



# Configuring the Cisco uBR10-SRP-OC12SML DPT WAN Card

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UBR10-SRP-OC12SML, UBR10-SRP-OC12SML=  
OL-2054-01 Rev. B0  
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## Feature History

Release	Modification
Release 12.2(4)BC1	This Cisco uBR10-SRP-OC12SML DPT WAN Card was supported on the Cisco uBR10012 universal broadband router.

This document describes the Cisco uBR10-SRP-OC12SML DPT WAN Card used in the Cisco uBR10012 chassis. This document provides the following information:

- [Feature Overview, page 2](#)
- [Benefits, page 8](#)
- [Restrictions, page 9](#)
- [Supported Platforms, page 9](#)
- [Supported Standards, MIBs, and RFCs, page 10](#)
- [Prerequisites, page 10](#)
- [Configuration Tasks, page 10](#)
- [Monitoring and Maintaining the DPT WAN Card, page 18](#)
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- [Glossary, page 27](#)



### Caution

This is a Class 1 laser product. Before using this product, see the translations for this warning and other warnings that apply to this product in the *Safety Information and Warnings* section in the *Cisco uBR10-SRP-OC12SML DPT WAN Card for the Cisco uBR10012 Series Router* document and in the *Cisco uBR10012 Universal Broadband Router Hardware Installation Guide*.

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## Feature Overview

The Cisco uBR10012 Spatial Reuse Protocol (SRP) OC12 single-mode fiber, long reach (SML) dynamic packet transport (DPT) adapter card provides shared IP connectivity over SONET capability for the Cisco uBR10012 series router platform.

The Cisco uBR10-SRP-OC12SML DPT WAN card is a double-width card that requires two network uplink card slots in the Cisco uBR10012 chassis. If you are installing two adapter cards, they should be installed in slots 2/0 and 4/0 in the chassis. If you are installing only one adapter card, it can be installed in either slot 2/0, 3/0, or 4/0 in the chassis.

This section contains the following information:

- [Spatial Reuse Protocol Overview, page 2](#)
- [Creating a DPT Ring, page 5](#)
- [Understanding DPT Topology, page 7](#)
- [Overview of the Intelligent Protection Switch Feature, page 7](#)

## Spatial Reuse Protocol Overview

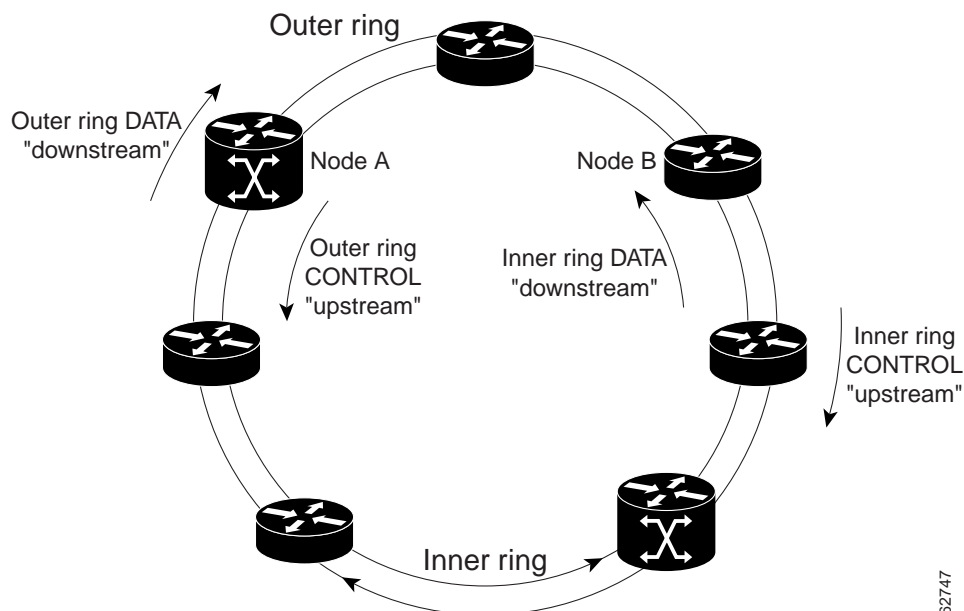
Spatial Reuse Protocol (SRP) is a media-independent MAC layer protocol that operates over two counter-rotating fiber-optic rings. The dual rings provide survivability of data in case of a failed node or a break in connecting cables by rerouting the data path over the alternate ring.

The SRP dual-ring topology offers a number of advantages over other technologies, including minimal protocol overhead, statistical multiplexing, and support for priority traffic at the MAC layer. An SRP ring does not require a software-based station management transfer (SMT) protocol or the ring master negotiation that is used in other ring-based protocols.

SRP provides a more efficient use of bandwidth by having packets traverse only the part of the ring necessary to get to the destination node. Once the packet has reached the destination node, it is removed from the ring, allowing other parts of the ring to reuse the bandwidth. Because each ring node can source packets onto the ring concurrently, this maximizes ring bandwidth.

Data packets travel on one ring, while associated control packets travel in the opposite direction on the alternate ring, ensuring that the data takes the shortest path to its destination. (See [Figure 1](#).)

Figure 1 DPT Ring

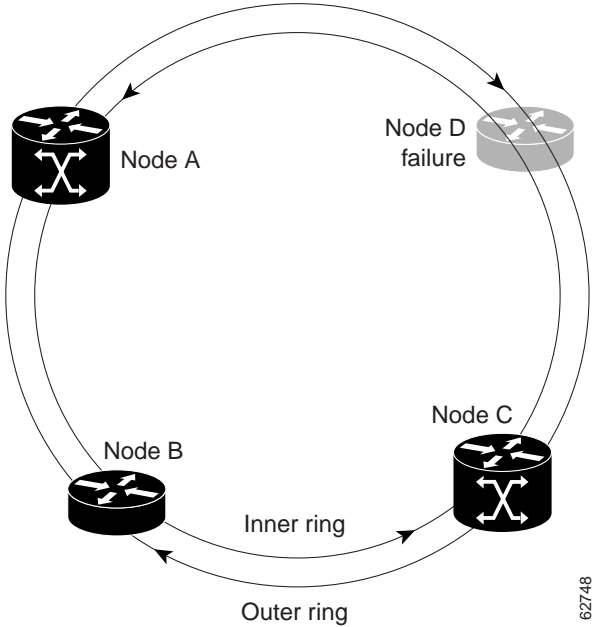


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Each node on a DPT ring represents a Cisco uBR10012 router or another Cisco router using a similar OC12 DPT WAN card (such as a Cisco 12000 series Gigabit Switch Router (GSR), Cisco 7500 series router, or a Cisco uBR7246 VXR universal broadband router). A DPT ring can contain up to 32 nodes at one time, with each node holding a map of the ring topology that it continually updates to ensure that data takes the shortest path to its destination. The frequency of the updating can be manually configured.

