

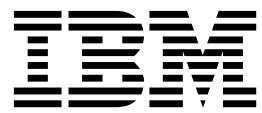
IBM Tivoli Storage Productivity Center for Replication for
System z
Version 5.2.8

Installation and Configuration Guide



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Note:

Before using this information and the product it supports, read the information in "Notices" on page 39.

This edition applies to version 5, release 2, modification 8 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.

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About this guide

This guide provides task-oriented installation and configuration 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

This guide is a supplement to the *IBM Tivoli Storage Productivity Center for Replication for System z Program Directory* and the *IBM Tivoli Storage Productivity Center for Replication Basic Edition for System z Program Directory* and focuses on the configuration and post installation steps that you must run after the SMP/E installation.

Who should read this guide

This publication is for administrators who install and configure Tivoli Storage Productivity Center for Replication for System z.

Administrators should be familiar with the following topics:

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

Publications

A number of publications are provided with IBM Spectrum Control™.

IBM Tivoli Storage Productivity Center for Replication is no longer installed with IBM Spectrum Control. For current Tivoli Storage Productivity Center for Replication users who upgrade to IBM Spectrum Control 5.2.8, Tivoli Storage Productivity Center for Replication will remain available. See IBM Knowledge Center for any earlier versions of Tivoli Storage Productivity Center for Replication publications.

The following section describes how to access these publications online.

Accessing publications online

Information about installing, configuring, using, upgrading, and uninstalling IBM Spectrum Control and related products is available online.

Use Table 1 on page viii to view and download these publications. Translated documents are available for some products.

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

Product	Online location
IBM Spectrum Control	<p>http://www.ibm.com/support/knowledgecenter/SS5R93/</p> <p>In the navigation pane, click IBM Spectrum Control for the appropriate release. To obtain PDF documents, in the navigation pane, click IBM Spectrum Control > Printable documentation.</p>
IBM Copy Services Manager (formerly known as IBM Tivoli Storage Productivity Center for Replication)	http://www.ibm.com/support/knowledgecenter/SSESK4
IBM WebSphere® Application Server	http://www.ibm.com/support/knowledgecenter/SSEQTP/mapfiles/product_welcome_was.html
Jazz™ for Service Management	http://www.ibm.com/support/knowledgecenter/SSEKCU/welcome
IBM System Storage® DS3000, IBM System Storage DS4000® or IBM System Storage DS5000™	<p>http://www.ibm.com/support/knowledgecenter/</p> <p>Go to the preceding website and go to System Storage > Disk systems.</p>
IBM System Storage DS6000™	<p>http://www.ibm.com/support/knowledgecenter/</p> <p>Go to the preceding website and go to System Storage > Disk systems > Enterprise Storage Servers > DS6000 series.</p>
IBM System Storage DS8000®	<p>http://www.ibm.com/support/knowledgecenter/</p> <p>Go to the preceding website and go to System Storage > Disk systems > Enterprise Storage Servers. Select the DS8000 series system that you want.</p>
IBM System Storage DS® Open Application Programming Interface publications	<p>http://www.ibm.com/support/docview.wss?uid=ssg1S7001160</p> <p>Use these publications for information about how to install, configure, and use the CIM agent.</p>
IBM System Storage SAN Volume Controller	http://www.ibm.com/support/knowledgecenter/STPVGU
IBM Storwize® V3500	http://www.ibm.com/support/knowledgecenter/STLM6B/landing/v3500_welcome.html
IBM Storwize V3700	http://www.ibm.com/support/knowledgecenter/STLM5A/landing/V3700_welcome.html
IBM Storwize V5000	http://www.ibm.com/support/knowledgecenter/STHGJ/landing/V5000_welcome.html
IBM Storwize V7000	http://www.ibm.com/support/knowledgecenter/ST3FR7/landing/V7000_welcome.html
IBM Storwize V7000 Unified	http://www.ibm.com/support/knowledgecenter/ST5q4U/landing/v7000_unified_welcome.html
IBM Scale Out Network Attached Storage (IBM SONAS)	http://www.ibm.com/support/knowledgecenter/STAV45/landing/sonas_151_kc_welcome.html
IBM XIV® Storage System	http://www.ibm.com/support/knowledgecenter/STJTAG

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

Product	Online location
IBM Spectrum Accelerate™	http://www.ibm.com/support/knowledgecenter/STZSWD/welcome
IBM Spectrum Scale™	http://www.ibm.com/support/knowledgecenter/SSFKCN/gpfs_welcome.html
IBM DB2® Database for Linux UNIX and Windows	http://www.ibm.com/support/knowledgecenter/SSEPGG/welcome
IBM System Storage N series	http://www.ibm.com/systems/storage/network/index.html For more information about IBM System Storage N series, see http://www.ibm.com/systems/storage/network/software/ .
IBM Systems Director	http://www.ibm.com/systems/software/director/index.html
VMware vSphere	http://www.vmware.com/support/pubs/vsphere-esxi-vcenter-server-pubs.html
IBM Cognos® Business Intelligence	http://www.ibm.com/support/knowledgecenter/SSEP7J
IBM FlashSystem™ V840 Enterprise Performance Solution	http://www.ibm.com/systems/storage/flash/v840/overview.html
IBM FlashSystem V9000	http://www.ibm.com/systems/storage/flash/v9000/overview.html

IBM Redbooks

The IBM Redbooks® are publications about specialized topics.

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

Translation

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

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

Providing feedback about publications

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

To provide comments or suggestions about the product documentation, go to the following location for IBM Spectrum Control: <http://www.ibm.com/support/knowledgecenter/SS5R93/>. Click **Add Comment** on the welcome page or on individual topic pages in a specific release. You must have an IBM ID and password to add a comment.

Service Management Connect community

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

Access Service Management Connect at <https://www.ibm.com/developerworks/servicemanagement/>. Use Service Management Connect in the following ways:

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

Conventions used in this guide

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

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

The following typeface conventions are used in this publication:

Bold

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

Italic

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

monospace

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

For syntax notations, remember the following details.

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

Contacting IBM Software Support

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

- Go to the IBM Spectrum Control technical support website at http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Productivity_Center.

To receive future support notifications, sign in under **Subscribe to support notifications**. You are required to enter your IBM ID and password. After you are authenticated, you can configure your subscription for IBM Spectrum Control technical support website updates.

- Customers in the United States can call 1-800-IBM-SERV (1-800-426-7378).
- For international customers, go to the IBM Spectrum Control technical support website to find support by country. Expand **Contact support** and click **Directory of worldwide contacts**.

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

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

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

Reporting a problem

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

Have the following information ready when you report a problem:

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

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 and uses Fibre Channel connection (FICON®) or TCP/IP communications to connect to and manage count key data (CKD) volumes. Tivoli Storage Productivity Center for Replication for System z uses TCP/IP to manage fixed-block architecture (FBA) volumes.

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

Tivoli Storage Productivity Center for Replication for System z product family

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.

These products provide the following features:

- 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.

Storage system	Session type
System Storage DS8000	<ul style="list-style-type: none">• Basic HyperSwap• FlashCopy
System Storage DS6000	<ul style="list-style-type: none">• Basic HyperSwap• FlashCopy

Storage system	Session type
TotalStorage Enterprise Storage Server® Model 800	<ul style="list-style-type: none"> • Basic HyperSwap • FlashCopy
SAN Volume Controller	<ul style="list-style-type: none"> • FlashCopy
Storwize V3500, Storwize V3700, and Storwize V7000	<ul style="list-style-type: none"> • FlashCopy
Storwize V7000 Unified (Tivoli Storage Productivity Center for Replication copy services are available only for Storwize V7000 Unified block storage)	<ul style="list-style-type: none"> • FlashCopy
The XIV system	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 • Metro Mirror - Metro Mirror (This session type is available only for storage systems with a microcode level that supports single source to multi-target relationships. To determine whether you can use this session type, refer to the System Storage DS8000 documentation for the microcode level that you are using.)
System Storage DS6000	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 • Global Mirror Failover/Failback with Change Volumes
Storwize V3500	<ul style="list-style-type: none"> • FlashCopy
Storwize V3700 and Storwize V7000	<ul style="list-style-type: none"> • 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 • Global Mirror Failover/Failback with Change Volumes
Storwize V7000 Unified (Tivoli Storage Productivity Center for Replication copy services are available only for Storwize V7000 Unified block storage)	<ul style="list-style-type: none"> • 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 • Global Mirror Failover/Failback with Change Volumes
The XIV system	<ul style="list-style-type: none"> • Snapshot • Metro Mirror Failover/Failback • Global Mirror Failover/Failback

Key components of Tivoli Storage Productivity Center for Replication for System z

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 configured automatically 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

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

Menu bar

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

Navigation

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

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

Overview

Click this item to open the Overview page. This page shows a status summary for all sessions, storage systems, host systems, and management servers that Tivoli Storage Productivity Center for Replication for System z is managing.

