

IBM Spectrum Control
Version 5.2.16

Administrator's Guide



Note:

Before using this information and the product it supports, read the information in “Notices” on page 193.

This edition applies to version 5, release 2, modification 16 of IBM Spectrum Control (product numbers 5725-F93, 5725-G33, 5725-Y23, and 5725-Y24) and to all subsequent releases and modifications until otherwise indicated in new editions.

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Contents

About this guide v

Who should read this guide	v
Publications	v
Accessing publications online.	v
IBM Redbooks	vi
Translation.	vi
Providing feedback about publications	vi
IBM Spectrum Control technical community	vi
Contacting IBM Software Support	vi
Reporting a problem	vii
Conventions used in this guide	vii

Chapter 1. Configuring 1

Starting IBM Spectrum Control	1
Overview of required user names for initial logon	2
Configuring alert notifications	2
Configuring email alert notifications	2
Configuring SNMP alert notifications	4
Configuring Tivoli Netcool/OMNIbus alert notifications	5
Configuring history and data retention	6
Configuring user authentication	8
Authorizing users	8
Managing LDAP	15
Adding customized text to the logon page	26
Configuring switches	26
Managing a SAN without agents	28
Setting timeout values for the Device server	28
Configuring Service Location Protocol	30
Router configuration	30
SLP directory agent configuration	30
Environment configuration	31
SLP registration and slptool	31
SLP discovery	31
Configuring IP addressing	32
Configuring IBM Spectrum Control with multiple IP addresses	32
Changing the HOSTS file.	33
Configuring the HOSTS provider	34
Registering a IBM Spectrum Control VASA provider	34
Using a IBM Spectrum Control Storage Provider certificate	35
Unregistering a IBM Spectrum Control VASA provider	36
Filter storage and file systems	36
Creating custom VM Storage Profiles.	37
Configuring the vSphere Web Client extension for IBM Spectrum Control.	37
Deploying the vSphere Web Client extension from IBM Spectrum Control server	38
Deploying the vSphere Web Client extension for IBM Spectrum Control locally	39
Unregistering the vSphere Web Client extension for IBM Spectrum Control	50

Updating the vSphere Web Client extension for IBM Spectrum Control.	51
Deploying Storage Resource agents	53
Deployment guidelines and limitations for Storage Resource agents	54
Creating a certificate for SSH protocol	60
Replacing default SSL certificates with custom certificates.	65
Configuration guidelines for 500 or more agents	69
Including a Storage Resource agent with a server master image.	70
Configuring LUN provisioning for Oracle Solaris.	71
Assigning TotalStorage Enterprise Storage Server, DS6000, or DS8000 LUNs to Oracle Solaris HBAs.	71
Modifying the HBA configuration file	72
Setting Persistent Name Binding for QLogic HBAs by using the appropriate software	72
Modifying the SCSI disk configuration file	73
Checking for TotalStorage Enterprise Storage Server, DS6000, or DS8000 multipaths in VxDMP.	74
Checking for a fully qualified host name	75
Checking for a fully qualified host name for AIX systems.	75
Checking for a fully qualified host name for Linux systems	76
Checking for a fully qualified host name for Oracle Solaris.	76
Checking for a fully qualified host name for Windows systems	77
Importing authentication information for a Storage Resource agent	77
Configuring and controlling the IBM Spectrum Control Monitoring Agent	78
Configuring the IBM Spectrum Control Monitoring Agent on Windows.	78
Configuring the IBM Spectrum Control Monitoring Agent on AIX or Linux	78
Starting and stopping the IBM Spectrum Control Monitoring Agent	79
Installing and configuring the IBM Spectrum Control server with multiple NIC cards	80
Creating an SSH certificate for the root user ID	81
Replacing the default SSL certificate for the Device, Alert, or Web server	82
Disabling TLS 1.0 and 1.1 for ports	84
Disabling TLS 1.1 and 1.0 for IBM Spectrum Control ports	84
Configuring DB2, AIX, and Linux for IPv6-only environment	85

Chapter 2. Administering 87

Administering resources and data sources	87
Storage systems	87
Hypervisors and VMware data sources	95
Switches and fabrics	97

Servers and Storage Resource agents	100
CIM agents	118
SNMP agents	122
Starting and stopping the IBM Spectrum Control servers	123
Starting the IBM Spectrum Control servers by using the GUI	123
Starting the IBM Spectrum Control servers by using scripts.	123
Stopping the IBM Spectrum Control servers by using the GUI	124
Stopping the IBM Spectrum Control servers by using scripts.	124
Checking the version and license of IBM Spectrum Control	125
Checking IBM Spectrum Control status.	126
Troubleshooting problems with the IBM Spectrum Control component and servers	126
Opening PMRs and packaging IBM Spectrum Control system log files for IBM Software Support	127
Increasing the memory allocation for the Data server	131
Increasing the memory allocation for the Data server that is running on AIX	132
Increasing the memory allocation for the Data server that is running on Linux	132
Increasing memory allocation for Data server that is running on Windows	133
Setting timeout values for the Device server	133
Changing passwords	135
Changing passwords by using the password tool.	135
Changing passwords on AIX and Linux systems with no X Window System installed.	141
Granting local administrative privileges to a domain account	142
Maintenance and security fixes	143
Collecting diagnostic information about IBM Spectrum Control	145
Service tool overview.	145
Collecting service logs for IBM Software Support troubleshooting.	147
Creating a compressed file for a Storage Resource agent	148
How to customize the service tool	149
Administering the IBM Spectrum Control database	151
Backing up the database.	152
Restoring the database	157
Disaster recovery	157
Maintaining and improving the performance of the database.	158

Repository copy tool	161
Administering DB2	162
Using the command line on UNIX and Linux	163
Manually starting DB2 on Windows.	163
Manually stopping DB2 on Windows	163
Starting the IBM Data Studio full client.	164
Monitoring DB2	164

Appendix A. Reference 167

Return codes used by Storage Resource agent	167
Agent types for monitoring fabrics and switches	170
Supported storage systems providing full disk encryption and solid-state drives	170
agent.sh command	171
Configuration files.	171
server.config file	172
scheduler.config file	173
TPCD.config file	174
Specifying the tablespace size for IBM Spectrum Control	175
agent.config file	176
Log files	176
Default locations of log files	176
Script parameters	178
Opening IBM Spectrum Control on Windows operating systems	180
Opening IBM Spectrum Control GUIs and CLIs	180
Accessing administration tools	182
Windows services used by IBM Spectrum Control	184
Frequently Asked Questions	184
Protocols and standards	185
Web Based Enterprise Management	185
Storage Management Initiative Specification	186
Service Location Protocol	186
Simple Network Management Protocol	187
Fibre Channel Methodologies of Interconnects	188

Appendix B. Accessibility features for IBM Spectrum Control 191

Notices 193

Privacy policy considerations	195
Trademarks	195

Glossary 197

Index 199

About this guide

IBM Spectrum Control™ manages storage infrastructure by centralizing, automating, and simplifying the management of complex and heterogeneous storage environments. This guide provides task-oriented administration information that helps you to obtain optimal product performance.

Who should read this guide

This guide is intended for administrators who are configuring and maintaining IBM Spectrum Control. A single administrator can manage IBM Spectrum Control, or several people can share administrative responsibilities.

Administrators should be familiar with the following topics:

- General procedures for managing software and services on Microsoft Windows, IBM® AIX®, and Linux.
- Storage area network (SAN) concepts
- IBM Spectrum Control concepts
- IBM DB2® and database concepts
- Simple Network Management Protocol (SNMP) concepts

Publications

A number of publications are provided with IBM Spectrum Control.

IBM Tivoli® Storage Productivity Center for Replication is no longer installed with IBM Spectrum Control. For current Tivoli Storage Productivity Center for Replication users who upgrade to IBM Spectrum Control, Tivoli Storage Productivity Center for Replication will remain available. See IBM Knowledge Center for any earlier versions of Tivoli Storage Productivity Center for Replication publications.

The following section describes how to access these publications online.


Accessing publications online

Use the following table to view and download publications for IBM Spectrum Control. Translated documents are available for some products.

Table 1. Locations of publications for IBM Spectrum Control and related products

Product	Online location
IBM Spectrum Control	To search across all publications or to download PDF versions of individual publications, go to the product documentation at http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/ .
IBM DB2 Database for Linux, UNIX, and Windows	http://www.ibm.com/support/knowledgecenter/SSEPGG/welcome
Jazz™ for Service Management	http://www.ibm.com/support/knowledgecenter/SSEKCU/welcome

Table 1. Locations of publications for IBM Spectrum Control and related products (continued)

Product	Online location
Tivoli Netcool/Impact	 http://www.ibm.com/support/knowledgecenter/SSSHYH/welcome

IBM Redbooks

The IBM Redbooks® are publications about specialized topics.

You can order publications through your IBM representative or the IBM branch office serving your locality. You can also search for and order books of interest to you by visiting the IBM Redbooks home page at <http://www.redbooks.ibm.com>.


Translation

Translated publications are available from IBM Knowledge Center, which is available in certain translated languages. It is displayed in the language that is appropriate for the browser locale setting.

When a locale does not have a translated version, the information is displayed in English, which is the default language. Translations of the PDFs are available when the information is translated.

Providing feedback about publications

Your feedback is important to help IBM provide the highest quality information.

To provide comments or suggestions about the product documentation, go to the IBM Knowledge Center for IBM Spectrum Control:  <http://www.ibm.com/support/knowledgecenter/SS5R93/>. Click **Feedback** at the bottom of any page and complete the form.

IBM Spectrum Control technical community

Connect, learn, and share with storage professionals: product support technical experts who provide their perspectives and expertise.

Access the IBM Spectrum Control technical community at <https://www.ibm.com/developerworks/servicemanagement/>.

Use IBM Spectrum Control technical community in the following ways:

- Become involved with transparent development, an ongoing, open engagement between other users and developers of IBM products.
- Connect one-on-one with the experts to collaborate and network about IBM and the Storage Management community.
- Read blogs to benefit from the expertise and experience of others.
- Use forums to collaborate with the broader user community.

Contacting IBM Software Support

You can contact IBM Software Support by phone, and you can register for support notifications at the technical support website.

- Go to the IBM Spectrum Control technical support website at http://www.ibm.com/support/entry/portal/product/tivoli/ibm_spectrum_control/ibm_spectrum_control_standard_edition.
To receive future support notifications, sign in under **Subscribe to support notifications**. You are required to enter your IBM ID and password. After you are authenticated, you can configure your subscription for IBM Spectrum Control technical support website updates.
- Customers in the United States can call 1-800-IBM-SERV (1-800-426-7378).
- For international customers, go to <https://www.ibm.com/planetwide/>.

You can also review the *IBM Software Support Handbook*, which is available at <http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html>.

The support website offers extensive information, including a guide to support services; frequently asked questions (FAQs); and documentation for all IBM Software products, including Redbooks and white papers. Translated documents are also available for some products.

When you contact IBM Software Support, be prepared to provide identification information for your company so that support personnel can readily assist you. Company identification information might also be needed to access various online services available on the website. See “Reporting a problem.”

Reporting a problem

Provide the IBM Support Center with information about the problems that you report.

Have the following information ready when you report a problem:

- The IBM Spectrum Control version, release, modification, and service level number.
- The communication protocol (for example, TCP/IP), version, and release number that you are using.
- The activity that you were doing when the problem occurred, listing the steps that you followed before the problem occurred.
- The exact text of any error messages.

Conventions used in this guide

Information is given about the conventions that are used in this publication.

This publication uses several conventions for special terms and actions, and for operating system-dependent commands and paths.

The following typeface conventions are used in this publication:

Bold

- Flags that display with text
- Graphical user interface (GUI) elements (except for titles of windows and dialogs)
- Names of keys

Italic

- Variables

- Values that you must provide
- New terms
- Words and phrases that are emphasized
- Titles of documents

monospace

- Commands and command options
- Flags that display on a separate line
- Code examples and output
- Message text
- Names of files and directories
- Text strings that you must type, when they display within text
- Names of Oracle Java™ methods and classes
- HTML and XML tags that display like this, in monospace type

For syntax notations, remember the following details.

- In AIX, the prompt for the root user is #.
- In AIX and Linux, the commands are case-sensitive, so you must type commands exactly as they are shown.


Chapter 1. Configuring

After IBM Spectrum Control is installed, you can configure it according to the standards and requirements of your storage environment.

Starting IBM Spectrum Control

You can start IBM Spectrum Control by opening a web browser and entering a web address for the IBM Spectrum Control logon page. For example, you might enter `https://storage.example.com:9569/srm`.

Before you start IBM Spectrum Control, ensure that you are using a supported web browser. For a list of web browsers that you can use with IBM Spectrum Control,

see  IBM Spectrum Control interoperability matrix at <http://www.ibm.com/support/docview.wss?uid=swg21386446>. In the *Agents, Servers and Browser* column, click the version of IBM Spectrum Control that is installed on your system. On the next page, click **Web Browsers** to find the web browsers that you can use.

Start the IBM Spectrum Control GUI to administer and monitor the condition, capacity, and relationships of the resources within your storage environment.

1. On a server running the Windows operating system, start **IBM Spectrum Control GUI**. If you are not on a server running the Windows operating system, start a web browser and enter the following address in the address field:

`https://host_name:port/srm`

In the preceding address, specify the following values:

host_name

The IBM Spectrum Control server. You can specify the host name as an IP address or a Domain Name System (DNS) name.

port

The port number for IBM Spectrum Control. The default port number for connecting to IBM Spectrum Control by using the HTTPS protocol is 9569. However, this port number might be different for your site. For example, the port number might be different if the default port range was not accepted during installation. If the default port number does not work, ask your IBM Spectrum Control administrator for the correct port number.

Tip: If you have a non-default port, check the value of the `WC_defaulthost_secure` property in `installation_dir/web/conf/portdef.props` file.

2. From the IBM Spectrum Control logon page, type your user name and password and click **Log in**. The IBM Spectrum Control GUI opens in the browser.

Tip: If you want to log on to the IBM Spectrum Control GUI with Windows Domain credentials, use this form: `domain_name\user`.

Overview of required user names for initial logon

The IBM Spectrum Control GUI requires a user ID and password. If you are logging in immediately after you installed the software, the user ID that you must use differs depending on the type of installation.

Immediately after you install IBM Spectrum Control, you must use the user name as described in the following information. After you log on, you can assign roles for users. When users log on, their roles determine their authorization level and the components that they can view and use.

Required user name for initial logon after installation on a single server when only the common user is defined

After you install IBM Spectrum Control in a single-server environment, the required user name for the initial logon is the common user name that was defined for the IBM Spectrum Control installation.

Required user name for initial logon after installation on multiple servers with a remote database schema

After you install the software on multiple servers with a remote database schema, you must use the user name that was defined for the installation of the IBM Spectrum Control server.

Required user name for initial logon after installation on multiple servers and IBM Spectrum Control reports are remote

After you install the software on multiple servers, and IBM Spectrum Control reports are remote, you must use the user name that was defined for the installation of the IBM Spectrum Control server.

Configuring alert notifications

Alerts can define notification actions that send email, generate Simple Network Management Protocol (SNMP) traps, or generate IBM Tivoli Netcool®/OMNIBus events. To enable these notification actions, you must configure IBM Spectrum Control for email, SNMP, or Tivoli Netcool/OMNIBus alert notifications.

Configuring email alert notifications

Specify the email server for sending alert notifications and the email addresses to which the notifications are sent. To enable the email notification, you must configure IBM Spectrum Control to use the correct mail server. To send alert notifications and reports, you must configure the email server.

To modify alert notification settings, you must be assigned the Administrator role.

To add or modify settings for the email server, you must be assigned the Administrator role.

The email server that is used to send alert notifications is also used to send reports. If you didn't configure the email server for alert notifications, you must configure the email server before you create reports.

IBM Spectrum Control ensures, when it sends alert notifications and reports by email to your email server, that it complies with the security standards that you configure on your email server. For example, if your email server requires authentication and TLS to send emails, then IBM Spectrum Control uses the authentication credentials that you provide when you set up the email server, and uses TLS to establish the connection with your email server. Because the email server that you set up is automatically trusted, you don't have any additional management tasks such as importing the server certificate into the keystores that are used by IBM Spectrum Control.

To configure email alert notifications, complete the following steps:

1. Go to **Settings > Alert Notifications**.
2. Click the **Email** tab.
3. Enable the email notification of alerts by specifying the following information about an email server:

Reply to address

If the recipient of an alert notification or a report replies to an email, the reply is sent to the email address that you enter in this field. Typically, you enter the email address of the administrator. Notifications for emails that can't be delivered are also sent to the email address that you enter here. If you don't enter a value, and you entered an email address in the **User Name** field, then replies are sent to that address. Otherwise, replies are sent to no-reply@<Spectrum_Control_server_host_name>.

Mail server

The name of the email server. You can specify the host name, or the IPv4 address or IPv6 address, depending on what is supported within your environment.

Port The port number for the outgoing email server. This port number is usually 25.

4. Optional: To verify that email alert notifications are configured correctly, you can send a test email. To send a test email, click **Test**.
5. Optional: To delete the configuration settings without specifying new settings, click **Remove**.
6. Enable the global email notification settings and specify the email addresses that you want to notify when an alert is generated. The email addresses that you specify are applied globally to all alert definitions, unless overridden. To override the global settings, edit the notification settings for a specific resource or for a specific alert definition that is associated with a resource.

Tip: Insert a comma and space to separate multiple email addresses, such as jsmith@abc.com, manager@abc.com, team1@abc.com.

7. Click **Settings > Alert Notifications**.
8. Type the host name, or IPv4, or IPv6 address of the email server.
9. Type the port number that is used by the email server to send alert notifications and reports.
10. Type the name of the user and the password that you want to use to authenticate with the email server.
11. Optional: Type the email address, such as the email address of the administrator, that you want to use for receiving replies to alert notifications and reports. If you don't enter a value, and you entered an email address in

the **User Name** field, then replies are sent to that address. Otherwise, replies are sent to no-reply@<Spectrum_Control_server_host_name>.

Tip: Before you save the settings for the email server, test the connection.

12. Optional: To specify the email addresses that you want to notify when an alert notification is generated, click **Global email notification settings**, and add each email address separated by a comma.

You can override the global setting for alert notifications by editing the notification settings for a specific resource or for a specific alert definition that is associated with a resource.

Restriction: Applies only to alert notifications.

13. Click **Save**.

Configuring SNMP alert notifications

You can define an alert to generate SNMP traps when an alert condition is detected on a monitored resource. To enable SNMP alert notifications, configure IBM Spectrum Control to direct the traps to at least one SNMP destination.

To modify alert notification settings, you must be assigned the Administrator role.

You must also be running an SNMP management application in your system environment. A Management Information Base (MIB) file is provided in the IBM Spectrum Control installation. You must set up the SNMP trap receiver with the MIB file to receive SNMP traps.

The MIB is automatically deployed when you install IBM Spectrum Control, and can also be found on the installation media.

Table 2. Location of MIB file

Location of MIB file	Directory
Installation media	\data\snmp\tivoliSRM.mib
After IBM Spectrum Control is installed	installation_dir\data\snmp\tivoliSRM.mib

To configure SNMP alert notifications, complete the following steps:

1. In the menu bar, go to **Settings > Alert Notifications**.
2. Click the **SNMP** tab.
3. Click **Edit**, and specify new settings or remove existing settings.
 - To specify new settings, complete the following steps:
 - a. Specify the following SNMP alert notification settings for each SNMP destination. You can specify up to two SNMP destinations.

Community

Specify the name of the SNMP community for sending SNMP traps. By default, the community is *public*.

IP address

Specify the host that is configured to receive SNMP traps. You can specify a host name, an IPv4 address, or an IPv6 address depending on what is supported within your environment.

Port Specify the port number for receiving SNMP traps. SNMP trap messages are sent to this port when an alert condition is detected. By default, the port is set to 162.

b. Click **Save**.

- To delete the current configuration settings without specifying new settings, click **Remove**.

Configuring Tivoli Netcool/OMNIBus alert notifications

You can define an alert to generate Tivoli Netcool/OMNIBus events when an alert condition is detected on a monitored resource. To enable Tivoli Netcool/OMNIBus notifications, configure IBM Spectrum Control to direct the events to a Tivoli Netcool/OMNIBus server.

To modify alert notification settings, you must be assigned the Administrator role.

In your system environment, you must be running a Tivoli Netcool/OMNIBus server that is configured to receive IBM Spectrum Control alerts.

To configure Tivoli Netcool/OMNIBus alert notifications, complete the following steps:

1. In the menu bar in the web-based GUI, go to **Settings > Alert Notifications**.
2. Click the **Netcool/OMNIBus** tab.
3. Click **Edit**, and specify new settings or remove existing settings.
 - To specify new settings, complete the following steps:

IP address

Specify the NetCool/OMNIBus server that is configured to receive notifications. You can specify a host name, and IPv4 address, or an IPv6 address. You cannot use a server that is configured for IPv6 only. The server must be IPv4 or dual stack enabled.

Port Specify the port for receiving alert notifications. Alert notifications are sent to this port when an alert condition is detected. By default, the port is set to 5529.

b. Click **Save**.

- To delete the current configuration settings without specifying new settings, click **Remove**.
4. Copy the EIF rules files that are provided with IBM Spectrum Control to the appropriate directory in the Tivoli Netcool/OMNIBus installation.

Rules file names	Location of rules files in IBM Spectrum Control	Copy rules files to this location in Tivoli Netcool/OMNIBus
<ul style="list-style-type: none">• tivoli_eif_tpc.rules• tivoli_eif_tpc_tbsm.rules	<i>extracted_installation_image</i> /data/omnibus	<i>\$OMNIHOME</i> /probes/arch/

For more information about rules file, see the Tivoli Netcool/OMNIBus Knowledge Center.

Configuring history and data retention

Specify how long to retain the data that is collected about resources and the log files that are generated by IBM Spectrum Control. By specifying the number of weeks for history retention, you can control the amount of data that is retained and available for historical analysis and charting. The longer that you retain data, the more informative your analysis, but the more storage space that is required to store that data.

Data that IBM Spectrum Control collects about a storage environment is stored in a DB2 database repository. The amount of data that is retained about resources can grow over time, and thus require more storage space for the repository. You can use the History Retention page to modify the data retention settings according to the monitoring and storage requirements of your environment. You must be assigned the Administrator role to modify data retention settings.

1. In the menu bar, go to **Settings > History Retention**.
2. Click **Edit** to modify the following data retention settings:

Capacity history

Specify how long to retain a history of the capacity data that is collected about monitored resources. This value determines the amount of capacity data that is retained and available for historical analysis and charting. The longer that you retain data, the more informative your analysis, but the more storage space that is required.

Daily Specify how long to retain capacity data that is collected daily about resources. You can retain daily data for up to 72 weeks and a minimum of 2 weeks.

Weekly

Specify how long to retain capacity data that is aggregated weekly for monitored resources. You can retain weekly aggregates for up to 96 weeks and a minimum of 4 weeks.

Monthly

Specify how long to retain capacity data that is aggregated monthly for monitored resources. You can retain monthly aggregates for up to 48 months and a minimum of 2 months.

Retention values from the stand-alone GUI: When you upgrade from Tivoli Storage Productivity Center V5.2 or earlier, the retention values that were defined in the stand-alone GUI are automatically consolidated and migrated. During the migration, IBM Spectrum Control ensures that the consolidated values are within acceptable boundaries. For example, if the monthly value for storage systems was set to 56 months in the stand-alone GUI, that value is changed to 48 months in the web-based GUI.

Performance data

Specify how long to retain data that is collected by performance monitors.

Sample

Specify how long to retain sample data that is collected by performance monitors. Sample data represents the data that is collected each time a performance monitor is run. Because sample data is collected frequently, retaining that data can require significant disk space in the database repository. The

required disk space is determined by the types of switches, storage systems, and number of volumes that are being monitored. You can retain sample data for up to 12 weeks.

Hourly

Specify how long to retain hourly data that is collected by performance monitors. You can retain hourly data for up to 24 weeks.

Daily Specify how long to retain daily data that is collected by performance monitors. You can retain daily data for up to 156 weeks.

Consolidating performance data: Performance data is collected at intervals. An interval represents the number of minutes over which samples of performance data are averaged. When performance history is retained, data that is collected at certain intervals is automatically consolidated, or rolled up, to higher intervals. For example, data collected at 1-minute intervals is consolidated into 5-minute data; data collected at 5-minute intervals is consolidated into 1-hour data; and so on.

Tip: If performance data is collected at 1-minute intervals, the amount of data that is stored in the database repository increases significantly. The product stores only 7 days of sample data that is collected at 1-minute intervals.

Data for missing resources

Specify how long to retain data about internal resources that are no longer detected by IBM Spectrum Control. You can retain the data of removed resources for up to 52 weeks.

If the internal resource of a top-level resource is not detected when that top-level resource is probed, data about the resource is removed when the time limit is reached. The internal resource is removed only from the top-level resource that is probed. For example, if two weeks are specified, the data for a pool that is missing from a storage system for more than two weeks will be removed.

Only internal resources are automatically removed according to this setting. Storage systems, servers, hypervisors, switches, and fabrics must be removed manually.

Alert logs

Specify how long to retain alerts. An entry is generated each time that an alert condition is detected on a resource. Any alert that is older than this value is deleted. You can retain alerts for up to 12 weeks.

Job logs

Specify the maximum number of logs that are retained for data collection jobs. A log file is created each time that a job is run. When this number is reached, the entry for the oldest log is deleted. For example, if you accept the default value 5, and then run a probe 6 times, the log file for the first run is deleted. You can retain up to 20 logs for a job.

3. Click **Save** to apply the retention settings.
4. Optional: Click **Restore Defaults** to restore the retention settings to their default values.

Configuring user authentication

When IBM Spectrum Control is installed, default repositories are created, which allow you to control user access to files and the operating system.

In the federated repositories framework, the following repositories are created:

File-based user repository

This repository contains the `tpcFileRegistryUser` user ID. This user password is the same as the common user password that was entered during the IBM Spectrum Control installation.

Operating system repository

In the federated repositories framework, the IBM Spectrum Control installation program creates two repositories on the IBM Spectrum Control web server. This server, which is in the `installation_dir/wlp/usr/servers/webServer` directory, is used as the primary WebSphere® Application Server Liberty server for user authentication in IBM Spectrum Control.

The Device server also runs on WebSphere Application Server Liberty, and it is only configured with the File-based user repository. If the web server is down, the Device server is used as the backup server to perform the user authentication and allows the common user name that was provided during IBM Spectrum Control installation and the `tpcFileRegistryUser` user ID to log on to the IBM Spectrum Control GUI.

You can add an LDAP repository after you install IBM Spectrum Control; this configuration is completed in the IBM Spectrum Control GUI. The LDAP repository configuration settings are not propagated to the Device server. Therefore, if the web server is not running, the authorized LDAP users cannot log in to IBM Spectrum Control GUI. The backup user authentication mechanism that is based on Device server allows the common user name that was entered during the IBM Spectrum Control installation, and the `tpcFileRegistryUser` user ID to be used to log on to the GUI.

If the computer is correctly configured with the Windows domain, the operating system repository also contains the domain users and groups that are managed by the Windows domain.

The LDAP repositories that are supported by IBM Spectrum Control depend on WebSphere Application Server Liberty support. For more information, about the LDAP repositories that are supported, see <http://www.ibm.com/support/docview.wss?uid=swg27036471>.

If these users or groups are present in more than one repository in the federated repositories framework, the WebSphere Application Server Liberty cannot resolve duplicated users or groups. An example of a duplicated user is, when an Administrator user exists in both the operating system and LDAP repositories. You must ensure that the duplicated users (or groups) are not used during the configuration or to manage IBM Spectrum Control.

Authorizing users

After IBM Spectrum Control is installed, you can assign roles to the user groups that are contained in the authentication repository. Roles determine the functions that are available to the users that are in a group.

The authentication repository can be an operating system repository or a Lightweight Directory Access Protocol (LDAP) repository. When IBM Spectrum Control is installed, the following user and groups are automatically configured for authentication to the product:

- User: tpcFileRegistryUser
- Windows group: Administrators group
- UNIX and Linux group: root
- AIX group: system

There are three IBM Spectrum Control roles that you can assign to user groups:

- Administrator (the Administrator, root, and system groups are automatically assigned to this role)
- Monitor
- External Application

Each role provides access to a specific set of functions. For more information about the functions that are available in each role, see “Role-based authorization.”

Role-based authorization

Roles determine the functions that are available to users of IBM Spectrum Control. When a user ID is authenticated to IBM Spectrum Control through the GUI, CLI, or APIs, membership in an operating system or LDAP group determines the authorization level of the user.

In Version 5.2, the roles that were previously defined in IBM Spectrum Control were consolidated into a smaller set of roles. The following table shows how the roles in versions earlier than 5.2 are mapped to the current set of roles:


Table 3. How roles in previous versions of IBM Spectrum Control are mapped to the roles in version 5.2 and later

Roles in previous versions	Roles in version 5.2 and later	Authorization level
Superuser Productivity Center administrator Disk administrator Fabric administrator Data administrator Tape administrator	Administrator	This role has full access to all monitoring and administrative functions. At least one group must have the Administrator role. Note: When IBM Spectrum Control is first installed, the following operating system groups are assigned the Administrator role: <ul style="list-style-type: none"> • Windows: Administrators • UNIX and Linux: root • AIX: system

Table 3. How roles in previous versions of IBM Spectrum Control are mapped to the roles in version 5.2 and later (continued)

Roles in previous versions	Roles in version 5.2 and later	Authorization level
Disk operator Fabric operator Data operator Tape operator	Monitor	<p>This role has access to the following read-only functions:</p> <ul style="list-style-type: none"> • Viewing and exporting information about monitored resources • Viewing, acknowledging, and removing alerts • Viewing tasks and data collection jobs • Viewing data paths • Opening management GUIs • Opening logs • Viewing chargeback reports <p>Exception: Users with the Monitor role can provision storage if they are granted permission in a service class. A service class is a logical entity that describes storage capabilities and characteristics and can be used to specify requirements for storage provisioning. For more information about service classes, see .</p>
This role did not exist in versions 5.1 or earlier.	External Application	<p>This role enables users of other applications to use the provisioning capability of IBM Spectrum Control 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 IBM Spectrum Control.</p> <p>If you assign the External Application role to the user, you must also assign one or more service classes to the user.</p> <p>This role does not enable users to log in to the IBM Spectrum Control GUI.</p>

Tips:

- To determine the role of the user who is logged in, click the user icon  in the upper-right corner of any page in the GUI.
- If a user belongs to multiple groups and the groups have different roles, the role with the highest level of authorization is granted to the user. For example, if a user belongs to a group that is assigned the Administrator role and also belongs to a group that is assigned a Monitor role, the user is granted the authorization of the Administrator role.
- If a user is not a member of a group that is assigned a IBM Spectrum Control role, no access is granted to that user.
- If assigned the Monitor role, a user can only open and view logs from the Data Collection page for the selected resource.

Nested groups are not supported: Adding active directory or any other type of domain user group to a local operating system group is not supported in IBM Spectrum Control. You can configure IBM Spectrum Control to authenticate domain IDs that rely on the operating system to perform the authentication operation against the active directory, but it cannot resolve nested groups.

Alternatively, you can configure LDAP authentication to perform queries against active directory user repositories and assign domain groups directly to roles within IBM Spectrum Control.

Assigning a role to a group

Assign an IBM Spectrum Control role to one or more user groups. The role that is assigned to a group determines the product functions that are available to the users in that group.

If you are using LDAP authentication and you are using Microsoft Active Directory as your LDAP repository, do not assign the Active Directory Primary group for a user to an IBM Spectrum Control role. IBM Spectrum Control cannot identify user membership in a Primary group. Assign an IBM Spectrum Control role to a group that is not the Primary group for the user.

To assign a role to a group, complete the following steps:

1. In the menu bar in the web-based GUI, go to **Settings > User Management**.
2. Click **Add Group** to search for groups that are defined in the authentication repository. You can type the name of a group if you know its name, or specify a filter to search for existing groups in the authentication repository. For filters, use an asterisk (*) to represent unknown characters. You must enter at least one character in addition to an *. For example, type tpc* to search for groups that begin with the letters "tpc" or "TPC". Type *t to search for groups that begin with or contain the letter "t" or "T".
3. In the list of groups, select one or more groups to which you want to assign a role.
4. In the **Role** field, select the role to assign to the group.
5. Click **OK** to assign the role. The role that you select is applied to all the groups that you are adding. You can change the role assignments at any time after the group is added.

Related tasks:

“Determining the groups to which a user belongs”

You can determine the groups to which a user belongs to and ensure that the user is in a group or groups that are assigned the correct IBM Spectrum Control role.

Related reference:

“Role-based authorization” on page 9

Roles determine the functions that are available to users of IBM Spectrum Control. When a user ID is authenticated to IBM Spectrum Control through the GUI, CLI, or APIs, membership in an operating system or LDAP group determines the authorization level of the user.

Determining the groups to which a user belongs

You can determine the groups to which a user belongs to and ensure that the user is in a group or groups that are assigned the correct IBM Spectrum Control role.

Use a command prompt to find the groups to which a user belongs.

To determine the groups to which a user belongs, complete the following steps depending on your operating system:

1. Log on to the computer where the IBM Spectrum Control servers are installed, open a command prompt, and enter:

Option	Description
Windows standalone operating system	net user <username>
Windows Domain	net user <username> /DOMAIN
Linux and AIX operating system	groups <username>
LDAP	See your LDAP administrator for more information.

2. Verify that the user is in a group or groups that are assigned the correct IBM Spectrum Control role.

Modifying the authentication mechanism

To modify how IBM Spectrum Control authenticates users and user groups, configure the authentication repository.

You must be assigned the Administrator role to modify the authentication repository and manage role and group assignments.

The authentication mechanism determines how IBM Spectrum Control authenticates users and the user groups that are available to be assigned roles. During the installation process, the WebSphere Application Server Liberty is configured with federated repositories. By default, authentication is configured to use the federated repositories, which contain a file repository and an operating system repository. The operating system repository includes the operating system users and groups that are defined on the server where IBM Spectrum Control is installed. For a server that is a member of a Windows domain, the operating system repository also includes the users and groups that are defined in that domain.

To modify your authentication, complete the following steps:

1. In the menu bar, go to **Settings > User Management**.
2. On the User Management page, click **Configure LDAP**. The LDAP Settings page is displayed.
3. Make your modifications.

Related concepts:

“Configuring user authentication” on page 8

When IBM Spectrum Control is installed, default repositories are created, which allow you to control user access to files and the operating system.

Related tasks:

“Adding an LDAP repository to the federated repositories for IBM Spectrum Control” on page 15

You can configure IBM Spectrum Control to communicate with an external LDAP repository, for example, IBM Tivoli Directory Server or Microsoft Active Directory. This enables you to make IBM Spectrum Control available to a larger set of users and groups and you are able to log in to IBM Spectrum Control with one set of credentials.

Actions that are available based on role

Your IBM Spectrum Control role and product license determine the actions that are available in the product.

Users who are assigned the Administrator role or the Monitor role can use product functions. The actions that are available for each function depend on the role that is assigned to the user:

Administrator role

Users who are assigned the Administrator role have access to all monitoring and administrative actions and are limited only by license restrictions.

Monitor role

Users who are assigned the Monitor role can view information about monitored resources and other objects such as tasks, alerts, and service classes. They can acknowledge alerts and resource statuses, open logs, and open management GUIs.

Users who are assigned the Monitor role do not have access to administrative functions, but they can be granted permission in a service class to provision storage by using the service class. If so, they can provision storage and create a provisioning task. Users can delete provisioning tasks that they create. If the service class specifies that administrator approval is not required, the users can run or schedule the provisioning tasks that they create.

To use some functions, you must have the IBM Spectrum Control Advanced Edition license. If you have the IBM Spectrum Control Standard Edition license or the IBM Spectrum Control Standard Select Edition license, the following functions are not available:

- Storage tier optimization.
- Pool balancing.
- Block storage provisioning. You are not able to provision volumes by provisioning storage or using the vSphere Web Client extension. However, there are no license restrictions for file storage provisioning, therefore, Network Attached Storage (NAS) file shares can be provisioned.
- Chargeback and consumer reporting.
- Exporting of chargeback and consumer information using the REST APIs.

The following table outlines the actions that are available only for the Administrators role. All other actions are available to the Monitor and Administrator roles. In addition to the restrictions listed in this table, users who are assigned the Monitor role do not have access to user management functions.

Table 4. Product actions that are available only to users with the Administrator role

Function	Actions that require the Administrator role
Single dashboard view of the storage environment that you can use to manage storage systems, hypervisors, servers, and Fibre Channel fabrics.	<ul style="list-style-type: none"> • Adding and removing resources • Administering connections • Scheduling data collection • Changing and viewing the automated probe schedule • Viewing and editing history retention settings • Modifying license compliance settings
Performance monitoring for storage systems and Fibre Channel networks.	<ul style="list-style-type: none"> • Scheduling performance monitors • Starting or stopping performance monitors
Capacity and usage monitoring of resources.	<ul style="list-style-type: none"> • Scheduling probes • Starting or stopping probes • Provisioning storage to servers and hypervisors • Modifying Storage Resource agents • Enabling automatic zoning
Health and alerting for hypervisors, networks, servers, and storage systems.	<ul style="list-style-type: none"> • Defining and modifying alert definitions • Editing alert notification settings
Capacity and performance of the storage that applications, departments, and general groups use.	<ul style="list-style-type: none"> • Creating applications, departments, and general groups • Creating, modifying, and removing filters to add resources to applications • Adding and removing resources in applications and general groups, directly • Adding applications as members of other applications • Adding departments to other departments • Adding applications to departments
Storage pool balancing, block storage provisioning, file provisioning, and storage reclamation.	<ul style="list-style-type: none"> • Balancing pools • Provisioning block storage • Viewing volumes that can be reclaimed • Creating, modifying, deleting service classes • Creating, modifying, and deleting capacity pools • Scheduling, running, and deleting tasks
Analytics-driven tiering that automatically moves volumes to the most cost-effective tier.	<ul style="list-style-type: none"> • Optimizing storage tiering • Transforming storage volumes • Creating, modifying, and deleting capacity pools

Table 4. Product actions that are available only to users with the Administrator role (continued)

Function	Actions that require the Administrator role
Roll-up reporting, in which capacity data is combined from multiple instances of IBM Spectrum Control for reporting purposes.	<ul style="list-style-type: none"> • Adding and removing subordinate servers • Starting a probe for a subordinate server • Modifying the connection information for a subordinate server
Reporting <ul style="list-style-type: none"> • Chargeback reports show the capacity and the cost of the storage that is used by applications, departments, hypervisors, and physical servers. • Consumer reports show the capacity and the cost of the block storage that is used by an application, department, hypervisor, and physical server. 	<ul style="list-style-type: none"> • Configuring the email server • Emailing reports • Creating, deleting, and editing reports

Managing LDAP

The IBM Spectrum Control™ installation program establishes a default authentication configuration using the federated repositories feature of the IBM® WebSphere® Application Server Liberty. You can configure and manage IBM Spectrum Control for LDAP authentication as a post-installation activity.

Adding an LDAP repository to the federated repositories for IBM Spectrum Control

You can configure IBM Spectrum Control to communicate with an external LDAP repository, for example, IBM Tivoli Directory Server or Microsoft Active Directory. This enables you to make IBM Spectrum Control available to a larger set of users and groups and you are able to log in to IBM Spectrum Control with one set of credentials.

When you install IBM Spectrum Control on a computer that is a member of a Windows domain, Active Directory users and groups also exist in the operating system repository. For this situation, do not add the same Active Directory user as an LDAP repository to the federated repositories.

IBM WebSphere Application Server Liberty cannot resolve duplicated users or groups when these users or groups are present in more than one repository in the federated repositories framework. For example, an Administrator user can exist in both the operating system and LDAP repository. You must ensure that the duplicated users (or groups) are not used during the configuration or to manage IBM Spectrum Control.

When you change the authentication configuration, IBM Spectrum Control is available to users and groups in other repositories.

Tip:

When you implement your initial LDAP configuration or update your existing LDAP configuration (for example, enabling secure communication), use the “Uploading an XML file to add an LDAP repository” on page 17 procedure. When you remove your LDAP configuration, use the “Removing an LDAP repository from the federated repositories for IBM Spectrum Control” on page 20 procedure.

If you encounter any issues with above mentioned procedures, see “Configuring user authentication alternatives” on page 20.

1. Back up the `ldapregistry.xml` file in the `installation_dir/wlp/usr/servers/webServer/registry/ldapregistry.xml` directory.
2. Log on as an administrator to the IBM Spectrum Control GUI.
3. Click **Settings > User Management**.
4. Click **LDAP Settings**.

After you add an LDAP repository to the federated repositories for IBM Spectrum Control, you must establish the authorization configuration before you can log on to IBM Spectrum Control with LDAP credentials. When you establish the authorization configuration, you assign LDAP groups to roles.

Important: Before you establish the authorization configuration for IBM Spectrum Control, ensure that no duplicated user names or group names are in the local file repository, the operating system repository, and the LDAP repository.

For IBM Spectrum Control LDAP configurations, you must add the group from the LDAP server to IBM Spectrum Control. In the IBM Spectrum Control GUI, go to **Settings > User Management > Add Group** to assign the roles to the user groups.

If you need assistance, contact your LDAP server administrator.

Related tasks:

“Exporting SSL certificate from the IBM Security Directory Server to a file” on page 22

To secure communications between IBM Spectrum Control and IBM Security Directory Server, you must export the SSL certificate to a file. The file that is created can then be added to the keystore for IBM Spectrum Control.

“Adding the SSL certificate for the LDAP server to the web server keystore using the `IKEYCMD` command” on page 23

To secure communications between the IBM Spectrum Control server and the LDAP server, you must add the SSL certificate from the LDAP server to the web server keystore for IBM Spectrum Control.

Related reference:

“Role-based authorization” on page 9

Roles determine the functions that are available to users of IBM Spectrum Control. When a user ID is authenticated to IBM Spectrum Control through the GUI, CLI, or APIs, membership in an operating system or LDAP group determines the authorization level of the user.

Uploading an XML file to add an LDAP repository:

You can use the Upload XML File method to add an LDAP repository to the federated repositories in IBM Spectrum Control.

1. On LDAP Settings page, click **Download Files**.
2. Save and extract the `ldapExamples.zip` file to the computer where you run your browser.
3. Use the information to edit the XML template file for your vendor. For example, if your LDAP server is IBM Tivoli Directory Server, edit the `IBMDirectoryServer.xml` file and if your LDAP server is Microsoft Active Directory, edit the `ActiveDirectoryServerDefault.xml` file.

Edit the following parameters:

id The unique identifier for the LDAP repository, which identifies the repository in the realm, for example, *LDAP1*.

host The host name of the primary LDAP server. The host name is either the IP address or the computer name in a domain name system (DNS).

sslEnabled

Indicates whether SSL is used to connect to the LDAP server.

Important: If you set this parameter to true, and set the **port** parameter to the LDAP server secure communications port, when you upload the edited XML template file, IBM Spectrum Control downloads the SSL certificate from the LDAP server. Then, it is added to the Web Server keystore. You must restart the Web Server.

port The port number for the LDAP server. By default, the port number for secure communication is 636, and for non-secure communication is 389.

Tip: Depending on the configuration of your LDAP server, you can specify a different port number.

baseDN

The baseDN (Distinguished Name) is the starting point for searches for users in the LDAP directory server. For example, if you have a DN value of `cn=John Doe, ou=rochester, o=ibm, c=us`, you can specify the LDAP base entry as any of the following options:

- `ou=rochester, o=ibm, c=us`
- `o=ibm, c=us`
- `c=us`

Important: The DN value that you enter in this field must be extensive enough to include all of the groups to which the users belong. For example, if a user in `ou=rochester, o=ibm, c=us` is also a member of groups that are in `ou=stategroups, o=ibm, c=us`, enter `o=ibm, c=us`.

If you want to set multiple **baseDN** parameters for your LDAP authentication configuration, then you must create a separate `<ldapRegistry>` entry in the XML template file for each unique **baseDN** parameter. For example:

```
<server description="IBM Web Server">
  <ldapRegistry activeFilters="active_dir_server1" baseDN="ou=Marketing,dc=storage,dc=ibm,dc=com"
bindDN="cn=Administrator,cn=users,dc=storage,dc=ibm,dc=com" bindPassword="password"
host="ldap.storage.ibm.com" id="LDAP1" ignoreCase="true" ldapType="Microsoft Active Directory"
port="389" realm="TPCRealm" sslEnabled="false"/>
  <activeLdapFilterProperties groupFilter="(&(cn=%v)(objectcategory=group))"
groupIdMap="*:cn" groupMemberIdMap="memberof:member"
id="active_dir_server1" userFilter="(&(sAMAccountName=%v)(objectcategory=user))"
userIdMap="user:sAMAccountName"/>
  <ldapRegistry activeFilters="active_dir_server2" baseDN="ou=Sales,dc=storage,dc=ibm,dc=com"
bindDN="cn=Administrator,cn=users,dc=storage,dc=ibm,dc=com" bindPassword="password"
host="ldap.storage.ibm.com" id="LDAP2" ignoreCase="true" ldapType="Microsoft Active Directory"
port="389" realm="TPCRealm" sslEnabled="false"/>
  <activeLdapFilterProperties groupFilter="(&(cn=%v)(objectcategory=group))"
groupIdMap="*:cn" groupMemberIdMap="memberof:member"
id="active_dir_server2" userFilter="(&(sAMAccountName=%v)(objectcategory=user))"
userIdMap="user:sAMAccountName"/>
  <ldapRegistry activeFilters="active_dir_server3" baseDN="ou=Management,dc=storage,dc=ibm,dc=com"
bindDN="cn=Administrator,cn=users,dc=storage,dc=ibm,dc=com" bindPassword="password"
host="ldap.storage.ibm.com" id="LDAP3" ignoreCase="true" ldapType="Microsoft Active Directory"
port="389" realm="TPCRealm" sslEnabled="false"/>
  <activeLdapFilterProperties groupFilter="(&(cn=%v)(objectcategory=group))"
groupIdMap="*:cn" groupMemberIdMap="memberof:member"
id="active_dir_server3" userFilter="(&(sAMAccountName=%v)(objectcategory=user))"
userIdMap="user:sAMAccountName"/>
  <federatedRepository>
    <primaryRealm allowOpIfRepoDown="true" name="TPCRealm">
      <participatingBaseEntry name="ou=Marketing,dc=storage,dc=ibm,dc=com"/>
      <participatingBaseEntry name="ou=Sales,dc=storage,dc=ibm,dc=com"/>
      <participatingBaseEntry name="ou=Management,dc=storage,dc=ibm,dc=com"/>
      <!-- The next two entries must NOT be changed -->
      <participatingBaseEntry name="o=TPCRealm"/>
      <participatingBaseEntry name="o=OSRealm"/>
    </primaryRealm>
  </federatedRepository>
</server>
```

The preceding example contains the following information:

- Each `<ldapRegistry>` entry contains the identical values for the **host**, **port**, **sslEnabled**, **bindDN**, and **bindPassword** parameters.
- Each `<ldapRegistry>` entry contains a unique value for the **baseDN** and **id** parameters.
- Each `<ldapRegistry>` entry references its' own unique `<activeLdapFilterProperties>` entry.
- The `<federatedRepository>` entry contains multiple `<participatingBaseEntry>` entries, with each one matching one of the **baseDN** values in the `<ldapRegistry>` sections.

bindDN

The distinguished name that WebSphere Application Server Liberty uses when it binds to the LDAP repository. If no name is specified, WebSphere Application Server Liberty binds anonymously to the LDAP repository. In most cases, the **bindDN** and **bindPassword** parameters are required. However, when an anonymous bind satisfies all of the required functions, the **bindDN** and **bindPassword** parameters are *not* required. If you are not sure whether an anonymous bind satisfies the required functions, contact your LDAP server administrator.

Attention: No single value for the **bindDN** parameter is correct for every Active Directory Server or for every LDAP server. The correct value for the **bindDN** parameter depends on the configuration of your Active Directory Server or your LDAP server. If you are unsure about the correct value to use for the **bindDN** parameter, contact your LDAP server administrator.

bindPassword

The password that the WebSphere Application Server Liberty uses when it binds to the LDAP repository.

participatingBaseEntry

You must set this value to the same value as you set for the **baseDN** parameter or the federation for the LDAP repository fails. For example, if you set the **baseDN** parameter to `ou=rochester, o=ibm, c=us`, you must set the **participatingBaseEntry** parameter to: `<participatingBaseEntry name="ou=rochester, o=ibm, c=us" />`.

Important: Do not change these **participatingBaseEntry** parameters in the XML template file:

```
<participatingBaseEntry name="o=TPCRealm" />
<participatingBaseEntry name="o=OSRealm" />
```

4. Save the XML template file.
5. On the LDAP Settings page, click **Browse**.
6. On the File Upload page, select the **XML template** file that you edited and saved and click **Open**. The XML template file is uploaded to IBM Spectrum Control server.
7. When IBM Spectrum Control downloads the SSL certificate from the LDAP server and adds it to the Web Server keystore, click **Restart Web Server**. While the Web server is restarting, do not refresh your browser or attempt to navigate to another part of the GUI.
8. When the Web server is back online, enter LDAP user name and password and click **Test**.
9. If your test is successful, click **Add Group** or **Close**. Verify that the LDAP Status indicator changes from **Pending Configuration** to **Configured** .
If your test is *not* successful, click one of the following actions:

Reconfigure LDAP

The current pending LDAP configuration is preserved and you are returned to the LDAP Settings page to try the procedure again. While the LDAP configuration is in **Pending Configuration** status, you are asked to enter your LDAP user name and password on the User Management page to complete the pending LDAP configuration.

Cancel

The current pending LDAP configuration is preserved and you are returned to the User Management page.

Discard configuration

Discards the current pending LDAP configuration. When you confirm, it restores your previous LDAP configuration and returns you to the User Management page.

The IBM Spectrum Control federated repositories include an LDAP repository. After you establish the authorization configuration with your LDAP groups, you can log on to IBM Spectrum Control GUI with LDAP credentials.

Related tasks:

“Adding an LDAP repository to the federated repositories for IBM Spectrum Control” on page 15

You can configure IBM Spectrum Control to communicate with an external LDAP repository, for example, IBM Tivoli Directory Server or Microsoft Active Directory. This enables you to make IBM Spectrum Control available to a larger set of users and groups and you are able to log in to IBM Spectrum Control with one set of

credentials.

Removing an LDAP repository from the federated repositories for IBM Spectrum Control:

To remove an LDAP repository from the federated repositories in IBM Spectrum Control, you can use the IBM Spectrum Control GUI.

The use of the IBM Spectrum Control single sign-on feature is limited when you remove an LDAP repository from the federated repositories in IBM Spectrum Control; in addition, it leaves only the operating system repository and the file-based repository. Storage system element managers do not support the operating system repository for single sign-on, even if the element manager is installed on the same system as IBM Spectrum Control.

1. Log in to the IBM Spectrum Control GUI as a non-LDAP user with the Administrator role.
2. In the menu bar, go to **Settings > User Management**.
3. On the User Management page, click **LDAP Settings**.
4. On the LDAP Settings page, click **Delete LDAP**.
5. On the LDAP Settings confirmation page, click **Delete LDAP** to confirm the deletion of the LDAP configuration.
6. On the User Management page, wait for the **LDAP Status indicator** to change from **Configured** to **Not Configured** or you can refresh the page.

