IBM Copy Services Manager 6.3

User's Guide

SC27-8542-20

Note:

Before using this information and the product it supports, read the information in “Notices” on page 357.

This edition applies to version 6, release 3, modification 0, fix pack 1, of IBM® Copy Services Manager and to all subsequent releases and modifications until otherwise indicated in new editions.

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About this guide

This guide provides task-oriented information for administrative users of IBM Copy Services Manager.

The Copy Services Manager family of products consists of the following licenses:

- IBM Copy Services Manager
- IBM Copy Services Manager for z Systems®
- IBM Copy Services Manager Basic Edition for z Systems

Who should read this guide

This publication is for users of Copy Services Manager.

Users should be familiar with the following topics:

- Copy Services concepts
- General principles of IBM AIX®, Linux®, Windows, and the IBM z/OS® operating systems
- Simple Network Management Protocol (SNMP) concepts
- Storage Area Network (SAN) concepts

Conventions used in this guide

Explanations are provided 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 Java™ methods and classes
- HTML and XML tags that display `like this`, in monospace type

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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.

Publications and related information

Product guides, other IBM publications, and websites contain information that relates to IBM Copy Services Manager.

To view a PDF file, you need Adobe Reader. You can download it at no charge from the Adobe website (get.adobe.com/reader/).

Online documentation

The IBM Copy Services Manager online product documentation (http://www.ibm.com/support/knowledgecenter/SSESK4) contains all of the information that is required to install, configure, and manage IBM Copy Services Manager. The online documentation is updated between product releases to provide the most current documentation.

Publications

You can order or download individual publications that have an order number from the IBM Publications Center website (www.ibm.com/resources/publications).

Table 1. IBM Copy Services Manager product publications

Title	Description	Order number
IBM Copy Services Manager Installation and Configuration Guide	This guide provides task-oriented information for anyone who installs and configures IBM Copy Services Manager.	V6.2.11 **SC27-8543-14** V6.2.10 **SC27-8543-13** V6.2.9 **SC27-8543-12** V6.2.7 **SC27-8543-11** V6.2.6 **SC27-8543-10** V6.2.5 **SC27-8543-09** V6.2.3 **SC27-8543-08** V6.2.2 **SC27-8543-07** V6.2.1 **SC27-8543-06** V6.2.0 **SC27-8543-05** V6.1.5 **SC27-8543-04** V6.1.4 **SC27-8543-03** V6.1.3 **SC27-8543-02** V6.1.2 **SC27-8543-01** V6.1.0 **SC27-8543-00**

Table 1. IBM Copy Services Manager product publications (continued)		
Title	**Description**	**Order number**
IBM Copy Services Manager User's Guide	This guide provides task-oriented information for users of IBM Copy Services Manager. Users should be familiar with the following topics • Copy Services concepts • General principles of IBM AIX, Linux, Windows, and the IBM z/OS operating systems • Simple Network Management Protocol (SNMP) concepts • Storage Area Network (SAN) concepts	V6.3.0.1 **SC27-8542-20** V6.3.0 **SC27-8542-19** V6.2.12 **SC27-8542-18** V6.2.11 **SC27-8542-17** V6.2.10 **SC27-8542-16** V6.2.9 **SC27-8542-15** V6.2.8 **SC27-8542-14** V6.2.7 **SC27-8542-13** V6.2.6 **SC27-8542-12** V6.2.5 **SC27-8542-11** V6.2.4 **SC27-8542-10** V6.2.3 **SC27-8542-09** V6.2.2 **SC27-8542-08** V6.2.1 **SC27-8542-07** V6.2.0 **SC27-8542-06** V6.1.5 **SC27-8542-05** V6.1.4 **SC27-8542-04** V6.1.3 **SC27-8542-03** V6.1.2 **SC27-8542-02** V6.1.1 **SC27-8542-01** V6.1.0 **SC27-8542-00**
IBM Copy Services Manager Command-line Interface User's Guide	This guide provides information for customizing and using the command-line interface for IBM Copy Services Manager. This guide provides information for customizing and using the command-line interface for IBM Copy Services Manager.	V6.3.0.1 **SC27-8998-13** V6.3.0 **SC27-8998-12** V6.2.12 **SC27-8998-11** V6.2.11 **SC27-8998-10** V6.2.9 **SC27-8998-09** V6.2.8 **SC27-8998-08** V6.2.7 **SC27-8998-07** V6.2.5 **SC27-8998-06** V6.2.4 **SC27-8998-05** V6.2.3 **SC27-8998-04** V6.2.2 **SC27-8998-03** V6.2.1 **SC27-8998-02** V6.2.0 **SC27-8998-01** V6.1.5 **SC27-8998-00**
IBM Copy Services Manager z/OS FlashCopy Manager User's Guide	This guide provides task-oriented information for those who administer FlashCopy® operations in a z/OS environment.	V6.3.0.1 **SC27-8032-06** V6.2.5 **SC27-8032-05** V6.2.3 **SC27-8032-04** V6.2.2 **SC27-8032-03** V6.2.0 **SC27-8032-02** V6.1.5 **SC27-8032-01** V6.1.3 **SC27-8032-00**
IBM Copy Services Manager Release Notes	This document contains the release notes in support of IBM Copy Services Manager.	Search on IBM Copy Services Manager at IBM Fix Central (www.ibm.com/support/fixcentral) to locate and download the Release Notes® related to your product version.

Table 1. IBM Copy Services Manager product publications (continued)		
Title	**Description**	**Order number**
IBM Copy Services Manager for z Systems Program Directory and *IBM Copy Services Manager Basic Edition for z Systems Program Directory*	These program directories are intended for system programmers who are responsible for program installation and maintenance. They contain information about the material and procedures associated with the installation of IBM Copy Services Manager for z Systems and IBM Copy Services Manager Basic Edition for z Systems.	*IBM Copy Services Manager for z Systems Program Directory* V6.2.5 **GI13-4517-08** V6.2.3 **GI13-4517-07** V6.2.2 **GI13-4517-06** V6.2.1 **GI13-4517-05** V6.2.0 **GI13-4517-04** V6.1.4 **GI13-4517-03** V6.1.3 **GI13-4517-02** V6.1.1 **GI13-4517-01** V6.1.0 **GI13-4517-00** *IBM Copy Services Manager Basic Edition for z Systems Program Directory* V6.2.5 **GI13-4518-08** V6.2.3 **GI13-4518-07** V6.2.2 **GI13-4518-06** V6.2.1 **GI13-4518-05** V6.2.0 **GI13-4518-04** V6.1.4 **GI13-4518-03** V6.1.3 **GI13-4518-02** V6.1.1 **GI13-4518-01** V6.1.0 **GI13-4518-00**
Program Directory for IBM Copy Services Manager FlashCopy Manager for IBM Copy Services Manager for z Systems	This guide is intended for the system programmer or storage administrator of the IBM Copy Services Manager z/OS FlashCopy Manager utility.	V6.2.5 **GI11-2904-08** V6.2.3 **GI11-2904-07** V6.2.2 **GI11-2904-05** V6.2.1 **GI11-2904-04** V6.2.0 **GI11-2904-03** V6.1.4 **GI11-2904-02** V6.1.3 **GI11-2904-01**
IBM DSCLI on z/OS Program Directory	This program directory is intended for system programmers who are responsible for program installation and maintenance. It contains information about the material and procedures associated with the installation of the IBM Copy Services Manager on the DS8000® HMC for access to the DS8000 CLI.	V6.2.5 **GI13-3563-05** V6.2.3 **GI13-3563-04** V6.2.2 **GI13-3563-03** V6.2.1 **GI13-3563-02** V6.2.0 **GI13-3563-01** V6.1.4 **GI13-3563-00**

Related websites

View the websites in the following table to get more information about IBM Copy Services Manager.

Table 2. IBM Copy Services Manager related websites	
Title	**Description**
IBM website (ibm.com®)	Find more information about IBM products and services.

Table 2. IBM Copy Services Manager related websites (continued)	
Title	**Description**
IBM Support Portal website (www.ibm.com/support/home)	Find support-related information such as downloads, documentation, troubleshooting, and service requests and PMRs.
Copy Services Manager Support Portal (https://ibm.biz/Bdqrwj)	Find technical support information that is specific to IBM Copy Services Manager.
IBM Directory of Worldwide Contacts website (www.ibm.com/planetwide)	Find contact information for general inquiries, technical support, and hardware and software support by country.
IBM Redbooks® website (www.redbooks.ibm.com/)	Find technical information developed and published by IBM International Technical Support Organization (ITSO).
IBM System Storage® Interoperation Center (SSIC) website (www.ibm.com/systems/support/storage/config/ssic)	Find information about supported host system models, operating systems, adapters, and switches.
IBM Fix Central (www.ibm.com/support/fixcentral)	Find fixes and updates for your system's software, hardware, and operating system.

Sending comments

Your feedback is important in helping to provide the most accurate and highest quality information.

Procedure

To submit any comments about this publication or any other IBM storage product documentation:

- Send your comments by email to ibmkc@us.ibm.co. Be sure to include the following information:
  - Exact publication title and version
  - Publication form number (for example, GA32-1234-00)
  - Page, table, or illustration numbers that you are commenting on
  - A detailed description of any information that should be changed

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 Copy Services Manager technical support website at Copy Services Manager Support Portal (https://ibm.biz/Bdqrwj).

  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 Copy Services Manager technical support website updates.

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” on page xviii.

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 Copy Services Manager 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 job log output for any failing IBM Copy Services Manager jobs.
- The exact text of any error messages.
- The operating system, such as z/OS, IBM i.
- The storage system, such as DS8000, SVC, Hitachi.
- The function, such as FCM, CSM.

Summary of changes

The following functions are introduced in IBM Copy Services Manager 6.3.0.1:

Version 6, Release 3, Modification 0, Fix Pack 1

This table provides the current technical changes and enhancements to Copy Services Manager as of August 2021.

Table 3. Summary of changes in Copy Services Manager 6.3.0.1 (August 2021)

Function or feature	Description
Support Spectrum Virtualize Safeguarded Copy Solution	This solution provides support to manage and monitor Safeguarded Copy in Spectrum Virtualize environments to help customers with their cyber resiliency. For more information see, "Safeguarded Copy in IBM FlashSystems/IBM Spectrum Virtualize" on page 117.

The following functions are introduced in IBM Copy Services Manager 6.3.0:

Version 6, Release 3

This table provides the current technical changes and enhancements to Copy Services Manager as of July 2021.

Table 4. Summary of changes in Copy Services Manager 6.3.0 (July 2021)

Function or feature	Description
Update user ID and password for Storage Hardware Management Console (HMC) connection from the Copy Services Manager API (REST API and Command Line Interface).	Copy Services Manager APIs have now been enabled so that you can create scripts to change passwords in environments that manage a large number of storage systems.
New look and feel for **Health Overview** panel	The **Overview** dashboard in Copy Services Manager now provides a summary of information based on managed data.
Display device number and subchannel (and UCB address) in Copy Services Manager GUI.	The GUI will now display the device number and subchannel set for volumes, when Copy Services Manager is attached to a z/OS system. This will allow you to efficiently map the volumes in a Copy Services Manager session to volumes on their z/OS system.
Provide ability to change from multi-target to cascading mode, and back on multi-target three-site session types.	This solution allows you to switch from a multi-target configuration to a cascaded configuration. This enables you to recover to the remote site with zero data loss, in the event of a link loss between the primary and remote site. For information on the new commands, see "Metro Mirror - Global Mirror commands" on page 158, "Metro Mirror - Global Mirror with Practice commands" on page 162, and "Metro Mirror - Global Mirror with Site 3 Global Mirror commands" on page 170.

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Table 4. Summary of changes in Copy Services Manager 6.3.0 (July 2021) (continued)	
Function or feature	**Description**
Enable **ResumeGM** command on multi-target Metro Mirror - Global Mirror session types	This solution allows the **ResumeGM** command to now be seen without a property by default, and adds the command to multi-target Metro Mirror - Global Mirror session types.

Chapter 1. Product overview

Copy Services Manager controls copy services in storage environments. Copy services are features that are used by storage systems such as IBM DS8000 to configure, manage, and monitor data-copy functions. Copy services include IBM FlashCopy, Metro Mirror, Global Mirror, and Metro Global Mirror.

Copy Services Manager runs on Windows, AIX, Linux, Linux on z Systems, and z/OS operating systems. When it is running on z/OS, Copy Services Manager uses the Fibre Channel connection (FICON®) to connect to and manage count-key data (CKD) volumes.

You can use Copy Services Manager to complete the following data replication tasks and help reduce the downtime of critical applications:

- Plan for replication when you are provisioning storage
- Keep data on multiple related volumes consistent across storage systems if there is a planned or unplanned outage
- Monitor and track replication operations
- Automate the mapping of source volumes to target volumes

Copy Services Manager product family

The IBM Copy Services Manager family of products consists of the following products: Copy Services Manager, Copy Services Manager for z Systems and Copy Services Manager Basic Edition for z Systems.

These products provide the following features:

- Copy Services Manager provides high availability and disaster recovery for multiple sites.
- Copy Services Manager for z Systems provides high availability and disaster recovery for multiple sites.
- Copy Services Manager Basic Edition for z Systems provides high availability for a single site if a disk storage system failure occurs.

Copy Services Manager

The fully licensed version of Copy Services Manager provides all supported FlashCopy, Metro Mirror, Global Copy, Global Mirror, Metro Global Mirror, and multi-target solutions.

Copy Services Manager for z Systems

The fully licensed version of Copy Services Manager provides all supported FlashCopy, Metro Mirror, Global Copy, Global Mirror, Metro Global Mirror, and multi-target solutions.

Copy Services Manager Basic Edition for z Systems

Copy Services Manager Basic Edition for z Systems supports a Basic HyperSwap® session type on DS8000 hardware and FlashCopy sessions across any supported hardware platform.

Supported languages

The Copy Services Manager GUI supports several languages.

These languages are supported:

- Chinese (zh-CN)
- Czech (cs)
- French (fr)
- German (de)

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- Hungarian (hu)
- Italian (it)
- Japanese (ja)
- Korean (ko)
- Polish (pl)
- Portuguese - Brazil (pt-BR)
- Russian (ru)
- Spanish (es)

Interfaces for Copy Services Manager

Copy Services Manager provides a graphical user interface (GUI) and a command-line interface (CLI) for managing data replication and disaster recovery.

Graphical user interface

The Copy Services Manager GUI contains the following components:

Menu bar

Use the menu bar to complete tasks, such as navigating the GUI, identifying the ID for the user who is logged on to the GUI, logging out of the GUI, and finding help and other product information.

Navigation

The menu bar contains items that open individual pages in the GUI. For example, if you click **Sessions**, the **Session** page opens. If you click **Storage** > **Storage Systems**, the **Storage Systems** page opens. To view the items that are in a menu, hover the mouse pointer over the menu.

You can open pages in the GUI by clicking the following items in the menu bar:

Overview

Click this item to open the **Overview** page. This page shows a status summary for all sessions, storage systems, host systems, and management servers that Copy Services Manager is managing.

The **Overview** page is displayed when you log on to the GUI.

Sessions

Click this item to open the **Sessions** page. Use this page to create and manage sessions.

Storage > Storage Systems

Click either of these items to open the **Storage Systems** page. Use this page to create and manage storage system connections and to configure the use of the IBM DS8000 Easy Tier® heat map transfer function.

Storage > Host Connections

Click this item to open the **Host Connections** page. Use this page to create and manage connections to host systems.

Storage > Volumes

Click this item to open the **Volumes** page. Use this page to view the volumes that are associated with a storage system.

Paths or Paths > ESS/DS Paths

Click either of these items to open the **ESS/DS Paths** page. Use this page to view and manage paths between source logical subsystems and target logical subsystems for TotalStorage Enterprise Storage Server® Model 800 and IBM DS8000 storage systems.

Console

Click this item to open the **Console** window. Use this window to view detailed information about actions that are taken by users, errors that occur during normal operation, and hardware error indications.

Settings > Advanced Tools
Use this page to perform several actions, including:

- Set user preferences for what language to use.
- Create a log file package for diagnostic purposes.
- Create a backup of the server configuration.
- Change the automatic refresh rate of the GUI.
- Enable or disable the Metro Mirror heartbeat for DS8000 storage systems.
- Export a license to enable another server.

  Note: This section only appears after a license has been applied.
- Export the truststore file for remote connections.
- Synchronize the truststore file with another server.

Settings > Management Servers
Click this item to open the **Management Servers** page. Use this page to manage the active and standby management servers in a high-availability relationship.

Settings > Administration
Click this item to open the **Administration** page. Use this page to view and manage the users and user groups for Copy Services Manager and their access privileges.

If one or more of the components that are shown on the GUI page have an Unknown, Severe, or Warning status, one of the following icons is displayed next to the item in the menu bar:

- Unknown status
- Severe status
- Warning status

If there are multiple components on a page and the components have different statuses, the highest level status icon is displayed next to the item in the menu bar. Unknown is the highest level status and Warning is lowest.

User ID
The user ID shows who is logged on to the GUI. An icon next to the user ID indicates the user role. To view the role, hover over the icon.

To change the user password, hover over the user ID and click **Edit Password**.

To log out of the GUI, hover over the user ID and click **Log Out**.

Help icon
The **Help** icon provides the links to the following items:

- Online help for the active page, window, or notebook in the GUI.
- Production documentation.
- Information about the product.

Breadcrumb
The breadcrumb shows your location in the GUI. You can click an element in the breadcrumb to jump to the corresponding location in the GUI.

For example, when you view the details page for a session, the following breadcrumb is displayed: **Sessions** > ***Session Name***. To return to the **Sessions** page, click **Sessions** in the breadcrumb.

Content area
The content area displays a page that represents to the component that you selected in the menu bar.

Dynamic images
The GUI provides dynamic images that show the status of the sites and role pairs that are in the session. The images present a pictorial view of information such as the status, progress, and

direction of the replication between sites. It also shows whether volumes are consistent between sites. Consistent volumes are blue, while inconsistent volumes are gray.

Data copying symbols indicate the type of copy that occurs between the sites and the status of the copy. The direction that the symbol is displayed in the GUI depends on the direction of the copy. For example, Figure 1 on page 4 represents a FlashCopy session. The FlashCopy operation occurs from the H1 volumes to the T1 volumes as indicated by the lightning bolt symbol. The symbol is gray because the FlashCopy operation is inactive and the T1 volumes are gray because they are not consistent.

Figure 1. Example of a FlashCopy session

Command-line interface

You can use the Copy Services Manager CLI by using the `csmcli` utilities. You can access the CLI directly or as a script to automate functions.

RESTful interface

Staring with Copy Services Manager 6.2.9, the online help also integrates with the RESTful (Representational State Transfer) API.

The RESTful API is a platform independent means by which to initiate create, read, update, and delete operations to the Copy Services Manager server. These operations are initiated with the HTTP commands: POST, GET, PUT, and DELETE. The RESTful API is intended for programmatically managing a replication environment managed by Copy Services Manager. You can use the RESTful API with a CURL command or through standard Web browsers.

The RESTful API is located in the Reference section of the IBM Copy Services Manager online product documentation (http://www.ibm.com/support/knowledgecenter/SSESK4).

Key concepts

To help you understand and use Copy Services Manager effectively, an overview of key concepts is provided.

Management server

The *management server* is a server that has Copy Services Manager installed. The management server provides a central point of control for managing data replication.

For more information about the management server, see “Management servers” on page 41.

Storage systems

A *storage system* is a hardware device on which data is stored. Copy Services Manager can control data replication within and between various storage systems.

To replicate data among storage systems by using Copy Services Manager, you must manually add a connection to each storage system in the Copy Services Manager configuration.

For more information about the storage systems that you can use with Copy Services Manager, see "Storage systems" on page 47.

Host systems

A *host system* for Copy Services Manager is an IBM z/OS system that connects to storage systems to enable certain replication features for those systems.

A connection to a z/OS host system is required if you want to enable z/OS features, such as HyperSwap and hardened freeze in Copy Services Manager sessions.

You can add z/OS host connections in Copy Services Manager regardless of the operating system on which the application is installed. For example, you can add a connection to a z/OS host in a Copy Services Manager instance that is running on Windows, Linux, or AIX.

For more information about the host systems and how to manage them in Copy Services Manager, see Chapter 5, "Managing host systems," on page 67.

Ports

The ports that are used by Copy Services Manager are used for the graphical user interface (GUI), the command-line interface (CLI), connecting to storage systems, and for connecting between an active and a standby Copy Services Manager server.

Copy Services Manager

Port numbers are defined during the installation of Copy Services Manager. To determine the port number for the ports that are used for Copy Services Manager, refer to the following table.

Table 5. Where to find Copy Services Manager port numbers

Copy Services Manager component	Location of port information
Web browser	To view the port number for the web browser, open the `bootstrap.properties` file in the main Copy Services Manager directory for distributed systems, which is *`install dir`*`\liberty\wlp\usr\servers\csmServer\properties`. On z/OS systems, the directory is *`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties`.
Standby management server	To view the port number for each management server, click **Management Servers** in the navigation pane of the Copy Services Manager GUI. You can also run the **`lshaservers`** command from the command-line interface to view the ports for the management servers.

Table 5. Where to find Copy Services Manager port numbers (continued)	
Copy Services Manager component	**Location of port information**
Client and CLI port	To view the port number for the client, click **About** in the navigation pane of the Copy Services Manager GUI. You can also run the **whoami** command from the command-line interface to view the port for the client.

Storage system ports

The following table lists the default ports for each storage system type.

Table 6. Storage system default ports		
Storage System	**Connection Type**	**Port**
• DS8000	Direct Connection	2433
• DS8000	Hardware Management Console Connection	1750 and 1751
Systems running IBM Spectrum Virtualize, including: • FlashSystem V840 • FlashSystem V9000 • FlashSystem 9100 • FlashSystem 9200 • SAN Volume Controller • Storwize® V3500 • Storwize V3700 • Storwize V5000 • Storwize V7000 • Storwize V7000 Unified	Direct Connection	443 and 22
• Systems running IBM Spectrum Accelerate, including: – XIV – FlashSystem A9000 – FlashSystem A9000R	Direct Connection	7778

Ensure that your network configuration is set up so that Copy Services Manager can send outgoing TCP/IP packets to the storage controllers.

Because multiple applications are usually running on the management server, it is possible that port conflicts might arise if other applications attempt to use the same ports that Copy Services Manager uses. Use the `netstat` command to verify which ports the various applications on the management server are using.

When you add a storage system to the Copy Services Manager configuration, the port field is automatically populated with the appropriate value. You can accept the default port or enter another port number.

If firewalls are being used in your configuration, ensure that none of these ports are being blocked. Also, ensure that not only is the Copy Services Manager server granted access to reach the other components, but that the other components are granted access to reach the Copy Services Manager server.

If the management server is running on Windows Server: Configure the inbound and outbound rules for Copy Services Manager. To create a new outbound rule, start the **New Outbound Rule Wizard** from the Windows Firewall with the **Advanced Security** menu.

Sessions

A *session* represents a specific set of volumes that is managed by the same copy services solution. The type of copy services solution that is associated with the session determines the replication actions that are available for the session. For example, the options for FlashCopy sessions are different from the options for Metro Mirror sessions.

For more information about sessions, see "Sessions" on page 79.

Copy sets

During data replication, data is copied from a source volume to one or more target volumes, depending on the session type. The source volume and target volumes that contain copies of the same data are collectively referred to as a *copy set*.

For more information about copy sets, see "Copy sets" on page 79.

Volume roles

A *volume role* is given to every volume in the copy set. The role defines how the volume is used in the copy set and, for multi-site sessions, the site location of the volume. For example, the H1 role is made up of host-attached volumes that are at site 1.

For more information about volume roles, see "Volume roles" on page 82.

Role pairs

A *role pair* is the association of two volume roles in a session that take part in a copy relationship. For example, in a Metro Mirror session, the role pair can be the association between host volumes at site 1 and host volumes at site 2 (H1-H2).

The flow of data in the role pair is indicated by an arrow. For example, H1>H2 denotes that H1 is the source and H2 is the target.

For more information about role pairs, see "Role pairs" on page 83.

Practice volumes

Practice volumes are volumes within a solution that can be used to practice disaster-recovery capability exactly as if there was a true disaster to recover to the remote site. You can use a *practice volume* to practice for disaster recovery without interrupting current data replication. Practice volumes are available in Metro Mirror, Global Mirror, Metro Global Mirror, and Metro Mirror - Global Mirror sessions.

You can practice disaster recovery actions without using practice volumes. However, without practice volumes, you cannot continue to copy data changes between volumes while you are practicing.

For more information about practice volumes, see "Practice volumes" on page 84.

Consistency groups

Copy Services Manager sessions are designed to maintain consistency across all the production volumes contained in a session. When Copy Services Manager refers to a *consistency group*, it is referring to the storage system container that the Copy Services Manager session is using to maintain consistency across all the volumes in the session. A storage system container, such as the DS8000 Global Mirror Master or

the SAN Volume Controller Global Mirror consistency group, is created by Copy Services Manager so that the storage system knows which pairs to maintain consistency across.

Copy Services Manager automatically assigns an ID to each consistency group on the storage systems. However, you can choose to assign a custom name to a storage-system consistency group. A custom-defined name is used to associate multiple sessions with a specific storage-system consistency group.

For more information about consistency groups, see "Working with user-defined consistency groups" on page 215.

Data exposure

Data exposure is the period when data is written to the storage at the primary site until data is replicated to storage at the secondary site. Data exposure is influenced by factors such as:

- Requested consistency-group interval time
- Type of storage systems
- Physical distance between the storage systems
- Available bandwidth of the data link
- Input/output (I/O) load on the storage systems

To manage data exposure, you can change the consistency-group interval time. The *consistency-group time interval* specifies how often a Global Mirror and Metro Global Mirror session attempts to form a consistency group. When you reduce this value, it might be possible to reduce the data exposure of the session. A smaller interval value causes the session to attempt to create consistency groups more frequently, which might also increase the processing load and message-traffic load on the storage systems.

Failover and failback operations

If a session has *failover* and *failback* capabilities, you can move the operation of Copy Services Manager from one site to another, and change the direction of the copy.

Failover is the process of temporarily switching production to a backup facility by following a scheduled maintenance period or a disaster at a production site. A failover operation can be followed by a failback operation, which is the process of returning production to its original location and resuming the copy between the two sites.

For more information about failover and failback operations, see "Failover and failback operations" on page 84.

Session commands

The commands that are available for a session depend on the session type.

For descriptions of the session commands for each session type, see "Session commands" on page 126.

Session types

Copy Services Manager provides several methods to replicate data. The type of data replication that is associated with a session is known as the *session type*.

The session types that are available depend on the storage system type and the edition of Copy Services Manager that you are using.

HyperSwap

HyperSwap is a copy services solution for IBM z/OS version 1.9 and later. HyperSwap provides high availability of data if a storage system failure occurs. If an I/O error occurs at the primary site, HyperSwap technology automatically swaps I/O to a secondary set of volumes with little to no impact to the customer.

Copy Services Manager supports enabling certain session types with HyperSwap capabilities. These session types include:

- Metro Mirror
- Metro Global Mirror
- Multi-target session types:
  - Metro Mirror - Metro Mirror
  - Metro Mirror - Global Mirror
  - Metro Mirror - Global Mirror with Practice
  - Metro Mirror - Global Mirror with Site 3 Global Mirror
  - Metro Mirror - Global Mirror with Site 4 Replication
  - Metro Mirror - Metro Mirror with Site 4 Replication

When enabled for HyperSwap, Copy Services Manager communicates with IBM Z to provide information on which volumes need to be highly available.

FlashCopy

FlashCopy replication creates a point-in-time copy of the data on a source volume to a target volume. Data that existed on the target volume is replaced by the copied data.

Snapshot

Snapshot replication creates a point-in-time copy of a volume or set of volumes without having to define a specific target volume. The target volumes of a Snapshot session are automatically created when the snapshot is created.

Metro Mirror Single Direction

Metro Mirror is synchronous replication that operates between two sites that are up to 300 km apart. The source volumes are on one storage system and the target volumes are on another storage system.

Metro Mirror replication maintains identical data in both the source and target volumes. When a write operation is issued to a source volume, the changes are propagated to the target volume before the write operation finishes processing.

With the Metro Mirror Single Direction session type, Metro Mirror replication is available only from the primary site.

Metro Mirror Single Direction sessions are available for the following Copy Services Manager editions and storage systems.

Metro Mirror Single Direction

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller

Supported editions	Supported storage systems
	– Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Metro Mirror Failover/Failback

With Metro Mirror Failover/Failback replication, you can switch the direction of the data flow so that you can use your secondary site as your production site. You can then copy changes that are made at the secondary site back to the primary site.

Metro Mirror Failover/Failback sessions are available for the following Copy Services Manager editions and storage systems.

Table 7. Metro Mirror Failover/Failback

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage) • Systems running IBM Spectrum Accelerate, including: – XIV – FlashSystem A9000 – FlashSystem A9000R

Metro Mirror Failover/Failback with Practice

Metro Mirror Failover/Failback with Practice replication combines Metro Mirror Failover/Failback and FlashCopy capabilities to provide a point-in-time copy of the data on the secondary site. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

Metro Mirror Failover/Failback with Practice sessions are available for the following Copy Services Manager editions and storage systems.

Table 8. Metro Mirror Failover/Failback with Practice	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Metro Mirror Failover/Failback with Change Volumes

Metro Mirror Failover/Failback with Change Volumes replication provides the same capabilities as the Metro Mirror Failover/Failback session type. However, Metro Mirror Failover/Failback with Change Volumes sessions also associate change volumes to the primary and secondary to enable consistency protection during restarts.

Metro Mirror Failover/Failback with Change Volumes sessions are available for the following Copy Services Manager editions and storage systems.

Table 9. Metro Mirror Failover/Failback with Change Volumes	
Supported editions	**Supported storage systems**
• Copy Services Manager	• Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller Version 6.3 and later – Storwize V3700 Version 6.4.1 and later – Storwize V5000 – Storwize V7000 Version 6.3 and later – Storwize V7000 Unified Version 1.3 and later (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Global Mirror Single Direction

Global Mirror is asynchronous replication that operates between two sites that are over 300 km apart. The source volumes are on one storage system and the target volumes are on another storage system.

Global Mirror replication maintains identical data in both the source and target volumes. When a write operation is issued to a source volume, the changes are typically propagated to the target volume a few seconds after the data is written to the source volume.

With the Global Mirror Single Direction session type, Global Mirror replication is available only from the primary site.

Global Mirror Single Direction sessions are available for the following Copy Services Manager editions and storage systems.

Table 10. Global Mirror Single Direction

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Global Mirror Either Direction

With Global Mirror Either Direction replication, you can run Global Mirror replication from either the primary or secondary site.

Global Mirror Either Direction sessions are available for the following Copy Services Manager editions and storage systems.

Table 11. Global Mirror Either Direction

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Global Mirror Either Direction with Two-Site Practice

With Global Mirror Either Direction with Two-Site Practice replication, you can run Global Mirror replication from either the primary or secondary site. This session type provides volumes on the primary and secondary site that you can use to practice for disaster recovery without losing your disaster recovery capability.

Global Mirror Either Direction with Two-Site Practice sessions are available for the following Copy Services Manager editions and storage systems.

Table 12. Global Mirror Either Direction with Two-Site Practice	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000

Global Mirror Failover/Failback

With Global Mirror Failover/Failback replication, you can switch the direction of the data flow so that you can use your secondary site as your production site. You can then copy changes that are made at the secondary site back to the primary site.

Global Mirror Failover/Failback sessions are available for the following Copy Services Manager editions and storage systems.

Table 13. Global Mirror Failover/Failback	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage) • Systems running IBM Spectrum Accelerate, including: – XIV – FlashSystem A9000 – FlashSystem A9000R

Global Mirror Failover/Failback with Change Volumes

Global Mirror Failover/Failback with Change Volumes replication provides the same capabilities as the Global Mirror Failover/Failback session type. However, Global Mirror Failover/Failback with Change Volumes sessions also provide the option of enabling or disabling the use of change volumes. Change volumes are available in SAN Volume Controller and Storwize storage systems.

Global Mirror Failover/Failback with Change Volumes sessions are available for the following Copy Services Manager editions and storage systems.

Table 14. Global Mirror Failover/Failback with Change Volumes	
Supported editions	**Supported storage systems**
• Copy Services Manager	• Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller Version 6.3 and later – Storwize V3700 Version 6.4.1 and later – Storwize V5000 – Storwize V7000 Version 6.3 and later – Storwize V7000 Unified Version 1.3 and later (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Global Mirror Failover/Failback with Practice

Global Mirror Failover/Failback with Practice replication combines Global Mirror Failover/Failback and FlashCopy capabilities to provide a point-in-time copy of the data on the secondary site. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

Global Mirror Failover/Failback with Practice sessions are available for the following Copy Services Manager editions and storage systems.

Table 15. Global Mirror Failover/Failback with Practice	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Metro Global Mirror

Metro Global Mirror replication provides continuous, remote data replication that operates between three sites that are varying distances apart. Metro Global Mirror combines Metro Mirror synchronous copy and Global Mirror asynchronous copy into a single session, where the Metro Mirror target is the Global Mirror source. With Metro Global Mirror replication, you can switch the direction of the data flow so that you can use your secondary or tertiary site as your production site.

Metro Global Mirror sessions are available for the following Copy Services Manager editions and storage systems.

Table 16. Metro Global Mirror

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Metro Global Mirror with Practice

Metro Global Mirror with Practice replication combines Metro Mirror, Global Mirror, and FlashCopy capabilities to provide a point-in-time copy of the data on the tertiary site. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

Metro Global Mirror with Practice sessions are available for the following Copy Services Manager editions and storage systems.

Table 17. Metro Global Mirror with Practice

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Metro Mirror - Metro Mirror

A Metro Mirror - Metro Mirror session is a multi-target session that consists of three sites. You can define any of the sites as the primary site and then run Metro Mirror replication from the primary site to either of the other sites individually or both sites simultaneously. For example, if Site 1 is the primary site, data replication can occur between the H1 and H2 volumes and the H1 and H3 volumes separately or at the same time.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 18. Metro Mirror - Metro Mirror

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Metro Mirror - Global Mirror

A Metro Mirror - Global Mirror session is a multi-target session that consists of three sites. From the primary site, you can define both a Metro Mirror copy and a Global Mirror copy, which allows for replication across both a short distance and long distance simultaneously.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

You can also use this session type with IBM FlashSystem A9000 and A9000R storage systems.

Note: HyperSwap is always enabled for the Metro Mirror - Global Mirror multi-target session type on FlashSystem A9000 and A9000R. If a swap occurs, the hardware automatically restarts the Metro Mirror pair in the opposite direction and re-enables HyperSwap. And after the swap, the remote Global Mirror is *not* automatically restarted.

See the IBM Redbooks publication at http://www.redbooks.ibm.com/redpieces/abstracts/redp5434.html for more specific details on how to set up this session type on the FlashSystem A9000 and A9000R storage systems.

Table 19. Metro Mirror - Global Mirror	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • IBM FlashSystem A9000 and A9000R

Note: To convert from a multi-target configuration to a cascaded configuration, refer "Converting from multi-target to Cascaded replication in a three site session type" on page 235.

Metro Mirror - Global Mirror with Practice

A Metro Mirror - Global Mirror with Practice session is a multi-target session that consists of three sites. From the primary site, you can define both a Metro Mirror copy and a Global Mirror copy, which allows for replication across both a short distance and long distance simultaneously. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 20. Metro Mirror - Global Mirror with Practice	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000

Note: To convert from a multi-target configuration to a cascaded configuration, refer "Converting from multi-target to Cascaded replication in a three site session type" on page 235.

Metro Mirror - Global Mirror with Site 3 Global Mirror

A Metro Mirror - Global Mirror with Site 3 Global Mirror session is a multi-target session that consists of three sites. From the primary site, you can define both a Metro Mirror copy and a Global Mirror copy, which allows for replication across both a short distance and long distance simultaneously. After recovery to Site 3, this session allows a Global Mirror replication back to either Site 1 or Site 2 and a cascaded Global Copy to the third site. This action provides disaster recover capabilities while production runs at Site 3.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 21. Metro Mirror - Global Mirror with Site 3 Global Mirror	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000

Note: To convert from a multi-target configuration to a cascaded configuration, refer "Converting from multi-target to Cascaded replication in a three site session type" on page 235.

Metro Mirror - Global Mirror with Site 4 Replication

A Metro Mirror - Global Mirror with Site 4 Replication session is a multi-target session that consists of four sites. From the primary site, you can define both a Metro Mirror copy and a Global Mirror copy, which allows for replication across both a short distance and long distance simultaneously. After recovery to Site 4, this session allows a Global Mirror replication back to either Site 1, Site 2, or Site 3, and a cascaded Global Copy to the fourth site. This action provides disaster recover capabilities while production runs at Site 4.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 22. Metro Mirror - Global Mirror with Site 4 Replication

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Metro Mirror - Metro Mirror with Site 4 Replication

A Metro Mirror - Metro Mirror with Site 4 Replication session is a multi-target session that consists of four sites. From the primary site, you can define a Metro Mirror - Metro Mirror copy, which allows for replication across two short distances simultaneously. After recovery to Site 4, this session allows a Metro Mirror replication back to either Site 1, Site 2, or Site 3, and a cascaded Metro Copy to the fourth site. This action provides disaster recovery capabilities while production runs at Site 4.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 23. Metro Mirror - Metro Mirror with Site 4 Replication

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Safeguarded Copy

A Safeguarded Copy session is designed to capture many point-in-time images of a production environment with optimized capacity usage and minimized performance impact. The backup created by a Safeguarded Copy session can be recovered to another set of volumes while the production environment continues to run. Safeguarded Copies help to prevent the data from being compromised, either accidentally or deliberately. Therefore, the Safeguarded Copy session type offers another layer of security in your environment.

Table 24. Safeguarded Copy

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000 • SAN Volume Controller and Spectrum Virtualize based FlashSystem devices

Migration

The new Migration session is available starting with Copy Services Manager 6.2.10. The Migration session is a two-volume session type with roles H1 and H2.

The Migration session ignores the rule that the primary and secondary have to be the same size and type. Therefore, you can use this session to migrate data from one set of volumes to another, regardless of size, as long as the hardware supports it.

You can only start a Migration session from H1. You cannot start in Metro Mirror mode. And a Migration session running in Global Copy mode will not manage freeze or run conditions.

You can still manually Suspend or Stop the session for consistent or inconsistent suspends. And you can Recover the session to failover the pairs, thereby allowing the targets to be writable.

From the Target Available state, you can only restart in the original direction or terminate. You cannot restart in the opposite direction.

Table 25. Migration

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Extent Space Efficient Sizer

The ESE Sizer session supports analyzing space requirements for DS8000 Extent Space Efficient (ESE) FlashCopy and Safeguarded Copy.

An accurate sizing of ESE FlashCopy and Safeguarded Copy is crucial. With the DS8880 microcode 8.5.4 release and DS8900F 9.1 release a Write Monitoring (WM) bitmap is implemented in the DS8000 to track all write to each volume.

The purpose of the Write Monitoring Bitmap is to provide an effective way to determine usable space requirements for both Extent Space Efficient (ESE) FlashCopy and Safeguarded Copy without impacting host write I/O or disk replication performance. The write monitoring bitmap enables a DS8000 to track the amount and locality of its changed data over definable time intervals and across a set time period in an existing production environment.

The new session type queries the Write Monitoring bitmap and provides output files on box and volume level. These output files contain the currently allocated extents, changed tracks, changed small extents and change large extents. This level of detail can readily be used to determine how much capacity will be allocated over time for both functions ESE FlashCopy and Safeguarded Copy.

The following tool can be used to process the data collected from the Copy Services Manager ESE Sizer session to provide more accurate capacity sizings in the configurations. Refer the link https://www.ibm.com/support/pages/node/6372180 for more detailed information regarding ESE Sizer session and the collected data.

The ESE Sizer session can start, stop, and reset the WM bitmap. With the available properties, you can define the volume query interval and the bitmap reset interval.

Note: It is recommended to run the ESE Sizer session on a Copy Services Manager instance that is not currently managing replication. While the ESE Sizer session does not affect replication, the data collected uses system memory resources so running on a separate server is recommended to avoid any memory constraints. Refer “Calculating server memory requirements” on page 37 for more information.

Table 26. ESE Sizer session

Supported editions	Supported storage systems
Copy Services Manager	IBM DS8000

Metro Mirror heartbeat

The Metro Mirror *heartbeat* guarantees data consistency across multiple storage systems when the Copy Services Manager management server cannot communicate with one or more storage systems.

The Metro Mirror heartbeat is disabled by default. When determining whether to use the Metro Mirror heartbeat, analyze your business needs. If you disable the Metro Mirror heartbeat, data might become inconsistent. If you enable the Metro Mirror heartbeat and a freeze occurs on the storage system, your applications cannot perform write operations during the freeze.

For more information about the Metro Mirror heartbeat, see "Metro Mirror heartbeat" on page 220.

Site awareness

You can associate a location with each storage system and each site in a session. This *site awareness* ensures that only the volumes whose location matches the location of the site are allowed for selection when you add copy sets to the session. Site awareness prevents a session relationship from being established in the wrong direction.

For more information about site awareness, see "Site awareness" on page 52.

User and group authentication

To log on to Copy Services Manager, a user ID and password are required.

Copy Services Manager uses one of the following repositories for user or group authentication:

- The basic user registry for distributed systems, or an operating system repository, such as RACF, for z/OS systems
- A Lightweight Directory Access Protocol (LDAP) repository for both distributed systems and z/OS systems

The basic user registry is a registry of users that is managed internally by the application by using the WebSphere® Liberty Profile.

If you choose to use LDAP authentication, you must configure the LDAP server information with the Copy Services Manager authentication server after the installation of Copy Services Manager is complete.

For information on managing user and group authentication, see Chapter 10, "Managing security," on page 313.

User roles

A *user role* is a set of privileges that is assigned to a user or user group to allow the user or user group to perform certain tasks and manage certain sessions.

To be assigned to a role, each user or group of users must have a valid user ID or group ID in the user registry on the management server.

Both individual users and a group of users can be assigned to a role. All users in a group are assigned the role of the group. If a user is assigned to one role as an individual and a different role as a member of a group, the user has access to the permissions of the role that has greater access.

Restricting access to sessions prevents unwarranted administrative access. This is especially useful in an open environment, where there can be many storage administrators who are responsible for their servers, applications, databases, file systems, and so on.

By default, the user that was defined during installation is granted access to Copy Services Manager and assigned to the Administrator role.

Copy Services Manager provides a set of predefined user roles: Monitor, Operator, User Administrator and Administrator.

For information on assigning and modifying user roles, see Chapter 10, "Managing security," on page 313.

Monitor

Monitors can view the health and status in the Copy Services Manager GUI and CLI; however, they cannot modify or perform any commands or actions.

Monitors can view the following information:

- All storage systems and storage system details
- All connections and connection details
- All sessions and session details
- All path information
- Management server status and details

When Should a Monitor Be Used:

A user or group should be set to a Monitor when you only want to provide that user or group the ability to view the status of the sessions and various server connections. Examples might include upper management or an external team that does not directly manage the replication, but might need to know whether their data is currently protected.

Operator

Operators can only monitor the sessions that they have access to. They can perform the following actions on their assigned sessions:

- Adding or removing a session. The user ID that created the session is automatically granted access to manage that session.
- Performing actions on an assigned session, such as start, flash, terminate, and suspend.
- Modifying session properties.
- Removing copy sets from a session.

  Note: Starting with Copy Services Manager 6.2.10, operators can no longer add copy sets to a session. This new behavior prevents operators from adding volumes that are in use, or are meant for another session or operator, including in multi-tenancy environments. Because Copy Services Manager sees all the volumes on a storage system, an administrator needs to add the copy sets to ensure that volumes are used by the correct sessions and operators.
- Adding Peer To Peer Remote Copy (PPRC) paths, and removing paths with no hardware relationships. PPRC paths are a common resource used in Copy Services Manager sessions and also in a DS8000 storage system relationship that is established between two common logical subsystems (LSSs).

  Notes:

  – The session operator cannot issue a force removal of a path.

  – A path can also be auto-generated when starting a session.
- Monitoring health and status, including viewing the following information:

  – All storage systems and storage system details

  – All connections and connection details

  – All sessions and session details

  – All path information

  – Management server status and details
- Packaging program error (PE) log files

When you select the Operator role, you must indicate which sessions the Operator has access to. You can either choose individual sessions from a list of sessions, or select the **all sessions** option. If you select **all sessions**, then the Operator will have the ability to manage all existing sessions, as well as automatically managing any new sessions that get created.

When Should an Operator Be Used:

A user or group should be set to an Operator when you only want to provide that user or group the ability to manage one or more sessions, but not the ability to manage higher level features, such as user access or server connections. Examples might include a multi-tenancy situation where more than one group is using the same Copy Services Manager server for replication, and you do not want one group to affect the replication of another.

The session Operator can also be used to provide a more-secure environment when combined with the User Administrator role. An Administrator is required for the initial setup of the server to create storage system connections, and so on. After all the connections are established, an Administrator can assign one or more users to the User Administrator role. The User Administrator can then remove Administrator privileges of the original Administrator, thereby making that Administrator an Operator.

This design creates a situation where you have User Administrators and Session Operators, but no one with all-encompassing Administrator access. A User Administrator might need to make individuals Administrators from time to time if server modifications need to be made. However, this action would require approval from the User Administrator; thereby creating a more-secure environment.

User Administrator

User Administrators do not have permissions to manage sessions, storage systems, and so on. User Administrators only have permission to manage the permissions for other users or groups, including:

- Creating and Removing basic users
- Granting permissions to users and groups of users
- Managing LDAP or Active Directory authentication
- Packaging program error (PE) log files

Note: User Administrators cannot modify their own administrative access rights.

When Should a User Administrator Be Used:

A user or group should be set to a User Administrator when you only want to provide that user or group the ability to manage the permissions of other users on the server.

You are not required to assign a User Administrator, because the Administrator role also allows a user to manage the permissions of others. However, you might want to separate the ability to manage permissions from the ability to manage sessions for security reasons. Examples might include environments where security for all servers are managed by a common group outside of the actual storage management group.

Administrator

Administrators have unrestricted access. They can manage all sessions and perform all actions associated with Copy Services Manager, including:

- Granting permissions to users and groups of users.
- Adding or removing a session. The user ID that created the session is automatically granted access manage that session.
- Performing actions on all sessions, such as start, flash, terminate, and suspend.
- Modifying session properties.
- Adding and removing copy sets from a session. The administrator can add volumes to a copy set only when the volume is not protected and not in another session.
- Protecting volumes and removing volume protection.
- Adding or removing storage system connections.
- Modifying connection properties.
- Assigning or changing storage system locations.

- Adding PPRC paths and removing paths with no hardware relationships. PPRC paths are a common resource used in Copy Services Manager sessions and also in a DS8000 storage-system relationship that is established between two common logical subsystems (LSSs).

  Note: A path can also be auto-generated when starting a session.
- Managing management servers. The standby management server is a common resource that is available to multiple sessions.
- Packaging program error (PE) log files.
- Monitoring health and status, including viewing the following information:
  - All storage systems and storage system details
  - All connections and connection details
  - All sessions and session details
  - All path information
  - Management server status and details

Note: Administrators cannot revoke their own administrative access rights.

When Should an Administrator Be Used:

A user or group should be set to a Administrator when you want that user or group to have all permissions on the server, including granting new permissions to other users, or managing replication sessions. Examples include environments where the same user or group that is managing the replication is also managing the security for the server.

Chapter 2. Administering

Administrative tasks within Copy Services Manager include authorizing users, starting and stopping services, and performing backup and recovery operations.

Exporting a license file

You can export a license (`.zip`) file from the Copy Services Manager GUI that contains the installed product licenses.

About this task

You can use the export license feature to transfer full licensed support to another server.

Use these steps to export a license (`.zip`) file from the Copy Services Manager GUI:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrative privileges.
2. In the menu bar, click **Settings** > **Advanced Tools**. The **Advanced Tools** panel is displayed.
3. Scroll down to locate the `Copy License Key or Export License` section of the panel. Click **Export**.

   Note: If no license file is available for export, a status message is displayed saying so.

   When you click **Export**, the server creates and stores a compressed (`.zip`) file of all the license information in the *<path_prefix>*`/csmServer/license` directory.

   When the license data is exported, the file name and location on the management server appears as a link. You can click the link to download the exported licenses to the server on which the web browser is running. You can import the file when you click **Update Licenses** from the Copy Services Manager GUI on another server. For information on how to import a license, see "Applying license files after installation or migration, or updating licenses" on page 24.

Copying a license key

The Copy Services Manager GUI supports the ability to import a string-based key for transferring a license to another server.

About this task

You can use the copy license key feature to transfer full licensed support to another server.

Use these steps to copy a license key from the Copy Services Manager GUI:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrative privileges.
2. In the menu bar, click **Settings** > **Advanced Tools**. The **Advanced Tools** panel is displayed.
3. Scroll down to locate the `Copy License Key or Export License` section of the panel. Click the displayed string value, or the **Copy License Key** button, to copy the license key string to the clipboard to enable another server.

   You can import the license key when you click **Update Licenses** from the Copy Services Manager GUI on another server. For information on how to import a license, see "Applying license files after installation or migration, or updating licenses" on page 24.

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Applying license files after installation or migration, or updating licenses

After you install or migrate to Copy Services Manager, you must apply the available license files if you did not do so during the installation process. This task can also be used to update licenses, such as for transfer to another server.

Before you begin

Contact your IBM representative to either obtain a Try-and-Buy key, or to determine where the license files are stored for your version of Copy Services Manager. The license enablement files, which contain the license keys to be applied, are stored within the ordering system that you used. You need to download the files from this location.

If you want to import a license to transfer licensed support to another server, you must first export the license (`.zip`) file. See "Exporting a license file" on page 23 for more information before you follow the procedure to apply the license file. Alternatively, you can import a license key string if your system does not support importing a license file, for example when Copy Services Manager is installed on the DS8000 HMC. The license key works like the Try-and-Buy activation key. See "Copying a license key" on page 23 for more information.

About this task

The following steps detail how to apply Copy Services Manager license files after installation or migration, or how to update licenses, such as for transfer to another server.

Use these steps to apply or update license files:

Procedure

1. If necessary, download the appropriate license files as instructed by your IBM representative. These files are in compressed (`.zip`) file format.
2. Log in to the Copy Services Manager GUI as a user with administrative privileges.
3. In the menu bar, on the far right, click **Update Licenses**.

   Note: This menu option only appears when there is no Try-and-Buy key and no full license applied. If either of those items are applied, this menu option disappears.

   - You can also click **Settings** > **Administration** to get to the **Update Licenses** button. This button appears on the **Administration** page if either no license files are applied, or only the Try-and-Buy license is applied. The button disappears only after you upload the full license compressed (`.zip`) file.
4. Update the license by either typing in the activation key or uploading a license file. The activation key is a string value that is provided for Try-and-Buy capabilities by your account representative, or through an export licenses action on an existing installation. If a license file was provided for activation, such as a `csm-license.zip` file, click the **Click here to activate the product by using the key file** text, and then click **Browse** to select a license file to upload.
5. Click **Apply** to submit, or click **Cancel** to exit without applying any licenses.

Results

When the necessary license files are applied, the available functions are enabled for use.

Starting and stopping Copy Services Manager

Use these procedures to manually start and stop Copy Services Manager.

Starting the Copy Services Manager server

The commands that are required to manually start the Copy Services Manager server depend on the operating system.

Before you begin

The Copy Services Manager server is started by default after the application is installed. A service is created that automatically restarts when the server is restarted. The start and stop features can be done manually, but that is not typically necessary.

Starting the Copy Services Manager server on Windows

About this task

To start the Copy Services Manager server, issue the following command from the command prompt:

```
Program Files\IBM\CSM\startCSM.bat
```

Where the variable *Program Files\IBM\CSM* is the installation directory. The default directory is `C:\Program Files\IBM\CSM`.

Starting the Copy Services Manager server on AIX or Linux

About this task

To start the Copy Services Manager server, issue the following command from the command line:

```
/CSM_install_directory/startCSM.sh
```

Where *CSM_install_directory* is the installation directory. The default directory is `/opt/IBM/CSM`.

Starting the Copy Services Manager server on z/OS

About this task

To start theCopy Services Manager server, complete the following steps:

Procedure

1. Ensure that the Copy Services Manager HFS is mounted on the UNIX System Services.

   The root production directory is *path_prefix*`/opt/IBM/CSM`.
2. Issue the command from the IBM z/OS System Display and Search Facility (SDSF) panel to start the Copy Services Manager server, as shown in the following example. The address spaces that are shown might be different in your environment.

   ```
   /START IWNSRV
   ```

   The initiator is IWNSRV and the job name is IWNSRV. For information about the IWNSRV job, see the IBM Copy Services Manager Installation and Configuration Guide.

Starting the Copy Services Manager authentication server

The commands that are required to manually start the Copy Services Manager authentication server depend on the operating system.

Before you begin

The Copy Services Manager authentication server is started by default after the application is installed. A service is created that automatically restarts when the server is restarted. The start and stop features can be done manually, but that is not typically necessary.

Starting theCopy Services Manager authentication server on Windows

About this task

To start the Copy Services Manager authentication server, issue the following command from the command prompt:

```
Program Files\IBM\CSM\startAuth.bat
```

Where the variable *Program Files\IBM\CSM* is the installation directory. The default directory is `C:\Program Files\IBM\CSM`.

Starting theCopy Services Manager authentication server on AIX or Linux

About this task

To start the Copy Services Manager authentication server, issue the following command from the command line:

```
/CSM_install_directory/startAuth.sh
```

Where *CSM_install_directory* is the installation directory. The default directory is `/opt/IBM/CSM`.

Starting the Copy Services Manager authentication server on z/OS

About this task

To start the Copy Services Manager authentication server, complete the following steps:

Procedure

1. Ensure that the Copy Services Manager HFS is mounted on the UNIX System Services.
   The root production directory is *path_prefix*`/opt/IBM/CSM`.
2. Issue the command from the IBM z/OS System Display and Search Facility (SDSF) panel to start the Copy Services Manager authentication server, as shown in the following example. The address spaces that are shown might be different in your environment.

   ```
   /START IWNAUTH
   ```

   The initiator is IWNAUTH and the job name is IWNAUTH. For information about the IWNAUTH job, see the IBM Copy Services Manager Installation and Configuration Guide.

Stopping the Copy Services Manager server

The commands that are required to manually stop the Copy Services Manager server depend on the operating system.

Stopping the Copy Services Manager server on Windows

About this task

To stop the Copy Services Manager server, issue the following command from the command prompt:

```
CSM_install_directory\IBM\CSM\stopCSM.bat
```

Where the variable *CSM_install_directory* is the installation directory. The default directory is `C:\Program Files\IBM\CSM`.

Stopping the Copy Services Manager server on AIX or Linux

About this task

To stop the Copy Services Manager server, issue the following command from the command line:

```
/CSM_install_directory/stopCSM.sh
```

Where *CSM_install_directory* is the installation directory. The default directory is `/opt/IBM/CSM`.

Stopping the Copy Services Manager server on z/OS

About this task

To stop the Copy Services Manager server, complete the following steps:

Procedure

1. Issue a command from the IBM z/OS System Display and Search Facility (SDSF) panel to stop Copy Services Manager, as shown in the following example command. The address space that is shown might be different in your environment.

   ```
   /STOP IWNSRV
   ```

   Where **/STOP IWNSRV** stops the server address space.
2. Issue the **/D A,L** command to show the processes that are running and verify that the stop command completed. If the IWNSRV address space is displayed, issue the **/CANCEL** command for the address space.

Stopping the Copy Services Manager authentication server

The commands that are required to manually stop the Copy Services Manager authentication server depend on the operating system.

Stopping the Copy Services Manager authentication server on Windows

About this task

To stop the Copy Services Manager authentication server, issue the following command from the command prompt:

```
CSM_install_directory\IBM\CSM\stopAuth.bat
```

Where the variable *CSM_install_directory* is the installation directory. The default directory is `C:\Program Files\IBM\CSM`.

Stopping the Copy Services Manager authentication server on AIX or Linux

About this task

To stop the Copy Services Manager authentication server, issue the following command from the command line:

```
/CSM_install_directory/stopAuth.sh
```

Where *CSM_install_directory* is the installation directory. The default directory is `/opt/IBM/CSM`.

Stopping the Copy Services Manager authentication server on z/OS

About this task

To stop the Copy Services Manager authentication server, complete the following steps:

Procedure

1. Issue a command from the IBM z/OS System Display and Search Facility (SDSF) panel to stop the Copy Services Manager authentication server, as shown in the following example command. The address space that is shown might be different in your environment.

   ```
   /STOP IWNAUTH
   ```

   Where **/STOP IWNAUTH** stops the server address space.
2. Issue the **/D A,L** command to show the processes that are running and verify that the stop command completed. If the IWNAUTH address space is displayed, issue the **/CANCEL** command for the address space.

Verifying that the Copy Services Manager server is running

You can verify that the Copy Services Manager server is running in several ways.

About this task

Complete one or more of these tasks to determine whether the Copy Services Manager server is running:

Procedure

- Start the Copy Services Manager GUI or command-line interface shell. If either of these methods is successful, the Copy Services Manager server is running.
- View the `csmTrace.log` file. For distributed systems, this file is in the *install dir*`\liberty\wlp\usr\servers\csmServer\logs\CSM\` directory. For z/OS systems, this file is in the *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/logs/CSM` directory. If the `csmTrace.log` file is updated regularly and is increasing in size, the Copy Services Manager server is running.

  Note: For z/OS systems, you can also issue the **/D A,L** command to display the processes that are running.

Verifying that the Copy Services Manager authentication server is running

You can verify that the Copy Services Manager authentication server is running in several ways.

About this task

Complete one or more of these tasks to determine whether the Copy Services Manager authentication server is running:

Procedure

- Attempt to log in to the Copy Services Manager GUI or CLI by using an LDAP user or group. If you are able to do log in this way, the authentication server is running because it is required to perform LDAP authentication.
- On distributed systems, open the *CSM_install_directory*\liberty\wlp\usr\servers\csmAuth\workarea directory. You see an .sRunning file if the authentication server is active. For z/OS systems, issue the **/D A,L** command to display the processes that are running.

Updating the server properties file

You can update the server properties file by using the Copy Services Manager GUI. You can also edit the file outside of the GUI if necessary.

About this task

The server properties file defines advanced properties for the Copy Services Manager server. Starting with Copy Services Manager Version 6.2.1, you can use the GUI to update the server properties configuration file.

Note: If the GUI is not available, you can also edit the server properties by using the rmserver.properties file in one of the following locations:

- For distributed systems: install dir\liberty\wlp\usr\servers\csmServer\properties
- For z/OS: path_prefix/opt/IBM/CSM/wlp/usr/servers/csmServer/properties

For more information, see "rmserver.properties file" on page 346.

Follow these steps to update the server properties in the Copy Services Manager GUI:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Settings** > **Server Properties**.
3. Click **Edit** and enter any properties in the text area.

   The following rules apply when you edit the server properties file:

   - Each line in the file represents a server property. Specify the property by writing the property name, the equals (=) sign, and then the value for the property. Example: log.file.maxFiles=50
   - To comment out a line place the pound (#) symbol at the start of the line. Example: #log.file.maxFiles=50
4. After the information is complete, click **Save** to save the properties. If any errors in the format are detected while the file is being saved, an error message displays to indicate the error. Click **Edit** to correct any format errors. Click **Cancel** to quit editing and restore the current server properties file.

Results

The server properties are updated according to the changes that you made.

Starting the Copy Services Manager GUI

You can start the graphical user interface (GUI) by opening a web browser and entering a web address for the Copy Services Manager logon page.

About this task

To start the Copy Services Manager GUI, use these steps:

Procedure

1. Start a web browser and enter the following address in the address field. The address field is case-sensitive.

   ```
   https://hostname:port/CSM
   ```

   In the preceding address field, specify these values:

   hostname
   The Copy Services Manager server. You can specify the host name as an IP address or a Domain Name System (DNS) name.

   port
   The port number for Copy Services Manager.

   Note: The default port for Copy Services Manager is 9559.

   You can find the port number in the `bootstrap.properties` file in the *`install dir`*`\liberty\wlp\usr\servers\csmServer\` directory for distributed systems, and in the *`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/` directory for z/OS.
2. From the Copy Services Manager logon page, enter your user ID and password, and click the **Log in** arrow.

   The GUI opens in the browser.

   For z/OS installations: Ensure that you use the user ID that was specified in the IWNRACF job and the password for that user.

Identifying the version of Copy Services Manager

The Copy Services Manager version determines the features that are available in the product.

To view the version of Copy Services Manager from the GUI, hover over the **?** icon in the menu bar, and click **About**.

To view the version of Copy Services Manager from the command-line interface, use the `-ver` command.

Setting the language preference

Starting with Copy Services Manager Version 6.2.2, you can change the language preference for the GUI.

About this task

You can choose what language to display in the Copy Services Manager GUI. The GUI defaults to the language in your browser setting, but you can set it to display a different language from the default.

This setting persists per associated user login for the currently used browser, so that different users can see different languages.

Perform the following steps to set the preferred language:

Procedure

1. Log in to the Copy Services Manager GUI as an administrator.
2. Go to **Settings** > **Advanced Tools**.
3. Under **User Preferences**, select which language that you want the GUI to display.

Results

The Copy Services Manager GUI text appears in the selected language. This same language is displayed each time you log in unless you change it again.

Backing up and restoring product data

You can back up the entire Copy Services Manager database, copy sets in a specific session, and registry files. You can then use the backup files to restore a previous configuration or recover from a disaster.

Backing up and recovering copy set data and the Copy Services Manager database

You can back up and recover copy set data for a specific session and the complete Copy Services Manager database.

Automatic backups

Copy Services Manager takes automatic backups during key configuration changes.

The automatic backups are stored in the *install dir*\liberty\wlp\usr\servers\csmServer\database\autobackup directory for distributed systems and in the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/database/autobackup directory for z/OS. The file names include a timestamp (for example, csmAutoBackup_20150526_103041965).

The following events will trigger an automatic backup:

- DELETE_SESSION
- NUM_COPYSET_CHANGE
- ROLE_PAIR_DIRECTION_CHANGE
- SESSION_ACTIVATED
- SESSION_DEACTIVATED
- ROLE_PAIR_CGNAME_CHANGE

You can also perform manual backups. For more information on performing backups, see “Backing up the Copy Services Manager database” on page 33.

Copy sets

You can export data about all copy sets in a specific session to maintain a backup copy that you can use to recover if you lose the session or to upgrade to a different management server.

When you export copy sets, Copy Services Manager creates a backup of the session and saves the data in a comma-separated value (CSV) file, which you can view or edit in a spreadsheet program such as Microsoft Excel. The exported CSV file includes the session name, session type, date that the data was exported, and the copy sets for each role pair. There is one line per copy set, and the volumes in the copy set are separated by a comma (for example: DS8000:2107.FX101:VOL:1408,DS8000:2107.HJ102:VOL:1408).

The following example illustrates the content of the CSV file for a FlashCopy session. The first valid row must contain the appropriate role names for the session. The order of the copy sets does not matter, and you can include extra roles. A copy set is created from each row that follows the role names. All

rows must have data in each column to be a valid row. The number sign (#) indicates that the line is a comment. Lines that are comments are ignored.

```
#Session1,
#FlashCopy,
#Oct 2, 2009 10:03:18 AM

H1,T1
DS8000:2107.FRLL1:VOL:1004,DS8000:2107.FRLL1:VOL:1104
DS8000:2107.FRLL1:VOL:1011,DS8000:2107.FRLL1:VOL:1101
DS8000:2107.FRLL1:VOL:1005,DS8000:2107.FRLL1:VOL:1105
```

Important: You must manually save this file on the local system when you export copy sets from the Copy Services Manager web interface.

Copy Services Manager database

Copy Services Manager database contains all product data, including data about storage systems, sessions, copy sets, paths, user administration, and management servers. You can back up this data and use the backup file to recover from a disaster or restore a previous configuration.

Important: You must have Administrator privileges to back up and recover the database.

The current data is stored in a new file each time you create a backup. The backup file is named *yyyyMMdd_HHmmssSSS*`.zip`, where *yyyy* is the year, *MM* is the month, *dd* is the day, *HH* is the hour, *mm* is the minute, *ss* is the seconds, *SSS* is the milliseconds when the backup command was run. It is your responsibility to delete backup versions that are no longer needed.

By default, the backup file is stored in the following location:

Copy Services Manager for Distributed Systems
path_prefix`\liberty\wlp\usr\servers\csmServer\properties`

Copy Services Manager for z/OS Systems
path_prefix`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties`

You can change the default location by editing the **`db.backup.location`** property in the `rmserver.properties` file, which is in the following location:

Copy Services Manager for Distributed Systems
path_prefix`\liberty\wlp\usr\servers\csmServer\properties`

Copy Services Manager for z/OS Systems
path_prefix`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties`

The backup file contains the Copy Services Manager database data at the time the backup was completed. Any changes that were made after the backup are not reflected when the backup files are used to restore an Copy Services Manager database.

Create a new backup file in the following situations:

- After you change the Copy Services Manager database data, such as adding or deleting a storage system, changing properties, and changing user privileges
- After an Copy Services Manager session changes direction. For example, if a Metro Mirror session was copying data from H1 to H2 when the backup was taken, and later, the session was started in the H2 to H1 direction. The session must be in the Prepared state before you create the backup.
- After a site switch has been declared and the Enable Copy To Site or Set Production to Site command is issued. After you create a backup, consider deleting the previous backup to prevent Copy Services Manager from starting the copy in the wrong direction.

When you create a backup, ensure that all Copy Services Manager sessions are either in the Defined, Prepared, or Target Available state.

Restoring the Copy Services Manager database from a backup copy puts Copy Services Manager back to the point in time when the backup was made. Relationships that exist on the storage systems that were created by Copy Services Manager after the backup was made are no longer be managed by Copy

Services Manager until you add the copy set to the session and Copy Services Manager assimilates the relationship into the session. Copy sets that were deleted after the backup are restored and a subsequent Start command to the session creates new relationships. Therefore, you must remove the deprecated copy sets before you issue the Start command.

After you restore a Global Mirror session, you must stop the Global Mirror master and subordinates before you restart the Global Mirror session. Refer to your storage system documentation for more information.

Backing up the Copy Services Manager database

The database contains information about the storage systems, sessions, copy sets, user administration, and management server configuration in Copy Services Manager.

About this task

You can back up the Copy Services Manager database by using either the GUI or the command line.

Backing up the Copy Services Manager database by using the GUI

You can back up the Copy Services Manager database by using the GUI.

About this task

Perform the following steps to back up the Copy Services Manager database through the GUI:

1. Log in to the Copy Services Manager GUI as a user with administrative privileges.
2. Go to **Settings** > **Advanced Tools**, and locate the **Create Backup** section.
3. Click **Create** to create a `.zip` file that contains the backup. When the backup is created, the file name and location on the management server is displayed as a link.
4. Click the **Download Backups** link to download older backups to the server on which the web browser is running.

Backing up the Copy Services Manager database by using the CLI

You can back up the Copy Services Manager database by using the CLI.

About this task

To back up the Copy Services Manager database at the command line, run the **mkbackup** command, as shown in the following example:

```
csmcli> mkbackup
```

You must have Administrator privileges to run this command.

For more information on the **mkbackup** command, see the IBM Copy Services Manager online product documentation (http://www-01.ibm.com/support/knowledgecenter/SSESK4). You can also see the associated command help information available from the Copy Services Manager command-line interface.

Restoring the Copy Services Manager database

You can restore a Copy Services Manager database that was previously backed up to the local system.

About this task

Restoring the database does not require administrator privileges. However, you must be able to access the files on the Copy Services Manager server that are listed in the procedure.

Complete these steps to restore the Copy Services Manager database from a backup database:

Procedure

1. Stop Copy Services Manager on the active management server as described in "Stopping the Copy Services Manager server" on page 27.
2. Copy the following directories, and all of their contents to another location, such as *<path prefix>*/..../csmdb_bak:
   - For distributed systems, copy the *install dir*\liberty\wlp\usr\servers\csmServer\database\csmdb directory.
   - For z/OS, copy the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/database/csmdb directory.

   You can delete the copy of the database directory after you restore the database.
3. Delete the following directories and all of their contents:
   - For distributed systems, delete the *install dir*\liberty\wlp\usr\servers\csmServer\database\csmdb directory.
   - For z/OS, delete the *path_prefix*opt/IBM/CSM/database/csmdb directory.
4. Extract the backup database in the following locations:
   - For distributed systems, in the *install dir*\liberty\wlp\usr\servers\csmServer\database\csmdb directory.
   - For z/OS, in the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/database/csmdb directory.

   The backup database is in the following locations:
   - For distributed systems, in the *install dir*\liberty\wlp\usr\servers\csmServer\database\backup\ directory.
   - For z/OS, in the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/database/backup/ directory.

   Tip: You can use the Java Archive (JAR) Packing Tool to extract the archived Copy Services Manager database backup on Linux and IBM Z by using the **jar -xvf** command.

   From the ../database folder, run the following command in the JAR Packing Tool to extract the Copy Services Manager database (csmdb):

   ```
   <path to java runtime>/jar -xvf <path to backup>/csmBackup_<DATESTAMP>.zip
   ```

   Note: You can also restore from the automatic backup file, which has the following naming convention: csmAutoBackup_YYYYMMDD_HHMMSSmmm.zip

   Only the <path to java runtime> is different between Linux and IBM Z.

   For more information on how to use the JAR Packing Tool and **jar** command, including examples, see https://docs.oracle.com/javase/8/docs/technotes/tools/unix/jar.html.

   On Windows operating systems, if the WinZip utility does not open by default, you can download it from http://www.winzip.com/win/en/index.htm. To extract all the contents of a compressed (.zip) folder on Windows, press and hold (or right-click) the folder, select **Extract All...**, and then follow the instructions.
5. *For UNIX and IBM Z only*: Issue the following commands to change the permissions of the csmdb directory:
   - chgrp -R *csm_user* csmdb
   - chmod -R u+rwx csmdb
   - chmod -R g+rwx csmdb
   - chmod -R o+r csmdb

Where *csm_user* is the Copy Services Manager user that is defined in the IWNRACF1 job, or a user that has authority to run z/OS UNIX System Services. For more information about the IWNRACF1 job, see the *IBM Copy Services Manager Installation and Configuration Guide*.

6. Restart Copy Services Manager on the active management server as described in "Starting the Copy Services Manager server" on page 25.
7. Verify that the sessions reflect the correct state and status, and contain all copy sets that were last known. Resolve any changes that occurred since the backup was created. If you exported copy sets, you can resolve changes by using the exported `.csv` files. For more information, see "Exporting copy set data" on page 35 and "Importing copy set data" on page 35.
8. Optional: Start the Copy Services Manager sessions by using the appropriate start commands. The start commands reestablish the relationship between the volume pairs and synchronize data on those volumes.

   Note: This step is not necessary if the database has the most recent data. Perform this step only if both the session state is not the same as the last known state *and* the changes that were made after the last backup require a start command to get the session in sync with the hardware. Ensure that the session state is unchanged. There might be a change if, for example, a disaster recovery event occurred while you were performing these steps by using the DS command-line interface (DSCLI). Otherwise, issuing a start command might overwrite the last valid consistency group.
9. Optional: If you have a standby management server, reestablish that standby relationship to update the database on the standby server.

   Note: This step is only needed if the standby server has also become corrupted and unusable. Otherwise, use the high availability (HA) function to restore the settings on the active server.

Exporting copy set data

You can export data about all copy sets in a specific session to maintain a backup copy that can be used to recover if you lose your session or upgrade to a different server.

About this task

Complete these steps to export the copy sets in a specific session:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session for which you want to export copy sets.
3. From the **Session Actions** list, select **Export** > **Export Copy Sets**. The **Export Copy Sets** window displays the status of the export and a link to the exported file if the export completed.
4. Right-click the link and save the file to a local system.

Importing copy set data

You can import copy set data that was previously exported to a comma separated value (CSV) file.

About this task

Perform the following steps to import copy sets into an existing session:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session for which you want to import copy sets.
3. From the **Session Actions** list, select **View/Modify** > **Add Copy Sets**. The Add Copy Sets wizard is displayed.
4. Select **Use a CSV file to import copy sets**.

5. Click **Browse**, select the CSV file, and then click **Next**.
6. Verify that the matching results were successful, and then click **Next**.
7. Select the copy sets that you want to add, and then click **Next**.
8. Confirm the number of copy sets that you want to create, and then click **Next**.
9. View the information on the **Results** page of the wizard, and then click **Finish**.

Exporting the LDAP and basic user registries

The `ldapRegistry.xml` and `basicRegistry.xml` files need to be regularly backed up in case you lose access to the Copy Services Manager server, or if the product needs to be uninstalled and reinstalled later.

About this task

The `ldapRegistry.xml` file contains information about how Copy Services Manager connects to an LDAP server. The `basicRegistry.xml` file contains encrypted information about the users that are allowed to access the product. These files are not backed up by any GUI or CLI commands, and are not replicated with high availability server relationships.

You can export the current LDAP and basic user registries by locating them on the file system and using the operating system copy function to create a new file to save.

Complete these steps to export the LDAP and basic user registries:

Procedure

1. Locate the files on your system.
   - On Windows systems:
     - The LDAP registry is at `C:\program files\IBM\CSM\wlp\servers\csmAuth\registries\ldapregistry.xml`.
     - The basic user registry is at `C:\program files\IBM\CSM\wlp\servers\csmServer\registries\basicregistry.xml`.
   - On UNIX or z/OS systems:
     - The LDAP registry is at `/opt/IBM/CSM/wlp/servers/csmAuth/registries/ldapregistry.xml`.
     - The basic user registry is at `/opt/IBM/CSM/wlp/servers/csmServer/registries/basicregistry.xml`.
2. Copy the files into a secure backup location whenever changes are made to the users or LDAP system.

Importing the LDAP and basic user registries

You can restore the `ldapRegistry.xml` and `basicRegistry.xml` files on a new installation of Copy Services Manager from a backup of the files on the file system.

About this task

Restoring the registries requires access to the file system on which the Copy Services Manager server is running. The files can be copied over to restore the users that are already set up to use Copy Services Manager.

Complete these steps to import the LDAP and custom user registries:

Procedure

1. Locate the files on your system.
   - On Windows systems:

- The LDAP registry is at `C:\program files\IBM\CSM\wlp\servers\csmAuth\registries\ldapregistry.xml`.
- The basic user registry is at `C:\program files\IBM\CSM\wlp\servers\csmServer\registries\basicregistry.xml`.

- On UNIX or z/OS systems:
  - The LDAP registry is at `/opt/IBM/CSM/wlp/servers/csmAuth/registries/ldapregistry.xml`.
  - The basic user registry is at `/opt/IBM/CSM/wlp/servers/csmServer/registries/basicregistry.xml`.

2. Stop Copy Services Manager as described in "Stopping the Copy Services Manager server" on page 27.
3. For UNIX and z/OS systems, issue the following commands to change the permissions of the registries directory:

```
chgrp -R csm_id *.xml
chmod -R u+rwx *.xml
chmod -R g+rwx *.xml
chmod -R o+r *.xml
```

   Where `csm_id` is the Copy Services Manager user, or a user with authority to access Copy Services Manager. If you have a z/OS installation, that user is defined in the IWNRACF1 job. For more information about the IWNRACF1 job, see the *IBM Copy Services Manager Installation and Configuration Guide*.
4. Restart Copy Services Manager on the active management server as described in "Starting the Copy Services Manager server" on page 25.

Calculating server memory requirements

It is important to determine the amount of memory required on a server to run Copy Services Manager for a given replication environment.

The Java heap size setting provides the maximum amount of memory that the server is allowed to use from the system memory. You can determine the maximum Java heap size setting by using the following table to calculate the maximum amount of memory that the configuration requires.

Note: The default Java heap size is 1280 MB on stand-alone installations, and 1024 MB on HMC installations.

Table 27. Calculation for estimating recommended Java heap size

Java heap size estimation
Non-session processing = 512 MB
Non-Safeguarded Copy sessions = 256 MB / 25,000 pairs **Note:** The number of pairs for a session is the number of copy sets times the number of role pairs in the session. See the topic titled "Copy sets" in the online help documentation at https://www.ibm.com/support/knowledgecenter/SSESK4 for more information.
Safeguarded Copy sessions = .8KB * number of volumes * number of backups
Total recommended heap size = non-session + non-Safeguarded Copy sessions + Safeguarded Copy sessions

Example: The following scenario shows how you would determine the necessary Java heap size for an environment like the one described:

Non-session processing
512 MB

Note: All servers need 512 MB for non-session processing.

Non-Safeguarded Copy sessions
A customer has a Global Mirror Failover/Failback DS8000 session with 15,000 copy sets. This session type has 3 role pairs. So the total number of pairs in the session is 15,000 x 3, or 45,000 pairs. Looking at the table, 256 MB is needed for every 25,000 pairs. This means that the customer would need at least **512 MB** to cover their 45,000 pairs.

Safeguarded Copy sessions
The customer also has a Safeguarded Copy session with 2000 volumes. If the customer wants to keep 250 backups for each of those 2000 volumes, then according to the table, the customer would need 2000 x 250 x .8 KB = 400®,000 KB = **400 MB**

Adding up all the calculations gives 512 MB (non-session) + 512 MB (non-Safeguarded Copy session) + 400 MB (Safeguarded Copy session) = 1424 MB. So the customer needs at least 1424 MB of memory allocated to Copy Services Manager for processing. Because memory is allocated in chunks of 256 MB, the recommended Java heap setting for this configuration would be 1536 MB.

If the calculation determines that more memory is required than the default setting on the server platform, then the maximum heap size can be modified by shutting down the Copy Services Manager server, changing the **-Xmx** parameter setting in the `jvm.options` file, and then restarting the Copy Services Manager server.

For distributed systems: The *`install dir`*`/liberty/wlp/usr/servers/csmServer/jvm.options` file now holds the maximum heap size for distributed systems, and can be used to configure the session with the **-Xmx** parameter (for example, **-Xmx1280m**).

For z/OS systems: The *`path_prefix`*`/opt/IBM/CSM/wlp/usr/server/csmServer/jvm.options` file now holds the maximum heap size for z/OS, and can be used to configure the session with the **-Xmx** parameter (for example, **-Xmx1280m**).

Recommended: If Copy Services Manager is running on a DS8000 HMC, the default heap size is set to 1024 MB. If the memory calculation goes above 768 MB, it is highly recommended that Copy Services Manager runs on an external server instead of the HMC.

For Copy Services Manager 6.2.10 and higher running on an HMC, if the HMC is configured with 32 GB, the maximum heap size is automatically set to 4096 MB. If the memory calculation goes above 3840 MB, it is highly recommended that Copy Services Manager runs on an external server instead of the HMC.

Contact support if you have questions on where Copy Services Manager should run, and the heap size setting.

For more information about the maximum heap size, see the information about sizing the Java heap size in the IBM SDK for Java Tools at https://www.ibm.com/developerworks/java/jdk/howdoi/index.html.

For more information about how to set up the Java heap size, see the *WebSphere Application Server V8.5 Liberty profile* technote at http://www.ibm.com/support/docview.wss?uid=swg21596474.

Disabling the SSLv3 protocol

You can disable SSLv3 after you upgrade to a system that no longer requires this protocol.

About this task

Newer levels of the IBM Java virtual machine (JVM) now disable SSLv3 by default, because it is no longer considered a secure protocol. This protocol can be affected by the Padding Oracle On Downgraded Legacy Encryption (POODLE) vulnerability. Systems with the POODLE fix should not use SSLv3 connections. However, older systems that do not have this fix still connect by using SSLv3. Copy Services Manager enables limited support for the SSLv3 protocol to accommodate these older systems. After you upgrade your system, you need to disable SSLv3.

Note: This procedure is not necessary for Copy Services Manager on the HMC because it only uses TLSv1.2 connections.

Disabling the SSLv3 protocol for DS8000 connections

You can disable the SSLv3 protocol for DS8000 connections.

About this task

Perform the following steps to disable SSLv3 in Copy Services Manager for DS8000 connections. You can either edit the `essclient.properties` and `jvm.options` files directly, or use the **chsystem** command.

Note: This procedure is not necessary for Copy Services Manager on the HMC because it only uses TLSv1.2 connections.

Disable SSLv3 on DS8000 by editing the `essclient.properties` and `jvm.options` files

You can edit the `essclient.properties` and `jvm.options` files to change the protocol from SSLv3 to TLSv1.2 for DS8000 connections.

About this task

Follow these steps to change the protocol from SSLv3 to TLSv1.2 by editing the `essclient.properties` and `jvm.options` files:

Procedure

1. In the *csm_install_directory*`/liberty/wlp/usr/servers/csmServer/properties/essclient.properties` file, add this line:

   ```
   ssl_protocol=TLSv1.2
   ```

2. In the *csm_install_directory*`/liberty/wlp/usr/servers/csmServer/jvm.options` file, delete the following line:

   ```
   -Dcom.ibm.jsse2.disableSSLv3=false
   ```

Disable SSLv3 on DS8000 by using the `chsystem` command

You can use the **chsystem** command to change the protocol from SSLv3 to TLSv1.2 for DS8000 connections.