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

Sessions

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

Storage or Storage > Storage Systems

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

Storage > Host Connections

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

Storage > Volumes

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

Paths or Paths > ESS/DS Paths

Click either of these items to open the ESS/DS Paths page. Use this page to view and manage paths between source logical subsystems and target logical subsystems for TotalStorage Enterprise Storage Server Model 800, System Storage DS6000, and System Storage DS8000 storage systems.

Console

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

Settings or Settings > Advanced Tools

Click either of these items to open the Advanced Tools page. Use this page to create a log file package for diagnostic purposes, change the automatic refresh rate of the GUI, and enable or disable the Metro Mirror heartbeat.




Settings > Management Servers

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

Settings > Administration

Click this item to open the Administration page. Use this page to view and manage the users and user groups for Tivoli Storage Productivity Center for Replication for System z and their access privileges.

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

- Unknown status 
- Severe status 
- Warning status 


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

User ID

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

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

Help icon

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

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

Breadcrumb

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

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

Content area

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

Dynamic images

The GUI provides dynamic images that show the status of the sites and role pairs that are in the session. The images present a pictorial view of information such as the status, progress, and direction of the replication between sites and whether volumes are consistent between sites. Consistent volumes are blue while inconsistent volumes are gray.

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



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 to automate functions.

For security, the CLI runs only on the Tivoli Storage Productivity Center for Replication for System z management server, which is the central point of control for managing data replication. You can run the CLI remotely by using a remote-access utility, for example, Secure Shell (SSH) or Telnet.

For on Windows systems, you can specify remote access to Linux or AIX terminals if you enabled Telnet on your Windows server.

Chapter 2. Prerequisite system requirements

These are the prerequisite system requirements that you need to verify before you install Tivoli Storage Productivity Center for Replication for System z.

Use the prerequisite tasks to verify that your system meets the requirements for installing Tivoli Storage Productivity Center for Replication for System z.

Prerequisites for Tivoli Storage Productivity Center for Replication for System z

Before you install Tivoli Storage Productivity Center for Replication for System z, ensure that the hardware and software requirements are met.

Your system must meet the following prerequisites:

Hardware requirements

- IBM z/OS operating system: IBM System z architecture
- Minimum disk space requirement: See the *Program Directory for Tivoli Storage Productivity Center for Replication for System z* for details
- Storage system requirements:
 - System Storage DS8000:
 - System Storage DS8000 Hardware Management Console (HMC) V4.3 microcode
 - Advanced Copy services licenses
 - Optional Ethernet adapters for Tivoli Storage Productivity Center for Replication
 - Single image - feature code 1801
 - Dual image - feature code 1802 and 1803
 - System Storage DS6000:
 - Minimum firmware level 6.2.2.64
 - Advanced Copy services licenses
 - TotalStorage Enterprise Storage Server Model 800:
 - Minimum firmware level 2.4.4.72
 - Feature codes 240 - PRC and 2240 - PRC
 - SAN Volume Controller
 - Minimum version 4.2.1
 - Copy services licenses
 - Storwize V3500
 - Storwize V3700
 - Storwize V5000
 - Storwize V7000
 - Minimum version 6.1.0
 - Storwize V7000 Unified
 - Minimum version 1.3
 - The XIV system

- Minimum version 10.2.4

Java Virtual Machine requires a minimum of 512 MB of memory allocated to UNIX System Services.

Software requirements

The software requirements for your z/OS operating system can be V1.12, V1.13, or V2.1.

Open HyperSwap® requirements

Open HyperSwap provides HyperSwap functions for open systems. The use of Open HyperSwap is optional. The following hardware and software are required for the Open HyperSwap feature.

- AIX V5.3 or V6.1 with the following modules:
 - Subsystem Device Driver Path Control Module (SDDPCM) V3.0.0.0 or later
 - Multi-Path Input/Output (MPIO) module V2.0.0.1. or later
- System Storage DS8000 5.1 or later.

For more information about the latest requirements for Open HyperSwap, see the IBM Multipath Subsystem Device Driver Path Control Module (PCM) Version 3.0.0.0 readme file for AIX at <ftp://ftp.software.ibm.com/storage/subsystem/aix/3.0.0.0/sddpcm.readme.3.0.0.0.txt>.

HyperSwap fixes and updates

To ensure that you have the latest z/OS APARs, updates, and program temporary fixes PTFs that are required to support HyperSwap, you can get the latest IBM HOLDDATA, and then use the fix category IBM.Function.HyperSwap to select and apply the appropriate PTFs or to identify any PTFs that are missing. For the latest information on HOLDDATA, see "Enhanced HOLDDATA for z/OS" at the support portal (<http://service.software.ibm.com/holdata/390holddata.html>). Use the full two-year file only. After receiving the latest HOLDDATA, you can use the SMP/E REPORT MISSINGFIX command to identify missing HyperSwap PTFs.

For more information about the REPORT MISSINGFIX command, see *SMP/E for z/OS Commands* document at http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/BOOKS/GIMCOM41/CCONTENTS?SHELF=GIM2BK80&DN=SA22-7771-13&DT=20090609031147. For a general discussion on how to use fix categories, see "Simplifying PSP Buckets" at <http://publibz.boulder.ibm.com/zoslib/pdf/IEA-PDF-SMP35-SimplifyingPSPBuckets.pdf>.

Chapter 3. Installing

To install IBM Tivoli Storage Productivity Center for Replication for System z or IBM Tivoli Storage Productivity Center for Replication Basic Edition for System z there are important procedures to implement.

To install the IBM Tivoli Storage Productivity Center for Replication for System z, follow these steps:

1. Ensure that your system meets the minimum software and hardware requirements. See “Prerequisites for Tivoli Storage Productivity Center for Replication for System z” on page 9 for more information.
2. Verify you have the latest z/OS APARs, updates, and PTFs needed to support Basic HyperSwap. Use either the Technical help database for Mainframe Preventive Service Planning buckets website at www14.software.ibm.com/webapp/set2/psp/srchBroker or the Enhanced PSP Tool or ServiceLink. To learn more about the website and the Enhanced Service Planning Tool, see the IBM Education Assistant website at publib.boulder.ibm.com/infocenter/ieduasst/stgv1r0/index.jsp. In the search box, enter Enhanced Preventive Service, then click the link in the results section.
3. Install Tivoli Storage Productivity Center for Replication for System z with SMP/E.
 - a. Configure jobs
 - b. Run jobs without errors

For detailed installation instructions, see the *Program Directory for IBM Tivoli Storage Productivity Center for Replication for System z* or *Program Directory for IBM Tivoli Storage Productivity Center for Replication Basic Edition for System z*

4. Complete the post-installation steps for z/OS after you installed IBM Tivoli Storage Productivity Center for Replication for System z.
 - a. Configure the IWNRACT, IWNINSTL, and IWNSRV jobs.
 - b. Run the IWNINSTL installation job with no errors. For more information, see “Configuring the IWNINSTL job” on page 15.
5. Start the Tivoli Storage Productivity Center for Replication for System z graphical user interface (GUI) as described in Chapter 7, “Starting the Tivoli Storage Productivity Center for Replication for System z GUI,” on page 33.

Chapter 4. Post-installation tasks for z/OS

After you have installed IBM Tivoli Storage Productivity Center for Replication on the z/OS operating system, you must complete post-installation tasks. These tasks include configuring and submitting the jobs that are presented in the following topics in the order that they are presented.

