



PCMCIA Disk Mirroring

This feature module describes the PCMCIA Disk Mirroring feature in Cisco IOS Release 12.1(5)DB, and includes the following sections:

- [Feature Overview, page 1](#)
- [Supported Platforms, page 3](#)
- [Supported Standards, MIBs, and RFCs, page 3](#)
- [Prerequisites, page 3](#)
- [Configuration Tasks, page 3](#)
- [Monitoring and Maintaining PCMCIA Disk Mirroring, page 9](#)
- [Command Reference, page 9](#)
- [Debug Commands, page 16](#)
- [Glossary, page 18](#)

Feature Overview

The PCMCIA Disk Mirroring feature enables automatic data synchronization between the PCMCIA disks of two redundant Cisco 6400 node switch processors (NSPs). Disk synchronization is the act of copying data from one disk to another.

When PCMCIA disk mirroring is enabled, as it is by default, disk synchronization is initiated each time that:

- The primary or secondary NSP boots or reloads.
- The secondary NSP is inserted into the Cisco 6400 chassis.
- A PCMCIA disk is inserted into disk slot 0 of the primary or secondary NSP.
- The PCMCIA disk in disk slot 0 of either NSP is formatted.
- A command is entered to:
 - Re-enable disk mirroring (**mirror**).
 - Explicitly initiate disk synchronization (**redundancy sync**).
 - Modify or reorganize the files on the disks (**copy, rename, delete, mkdir, format**).

Benefits

Complete NSP Redundancy for the NRP-2

The Cisco 6400 node route processor 2 (NRP-2) module has no local image or file storage. The NSP stores the following NRP-2 files on the PCMCIA disk installed in disk slot 0 (disk0:):

- Software images
- Startup configurations
- ROM state information
- Crash information

Without disk mirroring, there is no guarantee of NRP-2 support after an NSP failover (user intervention may be required to restore the NRP-2 to the state prior to the failover). With disk mirroring, the NRP-2 has continuous support from the NSP, except during the relatively short NSP failover period.

New Labels for Pairs of Mirrored Disks

The “**sec-**” command-line interface (CLI) prefix was introduced with redundancy support to refer to the secondary device. Examples include:

- **sec-disk0**—Secondary NSP’s PCMCIA disk in disk slot 0
- **sec-disk1**—Secondary NSP’s PCMCIA disk in disk slot 1
- **sec-bootflash**—Secondary NSP’s bootflash memory

Similarly, disk mirroring introduces the “**mir-**” CLI prefix to refer to the PCMCIA disks in both NSPs:

- **mir-disk0**—PCMCIA disks in disk slot 0 of both NSPs
- **mir-disk1**—PCMCIA disks in disk slot 1 of both NSPs

The new **mir-disk0** and **mir-disk1** labels enable you to perform any integrated file system (IFS) operations (such as **copy**, **rename**, and **delete**) on the same file on both the primary and secondary disks.

Restrictions

- If an NSP failover occurs during disk synchronization, the file that is being copied is deleted from the receiving disk, instead of only partially copied. This means that the file is no longer available to the NRP-2. The amount of time it takes to complete disk synchronization varies for each system, but depends on the number and sizes of files being copied.
- This feature does not support disk mirroring (automatic data synchronization between a pair of disks) between:

- Two disks on a single NSP
- Two disks with mismatched slot numbers (disk0: and disk1:)

You can, however, initiate disk synchronization between disk0: and disk1: on the active NSP, even in a single-NSP system.

Related Features and Technologies

The Cisco 6400 NRP-2, introduced in Cisco IOS Release 12.1(4)DC, relies on PCMCIA disk mirroring for full NSP redundancy. For more information on the NRP-2, see the *NRP-2* feature module.

