountered during our testing and want to make you aware of them.

3.3.1 Restarting WebSphere

When you are restarting WebSphere, you should make sure that WebSphere is completely stopped before you restart it. When we used the Windows Start menu entries the stop script was finished quickly. We ran the start script. However, WebSphere Application Server was not completely stopped and so our changes were never activated.

We have not verified if the Windows service is having the same issue, but the safest way to make sure that WebSphere is stopped, is to look for these files:

- Tivoli Storage Productivity Center WebSphere: C:\Program Files\IBM\TPC\ewas\profiles\WebServerProfile\logs\webServer\webserv1.pid
- JazzSM WebSphere: C:\Program Files\IBM\JazzSM\profile\logs\server1\server1.pid

Use the following command:

JazzSM_install_directory\profile\bin\startServer.bat server1

These files will get deleted when the WebSphere Application Server is successfully stopped. We typically rebooted the system because this was easier for us.

3.3.2 Error DPR-ERR-2107

There is a known issue that we saw on one test system. If you see the message shown in Figure 3-13 when you want to open the reporting from the Tivoli Storage Productivity Center web-based GUI menu, this is probably caused by having multiple sessions to multiple Tivoli Storage Productivity Center servers open in the same browser. When we used a different browser, or closed and reopened the browser, the error disappeared.

IBM Co	gnos software	Help 🔀
DPR-ER	R-2107	
X	The User Capabilities Cache cookie cannot be decoded.	
	Details ²	
	Handler trace back: [the_dispatcher] com.cognos.pogo.handlers.performance.PerformanceIndicationHandler [the_dispatcher] com.cognos.pogo.handlers.logic.ChainHandler [UserCapabilitiesCacheDecodeHandler] com.cognos.pogo.util.capability.UserCapabilitiesCacheDecodeHandler	
ОК		

Figure 3-13 DPR-ERR-2107 error message

4

Server Resource Management

This chapter describes the new agentless server and the Storage Resource agent (SRA) feature in a Tivoli Storage Productivity Center managed environment. It provides the information necessary to create a server object in Tivoli Storage Productivity Center, as well as information about what you can do with it. The differences between a server with a Storage Resource agent and an agentless server are described.

An agentless server can be either a physical server or a virtual machine. Details on adding and managing a Hypervisor with Tivoli Storage Productivity Center are described in Chapter 10, "VMware vCenter Server configuration and use" on page 233.

New for Tivoli Storage Productivity Center version 5.2.2 is the ability to add and manage Storage Resource agents via the Web-UI. Before this release, this function specifically ran from the stand-alone graphical user interface (GUI). All options have now been migrated to the web-based GUI for a more consistent feel to resource management.

4.1 Agentless server function

The agentless server is a server definition available with Tivoli Storage Productivity Center V5.2, in addition to the Tivoli Storage Productivity Center SRA.

Agentless server gives you the ability to model a host server, either a physical server or a virtual machine, in Tivoli Storage Productivity Center without deploying a Storage Resource agent. This is really useful in those situations where you cannot or do not want to deploy a Storage Resource agent either for security restrictions in providing administration credentials, or simply to avoid loading a production server with agent code.

Tip: A Serverless Agent can be any grouping of worldwide port names (WWPNs) that you want to do reporting on, for example a Cluster of Application.

By the definition of agentless servers, it is possible (as with Storage Resource agents) to get a complete view of the connectivity between servers and other top-level resources. This is useful in troubleshooting scenarios to view performance data for connected subsystem and switch resources.

To gather server information, Tivoli Storage Productivity Center correlates resources consumed by the server from storage system host connections and fabric zone aliases. The agentless server thus shows server Fibre Channel Ports, HBAs, SAN-attached disks, and related SAN components.

Note: Agentless servers do not provide file system or local disk information. Use a Storage Resource agent to access that information.

4.1.1 Requirements for using agentless server

The following requirements apply when you want to use the agentless server function:

License

You can use the plug-in with any version of Tivoli Storage Productivity Center.

Tivoli Storage Productivity Center users permission

Only Tivoli Storage Productivity Center administrators can add agentless servers.

4.2 Implementing agentless server

It is possible to add an agentless server by simply providing the IP address or host name of the server. The following optional entries can be provided:

- OS type
- Location
- Virtual machine or physical server
- Worldwide port names (WWPN)

Important: While adding WWPNs is optional, without WWPNs Tivoli Storage Productivity Center cannot correlate the SAN resources consumed by the server.

The WWPNs are used by Tivoli Storage Productivity Center to correlate the agentless server with the storage systems, fabrics, and switches that are being monitored. For example, the ports that you enter for an agentless server are compared to the ports on host connections for monitored storage systems. If there is a match between the server and a host connection, you can view the connectivity between the server and storage system and the capacity of volumes that are assigned to the server.

Once an agentless server is defined to Tivoli Storage Productivity Center, it is added to the **Servers** pane (from the Tivoli Storage Productivity Center web-based GUI navigation pane select **Server Resources** \rightarrow **Server**), as shown in Figure 4-1.

Serve	/ers ormal /arning gentless	d Samera						
Servers Alerts Ia	Servers Alerts Tasks Discovered Servers							
Add Server 🔢 Actions	-							
Name	Status 🔻	Probe Status	Agent State	ОЅ Туре	OS Version	IP Address	Cluster	Virtual Machine
pokvc1.itso.ibm.com	Vormal	Successful	🔽 Up	Windows	6.1:Service Pack 1	9.12.5.201		Yes
itsodns.itso.ibm.com	Agentless			AIX	Unknown	9.12.6.7		No

Figure 4-1 Servers pane

Tip: If you want to deploy a Storage Resource agent to a server or virtual machine, use the web-based GUI and deploy an agent for full server monitoring.

There are multiple ways to create an agentless server:

- Manually (creates a single agentless server).
- ► From a CSV file (creates multiple agentless servers).
- From discovered servers known to Tivoli Storage Productivity Center.
- From subsystem Host Connection.
- ► From Fabric/Switch discovered ports.

The following sections describe the different ways to add an agentless server.

4.2.1 Adding an agentless server manually

In this section, we show an example on adding an agentless server manually. The server we add in this scenario is the Windows system with host name SSPC15.

This system has several volumes defined in the storage system named "SVC CF8". A host connection with the name SSPC15 is defined on the storage system and visible in Tivoli Storage Productivity Center in the Host Connections panel.

 To access the Host Connections pane and display the host connections, select from the left navigation pane of the Tivoli Storage Productivity Center web-based GUI Storage Resources → Storage Systems and double-click the SVC CF8 system to access the detail pane. Finally, we choose the Host Connections entry from the Internal Resources section on the left side. See Figure 4-2 on page 64.

SVC_CF8	Host		;			
IBM SAN Volume Controller - 2145	Those connections					
Actions	Add Server 🗄 Actions	-	_		_	Q v
	Name 🔺	Connected Resource	Host Type	Ports	Volumes	U.
General	🦉 itso_scva1	Unavailable	GENERIC	👪 <u>2</u>	itso sitea	
Overview	🦉 itso_svca2	Unavailable	GENERIC	🔤 <u>2</u>	itso sitea	
Properties	🦉 itso_svcb1	Unavailable	GENERIC	👪 2		
Alerts (0)	itso_svcb2	Unavailable	GENERIC	👪 2		
👹 Tasks (143) 🛛 🥸	is poksrv3.itso.ibm.com	poksrv3.itso.ibm.com	GENERIC	👪 <u>2</u>	∃ <u>4</u>	
Data Collection (2)	SSPC15	Unavailable	GENERIC	👪 <u>2</u>	12	
Informal Resources Informal Resources Imaged Disks (33) Imaged Disks (33) Imaged Disks (33) Imaged Disks (2) Imaged Disks (2)						
Back-end Storage Systems (2)	Showing 6 items Selected 0 items					Refreshed a few moments ago
_						

Figure 4-2 SVC CF8 host connection pane

2. Click the **Ports** field to see the Host Ports details that relate to an unknown resource. This is indicated in the Connected Resource field as a status of Unavailable (see Figure 4-3).

SSPC15 Properties				
SSPC15 Properties	General	Volume Mappings ons FF2B4B67 FF2B4B66	Host Ports Connected Resource Unavailable Unavailable	
	Showing 2	items Selected 0 items		Refreshed a few moments ago
<u></u>			Close	

Figure 4-3 Host ports details

 Next, add the SSPC15 system as an agentless server. From the Tivoli Storage Productivity Center GUI left navigation pane, select Server Resources → Servers as shown in Figure 4-4.

Server Servers Alerts Tas	ers mal pr antless ks Discover	red Servers									
Add Server 🔢 Actions 🔻										Q 🔻 [
Name	Status 🔷 🔻	Probe Status	Agent State	OS Type	OS Version	IP Address	Cluster	Virtual Machine	Used Space	. Total Disk Space	e (Gif IJ
pokvc1.itso.ibm.com	Normal	Successful	💟 Up	Windows	6.1:Service Pack 1	9.12.5.201		Yes	63	.04	103.0

Figure 4-4 Servers pane

4. On the left of the top bar click **Add Server**. Agentless servers are added by default. The Add Server pane appears, as shown in Figure 4-5.



Figure 4-5 Add Server pane

5. We select the **Manually** icon and click **Next** to access the configuration panel, where we complete the fields, as shown in Figure 4-6 on page 66.

Add Server			
Configuratio	on		
		Host name or IP address:	SSPC15
•		OS type:	Windows
		Location:	No Location
Server		✓ Add ports	
		■ Back Next	Cancel

Figure 4-6 Add Server configuration pane

6. After you click Next, Tivoli Storage Productivity Center starts the validating host information process. The SSPC15 host name matches host connections present in the Tivoli Storage Productivity Center environment (as shown in Figure 4-3 on page 64). A message prompt with the proposed WWPNs for the server is presented as shown in Figure 4-7.

Add Server	
Assign Ports	BPCUI0180I Based on the known configuration of storage system host connections, fabric zone aliases, and HBA ports, additional ports may have been added to the selection below.
SSPC15	
	WWPNs:
	SSPC15
	a1000024FF2B4B66
	💩 21000024FF2B4B67
	Enter a new WWPN here Add
	Back Finish Cancel

Figure 4-7 Add Server with message indicating additional ports added to the selection

Important: We suggest that you always double-check the WWPN values to avoid possible errors due to misspellings or duplicated host names.

- 7. From the "Add Server" pane, you can:
- Accept the proposed WWPN values.
- Discard the WWPNs, by clicking the red cross.
- Manually add WWPNs (either in addition to or replacing the proposed values) by entering the WWPN in the field and clicking Add.

Since the proposed WWPNs are correct, we accept the values and click **Finish**. The agentless server is added to the Server pane, as shown in Figure 4-8.

Servers Image: Instant server Image: Image						
Servers Alerts Tasks Disco	vered Servers					
Add Server = Actions -						
Name Status	- Droho Statua	Agont State		Of Marrian	ID Address Clus	tor Virtual Mashina
Name Status	Probe Status	Agent State	Озтуре	05 version	IP Address Clus	
pokvc1.itso.ibm.com	Successful	🗹 Up	Windows	6.1:Service Pack 1	9.12.5.201	Yes
itsodns.itso.ibm.com 🧼 Agentles	s		AIX	Unknown	9.12.6.7	No
SSPC15 O Agentles	s		Windows	Unknown		No
						no

Figure 4-8 Agentless server SSPC15 added in Servers pane

Functions available for agentless server

The following functions are available for the SSPC15 agentless server. The functions are accessible by right-clicking the server icon:

View properties

From the properties pane, you can review and modify the fields entered during the agentless server definition. See Figure 4-9.

SSPC15 Properties		
	General Storage	
	Name	SSPC15
	Status	Agentless
	OS Type	Windows
Servers	IP Address	
	Domain Name	-
•	Virtual Machine	No
	Location	No Location *
	Custom Tag 1	No Custom Tag 🔹
	Custom Tag 2	No Custom Tag 🔹
	Custom Tag 3	No Custom Tag 🔹
	Sauce	Cancel
	Save	Cultor Close

Figure 4-9 Server properties pane

View details

The details pane summarizes in a single view information about configuration and performance (when available, depending on the performance job defined), for both internal and external related resources. See Figure 4-10.

	Overview	
	Space from Storage Systems	Nost Active Switch Ports Last 24 hours
SSPC15	300	
Actions General		1 No performance data is available for the last 24 hours. To view this chart, run a performance monitor to collect data from the resource.
Overview Image: second seco	100	
Internal Resources		
Controllers (2)	SVC_CF8 SVC_8G4	
Disks (3)	Maet Active Storage System Molumos	Last 24 hours
Related Resources	most Acuve and age aystem volumes	lles March
Storage Systems (2)	1.00 T	lization
Volumes (13)	0.90 -	
Mapaged Disks (34)	0.80 -	
RAID Arrays (1)	0.70 - © 0.60 -	\odot
Disks (2)	8 0.50 -	
I/O Groups (2)	0.40 -	
Nodes (4)	0.30 -	
Ports (16)	0.20	
Host Connections (3)	0.00	
Switcher (2)		
Ports (2)	ITSO_test_v01 ITSO_test_v02	11SO_test_v03
	TGC_test_vv4	11011034

Figure 4-10 Details pane showing Overview of managed environment

View Data Path

The data path shows the connectivity between host connections, server, storage systems, and the fabrics through which the server receives storage. This view includes graphical and tabular representations of the top-level resources in a data path. Figure 4-11 on page 69 shows the graphical view of the data path.



Figure 4-11 Data Path: graphical view

Provision storage

Storage provisioning with Tivoli Storage Productivity Center is detailed in 7.3, "Provisioning storage with Tivoli Storage Productivity Center" on page 172.

Analyze tiering

The Tivoli Storage Productivity Center analyze tiering function is detailed in "Analyze Tiering function" on page 209.

Modify ports

From this pane, you can change the WWPNs of the server, as described in the comment to Figure 4-7 on page 66.

Remove the agentless server

Once removed, all the data associated with server will be removed, including historical data.

4.2.2 Adding one or more agentless servers via comma-delimited file

You can add one or more servers by importing configuration information from a comma-delimited file. In this section, we describe the content of the comma-delimited file and then show the steps to add an agentless server using the file.

Each server has to be specified in a separate line with the format shown in Example 4-1.

Example 4-1 Comma-delimited file example

host name or IP address,OS type,machine type,location,WWPN

Where:

► *host name* or *IP address* are the only required fields.

- ► OS type is optional. If specified, it can be one of the following values:
 - Windows
 - Linux
 - AIX
 - Solaris
 - HPUX
 - Other
- machine type determines if the server is a physical device or a virtual machine. The following values are allowed:
 - Physical
 - Virtual
- ► *Location* represents the physical location of the server.
- ► *WWPN* is the worldwide port name associated with the server. Since there can be any number of ports, the WWPN list is open ended.

The optional fields can be omitted by using a comma as a placeholder. Comments are ignored and can be specified by the "#" character. Example 4-2 is a comma-delimited file example.

Example 4-2 Comma-delimited file example

```
tpcblade2-12,,Virtual,,210000096B368FBC,210000096B368FBD # DS8K-2107-1302541
tpcblade2-8,Solaris,Physical,,210000096B366126,210000096B366127 # storea
9.1.83.98,Linux,Physical,San Jose,10000000C9643A7C # XIV-2812-7825410-IBM
```

1. From the Add Server pane shown in Figure 4-5 on page 65, we select the **Import list** from a file option and click **Next**. The **Import List** pane opens as shown in Figure 4-12.

Add Server	
Import List	Î
Upload a file with one line per server to be created in the following comma separated format: Host name or IP address, OS type, Machine type, Location, WWPN, WWPN Only Host Name or IP Address is required.	
Select file: Choose File No file chosen	Ļ
Back Finish Cano	el

Figure 4-12 Import list from a file pane

2. In the Import list pane, click **Choose File** and browse to select the comma-delimited file. In our scenario, we saved the comma-delimited file as example.txt. When the file is selected click **Finish.** If there are syntax errors in the file, none of the servers in the file are added.

Tip: If you add several servers in the same input file, the process might require some time to complete. To run the process in the background, click **Close** on the Add Server window.

In the Servers pane, the newly added agentless servers are highlighted as shown in Figure 4-13.

 ✓ 1 Normal ④ 0 Warning ⊗ 0 Error ⊙ 5 Agentless 							
Servers Alerts Tasks	Discovered Servers						
Name Statu	is 🔻 Prohe Status	Agent State	OS Type	OS Version	IP Address	Cluster	Virtual Machine
pokvc1.itso.ibm.com	ormal Successful	Up	Windows	6.1:Service Pack 1	9.12.5.201	Cluster	Yes
9.1.83.98 O Ar	gentless		Linux	Unknown	9.1.83.98		No
itsodns.itso.ibm.com	gentless		AIX	Unknown	9.12.6.7		No
🗄 sspc15 🔅 Ar	gentless		Windows	Unknown			No
🔋 tpcblade2-12 🔅 Ag	gentless		Other	Unknown			Yes
🚦 tpcblade2-8 💮 A	gentless		Solaris	Unknown			No

Figure 4-13 Agentless servers added

4.2.3 Agentless server creation from Discovered Servers

Discovered servers are servers or virtual machines that were detected through a Windows domain discovery or hypervisor probe but are not being monitored.

To add a discovered server as an agentless server, complete the following steps.

- 1. Select one or more discovered servers that you want to add from the **Discovered Server** list. To access the list of discovered servers:
 - Click the **Discovered Server** option in the **Add Server** pane shown in Figure 4-5 on page 65.
 - Click the **Discovered Servers** tab in the **Servers** pane as shown in Figure 4-14 on page 72.

	1 Normal 0 Warning 0 Error 5 Agentless		
Servers Alerts	Tasks	I Servers	
Add Server 🔚 Act	ions 🔻		
Name	IP Address	OS Type	Hypervisor Discovered Time
base-win2k8x64	9.12.5.239	Windows	Oct 27, 2013 02:30:22 EDT
🗟 dsprojects	9.12.6.61	Windows	Nov 10, 2013 02:30:27 EST
🗟 itsopok	9.12.6.4	Windows	Oct 21, 2013 13:55:38 EDT
🗟 itsovc1	9.12.4.206	Windows	Oct 21, 2013 13:55:38 EDT
🗟 netauth	9.12.6.93	Windows	Oct 21, 2013 13:55:38 EDT
🔂 saw319-w1	9.12.5.134	Windows	Oct 21, 2013 13:55:38 EDT
🔂 saw319-w2	9.12.5.139	Windows	Oct 21, 2013 13:55:38 EDT
🗟 sd3c03-w1	9.12.5.252	Windows	Oct 21, 2013 13:55:38 EDT
🗟 sspcsrv	9.12.5.29	Windows	Oct 21, 2013 13:55:38 EDT
🔂 st3l10-w2	9.12.5.249	Windows	Oct 21, 2013 13:55:38 EDT
🗟 storagemgr	9.12.5.176	Windows	Oct 21, 2013 13:55:38 EDT
🔂 w3	9.12.6.20	Windows	Oct 21, 2013 13:55:38 EDT
🗟 WIN-ES4A3F549GU	9.12.5.87	Windows	Nov 7, 2013 15:03:45 EST
🗓 win-es4a3f549gu	9.12.5.87	Windows	Nov 10, 2013 02:30:27 EST
🗟 win-ymwi36tqjzs	9.12.5.159	Windows	Oct 21, 2013 13:55:38 EDT

Figure 4-14 Discovered Servers tab in Servers pane

2. From the pane you can select one or more servers, right-click, and select **Add Server** to start the wizard described in "Adding an agentless server manually" on page 63.

Note: When you select one server to add from the list of discovered servers, you can configure additional information about that server. When you select multiple servers to add, the servers are automatically created without the possibility to add additional configuration information.

After a discovered server is upgraded to an agentless server, it will no longer be shown in the Discovered Server list.

4.2.4 Agentless server creation from a subsystem host connection

Storage system host connections provide the server port to subsystem volume mapping configuration.

You can use the host connection to represent a server. When you select a host connection, you are specifying the internal resources (volumes and ports) that belong to that server from the perspective of the related storage system. Ports found from other storage system host connections and fabric zone aliases may also be included in the list of potential ports.

Note: Currently it is not possible to create multiple agentless servers from multiple host connections.

In this section, we create an agentless server using a host connection definition for the storage system SVC_CF8. To use a host connection to add an agentless server, complete the following steps:

- 1. To access the host connection tab for SVC_CF8 storage system:
 - From the Tivoli Storage Productivity Center GUI, select Storage Resources → Storage Systems and double-click the SVC_CF8 icon to open the detail pane.
 - Select Host Connections from the Internal Resources section as shown in Figure 4-15.

SVC_CFB	Hos	t Connections				
IBM SAN Volume Controller - 2145	Host Connections Volume Ma	ppings Mar Performance				
Actions x	Add Server 🔚 Actions	•				🔍 🔻 Filter
	Name 🔺	Connected Resource	Host Type	Ports	Volumes	
General	🦉 itso_scva1	Unavailable	GENERIC	👪 <u>2</u>	itso sitea	
Overview	🤠 itso_svca2	Unavailable	GENERIC	iiii 2	itso sitea	
Properties	👼 itso_svcb1	itso svcb1	GENERIC	2		
Alerts (0)	🦉 itso_svcb2	Unavailable	GENERIC	2		
Tasks (143) 3	🦉 poksrv3.itso.ibm.com	poksrv3.itso.ibm.com	GENERIC	👪 <u>2</u>	₿ 4	
Data Collection (2)	SSPC15	sspc15	GENERIC	iiii 2	12	
Internal Resources Volumes (22) Pools (4) Nanaged Disks (33) RAID Arrays (1) Disks (2) Vol Groups (1) Nodes (2) Ports (8) RAID Connections (6) Rainted Resources Related Resources Febrics (1) Pobrics (2) Pobric						
Back-end Storage Systems (2)	Showing 6 items Selected 1 item					Refreshed 1½ minutes ago

Figure 4-15 Storage System details: Host Connection

The host connections pane shows in the Connected Resource column the servers already defined to Tivoli Storage Productivity Center: the Storage Resource agent poksrv3 and the agentless servers sspc15 and itso_svcb1.

2. To add itso_scva1 as an agentless server, right-click the icon and select **Add Server** to start the wizard described in "Adding an agentless server manually" on page 63. In this scenario the host name, OS type, and ports are pre-populated in the wizard panes.

After creation, the agentless server will be shown under the **Connected Resource** column as shown in Figure 4-16 on page 74.

	Host	Connections			
SVC_CF8 IBM SAN Volume Controller - 2145	Host Connections Volume Map	pings 🌌 Performance			
Actions 😎	Add Server 🔚 Actions 🔻				-
	Name 🔺	Connected Resource	Host Type	Ports	Volumes
General	🧧 itso_scva1	itso scva1	GENERIC	<u>iii 2</u>	🗄 <u>itso sitea</u>
Overview	🦉 itso_svca2	Unavailable	GENERIC	👪 <u>2</u>	🗄 <u>itso sitea</u>
Properties	🧧 itso_svcb1	itso svcb1	GENERIC	🐱 <u>2</u>	
Alerts (0)	🧧 itso_svcb2	Unavailable	GENERIC	👪 <u>2</u>	
🎆 Tasks (143) 🛛 🔇	poksrv3.itso.ibm.com	poksrv3.itso.ibm.com	GENERIC	ä 2	III <u>5</u>
Data Collection (2)	E SSPC15	sspc15	GENERIC	ä 2	12
Pata Path					
Internal Resources					
Volumes (23)					
B Pools (4)					
Managed Disks (33)					
RAID Arrays (1)					
Disks (2)					
🗱 I/O Groups (1)					
m Nodes (2)					
B Ports (8)					
Host Connections (6)					

Figure 4-16 itso_svca agentless server added as connected resource

4.2.5 Agentless server creation from a fabric or switch discovered ports

Fabric or switch discovered ports are ports connected to the fabric or switch where Tivoli Storage Productivity Center does not know the device that they belong to.

You can create an agentless server selecting one or more discovered ports. The process is similar to the manual creation described in 4.2.1, "Adding an agentless server manually" on page 63, but this time the ports are pre-populated. You can also add ports found from other subsystem host connection and fabric zone aliases.

To create an agentless server from fabric or switch discovered ports, complete the following steps:

- The Discovered Ports pane is accessible either through the Switch or Fabric detail pane. Open the Switches pane from the Tivoli Storage Productivity Center GUI. Select Network Resources → Switches and double-click the IBM_2498_B24 switch icon in our scenario.
- 2. Select **Discovered Ports** from the **Related Resources** section as shown in Figure 4-17 on page 75.

8 mm:		Discovere	ed Ports				
IBM_2498_B24 IBM Brocade 300		✓ 11 Normal ▲ 0 Warning					
General							
Overview	Add Server	i≡ Actions ▼					
Alerts (10)	Adapter WWN	Discovered WWPN	Status 🗸	Port Type	State	Speed	
Data Collection (2)	2000000C98723AE	1000000C98723AE	Operational	N_PORT	Online	8	
Internal Resources	2000000C98723AF	1000000C98723AF	Operational	N_PORT	Online	8	
	20000024FF2B4B66	21000024FF2B4B66	Operational	Other	Online	8	
Ports (24)	200400A0B8174431	200400A0B8174432	Operational	N_PORT	Online	2	
Related Resources	200400A0B8174431	200500A0B8174432	Operational	N_PORT	Online	2	
Fabric	5005076400C0B8D7	C05076E5F9005911	Operational	N_PORT	Online	8	
Servers (1)	5005076400C0B8D7	C05076E5F9005E11	Operational	N_PORT	Online	8	
Storage Systems (4)	5005076400CB3BD5	5 C05076ECEA801D01	Operational	N_PORT	Online	8	
Hypervisors (1)	5005076400CB3BD5	5 C05076ECEA802531	Operational	N_PORT	Online	8	
Ø Discovered Ports (11)	5005076400CB3BD5	5 C05076ECEA805231	Operational	N_PORT	Online	8	
	5005076400CB3BD5	5 C05076ECEA805C11	Operational	N_PORT	Online	8	

Figure 4-17 Discovered ports for switch IBM_2498_B24

From this pane, you can select one or more discovered ports to create an agentless server.

Note that it is up to you to verify that the chosen WWPNs are actually related to the server you want to define as an agentless server. Tivoli Storage Productivity Center does not control vendor identifiers in the WWPN. You will not receive error or warning messages. For example, Figure 4-18 shows the create agentless wizard when a DS4500 port is selected.



Figure 4-18 Add server pane with erroneous DS4500 WWPN ports

4.2.6 Agentless server creation from a switch discovered port

To illustrate the agentless server creation from a switch discovered port, we use a scenario based on the **SSPC15** server that we previously defined in 4.2.1, "Adding an agentless server manually" on page 63.

We first remove the agentless server SSPC15 in order to make the server WWPNs available again in the Discovered Port pane. This allows us to create the agentless server again using the discovered port procedure.

Remove an agentless server

To remove the agentless server, complete the following action:

Open the **Servers** pane. From the Tivoli Storage Productivity Center GUI navigation pane, select **Server Resources** \rightarrow **Servers**. Right-click the **SSPC15** server and select **Remove** as shown in Figure 4-19.

Se	rvers				
	. Normal) Warning) Error 10 Agentless				
Servers Alerts	Tasks Discovered	Servers			
Add Server 📰 Actio	ns 🔻				
Name	Status 🔻 F	Probe Status	Agent State	OS Type	OS Versi
pokvc1.itso.ibm.com	🗹 Normal 🛛	Successful	🗹 Up	Windows	6.1:Service
9.1.83.98	Agentless			Linux	Unknown
itso_scva1	Agentless			Other	Unknown
itso_svcb1	Agentless			Other	Unknown
itsodns.itso.ibm.com	Agentless			AIX	Unknown
netwrk1.itso.ibm.com	Agentless			Windows	Unknown
saw319-w2.itso.ibm.co	m 🔘 Agentless			Windows	Unknown
🖥 sspc15	🚔 Agentless	_		Windows	Unknown
🖥 st3l10-w2	View Properties			Windows	Unknown
tpcblade2-12	View Details			Other	Unknown
tpcblade2-8	View Data Path			Solaris	Unknown
	Provision Storage				
	Analyze Tiering				
	Modify Ports				

Figure 4-19 Removing an agentless server

Note: Remember to run a probe on Switch/Fabrics after removing the server.

Add the agentless server created from a switch discovered port

To add the agentless server created from a switch discovered port, complete the following steps:

 From the Discovered Ports pane shown in Figure 4-17 on page 75, we chose the port WWPN of the system SSPC15 (the WWPN of the system is already in Tivoli Storage Productivity Center, as shown in "Adding an agentless server manually" on page 63). Right-click the 21000024FFB4B66 port and select Add Server. See Figure 4-20.

1000000533C9B9CC Brocade	Discovered Ports							
Actions Strength	Add Server	Actions 🔻						
	Adapter WWN	Discovered WWPN	Status 🔻	Port Type	State	Speed	Connected Switch	
Overview	2000000C98723AE	1000000C98723AE	Operational	N_PORT	Online	8	IBM 2498 B24	
Properties	2000000C98723AF	1000000C98723AF	Operational	N_PORT	Online	8	IBM 2498 B24	
Alerts (0) Table (2)	20000024FF2B4B66	21000024EE2B4B66	Operational	Other	Online	8	IBM 2498 B24	
Pasks (3)	200400A0B8174431	200400A(View Properties	erational	N_PORT	Online	2	IBM 2498 B24	
Data Collection (1)	200400A0B8174431	200500A(Add Server	erational	N PORT	Online	2	IBM 2498 B24	
Internal Resources	5005076400C0B8D7	C05076E5F9005911	Operational	N PORT	Online	8	IBM 2498 B24	
🚥 Switches (1) 📀	5005076400C0B8D7	C05076E5F9005E11	Operational	N PORT	Online	8	IBM 2498 B24	
👪 Ports (24) 🔇	5005076400CB3BD5	C05076ECEA801D01	Operational	N PORT	Online	8	IBM 2498 B24	
W Zone Sets (2)	5005076400CB3BD5	C05076ECEA802531	Operational	N PORT	Online	8	IBM 2498 B24	
Related Resources	5005076400CB3BD5	C05076ECEA8052331		N POPT	Online		IBM 2408 B24	
	5005070400CB3BD5	C05070ECEA005251		N_PORT	Online	0	IDM 2450 D24	
Storage Systems (4)	5005076400CB3BD5	C00070ECEA605C11		N_PORT	Unine	õ	IDIVI 2430 B24	
Hypervisors (1) Discovered Ports (11)								
UISCOVERED PORTS (11)								

Figure 4-20 SSPC15 WWPN selection

2. The procedure from this point is similar to the procedure described in "Adding an agentless server manually" on page 63.

After creating the agentless server, the **Discovered Ports** pane will no longer show the SSP15 WWPN.

4.3 Storage Resource agent

Adding and managing a Storage Resource agent is not a new function for the Tivoli Storage Productivity Center. The functionality merely migrated from the stand-alone GUI to the web-based GUI. Therefore, we will not cover the concepts in this chapter. However, it is best to illustrate the conditions on whether a Storage Resource agent or an agentless server is best for your environment.

The following link is from the IBM Knowledge Center about how to add resources to the Tivoli Storage Productivity Center:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.2/com.ibm.tpc_V522.doc/fqz0_ t_wz_adding_servers_all.html?lang=en

4.4 Implementing Storage Resource agents

Use the web-based GUI to add servers by deploying Storage Resource agents. This enables full server monitoring, which gathers the following server information:

- Asset information
- File and file system attributes
- Database application information
- Network-attached storage (NAS) device information
- Topology information
- Information about zoning and the fabrics that are visible to the server

You must have Administrator privileges to deploy an SRA.

Note: If using nonstandard ports for SRAs, deployment can only be done from the server side using agent.exe program.

4.4.1 Adding Storage Resource agents manually

In this section, we show an example on adding a Storage Resource agent manually. We use a Windows system with host name tpcblade3-14 for this scenario.

 From the Tivoli Storage Productivity Center GUI left navigation pane, select Server Resources → Servers as shown on Figure 4-21.

	Servers								
Home	12 Normal	1 Deploying or Pending							
	A 1 Warning								
	O Error O BR Amentiese								
Storage	0.000.000								
Resources	Servers 🔕 Alerts Tasks D	iscovered Servers							
	R Add Septer 1- Actions w							0	-
	B Add Server := Acdons +		1					4	Pritter
Server	Name	Status	Probe Status	Agent State	OS Type	OS Version	Total Disk Space (GiB)		15
Resources	tsmcveserver@1.storage.tucson.ibm	.com 🔒 Warning	Sailed	🔕 Down	AIX	7.1.2.15	11,238.10		<u>^</u>
	Squash.tpc.storage.tucson.ibm.com	Normal	🔒 Warning	🔽 Up	Windows	6.1:Service Pack 1	864.93		_
(M)	black-rock.storage.tucson.ibm.com	Normal	Successful	🔽 Up	Windows	6.1:Service Pack 1	558.79		
1	B blue-rock-storage-fucson.ibm.com	🔯 Normal	Successful	🖾 tin	Windows	6.2	558.79		

Figure 4-21 Server pane

2. On the left of the top bar, click **Add Server**. The Add Server pane appears as shown in Figure 4-22 on page 79. Make sure that the **Deploy an agent for full server monitoring** box is checked and select **Manually**.

Note: The **From Discovered Servers** option is not available for adding Storage Resource agents.

Add Server		
Select a Method to Add a Ser	ver	
Deploy an agent for full server mor	nitoring	
		Microsoft
Manually	From a File List	From Discovered Servers
0		Cancel

Figure 4-22 Add Server pane

3. Create a Storage Resource agent deployment job as shown on Figure 4-23. In this example, we are using the simplest authentication method, which is Username/Password. Secure Shell (SSH) is also available. We also need to provide the fully qualified installation path, for example "c:\tpc_SRA\bcdeguia_us\tpcblade3-5". Additionally, Storage Resource agent will run in a non-daemon mode. You can also choose to overwrite previous install agents to force installation of the Storage Resource agent. Click Next to continue.

Add Server		
Deploy Agent		
	Host name or IP address:	tpcblade3-14
$\odot \rightarrow$ –	Installation path:	:\tpc_sra\bcdeguia_us\tpcblade3-5 v
	Overwrite previously in:	stalled agents
	Authentication:	Username/Password 🔻
	User name:	administrator
	Password:	••••••
	Run in daemon mode	
0	A Back	Next Cancel

Figure 4-23 Deploy Agent pane

4. Configure a schedule for the agent deployment job on Figure 4-24 on page 80. In this example, once we click **Finish**, the deployment job runs right away.

Add Server			
Configure			
	Location:	No Location	•
	Agent deployment:	Immediate	-
O	Schedule probe:	18:00 MST 🔹 Every day	-
0	■ Back	Finish	Cancel

Figure 4-24 Schedule agent deployment

5. On the Servers panel, the agent deployment job will be seen as such on Figure 4-25.

Figure 4-25 Agent deployment

Note: If there are any issues with the agent deployment, you can take action immediately via right-clicking the deployment and opening the following pane shown in Figure 4-26.

合 Server Res	Server Resources > Servers Twoli Storage Productivity Center - Virtual Storage Center Edition					Edition
	Servers					
Home Storage Resources	I 2 Normal I 12 Normal I 1 Deploy ▲ 1 Warning I 1 Faied I 0 Error 368 Agenitess Servers Servers I Alerts Tasks Discovered Server	ing or Pending deployment ers				
	B Add Server I = Actions ▼					
Server	Name	Status 🔺 Probe Status	Agent State C	OS Type	OS Version	Total Disk Space (GiB)
Resources	9.52.173.169	O Deploying O Never Pro	Deploying U	Inknown		
	tpcblade3-14	🐼 Failed dep 📋 Never Pro	Sailed deploy U	Inknown		
	droid9.storage.tucsc Provision Storage	Agentless	A	чх	Unknown	42,027.79
Na fiya ala	pear.storage.tucson Open Logs	Agentless	W	Vindows	Unknown	985.48
Resources	tpcblade3-6.storage. Fix Deployment	Agentless	W	Vindows	Unknown	900.00
	tpcblade3-11.storage Cancel Deployment	Agentless	W	Vindows	Unknown	821.52
(a)	carrot.storage.tucson.ibm.com	Agentless	W	Vindows	Unknown	728.72

Figure 4-26 Failed agent deployment job

4.4.2 Adding one or more Storage Resource agents via comma-delimited file

You can add one or more Storage Resource agents by importing configuration information from a comma-delimited file. The details and procedures are the same as in Section 4.2.2 and 4.4.1 with exception to the contents of the comma-delimited file and the agent deployment configuration.

For the comma-delimited file, each line must have a server entry of the following format (Example 4-3).

Example 4-3

host name or IP address,OS type,location,custom tag 1,custom tag 2,custom tag 3

where:

- Host name or IP address is required for each server entry. An IP address can be in an IPv4 or IPv6 format. You must include a valid host name or IP address for each server that you want to add. You can enter the following characters when you enter a host name or IP address:
 - A Z (uppercase characters)
 - a z (lowercase characters)
 - 0 9 (numeric characters)
 - Symbols: . : _
- OS type is required and represents the operating system of the server. The OS type for a server must be one of the following values:
 - Windows
 - Linux
 - AIX
 - Solaris
 - HP-UX
- Location is optional and represents the physical location of the server. The location value can be up to 64 characters in length. If the length exceeds 64 characters, the location value is truncated when the server is added.
- Custom tag 1, custom tag 2, and custom tag 3 are optional and represent any significant information that you want to associate with the server. The custom tag values can be up to 64 characters in length. If the length exceeds 64 characters, the custom tag value is truncated when the server is added. The custom tags can be displayed on the Servers page or can be included as report columns when you generate reports for the server (Example 4-4).

Example 4-4

host1,Windows,San Jose,Accounting department # Comment host5,Linux,London,Finance department systemxyz.storage.widgets.com,Solaris,Chicago,Human Resources department 198.51.100.22,HP-UX,,Computing department 2001:DB8:0:0:0:0:0:0,Windows,TokyoNote: Consider the following:

- If you add many servers by using the same input file, the adding process might take some time to complete. To confirm that the servers are added, check the Status column on the Servers page.
- To comment out a line, enter a "#" at the beginning of the line. The server on that line is not added when the list is imported.
- ► If there are syntax problems in the file, none of the servers in the file are added.
- Create the agent deployment list in accordance to OS type or user credentials because all servers must share the same user name and password for deployment, which on Windows normally means a Domain Administrator.
- Deploying multiple SRA does not allow for:
 - Changing location of SRA
 - Overriding previously installed clients
 - Selecting to run in Daemon mode

The following steps show how to add a server and to deploy agents from a comma-delimited file:

 To add a server via comma-delimited files, click Server Resources → Add Server and then select From a File List. Check the Deploy an agent for full server monitoring box as seen on Figure 4-27.

Add Server		
Select a Method to Add a Serv	ver	
 Deploy an agent for full server monit 	toring	
		Microsoft
Manually	From a File List	From Discovered Servers
0		Cancel

Figure 4-27 Add Server pane

2. Select the comma-delimited file to import as shown in Figure 4-28 on page 83 and click **Next**.



Figure 4-28 Import a File List pane

 In this example, we used the Username/Password authentication to deploy the agents in the comma-delimited list. We also need to provide the fully qualified installation path, for example "c:\tpc_SRA\bcdeguia_us\tpcblade3-5", as seen in Figure 4-29. Click Next to continue.

Add Server		
Deploy Agent - W	indows	
	Installation path:	:\tpc_sra\bcdeguia_us\tpcblade3-5 🔻
	Authentication:	Username/Password 🔻
	User name:	administrator
	Password:	••••••
	🗌 Run in daemon m	node
0	Back	Next Cancel

Figure 4-29 Deploy Agent pane

4. Finalize the agent deployment by clicking **Finish** on the last agent deployment configure pane as seen on Figure 4-30.

Configure	Agent deployment: Schedule probe:	19:00 MST 2 hour span 19:00 MST 2 hour span	 Jul 23, 2014 Every day
@ Need Help		Back Finish	Cancel

Figure 4-30 Schedule the Agent deployment and Probe jobs

Note: Agent deployment errors can also be easily corrected as seen on Figure 4-26 when using the comma-delimited file list method.

5

Configuration and administration tasks

At this point, the installation or the upgrade of Tivoli Storage Productivity Center from a previous release is complete and your Tivoli Storage Productivity V5.2.x is up and running. In this chapter we take you through the tasks to configure your Tivoli Storage Productivity Center server to monitor, manage, and report on storage subsystems in your environment.

We do not provide detailed step-by-step instructions on how to perform each of the tasks. Since many of these *one-time* activities still need to be done in the stand-alone graphical user interface (GUI), we only provide you with a summary of what you should consider during this phase of the implementation.

5.1 Adding resources to Tivoli Storage Productivity Center

One of the first actions after a fresh installation will be adding devices to Tivoli Storage Productivity Center. The Add Device wizard in the Tivoli Storage Productivity Center V5.2 web-based GUI provides a simplified way for adding, discovering, and configuring devices.

Depending on the type of devices that you need to add to Tivoli Storage Productivity Center, you do this from different panels, for example:

- ► Storage Systems are added from the Storage Resources → Storage Systems panel
- VMware Hypervisors or vCenters are added from the Server Resources
 → Hypervisors
 panel
- ► Switches are added from the Network Resources → Switches panel
- ► Fabrics are added from the **Network Resources** → **Fabrics pane**

The concept of an Agentless Server and how it is defined is documented in Chapter 4, "Server Resource Management" on page 61. Since it is more a definition than adding a datasource that can be probed, the instructions for Agentless Servers are included in that chapter.

With Tivoli Storage Productivity Center V5.2, the following resources are added using the stand-alone GUI:

- IBM Scale Out Network Attached Storage (SONAS) systems
- Network-attached storage (NAS) files other than IBM Storwize V7000 Unified
- Tivoli Storage Productivity Center servers as a subordinate server

Since all other resources are added through the web-based GUI, their selections have been removed from the Add Device wizard in the stand-alone GUI.

Note: The configuration of devices will be performed in the web-based GUI for all device types so these functions have been disabled in the stand-alone GUI.

Also there are no longer Monitoring Groups schedule definitions (for example, Subsystem Standard Probe).

In general, the Add Device Wizard has three main steps:

- 1. Selecting a resource
- 2. Adding and discovering a device
- 3. Configuring a device

Because there are some differences depending on the type of devices that will be added, we divided this section into subsections. Since the three main steps are similar, we only provide one full walkthrough of an example of adding a SAN Volume Controller (SVC) to Tivoli Storage Productivity Center. We point out only differences in the other sections.

In addition to the three steps listed above, there is a fourth step: running an initial probe. Because this is automatically started and running in the background, we have not listed it above.

5.1.1 Discovery and probes in Tivoli Storage Productivity Center V5.2.2

Before we walk through the scenario of adding a device to Tivoli Storage Productivity Center V5.2.2, we describe what has changed in this release for the Discovery and Probe jobs.

Discovery of devices

If you worked with Tivoli Storage Productivity Center before, you will have noticed that we have not talked about the discovery process. In Tivoli Storage Productivity Center V5.2, discovery is generally no longer available as a separate job. Discovery now runs as part of adding a device or as part of probing a device.

For example, a switch attached to a server is discovered during a server probe. Similarly, if you added a new device to a CIM agent, running the Add Device wizard again using the CIM agent will discover the new device and you will then be able to configure the device. If you do not run the Add Device wizard again in this situation, the next probe will discover the new device. You will be able to see the new device in the list of storage systems, switches, or fabrics.

Note: The discovery job that tries to find servers in a Windows domain or NAS servers is still available in the stand-alone GUI.

Probes

With Tivoli Storage Productivity Center V5.2, a probe process is scheduled for a device. A probe is not scheduled for a datasource, and it is not scheduled for a Monitoring Group; this has not changed since Tivoli Storage Productivity Center V4. With Tivoli Storage Productivity Center V5.2, each data collection is scheduled for a single device. Tivoli Storage Productivity Center V5.2 selects the datasource that best fits for the selected device.

This is also reflected in the names and terms. A probe of a system running a Storage Resource agent (SRA) is called a *computer probe*, not an SRA probe. The schedule name will be named after the host name.

Similarly, for CIM agents, you do not probe a CIM agent, but you probe a device using a CIM agent. The schedule will be named after the device. If a CIM agent has two devices connected, you are also setting up one probe for each device.

The exception to this rule is that when you start or schedule a probe for a switch, Tivoli Storage Productivity Center will probe the complete fabric, and not the single switch itself. So in this sense the entire fabric can be thought of as a device. Thinking of the complete fabric makes sense since you need the information from the complete fabric in order to show any data paths.

5.1.2 Adding IBM storage systems

Generally the storage devices from IBM will be added using the native API, instead of using SMI-S with CIMOMs. The type of information you will be asked to provide, needed to add the device to Tivoli Storage Productivity Center depends on the device type. This is not new with Tivoli Storage Productivity Center V5.2.

In this section, we walk through the tasks to add a SAN Volume Controller to Tivoli Storage Productivity Center. The tasks are similar for other IBM storage systems:

1. Check the support matrix for the required level of firmware before you begin adding a device:

http://www.ibm.com/support/docview.wss?&uid=swg21386446

From the support matrix page, click the Tivoli Storage Productivity Center 5.2.x version in the column labeled *Storage*. This takes you to the list of supported storage systems and the supported firmware levels. If applicable, the SMI-S information and supported functions are listed.

 After verifying the required firmware levels, go to the Tivoli Storage Productivity Center web-based GUI to add the SVC. Navigate to the Storage Resources → Storage Systems panel as shown in Figure 5-1. From the empty list of Storage Systems click Add Storage System.

TPC Store	ge Systems +			_ 8 ×
🔶 🔒 https://	vcloud 140. storage. tucson .bm.com :9569/srm/gui#storageSystems		V C Google	
A Storage	Resources > Storage Systems			administrator (Administrator) 🧿
Home Home Storage Resources Servers Resources Network Resources Network Resources Network Resources Network Resources Network Resources Servers Setting Setting	Storage Syse C Denv C Denv C Denv Stock Storage File Storage Adets C Denv C De	ems reshold Violation Task: Performance Probe Status Performance Physical Allocation (*) Poo to block storage systems have to the block storage system storage to the block storage storage to the block storage system storage to the block storage system storage to the block storage to the block storage to the block storage storage to the block storage to th	A Capacify (Gr., Available Pool Space (GiB) een found.	© ▼ Filter
	Snowing o items Selected O items			Refreshed a few moments ago

Figure 5-1 Add storage system

3. A dialog appears (see Figure 5-2 on page 89) which lets you select the type of device that you want to add. The panel shows the IBM devices and "All others", for the storage systems of other vendors.

Add Storage System				
Select Type				
	And		P	A.R.B.R.B.
D \$8000	XIV	D\$6000	ESS800	SVC
Storwize Family	Storwize V7000U	SONAS	DS4000/DS5000	All others
0				Cancel

Figure 5-2 Select the type of device

If you look carefully, you will notice that IBM SONAS devices cannot be added using the web-based GUI. To add IBM SONAS devices you must use the stand-alone GUI. In the stand-alone GUI, go to **Disk Manager** \rightarrow **Storage Subsystems** and click **Add Storage Subsystem** to launch the Add Device wizard.

Note: The IBM storage systems DS6000[™], ESS, and DS4000/5000 are listed, even though they use SMI-S instead of the native API. The only difference between these IBM storage subsystems and the type "All others" is that the correct namespace is already preselected.

4. Clicking the SVC icon opens the Add Device wizard that is shown in Figure 5-3.

Add Storage System		
Discover		
	Host name or IP address:	9.12.5.67
1. IB.	Authentication:	Username/Password
	User name:	TPC_87
	Password:	••••••
SVC		
	Back	Next > Cancel

Figure 5-3 Specify connection details

5. Complete the connection information so that Tivoli Storage Productivity Center can discover the devices that are available for this datasource.

Note: Tivoli Storage Productivity Center can add an SVC or Storwize V7000 using only a user ID and password instead of Secure Shell (SSH) keys for SVC version 6.3 or later. This makes adding the devices simple. If a customer has strict rules about how often a password needs to be changed, using SSH keys might be the better option.

