Dynamic Packet Transport (DPT) Feature Module for Cisco 12000 Series Routers

Dynamic Packet Transport Overview

Dynamic Packet Transport (DPT) rings are dual, counter-rotating fiber rings. Both fibers are used concurrently to transport both data and control traffic.

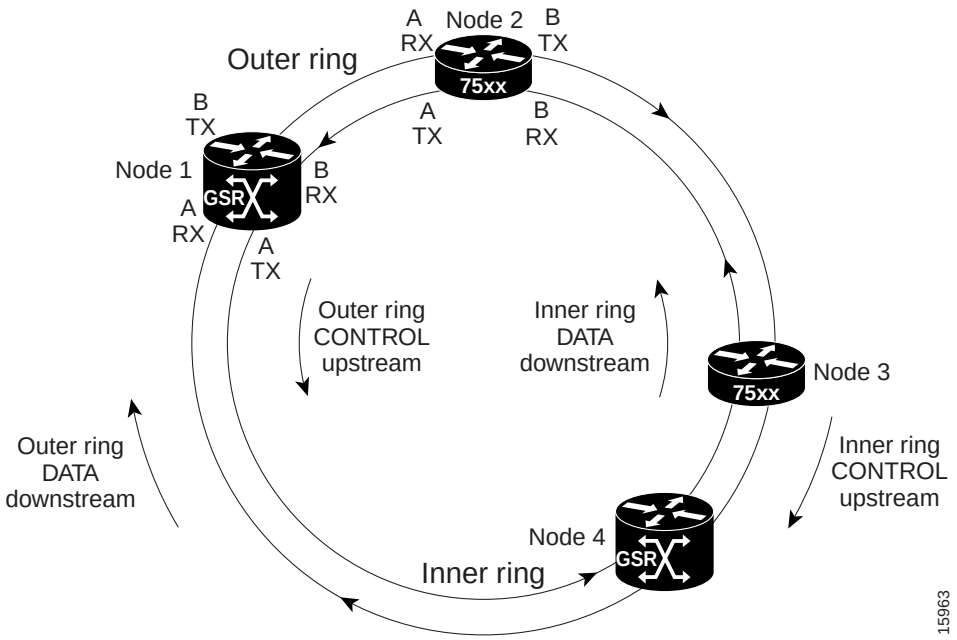
DPT rings use Intelligent Protection Switching (IPS) to provide proactive performance monitoring, event detection, rapid self-healing, and IP service restoration after fiber facility or node failures.

Spatial Reuse Protocol (SRP) is the media-independent Media Access Control (MAC) layer that enables DPT functionality in ring configurations. The SRP MAC layer provides the base functionality for addressing, packet stripping, managing bandwidth using the SRP fairness algorithm, and controlling message propagation on the ring.

Note SRP is supported on the 1OC-12/STM-4 SRP line card installed in Cisco 12000 series routers and 7500/7200 series routers. Throughout this publication, we use the term “SRP line card” to include all versions of Cisco 12000 series line cards and 7500/7200 port adapters that support SRP.

Each ring is composed of nodes that are interconnected by using two fiber rings, which are designated as inner and outer. On the outer ring, traffic flows clockwise; on the inner ring, traffic flows counter-clockwise. The side of a node that has outer ring receive fiber is identified as side A, the side of a node that has inner ring receive fiber is identified as side B. (See Figure 1.)

Figure 1 A Typical DPT Ring



Data packets are sent downstream on one ring, while the corresponding control packets are sent upstream on the opposite ring. Both fiber rings maximize the bandwidth for data packet transport and ensure that the data takes the shortest path to its destination. Spatial Reuse refers to the fact that unicast packets traverse only the necessary spans between the source node and the destination node. Each ring node concurrently transmits packets without waiting for a shared token on other parts of the ring, because the packets are removed by the destination nodes.

Each time you install a 1OC-12/STM-4 SRP line card in a Cisco 12000 series Gigabit Switch Router (GSR) or install the OC-12c Dynamic Packet Transport (DPT) Interface Processor (DPTIP) (port adaptor) in a Cisco 7500/7200 series router, the router appears on the ring as a node with an SRP interface. A 7500/7200 series router is most often used as an aggregation device for the GSR. The 7500/7200 series router collects data from lower-speed interfaces and passes it to a GSR. Typically, there will be more 7500/7200s aggregating traffic towards fewer GSRs. The ring topology automatically discovers when nodes are added or deleted. A user-configurable topology timer determines how frequently every node on the ring sends out a topology discovery packet to identify the nodes on the ring. The default is five seconds.

For initial implementations, Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) is used as a transport layer. The SRP interface uses the SONET-style ring architecture and Intelligent Protection Switching to provide redundancy and protection in the event of a failed node or fiber cut.

IPS provides the ability to:

- Detect and react to events on the rings
- Communicate information about detected faults and fault clearances
- Maintain topological knowledge, so network operators can insert and remove nodes from the ring or merge independent rings with minimal configuration
- Maintain an intelligent protection switching event hierarchy that handles concurrent multiple events (such as, signal failure and signal degradation events) without partitioning the ring into separate sub-rings

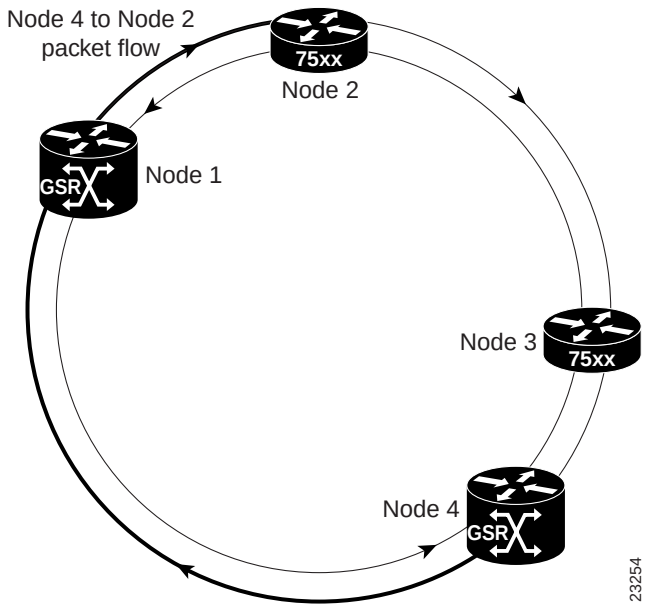
In a normal state, data packets flow from node 4 to Node 2 by taking the short single-hop path shown in Figure 2. When fiber cuts, node failures, or events occur, IPS uses two modes to heal the fibers and restore IP service:

- Pass-through mode allows the affected nodes to continue handling traffic without adding wraps to the ring. As long as the router is powered on and the MAC layer is working appropriately, an automatic or user-configured trigger can keep the line card in pass-through mode until the event is resolved. A line card can also enter pass-through mode when you enter the **shutdown** command. Therefore, you must enter a **no shutdown** command to exit the pass-through mode.

  In pass-through mode, any packets that are received by a node are simply forwarded transparently to the corresponding transmit fiber, and they continue to move downstream on the ring. The pass-through LED shows as orange when the line card is in pass-through mode.

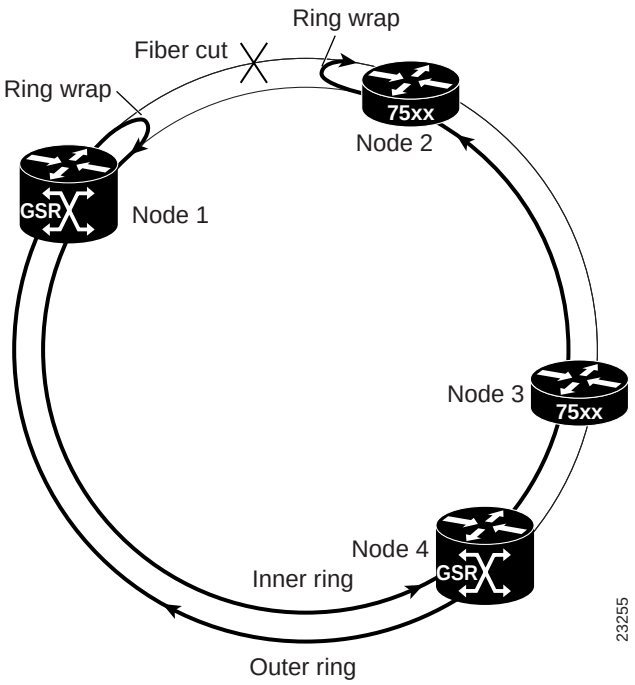
- Wrap mode is initiated when a node or fiber failure occurs on the ring between Node 1 and Node 2. As shown in Figure 3, IPS allows the ring to automatically recover from node or fiber failures by wrapping away from the failures and routing traffic around the wraps. The nodes adjacent to the failure will wrap the ring onto the alternate fiber.

Figure 2 An DPT Ring in a Normal State



In response to a fiber cut between Node 1 and Node 2, the data packets will take the multi-hop path from Node 4 to Node 2. Figure 3 shows the path that the intermediate nodes use to pass data to the intended destination.

Figure 3 An DPT Ring with a Fiber Cut in Wrap Mode



Benefits

The features on the 1OC-12/STM-4 SRP line card:

- Accommodate large-scale network topology
- Leverage fiber-optic capacity at OC-12 line rates
- Control the rate at which new packets are inserted on the media
- Allow data fair-shared access to the OC-12 rings
- Implement protection mechanisms, including wrap or unwrap, in the event of fiber or node failure
- Support both single-mode and multimode fiber transmissions

Restrictions

The Spatial Reuse Protocol supports up to 32 nodes simultaneously on one ring.

Related Documents

- See the *1OC-12/STM-4 SRP Line Card Installation and Configuration.*
- See the *Cisco 12.0 Release Notes* that came with your line card.
- See the *Cisco 12000 series router Installation and Configuration Guide* for information about your router.
- See the following modular configuration and command reference publications, as appropriate, for your particular system configuration:

- *Configuration Fundamentals Configuration Guide*
- *Configuration Fundamentals Command Reference*
- *Wide-Area Networking Configuration Guide*
- *Wide-Area Networking Command Reference*
- *Network Protocols Configuration Guide*
- *Network Protocols Command Reference*
- *Bridging and IBM Networking Configuration Guide*
- *Bridging and IBM Networking Command Reference*
- *Configuration Builder Getting Started Guide*
- *Troubleshooting Internetworking Systems*
- *Debug Command Reference*
- *System Error Messages*
- *Cisco IOS Software Command Summary*
- *Cisco Management Information Base (MIB) User Quick Reference*

Supported Platforms

The DPT features are supported on the following platforms:

- Cisco 12000 series routers
- Cisco 7500/7200 series routers
- Cisco 7200 series routers

Supported Standards, MIBs, and RFCs

The 1OC-12/STM-4 SRP line card supports the CISCO-CAR-MIB and the RFC 1595 SONET MIB.

Prerequisites

The SRP line card requires a full-fabric configuration in your GSR. It requires one or two clock and scheduler cards (CSCs) and three switch fabric cards (SFCs). A configuration with two CSCs is preferred. If you have an existing one-quarter fabric configuration on your router and you want to install an SRP line card, you must upgrade to a full-fabric configuration. For details on adding switch fabric cards, see the *Installation and Configuration Guide* that came with your router.

Configuration Tasks

The configuration tasks in this section explain how to configure and control data traffic on each SRP interface on the DPT ring by:

- Assigning an IP Address (Required)

- Changing a MAC Address (Optional)
- Counting Packets By Source Address (Optional)
- Rejecting Packets from a Specific Source Address (Optional)
- Configuring the Topology-Timer (Optional)
- Modifying SONET/SDH Configuration Parameters (Optional)
- Displaying DPT Ring Configuration Using Show Commands (Optional)

Note Cisco recommends that you configure a node before the fibers are connected to it, so that you avoid inserting an incorrectly configured node onto a DPT ring.

Table 1 provides sample IP and MAC addresses of routers that contain 1OC-12/STM-4 SRP line cards that will be used in the following configuration tasks. Note that for each SRP interface, the MAC address has a relationship with the IP address, so that even though all line cards are in slot 2 and port 0 in the routers on the network, you can identify an SRP interface by its' unique IP or MAC address.