Configuring user authentication alternatives

If you encounter any issues with the recommended procedures for configuring user authentication, see the following topics for support.

Enabling secure communication between IBM Spectrum Control and the LDAP repository:

You can use the Secure Socket Layer (SSL) protocol to secure the communication between IBM Spectrum Control and the LDAP repository that you are using for user authentication. The SSL protocol provides security and data integrity for communications over Transmission Control Protocol/Internet Protocol (TCP/IP) networks.

You added an LDAP repository to the federated repositories for IBM Spectrum Control and your system is operating properly with non-secure communication between IBM Spectrum Control and the LDAP repository. Before you implement the following procedure, add the SSL certificate from the LDAP server to the IBM Spectrum Control web server keystore or the connectivity between IBM Spectrum Control and the LDAP server fails.

1. Log in to the IBM Spectrum Control GUI as a non-LDAP user with the Administrator role.
2. In the menu bar, go to **Settings > User Management**.
3. On the User Management page, click **LDAP Settings**.
4. On the LDAP Settings page, click **Advanced Configuration Options**. If you are logged on to the GUI as the Common User or the file-based user, then you automatically are logged on to the Liberty Admin Center. If you are logged on to the IBM Spectrum Control GUI with credentials other than the Common User or the file-based user, you must explicitly log on to the Liberty Admin Center as the Common User or the file-based user.

5. On the Server Config page, click **LDAP User Registry**.
6. Change the value in the **Ldap ssl enabled** field from **false** to **true**.
7. Change the value of the **Port** field to the LDAP server port that listens for secure communications. The typical value is 636. Depending on your LDAP server configuration, you can specify a different port. If you do not know which port to use, contact your LDAP server administrator.
8. Click **Save** and log out of the Liberty Admin Center.
9. On the LDAP Settings page, click **Cancel**.

Secure communications are established between IBM Spectrum Control and the LDAP repository with SSL protocol.

Related tasks:

“Exporting SSL certificate from the IBM Security Directory Server to a file” on page 22

To secure communications between IBM Spectrum Control and IBM Security Directory Server, you must export the SSL certificate to a file. The file that is created can then be added to the keystore for IBM Spectrum Control.

“Exporting SSL certificate from the Microsoft Active Directory to a file” on page 22

To secure communications between IBM Spectrum Control and Microsoft Active Directory, you must export the SSL certificate from the Microsoft Active Directory to a file. The file that is created can then be added to the web server keystore for IBM Spectrum Control.

“Adding the SSL certificate for the LDAP server to the web server keystore using the IKEYCMD command” on page 23

To secure communications between the IBM Spectrum Control server and the LDAP server, you must add the SSL certificate from the LDAP server to the web server keystore for IBM Spectrum Control.

Disabling secure communication between IBM Spectrum Control and the LDAP repository:

You can disable the Secure Socket Layer (SSL) protocol between IBM Spectrum Control and the LDAP repository at any time using the IBM Spectrum Control GUI.

1. Log in to the IBM Spectrum Control GUI with Administrator privileges.
2. In the menu bar, go to **Settings > User Management**.
3. On the User Management page, click **LDAP Settings**.
4. On the LDAP Settings page, click **Advanced Configuration Options**. If you are logged on to the GUI as the Common User or the file-based user, then you automatically are logged on to the Liberty Admin Center.
If you are logged on to the GUI with credentials other than the Common User or the file-based user, you must explicitly log on to the Liberty Admin Center as the Common User or the file-based user.
5. On the Server Config page, click **LDAP User Registry**.
6. Change the value of the **Ldap ssl enabled** field from **true** to **false**.
7. Change the value of the **Port** field to the LDAP server port that listens for non-secure communications. The typical value is 389. Depending on your LDAP server configuration, you can specify a different port. If you do not know which port to use, contact your LDAP server administrator.
8. Click **Save** and log out of the Liberty Admin Center.
9. On the LDAP Settings page, click **Cancel**.

Exporting SSL certificate from the IBM Security Directory Server to a file:

To secure communications between IBM Spectrum Control and IBM Security Directory Server, you must export the SSL certificate to a file. The file that is created can then be added to the keystore for IBM Spectrum Control.

Important: This topic is an example of exporting the SSL certificate from the IBM Security Directory Server to a file.

If your LDAP server is the IBM Security Directory Server verify that the Web Administration tool is installed with your IBM Security Directory Server because it includes the correct IBM Key Management (iKeyman) utility.

For more information about exporting the SSL certificate from the LDAP server, see your LDAP administrator and the documentation for your specific LDAP server product.

1. Open the IBM Key Management utility in your IBM WebSphere Application Server directory structure.
2. Select **Key Database File > Open**.
3. Complete the following steps:
 - a. In **Key database type** field, select **CMS**.
 - b. In the **File Name** field, click **Browse** and go to the location of the key database (.kdb) file that is associated with your IBM Security Directory Server.
 - c. Click **Open**.
 - d. Click **OK**.
4. On the Password Prompt page, enter the correct password for the key database file and click **OK**.
5. In the **Personal Certificates** list, select the certificate that is the SSL certificate for the IBM Security Directory Server and click **Extract Certificate**.
6. Select **Base64-encoded ASCII data** as the data type and provide a **Certificate file name, Location**, and click **OK**.

The SSL certificate is exported from IBM Security Directory Server to a file so it can be added to the web server keystore for IBM Spectrum Control.

Exporting SSL certificate from the Microsoft Active Directory to a file:

To secure communications between IBM Spectrum Control and Microsoft Active Directory, you must export the SSL certificate from the Microsoft Active Directory to a file. The file that is created can then be added to the web server keystore for IBM Spectrum Control.

Important: This topic is an example of exporting the SSL certificate from the Microsoft Active Directory to a file.

You can use the Certification Authority tool to export the SSL certificate.

For more information about exporting the SSL certificate from the LDAP server, see your LDAP administrator and the documentation for your specific LDAP server product.

1. Open the Certification Authority tool.
2. Select **Certification Authority > Issued Certificates**.

3. Select your current SSL certificate for the Microsoft Active Directory and open the certificate.
4. On the Certificate page, click the **Details** tab and click **Copy to File**.
5. In the Certificate Export Wizard, select **Base-64 encoded X.509 (.CER)** and click **Next**.
6. Provide a file name and click **Next**.
7. Review your settings to verify that you have the correct Base-64 encoded X.509 (.CER) file and click **Finish**.

The SSL certificate is exported from Microsoft Active Directory to a file so it can be added to the web server keystore for IBM Spectrum Control.

Adding the SSL certificate for the LDAP server to the web server keystore using the IKEYCMD command:

To secure communications between the IBM Spectrum Control server and the LDAP server, you must add the SSL certificate from the LDAP server to the web server keystore for IBM Spectrum Control.

Tip: Contact your LDAP administrator and obtain the SSL certificate for your LDAP server. The SSL certificate must be in the form of a Base64-encoded file.

You can use the IBM Key Management (IKEYCMD) command to add the LDAP SSL certificate to the IBM Spectrum Control web server keystore.

1. Copy the Base64-encoded file to the location of your IBM Spectrum Control server.
2. Log on to the IBM Spectrum Control server with administrative privileges.
3. Open a command prompt and go to *installation_dir/jre/bin* directory.
4. Choose one of these options to add the SSL certificate for the LDAP server to the keystore for the web server:

- For Windows operating systems:

```
ikeycmd -cert -add -db installation_dir\wlp\usr\servers\webServer\resources
\security\key.jks -pw password -label label -file LDAP SSL certificate
```

- For AIX and Linux operating systems:

```
./ikeycmd -cert -add -db installation_dir/wlp/usr/servers/webServer/resources
/security/key.jks -pw password -label label -file LDAP SSL certificate
```

Where the *label* value is for the LDAP SSL certificate you are adding to the IBM Spectrum Control web server keystore. The *password* value is the password that is associated with the keystore. The *default* value for this password is *default*. The *LDAP SSL certificate* value is the Base64-encoded file that contains the SSL certificate from your LDAP server.

5. Restart the IBM Spectrum Control web server.
6. Choose one of these options to verify that the SSL certificate for LDAP was added to the keystore for the web server:
 - For Windows operating systems:


```
ikeycmd -cert -list -db installation_dir\wlp\usr\servers\webServer
\resources\security\key.jks -pw password
```
 - For AIX and Linux operating systems:


```
./ikeycmd -cert -list -db installation_dir/wlp/usr/servers/webServer
/resources/security/key.jks -pw password
```

The SSL certificate from the LDAP server was added to the IBM Spectrum Control web server keystore to enable secure communications.

Related tasks:

“Starting and stopping the IBM Spectrum Control servers” on page 123

You can start and stop the IBM Spectrum Control servers in the GUI or by running scripts.

“Exporting SSL certificate from the IBM Security Directory Server to a file” on page 22

To secure communications between IBM Spectrum Control and IBM Security Directory Server, you must export the SSL certificate to a file. The file that is created can then be added to the keystore for IBM Spectrum Control.

“Exporting SSL certificate from the Microsoft Active Directory to a file” on page 22

To secure communications between IBM Spectrum Control and Microsoft Active Directory, you must export the SSL certificate from the Microsoft Active Directory to a file. The file that is created can then be added to the web server keystore for IBM Spectrum Control.

Using the `ldapEntityType` element for advanced LDAP configuration

To narrow the IBM Spectrum Control view of your LDAP structure so that you can find and map your groups to IBM Spectrum Control roles, you need to configure the `ldapEntityType` element within the `ldapRegistry` element.

Example: LDAP user and group scenario

In this scenario, you want to provide access to LDAP users that reside in a different node of the LDAP structure than your LDAP groups. You also want to prevent authorization of LDAP users and groups that are not associated with IBM Spectrum Control.

In this scenario, the LDAP users use the following distinguished names:

- LDAP user 1: `cn=LDAPUser1,ou=MarketingUsers,dc=storage,dc=company,dc=com`
- LDAP user 2: `cn=LDAPUser2,ou=SalesUsers,dc=storage,dc=company,dc=com`
- LDAP user 3: `cn=LDAPUser3,ou=ManagementUsers,dc=storage,dc=company,dc=com`

In this scenario, the LDAP groups use the following distinguished names:

- LDAP user 1 is a member of LDAP group 1:
`cn=LDAPGroup1,ou=MarketingGroups,dc=storage,dc=company,dc=com`
- LDAP user 2 is a member LDAP group 2:
`cn=LDAPGroup2,ou=SalesGroups,dc=storage,dc=company,dc=com`
- LDAP user 3 is a member of LDAP group 3:
`cn=LDAPGroup3,ou=ManagementGroups,dc=storage,dc=company,dc=com`

In this scenario, `LDAPUser1` and `LDAPUser2` are in different nodes of the LDAP structure than the associated LDAP groups, `LDAPGroup1` and `LDAPGroup2`. You need to find and map `LDAPGroup1` and `LDAPGroup2` to the IBM Spectrum Control roles and be able to log in to IBM Spectrum Control as the `LDAPUser1` and `LDAPUser2`.

When you configure IBM Spectrum Control for LDAP authentication and you encounter this scenario, set the `baseDN` value in your LDAP XML template file to `dc=storage, dc=company, dc=com`.

In following example, this `baseDN` value is common to all LDAP users and groups.

Example of the LDAP XML template file that implements this baseDN value:

```
<server description="IBM Web Server">
  <ldapRegistry activeFilters="active_dir_server" baseDN="dc=storage,dc=company,dc=com"
    bindDN="cn=Administrator,cn=users,dc=storage,dc=company,dc=com" bindPassword="password"
    host="ldap.storage.company.com" id="LDAP1" ignoreCase="true"
    ldapType="Microsoft Active Directory"
    port="389" realm="TPCRealm" sslEnabled="false">
  </ldapRegistry/>

  <activeLdapFilterProperties groupFilter="(&(cn=%v)(objectcategory=group))" groupIdMap="*:cn"
    groupMemberIdMap="memberof:member" id="active_dir_server"
    userFilter="(&(sAMAccountName=%v)(objectcategory=user))" userIdMap="user:sAMAccountName"/>

  <federatedRepository>
    <primaryRealm allowOpIfRepoDown="true" name="TPCRealm">
      <participatingBaseEntry name="dc=storage,dc=company,dc=com"/>
      <!-- The next two entries must NOT be changed -->
      <participatingBaseEntry name="o=TPCRealm"/>
      <participatingBaseEntry name="o=OSRealm"/>
    </primaryRealm>
  </federatedRepository>
</server>
```

When you use this example LDAP XML template file, you also are able to find and map LDAPGroup3 to an IBM Spectrum Control role. This behavior enables LDAPUser3 to log in to IBM Spectrum Control, which is not part of the successful outcome. Use the `ldapEntityType` element within the `ldapRegistry` element so you can only find and map LDAPGroup1 and LDAPGroup2 to IBM Spectrum Control roles.

This is the previous example of the LDAP XML template file that was edited to use the `ldapEntityType` element within the `ldapRegistry` element:

```
<server description="IBM Web Server">
  <ldapRegistry activeFilters="active_dir_server" baseDN="dc=storage,dc=company,dc=com"
    bindDN="cn=Administrator,cn=users,dc=storage,dc=company,dc=com" bindPassword="password"
    host="ldap.storage.company.com" id="LDAP1" ignoreCase="true" ldapType="Microsoft Active Directory"
    port="389" realm="TPCRealm" sslEnabled="false">

    <ldapEntityType name="Group">
      <objectClass>group</objectClass>
      <searchBase>ou=MarketingGroups,dc=storage,dc=company,dc=com</searchBase>
      <searchBase>ou=SalesGroups,dc=storage,dc=company,dc=com</searchBase>
    </ldapEntityType>

    <ldapEntityType name="PersonAccount">
      <objectClass>user</objectClass>
      <searchBase>ou=MarketingUsers,dc=storage,dc=company,dc=com</searchBase>
      <searchBase>ou=SalesUsers,dc=storage,dc=company,dc=com</searchBase>
    </ldapEntityType>

  </ldapRegistry/>

  <activeLdapFilterProperties groupFilter="(&(cn=%v)(objectcategory=group))"
    groupIdMap="*:cn" groupMemberIdMap="memberof:member" id="active_dir_server"
    userFilter="(&(sAMAccountName=%v)(objectcategory=user))"
    userIdMap="user:sAMAccountName"/>

  <federatedRepository>
    <primaryRealm allowOpIfRepoDown="true" name="TPCRealm">
      <participatingBaseEntry name="dc=storage,dc=company,dc=com"/>
      <!-- The next two entries must NOT be changed -->
      <participatingBaseEntry name="o=TPCRealm"/>
      <participatingBaseEntry name="o=OSRealm"/>
    </primaryRealm>
  </federatedRepository>
</server>
```

When you use the LDAP XML template that implements the `ldapEntityType` element, it prevents you from finding and mapping LDAPGroup3 to IBM Spectrum Control role. However, you can find and map LDAPGroup1 and LDAPGroup2 to IBM Spectrum Control roles and LDAPUser1 and LDAPUser2 can log in to IBM Spectrum Control.

Adding customized text to the logon page

On the logon page for IBM Spectrum Control, you can show customized text when users access the GUI.

1. Open the directory that was created to install IBM Spectrum Control:
 - The default installation directory for Windows operating systems is `C:\Program Files\IBM\TPC`.
 - The default installation directory for AIX or Linux operating systems is `/opt/IBM/TPC`.
2. Go to the customization directory:

On Windows operating systems

The customization directory is in the `\wlp\usr\servers\webServer\` path.

On AIX or Linux operating systems

The customization directory is in the `/wlp/usr/servers/webServer/` path.

3. Open the `LoginText.html` file in a text editor:
 - a. Type the text that you want to show to the user before they log on to the GUI.

Tip: To format the text that you want to add, you can use HTML tags, such as paragraph tags, list tags, bold tags, and italic tags.

- b. Save the `LoginText.html` file.
4. Open the GUI.

The customized text that you added is shown below the logon page.

Configuring switches

IBM Spectrum Control can discover devices in the SAN and collect data about the performance of those devices. You must correctly configure the switches in your SAN to enable IBM Spectrum Control to complete these tasks.

IBM Spectrum Control is designed to operate using industry-based standards for communicating with Fibre Channel switches and other SAN devices. This communication can be done using simple network management protocol (SNMP) agents, Storage Management Initiative (SMI) agents, or a combination of these agent types. The supported switch vendors are Brocade, Cisco, and other switch types. IBM and other vendors often sell these switches under their own labels.

Determining the agent type or types to use with a switch

For Cisco switches and fabrics, an SNMP agent is required. SNMPv3 is the preferred version.

For Brocade switches and fabrics, the preferred type of agent is the SMI agent. The SMI agent provides most fabric functions, and other agent types can be added for redundancy.

To learn more about the information that is gathered by each type of agent, see Agent types for switch and fabric functions.

Using SNMP agents

IBM Spectrum Control uses the SNMP protocol to send queries across the IP network to management information bases (MIBs) supported on the switch. IBM Spectrum Control uses the Fibre Alliance FC Management MIB and the Fibre Channel FE MIB. The queries are sent only to switches that were added to IBM Spectrum Control for use as SNMP agents. SNMP information is collected for a single switch. The SNMP discovery registers each switch.

For a Cisco switch to successfully receive and respond to queries from IBM Spectrum Control, the following basic requirements must be met:

- IBM Spectrum Control can use SNMPv3 (preferred) or SNMPv1 to probe switches and fabrics. The SNMPv3 protocol is preferred because it provides better security, but switches that use the SNMPv1 protocol are also supported. Some switches are configured to use SNMPv3 by default.
- If the switch uses an SNMP agent, the Fibre Alliance FC Management MIB (FA MIB) and Fibre Channel Fabric Element MIB (FE MIB) must be enabled on the switch.
- When using the SNMPv1 protocol, the community string that is configured in IBM Spectrum Control must match one of the community strings that are configured on the switch with read access. Cisco switches must additionally have a community string match for write access. The default community strings in IBM Spectrum Control are “public” for read access and “private” for write access. Other community strings can be defined on the switches, but are not used. Community strings are not relevant when using the SNMPv3 protocol.
- SNMP access control lists must include the IBM Spectrum Control system. These access control lists are defined and configured on the switches. Some lists automatically include all hosts, while others exclude all by default.
- The Fibre Channel (FC) or Fibre Channel over Ethernet (FCoE) protocols must be enabled on the switch. Some switches, such as the Cisco Nexus 5000 series, require you to enable these protocols. Otherwise, IBM Spectrum Control will not recognize the switch when you try to add it using the **Add Switches and Fabrics for Monitoring** dialog. For instructions on how to configure Cisco switches for FCoE enablement, go to the Cisco product website at <http://www.cisco.com> and click **Support**.

Another aspect of the SNMP configuration includes trap notification. SNMP traps are generated by the switch and directed to IBM Spectrum Control as an indication that something in the fabric changed and that a discovery must occur to identify the changes. The default configuration for handling switch traps is to send them from the switch to port 162 on the IBM Spectrum Control system. To successfully generate and receive traps, there are some configuration requirements:

- The trap destination parameter on the switch must be set. This parameter is the host that receives the trap and sends it to IBM Spectrum Control. The parameter is set on the switch.
- The destination port parameter on the switch must be set. IBM Spectrum Control listens on port 162 by default. The parameter is set on the host.
- The traps must be sent as SNMPv1. This parameter is set on the switch.
- The trap severity level must be set to generate traps for change conditions. This level typically means to send error level traps and anything more severe. This parameter is set in IBM Spectrum Control.

Using SMI agents

You must install or enable an SMI agent to perform the following tasks for Brocade switches and fabrics, including:

- Scheduling probes to gather switch and fabric information.
- Gathering asset, status, and performance data about Brocade fabrics and switches.
- Creating and managing alerts.

For information about installing or enabling an SMI agent for a switch, contact the switch vendor.

Managing a SAN without agents

You can manage a SAN when there are no agents.

In the following situations, there might not be any agents on the SAN:

- The hosts do not currently have a Storage Resource agent or Fabric agent installed.
- The host operating system is not supported by the Storage Resource agent or Fabric agent.
- The customer requirements do not require the deployment of a Storage Resource agent or Fabric agent.

In these cases, it is recommended that an agent is installed on the Device server itself. This action allows the Device server to use advanced features like Remote Node Identification, which requires an agent.

Normally the Device server does not have a Fibre Channel host bus adapter. In this configuration, the following steps are taken:

1. A Fibre Channel host bus adapter is added to the manager.
2. An agent is installed on the Device server (the Device server is installed first).
3. All storage devices are verified to ensure that they use LUN masking techniques. The LUN masking techniques prevent the Device server from accessing the disks used by the host systems.
4. The Fibre Channel host bus adapter is attached to the SAN to be managed. This host is added to each zone that is intended to be managed by the Device server.

Setting timeout values for the Device server

If a probe or discovery of a storage subsystem times out before the operation completes, you can increase the timeout values for the Device server.

If a probe or discovery of a storage subsystem times out before the operation completes, you receive the following error message:

```
HWN021650E Encountered timeout while connecting to CIMOM IP:port.  
Check the CIMOM or increase timeout value.
```

where *IP* is the IP address, and *port* is the port number. If you determine that the Common Information Model Object Manager (CIMOM) is not the cause of the problem, you can use the command-line interface (CLI) to increase the timeout values for the Device server.

For those storage systems that use native interfaces to connect to IBM Spectrum Control you see this error message:

HWN020103E The external process exceeded the timeout limit and was cancelled.

The following storage systems use native interfaces to connect to IBM Spectrum Control:

- System Storage® DS8000®
 - SAN Volume Controller
 - The XIV®
 - IBM Spectrum Accelerate™
 - Storwize® V3500
 - Storwize V3700
 - Storwize V7000
 - Storwize V7000 Unified
 - FlashSystem V840
 - FlashSystem V9000
 - IBM SONAS
 - IBM Spectrum Scale™
 - IBM Cloud Object Storage
1. Run the **getdscfg** command to determine the current values of the timeout properties. From the command prompt, enter the following command:

```
cli>tpctool getdscfg -user user -pwd password -url host:port
-property timeout_property
```

where:

- *user* is an IBM Spectrum Control user ID.
- *password* is the password for the IBM Spectrum Control user ID.
- *host* is the host name or IP address, and *port* is a valid port number for the HTTP service of the Device server. The default value for *port* is typically 9550.
- *timeout_property* is one of the following strings:
 - httpTimeout
 - CIMClientWrapper.Timeout
 - Probe.Timeout.Array
 - Probe.Timeout.LMM
 - Discovery.Timeout
 - CIMOMManager.TestConnectionTimeout

Important: Timeout properties are displayed in milliseconds. If the value is 0 (zero), it means that there is no timeout.

For the storage systems that use the native interface, the *timeout_property* strings are:

- NAPI.Timeout.TestConnection
 - NAPI.Timeout.Probe
 - NAPI.Timeout.EventPoll
2. Run the **setdscfg** command to increase the timeout value. Run the following command:


```
cli>tpctool setdscfg -user user -pwd password -url host:port
-property timeout_property timeout_value
```

Tip: For IBM SONAS and Storwize V7000 Unified, the refresh of configuration data from the storage system can take some time to complete and might cause the probe to time out, even if the timeout value is increased. To reduce the duration of the probe run for IBM SONAS and Storwize V7000 Unified, run the following command:

```
cli>tpctool setdscfg -user user -pwd password -url host:port  
-property Probe.GetRecentSONASData -context DeviceServer false
```

This command changes the probe configuration to use cached configuration data from the storage system, which reduces the duration of the probe run. However, the information that is collected by the probe might be slightly out of date.

For more information about **tpctool**, go to the product documentation at

 http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/com.ibm.spectrum.sc.doc/fqz0_r_tpctool_command.html. You also can view help from the command line by issuing the command with the **-help** option.

Configuring Service Location Protocol

You can enable IBM Spectrum Control to discover a larger set of storage devices through Service Location Protocol (SLP). In addition to some of the more common SLP configuration issues, there is also information about router configuration, SLP directory agent configuration, and environment configuration.

For additional information about SLP, see the **Service Location Protocol Request for Comments** website at <http://www.ietf.org/rfc/rfc2165.txt>.

Note: The storage systems that use the native interfaces (DS8000, XIV, SAN Volume Controller, and Storwize V7000) do not use SLP discovery.

Router configuration

Configure the routers in the network to enable general multicasting or to allow multicasting for the SLP multicast address and port, 239.255.255.253, port 427. The routers of interest are the ones associated with subnets that contain one or more storage devices that are to be discovered and managed by IBM Spectrum Control.

To configure your router hardware and software, refer to your router and configuration documentation.

SLP directory agent configuration

Review these suggestions when you configure the SLP directory agent.

Configure the SLP directory agents (DAs) to circumvent the multicast limitations. With statically configured DAs, all service requests are unicast by the user agent. Therefore, it is possible to configure one DA for each subnet that contains storage devices that are to be discovered by IBM Spectrum Control. One DA is sufficient for each of the subnets. Each of these DAs can discover all services within its own subnet, but no other services outside its own subnet. To allow IBM Spectrum Control to discover all the devices, it needs to be statically configured with the addresses of each of these DAs. This operation can be accomplished by using the IBM Spectrum Control Discovery Preference panel.

You can use this panel to enter a list of DA addresses. IBM Spectrum Control sends unicast service requests to each of these statically configured DAs, and sends

multicast service requests on the local subnet on which IBM Spectrum Control is installed. Configure an SLP DA by changing the configuration of the SLP service agent (SA) that is included as part of an existing CIM Agent installation. This action causes the program that normally runs as an SLP SA to run as an SLP DA.

Note: The change from SA to DA does not affect the CIMOM service of the subject CIM Agent, which continues to function normally, sending registration and deregistration commands to the DA directly.

Environment configuration

This section provides information about the configuration of your environment.

It might be advantageous to configure SLP DAs in the following environments:

- In environments where there are other non-Disk Manager SLP UAs that frequently perform discovery on the available services, an SLP DA must be configured. This action ensures that the existing SAs are not overwhelmed by too many service requests.
- In environments where there are many SLP SAs, a DA helps decrease network traffic that is generated by the multitude of service replies. It also ensures that all registered services can be discovered by a given UA. The configuration of an SLP DA is recommended when there are more than 60 SAs that need to respond to any given multicast service request.

SLP registration and slptool

IBM Spectrum Control uses Service Location Protocol (SLP) discovery, which requires that all the CIMOMs that Disk Manager discovers are registered by using the SLP.

In a non-multicast network environment, SLP can only discover CIMOMs that are registered in its IP subnet. For CIMOMs outside of the IP subnet, you need to use an SLP DA and register the CIMOM by using **slptool**. Ensure that the **CIM_InteropSchemaNamespace** and **Namespace** attributes are specified.

For example, enter the following command:

```
slptool register service:wbem:https://myhost.com:port
```

Where *myhost.com* is the name of the server that is hosting the CIMOM, and *port* is the port number of the service, for example 5989.

Note: **slptool** is installed with a CIMOM. Run the command from the computer that is hosting the CIMOM.

SLP discovery

A common problem with SLP discovery is due to IP multicasting being disabled on the network router. Communication between the SLP SA and UA is done with IP multicasting. Follow these recovery procedures when there are SLP discovery problems and IP multicasting is disabled on the network router.

Note: The storage systems that use native interfaces, for example, DS8000, XIV, SAN Volume Controller, and Storwize V7000 do not use SLP discovery.

There are two recovery procedures when there are SLP discovery problems and IP multicasting is disabled on the network router:

1. Configure one DA for each subnet within the environment.
2. Enable IP multicasting on the router which is disabled by default. Here is a list of common router configurations for multicasting:
 - Internet Group Management Protocol (IGMP) is used to register individual hosts in particular multicast groups and to query group membership on particular subnets.
 - Distance Vector Multicast Routing Protocol (DVMRP) is a set of routing algorithms that use a technique called reverse path forwarding. These algorithms provide the best solution for how multicast packets are to be routed in the network.
 - Protocol-Independent Multicast (PIM) comes in two varieties: dense mode (PIM-DM) and sparse mode (PIM-SM). The dense mode and sparse mode routines are optimized for networks where either a large percentage of nodes requires multicast traffic (dense) or a small percentage of nodes requires the sparse traffic.
 - Multicast Open Shortest Path First (MOSPF) is an extension of OSPF. It is a link-state unicast routing protocol that attempts to find the shortest path between any two networks or subnets to provide the most optimal packet routing.

To properly configure the routers for multicasting, see the reference and configuration documentation from the router manufacturer.

Configuring IP addressing


This section provides information about configuring IP addressing.

Configuring IBM Spectrum Control with multiple IP addresses

If the system where IBM Spectrum Control is to be installed has multiple IP addresses, then a configuration value must be set manually as a post-installation task by using the **tpctool setdscfg** command. The value to be set is for the local IP address, which must be used for subscription for CIM Indications for CIM agents.

Restriction: This task does not apply to storage systems that use the native interfaces, for example, DS8000, XIV, SAN Volume Controller, and Storwize V7000.

If you are using IPv6 computers, go to the product documentation at

 http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/com.ibm.spectrum.sc.doc/fqz0_r_planning_ipv6.html.

For multiple IPv6 addresses, the IPv6 address to use for CIM indication subscription by IBM Spectrum Control can be specified by setting the property `System.LocalIPv6Address` as described.

With dual stack IPv4 and IPv6 IBM Spectrum Control servers, two IP addresses are required to subscribe to IPv4 CIMOMs and IPv6 CIMOMs. The configuration property `System.LocalIPv6Address` is used for IPv6 CIMOMs and the property `System.LocalIPAddress` is used for IPv4 CIMOMs.

To change the IP address, follow these steps:

1. Open a command prompt window on the server system.
2. Change to the following directory:

```
cd installation_dir\cli
```


3. Enter the following command:

```
tpctool setdscfg -user user_ID -pwd password -url  
host:port -property System.LocalIPv6Address value
```

Where:

user_ID

Is the user ID.

password

Is the password for the user.

host Is either the host name or IP address of the system that is running IBM Spectrum Control.

port Is a valid port number for the HTTP service of the Device server (the default is 9550).

value Is the local IP address, which must be used for subscription for CIM Indications for CIM agents.

4. Verify that the command was successful by entering this command:

```
tpctool getdscfg -user user_ID -pwd password  
-url host:port -property System.LocalIPv6Address
```

Changing the HOSTS file

When you install IBM Spectrum Control on your Windows operating systems, you must follow these steps to avoid addressing problems with the systems you want to manage. These problems are caused by the address resolution protocol that returns the host short name rather than the fully qualified host name. You can avoid this by modifying the entries in the corresponding host tables on the DNS server and on the local computer system. The fully qualified host name must be listed before the short name in each entry that is associated with systems managed by IBM Spectrum Control.

The **HOSTS** file is in the %SystemRoot%\system32\drivers\etc\ directory. To change the HOSTS file, follow these steps:

1. Open the HOSTS file in a text editor.
2. Add, remove, or modify the host entries. In the following example of a HOSTS file, the short name is incorrectly listed before the fully qualified host name. This can cause address resolution problems in IBM Spectrum Control.

```
# Copyright (c) 1993-2009 Microsoft Corp.  
#  
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.  
#  
# This file contains the mappings of IP addresses to host names. Each  
# entry should be kept on an individual line. The IP address should  
# be placed in the first column followed by the corresponding host name.  
# The IP address and the host name should be separated by at least one  
# space.  
#  
# Additionally, comments (such as these) may be inserted on individual  
# lines or following the machine name denoted by a '#' symbol.  
#  
# For example:  
#  
#      102.54.94.97      rhino.acme.com      # source server  
#      38.25.63.10      x.acme.com         # x client host  
#  
192.168.123.146        jason            jason.groupa.mycompany.com
```

3. In the following example, the order of the host names has been changed so that the fully qualified host name is placed before the short name. The host names must be entered in the order that is shown so IBM Spectrum Control can locate the host. Use this format for any hosts that are associated with IBM Spectrum Control.

```
# For example:
#
#      102.54.94.97      rhino.acme.com      # source server
#      38.25.63.10      x.acme.com         # x client host
#
192.168.123.146      jason.groupa.mycompany.com      jason
```

Note: Host names are case-sensitive. This is a WebSphere requirement. For example, if your computer shows the name as JASON (uppercase), then you must enter JASON in the HOSTS file.

Configuring the VASA provider

You need to register a IBM Spectrum Control server as a VASA provider to view IBM Spectrum Control data in vCenter reports and views, to export alarms, and to filter which storage and file systems share IBM Spectrum Control data with vCenter.

Registering a IBM Spectrum Control VASA provider

Use the vSphere Client or the vSphere Web Client to register IBM Spectrum Control as a VASA provider.

The IBM Spectrum Control VASA provider is automatically deployed and running after a IBM Spectrum Control installation.

To register IBM Spectrum Control as a VASA provider for a vCenter, follow these steps:

1. Start the vSphere Client or the vSphere Web Client.
2. If you are using vSphere Client: Under **Home**, click **Administration** and then **Storage Providers**. To add a VASA provider, click **Add**.
3. If you are using vSphere Web Client: Under **Home**, click **Hosts and Clusters** and then select the vCenter server. In the **Manage** tab, click **Storage Providers**. To add a VASA provider, click the plus (+) sign.
4. For **Name**, specify the display name you want to assign to the provider.
5. For **URL**, enter the address, `https://<TPCServer>:<port>/vasa/services/tpc`, where **<TPCServer>** is the name of the IBM Spectrum Control host and **<port>** is the port that is used for registering the VASA provider. The default port is 9569.
6. For **Login**, specify a valid IBM Spectrum Control user name.
7. For **Password**, specify the associated password.
8. If you are using the IBM Spectrum Control Storage Provider certificate, see “Using a IBM Spectrum Control Storage Provider certificate” on page 35.
9. Click **OK**. You may see a pop up dialog asking you if you trust the host. If so, click **Yes**.

When the registration completes, the status of the provider remains Unknown for some minutes. vCenter collects data from the VASA provider as part of its synchronization process. When synchronization is completed, provider status changes to Online.

vCenter must update its reports before users can see the VASA data collected by vCenter reflected in reports and views. The time required to complete this task depends on the number of assigned volumes, shares and existing data stores in the target ESX environment. The task can take some time.

When this process completes, you can view IBM Spectrum Control information in VASA provider reports and views.

VMware does not support scenarios where multiple VASA providers manage the same storage.

Note: VMware vCenter does not refresh VASA provider information after a IBM Spectrum Control upgrade. This can result in some information, including VASA version information, not being up to date. With vCenter events and alarms, information may be displayed in an older format, if a newer VASA version contains any new formats, events or alarms. When you upgrade IBM Spectrum Control, you must manually unregister and register the VASA provider again if you want to see updated VASA provider information.

Using a IBM Spectrum Control Storage Provider certificate

Specify a IBM Spectrum Control storage provider certificate when registering manually on vSphere Web Client.

When registering a IBM Spectrum Control VASA provider, the Use storage provider certificate is optional. By default, it is not selected.

If you want the vCenter Server to add the VASA provider certificate to its truststore during the VASA provider registration, select this option. Otherwise, it is not required.

Before selecting this option, you need to save the certificate from IBM Spectrum Control VASA provider as a file.

To save a IBM Spectrum Control storage provider certificate for use during registration, follow these steps in Firefox, or their equivalent in another browser:

1. In a web browser, enter the address, `https://<TPCServer>:<port>/vasa/services/tpc`, where **<TPCServer>** is the name of the IBM Spectrum Control host and **<port>** is the port that is used for registering the VASA provider. The default port is 9569.
2. Click the lock icon to display the security information for this page. Click on More Information.
3. Click View Certificate. Click the Details tab under Security and select the certificate you require from the certificate hierarchy.
4. Click Export, and save the certificate as a **.crt** file.

If you decide to select the Use storage provider certificate option during VASA registration, click on Browse... to select the **.crt** file that you saved. After selecting the Use storage provider certificate option, you will not be presented with a pop up dialog confirming that you trust the certificate.

Note: The VASA provider certificate is removed from the vCenter truststore when the VASA provider is removed from the vCenter. This is the case whether or not you selected the Use storage provider certificate option.

Unregistering a IBM Spectrum Control VASA provider

Use the vSphere Client or the vSphere Web Client to unregister IBM Spectrum Control as a VASA storage provider.

To unregister a IBM Spectrum Control VASA provider, follow these steps:

1. With the vSphere Client. Under **Home**, click **Storage Providers**. Select the provider and click **Remove**.
2. With the vSphere Web Client. Click **Hosts and Clusters**. In the **Manage** tab, click **Storage Providers**. Select the provider and click the delete (X) sign.

Verify that IBM Spectrum Control is unregistered as a VASA provider by inspecting the list of providers.

Note: VMware vCenter does not refresh VASA provider information after a IBM Spectrum Control upgrade. When you upgrade IBM Spectrum Control, you must manually unregister and register the VASA provider again to see updated VASA provider information.

Filter storage and file systems

You can exclude certain types of storage and file systems from the data IBM Spectrum Control VASA provider shares with vCenter.

If you are using multiple VASA providers, you can exclude certain system types from the information IBM Spectrum Control VASA provider shares with vCenter.

To exclude system types, use the filter properties file `vasa_filter.properties` in `installation_dir>/web/conf/`.

`vasa_filter.properties` is created when IBM Spectrum Control VASA provider is added to a vCenter.

The `vasa_filter.properties` file lists supported system types, together with the associated include/exclude setting. By default, all system types are included:

```
DS3000/DS4000=include
DS5000=include
IBM_ESS=include
IBM_DS6000=include
IBM_DS8000=include
IBM_SONAS=include
IBM_Storwize_V7000=include
IBM_Storwize_V7000U=include
IBM_SVC=include
IBM_XIV=include
EMC=include
Hitachi=include
HP=include
HP_XP=include
NetApp/IBM_N_Series=include
Other_NAS=include
Sun=include
Unknown=include
```

Use a text editor to modify this file. Set a system type to **include** or **exclude** all systems of that type from the information that is shared with vCenter.

The `vasa_filter.properties` file is refreshed when you synchronize the IBM Spectrum Control VASA provider from vCenter.

The refresh maintains any changes in the file at the time of the refresh.

Note: If an excluded system is deleted, the refresh adds it back to `vasa_filter.properties`, set to include.

When IBM Spectrum Control is upgraded, the `vasa_filter.properties` file remains in its last known state.

When the VASA provider is synchronized from vCenter, the `vasa_filter.properties` file is refreshed, and retains existing system settings.

After synchronizing, inspect the information in the vCenter reports to verify that excluded systems are no longer visible.

Creating custom VM Storage Profiles

Use the VMware Web Client to create custom VM Storage Profiles based on system-defined capabilities provided by VASA.

You can use the VMware Web Client to view system-defined capabilities, or to create user-defined capabilities.

It is also possible to create VM Storage Profiles based on system-defined capabilities provided by VASA. When you create a new VM Storage Profile, the capabilities of VASA are listed. You can either create a new user defined capability, or select one or more capabilities as the basis for custom user-defined capabilities.

To create VM Storage Profiles based on system-defined capabilities provided by VASA:

1. Use the vSphere Web Client to navigate to **Home**.
2. Click **Rules and Profiles** and select **VM Storage Profiles**.
3. Click **Create a new VM Storage Profile**.
4. Select one or more system-defined capabilities provided by VASA.

Configuring the vSphere Web Client extension for IBM Spectrum Control

Before you can use the vSphere Web Client extension for IBM Spectrum Control to provision storage or view reports, you must deploy the extension.

You can use the IBM Spectrum Control GUI to deploy the vSphere Web Client extension, or you can deploy the extension locally on the vCenter Server system.

When you deploy the extension from the IBM Spectrum Control server, the server configures the vSphere Web Client extension. The deployment process also registers IBM Spectrum Control as a VASA provider for the vCenter Server system. You can then view IBM Spectrum Control data in vSphere reports and views, export alarms, and filter which storage and file systems share IBM Spectrum Control data with the vCenter Server system.

When you deploy the extension locally on the vCenter Server system, you must manually save the IBM Spectrum Control server configuration information. You must also manually register IBM Spectrum Control as a VASA provider.

Related tasks:

“Saving the IBM Spectrum Control server configuration information” on page 42
You can save the configuration information for the IBM Spectrum Control server in the vSphere Web Client extension. The information includes the server credentials and connection information, which enable the vSphere Web Client extension to connect to IBM Spectrum Control.

“Registering a IBM Spectrum Control VASA provider” on page 34
Use the vSphere Client or the vSphere Web Client to register IBM Spectrum Control as a VASA provider.


Deploying the vSphere Web Client extension from IBM Spectrum Control server

Before you can use the vSphere Web Client extension for IBM Spectrum Control to provision storage, view reports, or view alerts, you must deploy the extension. You can deploy the vSphere Web Client extension and register IBM Spectrum Control as a VASA provider when you add a vCenter Server system, version 5.1 or later, as a data source in the IBM Spectrum Control GUI.

Adding vCenter Server systems

For IBM Spectrum Control to monitor multiple hypervisors, you must first add a vCenter Server system.

When you add vCenter Server version 5.1 or later, you can deploy the vSphere Web Client extension for IBM Spectrum Control and register the latter as a VASA provider. You can then provision storage, view reports, and publish alerts in the vSphere Web Client about storage that is monitored by IBM Spectrum Control.

You can add multiple hypervisors by specifying connection information for a vCenter Server system. For a complete list of hypervisors and vCenter Server systems that you can add, see the  IBM Spectrum Control interoperability matrix at <http://www.ibm.com/support/docview.wss?uid=swg21386446>, and go to the *Agents, Servers and Browsers* section.

1. In the menu bar, go to **Servers > Hypervisors**.
2. Click **Add Hypervisor**.
3. Select **VMware vCenter** and enter connection information about the vCenter Server system.
4. Optional: To deploy the vSphere Web Client extension for IBM Spectrum Control and register IBM Spectrum Control as a VASA provider, in the **Deploy vSphere extension** page, enter your credentials. For **VMware vCenter Server**, enter a user name and password for the vSphere administrator user. For **IBM Spectrum Control**, enter a user name and password for a IBM Spectrum Control user ID. You must have Administrator, Monitor, or External Application authority to deploy the extension. If you entered a vSphere administrator user name and password for the vCenter Server system, enter only the IBM Spectrum Control credentials.
5. Schedule a probe for the hypervisors that were discovered.
6. Follow the instructions in the wizard to add the vCenter Server system.

After a vCenter Server system is added for monitoring, probes collect status and asset information about its hypervisors.

When the collection of data is complete, you can view status information and capacity data about the hypervisors on the Hypervisors page.

Enabling the default alerts for hypervisors: To enable the default alerts for a resource so that you are automatically notified when certain conditions are detected, you must view the alert definitions for that resource. For example, to view the alert definitions for a hypervisor, go to **Servers > Hypervisors**, right-click a hypervisor, and select **Edit Alert Definitions**. The default alerts are automatically enabled for the hypervisor after you access the Edit Alert Definitions page.

Related tasks:

“Checking permissions to browse data stores” on page 95


Determine if the user name that you specified for a VMware data source has permission to browse through the data stores on a hypervisor.

Deploying the vSphere Web Client extension for IBM Spectrum Control locally

Before you can use the vSphere Web Client extension for IBM Spectrum Control to provision storage, view reports, or view alerts, you must deploy the extension. As part of the deployment process, you must register the vSphere Web Client extension and save the IBM Spectrum Control server configuration information. When you save the configuration information, the IBM Spectrum Control server is also automatically registered as a VASA provider for the vCenter Server system.

Registering the vSphere Web Client extension for IBM Spectrum Control

You can deploy the vSphere Web Client extension for IBM Spectrum Control on a vCenter Server so that you can use IBM Spectrum Control with a vCenter Server.

Ensure that IBM Spectrum Control is installed. You must also complete the planning activities. For more information about planning, go to the product documentation at  [Planning for the vSphere Web Client extension](#).

To deploy the extension for IBM Spectrum Control, you must copy the deployment setup utility to the vCenter Server, run the setup utility, and register the extension to the vCenter Server.

When the extension is registered with a vCenter Server, you can use IBM Spectrum Control on any vSphere Web Client that connects to the same vCenter Server.

1. On the server where IBM Spectrum Control is installed, go to the plug-in installation directory:
 - On Windows operating systems:
`C:\Program Files\IBM\TPC\web\TPCVMwareVspherePlugin`
 - On AIX or Linux operating systems:
`/opt/IBM/TPC/web/TPCVMwareVspherePlugin`
2. Copy the directory to the vCenter Server or the vCenter Server Appliance host machine, into a directory of your choice. Use binary mode for the transfer.
3. From the command line on the vCenter Server or the vCenter Server Appliance host machine, go to TPCVMwareVspherePlugin directory.
4. To start the registration process, run the deployment utility by using one of the following methods:
 - Run the deployment utility in command-line mode by issuing the **setup** command with the following parameters:
 - On Windows operating systems:
`C:\Program Files\IBM\TPC\web\TPCVMwareVspherePlugin> setup register -password password -tpcServerAddress tpcServerAddress`

- On Linux operating systems:

```
/opt/IBM/TPC/web/TPCVmwareVspherePlugin> ./setup.sh register
-password password -tpcServerAddress tpcServerAddress
```

This method registers the extension by using the default values for the command parameters.

- Run the deployment utility in read-from-file mode by issuing the **setup** command with the **-file** option to accept the parameters from a properties file:

- On Windows operating systems:

```
C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin> setup -file filename
```

- On Linux operating systems:

```
/opt/IBM/TPC/web/TPCVmwareVspherePlugin> ./setup.sh -file filename
```

where *filename* is the name of the properties file, including the path and the extension, that contains the parameters for the **setup** command. To create the properties file, follow the instructions in “Creating the **setup** command properties file” on page 41.

- Run the deployment utility in interactive mode by issuing the **setup** command and entering values when you are prompted:

- On Windows operating systems:

```
C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin> setup
```

- On Linux operating systems:

```
/opt/IBM/TPC/web/TPCVmwareVspherePlugin>> ./setup.sh
```

- Run the deployment utility in silent mode by using the **-silent** option. In silent mode, any output that is generated is saved to the log file on the disk. The log file, `TPCDeploymentUtility.log`, is in the following location:

- On Windows operating systems:

```
%ALLUSERSPROFILE%\IBM\TPC
```

For example, `C:\Documents and Settings\All Users\IBM\TPC\`

or `%PROGRAMDATA%\IBM\TPC`

For example, `C:\ProgramData\IBM\TPC\`

- On Linux operating systems:

```
/opt/IBM/TPC
```

Save the configuration information for the IBM Spectrum Control server in the vSphere Web Client extension. When you save the configuration information, the IBM Spectrum Control server credentials and connection information persist.

Related tasks:

“Saving the IBM Spectrum Control server configuration information” on page 42
You can save the configuration information for the IBM Spectrum Control server in the vSphere Web Client extension. The information includes the server credentials and connection information, which enable the vSphere Web Client extension to connect to IBM Spectrum Control.

Related reference:

“setup command for the vSphere Web Client extension” on page 44

Use the **setup** command from the command line on a vCenter Server system or vCenter Server Appliance to install and register the vSphere Web Client extension for IBM Spectrum Control. You can also use this command to unregister the extension on the vCenter Server system or the vCenter Server Appliance.

“Sample properties files for the vSphere Web Client extension” on page 48
You can use a properties file to register or unregister the vSphere Web Client extension for IBM Spectrum Control by using the **setup** command in read-from-file mode.

Creating the setup command properties file

You can create a properties file to use for registering or unregistering the vSphere Web Client extension for IBM Spectrum Control in read-from-file mode.

You can run the **setup** command with the **-file** option to register or unregister the vSphere Web Client extension by accepting the parameters from a properties file. You use key-value pairs to specify the parameters when you create the properties file.

1. Create a properties file that contains the following key-value pairs:

-mode=register

The **-mode** parameter is required. Enter the register value if you are creating a properties file to use in registration mode. When you register the vSphere Web Client extension for IBM Spectrum Control, you can use IBM Spectrum Control with a vCenter Server. Enter the unregister value if you are creating a properties file to use when you unregister the vSphere Web Client extension.

-password=password

The **-password** parameter is required. Enter the value in clear text.

-user=user

The **-user** parameter is optional. If you do not specify a user ID, the administrator ID is used.

-webserverPath=webserverPath

The **-webserverPath** parameter is optional. If you specify a path, you must use "\" as an escape character for the file path separator. For example, if the path is C:\Program Files\VMware\Infrastructure\tomcat, you must enter C:\\Program Files\\VMware\\Infrastructure\\tomcat. If you do not specify a path, the value from the Windows registry is used.

Tip: This parameter is not used when you are installing the vSphere Web Client extension on a vCenter Server Appliance.

-tpcServerAddress=tpcServerAddress

The **-tpcServerAddress** parameter is required only for **register** mode. Enter the host name or IP address of the server where IBM Spectrum Control is installed.

-tpcServerHttpsPort=tpcServerHttpsPort

The **-tpcServerHttpsPort** parameter is optional and only applies to **register** mode. Enter the HTTPS port of the IBM Spectrum Control web server. If you do not specify the port, the default port, 9569, is used.

2. Specify a file name, and save the file to a location of your choice.

Related tasks:

“Unregistering the vSphere Web Client extension for IBM Spectrum Control” on page 50

You can remove the vSphere Web Client extension for IBM Spectrum Control as an extension on the vCenter Server if you no longer want to use IBM Spectrum Control with a vCenter Server.

Related reference:

“setup command for the vSphere Web Client extension” on page 44

Use the **setup** command from the command line on a vCenter Server system or vCenter Server Appliance to install and register the vSphere Web Client extension for IBM Spectrum Control. You can also use this command to unregister the extension on the vCenter Server system or the vCenter Server Appliance.

“Sample properties files for the vSphere Web Client extension” on page 48

You can use a properties file to register or unregister the vSphere Web Client extension for IBM Spectrum Control by using the **setup** command in read-from-file mode.

Saving the IBM Spectrum Control server configuration information

You can save the configuration information for the IBM Spectrum Control server in the vSphere Web Client extension. The information includes the server credentials and connection information, which enable the vSphere Web Client extension to connect to IBM Spectrum Control.

When you save the configuration information, it persists for subsequent sessions.

Ensure that you register the vSphere Web Client extension for IBM Spectrum Control.

To access the vSphere Web Client extension for IBM Spectrum Control, you must be assigned the Administrator, Monitor, or External Application role.

Complete this task when you want to save IBM Spectrum Control configuration information for the first time.

When you use the vSphere Web Client extension for IBM Spectrum Control, you can provision storage and view information about resources that are monitored by IBM Spectrum Control. When you save the configuration information, the IBM Spectrum Control server can also be automatically registered as a VASA provider for the vCenter Server. To view IBM Spectrum Control storage data in the existing vCenter Server reports and views, you must ensure that the VASA provider registration process is completed.