Related Documents

- *Cisco 6400 Software Configuration Guide*
- *NRP-2* feature module

Supported Platforms

- Cisco 6400 NSP

Supported Standards, MIBs, and RFCs

None

Prerequisites

- Disk mirroring requires a dual-NSP (redundant) system. For more information on NSP redundancy, see the “Configuring Redundancy” section of the “Configuring System Features” chapter of the *Cisco 6400 Software Configuration Guide*.
- Disk mirroring only works for PCMCIA disks that are in matching disk slots of the redundant NSPs (disk0: or disk1:, not one of each).
- Cisco recommends that you use PCMCIA disks of the same memory capacity.

**Note**

Disk synchronization can be initiated between disk0: and disk1: of the active NSP, even in a single-NSP system.

Configuration Tasks

See the following sections for configuration tasks for the PCMCIA Disk Mirroring feature. All of the tasks are optional.

- [Disabling PCMCIA Disk Mirroring](#)
- [Enabling PCMCIA Disk Mirroring](#)
- [Specifying the File Size Threshold](#)
- [Specifying to Copy All Files Blindly](#)
- [Initiating PCMCIA Disk Synchronization](#)
- [Performing Mirrored IFS Operations](#)

Disabling PCMCIA Disk Mirroring

Disk mirroring is enabled by default. To disable disk mirroring, complete the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	Switch(config)# redundancy	Enters redundancy configuration mode.
Step 2	Switch(config-r)# main-cpu	Enters main-cpu configuration mode.
Step 3	Switch(config-r-mc)# no mirror	Disables data synchronization between the NSP PCMCIA disks.

Example

In the following example, PCMCIA disk mirroring is disabled:

```
!
redundancy
main-cpu
  auto-sync standard
  no mirror
!
```

Verifying that Disk Mirroring is Disabled

To verify that disk mirroring is disabled, use the **show redundancy sync-status EXEC** command:

```
Switch# show redundancy sync-status
→ Disk Mirror is disabled in configuration
Peer Secondary NSP is present
disk1 or sec-disk1 is wrong or missing

Switch#
```

Enabling PCMCIA Disk Mirroring

If disk mirroring is disabled, and you want to re-enable it, complete the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	Switch(config)# redundancy	Enters redundancy configuration mode.
Step 2	Switch(config-r)# main-cpu	Enters main-cpu configuration mode.
Step 3	Switch(config-r-mc)# mirror	Enables data synchronization between the NSP PCMCIA disks.

Example

In the following example, PCMCIA disk mirroring is enabled:

```
!
redundancy
  main-cpu
    auto-sync standard

  mirror
!
```

Verifying that Disk Mirroring is Enabled

To verify that disk mirroring is enabled, complete one or both of the following steps:

- Step 1** Use the **show redundancy sync-status EXEC** command to check that disk mirroring is enabled:

```
Switch# show redundancy sync-status
→ Disk Mirror is enabled in configuration:proper sync
(Mirror threshold is 0 MB:smaller files will be copied blindly)

Peer Secondary NSP is present
disk1 or sec-disk1 is wrong or missing

mir-disk0 (disk0 -> sec-disk0):in sync.
mir-disk1 (disk1 -> sec-disk1):out of sync.

Switch#
```

- Step 2** Use the **dir** command to verify matching file names and file sizes on the mirrored PCMCIA disks.

```
Switch# dir disk0:
Switch# dir sec-disk0:

Switch# dir disk1:
Switch# dir sec-disk1:
```

Specifying the File Size Threshold

By default, when performing disk synchronization (either through disk mirroring or user initiation), the system compares files between the PCMCIA disks. The system does not copy files with matching file names, sizes, and time stamps. You can, however specify a file size threshold below which files are copied without comparison.

To specify the file size threshold, complete the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	Switch(config)# redundancy	Enters redundancy configuration mode.
Step 2	Switch(config-r)# main-cpu	Enters main-cpu configuration mode.
Step 3	Switch(config-r-mc)# mirror threshold <i>size</i>	Specifies the file size threshold below which files are copied without comparison.