Table 1 Router IP and MAC Addresses on the Sample DPT Ring

Routers	Nodes	SRP Interface	IP Addresses	MAC Addresses
Router1	Node 1	2/0	10.1.2.1	0123.4567.0001
Router2	Node 2	2/0	10.1.2.2	0123.4567.0002
Router3	Node 3	2/0	10.1.2.3	0123.4567.0003
Router4	Node 4	2/0	10.1.2.4	0123.4567.0004
Router5	Node 5	2/0	10.1.2.5	0123.4567.0005

Assigning an IP Address

This section explains how to assign an IP address to an SRP interface. This is a required task. Each node on the ring must have an IP address assigned to its SRP interface. To assign an IP address, perform the following steps beginning in global configuration mode:

Step	Command	Purpose
1	`Router1# configure terminal` `Router1(config)#`	Type **configure terminal** to enter global configuration mode.
2	`Router1(config)# interface srp 2/0` `Router1(config-if)#`	Specify the SRP interface you want to configure by using the **interface srp** global configuration command. The prompt changes to interface configuration mode.

3	`Router1(config-if)# ip address 10.1.2.1 255.255.255.0`
	`Router1(config-if)# end`
	`Router1#`
		Enter the **ip address** and **subnet mask** for the SRP interface in interface configuration mode.

4	`Router1(config-if)# no shut` `Router1(config-if)#`	Enter the **no shut** command to keep the interface up.

Step	Command	Purpose
5	Router1(config-if)# Router1#	Type **end** until you return to privileged EXEC mode.
6	Router1# **show interface srp 2/0** Router1#	Use the **show interface** EXEC command and specify the SRP interface router slot and port number.

Changing a MAC Address

This is an optional task. This section explains how to change a default Media Access Control (MAC) address. The default MAC address is just a 48-bit number that carries no special meaning. The default MAC address that is assigned to each SRP line card is derived from a base address that is a property of the GSR chassis combined with an adjustment for the position of the line card within the chassis. This means that if you change the line card's slot position, or if you ever put the line card in another chassis, then the MAC address of the SRP line card will change.

You may find it useful to supply a MAC address for each SRP interface. You can assign a MAC address that has a relationship with the IP address of the SRP interface, or that has a relationship with some other identification of the nodes.

You can use a MAC address to:

- Count the number of packets that are received from a source node
- Reject packets from a particular source node

To change a default MAC address, perform the following tasks beginning in privileged EXEC mode:

Step	Command	Purpose
1	`Router1# configure terminal` `Router1(config)#`	Type the **configure terminal** to enter global configuration mode.
2	`Router1(config)# interface srp 2/0` `Router1(config-if)#`	Specify the **interface srp** global configuration command. The prompt changes to interface configuration mode.
3	`Router1(config-if)# mac-address 0123.4567.0001` `Router1(config-if)#`	Enter the **mac-address** interface configuration command and specify the new address.
4	`Router1(config-if)# end` `Router1#`	Type **end** to return to privileged EXEC mode.
5	`Router1# show controllers srp`	Verify the MAC address on the SRP interface by entering the **show controllers** EXEC command.

Counting Packets By Source Address

This section explains how to count packets by the source MAC address of the node that originated them. This is an optional task. By default, the SRP interface only counts the total numbers of packets received. To count packets according to their source MAC address, you must configure an SRP interface to maintain the appropriate counters. You can examine the counts using the **show srp** and the **show srp source-counters** commands.

To enter Cisco IOS commands that configure an SRP interface to maintain appropriate counters, perform the following steps beginning in privileged EXEC mode:

Step	Command	Purpose
1	`Router1# configure terminal` `Router1(config)#`	Type **configure terminal** to enter global configuration mode.
2	`Router1(config)# interface srp 2/0` `Router1(config-if)#`	Specify an SRP interface, using the **interface srp** global configuration command.

Step	Command	Purpose
3	Router1(config-if)# **srp count 0123.4567.0001** Router(config-if)#	Configure the SRP interface to count the number of packets received from a specific source address by entering the **srp count** interface configuration command and specify the source node's MAC address.
4	Router1(config-if)# **exit** Router#	Type **exit** until you return to privileged EXEC mode.
5	Router1# **show srp source-counters srp 2/0** Source Address Information for Interface SRP2/0 0123.4567.0001, pkt. count 1201	View the count of packets received from the designated source address by entering the **show srp** or the **show srp source-counters srp 2/0** EXEC commands.
6	Router1# **copy running-config startup-config**	Enter the **copy running-config startup-config** privileged EXEC command to write the new configuration to memory.

Rejecting Packets from a Specific Source Address

By default, an SRP interface accepts packets from any source. You can configure an SRP interface to reject all packets from a specific source MAC address. This may be useful if there are nodes on the ring that should not communicate. This is an optional task.

Perform the following steps to configure an SRP interface to reject all packets from a specific source MAC address, beginning in privileged EXEC mode:

Step	Command	Purpose
1	Router1# **configure terminal** Router1(config)#	Type **configure terminal** to enter global configuration mode.
2	Router1(config)# **interface srp 2/0** Router1(config-if)#	Select a specific SRP interface, using the **interface srp** global configuration mode command.
3	Router1(config-if)# **srp reject 0123.4567.0001** Router1(config-if)#	You can configure an SRP interface to discard all packets from a specific node by entering the **srp reject** interface configuration command and the source node's MAC address.
4	Router1(config-if)# **end** Router1#	Type **exit** until you return to privileged EXEC mode.
5	Router1# **copy running-config startup-config**	Enter the **copy running-config startup-config** command to write the new configuration to memory.

Configuring the Topology-Timer

This section explains how to configure the topology-timer on a DPT ring. This is an optional task. The **srp topology-timer** interface configuration command and a specified value determines how frequently topology discovery messages are sent around the ring to identify the current nodes on the DPT ring. Topology discovery is always on. The topology discovery frequency is user-configurable, the default value is 5 seconds.

To configure the topology-timer, perform the following steps beginning in privileged EXEC mode:

Step	Command	Purpose
1	Router1# **configure terminal** Router1(config)#	Type **configure terminal** to enter global configuration mode.
2	Router1(config)# **interface srp 2/0** Router1(config-if)#	Specify an SRP interface by entering the **interface srp** global configuration command. The prompt changes to interface configuration mode.
3	Router1(config-if)# **srp topology-timer 60** Router1(config-if)# **end** Router1#	Confirm the frequency of the topology message timer by entering the **srp topology-timer** interface configuration command and the value in seconds. Type **end** to return to the privileged EXEC mode
4	Router1# **show srp topology** Topology Map for Interface SRP2/0 Topology pkt. sent every 60 sec. (next pkt. after 2 sec.) Last received topology pkt. 00:00:02 Nodes on the ring:4 Hops (outer ring) MAC IP Address Wrapped Name 0 0123.4567.0001 10.1.2.1 No Router1 1 0123.4567.0002 10.1.2.2 No Router2 2 0123.4567.0003 10.1.2.3 No Router3 3 0123.4567.0004 10.1.2.4 No Router4	Specify the identity of the nodes on the DPT ring by entering the **show srp topology** EXEC command. The command output also shows the number of hops between nodes and identifies the nodes that are wrapped.

Modifying SONET/SDH Configuration Parameters

This section explains how to use the Cisco IOS configuration commands in Table 2 to change the default values of the line card parameters to match your network environment. These are optional tasks. You can modify the configuration parameters beginning in privileged EXEC mode:

Table 2 1OC-12/STM-4 SRP Line Card Configuration Default Values

Parameter	Configuration Command	Default Value
Cisco Discovery Protocol (cdp)	[**no**] **cdp enable**	cdp enable
Framing	**srp framing** [**sdh** | **sonet**] [**a** | **b**]	SONET OC-12c
Bandwidth	[**no**] **bandwidth** *kbps*	622000 kbps
SONET overhead	**srp flag** [**c2** *value*] [**j0** *value*] [**a** | **b**]	c2 set to 0x16 j0 set to 0xCC
Clock source	**srp clock-source** [**internal** | **line**] [**a** | **b**]	srp clock-source internal

Step	Command	Purpose
1	`Router1# configure terminal` `Router1(config)#`	Type **configure terminal** to enter global configuration mode.
2	`Router1(config)# interface srp 2/0` `Router1(config-if)#`	Use the **interface srp** interface configuration command to specify a node. The prompt changes to interface configuration mode.
3	`Router1(config-if)# srp framing sdh` `Router1(config-if)#`	To select framing, enter the **srp framing** interface configuration command.
4	`Router1(config-if)# srp clock-source line a` `Router1(config-if)#`	Enter the **srp clock-source** interface configuration command.
5	`Router1(config-if)#srp topology-timer 60` `Router1(config-if)#`	Set the topology timer frequency by entering the **srp topology-timer** interface configuration command.
6	`Router1(config-if)# end` `Router1#`	Type **end** until you return to privileged EXEC mode.

Configuring the SRP IPS Command Options

This section explains how to use SRP IPS command options that will insert or override Intelligent Protection Switching (IPS) modes. These are optional tasks. DPT ring architecture provides redundancy and protection from a failed node or a fiber cut through the use of IPS modes that are automatic or user-configured. Automatic SRP IPS modes take effect when the DPT ring detects an event, a fiber cut, or node failure and remain in effect until the default wait-to-restore (wtr) value expires. User-configured SRP IPS modes take effect as soon as you enter the commands and remain in effect until they are removed by a user-command or overridden by higher priority automatic SRP IPS modes. You can enter the **no** form of the SRP IPS request to negate an automatic or a user-configured command. Table 3 provides an explanation of the IPS requests in the order of priority, from highest to lowest.

Table 3 Explanation of SRP IPS Requests

SRP IPS Request	Explanation
Forced-Switch	Adds a high-priority protection switch wrap on each end of a specified span by entering the user-configured **srp ips forced-switch** command.
Signal Fail	Enters automatic protection switch wraps on a span when it is invoked by a media signal failure or SRP keep-alive failure. The signal fail protection switch wrap remains in effect until the event is repaired.
Signal Degrade	Enters automatic protection switch wraps on a span when it is invoked by a media signal degrade, such as an excessive bit error rate.
Manual-Switch	Adds a low-priority protection switch wrap on each end of a specified span by entering the user-configured **srp-ips manual-switch** command.
Wait-to-Restore	Invokes a waiting period after the working channel meets the restoration criteria after a signal fail or signal degrade condition disappears. The wait-to-restore period prevents protection switch oscillations.

If an automatic or user-configured protection switch is requested for a given span, the node that receives the protection request issues a protection request to the node on the other end of the span using both the short path over the failed span, as the failure may be unidirectional, and the long path, around the ring.

As the protection requests travel around the ring, the protection hierarchy is applied. For example, if a high-priority Signal Fail request enters the ring, it overrides a pre-existing lower-priority Signal Degrade request. If an event or a user-configured command enters a low-priority request, it is not allowed if a high-priority request is present on the ring. The only exception is that multiple Signal Fail and forced-switch requests can coexist on the ring.

All protection switches are performed bidirectionally and enter wraps at both ends of a span for transmit and receive directions, even if a failure is only unidirectional.

To enter user-configured SRP IPS requests when they are needed, perform the following steps beginning in privileged EXEC mode:

Step	Command	Purpose
1	`Router1# configure terminal` `Router1(config)#`	Type **configure terminal** to enter global configuration mode.
2	`Router1(config)# interface srp 2/0` `Router1(config-if)#`	Enter the **interface srp** global configuration command. The prompt changes to interface configuration mode.
3	`Router1(config-if)# srp ips request manual-switch a` `Router1(config-if)#`	To enter a manual-switch wrap state, enter the **srp ips request manual-switch** interface configuration command and specify side A or B.
4	`Router1(config-if)# srp ips request forced-switch a`	To enter a forced switch wrap state, enter the **srp ips request forced-switch** interface configuration command and specify side A or B.
5	`Router1(config-if)# srp ips wtr-timer 60`	To set a non-default value of the wait-to-restore timer, enter an **srp ips wait-to-restore timer** interface configuration command and the value in seconds.

