IBM Copy Services Manager z/OS FlashCopy Manager
Version 6 Release 2

User's Guide

SC27-8032-05

Note:
Before using this information and the product it supports, read the information in "Notices" on page 49.

This edition applies to version 6, release 2, modification 5 of IBM Copy Services Manager z/OS FlashCopy Manager, and to all subsequent releases and modifications until otherwise indicated in new editions.

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About this guide

This guide is intended for the system programmer or storage administrator of the IBM Copy Services Manager z/OS FlashCopy® Manager utility.

This guide contains several types of information.

- Preliminary information is required to customize z/OS FlashCopy Manager for use in a customer setting. This material includes a set of initial testing steps that are designed to ensure that the customization process is complete. This material is not needed by the general user and is in "Customization and initial testing" on page 34.
- Information for the general user:
  - Overview of z/OS FlashCopy Manager.
  - Planning information that you must understand before you use z/OS FlashCopy Manager.
  - Description of the flow of operations through the z/OS FlashCopy Manager panels.
  - Tasks that are related to using z/OS FlashCopy Manager to create a new FlashCopy configuration and build batch jobs to manage the configuration.
  - Descriptions of the operation of each of the z/OS FlashCopy Manager panels.
  - Advanced topics, such as how to handle target devices that are not defined to the system that is running z/OS FlashCopy Manager.

Who should read this guide

This guide is intended for storage administrators that manage FlashCopy operations in a z/OS® environment.

Administrators should be familiar with the following topics:

- Basic FlashCopy concepts.
- TSO/E, Interactive System Productivity Facility (ISPF and PDF), and System Display and Search Facility (SDSF)
- General understanding of job control language (JCL), including batch job constructs, JOB statements, and installation-specific batch-job submission requirements

Publications and related information

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

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

Online documentation

The IBM Copy Services Manager online product documentation (http://www-01.ibm.com/support/knowledgecenter/SSESK4) contains all of the information that is required to install, configure, and manage IBM Copy Services

Manager. The online documentation is updated between product releases to provide the most current documentation.

Publications

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

Table 1. IBM Copy Services Manager product publications

Title	Description	Order number
IBM Copy Services Manager Installation and Configuration Guide	This guide provides task-oriented information for anyone who installs and configures IBM Copy Services Manager.	V6.2.5 **SC27-8543-09** V6.2.3 **SC27-8543-08** V6.2.2 **SC27-8543-07** V6.2.1 **SC27-8543-06** V6.2.0 **SC27-8543-05** V6.1.5 **SC27-8543-04** V6.1.4 **SC27-8543-03** V6.1.3 **SC27-8543-02** V6.1.2 **SC27-8543-01** V6.1.0 **SC27-8543-00**
IBM Copy Services Manager User's Guide	This guide provides task-oriented information for users of IBM Copy Services Manager. Users should be familiar with the following topics • Copy Services concepts • General principles of IBM AIX®, Linux, Windows, and the IBM z/OS operating systems • Simple Network Management Protocol (SNMP) concepts • Storage Area Network (SAN) concepts	V6.2.5 **SC27-8542-11** V6.2.4 **SC27-8542-10** V6.2.3 **SC27-8542-09** V6.2.2 **SC27-8542-08** V6.2.1 **SC27-8542-07** V6.2.0 **SC27-8542-06** V6.1.5 **SC27-8542-05** V6.1.4 **SC27-8542-04** V6.1.3 **SC27-8542-03** V6.1.2 **SC27-8542-02** V6.1.1 **SC27-8542-01** V6.1.0 **SC27-8542-00**
IBM Copy Services Manager Command-line Interface User's Guide	This guide provides information for customizing and using the command-line interface for IBM Copy Services Manager. This guide provides information for customizing and using the command-line interface for IBM Copy Services Manager.	V6.2.5 **SC27-8998-06** V6.2.4 **SC27-8998-05** V6.2.3 **SC27-8998-04** V6.2.2 **SC27-8998-03** V6.2.1 **SC27-8998-02** V6.2.0 **SC27-8998-01** V6.1.5 **SC27-8998-00**
IBM Copy Services Manager z/OS FlashCopy Manager User's Guide	This guide provides task-oriented information for those who administer FlashCopy operations in a z/OS environment.	V6.2.5 **SC27-8032-05** V6.2.3 **SC27-8032-04** V6.2.2 **SC27-8032-03** V6.2.0 **SC27-8032-02** V6.1.5 **SC27-8032-01** V6.1.3 **SC27-8032-00**
IBM Copy Services Manager Release Notes	This document contains the release notes in support of IBM Copy Services Manager.	Search on IBM Copy Services Manager at IBM Fix Central (www.ibm.com/support/fixcentral) to locate and download the Release Notes® related to your product version.

Table 1. IBM Copy Services Manager product publications (continued)

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

Related websites

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

Table 2. IBM Copy Services Manager related websites

Title	Description
IBM website (ibm.com®)	Find more information about IBM products and services.
IBM Support Portal website(www.ibm.com/support/home)	Find support-related information such as downloads, documentation, troubleshooting, and service requests and PMRs.

Table 2. IBM Copy Services Manager related websites (continued)

Title	Description
Copy Services Manager Support Portal (https://www.ibm.com/support/home/product/10000480/IBM_Copy_Services_Manager)	Find technical support information that is specific to IBM Copy Services Manager.
IBM Directory of Worldwide Contacts website(www.ibm.com/planetwide)	Find contact information for general inquiries, technical support, and hardware and software support by country.
IBM Redbooks® website(www.redbooks.ibm.com/)	Find technical information developed and published by IBM International Technical Support Organization (ITSO).
IBM System Storage® Interoperation Center (SSIC) website (www.ibm.com/systems/support/storage/config/ssic)	Find information about supported host system models, operating systems, adapters, and switches.
IBM Fix Central (www.ibm.com/support/fixcentral)	Find fixes and updates for your system's software, hardware, and operating system.

Sending comments

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

Procedure

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

Send your comments by email to starpubs@us.ibm.com. Be sure to include the following information:

- Exact publication title and version
- Publication form number (for example, GA32-1234-00)
- Page, table, or illustration numbers that you are commenting on
- A detailed description of any information that should be changed

Contacting IBM Software Support

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

- Go to the Copy Services Manager technical support website at Copy Services Manager Support Portal (https://www.ibm.com/support/home/product/10000480/IBM_Copy_Services_Manager).

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

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

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

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

Reporting a problem

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

Have the following information ready when you report a problem:

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

Summary of changes

The following items were updated in Version 6.2.5:

Version 6, Release 2, Modification 5

This table provides the current updates to the *IBM Copy Services Manager z/OS FlashCopy Manager User's Guide* as of March 2019.

Table 3. Summary of changes in Version 6.2.5 (March 2019)

Item	Description
Various additions and corrections to documentation	Found throughout the guide. See left margin vertical revision indicators for specific text changes.

Chapter 1. Product overview

The z/OS FlashCopy Manager is an ISPF/PDS application dialog that helps simplify the FlashCopy Level 2 capabilities of an IBM DS8000 storage system.

FlashCopy technology can be used to address a range of business objectives. For example:

- Creating a copy of production data for subsequent transfer from disk to tape for disaster recovery.
- Creating a point-in-time restore point to minimize the impact of a software error that has corrupted a production database.

The only difference between the two business applications in the example is the user's definition of the FlashCopy source volumes that are to be used, and the timing and sequence of job executions that are created by z/OS FlashCopy Manager.

The z/OS FlashCopy Manager provides two related sets of functions:

1. FlashCopy Configuration Definition

   This set of functions creates the FlashCopy source-target relationships by using customer-defined criteria. Selection of FlashCopy source and target volumes can be done by using system-managed storage (SMS) groups, device volume serial numbers (VOLSERs), device number ranges, or a combination. After you define the source and target selection criteria, the z/OS FlashCopy Manager builds the source and target relationship configuration data sets that define the configuration.
2. FlashCopy Batch Job Creation

   This set of functions creates jobs to control the state of the defined FlashCopy configuration, as defined by the configuration data sets.

You do not need to understand the detailed operation of FlashCopy Level 2 functions to use z/OS FlashCopy Manager to configure and manage the storage environment. However, you do need to understand how to define FlashCopy source and target volumes by using the z/OS FlashCopy Manager ISPF panels.

All FlashCopy management functions are run by using batch jobs. The batch approach enables you to submit individual FlashCopy jobs or to construct a complex job stream. The job stream includes non-FlashCopy software, which controls the entire batch-job stream execution by using standard job scheduling facilities to achieve a required set of business objectives. Jobs that are created by z/OS FlashCopy Manager are a key part of the total job stream. In a disk-to-tape process, the z/OS FlashCopy Manager jobs control the FlashCopy part of the process and standard disk-to-tape software products complete the disk-to-tape part of the process. The control data sets created by z/OS FlashCopy Manager help make it easy to dynamically create control commands for disk-to-tape or other processes.

The z/OS FlashCopy Manager supports FlashCopy environments across multiple storage systems. For example, pairs 1 through n are in one storage subsystem 1, pairs n+1 through k are in storage subsystem 2. The FlashCopy source and target devices in any relationship must be in the same storage subsystem. FlashCopy data consistency is provided across multiple storage subsystems.

The z/OS FlashCopy Manager is designed to help simplify the work that is needed to use full volume FlashCopy capabilities available with the DS8000 series storage systems. The z/OS FlashCopy Manager incorporates an ISPF application that you can use to:

- Define a FlashCopy environment.
- Build batch jobs that are needed to manage a FlashCopy environment.

Batch jobs that are created by z/OS FlashCopy Manager can be submitted manually or incorporated into sophisticated job streams that implement a more complex business operation. For example, a FlashCopy job can be used at the start of a process that is designed to create copies of production volumes that are ultimately transferred to tape for disaster recovery.

You can use FlashCopy technology to configure FlashCopy environments and run jobs that manipulate the state of storage devices in a FlashCopy environment by using a high-level set of user interfaces.

Prerequisites

All of the prerequisites are based on the z/OS FlashCopy Manager feature technology because FlashCopy is the underlying driving technology.

FlashCopy support consists of the following hardware and software requirements.

Hardware requirements

1. Both the source and target devices of a FlashCopy pair must be contained within the same storage subsystem. The FlashCopy Level 2 feature must be installed and enabled.
2. If storage group selection is used, then the FlashCopy source volumes must be online to the LPAR on which z/OS FlashCopy Manager is running when the source devices are defined.
3. DS8000 FlashCopy Type 2 Change Recording must be installed on all of the storage systems.
4. The underlying DS8000 must also be enabled with a FlashCopy that is licensed for the Terabytes that are planned to be managed (for example, see the DSCLI **lslicense** command).

```
Activation Key             Authorization Level        (TB)        Scope
=============================================================================================
IBM FlashCopy              SE                         300.2       All
If FlashCopy onto remote pair is to be used the following license must also be activated:
Remote Mirror for z/OS     (RMZ)                      300.2       CKD
```

Software requirements

1. For minimum supported versions of z/OS, see https://www-01.ibm.com/support/docview.wss?uid=swg21260494.
2. If you do not have a license for the execution or runtime library for IBM SAA REXX/370, you must install the Alternate Library. The installation of the Alternate Library is documented in the Program Directory for IBM SAA REXX/370 Alternate Library, GI11-9910, function modification identifiers (FMIDs) HWJ9133 and JWJ9134.

Configuring a FlashCopy environment

You can work with two different FlashCopy configurations in z/OS FlashCopy Manager.

The first configuration is referred to as *new*, and the second is *current*. Jobs in the new configuration are meant for testing and changing to a new configuration when compared to the current configuration. The current configuration is meant to be the configuration that is currently being used in production.

The following tasks are required when you define a FlashCopy configuration with ISPF:

1. Create the configuration data sets.
2. Create the master device configuration data sets.
3. Define FlashCopy source-selection criteria and source-device selection.
4. Define FlashCopy target-selection criteria and target-device selection.
5. Create FlashCopy source-target relationships.
6. Create the new FlashCopy jobs.

The new configuration jobs are created to test a new configuration. There are also jobs to add or delete any persistent FlashCopy relationships when you compare the current configuration to the new configuration. After testing is completed, the switch job, called D@SWITCH, performs any necessary changes to make the new configuration the current configuration and create the current jobs. The D@SWITCH job is located in the `hlq.FCMGR.groupqual.NEW.JOBS` data set.

After data sets are allocated by using the ISPF panels, a single batch job is run to obtain detailed device-characteristic data. This data is obtained from all disk drives that are attached to the system on which the job runs. This job eliminates the need for you to provide detailed device-configuration data, which is required by some of the APIs that can be used with FlashCopy. In addition, this job obtains both device hardware data and data about the volume table of contents (VTOC) on each of the volumes.

As stated previously, the FlashCopy function is run by using batch jobs. Therefore, using ISPF panels along with ISPF file customization enables you to define and investigate a series of FlashCopy configurations. And you can obtain this information without running any FlashCopy operations on the hardware.

Managing a FlashCopy environment

You can divide the jobs that control the FlashCopy configuration into groups to help manage your environment.

Data sets that are associated with the *new* FlashCopy configuration have the character string *NEW* as a qualifier (node) in their data set names. For example, all jobs that operate on the new configuration are in a partitioned data set with a name of `hlq.FCMGR.groupqual.NEW.JOBS`.

Data sets that are associated with the *current* FlashCopy configuration have the character string *CURRENT* as a qualifier (node) in their data set names. For example, all jobs that work with the current configuration are in a partitioned data set named `hlq.FCMGR.groupqual.CURRENT.JOBS`.

Known limitations

There are some known limitations for the z/OS FlashCopy Manager technology.

- The product can only support up to 20,480 FlashCopy relationships, or 10,240 remote PPRC relationships in a single consistency group.

Planning for z/OS FlashCopy Manager

This section provides general guidance when you plan for z/OS FlashCopy Manager.

FlashCopy operations

The z/OS FlashCopy Manager operations are designed around two concepts: the FlashCopy configurations, and the batch jobs that are used to manage the configurations.

The following information describes the two concepts that are used to manage operations:

1. Two FlashCopy configurations:
   - The *CURRENT* configuration
     - The current configuration is the operational FlashCopy environment. Initially, this configuration does not contain FlashCopy pairs.
   - The *NEW* configuration
     - The new configuration is the next version of the current configuration.
2. The product configures batch jobs that are located in the `hlq.FCMGR.groupqual.NEW.JOBS` data set. These jobs are used to test out the "NEW" configuration and provide functions to manipulate FlashCopy and offer several other operations outlined in “Jobs for a new configuration” on page 15. After the configuration has been tested, you can make the transition from the NEW configuration to the CURRENT configuration. The CURRENT configuration is your production environment. Any changes can then be tested out in the NEW configuration and promoted to CURRENT when you are satisfied with the outcome of the test.

FlashCopy data consistency

The z/OS FlashCopy Manager is targeted for applications that need to make a time-consistent copy of a collection of full volumes of data.

The z/OS FlashCopy Manager does not support data-set-level FlashCopy. Instead, it provides full volume FlashCopy support only.

FlashCopy Level 2 provides a set of functions that allow the z/OS FlashCopy Manager to develop a time-consistent copy of data across multiple FlashCopy source devices that are contained in one or more IBM storage subsystems.