About this task

Follow these steps to change the protocol from SSLv3 to TLSv1.2 by using the **chsystem** command:

Procedure

1. Log in to the Copy Services Manager command line as a user with administrative authority.
2. Run the **chsystem** command as follows:

   ```
   csmcli> chsystem -f essclient -p ssl_protocol -v TLSv1.2
   ```

   Note: See the **chsystem** command in the IBM Copy Services Manager online product documentation (http://www-01.ibm.com/support/knowledgecenter/SSESK4) for more information.

   The *Command-line Interface User's Guide* also provides details on the **chsystem** command. See “Publications and related information” on page xiv for where to locate this guide.

Disabling the SSLv3 protocol for z/OS host connections

You can disable the SSLv3 protocol for z/OS host connections by using the **chsystem** command.

About this task

Follow this procedure to disable the SSLv3 protocol for z/OS host connections:

Procedure

1. Log in to the Copy Services Manager command line as a user with administrative authority.
2. Run the **chsystem** command as follows:

```
csmcli> chsystem -f zosclient -p protocol -v TLSv1.2
```

Note: See the **chsystem** command in the IBM Copy Services Manager online product documentation (http://www-01.ibm.com/support/knowledgecenter/SSESK4) for more information.

The *Command-line Interface User's Guide* also provides details on the **chsystem** command. See “Publications and related information” on page xiv for where to locate this guide.

Chapter 3. Managing management servers

You can set up active and standby management servers, restore a lost connection between the management servers, or complete a takeover on the standby management server.

Before you begin

Copy Services Manager Basic Edition does not support active and standby management servers. If you are using this product, the menu item **Management Servers** is not available.

Management servers

The *management server* is a system that has IBM Copy Services Manager installed. The management server provides a central point of control for managing data replication.

You can create a high-availability environment by setting up a *standby management server*. A standby management server is a second instance of Copy Services Manager that runs on a different physical system, but is continuously synchronized with the primary (or active) Copy Services Manager server. The active management server issues commands and processes events, while the standby management server records the changes to the active server. As a result, the standby management server contains identical data to the active management server and can take over and run the environment without any loss of data. If the active management server fails, you can issue the Takeover command to make the standby management server take over.

Connecting the active management server to the standby management server

Ensure that the active management server is connected to the standby management server. This connection creates the *management server relationship* that begins the synchronization process. Each management server can be in only one management server relationship.

Problems might occur during the synchronization process. For example, the management server relationship might become disconnected for a number of reasons, including a connectivity problem or a problem with the alternative server.

If a problem occurs during the synchronization process, the alternative server database is restored to its original state before the synchronization process began. Issue the Reconnect command to restore synchronization.

Completing a takeover on the standby management server

Avoid having two active management servers. If there are two active management servers and a condition occurs on the storage systems, both management servers respond to the same conditions, which might lead to unexpected behavior.

Important: After you perform the takeover, shut down the active server to prevent the two servers from managing the same set of pairs.

If you complete an action on the active management server when the servers are disconnected, the servers will be out of sync.

Viewing the status of the management servers

You can view the status of the active and standby management severs from the **Management Servers** page in the Copy Services Manager graphical user interface (GUI). If you are logged on to the active management server, the icons on this panel show the status of the standby management server. If you are logged on to the standby management server, the icons on this panel show the status of the active management server.

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When the status is Synchronized, the standby management server contains the same data that the active management server contains. Any update to the active management server database is replicated to the standby server database.

Setting exceptions for ephemeral port numbers

For management servers that use an Internet Protocol version 4 (IPv4) connection, the port that is shown on the **Management Servers** page of the Copy Services Manager GUI is the *listener* port. This port is set when Copy Services Manager is installed.

However, when the management server initiates a connection to standby server, the management server uses an *ephemeral* port.

An ephemeral port is a temporary port number that is assigned for the duration the connection. When the connection terminates, the ephemeral port is available for reuse. When the management server reconnects to the standby server, a new ephemeral port number is assigned.

If you are using a firewall, you must create exceptions that enable the management server to connect to the standby server by using outbound ephemeral ports.

Information specific to management servers in z/OS environments

If the standby management server is not in the active server z/OS sysplex, the standby server is not able to communicate with the storage systems by using a z/OS connection. Therefore, another connection must be made by using a TCP/IP connection.

Copy Services Manager Basic Edition does not support active and standby management servers. If you are using this product, the menu item **Management Servers** is not available.

Setting up a standby management server

The management server on which you are currently logged in can be set up as the standby, or a different server can be selected for this purpose.

About this task

Note: When you define a standby management server, the Copy Services Manager code must be at the same level on both the standby and active management servers.

Setting the local management server as the standby server

You can set the server on which you are currently logged in as the standby management server.

About this task

Attention: When you set a management server as the standby server, all the information on that management server is cleared. The operation cannot be undone.

To set the local management server as the standby server, complete the following steps:

Procedure

1. In the menu bar, click **Settings** > **Management Servers**.
2. On the **Management Servers** page, from the **Select Action** list, select **Set this Server as Standby**.
3. Enter the domain name or IP address of the server that you want to use as the active management server.
4. Click **OK** to connect to the active server. The server on which you are logged in is now the standby server.

Setting a remote management server as the standby server

You can define a remote server as the standby management server.

About this task

Attention: When you set a management server as the standby server, all the information on that management server is cleared. The operation cannot be undone.

To set a remote management server as the standby server, complete the following steps:

Procedure

1. In the menu bar, click **Settings** > **Management Servers**.
2. On the **Management Servers** page, from the **Select Action** list, select **Define Standby**.
3. Enter the domain name or IP address of the server that you want to use as the standby management server. Log in to the standby management server by entering the user name and password.
4. Click **OK** to connect to the standby management server.

Applying maintenance to an active management server

If you need to apply maintenance to an active management server, you can reinstall Copy Services Manager on the server without affecting the session.

About this task

Follow these steps to reinstall Copy Services Manager on the active management server.

Procedure

1. If the heartbeat is enabled, disable it:
   a) In the menu bar, click **Settings** > **Advanced Tools**.
   b) On the **Advanced Tools** page, click **Disable Heartbeat**.
2. On the standby server, Server 2, issue a take-over. This makes Server 2 the active server. It is possible that the original active server, Server 1, is still listed on the Server 2 Management Servers page. If so, select **Remove Standby**.
3. Disable the heartbeat on Server 2, in case there are any problems.
4. Upgrade Copy Services Manager on Server 1.

   Note: If no changes have been made to the configuration while Server 1 was being upgraded, steps 5 and 6 are not necessary.
5. When Copy Services Manager is running on Server 1, log into Server 2 and set Server 1 as the standby server for Server 2.

   This step copies the configuration from Server 2 to Server 1. This process takes a few minutes.
6. When the management servers status is synchronized, issue a take-over on Server 1.

   This makes Server 1 an active server, able to control sessions.

   Note: It is possible that Server 2 is still listed on the Server 1 Management Servers page. If this is the case, select **Remove Standby**.
7. Disable the heartbeat on Server 1 to make sure this active server does not have any problems.

   Note: If you do not need to upgrade Copy Services Manager on Server 2, skip the next step.
8. Upgrade Copy Services Manager on Server 2.
9. On Server 2, go to the Management Servers page and select the **Set This Server As Standby** option, entering the information for Server 1. When this step is complete, Server 1 is the active server, and Server 2 is the standby server.

10. When you are confident that the active server is running without any problems, enable the heartbeat again, if needed.

Reconnecting the active and standby management servers

If the active and standby management servers become disconnected, reestablish that connection.

About this task

To reconnect the active and standby management servers, complete the following steps:

Procedure

1. In the menu bar, click **Settings** > **Management Servers**.
2. On the **Management Servers** page, from the **Select Action** list, select **Reconnect**.

Changing the standby management server port number

The standby management server port is used is used for communication between the active and standby management server. This port is initially defined during the installation. You can manually change this port after installation.

About this task

Procedure

1. Open the `rmserver.properties` file in the *`install dir`*`\liberty\wlp\usr\servers\csmServer\properties` directory for distributed systems, or in the *`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory for z/OS systems.
2. Modify the port number for the following property:

   ```
   communications.haPort=port_number
   ```

3. Restart Copy Services Manager.

   You must restart Copy Services Manager to activate property changes. Properties are not synchronized between the Copy Services Manager management servers and must be done on each Copy Services Manager management server.

Changing the client port number

The client port is used to log in to the graphical user interface and command-line interface from a remote system. This port is initially defined during the installation. You can manually change this port after installation.

About this task

Procedure

1. Open the `rmserver.properties` file in the *`install dir`*`\liberty\wlp\usr\servers\csmServer\properties` directory for distributed systems, or the *`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory for z/OS systems.
2. Modify the port number for the following property:

   ```
   communications.port=port_number
   ```

3. Open the `repcli.properties` file in the *`install dir`*`\CLI\` directory for distributed systems, or in the *`path_prefix`*`/opt/IBM/CSM/CLI` directory for z/OS systems.
4. Modify the port number for the following property:

   ```
   port=port_number
   ```

5. Restart Copy Services Manager.

   You must restart Copy Services Manager to activate property changes. Properties are not synchronized between the Copy Services Manager management servers and must be maintained on each Copy Services Manager management server.

Chapter 4. Managing storage systems

To replicate data among storage systems using Copy Services Manager, you must add connections to the storage systems. After a storage system is added, you can associate a location, modify connection properties, set volume protection, and refresh the storage configuration for that storage system.

Storage systems

A *storage system* is a hardware device that contains data storage. Copy Services Manager can control data replication within and between various storage systems.

To replicate data among storage systems that use Copy Services Manager, you must manually add a connection to each storage system in the Copy Services Manager configuration. You can then omit storage systems for which Copy Services Manager does not manage replication and omit storage systems that are being managed by another Copy Services Manager management server.

For redundancy, you can connect a single storage system by using a combination of direct, Hardware Management Console (HMC), and IBM z/OS connections.

You can use the following storage systems:

- IBM DS8000
- Systems running IBM Spectrum Virtualize, including:
  - FlashSystem V840
  - FlashSystem V9000
  - FlashSystem 9100
  - FlashSystem 9200
  - IBM System Storage SAN Volume Controller
  - IBM Storwize family
  - Storwize V5000, Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)
- Systems running IBM Spectrum Accelerate, including:
  - XIV
  - FlashSystem A9000
  - FlashSystem A9000R

FlashSystem V840, FlashSystem V9000, FlashSystem 9100, FlashSystem 9200, SAN Volume Controller, and Storwize systems can virtualize various storage systems. Although Copy Services Manager does not support all storage systems, you can manage other storage systems through a single FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller or Storwize cluster interface. Copy Services Manager connects directly to the FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller or Storwize clusters.

You can define a location for each storage system and for each site in a session. When you are adding copy sets to the session, only the storage systems whose location matches the location of the site are allowed for selection. This design ensures that a session relationship is not established in the wrong direction.

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Easy Tier heat map transfer

The IBM DS8000 Easy Tier heat map transfer function transfers heat map information from a source storage system to one or more target storage systems. Each target storage system then generates volume migration plans based on the heat map data and the physical configuration of the storage system.

This process ensures that the performance characteristics of the target storage systems are consistently updated to reflect the performance characteristics of the source storage system.

The Easy Tier heat map transfer function is available for IBM DS8000 Release 7.1 and later.

You can enable heat map transfers for IBM DS8000 storage systems from the IBM Copy Services Manager graphical user interface (GUI). The storage systems must meet the following requirements:

- The source and target storage systems must be connected to Copy Services Manager by using a Hardware Management Console (HMC) connection.
- The Easy Tier heat map transfer function must be enabled on the source and target storage systems. If the function is disabled on either the source or target storage system, an error is displayed when the next transfer is attempted.

To enable, disable, and configure heat map transfers, see "Configuring the use of the Easy Tier heat map transfer function" on page 59.

Important:

When you enable or disable the use of the Easy Tier heat map transfer function in Copy Services Manager, the function is not enabled or disabled on the storage systems that are connected to Copy Services Manager. The configuration options that you set for Easy Tier heat map transfer in Copy Services Manager are used only by Copy Services Manager.

Do not manage heat map transfers for the same IBM DS8000 storage systems from multiple Copy Services Manager servers. Doing so causes transfers to occur more frequently than the default transfer schedule, which is 12 hours after the previous transfer.

Easy Tier heat map transfer log files

Easy Tier heat map transfer log files are in the *install dir*\liberty\wlp\usr\servers\csmServer\logs\ethmt\log\ directory for distributed systems and in the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/logs/ethmt/log directory for z/OS systems. If a problem related to the Easy Tier heat map transfer function occurs, you can send these log files to IBM Software Support for troubleshooting purposes.

Storage connections

You must create a connection from the IBM Copy Services Manager management server to each storage system.

The following types of connection are available. The connection type that you can use depends on the storage system type.

Direct Connection
This connection type is available for all storage systems other than IBM System Storage DS8700 or later storage systems or IBM DS8000 storage systems that are on an Internet Protocol version 6 (IPv6) network.

Hardware Management Console (HMC) Connection
This connection type is available for System Storage DS8700 or later storage systems and IBM DS8000 storage systems that are on an IPv4 or IPv6 network.

IBM z/OS Connection
This connection type is available for IBM DS8000 storage systems. If the storage system is connected to a z/OS system on which Copy Services Manager is installed, a native connection is automatically added. If the storage system is connected to another z/OS system, you can use an IP connection to connect to the system.

A single storage system can be connected by using multiple connections for redundancy. For example, you can connect to a IBM DS8000 storage system by using an HMC connection and a z/OS connection.

When you add a storage connection to the Copy Services Manager configuration, the storage system and the connection are added to the active management server and the standby server configuration.

Important: If the Metro Mirror heartbeat is enabled, do not connect to an IBM DS8000 storage system by using both an HMC connection and a direct connection. If you have both types of connections and the direct connection is lost, the session changes to the suspended state even though the HMC connection is still valid. If both connections are lost and the session is in the suspended state, restart the session when connectivity is regained to synchronize the session with the hardware.

Direct connection

By using a TCP/IP connection, the Copy Services Manager management server can connect directly to certain storage systems. The TCP/IP connection is required to discover a system's configuration (such as LSSs, volumes, volume size, and format), issue queries, and receive asynchronous events.

The Copy Services Manager management server can connect directly with the following systems:

- DS8000
- Systems running IBM Spectrum Virtualize, including:
  - FlashSystem V840
  - FlashSystem V9000
  - FlashSystem 9100
  - FlashSystem 9200
  - SAN Volume Controller
  - IBM Storwize family
  - Storwize V7000 Unified
- Systems running IBM Spectrum Accelerate, including:
  - XIV
  - FlashSystem A9000
  - FlashSystem A9000R

DS8000 storage systems on an IPv4 network can be connected directly to the management server. A direct connection requires an Ethernet card in the cluster. DS8000 systems on an IPv6 network cannot use a direct connection. They can be connected only through an HMC or z/OS connection.

When you add a direct connection to a DS or ESS cluster, specify the following information for clusters 0 and 1:

- IP addresses or domain names
- Ports
- User names
- Passwords

FlashSystem V840, FlashSystem V9000, FlashSystem 9100, FlashSystem 9200, SAN Volume Controller, and Storwize systems can virtualize various storage systems. Although Copy Services Manager does not support all storage systems, you can manage other storage systems through a single FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, or Storwize cluster interface. Copy Services Manager connects directly to the FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller or Storwize clusters.

When you add a direct connection to a cluster to the Copy Services Manager configuration, specify the cluster IP address of the cluster. Ensure that the user name and password are correct for the cluster. If incorrect values are used, significant communication problems can occur, such as never advancing to the Prepared state.

Important: The storage system user name must have privileges to maintain SSH keys. For information about troubleshooting Secure Shell connections to the storage system, see the Ethernet Connection Restrictions on SAN Volume Controller website at www-01.ibm.com/support/docview.wss?uid=ssg1S1002896.

Hardware Management Console connection

The Copy Services Manager management server can connect to DS8000 storage systems through a Hardware Management Console (HMC). An HMC can have multiple DS8000 storage systems that are connected to it. When you add an HMC to the Copy Services Manager configuration, all DS8000 storage systems that are behind the HMC are also added. You cannot add or remove individual storage systems that are behind an HMC.

You can also add a dual-HMC configuration, in which you have two HMCs for redundancy. You must configure both HMCs identically, including the user ID and password.

If planned maintenance is necessary on the HMC, it is recommended that you disable the Metro Mirror heartbeat on the management server while the maintenance is performed.

If the HMC needs to go down frequently or restarts frequently, it is recommended that you disable the Metro Mirror heartbeat. If the Metro Mirror heartbeat is required, the direct connection is recommended instead of an HMC connection.

Important: If a DS8000 storage system uses an HMC connection, the Metro Mirror heartbeat might trigger a freeze operation on the storage system. This freeze operation can impact applications during the long busy timeout timer if the HMC is shut down for any reason, including upgrading microcode. The long busy timeout timer is the time after which the storage system allows I/O to begin again after a freeze operation occurs if no run command is issued by Copy Services Manager. The default value is 2 minutes for CKD volumes or 1 minute for fixed block volumes.

Notes:

- The user ID that you use to connect to the HMC must have admin, op_storage, or op_copy_services privileges on the DS8000 storage system. In addition, the user ID must have Copy Services access to any volumes that are in resource groups on the DS8000 storage system.
- The user ID that you use to connect to the HMC must have *admin-level* authority to view the advanced storage system settings for DS8000. The op_storage, or op_copy_services privileges are not sufficient.
- Although you can use either an IP address or a host name to connect to an HMC, the use of a host name ensures that connection to the HMC is not lost if the IP address changes.
- You cannot modify the primary IP address or host name for the HMC in Copy Services Manager after you add the connection. If you want to change the IP address or host name, you must add a connection to the HMC and then remove the old connection.
- For minimum microcode requirements to connect to a DS8000 through a management console, see the Supported Storage Products List website at www-01.ibm.com/support/docview.wss?uid=ssg1S1005402.

z/OS connection

This connection type is available for IBM DS8000 storage systems. If the storage system is connected to an IBM z/OS system on which Copy Services Manager is installed, a native connection is automatically added. If the storage system is connected to another z/OS system, you must you use an IP connection to connect to the z/OS system.

To add a z/OS connection, the system must be listed on the **Host Connections** page and in the Connected state. You can add a connection to a z/OS system from Copy Services Manager that is running on any operating system. For example, you can add a connection to a z/OS system in Copy Services Manager that is running on Windows, Linux, or AIX. Or, you can add a connection in Copy Services Manager that is running on z/OS to another z/OS system.

The z/OS connection is used to issue replication commands and queries for attached count key data (CKD) volumes over an existing Fibre Channel network and to receive asynchronous events. When a

storage system is added to Copy Services Manager through a z/OS connection, all CKD volumes that are attached to the Copy Services Manager management system are added to the Copy Services Manager configuration. CKD volumes that are not attached to the Copy Services Manager z/OS management server are not added to the Copy Services Manager configuration through the z/OS connection.

Ensure that all volumes in the logical storage subsystem (LSS) that you want to manage through a z/OS connection are attached to a z/OS system. Either the entire LSS must be attached to z/OS or none of the volumes in the LSS should be attached to z/OS for Copy Services Manager to properly manage queries to the hardware. For example, if there are two CKD volumes in an LSS, and one volume is attached to Copy Services Manager by using a z/OS connection and the other is attached through a direct connection, Copy Services Manager issues commands to both volumes over the Fibre Channel network. However, commands issued to the direct connection volume fail, and Copy Services Manager shows that the copy set that contains that volume has an error.

Tip: It is recommended that you create both a Hardware Management Console (HMC) and direct connection for CKD volumes to allow for greater storage accessibility.

If a storage system was previously added to the Copy Services Manager configuration through a z/OS connection and later the storage system is added through a TCP/IP connection, all non-attached CKD volumes and fixed block volumes are added to the Copy Services Manager configuration.

The Metro Mirror heartbeat

The Metro Mirror heartbeat is not supported through a z/OS connection. To use the Metro Mirror heartbeat, the storage systems must be added by using an HMC or direct connection. If the Metro Mirror heartbeat is enabled and a storage system is added through a direct connection and a z/OS connection, a suspend results if the direct connection becomes disconnected because there is no heartbeat through the z/OS connection.

Removing connections to a z/OS system

If Copy Services Manager has multiple connections to a storage system, the order in which you remove the connections produces different results:

- If you remove direct and HMC connections first, the fixed-block and non-attached CKD volumes that are attached through these connection types are removed from the Copy Services Manager configuration.
- The remaining CKD volumes that are attached through the z/OS host connection remain in the Copy Services Manager configuration until the z/OS host connection is removed.
- If you remove the z/OS host connection first and there is an HMC or direct connection to volumes, those volumes are not removed from the Copy Services Manager configuration.

Protected volumes

You can mark volumes as protected if you do not want those volumes used for replication.

When a volume is marked as protected, you cannot include that volume in a copy set. This protection applies only to Copy Services Manager.

You might want to protect a volume in the following instances:

- The volume contains data that you never want to be copied to another volume. For example, the volume is secure, but if the data is copied to an unsecured volume, the data could be read. For this reason, the volume should not be the source for a relationship.
- The volume contains data that you do not want to be overwritten. For this reason, the volume should not be the target of a relationship.

Only administrators can change the volume protection settings.

Site awareness

You can associate a location with each storage system and each site in a session. This *site awareness* ensures that only the volumes whose location matches the location of the site are allowed for selection when you add copy sets to the session. This prevents a session relationship from being established in the wrong direction.

Note: To filter the locations for site awareness, you must first assign a site location to each storage system.

Copy Services Manager does not perform automatic discovery of locations. Locations are user-defined and specified manually.

You can change the location associated with a storage system that has been added to the Copy Services Manager configuration. You can choose an existing location or add a new one. Locations are deleted when there is no longer a storage system with an association to that location.

When adding a copy set to a session, a list of candidate storage systems is presented, organized by location. Storage systems that do not have a location are displayed and available for use when you create a copy set.

You can also change the location for any site in a session. Changing the location of a session does not affect the location of the storage systems that are in the session.

Changing the location of a storage system might have consequences. When a session has a volume role with a location that is linked to the location of the storage system, changing the location of the storage system could change the session's volume role location. For example, if there is one storage system with the location of A_Location and a session with the location of A_Location for its H1 role, changing the location of the storage system to a different location, such as B_Location, also changes the session's H1 location to Site 1. However, if there is a second storage system that has the location of A_Location, the session's role location is not changed.

Important: Location matching is enabled only when adding copy sets. If you change the location of a storage system or volume role, Copy Services Manager does not audit existing copy sets to confirm or deny location mismatches.

Adding a storage connection

You must add connections to storage systems before you can use Copy Services Manager to manage data replication.

Before you begin

To add a storage system connection, you must have an Administrator role.

Adding a connection to an IBM DS8000 storage system by using an HMC connection

You must use a Hardware Management Console (HMC) connection to connect to an IBM DS8000 storage system if the system is a DS8700 or later or is on an Internet Protocol version 6 (IPv6) network.

About this task

Complete the following steps to add a storage system connection:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click **Add Storage Connection**.
3. Click the **DS8000** icon.

4. On the **Connection** page of the Add Storage System wizard, click **HMC** and complete the following fields.

   Primary HMC
   Specify the following information about the primary HMC that is used to connect to the storage system.

   IP Address/Domain Name
   Enter the IP address or host name for the primary HMC. Although either an IP address or a host name are acceptable, the use of a host name ensures that connection to the HMC is not lost if the IP address changes.

   You cannot modify the primary IP address or host name for the HMC in Copy Services Manager after you add the connection. If you want to change the IP address or host name, you must add a new connection to the HMC and then remove the old connection.

   Username
   Enter the user name for the HMC.

   Password
   Enter the password for the HMC.

   Secondary HMC (Optional)
   Specify information about the secondary HMC, if applicable. A secondary HMC is used for redundancy.

   Both HMCs must be configured identically and must have the same user name and password.

   IP Address/Domain Name
   Enter the IP address or host name for the secondary HMC.
5. Click **Next** and follow the instructions in the wizard.

Adding a connection to an IBM DS8000 storage system by using a direct connection

You can connect to an IBM DS8000 storage system by using a direct connection if the system is earlier than a DS8700 and is on an Internet Protocol version 4 (IPv4) network.

About this task

Direct connection requires that each of the storage system clusters contains an Ethernet card.

Complete the following steps to add a storage system connection:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click **Add Storage Connection**.
3. Click the **DS8000** icon.
4. On the **Connection** page of the Add Storage System wizard, click **Direct Connect** and complete the following fields.

   Cluster 0
   Specify the following information about connection to cluster 0:

   IP Address/Domain Name
   Enter the IP address or host name for the cluster.

   Port
   Enter the port number for the cluster. The default value is 2433.

   Username
   Enter the user name for the cluster.

Password
Enter the password for the cluster.

Cluster 1
Specify the following information about connection to cluster 1. The port, user name, and password for cluster 0 are automatically entered in the corresponding fields for cluster 1. You can edit this information, if required for your environment.

IP Address/Domain Name
Enter the IP address or host name for the cluster.

Port
Enter the port number for the cluster. The default value is 2433.

Username
Enter the user name for the cluster.

Password
Enter the password for the cluster.

5. Click **Next** and follow the instructions in the wizard.

Adding a connection to a TotalStorage Enterprise Storage Server storage system

You can connect to a TotalStorage Enterprise Storage Server storage system by using a direct connection to the storage system.

About this task

Complete the following steps to add a storage system connection:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click **Add Storage Connection**.
3. Click the **ES800** icon.
4. On the **Connection** page of the Add Storage System wizard, enter the following information for the storage system clusters:

Cluster 0
Specify the following information about connection to cluster 0:

IP Address/Domain Name
Enter the IP address or host name for the cluster.

Port
Enter the port number for the cluster. The default value is 2433.

Username
Enter the user name for the cluster.

Password
Enter the password for the cluster.

Cluster 1
Specify the following information about connection to cluster 1. The port, user name, and password for cluster 0 are automatically entered in the corresponding fields for cluster 1. You can edit this information, if required for your environment.

IP Address/Domain Name
Enter the IP address or host name for the cluster.

Port
Enter the port number for the cluster. The default value is 2433.

Username
Enter the user name for the cluster.

Password
Enter the password for the cluster.

5. Click **Next** and follow the instructions in the wizard.

Adding a connection to a FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, or Storwize storage system

You can connect to a FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, or Storwize storage system by using a direct connection.

About this task

Complete the following steps to add a storage system connection:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click **Add Storage Connection**.
3. Click the icon for either **FlashSystem Spectrum Virtualize**; **SAN Volume Controller**; **Storwize Family**; or **Storwize V7000 Unified**.
4. On the **Connection** page of the Add Storage System wizard, enter the following information for the storage system cluster:

   Cluster IP / Domain Name
   Enter the IP address or host name of the storage system node.

   Username
   Enter the user name for the node.

   Password
   Enter the password for the node.

5. Click **Next** and follow the instructions in the wizard.

Adding a connection to a FlashSystem/IBM Spectrum Accelerate

You can connect to a FlashSystem/IBM Spectrum Accelerate by using a direct connection to the storage system.

About this task

Complete the following steps to add a storage system connection:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click **Add Storage Connection**.
3. Click the **FlashSystem Spectrum Accelerate** icon.
4. On the **Connection** page of the Add Storage System wizard, enter the following information for a node on the storage system.

   When you specify the information for one node, the remaining nodes are discovered automatically.

   IP Address/Domain Name
   Enter the IP address or host name for a node in the storage system.

   Username
   Enter the user name for the node.

Password
Enter the password for the node.

5. Click **Next** and follow the instructions in the wizard.

Adding a connection to a z/OS system

You can connect to storage systems that are connected to an IBM z/OS system regardless of the operating system on which Copy Services Manager is installed.

Before you begin

If a z/OS system is defined on the **Host Connections** page, you can add a connection to a z/OS from any operating system. For example, you can add a connection to a z/OS system in Copy Services Manager that is running on Windows, Linux, or AIX.

About this task

Complete the following steps to add a z/OS system connection:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click **Add Storage Connection**.
3. Click the **z/OS Direct Connection** icon.
4. On the **Connection** page of the Add Storage System wizard, select the storage systems that you want to add.
5. Click **Next** and follow the instructions in the wizard.

Removing a storage system

You can remove a storage system from the Copy Services Manager configuration.

About this task

Prerequisites: You must have Administrator privileges to remove a storage system.

Removing a storage system removes all volumes on that storage system from management server control. All copy sets with a volume on the removed storage system are removed from their respective sessions, making the target volume unrecoverable. All connections to the removed storage system are removed, and any storage systems sharing these connections are also removed.

Perform these steps to remove a storage system:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, select the storage system that you want to remove.

   Important: All connections to this storage system will be removed, all volumes on the storage system will be removed from management server control, and all copy sets that have a volume on this storage system will be removed from their respective sessions, leaving the target volume unrecoverable. Any storage systems sharing these connections will be removed as well.
3. From the **Select Action** list, select **Remove Storage System**.
4. Click **Yes** to remove the storage system.

What to do next

For high availability (HA) users: If you have a standby server, removing a storage system from the active server does not automatically remove it from the standby. If you want to remove the storage system from the standby server, you can resync the standby server with the following steps:

1. On the **Overview** panel of the Copy Services Manager GUI, click **Management Servers** > **Select Action** > **Remove Standby**.
2. Then, on the same panel, click **Select Action** > **Define Standby**. Enter the associated **Domain/IP**, **Username**, and **Password** for the standby server, and click **OK**. The standby server is then resynchronized.

Modifying the location of storage systems

You can associate a location with a storage system after a connection has been made to that storage system.

About this task

Prerequisites: You must have Administrator privileges to modify the location of a storage system.

Changing the location of a storage system might have consequences. When a session has a volume role with a location that is linked to the location of the storage system, changing the location of the storage system could change the session's volume role location. For example, if there is one storage system with the location of A_Location and a session with the location of A_Location for its H1 role, changing the location of the storage system to a different location, such as B_Location, also changes the session's H1 location to Site 1. However, if there is a second storage system that has the location of A_Location, the session's role location is not changed.

Perform these steps to modify the location of a storage system:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, change the location of the storage system by selecting a previously defined location from the drop-down list or type a new name in the table cell.

   To disable site awareness, set the location to **None**.

   Note: Locations are deleted from the drop-down list when there is no longer a storage system with an association to that location.

Modifying storage connection properties

You can modify the connection properties for a storage system, including IP addresses, user name and password.

About this task

Prerequisites:

- You must have Administrator privileges to modify storage connection properties.
- The storage system must be in the Disconnected state to change most storage connection parameters. You can add a secondary HMC to an existing HMC connection without the HMC being disconnected.

A storage system can lose connection to the management server, for example, if a port is blocked by a firewall or the user name or password is changed on the storage system. If the storage system loses connection, you might need to modify parameters (for example, user name or password) manually on the storage system, and then update the parameters in Copy Services Manager.

Perform these steps to modify storage connection properties:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click the **Connections** tab.
3. Click the storage connection ID.
4. Modify the appropriate settings to match the settings for the storage system.
5. Click **Apply**.

Refreshing the storage system configuration

You can refresh the storage system configuration to query the storage system for changes, such as which volumes are contained in an LSS. You might do this when you reconfigure a storage system and you want Copy Services Manager to be aware of the changes.

About this task

Prerequisites: You must have Administrator privileges to modify storage connection settings.

Perform these steps to refresh the storage configuration:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, select the storage system for which you want to refresh the configuration.
3. From the **Select Action** list, select **Refresh Configuration**.

Setting volume protection

To ensure that data on a volume is not overwritten, you set its status to protected. Protected volumes are excluded from replication.

Before you begin

You must have Administrator privileges to change the protection setting of a volume.

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click **Volume Protection**.
   The **Volume Protection** wizard is opened.
3. The Volume Protection wizard, select a storage system and complete the following steps:
4. Optional: Depending on the type of storage system:
   a) Select **All IO Groups** or a specific I/O group.
   b) Select **All Logical Storage Subsystems** or a specific logical storage subsystem.
   c) Select **All Pools** or a specific pool.
5. Optional: In the **Volume** field, select a single volume.
6. Optional: In the **Volume Mask** field, enter a sequence of characters and wildcards that match user-defined or system-defined volume IDs.
   To protect a specific volume, enter the volume ID such as `ESS:2105.FCA57:VOL:1000`. To use a pattern to retrieve one or more volume IDs, you can enter a partial volume ID and use the wildcard character (*) to represent zero or more characters.
   For example, to retrieve all volume IDs that contain the characters FCA57, you enter `*FCA57*`.
7. Click **Next**.

8. Verify the search results, and click **Next**.
9. Click **Select All** to protect all the volumes. Alternatively, select a check box next to the volumes that you want to protect.
10. Click **Next**.
11. Click **Finish**.

Restoring data from a journal volume

This topic provides information on restoring data from a journal (J) volume. It describes how to restore data from journal volume used as part of a DS8000 Global Mirror session, or as part of a Metro Global Mirror session, if data was corrupted on a host volume after you issued a **Recover** command. Following these steps will enable you to return to a consistent copy of the data on the host volume.

Perform the following steps to move the data from the journal volume back to the host volume:

Note: Follow these instructions only if you have already issued a **Recover** command to the site containing the journal volume. After the **Recover** command is issued, the journal volume will hold a copy of the consistent data at the time the command was issued.

1. Outside of Copy Services Manager, using the DS8000 GUI /CLI, issue withdraw initiate background copy (issue a `rmflash -cp` command) on pairs containing the journal volume (for example, H2J2). This copies the remaining uncopied tracks from the host to the journal. Then, ensure all the Out of Sync (OOS) tracks reach zero.
2. Create a separate FlashCopy session either with Copy Services Manager, or with the DS8000 GUI /CLI (issue a `mkflash` command with background copy), with the following conditions:
   - The journal volume (J*x*) is the source volume.
   - The host volume (H*x* or I*x* if using a session with Practice capabilities) is the target volume.
   - *x* is the site the **Recover** command was issued to.

Configuring the use of the Easy Tier heat map transfer function

You can enable Easy Tier heat map transfers for IBM DS8000 storage systems that are connected to IBM Copy Services Manager from the Copy Services Manager graphical user interface (GUI).

About this task

The heat map transfer configuration options that are available in Copy Services Manager include adding storage systems for which you want to transfer heat map data, and enabling or disabling the transfer of Easy Tier heat map data for those storage systems.

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. Click the **Easy Tier Heat Map Transfer** tab.
3. The following configuration options are available:

   Status
   Indicates whether the transfer of Easy Tier heat map data is enabled or disabled.

   Enable Transfer
   Click to enable the transfer of Easy Tier heat map data, and then click **Yes** in the confirmation window. Easy Tier heat map data is copied from the storage systems that are listed on this page to the target storage systems that are associated with those storage systems.

   Disable Transfer
   Click to disable the transfer of Easy Tier heat map data, and then click **Yes** in the confirmation window. The storage systems that are listed on this page remain displayed with a status of **Inactive**.

Transfer only session-managed relationships
Select this option to transfer Easy Tier heat map data for relationships that are defined in sessions on this server. Only relationships that are defined in sessions have the data transferred. The option can only be modified when the status is disabled.

Transfer all relationships on the storage systems
Select this option to transfer Easy Tier heat map data for all relationships that are defined on storage systems that are connected to this server. The option can only be modified when the status is disabled.

Select Action
Select a storage system that is listed on this page, and then select one of the following actions. After you make your selection, click **Go**:

View Transfer Details
Click to view detailed information about the transfer from the source storage system to its target storage systems. This information includes whether the transfer succeeded or failed and the date and time that the transfer started and stopped. This action is not available if the source storage system does not have target storage systems.

Storage system details
The following information is shown for each storage system:

Storage System
Lists each source storage system and its target storage systems, if available.

Connection Status
One of the following states is displayed for each storage system connection:

Connecting
Indicates that connection to the storage system is in progress.

Connected
Indicates that connection to the storage system is established.

Disconnected
Indicates that connection to the storage system was lost. The connection can be lost for several reasons, including:

- The storage system is not available.
- The user name and password that is used to connect to the storage system was changed.
- Firewall issues prevent connection to the storage system.

Inactive
Indicates that the transfer of Easy Tier heat map data is disabled.

Transfer Results for Storage System window

Use the **Transfer Results for Storage System** window to view details about the transfer of Easy Tier heat map data to target storage systems.

The following information is displayed in this window. This information includes the number of successful and failed transfers and the last start and stop time that a transfer occurred.

Target Storage System
Select the storage system for which you want to view the transfer details.

Attempts
Shows the number of attempts that were made to transfer the Easy Tier heat map data to the target storage system.

Successful Transfers
Shows the number transfers that were successful.

Failed Transfers
Shows the number of transfers that failed.

Last Transfer Start Time
Shows the date and time that the last transfer started. If a transfer is in progress, **In Progress** is shown.

Last Transfer Stop Time
Shows the date and time that the last transfer stopped. If a transfer is in progress, **Unknown** is shown.

Last Transfer Result
Provides a message that explains the results of the last transfer. If a transfer is in progress, a message specifying that the transfer is in progress is shown.

Next Transfer Time
Shows the date and time that the transfer is scheduled to occur again. If a transfer is in progress, **Unknown** is shown. Transfers are automatically scheduled for 12 hours after the previous transfer.

Viewing the storage system Topology Overview

You can use the storage system **Topology Overview** panel in the GUI to see a high-level view of the relationships between storage systems managed by Copy Services Manager.

About this task

When you share common resources across sessions, it is helpful to have the capability to identify which sessions are dependent on each other. Shared subsystem usage across sessions causes Metro Mirror or data-path management dependencies, as well as Metro Mirror and Global Mirror consistency-group handling dependencies.

Starting with V6.2.8, you can use the **Topology Overview** panel to view these dependencies by session or site.

Perform these steps to use the **Topology Overview**:

Procedure

1. Log in to the Copy Services Manager GUI.
2. In the menu bar, click **Storage** > **Topology Overview**.
3. On the **Topology Overview** page, you see a table that lists the following information across sessions:

   Site Location
   A user-defined name given to a storage system to organize storage that resides in a location. The site name that is associated with the session is used to determine the data that populates the **Topology Overview** panel. This data is shown for each defined session created in Copy Services Manager. If a session does not have a site location set it defaults to Site 1, Site 2, Site 3, and so on.

   Storage System
   A storage system defined to Copy Services Manager in the **Storage Systems** panel. It can be associated with several sessions. Each storage system can be given a user-defined location name in the **Storage Systems** panel; otherwise, the name defaults to *none*.

   Direction
   An arrow, which indicates the site direction of the relationship source to target. This column points left to right. If the direction of the replication is reversed, that is, after a recover command is issued to a session, the site and storage system order are switched in the table.

   Notes:

   - If you click the direction arrow, you are taken to a filtered version of the **Topology Details** panel. The filter is based on the columns on either side of the arrow. For example, if you assume columns on the **Overview** panel that are denoted by **| Site 1 | Storage A |** > **| Site 2 | Storage B |**, then clicking on the arrow filters the pull-down menus on the **Details** panel to **Site 1** > **Site 2**.
   - When you first enter the **Details** page, it has an automatic filter set on that site with a target filter of **ALL** selected. You can use the selections above the Details table to change the filtering.

See “Viewing the storage system Topology Details” on page 62 for more information.

Number of Sessions
The number of sessions that are sharing the same site and storage system combination.

Notes:

- You do not need to have the session started for it to populate in the **Topology Overview**.
- Columns cannot be moved, because the topology direction is dependent on the source and target storage system replication.
- Each row is based off the number of sites that make up various session solutions, which include cascaded relationships. A three-site session type, such as Metro Global Mirror, or a four-site session type, such as Metro Mirror - Global Mirror with Site 4 Replication, will cascade the copy of the data over three different sites. If the first two sites use the same storage systems as a two-site solution, such as Metro Mirror Failover/Failback, then those storage systems are depicted in multiple rows in the table: one for the two-site topology, and another row for a cascaded three-site topology, even though both the first and second site storage systems are the same.
- The table is dynamic and updates in context to the session site copy direction. For example, after recovering to site 3, the overview shows site 3 in the first column. The table also updates with any changes to site location or session site changes.
- When sessions and role pairs are in a Target Available state, although Copy Services Manager displays a direction, there is no true direction yet because both sites are writable on the hardware. Therefore, the relationship between sites might not be as expected when a Target Available state is shown in the Topology Overview. For example, on a Metro Mirror - Global Mirror with Site 4 Replication session, after recovering to site 4, it is possible that the relationships might indicate a 4-site cascaded topology. This situation is corrected when you choose which site to start from, and then restart the Copy Services Manager session.

Use the **Filter** field in the top right to filter on various views for the table. See the GUI panel help for additional information.

4. Optional: The configuration refreshes every 30 minutes by default. However, you can also use the **Refresh** button above the table to manually refresh the configuration whenever you choose.

   Note: You can also set a property to refresh at a higher or lower rate if you go to **Settings** > **Server Properties** and edit the properties in the displayed file. The property can be used to change the refresh rate after the next scheduled refresh.

Viewing the storage system Topology Details

You can use the storage system **Topology Details** panel in the GUI to see more detailed information about relationships between site location and storage systems sessions that are managed by Copy Services Manager.

About this task

This panel shows the topology details that are associated with a session copy role, its site relationship, copy type, consistency group name, and storage system. Table data is refreshed automatically based on the selected items.

Perform these steps to use the **Topology Details** panel:

Procedure

1. Log in to the Copy Services Manager GUI.
2. In the menu bar, click **Storage** > **Topology Details**.

   Notes:

   - You can also open the **Topology Details** panel from the **Topology Overview** panel when you click the direction arrow for a particular site location and storage system partnership. If you enter this

way, then you are taken to a filtered version of the **Details** panel. The filter is based on the columns on either side of the arrow. For example, if you assume columns on the **Overview** panel that are denoted by **| Site 1 | Storage A |** > **| Site 2 | Storage B |**, then clicking on the arrow filters the pull-down menus on the **Details** panel to **Site 1** > **Site 2**.

- When you first enter this detailed view from another panel, it has no filter set on either site because **ALL** is selected for the source and target. You can use the drop-down selections above the Details table to change the filtering.

See "Viewing the storage system Topology Overview" on page 61 for more information.

3. On the **Topology Details** page, you have filters above the table for **Source** and **Target**. Select the source site, target site, or both, for the session topology details that you want to view; or select **All** to view all relationships. You also see a table that lists the following information for each volume:

   Source
   The source storage system and subsystem (that is, LSS or I/O group).

   Source Role
   The role considered a source role in a role pair for a given session.

   Target
   The target storage system and subsystem (that is, LSS or I/O group).

   Target Role
   The role considered a target role in a role pair for a given session.

   Session
   The session that this relationship belongs to.

   Copy Type
   Shows the short name form of the copy type that is associated with this session role pair. The long form is shown when you hover over. The following copy types are possible:

   MM
   Metro Mirror

   GC
   Global Copy

   GM
   Global Mirror

   HS
   HyperSwap

   CG Name
   The consistency group name set for the particular role-pair in the session if one is present. This is a user-defined consistency group name or Global Mirror session ID on DS8000. This field can help you to determine if sessions are sharing a consistency group.

   Use the **Filter** field in the top right to filter on various views for the table. See the GUI panel help for additional information.

4. Optional: The configuration refreshes every 30 minutes by default. However, you can also use the **Refresh** button above the table to manually refresh the configuration whenever you choose.

   Note: You can also set a property to refresh at a higher or lower rate if you go to **Settings** > **Server Properties** and edit the properties in the displayed file. The property can be used to change the refresh rate after the next scheduled refresh.

Example

Topology Overview usage scenarios:

- *Find all H1 boxes for session "myself."*
- *Find all sessions that use box "ANXR32."*
- *Make sure that all connections from ANXR32 LSS 0 to ANZW65 LSS 0 are defined for MM.*

- *Determine if the data is flowing between the correct boxes at each site.*
- *Determine how many LSSs are using a given LSS as a target for remote copy.*
- *Determine which LSSs on a given box are using the same user-defined consistency group name (sharing the same Master session).*
- *After receiving an x0F12 or x0f85 error starting a session, filter on the LSS containing the volume and check if another session already has a relationship.*
- *After receiving the following error message, you can filter on the session ID to determine what other sessions are already using the consistency group name:*
  IWNR2326E
  Message Text:
  [timestamp] The pair in session VALUE_1 for copy set VALUE_2 with source VALUE_3 and target VALUE_4 could not be started because the maximum number of allowed Global Mirror sessions on the logical subsystem has been reached. No action was taken on this pair.

Notes:

- Four-site sessions are shown as two rows in the **Overview** panel, one for the Metro Global Mirror (MGM), and one for the multi-target Metro Mirror leg. Multi-target is also split into two rows. In the **Details** panel, this feature becomes more clear because each role has its own row.
- Single site sessions like FlashCopy or Safeguarded Copy are not displayed in either the **Overview** or **Details** panel.

Exporting data from GUI tables into a CSV file

You can export data from several tables in the GUI, including Volumes, Topology Overview, and Topology Details.

About this task

Perform these steps to export data from the following tables in the GUI:

Exporting data from the Volumes table

Procedure

1. Log in to the Copy Services Manager GUI.
2. In the menu bar, click **Storage** > **Volumes**.
3. Select a **Storage System** and **Logical Storage Subsystem** or **Pool** for which you want to export data from the pull-down menus at the top of the page, and click **Perform Query**.
4. Optional: You can use the **Filter** field to filter on any of the data. See the GUI help for instructions on using the filter.
5. Click the export icon ( ) in the upper right corner of the table to export the data to a comma-separated (CSV) file.

   Note: Data in the CSV file is filtered according to the filter criteria that you selected. The data is presented the same in the exported file as it is shown in the GUI table (for example, column ordering and hiding).
6. Select whether you want to **Open** or **Save** the file.
7. Click **OK** to confirm your selection, or click **Cancel** to exit the dialog without exporting the information.

Exporting data from the Topology Overview table

Procedure

1. Log in to the Copy Services Manager GUI.
2. In the menu bar, click **Storage** > **Topology Overview**.
3. Optional: You can use the **Filter** field to filter on any of the data. See the GUI help for instructions on using the filter.
4. Click the export icon ( ) in the upper right corner of the table to export the data to a comma-separated (CSV) file.

   Note: Data in the CSV file is filtered according to the filter criteria that you selected. The data is presented the same in the exported file as it is shown in the GUI table (for example, column ordering and hiding).
5. Select whether you want to **Open** or **Save** the file.
6. Click **OK** to confirm your selection, or click **Cancel** to exit the dialog without exporting the information.

Exporting data from the Topology Details table

Procedure

1. Log in to the Copy Services Manager GUI.
2. In the menu bar, click **Storage** > **Topology Details**, or you can enter from the **Topology Overview** panel when you click the copy direction arrow **<<insert copy direction graphic here>>**.
3. Select a **Source Site** and **Target Site** for which you want to export data from the pull-down menus at the top of the page.

   Note: If you entered this panel from the **Topology Overview**, then the **Details** panel reflects the site location and storage system combination that you were viewing in the previous panel. Therefore, you might not need to make any additional selections if the table already displays the information that you want to export.
4. Optional: You can use the **Filter** field to filter on any of the data. See the GUI help for instructions on using the filter.
5. Click the export icon ( ) in the upper right corner of the table to export the data to a comma-separated (CSV) file.

   Note: Data in the CSV file is filtered according to the filter criteria that you selected. The data is presented the same in the exported file as it is shown in the GUI table (for example, column ordering and hiding).
6. Select whether you want to **Open** or **Save** the file.
7. Click **OK** to confirm your selection, or click **Cancel** to exit the dialog without exporting the information.

Chapter 5. Managing host systems

A host system is an IBM z/OS system that connects to storage systems to enable certain replication features for those systems.

About this task

A connection to a z/OS host system is required if you want to enable z/OS features such as HyperSwap and hardened freeze in Copy Services Manager sessions.

If Copy Services Manager is installed on the host system, the host system connection is automatically added to Copy Services Manager. This connection is referred to as the native z/OS connection.

If Copy Services Manager is not installed on the host system, you must add the connection to the host system by using an IP connection. To use an IP connection, you must set certain Resource Access Control Facility (RACF®) settings on the z/OS host as described in the *IBM Copy Services Manager Installation and Configuration Guide*.

You can add z/OS host connections in Copy Services Manager regardless of the operating system on which the application is installed. For example, you can add a connection to a z/OS host system in Copy Services Manager that is running on Windows, Linux, or AIX.

Adding a host system connection

You can add a connection to one or more host systems to the Copy Services Manager configuration.

About this task

Prerequisites: You must have Administrator privileges to add a host system connection.

Follow these steps to add a host system connection:

Procedure

1. In the menu bar, click **Storage** > **Host Connections**.
2. On the **Host Connections** page, click **Add Host Connection**.
3. In the **Add Host Connection** window, enter the following information:

   Connection Type
   Select the host system type: z/OS or AIX.

   Host name / IP address
   Enter the host name or IP address for the host system.

   Port
   Enter the port for the host system.

   For z/OS, the port number must be the same as the port number that is specified for the HyperSwap management address space IOSHMCTL S0CKP0RT parameter on the z/OS system. For more information about the S0CKP0RT parameter, see the *IBM Copy Services Manager Installation and Configuration Guide*.

   For AIX, use the default port number 9930 unless the port was modified in Subsystem Device Driver Path Control Module (SDDPCM).

   User name
   Enter the user name. The **User name** field is displayed only for z/OS host systems. The user name and password must be the same name and password that are specified in the Resource Access Control Facility (RACF) settings on the host system. For more information about the RACF settings, see the *IBM Copy Services Manager Installation and Configuration Guide*.

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Password
Enter the password. The **Password** field is displayed only for z/OS host systems.

4. Click **Add Host**.

Results

The host system is displayed on the **Host Connections** page. If connection to the host system is successful, the status `Connected` is displayed. If the connection to the host system failed, the status `Disconnected` is displayed.

Note: On z/OS host systems, the TCPMAXRCVBUFRSIZE must be set to a minimum of 32K to accommodate the maximum size of an Secure Sockets Layer (SSL) record. Otherwise AT-TLS fails during the initial handshake.

Modifying a host system connection

You can modify host system connections that are in the Copy Services Manager configuration.

About this task

Prerequisites: You must have Administrator privileges to modify a host system connection and the connection must be in the **Disconnected** state.

Follow these steps to modify a host system connection:

Procedure

1. In the menu bar, click **Storage** > **Host Connections**.
2. On the **Host Connections** page, click the link for the host system in the **Host System** column.

   Complete the information in the following fields. The fields that are displayed depend on the host system and the type of connection to the host system.

   Note: All fields are presented for informational purposes; however, some fields are information-only fields.

   Host name or IP address
   For IBM z/OS host systems that are connected by using an IP connection, enter the host name or IP address for the host system.

   If Copy Services Manager is installed on the z/OS host system, **ZOS_NATIVE_CONNECTION** is displayed.

   Port
   Enter the port for the host system.

   For z/OS, the port number must be the same as the port number that is specified for the HyperSwap management address space IOSHMCTL S0CKP0RT parameter on the z/OS system. For more information about the S0CKP0RT parameter, see the *IBM Copy Services Manager Installation and Configuration Guide*.

   Type
   Shows the type of host system connection.

   System name
   Shows the name of the z/OS host system. If there is no connection to the host system, **Unknown** is displayed in this field.

   Sysplex name
   Shows the name of the z/OS sysplex that the host system is in or specifies that the system is not in a sysplex. If there is no connection to the host system, **Unknown** is displayed.

   User name
   Enter the user name for the z/OS host system. The user name and password must be the same name and password that are specified in the Resource Access Control Facility (RACF) settings

on the host system. For more information about the RACF settings, see the *IBM Copy Services Manager Installation and Configuration Guide*.

Password
Enter the user password for the z/OS host system. If you change the user name, you must change the password.

3. Click **Update Host**.

Results

The host system is displayed on the **Host Connections** page. If connection to the host system is successful, the status **Connected** is displayed. If the connection to the host system failed, the status **Disconnected** is displayed.

Removing a host system connection

You can remove host system connections from the Copy Services Manager configuration.

About this task

Prerequisites: You must have Administrator privileges to remove a host system.

Removing a host system connection disables the ability to use features that are supported by the host, such as HyperSwap. Sessions that use the host system to provide these features can no longer communicate with the host and the features are disabled for the entire session.

Follow these steps to remove a host system connection:

Procedure

1. In the menu bar, click **Storage** > **Host Connections**.
2. On the **Host Connections** page, select the host system connection that you want to remove.
3. From the **Select Action** list, select **Remove Host Connection**.
4. Click **OK** to remove the host system connection.

Results

The host system is removed from the **Host Connections** page.

Managing Sysplexes with the same name

Copy Services Manager allows multiple host connections to z/OS Sysplexes that have the same name. To use this feature, a CSV file can be used to give a user-defined name for the host connection or for the set of host connections. When the Sysplex name for a host connection is displayed, that was defined in the CSV file, Copy Services Manager displays the user-defined name. If multiple Sysplexes have the same name, define a unique user-defined name for each Sysplex. So that, when you associate a Sysplex to a particular session, the Sysplexes are distinguishable, which allows the user to select the correct Sysplex without renaming the Sysplex on z/OS.

About this task

Follow these steps to set Sysplexes with the same name:

Tip: Before you associate any session to a Sysplex, define the `zosSysplexAlias.csv` file.
If sessions are already associated with host connections whose Sysplex ID is changed in the `zosSysplexAlias.csv`, for each of those sessions, open the session properties and disable HyperSwap or Hardened Freeze, wherever applicable before you add the host connection to the zosSysplexAlias file.

Procedure

1. Define a file in **csmServer** > **properties** with a file name `zosSysplexAlias.csv`.
2. For each host connection that is supposed to be given a different Sysplex name than the pre-defined name in the system, create a line with the following format:
   `hostname:port,systemName,newSysplexID`
   For example,
   hostname1.labs.ibm.com:5858, LOCAL1, ZOSID1
   hostname2.labs.ibm.com:5858, LOCAL2, ZOSID2
   hostname3.labs.ibm.com:5858, LOCAL3, ZOSID3
3. Ensure that all host connections are added. (Refer "Adding a host system connection" on page 67)
4. Restart the Copy Services Manager server.
5. For each session that is associated with the changed sysplex ID, open the session properties and set the z/OS Sysplex Association to the correct Sysplex ID. Then, re-enable HyperSwap or Hardened Freeze as needed.

Chapter 6. Managing logical paths

Logical paths define the relationship between a source logical subsystem (LSS) and a target LSS that is created over a physical path. To configure logical paths for IBM DS8000 use the ESS/DS Paths panel in Copy Services Manager.

About this task

To configure partnerships for the following storage systems, use the graphical user interface (GUI) or command-line interface (CLI) for the storage system:

- FlashSystems/IBM Spectrum Virtualize
- SAN Volume Controller
- Storwize
- A FlashSystem/IBM Spectrum Accelerate

Viewing logical paths

You can view all logical paths that are defined on an IBM DS8000 storage system.

About this task

Complete one of these procedures to view logical paths:

Procedure

- From the **ESS/DS Paths** page of Copy Services Manager:
  a) In menu bar, click **Paths**.
  b) Click the storage system ID to display logical paths for that storage system.
- From the **Storage Systems** page:
  a) In menu bar, click **Storage** > **Storage Systems**.
  b) Select the storage system for which you want to view logical paths.
  c) From the **Select Action** list, select **View Paths**. The paths page is displayed with a list of defined logical paths.

Adding logical paths

You can add logical paths for IBM DS8000 storage systems.

Before you begin

Ensure that you have defined the appropriate storage systems on the **Storage Systems** page.

About this task

Perform these steps to add logical paths:

Procedure

1. In menu bar, click **Paths**.
2. Click **Manage Paths**. The Path Management wizard is displayed.
3. From the drop-down boxes in the Path Management wizard, select the source storage system, source logical subsystem, target storage system, and target logical subsystem. Then, click **Next**.

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4. From the drop-down boxes in the Path Management wizard, select the source port and target port and click **Add**.

   You can add multiple paths between the logical subsystems, or just one at a time. When you have made your selections, click **Next**.
5. Confirm your selections and click **Next**.
6. Verify the remaining wizard panels and click **Next**.
7. Click **Finish**.

Adding logical paths by using a CSV file

You can create a comma-separated value (CSV) file to define logical paths. The CSV file specifies storage systems pairings and associated port pairings that are used for replication. Copy Services Manager uses the port pairings that are defined in the CSV file to establish logical paths. You can edit the port pairings file by using the Copy Services Manager GUI. You can also edit the file manually if necessary.

Before you begin

You can define the following types of port pairings for the source and target storage systems:

- Port pairings for all logical subsystems that are in a session.
- Port pairings for a logical subsystem to logical subsystem mapping.
- Port pairings for all logical subsystems. You can define a single set of port pairings for the logical subsystems or you can define different pairings for all even logical subsystems and all odd logical subsystems.
- Port pairings based on the direction of the copy.

Adding logical paths with a CSV file by using the GUI

You can use the **DS8000 Port Pairings CSV** panel in the Copy Services Manager GUI to add logical paths by editing a sample CSV file.

About this task

You can define the port pairings within a CSV file by using the GUI. However, if the GUI is not accessible, you can also define them by manually editing the `portpairings.csv` file. For more information, see “Adding logical paths with a CSV file by editing it manually” on page 73.

Complete these steps to add IBM DS8000 logical paths with a CSV file in the Copy Services Manager GUI:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Paths** > **DS8000 Port Pairings CSV**.
3. Click **Edit** to put the CSV file into edit mode.
4. Enter the necessary changes to the sample `portpairings.csv` file for your environment. For more information, see the online help at **?** > **Help** for guidance and tips on editing the file.
5. When you are finished updating the file, click **Save** to keep your changes, or click **Cancel** to exit without saving changes.

Results

New logical paths are added according to the updates that you made in the CSV file.

Adding logical paths with a CSV file by editing it manually

You can manually edit a `portpairings.csv` sample file to add logical paths.

About this task

You can define the port pairings within a CSV file through a manual edit, if necessary. However, the preferred method is to define this file by using the Copy Services Manager GUI. For more information, see "Adding logical paths with a CSV file by using the GUI" on page 72.

Complete these steps to add IBM DS8000 logical paths with a CSV file by editing it manually:

Procedure

1. Create a CSV file that is named `portpairings.csv` in the *install dir*`\liberty\wlp\usr\servers\csmServer\properties` directory for distributed systems, or in the *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory for z/OS. You can create the CSV file in a spreadsheet such as Microsoft Excel or in a text editor.

   In the `properties` directory, find the sample CSV file that is named `portpairings.csv`. This file contains the following example port pairs:

```
# 1. Each line in the file represents a storage system pairing and its
#    associated port pairings.
#    There are multiple formats that define different port pairing types:
#
# Specific Session:  This format can be used if you want to use a
# different set of port pairings for each session.
# This might be necessary in some environments to prevent
# the paths of a session from affecting the paths of another session.
#
# Format:
# storageSystemA:storageSystemB:sessionName,port1:port2,...,portN:portM
#
# storageSystemA:storageSystemB,port1:port2,...,portN:portM
# where storageSystemA and storageSystemB are the storage system IDs
# that are used to identify the storage systems, and sessionName is
# the name of the session that you wish this port pairing to be used for.
# port1, port2, portN, portM are hexadecimal numbers which indicate the
# storage system communication ports.
#
# A valid example is:
# 2107.04131:2107.01532:myPayRollSession,0x0331:0x0024,
# 0x0330:0x0100,0x0331:0x000C
#
#
#
# Specific LSS to LSS pairing:  This format can be used if you want
# to specify for a specific LSS pairing to use a specific set of
# port pairings.
#
# Format:
# storageSystemA:systemALSS:storageSystemB:systemBLSS,
# port1:port2,...,portN:portM
#
# where storageSystemA and storageSystemB are the storage system IDs
# that are used to identify the storage systems, and systemALSS/systemBLSS
# are LSSs on storage Systems in hexadecimal format.  port1, port2,
# portN, portM are hexadecimal numbers which indicate the storage system
# communication ports.
#
# A valid example is:
# 2107.04131:0x52:2107.01532:0x5f,0x0331:0x0024,0x0330:0x0100,
# 0x0331:0x000C
#
#
#
#
# Box to Box pairing:  This format can be used if you want to
# specify a set of port pairings to use for all LSS pairings
# across the same source and target Box. This pairing has multiple options.
# A single set of port pairings can be defined for all LSS pairings between
# the boxes, OR the port pairings can define that the even source LSSs should
# use one set, and the odd LSSs should use a different set. There are some
# scenarios particularly with Global Mirror support where performance can be
```

```
# improved by mapping even and odd LSSs.
#
#
# Format:
# Option 1:
# storageSystemA:storageSystemB,port1:port2,...,portN:portM
#
# where storageSystemA and storageSystemB are the storage system IDs
# that are used to identify the storage systems.
# port1:port2,... portN:portM are hexadecimal numbers which indicate
# the storage system communication ports.
#
#
# A valid example is:
# 2107.04131:2107.01532,0x0331:0x0024,0x0330:0x0100,0x0331:0x000C
#
# Option 2:
# storageSystemA:storageSystemB,even, port1:port2,...,portN:portM,
# odd, port1:port2,...portX:portY
#
# where storageSystemA and storageSystemB are the storage system IDs
# that are used to identify the storage systems.
# port1:port2,...portN:portM is the set of port pairings to use when
# the source is on an even LSS
# port1:port2,...portX:portY is the set of port pairings to use when
# the source is on an odd LSS
# All ports are hexadecimal numbers which indicate the storage system
# communication ports.
#
# A valid example would be:
# 2107.04131:2107.01532,even,0x0331:0x0024,0x0330:0x0100,
# odd,0x0331:0x000C,0x0334:0x0330
```

2. To enable the changes in the file, complete a task that requires new paths to be established. For example, suspend a session to remove the logical paths, and then issue the **Start H1->H2** command to enable the paths to use the port pairings in the CSV file.

What to do next

Considerations when you are creating and using the CSV file:

- The CSV file now supports Global Mirror control paths. Please refer “Adding Global Mirror Control paths with a CSV file by editing it manually” on page 76 for more information.
- The entries for the port pairs are bidirectional unless the last comma-separated entry on the line is the string `onedir`. The `portpairings.csv` file contains the following information about using the `onedir` string:

```
# 2. The entry for the port pairs are bi-directional unless the last
# comma-separated entry on the line is the string "onedir".
# This means that a line that has systemA:systemB is equivalent to a line
# that has systemB:systemA, and the last entry in the file takes precedence.
#
# If the string "onedir" is the last entry in the line, as in the
# following example:
# 2107.04131:2107.01532,0x0331:0x0024,0x0330:0x0100,
# 0x0331:0x000C,onedir
# then the entry is not considered to be bi-directional, and the
# port pairings are only used if the first box listed (2107:04131)
# is the source of the pair, and the second box listed (2107.01532)
# is the target of the pair.
# NOTE: You can specify the "onedir" tag on any of the supported
# formats for port pairs. However, if there is also an entry for
# the same set of boxes without the "onedir" tag, the entry without
# the "onedir" tag might take precedence.
#
#  Example Session format:
#  2107.ZA811:2107.BAY81:myMM,0x0133:0x0332,onedir
#  2107.BAY81:2107.ZA811:myMM,0x0033:0x0030,onedir
#  The above example indicates that session "myMM" will use
#  0x0133:0x0332 for any establishes from ZA811 to BAY81,
#  but will use 0x0033:0x0030 for any establishes
#  from BAY81 to ZA811.
#
#  Example LSS to LSS format:
#  2107.ZA811:0xD0:2107.BAY81:0xD0,0x0133:0x0332,onedir
```

```
#  2107.BAY81:0xD0:2107.ZA811:0xD0,0x0033:0x0030,onedir
#  The above example indicates that ports 0x0133:0x0332
#  will be used for any establishes from ZA811 LSS 0xD0
#  to BAY81 LSS 0xD0, but that ports 0x0033:0x0030
#  will be used from BAY81 LSS 0xD0 to ZA811 LSS 0XD0.
#
#  Example Box to Box format:
#  2107.ZA811:2107.BAY81,0x0133:0x0332,onedir
#  2107.BAY81:2107.ZA811,0x0033:0x0030,onedir
#  The above example indicates that ports 0x0133:0x0332
#  will be used for any establishes from ZA811 to BAY81,
#  but that ports 0x0033:0x0030 will be used for any
#  establishes from BAY81 to ZA811.
#
# 3. Lines that are incorrectly formatted are discarded. For example,
# if a line contains ports without the 0x, or does not contain port
# pairs delimited by the : character, then the whole line is discarded.
#
# 4. A line can be properly formatted but contain invalid ports for your
# given storage system configuration. In this case, the ports will be
# passed down to the storage system to be established, and no validation
# is done. The valid ports might be established by the storage system,
# while the invalid ones might be rejected.
#
# 5. If a file contains duplicate lines for the same storage systems, the
# last line is used. And the ports on the last line are the ones that are used.
# Also note that the entries are bi-directional (see rule 2). Therefore, if you
# have systemA:systemB, and then a line with systemB:systemA, this second
# line is the one that is used.
#
# 6. This file is read at most once every 60 seconds. Therefore, if you change
# the file you might need to wait two minutes until you issue the next start
# command.
#
# 7. Any line that starts with a # character is counted as a comment and is
# discarded. The # must be at the start of the line. Placing it in other
# positions might cause the line to be invalid.
#
# 8. The portpairings.csv file is not automatically shared between
# two copy services management servers in a high availability environment.
# Therefore, it is possible that different port pairings can be established
# from the standby server after a takeover. In most cases you will want to
# copy the portpairings.csv file to the standby server to ensure that the
# two files are equal.
#
# 9. The following is the order in which each port pairing is checked.
# The first match when going down this order is used as the port pairings:
# a) If a Specific LSS pairing is found for the given LSS pairing being
# established
# b) If a Specific Session port pairing is found for the given session
# c) If a box to box mapping is found for the given pair being established
#
# For more information on how the port pairings works, see the
# user's guide and other documentation.
#
# Examples:
# Normal Box to Box Mappings
#2107.04131:2107.01532,0x0331:0x0024,0x0330:0x0100,0x0331:0x000C
#2107.05131:2107.01532,0x0330:0x0029,0x0331:0x0001
# Specific Session Option
#2107.04131:2107.01532:GMP,0x0030:0x0303,0x0031:0x0303
# Specific LSS to LSS Mapping Option
#2107.04131:0x50:2107.01532:0x51,0x0301:0x0303,0x0302:0x0303
# Box to Box Mapping with Even and Odd LSS pairings defined
#2107.04131:2107.01532,even,0x0030:0x0031,0x0032:0x0033,0x0030:
0x0033,odd,0x0300:0x0301,0x0302:0x0303
```

- If the CSV file contains multiple lines that specify the same storage system to storage system pairing, Copy Services Manager uses the last line. This rule applies regardless of the order of the storage system pairing. For example, if you have storage systems 2107.04131:2107.01532 defined on the first line of the CSV file and then have 2107.01532:2107.04131 defined on the second line, Copy Services Manager uses second line.
- If a line in the CSV contains information that is not formatted correctly, the line is ignored. This rule includes lines that specify storage systems but do not include ports or include ports that are not formatted correctly.

- If the CSV file contains valid and invalid port pairs, the valid port pairs might or might not be established. Invalid port pairs can cause the following errors to be displayed in the Copy Services Manager console and on the **ESS/DS Paths** page:
  - Return Code F52: This error is displayed if a port is invalid.
  - Return Code 0400: This error is displayed if a port is invalid and out of the range for the device.

  Other storage system error codes might be displayed also, depending on the path topology, types of paths, and the incorrect port pairings that are specified in the CSV file.
- If the CSV file contains no valid port pairs, no logical paths are established and subsequent commands to the storage systems that require logical paths might fail. Any existing logical paths for a storage system are used until they are removed.

Adding Global Mirror Control paths with a CSV file by editing it manually

You can manually edit a `sample.csv` file to add logical paths.

About this task

You can define the port pairings within a CSV file through a manual edit, if necessary. However, the preferred method is to define this file by using the Copy Services Manager GUI. For more information, see "Adding logical paths with a CSV file by using the GUI" on page 72.

Complete these steps to add IBM DS8000 logical paths with a CSV file by editing it manually:

Procedure

1. Create a CSV file that is named `sample.csv` in the *install dir*`\liberty\wlp\usr\servers\csmServer\properties` directory for distributed systems, or in the *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory for z/OS. You can create the CSV file in a spreadsheet such as Microsoft Excel or in a text editor.
2. In the `properties` directory, find the sample CSV file that is named `sample.csv`. This file contains the following example port pairs:

```
##################################################################################################
#################################################
# Starting in CSM 6.2.12, this file can now define Control Paths to use for sessions with
DS8000 Global Mirror
#
# Lines starting with "GM" define port pairings that should be used for Global Mirror
control paths between Master and Subordinate control systems
# This file supports two ways to define the control paths
#
# LSS to LSS - This format specifies the LSS on the Master and the LSS on the subordinate to
use when establishing the path
# The format for an LSS to LSS mapping is
#
GM,master:subordinate,LSS,master_lss:subordinate_lss,master_port1:subordinate_port1,master_po
rt2:subordinate_port2....
#
# LSS to LSS For Specific Session - This format also specifies specific LSSs but will only
be applied to a specific session
#     NOTE: When specifying the session name in the properties file, all spaces should be
replaced with "_".  Example "My session" should be specified as "My_session"
#     NOTE: When using this format, if you have multiple sessions with GM that share the
same consistency group name, all shared sessions should have a line in the file with the
same port pairings
# The format for a Specific Session mapping is
#
GM,master:subordinate:session_name,master_lss:subordinate_lss,master_port1:subordinate_port1,
master_port2:subordinate_port2....
#
#
# NOTE 1:  In order for the control paths to be created, there must be a line in this file
specifying the paths for every Master to Subordinate relationship in the session.
#          This line is NOT bi-directional as it is for MM or GC paths and as such will be
used to determine which of the source boxes will be the Master box.
# NOTE 2:  This file will only take affect when the Master is started new.  This might be a
new start or after a Suspend/Recover and restart.
#          Control paths in this file will not be used when simply restarting a session
```

```
#
# The following examples consider a session that has H1 volumes in a GM session across the
following boxes
# GXE34, KX432, LR345
#
# Example of defining LSS to LSS Mappings for the session where GXE34 is the desired Master
box
# GM,2107.GXE34:2107.KX432,LSS,0x05:0x10,0x0133:0x0130,0x0300:0x0301
# GM,2107.GXE34:2107.LR345,LSS,0x4D:0x5E,0x0233:0x0230,0x0320:0x0321
#
# Example of defining Specific Session Mappings for the session where GXE34 is the desired
Master box and the session is "My session"
# GM,2107.GXE34:2107.KX432:My_session,LSS,0x05:0x10,0x0133:0x0130,0x0300:0x0301
# GM,2107.GXE34:2107.LR345:My_session,LSS,0x4D:0x5E,0x0233:0x0230,0x0320:0x0321
```

Results

New logical paths are added according to the updates that you made in the CSV file.

Removing logical paths

You can remove logical paths that are defined on an IBM DS8000 storage system.

Procedure

1. In menu bar, click **Paths**.
2. Click the link for the storage system that contains the paths that you want to remove.
3. Select the paths that you want to remove.
4. From the **Select Action** list, select **Remove**.

Chapter 7. Setting up data replication

This topic describes the how to set up data replication in your environment, including creating sessions and adding copy sets to those sessions.

About this task

In a replication session, the number of volumes in a copy set and the role that each volume in the copy set plays are determined by the session type.

Sessions

A *session* completes a specific type of data replication for a specific set of volumes. During data replication, data is copied from a source volume to one or more target volumes, depending on the session type. The source volume and target volumes that contain copies of the same data are collectively referred to as a copy set. A session can contain one or more copy sets.

The type of data replication that is associated with the session determines the actions that you can perform against all copy sets in the session, the number of volumes that a copy set can contain, and the role that each volume plays.

Note: IBM i volumes should be initialized before you add them to Copy Services Manager sessions to start replication.

Attention: Use only the Copy Services Manager graphical user interface (GUI) or command-line interface CLI to manage session relationships, such as volume pairs and copy sets. Do not modify session relationships through other interfaces such as the System Storage DS CLI. If you modify relationships through other interfaces, a loss of consistency can occur across the relationships that are managed by the session. The exceptions to this requirement are failover operations that are managed by external applications for certain session and storage system types as described in “Failover and failback operations” on page 84.

Single-target and multi-target sessions

Sessions are referred to as single-target or multi-target sessions. With single-target sessions, the source volume site can have only one target site. Data replication occurs from the source to the target.

With multi-target sessions, the source volume site can have multiple target sites. Data replication can occur from the source to an individual target or to all targets simultaneously.

Copy sets

During data replication, data is copied from a source volume to one or more target volumes, depending on the session type. The source volume and target volumes that contain copies of the same data are collectively referred to as a *copy set*.

Each volume in a copy set must be of the same size and volume type. For example, SAN Volume Controller volumes must be used with other SAN Volume Controller volumes. The number of volumes in the copy set and the role that each volume plays is determined by the session type that is associated with the session to which the copy set belongs.

The following table lists the estimated number of role pairs and volumes per copy set that are supported for each session type.

Table 28. Number of role pairs and volumes per copy set for each session type

Session	Role Pairs	Volumes
Basic HyperSwap	1	2

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Table 28. Number of role pairs and volumes per copy set for each session type (continued)

Session	Role Pairs	Volumes
FlashCopy	1	2
Snapshot[1]	0	1
Metro Mirror Single Direction	1	2
Metro Mirror Failover/Failback	1	2
Metro Mirror Failover/Failback with Practice	3	3
Metro Mirror Failover/Failback with Change Volumes	1	4
Metro Mirror - Metro Mirror	3	3
Global Mirror Single Direction (IBM DS8000)	3	3
Global Mirror Single Direction (FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, Storwize)	1	2
Global Mirror Failover/Failback (IBM DS8000)	3	3
Global Mirror Failover/Failback (FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, Storwize)	1	1
Global Mirror Failover/Failback with Practice (IBM DS8000)	5	4
Global Mirror Failover/Failback with Practice (FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, Storwize)	3	3
Global Mirror Either Direction	5	4
Global Mirror Either Direction with Two-Site Practice	8	6
Global Mirror Failover/Failback with Change Volumes	1	4
Metro Global Mirror	6	4
Metro Global Mirror with Practice	8	5
Metro Mirror - Global Mirror[2]	6	4
Metro Mirror - Global Mirror with Practice	9	5
Metro Mirror - Global Mirror with Site 3 Global Mirror	10	6
Metro Mirror - Global Mirror with Site 4 Replication	11	6
Metro Mirror - Metro Mirror with Site 4 Replication	5	4
Safeguarded Copy [3]	1	2
Migration	1	2

1. A FlashSystem/IBM Spectrum Accelerate Snapshot session requires that the user define only the H1 volumes. All target volumes are created on the same storage pool as the source volumes.
2. For IBM FlashSystem A9000 and A9000R storage systems, there are 3 role pairs, and 3 volumes.
3. Source volumes need to have the safeguarded capacity defined on the DS8000 for use in a Safeguarded Copy session.

Use the Add Copy Sets wizard to add copy sets to a session. You can select a storage system; a logical subsystem (LSS), I/O group, or pool; or a single volume for reach role and then create one or more copy sets for the session.

You can use one of the following volume pairing options to automatically create multiple copy sets in the same session.

Storage system matching (IBM DS8000 Metro Mirror sessions only)
Creates copy sets by matching volumes (based on the volume IDs) across all LSSs for the selected storage systems. For example, volume 01 on the source LSS is matched with volume 01 on the target LSS.

You can select the storage system and select **All Logical Subsystems** in the list of LSSs. You can also do auto-matching at the LSS level for Metro Mirror sessions.

LSS, I/O group, or pool matching
Creates copy sets by matching all volumes based on the selected LSS, I/O group, or pool for each role in copy set.

Select the storage system and LSS, I/O group, or pool, and then select **All Volumes** in the **Volume** list.

If you do not want to use the auto-generated volume pairing for a copy set, clear that copy set so that it is not added during the wizard. Then, add the remaining copy sets and reopen the Add Copy Set wizard and manually enter the volume pairings that you want.

Invalid copy set are not added to the session. Copy sets can be invalid if their volumes are not the same type or size.

You can remove copy sets that you do not want to add to the session, even if they are valid. You can use this process to filter and eliminate unwanted copy sets before they are added to the session.

You can export the copy sets to take a snapshot of your session at a particular point in time for backup purposes.

Note: You can copy an entire storage system only for Metro Mirror sessions.

Adding copy sets

When you create a copy set for a session, a warning is displayed if one or more of the selected volumes exist in another session. If the volume you selected is in another session, confirm whether you want to add the volume to this session. Ensure that you intend to have the volume in multiple sessions because having the volume in multiple sessions can create conflicts. A scenario in which you would want the same volumes in multiple sessions is one in which you create a session for normal replication, and then create another session for a disaster recovery practice. You must use the same target volumes in both sessions.

You can use extent space-efficient volumes as copy set volumes, depending on the capabilities of the storage system.

Removing copy sets

You remove a copy set or range of copy sets by selecting the following items:

- Source volume
- LSS, I/O group, or pool
- Storage system

When the list of copy sets that meet your criteria is displayed, you can select the copy sets that you want to remove.

The consequence of removing copy sets varies depending on the state of the session:

Defined
There is no relationship on the hardware. The copy set is removed from the Copy Services Manager data store.

Preparing or Prepared
The copy set is copying data, so Copy Services Manager terminates the hardware relationship for the copy set. The rest of the copy sets continue to run uninterrupted.

Suspended or Target Available
Any existing relationships on the hardware are removed for the copy set.

Before you remove all copy sets from that session, terminate the session. Removing the copy sets when the session is active can considerably increase the amount of time it takes for the copy set removal to complete. Copy sets are removed one at a time, and when the session is active, commands are issued to the hardware. However, if you terminate the session first, then commands are not issued to the hardware and the removal process completes faster.

Tip: When you a remove copy set from Copy Services Manager, you might want to keep hardware relationships on the storage systems. These relationships are useful when you want to migrate from one session type to another, or when you are resolving problems. For more information about keeping the hardware relationships when you are removing copy sets, see Removing Copy Sets.

Depending on the storage system, the following actions occur when a copy set is removed:

DS8000:

- The complete copy set is removed from Copy Services Manager.
- Any Peer-to-Peer Remote Copy (PPRC) pair that is part of a Global Mirror consistency group is removed from the consistency group on the storage system.
- If the PPRC pair is part of a Global Mirror consistency group and is the last remaining source volume in a subordinate session, the subordinate session is removed from the storage system.
- If the PPRC pair is the last remaining participant in a Global Mirror session, the Global Mirror session is removed from the storage system.
- Any PPRC relationship remains on the storage system.
- FlashCopy relationship remains on the storage system if the hardware background copy is not complete.

FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, Storwize, Storwize V7000 Unified, or a FlashSystem/IBM Spectrum Accelerate

- The complete copy set is removed from Copy Services Manager.
- FlashCopy, Metro Mirror, and Global Mirror relationships are pulled out of their consistency group. If they are the last remaining relationship in a consistency group, that consistency group is removed from the hardware.

When you specify the force removal option, all knowledge of the specified copy set is removed from Copy Services Manager, even if the relationship itself still exists. In this situation, you are not able to remove the relationship by using Copy Services Manager because no information about the relationship exists. If you force a removal of a copy set and the removal fails, you must manually remove the relationship from the hardware. If you do not, you cannot to create new relationships.

One benefit of forcing a removal of the copy sets is that Copy Services Manager does not manage the consistency of copy sets that it has no knowledge of. This situation means that more commands to the session do not affect the removed copy sets, even though they are still in a relationship on the hardware.

If you do not specify the force removal option and an error occurs that prevents the hardware relationships from being removed, the copy set is not removed from Copy Services Manager. The copy set remains as part of the session, and you can still perform actions on it.

Volume roles

Volume roles are given to every volume in the copy set. The role defines how the volume is used in the copy set and the site location of the volume. For example, the H1 role is made up of host-attached volumes that are located at the primary site.

The site determines the location of the volumes. The number of sites in a copy set is determined by the session type. Copy Services Manager supports up to three sites:

Site 1
The location of the primary storage that contain the source data. Upon initial configuration, this site contains the host volumes with updates that are copied to the target volumes.

Site 2
The location of the secondary storage that receives the copy updates from the primary storage.

Site 3
The location of the tertiary storage that receives data updates from the secondary storage.

Site 4
The location for a fourth copy of the data that receives asynchronous updates from the third site.

The volume roles that are needed in a copy set are determined by the type of replication that is associated with the session. Copy Services Manager supports these volume roles:

Host volume
A host volume is a volume that is connected to a server that reads and writes I/O. A host volume can be the source of updated tracks when the server connected to the host volume is actively issuing read and write input/output (I/O). A host volume can also be the target of the replication. When the host volume is the target, writes are inhibited.

Host volumes are abbreviated as H*x*, where *x* identifies the site.

Journal volume
A journal volume stores data that has changed since the last consistent copy was created. This volume functions like a journal and holds the required data to reconstruct consistent data at the Global Mirror remote site. When a session must be recovered at the remote site, the journal volume is used to restore data to the last consistency point. A FlashCopy replication session can be created between the host or intermediate volume and the corresponding journal volume after a recover request is initiated to create another consistent version of the data.

