IBM Tivoli Storage Productivity Center for Replication for System z

Version 5.1.1

User's Guide

SC27-4054-01

IBM Tivoli Storage Productivity Center for Replication for System z
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Note:
Before using this information and the product it supports, read the information in "Notices" on page 187.

This edition applies to version 5, release 1, modification 1 of IBM Tivoli Storage Productivity Center for Replication for System z (product numbers 5698-Z11 and 5698-Z12) and to all subsequent releases and modifications until otherwise indicated in new editions. This edition replaces SC27-4054-00.

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About this guide

This guide provides task-oriented administration and user information for IBM® Tivoli® Storage Productivity Center for Replication for System z®.

The Tivoli Storage Productivity Center for Replication for System z family of products consists of the following licenses:

- IBM Tivoli Storage Productivity Center for Replication for System z
- IBM Tivoli Storage Productivity Center for Replication Basic Edition for System z

Intended audience

This publication is for users of Tivoli Storage Productivity Center for Replication for System z.

Users should be familiar with the following topics:

- Tivoli Storage Productivity Center for Replication for System z copy services concepts
- General principles of AIX®, Linux, Windows, and the z/OS® operating systems
- Simple Network Management Protocol (SNMP) concepts
- Storage Area Network (SAN) concepts

Accessing the Tivoli Storage Productivity Center for Replication Information Center

This topic explains how to access the IBM Tivoli Storage Productivity Center for Replication Information Center.

You can access the information center in the following ways:

- On the publications CD, a readme.txt file describes how to start the information center depending on platform and mode.
- The Tivoli Storage Productivity Center for Replication graphical user interface includes a link to the information center.
- Go to the Web at http://publib.boulder.ibm.com/infocenter/tivihelp/v59r1/index.jsp .

Publications and related information for Tivoli Storage Productivity Center for Replication for System z publications

This section lists the publications in the Tivoli Storage Productivity Center for Replication library and other related publications.

Information Centers

You can browse product documentation in the IBM Tivoli Storage Productivity Center for Replication for System z Information Center at:

http://publib.boulder.ibm.com/infocenter/tivihelp/v59r1/index.jsp

Publications

The IBM Publications Center website offers customized search functions to help you find the publications that you need. Some publications are available for you to view or download free of charge. You can also order publications. The publications center displays prices in your local currency. You can access the IBM Publications Center on the web at www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss

The IBM Publications Center website also offers you a notification system for IBM publications. Register and you can create your own profile of publications that interest you. The publications notification system sends you a daily email that contains information about new or revised publications that are based on your profile. Access the publications notification system from the IBM Publications Center on the web at www.ibm.com/e-business/linkweb/publications/servlet/pbi.wss to subscribe.

The following publications make up the Tivoli Storage Productivity Center for Replication for System z library:

IBM Tivoli Storage Productivity Center for Replication for System z Installation and Configuration Guide
: This guide contains instructions for installing and configuring the product on z/OS.

Program Directory for IBM Tivoli Storage Productivity Center for Replication Basic Edition for System z
: This Program Directory includes installation instructions associated with IBM Tivoli Storage Productivity Center for Replication Basic Edition for System z.

Program Directory for IBM Tivoli Storage Productivity Center for Replication for System z
: This Program Directory presents information concerning the material and procedures associated with the installation of Tivoli Storage Productivity Center for Replication for System z.

Program Directory for IBM WebSphere® Application Server for z/OS V7.0
: This Program Directory presents information related to installing WebSphere Application Server for z/OS V7.0.

Program Directory for IBM WebSphere Application Server OEM Edition for z/OS V7.0
: This Program Directory presents information related to installing WebSphere Application Server OEM Edition for z/OS V7.0.

Program Directory for IBM WebSphere Application Server for z/OS V8.0
: This Program Directory presents information related to installing WebSphere Application Server for z/OS version 8.0.

IBM Tivoli Storage Productivity Center for Replication for System z User's Guide
: This guide contains task-oriented instructions for using the product graphical user interface (GUI) to manage copy services.

IBM Tivoli Storage Productivity Center for Replication for System z Command-Line Interface User's Guide
: This guide provides information about how to use the product command-line interface (CLI).

IBM Tivoli Storage Productivity Center for Replication for System z Problem Determination Guide
This guide assists administrators or users who are troubleshooting problems with the product.

WebSphere Application Server for z/OS product website
This website provides information about WebSphere Application Server for z/OS, including links to sources of related information such as Redbooks, white papers, and ebooks. To view the website, go to http://www-01.ibm.com/software/webservers/appserv/zos_os390/.

Redbooks and white papers

Performance Monitoring and Best Practices for WebSphere on z/OS
This IBM Redbooks® publication provides a structure that you can use to set up an environment that is tuned to meet best performance and catch eventual performance bottlenecks.

Web resources

There are multiple websites and information center topics that relate to Tivoli Storage Productivity Center for Replication.

Websites

- IBM Tivoli Storage Productivity Center Suite

  www-03.ibm.com/systems/storage/software/center/

  This website describes the feature, benefits, and specifications of Tivoli Storage Productivity Center and Tivoli Storage Productivity Center for Replication. It also provides links to product support, Redbooks and white papers, and other related information.
- Tivoli Storage Productivity Center Technical Support

  www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Productivity_Center

  This website provides links to downloads and documentation for all currently supported versions of Tivoli Storage Productivity Center and Tivoli Storage Productivity Center for Replication.
- IBM WebSphere Application Server

  www.ibm.com/software/webservers/appserv/was/

  This website describes the WebSphere Application Server offerings and provides links for downloading a trial version, purchasing WebSphere Application Server, and viewing online publications and demos.
- IBM DB2 Software

  www.ibm.com/software/data/db2/

  This website describes the DB2 offerings and provides links for downloading a trial version, purchasing DB2, and viewing analyst reports, online publications, and demos.
- IBM System Storage® Disk Systems

  www.ibm.com/servers/storage/disk/

  This website provides links to learn more about the IBM System Storage disk systems products and offerings, including DS6000™ and DS8000®. It also provides links for viewing support and services, software and solutions, and other resources.
- IBM System Storage SAN Volume Controller

www.ibm.com/servers/storage/software/virtualization/svc/index.html

This website describes the SAN Volume Controller offering and provides links for requesting a quote for and purchasing SAN Volume Controller and viewing online publications, white papers, and case studies.

- IBM Storwize V3700

  www.ibm.com/systems/storage/disk/storwize_v3700/index.html

  This website describes the Storwize® V3700 offering and provides links for requesting a quote and viewing online publications and white papers.

- IBM Storwize V7000 and IBM Storwize V7000 Unified

  www.ibm.com/systems/storage/disk/storwize_v7000/index.html

  This website describes the Storwize V7000 and Storwize V7000 Unified offerings and provides links for requesting a quote and viewing online publications and white papers.

- IBM XIV Storage System

  www.ibm.com/systems/storage/disk/xiv

  This website describes the XIV® system offering and provides links for requesting a quote for an XIV system and viewing online publications, white papers, and demos.

- System z (and z/OS)

  www.ibm.com/systems/z/

  This website provides links to learn more about IBM System z offerings and software. It also includes information about upcoming webcasts, blogs, and demos.

Forums

- Tivoli Forums

  www.ibm.com/developerworks/forums/tivoli_forums.jspa

  This website provides a forum that you can use to discuss issues pertaining to Tivoli Storage Productivity Center, Tivoli Storage Productivity Center for Replication, and other Tivoli products. This website includes a link for obtaining the forum using a Rich Site Summary (RSS) feed.

- Technical Exchange Webcasts

  www-01.ibm.com/software/sysmgmt/products/support/supp_tech_exch.html

  This website provides webcasts in which technical experts share their knowledge and answer your questions. Visit this site often to see upcoming topics and presenters or to listen to previous webcasts.

Providing feedback about publications

Your feedback is important to help IBM provide the highest quality information. You can provide comments or suggestions about the documentation from the IBM Tivoli Storage Productivity Center for Replication Information Center.

Go to the information center at http://publib.boulder.ibm.com/infocenter/tivihelp/v59r1/index.jsp and click **Feedback** at the bottom of the information center Welcome page or topic pages.

New for Tivoli Storage Productivity Center for Replication for System z Version 5.1.1

Use this information to learn about new features and enhancements in IBM Tivoli Storage Productivity Center for Replication for System z Version 5.1.1. This information highlights the changes since the last release of Tivoli Storage Productivity Center for Replication for System z

Storwize V3500 and Storwize V3700 data replication

Tivoli Storage Productivity Center for Replication for System z 5.1.1 provides replication management for the IBM Storwize V3500 and IBM Storwize V3700 storage systems. These virtualized storage systems are the newest additions to the IBM Storwize family of disk systems.

For more information about these storage systems, go to the following information centers:

- Storwize V3500 http://pic.dhe.ibm.com/infocenter/storwize/v3500_ic/index.jsp
- Storwize V3700 http://pic.dhe.ibm.com/infocenter/storwize/v3700_ic/index.jsp

Support for the SAN Volume Controller 6.4 option to move volumes between I/O groups

To support this new IBM System Storage SAN Volume Controller feature, Tivoli Storage Productivity Center for Replication for System z includes the following changes:

- The I/O group was removed from the volume ID.
- The volume ID or the volume name can be used as a CLI command volume parameter for SAN Volume Controller, Storwize V3500, Storwize V3700, IBM Storwize V7000, and IBM Storwize V7000 Unified storage systems. The following CLI commands were updated to reflect this change:
  - **chvollspair**
  - **lscpset**
  - **lsvol**
  - **mkcpset** (where applicable for the specific volume parameter)
  - **importcsv**
  - **exportcsv**
  - **rmcpset**
  - **showcpset**

For more information, go to the Tivoli Storage Productivity Center for Replication for System z information center at http://publib.boulder.ibm.com/infocenter/tivihelp/v59r1/index.jsp and search by the command name.

HyperSwap® options available for Metro Global Mirror with Practice sessions

The session properties for Metro Global Mirror with Practice sessions include the same HyperSwap options that are available for Metro Global Mirror sessions.

For more information, see "Metro Global Mirror with Practice session properties" on page 164.

System Storage DS8000 consistency groups created for FlashCopy sessions
For FlashCopy sessions, Tivoli Storage Productivity Center for Replication for System z creates FlashCopy consistency groups in IBM System Storage DS8000. The consistency groups are created automatically during the creation of the FlashCopy session and no user input is required.

New for Tivoli Storage Productivity Center for Replication for System z Version 5.1

Use this information to learn about new features and enhancements in IBM Tivoli Storage Productivity Center for Replication for System z Version 5.1. This information highlights the changes since the last release of Tivoli Storage Productivity Center for Replication for System z

WebSphere Application Server for z/OS versions 7.0 and 8.0
Tivoli Storage Productivity Center for Replication for System z version 5.1 requires one of the following versions of IBM WebSphere Application Server for z/OS:

- WebSphere Application Server OEM Edition for z/OS version 7.0
- WebSphere Application Server for z/OS version 7.0
- WebSphere Application Server for z/OS version 8.0

Failover operations that are managed by other applications
Applications such as the IBM Series i Toolkit, VMware Site Recovery Manager, and Veritas Cluster Server manage failover operations for certain session types and storage systems. If an application completes a failover operation for a session, the Severe status is displayed for the session and an error message is generated for the role pairs for which the failover occurred.

For more information, see "Failover and failback operations" on page 65.

Additional support for space-efficient volumes in remote copy Tivoli Storage Productivity Center for Replication for System z sessions
You can use extent space-efficient volumes as copy set volumes for the following IBM System Storage DS8000 session types:

- FlashCopy® (System Storage DS8000 6.2 or later)
- Metro Mirror (System Storage DS8000 6.3 or later)
- Global Mirror or Metro Global Mirror (System Storage DS8000 6.3 or later)

For more information, see "Copy sets" on page 59.

New features
The following features are new for Tivoli Storage Productivity Center for Replication for System z version 5.1.

Reflash After Recover option for Global Mirror Failover/Failback with Practice sessions
You can use the **Reflash After Recover** option with System Storage DS8000 version 4.2 or later. Use this option to create a FlashCopy replication between the I2 and J2 volumes after the recovery of a Global Mirror Failover/Failback with Practice session. If you do not use this option, a FlashCopy replication is created only between the I2 and H2 volumes.

For more information, see “Global Mirror Failover/Failback with Practice session properties” on page 158.

No Copy option for Global Mirror with Practice and Metro Global Mirror with Practice sessions

You can use the **No Copy** option with System Storage DS8000 version 4.2 or later. Use 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 I2 volume until the blocks or tracks of the H2 volume are modified.

For more information, see “Global Mirror Failover/Failback with Practice session properties” on page 158 and “Metro Global Mirror with Practice session properties” on page 164.

Recovery Point Objective Alerts option for Global Mirror sessions

You can use the **Recovery Point Objective Alerts** option with IBM TotalStorage Enterprise Storage Server® Model 800, System Storage DS8000, and System Storage DS6000. Use this option to 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 in the event of a disaster.

For more information, see “Global Mirror Single Direction and Failover/Failback session properties” on page 157, “Global Mirror Either Direction with Two-Site Practice session properties” on page 159, “Global Mirror Failover/Failback with Practice session properties” on page 158, “Metro Global Mirror session properties” on page 160, and “Metro Global Mirror with Practice session properties” on page 164.

Enable Hardened Freeze option for Metro Mirror sessions

You can use the **Enable Hardened Freeze** option with TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000. Use this option to enable the z/OS Input/Output Supervisor (IOS) to manage freeze operations. This option is enabled by default.

For more information, see “Metro Mirror Single Direction session properties” on page 149, “Metro Mirror Failover/Failback session properties” on page 151, “Metro Mirror Failover/Failback with Practice session properties” on page 154, “Metro Global Mirror session properties” on page 160, and “Metro Global Mirror with Practice session properties” on page 164.

StartGC H1->H2 command for Global Mirror sessions

You can use the StartGC H1->H2 command with TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000. This command establishes Global Copy relationships between site 1 and site 2, and begins asynchronous data replication from H1 to H2.

For more information, see “Session commands” on page 99.

Export Global Mirror Data command for Global Mirror role pairs

You can use this option to export data for a Global Mirror role pair that is in a 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).

For more information, see "Exporting historical data for Global Mirror role pairs" on page 128.

New chsess command parameters

The command-line interface command **chsess** has new parameters:

- **-reflash**
- **-dsRPOwarning**
- **-dsRPOsevere**
- **-enableHardenedFreeze**

For more information, go to the Tivoli Storage Productivity Center for Replication for System z information center at http://publib.boulder.ibm.com/infocenter/tivihelp/v59r1/index.jsp and search for *chsess*.

Chapter 1. Product overview

IBM Tivoli Storage Productivity Center for Replication for System z manages copy services in storage environments. *Copy services* are features that are used by storage systems such as IBM System Storage DS8000 to configure, manage, and monitor data-copy functions. Copy services include IBM FlashCopy, Metro Mirror, Global Mirror, and Metro Global Mirror.

Tivoli Storage Productivity Center for Replication for System z runs on System z using a Fibre Channel connection (FICON®) and TCP/IP communications to connect to and manage storage systems regardless of whether the type of data on the system is extended count key data (ECKD™) or fixed-block architecture (FBA).

You can use Tivoli Storage Productivity Center for Replication for System z to complete the following data replication tasks:

- Plan for replication when provisioning storage
- Keep data on multiple related volumes consistent across storage systems in a planned or unplanned outage
- Monitor and track replication operations
- Automate the mapping of source volumes to target volumes
- Reduce downtime of critical applications

Introducing Tivoli Storage Productivity Center for Replication for System z

The Tivoli Storage Productivity Center for Replication for System z family of products consists of the following products: Tivoli Storage Productivity Center for Replication Basic Edition for System z and Tivoli Storage Productivity Center for Replication for System z.

Tivoli Storage Productivity Center for Replication Basic Edition for System z provides high availability for a single site if a disk storage system failure occurs.

Tivoli Storage Productivity Center for Replication for System z provides high availability and disaster recovery for multiple sites.

Tivoli Storage Productivity Center for Replication Basic Edition for System z

Tivoli Storage Productivity Center for Replication Basic Edition for System z provides copy services management for the storage systems and session types that are listed in the following table. You can use only two session types with Tivoli Storage Productivity Center for Replication Basic Edition for System z, whereas Tivoli Storage Productivity Center for Replication for System z uses various session types and has a wider range of features.

Storage system	Session type
System Storage DS8000	• Basic HyperSwap • FlashCopy

Storage system	Session type
System Storage DS6000	• Basic HyperSwap • FlashCopy
TotalStorage Enterprise Storage Server Model 800	• Basic HyperSwap • FlashCopy
SAN Volume Controller	• FlashCopy
Storwize V3500	• FlashCopy
Storwize V3700	• FlashCopy
Storwize V7000	• FlashCopy
Storwize V7000 Unified	• FlashCopy
The XIV system	• Snapshot

Tivoli Storage Productivity Center for Replication for System z

Tivoli Storage Productivity Center for Replication for System z provides copy services management for the storage systems and session types that are listed in the following table.

Storage system	Session type
System Storage DS8000	• Basic HyperSwap • FlashCopy • Metro Mirror Single Direction • Metro Mirror Failover/Failback • Metro Mirror Failover/Failback with Practice • Global Mirror Single Direction • Global Mirror Either Direction with Two-Site Practice • Global Mirror Failover/Failback • Global Mirror Failover/Failback with Practice • Metro Global Mirror • Metro Global Mirror with Practice
System Storage DS6000	• Basic HyperSwap • FlashCopy • Metro Mirror Single Direction • Metro Mirror Failover/Failback • Metro Mirror Failover/Failback with Practice • Global Mirror Single Direction • Global Mirror Either Direction with Two-Site Practice • Global Mirror Failover/Failback • Global Mirror Failover/Failback with Practice

Storage system	Session type
TotalStorage Enterprise Storage Server Model 800	• Basic HyperSwap • FlashCopy • Metro Mirror Single Direction • Metro Mirror Failover/Failback • Metro Mirror Failover/Failback with Practice • Global Mirror Single Direction • Global Mirror Either Direction with Two-Site Practice • Global Mirror Failover/Failback • Global Mirror Failover/Failback with Practice • Metro Global Mirror (only H1 site) • Metro Global Mirror with Practice (only H1 site)
SAN Volume Controller	• FlashCopy • Metro Mirror Single Direction • Metro Mirror Failover/Failback • Metro Mirror Failover/Failback with Practice • Global Mirror Single Direction • Global Mirror Failover/Failback • Global Mirror Failover/Failback with Practice
Storwize V3500	• FlashCopy
Storwize V3700	• FlashCopy
Storwize V7000	• FlashCopy • Metro Mirror Single Direction • Metro Mirror Failover/Failback • Metro Mirror Failover/Failback with Practice • Global Mirror Single Direction • Global Mirror Failover/Failback • Global Mirror Failover/Failback with Practice
Storwize V7000 Unified	• FlashCopy • Metro Mirror Single Direction • Metro Mirror Failover/Failback • Metro Mirror Failover/Failback with Practice • Global Mirror Single Direction • Global Mirror Failover/Failback • Global Mirror Failover/Failback with Practice
The XIV system	• Snapshot • Metro Mirror Failover/Failback • Global Mirror Failover/Failback

Architecture

Tivoli Storage Productivity Center for Replication for System z consists of several key components.

Tivoli Storage Productivity Center for Replication for System z server
The Tivoli Storage Productivity Center for Replication for System z server

is the control point for the sessions, storage systems, hosts, and other components that are managed by Tivoli Storage Productivity Center for Replication for System z.

Database
A single database instance serves as the repository for all Tivoli Storage Productivity Center for Replication for System z data.

An embedded database is provided with Tivoli Storage Productivity Center for Replication for System z.

GUI The graphical user interface (GUI) is used to manage all Tivoli Storage Productivity Center for Replication for System z functions.

CLI The command-line interface (CLI) is used to issue commands for key Tivoli Storage Productivity Center for Replication for System z functions.

Interfaces for Tivoli Storage Productivity Center for Replication for System z

Tivoli Storage Productivity Center for Replication for System z provides a graphical user interface (GUI) and a command-line interface (CLI) for managing data replication and disaster recovery.

Graphical user interface

The Tivoli Storage Productivity Center for Replication for System z GUI contains the following features:

Navigation tree
The navigation tree provides categories of tasks that you can complete in Tivoli Storage Productivity Center for Replication. Clicking a task opens a main page in the content panel.

Health Overview
The **Health Overview** area is under the navigation tree and shows a status summary for all sessions, storage systems, host systems, and management servers that Tivoli Storage Productivity Center for Replication for System z is managing.

Content area
The content panel displays content based on the item that you selected in the navigation tree.

You can view help for the currently displayed panel by clicking the **?** icon.

You can view the information center by clicking the **i** icon. You must have Internet access to view the information center.

When you log on to the GUI, the **Health Overview** panel is displayed in the content area.

Command-line interface

You can use the Tivoli Storage Productivity Center for Replication for System z CLI by using the **csmcli** utilities. You can use the CLI directly or as a script for automating functions.

For security, the CLI runs only on the Tivoli Storage Productivity Center for Replication for System z management server. You can run the CLI remotely using a remote-access utility, such as Secure Shell (SSH) or Telnet.

For Tivoli Storage Productivity Center for Replication on Windows, you can specify remote access to Linux or AIX terminals if you enabled Telnet on your Windows server.

Key concepts

This section describes key concepts to help you understand and effectively use IBM Tivoli Storage Productivity Center for Replication.

Management server

The *management server* is a server that has Tivoli Storage Productivity Center for Replication 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 29.

Storage systems

A *storage system* is a hardware device that contains data storage. Tivoli Storage Productivity Center for Replication can control data replication within and between various storage systems.

To replicate data among storage systems using Tivoli Storage Productivity Center for Replication, you must manually add a connection to each storage system in the Tivoli Storage Productivity Center for Replication configuration.

For more information about the storage systems that you can use with Tivoli Storage Productivity Center for Replication, see "Storage systems" on page 39.

Ports

Tivoli Storage Productivity Center for Replication uses ports for communication with the management servers in a high-availability relationship, graphical user interface (GUI), command-line interface (CLI), and storage systems.

Tivoli Storage Productivity Center for Replication

Port numbers are defined during the installation of Tivoli Storage Productivity Center for Replication. To determine the port number for the ports that are used for Tivoli Storage Productivity Center for Replication, refer to the following table.

Table 1. Where to find Tivoli Storage Productivity Center for Replication port numbers

Tivoli Storage Productivity Center for Replication component	**Location of port information**
Web browser	To view the port number for the Web browser, open the *WAS_HOME*/profiles/default/properties/portdef.props file. The ports are defined by the following properties in the file: • WC_defaulthost (HTTP port) • WC_defaulthost_secure (HTTPS port)

Table 1. Where to find Tivoli Storage Productivity Center for Replication port numbers (continued)

Tivoli Storage Productivity Center for Replication component	Location of port information
Standby management server	To view the port number for each management server, click **Management Servers** in the navigation panel of the Tivoli Storage Productivity Center for Replication GUI. You can also run the **lshaservers** command from the command-line interface to view the ports for the management servers. **Important:** The standby management server port number must be the same on both the management server and the standby management server in a high-availability relationship. If you change the standby management server port number on either the management server or the standby management server, you must also change the port number on the other server.
Client and CLI port	To view the port number for the client, click **About** in the navigation panel of the Tivoli Storage Productivity Center for Replication GUI. You can also run the **whoami** command from the command-line interface to view the port for the client. **Important:** The client port number must be the same on both the management server and the standby management server in a high-availability relationship. If you change the client port number on either the management server or the standby management server, you must also change the port number on the other server.

Storage system ports

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

Table 2. Storage system default ports

Storage System	Connection Type	Port
• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000	Direct Connection	2433
• System Storage DS8000	Hardware Management Console Connection	1750
• SAN Volume Controller • Storwize V3500 • Storwize V3700 • Storwize V7000 • Storwize V7000 Unified	Direct Connection	443 and 22

Table 2. Storage system default ports (continued)

Storage System	Connection Type	Port
• The XIV system	Direct Connection	7778

Ensure that your network configuration is set up so that Tivoli Storage Productivity Center can send outgoing TCP/IP packets to the storage controllers. It is possible when adding the storage controllers to Tivoli Storage Productivity Center to set a specific port number for your storage controller.

Because there are typically multiple applications running on the management server, it is possible that port conflicts might arise if other applications attempt to use the same ports that IBM Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication configuration, the port field is automatically populated with the appropriate value.

If firewalls are being used in your configuration, ensure that none of these ports are being blocked. Also ensure that not only is the Tivoli Storage Productivity Center for Replication server granted access to reach the other components, but that the other components are granted access to reach the Tivoli Storage Productivity Center for Replication server.

Storage connections

You must create a connection from the Tivoli Storage Productivity Center for Replication management server to each storage system. You can connect either directly or through a Hardware Management Console (HMC) or IBM z/OS connection.

A single storage system can be connected using multiple connections for redundancy. For example, you can connect an IBM System Storage DS8000 storage system by using an HMC connection and a z/OS connection. Tivoli Storage Productivity Center for Replication monitors how a storage system has been added to the configuration.

For more information about connecting to a storage system, see "Storage connections" on page 40.

Related concepts:

"Direct connection" on page 41
By using a TCP/IP connection, the Tivoli Storage Productivity Center for Replication 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.

"Hardware Management Console connection" on page 42
The IBM Tivoli Storage Productivity Center for Replication management server can connect to DS8000 storage systems through a Hardware Management Console (HMC). An HMC can have multiple DS8000 storage systems connected to it. When you add an HMC to the IBM Tivoli Storage Productivity Center for Replication 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.

"Storage connections" on page 40
You must create a connection from the IBM Tivoli Storage Productivity Center for Replication management server to each storage system. You can connect either directly or through a Hardware Management Console (HMC) or IBM z/OS connection.