Configuring the IWNRACF job

You configure the IWNRACF job to provide the necessary security and write permissions for the file system to run the Tivoli Storage Productivity Center for Replication for System z application. This job is found in the HLQ.ASAMPLIB data set.

You configure a user for Tivoli Storage Productivity Center for Replication, user ID number, group ID number, home directory for the Tivoli Storage Productivity Center for Replication user, and a group for the Tivoli Storage Productivity Center for Replication ID to be part of for the IBM Resource Access Control Facility (RACF®) security program on your target system.

Use the following steps to configure, and then submit the IWNRACF job:

1. Locate the IWNRACF job in the HLQ.ASAMPLIB data set and open it.
2. Modify the following procedure to meet your system requirements, for the RACF security program on your system:

```
//*****  
/*  
//ANTRAC EXEC PGM=IKJEFT01  
modify//SYSLBC DD DSN=SYS1.BROADCAST,DISP=SHR  
//SYSTSPRT DD SYSOUT=*  
//SYSTSIN DD *  
/* Define TPC-R user and group */  
ADDGROUP #tpcr_grp OMVS(GID(#gid))  
ADDUSER #tpcr_id DFLTGRP(#tpcr_grp) OMVS(UID(#uid) HOME  
(#ussPath) +  
PROGRAM(/bin/sh)) NAME('Liberty') NOPASSWORD NOOICARD  
ALU #tpcr_id PASSWORD(#tpcr_id) NOEXPIRE  
  
/* Define Started profiles */  
RDEF STARTED IWNSRV.* UACC(NONE) STDATA(USER(#tpcr_id) +  
GROUP(#tpcr_grp) PRIVILEGED(NO) TRUSTED(NO) TRACE(YES))  
SETROPTS RACLIST(STARTED) GENERIC(STARTED) REFRESH  
  
/* Define ANT.REPLICATIONMANAGER */  
RDEFINE FACILITY ANT.REPLICATIONMANAGER UACC(NONE)  
PERMIT ANT.REPLICATIONMANAGER CLASS(FACILITY) +  
ID(#tpcr_id) ACCESS(CONTROL)  
SETROPTS RACLIST(FACILITY) REFRESH  
/*
```

- a. Specify values for the following variables:

ADDGROUP

The group that the Tivoli Storage Productivity Center for Replication user ID belongs to.

ADDUSER

The user of Tivoli Storage Productivity Center for Replication. This

is the user ID that is used to log on to the Tivoli Storage Productivity Center for Replication GUI.

GID The group ID number for Tivoli Storage Productivity Center for Replication.

UID The user ID number that owns the Tivoli Storage Productivity Center for Replication files and directories.

HOME

The home directory of *TPCR_ProductionRoot* in z/OS UNIX System Services for the *tpcr_id* user.

3. After you supply the necessary values, submit the IWNCRHFS job.

Configuring the IWNCRHFS job

You allocate a hierarchical file system (HFS) data set to a root file system by specifying certain parameters in the IWNCRHFS job.

The files within an HFS data set are identified by their path and file names within Tivoli Storage Productivity Center for Replication.

1. Locate the IWNCRHFS job in the HLQ.ASAMPLIB data set and open it.
2. Modify the following values on your system.

```
//*****  
//CREATHFS EXEC PGM=IKJEFT01  
//SYSTSPRT DD SYSOUT=*  
//SYSTSIN DD *  
    PROFILE WTPMSG MSGID  
    TIME  
  
    ALLOC F(X) DA('#PRODUCT.HFS') NEW CATALOG +  
        DSNTYPE(HFS) +  
        SPACE(20000,5000) TRACKS DIR(1) +  
        VOL(XXXXXX)  
/*
```

3. Specify the zFS or HFS to be created by editing the **DA** (*#PRODUCT.HFS*) parameter.
4. Specify the **DSNTYPE** parameter; enter *HFS* for z/OS system or *ZFS* for UNIX users. The **SPACE** parameter is already defined with the default data set size of (20000, 5000).
5. Specify the **VOL** parameter; enter the volume name where the *HFS* resides. The default name of the volume is (XXXXXX).
6. Submit the IWNCRHFS job.

Configuring the IWNIMNT job

You can mount the hierarchical file system (HFS) created by the IWNCRHFS job by configuring and submitting the IWNIMNT job.

The IWNIMNT job creates, and then mounts the HFS at the mount point.

1. Locate the IWNIMNT job in the HLQ.ASAMPLIB data set and open it.
2. Modify the following values on your system.

```
//*****  
//*  
//IWNIMNT EXEC PGM=IKJEFT01  
//SYSTSPRT DD SYSOUT=*  
//SYSTSIN DD *
```

```

PROFILE WTPMSG MSGID
TIME

/* Make sure mountpoints exist. */
MKDIR '/opt/Tivoli'           MODE(7,5,5)
MKDIR '/opt/Tivoli/RM'       MODE(7,5,5)

/* Mount the HFS. */
MOUNT FILESYSTEM('#PRODUCT.HFS') TYPE(HFS) +
      MODE(RDWR) +
      MOUNTPOINT('/opt/Tivoli/RM')
/*

```

3. Specify the zFS or HFS created by the IWNCRHFS job by editing the **MOUNT FILESYSTEM** (*#PRODUCT.HFS*) parameter and the **TYPE** parameter.
4. Specify *TPCR_ProductionRoot* as the mount point by editing the **MOUNTPOINT** parameter. The default mount point is */opt/Tivoli/RM*.
5. Submit the IWNIMNT job.

Configuring the IWNINSTL job

To set up the data source, applications, security, Java virtual machine, and the libraries in WebSphere Application Server for z/OS Liberty Profile, configure, and submit the IWNINSTL installation job.

To configure the IWNINSTL job with the correct installation information, follow these steps:

1. Locate the IWNINSTL job in the HLQ.ASAMPLIB data set and open it.
2. Find the following strings and edit the values for your environment:

```

TPCR_USER=#tpcr_user
TPCR_GRP=#tpcr_grp
TPCR_InstallRoot=path_prefix/usr/lpp/Tivoli/RM
TPCR_ProductionRoot=path_prefix/opt/Tivoli/RM
TIME_ZONE=GMT
CLIENT_PORT=9560
HA_PORT=9561

```

TPCR_USER

The user ID for Tivoli Storage Productivity Center for Replication. This is the user ID that is used to log on to the Tivoli Storage Productivity Center for Replication GUI. The user ID must be the same as the ID that is defined in the *ADDUSER* variable in the IWNRACF job.

TPCR_GRP

The ID for the group that the user belongs to.

TPCR_InstallRoot

The location in which Tivoli Storage Productivity Center for Replication was installed by the SMP/E APPLY step. The data in this location is read only.

Do not change the *TPCR_InstallRoot* or *TPCR_ProductionRoot* paths in the job other than to modify the *path_prefix* directory. If you modify the *path_prefix* directory, verify that the directory exists in UNIX System Services (USS).

TPCR_ProductionRoot

The location in which Tivoli Storage Productivity Center for Replication stores the database and command-line interface. Data that requires read and write access must be in this path.

TIME_ZONE

The time zone that is used by Java virtual machine. The default is GMT, which is Greenwich mean time.

If you do not include a value for the **TIME_ZONE** parameter, the default is GMT.

CLIENT_PORT

The client port that is used by the GUI and CLI to communicate with the Tivoli Storage Productivity Center for Replication server. The default value is 9560.

HA_PORT

The standby management server port that is used for communication between the active and standby management server in a high-availability relationship. The default value is 9561.

Restriction: In a high-availability relationship, the client and standby management server port numbers must be the same on both the management server and the standby management server. 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.