Step	Command	Purpose
6	`Router1(config-if)# srp ips timer 90 a` `Router1(config-if)#`	To set a non-default value for the frequency of IPS messages, enter the **srp ips timer** interface configuration command and specify the value in seconds.
7	`Router1(config-if)# end` `Router1#`	Type **end** until you return to the privileged EXEC mode.
8	`Router1# show srp ips`	Use the **show srp ips** EXEC command to display the status of the srp ips requests.

Monitoring and Maintaining the DPT Ring

You can use the information in the following sections to monitor and maintain the DPT ring by:

- Displaying DPT Ring Configuration Using Show Commands
- Using LEDs to Monitor the DPT Ring Status

Displaying DPT Ring Configuration Using Show Commands

You must be in EXEC mode to display information about the SRP interfaces on the DPT ring using the Cisco IOS software show commands: **show interfaces srp**, **show srp**, **show srp ips**, **show controllers srp**, and **show srp topology**. Table 4 explains the terms in the show command output.

Step	Command	Purpose
1	`Router1# show interfaces srp` `Router1#`	Shows the status of an SRP line card in a specific router's slot and port number.
2	`Router1# show srp` `Router1#`	Shows the status of all of the SRP interfaces that are nodes on the DPT ring.
3	`Router1# show srp ips` `Router1#`	Shows intelligent protection switch (IPS) information.
4	`Router1# show controllers srp` `Router1#`	Displays the SRP controller that is currently running.
5	`Router1# show srp topology` `Router1#`	Displays the identity of the nodes on the DPT ring.

Table 4 Show Command Terms

Term	Explanation
Hardware address	Provides the MAC address of the DPT interface.
Interface	Provides the SRP interface and *slot/port* number.
IPS State	Provides wrap information.
IPS self-detected requests	Shows whether there is fiber cut or node failure.
IPS messages received	Shows the IPS messages received on sides A and B of a node.
IPS messages transmitted	Shows the IPS messages transmitted on sides A and B of a node.

Table 4 Show Command Terms (continued)

Protocol Address	Provides the internet protocol address.
Type	Indicates whether the node is on the inner or outer ring

Using LEDs to Monitor the DPT Ring Status

You can use the status LEDs to monitor the DPT ring. Each SRP interface corresponds to the line card ports. Some LEDs indicate status across the two ports of an interface, while others indicate the status of a single port. Table 5 explains how to interpret the line card LEDs.

Table 5 Explanation of Status LEDs

LED Type	LED Status	Explanation
Port LEDs	Active (Green)	Indicates the SRP interface is enabled, or in a **no shut** state.
	Carrier (Green)	Indicates proper reception of SONET framing.
	RX Packet (Green)	Indicates reception of packets into the port. Packets forwarded back out onto the ring do not trigger this LED.
Interface LEDs	Pass-through (Yellow)	Indicates that the SRP interface is configured for transparent operation. Packets are unconditionally forwarded in both directions. No packets are received into the interface.
	Wrap Indication	Indicates an SRP wrap from the interface's Active LEDs. When both LEDS are on, the interface is configured for normal, two ring operation. When both LEDs are off, the interface is shutdown. When only one LED is on, the corresponding port is configured for wrapped operation.

The status LEDs on the line card might not go on until you have configured the line card interfaces (or turned them on, if they were shut down). Follow the configuration tasks in this section to make sure each interface is enabled, beginning in privileged EXEC mode:

Step	Command	Purpose
1	`Router1# configure terminal` `Router1(config)#`	Type **configure terminal** to enter global configuration mode.
2	`Router1(config)# interface srp 2/0` `Router1(config-if)#`	Specify an srp interface on the ring by entering **interface srp** interface configuration command.
3	`Router1(config-if)# no shutdown`	To enable the interface, enter the **no shutdown** command. The **no shutdown** command passes an **enable** command that configures the SRP interface automatically, based on the configuration commands that were previously sent.
4	`Router1(config-if)# end` `Router1#`	Type **end** to return to privileged EXEC mode.

Configuration Examples

The following example configurations describe:

- Creating a Ring (Optional)
- Adding Node to a Ring-Method 1 (Optional)
- Adding a Node to a Ring-Method 2 (Optional)
- Deleting a Node from a Ring-Method 1 (Optional)
- Deleting a Node from a Ring-Method 2 (Optional)

Note The procedures in this section use the illustrations of a Cisco 12008 to support the descriptions of adding and deleting nodes. Although the card cages of the Cisco 12012 and Cisco 12008 differ in the number of card slots, the designated use of slots and the process of adding and deleting nodes are basically the same for all Cisco 12000 series routers. Therefore, separate procedures and illustrations for the 12012 are not included in this publication. This procedure also applies to the Cisco 7500/7200 series routers that you can add to the DPT ring.

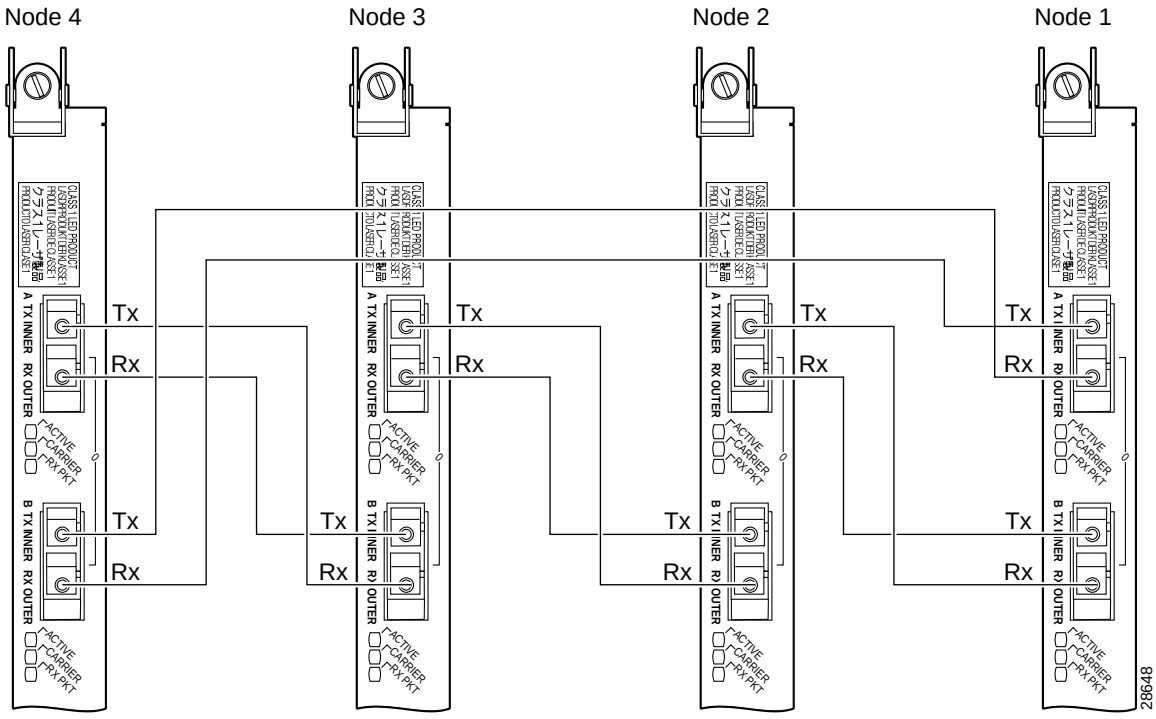
Creating a Ring

You can use the following steps to connect fiber-optic cables to an SRP line card in a Cisco 12000 series GSR to create a DPT ring:

Step	Command	Purpose
1	None	Install an SRP line card in a Cisco 12000series router on the network. The first router with a an SRP line card becomes Node 1, the first SRP interface on the ring.
2	None	To add more nodes to the ring, connect the cables observing the receive (Rx) and transmit (Tx) cabling relationship. The labels under the fiber connectors identify side A, Tx and Rx, and side B, Tx and Rx.

Be sure to connect the fiber-optic cables using the receive (Rx) and transmit (Tx) cabling relationship, which means that an Rx port on one SRP line card must be connected to a Tx port on the next SRP line card. A DPT ring is composed of two fiber rings: Outer and Inner. Outer ring traffic flows clockwise. Inner ring traffic flows counter-clockwise. The side of a node with Outer ring receive fiber is identified as side A, the side of a node with Inner ring receive fiber is identified as B. Side A must be connected to Side B. See Figure 4 and Figure 5.

Figure 4 Creating a DPT Ring Using SRP Line Cards



Use Figure 5 and Table 6 to make the cable connections for a four-node ring.

Figure 5 4-Node DPT Ring

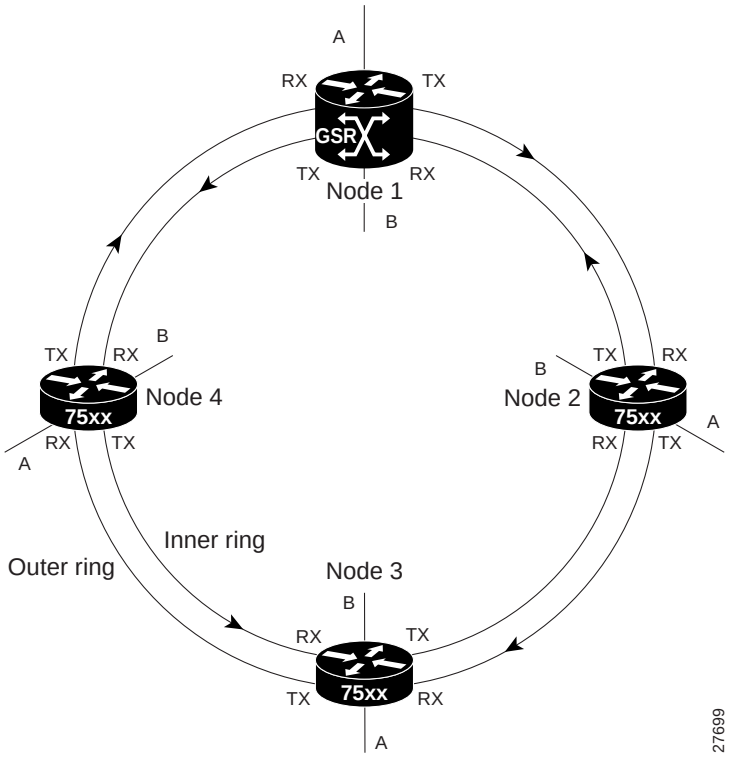


Table 6 lists the cable connections for a 4-node ring.

Table 6 Cable Connections for a 4-Node Ring

Cable Connections	
From Node / Connector	**To Node / Connector**
Node 1 / Tx side B	Node 2 / Rx side A
Node 2 / Tx side B	Node 3 / Rx side A
Node 3 / Tx side B	Node 4 / Rx side A
Node 4 / Tx side B	Node 1 / Rx side A
Node 1 / Tx side A	Node 4 / Rx side B
Node 4 / Tx side A	Node 3 / Rx side B
Node 3 / Tx side A	Node 2 / Rx side B
Node 2 / Tx side A	Node 1 / Rx side B

Adding Node to a Ring-Method 1

This section explains how to add Node 5 to a 4-node ring. You can insert a new node on a ring without powering down the routers on your network. As long as one connection remains, data traffic will pass-through the fiber, from the source node to the destination node, uninterrupted. The new node will be placed between Node1 and Node 4 on the ring. The connections between the two existing nodes must be broken to insert the connections to the new node. This intentional break in

the ring is handled by the Intelligent Protection Switching (IPS) facilities. See Figure 6 through Figure 9 for examples of adding a node to a ring. Figure 6 and Figure 7 show the physical configuration. Figure 8 and Figure 9 show the logical configuration.

You can add a node by using one of the following methods:

1. Disconnecting the fiber cables between Node1 and Node 4 will cause IPS to automatically enter signal-fail wraps on the DPT ring. Signal-fail wraps have the same function as manual-switch wraps. This is the simplest approach, but there will be some data loss while the automatic switching reacts to the change.
2. Using Cisco IOS commands to enter forced-switch wraps on the DPT ring at Node1 and Node 4, prior to removing the cables, will prevent loss of data.