The data consistency process operates as follows:

1. An I/O operation is initiated with each FlashCopy source device. The results of the I/O operation are as follows:
   a. It *freezes* the contents of the source device and the IBM storage subsystem, which places the source device in a *long busy* state. The *long busy* state suspends any write I/O to the device. The I/O requests are held by the operating system.
   b. A relationship is established between the source and target devices.
2. When all of the initial I/O *freeze* requests are completed, the z/OS FlashCopy Manager issues *run* I/O requests to logical subsystems (LSSs) that have devices in the FlashCopy environment. This action removes the *long busy* state and triggers a notification to the system that the devices are ready to resume normal operation. The operating system then redirects any held I/O operations.

Note: The freeze job is only created after the switch is run and the "Current" config data sets have been created

The *long busy* state ensures that all of the FlashCopy volumes have a transaction-consistent set of data in any volumes in the FlashCopy environment.

The FlashCopy targets have the same logical data on them that resided on the source volumes at the time that the FlashCopy was established.

FlashCopy use of persistent mode of operation

A FlashCopy target can only be the target of a single relationship. To ensure that all of the targets in an environment are available for a consistent FlashCopy application, a user selects the *persistent* mode of FlashCopy operation in z/OS FlashCopy Manager.

In the persistent mode, when a FlashCopy relationship is established, it remains established until it is withdrawn. With some other modes of FlashCopy operation, the relationship is terminated based on completion of a background copy task. This situation allows some non-related FlashCopy or PPRC relationship to be established to the target, which prevents its use when needed by the FlashCopy application. For example, if one device out of 500 is not available when required, the entire FlashCopy application must be restarted. This situation becomes a significant management problem. Using the persistent relationship capability ensures that the devices are available when needed. The **persistent** mode must also be specified when used with incremental FlashCopy.

Online versus offline FlashCopy targets

You can control the offline and online status of FlashCopy targets to manage exceptions on a job-by-job basis.

The z/OS FlashCopy Manager enables the user to control the offline and online requirement at two levels. Offline target volume status is the preferred status. You can set the target volumes to be offline at the time of a FlashCopy establish process. In some environments, the FlashCopy targets must be online to one or more systems at establish time.

The jobs that establish the FlashCopy relationships contain a parameter on the EXEC statement that controls the ability to allow targets to be online at establish time for that single JOB.

- The **TON** parameter allows FlashCopy target volumes to be ONLINE at establish time.
- The **TOFF** parameter prevents any FlashCopy establishes that are attempted to target volumes that are online to any system (that is, those that have established a path group).

  Note: The **TOFF** parameter is the default setting. This default setting can be changed by changing the value for **FCMGONOF** in the copy of **CSMFCM** that you created when the z/OS FlashCopy Manager was initially customized.

If you allow FlashCopy targets to be online when the FlashCopy establishes are done, then you must provide some external mechanism to ensure that the FlashCopy target is not in use by an application program when the FlashCopy relationship is established. If it is in use, the data on the target is overwritten by data from the FlashCopy source, which could lead to unexpected results.

FlashCopy data consistency and incremental FlashCopy

For a set of data that resides on volumes that consistently have FlashCopy operations performed on them by using the freeze method, every establish operation must be done by using the freeze method. These operations include the first FlashCopy to establish the base, and each subsequent increment. The job that coordinates this action is in the *CURRENT.JOBS* partitioned data set in a member named *B$FREEZE*.

The storage system returns a B6 code when you specify `incremental` for the first time that a device is established, because there is no existing relationship on which to base the increment. The B$FREEZE job performs the first establish operation with consistency by retrying it with the proper parameters set. This retry adds time to the duration of the freeze. Subsequent increments do not have to be retried. Look for message IWNAF019I for a count of the number of devices that were retried.

If you are going to use the **`Establish`** operation in the NEW.JOBS to do the initial establish, all applications that are writing to the volumes that are added into the consistency group must be quiesced to ensure data consistency. It is recommended that you withdraw relationships that are established by using the NEW.JOBS before you submit the *C$SWITCH* job.

FlashCopy configuration planning

You can use z/OS FlashCopy Manager to group devices into a pool of devices. After devices are grouped into a pool, FlashCopy relationships exist between the devices in a source pool and devices in a target pool that have the same *Group Identifier (GID)*. A device that is not a member of a defined pool is a member of the default pool.

Pools are defined by a **`GID(...)`** parameter suffix on the source or target specification statements. If a selection specification does not contain a **`GID(...)`** suffix, devices that are selected by this statement are placed in the default pool.

The z/OS FlashCopy Manager is designed to support distinctly different and unique FlashCopy environments as follows:

- FlashCopy targets that are offline to z/OS environments
- FlashCopy targets that are all online to z/OS environments.

Offline target environments

You can create offline target environments.

In offline target environments, a FlashCopy source volume is paired with a FlashCopy target device. The paired devices have the same cylinder capacity, and are on the same IBM storage subsystem. Source and target definition statements are preserved across ISPF sessions. Therefore, you can easily add or delete devices from either list.

Online target environments

When the FlashCopy target volumes are online to one or more z/OS environments, there are additional pairing constraints.

In online target environments, the VTOC location on the source and target must match. The VTOC index location and size must also match. The configuration logic generates the appropriate source and target pairing when possible. If the configuration logic fails to find a device in the target pool with the required characteristics, it creates an error record. This error record identifies what must be added to the target pool to create a valid configuration.

Specifying source and target devices

You can use four specifications to identify devices. The specifications can be used individually, in combination, and in any order.

IMPORTISMFL(dsninp)
An ISMF STORAGEGROUP report is used as input that is contained in a non-qualified (that is, with no quotation marks) data set as described by the **dsninp** parameter. In this case, the user controls devices that are to be included and defined by using the standard ISMF STORAGEGROUP report options. These options allow the user to select devices that are offline to the systems that are running z/OS FlashCopy Manager.

STORAGEGROUP(x)
Causes z/OS FlashCopy Manager to do a dynamic call to DCOLLECT and process the output. Devices must be online to the system that is running z/OS FlashCopy Manager at the time that the DCOLLECT runs.

devn,n
Specifies devices by the first device number and the number of consecutive devices.

Volumes in alternate subchannel sets can be included by specifying the five-digit device number followed by the number of devices to be processed. This method is consistent with the existing alternate subchannel set design for how devices are specified in an alternate subchannel by using device numbers. The active subchannel set can be specified by using a four-digit device number (for example, `xxxx`). To specify subchannel set 0, 1, or 2, you include the fifth high-order byte. For example, you would indicate `0xxxx` for subchannel set 0, `1xxxx` for subchannel set 1, or `2xxxx` for subchannel set 2.

devnfrom-devnto
Specifies the consecutive range of the device number of the first device and the device number of the last device.

Volumes in alternate subchannel sets can be included by specifying the five-digit device number followed by the number of devices to be processed. This method is consistent with the existing alternate subchannel set design for how devices are specified in an alternate subchannel by using device numbers. The active subchannel set can be specified by using a four-digit device number (for example, `xxxx`). To specify subchannel set 0, 1, or 2, you include the fifth high-order byte. For example, you would indicate `0xxxx` for subchannel set 0, `1xxxx` for subchannel set 1, or `2xxxx` for subchannel set 2.

volser*
Devices are selected by the volume label (serial number) on the volume at the time the setup job is executed. The volume label can have a wildcard at the end of the specification. For example, XI* selects all devices that have a volume label that begins with the character string XI.

Specification notes:

If you want to select a single device that uses the device number selection specification, you must specify it as `xxxx,1` or `xxxx-xxxx`. If the selection statement does not match the **IMPORTISMFL**or **STORAGEGROUP** criteria, and does not have a comma (,) or hyphen (-) in the specification, then the specification operates as a volume label selection.

For example, assume that a user wanted to create a configuration in which source devices in storage groups `ABC` and `DEF` are to have a FlashCopy operation that is performed on them to target devices in storage group `XYZ`. And source devices in storage group `MYDATA` are to have a FlashCopy operation that is performed on them to storage group `FCMYDATA`. In addition, assume that the user wanted to perform a FlashCopy on devices 951E-951F to 961E-961F. Given these requirements, the specified selection criteria are:

1. Source specification

   ```
   STORAGEGROUP(ABC,DEF) GID(A6)
   STORAGEGROUP(MYDATA) GID(999)
   951E-951F
   ```

2. Target specification

   ```
   STORAGEGROUP(XYZ) GID(A6)

   STORAGEGROUP(FCMYDATA) GID(999)
   961E-961F
   ```

The value in the **GID** field links the source pools to the target pool. There is a one-to-one relationship between a source device pool and a target device pool.

The STORAGEGROUP (ABC, DEF) GID (A6) specification can be written as two distinct statements as follows:

```
STORAGEGROUP(ABC) GID(A6)
STORAGEGROUP(DEF) GID(A6)
```

Use a comma to separate storage group names within a single STORAGEGROUP() or STOG() specification. The value in the GID() field can be 1 - 3 characters in length. It is simply a way to define a relationship between devices in a source pool and devices in a target pool.

If STORAGEGROUP() source selection is used without a GID(), the FlashCopy target devices are placed in the default pool and given an ID of $$$.

Because no GID() is specified for 951E-951F and 961E-961F, the source and targets are in the default pool.

Changing the storage hardware configuration

Changes to the storage configuration require changes to the z/OS device numbers and internal logical devices relationship.

If you change the storage configuration within a storage subsystem, you must change the relationship between z/OS device numbers and internal logical devices. Therefore, you must rebuild the FlashCopy configuration and jobs after the change.

To change the storage hardware configuration:

1. Ensure that you withdraw any active FlashCopy relationships.
2. Complete the configuration change.

3. Submit the X@GETDEV job in the `hlq.FCMGR.groupqual.NEW.JOBS` data set to update the configuration.
4. Change the source and target selection based on the new configuration.
5. Test the new configuration with the NEW JOBS.

Working with duplicate volume labels

There are several options to address the situation of having two devices with the same label.

A volume serial number, or VOLSER, is an identification number in a volume label that is assigned when a volume is prepared for use on the system. When you create a FlashCopy relationship, the target volume gets the VOLSER of the source volume, which creates a duplicate volume label.

Note: This duplicate label situation is independent of having a background copy or not.

Having the same VOLSERs can create duplicate volume-label messages during an IPL. This situation typically occurs when you perform an IPL in a test environment by using a common hardware configuration (I/O Generation).

Several techniques are available to address this situation. The choice of technique depends on what needs to be done after the FlashCopy operation is run. The options are as follows:

- Configure the FlashCopy target volumes to be offline.
- Use the **Keep the FlashCopy Target Volume Offline** function.
- Use Device Support Facilities (ICKDSF) jobs that are generated by z/OS FlashCopy Manager to change the labels on the FlashCopy volumes.

Configuring the FlashCopy target volumes to be offline

You must have a static environment to configure target volumes offline.

Any change to the set of target volumes mandates a change to the hardware configuration (I/O Generation) and an IPL.

Using the "Keep the FlashCopy target volumes offline" function

The z/OS FlashCopy Manager provides a **Keep the Target Volume Offline** function that prevents a FlashCopy target volume from being brought online when it is in a FlashCopy relationship.

If a FlashCopy target volume is not required to be brought online after a FlashCopy establish, then all target devices can be generated offline. Also, if the target devices are in a relationship at the time of an IPL, the system does not attempt to complete vary processing or issue duplicate label messages. Any attempts to vary a device online fails with an appropriate error message.

When the FlashCopy relationship is withdrawn, the target retains the VOLSER of the source if background copy is specified. If background copy is specified, or the source volume label is changed, then the target volume needs to be relabeled.

ICKDSF-generated jobs

The z/OS FlashCopy Manager provides an option to specify **relabel** parameters.

Relabel parameters are used by the file tailoring process to generate four ICKDSF jobs to relabel either the FlashCopy source or target volumes.

The following information lists the job names in the **hlq.FCMGR.groupqual.NEW.JOBS** data set.

- S@ICKDSF (relabel FlashCopy source volume)
- T@ICKDSF (relabel FlashCopy target volume)
- U@DMPCLR (Clear Dump Conditioning on FlashCopy target volume)
- U@DMPCND (Dump Condition FlashCopy target volume)

The following information lists the job names in the **CURRENT.JOBS** data set.

- S$ICKDSF (relabel FlashCopy source volume)
- T$ICKDSF (relabel FlashCopy target volume)
- U$DMPCLR (Clear Dump Conditioning on FlashCopy target volume)
- U$DMPCND (Dump Condition FlashCopy target volume)

Volumes to be relabeled must be offline. The ICKDSF jobs that include Dump Conditioning use the `VERIFY` option of the **REFORMAT** command. The `VERIFY` option ensures that the correct volume gets a label change.

If FlashCopy runs with no background copy, then withdraw and run the ICKDSF job to relabel the FlashCopy targets. The commands fail for any targets for which the label was not written when they were in a FlashCopy relationship. If the FlashCopy source volume was relabeled when the FlashCopy relationship was in place, then the original source label is copied to the FlashCopy target volume. The ICKDSF command for that target volume processes correctly. In most situations when no background copy is specified, all of the ICKDSF commands to relabel the target volumes fail.

The ICKDSF jobs are of greatest value when a background copy is specified. In this case, all the source labels are physically copied to the target volumes. If the target volumes are configured online, problems can occur with duplicate labels in a large storage subsystem configuration.

ICKDSF does not support the relabeling of volumes in alternate subchannel sets. To prevent the mislabeling of volumes in the active subchannel set, the REFORMAT line for any volume that was specified with a five-digit device number is commented out to prevent the relabel for that volume. If the volume to be relabeled is in the active subchannel set, remove the forward slashes and asterisk (`//*`) for that volume in the active subchannel set and submit the job.

Chapter 2. Configuration overview for the z/OS FlashCopy Manager environment

This section provides a high-level introduction to the functions, general operation, and logic flow within z/OS FlashCopy Manager, along with the data sets that it uses.

Six steps are required to configure a z/OS FlashCopy Manager environment, and to create the jobs that are used to manage it. These steps are displayed as option 1 - 6 on the primary z/OS FlashCopy Manager panel. The steps are as follows:

1. ALLOCATE - Allocate and deallocate data sets
2. SETUP - Create and submit set up job
3. SEL-SOURCE - Select source devices or volumes
4. SEL-TARGET - Select target devices or volumes
5. CONFIGURE - Configure the source-target environment
6. BUILD-JOBS - Build z/OS FlashCopy Manager jobs

Allocate Data Sets

The **Allocate Data Sets** function is used to create, delete, or rename all of the data sets used by z/OS FlashCopy Manager for a named FlashCopy environment

The environment name is specified by the *Group* qualifier, which is specified on the primary pane. This name is the third-level qualifier for all of the data sets that apply to the named environment.

Create and Submit Setup Job

The **Create and Submit Setup Job** function is used to build the utility job that obtains the required data from all available systems. The job that is created can be submitted from the panel.

Prerequisite: This job is run during step 2 of the product panels. It requires APF authorization of the load modules before submitting. This process is described further in "Customization and initial testing" on page 34.

The job that is created is placed in member X@GETDEV in the `hlq.FCMGR.groupqual.NEW.JOBS` data set. This job must be run in an LPAR that has the access to all potential source and target volumes. The volumes can be online or offline to the LPAR. When you submit from the product panel, you can specify to `Use model Job cards in`, and use one of the data sets that is defined in the PDS `hlq.CSMFCM.IBM.SIWNOPTS`. There are three models described in the section "FC JOB Creation panel" on page 24.