Example

In the following example, PCMCIA disk mirroring is enabled with a specified files size threshold of 2 MB:

```
!
redundancy
  main-cpu
    auto-sync standard

  mirror threshold 2
!
```

Verifying the File Size Threshold

To verify the file size threshold, use the **show redundancy sync-status EXEC** command to check the “Mirror threshold” field:

```
Switch# show redundancy sync-status
Disk Mirror is enabled in configuration:proper sync
→ (Mirror threshold is 2 MB:smaller files will be copied blindly)

Peer Secondary NSP is present
disk1 or sec-disk1 is wrong or missing

mir-disk0 (disk0 -> sec-disk0):out of sync.
mir-disk1 (disk1 -> sec-disk1):out of sync.

Disk Mirror full sync is in progress (disk0 to sec-disk0, 23%)

Switch#
```

Specifying to Copy All Files Blindly

Instead of specifying a file size threshold below which files are copied without comparison, you can choose to copy *all* files blindly (without comparing sizes or time stamps).

To copy all files blindly, complete the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	Switch(config)# redundancy	Enters redundancy configuration mode.
Step 2	Switch(config-r)# main-cpu	Enters main-cpu configuration mode.
Step 3	Switch(config-r-mc)# mirror all	Specifies to copy all files blindly when performing disk synchronization.

Example

In the following example, PCMCIA disk mirroring is enabled and set to copy all files blindly:

```
!
redundancy
  main-cpu
    auto-sync standard

  mirror all
!
```

Verifying Blind Copying

To verify blind copying, use the **show redundancy sync-status EXEC** command to check the configured synchronization type. The first line displayed should end with “full sync” instead of “proper sync.”

```
Switch# show redundancy sync-status
→ Disk Mirror is enabled in configuration:full sync
   (Mirror threshold is 0 MB:smaller files will be copied blindly)

Peer Secondary NSP is present
disk1 or sec-disk1 is wrong or missing

mir-disk0 (disk0 -> sec-disk0):out of sync.
mir-disk1 (disk1 -> sec-disk1):out of sync.

Disk Mirror full sync is in progress (disk0 to sec-disk0, 23%)

Switch#
```

Initiating PCMCIA Disk Synchronization

Disk synchronization copies the data from one PCMCIA disk to another. To initiate disk synchronization, use one of the following commands in global configuration mode:

Command	Purpose
Switch# redundancy sync disk0 [all] ¹	Copies data from disk0: ² of the primary NSP to disk0: of the secondary NSP.
Switch# redundancy sync disk1 [all]	Copies data from disk1: ³ of the primary NSP to disk1: of the secondary NSP.
Switch# redundancy sync disk0 reverse [all]	Copies data from disk0: of the secondary NSP to disk0: of the primary NSP.
Switch# redundancy sync disk1 reverse [all]	Copies data from disk1: of the secondary NSP to disk1: of the primary NSP.
Switch# redundancy sync local [all]	Copies data from disk0: of the primary NSP to disk1: of the primary NSP. Can be used with single-NSP systems.

1. Optional **all** keyword specifies to copy all files blindly (without comparing file sizes and time stamps).
2. disk0: = PCMCIA disk in NSP disk slot 0
3. disk1: = PCMCIA disk in NSP disk slot 1

Example—Disk Synchronization

```
Switch# redundancy sync disk0

00:29:52:%DISKMIRROR-6-PROGRS:Disk Sync in Progress (disk0 to sec-disk0, 0%)
Switch#
```

Example—Reverse Disk Synchronization

```
Switch# redundancy sync disk0 reverse

00:32:13:%DISKMIRROR-6-PROGRS:Disk Sync in Progress (sec-disk0 to disk0, 0%)
Switch#
```

Example—Local Disk Synchronization

```
Switch# redundancy sync local
```

```
00:32:13:%DISKMIRROR-6-PROGRS:Disk Sync in Progress (disk0 to disk1, 0%)
Switch#
```

Verifying Disk Synchronization

To verify disk synchronization, complete one or both of the following steps:

- Step 1** Use the **show redundancy sync-status EXEC** command to check that the disk content is synchronized:

```
Switch# show redundancy sync-status
Disk Mirror is enabled in configuration:proper sync
(Mirror threshold is 0 MB:smaller files will be copied blindly)

Peer Secondary NSP is present
disk1 or sec-disk1 is wrong or missing
```

- mir-disk0(disk0/sec-disk0):in sync.
mir-disk1(disk1/sec-disk1):out of sync.