Journal volumes are abbreviated as J*x*, where *x* identifies the site.

Intermediate volume
An intermediate volume receives data from the primary host volume during a replication with practice session. During a practice, data on the intermediate volumes is flash copied to the practice host volumes.

Depending on the replication method being used, data on intermediate volumes might not be consistent.

Intermediate volumes are abbreviated as I*x*, where *x* identifies the site.

Target volume
A target volume receives data from a host or intermediate volume. Depending on the replication type, that data might or might not be consistent. A target volume can also function as a source volume. For example, a common use of the target volume is as a source volume to allow practicing for a disaster (such as data mining at the recovery site while still maintaining disaster recovery capability at the production site).

Change volume (only FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, or Storwize storage systems)
A volume that contains point-in-time images that are copied from the host or target volume.

Change volumes are abbreviated as C*x*, where *x* identifies the site.

Role pairs

A *role pair* is the association of two volume roles in a session that take part in a copy relationship. For example, in a Metro Mirror session, the role pair can be the association between host volumes at the primary site and host volumes at the secondary site (H1-H2).

The flow of data in the role pair is shown using an arrow. For example, H1>H2 denotes that H1 is the source and H2 is the target.

Participating role pairs are role pairs that are currently participating in the session's copy.

Non-participating role pairs are role pairs that are not actively participating in the session's copy.

Snapshot sessions do not use role pairs.

Practice volumes

You can use a *practice volume* to practice what you would do in the event of a disaster, without interrupting current data replication. Practice volumes are available in Metro Mirror, Global Mirror, Metro Global Mirror, and Metro Mirror - Global Mirror sessions.

To use the practice volumes, the session must be in the prepared state. Issuing the Flash command against the session while in the Prepared state creates a usable practice copy of the data on the target site.

Note: You can test disaster-recovery actions without using practice volumes. However, without practice volumes, you cannot continue to copy data changes between volumes while testing disaster-recovery actions.

Consistency groups

For Global Mirror, Metro Global Mirror, and the multi-target session types, Copy Services Manager manages the consistency of dependent writes by creating a consistent point-in-time copy across multiple volumes or storage systems. A *consistency group* is a set of target volumes in a session that have been updated to preserve write order and are therefore recoverable.

Copy Services Manager automatically assigns an ID to each consistency group on the storage systems. However, you can choose to assign a custom name to a storage system consistency group. A custom-defined name allows you to associate multiple sessions with a specific storage system consistency group.

Data exposure is the period when data is written to the storage at the primary site until data is replicated to storage at the secondary site. Data exposure is influenced by factors such as:

- Requested consistency-group interval time
- Type of storage systems
- Physical distance between the storage systems
- Available bandwidth of the data link
- Input/output (I/O) load on the storage systems

To manage data exposure, you can change the consistency group interval time. The *consistency group time interval* specifies how often a Global Mirror and Metro Global Mirror session attempts to form a consistency group. When you reduce this value, it might be possible to reduce the data exposure of the session. A smaller interval value causes the session to attempt to create consistency groups more frequently, which might also increase the processing load and message-traffic load on the storage systems.

Failover and failback operations

If a session has *failover* and *failback* capabilities, you can perform a site switch in which you move the operation of Copy Services Manager from one site to another, and change the direction of the copy without completing a full copy.

Failover is the process of temporarily switching production to a backup facility after a scheduled maintenance period or a disaster at a production site. A failover operation can be followed by a failback operation, which is the process of returning production to its original location and resuming the copy between the two sites.

The failover and failback operations use remote mirror and copy functions for these tasks:

- To reduce the time that is required to synchronize volumes after sites are switched during planned or unplanned outages.
- To eliminate the need to perform a full volume copy from the recovery site to the production site, which can reduce the time that is required to resume operations at the production site.

Failover operations that are managed by other applications

Applications such as the IBM Series i Toolkit, VMware Site Recovery Manager, and Veritas Cluster Server can also manage failover operations for the session types that are listed in the following table.

Session type	Storage systems
Metro Mirror Single Direction	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified
Metro Mirror Failover/Failback	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V5000 – Storwize V3700 – Storwize V7000 – Storwize V7000 Unified • Systems running IBM Spectrum Accelerate, including: – XIV – FlashSystem A9000 – FlashSystem A9000R
Metro Mirror Failover/Failback with Practice	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified

Session type	Storage systems
Metro Mirror Failover/Failback with Change Volumes	• Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified
Multi-target session types: • Metro Mirror - Metro Mirror • Metro Mirror - Global Mirror • Metro Mirror - Global Mirror with Practice • Metro Mirror - Global Mirror with Site 3 Global Mirror	• IBM DS8000 **Note:** Multi-target session types are available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using. • IBM FlashSystem A9000 and A9000R **Note:** Only the Metro Mirror - Global Mirror multi-target session type is available for the FlashSystem A9000 and A9000R storage systems.
Global Mirror Single Direction	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified
Global Mirror Either Direction with Two-Site Practice	• IBM DS8000

Session type	Storage systems
Global Mirror Failover/Failback	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified • Systems running IBM Spectrum Accelerate, including: – XIV – FlashSystem A9000 – FlashSystem A9000R
Global Mirror Failover/Failback with Practice	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified
Global Mirror Failover/Failback with Change Volumes	• Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified

If an application completes a failover operation for a session, the Severe status is displayed for the session on the **Session Details** page in Copy Services Manager. An error message is also generated for the role pairs for which the failover occurred. To view the error message:

1. On the **Session Details** page, click the link for each role pair for which the failover occurred.

2. On the **Role Pair Details** page, click the **Show** link for each role pair. This link is in the **Details** column.

To change the session status to Normal, use the application to confirm that the role pairs that are in the session are consistent and then restart the session.

Session types

Copy Services Manager provides several methods to replicate data. The type of data replication that is associated with a session is known as the *session type*.

The session types that are available depend on the storage system type and the edition of Copy Services Manager that you are using.

HyperSwap

HyperSwap is a copy services solution for IBM z/OS version 1.9 and later. HyperSwap provides high availability of data if a storage system failure occurs. If an I/O error occurs at the primary site, HyperSwap technology automatically swaps I/O to a secondary set of volumes with little to no impact to the customer.

Copy Services Manager supports enabling certain session types with HyperSwap capabilities. These session types include:

- Metro Mirror
- Metro Global Mirror
- Multi-target session types:
  - Metro Mirror - Metro Mirror
  - Metro Mirror - Global Mirror
  - Metro Mirror - Global Mirror with Practice
  - Metro Mirror - Global Mirror with Site 3 Global Mirror
  - Metro Mirror - Global Mirror with Site 4 Replication
  - Metro Mirror - Metro Mirror with Site 4 Replication

When enabled for HyperSwap, Copy Services Manager communicates with IBM Z to provide information on which volumes need to be highly available.

FlashCopy

FlashCopy replication creates a point-in-time copy of the data on a source volume to a target volume. Data that existed on the target volume is replaced by the copied data.

Snapshot

Snapshot replication creates a point-in-time copy of a volume or set of volumes without having to define a specific target volume. The target volumes of a Snapshot session are automatically created when the snapshot is created.

Metro Mirror Single Direction

Metro Mirror is synchronous replication that operates between two sites that are up to 300 km apart. The source volumes are on one storage system and the target volumes are on another storage system.

Metro Mirror replication maintains identical data in both the source and target volumes. When a write operation is issued to a source volume, the changes are propagated to the target volume before the write operation finishes processing.

With the Metro Mirror Single Direction session type, Metro Mirror replication is available only from the primary site.

Metro Mirror Single Direction sessions are available for the following Copy Services Manager editions and storage systems.

Metro Mirror Single Direction

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Metro Mirror Failover/Failback

With Metro Mirror Failover/Failback replication, you can switch the direction of the data flow so that you can use your secondary site as your production site. You can then copy changes that are made at the secondary site back to the primary site.

Metro Mirror Failover/Failback sessions are available for the following Copy Services Manager editions and storage systems.

Table 29. Metro Mirror Failover/Failback	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage) • Systems running IBM Spectrum Accelerate, including: – XIV – FlashSystem A9000 – FlashSystem A9000R

Metro Mirror Failover/Failback with Practice

Metro Mirror Failover/Failback with Practice replication combines Metro Mirror Failover/Failback and FlashCopy capabilities to provide a point-in-time copy of the data on the secondary site. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

Metro Mirror Failover/Failback with Practice sessions are available for the following Copy Services Manager editions and storage systems.

Table 30. Metro Mirror Failover/Failback with Practice	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Metro Mirror Failover/Failback with Change Volumes

Metro Mirror Failover/Failback with Change Volumes replication provides the same capabilities as the Metro Mirror Failover/Failback session type. However, Metro Mirror Failover/Failback with Change Volumes sessions also associate change volumes to the primary and secondary to enable consistency protection during restarts.

Metro Mirror Failover/Failback with Change Volumes sessions are available for the following Copy Services Manager editions and storage systems.

Table 31. Metro Mirror Failover/Failback with Change Volumes	
Supported editions	**Supported storage systems**
• Copy Services Manager	• Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller Version 6.3 and later – Storwize V3700 Version 6.4.1 and later – Storwize V5000 – Storwize V7000 Version 6.3 and later – Storwize V7000 Unified Version 1.3 and later (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Global Mirror Single Direction

Global Mirror is asynchronous replication that operates between two sites that are over 300 km apart. The source volumes are on one storage system and the target volumes are on another storage system.

Global Mirror replication maintains identical data in both the source and target volumes. When a write operation is issued to a source volume, the changes are typically propagated to the target volume a few seconds after the data is written to the source volume.

With the Global Mirror Single Direction session type, Global Mirror replication is available only from the primary site.

Global Mirror Single Direction sessions are available for the following Copy Services Manager editions and storage systems.

Table 32. Global Mirror Single Direction

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Global Mirror Either Direction

With Global Mirror Either Direction replication, you can run Global Mirror replication from either the primary or secondary site.

Global Mirror Either Direction sessions are available for the following Copy Services Manager editions and storage systems.

Table 33. Global Mirror Either Direction

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Global Mirror Either Direction with Two-Site Practice

With Global Mirror Either Direction with Two-Site Practice replication, you can run Global Mirror replication from either the primary or secondary site. This session type provides volumes on the primary and secondary site that you can use to practice for disaster recovery without losing your disaster recovery capability.

Global Mirror Either Direction with Two-Site Practice sessions are available for the following Copy Services Manager editions and storage systems.

Table 34. Global Mirror Either Direction with Two-Site Practice	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000

Global Mirror Failover/Failback

With Global Mirror Failover/Failback replication, you can switch the direction of the data flow so that you can use your secondary site as your production site. You can then copy changes that are made at the secondary site back to the primary site.

Global Mirror Failover/Failback sessions are available for the following Copy Services Manager editions and storage systems.

Table 35. Global Mirror Failover/Failback	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage) • Systems running IBM Spectrum Accelerate, including: – XIV – FlashSystem A9000 – FlashSystem A9000R

Global Mirror Failover/Failback with Change Volumes

Global Mirror Failover/Failback with Change Volumes replication provides the same capabilities as the Global Mirror Failover/Failback session type. However, Global Mirror Failover/Failback with Change Volumes sessions also provide the option of enabling or disabling the use of change volumes. Change volumes are available in SAN Volume Controller and Storwize storage systems.

Global Mirror Failover/Failback with Change Volumes sessions are available for the following Copy Services Manager editions and storage systems.

Table 36. Global Mirror Failover/Failback with Change Volumes	
Supported editions	**Supported storage systems**
• Copy Services Manager	• Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller Version 6.3 and later – Storwize V3700 Version 6.4.1 and later – Storwize V5000 – Storwize V7000 Version 6.3 and later – Storwize V7000 Unified Version 1.3 and later (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Global Mirror Failover/Failback with Practice

Global Mirror Failover/Failback with Practice replication combines Global Mirror Failover/Failback and FlashCopy capabilities to provide a point-in-time copy of the data on the secondary site. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

Global Mirror Failover/Failback with Practice sessions are available for the following Copy Services Manager editions and storage systems.

Table 37. Global Mirror Failover/Failback with Practice	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified (Copy Services Manager copy services are available only for Storwize V7000 Unified block storage)

Metro Global Mirror

Metro Global Mirror replication provides continuous, remote data replication that operates between three sites that are varying distances apart. Metro Global Mirror combines Metro Mirror synchronous copy and Global Mirror asynchronous copy into a single session, where the Metro Mirror target is the Global Mirror source. With Metro Global Mirror replication, you can switch the direction of the data flow so that you can use your secondary or tertiary site as your production site.

Metro Global Mirror sessions are available for the following Copy Services Manager editions and storage systems.

Table 38. Metro Global Mirror

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Metro Global Mirror with Practice

Metro Global Mirror with Practice replication combines Metro Mirror, Global Mirror, and FlashCopy capabilities to provide a point-in-time copy of the data on the tertiary site. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

Metro Global Mirror with Practice sessions are available for the following Copy Services Manager editions and storage systems.

Table 39. Metro Global Mirror with Practice

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Metro Mirror - Metro Mirror

A Metro Mirror - Metro Mirror session is a multi-target session that consists of three sites. You can define any of the sites as the primary site and then run Metro Mirror replication from the primary site to either of the other sites individually or both sites simultaneously. For example, if Site 1 is the primary site, data replication can occur between the H1 and H2 volumes and the H1 and H3 volumes separately or at the same time.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 40. Metro Mirror - Metro Mirror

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Metro Mirror - Global Mirror

A Metro Mirror - Global Mirror session is a multi-target session that consists of three sites. From the primary site, you can define both a Metro Mirror copy and a Global Mirror copy, which allows for replication across both a short distance and long distance simultaneously.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

You can also use this session type with IBM FlashSystem A9000 and A9000R storage systems.

Note: HyperSwap is always enabled for the Metro Mirror - Global Mirror multi-target session type on FlashSystem A9000 and A9000R. If a swap occurs, the hardware automatically restarts the Metro Mirror pair in the opposite direction and re-enables HyperSwap. And after the swap, the remote Global Mirror is *not* automatically restarted.

See the IBM Redbooks publication at http://www.redbooks.ibm.com/redpieces/abstracts/redp5434.html for more specific details on how to set up this session type on the FlashSystem A9000 and A9000R storage systems.

Table 41. Metro Mirror - Global Mirror	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000 • IBM FlashSystem A9000 and A9000R

Note: To convert from a multi-target configuration to a cascaded configuration, refer "Converting from multi-target to Cascaded replication in a three site session type" on page 235.

Metro Mirror - Global Mirror with Practice

A Metro Mirror - Global Mirror with Practice session is a multi-target session that consists of three sites. From the primary site, you can define both a Metro Mirror copy and a Global Mirror copy, which allows for replication across both a short distance and long distance simultaneously. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 42. Metro Mirror - Global Mirror with Practice	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000

Note: To convert from a multi-target configuration to a cascaded configuration, refer "Converting from multi-target to Cascaded replication in a three site session type" on page 235.

Metro Mirror - Global Mirror with Site 3 Global Mirror

A Metro Mirror - Global Mirror with Site 3 Global Mirror session is a multi-target session that consists of three sites. From the primary site, you can define both a Metro Mirror copy and a Global Mirror copy, which allows for replication across both a short distance and long distance simultaneously. After recovery to Site 3, this session allows a Global Mirror replication back to either Site 1 or Site 2 and a cascaded Global Copy to the third site. This action provides disaster recover capabilities while production runs at Site 3.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 43. Metro Mirror - Global Mirror with Site 3 Global Mirror	
Supported editions	**Supported storage systems**
• Copy Services Manager	• IBM DS8000

Note: To convert from a multi-target configuration to a cascaded configuration, refer "Converting from multi-target to Cascaded replication in a three site session type" on page 235.

Metro Mirror - Global Mirror with Site 4 Replication

A Metro Mirror - Global Mirror with Site 4 Replication session is a multi-target session that consists of four sites. From the primary site, you can define both a Metro Mirror copy and a Global Mirror copy, which allows for replication across both a short distance and long distance simultaneously. After recovery to Site 4, this session allows a Global Mirror replication back to either Site 1, Site 2, or Site 3, and a cascaded Global Copy to the fourth site. This action provides disaster recover capabilities while production runs at Site 4.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 44. Metro Mirror - Global Mirror with Site 4 Replication

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Metro Mirror - Metro Mirror with Site 4 Replication

A Metro Mirror - Metro Mirror with Site 4 Replication session is a multi-target session that consists of four sites. From the primary site, you can define a Metro Mirror - Metro Mirror copy, which allows for replication across two short distances simultaneously. After recovery to Site 4, this session allows a Metro Mirror replication back to either Site 1, Site 2, or Site 3, and a cascaded Metro Copy to the fourth site. This action provides disaster recovery capabilities while production runs at Site 4.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, see the IBM DS8000 documentation for the microcode level that you are using.

Table 45. Metro Mirror - Metro Mirror with Site 4 Replication

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Safeguarded Copy

A Safeguarded Copy session is designed to capture many point-in-time images of a production environment with optimized capacity usage and minimized performance impact. The backup created by a Safeguarded Copy session can be recovered to another set of volumes while the production environment continues to run. Safeguarded Copies help to prevent the data from being compromised, either accidentally or deliberately. Therefore, the Safeguarded Copy session type offers another layer of security in your environment.

Table 46. Safeguarded Copy

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000 • SAN Volume Controller and Spectrum Virtualize based FlashSystem devices

Migration

The new Migration session is available starting with Copy Services Manager 6.2.10. The Migration session is a two-volume session type with roles H1 and H2.

The Migration session ignores the rule that the primary and secondary have to be the same size and type. Therefore, you can use this session to migrate data from one set of volumes to another, regardless of size, as long as the hardware supports it.

You can only start a Migration session from H1. You cannot start in Metro Mirror mode. And a Migration session running in Global Copy mode will not manage freeze or run conditions.

You can still manually Suspend or Stop the session for consistent or inconsistent suspends. And you can Recover the session to failover the pairs, thereby allowing the targets to be writable.

From the Target Available state, you can only restart in the original direction or terminate. You cannot restart in the opposite direction.

Table 47. Migration

Supported editions	Supported storage systems
• Copy Services Manager	• IBM DS8000

Extent Space Efficient Sizer

The ESE Sizer session supports analyzing space requirements for DS8000 Extent Space Efficient (ESE) FlashCopy and Safeguarded Copy.

An accurate sizing of ESE FlashCopy and Safeguarded Copy is crucial. With the DS8880 microcode 8.5.4 release and DS8900F 9.1 release a Write Monitoring (WM) bitmap is implemented in the DS8000 to track all write to each volume.

The purpose of the Write Monitoring Bitmap is to provide an effective way to determine usable space requirements for both Extent Space Efficient (ESE) FlashCopy and Safeguarded Copy without impacting host write I/O or disk replication performance. The write monitoring bitmap enables a DS8000 to track the amount and locality of its changed data over definable time intervals and across a set time period in an existing production environment.

The new session type queries the Write Monitoring bitmap and provides output files on box and volume level. These output files contain the currently allocated extents, changed tracks, changed small extents and change large extents. This level of detail can readily be used to determine how much capacity will be allocated over time for both functions ESE FlashCopy and Safeguarded Copy.

The following tool can be used to process the data collected from the Copy Services Manager ESE Sizer session to provide more accurate capacity sizings in the configurations. Refer the link https://www.ibm.com/support/pages/node/6372180 for more detailed information regarding ESE Sizer session and the collected data.

The ESE Sizer session can start, stop, and reset the WM bitmap. With the available properties, you can define the volume query interval and the bitmap reset interval.

Note: It is recommended to run the ESE Sizer session on a Copy Services Manager instance that is not currently managing replication. While the ESE Sizer session does not affect replication, the data collected uses system memory resources so running on a separate server is recommended to avoid any memory constraints. Refer “Calculating server memory requirements” on page 37 for more information.

Table 48. ESE Sizer session

Supported editions	Supported storage systems
Copy Services Manager	IBM DS8000

Basic HyperSwap

Basic HyperSwap is a copy services solution for z/OS version 1.9 and later. It provides high availability of data if a disk storage system failure occurs. Basic HyperSwap does not replace a disaster recovery

solution. If a session is suspended but the suspend operation was not caused by a HyperSwap trigger, the session is not frozen to ensure that it is consistent.

When HyperSwap is combined with Metro Mirror and Metro Global Mirror replication, you can prepare your system for disaster recovery and ensure high availability of data. If a session is suspended but the suspend operation was not caused by a HyperSwap trigger, the session is frozen to ensure that it is consistent.

Restriction: This replication method is available only for DS8000 storage systems.

Basic HyperSwap replication performs the following actions:

- Manages CKD volumes in Metro Mirror to manage synchronous peer-to-peer remote copy (PPRC) relationships.
- Permits only CKD volumes to be added to the HyperSwap session. The graphical user interface (GUI) shows only CKD volumes when you add a copy set. The command-line interface (CLI) does not add a copy set if a fixed block volume is specified.
- Monitors events that indicate a storage device failed.
- Determines whether the failing storage device is part of a Metro Mirror synchronous PPRC pair.
- Determines the action to be taken from policy.
- Ensures that data remains consistent.
- Swaps the I/O between the primary logical devices in the consistency group with the secondary logical devices in the consistency group. A swap can occur from the preferred logical devices to the alternate logical devices or from the alternate logical devices to the preferred logical devices.

Example

Jane is using multiple DS8000 storage systems. The host applications run on a z/OS operating system and the z/OS environment is connected to the DS8000 storage systems. She has a site in Manhattan and a secondary DS8000 in Hoboken. While it is not required that she has a disaster recovery solution in effect, she does need to have a high-availability solution to keep her applications running all the time. Jane is worried that if a volume fails on the DS8000 in Manhattan, her database application might fail. Even a small downtime can be costly to Jane.

Jane uses a Basic HyperSwap session to mirror the data on the DS8000 in Manhattan to the secondary DS8000 in Hoboken. If a volume at the Manhattan site fails, Basic HyperSwap automatically directs application I/O to the mirrored volumes in Hoboken.

FlashCopy

FlashCopy replication creates a point-in-time copy in which the target volume contains a copy of the data that was on the source volume when the FlashCopy was established.

The DS8000 provides multiple logical subsystems (LSSs) within a single physical subsystem, while the following platforms provide multiple I/O groups:

- Systems running IBM Spectrum Virtualize, including:
  - FlashSystem V840
  - FlashSystem V9000
  - FlashSystem 9100
  - FlashSystem 9200
  - SAN Volume Controller
  - Storwize V3500
  - Storwize V3700
  - Storwize V5000
  - Storwize V7000

– Storwize V7000 Unified

All platforms can use local replication in which the source volume is located in one LSS or I/O group and the target volume is located in the same or another LSS or I/O group. Using the FlashCopy feature, you can reference and update the source volume and target volume independently.

Figure 2 on page 100 illustrates a FlashCopy session.

Figure 2. FlashCopy session

z/OS Management option

When a z/OS system or sysplex name is set, the Flash command is submitted through the z/OS connection to that system or sysplex to provide performance improvements during the FlashCopy process for mainframe volumes.

Note: To enable this feature and take advantage of the performance enhancements, volumes in the session must be attached to the system or sysplex and IOS APAR OA59561 must be applied. In addition, for all storage systems that are going to be managed, a z/OS connection must be defined on the Storage Systems panel. Ensure that you create a z/OS storage system connection ("Storage connections" on page 48) for each storage system in the system or sysplex that will be managed by the session.

Example

Jane works for a bank. Jane uses a FlashCopy session to make a point-in-time copy of the customer data in existing international accounts. Every night, the bank's servers start batch processing. Jane uses the FlashCopy session to create checkpoint restarts for the batch processing if the batch processing fails. In the batch processing, the first step is to balance all international accounts and to make a FlashCopy point-in-time copy of the resulting data. The second step in the batch processing is to complete the international disbursements.

If the second step in the batch process fails, Jane can use the data from the FlashCopy session that was taken of the first step to repeat the second step. In this way, Jane does not have to begin the entire process again. Jane also uses a CLI script that performs a FlashCopy operation every night at 11:59 PM, and another script that quiesces the database. She backs up the data to tape on the target storage system, and then sends the tape to the bank's data facility for storage.

Snapshot

Snapshot is a session type that creates a point-in-time copy of a volume or set of volumes. You do not have to define a specific target volume. The target volumes of a Snapshot session are automatically created when the snapshot is created.

A FlashSystem/IBM Spectrum Accelerate uses a snapshot session to create a large number of volume copies without affecting system performance. By using the snapshot function to create a point-in-time copy, and to manage the copy, you can save storage. With the FlashSystem/IBM Spectrum Accelerate snapshots, no storage capacity is used by the snapshot until the source volume or the snapshot is changed.

Figure 3 on page 101 illustrates a Snapshot session.

Figure 3. Snapshot session

Example

Jane's host applications are using a FlashSystem/IBM Spectrum Accelerate for their back-end storage. With the FlashSystem/IBM Spectrum Accelerate, Jane can create a large number of point-in-time copies of the data. The snapshot function ensures that if data becomes corrupted, she can restore the data to any point in time.

Jane sets up a Snapshot session by using Copy Services Manager and specifies the volumes on the FlashSystem/IBM Spectrum Accelerate that are used by the host applications. Jane does not have to provision target volumes for all the snapshots she intends to make. She can quickly configure a single Snapshot session.

When the session is configured, Jane uses a CLI script that runs a **`Create Snapshot`** command to the session every two hours. If a problem occurs, such as data becoming corrupted, Jane can find a snapshot of the data from a time before the problem occurred. She can restore the data to that point.

By creating a set of snapshots of the data, Jane can also schedule batch processing against that data every day. She can use the batch processing to analyze certain trends in the market without affecting the host applications.

Metro Mirror

Metro Mirror is a method of synchronous, remote data replication that operates between two sites that are up to 300 KM apart. The source is in one storage system and the target is in another storage system.

Attention: If you have sessions that contain Metro Mirror relationships, ensure that the session does not contain system volumes (such as paging volumes) unless you select the **Manage H1-H2 with HyperSwap** or the **Enable Hardened Freeze** option for the session. By using these options, z/OS Input/Output Supervisor (IOS) manages freeze operations for the volumes in the session, which prevents Copy Services Manager from freezing the volumes and possibly freezing itself.

Metro Mirror replication maintains identical data on both the source and target. When a write operation is issued to the source copy, the changes that are made to the source data are propagated to the target before the write operation finishes processing. If the storage system ends, no data is lost when you use Metro Mirror if data must be used from the recovery site.

A Metro Mirror session in Global Copy mode creates an asynchronous relationship to accommodate the high volume of data that is migrated. As a result, the data on the target system might no longer be consistent with the source system. The Metro Mirror session switches back to a synchronous relationship when Metro Mirror reissues a **`Start`** command. In addition, you can start a Metro Mirror session in Global Copy mode and toggle between Metro Mirror and Global Copy modes to accommodate periods in which you require host I/O response time over data consistency.

Tip: To determine whether there is any out-of-sync data that must to be copied before the session is consistent, check the percent that is complete in the session details page.

Setting up multiple Copy Services Manager sessions with DS8000 Metro Mirror pairs

Starting with the Copy Services Manager 6.2.0 release, it is now possible to set up multiple Copy Services Manager sessions with DS8000 Metro Mirror pairs. By performing this set up, a suspend by command or event suspends the sessions consistently by freezing all sessions before thawing any session, according to the session policy.

To set up multiple sessions so that they freeze consistently:

- On the **Session Details** panel, or by going to the **Session Overview** panel and clicking **View/Modify** > **Set Consistency Group name**, modify the consistency group name for the role pair (for example, H1-H2) in each session that should be suspended consistently.

When a suspend by command or event occurs, all role pairs across all sessions that have the same consistency group name, process the suspend together.

Metro Mirror Single Direction

Figure 4 on page 102 illustrates a Metro Mirror Single Direction session.

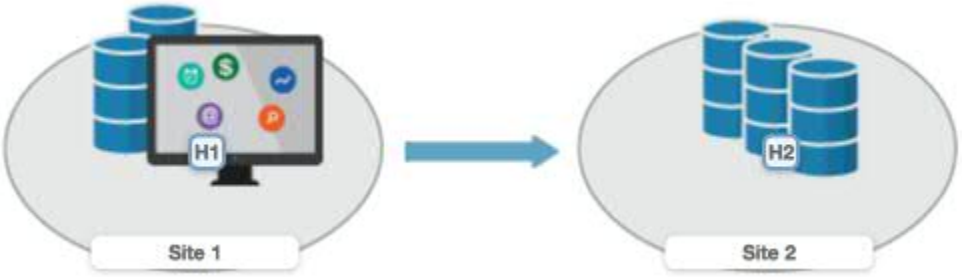

Figure 4. Metro Mirror Single Direction session

Metro Mirror Failover/Failback

Using Metro Mirror Failover/Failback, the data exists on the second site, which is less than 300 KM away, and you can switch the direction of the data flow. You can use this session type to run your business from the secondary site, and to copy changes that are made at the second site back to the primary site when you want to resume production at the primary site.

Figure 5 on page 102 illustrates a Metro Mirror with Failover/Failback session.

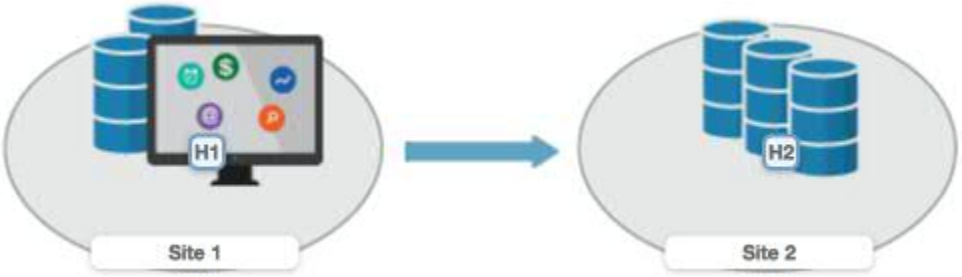

Figure 5. Metro Mirror Failover/Failback session

Metro Mirror Failover/Failback with Practice

A Metro Mirror Failover/Failback with Practice session combines Metro Mirror and FlashCopy features to provide a point-in-time copy of the data on the remote site. You can use this session type to practice what you might do if a disaster occurs, without losing your disaster recovery capability.

This solution consists of two host volumes and an intermediate volume.

Figure 6 on page 103 illustrates a Metro Mirror Failover/Failback with Practice session.

Figure 6. Metro Mirror Failover/Failback with Practice session

Metro Mirror Failover/Failback with HyperSwap

You can enable a Metro Mirror Failover/Failback session to have HyperSwap capabilities. To enable HyperSwap processing, see "Setting up the environment for HyperSwap" on page 120.

Metro Mirror Failover/Failback with HyperSwap combines the high availability of Basic HyperSwap with the redundancy of a two-site Metro Mirror Failover/Failback solution for managing count key data (CKD) volumes on z/OS. If the primary volumes encounter a permanent I/O error, the I/O is automatically swapped to the secondary site with minimal effect on the application.

A swap can be planned or unplanned. A planned swap occurs when you issue a HyperSwap command from the **Session Actions** list in the graphical user interface (GUI) or when you issue a `cmdsess -action hyperswap` command.

Figure 7 on page 103 illustrates a Metro Mirror Failover/Failback session that is enabled for HyperSwap.

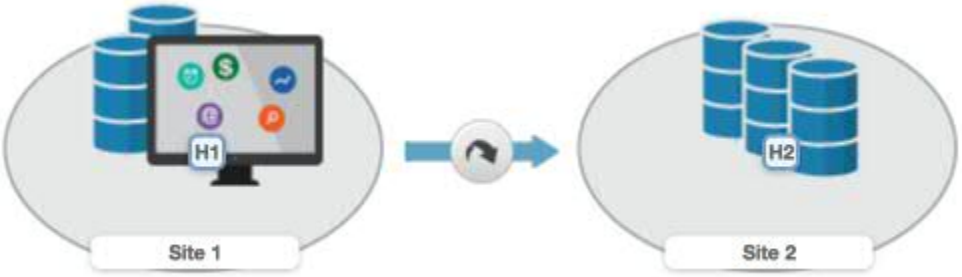

Figure 7. Metro Mirror Failover/Failback session with HyperSwap

Metro Mirror - Metro Mirror

A Metro Mirror - Metro Mirror session is a multi-target session that consists of three sites. You can define any of the sites as the primary site and then run Metro Mirror replication from the primary site to either of the other sites individually or both sites simultaneously. For example, if Site 1 is the primary site, data replication can occur between the H1 and H2 volumes and the H1 and H3 volumes separately or at the same time.

This session type is available only for IBM DS8000 storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, refer to the IBM DS8000 documentation for the microcode level that you are using.

Figure 8 on page 104 illustrates a Metro Mirror - Metro Mirror session.

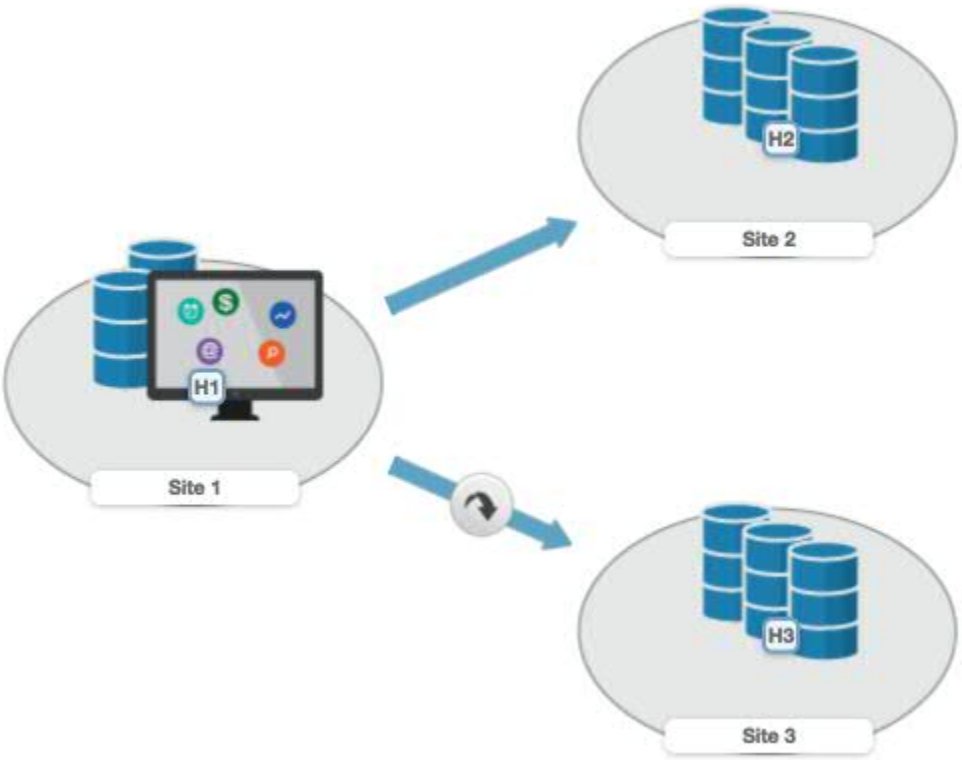

Figure 8. Metro Mirror - Metro Mirror session

Examples

Read the following scenarios for information on using Metro Mirror for synchronous, remote data replication between two sites.

Metro Mirror Single Direction

At the beginning of a work week, Jane is notified that between 10:00 AM and 11:00 AM on the next Friday, power in her building is going to be shut off. Jane does not want to lose any transactions during the power outage, so she decides to transfer operations to the backup site during the outage. She wants a synchronous copy method with no data loss for the critical business functions, so she chooses Metro Mirror, which can be used between locations that are less than 300 KM apart.

In a synchronous copy method, when a write is issued to change the source, the change is propagated to the target before the write is posted. This method of replication maintains identical data in both the source and target. The advantage of this method is when a disaster occurs, there is no data loss at the recovery site because both writes must complete before signaling completion of a write to the source application. Because the data must be copied to both IBM DS8000 devices before the write is completed, Jane can be sure that the data is safe.

The night before the planned outage, Jane quiesces the database and servers in San Francisco and starts the database and servers in Oakland. To accomplish this task, Jane issues the **Suspend** and **Recover** commands, and then issues the **Start** command on the secondary site. She shuts down the equipment in San Francisco to avoid any power spikes when she restarts the system after the power is turned on.

Metro Mirror in Global Copy mode

At the beginning of a work week, Jane is notified that between 10:00 AM and 11:00 AM on the next Friday, power in her building is going to be shut off. Jane does not want to lose any transactions during the power outage, so she decides to transfer operations to the backup site during the outage. She wants a synchronous copy method with no data loss for the critical business functions, so she chooses Metro Mirror, which can be used between locations that are less than 300 KM apart.

Jane wants to limit the effect on any applications while completing the initial Metro Mirror synchronization, so she begins the session in Global Copy mode. After she sees that approximately 70% of the data is copied, Jane decides to switch the session to Metro Mirror mode, assuring data consistency.

Metro Mirror with Practice

Jane wants to run a Metro Mirror with Practice from San Francisco to Oakland. She wants to verify the recovery procedure for the Oakland site, but she cannot stop running the Metro Mirror session while she takes time to practice a recovery. By using a Metro Mirror with Practice session, Jane can practice the disaster recovery scenario in Oakland while the Metro Mirror session runs uninterrupted. By practicing running the applications at the Oakland site, Jane is better prepared to recover data if a disaster occurs at the San Francisco site.

While her session is running in Prepared state, Jane practices a recovery at the Oakland site by issuing the **Flash** command. This command momentarily pauses the session and starts a FlashCopy to the H2 volumes. As soon as the FlashCopy is started, the session is restarted. These FlashCopy files create a consistent version of the data on the H2 volume that she can use for recovery testing, while the session continues to replicate data from San Francisco to Oakland. As a result, she can carry out the recovery testing without stopping the replication for any extended duration of time.

If, at some point, the Metro Mirror session is suspended because of a failure, Jane can use the practice session to restart the data replication process. She maintains a consistent copy of the data at the Oakland site, in case of a failure during the resynchronization process. When the session is suspended, she can issue a **Recover** command to create a consistent version of the data on the H2 volumes. After the **Recover** command completes, she can issue the **Start H1->H2** command to resynchronize the data from the San Francisco site to the Oakland site.

If a failure occurs before the restarted session is in Prepared state, she has a consistent version of the data on the H2 volumes. She only has to issue the **Recover** command to put the session into Target Available state and make the H2 volumes accessible from the servers. If the session was not in Prepared state when it was suspended, the subsequent **Recover** command does not issue the FlashCopy files to put the data on the H2 volumes. This means that the consistent data on the H2 volumes is not overwritten if the data to be copied to them is not consistent.

Selecting a HyperSwap session

A global insurance company decided to use Copy Services Manager to manage its disaster recovery environment. Jane wants minimal data exposure, both for planned outages such as routine maintenance, and for unplanned disasters. They have CKD volumes on IBM DS8000 devices, and use z/OS operating systems. They have two data centers in New York.

Jane chooses a Metro Mirror recovery solution because her priority is to protect the system from regional disasters. Jane decides to use Metro Mirror solution because her company has two data centers that are located near each other. Jane realizes that because she uses a z/OS operating system, CKD, and IBM DS8000 hardware, she can also use a HyperSwap solution. Using Metro Mirror Failover/Failback with HyperSwap, Jane can minimize the effects on any applications, while she maintains the failover process to the secondary site. Jane decides Metro Mirror Failover/Failback with HyperSwap is the best solution.

After installing and configuring Copy Services Manager on z/OS, Jane starts the Copy Services Manager GUI. She adds the Copy Services Manager storage devices that she intends to use on all sites. From the Sessions page, Jane opens the Create Session window and selects the **Metro Mirror Failover/Failback** session type. After completing the information in the window, Jane clicks **Launch Add Copy Sets Wizard**. After she completes the wizard, she selects the **Manage H1-H2 with HyperSwap** option in the View/Modify Properties notebook.

Jane then issues a **Start H1->H2** command. After the initial copy is completed, Jane can safely replicate the data between both sites. She can also issue the **HyperSwap** command between sites 1 and 2 to switch sites with minimal effect on the application during either a disaster or maintenance period.

Performing a planned HyperSwap

Jane's company used Metro Mirror Failover/Failback with HyperSwap sessions for the past three months. However, Jane must perform maintenance on an H1 volume. During this time, Jane does not want the applications or replication to be interrupted. To prevent this interruption, before the maintenance is scheduled to begin, Jane uses the Copy Services Manager GUI to perform a HyperSwap operation to the H2 volumes. This process changes the applications so that the data is written to H2. To perform a planned HyperSwap operation, Jane issues a **HyperSwap** command.

Understanding what happens when an unplanned HyperSwap occurs

Several weeks after the planned maintenance at Jane's company is completed, an incident occurs at the H1 site. A disk controller fails, causing one of the H1 volumes to encounter a permanent I/O error. Jane's data is safe because she used Metro Mirror Failover/Failback with HyperSwap, and the H2 volume is an exact duplicate of the H1 volume. When the permanent I/O error is detected, a HyperSwap is triggered. The application changes to write data to the H2 volumes. The applications are not interrupted.

Jane configured a Simple Network Management Protocol (SNMP) listener to alert her to any events, so she receives the SNMP event that indicates that a HyperSwap occurred. Jane investigates the cause of the HyperSwap process and uses the z/OS console to identify the volume that triggered the HyperSwap process. Jane replaces the faulty disk controller. Then, to recover from the unplanned HyperSwap process, Jane issues the **Start H2->H1** command.

Global Mirror

Global Mirror is asynchronous replication that operates between two sites that are over 300 km apart. The source volumes are on one storage system and the target volumes are on another storage system. Global Mirror replication maintains identical data in both the source and target volumes.

When a write operation is issued to a source volume, the changes are typically propagated to the target volume a few seconds after the data is written to the source volume. However, changes can occur on the source volume before the target volume verifies that it received the change.

Because consistent copies of data are formed on the secondary site at set intervals, data loss is determined by the amount of time since the last consistency group was formed. If the system fails, Global Mirror might lose some data that was transmitted when the failure occurred.

Global Mirror Single Direction

The Global Mirror Single Direction session type enables you to run Global Mirror replication from the primary site.

For IBM DS8000 storage systems, each copy set in the single direction session consists of two host volumes and a journal volume. Figure 9 on page 106 illustrates a Global Mirror Single Direction session for these storage systems.

Figure 9. Global Mirror Single Direction session

For FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize storage systems, each copy set in the Global Mirror Single Direction session consists of two host volumes. Figure 10 on page 107 illustrates a Global Mirror Single Direction session for these storage systems.

Figure 10. Global Mirror Single Direction session

Global Mirror Failover/Failback

The Global Mirror Failover/Failback with Practice session type combines Global Mirror Failover/Failback and FlashCopy capabilities to provide a point-in-time copy of the data on the secondary site. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

For IBM DS8000 storage systems, each copy set in the Global Mirror Failover/Failback session consists of two host volumes and a journal volume. Figure 11 on page 107 illustrates a Global Mirror Failover/Failback session for these storage systems.

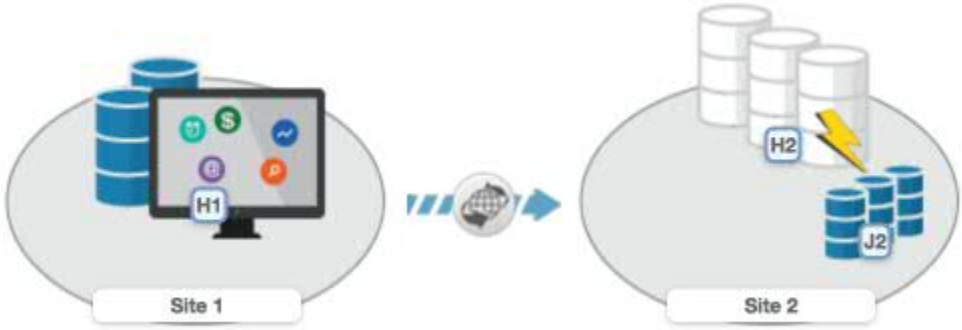

Figure 11. Global Mirror Failover/Failback session

For FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize storage systems, each copy set in the Global Mirror Failover/Failback session consists of two host volumes. Figure 12 on page 107 illustrates a Global Mirror Failover/Failback session for these storage systems.

Figure 12. Global Mirror Failover/Failback session

Global Mirror Failover/Failback with Change Volumes

Global Mirror Failover/Failback with Change Volumes replication provides the same capabilities as the Global Mirror Failover/Failback session type. However, Global Mirror Failover/Failback with Change Volumes sessions also provide the option of enabling or disabling the use of change volumes. Change volumes are available in FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize storage systems.

Change volumes are composed of a source change volume and a target change volume that contain a point-in-time image of the data from the source and target volumes, respectively.

A FlashCopy operation occurs between the source volume and the source change volume. The frequency of the FlashCopy operation is determined by the cycle period. For information about the cycle period and how it is set, see "Global Mirror Failover/Failback with Change Volumes session properties" on page 291. The data on the source change volume is then replicated to the target volume, and finally to the target change volume.

Because the data that is replicated between sites contains point-in-time changes rather than all changes, a lower bandwidth link is required between the sites. However, when you use change volumes, your data exposure can increase. Therefore, you might want to include or exclude change volumes depending on your network traffic or business requirements.

This session type is available only for FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize storage systems. Figure 13 on page 108 illustrates a Global Mirror Failover/Failback with Change Volumes session for these storage systems.

Figure 13. Global Mirror Failover/Failback session

Global Mirror Failover/Failback with Practice

The Global Mirror Failover/Failback with Practice session type combines Global Mirror Failover/Failback and FlashCopy capabilities to provide a point-in-time copy of the data on the secondary site. This session type provides volumes that you can use to practice for disaster recovery without losing your disaster recovery capability.

For IBM DS8000 storage systems, each copy set in the Global Mirror Failover/Failback with Practice session consists of two host volumes, an intermediate volume, and a journal volume. Figure 14 on page 109 illustrates a Global Mirror Failover/Failback with Practice session for these storage systems.

Figure 14. Global Mirror Failover/Failback with Practice session for DS8000 storage systems

For FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize storage systems, each copy set in the Global Mirror failover/failback with Practice session consists of two host volumes and an intermediate volume. Figure 15 on page 109 illustrates a Global Mirror Failover/Failback with Practice session for these storage systems.

Figure 15. Global Mirror Failover/Failback with Practice session for FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize

Global Mirror Either Direction

Global Mirror Either Direction enables you to run Global Mirror replication from either the primary or secondary site.

This session type is available only for IBM DS8000 storage systems.

The session consists of two host volumes, two intermediate volumes, and two journal volumes. Figure 16 on page 109 illustrates a Global Mirror Either Direction session for these storage systems.

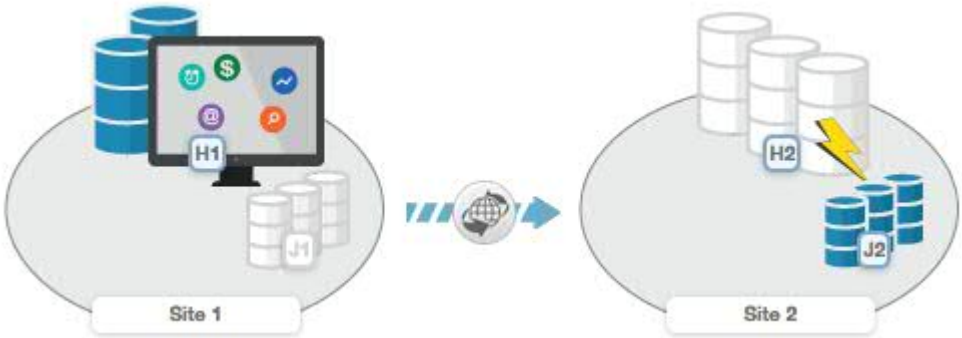

Figure 16. Global Mirror Either Direction session

Global Mirror Either Direction with Two-Site Practice

Global Mirror Either Direction with Two-Site Practice enables you to run Global Mirror replication from either the primary or secondary site. This session type provides volumes on the primary and secondary site that you can use to practice for disaster recovery without losing your disaster recovery capability.

This session type is available only for IBM DS8000 storage systems.

The session consists of two host volumes, two intermediate volumes, and two journal volumes. Figure 17 on page 110 illustrates a Global Mirror Either Direction with Two-Site Practice session for these storage systems.

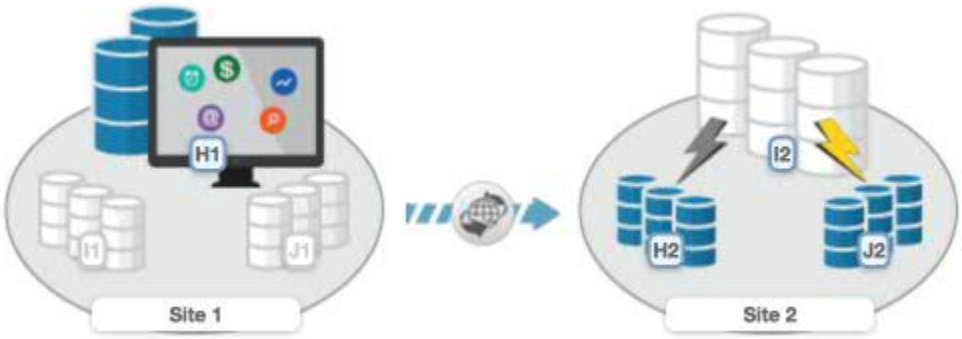

Figure 17. Global Mirror Either Direction with Two-Site Practice session

Examples

Read the following scenarios for information about using Global Mirror for asynchronous, remote data replication between two sites.

Global Mirror Single Direction

Although Jane's FlashCopy and Metro Mirror copies were both planned, Jane realizes that sometimes a failure can occur, and she wants to ensure that the data is safe. Because Jane works in San Francisco, she wants her other site to be far away if a disaster occurs locally. Her other site is based in Houston. A minor earthquake occurs in San Francisco and power and communications both fails. Jane arranged for the data on customer accounts that recently opened or closed to be asynchronously copied in Houston, using Global Mirror. Jane risks losing the bytes of data that were being processed when the tremor disrupted the processing in San Francisco. However, she understands that it is minor inconvenience when weighed next to the value of backing up her data to an area that is not prone to earthquakes.

Global Mirror with Practice

Jane wants to run a Global Mirror with practice from San Francisco to Houston. She plans to verify her recovery procedure for the Houston site, but she cannot stop running the Global Mirror session while she takes time to practice a recovery. By using a Global Mirror with Practice session, Jane can practice her disaster recovery scenario in Houston while the Global Mirror session runs uninterrupted. When she practices running the applications at the Houston site, Jane is better prepared to recover the data if a disaster ever strikes the San Francisco site.

Global Mirror Either Direction with Two-Site Practice

Jane wants to run a Global Mirror with Practice from San Francisco to Houston. She plans to verify her recovery procedure for the Houston site, but she cannot stop running the Global Mirror session while she takes time to practice a recovery. By using a Global Mirror Either Direction with Two-Site Practice session, Jane can practice her disaster recovery scenario in Houston while the Global Mirror session runs uninterrupted. When she practices running the applications at the Houston site, Jane is better prepared to recover the data if a disaster ever strikes the San Francisco site.

Jane can use the Global Mirror Either Direction with Two-Site Practice session to run asynchronous consistent data replication from either the San Francisco site or the Houston site. She can practice the disaster-recovery tasks at the target site, regardless of the location of the current production site.

Jane's business can run a consistent Global Mirror session from its Houston site back to San Francisco while it runs a production site at Houston.

Metro Global Mirror

Metro Global Mirror is a method of continuous, remote data replication that operates between three sites that are varying distances apart. Metro Global Mirror combines Metro Mirror synchronous copy and Global Mirror asynchronous copy into a single session, where the Metro Mirror target is the Global Mirror source.

This replication method is available on only TotalStorage Enterprise Storage Server Model 800 and IBM DS8000 storage systems. You can select ESS storage systems in only the H1 volume role. All other volume roles must use DS8000 volumes.

You can use both ESS and DS8000 volumes in the H1 volume role. If ESS and DS8000 storage systems are both used in the H1 role, the DS8000 storage system performs Incremental Resync processing, and the ESS storage system performs a full copy operation. Because you cannot use the Incremental Resync function with ESS, a full copy is required when you change from H1->H2->H3 to H1>H3 and from H2->H1->H3 to H2->H3.

Attention: If you have Copy Services Manager sessions that contain Metro Global Mirror relationships, ensure that the session does not contain system volumes (such as paging volumes) unless you select the **Manage H1-H2 with HyperSwap** or the **Enable Hardened Freeze** option for the session. By using these options, z/OS Input/Output Supervisor (IOS) manages freeze operations for the volumes in the session, which prevents Copy Services Manager from freezing the volumes and possibly freezing itself.

Metro Global Mirror maintains a consistent copy of data at the remote site, with minimal effect on applications at the local site. This remote mirroring function works in combination with FlashCopy to provide a disaster-recovery solution that includes the following features:

- Fast failover and failback
- Rapid reestablishment of three-site mirroring, without production outages
- Data currency at the remote site with minimal time lag at the local site, an average of only 3 - 5 seconds for many environments
- Quick resynchronization of mirrored sites using only incremental changes

If Copy Services Manager runs on a z/OS operating system, you can configure a Metro Global Mirror session to control the Metro Mirror relationship between the primary and secondary site by using the HyperSwap feature. With HyperSwap enabled, a failure on the primary storage system causes an automatic HyperSwap operation, which transparently redirects application I/O to the auxiliary storage system. The Global Mirror relationship continues to run uninterrupted throughout this process. With this configuration, you can achieve almost a zero data loss at larger distances.

Using synchronous mirroring, you can switch from local site H1 to remote site H2 during a planned or unplanned outage. It also provides continuous disaster recovery protection of the H2 and H3 sites. You do not have to configure H2, if a switch from site H1 occurs. With this configuration, you can reestablish H2->H1->H3 recoverability while production continues to run at site H2. Additionally, this setup can reduce the workload on site H1.

Important: In Metro Global Mirror and Metro Global Mirror with Practice sessions, when the H1 is on an ESS storage system, you might risk filling up the space efficient journal volumes. Because incremental resynchronization is not available on the ESS storage system, full copies are performed in many of the transitions.

Metro Global Mirror

A Metro Global Mirror session with Practice combines Metro Mirror, Global Mirror, and FlashCopy across three sites to provide a point-in-time copy of the data on the third site.

Figure 18 on page 112 illustrates a Metro Global Mirror session.

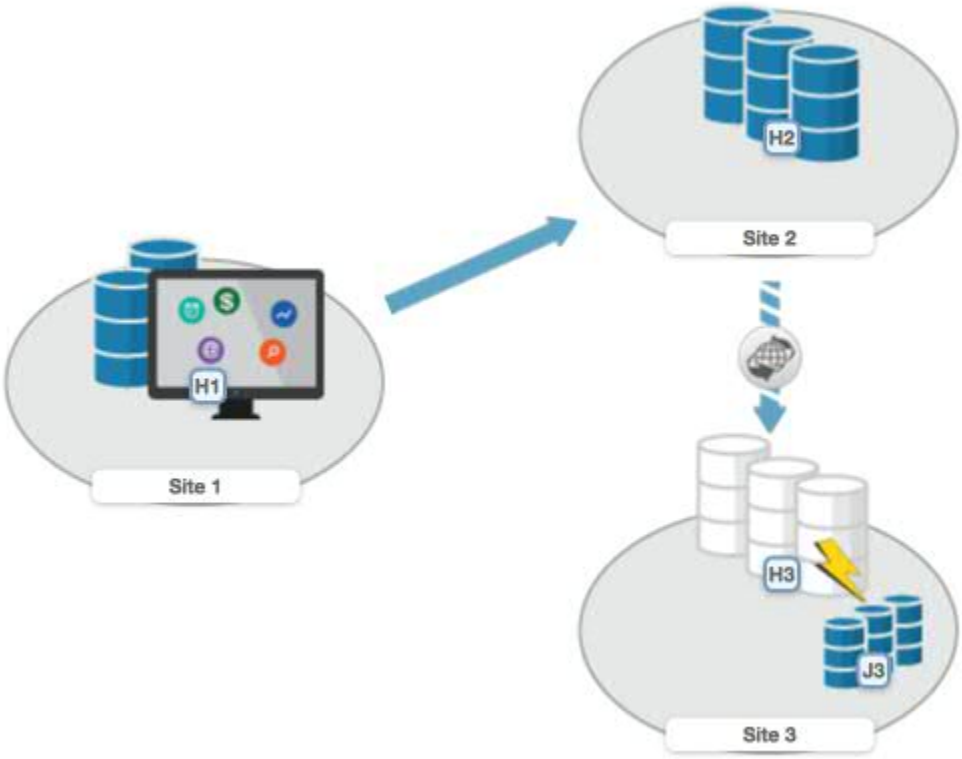

Figure 18. Metro Global Mirror session

Metro Global Mirror with Practice

A Metro Global Mirror session with Practice combines Metro Mirror, Global Mirror, and FlashCopy across three sites to provide a point-in-time copy of the data on the third site. You can use this session to practice what you might do if a disaster occurred without losing your disaster recovery capability.

The session consists of three host volumes, an intermediate volume, and a journal volume. Figure 19 on page 113 illustrates a Metro Global Mirror with Practice session.

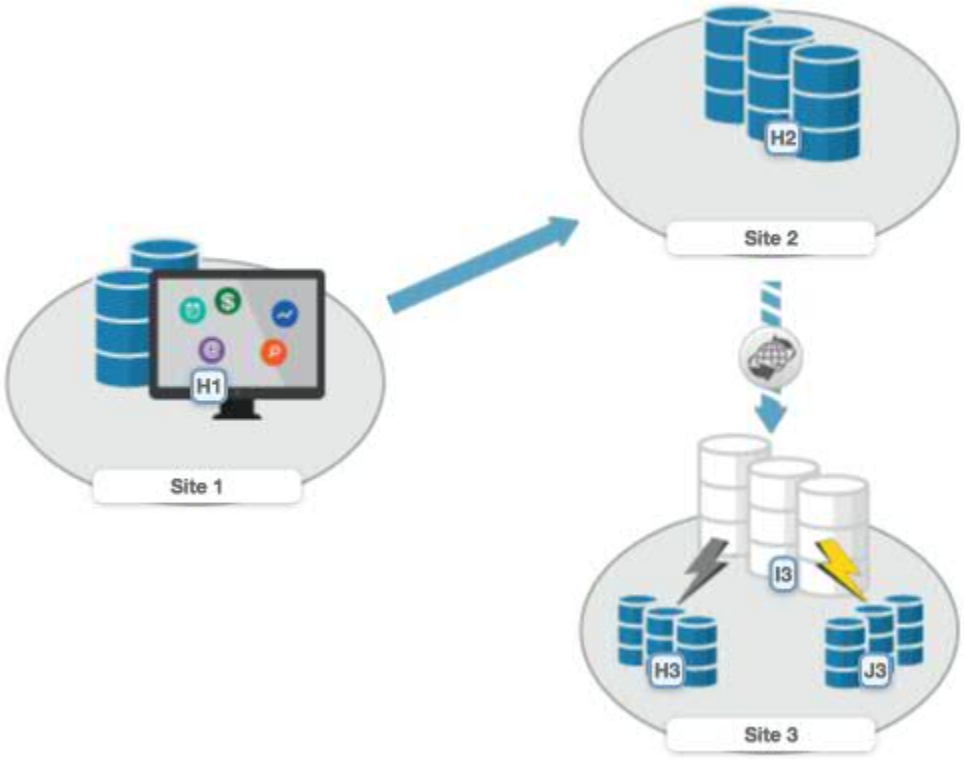

Figure 19. Metro Global Mirror with Practice session

Note: In Metro Global Mirror and Metro Global Mirror with Practice sessions, when the H1 is on an ESS storage system, you might risk filling up the space efficient journal volumes. Because incremental resynchronization is not available on the ESS storage system, full copies are performed in many of the transitions.

Examples

Read the following scenarios for information on using Metro Global Mirror for continuous, remote data replication between three sites.

Metro Global Mirror

Although Jane works in San Francisco, she wants to run the business from either Oakland, the secondary site, or Houston, the tertiary site. Jane can use Metro Global Mirror with Failover/Failback to switch the direction of the data flow, so that she can run the business from either Oakland or Houston. Using Metro Global Mirror, Jane has zero data loss at the secondary site and minimal data loss at the tertiary site.

Metro Global Mirror with Practice

Jane wants to run a Metro Global Mirror with Practice from San Francisco to Houston. She plans to verify her recovery procedure for the Houston site. However, she cannot stop running the Metro Global Mirror session while she takes time to practice a recovery. By using a Metro Global Mirror with Practice session, Jane can practice her disaster recovery scenario in Houston while the Metro Global Mirror session runs uninterrupted. When she practices running the applications at the Houston site and is prepared to run the applications at the Oakland site, if necessary, Jane is prepared to recover data if a disaster occurs at the San Francisco site.

Jane can use Metro Global Mirror with Practice to switch the direction of the data flow, so that she can run the business from either Oakland or Houston. Using Metro Global Mirror, Jane has zero data loss at the secondary site and minimal data loss at the tertiary site.

Safeguarded Copy

Safeguarded Copy is a protection mechanism that supports the ability to create cyber-resilient, point-in-time copies of volumes of data.

The Safeguarded Copy sessions secure data to prevent it from being compromised, either accidentally or deliberately. The function integrates with IBM Copy Services Manager to provide automated backup copies and data recovery.

Safeguarded Copy uses a *backup capacity*, *production volume*, and *recovery volume*:

- ***Backup capacity*** is the space needed for all backups. The size of the backup capacity depends on the frequency of the backups and the duration that backups need to be retained.
- The Safeguarded Copy session creates a consistency group across the source volumes to create a safeguarded backup, which stores the required data in the backup capacity.
- The ***production volume*** is the source volume for a Safeguarded Copy relationship. Depending on the specific client topology, this relationship can be a Metro Mirror, Global Mirror, or z/OS Global Mirror primary or secondary volume, or a Simplex volume.
- A ***recovery volume*** is used to restore a backup copy for host access while production continues to run on the production volume. The recovery volume is the target volume for a Safeguarded Copy recovery, which enables a previous backup copy to be accessed by a host that is attached to this volume. The recovery volume is typically thin-provisioned, but it does not have to be.

Accessing a backup copy on a recovery volume:

- Production systems can continue to run while this is done
- Optional background copy to copy all required data out of the backup capacity
- Identification of a good recovery point is expected to be done on the recovery volume

Safeguarded Copy terms

Safeguarded Copy (SGC)
A function that provides protection from logical data corruption. Usage: The Safeguarded Copy function provides protection from logical data corruption.

Safeguarded source (SGC source)
A volume that is protected by the Safeguarded Copy function. Usage: The Safeguarded source volume is protected by a Safeguarded backup capacity that contains a copy of the data in the source volume.

Safeguarded backup (SGC backup)
A point-in-time version of data that is created by the Safeguarded Copy function to protect a Safeguarded source volume. Usage: The Safeguarded backup capacity contains a copy of the data in the Safeguarded source volume.

Safeguarded backup location (SGC backup location)
The pool where the safeguarded backup capacity is stored for a safeguarded source. Usage: The safeguarded backup location contains the safeguarded backup capacity.

Safeguarded backup capacity (SGC backup capacity)
The physical capacity in the safeguarded backup location that contains the data that is stored the safeguarded backup copies. Usage: The safeguarded backup capacity is based on the size of the extra capacity that is allocated to that volume for creating backups.

Safeguarded virtual backup capacity (SGC virtual backup capacity)
The amount of volume (virtual) capacity that is configured to store safeguarded backup copies for a safeguarded source. The capacity that is required depends on the size of the source volume, the number of copies, and the predicted destage rate of the source volume's data.

Configure safeguarded backup Capacity (Configure SGC backup capacity)
Configure the location of the backup capacity, and use the backup planning tool to determine the virtual capacity that is required to store backup copies of a safeguarded source volume.

Recover backup
Recovers a safeguarded backup copy for a safeguarded source to a separate volume by selecting a safeguarded source volume, specifying a backup copy to recover, and determining the target volume to receive the data from the backup capacity.

Configure backup schedule/policy
Configure the backup schedule for a safeguarded source volume.

Create backup
Create a safeguarded backup copy outside of the normal backup schedule.

Recover/Recovery volume
A recovery volume is a normal addressable volume that can be accessed by the host for read and write operations. A safeguarded backup copy can be viewed or updated by recovering a backup capacity to a recovery volume.

Expire backup
Remove all backup copies and schedules for a safeguarded source.

Restore backup
Restores a Safeguarded backup copy to the Safeguarded Copy source volumes using FlashCopy.

Safeguarded Copy in DS8000

Safeguarded Copy provides data protection on DS8000 storage systems.

Safeguarded Copies can be used to take many frequent copies of a production environment (for example, hourly copies maintained for a number of days), while FlashCopy continues to be used to take a small number of less frequent copies (such as weekly copies maintained for 1-2 weeks).

See "Safeguarded Copy commands" on page 189 for more information on the commands that are available with this session type.

Safeguarded Copy capacity and scheduling

To use the Safeguarded Copy function, you can schedule backups and must assign *backup capacity*.

Backup capacity
Extra capacity allocated to that volume for the purpose of creating backups. The backup capacity should be allocated with enough space to accommodate your service level agreements (SLAs) to meet your requirement for frequency and retention period of backups.

You must first go to the DS8000 command line or GUI and define the backup capacity for the volumes that you want to enable for Safeguarded Copy. See the topic "Configuring safeguarded virtual capacity" in the DS8000 online documentation at https://www.ibm.com/support/knowledgecenter/ST5GLJ/ds8000_kcwelcome.html for more information.

Scheduler
You can set up an internal scheduler in Copy Services Manager to run a backup at the frequency that you require. The lowest interval time for a schedule is 30 minutes.

See "Creating scheduled tasks" on page 229 for more information.

Tip: If you choose a backup schedule that fills up your backup capacity before the duration of what you specified as the retention period, then you will see messages in Copy Services Manager indicating that the older backups have automatically rolled off the hardware. You need to maintain a balance driven by the SLA. Therefore, the retention should drive both the backup capacity size and the schedule. For example, if the SLA requires you to have a month's worth of backups on a daily schedule, then the retention would be 30 days, the schedule would be daily, and the backup capacity needs to be enough to hold 30 backups.

Minimum time frame per backup
This backup option is the number of minutes that controls the frequency that backups can be issued. If you set it to 30 minutes, then you can only backup every 30 minutes. This option provides extra security against malicious attempts to corrupt the data by preventing repeated backups from automatically rolling off all valid backups for the volumes.

Retention period since last recoverable backup

This backup option controls when Copy Services Manager expires older backups.

Important: The retention period is based on the second-to-last recoverable backup. The retention design always keeps at least two recoverable backups. The hardware might not support recovery of the last recoverable backup. If the hardware does not support it, Copy Services Manager allows you to recover the last recoverable backup, but automatically takes a new backup so that the recover can complete. Because a new backup takes up additional backup capacity, the design ensures that there is always one backup available for recovery that does not use more backup capacity. If additional backup capacity is used, it might cause older backups to automatically expire on the hardware due to a lack of space. However, if the hardware supports it, the last backup can be recovered without the need for an additional backup.

Backup option to Expire Backup on Auto Roll

When this option is set, the session automatically expires a backup when the session determines that one or more of the volumes has auto rolled the backup.

Expire Backup

When a backup is expired, the backup is removed from all volumes that contain the expired backup ID. A backup can be expired manually by command, automatically through the retention policy, or automatically when the `Expire Backup on Auto Roll` option is set, and one or more volumes have auto rolled the backup.

Auto Roll

A volume auto rolls an older backup to provide room for newer backups. If a volume is auto rolling backups, then the volume backup capacity might need to be re-sized or retention for the session might need to be reevaluated. When properly configured, the backup capacity for all volumes should have enough space to keep all necessary backups based off the retention and backup frequency.

Set the `Expire Backup on Auto Roll` option to free up additional space whenever one or more volumes do not have enough backup capacity to form new backups. This feature can help avoid out-of-space conditions. However, when a backup is automatically expired, it is no longer available for recovery across any of the volumes that contained that backup. By default, this option is NOT selected, so you must select it to enable this feature. When this option is not set, the backup is not automatically expired so that if one or more volumes did not auto roll the backup, those volumes can still be recovered to that backup. To allow recovery to those volumes, you must remove any volumes indicating that they auto rolled that backup, from the session. Search on the topic "Recovering volumes to backups marked as not recoverable due to volume auto roll" in the Troubleshooting section of the Copy Services Manager online help documentation at https://www.ibm.com/support/knowledgecenter/SSESK4 for more information.

Notes:

- If you select the `Expire Backup on Auto Roll` option, but the backup is in a recovery relationship, and the hardware rolls a volume off, Copy Services Manager does not expire it.
- When a backup is automatically expired by Copy Services Manager, it remains in the list of backups displayed on the **Session Details** page for diagnostic purposes.
  - You can view the volume results to determine which volumes were auto rolled by the hardware and evaluate if the volumes need more capacity, or if the frequency and retention options need adjusting.
    - To determine which volume or volumes might need increased capacity, select the backup on the **Session Details** page to view the list of volumes results.
  - To completely remove the backup from the list of backups in the **Session Details** page, navigate to the **`Expire Backup`** command and select the backup to remove.

H1-R1 No Copy option

This option defines if the recovery relationship will be established with background copy. If No Copy is selected, then a background copy is not automatically started when the relationship is established. To start the background copy for a no copy relationship, issue the Initiate® Background Copy command.

If No Copy is not selected, then a full background copy of the data will occur when the relationship is established. If the recovery volume is a space-efficient volume, the background copy might lead to fully provisioning the volume.

H1-R1 Persistent option
When this option is selected, the recovery relationship does not go away when the background copy completes.

Note: Microcode 9.02 level or higher is necessary to take advantage of the persistent feature. If you set the **Persistent** option, and microcode does not support it, the option is ignored, and the relationship disappears from the hardware when the background copy is complete.

z/OS Management option
When a z/OS system of sysplex name is set, the Backup command is submitted through the z/OS connection to that system or sysplex to provide performance improvements during the backup process for mainframe volumes.

Note: To enable this feature and take advantage of the performance enhancements, volumes in the session must be attached to the system or sysplex and IOS APAR OA59561 must be applied. In addition, for all storage systems that are going to be managed, a z/OS connection must be defined on the Storage Systems panel. Ensure that you create a z/OS storage system connection ("Storage connections" on page 48) for each storage system in the system or sysplex that will be managed by the session.

See "Creating a Safeguarded Copy session and adding copy sets" on page 206 for more details.

Safeguarded Copy in IBM FlashSystems/IBM Spectrum Virtualize

IBM Spectrum Virtualize is mapped to an Administrator account in Copy Services Manager to provide automated backup copies and data recovery.

Copy Services Manager automatically detects volume groups with defined Safeguarded backup policies and creates safeguarded backup copies according to the schedule defined in the policy.

Automated sessions

- To use Safeguarded Copy for IBM Spectrum Virtualize, you do not need to create sessions in Copy Services Manager. Copy Services Manager automates the creation of Safeguarded Copy sessions based on the volume groups that are defined on the system. Copy Services Manager also supports testing, restoring, and recovering operations with safeguarded backup copies. To configure the Safeguarded Copy function, it is recommended to create a new Administrator user.
- After a connection is established, Copy Services Manager queries the system every 5 minutes to process volume groups with Safeguarded backup policies.
- When Copy Services Manager detects a new populated volume group with a Safeguarded backup policy, it creates a session. After a session is created it adds all volumes in the volume group to the session. It also creates a scheduled task to create the Safeguarded backup copies. The session remains until the volume group is deleted or it no longer contains any volumes.
- Scheduled tasks that are created automatically by Copy Services Manager cannot be modified. However, you can set up automatic collection of log files when an error occurs or set-up tasks that are run when the current task completes.
- During the automated 5-minutes check, if Copy Services Manager identifies a volume group that is modified to no longer have a Safeguard backup policy, the scheduled task is removed from Copy Services Manager. The creation of backups is also stopped. If the policy is modified or a new policy is applied to the volume group, Copy Services Manager makes the appropriate changes as well.
- Copy Services Manager detects and handles changes to the volume group. It automatically adds or removes copy set from the session.
- To prevent Copy Services Manager from automatically discovering volume groups with policies, you can add the following property to server properties.

```
csm.server.enable.auto.specv.sgc=false
```

Note: When this property is added, any existing sessions and tasks that are discovered, are removed from Copy Services Manager as well. The volume group and backups remain on the storage system.

Manual backup

You can create manual backups in between the scheduled task by running the **Backup** command in the session. You are prompted to specify a retention time for the backup.

Backup copies expiration

- After copies expire according to the Safeguarded backup policy, IBM Spectrum Virtualize deletes them from the Safeguarded backup location. Copy Services Manager cannot expire or delete existing backups. If you need to detect an expired copy sooner, you can run the **Refresh States** command on the session to force Copy Services Manager to run the query.

Recovering and restoring data

- To recover a backup to a set of new recovery volumes, run the **Recover Backup** command and then select the relevant backup to recover. Copy Services Manager creates a recovery volume by using one or more parent pools of the source volumes or the pool that is specified in the Session properties. To view the volume names, click the **Recover Backup Info** tab on the session details panel. A pop-up window with all the >**R1** volumes in the session is displayed.
- When a recovered backup is no longer needed, you can run the **Terminate H1R1** command on the session, and select one or more recovered backups that you want to delete. This removes the relationships for the backups and deletes the recovery volumes from the hardware.
- If the same backup is recovered to again without previously terminating the relationships, the data from the backup is reflashed onto the existing R1 volumes. New volumes are not created again, unless a **Terminate H1R1** is issued.
- If you want to end the H1R1 recovery relationship but permanently keep the R1 volume, run the **Terminate H1R1 Keep R1** command.

  Note: When you run the **Terminate H1R1 Keep R1** command, Copy Services Manager stops managing the R1 volume. If the volume is no longer needed in the future, you must delete it from the IBM Spectrum Virtualize command-line interface(CLI) and graphical user interface(GUI).
- You can restore the original source from a backup by running the **Restore Backup** command and then selecting the relevant backup that you want to restore. Copy Services Manager automatically copies the data from the backup image that is selected to the original source. The session remains in the **Restoring** state until the restore is complete.

Recovery Volumes

When creating recovery volumes, Copy Services Manager uses the **mkvolume** command on the Spectrum Virtualize system. This allows the volume to use the provisioning policy that is assigned to the pool to define the attributes of the newly created volumes. To ensure that your recovery volumes have the correct attributes, you must define a provisioning policy on the pool that is associated with the recovery volumes. By default the recovery volumes are created in the source volume's parent pool. You can change the location of the pool recovery volumes by updating the **Recovery Pool** option on the **Recovery Options** tab for the Copy Services Manager session.

You can assign and remove recovery volumes from a host or host cluster by using the Copy Services Manager GUI.

- Assign R1 to host: To assign the R1 volumes to a host or host cluster, perform the following steps:
  1. In the Copy Services Manager GUI, click the **Recover Backup Info** tab and select a recovered backup. A table with all the R1 volumes is displayed.
  2. Select one or more R1 volumes from the table and click **Assign R1 to Host**. A confirmation window appears with a list of host or host clusters that are connected to the storage device.
  3. Select the host or host cluster that you want to map to the R1 volumes and click **Yes**. The R1 volume or volumes is successfully assigned to the host and a confirmation message is displayed.
- Remove R1 host mappings: To remove a host mapping from R1 volumes, perform the following steps:

1. In the Copy Services Manager GUI, click the **Recover Backup Info** tab and select a recovered backup. A table with all the R1 volumes is displayed.
2. Select one or more R1 volumes from the table and click **Remove Host Mapping**. All the host and host cluster mappings are removed from the selected R1 volumes and a confirmation message is displayed.

Recovery Options

The following recover options are available.

- Background copy rate: Set copy rate for the recovery relationships that the storage system uses to perform the background copy of the FlashCopy.
- Recovery pool: Choose a pool that is to be used to automatically create volumes for recovery relationships. If a pool is not specified, the pool of the source H1 volume is used.

ESE Sizer

The ESE Sizer session supports analyzing space requirements for DS8000 Extent Space Efficient(ESE) FlashCopy and Safeguarded Copy.

An accurate sizing of ESE FlashCopy and Safeguarded Copy is crucial. With the DS8000 microcode release 8.5.4 and DS8900F release 9.1, a Write Monitoring(WM) bitmap is implemented in the DS8000 to track all writes to each volume. This session type is available on any preinstalled version of Copy Services Manager on the DS8000 HMC without the need to purchase the full Copy Services Manager license.

The purpose of the Write Monitoring Bitmap is to provide an effective way to determine usable space requirements for both Extent Space Efficient(ESE) FlashCopy and Safeguarded Copy without impacting host write I/O or disk replication performance. The Write Monitoring bitmap enables a DS8000 to track the amount and locality of its changed data over definable time intervals and across a set time period in an existing production environment.

The new session type queries the Write Monitoring bitmap and provides output files on the box and volume level. Those output files contain the currently allocated extents, changed tracks, changed small extents and change large extents. This level of detail can readily be used to determine how much capacity would be allocated over time for both functions, ESE FlashCopy and Safeguarded Copy.

The following tool can be used to process the data collected from the Copy Services Manager ESE Sizer session to provide more accurate capacity sizings in the configurations. Refer the link https://www.ibm.com/support/pages/node/6372180 for more detailed information regarding ESE Sizer session and the collected data.

The ESE Sizer session can start, stop, and reset the WM bitmap. With the available properties, you can define the volume query interval and the bitmap reset interval.

Note: It is recommended to run the ESE Sizer session on a Copy Services Manager instance that is not currently managing replication. While the ESE Sizer session does not affect replication, the data collected uses system memory resources so running on a separate server is recommended to avoid any memory constraints. Refer “Calculating server memory requirements” on page 37 for more information.

Managing a session with HyperSwap

HyperSwapprovides high availability of data if a primary disk storage system failure occurs. When a failure occurs in writing I/O to the primary storage system, the failure is detected by IOS, and IOS automatically swaps the I/O to the secondary site with no user interaction and minimal application effect.

Sessions that can be enabled for HyperSwap

You can create sessions that enable swapping, which provides a session with a highly available business continuity solution.

Sessions that can enable HyperSwap

The following session types can enable HyperSwap processing:

- Basic HyperSwap
- Metro Mirror with Failover/Failback
- Metro Global Mirror
- Metro Global Mirror with Practice
- Metro Mirror - Metro Mirror
- Metro Mirror - Global Mirror
- Metro Mirror - Global Mirror with Practice

To enable HyperSwap processing, one of the following conditions must apply:

- The volumes that are managed by the session are only IBM DS8000 storage system volumes.
- The volumes are count key data (CKD) volumes that are attached to an IBM z/OS system.
- The z/OS system is listed on the Copy Services Manager **Host Connections** page and is in the Connected state.

Sessions that can enable FlashSystem/IBM Spectrum Accelerate HyperSwap

Only the Metro Mirror with Failover/Failback session type can enable FlashSystem/IBM Spectrum Accelerate HyperSwap processing.

To enable FlashSystem/IBM Spectrum Accelerate HyperSwap processing, the volumes in the session must be FlashSystem/IBM Spectrum Accelerate 12.1 or later volumes.

Setting up the environment for HyperSwap

You must set up an environment in which you can run HyperSwap processing before you can enable HyperSwap for a Copy Services Manager session.

Before you begin

To enable HyperSwap processing on IBM z/OS systems, the following conditions must exist:

- The HSIB and IOSHSAPI address spaces are started on the z/OS system to which the storage systems are connected.
- All reserve volumes are converted to global enqueues (ENQs).
- The storage system volumes are count key data (CKD) volumes that are attached to a z/OS system. The volumes can be attached to the same z/OS system or different systems.
- If the storage system volumes are not connected to a z/OS system on which Copy Services Manager is installed, the required Resource Access Control Facility (RACF) settings are set on the z/OS system and the **SOCKPORT** parameter is defined for the HyperSwap management address space IOSHMCTL. This set up enables Copy Services Manager to connect to the z/OS system by using an IP connection. For the required RACF settings, see the *IBM Copy Services Manager Installation and Configuration Guide*.

To enable HyperSwap processing on FlashSystem/IBM Spectrum Accelerate systems, the following conditions must exist:

- When adding copy sets to a FlashSystem/IBM Spectrum Accelerate session that will support HyperSwap, the source and target volumes in the copy set MUST have the same name. FlashSystem/IBM Spectrum Accelerate requires that the source and target have the same name.

- Before a FlashSystem/IBM Spectrum Accelerate session can be enabled for HyperSwap, a Quorum Witness must be defined on the storage system. See the following Redbooks publication (http://www.redbooks.ibm.com/abstracts/redp5434.html) for more information. Also see the Quorum Witness section in the IBM online documentation at https://www.ibm.com/support/knowledgecenter/en/STJKMM_12.3.2/cli_12.3.2.x/r_command__mirroring__quorum_witness_define.html.

About this task

Complete the following tasks to set up an environment in which you can run HyperSwap processing on z/OS or FlashSystem/IBM Spectrum Accelerate:

Procedure

1. Add a host connection for each z/OS system in the Copy Services Manager GUI. To add a connection, open the **Host Connections** page and click **Add Host Connection**.

