



Single Ring Recovery Protocol

Feature History

| Release | Modification |
|-----------|---|
| 12.0(16)S | This feature was introduced on the Cisco 12000 series routers in OC-48 networks. |
| 12.0(21)S | Support was added for on Cisco 7200, Cisco 7500, and Cisco 12000 series routers in OC-12 networks |
| 12.0(22)S | Support was added for the Cisco 10720 router. |
| 12.0(25)S | Support was added for SSR prevention. |

This document describes the Single Ring Recovery (SRR) protocol, an extension to the Spatial Reuse Protocol (SRP). The SRR protocol allows Dynamic Packet Transport (DPT) rings to operate over a single fiber.

This document includes the following main topics:

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Feature Overview

Single Ring Recovery (SRR) is an extension to the Spatial Reuse Protocol (SRP) protocol in Dynamic Packet Transport (DPT) rings. If multiple failures occur on one of the two counter-rotating SRP rings, the SRR protocol switches all traffic to the error-free ring, allowing the system to operate with full connectivity.

In all other cases, the SRP ring operates in standard Intelligent Protection Switching (IPS) behavior.

A summary of SRP ring behavior with SRR enabled is shown in the table below:

| Failure | Wrap | Ring Usage |
|---|------|--|
| Single failure on a ring | Yes | Both rings are used in standard IPS behavior. |
| More than one failure on a single ring (no failures on the other ring). | No | Only the failure free ring is used (all nodes are in IPS lockout). |
| Failures on both rings | Yes | Both rings are used in standard IPS behavior. |

SRR Discovery and Announcement Packets

An SRR packet is a new type of SRP control packet that travels around the ring in a store-and-forward fashion. The SRR packet is used for two main purposes:

- To *discover* how many failures are present on each of the rings.
- To *announce* the discovered state to the other nodes on the ring.

Nodes send Discovery SRR packets around the SRP ring to discover if failures are present. If multiple failures are discovered on one of the two rings, and the other ring is failure free, the node sends an Announcement packet directing the other nodes to use only the failure free ring.

When receiving an SRR packet, each node updates the appropriate counters and forwards the packet to the next node.

When no failure is present on the SRP ring, an SRR Discovery packet is sent every 10 seconds (the interval between packets is user configurable). This Discovery packet is only used to confirm that SRR operates normally for all the nodes on the ring and that all nodes support the same SRR version.



Note

SRR packets are source stripped by the originator and never wrap around the ring. Once an SRR packet is transmitted on a ring, it remains on the same ring until stripped.

When a node detects a local failure (or if a failure clears), it injects a Discovery packet on each of the rings:

- The Discovery packets travel around the ring.
- Each node updates the packet with local failure information.
- If a Discovery packet successfully goes around a ring, the originator can detect the number of failures present on both rings.

When the originating node receives its own Discovery packet, it transmits an Announcement packet indicating the number of failures present on each of the rings. If the originating node detects multiple failures on one of the rings and no failures on the other ring, it enables the single ring mode. All the other nodes will receive the Announcement packet and also enable the single ring mode, if necessary. An Announcement packet is also a new Discovery packet and is transmitted once every second.

If a node in single ring mode receives an SRR packet reporting a failure on the “sane” ring or indicating that only one or no failures are present on the “failed” ring, single ring mode is disabled and the node uses both rings under normal IPS behavior.



Note

The ring will also return to normal IPS behavior if the user configures a node to Forced Switch.

To prevent oscillations, a failure is considered present for an additional period of time, called the SRR WTR, after it has disappeared.

If the mate cable is disconnected between two single interface DPT line cards, or a Forced Switch is issued, the source forced switch indication is changed to SRR prevention (SP) indicating that single ring mode cannot be used.

SRR states

Every node can be in either of two possible states:

Discovery state:

- local failure present or
- local “Forced Switch” request is present

Idle state

otherwise

SRR modes

In addition to the two states, a node can also have the following modes enabled:

Announcement mode

When a node receives its own Discovery packet indicating the number of failures on each ring, it transmits an Announcement packet to the other nodes containing this information.