The SETUP job is run to obtain the required data from all of the devices on the system. To start this process, the X@GETDEV job is run. This partitioned data set (PDS) member resides in the z/OS FlashCopy Manager data set `hlq.FCMGR.groupqual.NEW.JOBS`.

The JCL parameter keyword on the X@GETDEV EXEC (EXECUTE) statements allows you to specify the criteria that are used to select devices for the FlashCopy SOURCE/TARGET volume pools.

When the FCMGPPRC is set to "Y" in the IWNOFMGR member of the SIWNOPTS PDS, an additional job, X@GETPPR, is run to scan all of the volumes that are included in the NEW.DEVICE.DATA data set for PPRC relationships. An entry for each volume that is a Primary in a PPRC Primary relationship is created in the NEW.DEVICE.DATA.PPRC data set.

Notes:

- The X@GETPPR job is created in Step 2 of the ISPF dialog. This action can be run any time the configuration changes, or if you want to add the ability to use PPRC inband function. It is harmless to production to run step 2, because this only creates the new X@GETPPR job (if needed). Data collection set to YES updates the master configuration with any changes to the attached UCBs; and if FCMGPPRC=Y, all devices in the master configuration table are scanned for a PPRC relationship, and data is output in the CONFIG.REMOTE files.
- This set up is a requirement for the FlashCopy onto remote targets functionality to be enabled.

The z/OS FlashCopy Manager SETUP step allows you to select devices in the alternate subchannel set. Up to three subchannel sets can be specified. An individual subchannel set can be specified only one time. More subchannel sets can be included on the **UCB** parameter by specifying the starting four or five device numbers followed by the number of devices to be processed.

The active subchannel set can be specified by indicating a four-digit device number (*xxxx*). To request subchannel set 0, 1, and 2, you must specify the fifth high-order byte. For example, 0xxxx, 1xxxx, and 2xxxx.

The first number in the pair specifies the starting device number and the second specifies the number of devices to process. To specify a second and third subchannel set, add the pair of numbers for the subchannel starting device and for how many devices to process.

Explanation of JCL PARM values for X@GETDEV example

The following examples from the PDS member X@GETDEV show the EXECUTE (EXEC) and PARAMETER (PARM) statements. Each **PARM** parameter depicts three pairs of device-selection criteria.

```
//IWNAT03C EXEC PGM=IWNAT03C,
// PARM='UCB=(00f40,10,1b000,4)'

and

//IWNAT02C EXEC PGM=IWNAT03C,
// PARM='UCB=(00f40,10,1b000,4)'
```

The z/OS FlashCopy Manager processes the volumes in subchannel set 0, starting at 0fb0 for 10 devices, and starting at device number b000 in subchannel set 1 for four devices.

It is recommended that you specify the same parameters for both IWNAT03C, which generates the data set`hlq.FCMGR.groupqual.NEW.DEVICE.DATA` and IWNAT02C, which generates the data sets

hlq.FCMGR.groupqual.NEW.DEVICE.DATA.RDC,
hlq.FCMGR.groupqual.NEW.DEVICE.DATA.VTCE and
hlq.FCMGR.groupqual.NEW.DEVICE.DATA.VTOC.

The z/OS FlashCopy Manager allows you to specify up to three parameter pairs on the **(JCL) PARM** parameter of PDS member X@GETDEV. Specifying more than three parameter pairs is flagged as an error.

Invalid subchannels are also be flagged as errors. Currently, valid subchannels are 0, 1, and 2.

The output from the setup job can be viewed in the following data sets:

hlq.FCMGR.groupqual.NEW.DEVICE.DATA.RDC

hlq.FCMGR.groupqual.NEW.DEVICE.DATA.VTCE

hlq.FCMGR.groupqual.NEW.DEVICE.DATA.VTOC

Note: The volumes now are displayed with a five-digit device number where the high-order digit is the subchannel set that contains that device.

Select Source Devices/Volume

You can use the **Select Source Devices/Volume** function to define source volumes for your FlashCopy environment.

You can use one or more of the following statements to define your source volumes:

IMPORTISMFL(*dsnx*)
Selects the devices that are listed in the ISMF STORAGEGROUP volume report that is contained in the data set with the fully qualified name *dsnx*. No quotation marks are used with the data set name.

STORAGEGROUP(a)
Same specification of groups as found when the DCOLLECT program is used. Storage group names must be separated by a comma.

Device Number Range

sxxxx, n
Where *s* is the subchannel set, *xxxx* is a starting device number, and *n* is the number of consecutive devices.

sxxxx-syyyy
Where *s* is the subchannel set, *xxxx* is a starting device number, and *yyyy* is the ending device number of a set of consecutive devices.

Note: You do not need to specify a subchannel set. If nothing is specified, the default of 0 is used.

Vol* Where *vol* is a string of text that identifies a set of devices based on their volume serial numbers.

The follow statements are an example of specifying source volumes. The set of source volumes consists of volumes with serial numbers that start with XI. All of the volumes in storage groups DB2® and IMS are included, plus the two volumes 951E and 951F.

```
000100 XI*
000200 STORAGEGROUP(DB2,IMS)
000300 951E-951F
```

Specification by device number is most often used in initial testing situations and when the **alternate subchannel** set is used.

Specification by volume serial numbers or STORAGEGROUP is used for source selection in production environments.

If the STORAGEGROUP specification is used, z/OS FlashCopy Manager must be running in an LPAR that has the storage group active.

Configuring the source-target environment

You can create a source-target relationship for pairs in a FlashCopy environment.

Three algorithms are available to create a source-target relationship for the pairs in a FlashCopy environment:

V - VTOC
The VTOC Match process is used when the FlashCopy target volumes are online at the time when the establish is done. VTOC Match uses the physical characteristics of the source and target devices, and it also uses VTOC and VTOC index criteria to establish the relationship.

This process requires **FCMGONOF = ON**

1 - First match
The First Match process automatically creates the source-target pairing by sequentially processing the list of source devices and matching them with the lowest device number in the target pool which:

- Is on the same storage device.
- Has the same number of cylinders.
- Has the same group identifier.

M - Manual
The Manual process allows you to fully control the source-target pairing.

Build FC Manager Jobs

Use the **Build FC Manager Jobs** function to build the jobs that are used to manage your FlashCopy environment.

The **Build FC Manager Jobs** function builds jobs that work with both the new and current configuration.

Data sets

The z/OS FlashCopy Manager creates and uses specific data sets for each FlashCopy environment.

The following list details the data sets that z/OS FlashCopy Manager uses. Here *groupqual* is the name of the FlashCopy environment.

```
hlq.FCMGR.groupqual.CURRENT.CGE.TABLE
hlq.FCMGR.groupqual.CURRENT.CONFIG
hlq.FCMGR.groupqual.CURRENT.CONFIG.DATA
hlq.FCMGR.groupqual.CURRENT.CONFIG.REM
hlq.FCMGR.groupqual.CURRENT.CONFIG.REV
hlq.FCMGR.groupqual.CURRENT.CONFIG.STATUS
hlq.FCMGR.groupqual.CURRENT.EXTRN
hlq.FCMGR.groupqual.CURRENT.JOBS
```

```
hlq.FCMGR.groupqual.CURRENT.VERIFY.ERRORS
hlq.FCMGR.groupqual.NEW.CONFIG
hlq.FCMGR.groupqual.NEW.CONFIG.DATA
hlq.FCMGR.groupqual.NEW.CONFIG.ESTABLSH
hlq.FCMGR.groupqual.NEW.CONFIG.MANUAL
hlq.FCMGR.groupqual.NEW.CONFIG.REMOTE
hlq.FCMGR.groupqual.NEW.CONFIG.REVERSE
hlq.FCMGR.groupqual.NEW.CONFIG.STATUS
hlq.FCMGR.groupqual.NEW.CONFIG.WITHDRAW
hlq.FCMGR.groupqual.NEW.CONFIG.WORK
hlq.FCMGR.groupqual.NEW.DEVICE.DATA
hlq.FCMGR.groupqual.NEW.DEVICE.DATA.RDC
hlq.FCMGR.groupqual.NEW.DEVICE.DATA.VTOC
hlq.FCMGR.groupqual.NEW.DEVICE.DATA.VTOCE
hlq.FCMGR.groupqual.NEW.EXTRN
hlq.FCMGR.groupqual.NEW.JOBS
hlq.FCMGR.groupqual.NEW.SOURCE.DEFN
hlq.FCMGR.groupqual.NEW.SOURCE.DEVICES
hlq.FCMGR.groupqual.NEW.TARGET.DEFN
hlq.FCMGR.groupqual.NEW.TARGET.DEVICES
hlq.FCMGR.groupqual.NEW.VERIFY.ERRORS

hlq.FCMGR.groupqual.TEMPC.JOBS
hlq.FCMGR.groupqual.TEMPZ.TABLE
```

Note: The `hlq.FCMGR.groupqual.CURRENT.CONFIG.REM` and `hlq.FCMGR.groupqual.NEW.CONFIG.REMOTE` data sets are optional. They are only created when PPRC is specified by the setting FCMGPPRC = ON.

Specifying the use of PPRC INBAND for managing FlashCopy operations allocates more CONFIG data sets with a low-order qualifier of REMOTE.

```
hlq.FCMGR.groupqual.NEW.CONFIG.REMOTE
hlq.FCMGR.groupqual.NEW.CONFIG.DATA.PPRC
```

Jobs for a new configuration

Jobs that are used to create the NEW FlashCopy configuration reside in the partitioned data set `hlq.FCMGR.groupqual.NEW.JOBS`.

Table 4 lists the members in the partitioned data set directory. Members that are named Q@, S@, X@, and Z@ are placeholders.

Table 4. Jobs to create FlashCopy pairs in the new configuration

Members	Description
@OPTIONS	Options that define the FlashCopy relationship
A@WITHDR	Withdraw CURRENT relationships that are removed from the NEW configuration
B@ESTABL	Establish required new FlashCopy relationships that are not included in the CURRENT configuration
C@VERIFY	Verify the state of active FlashCopy relationships
D@SWITCH	Switch NEW configuration to CURRENT configuration
Q@	*Placeholder*
Q@STATUS	Obtain status of the FlashCopy environment
N@NB2CPY	Start background copy
R@ZESTAB	Establish Remote FlashCopy pairs through inband PPRC commands

Table 4. Jobs to create FlashCopy pairs in the new configuration (continued)

Members	Description
R@ZSTATS	Retrieve status of the remote FlashCopy pairs
R@ZWITHD	Withdraw remote FlashCopy relationships
S@	*Placeholder*
S@ICKDSF	ICKDSF job to relabel FlashCopy source volumes
T@ICKDSF	ICKDSF job to relabel FlashCopy target volumes
U@DMPCLR	ICKDSF job to clear the Dump Conditioning of volumes
U@DMPCND	ICKDSF Dump Condition volumes
X@	*Placeholder*
X@GETDEV	Get device data need to develop FlashCopy configuration
X@GETPPR	Get PPRC information for all volumes in the hlq.FCMGR.groupqual.NEW.DEVICE.DATA data set
X@VARY	Member contains a set of VARY commands that can be used to vary FlashCopy target volumes offline
Z@	*Placeholder*
Z@ESTABL	Establish FlashCopy relationships for all pairs
Z@REVEST	Reverse restore from the FlashCopy target to the source
Z@WITHDR	Withdraw FlashCopy relationships for all pairs

Notes:

- The A@WITHDR and B@ESTABL jobs are used to change the state of FlashCopy pairs in the current configuration to the new configuration. Relationships that are no longer in the NEW configuration when compared to the CURRENT configuration are withdrawn. Relationships that are added in the NEW configuration when compared to the CURRENT configuration are established.
- The N@NB2CPY job is only generated if **Background Copy or No Background Copy "Y"** is specified in the FlashCopy Job Creation panel.
- The three jobs, R@ZESTAB, R@ZSTATS, and R@ZWITHD are generated when FCMGPPRC is set to **ON** in the IWMOFMGR member of the SIWNOPTS data set, and **ON** is specified for **FlashCopy via PPRC Inband** for ISPF dialog option 6 **FlashCopy Job Creation**.
- The X@GETPPR job is only generated if SIWNOPTS(IWNOFMGR) is edited, and FCMGPPRC is set to **ON**.
- There is limit of 10,240 devices for gathering the PPRC relationships when running the X@GETPPR job. If more devices need to be added, you need to split the "NEW.DEVICE.DATA" PDS and issue the SWITCH job to deploy the new configuration into CURRENT before adding more devices into the remote pair FlashCopy relationship.
- The reverse restore job, Z@REVEST, is only created when you select the FlashCopy options that support this function from the FlashCopy Job Creation panel.

Jobs for the current configuration

Jobs that are used to manipulate the state of FlashCopy pairs in the CURRENT configuration reside in the partitioned data set named `hlq.FCMGR.groupqual.CURRENT.JOBS`.

To create the initial copy of the `hlq.FCMGR.groupqual.CURRENT.JOBS` data set, the D@SWITCH member in the `hlq.FCMGR.groupqual.NEW.JOBS` must be submitted.

Table 5 lists the members in the partitioned data set directory. Members that are named Q$, S$, X$, and Z$ are placeholders.

Table 5. Jobs to control FlashCopy pairs in the current configuration

Members	Description
$OPTIONS	Options that define the FlashCopy relationship
A$VERIFY	Verify the state of active FlashCopy relationships
B$FREEZE	FlashCopy establish and FREEZE/RUN
I$	*Placeholder* (when Incremental is selected)
I$UPDATE	Incremental FlashCopy update (only when Incremental is selected)
N$	*Placeholder*
N$NB2CPY	Start background copy
Q$	*Placeholder*
Q$STATUS	Obtain status of the FlashCopy environment
R$ZESTAB	Establish Remote FlashCopy pairs through inband PPRC commands
R$ZSTATS	Retrieve status of the remote FlashCopy pairs
R$ZWITHD	Withdraw remote FlashCopy relationships
S$	*Placeholder*
S$ICKDSF	ICKDSF REFORMAT job to relabel FlashCopy source volumes
T$ICKDSF	ICKDSF REFORMAT job to relabel FlashCopy target volumes
U$DMPCLR	ICKDSF job to clear the Dump Conditioning of volumes
U$DMPCND	ICKDSF Dump condition volumes
X$	*Placeholder*
X$VARY	Member contains a set of VARY commands that can be used to vary FlashCopy target volumes offline
Z$	*Placeholder*
Z$ESTABL	Establish FlashCopy relationships for all pairs
Z$REVEST	Reverse restore from the FlashCopy target to the source
Z$WITHDR	Withdraw FlashCopy relationships for all pairs

Notes:

- The N$NB2CPY job is only generated if **Background Copy or No Background Copy "Y"** is specified in the FlashCopy Job Creation panel.

- The three jobs, R$ZESTAB, R$ZSTATS, and R$ZWITHD are generated when FCMGPPRC is set to **ON** in the IWMOFMGR member of the SIWNOPTS data set, and **ON** is specified for **FlashCopy via PPRC Inband** for ISPF dialog option 6 **FlashCopy Job Creation**.
- The reverse restore job, Z$REVEST, is only created when you select the FlashCopy options that support this function from the FlashCopy Job Creation panel.

