RPR+ on Cisco 7500 Series Routers

Feature History

12.0(19)ST1	This feature was introduced.
12.0(22)S	This feature was integrated into Cisco IOS Release 12.0(22)S.
12.2(14)S	This feature was integrated into Cisco IOS Release 12.2(14)S.

This document describes the Route Processor Redundancy Plus (RPR+) feature on Cisco 7500 series routers in and includes the following sections:

- Feature Overview, page 2
- Supported Platforms, page 3
- Supported Standards, MIBs, and RFCs, page 4
- Prerequisites, page 4
- Configuration Tasks, page 4
- Configuration Examples, page 8
- Command Reference, page 10
- Glossary, page 14

Feature Overview

The RPR+ feature is an enhancement of the RPR feature on Cisco 7500 series routers. RPR+ keeps the Virtual Interface Processors (VIPs) from being reset and reloaded when a switchover occurs between the active and standby route switch processors (RSPs).

Switchover Times

Whenever an RPR+ switchover occurs, the RSP will not completely be booted up and configured in its new state for approximately 11 minutes. The actual time of the switchover is dependant upon configuration and various other factors, and will take at least 5 minutes and 30 seconds in the best possible switchover scenario.

The following table provides some rough estimates regarding the time required to switch a new packet and total switchover time for various high availability features:

Feature	Time to Immediately Switch a Packet on New RSP After Failover	Expected Overall Time to Have New RSP in New High Availability State After Failover	Notes
High System Availability (HSA)	10 minutes	20 minutes	System default.
RPR	5 minutes	15 minutes	VIPs and legacy interface processors supported.
RPR+	30 seconds	11 minutes	VIPs supported.[1]
Stateful Switchover	7 seconds	7 minutes	

1. Legacy interface processors default to RPR. A message similar to the following is displayed during switchover:

```
%HA-2-NO_Quiesce: Slot 11 did not quiesce, it will be disabled and then reloaded.
```

Benefits

- RPR+ reduces the amount of unplanned downtime of a Cisco 7500 series router by enabling a faster switchover time to the standby RSP.
- RPR+ is an enhancement of RPR. Switchover time to begin switching packets with RPR+ is reduced to 30 seconds.

Restrictions

- RPR+ operates only in a system with VIPs as the line cards. Systems with legacy interface processors default to RPR.
- In RPR+ mode, configuration changes done through Simple Network Management Protocol (SNMP) may not be automatically configured on the standby RP after a switchover occurs.
- In Cisco IOS Release 12.2(14)S, RPR+ does not work on routers configured with MPLS. However, in Cisco IOS Release 12.0(22)S, RPR+ works on routers configured with MPLS.

Related Features and Technologies

- Route Processor Redundancy (RPR)
- Fast Software Upgrade (FSU)
- Single Line Card Reload (SLCR)

Related Documents

- *Cisco IOS Configuration Fundamentals Configuration Guide, Release 12.2*
- *Cisco IOS Configuration Fundamentals Command Reference, Release 12.2*
- *Cisco 7500 Single Line Card Reload*
- *Route Processor Redundancy and Fast Software Upgrade on Cisco 7500 Series Routers*

Supported Platforms

- Cisco 7507
- Cisco 7513

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

http://www.cisco.com/go/fn

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by this feature.

MIBs

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

http://tools.cisco.com/ITDIT/MIBS/servlet/index

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

http://www.cisco.com/register

RFCs

None

Prerequisites

RPR+ requires a Cisco 7500 series router loaded with two RSP8s or a combination of RSP2s and RSP4s.

Configuration Tasks

See the following sections for the configuration tasks for this feature. Each task in the list is identified as either required or optional.