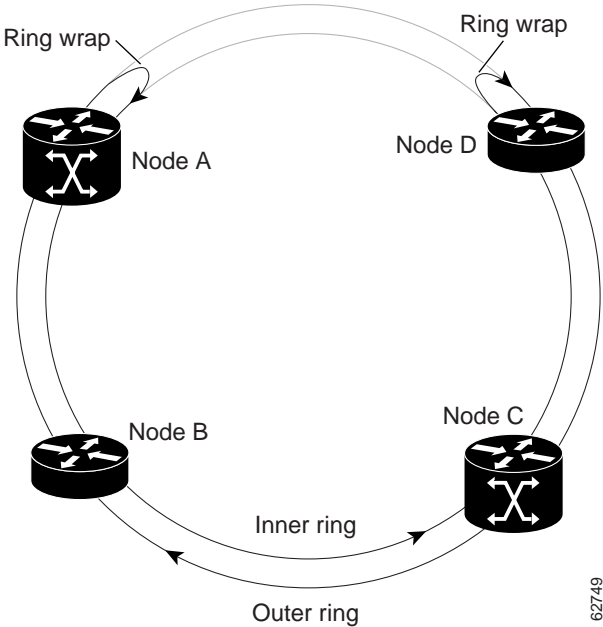
The DPT interface uses the SONET ring architecture, which provides redundancy and protection from a failed node or fiber cut through the use of the Intelligent Protection Switch (IPS). When the DPT ring topology changes because of a node failure, as shown in Figure 2, the system software automatically puts the node into pass-through mode, where data continues to pass through the node, but the node is no longer seen on the ring topology map.

Figure 2 DPT Ring with a Node in Pass-Through Mode



In the event of a fiber cut, ring wraps are created to redirect data traffic over the alternate ring. In both pass-through mode and wrap mode, data packets not destined for the affected node still reach their destination. See [Figure 3](#).

Figure 3 DPT Ring in Wrap Mode

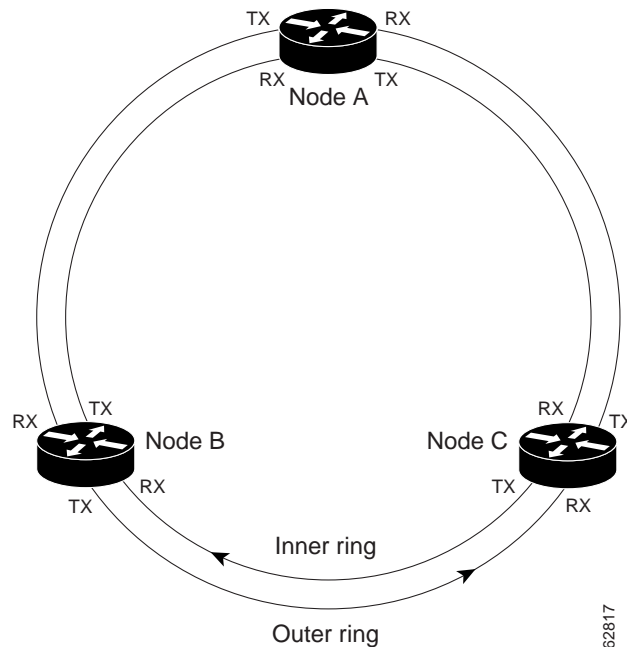


## Creating a DPT Ring

A DPT ring may contain as many as 32 nodes, or as few as 2 nodes. This section illustrates the layout and configuration of a simple three-node DPT ring.

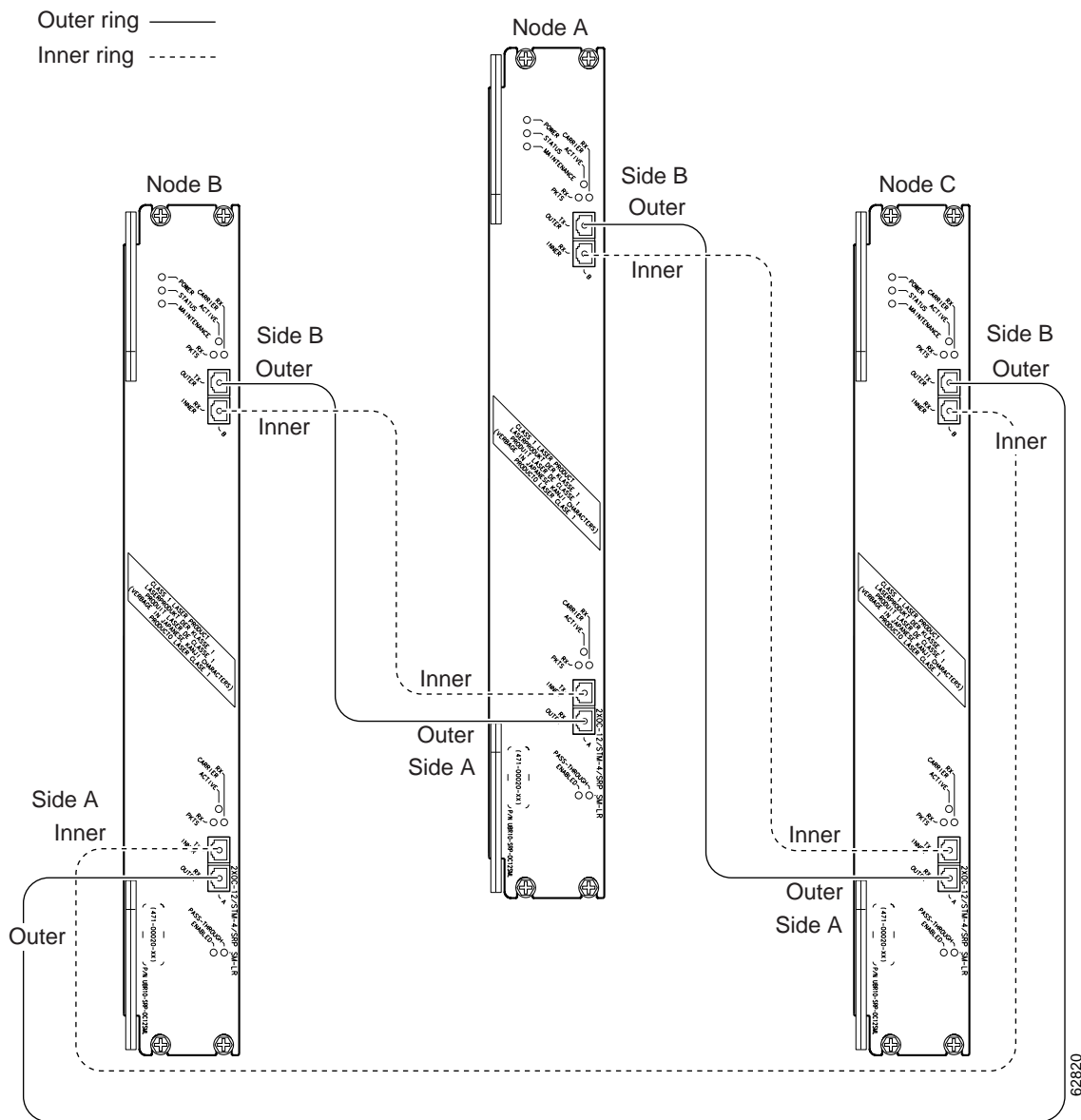
Before the DPT ring can be created, each node (Cisco uBR10012 router or other Cisco router with a DPT port adapter) must have a DPT WAN card installed and configured. After the individual nodes are configured, the inner and outer rings of the DPT ring must be connected as shown in [Figure 4](#).