Sessions

A *session* is used to complete a specific type of data replication against a specific set of volumes. The type of data replication 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 59.

The following concepts and components are related to sessions.

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 59.

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 the primary site.

For more information about volume roles, see "Volume roles" on page 63.

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 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 64.

Practice volumes

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, and Metro 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 64.

Consistency groups

For Global Mirror and Metro Global Mirror sessions, Tivoli Storage Productivity Center for Replication manages the consistency of dependant 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 were updated to preserve write order and are recoverable.

For more information about consistency groups, see "Consistency groups" on page 65.

Failover and failback operations

If a session has *failover* and *failback* capabilities, you can move the operation of Tivoli Storage Productivity Center for Replication 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 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 65.

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 99.

Session Types

Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center or Tivoli Storage Productivity Center for Replication that you are using as shown in this topic.

Basic HyperSwap

Basic HyperSwap is a copy services solution for IBM z/OS version 1.9 and later. Basic HyperSwap provides high availability of data if a storage system failure occurs.

The Basic HyperSwap session type enables Tivoli Storage Productivity Center for Replication to manage Basic HyperSwap by using Metro Mirror or Metro Global Mirror replication.

For more information about the Basic HyperSwap session type, see "Basic HyperSwap (ESS, DS6000, and DS8000)" on page 73.

Basic HyperSwap sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 3. Basic HyperSwap

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication Basic Edition for System z • Tivoli Storage Productivity Center for Replication for System z	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000

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.

For more information about the FlashCopy session type, see "FlashCopy" on page 74.

FlashCopy sessions are available for the following Tivoli Storage Productivity Center and Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 4. FlashCopy

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication Basic Edition for System z • Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V3500 • Storwize V3700 • Storwize V7000 • Storwize V7000 Unified

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.

For more information about the Snapshot session type, see "Snapshot" on page 75.

Snapshot sessions are available for the following Tivoli Storage Productivity Center and Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 5. Snapshot

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication Basic Edition for System z • Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	The XIV system

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.

For more information about the Metro Mirror Single Direction session type, see "Metro Mirror" on page 76.

Metro Mirror Single Direction sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 6. Metro Mirror Single Direction

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

Metro Mirror Failover/Failback

Metro Mirror Failover/Failback replication enables you to 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.

For more information about the Metro Mirror Failover/Failback session type, see "Metro Mirror" on page 76.

Metro Mirror Failover/Failback sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 7. Metro Mirror Failover/Failback

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified • The XIV system

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.

For more information about the Metro Mirror Failover/Failback with Practice session type, see "Metro Mirror" on page 76.

Metro Mirror Failover/Failback with Practice sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 8. Metro Mirror Failover/Failback with Practice

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

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.

For more information about the Global Mirror Single Direction session type, see "Global Mirror" on page 82.

Global Mirror Single Direction sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 9. Global Mirror Single Direction

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

Global Mirror Either Direction with Two-Site Practice

Global 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.

For more information about the Global Mirror Either Direction with Two-Site Practice session type, see "Global Mirror" on page 82.

Global Mirror Either Direction with Two-Site Practice sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 10. Global Mirror Either Direction with Two-Site Practice

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000

Global Mirror Failover/Failback

Global Mirror Failover/Failback replication enables you to 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 Tivoli Storage Productivity Center for Replication editions and storage systems. For more information about this session type, see "Global Mirror" on page 82.

Table 11. Global Mirror Failover/Failback

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified • The XIV system

Global Mirror Failover/Failback with Practice

Global Mirror Failover/Failback with Practice 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 more information about the Global Mirror Failover/Failback with Practice session type, see "Global Mirror" on page 82.

Global Mirror Failover/Failback with Practice sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 12. Global Mirror Failover/Failback with Practice

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

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.

Metro Global Mirror replication enables you to switch the direction of the data flow so that you can use your secondary or tertiary site as your production site.

For more information about the Metro Global Mirror session type, see "Metro Global Mirror (ESS and DS8000)" on page 86.

Metro Global Mirror sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 13. Metro Global Mirror

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 (only H1 site) • System Storage DS8000

Metro Global Mirror with Practice

Metro Global Mirror with Practice 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.

For more information about the Metro Global Mirror with Practice session type, see "Metro Global Mirror (ESS and DS8000)" on page 86.

Metro Global Mirror with Practice sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 14. Metro Global Mirror with Practice

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 (only H1 site) • System Storage DS8000

Metro Mirror heartbeat

The Metro Mirror *heartbeat* guarantees data consistency across multiple storage systems when the IBM Tivoli Storage Productivity Center for Replication 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 124.

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 44.

Users and groups

For authentication and authorization, Tivoli Storage Productivity Center for Replication uses users and groups that are defined in a configured user registry on the management server, which is associated with either the local operating system or a Lightweight Directory Access Protocol (LDAP) server.

Tivoli Storage Productivity Center for Replication does not provide the capability to create, update, or delete users or groups in the user registry. To manage users or groups, you must use the appropriate tool associated with the user registry in which the users and groups are stored.

For more information users and groups, see "Users and groups" on page 173.

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.

IBM Tivoli Storage Productivity Center for Replication provides the following predefined user roles: monitor, session operator, and administrator.

For more information users roles, see "User roles" on page 174.

Planning for Open HyperSwap replication

Open HyperSwap replication is a special Metro Mirror replication method designed to automatically failover I/O from the primary logical devices to the secondary logical devices in the event of a primary disk storage system failure. This function can be done with minimal disruption to the applications that are using the logical devices.

Overview

Open HyperSwap replication applies to both planned and unplanned replication sessions. When a session has Open HyperSwap enabled, an I/O error on the primary site automatically causes the I/O to switch to the secondary site without any user interaction and with minimal application impact. In addition, while Open HyperSwap is enabled, the Metro Mirror session supports disaster recovery. If a

write is successful on the primary site but is unable to get replicated on the secondary site, IBM Tivoli Storage Productivity Center for Replication suspends the entire set of data consistency checking, thus ensuring that a consistent copy of the data exists on the secondary site. If the system fails, this data might not be the latest data, but the data should be consistent and allow the user to manually switch host servers to the secondary site.

You can control Open HyperSwap from any system running IBM Tivoli Storage Productivity Center for Replication (AIX, Windows, Linux, or z/OS). However, the volumes that are involved with Open HyperSwap must be attached to an AIX system. The AIX system is then connected to Tivoli Storage Productivity Center for Replication.

Software and hardware requirements

There are several requirements for Open HyperSwap support:

AIX requirements

Open HyperSwap support requires AIX version 5.3 or 6.1. (You can find the supported AIX version for each Tivoli Storage Productivity Center for Replication release in the support matrix at http://www.ibm.com/support/docview.wss?rs=40&context=SSBSEX&context=SSMN28&context=SSMMUP&context=SS8JB5&context=SS8JFM&uid=swg21386446&loc=en_US&cs=utf-8&lang=en. Click the link for the applicable release under Agents, Servers and GUI.)

You must have the following AIX modules installed:

- Subsystem Device Driver Path Control Module (SDDPCM) version 3.0.0.0 or later
- Multi-Path Input/Output (MPIO) module (the version that is provided with AIX version 5.3 or 6.1)

DS8000 hardware requirements

Only DS8000 storage systems are supported. Open HyperSwap requires DS8000 5.1 or later.

Note: Open HyperSwap does not support PowerHA® (previously known as High Availability Cluster Multi-processing (HACMP™)).

General tasks

Before you can use Open HyperSwap, you must set up your environment for this function. The general steps are:

1. Prepare the AIX system for Open HyperSwap. Use the AIX configuration manager (**cfgmgr**) to identify all volumes that are involved with the Open HyperSwap session.
2. Set up the host connection of Tivoli Storage Productivity Center for Replication to the AIX system. Use the Tivoli Storage Productivity Center for Replication user interface to manually set up the connection to the AIX system. Use the Host Systems page to enter the IP address and port number for the AIX system.
3. Set up the Tivoli Storage Productivity Center for Replication Metro Mirror Failover/Failback session, selecting the function **Manage H1-H2 with Open HyperSwap**.
4. Add the copy sets to the session where all the volumes in the copy sets are volumes that are on the AIX system that is connected to Tivoli Storage Productivity Center for Replication.

5. You can now start your Open HyperSwap session the same as other sessions.

Chapter 2. Administering

Administer IBM Tivoli Storage Productivity Center for Replication to authorize users, start and use the graphical user interface (GUI), start and stop services, and many other administrative tasks.

Starting and stopping Tivoli Storage Productivity Center for Replication

Use these procedures to start and stop Tivoli Storage Productivity Center for Replication, including the embedded WebSphere Application Server and DB2®.

Starting Tivoli Storage Productivity Center for Replication

To start IBM Tivoli Storage Productivity Center for Replication, the embedded IBM WebSphere Application Server instance must be started. WebSphere Application Server is started by default after Tivoli Storage Productivity Center for Replication is installed.

This topic contains references to *WAS_HOME*, which refers to the path for the Tivoli Storage Productivity Center for Replication `ewas` directory. The path depends on the operating system and the location of the Tivoli Storage Productivity Center for Replication installation. The default path for Windows operating systems is `C:\Program Files\IBM\TPC\ewas`. The default path for AIX and UNIX operating systems is `opt/IBM/TPC/ewas`.

Starting Tivoli Storage Productivity Center for Replication on Windows

You can start Tivoli Storage Productivity Center for Replication from the desktop or from the command line.

From the desktop, start the WebSphere Application Server service by using the Windows **Services** interface.

From the command line, issue the following command:

```
WAS_HOME/profiles/ReplicationServerProfile/bin/
startServer.bat ReplicationServer
```

Starting Tivoli Storage Productivity Center for Replication on AIX or Linux

To start Tivoli Storage Productivity Center for Replication, issue the following command from the command line:

```
WAS_HOME/profiles/ReplicationServerProfile/bin/
startServer.sh –username user_name –password password ReplicationServer
```

Where *user_name* and *password* are your WebSphere Application Server user name and password.

Starting Tivoli Storage Productivity Center for Replication on z/OS

If you use IBM WebSphere Application Server OEM Edition for z/OS with IBM Tivoli Storage Productivity Center for Replication for System z, see the *IBM*

WebSphere Application Server OEM Edition for z/OS Configuration Guide to start Tivoli Storage Productivity Center for Replication for System z.

If you use WebSphere Application Server for z/OS, complete the following steps to start Tivoli Storage Productivity Center for Replication for System z:

1. Ensure that the WebSphere Application Server hierarchical file system (HFS), IBM DB2 HFS, and Tivoli Storage Productivity Center for Replication for System z HFS are all mounted on the UNIX System Services. The root installation directory for Tivoli Storage Productivity Center for Replication for System z is *path_prefix*/usr/lpp/Tivoli/RM. The root production directory is *path_prefix*/opt/lpp/Tivoli/RM.
2. Obtain the symbolic link for the was.env file. The symbolic link is in the format *cell_short_name.node_short_name.server_short_name*. For example, SYS7.SYS7.BBOS001. To get the symbolic link, complete the following steps:
   a. Issue the **TSO ISH** command to start the Interactive System Productivity Facility (ISPF) shell.
   b. Enter the path for the was.env file. For example, *path_prefix*/zWebSphere/*version*/config1.
   c. Find the symbolic link to the was.env file. This is the value that is required for the **ENV** parameter in the following step.
3. Issue the command from the IBM z/OS System Display and Search Facility (SDSF) panel to start the WebSphere Application Server, as shown in the following example. The address spaces that are shown might be different in your environment.

   ```
   /START BBO6ACR,JOBNAME=BBOS001,ENV=was.env_symbolic_link
   ```

   The initiator is BB06ACR, and the job name is BBOS001. When you start the BB06ACR address space, the BBODMNB address space also starts.

Stopping Tivoli Storage Productivity Center for Replication

To stop IBM Tivoli Storage Productivity Center for Replication, you must stop the embedded IBM WebSphere Application Server instance.

This topic contains references to *WAS_HOME*, which refers to the path for the Tivoli Storage Productivity Center for Replication ewas directory. The path depends on the operating system and the location of the Tivoli Storage Productivity Center for Replication installation. The default path for Windows operating systems is C:\Program Files\IBM\TPC\ewas. The default path for AIX and UNIX operating systems is opt/IBM/TPC/ewas.

Stopping Tivoli Storage Productivity Center for Replication on Windows

You can stop Tivoli Storage Productivity Center for Replication from the desktop or from the command line.

From the desktop, stop the WebSphere Application Server service from the Windows **Services** interface.

From the command line, issue the following command:

```
WAS_HOME/profiles/ReplicationServerProfile/bin/
stopServer.bat ReplicationServer
```

Stopping Tivoli Storage Productivity Center for Replication on AIX or Linux

To stop Tivoli Storage Productivity Center for Replication, issue the following command from the command line:

```
WAS_HOME/profiles/ReplicationServerProfile/bin/
stopServer.sh –username user_name –password password ReplicationServer
```

Where *user_name* and *password* are your WebSphere Application Server user name and password.

Stopping Tivoli Storage Productivity Center for Replication on z/OS

If you use IBM WebSphere Application Server OEM Edition for z/OS with IBM Tivoli Storage Productivity Center for Replication for System z, see the *IBM WebSphere Application Server OEM Edition for z/OS Configuration Guide* to stop Tivoli Storage Productivity Center for Replication for System z.

If you use WebSphere Application Server for z/OS, complete the following steps to stop Tivoli Storage Productivity Center for Replication for System z:

1. Issue commands from the IBM z/OS System Display and Search Facility (SDSF) panel to stop the WebSphere Application Server for z/OS daemon, as shown in the following example commands. The address spaces that are shown might be different in your environment.

   /STOP BBOS001

   /STOP BBODMNB

   Where **/STOP BBOS001** stops the server address space and **/STOP BBODMNB** stops the WebSphere Application Server for z/OS daemon address space.
2. Issue the **/D A,L** command to display the processes that are running and verify that the stop command completed. If the BBOS001 or BBODMNB address spaces are displayed, issue the **/CANCEL** command for each address space.

Starting and stopping DB2

Use the DB2 Command Line Processor to start and stop DB2.

Note: If you are using the zero administration embedded repository (Apache Derby), you do not need to start or stop the repository.

To start DB2, run the **db2start** command from the DB2 Command Line Processor.

To stop DB2, run the **db2stop** command from the DB2 Command Line Processor.

Important: All connections to DB2 must be removed, or the **db2stop** command will fail. It is recommended that you stop the embedded IBM WebSphere Application Server, IBM Tivoli Storage Productivity Center for Replication, and all other applications accessing DB2 to ensure there are no connections to DB2 before attempting to stop DB2.

Verifying that components are running

This information describes how to verify that the IBM Tivoli Storage Productivity Center for Replication components are running.

Verifying that WebSphere Application Server is running

The method that you use to verify that IBM WebSphere Application Server is running in your environment depends on the operating system. By default, the WebSphere Application Server is started automatically after IBM Tivoli Storage Productivity Center for Replication is installed.

Verifying that WebSphere Application Server is running on Windows

To verify that IBM WebSphere Application Server is running, open the Windows **Services** interface and check the status of the WebSphere Application Server service.

Verifying that WebSphere Application Server is running on AIX or Linux

To verify that WebSphere Application Server is running, issue the **ps** command.

Verifying that WebSphere Application Server is running on z/OS

To verify that WebSphere Application Server is running, use the IBM z/OS System Display and Search Facility (SDSF) panel to issue the **/D A,L** command.

If the server and daemon address spaces for IBM WebSphere Application Server for z/OS are started, for example BBOS001 and BBODMNB, then WebSphere Application Server for z/OS is running.

If the server and daemon address spaces for IBM WebSphere Application Server OEM Edition for z/OS are started, for example WASOM1S, WASOM1, and WASOM1D, then WebSphere Application Server OEM Edition for z/OS is running.

Verifying that the IBM Tivoli Storage Productivity Center for Replication server is running

This information describes how to verify whether the IBM Tivoli Storage Productivity Center for Replication server is running.

Perform one or more of these tasks to determine whether the IBM Tivoli Storage Productivity Center for Replication server is running:

- Start the IBM Tivoli Storage Productivity Center for Replication GUI or start up the IBM Tivoli Storage Productivity Center for Replication command line interface shell. If either of these methods is successful, then the IBM Tivoli Storage Productivity Center for Replication server is running.
- Determine whether IBM WebSphere Application Server is running. If IBM WebSphere Application Server is not running, then the IBM Tivoli Storage Productivity Center for Replication server is also not running.
- If IBM WebSphere Application Server is running, perform these steps to determine if IBM Tivoli Storage Productivity Center for Replication is configured correctly in IBM WebSphere Application Server:
  1. From a command prompt, change to the *WAS_HOME*/profiles/default/bin directory.
  2. Enter the **wsadmin** command.
  3. Enter the**$AdminApp list** command.

     If you see CSM and CSMGUI in the resulting list, then IBM Tivoli Storage Productivity Center for Replication is configured correctly.

- View the csmTrace.log file in the *WAS_HOME*/profiles/default/logs/CSM directory. If the csmTrace.log is being updated regularly and increasing in size, then IBM Tivoli Storage Productivity Center for Replication is running.

Verifying that DB2 is running

This information describes how to verify that DB2 is running in your environment.

If IBM Tivoli Storage Productivity Center for Replication is configured to use DB2 and DB2 is not running, IBM Tivoli Storage Productivity Center for Replication cannot start correctly. If this is the case, you will find log entries similar to the following the csmTrace.log files:

```
[2007-02-23 16:30:30.369-05:00] server.startup : 0 RepMgr D
com.ibm.csm.server.CSM databaseReady TRACE: The database is not ready for
connections. Will retry in 10 seconds

[2007-02-23 16:30:40.403-05:00] server.startup : 0 RepMgr D   DBService
isDatabaseReady TRACE: [IBM][CLI Driver] SQL1032N  No start database manager
command was issued.  SQLSTATE=57019 DSRA0010E: SQL State = 57019,
Error Code = -1,032
```

If DB2 is running and IBM Tivoli Storage Productivity Center for Replication can successfully connect to it, the following log entry can be found in the csmTrace.log file:

```
[2007-02-23 16:30:55.965-05:00] server.startup : 0 RepMgr D
com.ibm.csm.server.CSM databaseReady TRACE: The database is ready to go.
```

Starting Tivoli Storage Productivity Center for Replication for System z

You can start the Tivoli Storage Productivity Center for Replication for System z GUI by opening a web browser and entering a web address for the Tivoli Storage Productivity Center for Replication for System z logon page.

Before you start Tivoli Storage Productivity Center for Replication for System z, ensure that you are using a supported web browser. For a list of web browsers that you can use with Tivoli Storage Productivity Center, see the support matrix at http://www.ibm.com/support/docview.wss?uid=swg21386446. In the **Agents, Servers and GUI** column, click the version of Tivoli Storage Productivity Center that is installed on your system. On the next page, click **Web Browsers** to find the web browsers that you can use.

The Tivoli Storage Productivity Center for Replication for System z GUI provides a single point of control to configure, manage, and monitor copy services.

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

   http://*hostname*:*port*/CSM

   In the preceding address, specify the following values:

   hostname
   The Tivoli Storage Productivity Center for Replication for System z server. You can specify the host name as an IP address or a Domain Name System (DNS) name. To verify the host name, contact your Tivoli Storage Productivity Center for Replication for System z administrator.

   port
   The port number for Tivoli Storage Productivity Center for Replication for

System z. You can find the port number in the *WAS_HOME*/profiles/default/properties/portdef.props file on the Tivoli Storage Productivity Center for Replication for System z server. Depending on whether you enter http or https in the address field, the port is defined by the following property in the file:

- WC_defaulthost (HTTP port)
- WC_defaulthost_secure (HTTPS port)

Where the value for WC_defaulthost is the port for http and WC_defaulthost_secure is the port for https. You can also contact your Tivoli Storage Productivity Center for Replication for System z administrator to verify the host name and port number.

2. From the Tivoli Storage Productivity Center for Replication for System z logon page, type your user name and password and click **Login**. The Tivoli Storage Productivity Center for Replication for System z GUI opens in the browser.

Identifying the version of IBM Tivoli Storage Productivity Center for Replication

The version of code on the IBM Tivoli Storage Productivity Center for Replication server determines the available features and enhancements added to the product.

By clicking **About**, located in the Main menu, you can view the version and release of the IBM Tivoli Storage Productivity Center for Replication. The **-ver** command that is described in the *IBM Tivoli Storage Productivity Center Command-Line Interface Reference* also displays the current version of the product.

Backing up and restoring IBM Tivoli Storage Productivity Center for Replication configuration data

You can back up the entire IBM Tivoli Storage Productivity Center for Replication database. You can also back up copy sets in a specific session. You can then use the backup files to restore a previous configuration or recover from a disaster.

Back up and recovery

You can backup and recover copy set data for a specific session and the complete Tivoli Storage Productivity Center for Replication database.

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 exporting copy sets, Tivoli Storage Productivity Center for Replication 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: ESS:2105.FCA57:VOL:17C7,ESS:2105.12043:VOL:17C7).

The following example illustrates the content of the CSV file for a FlashCopy session. Note that 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. Note that 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 Tivoli Storage Productivity Center for Replication Web interface.

IBM Tivoli Storage Productivity Center for Replication database

Tivoli Storage Productivity Center for Replication 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 *tpcr_production_root*/database/backup directory. You can change the default location by editing the **db.backup.location** property in the rmserver.properties file, which is located in the *WAS_HOME*/profiles/default/properties directory.

The backup file contains the Tivoli Storage Productivity Center for Replication database data at the time the backup was performed. Any changes that were made after the backup are not reflected when the backup files are used to restore an Tivoli Storage Productivity Center for Replication database. It is recommended that you create a new backup file:

- After changing the Tivoli Storage Productivity Center for Replication database data, such as adding or deleting a storage system, changing properties, and changing user privileges
- After an Tivoli Storage Productivity Center for Replication 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 command has been issued. After you create a backup, consider deleting the previous backup to prevent Tivoli Storage Productivity Center for Replication from starting the copy in the wrong direction.

When you create a backup, ensure that all Tivoli Storage Productivity Center for Replication sessions are either in the Defined, Prepared or Target Available state.

Restoring the Tivoli Storage Productivity Center for Replication database from a backup copy puts Tivoli Storage Productivity Center for Replication back to the point in time when the backup was made. Relationships that exist on the storage systems that were created by Tivoli Storage Productivity Center for Replication after the backup was made will no longer be managed by Tivoli Storage Productivity Center for Replication until you add the copy set to the session and Tivoli Storage Productivity Center for Replication assimilates the relationship into the session. Copy sets that were deleted after the backup will be restored and a subsequent Start command to the session will create new relationships; therefore, you must remove the deprecated copy sets before issuing the Start command.

After restoring a Global Mirror session, you must stop the Global Mirror master and subordinates before restarting the Global Mirror session. Refer to your DS6000 and DS8000 storage system documentation for more information.

Backing up the IBM Tivoli Storage Productivity Center for Replication database

This topic describes how to create a backup of the IBM Tivoli Storage Productivity Center for Replication database, including data about storage systems, sessions, copy sets, user administration and management server configuration.

To back up the IBM Tivoli Storage Productivity Center for Replication database, run the **mkbackup** command from the command line, for example:

```
csmcli> mkbackup
```

Prerequisites:

- You must have Administrator privileges to run this command.
- This procedure applies to only the zero-administration embedded repository. This procedure *is not* applicable when DB2 is being used as the persistent datastore for the Tivoli Storage Productivity Center for Replication database. For information about restoring your DB2 environment, refer to your DB2 documentation.

By default, the backup file is stored in the *tpcr_production_root*`/database/backup` directory. You can change the default location by editing the **`db.backup.location`** property in the `rmserver.properties` file, which is located in the *WAS_HOME*`/profiles/default/properties` directory.

Restoring the IBM Tivoli Storage Productivity Center for Replication database

You can restore IBM Tivoli Storage Productivity Center for Replication database that was previously backed up to the local system.

Important:

- Restoring the database does not require Administrator privileges. However, you must be able to access the files on the IBM Tivoli Storage Productivity Center for Replication server that are listed in the procedure.
- This procedure applies to only the zero-administration embedded repository. This procedure *is not* applicable when DB2 is being used as the persistent

datastore for the Tivoli Storage Productivity Center for Replication database. For information about restoring your DB2 environment, refer to your DB2 documentation.

Perform these steps to restore the IBM Tivoli Storage Productivity Center for Replication database from a backed up version:

1. Stop IBM Tivoli Storage Productivity Center for Replication on the active management server by running the **stopServer** command from a command line.
2. Delete the *tpcr_production_root*/database/csmdb directory and all contents in it.
3. Uncompress the backup file into the *tpcr_production_root*/database directory.
4. If IBM Tivoli Storage Productivity Center for Replication is running on z/OS, change the permissions of the csmdb directory by running the following commands:
   - chgrp -R *$WAS_GROUP* csmdb
   - chmod -R u+rwx csmdb
   - chmod -R g+rwx csmdb
   - chmod -R o+r csmdb
5. Restart IBM Tivoli Storage Productivity Center for Replication on the active management server by running the **startServer** command from a command line.
6. Resolve any changes that might have occurred since the backup was created.
7. Start the IBM Tivoli Storage Productivity Center for Replication sessions using the appropriate start commands. The start commands reestablishe the relationship between the volume pairs and synchronize data on those volumes.
8. If you have a standby management server, reestablish that standby relationship to update the database on the standby 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.

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

1. In the navigation tree, select **Sessions**. The Sessions panel is displayed
2. Select the session for which you want to export copy sets.
3. Select **Export Copy Sets** from the **Actions** list, and click **Go**. The Export Copy Set wizard displays the status of the export and a link to the exported file.
4. Click that link and save the file to the local system.

   Important: You must save the file to your local system. After you close the panel, the data will be lost.
5. Click **Finish**.