- Step 2** Use the **dir** command to verify matching file names and file sizes on the mirrored PCMCIA disks.

```
Switch# dir disk0:
Switch# dir sec-disk0:
```

```
Switch# dir disk1:
Switch# dir sec-disk1:
```

Performing Mirrored IFS Operations

When disk mirroring is enabled and disk synchronization is complete, avoid performing IFS operations (such as **copy**, **rename**, and **delete**) using the labels **disk0:**, **disk1:**, **sec-disk0:**, or **sec-disk1:**. Modifying a file using these labels can break disk synchronization without affecting the output of the **show redundancy sync-status EXEC** command. In other words, the **show redundancy sync-status** command output can declare disks to be “in sync,” even after disk synchronization is broken using the improper labels.

Because the **dir** command does not *modify* any files, you can use the **dir** command with the **disk0:**, **disk1:**, **sec-disk0:**, or **sec-disk1:** labels at any time to check disk contents, as shown in the previous sections.

Cisco recommends that you perform *mirrored* IFS operations by using the labels **mir-disk0:** and **mir-disk1:**. These new labels target the PCMCIA disks in the specified slot of both NSPs, and ensure that the files affected by the IFS operations are still mirrored.

**Note**

If you want to save a file on only one PCMCIA disk and not have that file mirrored, use the **[sec-]disk0:/non-mirror** or **[sec-]disk1:/non-mirror** directory.

Examples

The following examples show mirrored IFS operations:

```
Switch# copy tftp://10.1.1.1/test-config mir-disk0:test-config
Switch# rename mir-disk0:test-config mir-disk0:test-config1
Switch# delete mir-disk0:test-config1
```

The following example shows an intentional nonmirrored IFS operation:

```
Switch# copy tftp://10.1.1.1/test-config2 sec-disk0:/non-mirror/test-config2
```

Troubleshooting Tips

Use the **debug disk-mirror EXEC** command to display debug messages for IFS call events, disk write events, and disk synchronization events.

Monitoring and Maintaining PCMCIA Disk Mirroring

Use the **show redundancy sync-status EXEC** command to display all status information on disk mirroring and synchronization.

Command Reference

This section documents new commands. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

- [mirror](#)
- [redundancy sync](#)
- [show redundancy sync-status](#)

mirror

To enable PCMCIA disk mirroring or specify mirroring characteristics, use the **mirror** main-cpu configuration command. To disable PCMCIA disk mirroring, use the **no** form of this command.

mirror [**all** | **threshold** *size*]

no mirror

Syntax Description	all	(Optional) Specifies that all files will be mirrored blindly (without comparing file names, sizes, and time stamps).
	threshold	(Optional) Specifies to blindly copy files smaller than the file size threshold.
	<i>size</i>	(Optional) Threshold size in megabytes (MB).

Defaults Enabled with file threshold size of 0 MB

Command Modes Main-cpu configuration

Command History	Release	Modification
	12.1(5)DB	This command was introduced on the Cisco 6400 NSP.

Usage Guidelines When you enter the **no mirror** command, any mirroring characteristics that were previously specified with the **all** and **threshold** keywords are permanently removed.

If disk synchronization is in progress when you enter the **no mirror** command, a prompt warns you that disk synchronization will terminate. You can either proceed with or cancel your disable request.