**Figure 4** Three-Node DPT Ring



To achieve this configuration, you must connect the DPT WAN cards as shown in [Figure 5](#), being careful to observe the receive (RX) and transmit (TX) cable relationship.

Figure 5 Internodal Connections of a Three-Node DPT Ring



**Note**

Side A (RX outer/TX inner) of the DPT WAN card or port adapter must be connected to side B (TX outer/RX inner) of the DPT WAN card or port adapter in the next node in the ring. See the *Cisco uBR10-SRP-OC12SML DPT WAN Card for the Cisco uBR10012 Series Router* for more details on how to connect cables to the DPT WAN card. The location of the Side A and Side B connectors on other OC-12 port adapters might be different from those on the DPT WAN card. See the documentation for those other cards for details.

Table 1 lists the internodal cable connections for a three-node DPT ring.

**Table 1** Three-Node DPT Ring Cable Connections

Internodal Cable Connections	
From Node/Connector	To Node/Connector
Node A/RX outer	Node C/TX outer
Node A/TX inner	Node C/RX inner
Node A/TX outer	Node B/RX outer
Node A/RX inner	Node B/TX inner
Node B/RX outer	Node A/TX outer
Node B/TX inner	Node A/RX inner
Node B/TX outer	Node C/RX outer
Node B/RX inner	Node C/TX inner
Node C/RX outer	Node B/TX outer
Node C/TX inner	Node B/RX inner
Node C/TX outer	Node A/RX outer
Node C/RX inner	Node A/TX inner

## Understanding DPT Topology

Every node on a DPT ring maintains a topology map of the ring so that it knows where to route traffic. It updates the topology map by periodically sending out a query, called a topology discovery packet, out onto the ring. Each node on the ring adds its own MAC address to the packet and resends the packet.

When the discovery packet returns to the originating node, the node uses the contents of the packet to update its node topology map. This ensures that each node has a real-time view of the DPT ring's topology and can respond quickly to any breaks in the ring.



Tip

You can use the **srp topology-timer** command to set the frequency with which the node sends out topology discovery packets. Use the **show srp topology** command to display the MAC addresses of each node on a DPT ring.

## Overview of the Intelligent Protection Switch Feature

The Intelligent Protection Switch (IPS) feature ensures that ring traffic flow continues uninterrupted even if device or ring failures occur. IPS protects the DPT ring by initiating ring wraps that route traffic in the opposite direction over the alternate ring.

The system software creates ring wraps by issuing an IPS request when failures are detected. Five different IPS requests are recognized. These five types of IPS requests are hierarchical, with higher-priority requests taking precedence over lower-priority requests.

[Table 2](#) lists the types of IPS requests in order of priority.

**Table 2** *IPS Request Hierarchy*

Request Priority	Request Type	Originator
1	Forced switch	Operator
2	Signal fail	Software
3	Signal degrade	Software
4	Manual switch	Operator
5	Wait to restore	Software

For example, if a signal failure was detected at the same time that an operator entered a manual switch request, the system would create the ring wrap at the point of signal failure, and the manual switch would be ignored.

**Tip**

The IPS feature is configured using the **srp ips** interface configuration commands, which are described in the documentation listed in the [“Related Documents” section on page 9](#).

## Benefits

The Cisco uBR10-SRP-OC12SML DPT WAN card provides the following benefits:

- Accommodates large scale network topology. The adapter card is deployed in SONET OC-12 DPT rings. The DPT rings are connected to SONET Add Drop Multiplexers (ADMS) allowing the creation of small or very large rings. Each DPT ring supports a maximum of 64 nodes.
- Leverages fiber optics capacity at OC-12c line rates. The adapter card has two SC duplex ports. Each SC duplex port provides the physical connection to an adjacent device in a DPT ring.
- Provides a seamless way to upgrade existing Cisco uBR7200 series CMTS routers to high-performance Cisco uBR10012 routers with higher capacity OC-12 connections.
- Intelligent Protection Switching (IPS) for IP self-healing and restoration and for performance monitoring after a link or node failure.
- Supports single mode fiber transmissions.
- Allows data to obtain fair-shared access to the OC-12c rings.
- Controls the rate at which new packets are inserted on one or both rings simultaneously.
- Implements protection mechanisms, including wrap and unwrap, in the event of fiber or node failure.
- Substantially lower costs by eliminating a layer of SONET/SDH equipment.
- Flexibility that provides capabilities to serve as a common technology base for LAN, MAN, and WAN applications.
- Plug-and-play operations that avoid the extensive configuration and station management requirements of SONET/SDH Fiber.
- Extensive management information via the SONET/SDH Management Information Base (MIB) and MAC-layer source counters for network management and ring traffic engineering.

## Restrictions

The Cisco uBR10-SRP-OC12SML DPT WAN card has the following restrictions.

- The Cisco uBR10-SRP-OC12SML DPT WAN card is a double-width card that requires two network uplink card slots in the Cisco uBR10012 chassis. You can therefore install a maximum of two DPT WAN cards in a chassis.

If you are installing two DPT WAN cards, they must be installed in slots 2/0 and 4/0 in the chassis. If you are installing only one DPT WAN card, it can be installed in either slot 2/0, 3/0, or 4/0 in the chassis.

## Related Features and Technologies

Dynamic Packet Transport—DPT is a packet ring technology designed to deliver scalable Internet service, reliable IP-aware optical transport, and simplified network operations. DPT-based solutions allow you to scale and distribute your Internet and IP services across a reliable optical packet ring infrastructure.