Importing copy set data

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

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

1. In the navigation tree, select **Sessions**. The Session panel is displayed.

2. Select the session for which you want to import copy sets.
3. Select **Add Copy Sets** from the **Actions** list, and click **Go**. The Add Copy Sets wizard is displayed.
4. Select **Use a CSV file to import copy sets**.
5. Type the location and name of the CSV file to import, or use **Browse** to select the file. Then, click **Next**.
6. Verify that the matching results were successful, and then click **Next**.
7. Select the copy sets you want to add, and then click **Next**.
8. Confirm the number of copy sets that you want to create, and click **Next**. A progress bar displays.
9. Click **Next**.
10. Verify the matches, and click **Finish**.

Chapter 3. Managing management servers

This section provides information about how to set up active and standby management servers, restore a lost connection between the management servers, or perform a takeover on the standby management server.

Management servers

The *management server* is a system that has IBM Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication that runs on a different physical system, but is continuously synchronized with the primary (or active) Tivoli Storage Productivity Center for Replication 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.

A management server relationship might become disconnected for a number of reasons, including a connectivity problem or a problem with the alternate server. Issue the Reconnect command to restore synchronization.

Completing a takeover on the standby management server

If you must perform a takeover and use the standby server, ensure that you shut down the active management server first. You must ensure that you do not have 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.

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

Viewing the status of the management servers

You can view the status of the active and standby management severs from the Management Servers panel in the Tivoli Storage Productivity Center for Replication 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.

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.

Managing volumes on storage systems

When you add direct connections, Hardware Management Console (HMC) connections, or z/OS connections on the active management server, Tivoli Storage Productivity Center for Replication automatically enables the management of attached extended count key data (ECKD) volumes, non-attached count key data (CKD) volumes, and all fixed-block volumes on the storage system. To disable management of volumes on the storage system, use the volume protection function.

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 Tivoli Storage Productivity Center for Replication GUI is the *listener* port. This port was set when Tivoli Storage Productivity Center for Replication was 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.

If DB2 is configured for data sharing mode across the z/OS sysplex, one of the Tivoli Storage Productivity Center for Replication servers must be configured to use the zero-administration embedded repository. If the embedded repository is not used, the two servers will overwrite the same data in the Tivoli Storage Productivity Center for Replication database.

SNMP alerts

This topic describes the SNMP alerts that are sent by IBM Tivoli Storage Productivity Center for Replication and the 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

Session state change SNMP trap descriptions

This topic lists the SNMP traps that are sent during a session state change. 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

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 15. 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.

Related reference:

"Session states" on page 142
You can view the health and status of a session in the Tivoli Storage Productivity Center for Replication GUI.

Configuration change SNMP trap descriptions

This topic lists the SNMP traps that are sent when the configuration changes. 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. Note that an alert for copy set changes is sent only once 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, if you make a copy set configuration change that causes an alert to be sent at 10:41:01, and if you were to make additional 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 been changed

  An alert is sent for each path configuration change made.

Table 16. 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 been changed. An event is sent for each path configuration change.

Suspending-event notification SNMP trap descriptions

These SNMP traps that are sent during a suspending-event notification. 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 17. 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

This topic lists the SNMP traps that are sent during a communication-failure. 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 18. 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

This topic lists the SNMP traps that 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 19. Management Servers state-change traps

Object ID (OID)	Description
1.3.6.1.4.1.2.6.208.0.14	The IBM Tivoli Storage Productivity Center for Replication Server Management Server connection X->Y has changed state to Unknown (previously Offline).
1.3.6.1.4.1.2.6.208.0.15	The IBM Tivoli Storage Productivity Center for ReplicationServer Management Server connection X->Y has changed state to Synchronized.
1.3.6.1.4.1.2.6.208.0.16	The IBM Tivoli Storage Productivity Center for Replication Server Management Server connection X->Y has changed state to Disconnected Consistent (previously Consistent Offline).
1.3.6.1.4.1.2.6.208.0.17	The IBM Tivoli Storage Productivity Center for Replication Server Management Server connection X->Y has changed state to Synchronization Pending.
1.3.6.1.4.1.2.6.208.0.18	The IBM Tivoli Storage Productivity Center for Replication Server Management Server connection X->Y has changed state to Disconnected.

Setting up a standby management server

You can set up a standby management server in two ways: setting up the management server you are logged in to as the standby management server, or designating another server as the standby management server.

Note: When you define a standby management server, the IBM Tivoli Storage Productivity Center for Replication code must be at the same level on both the standby and active management servers.

Setting the local management server as the standby server

This topic describes how to set the management server on which you are currently logged in as the standby management server.

Attention: When you set the local management server, the server you are logged in at will be wiped of all session information, and replaced with the session information belonging to the server you specified.

Important: The standby management server port number must be the same on both the management server and the standby management server in a high-availability relationship. If you change the standby management server port number on either the management server or the standby management server, you must also change the port number on the other server.

Perform these steps to set the local management server as the standby server:

1. In the navigation tree, select **Management Servers**.
2. From the **Action** menu, select **Set This Server as Standby**, and click **Go**. This opens the Set This Server As Standby panel.
3. Enter the domain name or IP address of the desired active management server.
4. Click **OK** to connect to the active server. You have now designated the server you are logged in at as the standby server.

Setting a remote management server as the standby server

This topic describes how to set up a management server on which you are not logged in as the standby server.

Attention: When you set a remote management server as the standby server, the remote management server is wiped of all session information and replaced with the session information belonging to the management server you specified.

Important: The standby management server port number must be the same on both the management server and the standby management server in a high-availability relationship. If you change the standby management server port number on either the management server or the standby management server, you must also change the port number on the other server.

Perform these steps to set a remote management server as the standby server:

1. In the navigation tree, select **Management Servers**.
2. Select **Define Standby** from the drop-down menu, and click **Go**. The Define Standby panel appears.
3. Type the domain name or IP address of the server that you are defining as the new standby management server. Log in to the standby management server by entering the username and password.

4. Click **OK** to connect to the standby management server.

Applying maintenance to an active management server

If an active management server develops a problem during an active session, you can reinstall Tivoli Storage Productivity Center for Replication on the server without affecting the session.

Follow these steps to reinstall Tivoli Storage Productivity Center for Replication on the active management server.

1. If the heartbeat is enabled, disable it:
   a. In the navigation tree, select **Advanced Tools**.
   b. 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. Uninstall Tivoli Storage Productivity Center for Replication on Server 1.
5. Reinstall Tivoli Storage Productivity Center for Replication on Server 1.

   Note: If no changes have been made to the configuration while Server 1 was being reinstalled, steps 6 and 7 are not necessary.
6. When Tivoli Storage Productivity Center for Replication 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.
7. 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**.
8. Disable the heartbeat on Server 1 to make sure this active server does not have any problems.

   Note: If you do not need to reinstall Tivoli Storage Productivity Center for Replication on Server 2, skip steps 9 and 10.
9. Uninstall Tivoli Storage Productivity Center for Replication from Server 2.
10. Reinstall Tivoli Storage Productivity Center for Replication on Server 2.
11. 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.
12. When you are confident that the active server is running without any problems, enable the heartbeat again, if desired.

Reconnecting the active and standby management servers

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

Perform these steps to cause the standby management server to become the active management server:

1. In the navigation tree, select **Management Servers**. The Management Servers panel is displayed.
2. Select **Reconnect** from the **Actions** list, and click **Go**.

Performing 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.

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.

Perform these steps to cause the standby management server to become the active management server:

1. If the active management server is functioning, take it offline so you do not have two active management servers managing the same sessions.
2. Log in to the IBM Tivoli Storage Productivity Center for Replication Web interface running on the standby management server.
3. In the navigation tree, select **Management Servers**. The Management Servers panel is displayed.
4. Select **Takeover** from the **Actions** list, and click **Go**.
5. To reestablish high-availability, perform 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 34.
   - 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.

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.

Configuring SNMP

The SNMP community name has a default value of `public`.

To change the community name, modify or add the **`csm.server.snmp_community_string`** property in the `rmserver.properties` file, which is located in the *`WAS_HOME`*`/profiles/default/properties` directory.

Adding SNMP managers

Use the **mksnmp** command to add an SNMP manager to the list of servers to which IBM Tivoli Storage Productivity Center for Replication sends SNMP alerts.

IBM Tivoli Storage Productivity Center for Replication uses management information base (MIB) files to provide a textual description of each SNMP alert sent by IBM Tivoli Storage Productivity Center for Replication. You must configure the SNMP manager to use both the SYSAPPL-MIB.mib and ibm-TPC-Replication.mib files. These MIB files are located in the *WAS_HOME*/profiles/default/etc directory. Follow the directions provided by your SNMP manager application to configure it to use the MIB files.

Tip: You can also find the MIB files on the installation DVD in the TPCRM/CSM-Client/etc directory.

Note: IBM Tivoli Storage Productivity Center for Replication 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.

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.

Important: The standby management server port number must be the same on both the management server and the standby management server in a high-availability relationship. If you change the standby management server port number on either the management server or the standby management server, you must also change the port number on the other server.

1. Open the rmserver.properties file in the *WAS_HOME*/profiles/default/properties directory.
2. Modify the port number for the following property:
   communications.haPort=*port_number*
3. Restart IBM Tivoli Storage Productivity Center for Replication. You must restart IBM Tivoli Storage Productivity Center for Replication to activate property changes. Properties are not synchronized between the IBM Tivoli Storage Productivity Center for Replication management servers and must be done on each IBM Tivoli Storage Productivity Center for Replication 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.

Important: The client port number must be the same on both the management server and the standby management server in a high-availability relationship. If you change the client port number on either the management server or the standby management server, you must also change the port number on the other server.

1. Open the rmserver.properties file in the *WAS_HOME*/profiles/default/properties directory.
2. Modify the port number for the following property:
   communications.port=*port_number*
3. Open the repcli.properties file in the *tpcr_production_root*/cli directory.
4. Modify the port number for the following property:

`port=port_number`

5. Restart IBM Tivoli Storage Productivity Center for Replication. You must restart IBM Tivoli Storage Productivity Center for Replication to activate property changes. Properties are not synchronized between the IBM Tivoli Storage Productivity Center for Replication management servers and must be maintained on each IBM Tivoli Storage Productivity Center for Replication management server.

Changing the time zone in z/OS

Timestamps automatically default to Greenwich Mean Time (GMT) on z/OS. This topic describes how to change to the Eastern Daylight Time (EDT).

To change the time zone to EDT instead of GMT, perform the following steps from the IBM WebSphere Application Server or IBM WebSphere Application Server OEM Edition for z/OS Administration Console:

1. Go to **Environment** > **WebSphere Variables** > **Cell Scope**.
2. Click **New**.
3. Type the name as `TZ`.
4. Type the value as `EST5EDT`.
5. Apply the changes.
6. Save the changes.
7. Restart IBM WebSphere Application Server or IBM WebSphere Application Server OEM Edition for z/OS.

Note: For instructions on changing to a time zone other than EDT, see the IBM WebSphere Application Server Express® information center on the web at publib.boulder.ibm.com/infocenter/wasinfo/v6r0/topic/com.ibm.websphere.express.doc/info/exp/ae/rrun_svr_timezones.html.

Chapter 4. Managing storage systems

To replicate data among storage systems using IBM Tivoli Storage Productivity Center for Replication, 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. Tivoli Storage Productivity Center for Replication can control data replication within and between various storage systems.

To replicate data among storage systems using Tivoli Storage Productivity Center for Replication, you must manually add a connection to each storage system in the Tivoli Storage Productivity Center for Replication configuration. You can then omit storage systems for which Tivoli Storage Productivity Center for Replication is not to manage replication and omit storage systems that are being managed by another Tivoli Storage Productivity Center for Replication management server.

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

You can use the following storage systems:

- IBM TotalStorage Enterprise Storage Server (ESS) Model 800
- IBM System Storage DS6000
- IBM System Storage DS8000
- IBM System Storage SAN Volume Controller
- IBM Storwize V3500
- IBM Storwize V3700
- IBM Storwize V7000
- IBM Storwize V7000 Unified
- IBM XIV Storage System

SAN Volume Controller can virtualize various storage systems. Although Tivoli Storage Productivity Center for Replication does not support all storage systems, you can manage other storage systems through a single SAN Volume Controller cluster interface. Tivoli Storage Productivity Center for Replication connects directly to the SAN Volume Controller clusters.

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

Notes:

- Tivoli Storage Productivity Center for Replication does not automatically discover the physical locations of storage systems. You can manually assign a location to a storage system from the GUI and CLI.

- Throughout this document, *ESS/DS* refers to the following models:
  - IBM TotalStorage Enterprise Storage Server Model 800
  - IBM System Storage DS8000
  - IBM System Storage DS6000

Storage connections

You must create a connection from the IBM Tivoli Storage Productivity Center for Replication management server to each storage system. You can connect either directly or through a Hardware Management Console (HMC) or IBM z/OS connection.

A single storage system can be connected using multiple connections for redundancy. For example, you can connect a IBM System Storage DS8000 storage system using an HMC connection and a z/OS connection. Tivoli Storage Productivity Center for Replication monitors how a storage system has been added to the configuration.

When you add a storage connection to the Tivoli Storage Productivity Center for Replication configuration, the storage system and the connection are added to the active management server configuration. For direct and HMC connections, the storage system and connection are also added to the standby management server configuration. For z/OS connections, only the storage system is added to the standby management server configuration. The connection is not added because the standby management server might not be running on z/OS and might not have access to the volumes on the storage system through a z/OS connection.

The storage systems are not required to be connected to the standby management server. However, if a storage system does not have a connection on the standby management server, you cannot manage copy services on the storage system from the standby server.

Important: If the Metro Mirror heartbeat is enabled, do not connect to a IBM TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, or System Storage DS6000 storage system 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.

When Tivoli Storage Productivity Center for Replication is running on z/OS and a storage system is added to the Tivoli Storage Productivity Center for Replication configuration through a TCP/IP (direct or HMC) connection, all ECKD volumes that are attached to the management server are managed through the TCP/IP connection. To use the Fibre Channel connection, you must explicitly add the storage system to the Tivoli Storage Productivity Center for Replication configuration through a z/OS connection.

If a storage system was previously added to the Tivoli Storage Productivity Center for Replication configuration through a z/OS connection and later the storage system is added through a TCP/IP connection, all non-attached ECKD volumes and fixed block volumes are added to the Tivoli Storage Productivity Center for Replication configuration.

When you remove a storage system, Tivoli Storage Productivity Center for Replication automatically removes all connections that the storage system is using with exception of the z/OS connection. You can also individually remove each connection through which the storage system is connected.

If Tivoli Storage Productivity Center for Replication has multiple connections to a specific storage system, the order in which you remove the connections produces different results:

- If you remove all direct and HMC connections first, the fixed block and non-attached ECKD volumes are removed from the Tivoli Storage Productivity Center for Replication configuration. The remaining ECKD volumes that are attached through the z/OS connection remain in the Tivoli Storage Productivity Center for Replication configuration until the z/OS connection is removed. Removing the TCP/IP connection also disables the Metro Mirror heartbeat.
- If you remove the z/OS connection first and if there is an HMC or direct connection to volumes, those volumes are not removed from the Tivoli Storage Productivity Center for Replication configuration.
- HyperSwap can run provided that volumes are attached and available to z/OS storage, even if you are using a TCP/IP connection to storage.

Direct connection

By using a TCP/IP connection, the Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication management server can connect directly with the following systems:

- TotalStorage Enterprise Storage Server
- DS6000
- DS8000
- SAN Volume Controller
- Storwize V3500
- Storwize V3700
- Storwize V7000
- Storwize V7000 Unified
- The XIV system

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 cluster 0 and 1:

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

System Storage SAN Volume Controller or Storwize V7000 can virtualize various storage systems. Although Tivoli Storage Productivity Center for Replication does

not support all storage systems, you can manage these storage systems through a single System Storage SAN Volume Controller or Storwize V7000 cluster interface. Tivoli Storage Productivity Center for Replication connects directly to the System Storage SAN Volume Controller or Storwize V7000 clusters. When you add a direct connection to a System Storage SAN Volume Controller or Storwize V7000 cluster to the Tivoli Storage Productivity Center for Replication configuration, specify the cluster IP address of the System Storage SAN Volume Controller or Storwize V7000 cluster, which in turn points to multiple System Storage SAN Volume Controller or Storwize V7000 storage systems. 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 IBM Tivoli Storage Productivity Center for Replication management server can connect to DS8000 storage systems through a Hardware Management Console (HMC). An HMC can have multiple DS8000 storage systems connected to it. When you add an HMC to the IBM Tivoli Storage Productivity Center for Replication 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 reboots 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 could trigger a freeze on the storage system and impact applications for the duration of 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 will allow I/O to begin again after a freeze occurs if no run command has been issued by Tivoli Storage Productivity Center for Replication. The default value is two minutes for ECKD volumes or one 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.
- 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=swg21386446.

z/OS connections

An IBM Tivoli Storage Productivity Center for Replication management server that runs on z/OS can connect to IBM TotalStorage Enterprise Storage Server (ESS) Model 800, DS8000, and DS6000 storage systems through a z/OS connection. The z/OS connection is used to issue replication commands and queries for attached ECKD volumes over an existing Fibre Channel network and to receive asynchronous events. When a storage system is added to IBM Tivoli Storage Productivity Center for Replication through the z/OS connection, all ECKD volumes that are attached to the IBM Tivoli Storage Productivity Center for Replication management system are added to the IBM Tivoli Storage Productivity Center for Replication configuration. ECKD volumes that are not attached to the IBM Tivoli Storage Productivity Center for Replication z/OS management server are not added to the IBM Tivoli Storage Productivity Center for Replication configuration through the z/OS connection.

Notes:

- Ensure that all volumes in the logical storage subsystem (LSS) that you want to manage through a z/OS connection are attached to z/OS. 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 IBM Tivoli Storage Productivity Center for Replication to properly manage queries to the hardware.
- The z/OS connection is limited to storage systems that are connected to an IBM Tivoli Storage Productivity Center for Replication management server running z/OS.
- The Metro Mirror heartbeat is not supported through the z/OS connection. To use the Metro Mirror heartbeat, the storage systems must be added using a direct connection or Hardware Management Console (HMC) connection. If the Metro Mirror heartbeat is enabled, a storage system is added through a direct connection and z/OS connection, and the direct connection becomes disconnected, then a suspend results as there is no heartbeat through the z/OS connection.

If at least one volume in a Logical Storage Subsystem (LSS) is attached through a z/OS connection, then all volumes in that LSS must be similarly attached. For example, if there are two ECKD volumes in an LSS, and one volume is attached to the IBM Tivoli Storage Productivity Center for Replication system using a z/OS connection and the other is attached through a direct connection, IBM Tivoli Storage Productivity Center for Replication would have knowledge of direct-connected volume. IBM Tivoli Storage Productivity Center for Replication issues commands to both volumes over the Fibre Channel network; however, commands issued to the direct-connection volume will fail, and IBM Tivoli Storage Productivity Center for Replication will show that the copy set that contains that volume has an error.

Use the following guidelines to add storage systems through a z/OS connection:

- Use the z/OS connection to manage ECKD volumes that are attached to an IBM Tivoli Storage Productivity Center for Replication management server running z/OS.
- To manage z/OS attached volumes through a z/OS connection (for example, for HyperSwap), you must explicitly add the z/OS connection for that storage system in addition to a TCP/IP connection (either the direct connection or the HMC connection).

- Create a z/OS connection before all TCP/IP connections if you want to continue to have IBM Tivoli Storage Productivity Center for Replication manage only the attached ECKD volumes.

Tip: It is recommended that you create both TCP/IP and z/OS connections for ECKD volumes to allow for greater storage accessibility.

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 IBM Tivoli Storage Productivity Center for Replication.

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.

IBM Tivoli Storage Productivity Center for Replication 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 IBM Tivoli Storage Productivity Center for Replication 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, IBM Tivoli Storage Productivity Center for Replication does not audit existing copy sets to confirm or deny location mismatches.

Adding a storage connection

You can add one or more connections to a storage system. To replicate data among storage systems by using Tivoli Storage Productivity Center for Replication, you must add connections to the storage systems.

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

A single storage system can be connected by a combination of direct, management-console, and z/OS connections. Perform these steps to add a storage system connection:

1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
2. Click **Add Storage Connection**. The Add Storage System wizard Type page is displayed.
3. Select the connection type that you want to use to add the storage systems and click **Next**. The Connection page is displayed.
4. Perform one of these steps depending on the type of storage connection that you selected:
   - **DS8000 / ESS 800 / DS6000 (Direct Connection)**: Enter the IP address or domain name, port number, user name, and password for both cluster 0 and cluster 1 in the appropriate fields.

     In a System Storage DS8000 environment, if resource groups are defined on the System Storage DS8000 that you are connecting to, the user name you define here must have the appropriate access level on the System Storage DS8000 to manage copy services for the volumes that are used by Tivoli Storage Productivity Center for Replication.
   - **DS8000 (HMC Connection)**: Enter the primary HMC IP address or domain, user name, password, and optionally the secondary HMC IP address or domain name in the appropriate fields.
   - **SAN Volume Controller / Storwize V3500 / Storwize V3700 / Storwize V7000 / Storwize V7000 Unified (Direct Connection)**: Click this button to add a single IBM System Storage SAN Volume Controller, IBM Storwize V3500, IBM Storwize V3700, IBM Storwize V7000, or IBM Storwize V7000 Unified cluster.

     The following are considerations for connection:

     a. Authentication with the storage system cluster is performed by public key exchange. When adding a storage system cluster to the Tivoli Storage Productivity Center for Replication configuration, specify the user ID and password of an administrator on the cluster that has sufficient privileges to maintain the Secure Shell (SSH) keys.

b. When a valid user name and password are specified, Tivoli Storage Productivity Center for Replication audits the public keys installed on the storage system cluster to ensure that the Tivoli Storage Productivity Center for Replication key has the correct access levels. If the key is not installed on the cluster, Tivoli Storage Productivity Center for Replication attempts to install the key. If you install the key yourself, install the public key found in the *WAS_HOME*/profiles/default/etc directory on the storage system cluster by using the SSH Key Maintenance panel on the storage system graphical user interface. The public key ID is installed under tpcr.

c. You must use a storage system cluster superuser user name and password to correctly receive indications from the storage system cluster.

d. For Storwize V3500, Storwize V3700, Storwize V7000, Storwize V7000 Unified, or SAN Volume Controller version 5.0 or later, you must create a user ID through the storage system administration console on the cluster to which you want to attach Tivoli Storage Productivity Center for Replication. This user ID must have local authentication type and have the Administrator role authority.

- **XIV (Direct Connection)**: Enter the IP address or domain name of the XIV system node. Enter a user name and password of a user with appropriate access rights to the XIV system.
- **z/OS (FICON Connection)**: Select one or more storage systems from the list of candidate systems that match the selected storage type, or click **All** to select all storage systems. This option is displayed only for IBM Tivoli Storage Productivity Center for Replication for System z.

5. Click **Next**.
6. Click **Finish**.

Related information:

http://publib.boulder.ibm.com/infocenter/dsichelp/ds8000ic/index.jsp

Removing a storage connection

You can remove a single connection to a storage system from the IBM Tivoli Storage Productivity Center for Replication configuration.

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

When removing a connection, the storage system might have other connections and therefore still be connected to IBM Tivoli Storage Productivity Center for Replication.

When removing a connection, all storage systems that rely on only that connection are removed. If a storage system is removed, the volumes for that storage system are removed from management server control. All copy sets with a volume on the removed storage systems are also removed from their respective sessions, making the target volume unrecoverable.

If Tivoli Storage Productivity Center for Replication has multiple connections to a specific storage system, the order in which you remove the connections produces different results:

- If you remove all direct and HMC connections first, the fixed block and non-attached ECKD volumes are removed from the Tivoli Storage Productivity

Center for Replication configuration. The remaining ECKD volumes that are attached through the z/OS connection remain in the Tivoli Storage Productivity Center for Replication configuration until the z/OS connection is removed. Removing the TCP/IP connection also disables the Metro Mirror heartbeat.

- If you remove the z/OS connection first and if there is an HMC or direct connection to volumes, those volumes are not removed from the Tivoli Storage Productivity Center for Replication configuration.
- HyperSwap can run provided that volumes are attached and available to z/OS storage, even if you are using a TCP/IP connection to storage.

Perform one of these procedures to remove a storage connection:

1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
2. Click the **Connections** tab.
3. Select the storage connection that you want to remove.

   Important: If you choose to delete an HMC connection, all storage systems that share the HMC connection will also be removed.
4. Select **Remove Connection** from the **Actions** list, and click **Go**.
5. Click **Yes** to remove the storage system.

Removing a storage system

You can remove a storage system from the IBM Tivoli Storage Productivity Center for Replication configuration.

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:

1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
2. 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. Select **Remove Storage System** from the **Actions** list, and click **Go**.
4. Click **Yes** to remove the storage system.

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.

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:

1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
2. 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.

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 IBM Tivoli Storage Productivity Center for Replication.

Perform these steps to modify storage connection properties:

1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
2. Click the **Connections** tab.
3. Perform one of these steps to view details for a specific storage connection:
   - Click the storage connection ID.
   - Select the storage connection, click **View/modify Connection Details** from the actions list, and then click **Go**.
4. Modify the appropriate settings match the settings for the storage system.
5. Click **Apply** to continue making changes, and click **OK** when finished.

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 IBM Tivoli Storage Productivity Center for Replication to be aware of the changes.

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

Perform these steps to refresh the storage configuration:

1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
2. Select the storage system for which you want to refresh the configuration.
3. Select **Refresh Configuration** from the **Actions** list, and click **Go**.

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.

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

1. In the navigation tree, select **Storage Systems**. The Storage Systems page is opened.
2. Click **Volume Protection**. The Volume Protection wizard is opened.
3. Select a storage system.
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 ESS/DS6000/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 IBM Tivoli Storage Productivity Center for Replication, 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 IBM Tivoli Storage Productivity Center for Replication, 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.