Sample @OPTIONS or $OPTIONS member

The @OPTIONS and $OPTIONS members of the `hlq.FCMGR.groupqual.CURRENT.JOBS` and `hlq.FCMGR.groupqual.NEW.JOBS` data sets have the options that were specified in the BUILD-JOBS step.

```
IWNBPJOP----------------------FlashCopy Manager - FlashCopy Job Creation----------
Command ===>

  FC High Level Dsn Qualifier ===> HSMATHO    FC Group Qualifier ===> PMRTEST :

  Select from the FlashCopy options listed below for use in Job creation
    Basic or Incremental FlashCopy (B or I)       ===>
    Persistent FlashCopy Relationship (P or N)    ===>
    Background Copy or No Copy (C or N)           ===>
    Write Inhibit FlashCopy Target (I or N)       ===>
    Keep FlashCopy Target OFFLINE (Y or N)        ===>
    FC Targets are PPRC Primaries (Y or N or R)   ===> Y

    FlashCopy Target Re-label Options :
      Re-Label algorithm    ===>
        ( 0 - Retain, 1 - Left, 2 - Right or 3 - Device Number )
      Re-label Data         ===> GM

Use Model Job Cards in PDS/PDSE Member   ===> IWNOJOBS
```

Chapter 3. Components of z/OS FlashCopy Manager

The z/OS FlashCopy Manager interface provides a set of panels for performing various tasks, including allocating data sets, creating batch jobs, defining source and target volumes, and configuring FlashCopy operations.

The z/OS FlashCopy Manager function panels

The z/OS FlashCopy Manager uses standard ISPF dialog processing and is designed to work similar to ISPF.

All z/OS FlashCopy Manager panels support the use of the ISPF jump function (=x) from any command line or command field. The use of other ISPF or Time Sharing Option (TSO) commands from the command or option line might or might not work depending on the specific panel that is active.

Help text is available for any field by positioning the cursor in that field and pressing `PF1` or the `HELP` key.

During processing, z/OS FlashCopy Manager issues messages that are followed by a line with three asterisks (***). Three consecutive asterisks are displayed by TSO when a series of line-oriented messages is displayed within a full-screen application such as ISPF. And you are returned to a full-screen 3270 display environment.

Ensure that your TSO PROFILE command specifies `PROF WTPMSG` to receive all write-to-programmer messages at your terminal. These messages can contain information about z/OS FlashCopy Manager error conditions that might require corrective action by the user. However, these messages can also be informational and require no corrective action. Press `Enter` to return to the panel dialog.

Primary panel

Use the Primary panel as the main entry, anchor, and starting point for z/OS FlashCopy Manager.

A sequence of panel-driven processes defines a FlashCopy configuration and creates the jobs that are used to manage and maintain the FlashCopy execution-time configuration.

The Primary panel is the only point within the panel hierarchy where you input the qualifiers that are used by z/OS FlashCopy Manager to define a FlashCopy environment. You can control two qualifiers with `High-level DSN qualifier` and `FC Group qualifier`.

In the following example, the High-level DSN qualifier is set to *IWNUSER* and the FC Group qualifier is set to *DB2AX*.

You select functions by placing the numeric identifier in the `OPTION ===>` field and pressing the `Enter` key.

You start from the function 1 and proceed to function 6. You can restart processes from any function, but must proceed through the panels that follow to generate a configuration and a set of jobs. The jobs can be used to manage that configuration.

One example of a restart is when you want to change the pool of target devices. After you initially run this function, you restart from function 4 (Select Target devices/volumes), and then proceed through functions (options) 5 and 6.

```
IWNPFC00 ------------ FlashCopy Manager - V6R2M0 - Primary panel -----------
OPTION ===>
Enter one of the following options:

FlashCopy Manager functions

1 ALLOCATE - Allocate/De-allocate datasets
2 SETUP - Create and submit setup JOB
3 SEL-SOURCE - Select Source devices/volumes
4 SEL-TARGET - Select Target devices/volumes
5 CONFIGURE - Configure Source-Target environment
6 BUILD-JOBS - Build FlashCopy Manager Jobs

FlashCopy Manager Dataset Control Information
High level DSN qualifier ===> IWNUSER
FC Group qualifier ===> DB2AX
```

File Management panel (allocate data sets)

Use the File Management panel to allocate data sets and perform file management service.

The File Management panel can be used to delete or rename all z/OS FlashCopy Manager data sets that have the same high-level or cluster-level-qualifier combination. For example, these data sets might have been used for testing, migration, or both, and might no longer be of value.

The data-set-qualifier variables are propagated across the z/OS FlashCopy Manager panel hierarchy from the primary panel by using the ISPF variable pool. Running an allocate function with the same qualifier set used in a previously successful allocation creates an error condition. The system prompts you on how to continue.

```
IWNPAF00 -------------------- FlashCopy - File Management --------------------
COMMAND ===>

Function type ===> a        (A=Allocate, D=delete, or R=rename)

To customize the location of FlashCopy Manager allocated datasets, enter values in either
VOLSER or MGMTCLAS/STORCLAS fields. Blank values in all of the fields will use the
default allocation policies or installation ACS-routines in place in your installation.

VOLSER ===> IWNVOL                      MGMTCLAS ===>
                                        STORCLAS ===>

High DSN qualifier       ===> IWNUSER
FC Group qualifier       ===> DB2AX

Press ENTER to execute function (after entering required information)
```

When the Enter key is pressed, you are presented with a list of all data sets that were allocated. In addition, three asterisks (***) are displayed following the list. Press PF3 twice and you are returned to this Primary panel.

Build setup jobs panel

The Build setup jobs panel creates and submits batch jobs that collect the device information. This device information is required to create a FlashCopy configuration and the batch jobs that are used to manage it.

The batch jobs collect information from each storage device that is physically attached and generated for use by the operating system. If FCMGPPRC is set to "Y" in the IWNOFMGR member, the an additional job is run to collect PPRC relationship information. Because this inspection and query process examines each device, z/OS FlashCopy Manager can take a few minutes to run in a large storage environment.

```
IWNPSU00 ---------------- FlashCopy Manager - Build setup jobs ---------------
COMMAND ===>


High DSN qual ===> IWNUSER          FC Group ===> DB2AX

   Build Data Collection JOB (Y/N) ---> Y


            Use Model JOB cards in ===> IWNOJOBS

   Submit Data Collection JOB(Y/N) ---> Y

Press ENTER to execute function (after entering required information)
Press PF3(END) to exit function
```

FC Source Definition/Selection panel

Use the FlashCopy source definition and selection (FC Source Definition/Selection) panel as the entry panel to the source-selection process.

The source-selection process has two parts:

1. Entry of the source-selection criteria.
2. A review of the selected devices.

Each part places the user in a PDF EDIT session. The first PDF EDIT session starts when the `Enter` key is pressed from the panel. The second PDF EDIT session starts when you press `PF3` from the first PDF EDIT session, and the selection data passes validity checking.

An ISMF Volume List report data set might be used as an input specification. The ISMF report records can only contain volume serial and device numbers. The z/OS FlashCopy Manager filters the header and other records from the report. The use of an ISMF Volume report might simplify the specification of volumes that are not online to the system currently running the z/OS FlashCopy Manager program.

A STORAGEGROUP is a container of volumes. If the selection criteria includes a STORAGEGROUP, the DCOLLECT program is called to get the devices contained within the specified storage group. Some time might be required for the devices in the storage group to be identified and source volumes to be selected. A series of messages is displayed as the selection process proceeds.

```
IWNPSS00 --------- FlashCopy Manager - FC Source Definition/Selection --------
COMMAND ===>

High DSN qual ===> IWNUSER                FC Group ===> DB2AX

FlashCopy Manager invokes ISPF EDIT to allow you to enter/modify a list
of FlashCopy SOURCE device selection criteria. Selection is done using any
combination of the four specifications statements.

1. IMPORTISMFL(dataset-name) - dataset-name fully qualified, no quotes
2. STORAGEGROUP(a) - Storage Group names must be separated by commas
3. VOLSER or VOL* - Specify SOURCE device volser. Use an * as an ending
   wildcard placeholder. MX8* would select all volsers starting with MX8.
4. Device Number Range - Specify device number, followed by the number of
consecutive devices to follow or a starting and ending range of devices.

Group ids are specified by the GID(x) suffix on any specification

FlashCopy Manager will select device records based on the selection criteria and will then
automatically enter a second ISPF EDIT session to allow you to review and edit the selected
FC SOURCE devices.

Press ENTER to execute function
Press PF1(HELP) for additional information
Press PF3(END) to exit function
```

FC Target Definition/Selection panel

Use the FlashCopy target definition and selection (FC Target Definition/Selection) panel as the entry to the target-selection process.

The target-selection process has two parts:

1. Entry of the target-selection criteria.
2. A review of the selected devices.

Each part places the user in a PDF EDIT session. The first PDF EDIT session starts when the `Enter` key is pressed from the panel. The second PDF EDIT session starts when you press `PF3` from the first PDF EDIT session, and the selection data passes validity checking.

An ISMF Volume List report data set might be used as an input specification. The ISMF report records can only contain volume serial and device numbers. The z/OS FlashCopy Manager filters the header and other records from the report. The use of an ISMF Volume report might simplify the specification of volumes that are not online to the system currently running the z/OS FlashCopy Manager program.

A STORAGEGROUP is a container of volumes. If the selection criteria includes a STORAGEGROUP, the DCOLLECT program is called to get the devices contained within the specified storage group. Some time might be required for the devices in the storage group to be identified and source volumes to be selected. A series of messages is displayed as the selection process proceeds.

With the selection criteria EXCLUDE, you can use a common target-pool specification for several FlashCopy environments. EXCLUDE informs this instance of the z/OS FlashCopy Manager that it is not to include any devices that are being used in the specified FlashCopy environment. Multiple EXCLUDE specification statements are permitted.

```
IWNPST00 --------- FlashCopy Manager - FC Target Definition/Selection --------
COMMAND ===>

High DSN qual ===> IWNUSER                  FC Group ===> DB2AX

FlashCopy Manager invokes ISPF EDIT to allow you to enter/modify a list of
FlashCopy TARGET device selection criteria. Selection is done using any
combination of the five specifications statements.

1. IMPORTISMFL(dataset-name) - dataset-name fully qualified, no quotes
2. STORAGEGROUP(a) - Storage Group names must be separated by commas
3. VOLSER or VOL* - Specify TARGET device volser. Use an * as an ending
wildcard placeholder. MX8* would select all volsers starting with MX8.
4. Device number range - 09510,8 or 09510-09517 for example.
5. EXCLUDE(gq) - Exclude TARGETS used in hlq.
FCMGR.groupqual.NEW.CONFIG

Group ids are specified by the GID(x) suffix on any specification

FlashCopy Manager will select device records based on the selection criteria and will then
automatically enter a second ISPF EDIT session to allow you to review
and edit the selected FC TARGET devices.

Press ENTER to execute function
Press PF1(HELP) for additional information
Press PF3(END) to exit function
```

FC Configuration generation panel

Use the FC Configuration generation panel to begin the FlashCopy configuration process. This process matches FlashCopy source volumes with FlashCopy target volumes.

Three configuration options are available:

VTOC match
Use this option only when the target devices are online to z/OS environments.

First match
Use this option for production applications.

Manual
Use this option in selected testing environments when you need control over the pairing. You must define each source-target pair by its device numbers.

```
IWNPCF00 ---------- FlashCopy Manager - FC Configuration generation ---------
COMMAND ===>
High DSN qual ===> IWNUSER            FC Group ===> DB2AX

     FlashCopy Manager currently supports three ways to create a FlashCopy Configuration

1 = First match - automatic process that matches source/target volumes
    based on device hardware characteristics
V = VTOC match - automatic process that matches source/target volumes
    based on VTOC structure and device hardware values
M = Manual - a multistep process that allows the user to control the
    source/target matching process at the device level

Select process matching process ===>
( 1 = First Match, V = VTOC match, M = Manual )

Press ENTER to execute function (after entering required information)
Press PF3(END) to exit function
```

You can review the configuration from an ISPF session.

FC JOB Creation panel

The JOB Creation panel helps you manage your FlashCopy environment.

Customizing JOB statements

The options PDS target library, IWN.SIWNOPTS, contains three members that consist of sample REXX source code, which z/OS FlashCopy Manager uses to create JOB statements. The member names are:

IWNOJOBM
Sample to create JOB statements with arbitrary job names.

IWNOJOBS
A copy of IWNOJOBM.

IWNOJOBT
Sample to create JOB statements in which TSOUSERIDs comprise part of the job names.

If the qualifier FIRST was chosen for the first of two configurations and SECOND for the second configuration, then you can create two different members in the OPTIONS PDS. In addition, you can create a member that is named FIRST to hold the model job statements for the FIRST configuration, and a different one named SECOND for the second configuration. In the FIRST member, you can use the letter F as the first letter of each job name. You can use the letter S as the first letter of each job name in the SECOND member. When jobs are run, you can look at the first character of the job name to quickly determine which FlashCopy environment is involved.

The z/OS FlashCopy Manager incorporates a feature to specify a value that is used to identify a FlashCopy relationship at the hardware level. If you specify TOD, then the time and date at which the FlashCopy was done is returned as part of the status record from a device while a relationship is active. Additionally, a four-character string for the identifier can be specified. The four-character string is returned as part of the status record from a device for which a relationship is active. If you leave the field blank, then no identifier is used. This scenario is the default behavior and provides extra compatibility with the former z/OS FlashCopy Manager service offering.

The FC JOB Creation panel, initiates the FlashCopy job-creation process. This process builds all jobs that work with both the `NEW.CONFIG` and the `CURRENT.CONFIG` data sets. Moreover, this process creates the delta data sets, NEW.CONFIG.ESTABLISH, and NEW.CONFIG.WITHDRAW. These data sets identify the FlashCopy relationship changes that are required to shift a `CURRENT.CONFIG` to a `NEW.CONFIG`. The members A@WITHDR and B@ESTABL are used to shift the `CURRENT.CONFIG` to the `NEW.CONFIG`. On successful completion, the `NEW.CONFIG` can replace the `CURRENT.CONFIG`.

Relabeling volumes

The relabeling options must be specified even if you do not plan to use them. The option that is specified determines the volume label in the ICKDSF members in the NEW.JOBS and CURRENT.JOBS PDS.

You have four relabel options:

Retain Builds the REFORMAT statements with the original VOLIDs. Relabel data is not required.

Left Takes the two characters that are specified in Relabel data and replaces the first two characters in the VOLID in the REFORMAT statement.

Right Takes the two characters that are specified in Relabel data and replaces the last two characters in the VOLID in the REFORMAT statement.

Dev Num
Takes the two characters that are specified in Relabel data and adds the device number to generate a VOLID for the REFORMAT statement.

Managing OFFLINE volumes

The current default operation of all FlashCopy establish jobs requires the FlashCopy targets be OFFLINE to all systems. However, the default behavior or operation can be changed selectively by editing an establish job, issuing a**FIND** command within PDF for TOFF, and changing the TOFF string to TON. The control of OFFLINE targets is set by field FCMGONOF in member IWNOFMGR of the options data set.

The **Keep FC Target offline** (Y or N) function might require z/OS operating system service (PTFs). This function generates FlashCopy targets, but prevents them from coming online when a system is initially loaded. FlashCopy establish operations can create large numbers of volumes with duplicate labels. However, having large numbers of online volumes with duplicate labels (volume serial numbers) at IPL is disruptive and can potentially cause an outage.