Note When the ring is in a wrapped state its traffic carrying capacity is somewhat reduced. It is not advisable to add the extra node at a time when the ring bandwidth is fully used.

The following examples show how to add a fifth node to a four-node ring. The nodes are named Router1, Router2, and so on. The additional node, Router5, will be added between Router1 and Router4. Side A of Router5 connects to Side B of Router4, and Side B of Router5 connects to Side A of Router1. Figure 6 shows four routers connected before a fifth router is added. Figure 7 shows five routers connected on a DPT ring. Follow the configuration examples in this section beginning in privileged EXEC mode.

Step	Command	Purpose
1	Router5# **configure terminal** Router5(config)# **interface srp 2/0** Router5(config-if)# **ip address 10.1.2.5 255.255.255.0** Router5(config-if)# **mac-address 0123.4567.0005** Router5(config-if)# **end** Router#	Type the **configure terminal** to enter global configuration mode. Configure the new node by using the **interface srp** global configuration command to specify the SRP interface. Then assign an IP address, and if necessary, assign a MAC address in interface configuration mode. Type **end** until you return to privileged EXEC mode.
2	Router1# **show srp**	Use the **show srp** privileged EXEC command to ensure that the ring's IPS state is IDLE and that the topology shows four nodes.
3	None	Disconnect the fibers on the span where the node is to be added. When the fibers are disconnected, a signal failure will be detected by Nodes 1 and 4, and automatically insert two (signal-fail) wraps away from the failure between the nodes.
4	None	Insert Router5 onto the ring by connecting Router5 to Router1. Then connect Router5 to Router4. Router5 will appear on the ring as node 5, between Nodes 1 and 4.
5	Router1# **show srp ips**	Use the **show srp ips** command to verify that the signal-fail wraps have disappeared. If the wraps are still present, wait for the default wait-to-restore timer to time out.

Step	Command	Purpose
6	`Router1# show srp topology`	Use the **show srp topology** privileged EXEC command to confirm that the wraps have disappeared and to verify that new node is part of the ring topology. **Note** It takes a few seconds for the new ring topology to become known so you may have to retry the command a few times.

Figure 6 Four Routers on the DPT Ring (12008 shown)

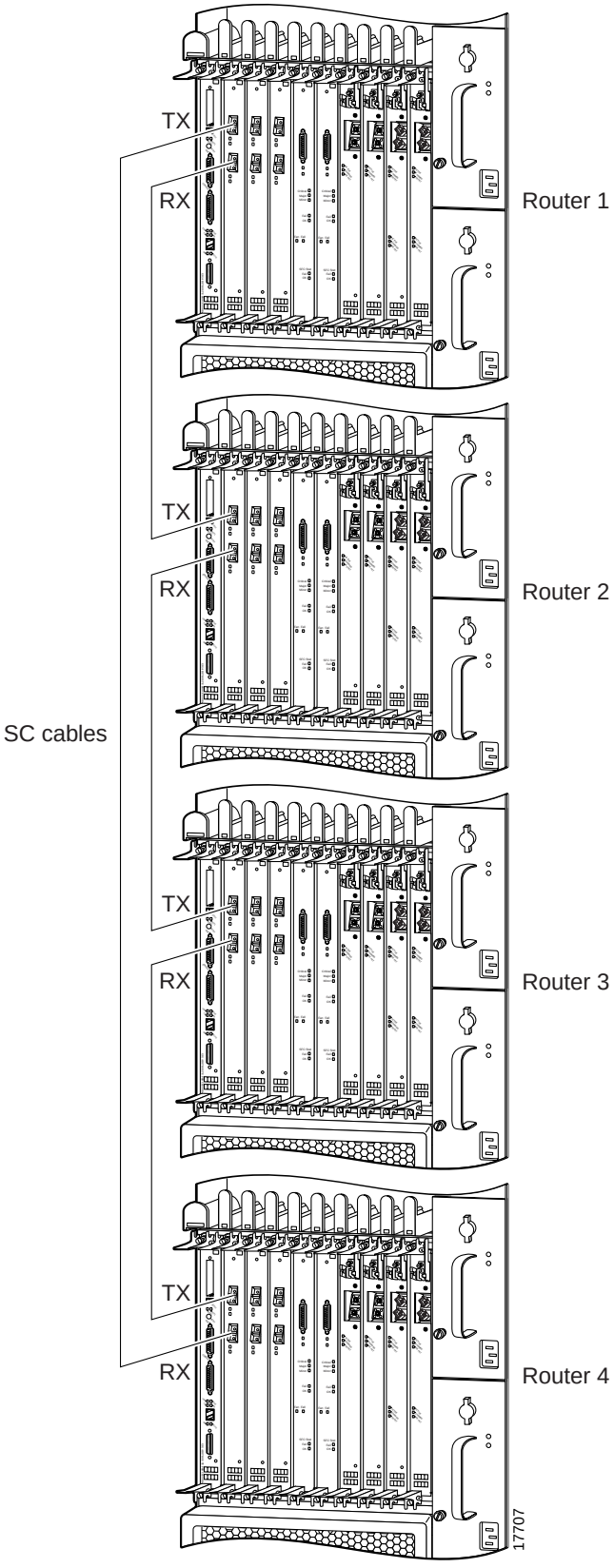


Figure 7 Adding a Router on the DPT Ring (12008 shown)

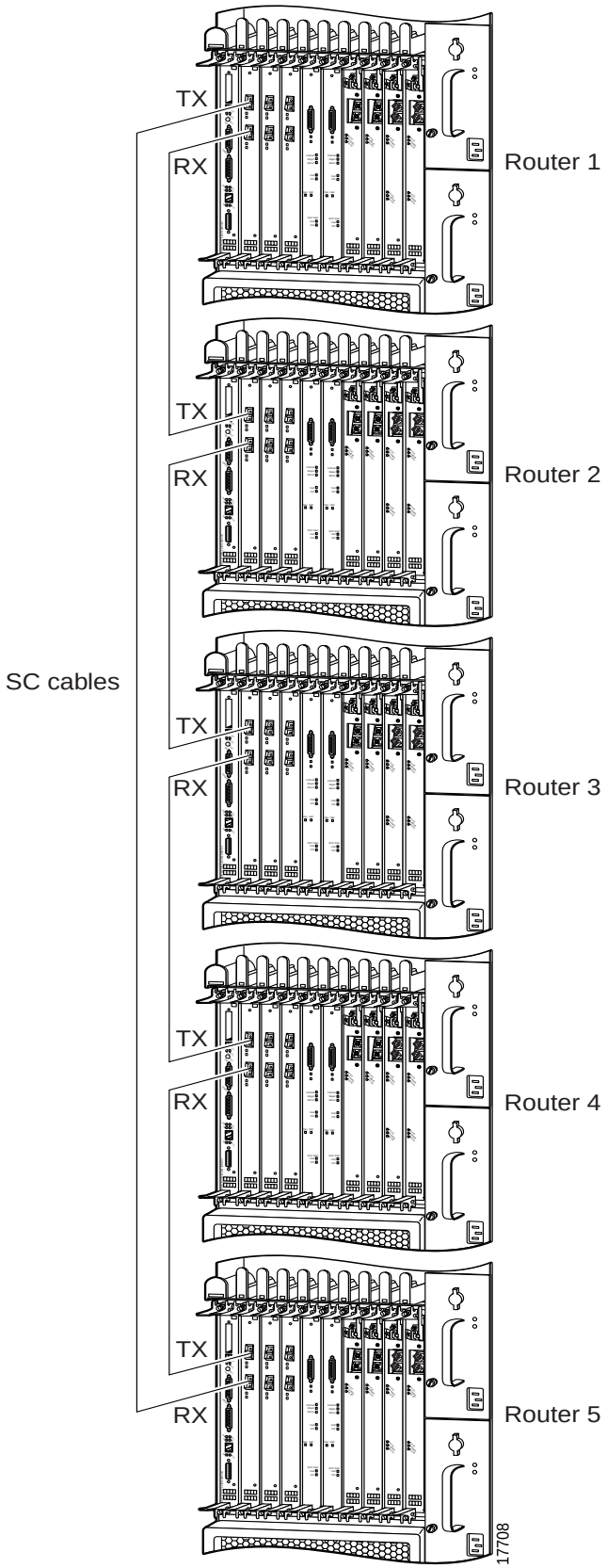


Figure 8 shows a four-node ring before a fifth node is added.

Figure 8 DPT Ring Topology with Four Nodes

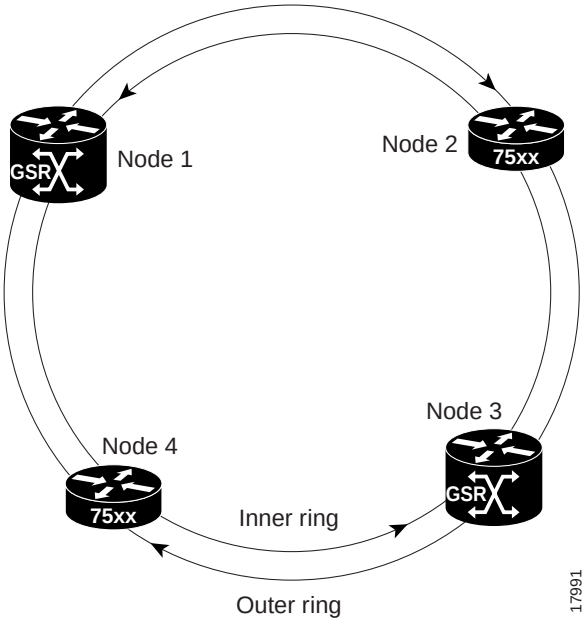
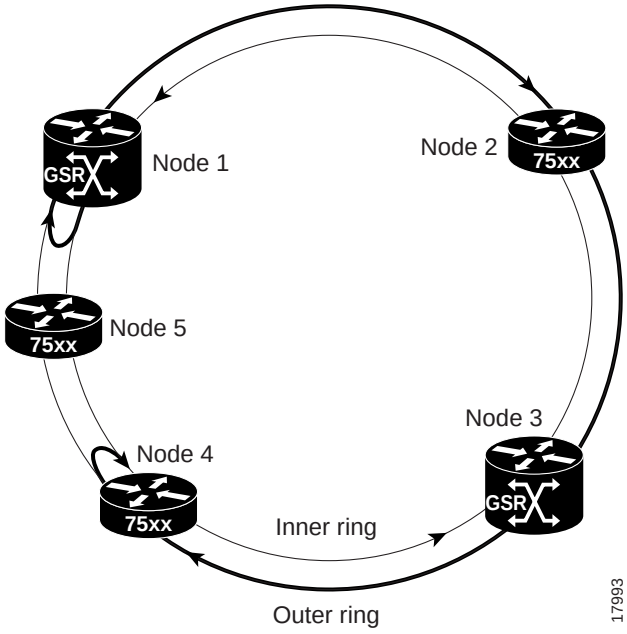


Figure 9 shows a ring with forced-switch wraps entered at Node 1 and Node 4. Node 5 is added to the ring between the forced-switch wraps.

Figure 9 DPT Ring Topology with Fifth Node Being Added to a Wrapped Ring



To verify that you can communicate with an SRP interface on the ring.

Step	Command	Purpose
1	Router1# **configure terminal** Router1(config)# **interface srp 2/0** Router1(config-if)# **end**	Type **configure terminal** to enter global configuration mode. Specify the new node on the ring by entering **interface srp** interface configuration command.
2	Router1# **ping 10.1.2.5**	Use the **ping** privileged EXEC command to verify that you can communicate with a new SRP interface on the ring.
3	None	If the ping is successful, continue configuring the new SRP interface. If the ping is unsuccessful, go to the following section, "Adding a Node to a Ring-Method 2."

Adding a Node to a Ring-Method 2

This section also shows how to add a fifth node to a four-node, using Cisco IOS commands that will insert forced-switch wraps away from the area on the fiber where the node is being added, and ensure a minimal loss of data traffic. For the purpose of this example, Node 5 will be placed between Node 1 and Node 4. Figure 6 and Figure 7 show the physical configuration. Figure 8 and Figure 9 show the logical configuration.

To add a node to a ring, follow the configuration example in this section beginning in privileged EXEC mode.