Chapter 5. Managing host systems

Host system refers to an IBM AIX 5.3 or 6.1 server that is connected to IBM System Storage DS8000 devices. A connection from Tivoli Storage Productivity Center for Replication to the host system is used to enable the automatic swap of input/output (I/O) from the primary storage unit to the secondary storage unit in the case of a primary error.

A connection to the host system is required to use the Tivoli Storage Productivity Center for Replication Open HyperSwap feature. For the software and hardware required to support Open HyperSwap, see "Setting up the environment for Open HyperSwap" on page 91.

Connecting to a host system requires the IP address or host name of the system and the port number for communication. All connections are secured via a Secure Socket Layer (SSL) connection.

Restriction: Open HyperSwap is not supported for AIX host servers that are in a clustered environment such as PowerHA (previously known as HACMP).

Related tasks:

"Managing a session with HyperSwap and Open HyperSwap replication" on page 90
HyperSwap and Open HyperSwap provide 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.

Adding a host system connection

You can add a connection to one or more host systems to the IBM Tivoli Storage Productivity Center for Replication configuration.

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

For the software and hardware required to support Open HyperSwap, see "Setting up the environment for Open HyperSwap" on page 91.

Perform these steps to add a host system connection:

1. In the navigation tree, select **Host Systems**. The Host Systems panel is displayed.
2. Click **Add Host Connection**. The Add Host Connection dialog box is displayed.
3. Enter the host name or IP address and the port for the host system and click **Add Host**. The host system is displayed on the Host Systems panel. The default port is 9930. Unless the port has been modified in Subsystem Device Driver Path Control Module (SDDPCM), use the default port.

The host system is displayed in the Host System table. If the connection is successful, the status **Connected** is displayed for the connection. If the connection was not successful, the status **Disconnected** is displayed.

Modifying a host system connection

You can modify host system connections in the IBM Tivoli Storage Productivity Center for Replication configuration.

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

Perform these steps to modify a host system connection:

1. In the navigation tree, select **Host Systems**. The Host Systems panel is displayed.
2. Select the host system connection that you want to modify.
3. Select **Modify Host Connection** from the **Select Action** list, and click **Go**.
4. Modify the information that is presented for the host system and click **Update Host**. The updated host system information is displayed on the Host Systems panel.

The updated host system information is displayed in the Host System table. If the connection is successful, the status **Connected** is displayed for the connection. If the connection was not successful, the status **Disconnected** is displayed.

Removing a host system connection

You can remove host system connections from the IBM Tivoli Storage Productivity Center for Replication configuration.

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

Removing a host system connection disables the ability to use Open HyperSwap. Any session using the host system to provide Open HyperSwap capabilities can no longer communicate with the host and Open HyperSwap is disabled for the entire session.

Perform these steps to remove a host system connection:

1. In the navigation tree, select **Host Systems**. The Host Systems panel is displayed.
2. Select the host system connection that you want to remove.
3. Select **Remove Host Connection** from the **Select Action** list, and click **Go**.
4. Click **OK** to remove the host system connection.

Removing a session from a host system connection

You can remove a session that is associated with a host system from the IBM Tivoli Storage Productivity Center for Replication configuration. Once removed, the host no longer recognizes the session that is managing the volumes attached to that host. This function is to be used primarily for cleanup purposes.

When a session has Open HyperSwap enabled, the session communicates with the host system and the host system stores an association to that session on the IBM Tivoli Storage Productivity Center for Replication server. If the Tivoli Storage

Productivity Center for Replication server that made the association becomes inaccessible, it might be necessary to clean up and remove the session association from a different Tivoli Storage Productivity Center for Replication server.

If a host system has an associated session, the session name is displayed in the **Sessions** column of the Host Systems table. If the session is a session that is currently defined on the Tivoli Storage Productivity Center for Replication server, the session name is displayed as a link. The link opens the Session Details panel.

If the session name is not a session on the server, an icon is displayed. This session must be removed because the host system can support only a single session association. The session association must be removed before a Tivoli Storage Productivity Center for Replication server can re-establish capabilities with the host system.

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

Perform these steps to remove session association from a host system connection:

1. In the navigation tree, select **Host Systems**. The Host Systems panel is displayed.
2. Select the host system connection that contains the session that you want to remove.
3. Select **Remove Session Association** from the **Select Action** list, and click **Go**.
4. Click **OK** to remove the host system connection.

The session name is removed from the **Session** column on the Host Systems table.

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 TotalStorage Enterprise Storage Server, System Storage DS8000, and DS6000, use the ESS/DS Paths panel in Tivoli Storage Productivity Center.

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

- SAN Volume Controller
- Storwize V3500
- Storwize V3700
- Storwize V7000
- Storwize V7000 Unified
- The XIV system

Viewing logical paths

You can view all logical paths that are defined on an IBM TotalStorage Enterprise Storage Server, IBM System Storage DS8000, or IBM System Storage DS6000 storage system.

Perform one of these procedures to view logical paths:

- From the ESS/DS Paths panel of IBM Tivoli Storage Productivity Center for Replication:
  1. In the navigation tree, select **ESS/DS Paths**. The ESS/DS Paths panel is displayed.
  2. Click the storage system ID to display logical paths for that storage system.
- From the Storage Systems panel:
  1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
  2. Select an ESS, DS6000, or DS8000 storage system for which you want to view logical paths.
  3. Select **View Paths** from the **Select Action** list, and click **Go**. The ESS/DS Paths panel is displayed with a list of defined logical paths.

Adding logical paths

This topic describes how to add IBM TotalStorage Enterprise Storage Server, IBM System Storage DS8000, and IBM System Storage DS6000 logical paths.

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

Perform these steps to add logical paths:

1. In the IBM Tivoli Storage Productivity Center for Replication navigation tree, select **ESS/DS 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 storage system, target storage system, and target logical storage system. Then, click **Next**.
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 storage 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 using a CSV file

You can create a comma separated (CSV) file to define logical paths. The CSV file specifies storage systems pairings and associated port pairings that are used for replication. IBM Tivoli Storage Productivity Center for Replication uses the port pairings defined in the CSV file to establish logical paths

Perform these steps to add IBM TotalStorage Enterprise Storage Server, IBM System Storage DS8000, and IBM System Storage DS6000 logical paths using a CSV file:

1. Create a CSV file named `portpairings.csv` in the *WAS_HOME*`/profiles/default/properties` directory. You can create the CSV file in a spreadsheet such as Microsoft Excel or in a text editor. An example CSV file is as follows:

   ```
   #
   # Example CSV file
   #
   2107.04131:2107.01532,0x0331:0x0024,0x0330:0x0100,0x0331:0x000C
   2107.05131:2107.01532,0x0330:0x0029,0x0331:0x0001
   ```

   Each line represents a storage system to storage system pairing. The first value represents the storage systems, which are delimited by a colon. The remaining values are the port pairs, which are delimited by a colon. All values are separated by a comma. Commented lines must start with #,
2. To enable the changes in the file, perform 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.

Considerations when creating and using the CSV file:

- The CSV file does not affect Global Mirror control paths.
- Port mapping is bi-directional. A logical path is established from system A to system B and from system B to system A depending on the direction of the pairs on the hardware.
- If the CSV file contains multiple lines that specify the same storage system to storage system pairing, Tivoli Storage Productivity Center for Replication 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, Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication console and in the ESS/DS Paths panel:
  - 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 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. If there are existing logical paths for a storage system, those paths are used until they are removed.

Removing logical paths

This topic describes how to remove IBM TotalStorage Enterprise Storage Server, IBM System Storage DS8000, and IBM System Storage DS6000 logical paths.

1. In the IBM Tivoli Storage Productivity Center for Replication navigation tree, select **ESS/DS 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 drop-down box, select **Remove**.
5. Click **Go**.

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.

A *session* is a container of multiple copy sets managed by a replication manager. A *copy set* is a set of volumes that contain copies of the same data. All the volumes in a copy set are the same format (count key data [CKD] or fixed block) and size. 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* is used to perform a specific type of data replication against a specific set of volumes. 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.

Attention: Use only the Tivoli Storage Productivity Center for Replication 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® 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 65.

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, 3380 volumes must be used with other 3380 volumes and 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 (or copy type) that is associated with the session to which the copy set belongs.

Important: Use the IBM WebSphere Application Server Administrator Console to check the Java™ heap size (**Application servers** > **Server1** > **Process Definition** > **Servant** > **Java Virtual Machine**) for the IBM z/OS servant region. The size of this region affects the performance of IBM Tivoli Storage Productivity Center for Replication. The default Java heap size is 512 MB, which supports fewer than 25,000 role pairs. Increasing the Java heap size to 768 MB increases support to a

maximum of 50,000 role pairs. For more information about how to set up the Java heap size, see the WebSphere Application Server information center at one of the following locations:

- WebSphere Application Server V7.0: http://publib.boulder.ibm.com/infocenter/wasinfo/v7r0/index.jsp
- WebSphere Application Server V8.0: http://publib.boulder.ibm.com/infocenter/wasinfo/v8r0/index.jsp

The following table lists the estimated number of role pairs and volumes per copy set that are supported for each session type.

Table 20. Support number of role pairs and volumes per copy set for each session type

Session	Role Pairs	Volumes
Basic HyperSwap	1	2
FlashCopy	1	2
Snapshot[1]	0	1
Metro Mirror	1	2
Metro Mirror with Practice	3	3
Global Mirror (ESS/DS)	3	3
Global Mirror (SAN Volume Controller)	1	2
Global Mirror with Practice (ESS/DS)	5	4
Global Mirror with Practice (SAN Volume Controller)	3	3
Global Mirror Two-Site Practice	8	6
Metro Global Mirror	6	4
Metro Global Mirror with Practice	8	5
1. An XIV 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.		

Use the Add Copy Sets wizard to add copy sets to an existing session. You can select a storage system; a logical subsystem (LSS), I/O group, or pool; or 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 (System Storage DS8000, System Storage DS6000, or TotalStorage Enterprise Storage Server Model 800 Metro Mirror sessions only)
Creates copy sets by matching volumes (based on the volume IDs) across all logical subsystems (LSSs) for the selected storage systems. For example, volume 01 on the source LSS is matched with volume 01 on the target LSS.

You cannot 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. This process enables you 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.

Considerations for 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 for the following System Storage DS8000 session types. Extent space-efficient volumes must be fixed block (FB). You cannot use count key data (CKD) volumes.

FlashCopy (System Storage DS8000 6.2 or later)
You can use a combination of extent space-efficient and other volume types as source and target volumes in the copy set.

Metro Mirror (System Storage DS8000 6.3 or later)
If you use an extent space-efficient volume as a source or target volume in the copy set, you must use extent space-efficient volumes for all source and target volumes in the copy set.

Global Mirror or Metro Global Mirror (System Storage DS8000 6.3 or later)
You can use extent space-efficient volumes as source, target, and journal volumes. If you use an extent space-efficient volume as a source or target volume in the copy set, you must use extent space-efficient volumes for all source and target volumes in the copy set. In this situation, the journal volumes can be extent space-efficient volumes, track space-efficient volumes, or a combination of both volume types. If extent space-efficient volumes are not used as source or target volumes, journal volumes can be extent space-efficient, track space-efficient, and other types of volumes.

Considerations for 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 Tivoli Storage Productivity Center for Replication data store.

Preparing or Prepared
The copy set is currently copying data, so Tivoli Storage Productivity Center for Replication 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 removing 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 Tivoli Storage Productivity Center for Replication, 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 resolving problems. For more information about keeping the hardware relationships when removing copy sets, see Removing Copy Sets.

The behavior that occurs when a copy set is removed varies depending on the storage system:

ESS 800, DS6000, and DS8000:

- The complete copy set is removed from Tivoli Storage Productivity Center for Replication.
- 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.
- A Metro Mirror (synchronous PPRC) pair that is in a HyperSwap configuration is removed from that configuration but the pair remains on the hardware.
- FlashCopy relationship remains on the storage system if the hardware has not completed any background copy.

SAN Volume Controller, Storwize V3500, Storwize V3700, Storwize V7000, Storwize V7000 Unified, or the XIV system

- The complete copy set is removed from Tivoli Storage Productivity Center for Replication.

- 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 Tivoli Storage Productivity Center for Replication, even if the relationship itself still exists. In this situation, you are not able to remove the relationship using Tivoli Storage Productivity Center for Replication, 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 Tivoli Storage Productivity Center for Replication does not manage the consistency of copy sets that it has no knowledge of. This means that additional 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 Tivoli Storage Productivity Center for Replication. 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, for multi-site sessions, 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 type of data replication (also known as the session type) that is associated with the session. Tivoli Storage Productivity Center for Replication 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 (Metro Global Mirror only) The location of the tertiary storage that receives data updates from the secondary storage.

The volume roles that are needed in a copy set are determined by the type of replication that is associated with the session. Tivoli Storage Productivity Center for Replication supports these volume roles:

Host volume

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 volume that 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
A volume that 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
(FlashCopy only) A volume that receives data from a source, either 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).

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, and Metro 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 and Metro Global Mirror sessions, IBM Tivoli Storage Productivity Center for Replication manages the consistency of dependant 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.

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 Tivoli Storage Productivity Center for Replication 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 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.

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 switching sites 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	• System Storage DS8000 • System Storage DS6000 • System Storage SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified
Metro Mirror Failover/Failback	• System Storage DS8000 • System Storage DS6000 • System Storage SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified • The XIV system
Metro Mirror Failover/Failback with Practice	• System Storage DS8000 • System Storage DS6000 • System Storage SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified
Global Mirror Single Direction	• System Storage DS8000 • System Storage DS6000 • System Storage SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified
Global Mirror Either Direction with Two-Site Practice	• System Storage DS8000 • System Storage DS6000
Global Mirror Failover/Failback	• System Storage DS8000 • System Storage DS6000 • System Storage SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified • The XIV system
Global Mirror Failover/Failback with Practice	• System Storage DS8000 • System Storage DS6000 • System Storage SAN Volume Controller • 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 Tivoli Storage Productivity Center for Replication and an error message is 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

Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center or Tivoli Storage Productivity Center for Replication that you are using as shown in this topic.

Basic HyperSwap

Basic HyperSwap is a copy services solution for IBM z/OS version 1.9 and later. Basic HyperSwap provides high availability of data if a storage system failure occurs.

The Basic HyperSwap session type enables Tivoli Storage Productivity Center for Replication to manage Basic HyperSwap by using Metro Mirror or Metro Global Mirror replication.

For more information about the Basic HyperSwap session type, see "Basic HyperSwap (ESS, DS6000, and DS8000)" on page 73.

Basic HyperSwap sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 21. Basic HyperSwap

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication Basic Edition for System z • Tivoli Storage Productivity Center for Replication for System z	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000

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.

For more information about the FlashCopy session type, see "FlashCopy" on page 74.

FlashCopy sessions are available for the following Tivoli Storage Productivity Center and Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 22. FlashCopy

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication Basic Edition for System z • Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V3500 • Storwize V3700 • Storwize V7000 • Storwize V7000 Unified

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.

For more information about the Snapshot session type, see "Snapshot" on page 75.

Snapshot sessions are available for the following Tivoli Storage Productivity Center and Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 23. Snapshot

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication Basic Edition for System z • Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	The XIV system

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.

For more information about the Metro Mirror Single Direction session type, see "Metro Mirror" on page 76.

Metro Mirror Single Direction sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 24. Metro Mirror Single Direction

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

Metro Mirror Failover/Failback

Metro Mirror Failover/Failback replication enables you to 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.

For more information about the Metro Mirror Failover/Failback session type, see "Metro Mirror" on page 76.

Metro Mirror Failover/Failback sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 25. Metro Mirror Failover/Failback

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified • The XIV system

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.

For more information about the Metro Mirror Failover/Failback with Practice session type, see "Metro Mirror" on page 76.

Metro Mirror Failover/Failback with Practice sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 26. Metro Mirror Failover/Failback with Practice

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

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.

For more information about the Global Mirror Single Direction session type, see "Global Mirror" on page 82.

Global Mirror Single Direction sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 27. Global Mirror Single Direction

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

Global Mirror Either Direction with Two-Site Practice

Global 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.

For more information about the Global Mirror Either Direction with Two-Site Practice session type, see "Global Mirror" on page 82.

Global Mirror Either Direction with Two-Site Practice sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 28. Global Mirror Either Direction with Two-Site Practice

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000

Global Mirror Failover/Failback

Global Mirror Failover/Failback replication enables you to 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 Tivoli Storage Productivity Center for Replication editions and storage systems. For more information about this session type, see "Global Mirror" on page 82.

Table 29. Global Mirror Failover/Failback

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified • The XIV system

Global Mirror Failover/Failback with Practice

Global Mirror Failover/Failback with Practice 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 more information about the Global Mirror Failover/Failback with Practice session type, see "Global Mirror" on page 82.

Global Mirror Failover/Failback with Practice sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 30. Global Mirror Failover/Failback with Practice

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 • System Storage DS8000 • System Storage DS6000 • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

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. Metro Global Mirror replication enables you to switch the direction of the data flow so that you can use your secondary or tertiary site as your production site.

For more information about the Metro Global Mirror session type, see "Metro Global Mirror (ESS and DS8000)" on page 86.

Metro Global Mirror sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 31. Metro Global Mirror

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 (only H1 site) • System Storage DS8000

Metro Global Mirror with Practice

Metro Global Mirror with Practice 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.

For more information about the Metro Global Mirror with Practice session type, see "Metro Global Mirror (ESS and DS8000)" on page 86.

Metro Global Mirror with Practice sessions are available for the following Tivoli Storage Productivity Center for Replication editions and storage systems.

Table 32. Metro Global Mirror with Practice

Supported editions	Supported storage systems
• Tivoli Storage Productivity Center for Replication for System z • All editions of Tivoli Storage Productivity Center	• TotalStorage Enterprise Storage Server Model 800 (only H1 site) • System Storage DS8000

Basic HyperSwap (ESS, DS6000, and DS8000)

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 only available on ESS, DS6000, and DS8000 storage systems, and on management servers that run IBM Tivoli Storage Productivity Center for Replication Basic Edition for System z or IBM Tivoli Storage Productivity Center for Replication for System z.

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.

Metro Mirror Failover/Failback with HyperSwap

Metro Mirror Failover/Failback uses HyperSwap to configure and manage synchronous PPRC pairs.

Metro Global Mirror with HyperSwap

Metro Global Mirror with HyperSwap is a z/OS replication feature that provides the three-site continuous replication that you can use if a disaster occurs.

Restriction: If a HyperSwap event occurs when you run a Metro Global Mirror operation with a HyperSwap session, a full copy operation of the data occurs to return the system to a full three-site configuration. If you issue a HyperSwap command when you run a Metro Global Mirror operation with a HyperSwap session, a full copy operation does not occur. A full copy is required only for an unplanned HyperSwap session or a HyperSwap-initiated session by using the z/OS **SETHS SWAP** command.

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

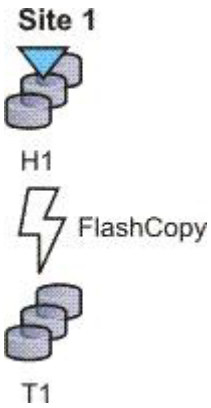
FlashCopy replication creates a point-in-time copy in which the target volume contains a copy of the data that was on the source volume when the FlashCopy was established.

The ESS, DS6000, and DS8000 provide multiple logical subsystems (LSSs) within a single physical subsystem, while the following platforms provide multiple I/O groups:

- SAN Volume Controller
- Storwize V3500
- Storwize V3700
- 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.

The following figure illustrates how a FlashCopy session works.



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.

The XIV system 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 XIV system snapshots, no storage capacity is used by the snapshot until the source volume or the snapshot is changed.

The following figure illustrates how a Snapshot session works.

Example

Jane's host applications are using an XIV system for their back-end storage. With the XIV system, 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 Tivoli Storage Productivity Center for Replication and specifies the volumes on the XIV system 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 located in one storage system and the target is located in another storage system.

Attention: If you have Tivoli Storage Productivity Center for Replication for System z 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 Tivoli Storage Productivity Center for Replication from freezing the volumes and possibly freezing itself.

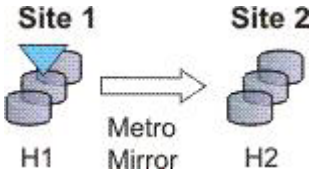
Metro Mirror replication maintains identical data in both the source and target. When a write operation is issued to the source copy, the changes made to the source data are propagated to the target before the write operation finishes processing. If the storage system ends, no data is lost when you use 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.

Metro Mirror Single Direction

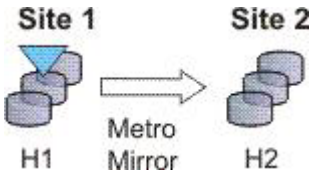
The following figure illustrates how a Metro Mirror Single Direction session works.



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 made at the second site back to the primary site when you want to resume production at the primary site.

The following figure illustrates how a Metro Mirror with Failover/Failback session works.

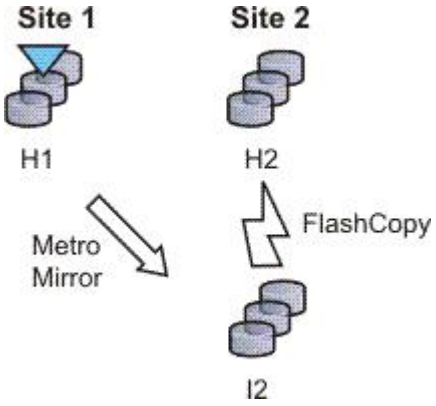


Metro Mirror Failover/Failback with Practice

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.

The following figure illustrates how a Metro Mirror Failover/Failback with Practice session works.



Metro Mirror Failover/Failback with HyperSwap

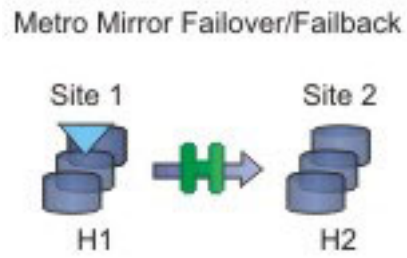
You can enable a Metro Mirror Failover/Failback session to have HyperSwap capabilities. To enable the HyperSwap feature, the following conditions must apply:

- The session is running on an Tivoli Storage Productivity Center for Replication server that runs on IBM z/OS.
- The volumes are only for TotalStorage Enterprise Storage Server, DS6000, and System Storage DS8000 systems.
- The volumes are count key data (CKD) volumes that are attached to the z/OS system.

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 when 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 **Select Action** list in the graphical user interface (GUI) or when you issue a **cmdsess -action hyperswap** command.

The following figure illustrates how a Metro Mirror Failover/Failback session that is enabled for HyperSwap works.



For more information about enabling HyperSwap, see "Managing a session with HyperSwap and Open HyperSwap replication" on page 90.

Metro Mirror Failover/Failback with Open HyperSwap

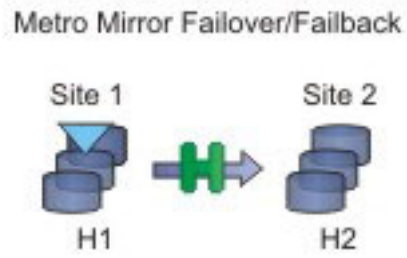
You can enable a Metro Mirror Failover/Failback session to have Open HyperSwap capabilities. To enable Open HyperSwap processing, the following conditions must apply:

- The volumes in the session are System Storage DS8000 5.1 or later volumes.
- The volumes in the session are fixed block and are mounted to IBM AIX 5.3 or AIX 6.1 hosts with the following modules installed:
  - Subsystem Device Driver Path Control Module (SDDPCM) version 3.0.0.0 or later
  - Multi-Path Input/Output (MPIO) module (the version that is provided with AIX version 5.3 or 6.1)
- The connections between the AIX host systems and the Tivoli Storage Productivity Center for Replication server are established.

Metro Mirror Failover/Failback with Open HyperSwap combines the high availability of Basic HyperSwap on z/OS for fixed-block AIX volumes with the redundancy of a two-site Metro Mirror Failover/Failback solution. 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 **Select Action** list in the GUI or when you issue a **cmdsess -action hyperswap** command.

The following figure illustrates how a Metro Mirror Failover/Failback session that is enabled for Open HyperSwap works.



For more information about enabling Open HyperSwap, see "Managing a session with HyperSwap and Open HyperSwap replication" on page 90.

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 System Storage 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.

Metro Mirror Failover/Failback enabled for Open HyperSwap

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 the session is running in a 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 the Metro Mirror session is suspended because of a failure, Jane can use the practice session to restart the data replication process while 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 the volumes is not consistent.

Selecting a HyperSwap session

A global insurance company decided to use Tivoli Storage Productivity Center for Replication 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 System Storage 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 located near each other. Jane realizes that because she uses a z/OS operating system, CKD, and System Storage 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 Tivoli Storage Productivity Center for Replication on z/OS, Jane starts the Tivoli Storage Productivity Center for Replication GUI. She adds the Tivoli Storage Productivity Center for Replication storage devices that she intends to use on all sites. From the Session Overview page, Jane uses the Create Session wizard, and selects the **Metro Mirror Failover/Failback** session type. She selects the **Manage H1H2 with HyperSwap** option. After finishing the wizard, Jane clicks **Launch Add Copy Sets Wizard**. She completes this wizard, and 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 needs to 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 Tivoli Storage Productivity Center for Replication GUI to perform a HyperSwap operation to the H2 volumes. This process transitions 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 transitions 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

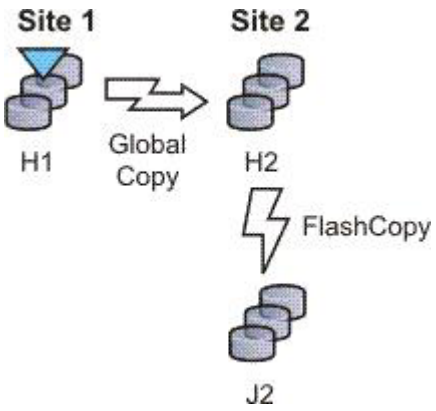
Global Mirror is a method of asynchronous, remote data replication between two sites that are over 300 kilometers (km) apart. It maintains identical data in both the source and target, where the source is located in one storage system and the target is located in another storage system.