   Note: If the z/OS system is the system on which Copy Services Manager is installed, a native connection is automatically added in the GUI. If the z/OS system does not have Copy Services Manager installed, you must you use an IP connection to connect to the z/OS system.
2. Add a connection to the storage systems that are attached to the z/OS or FlashSystem/IBM Spectrum Accelerate systems. To add a connection, open the **Storage Systems** page and click **Add Storage Connection**. You can connect to a storage system by using a Hardware Management Console (HMC), direct, or a z/OS connection.
3. Create a session that enables HyperSwap. To create a session, open the **Sessions** page and click **Create Session**.

Enabling HyperSwap for a session

Enabling HyperSwap for a session provides business recovery and business continuity.

Before you begin

Ensure that you can use the HyperSwap functions in your environment. See “Setting up the environment for HyperSwap” on page 120.

About this task

To enable HyperSwap for a session, complete the following steps:

Procedure

1. In the Copy Services Manager menu bar, click **Sessions**.
2. On the **Sessions** page, select the session.
3. From the **Session Actions** list, select **View/Modify** > **Properties**.
4. In the **View/Modify Properties** notebook, select the following properties on the applicable role pair options tab:

   For HyperSwap

   System or sysplex
   Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

   Manage H1-H2 with HyperSwap
   Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when there is a failure on the host accessible volumes. Copy Services Manager uses HyperSwap to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes
Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes
Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

For FlashSystem/IBM Spectrum Accelerate HyperSwap

Manage H1-H2 with HyperSwap
Select this option to enable the relationship for HyperSwap on FlashSystem/IBM Spectrum Accelerate volumes. This option redirects application I/O to the target volumes when there is a failure on the host accessible volumes.

Copy Services Manager uses HyperSwap to manage the H1-H2 sequence of a Metro Mirror session.

Planned and unplanned swaps

After a FlashSystem/IBM Spectrum Accelerate or z/OS session is enabled for HyperSwap, Copy Services Manager will set up HyperSwap relationships on the storage system. When the relationships are created and in a Prepared state, a planned or unplanned HyperSwap can occur.

When they are enabled, the session can start a planned or unplanned swap. A HyperSwap symbol is displayed over the arrow that shows replication between sites, as shown in Figure 20 on page 123.

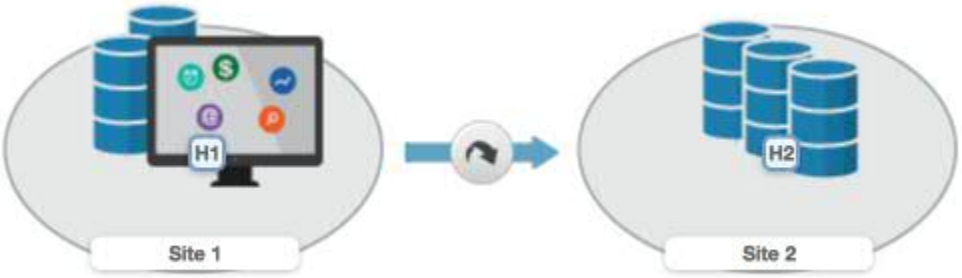

Figure 20. Swap-capable session

Completing a planned swap

When the session is enabled on z/OS or FlashSystem/IBM Spectrum Accelerate for HyperSwap, the session is considered swap-capable. There might be cases such as a planned maintenance or a migration from the primary storage, in which a planned swap might be required. When the session is in swap-capable state, a planned swap can be completed by issuing the **HyperSwap** command for the session.

After you run a planned swap for z/OS, the session transitions to Target Available state and all the H1-H2 pairs are in Target Available state. If the H1-H2 role pair was consistent at the time of the swap, the session has a status of Normal, which indicates that H1-H2 is consistent. If the H1-H2 role pair was not consistent at the time of the swap, the session has a status of SEVERE. The active host on the session is shown as H2.

After a planned swap for FlashSystem/IBM Spectrum Accelerate, the session does not go into a Target Available state. The FlashSystem/IBM Spectrum Accelerate automatically reverses the replication so that the session goes Prepared in the opposite direction if the auto restart is successful, or it goes Target Available if it is not successful.

All I/O is redirected to the H2 volumes. After a successful swap to site 2, you cannot enable the copy function to site 2. The only way to restart the copy processing is by issuing the **Start H2->H1** command. To have the volumes protected with high availability and disaster recovery again, correct the error that caused the swap to occur, and manually restart the session to begin copying data to the other site.

Unplanned swaps

When the session is enabled on z/OS or FlashSystem/IBM Spectrum Accelerate for HyperSwap processing, the session is considered swap-capable. If a primary I/O error occurs, a swap occurs automatically.

When an unplanned swap occurs for z/OS, the session transitions to Target Available state and all the H1-H2 pairs are in Target Available state. If the H1-H2 role pair was consistent at the time of the swap, the session has a status of Normal, and indicates that H1-H2 is consistent. If the H1-H2 role pair was not consistent at the time of the swap, the session might show a status of SEVERE. The active host on the session is shown as H2.

An unplanned swap on FlashSystem/IBM Spectrum Accelerate, most likely results in Target Available state. Because there is a primary I/O error in this situation, it probably means that the replication will not automatically start back in the opposite direction either.

All I/O is redirected to the H2 volumes. After a successful swap to site 2, you cannot enable the copy function to site 2. Therefore, it is not possible to issue a **Start H1->H2** command. The only way to restart the copy processing is by issuing a **Start H2->H1** command. To have the volumes protected with high availability and disaster recovery again, correct the error that caused the swap to occur, and manually restart the session to begin copying data to the other site.

Verifying a session for a planned or unplanned swap

You can verify whether a session is capable of a planned or unplanned swap from the z/OS console on HyperSwap

Verify the status of HyperSwap from the z/OS console:

1. View the overall status of the HyperSwap session. Issue the `d hs,status` command. For example:

```
15.03.06 SYSTEM1 d hs,status
15.03.06 SYSTEM1 STC00063 IOSHM0303I HyperSwap Status 531
Replication Session: SR_HS
HyperSwap enabled
New member configuration load failed: Disable
Planned swap recovery: Disable
Unplanned swap recovery: Disable
FreezeAll: No
Stop: No
```

2. Verify all the volumes in the configuration. Issue the `ds hs,config(detail,all)` command. For example:

```
15.03.51 SYSTEM1 d hs,config(detail,all)
15.03.51 SYSTEM1 STC00063 IOSHM0304I HyperSwap Configuration 534
Replication Session: SR_HS
Prim. SSID UA DEV# VOLSER Sec. SSID UA DEV# Status
06 02 00F42 8K3602 06 04 00FA2
06 01 00F41 8K3601 06 03 00FA1
06 00 00F40 8K3600 06 02 00FA0
```

Temporarily disabling HyperSwap

In some situations, it might be necessary to temporarily disable the HyperSwap function for a session.

About this task

You might want to disable HyperSwap in the following circumstances:

- If you are performing maintenance on the system
- If one sysplex member cannot communicate with one or more volumes

Complete these steps to disable HyperSwap for a specific session:

Procedure

1. In the Copy Services Manager menu bar, click **Sessions**.
2. On the **Sessions** page, select the sessions for which you want to disable the HyperSwap function.
3. From the **Session Actions** list, select **View/Modify** > **Properties**.
4. On the applicable tab of the View/Modify Properties notebook, select **Disable HyperSwap**.

   Tip: On management servers that run on a z/OS operating system, you can disable the HyperSwap function from an MVS command prompt window by entering the **SETHS DISABLE** command.

Using active and standby Copy Services Manager servers with HyperSwap

You can set up an active and standby management server configuration with HyperSwap.

Active and standby servers with z/OS HyperSwap

When the storage system is set up to connect through the z/OS interface, the connection information is sent to the standby server and a connection is attempted. The connection might fail if the standby server does not run on a z/OS operating system or does not have access to the same volumes. If the connection fails and the standby server resumes the processing, the standby server cannot manage the HyperSwap processing.

On the z/OS system, if the session configuration was successfully loaded before the HyperSwap processing, the z/OS system can manage the HyperSwap processing. If the z/OS system swaps the volumes but cannot communicate with the Copy Services Manager server, the session is set to Suspended or Severe state. To set the session to Target Available state, clear the **Manage H1-H2 with Hyperswap** option, and issue the **`Recover`** command for the session.

Managing z/OS HyperSwap or hardened freeze across multiple sessions within the same sysplex

You can manage z/OS HyperSwap or hardened freeze operations across multiple sessions within the same sysplex.

About this task

Copy Services Manager supports the ability to enable z/OS HyperSwap on DS8000 sessions that contain Metro Mirror pairs. However, only one HyperSwap configuration can be loaded at a time within a sysplex. This limitation means that only a single session that is associated with a particular sysplex can load a HyperSwap configuration.

However, in specific cases you might want all of your Metro Mirror pairs to be enabled with HyperSwap. But only a subset of those pairs requires an extra replication to a third site. For example, you might have production and development servers that are running Metro Mirror between two local sites and want both of these servers to be HyperSwap capable. But to save on replication and storage costs, perhaps only the production data needs to be replicated to the third site in a disaster.

Starting with the Copy Services Manager 6.2.0 release, you can now configure your environment so that multiple sessions of different session types can be HyperSwap capable within the same sysplex. With this feature, you can have asymmetric configurations for the data that you are replicating, while also ensuing that all of the data is HyperSwap capable.

Follow these steps to set up multiple sessions on the same sysplex to be HyperSwap capable:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrative privileges.
2. Click **Sessions**.
3. From the **Sessions Overview** panel, click **Session Actions** > **View/Modify** > **Properties**.
4. In the session properties for each session, clear the **Manage Hx-Hy with HyperSwap** and the **Enable Hardened Freeze** options, if checked. This action temporarily disables HyperSwap or hardened freeze.
5. In the session properties for each session, associate the session to the same `Sysplex`.
6. On the **Session Details** panel, or by selecting **View/Modify** > **Set Consistency Group name**, modify the consistency group name for the role pair (for example, H1-H2) in each session that will be HyperSwap capable, to the same name. The consistency group name that is defined on the Metro Mirror role pair is used to load the HyperSwap configuration on to z/OS.
7. In the session properties for each session, select the **Manage Hx-Hy with HyperSwap** option again.

Results

When all pairs in all sessions that have the same consistency group name for the HyperSwap role pair, reach a Prepared state, a load is issued that contains the configuration of all Metro Mirror pairs across all the sessions.

If there are multiple sessions with the same consistency group name defined, a configuration does *not* load until all the pairs across all the sessions are ready and in a Prepared state. If any session has pairs in a state other than Prepared, except for the Defined state, no load is issued and a warning is placed on the session until all sessions reach the Prepared state and load a configuration.

Special considerations: You can also use this feature to manage hardened freeze across multiple sessions. If you use the same process that was described in the previous task, except select only the

hardened freeze option in step “7” on page 125, multiple sessions load a hardened freeze configuration on z/OS. You can use this method to manage data in separate sessions and session types, but keep consistency across those sessions in a disaster. For example, you might have a Metro Global Mirror and a Metro Mirror session in your configuration. Without the consistency group name, you can set up hardened freeze for both sessions individually. However, if the Metro Global Mirror session processed an unexpected suspend and Suspended the session, the Metro Mirror session does not suspend. With the same consistency group name defined on the session, a single hardened freeze configuration is loaded on z/OS so that when an unexpected suspend occurs, both sessions are suspended consistently.

All sessions that have the same consistency group name defined need to have the same load type defined. If multiple sessions have the same consistency group name defined, but one is set up with HyperSwap and another with hardened freeze, the load does not occur and an error message appears on the session. To run separate load types, the consistency group name needs to be removed first. After you remove the consistency group name, then the session can load a different type of configuration.

Managing hardware reserves

Copy Services Manager 6.2.11 supports a new hardware reserves option for HyperSwap configurations.

About this task

This option requires the z/OS IOS APAR OA57049. It provides support to ensure that active hardware reserves on primary PPRC devices are properly transferred to the new primary devices after a HyperSwap, helping to remove the need to convert hardware reserves to Global ENQs. This option also provides support for sharing devices between sysplexes in a z/OS HyperSwap environment. The sharing is limited to devices in a single Metro Mirror HyperSwap configuration.

Follow these steps to enable the hardware reserves option for HyperSwap:

Note: This option is only supported on the two-site and multi-target Metro Mirror - Global Mirror sessions that support HyperSwap. This option is *not* supported on Metro Global Mirror, Metro Global Mirror with Practice, or the multi-target Metro Mirror - Metro Mirror session types.

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrative privileges.
2. Click **Sessions**.
3. From the **Session Overview** panel, click **Session Actions** > **View/Modify** > **Properties**.
4. In the session properties for sessions that support HyperSwap, select the **Enable Hardware Reserves** option.

Session commands

The commands that are available for a session depend on the session type, and for some commands, the storage system type.

Commands are issued to Copy Services Manager sessions. Any subsequent command that is issued to an individual session is not processed until the first command is completed. Some commands, such as the **Start** command, can take an extended amount of time to complete because the commands set up the hardware relationships. You can continue to issue commands to other sessions during this time. When a command is completed, the console shows the results of the command.

Basic HyperSwap commands

Use this information to learn about commands available for Basic HyperSwap sessions.

Note: Individual suspend and recover commands are not available in HyperSwap.

Table 49. Basic HyperSwap commands	
Command	**Action**
HyperSwap	Triggers a HyperSwap where I/O is redirected from the source volume to the target volume, without affecting the application using those volumes. You can use this command if you want to perform maintenance on the original source volumes.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Start H1->H2	Starts copying data synchronously from H1 to H2 in a Metro Mirror session. **Note:** A session might go into a Severe state with error code 1000000 before the session returns to Normal/Prepared State and HyperSwap Capable. The duration of the Severe state depends on how large of a session is running.
Start H2->H1	Starts copying data synchronously from H2 to H1 in a Metro Mirror session. You can issue this command only after the session has been swapped and the production site is H2. To enable data protection when the H1 volumes are available again, start I/O to the H2 volumes, and issue this command to replicate data from the H2 volumes to H1 volumes.
Stop	Suspends updates to all the targets of pairs in a session. You can issue this command at any time during an active session. **Note:** After you issue the stop command, targets might not be consistent.
Terminate	Removes all physical copies and relationships from the hardware during an active session.

FlashCopy commands

Use this information to learn about commands available for FlashCopy sessions.

Table 50. FlashCopy commands

Command	Action
Flash	Performs the FlashCopy operation using the specified options. Issue the Flash command to create a data consistent point-in-time copy for a FlashCopy Session with volumes on the following storage systems: • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3500 – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified • DS8000
Discover	Assimilates existing hardware relationships in a FlashCopy session on DS8000 and Spectrum Virtualize based storage systems. **Note:** For DS8000 systems, although discovered pairs are set consistent, the session is not able to validate that they are consistent to the time of all other pairs in the session. Be careful when using the feature, and keep this situation in mind if a restore has to be performed. See “Assimilate FlashCopy relationships” on page 219 for more information.
InitiateBackgroundCopy	Copies all tracks from the source to the target immediately, instead of waiting until the source track is written to. This command is valid *only* when the background copy is not already running.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.

Table 50. FlashCopy commands (continued)	
Command	**Action**
Restore	Restores the point-in-time relationships from the target volumes to the source volumes of the FlashCopy session, and overwrites any data on the source volumes. **Notes:** • Copy Services Manager can currently only perform a FlashCopy session restore operation on DS8000 and SAN Volume Controller systems. • If **Restore** is not a command option, a flash operation has not been done. You must perform a flash at least one time before you can do a restore. See "Restoring a FlashCopy session" on page 217 for more information.
Start	Performs any steps necessary to define the relationship before performing a FlashCopy operation. For DS8000, this command is not an option. Issue this command to put the session in the prepared state for the following storage systems: • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3500 – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified
Terminate	Removes all active physical copies and relationships from the hardware during an active session. If you want the targets to be data consistent before removing their relationship, you must issue the **InitiateBackgroundCopy** command if NOCOPY was specified, and then wait for the background copy to complete by checking the copying status of the pairs.

Snapshot commands

Use this information to learn about commands that are available for Snapshot sessions and groups. A snapshot group is a grouping of snapshots of individual volumes in a consistency group at a specific point in time.

Table 51. Snapshot session commands	
Command	**Action**
Create Snapshot	Creates a snapshot of the volumes in the session

Table 51. Snapshot session commands (continued)	
Command	**Action**
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Restore	Restores the H1 volumes in the session from a set of snapshot volumes. You must have at least one snapshot group to restore from. When you issue this command in the Copy Services Manager graphical user interface (GUI), you are prompted to select the snapshot group.

Table 52. Snapshot group commands	
Command	**Action**
Delete	Deletes the snapshot group and all the individual snapshots that are in the group from the session and from the FlashSystem/IBM Spectrum Accelerate. If the deleted snapshot group is the last snapshot group that is associated with the session, the session returns to the Defined state.
Disband	Disbands the snapshot group. When a snapshot group is disbanded, the snapshot group no longer exists. All snapshots in the snapshot group become individual snapshots that are no longer associated to the consistency group or the session. After a snapshot group is disbanded, it is no longer displayed in or managed by Copy Services Manager. If the disbanded snapshot group is the last snapshot group that is associated with the session, the session returns to the Defined state.
Duplicate	Duplicates the snapshot group. When a snapshot group is duplicated, a new snapshot group is created with new snapshots for all volumes that are in the duplicated group. The name of the duplicated snapshot group is generated automatically by the FlashSystem/IBM Spectrum Accelerate.
Lock	Locks a snapshot group. If the snapshot group is locked, write operations to the snapshots that are in the snapshot group are prevented. By default, a snapshot group is locked when it is created. This action is valid only if the snapshot group is unlocked.
Overwrite	Overwrites the snapshot group to reflect the data that is on the H1 volume.
Rename	Renames the snapshot group to a name that you provide. The name can be a maximum of 64 alphanumeric characters.
Restore	Restores the contents of a snapshot group by using another snapshot group in the session. Both of the snapshot groups must contain the same subset of volumes.

Table 52. Snapshot group commands (continued)	
Command	**Action**
Set Priority	Sets the priority in which a snapshot group is deleted. The value can be the number 1 - 4. A value of 1 specifies that the snapshot group is deleted last. A value of 4 specifies that the snapshot group is deleted first.
Unlock	Unlocks a snapshot group. If the snapshot group is unlocked, write operations to the snapshots that are in the snapshot group are enabled and the snapshot group is displayed as modified. This action is valid only if the snapshot group is locked.

Metro Mirror commands

Use this information to learn about commands available for Metro Mirror sessions.

Table 53. Metro Mirror commands	
Command	**Action**
Enable Copy to Site 1	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H2->H1** command becomes available.
Enable Copy to Site 2	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H1->H2** command becomes available.
HyperSwap	Triggers a HyperSwap where I/O is redirected from the source volume to the target volume, without affecting the application using those volumes. You can use this command if you want to perform maintenance on the original source volumes. **Note:** This command is available only for Copy Services Manager in DS8000 environments.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Recover	Issues the **Recover** command to suspended sessions. This command performs the steps necessary to make the target available as the new primary site. After this command completes, the session becomes Target Available.

Table 53. Metro Mirror commands (continued)	
Command	**Action**
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.
Start	Establishes a single-direction session with the hardware and begins the synchronization process between the source and target volumes.
Start H1->H2	Establishes Metro Mirror relationships between the H1 volumes and the H2 volumes, and begins data replication from H1 to H2.
Start H2->H1	Establishes Metro Mirror relationships between the H2 volumes and the H1 volumes and starts data replication from H2 to H1. Indicates direction of a failover and failback between two hosts in a Metro Mirror session. If the session has been recovered such that the production site is now H2, you can issue the **Start H2->H1** command to start production on H2 and start data replication.
Stop	Inconsistently suspends updates to all the targets of pairs in a session. This command can be issued at any point during an active session. **Note:** Targets after the suspend are not considered to be consistent.
StartGC	Establishes Global Copy relationships between the H1 volumes and the H2 volumes, and begins asynchronous data replication from H1 to H2. While in the Preparing state, it will not change to the Prepared state unless you switch to Metro Mirror. **Note:** This command is available only for Copy Services Manager in DS8000 environments.
Stop When Drained	After a **StartGC** command, the session is in a Preparing and Global Copy mode. The **Stop When Drained** command starts a thread that queries all pairs until zero pairs are out-of-sync (OOS). After the OOS for the pairs goes to zero, the **Stop** command is issued. **Note:** The **Stop** command is issued, rather than **Suspend**, so that this procedure can be used in cascaded environments. **Suspend** puts the pairs in Metro Mirror mode, which is not allowed if the source of the session is the target of another relationship.
Suspend	Causes all target volumes to remain at a data-consistent point and stops all data that is moving to the target volumes. This command can be issued at any point during a session when the data is actively being copied. **Note:** Avoid using the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If there are other Metro Mirror sessions overlapping the same LSS pairs as in this session, those sessions are also suspended. When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection.

Table 53. Metro Mirror commands (continued)	
Command	**Action**
Terminate	Removes all copy relationships from the hardware during an active session. If you want the targets to be data consistent before removing their relationship, you must issue the **Suspend** command, then the **Recover** command, and then the **Terminate** command.

Metro Mirror with Practice commands

Use this information to learn about commands available for Metro Mirror with Practice sessions.

Table 54. Metro Mirror with Practice commands	
Command	**Action**
Enable Copy to Site 1	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H2->H1** command becomes available.
Enable Copy to Site 2	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H1->H2** command becomes available.
Flash	Creates a FlashCopy image from I2 volumes to H2 volumes. The amount of time for this to occur will vary depending on the number of copy sets in the session. **Note:** For DS8000 storage systems, the **Flash** command uses the freeze and thaw processing to create a data consistent point for the FlashCopy. If there is another Metro Mirror session overlapping on one or more of the same LSS pairs, that session will be suspended. It is also possible that the suspension of the other session might cause the Metro Mirror session to remain suspended after the flash command is issued instead of returning to Prepared state. Avoid using the same LSS pairs for multiple Metro Mirror sessions if possible.
Allow Practice Flash	Issued to allow a **Flash** operation again on a Practice session after it has been suspended with the **Prevent Reflash of Practice volume after Flash or Recover** option. The **Allow Practice Flash** command appears in the Preparing or Prepared states only if it is currently preventing the reflash. If the session is Preparing, the **Flash** command does not display until the session gets to the Prepared state. See “Prevent a reflash when practicing disaster recovery” on page 239 for more information on using this command.
Recover	Takes a point-in-time copy of the data on I2 to the H2 volumes, enabling the application to be attached and run from the H2 volumes on site 2. **Note:** The point-in-time copy is performed when the session is in a recoverable state to avoid that previous consistent data on H2 are overwritten by inconsistent data upon Recover. You can issue the **Flash** command if you want to force a point-in-time copy from I2 to H2 volumes afterward.

Table 54. Metro Mirror with Practice commands (continued)	
Command	**Action**
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.
Start H1->H2	Establishes a Metro Mirror relationship from the H1 volumes to the I2 volumes, and begins data replication.
Start H2->H1	Establishes a Metro Mirror relationship from H2 to H1 and begins data replication.
StartGC_H1H2	Distinguishes when the session is in the Preparing state from H1 to I2 and begins the asynchronous process between the source and target volumes. While in the Preparing state the session will not change to the Prepared state unless you switch to Metro Mirror.
StartGC_H2H1	Distinguishes when the session is in the Preparing state from H2 to H1 and begins the asynchronous process between the source and target volumes. While in the Preparing state the session will not change to the Prepared state unless you switch to Metro Mirror.
Suspend	Causes all target volumes to remain at a data-consistent point and stops all data that is moving to the target volumes. This command can be issued at any point during a session when the data is actively being copied. **Note:** The Metro Mirror command uses a freeze command on the DS8000 devices to create the data-consistent point. If there are other Metro Mirror sessions overlapping the same LSS pairs as in this session, those sessions will also become suspended. Avoid using the same LSS pairs for multiple Metro Mirror sessions. When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection.
Stop	Inconsistently suspends updates to all the targets of pairs in a session. This command can be issued at any point during an active session. **Note:** Targets after the suspend are not considered to be consistent.
Terminate	Terminates all copy relationships on the hardware.

Table 54. Metro Mirror with Practice commands (continued)	
Command	**Action**
TerminateH2I2	Removes the FlashCopy relationships after a Flash command is issued. When you use Extent Space Efficient (ESE) volumes for your practice volumes (H2), it is recommended to set the No Copy option on the H2I2 role pair. When No Copy is set, data will only be physically written to H2 when a track is updated on I2. If the practice copy of the data is no longer needed, this command can be run to remove the FlashCopy relationship from I2 to H2, to prevent the relationship from consuming backend space. **Notes:** • If the command is issued, H2 will no longer hold a consistent logical copy of the data until the next Flash or Recover is issued. • This command is only available for DS8000 practice sessions while in the Preparing, Prepared, or Suspended states. This command is not available while in the Defined or Target Available states.

Global Mirror commands

Use this information to learn about commands available for Global Mirror sessions.

Table 55. Global Mirror commands	
Command	**Action**
Enable Copy to Site 1	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H2->H1** command becomes available.
Enable Copy to Site 2	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H1->H2** command becomes available.
Recover	Issue this command to recover the session to the target site. This command performs the steps necessary to make the target host volumes consistent and available for access as the new primary site. After this command completes, the session state becomes Target Available. Do not access H2 volumes until the **Recover** command is completed and the session displays Target Available and Recoverable. A Recover to H2 also establishes a point-in-time copy to J2 to preserve the last consistent data.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.

Table 55. Global Mirror commands (continued)	
Command	**Action**
Set Production to Site 1	Allows you to set the production volume to be at Site 1 from the Defined state.
Set Production to Site 2	Allows you to set the production volume to be at Site 2 from the Defined state.
Start	Establishes all relationships in a single-direction session and begins the process necessary to start forming consistency groups on the hardware.
Start H1->H2	Starts copying data from H1 to H2 in a Global Mirror Failover/Failback session. Establishes the necessary relationships in the session and begins the process necessary to start copying data from the H1 site to the H2 site and to start forming consistency groups.
Start H2->H1	Starts copying data from H2 to H1 in a failover and failback session for DS8000. If a recover was performed on a session such that the production site is now H2, you can issue a **Start H2->H1** command to start moving data back to Site 1. However, this start does not provide consistent protection as it copies only asynchronously back because of the long distance. A Global Copy relationship is used. When you are ready to move production back to Site 1, issue a suspend to the session. This action puts the relationships into a synchronized state and suspends them consistently. Sessions are consistent when a H2->H1 copy occurs for the following storage systems: • SAN Volume Controller • Storwize V3700 • Storwize V7000 • Storwize V7000 Unified
StartGC H1->H2 This command is available only for Global Mirror Failover/Failback and Global Mirror Failover/Failback with Practice sessions.	Establishes Global Copy relationships between site 1 and site 2 and begins asynchronous data replication from H1 to H2. To change the session state from Preparing to Prepared, you must issue the **Start H1->H2** command and the session must begin to form consistency groups. There is no disaster recovery protection for Global Copy relationships. If a disaster such as the loss of a primary storage system or a link failure between the sites occurs, the session might be inconsistent when you issue the **Recover** command. This command is available for the DS8000 storage system.
Stop	Inconsistently stops the pairs that are in a Global Copy mode.
Stop When Drained	After a **StartGC** command, the session is in a Preparing and Global Copy mode. The **Stop When Drained** command starts a thread that queries all pairs until zero pairs are out-of-sync (OOS). After the OOS for the pairs goes to zero, the **Stop** command is issued. **Note:** The **Stop** command is issued, rather than **Suspend**, so that this procedure can be used in cascaded environments. **Suspend** puts the pairs in Metro Mirror mode, which is not allowed if the source of the session is the target of another relationship.

Table 55. Global Mirror commands (continued)

Command	Action
Suspend	Pauses the Global Mirror master session, which causes the session to stop forming consistency groups, and suspends the H1 to H2 Global Copy pairs. **Note:** This action occurs only if the session is in Global Mirror mode. If the session is in Global Copy mode, the Suspend command attempts to consistently suspend the pairs by establishing the Global Copy pairs as Metro Mirror pairs. When these pairs all reach a Prepared state, a Freeze is then issued to have consistency at the remote site. **If you are using a System Storage DS8000:** The **Suspend** command invokes a pause command for IBM DS8000. The pause command that is invoked depends on the IBM DS8000 microcode level. If the following conditions are true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir -withsecondary**: • All primary volumes that are in the session are on a IBM DS8000 storage system with a microcode level that includes the pause with secondary consistency option. To determine whether this option is available for your storage system, see the IBM DS8000 documentation for the microcode level that you are using. • The pause with secondary consistency option is enabled on the storage system. If these conditions are not true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir**. Both commands temporarily pause the formation of consistency groups after the current consistency group is formed. However, the command for a pause with secondary consistency creates a consistent data set on the secondary volumes. If you do not want to suspend the Global Copy pairs when a Global Mirror session is suspended, open the `rmserver.properties` file in the *install dir*`\liberty\wlp\usr\servers\csmServer\properties` directory on distributed systems, or the *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory on z/OS, and add the following property: `csm.server.sus_gc_pairs_on_gm_pause = false` **Tip:** The pause with secondary consistency option requires that the Global Copy pairs are suspended. If you do not want to use the pause with secondary consistency option for storage systems on which the option is enabled, set the **csm.server.sus_gc_pairs_on_gm_pause** property to **false**.
Terminate	Removes all physical copies and relationships from the hardware during an active session. If you want the targets to be data consistent before you remove their relationship, you must issue the **Suspend** command, the **Recover** command, and then the **Terminate** command.

Global Mirror with Practice commands

Use this information to learn about commands available for Global Mirror with Practice sessions.

Table 56. Global Mirror with Practice commands

Command	Action
Enable Copy to Site 1	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H2->H1** command becomes available.
Enable Copy to Site 2	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H1->H2** command becomes available.
Flash	The Flash command ensures that all I2s are consistent, and then flashes the data from I2 to the H2 volumes. After the flash is complete, the Global Mirror session is automatically restarted, and the session begins forming consistency groups on I2. You can then use the H2 volumes to practice your disaster recovery procedures. For Global Mirror with Practice sessions for DS8000, the Flash command temporarily pauses the formation of consistency groups.
Allow Practice Flash	Issued to allow a **Flash** operation again on a Practice session after it has been suspended with the **Prevent Reflash of Practice volume after Flash or Recover** option. The **Allow Practice Flash** command appears in the Preparing or Prepared states only if it is currently preventing the reflash. If the session is Preparing, the **Flash** command does not display until the session gets to the Prepared state. See "Prevent a reflash when practicing disaster recovery" on page 239 for more information on using this command.
Recover	Restores consistent data on I2 volumes and takes a point-in-time copy of the data on I2 to the H2 volumes, enabling the application to be attached and run from the H2 volumes on site 2. The I2 volumes continue to hold the consistent data and can be flashed again to H2 by using the **Flash** command.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.

Table 56. Global Mirror with Practice commands (continued)	
Command	**Action**
ResumeGM	Resumes the Global Mirror master session on the hardware allowing the hardware to restart all relationships and consistency group formation. The command does not do any of the additional checks such as establishing for logical paths, etc. that are run by issuing the **Start** command. This command is only recommended to be used when the session is suspended for a short amount of time, such as when creating a FlashCopy or Safeguarded Copy backup at the remote site. **Note:** The command does not work for sessions that are suspended and share the same consistency group on the hardware. When sessions share a consistency group, the **Suspend** command removes the volumes of the suspended session out of the hardware session in order to allow other sessions to continue to form consistency groups. So the **ResumeGM** command will not cause the pairs in the suspended session to be restarted, you must run the **Start** command for the same.
Start H1->H2	Starts copying data from H1 to H2. After the first pass of the copy is complete for all pairs, the session establishes the I2->J2 FlashCopy pairs. The session starts the Global Mirror master so that the hardware begins to form consistency groups, to ensure that consistent data is at site 2.
Start H2->H1	Starts copying data from H2 to H1 in a failover and failback session. If a recover was performed on a session such that the production site is now H2, you can issue a **Start H2->H1** command to start moving data back to Site 1. However, this start does not provide consistent protection as it copies only asynchronously back because of the long distance. **Note:** DS8000 volumes are not consistent for the **Start H2->H1** command. A Global Copy relationship is used. When you are ready to move production back to Site 1, issue a suspend command to the session. The relationships are put into a synchronized state and are suspended consistently.
StartGC H1->H2 This command is available only for Global Mirror Failover/Failback and Global Mirror Failover/Failback with Practice sessions.	Establishes Global Copy relationships between site 1 and site 2 and begins asynchronous data replication from H1 to I2. To change the session state from Preparing to Prepared, you must issue the **Start H1->H2** command and the session must begin to form consistency groups. There is no disaster recovery protection for Global Copy relationships. If a disaster such as the loss of the primary Copy Services Manager server occurs, the session might be inconsistent when you issue the **Recover** command. This command is available for the DS8000 storage system.

Table 56. Global Mirror with Practice commands (continued)

Command	Action
Suspend	Pauses the Global Mirror master session, which causes the session to stop forming consistency groups, and suspends the H1 to H2 Global Copy pairs. **Note:** This action occurs only if the session is in Global Mirror mode. If the session is in Global Copy mode, the Suspend command attempts to consistently suspend the pairs by establishing the Global Copy pairs as Metro Mirror pairs. When these pairs all reach a Prepared state, a Freeze is then issued to have consistency at the remote site. **If you are using a System Storage DS8000:** The **Suspend** command invokes a pause command for IBM DS8000. The pause command that is invoked depends on the IBM DS8000 microcode level. If the following conditions are true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir -withsecondary**: • All primary volumes that are in the session are on a IBM DS8000 storage system with a microcode level that includes the pause with secondary consistency option. To determine whether this option is available for your storage system, see the IBM DS8000 documentation for the microcode level that you are using. • The pause with secondary consistency option is enabled on the storage system. If these conditions are not true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir**. Both commands temporarily pause the formation of consistency groups after the current consistency group is formed. However, the command for a pause with secondary consistency creates a consistent data set on the secondary volumes. If you do not want to suspend the Global Copy pairs when a Global Mirror session is suspended, open the `rmserver.properties` file in the *`install dir`*`\liberty\wlp\usr\servers\csmServer\properties` directory on distributed systems, or the *`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory on z/OS, and add the following property: `csm.server.sus_gc_pairs_on_gm_pause = false` **Tip:** The pause with secondary consistency option requires that the Global Copy pairs are suspended. If you do not want to use the pause with secondary consistency option for storage systems on which the option is enabled, set the **csm.server.sus_gc_pairs_on_gm_pause** property to **false**.
Terminate	Removes all physical copies and relationships that are on the hardware.

Table 56. Global Mirror with Practice commands (continued)	
Command	**Action**
TerminateH2I2	Removes the FlashCopy relationships after a Flash command is issued. When you use Extent Space Efficient (ESE) volumes for your practice volumes (H2), it is recommended to set the No Copy option on the H2I2 role pair. When No Copy is set, data will only be physically written to H2 when a track is updated on I2. If the practice copy of the data is no longer needed, this command can be run to remove the FlashCopy relationship from I2 to H2, to prevent the relationship from consuming backend space. **Notes:** • If the command is issued, H2 will no longer hold a consistent logical copy of the data until the next Flash or Recover is issued. • This command is only available for DS8000 practice sessions while in the Preparing, Prepared, or Suspended states. This command is not available while in the Defined or Target Available states.

Global Mirror Either Direction commands

Use this information to learn about commands available for Global Mirror Either Direction sessions.

Table 57. Global Mirror Either Direction commands	
Command	**Action**
Enable Copy to Site 1	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a Global Mirror Either Direction session. After you issue this command, the **Start H2->H1** command becomes available.
Enable Copy to Site 2	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a Global Mirror Either Direction session. After you issue this command, the **Start H1->H2** command becomes available.
Allow Practice Flash	Issued to allow a **Flash** operation again on a Practice session after it has been suspended with the **Prevent Reflash of Practice volume after Flash or Recover** option. The **Allow Practice Flash** command appears in the Preparing or Prepared states only if it is currently preventing the reflash. If the session is Preparing, the **Flash** command does not display until the session gets to the Prepared state. See “Prevent a reflash when practicing disaster recovery” on page 239 for more information on using this command.
Free Journal Space	Frees up journal space by deleting the FlashCopy relationships from the hardware. The Free Journal Space command is only available after a recover operation is issued on the Global Mirror leg of the selected session.

Table 57. Global Mirror Either Direction commands (continued)	
Command	**Action**
Recover	Issue this command to recover the session to the target site. This command performs the steps necessary to make the target host volumes consistent and available for access as the new primary site. After this command completes, the session state becomes Target Available. Do not access H2 volumes until the **Recover** command is completed and the session displays Target Available and Recoverable. A Recover to H2 also establishes a point-in-time copy to J2 to preserve the last consistent data.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Set Production to Site 1	Sets the production volume to be at Site 1 from the Defined state.
Set Production to Site 2	Sets the production volume to be at Site 2 from the Defined state.
Start	Establishes all relationships in a single-direction session and begins the process necessary to start forming consistency groups on the hardware.
Start H1->H2	Starts copying data from H1 to H2 in a Global Mirror Either Direction session. Establishes the necessary relationships in the session and begins the process necessary to start copying data from the H1 site to the H2 site and to start forming consistency groups.
Start H2->H1	Starts copying data from H2 to H1 in a Global Mirror Either Direction session. Establishes the necessary relationships in the session and begins the process necessary to start copying data from the H2 site to the H1 site and to start forming consistency groups.
StartGC H1->H2 This command is available only for Global Mirror Failover/Failback and Global Mirror Failover/Failback with Practice sessions.	Establishes Global Copy relationships between site 1 and site 2 and begins asynchronous data replication from H1 to H2. To change the session state from Preparing to Prepared, you must issue the **Start H1->H2** command and the session must form consistency groups. There is no disaster recovery protection for Global Copy relationships. If a disaster such as the loss of a primary storage system or a link failure between the sites occurs, the session might be inconsistent when you issue the **Recover** command. This command is available for the DS8000 storage system.

Table 57. Global Mirror Either Direction commands (continued)	
Command	**Action**
StartGC H2->H1	Establishes Global Copy relationships between site 1 and site 2 and begins asynchronous data replication from H2 to H1. To change the session state from Preparing to Prepared, you must issue the **Start H2->H1** command and the session must form consistency groups. There is no disaster recovery protection for Global Copy relationships. If a disaster such as the loss of a primary storage system or a link failure between the sites occurs, the session might be inconsistent when you issue the **Recover** command. This command is available for the DS8000 storage system.
Stop	Inconsistently stops the pairs that are in a Global Copy mode.
Stop When Drained	After a **StartGC** command, the session is in a Preparing and Global Copy mode. The **Stop When Drained** command starts a thread that queries all pairs until zero pairs are out-of-sync (OOS). After the OOS for the pairs goes to zero, the **Stop** command is issued. **Note:** The **Stop** command is issued, rather than **Suspend**, so that this procedure can be used in cascaded environments. **Suspend** puts the pairs in Metro Mirror mode, which is not allowed if the source of the session is the target of another relationship.

Table 57. Global Mirror Either Direction commands (continued)

Command	Action
Suspend	Pauses the Global Mirror master session, which causes the session to stop forming consistency groups, and suspends the H1 to H2 Global Copy pairs. **Note:** This action occurs only if the session is in Global Mirror mode. If the session is in Global Copy mode, the Suspend command attempts to consistently suspend the pairs by establishing the Global Copy pairs as Metro Mirror pairs. When these pairs all reach a Prepared state, a Freeze is then issued to have consistency at the remote site. **If you are using a System Storage DS8000:** The **Suspend** command invokes a pause command for IBM DS8000. The pause command that is invoked depends on the IBM DS8000 microcode level. If the following conditions are true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir -withsecondary**: • All primary volumes that are in the session are on a IBM DS8000 storage system with a microcode level that includes the pause with secondary consistency option. To determine whether this option is available for your storage system, see the IBM DS8000 documentation for the microcode level that you are using. • The pause with secondary consistency option is enabled on the storage system. If these conditions are not true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir**. Both commands temporarily pause the formation of consistency groups after the current consistency group is formed. However, the command for a pause with secondary consistency creates a consistent data set on the secondary volumes. If you do not want to suspend the Global Copy pairs when a Global Mirror session is suspended, open the `rmserver.properties` file in the *`install dir`*`\liberty\wlp\usr\servers\csmServer\properties` directory on distributed systems, or the *`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory on z/OS, and add the following property: `csm.server.sus_gc_pairs_on_gm_pause = false` **Tip:** The pause with secondary consistency option requires that the Global Copy pairs are suspended. If you do not want to use the pause with secondary consistency option for storage systems on which the option is enabled, set the **csm.server.sus_gc_pairs_on_gm_pause** property to **false**.
Terminate	Removes all physical copies and relationships from the hardware during an active session. If you want the targets to be data consistent before you remove their relationship, you must issue the **Suspend** command, the **Recover** command, and then the **Terminate** command.

Table 57. Global Mirror Either Direction commands (continued)	
Command	**Action**
TerminateH1I1 or TerminateH2I2	Removes the FlashCopy relationships after a Flash command is issued. When you use Extent Space Efficient (ESE) volumes for your practice volumes (H1 or H2), it is recommended to set the No Copy option on the H1I1 or H2I2 role pair. When No Copy is set, data will only be physically written to H1 or H2 when a track is updated on I1 or I2. If the practice copy of the data is no longer needed, this command can be run to remove the FlashCopy relationship from I1 or I2 to H1 or H2, to prevent the relationship from consuming backend space. **Notes:** • If the command is issued, H1 or H2 will no longer hold a consistent logical copy of the data until the next Flash or Recover is issued. • The command that you use, **Terminate H1I1** or **Terminate H2I2**, depends on the copy direction. • This command is only available for DS8000 practice sessions while in the Preparing, Prepared, or Suspended states. This command is not available while in the Defined or Target Available states.

Metro Global Mirror commands

Use this information to learn about commands available for Metro Global Mirror sessions.

Table 58. Metro Global Mirror commands	
Command	**Action**
Enable Copy to Site 1	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H2->H1->H3** command becomes available.
Enable Copy to Site 2	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session. After you issue this command, the **Start H1->H2->H3** command becomes available.
HyperSwap	Causes a site switch, equivalent to a suspend and recover for a Metro Mirror with failover and failback individual suspend and recover commands are not available. This command is available only for Copy Services Manager.
RecoverH1	Specifying H1 makes the H1 volume TargetAvailable. Metro Global Mirror (when running H2->H1->H3) can move production to either the H1 or H3 set of volumes. Copy Services Manager processing differs, depending on the recovery site. Therefore, the site designation is added to the **Recover** command so Copy Services Manager can set up for the failback.
RecoverH2	Specifying H2 makes the H2 volume TargetAvailable. Metro Global Mirror (when running H1->H2->H3) can move production to either the H2 or H3 set of volumes. Copy Services Manager processing is different depending on the recovery site. Therefore the site designation is added to the **Recover** command so Copy Services Manager can prepare for the failback.

Table 58. Metro Global Mirror commands (continued)	
Command	**Action**
RecoverH3	Specifying H3 makes the H3 volume TargetAvailable. Metro Global Mirror (when H1->H2->H3 is run) can then move production to the H3 set of volumes. Because Copy Services Manager processing differs depending on the recovery site, the site designation is added to the **Recover** command so that Copy Services Manager can prepare for the failback. This command prepares H3 so that you can start the application on H3. H3 becomes the active host, and you then have the option start H3->H1->H2 to perform a Global Copy copy back. The recovery establishes point-in-time copy to J3 volumes to preserve the last consistent data.
Re-enable Copy to Site 1	After you issue a **RecoverH1** command, you can run this command to restart the copy to the original the direction of replication in a failover and failback session.
Re-enable Copy to Site 2	After you issue a **RecoverH2** command, you can run this command to restart the copy to the original the direction of replication in a failover and failback session.
Re-enable Copy to Site 3	After you issue a **RecoverH3** command, you can run this command to restart the copy to the original the direction of replication in a failover and failback session.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.
Start H1->H2->H3 This command is the Metro Global Mirror initial start command.	Establishes Metro Mirror relationships between H1 and H2, and Global Mirror relationships between H2 and H3. For Metro Global Mirror, this relationship includes the J3 volume to complete the Global Mirror configuration. (The J3 volume role is the journal volume at site 3.) The **Start H1->H2->H3** command can be used from some Metro Global Mirror configurations to transition back to the starting H1->H2->H3 configuration. This command is valid only when the session is in a defined, preparing, prepared, target available, or suspended state.

Table 58. Metro Global Mirror commands (continued)

Command	Action
Start H1->H3	From the H1->H2->H3 configuration, this command changes the session configuration to a Global Mirror-only session between H1 and H3, with H1 as the source. Use this command in case of an H2 failure with transition bitmap support provided by incremental resynchronization. It can be used when a session is in preparing, prepared, and suspended states because there is not a source host change involved. You can use this command to bypass the H2 volume in case of an H2 failure and copy only the changed tracks and tracks in flight from H1 to H3. After the incremental resynchronization is performed, the session is running Global Mirror from H1 to H3 and loses the near-zero data loss protection that is achieved with Metro Mirror when H1->H2->H3 is run. However, data consistency is still maintained at the remote site with the Global Mirror solution. From H2->H1->H3 configuration, this command changes the session configuration to a Global Mirror-only session configuration between H1 and H3, with H1 as the source. Use this command when the source site has a failure and production is moved to the H1 site. For example, for an unplanned HyperSwap. The Global Mirror session is continued. This is a host-volume change so this command is valid only when you restart the H1->H3 configuration or from the TargetAvailable H2->H1->H3 state.
Start H2->H3	From the H1->H2->H3 configuration, this command moves the session configuration to a configuration between H2 and H3, with H2 as the source. Use this command when the source site has a failure and production is moved to the H2 site. For example, for an unplanned HyperSwap. The Global Mirror session is continued. This session is a host-volume change so this command is valid only when you restart the H1->H3 configuration or from the TargetAvailable H2->H1>H3 state. From the H2->H1->H3 configuration, this command changes the session configuration to a configuration between H2 and H3 with H2 as the source. Use this command in case of an H1 failure with transition bitmap support provided by incremental resynchronization. Because there is not a source-host change involved, this command can be used when the session is in the preparing, prepared, and suspended states. The **Start H2->H1->H3** command can be used to transition back to the starting H2->H1->H3 configuration.
Start H2->H1->H3 This command is the Metro Global Mirror start command.	This configuration completes the HyperSwap processing. This command creates Metro Mirror relationships between H2 and H1 and Global Mirror relationships between H1 and H3. For Metro Global Mirror, the J3 volume completes the Global Mirror configuration.
Start H3->H1->H2	After a recovery to H3 is completed, this command sets up the hardware to allow the application to begin writing to H3, and the data is copied back to H1 and H2. However, issuing this command does not guarantee consistency in the case of a disaster because only Global Copy relationships are established to cover the long-distance copy back to site 1. To move the application back to H1, you can issue a suspend while in this state to drive all the relationships to a consistent state and then issue a freeze to make the session consistent. You can then issue a **Rcover** followed by a **Start H1->H2->H3** to go back to the original configuration.

Table 58. Metro Global Mirror commands (continued)	
Command	**Action**
SuspendH2H3	Pauses the Global Mirror master session, which causes the session to stop forming consistency groups, and suspends the H2 to H3 Global Copy pairs. **If you are using a System Storage DS8000:** The **Suspend** command invokes a pause command for IBM DS8000. The pause command that is invoked depends on the IBM DS8000 microcode level. If the following conditions are true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir -withsecondary**: • All primary volumes that are in the session are on a IBM DS8000 storage system with a microcode level that includes the pause with secondary consistency option. To determine whether this option is available for your storage system, see the IBM DS8000 documentation for the microcode level that you are using. • The pause with secondary consistency option is enabled on the storage system. If these conditions are not true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir**. Both commands temporarily pause the formation of consistency groups after the current consistency group is formed. However, the command for a pause with secondary consistency creates a consistent data set on the secondary volumes. If you do not want to suspend the Global Copy pairs when a Global Mirror session is suspended, open the `rmserver.properties` file in the *`install dir`*`\liberty\wlp\usr\servers\csmServer\properties` directory on distributed systems, or the *`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory on z/OS, and add the following property: `csm.server.sus_gc_pairs_on_gm_pause = false` **Tip:** The pause with secondary consistency option requires that the Global Copy pairs are suspended. If you do not want to use the pause with secondary consistency option for storage systems on which the option is enabled, set the **csm.server.sus_gc_pairs_on_gm_pause** property to **false**.
SuspendH1H3	Pauses the Global Mirror master session, which causes the session to stop forming consistency groups, and suspends the H1 to H3 Global Copy pairs. The information that is specific to IBM DS8000 in the previous description for the **SuspendH2H3** command is also applicable to this command.

Metro Global Mirror with Practice commands

Use this information to learn about commands available for Metro Global Mirror with Practice sessions.

Table 59. Metro Global Mirror with Practice commands

Command	Action
Enable Copy to Site 1	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session.
Enable Copy to Site 2	Run this command and confirm that you want to reverse the direction of replication before you reverse the direction of copying in a failover and failback session.
Flash	This command is available in the following states: • Target Available state when the active host is H3 **Note:** Use this command if the FlashCopy portion of the Recover command from I3 to H3, fails for any reason. The problem can be addressed; and a **Flash** command can be issued to complete the flash of the consistent data from I3 to H3. • Prepared state when the active host is H1 and data is copying H1 to H2 to I3, or the active host is H2 and data is copying H2 to H1 to H3. • Prepared state when the active host is H2 and data is copying H2 to I3. • Prepared state when the active host is H1 and data is copying H1 to I3. Use this command if the FlashCopy portion of the Recover command from I3 to H3, fails for any reason. The problem can be addressed; and a **Flash** command can be issued to complete the flash of the consistent data from I3 to H3. Issuing a **Flash** command on a Global Mirror Practice session for DS8000 temporarily pauses the formation of consistency groups. Ensure that all I3s are consistent, and then flash the data from I3 to the H3 volumes. After the flash is complete, the Global Mirror session will automatically restart, and the session will begin forming consistency groups on I3. You can then use the H3 volumes to practice your disaster recovery procedures.
Allow Practice Flash	Issued to allow a **Flash** operation again on a Practice session after it has been suspended with the **Prevent Reflash of Practice volume after Flash or Recover** option. The **Allow Practice Flash** command appears in the Preparing or Prepared states only if it is currently preventing the reflash. If the session is Preparing, the **Flash** command does not display until the session gets to the Prepared state. See “Prevent a reflash when practicing disaster recovery” on page 239 for more information on using this command.
HyperSwap	Causes a site switch, equivalent to a suspend and recover for a Metro Mirror with failover and failback individual suspend and recover commands are not available. This command is available only for Copy Services Manager.

Table 59. Metro Global Mirror with Practice commands (continued)	
Command	**Action**
RecoverH1	Specifying H1 makes the H1 volume TargetAvailable. When H1->H2->H3 is run, Metro Global Mirror can move production to either the H2 or H3 set of volumes. Copy Services Manager processing differs, depending on the recovery site. Therefore the site designation is added to the **Recover** command so Copy Services Manager can prepare for the failback. The FlashCopy creates a consistent copy of the data on the H3 volumes so that an application can recover to those volumes and begin writing I/O. When the FlashCopy is complete, the session reaches a Target Available state, and you can attach your volumes on Site 3.
RecoverH2	Specifying H2 makes the H2 volume TargetAvailable. When H1->H2->H3 is run, Metro Global Mirror can move production to either the H2 or H3 set of volumes. Copy Services Manager processing differs, depending on the recovery site. Therefore the site designation is added to the **Recover** command so Copy Services Manager can prepare for the failback.
RecoverH3	Specifying H3 makes the H3 volume the TargetAvailable. When H1->H2->H3 is run, Metro Global Mirror can move production to either the H2 or H3 set of volumes. Copy Services Manager processing differs, depending on the recovery site; therefore, the site designation is added to the **Recover** command so Copy Services Manager can prepare for the failback.
Re-enable Copy to Site 1	After you issue a **RecoverH1** command, you can run this command to restart the copy to the original the direction of replication in a failover and failback session.
Re-enable Copy to Site 2	After you issue a **RecoverH2** command, you can run this command to restart the copy to the original the direction of replication in a failover and failback session.
Re-enable Copy to Site 3	After you issue a **RecoverH3** command, you can run this command to restart the copy to the original the direction of replication in a failover and failback session.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.

Table 59. Metro Global Mirror with Practice commands (continued)	
Command	**Action**
Start H1->H2->H3 This command is the Metro Global Mirror initial start command.	This command creates Metro Mirror relationships between H1 and H2, and Global Mirror relationships between H2 and H3. For Metro Global Mirror, this relationship includes the J3 volume to complete the Global Mirror configuration. (The J3 volume role is the journal volume at site 3.) The **Start H1->H2->H3** command can be used from some Metro Global Mirror configurations to return to the starting H1>H2>H3 configuration. This command is valid only when the session is in a defined, preparing, prepared, target available, or suspended state.
Start H1->H3	From the H1->H2->H3 configuration, this command changes the session configuration to a Global-Mirror-only session between H1 and H3, with H1 as the source. Use this command in case of an H2 failure with transition bitmap support provided by incremental resynchronization. Because there is not a source host change involved, it can be used when a session is in preparing, prepared, and suspended states. You can use this command to bypass the H2 volume in case of an H2 failure and copy only the changed tracks and tracks in flight from H1 to H3. After the incremental resynchronization is completed, the session is running Global Mirror from H1 to H3 and loses the near-zero data loss protection that is achieved with Metro Mirror when H1->H2->H3 is run. However, data consistency is still maintained at the remote site with the Global Mirror solution. From H2->H1->H3 configuration, this command changes the session configuration to a Global-Mirror-only session configuration between H1 and H3, with H1 as the source. Use this command when the source site has a failure and production is moved to the H1 site. For example, for an unplanned HyperSwap. The Global Mirror session is continued. This is a host-volume change so this command is valid only when you restart the H1->H3 configuration or from the TargetAvailable H2->H1->H3 state.
Start H2->H3	From the H1->H2->H3 configuration, this command moves the session configuration to a configuration between H2 and H3, with H2 as the source. Use this command when the source site has a failure and production is moved to the H2 site. For example, for an unplanned HyperSwap. The Global Mirror session is continued. This is a host-volume change so this command is valid only when you restart the H1>H3 configuration or from the TargetAvailable H2->H1->H3 state. From the H2->H1->H3 configuration, this command changes the session configuration to a configuration between H2 and H3 with H2 as the source. Use this command in case of an H1 failure with transition bitmap support provided by incremental resynchronization. Because there is not a source-host change involved, this command can be used when the session is in the preparing, prepared, and suspended states. The **Start H2->H1->H3** command can be used to return to the starting H2->H1->H3 configuration.
Start H2->H1->H3 This command is the Metro Global Mirror start command.	This configuration completes the HyperSwap processing. This command creates Metro Mirror relationships between H2 and H1 and Global Mirror relationships between H1 and H3. For Metro Global Mirror, the J3 volume completes the Global Mirror configuration.

Table 59. Metro Global Mirror with Practice commands (continued)	
Command	**Action**
Start H3->H1->H2	After a recovery to H3 is completed, this command sets up the hardware to allow the application to begin writing to H3, and the data is copied back to H1 and H2. However, issuing this command does not guarantee consistency in the case of a disaster because only Global Copy relationships are established to cover the long-distance copy back to site 1. To move the application back to H1, you can issue a suspend while in this state to drive all the relationships to a consistent state and then issue a freeze to make the session consistent. You can then issue a **Rcover** followed by a **Start H1->H2->H3** to go back to the original configuration.
SuspendH2H3	Pauses the Global Mirror master session, which causes the session to stop forming consistency groups, and suspends the H2 to H3 Global Copy pairs. **If you are using a System Storage DS8000:** The **Suspend** command invokes a pause command for IBM DS8000. The pause command that is invoked depends on the IBM DS8000 microcode level. If the following conditions are true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir -withsecondary**: • All primary volumes that are in the session are on a IBM DS8000 storage system with a microcode level that includes the pause with secondary consistency option. To determine whether this option is available for your storage system, see the IBM DS8000 documentation for the microcode level that you are using. • The pause with secondary consistency option is enabled on the storage system. If these conditions are not true, the **Suspend** command invokes a command that is equivalent to the IBM DS8000 command **pausegmir**. Both commands temporarily pause the formation of consistency groups after the current consistency group is formed. However, the command for a pause with secondary consistency creates a consistent data set on the secondary volumes. If you do not want to suspend the Global Copy pairs when a Global Mirror session is suspended, open the `rmserver.properties` file in the *`install dir`*`\liberty\wlp\usr\servers\csmServer\properties` directory on distributed systems, or the *`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory on z/OS, and add the following property: `csm.server.sus_gc_pairs_on_gm_pause = false` **Tip:** The pause with secondary consistency option requires that the Global Copy pairs are suspended. If you do not want to use the pause with secondary consistency option for storage systems on which the option is enabled, set the **csm.server.sus_gc_pairs_on_gm_pause** property to **false**.

Table 59. Metro Global Mirror with Practice commands (continued)	
Command	**Action**
SuspendH1H3	Pauses the Global Mirror master session, which causes the session to stop forming consistency groups, and suspends the H1 to H3 Global Copy pairs. The information that is specific to IBM DS8000 in the previous description for the **SuspendH2H3** command is also applicable to this command.
Terminate	This command terminates all copy relationships on the hardware.
TerminateH3I3	Removes the FlashCopy relationships after a Flash command is issued. When you use Extent Space Efficient (ESE) volumes for your practice volumes (H3), it is recommended to set the No Copy option on the H3I3 role pair. When No Copy is set, data will only be physically written to H3 when a track is updated on I3. If the practice copy of the data is no longer needed, this command can be run to remove the FlashCopy relationship from I3 to H3, to prevent the relationship from consuming backend space. **Notes:** • If the command is issued, H3 will no longer hold a consistent logical copy of the data until the next Flash or Recover is issued. • This command is only available for DS8000 practice sessions while in the Preparing, Prepared, or Suspended states. This command is not available while in the Defined or Target Available states.

Metro Mirror - Metro Mirror commands

Use this information to learn about commands available for Metro Mirror - Metro Mirror sessions.

Table 60. Metro Mirror - Metro Mirror commands	
Command	**Action**
Confirm Production at Site 1	Confirms that you want to establish site 1 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 2	Confirms that you want to establish site 2 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 3	Confirms that you want to establish site 3 as the production site after you issue suspend and recover commands for the session.
FailoverH1	Completes a failover operation to the H1 target site. This command enables read and write access to the target volumes. At the same time, it maintains a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH1 command is required.
FailoverH2	Completes a failover operation to the H2 target site. This command enables read and write access to the target volumes. At the same time, it maintains a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH2 command is required.

Table 60. Metro Mirror - Metro Mirror commands (continued)	
Command	**Action**
FailoverH3	Completes a failover operation to the H3 target site. This command enables read and write access to the target volumes. At the same time, it maintains a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH3 command is required.
HyperSwap H1	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H1, without affecting the application that is using those volumes.
HyperSwap H2	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H2, without affecting the application that is using those volumes.
HyperSwap H3	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H3, without affecting the application that is using those volumes.
RecoverH1	Recovers the session to the H1 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH2	Recovers the session to the H2 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH3	Recovers the session to the H3 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
Re-enable Original Direction	Sets the production site back to the original site and reenables the start commands in the original direction. You can use this command after you issue the suspend, recover, and confirm commands.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.
Set Production to Site 1	Establishes Site 1 as the production site while the session is in the Defined state. After you issue this command, the **Start H1->H2** and **Start H1->H3** commands become available.

Table 60. Metro Mirror - Metro Mirror commands (continued)	
Command	**Action**
Set Production to Site 2	Establishes Site 2 as the production site while the session is in the Defined state. After you issue this command, the **Start H2->H1** and **Start H2->H3** commands become available.
Set Production to Site 3	Establishes Site 3 as the production site while the session is in the Defined state. After you issue this command, the **Start H3->H1** and **Start H3->H2** commands become available.
Start	Establishes Metro Mirror relationships between the volumes on the production site and the volumes at the other sites in the session, and begins data replication to those sites. For example, if Site 1 is the production site, data replication occurs between the H1 and H2 volumes and the H1 and H3 volumes at the same time.
Start H1->H2	Establishes Metro Mirror relationships between the H1 volumes and the H2 volumes, and begins data replication from H1 to H2.
Start H1->H3	Establishes Metro Mirror relationships between the H1 volumes and the H3 volumes, and begins data replication from H1 to H3.
Start H2->H1	Establishes Metro Mirror relationships between the H2 volumes and the H1 volumes and starts data replication from H2 to H1.
Start H2->H3	Establishes Metro Mirror relationships between the H2 volumes and the H3 volumes and starts data replication from H2 to H3.
Start H3->H1	Establishes Metro Mirror relationships between the H3 volumes and the H1 volumes and starts data replication from H3 to H1.
Start H3->H2	Establishes Metro Mirror relationships between the H3 volumes and the H2 volumes and starts data replication from H3 to H2.
StartGC	Establishes Global Copy relationships between the volumes on the production site and the volumes at the other sites in the session, and begins asynchronous data replication to those sites. For example, if Site 1 is the production site, data replication occurs between the H1 and H2 volumes and the H1 and H3 volumes at the same time. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H1->H2	Establishes Global Copy relationships between the H1 volumes and the H2 volumes, and begins asynchronous data replication from H1 to H2. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H1->H3	Establishes Global Copy relationships between the H1 volumes and the H3 volumes, and begins asynchronous data replication from H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H2->H1	Establishes Global Copy relationships between the H2 volumes and the H1 volumes, and begins asynchronous data replication from H2 to H1. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.

Table 60. Metro Mirror - Metro Mirror commands (continued)	
Command	**Action**
StartGC H2->H3	Establishes Global Copy relationships between the H2 volumes and the H3 volumes, and begins asynchronous data replication from H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H3->H1	Establishes Global Copy relationships between the H3 volumes and the H1 volumes, and begins asynchronous data replication from H3 to H1. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H3->H2	Establishes Global Copy relationships between the H3 volumes and the H2 volumes, and begins asynchronous data replication from H3 to H2. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
Stop	Stops updates to all the target volumes of the pairs in a session. The following information applies to this command and the following **Stop** commands: • Targets are not consistent after the stop. • You can issue the command at any point during an active session.
StopH1H2	Stops updates from H1 to H2 volumes in a session.
StopH1H3	Stops updates from H1 to H3 volumes in a session.
StopH2H1	Stops updates from H2 to H1 volumes in a session.
StopH2H3	Stops updates from H2 to H3 volumes in a session.
StopH3H1	Stops updates from H3 to H1 volumes in a session.
StopH3H2	Stops updates from H3 to H2 volumes in a session.
Suspend	Suspends updates to all the target volumes of the pairs in a session. The following information applies to this command and the following **Suspend** commands: • You can issue the command at any point during an active session. • Avoid use of the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If other Metro Mirror sessions overlap the same LSS pairs as in this session, those sessions are also suspended. • When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection.

Table 60. Metro Mirror - Metro Mirror commands (continued)	
Command	**Action**
SuspendH1H2	Suspends updates from H1 to H2 volumes in a session.
SuspendH1H3	Suspends updates from H1 to H3 volumes in a session.
SuspendH2H1	Suspends updates from H2 to H1 volumes in a session.
SuspendH2H3	Suspends updates from H2 to H3 volumes in a session.
SuspendH3H1	Suspends updates from H3 to H1 volumes in a session.
SuspendH3H2	Suspends updates from H3 to H2 volumes in a session.
Terminate	Removes all copy relationships from the hardware during an active session. If you want the targets to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **Suspend** • **RecoverHx** Where x is the site to which you want to recover.
TerminateH1H2	Removes all H1>H2 or H2>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H2** • **Recoverx** Where x is the site to which you want to recover.
TerminateH1H3	Removes all H1>H3 or H3>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH2H3	Removes all H2>H3 or H3>H2 relationships from the hardware during an active session. • **SuspendH2H3** • **Recoverx** Where x is the site to which you want to recover.

Metro Mirror - Global Mirror commands

Use this information to learn about commands available for Metro Mirror - Global Mirror sessions.

Table 61. Metro Mirror - Global Mirror commands

Command	Action
Confirm Production at Site 1	Confirms that you want to establish site 1 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 2	Confirms that you want to establish site 2 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 3	Confirms that you want to establish site 3 as the production site after you issue suspend and recover commands for the session.
FailoverH1	Completes a failover operation to the H1 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH1 command is required.
FailoverH2	Completes a failover operation to the H2 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH2 command is required.
FailoverH3	Completes a failover operation to the H3 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH3 command is required.
HyperSwap H1	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H1, without affecting the application that is using those volumes.
HyperSwap H2	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H2, without affecting the application that is using those volumes.
RecoverH1	Recovers the session to the H1 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH2	Recovers the session to the H2 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH3	Recovers the session to the H3 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.

Table 61. Metro Mirror - Global Mirror commands (continued)	
Command	**Action**
Re-enable Original Direction	Sets the production site back to the original site and reenables the start commands in the original direction. You can use this command after you issue the confirm commands.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.
ResumeGM	Resumes the Global Mirror master session on the hardware allowing the hardware to restart all relationships and consistency group formation. The command does not do any of the additional checks such as establishing for logical paths, etc. that are run by issuing the **Start** command. This command is only recommended to be used when the session is suspended for a short amount of time, such as when creating a FlashCopy or Safeguarded Copy backup at the remote site. **Note:** The command does not work for sessions that are suspended and share the same consistency group on the hardware. When sessions share a consistency group, the **Suspend** command removes the volumes of the suspended session out of the hardware session in order to allow other sessions to continue to form consistency groups. So the **ResumeGM** command will not cause the pairs in the suspended session to be restarted, you must run the **Start** command for the same.
Set Production to Site 1	Establishes Site 1 as the production site while the session is in the Defined state. After you issue this command, the Site 1 **Start** commands become available.
Set Production to Site 2	Establishes Site 2 as the production site while the session is in the Defined state. After you issue this command, the Site 2 **Start** commands become available.
Set Production to Site 3	Establishes Site 3 as the production site while the session is in the Defined state. After you issue this command, the **StartGC H3->H1->H2** and **StartGC H3->H2->H1** commands become available.
Start H1->H2, H1->H3	Establishes Metro Mirror relationships between H1 and H2 volumes, and Global Mirror relationships between H1 and H3, and starts forming consistency groups. This relationship includes the J3 volume to complete the Global Mirror configuration.

Table 61. Metro Mirror - Global Mirror commands (continued)	
Command	**Action**
Start H1->H2->H3	Establishes Metro Mirror relationships between H1 and H2, and Global Mirror relationships between H2 and H3. The **Start H1->H2->H3** command can be used to transition from a multi-target configuration to a cascaded configuration. You can only transition from multi-target to cascaded if the Global Mirror leg is suspended.
Start H1->H2	Establishes Metro Mirror relationships between the H1 volumes and the H2 volumes, and begins data replication from H1 to H2.
Start GM H1->H3	Establishes a Global Mirror relationship between H1 and H3, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.
Start H2->H1, H2->H3	Establishes Metro Mirror relationships between H2 and H1 volumes, and Global Mirror relationships between H2 and H3, and starts forming consistency groups. This relationship includes the J3 volume to complete the Global Mirror configuration.
Start H2->H1	Establishes Metro Mirror relationships between the H2 volumes and the H1 volumes and starts data replication from H2 to H1.
Start GM H2->H3	Establishes a Global Mirror relationship between H2 and H3, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.
StartGC H1->H2, H1->H3	Establishes Global Copy relationships between the H1 and H2 volumes and between H1 and H3 volumes, and begins asynchronous data replication from H1 to H2 and H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H1->H2	Establishes Global Copy relationships between the H1 volumes and the H2 volumes, and begins asynchronous data replication from H1 to H2. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H1->H3	Establishes Global Copy relationships between the H1 volumes and the H3 volumes, and begins asynchronous data replication from H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H2->H1, H2->H3	Establishes Global Copy relationships between the H2 and H1 volumes and between H2 and H3 volumes, and begins asynchronous data replication from H2 to H1 and H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H2->H1	Establishes Global Copy relationships between the H2 volumes and the H1 volumes, and begins asynchronous data replication from H2 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.

Table 61. Metro Mirror - Global Mirror commands (continued)	
Command	**Action**
StartGC H2->H3	Establishes Global Copy relationships between the H2 volumes and the H3 volumes, and begins asynchronous data replication from H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H3->H1->H2	Establishes Global Copy relationships between the H3 volumes, and the H1 volumes, and H2 volumes, and begins asynchronous data replication from H3 to H1 and H2. The session remains in the Preparing state until you issue a Suspend, Stop, or Terminate command.
StartGC H3->H2->H1	Establishes Global Copy relationships between the H3 volumes, and the H2 volumes, and the H1 volumes, and begins asynchronous data replication from H3 to H2 and H1. The session remains in the Preparing state until you issue a Suspend, Stop, or Terminate command.
Stop	Stops updates to all the target volumes of the pairs in a session. Targets are not consistent after the stop.
StopH1H2	Stops updates from H1 to H2 volumes in a session.
StopH1H3	Stops updates from H1 to H3 volumes in a session.
StopH2H1	Stops updates from H2 to H1 volumes in a session.
StopH2H3	Stops updates from H2 to H3 volumes in a session.
Suspend	Suspends updates to all the target volumes of the pairs in a session. The following information applies to this command and the following **Suspend** commands: • You can issue the command at any point during an active session. • Avoid use of the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If other Metro Mirror sessions overlap the same LSS pairs as in this session, those sessions are also suspended. • When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection.
Suspend When Drained	Suspends the session after all I/O drains to the tertiary site and marks all volumes at all sites as consistent. All I/O must be quiesced before you issue this command.
SuspendH1H2	Suspends updates from H1 to H2 volumes in a session.

Table 61. Metro Mirror - Global Mirror commands (continued)	
Command	**Action**
SuspendH1H3	Suspends updates from H1 to H3 volumes in a session.
SuspendH2H1	Suspends updates from H2 to H1 volumes in a session.
SuspendH2H3	Suspends updates from H2 to H3 volumes in a session.
Terminate	Removes all copy relationships from the hardware during an active session. If you want the targets to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **Suspend** • **RecoverHx** Where x is the site to which you want to recover.
TerminateH1H2	Removes all H1>H2 or H2>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H2** • **Recoverx** Where x is the site to which you want to recover.
TerminateH1H3	Removes all H1>H3 or H3>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH2H3	Removes all H2>H3 or H3>H2 relationships from the hardware during an active session. • **SuspendH2H3** • **Recoverx** Where x is the site to which you want to recover.

Metro Mirror - Global Mirror with Practice commands

Use this information to learn about commands available for Metro Mirror - Global Mirror with Practice sessions.

Table 62. Metro Mirror - Global Mirror with Practice commands	
Command	**Action**
Confirm Production at Site 1	Confirms that you want to establish site 1 as the production site after you issue suspend and recover commands for the session.

Table 62. Metro Mirror - Global Mirror with Practice commands (continued)	
Command	**Action**
Confirm Production at Site 2	Confirms that you want to establish site 2 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 3	Confirms that you want to establish site 3 as the production site after you issue suspend and recover commands for the session.
FailoverH1	Completes a failover operation to the H1 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH1 command is required.
FailoverH2	Completes a failover operation to the H2 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH2 command is required.
FailoverH3	Completes a failover operation to the H3 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH3 command is required.
HyperSwap H1	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H1, without affecting the application that is using those volumes.
HyperSwap H2	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H2, without affecting the application that is using those volumes.
RecoverH1	Recovers the session to the H1 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH2	Recovers the session to the H2 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH3	Recovers the session to the H3 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.

Table 62. Metro Mirror - Global Mirror with Practice commands (continued)	
Command	**Action**
Flash	This command is available in the following states: • Prepared state when the active host is H1 and data is copying H1 to I3 • Prepared state when the active host is H2 and data is copying H2 to I3 If you issue a Flash command on a Global Mirror with Practice session for DS8000®, it temporarily pauses the formation of consistency groups. Ensure that all I3s are consistent, and then flash the data from I3 to the H3 volumes. After the flash is complete, the Global Mirror session automatically restarts, and the session begins forming consistency groups on I3. You can then use the H3 volumes to practice your disaster recovery procedures.
Allow Practice Flash	Issued to allow a **Flash** operation again on a Practice session after it has been suspended with the **Prevent Reflash of Practice volume after Flash or Recover** option. The **Allow Practice Flash** command appears in the Preparing or Prepared states only if it is currently preventing the reflash. If the session is Preparing, the **Flash** command does not display until the session gets to the Prepared state. See “Prevent a reflash when practicing disaster recovery” on page 239 for more information on using this command.
Re-enable Original Direction	Sets the production site back to the original site and reenables the start commands in the original direction. You can use this command after you issue the confirm commands.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.

Table 62. Metro Mirror - Global Mirror with Practice commands (continued)	
Command	**Action**
ResumeGM	Resumes the Global Mirror master session on the hardware allowing the hardware to restart all relationships and consistency group formation. The command does not do any of the additional checks such as establishing for logical paths, etc. that are run by issuing the **Start** command. This command is only recommended to be used when the session is suspended for a short amount of time, such as when creating a FlashCopy or Safeguarded Copy backup at the remote site. **Note:** The command does not work for sessions that are suspended and share the same consistency group on the hardware. When sessions share a consistency group, the **Suspend** command removes the volumes of the suspended session out of the hardware session in order to allow other sessions to continue to form consistency groups. So the **ResumeGM** command will not cause the pairs in the suspended session to be restarted, you must run the **Start** command for the same.
Set Production to Site 1	Establishes Site 1 as the production site while the session is in the Defined state. After you issue this command, the Site 1 **Start** commands become available.
Set Production to Site 2	Establishes Site 2 as the production site while the session is in the Defined state. After you issue this command, the Site 2 **Start** commands become available.
Set Production to Site 3	Establishes Site 3 as the production site while the session is in the Defined state. After you issue this command, the **StartGC H3->H1->H2** and **StartGC H3->H2->H1** commands become available.
Start H1->H2, H1->H3	Establishes Metro Mirror relationships between H1 and H2 volumes, and Global Mirror relationships between H1 and H3, and starts forming consistency groups. This relationship includes the J3 volume to complete the Global Mirror configuration.
Start H1->H2->H3	Establishes Metro Mirror relationships between H1 and H2, and Global Mirror relationships between H2 and H3. The **Start H1->H2->H3** command can be used to transition from a multi-target configuration to a cascaded configuration. You can only transition from multi-target to cascaded if the Global Mirror leg is suspended.
Start H1->H2	Establishes Metro Mirror relationships between the H1 volumes and the H2 volumes, and begins data replication from H1 to H2.
Start GM H1->H3	Establishes a Global Mirror relationship between H1 and H3, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.
Start H2->H1, H2->H3	Establishes Metro Mirror relationships between H2 and H1 volumes, and Global Mirror relationships between H2 and H3, and starts forming consistency groups. This relationship includes the J3 volume to complete the Global Mirror configuration.
Start H2->H1	Establishes Metro Mirror relationships between the H2 volumes and the H1 volumes and starts data replication from H2 to H1.
Start GM H2->H3	Establishes a Global Mirror relationship between H2 and H3, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.

Table 62. Metro Mirror - Global Mirror with Practice commands (continued)	
Command	**Action**
StartGC H1->H2, H1->H3	Establishes Global Copy relationships between the H1 and H2 volumes and between H1 and H3 volumes, and begins asynchronous data replication from H1 to H2 and H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H1->H2	Establishes Global Copy relationships between the H1 volumes and the H2 volumes, and begins asynchronous data replication from H1 to H2. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H1->H3	Establishes Global Copy relationships between the H1 volumes and the H3 volumes, and begins asynchronous data replication from H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H2->H1, H2->H3	Establishes Global Copy relationships between the H2 and H1 volumes and between H2 and H3 volumes, and begins asynchronous data replication from H2 to H1 and H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H2->H1	Establishes Global Copy relationships between the H2 volumes and the H1 volumes, and begins asynchronous data replication from H2 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H2->H3	Establishes Global Copy relationships between the H2 volumes and the H3 volumes, and begins asynchronous data replication from H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H3->H1->H2	Establishes Global Copy relationships between the H3 volumes, and the H1 volumes, and H2 volumes, and begins asynchronous data replication from H3 to H1 and H2. The session remains in the Preparing state until you issue a Suspend, Stop, or Terminate command.
StartGC H3->H2->H1	Establishes Global Copy relationships between the H3 volumes, and the H2 volumes, and the H1 volumes, and begins asynchronous data replication from H3 to H2 and H1. The session remains in the Preparing state until you issue a Suspend, Stop, or Terminate command.
Stop	Stops updates to all the target volumes of the pairs in a session. Targets are not consistent after the stop.
StopH1H2	Stops updates from H1 to H2 volumes in a session.

Table 62. Metro Mirror - Global Mirror with Practice commands (continued)	
Command	**Action**
StopH1H3	Stops updates from H1 to H3 volumes in a session.
StopH2H1	Stops updates from H2 to H1 volumes in a session.
StopH2H3	Stops updates from H2 to H3 volumes in a session.
Suspend	Suspends updates to all the target volumes of the pairs in a session. The following information applies to this command and the following **Suspend** commands: • You can issue the command at any point during an active session. • Avoid the use of the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If other Metro Mirror sessions overlap the same LSS pairs as in this session, those sessions are also suspended. • When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection.
Suspend When Drained	Suspends the session after all I/O drains to the tertiary site and marks all volumes at all sites as consistent. All I/O must be quiesced before you issue this command.
SuspendH1H2	Suspends updates from H1 to H2 volumes in a session.
SuspendH1H3	Suspends updates from H1 to H3 volumes in a session.
SuspendH2H1	Suspends updates from H2 to H1 volumes in a session.
SuspendH2H3	Suspends updates from H2 to H3 volumes in a session.
Terminate	Removes all copy relationships from the hardware during an active session. If you want the targets to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **Suspend** • **RecoverHx** Where x is the site to which you want to recover.
TerminateH1H2	Removes all H1>H2 or H2>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H2** • **Recoverx** Where x is the site to which you want to recover.

Table 62. Metro Mirror - Global Mirror with Practice commands (continued)	
Command	**Action**
TerminateH1H3	Removes all H1>H3 or H3>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH2H3	Removes all H2>H3 or H3>H2 relationships from the hardware during an active session. • **SuspendH2H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH3I3	Removes the FlashCopy relationships after a Flash command is issued. When you use Extent Space Efficient (ESE) volumes for your practice volumes (H3), it is recommended to set the No Copy option on the H3I3 role pair. When No Copy is set, data will only be physically written to H3 when a track is updated on I3. If the practice copy of the data is no longer needed, this command can be run to remove the FlashCopy relationship from I3 to H3, to prevent the relationship from consuming backend space. **Notes:** • If the command is issued, H3 will no longer hold a consistent logical copy of the data until the next Flash or Recover is issued. • This command is only available for DS8000 practice sessions while in the Preparing, Prepared, or Suspended states. This command is not available while in the Defined or Target Available states.

Example: Set the production site and starting a Metro Mirror copy to both targets

In this example, the production site is site 1 and H1>H2 and H1>H3 are in the Defined state. To change to the production site to site 3 and start a Metro Mirror copy to both H1 and H2, issue the commands in the order that is presented:

1. **Set Production to Site 3**
2. **Start**

Example: Set the production site and starting a Global Copy to both targets

In this example, the production site is site 1 and H1>H2 and H1>H3 are in the Defined state. To change to the production site to site 3 and start a Global Copy to both H1 and H2, issue the commands in the order that is presented:

1. **Set Production to Site 3**
2. **Start GC**

Example: Set the production site and starting a Metro Mirror copy to a single target

In this example, the production site is site 1 and H1>H2 and H1>H3 are in the Defined state. To change to the production site to site 3 and start a Metro Mirror copy only to H2, issue the commands in the order that is presented:

1. **Set Production to Site 3**
2. **Start H3->H2**

Example: Set the production site and starting Metro Mirror copy to one target and a Global Copy to the second target

In this example, the production site is site 1 and H1>H2 and H1>H3 are in the Defined state. To change the production site to site 3 and start a Metro Mirror copy to H2 and a Global Copy to H1, issue the commands in the following order:

1. **Set Production to Site 3**
2. **Start H3->H2**
3. **Start GC H3->H1**

Example: Change the production site after you recover to the site

In this example, the production site is site 1 and H1>H2 and H1>H3 are active. To recover to site 2 and confirm the production site as site 2, issue the following commands:

1. **Suspend**
2. **RecoverH2**
3. **Confirm Production at Site 2**

Example: Reenable the original production site

In this example, the production site is site 2 and H2>H1 and H2>H3 are active after issuing the commands in the preceding example. To re-enable H1 as the production site, issue the **Re-enable Original Direction** command.

Example: Complete a failover to a single target for practice

In this example, the production site is site 1 and H1>H2 and H1>H3 are active. To fail over to site 3, issue the following commands in the order that is presented:

1. **SuspendH1H3**
2. **FailoverH3**

If the production site is site 2 and H2>H1 and H2>H3 are active, issue the following commands to fail over to site 3:

1. **SuspendH2H3**
2. **FailoverH3**

Example: Suspend the copy of data to both target sites

In this example, the production site is site 1 and H1>H2 and H1>H3 are active. To suspend the copy of data to both target sites, issue the **Suspend** command.