1. Start the vSphere Web Client, and log on to the vCenter Server system.
2. From the vSphere Web Client Home tab, in the Administration section, click the **IBM IBM Spectrum Control** icon.
3. In the **Host name** field on the IBM Spectrum Control page, enter the host name of the system that is running IBM Spectrum Control.
4. In the **Port** field, enter the HTTPS port of the IBM Spectrum Control web server or accept the default port, 9569.
5. Enter an authorized user name and password.
6. Click **Save**. The `TPCServerConfiguration.properties` file is saved in the following location:
 - On Windows operating systems:
%ALLUSERSPROFILE%\IBM\TPC
For example, C:\Documents and Settings\All Users\IBM\TPC\
or %PROGRAMDATA%\IBM\TPC
For example, C:\ProgramData\IBM\TPC\
• On Linux operating systems:

/opt/IBM/TPC

7. Optional: If the registration process for the VASA provider displays an error message at the top of the window, you must manually register the VASA provider. Complete the manual registration process only if you want to view IBM Spectrum Control storage data in the existing vCenter Server reports and views.

Related tasks:

“Registering the vSphere Web Client extension for IBM Spectrum Control” on page 39

You can deploy the vSphere Web Client extension for IBM Spectrum Control on a vCenter Server so that you can use IBM Spectrum Control with a vCenter Server.

“Registering a IBM Spectrum Control VASA provider” on page 34

Use the vSphere Client or the vSphere Web Client to register IBM Spectrum Control as a VASA provider.

Related reference:

“Registration of IBM Spectrum Control as a VASA provider”

You must complete the VASA provider registration process so that you can view IBM Spectrum Control storage data in the existing vCenter Server reports and views. When you save the credentials and connection information for the IBM Spectrum Control server in the vSphere Web Client, IBM Spectrum Control can also be registered automatically as a VASA provider for the vCenter Server.

Registration of IBM Spectrum Control as a VASA provider:

You must complete the VASA provider registration process so that you can view IBM Spectrum Control storage data in the existing vCenter Server reports and views. When you save the credentials and connection information for the IBM Spectrum Control server in the vSphere Web Client, IBM Spectrum Control can also be registered automatically as a VASA provider for the vCenter Server.

Automatic registration

The registration process completes automatically in the following situations:

- No VASA providers are registered.
- VASA providers are registered. The IBM Spectrum Control VASA provider is registered, but it is not registered for the same IBM Spectrum Control server.

Manual registration

You must complete the registration process manually in the following situations:

- Only non-IBM VASA providers are registered.
- IBM Spectrum Control is already registered as a VASA provider for the same IBM Spectrum Control server.

Related tasks:

“Registering a IBM Spectrum Control VASA provider” on page 34

Use the vSphere Client or the vSphere Web Client to register IBM Spectrum Control as a VASA provider.

“Registering the vSphere Web Client extension for IBM Spectrum Control” on page 39

You can deploy the vSphere Web Client extension for IBM Spectrum Control on a vCenter Server so that you can use IBM Spectrum Control with a vCenter Server.

“Saving the IBM Spectrum Control server configuration information” on page 42
You can save the configuration information for the IBM Spectrum Control server in the vSphere Web Client extension. The information includes the server credentials and connection information, which enable the vSphere Web Client extension to connect to IBM Spectrum Control.

setup command for the vSphere Web Client extension

Use the **setup** command from the command line on a vCenter Server system or vCenter Server Appliance to install and register the vSphere Web Client extension for IBM Spectrum Control. You can also use this command to unregister the extension on the vCenter Server system or the vCenter Server Appliance.

Use the **setup.sh** command to run the deployment utility on vCenter Server Appliance.

You can run the command in command-line, interactive, or read-from-file mode. You must provide all the required parameters when you are using command-line mode. The password value is not hidden and is displayed in plain text in command-line mode. If you do not invoke command-line mode, the command output prompts you to enter the parameters or accept the defaults.

You must have Administrator authority to use this command.

Before you issue the **setup** command, ensure that you complete the following activities:

- Complete the planning activities. For more information about planning, go to the product documentation at [Planning for the vSphere Web Client extension](#).
- Copy the plug-in installation directory, which is in the IBM Spectrum Control web directory on the IBM Spectrum Control server system. Place the copy in any directory on the vCenter Server or the vCenter Server Appliance host machine.
- Create a properties file to store command parameters, if you plan to run the command in read-from-file mode.

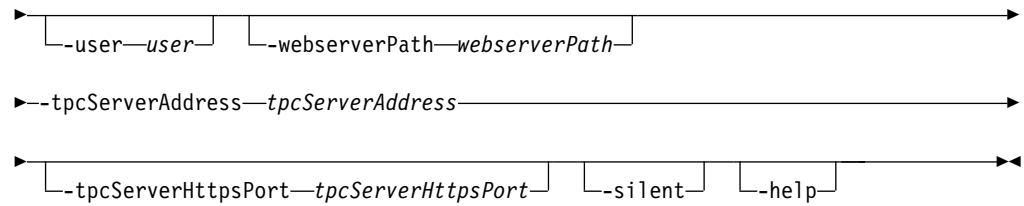
Run the command from the `TPC\vmware\vsphereplugin` directory on the vCenter Server or the vCenter Server Appliance.

You can check the command log file, `TPCDeploymentUtility.log`, to see the status of the command. The log file is in the following location:

- On Windows operating systems:
`%ALLUSERSPROFILE%\IBM\TPC`
For example, `C:\Documents and Settings\All Users\IBM\TPC\`
or `%PROGRAMDATA%\IBM\TPC`
For example, `C:\ProgramData\IBM\TPC\`
- On Linux operating systems:
`/opt/IBM/TPC`

Syntax

```
►► setup [-file filename] [register | unregister] [-password password]
```



Parameters

-file *filename*

Specifies the name and location of the properties file that contains the parameters. The parameters are specified in key-value pairs. You can create a properties file if you plan to run the command in read-from-file mode.

register | unregister

Specifies the action that the command is to complete. You can specify one of the following actions:

register

Register the IBM Spectrum Control plug-in package as an extension on the vCenter Server.

Tip: If the IBM Spectrum Control plug-in package is already registered with the vCenter Server, the extension information is updated on the vCenter Server. The TPC_VmPlug.zip package is also updated.

unregister

Remove the IBM Spectrum Control plug-in package as a vCenter Server extension.

-password *password*

Specifies the password that is used to authenticate with the vCenter Server.

-user *user*

Specifies a vCenter Server user ID. If you do not specify a user ID, the default value is the administrator ID.

-webserverPath *webserverPath*

Specifies the vCenter Server web server installation path. If you do not specify a path, the default value is copied from the Windows registry.

Note: This parameter is not used in a vCenter Server Appliance installation.

-tpcServerAddress *tpcServerAddress*

Specifies the host name or IP address of the server where IBM Spectrum Control is installed.

Restriction: This parameter is required only for **register** mode.

-tpcServerHttpsPort *tpcServerHttpsPort*

Specifies the HTTPS port of the IBM Spectrum Control web server. If you do not specify the port, the default value is 9569.

Restriction: This parameter only applies to **register** mode.

-silent

Specifies that any output that is generated is redirected to the command log file and not to the console. By default the output is generated on the console and to the log file.

-help

Lists help information for the command.

Example: Register the vSphere Web Client extension for IBM Spectrum Control in read-from-file mode with the silent option

Register the vSphere Web Client extension for IBM Spectrum Control as a vCenter Server extension in read-from-file mode.

```
C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin>setup -file register_file -silent
```

The command output is written to the command log file.

Example: Register the vSphere Web Client extension for IBM Spectrum Control in command-line mode

Register the vSphere Web Client extension for IBM Spectrum Control as a vCenter Server extension in command-line mode.

```
C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin>setup register -password password -tpcServerAddress system1.tpc.example.com -tpcServerHttpsPort 9569
```

The following output is returned:

```
INFO: 12/18/2013 05:08:42 Operating in command-line mode...
INFO: 12/18/2013 05:08:42 Communicating with the vCenter server...
INFO: 12/18/2013 05:08:55 Successfully authenticated with the vCenter server...
INFO: 12/18/2013 05:08:55 Mode: register
INFO: 12/18/2013 05:08:55 vCenter Server address: 127.0.0.1
INFO: 12/18/2013 05:08:55 vCenter Server port: 443
INFO: 12/18/2013 05:08:55 vCenter Server user ID: Administrator
INFO: 12/18/2013 05:08:55 Tivoli Storage Productivity Center address:
omni.storage.tucson.ibm.com
INFO: 12/18/2013 05:08:55 HTTPS port of the Tivoli Storage Productivity Center
web server: 9569
INFO: 12/18/2013 05:08:55 Registering TPC extension TPC_VmPlug.zip with vCenter
server.
INFO: 12/18/2013 05:08:55 Creating TPC extension com.ibm.tpc.Tpc ...
INFO: 12/18/2013 05:08:55 Extension URL: https://system1.tpc.example.com:9569/
vasa/TPC_VmPlug.zip
INFO: 12/18/2013 05:08:55 The vSphere Web Client extension for Tivoli Storage
Productivity Center is not found to be registered with vCenter Server.
INFO: 12/18/2013 05:08:55 Successfully registered TPC extension TPC_VmPlug.zip
with vCenter server.
INFO: 12/18/2013 05:08:55 Operation completed. Log information is generated
in C:\ProgramData\IBM\TPC\TPCDeploymentUtility.log.
```

Example: Register the vSphere Web Client extension for IBM Spectrum Control in interactive mode

Register the vSphere Web Client extension for IBM Spectrum Control as a vCenter Server extension in interactive mode.

```
C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin>setup
```

In interactive mode, you are prompted to enter the parameters or accept the defaults.

```
Enter the mode [register or unregister]: register
Enter the vCenter Server user ID [Administrator]. Press Enter for default:
Enter the vCenter Server password:
Enter the vCenter Server web server path [C:\Program Files\VMware\Infrastructure\
tomcat\]. Press Enter for default:
INFO: 12/18/2013 05:21:42 Communicating with the vCenter server...
```

```

INFO: 12/18/2013 05:21:57 Successfully authenticated with the vCenter server...
Enter the Tivoli Storage Productivity Center address: system1.tpc.example.com
Enter the HTTPS port of the Tivoli Storage Productivity Center web server [9569].
Press Enter for default:
INFO: 12/18/2013 05:22:19 Mode: register
INFO: 12/18/2013 05:22:19 vCenter Server address: 127.0.0.1
INFO: 12/18/2013 05:22:19 vCenter Server port: 443
INFO: 12/18/2013 05:22:19 vCenter Server user ID: Administrator
INFO: 12/18/2013 05:22:19 Tivoli Storage Productivity Center address:
system1.tpc.example.com
INFO: 12/18/2013 05:22:19 HTTPS port of the Tivoli Storage Productivity Center
web server: 9569
INFO: 12/18/2013 05:22:19 Registering TPC extension TPC_VmPlug.zip with vCenter
server.
INFO: 12/18/2013 05:22:19 Creating TPC extension com.ibm.tpc.Tpc ...
INFO: 12/18/2013 05:22:19 Extension URL: https://system1.tpc.example.com:9569/
vasa/TPC_VmPlug.zip
INFO: 12/18/2013 05:22:20 Extension com.ibm.tpc.Tpc found to be registered with
vCenter server.
INFO: 12/18/2013 05:22:20 Updating extension com.ibm.tpc.Tpc on the vCenter
server.
INFO: 12/18/2013 05:22:20 Successfully updated extension com.ibm.tpc.Tpc on the
vCenter server.
INFO: 12/18/2013 05:22:20 Successfully registered TPC extension TPC_VmPlug.zip
with vCenter server.
INFO: 12/18/2013 05:22:20 Operation completed. Log information is generated
in C:\ProgramData\IBM\TPC\TPCDeploymentUtility.log.

```

Example: Unregister the vSphere Web Client extension for IBM Spectrum Control in read-from-file mode with silent option

Unregister the vSphere Web Client extension for IBM Spectrum Control as a vCenter Server extension in read-from-file mode.

```

C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin>setup -file unregister_file
-silent

```

The command output is written to the command log file.

Example: Unregister the vSphere Web Client extension for IBM Spectrum Control in command-line mode

Unregister the vSphere Web Client extension for IBM Spectrum Control as a vCenter Server extension.

```

C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin>setup unregister
-password password
INFO: 12/18/2013 05:07:49 Operating in command-line mode...
INFO: 12/18/2013 05:07:49 Communicating with the vCenter server...
INFO: 12/18/2013 05:08:03 Successfully authenticated with the vCenter server...
INFO: 12/18/2013 05:08:03 Mode: unregister
INFO: 12/18/2013 05:08:03 vCenter Server address: 127.0.0.1
INFO: 12/18/2013 05:08:03 vCenter Server port: 443
INFO: 12/18/2013 05:08:03 vCenter Server user ID: Administrator
INFO: 12/18/2013 05:08:03 Unregistering TPC extension TPC_VmPlug.zip from vCenter
server.
INFO: 12/18/2013 05:08:03 Extension com.ibm.tpc.Tpc found to be registered with
vCenter server.
INFO: 12/18/2013 05:08:03 Successfully unregistered TPC extension TPC_VmPlug.zip
from vCenter server.
INFO: 12/18/2013 05:08:03 Operation completed. Log information is generated
in C:\ProgramData\IBM\TPC\TPCDeploymentUtility.log.

```

Example: Unregister the vSphere Web Client extension for IBM Spectrum Control in interactive mode

Unregister the vSphere Web Client extension for IBM Spectrum Control as a vCenter Server extension in interactive mode.

```
C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin>setup
```

In interactive mode, you are prompted to enter the parameters or accept the defaults.

```
Enter the mode [register or unregister]: unregister
Enter the vCenter Server user ID [Administrator]. Press Enter for default:
Enter the vCenter Server password:
Enter the vCenter Server web server path [C:\Program Files\VMware\Infrastructure\
tomcat\]. Press Enter for default:
INFO: 12/18/2013 05:10:14 Communicating with the vCenter server...
INFO: 12/18/2013 05:10:26 Successfully authenticated with the vCenter server...
INFO: 12/18/2013 05:10:26 Mode: unregister
INFO: 12/18/2013 05:10:26 vCenter Server address: 127.0.0.1
INFO: 12/18/2013 05:10:26 vCenter Server port: 443
INFO: 12/18/2013 05:10:26 vCenter Server user ID: Administrator
INFO: 12/18/2013 05:10:26 Unregistering TPC extension TPC_VmPlug.zip from vCenter
server.
INFO: 12/18/2013 05:10:26 Extension com.ibm.tpc.Tpc found to be registered with
vCenter server.
INFO: 12/18/2013 05:10:26 Successfully unregistered TPC extension TPC_VmPlug.zip
from vCenter server.
INFO: 12/18/2013 05:10:26 Operation completed. Log information is generated
in C:\ProgramData\IBM\TPC\TPCDeploymentUtility.log.
```

Related tasks:

“Creating the **setup** command properties file” on page 41

You can create a properties file to use for registering or unregistering the vSphere Web Client extension for IBM Spectrum Control in read-from-file mode.

“Registering the vSphere Web Client extension for IBM Spectrum Control” on page 39

You can deploy the vSphere Web Client extension for IBM Spectrum Control on a vCenter Server so that you can use IBM Spectrum Control with a vCenter Server.

“Saving the IBM Spectrum Control server configuration information” on page 42

You can save the configuration information for the IBM Spectrum Control server in the vSphere Web Client extension. The information includes the server credentials and connection information, which enable the vSphere Web Client extension to connect to IBM Spectrum Control.

“Unregistering the vSphere Web Client extension for IBM Spectrum Control” on page 50

You can remove the vSphere Web Client extension for IBM Spectrum Control as an extension on the vCenter Server if you no longer want to use IBM Spectrum Control with a vCenter Server.

Related reference:

“Sample properties files for the vSphere Web Client extension”

You can use a properties file to register or unregister the vSphere Web Client extension for IBM Spectrum Control by using the **setup** command in read-from-file mode.

Sample properties files for the vSphere Web Client extension

You can use a properties file to register or unregister the vSphere Web Client extension for IBM Spectrum Control by using the **setup** command in read-from-file mode.

You can run the **setup** command with the option to accept the parameters from the properties file:

- On Windows operating systems:

```
C:\Program Files\IBM\TPC\web\TPCVmwareVspherePlugin> setup -file filename
```

- On Linux operating systems:

```
/opt/IBM/TPC/web/TPCVmwareVspherePlugin> ./setup.sh -file filename
```

where *filename* is the name of the properties file, including the path and the extension, that contains the parameters for the **setup** command.

Sample properties file to register the vSphere Web Client extension

To register the vSphere Web Client extension by using the **setup** command in read-from-file mode, create a properties file that contains the following parameters in key-value pairs:

```
-mode=register  
-password=password  
-user=administrator  
-webserverPath=C:\\Program Files\\VMware\\Infrastructure\\tomcat  
-tpcServerAddress=system1.tpc.example.com  
-tpcServerHttpsPort=9569
```

Sample properties file to unregister the vSphere Web Client extension

To unregister the vSphere Web Client extension by using the **setup** command in read-from-file mode, create a properties file that contains the following parameters in key-value pairs:

```
-mode=unregister  
-password=password  
-user=administrator  
-webserverPath=C:\\Program Files\\VMware\\Infrastructure\\tomcat
```

Related tasks:

“Creating the **setup** command properties file” on page 41

You can create a properties file to use for registering or unregistering the vSphere Web Client extension for IBM Spectrum Control in read-from-file mode.

“Registering the vSphere Web Client extension for IBM Spectrum Control” on page 39

You can deploy the vSphere Web Client extension for IBM Spectrum Control on a vCenter Server so that you can use IBM Spectrum Control with a vCenter Server.

“Unregistering the vSphere Web Client extension for IBM Spectrum Control” on page 50

You can remove the vSphere Web Client extension for IBM Spectrum Control as an extension on the vCenter Server if you no longer want to use IBM Spectrum Control with a vCenter Server.

Related reference:

“setup command for the vSphere Web Client extension” on page 44

Use the **setup** command from the command line on a vCenter Server system or vCenter Server Appliance to install and register the vSphere Web Client extension for IBM Spectrum Control. You can also use this command to unregister the extension on the vCenter Server system or the vCenter Server Appliance.

Unregistering the vSphere Web Client extension for IBM Spectrum Control

You can remove the vSphere Web Client extension for IBM Spectrum Control as an extension on the vCenter Server if you no longer want to use IBM Spectrum Control with a vCenter Server.

When the extension is unregistered, you can no longer use IBM Spectrum Control on any vSphere Web Client that connects to the same vCenter Server. When you unregister the extension, the IBM Spectrum Control VASA provider is not removed from the vCenter Server. If you want to remove the VASA provider, you must remove it manually.

1. From the command line on the vCenter Server system or the vCenter Server Appliance host machine, go to the directory where you copied the TPCVmwareVspherePlugin content.
2. To start the process to unregister the extension, run the deployment utility in the unregister mode by using one of the following methods:

- Run the deployment utility in command-line mode by issuing the **setup** command with the following parameters:

- On Windows operating systems:

```
setup unregister  
-password password
```

- On Linux operating systems:

```
./setup.sh unregister  
-password password
```

This method unregisters the plug-in package by using the default values for the command parameters.

- Run the deployment utility in read-from-file mode by issuing the **setup** command with the **-file** option to accept the parameters from a properties file:

- On Windows operating systems:

```
setup -file filename
```

- On Linux operating systems:

```
./setup.sh -file filename
```

where *filename* is the name of the properties file, including the path and the extension, that contains the parameters for the **setup** command. To create the properties file, follow the instructions in “Creating the **setup** command properties file” on page 41.

- Run the deployment utility in interactive mode by issuing the **setup** command and entering values when you are prompted:

- On Windows operating systems:

```
setup
```

- On Linux operating systems:

```
./setup.sh
```

- Run the deployment utility in silent mode by using the **-silent** option. In silent mode, any output that is generated is saved to the log file on the disk. The log file, TPCDeploymentUtility.log, is in the following location:

- On Windows operating systems:

```
%ALLUSERSPROFILE%\IBM\TPC
```

For example, C:\Documents and Settings\All Users\IBM\TPC\

or %PROGRAMDATA%\IBM\TPC

For example, C:\ProgramData\IBM\TPC\

- On Linux operating systems:
/opt/IBM/TPC

The vSphere Web Client extension for IBM Spectrum Control is removed as an extension from the vCenter Server system. The IBM Spectrum Control icon remains on the vSphere Web Client Home tab for the session. To remove it, log out of the vSphere Web Client, and log in again.

Related tasks:

“Registering the vSphere Web Client extension for IBM Spectrum Control” on page 39

You can deploy the vSphere Web Client extension for IBM Spectrum Control on a vCenter Server so that you can use IBM Spectrum Control with a vCenter Server.

“Unregistering a IBM Spectrum Control VASA provider” on page 36

Use the vSphere Client or the vSphere Web Client to unregister IBM Spectrum Control as a VASA storage provider.

Related reference:

“setup command for the vSphere Web Client extension” on page 44

Use the **setup** command from the command line on a vCenter Server system or vCenter Server Appliance to install and register the vSphere Web Client extension for IBM Spectrum Control. You can also use this command to unregister the extension on the vCenter Server system or the vCenter Server Appliance.

“Sample properties files for the vSphere Web Client extension” on page 48

You can use a properties file to register or unregister the vSphere Web Client extension for IBM Spectrum Control by using the **setup** command in read-from-file mode.

Updating the vSphere Web Client extension for IBM Spectrum Control

To update the vSphere Web Client extension for IBM Spectrum Control, you must redeploy the extension. To update the IBM Spectrum Control server configuration information for the extension, such as the server host name, the version, or the build, you must also redeploy the extension.

You can update the vSphere Web Client extension in one of the following ways:

- Redeploy the vSphere Web Client extension by using the IBM Spectrum Control GUI.
- Redeploy the vSphere Web Client extension locally on the vCenter Server system.

When you redeploy the vSphere Web Client extension for IBM Spectrum Control, the IBM Spectrum Control server credentials are not updated.

Restriction: If you want to update the server credentials, you can only do so when you save the IBM Spectrum Control server configuration information in the vSphere Web Client extension.

Related tasks:

“Saving the IBM Spectrum Control server configuration information” on page 42

You can save the configuration information for the IBM Spectrum Control server in the vSphere Web Client extension. The information includes the server credentials and connection information, which enable the vSphere Web Client extension to

connect to IBM Spectrum Control.

Redeploying the vSphere Web Client extension from the IBM Spectrum Control server

To install updates to the vSphere Web Client extension for IBM Spectrum Control, redeploy the extension. To update the IBM Spectrum Control server configuration information for the vSphere Web Client extension, you must also reinstall the extension. Redeploy the extension by adding the vCenter Server system as a data source in the IBM Spectrum Control GUI.

To install updates to the vSphere Web Client extension for IBM Spectrum Control and redeploy the extension, use these steps:

1. In the menu bar, go to **Servers > Hypervisors**.
2. Click **Add Hypervisor**.
3. Select **VMware vCenter** and enter connection information about the vCenter Server system.
4. Optional: To deploy the vSphere Web Client extension for IBM Spectrum Control and register IBM Spectrum Control as a VASA provider, in the **Deploy vSphere extension** page, enter your credentials. For **VMware vCenter Server**, enter a user name and password for the vSphere administrator user. For **IBM Spectrum Control**, enter a user name and password for a IBM Spectrum Control user ID. You must have Administrator, Monitor, or External Application authority to deploy the extension. If you entered a vSphere administrator user name and password for the vCenter Server system, enter only the IBM Spectrum Control credentials.
5. Schedule a probe for the hypervisors that were discovered.
6. Follow the instructions in the wizard to add the vCenter Server system.

Redeploying the vSphere Web Client extension locally for IBM Spectrum Control

To install updates to the vSphere Web Client extension for IBM Spectrum Control, redeploy the extension. To update the IBM Spectrum Control server configuration information for the vSphere Web Client extension, you must also redeploy the vSphere Web Client extension. You can redeploy the extension by using the **setup** command on the vCenter Server system. You can redeploy the vSphere Web Client extension without first unregistering the existing registration.

To redeploy the vSphere Web Client extension for IBM Spectrum Control, download and register the new package to the vCenter Server system.

1. Run the deployment utility to register the vSphere Web Client extension without first unregistering the existing registration. To run the deployment utility, follow the instructions in “Registering the vSphere Web Client extension for IBM Spectrum Control” on page 39. The IBM Spectrum Control registration information is updated.
2. To download the new vSphere Web Client extension, log on to the vSphere Web Client.

Tip: When you log on to the vSphere Web Client for the first time, the vSphere Web Client extension for IBM Spectrum Control is downloaded to the vSphere Web Client computer. As a result, the logon process can take several minutes to complete.

The new vSphere Web Client extension is downloaded to the vSphere Web Client packages location on the vSphere Web Client computer, for example, %ProgramData%\VMware\VCServer\cfg\vsphere-client\vc-packages\vsphere-client-serenity.

Tip: Alternatively, to update the vSphere Web Client extension for IBM Spectrum Control, unregister the extension and then register a new vSphere Web Client extension.

Related tasks:

“Unregistering the vSphere Web Client extension for IBM Spectrum Control” on page 50

You can remove the vSphere Web Client extension for IBM Spectrum Control as an extension on the vCenter Server if you no longer want to use IBM Spectrum Control with a vCenter Server.

“Saving the IBM Spectrum Control server configuration information” on page 42

You can save the configuration information for the IBM Spectrum Control server in the vSphere Web Client extension. The information includes the server credentials and connection information, which enable the vSphere Web Client extension to connect to IBM Spectrum Control.

Related reference:

“setup command for the vSphere Web Client extension” on page 44

Use the **setup** command from the command line on a vCenter Server system or vCenter Server Appliance to install and register the vSphere Web Client extension for IBM Spectrum Control. You can also use this command to unregister the extension on the vCenter Server system or the vCenter Server Appliance.

“Sample properties files for the vSphere Web Client extension” on page 48

You can use a properties file to register or unregister the vSphere Web Client extension for IBM Spectrum Control by using the **setup** command in read-from-file mode.

Deploying Storage Resource agents

You can manage your Storage Resource agent deployments.

Deploy Storage Resource agents through the user interface rather than a separate installation wizard. You can have only one agent per host that points to the same IBM Spectrum Control server.

Before you begin: Before you deploy Storage Resource agents, see “Deployment guidelines and limitations for Storage Resource agents” on page 54 for a list of considerations.

If you deploy Storage Resource agents on multiple computers at the same time, the computers must have the same administrative user ID and password. IBM Spectrum Control uses these user credentials to log on to the computers when the Storage Resource agents are deployed.

To deploy Storage Resource agents, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. Click **Add Server**.
3. Select **Deploy an agent for full server monitoring**.
4. Select one of the following methods for adding a server:

- Add a server by manually entering information about the server and the Storage Resource agent.
 - Add one or more servers by importing configuration information from a comma-delimited file.
5. Configure deployment information for the Storage Resource agents.
 6. Schedule the agent deployment and the data collection for the servers.
 7. Click **Finish** to deploy the Storage Resource agents.

Deployment guidelines and limitations for Storage Resource agents

You must consider the following guidelines and limitations when you manage Storage Resource agents in your environment.


Use the following information when you deploy Storage Resource agents:

- Multiple Storage Resource agents that are probing or scanning the same storage resources
- Platforms that support the deployment of Storage Resource agents
- Product functions that are not available for storage devices monitored by Storage Resource agents
- Required authority for deploying Storage Resource agents
- Orphan zones
- Firewalls and Storage Resource agents deployments
- Deploying Storage Resource agents on multiple computers
- Communication between the IBM Spectrum Control server and a Storage Resource agent
- Daemon and non-daemon services
- Port numbers for Storage Resource agents deployed as a daemon service
- Authentication between the IBM Spectrum Control server and a Storage Resource agent
- Replacing default SSL certificates
- Storage Resource agents on the same computer
- Time zones for computers monitored by Storage Resource agents
- Connections for Linux and AIX operating systems by using Remote Shell protocol (RSH)
- Deployments on Windows - NetBIOS setting
- Deployments on Windows - User Account Control (UAC) remote restrictions

Multiple Storage Resource agents that are probing or scanning the same resources


If multiple Storage Resource agents are set up to probe or scan the same storage resources, the Storage Resource agent that was added to IBM Spectrum Control first is used for the probe or scan. Therefore, only data that is gathered by the first Storage Resource agent is shown.

Platforms that support the deployment of Storage Resource agents

For a list of platforms on which you can deploy Storage Resource agents, see the  IBM Spectrum Control interoperability matrix and go to the *Agents, Servers and Browsers* section.

Product functions that are unavailable for resources that are monitored by Storage Resource agents

Before you deploy a Storage Resource agent, ensure that the product functions you want to use on the monitored resources are available for those agents. The following functions are not available for resources that are monitored by Storage Resource agents:

- Certain relational database monitoring. For list of relational databases that can be monitored by Storage Resource agents, see the  IBM Spectrum Control interoperability matrix and go to the *Agents, Servers and Browsers* section.
- The reporting of HBA, fabric topology, or zoning information for fabrics that are connected to hosts that are running Linux on IBM System z[®] hardware. These limitations also apply to Storage Resource agents on all guest operating systems for VMware configurations.

Required authorities for deploying and running Storage Resource agents

Before you can create deployment schedules and deploy Storage Resource agents on target computers, you must meet the following requirements:

- To create deployment schedules, you must be logged in to IBM Spectrum Control with a user ID that has the **Administrator** role. For information about user roles, see “Authorizing users” on page 8.
- To deploy Storage Resource agents on target computers, you must provide a user ID that has administrative rights on those computers. You enter this ID when you create a deployment schedule. IBM Spectrum Control uses this ID to log on to the target computers and install and configure the necessary runtime files for the agents.

The user under which a Storage Resource agent (daemon or non-daemon) runs must have the following authorities on the target computers:

- On the Linux or AIX operating systems, the user must have root authority. By default, an agent runs under the user 'root'.
- On the Windows operating systems, the user must have Administrator authority and be a member of the Administrators group. By default, a Storage Resource agent runs under the 'Local System' account.

Orphan zones

Storage Resource agents do not collect information about orphan zones. An orphan zone is a zone that does not belong to at least one zoneset.

Firewalls and Storage Resource agent deployments

Before you can deploy a Storage Resource agent on a computer, you must turn off the firewall on that computer. If you do not turn off the firewall, the deployment fails.

To turn off the firewall on a Windows 2008 computer, complete the following steps:

1. Open Administrative Tools. For information about how to open Administrative Tools, see “Accessing administration tools” on page 182.
2. Click **Windows Firewall with Advanced Security**.
3. Click **Windows Firewall Properties**.
4. Change the **Firewall state** field to **Off** on the following tabs:
 - **Domain Profile**
 - **Private Profile**
 - **Public Profile**
5. Click **OK** to accept the changes and exit.

6. Deploy a Storage Resource agent to the Windows 2008 computer.

Deploying Storage Resource agents on multiple computers

If you deploy Storage Resource agents on multiple computers at the same time, the computers must have the same administrative user ID and password. IBM Spectrum Control uses these user credentials to log on to the computers when you install Storage Resource agents.

Tip: When you deploy Storage Resource agents on multiple computers, a globally unique identifier (GUID) is created for each computer (if one does not exist).

Communication between the IBM Spectrum Control server and a Storage Resource agent

The IBM Spectrum Control server connects to a monitored computer when a Storage Resource agent is deployed and whenever a data collection schedule runs against that agent.

During deployment, the server communicates with the target computer by using one of the following protocols:

- Windows server message block protocol (SMB)
- Secure Shell protocol (SSH)
- Remote execution protocol (REXEC)
- Remote shell protocol (RSH)

After deployment, the type of communication between the server and agent on that computer depends on whether you deployed the agent as daemon service or non-daemon service.

Daemon and non-daemon services

You can deploy a Storage Resource agent as a daemon or non-daemon service:

- A Storage Resource agent that is deployed as a daemon service runs in the background on the monitored computer and listens for requests from the IBM Spectrum Control server. Connectivity between the server and agent is established by using SSL. The server and agent have their respective certificates and no additional information is required besides those certificates and the security that is provided by the SSL protocol.
- A Storage Resource agent deployed as a service on demand (non-daemon service) runs as a stand-alone executable file on the monitored computer. Communication from the server to the agent uses the same protocol that was used during the deployment of the agent. Communication from the agent to the server uses SSL.
- A Storage Resource agent that is deployed as a daemon service on AIX, Linux, and Windows servers monitors disk paths in near real-time to detect errors. When deployed as a daemon service on an AIX server, the agent also monitors disk error events in near real-time.

If the Storage Resource agent detects path status changes or disk errors, they are included in the status of the disks and paths. You can define alerts so that you are notified of changes to the status of the paths on monitored disks.

Only status changes for existing paths are detected. If a new path is added, or an existing path is removed, the number of paths that is displayed is not updated immediately. The number of paths is updated after the next scheduled probe collects data.

If a disk on an AIX server has an error status and you fix the error, you might want the new status of the disk to be displayed immediately. To display the new status immediately, you must reset the status indicator for the disk. To reset the status indicator, use the **errclear** command to clear the error log. To clear the error log, use the following syntax:

```
errclear -d H -N disk_name 0
```

For example, if you fixed an error on hdisk4, and want to display the new status immediately, run the following command:

```
errclear -d H -N hdisk4 0
```

If you do not reset the status indicator for the disk, the status changes automatically after a few hours.

For information about the **errclear** command, see the product documentation at http://www.ibm.com/support/knowledgecenter/ssw_aix_71/com.ibm.aix.cmds2/errclear.htm.

Port numbers for Storage Resource agents deployed as a daemon service

The following port numbers are used by Storage Resource agents that are deployed as daemon service:

- 9567 (For the Storage Resource agent that is deployed on the same server as IBM Spectrum Control.)
- 9510 (For Storage Resource agents that are deployed on remote servers.)

Storage Resource agents that are deployed as a non-daemon service do not use a port.

Authentication between the IBM Spectrum Control server and a Storage Resource agent

IBM Spectrum Control requires the correct authentication information (user name, password, port, certificate location, or passphrase) for monitored computers each time it communicates with Storage Resource agents on those computers. If the authentication information changes for a host computer on which a Storage Resource agent is deployed, the authentication information for that agent must be updated by using the **Modify Agents > Update Credentials** action on the Servers page in the web-based GUI.

Replacing default SSL certificates

IBM Spectrum Control provides default SSL certificates for communication between the Data server and Storage Resource agent.

IBM Spectrum Control Version 5.2.2 uses SSL certificates with 2048-bit encryption keys whereas previous versions of IBM Spectrum Control used 1024-bit encryption keys. If you upgrade IBM Spectrum Control from a version earlier than 5.2.2, your SSL certificates are not updated automatically. If you want to use 2048-bit encryption keys with previous versions of IBM Spectrum Control, you must replace the default SSL certificates with custom SSL certificates.

For information about how to replace SSL certificates, see “Replacing default SSL certificates with custom certificates” on page 65.

Storage Resource agents on the same computer

You cannot deploy a Storage Resource agent on a computer where a Storage Resource agent is already installed and pointing to the same Data server. You can deploy a Storage Resource agent on the same computer as another Storage Resource agent if those agents communicate with different Data servers and use different ports when you listen for requests.

Time zones for computers that are monitored by Storage Resource agents

The time zones of computers that are monitored by Storage Resource agents are shown as Greenwich mean time (GMT) offsets in IBM Spectrum Control reports. For example, a computer in Los Angeles shows the following time zones in the By Computer report in Asset reporting:

(GMT-8:00) GMT-8:00

Connections for Linux and AIX operating systems by using Remote Shell protocol (RSH)

If RSH is configured to use a user ID and password, the connection fails. To successfully connect to a system by using RSH, you must set up the `.rhosts` file (in the home directory of the account). RSH must be configured to accept a login from the system that is running your application.

Deployments on Windows operating systems - NetBIOS setting

To install a Storage Resource agent on Windows targets, the **Enable NetBIOS over TCP/IP** option must be selected in the Control Panel settings for the computer's network connections properties. To set this option, complete the following steps:

1. Open Windows Control Panel. For information about how to open Windows Control Panel, see "Accessing administration tools" on page 182.
2. Select **Network and Dial-Up Connections > *some_connection* > Properties > Internet Protocol (TCP/IP) > Advanced > WINS > Enable NetBIOS over TCP/IP**.

To determine whether these ports are not blocked for inbound requests, see the documentation for your firewall.

To determine whether security policies are blocking the connection ports, open Administrative Tools. For information about how to open Administrative Tools, see "Accessing administration tools" on page 182.

Depending on whether your policies are stored locally or in Active Directory, follow these directions:

Policies that are stored locally

For policies that are stored locally, complete the following steps:

1. Open Windows Administrative Services.
2. Click **Local Security Policy > IP Security Policies on Local Computer**.

Policies that are stored in Active Directory

For policies that are stored in Active Directory, examine the IP security policies and edit or remove filters that block the ports:

- Click **Administrative Tools > Default Domain Security Settings > IP Security Policies on Active Directory**.
- Click **Administrative Tools > Default Domain Controller Security Settings > IP Security Policies on Active Directory**.

For all Windows systems, the Server service must be running to connect to a Windows system by using the Windows protocol.

The following table lists the ports that are reserved for NetBIOS. Ensure that these ports are not blocked.

Port	Description
135	NetBIOS Remote procedure call. (Not currently used.)
137	NetBIOS name service.
138	NetBIOS datagram. (Not currently used.)
139	NetBIOS session (for file and print sharing).
445	CIFS (on Windows XP).

For Windows Server 2008, shares must be shared for the Guest or Everyone accounts, and password protected sharing must be disabled. To disable password protected sharing, follow these steps:

1. Click **Control Panel > Networking and Sharing Center**.
2. Click the down arrow next to **Password protected sharing**.
3. Click **Turn off password protected sharing**.
4. Click **Apply**.
5. Exit from the Control Panel.

Deployments on Windows 2008 - User Account Control (UAC) remote restrictions

To install Storage Resource agents remotely on a Windows 2008 operating system, you must disable the User Account Control (UAC) remote restrictions on the Windows operating system. User Account Control is a security component on Windows operating systems.

Tip: To disable UAC restrictions, you must modify the computer registry. Serious problems might occur if you modify the registry incorrectly. Therefore, make sure that you follow these steps carefully. For added protection, back up the registry before you modify it. Then, you can restore the registry if problems occur. For information about how to back up and restore the registry, see <http://support.microsoft.com/kb/322756/>.

To disable UAC remote restrictions, follow these steps:

1. Open the Windows Run window. For information about how to open the Run window, see “Accessing administration tools” on page 182.
2. Enter **regedit** and click **OK**.
3. Locate and click the following registry subkey:
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\System
4. If the LocalAccountTokenFilterPolicy registry entry does not exist, follow these steps:
 - a. On the **Edit** menu, click **New > DWORD Value**.
 - b. Enter LocalAccountTokenFilterPolicy as the name for the DWORD value and click **Enter**.
 - c. Click **LocalAccountTokenFilterPolicy**, and click **Modify**.
 - d. In the Edit DWORD Value window, enter **1**, then click **OK**.
This value can be 0 or 1:
 - 0** This value builds a filtered token. This value is the default value. The administrator credentials are removed.
 - 1** This value builds an elevated token.
 - e. Exit the registry editor.

Creating a certificate for SSH protocol

Before you install the Storage Resource agents by using the SSH protocol, you can optionally create a certificate.

Note: The Storage Resource agent only supports either DES-EDE3-CBC encryption or no encryption for the private key used in SSH protocol communication between the server and agent. The default encryption that is used in the **ssh-keygen** command on UNIX is always DES-EDE3-CBC. However, with Windows Cygwin, the **ssh-keygen** command generates a key with AES-128-CBC encryption if a passphrase is specified. If there is no passphrase, the private key is generated without encryption. For more information about encryption, see <https://www.openssl.org/docs/man1.0.2/apps/enc.html>.

Creating a certificate for SSH protocol (non-Windows)

The Storage Resource agent only supports either DES-EDE3-CBC encryption or no encryption for the private key used in SSH protocol communication between the server and agent. The default encryption used in the **ssh-keygen** command on UNIX is always DES-EDE3-CBC but with Windows Cygwin, it is using AES-128-CBC encryption if a passphrase is specified. If there is no passphrase, the private key is generated without encryption.

To create a certificate for SSH protocol, complete the following steps:

1. Telnet to the remote machine using the root user ID.
2. To create an SSH certificate on AIX, you must first install the following packages (if not already installed):
`openssl.base.openssh.base.client`
`openssh.base.server`
3. Go to the directory where you want to create the certificate:
`cd ~/.ssh`
4. Enter **ssh-keygen -t rsa**. Accept the default names (for example, **id_rsa**).
5. Enter the passphrase.
6. Two files are created:
id_rsa The private key.
id_rsa.pub
The public key.
7. Create an `authorized_key` file in the same location as `id_rsa.pub` by entering the following command:
`cat id_rsa.pub >> authorized_keys`
8. Copy the `id_rsa` (private key) to your server machine. For example, to copy the `id_rsa` file to `:\keys\id_rsa` on the IBM Spectrum Control server (user responses are in boldface type):

```
# ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (//.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been save in //.ssh/id_rsa.
Your public key has been save in //.ssh/id_rsa.pub.
The key fingerprint is:
xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx root@server
# cat id_rsa >> authorized_keys
# ls -l
total 24
-rw-r--r-- 1 root system 1743 Oct 15 09:40 authorized_keys
-rw---- 1 root system 1743 Oct 15 09:39 id_rsa
-rw-r--r-- 1 root system 399 Oct 15 09:39 id_rsa.pub
#
```

Note: You must copy the file in binary mode.

9. To connect to the remote system by using the private key, enter the following information in the Remote Agent Machines window of the GUI, when you install the Storage Resource agent:
 - User
 - Certificate Location (c:\keys\id_rsa)
 - Passphrase

Setting up an SSH daemon on Windows

On Windows Server 2003, Windows XP, Windows Server 2008, or Windows Vista, you must run the **ssh-host-config** command.

Note: Cygwin is not a prerequisite for the Storage Resource agent on Windows. To use the SSH protocol on Windows, an SSH software program must be used because Windows does not come with an SSH service. Cygwin is a free software program providing SSH access to a Windows server. Cygwin can be used if you want to run the Storage Resource agent by using the SSH protocol.

You must be in a Cygwin window or be an X term user to create the **sshd** service. In most cases, you click the **cygwin.bat** file to start the Bash shell.

Complete the following steps:

1. Install Cygwin.
2. Set up your **sshd** service in Cygwin.
3. Create the certificate.

Installing Cygwin

To install Cygwin, go to <http://cygwin.com>. This page contains a link that displays help for the setup program and a link to download the setup program. Read the help before running the setup program. Then download the Cygwin program by clicking the **Install Cygwin now** link. Start the setup program on your computer by running the **setup.exe** program. Select the appropriate download option (**Install from Internet**, **Download from Internet**, or **Install from Local Directory**) as described in the help files.

If you are upgrading from an older version of Cygwin to a newer version, you need to remove the **sshd** service before installing the new version of Cygwin.

Accept the default installation options as they are presented to you (Root Directory, Install For, Default Text File Type, and so on). Select a download mirror that is geographically close to your location. Some sites require an FTP account before you can install Cygwin. You can either request an account or simply select another mirror.

During the installation process, a Select Packages list is displayed. Expand the plus sign (+) next to the Admin category and select **cygrunsrv** and the **Bin** check box. Expand the plus sign (+) next to the Net category and select **openssh**. Expand the plus sign (+) next to the Util category and select **diffutils**. Click **Next** to resume the setup program. The time required to download the packages depends on how busy the mirror is, and on the speed of your internet connection. With **openssh** and **cygrunsrv**, the downloaded files require approximately 70 MB of disk space. Allow 20 minutes to 30 minutes for the download and installation to complete.

Setting up your sshd service in Cygwin

Here is an example of the sequence of steps and responses. The responses to the prompts are in boldfaced type.

1. Run the **ssh-host-config** command.

Note: With Cygwin, you might experience permission problems when running the **ssh-host-config** command. If you have permission problems, run these commands:

```
chmod +r /etc/passwd
chmod +r /etc/group
chmod 777 /var
```

\$ ssh-host-config

```
*** Info: Generating missing SSH host keys
*** Query: Overwrite existing /etc/ssh_config file? (yes/no) yes
*** Info: Creating default /etc/ssh_config file
*** Query: Overwrite existing /etc/sshd_config file? (yes/no) yes
*** Info: Creating default /etc/sshd_config file

*** Info: StrictModes is set to 'yes' by default.
*** Info: This is the recommended setting, but it requires that the POSIX
*** Info: permissions of the user's home directory, the user's .ssh
*** Info: directory, and the user's ssh key files are tight so that
*** Info: only the user has write permissions.
*** Info: On the other hand, StrictModes don't work well with default
*** Info: Windows permissions of a home directory mounted with the
*** Info: 'noacl' option, and they don't work at all if the home
*** Info: directory is on a FAT or FAT32 partition.
*** Query: Should StrictModes be used? (yes/no) no
*** Info: Updating /etc/sshd_config file

*** Query: Do you want to install sshd as a service?
*** Query: (Say "no" if it is already installed as a service) (yes/no) yes
*** Query: Enter the value of CYGWIN for the daemon: [] ntsec
*** Info: On Windows Server 2003, Windows Vista, and above, the
*** Info: SYSTEM account cannot setuid to other users -- a capability
*** Info: sshd requires. You need to have or to create a privileged
*** Info: account. This script will help you do so.

*** Info: It's not possible to use the LocalSystem account for services
*** Info: that can change the user id without an explicit password
*** Info: (such as passwordless logins [e.g. public key authentication]
*** Info: via sshd) when having to create the user token from scratch.
*** Info: For more information on this requirement, see
*** Info: https://cygwin.com/cygwin-ug-net/ntsec.html#ntsec-nopasswd1

*** Info: If you want to enable that functionality, it's required to create
*** Info: a new account with special privileges (unless such an account
*** Info: already exists). This account is then used to run these special
*** Info: servers.

*** Info: Note that creating a new user requires that the current account
*** Info: have Administrator privileges itself.

*** Info: No privileged account could be found.

*** Info: This script plans to use 'cyg_server'.
*** Info: 'cyg_server' will only be used by registered services.
*** Query: Do you want to use a different name? (yes/no) no
*** Query: Create new privileged user account 'local_address\cyg_server'
*** Query: (Cygwin name: 'cyg_server')? (yes/no) yes
*** Info: Please enter a password for new user cyg_server. Please be sure
*** Info: that this password matches the password rules given on your system.
*** Info: Entering no password will exit the configuration.
*** Query: Please enter the password:password
*** Query: Reenter:password

*** Info: User 'cyg_server' has been created with password 'password'.
*** Info: If you change the password, please remember also to change the
*** Info: password for the installed services which use (or will soon use)
*** Info: the 'cyg_server' account.

*** Info: The sshd service has been installed under the 'cyg_server'
*** Info: account. To start the service now, call `net start sshd' or
*** Info: `cygrunsrv -S sshd'. Otherwise, it will start automatically
*** Info: after the next reboot.

*** Info: Host configuration finished. Have fun!
```

2. Start the **sshd** service:

a. Open a command prompt window.

- b. Enter **net start sshd** or in a Bash prompt, enter **cygrunsrv -S sshd**.
- c. Verify that the daemon is running.
- d. Enter **ps -a**. Examine the output to see if `/usr/sbin/sshd` is contained in the list of running processes.

To stop the service from a Windows command prompt, enter **net stop sshd**. Alternatively, you can change to the `C:\cygwin\bin` directory (or open a Bash shell) and enter **cygrunsrv -E sshd**.

3. When you have started the **sshd** service, test it by entering the following command from a Bash shell prompt:

```
ssh localhost
or
ssh host_name
```

If **localhost** does not work, use the short host name. If you receive a message indicating that the authenticity of localhost cannot be established, answer **Yes** to the question "Are you sure you want to continue connecting?" When prompted for your account password on **localhost**, enter the password you use when logging in to the computer.

4. Set the TEMP environment variable. For information about setting the environment variable, see <http://www.cygwin.com/cygwin-ug-net/setup-env.html>.

Here is an example of setting the environment variable:

- a. Click **My Computer > Properties > Advanced > Environment Variables**.
- b. Under **System variables**, find out the value of TEMP. For example, "C:\WINNT\TEMP"
- c. Set the TEMP environment variable to point to the Cygwin format of TEMP in the `~/.bashrc` file. For example run the following command:

```
export TEMP=/cygdrive/c/WINNT/temp
```

 Uncomment and modify this line in the `~/.bashrc` file from the default:

```
# export TEMP=/tmp
to
export TEMP=/cygdrive/c/WINNT/temp
```

The Cygwin **sshd** service must be added as a service that starts automatically. To verify this step, click **Start > Settings > Control Panel > Administrative Tools > Services**. Look for **CYGWIN sshd** in the name list. Verify that it is started and configured to start automatically.

Creating the certificate

To create a certificate for SSH protocol, complete the following steps:

1. Run this command:

```
cd ~/.ssh
```
2. Generate the public and private keys with a passphrase. The passphrase is required. From the Bash shell prompt, here is an example of the input and output (user responses are in boldface type):


```

Administrator ~/ssh
$ openssl genrsa -des3 -out key 1024
Generating RSA private key, 1024 bit long modulus
.....+++++
.....+++++
e is 65537 (0x10001)
Enter pass phrase for key:passphrase
Verifying - Enter pass phrase for key:passphrase

Administrator ~/ssh
$ chmod 600 ~/.ssh/key
$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/Administrator/.ssh/id_rsa): key_pairs
Enter passphrase (empty for no passphrase):passphrase
Enter same passphrase again:passphrase
Your identification has been saved in key_pairs.
Your public key has been saved in key_pairs.pub.
The key fingerprint is:
SHA256:ew00cta24Qw917tRqPcn9hETIRakksKcTgGrPkh4UZs Sheila@IBM243-PC0CJ5EF
The key's randomart image is:
+---[RSA 2048]-----+
|
| . . . . .0+
| . o + o . .o.
| . E . * o ...
| . . . oo. . . .
| . o .. S.B . oo.
| o o + O B . oo
| . o . * o +.
| . . .o+o
| ..o+
+---[SHA256]-----+
Administrator ~/ssh
$ cat id_rsa.pub >> authorized_keys
$

```

3. Copy the id_rsa (private key) to the IBM Spectrum Control server.
4. To connect to the remote system by using the private key, enter the following information in the GUI, when you install the Storage Resource agent:
 - User
 - Certificate Location (c:\keys\id_rsa)
 - Passphrase

Replacing default SSL certificates with custom certificates

IBM Spectrum Control provides default SSL certificates for communication between the Data server and Storage Resource agent. You can replace the default certificates with your own custom certificates.

Overview of replacing a default certificate for SSL protocol

IBM Spectrum Control uses SSL certificates for communication between the Data server and Storage Resource agents. IBM Spectrum Control provides default SSL certificates for this communication. If you want to use your own certificates, you can replace the default certificates with your custom certificates

Server certificate

The IBM Spectrum Control Data server uses the TPCDataServer.jks and server.pwd files for communication with the Storage Resource agents. If you are using custom certificates, you must replace these files.

Storage Resource agent certificate

The Storage Resource agent uses the certificate files sra.pem and sra.pwd for communication with the Data server. These two files are compressed

into the `certs.zip` file on the server system for deployment purposes. If you are using custom certificates, you must replace these files.