The data on the target is typically written a few seconds after the data is written to the source volumes. When a write is issued to the source copy, the change is propagated to the target copy, but subsequent changes are allowed to the source before the target 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 being transmitted when the failure occurs. Using Global Mirror, you can ensure that data is recoverable and consistent if a disaster occurs.

Global Mirror Single Direction

You can use a Global Mirror Single Direction session to run a Global Mirror replication process from only the primary site.

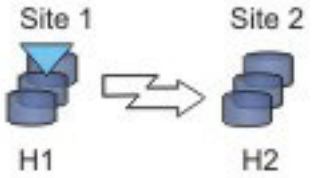
For ESS, DS6000, and DS8000 storage systems, each copy set in the single direction session consists of two host volumes and a journal volume. The following figure illustrates how a Global Mirror Single Direction session works on an ESS, DS6000, or DS8000 storage system.



For the following storage systems, each copy set in the Global Mirror Single Direction session consists of two host volumes:

- SAN Volume Controller
- Storwize V7000
- Storwize V7000 Unified

The following figure illustrates how a Global Mirror Single Direction session works on these storage systems.

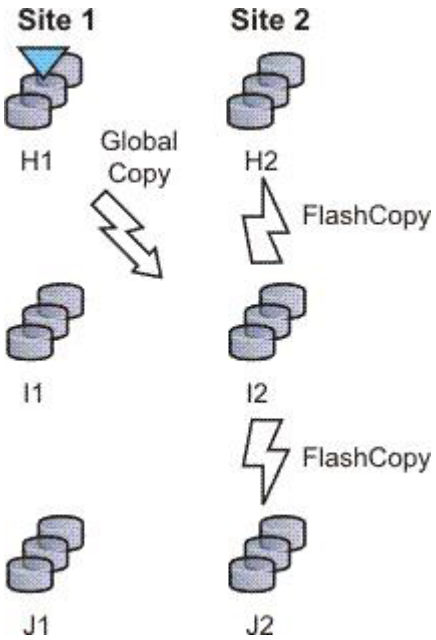


Global Mirror Either Direction with Two-Site Practice (ESS, DS6000, and DS8000)

By using a Global Mirror Either Direction with Two-Site Practice session, you can run Global Mirror replication from either the primary or secondary site. It 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. By using this practice session, you can create volumes on both the primary and secondary site to practice what you might do if a disaster occurred, without affecting the disaster recovery capability.

Restriction: This replication method is available on only ESS, DS6000, and DS8000 storage systems.

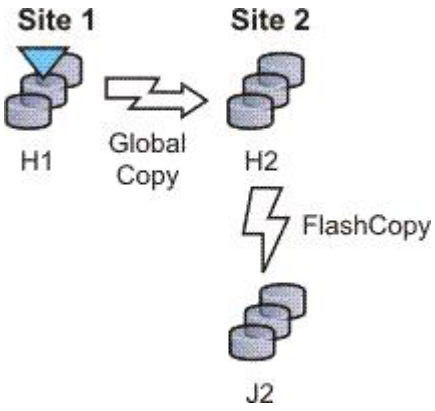
The session consists of two host volumes, two intermediate volumes, and two journal volumes. The following figure illustrates how a Global Mirror Either Direction with Two-Site Practice session works.



Global Mirror Failover/Failback

Using Global Mirror Failover/Failback, your data exists on the second site that is more than 300 km away, and you can use failover or failback processing to switch the direction of the data flow. You can run your business from the secondary site.

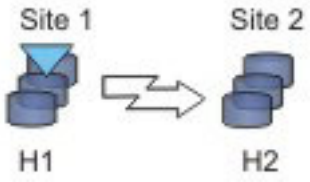
For ESS, DS6000, and DS8000 storage systems, each copy set in the Global Mirror Failover/Failback session consists of two host volumes and a journal volume. The following figure illustrates how a Global Mirror Failover/Failback session works on an ESS, DS6000, or DS8000 storage system.



For the following storage systems, each copy set in the Global Mirror Failover/Failback session consists of two host volumes:

- SAN Volume Controller
- Storwize V7000
- Storwize V7000 Unified
- The XIV system

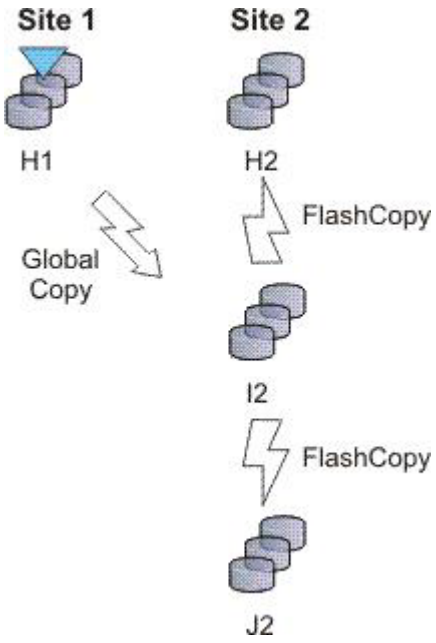
The following figure illustrates how a Global Mirror Failover/Failback session works on these storage systems.



Global Mirror Failover/Failback with Practice

A Global Mirror Failover/Failback with Practice session combines Global Mirror and FlashCopy features to provide a point-in-time copy of the data on a remote site at a distance over 300 KM away from your primary site. You can use this to practice what you might do if a disaster occurred, without affecting the disaster recovery capability.

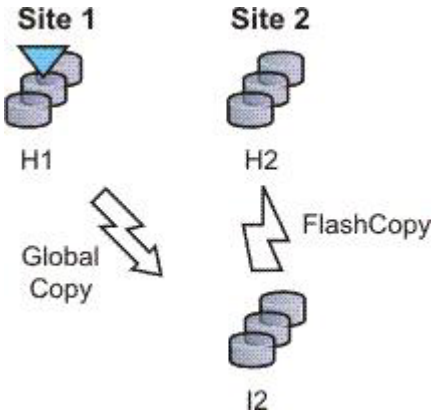
For ESS, DS6000, and DS8000 storage systems, each copy set in the Global Mirror Failover/Failback with Practice session consists of two host volumes, an intermediate volume, and a journal volume. The following figure illustrates how a Global Mirror Failover/Failback with Practice session works on an ESS, DS6000, or DS8000 storage system.



For the following storage systems, each copy set in the Global Mirror failover/failback with Practice session consists of two host volumes and an intermediate volume:

- SAN Volume Controller
- Storwize V7000
- Storwize V7000 Unified

The following figure illustrates how a Global Mirror Failover/Failback with Practice session works on these storage systems.



Examples

Read the following scenarios for information on 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.

Setting up Global Mirror for Resource Groups on System Storage DS8000

If resource groups are defined on a System Storage DS8000, Global Mirror session IDs might be defined for some users. To determine which session IDs are valid, you must modify the `rmserver.properties` file and add the following property:

```
gm.master.sessionid.gm_role,session_name = xx
```

where *gm_role* is the role that has the master volume (for example, H1 in a Global Mirror failover/failback session), *session_name* is the name of the session that uses the session ID, and *xx* is the decimal number for the session ID.

Tip: System Storage DS8000 represents session IDs as a two-digit hexadecimal number. Use the decimal version of that number. For example, if you want a Global Mirror Failover/Failback session to use a session ID of 0F, the decimal number is 15, as shown in the following example:

```
gm.master.sessionid.H2.11194_wprac=15
```

Metro Global Mirror (ESS and DS8000)

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 System Storage 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 andDS8000 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 Tivoli Storage Productivity Center for Replication for System z 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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:

- If HyperSwap occurs by event when running a Metro Global Mirror with a HyperSwap session, a full copy of the data occurs to return to a full three-site configuration. If you issue a HyperSwap command when running a Metro

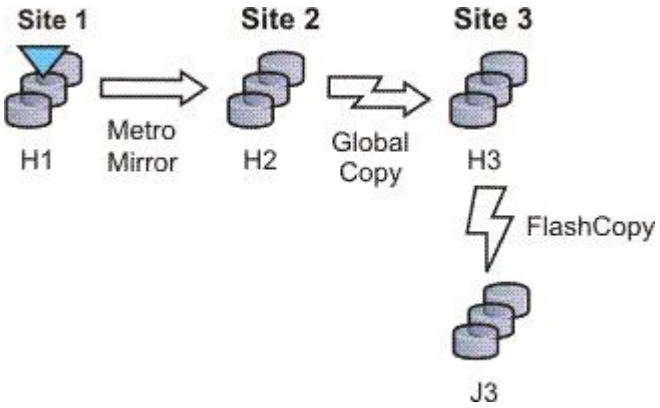
Global Mirror with a HyperSwap session, a full copy does not occur. A full copy is required only for an unplanned HyperSwap or a HyperSwap initiated using the z/OS SETHS SWAP command.

- 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.

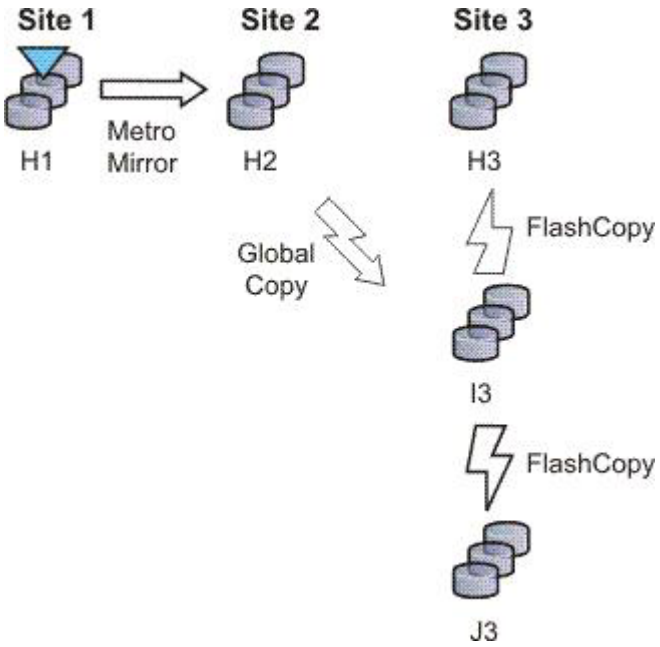
The following figure illustrates how a Metro Global Mirror session works.



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. The following figure illustrates how a Metro Global Mirror with Practice session works.



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.

Managing a session with HyperSwap and Open HyperSwap replication

HyperSwap and Open HyperSwap provide 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 or Open 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

To enable HyperSwap processing, the following conditions must apply:

- The session is running on a Tivoli Storage Productivity Center for Replication server that is running on IBM z/OS.
- The volumes are only for TotalStorage Enterprise Storage Server, System Storage DS8000, and DS6000 systems.
- The volumes are count key data (CKD) volumes that are attached to the z/OS system.

Sessions that can enable Open HyperSwap

Only the Metro Mirror with Failover/Failback session type can enable Open HyperSwap processing.

To enable Open HyperSwap processing, the following conditions must apply:

- The volumes in the session are System Storage DS8000 5.1 or later volumes.
- The volumes in the session are fixed block and mounted to IBM AIX 5.3 or AIX 6.1 hosts with the following modules installed:
  - Subsystem Device Driver Path Control Module (SDDPCM) version 3.0.0.0 or later
  - Multi-Path Input/Output (MPIO) module (the version that is provided with AIX version 5.3 or 6.1)
- The connections between the AIX host systems and the Tivoli Storage Productivity Center for Replication server are established.

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 IBM Tivoli Storage Productivity Center for Replication session.

Complete the following steps before you enable HyperSwap. For more information about these steps, see the IBM Tivoli Storage Productivity Center for Replication for System z Installation and Configuration Guide.

1. Install IBM Tivoli Storage Productivity Center for Replication for System z.
2. Set up the data store and configure other necessary system settings.
3. Ensure that all RESERVEs are converted to global enqueues (ENQs).
4. Ensure that all volumes in the session that you are enabling for HyperSwap are attached to the IBM z/OS system that runs Tivoli Storage Productivity Center for Replication.
5. Set up and start the IOSHSAPI and HSIB tasks.

Setting up the environment for Open HyperSwap

You must set up an environment in which you can run Open HyperSwap processing before you can enable Open HyperSwap for a IBM Tivoli Storage Productivity Center for Replication session.

Complete the following steps before you enable Open HyperSwap.

1. Ensure that the IBM AIX hosts and IBM System Storage DS8000 meet the following hardware and software requirements:

   AIX requirements
   You can find the supported AIX version for each Tivoli Storage Productivity Center for Replication release in the support matrix at http://www.ibm.com/support/docview.wss?uid=swg21386446. Click the link for the applicable release under Agents, Servers, and GUI.

   You must have the following AIX modules installed:

   - Subsystem Device Driver Path Control Module (SDDPCM) version 3.0.0.0 or later
   - Multi-Path Input/Output (MPIO) module (the version that is provided with AIX)

   System Storage DS8000 hardware requirements
   The Open HyperSwap function requires System Storage DS8000 5.1 or later.

   You cannot use Open HyperSwap with High Availability Cluster Multi-Processing (HACMP).
2. Create connections from Tivoli Storage Productivity Center for Replication to the AIX hosts by following the instructions at "Adding a host system connection" on page 51.
3. Assign copy set volumes from the storage device to the host by using the System Storage DS8000 command-line interface (CLI) or the graphical user interface (GUI).
4. Run the AIX **cfgmgr** command to discover the volumes that are assigned to the host.

Considerations for Open HyperSwap and the AIX host:

- A single session that has the Open HyperSwap function enabled can manage multiple hosts; however, each host can be associated with only one session. Multiple hosts can share the session.
- For AIX 5.3, a single host can manage a maximum of 1024 devices that are enabled for Open HyperSwap processing on the host. A maximum of eight logical paths can be configured for each copy set in the session. For AIX 6.1, a single host can manage a maximum of 1024 devices that are enabled for Open HyperSwap processing on the host. A maximum of 16 logical paths can be configured for each copy set in the session.

- If an application on the host opened a device, a Tivoli Storage Productivity Center for Replication session for that device cannot be ended. The **Terminate** command fails. To end the session, you must either close the application or remove the copy sets from the session. If you remove copy sets from the session, you must ensure that the application writes the data to the correct volume when the copy set relationship is restored.
- Open HyperSwap processing can fail on a subset of hosts for the session and continue to run on the remaining hosts for the same session. In this situation, you must determine the best action to take if the application is writing data to volumes on the source system and to volumes on the target system.
- To enable Open HyperSwap processing on the host, see the *IBM System Storage Multipath Subsystem Device Driver User's Guide*.

Configuring timers to support Open HyperSwap:

You can configure timeout values for the storage system, Tivoli Storage Productivity Center for Replication, and AIX hosts systems. These values can affect the operation of Open HyperSwap.

The following various timeout values can affect Open HyperSwap:

Storage system quiesce timeout value
This value is the time when the storage system starts a quiesce operation. When the timer value expires, I/O is resumed on the primary device. The default timeout value is 2 minutes, but the value can be set from 30 to 600 seconds. To set the quiesce timeout value, use the **chdev** command in the *IBM System Storage Multipath Subsystem Device Driver User's Guide*.

Storage system long busy timeout value
This value is the time in seconds that the logical subsystem (LSS) consistency group volume stays in the long busy state after a remote mirror and copy error is reported.

Timeout values for the applications that are on the host
The various applications that are running on the host have timeout values. The timeout values vary depending on the application.

Considerations for setting timers

Consider the following information for setting timers:

- If the host quiesce timer is set to a shorter value than the Tivoli Storage Productivity Center for Replication response timer, an I/O swap failure can occur. If a storage system triggers an unplanned failover and if the storage system quiesce timer expires before Tivoli Storage Productivity Center for Replication responds, the host attempts to write I/O to the primary volume where the loss of access occurred. If the hardware condition that caused the loss of access continues, the write I/O operation fails again and an unplanned Open HyperSwap is not performed.
- If the host quiesce timer is set to a longer value than the Tivoli Storage Productivity Center for Replication response timer, an application timeout might occur if Open HyperSwap takes too long to complete.

Enabling a session for HyperSwap or Open HyperSwap

Enabling HyperSwap or Open HyperSwap for a session provides business recovery and business continuity.

Ensure that you can use the HyperSwap or Open HyperSwap functions in your environment. See “Setting up the environment for HyperSwap” on page 90 or “Setting up the environment for Open HyperSwap” on page 91.

Enable a HyperSwap or Open HyperSwap session by completing the following steps:

1. In the Tivoli Storage Productivity Center for Replication navigation tree, select **Sessions**. Click the button next to the session that you want to enable.
2. From the **Select Action** menu, select **View/Modify Properties** and click **Go**. If you did not create the session, click **Create Session**. You can enable the HyperSwap or Open HyperSwap function on the Properties page
3. In **ESS / DS Metro Mirror Options**, select the appropriate HyperSwap or Open HyperSwap options:
   - **Manage H1-H2 with HyperSwap**. This option enables a session to manage the H1-H2 sequence using HyperSwap. If you select this option, select from the following additional options.
     - **Disable HyperSwap**. Select this option to prevent a HyperSwap from occurring by command or event.
     - **On Configuration Error**. Choose one of the following options:
       - **Partition the system(s) out of the sysplex**. Select this option to partition out of the sysplex when a new system is added to the sysplex and encounters an error in loading the configuration. A restart of your system is required if you select this option.
       - **Disable HyperSwap**. Select this option to prevent a HyperSwap from occurring by command or event.
     - **On Planned HyperSwap Error**. Choose one of the following options:
       - **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 continues the swap processing on any remaining systems.
       - **Disable HyperSwap after attempting backout**. Select this option to stop the HyperSwap action, and disable the HyperSwap commands or events.
     - **On Unplanned HyperSwap**. Choose one of the following options:
       - **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 continues the HyperSwap processing on the remaining systems when a new system is added to the sysplex and HyperSwap does not complete. A restart of your system is required if you select this option.
       - **Disable HyperSwap after attempting backout**. Select this option to stop the HyperSwap action, and disable the HyperSwap commands or events.
   - **Manage H1-H2 with Open HyperSwap**. If volumes are attached to an IBM AIX host, Tivoli Storage Productivity Center for Replication can manage the H1-H2 sequence of a Metro Mirror session using Open HyperSwap. If this option is selected, a failure on the host accessible volumes triggers a swap, which redirects application I/O to the secondary volumes. Only volumes that are currently attached to the host systems that are defined on the Tivoli Storage Productivity Center for Replication Host Systems panel are eligible for Open HyperSwap.

– **Disable Open HyperSwap**. Select this option to prevent a swap from occurring by a command or event while keeping the configuration on the host system and all primary and secondary volumes coupled.

4. Click **OK** to apply the selected options.

Restarting an AIX Host System that is enabled for Open HyperSwap

When an AIX host system is restarted, the host automatically opens any volumes for I/O that were open before the system was restarted. If Open HyperSwap was enabled for a set of volumes on the host system, the host must determine which storage system is the primary system before the host can allow the volumes to be opened.

If the Metro Mirror relationship for the set of volumes is in Prepared or Suspended state and the host has connectivity to both the primary and secondary storage systems, the host can determine through the hardware which storage system is the primary system. In this situation, the host automatically opens the volumes.

If the Metro Mirror relationship for the set of volumes is in Prepared state and the host has connectivity to only the secondary storage system, all I/O to the volumes might be blocked on the host system. The I/O might be blocked until the host can verify the primary volume in the relationship. The AIX `varyonvg` command fails to open the volumes for I/O to prevent the application from writing to an incorrect volume. If the host can determine which volume is the primary volume in the relationship and connectivity to the primary storage system is still lost, a Hyperswap event is triggered. This event causes all I/O to be automatically opened and directed to the secondary storage system.

If the Metro Mirror relationship for the set of volumes is in Target Available state or the host system does not have connectivity and is unable to determine which site is the primary site, all I/O to the volumes are blocked on the host system. The Target Available state occurs after a Hyperswap or a Recover command is issued for the session. The `varyonvg` command fails to open the volumes for I/O to prevent the application from writing to an incorrect volume.

Unblocking I/O on the host system after a host system restart

When any of the previous scenarios cause I/O to be blocked, manual actions might be necessary to remove the block.

If the relationships are in Target Available state on the hardware, issue the **`Start`** command to the session in the required direction of the relationship. This action defines the primary storage system for the host. The host system can allow the volumes to be opened for I/O processing.

If the relationships cannot be restarted, or the host cannot determine the primary storage system, it might be necessary to manually decouple the volumes on the host system.

To decouple the volumes, complete one of the following tasks:

- Stop the session or remove the copy set. This action requires a full copy when the relationships are restarted.
- Remove Object Data Manager (ODM) entries by using the following command:

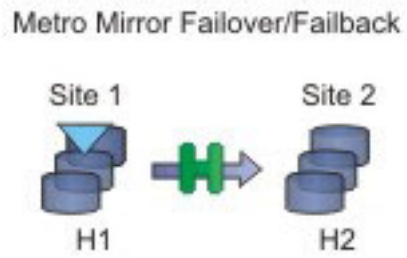
```
odmdelete -o Volume_Equivalency
```

Restriction: This command deletes copy set information; use it only for this scenario.

Planned and unplanned swaps

After a session is enabled for HyperSwap or Open HyperSwap processing and reaches Prepared state, Tivoli Storage Productivity Center for Replication loads the configuration of volumes that can be swapped to a z/OS or AIX operating system.

When the load is complete, the session can start a planned or unplanned swap. The H1-H2 role pair of the session shows a type of HS. An "H" is displayed over the connection in the dynamic image for that role pair, as shown in the following figure.



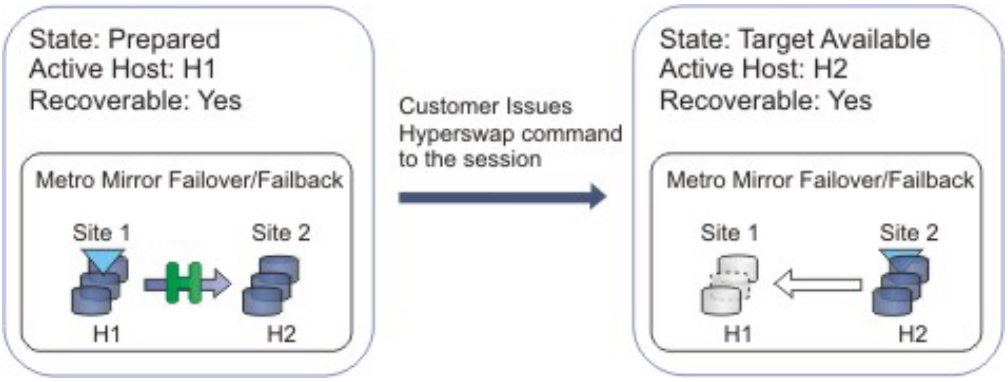
Completing a Planned Swap

When the session configuration is loaded on z/OS for HyperSwap or AIX for Open HyperSwap, the session is considered swap capable. There may 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 HyperSwap and Open HyperSwap, 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.

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.

The following figure illustrates a planned swap operation.



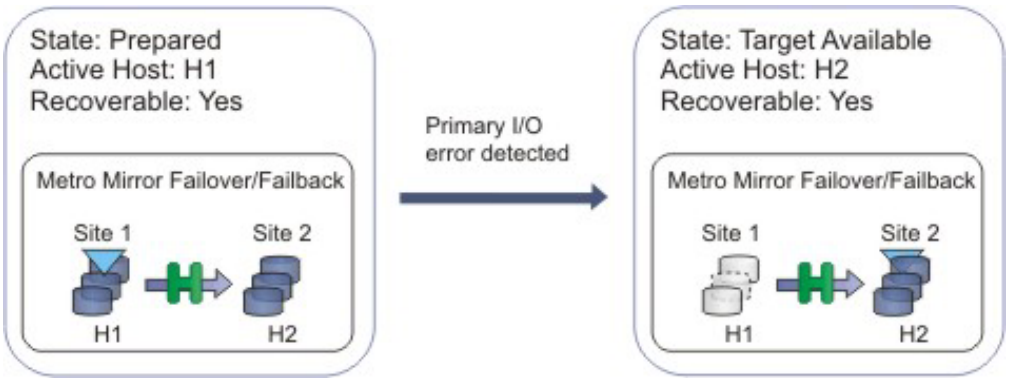
Unplanned swaps

When the session configuration is loaded on z/OS for HyperSwap processing or on AIX for Open HyperSwap processing, the session is considered swap capable. If a primary I/O error occurs, a swap occurs automatically. For HyperSwap, z/OS completes the swap and then alerts Tivoli Storage Productivity Center for Replication that a swap occurred. For Open HyperSwap, Tivoli Storage Productivity Center for Replication and the AIX host work together to complete the swap.

When an unplanned swap occurs for HyperSwap and Open HyperSwap, 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.

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.

The following figure illustrates an unplanned swap.



Scenarios that require a full copy in Metro Global Mirror with HyperSwap sessions

You must run a full copy to return to the three-site configuration after a swap when the following conditions occur:

- If you run a Metro Global Mirror session with the HyperSwap function and you issue the **HyperSwap** command by using the z/OS HyperSwap API.
- If you run a Metro Global Mirror session with the HyperSwap function and an unplanned swap occurs.

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 or the AIX host on Open HyperSwap.