Tip: If you plan to use the provisioning function, or if you have more than one Tivoli Storage Productivity Center server in your environment, consider using dedicated user IDs and SSH keys per Tivoli Storage Productivity Center server. This way you can easily perform the following tasks:

- Disable a Tivoli Storage Productivity Center server to access a device by deleting the ID or changing the password.
- Review the audit log files of a device to identify the commands that were issued by a Tivoli Storage Productivity Center server.
- 6. When you have entered the required information, click Next.

At this point, Tivoli Storage Productivity Center attempts to connect to the device. The process is basically the same as the process the wizard in the stand-alone GUI performed in previous releases.

If you add a connection that allows Tivoli Storage Productivity Center to communicate with more than one device (typically an SMI-S connection), the discovery process (shown in Figure 5-4) will detect this.

	1490 070000	
Disc	Discover Storage System	
4	Step 3 of 4 : Performing discovery	
	Close	
	■ Back Next ►	Cancel

Figure 5-4 Running a discovery job

7. Since we are adding an SVC, the discovery did not find more devices. The configuration step of the Add Device wizard will look similar to Figure 5-5 on page 91.

Add Storage System						
Configure						
	Display name:	SVC-2145-SVC-c	cetsvc1-l	BM)	
	Location:	No Location		-)	
	Data Collection					
	Probe:	15:00 MST	-	Every day	-	
SVC	Performance monitor:	Enabled	-	Every minute	-	
				Every minute		
				Every 5 minutes	1	
	< Back	Configure		Every 10 minutes	T.	
				Every 15 minutes		_
				Every 20 minutes		
				Every 30 minutes	- 1	
				Every 60 minutes		

Figure 5-5 Initial device configuration

This step is different from the Add Device wizard in the stand-alone GUI. Previously, you would have selected a monitoring group so that Tivoli Storage Productivity Center would manage items like the probe scheduling and alerting based on the group membership.

This is no longer required because the Add Device wizard has been enhanced with Tivoli Storage Productivity Center V5.2 in the following ways:

- Provide a name for the device
- Complete the location of the device
- Adjust the scheduling
- Enable performance collection and set the interval

When you have provided all information and adjusted the scheduling based on your needs, click **Configure**.

In previous versions, you had to wait for the first probe to set up the performance data collections. With Tivoli Storage Productivity Center, V5.2.2 will do all the configuration for you in the background and start the performance collection as soon as possible after the initial probe.

Notes:

As of Tivoli Storage Productivity Center V5.2.2, 1-minute performance monitoring interval is now available. The 1-minute performance monitoring interval facilitates finer granularity for troubleshooting, debugging, and reporting.

Be sure to consider the performance and space usage when running 1-minute performance monitoring on your server. It should be noted that the spaces usage is DB2 space usage. The size of the data collected is related to the number of objects that the devices contain (for example LUNs and disks).

Here are some of the limitations of 1-minute performance monitoring:

- The 1-minute intervals only show in a chart if the complete time range has 1-minute intervals, otherwise it "falls back" to 5-minute intervals.
- ► In Cognos, the 1-minute intervals are not available.
- The TPC exposed views do not support 1-minute intervals.

The alerting is evaluated based on 1-minute intervals, so you might need to think about adjusting your alert thresholds (no 5-minute averages, so the threshold might need to be set higher, longer intervals between repeating alerts).

8. When you see the dialog in Figure 5-6, click Close.

	Resources > Storage Systems		WIN-E S4A3F349GU(ladministrator
A Storage Home Storage Resources Server Resources Network Resources Advance	Recources > Storage Systems	Configure Storage Systems Image: Storage Storage Systems Image: Storage Storage Storage Systems Image: Storage	Raw Disk Capacity (GiB) Pool Capacity (C Available Pool Space (C) 912.46 773.25
Reporting Settings	<m Showing 1 item [Selected 0 items</m 		Refreshed a few moments ago

Figure 5-6 Device has been configured

5.1.3 Adding SMI-S based devices

Generally, all non IBM storage devices are connected to the Tivoli Storage Productivity Center using the SMI-S standard. The component that provides this interface on the device side is called the CIMOM or CIM agent.

1. From the panel shown in Figure 5-2 on page 89, click the **All others** device icon.
This opens the Discover CIM agent panel as shown in Figure 5-7.

Add Storage System			
Discover			
-	Туре:		
	CIM agent host name or IP address:	EMC Hitachi	
	User name:	HP	
	Password:	Other	
	CIM agent display name:		
	CIM agent description:		
	 Advanced 		
	Protocol:	https -	
	Port:	5989 👻	
	Namespace:	/interop 👻	
	■ Back	ilaxt > Cancel	

Figure 5-7 Discover CIM agent panel

- 2. From the drop-down menu in Figure 5-7, select the **Type** (vendor) of the device or **Other**. With this information, Tivoli Storage Productivity Center will change the selection in the Advanced section (which is typically collapsed) to the vendor-specific settings. You do not need to remember which namespace is required to communicate with a device. Note that you can overwrite the default settings if needed to tailor the information to the device you are adding.
- 3. If the discovery job finds more than one device that needs to be configured, the Configure panel will list the additional devices. The dialog will have tabs on the left under Storage System with the additional devices that will be configured in this step as shown in Figure 5-8. To complete adding the devices to Tivoli Storage Productivity Center, continue with step 7 and step 8 as described in "Adding IBM storage systems" on page 87.

Add Storage System				
Configure				
Storage System 🔒				
I DS6000-1750-13AAW2A-IBM	Display name:	Multiple		
IIII DS6000-1750-13AB1WA-IBM	Location:	No Location)	
	Data Collection			
	Probe:	09:30 MST -	Every day	-
	Performance monitor:	Enabled 👻	Every 5 minutes	-
	 ■ Back 	Configure		Cancel

Figure 5-8 Example of initial device configuration for multiple devices

5.1.4 Adding IBM Scale Out Network Attached Storage

The IBM Scale Out Network Attached Storage (SONAS) device can now be added through the web-based GUI. There have been few changes in the Add Device wizard from prior Tivoli Storage Productivity Center versions.

To add a SONAS to the Tivoli Storage Productivity Center, follow the normal procedure for adding a new storage subsystem by using the Username/Password authentication method shown in 5.1.2, "Adding IBM storage systems" on page 87. Additionally, the SONAS can be added via SSH method. Those steps are listed below.

 Select SONAS from the Add Storage → Select Type panel as shown in Figure 5-9 on page 94.

Add Storage System				
Select Type				
	Andreas Andrea	I	1	A R. R. R. R.
DS8000	XIV	D \$6000	ESS800	SVC
Storwize Family	Storwize V7000U	SONAS	DS4000/DS5000	All others
0				Cancel

Figure 5-9 Select the type of device

2. Click **SONAS**, which starts the wizard as shown in Figure 5-10.

Add Storage System		
Discover		
	Host name or IP address:	*
	Authentication:	Secure Shell (SSH)
- 11	Ise an existing SSH ke ○ Upload a new SSH key	veri en
SONAS	SSH key:	\${device.conf}/tpc_svc.pem
	User name:	
	Password:	
	Associate user:	* Enter User Get Users
	■ Back	Next > Cancel

Figure 5-10 Configure a SONAS device in Tivoli Storage Productivity Center

3. If you are using the existing SSH key option, the default Tivoli Storage Productivity Center SSH key will be used in association with a designated user. The default SSH key is located in "~install dir\TPC\device\conf\tpc_svc.pem." In the example on Figure 5-11 on page 95, SecurityAdmin username and password is required to get the associate user.

Add Storage System		
Discover		
	Host name or IP address:	9.11.92.144
	Authentication:	Secure Shell (SSH)
- 22	Use an existing SSH ke Upload a new SSH key	y
SONAS	SSH key:	\${device.conf}/tpc_svc.pem
	User name:	admin
	Password:	••••
	Associate user:	admin Get Users
· · · · · · · · · · · · · · · · · · ·		
	■ Back	Next Cancel

Figure 5-11 Use existing SSH key

4. If you upload a new SSH key, see Figure 5-12 on page 96. In this example, the same default Tivoli Storage Productivity Center SSH key was used along with a SecurityAdmin user to associate a specific user with the newly uploaded key.

Notes:

Create a user in SONAS for Tivoli Storage Productivity Center to be able to separate its operations in the audit log. The recommended user name is *admin*.

SONAS typically has two management consoles (primary/backup). If the backup takes over, it uses a different IP address, and monitoring can fail.

Add Storage System		
Discover		
	Host name or IP address:	9.11.123.156
	Authentication:	Secure Shell (SSH)
- 44	Use an existing SSH kee Upload a new SSH key	у
SONAS	SSH key:	Browse tpc_svc.pem
	Passphrase:	
	User name:	admin
	Password:	
	Associate user:	admin Get Users
C		
	■ Back	Next > Cancel

Figure 5-12 Upload a new SSH key

5. Click **Next** and continue with the Add Storage System wizard as seen on Figure 5-13.

Add Storage System					
Configure					
	Display name:	tpcsona	s1.storage	e.tucso	on.ibm.com
	Location:	No Loca	ation		•
	Data Collection				
	Probe:	15:45	MST	-	Every day 🔻
SONAS					
		Back	Config	ure	Cancel

Figure 5-13 Device configuration

6. The SONAS device will be seen under the File Storage tab when configuration completes as seen on Figure 5-14 on page 97.



Figure 5-14 Configure SONAS devices

5.1.5 Adding fabrics and switches

SAN switches are the only devices in Tivoli Storage Productivity Center that can be configured using three different methods (sometimes also called *datasources*) for the communication:

Inband	Tivoli Storage Productivity Center uses Storage Resource agents for the communication. After deploying the agent you will still need to configure the probe for the switches. The probe of a computer is only discovering switches, not probing them.
SNMP	Tivoli Storage Productivity Center can use SNMP to communicate with switches.
CIM Agents	Tivoli Storage Productivity Center can collect information by communication with CIM Agents.

Note: A probe is generally scheduled for a device, not for a datasource. Tivoli Storage Productivity Center selects the datasource that best fits the selected device.

The exception to this rule is that when you start or schedule a probe for a switch, Tivoli Storage Productivity Center will probe the complete fabric, and not the single switch itself. If there are multiple datasources available, Tivoli Storage Productivity Center will select the best for a particular switch. For example, a CIM agent datasource for Brocade switches will always be used, even if there are also a Storage Resource agent and an SNMP datasource available. It should be noted that use of Cisco switches incurs a cost for software to performance data.

The decision on which connection method you will have to use in your environment depends primarily on the switch vendor and the type of information you want to collect. This requires some planning in advance. The Tivoli Storage Productivity Center IBM Knowledge Center documentation contains a table that explains how different types of information will be collected. This table can be found here:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.3/com.ibm.tpc_V523.doc/fqz0_ r_planning_fabric_manager_smis_qlogic_cisco.html

Note: As a general rule, whenever you want to collect performance information (including error counters) you need a CIM agent connection for the switches.

For Brocade based fabrics, the CIM Agent is the recommended datasource to collect information. The good news here is that you can download and install the Brocade Network Advisor. During the installation, you can select SMI-S only. When you do this, the software is free and you can add multiple fabrics to the CIM agent.

Adding switches to Tivoli Storage Productivity Center

Follow these steps to add one or more switches to Tivoli Storage Productivity Center:

1. Check the support matrix for the correct level of firmware before you start adding a device. Here is a link that takes you to the overview of the support lists:

http://www.ibm.com/support/docview.wss?&uid=swg21386446

Tip: The preceding URL will not change when new Tivoli Storage Productivity Center versions are released so it is a good idea to bookmark the link.

From the *Find the Supported Hardware, Products and Platforms Interoperability Matrix Links* page, click the Tivoli Storage Productivity Center version (in our case 5.2.2.x) in the column labeled *Switches & Directors*. This takes you to the list of supported systems. It also provides the firmware levels, if required the SMI-S information, and information about what functions are supported.

 After you have verified the firmware levels, you can add the switch. Navigate to the Network Resources → Switches panel, which is shown in Figure 5-15 on page 99.

	Resources > Switches									WIN-ES	4A3F549GU\\administ	rator 👘 🕐
	Switches											
Home	O Normal											
Storage	2 Unreachable © 0 Error											
Resources	Switches Alerts Performance											
	Radd Switch i≡ Actions ▼						1				🔍 🔻 🛛 Filter.	
Server	Name Status V Pro	obe Status	Disabled	Ports	Connected Ports	Fabric	Principal Switch of Fabric	Brocade	Model	Firmware	1000000533C9B9CC	IP Add 12
Resources	IBM_2498_B24 () Unreachable ()	Disabled	Disabled			0 ♀ <u>1000000533F316EC</u>	IBM 2498 B24	Brocade	71.2	v6.4.2a	1000000533F316EC	9.12.5.50
۲												
Network Resources												
Advanced Analytics												
Reporting												
20												
Settings												
	Showing 2 items Selected 1 item				III						Refreshed 1%	► minutes ago

Figure 5-15 Add switches

Note: With Tivoli Storage Productivity Center V5.2, the Storage Resource agents that are installed with the Tivoli Storage Productivity Center server will have the Fabric function disabled. This has been implemented because of potential fabric or switch firmware defects. In the past, it has been observed with other products than Tivoli Storage Productivity Center, that certain inband fabric commands can cause a switch with a firmware defect to hang or reboot.

So when Tivoli Storage Productivity Center does its initial probes, it could potentially cause such an error in both fabrics at the same time, which would be a huge impact. Turning off the Fabric function avoids this because you have the opportunity to schedule the probes so they do not run at the same time.

In Figure 5-15, you can see that our Storage Resource agent that was running on the Tivoli Storage Productivity Center server had already discovered two switches, but since the Fabric function is disabled the status is displayed as Unreachable. If the switches would have been discovered by an SRA where the Fabric function is enabled the status would simply be Unknown, because no initial probe has been performed.

- 3. From the list of switches, click **Add Switch** when you want to either add a completely new switch or when you want to add a new datasource to an existing switch.
- 4. A dialog appears (see Figure 5-16 on page 100) in which you select the type of device that you want to add.

iscover			
	✓ Use CIM agent as data source		
	CIM agent host name or IP address:	9.12.5.87	
	User name:	administrator	
	Password:		
	CIM agent display name:	BNA12	
	CIM agent description:		
	▼ Advanced		
	Protocol:	https	•
	Port:	5989	•
	Namespace:	/interop	~

Figure 5-16 Switch connection panel using a CIM Agent

- At this point, you need to decide how the switch should be added to Tivoli Storage Productivity Center:
 - a. If the switch being added to Tivoli Storage Productivity Center is available through a CIM Agent, complete the connection information. Depending on the CIM agent, you might need to change the default communication protocol, port, and namespace to the information that you can find in the support matrix as explained earlier. When you have entered the information, click **Next** to continue.

Note: It is a good idea to use a meaningful CIM agent display name because that name will be later used to identify a datasource when you want to test the connection or update the credentials.

b. If you want to add the switch to Tivoli Storage Productivity Center using SNMP (for example, because you do not have a CIM Agent that is managing this switch), you must clear the check box Use CIM agent as data source in the upper left hand corner and click Next (see Figure 5-16).

-	-	-
Add Switch and Fabric		
Discover Switches		

9.12.5.50

Sack Next ►

This opens a new panel shown in Figure 5-17.

public

Figure 5-17 Switch connection panel using SNMP

Site 1

Complete the information for the SNMP datasource and click either on the green + to add another SNMP datasource, or click **Next** to continue.

Note: There are some differences between what you are able to input on the two panels:

- CIM agents typically manage more than one switch, so you cannot enter a switch name or location in this step.
- There is a 1:1 relationship between a switch and an SNMP datasource so here you have the option to enter a name and location.

6. Tivoli Storage Productivity Center will now verify that it can communicate with the datasource as well as discover which devices are available through this datasource.

Discovered switches

Switches that have been discovered by Tivoli Storage Productivity Center, but that have not been probed will typically show the following information:

- Name
- Status: Unreachable, which in this case means that Tivoli Storage Productivity Center is not able to retrieve the status of the switch
- Probe Status: Disabled
- ► Performance Monitor Status: Disabled
- Fabric (WWN of the Fabric)
- Principal Switch of Fabric
- Vendor
- Model
- Firmware
- WWN IP Address

Note: The information for discovered switches might differ depending on the type of connection through which they have been discovered and the vendor and type of the switch. The list above is only meant to give you an idea that a switch showing this level of information has never been probed.

At this point, you can simply right-click one of the switches, and select **Data collection** \rightarrow **Schedule**. Specify the probe schedule time based on your requirements. Tivoli Storage Productivity Center will start an initial probe immediately, regardless of when you scheduled it to occur.

Probes

Network resources are always probed on the fabric level. This means if you run a probe for a single switch in a fabric, it is exactly the same as running a probe for a fabric. The same is true for when you schedule those probes or look at the log files. You can do this from either the context of a switch or the corresponding fabric; this makes the fabric management quite easy.

Note that while probes are at the fabric level, performance data collection is performed at the individual switch level.

Common issues

Here we document the most common messages along with explanations of the cause that we encountered during our testing.

No SRA datasource

The following message indicates that there is no SRA datasource:

BTADS0090E There are no agents that are currently available to probe fabric 1000000533F316EC.

It simply means that there is no Storage Resource agent that has the Fabric function turned on in that fabric. To correct this, you can either enable the Fabric functions of one SRA, or add a datasource for the switch as shown in Figure 5-18.

🔗 Server R	esources > Servers					Tivoli Storage Productiv	vity Center				WIN-ES4A3F549GU\\a	dministrator 🦷 🍞
Home Home	E	Serv 1 No 0 Wa © 0 Err 1 Ag	ers rmal arning ror entless									
	Servers A	erts Ta	sks Discov	Probe Status	Agent State		OS Version	IP Addrose	Cluster	Virtual Machine	Q, ▼	Filter
Server Resources	WINLESAAGE Ss View Pr View De	549GU operties itails	Normal Agentless	Successful	Vp	Windows Windows	6.1:Service Pack 1 Unknown	169.254.95.120 9.12.5.29	Cluster	No No	27.14	
Network Resources	View Da Data Co Provisio	ita Path Ilection on Storage	•									
Advanced	Analyze Modify Logs	Tiering Agents	Test Conr Disable Enable Est	nection								
Analytics	Kenior	,	Disable ru	unning scripts on agent								
Reporting												
Settings												
	Showing 2 items 5	Selected 1 item									Refre	► shed 1½ minutes ago

Figure 5-18 Enable Fabric function for a Storage Resource agent

SRA as the only datasource

The following message indicates that a device has limited monitoring:

BTADS0083W Some or all information may not be collected for fabric/fabrics since agent/agents are not configured and/or not currently operational. Fabric probe for fabric 1000000533C9B9CC has some limitations.

For switch 1000000533C9B9CC following information will not be collected - Switch Blade Information,Switch Performance Management Information, Active Zone Configuration Information, Full Zone Database Information

This is just a warning that you are not fully monitoring this device. In this case, we were only using the SRA datasource. Unfortunately this warning will be shown for every probe and not just the initial one. However, this datasource provides enough information for viewing the Data Path within the web-based GUI.

5.1.6 Next steps

The new Add Device wizard simplifies the process of adding devices to Tivoli Storage Productivity Center by including the scheduling setup and customization. To complete the process of adding devices, we have listed several tasks you should complete:

Wait for the probe to finish to see if there are any components with a status other than Normal that you should acknowledge (for example, ports that are not connected to a fabric).

- Review names, Custom Tags, and Location in the property panel of the device, and update as necessary.
- If you have added a storage system, you may want to continue with setting the tier levels for the storage pools and add the storage pools to capacity pools.

The following tasks should be completed in the stand-alone GUI:

 Check the default alerts and set alerts for events or thresholds and specify email addresses or other alert notification options.

Do not forget that there is the new alert for the performance data collection task of storage systems and switches that will inform you if something happens to that data collection. These alerts are separate from the general alerts. Refer to Chapter 6, "Performance Management reporting" on page 119 for details.

Review the device data retention setting as required. You probably do not need to review the data retention settings for every device that you add, but when you get started with Tivoli Storage Productivity Center this is easy to forget.

For devices that have been automatically discovered (for example new switches in fabric), the Add Device wizard was never run. Therefore, for those devices it is very important to define the schedule for a probe and enable performance monitoring, in addition to the tasks listed previously.

5.1.7 Updating and testing a datasource

A *datasource* is the link between Tivoli Storage Productivity Center and a device. A typical change that can become necessary is to update the credentials (user ID and passwords), but sometimes it might also be required to change the IP address.

Testing the connection

In any case, it is important to know if Tivoli Storage Productivity Center can communicate with a device. Testing the connection is the first thing that we explain:

 From the list of devices (or from the devices detail panel), you start the test from the Actions menu by selecting Connections → Test Connection.

In Figure 5-19 on page 104, we used the context menu since using the Actions menu would have hidden some more important parts of the panel.

🔺 Storage R	esources > Storage	e Systems				Ti	voli Stora	ge Productivity Center			WIN-ES4A3F549GU\\administrator (?)
Home Home Storage Descurres		Sto	Normal Warning Unreachable Error	Systems							
	Block Storage	Alerts e System	Tasks	Performance							C v Filter
Server	Name		Statu	IS	Prob	e Status	Perfor	mance Monitor Status	Raw Disk Capacity (GiB)	Pool Capacity (G Availab	le Pool Space (GiB) Physical Al IJ
Resources	SVC-CF8		🌒 U	nreachable	🔽 S	View Properties	E Pur	ning	912.46	773.25	331.95 56%
Network Resources Advanced Analytics Reporting	37000			a ma		View Details View Data Path View Performance Data Collection Analyze Tiering Adalyze Tiering Connections Remove Acknowledge Status Open Storage System Gt	, ,	Test Connection Update Credentials	1,200.00	1,14550	03343 074
	Showing 2 items S	Selected 1 iter	m								Refreshed 1½ minutes ago

Figure 5-19 Test Connection panel

2. Tivoli Storage Productivity Center will try to use the datasource to communicate with the device. If the communication is successful, you will see the message in Figure 5-20. Click **Close** to return to the Storage Systems panel.

Normal	
	The connection test to datasource 9.12.5.69 was successful.
	Close

Figure 5-20 Successful connection test

If the test was successful, Tivoli Storage Productivity Center will update the status. If you are working with a device that has multiple datasources configured, this menu and the Update Credentials will have submenus that list the datasources as shown in Figure 5-21.

	View Properties				
L	View Details				
l	View Performance				
l	Data Collection	×			
	Connections	۲	Test Connection	•	BNA12
Γ	Remove		Update Credentials		9.12.5.50
l	Open Switch GUI	1			
-					

Figure 5-21 Update Credentials panel

Using the Connections panel to verify the datasources can be useful in determining how Tivoli Storage Productivity Center is set up to communicate with a device. This is because the web-based GUI does not yet have a central panel for listing the datasources and devices together.

Updating the credentials

In this section, we show how to update the device credentials.

 To update the user name and password, from the Actions menu select Connections → Update Credentials from either the device detail panel or from a list of the devices. See Figure 5-22.

☆ Storage	Resources > Storage Systems			Tivoli Storage Productivity Center			POKVC1\\administrator ③
Home Home Storage Resources	Block Storage Alerts @	ge Systems ^{tal} ing Tasks R Performance					
Server Resources Network Resources Advanced Analytics Reporting Settings	Add Storage System := A4 Nome D54800-D54800PCK-5-600A0 D58000-2107-75L3001-A0 D58000-2107-75L331-4BM SVC_654 SVC_CF8	ctions V Status Very Properties Very Properties View Data Path View Performance Data Collection Analyze Tiering Add to Capacity Pool Connections Remove Open Storage System GUI	Probe Status Successful Successful Successful Test Connection Update Credentials	Performance Monitor Status Running Running Running Running Running Running	Raw Disk Capacity (GIB) 1,002.05 6,6534.29 6,499.32 1,288.00 912.46	Pool Capacity (G 968.54 6,643.73 6,643.73 1,128.50 773.25	Image: Filter Available Pool Space (GiB) Physical Al IS 0.54 94% 391.73 95% 73.05 95% 579.75 45% 342.45 55%
	Showing 5 items Selected 1 item						Refreshed a few moments ago

Figure 5-22 Action Connection \rightarrow Update Credentials

2. In Figure 5-23, you can see the Enter User Credentials dialog for an SVC. Update the User name: and Password fields as required.

Enter User Credentials	Enter User Credentials					
	Host name or IP address: Authentication: User name:	9.12.5.70 Username/Password v superuser				
	Password:	*				
SVC						
	OK	Cancel				

Figure 5-23 Example of Update Credentials panel for an SVC

The menu and the panel where you enter the information will look a little bit different from device to device since this really depends on the datasource type.

As an example, we have defined both the CIM agent and an SNMP datasource for a switch. The connections menu will have two entries as shown in Figure 5-24 on page 106.

合 Network I	Resources > Switches		Tivoli Storage	Productivity Center		POKVC1\\administrator	D
	mmi	Switches					
Home	Switches Ale	2 Normal O Warning O Error					
Resources	Add Switch	≡ Actions ▼				🔍 🔻 Filter	1
	Name IBM_2498_B24	Status Verobe Status	Performance Monitor Status Dom	ain ID Ports Connected Ports	Fabric Pri 0 4 100000533C9B9CC ==	IBM 2498 B24 No	
Resources	IBM_2498_B24	View Properties	Running	1 <u>24</u>	11 Q <u>100000533F316EC</u> ===	<u>IBM 2498 B24</u> No	
Network		View Details View Performance Data Collection					
Resources		Connections Remove Open Switch GIII	Test Connection Update Credentials BNA12 B13.50				
Advanced Analytics							
<u>II</u>							
Reporting							
Settings							
	•		m			,	
	Showing 2 items Selec	cted 1 item				Refreshed a few moments ago	

Figure 5-24 Example: Choice of two datasources to update the credentials for a switch

Updating the datasource IP address

There is no explicit function to update the IP address for a datasource. Here we describe the way we simulated this scenario:

- 1. We swapped the cluster IP address and the service IP address of one of our SVCs.
- 2. We then added a new storage system to Tivoli Storage Productivity Center using the new cluster IP address.

What happens in the background is that Tivoli Storage Productivity Center will run a discovery and realize that the device is already known and simply update the IP address. The message is shown in Figure 5-25.

Add Storage System						
Discover						
	EPCUI0182I The resources that are managed by 9.12.5.69 are already being monitored.					
	Host name or IP address:	9.12.5.69				
SVC	Authentication:	Username/Password 🔻				
	User name:	tpc_87				
	Password:					
	■ Back	Next > Cancel				

Figure 5-25 Message after updating the IP address

3. When you see this message, click **Cancel**. The IP change has already been saved to the database. Tivoli Storage Productivity Center will now use the new IP address.

5.2 Managing Storage Resource agents

The Tivoli Storage Productivity Center Storage Resource agents can be managed within the Tivoli Storage Productivity Center V5.2 web-based GUI. You can run and schedule probes, look at log files, change properties (for example, in Custom Tags), as well as modify the settings (for example, trace level, enable/disable functions).

5.2.1 Updating agent properties

In this section, we show how to edit Storage Resource agent properties.

1. Open the Agent tab in the properties dialog of the server. See Figure 5-26.

tpcblade3-14 Properties			Data accurate as of Jul 2, 2014 12:29:48 MST
DE	General Hardware Storage	Agent	
	Agent State	Up	
0	Agent Version	5.2.2.0	
	Agent Installation Location	C:\tpc_sra\bcdeguia_us\vcloud140	
Servers	Fabric Functions	Disabled	
	Agent Trace	Enabled	
	Trace Level	Medium	
	Number of Trace Files	8	
	Trace File Size	1 MiB	
	Agent Runtime Mode	Non-daemon	
	Agent Port	N/A	
	Run Scripts on Agent	Yes	
	Last Update Time	Jun 25, 2014 12:25:59 MST	
	Last Scan Time	Jul 3, 2014 02:16:25 MST	
		Edit Close	

Figure 5-26 Agent properties

2. Click Edit to modify the agent properties. Several of the agent properties can be changed from the server Action list or the context menu.

The only function that is not yet available in the web-based GUI is the agent deployment. This task is still in the stand-alone GUI.

5.2.2 Advanced topics for Storage Resource agent management

There are situations where you need to make changes to the network setup that will affect your Storage Resource agents. In this section, we look at common network changes and how to update the Storage Resource agent to comply with the network change.

Changing the IP address of a Storage Resource agent

If you need to change the IP address of a computer running the Storage Resource agent, you can do this without any impact to Tivoli Storage Productivity Center. This is because Tivoli Storage Productivity Center is always using the DNS name to connect to the Storage Resource agent.

Changing the DNS name of a Storage Resource agent

When you change the DNS name, Tivoli Storage Productivity Center can no longer contact the agent. The new DNS name needs to be communicated to the Tivoli Storage Productivity Center server. Follow these steps to update the Tivoli Storage Productivity Center server:

- 1. Stop the Storage Resource agent.
- Create a file called REGISTERSRA (uppercase with no extension) in the root directory of the Storage Resource agent.
- 3. Restart the Storage Resource agent

When the agent detects the REGISTERSRA file, it will connect to the Tivoli Storage Productivity Center server and register itself or simply update the DNS name, if Tivoli Storage Productivity Center knows that SRA already.

This procedure is typically used when Tivoli Storage Productivity Center agents are included in a master image that is used to install new servers. For more information about the procedures, refer to the IBM Knowledge Center:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.3/com.ibm.tpc_V523.doc/fqz0_ t_set_up_master_image.html

Note: You can use the same process to register a Storage Resource agent with a new Tivoli Storage Productivity Center server when you modify the connection information in the config\Agent.config file.

5.3 Tivoli Storage Productivity Center configuration tasks

After you have the Tivoli Storage Productivity Center software successfully installed, it is time for some initial configuration. One of the first configuration tasks is to add devices to Tivoli Storage Productivity Center and begin collecting data. We explained how to do that earlier in this chapter.

When you are happy with the data that is collected, it is time to perform additional configuration of your Tivoli Storage Productivity Center environment. Remember that the configuration can be changed later on. Taking the time to go through these configuration items will generally help you better understand Tivoli Storage Productivity Center.

5.3.1 Configuration task reference

Since this a release guide, you should be familiar with Tivoli Storage Productivity Center. Therefore, we will not spend much time in explaining every step of the configuration items in detail. Instead, we list the most important topics and where those items are located within Tivoli Storage Productivity Center in Table 5-1 on page 109.

Configuration item	Location
Set up the authentication using LDAP or Active directory. See 5.5, "User authentication" on page 115.	Web-based GUI: Settings \rightarrow User Management \rightarrow Modify authentication mechanism
The mapping of Roles to Groups within Tivoli Storage Productivity Center. See 5.6, "User management in Tivoli Storage Productivity Center" on page 115.	Web-based GUI: Settings \rightarrow User Management
Retention settings: Log files Performance data Other data Removed resources	 Stand-alone GUI: Administrative Services → Configuration → Log File and Cached Batch Report Retention → Resource History Retention → Resource History Retention → Removed Resource Retention
Notification setup: Tivoli Storage Productivity Center: Email, SNMP	Stand-alone GUI: Administrative Services \rightarrow Configuration \rightarrow Alert Disposition
Notification setup: Tivoli Common Reporting/Cognos	Windows: Start \rightarrow Tivoli Common Reporting 3.1.0.1 \rightarrow IBM Cognos Configuration
Adjust alerts	$\begin{array}{l} \mbox{Stand-alone GUI:} \\ \mbox{Data Manager} \rightarrow \mbox{Alerting} \\ \mbox{Disk Manager} \rightarrow \mbox{Alerting} \\ \mbox{Disk Manager} \rightarrow \mbox{Monitoring} \rightarrow \mbox{Subsystem Performance Alert} \\ \mbox{Configuration} \\ \mbox{Fabric Manager} \rightarrow \mbox{Alerting} \\ \mbox{Fabric Manager} \rightarrow \mbox{Monitoring} \rightarrow \mbox{Switch Performance Alert} \\ \mbox{Configuration} \\ \mbox{Replication Manager} \rightarrow \mbox{Alerting} \end{array}$

5.3.2 Environment configuration

There are configuration tasks that affect the Tivoli Storage Productivity Center environment, but are not directly related to the configuration of the Tivoli Storage Productivity Center server.

Install additional items

See Table 5-2 on page 110 for additional applications and tools that can be installed to complete the implementation of the Tivoli Storage Productivity Center environment.

Item	Description
IBM Data Studio	 With DB2 Version 10, the Control Center is no longer available. The replacement for it is the IBM Data Studio. The software is available at no charge and can be downloaded from: http://www.ibm.com/developerworks/downloads/im/data/index. html It is not required that you install this software for running Tivoli Storage Productivity Center. However, if you have used the DB2 Control Center to do some basic administration tasks or to develop SQL queries for custom reporting, you should consider downloading and installing the Data Studio. Data Studio is useful in troubleshooting Tivoli Storage Productivity Center application slow downs resulting from slow running SQL queries. This tool can also recommend actions to speed up the performance of the Tivoli Storage Productivity Center (for example, adding indexes and reorgs) The following links provide more information about the Data Studio: http://www.ibm.com/software/products/en/data-studio http://pic.dhe.ibm.com/infocenter/db2luw/v10r1/topic/com.i bm.db2.luw.idm.tools.doc/doc/c0057028.html
VMware vSphere Web Client Extension for Tivoli Storage Productivity Center	This item needs to be manually installed on the server running the VMware vCenter Server. For general information, see Chapter 10, "VMware vCenter Server configuration and use" on page 233. For details about how to install it, refer to 10.5.5, "Implementing the vSphere Web Client extension for Tivoli Storage Productivity Center" on page 253.
Firefox	If you have installed Tivoli Storage Productivity Center on a Windows 2008 server you might want to install Firefox. The preinstalled Internet Explorer 8 is not supported by Tivoli Storage Productivity Center V5.2.2. Normally you will use the browser on your computer to access Tivoli Storage Productivity Center, but there might be situations where you directly log on to the server, so having a working browser is helpful. Check the "Supported Platforms Agents, Servers and Browsers" using the following link: http://www.ibm.com/support/docview.wss?&uid=swg21386446
Flash Player	The View Data Path function requires Flash Player be installed.

Table 5-2 Further configuration items

Backup Tivoli Storage Productivity Center

It is important to have a backup strategy for your Tivoli Storage Productivity Center environment. There can be several items that you need to back up depending on how you use Tivoli Storage Productivity Center. Here is a list of items that you should include in your backup strategy:

- Tivoli Storage Productivity Center database
- ► Tivoli Common Reporting/Cognos Content Store
- Reports that were saved to the file system
- ► Tivoli Common Reporting/Cognos Report definitions

Since Tivoli Storage Productivity Center and the Tivoli Common Reporting/Cognos Content Store are both stored in DB2, the backup can be easily integrated with Tivoli Storage Productivity Center or other backup tools. Any reports that are saved in the file system should be part of a regular file system backup.

The backup of report definitions is a bit more complex. Because any authorized user can create a report anytime, you should set up a job in Cognos to create an export of the report definitions regularly. The export is a compressed file that is written to the local file systems so that it can be backed up by the regular file system backup.

Important: For this approach to work, you should not use the "My Folders" location for your reports. In our testing, we have not found a way to regularly export reports that are stored there. We suggest you create a new folder in the Public Folders tab, and save your reports there.

You should not save any of your reports in the folders that Tivoli Storage Productivity Center is creating. The reason is that this might make future upgrades move complex than necessary. If you have a folder created in the Public Folders tab, you can create links to the Tivoli Storage Productivity Center provided reports. This makes it easier to find and navigate to the reports.

Set up notifications for DB2

In case you did not set up the notification and contact lists during the DB2 installation, you can do this later. Setting up the notifications allows your DB2 database product to contact you or others regarding the status of your databases. Here is a link on how you would do this, using simple DB2 commands:

http://www.ibm.com/support/knowledgecenter/SSEPGG_10.1.0/com.ibm.db2.luw.qb.upgrad e.doc/doc/t0007200.html

5.4 Proven practices

In this section, we provide tips on how we typically configure a Tivoli Storage Productivity Center environment.

5.4.1 User IDs for device logins

It is generally easier to simply use a superuser ID when you add a device to Tivoli Storage Productivity Center than creating a user ID specific for the storage management task. Nevertheless, we do not recommend doing this. Instead, we recommend that you create a special user ID for Tivoli Storage Productivity Center on the storage device. In the case that you have two Tivoli Storage Productivity Center servers (one for test and one for production), you should consider using separate users IDs for both Tivoli Storage Productivity Center servers. This way you have more control over which Tivoli Storage Productivity Center server can work with a specific device.

In our lab environment, we simply created a user called tpc_87 for the Tivoli Storage Productivity Center server whose IP ends in 87 on the devices that we have added to that Tivoli Storage Productivity Center instance.

For some datasources this would require extra effort because some CIM agents do not require authentication. Because Tivoli Storage Productivity Center is often the only

application using the CIM agent, we did not go through the extra effort of adding that user for the connection between Tivoli Storage Productivity Center and the CIM agent.

The DS4000/DS5000 CIM agent is an example of a datasource where we did not configure a special user ID setup. Typically, we use the user ID *any* and enter also the password *any* when we configure the datasource to document that no special user ID is set up between Tivoli Storage Productivity Center and the CIM agent.

For the communication between the DS4000/DS5000 CIM agent and the device, we do recommend you create and use a special user ID.

Tip: The added benefit for doing the kind of setup is that you can look into audit files and understand easily which commands Tivoli Storage Productivity Center has issued. Note that some devices will only log commands that change the configuration. For those devices, you will probably not see any entries in the audit log unless you use the optimization, provisioning, or transformation functions.

If you are using SVC or Storwize based storage systems and you do not want to or cannot use the user ID and password method, we suggest using a public/private key pair for each Tivoli Storage Productivity Center server.

5.4.2 Naming conventions

Using a consistent naming scheme is a good idea. Here is just one example of why this can make your work so much easier:

The panels that display information about pools do not provide information about the storage system type. If you have SVC or Storwize V7000 systems, you may want to see only those in the lists. The SVC and Storwize V7000 are like the pools that contain the volumes that are assigned to servers. So the names of a storage system should include some kind of information so that you can use as filters in the web-based GUI.

The filtering typically works across all columns in the displayed tables. You can also restrict Tivoli Storage Productivity Center to look for the search string in a particular column, as shown in Figure 5-27 on page 113.

倄 Storage F	Resources > Pools			Tivo	li Storage Productivity Cente	r		POKVC1\\administrator	?
Home Storage Besqueres	Pools	OIS 15 Normal 0 Varning 0 Error							_
Server Resources Network Resources Advanced Advanced Reporting Reporting Settings	E Actions ▼ Nane Source (1990) Source (1990)	Storage System 8VC 8C4 8VC 8C4 8VC 8C5 8VC 8C6 8VC 8C78 8VC 8C78 8VC 8C78 8VC 8C78 8VC 8C78	Status V C Online Online Online Online Online Online	apaciy Alloca 968.00 158.50 318.50 40.00 140.00 274.75	ed Space (GIB) Volum 649.25 34.24 224.17 21.03 65.04 122.26	Solid State 25 No 12 No 12 No 3 No 3 No 5 Yes	Control Contro	Storage System 👻 SVC Rese apacity HDD (GiB) Ter Available Space 966.00 165.50 316.50 40.00 140.00 140.00	
	Showing 6 items Selected 0 it	tems						Refreshed a few moments a	ago

Figure 5-27 Filter on Storage System

Tip: When the search function is used without restrictions, it will also look for the search string in columns that are not currently displayed.

By default, the Custom Tag columns are not displayed, but given the fact that Tivoli Storage Productivity Center will look into those columns anyway, you can use the Custom Tags to customize your environment in a way that lets you use filters to focus on what is important to you.

Since the actual values in a name depend on your environment and requirements, we cannot provide a general schema to use. Also, you might already have well established names that you do not want to change. The next section provides alternative ideas.

5.4.3 Add information to Tivoli Storage Productivity Center

Tivoli Storage Productivity Center offers ways that you can customize it. These may be more applicable than naming conventions in some cases. Tivoli Storage Productivity Center has had some of these options for years, but they were often not used to a great extent. Following is a list of items that we think are very useful:

Custom Tags/User-defined properties

These properties are the most versatile custom attributes that you can use for many different purposes. They are available for:

- Storage Systems
- Storage Pool
- Servers
- Hypervisors
- Switches
- Fabrics

Location

The location property is new in Tivoli Storage Productivity Center V5.2 and can be set for:

- Storage Systems
- Servers
- Hypervisors
- Fabrics
- Switches
- Capacity Pools

For custom reporting, you can find the properties in the data model within the "Component Properties" folder of the corresponding component. An example is the label "Storage Virtualizer Pool Custom Tag 1".

Tiers for storage pools

The definition of Tiers is another new function of Tivoli Storage Productivity Center V5.2. Since there are many ways that users define what a Tier is, Tivoli Storage Productivity Center offers a very simple and flexible way to define what you think a tier is. Basically you can choose a number between 1 and 10 and tag a storage pool with this information.

The Tier property is available for any storage pool no matter what type of storage system the pools belongs to. Since it is a simple tag, Tivoli Storage Productivity Center will not check for any inconsistencies. For example, you can define all your pools containing 15 k rpm disks as Tier 5, and all 10 k rpm disks as Tier 3 independent from the storage system type.

For custom reporting, you can find the properties in the data model within the "Component Properties" folder of the corresponding component as "Storage Virtualizer Pool Tier" or "Storage Pool Tier".

Storage Resource Groups (SRGs)

You can add almost any entity into a Storage Resource Group, and use the concept mainly for custom reporting. SRGs have a name, description, and properties as well as a consolidated status so they are very helpful when you use them to model your environment.

Note: Currently, SRGs are not available in the web-based GUI as a filter and can only be defined in the stand-alone GUI or via the Tivoli Storage Productivity Center CLI. Nevertheless, they can be used in some predefined or your own custom reports in Tivoli Common Reporting/Cognos.

Capacity pools

Capacity pools are part of the cloud configuration concept in Tivoli Storage Productivity Center. They provide a new way of grouping of storage pools. Essentially this is a special "type" of Storage Resource Group, which can only contain storage pools. Another difference is that one storage pool can only be assigned to one Capacity Pool.

There are also groups that you can define in the stand-alone GUI. The groups are called "Monitoring Groups" and "Reporting Groups", but those groups are not reflected in the web-based GUI.

Note: Not all of the preceding properties are available within Tivoli Common Reporting/Cognos for creating your custom reports via drag and drop. Nevertheless, some of the information is available via the TPCREPORT views.

5.5 User authentication

Tivoli Storage Productivity Center supports using LDAP or Active Directory as the authentication method. This is convenient since with the web-based GUI there is less reason to log on locally to the server. Because of this, the use of external authentication servers is growing.

Depending on your specific environment, there are different ways listed in Table 5-3 to configure Tivoli Storage Productivity Center after it is installed. By default, Tivoli Storage Productivity Center will use local OS authentication for the stand-alone GUI and the web-based GUI.

Note: Tivoli Common Reporting/Cognos also used the local OS authentication in Tivoli Storage Productivity Center V5.1. With the switch to the JazzSM package, the new default is now the file-based repository. This simply means that the Cognos web-based GUI checks the user ID and password entered against a file that contains user IDs and passwords instead of checking with the local OS. Therefore, you need to use the same user ID and password that you entered during the JazzSM installation to access Cognos.

Table 5-3 Authentication scenarios

	Scenario 1	Scenario 2	Scenario 3	
Operating system	Windows	Window	UNIX	
Member of the domain	no	yes	n/a	
Authentication	via WebSphere	implicit	via WebSphere	

5.5.1 Tivoli Common Reporting/Cognos single sign-on

Even when Tivoli Common Reporting/Cognos is set up using the same authentication server as Tivoli Storage Productivity Center, you will still have to authenticate again when you launch the reporting.

There is a way to configure the WebSphere server running Tivoli Common Reporting/Cognos to accept and use single sign-on (SSO) tokens so that you do not need to enter a user ID and password.

Refer to the following link for a description for instructions on how to set this up:

https://www.ibm.com/developerworks/community/blogs/9caf63c9-15a1-4a03-96b3-8fc700f
3a364/entry/configuring_sso_in_tivoli_common_reporting_3_1?lang=en

Important: This will only work if you have switched from the default file repository authentication to LDAP in the WebSphere that Cognos is using.

5.6 User management in Tivoli Storage Productivity Center

The user role concept was changed in Tivoli Storage Productivity Center V5.2. The roles have been reduced so that now only three roles are available as listed in Table 5-4 on page 116.

Role	Users that are assigned this role
Administrator	Can use every function in Tivoli Storage Productivity Center. By default, the following groups are assigned the Administrator role: • Windows: Administrators • Linux: root • AIX: system
External Application	 Cannot log in to the Tivoli Storage Productivity Center GUI. This role should be used for external applications that use the Tivoli Storage Productivity Center provisioning functions, such as: vSphere Web Client Extension for Tivoli Storage Productivity Center IBM SmartCloud Storage Access
Monitor	 Can log in to Tivoli Storage Productivity Center but cannot execute any function. A user with this role will still be able to see all information and open log files, but the only actions that the user can do are: Acknowledge alerts Acknowledge a non-normal status Set the tier level of a storage pool

Table 5-4 New roles in Tivoli Storage Productivity Center 5.2

The concept of user management remains the same as previous versions of Tivoli Storage Productivity Center. You assign a role to a group of users, so all users in that group can perform certain actions in Tivoli Storage Productivity Center.

If you had Tivoli Storage Productivity Center V5.1 or earlier running, the existing roles will be mapped to the new roles as described in Table 2-4 on page 24.

With Tivoli Storage Productivity Center V5.2, the role to group mapping has now been migrated to the web-based GUI. You will find a new icon on the bar on the left as shown in Figure 5-28 on page 117.

	> User Management	Twoli Storage Productivity Center	ST3L10-W2\\administrator 👔 🕐
Home Home Storage Resources	2	User Management	
-6	Add Group	Actions ▼	
	Administrators	Administrator	
Server Resources	🖳 Users	External application	
Network Resources			
Advanced Analytics			
Reporting			
Settings	User Management		
	Showing 2 items Selec	ded 0 items	Refreshed a few moments ago

Figure 5-28 Tivoli Storage Productivity Center User Management

From this panel, you can also directly launch into the WebSphere Integrated Solutions Console. That is where you configure the authentication mechanism like Active Directory and LDAP.

6

Performance Management reporting

In Tivoli Storage Productivity Center V5.2, the performance reports are available in the Tivoli Storage Productivity Center web-based graphical user interface (GUI), along with the performance data collection management and the threshold violation display.

This chapter describes all the new performance management functions that are not related to storage optimization. Chapter 9, "Storage optimization" on page 207 is dedicated to that topic. The functions included in this chapter are available with the Tivoli Storage Productivity Center or the Tivoli Storage Productivity Center Select Edition licenses.

There are also some smaller enhancements described in this chapter, which were added after the Tivoli Storage Productivity Center V5.1 was released but before Tivoli Storage Productivity Center V5.2.2 that are included in this chapter.

Note: With Tivoli Storage Productivity Center V5.2.2, 1-minute performance monitoring interval is now available. The 1-minute performance monitoring interval facilitates finer granularity for troubleshooting, debugging, and reporting.

As of V5.2.2, the default is 1-minute increments for supported devices. Be sure to take consideration of the performance and space usage when running this on your server.

6.1 Performance management panels

In addition to the new performance charts, the new web-based GUI also provides panels that are focused around managing performance with Tivoli Storage Productivity Center.

6.1.1 Dashboard

In Tivoli Storage Productivity Center V5.2, the panel in the center of the bottom row of panels in the main dashboard has been changed to show information solely on Performance Monitors (see Figure 6-1). Before Tivoli Storage Productivity Center V5.2.x, that panel was used to show information about recent jobs. Now it is more focused and you can easily see if all performance jobs are running as expected.