Single ring mode:

A node is in IPS lockout and is redirecting all data traffic to the failure free ring.

SRR in rings with Cisco ONS 1519x IP Transport Concentrator

For DPT rings that operate in a “inner-outer” fiber topology with two Cisco ONS 1519x IP Transport Concentrators, SRR provides redundancy to maintain full connectivity. In the event of a failure in one Cisco ONS 1519x, connectivity is maintained on the remaining ring.

Benefits

The SRR protocol provides DPT metro rings and PoPs with enhanced transport resiliency:

- A DPT ring can maintain connectivity with multiple failures on the same ring by allowing a DPT ring to operate over a single fiber.
- IPS functionality is not compromised.
- Supports physical ring connectivity or Cisco ONS 1519x star wiring.
- Provides Cisco ONS 1519x box redundancy.

Restrictions

Topology and Other Control Types

Since SRR enables an SRP ring to work over a single ring, no SRP control mechanism should assume a particular ring as its transmission path. Example: the topology should be able to work on either the inner or outer ring and not assume the outer ring is always available as is the case in a standard SRP ring.

**Note**

When the single ring mode is enabled by SRR, topology will not report the node as being wrapped since they are locked-out.

Fairness

In an OC-48 DPT ring, the default static fairness limiter is 400 megabits per second (configurable between 1 to 2488 megabits per second). This value can be configured using the command **srp srr bandwidth**.

In an OC-12 DPT ring, the static fairness limiter is not configured. Rather it is set to the total bandwidth divided by two more than the number of nodes, for example $622\text{Mbps}/(\text{number of nodes} + 2)$.

Clock Source

Because SRR converges slowly when 'line' clock-source is used, the 'internal' clock source should be used in all SRR enabled routers.

Related Features and Technologies

Intelligent Protection Switching (IPS)

SRR operates with standard IPS in the following ways:

- SRR relies on IPS to detect the local failure status of the node. It monitors the IPS status of both sides for an eventual "Signal Fail" or "Forced Switch" to occur.
- SRR doesn't consider remote failures transmitted through IPS short or long path messages.
- Whenever SRR enables the single ring mode, it will prevent IPS from wrapping the node by enabling IPS lockout on the node.
- When the single ring mode is not enabled by SRR, the SRP ring will follow standard IPS behavior and wrap accordingly.

Related Documents

The following Cisco Systems publications contain additional information related to the SRR protocol:

- *Cisco ONS 15190 Installation and Configuration Guide*
- *Cisco ONS 15194 Installation and Configuration Guide*
- *Dynamic Packet Transport (DPT) for Cisco 12000 Series Routers*

- *1OC-48/STM-16 SRP Line Card Installation and Configuration*
- *4OC-48/STM-16 SRP Line Card Installation and Configuration*
- *Weighted Random Early Detection on the Cisco 12000 Series Router*
- *Cisco 10720 Uplink Card Installation and Configuration*

Supported Platforms

For OC-48c/STM-16c, the SRR protocol requires Cisco IOS software version 12.0(16)S or 12.0(16)ST or higher. The SRR protocol is supported in the following products:

- Cisco 12000 series Internet Router
- Cisco 10720 series Internet Router
- Cisco ONS 15190 IP Transport Concentrator
- Cisco ONS 15194 IP Transport Concentrator

For OC-12c/STM-4c, the SRR protocol requires Cisco IOS software version 12.0(21)S or 12.0(21)ST or higher and is supported in the following products:

- Cisco 12000 series Internet Router
- Cisco ONS 15190 IP Transport Concentrator
- Cisco 7200 series OC-12/STM-4c SRP port adapter
- Cisco 7500 series OC-12/STM-4c SRP port adapter

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Supported Standards, MIBs, and RFCs

Standards

None

MIBs

The OC-48c/STM-16 and OC-12c/STM-4 SRP line cards supports the following MIBs

- CISCO-SRP-MIB
- RFC 1595 SONET MIB

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

SRR requires a fully SRR compatible ring to operate. In order for SRR to converge:

- all nodes on the SRP ring must support SRR
- all nodes must support the same SRR version

If one or more of the nodes does not support SRR or has a different SRR version, SRR will have no effect and the ring will operate like a standard SRP ring without SRR.