Verify the status of HyperSwap from the z/OS console:

1. View the overall status of the HyperSwap session. Issue the `ds 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
```

Verify the status of Open HyperSwap from the AIX host:

1. View the session association and the path that the I/O is being routed to. The path is indicated by an asterisk. Issue the `pcmpath query device` command. For example:

```
host1> pcmpath query device 14

  DEV#:   14  DEVICE NAME: hdisk14  TYPE: 2107900  ALGORITHM:  Load Balance
  SESSION NAME:     session1
  OS Direction:     H1<-H2
  ==========================================================================
  PRIMARY   SERIAL: 25252520000
  ----------------------------
  Path#      Adapter/Path Name          State     Mode     Select     Errors
     0           fscsi0/path0          CLOSE   NORMAL       6091          0
     1           fscsi0/path2          CLOSE   NORMAL       6300          0
     2           fscsi1/path4          CLOSE   NORMAL       6294          0
     3           fscsi1/path5          CLOSE   NORMAL       6187          0

  SECONDARY SERIAL: 34343430000 *
  ----------------------------
  Path#      Adapter/Path Name          State     Mode     Select     Errors
     4           fscsi0/path1          CLOSE   NORMAL      59463          0
```

```
5           fscsi0/path3          CLOSE   NORMAL      59250          0
6           fscsi1/path6          CLOSE   NORMAL      59258          0
7           fscsi1/path7          CLOSE   NORMAL      59364          0
```

Temporarily disabling HyperSwap or Open HyperSwap

In some situations, it might be necessary to temporarily disable the HyperSwap or Open HyperSwap function for a session.

You might want to disable HyperSwap or Open 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 Open HyperSwap for a specific session:

1. In the Tivoli Storage Productivity Center for Replication navigation tree, select **Sessions**.
2. Select the sessions for which you want to disable the HyperSwap or Open HyperSwap function.
3. Select **View/Modify Properties** from the **Select Actions** list, and click **Go**.
4. Select **Disable HyperSwap** or **Disable Open HyperSwap**, and click **OK**.

   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 Tivoli Storage Productivity Center for Replication servers with HyperSwap or Open HyperSwap

You can set up an active and standby management server configuration with HyperSwap or Open HyperSwap.

Active and standby servers with 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 Tivoli Storage Productivity Center for Replication 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.

Active and standby servers with Open HyperSwap

When there is an active and standby management server configuration and a host system connection is added to the active server, a connection is attempted between the host system and the standby server. After AIX loads the session configuration, Open HyperSwap processing is possible only if there is communication between AIX and the Tivoli Storage Productivity Center for Replication server. If a standby server resumes the processing and is unable to connect to the host system that

manages the swap, the session cannot run Open HyperSwap processing. You must activate communication to the host system before the session can run Open HyperSwap processing.

Related tasks:

Chapter 3, “Managing management servers,” on page 29
This section provides information about how to set up active and standby management servers, restore a lost connection between the management servers, or perform a takeover on the standby management server.

Session commands

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

Commands are issued synchronously to IBM Tivoli Storage Productivity Center for Replication sessions . Any subsequent command issued to an individual session is not processed until the first command has completed. Some commands can take an extended amount of time to complete, such as the **Start** command as it sets up the hardware. The GUI continues to allow you to issue commands to other sessions and not hold up functionality. When a command has completed, the console displays 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 33. 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.
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 34. FlashCopy commands

Command	Action
Start	Performs any steps necessary to define the relationship before performing a FlashCopy operation. For ESS, DS6000, and DS8000, this command is not an option. Issue this command to put the session in the prepared state for the following storage systems: • SAN Volume Controller • Storwize V3500 • Storwize V3700 • Storwize V7000 • Storwize V7000 Unified
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: • SAN Volume Controller • Storwize V3500 • Storwize V3700 • Storwize V7000 • Storwize V7000 Unified For a FlashCopy session containing ESS, DS6000, and DS8000 volumes, the Flash command by itself is not sufficient to create a consistent copy. To create a consistent copy using the ESS, DS6000, and DS8000 Flash commands, you must quiesce application I/O before issuing the Flash command.
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.
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 35. Snapshot session commands

Command	Action
Create Snapshot	Creates a snapshot of the volumes in the session

Table 35. Snapshot session commands (continued)

Command	Action
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 Tivoli Storage Productivity Center for Replication graphical user interface (GUI), you are prompted to select the snapshot group.

Table 36. 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 XIV system. 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 Tivoli Storage Productivity Center for Replication. 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 XIV system.
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.
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 37. 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 reversing 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. This command is available only for Tivoli Storage Productivity Center for Replication for System z.
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.

Table 37. Metro Mirror commands (continued)

Command	Action
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:** It is recommended that you avoid using the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on ESS, DS6000, and 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.
Recover	Issues the **Recover** command to suspended sessions. This command performs the steps necessary to make the target available as the new primary site. Upon completion of this command, the session becomes Target Available.
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 38. 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 reversing the direction of copying in a failover and failback session. After you issue this command, the **Start H1->H2** command becomes available.

Table 38. Metro Mirror with Practice commands (continued)

Command	Action
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 ESS, DS6000, and 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.
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 ESS, DS6000, and 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 38. Metro Mirror with Practice commands (continued)

Command	Action
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 JH2 volumes afterwards.

Global Mirror commands

Use this information to learn about commands available for Global Mirror sessions.

Table 39. 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 reversing the direction of copying in a failover and failback session. After you issue this command, the **Start H1->H2** command becomes available.
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 TotalStorage Enterprise Storage Server Model 800, System Storage DS6000, and System Storage DS8000. If a recover was performed on a session such that the production site is now H2, you can issue a **Start H2->H1** 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 puts the relationships into a synchronized state and suspends them consistently. Sessions are consistent when copying H2->H1 for the following storage systems: • SAN Volume Controller • Storwize V7000 • Storwize V7000 Unified

Table 39. Global Mirror commands (continued)

Command	Action
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 following storage systems: • TotalStorage Enterprise Storage Server Model 800 • System Storage DS6000 • System Storage DS8000
Suspend	Stops all consistency group formation when the data is actively being copied and suspends the H1->H2 Global Copy pairs. To issue the pause command to the Global Mirror session on the hardware without suspending the Global Copy pairs, open the `rmserver.properties` file and add the following property to disable the Global Copy suspension on the **Suspend** command: **`csm.server.sus_gc_pairs_on_gm_pause = false.`** The default property is **`true`** and the **Suspend** command automatically suspends the Global Copy pairs.
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. Upon completion of this command, the session 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.
Terminate	Removes all 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 **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 40. 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 reversing the direction of copying in a failover and failback session. After you issue this command, the **Start H1->H2** command becomes available.

Table 40. Global Mirror with Practice commands (continued)

Command	Action
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 TotalStorage Enterprise Storage Server Model 800, System Storage DS6000, and System Storage DS8000, the Flash command temporarily pauses the formation of consistency groups.
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** 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:** TotalStorage Enterprise Storage Server Model 800, System Storage DS6000, and System Storage 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 Tivoli Storage Productivity Center for Replication server occurs, the session might be inconsistent when you issue the **Recover** command. This command is available for the following storage systems: • TotalStorage Enterprise Storage Server Model 800 • System Storage DS6000 • System Storage DS8000
Terminate	Removes all physical copies and relationships on the hardware.
Suspend	Stops all consistency group formation when the data is actively being copied and suspends the H1-I2 Global Copy pairs. To issue the pause command to the Global Mirror session on the hardware without suspending the Global Copy pairs, open the `rmserver.properties` file and add the following property to disable the Global Copy suspension on the **Suspend** command: **`csm.server.sus_gc_pairs_on_gm_pause = false.`** The default property is **`true`** and the **Suspend** command automatically suspends the Global Copy pairs.

Table 40. Global Mirror with Practice commands (continued)

Command	Action
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.

Metro Global Mirror commands

Use this information to learn about commands available for Metro Global Mirror sessions.

Table 41. 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 reversing 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 Tivoli Storage Productivity Center for Replication for System z.
Start H1->H2->H3	(This 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 includes the J3 volume to complete the Global Mirror configuration. (The J3 volume role is the journal volume at site 3.). **Start H1->H2->H3** 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, or suspended state.

Table 41. 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. This command allows you 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 thus loses the near-zero data loss protection achieved with Metro Mirror when running H1->H2->H3. 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. This can be done for unplanned HyperSwap. The Global Mirror session is continued. This is a host-volume change so this command is valid only when restarting 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 unplanned HyperSwap. The Global Mirror session is continued. This session is a host-volume change so this command is valid only when restarting 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, it can be used when the session is in preparing, prepared, and suspended states **Start H2->H1->H3** can be used to transition back to the starting H2->H1->H3 configuration.
Start H2->H1->H3	(This is the Metro Global Mirror start command.) This is the configuration that 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, this includes the J3 volume to complete the Global Mirror configuration.

Table 41. Metro Global Mirror commands (continued)

Command	Action
Start H3->H1->H2	After recovering to H3, 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	When running H1->H2->H3, this command issues a pause to the Global Mirror master and causes the Global Mirror master to stop forming consistency groups. This command is valid only when the session is in a prepared state. Stops all consistency group formation when the data is actively being copied and suspends the H2>H3 Global Copy pairs. To issue the pause command to the Global Mirror session on the hardware without suspending the Global Copy pairs, open the `rmserver.properties` file and add the following property to disable the Global Copy suspension on the **Suspend** command: **`csm.server.sus_gc_pairs_on_gm_pause = false.`** The default property is **`true`** and the **Suspend** command automatically suspends the Global Copy pairs.
SuspendH1H3	When running H2->H1->H3, this command issues a pause to the Global Mirror master and causes the Global Mirror master to stop forming consistency groups. This command is valid only when the session is in a prepared state. Stops all consistency group formation when the data is actively being copied and suspends the H2->H3 Global Copy pairs. To issue the pause command to the Global Mirror session on the hardware without suspending the Global Copy pairs, open the `rmserver.properties` file and add the following property to disable the Global Copy suspension on the **Suspend** command: **`csm.server.sus_gc_pairs_on_gm_pause = false.`** The default property is **`true`** and the **Suspend** command automatically suspends the Global Copy pairs.
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. IBM Tivoli Storage Productivity Center for Replication processing differs, depending on the recovery site. Therefore, the site designation is added to the **Recover** command so IBM Tivoli Storage Productivity Center for Replication 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. IBM Tivoli Storage Productivity Center for Replication processing is different depending on the recovery site. Therefore the site designation is added to the **Recover** command so IBM Tivoli Storage Productivity Center for Replication can prepare for the failback.

Table 41. Metro Global Mirror commands (continued)

Command	Action
RecoverH3	Specifying H3 makes the H3 volume TargetAvailable. Metro Global Mirror (when running H1->H2->H3) can then move production to the H3 set of volumes. Because Tivoli Storage Productivity Center for Replication processing differs depending on the recovery site, the site designation is added to the **Recover** command so that Tivoli Storage Productivity Center for Replication 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.

Metro Global Mirror with Practice commands

Use this information to learn about commands available for Metro Global Mirror with Practice sessions.

Table 42. 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 reversing 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 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 issued to complete the flash of the consistent data from I3 to H3. Issuing a **Flash** command on a Global Mirror Practice session for ESS, DS6000 and DS8000 will temporarily pause 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 be automatically restarted, and the session will begin forming consistency groups on I3. You can then use the H3 volumes to practice your disaster recovery procedures.

Table 42. Metro Global Mirror with Practice commands (continued)

Command	Action
RecoverH1	Specifying H1 makes the H1 volume TargetAvailable. Metro Global Mirror (when running H1->H2->H3) can move production to either the H2 or H3 set of volumes. IBM Tivoli Storage Productivity Center for Replication processing differs, depending on the recovery site. Therefore the site designation is added to the **Recover** command so IBM Tivoli Storage Productivity Center for Replication 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 will reach a Target Available state, and you can attach your volumes on Site 3.
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. IBM Tivoli Storage Productivity Center for Replication processing differs, depending on the recovery site. Therefore the site designation is added to the **Recover** command so IBM Tivoli Storage Productivity Center for Replication can prepare for the failback.
RecoverH3	Specifying H3 makes the H3 volume the TargetAvailable. When running H1->H2->H3, Metro Global Mirror can move production to either the H2 or H3 set of volumes. IBM Tivoli Storage Productivity Center for Replication processing differs, depending on the recovery site; therefore, the site designation is added to the **Recover** command so IBM Tivoli Storage Productivity Center for Replication can prepare for the failback.
Re-enable Copy to Site 1	After issuing 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 issuing 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 issuing 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.
Start H1->H2->H3	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 includes the J3 volume to complete the Global Mirror configuration. (The J3 volume role is the journal volume at site 3.). **Start H1->H2->H3** 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.

Table 42. Metro Global Mirror with Practice 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. 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 performed, the session is running Global Mirror from H1 to H3 and thus loses the near-zero data loss protection achieved with Metro Mirror when running H1->H2->H3. 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. This can be done for unplanned HyperSwap. The Global Mirror session is continued. This is a host-volume change so this command is valid only when restarting 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. This can be done for unplanned HyperSwap. The Global Mirror session is continued. This is a host-volume change so this command is valid only when restarting 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 it can be used when the session is in preparing, prepared, and suspended states. **Start H2->H1->H3** can be used to return to the starting H2->H1->H3 configuration.
SuspendH2H3	When running H1->H2->H3, this command issues a pause to the Global Mirror master and causes the Global Mirror master to stop forming consistency groups. This command is valid only when the session is in a prepared state. It stops all consistency group formation when the data is actively being copied and suspends the H2->H3 Global Copy pairs. To issue the pause command to the Global Mirror session on the hardware without suspending the Global Copy pairs, open the `rmserver.properties` file and add the following property to disable the Global Copy suspension on the **Suspend** command: **`csm.server.sus_gc_pairs_on_gm_pause = false.`** The default property is **`true`** and the **Suspend** command automatically suspends the Global Copy pairs.

Table 42. Metro Global Mirror with Practice commands (continued)

Command	Action
SuspendH1H3	When running H2->H1->H3, this command issues a pause to the Global Mirror master and causes the Global Mirror master to stop forming consistency groups. This command is valid only when the session is in a prepared state. Stops all consistency group formation when the data is actively being copied and suspends the H2->H3 Global Copy pairs.To issue the pause command to the Global Mirror session on the hardware without suspending the Global Copy pairs, open the `rmserver.properties` file and add the following property to disable the Global Copy suspension on the **Suspend** command: **`csm.server.sus_gc_pairs_on_gm_pause = false.`** The default property is **`true`** and the **Suspend** command automatically suspends the Global Copy pairs.
Terminate	This command terminates all copy relationships on the hardware.

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.

IBM Tivoli Storage Productivity Center for Replication 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 IBM Tivoli Storage Productivity Center for Replication 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, IBM Tivoli Storage Productivity Center for Replication 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 will be performed (if possible) on both sites. If the consistency cannot be preserved, the Flash for the FlashCopy relationships will fail, and the data of the Metro Mirror relationship at the target of the FlashCopy relationship will not be changed.

Note: This option is available only on DS8000 storage devices with the required code levels installed.

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 to a Metro Mirror session going 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.

Refer to 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 will contain volumes that will be the source of the FlashCopy relationship and the target pair will always contain volumes that will be 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. IBM Tivoli Storage Productivity Center for Replication will ensure that all of the volumes remain consistent.

A drawback to this approach is that when using 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 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. As long as 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 will not be 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 IBM Tivoli Storage Productivity Center for Replication session. These factors cause both applications to receive extended long busy signals, instead of just the batch job.

Creating sessions and adding copy sets

This section describes how to create a session for a specific replication method and then add copy sets to that session.

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.

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.

1. Follow these steps to create a FlashCopy session:

a. In the navigation tree, select **Sessions**.
b. Click **Create Session**.
c. In the Create Session wizard, for the **Choose Hardware Type** list, select the item that shows the type of storage system for the session.
d. In the **Choose Session Type** list, select **FlashCopy** and click **Next**.
e. On the Properties page, enter a session name and a description. Select the options that you want, as described in "Viewing session properties" on page 147. The options that are displayed depend on the storage system type. After you select the options that you want, click **Next**.
f. On the Site Locations page, select a location for Site 1 and click **Next**.
g. On the Results page, verify that the session was added successfully.

2. Follow these steps to add copy sets to the session:
   a. On the Results page of the Create Session wizard, click **Launch Add Copy Sets Wizard**.
   b. In 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 role has a location assigned to it, acceptable values for the storage system list are storage systems assigned to the same location as the role, and storage systems assigned to no location. In this case, the storage systems are grouped under different headings. If the role does not have a location, any storage system is acceptable.

      Logical storage system or I/O Group
      Select a logical storage system (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.

      You can use extent space-efficient volumes as source and target volumes for System Storage DS8000 6.2 or later. You can use a combination of extent space-efficient and other volume types as source and target volumes.

      Extent space-efficient volumes must be fixed block (FB). You cannot use count key data (CKD) volumes.

      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.

c. On the Choose Target page, select the target storage system, LSS or I/O group, and volume. Click **Next**.

d. On the Select Copy Sets page, select the copy sets that you want to add. You can click **Select All** to select all copy sets, **Deselect All** to select none of the copy sets, or **Add More** to add more copy sets to this session. Click **Next**.

e. On the Confirm page, the number of copy sets to be added is displayed. Click **Next**.

f. A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

Related concepts:

"Sessions" on page 59
A *session* is used to perform a specific type of data replication against a specific set of volumes. 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.

"Session Types" on page 9
Tivoli Storage Productivity Center for Replication provides several methods to replicate data. The type of data replication that is associated with a session is known as the *session type*.

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 XIV system.

1. Follow these steps to create a Snapshot session:
   a. In the navigation tree, expand **Sessions**.
   b. Click **Create Session**.
   c. In the Create Session wizard, for the **Choose Hardware Type** list, select **XIV**.
   d. In the **Choose Session Type** list, select **Snapshot** and click **Next**.
   e. On the Properties page, type a session name and description, and click **Next**.
   f. On the Site Locations page, select a location for Site 1 and click **Next**.
   g. On the Results page, verify that the session was added successfully.
2. Follow these steps to add copy sets to the session:
   a. On the Results page of the Create Session wizard, click **Launch Add Copy Sets Wizard**.
   b. 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.
   c. From the **Host1 pool** list, select the pool that contains the volumes.

d. From the **Host1 volume** list, select the volumes. To select multiple volumes, press Ctrl or Shift and click the volumes in the list.

e. If you want 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. Click **Next**.

f. On the Matching Results page, click **Next** if the match was successful.

g. 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 **Host1 storage system** and **Host1 pool** lists are populated with the values from the previously selected copy set. When you select the volumes for the various roles, the volumes are matched together and added to the list of copy sets on this page.

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.

h. On the Confirm page, the number of copy sets to be added is displayed. Click **Next**.

i. A progress bar is displayed. When the copy sets are added, review the results and click **Finish**.

Related concepts:

"Sessions" on page 59
A *session* is used to perform a specific type of data replication against a specific set of volumes. 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.

"Session Types" on page 9
Tivoli Storage Productivity Center for Replication provides several methods to replicate data. The type of data replication that is associated with a session is known as the *session type*.

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.

1. Follow these steps to create a Metro Mirror session:
   a. In the navigation tree, select **Sessions**.
   b. Click **Create Session**.
   c. In the Create Session wizard, for the **Choose Hardware Type** list, select the item that shows the type of storage system for the session.
   d. In the **Choose Session Type** list, select a Metro Mirror session type and click **Next**.
   e. On the Properties page, enter a session name and description. Depending on the session type and storage system, additional options are displayed. Select the options that you want, as described in "Viewing session properties" on page 147. After you select the options that you want on the Properties page, click **Next**.
   f. On the Site Locations pages, select a location for Sites 1 and 2, and click **Next**.
   g. On the Results page, verify that the session was added successfully.
2. Follow these steps to add copy sets to the session:
   a. On the Results page of the Create Session wizard, click **Launch Add Copy Sets Wizard**.
   b. In the Add Copy Sets wizard, enter the following information for the Host 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 role has a location assigned to it, acceptable values for the storage system list are storage systems assigned to the same location as the role, and storage systems assigned to no location. In this case, the storage systems are grouped under different headings. If the role does not have a location, any storage system is acceptable.

      Logical storage system, I/O Group, or Pool
      Select a logical storage system (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.

      You can use extent space-efficient volumes as source and target volumes for System Storage DS8000 6.3 or later. If you use an extent

space-efficient volume as a source or target volume in the copy set, all source and target volumes in the copy set must be extent space-efficient volumes.

Extent space-efficient volumes must be fixed block (FB). You cannot use count key data (CKD) volumes.

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.

c. On the Select Copy Sets page, select the copy sets that you want to add. You can click **Select All** to select all copy sets, **Deselect All** to select none of the copy sets, or **Add More** to add more copy sets to this session. Click **Next**.

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**.

Related tasks:

"Managing a session with HyperSwap and Open HyperSwap replication" on page 90

HyperSwap and Open HyperSwap provide 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.

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.

1. Follow these steps to create a Global Mirror session:
   a. In the navigation tree, select **Sessions**.
   b. Click **Create Session**.
   c. In the Create Session wizard, for the **Choose Hardware Type** list, select the item that shows the type of storage system for the session.
   d. In the **Choose Session Type** list, select a Global Mirror session type and click **Next**.
   e. On the Properties page, enter a session name and description. Depending on the session type and storage system, additional options are displayed. Select the options that you want, as described in "Viewing session properties" on page 147. After you select the options that you want on the Properties page, click **Next**.

f. On the Site Locations pages, select a location for Sites 1 and 2, and click **Next**.

g. On the Results page, verify that the session was added successfully.

2. Follow these steps to add copy sets to the session:

   a. On the Results page of the Create Session wizard, click **Launch Add Copy Sets Wizard**.

   b. In the Add Copy Sets wizard, complete the following information for the Host and Journal 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 role has a location assigned to it, acceptable values for the storage system list are storage systems assigned to the same location as the role, and storage systems assigned to no location. In this case, the storage systems are grouped under different headings. If the role does not have a location, any storage system is acceptable.

      Logical storage system, I/O Group, or Pool
      Select a logical storage system (LSS), I/O group, or pool from this list.

      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.

      You can use extent space-efficient volumes as source, target, and journal volumes for System Storage DS8000 6.3 or later. If you use an extent space-efficient volume as a source or target volume in the copy set, all source and target volumes in the copy set must be extent space-efficient volumes. In this situation, the journal volumes can be extent space-efficient volumes, track space-efficient volumes, or a combination of both volume types. If you do not use an extent space-efficient volume as the source or target volume, journal volumes can be extent space-efficient, track space-efficient, and other types of volumes.

      Extent space-efficient volumes must be fixed block (FB). You cannot use count key data (CKD) volumes.

      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.

c. On the Select Copy Sets page, select the copy sets that you want to add. You can click **Select All** to select all copy sets, **Deselect All** to select none of the copy sets, or **Add More** to add more copy sets to this session. Click **Next**.

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**.

Related concepts:

"Sessions" on page 59
A *session* is used to perform a specific type of data replication against a specific set of volumes. 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.

"Session Types" on page 9
Tivoli Storage Productivity Center for Replication provides several methods to replicate data. The type of data replication that is associated with a session is known as the *session type*.

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.

1. Follow these steps to create a Metro Global Mirror session:
   a. In the navigation tree, select **Sessions**.
   b. Click **Create Session**.
   c. In the Create Session wizard, for the **Choose Hardware Type** list, select the item that shows the type of storage system for the session.
   d. In the **Choose Session Type** list, select a Metro Global Mirror session type and click **Next**.
   e. On the Properties page, enter a session name and a description. Select the options that you want, as described in "Viewing session properties" on page 147. After you select the options that you want, click **Next**.
   f. On the Site Locations pages, select a location for Sites 1, 2, and 3, and click **Next**.
   g. On the Results page, verify that the session was added successfully.
2. Follow these steps to add copy sets to the session:
   a. On the Results page of the Create Session wizard, click **Launch Add Copy Sets Wizard**.
   b. In the Add Copy Sets wizard, complete the following information for the Host and Journal 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 role has a location assigned to it, acceptable values for the storage system list are storage systems assigned to the same location as the role, and storage systems assigned to no location. In this case, the storage systems are grouped under different headings. If the role does not have a location, any storage system is acceptable.