DPT is based on the Spatial Reuse Protocol (SRP), which is a Cisco-developed MAC-layer protocol. See the *Dynamic Packet Transport (DPT) Feature Guide* for more information.

## Related Documents

The following documents describe the hardware components, installation, and cabling of the DPT WAN card and Cisco uBR10012 router:

- *Cisco uBR10-SRP-OC12SML DPT WAN Card for the Cisco uBR10012 Series Router*
- *Cisco uBR10012 Universal Broadband Router Hardware Installation Guide*

The following documents describe the software configuration tasks and commands used to configure the DPT WAN card and Cisco uBR10012 router:

- *Dynamic Packet Transport (DPT) Feature Guide*
- *Cisco IOS Interface Configuration Guide, Release 12.2*
- *Cisco IOS Interface Command Reference, Release 12.2*
- *Cisco uBR10012 Universal Broadband Router Software Configuration Guide*
- *Cisco CMTS Feature Guide*

These documents are available on Cisco.com and the Customer Documentation CD-ROM.

## Supported Platforms

This Cisco uBR10-SRP-OC12SML DPT WAN card is supported only on the Cisco uBR10012 universal broadband router.

### Determining Platform Support Through Feature Navigator

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

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image.

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

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

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

## Supported Standards, MIBs, and RFCs

### Standards

No new or modified standards are supported by this feature.

### MIBs

No new or modified MIBs are supported by this feature.



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**Note** The SONET-MIB and CISCO-SRP-MIB MIBs will be supported at a later date.

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To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

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

### RFCs

- RFC-1595
- Informational RFC-2892

## Prerequisites

The Cisco uBR10-SRP-OC12SML DPT WAN card requires the following:

- The Cisco uBR10012 router must be running Cisco IOS Release 12.2(4)BC1 or later to support the Cisco uBR10-SRP-OC12SML DPT WAN card.

## Configuration Tasks

See the following sections for configuration tasks for the Cisco uBR10-SRP-OC12SML DPT WAN card.

- [Enabling the Interface, page 11](#)
- [Shutting Down the Interface, page 11](#)
- [Performing a Basic Configuration, page 12](#)

- [Adding a Node to a DPT Ring, page 13](#)
- [Removing a Node from a DPT Ring, page 16](#)

## Enabling the Interface

Before using an interface, use the **no shutdown** command to enable the interface. Use the following procedure to enable an interface.

	Command	Purpose
Step 1	Router# <b>config t</b>	Enter global configuration mode.
Step 2	Router(config)# <b>int srp x/0/0</b>	Enter interface configuration mode for the DPT WAN card, where <i>x/0/0</i> identifies the appropriate slot number.  <b>Note</b> The interface <i>type</i> of the DPT WAN card is <b>srp</b> .
Step 3	Router(config-if)# <b>no shutdown</b>	Enable the DPT WAN card.
Step 4	Router(config-if)# <b>exit</b>	Exit global configuration mode.
Step 5	Router# <b>copy running-config startup-config</b>	Save the changes in the permanent configuration file in NVRAM.

For complete descriptions of software configuration commands, refer to the publications listed in the “[Related Documents](#)” section on page 9.

## Shutting Down the Interface

Before removing an interface, use the **shutdown** command to shut down (disable) the interface to prevent anomalies when you reinstall the new or reconfigured interface. When you shut down an interface, it is designated *administratively down* in the **show** command displays.

Use the following procedure to shut down an interface.

	Command	Purpose
Step 1	Router# <b>config t</b>	Enter global configuration mode.
Step 2	Router(config)# <b>int srp x/0/0</b>	Enter interface configuration mode for the DPT WAN card, where <i>x/0/0</i> identifies the appropriate slot number.  <b>Note</b> The interface <i>type</i> of the DPT WAN card is <b>srp</b> .
Step 3	Router(config-if)# <b>shutdown</b>	Shut down the DPT WAN card.
Step 4	Router(config-if)# <b>exit</b>	Exit global configuration mode.
Step 5	Router# <b>copy running-config startup-config</b>	Save the changes in the permanent configuration file in NVRAM.

For complete descriptions of software configuration commands, refer to the publications listed in the “[Related Documents](#)” section on page 9.

## Performing a Basic Configuration

This section describes guidelines for performing a basic configuration of the DPT WAN card, which includes enabling the DPT WAN card, configuring the IP address, and specifying IP routing. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.



### Tip

After configuring the DPT WAN card, see the [“Adding a Node to a DPT Ring”](#) section on page 13 for adding the router to a DPT ring.

Use the following procedure to initially configure the DPT WAN card.

	Command	Purpose
Step 1	Router# <b>confi g t</b>	Enter global configuration mode.
Step 2	Router(config)# <b>ip routing</b>	Enable IP routing.
Step 3	Router(config)# <b>int srp x/0/0</b>	Enter interface configuration mode for the DPT WAN card, where <i>x/0/0</i> identifies the appropriate slot number.  <b>Note</b> The interface <i>type</i> of the DPT WAN card is <b>srp</b> .
Step 4	Router(config-if)# <b>ip address ip-address mask</b>	Configure the IP address and subnet mask for the DPT WAN card.
The following <b>srp</b> commands configure the DPT WAN card for its default settings. They are therefore optional and do not need to be given unless you have previously configured the DPT WAN card with a different configuration.		
Step 5	Router(config-if)# <b>srp framing sonet side a</b> Router(config-if)# <b>srp framing sonet side b</b>	(Optional) Configure the framing for SONET for both side A and side B on the interface.
Step 6	Router(config-if)# <b>srp internal clock side a</b> Router(config-if)# <b>srp internal clock side b</b>	(Optional) Configure the clock source to internal for both side A and side B on the interface.
Step 7	Router(config-if)# <b>srp topology-timer x</b>	(Optional) Change the frequency that the DPT WAN card sends out topology discovery packets. The valid range is 1 to 600 value in seconds, with a default of 10 seconds.
Step 8	Router(config-if)# <b>no shutdown</b>	Enable the DPT WAN card.
Step 9	Router(config-if)# <b>exit</b>	Exit global configuration mode.
Step 10	Router# <b>copy running-config startup-config</b>	Save the changes in the permanent configuration file in NVRAM.

After you have completed your configuration, you can check it using **show** commands. For an explanation of the relevant **show** commands, see the [“Monitoring and Maintaining the DPT WAN Card”](#) section on page 18.



### Note

For detailed information about the DPT WAN card configuration commands, see the publications listed in the [“Related Documents”](#) section on page 9.