Example: Suspend the copy of data to a single target site

In this example, the production site is site 1 and H1>H2 and H1>H3 are active. To suspend the copy of data only from H1 to H3, issue the **SuspendH1H3** command.

Example: Stop the copy of data to both target sites

In this example, the production site is site 1 and H1>H2 and H1>H3 are active. To stop the copy of data to both target sites, issue the **Stop** command.

Example: Stop the copy of data to a single target site

In this example, the production site is site 1 and H1>H2 and H1>H3 are active. To stop the copy of data only from H1 to H3, issue the **StopH1H3** command.

Metro Mirror - Global Mirror with Site 3 Global Mirror commands

Use this information to learn about commands available for Metro Mirror - Global Mirror with Site 3 Global Mirror sessions.

Table 63. Metro Mirror - Global Mirror with Site 3 Global Mirror commands

Command	Action
Confirm Production at Site 1	Confirms that you want to establish site 1 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 2	Confirms that you want to establish site 2 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 3	Confirms that you want to establish site 3 as the production site after you issue suspend and recover commands for the session.
FailoverH1	Completes a failover operation to the H1 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH1 command is required.
FailoverH2	Completes a failover operation to the H2 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH2 command is required.
FailoverH3	Completes a failover operation to the H3 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH3 command is required.
RecoverH1	Recovers the session to the H1 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH2	Recovers the session to the H2 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH3	Recovers the session to the H3 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.

Table 63. Metro Mirror - Global Mirror with Site 3 Global Mirror commands (continued)	
Command	**Action**
Re-enable Original Direction	Sets the production site back to the original site and reenables the start commands in the original direction. You can use this command after you issue the confirm commands.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.
ResumeGM	Resumes the Global Mirror master session on the hardware allowing the hardware to restart all relationships and consistency group formation. The command does not do any of the additional checks such as establishing for logical paths, etc. that are run by issuing the **Start** command. This command is only recommended to be used when the session is suspended for a short amount of time, such as when creating a FlashCopy or Safeguarded Copy backup at the remote site. **Note:** The command does not work for sessions that are suspended and share the same consistency group on the hardware. When sessions share a consistency group, the **Suspend** command removes the volumes of the suspended session out of the hardware session in order to allow other sessions to continue to form consistency groups. So the **ResumeGM** command will not cause the pairs in the suspended session to be restarted, you must run the **Start** command for the same.
Set Production to Site 1	Establishes Site 1 as the production site while the session is in the Defined state. After you issue this command, the Site 1 **Start** commands become available.
Set Production to Site 2	Establishes Site 2 as the production site while the session is in the Defined state. After you issue this command, the Site 2 **Start** commands become available.
Set Production to Site 3	Establishes Site 3 as the production site while the session is in the Defined state. After you issue this command, the **StartGC H3->H1->H2** and **StartGC H3->H2->H1** commands become available.
Start H1->H2, H1->H3	Establishes Metro Mirror relationships between H1 and H2 volumes, and Global Mirror relationships between H1 and H3, and starts forming consistency groups. This relationship includes the J3 volume to complete the Global Mirror configuration.

Table 63. Metro Mirror - Global Mirror with Site 3 Global Mirror commands (continued)	
Command	**Action**
Start H1->H2->H3	Establishes Metro Mirror relationships between H1 and H2, and Global Mirror relationships between H2 and H3. The **Start H1->H2->H3** command can be used to transition from a multi-target configuration to a cascaded configuration. You can only transition from multi-target to cascaded if the Global Mirror leg is suspended.
Start H1->H2	Establishes Metro Mirror relationships between the H1 volumes and the H2 volumes, and begins data replication from H1 to H2.
Start GM H1->H3	Establishes a Global Mirror relationship between H1 and H3, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.
Start H2->H1, H2->H3	Establishes Metro Mirror relationships between H2 and H1 volumes, and Global Mirror relationships between H2 and H3, and starts forming consistency groups. This relationship includes the J3 volume to complete the Global Mirror configuration.
Start H2->H1	Establishes Metro Mirror relationships between the H2 volumes and the H1 volumes and starts data replication from H2 to H1.
Start GM H2->H3	Establishes a Global Mirror relationship between H2 and H3, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.
StartGC H1->H2, H1->H3	Establishes Global Copy relationships between the H1 and H2 volumes and between H1 and H3 volumes, and begins asynchronous data replication from H1 to H2 and H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H1->H2	Establishes Global Copy relationships between the H1 volumes and the H2 volumes, and begins asynchronous data replication from H1 to H2. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H1->H3	Establishes Global Copy relationships between the H1 volumes and the H3 volumes, and begins asynchronous data replication from H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H2->H1, H2->H3	Establishes Global Copy relationships between the H2 and H1 volumes and between H2 and H3 volumes, and begins asynchronous data replication from H2 to H1 and H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H2->H1	Establishes Global Copy relationships between the H2 volumes and the H1 volumes, and begins asynchronous data replication from H2 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.

Table 63. Metro Mirror - Global Mirror with Site 3 Global Mirror commands (continued)	
Command	**Action**
StartGC H2->H3	Establishes Global Copy relationships between the H2 volumes and the H3 volumes, and begins asynchronous data replication from H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H3->H1->H2	Establishes Global Copy relationships between the H3 volumes, and the H1 volumes, and H2 volumes, and begins asynchronous data replication from H3 to H1 and H2. The session remains in the Preparing state until you issue a Suspend, Stop, or Terminate command.
StartGC H3->H2->H1	Establishes Global Copy relationships between the H3 volumes, and the H2 volumes, and the H1 volumes, and begins asynchronous data replication from H3 to H2 and H1. The session remains in the Preparing state until you issue a Suspend, Stop, or Terminate command.
StartGM H3->H2->H1	Establishes Global Mirror relationships between the H3 volumes and the H2 volumes, followed by a cascaded Global Copy relationship from the H2 volumes and the H1 volumes. This command starts the session from Site 3 with disaster recovery capabilities by using Global Mirror to ensure that the H2 volumes are consistent.
StartGM H3->H1->H2	Establishes Global Mirror relationships between the H3 volumes and the H1 volumes, followed by a cascaded Global Copy relationship from the H1 volumes and the H2 volumes. This command starts the session from Site 3 with disaster recovery capabilities by using Global Mirror to ensure that the H1 volumes are consistent.
Stop	Stops updates to all the target volumes of the pairs in a session. Targets are not consistent after the stop.
StopH1H2	Stops updates from H1 to H2 volumes in a session.
StopH1H3	Stops updates from H1 to H3 volumes in a session.
StopH2H1	Stops updates from H2 to H1 volumes in a session.
StopH2H3	Stops updates from H2 to H3 volumes in a session.

Table 63. Metro Mirror - Global Mirror with Site 3 Global Mirror commands (continued)	
Command	**Action**
Suspend	Suspends updates to all the target volumes of the pairs in a session. The following information applies to this command and the following **Suspend** commands: • You can issue the command at any point during an active session. • Avoid use of the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If other Metro Mirror sessions overlap the same LSS pairs as in this session, those sessions are also suspended. • When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection.
Suspend When Drained	Suspends the session after all I/O drains to the tertiary site and marks all volumes at all sites as consistent. All I/O must be quiesced before you issue this command.
SuspendH1H2	Suspends updates from H1 to H2 volumes in a session.
SuspendH1H3	Suspends updates from H1 to H3 volumes in a session.
SuspendH2H1	Suspends updates from H2 to H1 volumes in a session.
SuspendH2H3	Suspends updates from H2 to H3 volumes in a session.
Terminate	Removes all copy relationships from the hardware during an active session. If you want the targets to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **Suspend** • **RecoverHx** Where x is the site to which you want to recover.
TerminateH1H2	Removes all H1>H2 or H2>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H2** • **Recoverx** Where x is the site to which you want to recover.

Table 63. Metro Mirror - Global Mirror with Site 3 Global Mirror commands (continued)	
Command	**Action**
TerminateH1H3	Removes all H1>H3 or H3>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH2H3	Removes all H2>H3 or H3>H2 relationships from the hardware during an active session. • **SuspendH2H3** • **Recoverx** Where x is the site to which you want to recover.

Metro Mirror - Global Mirror with Site 4 Replication commands

Use this information to learn about commands available for Metro Mirror - Global Mirror with Site 4 Replication sessions.

Table 64. Metro Mirror - Global Mirror with Site 4 Replication commands	
Command	**Action**
Confirm Production at Site 1	Confirms that you want to establish site 1 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 2	Confirms that you want to establish site 2 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 3	Confirms that you want to establish site 3 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 4	Confirms that you want to establish site 4 as the production site after you issue suspend and recover commands for the session.
FailoverH1	Completes a failover operation to the H1 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH1 command is required.
FailoverH2	Completes a failover operation to the H2 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH2 command is required.

Table 64. Metro Mirror - Global Mirror with Site 4 Replication commands (continued)	
Command	**Action**
FailoverH3	Completes a failover operation to the H3 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH3 command is required.
FailoverH4	Completes a failover operation to the H4 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH4 command is required.
Free Journal Space	Frees up journal space by deleting the FlashCopy relationships from the hardware. The Free Journal Space command is only available after a recover operation is issued on the Global Mirror leg of the selected session.
HyperSwap H1	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H1, without affecting the application that is using those volumes.
HyperSwap H2	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H2, without affecting the application that is using those volumes.
HyperSwap H3	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H3, without affecting the application that is using those volumes.
HyperSwap H4	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H4, without affecting the application that is using those volumes.
RecoverH1	Recovers the session to the H1 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH2	Recovers the session to the H2 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH3	Recovers the session to the H3 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH4	Recovers the session to the H4 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.

Table 64. Metro Mirror - Global Mirror with Site 4 Replication commands (continued)	
Command	**Action**
Re-enable Original Direction	Sets the production site back to the original site and re-enables the start commands in the original direction. You can use this command after you issue the confirm commands.
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.
Set Production to Site 1	Establishes Site 1 as the production site while the session is in the Defined state. After you issue this command, the Site 1 **Start** commands become available.
Set Production to Site 2	Establishes Site 2 as the production site while the session is in the Defined state. After you issue this command, the Site 2 **Start** commands become available.
Set Production to Site 3	Establishes Site 3 as the production site while the session is in the Defined state. After you issue this command, the Site 3 **Start** commands become available.
Set Production to Site 4	Establishes Site 4 as the production site while the session is in the Defined state. After you issue this command, the Site 4 **Start** commands become available.
Start H1->H2 H1->H3	Establishes Metro Mirror relationships between H1 and H2 volumes, and Global Mirror relationships between H1 and H3, and starts forming consistency groups. This relationship includes the J3 volume to complete the Global Mirror configuration.
Start H1->H2	Establishes Metro Mirror relationships between the H1 volumes and the H2 volumes, and begins data replication from H1 to H2.
Start GM H1->H3	Establishes a Global Mirror relationship between H1 and H3, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.
Start H2->H1 H2->H3	Establishes Metro Mirror relationships between H2 and H1 volumes, and Global Mirror relationships between H2 and H3, and starts forming consistency groups. This relationship includes the J3 volume to complete the Global Mirror configuration.
Start H2->H1	Establishes Metro Mirror relationships between the H2 volumes and the H1 volumes and starts data replication from H2 to H1.

Table 64. Metro Mirror - Global Mirror with Site 4 Replication commands (continued)	
Command	**Action**
Start H3->H4	Establishes Metro Mirror relationships between the H3 volumes and the H4 volumes, and starts data replication from H3 to H4.
Start H4->H3	Establishes Metro Mirror relationships between the H4 volumes and the H3 volumes, and starts data replication from H4 to H3.
StartGM H2->H3	Establishes a Global Mirror relationship between H2 and H3, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.
StartGM H3->H1	Establishes a Global Mirror relationship between H3 and H1, and starts forming consistency groups. The relationship includes the J3 volume to complete the Global Mirror configuration.
StartGM H4->H1	Establishes a Global Mirror relationship between H4 and H1, and starts forming consistency groups. The relationship includes the J1 volume to complete the Global Mirror configuration.
StartGC H1->H2 H1->H3	Establishes Global Copy relationships between the H1 and H2 volumes and between H1 and H3 volumes, and begins asynchronous data replication from H1 to H2 and H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H1->H2	Establishes Global Copy relationships between the H1 volumes and the H2 volumes, and begins asynchronous data replication from H1 to H2. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H1->H3	Establishes Global Copy relationships between the H1 volumes and the H3 volumes, and begins asynchronous data replication from H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H2->H1 H2->H3	Establishes Global Copy relationships between the H2 and H1 volumes and between H2 and H3 volumes, and begins asynchronous data replication from H2 to H1 and H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H2->H1	Establishes Global Copy relationships between the H2 volumes and the H1 volumes, and begins asynchronous data replication from H2 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H2->H3	Establishes Global Copy relationships between the H2 volumes and the H3 volumes, and begins asynchronous data replication from H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.

Table 64. Metro Mirror - Global Mirror with Site 4 Replication commands (continued)	
Command	**Action**
StartGC H3->H1	Establishes Global Copy relationships between the H3 volumes and the H1 volumes, and begins asynchronous data replication from H3 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H3->H4	Establishes Global Copy relationships between the H3 volumes and the H4 volumes, and begins asynchronous data replication from H3 to H4. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H3->H4 H3->H1	Establishes Global Copy relationships between the H3 and H4 volumes and between H3 and H1 volumes, and begins asynchronous data replication from H3 to H4 and H3 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H4->H1	Establishes Global Copy relationships between the H4 volumes and the H1 volumes, and begins asynchronous data replication from H4 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H4->H3	Establishes Global Copy relationships between the H4 volumes and the H3 volumes, and begins asynchronous data replication from H4 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H4->H3 H4->H1	Establishes Global Copy relationships between the H4 and H3 volumes and between H4 and H1 volumes, and begins asynchronous data replication from H4 to H3 and H4 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
Stop	Stops updates to all the target volumes of the pairs in a session. Targets are not consistent after the stop.
StopH1H2	Stops updates from H1 to H2 volumes in a session.
StopH1H3	Stops updates from H1 to H3 volumes in a session.
StopH2H1	Stops updates from H2 to H1 volumes in a session.
StopH2H3	Stops updates from H2 to H3 volumes in a session.
StopH3H1	Stops updates from H3 to H1 volumes in a session.
StopH3H4	Stops updates from H3 to H4 volumes in a session.
StopH4H1	Stops updates from H4 to H1 volumes in a session.

Table 64. Metro Mirror - Global Mirror with Site 4 Replication commands (continued)	
Command	**Action**
StopH4H3	Stops updates from H4 to H3 volumes in a session.
Suspend	Suspends updates to all the target volumes of the pairs in a session. The following information applies to this command and the following **Suspend** commands: • You can issue the command at any point during an active session. • Avoid use of the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If other Metro Mirror sessions overlap the same LSS pairs as in this session, those sessions are also suspended. • When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection.
SuspendH1H2	Suspends updates from H1 to H2 volumes in a session.
SuspendH1H3	Suspends updates from H1 to H3 volumes in a session.
SuspendH2H1	Suspends updates from H2 to H1 volumes in a session.
SuspendH2H3	Suspends updates from H2 to H3 volumes in a session.
SuspendH3H1	Suspends updates from H3 to H1 volumes in a session.
SuspendH3H4	Suspends updates from H3 to H4 volumes in a session.
SuspendH4H1	Suspends updates from H4 to H1 volumes in a session.
SuspendH4H3	Suspends updates from H4 to H3 volumes in a session.
Terminate	Removes all copy relationships from the hardware during an active session. If you want the targets to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **Suspend** • **RecoverHx** Where x is the site to which you want to recover.

Table 64. Metro Mirror - Global Mirror with Site 4 Replication commands (continued)	
Command	**Action**
TerminateH1H2	Removes all H1>H2 or H2>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H2** • **Recoverx** Where x is the site to which you want to recover.
TerminateH1H3	Removes all H1>H3 or H3>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH2H1	Removes all H2>H1 or H1>H2 relationships from the hardware during an active session. • **SuspendH2H1** • **Recoverx** Where x is the site to which you want to recover.
TerminateH2H3	Removes all H2>H3 or H3>H2 relationships from the hardware during an active session. • **SuspendH2H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH3H4	Removes all H3>H4 or H4>H3 relationships from the hardware during an active session. • **SuspendH3H4** • **Recoverx** Where x is the site to which you want to recover.
TerminateH3H1	Removes all H3>H1 or H1>H3 relationships from the hardware during an active session. • **SuspendH3H1** • **Recoverx** Where x is the site to which you want to recover.

Table 64. Metro Mirror - Global Mirror with Site 4 Replication commands (continued)	
Command	**Action**
TerminateH4H3	Removes all H4>H3 or H3>H4 relationships from the hardware during an active session. • **SuspendH4H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH4H1	Removes all H4>H3 or H3>H4 relationships from the hardware during an active session. • **SuspendH4H3** • **Recoverx** Where x is the site to which you want to recover.

Metro Mirror - Metro Mirror with Site 4 Replication commands

Use this information to learn about commands available for Metro Mirror - Metro Mirror with Site 4 Replication sessions.

Table 65. Metro Mirror - Metro Mirror with Site 4 Replication commands	
Command	**Action**
Confirm Production at Site 1	Confirms that you want to establish site 1 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 2	Confirms that you want to establish site 2 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 3	Confirms that you want to establish site 3 as the production site after you issue suspend and recover commands for the session.
Confirm Production at Site 4	Confirms that you want to establish site 4 as the production site after you issue suspend and recover commands for the session.
FailoverH1	Completes a failover operation to the H1 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH1 command is required.
FailoverH2	Completes a failover operation to the H2 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH2 command is required.
FailoverH3	Completes a failover operation to the H3 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH3 command is required.

Table 65. Metro Mirror - Metro Mirror with Site 4 Replication commands (continued)	
Command	**Action**
FailoverH4	Completes a failover operation to the H4 target site. This command enables read and write access to the target volumes. At the same time, a recording of changes to the volumes that prevents a full copy when the relationship is restarted. You can use this command to practice your disaster recovery capabilities without initiating a site switch. To switch sites, the RecoverH4 command is required.
HyperSwap H1	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H1, without affecting the application that is using those volumes.
HyperSwap H2	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H2, without affecting the application that is using those volumes.
HyperSwap H3	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H3, without affecting the application that is using those volumes.
HyperSwap H4	Triggers a HyperSwap operation where I/O is redirected from the source volume to the target volume H4, without affecting the application that is using those volumes.
RecoverH1	Recovers the session to the H1 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH2	Recovers the session to the H2 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH3	Recovers the session to the H3 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
RecoverH4	Recovers the session to the H4 target site. This command makes the target host volumes consistent and available for access as the new production site. Upon completion of this command, the session becomes Target Available.
Re-enable Original Direction	Sets the production site back to the original site and re-enables the start commands in the original direction. You can use this command after you issue the confirm commands.

Table 65. Metro Mirror - Metro Mirror with Site 4 Replication commands (continued)	
Command	**Action**
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Release I/O	Enables the source volume to receive data after a copy relationship is suspended. This command is not displayed if the **Release I/O after Suspend** property is selected for the session.
ResumeGM	Resumes the Global Mirror master session on the hardware allowing the hardware to restart all relationships and consistency group formation. The command does not do any of the additional checks such as establishing for logical paths, etc. that are run by issuing the **Start** command. This command is only recommended to be used when the session is suspended for a short amount of time, such as when creating a FlashCopy or Safeguarded Copy backup at the remote site. **Note:** The command does not work for sessions that are suspended and share the same consistency group on the hardware. When sessions share a consistency group, the **Suspend** command removes the volumes of the suspended session out of the hardware session in order to allow other sessions to continue to form consistency groups. So the **ResumeGM** command will not cause the pairs in the suspended session to be restarted, you must run the **Start** command for the same.
Set Production to Site 1	Establishes Site 1 as the production site while the session is in the Defined state. After you issue this command, the Site 1 **Start** commands become available.
Set Production to Site 2	Establishes Site 2 as the production site while the session is in the Defined state. After you issue this command, the Site 2 **Start** commands become available.
Set Production to Site 3	Establishes Site 3 as the production site while the session is in the Defined state. After you issue this command, the Site 3 **Start** commands become available.
Set Production to Site 4	Establishes Site 4 as the production site while the session is in the Defined state. After you issue this command, the Site 4 **Start** commands become available.
Start H1->H2 H1->H3	Establishes Metro Mirror relationships between H1 and H2 volumes, and Metro Mirror relationships between H1 and H3.
Start H1->H2	Establishes Metro Mirror relationships between the H1 volumes and the H2 volumes, and begins data replication from H1 to H2.
Start H1->H3	Establishes a Metro Mirror relationship between H1 and H3.

Table 65. Metro Mirror - Metro Mirror with Site 4 Replication commands (continued)	
Command	**Action**
Start H2->H1 H2->H3	Establishes Metro Mirror relationships between H2 and H1 volumes, and Metro Mirror relationships between H2 and H3.
Start H2->H1	Establishes Metro Mirror relationships between the H2 volumes and the H1 volumes and starts data replication from H2 to H1.
Start H3->H4	Establishes Metro Mirror relationships between the H3 volumes and the H4 volumes, and starts data replication from H3 to H4.
Start H4->H3	Establishes Metro Mirror relationships between the H4 volumes and the H3 volumes, and starts data replication from H4 to H3.
Start H2->H3	Establishes a Metro Mirror relationship between H2 and H3.
Start H3->H1	Establishes a Metro Mirror relationship between H3 and H1.
Start H4->H1	Establishes a Metro Mirror relationship between H4 and H1.
StartGC H1->H2 H1->H3	Establishes Global Copy relationships between the H1 and H2 volumes and between H1 and H3 volumes, and begins asynchronous data replication from H1 to H2 and H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H1->H2	Establishes Global Copy relationships between the H1 volumes and the H2 volumes, and begins asynchronous data replication from H1 to H2. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H1->H3	Establishes Global Copy relationships between the H1 volumes and the H3 volumes, and begins asynchronous data replication from H1 to H3. The session remains in the Preparing state until you issue a Start, Suspend, or Terminate command.
StartGC H2->H1 H2->H3	Establishes Global Copy relationships between the H2 and H1 volumes and between H2 and H3 volumes, and begins asynchronous data replication from H2 to H1 and H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H2->H1	Establishes Global Copy relationships between the H2 volumes and the H1 volumes, and begins asynchronous data replication from H2 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H2->H3	Establishes Global Copy relationships between the H2 volumes and the H3 volumes, and begins asynchronous data replication from H2 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.

Table 65. Metro Mirror - Metro Mirror with Site 4 Replication commands (continued)	
Command	**Action**
StartGC H3->H1	Establishes Global Copy relationships between the H3 volumes and the H1 volumes, and begins asynchronous data replication from H3 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H3->H4	Establishes Global Copy relationships between the H3 volumes and the H4 volumes, and begins asynchronous data replication from H3 to H4. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H3->H4 H3->H1	Establishes Global Copy relationships between the H3 and H4 volumes and between H3 and H1 volumes, and begins asynchronous data replication from H3 to H4 and H3 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H4->H1	Establishes Global Copy relationships between the H4 volumes and the H1 volumes, and begins asynchronous data replication from H4 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H4->H3	Establishes Global Copy relationships between the H4 volumes and the H3 volumes, and begins asynchronous data replication from H4 to H3. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
StartGC H4->H3 H4->H1	Establishes Global Copy relationships between the H4 and H3 volumes and between H4 and H1 volumes, and begins asynchronous data replication from H4 to H3 and H4 to H1. The session remains in the Preparing state until you issue a Start, Suspend, Stop, or Terminate command.
Stop	Stops updates to all the target volumes of the pairs in a session. Targets are not consistent after the stop.
StopH1H2	Stops updates from H1 to H2 volumes in a session. Targets are not consistent after the stop.
StopH1H3	Stops updates from H1 to H3 volumes in a session. Targets are not consistent after the stop.
StopH2H1	Stops updates from H2 to H1 volumes in a session. Targets are not consistent after the stop.
StopH2H3	Stops updates from H2 to H3 volumes in a session. Targets are not consistent after the stop.

Table 65. Metro Mirror - Metro Mirror with Site 4 Replication commands (continued)	
Command	**Action**
StopH3H1	Stops updates from H3 to H1 volumes in a session. Targets are not consistent after the stop.
StopH3H4	Stops updates from H3 to H4 volumes in a session. Targets are not consistent after the stop.
StopH4H1	Stops updates from H4 to H1 volumes in a session. Targets are not consistent after the stop.
StopH4H3	Stops updates from H4 to H3 volumes in a session. Targets are not consistent after the stop.
Suspend	Suspends updates to all the target volumes of the pairs in a session. The following information applies to this command and the following **Suspend** commands: • You can issue the command at any point during an active session. • Avoid use of the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If other Metro Mirror sessions overlap the same LSS pairs as in this session, those sessions are also suspended. • When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection. • If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.
SuspendH1H2	Suspends updates from H1 to H2 volumes in a session. If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.
SuspendH1H3	Suspends updates from H1 to H3 volumes in a session. If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.
SuspendH2H1	Suspends updates from H2 to H1 volumes in a session. If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.
SuspendH2H3	Suspends updates from H2 to H3 volumes in a session. If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.

Table 65. Metro Mirror - Metro Mirror with Site 4 Replication commands (continued)	
Command	**Action**
SuspendH3H1	Suspends updates from H3 to H1 volumes in a session. If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.
SuspendH3H4	Suspends updates from H3 to H4 volumes in a session. If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.
SuspendH4H1	Suspends updates from H4 to H1 volumes in a session. If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.
SuspendH4H3	Suspends updates from H4 to H3 volumes in a session. If the **Suspend** command is issued to a pair that is running in Global Copy mode, the pair is driven to Metro Mirror, and then suspended consistently.
Terminate	Removes all copy relationships from the hardware during an active session. If you want the targets to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **Suspend** • **RecoverHx** Where x is the site to which you want to recover.
TerminateH1H2	Removes all H1>H2 or H2>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H2** • **Recoverx** Where x is the site to which you want to recover.
TerminateH1H3	Removes all H1>H3 or H3>H1 relationships from the hardware during an active session. If you want the target to be data consistent before you remove their relationship, issue the following commands before you issue the **Terminate** command: • **SuspendH1H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH2H1	Removes all H2>H1 or H1>H2 relationships from the hardware during an active session. • **SuspendH2H1** • **Recoverx** Where x is the site to which you want to recover.

Table 65. Metro Mirror - Metro Mirror with Site 4 Replication commands (continued)	
Command	**Action**
TerminateH2H3	Removes all H2>H3 or H3>H2 relationships from the hardware during an active session. • **SuspendH2H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH3H4	Removes all H3>H4 or H4>H3 relationships from the hardware during an active session. • **SuspendH3H4** • **Recoverx** Where x is the site to which you want to recover.
TerminateH3H1	Removes all H3>H1 or H1>H3 relationships from the hardware during an active session. • **SuspendH3H1** • **Recoverx** Where x is the site to which you want to recover.
TerminateH4H3	Removes all H4>H3 or H3>H4 relationships from the hardware during an active session. • **SuspendH4H3** • **Recoverx** Where x is the site to which you want to recover.
TerminateH4H1	Removes all H4>H3 or H3>H4 relationships from the hardware during an active session. • **SuspendH4H3** • **Recoverx** Where x is the site to which you want to recover.

Safeguarded Copy commands

Use this information to learn about commands available for Safeguarded Copy sessions.

Table 66. Safeguarded Copy commands	
Command	**Action**
Backup	Creates a safeguarded backup for all volumes in the session, which is a point-in-time copy of the data on the safeguarded source volumes.

Table 66. Safeguarded Copy commands (continued)	
Command	**Action**
Recover Backup	Recovers the data in the designated safeguarded backup to the recovery volumes, for all source volumes that were part of the backup. **Important:** The hardware might not support recovery of the last recoverable backup. If the hardware does not support it, Copy Services Manager allows you to recover the last recoverable backup, but automatically takes a new backup so that the recover can complete. If additional backup capacity is used, it might cause older backups to automatically expire on the hardware due to a lack of space. However, if the hardware supports it, the last backup can be recovered without the need for an additional backup.
Restore Backup	For Spectrum Virtualize, this command restores the data of the source volumes to the data of the selected backup. For DS8000 this command restores the last backup recovered, to the R1 volumes in the Safeguarded Copy session, to the specified role in the associated remote copy session. This will remove all data on the specified volume, in the associated session, and replace it with the backup data, without requiring a full copy of the data. The associated session must be in a suspended or failed-over state to run the **Restore Backup** command.
InitiateBackgroundCopy	Copies all tracks from the source to the target immediately, instead of waiting until the source track is written to. The Initiate Background Copy command is only available after a Recover. **Note:** This command only applies to DS8000.
Expire Backup	Removes the designated safeguarded backup and all earlier safeguarded backups for the safeguarded source volumes in the session.
TerminateH1R1	Removes the H1R1 relationship that was created with the Recover command.
Refresh States	Refreshes the list of Safeguarded Copy backups on the session, and their recoverability status. The command queries all source volumes in the session for the list of existing Safeguarded Copy backups, as well as querying the latest state on the hardware for H1R1 recovery relationships. You are not required to run this command under typical circumstances. Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. **Important:** This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. **Note:** When adding new copy sets into a Safeguarded Copy session, the Refresh States command can be used to query the hardware for any existing backups that are associated with the source volumes. This action might result in the session going from a Defined state to a Protected state before a Backup command is issued.

Table 66. Safeguarded Copy commands (continued)	
Command	**Action**
Terminate	Removes all active physical copies and relationships from the hardware during an active session. If you want the targets to be data consistent before removing their relationship, you must issue the **InitiateBackgroundCopy** command if NOCOPY was specified, and then wait for the background copy to complete by checking the copying status of the pairs.
Terminate H1R1 Keep R1	Terminates the H1R1 recovery relationship but keeps the R1 volumes permanently. **Note:** This command only applies to IBM Spectrum Virtualize. After running this command Copy Services Manager stops managing the R1 volumes. If the volumes are no longer needed in the future, you must delete them from the IBM Spectrum Virtualize command-line interface and GUI.

Migration commands

Use this information to learn about commands available for Migration sessions.

Table 67. Migration commands	
Command	**Action**
Refresh States	Refreshes the states of the role pairs that are in the session (if applicable for the session type) and refreshes the state of the session if it is incorrect. This command queries the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session. This command is not available if the session is in the Defined state.
Recover	Issues the **Recover** command to suspended sessions. This command performs the steps necessary to make the target available to writes from an attached host as the new primary site.
Stop	Inconsistently suspends updates to all the targets of pairs in a session. This command can be issued at any point during the copying of an active session. **Note:** Targets after the suspend are not considered to be consistent.

Table 67. Migration commands (continued)	
Command	**Action**
StartGC H1->H2	Establishes Global Copy relationships between site 1 and site 2 and begins asynchronous data replication from H1 to H2. To change the session state from Preparing to Prepared, you must issue the **Start H1->H2** command and the session must begin to form consistency groups. There is no disaster recovery protection for Global Copy relationships. If a disaster such as the loss of a primary storage system or a link failure between the sites occurs, the session might be inconsistent when you issue the **Recover** command. This command is available for the DS8000 storage system.
Stop When Drained	After a **StartGC** command, the session is in a Preparing and Global Copy mode. The **Stop When Drained** command starts a thread that queries all pairs until zero pairs are out-of-sync (OOS). After the OOS for the pairs goes to zero, the **Stop** command is issued. **Note:** The **Stop** command is issued, rather than **Suspend**, so that this procedure can be used in cascaded environments. **Suspend** puts the pairs in Metro Mirror mode, which is not allowed if the source of the session is the target of another relationship.
Suspend	Causes all target volumes to remain at a data-consistent point and stops all data that is moving to the target volumes. This command can be issued at any point during a session when the data is actively being copied. **Note:** Avoid using the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If there are other Metro Mirror sessions overlapping the same LSS pairs as in this session, those sessions are also suspended. When a **Suspend** command is issued to a source volume in an LSS that has source volumes in another active Metro Mirror session, the other source volumes are affected only if they have the same target LSS. The primary volumes are suspended, but volumes in the same source LSS that have target volumes in a different LSS are not affected because they use a different PPRC path connection.
Terminate	Removes all copy relationships from the hardware during an active session. If you want the targets to be data consistent before removing their relationship, you must issue the **Suspend** command, then the **Recover** command, and then the **Terminate** command.

ESE Sizer commands

Use this information to learn about commands available for ESE Sizer sessions.

Table 68. ESE Sizer commands

Command	Action
Start Monitor	This command is used to start the data collection for all volumes in the session, based on the query interval time defined in the session properties. After the session starts, it will go into the Prepared state. **Note:** The start command will clear any previous historical data for the session.
Stop Monitor	This command will stop the data collection for all volumes in the session. After stopping the session it will go into the Defined state, however, data can still be exported for the session until the session is deleted or restarted.
Reset Monitor	This command is used to manually reset the hardware information for the data collected. The data automatically resets based on the reset time specified in the properties of the session. Manually resetting the session should only be done by a knowledgeable user or when directed by IBM support.
Export->Export ESE Box Data	After the session is started and is in the Prepared state, select **Export ESE Box Data** to export the data collected, summarized for each storage system in the session, to a CSV (comma separate value) file. The CSV file can be used in an external tool or spreadsheet to help in calculating the necessary capacity for a SafeGuarded Copy implementation based on volume usage.
Export->Export ESE Volume Data	After the session is started and is in the Prepared state, select **Export ESE Volume Data** to export the data collected for each volume in the session, to a CSV (comma separate value) file. The CSV file can be used in an external tool or spreadsheet to help in calculating the necessary capacity for a SafeGuarded Copy implementation based on volume usage.

Site awareness

You can associate a location with each storage system and each site in a session. This *site awareness* ensures that only the volumes whose location matches the location of the site are allowed for selection when you add copy sets to the session. This prevents a session relationship from being established in the wrong direction.

Note: To filter the locations for site awareness, you must first assign a site location to each storage system.

Copy Services Manager does not perform automatic discovery of locations. Locations are user-defined and specified manually.

You can change the location associated with a storage system that has been added to the Copy Services Manager configuration. You can choose an existing location or add a new one. Locations are deleted when there is no longer a storage system with an association to that location.

When adding a copy set to a session, a list of candidate storage systems is presented, organized by location. Storage systems that do not have a location are displayed and available for use when you create a copy set.

You can also change the location for any site in a session. Changing the location of a session does not affect the location of the storage systems that are in the session.

Changing the location of a storage system might have consequences. When a session has a volume role with a location that is linked to the location of the storage system, changing the location of the storage system could change the session's volume role location. For example, if there is one storage system with the location of A_Location and a session with the location of A_Location for its H1 role, changing the location of the storage system to a different location, such as B_Location, also changes the session's H1 location to Site 1. However, if there is a second storage system that has the location of A_Location, the session's role location is not changed.

Important: Location matching is enabled only when adding copy sets. If you change the location of a storage system or volume role, Copy Services Manager does not audit existing copy sets to confirm or deny location mismatches.

Preserve Mirror option

This topic presents recommendations for using the Preserve Mirror option in FlashCopy and Metro Mirror sessions.

When the source of the FlashCopy relationship is a source of a Metro Mirror relationship, and the target of the FlashCopy relationship is the source of a Metro Mirror relationship, the Preserve Mirror option attempts to preserve the consistency of the Metro Mirror relationship at the target of the FlashCopy relationship, preventing a full copy from being performed over the Metro Mirror link. Instead, parallel flashes are performed (if possible) on both sites. If the consistency cannot be preserved, the Flash for the FlashCopy relationships fails, and the data of the Metro Mirror relationship at the target of the FlashCopy relationship is not changed.

Note: This option is available only on DS8000 storage devices with the required code levels installed.

When you use Preserve Mirror, where the sources of the FlashCopy relationships are sources in a multi-target Metro Mirror relationship, you must currently specify which of the Metro Mirror relationships for the Preserve Mirror feature to use. To make this specification, add the following property to the `rmserver.properties` file: **`com.ibm.csm.<sessionName>.<rolepair>.userpfc`**. When the Metro Mirror pairs are established, any pairs that are marked with this property are set up so that when the source is flashed the Preserve Mirror feature knows to use these pairs. For more information, see the “rmserver.properties file” on page 346.

Notes:

- This property default is set to `false`. It must be set to `true` to enable the option on the role pair.
- This property is only used when establishing the Metro Mirror relationships. If the relationships are already established on the hardware, they need to be suspended and restarted to set up for Preserve Mirror. Alternatively, the DSCLI can be used to mark the pairs for Preserve Mirror. Use the DSCLI **`chpprc`** command with the `-action enable` option (to turn it on), and `-action disable` (to turn it off).
- When a pair is set up for Preserve Mirror in Copy Services Manager, there is currently no way to unset the pair. If there is a requirement to switch Preserve Mirror between the two Metro Mirror multi-target relationships, use the DSCLI to unset the current pair before you change the property to handle the other pair. Alternatively the Metro Mirror pair can be terminated, which removes the association on the DS8000.

However, in some instances, the Preserve Mirror option can cause a Metro Mirror session to go into a Preparing state, or even a Suspended state. This topic describes the recommended usage of the Preserve Mirror feature. Using this feature in other ways might lead a Metro Mirror session to go into a Preparing or Suspended state.

FlashCopy session

You can use the Preserve Mirror option in FlashCopy sessions in two different methods:

Perform an incremental resynchronization
To perform an incremental resynchronization, select the **Incremental** and **Persistent** options in the FlashCopy session: do *not* select the **No Copy** option.

Perform a single full copy

To perform a single full copy, ensure that the **Incremental**, **Persistent**, and **No Copy** options are *not* selected before you issue a **Flash** command. If you use the **No Copy** option, issue either an **Initiate Background Copy** command or **Terminate** command before you issue the Flash command.

See your DS8000 documentation for more information about the Preserve Mirror function.

Metro Mirror session

You can set up your Metro Mirror pairs in two different ways, depending on the level of consistency you need, and your preferences.

Note: For the examples in this section, the source pair is H1a->H2a and the target pair is H1b->H2b. The source pair contains volumes that are the source of the FlashCopy relationship and the target pair always contains volumes that are the target of the FlashCopy relationship.

Create one Metro Mirror session, and add the Metro Mirror pairs as copy sets to that session

The benefit to this approach is that you do not need to worry about whether the host considers the H1a->H2a and H1b->H2b volumes to be consistent with one another. Copy Services Manager ensures that all of the volumes remain consistent.

A drawback to this approach is that when you use the **Attempt to preserve Metro Mirror consistency, but fail FlashCopy if Metro Mirror target consistency cannot be preserved** option (Preserve Mirror Required), there is a chance that the target pair (H1b->H2b) might suspend unexpectedly. This situation causes all other pairs in the Metro Mirror session to suspend (including H1a->H2a). This can occur when a FlashCopy establish or withdraw fails unexpectedly on the remote (H1b->H2b) site. If the host requires the H1a->H2a and H1b->H2b volumes to be consistent, then you should suspend all other volumes.

Create one Metro Mirror session for the H1a->H2a volumes, and another Metro Mirror session for the H1b->H2b volumes

Use this option when the hosts and applications do not require the H1a->H2a and H1b->H2b volumes to be consistent with one another. In this case, you should create one Metro Mirror session for all of the H1a->H2a volumes, and another Metro Mirror session for the H1b->H2b volumes. The H1a->H2a pair is added to the first session, while the H1b->H2b pair is added to the second Metro Mirror session. If the host does not require consistency between the H1a and H1b volumes, this option benefits you when you use the **Attempt to preserve Metro Mirror consistency, but fail FlashCopy if Metro Mirror target consistency cannot be preserved** option (Preserve Mirror Required). The benefit is that if one pair is suspended (such as H1a->H2a), the pairs in the other session are not affected, since it is in a different Metro Mirror session. Using this method, you can avoid the situation in which a critical application is writing to the source pair (H1a->H2a), while a batch job is writing to the target pair (H1b->H2b), and both pairs are in the same Copy Services Manager session. These factors cause both applications to receive extended long busy signals, instead of just the batch job.

Creating sessions and adding copy sets

A *session* completes a specific type of data replication for a specific set of volumes. During data replication, data is copied from a source volume to one or more target volumes, depending on the session type. The source volume and target volumes that contain copies of the same data are collectively referred to as a copy set. A session can contain one or more copy sets.

Creating a FlashCopy session and adding copy sets

FlashCopy replication creates a point-in-time copy in which the target volume contains a copy of the data that was on the source volume when the FlashCopy session was established.

About this task

When you create a FlashCopy session for Global Mirror or Metro Global Mirror space-efficient target volumes, you must select **No Copy** for the FlashCopy session. With space-efficient volumes, you can

use your FlashCopy repository more efficiently. Instead of requiring an equal amount of space to write data to, you can set aside a smaller amount of space in which to write data, where only the tracks that are changed are recorded. When your pool of storage is full, you can no longer perform a FlashCopy operation, and your session goes into a Severe state.

To add a FlashCopy session, you create the session, add copy sets to the session, and then select the properties for the session.

Procedure

1. Follow these steps to create a FlashCopy session:
   a) In the menu bar, click **Sessions**.
   b) On the **Sessions** page, click **Create Session**.
   c) In the **Create Session** window, select the following options:

      Hardware type
      Select the type of storage system for the session:

      - DS8000
      - FlashSystem/IBM Spectrum Virtualize
      - SAN Volume Controller
      - Storwize Family (for storage systems in the IBM Storwize family)
      - Storwize V7000 Unified

      Session type
      Select **FlashCopy**.

      Session name
      Enter a name to identify the session.

      Note: For sessions that contain a SAN Volume Controller or Storwize storage system, it is recommended that you create a session name that contains 15 alphanumeric characters or less. By doing so, the consistency group name that is created on the hardware matches the session name. Session names with more than 15 characters cause a random consistency group name to be generated on the hardware.

      For sessions that contain other storage system types, the session name can be up to 250 alphanumeric characters. The default name for a new session is `newsession`.

      Site 1 Location
      For each site that is in the session, select the location for the site or **None**. The site location, if available, is set by storage system on the **Storage Systems** page.

      You can associate a location with each storage system and each site in a session. This site awareness ensures that you can select only storage systems that have either a matching site location for each role or have no defined location when you add copy sets to a session.

      Session image
      Shows an image that represents the session. The session image is displayed when you select a session type. The image is a visual aid to help you create your session. The lightning bolt in the image represents FlashCopy replication.

      If you selected a location for the site that is in the session, the site is labeled with the site location. If you did not select site locations, the sites are labeled with **Site *x***, where *x* is the site number. You can hover the mouse pointer over the site location to view the text in a larger format.

   d) Click **OK**.
   e) If the session was successfully created, click **Launch Add Copy Sets Wizard** and continue to the next step.

      If the session was not created, refer to the displayed message text to fix the problem.

2. Follow these steps to add copy sets to the session:
   a) On the **Select Host1** page of the Add Copy Sets wizard, complete the following information. The field names that are displayed depend on the storage system type. When you complete the information, click **Next**.

      Storage system
      Select a storage system. If the volume role has a site location that is assigned to it, you can select a storage system that is assigned to the same location as the role or a storage system that is not assigned to a location. Storage systems that have a location are listed under the location. Storage systems that do not have a location are listed under **None**. If the role does not have a site location, you can select any storage system.

      Logical storage system or I/O Group
      Select a logical subsystem (LSS) or I/O group.

      Volume
      Select one volume or all volumes. The volumes are limited to the volumes within the LSS or I/O group that you selected.

      The use of extent space-efficient volumes in volume roles depends on the capabilities of the storage system.

      Session image
      Shows an image that represents the session in which the role for which you are selecting volumes is highlighted. This image shows how many roles are in the session and how the roles are distributed between the sites.

      Volume Details
      Shows information about the selected volume, including the volume name, full name, type, capacity, and whether the volume is protected and space-efficient.

      Use a CSV file to import copy sets
      Select this option to import copy sets from a comma-separated value (CSV) file. Click **Browse** to select the CSV file.

   b) On the **Choose Target1** page, select the target storage system, LSS or I/O group, and volume. Click **Next**.

   c) On the **Select Copy Sets** page, select from the following options and click **Next**:

      Select All
      Click this button to select all of the copy sets in the table.

      Deselect All
      Click this button to clear all of the copy sets in the table.

      Add More
      Click this button to add another copy set to the list of copy sets to be created.

      When you click **Add More**, you are returned to the **Choose Host1** page of the wizard. On this page, the **Storage system** and **Logical storage system or I/O Group** lists are populated with the values from the previously selected copy set. Repeat the previous steps to complete the **Choose Host1** and **Choose Target1** pages and add more copy sets.

      Selection check boxes
      Select one or more copy sets that you want to create.

      Host 1
      Lists the volume IDs that are associated with the Host1 role. You can click the link to display information about the volume, including the full name, type, capacity, and whether the volume is protected and space efficient.

      Copy Set
      Displays the copy set information for the specified copy sets and any warning or error messages that are associated with the copy set.

      A warning or icon next to the **Show** button indicates that you cannot create a copy set for the H1 volume. Click **Show** to view the message.

d) On the **Confirm** page, the number of copy sets to be added is displayed. Click **Next**.

e) A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

3. Follow these steps to add properties for the session:

a) On the **Sessions** page, select the session.

b) From the **Session Actions** list, select **View/Modify** > **Properties**.

c) In the View/Modify Properties notebook, select the options that you want. For a description of the options, see “Viewing session properties” on page 254.

d) Click **OK**.

Creating a Snapshot session and adding copy sets

A Snapshot session is a session type that creates a point-in-time copy of a volume or set of volumes without having to define a specific target volume. Snapshot sessions are available only for the FlashSystem/IBM Spectrum Accelerate.

About this task

To add a Snapshot session, you create the session and then add copy sets to the session.

Procedure

1. Follow these steps to create a Snapshot session:

a) In the menu bar, click **Sessions**.

b) On the **Sessions** page, click **Create Session**.

c) In the **Create Session** window, select the following options:

Hardware type
Select **FlashSystem/IBM Spectrum Accelerate**.

Session type
Select **Snapshot**.

Session name
Enter a name to identify the session. The session name can be up to 58 alphanumeric characters. The default name for a new session is `newsession`.

Site 1 Location
For each site that is in the session, select the location for the site or **None**. The site location, if available, is set by storage system on the **Storage Systems** page.

You can associate a location with each storage system and each site in a session. This site awareness ensures that only storage systems that have either a matching site location for each role or have no defined location are displayed in the copy set wizard.

Session image
Shows an image that represents the session. The session image is displayed when you select a session type. The image is a visual aid to help you create your session.

If you selected a location for the site that is in the session, the site is labeled with the site location. If you did not select site locations, the sites are labeled with **Site *x***, where *x* is the site number. You can hover the mouse pointer over the site location to view the text in a larger format.

d) Click **OK**.

e) If the session was successfully created, click **Launch Add Copy Sets Wizard** and continue to the next step.

If the session was not created, refer to the displayed message text to fix the problem.

2. Follow these steps to add copy sets to the session:

a) From the **Host1 storage system** list, select the storage system that contains the volumes that you want to add.

   If the H1 role has an assigned location, only those storage systems that have the same location as the H1 role, or storage systems that do not have a set location, are displayed for selection.

   If the H1 role does not have an assigned location, all storage systems are displayed for selection.

   Storage systems that are assigned to a location are listed under the location name. Storage systems that are not assigned to a location are listed under the **None.** column.

b) From the **Host1 pool** list, select the pool that contains the volumes.

c) From the **Host1 volume** list, select the volumes.

   To select multiple volumes, press Ctrl or Shift and click the volumes in the list.

d) If you want to import copy sets from a comma-separated value (CSV) file, click **Use a CSV file to import copy sets**. Click **Browse** to select the CSV file and click **Next**.

e) On the **Matching Results** page, click **Next** if the match was successful.

f) On the **Select Copy Sets** page, select from the following options and click **Next**.

   Select All
   Click this button to select all of the copy sets in the table.

   Deselect All
   Click this button to clear all of the copy sets in the table.

   Add More
   Click this button to add another copy set to the list of copy sets to be created.

   When you click **Add More**, you are returned to the **Choose Host1** page of the wizard. The lists on this page are populated with the values from the previously selected copy set. Repeat the previous steps to complete the **Choose Host1** page and add more copy sets.

   Selection check boxes
   Select one or more copy sets that you want to create.

   Host 1
   Lists the volume IDs that are associated with the Host1 role. You can click the link to display information about the volume, including the full name, type, capacity, and whether the volume is protected and space efficient.

   Copy Set
   Displays the copy set information for the specified copy sets and any warning or error messages that are associated with the copy set.

   A warning or icon next to the **Show** button indicates that you cannot create a copy set for the H1 volume. Click **Show** to view the message.

g) On the **Confirm** page, the number of copy sets to be added is displayed. Click **Next**.

h) A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

What to do next

If you want to add a description for the session, select the session on the **Sessions** page. From the **Session Actions** list, select **View/Modify** > **Properties**.

Creating a Metro Mirror session and adding copy sets

A Metro Mirror session is a method of synchronous, remote data replication that operates between two sites that are up to 300 KM apart.

About this task

To add a Metro Mirror session, you create the session, add copy sets to the session, and then select the properties for the session.

Procedure

1. Follow these steps to create a Metro Mirror session:
   a) In the menu bar, click **Sessions**.
   b) On the **Sessions** page, click **Create Session**.
   c) In the **Create Session** window, select the following options:

      Hardware type
      Select the type of storage system for the session:

      - DS8000
      - FlashSystem/IBM Spectrum Virtualize
      - SAN Volume Controller
      - Storwize Family (for storage systems in the IBM Storwize family)
      - Storwize V7000 Unified
      - FlashSystem/IBM Spectrum Accelerate

      Session type
      Select a Metro Mirror session type.

      Session name
      Enter a name to identify the session.

      Note: For sessions that contain a SAN Volume Controller or Storwize storage system, it is suggested that you create a session name that contains 15 alphanumeric characters or less. By doing so, the consistency group name that is created on the hardware matches the session name. Session names with more than 15 characters cause a random consistency group name to be generated on the hardware.

      For sessions that contain a FlashSystem/IBM Spectrum Accelerate, the session name can be up to 58 alphanumeric characters. For sessions that contain other storage system types, the session name can be up to 250 alphanumeric characters. The default name for a new session is `newsession`.

      Site *x* Location
      For each site that is in the session, select the location for the site or **None**. The site location, if available, is set by storage system on the **Storage Systems** page.

      You can associate a location with each storage system and each site in a session. This site awareness ensures that you can select only storage systems that have either a matching site location for each role, or have no defined location when you add copy sets to a session.

      Session image
      Shows an image that represents the session. The session image is displayed when you select a session type. The image is a visual aid to help you create your session.

      This image shows the number of roles in the session and how the roles are distributed between the sites. The arrows indicate the type of copy between roles:

      - Straight arrows = synchronous replication
      - Straight arrows with an asynchronous replication symbol = asynchronous replication
      - Lightning bolts = FlashCopy replication

      If you selected a location for the sites that are in the session, the sites are labeled with the site location. If you did not select site locations, the sites are labeled with **Site *x***, where *x* is the site number. You can hover the mouse pointer over the site location to view the text in a larger format.

   d) Click **OK**.
   e) If the session was successfully created, click **Launch Add Copy Sets Wizard** and continue to the next step.

If the session was not created, see the displayed message text to fix the problem.

2. Follow these steps to add copy sets to the session:

   a) In the Add Copy Sets wizard, enter the following information for the choose volume pages. The field names that are displayed depend on the storage system type. When you complete the information on each page, click **Next**.

   Storage system
   Select a storage system. If the volume role has a site location that is assigned to it, you can select a storage system that is assigned to the same location as the role. Or you can select a storage system that is not assigned to a location. Storage systems that have a location are listed under the location. Storage systems that do not have a location are listed under **None**. If the role does not have a site location, you can select any storage system.

   Logical storage system, I/O Group, or Pool
   Select a logical subsystem (LSS), I/O group, or pool.

   Volume
   Select one volume or all volumes. The volumes are limited to the volumes within the LSS, I/O group, or pool that you selected.

   The use of extent space-efficient volumes in volume roles depends on the capabilities of the storage system.

   Session image
   Shows an image that represents the session in which the role for which you are selecting volumes is highlighted. This image shows how many roles are in the session and how the roles are distributed between the sites.

   Volume Details
   Shows information about the selected volume, including the volume name, full name, type, capacity, and whether the volume is protected and space-efficient.

   Use a CSV file to import copy sets
   Select this option to import copy sets from a comma-separated value (CSV) file, click **Use a CSV file to import copy sets**. Type the full path name of the CSV file or click **Browse** to select the CSV file.

   b) On the **Select Copy Sets** page, select from the following options and click **Next**:

   Select All
   Click this button to select all of the copy sets in the table.

   Deselect All
   Click this button to clear all of the copy sets in the table.

   Add More
   Click this button to add another copy set to the list of copy sets to be created.

   When you click **Add More**, you are returned to the **Choose Host1** page of the wizard. On this page, the **Storage system** and **Logical storage system, I/O Group, or Pool** lists are populated with the values from the previously selected copy set. Repeat the previous steps to complete the choose volume pages and add more copy sets.

   Selection check boxes
   Select one or more copy sets that you want to create.

   Host 1
   Lists the volume IDs that are associated with the Host1 role. You can click the link to display information about the volume, including the full name, type, capacity, and whether the volume is protected and space efficient.

   Copy Set
   Displays the copy set information for the specified copy sets and any warning or error messages that are associated with the copy set.

   A warning or icon next to the **Show** button indicates that you cannot create a copy set for the H1 volume. Click **Show** to view the message.

c) On the **Confirm** page, the number of copy sets to be added is displayed. Click **Next**.

d) A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

3. Follow these steps to add properties for the session:
   a) On the **Sessions** page, select the session.
   b) From the **Session Actions** list, select **View/Modify** > **Properties**.
   c) In the View/Modify Properties notebook, select the options that you want. For a description of the options, see "Viewing session properties" on page 254.
   d) Click **OK**.

Creating a Global Mirror session and adding copy sets

A Global Mirror session is a method of asynchronous, remote data replication between two sites that are over 300 KM apart.

About this task

To add a Global Mirror session, you create the session, add copy sets to the session, and then select the properties for the session.

Procedure

1. Follow these steps to create a Global Mirror session:
   a) In the menu bar, click **Sessions**.
   b) On the **Sessions** page, click **Create Session**.
   c) In the **Create Session** window, select the following options:

Hardware type
Select the type of storage system for the session:

- DS8000
- FlashSystem/IBM Spectrum Virtualize
- SAN Volume Controller
- Storwize Family (for storage systems in the IBM Storwize family)
- Storwize V7000 Unified
- FlashSystem/IBM Spectrum Accelerate

Session type
Select a Global Mirror session type.

Session name
Enter a name to identify the session.

Note: For sessions that contain a SAN Volume Controller or Storwize storage system, it is suggested that you create a session name that contains 15 alphanumeric characters or less. By doing so, the consistency group name that is created on the hardware matches the session name. Session names with more than 15 characters cause a random consistency group name to be generated on the hardware.

For sessions that contain a FlashSystem/IBM Spectrum Accelerate, the session name can be up to 58 alphanumeric characters. For sessions that contain other storage system types, the session name can be up to 250 alphanumeric characters. The default name for a new session is `newsession`.

Site *x* Location
For each site that is in the session, select the location for the site or **None**. The site location, if available, is set by storage system on the **Storage Systems** page.

You can associate a location with each storage system and each site in a session. This site awareness ensures that you can select only storage systems that have either a matching site location for each role, or have no defined location when you add copy sets to a session.

Session image
Shows an image that represents the session. The session image is displayed when you select a session type. The image is a visual aid to help you create your session.

This image shows the number of roles in the session and how the roles are distributed between the sites. The arrows indicate the type of copy between roles:

- Straight arrows = synchronous replication
- Straight arrows with an asynchronous replication symbol = asynchronous replication
- Lightning bolts = FlashCopy replication

If you selected a location for the sites that are in the session, the sites are labeled with the site location. If you did not select site locations, the sites are labeled with **Site *x***, where *x* is the site number. You can hover the mouse pointer over the site location to view the text in a larger format.

d) Click **OK**.

e) If the session was successfully created, click **Launch Add Copy Sets Wizard** and continue to the next step.

If the session was not created, refer to the displayed message text to fix the problem.

2. Follow these steps to add copy sets to the session:

a) In the Add Copy Sets wizard, enter the following information for the choose volume pages. The field names that are displayed depend on the storage system type. When you complete the information on each page, click **Next**.

Storage system
Select a storage system. If the volume role has a site location that is assigned to it, you can select a storage system that is assigned to the same location as the role. Or you can select a storage system that is not assigned to a location. Storage systems that have a location are listed under the location. Storage systems that do not have a location are listed under **None**. If the role does not have a site location, you can select any storage system.

Logical storage system, I/O Group, or Pool
Select a logical subsystem (LSS), I/O group, or pool.

Volume
Select one volume or all volumes. The volumes are limited to the volumes within the LSS, I/O group, or pool that you selected.

The use of extent space-efficient volumes in volume roles depends on the capabilities of the storage system.

Session image
Shows an image that represents the session in which the role for which you are selecting volumes is highlighted. This image shows how many roles are in the session and how the roles are distributed between the sites.

Volume Details
Shows information about the selected volume, including the volume name, full name, type, capacity, and whether the volume is protected and space-efficient.

Use a CSV file to import copy sets
Select this option to import copy sets from a comma-separated value (CSV) file, click **Use a CSV file to import copy sets**. Type the full path name of the CSV file or click **Browse** to select the CSV file.

b) On the **Select Copy Sets** page, select from the following options and click **Next**:

Select All
Click this button to select all of the copy sets in the table.

Deselect All
Click this button to clear all of the copy sets in the table.

Add More
Click this button to add another copy set to the list of copy sets to be created.

When you click **Add More**, you are returned to the **Choose Host1** page of the wizard. On this page, the **Storage system** and **Logical storage system, I/O Group, or Pool** lists are populated with the values from the previously selected copy set. Repeat the previous steps to complete the choose volume pages and add more copy sets.

Selection check boxes
Select one or more copy sets that you want to create.

Host 1
Lists the volume IDs that are associated with the Host1 role. You can click the link to display information about the volume, including the full name, type, capacity, and whether the volume is protected and space efficient.

Copy Set
Displays the copy set information for the specified copy sets and any warning or error messages that are associated with the copy set.

A warning or icon next to the **Show** button indicates that you cannot create a copy set for the H1 volume. Click **Show** to view the message.

c) On the **Confirm** page, the number of copy sets to be added is displayed. Click **Next**.

d) A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

3. Follow these steps to add properties for the session:
   a) On the **Sessions** page, select the session.
   b) From the **Session Actions** list, select **View/Modify** > **Properties**.
   c) In the View/Modify Properties notebook, select the options that you want. For a description of the options, see “Viewing session properties” on page 254.
   d) Click **OK**.

Creating a Metro Global Mirror session and adding copy sets

A Metro Global Mirror session is a method of continuous, remote data replication that operates between three sites of varying distances apart. Metro Global Mirror combines Metro Mirror synchronous copy and Global Mirror asynchronous copy into a single session, where the Metro Mirror target is the Global Mirror source.

About this task

To add a Metro Global Mirror session, you create the session, add copy sets to the session, and then select the properties for the session.

Procedure

1. Follow these steps to create a Metro Global Mirror session:
   a) In the menu bar, click **Sessions**.
   b) On the **Sessions** page, click **Create Session**.
   c) In the **Create Session** window, select the following options:

Hardware type
Select the hardware type **DS8000**.

Session type
Select a Metro Global Mirror session type.

Session name
Enter a name to identify the session. The session name can be up to 250 alphanumeric characters. The default name for a new session is `newsession`.

Site *x* Location
For each site that is in the session, select the location for the site or **None**. The site location, if available, is set by storage system on the **Storage Systems** page.

You can associate a location with each storage system and each site in a session. This site awareness ensures that you can select only storage systems that have either a matching site location for each role or have no defined location when you add copy sets to a session.

Session image
Shows an image that represents the session. The session image is displayed when you select a session type. The image is a visual aid to help you create your session.

This image shows the number of roles in the session and how the roles are distributed between the sites. The arrows indicate the type of copy between roles:

- Straight arrows = synchronous replication
- Straight arrows with an asynchronous replication symbol = asynchronous replication
- Lightning bolts = FlashCopy replication

If you selected a location for the sites that are in the session, the sites are labeled with the site location. If you did not select site locations, the sites are labeled with **Site *x***, where *x* is the site number. You can hover the mouse pointer over the site location to view the text in a larger format.

d) Click **OK**.

e) If the session was successfully created, click **Launch Add Copy Sets Wizard** and continue to the next step.

If the session was not created, refer to the displayed message text to fix the problem.

2. Follow these steps to add copy sets to the session:

a) In the Add Copy Sets wizard, enter the following information for the choose volume pages. The field names that are displayed depend on the storage system type. When you complete the information on each page, click **Next**.

Storage system
Select a storage system. If the volume role has a site location that is assigned to it, you can select a storage system that is assigned to the same location as the role or a storage system that is not assigned to a location. Storage systems that have a location are listed under the location. Storage systems that do not have a location are listed under **None**. If the role does not have a site location, you can select any storage system.

Logical storage system
Select a logical subsystem (LSS).

Volume
Select one volume or all volumes. The volumes are limited to the volumes within the LSS, I/O group, or pool that you selected.

The use of extent space-efficient volumes in volume roles is dependent on the capabilities of the storage system.

Session image
Shows an image that represents the session in which the role for which you are selecting volumes is highlighted. This image shows how many roles are in the session and how the roles are distributed between the sites.

Volume Details
Shows information about the selected volume, including the volume name, full name, type, capacity, and whether the volume is protected and space-efficient.

Use a CSV file to import copy sets
Select this option to import copy sets from a comma-separated value (CSV) file. Click **Browse** to select the CSV file.

b) On the **Select Copy Sets** page, select from the following options and click **Next**:

Select All
Click this button to select all of the copy sets in the table.

Deselect All
Click this button to clear all of the copy sets in the table.

Add More
Click this button to add another copy set to the list of copy sets to be created.

When you click **Add More**, you are returned to the **Choose Host1** page of the wizard. On this page, the **Storage system** and **Logical storage system, I/O Group, or Pool** lists are populated with the values from the previously selected copy set. Repeat the previous steps to complete the choose volume pages and add additional copy sets.

Selection check boxes
Select one or more copy sets that you want to create.

Host 1
Lists the volume IDs that are associated with the Host1 role. You can click the link to display information about the volume, including the full name, type, capacity, and whether the volume is protected and space efficient.

Copy Set
Displays the copy set information for the specified copy sets and any warning or error messages that are associated with the copy set.

A warning or icon next to the **Show** button indicates that you cannot create a copy set for the H1 volume. Click **Show** to view the message.

c) On the **Confirm** page, the number of copy sets to be added is displayed. Click **Next**.

d) A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

3. Follow these steps to add properties for the session:

a) On the **Sessions** page, select the session.

b) From the **Session Actions** list, select **View/Modify** > **Properties**.

c) In the View/Modify Properties notebook, select the options that you want. For a description of the options, see “Viewing session properties” on page 254.

d) Click **OK**.

Creating a Safeguarded Copy session and adding copy sets

Safeguarded Copy sessions capture many point-in-time images of a production environment with optimized capacity usage.

About this task

You can create a Safeguarded Copy session to capture multiple point-in-time images of a set of production volumes to prevent them from being compromised, either accidentally or deliberately.

You cannot create Safeguarded Copy sessions for IBM Spectrum Virtualize, the sessions are automatically created.

Note: The Safeguarded Copy session should not contain both the Metro Mirror source and target volumes.

To add a Safeguarded Copy session, you create the session, add copy sets to the session, and then select the properties for the session.

Procedure

1. Follow these steps to create a Safeguarded Copy session:
   a) In the menu bar, click **Sessions**.
   b) On the **Sessions** page, click **Create Session**.
   c) In the **Create Session** window, select the following options:

      Hardware type
      Select the type of storage system for the session:

      Note: Safeguarded Copy sessions are currently only available on the DS8000 storage system.

      Session type
      Select **Safeguarded Copy**.

      Session name
      Enter a name to identify the session.

      The session name can be up to 250 alphanumeric characters. The default name for a new session is `newsession`.

      Site 1 Location
      For each site that is in the session, select the location for the site or **None**. The site location, if available, is set by storage system on the **Storage Systems** page.

      You can associate a location with each storage system and each site in a session. This site awareness ensures that you can select only storage systems that have either a matching site location for each role or have no defined location when you add copy sets to a session.

   d) Click **OK**.
   e) If the session was successfully created, click **Launch Add Copy Sets Wizard** and continue to the next step.

      If the session was not created, refer to the displayed message text to fix the problem.
2. Follow these steps to add copy sets to the session:
   a) On the **Select Host1** page of the Add Copy Sets wizard, complete the following information. The field names that are displayed depend on the storage system type. When you complete the information, click **Next**.

      Note: Only storage systems that support Safeguarded Copy are displayed in the drop down for selection.

      Storage system
      Select a storage system. If the volume role has a site location that is assigned to it, you can select a storage system that is assigned to the same location as the role or a storage system that is not assigned to a location. Storage systems that have a location are listed under the location. Storage systems that do not have a location are listed under **None**. If the role does not have a site location, you can select any storage system.

      Logical storage system
      Select a logical subsystem (LSS).

      Volume
      Select one volume or all volumes. The volumes are limited to the volumes within the LSS that you selected.

      The use of extent space-efficient volumes in volume roles depends on the capabilities of the storage system.

      Note: Safeguarded capacity needs to added on the DS8000 storage system for each source that you want to use.

Session image
Shows an image that represents the session in which the role for which you are selecting volumes is highlighted. This image shows how many roles are in the session and how the roles are distributed between the sites.

Volume Details
Shows information about the selected volume, including the volume name, full name, type, capacity, and whether the volume is protected and space-efficient.

Use a CSV file to import copy sets
Select this option to import copy sets from a comma-separated value (CSV) file. Click **Browse** to select the CSV file.

Note: If a copy set is added to a session such that the source volume already contains backups, those backups will be assimilated into that session regardless of the session state. Therefore, backups might be assimilated into a session in the defined state, which causes the session to change to the protected state if valid backups are found on the newly added volume.

b) On the **Choose Recover1** page, select the target storage system, LSS, and volume. Click **Next**.

Note: Recovery volumes must reside on an even-numbered or odd-numbered LSS, depending on the location of the source volume. If a source volume is on an even-numbered LSS, then its recovery volume must reside on an even-numbered LSS. If the source volume is on an odd-numbered LSS, then its recovery volume must reside on an odd-numbered LSS.

c) On the **Select Copy Sets** page, select from the following options and click **Next**:

Select All
Click this button to select all of the copy sets in the table.

Deselect All
Click this button to clear all of the copy sets in the table.

Add More
Click this button to add another copy set to the list of copy sets to be created.

When you click **Add More**, you are returned to the **Choose Host1** page of the wizard. On this page, the **Storage system** and **Logical storage system** lists are populated with the values from the previously selected copy set. Repeat the previous steps to complete the **Choose Host1** and **Choose Recover1** pages and add more copy sets.

Selection check boxes
Select one or more copy sets that you want to create.

Host 1
Lists the volume IDs that are associated with the Host1 role. You can click the link to display information about the volume, including the full name, type, capacity, and whether the volume is protected and space efficient.

Copy Set
Displays the copy set information for the specified copy sets and any warning or error messages that are associated with the copy set.

A warning or icon next to the **Show** button indicates that you cannot create a copy set for the H1 volume. Click **Show** to view the message.

d) On the **Confirm** page, the number of copy sets to be added is displayed. Click **Next**.

e) A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

3. Follow these steps to add properties for the session:

a) On the **Sessions** page, select the session.

b) From the **Session Actions** list, select **View/Modify** > **Properties**.

c) In the View/Modify Properties notebook, select the options that you want. For a description of the options, see “Viewing session properties” on page 254.

d) Click **OK**.

Creating a Migration session and adding copy sets

A Migration session can be used to migrate data from one set of volumes to another, regardless of size.

About this task

To add a Migration session, you create the session, add copy sets to the session, and then select the properties for the session.

Procedure

1. Follow these steps to create a Migration session:
   a) In the menu bar, click **Sessions**.
   b) On the **Sessions** page, click **Create Session**.
   c) In the **Create Session** window, select the following options:

      Hardware type
      Select the type of storage system for the session:

      - **DS8000, DS6000, ESS**

        Note: The Migration session type is currently only available for DS8000 storage systems.

      Session type
      Select the Migration session type.

      Session name
      Enter a name to identify the session.

      Site *x* Location
      For each site that is in the session, select the location for the site or **None**. The site location, if available, is set by storage system on the **Storage Systems** page.

      You can associate a location with each storage system and each site in a session. This site awareness ensures that you can select only storage systems that have either a matching site location for each role, or have no defined location when you add copy sets to a session.

      Session image
      Shows an image that represents the session. The session image is displayed when you select a session type. The image is a visual aid to help you create your session.

      This image shows the number of roles in the session and how the roles are distributed between the sites. The arrows indicate the type of copy between roles:

      - Straight arrows = synchronous replication
      - Straight arrows with an asynchronous replication symbol = asynchronous replication
      - Lightning bolts = FlashCopy replication

      If you selected a location for the sites that are in the session, the sites are labeled with the site location. If you did not select site locations, the sites are labeled with **Site *x***, where *x* is the site number. You can hover the mouse pointer over the site location to view the text in a larger format.

   d) Click **OK**.
   e) If the session was successfully created, click **Launch Add Copy Sets Wizard** and continue to the next step.

      If the session was not created, see the displayed message text to fix the problem.
2. Follow these steps to add copy sets to the session:
   a) In the **Add Copy Sets** wizard, enter the following information for the choose volume pages. The field names that are displayed depend on the storage system type. When you complete the information on each page, click **Next**.

Storage system
Select a storage system. If the volume role has a site location that is assigned to it, you can select a storage system that is assigned to the same location as the role. Or you can select a storage system that is not assigned to a location. Storage systems that have a location are listed under the location. Storage systems that do not have a location are listed under **None**. If the role does not have a site location, you can select any storage system.

Logical storage system, I/O Group, or Pool
Select a logical subsystem (LSS), I/O group, or pool.

Volume
Select one volume or all volumes. The volumes are limited to the volumes within the LSS, I/O group, or pool that you selected.

The use of extent space-efficient volumes in volume roles depends on the capabilities of the storage system.

Session image
Shows an image that represents the session in which the role for which you are selecting volumes is highlighted. This image shows how many roles are in the session and how the roles are distributed between the sites.

Volume Details
Shows information about the selected volume, including the volume name, full name, type, capacity, and whether the volume is protected and space-efficient.

Use a CSV file to import copy sets
Select this option to import copy sets from a comma-separated value (CSV) file, click **Use a CSV file to import copy sets**. Type the full path name of the CSV file or click **Browse** to select the CSV file.

b) Repeat step "2.a" on page 209 for Host 2.

c) On the **Select Copy Sets** page, select from the following options and click **Next**:

Select All
Click this button to select all of the copy sets in the table.

Deselect All
Click this button to clear all of the copy sets in the table.

Add More
Click this button to add another copy set to the list of copy sets to be created.

When you click **Add More**, you are returned to the **Choose Host1** page of the wizard. On this page, the **Storage system** and **Logical storage system, I/O Group, or Pool** lists are populated with the values from the previously selected copy set. Repeat the previous steps to complete the choose volume pages and add more copy sets.

Selection check boxes
Select one or more copy sets that you want to create.

Host 1
Lists the volume IDs that are associated with the Host1 role. You can click the link to display information about the volume, including the full name, type, capacity, and whether the volume is protected and space efficient.

Copy Set
Displays the copy set information for the specified copy sets and any warning or error messages that are associated with the copy set.

A warning or icon next to the **Show** button indicates that you cannot create a copy set for the H1 volume. Click **Show** to view the message.

d) On the **Confirm** page, the number of copy sets to be added is displayed. Click **Next**.

e) A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

3. Follow these steps to add properties for the session:

a) On the **Sessions** page, select the session.

b) From the **Session Actions** list, select **View/Modify** > **Properties**.

c) In the View/Modify Properties notebook, select the options that you want. For a description of the options, see "Viewing session properties" on page 254.

d) Click **OK**.

Creating an ESE Sizer session and adding copy sets

The ESE Sizer session supports analyzing space requirements for DS8000 Extent Space Efficient (ESE) FlashCopy and Safeguarded Copy.

About this task

To add a ESE Sizer session, you create the session and then add copy sets to the session.

Procedure

1. Follow these steps to create a ESE Sizer session:
   a) In the menu bar, click **Sessions**.
   b) On the **Sessions** page, click **Create Session**.
   c) In the **Create Session** window, select the following options:

      Hardware type
      Select IBM DS8000.

      Session type
      Select **ESESizer**.

      Session name
      Enter a name to identify the session. The session name can be up to 58 alphanumeric characters. The default name for a new session is `newsession`.

      Site 1 Location
      For each site that is in the session, select the location for the site or **None**. The site location, if available, is set by storage system on the **Storage Systems** page.

      You can associate a location with each storage system and each site in a session. This site awareness ensures that only storage systems that have either a matching site location for each role or have no defined location are displayed in the copy set wizard.

      Session image
      Shows an image that represents the session. The session image is displayed when you select a session type. The image is a visual aid to help you create your session.

      If you selected a location for the site that is in the session, the site is labeled with the site location. If you did not select site locations, the sites are labeled with **Site *x***, where *x* is the site number. You can hover the mouse pointer over the site location to view the text in a larger format.

   d) Click **OK**.
   e) If the session was successfully created, click **Launch Add Copy Sets Wizard** and continue to the next step.

      If the session was not created, refer to the displayed message text to fix the problem.
2. Follow these steps to add copy sets to the session:
   a) From the **Host1 storage system** list, select the storage system that contains the volumes that you want to add.

      If the H1 role has an assigned location, only those storage systems that have the same location as the H1 role, or storage systems that do not have a set location, are displayed for selection.

      If the H1 role does not have an assigned location, all storage systems are displayed for selection.

Storage systems that are assigned to a location are listed under the location name. Storage systems that are not assigned to a location are listed under the **None.** column.

b) From the **Host1 LSS** list, select the LSS that contains the volumes.

c) From the **Host1 volume** list, select the volumes.

To select multiple volumes, press Ctrl or Shift and click the volumes in the list.

d) If you want to import copy sets from a comma-separated value (CSV) file, click **Use a CSV file to import copy sets**. Click **Browse** to select the CSV file and click **Next**.

e) On the **Matching Results** page, click **Next** if the match was successful.

f) On the **Select Copy Sets** page, select from the following options and click **Next**.

Select All
Click this button to select all of the copy sets in the table.

Deselect All
Click this button to clear all of the copy sets in the table.

Add More
Click this button to add another copy set to the list of copy sets to be created.

When you click **Add More**, you are returned to the **Choose Host1** page of the wizard. The lists on this page are populated with the values from the previously selected copy set. Repeat the previous steps to complete the **Choose Host1** page and add more copy sets.

Selection check boxes
Select one or more copy sets that you want to create.

Host 1
Lists the volume IDs that are associated with the Host1 role. You can click the link to display information about the volume, including the full name, type, capacity, and whether the volume is protected and space efficient.

Copy Set
Displays the copy set information for the specified copy sets and any warning or error messages that are associated with the copy set.

A warning or icon next to the **Show** button indicates that you cannot create a copy set for the H1 volume. Click **Show** to view the message.

g) On the **Confirm** page, the number of copy sets to be added is displayed. Click **Next**.

h) A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

What to do next

If you want to add a description for the session, select the session on the **Sessions** page. From the **Session Actions** list, select **View/Modify** > **Properties**.

Managing space

You have methods for managing space in Copy Services Manager, including the **`Reflash After Recover`** option and the **`Free Journal Space`** command for sessions that contain Global Mirror relationships. You can also release space for FlashCopy targets after you terminate a session with space-efficient volumes.

About this task

The following two methods can assist with space management in Copy Services Manager on DS8000 storage systems for sessions that contain Global Mirror relationships:

Reflash After Recover option
Keeps a consistent copy of the data during a resync from the original site. This option is available when you create sessions and add properties to them. If you do *not* set the **`Reflash After Recover`** option, then the space is not used up.

See “Using the Reflash After Recover option” on page 213 for more information.

Free Journal Space command
This command is available after a recover operation is performed for Global Mirror relationships. When the **Reflash After Recover** option is set, a FlashCopy relationship exists on the hardware. If the journal volume is a space-efficient volume, then the resync process might take up unnecessary back-end space, and fill up the repository. Use this command to delete the FlashCopy relationships from the hardware, which frees up the space.

See “Using the Free Journal Space command” on page 214 for more information.

Note: The two options listed previously are not limited to Extent Space Efficient (ESE) volumes.

In addition, you have another option for managing space for any DS8000 sessions with FlashCopy relationships:

Releasing space if a Terminate or Remove Copy Set action does not automatically release the space:
Starting with V6.2.7, when you issue a **Terminate** command to the entire practice session, the session no longer automatically frees up space for FlashCopy targets for which the background copy has completed. This design helps prevent an accidental deletion of the FlashCopy target data if the copy had completed.

If you need to free the space after a **Terminate**, you can use the following DSCLI command to release the back-end repository:

```
dscli > init<fb|ckd>vol -action releasespace <volid>
```

where <volid> is the 4 digit volume ID.

Attention: The Copy Services Manager **TerminateHxIx** command will free the space even if the background copy has completed. If you issue the **init** or **TerminateHxIx** commands to free up the space, the data will no longer be accessible.

Using the Reflash After Recover option

About this task

You can use the **Reflash After Recover** option from either the Copy Services Manager GUI or CLI.

Using the Reflash After Recover option from the GUI

About this task

To choose the **Reflash After Recover** option from the GUI, complete the following steps:

Procedure

1. Create a Copy Services Manager session and add copy sets to the session.
2. On the **Journal Options** tab, select **Reflash After Recover**.

What to do next

After you set this option, a consistent copy of the data is kept during a resync from the original site. However, this action uses up journal space. Therefore, to free up journal space after the recover operation, see “Using the Free Journal Space command” on page 214.

Using the Reflash After Recover option from the CLI

About this task

You can also set the **Reflash After Recover** option from the CLI.

Procedure

- To set the **Reflash After Recover** option through the CLI, issue one of the following commands:
  chsess -reflash yes <sessionName>
  chsess -reflash no <sessionName>
  For more information, see the **chsess** command help topic in the Copy Services Manager online help documentation at https://www.ibm.com/support/knowledgecenter/SSESK4.

What to do next

After you set this option, a consistent copy of the data is kept during a resync from the original site. However, this action uses up journal space. Therefore, to free up journal space after the recover operation, see "Using the Free Journal Space command" on page 214.

Using the Free Journal Space command

About this task

You can use the **Free Journal Space** command from either the Copy Services Manager GUI or CLI.

Using the Free Journal Space command from the GUI

About this task

To use the **Free Journal Space** command from the GUI, complete the following steps:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrative privileges.
2. On the **Sessions** details page, select a session for which you want to free up the journal space.
3. Click **Session Actions** > **Commands** > **Free Journal Space**.

   Note: The **Free Journal Space** command is only available after a recover operation is issued on the Global Mirror leg of the selected session.

Results

The FlashCopy relationships are deleted from the hardware, which frees up the journal space.

Using the Free Journal Space command from the CLI

About this task

You can also issue the **Free Journal Space** command from the CLI.

Procedure

- To free the journal space through the CLI, issue the following command:
  cmdsess -action free_journal_space <sessionName>
  For more information, see the **cmdsess** command help topic in the Copy Services Manager online help documentation at https://www.ibm.com/support/knowledgecenter/SSESK4.

Results

The FlashCopy relationships are deleted from the hardware, which frees up the journal space.

Working with user-defined consistency groups

A consistency group is a set of target volumes that are updated to preserve write order, and are therefore recoverable. You can define the name of a consistency group and use that name to assign multiple Global Mirror or Metro Global Mirror sessions to the same consistency group.

About this task

By default, Copy Services Manager automatically assigns an ID to a consistency group. However, you can choose to define the name of a consistency group instead. By using a user-defined consistency group name, you can assign multiple Global Mirror or Metro Global Mirror sessions to the same consistency group on the hardware. You can assign a consistency group for each LSS on the storage system.

Note: A user-defined consistency group name must have a hexadecimal value, and not exceed 250 characters.

Procedure

Follow these steps to assign a new user-defined consistency group name for one or more Global Mirror or Metro Global Mirror sessions:

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select one or more sessions.
3. From the **Session Actions** list, select **View/Modify** > **Set Consistency Group Name**.
4. In the **Set Consistency Group Name** window, enter the new consistency group name that you want to assign to each role pair.
5. Click **OK**.

Completing session administration tasks

Use session commands to complete session tasks such as starting, stopping, suspending, or terminating sessions.

Before you begin

You can issue session commands by using the GUI, as described in this topic, or you can use the CLI to issue commands. For a description of the CLI session commands, see the IBM Copy Services Manager online product documentation (http://www-01.ibm.com/support/knowledgecenter/SSESK4).