Configuration Tasks

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

- [Enabling the SRR Protocol](#) (required)
- [Setting the SRR Parameters](#) (optional)
- [Configure WRED](#) (optional but recommended)
- [Repeat the Configuration Process for all Other Ring Nodes](#) (required)

Enabling the SRR Protocol

By default, the SRR protocol is disabled. Follow the steps below to enable the SRR protocol on each node:

| | Command | Purpose |
|--------|--|---|
| Step 1 | Router# <code>configure terminal</code> | Enter the global configuration mode. |
| Step 2 | Router(config)# <code>interface srp x/x</code> | Specify the SRP interface port. |
| Step 3 | Router(config-if)# <code>srp srr enable</code> | Enable the SRR protocol for the specified port. |

Setting the SRR Parameters

Default values are automatically entered for the SRR parameters when the protocol is enabled. The default values can be used, or modified by the user.

**Note**

Cisco Systems recommends the use of the default bandwidth and timer values. Although examples of the SRR parameter commands are shown below, only **srp srr enable** command should be executed.

This section describes the modification of the default parameters if necessary. Please refer to the [“Command Reference” section on page 10](#) for additional information on these use of these commands.

| | Command | Purpose |
|--------|--|---|
| Step 1 | Router(config-if)# srp srr bandwidth <i>bandwidth</i> | Specify the bandwidth for the port in megabits per second (Mbps) when the interface operates on a single ring. The value is between 1 to the maximum possible bandwidth of the node (1-622). The default value is 400 Mbps for OC-48 interfaces. This command is available for OC-48 interfaces only. |
| Step 2 | Router(config-if)# srp srr timer <i>seconds</i> | Set the periodic time (in seconds) between SRR messages when the node is in Idle state. |
| Step 3 | Router(config-if)# srp srr wtr-timer <i>seconds</i> | Set the minimum time (in seconds) between the discovery of a ring failure and the return to normal ring operations. |

Configure WRED

When using the SRR protocol with the 10C-48/STM-16 SRP line card, it is recommended that WRED be enabled to prevent control packet loss in overloaded rings. Refer to *Weighted Random Early Detection on the Cisco 12000 Series Router* for information and instructions on enabling this feature.

Repeat the Configuration Process for all Other Ring Nodes

Repeat the configuration process for all nodes on the DPT rings.

**Note**

The same version of SRR must be installed on all nodes for the feature to operate correctly.

Verifying SRR Configuration

| Command | Purpose |
|----------------------------------|--|
| Router# show srp srr | This command summarizes the SRR information for every interface. |
| Router# show srp topology | This command displays a table that summarizes the SRP nodes on a ring. This table includes a column for “found” SRR nodes. Note Only nodes with the same SRR versions will be “found”. |