There are two ways you can replace the certificates:

- Before deployment of the agent
- After deployment of the agent

These are the general steps for replacing default certificates:

1. Generate the custom certificates.
2. Stop the Data server (and the Storage Resource agent, if the agent is already deployed).
3. Replace the custom certificates on the Data server and Storage Resource agent or on the product electronic installation image or the Storage Resource Agent installation image.
4. Start the Data server (and the Storage Resource agent, if the agent is already deployed).

Note: When you generate custom SSL certificates, the certificates have a start date, end date, and time when they are valid. These dates and times are related to the system where these custom certificates were generated (which is usually the server system). When you install a Storage Resource agent on a remote system, you must check the date and time on the Storage Resource agent system. If the server and agent systems are in the same time zone, they must have the same date and time. Otherwise, the time zone difference should be set.

For example, if the server system is 8:00 PM, the agent system should also be 8:00 PM. If the agent system is set at a different time (for example, 6:00 PM) at the time the SSL custom certificates are generated on the server system with a time of 8:00 PM, the deployment of the Storage Resource agent fails.

How to generate custom certificates

The script file `createSRACerts.sh` (for Linux or UNIX) or `createSRACerts.bat` (for Windows) is in the following directory:

`installation_dir/data/sra/tools/certs`

Where `installation_dir` is the directory where the IBM Spectrum Control servers are installed. The default directory is `/opt/IBM/TPC` for Linux or UNIX or `C:\Program Files\IBM\TPC` for Windows.

To generate custom certificates, follow these steps:

1. Create the custom certificates.

The `createSRACerts` script creates the custom certificates. The syntax is:

```
►► createSRACerts output_directory rootCAPassword
                  server_key_password server_store_password agent_password
◄◄
```

output_directory

Directory where the certificates are created.

rootCAPassword

Root CA password (root common authority password). The default non-encrypted password is: s5umEvApR6cafruhustu.

server_key_password

Server key password. The default non-encrypted password is: drUtahaswefraf9uth.

server_store_password

Server store password. The default non-encrypted password is: wr4d5Xekaqafehet5u2a.

agent_password

Agent password. The default non-encrypted password is: jawUchezuthew6azEjef.

Note: You are prompted for the password when the script is run. Provide the value of the rootCAPassword on the command line (if specified on the command line). Otherwise, use the default values in the createSRACerts.sh or createSRACerts.bat script when prompted for the password (twice). The following example creates the SSL certificate by using the default output directory and default passwords.

createSRACerts

The following examples create the SSL certificates by using the directory /tmp on UNIX and C:\temp on Windows. These examples use the default passwords. The certificate files are created in the following directory:

Windows

C:\temp\sra_certs_out

Here is an example:

createSRACerts C:\temp

UNIX or Linux

/tmp/sra_certs_out

Here is an example:

./createSRACerts.sh /tmp

The following examples create SSL certificates in the directory /tmp on UNIX and C:\temp on Windows. These examples use non-default passwords for root CA and server key. The certificate files are created in the following directory:

Windows

C:\temp\sra_certs_out

Here is an example of creating a non-default password for the root CA password and server key password:

createSRACerts C:\temp newpasswordforrootCA newpasswordforserver

UNIX or Linux

/tmp/sra_certs_out

Here is an example of creating a non-default password for the root CA password and server key password:

createSRACerts.sh /tmp newpasswordforrootCA newpasswordforserver

2. Regenerate the certificates again if you have a failure. Delete the files in the output directory before you rerun the createSRACerts script.

3. Stop the Storage Resource Agents (if any are deployed and running) and the Data Server. To remotely stop agents from the Data or Storage Resource agents table, complete one of the following steps:

- For Storage Resource agents that are running as a daemon service, in the **Select Action** menu, select **Shutdown**. For Storage Resource agents that are running as non-daemon agents, you do not need to stop the agent. Non-daemon processes do not need to be started or stopped.

Note: For Storage Resource agents that are running as a non-daemon service, search the IBM Spectrum Control product documentation for *agent.sh* command.

- At the command prompt, enter the following command:
`"Storage_Resource_Agent_installation_directory/agent/bin/agent.[sh|bat] stop"`

This command must be run locally on each system where an agent is running. On the Linux and UNIX operating systems, enter the *agent.sh* command, and on the Windows operating system, enter the *agent.bat* command.

For more information about starting or stopping IBM Spectrum Control services, see "Starting and stopping the IBM Spectrum Control servers" on page 123.

4. Replace the certificates. There are four scenarios:
 - Replacing the certificates after the server is installed.
 - Replacing the certificates after the agent is installed.
 - Replacing the certificates before the agent is locally.

Replacing the certificates after the server is installed

The new server certificates are created in the following directory:

output_directory/sra_certs_out/server

By default *output_directory* is the directory where the *createSRACerts* script is run:

installation_dir/data/sra/tools/certs

These files are the server certificate files:

TPCDataServer.jks
server.pwd

For the server certificate, copy the server certificate files to the following directory:

installation_dir/data/sra/certs

The server certificate files are created in the *certs.zip* file in the following directory:

output_directory/sra_certs_out/agent

Copy the *certs.zip* file into each agent directory:

installation_dir/data/sra/agent_operating_system
installation_dir/data/sra/server_operating_system

Extract the *certs.zip* file into the following directory:

installation_dir/data/sra/server_operating_system

agent_operating_system is the operating system of an agent that is remotely deployed. *server_operating_system* is the operating system on which the Data server is installed.

Replacing the certificates after the agent is installed

The new agent certificates were created on the server in the following directory:

output_directory/sra_certs_out/agent

By default, *output_directory* is:

installation_dir/data/sra/tools/certs

You must copy the *certs.zip* file to the agent system before you extract it in the *storage_resource_agent_install_directory/certs* directory. The Storage Resource agent is installed in the *storage_resource_agent_install_directory*.

Replacing the certificates before the agent is installed locally

Restriction: This process assumes that the Storage Resource agent disk image can be modified. You must copy the installation files to a writable location before proceeding.

Before the agent can be installed locally, the custom certificate must be copied to the agent system. Copy the *certs.zip* Storage Resource agent certificate file from the *output_directory/sra_certs_out/agent* directory on the IBM Spectrum Control server to the agent system.

By default, the *output_directory* is where the *createSRACerts* script was run. An example of this directory path is:

installation_dir/data/sra/tools/certs/

- a. On the agent system, extract the Storage Resource agent installation image in the *SRA_image_install_directory*.
- b. Extract the custom *certs.zip* file in the following directory:

storage_resource_agent_install_directory/agent/certs

directory.

Note: *SRA_image_install_directory* is the directory where the Storage Resource agent image was extracted. *agent_operating_system* is the directory that is named for the operating system where the agent is installed.

- c. Install the Storage Resource agent with the wanted option.
5. Start the Data server and the Storage Resource agent. If the Data server is stopped for replacement of the certificates, start the Data server after the replacement of the certificates.

If the Storage Resource agent is stopped for replacement of certificates, start the Storage Resource agent after the replacement of the certificates.

Configuration guidelines for 500 or more agents

You can use this information to help you manage 500 or more Storage Resource agents in IBM Spectrum Control.

If you have 500 or more Storage Resource agents communicating with IBM Spectrum Control, complete the following steps:

1. Probe the servers at least once a day or more, depending on when you want to test for alert conditions.
2. Set the following parameters in the *server.config* file:

MaxConnections=1200

The default is 500. Agents can have multiple connections to the server.

routerThreads=3 (max)

Incoming connections need to be routed to the correct Data Manager "service" queue and can stack up behind this thread. The server service runs the router and the agent service is where the connections are queued once routed and saved by any of three threads here to the repository.

3. Set the following parameter in the Scheduler.config file:

MaxSubmitthreads=8

Tells how many threads are used to tell the agents to start a job. Agent connections can queue up the scheduler service. After a job is run, the agent makes a connection to communicate with this thread to give it the job status.

Including a Storage Resource agent with a server master image

If you use a master operating system image to deploy new servers in your environment, you can include the Storage Resource agent on that master image. The master image enables the agents to start and register with the IBM Spectrum Control server automatically upon deployment. This support applies only to Storage Resource agents running in daemon mode.

The default agent directory is:

- For Windows: C:\Program Files\IBM\TPC\agent
- For UNIX: /opt/IBM/TPC/agent

Follow these instructions to include the IBM Spectrum Control agent on a master image.

1. Install the Storage Resource agent in daemon mode on the master image system.
2. Stop the Storage Resource agent on the master image system.

For the Windows system: Click **Start > Settings > Control Panel > Administrative Tools > Services**. Stop the following service: **IBM Tivoli Storage Resource Agent - directory**. *directory* is where the Storage Resource agent is installed. The default directory is `installation_dir\agent`.

For the UNIX or Linux system, run the following commands:

```
cd /opt/IBM/TPC/agent/bin/
./agent.sh stop
```

3. Create one of the following files in the root directory for the agent. These files can be empty. Any content in these files is ignored.

REGISTERSRA

The file name must be uppercase with no file extension. This file causes the agent to run a probe and then register with the server. This file will use the existing Globally Unique Identifier (GUID).

REGISTERSRA_REGENGUID

The file name must be uppercase with no file extension. This file causes the agent to regenerate a new Globally Unique Identifier (GUID), run a probe, and then register with the server.

4. Delete the contents of the `agent_installation_directory/logs` directory. This clears any existing log messages so that you can view new messages that are logged.

5. Create the master image copies of this system.
6. When a new system is preinstalled from this image and then started, the REGISTERSRA or REGISTERSRA_REGENGUID file is run. The Storage Resource agent automatically registers with the new IBM Spectrum Control server. You can then use the GUI to manage the Storage Resource agent deployment. For example, to confirm that the Storage Resource agent was deployed successfully, go to the Servers page and refresh the list.

Configuring LUN provisioning for Oracle Solaris

Tivoli Storage Productivity Center for Data provides a file system extension feature that can be used to automatically increase file system capacity for managed hosts when utilization reaches a specified level. This function allows for the automatic provisioning of (TotalStorage Enterprise Storage Server®, DS6000™, DS8000) LUNs when there is not enough space available in a volume group to extend a file system. There is also information about LUN provisioning for Solaris.

LUNs can be provisioned for file system hosts that run Solaris, but you must configure the hosts must to avoid a restart after provisioning. Before you install the Storage Resource agent, complete the following steps:

1. Assign TotalStorage Enterprise Storage Server, DS6000, or DS8000 LUNs to Solaris Host Bus Adapters (HBAs).
2. Modify the HBA configuration file to include persistent name binding.
3. Modify the SCSI Disk configuration file to allow the maximum number of LUNs.
4. If you are using multipathing, ensure that TotalStorage Enterprise Storage Server, DS6000, or DS8000 multipaths are detected by the Veritas Dynamic Multipathing (VxDMP) utility.

This section provides basic instructions for performing these configuration steps. For detailed information, see the HBA and VxDMP documentation.

Assigning TotalStorage Enterprise Storage Server, DS6000, or DS8000 LUNs to Oracle Solaris HBAs

This section provides information about assigning TotalStorage Enterprise Storage Server, DS6000, or DS8000 LUNs to Solaris HBAs.

You must assign at least one TotalStorage Enterprise Storage Server, DS6000, or DS8000 LUN to each HBA on the Solaris host.

If you are using multipathing, there are different ways to configure either the host and TotalStorage Enterprise Storage Server, DS6000, or DS8000. For example:

- For an TotalStorage Enterprise Storage Server, DS6000, or DS8000 without internal multipath configuration, assign the same LUNs to the World Wide Port Node (WWPN) of each HBA.
- For an TotalStorage Enterprise Storage Server, DS6000, or DS8000 with internal multipath configuration, assign the LUNs to the WWPN of one HBA or assign the same LUNs to the WWPNs of two or more HBAs.

Modifying the HBA configuration file

The HBA configuration file must be modified to include Persistent Name Binding on HBAs and targets so that both the controller and target numbers remain the same across system reboots. This section provides information about what to modify in the configuration file.

The HBA configuration file (for example, `qla2200.conf`) must be modified to include Persistent Name Binding on HBAs and targets so that both the controller and target numbers remain the same across system reboots. You must reboot the system with the new configuration for the changes to take effect.

QLogic QLA2200 and QLA2300 HBAs have been tested for use with IBM Spectrum Control. You can use the QLogic SANblade Control FX (**scfx**) application to modify the configuration file for these HBAs. The **scfx** application is included as part of the device driver installation package. The **scfx** application is installed in the `/opt/QLogic_Corporation/SANblade_Control_FX` directory.

To configure newer models of the QLogic HBAs, use the QLogic SANSurfer software, which is included with the device driver installation package for newer QLogic models. Consult the QLogic support documentation to be sure you are using the appropriate configuration software.

Setting Persistent Name Binding for QLogic HBAs by using the appropriate software

This section describes how to set Persistent Name Binding in the HBAs by using the **scfx** command for LUN provisioning under Oracle Solaris. To configure newer models of the QLogic HBAs, use the QLogic SANSurfer software, which is included with the device driver installation package for newer QLogic models. Consult the QLogic support documentation to be sure you are using the appropriate configuration software.

Follow these steps:

1. Install the QLogic HBA Driver, Common API Library, and QLogic SANblade Control FX (**scfx**) application if you have not already done so. For installation instructions, see the *SANblade 2200 Series User's Guide* or *SANblade 2300 Series User's Guide*. After these packages are installed successfully, restart and reconfigure the system by using the **reboot -- -rv** command.
2. After the system is rebooted, use **scfx** to configure Persistent Bind on HBAs and Targets in the `/kernel/drv/qla2xxx.conf` file.

- a. Start the **scfx** application. For example:

```
# /opt/QLogic_Corporation/SANblade_Control_FX/scfx
```

The main window of the **scfx** application consists of three sections:

Menu Bar

The menu bar provides three options: **File**, **Tools**, and **Help**.

HBA Tree

The HBA Tree displays the host with its connected adapters (HBAs), devices and LUNs. The HBAs are displayed with a model name and instance number. For example, Adapter 2200 (Instance #0). If a device is connected to an HBA, it has a plus sign (+) by the HBA, which can be expanded to view the list of attached devices. The devices are listed with their World Wide Port Names (WWPN).

Click the plus sign next to a device to expand the tree to show all the LUNs in that device. For a RAID device, such as an TotalStorage Enterprise Storage Server, DS6000, or DS8000, there are multiple LUNs per device.

Note: Expand all the devices to search the TotalStorage Enterprise Storage Server, DS6000, or DS8000 LUNs assigned to the system and note the WWPN of the target device. This information is required to identify the SCSI Target ID assigned or specified for the Persistent Bind Targets Setting.

Tabbed Pages

The contents of the Tabbed Pages changes depending on what is currently selected in the HBA Tree.

- b. Select an HBA.

Select an adapter in the HBA Tree. The Tabbed Pages show the **HBA Information, HBA Options, Target Settings, Boot Device, Diagnostics, and Utilities** tabs.

- c. Select the Persistent Bind HBA Setting.

Click the **HBA Options** tab. In the **Select Parameter Section** drop-down list, select **Advanced Host Parameters**. Select the check box for **Persistent Bind HBA**. Click **Save**.

- d. Select the Persistent Bind Target Setting.

Click the **Target Settings** tab. Select the check box for each target in the **Bind** column. If the check boxes are already checked and disabled, proceed to the next step. In the **Target ID** column, you can either accept the pre-selected SCSI Target ID or change to a different value. Each SCSI target ID must be unique and range from 0 to 255.

Note: Write down the selected Target ID for each TotalStorage Enterprise Storage Server subsystem device.
Click **Save**.

- e. Repeat Steps b through d for the next HBA.
- f. Exit the **scfx** application.

From the **Menu Bar**, select **File | Exit**. A Reboot Reminder dialog is displayed. Click **OK** to exit.

3. Restart and reconfigure the system by using the **reboot -- -rv** command.

Modifying the SCSI disk configuration file

You must configure the SCSI disk configuration file for the maximum number of LUNs per target for LUN provisioning for Oracle Solaris.

You must configure the SCSI disk (**sd.conf**) configuration file for the maximum number of LUNs (256) per target. The system must then be rebooted with the new configuration for the changes to take effect. Follow these steps:

1. Identify the SCSI Target ID assigned to the TotalStorage Enterprise Storage Server.
2. Edit the **/kernel/drv/sd.conf** file to include all the possible target and LUN mappings for the RAID device. For example, assume the SCSI Target ID assigned for an TotalStorage Enterprise Storage Server is 2. You can allow up to 256 LUNs (0 - 255) for this target:

```

name="sd" class="scsi" target=0 lun=0;
name="sd" class="scsi" target=1 lun=0;
name="sd" class="scsi" target=2 lun=0;
name="sd" class="scsi" target=2 lun=1;
name="sd" class="scsi" target=2 lun=2;
:
:
name="sd" class="scsi" target=2 lun=253;
name="sd" class="scsi" target=2 lun=254;
name="sd" class="scsi" target=2 lun=255;
name="sd" class="scsi" target=3 lun=0;
name="sd" class="scsi" target=4 lun=0;
:
:
name="sd" class="scsi" target=253 lun=0;
name="sd" class="scsi" target=254 lun=0;
name="sd" class="scsi" target=255 lun=0;

```

In this example, the system can detect up to 256 targets with 1 LUN (for example, multiple RAID devices with a total of 256 LUNs) and up to 256 LUNs for target 2 (for example, a RAID device with a total of 256 LUNs).

3. Restart and reconfigure the system by using the **reboot -- -rv** command.

Checking for TotalStorage Enterprise Storage Server, DS6000, or DS8000 multipaths in VxDMP

If you are using IBM TotalStorage Enterprise Storage Server, DS6000, or DS8000 LUNs with multipaths, you must ensure that all the paths are detected by Veritas Dynamic Multipathing (VxDMP) utility. This section provides information about how to check for multipathing in the VxDMP utility.

The VxDMP utility is an administrative interface to the Veritas Volume Manager (VxVM) Dynamic Multipathing (DMP) facility. It lists the paths under a DMP device, gets the DMP device corresponding to a path, lists all the disk controllers on the system, lists all the paths through a host disk controller, lists all the DMP nodes through a disk array, and enables or disables a host disk controller on the system. For more information, and detailed instructions, see the VxDMP documentation.

To list all disk controllers on the system, enter the following command:

```
# vxdmpadm listctlr all
```

The following sample output shows that controllers c3 and c4 are connected to the IBM TotalStorage Enterprise Storage Server with an Enclosure Type of IBM_SHARK and an Enclosure Name of IBM_SHARK0.

CTLR-NAME	ENCLR-TYPE	STATE	ENCLR-NAME
c1	Disk	ENABLED	Disk
c3	IBM_SHARK	ENABLED	IBM_SHARK0
c4	IBM_SHARK	ENABLED	IBM_SHARK0

To list all subpaths for controller c3, enter the following command:

```
# vxdmpadm getsubpaths ctlr=c3
```

The following sample output shows that the **DMPNODENAME** is the same as the device name for each TotalStorage Enterprise Storage Server LUN:

NAME	STATE	PATH-TYPE	DMPNODENAME	ENCLR-TYPE	ENCLR-NAME
c3t4d0s2	ENABLED	-	c3t4d0s2	IBM_SHARK	IBM_SHARK0
c3t4d1s2	ENABLED	-	c3t4d1s2	IBM_SHARK	IBM_SHARK0

To list all subpaths for controller c4, enter the following command:

```
# vxddmpadm getsubpaths ctlr=c4
```

The following sample output shows that the **DMPNODENAME** for each TotalStorage Enterprise Storage Server LUN is from controller c3. This means that VxDMP refers to the TotalStorage Enterprise Storage Server, DS6000 or DS8000 LUNs as devices from controller c3 and mask devices on controller c4 from VxVM:

NAME	STATE	PATH-TYPE	DMPNODENAME	ENCLR-TYPE	ENCLR-NAME
c4t4d0s2	ENABLED	-	c3t4d0s2	IBM_SHARK	IBM_SHARK0
c4t4d1s2	ENABLED	-	c3t4d1s2	IBM_SHARK	IBM_SHARK0

Checking for a fully qualified host name

IBM Spectrum Control requires fully qualified host names. Some machines might be configured to return a short host name, such as `system1` instead of a fully qualified host name, such as `system1.tpc.example.com`. This topic provides information on how to check for a fully qualified host name.

Checking for a fully qualified host name for AIX systems

This topic provides information on how to verify a fully qualified host name for AIX.

The default domain name search order is as follows:

1. Domain Name System (DNS) server
2. Network Information Service (NIS)
3. Local `/etc/hosts` file.

If the `/etc/resolv.conf` file does not exist, the `/etc/hosts` file is used. If only the `/etc/hosts` file is used, the fully qualified computer name must be the first one that is listed after the IP address.

Verify that the `/etc/resolv.conf` file exists and contains the appropriate information, such as:

```
domain mydivision.mycompany.com
nameserver 123.123.123.123
```

If NIS is installed, the `/etc/irs.conf` file overrides the system default. It contains the following information:

```
hosts = bind,local
```

The `/etc/netsvc.conf` file, if it exists, overrides the `/etc/irs.conf` file and the system default. It contains the following information:

```
hosts = bind,local
```

If the `NSORDER` environment variable is set, it overrides all of the preceding files. It contains the following information:

```
export NSORDER=bind,local
```

Checking for a fully qualified host name for Linux systems

This topic provides information on how to verify a fully qualified host name for Linux.

Linux uses a resolver library to obtain the IP address corresponding to a host name. The `/etc/host.conf` file specifies how names are resolved. The entries in the `/etc/host.conf` file tell the resolver library what services to use, and in what order, to resolve names. Edit the `host.conf` file using the `vi` editor to add the following lines:

```
# Lookup names through DNS first then fall back to /etc/hosts.
order bind,hosts
# Machines with multiple IP addresses.
multi on
# Check for IP address spoofing.
nospoof on
```

The **order** option indicates the order of services. The sample entry specifies that the resolver library should first consult the name server to resolve a name and then check the `/etc/hosts` file. It is recommended to set the resolver library to first check the name server, `bind` file, and then the `hosts` file (`hosts`) for better performance and security on all your servers. You must have the DNS and BIND software installed for this configuration to work.

The **multi** option determines whether a host in the `/etc/hosts` file can have multiple IP addresses. Hosts that have more than one IP address are said to be multihomed, because the presence of multiple IP addresses implies that the host has several network interfaces.

The **nospoof** option takes care of not permitting spoofing on this machine. IP-Spoofing is a security exploit that works by tricking computers into a trust relationship that you are someone that you really are not. In this type of attack, a machine is set up to look like a legitimate server and then issue connections and other types of network activities to legitimize end systems, other servers, or large data repository systems. This option must be set ON for all types of servers.

Checking for a fully qualified host name for Oracle Solaris

This topic provides information about how to verify a fully qualified host name for Oracle Solaris systems.

Verify that the `/etc/resolv.conf` file exists and contains the appropriate information, such as:

```
domain mydivision.mycompany.com
nameserver 123.123.123.123
```

A short name is used if the `/etc/nsswitch.conf` file contains a line that begins as follows and if the `/etc/hosts` file contains the short name for the computer:

```
hosts: files
```

To correct this problem, follow these steps:

1. Change the line in the `/etc/nsswitch.conf` file to the following:

```
hosts: dns nis files
```
2. Enter the following command to stop the **inet** service:

```
/etc/init.d/inetsvc stop
```
3. Enter the following command to restart the **inet** service:

```
/etc/init.d/inetd start
```

Checking for a fully qualified host name for Windows systems

Verify the fully qualified host name on Windows operating systems.

1. Choose one of these options:

Option	Description
Windows Server 2012	<ol style="list-style-type: none">1. On the Dashboard page, hover the mouse over the lower left corner of the page next to the Server Manager taskbar button, and then click Start.2. Click Control Panel, and then click System.3. Click Change Settings, click Change, and then click Change again.
Windows 7, Windows 2008	<ol style="list-style-type: none">1. Click Start > Control Panel > System and Security.2. Click System, and then click Change Settings.3. On the Computer Name tab, click Change.
Windows XP, Windows Vista	<ol style="list-style-type: none">1. On the desktop, right-click My Computer, and then click Properties.2. On the Computer Name tab, click Change.

2. In the **Computer name** field, enter the fully qualified host name, and then click **More**.
3. Verify that the **Primary DNS suffix** field contains a domain name, and then click **OK**.

Importing authentication information for a Storage Resource agent

The Storage Resource agent is installed as a non-daemon or daemon process. IBM Spectrum Control stores the authentication information to connect to the host on which the Storage Resource agent has installed for the non-daemon agent. This authentication information can be changed depending on the environment.

To change the authentication information for a Storage Resource agent for non-daemon service, follow these steps:

1. Export the authentication information for a Storage Resource agent.
2. The data file exported contains information such as the host name, user ID, password, certificate location, and passphrase for every agent selected. The information is separated by the pipe character (|). For example,
agent_host|user|password|certificate|passphrase

You can update the password or passphrase in encrypted format or plain text format. If you want to update the password or passphrase in encrypted format, then you can use the **tpctool**. For example, go to this directory and run the **tpctool**:

```
cd installation_dir/cli
tpctool encrypt string_to_be_encrypted
```

This generates an encrypted string. Place this string in the data file to be imported and add @ENC@ to the end of the encrypted string. For example,

```
agent_host|usera|encrypted_password@ENC@|certificate|
encrypted_passphrase@ENC@
```

encrypted_password is the encrypted string for the password and
encrypted_passphrase is the encrypted string for the passphrase.

3. Import the data file.

Configuring and controlling the IBM Spectrum Control Monitoring Agent

You can configure the IBM Spectrum Control Monitoring Agent to change the Tivoli Enterprise Monitoring Services connection, log path, or authentication parameters. You can also start and stop the IBM Spectrum Control Monitoring Agent.

Configuring the IBM Spectrum Control Monitoring Agent on Windows

You can configure the IBM Spectrum Control Monitoring agent on the Windows operating system.

To configure the IBM Spectrum Control Monitoring agent on Windows, complete the following steps:

1. Log on to the system with administrator authority on Windows.
2. Open the Tivoli Enterprise Monitoring Services Console. Click **Start > All Programs > IBM Tivoli Monitoring > Manage Tivoli Monitoring Services**.

Tip: Depending on how you have your Tivoli Monitoring Services components distributed across your enterprise, you will see different types of Tivoli Enterprise Monitoring Services components displayed.

3. On the Manage Tivoli Enterprise Monitoring Services window, select **Monitoring Agent for TPC**.
4. Click **Monitoring Agent for TPC** and click **Reconfigure**.
5. For information about the different parameters to change, go to the product documentation at http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/com.ibm.spectrum.sc.doc/fqz0_t_installing_itm_agent_windows.html.

Configuring the IBM Spectrum Control Monitoring Agent on AIX or Linux

You can configure the IBM Spectrum Control Monitoring Agent on the AIX or Linux operating systems.

To configure the IBM Spectrum Control Monitoring agent on the AIX or Linux operating systems, complete the following steps:

1. Log on to the system with the root user ID or a user ID that has root access rights.
2. Open the Tivoli Enterprise Monitoring Services Console.

3. Open a terminal session window and go to the Tivoli Monitoring Services bin installation directory.

The default directory is:

`/opt/IBM/ITM/bin`

4. Run the following command:
`./itmcmd manage`

Tip: Depending on how you have your Tivoli Monitoring Services components distributed across your enterprise, you will see different types of Tivoli Enterprise Monitoring Services components displayed.

5. On the Manage Tivoli Enterprise Monitoring Services window, select **Monitoring Agent for TPC**.
6. Click **Monitoring Agent for TPC** and click **Configure**.
7. For information about the different parameters to change, go to the product documentation at http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/com.ibm.spectrum.sc.doc/fqz0_t_installing_itm_agent_unix.html.

Starting and stopping the IBM Spectrum Control Monitoring Agent

You can start and stop the IBM Spectrum Control Monitoring Agent.

To start or stop the IBM Spectrum Control Monitoring agent on the Windows operating systems, complete the following steps:

1. Open the Tivoli Enterprise Monitoring Services Console. Click **Start > All Programs > IBM Tivoli Monitoring > Manage Tivoli Monitoring Services**.
2. On the Manage Tivoli Enterprise Monitoring Services window, select **Monitoring Agent for TPC**.
3. Click **Monitoring Agent for TPC**.
4. Click **Start** to start the agent, **Stop** to stop the agent, or **Recycle** to recycle the agent.
5. Wait for the agent to start, stop, or recycle.

To start or stop the IBM Spectrum Control Monitoring agent on the AIX or Linux operating systems, complete the following steps:

1. Open the Tivoli Enterprise Monitoring Services Console.
2. Open a terminal session window and go to the Tivoli Monitoring Services bin installation directory.
The default directory is:
`/opt/IBM/ITM/bin`
3. Run the following command:
`./itmcmd manage`
4. On the Manage Tivoli Enterprise Monitoring Services window, select **Monitoring Agent for TPC**.
5. Click **Monitoring Agent for TPC**.
6. Click **Start Service** to start the agent, **Stop Service** to stop the agent, or **Recycle Service** to recycle the agent.
7. Wait for the agent to start, stop, or recycle.

Installing and configuring the IBM Spectrum Control server with multiple NIC cards

If your IBM Spectrum Control server has multiple network interface cards (NIC), install the IBM Spectrum Control server using a fully qualified hostname that resolves to the IP address of NIC card you want to use. After you install the server, all incoming and outgoing communication are successfully handled.

Installing IBM Spectrum Control for a multiple network configuration

If the IBM Spectrum Control server you are installing has multiple NIC, and is configured to use multiple network addresses, ensure that you use the fully qualified hostname that resolves to the appropriate IP address during installation. You can either setup the HOSTS file or the DNS to resolve the fully qualified host names to appropriate IP addresses.

Outgoing communication initiated by the IBM Spectrum Control server

All the outgoing communication that is initiated by the IBM Spectrum Control server is not affected if the server is configured for a multiple network environment.

For example, if you have a IBM Spectrum Control server with two IP addresses: 10.10.10.11 and 9.9.9.10, and 10.10.10.11 is used during installation, all outgoing transmissions can be sent to the devices and agents in both networks.

The following list includes examples of outgoing communication that is initiated by the IBM Spectrum Control server:

Storage systems using native interfaces

Run probe, performance monitor, and provisioning jobs, and collect data events. Examples of storage systems that use the native interface include SAN Volume Controller, Storwize V7000 Unified, Storwize V7000, and XIV system.

Switches (SNMP)

Run SNMP discovery and probe jobs.

CIM agents

Run probe, performance monitor, and provisioning jobs.

VMware vSphere or vCenter

Run discovery and probe jobs.

Agents (Storage Resource agents)

Deploy agents, run probe jobs, and run scripts.

IBM Spectrum Control servers

Run probe jobs.

Incoming communication that is initiated by the resources, agents, and GUI

Incoming communication that is initiated by the resources or agents can work with only the IP address that is specified during the installation with the exception of DS8000 events.

For DS8000 events, the IBM Spectrum Control server must initiate and establish a socket connection directly with the Hardware Management Console (HMC) to receive events. The DS8000 HMC uses that socket connection to send events. As long as the IBM Spectrum Control server can initiate the communication to the HMC, DS8000 events can be received.

IBM Spectrum Control informs resources and agents to initiate communication to the IP address provided during the installation. This example uses the IP address 10.10.10.11. However, depending on the communication, you might be able to change the IP address. For example, IBM Spectrum Control does not configure SAN switches to send SNMP traps to IBM Spectrum Control, so you can use either 9.9.9.10 or 10.10.10.11.

The following list includes examples of incoming communication that are initiated by the resources, agents, and the GUI:

DS8000 events

Events sent by the HMC to the IBM Spectrum Control server

SNMP trap notifications

SNMP traps sent from the switches and other resources

CIM indications

Indications sent by the CIM agents

Servers (agents)

Job results and registration

IBM Spectrum Control GUI

Any request.

CIM indications

A CIM indication is an event that occurs on a managed object, for example, the completion or failure of an operation. The CIM indications are managed by the CIM object manager. IBM Spectrum Control uses the CIM agents for the managed objects to gather information about the device.

Manually customize CIM indications on a IBM Spectrum Control system that has multiple IP addresses. To configure IBM Spectrum Control to receive CIM indications in an IPv4, IPv6, and dual stack (IPv4 and IPv6) environment, see “Configuring IBM Spectrum Control with multiple IP addresses” on page 32.

The manual customization task does not apply to storage devices that use the native interfaces.

Creating an SSH certificate for the root user ID

You can create a Secure Shell (SSH) certificate for authentication for the Virtual I/O Server. Follow the certificate-generation instructions. However, if you want to use Telnet to connect to the Virtual I/O Server using the padmin user ID, you must follow this procedure.

To create an SSH certificate using the padmin user ID, follow these steps:

1. Telnet to the remote system using the padmin user ID.
2. Set up the AIX environment. Run the following command:
oem_setup_env

3. Change to the following /.ssh directory.
4. Enter **ssh-keygen**. Accept the default names (for example, id_rsa).
5. Enter the passphrase. Two new files are created:
id_rsa This is the private key.
id_rsa.pub
This is the public key.
6. Create an authorized_key file in the same location as the id_rsa.pub file. Enter the following command:
cat >> id_rsa.pub >> authorized_keys
The following example shows the command input and output (the commands are in bold):

```
# ssh-keygen

Generating public/private rsa key pair.
Enter file in which to save the key (//.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
You identification has been save in //.ssh/id_rsa.
Your public key has been save in //.ssh/id_rsa.pub.
The key fingerprint is:
xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx:xx root@<server>

# cat id_rsa >> authorized_keys
# ls -l

-rw-r--r-- 1 root system 1743 Oct 15 09:40 authorized_keys
-rw---- 1 root system 1743 Oct 15 09:39 id_rsa
-rw-r--r-- 1 root system 399 Oct 15 09:39 id_rsa.pub
```

7. Copy the id_rsa (private key) to your server machine.
Note: You must copy the file in binary mode.
8. To connect to the remote system by using the private key, enter the following information in the web-based GUI when you install the Storage Resource agent:
 - User
 - Certificate Location (c:\keys\id_rsa)
 - Passphrase

Replacing the default SSL certificate for the Device, Alert, or Web server

To replace the default SSL certificate for the Device, Alert, or Web server, use the IBM Key Management (iKeyman) utility.

If you have strong security requirements, you might want to replace the default certificate for the Web server so that you can securely connect to the Web server while you use the https protocol. When you replace the existing certificate, it can remove web browser certificate error warnings.

1. Log on to the server where IBM Spectrum Control is installed. Ensure that you log on with the appropriate user privileges.
2. Open the /jre/bin directory where IBM Spectrum Control is installed.
3. Enter the iKeyman utility command.
For Windows operating system, enter the following command:
ikeyman.exe

For AIX or Linux operating system, enter the following command:

```
./ikeyman
```

4. Click **Key Database File > Open**.

5. Complete the following tasks:

a. Set the Key database type to **JKS**.

b. In the **File Name** field, click **Browse**.

To replace the default SSL certificate for the Device server, go to the `<installation_dir>/wlp/usr/servers/deviceServer/resources/security/` directory, select the `key.jks` file, and click **Open**.

To replace the default SSL certificate for the Alert server, go to the `<installation_dir>/wlp/usr/servers/alertServer/resources/security/` directory, select the `key.jks` file, and click **Open**.

To replace the default SSL certificate for the Web server, go to the `<installation_dir>/wlp/usr/servers/webServer/resources/security/` directory, select the `key.jks` file, and click **Open**.

c. Click **OK**.

6. On the Password Prompt page, type `default`, and click **OK**. The Personal Certificates list contains only the certificate with the `default` label.

To replace the default certificate with a new self-signed certificate, complete the following tasks:

a. Click **New Self-Signed**.

b. On the Create New Self-Signed Certificate page, enter a unique value in the **Key Label** field.

c. Provide values for the other fields, and click **OK**.

The list of Personal Certificates contains your new self-signed certificate and the certificate with the `default` label.

d. Select the certificate with the `default` label and click **Rename**.

e. Enter a new label for the certificate, and click **OK**.

f. Select the new certificate and click **Rename**.

g. Enter `default` as the new label, and click **OK**.

To replace the default certificate with a new certificate that is signed by an external certificate authority, complete the following tasks:

a. In the iKeyman utility, select **Create > New Certificate Request**.

b. Enter a unique value in the **Key Label** field and provide values for the other fields.

c. Pay special attention to the value you provide in the **Enter the name of a file in which to store the certificate request** field and click **OK**.

A message is displayed that informs you where the file that contains your new certificate request is located. The message tells you to send that new certificate request file to your external certificate authority.

d. On the Message page, click **OK**.

The external certificate authority signs your new certificate request and sends back your new certificate. The external certificate authority might send their signer certificate or the external certificate authority might assume that you already have their signer certificate in the key database file.

If the external certificate authority sends their signer certificate, complete the following tasks:

a. Select **Signer Certificates** and click **Add**.

- b. Provide the **File Name** and **Location** values of the file that contains the Signer Certificate and click **OK**.

If the external certificate authority assumes that you already have their signer certificate in the key database file, complete the following tasks:

- a. Select **Signer Certificates** and click **Populate**.
- b. Search the lists of CA Certificates, select the one(s) for the external certificate authority that signed your new certificate request, and click **OK**.

If the lists of CA Certificates do not contain the one(s) for the external certificate authority that signed your new certificate request, ask your external certificate authority to send their signer certificate.

Once you have the signer certificate for the external certificate authority that signed your new certificate request, complete the following tasks:

- a. Select **Personal Certificates** and click **Receive**.
 - b. Provide the **File Name** and **Location** values of the file that contains your new certificate and click **OK**.
 - c. Select the certificate with the default label and click **Rename**.
 - d. Enter a new label for the certificate and click **OK**.
 - e. Select your new certificate and click **Rename**.
 - f. Enter default as the new label and click **OK**.
7. In the iKeyman utility, click **Key Database File > Exit**.
 8. Stop and start the Device, Alert, or Web server.

Related tasks:

“Starting and stopping the IBM Spectrum Control servers” on page 123

You can start and stop the IBM Spectrum Control servers in the GUI or by running scripts.

Disabling TLS 1.0 and 1.1 for ports

IBM Spectrum Control uses Transport Layer Security (TLS) to secure communications between IBM Spectrum Control components. You might want to disable TLS 1.0 and 1.1 to meet the security requirements in your storage environment.

Disabling TLS 1.1 and 1.0 for IBM Spectrum Control ports

To disable TLS 1.1 and 1.0 for IBM Spectrum Control ports, update the `java.security` file. For IBM Spectrum Control 5.2.13 and earlier, you must also update the `ssl.client.props` file.

If you disable TLS 1.1 and 1.0 for IBM Spectrum Control ports, IBM Spectrum Control might not be able to communicate with resources that do not support TLS 1.2. Contact your vendor if you want to upgrade your resources to a version that supports TLS 1.2.

1. Stop all IBM Spectrum Control servers.
2. For IBM Spectrum Control 5.2.14 and later, complete the following steps:
 - a. Open the file `installation_directory/jre/lib/security/java.security`.
 - b. To disable TLS 1.0 only, add the following text at the end of the `jdk.tls.disabledAlgorithms` line:

, TLSv1

For example:

`jdk.tls.disabledAlgorithms=MD5withRSA, DH keySize < 768, TLSv1`

To disable TLS 1.0 and 1.1, add the following text at the end of the `jdk.tls.disabledAlgorithms` line:

`, TLSv1, TLSv1.1`

3. For IBM Spectrum Control 5.2.13 and earlier, complete the following steps:

- a. Open the file `installation_directory/ewas/java/jre/lib/security/`.

- b. To disable TLS 1.0 only, add the following text at the end of the `jdk.tls.disabledAlgorithms` line:

`, TLSv1`

For example:

`jdk.tls.disabledAlgorithms=MD5withRSA, DH keySize < 768, TLSv1`

To disable TLS 1.0 and 1.1, add the following text at the end of the `jdk.tls.disabledAlgorithms` line:

`, TLSv1, TLSv1.1`

- c. Open the file `installation_directory/ewas/profiles/WebServerProfile/properties/ssl.client.props`.

- d. To disable TLS 1.0 only, set the `com.ibm.ssl.protocol` property to `TLSv1.1`.

To disable TLS 1.0 and 1.1, set the `com.ibm.ssl.protocol` property to `TLSv1.2`.

4. Restart the IBM Spectrum Control servers.

Configuring DB2, AIX, and Linux for IPv6-only environment

Use this information to configure DB2, AIX, and Linux for an IPv6-only environment.

Configuring the AIX system for IPv6 only

For IPv6 support, the AIX operating system must have level TL 5300–06 installed.

To configure the AIX operating system for IPv6, complete the following steps:

1. Obtain the most recent versions of **openssh** and **openssl** packages for AIX and install them. Some older version of **openssh** does not work in an IPv6-only environment.
2. Change **sshd** (Secure Shell Daemon) on AIX system to accept IPv6 connections.
 - a. In the `/etc/ssh/sshd_config` file, uncomment the line "ListenAddress".
 - b. Restart **sshd** with the following commands:

```
stopsrc -g ssh
startsrc -g ssh
```
 - c. From another IPv6 system, verify that you contact AIX over IPv6 (by using `ssh`).
3. In SMIT, set the IPv4 address to 0.0.0.0 for all interfaces. Save the file.
4. Edit the `/etc/resolv.conf` file to use IPv6 DNS server or servers.

Configuring DB2 on AIX for IPv6 systems

To get DB2 on AIX operating systems to work on IPv6 systems, complete the following steps:

1. Identify the host name that is used by DB2 in the `db2nodes.cfg` file:

```
# cat ~db2inst1/sqlllib/db2nodes.cfg
0 myhost 0
#
```

2. Edit the `/etc/hosts` file and make sure that the host name found in the `db2nodes.cfg` file resolves to an IPv6 address. Use the `vi` editor to verify that the host name is not on any line with an IPv4 address. In particular, ensure that the host name is not listed as an alias for the IPv4 loopback address 127.0.0.1.

```
# vi /etc/hosts
127.0.0.1 loopback localhost
::1 localhost
2001:db8:0:0:209:6bff:fe09:63fa myhost.mydomain myhost
```

3. Stop DB2 and set DB2 to use IPv6 addressing. Restart DB2.

- a. Source the DB2 profile:


```
. ~db2inst1/sqllib/db2profile
```
- b. Stop DB2:


```
db2stop
```
- c. Configure DB2 to use IPv6.


```
db2set
```

An example of the output is: `DB2FCMCOMM=TCPIP6`.

- d. Start DB2.


```
db2start
```

In some installations, the AIX server does not have a graphical console that is attached to the server. In this situation, you can select another system with an X11 server to display the IBM Spectrum Control installation and IBM Spectrum Control application. The X11 server must have IPv6 configured and an SSH client installed. Open an SSH connection from a shell on the X11 server desktop with the `-X` option to permit forwarding of X11 applications from the remote AIX server. Start the IBM Spectrum Control installation program or application from the SSH shell.

```
ssh -X my_IPv6_host
/opt/IBM/TPC/gui/TPCD.sh
```

Configuring DB2 on Linux for IPv6-only systems

To get DB2 on Linux systems to work in an IPv6-only environment, follow these steps:

1. Install DB2 in dual-stack configuration.
2. Stop DB2 and set DB2 to use IPv6 addressing:
 - a. As the root user from the Linux command-line, run this command:


```
su - db2inst1
```
 - b. Stop DB2 by running this command:


```
db2stop
```
 - c. Configure DB2 to use IPv6 by running this command:


```
db2set
```

An example of the output is: `DB2FCMCOMM=TCPIP6`.

The host name in the `db2nodes.cfg` file resolves to an IPv6 address. This action can require you to change the domain or search directive in the `/etc/resolv.conf` file to specify a domain in which the host name can resolve to IPv6. You can also edit the `/etc/hosts` file so that the host name resolves to an IPv6 address.

- d. Start DB2 by running this command:


```
db2start
```

Chapter 2. Administering

Administer IBM Spectrum Control and its components to ensure that your storage environment is being monitored as intended. Some administering tasks include stopping and starting product services, increasing memory allocation, monitoring the health of product components, and managing storage resources and data sources. You can use the DB2 command-line interface or IBM Data Studio to administer DB2.

Administering resources and data sources

Administer monitored resources and the data sources that are associated with those resources. Data sources can be agents that manage resources or VMware vCenter servers. An agent might be a CIM agent or a Storage Resource agent.

Storage systems

Administer the storage systems that are monitored by IBM Spectrum Control. Administering actions include adding and removing storage systems, updating credentials, and testing connections.

Viewing information about storage systems

View detailed information about storage systems that are monitored by IBM Spectrum Control.

To view information about storage systems, complete the following steps:

1. Depending on how the storage system is configured, go to **Storage > Block Storage Systems**, **Storage > File Storage Systems**, or **Storage > Object Storage Systems**. Storage systems can be configured in the following ways:

Block storage system

Storage systems that are configured for storing or retrieving data only in block format include System Storage DS series, SAN Volume Controller, Storwize V7000, and other SAN-based storage systems.

Storage systems that can be configured for both file and block data include Storwize V7000 Unified and NetApp Filers.

File storage system

Storage systems that are configured for storing or retrieving data only in file format include IBM SONAS and other network-attached storage (NAS) based storage systems.

Storage systems that can be configured for both file and block data include Storwize V7000 Unified and NetApp Filers.

Object storage system

The storage system that can be configured for both file and object data is IBM Spectrum Scale storage system.

The storage system that can be configured only for object data is IBM Cloud Object Storage.

Information about monitored storage systems is displayed.

2. Right-click a storage system and select **View Properties** to view the key properties for the system.

Updating the credentials for storage systems

Change the credentials that IBM Spectrum Control uses to authenticate to a storage system or the CIM agent that manages a storage system. You can also change the host name or the IP address.

If the storage system is managed by multiple data sources, for example multiple CIM agents, the menu is displayed as **Connections > Modify Connection > data_sources**. Select the data source for which you want to update the credentials.

The type of storage system determines the credentials that you can update.

Updating the credentials for a System Storage DS8000 storage system:

Change the credentials that IBM Spectrum Control uses to authenticate to a System Storage DS8000 storage system.

To update the credentials for a System Storage DS8000 storage system, complete the following steps. You can update the host name or IP address for the secondary HMC that is used to manage the storage system, the user name, and the password.

1. In the menu bar, go to **Storage > Block Storage Systems**. Information about monitored storage systems is displayed.
2. Right-click a storage system and click **Connections > Modify Connection**.
3. Change the secondary HMC host name or IP address, the user name, or the password, and then click **OK**.

Updating the credentials for an XIV or IBM Spectrum Accelerate:

Change the credentials that IBM Spectrum Control uses to authenticate to an XIV or IBM Spectrum Accelerate.

To update the credentials for an XIV or IBM Spectrum Accelerate, complete the following steps. You can update the IP address or host name, the user name, and the password.

1. In the menu bar, go to **Storage > Block Storage Systems**.
2. Right-click a storage system and click **Connections > Modify Connection**.
3. Change the host name or IP address, user name, or password, then click **OK**.

Updating the credentials for a SAN Volume Controller or Storwize family storage system:

Change the credentials that IBM Spectrum Control uses to authenticate to a SAN Volume Controller or Storwize family storage system.

To update the credentials for a SAN Volume Controller or Storwize family storage system, complete the following steps. You can update the IP address or host name, the user name, and the password.

1. In the menu bar, go to **Storage > Block Storage Systems**. Information about monitored storage systems is displayed.
2. Right-click a storage system and click **Connections > Modify Connection**.
3. Update the following credentials as required and then click **OK**:

Authentication

You can use a user name and password or a private Secure Shell (SSH)

key to log on to the storage system. The authentication method that you select determines the options that are displayed.

User name/Password

The user name and password for logging on to the storage system.

Secure Shell (SSH)

Use an existing SSH key or upload a new key to the storage system. Select one of the following actions:

Use an existing SSH key

Use an SSH key that was uploaded to the storage system by using a method other than through IBM Spectrum Control, such as the storage system web interface.

SSH key

The location of the SSH key.

The default location is `${device.conf}\tpc_svc.pem`, which represents the IBM Spectrum Control default key file `tpc_svc.pem`. The `tpc_svc.pem` file is in the `conf` directory where the Device server is installed.

You can enter another location or select **Browse** to search for a key file. If you select **Browse**, the following fields are displayed:

Select file

The location of the SSH key file. You can click **Browse** to search for a file.

Passphrase

The passphrase for the SSH key pair. If you do not have a passphrase, leave this field blank.

The SSH key file is transferred from the computer where the web browser is located to the computer where the IBM Spectrum Control server is located.

Upload a new SSH key

Provide the following information to upload an SSH key to the storage system:

SSH key

The location of the SSH key. The key must exist on the system where you are running the IBM Spectrum Control user interface.

The SSH key must be in OpenSSH format or in PuTTY (.ppk) format that is not password protected.

Passphrase

The passphrase for the SSH key pair. If you do not have a passphrase, leave this field blank.

User name, Password

The name and password for a user that belongs

to the storage system Security Administrator role for the cluster that contains the storage system.

IBM Spectrum Control uses this value to configure the SSH key for the user that is entered in the **Associate user** field. The user name that is entered in the **User name** field must have privileges to modify other user accounts, otherwise IBM Spectrum Control cannot configure the SSH key.

Associate user

The user that is associated with the SSH key. If the user name does not exist, it is created and assigned to the storage system Administrator role.

You can click **Get Users** to retrieve all of the existing users from the storage system. You must select a user that belongs to the storage system Administrator role.

The SSH key file is transferred from the computer where the web browser is located to both the computer where the IBM Spectrum Control server is located and to the storage system.

Updating the credentials for a Storwize V7000 Unified storage system:

Change the credentials that IBM Spectrum Control uses to authenticate to a Storwize V7000 Unified storage system.

To update the credentials for a Storwize V7000 Unified storage system, complete the following steps. You can update the IP address or host name, the user name, and the password.

1. In the menu bar, go to **Storage > Block Storage Systems**. Information about monitored storage systems is displayed.
2. Right-click a storage system and click **Connections > Modify Connection**.
3. Update the following credentials as required, and then click **OK**:

Authentication

You can use a user name and password or a private Secure Shell (SSH) key to log on to the storage system. The authentication method that you select determines the options that are displayed.

User name/Password

The user name and password for logging on to the storage system.

Secure Shell (SSH)

Use an existing SSH key or upload a new key to the storage system. Select one of the following actions:

Use an existing SSH key

Use an SSH key that was uploaded to the storage system by using a method other than through IBM Spectrum Control, such as the storage system web interface.

SSH key

The location of the SSH key.

The default location is `${device.conf}\tpc_svc.pem`, which represents the IBM Spectrum Control default key file `tpc_svc.pem`. The `tpc_svc.pem` file is in the `conf` directory where the Device server is installed.

You can enter another location or select **Browse** to search for a key file. If you select **Browse**, the following fields are displayed:

Select file

The location of the SSH key file. You can click **Browse** to search for a file.

Passphrase

The passphrase for the SSH key pair. If you do not have a passphrase, leave this field blank.

The SSH key file is transferred from the computer where the web browser is located to the computer where the IBM Spectrum Control server is located.

Upload a new SSH key

Provide the following information to upload an SSH key to the storage system:

SSH key

The location of the SSH key. The key must exist on the system where you are running the IBM Spectrum Control user interface.

The SSH key must be in OpenSSH format or in PuTTY (.ppk) format that is not password protected.