About this task

To issue a command for a session, complete the following steps:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session for which you want to issue a command.
3. Click **Session Actions** > **Commands**.

   If the session is a single-target session type, all available commands are displayed under **Commands**. Click the command that you want to issue.

   If the session is a multi-target session type, some of the commands are grouped by overall function. For example, **Start**, **Stop**, or **Suspend**. When you click a command, a window is displayed that provides specific commands for that function. For example, for Metro Mirror - Metro Mirror sessions, if you select **Start**, a window is displayed that contains the specific start commands that you can select. Select the command that you want, review the message text for that command, and then click **Yes** if you want the command to run.

Setting a user-defined group name for one or more sessions

You can assign one or more sessions to a user-defined group.

About this task

If you assign one or more sessions into defined groups, you can easily sort them.

Procedure

Follow these steps to set a user-defined name for one or more sessions:

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, click the session name to select one or more sessions that you want to assign to a group.
3. Select **Session Actions** > **View/Modify** > **Set User-Defined Group Name**.

   Note: You can also set a group name from the Session details page by selecting a session, then clicking **Session Actions** > **View/Modify** > **View Details**. Then, you can follow the actions that start at step 3.
4. In the **Set User-Defined Group Name** window, you can either select an existing group name from the pull-down menu, or enter a new group name to assign to the selected session or sessions.

   Note: Group names must not exceed 250 alphanumeric characters.
5. Click **OK**.

Results

A user-defined group name is assigned to the selected session or sessions.

Removing a user-defined group name from one or more sessions

You can remove the group name assignment from one or more sessions.

Procedure

Follow these steps to remove the group name that is assigned to one or more sessions:

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session or sessions that you want to remove from an assigned group.
3. Select **Session Actions** > **View/Modify** > **Set User-Defined Group Name**.

   Note: You can also remove a group name from the Session details page by selecting a session, then clicking **Session Actions** > **View/Modify** > **View Details**. Then, you can follow the actions that start at step 3.
4. In the **Set User-Defined Group Name** window, use the pull-down menu to select **No group name defined** to remove the existing group name from the selected session or sessions.
5. Click **OK**.

Results

The group name assignment is removed from the selected session or sessions.

Restore FlashCopy session

A FlashCopy session can be restored such that the direction of a persistent FlashCopy relationship is reversed.

In performing a FlashCopy restore, the volume that was previously defined as the target becomes the source for the volume that was previously defined as the source (and is now the target). The changed data is copied to the volume that was previously defined as the source.

Note: Copy Services Manager can currently only perform a FlashCopy session restore operation on DS8000 and SAN Volume Controller systems.

You can restore a FlashCopy session if you want to restore a source volume (Volume A) to the point in time of the last flash operation. In effect, you are restoring the data on the source volume to the time of the last flash, which overwrites any updates since the last flash.

For DS8000 only: If the background copy process of a FlashCopy operation is not complete, a Fast Reverse Restore is done, which causes the original target volume to be unusable. Also, if the incremental option is not specified for the session, a Fast Reverse Restore is done. The Fast Reverse Restore operation does not exist for SAN Volume Controller.

There might be circumstances when you want to restore an original FlashCopy session. For example, suppose that you create a FlashCopy relationship between source volume A and target volume B. Data loss occurs on source volume A. To keep applications running, you can restore the FlashCopy session so that volume B is copied to volume A.

Restoring a FlashCopy session

You can restore a FlashCopy session on a storage system.

About this task

The restore command restores the point-in-time relationships from the target volumes to the source volumes of the FlashCopy session, and overwrites any data on the source volumes.

Follow these steps to restore a FlashCopy session:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrative privileges.
2. Click **Sessions**.
3. From the **Sessions overview** page, select the FlashCopy session that you want to restore.

   Note: Copy Services Manager can currently only perform a FlashCopy session restore operation on DS8000 and SAN Volume Controller systems.
4. Select **Session Actions** > **Commands** > **Restore**.

   Notes:

   - If **Restore** is not a command option, a flash operation has not been done. You must perform a flash at least one time before you can do a restore.
   - For DS8000 only: The **Restore** command is only available if incremental or persistent is set. Incremental implies persistent. You can only restore if you have a persistent relationship.

Results

The FlashCopy session is restored in the opposite direction.

What to do next

When the session is in a new restored state, you can **Restore** it again, **Flash** back, or **Terminate** the session.

Restoring Safeguarded Copy backups to Remote Copy source volumes

You can integrate Safeguarded Copy with any of your existing remote copy sessions and solutions. These remote copy sessions can be Metro Mirror - Global Mirror sessions, or three-site sessions such Metro Mirror - Global Mirror and Global Mirror multiple-target sessions.

About this task

Starting with Copy Services Manager 6.3.0 and DS8000 9.2, you can use the **Restore Backup** command to restore the source volume in the remote copy session to one of the Safeguarded Copy backups, without a full copy. To use the **Restore Backup** command, you must configure a Safeguarded Copy session for a target volume through their remote copy sessions.

To restore a Safeguarded Copy backup to the source of a different remote copy session, you must first associate the Safeguarded Copy session to the remote copy session.

Procedure

1. Follow these steps to associate a Safeguarded Copy session to a remote copy session.
   a. From the **Session Overview** panel click the Safeguarded Copy session that you want to associate to another session.
   b. On the **Session Details** panel for the Safeguarded Copy session, click **Session Actions** >**View/ Modify**>**Session Associations**>**Add/Update Associations**. The **Add/Update** association box is displayed.
   c. Select a value for each of the following questions.
      i) **Which session should be associated to this Safeguarded Copy session?** - select the remote copy session that is being used to create the Safeguarded Copy backups.
      ii) **Which role pair in the session selected above should be associated to the session?** - select the role pair in the session that is selected in step i, where the target of role pair contains the H1 volumes of the Safeguarded Copy session.
      iii) **Which role in the selected role pair is the H1 volume in the Safeguarded Copy session?** - select the role in the role pair that is selected in step ii, which contains the same volumes as the H1 volumes of the Safeguarded Copy session.
      iv) **Which role in the selected role pair do you want to restore from a Safeguarded backup?** - select the role in the role pair that is selected in step ii, which contains the volumes that are restored when the **Restore Backup** command is issued.

      Note: This must be a different role than the role selected in step iii and must be the source of the remote copy relationship.
   d. Click **OK**.

      Note: After the Safeguarded Copy session is associated to another session, the server compares the H1 volumes of the Safeguarded Copy session to the volumes in the role selected in step iii of the associated session. If the volumes do not match, both the Safeguarded Copy session and the associated session display a warning message.

   After a session is associated to the Safeguarded Copy session, any recoverable backup on the Safeguarded Copy session can be used to restore the source volume on the associated session.
2. Follow these steps to restore a backup to the volumes in the selected role on the associated session.
   a. Run the **Recover Backup** command and in the **Recover Backup** dialog box, choose backup you want to recover. This recovers the selected backup to the R1 volumes in the session.
   b. Validate the R1 volumes.

Note: It is important to validate the data on the R1 volumes before you restore the production volumes in the associated session. Ensure that the backup is not corrupted and contains the data that is to be restored on the associated session.

c. Ensure that the associated role pair in the associated session is in a **Suspended** or **Target Available** state.

Note: For more information on how to suspend a role pair, see commands for relevant session types under the Sessions command section.

d. Run the **Restore Backup** command. The **Restore Backup** command appears only in the **Target Available** state after a **Recover Backup** command is run.

The **Restore Backup** command does not prompt for a backup but uses the backup that is specified on the **Recover Backup** command. After running the **Restore Backup** command, the session goes into a **Restoring** state. Progress messages are displayed on the session which indicate the steps that are being run throughout the restore process. Data is recovered to R1 and then replicated from R1 back to the selected role in the associated role pair on the associated session.

The session automatically goes back to a **Prepared** state after the restore is complete. The R1 volumes no longer have a valid copy of the backup data when the restore is complete. All data from the backup is now on the selected role in the associated role pair on the associated session.

Assimilate FlashCopy relationships

Copy Services Manager can assimilate FlashCopy relationships on several storage systems, including DS8000 and those that are based on Spectrum Virtualize technology.

Assimilate FlashCopy pairs on DS8000 storage systems

Starting with Copy Services Manager 6.2.9, you can assimilate existing hardware relationships in a Copy Services Manager FlashCopy session on DS8000 storage systems.

Copy Services Manager has a **`Discover`** command on the FlashCopy session type for DS8000 sessions. When the **`Discover`** command is issued, Copy Services Manager queries the hardware for any existing relationships on defined pairs. If a defined pair is determined to be established on the hardware, then the pair is set to Target Available and consistent.

The **`Discover`** command behaves in the following ways:

- The **`Discover`** command can be run from the Defined or Target Available state. Defined pairs are set to consistent and Target Available if a relationship is found on the hardware. However, they do not indicate a time of the flash.
- Although discovered pairs are set consistent, the session is not able to validate that they are consistent to the time of all other pairs in the session.

  Remember: Be careful when using the feature, and keep this situation in mind if a restore has to be performed.
- If the FlashCopy session is set with the `Incremental` option turned off, even if the **`Discover`** command assimilated an incremental relationship, the flash always terminates and reflashes the relationship.
- If the FlashCopy session is set with the `Incremental` option turned on, if the **`Discover`** command finds an incremental relationship on the hardware for a logical subsystem (LSS), the **`Flash`** command to the session attempts an incremental reflash for all pairs on that LSS.
- After the **`Discover`** command is run, if you have a situation where some pairs on an LSS were flashed with incremental and some were not, the session still attempts an incremental reflash, which fails on the pairs that have not been flashed with incremental.

  Tip: When this situation occurs, you need to remove the copy sets that were not flashed with incremental. You can then flash the copy sets with incremental outside the session before adding them back in.

Assimilate FlashCopy pairs on Spectrum Virtualize based storage systems

Starting with Copy Services Manager 6.2.11, you can assimilate FlashCopy pairs for Spectrum Virtualize based storage systems.

Important: Pairs for Spectrum Virtualize FlashCopy based sessions can only be assimilated if they are in a consistency group. Although other Spectrum Virtualize session types can only assimilate pairs if they are *not* in a consistency group, the Spectrum Virtualize FlashCopy session requires that they be in a consistency group. This design ensures that the assimilated relationships are in the same state as the existing FlashCopy relationships in the session, thereby preventing any issues in attempting to add the new relationships.

Note: Because the relationships are part of a consistency group, it is assumed that the relationships are flashed and consistent across all pairs in the session.

When the **Discover** command is issued, Copy Services Manager queries the hardware for any existing relationships on defined pairs.

The **Discover** command for Spectrum Virtualize systems behaves in the following ways:

- The **Discover** command can be run from the Defined, Prepared, or Target Available state. Defined pairs are set to consistent and Target Available if a relationship is found on the hardware that is part of a consistency group.

  Note: It is assumed that the relationships are flashed and consistent.
- For DS8000 and Spectrum Virtualize systems, although discovered pairs are set consistent, the session is not able to validate that they are consistent to the time of all other pairs in the session.

  Remember: Be careful when using the feature, and keep this situation in mind if a restore has to be performed.
- If a consistency group is not yet established for the session, the **Discover** command assimilates the consistency group for the first pair found into the session.
- If the hardware relationship found for a pair is not part of a consistency group, the **Discover** command fails and error message IWNR2096E is set for the pair.
- If the hardware relationship found for a pair is not in the correct state (that is, flashed), the **Discover** command fails and error message IWNR2096E is set for the pair.
- If the hardware relationship found for a pair is part of a different consistency group than that established for or assimilated into the session, the **Discover** commands fails and error message IWNR2096E is set for the pair.
- If the FlashCopy session is set with the Incremental option turned **off**, even if the **Discover** command assimilated an incremental relationship, the flash always terminates and reflashes the relationship.

Using the Metro Mirror heartbeat

This topic provides information about Metro Mirror heartbeat, including how to enable and disable the heartbeat.

Metro Mirror heartbeat

The *heartbeat* is a Metro Mirror function. When the Metro Mirror heartbeat is disabled, data consistency across multiple storage systems is not guaranteed if the Copy Services Manager management server cannot communicate with one or more storage systems. The problem occurs as a result of the Hardware Freeze Timeout Timer function within the storage system. If the controlling software loses connection to a storage system, the Metro Mirror relationships that it is controlling remains established and there is no way to *freeze* those pairs to create consistency across the multiple storage systems. When the freeze times out, dependent I/O is written to the target storage systems, which might corrupt data consistency. Freeze refers to a Metro Mirror (peer-to-peer remote copy [PPRC]) freeze function.

When determining whether to use the Metro Mirror heartbeat, analyze your business needs. Disabling the Metro Mirror heartbeat might result in data inconsistency. If you enable the Metro Mirror heartbeat and a freeze occurs, your applications will be unable to write during the freeze.

Metro Mirror heartbeat is disabled by default.

Metro Mirror heartbeat is not available for Metro Mirror with HyperSwap or Metro Global Mirror with HyperSwap.

There are two cases where lost communication between the coordination software (controller) and one or more storage systems can result in data consistency loss:

Freeze event not detected by a disconnected storage system

Consider a situation with four storage system machines in a primary site and four in a secondary site. One of the four storage systems on the primary loses the connection to the target site. This causes the affected storage system to prevent any writes from occurring, for a period determined by the Freeze timeout timer. At the same time, the affected storage controller loses communication with the controlling software and cannot communicate the Freeze event to the software.

Unaware of the problem, the controlling software does not issue the Freeze command to the remaining source storage systems. The freeze will stop dependent writes from being written to connected storage systems. However, once the Freeze times out and the long-busy is terminated, dependent write I/Os continue to be copied from the storage systems that did not receive the Freeze command. The Metro Mirror session remains in a state where one storage system has suspended copying while the other three storage systems are still copying data. This state causes inconsistent data on the target storage systems.

Freeze event detected, but unable to propagate the Freeze command to all storage systems

Consider a situation with four storage system machines in a primary site and four in a secondary site. One of the four storage systems on the primary loses the connection to the target site. This causes the affected storage system to issue long-busy to the applications for a period determined by the Freeze timeout timer. At the same time, one of the remaining three source systems loses communications with the controlling software.

The storage system that had an error writing to its target cannot communicate the Freeze event to the controlling software. The controlling software issues the Freeze command to all but the disconnected storage system (the one that lost communication with the software). The long-busy stops dependent writes from being written to the connected storage systems.

However, once the Freeze times out on the frozen storage system and the long-busy is terminated, dependent write I/Os continue to the target storage system from the source storage system that lost communication and did not receive the Freeze command. The Metro Mirror session remains in a state where three storage systems have suspended copying and one storage system is still copying data. This state causes inconsistent data on the target storage systems.

Before Copy Services Manager V3.1, if the controlling software within a Metro Mirror environment detected that a managed storage system lost its connection to its target, the controlling software stopped all the other source systems to ensure consistency across all the targets. However, if the controlling software lost communication with any of the source subsystems during the failure, it could not notify those storage systems of the freeze event or ensure data consistency. The Metro Mirror heartbeat helps to overcome this problem. In a high-availability configuration, the Metro Mirror heartbeat is continued by the standby server after the Takeover command is issued on the standby, enabling you to perform actions on the standby server without causing a freeze.

Copy Services Manager registers with the managed DS8000 storage system within a Metro Mirror session when the start command is issued to the session. After this registration occurs, a constant heartbeat is sent to the storage system. If the storage system does not receive a heartbeat from the Copy Services Manager management server within the allotted time (a subset of lowest LSS timeout value across all the source LSSs), the storage system initiates a freeze. If Copy Services Manager did not successfully communicate with the storage system, it initiates a freeze on the remaining storage system after the allotted time is expired.

Note: Avoid using the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on DS8000 storage systems to create the data-consistent point. If there are other Metro Mirror sessions overlapping the same LSS pairs as in this session, those sessions are also suspended.

When you are using the Metro Mirror heartbeat, be aware that:

- The Metro Mirror heartbeat can cause a single point of failure: if an error occurs on just the management server and not the storage system, a freeze might occur.
- When the Metro Mirror heartbeat timeout occurs, the storage system remains in a long busy state for the duration of the LSS freeze timeout.

Note: If Metro Mirror heartbeat is enabled for storage systems that are connected through a HMC connection, a connection loss might cause lost heartbeats, resulting in Freeze actions with application I/O impact for configured Extended Long Busy timeout.

The Metro Mirror heartbeat is supported on storage systems connected though a TCP/IP (direct connect or HMC) connection. It is not supported on storage systems connected though a z/OS connection. Enabling the Metro Mirror heartbeat with a z/OS connection does not fail; however, a warning message is displayed specifying that the Metro Mirror heartbeat function does not work unless you have an IP connection.

If Metro Mirror heartbeat is enabled for storage systems that are connected through a TCP/IP (either direct connect or HMC) connection and z/OS connection, and the TCP/IP connection fails, Copy Services Manager suspends the Metro Mirror session because there is no heartbeat through the z/OS connection.

If Metro Mirror heartbeat is enabled for storage systems that are connected through a TCP/IP connection and z/OS connection and you remove all TCP/IP connections, Copy Services Manager suspends the Metro Mirror sessions and the applications using those volume will be in Extended Long Busy timeout until the storage system's internal timeout timer expires. Ensure that you disable the Metro Mirror heartbeat for all Metro Mirror sessions before removing the last TCP/IP connection to avoid the Extended Long Busy timeout.

Enabling and disabling the Metro Mirror heartbeat

The Metro Mirror heartbeat guarantees data consistency across multiple storage systems when the Copy Services Manager management server cannot communicate with one or more storage systems. The Metro Mirror heartbeat is disabled by default.

About this task

To enable the Metro Mirror heartbeat, perform the following steps:

Procedure

1. In the menu bar, click **Settings** > **Advanced Tools**.
2. To enable the Metro Mirror heartbeat, click **Enable Heartbeat**.
3. To disable the Metro Mirror heartbeat, click **Disable Heartbeat**.

Exporting copy set data

You can export data about all copy sets in a specific session to maintain a backup copy that can be used to recover if you lose your session or upgrade to a different server.

About this task

Complete these steps to export the copy sets in a specific session:

Procedure

1. In the menu bar, click **Sessions**.

2. On the **Sessions** page, select the session for which you want to export copy sets.
3. From the **Session Actions** list, select **Export** > **Export Copy Sets**. The **Export Copy Sets** window displays the status of the export and a link to the exported file if the export completed.
4. Right-click the link and save the file to a local system.

Importing copy set data

You can import copy set data that was previously exported to a comma separated value (CSV) file.

About this task

Perform the following steps to import copy sets into an existing session:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session for which you want to import copy sets.
3. From the **Session Actions** list, select **View/Modify** > **Add Copy Sets**. The Add Copy Sets wizard is displayed.
4. Select **Use a CSV file to import copy sets**.
5. Click **Browse**, select the CSV file, and then click **Next**.
6. Verify that the matching results were successful, and then click **Next**.
7. Select the copy sets that you want to add, and then click **Next**.
8. Confirm the number of copy sets that you want to create, and then click **Next**.
9. View the information on the **Results** page of the wizard, and then click **Finish**.

Exporting historical data for Global Mirror role pairs

You can export data for a Global Mirror role pair that is in a IBM DS8000 session to a comma-separated value (CSV) file. You can then use the data in the CSV file to analyze trends in your storage environment that affect your recovery point objective (RPO).

About this task

Complete these steps to export data to a CSV file:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, click the Global Mirror session for which you want to export data.
3. From the **Session Actions** list, select **Export** > **Export Global Mirror Data**.
4. In the **Export Historical Data for Global Mirror** window, complete the following information, and then click **OK**:

   Select the role pair
   Select the role pair for the data that you want to show in the CSV file.

   Select the type of data
   Select the type of data that you want to export to a CSV file. Depending on the data type that you select, the CSV file contains data about the RPO or data about logical subsystem (LSS) out-of-sync tracks.

   To better analyze trends, you can create a CSV file with one data type and then create a file with the other data type. For example, the file that contains data for the RPO might show that the RPO threshold is often exceeded on a particular day and time. You can then view the file that contains data for LSS out-of-sync tracks to see whether a particular LSS or set of LSSs have high out-of-sync track values for that day and time.

RPO
Select this option to export data for the RPO. The data that is shown in the export file includes the average RPO for the dates that you select and information related to the formation of consistency groups.

LSS Out-of-Sync Tracks
Select this option to export data for the out-of-sync tracks that are in the LSSs.

Start date
Select the start date for the data that you want to show in the export file.

By default, the date range maximum for RPO files is 31 days of data and the maximum for LSS out-of-sync track files is 7 days of data.

End date
Select the end date for the data that you want to show in the export file.

Results

After you click **OK** to export the file, a results window displays the status of the export and a link to the exported file if the export completed. Download and save the file to a local system.

Exporting historical RPO data for SAN Volume Controller Global Mirror with Change Volume sessions

You can use the GUI or the CLI to export historical RPO data for SAN Volume Controller Global Mirror with Change Volume sessions.

About this task

You can store and export historical records for recovery point objective (RPO) values on SAN Volume Controller Global Mirror with Change Volume sessions. Every time the actual RPO is calculated, the value is maintained in the internal data store. You can export the values to a CSV file, over a one-month time period.

You can use either the Copy Services Manager GUI or CLI to export RPO data.

Format of the CSV file for SAN Volume Controller Global Mirror with Change Volumes history

The CSV file is generated with the following values that are separated by a comma:

Table 69. SAN Volume Controller Global Mirror with Change Volumes history CSV file output values

CSV file value	Description
Query Time	Time that the actual RPO value was calculated.
Session Name	Name of the Copy Services Manager session.
Role Pair Name	Name of the role pair that is represented in the data.
Consistency Group Name	Name of the consistency group on the hardware.
Query Interval (in seconds)	Query interval setting to determine actual RPO.
Data Exposure (in hours:minutes:seconds format)	RPO data exposure is displayed in a readable format.
Data Exposure (in milliseconds)	RPO data exposure to provide for graphing and charting.

Example CSV file output

```
#Generated at:,"Feb 23, 2016 4:14:55 PM"
```

```
#Session Name:,CSM-GMCV

#Role Pair:,H1-H2

#Start Date:,"Nov 1, 2015"

#End Date:,"Feb 23, 2016"

#Query Time,Session Name,Role Pair Name,Consistency Group Name,Query
    Interval(secs),Data Exposure(hh:mm:ss),Data Exposure(milliseconds),
2015-11-23 11:56:05.0,CSM-GMCV,H1-H2,CSM-GMCV,30,0:03:19,199000
```

Exporting RPO history by using the GUI

About this task

Follow these steps to export RPO history through the GUI:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. From the **Overview** panel, click **Session Overview**. Or, from the menu bar, click **Sessions** to get to the **Sessions Details** panel.
3. From the **Session Actions** menu, select **Export** > **Export Global Mirror Data**. A pop-up window is displayed.
4. Select the role pair.
5. Ensure that the **RPO** option is selected for the type of data.
6. Enter a valid date range that spans no longer than a 31-day period for the start and end dates for the export.
7. Click **OK** to confirm, or click **Cancel** to exit.

Results

A **CSV** file is created with the historical RPO data. A link is also provided to download the file to your local system.

Exporting RPO history by using the CLI

About this task

Follow these steps to export RPO history through the CLI:

Procedure

1. Log in to the Copy Services Manager CLI as a user with administrator privileges.
2. Use the **exportgmdata** command with the `-rpohistory` option to indicate that you want to export the RPO history. Then use the **-rpo_start** and **-rpo_end** parameters to specify the date range, which must span within a 31-day period.

Results

A message is displayed, which indicates the location of the newly created **CSV** file. This file now contains the historical RPO data for the specified dates.

Customizing settings in the `rmserver.properties` file

About this task

You can customize some of the settings for the historical RPO reporting in the `rmserver.properties` file, including the retention period, the query interval, and the reserved disk space.

- **Retention period:** The default retention for RPO data is set to 91 days. After 90 days, RPO data is removed from the internal data store. The **`db.svcgmsessionrpo.retention.days`** property can be created and set in the `rmserver.properties` file to change the default retention value. Change this value to indicate how many days of data to keep in the internal data store.
- **Query interval:** During the 30-second default query interval, the actual RPO is calculated and an entry for the session is added to the internal data store. You can modify the query interval in the **`hw.svc.gmcv.dataExposureInterval`** property in the `rmserver.properties` file. The value is in seconds. Change the value of this property to the number of seconds that you want to determine the actual RPO.
- **Reserved disk space:** You can determine the amount of space that is needed for historical reporting. With the default query interval set to 30 seconds, a year of data for a single session is estimated at around 200 MB of disk space. If you increase values for retention or query interval, you must ensure that there is enough disk space to accommodate the changes.

Modifying the location of session sites

You can change the location that is associated with each site in session.

About this task

Prerequisites: You must have Administrator privileges or Operator privileges for the session to modify the location of a site in a session.

Changing the location of a site in a session does not affect the location of the storage systems that are associated with that site.

Complete the following steps to modify the location of a site:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session whose site locations you want to change.
3. From the **Session Actions** list, select **View/Modify** > **Site Location(s)**.
4. In the **Modify Site Locations** window, select a site location or **None** for each site that you want to change.

   An image that represents the sites in the session is displayed. If you selected locations for the sites that are in the session, the sites are labeled with the site location. If you did not select site locations, the sites are labeled with **Site *n***, where *n* is the site number. You can hover the mouse pointer over the site name to view the name in a larger format.
5. Click **OK**.

Removing sessions

This topic describes how to remove sessions.

About this task

Important: You can remove only sessions that are in the Defined state.

Complete these steps to remove a session:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session that you want to remove.
3. From the **Session Actions** list, select **Remove Session**.
4. Click **Yes** to confirm that you want to remove the session.

Removing copy sets

This topic describes how to remove copy sets.

About this task

Complete these steps to remove a copy set:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session that you want to remove copy sets from.
3. From the **Session Actions** list, select **View/Modify** > **Remove Copy Sets**. This action starts the Remove Copy Sets wizard.
4. From the drop-down menus in the **Remove Copy Sets** wizard, select the Host 1 storage system, and logical storage subsystem.

   Note: If you select **All Storage Systems**, and then **All Logical Subsystems**, no table appears. However, the **Next** button is available so that all copy sets in the session can be deleted.
5. From the table on the same page, select the Host 1 volume. You can view the volumes by filtering on the user name or full name. You can select one or more volumes, or you can choose to **Select All** or **Deselect All**. Select the volumes that you want, and click **Next**.
6. On the **Select Copy Sets** page, choose which copy sets to remove. You can select them individually, or choose to **Select All** or **Deselect All**.

   Note: Alternatively, you can select **Use a CSV file** to import copy sets. All the copy sets from this CSV file listing will be selected.
7. After you select which copy sets to remove, click **Next**.
8. The number of copy sets to be removed is displayed. Select the following options for removing the copy sets and click **Next**:

   - **Do you want to keep the base relationships on the hardware, but remove the copy sets from the session?**
     - **No**. This option specifies that all relationships for the copy sets are removed from the hardware and from the Copy Services Manager session. This option is the default.
     - **Yes**. This option specifies that the base relationships remain on the hardware, but the copy sets are removed from the Copy Services Manager session. This option supports scenarios in which it might be best to leave the relationship on the hardware to avoid performing a full copy. For example, when you migrate from one session type to another.

       Only the base relationships (Metro Mirror, Global Copy, Snapshot, and FlashCopy) remain on the hardware. The relationships are removed from any consistency groups that are defined on the storage system.
   - **If there are errors removing relationships on the hardware, do you want to force the copy sets to be removed from the session?**
     - **No**. This option does not force the removal of copy sets. This option enables you to correct the errors and try to remove the copy sets again. This option is the default.
     - **Yes**. This option forces the removal of copy sets despite any errors that occur when the relationships are removed from the storage system. After a forced removal is complete, any

relationships that remain on the storage system for that copy set must be removed manually by using the storage system interface.

9. After the copy sets are removed, click **Finish**.

Removing a storage system from an active Global Mirror configuration running on a Copy Services Manager session

During hardware migration that involves equipment that is running Copy Services Manager sessions, there is a manual process to remove a storage system from an active Global Mirror configuration.

About this task

When DS8000 sets up a Global Mirror relationship, it can span multiple source (H1) storage systems and creates a master/subordinate topology. The master source storage system coordinates the consistency group formation with the other subordinate source storage systems.

When you remove a storage system from a Global Mirror configuration, steps need to be taken to update the master/subordinate topology on the DS8000.

To modify the topology on the hardware, consistency group formation needs to be stopped. The Copy Services Manager session does not automatically stop consistency group formation when removing the last copy set from the storage system that is being removed.

Before removing the storage system completely from the environment, the following steps should be performed when consistency group formation can be temporarily stopped.

Complete these steps to remove a storage system from an active Global Mirror configuration running on a Copy Services Manager session:

Note: Do not attempt this manual process of removing a storage system during a highly active or sensitive time frame in your storage environment.

Procedure

1. Add in new copy sets to replace the old source storage system, and populate the copy sets with the old source storage system data with a product such as TDMF.
2. After all data is migrated and you are ready to remove the source storage system from the environment, remove the copy sets from the Copy Services Manager session.
3. **Suspend** the Global Mirror session or the Global Mirror leg of a 3 or 4 site session.

   Note: If the **Suspend** operation fails, you need to issue the **Stop** command to reach a suspended Global Mirror leg. If a **Stop** is processed, it will remove the Global Mirror Master configuration from the hardware.
4. Issue a **Recover** to the Global Mirror session, or **Failover** to the Global Mirror target in a 3 or 4 site multi-target session.

   Note: For Metro Global Mirror with Practice (MGMP) sessions, you cannot issue the Recover H3 command. You need to ensure that you issue the Stop command while the Session is in Suspending Hx-H3 state.
5. Restart the Global Mirror session or the Global Mirror leg of a 3 or 4 site session.

   Note: During the restart, Copy Services Manager detects that the old source storage system is no longer in the session, and builds the new master/subordinate topology.
6. Remove the connection for the old source storage system.

Creating scheduled tasks

You can schedule tasks for Copy Services Manager.

About this task

Starting with Copy Services Manager Version 6.2.1, you can use a GUI wizard to schedule tasks. Currently, tasks can only be scheduled against sessions.

The scheduled tasks can consist of one or more actions, including issuing commands, and waiting for states.

The **Wait for State** action ensures that the next action in the list does not occur until the session is in the right state. The list of actions that you create in the wizard occur sequentially, one after the other. So the **Wait for State** action delays the next action in the task from running until the specified state is reached. The task fails if the state is not reached.

Perform the following steps to schedule a task:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Settings** > **Scheduled Tasks**.
3. Click **Create Task**. The **Scheduled Task** wizard is displayed.
   a) Type a name for the scheduled task in the **Task Name** field.
   b) Optional: You can enter a **Description** for the scheduled task.
   c) You can also set the option to **Create a PE package if error occurs running the task**.

      Tip: The information in a PE package can be helpful when troubleshooting.
   d) Click **Next**.
4. On the next page of the wizard, select whether you want the task to run **Hourly** or **Daily/Weekly**. You can also select **No schedule** if you do not want the task to run on a set schedule.

   Notes:

   - The task does not start running on the schedule until it is enabled.
   - If you select **No schedule**, you cannot enable the task because it does not have a schedule. You can run the task manually, but you must set a schedule to enable it.
   - If you select **Hourly**, indicate how often (for example, every 3 hours). The task is scheduled to start at the top of the hour at the selected interval.

     Note: The hourly scheduling is set by dividing a 24-hour day into the number of intervals that you want. For example, if wanted to run the task every 3 hours, that would equal eight times per day. In this example, starting at midnight, the day is divided into eight intervals.

     If you require a specific time of the day for the task to start, use the Daily/Weekly schedule.
   - If you select **Daily/Weekly**, select which day or days of the week, and a **Time** of day to start.

     Note: The start time is based on the browser, which uses the local system time. The Copy Services Manager server might not be located in the same time zone as the browser. Keep this fact in mind when you select the **Time** option.

   a) Click **Next**.
5. Click **Add Action**.
6. On the next page of the wizard, make the following selections:
   a) Choose the action **Type** from one of the following options:

      Command
      Runs a selected command on the selected session at the selected time interval. You select the command and session in a later step.

Wait For State
Waits until the selected session reaches a specified state before the next action is performed. You select the state and session in a later step.

Wait For Percent Complete
Waits until the selected role pair in the session reaches a certain percentage of completion before the next action is performed. You select the session in a later step.

Validate Role Pair Consistency
Checks the current consistency for the role pair. If it is not consistent, the task fails. You select the session in a later step.

b) From the table, select the session for which you want to schedule the action. Only sessions for which the selected action can be performed are displayed.

Note: Currently, you can only schedule an action against one session at a time.

The following information is provided about each session that you can choose from for scheduling a task:

Name
The session name.

Type
Indicates the type of session.

You can customize the session list by filtering information, resizing columns, reordering columns, sorting rows, and hiding columns. All changes that you make to the sorting, column sizing, column order, and table filters persist for each user on a browser across logins.

- To filter the list by session name or type, enter the filter text in the **Filter** field. You can enter complete text or partial text. To remove the filtering for the list, click the X icon in the **Filter** field.
- To resize a column, drag the column heading border until the column is at the width that you want.
- To sort the rows in the list, click the heading for the column that contains the value that you want to use for sorting. For example, if you want to sort by the session type, click the **Type** heading. The list sorts by the value in that column. You can choose an ascending or descending sort order by clicking the column heading.
- To reorder columns, left click and drag a column from the current location in the table to the new preferred location.
- To hide columns or make columns visible, right-click on the table header. This action gives you a list of possible columns for the table. Or you can left-click on the icon in the upper right of the table header. Clear the check from any column to hide it from the table. Check any column to make it visible in the table.

c) For **Command**, **Wait For State**, **Wait For Percent Complete**, and **Validate Role Pair Consistency** actions, you need to make more selections.

For a **Command** action:

- Select the command that you want to issue.

  Note: The commands that are available depend on the type of session that you select.

For the **Wait For State** action:

- Select which state to wait for before the next action is performed.

  Note: The states that are available depend on the type of session that you select.
- Select a time, in minutes, to wait before the action times out.

For the **Wait For Percent Complete** action:

- Select the role pair. All of the Metro Mirror, Global Copy, FlashCopy, or Safeguarded Copy role pairs are listed for the selected session.

- You can specify the percent complete, from 1% to 100%. The default setting is 100%.
- Choose how long to wait (in minutes) for the action to reach the chosen percent complete before timing out.

Note: If the command fails, or the state, or percent complete is not reached before the timeout time that you selected, the entire task fails and no other actions run.

For the **Validate Role Pair Consistency** action:

- Select the role pair.

d) Click **OK** to save your changes for the scheduled task action, or click **Cancel** to exit without saving changes.

7. You can run a scheduled task on success or failure of this task. Find the fields below the task table that provide those options. From the pull down lists beside each option, you can choose an existing scheduled task to run on success (**Run the following task if successful**), or on failure (**Run the following task on failure**) of the current scheduled task.

   Note: The default for both options is **Do not run a Task**.

8. Repeat steps 5 and 6 for every action that you want to perform in the scheduled task.

   Example:

   You might have two sessions: a Global Mirror Failover/Failback (GM) session and a Metro Mirror Failover/Failback (MM) session. In this example, the MM session is running in Global Copy mode and is cascaded off the GM session's Global Copy target volumes to a third site. You might want to periodically schedule a set of actions so that the targets of the MM session that is running in GC mode get a consistent image.

   You can schedule this set of actions as follows:

   a. Create a new task.
   b. Choose a schedule when the task runs (such as daily at midnight).
   c. Add a Command action that issues a Suspend command to the GM session. This action suspends the GM session consistently if the DS8000 supports Pause with Consistency.
   d. Add a Wait for State action that waits until the GM session is in a Suspended state.
   e. Add a Command action that issues a Suspend command to the MM session.
   f. Add a Wait for State action that waits until the MM session is in a Suspended state.
   g. Add a Command action that issues a Start H1->H2 command to the GM session. This command restarts the GM session so that replication is running again to the second site.

9. You can change the order in which the actions are performed by clicking **Up** or **Down**. You can also delete actions by selecting them from the table and clicking **Remove Action**. Or you can make changes to actions by clicking **Modify Action**.
10. On the next page, review the summary for the scheduled task actions. If everything is correct, click **Finish**. If you need to make changes, click **Back** to return to any pages in the wizard where changes need to be made.
11. If you click **Finish**, a message indicates whether the task was created successfully.

Results

The scheduled task appears in the **Scheduled Tasks** table.

Note: Tasks are initially in a disabled state. You must use either the **Enable** command to start them according to the preset schedule, or the **Run** command to execute them immediately, including in a disabled state. For more information, see "Enabling a scheduled task" on page 233 and "Running a scheduled task" on page 234.

The following information is provided about each scheduled task:

Name
The scheduled task name.

Type
Indicates the type of the scheduled task.

Affected Sessions
The sessions that are used for the scheduled task to run.

Status
Indicates whether the task is enabled, disabled, or running.

Schedule
The time and days of week that this task is scheduled to run.

Next Run Time
Shows the date and time of when the scheduled task will run next. When you use an hourly schedule, the scheduling is set by dividing a 24-hour day into the number of intervals that you want. For example, if you wanted to run the task every 3 hours, that would equal eight times per day. In this example, starting at midnight, the day is divided into eight intervals. If you require a specific time of the day for the task to start, use the Daily/Weekly schedule.

Last Run Time
The date and time of when the scheduled task ran the last time.

Last message
Shows the message ID of the status from the last run. To see more details, click the message to open the **Help** page.

You can filter and customize the scheduled tasks list as previously described for the session table in the scheduled tasks wizard.

Modifying a scheduled task

You can modify scheduled tasks.

About this task

Modifying a scheduled task brings up the schedule task wizard for you to make changes.

Note: You can only modify one task at a time.

Follow these steps to modify a scheduled task:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Settings** > **Scheduled Tasks**.
3. From the table, select the scheduled task that you want to modify.

   Note: You can only select one task at a time to modify.
4. Click **Actions** > **Modify Task**.
5. Change any of the wizard settings for the scheduled task, as required.

   Note: If a schedule is already running, a change in the scheduled time takes effect after the next already scheduled run completes. To update to the new scheduled time immediately, disable and then re-enable the schedule.
6. On the final page of the wizard, review the summary for the scheduled task. If everything is correct, click **Finish**. If you need to make changes, click **Back** to return to any pages in the wizard where changes need to be made.
7. If you click **Finish**, a message indicates whether the task was modified successfully.

Results

The modified scheduled task appears in the **Scheduled Tasks** table.

Removing a scheduled task

You can remove a scheduled task.

About this task

You can select multiple scheduled tasks to remove.

Follow these steps to remove one or more scheduled tasks:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Settings** > **Scheduled Tasks**.
3. From the table, select the scheduled task or tasks that you want to remove.
4. Click **Actions** > **Remove Task**.
5. A warning message is displayed for confirmation. Click **Yes** to remove the selected task or tasks. Click **No** to exit without removing the selected task or tasks.
6. If you click **Yes**, a message appears indicating that the selected task or tasks have been removed.

Results

Any scheduled task that you chose to remove no longer appears in the **Scheduled Tasks** table.

Enabling a scheduled task

You can enable a scheduled task to run according to the preset schedule.

About this task

You can select multiple scheduled tasks to enable.

When a task is initially created, it is put into a disabled state. The **Enable** command starts the task so that the timer begins running. The task executes based on the schedule that you set for it.

Follow these steps to enable one or more scheduled tasks:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Settings** > **Scheduled Tasks**.
3. From the table, select the scheduled task or tasks that you want to enable.
4. Click **Actions** > **Enable Task**. You then select from two options for when you want the task to run:
   a) Enable the task to run **Now**. The task will start immediately after you confirm at the next step.
   b) Or, enable the task to run **At a specified time**.

   Note: The **At a specified time** option is only available if the schedule that you selected was `Hourly`. If you selected `Weekly` or `No Schedule`, then only the run **Now** option is available.
5. A warning message is displayed for confirmation. Click **Yes** to enable the task to either run now, or at the specified time. Click **No** to exit without enabling the task.
6. If you click **Yes**, a message appears indicating that the selected task or tasks were enabled.

Results

The scheduled task or tasks are enabled, and start running according to the option that you selected, either immediately, or at the later time as indicated.

Disabling a scheduled task

You can disable a scheduled task that has been started with the **Enable** command.

About this task

You can select multiple scheduled tasks to disable.

When a task is initially created, it is put into a disabled state. The **Enable** command starts the task so that the timer begins running. The task executes based on the schedule that you set for it. The **Disable** command can be used to stop an enabled, scheduled task.

Follow these steps to disable one or more enabled, scheduled tasks:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Settings** > **Scheduled Tasks**.
3. From the table, select the enabled, scheduled task or tasks that you want to disable.
4. Click **Actions** > **Disable Task**.
5. A warning message is displayed for confirmation. Click **Yes** to disable the task. Click **No** to exit without disabling the task.
6. If you click **Yes**, a message appears indicating that the selected task or tasks were disabled.

Results

The scheduled task or tasks are disabled, and stop running.

Running a scheduled task

You can run a scheduled task.

About this task

You can select multiple scheduled tasks to run.

The **Run** command is different from the **Enable** command. It forces the task to run immediately without regard to the schedule. The task can also be run from a disabled state.

Follow these steps to run one or more scheduled tasks:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Settings** > **Scheduled Tasks**.
3. From the table, select the scheduled task or tasks that you want to run.
4. Click **Actions** > **Run Task**.
5. A warning message is displayed for confirmation. Click **Yes** to run the task. Click **No** to exit without running the task.
6. If you click **Yes**, a message appears indicating that the selected task or tasks will start running.

Results

The scheduled task or tasks start running immediately.

Migrating existing hardware relationships to Copy Services Manager

You can convert existing hardware relationships for copy services to a Copy Services Manager session.

About this task

For session types other than multi-target sessions, you can either complete this action manually, as described, or use the data migration utility for Copy Services Manager. The data migration utility is not available for multi-target sessions.

To download the data migration utility, go to http://www.ibm.com/support/docview.wss?uid=swg24000625. The data migration utility produces the Copy Services Manager CLI command script files and DSCLI script files that necessary to migrate the configuration to Copy Services Manager.

To manually migrate role pairs in a hardware relationship, complete the following steps:

Procedure

1. Identify the hardware relationships that you want to migrate.
2. Create a Copy Services Manager session and add copy sets to the session.
3. If you are migrating from one of the following storage systems, complete the applicable step:
   a. For DS8000 storage systems with Global Mirror relationships, terminate the Global Mirror master.
   b. For FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, Storwize, or the FlashSystem/IBM Spectrum Accelerate storage systems, remove all volumes from the consistency group.
4. Issue a start command to start the Copy Services Manager session.

Converting from multi-target to Cascaded replication in a three site session type

The session types Metro Mirror – Global Mirror, Metro Mirror – Global Mirror with Practice, and Metro Mirror – Global Mirror with three Site Global Mirror, now support the ability to convert from a multi-target configuration to a cascaded configuration and back. Cascaded configurations change the session so that the Global Mirror relationship is cascaded off of the Metro Mirror relationship and behave similar to the Metro Global Mirror session type.
When in a supported state, the Start H1->H2->H3 or Start H2->H1->H3 command is available which converts the session from a multi-targeted to cascaded configuration.
To convert from a cascaded configuration back to a multi-target configuration, the Start H1->H2 H1->H3, or Start H2->H1 H2->H3, command is available in supported states.

Before you begin

1. Conversion between multi-target and cascaded modes, and vice versa, is done without a full copy. However, full three site protection is not available until the conversion is complete, so the change should be scheduled for an appropriate time.

   Note: If HyperSwap is enabled, during the conversion from multi-target to cascaded mode, HyperSwap is temporarily disabled at a point during the conversion to establish the pairs for cascaded incremental resync capabilities.
2. The session must be in Suspended or Suspended Partial state to transition from multi-target to cascaded mode

   Note: The session does not need to be in suspended state to go from cascaded mode back to multi-target.

   .

3. After recovering the session to H3, from being in a cascaded H1->H2->H3 or H2->H1->H3 mode. The options for starting at H3 are limited to commands which avoids a full copy.
4. While running the session in the cascaded H1->H2->H3 or H2->H1->H3 mode, if the intermediate site is lost, an incremental start from the primary site to the remote site is available as it is in a Metro Global Mirror session.

   Note: In the event that a disaster occurs while in a two site Global Mirror configuration, after losing the intermediate site, any Start command from Site 3 results in a full copy of the remote Global Copy leg. This case is rare and occurs only after first losing the intermediate site and then the primary site.

Migrating from the Metro Global Mirror session type to multi-target Metro Mirror – Global Mirror session type running in the cascading mode

About this task

If you are running a Metro Global Mirror cascaded session or Metro Global Mirror with Practice session, you might want to migrate to a multi-target Metro Mirror – Global Mirror session or Metro Mirror – Global with Practice session.

The following are the advantages of migrating from a Metro Global Mirror or Metro Global Mirror with Practice session to a multi-target Metro Mirror – Global Mirror or multi-target Metro Mirror Global Mirror with Practice session type:

1. The multi-target session types support DS8000 multi-target capabilities, simplifying some of the transitions between the sites.
   For example: : When the session is running H1->H2->H3 and a Recover H2 is issued, the cascaded Metro Global Mirror solution today copies data from H2->H3->H1 in order to get back to an H2->H1->H3 configuration. With the multi-target solution this is no longer necessary and the session can failback directly to a H2->H1->H3 configuration after the recover to H2.
2. All the features of the Metro Global Mirror and Metro Global Mirror with Practice session are available in the multi-target session types.

   Note: Some transitions between sites are slightly different due to using the multi-target capabilities of the hardware.
3. Starting from site three on the Metro Global Mirror session type requires a full copy. The new multi-target sessions use DS8000 multi-target technology to avoid full copies from site three.

   Note: The multi-target Metro Mirror – Global Mirror with Practice session still requires a full copy after starting at site three and the recovering back to either site 1 or site 2, for the replication back to site 3. This is because the volumes used in the practice session for the host at site 3 are different than the volumes used to replicate from site 1 or 2 to site 3. The Metro Mirror relationships does not require a full copy so there will still be Metro Mirror protection while the copy to site 3 occurs.

Procedure

1. Ensure that the existing Metro Global Mirror or Metro Global Mirror with Practice session is in a Prepared and normal state before migrating session to the new multi-target session type.

   Important: Do not migrate the session when the session is not in a full three site configuration.
2. Export all copy sets from the existing Metro Global Mirror or Metro Global Mirror with Practice session (Refer “Exporting copy set data” on page 35).
3. Create a multi-target Metro Mirror – Global Mirror or multi-target Metro Mirror – Global Mirror with Practice session.
4. Set the Consistency Group for all Global Mirror role pairs on the new session to match the consistency group number, used on the existing cascaded session.

5. Import the copy sets from step 2 into the new multi-target session (Refer “Importing copy set data” on page 35).
6. Remove all copy sets from the Metro Global Mirror or Metro Global Mirror with Practice session using the **Keep existing relationships on the hardware** option.

   Note: Make sure to use the **Keep existing relationships on the hardware** option or the procedure results in a full copy.
7. Issue Start H1->H2->H3 from the new session to start the session in cascaded mode. This method assimilates the existing relationships on the hardware.

   Note: If the cascaded session was in H2->H1->H3 mode then you can issue the Set Production to Site 2 command followed by the Start H2->H1->H3 command.

Chapter 8. Practicing disaster recovery

You can use practice volumes to test your disaster recovery actions while maintaining disaster recovery capability. Practice volumes are available in Metro Mirror Failover and Failback sessions, Global Mirror Failover and Failback, Global Mirror Either Direction sessions, and Metro Global Mirror with Practice sessions.

Practice volumes

You can use a *practice volume* to practice what you would do in the event of a disaster, without interrupting current data replication. Practice volumes are available in Metro Mirror, Global Mirror, Metro Global Mirror, and Metro Mirror - Global Mirror sessions.

To use the practice volumes, the session must be in the prepared state. Issuing the Flash command against the session while in the Prepared state creates a usable practice copy of the data on the target site.

Note: You can test disaster-recovery actions without using practice volumes. However, without practice volumes, you cannot continue to copy data changes between volumes while testing disaster-recovery actions.

Prevent a reflash when practicing disaster recovery

Starting with Copy Services Manager 6.2.7, there is a new property for DS8000 practice sessions to prevent a reflash of the practice volume after a **Flash** or **Recover** operation.

When you manage practice sessions, you might have a batch job that runs on a schedule and issues a **Flash** to the practice session. It is useful to have the ability to prevent the session from allowing a reflash while the batch tests are running.

You do not want the automated **Flash** to reflash the practice volumes until all practice testing is complete from the last flash, because these are two non-coordinated activities.

This new property can be used on the following session types for DS8000 only:

- Metro Mirror with Practice
- Global Mirror with Practice
- Global Mirror Either Direction with Two-Site Practice
- Metro Global Mirror with Practice
- Multi-target Metro Mirror - Global Mirror with Practice

This property can be set using either the GUI or the CLI.

In the GUI, the option is called **Prevent Reflash of Practice volume after Flash or Recover**.

See the **lssessdetails** and **chess** commands in the IBM Copy Services Manager online product documentation (http://www.ibm.com/support/knowledgecenter/SSESK4) for more information about setting this property in the CLI.

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Practicing disaster recovery for a Metro Mirror Failover/Failback with Practice session

A Metro Mirror Failover and Failback session with Practice combines Metro Mirror and FlashCopy to provide a point-in-time copy of the data on the remote site. You can use this to practice what you might do if a disaster occurred, without losing your disaster recovery capability.

Before you begin

This function is available on the following storage systems:

- IBM DS8000
- Systems running IBM Spectrum Virtualize, including:
  - FlashSystem V840
  - FlashSystem V9000
  - FlashSystem 9100
  - FlashSystem 9200
  - SAN Volume Controller
  - Storwize V3700
  - Storwize V5000
  - Storwize V7000
  - Storwize V7000 Unified

About this task

Perform these steps to practice disaster recover actions for a Metro Mirror Failover/Failback with Practice session:

Procedure

1. Start a Metro Mirror with Practice session.
2. When the Metro Mirror session reaches the Prepared state, issue a Flash command to make a point-in-time copy of the data on H2. This creates a consistent point-in-time copy of your data on the H2 volume and then restarts the session so the copying from H1 to I2 continues. This temporarily stops copying of the data from site 1 to site 2, and creates a consistent point-in-time copy. The data replication from H1 to I2 is then restarted.

   Note: For DS8000 storage systems, the **Flash** command uses the freeze and thaw processing to create a data consistent point for the FlashCopy. If there is another Metro Mirror session overlapping on one or more of the same LSS pairs, that session will be suspended. It is also possible that the suspension of the other session might cause the Metro Mirror session to remain suspended after the flash command is issued instead of returning to Prepared state. Avoid using the same LSS pairs for multiple Metro Mirror sessions if possible.
3. Practice the same actions you would take in an actual disaster, using H2 as your new host volume, while running the real application on H1.

Practicing disaster recovery for a Global Mirror either Direction with two-site Practice session

A Global Mirror (either direction) with two-site Practice combines Global Mirror and FlashCopy to provide a point-in-time copy of the data on a remote site at a distance over 300 km away from your first site. You

can use this to practice what you might do if a disaster occurred, without losing your disaster recovery capability.

Before you begin

Note: This function is available only on DS8000 storage systems.

About this task

Perform these steps to practice disaster recover actions for a Global Mirror either Direction with two-site Practice session:

Procedure

1. Start a Global Mirror with Practice session.
2. When the session reaches the Prepared state, issue a Flash command to restore consistent data on I2 and make a point-in-time copy of the data on H2. This creates a consistent point-in-time copy of your data on the H2 volume and then restarts the session so the copying from H1 to I2 continues. This temporarily stops copying of the data from site 1 to site 2, and creates a consistent point-in-time copy. The data replication from H1 to I2 is then restarted.
3. Practice the same actions you would take in an actual disaster, using H2 as your new host volume, while running the real application on H1.

   Note: With two directions, you can reverse the direction of your data flow.

Practicing disaster recovery for a Global Mirror Failover/Failback with Practice session

A Global Mirror Failover and Failback with Practice combines Global Mirror and FlashCopy to provide a point-in-time copy of the data on a remote site at a distance over 300 km away from your first site. You can use this to practice what you might do if a disaster occurred.

Before you begin

You can do this practice without losing your disaster recovery capability. The number of volumes used for the device varies, but the steps to conduct a Global Mirror Failover and Failback with Practice are the same for both devices.

This function is available on the following storage systems:

- IBM DS8000
- Systems running IBM Spectrum Virtualize, including:
  - FlashSystem V840
  - FlashSystem V9000
  - FlashSystem 9100
  - FlashSystem 9200
  - SAN Volume Controller
  - Storwize V3700
  - Storwize V5000
  - Storwize V7000
  - Storwize V7000 Unified

About this task

Perform these steps to practice disaster recover actions for a Global Mirror Failover/Failback with Practice session:

Procedure

1. Start a Global Mirror with Practice session.
2. When the session reaches the Prepared state, issue a Flash command to restore consistent data on I2 and make a point-in-time copy of the data on H2. This creates a consistent point-in-time copy of your data on the H2 volume and then restarts the session so the copying from H1 to I2 continues. This temporarily stops copying of the data from site 1 to site 2, and creates a consistent point-in-time copy. The data replication from H1 to I2 is then restarted.
3. Practice the same actions you would take in an actual disaster, using H2 as your new host volume, while running the real application on H1.

Practicing disaster recovery for a Metro Global Mirror Failover/ Failback with Practice session

A Metro Global Mirror Failover/Failback with Practice session combines Metro Mirror, Global Mirror and FlashCopy across three sites to provide a point-in-time copy of the data on the third site. You can use this to practice what you might do if a disaster occurred without losing your disaster recovery capability.

Before you begin

Note: This function is available on DS8000 storage systems.

About this task

The intermediate volume is on the third site (I3). This maintains disaster recovery capability while a copy is kept on the H3 volume for practice purposes.

Perform these steps to practice disaster recover actions for a Metro Global Mirror Failover/Failback with Practice session:

Procedure

1. Start a Metro Global Mirror with Practice session.
2. When the session reaches the Prepared state, issue a Flash command to take a point-in-time copy of the data that is on I3, on H3. This creates a consistent point-in-time copy of your data on the H3 volume, and then automatically restarts the session so that copying from H1 to H2 to I3 continues. The Flash command temporarily stops copying the data from site 2 to site 3, in order to create a consistent point-in-time copy on I3, while maintaining disaster recovery capabilities on site 2 using the Metro Mirror portion of the session. Then, data replication from H2 to I3 is restarted.
3. Practice the same actions you would take in an actual disaster, using H3 as your practice host volume, while you run the real application on H1. This enables you to use the same scripts and commands to run on H3 that you would use in an actual disaster.

Chapter 9. Monitoring health and status

There are several options within Copy Services Manager for monitoring the health and status of sessions, storage systems, host systems, and management servers.

Viewing the health summary

Use the **Overview** page to view overall health and status of sessions, storage systems, host systems, and management servers.

About this task

The **Overview** page is the first page that you see after you log on. You can display this page by selecting **Overview** in the Copy Services Manager menu bar. This panel provides the following information:

Overall session status
Indicates session status, which can be normal, warning, or severe. The status can also be inactive, if all sessions are defined or if no sessions exit.

Overall storage system status
Indicates the connection status of storage systems.

Overall host system status
Indicates the connection status of host systems.

Management server status
Indicates the status of the standby server if you are logged on to the local server. If you are logged on to the standby server, this status indicates the status of the local server.

Viewing sessions

The Copy Services Manager GUI includes icons, images, messages, and other visual and informational aids to help you to determine the status and state of your sessions.

Customizing the session list

The **Session** page provides a list of created sessions. This list is organized in columns and rows. There is a row for each session and columns for information that is related to that session, such as the session name, status, state, and type. You can customize the session list by filtering information, resizing columns, and sorting rows.

Filtering the session list

Use filtering when you want to limit the rows that are shown in the session list based on the session name or type. To apply a filter, enter the filter text in the **Filter** field on the **Session** page. You can enter complete text or partial text. Only those rows that contain matching text in the **Name** or **Type** column are displayed in the list.

To remove the filtering for the list, click the **X** icon in the **Filter** field.

Resizing the columns in the session list

You can resize columns to more easily view the information in the list. To resize a column, drag the column heading border until the column is at the width that you want.

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Sorting the session list

By default, the sessions in the list are sorted by session name in ascending order. You can change the value that is used for sorting by clicking the appropriate column heading. For example, if you want to sort by the session type, click the **Type** heading. The list sorts by the value in that column. You can choose an ascending or descending sort order by clicking the column heading.

Session status icons

The Copy Services Manager GUI uses icons to represent the status of each session.

The following table describes each session status icon.

Table 70. Session status icons

Icon	Meaning	Description
	Inactive	The session is in a defined state, with no activity on the hardware.
	Normal	A consistent copy of the data either exists or is being maintained.
	Warning	For Metro Mirror, Global Mirror, and Metro Global Mirror, the session might have volumes that are being synchronized or are about to be synchronized, with no suspended volumes. For FlashCopy, the warning status is valid only after the start command is issued and before the flash. This warning status means that the session is either preparing or is ready for a flash command but targets do not yet have a consistent copy. If a HyperSwap session is degraded, which means it is enabled on one or more sysplex members and disabled on at least one sysplex member, then the session is in a warning state.
	Severe	One or more errors must be dealt with immediately. Possible causes include the following: • One or more volumes are suspended • A session is suspended • A volume is not copying correctly

Session images

The Copy Services Manager GUI provides a visual aid to help you create and manage your sessions. The visual aid shows the number of volume roles in the session and how the roles are distributed between the sites. It also shows the copy method and direction.

Volume role symbols

The volume role symbols represent the replication status on the volumes.

Table 71. Volume role symbols		
Symbol	**Description**	**Meaning**
	Active host volumes	This symbol represents volumes that contain the source of updated tracks to which the application is actively issuing read and write input/output (I/O).
	Active host volumes with change volumes or Safeguarded Copy volumes	This symbol represents volumes that contain the source of updated tracks to which the application is actively issuing read and write I/O and change volumes.
	Recoverable volumes	This symbol represents volumes that contain a consistent copy of the data.
	Recoverable volumes with change volumes	This symbol represents volumes and change volumes that contain a consistent copy of the data.

Table 71. Volume role symbols (continued)		
Symbol	**Description**	**Meaning**
	Inconsistent volumes	This symbol represents the volumes that do not contain a consistent copy of the data.
	Inconsistent volumes with change volumes	This symbol represents the volumes and change volumes that do not contain a consistent copy of the data.

Data copying symbols

The data copying symbols indicate the type of copy that occurs between the volume roles. The direction that the symbol is displayed in the Copy Services Manager GUI depends on the direction of the copy.

Table 72. Data copying symbols		
Symbol	**Type of Copy**	**Meaning**
	FlashCopy	This symbol represents a FlashCopy operation.
	FlashCopy with errors	This symbol represents a FlashCopy operation with errors on one or more pair.
	FlashCopy inactive	This symbol represents an inactive FlashCopy operation.
	FlashCopy inactive with errors	This symbol represents an inactive FlashCopy operation with errors on one or more pair.
	Synchronous	This symbol represents a synchronous copy.
	Synchronous with errors	This symbol represents a synchronous copy with errors on one or more pairs.
	Synchronous inactive	This symbol represents an inactive synchronous copy.

Table 72. Data copying symbols (continued)		
Symbol	**Type of Copy**	**Meaning**
	Synchronous inactive with errors	This symbol represents an inactive synchronous copy with errors on one or more pair.
	Asynchronous (Global Copy)	This symbol represents an asynchronous copy in Global Copy mode.
	Asynchronous (Global Copy) with errors	This symbol represents an asynchronous copy in Global Copy mode with errors on one or more pair.
	Asynchronous (Global Copy) inactive	This symbol represents an inactive asynchronous copy in Global Copy mode.
	Asynchronous (Global Copy) inactive with error	This symbol represents an asynchronous inactive copy in Global Copy mode with an error.
	Global Mirror	This symbol represents an asynchronous consistent copy in Global Mirror mode.
	Global Mirror with error	This symbol represents an asynchronous consistent copy in Global Mirror mode with an error.
	HyperSwap	This symbol indicates that the HyperSwap feature is enabled for the relationship. If a failure occurs when I/O is being written to the primary storage system, these features automatically swap the I/O to the secondary site with no user interaction and little or no application impact.
	Suspended	This symbol represents a suspended copy relationship.
	Failed over	This symbol represents a failover copy relationship.

Session states

You can view the health and status of a session in the Copy Services Manager GUI.

Attention: Use only the Copy Services Manager graphical user interface (GUI) or command-line interface CLI to manage session relationships, such as volume pairs and copy sets. Do not modify session relationships through other interfaces such as the System Storage DS CLI. If you modify relationships through other interfaces, a loss of consistency can occur across the relationships that are managed by the session. The exceptions to this requirement are failover operations that are managed by external applications for certain session and storage system types as described in "Failover and failback operations" on page 84.

The **`Refresh States`** command is used to refresh the states of the role pairs that are in a session (if applicable for the session type) and refresh the state of the session if it is incorrect. Issue this command to query the states of the copy sets on the hardware. You are not required to run this command under typical circumstances; Copy Services Manager refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Copy Services Manager and the hardware, you can use this command to enable Copy Services Manager to update itself. This command triggers

multiple queries on the hardware, which can impact hardware performance. Do not run this command more frequently than every few minutes in each session.

The following table describes each session state.

Table 73. Session states

State	Session type	Description
Defined	All	The session exists but is inactive.
Flashing	All	In a Metro Mirror or Global Mirror session, data copying is temporarily suspended while a consistent practice copy of data is being prepared on site 2. In a Metro Global Mirror session, data copying is temporarily suspended while a consistent practice copy of data is being prepared on site 3.
Prepared	All	The source to target data transfer is active. In a Metro Mirror, Global Mirror, or Metro Global Mirror session, the data that is written to the source is transferred to the target, and all volumes are consistent and recoverable. In a FlashCopy session, the volumes are not yet consistent, but the flash is ready to begin. **Important:** For sessions on the following storage systems, do not alter the relationships on the hardware that you established with Copy Services Manager: • Systems running IBM Spectrum Virtualize, including: – FlashSystem V840 – FlashSystem V9000 – FlashSystem 9100 – FlashSystem 9200 – SAN Volume Controller – Storwize V3500 (use only FlashCopy sessions for this storage system) – Storwize V3700 – Storwize V5000 – Storwize V7000 – Storwize V7000 Unified For example, if a Metro Mirror session with one copy set is in the Prepared state, and you stop the role pair, the session is still displayed in the Prepared state.

Table 73. Session states (continued)

State	Session type	Description
Preparing	All	The volumes are initializing, synchronizing, or resynchronizing. In a Metro Mirror, Global Mirror, or Metro Global Mirror session, synchronization occurs after the first **Start** command is issue on a session. Resynchronization occurs when a volume was prepared and then suspended. The hardware records the changed tracks so that on the next startup, only the changed tracks are copied. In a FlashCopy session, the volumes are initializing. The preparing state for FlashCopy sessions applies only to FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, or Storwize storage systems.
Protected	Safeguarded Copy	All volumes in the session have a valid backup. **Note:** The Target Available state overrides the Protected state if a Recover Backup has been issued to the session.
Recovering	All	The session is in the process of recovering.
Suspended	All	Data copying has temporarily stopped. **Important:** The suspended state applies only to Global Mirror, Metro Mirror, and Metro Global Mirror sessions.
Suspended (Partial)	Multi-target sessions	Data copying between the source site and one of the target sites has suspended.
SuspendedH1H3 MGM	Metro Global Mirror	Data copying between site 1 and site 3 is suspended.
SuspendedH1H2 MGM	Metro Global Mirror	Data copying between site 1 and site 2 is suspended.
Suspending	All	The session is changing into a Suspended state. **Important:** The Suspending state applies only to Metro Mirror Sessions in Global Copy mode, Global Mirror, and Metro Global Mirror sessions and does not apply to FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, or Storwize storage systems.
Target available	All	Target volumes are available for application updates.

Table 73. Session states (continued)		
State	**Session type**	**Description**
Terminating	FlashCopy	The session is being terminated because you issued a Terminate action under the following conditions: • You permitted the target to be Metro Mirror or Global Copy. • You set the Require or Attempt to Preserve Mirror option. The session displays as Terminating until the FlashCopy background copy is complete and no longer exists on the hardware.
Unprotected	Safeguarded Copy	Not all volumes in the session have a valid backup. **Note:** The Target Available state overrides the Unprotected state if a Recover Backup has been issued to the session.

Role pair status and progress

In a session, a *role pair* is the association of two volume roles that take part in a copy relationship. Copy Services Manager provides detailed role pair status and progress messages for sessions.

The role pair status and progress messages are updated to provide a message that indicates what the session is doing at the time. By hovering over a progress bar, you can see specific information about the action that is running on the session. Some status messages might include an estimated time-to-completion for the action in hours and minutes.

Role pair status is not provided for the FlashSystem/IBM Spectrum Accelerate Snapshot sessions because role pairs are not used for these sessions.

The status messages are displayed in the **Session Details** and **Role Pair Details** page.

Table 74. Detailed status messages for Participating and Non-Participating role pairs	
Supported session type	**Status message**
FlashCopy Metro Mirror Global Copy Global Mirror	Starting *role_pair_name* relationships on the hardware
Metro Mirror Global Mirror	Waiting for all pairs in the role pair *role_pair_name* to reach state of *state*
FlashCopy Metro Mirror Global Copy Global Mirror	Terminating all pairs in role pair *role_pair_name*
FlashCopy Metro Mirror Global Mirror	Recovering all pairs in role pair *role_pair_name*

Table 74. Detailed status messages for Participating and Non-Participating role pairs (continued)	
Supported session type	**Status message**
Metro Mirror Global Copy Global Mirror	Suspending all pairs in role pair *role_pair_name*
FlashCopy	Background copy is running for role pair *role_pair_name*
Global Copy	Waiting for all pairs in role pair *role_pair_name* to become consistent
Global Copy	Waiting for all pairs in role pairs *role_pair_name* to complete the initial copy
FlashCopy	Waiting for all pairs in role pairs *role_pair_name* to complete FRR
Global Mirror	Waiting for all pairs in role pairs *role_pair_name* to join the Global Mirror session
Safeguarded Copy	The hardware is preparing to create a backup for all *role* volumes.

Viewing session details

You can view detailed information about a session, including role pairs, error count, whether the session is recoverable, copying progress, session type, and the timestamp.

About this task

Perform these steps to view session details:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session that you want to view.
3. From the **Session Actions** list, select **View/Modify** > **View Details**.

Viewing additional details for Global Mirror sessions

Additional detail information is available for IBM DS8000 Global Mirror sessions that do not have an Inactive status. This information includes details about the Global Mirror master, consistency groups that have been formed, and data exposure.

About this task

Complete these steps to view additional details for Global Mirror sessions:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the Global Mirror session that you want to view.
3. From the **Session Actions** list, select **View/Modify** > **View Details**.
4. Click the **Global Mirror Info** tab.

   The following information is displayed on the tab:

Global Mirror Master
Shows the name of the storage system acting as the Global Mirror master.

Last Master Consistency Group Time
Shows the time that the last consistency group was formed

Master Time During Last Query
Shows the time on the master storage device when the query was performed,

Data Exposure
Shows the average exposure to potential data loss in seconds over the query interval.

Session ID
Shows the Global Mirror session ID.

Master State
Shows the state of the master session on the hardware.

Unsuccessful CGs since last successful CG
Shows the number of consistency groups that have failed to form since the last successful consistency group was formed.

CG Interval Time
Shows the interval time between attempts to form a consistency group.

Max Coordination Interval
Shows the extended distance consistency maximum coordination interval.

Max CG Drain Time
Shows the maximum time the consistent set of data is allowed to drain at the remote site before failing consistency group formation.

Unsuccessful CGS/Previous Query
Shows the number of consistency groups and percentage of consistency groups that were unsuccessful since the previous query.

Unsuccessful CGS/Total
Shows the total number of unsuccessful consistency groups and percentage of consistency groups that have failed.

Successful CGS/Previous Query
Shows the number of consistency groups and percentage of consistency groups that were successful since the previous query.

Successful CGS/Total
Shows the total number of successful consistency groups and percentage of consistency groups that have been successful.

Consistency Group Failure Messages
Shows the failure messages that have occurred on the Global Mirror session that prevented the formation of a consistency group.

Data Exposure chart
Shows the data exposure values in seconds for the last 15 minutes or 24 hours.

Highlight Data Exposure
Use the following fields to define a value in seconds for which you want data exposure to tracked in the **Data Exposure** chart.

Show Data Exposure over
Data exposure that is over the value that is entered in this field is shown in the **Data Exposure** chart.

Show Data Exposure under
Data exposure that is under the value that is entered in this field is shown in the **Data Exposure** chart.

Export Global Mirror Data
Exports data for Global Mirror role pairs to a CSV file. You can use this data to analyze trends in your storage environment that affect your RPO.

Attention: Because historical data is purged when you delete a session or set the management server as the standby server, export data before you perform these actions.

Viewing Global Mirror RPO historical data

You can view historical data for any session type that has Global Mirror.

About this task

Starting with Copy Services Manager 6.2.10, you can view the RPO historical data for a selected session and role pair from the Copy Services Manager GUI. This information is available over selected ranges per Global Mirror session.

Interpreting historical Global Mirror RPO data

When you view the chart in the GUI, the x-axis is the time that the RPO data was collected. On the y-axis is the actual average RPO time in seconds. You can see when there were spikes in the RPO, which represent greater data exposure periods. If any disasters occurred during those spikes, more data could have been lost.

You can investigate if there were any issues when the spikes occurred. Issues could be SAN-related, or from other causes.

Complete these steps to view historical Global Mirror RPO data:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session that you want to view.
3. From the **Session Actions** list, select **View/Modify** > **View Global Mirror Data**.

Results

A chart appears where you can select a data range using the lower bar to see specific point-in-time historical information. For more detail, export the RPO history and LSS OOS history of the session to a CSV file. See “Exporting historical data for Global Mirror role pairs” on page 223 for more information.

Viewing LSS OSS chart

You can view historical data for any session type that has Global Mirror.

About this task

Starting with Copy Services Manager 6.2.11, you can view the LSS (Logical Subsystem) OOS (Out of Sync Tracks) historical data for a selected session, LSS and role pair from the Copy Services Manager GUI. This information is available over selected ranges per Global Mirror session.

Interpreting historical Global Mirror LSS OSS data

When you view the chart in the GUI, the x-axis is the time that the LSS OOS data was collected and the y-axis is the count of OOS tracks. You can use the LSS OOS historical data to determine whether one or more LSS has a high OOS count that might result in a high RPO value that is viewed in the Global Mirror RPO data chart.

To filter the specific LSS, click the side bar and select the LSS you want to view in the graph.

Each line on the chart represents a different LSS on the selected box and role pair in the session. You can filter on which LSS you would prefer to view and the time range as well.

The time is limited to 7 days of data, due to the large number of data points. When many LSS are viewed together, the top 10 LSS with the highest OOS count gets summarized when hovering over a data point.

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session that you want to view.
3. From the **Session Actions** list, select **View/Modify** > **View Global Mirror Data**.
4. From the side bar, select LSS Graph.

Results

A chart appears where you can select a data range that uses the top drop-down calendars for a 7 days range and then use lower bar to see specific point-in-time information. For more detail, export the RPO history and LSS OOS history of the session to a CSV file. See "Exporting historical data for Global Mirror role pairs" on page 223 for more information.

Viewing session properties

You can view and modify the description and options for a session. The options that are presented depend on the storage system type and the session type that you select.

About this task

To view or modify the properties for a session, complete the following steps:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session with the properties that you want to view.
3. From the **Session Actions** list, click **View/Modify** > **Properties**.

   The properties that are displayed depend on the session type as described in the following sections.

IBM DS8000 sessions

The properties for IBM DS8000 sessions depend on the session type.

The following sections describe the properties for each session type.

FlashCopy session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 FlashCopy sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-T1 Options** tab to set properties that apply to the role pair.

Session Options

Enter the properties for the session.

Description

Type the description for this session.

System or sysplex

Select the z/OS system or sysplex that you want to associate with the session. When this option is set, the Flash command is submitted through the z/OS connection to that system or sysplex to provide performance improvements during the FlashCopy process. To enable this feature, volumes in the session must be attached to the system or sysplex and IOS APAR OA59561 must be applied.

If you select No Association, then the session submits the command in the regular manner and the performance advantage of submitting the FlashCopy operation through the system or sysplex will not be applicable.

This option is displayed only if the copy services management server is installed on or connected to a z/OS host system.

H1-T1 Options

Enter the properties for the role pair.

Incremental

Select this option to apply incremental changes to the target volume. After the initial FlashCopy operation, only data that changed on the source volume since the last FlashCopy operation was performed is copied to the target volume. If the multiple incremental feature is supported on the storage system, it will be used.

If you select this option, a persistent FlashCopy relationship is created regardless of whether you select the **Persistent** check box.

Persistent

Select this option to keep the FlashCopy relationship established on the hardware after all source tracks are copied to the target volume. If you do not select this option, the local replication relationship ends after the target volume contains a complete point-in-time image of the source volume.

No Copy

Select this option if you do not want the hardware to write the background copy until the source track is written to. Data is not copied to the target volume until the blocks or tracks of the source volume are modified.

This option is required for space-efficient volumes.

Fail Flash if target is online (CKD only)

Select this option to fail any command for a FlashCopy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

Allow FlashCopy target to be Metro Mirror source

Select this option to enable the FlashCopy operation if the target volume of the FlashCopy relationship is also the source volume of a Metro Mirror relationship. If this option is not selected, the FlashCopy operation fails.

Requirement: This option requires that the IBM Remote Pair FlashCopy option is available for your IBM DS8000 storage system. To determine whether you can use the IBM Remote Pair FlashCopy option with your IBM DS8000 storage system, see the IBM DS8000 documentation for microcode level that you are using.

Select one of the following options to specify whether you want to maintain consistency, if possible:

Do not attempt to preserve Metro Mirror consistency

Click this option if you want the FlashCopy operation to complete without preserving consistency of the Metro Mirror relationship on the remote site. The FlashCopy operation does not occur on the remote site.

Attempt to preserve Metro Mirror consistency, but allow FlashCopy even if Metro Mirror target consistency cannot be preserved

Click this option to preserve the consistency of the Metro Mirror relationship at the target of the FlashCopy relationship when both the source and target of the FlashCopy relationship are the source of a Metro Mirror relationship. If the consistency cannot be preserved, a full copy of the Metro Mirror relationship at the target of the FlashCopy relationship is performed. To preserve consistency, parallel FlashCopy operations are performed on both sites if possible.

Attempt to preserve Metro Mirror consistency, but fail FlashCopy if Metro Mirror target consistency cannot be preserved

Click this option to prevent a full copy from being performed over the Metro Mirror link. Instead, if possible, parallel FlashCopy operations are performed on both sites. If the

consistency cannot be preserved, the flash for the FlashCopy relationships fails, and the data of the Metro Mirror relationship at the target of the FlashCopy relationship is not changed.

Metro Mirror Single Direction session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Mirror Single Direction sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-H2 Options** tab to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-H2 Options
Enter the properties for the role pair.

Metro Mirror Suspend Policy
Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend
Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend
Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

z/OS Management
Select the following options to manage IBM z/OS features for the role pair.

The **z/OS Management** options are displayed only if Copy Services Manager is installed on or connected to a z/OS host system. You can add a z/OS host connections in Copy Services Manager regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Enable Hardened Freeze
Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap Management and Basic HyperSwap API. For instructions about how to start these address spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Copy Services Manager server is started or stopped.

In addition, this option enables you to include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents Copy Services Manager from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

Metro Mirror Failover/Failback session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Mirror Failover/Failback sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-H2 Options** tab to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-H2 Options
Enter the properties for the role pair.

Metro Mirror Suspend Policy
Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend
Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend
Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

z/OS Management
Select the following options to manage IBM z/OS features for the role pair.

The **z/OS Management** options are displayed only if Copy Services Manager is installed on or connected to a z/OS host system. You can add a z/OS host connections in Copy Services Manager regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Enable Hardened Freeze
Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap Management and Basic HyperSwap API. For instructions about how to start these address spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Copy Services Manager server is started or stopped.

In addition, this option enables you to include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents Copy Services Manager from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

If you select the **Manage H1-H2 with HyperSwap** option for the session, this option is ignored. HyperSwap includes IOS for managing freeze operations. The **Enable Hardened Freeze** option ensures data integrity if Copy Services Manager freezes and HyperSwap are not enabled for a session.

Manage H1-H2 with HyperSwap
Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when there is a failure on the host accessible volumes. Copy Services Manager uses HyperSwap to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes
Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes
Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

Metro Mirror Failover/Failback with Practice session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Mirror Failover/Failback with Practice sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session or multiple role pairs in the session. Use the **H2-I2 Options** tab to set properties that apply to that role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, see the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

Metro Mirror Suspend Policy

Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend

Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend

Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

z/OS Management

Select the following options to manage IBM z/OS features for the H1-I2 and H2-H1 role pairs.

The **z/OS Management** options are displayed only if Copy Services Manager is installed on or connected to a z/OS host system. You can add a z/OS host connection in Copy Services Manager regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex

Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Enable Hardened Freeze

Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap Management and Basic HyperSwap API. For instructions about how to start these address spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Copy Services Manager server is started or stopped.

In addition, with this option, you can include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents Copy Services Manager from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

H2-I2 Options

Enter the properties for the role pair.

Persistent

Select this option to keep FlashCopy pairs persistent on the hardware.

Incremental
Select this option to apply incremental changes to the target volume. After the initial FlashCopy operation, only data that changed on the source volume since the last FlashCopy operation completed is copied to the target volume. If the multiple incremental feature is supported on the storage system, it will be used. If you select this option, a persistent FlashCopy relationship is created regardless of whether you select the **Persistent** check box.

Global Mirror Single Direction and Failover/Failback session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Global Mirror Single Direction and Global Mirror Failover/Failback sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-J2 Options** tab to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-J2 Options
Enter the properties for the role pair.

Consistency group interval time (seconds)
Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Recovery Point Objective Alerts
Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)
Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)
Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the **Warning level threshold (seconds)** field.

Global Mirror Failover/Failback with Practice session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Global Mirror Failover/Failback with Practice sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set properties that apply to specific role pairs. For example, options for the H1-J2 role pair are contained in the **H1-J2 Options** tab.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, see the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

H1-J2 Options
Enter the properties for the role pair.

Consistency group interval time (seconds)
Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Max Coordination Interval (milliseconds)
Type in the maximum amount of time, in milliseconds, for the extended-distance consistency-coordination interval. The default value for new sessions is 50 milliseconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Max CG Drain Time (seconds)
Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before it fails consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Recovery Point Objective Alerts
Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)
Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)
Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the **Warning level threshold (seconds)** field.

H2-I2 Options
Enter the properties for the role pair.

Persistent
Select this option to keep FlashCopy pairs persistent on the hardware.

No Copy
Select this option if you do not want the hardware to write the background copy until the source track is written to. Data is not copied to the H2 volume until the blocks or tracks of the I2 volume are modified.

Incremental
Select this option to apply incremental changes to the target volume. After the initial FlashCopy operation, only data that changed on the source volume since the last FlashCopy operation completed is copied to the target volume. This option is only valid if the source storage system supports multiple incremental FlashCopy.

If you select this option, a persistent FlashCopy relationship is created regardless of whether you select the **Persistent** check box.

Journal Options
Reflash After Recover

Select this option to reflash a consistent set of data to the journal volume after a Recover command is issued to the session. Reflashing to the journal volume ensures that there is a consistent copy of the data to recover from if failures occur during resynchronization. If you do not select this option, the journal volumes will not have a consistent copy of the data after the recover operation. However, the space will be available when space-efficient volumes are used.

Global Mirror Either Direction and Global Mirror Either Direction with Two-Site Practice session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Global Mirror Either Direction and Global Mirror Either Direction with Two-Site Practice sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set properties that apply to specific role pairs. For example, properties for the H1-J2 role pair are contained in the **H1-J2 Options** tab.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-J2 Options and H2-J1 Options
Enter the properties for the role pair.

Consistency group interval time (seconds)
Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Max Coordination Interval (milliseconds)
Type in the maximum amount of time, in milliseconds, for the extended-distance consistency-coordination interval. The default value for new sessions is 50 milliseconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Max CG Drain Time (seconds)
Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before it fails consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Recovery Point Objective Alerts
Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)
Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)
Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the **Warning level threshold (seconds)** field.

H1-I1 and H2-I2 Options
Enter the properties for the role pair. The following options are available only for IBM DS8000 version 4.2 or later.

Incremental
Select this option to apply incremental changes to the target volume. After the initial FlashCopy operation, only data that changed on the source volume since the last FlashCopy operation completed is copied to the target volume. This option is only valid if the source storage system supports multiple incremental FlashCopy. If you select this option, a persistent FlashCopy relationship is created.

Journal Options
Reflash After Recover

Select this option to reflash a consistent set of data to the journal volume after a Recover command is issued to the session. Reflashing to the journal volume ensures that there is a consistent copy of the data to recover from if failures occur during resynchronization. If you do not select this option, the journal volumes will not have a consistent copy of the data after the recover operation. However, the space will be available when space-efficient volumes are used.