Specifying FlashCopy options

The following example shows the FC JOB Creation panel. This panel is used to specify options to use in the jobs that manage the configuration. In this case, the default JOBCARDS member of the IWN.SIWNOPTS PDS is used to create the job statements.

```
IWNPBJ00 ---------------- FlashCopy Manager - FC JOB Creation ------------

COMMAND ===>

High Level DSN Qualifier ===> IBMUSER          FC Group Qualifier ===> BATCH01

Select the following options for use in JOB creation:
Basic or Incremental FlashCopy ( B or I ) ===>
Persistent FlashCopy Relationship ( P or N ) ===>
Background Copy or No Copy ( C or N ) ===>
Write Inhibit FlashCopy Target ( I or N ) ===>
Keep FlashCopy Target OFFLINE ( Y or N ) ===>

FlashCopy Target Re-label options:
Re-Label algorithm ===> 0
( 0 - retain, 1 - left, 2 - right or 3 - Dev Num)
Re-label data ===> ??

Use Model JOB cards in ===> IWNOJOBS

(PF1) = HELP         PF3 = END      ENTER = Execute FC Manager Function
```

Chapter 4. Advanced topics

You can also use z/OS FlashCopy Manager to help implement a more complex set of business solutions.

Scheduling jobs in batch mode

Using a batch mode of operation eliminates the requirement to use repeated ISPF dialogs.

Source or target devices that are selected by using device labels or System Managed Storage (SMS) storage groups present a set of dynamic configuration and job-creation tasks. If you use the normal ISPF panel logic, you are required to complete four steps every time a volume serial number or storage group is changed. In an environment where large numbers of devices are managed, by using the ISPF dialogs would quickly become a labor-intensive task. Batch mode eliminates having to use repeated ISPF dialogs.

The batch mode of operation runs program logic identical to that of the Primary panel steps 2 - 5. You can schedule jobs manually, or for automatic processing. You can also schedule jobs on demand by using ISPF services that are run in batch under control of the job-entry subsystem and the TSO Terminal Monitor Program (TMP).

Batch mode does not provide direct user feedback that is normally associated with foreground, interactive processing. Review the final job return code for success or failure of the configuration. You can review the activities that are associated with building the jobs, and comprehensive job output that shows where any failures occurred.

Combining FlashCopy with PPRC

You can use z/OS FlashCopy Manager with PPRC. Both FlashCopy and PPRC are used in the development and implementation of discrete business processes.

You can use FlashCopy to create a copy of data that serves as the source for Peer-to-Peer Remote Copy (PPRC). Or, you can use it to create a data copy that is based on the content of PPRC secondary volumes. Furthermore, separate FlashCopy environments can be defined and used for each of these different applications within the same business process.

FlashCopy target devices as PPRC primary devices

In this application, FlashCopy is used to create a consistent copy of data. PPRC is used to transfer the data to a different set of storage devices.

You can use two basic modes for the application of these technologies:

1. When a FlashCopy relationship is established between two volumes that are being mirrored by Metro Mirror to a remote site; when the FlashCopy is established between the two volumes on the primary site, the FlashCopy command is sent to the remote site to establish the relationship between the two Metro Mirror target volumes at the remote site.

2. A Metro Mirror primary volume is used to transfer a FlashCopy command to the Metro Mirror secondary volume to establish a FlashCopy relationship between the Metro Mirror secondary volume and another volume at the secondary site. This is known as *Inband FlashCopy*.

PPRC secondaries as FlashCopy source devices

The FlashCopy environment can be managed in two different ways.

Managing FlashCopy from an LPAR that has addressability to the PPRC primary devices require some additional actions. FlashCopy Manager simplifies the actions that are required of earlier versions.

IBM storage subsystems provide a function that is referred to as *Inband FlashCopy*. FlashCopy operations take place between the PPRC secondary devices and a set of devices that reside in the same storage device as the PPRC secondaries. The I/O Commands to use Inband FlashCopy are sent to the PPRC primary devices, not the FlashCopy source devices. This mode of operation allows the installation to manage FlashCopy functions in a storage device, which is not currently attached to a processor from a job stream at the production site.

If the FCMGPPRC function switch is set to **ON**, then a job creation panel with more options is displayed.

Note: The two additional options that are offered are **FC Targets are PPRC Primaries** and **FlashCopy via PPRC Inband**.

```
IWNPBJ0P  ------------- FlashCopy Manager - FlashCopy Job Creation ------------
Command ===>
FC High Level Dsn Qualifier ===> IWNUSER   FC Group Qualifier ===> DB2AX

 Select from the FlashCopy options listed below for use in Job creation:
   Basic or Incremental FlashCopy (B or I)              ===>
   Persistent FlashCopy Relationship (P or N)           ===>
   Background Copy or No Copy (C or N)                  ===>
   Write Inhibit FlashCopy Target (I or N)              ===>
   Keep FlashCopy Target OFFLINE (Y or N)               ===>
   FC Targets are PPRC Primaries (Y or N or R)          ===>
   FlashCopy via PPRC Inband (Y or N)                   ===>

   FlashCopy Target Re-label Options:
     Re-Label algorithm  ===> 0
      ( 0 - Retain, 1 - Left, 2 - Right or 3 - Device Number )
     Re-label Data       ===> ??

 Use Model Job Cards in PDS/PDSE Member ===> IWNOJOBS
 Use the FlashCopy Identifier           ===>
```

FlashCopy Manager FC JOB and remote data set creation panels

One of two different panels displays when you create jobs to manage your FlashCopy environment. The panel might a simple version or a detailed version.

About this task

The panel that is displayed when creating jobs to manage the FlashCopy environment depends on the value of variable FCMGPPRC, which was set in the REXX member that is used to start FlashCopy Manager. If the value of variable FCMGPPRC is OFF, then the simpler of two panels is displayed. However, if the value is ON, then a more complex panel is displayed.

Using FlashCopy with the PPRC INBAND function

Installations that choose to manage FlashCopy with the PPRC INBAND function have unique requirements that non-PPRC users do not have.

To reduce confusion, these two implementation scenarios are separated such that FlashCopy Manager contains a control function. This control function allows the user to define which of these sets of functions are to be used for each invocation of FlashCopy Manager. The IWNOFMGR member of the IWN.SIWNOPTS PDS contains a value that controls the user interface. The value is held in the ISPF SHARED variable named FCMGPPRC. If the value of FCMGPPRC is **Off** (the default), then the user does not need to be concerned about PPRC. If the user wants to combine FlashCopy with PPRC, then set the value of FCMGPPRC to **On**.

All changes that the user sees in the ISPF panels are contained in the Job Build control panel.

The following example shows how to specify the options that are used in the jobs that are created when FlashCopy is combined with PPRC.

```
IWNPBJ0P          -------- FlashCopy Manager - FlashCopy JOB Creation ------
Command ===>

FC High Level Dsn Qualifier ===> IWNUSER   FC Group Qualifier ===> DB2AX


Select from the FlashCopy options listed below for use in Job creation:
    Basic or Incremental FlashCopy (B or I)       ===>
    Persistent FlashCopy Relationship(P or N)     ===>
    Background Copy or No Copy(C or N)            ===>
    Write Inhibit FlashCopy Target(I or N)        ===>
    Keep FlashCopy Target OFFLINE (Y or N)        ===>
    FC Targets are PPRC Primaries(Y or N or R)    ===>
    FlashCopy via PPRC Inband (Y or N)            ===>

    FlashCopy Target Re-label Options:
     Re-Label algorithm  ===> 0
      ( 0 - Retain, 1 - Left, 2 - Right or 3 - Device Number )
     Re-label Data       ===> ??

    Use Model Job Cards in PDS/PDSE Member ===> FLYOJOBS
    Use the FlashCopy Identifier           ===>
```

Specify **Y** to **FlashCopy via PPRC INBAND (Y or N)** to use PPRC INBAND processing. In addition to changes to the ISPF panel, jobs that use the PPRC INBAND function are contained in partitioned data set members that are named with an initial character R.

Using the job creation panels with PPRC INBAND functions

If Y is selected for FlashCopy via PPRC INBAND and batch jobs are created.

Developing .REMOTE files by using the CONFRMTF job

You can develop the .REMOTE file for use with PPRC Manager at the time when the jobs are built. If the process cannot be completed at that time, you can use the CONFRMTF job to do the required processing.

About this task

The CONFRMTF sample job is configured as an inline JCL procedure. The user provides the required qualifiers on the `//FCX EXEC PROC=CONVERT` statement. Specify four parameters: two for PPRC, and two for FlashCopy. Specify the HLQ and LLQ

of the FlashCopy session and the HLQ and LLQ of the hlq.FCMGR.groupqual.NEW.DEVICE.DATA data set that contains the device information that is to be used. Normally, the HLQ and LLQ of the FlashCopy session are the same as the hlq.FCMGR.groupqual.NEW.DEVICE.DATA. The FlashCopy parameters are the high-level qualifier and the FC Group qualifier.

Notes:

- When PPRC INBAND functions are being used, the CONFIG.REMOTE files need to be generated by running the X@GETPPR job created in Step 2 of the ISPF dialog.
- Normally the .REMOTE data sets are generated each time that you exit the FlashCopy job creation panel. If you wish to generate this list in a batch job, update and use the IWNCRMFT job.

Procedure

In the following example, IBMUSER is the high-level qualifier for the PPRC and FlashCopy files. INBAND is the second qualifier that is specified for both the PPRC and FlashCopy configurations.
Use the following steps to customize the job:

Note: When PPRC INBAND functions are being used, the CONFIG.REMOTE files need to be generated by running the X@GETPPR job created in Step 2 of the ISPF dialog.

1. Edit a new member in a copy of IWN.SIWNCNTL.
2. Copy the sample member into the newly created or edited member.
3. Change the job statement according to the installation requirements.
4. Change the data set name in the SYSPROC DD statement of a TSO LOGON cataloged procedure to correspond to the data set name in use.
5. Change the values for the **PPRCHQ=** and **PPRCMQ=** fields.
6. Change the values for the **FCHQ=** and **FCGQ=** fields.
7. Submit the job.

FlashCopy jobs used with INBAND FlashCopy

When PPRC INBAND function-based FlashCopy jobs are requested, more jobs are created in the hlq.FCMGR.groupqual.NEW.JOBS and hlq.FCMGR.groupqual.CURRENT.JOBS partitioned data sets.

Members that contain jobs that use PPRC INBAND processing have an initial character R in their member names. The set of jobs that is created also contain the standard jobs, which allows the user to manage FlashCopy from an LPAR-attached to storage devices that contain the FlashCopy source devices.

Jobs that manage FlashCopy by using PPRC INBAND processing have member names that are similar to member names used with FlashCopy operations from LPARS directly attached to the FlashCopy source devices. For example, in hlq.FCMGR.groupqual.NEW.JOBS the member Z@ESTABL contains a job that establishes all the FlashCopy relationships. Member R$ZESTAB contains a job that runs identically by using PPRC INBAND operations. In the CURRENT.JOBS partitioned data set, submitting I$UPDATE executes an Incremental FlashCopy update, and submit R$ZUPDAT, which performs the same function by using PPRC INBAND.

Using FlashCopy to target devices not in the hardware configuration

You can use z/OS FlashCopy Manager to create an environment where the FlashCopy target device numbers are not in the hardware configuration for the LPAR that is running the FlashCopy jobs.

About this task

This capability can be used in large, complex environments that have:

- Exhausted UCB device numbers on a single LPAR
- FlashCopy target device numbers on the system that can address the targets are the same as the source device numbers in production systems that cannot address the FlashCopy targets.

Assume the following scenario:

- Insufficient addressing capability exists on a production LPAR, named, for example, SYSS, to address all FlashCopy source devices and associated FlashCopy target devices
- A different LPAR, named, for example, SYST, which might address potential FlashCopy target devices, but not the FlashCopy source devices. Because the LPAR has UCB-address constraints, the device numbers of the FlashCopy source devices might overlap the device numbers of the FlashCopy targets. Consider the following example in which the UCB device number 1008 might address a FlashCopy source on SYSS and the same device number, 1008, addresses a different logical device from SYST.

The z/OS FlashCopy Manager uses a single sequential data set, `hlq.FCMGR.groupqual.NEW.DEVICE.DATA`, that defines devices that are available as FlashCopy source and target devices. When the FlashCopy source and target devices are not addressable from the same LPAR, more effort is required to develop the `hlq.FCMGR.groupqual.NEW.DEVICE.DATA` data set.

You need to create a single file with device data from SYSS and SYST such that z/OS FlashCopy Manager can select source and target devices while it creates a valid configuration. The device and volume serial numbers in the data that is collected from SYST are modified. This modification is done in a manner that makes the data easy to distinguish by z/OS FlashCopy Manager. The procedure results in the following changes:

- All SYST device numbers in the records change from their correct values to four questions marks (????).
- The high-level qualifier character of the label data becomes a forward slash (/).
- The modified file is concatenated from SYST to the end of the file from SYSS.

Procedure

Use the following steps:

1. Install z/OS FlashCopy Manager on both SYSS and SYST.
2. Run z/OS FlashCopy Manager steps 1 and 2 on SYSS and SYST. Wait for the jobs that are submitted to complete on SYSS and SYST.
3. On SYST, edit the `hlq.FCMGR.groupqual.NEW.DEVICE.DATA` file as follows:
   a. Delete any unwanted device records available as FlashCopy targets. Candidate targets are most likely found in blocks of addresses. Therefore, editing should be fairly easy to complete.

Note: There is no requirement to delete the header records.

b. Save the file.

4. Edit `userif.IWN.SIWNCNTL(IWNCCONV)`.
   a. Change the job statement or statements to run on SYST.
   b. Change the SYSPROC DD statement to point to the correct data set.
   c. Change the HQ= and GQ= qualifiers to match the qualifiers that are used when the `hlq.FCMGR.groupqual.NEW.DEVICE.DATA` file is created on SYST.
   d. Submit the job. The job allocates a new file named `hlq.FCMGR.groupqual.NEW.DEVICE.DATA.QM`. It uses the device records in the `hlq.FCMGR.groupqual.NEW.DEVICE.DATA` file to create records in the `.QM` file with the required changes to the device numbers and volume serial numbers.
5. Transfer the `hlq.FCMGR.groupqual.NEW.DEVICE.DATA.QM` file from SYST to SYSS.
6. Concatenate file `hlq.FCMGR.groupqual.NEW.DEVICE.DATA.QM` to the `hlq.FCMGR.groupqual.NEW.DEVICE.DATA` file created on SYSS.
7. Start z/OS FlashCopy Manager on SYSS, and run the source-selection process.
8. Run the target-selection process by specifying a forward slash and asterisk (`/*`) as the sole selection criteria. Exit the panel by pressing `PF3`. All of the device records created on SYST are then found in the `NEW.DEVICE.DATA.QM` file.
9. Run the CONFIGURE and JOB Build steps in a routine fashion.

Results

A FlashCopy configuration now exists that can be used to manage SYSS. The data on the FlashCopy target volumes can be used thereafter from SYST for any eligible business requirements.

Using sample z/OS FlashCopy Manager utility jobs

The z/OS FlashCopy Manager provides sample jobs that perform utility functions. These jobs are useful, but not required.