3. Optional: Add the following JCL to the job so that the installation log and error files are written to the job output.

```
//*****  
//* PRINT OUT LOG AND ERROR INFO  
//*****  
//LOGOUT EXEC PGM=IKJEFT01,DYNAMNBR=300,COND=EVEN  
//SYSTSPRT DD SYSOUT=*  
//HFSOUT DD PATH='PATH='path_prefix/etc/install_RM.log'  
//HFSERR DD PATH='PATH='path_prefix/etc/install_RM_err.log'  
//STDOUTL DD SYSOUT=*,DCB=(RECFM=VB,LRECL=133,BLKSIZE=137)  
//STDERRL DD SYSOUT=*,DCB=(RECFM=VB,LRECL=133,BLKSIZE=137)  
//SYSPRINT DD SYSOUT=*  
//SYSTSIN DD *  
OCOPY INDD(HFSOUT) OUTDD(STDOUTL)  
OCOPY INDD(HFSERR) OUTDD(STDERRL)  
/*
```

4. Submit the IWNINSTL installation job.

After the IWNINSTL job is complete, look for any return codes. The return codes 0 and 1 are acceptable. For other job return codes, see the following error and log files:

```
//HFSOUT DD PATH='PATH='path_prefix/etc/install_RM.log'  
//HFSERR DD PATH='PATH='path_prefix/etc/install_RM_err.log'
```

You can also locate the *path_prefix/etc/* directory by using iShell or use the OMVS command line, and look for the log files to identify any errors that might occur.

Related tasks:

“Configuring the IWNRACF job” on page 13

You configure the IWNRACF job to provide the necessary security and write permissions for the file system to run the Tivoli Storage Productivity Center for Replication for System z application. This job is found in the HLQ.ASAMPLIB data set.

Configuring the IWNSRV job

Edit the IWNSRV job and copy it to the PROCLIB system library with the correct directory paths to start and stop IBM Tivoli Storage Productivity Center for Replication.

After you run the IWNRACF and IWNINSTL jobs, you configure the IWNSRV job. To start Tivoli Storage Productivity Center for Replication through the console, issue the **Start IWNSRV** command. To stop Tivoli Storage Productivity Center for Replication, issue the **Stop IWNSRV** command.

1. Edit the *path_prefix* variable in the following directory path, with the correct information for your environment:

```
/*-----  
// SET INSTDIR='path_prefix/opt/Tivoli/RM/wlp'  
// SET USERDIR='path_prefix/opt/Tivoli/RM/wlp/usr'  
/*-----
```

where:

INSTDIR

The directory path to the WebSphere Application Server for z/OS Liberty Profile server installation. This path is used to find the product code.

USERDIR

The directory path to the WebSphere Application Server for z/OS Liberty Profile server user area. This path is used to store shared-and server-specific configuration information.

2. If you want the job to output log information to z/OS UNIX System Services, uncomment and edit the *STDENV* variable.

```
/* Start the server  
/*-----  
//STEP1 EXEC PGM=BPXBATSL,REGION=0M,TIME=NOLIMIT,  
// PARM='PGM &INSTDIR./lib/native/zos/s390x/bbgzsrv &PARMS'  
//WLPUDIR DD PATH='&USERDIR.'  
//STDOUT DD SYSOUT=*  
//STDERR DD SYSOUT=*  
/*STDENV DD PATH='/etc/system.env',PATHOPTS=(ORDONLY)  
/*STDOUT DD PATH='&ROOT/std.out',  
/* PATHOPTS=(OWRONLY,OCREAT,OTRUNC),  
/* PATHMODE=SIRWXU  
/*STDERR DD PATH='&ROOT/std.err',  
/* PATHOPTS=(OWRONLY,OCREAT,OTRUNC),  
/* PATHMODE=SIRWXU  
/*
```

where:

WLPUDIR

The DD PATH that points to the WebSphere Application Server for z/OS Liberty Profile server USERDIR directory. If the DD PATH is not allocated, the USERDIR directory location defaults to the wlp/usr directory in the installation tree view.

STDOUT

The destination for the STDOUT variable (DD SYSOUT - System.out).

STDERR

The destination for the STDERR variable (DD SYSOUT - System.err).

STDENV

In the initial UNIX environment, this path is read by the system. The

installation default and specific server environment files are merged into this environment before the Java Virtual Machine is launched.

Troubleshooting problems that occur during installation

Problems might arise when you are installing Tivoli Storage Productivity Center for Replication for System z. This workaround might be helpful.

You cannot connect to the server with the GUI when local host is defined in `csmConnections.properties` file

In rare cases, you might not have local host resolution on your local system, which can prevent the graphical user interface (GUI) from connecting to the Tivoli Storage Productivity Center for Replication for System z management server. In this situation, complete the following steps:

1. Edit the `csmConnections.properties` file, which is located in `path_prefix/wlp/usr/servers/replicationServer/properties` directory, and change the `csm.server.address` property to the IP address or host name of the local system.
2. Restart the graphical user interface (GUI) so that it can connect to the local system.
3. Edit the `repcli.properties` file, in the `cli` directory, and change the `server` property to the IP address or host name of the local system.

Configuring additional features

After you complete your post installation tasks, there are additional features you might want to configure to add more functionality to your IBM Tivoli Storage Productivity Center for Replication for System z environment.

The following topics provide instructions for IBM Tivoli Storage Productivity Center for Replication to connect to a z/OS host system. The Tivoli Storage Productivity Center for Replication server can be running on either a different z/OS server or a Tivoli Storage Productivity Center for Replication Open server.

Enabling a host name or IP address connection to a z/OS host system

You can use a host name or IP address to connect to IBM z/OS host systems in Tivoli Storage Productivity Center for Replication regardless of the operating system on which the application is installed.

You can connect to a z/OS host system from Tivoli Storage Productivity Center for Replication that is running on Windows, Linux, AIX, or z/OS. Once you are connected to a host system, you can manage HyperSwap sessions that are running on the system. In addition, a single instance of Tivoli Storage Productivity Center for Replication is used to manage multiple HyperSwap instances that are running in different z/OS systems and sysplexes.

The following steps set the required Resource Access Control Facility (RACF®) settings on the host system, and define the **SOCKPORT** parameter when the HyperSwap IOSHMCTL management address space is started.

To connect to a z/OS host system from Tivoli Storage Productivity Center for Replication, use these steps:

1. If your installation uses the STARTED class or the started procedures table (ICHRIN03) of the z/OS Security Server, ensure that the user BHIHSRV is associated with the started task BHIHSRV. You will define the user BHIHSRV in the next step. For more information about using the STARTED class or the started procedures table, see the information about using started procedures in the *Security Server RACF Security Administrator's Guide* at <http://www-01.ibm.com/support/docview.wss?uid=pub1sa22768315>.
2. Define the user identifier BHIHSRV as a user, with an OMVS segment as shown in the following example command:


```
ADDUSER BHIHSRV OMVS(UID(user_identifier) SHARED HOME('/')) NOPASSWORD
```

where *user_identifier* is a number that represents the user ID.
3. If the ANT.REPLICATIONMANAGER entity is not defined to the FACILITY class, issue the following command. If the entity is defined, continue to step 3.


```
RDEFINE FACILITY ANT.REPLICATIONMANAGER UACC(NONE)
```
4. Authorize the user identifier BHIHSRV to the ANT.REPLICATIONMANAGER entity in the FACILITY class by issuing the following command:


```
PERMIT ANT.REPLICATIONMANAGER CLASS(FACILITY) ID(BHIHSRV) ACCESS(CONTROL)
```
5. To define the user ID and password that are used for authentication from Tivoli Storage Productivity Center for Replication to the z/OS host system, issue the following commands. You must enter this user ID and password when you add the z/OS host system to Tivoli Storage Productivity Center for Replication.


```
ADDUSER userid PASSWORD(password)
PERMIT ANT.REPLICATIONMANAGER CLASS(FACILITY) ID(userid) ACCESS(CONTROL)
```
6. Activate the changes by issuing the following command:


```
SETRPTS RACLIST(FACILITY) REFRESH
```
7. Start the IOSHMCTL address space with the **SOCKPORT** parameter as shown in the following example:


```
//HSIB JOB MSGLEVEL=(1,1),TIME=NOLIMIT,REGION=0M
//IEFPROC EXEC PGM=IOSHMCTL,PARM='SOCKPORT=port_number'
```

where *port_number* is a number in the 1 - 65535 range. You must enter this port number when you add the z/OS host system to Tivoli Storage Productivity Center for Replication.