Logical storage system
Select a logical storage system.

Volume
Select one volume or all volumes. The volumes are limited to the volumes within the LSS that you selected.

You can use extent space-efficient volumes as source, target, and journal volumes for System Storage DS8000 6.3 or later. If you use an extent space-efficient volume as a source or target volume in the copy set, all source and target volumes in the copy set must be extent space-efficient volumes. In this situation, the journal volumes can be extent space-efficient volumes, track space-efficient volumes, or a combination of both volume types. If you do not use an extent space-efficient volume as the source or target volume, journal volumes can be extent space-efficient, track space-efficient, and other types of volumes.

Extent space-efficient volumes must be fixed block (FB). You cannot use count key data (CKD) volumes.

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.

c. On the Select Copy Sets page, select the copy sets that you want to add. You can click **Select All** to select all copy sets, **Deselect All** to select none of the copy sets, or **Add More** to add more copy sets to this session. Click **Next**.

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**.

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 IBM Tivoli Storage Productivity Center for Replication 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 IBM Tivoli Storage Productivity Center for Replication 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.

IBM Tivoli Storage Productivity Center for Replication registers with the managed ESS 800, DS6000 or DS8000 storage systems 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 IBM Tivoli Storage Productivity Center for Replication 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 IBM Tivoli Storage Productivity Center for Replication did not successfully communicate with the storage system, it initiates a freeze on the remaining storage system after the allotted time is expired.

Note: It is recommended that you avoid using the same LSS pairs for multiple Metro Mirror sessions. Metro Mirror uses a freeze command on ESS, DS6000, and 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 Metro Mirror 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, IBM Tivoli Storage Productivity Center for Replication 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, IBM Tivoli Storage Productivity Center for Replication 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 IBM Tivoli Storage Productivity Center for Replication management server cannot communicate with one or more storage systems. The Metro Mirror heartbeat is disabled by default.

To enable the Metro Mirror heartbeat, perform the following steps:

1. In the navigation tree, select **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.

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

1. In the navigation tree, select **Sessions**. The Sessions panel is displayed
2. Select the session for which you want to export copy sets.
3. Select **Export Copy Sets** from the **Actions** list, and click **Go**. The Export Copy Set wizard displays the status of the export and a link to the exported file.
4. Click that link and save the file to the local system.

   Important: You must save the file to your local system. After you close the panel, the data will be lost.
5. Click **Finish**.

Importing copy set data

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

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

1. In the navigation tree, select **Sessions**. The Session panel is displayed.
2. Select the session for which you want to import copy sets.
3. Select **Add Copy Sets** from the **Actions** list, and click **Go**. The Add Copy Sets wizard is displayed.
4. Select **Use a CSV file to import copy sets**.

5. Type the location and name of the CSV file to import, or use **Browse** to select the file. Then, click **Next**.
6. Verify that the matching results were successful, and then click **Next**.
7. Select the copy sets you want to add, and then click **Next**.
8. Confirm the number of copy sets that you want to create, and click **Next**. A progress bar displays.
9. Click **Next**.
10. Verify the matches, and click **Finish**.

Exporting historical data for Global Mirror role pairs

You can export data for a Global Mirror role pair that is in a 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).

Complete these steps to export data to a CSV file:

1. In the IBM Tivoli Storage Productivity Center for Replication navigation tree, click **Sessions**.
2. Click the Global Mirror session for which you want to export data.
3. Click **Export Global Mirror Data** from the **Select Action** menu, and click **Go**. The Export Historical Data for Global Mirror wizard is displayed.
4. Complete the following information, and then click **Next**.

   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 logical subsystem (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.

If the export was successful, a link to the CSV file is provided on the Results page. You can save the CSV file to your local system.

Modifying the location of session sites

You can change the location associated with each site of in session.

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

Changing the location of a site in a session does not affect the location of the storage systems associated with that site.

Perform these steps to modify the location of a site:

1. In the navigation tree, select **Sessions**. The Sessions panel is displayed.
2. Select the session whose site locations you want to change.
3. Click **Modify Site Location(s)** from the actions list, and then click **Go**. The Modify Site Locations wizard is displayed.
4. Select the location for the site from the drop-down list, and then click **Next**. Repeat for each available site.

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

   Note: You can select only locations that have already been associated with one or more storage systems.
5. Click **Next**.
6. Click **Finish**.

Removing sessions

This topic describes how to remove sessions.

Important: You can remove only sessions that are in the Defined state.

Perform these steps to remove a session:

1. In the navigation tree, select **Sessions**.
2. Click the radio button next to the session you want to remove.
3. Select **Remove Session** from the **Actions** drop-down menu, and click **Go**.

Removing copy sets

This topic describes how to remove copy sets.

Perform these steps to remove a copy set:

1. In the IBM Tivoli Storage Productivity Center for Replication navigation tree, select **Sessions**. Click the radio button next to the session that you want to remove copy sets from.
2. From the **Select Action** menu, select **Remove Copy Sets** and click **Go**. This starts the Remove Copy Sets wizard.

3. From the drop-down menus in the Remove Copy Sets wizard, select the Host 1 storage system, logical storage subsystem, and volume or select the all option. If you select all for a filter, the lower-level filter or filters are disabled. Click **Next**.
4. Select the copy sets that you want to remove and click **Next**.
5. 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?**
     - **Yes**. This option specifies that the base relationships remain on the hardware, but the copy sets are removed from the Tivoli Storage Productivity Center for Replication 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 are migrating 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.
     - **No**. This option specifies that all relationships for the copy sets are removed from the hardware as well as the Tivoli Storage Productivity Center for Replication session. This option is the default.
   - **If there are errors removing relationships on the hardware, do you want to force the copy sets to be removed from the session?**
     - **Yes**. This option forces the removal of copy sets despite any errors that occur when removing the relationships from the storage system. Once a forced removal is complete, any relationships that remain on the storage system for that copy set must be removed manually using the storage system interface.
     - **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.
6. After the copy sets are removed, click **Finish**.

Important: If an application on the host has opened a device, the copy sets in a Tivoli Storage Productivity Center for Replication session for that device are removed, but the copy sets remain coupled on the host. To decouple the copy sets, see the Troubleshooting and support section of theTivoli Storage Productivity Center for Replication Information Center at http://publib.boulder.ibm.com/infocenter/tivihelp/v59r1/index.jsp.

Related concepts:

"Copy sets" on page 59
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*.

Migrating an existing configuration to Tivoli Storage Productivity Center for Replication

This topic describes how to convert an existing DS6000 or DS8000 hardware relationship for a Metro Mirror, Global Mirror, or Metro Global Mirror session. This topic also describes how to assimilate pairs in a relationship for a Metro Mirror or Global Mirror session with SAN Volume Controller, Storwize V3500, Storwize V3700, Storwize V7000 Unified or Storwize V7000 volumes.

You can either complete this action manually or use the data migration utility for Tivoli Storage Productivity Center for Replication. You can download the data migration utility from the Data Migration Utility for IBM Tivoli Storage Productivity Center for Replication website at http://www-01.ibm.com/support/docview.wss?uid=swg24000625. The data migration utility can handle all session types, and produces the Tivoli Storage Productivity Center for Replication CLI command script files and DSCLI script files necessary to migrate the relationships to Tivoli Storage Productivity Center for Replication.

Metro Mirror

To manually assimilate pairs in a relationship for a Metro Mirror session, complete the following steps:

1. Determine which existing Metro Mirror pairs you want Tivoli Storage Productivity Center for Replication to manage, and record the names of your source and target volumes.
2. Create a Metro Mirror session in Tivoli Storage Productivity Center for Replication.
3. Using the Add Copy Set Wizard, choose the same source and target volumes that you identified in step 1.
4. Complete the Add Copy Set Wizard, and ensure that all copy sets are created successfully.
5. Issue a **Start** command from Tivoli Storage Productivity Center for Replication. At this time, the session automatically assimilates the relationships on the hardware (for example, if they are already in a Prepared state, Tivoli Storage Productivity Center for Replication will show them as Prepared).

   Note: The **Start** command does not fully resynchronize data; instead, it detects the existing relationships and adopts them.

Global Mirror

To manually assimilate pairs in a relationship for a Global Mirror session, complete the following steps:

1. Terminate the Global Mirror session on the hardware using the IBM System Storage DS command-line interface (DSCLI) or another application.
2. Remove the volumes from the Global Mirror session using the DSCLI or another application

3. Close the session on each LSS upon which it is open using the DSCLI or another application.
4. Determine which existing Global Mirror pairs you want Tivoli Storage Productivity Center for Replication to manage, and record the names of your source and target volumes.
5. Create a Global Mirror session in Tivoli Storage Productivity Center for Replication.
6. Using the Add Copy Set Wizard, choose the same source and target volumes that you identified in step 4.
7. Complete the Add Copy Set Wizard, and ensure that all copy sets are created successfully.
8. Issue a **Start** command from Tivoli Storage Productivity Center for Replication. At this time, the session automatically assimilates the relationships on the hardware.

   Note: The **Start** command does not fully resynchronize data; instead, it detects the existing relationships and adopts them.

Assimilating Metro Mirror pairs into a Three Site Metro Global Mirror session

To manually assimilate a set of Metro Mirror pairs into a Three Site Metro Global Mirror session, complete the following steps:

1. Determine which existing Metro Mirror pairs you want Tivoli Storage Productivity Center for Replication to manage, and record the names of your source and target volumes.
2. Create a Metro Global Mirror session in Tivoli Storage Productivity Center for Replication.
3. Using the Add Copy Set Wizard, choose the same source and target volumes for the H1 and H2 roles of the Metro Global Mirror copy set, that you identified in step 1.
4. Complete the Add Copy Set Wizard, and ensure that all copy sets are created successfully.
5. Issue a **Start** command from Tivoli Storage Productivity Center for Replication. At this time, the session automatically assimilates the Metro Mirror relationships on the hardware (for example, if they are already in a Prepared state, Tivoli Storage Productivity Center for Replication will show them as Prepared). In addition, the **Start** command will establish the Global Copy relationships.

   Note: The **Start** command does not fully resynchronize data on the Metro Mirror pairs assimilated; instead, it detects the existing relationships and adopts them. However, a full synchronization will be required for the Global Copy pairs.

Assimilating Three Site pairs into a Three Site Metro Global Mirror session

To assimilate a full Three Site set of pairs into a Three Site Metro Global Mirror session, complete the following steps:

1. Terminate the Global Mirror session on the hardware using the IBM System Storage DS command-line interface (DSCLI) or another application.

2. Remove the volumes from the Global Mirror session using the DSCLI or another application
3. Close the session on each LSS upon which it is open using the DSCLI or another application.
4. Determine which existing Metro Mirror and Global Copy pairs you want Tivoli Storage Productivity Center for Replication to manage, and record the names of your source and target volumes.
5. Create a Metro Global Mirror session in Tivoli Storage Productivity Center for Replication.
6. Using the Add Copy Set Wizard, choose the same source and target volumes for the H1, H2 and H3 roles of the Metro Global Mirror copy set, that you identified in step 4.
7. Complete the Add Copy Set Wizard, and ensure that all copy sets are created successfully.
8. Issue a Start command from IBM Tivoli Storage Productivity Center for Replication. At this time, the session automatically assimilates the Metro Mirror and Global Copy relationship on the hardware.

   Note: The **Start** command does not fully resynchronize data on the Metro Mirror and Global Copy pairs assimilated; instead, it detects the existing relationships and adopts them.

Global Mirror and Metro Mirror assimilation for SAN Volume Controller, Storwize V3500, Storwize V3700, Storwize V7000, Storwize V7000 Unified, or the XIV system

To manually assimilate pairs in a relationship for a Metro Mirror or Global Mirror session with SAN Volume Controller, Storwize V3500, Storwize V3700, Storwize V7000,Storwize V7000 Unified or the XIV system volumes, complete the following steps:

1. Remove all pairs from the consistency group and delete the consistency group on the storage system using CLI for the storage system.
2. Determine which existing Metro Mirror and Global Mirror pairs you want Tivoli Storage Productivity Center for Replication to manage, and record the names of your source and target volumes.
3. Create a Metro Mirror or Global Mirror session in Tivoli Storage Productivity Center for Replication.
4. Using the Add Copy Set Wizard, choose the same source and target volumes that you identified in step 2.
5. Complete the Add Copy Set Wizard, and ensure that all copy sets are created successfully.
6. Issue a **Start** command from Tivoli Storage Productivity Center for Replication. The session automatically assimilates the relationships on the hardware and adds them to a new consistency group on the storage system.

   Note: The **Start** command does not fully resynchronize data; instead, it detects the existing relationships and adopts them placing them in a consistency group managed by the session.

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.

Important: You can test your disaster recovery actions without using practice volumes. However, without practice volumes, you cannot maintain disaster recovery capability while continuing to copy the data.

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, and Metro 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.

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.

This function is available on the following storage systems:

- System Storage SAN Volume Controller
- Storwize V7000
- TotalStorage Enterprise Storage Server Model 800
- System Storage DS8000
- System Storage DS6000

Perform these steps to practice disaster recover actions for a Metro Mirror Failover/Failback with Practice session:

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 ESS, DS6000, and 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.

Note: This function is available only on ESS, DS6000, and DS8000 storage systems.

Perform these steps to practice disaster recover actions for a Global Mirror either Direction with two-site Practice session:

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.

   Note: FlashCopy must be always a full copy due to limitations of the hardware.
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.

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:

- System Storage SAN Volume Controller

- Storwize V7000
- TotalStorage Enterprise Storage Server Model 800
- System Storage DS8000
- System Storage DS6000

Perform these steps to practice disaster recover actions for a Global Mirror Failover/Failback with Practice session:

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.

   Note: FlashCopy must be always a full copy due to limitations of the hardware.
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.

Note: This function is available on ESS, DS6000, and DS8000 storage systems.

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:

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.

   Note: FlashCopy must be always a full copy due to hardware limitations.
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

Viewing the health summary

Use the Health Overview panel to view overall health and status of sessions, storage systems, host systems, and management servers.

The Health Overview panel is the first panel that you see after you log on. You can display this panel by selecting **Health Overview** in the Tivoli Storage Productivity Center for Replication navigation tree. 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. Management server status is not available if you are using Tivoli Storage Productivity Center for Replication Basic Edition for System z.

Health information is always shown as a mini-panel under the navigation tree.

Viewing SNMP alerts

IBM Tivoli Storage Productivity Center for Replication SNMP trap descriptions can be viewed from the IBM Tivoli Storage Productivity Center Alert panel.

From the IBM Tivoli Storage Productivity Center GUI, in the navigation tree, expand **Alerting** > **Alert Log** > **All** and select **Replication**.

Viewing sessions

This section describes how to view sessions details and session properties.

Session status icons

The IBM Tivoli Storage Productivity Center for Replication GUI uses icons to represent the status of each session.

The following table describes each session status icon.

Table 43. Session status icons

Icon	Meaning	Description
	Inactive	The session is in a defined state, with no activity on the hardware.

Table 43. Session status icons (continued)

Icon	Meaning	Description
	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 IBM Tivoli Storage Productivity Center for Replication 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 44. 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).
	Recoverable volumes	This symbol represents volumes that contain a consistent copy of the data.
	Inconsistent volumes	This symbol represents the volumes that do not contain a consistent copy of the data.

Table 44. Volume role symbols (continued)

Symbol	Description	Meaning
	Selected volumes	This symbol represents the volumes that are selected for an operation (for example, changing location or displaying role pair information).
		
		

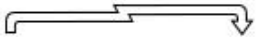
Data copying symbols

The data copying symbols are arrows indicate the type of copy that occurs between the volume roles. The direction of the arrow indicates the direction of the copy.

Table 45. Data copying symbols

Symbol	Description	Meaning
	FlashCopy copying (the lightning bolt indicates the direction of the FlashCopy)	This symbol represents a FlashCopy relationship in which data is being copied from the host to the target.
		
	FlashCopy copying with errors (the lightning bolt indicates the direction of the FlashCopy)	This symbol represents a FlashCopy relationship in which data is being copied from the host to the target, but there are errors on one or more pairs.
		
	FlashCopy inactive (the lightning bolt indicates the direction of the FlashCopy)	This symbol represents an inactive FlashCopy relationship.
		
	FlashCopy inactive with errors (the lightning bolt indicates the direction of the FlashCopy)	This symbol represents an inactive FlashCopy relationship in which there are errors on one or more pairs.
		
	Metro Mirror copying	This symbol represents a copying Metro Mirror relationship.
	Metro Mirror copying with errors	This symbol represents a Metro Mirror relationship that is copying, but with errors on one or more pairs.
	Metro Mirror inactive	This symbol represents an inactive Metro Mirror relationship.

Table 45. Data copying symbols (continued)

Symbol	Description	Meaning
	Metro Mirror inactive with errors	This symbol represents an inactive Metro Mirror relationship with errors on one or more pairs.
 	Global Copy copying	This symbol represents a copying Global Copy relationship.
 	Global Copy copying with errors	This symbol represents a copying Global Copy relationship with errors on one or more pairs.
 	Global Copy inactive	This symbol represents an inactive Global Copy relationship.
 	Global Copy inactive with errors	This symbol represents an inactive Global Copy relationship with errors on one or more pairs.
	HyperSwap or Open HyperSwap	This symbol HyperSwap or Open HyperSwap for a session. If a failure occurs when input/output (I/O) is being written to the primary storage system, HyperSwap or Open HyperSwap automatically swap the I/O to the secondary site with no user interaction and little or no application impact.

Session states

You can view the health and status of a session in the Tivoli Storage Productivity Center for Replication GUI.

Attention: Use only the Tivoli Storage Productivity Center for Replication 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 65.

The `Refresh States` command is used to refresh the states of the session. Issue this command to query the states of the copy sets on the hardware. You do not need to run this command under typical circumstances; Tivoli Storage Productivity Center for Replication refreshes the states of its sessions through multiple means. However, if you discover an inconsistency between Tivoli Storage Productivity Center for Replication and the hardware, you can use this command to enable IBM Tivoli Storage Productivity Center for Replication to update itself. Because this command triggers multiple queries on the hardware (having an adverse impact on hardware performance if you run it too often), you can only execute this command every few minutes in each session.

The following table describes each session state.

Table 46. 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 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 Tivoli Storage Productivity Center for Replication: • SAN Volume Controller • Storwize V3500 (use only FlashCopy sessions for this storage system) • Storwize V3700 (use only FlashCopy sessions for this storage system) • Storwize V7000 • IBM 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 46. 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 the SAN Volume Controller, Storwize V3500, Storwize V3700, Storwize V7000, or IBM Storwize V7000 Unified.
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.
SuspendedH1H2 MGM	Metro Global Mirror	Data copying between site 1 and site 2 is suspended.
SuspendedH1H3 MGM	Metro Global Mirror	Data copying between site 1 and site 3 is suspended.
Suspending	All	The session is transitioning into a Suspended state. **Important:** The Suspending state applies only to Global Mirror and Metro Global Mirror sessions and does not apply to the SAN Volume Controller, Storwize V7000, or IBM Storwize V7000 Unified.
Target available	All	Target volumes are available for application updates.
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.

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. Tivoli Storage Productivity Center for Replication 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 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 XIV system 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 47. 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*
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

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.

Perform these steps to view session details:

1. In the navigation tree, select **Sessions**.
2. Select the session that you want to view.
3. Select **View Details** from the **Actions** drop-down menu, and click **Go**.

Viewing additional details for Global Mirror sessions

Additional detail information is available for Global Mirror sessions, including information about the Global Mirror master, consistency groups that have been formed, and data exposure.

Perform these steps to view additional details for Global Mirror sessions:

1. In the IBM Tivoli Storage Productivity Center for Replication navigation tree, select **Sessions**.
2. Select the Global Mirror session that you want to view.
3. Select **View Details** from the **Actions** drop-down menu, and click **Go**.
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.

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.

To view or modify the properties for a session, complete the following steps:

1. In the navigation tree, click **Sessions**. The Sessions page is displayed.
2. Select the session with the properties that you want to view.
3. Click **View/Modify Properties** on the **Select Action** menu and click **Go**. The properties that are displayed depend on the session type as described in the following sections.

TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 sessions

The properties for IBM TotalStorage Enterprise Storage Server Model 800, IBM System Storage DS8000, and IBM System Storage DS6000 sessions depend on the session type.

The following sections describe the properties for each session type.

FlashCopy session properties

Use the View/Modify Properties page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 FlashCopy sessions.

The following options are on this page.

Description
Enter a description for the session.

ESS/DS FlashCopy Options
Select the options for the session.

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 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.

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 System Storage DS8000 storage system. To determine whether you can use the IBM Remote Pair FlashCopy option with your System Storage DS8000 storage system, refer to the System Storage 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 page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 Metro Mirror Single Direction sessions.

The following options are on this page.

Description
Enter a description for the session.

ESS/DS Metro Mirror Options
Select the options for the session. The options that are displayed depend on whether you are using Tivoli Storage Productivity Center for Replication or Tivoli Storage Productivity Center for Replication for System z.

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.

Enable Hardened Freeze
Select this option to enable the IBM z/OS Input/Output Supervisor (IOS) to manage freeze operations. This option is enabled by default.

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 Tivoli Storage Productivity Center for Replication for System z Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication **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.

If the **Manage H1-H2 with Hyperswap** option is selected, you must determine what caused the relationships to be suspended and then take the following actions:

If the source volumes are accessible.

Issue the z/OS **SETHS RESUMEIO** command and the **Release I/O** command. If you do not issue the **SETHS RESUMEIO** command, the z/OS extended long busy timer value must expire before you can issue the **Release I/O** command.

There are situations in which an application must access some of the HyperSwap managed volumes, such as the paging volumes, and you might not be able to issue the **SETHS RESUMEIO** command or the command might not finish. In these situations, restart the application to enable write operations to the H1 site to resume. Restart the application after

you issue the **Release I/O** command in Tivoli Storage Productivity Center for Replication or after the extended long busy timer value expires.

If one or more of the source volumes are no longer accessible, for example, in the case of a disaster.
Issue the Tivoli Storage Productivity Center for Replication **Recover** command and complete an initial program load (IPL) on the H1 site by using the storage data from the H2 site. This data might not be the latest data, but the data should be consistent.

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 affect 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.

Metro Mirror Failover/Failback session properties

Use the View/Modify Properties page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 Metro Mirror Failover/Failback sessions.

The following options are on this page.

Description
Enter a description for the session.

ESS/DS Metro Mirror Options
Select the options for the session. The options that are displayed depend on whether you are using IBM Tivoli Storage Productivity Center for Replication or IBM Tivoli Storage Productivity Center for Replication for System z.

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.

Enable Hardened Freeze
Select this option to enable the IBM z/OS Input/Output Supervisor (IOS) to manage freeze operations. This option is enabled by default.

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 Tivoli Storage Productivity Center for Replication for System z Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication **`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.

If the **Manage H1-H2 with Hyperswap** option is selected, you must determine what caused the relationships to be suspended and then take the following actions:

If the source volumes are accessible.

Issue the z/OS **`SETHS RESUMEIO`** command and the **`Release I/O`** command. If you do not issue the **`SETHS RESUMEIO`** command, the z/OS extended long busy timer value must expire before you can issue the **`Release I/O`** command.

There are situations in which an application must access some of the HyperSwap managed volumes, such as the paging volumes, and you might not be able to issue the **SETHS RESUMEIO** command or the command might not finish. In these situations, restart the application to enable write operations to the H1 site to resume. Restart the application after you issue the **Release I/O** command in Tivoli Storage Productivity Center for Replication or after the extended long busy timer value expires.

If one or more of the source volumes are no longer accessible, for example, in the case of a disaster.
Issue the Tivoli Storage Productivity Center for Replication **Recover** command and complete an initial program load (IPL) on the H1 site by using the storage data from the H2 site. This data might not be the latest data, but the data should be consistent.

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 affect 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.

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. Tivoli Storage Productivity Center for Replication uses HyperSwap to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

This option requires that Tivoli Storage Productivity Center for Replication is running on z/OS and the volumes are attached by a Fibre Channel connection.

When this option is selected, the **Suspend H1-H2** command is available only if the **Disable HyperSwap** option is also selected. Setting this option automatically sets the Release IO after suspend Metro Mirror policy.

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: You must restart the system if you select this option.

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.

Manage H1-H2 with Open HyperSwap
Select this option to trigger an Open HyperSwap operation for volumes that are attached to an IBM AIX host. This option redirects application I/O to the target volumes when there is a failure on the host accessible volumes.

Tivoli Storage Productivity Center for Replication uses Open HyperSwap to manage the H1-H2 sequence of a Metro Mirror session.

Only volumes that are attached to host systems that are defined in the Tivoli Storage Productivity Center for Replication Host Systems panel are eligible for Open HyperSwap.

Disable Open HyperSwap
Select this option to prevent an Open HyperSwap operation from occurring while keeping the configuration on the host system and all source and target volumes coupled.

Metro Mirror Failover/Failback with Practice session properties

Use the View/Modify Properties page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 Metro Mirror Failover/Failback with Practice sessions.

The following options are on this page.

Description
Enter a description for the session.

ESS/DS Metro Mirror Options
Select the options for the session. The options that are displayed depend on whether you are using IBM Tivoli Storage Productivity Center for Replication or IBM Tivoli Storage Productivity Center for Replication for System z.

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.

Enable Hardened Freeze
Select this option to enable the IBM z/OS Input/Output Supervisor (IOS) to manage freeze operations. This option is enabled by default.

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 Tivoli Storage Productivity Center for Replication for System z Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication **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.