The following sample jobs incorporate capabilities to:

- Develop capacity information for a defined FlashCopy configuration.
- Develop files to be used with inband FlashCopy operations.
- Develop data from installed storage subsystems.
- Reduce the data from installed storage subsystems to a single record per LSS.

In the topics that follow, the titles contain suggested new member names and the member name of each sample. The samples are in the `IWN.SIWNCNTL` partitioned data set. For example, CAPACITY(IWNCCAPC) identifies a member that is created by using the sample member IWNCCAPC. After customization, the JOB in CAPACITY develops summary capacity information for the specified FlashCopy configuration.

Calculating capacity data by using the CAPACITY (IWNCCAPC) job

The CAPACITY job develops capacity data for the FlashCopy configuration file that is specified. Scientific notation is used in the cylinder and byte capacity. The program reports on a configuration that scales from a single one-cylinder device to one that consists of thousands of devices.

About this task

The data that is produced by this job is similar to what is shown in the following example. Notice the data with four logical subsystems (LSSs). The *devn* is the first device in the configuration for that storage image.

Procedure

```
FC configuration information -  total device count   =     308
                             - total Cylinder count  =  46.200E+3
                             - total Byte count      = 8.808E+9

Serial No.(dev)       LSS      Device       Cylinder
                    Count       Count          Count
13-00FCA81(D400)        4         308          46200
```

Use the following steps to customize the job.

1. Edit a new member in a copy of IWN.SIWNCNTL.
2. Copy the sample member into the newly created or edited member.
3. Change the job statement per installation requirements.
4. Change the data set name in the SYSPROC DD statement of a TSO LOGON cataloged procedure to correspond to the data set name in use.
5. Change the data set name in the DDIN DD statement to correspond to the data set names in use for the `hlq.FCMGR.groupqual.NEW.CONFIG` or `hlq.FCMGR.groupqual.CURRENT.CONFIG` data set.
6. Submit the job.

Developing data for logical devices by using the GETDATA (IWNCSTAT) job

The GETDATA sample job is a single, simple job. It is configured as an inline JCL procedure to create a subset of the device number range and obtain the data for devices in each subset.

About this task

The GETDATA job contains the contents of the first step of the job that is used in the SETUP process. The GETDATA job produces the same data that is found in the `hlq.FCMGR.groupqual.NEW.DEVICE.DATA` data set.

The sample job contains two steps that allocate the output data set, and is followed by EXEC PROC=IWNAT03C statements. The two parameters that are passed to the inline procedure specify the starting device number and the number of consecutive device numbers from the starting device number.

The customization process for the job follows these instructions: `UNIT=5700,N=128`. These parameters direct the program to start with device number 5700 and collect data for the next 128 device numbers. Assuming that there are only 8 storage devices in the device number range 5700 through 577f, then only eight device records will be in the output data set. The devices can be online or offline.

Procedure

Use the following steps to customize the job:

1. Edit a new member, GETDATA, in a copy of IWNSFCNTL.
2. Copy IWNCSTAT into the newly created or edited member.

3. Change the job statement according to the installation requirements.
4. Change the data set name in the STEPLIB DD statement to correspond to the data set names that are in use.
5. Change the string *IBMUSER* to an appropriate TSO USERID.
6. Change the string *MES01* to an identifier for the system on which the jobs are to be run.
7. Submit the job. The job might run in less time than the original setup job because it is only collecting device data.

Summarizing data at the LSS level by using the XUNIQUE (IWNCUNIQ) job

You can use the XUNIQUE job to summarize data at the LSS level.

Procedure

Use the following steps to customize the job:

1. Edit a new member, XUNIQUE, in a copy of IWN.SIWNCNTL.
2. Copy IWNCUNIQ into the newly create or edited member.
3. Change the job statement according to the installation requirements.
4. Change the data set name in the SYSPROC DD statement of a TSO LOGON cataloged procedure to correspond to the data set name that is in use.
5. Change the string *IBMUSER* to an appropriate TSO USERID.
6. Change the string *MES01* to an identifier for the system on which the jobs are to be run.
7. Change the data set name on the DDIN DD statement to the name of a data set for which processing is a consideration.

Customization and initial testing

Ensure that you meet the software and hardware requirements before you start customization and initial testing.

Software requirements

- Complete the installation process that is described in the Program Directory for z/OS FlashCopy Manager before any customization is performed.
- The z/OS FlashCopy Manager load library must be APF-authorized.

  Note: The IWNAT03C program must be linked into an APF-authorized library. Before running the device configuration job, FC@XGETD, the following command must be issued from the operator console:

  ```
  SETPROG apf,add,dsname=hlq.CSMFCM.fcqual.IBM.SIWNLOAD,volume=VVVVVV
  ```

  where VVVVVV is the volume to which you have installed z/OS FlashCopy Manager.
- Sites that want to select devices that use storage groups must ensure that IDCAMS is listed as an authorized program in SYS1.PARMLIB(IKJTSOxx).
- The z/OS FlashCopy Manager has no known z/OS system release dependencies.

Hardware requirements

- FlashCopy Version 2 must be installed and enabled on each IBM storage subsystem to be used by z/OS FlashCopy Manager.
- The FlashCopy Version 2 licensed microcode feature must be enabled on each IBM storage subsystem to be used by z/OS FlashCopy Manager.

Program library information

Consult the product Program Directory for target library data set names.

The SMP/E target library default data set names are described in the IBM Copy Services Manager z/OS FlashCopy Manager Program Directory (GI11-2904). See the Publications topic for information on where to obtain this directory.

If they are used during SMP/E RECEIVE, APPLY, and ACCEPT installation processing, data sets exist that contain the following product binary files:

IWN.SIWNCNTL
Sample miscellaneous jobs.

A partitioned data set that contains sample jobs, which can be of interest. The sample jobs are not required for use by z/OS FlashCopy Manager. However, they require installation-specific customization before their initial use.

IWN.SIWNEXEC
A partitioned data set that contains compiled REXX.

IWN.SIWNLOAD
A load library that must be APF-authorized. These load modules must be link-edited during the SMP/e installation process using the supplied JCLIN.

IWN.SIWNMENU
An ISPF message library.

IWN.SIWNOPTS
A partitioned data set that contains REXX source. These REXX EXECs require installation-specific customization before initial execution of z/OS FlashCopy Manager.

IWN.SIWNPENU
An ISPF panels library.

Do not use the z/OS FlashCopy Manager SMP/E target libraries directly. Copy them to a new set of libraries, which will be used by z/OS FlashCopy Manager after you complete any installation customization specific to your environment. In the topics that follow, the copied data set names begin with the additional prefix/qualifier `X`. For example, a copy of IWN.SIWNOPTS is named X.IWN.SIWNOPTS.

Customizing members of the OPTIONS data set

To use z/OS FlashCopy Manager, you must modify the members in the X.IWN.SIWNOPTS partitioned data set.

The only program library that contains members that must be modified to use z/OS FlashCopy Manager is the X.IWN.SIWNOPTS partitioned data set. In the following text, *options PDS* is a reference to the X.IWN.SIWNOPTS data set.

Important: Ongoing use of z/OS FlashCopy Manager requires that you create, modify, and maintain customized versions of the original members. As stated previously, during the customization process, do not modify the original members in the z/OS FlashCopy Manager options PDS target library. Use them only as starting points for crafting and implementing installation-specific (and standards-compliant) jobs.

Two types of members populate the options PDS:

1. Source REXX used to initially start z/OS FlashCopy Manager.
2. Source REXX used by z/OS FlashCopy Manager to create JCL JOB statements.

The default member names, which are used in the options PDS, conform to IBM product packaging standards. In this case, z/OS FlashCopy Manager uses a four-character element prefix of `IWNO`.

Customizing REXX source to start z/OS FlashCopy Manager

The member IWNOFMGR of the options PDS consists of a model REXX EXEC that can be used to start z/OS FlashCopy Manager. IWNOFMGR contains the names of the program libraries that are used by z/OS FlashCopy Manager and other options.

About this task

Remember: Do not modify the original target library copy of IWNOFMGR.

Procedure

Use the following steps to implement a site-specific customization of z/OS FlashCopy Manager before it is first started. Create a member in the options PDS named `CSMFCM` by copying the contents of member IWNOFMGR into it. Edit the new member as follows:

1. If the default program library data set names are not being used, then change all occurrences of the string `IWN.SIWNEXEC` to a data set name that complies with installation-specific naming conventions.
2. Review the following three optional customization choices according to your environment:
   - Variable *FCMGPDSE* controls data set organization for partitioned data sets that are created by z/OS FlashCopy Manager. The default is partitioned data set extended (PDSE), that is, `LIBRARY(PDSE)`. If use of the PDS format is requested, change the REXX statement `FCMGPDSE="Y"` to `FCMGPDSE="N"`.

     Note: This change is appropriate only if an installation does not support the use of PDSEs. Otherwise, this change is unnecessary.
   - The variable *FCMGONOF* controls the setting that allows FlashCopy target devices to be online at the time that the FlashCopy relationship is established. The default setting for this option is `OFF`. To change the default value to unconditionally permit all FlashCopy target devices to be online, change the REXX statement `FCMGONOF="OFF"` to `FCMGONOF="ON"`.

Attention: Only use the FCMGONOF = "ON" option with initial testing if the target devices must be online to another system, typically a virtual machine (VM) system.

If FlashCopy target devices are permitted to be online, take caution when you select target devices. If a production device is mistakenly selected as a target, all production data on the target volume might be irrevocably lost.

3. Save the edited version of CSMFCM. You can now start z/OS FlashCopy Manager by running the CSMFCM member of the options PDS.
4. Optionally, you can configure z/OS FlashCopy Manager to start by entering **CSMFCM** on the command line in the ISPF Command Shell (option 6) by running the following REXX EXEC: **EX 'userid.IWN.SIWNOPTS(CSMFCM'**.

Customizing REXX source that is used to create JCL JOB statements

The options PDS contains three members in which sample REXX EXECs are used to define the JOB statements that z/OS FlashCopy Manager uses when it creates batch jobs.

About this task

The member names are as follows:

IWNOJOBM
Sample of job statements with arbitrary JOB names.

IWNOJOBS
A copy of IWNOJOBS.

IWNOJOBT
Sample of job statements with TSO USERIDs used as JOB names.

The z/OS FlashCopy Manager offers a way to specify which member of the options PDS to use when JOB statements are developed at the time batch jobs are built. This specification can be made if an installation permits use of arbitrary JOB names, different batch JOB names for various FlashCopy JOBs, and different FlashCopy environments are conceivable. If the installation standards mandate the use of the TSO user ID as the permissible prefix of a JOB name, you cannot take advantage of different JOB names

Three sample members contain REXX commands that z/OS FlashCopy Manager uses to create unique JOB statements for z/OS FlashCopy Manager jobs. Each member contains extensive commentary, which describes the logic that is used by z/OS FlashCopy Manager to construct JOB names.

To simplify the initial running of z/OS FlashCopy Manager, create a new member in the options PDS named JOBCARDS.

Important: Do not edit the IWNOGOB* members.

Keep the members in their original, unmodified form so that they can be used as models. The original member is helpful in the following situations:

- If problems arise when a set of JOB statements are created.
- When an EXEC creates a set of JOB statements that might need to be re-created.
- For reference by IBM service personnel.

Procedure

You can use or reuse the JOB statements as you gain experience with z/OS FlashCopy Manager.

1. Create a new empty member named JOBCARDS.
2. Copy one of the sample members into JOBCARDS.
   a. Copy IWNOJOBM if no installation restriction exists with the use of JOB names.
   b. Copy IWNOJOBT if installation standards require the use of a TSO USERID in the JOB name.

      Note: A hardcopy of the JOBCARDS member can be useful to review the comment text of the member as you define changes that incorporate the execution-time logic of the FlashCopy batch job stream.
3. If IWNOJOBT is the chosen starting point, globally change the string IBMUSER to the TSO USERID that you want. The assumption is that the TSO USERID is 7 characters or less in length. If the chosen TSO USERID is 8 characters or more in length, then change IBMUSER to the chosen TSO USERID. In this case, z/OS FlashCopy Manager (in other words, TSO) cannot incorporate or generate a unique, terminating character for the JOB name.
   a. Inspect and make global changes, if needed, to the CLASS= and MSGCLASS= JOB statement parameters according to the installation standards.
4. Customize the content of the JOB statement. The following steps are a simplified example:
   a. Exclude all lines by using the **X ALL (EXCLUDE ALL)** command line directive of the PDF editor.
   b. Find all lines that contain the character string `.1` by using the "`F '.1' ALL`" operation on the command line. By design, the PDF editor **FIND** command displays EXCLUDED lines in which character strings are found (that is, they are brought out of excluded status). Therefore, you need to also be in view of the accounting field within the JOB statement. Inspect and make global changes to the accounting field according to the installation standards.
   c. After completion of all changes to the JOB statements that address installation standards, reinspect for errors, and ensure that the changes are syntactically correct REXX statements. Finally, save the member for future reference.

Results

The z/OS FlashCopy Manager customization is now complete, and you can proceed with initial testing.

When initial testing is complete, copy the IWNOFMGER member of SIWNOPTS PDS into a default CLIST. Then z/OS FlashCopy Manager can be started like other programs that can be run directly from within the ISPF environment

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Appendix. FlashCopy Manager messages

All FlashCopy Manager messages follow a consistent naming convention whereby each message starts with a five character prefix of IWNAF and IWNRF.

A typical sequence of messages generated by the status job in data set hlq.FCMGR.groupqual.CURRENT.JOBS(Q@STATUS) is as follows.

```
IWNAF010I  PROCESSING RECORDS FOR 308 DEVICES
IWNAF020I  308 DEVICES ARE IN THE 01 STATE - FC ACTIVE
IWNAF021I  308 DEVICES ARE IN THE 01 STATE - NO BCPY P MODE
IWNAF015I  COMPLETED PROCESSING FOR 308 DEVICES
```

A typical sequence of messages generated by the Establish step in the job found in data set hlq.FCMGR.groupqual.CURRENT.JOBS(B$FREEZE) is as follows.

```
IWNAF999I  IWNAFCA7 STARTING
IWNAF010I  PROCESSING RECORDS FOR 308 DEVICES
IWNAF600I  FRZ DELAY = 1.146 seconds
IWNAF601I  I/O DELAY = 1.203 seconds
IWNAF015I  COMPLETED PROCESSING FOR 308 DEVICES
```

Message numbers below 010 identify problems with the input data to the FlashCopy program being run.

The message numbers IWNAF010I and IWNAF015I bracket the FlashCopy operation. IWNAF010I marks the starting point for functions that passed input data validity checking. IWNAF015I marks the ending point of operations against the FlashCopy volumes; the device count in the message will identify the number of devices in the input data set.

Message numbers in the 090-099 range indicate internally detected error conditions and may have two causes:

1. Insufficient region size specified on the job or run statement.
2. An internal program logic error.

Message numbers above 900 provide data about selected processing functions. See the message description for more details.

Note: The following link describes a more comprehensive list of the return codes that you might see when you run FlashCopy Manager jobs: https://www.ibm.com/support/knowledgecenter/en/SSESK4_6.2.4/com.ibm.storage.csm.help.doc/msgs/msg_channel_return_codes.html

IWNAF000I variable

Explanation: Messages that use this message number are generated as a block of messages and are designed to make the summary status easy to find.

System action: None.

User response: Review the job variable messages to determine whether any action is needed.