Passphrase

The passphrase for the SSH key pair. If you do not have a passphrase, leave this field blank.

User name, Password

The name and password for a user that belongs to the storage system Security Administrator role for the cluster that contains the storage system.

IBM Spectrum Control uses this value to configure the SSH key for the user that is entered in the **Associate user** field. The user name that is entered in the **User name** field must have privileges to modify other user accounts, otherwise IBM Spectrum Control cannot configure the SSH key.

Associate user

The user that is associated with the SSH key. If

the user name does not exist, it is created and assigned to the storage system Administrator role.

You can click **Get Users** to retrieve all of the existing users from the storage system. You must select a user that belongs to the storage system Administrator role.

The SSH key file is transferred from the computer where the web browser is located to both the computer where the IBM Spectrum Control server is located and to the storage system.

Use different authentication credentials for file storage

Storwize V7000 Unified contains block-level and file-level data. If the credentials are different for block storage and file storage, select this check box to define the credentials for file storage. The options and fields that are displayed are described previously under **Authentication**.

Tip: If you use an SSH key to log on to the file module, the user that you associate with the key must exist on the Storwize V7000 File Module.

Updating the credentials for an IBM SONAS storage system:

Change the credentials that IBM Spectrum Control uses to authenticate to an IBM SONAS storage system.

To update the credentials for an IBM SONAS storage system, complete the following steps. You can update the host name or IP address of the storage system, the user name, and the password.

1. In the menu bar, go to **Storage > File Storage Systems**.
2. Right-click a storage system and click **Connections > Modify Connection**.
3. Update the following credentials as required, and then click **OK**.

Authentication

You can use a user name and password or a private Secure Shell (SSH) key to log on to the storage system. The authentication method that you select determines the options that are displayed.

User name, Password

The user name and password for logging on to the storage system.

Secure Shell (SSH)

Use an existing SSH key or upload a new key to the storage system. Select one of the following actions:

Use an existing SSH key

Use an SSH key that was uploaded to the storage system by using a method other than through IBM Spectrum Control, such as the storage system web interface.

SSH key

The location of the SSH key.

The default location is `${device.conf}\tpc_svc.pem`, which represents the IBM Spectrum Control default key file `tpc_svc.pem`. The `tpc_svc.pem` file is in the `conf` directory where the Device server is installed.

You can enter another location or select **Browse** to search for a key file. If you select **Browse**, the following fields are displayed:

Select file

The location of the SSH key file. You can click **Browse** to search for a file.

Passphrase

The passphrase for the SSH key pair. If you do not have a passphrase, leave this field blank.

The SSH key file is transferred from the computer where the web browser is located to the computer where the IBM Spectrum Control server is located.

User name, Password

The name and password for a user that belongs to the storage system Security Administrator role for the cluster that contains the storage system.

IBM Spectrum Control uses this value to configure the SSH key for the user that is entered in the **Associate user** field. The user name that is entered in the **User name** field must have privileges to modify other user accounts, otherwise IBM Spectrum Control cannot configure the SSH key.

Associate user

The user that is associated with the SSH key. You must create the user on the storage system before you add the storage system.

You can click **Get Users** to retrieve all of the existing users from the storage system. You must select a user that belongs to the storage system Administrator role.

Upload a new SSH key

Provide the following information to upload an SSH key to the storage system:

SSH key

The location of the SSH key. The key must exist on the system where you are running the IBM Spectrum Control user interface.

The SSH key must be in OpenSSH format or in PuTTY (.ppk) format that is not password protected.

Passphrase

The passphrase for the SSH key pair. If you do not have a passphrase, leave this field blank.

User name, Password

The name and password for a user that belongs to the storage system Security Administrator role for the cluster that contains the storage system.

IBM Spectrum Control uses this value to configure the SSH key for the user that is entered in the **Associate user** field. The user name that is entered in the **User name** field must have privileges to modify other user accounts, otherwise IBM Spectrum Control cannot configure the SSH key.

Associate user

The user that is associated with the SSH key. You must create the user on the storage system before you add the storage system.

You can click **Get Users** to retrieve all of the existing users from the storage system. You must select a user that belongs to the storage system Administrator role.

The SSH key file is transferred from the computer where the web browser is located to both the computer where the IBM Spectrum Control server is located and to the storage system.

Updating the credentials for a storage system that is managed by a CIM agent:

Change the credentials that IBM Spectrum Control uses to authenticate to a CIM agent.

IBM Spectrum Control communicates with Common Information Model (CIM) agents to collect information about the following resources:

- IBM TotalStorage Enterprise Storage Server
- IBM System Storage DS4000®
- IBM System Storage DS5000™ Storage Manager
- IBM System Storage DS6000
- Non-IBM storage systems that are managed by SMI-S certified Common Information Model Object Manager (CIMOM), such as EMC, Hitachi, and NetApp
- Switches: Brocade

To update the credentials for a CIM agent for a storage system, complete the following steps. You can update the host name or IP address, user name, password, and other information. You can also update the CIM agent credentials for other devices, such as switches, from the GUI pages for those devices.

1. In the menu bar, go to **Storage > Block Storage Systems**. Information about monitored storage systems is displayed.
2. Right-click a storage system and click **Connections > Modify Connection**.

3. Change the CIM agent host name or IP address, the user name, or the password. Under **Advanced**, you can also specify the protocol, port, and namespace. Click **OK**.

Testing the connection to a storage system

Verify that IBM Spectrum Control can communicate with a monitored storage system. For storage systems that are managed by a CIM agent or Storage Resource agent, the connection to the agent is tested.

To test the connection to a storage system, complete the following steps:

1. Depending on the type of storage system that you want to test, go to **Storage > Block Storage Systems**, **Storage > File Storage Systems**, or **Storage > Object Storage Systems**. Information about monitored storage systems is displayed.
2. Right-click a storage system and click **Connections > Test Connection**. A message that shows the results of the test is displayed.

Removing storage systems

Remove storage systems that you no longer want to monitor with IBM Spectrum Control.

To remove a storage system, complete the following steps:

1. In the menu bar, go to **Storage** and select the type of storage system that you want to remove.
2. Right-click a storage system and click **Remove**.
3. Click **Remove** to confirm that you want to remove the storage system.

Hypervisors and VMware data sources

Administer the hypervisors, vCenter Server Appliance systems and vCenter Server systems that are monitored by IBM Spectrum Control. vCenter Server Appliance systems and vCenter Server systems are data sources that can monitor multiple hypervisors. A hypervisor can be an ESX or ESXi host. Each hypervisor can host multiple virtual machines.

Checking permissions to browse data stores

Determine if the user name that you specified for a VMware data source has permission to browse through the data stores on a hypervisor.

When you add a VMware data source in IBM Spectrum Control, the user name that you specify must have permission to browse through the data stores on VMware. IBM Spectrum Control must browse through the data stores to collect information from the hypervisors. However, the "Read Only" role as defined by VMware does not allow IBM Spectrum Control to browse the data stores. You can use the "Virtual Machine Power User" role if you do not want to use the Administrator role, or you can create a custom role with the required permissions.

To verify that a VMware user is assigned the correct role and privileges to monitor VMware data sources, follow these steps:

1. Ensure that the user role has the required VMware datastore permissions by completing the following steps:
 - a. Connect the vSphere Web Client to the VMware data source. The data source can be an ESX server, a vCenter Server Appliance, or a vCenter Server.
 - b. From the Inventories view, select **Hosts and Clusters**.

- c. Select a host, and click the **Related Objects** tab.
- d. View the datastores by clicking the **Datastores** tab.
- e. Right-click a datastore, and select **File Browser**. If you can view the **Files** tab for the datastore, your browse permission is working correctly.
2. Determine the role that is assigned to the user by logging in to the vSphere Web Client by using the administrator user ID. From the Administration view, select **Roles**. Verify the role name that is assigned to the user.
3. Determine the privileges that are assigned to the role by selecting the user's role and clicking **Privileges**. Expand the privilege groups to view the specific privileges.
4. Optional: If you must edit the privileges for the role, select the role and click the **Edit role action** icon. Select privilege groups or expand to select specific privileges.

For more information about VMware user roles, go to the VMware documentation center and search for *vSphere users and permissions*.

Viewing information about hypervisors

View detailed information about hypervisors that are monitored by IBM Spectrum Control.

To view information about hypervisors and vCenter servers, complete the following steps:

1. Go to **Servers > Hypervisors**. Information about monitored hypervisors and vCenter servers is displayed.
2. Right-click a hypervisor and select **View Properties** to view the key properties of that hypervisor.
3. Optional: Right-click a hypervisor and select **View Details** to view more detailed information about that hypervisor, such as triggered alerts, data collection schedules, and information about its internal and related resources.

Updating the credentials for a hypervisor

You can change the user name and password that IBM Spectrum Control uses to log in to a hypervisor. You can also change the host name or IP address of the hypervisor.

1. In the menu bar, go to **Servers > Hypervisors**.
2. Right-click a hypervisor and select **Connections > Modify Connection**.
3. Update the host name or IP address, user name, or password for the hypervisor. The user name and password must contain the following valid characters:
 - A through Z (uppercase characters)
 - a through z (lowercase characters)
 - 0 through 9 (numeric characters)
 - Special characters: ! # % & * + - / = ? ^ _ { } () . ,

Restrictions:

- User names and passwords cannot contain spaces and must have at least one character.
- The maximum length of a user name or password is 128 characters.
- The user name must have permission to browse the data stores on a hypervisor. For more information about permissions, see “Checking permissions to browse data stores” on page 95.

4. Click **OK**.

Removing hypervisors and VMware data sources

Remove hypervisors and VMware vCenter servers that you no longer want to monitor with IBM Spectrum Control.

To remove hypervisors and vCenter servers, complete the following steps:

1. Go to **Servers > Hypervisors** Information about monitored hypervisors and vCenter servers is displayed.
2. Right-click a hypervisor and select **Remove**. The hypervisor and all its data are removed from IBM Spectrum Control immediately. Any data collection jobs and alerts are also removed.

When you remove a vCenter Server, the hypervisors that it manages are also removed from IBM Spectrum Control. However, information about the hypervisors is not removed immediately, but is retained according to the **Data for missing resources** setting on the History Retention page. The default setting is 14 days. If the default setting is used, all information about the hypervisors is deleted 14 days after the related vCenter Server was removed.

Tips: After a vCenter Server is removed, but before its managed hypervisors are removed according to the retention settings, the following conditions occur:

- Any data collection jobs that are scheduled for the hypervisors fail.
- Because data is no longer collected, any alerts that were based on that data are not generated.

Switches and fabrics

Administer the switches and fabrics that are monitored by IBM Spectrum Control. Administering actions include adding and removing switches and fabrics, modifying connection information, and testing connections.

Viewing information about switches and fabrics

View detailed information about switches and fabrics that are monitored by IBM Spectrum Control.

To view information about switches and fabrics, complete the following steps:

1. In the menu bar in the web-based GUI, go to **Network > Switches** or **Network > Fabrics**. Information about monitored switches or fabrics is displayed.
2. Right-click a switch or fabric and click **View Properties** to view the key properties for the switch or fabric.

Updating the connection information for switches and fabrics

Change the connection information that IBM Spectrum Control uses to authenticate to a data source that manages a switch or fabric.

Depending on the functions that you want to enable, you can use CIM agents or SNMP agents to manage switches and fabrics in your enterprise. You can update the connection information for a switch and fabric to change its data source at any time. The type of data source determines the connection information that you can update.

Updating the connection information for a switch:

Change the connection information that IBM Spectrum Control uses to authenticate to a data source that manages a switch. The data source can be a CIM agent or an SNMP agent.

To update the connection information for a switch, complete the following steps:

1. In the menu bar, go to **Network > Switches**. Information about monitored switches is displayed.
2. Right-click a switch and click **Connections > Modify Connection**.

Tip: If a switch is managed by multiple data sources, for example multiple CIM agents, the menu is displayed as **Connections > Modify Connection > data_sources**. Select the data source for which you want to update the connection information.

3. Update the following information as required and then click **OK**. The information that is displayed depends on the type of data source.

CIM agent

CIM agent host name or IP address

The IP address or host name of the CIM agent that manages the switch.

User name, Password

The user name and password for logging on to the CIM agent.

Advanced

Protocol

The https or http protocol.

Port The 5989 or 5988 port.

Namespace

The /interop namespace.

SNMPv3 agent

SNMP version

The SNMP version of the agent.

User name

The user name used to log in to the switch.

Authentication password

The password for the user logged in to the switch.

Authentication protocol

The protocol or digest used for authentication to the switch.

Encryption protocol

The protocol used for encryption.

SNMPv1 agent

SNMP version

The SNMP version of the agent.

Read community

The SNMP community string. The default is **public**.

Write community

The SNMP community string. The default is **private**.

Updating the connection information for a fabric:

Change the connection information that IBM Spectrum Control uses to authenticate to a data source that manages a fabric. The data source can be a CIM agent or an SNMP agent.

To update the connection information for a fabric, complete the following steps:

1. In the menu bar, go to **Network > Fabrics**. Information about monitored fabrics is displayed.
2. Right-click a fabric and click **Connections > Modify Connection**.

Tip: If a fabric is managed by multiple data sources, for example multiple CIM agents, the menu is displayed as **Connections > Modify Connection > data_sources**. Select the data source for which you want to update the connection information.

3. Update the following information as required and then click **OK**. The information that is displayed depends on the type of data source.

CIM agent

CIM agent host name or IP address

The IP address or host name of the CIM agent that manages the switch.

User name, Password

The user name and password for logging on to the CIM agent.

Advanced

Protocol

The https or http protocol.

Port The 5989 or 5988 port.

Namespace

The /interop namespace.

SNMPv3 agent

SNMP version

The SNMP version of the agent.

User name

The user name used to log in to the switch.

Authentication password

The password for the user logged in to the switch.

Authentication protocol

The protocol or digest used for authentication to the switch.

Encryption protocol

The protocol used for encryption.

SNMPv1 agent

SNMP version

The SNMP version of the agent.

Read community

The SNMP community string. The default is **public**.

Write community

The SNMP community string. The default is **private**.

Testing the connection to a switch or fabric

Verify that IBM Spectrum Control can communicate with the data source that manages a switch or fabric.

To test the connection to the data source that manages a switch or fabric, complete the following steps:

1. In the menu bar in the web-based GUI, go to **Network > Switches** or **Network > Fabrics**. Information about monitored fabrics or switches is displayed.
2. Right-click a switch or fabric and click **Connections > Test Connection**. A message that shows the results of the test is displayed.

Removing switches and fabrics

Remove a switch or fabric that you no longer want to monitor with IBM Spectrum Control.

To remove a switch or fabric, complete the following steps:

1. In the menu bar in the web-based GUI, go to **Network > Switches** or **Network > Fabrics**. Information about monitored fabrics or switches is displayed.
2. Right-click a fabric or switch and select **Remove**.

Note: To remove a Cisco fabric, you must remove all the switches in that fabric. The Cisco fabric is then automatically removed.

3. Follow the directions that are presented in the information message.

Servers and Storage Resource agents

Administer servers and the Storage Resource agents that collect asset, status, and file system information about servers.

Fixing deployments

Use the Servers page to monitor servers that are added to IBM Spectrum Control by deploying a Storage Resource agent. You can identify agents that failed to deploy, investigate and resolve the problems that caused the deployment failure, and deploy the agents again.

To use the **Fix Deployment** action, you must have Administrator privileges.

When you use the **Fix Deployment** action, the existing agent deployment on the server is automatically overwritten when the agent is deployed again.

Use the following steps to identify and fix Storage Resource agents that failed to deploy:

1. Use the Status column on the Servers page to identify agents that failed to deploy. A status of Failed deployment indicates that an error occurred when the agent was deployed.
2. Use the deployment log to investigate the problems that prevented the agent from deploying.

Tip: The **Open Logs** action is not available if you select multiple server rows. The **Fix Deployment** action is available if you select a single server row or multiple server rows.

3. Use the **Fix Deployment** action to change the deployment settings for the agents and deploy the agents again.

The following examples show some of the problems that cause agent deployments to fail and the actions that you might take to resolve the problems:

Errors that do not require changes to the deployment settings

The log message indicates that the DB2 database or the Data server is not running. Start the service that is not running and use the **Fix Deployment** action to deploy the agent. You do not need to change the deployment settings.

Errors that require changes to the deployment settings

The log message indicates that the port number on which the agent listens for requests from IBM Spectrum Control is in use by another service. Use the **Fix Deployment** action to change the setting for the Port field and to deploy the agent.

1. In the menu bar, go to **Servers > Servers**.
2. Locate the servers with failed agent deployments that you want to fix.
3. For each server with a status of Failed deployment, complete the following steps:
 - a. To view the error messages, right-click the server row and click **Open Logs**.
 - b. Investigate and resolve the errors.
4. Click a single or multiple servers with a status of Failed deployment and click **Actions > Fix Deployment**.
5. On the Deploy Agent page, change the settings that caused the deployment errors. For example, if the deployment fails because there is not enough disk space at the location that is specified in the Installation path field, you might change the installation location for the agents.

If you selected multiple servers with different operating systems, separate configuration pages are displayed for agents that are deployed on Windows servers and agents that are deployed on UNIX servers.

Tip: If you select multiple servers, the following rules are used to determine the settings for the agent deployment fields:

- a. If the servers use different authentication methods, you cannot change the authentication settings. **Keep current settings** is displayed in the Authentication field and the fields that are used to configure the authentication settings are hidden.
 - b. If the servers are configured with different daemon modes, you can specify the daemon mode to apply to all the selected servers.
 - c. For other fields, if the servers have the same value for the field, the value is displayed. If the servers have different values for the field, the field is blank.
6. On the Configure page, if the setting for the Location field caused a deployment error, change the field setting.
 7. Schedule the deployment of the Storage Resource agents.

If you are fixing the agent deployment for multiple servers, a time span is calculated during which the agents are deployed. The agents are deployed at regular intervals during the time span to avoid excessive load on the IBM Spectrum Control server.
 8. Schedule the time and frequency that probes are run for the servers.

If you are fixing the agent deployment for multiple servers, a time span is calculated during which the servers are probed.
 9. Click **Finish** to deploy the agents.

The changes are applied to the servers that have a status of Failed deployment. If you select servers that have other statuses, for example, Pending deployment, those servers are not affected by the action.

A probe is automatically run for a server after the agent is successfully deployed.

To monitor the status of the agent deployment, check the **Agent State** column on the Servers page.

Canceling deployments

Use the Servers page to cancel the deployment of Storage Resource agents.

To use the **Cancel Deployment** action, you must have Administrator privileges.

Check the **Agent State** column on the Servers page to identify the agent deployments that you can cancel. You can cancel the agent deployment for servers with a status of Failed deployment or Pending deployment.

1. In the menu bar, go to **Servers > Servers**.
2. Locate the servers with the agent deployments that you want to cancel.
3. Click a single or multiple servers with a status of Failed deployment or Pending deployment, and then click **Actions > Cancel Deployment**.

The agent deployment is canceled for the servers with a status of Failed deployment or Pending deployment. If you select servers that have other statuses, for example, Deploying, those servers are not affected by the action.

When you cancel the agent deployments, the servers are removed from IBM Spectrum Control. To add the servers again, click **Deploy Agent**.

Modifying deployment schedules

Use the Servers page to modify deployment schedules for Storage Resource agents.

To use the **Modify Deployment Schedule** action, you must have Administrator privileges.

Check the **Agent state** column on the Servers page to identify the agent deployments that you can modify. You can modify the deployment schedules for servers that have a status of Pending deployment.

The **Modify Deployment Schedule** action is available if you click a single server row or multiple server rows.

1. In the menu bar, go to **Servers > Servers**.
2. Locate the servers with the agent deployments that you want to modify.
3. Click a single or multiple servers with a status of Pending deployment, and then click **Actions > Modify Deployment Schedule**.
4. On the Modify Deployment Schedule window, the current schedule values for the agent deployments are shown. You can change the date and time that agents are deployed.

If you are modifying the deployment schedule for multiple agents, a time span is calculated during which the agents are deployed. The agents are deployed at regular intervals during the time span to avoid excessive load on the IBM Spectrum Control server.

Tips:

- If you select multiple servers and the servers have the same value for a field, the value is displayed. For example, if the selected servers have the same deployment date, the date is displayed. If the servers have different values for the field, the field is blank.
- The scheduled time for an agent deployment is based on the time zone of the IBM Spectrum Control server, not the time zone of the server where the agent is deployed.

5. Click **Save**.

The deployment schedules are modified for the servers that have a status of Pending deployment. If you select servers that have a status other than Pending deployment, the changes to the deployment schedule are not applied to those servers.

Viewing information about Storage Resource agents

View detailed information about the Storage Resource agents that are deployed on monitored resources.

To view information about a Storage Resource agent, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server where the agent is deployed and select **View Properties**.
3. In the properties notebook, click the **Agent** tab.

Detailed information about the agent is shown, such as the agent state and version, and the date and time when the agent was last updated.

If the Storage Resource agent has a state of Upgrade needed, the agent must be upgraded to the same version level as the IBM Spectrum Control server to which it is communicating.

Viewing Storage Resource agent log files

The log files for a Storage Resource agent contain informational, warning, and error messages for the actions that were taken by the agent. You can use the content of the log files to troubleshoot any errors that might occur when a Storage Resource agent is started, processing data, or shut down.

By default, the log files are located in the following directories on the server where an agent is deployed:

Windows

`C:\Program Files\IBM\TPC\agent\log\SRV1\agent.log`





Linux, UNIX, and AIX

`/opt/IBM/TPC/agent/log/computer_name/agent.log`

where *computer_name* represents the name of the server where IBM Spectrum Control is installed. If an agent communicates with more than one installation of IBM Spectrum Control, a subfolder is created for each installation. For example, if the agent communicates with servers named SRV1 and SRV2, the following folders are created:

- `C:\Program Files\IBM\TPC\agent\log\SRV1\agent.log`
- `C:\Program Files\IBM\TPC\agent\log\SRV2\agent.log`

To view the log file for a Storage Resource agent, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, locate the server that contains the Storage Resource agent that you want to analyze.
3. Right-click the server row and select **Logs > View Agent Log**.
4. Optional: To view only the log entries that have a Warning or Error status, select an option from the **Show all** list. You can choose to view only entries that have the following statuses:
 -  Only error entries
 -  Only warning entries
 -   Error and warning entries
5. Optional: To view an explanation of the message that is associated with a log entry, click the link in the **ID** column.

Upgrading Storage Resource agents

Upgrade Storage Resource agents to ensure that they are at the same release level as the IBM Spectrum Control server.

When you apply maintenance to IBM Spectrum Control, you can upgrade Storage Resource agents immediately or at a later time. To ensure that all your agents are at the current release level and to manage your network load, schedule upgrades regularly.

If a Storage Resource agent is not at the same level as the IBM Spectrum Control server, the following limitations occur:

- New functions in the current release might not be available for the resources that are monitored by the agent.
- Problem fixes are not applied to the agent.

You can upgrade Storage Resource agents by using the following methods:

- Use the **Modify Agents > Upgrade** action on the Servers page in the GUI.
- Use a Storage Resource agent command.

To determine if a Storage Resource agent must be upgraded, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. View the values in the **Agent State** column. If the state of the agent is **Upgraded needed**, the Storage Resource agent for the related server must be upgraded.

Starting agent upgrades:

Upgrade a Storage Resource agent to the same release level as the IBM Spectrum Control server.

The ability to start the upgrade process for a Storage Resource agent is available when the following conditions are met:

- A Storage Resource agent must be deployed on the server that you want IBM Spectrum Control to monitor.
- An agent upgrade is not currently running for the server.


- The version of the agent that is deployed on the server is earlier than the IBM Spectrum Control server version.

Restriction: It is not possible to run a scheduled upgrade from versions of a Windows Storage Resource agent deployed in non-daemon mode when you upgrade from IBM Spectrum Control version 5.2.8, 5.2.9, 5.2.10 or 5.2.11 to IBM Spectrum Control version 5.2.13 or later versions.

To upgrade a Storage Resource agent that was not upgraded at maintenance time, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server that contains the Storage Resource agent to upgrade and select **Modify Agents > Upgrade**.
3. Select **Immediate** from the **Agent Upgrade** list on the Upgrade Agent window.
4. Click **Upgrade** to start the upgrade process.

Related information:

 Upgrading Windows Storage Resource agents from previous versions of IBM Spectrum Control to 5.2.13 or later

Scheduling agent upgrades:

Schedule the upgrade process for a Storage Resource agent.

You can schedule the upgrade process for a Storage Resource agent when the following conditions are met:

- A Storage Resource agent must be deployed on the server that you want IBM Spectrum Control to monitor.
- An agent upgrade is not currently running for the server.
- The version of the agent that is deployed on the server is earlier than the IBM Spectrum Control server version.

Tips:

- To manage the workload for a server and the network, schedule the agent upgrade for a time when the server and network are not busy.
- The scheduled time for an agent upgrade is based on the time zone of the IBM Spectrum Control server, not the time zone of the server where the Storage Resource agent is installed. For example, if an agent is installed on a server in the Central (CST) time zone, but the IBM Spectrum Control server is in the Pacific (PST) time zone, the time that is shown in the web-based GUI when you schedule the upgrade is PST.


Restriction: It is not possible to run a scheduled upgrade from versions of a Windows Storage Resource agent deployed in non-daemon mode when you upgrade from IBM Spectrum Control version 5.2.8, 5.2.9, 5.2.10 or 5.2.11 to IBM Spectrum Control version 5.2.13 or later versions.

To schedule the upgrade of a Storage Resource agent that was not upgraded at maintenance time, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server that contains the Storage Resource agent to upgrade and select **Modify Agents > Upgrade**.
3. Select **Scheduled** from the **Agent Upgrade** list on the Upgrade Agent window.

4. Select the date and time and click **Upgrade** to schedule the agent upgrade.

Related information:

 Upgrading Windows Storage Resource agents from previous versions of IBM Spectrum Control to 5.2.13 or later

Upgrading Storage Resource agents by using a command:

You can manually upgrade Storage Resource agents.

To manually upgrade the Storage Resource agent, complete the following steps:

1. Go to the DVD location of the installation program (by using the Storage Resource Agent image) and go to the bin directory:

```
cd DVD_image_location/data/sra/operating_system_name
```

Where *DVD_image_location* is the location of the installation image for the Storage Resource agent.

2. Run the upgrade command:

```
►► bin/Agent -upgrade -installLoc agent_install_directory ►
(1)
► -commType Daemon ►►
```

Notes:

- 1 Parameter when the agent is run as a daemon service.
The parameters are:

-installLoc "*agent_install_directory*"

Location where the agent is installed. Enclose the directory name in quotation marks, for example, "C:\Program Files\IBM\TPC_SRA\".

-commType Daemon

If the agent is run as a daemon service, then this parameter must be specified.

Here is an example for a daemon-based service by using the default location:

```
bin/Agent -upgrade
-installLoc "/opt/IBM/TPC/"
-commType Daemon
```

Here is an example for a non-daemon service by using a non-default location:

```
bin/Agent
-upgrade -installLoc "C:\Program Files\IBM\TPC_SRA\"
```

Tip: If you run the upgrade program outside of the *DVD_image_location* installation directory, then you must specify the full path.

Disabling Storage Resource agents

Disable Storage Resource agents so that they no longer collect data or run IBM Spectrum Control jobs.

You might want to disable a Storage Resource agent under the following conditions:

- The monitored server is undergoing maintenance and is unavailable. This action prevents IBM Spectrum Control from flagging the agent as "down" if it cannot reach the agent. The number of times that the server tries to contact the agent is defined by the **agentErrorLimit** parameter in the `server.config` file.
- The monitored server is busy with resource-intensive processing and you do not want to add any IBM Spectrum Control jobs to that processing load.

To disable a Storage Resource agent, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server where the agent is deployed and select **Modify Agents > Disable**.
3. Click **OK** to confirm that you want to disable the agent. The state of the agent is changed to Disabled and remains in that state until it is enabled again. You can disable agents on multiple servers at the same time.

When you disable a Storage Resource agent that is deployed as a daemon service, the service is shut down, and the agent is disabled. IBM Spectrum Control no longer sends requests to the agent or contacts it for job processing. A Storage Resource agent that is deployed as a non-daemon agent runs as a stand-alone process. Because a service is not required for this type of agent, it is not necessary to shut down the agent before it is disabled.

Enabling Storage Resource agents

You can enable Storage Resource agents that are in a Disabled or Down state. After an agent is enabled, the IBM Spectrum Control server resumes communication with that agent.

If the IBM Spectrum Control server cannot contact an agent, the agent is automatically flagged as "down". You can use the **Enable** action to reestablish communication between the agent and the IBM Spectrum Control server. The number of times that the IBM Spectrum Control server tries to contact the agent is specified in the **agentErrorLimit** parameter in the `server.config` file. The default value for the **agentErrorLimit** parameter is 3.

By default, the `server.config` file is located in the following directory:

Windows

`C:\Program Files\IBM\TPC\Data\config`

Linux or UNIX

`/opt/IBM/TPC/Data/config`

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server where the agent is deployed and select **Modify Agents > Enable**. You can enable agents on multiple servers at the same time.
3. Click **OK** to confirm that you want to enable the agent.
4. If the agent is running as a daemon service, enter the user ID, password, and other credentials for the server where the agent is deployed. Click **OK** to start the service and enable the agent.

The agent is enabled and the state of the agent is updated to reflect its current condition, such as Up or Upgrade needed. If the agent is deployed as a daemon service, the service is started when you enable the agent.

Testing the connection with a Storage Resource agent

Verify that the IBM Spectrum Control server can communicate with the server where a Storage Resource agent is deployed.

Use the **Test Connection** action in the web-based GUI to verify the state of the Storage Resource agent. For example, if the agent has a state of Down or Unreachable on the Servers page, you can test the connection to verify the state of the agent.

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server where the Storage Resource agent is deployed and select **Modify Agents > Test Connection**.
3. Optional: If the process is slow, click **Close** in the Testing Agent Connection window to run the operation in the background.

When the operation is complete, the server status and the agent state are automatically updated on the Servers page.

Changing credentials for Storage Resource agents

You can change Storage Resource agent credentials, such as the user name and password that IBM Spectrum Control uses for logging on to the server where the agent is deployed.

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server where the agent is deployed and select **Modify Agents > Update Credentials**.
3. In the Enter User Credentials window, change the credentials for logging on to the server where the agent is installed. You can change the following credentials:

User name, Password

The user name and password that IBM Spectrum Control uses for logging on to the server where the Storage Resource agent is deployed. The user name must have administrative or root privileges on the server. This action is available only for Storage Resource agents that were deployed as non-daemon services.

The user name and password must contain valid characters. You can enter the following characters:

- A - Z (uppercase characters)
- a - z (lowercase characters)
- 0 - 9 (numeric characters)
- Series of punctuation marks or special characters: ! # % & * + - / = ? ^ _ { } () . ,

Restrictions:

- User names and passwords cannot contain spaces and must have at least one character.
- The maximum length of a user name or password is 128 characters.

Certificate location

The fully qualified path of the certificate file for the Storage Resource agent, for example, `installation_dir/data/sra/operating_system/certs/sra.pem`. This file is on the computer where the IBM Spectrum Control server is installed. If the agent uses Secure Shell (SSH) protocol for communication, the certificate location field is displayed.

Passphrase

The passphrase for the certificate file. The passphrase was created when the certificate was generated.

4. Click **OK** to save the changes.

For more information about using certificates after you install a Storage Resource agent, go to the product documentation at http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/com.ibm.spectrum.sc.doc/fqz0_r_planning_agent_protocols.html.

Collecting service data

Collect service data about the selected Storage Resource agent. Service data includes diagnostic information such as logs, trace files, configuration information, and computer details. Use this information to troubleshoot any errors that might occur during startup, processing, or shutdown of a Storage Resource agent.

To collect service data for a Storage Resource agent, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. Right-click a server and select **Logs > Collect Agent Logs**. A message is displayed that shows the location where the service file is stored on the IBM Spectrum Control server.
3. In a command line or other navigation tool, go to the directory where the service file is located and unpack its contents.

If the collection of service data is successful, a message is displayed that shows the location of the resulting service file (.zip). The file is stored in a directory on the same computer as the IBM Spectrum Control server. The file is in the following default directories:

- Windows operating system: C:\Program Files\IBM\TPC\data\log\SRATraces\agent_computer_name\TPCServiceInfo.zip
- UNIX or Linux operating system: /opt/IBM/TPC/data/log/SRATraces/agent_computer_name/TPCServiceInfo.zip

Where *agent_computer_name* represents the name of the server on which a Storage Resource agent is deployed. If an agent communicates with more than one installation of IBM Spectrum Control, a subfolder is created for each installation.

If the collection of service data fails, an error message is displayed. For more information about why a data collection failed, see the server log file or the services script. These files are in the following default directories:

- Server log file (on the computer where the IBM Spectrum Control server is installed):
 - Windows operating system: c:\Program Files\IBM\TPC\data\log
 - UNIX or Linux operating system: /opt/IBM/TPC/data/log
- Services script file (on the server where the Storage Resource agent is deployed):
 - Windows operating system: C:\Program Files\IBM\TPC\agent\service\agent_computer_name\TPCServiceInfo.html
 - UNIX or Linux operating system: /opt/IBM/TPC/agent/service/agent_computer_name/TPCServiceInfo.html

Where *agent_computer_name* represents the name of the server on which the Storage Resource agent is deployed.

Enabling or disabling scripts for Storage Resource agents

You can enable or disable scripts that are sent from the IBM Spectrum Control server to Storage Resource agents.

If you enable scripts to run, the Storage Resource agent runs the scripts that are sent from the IBM Spectrum Control server.

If you disable scripts from running, the Storage Resource agent only runs the scripts that are stored on the server where the agent is deployed. The agent does not run scripts that are sent from the IBM Spectrum Control server.

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server where the agent is deployed. Select **Modify Agents > Enable running scripts on agent** or **Modify Agents > Disable running scripts on agent** to enable or disable scripts from running.

Enabling or disabling the monitoring of fabrics by Storage Resource agents

You can enable or disable fabric monitoring by Storage Resource agents. Fabric monitoring is enabled by default. When you enable fabric monitoring, the agent collects information about fabrics that the server is connected to.

After you install a Storage Resource agent on a server, you can enable or disable the monitoring of fabrics that the server is connected to. If you enable fabric monitoring, the agent collects information about the SAN and zoning.

If you disable fabric monitoring, the agent cannot collect fabric information or monitor fabrics that the server is connected to. If the agent is the only data source that is managing the fabric, the fabric is no longer managed. A state of Unreachable is shown for the fabric on the Fabrics page.

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server where the agent is deployed. Select **Modify Agents > Enable Fabric Functions** or **Modify Agents > Disable Fabric Functions** to enable or disable fabric monitoring.

Using the help command for Storage Resource agents

The **help** command for Storage Resource agents provides information about the parameters for installing, uninstalling, and upgrading Storage Resource agents.

For information about the Storage Resource agent commands, run the **help** command. Follow these steps:

1. Go to the installation location for the Storage Resource agent:

```
cd <installation_location>
```

2. Run the following command:

```
bin/Agent -help
```

3. The output from the **help** command is as follows:

```
Usage:
Agent -INSTALL
      [-COMMTYPE DAEMON -AGENTPORT portnumber]
      [-FORCE]
      -INSTALLLOC pathname
      -SERVERIP address[,address,...]
      -SERVERPORT portnumber
      [-USERID username -PASSWORD password -CERT file -PASSPHRASE phrase]
```

```
Agent -UNINSTALL  
      [-FORCE]  
      -SERVERNAME servername
```

```
Agent -UPGRADE  
      -INSTALLLOC pathname
```

Removing servers

You can remove servers that you no longer want to monitor with IBM Spectrum Control.

You can use the GUI to remove servers. If a Storage Resource agent is deployed to the server, the agent is uninstalled.

When the server is removed, it is no longer monitored by IBM Spectrum Control. All the data that was collected about the server is removed from the database repository.

Tip: When you remove a server, it is only removed from IBM Spectrum Control. The server is not physically deleted from the storage environment.

To remove a server, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. On the Servers page, right-click the server where the agent is deployed and select **Remove**.
3. Click **Remove** to confirm that you want to remove the server.

Registering a Storage Resource agent with a different IBM Spectrum Control server

You can register a Storage Resource agent with a different IBM Spectrum Control server.

A Storage Resource agent is registered with IBM Spectrum Control server A. You want the Storage Resource agent to point instead to IBM Spectrum Control server B.

To register a Storage Resource agent with a different IBM Spectrum Control server, use these steps:

1. From server B, in the menu bar, go to **Servers > Servers**. Click **Add Server**, select **Deploy an agent for full server monitoring**, and click **Manually**.
2. On the Deploy Agent page, configure deployment information for the Storage Resource agent. Specify the same port number and installation location that are used for the Storage Resource agent on server A. Select **Overwrite previously installed agents**.
3. On the Configure page, schedule the deployment of the Storage Resource agent and click **Finish**.

When the deployment job completes, the Storage Resource agent is registered with server B.

Server A can no longer communicate with the Storage Resource agent. To remove the Storage Resource agent from server A, on the Servers page in the web-based GUI, right-click the server that the Storage Resource agent is deployed on and click **Remove**.

Manually changing the Windows service logon

Change the Windows service logon for a Storage Resource agent.

1. Start Windows Services.
2. On the Services window, right-click **IBM Spectrum Control Storage Resource agent - 'C:\Program Files\IBM\TPC\'**.
3. Select **Properties**.
4. Click the **Log On** tab.
5. Change the values for **This account**, **Password**, and **Confirm password** to the login credentials that you want to use. If your IBM Spectrum Control server is part of a Windows domain, change this logon to <domain>\<account>. For example: mydomain\myaccount.

Important: The Storage Resource agent requires that the domain account has local administrator privileges and the "Log on as a service" and "Act as part of the operating system" user rights.

6. Click **Apply** and then **OK** to save your changes.

Managing the daemon Storage Resource agent service on the Virtual I/O Server

Use this information to start and stop the daemon Storage Resource agent service for the Virtual I/O Server.

Starting and stopping the daemon Storage Resource agent service

To start or stop the daemon service, follow these steps:

1. Log in to the Virtual I/O Server using the **padmin** user ID.
2. Run the following command to set up the AIX environment:
oem_setup_env
3. Change to the base directory where the Storage Resource agent is located. For example:
 - To stop the service, run this command:
/SRA_install_directory/agent/bin/agent.sh stop
 - To start the service, run this command:
/SRA_install_directory/agent/bin/agent.sh start

Deployment guidelines and limitations for Storage Resource agents

You must consider the following guidelines and limitations when you manage Storage Resource agents in your environment.

Use the following information when you deploy Storage Resource agents:


- Multiple Storage Resource agents that are probing or scanning the same storage resources
- Platforms that support the deployment of Storage Resource agents
- Product functions that are not available for storage devices monitored by Storage Resource agents
- Required authority for deploying Storage Resource agents
- Orphan zones
- Firewalls and Storage Resource agents deployments
- Deploying Storage Resource agents on multiple computers

- Communication between the IBM Spectrum Control server and a Storage Resource agent
- Daemon and non-daemon services
- Port numbers for Storage Resource agents deployed as a daemon service
- Authentication between the IBM Spectrum Control server and a Storage Resource agent
- Replacing default SSL certificates
- Storage Resource agents on the same computer
- Time zones for computers monitored by Storage Resource agents
- Connections for Linux and AIX operating systems by using Remote Shell protocol (RSH)
- Deployments on Windows - NetBIOS setting
- Deployments on Windows - User Account Control (UAC) remote restrictions

Multiple Storage Resource agents that are probing or scanning the same resources


If multiple Storage Resource agents are set up to probe or scan the same storage resources, the Storage Resource agent that was added to IBM Spectrum Control first is used for the probe or scan. Therefore, only data that is gathered by the first Storage Resource agent is shown.

Platforms that support the deployment of Storage Resource agents

For a list of platforms on which you can deploy Storage Resource agents, see the  IBM Spectrum Control interoperability matrix and go to the *Agents, Servers and Browsers* section.

Product functions that are unavailable for resources that are monitored by Storage Resource agents

Before you deploy a Storage Resource agent, ensure that the product functions you want to use on the monitored resources are available for those agents. The following functions are not available for resources that are monitored by Storage Resource agents:

- Certain relational database monitoring. For list of relational databases that can be monitored by Storage Resource agents, see the  IBM Spectrum Control interoperability matrix and go to the *Agents, Servers and Browsers* section.
- The reporting of HBA, fabric topology, or zoning information for fabrics that are connected to hosts that are running Linux on IBM System z hardware. These limitations also apply to Storage Resource agents on all guest operating systems for VMware configurations.

Required authorities for deploying and running Storage Resource agents

Before you can create deployment schedules and deploy Storage Resource agents on target computers, you must meet the following requirements:

- To create deployment schedules, you must be logged in to IBM Spectrum Control with a user ID that has the **Administrator** role. For information about user roles, see “Authorizing users” on page 8.
- To deploy Storage Resource agents on target computers, you must provide a user ID that has administrative rights on those computers. You enter this ID when you create a deployment schedule. IBM Spectrum Control uses this ID to log on to the target computers and install and configure the necessary runtime files for the agents.

The user under which a Storage Resource agent (daemon or non-daemon) runs must have the following authorities on the target computers:

- On the Linux or AIX operating systems, the user must have root authority. By default, an agent runs under the user 'root'.
- On the Windows operating systems, the user must have Administrator authority and be a member of the Administrators group. By default, a Storage Resource agent runs under the 'Local System' account.

Orphan zones

Storage Resource agents do not collect information about orphan zones. An orphan zone is a zone that does not belong to at least one zoneset.

Firewalls and Storage Resource agent deployments

Before you can deploy a Storage Resource agent on a computer, you must turn off the firewall on that computer. If you do not turn off the firewall, the deployment fails.

To turn off the firewall on a Windows 2008 computer, complete the following steps:

1. Open Administrative Tools. For information about how to open Administrative Tools, see “Accessing administration tools” on page 182.
2. Click **Windows Firewall with Advanced Security**.
3. Click **Windows Firewall Properties**.
4. Change the **Firewall state** field to **Off** on the following tabs:
 - **Domain Profile**
 - **Private Profile**
 - **Public Profile**
5. Click **OK** to accept the changes and exit.
6. Deploy a Storage Resource agent to the Windows 2008 computer.

Deploying Storage Resource agents on multiple computers

If you deploy Storage Resource agents on multiple computers at the same time, the computers must have the same administrative user ID and password. IBM Spectrum Control uses these user credentials to log on to the computers when you install Storage Resource agents.

Tip: When you deploy Storage Resource agents on multiple computers, a globally unique identifier (GUID) is created for each computer (if one does not exist).

Communication between the IBM Spectrum Control server and a Storage Resource agent

The IBM Spectrum Control server connects to a monitored computer when a Storage Resource agent is deployed and whenever a data collection schedule runs against that agent.

During deployment, the server communicates with the target computer by using one of the following protocols:

- Windows server message block protocol (SMB)
- Secure Shell protocol (SSH)
- Remote execution protocol (REXEC)
- Remote shell protocol (RSH)

After deployment, the type of communication between the server and agent on that computer depends on whether you deployed the agent as daemon service or non-daemon service.

Daemon and non-daemon services

You can deploy a Storage Resource agent as a daemon or non-daemon service:

- A Storage Resource agent that is deployed as a daemon service runs in the background on the monitored computer and listens for requests from the IBM Spectrum Control server. Connectivity between the server and agent is established by using SSL. The server and agent have their respective certificates and no additional information is required besides those certificates and the security that is provided by the SSL protocol.
- A Storage Resource agent deployed as a service on demand (non-daemon service) runs as a stand-alone executable file on the monitored computer. Communication from the server to the agent uses the same protocol that was used during the deployment of the agent. Communication from the agent to the server uses SSL.
- A Storage Resource agent that is deployed as a daemon service on AIX, Linux, and Windows servers monitors disk paths in near real-time to detect errors. When deployed as a daemon service on an AIX server, the agent also monitors disk error events in near real-time.

If the Storage Resource agent detects path status changes or disk errors, they are included in the status of the disks and paths. You can define alerts so that you are notified of changes to the status of the paths on monitored disks.

Only status changes for existing paths are detected. If a new path is added, or an existing path is removed, the number of paths that is displayed is not updated immediately. The number of paths is updated after the next scheduled probe collects data.

If a disk on an AIX server has an error status and you fix the error, you might want the new status of the disk to be displayed immediately. To display the new status immediately, you must reset the status indicator for the disk. To reset the status indicator, use the **errclear** command to clear the error log. To clear the error log, use the following syntax:

```
errclear -d H -N disk_name 0
```

For example, if you fixed an error on `hdisk4`, and want to display the new status immediately, run the following command:

```
errclear -d H -N hdisk4 0
```

If you do not reset the status indicator for the disk, the status changes automatically after a few hours.

For information about the **errclear** command, see the product

documentation at http://www.ibm.com/support/knowledgecenter/ssw_aix_71/com.ibm.aix.cmds2/errclear.htm.

Port numbers for Storage Resource agents deployed as a daemon service

The following port numbers are used by Storage Resource agents that are deployed as daemon service:

- 9567 (For the Storage Resource agent that is deployed on the same server as IBM Spectrum Control.)
- 9510 (For Storage Resource agents that are deployed on remote servers.)

Storage Resource agents that are deployed as a non-daemon service do not use a port.

Authentication between the IBM Spectrum Control server and a Storage Resource agent

IBM Spectrum Control requires the correct authentication information (user

name, password, port, certificate location, or passphrase) for monitored computers each time it communicates with Storage Resource agents on those computers. If the authentication information changes for a host computer on which a Storage Resource agent is deployed, the authentication information for that agent must be updated by using the **Modify Agents > Update Credentials** action on the Servers page in the web-based GUI.

Replacing default SSL certificates

IBM Spectrum Control provides default SSL certificates for communication between the Data server and Storage Resource agent.

IBM Spectrum Control Version 5.2.2 uses SSL certificates with 2048-bit encryption keys whereas previous versions of IBM Spectrum Control used 1024-bit encryption keys. If you upgrade IBM Spectrum Control from a version earlier than 5.2.2, your SSL certificates are not updated automatically. If you want to use 2048-bit encryption keys with previous versions of IBM Spectrum Control, you must replace the default SSL certificates with custom SSL certificates.

For information about how to replace SSL certificates, see “Replacing default SSL certificates with custom certificates” on page 65.

Storage Resource agents on the same computer

You cannot deploy a Storage Resource agent on a computer where a Storage Resource agent is already installed and pointing to the same Data server. You can deploy a Storage Resource agent on the same computer as another Storage Resource agent if those agents communicate with different Data servers and use different ports when you listen for requests.

Time zones for computers that are monitored by Storage Resource agents

The time zones of computers that are monitored by Storage Resource agents are shown as Greenwich mean time (GMT) offsets in IBM Spectrum Control reports. For example, a computer in Los Angeles shows the following time zones in the By Computer report in Asset reporting:

(GMT-8:00) GMT-8:00

Connections for Linux and AIX operating systems by using Remote Shell protocol (RSH)

If RSH is configured to use a user ID and password, the connection fails. To successfully connect to a system by using RSH, you must set up the `.rhosts` file (in the home directory of the account). RSH must be configured to accept a login from the system that is running your application.

Deployments on Windows operating systems - NetBIOS setting

To install a Storage Resource agent on Windows targets, the **Enable NetBIOS over TCP/IP** option must be selected in the Control Panel settings for the computer's network connections properties. To set this option, complete the following steps:

1. Open Windows Control Panel. For information about how to open Windows Control Panel, see “Accessing administration tools” on page 182.
2. Select **Network and Dial-Up Connections > *some_connection* > Properties > Internet Protocol (TCP/IP) > Advanced > WINS > Enable NetBIOS over TCP/IP**.

To determine whether these ports are not blocked for inbound requests, see the documentation for your firewall.

To determine whether security policies are blocking the connection ports, open Administrative Tools. For information about how to open Administrative Tools, see “Accessing administration tools” on page 182.

Depending on whether your policies are stored locally or in Active Directory, follow these directions:

Policies that are stored locally

For policies that are stored locally, complete the following steps:

1. Open Windows Administrative Services.
2. Click **Local Security Policy > IP Security Policies on Local Computer**.

Policies that are stored in Active Directory

For policies that are stored in Active Directory, examine the IP security policies and edit or remove filters that block the ports:

- Click **Administrative Tools > Default Domain Security Settings > IP Security Policies on Active Directory**.
- Click **Administrative Tools > Default Domain Controller Security Settings > IP Security Policies on Active Directory**.

For all Windows systems, the Server service must be running to connect to a Windows system by using the Windows protocol.

The following table lists the ports that are reserved for NetBIOS. Ensure that these ports are not blocked.

Port	Description
135	NetBIOS Remote procedure call. (Not currently used.)
137	NetBIOS name service.
138	NetBIOS datagram. (Not currently used.)
139	NetBIOS session (for file and print sharing).
445	CIFS (on Windows XP).

For Windows Server 2008, shares must be shared for the Guest or Everyone accounts, and password protected sharing must be disabled. To disable password protected sharing, follow these steps:

1. Click **Control Panel > Networking and Sharing Center**.
2. Click the down arrow next to **Password protected sharing**.
3. Click **Turn off password protected sharing**.
4. Click **Apply**.
5. Exit from the Control Panel.

Deployments on Windows 2008 - User Account Control (UAC) remote restrictions

To install Storage Resource agents remotely on a Windows 2008 operating system, you must disable the User Account Control (UAC) remote restrictions on the Windows operating system. User Account Control is a security component on Windows operating systems.

Tip: To disable UAC restrictions, you must modify the computer registry. Serious problems might occur if you modify the registry incorrectly. Therefore, make sure that you follow these steps carefully. For added protection, back up the registry before you modify it. Then, you can restore

the registry if problems occur. For information about how to back up and restore the registry, see <http://support.microsoft.com/kb/322756/>.

To disable UAC remote restrictions, follow these steps:

1. Open the Windows Run window. For information about how to open the Run window, see “Accessing administration tools” on page 182.
2. Enter **regedit** and click **OK**.
3. Locate and click the following registry subkey:
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\ Policies\System
4. If the LocalAccountTokenFilterPolicy registry entry does not exist, follow these steps:
 - a. On the **Edit** menu, click **New > DWORD Value**.
 - b. Enter LocalAccountTokenFilterPolicy as the name for the DWORD value and click **Enter**.
 - c. Click **LocalAccountTokenFilterPolicy**, and click **Modify**.
 - d. In the Edit DWORD Value window, enter **1**, then click **OK**.
This value can be 0 or 1:

0	This value builds a filtered token. This value is the default value. The administrator credentials are removed.
1	This value builds an elevated token.
 - e. Exit the registry editor.

CIM agents

Administer CIM agents that are associated with storage resources that are monitored by IBM Spectrum Control. Common Information Model (CIM) agents provide a CIM interface for collecting information about certain types of storage systems and switches.