Step	Command	Purpose
1	Router1# **configure terminal** Router1(config)#	Type **configure terminal** to enter global configuration mode.
2	Router1(config)# **interface srp 2/0** Router1(config-if)#	Specify the Node 1 SRP interface by entering the **interface srp** global configuration command. The prompt will change to interface configuration mode.
3	Router1(config-if)# **srp ips request forced-switch a**	Stop data traffic flowing from Node 1on the fiber that will be disconnected by entering an **srp ips request forced-switch** interface configuration command to create a wrap next to Node 1on side A.
4	Router1(config-if)# **end** Router1(config)#	Type **end** to return to global configuration mode.
5	None	Disconnect the fiber-optic cables connecting Node 1 to Node 4.
6	None	Connect the cables to add the new node while observing the receive (Rx) and transmit (Tx) cabling relationship.
7	Router1(config)# **interface srp 2/0** Router1(config-if)#	Specify the Node 1 SRP interface by entering the **interface srp** global configuration command. The prompt changes to interface configuration mode.

Step	Command	Purpose
8	`Router1(config-if)# no srp ips request forced-switch a` `Router1(config-if)#`	Remove the wrap on Node 1 by entering the **no srp ips request forced-switch** interface configuration command.
9	`Router1(config-if)# end` `Router1(config)#`	Type **end** to return to privileged EXEC mode.
10	`Router1# show srp topology`	Use the **show srp topology** EXEC command to confirm that the wraps have disappeared and the new node is part of the ring topology. See Figure 9. It takes a few seconds for the new ring topology to become known so you may have to retry the command a few times.

Deleting a Node from a Ring-Method 1

This section explains how to delete Node 5 that is positioned between Node1 and Node 4 on the ring. You must disconnect the cables to break the connection between Node5 and Nodes 1 and 4. After Node 5 is removed, you must connect Node1 and Node 4. The intentional break on the ring is handled by the IPS facilities.

There are two ways to delete a node:

1. You can just disconnect the existing cables, and IPS will automatically wrap the ring at the two nodes. This is the simplest approach, but there will be some data loss while the automatic switching reacts to the change.
2. You can add manual wraps prior to disconnecting the cables to reduce data loss.

Note When the ring is in a wrapped state, its traffic carrying capacity is somewhat reduced. It is not advisable to remove a node when the ring bandwidth is in full use.

The following configuration example shows how to remove a node from a five node ring. The nodes are named Router1, Router2 and so on. The Router5 node will be removed from its current position between Router1 and Router4. Then Side A of Router1 connects to Side B of Router4.

To remove a node from a ring, follow the configuration example in this section beginning in privileged EXEC mode.

Step	Command	Purpose
1	`Router1# show srp ips`	Ensure that the ring is in the idle state by using the **show srp ips** EXEC command.
2	None	Disconnect the cables from the router you want to delete from the ring.
3	None	When the fibers are disconnected, the ring detects a signal failure and automatically inserts signal fail wraps to direct traffic away from the failure.

Step	Command	Purpose
4	None	Reconnect the cables to the 1OC-12/STM-4 SRP line cards that you want on the ring. Be sure to observe the Rx and Tx cabling relationships.
5	None	When the default wait-to-restore timer expires the wraps will disappear and enable traffic on the ring.
6	Router1# **show srp topology**	Confirm that the topology does not show the deleted node and that the wraps have been removed by using the **show srp topology** EXEC command.

Deleting a Node from a Ring-Method 2

The following configuration example shows how to remove a node from a ring using forced protection switches to insert wraps on the ring, thereby logically removing the node from the ring prior to physically removing it. As in the previous example, you will remove Router5 from its current position between Router1 and Router4. To remove a node from a ring, follow the configuration example in this section beginning in privileged EXEC mode.

Step	Command	Purpose
1	Router1# **show srp ips** Router1#	Enter the **show srp ips** EXEC command to ensure that the ring is in an idle state, and that no wraps exist.
2	Router5# **configure terminal** Router5(config)#	Type **configure terminal** to enter global configuration mode on the router that you want to remove.
3	Router5(config)# **interface srp 2/0** Router5(config-if)#	Specify the Node 5 SRP interface by entering the **interface srp** global configuration command. The prompt changes to interface configuration mode.
4	Router5(config-if)# **shutdown** Router5(config-if)#	Enter a **shutdown** command on the SRP interface you want to remove to place the interface in pass-through mode. The ring will revert to a four-node operation, even though the fifth node is still physically attached to the ring.
5	Router5(config-if)# **end** Router5#	Type **end** to return to privileged EXEC mode
6	Router1# **show srp**	Enter the **show srp** EXEC command on a neighboring node to verify that Node 5 has disappeared from the DPT ring topology.
7	Router1# **configure terminal** Router1(config)#	Type **configure terminal** to enter global configuration mode on a router adjacent to the one that is to be removed.
8	Router1(config)# **interface srp 2/0** Router1(config-if)#	Specify the node's SRP interface by entering the **interface srp** global configuration command. The prompt changes to interface configuration mode.

Step	Command	Purpose
9	`Router1(config-if)# srp ips request forced-switch a` `Router1(config-if)#`	Add a wrap next to Node 1 by entering an **srp ips request forced-switch** interface configuration command.
10	`Router1(config-if)# end` `Router1(config)#`	Type **end** to return to privileged EXEC mode.
11	`None`	Disconnect the Rx and Tx fibers from Node 5.
12	`None`	Reconnect the fibers between Node 4 to Node 1. Be sure to observe the Rx and Tx cabling conventions.
13	`Router1# configure terminal` `Router1(config)#`	Type **configure terminal** to enter global configuration mode.
14	`Router1(config)# interface srp 2/0` `Router1(config-if)#`	Specify the Node 1 SRP interface by entering the **interface srp** global configuration command. The prompt changes to interface configuration mode.
15	`Router1(config-if)# no srp ips request forced-switch a` `Router1(config-if)#`	Remove the wrap created by the forced switch request on Node 1 by entering the **no srp ips request forced switch** interface configuration command.
16	`Router1(config-if)# exit` `Router1(config)#`	Type **exit** to return to global configuration mode.
17	`Router1# show srp topology`	Confirm that no wraps exist on Node 1 and Node 4 by entering the **show srp topology** EXEC command.

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the *Cisco IOS Release 12.0 Command Reference*.

- **clear counters srp**
- **show controllers srp**
- **show interfaces srp**
- **show srp**
- **show srp ips**
- **show srp source-counters**
- **show srp topology**
- **shutdown**
- **srp clock-source**
- **srp count**
- **srp flag**
- **srp framing**
- **srp ips request forced-switch**
- **srp ips request manual-switch**
- **srp ips timer**
- **srp ips wtr-timer**
- **srp loopback**
- **srp reject**
- **srp report**
- **srp shutdown**
- **srp threshold**
- **srp topology timer**

clear counters srp

To clear the output from the **show srp** or the **show srp source-counters** EXEC commands, use the **clear counters srp** privileged EXEC command.

clear counters srp *slot/port*

Syntax Description

slot/port	Identifies the router slot and port number for the SRP interface.

Defaults

If no interface is specified by a slot/port combination, then counters for all SRP interfaces on the router are cleared.

Command Modes

EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Examples

The following example shows how to use the **clear counters srp** command to make the counts displayed from the **show srp source-counters** command return to zero:

```
Router# show srp source-counters

 Source Address Information for Interface SRP2/0
    0000.0000.0009, index 1, pkt. count 0
    0000.0000.0010, index 2, pkt. count 126
    0000.0000.0011, index 3, pkt. count 0

Router# clear counters srp 2/0
Clear "show interface" counters on this interface [confirm]y
Router#
*Jan  2 20:52:26.621: %CLEAR-5-COUNTERS: Clear counter on interface SRP2/0
```

Related Commands

Command	Description
show srp	Shows the current Intelligent Protocol Switching (IPS) and topology status of SRP interfaces on the ring.

show srp source-counters	Counts packets by source address and shows the total packets sent from a node.
srp count	Counts packets based on source MAC address.

show controllers srp

To display the currently running SRP controller, use the **show controllers srp** EXEC command.

show controllers srp [*slot*/*port*] [**details**]

Syntax Description

slot/*port*	Displays SRP controller information specific to a particular router slot and port number, or information about all SRP controllers in the router will be displayed.
details	Provides additional information about the controller in the output.

Default

No default behavior or values.

Command Mode

EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Example

The following example shows output from the **show controllers srp** command and displays the current configuration on the specified SRP interface:

```
Router1# show controllers srp 2/0
SRP2/0

SRP2/0 - Side A (Outer RX, Inner TX)
SECTION
 LOF = 0          LOS    = 0                            BIP(B1) = 0
LINE
  AIS = 0          RDI    = 0          FEBE = 0          BIP(B2) = 0
PATH
  AIS = 0          RDI    = 0          FEBE = 0          BIP(B3) = 0
  LOP = 0          NEWPTR = 0          PSE  = 0          NSE     = 0

Active Defects:None
Active Alarms: None
Alarm reporting enabled for:SLOS SLOF PLOP

Framing           :SONET
Rx SONET/SDH bytes:(K1/K2) = 0/0        S1S0 = 0  C2 = 0x16
Tx SONET/SDH bytes:(K1/K2) = 0/0        S1S0 = 0  C2 = 0x16  J0 = 0xCC
Clock source      :Internal
Framer loopback   :None
Path trace buffer :Stable
  Remote hostname :Router2
  Remote interface:SRP2/0
  Remote IP addr  :10.1.2.2
  Remote side id  :B

BER thresholds: SF = 10e-3  SD = 10e-6
TCA thresholds: B1 = 10e-6  B2 = 10e-6  B3 = 10e-6

SRP2/0 - Side B (Inner RX, Outer TX)
SECTION
  LOF = 0          LOS    = 0                            BIP(B1) = 0
LINE
  AIS = 0          RDI    = 0          FEBE = 0          BIP(B2) = 0
PATH
  AIS = 0          RDI    = 0          FEBE = 0          BIP(B3) = 0
  LOP = 0          NEWPTR = 0          PSE  = 0          NSE     = 0

Active Defects:None
Active Alarms: None
Alarm reporting enabled for:SLOS SLOF PLOP

Framing           :SONET
Rx SONET/SDH bytes:(K1/K2) = 0/0        S1S0 = 0  C2 = 0x16
Tx SONET/SDH bytes:(K1/K2) = 0/0        S1S0 = 0  C2 = 0x16  J0 = 0xCC
Clock source      :Internal
Framer loopback   :None
Path trace buffer :Stable
  Remote hostname :Router4
  Remote interface:SRP2/0
  Remote IP addr  :10.1.2.4
  Remote side id  :A

BER thresholds: SF = 10e-3  SD = 10e-6
TCA thresholds: B1 = 10e-6  B2 = 10e-6  B3 = 10e-6
Router2#
```

Related Commands

Command	Description
show srp	Show further SRP related details.
show interfaces srp	Show interface details such a packet rates.

show interfaces srp

To show information about an SRP interface, use the **show interfaces srp** EXEC command.

show interfaces srp *slot-port* [**accounting | crb** | **fair-queue** | **irb** | **mac-accounting** | **precedence** | **random-detect** | **rate-limit** | **shape**]

Syntax Description

slot/port	Identifies the router slot and port number for the SRP line card.
accounting	(Optional) Displays the number of packets of each protocol type that has been sent through the interface.
crb	(Optional) Shows interface routing and bridging information.
fair-queue	(Optional) Shows interface queueing information
irb	(Optional) Shows integrated routing bridge information.
mac-accounting	(Optional) Shows interface MAC accounting information.
precedence	(Optional) Shows interface precedence accounting information.
random-detect	(Optional) Shows interface Weighted Random Early Detection (WRED) information.
rate-limit	(Optional) Shows interface rate-limit information.
shape	(Optional) Shows interface Traffic Shape information.

Default

No default behavior or values.

Command Mode

EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

All of the options are not relevant to SRP interfaces.