Press **Return** to proceed with disabling disk mirroring and terminating the unfinished disk synchronization:

```
Switch(config-r-mc)# no mirror
```

```
→ Disk synch will terminate. Proceed with disable? [confirm] <Cr>
Switch(config-r-mc)#
21:35:19:%DISKMIRROR-6-FINISH:Disk Sync Finished (0 files synced; 6 failed)
Switch(config-r-mc)#
```

Type **no** to cancel the **no mirror** command and to allow disk synchronization to continue:

```
Switch(config-r-mc)# no mirror
```

```
→ Disk synch will terminate. Proceed with disable? [confirm] no
Switch(config-r-mc)#
```

Examples

In the following example, PCMCIA disk mirroring is disabled:

```
!
redundancy
main-cpu
  auto-sync standard
→ no mirror
!
```

In the following example, PCMCIA disk mirroring is enabled and set to copy all files blindly:

```
!
redundancy
main-cpu
  auto-sync standard

  mirror all
!
```

In the following example, PCMCIA disk mirroring is enabled with a specified files size threshold of 2 MB:

```
!
redundancy
main-cpu
  auto-sync standard

  mirror threshold 2
!
```

Related Commands

Command	Description
redundancy sync	Copies the data from one PCMCIA disk to its mirror disk.
show redundancy sync-status	Displays status of disk mirroring and disk synchronization.

redundancy sync

To initiate disk synchronization, or copy the data from one PCMCIA disk to another, use the **redundancy sync** EXEC command.

redundancy sync [**disk0** | **disk1** | **local**] [**reverse**] [**all**]

Syntax Description

disk0	Specifies the PCMCIA disks in slot 0 of the redundant NSPs.
disk1	Specifies the PCMCIA disks in slot 1 of the redundant NSPs.
local	Copies data from disk0: to disk1: in the primary NSP.
reverse	Specifies reverse synchronization (copies data from the secondary NSP to the primary NSP).
all	Specifies to copy all files blindly (without comparing file names, sizes, and time stamps)

Defaults

With no keywords entered, this command copies data from disk0: of the primary NSP to disk0: of the secondary NSP. The system compares files between the PCMCIA disks and does not copy files with matching file names, sizes, and time stamps.

Command Modes

EXEC

Command History

Release	Modification
12.1(5)DB	This command was introduced on the Cisco 6400 NSP.

Usage Guidelines

By default, when performing disk synchronization (either through disk mirroring or user initiation), the system compares files between the PCMCIA disks. The system does not copy files with matching file names, sizes, and time stamps. The **all** keyword specifies to copy all files without comparison.

Without the **all** keyword, and if the **mirror** main-cpu configuration command is configured with a file threshold size, only files smaller than the threshold will be copied without comparison.

Examples

The following example demonstrates PCMCIA disk synchronization:

```
Switch# redundancy sync disk0

00:29:52:%DISKMIRROR-6-PROGRS:Disk Sync in Progress (disk0 to sec-disk0, 0%)
Switch#
```

The following example demonstrates reverse disk synchronization:

```
Switch# redundancy sync disk0 reverse

00:32:13:%DISKMIRROR-6-PROGRS:Disk Sync in Progress (sec-disk0 to disk0, 0%)
Switch#
```

The following example demonstrates local disk synchronization:

```
Switch# redundancy sync local
```

```
00:32:13:%DISKMIRROR-6-PROGRS:Disk Sync in Progress (disk0 to disk1, 0%)  
Switch#
```

Related Commands

Command	Description
mirror	Enables PCMCIA disk mirroring.
show redundancy sync-status	Displays status of disk mirroring and disk synchronization.

show redundancy sync-status

To display the status of PCMCIA disk mirroring and synchronization type, use the **show redundancy sync-status EXEC** command.

show redundancy sync-status

Syntax Description This command has no keywords or arguments.

Defaults No default behavior or values.

Command Modes EXEC

Command History	Release	Modification
	12.1(5)DB	This command was introduced on the Cisco 6400 NSP.