Configuration Examples

```
GSR_Left# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
GSR_Left(config)# int srp 6/0
GSR_Left(config-if)# srp srr enable
GSR_Left(config-if)# srp srr bandwidth 300
GSR_Left(config-if)# srp srr timer 5
GSR_Left(config-if)# srp srr wtr-timer 50
GSR_Left(config-if)# end
GSR_Left# show srp srr

SRR Information for Interface SRP6/0
SRR version: 0
Current node Info:
Node MAC address: 0001.0004.0001
State          : Idle
Outer In Use   : Yes
Inner In Use   : Yes
Announcing     : No
Outer Fail     : IDLE
Inner Fail     : IDLE
SRR Prevention : No (Idle)
Periodic SRR packet sent every 5 sec. (next pkt. after 1 sec.)
Single ring bandwidth set to 300 Mbps.
SRR WTR timer set to 50 sec.
Side A WTR countdown is inactive.
Side B WTR countdown is inactive.
Name           MAC           Outer fail Inner fail Announce Last received
GSR_Left       0001.0004.0001 IDLE       IDLE       No       00:00:04
GSR_Back_Left  0001.0004.0003 IDLE       IDLE       No       00:00:02
GSR_Right      0001.0004.0002 IDLE       IDLE       No       00:00:02
GSR_Back_Right 0001.0004.0004 IDLE       IDLE       No       00:00:06

GSR_Left#show srp topology

Topology Map for Interface SRP6/0
Topology pkt. sent every 5 sec. (next pkt. after 2 sec.)
Last received topology pkt. 00:00:02
Last topology change was 03:11:05 ago.
Nodes on the ring: 4
Hops (outer ring)  MAC           IP Address      Wrapped SRR  Name
0                  0001.0004.0001 20.1.4.1       No          found GSR_Left
1                  0001.0004.0003 20.1.4.3       No          found GSR_Back_Left
2                  0001.0004.0002 20.1.4.2       No          found GSR_Right
3                  0001.0004.0004 20.1.4.4       No          found GSR_Back_Right
```


Command Reference

This section documents new or modified commands used with the SRR protocol. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

- [debug srp srr, page 11](#)
- [srp srr bandwidth, page 12](#)
- [srp srr enable, page 13](#)
- [srp srr timer, page 14](#)
- [srp srr wtr-timer, page 15](#)
- [show srp srr, page 16](#)
- [show srp ips, page 19](#)
- [show srp topology, page 20](#)

debug srp srr

The SRR debugging command displays all the SRR received and transmit packets. This command also displays SRR special events.

debug srp srr

| | |
|---------------------------|---|
| Syntax Description | srp srr to display debug messages for the SRR feature. |
|---------------------------|---|

Defaults No default behavior or values.

| Command History | Release | Modification |
|------------------------|----------------|------------------------------|
| | 12.0(16)S | This command was introduced. |

Examples The following is an example of the SRR information:

```
debug srp srr
00:11:12: srp_process_srr_packet: SRP2/1, checksum 63265, ttl 255, rcvd
{0008.e23e.2554, SRC:I=IDLE,O=IDLE D:I=0,O=0, SP=Off A:NV,I=0,O=0, SP=Off} on
side B
00:11:12: TX pkt node SRP2/1 side A ttl=254
{0008.e23e.2554, SRC:I=IDLE,O=IDLE D:I=0,O=0, SP=Off A:NV,I=0,O=0, SP=Off}
```

srp srr bandwidth

To set the bandwidth used when OC-48 interfaces operate on a single ring, use the **srp srr bandwidth** interface configuration command.

The **no** version of this command restores the setting to the default value.

srp srr bandwidth *bandwidth*

no srp srr bandwidth *bandwidth*

Syntax Description

| | |
|------------------|--|
| <i>bandwidth</i> | specifies the bandwidth in megabits per second (Mbps) when the interface operates on a single ring. The value is between 1 to the maximum possible bandwidth of the node (1-2488). |
|------------------|--|

Defaults

The default value is 400 Mbps for OC-48 interfaces.

The **no** version of this command restores the setting to the default value.

Command Modes

Interface configuration in privileged EXEC

Command History

| Release | Modification |
|-----------|------------------------------|
| 12.0(16)S | This command was introduced. |

Usage Guidelines

This command is available for OC-48 interfaces only.

Examples

The following example sets the interface bandwidth to 300 Mbps:

```
srp srr bandwidth 300
```

srp srr enable

To enable SRR, use the **srp srr disable** interface command. To disable SRR, use the **no** form of this command

srp srr enable

no srp srr enable

| Syntax Description | enable | enables the SRR protocol for the specified interface |
|--------------------|--------|--|
|--------------------|--------|--|

Defaults The SRR protocol is disabled by default.