Example

The following example shows how to examine a specific SRP interface using the **show interfaces srp** command:

```
Router# show interfaces srp 2/0
SRP2/0 is up, line protocol is up
  Hardware is SRP over SONET, address is 0123.4567.0001 (bia 0050.e28c.5440)
  Internet address is 10.1.2.1/24
  MTU 4470 bytes, BW 622000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation SRP,       Side A loopback not set   Side B loopback not set
     4 nodes on the ring   MAC passthrough not set
     Side A:not wrapped   IPS local:IDLE           IPS remote:IDLE
     Side B:not wrapped   IPS local:IDLE           IPS remote:IDLE
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of "show interface" counters 18:26:08
  Queueing strategy:fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 20000 bits/sec, 1 packets/sec
  5 minute output rate 9000 bits/sec, 3 packets/sec
     111517 packets input, 184059367 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     203428 packets output, 78234051 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     Side A received errors:
     0 input errors, 0 CRC, 0 runts, 0 giants, 0 ignored, 0 abort
     Side B received errors:
     0 input errors, 0 CRC, 0 runts, 0 giants, 0 ignored, 0 abort
Router#
```

Related Commands

Command	Description
None	

show srp

To show the current Intelligent Protocol Switching (IPS) source counter and topology status of SRP interfaces on the ring, use the **show srp** EXEC command.

show srp [*srp slot port*]

Syntax Description

srp slot/port	(Optional). Identifies the router slot and port number for a specific srp interface, otherwise srp information for all interfaces is shown.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Example

The following example produces output that displays the IPS, source-counter, and topology status of the SRP interface by using the **show srp** command:

```
Router# show srp

IPS Information for Interface SRP2/0
 MAC Addresses
   Side A (Outer ring RX) neighbor 0123.4567.0004
   Side B (Inner ring RX) neighbor 0123.4567.0002
   Node MAC address 0123.4567.0001
 IPS State
   Side A not wrapped
   Side B not wrapped
   Side A (Inner ring TX) IPS pkt. sent every 1 sec. (next pkt. after 0 sec.)
   Side B (Outer ring TX) IPS pkt. sent every 1 sec. (next pkt. after 0 sec.)
   IPS WTR period is 60 sec. (timer is inactive)
   Node IPS State IDLE
 IPS Self Detected Requests     IPS Remote Requests
   Side A IDLE                    Side A IDLE
   Side B IDLE                    Side B IDLE
 IPS messages received
   Side A (Outer ring RX) {0123.4567.0002,IDLE,S}, TTL 128
   Side B (Inner ring RX) {0123.4567.0004,IDLE,S}, TTL 128
 IPS messages transmitted
   Side A (Inner ring TX) {0123.4567.0001,IDLE,S}, TTL 128
   Side B (Outer ring TX) {0123.4567.0001,IDLE,S}, TTL 128

 Source Address Information for Interface SRP2/0
    0123.4567.0001, index 1, pkt. count 409847
    0123.4567.0002, index 2, pkt. count 2479330
    0123.4567.0003, index 3, pkt. count 724384
    0123.4567.0004, index 4, pkt. count 1472439

 Topology Map for Interface SRP2/0
  Topology pkt. sent every 10 sec. (next pkt. after 5 sec.)
  Last received topology pkt. 00:00:04
  Nodes on the ring:4
  Hops (outer ring)      MAC       IP Address      Wrapped Name
      0             0123.4567.0001 10.1.2.1          No    Router1
      1             0123.4567.0002 10.1.2.2          No    Router2
      2             0123.4567.0003 10.1.2.3          No    Router3
      3             0123.4567.0004 10.1.2.4          No    Router4
Router#
```

Table 7 describes selected fields from the **show srp** command output.

Table 7 show srp Field Descriptions

Field	Description
IPS Information for Interface SRP2/0	IPS (Intelligent Protection Switching) identifies the status of an SRP interface on the DPT ring. The IPS field in the **show srp** command output is also produced by the **show srp ips** command output.
MAC Addresses	
Side A (Outer ring RX) neighbor 0123.4567.0002	The MAC address of the next SRP node on the outer ring.
MAC Addresses	
Side B (Inner ring RX) neighbor 0123.4567.0002	The MAC address of the next SRP node on the inner ring.
Node MAC address 0123.4567.0001	The MAC address of this SRP node.

Table 7 show srp Field Descriptions (continued)

Field	Description
IPS State	Reports whether or not a wrap exists on Side A or Side B of the DPT ring.
IPS WTR period is 60 sec. (timer is inactive)	Displays the current WTR (Wait to Restore) timer value. If a timer is active, the time remaining before timer expiry will also be given.
Node IPS State IDLE	Displays the current IPS state of the node. IDLE is the normal state. Other states are WRAPPED and PASSTHRU.
IPS Self-Detected Requests	Indicates any locally generated requests Indicates any remotely generated requests Displays local IPS requests, as well as IDLE status. Possible requests include the following: LO — Lock-out FS — Forced Switch SF — Signal Fail SD — Signal Degrade MS — Manual Switch WTR — Wait to Restore
IPS Remote Requests	Indicates any locally generated requests Indicates any remotely generated requests Displays remote IPS requests, as well as IDLE status. Possible requests include the following: LO — Lock-out FS — Forced Switch SF — Signal Fail SD — Signal Degrade MS — Manual Switch WTR — Wait to Restore
IPS messages received	Indicates IPS messages received on Side A {0123.4567.0002,IDLE,S}, TTL 128 Indicates IPS messages received on Side B {0123.4567.0004,IDLE,S}, TTL 128 Provides details of the last IPS messages received. Fields within the braces {} are the MAC address of the sending node, the APS state (IDLE, LO, FS, and so on) and indicates either a short (S) or long (L) path.
IPS messages transmitted	Indicates IPS messages received on Side A {0123.4567.0001,IDLE,S}, TTL 128 Indicates IPS messages received on Side B {0123.4567.0001,IDLE,S}, TTL 128 Provides details of the last IPS messages transmitted. The format is per the received messages
Source Address Information for Interface SRP2/0	Provides SRP source counter information that identifies the SRP interface. This section of the **show srp** command output is also produced by **show srp source-counters** command output
0123.4567.0001, index 1, pkt. count 409847	Displays the initial number is the MAC address of the SRP node whose packets are being counted.The index refers to an internal detail of the SRP implementation, and has no operational significance. pkt. count indicates that packets from the MAC address are being counted, and the actual count will follow.
Topology Map for Interface SRP2/0	Displays SRP topology information that identifies the SRP interface. This section of the **show srp** command output is also produced by **show srp topology** command output.

Table 7 show srp Field Descriptions (continued)

Field	Description
Topology pkt. sent every 10 sec. (next pkt. after 5 sec.)	Displays the interval between successive topology packets sent from this node, and the time until the next one is to be sent (rounded down to the nearest second).
Last received topology pkt. 00:00:04	Displays the time since the last topology packet was received at this node.

Nodes on the ring:4	Displays the number of nodes in the current ring topology.
	`Hops (outer ring) MAC IP Address Wrapped Name`
	`0 0123.4567.0001 10.1.2.1 No Router1`
	`1 0123.4567.0002 10.1.2.2 No Router2`
	`2 0123.4567.0003 10.1.2.3 No Router3`
	`3 0123.4567.0004 10.1.2.4 No Router4`

Hops	Displays the number of hops to the destination node, beginning with the assumption that the node is travelling on Side A. The local node is at hop count zero.
MAC	Displays the MAC address of the node.
IP Address	Displays the IP Address of the SRP interface on the node. If the address is not known, the text string unknown will be displayed. Note that the IP address information is gathered by the ARP table. When a ring is first established it is normal for the IP address of a node to remain unknown until some time after the MAC address is known. If the topology continues to display unknown for the IP address after a reasonable length of time, then there is probably a problem with address resolution protocol.
Wrapped	Indicates whether the SRP ring is wrapped at that node, by either Yes or No.
Name	Displays the host name of the router. If the name is not known then this field is left blank. Note that the host name is obtained from information that is broadcast on the ring at a slower rate than other topology information. When a ring is first established it is normal for the host name of a remote node to remain unknown until some time after the MAC address is known.

Related Commands

Command	Description
show controllers srp	Displays the current controller configuration on an SRP interface.
show interfaces srp	Displays the configuration on an SRP interface.
show srp ips	Displays the Intelligent Protection Switching (IPS) status.
show srp source-counters	Displays a list of the packets counted by the source address on an srp interface.
show srp topology	Identifies the nodes on the Dynamic Packet Transport ring.

show srp ips

To display the Intelligent Protection Switching (IPS) status, use the **show srp ips** EXEC command. This command displays a subset of the information displayed by the **show srp** EXEC command.

show srp ips [*srp slot/port*]

Syntax Description

srp slot/port	(Optional). Specifies the router slot and port number of a specific SRP interface, otherwise the command displays information about all SRP interfaces in the router.

Default

SRP IPS is on by default and cannot be disabled.

Command Mode

EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Examples

The following example checks the Intelligent Protection Switching on the ring by using the **show srp ips** EXEC command:

```
Router# show srp ips

 IPS Information for Interface SRP2/0
 MAC Addresses
   Side A (Outer ring RX) neighbor 0123.4567.0004
   Side B (Inner ring RX) neighbor 0123.4567.0002
   Node MAC address 0123.4567.0001
 IPS State
   Side A not wrapped
   Side B not wrapped
   Side A (Inner ring TX) IPS pkt. sent every 1 sec. (next pkt. after 0 sec.)
   Side B (Outer ring TX) IPS pkt. sent every 1 sec. (next pkt. after 0 sec.)
   IPS WTR period is 60 sec. (timer is inactive)
   Node IPS State IDLE
 IPS Self Detected Requests     IPS Remote Requests
   Side A IDLE                    Side A IDLE
   Side B IDLE                    Side B IDLE
 IPS messages received
   Side A (Outer ring RX) {0123.4567.0002,IDLE,S}, TTL 128
   Side B (Inner ring RX) {0123.4567.0004,IDLE,S}, TTL 128
```

```
 IPS messages transmitted
   Side A (Inner ring TX) {0123.4567.0001,IDLE,S}, TTL 128
   Side B (Outer ring TX) {0123.4567.0001,IDLE,S}, TTL 128
Router#
```

Related Commands

Command	Description
show srp	Displays SRP IPS information in addition to source-counter and topology information.
show controllers srp	Displays the current controller configuration on an SRP interface.
show interfaces srp	Displays the configuration on an SRP interface.

show srp source-counters

To display a list of the packets counted by the source address on an srp interface, use the **show srp source-counters** EXEC command. The command output displays a subset of the information displayed by the **show srp** EXEC command.

show srp source-counters [*srp slot*/*port*]

Syntax Description

srp slot/*port*	(Optional). Specifies the router slot and port number of a specific SRP interface, otherwise the command displays information about all SRP interfaces in the router.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

To clear the counters, use the **clear counters srp** command.

Example

The following example shows the output from the **show srp source-counters** command after counting has been switched on for source address 0123.4567.0004:

```
Router# show srp source-counters

Source Address Information for Interface SRP2/0
0123.4567.0004, index 4, pkt. count 1472439

Router#
```

Related Commands

Command	Description
srp count	Counts packets based on source mac address.
clear counters srp	Clears the output from the **show srp** or the **show srp source-counters** EXEC commands.

show srp	Displays SRP source-counter information, in addition to IPS and topology information.

show srp topology

To identify the nodes on the ring, use the **show srp topology** EXEC command.

show srp topology [*srp slot/port*]

Syntax Description

srp slot/port	(Optional). Specifies the router slot and port number of a specific SRP interface, otherwise the command displays information about all SRP interfaces in the router.

Default

No default behavior or values.

Command Mode

EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Examples

The following example shows output from the **show srp topology** command that identifies SRP interfaces on the ring:

```
Router# show srp topology

 Topology Map for Interface SRP2/0
  Topology pkt. sent every 10 sec. (next pkt. after 5 sec.)
  Last received topology pkt. 00:00:04
  Nodes on the ring:4
  Hops (outer ring)      MAC       IP Address      Wrapped Name
      0             0123.4567.0001 10.1.2.1          No    Router1
      1             0123.4567.0002 10.1.2.2          No    Router2
      2             0123.4567.0003 10.1.2.3          No    Router3
      3             0123.4567.0004 10.1.2.4          No    Router4
Router#
```

Related Commands

Command	Description
show controllers srp	Displays the current controller configuration on an SRP interface.
show interfaces srp	Displays the configuration on an SRP interface.
show srp	Displays SRP source-counter information, in addition to IPS and topology information.

shutdown

To disable an interface, use the **shutdown** interface configuration command. To restart a disabled interface, use the **no** form of this command.

shutdown
no shutdown

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Command History

Release	Modification
10.0	This command was first introduced
12.0(6)S	This command invokes the pass-through mode on the DPT ring.