IBM Spectrum Control communicates with Common Information Model (CIM) agents to collect information about the following resources:

- IBM TotalStorage Enterprise Storage Server
- IBM System Storage DS4000
- IBM System Storage DS5000 Storage Manager
- IBM System Storage DS6000
- Non-IBM storage systems that are managed by SMI-S certified Common Information Model Object Manager (CIMOM), such as EMC, Hitachi, and NetApp
- Switches: Brocade

IBM Spectrum Control communicates directly with the following storage systems and does not require CIM agents:

- IBM System Storage DS8000
- IBM System Storage SAN Volume Controller
- The XIV
- IBM Spectrum Accelerate
- IBM Storwize family of storage systems
- IBM FlashSystem family of storage systems
- IBM SONAS

- IBM Cloud Object Storage

Adding a CIM agent

Add storage systems and switches that are managed by CIM agents. When you enter information about a storage system or switch, you must enter connection information for the CIM agent that manages it.

You must specify connection information for CIM agents when you add the following resources:


- IBM TotalStorage Enterprise Storage Server
- IBM System Storage DS4000
- IBM System Storage DS5000 Storage Manager
- IBM System Storage DS6000
- Non-IBM storage systems that are managed by SMI-S certified Common Information Model Object Manager (CIMOM), such as EMC, Hitachi, and NetApp
- Switches: Brocade

Tips:

- If a CIM agent manages multiple resources, all the resources that it manages are added to IBM Spectrum Control.
- CIM agents must comply with SMI-S standards.
- For a complete list of resources and their CIM agents that you can add, see the *Switches & Directors* and *Storage* sections in the [IBM Spectrum Control interoperability matrix](#).

To add storage system or switch that is managed by a CIM agent, complete the following steps:

1. In the menu bar, go to the resource that you want to add. To add a storage system, go to **Storage** and select the type of storage system you want to monitor. To add a switch, go to **Network > Switches**.
2. Click **Add resource**, where *resource* represents the type of resource that you want to add. To add a storage system, click **Add Storage System** and select the type of storage system that you want to add. To add a switch, click **Add Switch**.
3. Specify information about the CIM agent that manages the resource.

Help tips in the GUI: To view descriptions of the information that you must enter for a CIM agent, hover the mouse pointer over the related help icons  .

4. Complete adding a storage system or switch that is managed by a CIM agent.

This procedure does not physically add a CIM agent, but enables IBM Spectrum Control to communicate with that agent and collect data about its managed resources.

Viewing information about a CIM agent

View detailed information about CIM agents that manage the resources that are monitored by IBM Spectrum Control.

To view information about a resource that is managed by a CIM agent, complete the following steps:

1. In the menu bar, go to the type of resource that you want to view. To view a storage system that is managed by a CIM agent, go to **Storage** and select the type of storage system you want to monitor. To view a switch that is managed by a CIM agent, go to **Network > Switches**.
2. On the resource list page, right-click a storage system or switch that is managed by a CIM agent and select **View Properties**. The key properties of the resource and its CIM agent is displayed.

Updating the credentials for a CIM agent

Change the credentials that IBM Spectrum Control uses to authenticate to a CIM agent. You can also change the host name or IP address.

To update the credentials for a CIM agent, complete the following steps:

1. In the menu bar in the web-based GUI, go to the resource that is managed by a CIM agent. To update the credentials of a CIM agent that manages a storage system, go to **Storage** and select the type of storage system you want to monitor. To update the credentials of a CIM agent that manages a switch, go to **Network > Switches**.
2. Right-click the storage system or switch that is managed by a CIM agent and select **Connections > Modify Connection**. If a resource is managed by multiple CIM agents, the menu is displayed as **Connections > Modify Connection > data sources**. Select the data source for which you want to update the credentials.
3. Update the user name and password for a CIM agent. The following information is shown for a CIM agent:

CIM agent host name or IP address

The host name or IP address for the computer on which the CIM agent that manages the resource is installed. Depending on what is supported in your environment, you can enter an Internet Protocol version 4 (IPv4) or IPv6 address. If you enter an IPv6 address, the preferred representation is written as eight groups of four hexadecimal digits. Example: 2001:DB95:0000:1234:0000:0000:5678:ABCD.

User name, password

The user name and password that are used to authenticate to the CIM agent.

4. Click **OK**.

Testing the connection to a CIM agent

Ensure that IBM Spectrum Control is communicating properly with a CIM agent.

To test the connection between IBM Spectrum Control and a CIM agent, complete the following steps:

1. In the menu bar of the web-based GUI, select the resource that is managed by a CIM agent. To test the connection of a CIM agent that manages a storage system, go to **Storage** and select the type of storage system you want to monitor. To test the connection of a CIM agent that manages a switch, go to **Network > Switches**.
2. Right-click the storage system or switch that is managed by a CIM agent and select **Connections > Test Connection**. If a resource is managed by multiple CIM agents, the menu is displayed as **Connections > Test Connection > data sources**. Select the data source for which you want to test the connection. This process might take some time to complete. In this case, you can choose to

continue the operation in the background. The status of the resource is automatically updated when the process is complete.

Collecting CIM agent logs

You can collect logs for certain IBM CIM agents using the command line interface.

Remember: Storage systems that use the native interfaces (for example, DS8000, the XIV, SAN Volume Controller, and Storwize V7000) do not use CIM agents.

1. Change to the directory where the CIM agent is installed.
 - On Linux operating systems, DS3000, DS4000, DS5000, DS6000 are installed at /opt/IBM/cimagent/cimom
 - On Windows operating systems, DS3000, DS4000, DS5000, DS6000 are installed at C:\Program Files\IBM\cimagent\cimom
2. Run one of the following commands:

On Linux operating systems

collectLogs.sh

On Windows operating systems

collectLogs.bat

A **collectedLogs.zip** file is created.

Important: This file is overwritten if you run the script again.

Verifying that a CIM agent is running

You can verify that a CIM agent is running from the command line interface.

To verify that a CIM agent is up and running, run the following command:

```
telnet <IP> <port>
```

Where <IP> is the IP address of the system where the CIM agent is installed, and <port> is the port number. By default, this is 5989 for a secure connection and 5988 for an unsecure connection.


Interop namespaces for CIM agents for switches and storage systems

This section describes the namespaces for switches and storage system CIM agents that are used in IBM Spectrum Control.


If you specify an incorrect namespace the following issues might occur:

- The connection test fails when the CIMOM is added.
- The discovery does not discover all information of the system that is managed by the CIMOM.
- The probe fails.
- The function that you want to perform on the system might fail (for example, collecting performance data).

For information about the interoperability namespaces for storage systems, see the

 IBM Spectrum Control interoperability matrix for storage systems.

For information about the interoperability namespace for switches and directors,

see the  IBM Spectrum Control interoperability matrix for switches and directors.

SNMP agents

SNMP agents are switches and directors that communicate with IBM Spectrum Control through SNMP.

IBM Spectrum Control uses SNMP to send queries across the IP network to management information bases (MIBs) supported on switches and directors. IBM Spectrum Control uses the Fibre Alliance FC Management MIB and the Fibre Channel FE MIB specifications. The queries are sent only to switches that were added to IBM Spectrum Control for use as SNMP agents. Information is collected from each switch that is configured to use SNMP. The SNMP discovery registers each switch.

You add a switch as an SNMP agent on the **Network > Switches** page. You can then perform actions on the switch, including:

- running an immediate probe job, or scheduling a probe job to collect data from the switch at a specified time
- viewing information about the switch, such as the condition of the switch, the status of the most recent probe job, and other information
- modifying the connection information and credentials for the switch
- removing the switch so it is no longer managed by IBM Spectrum Control.

For information about adding switches to IBM Spectrum Control, go to the product documentation at [Adding fabrics and switches](#).

Displaying information about an SNMP agent

You can view information about an SNMP agent including the IP address, user name, and password.

To display information about an SNMP agent, follow this procedure:

1. In the menu bar, go to **Network > Switches**. Information about monitored switches is displayed.
2. Right-click an SNMP switch and click **Connections > Modify Connection**.
3. The following information is displayed.

SNMPv3 agent

SNMP version

The SNMP version of the agent.

User name

The user name used to log in to the switch.

Authentication password

The password for the user logged in to the switch.

Authentication protocol

The protocol or digest used for authentication to the switch.

Encryption protocol

The protocol used for encryption.

SNMPv1 agent

SNMP version

The SNMP version of the agent.

Read community

The SNMP community string. The default is **public**.

Write community

The SNMP community string. The default is **private**.

Removing an SNMP agent

To remove an SNMP agent that is being managed by IBM Spectrum Control, you must remove the switch or fabric that the SNMP agent is monitoring. Data collected by the agent is not removed from the database repository.

To remove an SNMP agent, follow this procedure:

1. In the menu bar of the GUI, go to **Network > Switches** or **Network > Fabrics**.
2. Right-click a switch or fabric and select **Remove**.

To remove a Cisco fabric, you must remove all the switches in that fabric. The Cisco fabric is then automatically removed.

3. Follow the directions that are presented in the information message.

Starting and stopping the IBM Spectrum Control servers


You can start and stop the IBM Spectrum Control servers in the GUI or by running scripts.

Starting the IBM Spectrum Control servers by using the GUI

Start the IBM Spectrum Control Data server, Device server, or Alert server by using the System Management page in the GUI.

1. In the menu bar, go to **Home > System Management**.
2. Click **Component Servers** in the **Components** section.
3. Click **Start Server** next to the server that you want to start.

Tip: To start the Web server, use scripts that are provided with the product.

In the **Overview** section of the System Management page, the running icon  is displayed next to the server to indicate that it is running.

Starting the IBM Spectrum Control servers by using scripts

Run scripts to start the IBM Spectrum Control servers on the Windows, Linux, or AIX operating systems.

Starting the IBM Spectrum Control servers on Windows

Tip: The default *installation_dir* is C:\Program Files\IBM\TPC.

To start the servers on the Windows operating system, enter the following commands in the following order:

Data server

```
installation_dir\scripts\startTPCData.bat
```

Device server

```
installation_dir\scripts\startTPCDevice.bat
```

Alert server

```
installation_dir\scripts\startTPCAAlert.bat
```

Web server

```
installation_dir\scripts\startTPCWeb.bat
```

Storage Resource Agent - *directory*

Tip: The **Storage Resource Agent service** is started on the Windows operating system by using Windows Services.

To start the **Storage Resource Agent** service on Windows, complete the following steps:

1. Open Windows Services. For information about how to start Services, see “Accessing administration tools” on page 182.
2. Start the **IBM Storage Resource Agent - *directory*** service where *directory* is where the Storage Resource agent is installed.

Starting the IBM Spectrum Control servers on Linux or AIX

Note: The default *installation_dir* is /opt/IBM/TPC.

To start the servers on the Linux or AIX operating systems, enter the following commands in the following order:

Data server

```
/installation_dir/scripts/startTPCData.sh
```

Device server

```
/installation_dir/scripts/startTPCDevice.sh
```

Alert server

```
installation_dir/scripts/startTPCAAlert.sh
```

Web server

```
/installation_dir/scripts/startTPCWeb.sh
```

Storage Resource Agent


```
/installation_dir/agent/bin/agent.sh start
```

Stopping the IBM Spectrum Control servers by using the GUI

Stop the IBM Spectrum Control Data server, Device server, or Alert server by using the System Management page in the GUI.

1. In the menu bar, go to **Home > System Management**.
2. Click **Component Servers** in the **Components** section.
3. Click **Stop Server** next to the server that you want to stop.

Tip: To stop the Web server, use scripts that are provided with the product.

In the **Overview** section of the System Management page, the error icon  is displayed next to the server to indicate that it is stopped. While a server is stopped, some product functions are not available. For example, if the Alert server is stopped, the ability to detect alert conditions on resources and send notifications is not available.

Stopping the IBM Spectrum Control servers by using scripts

Run scripts to stop the IBM Spectrum Control servers on the Windows, Linux, or AIX operating systems.

Stopping the IBM Spectrum Control servers on Windows

Tip: The default *installation_dir* is C:\Program Files\IBM\TPC.

To stop the servers on the Windows operating system, enter the following commands in the following order:

Storage Resource agent

To stop the **Storage Resource Agent** service on Windows, complete the following steps:

1. Open Windows Services. For information about how to open Windows Services, see “Accessing administration tools” on page 182.
2. Stop the **IBM Storage Resource Agent - *directory*** service where *directory* is where the Storage Resource agent is installed.

Web server

installation_dir\scripts\stopTPCWeb.bat

Data server

installation_dir\scripts\stopTPCData.bat

Device server

installation_dir\scripts\stopTPCDevice.bat

Alert server

installation_dir\scripts\stopTPCAAlert.bat

Stopping the IBM Spectrum Control servers on Linux or AIX

Tip: The default *installation_dir* is /opt/IBM/TPC.

To stop the servers on Linux or AIX operating systems, enter the following commands in the following order:

Storage Resource Agent

/SRA_installation_dir/agent/bin/agent.sh stop

Web server

/installation_dir/scripts/stopTPCWeb.sh

Data server

/installation_dir/scripts/stopTPCData.sh.

Device server

/installation_dir/scripts/stopTPCDevice.sh

Alert server

installation_dir/scripts/stopTPCAAlert.sh

Checking the version and license of IBM Spectrum Control

The version and license of IBM Spectrum Control that is installed on your system determine the IBM Spectrum Control functions that are available.

Check the version of IBM Spectrum Control that is installed on your system to verify that you are using the correct level of the documentation.

Check the license that is installed on your system if documented functions are not available. The functions might be restricted to a different license.

To check the version and license of IBM Spectrum Control that is installed, complete the following steps in the web-based GUI:

1. Click the question mark icon in the banner pane of the window to display a list of help topics.

2. From the list of help topics, select **About**.

Checking IBM Spectrum Control status

The System Management page shows a high-level summary of the status of the server or servers on which IBM Spectrum Control is installed. Use the System Management page to troubleshoot problems with the system, create trace logs, and get technical support.

The following system status information is available:

- The state of component servers, such as the Data server, Device server, and Alert server, and the DB2 database. In a multiple-server environment, the Tivoli Common Reporting server or the DB2 database can run on a separate server from the Data server, Device server, and Alert server. In such a multiple-server environment, the System Management page shows which components are installed on each server.
- A chart showing the amount of used and available file system space on the server over time. Use this chart to view the storage usage trends on the server to identify or predict performance problems. In a multiple-server environment, a separate chart is shown for the two servers.
- A set of charts showing performance information for the storage system volumes that the server writes to and reads from most often. The charts show the following information for the volumes:
 - Volume utilization
 - I/O rate
 - Data rate
 - Response time
 - Read cache hits

In a multiple-server environment, these charts are shown for each server.

- Alert conditions detected on the server or servers on which IBM Spectrum Control is installed.

Troubleshooting problems with the IBM Spectrum Control component and servers

If IBM Spectrum Control is not running or its performance has degraded, you can use the System Management page of the IBM Spectrum Control GUI to assess the overall condition of the system. You can also view the file system capacity and volume performance trends to help you anticipate future needs and prevent problems.


To view file system capacity information, the Storage Resource agent on the IBM Spectrum Control server must be running. In a multiple-server environment, a Storage Resource agent must be installed and running on the secondary server to view file system capacity information for the secondary server.

To view performance information for storage system volumes, the storage systems must be managed by IBM Spectrum Control and have performance monitors running.

The System Management page shows a high-level summary of the condition of the server or servers on which IBM Spectrum Control is installed.

To troubleshoot problems with IBM Spectrum Control, complete the following steps:

1. In the menu bar, go to **Home > System Management**.
2. Use the System Management page to view the status of the IBM Spectrum Control system.
 - Check the state of each component server and the DB2 database to verify that they are all running. To examine the status and resource usage of component resources in detail and, if necessary, to restart the Data server, Device server, or Alert server, complete the following steps:
 - a. Click **Component Servers** in the **Components** section. View the state, memory use, and database connections for each component server.
 - b. Optional: If the Data server, Device server, or Alert server is not running, click the **Start Server** button to restart the server. If the Device server is running, but one or more of its services are not running, click the **Start Services** button to restart the services.
 - If the performance of the IBM Spectrum Control is slow, examine the chart for available file system space and the volume performance charts.
 - Check whether there are any alerts for the server or servers on which IBM Spectrum Control is installed. The **Alerts** link in the **Overview** section shows the number of alerts and the greatest alert severity. Click **Alerts** in the **Overview** section to view the alerts.
3. Optional: You can also view the status of the product servers on Windows:
 - a. On the Windows desktop, click **Start > Control Panel > Administrative Tools > Services**.

Tip: For information about how to view information about services on different versions of Windows, see  http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/com.ibm.spectrum.sc.doc/fqz0_t_windows_start_tools.html.
 - b. On the Services window, locate the names of the server services. For example, the service for the Alert server is **IBM Spectrum Control - Alert Server**.
 - c. View the **Status** column to determine if the service is running or stopped.
 - d. Optional: If a server is not running and you want to restart it, right-click the service name for that server and click **Start**.

Opening PMRs and packaging IBM Spectrum Control system log files for IBM Software Support

To provide trace information to IBM Software Support about the performance of IBM Spectrum Control, you can open a PMR and package a set of log files. The log files contain trace information for component servers such as the Data server, Device server, Web server, and Alert server.

To package IBM Spectrum Control system log files, you must be assigned to the Administrator role.

The **Home > System Management** page shows an overview of IBM Spectrum Control system status, and can be used to troubleshoot performance problems. If you are unable to resolve the problems, click **Get Support** to open a PMR (Problem Management Record), collect log files, and upload a package of those log files to IBM Software Support.

When the IBM Spectrum Control component servers are running, they write trace information to log files. From the **System Management** page, you can save log files. When you save log files, IBM Spectrum Control packages the log files from all the component servers into a single compressed file that you can send to IBM Software Support.

Tip: Only one version of the log file package is retained at a time. When you create a new package, the previous package is overwritten.

Before you package the log files, you can, optionally, adjust the level of trace recording for each component server. For the Device server, you can adjust the trace level for individual services. By selectively setting trace levels, you can provide IBM Software Support with more information on particular component servers that are the suspected source of the problem. You can also reduce the trace level for a particular component server to improve system performance.

To package IBM Spectrum Control log files for IBM Software Support, complete the following steps:

1. In the menu bar, go to **Home > System Management**.
2. Optional: To adjust the trace level for any of the component servers, complete the following steps:
 - a. Click **Component Servers** in the **Components** section. In the **Component Servers** pane, you can view performance information for each component server. The current trace level for each component server and the Device server services is highlighted.
 - b. Adjust the trace level for a component server or a Device server service by clicking **Low**, **Medium**, or **High**.

Tip: If you adjust the trace level for one or more component servers, wait at least several hours before you package the log files. If you package the log files too soon after you adjust the trace levels, the logs will not contain enough traces at the new level. Before you create the logs, you might want to try to re-create the problem so that the log files contain the relevant trace data.

3. Click **Get Support** in the **General** section.
4. Optional: On the **Get Support** page, click **Open PMR** if you do not already have a PMR associated with your issue. A PMR is used by IBM Support to track and manage your issue and is required when you upload a log file package.
5. Click **Collect Log** to create a package of log files and upload that package to IBM Support. You can automatically upload the package to IBM Support, or you can upload it manually by using the FTP transfer methods that are described on the **Get Support** page. For more information about uploading and resolving any FTP-related problems when you upload the package, see “Troubleshooting FTP transfers” on page 129.

It can take 20 minutes or longer for IBM Spectrum Control to generate and package the log files. You can do other work or log out of IBM Spectrum Control while the package is being created. When the process completes, you can download the package by clicking the provided link on the System Management page.

Depending on the environment, the size of the log file package can vary. Its size is determined by the following factors:

- How frequently the product is used
- The number of resources that are monitored, the type of data that is being collected, and how frequently that data is collected
- The length of time that the product has been up and running

For example, if the product monitors five storage systems over a period of three days, and collects asset and performance each day, the size of the package might be 200 - 300 MB.

Troubleshooting FTP transfers

When you attempt to send files to IBM by using FTP, such as a log package from the System Management page or a compressed file from the service tool, the upload cannot be completed. This problem might occur because of network or firewall restrictions.

When IBM Spectrum Control uploads a log package to IBM Software Support, it is sent to the Enhanced Customer Data Repository (ECuRep) by using standard FTP protocol. The upload is secure and the data is encrypted with AES-128 key for each file part and RSA-2048 key for the key exchange. The name of the FTP server that receives the upload is `ftp.ecurep.ibm.com`.

If IBM Spectrum Control cannot connect to the FTP server because of firewall restrictions in your organization, you must open the necessary ports for FTP transfers from the IBM Spectrum Control server. Because standard, unencrypted FTP in passive mode is used for uploads (encryption is done at the data level, not the connection level), the firewall must be configured to allow passive FTP connections to `ftp.ecurep.ibm.com`. Contact your network administrator for assistance.

For older firewalls, open port 21 (the default FTP) and ports 65024 - 65535 (for passive FTP). For more information, see http://www.ibm.com/de/support/ecurep/send_ftp.html.

If your organization uses a proxy server for FTP, complete the following steps to troubleshoot uploads from IBM Spectrum Control:

1. Use a text editor to create a file that is named `ibmsdduu.config`.
2. In `ibmsdduu.config`, specify the proxy configuration to use.
 - a. To determine the specific information that must be included in `ibmsdduu.config` for your FTP proxy, review the following instructions:

SOCKS Server and HTTP Proxy Support

```
-socks4 enable SOCKS 4 support
-socks5 enable SOCKS 5 support
-http_proxy enable support for http proxy tunneling
```

`-socks4` `-sock5` and `-http_proxy` are exclusive, the last switch in command line is used

`-proxyhost=<host>` define the address of the proxy or SOCKS server

`-proxyport=<port>` define the port of the proxy.
default: 1080 for SOCKS4 and SOCKS5
8080 for http_proxy

`-proxyuser=<userid>` define the userid for the proxy or SOCKS server

`-proxypw=<password>` define the password for the proxy or SOCKS server

proxy userid and proxy password are optional

FTP Proxies

ftp proxy support is enabled with a separate command line option. This enables the combination of SOCKS server and a ftp proxy if necessary.

- ftp_proxytype=<type> enables ftp proxy support and define the type of the proxy. <type> is an integer, see ftp proxy types below
Default: 0 - no proxy
- ftp_proxyuser userid for the ftp proxy
- ftp_proxypw password for the ftp proxy
- ftp_proxyhost hostname or ip address of the ftp proxy
- ftp_proxyport port number of the ftp proxy
Default: 21

FTP Proxy Types

There are several ftp proxy types known. Each type is using a different login procedure and needs different commands to connect to the target ftp server.

In the list of supported ftp proxy types <server>,<user>,<password> are referring to the target ftp server, <p_user> and <p_passwd> to the ftp proxy account.

- ftp_proxytype=0
no ftp proxy is used (this is the default)
- ftp_proxytype=1
connect; USER <p_user>; PASS <p_passwd>;
SITE <server>; USER <user>; PASS <passwd>
- ftp_proxytype=2
connect; SITE <server>; USER <user>; PASS <passwd>
- ftp_proxytype=3
connect; USER <p_user>; PASS <p_passwd>;
OPEN <server>; USER <user>; PASS <passwd>
- ftp_proxytype=4
connect; OPEN <server>; USER <user>; PASS <passwd>
- ftp_proxytype=5
connect; USER <user>@<server>; PASS <passwd>
- ftp_proxytype=6
connect; USER <p_user>@<server>; PASS <p_passwd>;
USER <user>; PASS <passwd>
- ftp_proxytype=7
connect; USER <user>@<server> <p_user>;PASS <p_passwd>;
ACCT <passwd>
- ftp_proxytype=8
connect; USER <user>@<server> <p_user>;PASS <passwd>;
ACCT <p_passwd>
- ftp_proxytype=9
connect; USER <user>@<p_user>@<server>;PASS <passwd>;

- ```

ACCT <p_passwd>

-ftp_proxytype=10
connect; USER <user>@<p_user>@<server>;PASS <p_passwd>;
ACCT <passwd>

-ftp_proxytype=11
connect; USER <p_user>; PASS <p_passwd>;
USER <user>@<server>; PASS <passwd>

-ftp_proxytype=12 (CheckPoint Firewall 1)
connect; USER <user>@<p_user>@<server>
PASS <passwd>@<p_passwd>

```
- b. Based on the type of FTP proxy server that you use, copy and paste the appropriate section from step 2a into `ibmsdduu.config`.
  - c. For the section that you pasted into `ibmsdduu.config`, provide information such as host name, port, user ID, and password, as needed. For example:

```

-ftp_proxytype=1
-ftp_proxyuser=my_user_id
-ftp_proxypw=my_password
-ftp_proxyhost=ftp_proxy.my_company.com
-ftp_proxyport=21

```

Where:

    - `my_user_id` and `my_password` represent the authentication credentials for connecting to the FTP proxy server.
    - `ftp_proxy.my_company.com` represents the DNS name of the FTP proxy server.
  3. Save the file to `installation_dir/services`, where `installation_dir` represents the directory where IBM Spectrum Control is installed. The default installation directory is as follows:
    - Windows: `C:\Program Files\IBM\TPC`
    - Linux / AIX: `/opt/IBM/TPC`
  4. Try to upload the log package or compressed file again.

If you still cannot automatically upload a log package in the IBM Spectrum Control GUI, you can try uploading it manually. For information about how upload files to ECuRep manually, see the following topics:

- FTP Transfer
- Upload through browser

Log packages are stored on the IBM Spectrum Control server at the following location: `installation_dir/wlp/usr/servers/webServer/apps/WebServer.ear/TPC-GUI.war/serviceLog`

---

## Increasing the memory allocation for the Data server

If the data memory that is allocated for your Data server is insufficient, you can increase the memory. The default maximum memory for the Data server is set to 1024 MB.

You cannot increase the memory for the Device server. The memory for the Device server is set to the maximum heap size for the JVM.

## Increasing the memory allocation for the Data server that is running on AIX

Increase the memory allocation for the Data server that is running on AIX.

To increase the memory that is allocated for the Data server, complete the following steps:

1. Log on as a user with root authority.
2. Stop the Data server. From the command line, run the following command:  
`/TPC_install_directory/scripts/stopTPCData.sh`

Where *TPC\_install\_directory* is the installation directory. The default directory is `/opt/IBM/TPC`.

3. Using a text editor, open the `/TPC_install_directory/data/server/tpcdsrv1` file.
4. Locate the following line:

```
exec $JAVAEXE -Dsun.net.inetaddr.ttl=300 -Xrs -XmxXXXXm
-cp $CLASSPATH com.tivoli.itsrm.server.Server &
```

where XXXX is the memory allocated for the Data server. The default is 1024m (1024 MB).

5. Increase the memory that is allocated for the Data server. For example, to increase the memory to 1536 MB, change the line to read as follows:

```
exec $JAVAEXE -Dsun.net.inetaddr.ttl=300 -Xrs -Xmx1536m
-cp $CLASSPATH com.tivoli.itsrm.server.Server &
```

6. Save the modified `tpcdsrv1` file.
7. Start the Data server by running the following command:  
`/TPC_install_directory/scripts/startTPCData.sh`

## Increasing the memory allocation for the Data server that is running on Linux

Increase the memory allocation for the Data server that is running on Linux.

To increase the memory that is allocated for the Data server, complete the following steps:

1. Log on as a user with root authority.
2. Stop the Data server.
3. From the command line, run the following command:  
`/installation_dir/scripts/stopTPCData.sh`

Where *installation\_dir* is the installation directory. The default directory is `/opt/IBM/TPC`.

4. Using a text editor, open the `/installation_dir/data/server/tpcdsrv1` file.
5. Locate the following line:

```
exec $JAVAEXE -Dsun.net.inetaddr.ttl=300 -Xrs -XmxXXXXm
-cp $CLASSPATH com.tivoli.itsrm.server.Server &
```

Where XXXX is the memory that is allocated for the Data server. The default is 1024m (1024 MB).

6. Increase the memory that is allocated for the Data server. For example, to increase the memory to 1536 MB, change the line to read as follows:

```
exec $JAVAEXE -Dsun.net.inetaddr.ttl=300 -Xrs -Xmx1536m
-cp $CLASSPATH com.tivoli.itsrm.server.Server &
```

7. Save the modified `tpcdsrv1` file.
8. Start the Data server by running the following command:  
`/installation_dir/scripts/startTPCData.sh`

## Increasing memory allocation for Data server that is running on Windows

Increase the memory allocation for the Data server that is running on Windows.

To increase the memory that is allocated for the Data server, complete the following steps:

1. Open the Run window. For information about how to open the Run window, see “Accessing administration tools” on page 182.
2. Type `regedit` and click **OK**. The Registry Editor window is displayed.
3. Expand the **HKEY\_LOCAL\_MACHINE > SOFTWARE > Wow6432Node > IBM > TSRM > 1** in the Registry Editor window.
4. Right-click the **1** folder and click **New > String Value**.
5. Type `SRVJPAMS` as the name of the string.
6. Right-click the name of the string and click **Modify**.
7. Enter `-XmxXXXXm` in the **Value data** field, where `XXXX` represents the number of megabytes for the server maximum heap size. Click **OK**. The default size is 1024 MB. The largest possible value for the maximum heap size is 1536 MB. If the value is set to something larger than 1536, that value is ignored and 1536 MB is used as the maximum heap size.
8. Stop and restart the server to have the changes take effect. To stop the server, complete the following steps:
  - a. Open Windows Services. For information about how to open Services, see “Accessing administration tools” on page 182.
  - b. Right-click **IBM Spectrum Control - Data Server** and click **Stop**. To restart the server, right-click the service and click **Start**.

---

## Setting timeout values for the Device server

If a probe or discovery of a storage subsystem times out before the operation completes, you can increase the timeout values for the Device server.

If a probe or discovery of a storage subsystem times out before the operation completes, you receive the following error message:

```
HWN021650E Encountered timeout while connecting to CIMOM IP:port.
Check the CIMOM or increase timeout value.
```

where *IP* is the IP address, and *port* is the port number. If you determine that the Common Information Model Object Manager (CIMOM) is not the cause of the problem, you can use the command-line interface (CLI) to increase the timeout values for the Device server.

For those storage systems that use native interfaces to connect to IBM Spectrum Control you see this error message:

```
HWN020103E The external process exceeded the timeout limit and was cancelled.
```

The following storage systems use native interfaces to connect to IBM Spectrum Control:

- System Storage DS8000
- SAN Volume Controller
- The XIV
- IBM Spectrum Accelerate
- Storwize V3500
- Storwize V3700
- Storwize V7000
- Storwize V7000 Unified
- FlashSystem V840
- FlashSystem V9000
- IBM SONAS
- IBM Spectrum Scale
- IBM Cloud Object Storage

1. Run the **getdscfg** command to determine the current values of the timeout properties. From the command prompt, enter the following command:

```
cli>tpctool getdscfg -user user -pwd password -url host:port
-property timeout_property
```

where:

- *user* is an IBM Spectrum Control user ID.
- *password* is the password for the IBM Spectrum Control user ID.
- *host* is the host name or IP address, and *port* is a valid port number for the HTTP service of the Device server. The default value for *port* is typically 9550.
- *timeout\_property* is one of the following strings:
  - httpTimeout
  - CIMClientWrapper.Timeout
  - Probe.Timeout.Array
  - Probe.Timeout.LMM
  - Discovery.Timeout
  - CIMOMManager.TestConnectionTimeout

**Important:** Timeout properties are displayed in milliseconds. If the value is 0 (zero), it means that there is no timeout.

For the storage systems that use the native interface, the *timeout\_property* strings are:

- NAPI.Timeout.TestConnection
  - NAPI.Timeout.Probe
  - NAPI.Timeout.EventPoll
2. Run the **setdscfg** command to increase the timeout value. Run the following command:

```
cli>tpctool setdscfg -user user -pwd password -url host:port
-property timeout_property timeout_value
```


**Tip:** For IBM SONAS and Storwize V7000 Unified, the refresh of configuration data from the storage system can take some time to complete and might cause

the probe to time out, even if the timeout value is increased. To reduce the duration of the probe run for IBM SONAS and Storwize V7000 Unified, run the following command:

```
cli>tpctool setdscfg -user user -pwd password -url host:port
-property Probe.GetRecentSONASData -context DeviceServer false
```

This command changes the probe configuration to use cached configuration data from the storage system, which reduces the duration of the probe run. However, the information that is collected by the probe might be slightly out of date.

For more information about **tpctool**, go to the product documentation at

 [http://www.ibm.com/support/knowledgecenter/SS5R93\\_5.2.16/com.ibm.spectrum.sc.doc/fqz0\\_r\\_tpctool\\_command.html](http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/com.ibm.spectrum.sc.doc/fqz0_r_tpctool_command.html). You also can view help from the command line by issuing the command with the **-help** option.

---

## Changing passwords

IBM Spectrum Control provides a GUI and non-GUI password tool; however, both tools achieve the same purpose. It is recommended that you use the GUI password tool. Whichever tool you use, you must consistently use that tool for all future password updates.

If you installed IBM Spectrum Control and used the same DB2 user ID and password for the items IBM Spectrum Control requires, then when you change the DB2 password, you must also change the passwords for the items that the DB2 password applies to.

The DB2 administrative password might also apply to the following items:

- The database administration user ID and password (for the Data or Device server to connect to the database).
- The database user ID and password to create the database schema.
- The host authentication password (for the Storage Resource agents to communicate with the Device server).
- The Storage Resource agent service login user ID and password (for Windows only, if this user ID does not exist).

## Changing passwords by using the password tool

Use the password tool to change the passwords for DB2 and IBM Spectrum Control so that they can continue to authenticate to one another whenever you change a password.

If you are logged on to IBM Spectrum Control by using a domain user account, which is also a member of the local administrator group, when you run the change password tool, passwords are not updated. If you run the tool by using a local OS user account, and an error occurs, complete these steps.

To run the password tool when you log in by using a domain user account, choose one of the following steps:

- Right-click the `changepasswords.bat` file and select **Run as administrator**.
- Complete the following steps:
  1. Click **Start > All Programs > Open Administrative Tools > Local Security Policy**.

2. On the Local Security Policy window, disable **User Account Control: Run all administrators in Admin Approval Mode**.
3. Restart your computer.

### Single server installation where components use the same logon credentials

Use the password tool to change the password for IBM Spectrum Control when it is installed on a single server and the Common User and the DB2 User are identical and use the same logon credentials. The credentials are usually *db2admin* on a Windows operating system or *db2inst1* on AIX and Linux operating systems.

Before you use the password tool, ensure that you know the existing password or passwords that you want to change. Stop the IBM Spectrum Control servers.

Use the following steps to change the DB2 password in the Windows, AIX, or Linux operating systems. Then, use the IBM Spectrum Control password tool to update the IBM Spectrum Control servers to use the new DB2 password.

To change a password in the Windows operating system, follow these steps:

1. Open the Control Panel. For more information, see “Accessing administration tools” on page 182.
  - a. Select **User Accounts** and click **Change account type**.
  - b. Select the user account of the password that you want to change.
  - c. Select **Change password**.
  - d. Enter and confirm the new password and click **Change password**.

If the password, for the Windows domain user ID that you used as the IBM Spectrum Control Common User expired, change that password in the Windows domain before you continue. If you see the following error or a similar error after you run the password tool, verify that the password for your Common User Windows domain user ID did not expire:

```
com.tivoli.itsrm.tools.changepasswords.ChangePasswords error
SEVERE: The DB2 password is invalid.
```

If necessary, change the Common User Windows domain password and run the password tool again.

To change a password in the AIX or Linux operating system, follow these steps:

2. Log in as the root user.
  - a. Run the following command:
 

```
passwd username
```

Where *username* is the user whose password you want to change.
  - b. Enter the new password and confirm that new password is correct.

To use the IBM Spectrum Control password tool to update the IBM Spectrum Control servers to use the new password, follow these steps:

3. Open a command prompt and change the directory to the following directory:

#### Windows operating systems

*Spectrum\_Control\_Installation\_dir\service*

#### Linux or UNIX operating systems

*Spectrum\_Control\_Installation\_dir/service*

4. Start the password tool by running the following command:

#### Windows operating systems

*changepasswords.bat*



### Linux or UNIX operating systems

./changepasswords

5. Select **Change the IBM Spectrum Control and DB2 Passwords** and click **OK**.
6. Enter and then confirm the same new password that you entered when you changed the password in the operating system in Step 1 or Step 2. Verify that the **Restart servers** option is selected.
7. Click **OK**.
8. In the Confirm password change window, click **Yes**.
9. When the tool finishes, click **Back To Main**.
10. Click **Exit program**.

**Tip:** To verify that the password changes were successful, review the log file that is located in the *Spectrum\_Control\_installation\_dir\service\log* directory.

#### Related tasks:

“Single-server installation where components use different logon credentials”

Use the password tool to change the passwords for IBM Spectrum Control when it is installed on a single server and the Common User and the DB2 User are different and use different logon credentials.

“Multiple-server installation where DB2 is remote” on page 139

Use the password tool to change the passwords for IBM Spectrum Control when the IBM Spectrum Control database repository and the IBM Spectrum Control servers are installed on different servers.

#### Related reference:

“Stopping the IBM Spectrum Control servers by using scripts” on page 124

Run scripts to stop the IBM Spectrum Control servers on the Windows, Linux, or AIX operating systems.

### Single-server installation where components use different logon credentials

Use the password tool to change the passwords for IBM Spectrum Control when it is installed on a single server and the Common User and the DB2 User are different and use different logon credentials.

Before you use the password tool, ensure that you know the existing password or passwords that you want to change. Stop the IBM Spectrum Control servers.

Use the following steps to change the passwords in the Windows, AIX, or Linux operating systems. Then, use the IBM Spectrum Control password tool to update the IBM Spectrum Control servers to use the new passwords.

To change a password in the Windows operating system, follow these steps:

1. Open the Control Panel. For more information, see “Accessing administration tools” on page 182.
  - a. Select **User Accounts** and click **Change account type**.
  - b. Select the user account of the password that you want to change.
  - c. Select **Change password**.
  - d. Enter and confirm the new password and click **Change password**.

If the password, for the Windows domain user ID that you used as the IBM Spectrum Control Common User expired, change that password in the Windows domain before you continue. If you see the following error or a

similar error after you run the password tool, verify that the password for your Common User Windows domain user ID did not expire:

```
com.tivoli.itsrm.tools.changepasswords.ChangePasswords error
SEVERE: The DB2 password is invalid.
```

If necessary, change the Common User Windows domain password and run the password tool again.

To change a password in the AIX or Linux operating system, follow these steps:

2. Log in as the root user.
  - a. Run the following command:  
`passwd username`  
Where *username* is the user whose password you want to change.
  - b. Enter the new password and confirm that new password is correct.

To use the IBM Spectrum Control password tool to update the IBM Spectrum Control servers to use the new passwords, follow these steps:

3. Open a command prompt and change the directory to the following directory:

**Windows operating systems**

*Spectrum\_Control\_Installation\_dir\service*

**Linux or UNIX operating systems**

*Spectrum\_Control\_Installation\_dir/service*

4. Start the password tool by running the following command:

**Windows operating systems**

`changepasswords.bat`

**Linux or UNIX operating systems**

`./changepasswords`

5. To change the Common User's password in IBM Spectrum Control, do the following in the password tool:
  - a. Select **Change IBM Spectrum Control Passwords** and click **OK**.
  - b. Enter and then confirm the same new password that you entered when you changed the Common User's password in the operating system in Step 1 or Step 2.
  - c. Click **OK**.
  - d. In the Confirm password change window, click **Yes**.
  - e. When the process is completed, click **Back to Main**.
6. To change the DB2 User's password in IBM Spectrum Control, do the following in the password tool:
  - a. Select **Change DB2 password** and click **OK**.
  - b. Enter and confirm the same new password as you entered when changing the DB2 User's password in the operating system in Step 1 or Step 2. Verify that the **Restart servers** option is selected.
  - c. Click **OK**.
  - d. In the Confirm password change window, click **Yes**.
  - e. When the process is completed, click **Back to Main**.
7. Click **Exit Program**.

**Tip:** To verify that the password changes were successful, review the log file that is located in the *Spectrum\_Control\_installation\_dir\service\log* directory.

**Related tasks:**

“Single server installation where components use the same logon credentials” on page 136

Use the password tool to change the password for IBM Spectrum Control when it is installed on a single server and the Common User and the DB2 User are identical and use the same logon credentials. The credentials are usually *db2admin* on a Windows operating system or *db2inst1* on AIX and Linux operating systems.

“Multiple-server installation where DB2 is remote”

Use the password tool to change the passwords for IBM Spectrum Control when the IBM Spectrum Control database repository and the IBM Spectrum Control servers are installed on different servers.

**Related reference:**

“Stopping the IBM Spectrum Control servers by using scripts” on page 124

Run scripts to stop the IBM Spectrum Control servers on the Windows, Linux, or AIX operating systems.

**Multiple-server installation where DB2 is remote**

Use the password tool to change the passwords for IBM Spectrum Control when the IBM Spectrum Control database repository and the IBM Spectrum Control servers are installed on different servers.

For this procedure, the terms *Server A* and *Server B* denote the two servers. *Server A* has DB2 and the IBM Spectrum Control database repository installed. *Server B* has the IBM Spectrum Control servers installed.

Before you use the password tool, ensure that you know the existing passwords that you want to change. Stop the IBM Spectrum Control servers on *Server B*.

Use the following steps to change the passwords in the Windows, Linux, or AIX operating system on *Server A* and *Server B*. Then, use the IBM Spectrum Control password tool on *Server A* and *Server B* to update IBM Spectrum Control to use the new passwords.

To change a password in the Windows operating system, follow these steps:

1. Open the Control Panel. For more information, see “Accessing administration tools” on page 182.
  - a. Select **User Accounts** and click **Change account type**.
  - b. Select the user account of the password that you want to change.
  - c. Select **Change password**.
  - d. Enter and confirm the new password and click **Change password**.

If the password for the Windows domain user ID that you used as the IBM Spectrum Control Common User expired, change that password in the Windows domain before you continue. If you see the following error or a similar error after you run the password tool, verify that the password for your Common User Windows domain user ID did not expire:

```
com.tivoli.itsrm.tools.changepasswords.ChangePasswords error
SEVERE: The DB2 password is invalid.
```

If necessary, change the Common User Windows domain password and run the password tool again.

To change a password in the AIX or Linux operating system, follow these steps:

2. Log in as the root user.
  - a. Run the following command:

`passwd username`

Where *username* is the user whose password you want to change.

- b. Enter the new password and confirm that new password is correct.

To use the IBM Spectrum Control password tool to update IBM Spectrum Control to use the new passwords, follow these steps:

3. On *Server A*, open a command prompt and change the directory to the following directory:

**Windows operating systems**

`Spectrum_Control_Installation_dir\service`

**Linux or UNIX operating systems**

`Spectrum_Control_Installation_dir/service`

4. On *Server A* start the password tool by running the following command:

- For Windows operating system:  
`changepasswords.bat`
- For Linux or AIX operating system:  
`changepasswords`

5. Select **Change DB2 password** and click **OK**.
6. Enter and confirm the same new password as you entered when changing the DB2 User's password in the operating system in Step 1 or Step 2. Verify that the **Restart servers** option is selected.
7. Click **OK**.
8. In the Confirm password change window, click **Yes**.
9. When the process is completed, click **Back to Main**.
10. Click **Exit Program**.
11. On *Server B*, open a command prompt window and change the directory to the following directory:

**Windows operating systems**

`Spectrum_Control_Installation_dir\service`

**Linux or UNIX operating systems**

`Spectrum_Control_Installation_dir/service`

12. On *Server B* start the password tool by running the following command:

- For Windows operating system:  
`changepasswords.bat`
- For Linux or AIX operating system:  
`changepasswords`

13. To change the Common User's password in IBM Spectrum Control on *Server B*, do the following in the password tool:
  - a. Select **Change IBM Spectrum Control Passwords** and click **OK**.
  - b. Enter and then confirm the same new password that you entered when you changed the Common User's password in the operating system in Step 1 or Step 2.
  - c. Click **OK**.
  - d. In the Confirm password change window, click **Yes**.
  - e. When the process is completed, click **Back to Main**.
14. To change the DB2 User's password in IBM Spectrum Control on *Server B*, do the following in the password tool:
  - a. Select **Change DB2 password** and click **OK**.

- b. Enter and confirm the same new password as you entered when you changed the DB2 User's password in the operating system on *Server A* in Step 1 or Step 2. Verify that the **Restart servers** option is selected.
  - c. Click **OK**.
  - d. In the Confirm password change window, click **Yes**.
  - e. When the process is completed, click **Back to Main**.
15. Click **Exit Program**.

**Tip:** To verify that the password changes were successful, review the log file that is located in the *Spectrum\_Control\_installation\_dir\service\log* directory.

**Related tasks:**

"Single server installation where components use the same logon credentials" on page 136

Use the password tool to change the password for IBM Spectrum Control when it is installed on a single server and the Common User and the DB2 User are identical and use the same logon credentials. The credentials are usually *db2admin* on a Windows operating system or *db2inst1* on AIX and Linux operating systems.

"Single-server installation where components use different logon credentials" on page 137

Use the password tool to change the passwords for IBM Spectrum Control when it is installed on a single server and the Common User and the DB2 User are different and use different logon credentials.

**Related reference:**

"Stopping the IBM Spectrum Control servers by using scripts" on page 124

Run scripts to stop the IBM Spectrum Control servers on the Windows, Linux, or AIX operating systems.

## Changing passwords on AIX and Linux systems with no X Window System installed

Use the `changepasswords_noX.sh` script to change the passwords for IBM Spectrum Control on an AIX or Linux server that does not have the X Windows System installed.

Before you use the `changepasswords_noX.sh` script, ensure that you know the existing passwords that you want to change. Stop the IBM Spectrum Control servers.

Use the following steps to change the DB2 password in the Windows, AIX, or Linux operating systems. Then, use the IBM Spectrum Control `changepasswords_noX.sh` script to update the IBM Spectrum Control servers to use the new passwords.

To change a password in the AIX or Linux operating system, follow these steps:

1. Log in as the root user.
  - a. Run the following command:
 

```
passwd username
```

 Where *username* is the user whose password you want to change.
  - b. Enter the new password and confirm that new password is correct.

To use the IBM Spectrum Control `changepasswords_noX.sh` script to update the IBM Spectrum Control servers to use the new passwords, follow these steps:

2. Open a command prompt and change the directory to the following directory:  
*Spectrum\_Control\_Installation\_dir/service*
3. Start the *changepasswords\_noX.sh* script by running the following command:  
*./changepasswords\_noX.sh*
4. Enter the corresponding option for the password that you want to change: *tpc* or *db*.
5. Enter the same new password that you entered when you changed the user password in the operating system in Step 1.
6. When you are finished using the *changepasswords\_noX.sh* script, enter *quit* in the prompt window.

---

## Granting local administrative privileges to a domain account

Automatically grant administrative privileges to Windows domain accounts. The user account for the Storage Resource agent requires local administrative rights. Because these rights are not necessarily guaranteed for domain users in a Windows domain environment, you are shown how to grant local administrative rights to domain users. Using this procedure, you do not have to manually process each machine in the domain.

**Note:** These steps are for a Windows system that is a member of a Windows domain and not for the Windows Domain Primary Domain Controller.

To use Group Policy to grant local administrative privileges to a domain account, complete the following steps:

1. On the domain controller, go to **Administrative Tools > Active Directory Users and Computers** (you must be running with Domain Administrator privileges).
2. Right-click on the Organizational Unit (OU) upon which you want to apply the Group Policy. Click **Properties**.
3. The Group Policy Properties panel is displayed. Select the Group Policy tab and click **New** to create a Group Policy.
4. Designate a name for the new Group Policy. Select the new Group Policy and click **Edit**.
5. The Group Policy Object Editor panel is displayed. Go to **New Group Policy Object *your\_policy* > Computer Configuration > Windows Settings > Security Settings > Restricted Groups**. Right-click **Restricted Groups**, and then click **Add Group**.
6. For example, name the new group **Administrators**. Under **Properties**, add the user **Administrator**, and the domain accounts or groups upon which you want the Group Policy in effect for. For example, you can add **TPC\storageadmin**, **TPC\storagegroup**, and **TPC\TestGroup**. Click **OK**.
7. Add these user rights to the domain account:
  - Act as part of the operating system
  - Log on as a service

In the Group Policy Object Editor, go to **New Group Policy Object *your\_policy* > Computer Configuration > Windows Settings > Security Settings > Local Policies > User Rights Assignments**. In the content pane, select "Log on as a service" and double-click. Add the domain user for whom you are granting user rights and click **OK**. Repeat this step for "Act as part of the operating system."

8. The group policy is now enforced for the Organizational Unit to include the domain accounts and groups specified under the local **Administrators** group on

each computer in the Organizational Unit. In addition, the domain user has been granted the necessary rights. To verify the user rights, log in to a domain computer and open the Computer Management console. Select **Groups**, double-click the Administrators group, and verify the membership of the domain users.

---

## Maintenance and security fixes

IBM Spectrum Control provides regular maintenance packages that can include code fixes, security fixes, new features, and enhancements.

Three types of maintenance packages are available for IBM Spectrum Control:

- **Releases** represent a significant update to the product, which includes, but is not limited to, new features, enhancements to existing features, code fixes, and security fixes.
- **Refresh packs** are quarterly deliverables that update the modification level of a release, and include new features, enhancements to existing features, code fixes, and security fixes.
- **Fix packs** update the fix level of a release, and primarily include code and security fixes.

All types of maintenance packages are cumulative: a fix pack includes all previous fix packs; a refresh pack includes all the previous fix packs and refresh packs; a release includes all previous fix packs, refresh packs, and releases.

With each new maintenance package that is delivered, the product number changes. The following table provides example of product number changes when you install a package.

| Maintenance packages              | Product version change examples |
|-----------------------------------|---------------------------------|
| Release                           | 5.2                             |
| Refresh pack (modification level) | 5.2.1                           |
| Fix pack                          | 5.2.1.1                         |

A fix pack is installed on top of a specific modification level and release. If you install a fix pack that belongs to a newer level than your current fix pack, then your environment is automatically upgraded to the newer fix pack. For example:

- If you are on fix pack 1 (5.2.10.1) and you apply fix pack 2, then the version is changed to 5.2.10.2
- If you are on fix pack 1 (5.2.10.1) and you apply fix pack 3, then your environment is automatically updated to fix pack 3 and your version is changed to 5.2.10.3.

**Tip:** When you install a release, the modification level and fix pack number are reset to 0.

### Getting fixes from Fix Central

Fix Central is the recommended site for retrieving fixes for most IBM products. Fix Central enables customers to search, select, and download appropriate fixes for their situation. You can access Fix Central at <http://www.ibm.com/support/fixcentral/>.

## Managing security for IBM Spectrum Control

Maintenance and security fixes are regularly provided for the IBM Spectrum Control base product. The base product includes core technology and components such as WebSphere Application Server Liberty profile and the Java Runtime Environment.

When security issues or vulnerabilities are discovered in IBM Spectrum Control or its core components, IBM analyzes the product and distributes a fix or mitigation instructions, as appropriate. These issues are communicated through security bulletins on [ibm.com](http://ibm.com) and through discrete communication when necessary.