- Copying an Image onto an RSP, page 5 (required)
- Setting the Config-Register Boot Variable, page 6 (optional)
- Configuring RPR+, page 7 (required)
- Verifying RPR+, page 8 (optional)

Copying an Image onto an RSP

Use TFTP to copy a high availability Cisco IOS image onto the active and standby RSPs:

	Command	Purpose
Step 1	`Router# copy tftp slot`*slot-number*`:`	Uses TFTP to copy a high availability Cisco IOS image onto the Flash memory card of the active RSP.[1] • **slot***slot-number*—Specifies the Flash memory card of the active RSP.
	`Address or name of remote host []? `*ip-address*	The router prompts you for the IP address of the TFTP server. • *ip-address*—Specifies the IP address of the TFTP server that contains the new image.
	`Source filename []? `*imagename*	The router prompts you for the name of the image file you are copying to the Flash memory card. • *imagename*—Indicates the name of the image to be loaded onto the Flash memory card.
	`Destination file name? [`*imagename1*`] <Return>` `Accessing tftp://`*ip-address*`/...`	The router prompts you to enter the name under which you want the file to appear at the destination. • *imagename1*—Indicates the name of the image as it appears at the destination.
Step 2	`Router# copy tftp slaveslot`*slot-number*`:`	Uses TFTP to copy a high availability Cisco IOS image onto the Flash memory card of the standby RSP. • **slaveslot***slot-number*—Specifies the Flash memory card of the standby RSP.
	`Address or name of remote host []? `*ip-address*	The router prompts you for the IP address of the TFTP server. • *ip-address*—Specifies the IP address of the TFTP server that contains the new image.
	`Source filename []? `*imagename*	The router prompts you for the name of the image file you are copying to the Flash memory card. • *imagename*—Indicates the name of the image to be loaded onto the Flash memory card.
	`Destination file name? [`*imagename1*`] <Return>` `Accessing tftp://`*ip-address*`/...`	The router prompts you to enter the name under which you want the file to appear at the destination. • *imagename1*—Indicates the name of the image as it appears at the destination.

1. Before you copy a file to Flash memory, be sure there is ample space available in Flash memory. Compare the size of the file you are copying to the amount of available Flash memory shown. If the space available is less than the space required by the file you will copy, the copy process will not continue and an error message similar to the following will be displayed;

```
%Error copying tftp://image@server/tftpboot/filelocation/imagename (Not enough space on device).
```

Setting the Config-Register Boot Variable

Though it is not required, we recommend that you modify the software configuration register boot field so that the system boots the same image that the **hw-module slot***slot-number* **image** *file-spec* command specified in the "Configuring RPR+" section.

	Command	Purpose
Step 1	`Router# show version`	Obtains the current configuration register setting.
Step 2	`Router# configure terminal`	Enters configuration mode, selecting the terminal option.
Step 3	`Router(config)# boot system flash slot`*slot-number*`:[`*imagename*`]`	Specifies the filename of an image stored in Flash memory. • *slot-number*—Specifies the active RSP slot where the Flash memory card is located. Valid numbers are slot 0 or slot 1 for the 7500 series RSP. • *imagename*—It is recommended that you set the boot variable so that the system boots the same image specified by the **hw-module slot** *slot-number* **image** *file-spec* command. See Step 2 of the "Configuring RPR+" section on page 7.
Step 4	`Router(config)# config-register` *value*	Modifies the existing configuration register setting to reflect the way in which you want to load a system image. *value*—0x0 to 0xFFFF
Step 5	`Router# Ctrl-Z`	Exits configuration mode.
Step 6	`Router# reload`	Reboots the router to make your changes take effect.

Configuring RPR+

To configure RPR+, enter the commands as shown below:

	Command	Purpose
Step 1	`Router# configure terminal`	Enters configuration mode.
Step 2	`Router(config)# hw-module slot`*slot-number* `image` *file-spec*	Verifies that the specified image is compatible with RPR+ and exists on the standby RSP. If a high availability image is found, the running configuration is updated. • *slot-number*—Specifies the standby RSP slot where the Flash memory card is located. Valid numbers are slot 2 or slot 3 for a Cisco 7507 router or slot 6 or slot 7 for a Cisco 7513 router. • *file-spec*—Indicates the Flash device and the name of the image on the standby RSP. **Note** The image indicated by the *file-spec* attribute must be available on the local Flash device. Remote protocols such a Trivial File Transfer Protocol (TFTP) and remote copy protocol (RCP) are not available.
Step 3	`Router(config)# hw-module slot`*slot-number* `image` *file-spec*	Verifies that the specified image is compatible with RPR+ and exists on the active RSP. If a high availability image is found, the running configuration is updated. • *slot-number*—Specifies the active RSP slot where the Flash memory card is located. Valid numbers are slot 2 or slot 3 for a Cisco 7507 router or slot 6 or slot 7 for a Cisco 7513 router. • *file-spec*—Indicates the Flash device and the name of the image on the active RSP. **Note** The image indicated by the *file-spec* attribute must be available on the local Flash device. Remote protocols such a Trivial File Transfer Protocol (TFTP) and remote copy protocol (RCP) are not available.
Step 4	`Router(config)# redundancy`	Enters redundancy mode.
Step 5	`Router(config-r)# mode rpr-plus` `Operating mode is RPR, configured mode is rpr-plus.`	Sets the redundancy mode to RPR+ on both the active and standby RSPs. HSA is the default redundancy mode. **Note** If the active and standby RSPs are running different IOS images and have Fast Software Upgrade configured, the default redundancy mode is RPR.