Command Modes Interface configuration in privileged EXEC.

| Command History | Release | Modification |
|-----------------|-----------|------------------------------|
| | 12.0(16)S | This command was introduced. |

Examples The following example enables the SRR protocol from an interface:

```
srp srr enable
```

| Related Commands | Command | Description |
|------------------|-----------------------|--|
| | srp srr enable | enables the SRR protocol on an interface |

srp srr timer

To set the periodic timer for SRR messages on Idle state, use the **srp srr timer** interface command.

To re-set this value to the default, use the **no** form of the command.

srp srr timer *seconds*

no srp srr timer

Syntax Description

| | |
|----------------|--|
| <i>seconds</i> | Value in seconds: determines the frequency of SRR messages sent on Idle state. |
|----------------|--|

Defaults

The default is 10 seconds.

The **no** version of this command returns the value to the default.

Command Modes

Interface configuration in privileged EXEC

Command History

| Release | Modification |
|-----------|------------------------------|
| 12.0(16)S | This command was introduced. |

Usage Guidelines

This command sets the periodic timer for SRR messages in Idle state.

On Discovery state, the SRR messages are sent every 1 second. This parameter is not user configurable.

Examples

The following example sets the periodic timer to send an SRR message every 12 seconds in Idle state:

```
srp srr timer 12
```

srp srr wtr-timer

To set the WTR timer for the SRR node, use the **srp srr wtr-timer** interface command. Use the **no** form of this command to return the value to the default.

srp srr wtr-timer *seconds*

no srp srr wtr-timer *seconds*

| | | |
|---------------------------|----------------|--|
| Syntax Description | <i>seconds</i> | Value in seconds: the minimum time between the disappearance of a ring failure and the return to normal ring operations. |
|---------------------------|----------------|--|

Defaults The default value is 60 seconds. The **no** form of this command returns the setting to the default.

Command Modes Interface configuration in privileged EXEC

| Command History | Release | Modification |
|------------------------|----------------|------------------------------|
| | 12.0(16)S | This command was introduced. |

Usage Guidelines To prevent oscillations, a failure is considered present for a period of time after that failure has disappeared. This is called the called the SRR WTR. This command allows the user to specify a WTR time other than the default value is 60 seconds.

Examples The following example sets the WTR timer to 50 seconds:

```
srp srr wtr-timer 50 seconds
```

show srp srr

To display a summary of SRR information for every interface, use the **show srp srr** EXEC command.

show srp srr

| | | |
|---------------------------|----------------|---|
| Syntax Description | srp srr | Display a summary of SRR information for every interface. |
|---------------------------|----------------|---|

| | |
|-----------------|--------------------------------|
| Defaults | No default behavior or values. |
|-----------------|--------------------------------|

| | |
|----------------------|------|
| Command Modes | EXEC |
|----------------------|------|

| Command History | Release | Modification |
|------------------------|----------------|--|
| | 12.0(16)S | This command was introduced. |
| | 12.0(25)S | SRR prevention (SP) added; forced switch (FS) removed. |

Usage Guidelines This section describes the fields shown when the command is entered:

| Field | Description |
|------------------|--|
| SRR version | The SRR version of the interface. |
| Node MAC address | The MAC address of the SRP interface. |
| State | The State of the SRR for the current interface <ul style="list-style-type: none"> <i>Discovery</i>: local failure present OR local “Forced Switch” request is present <i>Idle</i>: otherwise |
| Outer In Use | Indicates if the outer ring is used for the current interface. |
| Inner In Use | Indicates if the inner ring is used for the current interface. |
| Announcing | Indicates if the node is announcing the discovered SRR information to the other nodes in the ring. |
| Outer Fail | Type of SRR failure detected on the outer ring (IDLE, SF, FS, SP or WTR). Description: <ul style="list-style-type: none"> IDLE: No SRR failure. SF: Signal Fail. FS: Forced Switch (for software releases prior to 12.0(25)S). SP: SSR Prevention—indicates that a mate cable is disconnected between two single port DPT line cards, or a forced switch (from software release 12.0(25)S). WTR: SRR Wait to restore. |