To find security bulletins, go to the following pages on [ibm.com](http://ibm.com):

- IBM Support portal
  - IBM Spectrum Control Standard Edition: [https://www.ibm.com/support/entry/myportal/alerts/tivoli/ibm\\_spectrum\\_control/ibm\\_spectrum\\_control\\_standard\\_edition?productContext=365750483](https://www.ibm.com/support/entry/myportal/alerts/tivoli/ibm_spectrum_control/ibm_spectrum_control_standard_edition?productContext=365750483)
  - IBM Spectrum Control Advanced Edition: [https://www.ibm.com/support/entry/myportal/alerts/tivoli/ibm\\_spectrum\\_control/ibm\\_spectrum\\_control\\_advanced\\_edition?productContext=80956291](https://www.ibm.com/support/entry/myportal/alerts/tivoli/ibm_spectrum_control/ibm_spectrum_control_advanced_edition?productContext=80956291)
- IBM Product Security Response Team blog at <https://www.ibm.com/blogs/psirt/>
- Interoperability Matrix at <http://www.ibm.com/support/docview.wss?uid=swg21386446>

## Managing security for related software

An IBM Spectrum Control installation also includes other products, such as DB2. You can monitor fixes for these related products in the same way that you do for IBM Spectrum Control on [ibm.com](http://ibm.com):

- IBM support portal for DB2: [https://www.ibm.com/support/entry/myportal/product/information\\_management/db2\\_for\\_linux\\_unix\\_and\\_windows](https://www.ibm.com/support/entry/myportal/product/information_management/db2_for_linux_unix_and_windows)
- IBM support portal for IBM WebSphere Application Server:  
[https://www.ibm.com/support/entry/myportal/product/websphere/websphere\\_application\\_server](https://www.ibm.com/support/entry/myportal/product/websphere/websphere_application_server)
- IBM Product Security Response Team blog at <https://www.ibm.com/blogs/psirt/>

Each product team is responsible for publishing their own security bulletins. Review any published security bulletins to identify affected versions and follow the remediation or fix information. If these products are affected, they might provide a maintenance fix. It is acceptable to apply a fix pack to these products to resolve security vulnerabilities or other problems.

**Restriction:** Upgrading to a new version or release of these products is not typically supported by IBM Spectrum Control and might result in compatibility issues. Even with fix pack updates, read the security bulletins carefully for any compatibility concerns. For example, if a common protocol is disabled, both the related product and IBM Spectrum Control must also accommodate a new protocol.




## Subscribing to support notifications

If you want to be notified automatically of security bulletins and flashes, you can subscribe to My Notifications. With My Notifications, you can specify that you want to receive daily or weekly email announcements. You can specify what type of information you want to receive (such as publications, hints and tips, product flashes (also known as alerts), downloads, and drivers). In My Notifications, you can customize and categorize the products about which you want to be informed and the delivery methods that best suit your needs.

To sign up for notifications, go to  <http://www.ibm.com/software/support/einfo.html>.

## Submitting a Problem Management Report (PMR)

If you encounter a technical product issue, you can submit a PMR. For more information about PMRs, see  What's a PMR?. If needed, the IBM Spectrum Control team can create a fix and deliver the fix in a future fix pack. IBM Spectrum Control will not deliver interim fixes for your specific issue. You need to wait for a fix pack that includes your fix, and then install the applicable fix pack.

---

## Collecting diagnostic information about IBM Spectrum Control

You can use the service tool to collect diagnostic information about IBM Spectrum Control. The tool detects the system configuration, collects the applicable information, and creates a compressed file that can be sent to IBM Software Support.

### Related tasks:

“Creating a compressed file for a Storage Resource agent” on page 148  
Run the service tool on Storage Resource agents that were deployed by using the web-based GUI to create a compressed file that can be sent to IBM Software Support.

“Collecting service logs for IBM Software Support troubleshooting” on page 147  
Run the service tool to create a compressed file of service logs that can be sent to IBM Software Support for problem determination.

### Related reference:

“Service tool overview”

The service tool collects information from all installed IBM Spectrum Control components. The tool detects the system configuration, collects the applicable information, and creates a compressed file that can be sent to IBM Software Support.

“How to customize the service tool” on page 149

The default behavior of the service tool is to collect data about all IBM Spectrum Control components, but you can use the service tool to collect data about specific components. You can also use command-line parameters to specify a location to place the data that is collected, specify that the data is compressed, or to specify both.

## Service tool overview

The service tool collects information from all installed IBM Spectrum Control components. The tool detects the system configuration, collects the applicable information, and creates a compressed file that can be sent to IBM Software Support.

The service tool collects the following information:

- Host name
- IP address and configuration information
- Operating system and version. On the Windows operating system, a `msInfo.txt` report is also generated
- Java home, version, and class path
- Java Virtual Machine (JVM) implementation name and version
- Protocol statistics
- Internet Protocol network connections for IBM Spectrum Control, including listening ports
- Diagnostic information about the system and its services
- Listing of all library files, for example, server and library and agent and library
- HOSTS file
- IBM Spectrum Control version and license files

When the service tool is run on the system where the Data server or the Device server are installed, it also collects the following information:

- For the Data server, information about all of the remote and local graphical user interfaces (GUIs) that are associated with it
- For the Device server, Alert server, and web server, information about their profiles in IBM WebSphere Application Server Liberty
- All applied interim fixes
- Installation logs
- The contents of the `log` and `logs` directory, including subdirectories
- The contents of the `conf` and `config` directory
- Directory listing of the `lib` and `bin` directory
- The contents of the `log` and `conf` subdirectories of the web directory
- For the IBM Spectrum Control GUI, information about its profile in the embedded WebSphere Application Server Liberty
- Information from the **`ipconfig /all`** command on Windows operating systems
- Information from the **`ipconfig -a`** command on Linux and AIX operating systems
- Information from the **`netstat -an`** command on all operating systems

When the service tool is run on the system where the database repository is installed, it also collects the DB2 support information.

When the service tool is run on the system where Tivoli Common Reporting component is installed, it also collects the following information:

- Logs for the deployment engine
- A listing of the Composite Offering Installer (COI) components that are installed
- InstallAnywhere logs for Tivoli Common Reporting
- Logs, configuration, and profile files for Jazz for Service Management
- Logs and configuration files for Tivoli Common Reporting that are located in the `reporting` directory in the Jazz for Service Management installation directory
- Information from the **`ipconfig /all`** command on Windows operating systems
- Information from the **`ifconfig -a`** command on Linux and AIX operating systems
- Information from the **`netstat -an`** command on all operating systems

When the service tool runs on the Storage Resource agent computer, it collects the following information:

- All applied interim fixes
- Everything in the config, log, nls, output, and service directories, including subdirectories
- Everything in the opt/IBM/CAP directory on Linux and AIX operating systems
- Directory listing of the ProgramData\Application Data\IBM\CAP directory on Windows operating systems
- Directory listing of the agent directory
- Directory listing of the bin directory
- Listing of version numbers for the Storage Resource agent component
- Information from the **ipconfig /all** command on Windows operating systems
- Information from the **ifconfig -a** command on Linux and AIX operating systems
- Information from the **netstat -an** command on all operating systems

By default, the service data is collected in one of the following directories:

For Windows operating systems:

*installation\_directory\service\data*

For Linux and AIX operating systems:

*installation\_directory/service/data*

For more information about changing the default directory, see “How to customize the service tool” on page 149.

You can run the service tool on IBM Spectrum Control regardless of whether you configured it on a single server or on multiple servers. The service tool automatically recognizes the installed components and collects service data about them. For more information about running the service tool for servers, see “Collecting service logs for IBM Software Support troubleshooting.”

## Collecting service logs for IBM Software Support troubleshooting

Run the service tool to create a compressed file of service logs that can be sent to IBM Software Support for problem determination.

You must have administrator authority on Windows operating systems or root authority on AIX and Linux operating systems.

The compressed file contains data about the following IBM Spectrum Control components: Alert server, Data server, Device Server, Web server, Storage Resource agent, DB2, Tivoli Common Reporting, CLI, and installation.

You can customize the service tool to collect data about specific IBM Spectrum Control components.

To run the service tool for all components, follow these steps:

1. Log on to the system where IBM Spectrum Control is installed.
2. If you used the default directory, go to the following directory:

**Windows operating systems:**

C:\Program Files\IBM\TPC\service\

**Linux or AIX operating systems:**

/user\_or\_opt/IBM/TPC/service/

3. Run the following program:

**Windows operating systems:**

service.bat

**Linux or AIX operating systems:**

service.sh

A compressed file, SCServiceFiles\_all.zip, is created in the following directory:

**Windows operating systems:**

*installation\_directory\wlp\usr\servers\webServer\serviceLog*

**Linux or AIX operating systems:**

*installation\_directory/wlp/usr/servers/webServer/serviceLog*

**Tip:** You can customize the data that is collected by the service tool. For more information, see “How to customize the service tool” on page 149.

**Related tasks:**

“Creating a compressed file for a Storage Resource agent”

Run the service tool on Storage Resource agents that were deployed by using the web-based GUI to create a compressed file that can be sent to IBM Software Support.

**Related reference:**

“How to customize the service tool” on page 149

The default behavior of the service tool is to collect data about all IBM Spectrum Control components, but you can use the service tool to collect data about specific components. You can also use command-line parameters to specify a location to place the data that is collected, specify that the data is compressed, or to specify both.

## Creating a compressed file for a Storage Resource agent

Run the service tool on Storage Resource agents that were deployed by using the web-based GUI to create a compressed file that can be sent to IBM Software Support.

You must have administrator authority on Windows operating systems or root authority on AIX and Linux operating systems.

To run the service tool on the Storage Resource agents, complete the following steps:

1. In the menu bar, go to **Servers > Servers**.
2. Right-click the server where the Storage Resource agent is deployed, and select **Logs > Collect Agent Logs**.

The following compressed files are created:

**Windows operating systems:**

C:\Program Files\IBM\TPC\data\log\SRATraces\SRA\_computer\_name\  
SCServiceInfo.zip

**AIX and Linux operating systems:**

`/opt/IBM/TPC/data/log/SRATraces/SRA_computer_name/SCServiceInfo.zip`

where *SRA\_computer\_name* represents the name of the computer on which the Storage Resource agent is located.

If the compressed file cannot be created, a message indicates that the job was unsuccessful.

For more information about the error, see the server log file or the services script information file. The files are in one of the following default directories:

**Server log file**

This file is on the system where IBM Spectrum Control is installed:

**Windows operating systems:**

`c:\Program Files\IBM\TPC\data\log`

**AIX or Linux operating systems:**

`/opt/IBM/TPC/data/log`

**Services script information file**

This file is on the computer on which the Storage Resource agent is installed:

**Windows operating systems:**

`c:\Program Files\IBM\TPC\SRA_computer_name\services\SCServiceInfo.log`

**AIX or Linux operating systems:**

`/opt/IBM/TPC/SRA_computer_name/services/SCServiceInfo.log`

For more information about customizing the data that is collected by the service tool, see “How to customize the service tool.”

**Related tasks:**

“Collecting service logs for IBM Software Support troubleshooting” on page 147  
Run the service tool to create a compressed file of service logs that can be sent to IBM Software Support for problem determination.

## How to customize the service tool

The default behavior of the service tool is to collect data about all IBM Spectrum Control components, but you can use the service tool to collect data about specific components. You can also use command-line parameters to specify a location to place the data that is collected, specify that the data is compressed, or to specify both.

### Specifying help and output command-line parameters

To obtain information about the service tool usage, use the **-help** command-line parameter.

To specify the data that is collected by the service tool, use the following command-line parameters when you run service tool:

**-output *directory\_path***

Places the files that contain the data that was collected in a directory that you

specify. If you specify a directory that does not exist on your system, that directory is created. If you do not use the **-output** *directory\_path* parameter, the files are placed in the default directory:

**Windows operating systems**

*installation\_dir\service\data*

**Linux or AIX operating systems**

*installation\_dir/service/data*

**Restriction:** If you specify a directory, the directory path cannot contain spaces. This restriction refers to the **-output** option.

**-pmr**

The number of the PMR to which the support information is related. Use the following format to enter the number: *nnnnn,nnn,nnn* where *n* represents a number, such as 12345,123,123. If you enter a value for the **-pmr** parameter, the service tool automatically uses FTP to upload the service information to IBM. If the service tool cannot upload the service information to IBM from the IBM Spectrum Control server, the generated file must be uploaded manually. The **-pmr** parameter is ignored if the **-nozip** parameter is used.

**-nozip**

When you use this parameter, the compressed collected data archives are no longer created. The service tool creates separate directories for each component for which data was collected. You can then create compressed archives for the collected files. In this way, you can control the size and content of each compressed file. To specify a directory other than the default directory, use the **-output** *directory\_path* parameter.

**Tip:** You can specify more than one parameter, for example, `C:\Program Files\IBM\TPC\service>service -install -nozip`.

## Collecting data for specific IBM Spectrum Control components

You can use the service tool to collect data about specific IBM Spectrum Control components.

Use the following parameters to specify the components:

**-all**

All components. The default behavior is to collect data about all components.

**-install**

Installation component files.

**-data**

Data Server component files.

**-device**

Device server component files.

**-alert**

Alert server component files.

**-sra**

Storage Resource agent component files.

**-db**

DB2 files.

**-cli**

Command-line interface files.

**-gui**

Collects data about GUI files.

**-tcr**

Jazz for Service Management and Tivoli Common Reporting data.

**Tip:** You can specify to collect data for more than one component, for example, C:\Program Files\IBM\TPC\service>service **-tcr -install -gui**.

If you collect information about a particular component, and you do not specify the **-nozip** parameter, you can identify the contents of a compressed service file from its name. For example, if you specify the **-tcr -install -gui** parameters but did not specify the **-nozip** parameter, a file named SCServiceFiles\_tcr\_install\_gui.zip is created.

**Note:** An existing compressed file is overwritten when another file of the same name is created. For example, if you run C:\Program Files\IBM\TPC\service>service **-db -gui**, a file named SCServiceFiles\_db\_gui.zip is created. If you rerun the tool with the same component options, a new file named SCServiceFiles\_db\_gui.zip is created. This new file overwrites the previously created file unless you specify the **-nozip** parameter, or use the **-output** parameter to specify a different path.

If you specify the **-nozip** parameter, a directory is created for the components that you specified in the parameter. If you did not specify a specific component, data is collected for all installed components, and the data is placed in files in the following directory:

**Windows operating systems:**

*installation\_dir\service\data*

**Linux or AIX operating systems:**

*installation\_dir/service/data*

Files for particular components are then placed in a directory that corresponds to that component. Common files, such as license.txt, are placed in the following directory:

**Windows operating systems:**

*installation\_dir\service\data*

**Linux or AIX operating systems:**

*installation\_dir/service/data*

**Restriction:** You cannot specify a specific component as a command-line parameter when you specify the **-all** parameter. Also, when you specify a component that is not installed on the computer, the service tool displays an error message.

---

## Administering the IBM Spectrum Control database

The IBM Spectrum Control database is the repository for information that is collected about the monitored resources in your environment.

## Backing up the database

Choose and then implement the DB2 backup method for securing the data that is collected and stored in the database for IBM Spectrum Control.

### Backup types

To back up your database, choose one of the following options:

#### Offline (Default)

When the data is being backed up, you can neither access nor connect to the database.

#### Online

When the data is being backed up, you can access and connect to the database. Unlike the offline option, the database remains available to you and the applications that use the database. To configure this option, requires a good knowledge of DB2.

### Output locations

To specify the location of the data that is backed up, choose one of the following options:

#### File system (Default)

Back up the data on a file system.

You can copy the file system that you specified to a removable tape or use IBM Spectrum Protect<sup>™</sup> to back up the file system.

#### IBM Spectrum Protect

Back up the data to IBM Spectrum Protect. To back up the data, use IBM Spectrum Protect Backup/Archive client and client API on the same computer that hosts the IBM Spectrum Control DB2 databases.

### Logging types

In the event of a system failure, the log files are used to recover data. You can choose either circular logging or archive logging.

The types of logging are:

#### Circular (Default)

This type of logging is used with IBM Spectrum Control for an offline backup.

#### Archive

This type of logging is used with an online backup. With archive logging, you can enable a rollforward recovery of the database to a specific date and time. A good knowledge of DB2 is needed to manage this type of logging.

#### Related concepts:

“Comparison of database backup methods” on page 153

The method that you choose to back up your data determines whether IBM Spectrum Control remains online or offline during the backup process.

#### Related information:

 [Restore overview](#)

 [Recover overview](#)



## **Comparison of database backup methods**

The method that you choose to back up your data determines whether IBM Spectrum Control remains online or offline during the backup process.

### **Advantages of an offline backup**

The advantages of the offline backup method are:

- The offline backup method is the default method and it is easier than the online method to configure and to maintain.
- The circular type of logging that is used for offline backups is easier to configure and maintain than the type of logging that is used for online backups.

### **Disadvantages of an offline backup**

The disadvantages of the offline backup method are:

- You must stop IBM Spectrum Control when you back up the data. So data is not collected and your storage resources are not being monitored during the back up process.
- You cannot collect performance data for the disk subsystems and SAN fabrics when data is being backed up.
- You might miss critical events, for example, failures within a SAN fabric, that occur during the backup process.

**Tip:** To minimize the loss of data for your storage resources and to ensure that you do not miss critical events, back up your data when your storage resources are not being used or when storage usage is low.

### **Advantages of an online backup**

The advantages of the online backup method are:

- You continue to collect data and monitor your storage resources during the backup process because you do not have to stop IBM Spectrum Control.
- You continue to receive alerts and can respond quickly to critical events at any time of day.
- You continue to collect performance data for your disk subsystems and SAN fabrics.

### **Disadvantages of an online backup**

The disadvantages of the online backup method are:

- The archive type of logging that is used with this type of backup is a more advanced method; it requires a good knowledge DB2 operation and administration.
- Software upgrades to IBM Spectrum Control that involve changes to the layout of the database might not complete successfully. In such cases, you can use circular logging to ensure that the software upgrade succeeds. You can switch back to archive logging after the software upgrade is installed.

#### **Related information:**

 DB2 documentation

 IBM Redbook: IBM Tivoli Storage Productivity Center Beyond the Basics

## Backing up the database offline using the command line

By default, the IBM Spectrum Control database (TPCDB) is configured to use circular logging that requires backups to be performed offline. You can use the command line to perform the offline backup.

To back up the database using a command line, complete the steps 1-8. To back up the database using IBM Data Studio client, complete the tasks in step 10:

1. Close the IBM Spectrum Control GUI.
2. Stop the IBM Spectrum Control services. For more information about how to stop the services, see “Stopping the IBM Spectrum Control servers by using scripts” on page 124.
3. On Windows operating systems, complete these steps to initialize the DB2 environment:
  - a. Open a command window.
  - b. Run the **db2cmd** command.

On Linux and AIX operating systems run the **db2profile** command.

**Restriction:** You must have DB2 administrator privileges to run these commands.

4. In the DB2 command window, run the **db2 force application all** command and the **db2 terminate** command to prevent all users or applications from accessing DB2.
5. In the DB2 command window, run the **db2 list applications** command to ensure that applications are not accessing DB2.
6. Create a directory to back up the DB2 output data.

**Tip:** Choose a directory location that has enough free space to hold the number of backups that you plan to retain. Use a separate file system rather than the file system that contains the DB2 database. You can choose to use a location that is a remotely mounted Common Internet File System (CIFS) or Network File System (NFS), so the backup data is secured to another server.

7. Run the backup command: `DB2 BACKUP DATABASE TPCDB USER user_name USING password TO location COMPRESS`


Where *user\_name* is the user who owns the DB2 instance where the IBM Spectrum Control database is located, *password* is the password that is associated with that user name, and *location* is the directory (created in step 7) where the backup is stored. Examples:

- Windows operating system: `DB2 BACKUP DATABASE TPCDB USER johndoe USING password1234 TO C:\DB_Backup COMPRESS`
- Linux and AIX operating systems: `DB2 BACKUP DATABASE TPCDB USER johndoe USING password1234 TO /tmp/DB_Backup COMPRESS`

8. Restart the IBM Spectrum Control services. For more information about how to start the services, see “Starting the IBM Spectrum Control servers by using scripts” on page 123. After the services are restarted, the backup is complete.

The offline database backup to a file system is run and the IBM Spectrum Control services are started again.


**Related reference:**

 <https://www.ibm.com/support/knowledgecenter/en/search/BACKUPDATABASEcommand?scope=SSEPGG>

“Stopping the IBM Spectrum Control servers by using scripts” on page 124  
Run scripts to stop the IBM Spectrum Control servers on the Windows, Linux, or AIX operating systems.

“Starting the IBM Spectrum Control servers by using scripts” on page 123  
Run scripts to start the IBM Spectrum Control servers on the Windows, Linux, or AIX operating systems.

#### Related information:

 IBM Data Studio documentation

 DB2 documentation

 IBM Redbook: IBM Tivoli Storage Productivity Center Beyond the Basics (Chapter 3)

### Backing up the database offline using IBM® Data Studio client

By default, the IBM Spectrum Control database (TPCDB) is configured to use circular logging that requires backups to be performed offline. You can use the IBM Data Studio client to perform the offline backup.

1. Stop the IBM Spectrum Control services.
2. Start the IBM Data Studio client. To start the IBM Data Studio client from a command window, enter:
  - On Windows operating system:  
`product_installation_directory\eclipse.exe`
  - On Linux operating system:  
`.product_installation_directory/eclipse`
3. On the New Connection page, select **DB2 for Linux, UNIX and Windows** and configure your IBM Spectrum Control database connection parameters.
4. Click **Next**.
5. On the Database Administration - IBM Data Studio page, expand **DB2**.
6. Right-click **DB2** and select **TPCDB > Back Up and Restore > Back Up**.
7. On the Back up TPCDB page, confirm the details of your database.
8. Click **Backup Type**.
9. Click **Backup Image** and select **File System** as the media type.
10. Click **Backup Options**.
11. In the Backup options compression and throttle section, select the **Compress backup image** and **Throttle this utility to regulate the performance impact on the database workload** check boxes.
12. Click **Backup Performance**. To accelerate the backup process, you can increase the number of table spaces and buffers.
13. After you have set all of the options, click **Run** or **Preview Command** to see the actual DB2 command that is run to backup the data.
14. Restart the IBM Spectrum Control services.

The offline database backup to a file system is run and the IBM Spectrum Control services are started again.

### Backing up the database online using IBM® Data Studio client

You can use the online method to back up a IBM Spectrum Control database and ensure continuous availability of the database and the applications that use it.

When you use the online backup method, DB2 does not clean up old archive log files. You need to have processes in place to clean up the old log files after a

specific amount of time to prevent the system from filling up. You also need to plan for the amount of space you might need. The log space that is required for a IBM Spectrum Control database can grow larger than the DB2 database over period of time.


To backup the database, complete these steps:

1. Open IBM Data Studio client.
2. Start the IBM Data Studio client. To start the product from a command window, enter:
  - On Windows operating system:  
`product_installation_directory\eclipse.exe`
  - On Linux operating system:  
`.product_installation_directory/eclipse`
3. On the New Connection page, select **DB2 for Linux, UNIX and Windows** and configure your IBM Spectrum Control database connection parameters.
4. Click **Next**.
5. On the Database Administration - IBM Data Studio page, expand **DB2**.
6. Right-click **DB2 for Linux, UNIX and Windows** and select **TPCDB > Set Up and Configure > Configure Database Logging**.
7. On the Configure Database Logging TPCDB page, click **Logging Type** and select **Archive**.
8. Click **Logging Size** and enter your log file size information. For example, 2500.
9. Click **Log Location** and enter the DB2 log path information.
10. On the Database Administration - IBM Data Studio page, expand **DB2**.
11. Right-click **DB2** and select **TPCDB** and select **Back Up and Restore > Back Up**.
12. Click **Backup Image** and select **File System** as the media type.
13. Click **Backup Options**.
14. In the Backup options compression and throttle section, select the **Compress backup image** and **Throttle this utility to regulate the performance impact on the database workload** check boxes.
15. Click **Backup Performance**. You can increase the number of table spaces and buffers, from the default values, to improve performance.
16. After you set all of the options, click **Run** or **Preview Command** to see the actual DB2 command that is run as part of the backup.

The online database backup to a file system is run and the backup is complete.

**Tip:** You can also perform an online backup of the IBM Spectrum Control databases to a Tivoli Storage Manager server. The significant difference between online and offline backup is the need to enable archive logging on the databases. When you use the online method, it provides many backup and recovery benefits at the expense of increased complexity in the database operation. Set up and test your DB2 to Tivoli Storage Manager integration before you implement the online method to the Tivoli Storage Manager output destination to verify the communication is working properly.


**Related information:**

 [IBM Data Studio documentation](#)

 [DB2 documentation](#)

## Restoring the database

To restore the IBM Spectrum Control database (TPCDB), use the IBM Data Studio client.

Download and install the IBM Data Studio client. For more information about how to download and install the IBM Data Studio client, see  <http://www.ibm.com/developerworks/downloads/im/data/>.

Before you can use the IBM Data Studio client to restore the IBM Spectrum Control database, you must add a connection to the database in the IBM Data Studio client.

### Restriction:

Do not restore the IBM Spectrum Control database from one version of IBM Spectrum Control into another version. For example, do not restore a backup from IBM Spectrum Control 5.2.14 into 5.2.15, or any other version.


1. Stop the IBM Spectrum Control services.
2. Start the IBM Data Studio client.
3. Click the **Administer** tab in the Data Studio client Task Launcher, then click **Connect and browse a database**.
4. On the Connection Parameters page, click **DB2 for Linux, UNIX, and Windows** and configure your IBM Spectrum Control database connection parameters.
5. Click **Next**.
6. On the Database Administration - IBM Data Studio page, expand **DB2**.
7. Right-click **TPCDB**, then click **Back Up and Restore > Restore**.
8. On the Restore Database TPCDB page, click **Restore backup to the current database** to set the restore type.
9. Click **Restore Objects**, and then click **Restore the entire database**.
10. Select the backup image that you want to restore.
11. On the Restore Database TPCDB page, click **Run**.
12. Restart the IBM Spectrum Control services.

### Related tasks:

“Starting the IBM Data Studio full client” on page 164

You can start the Data Studio full client on your workstation from either a menu option or the command line.

### Related information:

 IBM Data Studio documentation

 DB2 documentation

## Disaster recovery

Back up your database regularly to be prepared for disaster recovery if a disaster event occurs.

Disaster recovery is the rebuilding of a database or table space after a disaster event such as media or storage failure, power interruption, or application failure

occurs. If a disaster event occurs and a database or table space is damaged or corrupted, you can restore one of your backups.

**Related tasks:**

“Restoring the database” on page 157

To restore the IBM Spectrum Control database (TPCDB), use the IBM Data Studio client.

**Related reference:**

“Backing up the database” on page 152

Choose and then implement the DB2 backup method for securing the data that is collected and stored in the database for IBM Spectrum Control.

**Related information:**



Data recovery

## Maintaining and improving the performance of the database

You can use the database maintenance tool to calculate statistics for the IBM Spectrum Control database. The tool can also reorganize the database to restore efficiency and improve performance.

By default, the database maintenance tool runs the DB2 **runstats** command on all database tables that are used by IBM Spectrum Control. By using the **runstats** command, the database maintenance tool updates statistics about the characteristics of a table and its associated indexes. Because DB2 uses the statistics to determine access paths to data, when you run the database maintenance tool you help to ensure the effectiveness of the paths that are selected.

By specifying an option of the database maintenance tool, you can instruct the tool to reorganize the database tables, if necessary. A set of formulas are applied to the statistics that were collected about the database to determine if reorganization is necessary. Tables are reorganized by reconstructing rows to eliminate fragmented data and by compacting information. Index data is reorganized into unfragmented, physically contiguous pages.

You can customize the reorganization function in the database maintenance tool by updating a properties file. Properties determine which formulas can trigger database reorganization. You can specify properties that exclude tables from being reorganized based on size. Also, you can specify a property to force database reorganization.

### Updating database statistics

Use the database maintenance tool to update statistics about the databases that are used by IBM Spectrum Control. Because DB2 uses these statistics to select access paths to data, when you run the database maintenance tool, you can help to improve the effectiveness of the paths that DB2 selects.

Run the database maintenance tool to make substantial changes to the IBM Spectrum Control database, such as numerous table space updates, deletions, or insertions. The database maintenance tool uses the **RUNSTATS** command to update statistics about the physical characteristics of a table and the associated indexes.

**Note:**

The database maintenance script for updating statistics for IBM Spectrum Control can be run online or offline.

To update statistics for databases, follow these steps:

1. Log on to the computer where you installed IBM Spectrum Control.
2. Change the directory.

**Linux and UNIX operating systems**

/opt/IBM/TPC/data/server/tools/

**Windows operating systems**

C:\Program files\IBM\TPC\data\server\tools\

3. Enter the following command to run the database maintenance tool:

**Linux and UNIX operating systems**

runTPCDBMaintenance

**Windows operating systems**

runTPCDBMaintenance.bat

**Note:** To monitor the progress of a statistical update for the database, redirect your output to a file.

runTPCDBMaintenance > /tmp/tpcdb\_update\_stats.txt

## Reorganizing database tables

Use the database maintenance tool to analyze the database tables that are used by IBM Spectrum Control. If necessary, the database maintenance tool reorganizes the database tables and indexes.

The database maintenance tool uses a set of formulas to analyze the physical location of rows, and the size of the tables; it analyzes the indexes and their relationship to the table. If the calculated result of a formula exceeds set boundaries, the tool reorganizes the tables and indexes as needed. The tool reorganizes database tables, if necessary, by reconstructing rows to eliminate fragmented data. The tool reorganizes index data, if necessary, into unfragmented, physically contiguous pages.

### Tips:

- Run the database maintenance script for analyzing database tables while IBM Spectrum Control is offline; no database workload is present.
- Ensure that you have enough available space to reorganize the database tables. An offline reorg might require an amount of available space that is 2 to 3 times the size of the existing IBM Spectrum Control tables.

To analyze and reorganize databases, follow these steps:

1. Log on to the computer where you installed IBM Spectrum Control.
2. Change the directory.

**Linux and UNIX operating systems**

/opt/IBM/TPC/data/server/tools/

**Windows operating systems**

C:\Program files\IBM\TPC\data\server\tools\

3. Enter the following command to run the database maintenance tool to analyze and reorganize databases:

**Linux and UNIX operating systems**

runTPCDBMaintenance reorg

**Windows operating systems**

runTPCDBMaintenance.bat reorg

```
runTPCDBMaintenance reorg > /tmp/tpcdb_reorg.txt
```

**Note:** To monitor the progress of the database reorganization, redirect your output to a file.

## Customizing the reorganization function of the database maintenance tool

You can customize the database maintenance tool to specify which formulas determine whether a database is reorganized.

To specify which formulas can trigger a database reorganization, edit the properties in the `TPCDBMaintenance.properties` file. For example, you can customize the tool to ignore tables that are smaller or larger than the defined size limits, or customize it to always reorganize the database.

To analyze and reorganize databases, follow these steps:

1. Log on to the system where IBM Spectrum Control is installed.
2. Change to the following directory:

### Linux and UNIX operating systems

`/opt/IBM/TPC/data/server/tools/`

### Windows operating systems

`C:\Program files\IBM\TPC\data\server\tools\`

3. Open `TPCDBMaintenance.properties` in a text editor and modify the property settings as needed.

The f1-f8 properties all refer to the same formulas that are used by the DB2 **REORGCHK** command. For more information about any of these formulas, see the DB2 documentation about the **REORGCHK** command. For more information about any of these formulas, see the DB2 product documentation about the **REORGCHK** command at <http://www.ibm.com/support/knowledgecenter/SSEPGG/welcome>.

You can modify the following properties:

**f1= {true | false}**

Specifies whether the result of formula 1 can trigger a database table reorganization. Formula 1 checks the number of overflow rows in a table.

**f2= {true | false}**

Specifies whether the result of formula 2 can trigger a database table reorganization. Formula 2 checks the effective space utilization of data pages.

**f3= {true | false}**

Specifies whether the result of formula 3 can trigger a database table reorganization. Formula 3 checks the number of empty pages. Pages can become empty after rows are deleted.

**f4= {true | false}**

Specifies whether the result of formula 4 can trigger the reorganization of index data. Formula 4 checks the clustering ratio of an index.

**f5= {true | false}**

Specifies whether the result of formula 5 can trigger the reorganization of index data. Formula 5 checks the space that is reserved for index entries.



**f6= {true | false}**

Specifies whether the result of formula 6 can trigger the reorganization of index data. Formula 6 determines whether re-creating an index would result in a tree with fewer levels.

**f7= {true | false}**

Specifies whether the result of formula 7 can trigger the reorganization of index data. Formula 7 checks the number of pseudo-deleted RIDs on non-pseudo-empty pages.

**f8= {true | false}**

Specifies whether the result of formula 8 can trigger the reorganization of index data. Formula 8 checks the number of pseudo-empty leaf pages.

**maxReorgTableSize= {size\_in\_bytes | none}**

Specifies the maximum size that a database table must be to be considered for reorganization.

**minReorgTableSize= {size\_in\_bytes | none}**

Specifies the minimum size that a database table must be to be considered for reorganization.

**forceReorg= {true | false}**

Specifies whether the database is always reorganized by the database maintenance tool when the reorg argument is specified. If this property is set to true, all other properties in the file are ignored.

4. Save TPCDBMaintenance.properties.

## Repository copy tool

You can use the Repository copy tool, **repocopy**, to export all the tables in the IBM Spectrum Control database repository for purposes of debugging problems.

You can send the exported data to IBM Software Support to help debug problems.

**Tip:** If you want to export only performance data from the IBM Spectrum Control repository, you can create performance support packages. You can create performance support packages for storage systems or fabrics. For more information about exporting performance support packages, see [Exporting performance data for storage systems and fabrics](#).

## Exporting repository data

Use the Repository copy tool to export data from an existing repository into a text file.

To export repository data, follow these steps:

1. Go to the following default directory:

**Windows operating systems:**

c:\Program Files\IBM\TPC\data\server\tools

**Linux or AIX operating systems:**

/opt/IBM/TPC/data/server/tools

2. Issue the **repocopy** command:

**Windows operating systems:**

repocopy.bat

**Linux or AIX operating systems:**

repocopy.sh

3. Select **Export data from repository tables** and click **Next**.
4. In the Options for Import/Export window, enter information in the following fields:

**Directory for Export**

Enter the directory where the comma-delimited file is saved.

**Delimiter**

Enter a delimiter for the delimited file format (a comma is the default).

**Quote** Enter the symbol that contains string data (double quotation marks is the default).

IBM Spectrum Control exports the data into the comma-delimited file that you specify, and places it in a file named *tablename.txt*. Click **Next**.

5. Select one of the following options and click **Next**.
  - Export by using DB2 native format.
  - Export by using text files (the preferred method).
6. Select one of the following options and click **Next**.
  - Export base tables (always export the base tables)
  - Export Performance Manager tables, if requested by IBM Software Support
  - Export history tables that are used for Tivoli Storage Productivity Center for Data history reports, only if requested by IBM Software Support

The information that is detected in the *server.config* file is displayed in the Connection Properties window within the following fields:

- Database Types
- User name
- Password
- Driver Class
- Driver URL
- Database
- DB Creator
- Classpath

If you want to export data from a different database from the one listed in the *server.config* file, you can select the database from the **Database Types** list box. Manually enter the database information.

7. Click **Finish**.
8. Click **Run**.

As you progress through the export process, messages are written to a progress log that is displayed. You can track the steps through the progress log.

When the **repocopy** command is used with a remote database, the DB2 shared library is not available for loading the *libTSRMinsudb.so* file. You can ignore this message. Click **OK** and continue.

---

## Administering DB2

Administer DB2 by backing up the IBM Spectrum Control database, starting the IBM Data Studio full client, and starting and stopping DB2.

## Using the command line on UNIX and Linux

This topic describes how to use a command line to perform actions against a DB2 instance under UNIX or Linux.

If the DB2 Control Center is unavailable or you do not have access to a graphical user interface, you can use a command line to execute DB2 commands such as starting and stopping an instance.

**Important:** If you are using DB2 10.1, you must use the command-line interface.

To use a command line to perform actions against an instance of DB2, complete the following steps:

1. Log in with a user ID or name that has ROOT, SYSADM, SYSCTRL, or SYSMANT authority on the instance; or log in as the instance owner.
2. Run the startup script:
  - For Bourne or Korn shell, type: **. HOME/sqlllib/db2profile**.
  - For C shell, type: **source HOME/sqlllib/db2cshrc**.

where HOME is the home directory of the instance you want to use.

3. To start the instance using the command line, type **db2start**.

**Note:** When you run commands to start the database manager instance, the DB2 database manager applies the command to the current instance.

4. To stop the instance using the command line, type **db2stop**.

**Note:** When you run commands to stop the database manager instance, the DB2 database manager applies the command to the current instance.

## Manually starting DB2 on Windows

Start DB2 on Windows operating systems.

To start DB2 manually, complete the following steps:

1. Start the following Windows services:
  - DB2 - DB2-0
  - DB2DAS - DB2DAS00
  - DB2 JDBC Applet Server
  - DB2 License Server
  - DB2 Security Server
2. Open a DB2 command window.
3. From the DB2 Command window, run the **db2start** command.

## Manually stopping DB2 on Windows

Stop DB2 manually on Windows.

1. Stop the following Windows services:
  - DB2 Security Server
  - DB2 License Server
  - DB2 JDBC Applet Server
  - DB2DAS - DB2DAS00
  - DB2 - DB2-0

**Note:** When you stop the **DB2 Security Server** service, you are prompted to stop the Warehouse logger and Warehouse Serve. Click **Yes**.

2. To open a DB2 command window, click **Start > Programs > IBM DB2 > Command Line Tools > Command Window**.
3. From the DB2 Command window, issue the **db2stop** command.

To restart DB2, issue the **db2start** command from the DB2 Command window. Before you can issue the command, you must first start these services on the Windows Services panel:

DB2 - DB2-0  
DB2DAS - DB2DAS00  
DB2 JDBC Applet Server  
DB2 License Server  
DB2 Security Server

## Starting the IBM Data Studio full client

You can start the Data Studio full client on your workstation from either a menu option or the command line.

### Opening IBM Data Studio Administration client on Windows operating systems

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | <ol style="list-style-type: none"><li>1. On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b>.</li><li>2. On the Start page, right-click, and then click the <b>All apps</b> taskbar button.</li></ol> |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start &gt; All Programs</b> .                                                                                                                                                                                                                                                                        |

2. Click **IBM Data Studio > Data Studio Administration Client**.

### Open IBM Data Studio Administration client on Linux and AIX operating systems

On the command line, issue the following command:

```
DS_install_dir/eclipse
```

where `DS_install_dir` is the directory where you installed the full client.

```
/opt/IBM/DS3.1.1/eclipse
```

## Monitoring DB2

The minimum user authority level needed for monitoring DB2 instances is a user with DB2 system maintenance authority (SYSMAINT).

To check and set SYSMAINT authority, follow these steps:

1. Run this command in the DB2 command prompt window to check to see if there is an operating system user group defined to have SYSMAINT authority:  

```
db2 get dbm cfg
```

In the output file, look for this information:

|                     |                    |
|---------------------|--------------------|
| SYSADM group name   | (SYSADM_GROUP) =   |
| SYSCTRL group name  | (SYSCTRL_GROUP) =  |
| SYSMAINT group name | (SYSMAINT_GROUP) = |
| SYSMON group name   | (SYSMON_GROUP) =   |

If the setup for the operating system group has not been done, you do not see a value set.

If the setup has been done, this example shows what you can expect to see:

|                     |                                   |
|---------------------|-----------------------------------|
| SYSADM group name   | (SYSADM_GROUP) =                  |
| SYSCTRL group name  | (SYSCTRL_GROUP) =                 |
| SYSMAINT group name | (SYSMAINT_GROUP) = ADMINISTRATORS |
| SYSMON group name   | (SYSMON_GROUP) =                  |

In this example, the "ADMINISTRATORS" group has SYSMAINT\_GROUP authority.

2. If the setup has been done, add the user you want to use to the ADMINISTRATORS group using the operating system utilities or use a user that already belongs to the ADMINISTRATORS group.

If you want to give a user group "SYSMAINT\_GROUP" authority, follow these steps:

- a. If a user (for example userA) belongs to an operating system group called db2monitor, here is an example of setting the db2monitor group with SYSMAINT authority. From the DB2 command prompt window, run the following command:
 

```
db2 update dbm cfg using SYSMAINT_GROUP db2monitor
```
- b. After issuing the **db2 update** command, restart DB2 by running the following command from the DB2 command prompt window or restarting the system:
 

```
db2 force application all
```

This command might need to be issued a few times to stop all the database connections.

- c. Run the following commands from the DB2 command prompt window:
 

```
db2stop
db2start
```
- d. UserA can now monitor the DB2 database.



---

## Appendix A. Reference

View reference information that is related to IBM Spectrum Control. Topics include information about alerts, fabrics, commands, configuration and log files, performance metrics, protocols, standards, and accessibility features.

---

### Return codes used by Storage Resource agent

This topic lists the return codes used by the Storage Resource agent.

The following table lists the return codes used by the Storage Resource agent during installation, uninstallation, and upgrade.

*Table 5. Storage resource agent return codes*

| Return code | Explanation                                                                                                                                                              |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1           | There is a problem uninstalling the Fabric agent. For more information about what caused the uninstallation to fail, check the uninstallation logs for the Fabric agent. |
| 2           | Command not valid.                                                                                                                                                       |
| 3           | Option provided is not valid.                                                                                                                                            |
| 5           | Argument is not valid.                                                                                                                                                   |
| 6           | Missing value for argument (e.g. -installLoc <Value>, where <Value> is missing).                                                                                         |
| 7           | Missing localized string in message file.                                                                                                                                |
| 8           | Probe is running.                                                                                                                                                        |
| 9           | Failed to open file for write.                                                                                                                                           |
| 10          | Failed to close file.                                                                                                                                                    |
| 11          | Logfile not specified.                                                                                                                                                   |
| 19          | Failed in tracing.                                                                                                                                                       |
| 21          | Cannot spawn a probe because it is busy.                                                                                                                                 |
| 30          | This is an internal error in initializing tracing. Save the error message and error log and contact your service representative for assistance in resolving the error.   |
| 32          | Invalid socket.                                                                                                                                                          |
| 33          | Start service failed.                                                                                                                                                    |
| 34          | Registry entry not found.                                                                                                                                                |
| 35          | Deployment of the agent failed, error creating startup scripts.                                                                                                          |
| 36          | File does not exist.                                                                                                                                                     |
| 40          | Missing upgrade files.                                                                                                                                                   |
| 41          | Failed to extract files in upgrade process.                                                                                                                              |
| 42          | Failed to stop probe in upgrade process.                                                                                                                                 |
| 43          | Failed to stop Agent.                                                                                                                                                    |
| 44          | Failed to start Agent.                                                                                                                                                   |
| 45          | Agent Registration to server failed.                                                                                                                                     |

Table 5. Storage resource agent return codes (continued)

| Return code | Explanation                                                                                                                                                                                                            |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 46          | File extraction needs more space.                                                                                                                                                                                      |
| 47          | Failed to open archive file.                                                                                                                                                                                           |
| 48          | Agent did not start after upgrade.                                                                                                                                                                                     |
| 49          | Installation directory not valid at upgrade time.                                                                                                                                                                      |
| 50          | Probe is running.                                                                                                                                                                                                      |
| 51          | Data file not found.                                                                                                                                                                                                   |
| 52          | Exit code not in the output file.                                                                                                                                                                                      |
| 53          | Failed to send job status.                                                                                                                                                                                             |
| 54          | Failed to copy certificate files.                                                                                                                                                                                      |
| 55          | Failed to create directory.                                                                                                                                                                                            |
| 56          | Failed to remove directory.                                                                                                                                                                                            |
| 57          | Exec command failed.                                                                                                                                                                                                   |
| 58          | Conversion of wide character failed.                                                                                                                                                                                   |
| 59          | Installation directory not valid.                                                                                                                                                                                      |
| 60          | Server name not defined.                                                                                                                                                                                               |
| 61          | Error in removing entries from configuration file.                                                                                                                                                                     |
| 62          | Failed to stop probe at uninstall time.                                                                                                                                                                                |
| 63          | Failed to remove registry entry at uninstall time.                                                                                                                                                                     |
| 64          | Failed to remove service entry at uninstall time.                                                                                                                                                                      |
| 65          | Failed to stop service at uninstall time.                                                                                                                                                                              |
| 66          | Specified server name is not valid.                                                                                                                                                                                    |
| 67          | There is an error installing the Storage Resource agent as part of the migration process. For more information about what caused the installation to fail, check the installation logs for the Storage Resource agent. |
| 71          | Failed to spawn process.                                                                                                                                                                                               |
| 73          | Failed to spawn probe process.                                                                                                                                                                                         |
| 101         | Failed to create lock at installation time.                                                                                                                                                                            |
| 102         | Failed to stop probe at re-installation time.                                                                                                                                                                          |
| 103         | Failed to stop agent at re-installation time.                                                                                                                                                                          |
| 104         | Failed to create registry at installation time.                                                                                                                                                                        |
| 105         | Failed to extract files at installation time.                                                                                                                                                                          |
| 106         | Failed to create entries in configuration file at installation time.                                                                                                                                                   |
| 107         | Failed to stop service at re-installation time.                                                                                                                                                                        |
| 108         | Service already exists.                                                                                                                                                                                                |
| 109         | Failed to create service.                                                                                                                                                                                              |
| 110         | Failed to start service.                                                                                                                                                                                               |
| 111         | Probe failed at installation time.                                                                                                                                                                                     |
| 112         | Creation of daemon failed.                                                                                                                                                                                             |
| 113         | Installation of GUID failed.                                                                                                                                                                                           |
| 114         | Commtype parameter is not valid.                                                                                                                                                                                       |



Table 5. Storage resource agent return codes (continued)

| Return code | Explanation                                                                                                                                                                                                                                                                                             |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 115         | Specified port is in use.                                                                                                                                                                                                                                                                               |
| 116         | Installation/Upgrade does not have enough space.                                                                                                                                                                                                                                                        |
| 117         | Installation in progress.                                                                                                                                                                                                                                                                               |
| 118         | Cannot get server name from Server.                                                                                                                                                                                                                                                                     |
| 119         | Installation location is not empty.                                                                                                                                                                                                                                                                     |
| 120         | Missing parameter Server Name.                                                                                                                                                                                                                                                                          |
| 121         | Missing parameter Server Port.                                                                                                                                                                                                                                                                          |
| 123         | Missing parameter Server IP.                                                                                                                                                                                                                                                                            |
| 124         | Missing parameter Agent Port.                                                                                                                                                                                                                                                                           |
| 125         | Missing parameter Installation location.                                                                                                                                                                                                                                                                |
| 126         | A value has not been specified for parameter userID. A value for this parameter is required when using RXA-based communication to deploy a Storage Resource agent as a non-daemon service. IBM Spectrum Control uses this user ID when connecting to the computer on which the agent will be installed. |
| 127         | Deployment from Windows to Linux failed.                                                                                                                                                                                                                                                                |
| 130         | Failed to send probe results.                                                                                                                                                                                                                                                                           |
| 131         | Failed to initialize Agent.                                                                                                                                                                                                                                                                             |
| 133         | Missing port number for Service.                                                                                                                                                                                                                                                                        |
| 134         | Get data file stat failed.                                                                                                                                                                                                                                                                              |
| 135         | Get data file read failed.                                                                                                                                                                                                                                                                              |
| 137         | Failed to send data to server.                                                                                                                                                                                                                                                                          |
| 138         | Failed to receive data from server.                                                                                                                                                                                                                                                                     |
| 139         | Full path not specified for copy file.                                                                                                                                                                                                                                                                  |
| 140         | Create file failed in copy file function.                                                                                                                                                                                                                                                               |
| 141         | Write file failed in copy file function.                                                                                                                                                                                                                                                                |
| 142         | Open file failed in copy file function.                                                                                                                                                                                                                                                                 |
| 143         | Read file failed in copy file function.                                                                                                                                                                                                                                                                 |
| 145         | UCS conversion failed.                                                                                                                                                                                                                                                                                  |
| 146         | Server connection failed.                                                                                                                                                                                                                                                                               |
| 148         | Failed to create zip file.                                                                                                                                                                                                                                                                              |
| 149         | Failed to unzip file.                                                                                                                                                                                                                                                                                   |
| 160         | Failed to send scan results.                                                                                                                                                                                                                                                                            |
| 161         | Failed to send TSM status results.                                                                                                                                                                                                                                                                      |
| 164         | Failed to validate user.                                                                                                                                                                                                                                                                                |
| 165         | Job file was not found.                                                                                                                                                                                                                                                                                 |
| 166         | Job was not stopped.                                                                                                                                                                                                                                                                                    |
| 168         | Not enough free space available while copying file from server.                                                                                                                                                                                                                                         |
| 169         | Multipath driver not found.                                                                                                                                                                                                                                                                             |
| 170         | Multipath device not found.                                                                                                                                                                                                                                                                             |
| 171         | Multipath policy is not supported.                                                                                                                                                                                                                                                                      |

Table 5. Storage resource agent return codes (continued)

| Return code | Explanation                                                   |
|-------------|---------------------------------------------------------------|
| 172         | Only Round Robin policy is supported for Multipath DM driver. |
| 175         | The command failed to run.                                    |
| 176         | The command ran, but failed to complete successfully.         |

---

## Agent types for monitoring fabrics and switches

Depending on the type of switch you want to manage, you can use a CIM agent or SNMP agent as the data source for the switch.

Table 6. Agent types for switch and fabric functions

| Function                                                      | Brocade   | Cisco      | Other                                                                   |
|---------------------------------------------------------------|-----------|------------|-------------------------------------------------------------------------|
| Monitor performance                                           | CIM agent | SNMP agent | Other fabric vendor switches cannot be used for performance monitoring. |
| Collect information about switches and switch ports           | CIM agent | SNMP agent | CIM agent or SNMP agent                                                 |
| Collect information about topology connectivity               | CIM agent | SNMP agent | CIM agent or SNMP agent                                                 |
| Collect information about zoning information and zone control | CIM agent | SNMP agent | CIM agent                                                               |
| Generate alerts                                               | CIM agent | SNMP agent | CIM agent or SNMP agent                                                 |

Check the IBM Spectrum Control interoperability matrix for switches and directors for information about the switches and directors that are supported by IBM Spectrum Control, and limitations that you need to know about when you use these devices.

---

## Supported storage systems providing full disk encryption and solid-state drives

IBM Spectrum Control supports full disk encryption and solid-state drives in the IBM System Storage DS8000 and IBM System Storage DS5000 Storage Manager systems described in this topic.

### DS8000 4.2 and later

IBM Spectrum Control supports full disk encryption and solid-state drives in DS8000 4.2 and later.

### IBM System Storage DS5000 Storage Manager series

IBM Spectrum Control supports full disk encryption and solid-state drives in the following DS5000 series systems:

- DS5100 and DS5300 - full disk encryption, solid-state drives, 1 TB SATA drives
- DS5020 - full disk encryption

To support full disk encryption and solid-state drives in DS5000, the LSI SMI-S Provider is required. For more information about the LSI SMI-S Provider, see the LSI website at <http://www.lsi.com>.

---

## agent.sh command

The **agent.sh** command lets you start, stop, and restart the Storage Resource agent. You can also display the status and version of the Storage Resource agent.

### Note:

- You must have root authority to run this command.
- For Windows, the status, stop, and start functions are handled through the Windows Services panel.