## Adding a Node to a DPT Ring

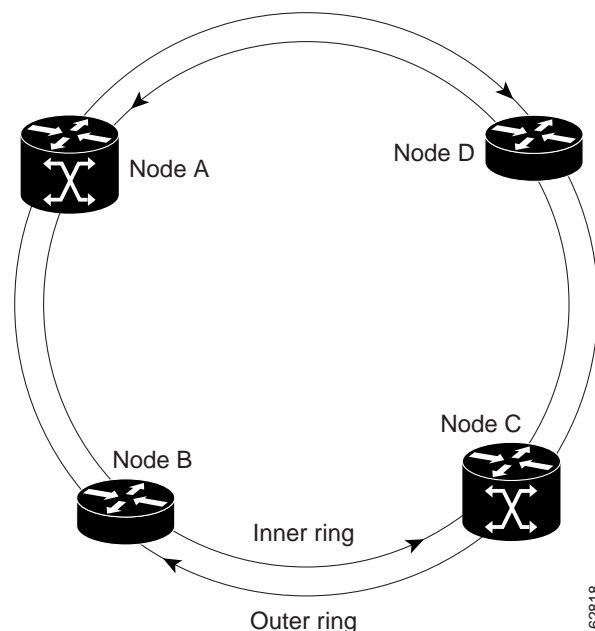
This section describes how to install and configure a Cisco uBR10012 router with a DPT WAN card as a node in the DPT ring. Before proceeding, verify that you have successfully installed and configured a DPT WAN card in the Cisco uBR10012 router, as described in the [“Performing a Basic Configuration” section on page 12](#).

To add a node to a DPT ring, you must perform the following procedures in the order given:

- [“Forcing a Ring Wrap to Create a Break in the DPT Ring” section on page 13](#)
- [“Inserting the New Node” section on page 14](#)
- [“Enabling the New Node” section on page 16](#)
- [“Removing the Ring Wrap” section on page 16](#)

The following sections describe the commands needed for each procedure. For the purposes of this section, the new node (the Cisco uBR10012 router with the DPT WAN card) is being inserted between Node A and Node D, as shown in [Figure 6](#):

**Figure 6** DPT Ring Topology with Four Nodes



### Forcing a Ring Wrap to Create a Break in the DPT Ring

To add a node to a DPT ring, you must first reroute the traffic flow around the break where the new node is to be inserted. This is done by using the **srp ips forced-switch** command to force a ring wrap at that point. Use the following procedure on Node A to force a ring-wrap between Node A and Node D, as given in [Figure 6](#).



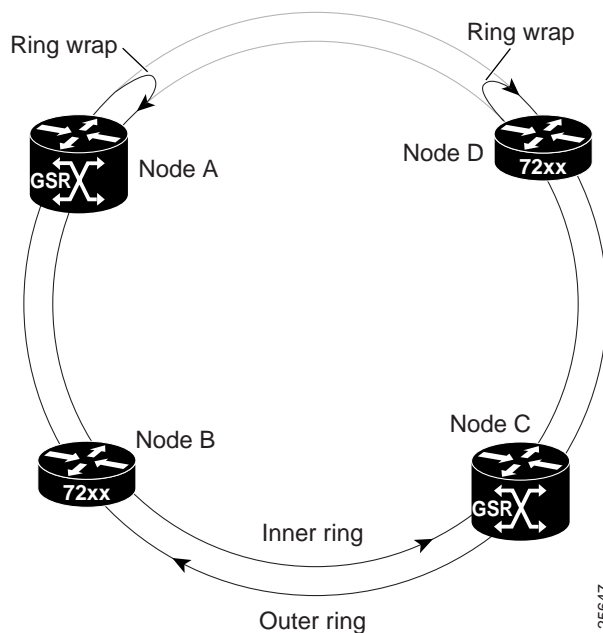
#### Note

You can add a node to a DPT ring without entering the **srp ips forced-switch** command, but you then cannot control when the traffic is rerouted and restored; the system determines the time instead.

	Command	Purpose
Step 1	Router# <code>config t</code>	Enter global configuration mode on Node A.
Step 2	Router(config)# <code>int srp x/0/0</code>	Enter interface configuration mode for the DPT WAN card on Node A, where <code>x/0/0</code> identifies the appropriate slot number.
Step 3	Router(config-if)# <code>srp ips request forced-switch a</code>	Force a ring-wrap on the interface with Node D.
Step 4	Router(config-if)# <code>exit</code>	Exit global configuration mode.

After completing this procedure, the DPT ring topology changes, as shown in [Figure 7](#):

**Figure 7** DPT Ring with Ring Wraps Created by a Forced Switch



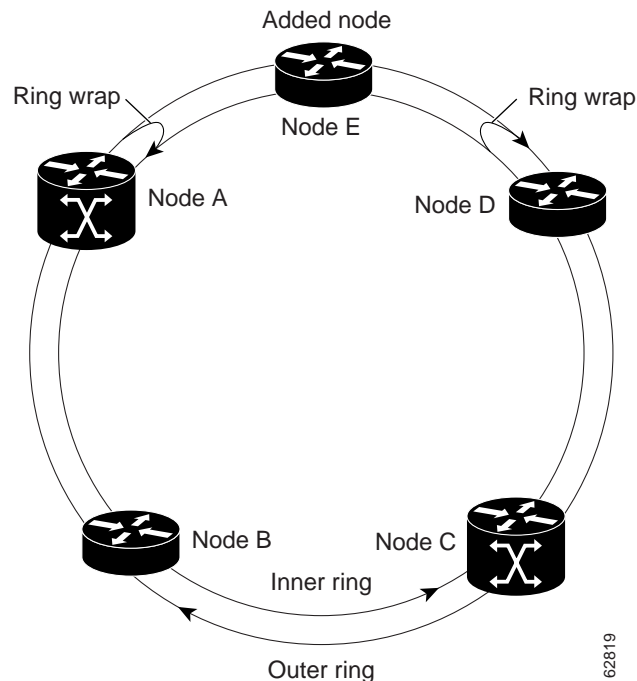
Tip

Use the command `show srp topology` to verify that the ring wraps are in place. See the [“Monitoring and Maintaining the DPT WAN Card”](#) section on page 18.

## Inserting the New Node

After forcing a ring wrap in the DPT ring to create a break for the new node, you must then insert the new node (the Cisco uBR10012 router with the DPT WAN card) into the DPT ring, as shown in [Figure 8](#).

Figure 8 DPT Ring Topology with an Added Node



Use the following procedure to insert the new node (Node E, the Cisco uBR10012 router with the DPT WAN card) into the DPT ring.

- 
- Step 1** Disconnect the fiber-optic cables connecting side A of node A to side B of node D.
- Step 2** Connect side A of node A to side B of the new node (node E, the Cisco uBR10012 router), using two simplex or one duplex fiber-optic cable. Connect side A of Node E to side B of node D.