For more information about RACF commands, see the *z/OS V1R13.0 Security Server RACF Command Language Reference* at <http://www-01.ibm.com/support/docview.wss?uid=pub1sa22768716>.

Preparing to use HyperSwap from z/OS

Before you can use HyperSwap with Tivoli Storage Productivity Center for Replication, you must configure z/OS to use HyperSwap.

Configuring HyperSwap

On System z, HyperSwap requires that all RESERVEs are converted to global enqueues (ENQs).

When a HyperSwap is initiated and a RESERVE exists on any PPRC device, the RESERVE might be lost.

To prevent data integrity exposure, configure global resource serialization (GRS) to convert RESERVEs to Global ENQs, use these steps:

1. Run the ENQ/RESERVE/DEQ Monitor with filtering REQTYPE of NCRESERVE to gather reports on non-converted RESERVEs issued by the system. For more information about using the ENQ/RESERVE/DEQ monitor tool, see the *z/OS MVS™ Planning: Global Resource Serialization* document.
2. Use the GRSRNLxx member of SYS1.PARMLIB statement, to add an RNLDEF customization parameter.
3. To convert any RESERVE that might be issued against volumes that are managed by HyperSwap to Global ENQs, use a PATTERN entry.
4. Use the RNLDEF parameter to convert all RESERVEs to Global ENQs: RNLDEF RNL(CON) TYPE(PATTERN) QNAME(*).

For more information about converting RESERVEs to Global ENQs, see the section about GRSRNLxx (global resource serialization resource name lists) in the latest version of the *z/OS MVS Initialization and Tuning Reference*.

When RESERVEs are converted to GRS Global ENQs, the ENQs might take longer to resolve if the ISGLOCK structure is too small to process each global ENQ independently. If this situation occurs, you might want to increase the size of your ISGLOCK structure. For information about GRS, including guidelines on how to resize your ISGLOCK structure, see the latest version of the *z/OS MVS Planning: Global Resource Serialization* document.

Sharing the HyperSwap managed devices outside of the sysplex

When HyperSwap is started, the cross-system coupling facility or XCF is used to coordinate all the systems in the sysplex through the swap. Any system outside the sysplex does not participate in the swap, and is unaware that the device was swapped. In certain cases, the system outside the sysplex continues using the old primary volumes following a swap, that results in data integrity exposures.

The HyperSwap address spaces

HyperSwap requires two address spaces: the HyperSwap management address space and the HyperSwap API address space. Follow these steps to start the address spaces:

1. Add procedures for the address spaces to the SYS1.PROCLIB data set:

For the HyperSwap management address space:

```
//HSIB JOB MSGLEVEL=(1,1),TIME=NOLIMIT,REGION=0M
//IEFPROC EXEC PGM=IOSHMCTL
```

For the HyperSwap API address space:

```
//IOSHSAPI JOB MSGLEVEL=(1,1),TIME=NOLIMIT,REGION=0M
// EXEC PGM=IOSHSAPI
```

2. Start the address spaces in one of the following ways:
 - Issue the **START** command manually.
 - Include the **START** command in the COMMNDxx member of the SYS1.PARMLIB data set.

These are the START commands for the specific address spaces:

For the HyperSwap management address space start command:

```
START HSIB
```

For the HyperSwap API address space start command:

```
START IOSHSAPI
```

HyperSwap can fail if both of the following conditions occur:

- The volumes that contain paging data sets are included in the HyperSwap configuration.
- The address spaces that are required for HyperSwap have page faults.

To reduce the possibility of a swap failure because of page faults, enable the CRITICALPAGING function. To enable the CRITICALPAGING function, use the FUNCTIONS statement of the COUPLExx PARMLIB member for each system in the sysplex.

For example, add the following CRITICALPAGING statement to the COUPLExx PARMLIB member:

```
FUNCTIONS ENABLE(CRITICALPAGING)
```

Tip: You cannot enable the CRITICALPAGING function through the SETXCF command. However, you can use either method to stop CRITICALPAGING.

For information about indicating the address spaces that are critical for paging, see the *z/OS V1R12.0 MVS Initialization and Tuning Reference* document.

Gathering information or controlling a HyperSwap session by using commands

When you are running HyperSwap, you can use additional commands to gather information or control a HyperSwap session on z/OS.

Table 2. Additional HyperSwap commands on z/OS

Command	Result
D HS,STATUS	Displays the status of a HyperSwap session. This command also displays any reasons why HyperSwap might be disabled, and the policies for the HyperSwap session.
D HS,CONFIG(DETAIL,ALL)	Displays the detailed configuration for the HyperSwap session. The volumes and status of all pairs in the HyperSwap configuration are listed.
SETHS SWAP	Starts a planned HyperSwap session. You can issue this command instead of issuing the HyperSwap command from Tivoli Storage Productivity Center for Replication.
SETHS DISABLE	Disable HyperSwap by operator command. This command prevents a HyperSwap session from occurring, either by command or automatically.
SETHS ENABLE	Enable HyperSwap by operator command. This command allows a HyperSwap session to be performed, either by command or automatically, if a HyperSwap session is not disabled for other reasons.
SETHS RESUMEIO	Resumes normal I/O activity to devices following a suspended HyperSwap action because the Hold I/O option was used.

Configuring a secure communication between HyperSwap and the client

Create a certificate authority (CA) for TLS with Resource Access Control Facility (RACF) and prepare the CA for export to the client for server certificate authenticity.

The Tivoli Storage Productivity Center for Replication for System z server communicates through the TCP/IP protocol, which is encrypted by Transport Layer Security (TLS), to a HyperSwap management address space that you can manage your attached storage devices, including the HyperSwap and z/OS Hardened Freeze functions.

Important: When you create the CA, the user ID that you use for your commands must be the same user ID that is used to run HyperSwap.

To create a CA and prepare it for export, use the following steps:

1. Generate a self-signed certificate, by issuing the following command:

```
RACDCERT CERTAUTH GENCERT SUBJECTSDN (OU('TPCR Certificate Authority')
O('tpcr') C('us')) KEYUSAGE(CERTSIGN)
WITHLABEL('TPCR Local Certificate Authority')
```

This certificate is used as the certificate authority certificate. RSA is the default encryption algorithm with 1024 bits of strength.

Specify values for the following parameters:

OU The name of your organization unit. For example, TPCR Certificate Authority.

O The name of the organization. For example, tpcr.

C The name of the country where the certificate is created. For example, us.

2. Refresh the certificate so it is placed in storage. Issue the following commands:

```
SETR CLASSACT(DIGTCERT)
SETR RACLIST(DIGTCERT)
SETR RACLIST(DIGTCERT) REFRESH
```

3. Export the certificate to a data set by specifying the **DSN** parameter, which is the name of the output data set, for example, 'TPCR.LOCCERTA.CERT' Issue the following command:

```
RACDCERT CERTAUTH EXPORT (LABEL('TPCR LOCAL CERTIFICATE AUTHORITY'))
DSN('TPCR.LOCCERTA.CERT') FORMAT(CERTDER)
```

4. Create a certificate for the server by using your user ID, and issuing the following command:

```
RACDCERT ID('userid') GENCERT SUBJECTSDN(CN('TPCR Client')OU('Hyperswap Server')
O('TPCR') C('US')) WITHLABEL('Hyperswap Manager')
SIGNWITH(CERTAUTH LABEL('TPCR Local Certificate Authority')) KEYUSAGE(HANDSHAKE)
```

This command generates a server certificate with the default size of 1024 bits, and the default key type, ICSF RSA. This certificate is signed by the CA that was previously created in step 1.

Specify the following parameters:

ID The user ID for the certificate. You can change this parameter for your environment. For example, userid.

CN The common name of your organization unit. For example, TPCR Client.

OU The name of your organization unit. For example, Hyperswap Server.

O The name of the organization. For example, TPCR.

C The name of the country where the certificate is created. For example, US.