Figure 6-1 Tivoli Storage Productivity Center Dashboard

The status of the performance monitors shown in the dashboard will be one of those listed in Table 6-1.

Status	Meaning
Running	The number of performance monitors that are in the process of starting or stopping.
Running with problems	The number of performance monitors that are encountering problems when collecting data. Check the log for a performance monitor to view its warning or error messages. If the performance monitor does not encounter problems during the next time it collects data, its status is changed to Running.
Failed	The number of performance monitors that encountered error conditions during processing and are no longer running. Check the log of a performance monitor to view its error messages.
Not running	The number of performance monitors that are not running, were canceled, or have completed normally.

Table 6-1 Status of performance monitor jobs on the dashboard

In our example, there are two jobs "Running with Warnings". When you open the Performance Monitors panel by clicking the hypertext link, you can find additional information about those jobs.

6.1.2 Performance Monitors

You can open the Performance Monitors panel from either the dashboard or the navigation pane on the left by clicking Home \rightarrow Performance Monitors.

The panel has two tabs:

- Performance Monitors
- Threshold Violations

Figure 6-2 shows the Performance Monitors tab of the panel. It is opened by clicking the link from the Tivoli Storage Productivity Center dashboard.

formance Monitors		Tivoli Stor	age Productivity Center		ST3L10	-W2\\administrator
Perfo ● 4 Runni © 0 Pailed ● 0 Not ru	mance Monitors				Threshold ③ Last ⑥ 0 cr ℓ 0 or ℓ 0 or	Violations hour itical Stress itical Idle arning Stress arning Idle
Performance Monitors Threshold	Violations					
i≣ Actions ▼					Q -	· [
Name	Status	 Interval (min) 	Last Day Success (%)	Latest Collection	Latest Error	Start
IBM_2498_B24_49	Running with problems		5	0 1 Nov 2013 16:00:00 EDT	HWNPM2132W	24 Oct 2013 19
IBM_2498_B24_50	Running with problems		5	0 1 Nov 2013 16:00:00 EDT	HWNPM2132W	24 Oct 2013 19
SVC-2145-IT SO_SVC_8G4-IBM	Running		5	100 5 Nov 2013 18:47:36 EST		15 Oct 2013 16
DS8000-2107-75L3001-IBM	Running		5	100 5 Nov 2013 18:50:00 EST		17 Oct 2013 2
DS8000-2107-75L3331-IBM	Running		6	100 5 Nov 2013 18:50:00 EST		15 Oct 2013 1
SVC-2145-ITSO_SVC_CF8-IBM	Running		5	100 5 Nov 2013 18:50:00 EST		17 Oct 2013 2
•						

Figure 6-2 Performance Monitors panel

On the Performance Monitors panel, you can easily see and manage all performance data collection jobs from a central place. The panel is similar to the one that was available in Tivoli Storage Productivity Center V5.1 as a tab on the Jobs panel. The following columns have been added:

- Type. Distinguishes between a storage system and a switch.
- Latest Collection. Shows you the time of the latest collected performance sample, based on the date and time settings of the device.
- Threshold Violations. Number of threshold violations in the latest collected performance sample.

If you look at the jobs in warning state in Figure 6-2, you quickly see that Tivoli Storage Productivity Center was not able to retrieve any information in the last day in the column called Last Day Success (%).

Note: This success rate is defined as:

```
Successful Collections + Attempted Collections (× 100)
```

```
A 24-hour sliding window is used to calculate the value.
```

You can also see when the last successful attempt was made as well as an error message.

You can start, stop, and modify the schedule of a performance monitor (see the context menu in Figure 6-3), as well as view the logs for any job.



Figure 6-3 Actions you can run

In addition, you can directly open the resources detail page or properties. You can also view the performance of the device, which opens a new window.

6.1.3 Threshold violations

Tivoli Storage Productivity Center has the ability to define thresholds that can triggers alerts. The alerts are either stored in the Tivoli Storage Productivity Center Alert Log (**Home** \rightarrow **Alerts**) or they can be forwarded via email or other mechanisms. This means you can view the threshold violation in the Alerts log as well.

The Performance Monitors window in Tivoli Storage Productivity Center V5.2.2 provides a Threshold Violations tab. This tab shows only the threshold violations. It acts as a filter to the alert log as shown in Figure 6-4 on page 123.

Pe	rformance Mo	nitors				Threshold Violations
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	6 Running 0 Running with problems 0 Failed 0 Not running					© 0 Critical Stress © 161 Critical Idle
Performance Monitors Th	reshold Violations					
∂ Refresh != Actions	•					🔍 🔻 🛛 Filter
Time	Condition	Severity	Resource	Internal Resource	Boundary Type	Critical Boundary Warning
Oct 24, 2013 21:11:22 EDT	Disk Utilization Percentage	🔒 Warning	DS8000-2107-75L3331-IBM	107.75L3331-A8	Stress	80 %
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	A Warning	DS8000-2107-75L3331-IBM	👪 <u>0030</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	🔒 Warning	DS8000-2107-75L3331-IBM	<u>88 0100</u>	Stress	550 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	👍 Warning	DS8000-2107-75L3331-IBM	0103	Stress	550 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	🔒 Warning	DS8000-2107-75L3331-IBM	<u>0130</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	👍 Warning	DS8000-2107-75L3331-IBM	iii <u>0200</u>	Stress	550 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	🔒 Warning	DS8000-2107-75L3331-IBM	<u>0230</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	🚯 Warning	DS8000-2107-75L3331-IBM	<u>0330</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	Critical	DS8000-2107-75L3331-IBM	<u>0001</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	Oritical	DS8000-2107-75L3331-IBM	<u>0002</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	Critical	DS8000-2107-75L3331-IBM	<u>0003</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	Critical	DS8000-2107-75L3331-IBM	0031 <u>0031</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	Critical	DS8000-2107-75L3331-IBM	<u>0032</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	Critical	DS8000-2107-75L3331-IBM	<u>0033</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	Critical	DS8000-2107-75L3331-IBM	👪 <u>0101</u>	Idle	10 ops/s
Oct 24, 2013 21:11:21 EDT	Total Port I/O Rate	Critical	DS8000-2107-75L3331-IBM	<u>0102</u>	Idle	10 ops/s
K		~ • ··· ·		· · · · ·		
	I Coloridad A Barry				Defe	a de la deve en entre la companya de la della de la

Figure 6-4 Threshold Violations panel

The Threshold Violations table can get large and span multiple pages. It is limited to show events from the last three weeks. Currently, the setting of three weeks cannot be changed by the user.

Note: In Tivoli Storage Productivity Center, there are several default thresholds that are always set, even if you have not set up your own alerts. If these are triggered, you will see a threshold violation entry on this panel even though there is no entry in the Alerts panel.

Alerts and Threshold Violations differ in several other ways, which might not have been obvious so far:

- ► Alerts can be acknowledged but threshold violations cannot be acknowledged.
- Threshold violations will expire based on the retention setting of sample performance data.

Threshold Violation details

If you double-click any of the entries in the table, a dialog box opens and provides details about the specific event that generated the threshold violation. Figure 6-5 on page 124 shows the details of a disk utilization percentage threshold violation.

2107.75L3	331-A8 Disl	k Utilization Percentage					1 Oct 24, .	2013 21:11:2	2 EDT
Disk Utilization Percentage									
Boundary	y type:	Stress	2	3				l	
Measured	d value:	62.09 %			80.00				
Critical bo	oundary:	80 %		<i>.</i> 0	60.00		\sim		
Warning I	boundary:	50 %		o,	20.00				
Resource	es:	DS8000-2107-75L	<u>3331-IBM</u>		0.00	9 20	21	22 23	
Top Contr	ributina Volu	Imes:							
i≣ Act	tions 🔻						Q -		
Rank	▲ Nam	e	Hosts	Rea	d I/	Write I/	Total I/	Read C	V IJ
	1 📳 S'	VC8G4_3103	4		0.00	66.32	66.32	0.00	<u>^</u>
	2 📳 S	VC8G4_3101	4		0.00	56.99	56.99	0.00	
2	3 📳 S'	VC8G4_3105	4		0.00	52.77	52.77	0.00	
3	4 📳 S'	VC8G4_3108	4		0.00	52.83	52.83	0.00	=
	5 📳 S'	VC8G4_3106	4		0.00	39.56	39.56	0.00	
	6 📳 S'	VC8G4_3104	4		0.00	39.10	39.10	0.00	
	7 🗄 S	VC8G4_3107	4		0.00	36.35	36.35	0.00	-
•									F
Showing 8 items Selected 0 items Refreshed a few moments ago									
8									
				Close					

Figure 6-5 Example of Threshold Violation details

The threshold violation shown in Figure 6-5 contains the following details:

- 1. The date and time of the event.
- 2. Information about the measured values and the threshold settings at that specific time.
- 3. An overview chart displaying the performance 2 hours before and up to 2 hours after the event. This information is presented in both a tabular and graphical form. The event itself is indicated by a vertical line. The red and yellow horizontal lines show the threshold settings at the point of the event.

Note: If you changed the threshold settings within the 4-hour window, Tivoli Storage Productivity Center will not show this. Only the settings at the time of a violation are retained by Tivoli Storage Productivity Center.

Note the little icon on the upper right corner of the violation details panel. If you click it the same chart will be opened in a new window. In this window, you can take actions such as changing the time frame and changing the displayed metrics.

Depending on the type of the alert, Tivoli Storage Productivity Center will be able to help you find a cause of the violation by showing you the top contributing resources. For example, the volumes that had the highest workload or the affected volumes and hosts.

6.2 Performance charts

In this section, we describe how you access performance charts and use the information they contain.

6.2.1 GUI access

One of the biggest differences between the stand-alone GUI and the web-based GUI is how you open and work with performance charts. In the stand-alone GUI, the performance information was only accessible at specific points in the navigation tree.

In the web-based GUI, the reporting menu in the navigation pane on the left is only used for the Tivoli Common Reporting/Cognos integration. All interactive performance reports are available either through:

- ► The Action menu on tables, which show entities like volumes, pools, and ports.
- ► Context menus of entities like volumes, pools, and ports.
- ► From panels that have a tab called Performance.

Figure 6-6 shows an example of how you can initiate viewing performance charts in the new web-based GUI.

备 Server Resources > Servers > SSPCSRV15	Tivoli Storage Productivity Center	ST3L10-W2\\administrator 🤅 🅐
Home Storage Resources Storage Resources Actions	Volumes Volumes Volumes Prore Volumes Performance Performance Perf	
Server © Overview Server © Overview @ Properties @ Alerts (0) @ Tasks (0) @ Tasks (0) @ Data Path @ Data Path Resources Internal Resources @ Controllers (3) @ Disks (13) @ Disks (13) @ Shares and Exports (12) @ Shares and Exports (12) @ Monitored Directories (0) @ Storage Systems of 1) @ Bools (4) @ Disks (23) @ Disks (25) @ Disks (2) @ Disks (2) @ Disks (2) @ Disks (2) @ Disks (2) @ Ports (8) @ Ports (2) @	Norme Status Pool Capacity NAUD Level Dynamic Wew Properties 0 mine © pss300 75L3331 46 5.00 EnsylfierTest2 View Performance	Nos Thin Prov I Ib SSPC Yes Ib SSPC Yes

Figure 6-6 Example of launch points for performance charts

Multiple launch points for performance reports make performance reporting easier to use. You can use all the drill-through function to navigate from one properties panel to another, and finally open a performance chart. There is no longer a need to open one report and make notes of how entities are related to each other before you open a performance report like you had to do in the stand-alone GUI.

This new implementation of how performance information is available in the web-based GUI is especially useful when you are looking at a server's details. From the panels in the Related Resources section, you can directly open performance charts and start your investigation.

Note: The tab called Performance with this icon opens a special performance report.

The report will include all objects from the panel that this tab is on. In addition, it will have preselected the five most active resources. Note that the performance chart will be included in the panel itself, rather than in a new window. See Figure 6-7 for an example.



Figure 6-7 Most active resources performance chart

6.3 Using performance charts

The structure of the charts will be the same regardless of where you initiate them. Here we take you through a performance chart and explain what you will be able to see, and how you can use the information presented.

6.3.1 General chart structure

The general structure is shown in Figure 6-8 on page 127.



Figure 6-8 Panel structure

There are three main areas in the performance chart:

- 1. Diagram area
- 2. Resources area
- 3. Legend table

The performance charts include controls that allow the chart to be customized. See Figure 6-9 on page 128.



Figure 6-9 Controls on the performance panels

The following is a list of the controls that corresponds to the information in Figure 6-9:

- 1. Metrics (see 6.3.2, "Metrics selection" on page 129)
- 2. Show/hide the Resource panel
- 3. Select aggregation level

Tivoli Storage Productivity Center collects data in intervals (typically 5-minute increments) and creates average values for each hour and each day. For each of these levels (sample, hourly, and daily) there is a selectable icon to change the value in the chart.

Note: As of V5.2.2, the default is 1-minute increments for supported devices.

4. Select time ranges

You can select the time ranges either by specifying a start and end time or by selecting a relative time frame from the list above the chart. A relative time frame, such as 12 hours or 1 week, goes back in time from current date and time.
Note: Tivoli Storage Productivity Center V5.1 and prior versions displayed time stamps in the time zone of where the Tivoli Storage Productivity Center user interface was running. The Tivoli Storage Productivity Center V5.2.2 web-based GUI will display time stamps based on the time zone where the Tivoli Storage Productivity Center server is installed.

- 5. Chart actions (see 6.3.5, "Controls" on page 131)
- 6. Key Metrics View (see 6.3.3, "Legend table" on page 130)

6.3.2 Metrics selection

Depending on the component type, there are different metrics available to be included in the chart. If you click the plus sign (see Figure 6-9 on page 128 box marked "1"), a window is opened that lets you choose the metrics.

The chart can have up to two Y-axes. You can select more than two metrics, however the metrics cannot have more than two different units. For example, you could select the four metrics read I/O rate, write I/O rate, read response time, and write response time in a single chart. If you want to add a cache hit metric, you will need to clear either the I/O rates or the response times. This is because cache hits are expressed as a percentage, which is a different unit.

As of Tivoli Storage Productivity Center V5.2, the metrics are grouped in the Select Chart Metrics window (see Figure 6-10). There are key metrics that are always shown. Additional metrics are available when you click **More** to expand the metrics window. Within the expanded sections, the metrics are further grouped to make it easier to locate and select metrics.

elect Chart Metrics			🛿 2 Sele	cted
Volume Metrics (2)	Netrics 📓 Port Metrics			
Overall I/O Rate (ops/s)	Read	Write	🗹 Total	
Data Rate (MiB/s)	Read	Write	Total	
Response Time (ms/op)	Read	Write	✓ Overall	
Other	Cache Holding Tim	CPU Utilization P	Overall Host Attr	Ξ
	Write-cache Delay			
▼ More				
I/O Rates				
Write-Cache I/O Rate (ops/s)	Elush-through	Write-through	Overflow	
	Delay			
Normal I/O Rate (ops/s)	Read	Write	Total	
Sequential I/O Rate (ops/s)	Read	Write	Total	
High Performance FICON (ops/s)	Read	Write	Total	
Average Transfer Rate (ops/s)	Disk-to-Cache	Cache-to-Disk		
Other (ops/s)	PPRC Transfer Rate	Record Mode Read		
				-
	ОК	Cancel		

Figure 6-10 Select Chart Metrics window

Depending on the component type, you might see different tabs because metrics might be available at different levels. In the upper right corner, you can see how many metrics you have selected across the different tabs. You can clear all of them by clicking the "x" icon next to the number of selected metrics.

Note: You can select up to six metrics to be displayed in a chart. More metrics can be displayed in the tabular view. To add metrics in the table view, right-click the table head line and select the metrics.

6.3.3 Legend table

The legend table contains all the entities that were available from where you launched the performance chart, for the entity that you used for a drill up/drill down action.

You can select up to 10 entities that will be then added to the Resources area. Only those entities be drawn on the diagram area.

Because this legend is designed as a table, it provides some very helpful functions; for example, you can filter and sort it like any other table. In addition, you can change the sorting while still retaining the selection of entities, which is helpful during an analysis.

Average and worst values of the key metrics

In addition to the performance metrics collected, Tivoli Storage Productivity Center will show in the legend table the average and worst (can be high or low values) of the Key Metrics. The values are calculated online based on the time frame and the selected aggregation level (daily, hourly, or by sample) shown in the diagram.

You can change the Key Metrics by clicking the drop-down menu, and select Custom View. This allows you to specify which metrics Tivoli Storage Productivity Center should calculate the average and worst values for.

6.3.4 Resources

The Resource panel on the left shows you the currently selected resources of the legend table. You can quickly switch them on or off by clicking the specific resource name.

Line colors

For better readability, Tivoli Storage Productivity Center will use different colors for the same entity and different line styles for the metrics per entity in the charts. Because there are not that many colors that a visually impaired person can distinguish, the number of entities is limited to 10.

In the case where there is only one entity selected, Tivoli Storage Productivity Center will use different colors for each metric in the performance chart for better readability. Figure 6-11 on page 131 shows an example of a performance chart of a single SAN Volume Controller (SVC) Cluster.



Figure 6-11 Performance chart line colors for a single entity

Highlighting lines

To quickly identify a resource on a chart, you can click the little square or the name in the Resource panel. This dims all other resources. To undo the highlighting, simply click the resource again.

You can highlight more than one resource by using the Control key when clicking an additional resource, similar to selecting multiple rows in a table.

The same can be done with the metrics lines. You can click one to only show this metric for all resources, and click it again to turn this highlighting off, or press the Control key to highlight an additional metric.

6.3.5 Controls

Each performance diagram has three or four icons in the upper right corner, depending on what is displayed:

Chart view

This is the view that is opened by default, so you will only see this icon if you switched to the table view.

Tabular view

You can easily switch between the chart and the table view. When you have displayed more than six metrics in the tabular view, switching back to the chart will only show up to six metrics.

Export data

You can export the data that is visible in the chart or in the table as a CSV file by clicking this icon.

Tip: If you want to export more metrics for the components in the chart, go to the tabular view first and right click the table headline. This opens the context menu so that you can add more metrics to the table before you click export.

Synchronize time (

When you click this icon, the time range settings of this window will be synchronized with all other open external windows with performance charts.

Open in new window <a>[a] (also called pop out)

Open the current chart in an external window (or new tab based on your browser settings) to enlarge the chart.

Tip: The metrics, time frame, and resources for a chart are tracked in the window web address when you pop out a chart in a new window.

Once you have modified the settings for a chart to your needs, and you open that chart in a new window you can:

- Bookmark the window web address showing this report.
- Copy and paste the web address into an email or chat window.

The next time that you visit the web address, you should see the exact same chart that you were initially looking at. In Tivoli Storage Productivity Center V5.2, the URL always had a fixed time range encoded. However, this has been enhanced so that now also relative time ranges (for example the last 12 hours) are included in the URL. Therefore, when you open that link days later, you see the last 12 hours from the time when you opened the URL.

6.3.6 Drill up/down

The drill up/down action does not have a dedicated icon like it had in the stand-alone GUI. To initiate a drill up/down action, right-click a component in the legend table, or click the action menu and select the component that you want to be displayed in a new chart. An example is shown in Figure 6-12 on page 133.



Figure 6-12 Drill up/down action

Tivoli Storage Productivity Center V5.2 now allows more flexible drill up/down actions than before. Even the connection to the switches is available from the context of a storage system. The combinations of how you drill from one component to another are documented in the IBM Knowledge Center at the following web page:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.2/com.ibm.tpc_V522.doc/tpch_ r_performance_view_resources.html

6.4 Constraint violation report

As we described in 6.1.3, "Threshold violations" on page 122, the performance threshold violations are available in the web-based GUI. The Constraint Violations report in the stand-alone GUI is still available. This report provides statistics over a time range and includes how many times a threshold was reached. See an example in Figure 6-13.

🗐 IBM Tivoli Storage Productivity Center: pokvc1 -	- Storage Subsystem Performan	ce: Constraint Violations	
File View Connection Preferences Window Help			
Navigation Tree	Selection Constraint Violation	s	
Administrative Services IBM Tivoli Storage Productivity Center Data Manager Disk Manager	Storage Subsystem Performance: C	onstraint Violations	
Storage Subsystems	Subsystem	Disk Utilization Percentage Thres	Overall Port Response Time Thre
+ Monitoring	DS8000-2107-75L3001-IBM	44	0
Alerting	DS8000-2107-75L3331-IBM	13	0
E-Reporting	C SVC_CF8	0	0
⊕Groups		•	F
Storage Subsystem Performance			
By Storage Subsystem			
By I/O Group			
By Module/Node			
By Array			
By Managed Disk Group			
By Yolume			
By Managed Disk			
-By Port			
Constraint Violations			
Handlighten Manager			
terication Manager			
J			

Figure 6-13 Constraint Violation report

Note: The number of threshold violations may not match the number of alerts that have been triggered or emails that you might have received. This is because you may have configured alert suppression options. In this case, you will see fewer alerts than threshold violations.

6.5 New performance capabilities

The changes in the web-based GUI as of Tivoli Storage Productivity Center V5.2 are the most noticeable changes. There are other performance enhancements, which we describe in this section.

6.5.1 SVC and Storwize disk performance

The SVC code creates new statistic files for the disk that are integrated in a storage system. Generally that applies to the Storwize V7000. But since SVC can also have internal SSDs, those resources can now be seen in disk performance reports.

Following is a list of metrics that Tivoli Storage Productivity Center can report on per internal disk:

- I/O Rate (read/write/total)
- Data Rate (read/write/total)
- Response Time (read/write/overall)
- Peak Back-end Response Time (read/write)
- Peak Back-end Queue Time (read/write)
- Queue Time (read/write/overall)
- Average Transfer Size (read/write/overall)

Drill through capabilities

In Tivoli Storage Productivity Center V5.2, there is another drilling level for performance troubleshooting from an MDisk to the related disk drives. In Figure 6-14, you can see the performance on an MDisk named mdisk10.



Figure 6-14 Start drill down for mdisk10

The MDisk has been selected and the context menu opened to show you how to drill down to the disk drives of that MDisk. A new window is opened as shown in Figure 6-15. That window shows all the disk drives that are included in the array that forms the highlighted MDisk.



Figure 6-15 Disk drive performance for mdisk10

Real-time SVC and Storwize performance

This feature is only available for SVC and Storwize V7.2 or greater. This option allows greater accuracy for viewing performance for the SVC and Storwize device family.

Add an SVC or Storwize V7.2 or greater and probe the device. When complete, go to the **Storage Systems** pane, right-click the device as seen in Figure 6-16 on page 137, and choose the **View Real-Time Performance** option. This launches a separate window (Figure 6-17 on page 137) with the SVC/Storwize GUI URL.



Figure 6-16 Real-time performance option



Figure 6-17 Separate Performance window for SVC or Storwize

6.5.2 SAN Volume Controller enhancements

For SVC, there are new hardware options available as of Tivoli Storage Productivity Center V5.2.

Additional CPU card

The SVC CG8 nodes can be equipped with an additional CPU card. This card is only used when the node is doing compression. In this case, it does not take away any processing power from the other CPU, which will be used for all other processes.

Currently, Tivoli Storage Productivity Center does not include the workload of the compression function in the CPU utilization metric. Ultimately, SVC and Tivoli Storage Productivity Center should use a separate metric for this. With the current design, the CPU or cores are dedicated, so it really makes sense to look at them individually.

Additional four port HBA card

SVC supports a second HBA card with four additional ports. This means you can have a total of eight ports per node.

Tivoli Storage Productivity Center supports this additional HBA card with Tivoli Storage Productivity Center V5.1.1.2 and later.

6.5.3 Pool performance

For some devices, a storage pool aggregation level of performance data has been added. This has been available for SVC in previous releases.

DS8000 has had the possibility to map ranks to extent pools different ways: in a 1:1 relationship or in a 1:many relationship. Based on how you had set up the DS8000 storage pools, you did or did not see this information.

The pool performance data is aggregated from the volume performance data, but only data from primary volumes is included in the aggregation. In addition, it includes performance data gathered behind the cache.

Generally, the stand-alone GUI is no longer enhanced. This is because the web-based GUI will eventually replace it. The decision was made to retain the performance report in the stand-alone GUI for now to ease the migration. The new storage pool performance data can be found in the stand-alone GUI at:

Disk Manager \rightarrow Reporting \rightarrow Storage Subsystem Performance \rightarrow By Managed Disk Group

Figure 6-18 on page 139 shows the Managed Disk Groups performance report.

🗐 IBM Tivoli Storage Productivity Center: pokyc1 Storage Subsystem Performance: By Managed Disk Group 💶 🛛 🗙						
File View Connection Preferences Window Help						
]	
Navigation Tree	Selecti	ion Managed Disk Group	5			
Administrative Services JBM Tivoli Storage Productivity Center Joic Manager Did Manager	Storage	e Subsystem Performance: B Jumber of Rows: 8	y Managed Disk Group			
Storage Subsystems		Subsystem	Managed Disk Group	Time	Interval	Read I/O Rate
Honitoring	10	D58000-2107-75L3001-IBM	CKD_000	Nov 8, 2013 12:41:43 PM	300 s	
	10	DS8000-2107-75L3001-IBM	CKD_001	Nov 8, 2013 12:41:43 PM	300 s	
⊟ -Reporting	10	DS8000-2107-75L3001-IBM	FB_000	Nov 8, 2013 12:41:43 PM	300 s	
⊕ Groups	10	DS8000-2107-75L3001-IBM	FB_001	Nov 8, 2013 12:41:43 PM	299 s	
	10	DS8000-2107-75L3331-IBM	CKD_000	Nov 8, 2013 1:27:08 PM	301 s	
Storage Subsystem Performance	10	D58000-2107-75L3331-IBM	CKD_001	Nov 8, 2013 1:27:08 PM	301 s	
By Storage Subsystem	10	DS8000-2107-75L3331-IBM	FB_000	Nov 8, 2013 1:27:08 PM	300 s	
By I/O Group	10	D58000-2107-75L3331-IBM	FB_001	Nov 8, 2013 1:27:08 PM	300 s	
By Module/Node				•		Þ
By Array						
By Managed Disk Group						
By Volume						
-By Managed Disk						
-By Port						
Constraint Violations						
Herapric Manager						
m ^r rcpiication Manayer						

Figure 6-18 DS8000 Managed Disk Group report

6.5.4 Host connection performance

For DS8000, SVC, and Storwize storage subsystems, the performance data of primary volumes is aggregated and stored in the Tivoli Storage Productivity Center database for each host connection.

The aggregation works by summing up all read I/Os for all of the volumes connected to a host, as well as for the data rates. For other metrics such as response times or block sizes (transfer sizes), a weighted average is calculated.

Attention: For most devices, the performance model is limited and does not provide counters per volume per host. That means if you have a cluster with two or more servers and you define nodes of the cluster as individual host connections, each of the cluster nodes will all show the same aggregated performance. As a result, you should never manually sum up the performance of all cluster nodes, in order to avoid double counting.

The XIV storage subsystem keeps track of performance data by host port. Tivoli Storage Productivity Center can calculate the performance based on the actual workload that a specific host issues against a volume, even if other hosts are also using this volume.

This new aggregation for host connections is not available in the stand-alone GUI.

Pool Activity Score

Tivoli Storage Productivity Center V5.2.2 replaces Storage Pool Utilization with Pool Activity Score. It attempts to combine multiple metrics and calculate one key performance indicator. It is expressed as a percentage value.

The Pool Activity Score has the following attributes:

► The metric is calculated by Tivoli Storage Productivity Center.

- The metric can be displayed in every storage pool panel in the web-based GUI even outside of performance charts.
- The metric is available for every storage system that is supported by the Tivoli Storage Productivity Center.

Calculation

When Tivoli Storage Productivity Center collects performance data from a device (typically every 1 - 5 minutes), the Pool Activity Score is calculated and stored in the Tivoli Storage Productivity Center database. It is aggregated to hourly and daily values just like any other metric.

The Pool Activity Score metric is expressed in I/Os per second per Gigabyte (IOPS/GiB). It is the measure of the approximate amount of activity that occurred for the particular pool over a particular time interval. The exact formula varies by storage system type. For more information, the following link gives more detailed calculations used by Tivoli Storage Productivity Center:

http://www.ibm.com/support/knowledgecenter/SSNE44_5.2.2/com.ibm.tpc_V522.doc/fqz0_ r_balance_analysis_criteria.html?lang=en

Displaying the value

The Pool Activity Score (IOPS/GiB) metric is displayed by default under the performance tab of a storage system pool (see Figure 6-19) and will be displayed by default.



Figure 6-19 Pool Activity Score example

By default, the Total I/O Rate and the Overall Response Time metrics are preselected. Click the plus sign next to Metrics to select it, as shown in Figure 6-20 on page 141.

TPC DS8	000-2107-75RA271-IBM +										
https:/	//tpcblade3-5.storage.tucson. ibm.com :9569/srm/gui#storageD	etail?l3=14138518specDev=ds80008iink=pools				⊽ C	8 🛪 Google			<mark>ዖ</mark> ☆ 🛙	à 🖡 1
ଳ` Storage I	Resources > Storage Systems > DS8000-2107-75RA2	271-IBM ∏	voli Storage Productivity	Center - Virtual Storage Ce	nter Edition			_	admi	nistrator (Admin	istrator) I
Home Storage	DS8000-2107-75RA271-IBM IBM DS8800	Pools Pools Pools Pools Pools									
	Actions 🐨		Last: 1 hour 6 hou	rs 12 hours 1 day 1 wee	ek 1 month						
Server	General	Select Chart Metrics				2	Selected			- 9	
Reporting	© Oranewie © Properties → Antris (2) → Transhold Volations (644) → Transhold Volations (644) → Transhold Volations (644) → Transhold Volations (64) → Transhold Volations (7) → Pools (19) → Controllers (2) → Controllers (2) → Transhold Volations (133)	♥ Volume Metrics (2) ● Disk. Overall UX Rate (opsis) Overall UX Rate (opsis) Overall UX Cache Hits (%) Data Rate (MB/s) Response Time (malop) Average Transfer Size (NBlop) Other ▶ More	Metrics Read Read Read Read Read Read Read Read	Write Write Write Write Write Write Write Grancet	♥T □T □C Delay	otal otal otal verall verall	04	05	05 07	8 7 6 5 4 4 3 2 2 1 0 8 0 8 0 8 0 8 0 8 0 8 0 8 0 8	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
.0	Related Resources	I≣ Actions ▼ Key Metrics View ▼					_			🔍 🔻 🛛 Filter	
Cottings	Servers (10)	Name Total	I/O 🔻 🛛 Max Total	Read I/O R M	ax Read 🛛 Wr	ite I/O Ma	k Write Rea	id Cac Min	Read Wri	te Cac Mir	n Write 🎚
Journas	Fabrics (1) Switches (2)	8 IO_BACKEND_ONLY	860.29 8	36.26 395.46	410.44	464.82	475.82	52.72	49.63	100.00	1(
	Virtualizer Storage Systems (2)	80 FB_SVC_V/000	323.05 3	(4.94 145.35 72.42 80.29	145.85	177.70	179.28	88.78	99.35	100.00	1(
		8 FB_P6_CET	227.99 6	23.42 153.59	611.25	74.40	244.12	90.39	63.67	100.00	1(
		8 tpcsvc61	188.29 1	91.09 63.19	64.09	125.10	127.15	0.65	0.47	100.00	1(
		8 FB_P0	69.68	73.30 0.87	1.87	68.81	71.43	61.10	47.93	100.00	1(
		Showing 18 items Selected 5 items		Jul 6, 2014,	20:29:53 MST - Jul 7,	2014, 08:29:53 MST				Refreshed 12%	minutes ago

Figure 6-20 Selecting the metric

Before you can select the Pool Utilization metric, you must first clear the other metrics.

6.5.5 XIV metrics

There are now metrics in Tivoli Storage Productivity Center that are specific to the XIV storage subsystem.

SSD metrics

The XIV storage subsystem supports the use of SSD drives as an additional layer of cache since version 11.1. This implementation is quite different from how the DS8000 or the SVC is using SSDs: The SSDs are only used for reads and not for writes.

Because the SSDs are used as a second layer of cache, a read cache hit can therefore be a direct RAM cache hit or an SSD cache hit. To distinguish the two, additional metrics are needed.

Tivoli Storage Productivity Center introduces the following metrics, which represent those I/Os that were misses in RAM cache but hits in SSD cache:

- ► SSD Read Cache Hit %
- SSD Read Data Cache Hit %
- SSD Read Cache Hit Response Time (ms/op)

Since these are just new metrics for components that Tivoli Storage Productivity Center is already providing reports for, these metrics are also included in the reports in the stand-alone GUI.

6.5.6 Enhancement of performance data collection

The performance monitor jobs have been enhanced so that they can now send alerts not only when the performance monitor stops, but also when Tivoli Storage Productivity Center was not able to retrieve any performance data for a number of samples.

Because the alert definition is still performed in the Tivoli Storage Productivity Center stand-alone GUI, this option is also located here. This function has its own navigation tree entry. Figure 6-21 shows the new Subsystem Performance Alert Configuration option for a storage subsystem. It is available for fabric switches too, under the Fabric Manager branch.

🗐 IBM Tivoli Storage Productivity Center: st3l10-w2.itso.ibm.com Edit Switc	h Performance Alert Configuration	
File View Connection Preferences Window Help		
		8
Navigation Tree	Fedit Switch Performance Alert Configuration	
Navigation Tree Administrative Services BIBM Tirol Storage Productivity Center Data Manager Disk Manager Monitoring Groups Administrator.Performance_Monitor_DS000_751331 Administrator.Performance_Monitor_DS000_751331 Administrator.Performance_Monitor_JBM_SANVC_CLUSTER_SVC-2145-ITSC Administrator.Performance_Monitor_JBM_SANVC_CLUSTER_SVC-2145-ITSC Administrator.Performance_Monitor_JBM_SANVC_CLUSTER_SVC-2145-ITSC Fabric Manager Replication Manager	Edit Switch Performance Alert Configuration Creator: administrator Name: Performance_Monitor_SWITCH_1000000533F316EC_1382656359958 Description:	
4 · · · · · · · · · · · · · · · · · · ·		

Figure 6-21 Subsystem Performance Alert Configuration; new since Tivoli Storage Productivity Center V5.1.1

It might be a bit confusing at first, but it is simple to configure.

You do not create the performance data collection jobs anymore. They are created when you add a device. You simply specify if the collection of performance data is enabled or not. This can be changed later. All this is done in the web-based GUI.

In the stand-alone GUI, the Subsystem Performance Alert Configuration is located at:

Disk Manager \rightarrow Monitoring \rightarrow Subsystem Performance Alert Configuration

Note: For each storage system for which Tivoli Storage Productivity Center can collect performance data, an entry is created automatically. It does not matter if performance collection is enabled, but it is a good idea to check the configuration. If you want to receive notifications, you must specify an email address.

6.6 Tivoli Common Reporting/Cognos performance management reports

Now that the web-based GUI has so many new functions to view performance reports, you might ask yourself what additional information or reports can Tivoli Common Reporting/Cognos provide. In this section, we look at Tivoli Common Reporting in Tivoli Storage Productivity Center V5.2.

6.6.1 Cognos reports

The most innovative reports that Tivoli Storage Productivity Center V5.2 provides in Cognos are:

► Time range comparison

This report allows you to compare two time ranges and look for changes in the performance and workload. Among other settings, you will select two entities: a metric (for example, I/O rate) and two time ranges (for example, 2011 December 31 and 2012 December 31). Tivoli Storage Productivity Center creates a chart with one line per entity, but both start at the same point on the x-axis, and continue for the duration you selected. You can say that Tivoli Storage Productivity Center now shows two x-axes.

This type of report is available for the following entities:

- Switch
- Port of a switch
- Pools

Use the Request for Enhancements process if you would like to see this function expanded to other entities.

Performance Data Export

Tivoli Storage Productivity Center allows you to export the collected performance data for a complete storage system as a single Microsoft Excel file. You can use this function for the following situations:

- Offline analysis using functions in Excel that you are more familiar with.
- Archiving of a certain time range before it expires in Tivoli Storage Productivity Center for later reference.
- Sending performance information to a support organization in case of problems with a device.

This report is in Public Folders \rightarrow IBM Tivoli Storage Productivity Center Predefined Reports \rightarrow Storage Systems \rightarrow Performance Data Export

Note: Cognos only displays 15 report or folder names in one page, so to get this report you must use the page controls on the upper right corner of the list. See Figure 6-22 on page 144.

Connectio	n VMMProvider:ST3L10-W2\Administrator Log Off 🖗	Q - 6	👻 🖉 👻 Launch 👻 🕜 👻
▽ Pu	Dic Folders My Folders		
Public Folde	rs > IBM Tivoli Storage Productivity Center Predefined Reports > Storage Systems	🔲 II: 😂 📽 📽 💖	📑 😽 🗈 🍙 🗶 📮 👫
		Entries: 1	- 15 🜔 [4 44]> [4
	Name 🕀	Modified ⇔	Actions
	Controllers, Modules, or Nodes	4 October 2013 10:12:14	More
	Disks	4 October 2013 10:12:14	More
	Host Connections	4 October 2013 10:12:15	More
	IO Groups	4 October 2013 10:12:16	More
	Managed Disks	4 October 2013 10:12:16	More
	Pools	4 October 2013 10:12:18	More
	Ports	4 October 2013 10:12:19	More
	RAID Arrays	4 October 2013 10:12:19	More
	Volumes	4 October 2013 10:12:21	More
🗆 🗖 🕨	Storage Systems Capacity	4 October 2013 10:12:25	🔲 🕨 📐 🚯 🔡 🎒 More
	Storage Systems Historical Capacity	4 October 2013 10:12:25	🔲 🕨 📐 🕥 🔛 🎒 More
🗆 🗖 🕨	Most Active Storage Systems	4 October 2013 10:12:23	🔲 🕨 📐 🚯 🔡 🎒 More
🗆 🗖 🕨	Performance of One Storage System	4 October 2013 10:12:25	🔲 🕨 📐 🚯 🔛 🌐 More
🗆 🗖 🕨	Compare Performance of Multiple Storage Systems	4 October 2013 10:12:22	🔲 🕨 📐 🚯 🔡 🎒 More
□ 🗖 ►	Compare Performance of One Storage System over Time Ranges	4 October 2013 10:12:22	🔲 🕨 📐 🚯 🔛 🎒 More

Figure 6-22 Page icons in the list of reports

 Other noticeable reports (that are not all new) are the performance reports for a server or hypervisor showing the aggregated performance of all the used volumes.

6.6.2 Positioning the interfaces

This section should help you understand which GUI to use for performance reporting with the Tivoli Storage Productivity Center at the time of this writing.

When to use the stand-alone GUI

This is clearly the easiest scenario to describe:

- If you need the statistical overview of threshold violation
- If you have already defined custom reports in the stand-alone GUI

You can re-create custom reports using the bookmark capability in the web-based GUI, but unfortunately that is a manual task.

When to use the web-based GUI

The web-based GUI will now be used for the majority of the performance reporting functions:

- Any interactive performance troubleshooting situation.
- Any analysis of a threshold violation.
- Comparing data from different components within one device or time ranges using multiple windows.

When to use Tivoli Common Reporting/Cognos

Cognos is useful in the following situations:

When you want to use a standard report layout to pass along to someone else, for example a server administrator. Cognos provides some performance overview reports that include multiple charts in a single report.

- If you are familiar with the standard reports in Cognos, you can use some of the reports in troubleshooting situations, for example, the new report that shows two time ranges in one chart.
- When you want to run batch reports via a scheduler either to just render the reports for faster load times, or to send the reports via email, or store the reports centrally on a share.
- To interactively create a new report that could be saved and later repeatedly run (or even scheduled) for special analysis.

6.6.3 Complete list of the performance report in Tivoli Common Reporting/Cognos

In this section is a list of all the predefined reports in Tivoli Storage Productivity Center V5.2.2, available in the **Public Folders** \rightarrow **IBM Tivoli Storage Productivity Center Predefined Reports** path.

- Fabrics and Switches
 - Switches
 - Performance of One Switch
 - Compare Performance of Multiple Switches
 - Compare Performance of One Switch over Time Ranges
 - Switch Ports
 - Most Active Switch Ports
 - Performance of One Switch Port
 - Compare Performance of Multiple Switch Ports
 - Compare Performance of One Switch Port over Time Ranges
- Hypervisors
 - Hypervisors Capacity
 - Most Active Hypervisors
 - Summarized Performance of Volumes by Hypervisor
 - Performance of Volumes by Hypervisor
 - Hypervisor Data Stores Capacity
 - Hypervisor Disks Capacity
- Servers
 - File Systems
 - File Systems Capacity
 - Servers Capacity
 - Most Active Servers
 - Summarized Performance of Volumes by Server
 - Performance of Volumes by Server
 - Server Disks Capacity
- Storage Systems
 - Controllers, Modules, or Nodes
 - Most Active Controllers or Modules
 - Performance of One Controller or Module
 - Most Active Nodes
 - Performance of One Node
 - Compare Performance of Multiple Controllers and Modules
 - Compare Performance of Multiple Nodes
 - Disks
 - Disks Capacity
 - Most Active Disks
 - Performance of One Disk
 - Compare Performance of Multiple Disks

- Host Connections
 - Most Active Host Connections
 - Summarized Performance of Volumes by Host Connection
 - Performance of Volumes by Host Connection
- I/O Groups
 - Most Active I/O Groups
 - Performance of One I/O Group
 - Compare Performance of Multiple I/O Groups
- Managed Disks
 - Managed Disks Capacity
 - Most Active Managed Disks
 - Performance of One Managed Disk
 - Compare Performance of Multiple Managed Disks
- Pools
 - Pools Capacity
 - Pools Historical Capacity
 - Most Active Pools
 - Performance of One Pool
 - Compare Performance of Multiple Pools
 - Compare Performance of One Pool over Time Ranges
- Ports
 - Most Active Ports
 - Performance of One Port
 - Compare Performance of Multiple Ports
- RAID Arrays
 - Most Active RAID Arrays
 - Performance of One RAID Array
 - Compare Performance of Multiple RAID Arrays
- Volumes
 - Volumes Capacity
 - Volumes Historical Capacity
 - Most Active Volumes
 - Performance of One Volume
 - Compare Performance of Multiple Volumes
- Storage Systems Capacity
- Storage Systems Historical Capacity
- Most Active Storage Systems
- Performance of One Storage System
- Compare Performance of Multiple Storage Systems
- Compare Performance of One Storage System over Time Ranges
- Performance Data Export
- Storage Resource Relationships Summary
- ► Storage Resource Relationships Summary (Configurable)
- ► File System to Volume Relationships

7

Cloud configuration and provisioning

With Tivoli Storage Productivity Center V5.2.2, updates to the new cloud configuration and provisioning functions are available. Using the Provisioning Storage wizard, you can request the amount of storage you need while conforming to requirements of the placement of volumes and shares.

In this chapter, we describe these new functions, focusing on the cloud configuration and provisioning concepts and possible use cases. We describe implementation through test cases on both cloud configuration and provisioning.

Also described are the following advanced analytical functions that are available in the web-based GUI:

- Optimize storage tiering by using the Analyze Tiering wizard.
- Distribute the workload of volumes across pools on the same tier by using the Balance Pools wizard.
- Provision block storage by using the Provision Storage wizard.
- Enable automatic zoning to create zones during block storage provisioning to connect a server to a storage system.

Note: All operations in this chapter were performed with the IBM SmartCloud Virtual Storage Center (VSC) license.

7.1 Tivoli Storage Productivity Center Cloud Overview

The Tivoli Storage Productivity Center V5.2 Cloud Configuration function allows you to organize your storage environment by categorizing the resources in tiers and defining service classes with specific qualities of service.

This function is a requirement in setting up a storage cloud implementation, but it is highly recommended also in a traditional storage provisioning context.

The following section describes the feature overview, which is Tivoli Storage Productivity Center Configuration, based on the Storage Management API for Clouds (SMAC). Also provided in the following section is a typical workflow for storage provisioning, and the prerequisite steps to organize your storage environment in tiers, as well as an overview on service classes and capacity pools.

7.1.1 Feature overview

Tivoli Storage Productivity Center Cloud Configuration is based on the SMAC API. Storage Management API for Clouds was introduced as a new API in Tivoli Storage Productivity Center V5.1. In Tivoli Storage Productivity Center V5.2, it was integrated in the web-based GUI. 5.2, and with each following release it was enhanced.

A useful introductory set of panels has been implemented in the web-based GUI, which explains the new concepts in detail. You can access these panels from the navigation pane from Advanced Analytics \rightarrow Cloud Configuration \rightarrow Learn the concepts.

The Storage Management API for Clouds REST API allows integration of external clients. It is used by SmartCloud Orchestrator and SmartCloud Storage Access. Tivoli Storage Productivity Center uses templates called *Service Classes* to ease the provisioning of volumes. By using Storage Management API for Clouds, Tivoli Storage Productivity Center users can define Service Classes and optionally Capacity Pools.

IBM SmartCloud Orchestrator provides an open and extensible cloud management platform by managing heterogeneous hybrid environments. Figure 7-1 on page 149 shows the integration between SMAC and SmartCloud Orchestrator.

IBM SmartCloud Orchestrator		1 admin@admin	🔿 Help About Log Out 🛛 🔢
Home Self-service My Requests II	istances - Images & Patterns - Com	ponents - Reports - Configuration	Administration - My Inbox
Storage and Backup Services	Create File System		Create File System
These service offerings allow you to manage storage and backup services.	Offering name: Create F	le System	Create a NFS File system
	Offering long: Storage	Icon	
	Category: NAS St	Create Fil	lesystem
	Process: Create F	leSystem	aaa
	Process application or toolkit of SCOrrhe	* Storage SONAS	storage pool:
	User interface: Create F	ileSystem	Service dass: NormalIsolation
	Process application or toolkit of SCOrche	strator_StorageNAS_Toolkit 1	f filesystems: Size: (G8)
	Service Cla	sses Cap SMAC/TF	acity Pools

Figure 7-1 Storage Management API for Cloud (SMAC) integration in Tivoli SmartCloud Orchestrator

• Service Classes allow simple provisioning of volumes and NAS shares.

Storage consumers only need to specify the size and required service class of the new volume or NAS share, and Tivoli Storage Productivity Center will determine the "best fit" for the storage resource hosting the new volume or share that is able to provide the service class.

 Capacity Pools may optionally be defined for specifying limits around which storage resources are available to be provisioned from.

Depending on the requirements, Capacity Pools may be more useful for customers that cater to a larger number of different storage consumers, or in an environment that spans several geographically separated locations.

The combination of Cloud Configuration and Provisioning functions (described in 7.3, "Provisioning storage with Tivoli Storage Productivity Center" on page 172) makes Tivoli Storage Productivity Center a key component in the control plane of Software Defined Storage implementation.

7.1.2 Workflow

This section describes workflow scenarios for storage provisioning from the Tivoli Storage Productivity Center.

Typical Workflow

After you have configured your environment as we have described later in this chapter, this is a typical workflow for storage provisioning that uses Tivoli Storage Productivity Center functions:

1. Configuration and setup (Cloud Configuration)

Add the definition of Tiers to storage pools

Tivoli Storage Productivity Center administrator configures a set of Service Classes (and optionally Capacity Pools), which reflect the different capabilities of the storage infrastructure.

2. Selection

The user reviews the set of available Service Classes and selects the one he wants to use for a new volume or NAS share.

- 3. Implementation (Tivoli Storage Productivity Center Provisioning)
 - Filtering

Tivoli Storage Productivity Center determines the set of storage resources able to provide the selected Storage Classes.

- Configuration

Out of the set of eligible storage resources, Tivoli Storage Productivity Center picks the most appropriate one, and reconfigures it for the new volume or share.

Notes:

Provisioning block storage requires a Virtual Storage Center license.

The preceding workflow steps are also the same when you use the VMware plug-in, but may be different when SMAC is used by other products, because they may have their own approval process.

Workflow

Another potential scenario is when a user does not have the authorization to execute the provisioning. In this case, the provisioning request would go into a *pending* status, and the administrator will see the "cog wheel" icon next to the user name on the top black line of the web-based GUI.