| Field | Description |
|--|--|
| Inner Fail | Type of SRR failure detected on the inner ring (IDLE, SF, FS, SP or WTR). Description: IDLE: No SRR failure. SF: Signal Fail. FS: Forced Switch (for software releases prior to 12.0(25)S). SP: SSR Prevention—indicates that a mate cable is disconnected between two single port DPT line cards, or a forced switch (from software release 12.0(25)S). WTR: SRR Wait to restore. |
| SRR Prevention | Indicates whether SRR Prevention is enabled or not. |
| Periodic SRR packet sent every 10 sec. (next packet after 3 seconds) | The time between periodic SRR messages and the time until the next packet is sent. |
| Single ring bandwidth set to 100 Mbps | Indicates the bandwidth that would be used when the SRR is working with a single ring. This bandwidth remains static as long as a single ring is used: no fairness algorithm performed. |
| SRR WTR timer set to 10 seconds | Indicates the SRR WTR timer. To prevent oscillations, a failure is considered present for a period of time after that failure has disappeared. This is called the SRR WTR. The default value is 60 seconds. |
| Side A WTR countdown is inactive | Displays the SRR WTR counter for side A of the interface when the timer is active. |
| Side B WTR countdown is inactive | Displays the SRR WTR counter for side B of the interface when the timer is active. |
| Summary table: see the examples below | A summary table is displayed of all the SRR information received from other nodes on the ring (see the examples below). <ul style="list-style-type: none"> If topology information is detected, the table displays the information in the same order as the topology table (by outer ring order). See example 1. If no SRR information is detected but topology detected, the node is displayed without SRR information. See example 2. <p>If SRR packets were not received from other nodes for more than 60 seconds, the Information removed from the table.</p> |

Summary Table example 1:

| Name | MAC | Outer fail | Inner fail | Announce | Last received |
|-----------------|----------------|------------|------------|----------|---------------|
| Not In Topology | 0001.0001.0003 | IDLE | SF | No | 00:00:00 |
| Not In Topology | 0001.0001.0002 | SF | IDLE | No | 00:00:00 |

Summary Table example 2:

| Name | MAC | Outer fail | Inner fail | Announce | Last received |
|----------------|----------------|-----------------------|------------|----------|---------------|
| GSR_Right | 0001.0001.0003 | SRR Info not detected | | | |
| GSR_Back_Right | 0001.0001.0002 | SF | IDLE | No | 00:00:00 |

Examples

The following is an example of the information displayed by the **show srp srr** command:

```
GSR_Right> show srp srr
```

```
SRR Information for Interface SRP3/0
SRR version: 0
Current node Info:
Node MAC address: 0008.e23e.4dfe
State           : Discovery
Outer In Use    : Yes
Inner In Use    : Yes
Announcing      : Yes
Outer Fail      : SP
Inner Fail      : SP
SRR Prevention  : Yes (Mate cable error)
Periodic SRR packet sent every 1 sec. (next pkt. after 1 sec.)
Single ring bandwidth set to 400 Mbps.
SRR WTR timer set to 10 sec.
Side A WTR countdown is inactive.
Side B WTR countdown is inactive.
```

| Name | MAC | Outer fail | Inner fail | Announce | Last received |
|-----------------|----------------|------------|------------|----------|---------------|
| Q143 | 0008.e23e.4dfe | SP | SP | Yes | 00:00:00 |
| Q163 | 0008.e23e.25fe | IDLE | IDLE | No | 00:00:03 |
| Not In Topology | 0006.52a9.2e00 | IDLE | IDLE | No | 00:00:06 |
| Not In Topology | 0009.b62f.d400 | SF | IDLE | Yes | 00:00:00 |

show srp ips

The command **show srp ips** has been modified to indicate if a ring is “locked out”. IPS lock out prevents node wraps.