Metro Global Mirror session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Global Mirror sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set properties that apply to specific role pairs. For example, properties for the H1-H2 role pair are contained in the **H1-H2 Options** tab.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-H2 Options
Enter the properties for the role pair.

Metro Mirror Suspend Policy
Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend
Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend
Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

z/OS Management
Select the following options to manage IBM z/OS features for the role pair.

The **z/OS Management** options are displayed only if Copy Services Manager is installed on or connected to a z/OS host system. You can add a z/OS host connections in Copy Services Manager regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Volumes in the session must be attached to the system or sysplex that you choose to enable the z/OS features. Commands for the features are issued to this system or sysplex.

Enable Hardened Freeze
Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap Management and Basic HyperSwap API. For instructions about how to start these address spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Copy Services Manager server is started or stopped.

In addition, this option enables you to include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents Copy Services Manager from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

If you select the **Manage H1-H2 with HyperSwap** option for the session, this option is ignored. HyperSwap includes IOS for managing freeze operations. The **Enable Hardened Freeze** option ensures data integrity if Copy Services Manager freezes and HyperSwap are not enabled for a session.

Manage H1-H2 with HyperSwap
Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when there is a failure on the host accessible volumes. Copy Services Manager uses HyperSwap to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes
Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes
Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

H1-J3 Options and H2-J3 Options
Enter the properties for the role pair.

Consistency group interval time (seconds)
Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Max Coordination Interval (milliseconds)
Type in the maximum amount of time, in milliseconds, for the extended-distance consistency-coordination interval. The default value for new sessions is 50 milliseconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Max CG Drain Time (seconds)
Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before it fails consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Recovery Point Objective Alerts
Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)
Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)
Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the **Warning level threshold (seconds)** field.

Journal Options
Reflash After Recover

Select this option to reflash a consistent set of data to the journal volume after a Recover command is issued to the session. Reflashing to the journal volume ensures that there is a consistent copy of the data to recover from if failures occur during resynchronization. If you do not select this option, the journal volumes will not have a consistent copy of the data after the recover operation. However, the space will be available when space-efficient volumes are used.

Metro Global Mirror with Practice session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Global Mirror with Practice sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set properties that apply to specific role pairs. For example, properties for the H1-H2 role pair are contained in the **H1-H2 Options** tab.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-H2 Options
Enter the properties for the role pair.

Metro Mirror Suspend Policy
Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend
Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend
Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

z/OS Management
Select the following options to manage IBM z/OS features for the role pair.

The **z/OS Management** options are displayed only if Copy Services Manager is installed on or connected to a z/OS host system. You can add a z/OS host connections in Copy Services Manager regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Enable Hardened Freeze
Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap Management and Basic HyperSwap API. For instructions about how to start these address spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Copy Services Manager server is started or stopped.

In addition, this option enables you to include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents Copy Services Manager from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

If you select the **Manage H1-H2 with HyperSwap** option for the session, this option is ignored. HyperSwap includes IOS for managing freeze operations. The **Enable Hardened Freeze** option ensures data integrity if Copy Services Manager freezes and HyperSwap are not enabled for a session.

Manage H1-H2 with HyperSwap
Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when there is a failure on the host accessible volumes. Copy Services Manager uses HyperSwap to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes
Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes
Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

H1-J3 Options and H2-J3 Options
Enter the properties for the role pair.

Consistency group interval time (seconds)
Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Max Coordination Interval (milliseconds)
Type in the maximum amount of time, in milliseconds, for the extended-distance consistency-coordination interval. The default value for new sessions is 50 milliseconds. Setting this field to 0 is equivalent to <auto> and indicates to the storage system to use the default value.

Max CG Drain Time (seconds)
Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before failing consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to <auto> and indicates to the storage system to use the default value.

Recovery Point Objective Alerts
Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)
Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)
Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the **Warning level threshold (seconds)** field.

H3-I3 Options
Enter the properties for the role pair.

No Copy
Select this option if you do not want the hardware to write the background copy until the source track is written to. Data is not copied to the H3 volume until the blocks or tracks of the I3 volume are modified.

This option is available only for IBM DS8000 version 4.2 or later.

Incremental
Select this option to apply incremental changes to the target volume. After the initial FlashCopy operation, only data that changed on the source volume since the last FlashCopy operation completed is copied to the target volume. This option is only valid if the source storage system supports multiple incremental FlashCopy. If you select this option, a persistent FlashCopy relationship is created.

Journal Options
Reflash After Recover

Select this option to reflash a consistent set of data to the journal volume after a Recover command is issued to the session. Reflashing to the journal volume ensures that there is a consistent copy of the data to recover from if failures occur during resynchronization. If you do not select this option, the journal volumes will not have a consistent copy of the data after the recover operation. However, the space will be available when space-efficient volumes are used.

Metro Mirror - Metro Mirror session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Mirror - Metro Mirror sessions.

If Copy Services Manager is installed on or connected to a z/OS host system, the properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set z/OS management properties that apply to specific role pairs. For example, properties for the H1-H2 role pair are contained in the **H1-H2 Options** tab. Use the **HyperSwap Options** tab to set properties for managing HyperSwap operations for the session.

If Copy Services Manager is not installed on or connected to a z/OS host system, only the **Session Options** tab is displayed.

Connecting to a z/OS host: You can add a z/OS host connection in Copy Services Manager regardless of the operating system on which the application is installed. When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

Metro Mirror Suspend Policy

Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend

Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend

Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

System or sysplex

Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

If you select **No Association**, the options that are on the remaining tabs in the notebook are unavailable.

This option is displayed only if Copy Services Manager is installed on or connected to a z/OS host system.

H1-H2 Options, H1-H3 Options, and H2-H3 Options

Enter the properties for the role pair.

Manage H*x*-H*x* with HyperSwap

Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when there is a failure on the host accessible volumes. Copy Services Manager uses HyperSwap to manage the H1-H2, H1-H3, or H3-H2 sequence of the session.

HyperSwap Options

Enter the HyperSwap properties for the role pairs that are in the session. If you select **Manage Hx-Hx with HyperSwap** on the **H1-H2 Options**, **H1-H3 Options**, or **H2-H3 Options** tab, these properties define how HyperSwap Manager determines the target site for the HyperSwap operation, the priority for target sites, and the process that occurs in the event of an error during the operation.

Disable HyperSwap

Select this option to prevent a HyperSwap operation from occurring for all of the role pairs in the session. This option is typically selected to disable HyperSwap temporarily. For example, to disable HyperSwap for planned maintenance.

Reset In Use By System on Secondary Volumes

Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes

Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

If you select this option, you must restart the system.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

HyperSwap Site Selection
Select one of the following options to specify how HyperSwap Manager selects the target site for a HyperSwap operation.

Allow HyperSwap Manager to determine the HyperSwap site
Select this option to enable HyperSwap to select the target site for a HyperSwap operation.

HyperSwap Manager selects the target site that keeps the most sysplex members active. If multiple target sites are equal candidates for the HyperSwap operation, HyperSwap Manager uses the **Site HyperSwap Priorities** value to select the target site. For example, if both site 1 and site 3 are equal, but the **Site HyperSwap Priorities** priority is site 3, site 2, and site 1, HyperSwap Manager selects site 3.

Determine the HyperSwap site by specified priorities
Select this option to direct HyperSwap Manager to select the target site based on the priority list that is specified by the **Site HyperSwap Priorities** option.

HyperSwap Site Priorities
Specify the priority in which HyperSwap Manager selects the target site for a HyperSwap operation.

The default value priority is site 1, site 2, and site 3. This order indicates that the first priority is site 1, the second priority is site 2, and the third priority is site 3. If site 1 is the active site, then site 1 is ignored and HyperSwap Manager selects site 2 or 3 depending on the load status and availability of the sites, with site 2 being the preferred site.

If you select **Allow HyperSwap Manager to determine the HyperSwap site**, this option is used only when multiple target sites are equal candidates for a HyperSwap operation.

If you select **Determine the HyperSwap site by specified priorities**, this option determines the order in which HyperSwap Manager selects the target site.

Metro Mirror - Global Mirror session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Mirror - Global Mirror sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set properties that apply to specific role pairs. For example, properties for the H1-H2 role pair are contained in the H1-H2 Options tab.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-H2 Options
Enter the properties for the role pair.

Metro Mirror Suspend Policy
Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend
Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend
Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

z/OS Management

Select the following options to manage IBM z/OS features for the role pair.

The z/OS Management options are displayed only if the copy services management server is installed on or connected to a z/OS host system. You can add a z/OS host connection to the copy services management server regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Enable Hardened Freeze
Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap® Management and Basic HyperSwap API. For instructions about how to start these address

spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the copy services management server is started or stopped.

In addition, with this option you can include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents the copy services management server from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

If you select the Manage H1-H2 with HyperSwap option for the session, this option is ignored. HyperSwap includes IOS for managing freeze operations. The `Enable Hardened Freeze` option ensures data integrity if copy services management server freezes and HyperSwap is not enabled for a session.

Manage H1-H2 with Hyperswap
Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when a failure occurs on the host accessible volumes. HyperSwap is used to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes
Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes
Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap error:
Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap error:
Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

H1-J3 Options and H2-J3 Options
Enter the properties for the role pair.

Consistency group interval time (seconds)
Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Max Coordination Interval (milliseconds)
Type in the maximum amount of time, in milliseconds, for the extended-distance consistency-coordination interval. The default value for new sessions is 50 milliseconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Max CG Drain Time (seconds)
Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before it fails consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Recovery Point Objective Alerts
Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)
Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field, and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)
Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the Warning level threshold (seconds) field.

Journal Options
Reflash After Recover

Select this option to reflash a consistent set of data to the journal volume after a Recover command is issued to the session. Reflashing to the journal volume ensures that there is a consistent copy of the data to recover from if failures occur during resynchronization. If you do not select this option, the journal volumes will not have a consistent copy of the data after the recover operation. However, the space will be available when space-efficient volumes are used.

Metro Mirror - Global Mirror with Practice session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Mirror - Global Mirror with Practice sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set properties that apply to specific role pairs. For example, properties for the H1-H2 role pair are contained in the H1-H2 Options tab.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, see the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-H2 Options
Enter the properties for the role pair.

Metro Mirror Suspend Policy
Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend
Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend
Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

z/OS Management

Select the following options to manage IBM z/OS features for the role pair.

The z/OS Management options are displayed only if the copy services management server is installed on or connected to a z/OS host system. You can add a z/OS host connection to the copy services management server regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Enable Hardened Freeze
Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap® Management and Basic HyperSwap API. For instructions about how to start these address spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the copy services management server is started or stopped.

In addition, with this option you can include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents the copy services management server from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

If you select the Manage H1-H2 with HyperSwap option for the session, this option is ignored. HyperSwap includes IOS for managing freeze operations. The `Enable Hardened Freeze` option ensures data integrity if the copy services management server freezes and HyperSwap is not enabled for a session.

Manage H1-H2 with Hyperswap
Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when a failure occurs on the host accessible volumes. HyperSwap is used to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes
Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes
Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap error:
Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap error:
Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

H1-J3 Options and H2-J3 Options

Enter the properties for the role pair.

Consistency group interval time (seconds)

Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Max Coordination Interval (milliseconds)

Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before it fails consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Max CG Drain Time (seconds)

Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before it fails consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Recovery Point Objective Alerts

Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)

Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field, and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)

Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the Warning level threshold (seconds) field.

H3-I3 Options

Enter the properties for the role pair.

No Copy

Select this option if you do not want the hardware to write the background copy until the source track is written to. Data is not copied to the H3 volume until the blocks or tracks of the I3 volume are modified.

Incremental

Select this option to apply incremental changes to the target volume. After the initial FlashCopy operation, only data that changed on the source volume since the last FlashCopy operation completed is copied to the target volume. This option is only valid if the source storage system supports multiple incremental FlashCopy.

Journal Options

Reflash After Recover

Select this option to reflash a consistent set of data to the journal volume after a Recover command is issued to the session. Reflashing to the journal volume ensures that there is a consistent copy of the data to recover from if failures occur during resynchronization. If you do not select this option, the journal volumes will not have a consistent copy of the data after the recover operation. However, the space will be available when space-efficient volumes are used.

Metro Mirror - Global Mirror with Site 3 Global Mirror session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Metro Mirror - Global Mirror with Site 3 Global Mirror sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set properties that apply to specific role pairs. For example, properties for the H1-H2 role pair are contained in the H1-H2 Options tab.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Reset Secondary Reserves
Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-H2 Options
Enter the properties for the role pair.

Metro Mirror Suspend Policy
Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend
Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend
Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

z/OS Management

Select the following options to manage IBM z/OS features for the role pair.

The z/OS Management options are displayed only if the copy services management server is installed on or connected to a z/OS host system. You can add a z/OS host connection to the copy services management server regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Enable Hardened Freeze
Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap® Management and Basic HyperSwap API. For instructions about how to start these address spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the copy services management server is started or stopped.

In addition, with this option you can include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents the copy services management server from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

If you select the Manage H1-H2 with HyperSwap option for the session, this option is ignored. HyperSwap includes IOS for managing freeze operations. The `Enable Hardened Freeze` option ensures data integrity if copy services management server freezes and HyperSwap is not enabled for a session.

Manage H1-H2 with Hyperswap
Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when a failure occurs on the host accessible volumes. HyperSwap is used to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

On Configuration Error:
Partition the system(s) out of the sysplex

Select this option to partition a new system out of the sysplex when an error occurs because the system cannot be added to the HyperSwap configuration.

Disable HyperSwap

Select this option to prevent a HyperSwap operation from occurring.

On Planned HyperSwap error:
Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

H1-J3, H2-J3, H3-J1 and H3-J2 Options

Enter the properties for the role pair.

Consistency group interval time (seconds)

Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Max Coordination Interval (milliseconds)

Type in the maximum amount of time, in milliseconds, for the extended-distance consistency-coordination interval. The default value for new sessions is 50 milliseconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Max CG Drain Time (seconds)

Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before it fails consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Recovery Point Objective Alerts

Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)

Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field, and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)

Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the Warning level threshold (seconds) field.

Journal Options

Reflash After Recover

Select this option to reflash a consistent set of data to the journal volume after a Recover command is issued to the session. Reflashing to the journal volume ensures that there is a consistent copy of the data to recover from if failures occur during resynchronization. If you do not select this option, the journal volumes will not have a consistent copy of the data after the recover operation. However, the space will be available when space-efficient volumes are used.

Metro Mirror - Global Mirror with Site 4 Replication session properties

Use the **View/Modify Properties** notebook to edit properties for IBM DS8000 Metro Mirror - Global Mirror with Site 4 Replication sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set properties that apply to specific role pairs. For example, properties for the H1-H2 role pair are contained in the H1-H2 Options tab.

Session Options

Enter the properties for the session.

Description

Type the description for this session.

Reset Secondary Reserves

Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Fail MM/GC if target is online (CKD only)

Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

z/OS Management

Select the following options to manage IBM z/OS features for the role pair.

Enable Hardened Freeze

Select this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations.

Requirement: This option requires the z/OS address spaces Basic HyperSwap® Management and Basic HyperSwap API. For instructions about how to start these address spaces, see the information about preparing to use Basic HyperSwap from z/OS in the *IBM Copy Services Manager Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the copy services management server is started or stopped.

In addition, with this option you can include z/OS system volumes such as paging, database, and IBM WebSphere Application Server hierarchical file system (HFS) as Metro Mirror volumes in the session. When you select this option, IOS manages the freeze operations for all Metro Mirror volumes in the session, which prevents the copy services management server from freezing the volumes and possibly freezing itself. This option does not enable IOS to manage freeze operations for Global Mirror volumes.

If you select the Manage H1-H2 or H3-H4 with HyperSwap option for the session, this option is ignored. HyperSwap includes IOS for managing freeze operations. The `Enable Hardened Freeze` option ensures data integrity if copy services management server freezes and HyperSwap is not enabled for a session.

Metro Mirror Suspend Policy

Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend

Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend

Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

H1-H2 or H3-H4 Options

Enter the properties for the role pair.

z/OS Management

Select the following options to manage IBM z/OS features for the role pair.

The z/OS Management options are displayed only if the copy services management server is installed on or connected to a z/OS host system. You can add a z/OS host connection to the copy services management server regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex

Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Manage H1-H2 or H3-H4 with Hyperswap

Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when a failure occurs on the host accessible volumes. HyperSwap is used to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

HyperSwap options

Disable HyperSwap

Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes

Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes

Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

H1-J3, H2-J3, H3-J1 and H4JI Options

Enter the properties for the role pair.

Consistency group interval time (seconds)

Type how often, in seconds, the Global Mirror session attempts to form a consistency group. A lower value possibly reduces the data exposure of the session. However, a lower value also causes the session to attempt to create consistency groups more frequently, which can increase network traffic.

Max Coordination Interval (milliseconds)

Type in the maximum amount of time, in milliseconds, for the extended-distance consistency-coordination interval. The default value for new sessions is 50 milliseconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Max CG Drain Time (seconds)

Type in the maximum amount of time, in seconds, that the consistent set of data is allowed to drain at the remote site before it fails consistency group formation. The default value for new sessions is 90 seconds. Setting this field to 0 is equivalent to *<auto>* and indicates to the storage system to use the default value.

Recovery Point Objective Alerts

Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time in seconds of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 65535 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)

Type the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Consistency group interval time (seconds)** field, and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)

Type the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the Warning level threshold (seconds) field.

Journal Options

Enter the properties for the role pair.

Reflash After Recover

Select this option to reflash a consistent set of data to the journal volume after a Recover command is issued to the session. Reflashing to the journal volume ensures that there is a consistent copy of the data to recover from if failures occur during resynchronization. If you do not select this option, the journal volumes will not have a consistent copy of the data after the recover operation. However, the space will be available when space-efficient volumes are used.

Metro Mirror - Metro Mirror with Site 4 Replication session properties

Use the **View/Modify Properties** notebook to edit properties for IBM DS8000 Metro Mirror - Metro Mirror with Site 4 Replication sessions.

If the copy services management server is installed on or connected to a z/OS® host system, the properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the individual role pair option tabs to set z/OS management properties that apply to specific role pairs. For example, properties for the H1-H2 role pair are contained in the H1-H2 Options tab. Use the HyperSwap® Options tab to set properties for managing HyperSwap operations for the session.

If the copy services management server is not installed on or connected to a z/OS host system, only the Session Options tab is displayed.

Session Options

Enter the properties for the session.

Description

Type the description for this session.

Fail MM/GC if target is online (CKD only)

Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

Reset Secondary Reserves

Select this option to remove any persistent reserves that might be set on the target volumes of the copy sets when a Start command is issued for the session.

Attention: This option causes the session to overwrite all data that is on the target volume.

Metro Mirror Suspend Policy

Select one of the following options to specify the policy for holding or releasing input/output (I/O) after a Metro Mirror relationship is suspended. When a relationship is in a Suspended state, write operations from the source volume are no longer mirrored to the target volume.

Hold I/O after Suspend

Click this option to prevent the source volume from receiving new data after the relationship is suspended. Use this option if you want to determine the scope of the suspension before new data is written to the source volume. This option helps to ensure that the data on the source and target volumes remains the same.

To enable write operations to the source volume to continue, issue the Copy Services Manager **`Release I/O`** command for the session. If you do not issue this command, write operations are enabled when the hardware timeout value on the storage system expires.

Release I/O after Suspend
Click this option to enable the source volume to automatically receive data after the relationship is suspended. Use this option if you want to limit the effect on the applications that are writing to the source volume. This option is enabled by default.

Attention: This option can cause the data on the source volume to be different from the data on target volume.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

If you select No Association, the options that are on the remaining tabs in the notebook are unavailable. This option is displayed only if the copy services management server is installed on or connected to a z/OS host system.

H1-H2 Options, H1-H3 Options, H2-H3 Options, H3-H4 Options and H1-H4 Options
Enter the properties for the role pair.

Manage Hx-Hx with HyperSwap
Select this option to trigger a HyperSwap operation, which redirects application I/O to the target volumes when there is a failure on the host accessible volumes. HyperSwap is used to manage the H1-H2, H1-H3, or H3-H2 sequence of the session.

HyperSwap options
Enter the HyperSwap properties for the role pairs that are in the session. If you select Manage Hx-Hx with HyperSwap on the H1-H2 Options, H1-H3 Options, or H2-H3 Options tab, these properties define how HyperSwap Manager determines the target site for the HyperSwap operation, the priority for target sites, and the process that occurs in the event of an error during the operation.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes
Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes
Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap error:
Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap error:
Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

HyperSwap Site Selection
Select one of the following options to specify how HyperSwap Manager selects the target site for a HyperSwap operation.

Allow HyperSwap Manager to determine the HyperSwap site
Select this option to enable HyperSwap to select the target site for a HyperSwap operation.

HyperSwap Manager selects the target site that keeps the most sysplex members active. If multiple target sites are equal candidates for the HyperSwap operation, HyperSwap Manager uses the Site HyperSwap Priorities value to select the target site. For example, if both site 1 and site 3 are equal, but the Site HyperSwap Priorities priority is site 3, site 2, and site 1, HyperSwap Manager selects site 3.

Determine the HyperSwap site by specified priorities
Select this option to direct HyperSwap Manager to select the target site based on the priority list that is specified by the Site HyperSwap Priorities option.

HyperSwap Site Priorities
Specify the priority in which HyperSwap Manager selects the target site for a HyperSwap operation.

The default value priority is site 1, site 2, and site 3. This order indicates that the first priority is site 1, the second priority is site 2, and the third priority is site 3. If site 1 is the active site, then site 1 is ignored and HyperSwap Manager selects site 2 or 3 depending on the load status and availability of the sites, with site 2 being the preferred site.

If you select Allow HyperSwap Manager to determine the HyperSwap site, this option is used only when multiple target sites are equal candidates for a HyperSwap operation.

If you select Determine the HyperSwap site by specified priorities, this option determines the order in which HyperSwap Manager selects the target site.

Safeguarded Copy session properties

Use the **View/Modify Properties** notebook to view or modify properties for IBM DS8000 Safeguarded Copy sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **Backup Options** options tab to set properties that apply to the backup. Use the **H1-R1 Options** tab to set properties that apply to the recovery relationship.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. When this option is set, the Backup command is submitted through the z/OS connection to that system or sysplex to provide performance improvements during the backup process. To enable this feature, volumes in the session must be attached to the system or sysplex and IOS APAR OA59561 must be applied.

If you select No Association, then the session submits the command in the regular manner and the performance advantage of submitting the backup through the system or sysplex will not be applicable.

This option is displayed only if the copy services management server is installed on or connected to a z/OS host system.

Backup Options
Enter the properties for the Safeguarded backups.

Expire Backup on Auto Roll

When this option is set, the session automatically expires a backup when the session determines that one or more of the volumes has auto rolled the backup. Set the `Expire Backup on Auto Roll` option to free up additional space whenever one or more volumes do not have enough backup capacity to form new backups. This feature can help avoid out-of-space conditions. However, when a backup is automatically expired, it is no longer available for recovery across any of the volumes that contained that backup. By default, this option is NOT selected, so you must select it to enable this feature. When this option is not set, the backup is not automatically expired so that if one or more volumes did not auto roll the backup, those volumes can still be recovered to that backup. To allow recovery to those volumes, you must remove any volumes indicating that they auto rolled that backup, from the session. Search on the topic "Recovering volumes to backups marked as not recoverable due to volume auto roll" in the Troubleshooting section of the Copy Services Manager online help documentation at https://www.ibm.com/support/knowledgecenter/SSESK4 for more information.

Note: If you select the `Expire Backup on Auto Roll` option, but the backup is in a recovery relationship, and the hardware rolls a volume off, Copy Services Manager does not expire it.

For more explanation about expired backups and auto roll, see “Safeguarded Copy” on page 114.

Minimum Timeframe per backup

This option defines the minimum time in minutes that the session will allow the backup command to be issued. The options are designed to ensure that the backup command cannot be issued at a rate that would cause older backups to automatically roll off because of space conditions when the preferred duration of the backups is no longer met.

Retention Period Since Last Recoverable Backup

This option defines the customers preferred duration for the backups on the session based on the last recoverable backup that was taken. This option helps you define how long backups should be retained to meet service level agreements. The backup capacity for all volumes in the session and the schedule of the backups should be set to values that support the retention period.

Important: The retention period is based on the second-to-last recoverable backup. The retention design always keeps at least two recoverable backups. The hardware might not support recovery of the last recoverable backup. If the hardware does not support it, Copy Services Manager allows you to recover the last recoverable backup, but automatically takes a new backup so that the recover can complete. Because a new backup takes up additional backup capacity, the design ensures that there is always one backup available for recovery that does not use more backup capacity. If additional backup capacity is used, it might cause older backups to automatically expire on the hardware due to a lack of space. However, if the hardware supports it, the last backup can be recovered without the need for an additional backup.

H1-R1 Options

Enter the properties for the role pair.

No Copy

This option defines if the recovery relationship will be established with background copy. If No Copy is selected, then a background copy is not automatically started when the relationship is established. To start the background copy for a no copy relationship issue the Initiate Background Copy command. If No Copy is not selected, then a full background copy of the data will occur when the relationship is established. If the recovery volume is a space efficient volume, the background copy might lead to fully provisioning the volume.

Persistent

Select this option to keep the recovery relationship established on the hardware after all tracks are copied to the target volume. If you do not select this option, the recovery replication relationship is removed from the hardware after the target volume contains a complete image of the recovered backup.

Requirement: This option requires that the persistent recovery option for Safeguarded Copy is available for your IBM System Storage® DS8000® storage system. To determine whether you can use the persistent recovery option for Safeguarded Copy with your System Storage DS8000

storage system, refer to the System Storage DS8000 documentation for microcode level that you are using.

FlashSystems/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize sessions

The properties for IBM FlashSystems/IBM Spectrum Virtualize, IBM System Storage SAN Volume Controller, and IBM Storwize sessions depend on the session type.

The following sections describe the properties for each session type with the exception of session types that include only the **Description** property.

FlashCopy session properties

Use the **View/Modify Properties** notebook to view or modify properties for FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize FlashCopy sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-T1 Options** tab to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

H1-T1 Options
Enter the properties for the role pair.

Incremental
Select this option to apply incremental changes to the target volume. After the initial FlashCopy operation, only data that changed on the source volume since the last FlashCopy operation was performed is copied to the target volume.

Background copy rate
Type the copy rate that the storage system uses to perform the background copy of the FlashCopy role pair.

Note: For older storage systems running IBM Spectrum Virtualize, you can specify a value in the range of 0-100. For newer storage systems at release 7.8.1 and higher, you can specify a value in the range of 0-150. The default rate is 50.

Specify 0 if you do not want the hardware to write the background copy until the source track is written to. Data is not copied to the target volume until the blocks or tracks of the source volume are modified.

You can modify this value at any time during the session. If the session is performing a background copy when you change the option, IBM Copy Services Manager immediately modifies the background copy rate of the consistency group on the storage system. The storage system consistency group immediately starts by using this new rate to complete the background copy.

Metro Mirror and Global Mirror Failover/Failback with Practice session properties

Use the **View/Modify Properties** notebook to view or modify properties for FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize Metro Mirror Failover/Failback with Practice and Global Mirror Failover/Failback with Practice sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H2-I2 Options** tab to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

H2-I2 Options
Enable automatic restart on unexpected suspends
When you select this option, the Copy Services Manager server automatically restarts the session when it unexpectedly suspends due to reason code 1720 or 1920. An automatic restart is attempted for every suspend with reason code 1720 or 1920 up to a predefined number of times within a 30-minute time period. The number of times that a restart is attempted is determined by the storage server *gmlinktolerance* value. If the number of allowable automatic restarts is exceeded within the time period, the session does not restart automatically on the next unexpected suspend. Issue a **`Start`** command to restart the session, clear the automatic restart counters, and enable automatic restarts.

Warning: When you enable this option, the session is automatically restarted by the server. When this situation occurs, the secondary site is not consistent until the relationships are fully resynched.

Delay time before restart (seconds)
Specify the amount of time (in seconds) in which the copy services management server waits after an unexpected suspend, before automatically restarting the session. The range of possible values is 0 - 43200. The default is 0, which specifies that the session is restarted immediately following an unexpected suspend.

Enter the properties for the role pair.

Incremental
Select this option to set up the relationship for recording changes to the practice volume (H2). All subsequent FlashCopy operations between the intermediate volume and the host volume copy only the data that changed since the previous FlashCopy operation.

Background Copy Rate for H2-I2
Type the copy rate that the storage system uses to perform the background copy of the FlashCopy role pair.

Note: For older storage systems running IBM Spectrum Virtualize, you can specify a value in the range of 0-100. For newer storage systems at release 7.8.1 and higher, you can specify a value in the range of 0-150. The default rate is 50.

Specify 0 if you do not want the hardware to write the background copy until the source track is written to. Data is not copied to the target volume until the blocks or tracks of the source volume are modified.

You can modify this value at any time during the session. If the session is performing a background copy when you change the option, IBM Copy Services Manager immediately modifies the background copy rate of the consistency group on the storage system. The storage system consistency group immediately starts by using this new rate to complete the background copy.

Global Mirror Failover/Failback with Change Volumes session properties

Use the **View/Modify Properties** notebook to view or modify properties for FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, and Storwize Global Mirror Failover/Failback with Change Volumes sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-H2 Options** tab to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

H1-H2 Options

Enter the properties for the role pair.

Enable automatic restart on unexpected suspends

When you select this option, the Copy Services Manager server automatically restarts the session when it unexpectedly suspends due to reason code 1720 or 1920. An automatic restart is attempted for every suspend with reason code 1720 or 1920 up to a predefined number of times within a 30-minute time period. The number of times that a restart is attempted is determined by the storage server *gmlinktolerance* value. If the number of allowable automatic restarts is exceeded within the time period, the session does not restart automatically on the next unexpected suspend. Issue a **`Start`** command to restart the session, clear the automatic restart counters, and enable automatic restarts.

Note: If a Global Mirror with Change Volumes session is running with change volumes disabled, this option causes the session to restart automatically with change volumes enabled; and to form consistency groups based on the cycle time defined in the session properties. After the condition that caused the suspend with reason code 1720 or 1920 is fixed, you can disable change volumes manually in the **View/Modify Properties** window for the session in the GUI.

Warning: When you enable this option, the session is automatically restarted by the server. When this situation occurs, the secondary site is not consistent until the relationships are fully resynched.

Delay time before restart (seconds)

Specify the amount of time (in seconds) in which the copy services management server waits after an unexpected suspend, before automatically restarting the session. The range of possible values is 0 - 43200. The default is 0, which specifies that the session is restarted immediately following an unexpected suspend.

Enable change volumes

Select this option to enable the use of change volumes in the copy sets for the session. If this option is not selected, the session functions the same as a Global Mirror Failover/Failback session.

Change volumes are denoted as C*x*, where *x* identifies the site. These volumes contain point-in-time images that are copied from the H1 and H2 volumes. The C1 volume stores changes from the H1 volume. These changes are sent from the C1 volume to the H2 volume, and then to the C2 volume.

Because the data that is replicated between sites contains point-in-time changes rather than all changes, a lower bandwidth link is required between the sites when change volumes are used. However, the use of change volumes can result in an increase to data exposure. Therefore, you might want to enable or disable this option, which depends on your network traffic or business requirements.

When you select this option, it is the equivalent of setting the **`-cyclingmode`** parameter to `multi` on a FlashSystem/IBM Spectrum Virtualize, SAN Volume Controller, or Storwize storage system. When you clear this option, it is the equivalent of setting the **`-cyclingmode`** parameter to `none` for these storage systems.

Cycle period (seconds)

Specify the amount of time, in seconds, in which the change volumes are refreshed with a consistent copy of the data. If a copy does not complete in the cycle period, the next cycle period will not start until the copy is complete. The range of possible values is 60 - 86400. The default is 300.

Recovery Point Objective Alerts

Specify the length of time that you want to set for the recovery point objective (RPO) thresholds. The values determine whether a Warning or Severe alert is generated when the RPO threshold is exceeded for a role pair. The RPO represents the length of time, in seconds, of data exposure that is acceptable if a disaster occurs.

Use the following options to set the RPO threshold values. For both options, you can specify an RPO threshold in the range of 0 - 172800 seconds. The default is 0 seconds, which specifies that no alerts are generated.

Warning level threshold (seconds)
Specify the number of seconds that you want to set for the warning level RPO threshold. If the RPO is greater than this value, an alert is generated.

If the value in this field is other than 0, it must be greater than the value in the **Cycle period (seconds)** field and less than the value in the **Severe level threshold (seconds)** field.

Severe level threshold (seconds)
Specify the number of seconds that you want to set for the severe level RPO threshold. If the RPO is greater than this value, an alert is generated and the session status changes to Severe.

If the value in this field is other than 0, it must be greater than the value in the **Warning level threshold (seconds)** field.

FlashSystem/IBM Spectrum Accelerate sessions

The properties for the FlashSystem/IBM Spectrum Accelerate sessions depend on the session type.

The following topic describes the properties for each session type with the exception of session types that include only the **Description** property.

FlashSystem/IBM Spectrum Accelerate Global Mirror Failover/Failback session properties

Use the **View/Modify Properties** notebook to view or modify properties for the FlashSystem/IBM Spectrum Accelerate Global Mirror Failover/Failback sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-H2 Options** to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

H1-H2 Options
Enter the properties for the role pair.

Recovery point objective threshold (seconds)
Type the number of seconds that you want to set for the recovery point objective (RPO) threshold for the role pair.

If the FlashSystem/IBM Spectrum Accelerate determines that the RPO is greater than this threshold value, an alert is generated and the session status changes to Severe. You can specify an RPO in the range of 30 - 86400 seconds. The default is 30 seconds.

Synchronization schedule (HH:MM:SS)
Select an interval to create a synchronization schedule. The schedule is used to form consistency groups. The FlashSystem/IBM Spectrum Accelerate attempts to form consistent points of data by taking automatic snapshots of the volumes in the session at this interval. The default is **Minimum Interval**, which is 20 seconds.

If you select **Never**, synchronization is not scheduled and the FlashSystem/IBM Spectrum Accelerate does not create consistency groups. When the FlashSystem/IBM Spectrum Accelerate determines that the RPO threshold is exceeded, the session state becomes Severe.

FlashSystem/IBM Spectrum Accelerate Metro Mirror Failover/Failback session properties

Use the **View/Modify Properties** notebook to view or modify properties for the FlashSystem/IBM Spectrum Accelerate Metro Mirror Failover/Failback sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-H2 Options** to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

H1-H2 Options
Enter the properties for the role pair.

HyperSwap management: Manage H1-H2 with HyperSwap
Select this option to enable the relationship for HyperSwap on the Spectrum Accelerate System. HyperSwap redirects application I/O to the target volumes when there is a failure on the host accessible volumes. Copy Services Manager uses HyperSwap to manage the H1-H2 sequence of the Metro Mirror session.

FlashSystem/IBM Spectrum Accelerate Metro Mirror - Global Mirror session properties

Use the **View/Modify Properties** notebook to view or modify properties for the FlashSystem/IBM Spectrum Accelerate Metro Mirror - Global Mirror sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-H3 Options and H2-H3 Options** to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

H1-H3 Options and H2-H3 Options
Enter the properties for the role pair.

Recovery point objective threshold (seconds)

Type the number of seconds that you want to set for the recovery point objective (RPO) threshold for the role pair.

If the Spectrum Accelerate system determines that the RPO is greater than this threshold value, an alert is generated and the session status changes to Severe. You can specify an RPO in the range of 30 - 86400 seconds. The default is 90 seconds.

Synchronization schedule (HH:MM:SS)

Select an interval to create a synchronization schedule. The schedule is used to form consistency groups. The Spectrum Accelerate system attempts to form consistent points of data by taking automatic snapshots of the volumes in the session at this interval. The default is the min_interval schedule defined on the hardware.

If you select Never, synchronization is not scheduled and the Spectrum Accelerate system does not create consistency groups. When the Spectrum Accelerate system determines that the RPO threshold is exceeded, the session state becomes Severe.

Basic HyperSwap session properties

Use the **View/Modify Properties** notebook to view or modify properties for Basic HyperSwap sessions.

The properties are displayed on different tabs in the notebook. Use the **Session Options** tab to set properties that apply to the entire session. Use the **H1-H2 Options** tab to set properties that apply to the role pair.

Session Options
Enter the properties for the session.

Description
Type the description for this session.

Fail MM/GC if target is online (CKD only)
Select this option to fail any session commands for a Metro Mirror or Global Copy relationship if the target volume is in the Online state. For more information about this state, refer to the documentation for the storage system.

This option applies only to count key data (CKD) volumes.

H1-H2 Options
Enter the properties for the role pair.

z/OS Management
The **z/OS Management** options are displayed only if Copy Services Manager is installed on or connected to a z/OS host system. You can add a z/OS host connections in Copy Services Manager regardless of the operating system on which the application is installed.

When you are connected to a z/OS host system, you can manage z/OS features for volumes that are attached to the host system. In addition, you can manage these features for volumes that are attached to other z/OS systems that are connected to the host system through a sysplex.

System or sysplex
Select the z/OS system or sysplex that you want to associate with the session. Commands for z/OS features are issued to this system or sysplex. Volumes in the session must be attached to the system or sysplex to enable the features.

Disable HyperSwap
Select this option to prevent a HyperSwap operation from occurring.

Reset In Use By System on Secondary Volumes
Select this option to have the load of the configuration automatically reset the In Use By System state on all secondary volumes (UCBNALOC = OFF). When this option is not selected, a load of the configuration fails when secondary volumes are in the In Use By System state (UCBNALOC is ON). This feature is only available after APAR OA53082 is applied to the z/OS system.

Unbox Secondary Volumes
Select this option to have the load of the configuration automatically unbox all secondary volumes in the configuration. When this option is not selected, a load of the configuration fails when secondary volumes are in a boxed state. This feature is only available after APAR OA53082 is applied to the z/OS system.

On Planned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)
Select this option to partition out the failing system and continue the swap processing on any remaining systems.

Disable HyperSwap after attempting backout
Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

On Unplanned HyperSwap Error:

Partition out the failing system(s) and continue swap processing on the remaining system(s)

Select this option to partition out the failing systems and continue HyperSwap processing on the remaining systems when a new system is added to the sysplex and the HyperSwap operation does not complete.

Requirement: If you select this option, you must restart the system.

Disable HyperSwap after attempting backout

Select this option to enable IOS to back out the HyperSwap operation, if possible, if an error occurs during HyperSwap processing. HyperSwap is disabled.

Viewing copy sets in a session

You can view the copy sets that are in a session. You can also export the copy sets to a comma-separated value (CSV) file for backup purposes.

About this task

Follow these steps to view or export the copy sets for a session:

Procedure

1. In the menu bar, click **Sessions**.
2. On the **Sessions** page, select the session that contains the copy sets.
3. From the **Session Actions** list, select **View/Modify** > **View Copy Sets**.

Viewing storage system details

You can view detailed information about storage system, including the name, location, type, vendor, and the status of all connections to the storage system.

About this task

Perform these steps to view storage system details:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click the ID for the storage system in **Storage System** column.

Viewing DS8000 advanced settings

You can use the Copy Services Manager GUI to view and download a file that contains the advanced settings for DS8000 storage systems.

About this task

The DS8000 advanced settings file highlights which settings are modified from the default values. The only values that are displayed in the table are properties that are *not* set to the default values.

Notes: To view the advanced settings, two conditions must be met:

- The DS8000 system must be at version 8.1.1. or higher.
- The user who is connected to the Hardware Management Console (HMC) must have admin-level access on the DS8000.

Perform these steps to view the advanced settings for a DS8000 storage system by using the Copy Services Manager GUI:

Procedure

1. Log in to the Copy Services Manager GUI as an administrator.
2. In the menu bar, click **Storage** > **Storage Systems**.
3. From the **Storage Systems** tab, select the DS8000 storage system for which you want to view the advanced settings.
4. Click **Select Action** > **View Advanced Settings**.
5. A table is displayed that lists the advanced settings properties for the selected DS8000 storage system. The current value for each property is shown, along with the associated default value for that property.

   Notes:

   - If all values are set to the default, then no table is displayed.
   - You cannot modify the advanced settings from within this table. You can only view and download them.
6. You can open the advanced settings file, or save it to your local system.
7. Click **OK** to close the advanced settings information when you are finished.

Creating storage system diagnostics

You can perform a warm start or an on-demand data (ODD) dump of a selected storage system to collect diagnostic information.

About this task

Sometimes IBM Support requires extra diagnostic information to help resolve a storage system issue by determining the root cause. In this scenario, it can be useful to create storage system diagnostics.

A *warm start* is an error recovery process for the DS8000 storage system. A warm start collects microcode data that is useful in diagnosing problems. It is designed for data integrity, data protection, and data capture. For more information about the warm start procedure, see your storage system documentation.

An ODD dump is a nondisruptive action to collect the diagnostic information.

Note: Creating system diagnostics is only available in the Copy Services Manager GUI if a storage system has an HMC connection. If the storage system only has a FICON z/OS connection, or is a SAN Volume Controller or XIV-based system, then the option is not displayed.

Follow these steps to perform a storage system warm start or ODD:

Procedure

1. Log in to the Copy Services Manager GUI as an administrator.
2. In the menu bar, click **Storage** > **Storage Systems**.

   You can also access this option from the **Storage System Details** page.
3. On the **Storage Systems** page, select the ID for the storage system in the **Storage System** column.
4. Click **Select Action** > **Create System Diagnostics**.
5. Select from the following options: `On Demand Dump` (default), or `Warm Start`.
6. Click **OK**.

   - If you choose the **On Demand Dump** option, the system starts to immediately process your request after you click **OK**.

- If you choose the **Warm Start** option, a warning message appears in which you must confirm before the warm start initiates. A warm start is the equivalent of rebooting the system without powering it off.

  Click **OK** in the message to proceed with the warm start, or click **Cancel** to exit without performing the warm start.

Results

System diagnostics information is created, which can be used as needed in resolving issues.

Viewing storage connection details

You can view storage connection details and a list of all storage systems that are located behind the connection.

About this task

Perform these steps to view storage connection details:

Procedure

1. In the menu bar, click **Storage** > **Storage Systems**.
2. On the **Storage Systems** page, click the **Connections** tab.
3. Click the ID for the storage system connection in the **Storage Connection** column.

Viewing volume details

You can view information about volumes such as the name of the volume, the capacity of the volume, and the type of volume.

Procedure

1. In the menu bar, click **Storage** > **Volumes**.
2. On the **Volumes** page, select a storage system.
3. Depending on the type of storage system, complete one of the following actions:
   - Select **All IO Groups** or a specific I/O group.
   - Select **All Logical Storage Subsystems** or a specific logical storage subsystem.
   - Select **All Pools** or a specific pool.
4. Click **Perform Query**.
   - Information about the volumes is displayed in a table.
   - The **Session** column identifies any Copy Services Manager sessions that the volume is included in. Knowing the session dependencies helps to determine:
     - which volumes are in sessions
     - which volumes might not be in sessions but should be
     - which volumes might be shared across multiple sessions

   Tip: To filter the list by user name, full name, type, capacity, device number or sessions, enter the filter text in the **Filter** field. You can enter complete or partial text. To remove the filtering for the list, click the X icon in the **Filter** field.

Viewing logical paths

You can view all logical paths that are defined on an IBM DS8000 storage system.

About this task

Complete one of these procedures to view logical paths:

Procedure

- From the **ESS/DS Paths** page of Copy Services Manager:
  a) In menu bar, click **Paths**.
  b) Click the storage system ID to display logical paths for that storage system.
- From the **Storage Systems** page:
  a) In menu bar, click **Storage** > **Storage Systems**.
  b) Select the storage system for which you want to view logical paths.
  c) From the **Select Action** list, select **View Paths**. The paths page is displayed with a list of defined logical paths.

Viewing host connection details

You can view and modify the connection information for a host system. You can modify the connection information only if the host system in the Disconnected state.

About this task

Follow these steps to view or modify connection information for a host system:

Procedure

1. In the menu bar, click **Storage** > **Host Connections**.
2. On the **Host Connections** page, click the link for the host system in the **Host System** column.

Viewing console messages

Copy Services Manager provides a detailed log of user and system activity.

Procedure

To view this log, click **Console** in the menu bar. The **Console** window contains log entries that specify the activity that has occurred and a link to the correlating message for that activity.

Note:

The console by default displays the last 1000 messages. This default value can be changed by adding the following property to the server properties. Do not specify more than 5000 messages as you might experience memory issues with the GUI attempting to load that many messages.

Example

server.max.console.msgs=1200

Initiating a takeover on the standby management server

If the active management server fails, you can force the standby management server to take over monitoring and managing replication responsibilities.

About this task

Important: If the current active management server is still active, you must not attempt to control the replication environment simultaneously from both management servers. Instead, either reconfigure the current active management server to be a standby management server, or shut it down.

Complete these steps to cause the standby management server to become the active management server:

Procedure

1. If the active management server is functioning, take it offline so that you do not have two active management servers managing the same sessions.
2. Log on to the Copy Services Manager GUI that is running on the standby management server.
3. In the menu bar, click **Settings** > **Management Servers**.
4. On the **Management Servers** page, from the **Select Action** list, select **Takeover**.
5. To reestablish high-availability, complete one of these steps:
   - Choose another server to be the standby management server. See instructions for setting up a standby management server.
   - Bring the failed management server back online, and then make that server the standby management server. See “Setting up a standby management server” on page 42.
   - Bring the failed management server back online, and then make that server the active management server to return to the original configuration. Repeat the steps in this section and then add the original standby server as the standby server.

What to do next

Important: Do *not* use the **Reconnect** command if you perform a takeover. You would use the **Reconnect** command when the active server loses its connection with the standby server; it reconnects the two servers. Do *not* use the **Reconnect** command after a takeover to reconnect to the original active server.

Logging to the syslog

When Copy Services Manager is running on a z/OS system, it can send messages to the z/OS syslog to help with diagnosing problems or externally automating actions based off of certain Copy Services Manager messages.

About this task

You can configure z/OS syslog message output by modifying properties in the `rmserver.properties` configuration file.

- You can toggle the message output on and off.

  Note: By default, this logging is turned off, so you must enable it if you want to see these messages.
- You can choose to log all messages, or a subset of messages to the syslog.

Prerequisite: You must have Administrator privileges to perform this action.

Procedure

1. Open the `rmserver.properties` file. You can access this file from the Copy Services Manager GUI under **Settings** > **Server Properties**. You can manually enter and edit the file properties on that page.

   Note: See "rmserver.properties file" on page 346 for more information on locating and using this file.
2. Set the following properties in the `rmserver.properties` file to enable and control the messages that are logged to the z/OS syslog:

   com.ibm.csm.zconsole.logging=none (default) | `all` | `error`
   Specifies the standard out logging level to the syslog, where the possible values are *none*, *all*, or *error*.

   - When *none* is specified, Copy Services Manager does not log to the syslog at all (default).
   - When *all* is specified, Copy Services Manager logs all I, W, and E messages to the syslog.
   - When *error* is specified, Copy Services Manager logs all W and E messages to the syslog.

   Example: To log all messages: `com.ibm.csm.zconsole.logging=all`

   com.ibm.csm.zconsole.logging.includechildren=`true` | `false` (default)
   Specifies whether or not to log child messages to the syslog. By default, only high level messages are logged. Child messages are not logged. Use this property setting to override this behavior and enable child messages to be logged.

   Notes:

   - Be aware that setting the logging to all messages, including the child messages, can result in a very large amount of messages. Only set the **`includechildren`** property to `true` when it is important to see the child messages.
   - When you set the **`includechildren`** property to `true`, all child messages are printed to the syslog, including any in the **`excludedmsgs`** list, as discussed next.

   Example: To log all child messages:
   `com.ibm.csm.zconsole.logging.includechildren=true`

   com.ibm.csm.zconsole.logging.excludedmsgs=*<messages to exclude in comma-separated list>*
   Specifies which messages to exclude from writing to the syslog, where the values are a comma-separated list of message IDs. Any ID in the list will not appear in the syslog.

   Note: The **`excludedmsgs`** property is only for parent messages.

   Example: To exclude the IWNR1028I and IWNR6000I messages from being logged:
   `com.ibm.csm.zconsole.logging.excludedmsgs=IWNR1028I,IWNR6000I`

Logging to a remote syslog server

The Copy Services Manager server stores audit logs on the server itself, where the product is installed. If there is a requirement to store audit logs on an external server or monitor audit logs for the product, a file monitor service can be set up to send audit logs to a remote syslog server.

About this task

There are several file monitor services that can be used. This task describes the use of product remote syslog server to monitor the Copy Services Manager audit logs. These steps would be similar when used for different file monitor services.

Note: The external syslog feature is not supported for Copy Services Manager servers running on DS8000 Hardware Management Console (HMC).

Configuring service on Windows

About this task

Follow these steps to configure the File Monitor Service by using remote syslog on windows. You can use this service to capture information from `csmMessage.log` file.

Procedure

1. Install remote syslog or File Monitor Service on Copy Services Manager server.
2. Set the necessary rule and corresponding action.
   a) Define a new rule set.
   b) In the configuration wizard, enter the name of the rule.
   c) Click **Next** and select the rule that is mentioned in previous step.
   d) Click **Finish** on the confirmation page to create the rule set.
   e) In the main window, expand the created rule set from the navigation window.
   f) Select **Action** level of the selected rule set.
   g) Configure the **Action**.
      - Enter IP or hostname of your syslog server.
      - Select the **Protocol Type**.
      - Set the Syslog port.
   h) Click **Save** to apply the changes. Then, restart the service.
3. Setup File Monitor Service.
   a) Go to **Add Service** and then **File Monitor**.
   b) In the configuration wizard, create the name of the service. Use default settings and press **Next**.
   c) Click **Finish** on the confirmation page.
   d) In the main window, expand **Services** from navigation window.
   e) Select the newly created service, click **Browse**, and select `csmMessage.log` file. This file is usually present at *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/logs/CSM`.
   f) Select the created rule set.
   g) Save the changes and restart the application.

Results

The File Monitor now sends all the incoming Copy Services Manager messages to the external syslog server.

Configuring service on Linux/AIX

About this task

Follow these steps to configure the remote syslog configuration file on Linux/AIX. You can use this configuration to capture information from `csmMessage.log` file.

Note: The following commands are meant for Unix system, which might differ for different level of Linux and remote syslog server.

Procedure

1. Set up `rsyslog.conf` to forward message to a remote server.
   a) Open the `rsyslog.conf` in edit mode.
   ```
   edit /etc/rsyslog.conf
   ```

b) The `rsyslog.conf` has several examples. Find and edit, or add the action that forwards the logs to a remote syslog server. The target is the IP(hostname) for the remote syslog server and the port is the communication port that is configured to receive the logs.
For example:
```
*.* action(type="omfwd" target="192.0.2.2" port="10514" protocol="tcp"
action.resumeRetryCount="100" queue.type="linkedList" queue.size="10000")
This action decouples the message sending from other logging actions, and
prevent delays when the remote system is not reachable. In addition, it
tries to connect 100 times before it discards message as undeliverable.
```

2. Modify `rsyslog.conf` to monitor `csmMessage.log`.
   a) Load the imfile module at the beginning of remote syslog configuration file. This module monitors the file.
   ```
   module(load="imfile" PollingInterval="10")
   ```
   Note: All modules are to be loaded once. Polling Interval is a module directive, which must be set while you load the module.
   b) Configure input and its parameters. This input is used by the imfile module to indicate which file to monitor. Set the input to monitor file:
   ```
   /opt/IBM/CSM/liberty/wlp/usr/servers/csmServer/logs/CSM/csmMessage.log
   input(type="imfile" File="/opt/IBM/CSM/liberty/wlp/usr/servers/csmServer/
   logs/CSM/csmMessage.log" Tag="csmMessage")
   ```
3. Start and restart syslog.
   Example for starting and stopping on some Linux platforms. For more information, view the remote syslog documentation for the specified level and platform.
   ```
   systemctl stop rsyslog
   systemctl start rsyslog
   ```

Results
The remote syslog server now sends all the incoming Copy Services Manager messages to the external syslog server.

Alerts

Copy Services Manager can deliver two different types of alerts: either email alerts, or SNMP notifications.

Email alerts

You can receive email alerts from Copy Services Manager based on triggering events.

Email alerts are sent for the following general events:

Session State Change
When the state of any session changes, or if an auto-restart to a session was attempted.

Example: IWNR1950I [Aug 12, 2019 2:52:50 PM] Session GMP changed from the Preparing state to the Prepared state.

Configuration Change
When there are configuration changes involving adding or removing copy sets from sessions.

Example: IWNR1956I [Aug 14, 2019 2:12:46 PM] At least one copy set has been added to or removed from session GMP.

Unexpected Severe Status
When any session goes into an unexpected Severe status.

Example: IWNR1958W [Aug 14, 2019 2:43:05 PM] Session GMP has changed to the SEVERE status due to an unexpected error.

Communication Failure
When there is loss of communication to the storage systems.

Example: IWNR1955E [Aug 12, 2019 11:30:52 PM] The copy services management server, serverA.xyz.xyzlabs.ibm.com, has encountered communication errors with storage system DS8000:BOX:2107.BOXAB.

Active Standby Connected
When the active and standby server are connected.

Example: IWNR1951I [Aug 12, 2019 11:32:54 PM] High-Availability relationship serverA.xyz.xyzlabs.ibm.com->serverB.xyz.xyzlabs.ibm.com changed to the Synchronized state.

Active Standby Disconnected
When the active and standby server are disconnected.

Example: IWNR1951I [Aug 14, 2019 1:56:32 PM] High-Availability relationship serverA>serverB.xyz.xyzlabs.ibm.com changed to the Disconnected state.

Scheduled Task Completed
When a scheduled task completes successfully.

Example: IWNR2212I [Aug 14, 2019 3:10:55 PM] The scheduled task TASKX has finished running.

Scheduled Task Failed
When a scheduled task fails to complete successfully.

Example: IWNR2219E [Aug 14, 2019 3:08:53 PM] Scheduled task TASKX failed due to an error that was encountered while it was running.

Session RPO Trigger
When there are session RPO warning and severe threshold alerts.

Example: IWNR2752E [Aug 14, 2019 2:54:31 PM] The recovery point objective for the role pair of H1-J2 in session GMP has passed the severe threshold of 2 seconds.

Logical Path Change
When there are DS8000 storage system logical path updates or errors.

Example: IWNR1957I [Aug 12, 2019 3:09:36 PM] At least one path definition has been added or removed.

Configuring email alerts by using the GUI

Starting with Copy Services Manager Version 6.1.4, you can also use the GUI to configure email alerts.

About this task

Configuring email alerts at the GUI involves two steps:

- Configuring the email server
- Configuring the list of recipients

Procedure

1. Log in to the Copy Services Manager GUI as an administrator.
2. Go to **Settings** > **Alert Notifications**. The **Email** configuration page is displayed.

Configuring the email server

About this task

You must first configure the email server to use for sending the alerts.

Procedure

1. Click **Edit**.

2. Define an email server by entering a host name or IP address in the **Email server** field.
3. Enter the **Port** for the email server.

   Note: The default port is 25.
4. Optional: Enter a valid email address in the **Reply-to address** field.

   Notes:

   - You can only enter *one* reply-to address.
   - The reply-to address receives emails if a recipient replies to the email alert.
5. Click **Save** to save the changes, or click **Cancel** to exit without saving your changes.

Configuring the list of recipients

About this task

Next, you must configure the list of email addresses for the alert recipients.

Procedure

1. Click **Add** to add one or more email addresses for alert recipients.
2. Enter, or copy and paste one or more email addresses into the **Add email alert recipients** dialog.

   Note: You can add more than one email address by using commas to separate each address.
3. Before the 6.2.7 release, all of the email recipients that you specified in the previous step received all of the alert types. However, starting with Copy Services Manager 6.2.7, you can specify which alerts these email recipients will receive in the table under the field to add email addresses. See "Email alerts" on page 303 for a detailed listing of the alert types. You can also view the alert descriptions by using the pull-down option in the top right corner of the table. Select the types of alerts that you want to go to these addresses, and click **Add**.

   Note: (Optional) You can also use the filter field to search for alert types in the table.

   Important: After an upgrade to version 6.2.7 or higher, any predefined email recipients automatically get All Events.
4. Click **Add** to save your changes, or click **Cancel** to exit without saving your changes.

   - You can also select any email addresses that were previously added and click **Remove** to remove them from the list of recipients.
5. Optional: If the email server is configured, you can click **Test** to send a test email to all alert recipients. This test verifies that the email server is configured properly, and that recipients are receiving the emails.

Results

Email alerts are now configured.

Configuring email alerts by using the CLI

Starting with Copy Services Manager Version 6.1.2, you can use the command-line to configure email alerts.

About this task

The following commands are available for setting email alerts:

`addemailserver`
Configures the server to use for sending email alerts.

Note: The **`addemailserver`** command can overwrite the existing server configuration.

lsemailserver
Displays the configuration that is being used for email alerts, if any.

rmemailserver
Removes the SMTP server configuration that is used to send email alerts.

Note: After you submit the command, email alerts are no longer sent.

addemailalert
Adds email addresses to the list of email addresses that receive email alerts.

rmemailalert
Removes email addresses from the list of email addresses that receive email alerts.

lsemailalert
Displays the recipient list of email addresses to send email alerts to.

testalert
Uses the current alert configuration to send a test alert.

Note: Currently, this command only supports sending a test email alert.

For more information, see the IBM Copy Services Manager online product documentation (http://www-01.ibm.com/support/knowledgecenter/SSESK4). Command syntax details are located under the "Reference" section of the navigation.

The flow of tasks for configuring email alerts from the CLI is as follows:

Procedure

1. Define an email server, and an optional reply-to email address.
2. Define the email recipients.
3. (Optional) You can use the **testalert** command to verify that the email alert function is working and that recipients are receiving emails.

   Important: If you have problems sending outgoing email alerts, you might need to customize the setting that defines the outgoing email server name. The default server name for sending email alerts is csmServer@<server hostname>. However, some environments do not accept this server email address. You can change the default setting by using the **csm.server.notification.sender.address:[email address]** parameter in the `rmserver.properties` file.

   For more information, see “rmserver.properties file” on page 346.

SNMP alerts

SNMP alerts are sent with associated object IDs (OIDs).

SNMP alerts are sent during the following general events:

- Session state change
- Configuration change
- Suspending-event notification
- Communication failure
- Management Server state change

Configuring SNMP alerts by using the GUI

Starting with Copy Services Manager Version 6.1.4, you can also use the GUI to configure SNMP alerts.

About this task

To configure SNMP alerts, you must configure one or more SNMP managers.

Procedure

1. Log in to the Copy Services Manager GUI as an administrator.
2. Go to **Settings** > **Alert Notifications**. The **Email** configuration page is displayed by default.
3. Click the **SNMP** tab.
4. Click **Add** to configure one or more SNMP managers.
5. Enter a **Host name or address** and an associated **Port** for a valid SNMP manager.

   Note: The default port is 162.
6. Click **Add** to save the changes, or click **Cancel** to exit without saving your changes.

   Notes:

   - You can add only one SNMP manager at a time.
   - You can select any SNMP managers that were previously added and click **Remove** to remove them from the list.

Results

SNMP alerts are now configured.

Configuring the SNMP community name

The SNMP community name has a default value of `public`.

What to do next

To change the community name, modify or add the **`csm.server.snmp_community_string`** property in the `rmserver.properties` file. This file is in the *`install dir`*`\liberty\wlp\usr\servers\csmServer\properties`*`path_prefix`*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory.

Adding SNMP managers

Use the **`mksnmp`** command to add an SNMP manager to the list of servers to which Copy Services Manager sends SNMP alerts.

About this task

Copy Services Manager uses management information base (MIB) files to provide a textual description of each SNMP alert that is sent by Copy Services Manager. You must configure the SNMP manager to use both the `SYSAPPL-MIB.mib` and `ibm-CSM.mib` files. These files are on the installation DVD in the `replication\CSM-Client\etc` directory. Follow the directions that are provided by your SNMP manager application to configure it to use the MIB files.

Copy Services Manager sends all SNMP alerts to each registered SNMP manager. SNMP alerts are not specific to any particular session, and all alerts for any session are sent. You cannot choose to send a subset of SNMP alerts.

Session state change SNMP trap descriptions

SNMP traps are sent during session state changes. A different trap is sent for each state change. These alerts are sent by only the active management server.

A session state change SNMP trap is sent each time the session changes to one of the following states:

- Defined
- Preparing
- Prepared
- Suspended

- Recovering
- Flashing
- Target Available
- Suspending
- (Metro Global Mirror only) SuspendedH2H3
- (Metro Global Mirror only) SuspendedH1H3
- Auto restarted
- (Safeguarded Copy only) Protected
- (Safeguarded Copy only) Unprotected

An SNMP trap is also sent when a recovery point objective (RPO) threshold is exceeded for a role pair that is in the session.

Table 75. Session state change traps

Object ID (OID)	Description
1.3.6.1.4.1.2.6.208.0.1	The state of session *X* has transitioned to Defined.
1.3.6.1.4.1.2.6.208.0.2	The state of session *X* has transitioned to Preparing.
1.3.6.1.4.1.2.6.208.0.3	The state of session *X* has transitioned to Prepared.
1.3.6.1.4.1.2.6.208.0.4	The state of session *X* has transitioned to Suspended.
1.3.6.1.4.1.2.6.208.0.5	The state of session *X* has transitioned to Recovering.
1.3.6.1.4.1.2.6.208.0.6	The state of session *X* has transitioned to Target Available.
1.3.6.1.4.1.2.6.208.0.19	The state of session *X* has transitioned to Suspending.
1.3.6.1.4.1.2.6.208.0.20	The state of session *X* has transitioned to SuspendedH2H3.
1.3.6.1.4.1.2.6.208.0.21	The state of session *X* has transitioned to SuspendedH1H3.
1.3.6.1.4.1.2.6.208.0.22	The state of session *X* has transitioned to Flashing.
1.3.6.1.4.1.2.6.208.0.23	The state of session *X* has transitioned to Terminating.
1.3.6.1.4.1.2.6.208.0.26	The recovery point objective for the role pair of *X* in session *Y* has passed the warning threshold of *Z* seconds.
1.3.6.1.4.1.2.6.208.0.27	The recovery point objective for the role pair of *X* in session *Y* has passed the severe threshold of *Z* seconds.
1.3.6.1.4.1.2.6.208.0.28	A suspend event occurred triggering the auto restart feature for session *X*. The session will be restarted in *Y* seconds.
1.3.6.1.4.1.2.6.208.0.29	Session *X* was enabled for auto restart. However, the session could not be restarted.
1.3.6.1.4.1.2.6.208.0.33	The state of session X has transitioned to Protected.
1.3.6.1.4.1.2.6.208.0.34	The state of session X has transitioned to Unprotected.

Configuration change SNMP trap descriptions

SNMP traps are sent when configuration changes occur. These alerts are sent by only the active management server.

Configuration change SNMP traps are sent after the following configurations changes are made:

- One or more copy sets have been added or deleted from a session

An alert is sent for each set of copy sets added to or removed from a session. An alert for copy set changes is sent only one time within 15 minutes of a configuration change, so you might not see alerts from successive changes that occur within that 15-minute period. For example, you might make a copy set configuration change that causes an alert to be sent at 10:41:01. If you were to make more copy set changes at 10:42:04 and 10:50:09, no alerts would be sent for these two changes because they occurred within the 15-minute minimum interval from the first alert.

- PPRC path definitions have changed

  An alert is sent for each path configuration change that is made.

- Any path failures are detected

  Even if not all of the paths went away, path failures can degrade replication bandwidth or performance. Copy Services Manager periodically queries for path states and displays an associated message in the GUI.

  Notes:

  – An email notification is also sent out when any path failures occur.

  – The event does not occur if there are no HMC connections for the storage system.

Table 76. Configuration change traps

Object ID (OID)	Description
1.3.6.1.4.1.2.6.208.0.7	One or more copy sets have been added or deleted from this session. **Note:** An event is sent for each session at least every 15 minutes.
1.3.6.1.4.1.2.6.208.0.8	Peer-to-Peer Remote Copy (PPRC) path definitions have changed. An event is sent for each path configuration change.
1.3.6.1.4.1.2.6.208.0.30	One or more logical paths between storage systems have entered an error state or have been removed.

Suspending-event notification SNMP trap descriptions

SNMP traps are sent during suspending-event notifications. The traps are sent by the active and standby management server.

Suspending-event notification SNMP traps indicate that a session has transitioned to a Severe status due to an unexpected error.

Table 77. Suspending-event notification traps

Object ID (OID)	Description
1.3.6.1.4.1.2.6.208.0.9	The session is in a Severe state due to an unexpected error.

Communication-failure SNMP trap descriptions

SNMP traps are sent during communication failures. These alerts are sent by both the active and standby management servers.

Communication-failure SNMP traps are sent after the following events occur:

- A server times out attempting to communicate with a storage system.
- A server encounters errors attempting to communicate with a storage system.
- An active server terminates communication with a standby server as a result of communication errors.
- A standby encounters communication errors with an active server.

After an SNMP trap for a given failure is sent, it is not resent unless communication has been reestablished and failed again.

Table 78. Communication-failure traps	
Object ID (OID)	**Description**
1.3.6.1.4.1.2.6.208.0.10	Server *X* has timed out attempting to communicate with storage system *Y*.
1.3.6.1.4.1.2.6.208.0.11	Server *X* has encountered errors attempting to communicate with storage system *Y*.
1.3.6.1.4.1.2.6.208.0.12	Active server *X* has terminated communication with standby server *Y* as a result of communication errors.
1.3.6.1.4.1.2.6.208.0.13	Standby server *X* has encountered communication errors with active server *Y*.

Management Servers state-change SNMP trap descriptions

SNMP traps are sent when the state of the management server changes. These alerts are sent by both the active and standby management servers.

A management server state change SNMP trap is sent each time the management server changes to one of the following states:

- Unknown
- Synchronization Pending
- Synchronized
- Disconnected Consistent
- Disconnected

Table 79. Management Servers state-change traps	
Object ID (OID)	**Description**
1.3.6.1.4.1.2.6.208.0.14	The copy services management server HA connection X->Y has changed state to Unknown (previously Offline).
1.3.6.1.4.1.2.6.208.0.15	The copy services management server HA connection X->Y has changed state to Synchronized.
1.3.6.1.4.1.2.6.208.0.16	The copy services management server HA connection X->Y has changed state to Disconnected Consistent (previously Consistent Offline).
1.3.6.1.4.1.2.6.208.0.17	The copy services management server HA connection X->Y has changed state to Synchronization Pending.
1.3.6.1.4.1.2.6.208.0.18	The copy services management server HA connection X->Y has changed state to Disconnected.

Scheduled task notification SNMP trap descriptions

SNMP traps are sent for certain events that are associated with scheduled session tasks. These alerts are sent by only the active management server.

Scheduled session task SNMP traps are sent after the following events occur:

- The scheduled task completes.
- The scheduled task fails due to an error that was encountered while it was running.

Table 80. Scheduled task notification traps	
Object ID (OID)	**Description**
1.3.6.1.4.1.2.6.208.0.31	The scheduled task ibmTPCRtaskname has finished running.

Table 80. Scheduled task notification traps (continued)	
Object ID (OID)	**Description**
1.3.6.1.4.1.2.6.208.0.32	Scheduled task ibmTPCRtaskname failed due to an error that was encountered while it was running.

Chapter 10. Managing security

The Copy Services Manager authentication process uses a configured user registry from either: the basic user registry (on distributed systems); an operating system repository, such as RACF (on the z/OS platform); or a Lightweight Directory Access Protocol (LDAP) registry.

About this task

To perform certain actions and manage specific sessions in the Copy Services Manager GUI or CLI, the user must also have the appropriate authorization. Authorization is granted by assigning a specific role to the user account or user group.

Starting with Copy Services Manager Version 6.1.1, DS8000 storage systems can now use a Copy Services Manager server to enable LDAP authentication on the storage system. For specific instructions on how to configure LDAP support through Copy Services Manager on a DS8000 system, see your DS8000 product documentation.

Adding a user to the basic user registry

You can add a new user to the basic user registry.

About this task

Perform the following steps to add a user to the basic user registry:

Procedure

1. Log in to Copy Services Manager as a user with administrator privileges.
2. In the menu bar, click **Settings** > **Administration**.
3. On the **Administration** page, click **Add Access**. The Add Access wizard is displayed.
4. The **Create a User in the Basic User Registry** task is already selected by default. Type the user name, password, confirm the password, and click **Next**.

   Notes:

   - The user name cannot contain spaces, tabs, or any of the following special characters: " # $ % & ' ( ) * + , / : ; < = > ? [\ ] ^ } | {
   - User names must be unique between the basic user registry and LDAP.
   - Avoid having the same user ID with different cases. When you have multiple user IDs that are the same spelling, but different case, and remove one of them, other case-variations of that user name might also be removed from the Copy Services Manager access control list. This scenario can cause unintended consequences when other case variations of the same user ID then attempt to log in.

   The **Select Access Level** page is displayed.
5. Select the role to associate with this user.
6. If you selected the Operator role, select one or more sessions that this user can manage, and click **Next**. The **Confirmation** page is displayed.
7. Click **Next** to confirm your access privilege selections for the user.
8. Click **Finish** to exit the wizard.

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Configuring LDAP

You can configure LDAP authentication for Copy Services Manager by using either the GUI or the CLI.

About this task

Restriction: RACF LDAP is currently not supported, because the underlying product libraries require full LDAP version 3 compliance. Specifically, it does not support most complex filters.

Configuring LDAP by using the GUI wizard

You can use a GUI wizard to configure LDAP authentication in your Copy Services Manager environment.

About this task

Perform the following steps to configure LDAP authentication support by using the GUI wizard:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. Click **Settings** > **Administration**.

   Note: On the **Administration** page, you see a status indicator for the **LDAP server**. Before LDAP is configured the first time, the status is shown as **Not configured** with a link to **Modify**.
3. Click **Modify**. The **LDAP Configuration** wizard is displayed.

   Note: After you configure LDAP for the first time, a link to **Remove** the LDAP configuration becomes available. For instructions on removing the LDAP server configuration, see "Removing LDAP by using the GUI wizard" on page 317. After the initial configuration, the LDAP server status indicator also changes from "Not configured" to the name of the LDAP server.

   If you already have a manually configured custom LDAP repository in your environment, the **Modify** link opens to the **Advanced** LDAP configuration tab where you can make direct edits. The **Basic** tab is disabled if you are modifying a custom configuration.
4. Select either the **Basic** or **Advanced** tab. If you complete the information on the **Basic** tab, Copy Services Manager automatically configures your LDAP registry based on those inputs. However, if you want to edit the `ldapRegistry.xml` file directly, for a more custom configuration with the LDAP method, you can select the **Advanced** tab. The `ldapRegistry.xml` file contains information about how Copy Services Manager connects to an LDAP server.
   - If you select the **Basic** tab, go to "Configuring LDAP - Basic method" on page 314.
   - If you select the **Advanced** tab go to "Configuring LDAP - Advanced method" on page 315.

Configuring LDAP - Basic method

You can configure LDAP in the GUI with the Basic method by completing a few fields.

Before you begin

You can configure LDAP in two ways:

- On the **Basic** tab, you complete fields that Copy Services Manager uses to set up the configuration. This topic covers the Basic method.
- On the **Advanced** tab, you can directly edit the raw data in the LDAP registry file for a more customized approach. Or, if you already have a custom LDAP configuration, you must use the **Advanced** tab to make changes. For the Advanced method, go to "Configuring LDAP - Advanced method" on page 315.

Note: Copy Services Manager only tests or saves the configuration on the current tab that you are viewing, whether Basic or Advanced. Changes that you make in one tab are not synchronized with the other tab.

About this task

Follow these steps if you select the **Basic** tab for configuring LDAP:

Procedure

1. Select the authentication method, either **Active Directory** or **LDAP**. The **Active Directory** method is already selected by default.
2. When you configure LDAP for the first time, no server is defined. Click **Add Authentication Server**.
3. Type the appropriate **Authentication Server** host name, and **Port**, and then click **Add**. The server name is displayed in the Server list.

   Note: You can specify one or more authentication servers. The ports must be an integer 1 - 65535.
4. Type the user ID in the **Bind Distinguished Name (DN) or User ID** field.
5. Type the associated password for the user ID in the **Bind Password** field.
6. Type a string value for the filter to search on in the **Search base for users and groups** field.
7. Optional: Select the **Enable SSL** check box to upload an SSL key file to the LDAP server that you are connecting to. Then, click **Load Certificate** and select the file name.

   Notes:

   - When you modify an existing LDAP server configuration, the **Enable SSL** check box is already selected. You can use the existing certificate file that is displayed, or click **Load Certificate** again if you need to load a new one. You can also choose to remove the check from **Enable SSL**.
   - You can load a certificate file that contains multiple certificates in a single file, if needed. For more information, see "Creating a file with multiple certificates for LDAP configuration" on page 320.
8. Click **Test** to test the connection. If the system cannot connect, an error message appears.

   Note: If you get a message that no users or groups were found, you can modify your inputs and click **Test** again. Alternately, you can save the configuration without making more changes.
9. Click **Save** to complete the LDAP configuration, or click **Cancel** to exit.

Results

When all the fields are correctly completed, and the test connection is successful, one or more servers are configured for LDAP authentication.

Configuring LDAP - Advanced method

You can configure LDAP in the GUI with the Advanced method by updating the LDAP registry file.

Before you begin

You can configure LDAP in two ways:

- On the **Basic** tab, you complete fields that Copy Services Manager uses to set up the configuration. For the Basic method, go to "Configuring LDAP - Basic method" on page 314.
- On the **Advanced** tab, you can directly edit the raw data in the LDAP registry file for a more customized approach. Or, if you already have a custom LDAP configuration, you must use the **Advanced** tab to make changes. This topic covers the Advanced method.

Notes:

- Copy Services Manager only tests the configuration on the current tab that you are viewing, whether Basic or Advanced. Changes that you make in one tab are not synchronized immediately with the other tab. After saving the configuration, changes can be seen by clicking **Modify** again and viewing the tabs.

About this task

Follow these steps if you select the **Advanced** tab for configuring LDAP:

Procedure

1. Edit the `ldapRegistry.xml` file. The wizard displays the file with syntax highlighting to assist you. See the WebSphere Application Server Liberty documentation for a full listing of the tags and attributes available for the LDAP registry file.

   The `ldapRegistry.xml` file must be enclosed in server tags as shown:

   ```
   <server>
       <ldapRegistry>
       </ldapRegistry>
   </server>
   ```

   Note: To change the password, starting with V6.2.7, you can now use the new **Bind Password** field, instead of having to modify the `ldapRegistry.xml` file with clear text.

   If you update the password in the `ldapRegistry.xml` file in plain text and save the file, Copy Services Manager encrypts the password so that the next time the wizard is opened, the password does not appear in plain text. However, to avoid any potential security issues of entering a password in plain text at all, you can instead use the new **Bind Password** field on the **Advanced** tab.
2. Optional: Select the **Enable SSL** check box to upload an SSL key file to the LDAP server that you are connecting to. Then, click **Load Certificate** and select the file name.

   Notes:

   - This action adds the attributes `sslEnabled="true"` and `sslRef="ldapsslref"` to the configuration. These attributes need to be removed from the text to disable SSL.
   - When you modify an existing LDAP server configuration, the **Enable SSL** check box is already selected, and the associated SSL attributes are already set to `sslEnabled="true"` and `sslRef="ldapsslref"`. You can use the existing certificate file that is displayed, or click **Load Certificate** again if you need to load a new one. Or, remove these attributes from the `ldapRegistry.xml` file to disable SSL.
   - You can load a certificate file that contains multiple certificates in a single file, if needed. For more information, see "Creating a file with multiple certificates for LDAP configuration" on page 320.
3. Optional: If you plan on using a configuration with nested groups, the following additional parameter must be added to the `ldapregistry.xml` file:

   ```
   recursiveSearch="true"
   ```

   See "Configuring nested groups in LDAP" on page 316 for more information.
4. Click **Test** to test the connection. If the system cannot connect, an error message appears.

   Note: If you get a message that no users or groups were found, you can modify your inputs and click **Test** again. Alternately, you can save the configuration without making more changes.
5. Click **Save** to complete the LDAP configuration, or click **Cancel** to exit.

Results

When all the fields are correctly completed, and the test connection is successful, one or more servers are configured for LDAP authentication.

Configuring nested groups in LDAP

Nested groups are supported as part of the Advanced LDAP setup.

About this task

If your LDAP or Active Directory configuration contains users in nested groups, an additional parameter is required. See the optional step "3" on page 316 in the previous advanced configuration procedure for more information.

Note: This parameter adds some overhead to the search algorithm, and might affect the search performance if it is set.

Removing LDAP by using the GUI wizard

After you configure LDAP authentication in your Copy Services Manager environment, you can also remove the configuration by using the GUI.

About this task

Perform the following steps to remove the LDAP authentication support by using the GUI:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator privileges.
2. In the menu bar, click **Settings** > **Administration**.

   Note: On the **Administration** page, you see a status indicator for the **LDAP server**. After LDAP is configured, the links give the options to **Modify** or **Remove** the LDAP configuration.

   For instructions on configuring LDAP, see "Configuring LDAP by using the GUI wizard" on page 314.
3. Click **Remove**. A message is displayed asking you to confirm that you want to remove the LDAP configuration.
4. Click **Yes** to confirm the removal or click **No** to cancel.
5. If you click **Yes**, another message is displayed telling you that the LDAP configuration was successfully removed. Click **OK** to close the message.

Results

The LDAP configuration is removed, and the status indicator for the **LDAP server** is labeled as **Not Configured** with a link to **Modify**.

Configuring LDAP by using the CLI

You can use the command-line interface (CLI) to configure LDAP authentication in your Copy Services Manager environment.

About this task

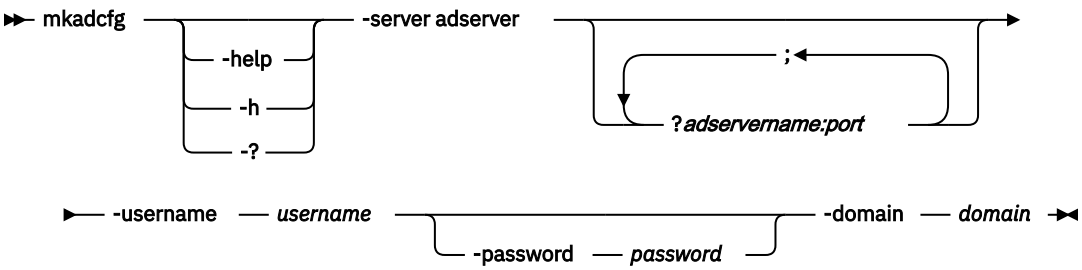
The basic user registry is the default user-authentication method for Copy Services Manager. If you do not use the basic user registry, you can configure Copy Services Manager to use either an Active Directory Server or an LDAP Server-based authentication method.

Note: After LDAP authentication is configured, users from the basic user registry are still able to authenticate. It is recommended that you leave at least one user from the basic user registry with the administrator role. This user serves as a backup if there is ever a loss in communication to the LDAP servers.

Perform the following steps to configure LDAP authentication support by using the CLI:

Procedure

1. Log in to Copy Services Manager CLI as a user with administrator privileges.
2. You can choose to establish either an Active Directory or LDAP Server configuration.
   a) Enter the **mkadcfg** command to configure Copy Services Manager to use Active Directory server-based authentication.



Parameters

-help | -h | -?
Lists help for the command. If you specify additional parameters and arguments, those parameters and arguments are ignored.

-server ***adserver***
Specifies the Active Directory servers. The input format is "adservername:port", for example, " adServer1:636". Multiple backup Active Directory servers can be specified by using a semicolon to separate each server. If a port is not specified, the default port that is used is 389.

-username ***username***
Specifies the user name that is required for accessing the Active Directory domain. Any domain user from the Active Directory server that is identified by the server parameter can be specified for this operation.

-password ***password***
Specifies the password of the user who is specified with the **username** parameter. To hide the password, call the command without this option. The command prompts for the password, which is not echoed.

-domain ***domain***
Specifies the domain of the user who is specified with the username parameter.

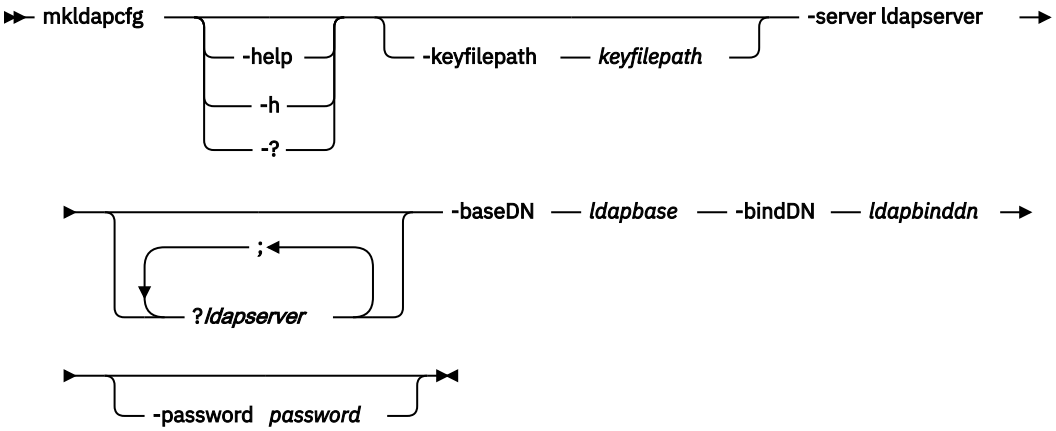
Example:

```
csmcli> mkadcfg -server ADserver1.ibm.com:1234 -username admin -password
passw0rd -domain ibm.com
```

The following output is returned:

```
IWNR4950I [Aug 11, 2015 9:28:06 AM] Successfully updated the LDAP
configuration.
```

b) Enter the **mkldapcfg** command to configure Copy Services Manager to use LDAP server-based authentication.