5. Create a key ring for the certificate by issuing the following command:

```
RACDCERT ID('userid') ADDRING(tpcrkeyring)
```

6. Connect the server certificate to the key ring by issuing the following command:


```
RACDCERT ID('userid') CONNECT(LABEL('Hyperswap Manager')
RING(tpcrkeyring) default)
```
7. Connect the certificate authority certificate to the newly created to key ring by issuing the following command:


```
RACDCERT ID('userid')CONNECT(CERTAUTH LABEL('TPCR Local Certificate Authority')
RING(tpcrkeyring))
```
8. Provide the SETUP permission so the user ID can read its own key ring, by issuing the following commands:


```
RDEFINE FACILITY IRR.DIGTCERT.LISTRING UACC(NONE)
PERMIT IRR.DIGTCERT.LISTRING CLASS(FACILITY) ID('userid') ACCESS(READ)
```

Importing a certificate into a JKS file using IBM Key Management utility

Tivoli Storage Productivity Center for Replication for System z cannot access raw certificates. The certificate authority (CA) needs to be in the JKS file format before it is imported into the file.

To change the file format of the CA into the necessary format, the CA must be imported into a JKS database by using the IBM Key Management utility. After the CA is imported, Tivoli Storage Productivity Center for Replication for System z can access the CA and import it to the z/OS system.

To change the CA into the necessary file format and import it into the JKS file, use these steps:

1. Download and install IBM Java Runtime Environment (JRE) that includes the IBM Key Management utility. You might already have the utility installed on your system, if you have a recent version of IBM JRE on your computer.
2. Start the IBM Key Management utility by issuing the following command:


```
ikeyman
```
3. From the **Key Database File** menu of the Key Management GUI, click **New**.
4. In the New window, enter information for the following fields:
 - a. In the **Key database type** field, select **JKS**.
 - b. In the **File Name** field, enter a name for the JKS file and click **OK**. An example for a file name might be *key.jks*.
5. In the Password Prompt window, enter a new password to create a database. Confirm the password and click **OK**.

The **Key database content** area shows any previously created CA certificates that you can select.

 - a. Click the **Signer Certificate** tab and then, click **Add** to import the certificate that was exported in 'TPCR.LOCCERTA.CERT'. See “Configuring a secure communication between HyperSwap and the client” on page 21.

Your CA certificate is listed in the **Signed Certificate** area of the Key database content information.

The JKS file format has been created and the CA is imported into the .jks file.

Creating and deploying a policy file for Application Transparent Transport Layer Security

Application Transparent Transport Layer Security (AT-TLS) is a service that is provided by the z/OS Communication Server Policy Agent (PAGENT) and the TCP/IP stack. The AT-TLS service manages connections on behalf of applications that are running on the z/OS operating system. You create the AT-TLS policy file, install the configuration files, and upload them to the necessary z/OS system, for a host connection.

The following steps assume that you have AT-TLS already up and running successfully on your system and the policy agent is configured and activated. For more details, see the WebSphere documentation.

Use these steps to create a policy file:

1. Download and install IBM Configuration Assistant for z/OS Communications Server, V1.13 or later. You create a AT-TLS policy file by using the Configuration Assistant GUI.
2. Start the configuration assistant by clicking **Start > All Programs > IBM Programs > IBM Configuration Assistant for z/OS > Configuration Assistant V1R13**.
3. From the **Perspective** menu, select **AT-TLS**.
4. In the AT-TLS Perspective window, click **Add a New z/OS Image**.
5. In the New z/OS Image window, enter information in the **z/OS image name**, **Description**, **z/OS release** and **Key ring** fields, and then click **OK**.
This key ring name must be the same name that you used when you first generated a key ring. See “Configuring a secure communication between HyperSwap and the client” on page 21.
6. In the Proceed to the Next Step window, click **Yes** to add a TCP/IP stack to the z/OS image.
7. In the New TCP/IP Stack Information window, type a stack name in the **TCP/IP stack name** field, add information to the **Description** field, and then click **OK**.
8. In the AT-TLS Perspective window, click **Add** to create a connectivity rule.
9. In the New Connectivity Rule wizard, click **Next**.
10. Identify the data endpoints by completing the following fields:
 - a. In the **Connectivity rule name** field, enter a suffix for a name of the rule.
 - b. In the **Local data endpoint** field, select **ALL_IP_Addresses**.
 - c. In the **Remote data endpoint** field, select **ALL_IP_Addresses**.
 - d. Click **Next**.
A generic rule facilitates testing.
11. Click **Traffic Descriptor** .
12. Click **Add** to add a traffic descriptor.
13. In the New Traffic Descriptor page, enter information in the **Name** and **Description** fields. Click **Add** .
In the New Traffic Type notebook, use the **Details** tab to specify the port configuration for the HyperSwap side of the port.
14. In the New Traffic Type notebook, click the **Key Ring** tab and specify the certificate label for your key ring and click **OK**. Click **OK** again, and then click **Close**.

15. In the New Connectivity Rule-Select Requirement Map page, click **Create a new requirement map**. Verify that this new map includes the traffic descriptor that you created in step 12.
 - a. In the **Name** field, enter the name of the requirement map
 - b. Click **Security Levels** and add a security level of Silver or lower.
 - c. Click **Next** .
16. Click **Advanced** to add any other necessary stacks, if not, then click **Finish**.
17. Select the enabled rule from the list and click **Apply Changes**.
18. On the **Image Information** tab, review the pertinent information and click **Application Setup Tasks**. Complete the initial setup tasks including RACF directives and start procedures.
19. In the Application Setup Tasks window, click **Display All Instructions** to see more detailed information. The Task Configure Installation Setup window opens.
20. In the Task Configure Installation Setup window, click **Location Information** to input the installation setup. The Installation Location Setup window opens.
 - a. Click **Instructions** to see the documentation that comes bundled with the application.
21. In the Installation Location Setup window, enter your correct FTP information to upload the policy file. Click **OK**. After the file transfer, refresh or restart the policy agent (PAGENT).
22. In the AT-TLS Perspective window, click **Install Configuration Files**. The generated policy files are installed for the z/OS image. The List of Configuration Files window opens.
23. In a OMVS session, edit the /etc/pagent/conf.txt file by adding the following lines:


```
LogLevel=255
CommonTLSConfig /etc/pagent/ttlsPol.txt
TLSConfig/etc/pagent/ttlsPol.txt
```
24. In a OMVS session, edit the /etc/pagent/env.txt file by adding the following lines:


```
PAGENT_CONFIG_FILE=/etc/pagent/conf.txt
PAGENT_LOG_FILE=/tmp/pagent2.log
```
25. Create SYS1.PROCLIB(PAGENT), if it does not exist, and edit the following line:


```
//STDENV DD PATH='/etc/pagent/env.txt',PATHOPTS=(ORDONLY)
```
26. In the List of Configuration files window, view the configuration files and click **Install**.
27. In the Install Files to Remote host window, confirm the credentials and the FTP logon information. Verify that the file location is /etc/pagent/ttlsPol, and then, click **Go**. The policy file is installed.
28. Create a data set, `${data_set_name}` with the following contents:


```
TCPCONFIG TTLS
```

 - a. Issue the following command:


```
V TCP,IP,TCP,IP,OBEYFILE,${data_set_name}
```

The policy file is created and deployed.

Verifying the Tivoli Storage Productivity Center for Replication for System z trust file

The certificate authority that was imported into the correct JKS file format must be renamed and be in the proper directory so the trust file can be verified.

Place the JKS file, in the *path_prefix/opt/Tivoli/RM/wlp/usr/servers/replicationServer/* etc directory, with the *zosTrust.jks* file name.

Verifying the z/OS system host connection

Use the Tivoli Storage Productivity Center for Replication GUI to verify that a host can connect to a z/OS system.

To verify a host connection on the z/OS system, follow these steps:

1. In the Tivoli Storage Productivity Center for Replication administrator console, enter your user name and password and click **Log in**.
2. In the Health Overview page, click **Host Systems**.
3. In the Host Systems page, click **Add Host Connection**.
4. In the Add Host Connection dialog, enter the host connection information and click **Add Host**. The local host connection is displayed as connected in the list.

Chapter 5. Uninstalling on z/OS operating system

A job file can be used to uninstall IBM Tivoli Storage Productivity Center for Replication for System z on IBM z/OS operating system.

Some of the information in the following steps is generic and must be made specific for your particular installation.