Note: We have only seen this type of warning displayed for requests from within Tivoli Storage Productivity Center or from VMware.

In the following sections, we describe Service Classes and Capacity Pools. The Tivoli Storage Productivity Center Provisioning function is described in 7.3, "Provisioning storage with Tivoli Storage Productivity Center" on page 172.

7.1.3 Prerequisite step: Organize your storage environment in tiers

As a prerequisite step for Cloud Configuration and provisioning, you have to assign storage pools to tiers.

You can access a set of panels in Tivoli Storage Productivity Center web-based GUI, which explains the new cloud concepts in detail. To access these panels from the navigation pane, click Advanced Analytics \rightarrow Provisioning \rightarrow Learn the concepts.

Storage tiering is a step towards defining Service Classes and provisioning volumes that require a certain tier level. It allows you to optimize the placement of volumes. It is also used in the Tivoli Storage Productivity Center optimization tasks, Analyze Tiering, and Balance Pool, as described in Chapter 9, "Storage optimization" on page 207.

Considerations for Tiering

Some consideration should be given regarding the organization of your storage environment and to allow for easily assigning different categories of data to different types of storage. One method to facilitate this process is to initially assign a tier level to all storage pools in your environment.

Although the tiers are only used for SAN Volume Controller (SVC)/Storwize for the Optimization function later described in this book, the provisioning is supported even without SVC/Storwize, so it makes sense to set up the tiers for all storage pools in your environment.

Optimization only runs on the *highest level* so if you have an SVC with a V5000 as the backend it would run on the SVC. Even if you only do provisioning at the SVC level, you could still use the Tiers of backend storage pools for reporting, filtering, or documentation.

Tivoli Storage Productivity Center V5 10 Tiering Levels

With Tivoli Storage Productivity Center V5, 10 tiering levels of storage pools are available, from tier 1 (best performing tier) through tier 10 (least performing tier). You can use as many different levels of tier as you want, based on the different storage subsystems and disk technologies in your environment.

In the storage pools tiering process, consider those technologies not present in your storage environment, but that could be added soon. This allows you to leave space among tier levels for assignment later. This will keep you from having to reconfigure tiers and Service Classes if new technologies are added to your environment.

Tip: It is a good practice to avoid using Tier 10 if possible. It is unlikely you will need all 10 tiers, and when you start using reporting, and you sort a report by the label, it will display similar to the following, which is most likely not the preferred format:

- Tier 1
- Tier 10
- ► Tier 2
- Tier 3

Following is a sample storage categorization:

- Tier 1. Leave this level available for future uses.
- Tier 2. SSD Disk Pools and Flash Disks Pools.
- ► Tier 3. Leave this level available for future uses.
- ► Tier 4. Hybrid Pool.
- ► Tier 5. Leave this level available for future uses.
- ► Tier 6. FC and SAS Disk Pools.
- Tier 7. Leave this level available for future uses.
- ► Tier 8. SATA Disk Pool.

Assign tiers

To assign a tier level to a storage pool, complete the following tasks:

1. Select **Storage Resources** \rightarrow **Pools** from the navigation pane.

- E Actions -Storage System Status Tier Capacity... DS4500 ITSO SVC 8G4 🔽 Online 3 0.00 Server 🔽 Online DS4800_PW3501 ITSO SV None 3 968.00 Resources ITSO SV 1 🔽 Online 3 158.50 FC pool ITSO SV 2 DS8300_75L3001 Online 2 318.50 ITSO SV 3 DS8300_75L3331 Online 2 120.00 II. վեյ Network DS8300 75L3331 16 ITSO SV Online 3 40.00 4 Resources 🔽 Online 134.75 ITSO SV 1 ssd 5 CKD_000 DS8000-2 🔽 Normal 9 2,933.86 CKD 001 H DS8000-2 🔽 Normal 9 2,933.86 7 IR DS8000-3 FB_000 🔽 Normal 388.00 Advanced View Properties 8 FB 001 🔽 Normal Analytics 388.00 9 View Performance CKD 00 🔽 Normal 2,933.86 Set Tier 10 CKD_00 🔽 Normal 2,933.86 FB 000 Add to Capacity Pool 107-75L3331-IBM 🔽 Normal 388.00 Reporting DS8000-2107-75L3331-IBM FB_001 🔽 Normal 388.00 CKD P0 DS8000-2107-75W9161-IBM 🔽 Normal 10,163.68 DS8000-2107-75W9161-IBM 🔽 Normal 12,228.84 CKD P1 Settings
- 2. Right-click a pool (choosing multiple pools is also possible) and select **Set Tier**, as shown in Figure 7-2.

Figure 7-2 Storage Pool Tier assignment

Tips:

You can assign a tier to a pool on almost every storage pool table that gets displayed anywhere in the web-based GUI.

You can filter/sort the table by storage system to easily find the pools where you want to set up tiers.

7.1.4 Service classes

Service classes enable provisioning automation through infrastructure abstraction, delegating the determination of the *best fit* storage resource to Tivoli Storage Productivity Center. Tivoli Storage Productivity Center takes into account all attributes of the service class specified in a provisioning request, as well as current storage resource utilization (space, performance, and status) in order to identify the most appropriate resource for the new volume or share.

Note: If you see capacity in the column "unavailable Storage", that is storage where the status of the pool of storage system has issues, so it will not be used for provisioning.

Service classes are a key point in mapping business requirements (capacity, accessibility, performance, and availability) in infrastructure capabilities (media type, disk technologies, RAID levels, encryption, compression, and thin provisioning).

Two types of service classes are available:

1. Block-storage service classes

A block-storage service class describes attributes and capabilities of block storage resources. When you provision volumes, you specify the requirements by using a block-storage service class. Based on the requirements of the service class, Tivoli Storage Productivity Center identifies a storage pool for the volume.

Tivoli Storage Productivity Center V5.2 provides three predefined block-storage service classes. While the classes are predefined, you might need to change them or adjust your tiers, RAID levels, and so on.

- Gold. Defined for mission-critical applications (highest-performing storage).
- Silver. Defined for applications in production (high-performing storage).
- Bronze. Defined for non-mission-critical applications (standard storage).
- 2. File-storage service classes
 - Normallsolation. The file system from which the NAS share is provisioned can contain other NAS shares. Shared storage is allowed.
 - EnhancedIsolation. The file system from which the NAS share is provisioned cannot contain other NAS shares. Dedicated storage required.

To determine which storage systems (block and file) are supported for provisioning, refer to the following link:

http://www.ibm.com/support/docview.wss?&uid=swg21386446

Tip: As of Tivoli Storage Productivity Center V5.2.1, you can use the candidate storage tab of the service class dialog to see the matching pools.

To access the **Service Classes** pane, select from the Navigation menu **Advanced Analytics** \rightarrow **Cloud Configuration** and then click **Work with Service Classes**. See Figure 7-3.

Home Storage Resources	(f) (f) (f) (f) (f) (f) (f) (f)	Learn the Concepts Assign Storage to Tiers			Servi	ce Classes	
Server	2	Work With Service Classes	Create Service Class Name Provide Bronze	E Actions ▼ Type ▲ Block	Used Space (%)	Total Capacity (GiB) 0.00	Available Space (GiB) 0.00
Resources	80	Work With Capacity	😲 Gold	Block		0.00	0.00
	-	Pools	P Silver	Block	0%	368.75	368.75
			P EnhancedIsolation	File		0.00	0.00
Network			P Normallsolation	File		0.00	0.00
Advanced Analytics							

Figure 7-3 Service Classes pane

From the Service Classes pane you can view, edit, or delete existing classes. To define a new Service Class, click **Create Service Class** at the top of the Service Class list.

Note: To create a new block-storage service class, the IBM SmartCloud Virtual Storage Center (VSC) Storage license is required.

Block-storage service classes configuration

Figure 7-4 shows the General Service Class properties pane for a block-storage service class. From the Service Classes pane, double-click a Service Class or right-click and select **View/Modify**.

Gold Properties			
General			
Storage Constraints		Name:	Gold
Users	T T	Description:	Highest-performing storage for mission-
Volumes			
Candidate Storage		Storage tier:	Y 2 3 4 5 6 7 8 9 10
		RAID level:	RAID 5
		Virtualization:	On On
		VDisk mirroring:	On On
		Thin provisioning:	On 🧼
		Compression:	On Con
		Overallocation limit:	100 %
		✓ Redundant fabrics	
		Advanced	
		Save Ca	ncel

Figure 7-4 Block-Storage Service Class Properties pane: General

From this pane, you can customize the Service Class by editing its attributes.

Table 7-1 describes the General Block-Storage Service Class attributes and the related resources requirements.

5		
Attribute	Resource requirements	
Storage Tier	If enabled, storage pool needs to have been assigned to a tier value within the tier range specified in the service class.	

Table 7-1 Block-Storage Service Class General attributes

Attribute	Resource requirements
RAID level	Storage pool's RAID level needs to match (select "Any" for exclude filtering on RAID level).
Virtualization	On. Pool must reside on SVC or V7000. Off. Pool must not reside on SVC or V7000.
VDisk mirroring	On. Provisioned volumes are mirrored onto a second storage pool. Off. Provisioned volumes are not mirrored. (This option is enabled when Virtualization is set to On.)
Thin Provisioning	On. Pools need to allow Thin Provisioning. Off. None (except for XIV, where you must set "Soft Space" equal to "Capacity" to prevent Thin Provisioning).
Compression	On. Provisioned volumes are compressed. Off. Provisioned volumes are not compressed. (This option is enabled when Thin Provisioning is set to On.) ^a
Overallocation limit	XIV: "Soft Space"/"Capacity" must be less than specified value. Other: "Virtual Allocation" must be lower than specified value.
Encryption	On: Pool must be on a DS8000, encrypted, and configured in same Encryption Group as is specified in service class. Off: Pool must be not encrypted. ^b
Redundant Fabric	Checkbox selected. Full redundant paths through a minimum of two fabrics are used. Checkbox not selected. All available paths will be used (even single paths).
Resource tags	Storage resources or parent storage system needs to have all specified tags assigned.

a. Tivoli Storage Productivity Center can only create compressed volumes in I/O groups that have at least one compressed volume already. If there is no I/O group with a compressed volume, Tivoli Storage Productivity Center considers this as if compression is not enabled on the SAN Volume Controller, Storwize V7000, or Storwize V7000 Unified system. This methodology is used to protect you from a system where you might have different node hardware, therefore ensure that you run compression only on certain I/O groups, or similar situations.

b. At the time of the writing of this book, if encryption is turned on, storage can only be provisioned from a DS8000 directly, which has the corresponding encryption group configured.

Click **Advanced** to get to the pane where you can set the advanced settings from the two tabs of the pane (see Figure 7-5 on page 156 and Figure 7-6 on page 156):

Thin Provisioning tab

This tab is shown differently depending on the virtualization switch selection in the General Properties pane.

Note: This tab is available only if on the General Properties pane the Thin Provisioning option is set to **On.**

- Virtualization On

In this case, the table refers to SVC and Storwize V7000. From the panel, you can set the initially allocated space. If the **Auto-expand** option is selected, you can define the granularity of the expansion and the warning level that will trigger an SVC alert. See Figure 7-5 on page 156.

Advanced Properties	
Thin Provisioning Multipathing Resource tags SAN Volume Controller / Storwize V7000	Warning level: 70 %
Allocated space: Image: Control of the space of the	50 % 70 %
	2.50 ND
	OK Cancel

Figure 7-5 Thin Provisioning tab: Virtualization On

Virtualization Off

In this case, the tab refers to XIV. You can select the locking behavior of the pool in case it runs out of space. See Figure 7-6.

Advanced Properties					
Thin Provisioning Multipati	ing Resource tags				
XIV System					
Locking behavior:	No preference	Read only	No I/O		
	2				
	OK	Cancel			

Figure 7-6 Thin Provisioning tab: Virtualization Off

Multipathing tab

From this tab, you can select the Multipathing Policy (Load balancing, Round robin, or Fail-over), VMware vSphere policy (Default, Round robin, or Most recently used), and the number of paths that will be defined during provisioning (Auto, 4, 5, 6, 7, or 8).

Note: If AUTO is selected, four paths are configured for IBM storage virtualizer, and two paths are configured for other storage systems.

Figure 7-7 shows the Multipathing pane, where the requirement conditions that have to be met to use the multipath policy are listed.

Advanced Properties			
Thin Provisioning Multipathing Resource tags			
Multipathing [2]			
Server policy Load balancing v			
VMware vSphere policy Default			
Number of paths Auto			
 To provision to a server or hypervisor when a multipathing policy is specified, the requirements are as follows: The server or hypervisor must have fabric connectivity. For fabric-related options to be configured, the fabric must be managed by Tivoli Storage Productivity Center. You can still provision to servers that are connected to unknown fabrics, but fabric-related options such as redundant fabrics and number of paths are ignored. For servers, a Storage Resource Agent must be running on the server in order for the multipath driver to be configured. Otherwise, the server's default multipathing policy is used. For hypervisors, the multipath driver is configured only if provisioning is initiated from the vSphere Web Client extension for Tivoli Storage Productivity Center. Otherwise, the hypervisor's default multipathing policy is used. The server or hypervisor must be using a supported multipath driver. For a list of supported multipath drivers, refer to the Support matrix for Tivoli Storage Productivity Center. 			
OK Cancel			

Figure 7-7 Block-Storage Service Class Advanced Properties pane

Resource tags

Resource tags are used to refine the candidates for provisioning. You can define up to three resource tags. If resource tags are specified for the service class, only pools that have all the same tags are candidates for provisioning.

File-storage service classes configuration

Figure 7-8 on page 158 shows the **General** Service Class properties pane for a file-storage service class. To access this pane, from the Service Classes pane, double-click a file-storage service class or right-click and select **View/Modify**.



Figure 7-8 File-Storage Service Class Properties pane: General

From this pane, you can customize the service class by editing its attributes.

Table 7-2 contains the general file-storage service class attributes and the related resource requirements.

Attribute	Resource requirements		
Shared storage	Any SONAS or Storwize V7000 Unified file system with free space available		
Charoa otorago	or unused SONAS NSD of type "Data, Metadata".		
Dedicated storage	Unused SONAS NSD of type "Data, Metadata".		
Resource tags	Storage resources or parent storage system needs to have all specified tags assigned.		

Table 7-2 File-storage service class general attributes

Click **Advanced** to get to the pane where you can set the advanced settings from the two tabs of the pane. See Figure 7-9 on page 159.

Advanced Properties
General Resource tags
File set type:
Create independent file sets: No
Access path host replacement: By default, the file share access path includes the cluster name of the file storage system in which it is created. If the cluster name is not a valid host name that is registered with a DNS server, the share is not accessible under the access path. If the cluster name does not contain a valid host name, use the following resource tag on the storage system to specify a valid host name. <u>More</u>
Resource tag: None V
OK Cancel

Figure 7-9 File-Storage Service Class Properties pane: Advanced

General tab

From this tab you can:

- Specify whether you want to create an independent file set with its own allocated inodes. Otherwise, the file set is created as a dependent file set, and is allocated on the file system. Other considerations that you should think about with this decision about the file set type include snapshots, quotas, and Tivoli Storage Productivity Center alerts.
- Choose to set the access path host replacement to the custom tag that specifies the replacement host name. When the share is provisioned, the access path that is returned by Tivoli Storage Productivity Center includes the replacement host name if one is specified on the custom tag for the storage system. If the storage system does not specify a value for the custom tag, the cluster name is used in the access path.
- Resource tags tab

This tab has the same functionality as the Resource tags tab for block-storage service classes (see "Block-storage service classes configuration" on page 154).

Service class and users permissions

Tivoli Storage Productivity Center administrators can grant users permission to provision by using the service class. They can also specify whether scheduling or running provisioning tasks that are created by using the service class requires administrator approval.

To access the service class user permission pane, click **Users** in the navigation pane of the service class Properties window. As an example, we have defined in our environment a user with a Monitor Role, called TPCoperator, and allowed the user to define a provisioning task on the Bronze service class. See Figure 7-10 on page 160.

Bronze Properties	
General	
Users	Approval required:
Volumes	 Allow only administrators to provision
ß	Allow administrators and specified users to provision Search for users in the repository. Use the wildcard character * with at least one other
	character to match multiple user names.
	T* Search
	Name
	TPCoperator
	Only users who are limited to the Monitor or External Application roles are listed.
	Add User
	User Groups Roles
	TPCoperator Users Monitor
	Save Cancel

Figure 7-10 Block-Storage Service Class Properties pane: Users

Since the Approval required switch is set to Yes, the TPCoperator **User** can only define and save the task. An administrator can later schedule or run it.

Note: If the Approval required is set to No, the defined User for TPCoperator, in addition to its monitoring role, can define and save the task, and also schedule or run it.

Optionally associate capacity pools with the service class

A service class can be optionally associated with one or more capacity pools. Refer to 7.1.5, "Capacity pool" on page 162 for details about capacity pool.

If capacity pools are defined, the Storage Constraints entry will be available in the navigation pane of the Service Class window. See Figure 7-11 on page 161.



Figure 7-11 Storage Constraints pane

Candidate Storage

Storage pools that satisfy all requirements of a service class can be seen in this pane. All criteria must be satisfied or the storage pool will not be listed. In the example on Figure 7-12 on page 162, "test_service_class" was created with the requirement of Storage tier 10 at any RAID level. Only the volumes that met all criteria were displayed.

test_service_class Prope	rties					
General The following storage pools can provide storage that satisfies the requirements of test_service_class						
Storage Constraints	Eiter					
Users	Name	Storage System	Availability	Space (GiB)		
Volumes	8 200	<u>DS4000-vcloud5k1-60080</u>	Available	128.96		
Candidate Storage	HyperV_Cluster	DS4000-vcloud5k1-60080	Available	0.01		
	🍪 esx5	DS4000-vcloud5k1-60080	Available	43.46		
	PowerHA7_barley	<u>DS4000-vcloud5k1-60080</u>	Available	61.23		
	8 1	DS4000-vcloud5k1-60080	Available	0.00		
	Showing 5 items Selected 0 items					
		Close				

Figure 7-12 Service class candidate storage

7.1.5 Capacity pool

A capacity pool is a logical grouping of the following resources:

- Storage systems
- Storage pools
- ► File systems of file storage systems
- ► IBM Scale Out Network Attached Storage (SONAS) Network Shared Disks (NSDs)

It is possible to organize storage resources in separate capacity pools in any way that serves the required business needs. For example, it can be used to separate storage resources installed in geographically separate sites, or that have to be allocated for separate divisions (as well as for separate customers).

Organizing resources in capacity pools allows you to track the storage use for each division separately, and restrict provisioning requests to the appropriate set of storage resources, by restricting the Service Classes to specific Capacity pools.

Note: The use of capacity pools is optional.

To access the Capacity Pools pane, complete the following steps:

1. From the navigation menu select Advanced Analytics \rightarrow Cloud Configuration.

2. Click Work with Capacity Pools as shown in Figure 7-13.

From this pane, you can select the available resources in your environment that you can assign to a Capacity Pool, by clicking the corresponding link.



Figure 7-13 Capacity Pools pane

To assign a resource to a Capacity Pool, complete the following steps:

- 1. Go to the resource pane, right-click the resource, and select Add to Capacity Pool.
- 2. If your environment does not have any Capacity Pools, the Create Capacity Pool window opens. See Figure 7-14.

Create Capacity Pool				
		This value is required.		
	Name:	() c	Custom tags: 🔹 🔹	
GEB	Description:			
GED.				
	Capacity:	318 GiB Availa	able Block 808.5 GiB (71.77%)	
			Total 1,126.5 GiB	
OK Cancel				

Figure 7-14 Create Capacity Pool pane

3. In the Create Capacity Pool pane, you define a new Capacity Pool. Enter a Name for the Capacity Pool and optionally a description and up to three tags.

When you add a storage system to a Capacity Pool, note that any storage pool, file system, or IBM SONAS NSD that is an internal resource of that storage system is also indirectly assigned to the Capacity Pool.

Restriction: A resource can be assigned to only one capacity pool. When you attempt to add one or more resources to a capacity pool, and those resources are already assigned to a different capacity pool, Tivoli Storage Productivity Center displays a message that lists the resources and their capacity pool assignments. When a message is displayed, ensure that you want to change the capacity pool assignments for the listed resources.

4. If capacity pools are already defined, the **Adding Resources** pane opens. Select a capacity Pool and click **Save**. See Figure 7-15.

A	dding Resources						
	Select a capacity pool to add the resource to:						
	🍓 Create Capacity Pool 🛛 🗄 Actions 🔻				Q 🔻	Filter	
	Name 🔺 Capacity (GiB)		Total Capacity (GiB)	Description			I.
	Site 1		613.25	resources in site 1			
	Site 2		0.00	resources in site 2			
		45					
							P
	snowing z items Selected 1 item				Refresh	ed a few moments	ago
		_					
		Sav	ve Cancel				

Figure 7-15 Adding Resources pane

7.2 Cloud configuration case study

In this section, we show an example of cloud configuration with Tivoli Storage Productivity Center using the concepts described.

The following typical steps are used to complete a cloud configuration:

- 1. Assign the tier to storage pools
- 2. Refine the customization by assigning tags to storage resource
- 3. Define capacity pools
- 4. Define service class

7.2.1 Assign the tier to storage pools

In our test environment, we assigned the storage pools tier level for a subset of storage pools as follows:

- ► Tier 2: SSD Disk Pool on SVC.
- Tier 4: FC Disks Pools defined on SVC using DS83000 MDisks.
- Tier 6: FC Disks Pools defined on SVC using DS4800 MDisks.
- ► Tier 8: FC Disk Pools defined using DS48000.
The storage pool tiering in our test environment is shown in Figure 7-16.

Pools								
I≡ Actions ▼								
Name	Storage System	Status	~	Tier		Capacity	Allocated Space (GiB)	Available Pool Space (GiB)
8 DS4800_site2_p01	SVC-2145-ITSO SVC 8G4-IBM	🔽 Online		6		968.00	290.00	678.00
8 DS8300_site2_p01	SVC-2145-ITSO SVC 8G4-IBM	🔽 Online		4	N	158.50	32.44	125.50
8 DS8300_site1_p01	SVC-2145-ITSO SVC CF8-IBM	Online		4	2	40.00	3.40	36.56
8 DS8300_site1_p02	SVC-2145-ITSO SVC CF8-IBM	Online		4		120.00	2.22	117.50
8 DS8300_site1_p03	SVC-2145-ITSO SVC CF8-IBM	Online		4		318.50	66.41	251.25
🛞 ssd	SVC-2145-ITSO SVC CF8-IBM	Online		2		134.75	134.50	0.00
8 PW_3501	<u>DS4800-DS4800POK-5-600A0</u>	Normal		8		968.54	968.00	0.54

Figure 7-16 Storage pool tiering in our test environment

7.2.2 Refine the customization by assigning tags to storage resource

We further refine the customization by defining **Custom Tags** on a subset of the Pool Resources in order to reserve different pools (all of those are MDisk Groups) for different purposes, for example, assign each pool to a single department, as shown in Table 7-3.

Pool name	Project
ssd	Research
DS8300_site1_p01	Research
DS8300_site1_p02	Research
DS8300_site1_p03	Marketing
DS8300_site2_p01	Research
DS4800_site2_p01	Marketing

Table 7-3 Pools department assignment

We assign a Custom Tag with the department name to all the pools in Table 7-3.

To define a Custom Tag to the pool complete these steps:

- 1. Right-click the pool and select View Properties.
- 2. From the **Properties** pane, click **Edit** and enter the Custom Tag name. See Figure 7-17 on page 166.

ssd Properties						Last da	ata collection: 25	Oct 2013 14:16:30 EDT
and a	General	Storage	Back-end Storage	Easy Tier	Volumes	RAID Arrays	Managed Disks	Performance
	Name		🕘 ssd					
	Status		🔽 Onl	ine				
Pools	Storage Sy	stem	<u>SVC</u>	-2145-ITSO :	SVC CF8-IBM	!		
	RAID Level		RAID 1	D				
	Extent Size	•	256.00	MiB				
	Solid State		Yes					
	Tier		2		-			
	Custom Ta	g 1	Resea	irch	I × -)?		
	Custom Ta	g 2	No Cu	No Custom Tag				
	Custom Ta	g 3	No Cu	istom Tag	*]		
-			Save	Cancel	Close			

Figure 7-17 Pool properties pane: Adding a Custom Tag

7.2.3 Define capacity pools

In this step, we want to define capacity pools based on location. Since our environment is spread in two sites, we implement the capacity pool assignment at the storage subsystems level. We assigned the two SVC systems to the corresponding capacity pool, as shown in Table 7-4.

Table 7-4Capacity pool mapping

Storage resource	Capacity pool		
SVC CF8	Site 1		
SVC 8G4	Site 2		

To add the storage system to a capacity pool complete the following steps:

- 1. Right-click the system and select Add to Capacity Pool.
- 2. From the Capacity Pool pane, enter the Pool name (and optionally a description and up to three Custom Tags). See Figure 7-18 on page 167.

Create apacity Pool						
	Name: Description:	Site 2	×	Custom tags:		•
<u>C</u>)					
	Capacity:	323 GiB	A	vailable Block 803.5 GiE	B (71.33%) Total 1 12	6.5.G/B
					101011,12	
		ОК	Cancel			

Figure 7-18 Create Capacity Pool pane

7.2.4 Define service classes

In this section, we use predefined service classes and define new ones with different filtering options activated:

1. Editing the predefined service class

In order to make the predefined service classes more adequate to our test environment, we modify the tier options as shown in Table 7-5.

Service Class	Storage Tier allowed ^a
Gold	Tier 2, Tier 3
Silver	Tier 4, Tier 6
Bronze	Tier 8, Tier 9

Table 7-5 Storage tiers for predefined service classes

a. Tier level 1, 5, and 7 were left available for future uses.

- 2. Modify the storage tier in the service class by opening the **Service Class Properties** and move the tabs in the **Storage tier** section as shown in Figure 7-19 on page 168:
 - Tier 1. Leave this level available for future uses.
 - Tier 2. SSD Disk Pools and Flash Disks Pools.
 - Tier 3. Leave this level available for future uses.
 - Tier 4. Hybrid Pool.
 - Tier 5. Leave this level available for future uses.
 - Tier 6. FC and SAS Disk Pools.
 - Tier 7. Leave this level available for future use.
 - Tier 8. SATA Disk Pool.

Gold Properties		
General		
Storage Constraints	Name:	Gold
Users	Description:	Highest-performing storage for mission-
Volumes		critical applications.
	Storage tier:	1 5 6 7 8 9 10
	RAD level:	RAID 10 ?
	Virtualization:	On 🦳
	Thin provisioning:	Off
	Redundant fabrics	5
	Advanced	
	Save Cance	
	 Storage tier: RA level: Virtualization: Thin provisioning: Redundant fabric: Advanced Save Cance 	5 6 7 8 9 10 RAID 10 2 On 0 Orff

Figure 7-19 Editing the service class storage tiers

Tip: In order to select a specific RAID level in the service class, be sure that the target storage system is probed by Tivoli Storage Productivity Center. In case the pool is an MDisk Group, the backend storage where the MDisk Group is defined has to be probed.

Figure 7-20 shows the available space for the modified predefined service classes and the relationship between storage pools and service classes.

Create Service Class	E Actions	¥						
Name	Туре 🔺	Total Capacity (GiB)	Available Sp	ace (GiB)	Unavailable Space (GiB)			
😤 Bronze	Block	678.00		678.00	0.00			
🍄 Gold	Block	0.00		0.00	0.00			
🍄 Silver	Block	530.81		530.81	0.00			
P Enhancedisolation	File	0.00		0.00	0.00			
P NormalIsolation	File	0.00		0.00	0.00			
Pools								
IE Actions								
Name	Stor	age System	Status	Tier	Available Pool Space (SiB) (Capacity	RAID Level
B DS4800_site2_p01	1	VC-2145-ITSO_SVC_8G4-IBM	Online	6	Bronze	678.00	968.00	RAID 5
DS8300_site2_p01	1	SVC-2145-ITSO_SVC_8G4-IBM	Online	4		125.50	158.50	RAID 5
DS8300_site1_p01	i 1	VC-2145-ITSO_SVC_CF8-IBM	Online	4	Ciluor	36.56	40.00	RAID 5
DS8300_site1_p02	i 1	VC-2145-ITSO_SVC_CF8-IBM	Online	4	Silver	117.50	120.00	RAID 5
DS8300_site1_p03	1	VC-2145-ITSO_SVC_CF8-IBM	Online	4		251.25	318.50	RAID 5
👸 ssd	1	VC-2145-ITSO_SVC_CF8-IBM	Online	2	Gold	0.00	134.75	RAID 10

Figure 7-20 Pre-defined service classes and storage pools

The Create Service Class page displays both the available space and the unavailable space for a service class (see the top pane in Figure 7-20). The Unavailable Space column shows the amount of storage that satisfies the requirements of the service class. It is unavailable because of the consolidated status of the storage system or its internal resources.

Using capacity pools

In this case study, we illustrate several ways to specify capacity pool usage:

Site-specific service class

In the first example, we create a service class based on the predefined Silver service class. We filter on the pools, choosing only the pools present in Site 2.

To do this, we use the capacity pools that we defined in 7.2.3, "Define capacity pools" on page 166.

Note: Since we defined the capacity pools at storage system level, and no overwriting of this property has been made at storage pools level, all the pools of the storage system are assigned at the same capacity pool (see 7.1.5, "Capacity pool" on page 162).

We create a new service class, **Silver Site 2**, with the same general attributes of the service class **Silver** and filtering on capacity pools from the **Specify Capacity Pool**. See Figure 7-21.

Create Service Class				
Specify Capacit	ty Pool			
Silver Site 2	To optionally more capacit selected cap Allow pr Only allo	limit storage placement to a subset of avai ty pools. During provisioning, only the stora acity pools are candidates for storage plac rovisioning from any available storage ow provisioning from selected capaci	ilable storage re ige resources the ement. 2. ty pools:	sources, select one or at are assigned to the
= Actions 🔻			Q v	Filter
Namo		Canacity (GiB)	Total Ca	anacity (GiB)
Site 1		Capacity (GID)	Total Ca	642.25
Site 7				1 126 50
5	5			
Showing 2 items Select	ed 1 item		Refreshe	ed a few moments ago
		Back Next ►		Cancel

Figure 7-21 Service class creation: Specify capacity pool

Important: If there are VMware systems in your environment and you are planning to use the Tivoli Storage Productivity Center vSphere Storage APIs for Storage Awareness (VASA) Provider, you should not use blank characters in service class names. See Chapter 10, "VMware vCenter Server configuration and use" on page 233 for further details.

Figure 7-22 shows the available space for the **Silver Site 2** service class and its relationship with storage pools. As you can see, the available space in this service class is less than the space in **Silver** service class because it takes only pools from SVC 8G4 (see 7.2.3, "Define capacity pools" on page 166).

😪 Create Service Class	I≡ Actions ▼								Q, 🔻
Name	Type 🔺 Tota	al Capacity (GiB)	Available Sp	pace (GiB)	Unavailable Space	e (GiB)	Description		
😍 Bronze	Block	678.0	0	678.00		0.00	Standard storage	for non-mission-cr	ritical applications.
😲 Gold	Block	0.0	0	0.00		0.00	Highest-performi	ng storage for mis	sion-critical applicatio.
😲 Silver	Block	530.0	1	530.81		0.00	High-performing	storage for applicat	tions in production.
P Silver Site 2	Block	125.0	0	125.50		0.00	Silver based serv	ice class with filter	on capacity pools
P EnhancedIsolation	File	0.0	0	0.00		0.00	Enhanced isolated	d file storage.	
P NormalIsolation	File	0.0	0	0.00		0.00	Normal isolated fi	le storage.	
Pools									
Name	Storage System	n St	atus 🔻 Ti	er Av	ailable Pool Space	e (GiB)	Capacity	RAID Level	
DS4800_site2_p01	SVC-2145-ITS	O SVC 8G4-IBM	Online 6			678.0	968.00	RAID 5	
DS8300_site2_p01	SVC-2145-ITS	O SVC 8G4-IBM	Online 4	Sih	/er Site 2	125.5	158.50	RAID 5	
DS8300_site1_p01	SVC-2145-ITS	O SVC CF8-IBM	Online 4			36.5	40.00	RAID 5	
DS8300_site1_p02	SVC-2145-ITS	O SVC CF8-IBM	Online 4			117.5	120.00	RAID 5	
058300_site1_p03	SVC-2145-ITS	O SVC CF8-IBM	Online 4			251.25	318.50	RAID 5	
📆 ssd	SVC-2145-ITS	O SVC CF8-IBM	Online 2			0.00	134,75	RAID 10	

Figure 7-22 Silver Site 2 service class and service pools

Service class with both sites capacity pools

In this second example, we just modify the **Silver** service class, selecting from the storage constraints panel both site capacity pools. See Figure 7-23.

Silver Properties				
General		To optionally limit storage placement to a	a subset of availab	le storage resources,
Storage Constraints		select one or more capacity pools. During	g provisioning, only ted canacity pools	y the storage
Users	I	storage placement.		are canonates for
Volumes		Allow provisioning from any available	ilable storage.	
		Only allow provisioning from sel	ected capacity p	ools:
	Silver			
	I≡ Actions ▼		0, 🔻	Filter
	Name	 Capacity (GiB) 		Total Capaci IJ
	Site 1			
	Site ¥			
				Þ
	Showing 2 items Selecte	ed 2 items	Refre	eshed 1½ minutes ago
		Save Cancel		

Figure 7-23 Silver service class editing: Specify capacity pools

Since the Silver service class uses storage systems that are assigned to **Site1** or **Site2** capacity pools, the available space will be the same as the original Silver service class,

reported in Figure 7-20 on page 168. In this case, when configuring the provisioning task, users must choose which capacity pool to use.

Using resource tags

In this example, we define a specific service class that uses only storage pools dedicated to Research Department. To do so, we use resource tags as defined in 7.2.2, "Refine the customization by assigning tags to storage resource" on page 165.

We define the new Silver Research service class, based on the predefined Silver service class, by adding the Research Department tag in the Advanced Properties pane. See Figure 7-24.

Advanced Properties			
Multipathing Resource tags			
Filter candidates for provisioning by spe all the same tags.	cifying up to three custom tags. To provide the service class, storage resources must have		
Custom tags:	Research +		
Custom tags: Research Vou can set matching tags on the General tab of the View Properties notebook for block storage systems or pools. If a pool is not tagged, any tags on the containing storage system also apply to the pool.			
	OK Cancel		

Figure 7-24 Service class creation: Add resource tag

Figure 7-25 on page 172 shows the available space for the Silver Research service class and its relationship with storage pools. As you can see in Figure 7-25 on page 172, the available space in this service class is less than the space in the Silver service class. This is because it takes only from pools with the Research Department Custom tag resource tags that we defined in 7.2.2, "Refine the customization by assigning tags to storage resource" on page 165.

Screate Service Class	I≡ Actions ▼							Q, •
Name	Туре 🔺	Total Capacity (GiB)	٨	vailable Space (GiB)	Unavailable Space (GiB)	Description		
😲 Bronze	Block	6	78.00	678.00	0.00	Standard storage	for non-mission-cri	itical applications.
😲 Gold	Block		0.00	0.00	0.00	Highest-performi	ng storage for miss	ion-critical applicatio
😲 Silver	Block	5	30.81	530.81	0.00	High-performing	storage for applicati	ions in production.
👽 Silver Research	Block	2	79.56	279.56	0.00	Silver based serv	ice class with filter	on resource tags
Silver Site 2	Block	1	25.50	125.50	0.00	Silver based serv	ice class with filter	on capacity pools
P EnhancedIsolation	File		0.00	0.00	0.00	Enhanced isolated	d file storage.	
NormalIsolation	File		0.00	0.00	0.00	Normal isolated fi	ile storage.	
Pools								
Name	Storage S	ystem	Status	▼ Tier I	vailable Pool Space (GiB)	Capacity	RAID Level	
D\$4800_site2_p01	SVC-21	45-ITSO_SVC_8G4-IBM	🖉 Onlir	ne 6	678	00 968.00	RAID 5	
DS8300_site2_p01	SVC-21	45-ITSO_SVC_8G4-IBM	Onlin	ne 4	125	50 158.50	RAID 5	
DS8300_site1_p01	SVC-21	45-ITSO_SVC_CF8-IBM	🔄 Onlir	ne 4	Silver Site 2 36	56 40.00	RAID 5	
DS8300_site1_p02	SVC-21	45-ITSO SVC CF8-IBM	🔄 Onlir	ne 4	117	50 120.00	RAID 5	
DS8300_site1_p03	5VC-21	45-ITSO_SVC_CF8-IBM	🔄 Onlir	ne 4	251	25 318.50	RAID 5	
🍔 ssd	SVC-21	45-ITSO SVC CF8-IBM	🖉 Onlin	ne 2	0.	00 134.75	RAID 10	

Figure 7-25 Silver Research service class and service pools

Putting together capacity pools and resource tags

In this last example, we further refine the filters, defining a service class for Research Department in Site 1.

We create the new service class **Silver Research Site 1**, based on the **Silver** service class, with the following advanced configurations:

- Filter on capacity pool Site 1
- Filter on resource tag Research Department

Figure 7-26 shows the available space for the Silver Research Site 1 service class and its relationship with storage pools.

Screate Service Class	E Actions 🔻									Q, 🗸
Name	Туре 🔺	Total Capacity (GiB)	Ava	ilable Space	(GiB)	Unavailable Space ((GiB)	Description		
🔮 Bronze	Block	6	8.00		678.00		0.00	Standard storage	for non-mission-c	ritical applications.
😤 Gold	Block		0.00		0.00		0.00	Highest-perform	ing storage for mis	sion-critical applicatio
🔮 Silver	Block	5	0.81		530.81		0.00	High-performing	storage for applica	tions in production.
🔮 Silver Research	Block	2	9.56		279.56		0.00	Silver based serv	rice class with filter	r on resource tags
Silver Research Site 1	Block	1	4.06		154.06		0.00	Silver based serv	rice class with capa	city pool and resourc
P Silver Site 2	Block	10	5.50		125.50		0.00	Silver based serv	rice class with filter	r on capacity pools
EnhancedIsolation	File		0.00		0.00		0.00	Enhanced isolate	d file storage.	
P NormalIsolation	File		0.00		0.00		0.00	Normal isolated f	ile storage.	
Pools										
I = Actions										
Name	Storage S	/stem	Status	▼ Tier	A	vailable Pool Space (GiB)	Capacity	RAID Level	
DS4800_site2_p01	SVC-214	S-ITSO SVC 8G4-IBM	Online	6			678.0	0 968.00	RAID 5	
DS8300_site2_p01	SVC-214	5-ITSO_SVC_8G4-IBM	Online	4			125.5	0 158.50	RAID 5	
DS8300_site1_p01	SVC-214	5-ITSO SVC CF8-IBM	🔄 Online	4	Cilver	Decemb Site 1	36.5	6 40.00	RAID 5	
DS8300_site1_p02	SVC-214	5-ITSO SVC CF8-IBM	🖉 Online	4	Silveri	vesear on Site 1	117.5	0 120.00	RAID 5	
DS8300_site1_p03	SVC-214	5-ITSO SVC CF8-IBM	Online	4			251.2	5 318.50	RAID 5	
🍓 ssd	SVC-214	5-ITSO SVC CF8-IBM	Online	2			0.0	0 134.75	RAID 10	

Figure 7-26 Silver Research Site 1 service class and service pools

7.3 Provisioning storage with Tivoli Storage Productivity Center

As of Tivoli Storage Productivity Center V5.2, the Provision Storage wizard is available. The Provision Storage wizard has changed since its introduction in V5.2 so that you can now select a service class for each volume in the provisioning dialog. The wizard combines SMAC

Cloud concepts and SAN Planner engine in a single simplified user interface that allows end-to-end storage provisioning.

7.3.1 Provisioning feature overview

Volume provisioning is available for Storage Resource agents, and agentless servers. The use of provisioning shares is possible with any Tivoli Storage Productivity Center version.

When using the Provision Storage wizard, you concern yourself only with which service class is needed for the new volumes or shares, and how much capacity you require. Tivoli Storage Productivity Center uses the service class to identify storage requirements and determines the best location for the storage.

You can access a set of panels in Tivoli Storage Productivity Center web-based GUI, which explains the new cloud concepts in detail. To access these panels from the navigation pane click Advanced Analytics \rightarrow Provisioning \rightarrow Learn the concepts.

To provision volumes, you select one or more servers and start the Provision Storage wizard, where you specify:

- Capacity that is required for one volume (or for more volumes)
- Service class

Note: To provision volumes, you must have the IBM SmartCloud Virtual Storage Center storage license.

Tivoli Storage Productivity Center identifies the storage pools that can provide the capacity and the service class. From the set of pools that can provide the capacity and service class, Tivoli Storage Productivity Center identifies the best location for the storage. The best location for the storage is based on the deallocated volume space in the pool and performance data. Preference is given to systems that have available performance data; in this case the provision process is based on the stand-alone GUI Planner functionality.

By using the "pool utilization value" as a reference, Tivoli Storage Productivity Center simulates a new volume allocation (volume with "OLTP High" profile - worst case) and measures the value of the pool utilization to decide if the candidate pool can be the target pool. In Online Transaction Processing (OLTP) environments, transaction processing is typically characterized by a large volume of short transactions that are directly related to business processes. The primary goal of an OLTP system is very fast query processing while maintaining data integrity. Its effectiveness is measured by the number of transactions per second that can be achieved.

Note: Performance-based planning will be implemented only if performance data was collected in last seven days. Otherwise, the plan falls back to "space only" planning, where Tivoli Storage Productivity Center will favor pools with more available space over ones with less available space.

To provision a share, you select one or more servers or hypervisors and start the Provision Storage wizard where you specify:

- Capacity required for the share.
- Service class.
- Information about how to export the share.

Tivoli Storage Productivity Center identifies the file systems and Network Shared Disks (NSDs) that can provide the capacity and the service class. From the set of file systems and NSDs that can provide the capacity and service class, Tivoli Storage Productivity Center identifies the best location for the storage. The best location for the storage is based on the available space on the file system or NSD.

Note: File share provisioning supports SONAS and Storwize V7000 Unified systems.

7.3.2 Prerequisites steps

The steps to implement storage provisioning with Tivoli Storage Productivity Center are described in this section:

- 1. Set up storage and SAN monitor
 - Collect storage systems asset and performance data.
 - Collect switch and fabric data.

Note: Switch and fabric data are required for optional multipath planning (see "Block-storage service classes configuration" on page 154) and zoning changes (see 7.3.3, "Set zoning policy" on page 174).

Important: SRA is required for multipathing policy configuration.

- 2. Prepare the servers
 - Deploy SRA agents for enhanced host configuration:
 - Collect host worldwide port name (WWPN) information.
 - Rescan for new disks during provisioning.
 - Automated HBA Multipathing policy configuration.
 - Define agentless servers with operating system type and ports as described in Chapter 4, "Server Resource Management" on page 61.
 - Collect VMWare ESX Server Data as described in Chapter 7, "Cloud configuration and provisioning" on page 147.

Note: Tivoli Storage Productivity Center allows vSphere users to provision new storage and to create data stores. In this case, the VMware vSphere Web Client extension for Tivoli Storage Productivity Center must be installed and configured on the vCenter server.

3. Configure for SMAC Cloud concepts. See 7.1, "Tivoli Storage Productivity Center Cloud Overview" on page 148.

7.3.3 Set zoning policy

You can set a zoning policy to enable automatic zoning. When automatic zoning is enabled, Tivoli Storage Productivity Center can create zones during storage provisioning to connect a server to a storage system.

When Tivoli Storage Productivity Center creates a provisioning task, it identifies the best location for the new storage that satisfies the requirements of the service class. If automatic

zoning is enabled, then, during provisioning, existing zones are used if the server already has connectivity to the storage system. Otherwise, one or more zones are created between a host initiator port and a controller, node, or module port.

Note: If Tivoli Storage Productivity Center is creating new zones, it uses only one single initiator and one target port per zone.

Enable automated zoning

To enable Tivoli Storage Productivity Center automated zoning, complete the following steps:

- 1. From the navigation pane, click **Advanced Analytics** \rightarrow **Provisioning**.
- 2. From the **Provisioning** pane, click **Set Zoning Policy** and select **Enable** from the drop-down menu (see Figure 7-27).

		Set Zoning Policy
	Learn the Concepts	San X and
	Set Zoning Policy	Automatic zoning: Enabled
	Provision to Servers	During provisioning, new zones might be created to connect a server to the storage system Existing zones are used if the server already has connectivity to the storage system. Otherwise, a new zone is created between a host initiator port and a controller, node, or
	Provision to Hypervisors	Zone name prefix: TPC
		The naming convention for new zones is TPC_host_storage-system_suffix-number.
		Make changes to the active zone set
_		Server Zone Storage System Host Bus Adapter Fabric Controller / Node / Module
		Host Bus Adapter

Figure 7-27 Set Zoning Policy pane

3. You can access the same pane also from the Fabric or Switch panel. Select a fabric and choose **Set Zoning Policy** from the Action drop-down menu (see Figure 7-28 on page 176).

A Network	Resources > Fabrics			Tivoli Storage Prod
	60	Fabrics		
Home		🔽 0 Normal		
		 A Warning 1 Unreachable 1 Error 		
Storage Resources	Fabrics 🔒 A	lerts Tasks		
	Add Fabric	I≣ Actions ▼		
Server	Name	View Properties	Probe Status	Principal Switch of <u>sentra</u>
	Q unstable_Bro	Data Collection	Never Probed	maven48
		Set Zoning Policy Connections	,	
Network		Remove		
Resources		Acknowledge Status		
		Export	•	

Figure 7-28 Accessing to Set Zoning Policy pane from fabric pane

When you enable automatic zoning, you can specify the following options:

Zone name prefix

If you specify a zone name prefix, all zones that are automatically created by Tivoli Storage Productivity Center are prefixed with a string that you specify.

Tip: The prefix can help you identify which zones were automatically created, and which were created manually.

Separate zones for each path will be planned and created, with a single port initiator port and a single subsystem target port in each zone.

Make changes to the active zone set

If this check box is selected, changes are made to the active zone set. If the check box is cleared, changes are made to the inactive zone set. In this case, the new inactive zone will contain only the new zones.

Notes:

When automatic zoning is enabled, in the provisioning task only new zones are planned and created. Zoning will not change if similar zoning exists in the active zone set.

In order to implement the zones, a Windows specific application is needed such as IBM Network Advisor. For more information, see 5.1.5, "Adding fabrics and switches" on page 97.

7.3.4 Provision Storage wizard

The following list itemizes the pre-checks and considerations for storage provisioning with Tivoli Storage Productivity Center:

- Hosts (both servers and hypervisors) without WWPNs cannot be used to provision volumes.
- For hosts with a connection to the Tivoli Storage Productivity Center managed fabric, only storage systems connected to same fabric are considered.
- Multiple hosts must have the same operating system type for volume provisioning. If the servers are virtual machines, the hypervisors that manage the servers must all run the same operating system.
- If the service class requires multipathing, or if automatic zoning is enabled, the fabrics and switches must be managed by Tivoli Storage Productivity Center. If the fabric is not managed by Tivoli Storage Productivity Center, fabric-related configuration options are ignored during provisioning.
- ► You cannot provision storage volumes to servers and virtual machines at the same time.
- When you request multiple volumes, they are provisioned from pools in the same storage system.

Using the Provisioning wizard

To launch the Provisioning wizard, select a server or hypervisor from the **Server Resources** pane and click **Action** \rightarrow **Provision Storage**. The Provision Storage pane opens. See Figure 7-29.



Figure 7-29 Provision Storage pane: Extended license version

Note: To report issues, send feedback, or submit enhancement requests, you can open the IBM Request for Enhancement (RFE) Community with your web browser at:

http://www.ibm.com/developerworks/rfe

For more details about request for enhancements see Appendix A, "Request for Enhancements" on page 285.