**Note** Whenever you are adding nodes to the ring, connect the cables by carefully 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, so that you always connect an Rx port on one SRP line card to a Tx port on the next SRP line card. Side A has outer ring receive fiber, and side B has inner ring receive fiber. Side A must be connected to side B of the adjacent node in the ring and vice versa.



**Tip** Be careful to observe the proper cable orientation. When using duplex cables, you must reverse one of the cable ends for correct orientation. For complete information on cabling, see the *Cisco uBR10-SRP-OC12SML DPT WAN Card for the Cisco uBR10012 Series Router* document.

- Step 3** If the DPT WAN card in the new router (node E) has not been configured, do so at this time. See the [“Performing a Basic Configuration”](#) section on page 12.
-

## Enabling the New Node

After inserting and cabling the new node into the DPT ring, enable the DPT WAN card on the new node (node E), using the following procedure.

	Command	Purpose
Step 1	Router# <b>config t</b>	Enter global configuration mode on the new node (node E, the Cisco uBR10012 router).
Step 2	Router(config)# <b>int srp x/0/0</b>	Enter interface configuration mode for the DPT WAN card, where <i>x/0/0</i> identifies the appropriate slot number.
Step 3	Router(config-if)# <b>no shutdown</b>	Enable the DPT WAN card on the new node (node E, the Cisco uBR10012 router).
Step 4	Router(config-if)# <b>exit</b>	Exit global configuration mode.
Step 5	Router# <b>copy running-config startup-config</b>	Save the changes in the permanent configuration file in NVRAM.



Tip

Use the command **show srp topology** to verify that the ring wraps are in place. See the “[Monitoring and Maintaining the DPT WAN Card](#)” section on page 18.

## Removing the Ring Wrap

The final step in inserting a new node is to remove the ring wrap on node A. Use the following procedure on node A to remove the ring wrap and to start passing traffic through the new node (node E, the Cisco uBR10012 router).

	Command	Purpose
Step 1	Router# <b>config t</b>	Enter global configuration mode on node A.
Step 2	Router(config)# <b>int srp x/0/0</b>	Enter interface configuration mode for the DPT WAN card on node A, where <i>x/0/0</i> identifies the appropriate slot number.
Step 3	Router(config-if)# <b>no srp ips request forced-switch a</b>	Remove the ring wraps that were created between node A and node D.
Step 4	Router(config-if)# <b>exit</b>	Exit global configuration mode.
Step 5	Router# <b>copy running-config startup-config</b>	Save the changes in the permanent configuration file in NVRAM.



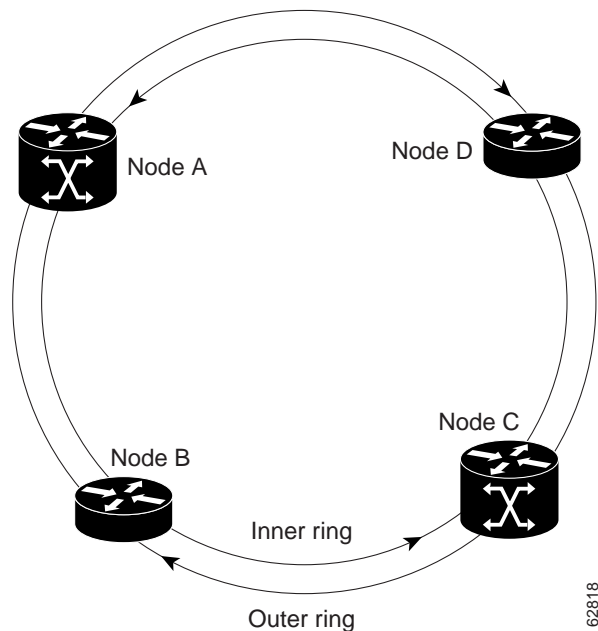
Tip

Use the command **show srp topology** to verify that the ring wraps are in place. See the “[Monitoring and Maintaining the DPT WAN Card](#)” section on page 18.

## Removing a Node from a DPT Ring

Use the following procedure to remove an existing node from a DPT ring. This procedure assumes you are removing node D from the DPT ring shown in [Figure 9](#).

Figure 9 DPT Ring Topology with Four Nodes



- Step 1** Isolate node D by entering the **srp ips request forced-switch a** command on the node A router, and the **srp ips request forced-switch b** command on the node C router. For example, if node A is a Cisco uBR10012 router with a DPT WAN card in slot 2/0, you would issue the following commands:

```
NodeA-Router# config t
NodeA-Router(config) int s2/0/0
NodeA-Router(config-if)# srp ips request forced-switch a
NodeA-Router(config-if)# exit
NodeA-Router(config)# exit
NodeA-Router#
```

If node C is a Cisco uBR10012 router with a DPT WAN card in slot 4/0, you would issue the following commands:

```
NodeC-Router# config t
NodeC-Router(config) int s4/0/0
NodeC-Router(config-if)# srp ips request forced-switch b
NodeC-Router(config-if)# exit
NodeC-Router(config)# exit
NodeC-Router#
```

- Step 2** Enter the **show srp topology** command on either router to verify that the ring wraps are in place and that node D no longer exists on the ring. (See the [“Monitoring and Maintaining the DPT WAN Card”](#) section on page 18.)
- Step 3** Disconnect both ends of the cable connecting side A of node D to side A of node C.
- Step 4** Disconnect the cable connected to side B of node D and connect it to side B of node C.
- Step 5** Remove the two ring wraps created by the forced switch on nodes A and C by entering the **no srp ips request forced-switch a** command on node A, and **no srp ips request forced-switch b** command on node C.

**Step 6** Enable IP routing by entering the **ip routing** command to restart data traffic across the DPT ring.

## Monitoring and Maintaining the DPT WAN Card

The following sections describe the different show commands that provide information about the status and operation of the Cisco uBR10-SRP-OC12SML DPT WAN card.

- [Displaying Version Information, page 18](#)
- [Displaying a Summary of All Interfaces, page 19](#)
- [Verifying the DPT WAN Card Configuration and Status, page 19](#)
- [Displaying Hardware Information, page 20](#)
- [Displaying the DPT Ring Topology, page 21](#)
- [Displaying Packet Information, page 23](#)
- [Displaying Intelligent Protection Switch Status, page 23](#)



### Note

For complete descriptions of the commands shown in the following sections, see the publications listed in the [“Related Documents” section on page 9](#).