IWNAF001I ERROR DETECTED IN INPUT PARMS

Explanation: An error was detected during processing of the step input parameters.

System action: The program stops.

User response: Review the job output to determine the nature of the error. Correct the error and resubmit the job.

IWNAF002I PRINT DD OPEN FAILED LOADDS DD OPEN FAILED SNAP DD OPEN FAILED DEVLIST DD OPEN FAILED STATSDCB DD OPEN FAILED CGELIST DD OPEN FAILED

Explanation: The data set on the DD name referenced could not be opened.

System action: The program stops.

User response: Review the job output to determine the nature of the error. Correct the error and resubmit the job.

IWNAF003I EXCESSIVE NUMBER OF INPUT RECORDS

Explanation: The number of device input records could not be handled. This can be due to an insufficient region size specified on the job or run statement, or the number of device input records could have exceeded 20,480.

System action: The program stops.

User response: Review the job output to determine the nature of the error. Correct the error and resubmit the job. It is recommended that you specify REGION=0M on the job card if you are working with many volumes. Also, if the parameter FCMGPPRC is set to "ON," the device import record should not exceed 10,240.

IWNAF004I INPUT DATASET WAS EMPTY GCE DATASET WAS EMPTY

Explanation: No device records were in the input data set.

System action: The program stops.

User response: Review the job output to determine the nature of the error. Correct the error and resubmit the job.

IWNAF005I INVALID TR/CYL VALUE-dev(trk)

Explanation: The program checks to make sure that the value in the tracks/cylinder field is valid. The logic detected an invalid value. The input data set has been corrupted. The **dev** value identifies the device number and the **trk** value identifies the invalid string.

System action: The program stops.

User response: Review the job output to determine the nature of the error. Run FlashCopy Manager step 2, Set up. After the Setup job completes, run Steps 3, 4, 5, 6, and resubmit the job.

IWNAF010I PROCESSING RECORDS FOR n DEVICES

Explanation: Input validity checking and input record processing have completed and the FlashCopy Manager functions are starting to run. There were *n* device records in the input data set.

System action: None.

User response: This is an expected status message.

IWNAF015I FLASHCOPY request_type PROCESSING SUCCESSFULLY COMPLETED FOR n DEVICES

Explanation: Function processing has completed. There were n device records in the input data set.

System action: None.

User response: This is an expected status message.

IWNAF016I PERMANENT I/O ERRORS OCCURRED DURING FC request_type PROCESSING

Explanation: Function processing has completed. Permanent I/O errors were detected for one or more devices.

System action: FlashCopy job completes.

User response: This is an error message where one or more FlashCopy relationships failed to establish. Look at the job output and system log to determine the cause of the error. Fix the problem and rerun the job.

Note: It may be necessary to run the FlashCopy withdraw job to clean up any FlashCopy relationships that were successfully established.

IWNAF017I FLASHCOPY RELATIONSHIPS WERE UPDATED FOR ALL n DEVICES

Explanation: FlashCopy Freeze processing has completed. FlashCopy relationships have been successfully created for n devices. However, a problem was encountered issuing the Consistency Group Created command to one or more LSSs containing a source device of the FlashCopy. This will result in one or more FlashCopy source volumes remaining in an Extended Long Busy state until the ELB times out.

System action: FlashCopy freeze processing completes. One or more FlashCopy source volumes will remain in Extended Long Busy state until the EBL timeout expires.

User response: This is an error message where one or more FlashCopy Consistency Group Created commands failed. Look at the job output and system log to determine the cause of the error. Fix the problem and rerun the job.

Note: It might be necessary to run the FlashCopy withdraw job to clean up any FlashCopy relationships that were successfully established.

IWNAF018I CONSISTENCY GROUP COMPLETE PROCESSING SUCCESSFULLY DONE

Explanation: FlashCopy Freeze processing has completed. The Consistency Group Created command was successfully issued to all FlashCopy source LSSs. However, one or more FlashCopy establishes failed. Look for an accompanying IWNAF017I message.

System action: FlashCopy Freeze processing completes.

User response: See the User Response for the IWNAF017I message.

IWNAF019I FLASHCOPY request_type PROCESSING RETRIED I/O n DEVICES

Explanation: Function processing has completed. There were n device where the FlashCopy establish had to be retried. One case where it occurs is when FlashCopy with Incremental is specified and this is the first FlashCopy for a pair. This is due to the storage system requirement that a parameter must not be set on the first establish. FlashCopy Manager detects this condition and retries the FlashCopy Establish with the correct parameters for a first time Establish. Subsequent established for Incremental will work without retrying.

Note: If freeze is being used to make a consistent copy of the group, the retry will add to the freeze delay.

System action: None.

User response: This is an expected status message for first time establishes when specifying Incremental.

IWNAF020I n DEVICES ARE IN THE 01 STATE - FC ACTIVEn DEVICES ARE IN THE 00 STATE - SIMPLEX VOLUME

Explanation: This message will give the user the summary of the FlashCopy relationships defined in the CONFIG data sets. Additional details are provided in the IWNFC021I messages that follow when one or more devices are in the 01 state. When background copy has been requested, the device will go from the 00(simplex) state to the 01(FC active state) and when the background copy has completed and persistent was not specified, the source device will return to the 00(simplex) state.

System action: None.

User response: This is an expected status message.

IWNAF021I n DEVICES ARE IN THE 01 STATE - NO BCPY P MODEn DEVICES ARE IN THE 01 STATE - BCPY MODE

Explanation: This set of messages gives the user the next level of detail about the relationships defined in the CONFIG data set. When Background copy has been requested, it is indicated by BCPY. If no background copy was requested, then "NO BCPY" will be in the text. If persistent was specified, a "P" will be in the text.

System action: None.

User response: This is an expected status message.

IWNAF090I GETSTOR FAILED ON SNAP AREA CALLGETSTOR FAILED ON INITIAL CALL GETSTOR FAILED, PRIOR LIST ID=n

Explanation: The program attempted to obtain storage and was not able to obtain it.

System action: The program stops.

User response: This is generally caused by insufficient region size.

IWNAF091I ATTACH FAILED FOR SUBTASK n

Explanation: The program attempted to obtain storage and was not able to obtain it.

System action: The program stops.

User response: This is generally caused by insufficient region size.

IWNAF092I INTERNAL LOGIC ERROR ENCOUNTERED

Explanation: An internal logic error was detected by the program logic.

System action: The program stops.

User response: If the problem persists, contact IBM Support.

IWNAF093I LOOP LIMIT REACHED

Explanation: The program limits the number of status cycles and the limit was reached. This error occurs when a device does not reach the desired state within the specified number of cycles.

System action: The program stops.

User response: Use the Q@STATUS or the Q$STATUS job to verify that the device is in the correct state.

IWNAF101I SUBTASK n DEVICE dev, UCB NOT CONNECTED SUBTASK n DEVICE dev, UCB NOT CONNECTED-CC3 SUBTASK n DEVICE dev, UCB NOT CONNECTED-RS28

Explanation: An attempt to do I/O to device *dev* failed.

System action: The program stops.

User response: Use the DEVSERV command to verify that the device is defined by the I/O configuration for the system and that a device responds when I/O is attempted to the device.

IWNAF102I SUBTASK n DEVICE dev, ccw, AOM RC=rtn

Explanation: An attempt to do I/O to device dev failed. The first CCW in the channel program that was issued was ccw and the return code from AOM was rtn.

System action: The program stops.

User response: If the problem persists, contact IBM Support.

IWNAF103I IWNAFCB9 SUBTASK subtaskid, DEVICE device number, CG COMPLETE, PERMANENT I/O ERROR

Explanation: A permanent I/O error has been received for device number *DEVICE* while attempting the creation of a consistency group.

System action: Processing continues for other devices.

User response: See additional related messages to determine the cause of the error, fix the problem, and retry. If problem persists, contact IBM Support.

IWNAF104I IWNAFC19 SUBTASK subtaskid DEVICE devn FC ESTABLISH, PERMANENT I/O ERROR

Explanation: A permanent I/O error has been received for device number *DEVICE* while attempting a FlashCopy Establish.

System action: Processing continues for other devices.

User response: See additional related messages to determine the cause of the error, fix the problem, and retry. If problem persists, contact IBM Support.

IWNAF104I IWNAFC19 SUBTASK subtaskid DEVICE devn FC WITHDRAW, PERMANENT I/O ERROR

Explanation: A permanent I/O error has been received for device number *DEVICE* while attempting a FlashCopy Withdraw.

System action: Processing continues for other devices.

User response: See additional related messages to determine the cause of the error, fix the problem, and retry. If problem persists, contact IBM Support.

IWNAF190I SUBTASK n ID MISMATCH DETECTED

Explanation: An internal logic error was detected by the program logic.

System action: The program stops.

User response: If the problem persists, contact IBM Support.

IWNAF193I SUBTASK n INVALID REQUEST TO BUILD CCW

Explanation: An internal logic error was detected by the program logic.

System action: The program stops.

User response: If the problem persists, contact IBM Support.

IWNAF195I SUBTASK n FC PHASE2 INVALID EXTENT LENGTH FOR dev

Explanation: The extent length returned from device dev was different from that which the program expected.

System action: The program stops.

User response: Verify that you are using the latest level of FlashCopy Manager code. The microcode in the storage subsystem might be at a later level than that which the program supports.

IWNAF215I SUBTASK n SUBSYSTEM WITH DEVICE dev DOES NOT SUPPORT FC PHASE 2

Explanation: FlashCopy Manager detected that the subsystem that contains device number dev does not support FlashCopy Level 2.

System action: The program stops.

User response: If the device is one you wish to use, contact IBM Support to have the feature activated.

IWNAF216I SUBTASK n UNABLE TO READ FEATURES FOR dev

Explanation: FlashCopy Manager was unable to read the Feature Code data from device dev.

System action: The program stops.

User response: If the problem persists, contact IBM Support.

IWNAF600I FRZ DELAY = x.xxx seconds

Explanation: The elapsed time measured from the first call to AOM to run a FlashCopy Establish (with Freeze) to the last response received from AOM for the last

Establish (with Freeze) request. Time is measured in seconds.

System action: None.

User response: None.

IWNAF601I I/O DELAY = x.xxx seconds

Explanation: The elapsed time measured from the first call to AOM to run a FlashCopy Establish (with Freeze) to the last response received from AOM for the last Consistency Group Established I/O. Time is measured in seconds. This time is a measure of the maximum end user impact time for what is commonly referred to as the Freeze/Run process.

System action: None.

User response: None.

IWNAF604I LONGEST I/O devicenumber x.xxx seconds

Explanation: The device number and elapsed time that it took to do the I/O for the device that took the longest to complete the Establish or withdraw I/O. The device number is for the device that completed the I/O first with the longest time. Other devices might have taken the same amount of time but completed the I/O after. Time is measured in seconds. This message is issued when 'X' is an input parameter to the IWNAFC09 call. A message for each established device can be specified by adding the 'TRACE' parameter. See IWNAF903I. This time is a measure of the maximum end user impact time for what is commonly referred to as the Freeze/Run process.

System action: None.

User response: None.

IWNAF700I NO UCB FOUND FOR DEVICE NUMBER SPECIFIED IN INPUT

Explanation: FlashCopy processing attempted to locate the UCB for the device, but the UCB could not be found.

System action: The program stops.

User response: Check the device number that is specified in the FlashCopy CONFIG file and ensure it is a valid device as defined to the host system. Resubmit the FlashCopy job with a valid device number.

IWNAF701I PROGRAM: READ DEVICE CHARACTERISTICS FAILED

Explanation: FlashCopy processing attempted to read device characteristics from the device. The channel program for this request received a unit check.

System action: The program stops.

User response: Multiple conditions can cause this error. The device is defined to the host but cannot respond to the I/O request. Use the DEVSERV commands to check path and device status from the system console. Correct the conditions and resubmit the command. If this error recurs, research problem reporting databases for a resolution. If no problem resolution is found, contact IBM Support.

IWNAF702I CHANNEL PROGRAM: READ CONFIGURATION DATA FAILED

Explanation: FlashCopy processing attempted to read device configuration information from the subsystem for the specified device. The channel program for this request received a unit check.

System action: The program stops.

User response: Multiple conditions can cause this error. The device is defined to the host but cannot respond to the I/O request. Use the DEVSERV commands to check path and device status from the system console. Correct the conditions and resubmit the command. If this error recurs, research problem reporting databases for a resolution. If no problem resolution is found, contact IBM Support.

IWNAF703I CHANNEL PROGRAM: SENSE SUBSYSTEM STATUS FAILED

Explanation: FlashCopy processing attempted to read subsystem status information about the specified device. The channel program for this request received a unit check.

System action: The program stops.

User response: Multiple conditions can cause this error. The device is defined to the host but cannot respond to the I/O request. Use the DEVSERV commands to check path and device status from the system console. Correct the conditions and resubmit the command. If this error recurs, research problem reporting databases for a resolution. If no problem resolution is found, contact IBM Support.

IWNAF706I CHANNEL PROGRAM: READ CYLINDER BITMAP FAILED

Explanation: An error occurred when the program attempted to run a channel program that attempted to read the FlashCopy bitmap from the device. Refer to the IOS/DASD ERP messages issued to the system console for additional information.

System action: The program stops.

User response: Multiple conditions can cause this error. The device is defined to the host but cannot respond to the I/O request. Use the DEVSERV commands to check path and device status from the system console. Correct the conditions and resubmit the command. If this error recurs, research problem reporting databases for a resolution. If no problem

resolution is found, contact IBM Support.

IWNAF707I UNIT IS ALIAS DEVICE, SPECIFIED OPERATION NOT ALLOWED

Explanation: FlashCopy processing detected the specified device is a Parallel Access Volume (PAV) alias device. FlashCopy requests can only be issued to the PAV base device or non-PAV devices.

System action: The program stops.

User response: Ensure that the device specified is the correct device, and resubmit the job.

IWNAF708I UNIT IS NOT A VALID DEVICE TYPE FOR SPECIFIED OPERATION

Explanation: FlashCopy processing detected that the specified device is not a direct access storage device (DASD). FlashCopy requests can be issued only to DASD devices in IBM storage subsystems that support FlashCopy technology.

System action: The program stops.

User response: Ensure that the device specified is the correct device, and resubmit the job.

IWNAF709I UNIT DOES NOT SUPPORT FLASHCOPY OPERATIONS

Explanation: A FlashCopy request was made to the storage subsystem, but the storage subsystem reports that the FlashCopy function is inactive or not installed for this unit.

System action: The program stops.

User response: Verify that the source and target devices are correctly specified. Verify that the storage subsystem has the FlashCopy function installed and active.

IWNAF711I FLASHCOPY DEVICE IN UNDETERMINED STATUS

Explanation: A FlashCopy request detected that the device is in customer engineering (CE) mode or the device status is unknown.

System action: The program stops.

User response: This error is returned from the storage subsystem when the device is in CE mode, or the status is not known to the ESS. If the condition cannot be cleared, contact IBM hardware service and support.

IWNAF714I FLASHCOPY DEVICE HAS PINNED DATA

Explanation: The FlashCopy source or target volume has pinned data. The pinned data condition needs to be resolved before a FlashCopy relationship may be established.

System action: The program stops.

User response: The pinned data status must be cleared before the FlashCopy request may be completed. Use the DEVSERV command to obtain information about the device. If the condition cannot be cleared, contact IBM hardware service and support.