If you have the Tivoli Storage Productivity Center base license, the Volumes option will be disabled.

From the Provision Storage pane, the wizard flow is:

- Select between provisioning of volumes or shares.
- Complete or select the fields:
 - Name and Capacity

In the case of volume provisioning, you can also plan additional volumes. All volumes will have the same size, service class, and capacity pool.

Ticket (optional)

The ticket identifier is associated with the provisioning plan and task, and with any volume or share that is created by the provisioning task.

Service Class

Service classes that do not provide sufficient capacity for the selected service class are disabled.

Capacity Pool

This is an optional field. Capacity pools that do not provide sufficient capacity for the selected service class are disabled.

- For Shares provisioning only, complete or select the share permission details fields:
 - Owner and Group of Fileshare

The wizard does not check these values. Use a valid user and group from the filer user-repository.

- Select export protocol:
 - Network File System (NFS)

This is preselected if the wizard is started from a Linux server, UNIX server, or hypervisor server.

Select the NFS access options of host name or IP address.

Common Internet File System (CIFS)

This is preselected if the wizard is started from a Windows Server.

Select CIFS options and ACL entries. The wizard does not check user, group, or SID values. Use valid entries from the filer user-repository.

Tivoli Storage Productivity Center determines the storage placement recommendation and return a summary panel with the planned overall task and subtasks. The task plan and subtasks are shown in Figure 7-30 on page 179. The subtasks shown in the plan are:

- Network subtask (if automatic zoning is enabled, see 7.3.3, "Set zoning policy" on page 174).
- Storage subtask.
- Host Connections subtask.
- Multipathing subtask (for SRA only, if multipathing policy is set).

Provision Storage						
Service Class: 🥐	Silver Site 2	Ticket: 1	User: administrator	r		
Network						
Status	Action	Zone Name	Zone Members	Zone Set	Fabric	
🔘 Not running	Create	TPCpoksrv3	1000000C9809B6B	7 IT SO 2498	@ <u>100000533F</u>	A
🔘 Not running	Create	TPCpoksrv3	5005076801304D88	7 <u>IT SO 2498</u>	@ <u>100000533F</u>	
🔘 Not running	Create	TPCpoksrv3	1000000C9809B6B	7 <u>IT SO 2498</u>	@ <u>100000533F</u>	τ.
Storage	Action	Volume Name	Pool	Storage System	Capacity (SiB)
	Create	test 01	B DS8300 site	SVC-2145-ITSO	sv	1.00
Host Connections						
Status	Action	Host Name	Host Type	Port	Volume	L.
🔘 Not running	Assign	poksrv3.itso.ib	om.c VMware ES	X 1000000C9	809B6B test_01	
		Back Exec	ute Schedule	Save		Cancel

Figure 7-30 Provision Storage task

Refer to Chapter 5, "Configuration and administration tasks" on page 85 for details about Tivoli Storage Productivity Center management tasks.

The Execute and Schedule buttons are always available for Administrator users.

These buttons are also available for specific Monitor or External Application users only in the following situations:

- Users have been allowed to provision in the service class configuration.
- ► The corresponding service class approval required option is set to No.

See "Service class and users permissions" on page 159 for details.

7.3.5 Provisioning scenario

In this scenario, we illustrate the provisioning process with Tivoli Storage Productivity Center by launching the provisioning wizard to create a volume using the **Silver** service class.

We use a non-administrator user to launch the wizard, and then we execute the planned task as a Tivoli Storage Productivity Center administrator.

The following sections describe the provisioning flow.

Modifying service class server option

In our example we use the **Silver** service class configured in section 7.2.4, "Define service classes" on page 167.

We modify the Users service class options to allow the TPCoperator user to provision and set the **Approval required**: option to Yes. See Figure 7-31.

Silver Properties					
General Storage Constraints Users Volumes	Approval required: Yes Approv				
	TPC* Only users who are limited to the Monitor or External Application roles are listed.				
	Add User Groups Roles TPCoperator Users Monitor				
	Save Cancel				

Figure 7-31 Changing default Silver service class Users option

Launching the provision wizard

In this scenario, we log on to the SVC server with TPCoperator credential, and launch the provisioning wizard to provision a 1 GB volume to **poksrv3** hypervisor system. The tasks to do this are:

- 1. Click Advanced Analytics \rightarrow Provisioning.
- 2. From the Provisioning pane, click Provision to Hypervisor.
- 3. Right-click the **poksrv3** server and select **Provision Storage**. See Figure 7-32 on page 181.

TPC Provisio	oning	+						
🗲 🔒 https://t	ocblade3-5.st	orage.tucson. ibm.com :9569/sr	m/gui#provisioning?tab=provisionT	oHypervisors				
合 Advanced A	Analytics > I	Provisioning				Tivoli Storage	Productivity Center - Vir	tual Storage Center Edition
	_							
Home		Loop the Conserts	05	Provision	to	Hyper	/isors	
		Learn the Concepts		Select a hypervisor	r and	issue a "Provi	sion Storage" actior	n. This action is available in all tables
Storage Resources	<u> </u>	Set Zoning Policy	Hypervisors					
		Provision to Servers	Add Hypervisor	I≡ Actions ▼ View Properties		Status 💌	Probe Status	Used Space Total
Server Resources	of E	Provision to Hypervisors	tsmcveh02.stor	at Provision Storage		Creation Control	S Failed	0%
			tsmcveh0710	aj		Crror	S Failed	0%
Notwork			tsmcveh01.stor	age.tu		Warning	S Failed	20%
Resources			tsmcveh04.stor	age.tu		Warning	S Failed	26%
~			tsmcveh05.stor	age.tu		Warning	Sailed	25%
			brownie.storag	a.tucs		Normal	Successful	55%
			Chorizo.storage	.tucs		Normal	Sailed	76%
Advanced			decaf.storage.t	icson		Normal	S Failed	37%
Analytics			infinity.storage.	tucso		Normal	V Successful	57%
di la			kellogs.storage	.tucso		Normal	Sailed	37%
			mcgriddle.stor	ige.tuc		Normal	🔁 Running	92%
Reporting	-		thebeast.storag	e.tucs		Normal	🗹 Successful	49%
reporting			thresh2c1.store	ge.tuc		Normal	Successful	1%
1			trout.storage.tu	cson.i		Normal	Sailed	52%

Figure 7-32 Select Provision Storage from provisioning pane

4. Next, customize the **Provision Storage** pane with our specific requirements. Select type Volumes as shown in Figure 7-33.



Figure 7-33 Select volumes type

5. Define the volume as shown in Figure 7-34 on page 182.

Provis	ion Storage			
	Define Volumes Specify the characteristics of the volum	es to create.		
1	Name site2_vol01	Capacity	Service Class <u>View</u>)
100	+ Add More			
	Ticket:			
0		■ Bac	ck Next ►	Cancel

Figure 7-34 Define volumes

This definition includes:

- Specify name and size.
- Selection of Silver service class.
- Selection of Site 2 service class.

Note: The exclamation mark next to the **Silver** service class alerts you that, since the service class specifies multipathing but no SRA is installed on the hypervisor (an SRA cannot be installed on a hypervisor), multipath options will be ignored by the provision task.

6. Click **Next**. The Tivoli Storage Productivity Center wizard process runs to determine the storage placement recommendation. See Figure 7-35.

Provision S	Provision Storage						
	Determining storage placement recommendation						
	Close						

Figure 7-35 Tivoli Storage Productivity Center provision plan process running

The output of the plan is shown in Figure 7-36 on page 183.

Provision Storage									
Service Class: 🥐	<u>Silver</u> Use	r: TPCoperator							
Network									
Status	Action	Zone Name	Zone	Members	Zone	Set	Fabri	ic	
Not running	Create	TPCpoksrv3	10000	000C9809B6B	🍘 🖽	<u>so 2498</u>	<u>۵ 10</u>	00000533	A
🔘 Not running	Create	TPCpoksrv3	50050	76801404D88	7 п	<u>so 2498 </u>	<u>۵ 10</u>	00000533	
Not running	Create	TPCpoksrv3	10000	000C9809B6B	7 🖽	<u>so 2498 </u>	<u>۵ ا</u>	00000533	
Storage									
Status	Action	Volume Name	Pool	_	Stora	ge System		Capacity (GiB) 🔢
Not running	Create	site2_test_01	8 DS	88300 site	<u></u>	/C 8G4		1.	.00
Host Connections									
Status	Action	Host Name		Host Type		Port		Volume	
O Not running	Assign	poksrv3.itso.ib	<u>m.c</u>	VMware ES	x	1000000000	809B	site2_test_01	
Not running	Assign	poksrv3.itso.ib	<u>m.c</u>	VMware ES	x	1000000C9	809B6B	site2_test_01	
Multipath <u>A HWNCA0057W</u>	The multipath polic	cy cannot be set on	the fol	lowing hyper	visors:	poksrv3.itso	.ibm.co	om.	
		■ Ba	:k (Save	\mathcal{D})			Cancel

Figure 7-36 Tivoli Storage Productivity Center provision storage task and subtasks

Note: As TPCoperator, the only option available for the task is Save.

7. Click **Save** to save the job for approval by a Tivoli Storage Productivity Center administrator.

Run the provision task

After the provisioning task is created, the next step is to run the provisioning task:

- 1. Log on to the Tivoli Storage Productivity Center as Tivoli Storage Productivity Center administrator.
- 2. Access the Task pane by clicking **Home** \rightarrow **Tasks** from the navigation pane.

See Figure 7-37 on page 184, where the task we have defined is highlighted.

1012	Tasks	5			
0	 Ø Faile ▲ 3 Warr ☑ 1 Succ ☑ 0 Runr 	d ዐ 1 Not running ning essful ning			
I≡ Actions ▼					
Name		Туре	Status	Related Task	Schedule
Silver_site2_test_01-2	20131029-1	Provisioning	🔘 Not running		Disabled
Silver_site2_vol01-201	 131029-145	Provisioning	. 👍 Warning		None
Silver Research Site 1	_RawVolu	Provisioning	Successful		None
Silver_V_131028_1907	20-2013102	Provisioning	🔒 Warning		Disabled
Silver_V_131028_1904	34-2013102	Provisioning	🚹 Warning		Disabled

Figure 7-37 Tasks pane

3. Double-click the task; the task details pane is shown. See Figure 7-38.

Provisioning					
s of the action. If an acti Failed, then the provisio	Iver_site2_test	_ 01-20131029-1 r: TPCoperator	82829 Renam	e	Scheduled: Disabled
a status of Failed.					
Status	Action	Zone Name	Zone Members	Zone Set	Fabric IJ
🔘 Not running	Create	TPCpoksrv3	1000000C9809B6B	7 IT SO 2498	@ <u>100000533</u>
Not running	Create	TPCpoksrv3	5005076801404D88	7 <u>ITSO 2498</u>	@ <u>100000533</u>
🔘 Not running	Create	TPCpoksrv3	1000000C9809B6B	7 <u>ITSO 2498</u>	<u> 100000533</u>
Storage Status	Action	Volume Name	Pool	Storage System	Capacity (GiB)
O Not running	Create	site2_test_01	8 DS8300 site	SVC 8G4	1.00
Host Connections					
Status	Action	Host Name	Host Type	Port	Volume 🕠
🔘 Not running	Assign	poksrv3.itso.ib	m.c VMware ES	X 1000000C9	809B site2_test_01
Not running	Assign	poksrv3.itso.ib	m.c VMware ES	X 1000000C9	809B6B site2_test_01
Multipath	<u>N</u> The multipath pol	icy cannot be set on	the following hyper	visors: poksrv3.itsc	p.ibm.com.
Need Help	E	cecute Sched	ule Delete	Close	

Figure 7-38 Provisioning task details

4. As the Tivoli Storage Productivity Center administrator, you can choose to **Schedule**, **Execute**, or **Delete** the task. In our scenario, we execute the task.

When the task is running, an arrow replaces the "stop" icon in the upper left part of the pane. See Figure 7-39 on page 185.

Provisioning									
Service Class: Silver Silver User: TPCoperator Network									
Status	Action	Zone Name	Zone Members	Zone Set	Fabric	IJ			
O Not running	Create	TPCpoksrv3	10000000C9809B6B	77 IT SO 2498	@ <u>100000533</u>	*			
Not running	Create	TPCpoksrv3	5005076801404D88	77 ITSO 2498	@ <u>100000533</u>				
Not running	Create	TPCpoksrv3	1000000C9809B6B	7 ITSO 2498	@ <u>100000533</u>	-			
Storage Status O Not running	Action Create	Volume Name site2_test_01	Pool B DS8300 site	Storage System SVC 864	Capacity (GiB) 1.00				
Host Connections	Action	Host Name	Host Type	Port	Volume				
O Not running	Assign	poksrv3.itso.ib	m.c VMware ES	X 1000000C9	809B site2 test 01				
Not running	Assign	poksrv3.itso.ib	m.c VMware ES	X 1000000C9	809B6B site2 test 01				
Multipath <u>A</u> <u>HWNCA0057W</u>	The multipath polic	cy cannot be set on	the following hyper	visors: poksrv3.itso	.ibm.com.				
Need Help	Ex	ecute Sched	ule Delete	Close					

Figure 7-39 Tivoli Storage Productivity Center provision task panel

Figure 7-40 on page 186 shows the summary pane for the submitted task. As you can see, even if all the subtasks successfully completed, the overall task completed with a warning message. The warning was expected since the service class multipath option was not considered.

Provisioning									
Service Class: Silver Silver User: TPCoperator Network									
Status	Action	Zone Name	Zone Members	Zone Set	Fabric	U			
Successful	Create	TPCpoksrv3	10000000C9809B6B	77 ITSO 2498	@ <u>100000533</u>	1			
V Successful	Create	TPCpoksrv3	5005076801404D88	7 IT SO 2498	@ <u>100000533</u>				
🔽 Successful	Create	TPCpoksrv3	1000000C9809B6B	7 <u>IT SO 2498</u>	@ <u>100000533</u>	Ŧ			
Storage Status Successful	Action Create	Volume Name	Pool BS8300 site	Storage System	Capacity (GiB) 1.00				
Host Connections									
Status	Action	Host Name	Host Type	Port	Volume	U			
Successful	Assign	poksrv3.itso.ib	m.c VMware ES	X 1000000C9	809B 🗄 <u>site2 test 01</u>				
Successful	Assign	poksrv3.itso.ib	m.c VMware ES	X 1000000C9	809B6B 🗄 <u>site2 test 01</u>				
HUNCA0057W Need Help	To multipath polic	cy cannot be set on ecute	the following hyper	rvisors: poksrv3.itsc Close	p.ibm.com.				

Figure 7-40 Provisioning task summary with warning message

5. A combined log file, combining the logs for all the subtasks is generated. To access the log, click the **Open Logs** link from the Provisioning pane. See Figure 7-41, where a part of the log is reported with the highlighted warning message.

i	Information	Oct 29, 2	2013	18:43:25.437 EDT	HWNEP0127I	Finished creation of host poksrv3.itso.ibm.com867 on subsystem SVC-2145- ITSO_SVC_8G4-IBM with initiator ports 10000000c9809b6a.
i	Information	Oct 29, 2	2013	18:43:25.546 EDT	HWNEP0122I	Started assignment of volume site2_test_01 on subsystem SVC-2145-ITSO_SVC_8G4-IBM to host poksrv3.itso.ibm.com867.
i	Information	Oct 29, 2	2013	18:43:25.609 EDT	HWNEP0123I	Finished assignment of volume site2_test_01 on subsystem SVC-2145-ITSO_SVC_8G4-IBM to host poksrv3.itso.ibm.com867.
i.	Information	Oct 29, 2	2013	18:43:26.638 EDT	HWNEP0019I	External process for devices SVC-2145-ITSO_SVC_8G4-IBM completed successfully.
i	Information	Oct 29, 2	2013	18:44:16.059 EDT	BTACS0001I	Finished Control Process: Device Server RUN ID=2168, Job ID=3367, Status=1, Return Code=0.
i.	Information	Oct 29, 2	2013	18:44:16.964 EDT	HWN020001I	Operation assignStorageVolumesToWWPNs processed successfully.
i.	Information	Oct 29, 2	2013	18:44:16.964 EDT	HWNEP0138I	External process was successfully executed for device 0000020064409B10.
i	Information	Oct 29, 2	2013	18:44:16.964 EDT	HWNEP0138I	External process was successfully executed for device 0000020064409B10.
1	Information	0 29, 2	2013	18:44:16.964 EDT	HWNLM0016I	HWNLM0016I Completed assigning storage volumes to WWPNs.
<u>^</u>	Warning	Oc 29, 2	2013	18:44:16.979 EDT	HWNLM0032W	HWNLM0032W TPC is unable to set the multipath policy on host poksrv3.itso.ibm.com because it is an ESX hypervisor. After the provisioning operation completes, log in to the hypervisor or use VMware tools to set the multipath policy on the hypervisor.

Figure 7-41 Task consolidated log

Verifying the storage provision

In this section, we describe the steps to verify our provisioning. Access the detail pane of the **poksrv3** hypervisor and search for the new volume:

- 1. From the navigation pane, click **Server Resources** \rightarrow **Hypervisor**.
- 2. Right-click poksrv3 and select **View Details**. The Overview pane for poksrv3 opens. See Figure 7-42.



Figure 7-42 poksrv3 Details pane

3. Click the Disks entry in the left navigation pane (highlighted in Figure 7-42) to access the disk detail pane.

poksrv3.itso.ibm.com		Di	sks				
VMware ESX 5.1.0		= Actions -					
Actions 🗸		Name	Paths	Capacity (GiB)	Available Disk Space (GiB)	Used Space (G	Data Store
General		naa.600605b00169f2c0ff00	02 🕌 <u>1</u>	135.97	0.00	135.97	🔓 poksrv3ds1
Overview		naa.600605b00169f2c0ff00	03 🕌 <u>1</u>	556.93	0.00	556.93	boksrv3ds2
Properties		📃 naa.60050768018305e1200	00 🕌 <u>1</u>	10.00	0.00	10.00	
Alerts (0)		🙎 naa.600507680191026c400	000 🖞 🙎	1.00	1.00	0.00	
🎆 Tasks (4)	▲						
Data Collection (1)	▲						
🖁 Data Path							

Figure 7-43 poksrv3 Disks details pane

4. In order to have a comprehensive view on the available connections from the server to the storage as defined in the provision task, use the web-based GUI Data Path.

To access the Data Path Explorer from the Hypervisor pane, right-click **poksrv3** and select **View Data Path**. Figure 7-44 shows the Topology View tab of the Data Path Explorer pane for the system after the task provision ran.

Note: Before you can view information in the Data Path Explorer, run a probe job against the fabrics involved in the provision task in order to align the Tivoli Storage Productivity Center database with the new zone configurations (see "Probes" on page 101 for details about probe process).



Figure 7-44 Data Path for poksrv3

8

Transforming volumes

In Tivoli Storage Productivity Center V5.2, you can transform fully allocated volumes to compressed or thin-provisioned volumes, or transform compressed or thin-provisioned volumes to fully allocated volumes. You can move volumes to other pools or to pools that are enabled for Easy Tier.

Tivoli Storage Productivity Center can set these characteristics for a volume:

- Migrate pool
- Thin provisioning
- Compression
- Easy Tier

In this chapter, we describe the latest volume transformation functions available as of Tivoli Storage Productivity Center V5.2, and show actual implementation through the description of test cases in our environment.

Note: All operations in this chapter were performed with the IBM SmartCloud Virtual Storage Center (VSC) license.

8.1 Transform storage feature overview

With the new Tivoli Storage Productivity Center web-based GUI, several methods of transforming storage have been introduced on virtualized storage systems (IBM SAN Volume Controller (SVC), IBM Storwize V7000, and IBM Storwize V7000 Unified), which were not available in Tivoli Storage Productivity Center V5.1. In prior releases, the web-based GUI was basically only used to visualize what you have in your environment and how the entities are related to each other.

As of Tivoli Storage Productivity Center V5.2, volumes can be moved from one pool to the other or even within one pool. The transform storage functions, even if not strictly defined as storage optimization functions, change volumes attributes. They have impact on volume behavior and on storage environment settings, like tiers and capacity pool (described in Chapter 7, "Cloud configuration and provisioning" on page 147).

Tivoli Storage Productivity Center V5.2 uses VDisk mirroring to implement most of the transformations. This means that volume transformation is only supported with SVC, Storwize V7000, and Storwize V7000 Unified.

8.1.1 Transform Storage wizard

The Transform Storage wizard groups a set of functions that allow you to perform the following actions on volumes:

- Transform fully allocated volumes to compressed or thin provisioned volumes and vice versa.
- Move volume to other pools, or to pools that are enabled for Easy Tier.

Before you open the Transform Storage wizard, you must probe the storage virtualizers to collect information about the logical devices, such as volumes and virtual disks that are associated with the storage virtualizer.

Figure 8-1 shows the available Transform Storage options. To access this pane:

- 1. From the Volumes pane right-click an SVC, V7000, or V7000 Unified volume.
- 2. Select Transform Storage.

Tran	sform Storage			
Sele	ect the volume setting	gs that you want to chan	ge.	
	Migrate Pool	Compression	Thin Provisioning	Easy Tier
0		■ Back	Next ►	Cancel

Figure 8-1 Transform Storage pane

Note: Multiple choices are also available. For example, you could want to implement compression or thin provisioning on a volume and move the volume in a different pool at the same time.

By using the Transform Storage wizard, a specific task with the suggested operation is generated. See 7.3.4, "Provision Storage wizard" on page 177 for details about task creation and use.

If you have defined capacity pools in your storage environment when implementing Migrate Pool or Easy Tier actions, capacity pool restrictions are not considered by Tivoli Storage Productivity Center. Therefore, the candidate target pools *cannot* be in the current capacity pool.

For this reason, when selecting the Transform Storage option for a volume in a capacity pool, a warning message appears, as shown in Figure 8-2.

Transform Stor	age
	e following conditions were detected during the analysis of the volumes. Before a proceed, determine whether it is necessary to take any remedial action.
80	One or more of the pools that are selected are in capacity pools. The recommendations might involve moving volumes to destination pools that are not in the current capacity pool.
	▶ Details
0	Back Next > Cancel

Figure 8-2 Warning message for volumes in a capacity pool

If you receive the message in Figure 8-2, we suggest you choose, if available, a storage pool in the same capacity pool as the candidate target pools. Otherwise, consider if other actions may be needed before implementing the volume transformation. For example, review either the capacity pools definitions or the requirements for volume transformation.

8.1.2 Requirements and restrictions

In this section, we list requirements for implementing volume transformation:

- The Transform Storage feature is only available with the IBM SmartCloud Virtual Storage Center storage license.
- Only Tivoli Storage Productivity Center administrators can implement the Transform Storage functions.
- The volume transformation functions are based on VDisk copies. They are only supported for volumes defined within the SVC, Storwize V7000, and the Storwize V7000 Unified storage systems.

Following are restrictions for converting or moving volumes:

► To move volumes, the destination pool must be on the same storage virtualizer.

To convert or move volumes, image mode volumes must be converted to managed mode volumes. Refer to the V7.1 Information Center for IBM System Storage SAN Volume Controller for detailed information about volume conversion. The IBM Knowledge Center can be found at the following web address:

http://www-01.ibm.com/support/knowledgecenter/STPVGU/landing/SVC welcome.html

► To convert fully allocated volumes to compressed volumes, you must have the IBM Real-time Compression[™] license.

8.2 Transform storage functions use

In this section, we provide the volume transformation tasks available with Tivoli Storage Productivity Center, and illustrate practical use of these functions through test cases we ran in our lab.

Note: If a pool migration is requested by a user (Migrate Pool function) or maybe required by the function itself (Easy Tier function), Tivoli Storage Productivity Center uses the same Planner functionality used for provisioning, described in 7.3, "Provisioning storage with Tivoli Storage Productivity Center" on page 172, to choose the target pool among the candidate pools available.

8.2.1 Migrate pool

The migrate pool options are self-explanatory. Through the Transform Storage wizard Migrate Pool option, you create a task that will move the selected volume on the recommended pool among those that you selected among the available pools (pools with enough space in the same storage subsystem where the selected volume is).

Tivoli Storage Productivity Center chooses the target pool using the same criteria used for provisioning, as discussed in 7.3, "Provisioning storage with Tivoli Storage Productivity Center" on page 172. The real volume utilization is used instead of the "OLTP High" profile.

If a pool migration is requested through the Migrate Pool function, or required by the Easy Tier function, Tivoli Storage Productivity Center uses the same Planner function used for provisioning (described in 7.3, "Provisioning storage with Tivoli Storage Productivity Center" on page 172) to choose the target pool among the candidate pools available.

Test case volume migration

In this example, we run the Migrate Pool wizard for the volume ITSO_test_v01. The ITSO_test_v01 volume is defined in the DS8300_site1_p03 pool in the SVC_CF8 storage system:

1. Right-click the ITSO_test_v01 volume from the Volumes pane and select **Transform Storage** as shown in Figure 8-3 on page 193.

Tip: Since we know that the volume is defined in the storage system SVC_CF8, we use the filter field to select only entries with CF8 characters.

Volumes									
Volumes									
Name Storage System	Status V Pool	Capacity RAID Level	Hosts Thin Provisioned	Allocated Space (GiB) Physical Allocation (% .					
SVCCF8_1107	Viormal 🛞 FB 000	20.00 RAID 5	<u>8</u> No	20.00 Fully Allocated					
SVCCF8_1108 DS8000-2107-75L3331-IBM	Normal 🛞 FB 000	20.00 RAID 5	<u>8</u> No	20.00 Fully Allocated					
Bynamic SVC CF8	Online 🛞 DS8300 site1 p01	5.00	SSPC Yes	0.03 0%					
🗄 itso_sitea 📲 SVC CF8	Online 🛞 DS8300 site1 p03	10.00	<u>2</u> No	10.00 Fully Allocated					
TSO_test_v01	Online 🛞 DS8300 site1 p03	10.00	SSPC Yes	7.26 72%					
ITSO_test_ View Properties	Online 8 DS8300 site1 p03	10.00	SSPC Yes	8.65 86%					
ITSO_test_ View Performance	Online 🛞 DS8300 site1 p03	10.00	SSPC Yes	3.23 32%					
ITSO_test_ Analyze Tiering	Online 8 DS8300 site1 p03	10.00	SSPC Yes	0.22 2%					
ITSO_test_ Transform Storage	Online 🛞 DS8300 site1 p03	13.00	SSPC Yes	11.96 92%					
ITSO_test_v06	Online 🛞 DS8300 site1 p02	0.93	SSPC Yes	0.02 1%					

Figure 8-3 Volume selection

2. The warning message shown in Figure 8-2 on page 191 appears. Click **Next** and proceed with the wizard.

Note: The capacity pools that we defined in Chapter 7, "Cloud configuration and provisioning" on page 147 were defined at storage system level, and the Migrate Pool option suggests as target pools only pools in the same storage system. Based on this, the volume will not be moved to a different capacity pool.

3. From the Transform Storage pane, we select Migrate Pool as shown in Figure 8-4.



Figure 8-4 Transform Storage pane: Migrate Pool selection

We now choose to move the volume to a different pool with the same tier level. Select DS8300_site1_p01 and DS8300_site1_p02 among the available volumes. See Figure 8-5 on page 194.

E Actions ▼				🔍 🔻 Filter	
lame	Status -	Tier	Capacity (GiB)	Available Space	
DS8300_site1_p01	🔽 Online	4	40.00	2	6.56
B DS8300_site1_p02	🔽 Online	4	120.00	5	4.50
DS8300_site1_p03	🗹 Online	4	318.50	23	1.25
👌 ssd	🗹 Online	2	294.75	27	4.25

Figure 8-5 Transform Storage: Target pools selection

5. Clicking **Recommend** creates the Transform Plan task. Figure 8-6 shows the successfully completed task for the volume.

Transform Plan							
Transform Schedule Exc	ns_20131030_200635524 ecution	4 Rename			Con	pleted: Oct 30, 2013 20:06: Duration: 1 Or	:37 EDT 1 second pen Logs
Transform Storage:	Recommendations						
S	I≡ Actions ▼						
Related Resources:	Volume	Source Pool	Destination Pool	Source Tier	Destination Tier	Server	1.
DS8300 site1 p02 ITSO test v01	ITSO test v01	🛞 DS8300 site1 p03	🛞 <u>DS8300 site1 p01</u>		4	4 B SSPC SRV15	
DS8300 site1 p01							
	<						
	Showing 1 item Selected 0 items					Refreshed a few mome	ents ago
0			Execute Delete	Close			

Figure 8-6 Transform Plan pane showing successful task creation

Tivoli Storage Productivity Center chose DS8300_site1_p01 as the destination pool that best fits the request. See 7.3.4, "Provision Storage wizard" on page 177 for details about the Tivoli Storage Productivity Center algorithm.

6. You can now **Schedule** or **Execute** the task. Refer to Chapter 5, "Configuration and administration tasks" on page 85 for further details about Tivoli Storage Productivity Center task management. Click **Execute** to run the task. Figure 8-7 on page 195 shows the result.

Analysis Execution			
Transforms_20131030_200635524_1	ame		Completed: Oct 30, 2013 20:12:01 EDT Duration: 3 minutes <u>Open Logs</u>
I≡ Actions ▼			
Status Volume Source Pool	Destination Pool Source Tier	r Destination Tier	Server 📕
Completed 🚦 ITSO test v01 🚳 DS8300 site1 p03	8 <u>DS8300 site1 p01</u>	4	4 B SSPCSRV15
Showing 1 item Selected 0 items			Refreshed a few moments ago
0	Execute Schedule Delete	Close	

Figure 8-7 Task result showing successful task completion

 In order to update the Tivoli Storage Productivity Center database tables with the changes the task made, after task completion, we run a probe against the storage system SVC_CF8.

From the Storage System pane, we right-click SVC_CF8 and select Data Collection \rightarrow Start Probe, as shown in Figure 8-8 on page 196.

	Storage Syst	ems		
Block Storage	🚹 Alerts 🛛 🔕 Tasks 🛛 🜌 Perfe	ormance		
Add Storage	System I≡ Actions ▼			
Name	Status	Probe Status	Performance Monitor Status	Raw Disk Capacity (GiB)
	00POK-5-600A0 🔽 Normal	Successful	🔁 Running	1,002.05
DS8000-2107-	75L3001-IBM Vormal	Successful	Running	8,634.29
DS8000-2107-	75L3331-IBM 🔽 Normal	Successful	Running	8,566.31
SVC_8G4	🔽 Normal	🔽 Successful	Running	1,288.00
SVC_CF8	Marmal	Successful	Running	912.46
	View Properties			
	View Details			
	View Data Path			
	View Performance	1	1	
	Data Collection	Start Probe		
	Analyze Tiering	Open Probe Logs		
	Add to Capacity Pool	Stop Performance Monitor		
	Connections	Open Performance Monitor Logs		
	Remove	Schedule		
	Open Storage System GUI			

Figure 8-8 Running a probe against SVC_CF8

8. After the probe completion, we finally verify the new volume location using the **Volumes** pane. We use the filter function to quickly select the volume. Figure 8-9 shows the volume and highlights the new pool where it is located.

Volume	IES rmal ng					
Refresh i≡ Actions ▼	Storago System	Ctatus 🐨	Dool	Capacity DAID Loval	Hosts This Drovisioned	Trso_test_v01 eset
TSO test v01 EC target	SUC 864		DS8300_cite2_p01	10.00	Vae	Anotated space (GID)
ITSO_test_v01_RC_target	SVC 864		DS8300 site2 p01	10.00	Yes	7.25 72%
TSO test v01	SVC CF8	Online	(B) D\$8300 site1 p01	10.00	Yes	7.08 70%
		_				

Figure 8-9 Volume ITSO_test_v01 moved to DS8300_site1_p01 pool

8.2.2 Thin provisioning

Thin provisioning enables the storage to present the required capacity to the host while allocating only the actual used capacity in terms of space on the physical storage media.

Using the thin provisioning function, you can convert fully allocated volumes to thin-provisioned volumes or thin-provisioned volumes to fully allocated volumes.

Multiple volumes selection is possible. In this case, the wizard shows the maximum capacity of the volume with the lowest capacity. For example, you select two volumes. The maximum capacities of the volumes are 10 GiB and 20 GiB. The maximum volume capacity that is shown is 10 GiB. The changes to the settings are applied to all of the volumes.

Note: Extra space is temporarily required to convert volumes to thin-provisioned or fully allocated volumes.

Test case thin provisioning

In this example, we illustrate the thin provisioning function by using the function on a fully allocated volume named ITSO_test_v20. Figure 8-10 shows the volume and highlights the columns where we see that it is a fully allocated volume.

	Volumes				
	 4995 Normal 0 Warning 				
	🛞 0 Error				
Volumes					
😔 Refresh 🚦	Actions 🔻				Q.
Name	✓ Storage System	Status	Pool	Capacity (GiB) Thin Provisioned	Allocated Space (GiB) Physical Allocation (%)
ITSO_test_v2	0 SVC_CF8	Online	🛞 DS8300 site1 p02	20.00 No	20.00 Fully Allocated

Figure 8-10 Volumes pane: ITSO_test_v20 details

- 1. Right-click the **ITSO_test_v20** volume and select **Transform Storage**. Since the pools where the volume is defined is in a capacity pool, we receive the warning message shown in Figure 8-2 on page 191.
- 2. From the **Transform Storage** pane, select the **Thin Provisioning** option and set the switch to **On**. See Figure 8-11.



Figure 8-11 Transform Storage pane: Thin Provisioning selection

3. After clicking **Next**, the **Transform Storage** pane in Figure 8-12 is presented. Enter the required information and set the values as required.

Transform Storage		
	ITSO_test_v20	
	Current capacity:	20.00 GiB
	Allocated space:	1.00 GiB •
	Auto expand:	Yes
	Warning level:	9 % 2
	Unallocat	ed space 19,00 GiB
	FlashCopy volume:	Yes
	Grain size:	256 KB 🔻
0	Back Recon	nmend Cancel

Figure 8-12 Thin Provisioning configuration pane

In case of multiple volumes selection for the function, the **Maximum volume capacity** field refers to the smallest volume size. Figure 8-13 shows an example where two volumes are selected.

Transform Storage					
	You selected 2 volumes. The changes to the settings are applied to all of the volumes.				
	Maximum volume capacity:	10.00 GiB			
	Allocated space:	10 % •			
	Auto expand:	Yes			
	Warning level:	80 %			
	FlashCopy volumes:	No			
0	Back Recon	nmend Cancel			

Figure 8-13 Thin Provisioning configuration pane for multiple volumes

Following are the configuration pane fields in Figure 8-12 on page 198 and their use:

- Allocated Space

In this field, we enter the real capacity value. By using the drop-down menu, is it possible to use percentage or absolute values (expressed in MiB, GiB, TiB).

- Percentage values. In this case, the real capacity is equal to the indicated percentage value of the current capacity.
- Absolute values. As an example, an absolute value of 1 GiB would be the real capacity for the ITSO_test_v20 volume.
- Auto Expand
 - When this option is set to Yes, space is automatically added to the thin-provisioned volume when it is needed. The amount of space that is added is determined by the value that you enter in the Allocated Space field; in our case the value is 1 GiB for volume ITSO_test_v20.
 - If Auto expand is set to **No**, the thin-provisioned volume is taken offline when it runs out of available space.
- Warning level. A warning event is generated on the storage system when the percentage of used space exceeds the value that you specify. You can define a warning level by both entering the value in the field or moving the warning level in the bar. In our case we set the warning level at 9%.

Note: You must set Auto expand to Yes to set a warning level.

- FlashCopy Volumes. In our example, we simulate that ITSO_test_v20 is defined in a FlashCopy relationship (for example as source volumes). So we set this option to Yes. This setting makes the Grain size field available.
- Grain size. This field is required if the volumes are in a FlashCopy relationship because the value must be set equal to the value of the corresponding volume in the Copy relationship.
- 4. By clicking the **Recommend** button the Transform Plan task is shown in Figure 8-14 on page 200.

Transform Plan							
Transforms_20131104_133027403 Rename Completed: Nov 4, 2013 13:30:31 EST Schedule Execution Schedule Execution Schedule Execution							
Transform Storage:	Recommendations						
	i≡ Actions ▼						
Related Resources:	Volume	Source Pool	Destination Pool	Source Tier	Destination Tier	Server 🚽	
a <u>1130 test v20</u>	ITSO test v20	🔀 DS8300 site1 p02	🛞 DS8300 site1 p02		4	4	
	Showing 1 item Selected 0 item	S				Refreshed a few moments ago	
0		(Execute Delete	Close			

Figure 8-14 Transform Plan pane

5. Run the task by clicking **Execute**. Figure 8-15 shows the successfully completed task for the volume.

Analysis Execution						
Transforms_20131104_13	3027403_1 Rename				Completed: Nov 4, 2013 13:38:22 EST Duration: 6 minutes <u>Open Loas</u>	
E Actions -						
Status v Volume	Source Pool	Destination Pool	Source Tier	Destination Tier	Server	
Completed 🔮 ITSO test v20	8 DS8300 site1 p02	8 DS8300 site1 p02	4	4	1	
Showing 1 item Selected 0 items					Refreshed a few moments ago	
0	c					
9		Execute Schedule	Delete Close			

Figure 8-15 Task execution successfully completed

 In order to update the Tivoli Storage Productivity Center database tables with the changes the task made, after task completion, run a probe against the storage system SVC_CF8. From the Storage System pane, right-click SVC_CF8 and select Data Collection → Start Probe.
After the probe completes, verify the new ITSO_test_v20 attributes using the Volume pane. Figure 8-16 shows the volume and highlights the attributes.

	Vol	umes				
	 ✓ 49 ▲ 0 1 ▲ 0 1 ▲ 0 1 	95 Normal Warning Error				
Volumes						
G Refresh i≡ #	Actions 🔻	,				Q
Name		Storage System	Status	Pool	Capacity (GiB) Thin Provisioned	Allocated Sp ce (GiB) Physical Allocation (%)
TSO_test_v20		SVC CF8	🔽 Online	8 DS8300 site1 p02	20.00 Yes	1.02 3%

Figure 8-16 Volumes pane: ITSO_test_v20 details

8.2.3 Compression

The volume compression function in SVC and Storwize storage systems is based on the Random Access Compression Engine (RACE), implemented into the SAN Volume Controller and Storwize V7000 thin provisioning layer.

RACE is seamlessly integrated into the existing software stack of SAN Volume Controller version 6.4.0 in a fully transparent way. This integration does not alter the behavior of the system so that previously existing features are supported for compressed volumes.

Refer to the IBM Redbooks publication *Real-time Compression in SAN Volume Controller and Storwize V7000*, REDP4859, for details about the Real-time Compression feature.

To implement the Compression function on a volume, complete the following steps:

- 1. Right-click the volume and select Transform Storage.
- 2. From the **Transform Storage** pane, we select the **Compression** option and set the switch to **On** as shown in Figure 8-17.



Figure 8-17 Transform Storage pane: Compression selection

Note: When you set **Compression** to **On**, thin provisioning is automatically enabled. This is because compression algorithms use the thin provisioning function of SVC.

The **Compression** implementation process is very similar to the thin provisioning process described in "Test case thin provisioning" on page 197, so we do not go into detail describing a test case for compression. Refer to the settings explanation described after Figure 8-12 on page 198.

8.2.4 Easy Tier

Easy Tier is a performance function that automatically migrates or moves extents off a volume to, or from, one MDisk storage tier to another MDisk storage tier. Easy Tier monitors the host I/O activity and latency on the extents of all volumes with the Easy Tier function turned on in a multitier storage pool over a 24-hour period (heatmap creation).

Next, it creates an extent migration plan based on this activity and then dynamically moves high activity or hot extents to a higher disk tier within the storage pool. It also moves extents whose activity has dropped off or cooled from the high-tier MDisks back to a lower-tiered MDisk.

Refer to the IBM Redbooks publication *Implementing the IBM System Storage SAN Volume Controller V6.3*, SG24-7933, for details about the SVC thin provisioning feature.

Important: When you use this function on a volume, Tivoli Storage Productivity Center selects as candidate target pools those pools on which Easy Tier is enabled. This does not necessarily mean that the target pool is a hybrid pool (for SVC a hybrid pool is a pool that contains both SSD and HDD disks). It could also be a pool where the Easy Tier is enabled for the creation of volumes heatmap in order to define candidate volumes for Easy Tiering.

Test case Easy Tier

In this example, we use the Easy Tier function on the itso_test_v10 volume to move it on a hybrid pool. The volume is initially defined in a regular storage pool, DS8300_site1_p03. See Figure 8-18.

	Volumes 4998 Normal (A) 0 Warning (R) 0 Error						
Volumes	Actions ×						0
Name	 Storage System 	Status	Pool	Capacity (GiB) Thin Provision	ed Allocated Space (GiB)	Physical Allocation	(%)
itso_test_v10	SVC_CF8	🔽 Online	8 DS8300 site1 p03	10.00 No	10.00	Fully Allocated	



The thin provisioning function will move the volume in a hybrid storage pool, in our case ssd.

- 1. Right-click the volume and select **Transform Storage**. Since the pools where the itso_test_v10 volume is defined are in a capacity pool, we receive the warning message shown in Figure 8-2 on page 191.
- 2. From the Transform Storage pane, we select the Easy Tier option. See Figure 8-19.



Figure 8-19 Transform Storage pane: Easy Tier selection

Note: Since the **Easy Tier** function moves the volume from the current pool to a hybrid pool, when you select **Easy Tier**, the **Migrate Pool** function is automatically selected, as shown in Figure 8-19.

3. In the **Easy Tier** pane, select a target pool among the candidate pools. Since we want to move the volume in a hybrid pool, we choose **ssd** as the target pool, which is the only available hybrid pool. DS8300_site1_p03 is not a hybrid pool, but it has the Easy Tier function enabled, as discussed in 8.2.4, "Easy Tier" on page 202. See Figure 8-20.

Fransform Storage					
Select one or more target po	ols.				
I≡ Actions ▼				0, 🔻	Filter
Name	Status 🗸	Tier	Capacity (GiB)	Available Spa	Easy Tier
8 D\$8300_site1_p03	🔽 Online	4	318.50	143.75	Enabled/Active
🛞 ssd	🔽 Online	2	274.75	172.00	Auto/Active
Snowing 2 items Selected 1 iter	m			Re	erresned 3 minutes ago
Need Help		Back	Recommend		Cancel

Figure 8-20 Transform Storage pane: Target pool selection

4. Click **Recommend**. The Transform Plan task is shown. See Figure 8-21.

Transform Plan							
Transform Schedule Ex	ns_20131104_173945598 ecution	Rename			Compl	eted: Nov 4, 2013 17:39:48 EST Duration: 2 seconds <u>Open Loas</u>	
Transform Storage:	Recommendations						
	I≡ Actions ▼						
Related Resources:	Volume	Source Pool	Destination Pool	Source Tier	Destination Tier	Server IJ	
itso test v10	itso test v10	🛞 <u>D\$8300 site1 p03</u>	🛞 <u>ssd</u>		4	2	
	Showing 1 item Selected 0 items					Refreshed a few moments ago	
Need Help			xecute Delete	Close			

Figure 8-21 Transform Plan pane

5. To run the task, click **Execute**. Figure 8-22 shows the successfully completed task for the volume.

Analysis Execution						
Transforms_20	131104_173945598_1 Rename	1			Completed: Nov 4, 2013 17: Duration:	46:19 EST 4 minutes Open Logs
I≡ Actions ▼						
Status 🔻 Volume	Source Pool	Destination Pool	Source Tier	Destination Tier	Server	IJ
Completed 🚦 itso test v10	DS8300 site1 p03	🖲 <u>ssd</u>		4	2	
Showing 1 item Selected 0 items					Refreshed a few m	ioments ago
@ Need Help		Execute Schedule	Delete Close			

Figure 8-22 Task execution successfully completed

6. In order to update the Tivoli Storage Productivity Center database tables with the changes the task made, after task completion, run a probe against the storage system **SVC_CF8**.

From the Storage System pane, right-click SVC_CF8 and select Data Collection \rightarrow Start Probe.

7. After the probe completion, verify the new **ITSO_test_v10** was moved to the ssd pool using the Volumes pane. See Figure 8-23.

	Volumes					
	 ✓ 4999 Normal ▲ 0 Warning ⑥ 0 Error 					
Volumes						
Geresh i≡ A	Actions 🔻					Q, •
Name	 Storage System 	Status	Pool	Capacity (GiB) Thin P	Provisioned Allocated Space (GiB) F	Physical Allocation (%)
itso_test_v10	SVC_CF8	🗹 Online 🌔	🛞 <u>ssd</u>	10.00 No	10.00	Fully Allocated

Figure 8-23 Volume itso_test_v10 details

9

Storage optimization

In this chapter, we introduce storage optimization and provide the planning knowledge that you need to work with the tiering and balancing features that are included in the optimization topic. Some of the functions have been available in prior releases of Tivoli Storage Productivity Center and Virtual Storage Center. In Tivoli Storage Productivity Center V5.2, all the optimization features have been consolidated and are available in the new web-based GUI, so it is easy to use.

The storage optimization function for tiering analysis has been enhanced in a way that you no longer need to provide the storage pool read I/O capability in order to make recommendations. SAN Volume Controller (SVC) and Storwize V7000/V7000 Unified are collecting the data required for calculating and using Tivoli Storage Productivity Center's formulas to calculate activity.

Tiering analysis provides a simple and unified storage volume placement optimization through a new automatic mode that works to optimize the storage within a tier level first by balancing pools before making a recommendation to up-tier or down-tier a volume. You might find recommendations to move a volume within a tier.

In addition to optimization, there is a new function in Tivoli Storage Productivity Center V5.2.2 called *Volume Transformation*, which is described in Chapter 8, "Transforming volumes" on page 189. Volume Transformation is similar in its implementation of the tasks and schedules to storage optimization. We do not spend much time repeating these concepts in this chapter.

Note: All operations in this chapter require the IBM SmartCloud Virtual Storage Center (VSC) license.

9.1 Storage optimization in Tivoli Storage Productivity Center

Tivoli Storage Productivity Center has included functions to help administrators use storage more efficiently for quite some time. In this chapter, we look at the history of storage optimization in Tivoli Storage Productivity Center. We then look at how it is implemented in Tivoli Storage Productivity Center V5.2.

9.1.1 Storage Optimization functions

Since there are two very different functions put together under the name Storage Optimization, we describe them separately and use the terms that the Tivoli Storage Productivity Center web-based GUI is also using:

- Analyze Tiering (formerly known as Tiered Storage Optimizer)
- Balance Pool (formerly known as the Storage Optimizer)

The diagram in Figure 9-1 provides a simplified overview of the intent of the two functions. It also shows that you can use the functions together with Easy Tier. In that case, Tivoli Storage Productivity Center can help determine which volumes are good candidates to be moved to an Easy Tier enabled pool. There is no need for you to manually review performance data for many candidate volumes.

Note: The fact that one of your tiers is using Easy Tier is not directly considered, so you need to make sure where in the hierarchy of up to 10 tiers you position Easy Tier enabled pools.

We also recommend using the Advanced method to analyze which of the volumes should be moved into an Easy Tier enabled pool or the other way around.



Figure 9-1 Analyze Tiering versus Balance Pools

Tivoli Storage Productivity Center is not limited to four pools only, but for the purpose of explaining the concept this is sufficient.

Analyze Tiering function

The Analyze Tiering function will help you determine if a selected set of volumes or pools can use the storage more efficiently by moving some volumes to a different tier level. For that purpose, you should have tagged the pools with the appropriate tier levels so that Tivoli Storage Productivity Center understands what up-tiering and down-tiering means in your environment.

As an example, you can identify volumes that are currently in an Easy Tier enabled pool, or a high tier pool in general, but do not really have a high enough workload to justify the placement. This enables you to down-tier volumes to free up space for other volumes.

At this time, the tiering recommendations are only based on the performance data and analysis that Tivoli Storage Productivity Center is doing. Tivoli Storage Productivity Center does not consult the SVC heat map files, so you should still review the recommendations with this in mind.