►—agent.sh—┐ status ┐ start ┐ stop ┐ restart ┐ version ┐ versionall ┐►

Parameters:

### status

Displays the current status of the Storage Resource agent. The status is returned is running or not running.

### start

Starts the Storage Resource agent.

### stop

Stops the Storage Resource agent.

### restart

Stop and then start the Storage Resource agent.

### version

Displays the current version of the Storage Resource agent.

### versionall

Displays the version of the Storage Resource agent and its related components.

---

## Configuration files

Use the parameters in IBM Spectrum Control configuration files to help resolve problems.

The parameters in the configuration files are case-sensitive.

The default *installation\_dir* for IBM Spectrum Control installations is as follows:

### Windows operating systems:

c:\Program Files\IBM\TPC

### Linux or AIX operating systems:

/opt/IBM/TPC

The default file locations for the configuration files for IBM Spectrum Control are as follows:

### IBM Spectrum Control:

#### Windows operating systems:

*installation\_dir*\config

**Linux or AIX operating systems:**  
*installation\_dir/config*

**Data server:**

**Windows operating systems:**  
*installation\_dir\data\config*

**Linux or AIX operating systems:**  
*installation\_dir/data/config*

**Device server:**

**Windows operating systems:**  
*installation\_dir\device\conf*

**Linux or AIX operating systems:**  
*installation\_dir/device/conf*

**Storage Resource agent:**

**Windows operating systems:**  
*installation\_dir\agent\config\agent.config*

**Linux or AIX operating systems: operating systems:**  
*installation\_dir/agent/config/agent.config*

**Restriction:** On Windows installations, if you installed IBM Spectrum Control by using a domain user account, you must disable User Account Control to edit the configuration files.

## server.config file

The following information lists the parameters that are set in the server.config file. These parameters include controller, logging, repository, and service.

### Controller parameters

**name** The Data Manager server name is the name of the host computer.

**port** The port on which the server listens for requests. The default is 9549.

**maxConnections**

The maximum number of concurrent sockets that the server opens. The default is 500.

**routerThreads**

The number of threads that redirect incoming requests to the appropriate service provider. The default is 1.

**serviceThreads**

The number of threads to allocate for the internal service provider of the server. The default is 2.

**agentErrorLimit**

The number of consecutive attempts to reach an agent before the agent is displayed as DOWN. The default is 3. When an agent is in this state, no attempts to connect are made until either the agent contacts the server or the agent status is manually changed to UP.

**adminGroup**

The name of the group a user must be a member of to perform administrative functions from the GUI, the default is adm.

**commEncrypted**

The switch that secures communication between the Server or Agent and the Server/GUI by encrypting the DataStream.

- 0 = Off. Do not encrypt the DataStream.
- 1 = On. Encrypt the DataStream.

**FileSystemScan NFSTimeout**

Determines the numbers of seconds that a Storage Resource agent waits for a status system call on a Network File System (NFS) before it times out.

**hostAlias**

This parameter is displayed if the HOST\_ALIAS is not specific and represents the name of the server. The value for this parameter is used when multiple computers have the same name or the name cannot be determined.

**Logging parameters****logsKept**

The number of server logs to keep. The default is 5.

**messagesPerLog**

The maximum number of messages in a log. When this number is reached the log is closed and a new log is created. The default is 100,000.

**Repository parameters**

**driver** The name of the JDBC driver to use, normally:

- DB2: COM.ibm.db2.jdbc.app.DB2Driver

**url** The URL used to connect to the database, normally:

- DB2: jdbc:db2:*database\_name*

**user** The user name that IBM Spectrum Control uses to connect to the repository.

**connectionPool**

The number of database connections in a pool of reusable open connections. The default is 10.

**Service parameters**

**name** Repeating section that indicates the service providers that are required to start.

The REQUIRED parameters are as follows:

- TStorm.server.svp.GuiSvp
- TStorm.server.svp.AgentSvp
- scheduler.Scheduler

**scheduler.config file**

The following information lists the parameters that are set in the scheduler.config file. These parameters include concurrency parameters and jobs parameters.

**Concurrency parameters****maxSubmitThreads**

The maximum number of threads to create that handle the submission of jobs. The default is 3.

**maxCompleteThreads**

The maximum number of threads to create to handle job completions. Initially creates a pool of half the number of threads specified that can grow to the maximum. The default is 3.

**Jobs parameters****minutesAdvanced**

The number of minutes in advance of scheduled time to begin the scheduling process. The default is 1. Use this option to allow for the processor time that is involved in scheduling a job so that the job starts close to the scheduled time.

**delayLimitMinutes**

Number of minutes after scheduled start time that the Scheduler continues to attempt to start a job for a selected resource, so that resource state is not in a down state or, connection status is not in a failed state. The default is 120.

**Location of the scheduler.config file**

The scheduler.config file is in the following directories:

**Windows operating systems:**

*installation\_dir\data\config*

**Linux or AIX operating systems:**

*installation\_dir/data/config*

**TPCD.config file**

The list of parameters that are set in the TPCD.config file include server parameters and GUI parameters.

The following list describes the server parameters:

**threadPoolSize**

Number of initial threads to create for handling requests. The default is 3.

**abbreviatedProbe**

Only SCSI commands are sent to disk drives for inquiry and disk capacity information. The default is 1.

**maxThreads**

Set the maximum number of threads for handling requests. The default is 8.

**pingReceiveTimeout**

Number of seconds to wait before it indicates that a ping failed. The default is 10.

**skipAutoFS**

Set to 1 if you want to skip the **automount** process during discovery on the Oracle Solaris Storage Resource agent. By default, discovery always processes **automount** on all Oracle Solaris Storage Resource agents managed by the Data server.

**saveNonRoot**

Set to 1 if you want to monitor non root exports. The default is 0.

If you do not set this parameter, the export paths that are not at the root of the file system are discarded. If the NAS server has only non root exports accessible to the agent, it will not be added. Restart the Data server for this setting to take effect.

#### **batchPartitionWaitRetryCount**

Specify the number of times that the Storage Resource agent tries to get a report partition before the Storage Resource agent fails with an error.

Large batch reports are generated in partitions. The partitions are placed on the IBM Spectrum Control server, and the Storage Resource agent gets them from the server when the batch report is created.

The following list describes the GUI parameters:

#### **threadPoolSize**

Number of initial threads to create for handling user interface requests. The default is 3.

#### **maxThreads**

Set the maximum number of threads for handling user interface requests. The default is 10.

#### **reportRowLimit**

Maximum number of rows that are sent at a time to the user interface. If this number is exceeded, a **More** button is displayed over the table, along with a warning message. The default is 5000.

#### **keepCachedReport**

Number of minutes to retain incomplete reports in the tmp directory for the server. The default is 120.

## **Specifying the tablespace size for IBM Spectrum Control**

This section provides information on the size of the tablespace to specify when you install IBM Spectrum Control

When you install IBM Spectrum Control, you can specify the tablespace size of the repository database or accept the default values. The space needed for the IBM Spectrum Control database schema varies significantly with storage network configuration, data collection, data retention period, and other factors.

The following table provides space estimates for a storage configuration containing 5000 volumes with some general assumptions.

*Table 7. Tablespace allocation for the IBM Spectrum Control database schema*

| <b>Tablespace</b> | <b>Description of tablespace usage</b>                                                                                                                                                                                  | <b>Recommended size for a 5000 volume configuration</b> | <b>Assumptions</b>                                                                                                                                                                                                                     |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| KEY               | This tablespace is used for configuration data which is constantly used. For example, the key entity and relationships data (T_RES_STORAGE_SUBSYSTEM, T_RES_STORAGE_VOLUME, and the normalization tables, and so forth) | 500 MB                                                  | A table that uses significant space is T_RES_DATA_PATH. This table uses about 300 bytes for each record for the relationship between the storage volumes and host ports. There could be dozens to hundreds of data paths for a volume. |

Table 7. Tablespace allocation for the IBM Spectrum Control database schema (continued)

| Tablespace | Description of tablespace usage                                                            | Recommended size for a 5000 volume configuration | Assumptions                                                                                                                                                                                                                                                                                                                                                                                           |
|------------|--------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NORMAL     | This tablespace is used for snapshots and miscellaneous data                               | 500 MB                                           | A table that uses significant space is T_RES_STORAGE_VOLUME_SNAPSHOT. This table uses about 2500 bytes for each record. The number of snapshots depends on the data collection activities.                                                                                                                                                                                                            |
| BIG        | This tablespace is used for performance statistics                                         | 2 to 3 GB or 400 MB per day of performance data  | The data collected for performance data for storage volumes can use a significant amount of space (about 200 bytes for each record). For 5000 volumes, if performance data is collected every 5 minutes, the data for one day would be 300 MB. If the data is kept for 7 days, the data collected would take about 2 to 3 GBs. If the data is kept longer, the storage must be scaled up accordingly. |
| TEMP       | This tablespace is used for temporary data for query processing and other temporary tables | 1GB                                              |                                                                                                                                                                                                                                                                                                                                                                                                       |

## agent.config file

The agent.config file contains configuration parameters for the Storage Resource agent. These parameters are set when the Storage Resource agent is installed. The parameters can also be changed manually by editing the file.

The following list contains the parameters for the agent.config file.

### Servername

Fully qualified host name of the system on which the Data server is installed.

### Portnumber

Port on which the Data server listens for communications from the Storage Resource agent. By default, the port is set to 9549.

### IPAddress

IP address of the server on which the Data server is installed.

---

## Log files

When you have a problem, you can check several product log files.

## Default locations of log files

Check the log files to view detailed information about IBM Spectrum Control processing and to troubleshoot problems.

The following list shows the default log file locations for IBM Spectrum Control and other components.



**Device server:**

The IBM WebSphere Liberty Profile log files for the Device server are in the following directories:

**Windows operating systems**

*installation\_dir\wlp\usr\servers\deviceServer\logs*

**Linux or AIX operating systems:**

*installation\_dir/wlp/usr/servers/deviceServer/logs*

The operational log files for the Device server are in the following directories:

**Windows operating systems:**

*installation\_dir\device\log*

**Linux or AIX operating systems:**

*installation\_dir/device/log*

**Alert server:**

The IBM WebSphere Liberty Profile log files for the Alert server are in the following directories:

**Windows operating systems**

*installation\_dir\wlp\usr\servers>alertServer\logs*

For example: C:\Program Files\IBM\TPC\wlp\usr\servers>alertServer\logs

**Linux or AIX operating systems:**

*installation\_dir/wlp/usr/servers/alertServer/logs*

The operational log files for the Alert server are in the following directories:

**Windows operating systems:**

*installation\_dir>alert\log*

For example: C:\Program Files\IBM\TPC>alert\log

**Linux or AIX operating systems:**

*installation\_dir/alert/log*

**Data server:****Windows operating systems:**

*installation\_dir\data\log*

**Linux or AIX operating systems:**

*installation\_dir/data/log*

**Web server log files:****Windows operating systems:**

*installation\_dir\wlp\usr\servers\webServer\logs*

**Linux or AIX operating systems:**

*installation\_dir/wlp/usr/servers/webServer/logs*

**IBM Spectrum Control GUI:****Windows operating systems:**

*installation\_dir\web\log*

**Linux or AIX operating systems:**

*installation\_dir/web/log*

**Storage Resource agents:**

*installation\_dir*/agent/log/name\_of\_server\_SRA\_communicates\_with

**Tips:**

- For Windows operating systems, the default *installation\_dir* is C:\Program Files\IBM\TPC.
- For Linux or AIX operating systems, the default *installation\_dir* is /opt/IBM/TPC.

---

## Script parameters

Script parameters provide specific information on the alert that triggered the script to be run.

The parameters that are passed to a script depend on the type of alert that was triggered. The following table describes all the script parameters:

| Script Parameter      | Description                                                                                                                                                                                   |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| amount                | Threshold exceeded amount.                                                                                                                                                                    |
| archive-file-count    | The number of log files in the archived log directory.                                                                                                                                        |
| archive-log-directory | Name of the archive log directory that triggered the archive log directory Instance alert.                                                                                                    |
| available-extents     | The number of extents still available to the segment for growth. This value equals the maximum extents available to the object minus the extents that are currently allocated to the segment. |
| available-space       | Available pool space after a change                                                                                                                                                           |
| blade                 | Name of a blade.                                                                                                                                                                              |
| chained-row-count     | The number of chained rows in a table that triggered the Chained Row table alert.                                                                                                             |
| computer              | Computer name where the triggering condition occurred.                                                                                                                                        |
| consecutive-failures  | Number of consecutive failed attempts to ping the computer.                                                                                                                                   |
| controller            | Name of a back-end controller.                                                                                                                                                                |
| cluster-name          | The name of an HACMP or MSCS cluster.                                                                                                                                                         |
| creator.name          | Creator of the ping, probe, or scan schedule. Name of the schedule.                                                                                                                           |
| current-grown-defects | Current number of grown defects on the disk.                                                                                                                                                  |
| current-node-name     | When an HACMP or MSCS cluster resource group moves, this parameter identifies the cluster node that now hosts the cluster resource group.                                                     |
| current-RAM MB        | Current value of the RAM in megabytes.                                                                                                                                                        |
| current-VM MB         | Current value of the sum of the RAM and the swap space in megabytes.                                                                                                                          |
| database              | The name of the database where the triggering condition occurred.                                                                                                                             |
| database-tablespace   | The name of the database or table space where the triggering condition occurred.                                                                                                              |
| datapath              | Name of a data path.                                                                                                                                                                          |
| device-name           | Name of a device.                                                                                                                                                                             |
| disk-array            | Name/alias of a disk array.                                                                                                                                                                   |
| dump-date             | The date when the last memory dump was performed.                                                                                                                                             |
| endpoint              | Name of an endpoint device.                                                                                                                                                                   |

| Script Parameter                    | Description                                                                                                                                                                                  |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| extent-count                        | The number of extents that are allocated to a segment, or the number of free extents in the table space (depends on Alert type).                                                             |
| failed-jobs                         | Number of failed jobs in the run. (Each job runs on a different computer).                                                                                                                   |
| file-of-violating-files             | Temporary file that contains a list of files that violate the constraint. The files are listed as one file per line.                                                                         |
| file-of-violating-owners            | Temporary file that contains a list of owners who owns the violating files.                                                                                                                  |
| free-inodes                         | Maximum number of files available to be created on this file system.                                                                                                                         |
| free space size-designator          | Total amount of free space, in KB, MB, or GB.                                                                                                                                                |
| from-entity-type                    | Type of new fabric connection from an entity.                                                                                                                                                |
| HBA-driver                          | HBA driver                                                                                                                                                                                   |
| HBA-firmware                        | HBA firmware                                                                                                                                                                                 |
| io-group                            | Name of the I/O group.                                                                                                                                                                       |
| largest-extent-size size-designator | Total amount of the largest free extent in the table space, which is measured in KB, MB, or GB.                                                                                              |
| manufacturer/serial-number          | Manufacturer of the disk. Serial number of the disk.                                                                                                                                         |
| mdisk                               | Name of an MDisk.                                                                                                                                                                            |
| mdisk-group                         | Name of an MDisk group.                                                                                                                                                                      |
| mount-point                         | Path to the file system.                                                                                                                                                                     |
| new-capacity                        | New capacity of a storage subsystem, volume, or pool.                                                                                                                                        |
| new-version                         | New version of the HBA driver, firmware, or a subsystem.                                                                                                                                     |
| node                                | Name of a node.                                                                                                                                                                              |
| old-capacity                        | Previous capacity of a storage subsystem, volume, or pool.                                                                                                                                   |
| old-grown-defects                   | Previous number of grown defects on the disk.                                                                                                                                                |
| old-node-name                       | When an HACMP or MSCS cluster resource group moves, this parameter identifies the cluster node that previously hosted the cluster resource group.                                            |
| old-RAM MB                          | Previous value of the RAM in megabytes.                                                                                                                                                      |
| old-version                         | Previous version of the HBA driver, firmware, or a subsystem.                                                                                                                                |
| old VM MB                           | Previous value of the sum of the RAM and the swap space in megabytes.                                                                                                                        |
| path                                | Path to the directory.                                                                                                                                                                       |
| percent-of-capacity %               | Percentage of capacity of the file system, database, or table space.                                                                                                                         |
| percent-of-table-size               | The percentage of space that is allocated to a segment that is empty and unused (the percentage of space over the "high-water mark"). Available on the Empty Used Segment Space table alert. |
| percent-of-total-rows %             | The percentage of table rows that are chained.                                                                                                                                               |
| pool                                | Name of a storage pool.                                                                                                                                                                      |
| port                                | Name of a port.                                                                                                                                                                              |
| rdbms-instance-name                 | Oracle SID, SQL Server name, Sybase Server name, UDB Instance name                                                                                                                           |
| rdbms-type                          | Oracle, SQL Server, or Sybase                                                                                                                                                                |
| run-number                          | Number of the run.                                                                                                                                                                           |
| segment                             | The name of the table segment that triggers the alert.                                                                                                                                       |

| Script Parameter                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| segment-type                       | <p>The type of segment that triggers the alert. The following list includes the possible types of segments.</p> <ul style="list-style-type: none"> <li>• TABLE</li> <li>• TABLE PARTITION</li> <li>• TABLE SUBPARTITION</li> <li>• NESTED TABLE</li> <li>• CLUSTER</li> <li>• INDEX</li> <li>• INDEX PARTITION</li> <li>• INDEX SUBPARTITION</li> <li>• LOBINDEX</li> <li>• LOBSEGMENT</li> <li>• LOB PARTITION</li> <li>• LOB SUBPARTITION</li> </ul> |
| storage-volume                     | Name of a storage volume                                                                                                                                                                                                                                                                                                                                                                                                                               |
| subsystem                          | Name of a storage subsystem                                                                                                                                                                                                                                                                                                                                                                                                                            |
| switch                             | Name of a switch                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| table                              | The name of the table that triggered the alert condition.                                                                                                                                                                                                                                                                                                                                                                                              |
| table space                        | The name of the table space that triggered the alert condition.                                                                                                                                                                                                                                                                                                                                                                                        |
| threshold                          | Value that you set for the triggering condition. If the value unit was specified as a %, then a % follows this value.                                                                                                                                                                                                                                                                                                                                  |
| threshold thr-designator           | Value of the triggering condition, in KB, MB, or GB, or % (value units).                                                                                                                                                                                                                                                                                                                                                                               |
| to-entity-type                     | Type of new fabric connection to an entity.                                                                                                                                                                                                                                                                                                                                                                                                            |
| total-jobs                         | Total number of jobs in a run.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| totalled-file-size size designator | Total amount of storage that is consumed by the archive log directory, which is measured in KB, MB, or GB.                                                                                                                                                                                                                                                                                                                                             |
| usage size-designator              | Value of used disk space, in KB, MB, or GB.                                                                                                                                                                                                                                                                                                                                                                                                            |
| violating-file-count               | Number of files that met the conditions that are defined in the constraint.                                                                                                                                                                                                                                                                                                                                                                            |
| virtual-server-name                | The name of an HACMP or MSCS cluster resource group.                                                                                                                                                                                                                                                                                                                                                                                                   |
| zone                               | Name of a zone.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| zoneset                            | Name of a zone set.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| zone-alias                         | Name of a zone alias                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| zone-member                        | Name of a zone member                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Opening IBM Spectrum Control on Windows operating systems

You can open IBM Spectrum Control CLIs and GUIs and administer IBM Spectrum Control on Windows operating systems.

### Opening IBM Spectrum Control GUIs and CLIs

To manage and monitor storage resources, open IBM Spectrum Control GUIs and CLIs.

You can open the following GUIs and CLIs:

- “Opening IBM Spectrum Control GUI” on page 181

- “Opening DB2 Command Window”
- “Opening IBM Data Studio Administration client on Windows operating systems”
- “Opening IBM Tivoli Monitoring Services” on page 182

## Opening IBM Spectrum Control GUI

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | <ol style="list-style-type: none"> <li>1. On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b>.</li> <li>2. On the Start page, right-click, and then click the <b>All apps</b> taskbar button.</li> </ol> |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start &gt; All Programs</b> .                                                                                                                                                                                                                                                                           |

2. Click **IBM Spectrum Control > IBM Spectrum Control**.

## Opening DB2 Command Window

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | <ol style="list-style-type: none"> <li>1. On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b>.</li> <li>2. On the Start page, right-click, and then click the <b>All apps</b> taskbar button.</li> </ol> |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start &gt; All Programs</b> .                                                                                                                                                                                                                                                                           |

2. Click **IBM DB2 > Command Line Tools > Command Window**.

## Opening IBM Data Studio Administration client on Windows operating systems

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | <ol style="list-style-type: none"> <li>1. On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b>.</li> <li>2. On the Start page, right-click, and then click the <b>All apps</b> taskbar button.</li> </ol> |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start &gt; All Programs</b> .                                                                                                                                                                                                                                                                           |

2. Click **IBM Data Studio > Data Studio Administration Client**.

## Opening IBM Tivoli Monitoring Services

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | <ol style="list-style-type: none"><li>1. On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b>.</li><li>2. On the Start page, right-click, and then click the <b>All apps</b> taskbar button.</li></ol> |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start &gt; All Programs</b> .                                                                                                                                                                                                                                                                        |

2. Click **IBM Tivoli Monitoring > IBM Tivoli Monitoring Services**.

## Accessing administration tools

To manage and maintain IBM Spectrum Control, access the Windows system administration tools.

To complete tasks in IBM Spectrum Control, you must open the following administration and maintenance facilities:

- “Accessing the Control Panel”
- “Accessing Administrative Tools”
- “Accessing Windows Services” on page 183
- “Accessing Computer Management” on page 183
- “Accessing Programs and Program Features” on page 183

### Accessing the Control Panel

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                   |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b> . |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start</b> .                                                                                                                                          |

2. Click **Control Panel**

### Accessing Administrative Tools

1. Choose one of these options:

| Option                    | Description                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012       | On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b> . |
| Windows 7, Windows 2008   | Click <b>Start</b> .                                                                                                                                          |
| Windows XP, Windows Vista | Click <b>Start &gt; Control Panel</b> .                                                                                                                       |

2. Click **Administrative Tools**

## Accessing Windows Services

1. Choose one of these options:

| Option                    | Description                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012       | On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b> . |
| Windows 7, Windows 2008   | Click <b>Start</b> .                                                                                                                                          |
| Windows XP, Windows Vista | Click <b>Start &gt; Control Panel</b> .                                                                                                                       |

2. Click **Administrative Tools > Services**

## Accessing Computer Management

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                   |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b> . |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start</b> .                                                                                                                                          |

2. Click **Control Panel > Computer Management**

## Accessing Programs and Program Features

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                   |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b> . |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start</b> .                                                                                                                                          |

2. Click **Control Panel > Programs and Program Features**.

## Accessing Window Run

1. Choose one of these options:

| Option                                             | Description                                                                                                                                                   |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Windows Server 2012                                | On the Dashboard page, hover the mouse over the lower left corner of the page next to the <b>Server Manager</b> taskbar button, and then click <b>Start</b> . |
| Windows 7, Windows 2008, Windows Vista, Windows XP | Click <b>Start</b> .                                                                                                                                          |

2. Click **Run**.

---

## Windows services used by IBM Spectrum Control

To start, stop, or restart a component or related program in IBM Spectrum Control, use the Windows Services panel.

The following table provides a list of the Windows services.

*Table 8. List of Windows services used by IBM Spectrum Control*

| Program                                     | Service name                                                                                                                                                                                                       | Comment                                                                                                     |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| IBM DB2                                     | DB2 - DB2COPY1 - DB2 - 0<br>DB2 Governer (DB2COPY1)<br>DB2 License Server (DB2COPY1)<br>DB2 Management Service (DB2COPY1)<br>DB2 Remote Command Server (DB2COPY1)<br>DB2DAS - DB2DAS00<br>DB2TS - DB2COPY1 - DB2-0 | The service account owner is <b>db2admin</b> . The account needs to be part of Administrators and DB2ADMNS. |
| IBM Spectrum Control Data server            | IBM Spectrum Control - Data Server                                                                                                                                                                                 | Note that the Data server does not have a WebSphere application service name.                               |
| IBM Spectrum Control Device server          | IBM Spectrum Control -Device Server                                                                                                                                                                                |                                                                                                             |
| IBM Spectrum Control Alert server           | IBM Spectrum Control - Alert server                                                                                                                                                                                |                                                                                                             |
| IBM Spectrum Control Storage Resource agent | IBM Spectrum Control Storage Resource Agent                                                                                                                                                                        |                                                                                                             |
| IBM Spectrum Control Web server             | IBM Spectrum Control - Web server                                                                                                                                                                                  |                                                                                                             |

---

## Frequently Asked Questions

View answers to common questions about IBM Spectrum Control.

### **How do you know if your storage system is supported by IBM Spectrum Control and which SMI-S agents are supported?**

To confirm whether your storage system is supported and which SMI-S agent is supported for that system, review the supported products list for the current release of IBM Spectrum Control at IBM Spectrum Control interoperability matrix for storage systems.

### **You encounter errors while collecting performance data on SAN Volume Controller. You fail to associate SAN Volume Controller performance data from non-configuration node with SAN Volume Controller performance data from configuration node. You encounter incomplete SAN Volume Controller performance data sample.**

This issue is caused by a configuration issue with SAN Volume Controller (time zone). Reset the time zone on SAN Volume Controller by logging into the SAN Volume Controller through putty. Run this command first:  
`svctask settimezone -timezone 509`



This forces the cluster into the Universal time zone. To get the time zone you want the cluster to be in, run this command:

```
svctask settimezone -timezone
```

---

## Protocols and standards

This section provides an overview of the protocols and standards that are used within IBM Spectrum Control.

### Web Based Enterprise Management

Web Based Enterprise Management (WBEM) is an initiative of the Distributed Management Task Force (DMTF) with the objective to enable the management of complex IT environments. It defines a set of management and internet standard technologies in order to unify the management of complex IT environments.

The WBEM initiative is composed of three main conceptual elements:

#### Common Interface Model (CIM)

CIM is a formal object-oriented modeling language that is used to describe the management aspects of systems.

#### xmlCIM

This is the grammar to describe CIM declarations and messages used by the CIM protocol.

#### Hypertext Transfer Protocol (HTTP)

HTTP is used as a way to enable communication between a management application and a device that both use CIM.

The WBEM architecture defines the following elements:

#### CIM Client

The CIM Client is a management application like IBM Spectrum Control that uses CIM to manage devices. A CIM Client can reside anywhere in the network, because it uses HTTP to talk to CIM Object Managers and Agents.

#### CIM Managed Object

A Managed Object is a hardware or software component that can be managed by a management application by using CIM.

#### CIM Agent

A CIM Object Manager that includes the provider service for a limited set of resources. An agent may be embedded or hosted and can be an aggregator for multiple devices.

#### CIM Provider

A CIM Provider is the element that translates CIM calls to the device-specific commands. A provider is always closely linked to a CIM.

#### CIM Object Manager (CIMOM)

The central component of the CIM Server responsible for the communication between the CIM server components.

#### CIM Server

A server that receives and processes CIM Operation Message Requests and issues CIM Operation Message Responses.

## Storage Management Initiative Specification

The Storage Networking Industry Association (SNIA) defines a standard that is used within IBM Spectrum Control to create and develop a universal open interface for managing storage devices including storage networks.

For information about SMI-S, see <http://www.snia.org>.

SNIA has fully adopted and enhanced the Common Information Model (CIM) standard for storage management in its Storage Management Initiative - Specification (SMI-S). SMI-S was launched to create and develop a universal open interface for managing storage devices including storage networks. SMI-S provides:

- A comprehensive specification for the management of heterogeneous storage and storage area networks (SANs).
- The information available to a WBEM client from an SMI-S compliant CIM server (provider).
- Profiles organized by:
  - Storage
  - Fabric
  - Host
  - Common profiles and subprofiles
- An object-oriented CIM and XML-based interface for managing SAN devices, services, and fabrics.
- An initial discovery, which is SLP based.

The idea behind SMI-S is to standardize the management interfaces so that management applications can utilize these and provide cross-device management. This means that a newly introduced device can be immediately managed as it will conform to the standards.

The models and protocols in the SMI-S implementation are platform-independent, enabling application development for any platform, and enabling them to run on different platforms. The SNIA will also provide interoperability tests which will help vendors test their applications and devices if they conform to the standard.

## Service Location Protocol

The Service Location Protocol (SLP) is an Internet Engineering Task Force (IETF) standard. SLP provides a scalable framework for the discovery and selection of network services.

The Internet Engineering Task Force (IETF) is a large open international community of network designers, operators, vendors, and researchers that are concerned with the evolution of the Internet architecture and the smooth operation of the Internet. The IETF includes formal standards for SNMP and MIBs. For more information about IETF, see <http://www.ietf.org>.

SLP enables the discovery and selection of generic services, which can range in function from hardware services such as those for printers or fax machines, to software services such as those for file servers, email servers, web servers, databases, or any other possible services that are accessible through an IP network.

Traditionally, to use a particular service, a user, or client application provided the host name or network IP address for the service. With SLP, however, it is not necessary for the user or client application to know individual host names or IP

addresses. Instead, the user or client application can search the network for the required service type and an optional set of qualifying attributes.

For example, a user can search for all available printers that support Adobe PostScript. Based on the service type such as printers and the attributes such as PostScript, SLP searches the user's network for matching services, and returns the discovered list to the user.

## Simple Network Management Protocol

The Simple Network Management Protocol (SNMP) is an Internet Engineering Task Force (IETF) protocol for monitoring and managing systems and devices in a network. Functions supported by the SNMP protocol are the request and retrieval of data, the setting or writing of data, and traps that signal the occurrence of events.

SNMP is a protocol that enables a management application to query information from a managed device. The managed device has software running that sends and receives the SNMP information. This software module is usually called the SNMP agent.

An SNMP management application can read information from an SNMP agent in order to monitor the device that the SNMP agent is running on. Therefore, the device needs to be polled on an interval bases. The SNMP manager can also change the configuration of a device, by setting certain values to corresponding variables. A device can also be set up to send a notification to the SNMP manager (this is called a trap) to asynchronously inform this SNMP manager of a status change.

Depending on the existing environment and organization it is very likely that your environment already has an SNMP management application in place. IBM Spectrum Control can be set up to send traps.

SNMP uses a hierarchical structured Management Information Base (MIB) to define the meaning and the type of a particular value. A MIB defines managed objects that describe the behavior of the SNMP entity, which can be anything from an IP router to a storage subsystem. The information is organized in a tree structure.

For users planning to make use of the IBM Spectrum Control SNMP trap alert notification capabilities, an SNMP MIB is included in the server installation.

The MIB is provided for use by your SNMP management console software. Most SNMP management products provide a program called a MIB compiler that can be used to import MIBs. This will allow you to view IBM Spectrum Control generated SNMP traps from within your management console software. Refer to your management console software documentation for instructions on how to compile or import a third party MIB.

For a Cisco switch to successfully receive and respond to queries from IBM Spectrum Control, the following basic requirements must be met:

- IBM Spectrum Control can use SNMPv3 (preferred) or SNMPv1 to probe switches and fabrics. The SNMPv3 protocol is preferred because it provides better security, but switches that use the SNMPv1 protocol are also supported. Some switches are configured to use SNMPv3 by default.

- If the switch uses an SNMP agent, the Fibre Alliance FC Management MIB (FA MIB) and Fibre Channel Fabric Element MIB (FE MIB) must be enabled on the switch.
- When using the SNMPv1 protocol, the community string that is configured in IBM Spectrum Control must match one of the community strings that are configured on the switch with read access. Cisco switches must additionally have a community string match for write access. The default community strings in IBM Spectrum Control are “public” for read access and “private” for write access. Other community strings can be defined on the switches, but are not used. Community strings are not relevant when using the SNMPv3 protocol.
- SNMP access control lists must include the IBM Spectrum Control system. These access control lists are defined and configured on the switches. Some lists automatically include all hosts, while others exclude all by default.
- The Fibre Channel (FC) or Fibre Channel over Ethernet (FCoE) protocols must be enabled on the switch. Some switches, such as the Cisco Nexus 5000 series, require you to enable these protocols. Otherwise, IBM Spectrum Control will not recognize the switch when you try to add it using the **Add Switches and Fabrics for Monitoring** dialog. For instructions on how to configure Cisco switches for FCoE enablement, go to the Cisco product website at <http://www.cisco.com> and click **Support**.

IBM Spectrum Control uses port 162 to listen for SNMP traps. This is the default port. For switches, you must configure the switch to send SNMP traps to the Device server IP address. If you need to change the default port number, use the **setdscfg** command. The attribute to set is **SNMPTrapPort**.

System administrators must set up their SNMP trap ringer with the provided MIB files in order to receive SNMP traps from IBM Spectrum Control. These files are located in the following directories on the product installation DVD:

For the Data server:

`data\snmp\tivoliSRM.mib`

For the Device server :

`device\snmp\fabric.mib`

## Fibre Channel Methodologies of Interconnects

IBM Spectrum Control supports the ANSI T11 Fibre Channel FC-MI (Fibre Channel Methodologies of Interconnects) for the automated discovery of FC SAN assets and topology.

ANSI T11 Fibre Channel FC-MI includes the following for the automated discovery of FC SAN assets and topology:

- Hosts (HBAs)
- FC interconnects
- FC storage devices

The T11 FC-MI also includes the following:

- FC-GS-3/4 (discovery, zoning, and so forth)
- RNID (advanced device recognition)
- Platform registration (device recognition and launch)
- Common HBA API (fabric and storage views)

- Name server (connectivity)
- Management server (SAN connectivity and topology)
- RSCN (advanced event detection)
- SCSI queries (storage views, volume information, and so forth)
- SNMP Fabric Element (FE) MIB
- SNMP FC Management MIB (discovery, performance statistics, and so forth)
- SNMP alerts



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## Appendix B. Accessibility features for IBM Spectrum Control

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

### Accessibility features

The following list includes the major accessibility features in IBM Spectrum Control:

- Keyboard-only operation in the GUI.
- A Knowledge Center that includes the following accessibility features:
  - The Knowledge Center is provided in XHTML 1.0 format, which is viewable in most web browsers. With XHTML, you can view documentation according to the display preferences that are set in your browser. XHTML supports screen readers and other assistive technologies.
  - All documentation for IBM Spectrum Control is available in Adobe Portable Document Format (PDF) by using the Adobe Acrobat Reader. To access PDFs, go to [http://www.ibm.com/support/knowledgecenter/SS5R93\\_5.2.16/com.ibm.spectrum.sc.doc/fqz0\\_r\\_printable\\_doc.html](http://www.ibm.com/support/knowledgecenter/SS5R93_5.2.16/com.ibm.spectrum.sc.doc/fqz0_r_printable_doc.html).
  - All images in the Knowledge Center are provided with alternative text, so that visually impaired users can understand the contents of the images.
- Interfaces that are commonly used by screen readers.

The setting for the automatic-refresh button in the screen reader is toggled to the ON position by default. If you want the screen reader to read the previous text, complete the following steps:

1. Navigate to the Accessibility Settings Navigation region by using the arrow keys. The region is located after the IBM Spectrum Control application title.
2. Click **Enter** to toggle the automatic-refresh button to the OFF position. (An alert sounds to make you aware that the turn-off automatic-refresh toggle button was pressed.)
3. To move backward to the previously read text so that the screen reader can read it again, use the arrow keys. You can move backwards and forwards through the page.
4. When you are ready to move on, click **Enter** to toggle the automatic-refresh button to the ON position and to refresh the page. (An alert sounds to make you aware that the turn-on, automatic-refresh toggle button was pressed.)

**Tip:** Alternatively, let the toggle setting persist, and refresh as needed by pressing the F5 key.

### Keyboard navigation

Most of the features of the IBM Spectrum Control GUI are accessible by using the keyboard. For those features that are not accessible, equivalent function is available by using the command-line interface (CLI), except as noted in the product release notes.

You can use keys or key combinations to perform operations and initiate many menu actions that can also be done through mouse actions. The following sections describe the keys or key combinations for different parts of the GUI:

**For navigating in the GUI and the context-sensitive help system:**

- To navigate to the next link, button, or topic within a panel, press Tab.
- To move to the previous link, button, or topic within a panel, press Shift+Tab.
- To select an object, when the object is in focus, press Enter.

**For actions menus:**

- To navigate to the grid header, press Tab.
- To reach the drop-down field, press the Left Arrow or Right Arrow key.
- To open the drop-down menu, press Enter.
- To select the menu items, press the Up Arrow or Down Arrow key.
- To start the action, press Enter.

**For filters:**

To specify a filter option and text:

1. Press Tab to navigate to the magnifying glass icon.
2. Press the Up Arrow or Down Arrow key to navigate the filtering list.
3. Press Enter to select a filtering option.
4. When a filtering option is selected, the cursor moves to the filter text box. Type the filter text and press Enter. To reset a filter, press Enter.

**For text fields:**

- To navigate to text fields, press Tab.
- To navigate to the fields that are available for editing, press Tab.
- To navigate to the next field or to the **Submit** button, press Tab.

**For tables or lists:**

- To navigate between column headers, focus on a column header and use the Left Arrow and Right Arrow keys to move to other column headers.
- To navigate between data cells, focus on a data cell and use the Left, Right, Up, Down, Pageup, and Pagedown Arrow keys.
- To sort a column, focus on a column header and press Enter. The focus remains on the column header after the sort occurs.
- To change the size of a column, focus on the column header, hold Shift+Control, and press the Left or Right Arrow keys.
- To follow a link in a data cell, focus on a data cell and press Shift+F9.
- To open a menu for a table row, focus on the row and press Shift+F10.
- To select consecutive rows, select the first row and hold Shift, press the Up or Down Arrow keys to go to the last row in the range, and press the Space bar to add the new rows to the selection.
- To select non-consecutive rows, select a row and hold Control, press the Up or Down Arrow keys, and press the Space bar to add the new row to the selection.

**Restriction:** For Chinese languages, the keyboard combination Control+Space bar is not enabled for selecting multiple rows at the same time.

**IBM and accessibility**

For more information about IBM's commitment to accessibility, see the IBM Human Ability and Accessibility Center website at  <http://www.ibm.com/able/>.



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## Glossary

A glossary is available with terms and definitions for the IBM Spectrum Control family of products.

You can view the glossary in the IBM Spectrum Control product documentation at <http://www.ibm.com/support/knowledgecenter/SS5R93/>.

To view glossaries for other IBM products, see <http://www.ibm.com/software/globalization/terminology/>.



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# Index

## A

- about this document vi
- accessibility features
  - for IBM Spectrum Control 191
- adding
  - CIM agents 118
- adding resources
  - canceled agent deployment 102
  - fixing agent deployment problems 100
  - hypervisors 95
  - modifying deployment schedules for agents 102
  - vCenter Server system 38
- agent.config 176
- agent.sh command
  - syntax 171
- agents
  - changing credential for a Storage Resource agent 108
  - CIM agents 118
  - deploying Storage Resource agents 53
  - deployment considerations for Storage Resource agents 54, 112
  - enabling a Storage Resource agent 107
  - enabling or disabling scripts for a Storage Resource agent 110
  - enabling or disabling the monitoring of fabrics by a Storage Resource agent 110
  - preparing Storage Resource agents for installation 54, 112
  - registering with a different server 111
  - scheduling a Storage Resource agent upgrade 105
  - starting a Storage Resource agent upgrade 104
  - testing the connection with the server where a Storage Resource agent is deployed 108
  - uninstalling a Storage Resource agent 111
  - upgrading Storage Resource agents 104
  - viewing information about Storage Resource agents 103
  - viewing Storage Resource agent log files 103
- alert notifications
  - email 2
  - Netcool/OMNIBus 5
  - SNMP 4
- Alert server
  - troubleshooting 126
- assigning roles 11
- authentication mechanism, modify 12
- authorizing users 9
  - assigning roles 11

## B

- backup considerations
  - Tivoli Storage Productivity Center 153
- Brocade 170

## C

- certificates
  - creating for Storage Resource agents 60
  - replacing for Storage Resource agents 65
- Cisco fabrics
  - removing 100
- CIM agents 118
  - adding 119
  - collecting logs 121
  - testing a connection 120
  - updating user credentials 120
  - verify they are running 121
  - viewing information 119
- Cisco 170
- commands
  - agent.sh 171
  - repocopy 161
- comments, sending vi
- common user, about 2
- configuration
  - assigning roles to groups 9
  - authorizing users 9
  - for switches 26
- configuration files
  - agent.config 176
  - default locations 171
  - encryption 172
  - for IBM Spectrum Control 171
  - scheduler.config 173
  - server.config 172
  - TPCD.config 174
- configuring
  - data retention 6
  - Monitoring agent 78
- custom VM storage profiles
  - creating 37

## D

- data collection
  - configuring data retention 6
- Data server
  - increasing memory 131
  - increasing memory on AIX 132
  - increasing memory on Linux 132
  - increasing memory on UNIX 132
  - increasing memory on Windows 133
  - troubleshooting 126
- Data Studio
  - data studio 164

- database
  - administering the IBM Spectrum Control database 152, 158
  - reorganizing 159
  - updating statistics 158
- database backups
  - IBM Spectrum Control 152
- database maintenance tool
  - collecting statistics about the database 158
  - customizing 160
  - maintaining the database 158
  - reorganizing tables in the database 158
- DB2
  - command line 163
  - monitoring 164
  - starting 184
  - stopping 184
- DB2, stop 163
- Device server
  - setting timeout values 28, 133
  - troubleshooting 126
- disaster recovery 152, 154, 155
- Distributed Management Task Force (DTMF) 185
- domain account
  - how to grant local administrative privileges 142

## E

- EIF rules files 5
- email alert notifications 2
- encryption 172

## F

- Fabric zone configuration 170
- fabric.mib file 187
- fabrics
  - changing connection information 99
  - changing credentials 99
  - connection information 99
  - removing 100
  - testing connection 100
  - updating connection information 97
  - viewing information 97, 99
- federated repositories
  - adding an LDAP repository for IBM Spectrum Control 15
  - configuring alternative user authentication for federated repositories in IBM Spectrum Control 20
  - removing an LDAP repository for IBM Spectrum Control 20
  - uploading XML file to add an LDAP repository for IBM Spectrum Control 17

- federated repository 12
- fibre channel
  - methodologies of interconnects 188
- file system 154, 155
- ftp 129
- full disk encryption
  - support for 170
- fully qualified host name
  - checking for on AIX 75
  - checking for on Linux 76
  - checking for on Solaris 76
  - Windows, verify 77

## H

- historical trending
  - configuring data retention 6
- hypervisors
  - adding 95
  - updating credentials 96

## I

- IBM Spectrum Control
  - configuration files 171
  - log files 176
  - using a VASA storage provider certificate 35
- installing
  - Storage Resource agent
    - considerations 54, 112
  - Storage Resource agents 53
  - Storage Resource agents remotely 54, 112
- Internet Engineering Task Force (IETF) 186
- interop namespaces 121
- IPv6
  - configuring
    - AIX for IPv6 85
    - DB2 on AIX for IPv6 85
    - DB2 on Linux for IPv6 86
  - configuring DB2 on Linux 86
  - configuring for AIX 85
  - configuring for DB2 on AIX 85

## L

- LDAP
  - managing user authentication in IBM Spectrum Control 15
- LDAP authentication
  - advanced configuration 24
- LDAP federated repositories framework
  - alternative user authentication for federated repositories in IBM Spectrum Control 20
- LDAP repository
  - adding to federated repositories for IBM Spectrum Control 15
  - removing for IBM Spectrum Control 20
  - uploading XML file 17

- LDAP server to a file
  - exporting SSL certificate from IBM Security Directory Server to a file 22
  - exporting SSL certificate from Microsoft Active Directory LDAP Server to a file 22
- ldapEntityType element
  - configuring 24
- license
  - check 125
- license restrictions 13
- Linux
  - IBM Data Studio, start 164
- log files
  - for IBM Spectrum Control 176
  - packaging 127
- logon page
  - terms and conditions, add 26
  - terms and conditions, show 26

## M

- maintenance 143
- Management Information Base (MIB) files 187
- memory
  - increasing allocation for Data server
    - on AIX 132
  - increasing allocation for Data server
    - on Linux 132
  - increasing allocation for Data server
    - on Windows 133
- memory allocation
  - Data server 131
- Monitoring agent
  - configuring 78
  - configuring for Windows 78
  - configuring on UNIX 78
  - starting 79
  - stopping 79

## N

- namespaces, interop 121
- Netcool/OMNIBus alert notifications 5

## O

- offline backup
  - IBM Spectrum Control 154, 155
- online backup
  - Tivoli Storage Productivity Center 155

## P

- packaging log files 127
- parameters 178
- passwords
  - changing 135
  - changing using password tool 135, 136, 137, 139
  - changing when no X Window System is installed 141

- passwords (*continued*)
  - same logon credentials 136
  - single server installation 136
- planning
  - authorization for users 2
- PMRs
  - opening 127
- problems
  - report vii
- product
  - license, check 125
  - version, check 125

## R

- reader feedback, sending vi
- redeploying
  - vSphere Web Client extension 51
- redeploying from IBM Spectrum Control server
  - vSphere Web Client extension 52
- redeploying locally
  - vSphere Web Client extension 52
- registering
  - VASA provider 34
  - vSphere Web Client extension 39
- registration 34
- removing
  - Cisco fabrics 100
  - fabrics 100
  - storage systems 95
  - switches 100
- replace, servers 82
- repocopy command 161
  - exporting data 161
- repocopy tool
  - exporting data 161
- reporting problems vii
- Reporting server
  - troubleshooting 126
- Repository Copy tool 161
- resources
  - adding hypervisors for monitoring 38, 95
  - retaining data 6
  - updating credentials for hypervisors 96
  - updating credentials for storage systems 88
- restrictions
  - based on license 13
  - based on role 13
- return codes 167
- role restrictions 13
- roles 9
  - assigning 11

## S

- SAN Volume Controller
  - publications v
- scheduler.config 173
- scripts
  - parameters 178
- Secure Socket Layer (SSL)
  - disabling 21



- Secure Socket Layer (SSL) *(continued)*
  - enabling 20
- security 9
- sending comments vi
- server.config 172
- servers
  - adding by deploying an agent 100, 102
  - canceling agent deployment 102
  - fixing agent deployment
    - problems 100
  - modifying deployment
    - schedules 102
  - removing 111
  - starting 123
  - stopping 124
- service vi
- Service Location Protocol (SLP)
  - overview 186
- service management connect vi
- service tool
  - for servers 147
- Service tool
  - for agents 148
- services
  - starting 123
  - starting by using the GUI 123
  - stopping 124
  - stopping by using the GUI 124
- SMC vi
- SNMP
  - MIBs 187
  - overview 187
  - traps 187
- SNMP alert notifications 4
- solid-state drives
  - support for 170
- SSH protocol
  - creating a certificate 60
- SSL certificate ldap
  - adding SSL certificates to web server
    - keystore 23
- SSL certificate LDAP IBM Security
  - Directory Server to file
    - exporting SSL certificate from LDAP
      - server to a file 22
- SSL certificate Microsoft Active Directory
  - LDAP Server to file
    - exporting SSL certificate from LDAP
      - server to a file 22
- SSL certificates 82
  - replacing a certificate 65
- starting
  - Alert server 184
  - Data Server 184
  - DB2 184
  - Device server 184
  - IBM Spectrum Control web-based
    - GUI 1
- starting product servers 123
- starting product services 123
- stopping
  - agents
    - starting 184
    - stopping 184
  - Alert server
    - starting 184

- stopping *(continued)*
  - Alert server *(continued)*
    - stopping 184
  - Data Server
    - starting 184
    - stopping 184
  - DB2 184
  - Device server
    - port numbers 184
    - starting 184
    - stopping 184
- stopping product servers 124
- stopping product services 124
- storage and file systems
  - filtering for VASA provider 36
- Storage Management Initiative - Specification (SMI-S) 186
- Storage Networking Industry Association (SNIA) 186
- storage profiles
  - creating 37
- Storage Resource agent 167
  - changing credentials 108
  - changing the Windows service
    - logon 112
- Storage Resource agents
  - creating certificates for 60
  - deploying 53
  - deployment considerations 54, 112
  - enabling 107
  - enabling or disabling scripts 110
  - enabling or disabling the monitoring
    - of fabrics 110
  - importing authentication
    - information 77
  - installing 53
  - registering with a different
    - server 111
  - replacing SSL certificates 65
  - scheduling an upgrade 105
  - starting an upgrade 104
  - testing the connection with IBM
    - Spectrum Control 108
  - uninstalling using GUI 111
  - upgrading 104
  - upgrading manually 106
  - viewing information 103
  - viewing log files 103
- storage subsystems
  - overview 87
- storage system
  - testing connection 95
- storage systems
  - removing 95
  - updating credentials 88
- support vi
- Support
  - contact vii
- Switch Performance Management 170
- switches
  - changing connection information 98
  - changing credentials 98
  - configuring 26
  - connection information 98
  - removing 100
  - testing connection 100
  - updating connection information 97

- switches *(continued)*
  - viewing information 97, 98
- SYSMAINT authority
  - checking and setting 164
- system maintenance authority
  - checking and setting 164
- system management
  - saving trace logs 126
  - troubleshooting 126

## T

- T11 FC-MI 188
- terms and conditions
  - logon page, show 26
- testing connection
  - fabrics 100
  - storage system 95
  - switches 100
- timeout values
  - setting for Device server 28, 133
- tivoliSRM.mib file 187
- tools
  - repository copy 161
- TPCD.config 174
- trademarks 195
- translations
  - browser locale requirement vi
- traps for SNMP 187
- troubleshooting 126

## U

- unregistering
  - vSphere Web Client extension 50
- unregistration
  - VASA provider 36
- updating connection information
  - fabrics 97
  - switches 97
- updating credentials
  - fabrics 97
  - hypervisors 96
  - storage systems 88
  - switches 97
- upgrading
  - scheduling a Storage Resource agent
    - upgrade 105
  - starting a Storage Resource agent
    - upgrade 104
  - Storage Resource agents 104
  - Storage Resource agents
    - manually 106
- uploading logs 129
- user authentication
  - configuring 8
  - managing in IBM Spectrum
    - Control 15
  - Secure Socket Layer (SSL)
    - disabling 21
    - enabling 20
- users
  - assigning roles 9
  - determining group membership 11

## V

- VASA provider 34
  - configuring 34
  - filtering storage and file systems 36
  - registering automatically 43
  - registering manually 43
  - unregistering 36
  - using a storage provider
    - certificate 35
- VASA provider custom VM storage
  - profiles
    - creating 37
- vCenter Server system
  - adding 38
- version
  - check 125
- vSphere Web Client extension
  - configuring 37
  - creating a properties file 41
  - deploying from IBM Spectrum Control server 38
  - deploying locally 39
  - redeploying 51
  - redeploying from IBM Spectrum Control server 52
  - redeploying locally 52
  - registering 39
  - registering the VASA provider 43
  - sample properties file registering 49
  - sample properties file
    - unregistering 49
  - sample setup command properties files 49
  - saving configuration information 42
  - setup command registering 44
  - setup command unregistering 44
  - unregistering 50

## W

- Web Based Enterprise Management (WBEM) 185
- Web server
  - troubleshooting 126
- web server keystore
  - adding SSL certificates to web server keystore 23
- Windows 180, 182
  - host names, verify 77
  - IBM Data Studio, start 164
- Windows service logon
  - changing for a Storage Resource agent 112





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