1. Use a job file as shown in the following example to remove Tivoli Storage Productivity Center for Replication function modification identifiers (FMID), Hierarchical File System (HFS) files, and data sets. If you have multiple z/OS systems attached to the same driver, you must detach all systems other than the system on which you are uninstalling Tivoli Storage Productivity Center for Replication.

```
//REMTPCRM JOB , 'SMP DELETE', REGION=0M, MSGCLASS=H, MSGLEVEL=(1,1),
// NOTIFY=&SYSUID
//*-----
/** The purpose of this job is to DELETE TPCR product and
/** its associated datasets.
/** Fill in volser, CSI and HFS dataset names
/**-----
//SMPE EXEC PGM=GIMSMP, REGION=0M SMP/E EXEC STATEMENT
//SMPLD DD DUMMY
//SMPOUT DD SYSOUT=*
//SMRPT DD SYSOUT=*
//SMPLIST DD SYSOUT=*
//SYSPRINT DD SYSOUT=*
//SMPSNAP DD DUMMY
//SMPHOLD DD DUMMY
/**SMPTLIB DD UNIT=3390, VOL=SER=volser, DISP=SHR
//SMPTLIB DD UNIT=3390, VOL=SER=VOL, DISP=SHR
//SMPCSI DD DSN=HLQ.SMPE.CSI, DISP=OLD your csi dataset name
//SYSUT1 DD UNIT=SYSDA, SPACE=(CYL,(200,50)), DISP=(,DELETE)
//SYSUT2 DD UNIT=SYSDA, SPACE=(CYL,(33,1)), DISP=(,DELETE)
//SYSUT3 DD UNIT=SYSDA, SPACE=(CYL,(33,1)), DISP=(,DELETE)
//SYSUT4 DD UNIT=SYSDA, SPACE=(CYL,(33,1)), DISP=(,DELETE)
//SMPWRK1 DD UNIT=SYSDA, SPACE=(CYL,(25,25,200)),
// DISP=(,DELETE), DCB=BLKSIZE=6160
//SMPWRK2 DD UNIT=SYSDA, SPACE=(CYL,(25,25,200)),
// DISP=(,DELETE), DCB=BLKSIZE=6160
//SMPWRK3 DD UNIT=SYSDA, SPACE=(CYL,(90,45,2000)),
// DISP=(,DELETE), DCB=BLKSIZE=3200
//SMPWRK4 DD UNIT=SYSDA, SPACE=(CYL,(25,25,500)),
// DISP=(,DELETE), DCB=BLKSIZE=3200
//SMPWRK6 DD UNIT=SYSDA, SPACE=(CYL,(200,75,2000)),
// DISP=(,DELETE), DCB=BLKSIZE=6160
//SMPPTFIN DD *
++FUNCTION(DELPROD) .
++VER(Z038)
DELETE(HIWN52B,JIWN52Y) .
/*
//SMPCNTL DD *
SET BDY(GLOBAL) .
RECEIVE LIST SYSMODS .
SET BDY(RMTZN) .
APPLY S(DELPROD) BYPASS(ID) C(ALL) .
SET BDY(RMDZN) .
ACCEPT S(DELPROD) C(ALL) .
SET BDY(RMTZN) .
UCLIN .
DEL SYSMOD(DELPROD) .
```

```

ENDUCL .
SET BDY(RMDZN) .
UCLIN .
DEL SYSMOD(DELPROD) .
ENDUCL .
SET BDY(GLOBAL) .
REJECT DELETEFMID(HIWN52B) NOFMID .
REJECT DELETEFMID(JIWN52Y) NOFMID .
LIST ALLZONES FORFMID(HIWN52B) .
LIST ALLZONES FORFMID(JIWN52Y) .
/*
/**
/**----- This step will unmount HFS datasets associated with TPCR
/**
//UNMOUNT EXEC PGM=IKJEFT01
//SYSTSPRT DD SYSOUT=*
//SYSTSIN DD *
    PROFILE WTPMSG MSGID
    TIME
    UNMOUNT FILESYSTEM('<TPCRM_InstallRoot>') IMMEDIATE
    UNMOUNT FILESYSTEM('<TPCRM_ProductionRoot>') IMMEDIATE
/*
//DELETE EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
    DELETE TPCRM.AIWNHFS.SYSD
    DELETE TPCRM.AIWNHFSX.SYSD
    DELETE TPCRM.ASAMPLIB.SYSD
    DELETE TPCRM.SAMPLIB.SYSD
    DELETE <TPCRM_InstallRoot>
    DELETE <TPCRM_ProductionRoot>
/*
/* DELETE ALL SMPE DATASETS */
/*
DELETE HLQ.SMPE.CSI CLUSTER
DELETE HLQ.SMPE.GLOBAL.SMPLOG
DELETE HLQ.SMPE.GLOBAL.SMPLOGA
DELETE HLQ.SMPE.RMDZN.SMPLOG
DELETE HLQ.SMPE.RMDZN.SMPLOGA
DELETE HLQ.SMPE.RMTZN.SMPLOG
DELETE HLQ.SMPE.RMTZN.SMPLOGA
DELETE HLQ.SMPE.SMPLTS
DELETE HLQ.SMPE.SMPMTS
DELETE HLQ.SMPE.SMPPTS
DELETE HLQ.SMPE.SMPSTS
DELETE HLQ.SMPE.SMPSCDS//

```

2. Ensure that WebSphere Application Server for z/OS Liberty Profile is in the stop state. For instructions for stopping WebSphere Application Server for z/OS Liberty Profile, see “Configuring the IWNSRV job” on page 17.

Chapter 6. Upgrading and migrating

Use this information to upgrade from a previous release to the latest release of IBM Tivoli Storage Productivity Center for Replication Basic Edition for System z , upgrade to the latest release of IBM Tivoli Storage Productivity Center for Replication for System z, migrate your existing DB2 database to an embedded database and migrate to Metro Mirror with HyperSwap session.

Upgrading from a previous version of Tivoli Storage Productivity Center for Replication for System z

You can upgrade Tivoli Storage Productivity Center for Replication for System z from a previous version to Version 5.2 or later.

During the upgrade, the Tivoli Storage Productivity Center for Replication for System z management server is not available. Therefore, the capability for disaster recovery during the migration process is not available unless you have a high-availability environment established. A high-availability environment includes an active and standby management server.

If you want to maintain disaster recovery capability, you must complete the steps to perform a takeover on the standby management server before you upgrade the active management server. The standby management server continues to manage sessions during the upgrade process, which ensures disaster recovery capability and minimizes downtime if the upgrade fails.

If you do not want to maintain disaster recovery capability during the migration process, a standby management server is not required. In general, this migration method is used only if you are using Tivoli Storage Productivity Center for Replication for System z only for monitoring purposes and are not managing sessions. If you use this method, it is more difficult to restore your Tivoli Storage Productivity Center for Replication for System z configuration if the upgrade fails.

To upgrade Tivoli Storage Productivity Center for Replication for System z while maintaining disaster recovery capability, complete all of the following steps. To upgrade without maintaining disaster recovery capability, complete steps 10 on page 30 and 11 on page 30.

1. Install Tivoli Storage Productivity Center for Replication for System z on a temporary server. The version must be the same as the version of Tivoli Storage Productivity Center for Replication for System z on the original server.
2. Add the temporary Tivoli Storage Productivity Center for Replication for System z server as a standby server to the original server. This step copies the configuration from the original server to the standby server.
3. Verify that the synchronization of the standby server is complete and that the Tivoli Storage Productivity Center for Replication for System z sessions are not in a transitory state such as Preparing, Suspending, or Recovering, .
4. Move the management of the Tivoli Storage Productivity Center for Replication for System z to the standby server by issuing the **Takeover** command.
5. On the standby server, remove the original server from the standby relationship.