Balance Pools function

Balance Pools is basically the Storage Optimizer function. Think about this situation: you might have created a lot a new volumes last week, and this week you need to delete a number of volumes. The remaining volumes are in the same tier, but in different storage pools. At this point, it is likely that the two (or more) pools are receiving different workloads. The Balance Pool function attempts to determine which volumes should be moved from one pool to the other to achieve a more balanced workload across the pools in this tier.

Volume Transformation

This is a new function in Tivoli Storage Productivity Center V5.2.2 that is not strictly a storage optimization function, but it is a way to manually change attributes (compression, thin provisioning, and Easy Tier) and the location of a volume or a group of volumes.

In some ways the volume transformation is very closely related to storage optimization for the following reasons:

- Turning Easy Tier on for a volume will change its performance.
- Moving a volume to a different pool can change the performance of a volume.

If you think about it, the volume transformation is really a manual way to do the same as the tiering analyses or balancing. You take a volume and move it somewhere else. This is helpful because you can schedule execution of volume transforms for a future time and can select multiple target pools for such a task. Then Tivoli Storage Productivity Center will make a recommendation into which target pool the volume should be moved, which is very close to what the other optimization features do. With a simple right click, you can also look at the volumes workload before you move it, so everything you need to manage your SVC or Storwize is in one place. Volume Transformation is described in detail in Chapter 8, "Transforming volumes" on page 189.

9.1.2 Storage Optimization process

In the section, we look at the process to get started with Storage Optimization.

Learn the Concepts introduction dialogs

For some of the new or changed functions In Tivoli Storage Productivity Center V5.2.2, you will find the so called *Learn the Concepts* introduction dialogs when you open the functions in the Advanced Analytics in the main navigation bar. See Figure 9-2 on page 210.



Figure 9-2 Storage Optimization: Learn the Concepts

The Learn the Concepts panel is meant to provide a quick introduction with text and pictures. There are panels from which you can take the next steps by clicking the tabs:

- Assign Storage to Tiers
- Optimize Volumes
- Optimize Pools

You do not need to perform any of the steps from the Advanced Analytics dialog because you can start the assignment and the task from anywhere in the Tivoli Storage Productivity Center web-based GUI. However, as you are getting familiar with Storage Optimization, this panel provides a helpful guide through the process.

You might ask yourself why, in addition to SVC or other Storwize storage systems, in the Assign Storage to Tiers panel you will simply list all storage pools. The tier definition is not only used for the optimization but also for the other functions in Tivoli Storage Productivity Center like provisioning. So it does make sense to define tiers level also to storage pools of other storage systems. It may seem unnecessary for pools that are only providing capacity (MDisks) to a storage virtualizer. But since theoretically that pool might just as well provide storage to a server, Tivoli Storage Productivity Center will list those pools as well in this panel.

However, for the optimization to work, you only need to assign tiers to pools of SVC or Storwize V7000/V7000 Unified pools.

The volume transformation is not listed here because it really is meant to be a manual tool, that you can quickly start from many places in the web-based GUI.

This was just a short introduction of the functions and the history of Tivoli Storage Productivity Center. In the next sections, we will describe the functions in more detail.

9.1.3 Outline of steps

Basically, any kind of optimization (and also transformation) is a two-phase process. At this point, we provide a brief outline of the process.

Phase 1

The first phase of the storage optimization process is to select the resources.

You can initiate the optimization tasks from many places in the Tivoli Storage Productivity Center web-based GUI either through the actions menus or when you right-click an object. Depending on the type of object that you selected (storage system, pool, volume, or server), you might not see not all functions. For example, if you just selected volumes, the Balance Pool functions will not be available.

These are the contexts from which you can start the analysis:

- Server (either with SRA or Agentless)
- Hypervisors
- Storage Systems
- Pools
- Volumes

Except for some panels in the Advanced Analytics menu, you can start the optimization from any panel that lists volumes or pools.

Specify parameters

This part is specific to the type of optimization that you are running. We have documented this for the two functions separately here:

- Analyze Tiering: 9.2.4, "Using Analyze Tiering" on page 218
- ► Balance Pools: 9.3.4, "Using Balance Pools" on page 225

Run an analysis summary

The analysis will first check some prerequisites and then open a wizard that might display informational messages. You can enter information like thresholds. At the end, you click the **Analyze** button. At this point, an analysis task will be created and runs in the background. If you do need to do other work you can close the dialog now, and return to that task later on. The task will be available in the context of the devices that are related to the task, as well as on the Task tab of Storage Systems and Tasks panel within the Home menu.

Once the analysis is finished and the results are displayed, you can change the default name of the analysis task to give it a more meaningful name.

In case you had closed the wizard, you can open the results of the analysis task from one of the task panels.

From the results of the analysis task, you can also take the action to schedule the analysis part to run repeatedly every scheduled number of days.

Phase 2

The second phase of the storage optimization process is to review the results of the analysis task. Either you still have the wizard open, or you will go to a task panel, and double-click an analysis task to review the results.

Note: At the time of this writing, previously created analysis tasks allow you to edit certain input parameters and rerun analysis but it is not possible to change the list of storage objects (storage systems, pools, volumes, or servers) that were initially selected.

Execute the recommendations now or schedule the execution to run later

If you are happy with the recommendations, you can let Tivoli Storage Productivity Center implement them by clicking **Execute** or you can set up a one-time schedule if you click the **Schedule** drop-down list and select **Execution.** However, scheduling the execution is obviously a one time task, and cannot be repeated.

The execution of the task is based on the SVC VDisk mirror functions. Tivoli Storage Productivity Center is adding a VDisk copy, syncing it, and removing the initial copy, just like Tivoli Storage Productivity Center is also doing for Volume Transformations.

While the execution is running, you can pause, cancel, or resume the task.

Note: SVC allows you to adjust the speed of syncing volume copies by specifying a sync rate. This rate can be changed even during the process. So all Tivoli Storage Productivity Center is doing when you pause a running task is set the sync rate to zero. When you resume, the sync rate is set to 100 again to restart the data movement.

In case your VDisk was initially mirrored, Tivoli Storage Productivity Center will set the sync rate to the value it was set before the execution of the task.

9.1.4 Assigning tiers

Tivoli Storage Productivity Center V5.2.2 introduced the tagging of storage pool, so that you can assign a Tier label to a pool. Each environment is slightly different so Tivoli Storage Productivity Center provides up to 10 Tier levels that you can use.

Tip: Since there are 10 levels available you might not just use Tier1, Tier2, and Tier3, but you might want to leave some tier levels empty so that can better react to changes in your environment.

In Chapter 7, "Cloud configuration and provisioning" on page 147, we explained how you assign the tier, which can be done from all panels in the web-based GUI showing a storage pools table by right-clicking a pool and selecting Set Tier from the menu. You can assign Tier 1 - 10 and you can also reset the Tier by selecting None.

Considerations

There are several considerations when you assign tiers:

- Any user with the Administrator or Monitor role can set tiers
- For the optimization functions, you only need to set a tier for pools of SVC or Storwize storage systems.
- In general, it is a good practice to use this function even if you are not using the optimization function of Tivoli Storage Productivity Center because it allows you also to group, sort, and filter similar pools and create reports based on the tier level.
- When you assign the Tier tags to storage pools, Tivoli Storage Productivity Center allows you to choose numbers between 1 and 10. You should make use of this, and not use sequential numbering. You might need a tier definition in the middle later on.

9.2 Analyze tiering

The tiering analysis function is a tool that you can use to optimize your storage resources. When evaluating volume tier placement, there are two key concerns:

- Performance capability constraints: Even if a storage pool has sufficient physical capacity for many more storage volumes, the additional input/output (I/O) load of these volumes may be such that one or more of the storage components (for example, the backing subsystem) may become overwhelmed, resulting in degraded performance for all storage volumes in the storage pool. Tivoli Storage Productivity Center allows the specification on an *Activity Limit* to help avoid such situations.
- Although multiple pools in the same tier are likely to be using the same (or similar) disk technology, the actual storage pool performance scales with the number of disk drives. Tivoli Storage Productivity Center's *activity score* measure normalizes non-cache I/O activity by storage pool capacity as a basic approximation for this.

So when using this function, Tivoli Storage Productivity Center will look at the workload of the selected volumes or pools (and the storage pools that the selected volumes belong to), as well as the current workload and the capability of the target pools that were specified in the analysis task wizard. Tivoli Storage Productivity Center will run an analysis and provide recommendations for the movement of volumes, if it can find any better placement.

The function Analyze Tiering is not completely new in Tivoli Storage Productivity Center V5.2.2. In V5.1, Analyze Tiering was already introduced, but at that time the function was almost completely command-line driven. With Tivoli Storage Productivity Center V5.2.2, the function has been expanded and it is now available in the web-based GUI.

9.2.1 When to use Analyze Tiering

These are several situations when you might want to use the tiering analysis:

- Over time workloads may change, or the person requesting a volume might have over-estimated or under-estimated the requirements, and so the volume might not be in the optimal pool anymore. In this case, you can define an analysis task to check if there is a better location for the workload.
- ► If you have a performance problem for one set of volumes, you can use this function to:
 - Determine if those volumes should be moved up to a higher tier level.
 - Determine if other volumes of the same pool might cause a problem and should be moved up a tier level.
 - Find a set of less active volumes that can be moved down a tier without impacting their performance. Depending on the situation, you might also run the Balance Pools function if you have more than one pool defined.
- Maybe you allocated volumes on a high performance tier just because there was free capacity then. Over time, the tier might fill up so you should continuously check and see if there are volumes that should be moved to a different tier. In this case, you can set up Tivoli Storage Productivity Center so that the analysis phase runs regularly (for example, every 1 to 14 days).

9.2.2 Considerations for using Analyze Tiering

In this section, we list various considerations regarding the use of the Analyze Tiering function:

 Tivoli Storage Productivity Center is always moving full volumes from one tier to the other, so Tivoli Storage Productivity Center tiering is not the same as the SVC and Storwize Easy Tier function.

Note: All movement of storage will be contained within the same storage device.

- The analysis is always based on the primary copy of a volume or VDisk because that is the volume receiving the read I/Os.
- ► The analysis is a two-phase task:

In the first phase, you select the resources and parameters and Tivoli Storage Productivity Center will run an analysis. Analyzing the resources might take a while so Tivoli Storage Productivity Center also provides scheduling capabilities.

The second phase is to review and execute the recommendations. In contrast to the older Storage Optimizer, Tivoli Storage Productivity Center can implement the recommendations for you and you can do this either immediately or create a schedule to be run at a more convenient time.

See 9.2, "Analyze tiering" on page 213 for more information about the phases.

Always review the recommendations before you execute them.

Modes of optimization

You can use the Analysis Tiering function in two ways; automatic and advanced. The primary differences in the two modes are described here:

Automatic mode

In the automatic mode, Tivoli Storage Productivity Center will balance the pools and analyze if it finds volumes that should be up-tiered or down-tiered.

Tips:

If you start the analysis by selecting several volumes, Tivoli Storage Productivity Center will determine which pools they belong to. If there is more than one pool per tier, the automatic mode will be run to balance pools before making any up-tiering or down-tiering suggestions.

If you are unsure what activity limit value to use, consider the Tivoli Storage Productivity Center reported maximum and average activity values in relation to your understanding of your storage device's performance. If there have been no performance problems, set the activity limit somewhat higher than either the maximum or average value (for example: 20%). If there have been performance problems, set the activity limit somewhat lower than either the maximum or average value (for example: -20%). If you are unsure, set the activity limit equal to the current maximum value.

Advanced mode

In the advanced mode option, you can fine-tune your tiering and act even before limits are reached by trying to find a more optimal placement for a volume. You do this by providing minimum thresholds for I/O rate or I/O density, and file usage that volumes need to meet in order to *qualify* to be placed in a certain tier.

For both methods you specify an "Activity limit" for the destination pools. Volumes are not added to destination pools if they cause the activity level of the pools to exceed the activity limit that you want to specify for pools. Basically, it is a contingency value that you can specify as an upper boundary so that you do not overload a pool, by moving volumes into a target pool.

Tip: If you do not know what good values for the advanced mode thresholds are, use the automatic mode.

If you have pools, volumes, and applications that require special handling or should never be included in an analysis, consider using the advanced mode.

How optimization works

In this section, we list the basic functions of storage optimization:

- The automatic analysis always tries to optimize the storage within a tier level first by balancing pools, before making a recommendation to up-tier or down-tier a volume. You might find recommendations to move a volume within a tier.
- The automatic analysis will start at the lowest tier (tier 10) and work its way up to the highest tier (tier 1).
- Tivoli Storage Productivity Center will only look at the selected pools or volumes and the specified targets. It will never make a recommendation outside of the selected source and target pools.
- ► No performance data from the back-end storage systems is required for the optimization.
- From the specified target pools, Tivoli Storage Productivity Center will only work with pools that meet the following conditions:
 - The pool must be online.
 - The pool must be in a non-error state.
 - The pool must have sufficient available space.
- If you schedule the optimization run to be executed at a later time, Tivoli Storage Productivity Center will perform some basic checks, but it will not run the analysis again. The basic checks include:
 - Check for sufficient space.
 - Check that the volume is still in the same source pool.
 - If the volume is using VDisk mirror, the status is checked.
- During analysis, the activity score of a destination pool must not exceed the activity limit value.
- Automatic mode. During the analysis, Tivoli Storage Productivity Center will use the new calculated average and maximum activity for all storage pools within the same tier. Additionally, a wanted activity limit must be calculated based on the sum of the maximum read I/O rate and write I/O rate operations that you want to specify as limits divided by the average capacity of all the pools on the same tier.
- Advanced mode options. In addition to the data from the Automatic mode, I/O density or I/O rate with minimum threshold level and percentage of file accessed and the period of accessing the files are used for tiering analysis.
- Tivoli Storage Productivity Center is using the VDisk mirror function to move a volume from one pool to another. This is online and transparent to the application, and can even be used if the pools are using different extent sizes.

- For volumes that are already using VDisk mirroring, the primary copy gets analyzed. When you execute a recommendation for a mirrored volume, Tivoli Storage Productivity Center will delete the primary copy and create a new copy in the recommended location. You can choose which of the volume copies will be set as the primary copy after completing the execution. For more information, see "SVC stretched cluster considerations" on page 216.
- Tivoli Storage Productivity Center no longer needs you to specify the storage pool capabilities in the SVC or Storwize V7000 storage pool properties panel in terms of how many read I/Os are regarded as the maximum that this pool can do. Even if you have non IBM storage systems, you do not need to set up the pool capability because this was only used with optimization in prior versions.

Additional considerations

Here is a list of additional considerations for implementing Storage Optimization:

- ► The tiering analysis can be set up in a way that you can use capacity pools as boundaries for recommendations. You may also choose whether to enforce service class restrictions.
- It is not possible to run an analysis and have Tivoli Storage Productivity Center make recommendations to move volumes from one storage system to another, but you can include multiple storage systems in one analysis task.
- Be aware that Tivoli Storage Productivity Center tiering analysis is only looking at performance and not availability, so when you select pools as target pools you should make sure that they provide the same level of availability as the source pools.

If you consider one pool to be more available than another pool, you can use the capacity pool concept to group the pools. Then, tell Tivoli Storage Productivity Center to only make recommendations within the boundaries of capacity pools.

- When Tivoli Storage Productivity Center is recommending to move a volume from an SVC Easy Tier pool down to a non Easy Tier pool, check the SVC heat map using the Storage Tiering Advisor Tool (STAT) to confirm that this volume can be moved down. The I/O density or the file age calculation can sometimes lead to a decision that is not optimal.
- Tivoli Storage Productivity Center is using SSH sessions to communicate with the SVC or Storwize storage system. The number of available SSH sessions are limited to 10 with recent versions of the SVC software. As a result, you should not run too many tasks in parallel, or otherwise Tivoli Storage Productivity Center might use up all the sessions.

SVC stretched cluster considerations

There are some considerations when you are using SVC stretched cluster:

- Volume movement is implemented by using VDisk mirroring. If you are using VDisk mirroring already as in stretched cluster environments, Tivoli Storage Productivity Center will have to drop one of the VDisk copies first, before it can implement any recommendation. You can argue that this may compromise the availability of a volume, but it is a limitation of SVC that you can only have a maximum of two VDisk copies per volume.
- ► The optimization wizard will ask if you want to include mirrored volumes or not.
- Currently, Tivoli Storage Productivity Center will not analyze and optimize both copies. Tivoli Storage Productivity Center will always delete the primary copy of a volume, and create a new copy in the recommended pool. During the definition of the optimization task, you can choose which of the volume copies should act as the primary copy once the task is completed.
 - If the new copy will act as the primary copy, your application will benefit from the optimization, but the other copy (which stays the secondary copy) is left in the original tier.

- If the secondary becomes the primary, your application will not immediately benefit from the optimization but now this copy receives the read workload. It is likely to be optimized in the next optimization run.
- You can use capacity pools to group the storage pool for each site even if you do not plan to use any cloud configuration. This enables you to limit Tivoli Storage Productivity Centers analysis to only make up-tiering and down-tiering suggestions within one site. You can still use a single job for the analysis.

9.2.3 Requirements for using Storage Optimization

In this section, we look at the requirements for using the Storage Optimization function.

License and hardware

You can use this function with only with IBM SmartCloud Virtual Storage Center V5.2.2. The function is only supported for:

- IBM SAN Volume Controller
- IBM Storwize V7000 and IBM Storwize V7000 Unified

Note that the Analysis Tiering is limited to the block storage part of the V7000 Unified.

Although other members of the Storwize family use the same code and provide the same set of underlying commands, they are not supported.

Note: Any storage that is supported by SVC or Storwize and is configured as a storage pool (managed disk group) in the storage system can be used with this function because the function works on the SVC or Storwize storage systems.

Required privileges

You need to have administrator authority in Tivoli Storage Productivity Center to start this function.

Tier levels

You need to have set up the tier levels for the storage pools on the supported devices. On the back-end devices, you do not need to set a tier level for this function to work, but it can be helpful for other uses.

Performance data collection

Before using the Storage Optimization function, you must collect performance data for the storage systems.

You need a minimum of one day of performance data, but to make more accurate recommendations you should have more data. Figure 9-3 on page 218 shows an example of a message that you will see when there is not enough data available.

1	Optimization requires performance data for all storage systems involved in th optimization. The selected storage systems do have performance monitors running, but 24 hours worth of performance data is not yet available. 14 days worth of performance data is recommended for accurate optimization.
▼ Deta	ils
🔒 sv	/C-2145-ITSO_SVC_CF8-IBM lacks 24 hours of performance data

Figure 9-3 Not enough performance data available

This prerequisite is true for the source volumes and pools, as well as for the target pools. When you create new volumes or new pools, they cannot be optimized within the first day, and should only be optimized after 14 days.

Note: By default, Tivoli Storage Productivity Center will perform the analysis over a period of the last 14 days, but you can edit this value by using this tpctool command:

tpctool setdscfg -url localhost:9550 -user <user ID> -pwd <password> -property tiering_pm_days -context tiering <number of days>

At this point, this is the only parameter that you can change in the command-line interface (CLI).

9.2.4 Using Analyze Tiering

In this section, we walk you through using analyzing tiering up to the point of the analysis.

There is no real implementation of this function other than setting the Tier information for the storage pools, as we described in 7.2.1, "Assign the tier to storage pools" on page 164.

In the remainder of this section, we show the Analyze Tiering function:

 When you have defined your tiers, you can simply select a couple of volumes, or SVC or Storwize pools and select the **Analyze Tiering** function from either the action menu or the context menu, as shown in Figure 9-4 on page 219.

A Storage	Resources > Pools			٦	Fivoli Storage Pro	Juctivity Center			ſ	POKVC1\\administrator	1 🕐
Home Home Storage Resources	Pools	DOIS 15 Normal 0 Warning 0 Error									
Server Resources Network Resources Advanced Analytics Reporting Reporting Settings	E Actions ▼ Name S sad D 05300 site1 p01 S 05300 site1 p03 D 05300 site1 p02 D 05300 site1 p02 Stowno 4 liems 1 Selected 2	Storage System Storage System SVC CF8 SVC CF8 SVC CF8 SVC CF8	Status © Online © Online © Online © Online	Utilization (%) (%) % % % % % % % % % % % % % % % %	Tier C 2 4 4 4 4 4	Allocated Sr Analyze Tiering Balance Pools Set Tier Add to Capacity Pool	127.66 21.03 226.75 65.04	Solid State 5 Yes 3 No 12 No 3 No	C Storage System + Tier Capacity SSD (*	SVC_CF8 R R R R R R R R R R R R R R R R R R R	keset

Figure 9-4 Start Analyze Tiering

Tip: Use the filter function to limit what gets listed in the table; for example, we used a filter on the Storage System and entered SVC_CF8 as the name of one of the SVCs.

2. In our scenario, we manually select the target pools in order to show you the next step of the wizard. Figure 9-5 shows the result of choosing this option.

Analyze Tiering						
Select one or more target	pools to optimize the placeme	nt of volumes.				
i≡ Actions ▼					C	Filter
Name	Storage System	Status	Utilization (%)	Tier 4	Capacity	Allocated Space (GiE IJ
🛞 ssd	SVC_CF8	Online	1%	2	274.75	127.86
8 DS8300_site1_p01	SVC_CF8	Online	0%	4	40.00	21.03
🛞 DS8300 site1 p03	SVC CF8	Online	0%	4	318.50	226.75
8 DS8300_site1_p02	SVC CF8	Online	0%	4	140.00	65.04
6						>
Showing 4 items Selected 0 i	items					Refreshed 61/2 minutes ago
choing month occord of						rionositou ezz minutos ugo
0						
U		■ Back	- ixell			Cancel

Figure 9-5 Manually select the target pools

3. There are volumes that use the VDisk mirror in the selected pools in Figure 9-6. The wizard presents you with a choice of what to do with those volumes.

Analyze Tiering			
If you optimize volumes w volume is created in the d its copy as the primary vo	ith mirrored volumes, the primary volu estination pool. You can specify wheth lume.	me is removed, and a copy of the secondar er to set the original secondary volume or	У
Volume	Primary Volume Pool	Secondary Volume Pool	J.
TPCDB52	8 <u>ssd</u>	8 DS8300 site1 p03	
ITSO_test_v05	🋞 <u>ssd</u>	8 DS8300 site1 p03	
Optimize volumes with	n mirrored volumes		
۲	Back Next I	Canc	el

Figure 9-6 VDisk mirrored volumes detected

You must select the check box **Optimize volumes with mirrored volumes** if Tivoli Storage Productivity Center should include the primary copies of those volumes in the analysis.

4. In the next step, you must decide if you want to use the automatic or the advanced tiering mode. If you just set a pool threshold in Figure 9-7 and click **Next**, you will be using the automatic mode.

Analyze Tiering
Optimize the Placement of Volumes Analyze pool activity over the previous 1 2 days Restrict Volume Placement Colocate volumes assigned to the same server or hypervisor: Yes
Tier Policy Show advanced options Tier 2 Current average activity: - Current max activity: - Activity limit: * Help me calculate
Analyze Cancel

Figure 9-7 Selection thresholds and the optimization mode

If you check the **Show advanced options** box, the wizard will change as shown in Figure 9-8 on page 221.

Analyze Tiering
Optimize the Placement of Volumes Analyze pool activity over the previous 1 + days Restrict Volume Placement Colocate volumes assigned to the same server or hypervisor: Yes Tier Policy Show advanced options
Tier 2 Current average activity: - Tiering Thresholds Current max activity: - ✓ I/O Density ▼ I/O per second per GiB: 80 Activity limit: * ✓ Percentage of files: 26 ♀ Last accessed within: 1 day ▼ Help me calculate Help me calculate Help me calculate Help me calculate
Analyze Cancel

Figure 9-8 Advanced tiering options. I/O Density and I/O rate are in the same drop-down box.

You can now change the thresholds for the given tier level.

Note: The default values for I/O density or I/O rate are not based on any analysis. You need to change those numbers based on your system requirements.

If you do not know what threshold values to use, consider using the automatic mode. The advanced mode implies that you understand the workload of the tiers and that you need this flexibility.

5. Calculate the Activity limit by clicking on the Help me calculate link. This will display Figure 9-9 on page 222. This value is set to the sum of the maximum read I/O rate and the write I/O rate operations that you want to specify as limits divided by the average capacity of all of the pools on the same tier. Additionally, the maximum write I/O rate is the highest value that a pool in the storage tier can accommodate in conjunction with the read I/O and vice versa. They must stay within desired performance bounds.

	Tier 2
Analyze Tier	Calculate the Activity Limit
Optim	The activity limit is set to the sum of the maximum read I/O rate and
Analyze p	the average capacity of all of the pools on the same tier.
Restrict	Maximum write I/O rate:
Colo	Maximum read I/O rate:
	Average pool capacity: 2376.62 GiB
Tier Polic	
Tier 2 -	Calculated activity limit: -
Curr	
Curr	OK Cancel
Activ	
	Help me calculate
0	Back Analyze Cancel

Figure 9-9 Calculate the Activity Limit

In our scenario, the tiering analysis did not find any volumes that needed to be moved based on the specified thresholds. The Tiering Analysis result window in Figure 9-10 does not show any results.

Tiering Analysis	nalysis								
Related Resources:	Based on the analysis of for tiering or balancing p the messages in the log	T96 Rename the current performance data, sools, schedule the task to anal file.	none of the source volumes re yze the source volumes or poo	equire relocation to other stora Is to run at regular intervals. F	Completed: ge virtualizer pools. To reg or more information, click	28 Nov 2013 12:11:31 EST Duration: 2 seconds <u>Open Loss</u> ularly monitor conditions the Open Logs link to view			
	Analysis Recommendations]							
	I Actions 👻								
	Pool	Storage System	Original Utilization (%)	Projected Utilization (%)	Current Space (GiB)	Projected Spac IJ			
			🚺 No items fo	sund					
	<					>			
	Showing Uitems Selected 0 items					Refreshed a few moments ago			
@ Need Help		Exect	ite Delete Close						

Figure 9-10 Analysis result

6. You can still create a recurring schedule when you select Schedule and then Analysis in the upper left corner as shown in Figure 9-11. Tivoli Storage Productivity Center will use the selections that you made when you stepped through the wizard, and it will regularly analyze the potential for optimization.

Schedule Tie	eringAnalysis	s_20131128_1	21127969	
Analysis:	Enabled	▼ 18:30	EST • Every 7 days	•
		Save	Cancel	

Figure 9-11 Schedule analysis task to run repeatedly

Even though the analysis part is scheduled, you still have to review the results and execute them manually.

You should now have a good understanding how to set up the first phase of this two-step function. The execution part is similar to the volume transformation tasks.

9.3 Balance Pools

The Balance Pools function provides basically the same function as previously described for the Storage Optimizer, but there are a few differences:

- By setting a tier level to storage pools, Tivoli Storage Productivity Center understands what pools are treated equally.
- ► The function has been moved from the stand-alone GUI. It is now completely integrated into the new web-based GUI.

There are several new terms and the panels look different, but if you have used the Storage Optimizer in prior releases, you will understand this function very quickly.

9.3.1 When to use Balance Pools

Here are some situations where you might want to use the Balance Pools function:

- You recently provisioned new volumes in your environment and now performance data has been retrieved for the new storage, which is in the same tier to the same storage virtualizer as your existing storage. Your existing storage is likely to be used in an unbalanced way. This is when the Balance Pools function will be helpful because it will provide you with suggestions as to which volumes you should migrate so that each pool in the tier receives roughly the same workload, and thus avoid hot spots.
- You recently provisioned new volumes in your environment and now the new storage has been set up and assigned in the same tier to the same storage virtualizer as your existing storage. Your existing storage in the same tier is likely to be used in an unbalanced way. This is when the Balance Pools function will be helpful because it will provide you suggestions on which volumes you should migrate from one pool to the other so that each pool in the tier receives roughly the same workload, and thus avoid hot spots.
- Workloads also change over time, so you can let Tivoli Storage Productivity Center run a balance analysis on a set schedule and see whether there is potential to optimize the distribution of the volumes.

Note: The scenario to empty one pool and move all volumes from one pool to other pools is now part of the Transform Storage function using the Migrate Pool option. You simply select all volumes of a pool and start the transformation for the context or actions menu.

9.3.2 Considerations for using Balance Pools

In this section, we list various considerations regarding the use of the Balance Pools function:

- You select pools and not volumes (like in Analyze Tiering), and you need to select at least two pools per storage system, per tier.
- The analysis is always based on the primary copy of a volume or VDisk because that is the volume receiving the read I/Os.
- If you have multiple sites, you need to be careful when you select the target pools for this optimization so that Tivoli Storage Productivity Center will not move the volumes of a server into another location, which may result in a higher response time between storage and server, even though the back-end is better utilized.

Tivoli Storage Productivity Center does understand the location of a storage system. But from that perspective, an SVC stretched cluster is running in two locations, and this is currently not supported by Tivoli Storage Productivity Center.

Therefore, you should define one task per location, and in general not mix pools of different locations.

The Balance Pools function is different from the Perl rebalance script that is available, as shown in Table 9-1.

	Tivoli Storage Productivity Center Balance Pools	SVC Perl rebalance script
Boundary	Across pools	With one pool
Purpose	Analyze and optimize volume performance	Avoid hotspots simply by restriping extents across all MDisks, without taking actual performance numbers into consideration
Granularity	Volumes	Extents

Table 9-1 Comparing Tivoli Storage Productivity Center Balance Pools and SVC Perl rebalance script

9.3.3 Requirements for using Balance Pools

The following requirements apply when you want to use Balance Pools.

License and hardware

You can use this function only with IBM SmartCloud Virtual Storage Center V5.2.2.

The function is only supported for:

- IBM SAN Volume Controller
- IBM Storwize V7000 and IBM Storwize V7000 Unified

Although other members of the Storwize family use the same code and provide the same set of underlying commands, they are not supported.

Note: Any storage that is supported by SVC or Storwize and is configured as a storage pool (managed disk group) in the storage system can be used with this function because the function works on the SVC or Storwize level.

Required privileges

You need to have administrator authority in Tivoli Storage Productivity Center to start this function.

Tier levels

You need to have set a tier level for the storage pools on the supported devices. On the back-end devices, you do not need to set a tier level for this function to work, but it can be helpful for other uses.

You need a minimum of one day of performance data, but to make more accurate recommendations you should have more data. Figure 9-3 on page 218 shows an example of a message that you will see when there is not enough data available.

9.3.4 Using Balance Pools

At this point, we provide a quick walk-through on how you would use this function. Since there is no unbalanced workload in our environment, no recommendations are shown at the end:

1. You can start the Balance Pools function from any list of pools. Because Tivoli Storage Productivity Center can only balance pools within one storage system, and because we have shown the Analyze Tiering function for the panel that shows all pools, in Figure 9-12 we now use the Pools panel of one SVC.

🖀 Storage	Resources > Storage Systems > SVC_CF8		POKVC1\\administrator (2)
Home Home Storage	SVC CEB	Pools A Normal O Denfermance Denfermance	
Resources	IBM SAN Volume Controller - 2145		
	Actions	Image: Status ▼ Utilization (%) Tier Capacity Allocated Space (GIB) Physical Allocation (%)	Q ▼ Filter Unallocated Volume U
Server Resources	General	Image: Second start p03 Online 0% 4 View Performance 228.29 24% Image: Second start p01 Online 0% 4 View Performance 21.03 5%	
Network Resources Advanced Analytics Reporting	 Properties Aletts (2) Tasks (145) Data Collection (2) Data Collection (2) Data Collection (2) Nanged Disks (33) RAID Arrays (1) Disks (2) I/O Groups (1) Nodes (2) Ports (8) Hots Connections (6) 	Image: Second	
	Servers (3) Hypervisors (1) Fabrics (1) Switches (1) Back-end Storage Systems (2)	Shoving 4 titems Selected 3 items	> Refreshed a few moments ago

Figure 9-12 Initiate Balance Pools

2. You select the pools and either use the Actions menu or the context menu to start the function.

When you click **Next**, Tivoli Storage Productivity Center checks for VDisk mirrored volumes, as you can see in Figure 9-13.

Balance Pools								
The migration of the primary volum balance a pool. When you migrate t secondary volume is created in the	e in a mirrored volume relationsh the primary volume, the primary v destination pool.	ip to another pool might be required to olume is removed, and a copy of the						
Volume 🔻	Primary Volume Pool	Secondary Volume Pool 🛛 🕔						
B MST_VM_TEST	8 DS8300 site1 p02	8 DS8300 site1 p01						
ITSO_test_v20	8 DS8300 site1 p02	8 DS8300 site1 p02						
Exclude volumes in mirrored volumes	lume relationships							
Include volumes in mirrored volume relationships								
Need Help	■ Back Next ►	Cancel						

Figure 9-13 Define what to do with mirrored volumes

This panel references VDisks with two copies, not to Metro Mirror or Global Mirror relationships.

3. On the next panel, shown in Figure 9-14, you can set the maximum utilization (in terms work workload) and how many days should be analyzed. Additionally, there is an option to restrict volumes assigned to the same server or hypervisor from being separated between the source and destination pool.

Balance Pools	
Balance pools by redistributing volume workload across pools on the same tier. Analyze pool activity over the previous 1 🔷 days Restrict Volume Placement Colocate volumes assigned to the same server or hypervisor: Yes	
✓ Advanced balancing Tier 2 Current average activity: - Current max activity: - Activity limit: * Help me calculate	
Image: Second	

Figure 9-14 Balance Pools analysis settings

Like the tiering analysis on 9.2.4, "Using Analyze Tiering" on page 218, item 5, Calculate the Activity limit by clicking the **Help me calculate** link. This displays Figure 9-9 on page 222.

During the analysis, Tivoli Storage Productivity Center looks at pools with an above average utilization to analyze which volumes, if any, should be moved to other pools. The target pools must be able to accept the additional workload for the balance to work, so if all pools have a higher utilization than you have specified in the wizard, Tivoli Storage Productivity Center will not be able to optimize anything.

In our example, all pools were already within 10% of the average activity and thus no action was required to balance them. Thus, the result of the analysis looks like Figure Figure 9-15.

Balance Analysis									
BalanceA Schedule	InceAnalysis_20131204_13420 × Completed: 4 Dec 2013 13:42:08 ES Duration: 2 second dule								
Related Resources: B DS8300 site1 p02 DS8300 site1 p03 DS8300 site1 p01	Based on the analysis of the current performance data, none of the source volumes require relocation to other storage virtualizer pools. To regularly monitor conditions for tiering or balancing pools, schedule the task to analyze the source volumes or pools to run at regular intervals. For more information, click the Open Logs link to view the messages in the log file.								
	Analysis Recommendations								
	i≡ Actions ▼								
	Pool	Storage System	Original Utilization (%)	Projected Utilization (%)	Current Space (GiB)	Projected Sp:			
			1 No items fo	und					
	<					>			
	Snowing unterns Selected Unterns				Retres	ied a iew moments ago			
@ Need Help		Execu	e Delete Close						

Figure 9-15 Analysis result

The recommendations results are shown on the second tab, but in this example it was empty as well as you can see in Figure 9-16 on page 228.

Balance Analysis						
BalanceA Schedule	nalysis_20131204_1342	056 Rename			Completed: 4 Dec	Duration: 2 seconds Open Logs
Big DS8300_site1_p02 Big DS8300_site1_p03 Big DS8300_site1_p03 Big DS8300_site1_p01	Based on the analysis of conditions for tiering or I Logs link to view the me Analysis Recommendations	the current performance data, balancing pools, schedule the ta ssages in the log file.	none of the source volumes re ask to analyze the source volur	equire relocation to other storag mes or pools to run at regular i	ge virtualizer pools. To regular ntervals. For more informatior	ly monitor 1, click the Open
	I Actions 💌					
	Volume	Source Pool	Destination Pool	Source Tier	Destination Tier	Server IJ
	<		There are no recommenda	lions for this task.		>
	Showing 0 items Selected 0 items				Refres	hed a few moments ago
Need Help		Execut	e Delete Close			

Figure 9-16 Analysis recommendations

However, just like for the Tiering Analysis you can still create a recurring schedule when you select Schedule and then Analysis in the upper left corner. Tivoli Storage Productivity Center uses the selections that you have made when you stepped through the wizard, and it will regularly analyze the potential for optimization.

9.4 Background information

In this section, we provide some information about the basic concepts that are applied by the optimization analysis.

9.4.1 History of storage optimization

This section provides an overview of how the storage optimization in Tivoli Storage Productivity Center V5.2.2 as evolved. Here is a summary of the history of the storage optimization functions:

Tivoli Storage Productivity Center V4.1 Storage Optimizer

Tivoli Storage Productivity Center V4.1could analyze the utilization of pools and provide recommendations on how to use them better, by trying to either:

- Achieve a more even workload on a set of pools.
- Move volumes to an optimal target pool, for example when a storage system needs to be retired and so all volumes need to be moved to a new location.

The Storage Optimizer was using performance data, asset, and configuration information and software called *Disk Magic* to estimate the impacts of suggested changes to the overall performance. For SVC, the Storage Optimizer would also provide CLI commands to perform the changes, which were not possible for other systems then.

Tivoli Storage Productivity Center V4.2 Storage Tiering Reports

In Tivoli Storage Productivity Center V4.2, a function was added to analyze storage tiers. The function was based on a method used successfully in IBM projects. It required you

install an optional component to the Tivoli Storage Productivity Center server: Cognos. At that time, Cognos was not integrated as Tivoli Common Reporting.

Tivoli Storage Productivity Center V5.1 Tiered Storage Optimizer

In V5.1, the Storage Tiering Report idea was further developed. It created policies that were evaluated on demand by the administrator, by running commands using TPCTOOL, the Tivoli Storage Productivity Center command-line interface.

Tivoli Storage Productivity Center V5.2.2 Storage Optimization

The functions of the Storage Optimizer and the functions of the Tiered Storage Optimizer have been revised and ported to the new Tivoli Storage Productivity Center web-based GUI. Now you can initiate the functions right in the context.

The revision has introduced some new features that make the overall process of optimizing storage much easier than before:

- Tier tags. You can now tag storage pools with a tier level so that Tivoli Storage Productivity Center better understands what you define as a tier and which volumes are in the same or a different tier.
- Moving the volumes. Tivoli Storage Productivity Center can now move the volumes from one pool to the other for SVC and Storwize V7000/V7000U.

9.4.2 Read I/O Capability

There are rules of thumb that you can use to estimate the number of I/Os that a single hard disk can do. If you also factor in the RAID level and the number of hard disks per pool, you can estimate a total number of I/Os for a given storage pool. The Tivoli Storage Productivity Center optimization in earlier versions was based on this estimate, and so you had to provide the information. For environments that were upgraded, the settings can still be viewed on a storage pools property panel on the **Back-end storage** tab.

For new installations, this tab might still show information, but as said earlier, the data will not be used anymore.

Figure 9-17 on page 230 shows an example of a pool where Tivoli Storage Productivity Center was able to determine the Read I/O Capability because the back-end storage system is supported by Tivoli Storage Productivity Center and has been successfully probed.

D\$8300_75L3001 Properti	ies					Last da	ata collection: 20	Oct 2013 21:59:18 EDT
	General	Storage	Back-end Storage	Easy Tier	Volumes	RAID Arrays	Managed Disks	Performance
	Back-end S	Storage Syste	m Type 📲 IBM	DS8000				
	Back-end S	Storage RAID	Level 5					
Pools	Back-end S	Storage Disk T	Type Fiber -	15,000 rpm -	DS8700			
	Back-end S	Storage Disks	12					
	Read I/O C	apability	1,517.0	0 ops/s				
			Edi	t Cl	ose			

Figure 9-17 Storage pool back-end Read I/O Capability has been set

There are situations where Tivoli Storage Productivity Center cannot determine the capability, so this tab will look like the one in Figure 9-18.

D\$4800_PW3501 Properti	es					Last da	ata collection: 20	Oct 2013 23:44:13 EDT
and a	General	Storage	Back-end Storage	Easy Tier	Volumes	RAID Arrays	Managed Disks	Performance
	Back-end S	Storage Syste	m Type 🛛 👩 Unk	nown				
	Back-end S	Storage RAID	Level Unknow	'n				
Pools	Back-end S	Storage Disk T	ype Unknow	'n				
	Back-end S	Storage Disks	-					
	Read I/O C	Capability	0.00 op	s/s				
			Edi	t Cl	ose			

Figure 9-18 Storage pool back-end Read I/O Capability has not been set

Even in this case there is no need to specify any of the information.

When a pool receives more workload than the pool capability, it is likely to get saturated and response times will increase. So the idea of tiering and balancing is to identify pools that are overloaded and try to reduce the workload by moving volumes out of the pool; either to a different pool within the tier or a pool that is a tier level higher or lower.

9.4.3 Analyze Tiering: I/O density and I/O rate settings

The I/O density (sometimes also called *Access Density*) is a measure of I/O throughput per unit of usable storage capacity. It is computed as throughput (in I/Os per second) divided by the capacity (in Gigabytes). The primary use of I/O density is to identify a range on a response time curve to give the typical response time expected by the average customer, based on the amount of total usable storage in their environment.

The I/O rate involves the average read and write I/O operations per second daily. In tiering analysis, the highest daily average over the period for analysis is used.

9.4.4 Analyze Tiering: Percentage of files settings

The percentage of files setting is a different view point for achieving basically the same thing: Tivoli Storage Productivity Center is trying to find out volumes that are used a lot or volumes that are used not so much in order to see if the storage can be used more efficiently.

A volume where a high percentage of the files has not been accessed for the last n days or weeks is likely to have a lower I/O density than a volume where most files are frequently accessed.

Note: To use this setting, you must have Storage Resource agents deployed and you must schedule file scans, so that Tivoli Storage Productivity Center can collect the information about access times. The profile that you have to select for that scan job is called TPCUser.By Access.

10

VMware vCenter Server configuration and use

As of Tivoli Storage Productivity Center V5.2, there are two new independent functions that will help VMware administrators work with the data that Tivoli Storage Productivity Center has collected in the environment. The functions can be used independently:

- The vSphere Web Client is the strategic user interface that VMware will be using in the future. Tivoli Storage Productivity Center has created an extension that enables VMware administrators to view end-to-end information about storage and fabrics in new reports. The extension allows you to start the Tivoli Storage Productivity Center provisioning task from the VMware Web Client. This extension is also referred to as the Tivoli Storage Productivity Center plug-in.
- The Tivoli Storage Productivity Center vSphere Storage APIs for Storage Awareness (VASA) Provider enables storage data to be accessible in the existing vCenter Server reports and views as well as receives Tivoli Storage Productivity Center alerts.

Since the vSphere Web Client is the strategic client interface for VMware, we focus on the use of this interface and where possible only show screen captures of that GUI. In this chapter, we show you how to configure and set up the vSphere Web Client Extension, and what information a VMware user can easily gain from VMware.

If you are interested to learn more about the interaction, we also show you how to add VMware to Tivoli Storage Productivity Center, and later we show you how Tivoli Storage Productivity Center can make the life on a VMware administrator easier.

10.1 Introduction to VMware in Tivoli Storage Productivity Center

The Tivoli Storage Productivity Center web-based GUI is used to add a vCenter Server or an ESX Hypervisor to Tivoli Storage Productivity Center. Therefore, we start with an introduction on what Tivoli Storage Productivity Center can report on VMware. VMware has been available since Tivoli Storage Productivity Center V5.1. Read this chapter to understand the rationale and the steps to add VMware to Tivoli Storage Productivity Center *before* you add the Tivoli Storage Productivity Center functions to VMware.

10.1.1 Hypervisor information

We first provide examples of information that you can easily obtain from the Tivoli Storage Productivity Center web-based GUI without using any of the new functions. We walk you through the panels and show the links that enable you to drill through to other panels. You start from the Hypervisor Level 2 panel as shown in Figure 10-1.

	合 Server Re	esources > Hypervisors			Tivoli Storage Produc	tivity Center			ST3L10-W2\\adm	nistrator 🤉 🕐
	Home	Hypervis	sors							
	Storage	A 0 Warning ⊗ 0 Error								
R	lesources	Hypervisors Alerts Tasks	Discovered Virtual Mach	ines						
		Add Hypervisor 🗄 Actions 👻		_					Q -	
4	Server	Name Cluster	Status 🔻	Probe Status	OS Type	OS Version	IP Address	Used Space Total Di	sk Space (GiB) Disk Space fro	m Storage 🛿
R	Resources	poksrv3.itso.ibm.com	Normal	Successful	VMware ESX	5.1.0		10.13	996.90	304
_	Network									
R	(Columbia)									
A 7	Advanced Analytics									
F	Reporting									
103	Settings									
		Showing 1 item Selected 0 items	m						Refreshed a	few moments ago

Figure 10-1 Overview of all hypervisors

Here you can already see the hypervisors known to Tivoli Storage Productivity Center. If you switch to the tab Discovered Virtual Machines, you see a list of all virtual machines in all of the hypervisors. In our case, we only had one VM as shown in Figure 10-2 on page 235.

This list contains all the discovered virtual machines that are not modeled in Tivoli Storage Productivity Center in any other way. This means that they do not have a Storage Resource agent (SRA) running and they are not added as an agentless server. This is a list of unmanaged servers.

Server R	esources > Hyper	visors				ST3L10-W2\\administrator 🤅 🤅
	05	Hypervis	sors			
Home	03	🛛 1 Normal 🕖 0 Warning				
	0511	⊗ 0 Error				
Storage Resources	Hypervisors	Alerts Tasks	Discovered Virtual Machines			
	🗟 Add Serv	er 🛯 📃 Actions 🔻				🔍 🔻 Filter
	Name	🔺 IP Add	iress OS Type	Hypervisor	Discovered Time	U
Resources	🔯 pokvc1	9.12.5.2	01 Microsoft Window	poksrv3.itso.ibm.com	28 Oct 2013 18:31:40 EDT	
Network						
Resources						
Advanced Analytics						
Reporting						
*						
Settings						
	Showing 1 item	Selected 0 items				Refreshed a few moments ago

Figure 10-2 Discovery of virtual machines

Overview information

To get details about the hypervisor, simply click the hyperlink under the Hypervisor column. Tivoli Storage Productivity Center will display the Overview panel (shown in Figure 10-4 on page 236) of the hypervisor that the selected virtual machine is running on. You could also go to Figure 10-3 and double-click the wanted hypervisor.



Figure 10-3 Details of a hypervisor

The first panel that you see is the Overview panel with capacity and performance information about the hypervisor. This dashboard shows information that was collected on the storage system and that was correlated to this hypervisor, for example the Most Active Storage System Volumes.

At the upper left under the picture of the hypervisor, there is an Actions menu. From this menu, you can start actions such as provisioning and tiering optimization.

Data Path panel

In the General section, you find information like the properties, data collection, and alerts for the hypervisor. The Data Path in a graphical form, as shown in Figure 10-4, can be launched.



Figure 10-4 Data Path from the ESX perspective

If you open the Data Path, as highlighted in Figure 10-4, you see that virtual machine located on top of the ESX server. If an SRA or serverless agent was configured for any virtual machines, they will also be shown on top of the VMware hypervisor.

Note: With Microsoft Internet Explorer 9 and later, the Data Path panel opens in a separate window. With Firefox, the Data Path is shown within the Tivoli Storage Productivity Center window. To view Data Path, you need to have installed the Adobe Flash Player plug-in.

Virtual Machines panel

On the left pane, you can see Internal Resources information, which includes Virtual Machines, Disks, Controllers, VMDKs, and Data Stores. If you click any of those items, Tivoli Storage Productivity Center provides information about them including identified correlations.