Usage Guidelines

The **shutdown** command disables all functions on the specified interface. On serial interfaces, this command causes the data terminal ready (DTR) signal to be dropped. On Token Ring interfaces, this command causes the interface to be removed from the ring. On FDDI interfaces, this command causes the optical bypass switch, if present, to go into bypass mode.

On SRP interfaces, The **shutdown** command causes the interface to go into pass-through mode, logically removing it from the ring.

This command also marks the interface as unavailable. To check whether an interface is disabled, use the **show interfaces** EXEC command. An interface that received the **shutdown** command is shown as administratively down in the display from this command.

Examples

The following example turns off Ethernet interface 0:

```
Router(config)# interface ethernet 0
Router(config-if)# shutdown
Router(config-if)#
```

The following example turns the interface back on:

```
Router(config)# interface ethernet 0
Router(config-if)# no shutdown
Router(config-if)#
```

Related Commands

Command	Description
show interfaces	Shows the status of interfaces on the router.

srp clock-source

To configure the clock source, use the **srp clock-source** interface configuration command. Use the **no** form of this command to restore the default **srp clock-source**.

srp clock-source [*line* | *internal*] [**a** | **b**]
no srp clock-source [*line* | *internal*] [**a** | **b**]

Syntax Description

line	Specifies the clock source as line, used when connecting a router to SONET/SDH ADM.
internal	Specifies the clock source as internal, used when connecting between two routers over a dark fiber or over Wavelength Division Multiplexing (WDM) system.
A	Specifies the clock source on side A of the router.
B	Specifies the clock source on side B of the router.

Default

srp clock-source [*line* | *internal*] [**a | b**]

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Examples

The following is an example of how to use the **srp clock-source** command to select line as a clock source on side A:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp clock-source line a
Router(config-if)#
```

Related Commands

Command	Description
show controllers srp	Shows current clock-source, in addition to other information.

srp count

To count packets based on source mac address, use the **srp count** interface configuration command and specify the 48-bit source address. The counts may be viewed by the **show srp** or **show srp source-counters** EXEC commands and cleared by the **clear counters srp** command. You can also use the **no** form of this command to stop the counting.

srp count [H.H.H]
no srp count [H.H.H]

Syntax Description

srp count H.H.H.	Specifies the 48-bit MAC address for the node that originated the packets that will be counted.

Default

no srp count

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Examples

The following example shows how to use the **srp count** command to configure the SRP interface in slot 2 to count packets originating from the node with MAC address 000a.1234.5678:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp count 000a.1234.5678
Router(config-if)# end
```

Related Commands

Command	Description
clear counters srp	Clears the packet count created by the **srp count** command.
srp reject	Forces the SRP interface to reject packets sent to it by a specified source MAC address.

show srp	Displays SRP source-counter information, in addition to IPS and topology information.
show srp source-counters	Displays SRP source-counter information.

srp flag

To specify SONET/SDH overhead values for the frame header, use the **srp flag** interface configuration command. Use the **no** form of this command to restore the default srp flag.

srp flag [**c2** | **j0**] *value* [**a** | **b**]
no srp flag [**c2** | **j0**] *value* [**a** | **b**]

Syntax Description

c2 value	Path signal label byte.
j0 value	Section trace byte. For interoperability with some SDH equipment in Japan use the value 0x1.
A	The side of a node that has outer ring receive fiber is identified as side A.
B	The side of a node that has inner ring receive fiber is identified as side B.

Default

The default c2 value is 0x16, and the default j0 value is 0xCC

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only. Note that the s1s0 flag is specified indirectly by the choice of SONET or SDH framing in the **srp framing** command.

Example

The following example shows how to use the **srp flag** command to specify the SONET/SDH overhead values on an SRP interface:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp flag j0 0x1
Router(config-if)#
```

Related Commands

Command	Description
srp framing	Specifies framing for the packet header and trailer to ensure synchronization and error control.

srp framing

To specify framing for the packet header and trailer to ensure synchronization and error control, use the **srp framing** interface configuration command. Use the **no** form of this command to restore the default value for srp framing.

srp framing [**sdh** | **sonet**] [**a** | **b**]
no srp framing [**a** | **b**]

Syntax Description

sdh	Select SDH framing and s1s0=2
sonet	Select SONET framing and s1s0=0 (default)
A	The side of a node that has outer ring receive fiber is identified as side A.
B	The side of a node that has inner ring receive fiber is identified as side B.

Default

srp framing [**a** | **b**]

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Example

The following example allows you to set framing to SDH by using the **srp framing** command:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp framing sdh
```

Related Commands

Command	Description
srp flag	Specifies SONET/SDH overhead values.

srp ips request forced-switch

To initiate a forced-switch wrap on a ring, use an **srp ips request forced-switch** interface configuration command. Use the **no** form of this command to remove the wrap.

srp ips request forced-switch [**a** | **b**]
no srp ips request forced-switch [**a** | **b**]

Syntax Description

A	The side of a node that has outer ring receive fiber is identified as side A.
B	The side of a node that has inner ring receive fiber is identified as side B.

Default

srp ips request forced-switch [**a** | **b**]

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Example

The following example shows how to insert a forced-switch wrap on side A of the interface by entering the **srp ips request forced-switch a** command:

```
Router# configure terminal
Router(config)# interface srp2/0
Router(config-if)# srp ips request forced-switch a
Router(config-if)#
```

Related Commands

Command	Description
srp ips request manual-switch	Inserts a manual-switch wrap on the ring.
show srp	Displays current IPS wrap state, along with other information.
srp shutdown	Provides an alternative form of **srp ips request forced-switch** command.

show srp ips	Displays current IPS wrap state, along with other information.
show interfaces srp	Displays current IPS wrap state, along with other information.
srp ips wtr-timer	A user-configurable wait-to-restore interval that determines how long a wrap remains on the fiber once the original cause of the wrap has been removed.

srp ips request manual-switch

To insert a manual-switch wrap on the ring fiber, use an **srp ips request manual-switch** interface configuration command. Use the **no** form of the command to remove the wrap.

srp ips request manual-switch [**a** | **b**]
no srp ips request manual-switch [**a** | **b**]

Syntax Description

A	The side of a node that has outer ring receive fiber is identified as side A.
B	The side of a node that has inner ring receive fiber is identified as side B.

Default

srp ips request manual-switch [**a** | **b**]

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Note The **srp ips request manual-switch** command is applied to the srp interface, but may be overridden by higher priority events. If such cases, the manual-switch is discarded. The manual-switch is not saved to running-config and will not persist across reloads.

Example

The following example shows how to enter a manual-switch wrap on side B of the interface by using the **srp ips request manual-switch b** command:

```
Router# configure terminal
Router(config)# interface srp2/0
Router(config-if)# srp ips request manual-switch b
Router(config-if)#
```

Related Commands

Command	Description
show srp	Displays current IPS wrap state, along with other information.
show srp ips	Displays current IPS wrap state, along with other information.
show interfaces srp	Displays current IPS wrap state, along with other information.
srp ips request forced-switch	Inserts a forced-switch request wrap on side A or B through a user-configured command.
srp ips wtr-timer	An automatic or user-configurable wait-to-restore interval that determines how long a wrap remains on the fiber once the original cause of the wrap has been removed.

srp ips timer

To control the frequency of the transmission of ips requests, use the **srp ips timer** interface configuration command. Use the **no** form of this command to restore the default value.

srp ips timer <*value*> [**a** | **b**]
no srp ips timer [**a** | **b**]

Syntax Description

timer	Controls the frequency of IPS requests sent around the ring.
value	1– 60 value in seconds.
A	The side of a node that has outer ring receive fiber is identified as side A.
B	The side of a node that has inner ring receive fiber is identified as side B.

Default

The default setting of the IPS timer is one second.

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Examples

The following example shows how to set the **srp ips timer** command to 5 seconds on side A:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp ips timer 5 a
Router(config-if)#
```

Related Commands

Command	Description
show srp	Displays current IPS timers, along with other information.
show srp ips	Displays current IPS timers, along with other information.
srp ips wtr-timer	A user-configurable wait-to-restore interval that determines how long a wrap remains after a trigger to an automatic request, such as signal fail, has disappeared.

srp ips wtr-timer

To change the srp ips wait-to-restore timer from its default value, use the **srp ips wtr-timer** interface configuration command. Use the **no** form of this command to restore the default value.

srp ips wtr-timer <*value*>
no srp ips wtr-timer

Syntax Description

value	10–600 value in seconds

Default

60 seconds

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

When the cause of a wrap is removed, the wrap remains in place for a length of time determined by the srp wait-to-restore timer. This mechanism prevents oscillations on the DPT ring.

Examples

The following example shows how to use the **srp ips wtr-timer** command to change the srp ips wtr-timer to10 seconds on SRP interface 2/0:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp ips wtr-timer 10
Router(config-if)# end
```

Related Commands

Command	Description
show srp	Displays current IPS timers, along with other information.
show srp ips	Displays current IPS timers, along with other information.
srp ips timer	Controls the frequency of the transmission of srp ips packets.

srp loopback

To configure the framer into loopback mode, use the **srp loopback** interface configuration command. Use the **no** form of this command to restore the default value.

srp loopback [*internal* | *line*] [**a** | **b**]
no srp loopback [*internal* | *line*] [**a** | **b**]

Syntax Description

internal	Internal (framer) loopback.
line	Loopback line data.
A	The side of a node that has outer ring receive fiber is identified as side A.
B	The side of a node that has inner ring receive fiber is identified as side B.

Defaults

No loopbacks in place.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

Caution Using **srp loopback** breaks connectivity. This command is used mostly during the initial setup of the SONET link (such as a node-to-node fiber connection), or when general connectivity is not clearly and obviously achieved. You can also use the **srp loopback** command when fiber or equipment connections are rearranged, or if new connectivity problems arise.

Examples

The following example shows how to enter the **srp loopback** command on side A:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp loopback line a
Router(config-if)#
```

Related Commands

Command	Description
show controllers srp	Displays current loopback modes along with other information.

srp reject

To force the SRP interface to reject packets sent to it by a specified source MAC address, use the **srp reject** interface configuration command. Use the **no** form of this command to restore the default value:

srp reject [**H.H.H**]
no srp reject [**H.H.H**]

Syntax Description

H.H.H	Specifies the 48-bit MAC address for the node whose packets are to be rejected.

Default

no srp reject [**H.H.H**]

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only. If the SRP interface is instructed to reject packets by source address then this will be shown by the **show srp** and **show srp source-counters** commands.

Example

The following example shows how to use the **srp reject** command to configure an SRP interface to reject any packets from source MAC address 0123.4567.0001:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp reject 0123.4567.0001
Router(config-if)# end
```

Related Commands

Command	Description
srp count	Counts packets based on a source MAC address.
show srp source-counters	Shows the currently rejected MAC addresses, along with other information.
show srp	Shows the currently rejected MAC addresses, along with other information.

srp report

To enable reporting of selected alarms, use the **srp report** interface configuration command. Use the **no** form of this command to restore the default value.

srp report [**b1-tca** | **b2-tca** | **b3-tca** | **lais** | **lrdi** | **pais** | **plop** | **prdi** | **sd-ber** | **sf-ber** | **slof** | **slos**] [**a** | **b**]
no srp report [**b1-tca** | **b2-tca** | **b3-tca** | **lais** | **lrdi** | **pais** | **plop** | **prdi** | **sd-ber** | **sf-ber** | **slof** | **slos**] [**a** | **b**]

Syntax Description

b1-tca	Reports B1 bit error rate (BER) threshold crossing alarm errors.
b2-tca	Reports B2 BER threshold crossing alarm errors.
b3-tca	Reports B3 BER threshold crossing alarm errors.
lais	Reports line alarm indication signal errors.
lrdi	Reports line remote defect indication errors.
pais	Reports path alarm indication signal errors.
plop	Reports path loss of pointer errors.
prdi	Reports path remote defect indication errors.
sd-ber	Reports LBIP BER in excess of signal degradation threshold.
sf-ber	Reports LBIP BER in excess of signal failure threshold.
slof	Reports section loss of frame errors.
slos	Reports section loss of signal errors.