6. Stop Tivoli Storage Productivity Center for Replication for System z on the original server.
7. Upgrade the original server to Tivoli Storage Productivity Center for Replication for System z to Version 5.2 or later.
8. When the sessions are not in a transitory state, start Tivoli Storage Productivity Center for Replication for System z on the original server.
9. Stop Tivoli Storage Productivity Center for Replication for System z on the standby server.
10. Install Tivoli Storage Productivity Center for Replication for System z. For installation instructions, see the *Program Directory for Tivoli Storage Productivity Center for Replication for System z* or *Program Directory for Tivoli Storage Productivity Center for Replication Basic Edition for System z* at
<ftp://public.dhe.ibm.com/software/tivoli/tpc/v524/>.
11. Complete the post-installation steps for z/OS after you install IBM Tivoli Storage Productivity Center for Replication for System z as described in the topics that are under Chapter 4, "Post-installation tasks for z/OS," on page 13.

Migrating an existing DB2 database

Modify and run the `db2Migration.sh` script to migrate an existing DB2 database to an embedded database for the current version of Tivoli Storage Productivity Center for Replication for System z.

Locate the `db2Migration.sh` script in the `path_prefix/opt/Tivoli/RM/database` directory, open it, and modify the following variables for your environment:

```
#####
# DB2 Variables
databaseName=<dbname>
serverLocation=<serverLocation>
dbuser=<dbuser>
password=<password>
port=<port>
driverType=<2|4>

# Path to db2 jars
db2jccPath=<db2_path>/db2jcc.jar
db2jccLic=<db2_path>/db2jcc_license_cisuz.jar

# TPCR Variables
tpcruser=<tpcruser>
tpcgrp=<tpcgrp>
TPCR_ProductionRoot=<TPCR_ProductionRoot>
#####
```

where:

databaseName

The name of the DB2 database from the previous release of Tivoli Storage Productivity Center for Replication for System z.

serverLocation

The location of the DB2 server from the previous release of Tivoli Storage Productivity Center for Replication for System z.

dbuser The user who was granted authorization to the DB2 database.

password

The password of the user who was granted authorization to the DB2 database.

port The port that was used for the connection to the DB2 database.

driverType

The driver type that was used as part of the DB2 installation; you select 2 or 4.

db2jccPath

The DB2 jar file that contains the needed libraries for the database migration.

db2jccLic

The DB2 jar file that contains the DB2 product license.

tpcruser

The user of Tivoli Storage Productivity Center for Replication.

tpcgrp

The group that the Tivoli Storage Productivity Center for Replication user belongs to.

TPCR_ProductionRoot

The location in which Tivoli Storage Productivity Center for Replication stores the database and command-line interface. Data that requires read and write access must be in this path.

In a previous version of Tivoli Storage Productivity Center for Replication for System *z*, the DB2 variables of the `db2Migration.sh` script were used to setup your DB2 database. To locate the DB2 variables needed for the automation to the embedded database, run the `-<db2 subsystem id> DISPLAY DDF` command, from the *z/OS* console.

The directory path that you set on your system for the DB2 jar files must be the same path that was used for the DB2 database creation.

The Tivoli Storage Productivity Center for Replication server variables must be the same variables that you used to run the IWNINSTL installation job in the HLQ.ASAMPLIB library.

To migrate the DB2 database to the embedded database, use these steps:

1. Install Tivoli Storage Productivity Center for Replication for System *z*. For more information on installing, see Chapter 3, "Installing," on page 11.
2. After you run the IWNINSTL job, but before you start the Tivoli Storage Productivity Center for Replication server, run the `db2Migration.sh` script. If the `db2Migration.sh` script completes successfully, a `csmdb` folder is created in `path_prefix/opt/Tivoli/RM/database` directory.
3. To start the Tivoli Storage Productivity Center for Replication server, issue the **Start IWNSRV** command from the *z/OS* console. The Tivoli Storage Productivity Center for Replication server uses the newly created migrated database. If the migrated `csmdb` database directory is not created, then a new embedded database is created.

The migration from a DB2 database to an embedded database is complete and Tivoli Storage Productivity Center for Replication is ready to run.

Updating customized properties files

When you upgrade to a new version or release of Tivoli Storage Productivity Center for Replication for System z, any changes that you have made to Tivoli Storage Productivity Center for Replication for System z properties files, for example, `csmConnections.properties`, `repli.properties`, or `rmserver.properties` are overwritten.

Follow these steps to use customized properties files:

1. Make copies of the properties files before you do any upgrade procedures.
2. After the upgrade is complete, update the new property files to include the custom properties from your saved files.
3. Do not replace the new property files with your old files because the new files might have been updated for the new version or release of Tivoli Storage Productivity Center for Replication for System z.

Chapter 7. Starting the Tivoli Storage Productivity Center for Replication for System z GUI

You can start the Tivoli Storage Productivity Center for Replication for System z graphical user interface (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 IBM Spectrum Control, see IBM Spectrum Control interoperability matrix. In the **Agents, Servers and Browser** column, click the version of IBM Spectrum Control that is installed on your system. On the next page, click **Web Browsers** to find the web browsers that you can use.

To start the Tivoli Storage Productivity Center for Replication for System z GUI, use these steps:

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

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

In the preceding address field, specify these values:

hostname

The 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.

port

The port number for Tivoli Storage Productivity Center for Replication for System z. You can find the port number in the `bootstrap.properties` file in the `path_prefix/opt/Tivoli/RM/wlp/usr/servers/replicationServer/` directory on the Tivoli Storage Productivity Center for Replication for System z server.

2. From the Tivoli Storage Productivity Center for Replication for System z logon page, enter your user ID and password, and click the **Log in** arrow. The Tivoli Storage Productivity Center for Replication for System z GUI opens in the browser.

If you are logging on for the first time after installation: Ensure that you use the user ID that was specified in the IWNRACTF job and the password for that user.

Setting the browser refresh rate

The browser refresh rate in the IBM Tivoli Storage Productivity Center for Replication graphical user interface (GUI) can be adjusted to accommodate certain software. For example, software designed for the visually impaired. The refresh rate can be extended so the browser does not refresh while the software is processing.

The default browser refresh rate is 30 seconds.

Complete these steps to set the browser refresh rate:

1. In the navigation tree of the IBM Tivoli Storage Productivity Center for Replication GUI, select **Advanced Tools**.
2. Enter the auto-refresh rate in seconds, and click **Apply**.

Appendix. 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.

Accessibility features

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
- A Knowledge Center that includes the following accessibility features:
 - The Knowledge Center is provided in XHTML 1.0 format, which is viewable in most web browsers. With XHTML, you can view documentation according to the display preferences that are set in your browser. XHTML supports screen readers and other assistive technologies.
 - All documentation for Tivoli Storage Productivity Center for Replication is available in Adobe Portable Document Format (PDF) by using the Adobe Acrobat Reader. To access the PDFs, go to <ftp://public.dhe.ibm.com/software/tivoli/tpc/>.
 - All images in the Knowledge Center are provided with alternative text so that visually impaired users can understand the contents of the images.

Keyboard navigation

Use the following key combinations to navigate the interface by keyboard:

- To go directly to the topic pane, press Alt+K, and then press Tab.
- In the topic pane, to go to the next link, press Tab.
- To go directly to the Search Results view, press Alt+R, and then press the Enter or Up-Arrow key to enter the view.
- To go directly to the Navigation (Table of Contents) view, press Alt+C, and then press the Enter or Up-Arrow key to enter the view.
- To expand and collapse a node in the navigation tree, press the Right and Left-Arrow keys.
- To move to the next topic node, press the Down-Arrow or Tab key.
- To move to the previous topic node, press the Up-Arrow key or Shift+Tab.
- To go to the next link, button, or topic node from inside on of the views, press Tab.
- To scroll all the way up or down in a pane, press Home or End.
- To go back, press Alt+Left Arrow; to go forward, press Alt+Right Arrow.
- To go to the next pane, press F6.
- To move to the previous pane, press Shift+F6.
- To print the active pane, press Ctrl+P.

Related accessibility information

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 TotalStorage Enterprise Storage Server Model 800, System Storage DS6000, or System Storage 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 Windows Internet Explorer. Use the command-line interface instead of the GUI with JAWS on Windows Internet Explorer.

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.

IBM and accessibility

For more information about IBM's commitment to accessibility, see the IBM Human Ability and Accessibility Center website at  <http://www.ibm.com/able>.

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