Usage Guidelines The command output displays several lines:

Line Number (from top)	Description of Output
1	Displays disk mirroring status (enabled or disabled). Also displays whether disk mirroring is configured to copy all files blindly (full sync), or compares file names, sizes, and time stamps before synchronizing data (proper sync).
2	Displays the file threshold size (0 MB is the default) configured with the mirror command.
3	Displays whether or not the secondary NSP is in the chassis.
4	Displays whether or not a PCMCIA disk is missing from disk slot 1 of the primary or secondary NSP.
5	Displays whether or not the disks in slot 0 are synchronized between the primary and secondary NSP.
6	Displays whether or not the disks in slot 1 are synchronized between the primary and secondary NSP.
7	Only appears while synchronization is in progress. Identifies which disks are being synchronized, and what percentage of the synchronization is complete.

Examples

The following example shows that disk mirroring is enabled and that disk synchronization is in progress:

```

→ Switch# show redundancy sync-status
Disk Mirror is enabled in configuration:proper sync
(Mirror threshold is 0 MB:smaller files will be copied blindly)

Peer Secondary NSP is present
disk1 or sec-disk1 is wrong or missing

mir-disk0 (disk0 -> sec-disk0):out of sync.
mir-disk1 (disk1 -> sec-disk1):out of sync.

→ Disk Mirror full sync is in progress (disk0 to sec-disk0, 23%)

Switch#

```

The following example shows that disk mirroring is enabled and that the PCMCIA disks in slot 0 of the NSPs are synchronized.

```

Switch# show redundancy sync-status
Disk Mirror is enabled in configuration:proper sync
(Mirror threshold is 0 MB:smaller files will be copied blindly)

Peer Secondary NSP is present
disk1 or sec-disk1 is wrong or missing

→ mir-disk0 (disk0 -> sec-disk0):in sync.
mir-disk1 (disk1 -> sec-disk1):out of sync.

Switch#

```

Related Commands

Command	Description
mirror	Enables PCMCIA disk mirroring.
redundancy sync	Copies the data from one PCMCIA disk to its mirror disk.

Debug Commands

This section documents the new **debug** command related to the PCMCIA Disk Mirroring feature.

- [debug disk-mirror](#)

debug disk-mirror

To display debug messages for IFS call events, disk write events, and disk synchronization events, use the **debug disk-mirror** EXEC command. To disable debugging output, use the **no** form of this command.

debug disk-mirror

no debug disk-mirror

Syntax Description This command has no keywords or arguments.

Defaults Disabled

Command History	Release	Modification
	12.1(5)DB	This command was introduced on the Cisco 6400 NSP.

Examples The following example shows how to enable debugging for disk mirroring. The example also shows the messages that appear when copying a file to the PCMCIA disks in disk slot 0 of both NSPs:

```
Switch# debug disk-mirror

NSP DISK MIRROR debugging is on
Switch# copy running-config mir-disk0:
...
21:38:06:DISK-MIRROR:enter mfs_open()...
21:38:06:DISK-MIRROR:leave mfs_open()
...
21:38:06:DISK-MIRROR:enter mfs_write()...
21:38:06:DISK-MIRROR:leave mfs_write()
...
21:38:06:DISK-MIRROR:enter mfs_close()...
21:38:06:DISK-MIRROR:leave mfs_close()
```

Glossary

IFS—integrated file system, such as PCMCIA disks, TFTP, FTP, or rcp servers.

NSP—node switch processor. One of the component modules used in the Cisco 6400. This module is responsible for all ATM switching and control functions within the Cisco 6400.

NRP—node route processor. One of the component modules used in the Cisco 6400. This module is the Layer 3 element for the Cisco 6400 responsible for implementing the routing function.

NRP-1—Node route processor that incorporates a 100-Mbps Fast Ethernet interface for connecting into an IP network and has processing capability for OC-3 rate of user traffic. Compare with NRP-2.

NRP-2—Node route processor that provides a Gigabit Ethernet interface and sufficient processing capability for handling OC-12 rate of user traffic. Compare with NRP-1.

PCMCIA—Personal Computer Memory Card International Association. Refers to a standard used for credit-card sized computer peripherals. Type I devices are very thin memory cards. Type 2 devices include most modems and interfaces, and Type 3 devices are used for disk drives and thicker components.