Parameters

-help | -h | -?
Lists help for the command. If you specify additional parameters and arguments, those parameters and arguments are ignored.

-keyfilepath ***keyfilepath***
Specifies the absolute path of the key file that holds the CA certificate. If multiple certificates are required, then include all of them in a single file to be provided as input. The file should be present on the system from which **mkldapcf** is initiated. This parameter is optional.

Note: For information on how to create a file with multiple certificates, see "Creating a file with multiple certificates for LDAP configuration" on page 320.

-server ***ldapserver***
Specifies the LDAP servers. The input format is "ldapservername:port", for example, "ldapserver1:636". Multiple backup LDAP servers can be specified by using a semicolon to separate each server. Multiple LDAP servers must be replicas of the primary LDAP server, or they can be any LDAP host with the same schema, which contains data that is mirrored from the same LDAP Data Interchange Format (LDIF) file. If a port is not specified, the default ports that are used are 389 for ldap:// and 636 for ldaps://.

-baseDN ***ldapbase***
Specifies the LDAP base DN.

-bindDN ***bindDN***
Specifies the binding DN of an LDAP user who has sufficient permissions to read user data.

-password ***password***
Specifies the password of the user who is specified with **bindDN** parameter. To hide the password, call the command without this option. The command prompts for the password, which is not echoed.

Example:

```
csmcli> mkldapcfg -server ldapserver.ibm.com:1234
 -bindDN cn=root -baseDN ou=test,o=ibm,c=us -password passw0rd
```

The following output is returned:

```
IWNR4950I [Aug 11, 2015 8:45:21 AM] Successfully updated the
 LDAP configuration.
```

Example:

```
csmcli> -server ldapserver.ibm.com:1234 -bindDN cn=root
 -baseDN ou=test,o=ibm,c=us -keyfilepath c:\security\ldap.crt
```

The following output is returned:

```
Please enter a password:>
An LDAP configuration already exists. Are you sure you want to replace
 it?  [y/n]:y
IWNR4950I [Aug 11, 2015 8:45:21 AM] Successfully updated the LDAP
 configuration.
```

Note: Only one authentication method can be used. For example, if you enter the **mkadcfg** command first, and then enter the **mkldapcfg** command later, the last command overwrites the previous configuration.

Results

When Copy Services Manager is configured to connect to the appropriate server, all LDAP users are authenticated through that server.

Creating a file with multiple certificates for LDAP configuration

You can add multiple certificates to a single file to upload for LDAP configuration.

About this task

If you have an environment with multiple LDAP servers, you can upload a file with multiple certificates for LDAP configuration. Two situations might require the use of a file with multiple certificates:

- Some of them are not signed with the same certificate (or not signed by a certificate authority at all).
- They are all signed with the same certificate, but the certificate was generated with a weak algorithm that the Copy Services Manager security settings are rejecting.

To load multiple certificates, you need to first create a text file that contains all of the necessary certificates.

Procedure

1. Open a new text file in a text editor, such as Notepad for Windows or vi for Linux.
2. Paste each section of encoded certificate data into the file with separation by new lines.
   A certificate looks like this example:

```
-----BEGIN CERTIFICATE-----
MIICMTCCAZqgAwIBAgIIRwuGTeIhbRwwDQYJKoZIhvcNAQEFBQAwOTELMAkGA1UE
BhMCdXMxDDAKBgNVBAoTA2libTEcMBoGA1UEAxMTbmF1dGlsdXMtbGRhcHNlcnZl
cjAeFw0xNzA5MDYxMzM0MzlaFw0xODA5MDcxMzM0MzlaMDkxCzAJBgNVBAYTAnVz
MQwwCgYDVQQKEwNpYm0xHDAaBgNVBAMTE25hdXRpbHVzLWxkYXBzZXJ2ZXIwgZ8w
DQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAOBCk1xbcnhedJyhv1GUV/kQyi/Bet7n
9SJE4QlZJtpL4Fi6C7zMs0lQqJGXaRS4hzMcxAmhGpz/UD2k2N49RRkCtbg6YRvb
TcoywJIW2xtlwRZkbZu17keM0HFPbdW7/RgNs4n/GJyF1KGW0t4dH9CPNULmOHWh
4+KcXS8fWkafAgMBAAGjQjBAMB0GA1UdDgQWBBQKyGuIhDHwmVd7xQLuf4jYN3gx
bzAfBgNVHSMEGDAWgBQKyGuIhDHwmVd7xQLuf4jYN3gxbzANBgkqhkiG9w0BAQUF
AAOBgQA9Au3jlam63rEdCzlj2tO9yCbDwyRA5JRqAbz59C14mLyFvTkeo1wyJ+oP
lT8VStwgYObux3sOMTCuK3j0NtkqJS9sBMuSnVAasw9RNFR+dYNX4nyKV4B/r9Rm
ndbo7YXP+9Rb1UCE+H6hmbSUmjLNpgKvs94xZBqAGDFBW9Uy8Q==
-----END CERTIFICATE-----
```

   So multiple certificates in a single file look like this example:

```
-----BEGIN CERTIFICATE-----
<Base64 encoded certificate data>
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
<Base64 encoded certificate data>
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
<Base64 encoded certificate data>
-----END CERTIFICATE-----
```

3. Save the file.

Results

You now have a file with multiple certificates to use for LDAP configuration. Select to upload this multi-certificate file when you configure LDAP authentication for Copy Services Manager. For more information, see “Configuring LDAP” on page 314.

Switching the default Copy Services Manager certificates

You can change the default certificates that are supplied by Copy Services Manager.

The HTTPS certificates used by browsers for the Copy Services Manager graphical user interface (GUI) can be switched independently of the Copy Services Manager server and client certificates.

Switching default Copy Services Manager graphical user interface(GUI) HTTPS certificates

You can switch out the default Copy Services Manager GUI certificates that are supplied by Copy Services Manager.

About this task

To switch out the default Copy Services Manager GUI HTTPS certificates, you need to change the keystore files that are used by the csmServer and csmAuth application servers that are running under WebSpere Liberty. These are the two default keystore files.

- `wlp/usr/servers/csmServer/resources/security/key.jks`
- `wSlp/usr/servers/csmAuth/resources/security/key.jks`

These files are at these locations.

- *path_prefix*`/opt/IBM/CSM/` for z/OS®
- *install dir*`/liberty/` for distributed systems

You can create new versions of these files by using iKeyman, which is distributed with the Copy Services Manager version of Java™.

Note:

- You can locate the iKeyman tool at `install dir/liberty/wlp/IBM/Java/jre/bin/ikeyman` (or `ikeyman.exe` on Windows systems).
- The iKeyman tool is not available on z/OS. Therefore, you must first complete this procedure on a distributed system, and then upload the changes to the z/OS server. The JKS files need to be uploaded to z/OS UNIX System Services in a binary format.
- On z/OS, you can use the command-line based tool ikeycmd located in `path_prefix/opt/IBM/CSM/Java/bin` to create and manage key files and certificates. However, the commands are not described here in detail. For more information, use the **ikeycmd -help** command in ikeycmd.

Restriction: You cannot follow this procedure to switch out the default https certificates when Copy Services Manager is installed on the DS8000 Hardware Management Console (HMC).

When you switch default Copy Services Manager certificates, you can use a shared custom certificate for all your Copy Services Manager servers (Active and Standby server), or have dedicated certificates for each Copy Services Manager server.

You can also encrypt the keystore passwords to avoid specifying plain text passwords in property files. Use the `securityUtility` script to encode a password. The tool is at these locations.

- *path_prefix*`/opt/IBM/CSM/wlp/bin/` for z/OS®
- *install dir*`/liberty/wlp/bin/` for distributed

Usage example:

```
wlp/bin> securityUtility encode --encoding=xor passw0rd
{xor}Lz4sLChvLTs=

Encoding options:
--encoding={xor|aes|hash}
    Specify how to encode the password. Supported encodings are xor, aes,
    and hash. The default encoding is xor.
```

Note: As of Copy Services Manager 6.2.11, encrypted passwords for the HTTPS keystore are only supported by XOR encoding.

Procedure

Follow these steps to switch out the default certificates that are assigned by Copy Services Manager. The example uses different keystore file names to clearly differentiate the configuration from default keystores and certificates. It also prevents you from overwriting the original files.

1. Back up the original versions of the `key.jks` files to a new directory.
2. In iKeyman, select **Key Database File** > **New** to create a new keystore file, for example, `myCsmKeyStore.jks` file, and provide a password for it.

   Note: If you use the default file name `key.jks`, save the new file to a different location from the existing version of the file so that you do not overwrite it.
3. In iKeyman, select **Key database content** > **Personal Certificates** > **New Self-Signed** to generate a new self-signed certificate. Or, you can choose to import a signed certificate, by selecting **Import**.
   a. Assign a label to the self-signed certificate. For example, you can select a label such as `csm-<servername>` to indicate that the label is different from the default.
   b. Enter a **key size** of at least 2048 for a new self-signed certificate.
   c. Change the default algorithm to a more-secure signature algorithm. The iKeyman tool suggests an SHA-1 signing algorithm, and a one-year expiration by default. You can change the signature algorithm to that of SHA256WithRSA, and add an extended expiration date.
4. Optional: If you want dedicated (self) signed server certificates for each Copy Services Manager server, repeat step 3 to create another keystore file with another (self) signed certificate. For dedicated (self) signed server certificates, enter the server name in the keystore file names as well, for example, `myCsmKeyStore <ServerName>.jks`
5. Edit the `bootstrap.properties` file to point the server to use the new keystore file that contains the SSL certificate. In the `bootstrap.properties` file for the csmServer application, you can define the HTTPS keystore that is used by browser connections to the Copy Services Manager server GUI. The `bootstrap.properties` file is at these locations.

   - *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/` for z/OS
   - *install dir*`/liberty/wlp/usr/servers/csmServer/` for distributed systems

   If you do not specify a full path name for `keystore_location`, you can copy the `myCsmKeyStore<ServerName>.jks` file to the default folders. This ensures that the file is automatically picked up with a Copy Services Manager server backup when the backup is created with Copy Services Manager 6.2.9 or higher. These are the default folders for the keystore file.

   - *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/resources/security` for z/OS
   - *install dir*`/liberty/wlp/usr/servers/csmServer/resources/security` for distributed systems

   The default path name of `keystore_location` is where you copy the keystore file, therefore you need to specify only your keystore file. Following example shows how to specify the copied keystore file located in `csmAuth/resources/security`.

   ```
   #relative to csmServer/resources/security
   keystore_location=myCsmKeyStore<ServerName>.jks
   keystore_password=<assigned password>
   ```

   Note: In the `bootstrap.properties` file, when you enter the value for `keystore_location`, use a slash '/' as a path separator. When you use a backslash, you must add two backslashes together, such as '\\'. Adding a single backslash can cause the file to not be found. The Copy Services Manager server can even fail to start.

   If you do not define a `keystore_location`, the server defaults to use a `key.jks` file in the `resources/security` directory, when the Copy Services Manager server is started.

If the specified keystore file is not found when, the Copy Services Manager server starts, a default file is created to serve browser connection requests to the Copy Services Manager GUI. This file has a certificate with an expiration of 1 year.

The password that is defined in `keystore_password` is eXclusive OR (XOR) encrypted with the securityUtility. A plain text password is not automatically encrypted when the Copy Services Manager server starts.

For more information, see "bootstrap.properties file" on page 342.

6. Restart the Copy Services Manager server for the changes to take effect. You can check the `csmServer messages.log` file to check whether the `bootstrap.properties` configuration changes were successful and the correct keystore and certificate is used. The `csmServer messages.log` file is at these locations.
   - *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/logs` for z/OS
   - *install dir*`/liberty/wlp/usr/servers/csmServer/logs` for distributed systems
7. If you want to use LDAP configuration for Copy Services Manager user authentication on the Copy Services Manager server, follow the next steps to switch the keystore of the csmAuth server as well.
8. Copy your new keystore file that you created in step 3 into the original csmAuth keystore directory.
   - *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmAuth/resources/security/` for z/OS
   - *install dir*`/liberty/wlp/usr/servers/csmAuth/resources/security/` for distributed systems

   If you use dedicated keystore files for each Copy Services Manager server, such as `myCsmKeyStore<`*ServerName*`>.jks`, copy the corresponding keystore to the appropriate Copy Services Manager server.
9. Edit the `bootstrap.properties` file of the csmAuth server to point the server to use the new keystore file that contains your certificate that is used for the SSL connection. The file is at these locations.
   - *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmAuth/` for z/OS
   - *install dir*`/liberty/wlp/usr/servers/csmAuth/` for distributed systems

   In the `keystore_location` field, enter the keystore file name. The path where you copied the keystore file is updated in the field by default `keystore_location`. The following example shows how to specify the copied keystore file located in `csmAuth/resources/security`.

```
#relative to csmAuth/resources/security
keystore_location=myCsmKeyStore<ServerName>.jks
keystore_password=<assigned password>
```

   Note: In the `bootstrap.properties` file, when you enter the value for `keystore_location`, use a slash '/' as a path separator. When you use a backslash, you must add two backslashes together, such as '\\'. Adding a single backslash can cause the file to not be found. The Copy Services Manager server can even fail to start.

   If you do not define a `keystore_location`, the server defaults to use a `key.jks` file in the `resources/security` directory, when the Copy Services Manager server is started.

   If the specified keystore file is not found when, the Copy Services Manager server starts, a default file is created to serve browser connection requests to the Copy Services Manager GUI. This file has a certificate with an expiration of 1 year.

   The password that is defined in `keystore_password` is eXclusive OR (XOR) encrypted with the securityUtility. A plain text password is not automatically encrypted when the Copy Services Manager server starts.
10. Restart the Copy Services Manager server for the changes to take effect. You can check the `csmAuth messages.log` file to check whether the `bootstrap.properties` configuration changes were successful and the correct keystore and certificate is used. The `csmServer messages.log` file is at these locations.

- *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/logs for z/OS
- *install dir*/liberty/wlp/usr/servers/csmServer/logs for distributed systems

Results

The default Copy Services Manager certificates that are supplied by Copy Services Manager GUI for browser HTTPS requests are switched out.

Switching default Copy Services Manager server and client certificates

You can switch the default server and client certificates for Copy Services Manager. The server and client certificates are used for encrypting all connections between any Copy Services Manager client to any Copy Services Manager server. The Copy Services Manager clients include the command-line interface (CLI), the graphical user interface (GUI), and high availability (HA) clients for Copy Services Manager active and standby connections.

About this task

To switch out the default Copy Services Manager server and client certificates, you need to change these two main files.

- etc/csmKeyStore.jks
- etc/csmTrust.jks

These files are at these locations.

- *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/etc/ for z/OS®
- *install dir* liberty/wlp/usr/servers/csmServer/etc/ for distributed

You can create new versions of these files by using iKeyman, which is distributed with the Copy Services Manager version of Java™.

Note:

- You can locate the iKeyman tool at install dir/liberty/wlp/IBM/Java/jre/bin/ikeyman (or ikeyman.exe on Windows systems).
- The iKeyman tool is not available on z/OS. Therefore, you must first complete this procedure on a distributed system, and then upload the changes to the z/OS server. The JKS files need to be uploaded to z/OS UNIX System Services in a binary format.
- On z/OS, you can use the command-line based tool ikeycmd located in path_prefix/opt/IBM/CSM/Java/bin to create and manage key files and certificates. However, the commands are not described here in detail. For more information, use the **ikeycmd -help** command in ikeycmd.

Restriction: You cannot follow this procedure to switch out the default https certificates when Copy Services Manager is installed on the DS8000 Hardware Management Console (HMC).

When you switch default Copy Services Manager certificates, you can use a shared custom certificate for all your Copy Services Manager servers (Active and Standby server), or have dedicated certificates for each Copy Services Manager server. When using dedicated server certificates, you need to ensure that the keystore only contains the dedicated (self) signed server certificate. The truststore that is used by client connections must import each certificate that might be used by any of your servers. Otherwise, it can happen that only local client connections are established, but there are no connections to other Copy Services Manager servers that use a different (self) signed certificate in their keystore.

You can also encrypt the keystore passwords to avoid specifying plain text passwords in property files. Use the securityUtility script to encode a password. The tool is at these locations.

- *path_prefix*/opt/IBM/CSM/wlp/bin/ for z/OS®
- *install dir*/liberty/wlp/bin/ for distributed

Usage example:

```
wlp/bin> securityUtility encode --encoding=xor passw0rd
{xor}Lz4sLChvLTs=

Encoding options:
--encoding={xor|aes|hash}
    Specify how to encode the password. Supported encodings are xor, aes,
    and hash. The default encoding is xor.
```

Note: As of Copy Services Manager 6.2.11, encrypted passwords for the HTTPS keystore are only supported by XOR encoding, but encoding is not supported in every properties file.

Procedure

Follow these steps to switch out the default certificates and key files that are assigned by Copy Services Manager. The example uses different keystore and truststore file names to clearly differentiate the configuration from keystores and certificates. It also prevents you from overwriting the original files.

1. Back up the original versions of the `csmKeyStore.jks` and `csmTrust.jks` files to a new directory.
   These files are at these locations:
   - *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/etc/` for z/OS
   - *`install dir`*`/liberty/wlp/usr/servers/csmServer/etc/` for distributed systems
2. In iKeyman, select **Key Database File > New** and create a new keystore file and provide a password for it.
   For example, name the file `myCsmKeyStore.jks` file, and provide a password for it.

   Note: If you use the default file name `key.jks`, save the new file to a different location from the existing version of the file so that you do not overwrite it.
3. In iKeyman, select **Key database content** > **Personal Certificates** > **New Self-Signed** to generate a new self-signed certificate. Or, you can choose to import a signed certificate, by selecting **Import**.
   a. Assign a label to the self-signed certificate. For example, you can select a label such as `csm-<servername>` o indicate that the label is different from the default.
   b. Enter a **key size** of at least 2048 for a new self-signed certificate.
   c. Change the default algorithm to a more-secure signature algorithm. Change this algorithm to a more-secure signature algorithm. You can change the signature algorithm to that of `SHA256WithRSA`, and add an extended expiration date.
4. Click **Extract Certificate** and export the certificate as `csm-<servername>.arm`, which is the public certificate information.
5. Optional: If you want dedicated (self) signed server certificates for each Copy Services Manager server, repeat step 3 to create another keystore file with another (self) signed certificate. For dedicated (self) signed server certificates, enter the server name in the keystore file names as well, for example, `myCsmKeyStore <ServerName>.jks`
6. Create a JKS file for the common truststore, for example `myCsmTrust.jks` file by selecting **Key Database** > **File New**, and provide a password for it.

   Note: If you use the default file name `key.jks`, save the new file to a different location from the existing version of the file so that you do not overwrite it.
7. In the **Key** database content menu, select **Signer Certificates**. Click **Add** to add the extracted certificate, `csm-<serverame>.arm`, and assign the same label as you did in step 3.a., such as `csm-<servername>`.
   Repeat this step to import all extracted certificate files for each server in case you use dedicated server certificates, as created in step 5. Use different labels for each imported certificate, such as `csm-<servername>` to distinguish the certificates later.

   The iKeyman tool automatically saves your information and you can simply exit the tool.
8. Move the new `myCsmKeyStore.jks` and `myCsmTrust.jks` files that you re-created with the iKeyman tool, into these original directories.

- *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/etc/ for z/OS
- *install dir*/liberty/wlp/usr/servers/csmServer/etc/ for distributed systems

If you use dedicated keystore files for each Copy Services Manager server, such as myCsmKeyStore<*ServerName*>.jks, copy the corresponding keystore to the appropriate Copy Services Manager server. The truststore file myCsmTrust.jks is common and can be used for any of your Copy Services Manager servers or external CSMCLI clients.

9. Create a backup of your rmserver.properties file. In the rmserver.properties file, you can define your custom keystore and truststore files to be used by the Copy Services Manager server. The rmserver.properties file is at these locations.

   - *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/properties for z/OS
   - *install dir*/liberty/wlp/usr/servers/csmServer/properties for distributed systems

   Locate the default sections of the file and update the file name and password for the following options as shown:

   ```
   #  *Used to setup SSL sockets between the clients and server.
   communications.keyStore=etc/myCsmKeyStore<ServerName>.jks
   communications.keyStorePwd=<Password for myCsmKeyStore<ServerName>.jks>

   #  *Used so that Clients can authenticate with the server using Certificates.
   communications.authStore=etc/myCsmTrust.jks
   communications.authStorePwd=<Password for myCsmTrust.jks>
   ```

   Note:

   - As of Copy Services Manager 6.2.11, encrypted passwords for the keystore and truststore password properties are not supported. If you used default file names for your keystore and truststore, you do not need to update the corresponding properties.
   - Certificate configuration errors in this file result in GUI, CLI, or HA client not connecting to the server.

10. Back up a copy of your csmConnection.properties file. In the csmConnection.properties file, you can define the truststore that is used by any GUI or HA client to connect to local or remote server. Back up a copy of your csmConnection.properties file.

    This file is at these locations:

    - *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/etc/ for z/OS
    - *install dir*/liberty/wlp/usr/servers/csmServer/etc/ for distributed systems

    Update csmConnection.properties with the truststore file name and the certificate name in the keystore file. For the csm.server.certificate field, enter the name that you assigned to the self-signed server certificate, as you created in step 3.a. Refer to the following example to update the csmConnection.properties.

    ```
    csm.server.keystore=etc/myCsmTrust.jks
    csm.server.certificate=csm-<servername>
    ```

    Note: : You do not need to specify a password for the truststore in this file. The truststore password as specified in rmserver.properties is used to access the file.

11. Edit the bootstrap.properties file to point the server to use the new keystore file that contains the SSL certificate. In the bootstrap.properties file, you can define the HTTPS keystore that is used by browser connections to the Copy Services Manager server GUI. The HTTPS certificates can be switched independently, but it is simpler to use the same certificates as switched for the Copy Services Manager server. The bootstrap.properties file is at these locations.

    - *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/ for z/OS
    - *install dir*/liberty/wlp/usr/servers/csmServer/ for distributed systems

    To edit the bootstrap.properties file, copy the myCsmKeyStore<*ServerName*>.jks file to the default folder. The default folder in the following path.

- *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/resources/security for z/OS
- *install dir*/liberty/wlp/usr/servers/csmServer/resources/security for distributed systems

Note:

- If the specified keystore file is not found when, the Copy Services Manager server starts, a default file is created to serve browser connection requests to the Copy Services Manager GUI. This file has a certificate with an expiration of 1 year.
- If you do not define a keystore_location, the server defaults to use a key.jks file in the resources/security directory, when the Copy Services Manager server is started.
- The password that is defined in keystore_password is eXclusive OR (XOR) encrypted with the securityUtility. A plain text password is not automatically encrypted when the Copy Services Manager server starts.

For more information, see "bootstrap.properties file" on page 342.

12. Optional: You can also edit the bootstrap.properties file by specifying a relative or absolute path name to point to your keystore file at etc/myCsmKeyStore<*ServerName*>.jks.

    The following example shows how to specify the keystore with a relative path name to the default folder. On Windows systems, you can also prefix the drive letter in an absolute path name declaration.

    ```
    #relative to csmServer/resources/security
    keystore_location=myCsmKeyStore<ServerName>.jks
    keystore_password=<assigned password>
    #absolute path example on Windows
    #keystore_location=C:/<path_prefix>/CSM/liberty/wlp/usr/servers/csmServer/etc/
    myCsmKeyStore<ServerName>.jks
    ```

    Note: In the bootstrap.properties file, when you enter the value for keystore_location, use a slash '/' as a path separator. When you use a backslash, you must add two backslashes together, such as '\\'. Adding a single backslash can cause the file to not be found. The Copy Services Manager server can even fail to start.

13. Restart the Copy Services Manager server for the changes to take effect. You can check the csmServer messages.log file to check whether the bootstrap.properties configuration changes were successful and the correct keystore and certificate is used. The csmServer messages.log file is at these locations.
    - *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/logs for z/OS
    - *install dir*/liberty/wlp/usr/servers/csmServer/logs for distributed systems

The next five steps involve the command-line interface (CLI).

14. Copy your common trust file myCsmTrust.jks to the Copy Services Manager CLI directory at install dir/CLI/etc.
15. Create a properties directory in the CLI directory (install dir/CLI/properties)
16. Create a csmclient.properties file in the properties directory. This file is used to specify a custom truststore for encryption between the CLI client and the Copy Services Manager server. Add the following details in the file.

    ```
    communications.trustStore=etc/myCsmTrust.jks
    communications.trustStore.password=<assigned password>
    ```

    Note:

    - The default csmTrust.jks file is embedded in the csmcli.jar file. You cannot remove it. Use the csmclient.properties file to use a different truststore. The truststore file is at install dir/CLI/etc by default.
    - As of Copy Services Manager 6.2.11, encrypted passwords for the truststore password are not supported.

- Certificate configuration errors in this file result in CSMCLI login not working due to invalid encryption for authenticating with the Copy Services Manager server.

17. Log on to the Copy Services Manager CLI.
18. Optional: If you have the stand-alone CLI extracted on other systems in your environment, repeat the CLI steps.
19. To establish a Copy Services Manager HA relationship to another Copy Services Manager server, switch the default certificates for the other Copy Services Manager server. Copy the dedicated server keystore file and common truststore file to the other Copy Services Manager server and update all property files as described in steps 8-18.

    If you do not switch the certificates for the other Copy Services Manager server, the Copy Services Manager Management server relationship is not established and fails with a connection error.
20. To use LDAP configuration for Copy Services Manager user authentication on the Copy Services Manager server, follow the next steps to switch the keystore of the csmAuth server as well.
21. Copy your new keystore file that you created in step 3 into the original csmAuth keystore directory.
    - *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmAuth/resources/security/` for z/OS
    - *install dir*`/liberty/wlp/usr/servers/csmAuth/resources/security/` for distributed systems

    If you use dedicated keystore files for each Copy Services Manager server, such as `myCsmKeyStore<`*ServerName*`>.jks`, copy the corresponding keystore to the appropriate Copy Services Manager server.
22. Edit the `bootstrap.properties` file of the csmAuth server to point the server to use the new keystore file that contains your certificate that is used for the SSL connection. The file is at these locations.
    - *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmAuth/` for z/OS
    - *install dir*`/liberty/wlp/usr/servers/csmAuth/` for distributed systems

    The default path name of the `keystore_location` is where you copied the keystore file, therefore you need to specify only your keystore file. Following example shows how to specify the copied keystore file located in `csmAuth/resources/security`.

    ```
    #relative to csmAuth/resources/security
    keystore_location=myCsmKeyStore<ServerName>.jks
    keystore_password=<assigned password>
    ```

    Note:

    - In the `bootstrap.properties` file, when you enter the value for `keystore_location`, use a slash '/' as a path separator. When you use a backslash, you must add two backslashes together, such as '\\'. Adding a single backslash can cause the file to not be found. The Copy Services Manager server can even fail to start.
    - If you do not define a `keystore_location`, the server defaults to use a `key.jks` file in the `resources/security` directory, when the Copy Services Manager server is started.
    - If the specified keystore file is not found when, the Copy Services Manager server starts, a default file is created to serve browser connection requests to the Copy Services Manager GUI. This file has a certificate with an expiration of one year.
    - The password that is defined in `keystore_password` is eXclusive OR (XOR) encrypted with the securityUtility. A plain text password is not automatically encrypted when the Copy Services Manager server starts.

Results

The default certificates that are supplied by Copy Services Manager are switched out.

Synchronizing a remote server with the csmAuth certificate

You can set up remote Copy Services Manager servers for LDAP authentication redundancy.

About this task

To configure LDAP authentication redundancy, both servers need to start csmAuth with the same truststore file (`key.jks`). You can use either the Copy Services Manager GUI or the CLI to synchronize remote servers with the csmAuth certificate.

Synchronizing a remote server with the csmAuth certificate by using the GUI

You can synchronize a remote server with the csmAuth certificate by using the GUI.

Before you begin

You must have administrator authority to perform this task.

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrative authority.
2. From the menu, click **Settings** > **Advanced Tools**.
3. Scroll down to find the section for exporting and synchronizing a truststore file.

   Note: You can click **Export** to export the truststore file. This file is used for remote authentication by storage systems, including DS8000. Synchronizing does not require exporting, but it ensures that when the synchronization occurs, that the exported file can allow the storage system to use both Copy Services Manager servers.
4. Click **Synchronize** to synchronize the exported truststore file onto another Copy Services Manager server. Complete the following fields:
   a) Enter the **Host name or IP address** for the Copy Services Manager server.
   b) Enter the **Port** for the Copy Services Manager server. The default port is the one that the current CLI connection is using.

      Note: If you want to synchronize from Copy Services Manager on the DS8000 HMC to another server that has a different CLI port, you might first need to unblock the firewall for that port.
   c) Enter the **User name** for a user with administrator authority on the Copy Services Manager server.
   d) Enter the **Password** for the specified user.
5. For changes to take effect, csmAuth needs to be restarted on the destination server.

Results

One or more remote Copy Services Manager servers are synchronized with the same truststore file to enable LDAP authentication redundancy.

Synchronizing a remote server with the csmAuth certificate by using the CLI

You can synchronize a remote server with the csmAuth certificate by using the CLI.

Before you begin

You must have administrator authority to perform this task.

Procedure

1. Log in to the Copy Services Manager command line as a user with administrative authority.

2. Run the **syncauthservice** command to synchronize remote Copy Services Manager servers with the same truststore file (`key.jks`). By synchronizing these files, the remote authentication can communicate with either server by using the same `key_itso.jks` file.

   Note: See the **syncauthservice** command in the IBM Copy Services Manager online product documentation (http://www-01.ibm.com/support/knowledgecenter/SSESK4) for more information.

   The *Command-line Interface User's Guide* also provides details on the **syncauthservice** command. See "Publications and related information" on page xiv for where to locate this guide.
3. For changes to take effect, csmAuth needs to be restarted on the destination server.

Results

One or more remote Copy Services Manager servers are synchronized with the same truststore file to enable LDAP authentication redundancy.

Granting access privileges for LDAP or RACF users or groups

You can assign user roles to a user or group, which then enables you to grant access privileges to individual sessions and tasks.

About this task

Perform the following steps to authorize an LDAP or RACF user or group:

Notes:

- You can use an operating system repository, such as RACF, which is the example that is used in this task, for z/OS systems. LDAP can be used for both distributed systems and z/OS systems.
- The immediate parent group must be added as a user to be able to log in with user names that belong to the group.

Procedure

1. Log on to Copy Services Manager as a user with administrator privileges.
2. In the menu bar, click **Settings** > **Administration**.
3. On the **Administration** page, click **Add Access**. The Add Access wizard is displayed.
4. To search on an existing LDAP or RACF (for example) user or group to grant access to, select **Search for Users or Groups**, and type the name of the LDAP or RACF user or group.

   Tip: You can enter a partial name and use the * wildcard character to represent zero or more characters. For some registries, the search on user or group is case-sensitive.
5. Click **Next**. The **Select Users and Groups** page is displayed.
6. Choose one or more LDAP or RACF users or group names by selecting the appropriate check boxes.
7. Click **Next**. The **Select Access Level** page is displayed.
8. Select the role to associate with the LDAP or RACF user or group.

   Notes:

   - If you selected more than one LDAP or RACF user or group, you must assign them all the same role. To assign different roles to different LDAP or RACF users or groups, you must select them individually.
   - If an LDAP or RACF user is assigned to one role as an individual and a different role as a member of a group, the user has access to the permissions of the role with greater access.
9. If you selected the Operator role, select one or more sessions that this LDAP or RACF user or group can manage, and click **Next**. The **Confirmation** page is displayed.
10. Click **Next** to confirm your access privilege selections for the LDAP or RACF user or group.
11. Click **Finish** to exit the wizard.

Viewing access privileges for a user or group

You can view a list of all Copy Services Manager users and groups and their assigned roles. You can also view the assigned sessions for each user or group.

About this task

Complete the following steps to view access privileges for a user or group:

Procedure

1. Log in to Copy Services Manager as a user with administrator privileges.
2. In the menu bar, click **Settings** > **Administration**. The **Administration** page is displayed with a list of Copy Services Manager user and user group names, and their associated role.
3. Select the user or group whose access privileges you want to view.
4. From the **Select Action** list, select **View/Modify Access**. The **View/Modify Access** page is displayed. This page shows the role assigned to the user or group and lists the sessions that the user or group can manage.
5. Click **Cancel** to close the page.

Modifying access privileges for a user or group

You can change the user role and assigned sessions for a Copy Services Manager user or group.

About this task

Complete the following steps to modify the access privileges for a user or group:

Procedure

1. Log in to Copy Services Manager as a user with administrator privileges.
2. In the menu bar, click **Settings** > **Administration**. The **Administration** page is displayed with a list of Copy Services Manager users and user group names, and their associated roles.
3. Select the user or group whose access privileges you want to modify.
4. From the **Select Action** list, select **View/Modify Access**. The **View/Modify Access** page is displayed. This page shows the role assigned to the user or group and lists the sessions that the user or group can manage.

   Note: You can also modify user or group access by clicking **Add Access** from the Administration page. Then you can select **Search for Users or Groups** and enter a user or group name. For some registries, the search on user or group is case-sensitive. Click **Next**, and then select the user or group for which you want to modify the access level, and click **Next** again.
5. Select the role to associate with the user or group.
6. If you selected the Operator role, select one or more sessions that the user or group can manage and click **Next**.
7. Click **OK**.

Deleting access privileges for a user or group

You can delete access privileges for a Copy Services Manager user or group. When you delete access, the user or group ID cannot access the Copy Services Manager GUI or run commands from the command line.

About this task

Perform the following steps to delete user or group access:

Procedure

1. Log in to Copy Services Manager as a user with administrator privileges.
2. In the menu bar, click **Settings** > **Administration**. The **Administration** page is displayed with a list of Copy Services Manager users and user groups and their associated role.
3. Select the user or group for which you want to delete access.
4. From the **Select Action** list, select **Delete Access**.

   Important:

   - At the command line, you can use the **rmuser** and **rmauth** commands to delete user access privileges. The **rmuser** command is for users from the basic user registry, and only removes access for those users. The **rmauth** command must be used to remove access for LDAP users.

     See the *Copy Services Manager Command-Line Interface User's Guide* for more information on using the **rmuser** and **rmauth** commands. You can find details on where to obtain this guide in "Publications and related information" on page xiv.
   - When you delete access for a basic user, the user is deleted and the user's access is removed. When you delete access for an LDAP user or group, or, for example, a RACF user or group on z/OS, only access is removed. The user or group is not deleted from the LDAP registry or the RACF repository.
5. A warning message appears for you to confirm that you want to delete access for the selected user. Select **Yes** to delete, or **No** to cancel.

Dual control

Dual control functionality is provided for additional security starting with Copy Services Manager Version 6.2.5.

About this task

Dual control provides a higher level of security. When dual control is enabled on a Copy Services Manager server, the security procedure requires two people with proper authority to perform a given task or action. This design helps to prevent malicious attacks against the server. It also provides added safety for commands that are issued against the server because multiple people have to agree that the task or action should be taken.

Dual control can be enabled or disabled at the GUI. The dual control setting can be accepted or rejected in the GUI and CLI, but can only be viewed in the GUI.

Enabling or disabling dual control requires two users with admin authority - at either the Admin or User Admin level. Approving or rejecting a dual control request requires two users that have authority for the type of command that was being requested. Monitors should never see requests because they cannot issue any actions.

Dual control requests

The following list details the types of dual control requests that are supported in Version 6.2.5:

Run command
Any command action issued against a Copy Services Manager session. These actions include commands, such as **Start H1->H2**, **Suspend**, **Recover**, **Terminate**, and **Backup**.

SnapGroup command
A command against a snapgroup in a snapshot session for IBM Spectrum Accelerate devices.

Set Properties on a session
Modifying the description or properties for a session.

Add/Remove Copy sets
Adding or removing copy sets on a session.

Scheduled Task (modify, delete, enable, disable, run)
Modifying, deleting, enabling , disabling, or running a scheduled task. Creating a scheduled task does NOT require dual control because the creation does not run or enable the schedule of the task.

Note: After a task is enabled and approved by a second user, the task runs on the defined schedule automatically without requiring approval each time that it runs.

User Action (add access, delete access, modify access, create user, remove user)
Managing users from the **Administration** tab.

Enable/Disable Dual Control on the server
The act of turning dual control on or off on a Copy Services Manager server.

Set CG Name on a session
Defining a consistency group name for a given session.

An active/standby setup command (set standby, set as standby) for high availability (HA)
Setting a server as a standby, or setting a standby server both require dual control. Additional rules apply for active/standby support with dual control.

Dual control request notifications

When dual control is enabled on a server, a request is created. This request displays under the **Notifications->Dual Control Requests** tab on the Copy Services Manager GUI Navigator (and corresponding Copy Services Manager CLI commands).

When one or more requests exist, a number appears next to the **Notifications** tab in the Navigator, alerting the requester and any valid approvers that there is a pending request. A valid approver is anyone who is NOT the requester, and has the authority to issue the command or task that was requested.

Example: If both John and Bob can manage session GMP, but Tim cannot, when John issues a **`Start H1->H2`** command to session GMP, both John and Bob can see the pending request, but Tim does not.

The **Notification->Dual Control Requests** panel displays all the requests in a table that lists the ID, Type, Requesting User, Time Requested, and Summary for each request. The requester sees a **Cancel** button next to the request, and can cancel the request at any time before someone else approves it. Approvers see the **Approve** and **Reject** buttons. If the **Approve** button is selected, approvers are asked to confirm that they want to approve the request. If they do approve, then the request is executed. If they choose to **Reject** the request, they can optionally enter a reason for the rejection. The request is then denied, and removed from the table.

Important:

1. When you enable a server for dual control, it is important to remember that all of the previously listed actions require two users to execute them. You must ensure that you always have at least two users defined on the server that is used to approve the actions. Otherwise, you might be locked out of issuing actions.
2. Dual control can only be enabled or disabled by an Admin or User Admin, and therefore needs approval by another Admin or User Admin. So you must have at least two Admins or User Admins defined on the server.

When dual control is enabled, and the Copy Services Manager server is restarted, or a High Availability takeover occurs, any pending dual control requests are automatically rejected, thereby leaving no pending requests when the servers come back up.

When dual control is disabled, any pending dual control requests are automatically rejected.

Active/standby design for dual control

Dual control for Copy Services Manager includes the following design considerations for the active/standby servers:

- Active/standby support is handled by enabling dual control on the **`Define Standby`** and **`Set this Server as Standby`** commands ONLY.
- If the active server has dual control enabled, the standby MUST also have dual control enabled before you attempt to create the connection.

- If the standby server has dual control enabled, it is NOT necessary for the active server to have dual control enabled, although this scenario is highly unlikely and results in the standby losing dual control.
- If dual control is enabled on the active server, the connection MUST be set up from the active server. If you attempt the connection from the standby, it fails. You cannot set a server as a standby of another without the active giving permission.
- If dual control is enabled on both servers, approval to set up the connection is multi-phased and requires the approval first on the active server, and then on the standby server.
- When dual control is enabled and the **Define Standby** or **Set this Server as Standby** command is called, a dual control request is created as in the following example:

  ```
  Feb 7, 2019 2:14:56 PM : csmadmin : IWNR2629I : User csmadmin requested command
  SET_STANDBY on the standby server. The time of the request is
  Thu Feb 07 14:14:56 CST 2019.
  ```

- The **Remove Active**, **Remove Standby**, **Takeover**, and **Reconnect** commands do not need dual control. If the active/standby connection is already set up, then dual control has already approved the pairing. After the action is complete, dual control is still enabled, and all dangerous actions still require multiple users.
- If an active/standby connection already exists, and is in a Connected or Synchronized state when attempting to set up dual control on the active server, then after dual control is approved by a second user, the dual control requirement is synchronized on the standby server. When a takeover is issued on the standby server, the standby server should automatically be in dual control mode as well (the takeover does not require dual approval).

  Important:

  – To avoid getting locked out of dual control actions after a takeover, you MUST ensure that two Admins (or User Admins) already exist on both the active and standby servers BEFORE you enable dual control.

  – It is VITAL to ensure there are at least two Admins or User Admins defined on both the active and standby servers. If not, a takeover might be issued where the server ends up in dual control mode because the active server was dual control. If the standby is in dual control without at least two Admins or User Admins defined, then you will be locked out of executing most actions, and will not have the ability to disable dual control or add additional users without a second admin. If this situation occurs, you will need to contact IBM Support.

The following table shows the possible variations of active/standby enablement and the expected results.

Table 81. Active/standby enablement variation and results

Command issued	Active status	Standby status	Result
DEFINE STANDBY	Active dual control off	Standby dual control off	Sync completes without approvals
DEFINE STANDBY	Active dual control on	Standby dual control off	Approve Request on active fails and issues message IWNR3016E with reason code 124 (must enable dual control on standby)
DEFINE STANDBY	Active dual control on	Standby dual control on	Approve on active, approve on standby, and then sync should complete
DEFINE STANDBY	Active dual control off	Standby dual control on	Approve on standby, and then sync should complete

Table 81. Active/standby enablement variation and results (continued)			
Command issued	**Active status**	**Standby status**	**Result**
SET THIS SERVER AS STANDBY	Active dual control off	Standby dual control off	Sync completes without approvals
SET THIS SERVER AS STANDBY	Active dual control on	Standby dual control off	No approvals, but fails and issues message IWNR3016E with reason code 125 (must connect from active)
SET THIS SERVER AS STANDBY	Active dual control on	Standby dual control on	Approve Request on standby fails and issues message IWNR3016E with reason code 125 (must connect from active)
SET THIS SERVER AS STANDBY	Active dual control off	Standby dual control on	Approve on standby, and then sync should complete

Using dual control

You must use the Copy Services Manager GUI to enable or disable dual control requests. You can approve, reject, cancel, or view a listing of dual control requests in both the GUI and CLI.

Enabling dual control

You can enable dual control using the GUI.

About this task

Follow these steps to enable dual control:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator (either Admin or User Admin) privileges.
2. Click **Settings** > **Administration**.
3. Click **Enable Dual Control**.

   Note: If the **Enable Dual Control** button is disabled, then someone has already enabled dual control.

Results

A request to enable dual control is sent, and appears in the **Notifications** > **Dual Control Requests** table.

A second administrator (Admin or User Admin) must approve the request to enable dual control. The person who requested that dual control be enabled, can also view and cancel the request from the **Notifications** > **Dual Control Requests** table before it is approved or rejected. See “Canceling a dual control request” on page 338.

When dual control is enabled, the **Enable Dual Control** button is not usable until dual control is disabled again.

Disabling dual control

You can disable dual control using the GUI.

About this task

Follow these steps to disable dual control:

Procedure

1. Log in to the Copy Services Manager GUI as a user with administrator (either Admin or User Admin) privileges.
2. Click **Settings** > **Administration**.
3. Click **Disable Dual Control**.

   Note: If the **Disable Dual Control** button is disabled, then someone has already disabled dual control.

Results

A message displays indicating that a dual control request was sent. The request then appears in the **Notifications** > **Dual Control Requests** table.

A second administrator (Admin or User Admin) must approve the request to disable dual control. The person who requested that dual control be disabled, can also view and cancel the request from the **Notifications** > **Dual Control Requests** table before it is approved or rejected. See "Canceling a dual control request" on page 338.

When dual control is disabled, the **Disable Dual Control** button is not usable until dual control is enabled again.

Viewing dual control requests

You can use either the GUI or CLI to view a listing of pending dual control requests.

Viewing dual control requests using the GUI

You can use the GUI to view pending dual control requests.

About this task

If there are any pending dual control requests, you will see a number listed on the **Notifications** tab that corresponds to the number of pending requests.

Note: Only pending requests are shown. You can only see pending requests that you have the ability to approve, reject or cancel. As soon as a request is approved, rejected or canceled, it no longer displays in the table. The console will show the history for previous dual control requests.

Follow these steps to view dual control requests in the GUI:

Procedure

1. Log in to the Copy Services Manager GUI.
2. Click **Notifications** > **Dual Control Requests** to view a table listing the dual control requests.

Results

All the requests that have been created by or require approval from the current user are displayed.

Viewing dual control requests using the CLI

You can use the CLI to view pending dual control requests.

About this task

Follow these steps to view pending dual control requests using the CLI:

Procedure

1. Log in to the Copy Services Manager CLI.
2. Enter the following command: **`lsdcrequests-l`**.

   Note: See the *Copy Services Manager Command-Line Interface User's Guide* for more information on using the **`lsdcrequests`** command. You can find details on where to obtain this guide in “Publications and related information” on page xiv.

Results

All the requests that have been created by or require approval from the current user are displayed.

Approving or rejecting a dual control request

You can use either the GUI or CLI to approve or reject a dual control request.

Approving or rejecting a dual control request using the GUI

You can use the GUI to approve or reject a dual control request.

About this task

If there are any pending dual control requests, you will see a number listed on the **Notifications** tab that corresponds to the number of pending requests.

Follow these steps to approve or reject a dual control request using the GUI:

Procedure

1. Log in to the Copy Services Manager GUI.
2. Click **Notifications** > **Dual Control Requests** to view a table listing the pending dual control requests.
3. Click **Approve** for any requests that you want to approve. A confirmation message displays for you to confirm or cancel the approval. Click **Yes** to approve or **No** to cancel. Or you can click **Reject** for any requests that you want to reject. A message box displays in which you can optionally enter a reason for rejecting the request. Click **Reject** again to reject the request, or click **Close** to cancel.

   Note: If you confirm the approval or rejection, then the request goes away. There is no undo action to reject a previous approval, or approve a previous rejection.

Results

The request is approved or rejected for the associated action or command, and disappears from the list of pending requests.

Approving or rejecting a dual control request using the CLI

You can use the CLI to approve or reject a dual control request.

About this task

Dual control requests can only be approved or rejected by an Admin or User Admin other than the one who sent the original request.

Follow these steps to approve or reject a dual control request using the CLI:

Procedure

1. Log in to the Copy Services Manager CLI.
2. Enter the following command: **dcrequestaction**, along with the appropriate syntax to approve or reject the request.

   Note: See the *Copy Services Manager Command-Line Interface User's Guide* for more information on using the **dcrequestaction** command. You can find details on where to obtain this guide in “Publications and related information” on page xiv.

Results

The request is approved or rejected for the associated action or command.

Canceling a dual control request

You can cancel a dual control request that you submitted for approval.

About this task

If you submit a dual control request that requires approval, and then want to cancel it before it gets approved, you can do so. Only the individual who submitted the request can cancel it.

You can cancel a dual control request from the GUI with the **Cancel** button.

Note: To "cancel" a dual control request from the CLI, you would just use the **dcrequestaction** command to reject it. See the *Copy Services Manager Command-Line Interface User's Guide* for more information on using the **dcrequestaction** command. You can find details on where to obtain this guide in “Publications and related information” on page xiv.

Procedure

1. Log in to the Copy Services Manager GUI.
2. Click **Notifications** > **Dual Control Requests** to view a table listing the dual control requests.
3. Click **Cancel** next to the request that you want to cancel.

   Note: The cancel button appears next to a request only if the logged in user is the requester of the associated dual control request.

Results

The request is canceled, and disappears from the table of pending dual control requests.

Changing a user password

Only users can change their own passwords.

About this task

Administrators cannot change any user passwords except their own. If a user forgets the password, an administrator must delete the user's access, re-add the user to the basic user registry, and set a default password that the user can change.

Note: Only users from the basic user registry can change their password. This option is not available to LDAP users, or users from a z/OS operating system repository, such as RACF.

Users can perform the following steps at the GUI to change their own password:

Procedure

1. Log on to Copy Services Manager.
2. Locate the user name on the menu bar. Hover over it and click **Edit Password**. The Edit Password wizard is displayed.
3. Enter a new password in the **Password** field.
4. Retype the new password to confirm.
5. Click **Next**. A message indicates that the password was successfully changed.
6. Click **Finish** to exit the wizard.

Managing security changes after an upgrade

After you upgrade Copy Services Manager, the upgrade might also include upgrades to internal components, such as Java.

Secure LDAP

To support a more secure LDAP connection, Java made a change in endpoint validation from relaxed to strict by default. Unfortunately, any existing LDAP connections that were not configured for endpoint identification fail if endpoint identification is required. Therefore, by default, Copy Services Manager disables endpoint identification in Java. This practice ensures that existing LDAP connections that are not configured for endpoint identification still work and you can continue logging in to Copy Services Manager.

If your LDAP service has been configured for endpoint identification, it is recommend that you re-enable this Java feature for better security. To reset the Java property after an upgrade, perform the following steps:

Procedure

1. Open the `JVM.options` file.
2. Set the following property to `false`, as shown:
   `-Dcom.sun.jndi.ldap.object.disableEndpointIdentification=false`
3. Restart the Copy Services Manager server.

Results

Copy Services Manager should be able to reconnect to LDAP servers for user authentication.

Storage system connections

For DS8000 HMC users: Java updates can cause disconnects to DS8000® systems after Copy Services Manager upgrades if Java disables older encryption algorithms. Contact support to help re-enable the algorithms.

z/OS over IP connection with self-signed certificates

If you used self-signed certificates to establish a host connection to z/OS over IP before upgrading to Copy Services Manager 6.2.9, you might need to re-certify and reclaim the certificates to successfully connect again after upgrading to 6.2.9. The newer versions of Java (as of version 1.8 -- 8.0.6.10) require a key tag attribute called **CA:TRUE**, which is not available from older, self-signed certificates.

Recommended: You should purchase a signed CA to provide an additional layer of security.

Procedure

- See the IBM Copy Services Manager Implementation Guide (http://www.redbooks.ibm.com/redbooks/pdfs/sg248375.pdf) Redbooks publication located on the IBM Redbooks website (www.redbooks.ibm.com/) for more information on how to generate a self-signed certificate in z/OS.

Appendix A. Configuration files

This topic provides default file locations for Copy Services Manager configuration files.

The following table shows the default file location for each configuration file.

Configuration file	Default location
`bootstrap.properties`	• For management server on distributed systems: *install dir*`\liberty\wlp\usr\servers\csmServer\bootstrap.properties` • For authentication server on distributed systems: *install dir*`\liberty\wlp\usr\servers\csmAuth\bootstrap.properties` • For management server on z/OS: *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/bootstrap.properties` • For authentication server on z/OS: *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmAuth/bootstrap.properties`
`csmConnections.properties`	• For distributed systems: *install dir*`\liberty\wlp\usr\servers\csmServer\properties` • For z/OS: *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties`
`diagnostics.properties`	• For distributed systems: *install dir*`\liberty\wlp\usr\servers\csmServer\properties` • For z/OS: *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties`
`javaoptions.properties`	If the `javaoptions.properties` file preexists in your environment, it is located in the following directory: • For distributed systems: *install dir*`\CLI` • For z/OS: *path_prefix*`/opt/IBM/CSM/CLI` **Note:** Note: If the `CLI/javaoptions.properties` file does not exist, you can create it and define the **JAVA_OPTIONS** parameter with your required options.
`repcli.properties`	• For distributed systems: *install dir*`\CLI` • For z/OS: *path_prefix*`/opt/IBM/CSM/CLI`
`rmserver.properties`	• For distributed systems: *install dir*`\liberty\wlp\usr\servers\csmServer\properties` • For z/OS: *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` **Note:** You can also access and manually edit the `rmserver.properties` file from within the Copy Services Manager GUI under **Settings** > **Server Properties**.

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bootstrap.properties file

Two `bootstrap.properties` files contain the configuration attributes for the Copy Services Manager servers. One bootstrap properties file sets the configuration for the management server and another for the authentication server.

The `bootstrap.properties` file is in the following locations on distributed systems:

- Management server:
  install_dir`\liberty\wlp\usr\servers\csmServer\bootstrap.properties`
- Authentication server:
  install_dir`\liberty\wlp\usr\servers\csmAuth\bootstrap.properties`

The `bootstrap.properties` file is in the following locations on z/OS systems:

- Management server: *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/bootstrap.properties`
- Authentication server: *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmAuth/bootstrap.properties`

The file contains the following properties:

https_port_var
Specifies the GUI port (for csmServer) or the authentication port (for csmAuth). The port number is set during installation. However, you can modify this property value to change the port number after installation.

keystore_id
Specifies a unique configuration ID.

keystore_location_prefix
Simplifies specification of the key ring URL for z/OS. The default value is blank for file-based keystores.

keystore_location
Specifies an absolute or relative path to the keystore file. If a relative path is provided (for example, `key.jks`), the server attempts to locate the file in the `csmServer/resources/security` directory.

keystore_password
Specifies the password that is used to load the keystore file. The value can be stored in cleartext or encoded form. An encoded password string is preceded with `{xor}`.

keystore_type
Specifies a keystore type that is supported by the target SDK. The default value is JKS.

keystore_fileBased
Specifies whether the keystore is based on a file. The default value is `true`.

keystore_readOnly
Specifies whether the keystore is to be used by the server for read operations only. The default value is `false`. The value `false` indicates that the server can write to the keystore.

ssl_protocol
Specifies the SSL handshake protocol that is used on the HTTPS port for that server. The value is determined by the Java release and can default to the minimum value (for instance, `TLSv1.2`) automatically during upgrade.

Note: You must restart the server for your modifications of the bootstrap properties file to take effect in the server configuration.

The default contents of each `bootstrap.properties` file is displayed in the following example.

```
################################################################################
#This section is for the HTTPS settings of the IBM Copy Services Manager GUI. #
################################################################################
https_port_var=9559
ssl_protocol=TLSv1.2
```

```
################################################################################################
#This section is for the keystore certificate information.  This can be       #
#changed to match your environment.                                            #
#                                                                              #
#Note that keystore_location is relative to csmServer/resources/security      #
#The keystore_location_prefix is typically left blank for file based           #
#keystores.                                                                    #
################################################################################################
keystore_id=keystore
keystore_location_prefix=
keystore_location=key.jks
keystore_password={xor}HjktbwhvMzkMOi0pOi0=
keystore_type=JKS
keystore_fileBased=true
keystore_readOnly=false

################################################################################################
#This section is a sample JCERACFKS certificate keystore configuration that   #
#can be uncommented and modified to match your environment.                    #
#                                                                              #
#The location must be a safkeyring url syntax with the first qualifier as the #
#IWNSRV and keyring owner and the second qualifier as the keyring name.  The  #
#safkeyring url syntax is important, in order to pass it propertly into       #
#server.xml, it is split across two properties values.  The                   #
#keystore_location_prefix is set to "safkeyring:" while the keystore_location #
#is the rest of the safkeyring url.                                            #
#                                                                              #
#The keystore id and password will be used to create a local keystore with    #
#the specified ID and password holding the cached certificate for the GUI.    #
################################################################################################
#keystore_id=keystore
#keystore_location_prefix=safkeyring:
#keystore_location=//CSMUSER/GUIKEYRING
#keystore_password=password
#keystore_type=JCERACFKS
#keystore_fileBased=false
#keystore_readOnly=true
```

csmConnections.properties file

The csmConnections.properties file contains configuration information about Copy Services Manager graphical user interface (GUI) and management server connection information.

The csmConnections.properties file is located in the *install dir*\liberty\wlp\usr\servers\csmServer\properties directory on distributed systems, and the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/properties directory on z/OS.

The file contains the following properties:

csm.server.address
The domain name or IP address of the Copy Services Manager server. The default value is localhost.

Tip: This value must match the value of the **server** property in the *install dir*\CLI\repcli.properties file on distributed systems, and the *path_prefix*/opt/IBM/CSM/CLI/repcli.properties file on z/OS.

csm.server.port
The client port for the GUI to connect to the management server. The default value is 9560.

Tip: This value must match the *install dir*\liberty\wlp\usr\servers\csmServer\properties\rmserver.properties file and the **port** property in the *install dir*\CLI\repcli.properties file on distributed systems; and the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/properties/rmserver.properties file, and the **port** property in the *path_prefix*/opt/IBM/CSM/CLI/repcli.properties file on z/OS.

csm.server.authtype
The authentication type for the GUI to connect to the management server. The default value is certificate.

csm.server.keystore
The location of the `csmGuiTrust` trust file for certificate authentication of the GUI. The default value is `/etc`.

csm.server.certificate
The certificate ID. The default value is `csmserverdefault`.

csm.server.standbyPort
The HTTPS port that is used for a standby management server. Define this property if the active and standby management servers run on two different GUI ports to ensure that the URL links to the other management server are valid. For example, if you have an active Windows management server that uses port 9559 for the GUI and a standby z/OS management server that uses port 33209 for the GUI, set this property, if you want the GUIs to be able to start the remote GUI.

The default contents of each `csmConnections.properties` file is displayed in the following example.

Note: The values that are set in this file are case-sensitive and must not contain spaces.

```
#
# Define the information for connecting to the CSM Server.
#
csm.server.address=localhost
csm.server.port=9560

###############################################################################
# CERTIFICATE BASED AUTHENTICATION FROM UI TO CSM SERVER
###############################################################################
csm.server.authtype=certificate
csm.server.keystore=etc/csmTrust.jks
csm.server.certificate=csmserverdefault

#csm.server.standbyPort=
```

diagnostics.properties file

The `diagnostics.properties` file contains configuration information about Copy Services Manager log packages.

The `diagnostics.properties` file is in the *install dir*`\liberty\wlp\usr\servers\csmServer\properties` directory on distributed systems, and the *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/properties` directory on z/OS.

Restart the Copy Services Manager graphical user interface to activate property changes. Properties are not synchronized between the Copy Services Manager management servers and must be maintained on each Copy Services Manager management server.

The file contains the following properties:

sourcedir
The source directory to be used to create the Copy Services Manager log package.

targetdir
The target directory where Copy Services Manager log packages are to be created. The default directory is *install dir*`\liberty\wlp\usr\servers\csmServer\diagnostics` on distributed systems, and *path_prefix*`/opt/IBM/CSM/wlp/usr/servers/csmServer/diagnostics` on z/OS.

javaoptions.properties file

The `javaoptions.properties` file contains the information that is used by the Copy Services Manager CLI for Java runtime.

When the `javaoptions.properties` property file specifies the **JAVA_OPTIONS** parameter, Copy Services Manager uses those options when starting Java for the CLI.

If the `javaoptions.properties` file preexists in your environment, it is located in the *`install dir`*`\CLI\` directory for distributed systems, and the *`path_prefix`*`/opt/IBM/CSM/CLI` directory for z/OS.

Note: If the `CLI/javaoptions.properties` file does not exist, you can create it and define the JAVA_OPTIONS parameter with your required options.

Restart the Copy Services Manager CLI to activate Java property file changes. The Java properties are valid for all Copy Services Manager CLI users on the modified system.

Some examples of possible options in the `javaoptions.properties` file include:

Xquickstart
Enables the CLI to start up with a subset of optimizations, which can improve the performance when invoking the CLI for short operations. Batch jobs initiate individual calls to the Copy Services Manager CLI, which means that Java has to be started up for each call. This requirement can add to the overall runtime of the batch job. However, you can use the Java Quickstart option to reduce the Java start time.

Xmx*<value>*
Modifies the max memory setting for the CLI. If no `javaoptions.properties` file is present, the **`Xmx`** value defaults to 512m (512 MB).

Duser.language=*<ll>*
Specifies the code of a supported language for the Copy Services Manager CLI to use. This parameter overrides the default language locale setting of the CLI host system.

Copy Services Manager supports the following language locales:

- Chinese - China (zh-CN)
- Czech (cs)
- English (en)
- French (fr)
- German (de)
- Hungarian (hu)
- Italian (it)
- Japanese (ja)
- Korean (ko)
- Polish (pl)
- Portuguese - Brazil (pt-BR)
- Russian (ru)
- Spanish (es)

After the `javaoptions.properties` file is set up, every time the Copy Services Manager CLI is invoked, the specified Java options are used.

Example: Code sample for a `javaoptions.properties` file that sets the maximum memory to 1024 MB, specifies Quickstart, and sets the CLI language to English:

```
# This is the properties file that can be used to add additional options
 to the CSM CLI Java runtime without having to update the sh/bat files.

# Add additional options to the parm below separated by a space.

# ex. -Xmx1024m -Xquickstart -Duser.language=en

JAVA_OPTIONS=-Xmx1024m -Xquickstart -Duser.language=en
```

repcli.properties file

The repcli.properties file contains the server and port information that is used to communicate with the Copy Services Manager server and the command-line interface.

The repcli.properties file is located in the *install dir*\CLI\ directory for distributed systems, and the *path_prefix*/opt/IBM/CSM/CLI directory for z/OS.

Restart Copy Services Manager to activate property changes. Properties are not synchronized between the Copy Services Manager management servers and must be maintained on each Copy Services Manager management server.

The file contains the following properties:

server
The domain name or IP address of the Copy Services Manager server. The default value is localhost.

Tip: This value must match the value of the **csm.server.address** property in the *install dir*\liberty\wlp\usr\servers\csmServer\csmConnections.properties file for distributed systems, and the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/csmConnections.properties file for z/OS.

port
The client port that is used by the CLI to communicate with the Copy Services Manager server. The default value is 9560.

Tip: This value must match the **communications.port** property in the rmserver.properties file that is located in the *install dir*\liberty\wlp\usr\servers\csmServer\ directory for distributed systems, and in the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/ directory for z/OS. And this value must also match the **csm.server.port property** in the csmConnections.properties file in the *install dir*\liberty\wlp\usr\servers\csmServer\ directory for distributed systems, and the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/ directory for z/OS.

rmserver.properties file

The rmserver.properties file contains various configuration settings for Copy Services Manager server.

The default location of the rmserver.properties file is the *install dir*\liberty\wlp\usr\servers\csmServer\properties directory on distributed systems, and the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/properties directory on z/OS.

Note: You can use the **chsystem** command with the **-f server** parameter to change the properties.

You can also access and manually edit the rmserver.properties file from within the Copy Services Manager GUI under **Settings** > **Server Properties**.

Restart Copy Services Manager to activate the property changes. Properties are not synchronized between the Copy Services Manager management servers and must be maintained on each Copy Services Manager management server.

The file contains the following parameters that you might need to customize for your environment:

log.file
The name of the Copy Services Manager server log file. The default value is csmTrace.log.

The newest log file is the name the same as this value. Subsequent log files have a number that is appended to the file name. For example, csmTrace1.log and csmTrace2.log.

This log file is in the *install dir*\liberty\wlp\usr\servers\csmServer\logs\CSM directory on distributed systems, and the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/logs/CSM directory on z/OS.

log.file.maxFiles
The maximum number of Copy Services Manager server log files that are created before old log files are overwritten. The default value is 50.

log.file.maxFileSize
The maximum size, in KB, of each Copy Services Manager server log file. The default value is 10240.

communications.port
The client port that is used by the GUI and CLI to communicate with the Copy Services Manager server. The default value is 9560.

Tip: This value must match the **port** property in the *install dir*\CLI\repcli.properties file and the *install dir*\libery\wlp\usr\servers\csmServer\properties\csm.Connection.properties file on distributed systems, and it must match the **port** property in the *path_prefix*/opt/IBM/CSM/CLI/repcli.properties file and the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/properties/csmConnection.properties file on z/OS.

communications.haPort
The standby management server port that is used for communication between the active and standby management server. The default value is 9561.

csm.server.snmp_community_string
The SNMP community name. The default value is public.

csm.server.sus_gc_pairs_on_gm_pause
A flag that indicates whether to suspend the Global Copy pairs when a Global Mirror session is suspended. The valid values are true and false.

db.backup.location
The directory that is used by the mkbackup command to store a backup copy of the IBM Copy Services Manager database. By default, the backup file is stored in the *install dir*\liberty\wlp\usr\servers\csmServer\database\csmdb directory for distributed systems, or in the *path_prefix*/opt/IBM/CSM/wlp/usr/servers/csmServer/database/csmdb directory for z/OS.

server.logpackages.maxpackages
The maximum number of log packages that is maintained by the server.

server.backup.maxbackups
The maximum number of backups that is maintained by the server.

csm.server.notification.sender.address: *<email address>*
Specifies the email address from which to send outgoing email alerts. By default, outgoing email alerts are set to come from the generated email address csmServer@*<server hostname>*. However, for some SMTP server software or configurations, this email address is not accepted. Therefore, you can change the outgoing server email address to something that meets the requirements of your environment.

csm.server.ldap.enabled
Enables LDAP in your environment when set to true.

Note: The default value for **csm.server.ldap.enabled** is set to false for z/OS systems and true for distributed systems.

com.ibm.csm.*<sessionName>*.*<rolepair>*.userpfc
Specifies which of the Metro Mirror relationships for the Preserve Mirror feature to use. When the Metro Mirror pairs are established or failed over, any pairs that are marked with this property are set up so that when the source is flashed the Preserve Mirror feature knows to use these pairs. For example, setting the property to com.ibm.csm.MySess.H1-H2.userpfc indicates that session "MySess" and the role pair "H1-H2" to be used for Preserve Mirror.

Notes:

- This property default is set to false. It must be set to true to enable the option on the role pair.

- Use underscores to indicate any spaces in the property setting. For example, for the session "MySess" you would specify `My_Sess` in the property.

com.server.svc.fc.cleanreate =*<cleanrate>*
com.server.svc.fc.cleanrate.*<sessionName>*=*<cleanrate>*
A cleaning rate can be specified for a FlashCopy session (or a session that contains a FlashCopy sequence) that is independent of the background copy rate. The clean rate controls the rate at which the cleaning process operates. The cleaning process copies data from the target volume of a mapping to the target volumes of other mappings that depend on this data.

Notes:

- For older storage systems that run IBM Spectrum® Virtualize, the *<cleanrate>* range is 0-100. For new storage systems at release 7.8.1 and higher, the range is 0-150. If this property is not specified, the default rate is 50. For more information on the clean rate, see your storage system user guide.
- This property is only valid for storage systems that run IBM Spectrum Virtualize. If a *<sessionName>* is not specified, the cleaning rate value is applied to all FlashCopy sessions, and sessions that contain a FlashCopy sequence, for storage systems that are running IBM Spectrum Virtualize.

csm.auto.restart.after.swap=*<true>*
After a swap occurs, this option automatically restarts replication from the site that was swapped to, to the alternative site without user intervention.

When HyperSwap is enabled on multi-target sessions with Metro Mirror relationships, by default a HyperSwap command or event results in all I/O being swapped to the Metro Mirror secondary. And then the Copy Services Manager session moves to a Target Available state.

After the swap, no replication occurs, and a manual **`Start`** command must be issued for replication to run again.

If HyperSwap is enabled on the role pair that is automatically started, as soon as all pairs in the role pair reach a Prepared state, the HyperSwap configuration is automatically loaded as well. This option helps to ensure that replication is started quickly after a HyperSwap command or event to provide continual disaster recovery and high availability needs.

When this option is set, synchronization starts automatically, which causes the alternative site to be inconsistent until all pairs in the role pair reach a Prepared state.

com.ibm.csm.zconsole.logging=none (default) | `all` | `error`
Specifies the standard out logging level to the syslog, where the possible values are *none*, *all*, or *error*.

- When *none* is specified, Copy Services Manager does not log to the syslog at all (default).
- When *all* is specified, Copy Services Manager logs all I, W, and E messages to the syslog.
- When *error* is specified, Copy Services Manager logs all W and E messages to the syslog.

Example: To log all messages

```
com.ibm.csm.zconsole.logging=all
```

com.ibm.csm.zconsole.logging.includechildren=`true` | `false` (default)
Specifies whether to log child messages to the syslog or not. By default, only high-level messages are logged. Child messages are not logged. Use this property setting to override this behavior and enable child messages to be logged.

Notes:

- Be aware that setting the logging to all messages, including the child messages, can result in a large number of messages. Only set the **`includechildren`** property to `true` when it is important to see the child messages.
- When you set the **`includechildren`** property to `true`, all child messages are printed to the syslog, including any in the **`excludedmsgs`** list, as discussed next.

Example: To log all child messages

```
com.ibm.csm.zconsole.logging.includechildren=true
```

com.ibm.csm.zconsole.logging.excludedmsgs=*<messages to exclude in comma-separated list>*
Specifies which messages to exclude from writing to the syslog, where the values are a comma-separated list of message IDs. Any ID in the list does not appear in the syslog.

Note: The **excludedmsgs** property is only for parent messages.

Example: To exclude the IWNR1028I and IWNR6000I messages from being logged:

```
com.ibm.csm.zconsole.logging.excludedmsgs=IWNR1028I,IWNR6000I
```

csm.disable.mm.mode.sessionname=true | false (default)
Specifies whether to disable Metro Mirror mode, where *session_name* is the name of the session on which you want to disable it or not. This property affects Metro Mirror Failover/Failback sessions only.

- Replace any spaces in *session_name* with an underscore symbol ("_").
- This property is case-sensitive.

Note: If you do not see the option take effect right away in the GUI, you can either restart the Copy Services Manager server, or issue a command, such as **Stop**, to have the GUI refresh the available commands list.

Example: To disable Metro Mirror mode in session "My MM:"

```
csm.disable.mm.mode.My_MM=true
```

csm.percent.complete.warning.threshold=<percent from 0-100> | 0 (default)
Specifies the percent of completion of a Global Copy session before a warning is issued. This property affects Metro Mirror Failover/Failback sessions only, and after a **StartGC H1->H2** or **StartGC H2->H1** command. The percentage (<percent from 0-100>) option must be an integer in the range 0 - 100.

- If the current progress on the session is less than or equal to the value specified in the property, then a warning status message appears on the session, and the session stays in a Preparing or Warning state.
- If the progress is greater than the value specified in the property, then no status message (IWNR2768W) displays, and the session shows Preparing or Normal status.
- The status message that appears:
  IWNR2768W
  [May 21, 2020 3:43:49 PM] Session MM and role pair H1-H2 is at or below the warning threshold of x percent complete.

Example: A session is started with the **StartGC H1->H2** command. The percent complete specified is 80. While the progress for the session shows anything in the range 0 - 80, the session shows Preparing or Warning with a status message. When the progress is 80% or greater, the status message goes away, and the session goes into Preparing or Normal state.

```
csm.percent.complete.warning.threshold=80
```

Appendix B. Using the system logger in a Copy Services Manager environment

The system logger is an IBM z/OS component that provides a logging facility for applications running in a single-system or multisystem sysplex. There are many factors to consider when you are using the system logger in a IBM Copy Services Manager environment and are using Metro Mirror sessions.

Configuring the system logger for use in the Copy Services Manager environment

When the system logger is used in an IBM Copy Services Manager environment, steps must be taken to avoid data consistency issues.

The following situations can lead to data consistency issues when using Copy Services Manager with the system logger:

- The **Release I/O after Suspend** option has been selected for a Metro Mirror session.
- The system logger couple data sets (CDSs) are not part of the Metro Mirror session. In this situation, the data sets are not frozen even though the related application secondary volumes have been frozen.
- The system logger log streams use coupling facility (CF) structures.
- After a suspend event, the primary site fails and you must recover at the alternate site.

If the secondary disks in the Metro Mirror session are frozen and the workload continues to run using the primary disks, the data on the secondary disks is out of sync with the CF structures or the CDSs. If you attempt to restart the applications using the frozen secondary disks, the restart fails because of this inconsistency. For example, Customer Information Control System (CICS) require a cold start instead of an emergency restart, and transaction backout and handling of in-doubt transactions are not possible.

If **Release I/O after Suspend** has been selected for Metro Mirror sessions, the actions that are shown in Figure 21 on page 352 are required.

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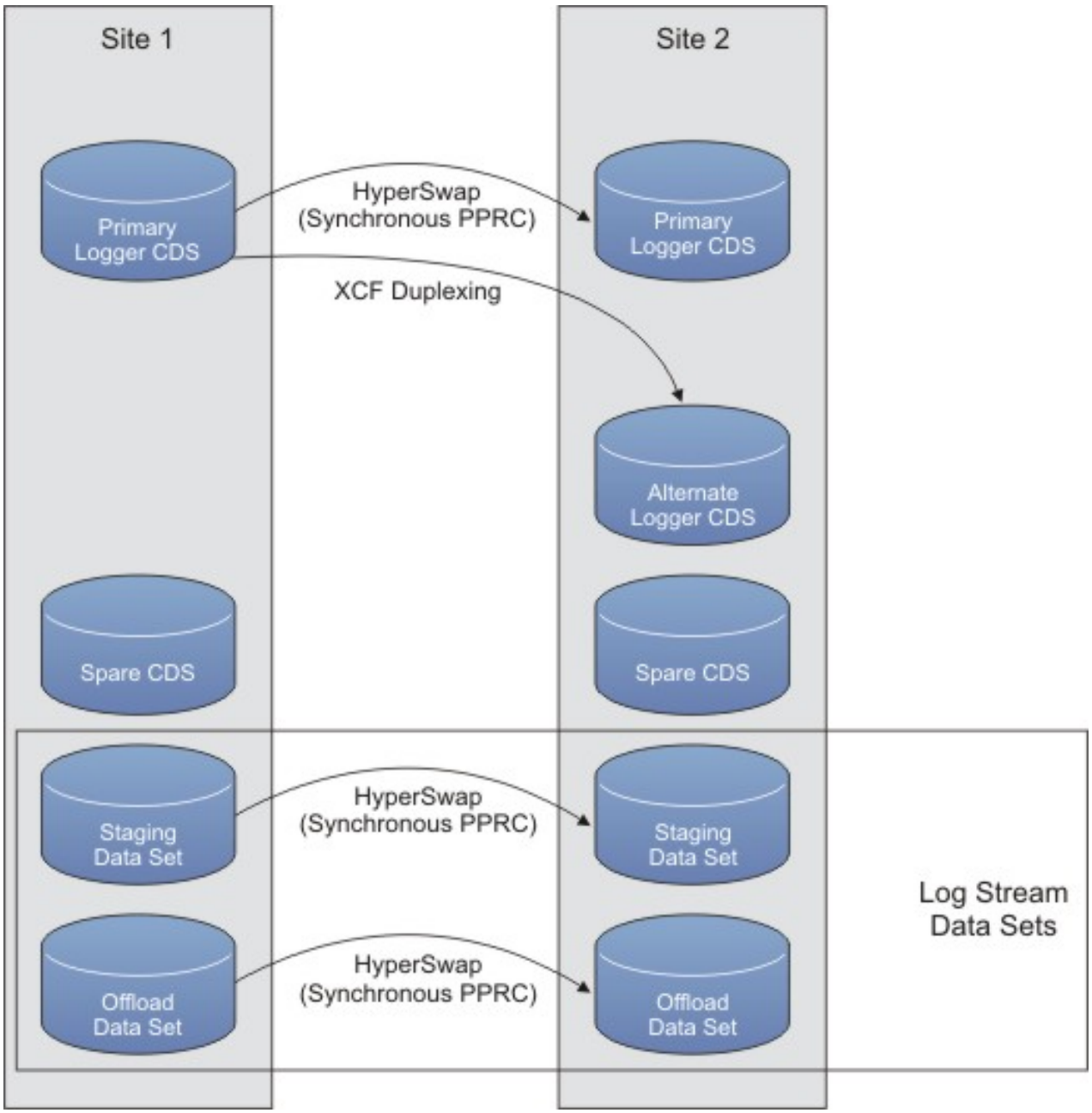

Figure 21. Planned swap

1. In the system logger policy, all CF log streams must be forced to duplex to staging data sets. The following data sets must be in the same Metro Mirror session:
   - Log stream staging data sets that are direct access storage device (DASD)-only
   - CF log stream data sets
   - All of the offload data sets for both types of log streams
2. Four system logger CDSs must be set up as follows:
   - The primary system logger CDS in Site 1 must be in the same Metro Mirror session.
   - The spare system logger CDS in Site 1 must not be in a Metro Mirror session.
   - The alternate system logger CDS in Site 2 must not be in a Metro Mirror session.
   - The spare system logger CDS in Site 2 must not be in a Metro Mirror session.

Set up all CDS types other than the system logger CDSs as required for Copy Services Manager. That is, the primary system logger CDS should be in Site 1 and the alternate system logger CDS in Site 2. There should be spare CDSs in both sites. The alternate and spare CDSs should be not be in a Metro Mirror session.

By following the preceding steps, the primary system logger CDS, CF log stream staging, and offload data sets are on volumes in the Metro Mirror session. If a freeze occurs, system logger data will be consistent on the secondary devices. If the reason for the freeze requires that you restart from the secondary devices, you can recover and use this frozen copy of the system logger environment.

Important: Ensure that no CF log streams remain allocated in any coupling facilities that the production systems have access to following a disaster. In this situation, recovery occurs from the mirrored copies of the data. If any log streams are allocated, you must force the connections and ensure the structure is deleted before restarting your production systems.

Reintroducing frozen system logger CDSs into your sysplex

In the event that CDSs become frozen, you can correct the issue that resulted in the freeze and re-introduce the CDS into your sysplex.

Reintroducing CDSs after an unplanned swap

After a suspend event, the secondary disks are frozen and you cannot access the disks. To recover at the secondary site, you must make the disks accessible by using IBM Copy Services Manager to initiate a recover. The Recover command performs the steps necessary to make the target available as the new primary site. Upon completion of this command, the session is in the Target Available state.

If the active Copy Services Manager server was located at Site 1, and the system the server was running on failed, you must use your standby server to recover. Issue the Takeover command, before initiating the Recover command.

When the session is in the Target Available state, the systems at Site 2 can be restarted using the Site 2 volumes.

Switching Disks Back to Site 1 After an Unplanned Failover to Site 2

To switch disks back to Site 1, see the information about switching from Site 2 to Site 1 in the following sections.

Reintroducing CDSs after a planned swap

Typically, you perform a planned switch from Site 1 to Site 2 for one of the following reasons:

- The Site 1 disk is temporarily unavailable because of a disruptive disk maintenance action.
- Site 1 is temporarily unavailable in its entirety because of a site maintenance activity.

In these situations, switch the disks to Site 2. When the Site 1 disk is available again, switch back to the Site 1 disk when you have the Site 2-to-Site 1 mirroring in full duplex.

Considerations for a Planned Metro Mirror Swap

When the system logger CDS is part of the Metro Mirror session and you plan to switch your primary disks from Site 1 to Site 2, you must complete the following tasks to release the allocation against the system logger CDS:

1. Switch to the system logger CDS that is not in the Metro Mirror session (that is, make the Site 2 alternate system logger CDS the new primary system logger CDS) by issuing the following command:

   ```
   SETXCF COUPLE,TYPE=LOGR,PSWITCH
   ```

2. Make the Site 2 spare CDS the new alternate data set by issuing the following command:

   ```
   SETXCF COUPLE,TYPE=LOGR,ACOUPLE=(spare cds in site 2)
   ```

When you switch back from Site 2 to Site 1, switch the Metro Mirror direction and then perform a CDS switch to return to the normal CDS configuration. After you switch the Metro Mirror session direction, perform the following actions to switch the CDS:

1. Make the primary at Site 1 the alternate by issuing the following command:

```
SETXCF COUPLE,TYPE=LOGR,ACOUPLE=(original primary cds in site 1)
```

2. Make the original primary the primary again using the following command:

```
SETXCF COUPLE,TYPE=LOGR,PSWITCH
```

3. Make the original alternate CDS at Site 2 the alternate again using the following command:

```
SETXCF COUPLE,TYPE=LOGR,ACOUPLE=(original alternate cds in site 2)
```

Considerations for Planned HyperSwap

If you are using Copy Services Manager planned HyperSwap capability and you have your system logger CDSs mirrored, when swapping disks from Site 1 to Site 2, switch your CDS configuration to use only Site 2 CDSs before running the SWAP command to perform the disk swap. When swapping back to the Site 1 disks, use the normal CDS configuration after the HyperSwap has completed successfully.

Appendix C. Accessibility features for IBM Copy Services Manager

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 Copy Services Manager:

- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Keys that are discernible by touch but do not activate just by touching them
- Industry-standard devices for ports and connectors
- The attachment of alternative input and output devices

Keyboard navigation

Use the following key combinations to navigate the interface by keyboard:

- To go directly to the topic pane, press Alt+K, and then press Tab.
- In the topic pane, to go to the next link, press Tab.
- To go directly to the Search Results view, press Alt+R, and then press the Enter or Up-Arrow key to enter the view.
- To go directly to the Navigation (Table of Contents) view, press Alt+C, and then press the Enter or Up-Arrow key to enter the view.
- To expand and collapse a node in the navigation tree, press the Right and Left-Arrow keys.
- To move to the next topic node, press the Down-Arrow or Tab key.
- To move to the previous topic node, press the Up-Arrow key or Shift+Tab.
- To go to the next link, button, or topic node from inside on of the views, press Tab.
- To scroll all the way up or down in a pane, press Home or End.
- To go back, press Alt+Left Arrow; to go forward, press Alt+Right Arrow.
- To go to the next pane, press F6.
- To move to the previous pane, press Shift+F6.
- To print the active pane, press Ctrl+P.

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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