If the **Manage H1-H2 with Hyperswap** option is selected, you must determine what caused the relationships to be suspended and then take the following actions:

If the source volumes are accessible.

Issue the z/OS **SETHS RESUMEIO** command and the **Release I/O** command. If you do not issue the **SETHS RESUMEIO** command, the z/OS extended long busy timer value must expire before you can issue the **Release I/O** command.

There are situations in which an application must access some of the HyperSwap managed volumes, such as the paging volumes, and you might not be able to issue the **SETHS RESUMEIO** command or the command might not finish. In these situations, restart the application to enable write operations to the H1 site to resume. Restart the application after you issue the **Release I/O** command in Tivoli Storage Productivity Center for Replication or after the extended long busy timer value expires.

If one or more of the source volumes are no longer accessible, for example, in the case of a disaster.

Issue the Tivoli Storage Productivity Center for Replication **Recover** command and complete an initial program load (IPL) on the H1 site by using the storage data from the H2 site. This data might not be the latest data, but the data should be consistent.

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 affect 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.

DS FlashCopy Options for Role pair H2-I2

The following option is available only for IBM System Storage DS8000 version 4.2 or later.

Persistent

Select this option to keep FlashCopy pairs persistent on the hardware.

Global Mirror Single Direction and Failover/Failback session properties

Use the View/Modify Properties page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 Global Mirror Single Direction and Global Mirror Failover/Failback sessions.

The following options are on this page.

Description

Enter a description for the session.

ESS/DS Global Mirror Options

Select the options for the session.

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. If the Severe level threshold is set to a value other than 0, the Warning level threshold must be lower than the Severe level threshold or set to 0.

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.

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.

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.

Global Mirror Failover/Failback with Practice session properties

Use the View/Modify Properties page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 Global Mirror Failover/Failback with Practice sessions.

The following options are on this page.

Description
Enter a description for the session.

ESS/DS Global Mirror Options
Select the options for the session.

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. If the Severe level threshold is set to a value other than 0, the Warning level threshold must be lower than the Severe level threshold or set to 0.

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.

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.

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.

DS FlashCopy Options for Role pair H2-I2
The following option is available only for IBM System Storage DS8000 version 4.2 or later.

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.

DS FlashCopy Options for Role pair I2-J2
The following option is available only for System Storage DS8000 version 4.2 or later.

Reflash After Recover
Select this option if you want to create a FlashCopy replication between the I2 and J2 volumes after the recovery of a Global Mirror Failover/Failback with Practice session. If you do not select this option, a FlashCopy replication is created only between the I2 and H2 volumes.

Global Mirror Either Direction with Two-Site Practice session properties

Use the View/Modify Properties page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 Global Mirror Either Direction with Two-Site Practice sessions.

The following options are on this page.

Description
Enter a description for the session.

ESS/DS Global Mirror Options
Select the options for the session.

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. If the Severe level threshold is set to a value other than 0, the Warning level threshold must be lower than the Severe level threshold or set to 0.

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.

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.

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 Global Mirror session properties

Use the View/Modify Properties page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 Metro Global Mirror sessions.

The following options are on this page.

Description
Enter a description for the session.

ESS/DS Metro Global Mirror Options
Select the options for the session. The options that are displayed depend on whether you are using IBM Tivoli Storage Productivity Center for Replication or IBM Tivoli Storage Productivity Center for Replication for System z.

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. If the Severe level threshold is set to a value other than 0, the Warning level threshold must be lower than the Severe level threshold or set to 0.

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.

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.

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.

Enable Hardened Freeze
Select this option to enable the IBM z/OS Input/Output Supervisor (IOS) to manage freeze operations. This option is enabled by default.

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 Tivoli Storage Productivity Center for Replication for System z Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication **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.

If the **Manage H1-H2 with Hyperswap** option is selected, you must determine what caused the relationships to be suspended and then take the following actions:

If the source volumes are accessible.

Issue the z/OS **SETHS RESUMEIO** command and the **Release I/O** command. If you do not issue the **SETHS RESUMEIO** command, the z/OS extended long busy timer value must expire before you can issue the **Release I/O** command.

There are situations in which an application must access some of the HyperSwap managed volumes, such as the paging volumes, and you might not be able to issue the **SETHS RESUMEIO** command or the command might not finish. In these situations, restart the application to enable write operations to the H1 site to resume. Restart the application after

you issue the **Release I/O** command in Tivoli Storage Productivity Center for Replication or after the extended long busy timer value expires.

If one or more of the source volumes are no longer accessible, for example, in the case of a disaster.
Issue the Tivoli Storage Productivity Center for Replication **Recover** command and complete an initial program load (IPL) on the H1 site by using the storage data from the H2 site. This data might not be the latest data, but the data should be consistent.

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 affect 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.

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. Tivoli Storage Productivity Center for Replication uses HyperSwap to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

This option requires that Tivoli Storage Productivity Center for Replication is running on z/OS and the volumes are attached by a Fibre Channel connection.

When this option is selected, the **Suspend H1-H2** command is available only if the **Disable HyperSwap** option is also selected. Setting this option automatically sets the Release IO after suspend Metro Mirror policy.

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: You must restart the system if you select this option.

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 Global Mirror with Practice session properties

Use the View/Modify Properties page to view or modify properties for TotalStorage Enterprise Storage Server Model 800, System Storage DS8000, and System Storage DS6000 Metro Global Mirror with Practice sessions.

The following options are on this page.

Description
Enter a description for the session.

ESS/DS Metro Global Mirror Options
Select the options for the session. The options that are displayed depend on whether you are using IBM Tivoli Storage Productivity Center for Replication or IBM Tivoli Storage Productivity Center for Replication for System z.

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. If the Severe level threshold is set to a value other than 0, the Warning level threshold must be lower than the Severe level threshold or set to 0.

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.

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.

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.

Enable Hardened Freeze
Select this option to enable the IBM z/OS Input/Output Supervisor (IOS) to manage freeze operations. This option is enabled by default.

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 Tivoli Storage Productivity Center for Replication for System z Installation and Configuration Guide*.

If you select this option, IOS can freeze volumes regardless of whether the Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication 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 Tivoli Storage Productivity Center for Replication **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.

If the **Manage H1-H2 with Hyperswap** option is selected, you must determine what caused the relationships to be suspended and then take the following actions:

If the source volumes are accessible.

Issue the z/OS **SETHS RESUMEIO** command and the **Release I/O** command. If you do not issue the **SETHS RESUMEIO** command, the z/OS extended long busy timer value must expire before you can issue the **Release I/O** command.

There are situations in which an application must access some of the HyperSwap managed volumes, such as the paging volumes, and you might not be able to issue the **SETHS RESUMEIO** command or the command might not finish. In these situations, restart the application to enable write operations to the H1 site to resume. Restart the application after you issue the **Release I/O** command in Tivoli Storage Productivity Center for Replication or after the extended long busy timer value expires.

If one or more of the source volumes are no longer accessible, for example, in the case of a disaster.

Issue the Tivoli Storage Productivity Center for Replication **Recover** command and complete an initial program load (IPL) on the H1 site by using the storage data from the H2 site. This data might not be the latest data, but the data should be consistent.

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 affect 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.

ESS / DS FlashCopy Options for Role pair H3-I3
The following option is available only for IBM System Storage DS8000 version 4.2 or later.

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.

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. Tivoli Storage Productivity Center for Replication uses HyperSwap to manage the H1-H2 sequence of a Metro Mirror or Metro Global Mirror session.

This option requires that Tivoli Storage Productivity Center for Replication is running on z/OS and the volumes are attached by a Fibre Channel connection.

When this option is selected, the **Suspend H1-H2** command is available only if the **Disable HyperSwap** option is also selected. Setting this option automatically sets the Release IO after suspend Metro Mirror policy.

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: You must restart the system if you select this option.

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.

SAN Volume Controller, Storwize V3500, Storwize V3700, Storwize V7000, and Storwize V7000 Unified sessions

The properties for IBM System Storage SAN Volume Controller, IBM Storwize V3500, IBM Storwize V3700, IBM Storwize V7000, and IBM Storwize V7000 Unified 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 page to view or modify properties for SAN Volume Controller, Storwize V3500, Storwize V3700, Storwize V7000, and Storwize V7000 Unified FlashCopy sessions.

The following options are on this page.

Description
Enter a description for the session.

SAN Volume Controller / Storwize V3500 / Storwize V3700 / Storwize V7000 / Storwize V7000 Unified FlashCopy Options
Select the options for the session.

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. You can specify a percentage in the range of 0 - 100. The default 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 Tivoli Storage Productivity Center for Replication 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 page to view or modify properties for SAN Volume Controller, Storwize V3500, Storwize V3700, Storwize V7000, and Storwize V7000 Unified Metro Mirror Failover/Failback with Practice and Global Mirror Failover/Failback with Practice sessions.

The following options are on this page.

Description
Enter a description for the session.

SAN Volume Controller / Storwize V3500 / Storwize V3700 / Storwize V7000 / Storwize V7000 Unified Metro Mirror Options
Select the options for this session.

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. You can specify a percentage in the range of 0 - 100. The default is 50.

XIV system sessions

The properties for the XIV system 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.

XIV system Global Mirror Failover/Failback session properties

Use the View/Modify Properties page to view or modify properties for the XIV system Global Mirror Failover/Failback sessions.

The following options are on this page.

Description
Enter a description for the session.

XIV Global Mirror Options
Select the options for the session.

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 XIV 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 30 seconds.

Synchronization schedule (HH:MM:SS)
Select an interval to create a synchronization schedule. The schedule is used to form consistency groups. The XIV system 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 XIV system does not create consistency groups. When the XIV system determines that the RPO threshold is exceeded, the session state becomes Severe.

Basic HyperSwap session properties

Use the View/Modify Properties page to view or modify properties for Basic HyperSwap sessions.

The following options are on this page.

Description
Enter a description for the session.

Basic HyperSwap Options
Select the options for the session.

If Tivoli Storage Productivity Center for Replication is running on z/OS, and volumes are attached by a Fibre Channel connection, Tivoli Storage Productivity Center for Replication can manage a HyperSwap session. With this option selected, a failure on the host accessible volumes triggers a HyperSwap, redirecting application input/output (I/O) to the secondary volumes.

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: You must restart the system if you select this option.

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.

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.

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.

Perform these steps to view storage system details:

1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
2. Perform one of these steps to view details for a specific storage system:
   - Click the storage system ID.
   - Select the storage system, click **View storage system details** from the **Actions** list, and then click **Go**.

Viewing storage connection details

You can view storage connection details and a list of all storage systems that are located behind the connection.

Perform these steps to view storage connection details:

1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
2. Click the **Connections** tab.
3. Perform one of these steps to view details for a specific storage connection:
   - Click the storage connection ID.
   - Select the storage connection, click **View/modify Connection Details** from the actions list, and then click **Go**.

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.

1. In the navigation tree, select **Volumes**.
2. Select a storage.
3. Depending on the type of storage system, do one of the following actions:
   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.
4. Click **Perform Query**. Information about the volumes is displayed in a table.

Viewing logical paths

You can view all logical paths that are defined on an IBM TotalStorage Enterprise Storage Server, IBM System Storage DS8000, or IBM System Storage DS6000 storage system.

Perform one of these procedures to view logical paths:

- From the ESS/DS Paths panel of IBM Tivoli Storage Productivity Center for Replication:
  1. In the navigation tree, select **ESS/DS Paths**. The ESS/DS Paths panel is displayed.
  2. Click the storage system ID to display logical paths for that storage system.
- From the Storage Systems panel:
  1. In the navigation tree, select **Storage Systems**. The Storage Systems panel is displayed in the Storage Systems view.
  2. Select an ESS, DS6000, or DS8000 storage system for which you want to view logical paths.
  3. Select **View Paths** from the **Select Action** list, and click **Go**. The ESS/DS Paths panel is displayed with a list of defined logical paths.

Viewing console messages

This topic describes how to view the console and messages.

IBM Tivoli Storage Productivity Center for Replication provides detailed information about actions taken by users, errors that occur during normal operation, and hardware error indications.

From the graphical user interface, you can view console messages by selecting **Console** in the navigation tree. You can then click the link for the specific message code to get more information on the message.

You can also get detailed information and help for specific messages in the IBM Tivoli Storage Productivity Center for Replication for System z information center at http://publib.boulder.ibm.com/infocenter/tivihelp/v59r1/index.jsp .

Chapter 10. Security

The IBM Tivoli Storage Productivity Center for Replication authentication process uses a configured user registry from either the operating system or Lightweight Directory Access Protocol (LDAP) server. To perform a specific action and manage specific sessions in the IBM Tivoli Storage Productivity Center for Replication 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.

Users and groups

For authentication and authorization, IBM Tivoli Storage Productivity Center for Replication uses users and groups that are defined in a configured user registry on the management server, which is associated with either the local operating system or a Lightweight Directory Access Protocol (LDAP) server.

IBM Tivoli Storage Productivity Center for Replication does not provide the capability to create, update, or delete users or groups in the user registry. To manage users or groups, you must use the appropriate tool associated with the user registry in which the users and groups are stored.

IBM Tivoli Storage Productivity Center for Replication uses roles to authorize users to manage certain sessions and perform certain actions.

For more information about authentication, see the information about single sign-on in the IBM Tivoli Storage Productivity Center documentation.

Primary administrative ID

If you switch the authentication method, either from the local operating system to an LDAP server or vice versa, IBM Tivoli Storage Productivity Center for Replication removes all access to existing users and user groups. This occurs because the user IDs might not be on the same local operating system and the LDAP server; however, you must have at least one user ID that can log in to IBM Tivoli Storage Productivity Center for Replication.

When you change the authentication method using Tivoli Integrated Portal, you can specify a primary administrative ID for both local operating system and LDAP authentication. Use this primary administrator to log in to IBM Tivoli Storage Productivity Center for Replication and manually add user IDs requiring access to IBM Tivoli Storage Productivity Center for Replication.

You can log in to both IBM Tivoli Storage Productivity Center for Replication and IBM Tivoli Storage Productivity Center using the primary administrative ID and password.

You cannot use the following characters for the IBM Tivoli Storage Productivity Center for Replication administrative password:

- square brackets ([and])
- semicolon (;)
- backward slash (\)

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.

IBM Tivoli Storage Productivity Center for Replication provides a set of predefined user roles: monitor, session operator, and administrator.

Monitor

Monitors can view the health and status in the IBM Tivoli Storage Productivity Center for Replication 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

Operator

Session operators can manage sessions to which they have been assigned, including:

- 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.
- Adding copy sets to a session. The session operator can add volumes to a copy set only when the volume is not protected and not in another session.
- Removing copy sets from a session.
- Adding Peer To Peer Remote Copy (PPRC) paths, and removing paths with no hardware relationships. PPRC paths are a common resource used in IBM Tivoli Storage Productivity Center for Replication sessions and also in an ESS, DS6000, or DS8000 storage-system relationship that is established between two common logical subsystems (LSSs).

  Note: The session operator cannot issue a force removal of a path.

Note: 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

Note: Session operators can make changes only to the volumes that they own. They are not able to make changes to volumes being managed by other users.

Administrator

During installation of IBM Tivoli Storage Productivity Center for Replication, the installation wizard requests an ID to use for the initial administrator user ID.

Administrators have unrestricted access. They can manage all sessions and perform all actions associated with IBM Tivoli Storage Productivity Center for Replication, 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 IBM Tivoli Storage Productivity Center for Replication sessions and also in an ESS, DS6000, or 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

Important: IBM Tivoli Storage Productivity Center supports multiple user roles, including the Superuser role. A superuser can perform all IBM Tivoli Storage Productivity Center functions. For IBM Tivoli Storage Productivity Center

superusers to have full access to IBM Tivoli Storage Productivity Center for Replication, the Superuser group must be added to the IBM Tivoli Storage Productivity Center for Replication and assigned to the Administrator role. Then, you can manage the IBM Tivoli Storage Productivity Center and IBM Tivoli Storage Productivity Center for Replication products by groups, instead of by user IDs.

Note: Administrators cannot revoke their own administrative access rights.

Adding the IBM Tivoli Storage Productivity Center for Replication Administrator role to the IBM Tivoli Storage Productivity Center Superuser group

If you use local operating system or Lightweight Directory Access Protocol (LDAP) authentication, you must add the IBM Tivoli Storage Productivity Center superuser group to IBM Tivoli Storage Productivity Center for Replication with administrator privileges.

Prerequisite: You must have Administrator privileges to perform this action.

Perform these steps to add the superuser group to IBM Tivoli Storage Productivity Center for Replication:

1. Log in to IBM Tivoli Storage Productivity Center as the superuser.
2. In the navigation tree, expand **Administrative Services** > **Configuration** and select **Role-to-Group Mappings**.
3. Locate the name of the superuser user group.
4. Log in to IBM Tivoli Storage Productivity Center for Replication using a user ID with administrator privileges.
5. In the navigation tree, select **Administration**. The Administration panel is displayed.
6. Click **Add Access**. The Add Access wizard is displayed.
7. Type the name of the superuser group in the **User or group names** field, and click **Next**.
8. Select the name of the superuser group, and click **Next**.
9. Select **Administrator privileges**, and click **Next**.
10. Click **Next** to confirm this action.
11. Click **Finish**.

Granting access privileges for a user

You can assign user roles to an IBM Tivoli Storage Productivity Center for Replication user to grant access privileges to individual sessions and tasks.

Perform the following steps to authorize a user:

1. Create the user ID or group ID if it does not already exist in the user registry, either the operating system of the active management server or Lightweight Directory Access Protocol (LDAP) server.
2. Log in to IBM Tivoli Storage Productivity Center for Replication as a user with administrator privileges.
3. In the navigation tree, select **Administration**. The Administration panel is displayed.

4. Click **Add Access**. The Add Access wizard is displayed.
5. Type the name of the user to whom you want to give access, and click **Next**. The Select Users and Groups panel is displayed.

   Tip: You can enter a partial name and use the * wildcard character to represent zero or more characters.
6. Select one or more names from the list of found users.
7. Select the role to associate with this user.
8. If you selected the Operator role, select one or more session that this user can manage, and click **Next**.
9. Click **Next** to confirm this action.
10. Click **Finish**.

Viewing access privileges for a user

You can view a list of all IBM Tivoli Storage Productivity Center for Replication user and their assigned roles. You can also view the assigned sessions for each user.

Perform the following steps to view access privileges for a user:

1. Log in to IBM Tivoli Storage Productivity Center for Replication as a user with administrator privileges.
2. In the navigation tree, select **Administration**. The Administration page is displayed with a list of IBM Tivoli Storage Productivity Center for Replication users and user groups and their associated role.
3. Select the user whose access privileges you want to view.
4. Select **View/Modify Access** from the **Actions** drop-down list, and click **Go**. The View/Modify Access panel is displayed. This panel shows the role assigned to the user and lists the sessions that the user can manage.
5. Click **Cancel**.

Modifying access privileges for a user

You can change the user role and assigned sessions for an IBM Tivoli Storage Productivity Center for Replication user.

Prerequisite: You must have Administrator privileges to perform this action.

Perform the following steps to modify the access privileges for a user:

1. Log in to IBM Tivoli Storage Productivity Center for Replication as a user with administrator privileges.
2. In the navigation tree, select **Administration**. The Administration panel is displayed with a list of users and user groups and their associated role
3. Select the user whose access privileges you want to view.
4. Select **View/Modify Access** from the **Select Action** drop-down list, and click **Go**. The View/Modify Access panel is displayed. This panel shows the role assigned to the user and lists the sessions that the user can manage.
5. Select the role to associate with this user.
6. If you selected the Operator role, select one or more session that this user can manage and click **Next**.
7. Click **OK**.

Removing access privileges for a user

You can remove access privileges for an IBM Tivoli Storage Productivity Center for Replication user. When you remove access, the user ID cannot access the IBM Tivoli Storage Productivity Center for Replication GUI or run commands from the command line.

Prerequisite: You must have Administrator privileges to perform this action.

Perform the following steps to remove user access:

1. Log in to IBM Tivoli Storage Productivity Center for Replication as a user with administrator privileges.
2. In the navigation tree, select **Administration**. The Administration panel is displayed with a list of users and user groups and their associated role.
3. Select the user from which you want to remove access.
4. Select **Remove Access** from the **Actions** list, and click **Go**.

Appendix A. Using the system logger in a Tivoli Storage Productivity Center for Replication for System z 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 Tivoli Storage Productivity Center for Replication for System z environment and are using Metro Mirror sessions.

Configuring the system logger for use in the Tivoli Storage Productivity Center for Replication for System z environment

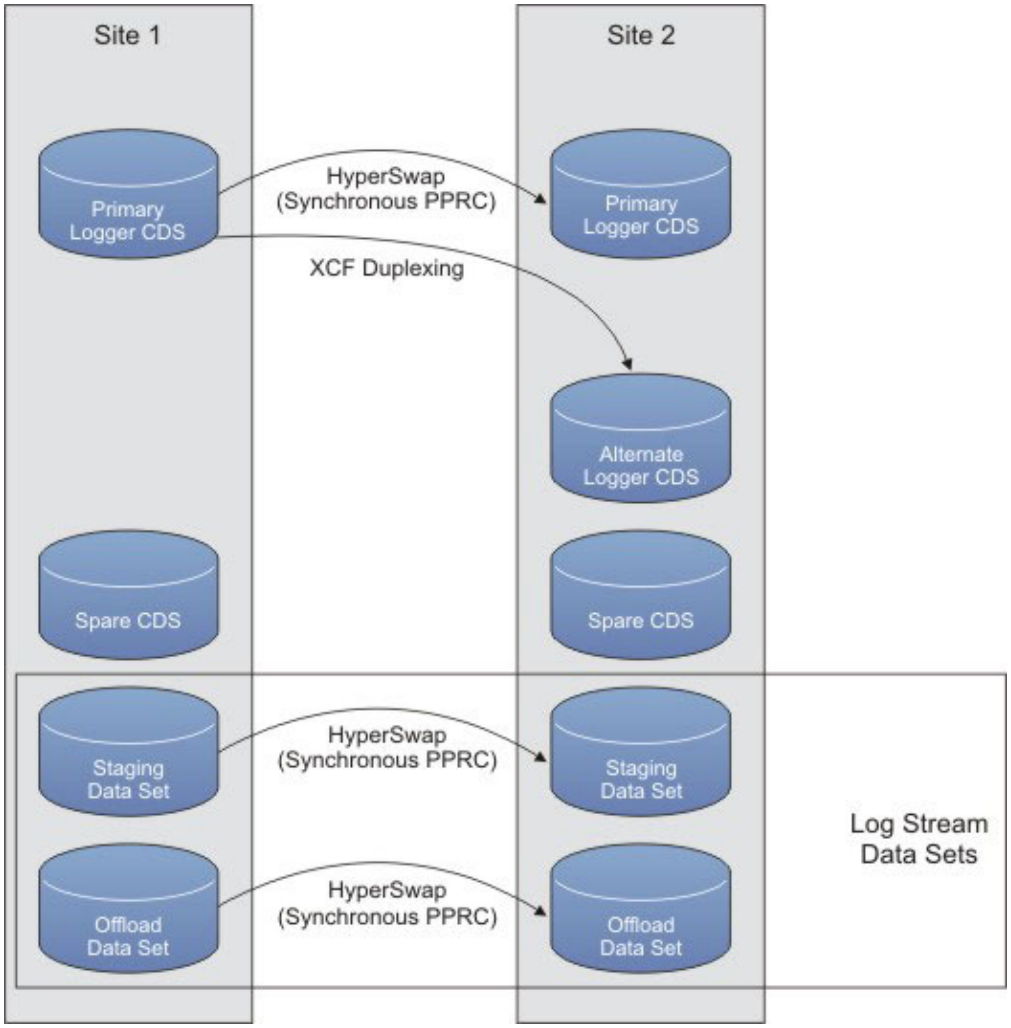
When the system logger is used in an IBM Tivoli Storage Productivity Center for Replication for System z environment, steps must be taken to avoid data consistency issues.

The following situations can lead to data consistency issues when using Tivoli Storage Productivity Center for Replication for System z 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 the following figure are required.



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 Tivoli Storage Productivity Center for Replication for System z. 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 Tivoli Storage Productivity Center for Replication for System z 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 Tivoli Storage Productivity Center for Replication for System z 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 Tivoli Storage Productivity Center for Replication for System z 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 B. Accessibility features for Tivoli Storage Productivity Center for Replication

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

The following list includes the major accessibility features in Tivoli Storage Productivity Center for Replication:

- 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

See the IBM Human Ability and Accessibility Center website at www.ibm.com/able for more information about the commitment that IBM has for accessibility.

Accessibility and keyboard shortcuts in the information center

Accessibility features help users with physical disabilities, such as restricted mobility or limited vision, to use software products successfully. Using the major accessibility features in this product, users can perform these tasks:

- Use assistive technologies, such as screen-reader software and digital speech synthesizer, to hear what is displayed on the screen. Consult the product documentation of the assistive technology for details on using those technologies with this product.
- Operate specific or equivalent features by using only the keyboard.
- Magnify what is displayed on the screen.

In addition, the documentation was modified to include the following features to aid accessibility:

- All documentation is available in HTML formats to give the maximum opportunity for users to apply screen-reader software technology.
- All images in the documentation are provided with alternative text so that users with vision impairments can understand the contents of the images.

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.

Related accessibility information for sight-impaired users

The following list contains hints and tips that can help you more fully use the graphical user interface:

Drop-down lists are positioned directly over or before the radio button that activates it.

If you use a screen reader, you should be aware that there are radio buttons to activate drop-down lists for several GUI pages. The way to activate the drop-down list is by selecting the associated radio button. The drop-down list is positioned directly over or before the radio button that activates it. When you use a screen reader that processes the fields and controls of a page sequentially, you might select the radio button, but not know that the associated drop-down list has been activated. The screen reader processes inactive drop-down lists first, and then processes the next radio button. The drop-down list is activated if you select the radio button.

On the following pages, keep in mind that radio buttons activate a drop-down list:
- Administration
- ESS/DS Paths
- Sessions
- Session Details
- Storage Systems

Tables are best understood by reviewing the surrounding text and the table row and column number of the table.

On some graphical user pages, tables use the header or row ID attributes when reading a single cell. The screen reader reads the table row and column number, along with cell data. Therefore, you can infer the column header and row ID.

Experiment with and fine-tune the way your screen reader pronounces some of the product abbreviations.

Your screen reader might pronounce abbreviations as if they were words. For example, the common abbreviation for Enterprise Storage Server is ESS. Your screen reader might read ESS as the word "ess". With some screen readers you can hear alternate pronunciations. If you frequently use the software you might prefer to fine-tune such associations in your settings. When an association is created, the screen reader can recognize the abbreviation as a word. If you can add dictionary words with your screen reader, replace the capitalized character sequence with the sequence E space S space S.

Typically, this abbreviation is used in the combination form of ESS/DS. This term refers to the Enterprise Storage Server 800, the DS6000, or the DS8000.

Some decorative artifacts might persist if the cascading style sheet is disabled.

Enable cascading style sheets when possible; otherwise, some decorative elements might persist in the web browser GUI. These artifacts do not affect performance. If they become too distracting, consider using the command-line interface instead.

For efficiency, confirmation dialogs place initial focus on the Yes button.

When a confirmation dialog box is displayed, focus is given to the **Yes** button. Therefore, the screen reader reads "Yes" but does not read the confirmation text. The software processes the information in this way when you do the following types of tasks:

- Perform an action on a session
- Remove a connection to a storage system
- Click the **About link**
- Create a high-availability connection

To read the confirmation text before clicking the **Yes**, **No**, or **OK** button, view the previous heading before the button.

Dojo components are not read by all screen readers.

The Job Access for Windows and Speech (JAWS) screen reader does not read some Dojo components on Internet Explorer 7. Use the command-line interface instead of the GUI with JAWS on Internet Explorer 7.

Firefox is the preferred browser for use with a screen reader.

Use Firefox as the screen reader because other browsers might not fully expose assistive technology content to the screen reader.

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Product Number: 5698-Z11, 5698-Z12

Printed in USA

SC27-4054-01