If you click **Virtual Machines** under the Internal Resources heading, you are presented the panel as shown in Figure 10-5 on page 237.
A Server R	esources > Hypervisors > tucker.storon.ibn	.com			Tivoli Storage Produc	tivity Center - Virtual Storag	e Center Edition					root (Admir
Home Storage	tucker.storage.tucson.ibm.com			Virtual Machines								
Resources		IE Act	ctions 🔻									🔍 🔻 🛛 Filte
	Actions -	Name	;	Status 🔻 Agent	Data Stores	Configuration File	OS Type	Processor Count	RAM (Capacity	VMDKs	
	General	🖹 🖹 alas	iska	Normal	datastore3_al	alaska.vmx	Red Hat Enterprise Linux 6 (64		1 8	00 90.00	Idatas	
Server	Overview	iow	wa	2 Normal	datastore2 io	iowa.vmx	Novell SUSE Linux Enterprise 1		1 2	00 50.00	datas	
Resources	Properties	D, nev	vada	Normal	datastore1 n	nevada.vmx	Microsoft Windows Server 20		1 4	00 100.00	datas	
Network Resourced Advanced Analytics Reporting Settings	Ansa (a) Tasa (a) Tasa (a) Tasa (b) Tasa (b) Tasa (b) Tasa (b) Tasa (b) Tasa Machines (4) Contorles (5) Contorles (5) Contorles (5) Tasa (b) Ta		52	Normal	III USSK VASAZ	vas£2.vmx	Ked fat Enterprise Linux 8 (sk		1 2	00 10.00		

Figure 10-5 Virtual machines of this hypervisor

On this panel, you can easily see if a virtual machine is using capacity from one or more data stores. If it is one data store, you can directly see the name of it in the panel. If there are multiple data stores, you will see a number under the Data Stores heading. Click the number to see a list of those data stores (refer to 10.2, "Navigating in the properties panels" on page 239).

Disks panel

If you click **Disks** under the Internal Resources heading, you are presented the panel shown in Figure 10-6.

☆ Server R	esources > Hypervisors > tucker.storon.ibm.com		Tivoli	Storage Produc	ctivity Center - Vi	irtual Storage C	Center Edition				administrator	(Administrator) 🧿
Home Home Storage Resources Server Resources Server Resources Network Resources Advanced Analytice	Strate Systems (1)	Disk Disk Construction Construction Disk	Pathe Image: 1 I	Vendor I ServeRA S ServeRA S ServeRA S ServeRA S IBM 2 IBM 2	Model Fit vvcl_0 Vr vvcl_1 Vr vvcl_2 Vr vvcl_3 Vr 2167590 -1-	itmware 1.0 1.0 1.0 1.0 44 44	Serial Nu 8000 8002	Capacity (GiB) 156.42 156.42 156.42 156.42 156.42 56.00 56.00	Available 0.00 0.00 0.00 0.00 0.00 0.00 0.0	Used Space (G 136.62 136.62 136.62 0.00 0.00 50.00	Data Storet By datastoret nevada By datastoret Jatasta By DSSK VASA2	(Filler)
Settings	B Volumes (2) B Pools (1) B RAD Arrays (5) B Datas (40) B Controllers (1) B Ports (58) C Fabrics (1) Switches (1) Switches (1) B Ports (2)											
		Snowing 6 rems Selected 0 items									Refresh	ed a rew moments ago

Figure 10-6 Internal and SAN-attached disks from an ESX perspective

VMDKs panel

If you click **VMDKs**, under the Internal Resources heading, you are presented the panel shown in Figure 10-7.

☆ Server F	tesources > Hypervisors > tucker.storon.ibm.com		Tivoli Storage Productivity Center - Virtual Storage Cen	nter Edition		root (Administrator)
	05	VMDKs				
Home						
Storage Resources	tucker.storage.tucson.ibm.com VMware ESX 50.0	i≣ Actions ▼	La ma			🔍 🔻 [Filter
Server	General Overview	[datastore1_nevada] nevada/nevada.vmdk [datastore2_iowa] iowa/iowa.vmdk [datastore2_alaska] alaska/alaska.vmdk	Size (GID) Data Store 100.00 C datastore1 nevada 50.00 C datastore2 iowa 90.00 C datastore3 alaska	D, nevada D, iowa D, iowa	Storage System	
(Contraction of the second sec	Properties Alerts (0) Tasks (0) Data Collection (1) Pata Eath	[DS8K_VASA2] vasa2/vasa2.vmdk	10.00 🔓 DS8K VASA2	B vasa2		
Network Resources	Internal Resources Virtual Machines (4) Controllers (5)					
Advanced Analytics	Disks (6) Data Stores (5) VMDKs (4)					
Reporting	Storage Systems (1) Fabrics (1) Storage Systems (1) Fabrics (1) Switches (1)					
Settings	Ports (1)					

Figure 10-7 Virtual machine disks (VMDKs) of this particular hypervisor

On this panel, you can see the virtual machine disks that store the contents of the hard disk drive for the virtual machine.

For the Related Resources, we selected the Volumes panel located under the Storage Systems. Figure 10-8 shows the volumes that this ESX server is using from the storage system perspective.

A Server F	Resources > Hypervisors > tucker.storon.ibm.com	Twoli Storage Productivity Center - Virtual Storage Center Edition	administrator (Administrator) 🧷
Home Home Storage Resources	Under ESX 5.0.	Volumes 2 Jornal 0 Valmag 0 Error Volumes Volume Mappings Performance Parformance	
Server Resources Network Resources Advanced Advanced Reporting Settings	Centeral Overview Properties Anters (n) Tasks (n) Data Colection (1) All Data Path Internal Resources Virtual Machines (11) Outroiters (5) Data Stores (5) ValVas (8) Extrage Systems (1) Exolution Resources Storage Systems (1) Volumes (2) Pool (1) RAD Arrays (5) Data Stores (5) Outroiters (1) Ports (36) Tota Connectorus (6) Fartis (1) Storage (1) Storage Systems (1) Storage Systems (1) Data Stores (1) Data Stores (1) Data Stores (1) Storage Static Connections (6) Fartiss (1) Storage Statics (1) Storage Statics (1) Storage Static (1) Storage Static	Rofresh [= Actions * Nume Pool Storage System Status * Capacity Hosts Allocated Il adrian_Vasa_1 Ib En P1 In DS000_107.758A27148M Immal 50.00 4 Il adrian_Vasa_2 Immal FB_P1 Immal 50.00 9	Space (GIB) Physical Allocation (%) S Ib 33.0 66% 0 26.00 5% 0 26.00 5%
		s] Showing 2 tems Selected 0 tems	Refreshed a few moments ago

Figure 10-8 Volumes from storage system perspective

The Volume Mappings tab is shown in Figure 10-9. It puts the information from the internal Disks perspective and the Storage System Volumes perspective into a single table to show the relationship.

A Server F	Resources > Hypervisors > tucker.storon.ibm.com	Thvoli Storage Productivity Center - Virtual Storage Center Edition	administrator (Administrator) 🧿
Sorver F Home Home Storage Resources Server Resources Network Resources Advanced Analytics Reporting	esecurces > Hypervisers > tucker.storon.bm.com 500 500 500 500 500 500 500 50	Volumes Volumes <td< th=""><th>administrator (Administrator)</th></td<>	administrator (Administrator)
Settings	Pools (1) Pools (2) DAD Arrays (5) Dals (46) Controllers (1) Ports (26) Host Connections (6) Fantic (1) Switches (1) Switches (1) Ports (2)		
		Showing 3 tems Selected 0 tems	Refreshed a few moments ago

Figure 10-9 Correlation between Storage System Volumes and the Disks of an ESX server

On each of the panels there are filters, action, and context menus allowing you to take actions, show additional information, or focus on objects. You can also add, remove, and rearrange the columns of any of the tables.

This section provided an introduction to some of the different views on virtual machine resources that are available in Tivoli Storage Productivity Center. In the next section, we look at the information you can get from the properties panels and how you can use that information.

10.2 Navigating in the properties panels

In this scenario, we demonstrate how you can navigate in the properties panels to learn more about how resources are connected. In the list of virtual machines shown in Figure 10-5 on page 237, you can see that the virtual machine vasa2 is using storage in one datastore. We show you how you can use the properties panels to get to this information.

1. First, click the hyperlink in the Data Stores column to open the Data Stores tab within the properties dialog of that virtual machine (vasa2) as shown in Figure 10-10 on page 240.

vasa2 Properties		
	General Data Stores VMDKs	
	I≡ Actions ▼	🔍 🔻 🛛 Filter
	Name 🔺 Type File System File System Type	Cluster Data Stor IJ
Virtual Machines	BS8K_VASA2 Concaten Concaten Concaten Concaten Concaten	
	Showing 1 item Selected 0 items	Refreshed a few moments ago
	• •	
	Close	

Figure 10-10 vasa2 Properties with the Data Stores tab opened

Now you can already see which datastores the VM is using.

You could now write down the datastore name, and go to the Volumes Mappings panel in Figure 10-10, but there is also an easier way.

2. Click the VMDKs tab. This immediately provides the name and the volume name on the storage system side. Figure 10-11 shows the datastore properties.

vasa2 Properties									
	General Data Stores VINDKs								
	i≘ Actions ▼	🔍 🔻 Filter							
	Path A Size (G Data Store Volume Storage System	IJ							
Virtual Machines	[DS8K_VASA2] vasa2/vasa2.v 10.00 🛗 DS8K_VASA2 📳 adrian_Vasa_2								
		Defeated 414 minutes and							
	Snowing 1 nem Selected 0 nems	Refreshed 1 1/2 minutes ago							
	Close								

Figure 10-11 VMDKs properties of the datastore

So now you see the virtual machine vasa2 using storage in the DS8K_VASA2, which is on the DS8000-2107-75RA271-IBM and using the adrian_Vasa_2 volume. The chain of elements that make up this path is:

vasa2 \rightarrow datastore \rightarrow ESX Disk \rightarrow ESX Controller \rightarrow Storage System and Volume

If you had clicked the vmhba3 name in the Controller column in Figure 10-12, you could see which switch and port this HBA is connected to. This is similar to the information of the storage system.

naa.6005076309ffc6fe000	naa.6005076309ffc6fe0000000008d02 Properties						
.c	General Paths Data Stores						
. 9)	i≡ Actions ▼			Q	Filter		
	Name 🔺 Co	ntroller	Target Identifier	Logical Unit Number	Instance Number 🔱		
and the second sec	naa.6005076309ffc6fe0000000000	<u>vmhba2</u>	0x0000	0x0001	0x0002		
Disks	naa.6005076309ffc6fe0000000000	<u>vmhba3</u>	0x0000	0x0001	0x0003		
	naa.6005076309ffc6fe0000000000	vmhba2	0x0001	0x0001	0x0002		
	naa.6005076309ffc6fe0000000000 📟	<u>vmhba3</u>	0x0001	0x0001	0x0003		
	naa.6005076309ffc6fe0000000000 📟	<u>vmhba2</u>	0x0002	0x0001	0x0002		
	naa.6005076309ffc6fe0000000000 📟	<u>vmhba3</u>	0x0002	0x0001	0x0003		
	naa.6005076309ffc6fe0000000000 📟	<u>vmhba2</u>	0x0003	0x0001	0x0002		
	naa.6005076309ffc6fe0000000000 📟	<u>vmhba3</u>	0x0003	0x0001	0x0003		
	naa.6005076309ffc6fe0000000000	<u>vmhba2</u>	0x0004	0x0001	0x0002		
	naa.6005076309ffc6fe0000000000 📟	<u>vmhba3</u>	0x0004	0x0001	0x0003		
	naa.6005076309ffc6fe0000000000 📟	<u>vmhba3</u>	0x0005	0x0001	0x0003		
	naa.6005076309ffc6fe0000000000	vmhba2	0x0005	0x0001	0x0002		
					F		
	Showing 12 items Selected 0 items			R	efreshed a few moments ago		
			Close				

Figure 10-12 Properties of VMware disk

10.3 VMware connections with Tivoli Storage Productivity Center

As an overview of VMware connections with Tivoli Storage Productivity Center, we created Figure 10-13 on page 242. In the picture you can see:

Probes

Tivoli Storage Productivity Center collects information about VMware datasources.

- Reports and Provisioning
 Function of the Tivoli Storage Productivity Center extension.
- Storage Capabilities and Events/Alarm VASA functions.



Figure 10-13 VMware connections to Tivoli Storage Productivity Center

The arrows show where a connection is started. For example, a probe is started from Tivoli Storage Productivity Center to the vCenter or to an ESX server.

The box labeled SMS is the VMware vCenter Storage Monitoring Service and enables the communication with a VASA Provider.

Events and alarms are VMware terms, which correspond to alerts in Tivoli Storage Productivity Center. In VMware, *events* are generated for property changes, while *alarms* are generated for status changes.

10.3.1 Report overview

When you install the Web Client Extension or Tivoli Storage Productivity Center, the reports listed in Table 10-1 on page 243 are added to the Web Client and available to you. For Web Client Extension implementation details, refer to 10.5.5, "Implementing the vSphere Web Client extension for Tivoli Storage Productivity Center" on page 253. When you also register the Tivoli Storage Productivity Center VASA Provider, you will not see new reports, but additional information in existing vSphere panels. We listed both reports types together and added a column named Source to indicate how the data is obtained.

Context	Entity	Report location	Source	More information
ESX Hosts	FC HBA	Manage \rightarrow Storage \rightarrow Storage Adapters \rightarrow <adapter> \rightarrow Fabric Connections</adapter>	Tivoli Storage Productivity Center Extension	10.9.1, "Fabric Connections report" on page 275
ESX Hosts	Volumes	Monitor → Performance → Storage System Metrics	Tivoli Storage Productivity Center Extension	10.9.2, "Storage System Metrics report" on page 276
Virtual Machines	Virtual Disks	Monitor → Storage Mapping	Tivoli Storage Productivity Center Extension	10.9.3, "Storage Mapping report" on page 279
ESX Hosts	 Datastores SCSI Volumes NAS Mounts 	Monitor → Storage Reports → Datastores SCSI Volumes (LUNs) NAS Mounts	Tivoli Storage Productivity Center VASA Provider	10.11, "VMware VASA reports" on page 283

Table 10-1 Reports provided available containing information from Tivoli Storage Productivity Center

Note, the text in bold in the column Report location shows the name of the tab or panel that the Tivoli Storage Productivity Center Extension has added to the vSphere Client.

We only listed one location of the reports, but the reports are also available through different paths.

You can find more information about the report in the sections of this chapter listed in the last column. For some of the reports, you will need to have certain privileges, which we have documented in 10.7, "VMware and Tivoli Storage Productivity Center privileges-permissions" on page 266.

Note: In order for the reports to contain data, you must make sure that you not only have probed the storage device, but also the SAN fabrics and the ESX server or vCenter. Some information might be available even when you have probed only some devices, but that is not always the case. Tivoli Storage Productivity Center could even know that, for example, a volume is assigned to an ESX server from the storage system point of view. Without the ESX probe, the correlation is not made.

10.3.2 vSphere Web Client introduction

This section will only provide a basic introduction to the vSphere Web Client. You start the Web Client by opening the following web address:

https://<hostname>:9443/vsphere-client

After you have logged in, you will see the home panel as shown in Figure 10-14 on page 244.



Figure 10-14 Home panel

You can always return to this panel by clicking the little icon that shows the symbol of a house.

Be aware that the panel has two tabs: *Getting Started* and *Home*. Read the documentation carefully if you need to return to the Home tab or panel.

After installing the Web Client Extension for Tivoli Storage Productivity Center, you see a Tivoli Storage Productivity Center icon in the bottom row of icons. This icon is only used to configure the Web Client Extension for Tivoli Storage Productivity Center, so it is rarely used. Also note that the Tivoli Storage Productivity Center VASA Provider is not registered here because VASA itself is a built-in function of VMware.

The icons in the top row in the red rectangle (see Figure 10-14) are the inventory areas that you will use most often. They are:

- vCenter. Here you register the Tivoli Storage Productivity Center VASA Provider and start a manual rescan.
- Hosts and Clusters. Reports with the context of ESX Hosts (hypervisors) are available from here.
- ► VMs and Templates. Reports with the context of virtual machines are available from here.
- Storage. Reports with the context of Storage and Datastores are available from here.

When you click any of these icons, a new panel opens that is similar to Figure 10-15 on page 245. The new panel has a navigation area on the left and a main panel in the middle.

vmware vSphere Web C	lient 🔒 🗗				U Administrator@POKVC1 -	i Help + I 🭳	, Search 🔻
	poksrv3.itso.ibm.com Action	S *				Ξ.	*
	Getting Started Summary Mon	itor Manage Related Objects					🔹 🗊 Recent Tasks 🗆 🔺
✓ POKVC1 ✓ POKDS1 ✓ PokDS1	Issues Performance Resource	Allocation Storage Reports Tasks	s Events Hardware Status Log B	Browser			All Running Failed
poksivsitiscibilicoli p	<u>@</u>			Report On: Virtual Machines	▼ Q Filter	•	
	VM	Multipathing Status	Space Used	Snapshot Space	Shared Space	Disks	
	pokvc1	Partial/No Redundancy	89.52 GB	66.42 GB	0.00 B	4	
							My Tasks 👻 More Tas
							• • •
							👻 📝 Work In Progress
							All (Ne Ack
							A POKVC1
							Health status moni
	Last updated 01 November 20	013 18:44:13 🚯				1 items 📑 👻	

Figure 10-15 Description of a vSphere Web Client panel

The first thing to point out here is that with the little icons on the upper left side, you can quickly switch between the inventory areas.

The tree on the left shows:

- ► vCenter. In our example POKVC1.
- ► Data Center. In our example POKDS1.
- ► ESX Server. In our example poksrv3.itso.ibm.com.
- ► A single virtual machine. In our example pokvc1.

It is important to point out that depending on your selection here, the name in the top row will change, and so do the tab names in the central panel.

There are two rows with tabs in the central pane. The second row of tabs is essentially tabs within the tabs in the first row.

10.4 Adding VMware to Tivoli Storage Productivity Center

You can add your VMware environment to Tivoli Storage Productivity Center. This provides an almost complete picture of how the storage is used, and what the fabric connectivity looks like.

10.4.1 When to use a VMware datasource

Adding a VMware datasource to Tivoli Storage Productivity Center provides the following advantages:

- ► End-to-end reporting of storage consumption and assignment.
- Capacity reporting of virtual machines and data stores.

- When you add a VMware datasource you get information about virtual machines, and some of their configuration settings, such as:
 - vmdk files in data stores
 - vmdk files per virtual machine

Note: If you need more detailed information, you will need to deploy Storage Resource agents. One such example would be if you need to see which file system in the virtual machine is using a certain vmdk file.

Use Tivoli Storage Productivity Center provisioning

If you want to be able to provision storage through Tivoli Storage Productivity Center either by using the Tivoli Storage Productivity Center web-based GUI or the vSphere Web Client extension for Tivoli Storage Productivity Center, you need to add a VMware datasource.

10.4.2 Considerations using a VMware datasource

These are the considerations when you add a VMware datasource:

- The user name that you configure when adding the datasource must have permission to browse through the data stores on VMware.
- There are two ways to add VMware. See Figure 10-16.
 - Adding each ESX Server individually.
 - Adding the vCenter Server, which will automatically add all the configured ESX servers.



Figure 10-16 Ways to connect a VMware datasource

Note: In previous versions of Tivoli Storage Productivity Center, you needed to download or copy the certificates from the ESX hypervisors or the vCenter server to Tivoli Storage Productivity Center and add them to a Java keystore file. With Tivoli Storage Productivity Center V5.2.2, this is no longer required.

- ► Tivoli Storage Productivity Center support both VMware Clusters and Datastore clusters.
- Tivoli Storage Productivity Center can report on device mapping and raw devices in Cognos.

10.4.3 Requirements using a VMware datasource

The following requirements apply to adding a VMware datasource:

License

You can use the plug-in with any version of Tivoli Storage Productivity Center.

Supported environments

Currently, the vSphere Web Client Extension for Tivoli Storage Productivity Center is supported in the following environments:

http://www.ibm.com/support/docview.wss?uid=swg27039833#hypervisor

User ID requirements

The user ID that is used by Tivoli Storage Productivity Center to connect to the vCenter or ESX needs to have permission to browse through the data stores on VMware.

10.4.4 Adding a VMware datasource

These are the steps to add a VMware datasource to Tivoli Storage Productivity Center using the new Tivoli Storage Productivity Center V5.2.2 web-based GUI.

1. Go to Server Resources \rightarrow Hypervisors

If you have not added any hypervisors, you will see a panel similar to Figure 10-17.

Server R	Resources > Hypervisors		ST3L10-W2\\administrator
Home Storage	Bypervisors Hypervisors O Normal O Varning 0 Error		
Resources	Hypervisors Alerts Tasks Discovered Virtual Machines		
	Add Hypervisor HE Actions Actions	OS Varaian ID Address	Q ▼ admini Reset
Server Resources Network Resources Advanced Analytics Reporting	Status Probe Status	OS Type OS Version IP Addres	Used Space Total Disk Space (GiB) Disk Space from Storage 11.
Settings	Showing 0 items Selected 0 items		Refreshed a few moments ago

Figure 10-17 Hypervisor panel

2. Click Add Hypervisor to start the wizard. See Figure 10-18 on page 248.

🗥 Server Re	esources > Hypervisors	Tivoli Stora	ge Productivity Center	ST3L10-W2\\administrator
Home	Source A contract of the second			
Storage Resources	Hypervisors Alerts Tasks Discovered Virtual I	Add Hypervisor Discover		admini Reset
Server Resources	Name Cluster Status	Host name or IP address User name:	ESX/ESXi VMware vCenter s: 9.12.5.201 Administrator	Space Total Disk Space (GiB) Disk Space from Storage t∐:
Network Resources		Password: Display name:	POKVC1	
Advanced Analytics		Description: Advanced Protocol:	https •	
Reporting		Port:	443 ✓ X Next ► Cancel	
	<	III		, ,
Settings	Showing 0 items Selected 0 items			Refreshed 1½ minutes ago

Figure 10-18 Add Hypervisor wizard

- 3. Enter the required information:
 - Type of connection is ESX/ESXi or VMware vCenter
 - User ID and password of an VMware user
 - Name and optionally a description
 - The advanced settings typically do not require any changes

When you click **Next**, Tivoli Storage Productivity Center will add the datasource and perform Discovery. Depending of the size of the environment, this might take several minutes. You can close the dialog, but then you have to come back and set up the scheduling manually later.

4. If you have not closed the wizard, you will see Figure 10-19 on page 249.

In the Configuration step, you can:

- Add location information
- Adjust the schedule of the data collection tasks that will be created for that datasource

🔺 Server Re	esources > Hypervisors	Tivoli Storage Productivity Center	ST3L10-W2\\administrator
Home Home Storage Resources	Official State Offici	ines	
Resources	Name Cluster Status ▼	Add Hypervisor Configure Display name: poksry 3 Iso ibm.com Location: Site 1 Data Collection Probe: 15:45 EDT Every day Every day Configure Cancel	Q_ → admini Reset Used Space Total Disk Space (GiB) Disk Space from Storage * IE
Settings	<showing 0="" items="" items<="" selected="" td="" =""><td></td><td>r Refreshed a few moments ago</td></showing>		r Refreshed a few moments ago

Figure 10-19 Configure datasource

5. Click **Configure** to finish adding the datasource.

Tivoli Storage Productivity Center performs an initial probe for the device. You are presented Figure 10-20 as a confirmation that you have successfully added the datasource.

合 Server R	sources > Hypervisors	Tivoli Storage Productivity Center	ST3L10-W2\\administrator ③
Home Storage Resources	Official O Hormal O Hormal I Warning O Error		
Server Resources	Image: Actions ▼ Name Cluster Status ▼ Probe St	Configure Storage Systems for poksrv3.itso.ibm.com in Site 1 is configured.	Q ▼ admini Reset ss Used Space Total Disk Space (GiB) Disk Space from Storage 13
Network Resources		✓ Details ✓ Details ✓ An initial probe is collecting data about the resource. Subsequent probes are scheduled daily at 15:45.	
Advanced Analytics		Close	
Reporting			
Settings	< [F Refreshed a few moments ago

Figure 10-20 Initial probe status

10.5 vSphere Web Client extension for Tivoli Storage Productivity Center

The Tivoli Storage Productivity Center vSphere Web Client extension is a piece of additional software that you can install on a VMware vCenter server. It provides a VMware administrator information and functions to help them understand details about the storage environment that the VMware Hypervisors are using.

This extension is not adding any information to Tivoli Storage Productivity Center like when you configure a VMware datasource. It works the other way around. The extension is providing information to VMware. The name tries to emphasize that this is an extension to the vSphere web client to view information from and perform action with Tivoli Storage Productivity Center.

Note: At times, we use the term *extension* and sometimes *plug-in*, but essentially both terms have the same meaning in this chapter when referring to the function included in Tivoli Storage Productivity Center V5.2.2.

10.5.1 When to use the vSphere Web Client extension for Tivoli Storage Productivity Center

You can use this vSphere Web Client extension for Tivoli Storage Productivity Center to:

- View end-to-end mappings between back-end storage and resources such as virtual machines, virtual machine file systems, hypervisors, and clusters:
 - Fabric details
 - Port connectivity, switch, fabric, and active zone information
 - Mapping

End-to-end for virtual disks, storage system details (pool and volume)

- View details about your environment such as volume performance and fabrics.
 - Subset of System performance metrics
- Launch Tivoli Storage Productivity Center from several panels within the vSphere Web Client. This is helpful for getting more detailed information as in troubleshooting situations.
- Initiate the provision of block and file storage and make the storage available as a datastore, using the storage service catalog (Cloud Configuration) that your Tivoli Storage Productivity Center administrator has defined. Tivoli Storage Productivity Center will do the provisioning but the progress gets reported back to VMware as a vCenter task. You can choose to create data stores on the storage volumes.

In Chapter 7, "Cloud configuration and provisioning" on page 147, you can find more information about how to set up service classes. You will learn how you can allow an external application user to use a service class limit as well as use storage constraints and custom tags to limit which storage pools are eligible for a provisioning task when using a service class.

10.5.2 Considerations for using the vSphere Web Client extension for Tivoli Storage Productivity Center

In this section, we list various considerations regarding the use of the vSphere Web Client extension for Tivoli Storage Productivity Center:

Even though this extension is separate from having a VMware datasource in Tivoli Storage Productivity Center, you should add the VMware environment also to Tivoli Storage Productivity Center so that the Tivoli Storage Productivity Center and the VMware administrators can better understand each other's environment.

Note: There are situations where you need to have a VMware datasource to provide some kind of translation between what Tivoli Storage Productivity Center will collect from storage devices and what it will make available in the reports within the vSphere Web Client extension.

VMware has a very granular system for providing privileges to users, which limits not only the actions you can do, but also which information you can see. That means that you can have the authority to view information provided by Tivoli Storage Productivity Center, but you might not be able to either change the configuration of the extension or to initiate the provisioning of storage.

When you plan to use the extension, make sure that you have read 10.7, "VMware and Tivoli Storage Productivity Center privileges-permissions" on page 266, and discussed it with the VMware administrator.

- Being a Web Client extension, the Tivoli Storage Productivity Center code does not get loaded until you start one of its functions. There might be a delay in opening menus, or loading data from a remote Tivoli Storage Productivity Center server.
- The VASA Provider that comes with Tivoli Storage Productivity Center V5.2.2 will be automatically registered when you set up the extension. There are situations where the automatic registration may fail. In that case, you need to correct the issue and register it manually.
- ► Firewall ports are typically not problematic because the extension is using the same port as you use when you open the Tivoli Storage Productivity Center web-based GUI. This means that the port will probably be open in the firewall. The default port is 9569.

Provisioning through Tivoli Storage Productivity Center

When a VMware administrator uses the vSphere Web Client extension for Tivoli Storage Productivity Center to provision storage to the VMware environment, Tivoli Storage Productivity Center will perform different functions depending on the type of file provisioned.

Attention: If you need to provision volumes, you need the IBM SmartCloud Virtual Storage Center Storage license.

Block provisioning

In block provisioning, if the ESX server belongs to a cluster:

- The new LUN will always be assigned to all the ESX servers in that cluster, even though you start this function from a single ESX server context and not from the cluster context.
- ► Perform a host bus adapter (HBA) rescan on all the ESX servers in that cluster.
- Optionally a data store will be created for all the ESX servers in that cluster.

File provisioning

In File provisioning, if the ESX server belongs to a cluster:

- The new network-attached storage (NAS) file share is created for all the ESX servers in that cluster.
- ► NAS data store is created for all the ESX servers in that cluster.

10.5.3 Requirements for using the vSphere Web Client extension for Tivoli Storage Productivity Center

The following requirements apply to using the vSphere Web Client extension:

License:

You can use the plug-in with any version of Tivoli Storage Productivity Center.

Supported environments:

Currently, the vSphere Web Client Extension for Tivoli Storage Productivity Center is supported in the following environments:

http://www.ibm.com/support/docview.wss?uid=swg27039833#hypervisor

- User role requirements are described in 10.7.2, "vSphere Web Client extension for Tivoli Storage Productivity Center" on page 268.
- Even though this extension is separate from having a VMware datasource in Tivoli Storage Productivity Center, you must add the VMware environment also to Tivoli Storage Productivity Center.
- ► Requirements for provisioning:
 - Ensure that the ESX server is added into Tivoli Storage Productivity Center. If the hypervisor belongs to a cluster, all the ESX servers on that cluster must be managed by Tivoli Storage Productivity Center.
 - Ensure that the service classes are created in Tivoli Storage Productivity Center. Tivoli Storage Productivity Center provides a number of predefined service classes, which you can use, modify, or delete.

10.5.4 Limitations

In this section, we list the known limitations of the vSphere Web Client:

The VMware Web Client has a default timeout of 120 minutes. After this time, the Web Client disconnects from the vCenter server. If you are provisioning storage and use the approval process, the request might not be approved within this time frame, so the task status within vSphere might not reflect any updates that have happened after the 120 minutes.

Log in to the Web Client is the first step to update the status of the tasks. The second step is to go to one of the Tivoli Storage Productivity Center related panels in the Web Client, so that a connection to Tivoli Storage Productivity Center is established. This updates the VMware tasks.

If you must change the user ID or password of the IP address of your Tivoli Storage Productivity Center server, you can do that through the same panel as you configured the Web Client extension for Tivoli Storage Productivity Center. Due to a limitation in the VMware API, the automatic registration of the VASA Provider will fail. You to do that manually by deleting and registering the Tivoli Storage Productivity Center VASA Provider again. For details, see 10.6.4, "Implementing and registering the VASA Provider manually" on page 262.

10.5.5 Implementing the vSphere Web Client extension for Tivoli Storage Productivity Center

The installation of the vSphere Web Client extension is a simple two-step setup:

- 1. Installation of the extension on the vCenter Server.
- 2. Establish connection to a Tivoli Storage Productivity Center server.

Step 1: Installation of the extension on the vCenter Server

The Web Client extension must be installed on the server running the vCenter software. The vCenter software provides different types of add-ons. Add-ons can run within the stand-alone clients or they can be integrated into the Web Client. The extension for Tivoli Storage Productivity Center runs in the Web Client:

- 1. The first thing that you have to do is to make the code available on the vCenter server:
 - Navigate to the Plug-in installation folder inside the Tivoli Storage Productivity Center web folder. The default folder name is:

<TPC_installation_directory>\web\TPCVmwareVspherePlugin

In our environment, the folder name is:

C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin

Copy the contents of the folder to the VMware vCenter Server host machine, into a folder of choice.

- Tivoli Storage Productivity Center vSphere plug-in package is also available on the installation media (CD/DVD or extracted folders) under web\TPCVmwareVspherePlugin. You can either copy or mount the software on the vCenter server.
- 2. To install the package, you have to run the setup.bat script with the register command. You can run the script interactively, providing all information as parameters to the script or read the parameters from a file. In Example 10-1 on page 254, we used the interactive method:

The only real difference is that when you provide the parameters on the command line, using the syntax below, you must provide the password in clear text:

setup <mode> -password <password in clear text>

Example 10-1 Interactive installation

Directory of c:\temp\TPCVmwareVspherePlugin 10/25/2013 02:52 PM <DIR> . 10/25/2013 02:52 PM <DIR> .. 10/21/2013 02:23 PM <DIR> lib 10/21/2013 02:23 PM 738 log-config.properties 10/21/2013 02:23 PM 571 setup.bat 10/21/2013 02:23 PM 284 setup.sh 10/21/2013 02:23 PM 90,910 TPCPluginDeploymentUtility.jar 19,223,923 TPC_VmPlug.zip 10/21/2013 02:23 PM 5 File(s) 19,316,426 bytes 3 Dir(s) 3,507,523,584 bytes free c:\temp\TPCVmwareVspherePlugin>setup.bat Enter the mode [register or unregister]: register Enter the vCenter Server user id [Administrator]. Press Enter for default: Enter the vCenter Server password: INFO: 10/25/2013 02:57:03 Attempting to communicate with the vCenter server... INFO: 10/25/2013 02:57:05 Successfully authenticated with the vCenter server... INFO: 10/25/2013 02:57:05 Fetching vCenter web server port from registry... INFO: 10/25/2013 02:57:05 Successfully fetched vCenter web server port from registry as 8443. INFO: 10/25/2013 02:57:05 Mode: register INFO: 10/25/2013 02:57:05 vCenter server address: 9.12.5.201 INFO: 10/25/2013 02:57:05 vCenter server user id: Administrator INFO: 10/25/2013 02:57:05 vCenter web server port: 8443 INFO: 10/25/2013 02:57:05 TPC Plugin package location: C:\Program Files\VMware\Infrastructure\tomcat\webapps\ROOT INFO: 10/25/2013 02:57:05 Registering TPC Plugin package TPC VmPlug.zip with vCenter server. INFO: 10/25/2013 02:57:05 Extension URL: https://9.12.5.201:8443/TPC VmPlug.zip INFO: 10/25/2013 02:57:05 Creating TPC Plugin extension com.ibm.tpc.Tpc ... INFO: 10/25/2013 02:57:07 Copying TPC plugin package TPC VmPlug.zip onto vCenter web server root location C:\Program Files\VMware\Infrastructure\tomcat\webapps\ROOT. **** INFO: 10/25/2013 02:58:13 Successfully copied TPC plugin package TPC VmPlug.zip onto vCenter webserver root location. INFO: 10/25/2013 02:58:13 Successfully registered TPC Plugin package TPC VmPlug.zip with vCenter server. INFO: 10/25/2013 02:58:13 TPC deployment utility finished execution. Log information generated in C:\ProgramData\IBM\TPC\TPCDeploymentUtility.log.

c:\temp\TPCVmwareVspherePlugin>

The script will ask you for the following information:

- The mode (command) either register (install) or unregister (uninstall)
 - Register. Copy the software to the web server and register the extension.
 - Unregister. Unregistering a Tivoli Storage Productivity Center extension removes its reference from the list of extensions maintained by the vCenter Server. Additionally, this causes the Tivoli Storage Productivity Center Plug-in package (TPC_VmPlug.zip) to be removed from the vCenter Server Web server location.

- A VMware user ID, with the appropriate authority (see 10.7.2, "vSphere Web Client extension for Tivoli Storage Productivity Center" on page 268).
- The password for the VMware user.
- When you do not use the interactive installation method, you also have the option to provide a value for the WebserverPath. It is not required.

WebserverPath is the optional web server path associated with the vCenter server. TPC_VmPlug.zip is copied here after successful registration.

Step 2: Establish connection to a Tivoli Storage Productivity Center server

After the extension is successfully installed and registered, you need to open the vSphere Web Client and configure the Tivoli Storage Productivity Center server information:

- 1. Open https://<vCenter Server>:9443/vsphere-client/ in a browser
- 2. Go to the Home tab on the Home panel as shown in Figure 10-21.



Figure 10-21 Go to Home tab

3. Click the Tivoli Storage Productivity Center icon as shown in Figure 10-22 on page 256.

History 💌 🖡	🚹 Home						
付 Home	Getting Started	Home					
🕝 vCenter >	Inventories						
🚡 Rules and Profiles 💦 👌						— •	
O vCenter Orchestrator >			- CP		<u> </u>	0	
🍇 Administration 🔰 🔉	vCenter	Hosts and	VMs and	Storage	Networking	vCenter	
🗊 Tasks		Giustera	Templates			Orchestrator	
🔁 Log Browser	Monitoring						
Events	<u></u>	_					
🧳 Tags	No. 10				22		
🔍 New Search 🔰 🔉	Task Console	Event Console	Host Profiles	VM Storage Profiles	Customization Specification		
aved Searches				Tronico	Manager		
	Administration						
	8	2		M			
	Roles	Licensing	vCenter Solutions Manager	IBM Tivoli Storage Productivity C			
	Watch How	-to Videos					

Figure 10-22 Click the Tivoli Storage Productivity Center icon

- 4. In the IBM Tivoli Storage Productivity Center panel that is shown in Figure 10-23 on page 257, you enter the Tivoli Storage Productivity Center server connection information:
 - Host name: Enter a host name or IP address
 - Port: The default is 9569
 - User name: A user that can log in to Tivoli Storage Productivity Center
 - Password: The password of that user

History	- I	IBM Tivoli Storage I	Productivity Center	
삼 Home				3
🕝 vCenter	>			
🚡 Rules and Profiles	>			
O vCenter Orchestrator	>		IBM Tivoli Storage Productivity Center is software	that centralizes, automates, and simplifies storage management.
🍓 Administration	>		You can use this vSphere Web Client extension for 1. Provision block and file storage and make the s	or Tivoli Storage Productivity Center to: storage available as a datastore.
 Tasks Log Browser Events Tags 			 View details about your environment such as vo 3. View end-to-end mappings between back-end systems, hypervisors, and clusters. Enter and save credentials and connection infor registers Tivoli Storage Productivity Center as a V. 	olume performance and fabrics storage and resources such as virtual machines, virtual machine file rmation to connect to Tivoli Storage Productivity Center. Saving also ASA provider for the vCenter Server.
Q New Search	>			
Saved Searches	>			
		Host name:	9.12.5.249	IBM Tivoli Storage Productivity Center
		Port:	9569	Extension version: 5.2.0.0.20131004
		User name:	tpcwebplugin	Licensed Material - Property of IBM Corp. 5725-F92, 5725-F93, 5 IBM, the IBM logo, and Tivoli are trademarks of IBM Corp., registe
		Password:	*****	For more information visit: <u>http://pic.dhe.ibm.com/infocenter/tivihe</u>
		•	::	•
		Save		

Figure 10-23 Configuration panel for the Tivoli Storage Productivity Center server connection information

See also 10.7.2, "vSphere Web Client extension for Tivoli Storage Productivity Center" on page 268 to understand the requirements of the Tivoli Storage Productivity Center user that you configure here.

5. Click **Save** and the configuration of the Web Client extension for Tivoli Storage Productivity Center is completed. See Figure 10-24 on page 258.

History -	IBM Tivoli Storage Prod	luctivity Center					
🚹 Home			(?)				
🕝 vCenter	>						
₃ Rules and Profiles	>						
O vCenter Orchestrator		IBM Tivoli Storage Productivity Center is software t	that centralizes, automates, and simplifies storage management.				
🍓 Administration		You can use this vSphere Web Client extension for 1. Provision block and file storage and make the s	sion for Tivoli Storage Productivity Center to: e the storage available as a datastore.				
😨 Tasks		 View details about your environment such as volume performance and fabrics View end-to-end mappings between back-end storage and resources such as virtual machines, virtual machine file systems, hypervisors, and clusters. 					
ie Log Browser							
Events	100	registers Tivoli Storage Productivity Center as a V	mation to connect to Tivoli Storage Productivity Center. Saving also ASA provider for the vCenter Server.				
🧭 Tags							
🔍 New Search	>						
🔚 Saved Searches	>						
	Host name: 9.1	12.5.249	IBM Tivoli Storage Productivity Center				
	Port: 95	69	Extension version: 5.2.0.0.20131004				
	User name: tpo	cwebplugin	Licensed Material - Property of IBM Corp. 5725-F92, 5725-F93, 5 IBM, the IBM logo, and Tivoli are trademarks of IBM Corp., registe				
	Password: ***	*****	For more information visit: http://pic.dhe.ibm.com/infocenter/tivihe				
	Connected Ver	rsion: 5.2.0.0 Build: 20131004-0602					
	4	::	Þ				
	Save						

Figure 10-24 Successful configured Tivoli Storage Productivity Center extension

If you need to update the information, return to this page and click **Save** again after making updates.

The configuration process will automatically attempt to register the same Tivoli Storage Productivity Center server as a VASA Provider. There are situations where the automatic registration can fail, for example, if a Tivoli Storage Productivity Center VASA Provider is already registered. Refer to 10.6.4, "Implementing and registering the VASA Provider manually" on page 262 to learn how to manually register the Tivoli Storage Productivity Center VASA Provider.

To learn more about the Tivoli Storage Productivity Center VASA Provider, see: 10.6, "Tivoli Storage Productivity Center VASA Provider" on page 260.

Note: If the Tivoli Storage Productivity Center credential update fails, delete and re-register the Tivoli Storage Productivity Center Provider manually, which is done in less than 5 minutes.

Verification

To verify the installation or de-installation of the extension, perform the following tasks:

- 1. Start VMware vSphere Client program by using Start \rightarrow All Programs \rightarrow VMware \rightarrow VMware vSphere Client.
- Verify plug-in registration by invoking the Plug-ins → Manage Plug-ins... menu option. Tivoli Storage Productivity Center Extension must be listed in the Available Plug-ins category of the Plug-in Manager window. See Figure 10-25 on page 259.

🛃 POKVC1 - vSphe	ere Client							
File Edit View II	nventory Administratio	n Plug-ins He	lp					
🖸 🖸 🛕	Home	Manag	ge Plug-ins			.	Search Inventory	, Q
Inventory								
Q	<u>j</u>	Ð						
Search	Hosts and Clusters	VMs and Templates	Datastores and Datastore Clusters	Networking				
Administration								
8	2			P			V3	
Roles	Sessions	Licensing	System Logs	vCenter Server Settings	vCenter Solutions Manager	Storage Providers	vCenter Service Status	
Management								
20		5			-			
Scheduled Tasks	Events	Maps	Host Profiles	VM Storage Profiles	Customization Specifications Manager			
Recent Tasks					Name, Target or	Status contains: 🕶 🗍		Clear ×
Name	Target	St	atus Deta	ails Initiated	by VCenter Ser	ver Request	ed Start Ti 🔽	Start Time
•								Þ
🔄 Tasks 💇 Ala	arms					Evaluation Mode: 47	days remaining	Administrator 🏼 🎢

Figure 10-25 Verify VMware plug-ins

3. A new dialog box is opened showing information as shown in Figure 10-26.

🗿 Plug	in Manager				_ 🗆 X
Plug-i	n Name	Vendor	Version	Status	Description
Insta	lled Plug-ins				
8	VMware vCenter Storage Mon	VMware Inc.	5.1	Enabled	Storage Monitoring and Reporting
8	vCenter Service Status	VMware, Inc.	5.1	Enabled	Displays the health status of vCenter services
8	vCenter Hardware Status	VMware, Inc.	5.1	Enabled	Displays the hardware status of hosts (CIM monitoring)
Avail	able Plug-ins				
3	TPC Extension	IBM	5.2.0.020131004	No client side download is needed for this plug-in.	Extension for IBM Tivoli Storage Productivity Center.
<u>.</u> н	elp				

Figure 10-26 Look of the Tivoli Storage Productivity Center Extension

When you are unregistering the extension, it should no longer be listed.

Note: The status displayed in Figure 10-26 is valid since this is a plug-in (or extension) that is only available through the vSphere Web Client.

4. After you log in to the vSphere Web Client, the Tivoli Storage Productivity Center extension package will be downloaded into the following directory on the vCenter server:

%ProgramData%\VMware\vSphere Web Client\vc-packages\vsphere-client-serenity

Log files

Since the Web Client extension is code that runs on the vCenter and in your web browser, the service tool provided by Tivoli Storage Productivity Center called service.bat (or service.sh) cannot gather the log files of the Web Client extension code. You might be directed by the support to manually gather some log files in case of problems.

10.5.6 Updating the Tivoli Storage Productivity Center extension

When Tivoli Storage Productivity Center undergoes an upgrade, the Tivoli Storage Productivity Center extension might need to be reinstalled with a new version.

Reinstallation is achieved by running the setup command again, in register mode, without unregistering the previous registration. This causes any Tivoli Storage Productivity Center registration information to be updated, including the Tivoli Storage Productivity Center plug-in package (TPC_VmPlug.zip).

After setup completes successfully, log in to the vCenter server using the vSphere Web Client. This will automatically download the new Tivoli Storage Productivity Center extension into the vSphere Web Client packages location on the vSphere Web Client machine.

An alternative to reinstallation is to unregister the current Tivoli Storage Productivity Center extension. The new extension can then be registered.

10.6 Tivoli Storage Productivity Center VASA Provider

The Tivoli Storage Productivity Center VASA Provider provides the underlying connectivity that enables VMware to query information about storage systems from the Tivoli Storage Productivity Center database, and display that information directly in the vSphere GUI. The difference to the vSphere Web Client Extension for Tivoli Storage Productivity Center is that all information collected by VMware through VASA is completely integrated into standard vSphere panels. With the extension, Tivoli Storage Productivity Center is providing additional panels or tabs and only within the vSphere Web Client.

10.6.1 What is VASA?

The vSphere Storage APIs for Storage Awareness (VASA) is a set of the APIs VMware has created to integrate storage systems closer to the VMware infrastructure. The idea of VASA is that storage vendors implement these APIs within the storage devices just like the SNMP or SMI-S interface. VMware can then use the APIs to gather more information from the storage system. Instead of calling this an agent, the function that the storage vendors have to integrate is simply called a *VASA Provider*.

There are two services that Tivoli Storage Productivity Center VASA provides in its initial release:

Storage Capabilities. Enables VMware to gather information about a volume.

A Storage Capability is simply a property of a LUN or volume with a name and a description. The storage vendors define what should be surfaced to VMware. Typically this is information such as thin provisioning, disk type and speed, and RAID Level.

 Health Monitoring. VASA Providers provide an interface for VMware to enable health monitoring of a storage device by VMware. The main purpose of VASA is to use the Storage Capabilities for VM Storage Profiles (also known as *Profile Driven Storage*). You can find more information about the VMware storage APIs in general in the *What's New in VMware vSphere 5.1 – Storage* white paper. This paper can be found at the following web page:

http://www.vmware.com/files/pdf/techpaper/Whats-New-VMware-vSphere-51-Storage-Tech nical-Whitepaper.pdf

More information about VASA can be found in this VMware blog entry:

http://blogs.vmware.com/vsphere/2011/08/vsphere-50-storage-features-part-10-vasa-v
sphere-storage-apis-storage-awareness.html

In 10.8, "VMware Profile Driven Storage and VM storage profiles" on page 270, we explain how the VM Storage Profiles are linked to the Service Classes in Tivoli Storage Productivity Center.

The specification of the APIs did not mandate that only storage systems can provide the VASA services. Tivoli Storage Productivity Center has written a VASA Provider that will run inside of Tivoli Storage Productivity Center and provide the same set of functions, for the storage systems that the Tivoli Storage Productivity Center instance knows about. This allows VMware to take advantage of Tivoli Storage Productivity Center information, even if a particular device does not have a VASA Provider.

10.6.2 When to use the VASA Provider

For VMware vSphere users, the Tivoli Storage Productivity Center VASA Provider improves the ability to monitor and automate storage-related operations in VMware environments. There are a number of reasons for implementing the VASA Provider:

- You (or the VMware administrator) want to use VMware Storage Profiles (also known as *Profile Driven Storage*) and align those profiles with the Tivoli Storage Productivity Center Service Classes.
- The Tivoli Storage Productivity Center VASA Provider makes information about block and file storage available to VMware.
- You want VMware to display additional information in the VMware Storage Reports about the attributes of the underlying disks, as well as VASA capabilities for resources that are mapped to the ESX servers.
- Tivoli Storage Productivity Center can share certain alerts for resources that are mapped to ESX servers. The alerts will be available as vCenter Events and Alarms. The capabilities are included in some of the VMware standard reports.

10.6.3 Requirements for using the VASA Provider

The following requirements apply to the VASA Provider:

License

You can use the plug-in with any version of Tivoli Storage Productivity Center.

Privileges and permissions

Depending on what you do within VMware, you need additional privileges. These are described in 10.7, "VMware and Tivoli Storage Productivity Center privileges-permissions" on page 266.