IWNAF715I FLASHCOPY TARGET IN PATH GROUP - ONLINE TARGET NOT ALLOWED

Explanation: A FlashCopy Establish request detected an active path group connection between the target device and a host system, and the ONLINTGT(YES) keyword was not specified.

System action: The program stops.

User response: The active path group connection to the target device is detected in the storage subsystem. This indicates the target device may possibly be online to some host system. The online status of the device must be checked from every host system with access to the target device. If the target device is offline to all attached host systems and the path group connection is still active, the ONLINTGT(YES) keyword may be added to the FlashCopy Establish request. The host system console command VARY OFFLINE may also reset the path group connection.

IWNAF720I ASYNCHRONOUS OPERATION MGR. REQUEST FAILED RTN: 04 REAS:rsn

Explanation: The asynchronous operations manager (AOM) detected an error while handling an I/O request from FlashCopy processing.

System action: The program stops.

User response: This is an internal error. If this error recurs, research problem reporting databases for a resolution. If no problem resolution is found, contact IBM Support. Additional AOM return and reason codes explanations may be found in the z/OS DFSMSdfp Diagnosis Reference.

IWNAF721I ASYNCHRONOUS OPERATION MGR. OPERATION FAILED RTN: 08 REAS:rsn

Explanation: The asynchronous operations manager (AOM) detected an error while handling an I/O request from FlashCopy processing.

System action: The program stops.

User response: This is an internal error. If this error recurs, research problem reporting databases for a resolution. If no problem resolution is found, contact IBM Support. Additional AOM return and reason codes explanations may be found in the z/OS DFSMSdfp Diagnosis Reference.

IWNAF722I ASYNCHRONOUS OPERATION MGR. INTERNAL ERROR RTN: 12 REAS: rsn

Explanation: The asynchronous operations manager (AOM) detected an error while handling an I/O request from FlashCopy processing.

System action: The program stops.

User response: This is an internal error. If this error recurs, research problem reporting databases for a problem resolution. If no problem resolution is found, contact IBM Support. Additional AOM return and reason codes explanations may be found in the z/OS DFSMSdfp Diagnosis Reference.

IWNAF730I REMOTE FLASHCOPY REQUIRES A PPRC PRIMARY

Explanation: An inband FlashCopy operation failed because the device to which the commands were sent was not a PPRC Primary device.

System action: The program stops.

User response: Verify that the device to which the I/O was done is the primary of a PPRC pair. The job used the devices defined in a CONFIG.REMOTE data set.

IWNAF731I NO PPRC PATHS AVAILABLE FOR REMOTE FLASHCOPY

Explanation: An inband FlashCopy operation failed because the device to which the commands were sent did not have active PPRC paths.

System action: The program stops.

User response: Verify that the device to which the I/O was done is the primary of a PPRC pair and that the PPRC paths were operational. The job has used devices defined in a CONFIG.REMOTE data set.

IWNAF732I PPRC COMMUNICATIONS TIMEOUT FOR REMOTE FLASHCOPY

Explanation: An inband FlashCopy operation failed because the device to which the commands were sent was not able to forward them on to the remote device because of a timeout condition on the PPRC path.

System action: The program stops.

User response: Verify that the device to which the I/O was done is the primary of a PPRC pair and that the PPRC paths were operational. The job has used devices defined in a CONFIG.REMOTE data set.

IWNAF740I FLASHCOPY ESTABLISH - FLASHCOPY ALREADY ACTIVE OR NO RESOURCES

Explanation: A FlashCopy Establish request detected that a specified device is in a FlashCopy relationship, or the internal storage subsystem processing detected insufficient resources to complete the Establish of the FlashCopy relationship. This message might be issued if one or both of the specified devices specified in a FlashCopy Version 2 Establish request are in an active FlashCopy Version 1 relationship.

System action: The program stops.

User response: The possible causes of this error are as follows: (a) one or both of the devices specified in a FlashCopy Version 2 Establish request is in an active FlashCopy Version 1 relationship, or (b) that another FlashCopy Establish for one or both of the specified devices completed just before this FlashCopy Establish was requested. Use the FCQUERY request to determine the status of the requested devices. If the devices are not in a FlashCopy relationship, this FlashCopy Establish request may be retried later, when storage subsystem resources may be available.

IWNAF741I FLASHCOPY ESTABLISH - ESS BATTERY NOT AVAILABLE OR INSTALLED

Explanation: A FlashCopy Establish request detected that the storage subsystem battery feature was inactive or not installed.

System action: The program stops.

User response: The storage subsystem battery feature must be installed and active before FlashCopy may be used. Contact IBM hardware service and support to correct the problem.

IWNAF742I FLASHCOPY VOLUMES DIFFERENT DEVICE TYPE OR TRACK SIZE/FORMAT

Explanation: The FlashCopy source and target volumes have different device types or track formats. An invalid device number was specified in the input data. FlashCopy Manager will not configure a FlashCopy relationship in this situation.

System action: The program stops.

User response: Modify the request to ensure the source and target device track size and format are the same, and rebuild the FlashCopy configuration and jobs. Resubmit the FlashCopy Establish job.

IWNAF743I FLASHCOPY TARGET DEVICE IN CONFLICT WITH COPY SERVICES STATUS

Explanation: A FlashCopy Establish request detected that the specified target device is an XRC Primary volume, a PPRC device (primary or secondary), or a Concurrent Copy source volume.

System action: The program stops.

User response: Use the TSO FCQUERY command to determine which copy service is active on the target device (XRC, PPRC, or CC). Make any necessary

changes or corrections and run the FlashCopy Establish job again.

IWNAF744I FLASHCOPY FEATURE NOT INSTALLED OR ACTIVE

Explanation: The FlashCopy feature is not installed or not activated. Check the storage subsystem status to determine which condition exists.

System action: The program stops.

User response: Ensure that the storage subsystem has the Level 2 FlashCopy feature installed and active. Users might need to contact IBM Support or an IBM hardware service representative for assistance to resolve the problem.

IWNAF746I FLASHCOPY TARGET IN USE BY OTHER COPY OPERATION

Explanation: The target device is being used in a copy services function that does not allow it to be used as a FlashCopy target.

System action: The program stops.

User response: The storage subsystem gives this error when the specified target device is in use by another outboard copy operation (such as an XRC secondary or in use by TDMF). Verify that the target device is correctly specified and not in use by another outboard copy operation. Reissue the FlashCopy command.

IWNAF747I FLASHCOPY ESTABLISH RESOURCE SHORTAGE

Explanation: The operation failed due to a resource shortage in the storage subsystem.

System action: The program stops.

User response: The storage subsystem stopped the I/O operation due to internal resource conditions. Run the job again; if it fails to complete successfully, contact IBM Support.

IWNAF750I FLASHCOPY ESTABLISH DEVICE AT MAXIMUM FLASHCOPY RELATIONSHIPS

Explanation: A FlashCopy Establish request failed for a device that is specified on the request. The maximum number of active FlashCopy relationships has been reached for the source device.

System action: The program stops.

User response: Use the FlashCopy query request to determine the current status of the source and target devices that are specified on the FlashCopy Establish request. Refer to z/OS DFSMS Advanced Copy Services for examples of FlashCopy query output. Resubmit the FlashCopy Establish request when the FlashCopy output for the device indicates that the maximum number of active relationships for the device are no longer being used. If the failure persists, contact IBM Support.

IWNAF751I FLASHCOPY ESTABLISH MAXIMUM SOURCE RELATIONSHIPS ARE ACTIVE

Explanation: A FlashCopy Establish request failed for a source track because the maximum number of FlashCopy relationships has been reached for one or more tracks contained within the extents that are specified on the request.

System action: The program stops.

User response: Use the FlashCopy query request to determine the status of the source device that is specified on the FlashCopy Establish request. Refer to z/OS DFSMS Advanced Copy Services for examples of FlashCopy query output. The FlashCopy query output does not provide information on a track basis, but you might be able to make this determination based on the extents you specified on the Establish request. If the request continues to fail, contact IBM Support.

IWNAF752I FC TARGET RELATIONSHIP DETECTED ON SOURCE nnnn, SX= ppxxcccc

Explanation: One or more of the tracks on the specified FlashCopy source device is a target track of some other FlashCopy relationship. nnnn is the device number of the source device that contains the unexpected target track. The SX= string provides information on the FlashCopy source device for the relationship that has target tracks on device nnnn. pp is identifies the LSS that contains the source device and xx identifies the device within LSS pp. The cccc data contain the flag bytes that describe the relationship. The flag bytes are provided to assist IBM service and support.

System action: The program stops.

User response: Decode the LSS and device number values in the SX= data to determine the source device for the FlashCopy target tracks that are preventing the new FlashCopy relationship from being established. Withdraw the FlashCopy relationship that is causing the problem and resubmit the failing JOB.

IWNAF760I FLASHCOPY WITHDRAW MAXIMUM DEVICE RELATIONSHIPS ARE ACTIVE

Explanation: The maximum number of FlashCopy relationships are active.

System action: The program stops.

User response: Concurrent attempts were made to withdraw too many relationships simultaneously. Resubmit the job.

IWNAF765I FLASHCOPY ESTABLISH TARGET TRACK IS AN ACTIVE TARGET TRACK

Explanation: A FlashCopy Establish request failed because one or more target tracks contained within the extents specified was found to already be a target track in a FlashCopy relationship.

System action: The program stops.

User response: Use the FlashCopy query request to determine the status of the target device specified on the FlashCopy Establish request. Refer to z/OS DFSMS Advanced Copy Services for examples of FlashCopy query output. The FlashCopy query output does not provide information on a track basis, but you may be able to make this determination based on the extents specified upon the Establish request. This message can be also received if an Establish request is completed by the storage subsystem after the missing interrupt handler processing has been initiated. Resubmit the request. If the failure persists, contact IBM Support.

IWNAF766I FLASHCOPY ESTABLISH TARGET TRACK IS AN ACTIVE SOURCE TRACK

Explanation: A FlashCopy Establish request failed because one or more target tracks contained within the extents specified was found to already be a source track in a FlashCopy relationship.

System action: The program stops.

User response: Use the FlashCopy query request to determine the status of the target device that is specified on the FlashCopy Establish request. Refer to z/OS DFSMS Advanced Copy Services for examples of FlashCopy query output. The FlashCopy query output does not provide information on a track basis, but one might be able to make this determination based on the extents you specified on the Establish request. Resubmit the request. If the failure persists, contact IBM Support.

IWNAF790I FLASHCOPY OPERATION ERROR. MSG FRMT: 0, MSG NMBR: F, REAS: rsn

Explanation: The storage subsystem detected an internal error while processing the FlashCopy request. The request was not completed.

System action: The program stops.

User response: This error is caused typically by existing conditions or states in the subsystem. If the problem recurs, research problem reporting databases for a resolution. If no problem resolution is found, contact IBM Support. An unformatted GTF I/O trace on the specified device as the problem occurs may be required for subsequent analysis and problem determination.

Note: The reasons for the internal error may be user correctable. The following list is representative of some of these errors and descriptions of the errors:

MSG FRMT = _, MSG NMBR = F, REAS: 56
FlashCopy request specified a volume that has pinned data. Correct the pinned data situation. Resubmit the FlashCopy request.

MSG FRMT = _, MSG NMBR = F, REAS: 60
The target device for a FlashCopy request is in a path group status. This implies the device is online to a host system (not necessarily to the host issuing this FlashCopy request). Ensure that the target device is offline to all systems, or specify the ONLINTGT(YES) parameter.

MSG FRMT = _, MSG NMBR = F, REAS: 82
The subsystem has insufficient resources or too many FlashCopy relationships to complete this FlashCopy request. Resubmit the request when the condition is corrected or the constraint is relieved.

MSG FRMT = _, MSG NMBR = F, REAS: 84
The FlashCopy request specified devices that are not in the same logical storage subsystem, or the devices are not the same size and format.

IWNAF799I AOM DETECTED I/O ERROR, MSG FRMT = f, MSG NMBR= n, REAS: rsn

Explanation: The asynchronous operations manager (AOM) detected an error while handling an I/O request from FlashCopy processing. The message format *f*, the message number *n*, and the reason rsn are taken from the sense bytes obtained after the error.

System action: The program stops.

User response: This is an internal error. If this error recurs, research problem reporting databases for a resolution. If no problem resolution is found, contact IBM Support.

IWNAF800I EXEC PARM MISSING

Explanation: The required parameter data is missing.

System action: The program is stopped.

User response: Correct the parameter list and run the job again.

IWNAF801I DEVICE ADDRESS ERROR IN 'UCB=(' PARM, COMMA MISSING OR MISPLACED

Explanation: The parameter string contains a syntax error.

System action: The program is stopped.

User response: Correct the parameter list and run the job again.

IWNAF802I NUMBER DEVICES ERROR IN 'UCB=(' PARM, PAREN MISSING OR MISPLACED

Explanation: The parameter string contains a syntax error.

System action: The program is stopped.

User response: Correct the parameter list and run the job again.

IWNAF803I DEVICES ERROR IN 'UCB=(' PARM, VALUE NOT NUMERIC

Explanation: The parameter string contains a syntax error.

System action: The program is stopped.

User response: Correct the parameter list and run the job again.

IWNAF804I UCB ADDRESS COULD NOT BE FOUND BY UCBLOOK SYSTEM SERVICES

Explanation: A device in the requested address range is not in the IO configuration for the system.

System action: The program is stopped.

User response: Correct the parameter list and run the job again.

IWNAF805I ADDRESS RANGE TRUNCATED

Explanation: The computed device number for some device in requested range exceeded 65535. As a result, the number of devices processed will be less than the number of devices specified in the parameter list.

System action: None.

User response: The program will complete with RC=4. Data for all devices up to the limit will be included in the output.

IWNAF903I IWNAFC19 SUBTASK subtask_number device_number x.xxx SECONDS

Explanation: This is a trace debug message issued when 'TRACE' is specified as a parameter in an IWNAFC09 call. An individual message is issued for each established device giving the length in seconds that the FlashCopy establish took for this device.

System action: None.

User response: None.

IWNAF999I pgm STARTING

Explanation: Used to identify the program (pgm) that is starting.

System action: None.

User response: None.

IWNRF001W WARNING. Possible DEVICE error detected. The length of the FlashCopy SOURCE|TARGET device dev-addr must be 4 or 5 digits.

Explanation: The FlashCopy SOURCE or TARGET device specified by the user has an invalid length. The device length must be either 4 or 5 digits. Devices that are specified as 5 digits must include a valid subchannel in position 1, followed by the 4-digit device number. Valid subchannels are 0, 1, and 2. Specifying a 4-digit device is allowed. If the user specifies the device as a 4-digit entity, the (device) subchannel will default to 0.

System action: ISPF edit fails with RC=8.

User response: Return to the ISFP edit session and specify the FlashCopy SOURCE or TARGET device(s) with 5 digits (1-digit subchannel + 4-digit device number) or 4 digits (4-digit device number). Devices specified with 4 digits will have a (default) subchannel of 0.

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Glossary

A glossary is available with terms and definitions for the IBM Copy Services Manager product.

You can view the glossary in the reference section of the IBM Copy Services Manager online product documentation (http://www-01.ibm.com/support/knowledgecenter/SSESK4).

To view glossaries for other IBM products, see http://www.ibm.com/software/globalization/terminology/.

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