Use the **show srp ips** in user EXEC mode to display the IPS status of the SRP ring.

```
show srp ips
```

| | | |
|---------------------------|--------------------------------|---|
| Syntax Description | srp ips | Display the IPS status of the ring, including IPS lockout status. |
| Defaults | No default behavior or values. | |
| Command Modes | EXEC | |
| Command History | Release | Modification |
| | 12.0(6)S | This command was introduced. |
| | 12.0(16)S | This command was modified to include IPS lockout status. |

Examples

The following example displays IPS information for a sample SRP system:

```
show srp ips

IPS Information for Interface SRP4/0
MAC Addresses
  Side A (Outer ring RX) neighbor 0001.0004.0003
  Side B (Inner ring RX) neighbor 0001.0004.0004
  Node MAC address 0001.0004.0002
IPS State
  Side A not wrapped(locked out)
  Side B not wrapped(locked out)
  Side A (Inner ring TX) IPS pkt. sent every 1 sec. (next pkt. after 1 sec.)
  Side B (Outer ring TX) IPS pkt. sent every 1 sec. (next pkt. after 1 sec.)
  inter card bus enabled
  IPS WTR period is 10 sec. (timer is inactive)
  Node IPS State: locked out
IPS Self Detected Requests          IPS Remote Requests
  Side A IDLE                        Side A SF
  Side B SF                          Side B IDLE
IPS messages received
  Side A (Outer ring RX) {0001.0004.0003,SF,SHORT}, TTL 128
  Side B (Inner ring RX) none
IPS messages transmitted
  Side A (Outer ring RX) {0001.0004.0002,IDLE,SHORT}, TTL 128
  Side B (Inner ring RX) {0001.0004.0002,SF,SHORT}, TTL 128
```

show srp topology

The **show srp topology** command has been modified to include a new column indicating is SRR was found on other nodes in the ring. This command only displays SRR nodes of the same version.

show srp topology

| | | |
|---------------------------|---------------------|--|
| Syntax Description | srp topology | displays the topology of the SRP rings, including SRR nodes of the same version. |
|---------------------------|---------------------|--|

Defaults No default behavior or values.

Command Modes EXEC

| Command History | Release | Modification |
|------------------------|----------------|--|
| | 12.0(6)S | This command was introduced. |
| | 12.0(16)S | This command was modified to include SRR column. |

Examples The following example displays a summary of the SRP ring topology. This command has been modified to include a column on SRR node information:

```
show srp topology
```

```
Topology Map for Interface SRP2/0
Topology pkt. sent every 5 sec. (next pkt. after 0 sec.)
Last received topology pkt. 00:00:04
Nodes on the ring: 3
Hops (outer ring)      MAC          IP Address      Wrapped SRR      Name
0                      0001.0001.0002 20.1.1.2        No               - GSR_Back_Right
1                      0001.0001.0003 20.1.1.3        No               - GSR_Right
2                      0001.0001.0001 20.1.1.1        No               found GSR_Left
```

Glossary

DPT—Dynamic Packet Transport

Failure—A “Signal Fail” condition, as reported by IPS, under which an SRP node would normally wrap. SRR only considers locally detected failures. SRR doesn't consider other IPS failures such as WTR, MS and SD since no more than one of these can exist on an SRP ring at one given time. SRR requires that at least two (2) failures be present on a ring to enable the single ring mode.

IPS—Intelligent Protection Switching

Lockout—An IPS status in which a node is prevented from wrapping.

Node side—Either side A or side B of an SRP node. Side A receives from the outer ring and transmits on the inner ring. Side B receives from the inner ring and transmits on the outer ring.

Ring—In the context of this document, “ring” (in contrast to “SRP ring”) refers to either one of the two counter-rotating rings of an SRP ring.

Single ring mode—A mode in which SRR enables lockout on a node and redirects all data traffic to the failure free ring. In single ring mode, the failure free ring is referred to as the “sane” ring and the other one as the “failed” ring.

SRP—Spatial Reuse Protocol.

SRP Ring—An SRP ring is composed of two counter-rotating rings referred to as the inner ring and the outer ring.

SRR—Single Ring Recovery.