Default

Reporting enabled for SLOS, SLOF, and PLOP

Command Mode

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
12.0(6)S	This command generates reports on specific alarms.

Usage Guidelines

To determine which alarms are reported on the srp interface, use the **show controllers srp** command.

Example

The following example shows how to use the **srp report** command to enable reports for the SD-BER and LAIS alarms on an SRP interface:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp report sd-ber
Router(config-if)# srp report lais
Router(config-if)#
```

Related Commands

Command	Description
show controllers srp	Displays conditions to be reported along with other information.

srp shutdown

To shutdown an interface by entering a forced-switch, use the **srp shutdown** interface configuration command. Use the **no** form of this command to remove the forced-switch wrap near the interface.

srp shutdown [**a** | **b**]
no srp shutdown [**a | b**]

Syntax Description

A	The side of a node that has outer ring receive fiber is identified as side A.
B	The side of a node that has inner ring receive fiber is identified as side B.

Defaults

srp shutdown [**a** | **b**]

Command Modes

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This **srp shutdown** command is a shorthand form of the **srp ips request forced-switch** interface configuration command that enters a forced-switch request and inserts a wrap on a ring. Use the **no** form of this command to remove the wrap on the ring. The long form, **srp ips request forced-switch**, will appear in the show command output.

Note The **srp shutdown** command differs from the **shutdown** command in the following manner; **srp shutdown** inserts a forced-switch wrap on a ring, **shutdown** invokes the pass-through mode, logically removing the interface from the ring.

Examples

The following example shows how to enter an **srp shutdown** request on side A of an SRP interface:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp shutdown a
Router(config-if)#
```

Related Commands

Command	Description
show srp	Displays current IPS wrap state along with other information.
show srp ips	Displays current IPS wrap state along with other information.
show interfaces srp	Displays current IPS wrap state along with other information.
srp ips request forced-switch	This command is an alternate form of srp shutdown.

srp threshold

To set the BER threshold values of the specified alarms for a SRP interface, use the **srp threshold** interface configuration command. Use the **no** form of this command to restore the default value.

srp threshold [**b1-tca** | **b2-tca** | **b3-tca** | **sd-ber** | **sf-ber**] <*rate*> [**a** | **b**]
no srp threshold [**b1-tca** | **b2-tca** | **b3-tca** | **sd-ber** | **sf-ber**] <*rate*> [**a** | **b**]

Syntax Description

b1-tca	Specifies the B1 bit error rate (BER) threshold crossing alarm.
b2-tca	Specifies the B2 BER threshold crossing alarm.
b3-tca	Specifies the B3 BER threshold crossing alarm.
sd-ber	Sets the signal degrade BER threshold.
sf-ber	Sets the signal failure BER threshold.
rate	Specifies the bit error rate from 3 to 9 (10-n). The default is 6 for all thresholds, except for the **sf-ber**, where the default is 3 (that is, 10e-3).
A	The side of a node that has outer ring receive fiber is identified as side A.
B	The side of a node that has inner ring receive fiber is identified as side B.

Default

The default is 6 (10e-6) for all thresholds except for sf-ber, where the default is 3 (10e-3).

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Example

The following example shows how to set the **srp threshold** values on side A of an SRP interface:

```
Router# configure terminal
Router(config)# interface srp 3/0
Router(config-if)# srp threshold sd-ber 8 a
Router(config-if)# srp threshold b1_tca 4 a
Router(config-if)# end
Router#
```

Related Commands

Command	Description
show controllers srp	Shows current alarm thresholds, along with other information.
srp report	Controls reporting of selected alarms.

srp topology timer

To specify the frequency of the topology timer, use the **srp topology-timer** interface configuration command. Use the **no** form of this command to restore the default value.

srp topology-timer <*value*>
no srp topology-timer

Syntax Description

value	1–600 value in seconds.

Default

The default value for the topology timer is10 seconds.

Command Mode

Interface configuration

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

The **srp topology-timer** interface configuration command and a specified value determines how frequently topology discovery messages are sent around the ring to identify the current nodes on the DPT ring.

Example

The following example shows how to set the frequency for how often srp topology packets are sent around the ring to identify the nodes:

```
Router# configure terminal
Router(config)# interface srp 2/0
Router(config-if)# srp topology-timer 100
Router(config-if)#
```

Related Commands

Command	Description
show srp	Displays current topology and topology timer, along with other information.
show srp topology	Displays current topology and topology timer, along with other information.

Debug Commands

Use the following **debug srp** commands if you recognize configuration problems that need debugging, such as loss of packets, cyclic redundancy check (CRC) errors, card resets, alarms, and so on. This section describes the following debug commands:

- **debug srp error**
- **debug srp ips**
- **debug srp packet**
- **debug srp periodic**
- **debug srp topology**

debug srp error

To display SRP interface protocol errors and error statistics, use the **debug srp error** privileged EXEC command.

[**no**] **debug srp error**

Syntax Description

srp error	Displays errors from all SRP interfaces on the ring.

Default

no debug srp error

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

The debug srp error command generates the following output:

- Lack of memory when attempting to originate packets
- SRP version mismatches
- TTL problems (TTL is "Time To Live", if a packet has TTL expiration it implies that it is not being properly removed from the ring). TTL problems should not affect the normal operation of the ring
- Checksum failures
- Incorrectly sized topology packets
- Incorrect packet type
- Internal software errors

Example

The following example shows how to use the **debug srp error** command to list error statistics on an SRP interface:

```
Router# debug srp error
Router#
```

Related Commands

Command	Description
debug srp packet	Debugs information on a specific SRP packet.
debug srp periodic	Debugs a specific periodic activity.
debug srp topology	Examines ring topology information.

debug srp ips

To debug an SRP interface on the ring, use the **debug srp ips** privileged EXEC command.

[**no**] **debug srp ips**

Syntax Description

srp ips	Displays IPS request messages.

Default

no debug srp ips

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Example

The following example shows how to enter the debug mode to debug an SRP interface:

```
Router# debug srp ips
Router#
```

Related Commands

Command	Description
debug srp error	Displays SRP interface protocol errors and error statistics.
debug srp packet	Debugs information on a specific SRP packet.
debug srp periodic	Debugs a specific periodic activity.
debug srp topology	Examines ring topology information.

debug srp packet

To display information about how to debug a specific SRP packet, use the **debug srp packet** privileged EXEC command and specify the MAC address of the SRP interface.

[**no**] **debug srp packet**

Syntax Description

srp packet	Determines which packet was rejected from the source node.

Default

no debug srp packet

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Example

The following example enters debug mode to debug information on a specific packet on an SRP interface:

```
Router# debug srp packet 000b.1234.5678
Router#
```

Related Commands

Command	Description
debug srp error	Displays SRP interface protocol errors and error statistics.
debug srp periodic	Debugs a specific periodic activity.
debug srp topology	Examines ring topology information.

debug srp periodic

To debug a specific periodic activity, use the **debug srp periodic** privileged EXEC command.

[**no**] **debug srp periodic**

Syntax Description

srp periodic	Checks the frequency of IPS requests and topology messages.

Default

no debug srp periodic

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Usage Guidelines

This command applies to SRP interfaces only.

Example

The following example shows how to debug a specific periodic activity on an SRP interface:

```
Router# debug srp periodic
Router#
```

Related Commands

Command	Description
debug srp error	Displays interface protocol errors and error statistics.
debug srp periodic	Debugs a specific periodic activity.
debug srp topology	Examines ring topology information.

debug srp topology

To examine ring topology information, use the **debug srp topology** privileged EXEC command.

[**no**] **debug srp topology**

Syntax Description

srp topology	Provides information on topology messages that identify nodes on the ring.

Default

no debug srp topology

Command Mode

Privileged EXEC

Command History

Release	Modification
12.0(6)S	This command was first introduced.

Example

The following example shows how to examine the topology information on an SRP interface:

```
Router# debug srp topology
Router#
```

Related Commands

Command	Description
debug srp error	Displays SRP interface protocol errors and error statistics.
debug srp periodic	Debugs a specific periodic activity.
debug srp topology	Examines ring topology information.

Glossary

The following terms and acronyms are used in reference to the 1OC-12/STM-4 SRP line card:

- ADM—Add/Drop Multiplexer. The device used to add or drop virtual channels from SONET/SDH lines into physical tributaries.
- ARP—Address Resolution Protocol. Internet protocol used to map an IP address to a MAC address. defined in RFC 826.
- Average Rate—Maximum long-term average rate of conforming traffic.
- CAR—Committed Access Rate. Quality of Service (QoS) feature that performs rate limiting and packet classification.
- Conform Action—Action to take on packets below the rate allowed by the rate limit.
- DCAR—Distributed CAR. An implementation of CAR. DCAR performs all of the functions of CAR, but all of the processing takes place on the VIP.
- DPT—Dynamic Packet Transport. Dynamic Packet Transport (DPT) rings are dual, counter-rotating fiber rings. Both fibers are used concurrently to transport both data and control traffic, and use Intelligent Protection Switching (IPS) that provides proactive performance monitoring, event detection, rapid self-healing, and restores IP service after fiber facility or node failures.
- exceed action—Action to take on packets above the rate allowed by the rate limit.
- excess burst size—Bytes allowed in a burst before all packets will exceed the rate limit.
- IPS—Intelligent Protection Switching. The ability of the DPT ring to recover from fiber cuts and node failures by “wrapping” traffic onto the alternate fiber.
- LCP—Link Control Protocol. Protocol that establishes, configures, and tests data-link connections for use by Point-to-Point Protocol.
- MIB—Management Information Base. Database of network management information that is used and maintained by a network management protocol, such as Simple Network Management Protocol (SNMP) or Common Management Information Protocol (CMIP). The value of a MIB object can be changed or retrieved using SNMP or CMIP commands, usually through a GUI network management system. MIB objects are organized in a tree structure that includes public (standard) and private (proprietary) branches.
- normal burst size—Bytes allowed in a burst before some packets will exceed the rate limit. Larger bursts are more likely to exceed the rate limit.
- QoS group—Quality of Service group ID for a packet used to determine rate-limiting or weighted fair queuing characteristics for that packet.
- rate limit—Traffic descriptor defined by the average rate, normal burst size, and excess burst size.
- rate policy—The rate limit, conform actions, and exceed actions that apply to traffic matching a certain criteria.
- SDH—Synchronous Digital Hierarchy. European standard that defines a set of rate and format standards that are transmitted using optical signals over fiber. SDH is similar to SONET, with a basic SDH rate of 155.52 Mbps, designated at STM-1.
- SONET—Synchronous Optical Network. High-speed synchronous network specification developed by Bellcore and designed to run on optical fiber. STS-1 is the basic building block of SONET. Approved as an international standard in 1988.
- SPE—Synchronous Payload Envelope. The payload portion of the SONET frame into which the octet-oriented user data is mapped. Octet boundaries are aligned with the SPE octet boundaries.

- SRP—Spatial Reuse Protocol. This is a Layer 2 Media Access Control (MAC) protocol that is media-independent, but the initial SRP implementation is over SONET/SDH. SRP runs over a dual-ring network topology and is characterized by shared media, statistical multiplexing, global fairness, bandwith allocation, and spatial reuse.
- STM-1—Synchronous Transport Module level 1. One of a number of SDH formats that specifies the frame structure for the 155.52-Mbps lines used to carry packets.
- STM-N—Synchronous Transport Module level N. A SDH multiplexing measure, where N indicates the number of 155.52-Mbps channels.
- STS-Nc/STM-Nc—STS is defined as Synchronous Transport Signal. STM is defined as Synchronous Transport Module. The lowercase c after N indicates that N channels are concatenated into one logical channel with a bandwidth of N multiplied by the appropriate rate for SONET/SDH. For SONET, N is defined as having values 3, 12, 48, and 192. For SDH, the legal values are 1, 4, and 16.