Even though this extension is separate from having a VMware datasource in Tivoli Storage Productivity Center, you must add the VMware environment also to Tivoli Storage Productivity Center.

10.6.4 Implementing and registering the VASA Provider manually

The Tivoli Storage Productivity Center VASA Provider is deployed and started with the Tivoli Storage Productivity Center server installation. If you register a Tivoli Storage Productivity Center server as a vSphere Web Client extension to view Tivoli Storage Productivity Center information in vCenter storage reports and views, the Tivoli Storage Productivity Center server is automatically registered as a VASA Provider.

If you need to manually register the Tivoli Storage Productivity Center VASA Provider with VMware, you need to provide the following information:

- ► Name: Typically you choose something like "Tivoli Storage Productivity Center server"
- URL: https://<TPCServer>:9569/vasa/services/tpc
- Login: Tivoli Storage Productivity Center user name
- Password: Tivoli Storage Productivity Center user password

For more information about permissions of the user that can register the VASA Provider and the user ID, which is used by VMware to communicate with Tivoli Storage Productivity Center, see 10.7.3, "VASA Provider" on page 269.

Registering the Tivoli Storage Productivity Center VASA Provider

You can register the Tivoli Storage Productivity Center VASA Provider from either the stand-alone vSphere Client or from the vSphere Web Client.

- 1. In the vSphere Web Client:
 - a. Home \rightarrow vCenter \rightarrow vCenter Servers \rightarrow <your vCenter>
 - b. In the panel on the right:
 - Click Manage
 - Click Storage Providers

Figure 10-27 on page 263 shows an example of the vSphere Web Client GUI with a registered Tivoli Storage Productivity Center server as a VASA Provider.

vCenter 🔹	C POKVC1 Actions -							
	Getting Started Summary Monito	r Manage Related Objects						
	Settings Alarm Definitions Tags	Permissions Sessions Storage Provi	ders Scheduled Tasks					
poksiva.itsu.ibn.com	Storage Providers							
	+ × 🗉	+ X 🗄 (Q, Filter -						
	Name	Status	URL	Last Rescan Time	VASA API Version			
	TPC	Online	https://9.12.5.249:9569/vasa/servic	10/25/2013 4:13 PM	1.0			
	86				1 item	is 斗 -		
	Character Dansidan Dataila		-					
	Storage Provider Details							
	**	Supported Vendor IDs						
	General	Supported Vendor IDs	ş	Supported Model IDs				
	Supported vendor IDs	IBM	f	System Storage DS8000 Series		^		
		IBM	1	SAN Volume Controller				
		IBM	>	VIV				
		IBM	\$	Storwize V3000				
		IBM	5	Storwize V7000				
		IBM	5	Storwize V7000U				
		IBM	5	Scale Out Network Attached Storage (SON	NAS)	*		

Figure 10-27 vSphere Web Client - Storage Providers

From this panel, you can add or delete a provider and list the supported vendor IDs, which is the list of devices that the Tivoli Storage Productivity Center VASA Provider is supporting.

Note: The list is not complete because all devices that are supported by Tivoli Storage Productivity Center in general are also supported through the Tivoli Storage Productivity Center VASA Provider.

2. To register a new provider, simply click the green plus icon. The dialog box shown in Figure 10-28 is displayed.

POKVC1 - Regist	er Storage Provider		?
Name:	TPC		7
URL:	https://9.12.5.201:9569/vasa/services/tpc		
Login:	administrator		
Password:	****		
Use storage prov	vider certificate		
Certificate location:		Browse	
		OK	el j

Figure 10-28 Registering a VASA Provider manually

3. When registering the VASA Provider, you have the option to "Use storage provider certificates". If you do not check this box, the vSphere Web Client will download the certificates and present you a "Security Alert" window (see Figure 10-29 on page 264) to accept the certificates. This is similar to how Firefox handles this situation.

If you do check this option, you need to provide the certificate location because the dialog assumes that you have manually downloaded the certificate. If you downloaded the certificate, you do not see the security alert.



Figure 10-29 Accept the certificate

4. When you click Yes, you might see the notification shown in Figure 10-30.

No	Notification (8)				
•	The "Register new storage provider operation failed for the entity with the following error message.				
	Unable to verify the authenticity of the specified host.				

Figure 10-30 Notification that can be ignored

Note: The origin of the VMware notification was not determined in Figure 10-30. In this case, the provider was successfully registered, and the notification was ignored. This message may have been issued before accepting the certificates.

5. If the provider shows a status of *unknown* as shown in Figure 10-31 on page 265, but the rest of the information displayed is correct, you simply need to rescan the provider.

Storage Providers				
+ 🗙 📃				Q Filter -
Name	Status	URL	Last Rescan Time	VASA API Version
TPC	Unknown	https://9.12.5.201:9569/vasa/serv	-	1.0
	· · · · · · · · · · · · · · · · · · ·			
M				1 items 📑 👻
Storage Drovider Details		=		
Storage i Tonaci Detailo				
••	General			
General	Provider name	TPC		
Supported vendor IDs	Provider status	Unknown		
	URL	https://9.12.5.201:9569/vasa/services/tpc		
	Provider version	5.2.0.0		
	VASA API version	1.0		
	Default namespace	com.ibm.tpc.vasa		

Figure 10-31 Status of registered provider

Note: VMware SMS does refresh the information from Tivoli Storage Productivity Center, which is similar to a Tivoli Storage Productivity Center probe. The Last Rescan Time field shows you how current the information is that VMware has collected from Tivoli Storage Productivity Center.

Also be aware that general information about the provider itself, for example, the Provider version, is never refreshed. You need to delete and register the provider again for this information to be updated.

Alternative registration

You can also user the stand-alone vSphere Client to register a VASA Provider, if you go to:

$\textbf{Home} \rightarrow \textbf{Administration} \rightarrow \textbf{Storage Providers} \rightarrow \textbf{<your vCenter} \textbf{>}$

Since the vSphere Web Client is the strategic GUI for VMware, this is a good way to make yourself familiar with the new GUI.

Updating connection information

VMware does not provide a way to update the information of a registered VASA Provider at this time. If any information such as IP address, user ID, or password needs to be changed, you have to delete the provider and register it again.

Log file locations

The Tivoli Storage Productivity Center VASA Provider is running on the Tivoli Storage Productivity Center server and it uses the following logs and locations:

- VASA configuration files. <TPC_installation_directory>/web/conf/
- VASA logs. <TPC_installation_directory>/web/log/tpcvasatrace*.log

There is also a log file on the vCenter server side that might be helpful in some situations:

vSphere SMS logs. C:\ProgramData\VMware\VMware VirtualCenter\Logs\sms.log

10.6.5 Updating the Tivoli Storage Productivity Center VASA Provider

If you update your Tivoli Storage Productivity Center server, there is nothing you need to do in terms of upgrade. The VASA Provider runs on the Tivoli Storage Productivity Center server itself. It will be updated during the Tivoli Storage Productivity Center update process itself.

10.6.6 Refreshing VASA information

When VMware SMS is collecting data from the VASA Providers, that data is stored in a database.

The reports that include information collected by the VASA Providers get refreshed roughly every 2 hours based on the information that is in the database. If the information in the reports is not showing recent information, there are two steps that you can take to cause the information to be refreshed:

- 1. Rescan the storage providers
 - a. Go to Home \rightarrow vCenter \rightarrow vCenter Servers \rightarrow <your vCenter>
 - b. In the panel on the right:
 - Click Manage
 - Click Storage Providers
 - c. Select the provider
 - d. Click the rightmost icon on top of the table as shown in Figure 10-31 on page 265.
- 2. Refresh the report

While you are looking at a report, you can click the refresh button to generate the report again.

Sometimes you only need one of the two steps, but the refresh alone did not work consistently for us.

10.7 VMware and Tivoli Storage Productivity Center privileges-permissions

Because having the correct privileges is important, we have dedicated it a section that is referenced from different points in this chapter.

In the first section, we added some general information about vCenter permissions because this might be helpful as background when reading the rest. We think it will be especially helpful if you plan to do provisioning through the vSphere Web Client, but want or need to restrict that action to specific users.

10.7.1 General vCenter permission information

The vCenter Administrator assigns permissions to vCenter entities such as virtual machines or datastores. A user is associated with a role and its given permission on a specific entity. For example, the user, vmusr1, is associated with role1 (which consists of a set of privileges).

The administrator gives a user permission to access VM machine, vm1, with role1 privileges. The user can perform the operation associated with the privileges in role role1, on virtual machine, vm1.

The following scenarios describe the interaction between VMware permissions and Tivoli Storage Productivity Center plug-in.

Scenario 1

A user that has been given permission to a virtual machine with the pre-configured "read-only" role or with a new role with no additional privileges can view the report:

Virtual Machine Monitor \rightarrow Storage Mapping report

The following notes apply to this scenario:

- Disk in the Hypervisor data column in the report is not available from vCenter, but is available from the Tivoli Storage Productivity Center.
- ► User cannot create or change Tivoli Storage Productivity Center server configuration.
- ► User cannot provision storage since the provisioning menu is not displayed.

Scenario 2

A user with that has been given permission to a virtual machine and its ESX host with the pre-configured "read-only" role or with a new role with no additional privileges can view all reports: Virtual machine storage report, volume performance report, and fabric information report.

The following notes apply to this scenario:

- ► User cannot create or change the Tivoli Storage Productivity Center server configuration.
- User cannot provision storage since the provisioning menu is not displayed.

Scenario 3

A user with that has been given permission to a virtual machine and its ESX host with a new role that includes all privileges required by Tivoli Storage Productivity Center can view all reports: Virtual machine storage report, volume performance report, and fabric information report.

The following notes apply to this scenario:

- ► User cannot create or change the Tivoli Storage Productivity Center server configuration.
- User cannot provision storage because they do not have the permission on the vCenter to create tasks or update tasks.

Scenario 4

A user that has been given permission to a virtual machine, its ESX host, and the vCenter with a new role that includes all privileges required by Tivoli Storage Productivity Center (listed in Table 10-4 on page 269). The user can perform all Tivoli Storage Productivity Center plug-in functions.

10.7.2 vSphere Web Client extension for Tivoli Storage Productivity Center

Depending on what you do within VMware you need additional privileges. We discuss the necessary privileges in this section:

- Installation and configuration. See Table 10-2.
- ▶ View reports. See Table 10-3.
- ► Provision storage using Tivoli Storage Productivity Center. See Table 10-4 on page 269.

For any of those actions, you must have the system-defined privileges System. Anonymous, System. View, and System. Read. These privileges are always present for any user-defined roles.

Table 10-2 VMware privileges for installation and configure

Торіс	Role requirement	
Register vSphere Web Client extension	Permissions.Modify Permission	
Register, unregister, and scan the VASA Provider	Storage views.Configure service	

Note: One step of the registration of the vSphere Web Client extension is to also register the VASA Provider automatically, so you need all of the privileges listed above.

Table 10-3	VMware priv	ileges to viev	v reports in ti	he vSphere	Web Client extension
------------	-------------	----------------	-----------------	------------	----------------------

Торіс	Role requirement
To view data store objects	Datastore.Browse datastore on data store objects
To view storage view objects	Storage views.View privilege on the root vCenter Server

When a user invokes a provision request in Tivoli Storage Productivity Center, the user ID that is used by the vCenter to log in to Tivoli Storage Productivity Center is not the ID of the user initiating the request. Instead, it is the specific user ID that was defined during the configuration.

Note: In a production environment, it might be a good idea to not configure the user ID of an administrator, but create a dedicated user ID that is authorized in Tivoli Storage Productivity Center and configured in the Tivoli Storage Productivity Center Extension.

Since there is a specific Tivoli Storage Productivity Center user ID stored in the configuration of the vSphere Web Client extension for Tivoli Storage Productivity Center, the actual user that logs in to the vSphere Web Client does need any authority on the Tivoli Storage Productivity Center server itself. To prevent that just any user that is logged in to vSphere can initiate provisioning tasks, vSphere requires that the roles that are assigned to your user ID have the privileges listed in Table 10-4 on page 269 in the vCenter Server.

Торіс	Role requirement		
Role requirements for the vSphere Web Client extension in VMware			
To start provisioning	Host.Configuration.Storage partition configuration		
To create and update tasks	Tasks.Create task and Tasks.Update task privileges on the root vCenter Server		
To view information about events	Global.LogEvent privilege		
To configure storage partitions	Host.Configuration.Storage partition configuration privilege on host objects		
To configure data stores	Datastore.Configure datastore privilege on data store objects		
Role requirements for the vSphere Web Client extension in Tivoli Storage Productivity Center			
To use a service class Note: This applies to the user ID that is configured with the vSphere Web Client extension for Tivoli Storage Productivity Center	Administrator or the user ID needs to have been allowed to use the service class		

Table 10-4 VMware privileges required for provisioning

10.7.3 VASA Provider

Depending on what you do within VMware, you need additional privileges.

- ► Installation and configuration. See Table 10-5.
- View data collected by the Tivoli Storage Productivity Center VASA Provider. See Table 10-3 on page 268.

For any of those actions you must have the system-defined privileges System. Anonymous, System. View, and System. Read. These privileges are always present for any user-defined roles.

Table 10-5 Villware privileges for installation and configuration	
Торіс	Role requirement
Register, unregister, and scan the VASA Provider	Storage views.Configure service

Table 10-5 VMware privileges for installation and configuration

To view alarms and storage capabilities in vSphere that are collected by the Tivoli Storage Productivity Center VASA Provider, you must have the following privileges for vSphere.

Table 10-6 VMware privileges to view data collected through VASA

Торіс	Role requirement	
To view Datastore objects	Browse Datastore privilege	
To view Storage Reports	View privilege	

Role requirements for VASA Provider within Tivoli Storage Productivity Center

Registering and using the features of the Tivoli Storage Productivity Center VASA Provider requires a user ID with one of the following roles to be configured:

- Administrator
- Monitor
- External Application

10.8 VMware Profile Driven Storage and VM storage profiles

The VMware Profile Driven Storage is a function that helps you to select the optimal datastore when you create a new virtual machine. The decision which datastore is selected depends on profiles that you select so this is very similar to the Tivoli Storage Productivity Center Service Classes.

These profiles are called *VMware Storage Profiles*. When you define profiles, you associate capabilities with the profiles. If you use the capabilities reported through VASA, VMware can automatically understand the type of volume.

You need to implement a number of steps to successfully use the VM Storage Profiles for provisioning. Here is just a rough outline:

- 1. Register the Tivoli Storage Productivity Center VASA Provider
- 2. Review the System Capabilities that your registered VASA Providers can report and optionally add user-defined capabilities
- 3. If you chose to use user-defined capabilities, you need to assign them to volumes/LUNs
- 4. Define VM Storage Profiles
- 5. Enable VM Storage Profiles
- 6. Use the VM Storage Profiles to provision a new virtual machine

Note: Since VMware has a very sophisticated model of permission, you probably need certain rights to be able to do those tasks.

This is very similar to the Cloud Configuration within Tivoli Storage Productivity Center, but the details are very different. Since many storage administrators may not be familiar with the VMware terms, we created Table 10-7 as a high-level comparison.

Tivoli Storage Productivity Center	VMware
Service Class	Storage Profile
Capacity Pools	Storage DRS
Storage Pools	Datastores
Tivoli Storage Productivity Center Tiers/Custom Tags	User-defined capabilities
Attributes gathered during a probe	System capabilities

Table 10-7 Comparing concepts

10.8.1 System capabilities reported through Tivoli Storage Productivity Center

Tivoli Storage Productivity Center will report the following system capabilities including all of the following combinations back to VASA:

- Thin Provisioning
- Encryption
- SSD
- ► HDD
- Replication
- Compression
- ► File

In addition to those capabilities, Tivoli Storage Productivity Center will also report the service class names to VMware through the VASA interface.

Note: The capabilities will always be reported regardless of whether the type of storage is configured or not. This is so you can use the capabilities when you define the VM Storage Profiles.

Steps to check the capabilities reported by Tivoli Storage Productivity Center

If you want to check the entire list of the capabilities that are available in your environment, complete the following tasks:

- 1. Open the VM Storage Profiles from the home panel in the vSphere Web Client.
- 2. From the profiles panel, click upper right icon, as shown in Figure 10-32.

Home 🔻 I	🔂 VM Storage Profiles				
📑 VM Storage Profiles 🛛 🗾 🚺	15 IS IS			Q Filter	-
	Name	Virtual Center	Associated VMs	Associated Virtual Disks	
		Th	is list is empty.		
	M			0 item	is 斗 -

Figure 10-32 VM Storage Profiles

A new window opens and shows you the currently configured User Defined capabilities and the list of available System capabilities as shown in Figure 10-33 on page 272.

Manage Storage Capabilities			
vCenter Server: POKVC1 -			
Storage capabilities are a group of parameters that a datast capabilities to a datastore and you cannot modify them. You	ore guarantees. Capabilities can be system-defined or user-o can add, remove and edit user-defined storage capabilities a	defined. Supported storage syste nd later associate them with dat	ems assign system-defined astores.
🕈 🧷 🗙 🛅 -			Q Filter -
Capability Name	Description	Туре	
Bronze	Standard storage for non-mission-critical applications.	System	<u>م</u>
EnhancedIsolation	Enhanced isolated file storage.	System	
Gold	Highest-performing storage for mission-critical applicati	System	
Normallsolation	Normal isolated file storage.	System	
Silver	High-performing storage for applications in production.	System	
Silver_Research	Silver based service class with filter on resource tags	System	:
Silver_Research_Site_1	Silver based service class with capacity pool and resour	System	
Silver_Site_2	Silver based service class with filter on capacity pools	System	
Thin	Thin Provision	System	
Encryption, Thin	Encryption, Thin Provision	System	
EasyTier,Thin	Easy Tier, Thin Provision	System	
EasyTier	Easy Tier	System	
EasyTier,Encryption,Thin	Easy Tier, Encryption, Thin Provision	System	
EasyTier,Replication	Easy Tier, Replication	System	
SSD,Thin,Compression,Replication	Solid State Disk, Thin Provision, Compression, Replicati	System	
Encryption	Encryption	System	
Compression	Compression	System	
HDD,Compression	Hard Disk Drive, Compression	System	
SSD,Encryption,Thin	Solid State Disk, Encryption, Thin Provision	System	
HDD,Encryption	Hard Disk Drive, Encryption	System	
Encryption, Thin, Replication	Encryption, Thin Provision, Replication	System	
EasyTier,Thin,Compression	Easy Tier, Thin Provision, Compression	System	
HDD,Encryption,Thin	Hard Disk Drive, Encryption, Thin Provision	System	
HDD Thin Replication	Hard Disk Drive Thin Provision Replication	System	*
			Close

Figure 10-33 List of all available capabilities that can be used to define VM Storage Profiles

10.8.2 Create a profile

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To create a new profile, simply click the leftmost icon in Figure 10-32 on page 271. You can select any of the available capabilities listed and you can select combinations of them.

If you are using the Tivoli Storage Productivity Center Cloud Configuration and Provisioning, you can also align a Service Class to a VM Storage Profile in a one-to-one fashion.
Create New VM Storage P	rofile		
vCenter:	POKVC1 -		
Name:	Gold_Profile		
Description:			
Storage Canabilities:			(a. 511-2
Storage Capabilities.	Clear All Select All II Select All		Q Filter
	Name	Туре	
	Bronze	System	
	EnhancedIsolation	System	
	Gold	System	
	NormalIsolation	System	
	Silver	System	
	Silver_Research	System	
	Silver_Research_Site_1	System	
	Silver_Site_2	System	
	Thin	System	
	Encryption,Thin	System	
	EasyTier,Thin	System	

Figure 10-34 Define a profile

10.8.3 Enable VM Storage Profile

After you have defined the profiles, you still need to enable the function for a host or a cluster. In order to do that, you must click the center icon shown in Figure 10-32 on page 271. This opens a window like the one shown in Figure 10-35 on page 274.

Enable VM Storage Profiles							? X
vCenter Server: POKVC1 -							
Enable or disable VM Storage Profile	es for a host or a cluster. To enable ti	he feature for a hos	t, its license must	t include VM Storage Profiles. To	enable the	feature for a cluster, a	all the
hosts in the cluster must have a lice	ense that includes VM Storage Profile	S.					
Hosts and Clusters:							
Disable Enable 🕻	→					Q Filter	•
Name	Datacenter	Licensing Status		VM Storage Profile Status	Notes		
poksrv3.itso.ibm.com	POKDS1	Licensed		Enabled			
							::
							•
Hosts in selected cluster:							
Name			Licensing Status				
							Close
							01036

Figure 10-35 Enabling the VM Storage Profiles function

10.9 vSphere Web Client Extension for Tivoli Storage Productivity Center: Reports

One function that the Web Client Extension for Tivoli Storage Productivity Center provides is the access reports about fabric and storage information collected by Tivoli Storage Productivity Center in the vSphere Web Client. This will help the VMware administrator to identify resources much more easily, and spreadsheets or other forms of documentation are no longer necessary.

The following types of reports are available with Tivoli Storage Productivity Center V5.2.2:

- Fabric Connections. View information about the fabric connected to ESX host storage adapter.
- ► Storage System Metrics. View performance metrics for the back-end storage systems.
- ► Storage Mapping. View mapping of virtual storage resources to storage systems.

The reports include hyperlinks directly to the storage entities in Tivoli Storage Productivity Center web-based GUI.

Obviously, you need to have the environment configured, probed, and performance data collection tasks need to be running to provide information back to the VMware Web Client.

Another prerequisite is the access level that you need: Users logged to the vSphere Web Client must have at least the pre-configured "read-only" role to the hosts and the virtual machines.

10.9.1 Fabric Connections report

The Fabric Connections report does provide some essential information about how a particular adapter of the ESX server is connected to the SAN fabric, so it includes:

- ► Fabric name
- Switch name
- Switch port
- Active zone

The reporting level is at the HBA level of an ESX server.

You can access the report related to fabric connections by looking at an ESX server as shown in Figure 10-36.

Home	poksrv3.itso.ibm.com Action	ns 🔻					=*
	Getting Started Summary Mor	nitor Manage Related Objects					
✓ ✓ ♥ POKVC1 ✓ ♥ POKDS1 ✓ ♥ poksp/3 itso ibm com	Settings Networking Storage	Alarm Definitions Tags Permissi	ons				
poksivo.iso.isin.com		Storage Adapters					
	Storage Adapters	+ 💻 🔂 🔔 🐚 + 🗁 🎟				Q Filter	•
	Storage Devices	Adapter	Туре	Status	Identifier	Targets	Devices
	Host Cache Configuration	ICH10 4 port SATA IDE Controller					
		🚱 vmhba32	Block SCSI	Unknown		0	0
		🔄 vmhba0	Block SCSI	Unknown		1	1
		LPe12000 8Gb Fibre Channel Hos	st Adapter				
		🚱 vmhba4	Fibre Cha	Online	20:00:00:00:c9:80:9b:6b 10:00:00:c9:80:9b:6b	4	3 ::
		🔄 vmhba3	Fibre Cha	Online	20:00:00:00:c9:80:9b:6a 10:00:00:c9:80:9b:6a	4	2
		MegaRAID SAS GEN2 Controller					
		🔄 vmhba2	SCSI	Unknown		2	2 🔻
		4					•
		Adapter Details					
		Properties Devices Paths	Fabric Connec	tions			
				1			(?)
		Fabric name 1000000533E	316EC				
		Switch name IBM_2498_B2	4				
		Switch port 20:0c:00:05:33	3:f3:16:ec				
		▼Active zones 2					
		Zone name TPCpoksrv3	3_SVC_8G4_1				
		Zone name TPCpoksrv3	SVC_8G4_2				

Figure 10-36 Fabric Connections report

To get there, navigate from the home tab in the vSphere Web Client to:

- 1. Hosts and Clusters
- 2. Select a vCenter in our example POKVC1
- 3. Select a data center in our example POKDS1
- 4. Select an ESX server in our example poksrv3.itso.ibm.com
- 5. Now open the Manage tab
- 6. Click the **Storage** button
- 7. Click Storage Adapters
- 8. Select a Fibre Channel adapter
- 9. The Fabric Connections report is in the Adapter Details section

The fabric name, the switch name, and the switch port are hyperlinks to the corresponding panels within the Tivoli Storage Productivity Center web-based GUI. If you have not authenticated with the Tivoli Storage Productivity Center server, you have to provide a user ID and password the first time you click a link.

10.9.2 Storage System Metrics report

The Storage System Metrics report provides information about the volume performance of the volumes that are used by an ESX server from the perspective of the storage system. The following types of performance metrics are available. For each, you can display reads, writes and total/overall data:

- I/O rate
- Data rate
- Response times
- Transfer size

The reporting level is the volumes of an ESX server.

The report is implemented as a new tab on the VMware performance monitor panel, called Storage System Metrics. You can access the report related to fabric connections by looking at an ESX server as shown in Figure 10-37.



Figure 10-37 Storage performance report

In order to insure the storage performance report, complete the following tasks:

- 1. Navigate from the home tab in the vSphere Web Client to Hosts and Clusters
- 2. Select a vCenter in our example POKVC1
- Select a data center in our example POKDS1
- 4. Select an ESX server in our example poksrv3.itso.ibm.com
- 5. Open the Monitor tab
- 6. Click the Performance button

7. Select the Storage System Metrics tab

This is a new tab that is provided by the Tivoli Storage Productivity Center extension.

Controls

By default, the performance of all connected volumes is displayed, as shown in Figure 10-38 on page 278. By selecting one or more volumes from the table below the chart called the Performance Chart Legend, you can control what is shown in the diagram.

On the upper right part of the tab panel, you can select one of the following time frames:

- Last hour
- Last day
- Last week

You can also select the metric that should be displayed:

- ► I/O rate (read, write, or total)
- Data rate (read, write, or total)
- Response times (read, write, or overall)
- Transfer size (read, write, or overall)

Tip: With this release, there are only 12 metrics available, but in contrast to the information that VMware can report on, this information is measured by Tivoli Storage Productivity Center at the storage system level. If you would like to see other performance metrics here, submit a Request for Enhancement through the RFE tool. For details on submitting a Request for Enhancement, refer to Appendix A, "Request for Enhancements" on page 285.



Figure 10-38 Tivoli Storage Productivity Center performance report panel

In the Performance Chart Legend, you will also see information about the Storage System, Storage Pool, and Storage Volume, from the storage system perspective. This information is provided by Tivoli Storage Productivity Center. Links into the Tivoli Storage Productivity Center web-based GUI for a quick reference and more information are provided.

You need to have a user ID in Tivoli Storage Productivity Center in order to open the panels. If you do not have a Tivoli Storage Productivity Center user ID, you can still click the links and copy the URL from the browser windows into an email or chat tool to send it to a Tivoli Storage Productivity Center administrator. This makes pointing to the exact object very easy.

Note: If some information is missing in that panel, for example, storage system, pool, and volume information like shown in Figure 10-38, this simply means that Tivoli Storage Productivity Center has not yet run a probe against the ESX server or vCenter after this volume has been mapped.

On the lower right corner is a little export button that allows you to export the legend table to a csv file. All data for the selected volumes will be exported including the average values that are explained next.

If you scroll to the right in the Performance Chart Legend, Tivoli Storage Productivity Center provides average values for the volumes per sample of performance data collected and also hourly averages:

- If last hour is display, only averages for samples are available
- If last day is display, all averages are available
- If last week, all averages are available

Total I/O Rate S	Total I/O Rate H	Read Response	Read Response	Overall Response	Overall Response Time Hourly (ms/op)
0	0.04	0	0.04	0	0.04
89.14	0	0.17	0	0.22	0
0	0	0	0	0	0

Figure 10-39 Performance Chart Legend scrolled to the right

10.9.3 Storage Mapping report

The Storage Mapping report is available only with the vSphere Web Client extension for Tivoli Storage Productivity Center. The report displays storage mapping information for each virtual disk on a virtual machine. The information is collected from Tivoli Storage Productivity Center and vSphere vCenter Server. The following information is displayed:

- In the title:
 - Guest OS Host Name
 - Hypervisor Host Name
- In the table:
 - Virtual Disk
 - Virtual Disk Size
 - Virtual Disk Maximum Size
 - Thin Provisioned
 - Raw Device Mapping
 - File (the vdsk file name)
 - Mount Point on Guest OS (Information provided if an SRA is installed in the VM)
 - Used Space on Guest OS (Information provided if an SRA is installed in the VM)
 - Storage System
 - Storage Pool
 - Storage Volume
 - NAS Server
 - NAS Share Path

The level of reporting is the virtual machine.

You can access the report related to fabric connections by looking at an ESX server as shown in Figure 10-40 on page 280.

bokvc1	Actions 👻											≡*
Getting Starte	d Summary	Monitor Manage	Related Obj	jects								
Issues Per	formance St	orage Mapping Resourc	e Allocation	Storage Rep	orts Tasks Events							
											<u> </u>	
Guest O	** Guest OS Host Name: <u>polyc1.ltso.lbm.com</u> Hypervisor Host Name: <u>polyc1.ltso.lbm.com</u> Q											
Virtual Disk 1	Virtual Disk	Virtual Disk Maximum Size	Thin Prov	Raw Device	File	Mou	Used Space on Guest OS	Disk on Guest	Disk on Hypervisor	Storage System	Storage Pool	Storage Volume
Hard disk 1	40.00 GiB	232.29 GiB	Yes	No	[SVC_Datastore] pokvc1/pokvc1-000002.vmdk	C:/	37.88 GiB	Disk 0	naa.60050768	SVC-2145-ITSO	ssd	SVC_Datastore
Hard disk 2	40.00 GIB	232.29 GiB	Yes	No	[SVC_Datastore] pokvc1/pokvc1_1-000001.vmdk	E:/	8.17 GIB	Disk 1	naa.60050768	SVC-2145-ITSO	ssd	SVC_Datastore
Hard disk 3	10.00 GiB	10.00 GiB	N/A	Yes	[SVC_Datastore] pokvc1/pokvc1_2.vmdk		-		naa.60050768	SVC-2145-ITSO	DS8300_site1_p01	RawVolume
Hard disk 4	1.00 GiB	1.00 GiB	N/A	Yes	[SVC_Datastore] pokvc1/pokvc1_3.vmdk			-	naa.60050768	SVC-2145-ITSO	DS8300_site2_p01	site2_test_01
Last update	d Friday, Nove	mber 01, 2013 2:20:55 PI	N									4 items 🕒 👻

Figure 10-40 Storage mapping report

In order to see NAS information, you must scroll to the right. The report also provides links to the Tivoli Storage Productivity Center panels of a particular object if you click it.

To get to this report, navigate from the home tab in the vSphere Web Client to:

- 1. VMs and Templates
- 2. Select a vCenter, in our example POKVC1
- 3. Select a data center, in our example POKDS1
- 4. Select a virtual machine, in our example pokvc1
- 5. Now open the Monitor tab
- 6. Select the Storage Mapping button

10.10 Storage provisioning with the vSphere Web Client

Provisioning storage through the Tivoli Storage Productivity Center service catalog cannot only be done by the Tivoli Storage Productivity Center administrator from the Tivoli Storage Productivity Center web-based GUI, it can also be performed by the VMware administrator through the vSphere Web Client.

Setting up the storage services catalog is described in detail in Chapter 9, "Storage optimization" on page 207.

To start the task of provisioning:

- 1. Start the vSphere Web Client.
- 2. From the vSphere Web Client Inventories view, select Hosts and Clusters.
- 3. Select the hypervisor for which you want to provision storage.
- Click the Actions menu item, and after a short time, the web server has loaded the extension and guides you through the process to select All TPC Actions, as shown in Figure 10-41 on page 281.

Home 🔽 I	poksrv3.itso.ibm.com	Actions 👻						±.	
	Getting Started Summary	Actions - poksrv3.itso.ibm.com	bjects						
♥ POKVC1 POKDS1 ▷ ■ poksrv3.itso.ibm.com >	Issues Performance Res ff CPU Memory Storage	Berler Maintenance Mode Exit Maintenance Mode Descente Power On Beboot Boltzonnect Power Virtual Machine Power DV VF Template New Datastore	s Tasks	s Tasks Events Hardware Status Log Browser 15.85 GHz 15.85 GHz 0.00 GHz 15.85 GHz					
		Move To		Reservation (MHz)	Limit (N	MHz)	Shares	Shares Value	
		Alarms >		0	Unlim	nited	Normal		
	l	All TPC Actions	Prov	ńsion Block Storage Ision File Storage					
		4						Þ	

Figure 10-41 All Tivoli Storage Productivity Center Actions menu

- 5. Select Provision Block Storage for block or select Provision File Storage for file.
- 6. For block storage, you will see a dialog box as shown in Figure 10-42.

Size:	10 Gi	3 🔹	
Service class:	Silver	•	
Capacity pool:	Site 1 (405.31 GiB)	•	
🗹 Create datastore	NewDatastore		

Figure 10-42 Block Storage Provisioning

In the wizard, enter the following information to provision volumes:

- Size: The total usable storage space on a volume. The default unit for volume is GiB. If you select to create a datastore, the minimum volume size is 2 GiB.
- Service class: The name of the service class. For block storage, a service class typically represents a particular quality of service, for example, Gold, Silver, or Bronze.

Note: Users can select only service classes with available capacity that the user ID configured for the Web Client extension is authorized to use.

7. When you click **OK**, Tivoli Storage Productivity Center creates a task to execute the creation and optionally the zoning of the volume, as well as create the data store if that was selected.

8. You can monitor the progress within the vSphere Web Client as shown in Figure 10-43: $<vCenter> \rightarrow <Data Center> \rightarrow <ESX server> \rightarrow Monitor \rightarrow Tasks$

Home	poksrv3.itso.ibm.com Actions -				=*
	Getting Started Summary Monitor Manage	Related Objects			
→ @ POKVC1					
▼ POKDS1	Issues Performance Resource Allocation Sto	rage Reports Tasks Events Ha	rdware Status Log Browser		
poksivs.itso.ibm.com	≡ · –				Q Filter 🔹
	Task Name	Target	Status	Initiator	Start Time
	Create VMFS datastore	poksrv3.itso.ibm.com	 Completed 	Administrator	28/10/2013 16:09
	Rescan HBA	poksrv3.itso.ibm.com	 Completed 	Administrator	28/10/2013 16:09
	Create VMFS datastore	poksrv3.itso.ibm.com	 Completed 	Administrator	28/10/2013 16:08
	Rescan HBA	poksrv3.itso.ibm.com	 Completed 	Administrator	28/10/2013 16:08
	Provision storage for LUN	poksrv3.itso.ibm.com	 Completed 	administrator	28/10/2013 16:07
	4				•
	195			91	items 🖪 Previous Next 🕨
	Create VMFS datastore Status:				
	Related events:				▲
	28 October 2013 16:09:59	Fask: Create VMFS datastore			
					T

Figure 10-43 Monitor progress of the provisioning

Note: Due to the limitations of vSphere API, the exact error message from Tivoli Storage Productivity Center cannot always be viewed in the vSphere Web Client task. The most common errors have been added and are visible in the task status.

10.10.1 Considerations

There are several considerations that we would like to point out here that are different from the provisioning when launched from the Tivoli Storage Productivity Center GUI:

- ► It may take some time for the drop-down fields to be initialized
- You can only create one volume at a time
- Tivoli Storage Productivity Center will create a volume name like V_131028_190434, which you cannot change at this time.

Where:

- V_ for Volume
- 131028 for the date: 28th of October 2013
- 190434 for the time: 19:04:34

The date and time will also be reflected in the task name within Tivoli Storage Productivity Center.

You can optionally create a new data store for the new volume

10.10.2 Troubleshooting tip

If you receive a failure when provisioning storage with an error message like HWN020003E Invalid parameter 210000C0DD122527 in the log, this error happens because one or more ESX servers in a cluster is not managed by Tivoli Storage Productivity Center.

In this error, the invalid parameter 210000C0DD122527 is the worldwide port name (WWPN) of an ESX server, which is in a cluster with a host that you are running the provisioning.

To fix this problem, you need to add all the ESX servers that are in the same cluster to Tivoli Storage Productivity Center. This can be done by adding the vCenter server or individual ESX servers.

10.11 VMware VASA reports

Data that is gathered through any VASA Provider is displayed in reports that are built into VMware. These reports are always present, no matter if there is a VASA Provider registered or if the Web Client Extension for Tivoli Storage Productivity Center has been installed. Therefore, it should be very intuitive for a VMware administrator to work with the reports.

To get to this report, navigate from the Home tab in the vSphere Web Client to:

- 1. Hosts and Clusters
- 2. Select a vCenter, in our example POKVC1
- 3. Select a data center, in our example POKDS1
- 4. Select a virtual machine, in our example pokvc1
- 5. Now open the Monitor tab
- 6. Select the Storage Reports button
- Out of the seven reports listed in the "Report On" drop-down list, only three reports contain information that was gathered through the VASA Provider. The three reports and the columns containing VASA data provided by Tivoli Storage Productivity Center, as listed below:
 - a. Datastores
 - · System capability
 - Storage Provider Namespace. Identifies which VASA Provider has collected the information
 - b. SCSI Volumes (LUNs)
 - · Committed. Space that is committed to the thin-provisioned volume
 - Thin Provisioned. Status on thin provisioning in the storage system
 - System capability
 - Storage Array. Name of the storage system
 - Identifier on Array. Volume name/identifier on the storage system
 - Storage Provider Namespace. Identifies which VASA Provider has collected the information

- 8. NAS Mounts
 - System capability
 - Storage Provider Namespace. Identifies which VASA Provider has collected the information

Note: The * after the column name indicates that the information was collected through VASA.

In the Figure 10-44 screen capture, you can see an example of a SCSI Volumes (LUNs) report.

poksrv3.itso.ibm.com Actions	3 v											≡*
Getting Started Summary Monit	tor Manage Rela	ated Obj	jects									
Issues Performance Resource	Allocation Storage F	Reports	Tasks Event	s Hardware S	Status Log Browser]						
<u>@</u>								1	Report On: SCSI Vo	lumes (LUNs)	•	Filter -
SCSI ID	Runtime Name	Lun	Status	Host status	Datastore	Capacity 2	Committed *	Thin Provisioned *	System Capability *	Storage Array *	Identifier on Array *	Volume Name
02000000060050768018305e	vmhba3:C0:T1:L0	0	Unknown	Down 3		10.00 GB	1					IBM Fibre Channel Disk (n
02000000060050768018305e	vmhba4:C0:T5:L0	0	Unknown	Up	SVC_Datastore	283.00 GB	87869620224	true	EasyTier,Thin	SVC_CF8	SVC_Datastore	IBM Fibre Channel Disk (n
020000000600605b00169f2c	vmhba2:C2:T1:L0	0	Unknown	Up	poksrv3ds2	556.93 GB						Local IBM Disk (naa.6006(
020000000600507680191026	vmhba3:C0:T3:L0	0	Unknown	Up		1.00 GB	0	false	Silver	SVC_8G4	site2_test_01	IBM Fibre Channel Disk (n
020000000600605b00169f2c	vmhba2:C2:T0:L0	0	Unknown	Up	poksrv3ds1	135.97 GB						Local IBM Disk (naa.6006(
4			1				1					•
Last updated 01 November 20	13 18:44:13 🚯											5 items 📑 🗸

Figure 10-44 Report example containing information collected through VASA

In the example, we have pointed out the following fields:

- 1. The drop-down field, where you can select "Report on"
- 2. The information collected by VASA Providers

In addition, we highlighted why some fields in the VASA section of the report are empty:

- 3. The volume is missing, but still contained in the VMware configuration inventory
- 4. Those are internal disks of the ESX server

Note: Since the report was not created by the Web Client Extension for Tivoli Storage Productivity Center, you will not see links to the Tivoli Storage Productivity Center web-based GUI.

There is also a column called User Defined Capability with an * but the information reported here has been configured within VMware and not been collected via one of the providers.

Α

Request for Enhancements

When you have an idea on how to enhance a product by adding a new feature, changing a function or adding support for something else more often than not this idea will not get heard by the right people. We at IBM know that there are always situations where a product can be enhanced so we wanted to make it easier for you to tell us your ideas about how we can make the products better.

Until recently, only IBM employees could use an internal application to enter change requests, so you would have to talk to the right person that could understand your idea and that person would then forward that idea.

This new process is not yet known to many Tivoli Storage Productivity Center users. We would like to use this opportunity to explain what the Request for Enhancement process is and how it works, so that you can help to make Tivoli Storage Productivity Center even better.

What is the IBM Request for Enhancements (RFE) Community

The IBM Request for Enhancements Community is a community that is hosted on the IBM developerWorks® website where you can collaborate with the IBM product management and with other product users. It allows you to submit and track your ideas on how to improve a product.

The community also provides functions to view, search, watch, and vote for ideas that others have submitted. This is important because it provides a good way to understand the demand of new functions and features or supported environments much more easily.

Current process differences

There is no need to involve IBM Customer Support or IBM sales representatives in this process. You can submit ideas right at the time, when you work with the product and notice a missing function or the way something works.

RFE also improves the ability to monitor and manage your ideas because you do not need to go through a middle man any longer.

Who can use it

Customers, partners, and IBM employees can use the RFE Community. However, there is a small restriction that comes from functions like tracking your ideas or voting for ideas of others. You need to sign in to the community for using most of the functions. For this, you need an IBM ID, which is available for everyone at no charge. You may already have an ID from signing up for support newsletters or for downloading code. If not, the next step shows you how to create one.

Getting started

Simply open the community with your web browser and go to:

http://www.ibm.com/developerworks/rfe

You can browse some things even without signing in. When you open a panel that requires you to sign in, you will see a prompt. You can also click **Sign in (or register)** in the upper right corner, as shown in Figure A-1 on page 287.



Figure A-1 Sign in or register

If you do not have an IBM ID yet, click Need an IBM ID? to create one.

Status meaning

When you start looking at requests you will notice the different status information. In this section, we describe the status meanings.

Planned for Future Release

The request is approved and planned for delivery within the next year or next generally available (GA) release. IBM will confirm this request at GA and will update the status to *Delivered*.

Uncommitted Candidate

If the status is *Uncommitted Candidate*, this request will not be delivered within the next year, but the theme is aligned with our two-year strategy. IBM is soliciting feedback for this request, and within one year from submission, status will be updated to either *Rejected* or *Planned for Future Release*. See Figure A-2 on page 288.



Figure A-2 Flow of Request for Enhancement

Note: When RFE is created:

- ► The author has 24 hours to modify any field.
- After 24 hours, the request is locked and bridged to the back-end system.
- Submitter can add comments at any time, but not modify the original information. This prevents requirement changes after the evaluation by the IBM team.

Response process after an RFE is submitted

IBM works to provide an initial response within the first 30 days of submission, and a more definitive response within 90 days. Not all requests will meet these commitments because sometimes we need more information from you to understand the request. In addition, IBM might need to do a rough sizing estimate before a decision can be made on its inclusion in a future version of the product.

If more information is needed, you will sometimes be directly contacted by a developer or a product manager with questions to better understand your idea.

Required information

To submit a new idea as a Request for Enhancement, you will first click the submit tab (see Figure A-1 on page 287). Start with entering a short headline and a priority. Figure A-3 on page 289 shows what an empty form looks like.

	evel <u>operWo</u>	rks	Technical topics	s Evaluatio	n software	Comn	nunity Ev	vents	non • Instantidau •	a
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Figure A-3 Request form

Next, select from a set of drop-down boxes the product for which you want to submit an idea:

- IBM brand. For Tivoli Storage Productivity Center, select Tivoli.
- Product family. For Tivoli Storage Productivity Center, select Storage.
- Product. Select IBM Tivoli Storage Productivity Center.
- Component. The components that are currently available in the drop-down box do not apply to Tivoli Storage Productivity Center anymore, so you can select any of them.
- Operating system. Most of the time you will select Multiple or Other because more often than not the function is not related to a specific operating system.

The following fields will be used to describe what this idea is about and when or how the function or feature would be used:

- Description. What is this function.
- Use Case. When would this function be used.

Optionally, you can enter a Business justification to explain why IBM should add this feature. Include information such as extent of individuals affected, impact on your business, project, or daily work.

Note: The fields Company and Business information are only visible to IBM and not to any other users in the RFE community.

Priority definitions

Obviously, you want to have the function as quickly as possibly. Use the following definitions when selecting the priority of your request.

- **Low** RFE would be a nice feature to have.
- Medium Lack of the RFE functionality is a minor road block to deployment or adoption.
- **High** Lack of RFE function is a major road block to deployment and adoption.

Urgent Deployment and adoption cannot continue without this RFE.

If you want to learn more, start exploring the views and tabs and read the frequently asked questions, which are very helpful if you get stuck.

My notifications

IBM uses an *opt-in* policy for web applications such as the RFE Community Tool. That means if you do not intentionally indicate you want the RFE tool to notify you of changes to your RFEs, you will not get notification.

You can see the RFEs you have submitted in the *My stuff* tab, and opt-in for email notifications for all RFEs in your watchlist by subscribing from the My notifications page. See Figure A-4 on page 291.

developerWorks.	Technical topics Evaluati	on software Co	ommunity Eve	Englis	sh 👻 mstandau 👻	dW				
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					→ WebSphere					

Figure A-4 My notifications window

RSS feeds

Your notifications are also available as multiple RSS feeds, grouped by:

- My watchlist
- My requests
- My votes

There are RSS feeds for groups that you have created. A third type of RSS feed is feeds for the entire community, but since all products are listed in those feeds, they might not be that interesting for most users.

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this book.

IBM Redbooks

The following IBM Redbooks publications provide additional information about the topic in this document. Note that some publications referenced in this list might be available in softcopy only.

- Tivoli Storage Productivity Center Advanced Topics, SG24-8236
- ► IBM Tivoli Storage Productivity Center V5.1 Technical Guide, SG24-8053
- Tivoli Storage Productivity Center for Replication for Open Systems, SG24-8149
- IBM Tivoli Storage Manager as a Data Protection Solution, SG24-8134
- IBM System Storage SAN Volume Controller V6.3, SG24-7933
- IBM SmartCloud Virtual Storage Center Solution, TIPS0991

You can search for, view, download or order these documents and other Redbooks, Redpapers, Web Docs, draft and additional materials, at the following website:

ibm.com/redbooks

Other publications

These publications are also relevant as further information sources:

- IBM Tivoli Storage Productivity Center Installation Guide, SC27-4058
- Tivoli Common Reporter User Guide, SC14-7613

Online resources

These websites are also relevant as further information sources:

- Service Management Connect http://www.ibm.com/developerworks/servicemanagement
- Request for Enhancements http://www.ibm.com/developerworks/rfe
- IBM Knowledge Center, Tivoli Storage Productivity Center http://www.ibm.com/support/knowledgecenter/SSNE44/welcome
- Tivoli Storage Productivity Center Interoperability Matrix www.ibm.com/support/docview.wss?&uid=swg21386446

Help from IBM

IBM Support and downloads **ibm.com**/support IBM Global Services **ibm.com**/services



IBM Tivoli Storage Productivity Center V5.2 Release Guide

IBM

Redbooks



IBM Tivoli Storage Productivity Center V5.2 Release Guide



Details Tivoli Storage Productivity Center V5.2 features and functions

Includes installation and customization hints and tips

Provides worked examples for using the product IBM Tivoli Storage Productivity Center V5.2 is a feature-rich storage management software suite. The integrated suite provides detailed monitoring, reporting, and management within a single console. In addition, implementing the IBM SmartCloud Virtual Storage Center (VSC) license with Tivoli Storage Productivity Center addresses new workloads that require massive scale and rapid pace, and accelerates business insight, by adding advanced analytics functions such as storage optimization, provisioning, and transformation.

This IBM Redbooks publication is intended for storage administrators and users who are installing and using the features and functions in IBM Tivoli Storage Productivity Center V5.2. The information in this Redbooks publication can be used to plan for, install, and customize the components of Tivoli Storage Productivity Center in your storage infrastructure.

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IBM Redbooks are developed by the IBM International Technical Support Organization. Experts from IBM, Customers and Partners from around the world create timely technical information based on realistic scenarios. Specific recommendations are provided to help you implement IT solutions more effectively in your environment.

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