	Command	Purpose
Step 6	`Router# Ctrl-Z`	Exits configuration mode.
Step 7	`Router# copy system:running-config nvram:startup-config`	(Optional) Copies the running configuration to the startup configuration.
Step 8	`Router# hw-module sec-cpu reset`	Resets and reloads the standby RSP with the specified Cisco IOS image and executes the image. **Note** If you do not specify a Cisco IOS image in Step 2, this command loads and executes the bundled default IOS standby image. The system then operates in HSA mode.

Verifying RPR+

Use the **show redundancy** command to verify that RPR+ is enabled:

```
Router# show redundancy
Operating mode is rpr-plus
redundancy mode rpr-plus
hw-module slot 2 image disk0:rsp-pv-mz
hw-module slot 3 image disk0:rsp-pv-mz

The system total uptime since last reboot is 5 days, 19 hours 36 minutes.
The system has experienced 27 switchovers.
The system has been active (become master) for 5 days, 15 hours 14 minutes.
Reason for last switchover:User forced.
```

Troubleshooting Tips

Use the commands in the table below to troubleshoot the RPR+ feature on the Cisco 7500 series routers:

Command	Purpose
`Router# show diag`	Use this command to display hardware information for the router.
`Router# show redundancy`	Use this command to display the redundancy mode of the RSP. This command also displays information about the number of switchovers, system uptime, RSP uptime, and reasons for any switchovers.
`Router# show version`	Use this command to display image information for each RSP.

Configuration Examples

This section provides the following configuration example:

- Configuring RPR+ Example, page 9

Configuring RPR+ Example

In the following example, the active RSP is in slot 2 and the standby RSP is installed in slot 3 of a Cisco 7507 router.

```
Router# copy tftp slot0:rsp-pv-mz
Router# copy tftp slaveslot0:rsp-pv-mz
Router# configure terminal
Router(config)# hw-module slot 2 image slot0:rsp-pv-mz
Router(config)# hw-module slot 3 image slot0:rsp-pv-mz
Router(config)# redundancy
Router(config-r)# mode rpr-plus
Router(config-r)# end
Router# hw-module sec-cpu reset
Router# show running-config
version 12.2
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
service single-slot-reload-enable
!
hostname Router1
!
boot system rcp://path/to/image/rsp-boot-mz
boot system tftp://path/to/image/rsp-boot-mz
boot bootldr bootflash:rsp-boot-mz
enable password password
!
redundancy
 mode rpr-plus !Indicates Redundancy mode has been configured for RPR+
!
hw-module slot 2 image slot0:rsp-pv-mz
hw-module slot 3 image slot0:rsp-pv-mz
ip subnet-zero
ip rcmd remote-username router1
ip cef distributed
ip host iphost 192.168.0.1
mpls traffic-eng auto-bw timers
!
!
controller T3 6/0/0
 clock source line
!
!
interface Ethernet0/0/0
 ip address 10.0.0.1 255.255.0.0
 no ip directed-broadcast
 ip route-cache distributed
 no keepalive
.
.
.
exec-timeout 0 0
 history size 40
 transport preferred none
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

Command Reference

This section documents the modified commands used to configure the RPR+ feature. All other commands used with this feature are documented in the *Route Processor Redundancy and Fast Software Upgrade on Cisco 7500 Series Routers* document and in the Cisco IOS Release 12.2 command reference publications.

- **hw-module sec-cpu reset**
- **mode (redundancy)**

hw-module sec-cpu reset

To reset and reload the standby Route Switch Processor (RSP) with the specified Cisco IOS image and to execute the image, use the **hw-module sec-cpu reset** command in privileged EXEC mode.

hw-module sec-cpu reset

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(16)ST	This command was introduced.
12.0(19)ST1	This command was enabled in privileged EXEC mode.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.3(7)T	This command was integrated into Cisco IOS Release 12.3(7)T.

Usage Guidelines

Before using this command, you must use the **hw-module slot image** global configuration command to specify a high availability Cisco IOS image to run on the standby RSP. After the high availability image is loaded in the active RSP, use the **hw-module sec-cpu reset** command to reset and reload the standby RSP with the specified Cisco IOS image and to execute the image. To load the standby RSP with the default micro-IOS software contained in the active RSP image instead of a high availability Cisco IOS image, use the **no** form of the **hw-module slot image** command followed by the **hw-module sec-cpu reset** command.

Examples

The following example shows a Cisco 7513 router with the standby RSP loaded in slot 7. The standby RSP is reset and reloaded with the rsp-pv-mz high availability Cisco IOS image. Both RSPs have slot 0 flash memory cards.

```
Router(config)# hw-module slot 7 image slot0:rsp-pv-mz
Router(config)# end
Router# hw-module sec-cpu reset
```

Related Commands

Command	Description
hw-module slot image	Specifies a high availability Cisco IOS image to run on an active or standby RSP.

mode (redundancy)

To configure the high availability mode, use the **mode** command in redundancy configuration mode. To use the default redundancy mode, use the **no** form of this command.

mode {**hsa** | **rpr** | **rpr-plus**}

no mode {**hsa** | **rpr** | **rpr-plus**}

Syntax Description

hsa	Selects High System Availability redundancy mode.
rpr	Selects RPR redundancy mode.
rpr-plus	Selects RPR+ redundancy mode.

Defaults

High System Availability redundancy mode

Command Modes

Redundancy configuration

Command History

Release	Modification
12.0(16)ST	This command was introduced.
12.0(19)ST1	The **rpr-plus** keyword was added.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

The mode selected by the **mode** command in redundancy configuration mode must be fully supported by the image that has been set into both the active and standby RSPs. A high availability image must be installed into the RSPs before RPR+ can be configured. Use the **hw-module slot image** command to specify a high availability image to run on the standby RSP.

If the mode cannot be set on both RSPs, HSA is the default mode. A Cisco 7507 or Cisco 7513 router that has only one RSP installed operates in single Route Processor mode.

Examples

The following example enters redundancy configuration mode and sets RPR+ as the redundancy mode for a Cisco 7500 series router.

```
Router(config)# redundancy
Router(config-r)# mode rpr-plus
Router(config-r)# end
```

Related Commands

Command	Description
hw-module sec-cpu reset	Resets and reloads the standby RSP with the specified Cisco IOS image and executes the image.
hw-module slot image	Specifies a high availability Cisco IOS image to run on an active or standby RSP.
redundancy	Enters redundancy configuration mode.
redundancy force-switchover	Switches control of a router from the active RSP to the standby RSP.
show redundancy	Displays the current redundancy mode.

Glossary

Active RSP—The RSP that controls and runs the routing protocols, and presents the system management interface.

FSU—Fast Software Upgrade. A mechanism to upgrade the Cisco IOS software images on RSPs and line cards without reinitializing the entire system. When FSU is configured, the router is in RPR redundancy mode.

HSA—High System Availability. HSA enables a system to reset and use a standby RSP in the event of a failure of the active RSP.

RPR—Route Processor Redundancy. An alternative to HSA that reduces unplanned downtime.

RPR+—Route Processor Redundancy Plus. An enhancement to RPR in which the standby RSP is fully initialized. An RPR+ switchover does not involve line card reset or line card software reload for VIPs. Legacy interface processors are reset and reloaded during switchover.

RSP—Route Switch Processor. The Route Processor on the Cisco 7500 series router.

Standby RSP—The RSP that waits ready to take over the functions of the active RSP in the event of unplanned or planned downtime.