## Displaying Version Information

To display the version of Cisco IOS software being run, as well as a list of interfaces that are installed and recognized, use the show version command:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 10000 Software (UBR10K-P6-M), RELEASE Version 12.2(4)BC1
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Fri 09-Nov-01 16:45 by abcd
Image text-base: 0x60008960, data-base: 0x61390000

ROM: System Bootstrap, Version 12.0(9r)SL2, RELEASE SOFTWARE (fc1)
BOOTFLASH: 10000 Software (C10K-EBOOT-M), Version 12.0(11)SL, RELEASE SOFTWARE (fc1)

SRP-10K uptime is 4 days, 18 hours, 57 minutes
System returned to ROM by reload at 03:30:56 UTC Thu Sep 14 2000
System image file is "disk0:ubr10k-p6-mz"

cisco uBR10000 (PRE-RP) processor with 393215K/131072K bytes of memory.
Processor board ID TBA05301491
R7000 CPU at 262Mhz, Implementation 39, Rev 2.1, 256KB L2, 2048KB L3 Cache
Backplane version 1.1, 8 slot

Last reset from power-on
Toaster processor tmc0 is running.
Toaster processor tmc1 is running.
2 TCCplus card(s)
1 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
1 Gigabit Ethernet/IEEE 802.3 interface(s)
1 SRP network interface(s)
```

```

2 Cable Modem network interface(s)
509K bytes of non-volatile configuration memory.

125440K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).
32768K bytes of Flash internal SIMM (Sector size 256KB).
Configuration register is 0x0
Router#

```

## Displaying a Summary of All Interfaces

To display a summary of all interfaces, including the DPT WAN card, use the **show ip interface brief** command in privileged EXEC mode:

```

Router# show ip interface brief

```

Interface	IP-Address	OK?	Method	Status	Protocol
Ethernet0/0/0	127.0.0.254	YES	unset	up	up
FastEthernet0/0/0	1.8.22.13	YES	NVRAM	up	up
SRP2/0/0	200.1.1.10	YES	NVRAM	up	up
SRP4/0/0	202.1.1.10	YES	NVRAM	up	up
Cable5/0/0	130.1.1.1	YES	NVRAM	up	up
Cable5/0/1	unassigned	YES	NVRAM	up	up
Loopback0	203.1.1.10	YES	NVRAM	up	up

```

Router#

```

## Verifying the DPT WAN Card Configuration and Status

To verify the DPT WAN card's configuration, including whether an interface is up or shut down, use the **show interfaces** command. The following example shows a typical display for a DPT WAN card that is up and online:

```

Router# show interfaces srp 2/0/0
SRP2/0/0 is up, line protocol is up
  Hardware is SRP, address is 0000.1010.1010 (bia 0005.00e1.44cc)
  Internet address is 192.168.100.10/24
  MTU 4470 bytes, BW 622000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SRP,      Side A loopback not set  Side B loopback not set
    5 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 00:00:02, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  30 second input rate 573000 bits/sec, 1122 packets/sec
  30 second output rate 10000 bits/sec, 1 packets/sec
  4514360 packets input, 287581030 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
  88337 packets output, 9918292 bytes, 0 underruns
  0 output errors, 0 collisions, 2 interface resets
  0 output buffer failures, 0 output buffers swapped out
  Side A received errors:
    0 input errors, 0 CRC, 0 ignored,
    0 framer runts, 0 framer giants, 0 framer aborts,
    0 mac runts, 0 mac giants, 0 mac aborts
  Side B received errors:
    0 input errors, 0 CRC, 0 ignored,
    0 framer runts, 0 framer giants, 0 framer aborts,

```

```

    0 mac runts, 0 mac giants, 0 mac aborts
Router#

```

The following example shows a typical display when the DPT WAN card has been disabled with the **shutdown** command:

```

Router# show interfaces srp 2/0/0
SRP2/0/0 is administratively down, line protocol is down
  Hardware is SRP, address is 0000.1010.1010 (bia 0005.00e1.44cc)
  Internet address is 200.1.1.10/24
  MTU 4470 bytes, BW 622000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SRP, Side A loopback not set Side B loopback not set
    4 nodes on the ring MAC passthrough set
  Side A: not wrapped IPS local: IDLE IPS remote: IDLE
  Side B: not wrapped IPS local: IDLE IPS remote: IDLE
Router#

```

Another quick way of displaying a card's status is with the **show protocols** command:

```

Router# show protocols srp 2/0/0
SRP2/0/0 is up, line protocol is up

```

## Displaying Hardware Information

To display hardware information about the DPT WAN card, use the **show diag** and the **show controllers srp** commands. The following is a typical display for the **show diag** command for a DPT WAN card:

```

Router# show diag 2/0
Slot/Subslot 2/0:
  2oc12srp-sm-lr card, 1 port
  Card is full slot size
  Card is analyzed
  Card detected 1d23h ago
  Card uptime 1 days, 23 hours, 25 minutes, 30 seconds
  Card idle time N/A
  Voltage status: 5V Nominal 3.3V Nominal 2.5V Nominal
EEPROM contents, slot 2/0:
  Hardware Revision      : 3.0
  Top Assy. Part Number  : 800-19092-01
  Board Revision         : 17
  Product Number         : UBR10-SRP-OC12SML
  CLEI Code              : IPI8KP0CAA
  Deviation Number       : 0-0
  Fab Version            : 03
  PCB Serial Number      : CAB0544L6EA
  RMA Test History       : 00
  RMA Number             : 0-0-0-0
  RMA History            : 00
LCMON version, slot 2/0
  IOS (tm) 7200 Software (UBR10KCLC-LC-M), RELEASE Version 12.2(4)BC1
  Compiled Wed 10-Oct-01 12:18 by skaw
  Reset due to: reload
Operational Image version, slot 2/0
  IOS (tm) 7200 Software (UBR10KCLC-LC-M), Experimental Version
  12.2(20011114:234401) [skaw-fantail 101]
  Compiled Wed 14-Nov-01 16:08 by skaw
Router#

```

The following is an excerpt of a typical display for the **show controllers srp details** command for a DPT WAN card:

```
Router# show controllers srp details
Interface Ethernet0/0/0
Hardware is AMD Laguna
ADDR: 61BD31E0, FASTSEND: 600960C8, MCI_INDEX: 0
DIST ROUTE ENABLED: 0
Route Cache Flag: 11
CSR0=0x72, CSR3=0x1044, CSR4=0x493D, CRDA=0x8A76ED0, CXDA=0x8A779B0
LADRF=0x0000 0x0000 0x0000 0x0000
CSR80=0x9E00
CSR15=0x0
HW filtering information:
  Promiscuous Mode Disabled, PHY Addr Enabled, Broadcast Addr Enabled
  PHY Addr=0200.0000.00A0, Multicast Filter=0x0000 0x0000 0x0000 0x0000
CSR5=0x1, CSR7=0x820, CSR100=0xF000, CSR125=0x603C
BCR2=0x0, BCR9=0x0, BCR18=0x10E0
BCR25=0x0, BCR26=0x0, BCR27=0x10, BCR32=0x400,
amdfe_ds=0x70348648, registers=0x48100000, ib=0x8A7EAC0
rx ring entries=128, tx ring entries=128
rxring=0x8A7EB20, rxr shadow=0x6391C23C, rx_head=1, rx_tail=0
txring=0x8A7F360, txr shadow=0x70348778, tx_head=44, tx_tail=44, tx_count=0
Software MAC address filter(hash:length/addr/mask/hits):
spurious_idon=0, filtered_pak=0, throttled=0, enabled=0, disabled=0
rx_framing_err=0, rx_overflow_err=0, rx_buffer_err=0, rx_bpe_err=0
rx_soft_overflow_err=0, rx_no_enp=0, rx_discard=0, rx_miss_count=0

Interface SRP2/0/0(idb 0x717D8674)
Hardware is SRP
ip_routecache=0x11(dfs=0/mdfs=0), max_mtu=4572
cr10k_oc12srp_ds=0x717DC0F4
resets=0, reset_init=1, reset_restart=3

Interface SRP4/0
Hardware is SRP
idb=0x60A81C30, ds = 0x60A86104
Interrupt stat:
Receive : error_intr = 0          , pkt_intr = 126519547 , rx_intr =126142294
         mac_spurious_intr = 0      , tx_error_intr = 0

Side A :
FRAMER : framer_intr = 28
MAC    : ctrl_intr = 101223      , error_intr = 581
TX     : IPS = 10277011 , High = 0          , Low = 18

Side B :
FRAMER : framer_intr = 15
MAC    : ctrl_intr = 101239      , error_intr = 4
TX     : IPS = 59535703 , High = 0          , Low = 2

...
```

## Displaying the DPT Ring Topology

To display the topology of the DPT ring, use the **show srp topology** command. The following is a typical display for a Cisco uBR10012 router with two DPT WAN cards installed in slots 2/0 and 4/0. The key components of the display are the list of nodes in the DPT ring, the frequency of the topology discovery packets, the time that a topology discovery packet was last received, and the time that the topology of the DPT ring actually changed.

```
Router# show srp topology
```

```
Topology Map for Interface SRP2/0/0
Topology pkt. sent every 5 sec. (next pkt. after 3 sec.)
Last received topology pkt. 00:00:55
Last topology change was 00:13:00 ago.
Nodes on the ring: 5
Hops (outer ring)      MAC           IP Address      Wrapped Name
0                       aaaa.bbbb.0010 200.1.1.10     No    UBR10K
1                       2555.5555.5555 200.1.1.5      No    7505
2                       aaaa.bbbb.1111 200.1.1.1      No    7246
3                       aaaa.bbbb.7777 200.1.1.7      No    ubr7246VXM
4                       2222.2222.2222 200.1.1.2      No    UBR10K
```

```
Topology Map for Interface SRP4/0/0
Topology pkt. sent every 5 sec. (next pkt. after 2 sec.)
Last received topology pkt. 00:0:03
Last topology change was 00:14:05 ago.
Nodes on the ring: 2
Hops (outer ring)      MAC           IP Address      Wrapped Name
0                       0005.00e1.44e4 202.1.1.10     No    UBR10K
1                       aaaa.bbbb.0050 202.1.1.8      No    c7206
```

```
Router#
```

The following shows a DPT ring where ring wrap has occurred, indicating a possible break in the cabling between nodes 2 and 3:

```
Router# show srp topology
```

```
Topology Map for Interface SRP2/0/0
Topology pkt. sent every 5 sec. (next pkt. after 3 sec.)
Last received topology pkt. 00:00:55
Last topology change was 00:13:00 ago.
Nodes on the ring: 5
Hops (outer ring)      MAC           IP Address      Wrapped Name
0                       aaaa.bbbb.0010 200.1.1.10     No    UBR10K
1                       2555.5555.5555 200.1.1.5      No    7505
2                       aaaa.bbbb.1111 200.1.1.1      Yes   7246
3                       aaaa.bbbb.7777 200.1.1.7      Yes   ubr7246VXM
4                       2222.2222.2222 200.1.1.2      No    UBR10K
```

```
Router#
```

The following display shows that the interface has not received a topology discovery packet for 2 days and 18 hours. This was also the time that the last topology change occurred, which indicates that this node might have been isolated from the DPT ring, either due to a break in the fiber optics cabling or by a forced ring wrap.

```
Router# show srp topology
```

```
Topology Map for Interface SRP2/0/0
Topology pkt. sent every 30 sec. (next pkt. after 0 sec.)
Last received topology pkt. 2d18h
Last topology change was 2d18h ago.
Nodes on the ring: 6
Hops (outer ring)      MAC           IP Address      Wrapped Name
0                       aaaa.bbbb.0010 200.1.1.10     No    SRP-10K
1                       aaaa.bbbb.1111 200.1.1.1      No    7246
2                       aaaa.bbbb.3333 200.1.1.3      No    ubr1
3                       2555.5555.5555 200.1.1.5      No    7505
4                       aaaa.bbbb.0050 200.1.1.8      No    c7206
5                       2222.2222.2222 200.1.1.2      No    UBR10K
```

```
Router#
```

## Displaying Packet Information

You can count the number of packets from a specific MAC address with the **srp count** interface configuration command. You can then display the number of packets received or rejected with the **show srp source-counters** command. For example:

```
Router# config t
Router(config)# int srp2/0/0
Router(config-if)# srp count aaaa.bbbb.cccc
Router(config-if)# exit
Router(config)# exit
Router#
...
Router# show srp source-counters

Source Address Information for Interface SRP2/0/0
  aaaa.bbbb.cccc, index 1, pkt. count 1201
  aaaa.bbbb.cccc, reject, pkt. count 400
```

## Displaying Intelligent Protection Switch Status

To display the current IPS status, use the **show srp ips** command:

```
Router# show srp ips

IPS Information for Interface SRP2/0/0
MAC Addresses
  Side A (Outer ring RX) neighbor aaaa.bbbb.0010
  Side B (Inner ring RX) neighbor aaaa.bbbb.0020
  Node MAC address aaaa.bbbb.3333
IPS State
  Side A not wrapped
  Side B not wrapped
  Side A (Inner ring TX) IPS pkt. sent every 1 sec. (next pkt. after 1 sec.)
  Side B (Outer ring TX) IPS pkt. sent every 1 sec. (next pkt. after 1 sec.)
  inter card bus enabled
  IPS WTR period is 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) {aaaa.bbbb.0010, IDLE, SHORT}, TTL 128
  Side B (Inner ring RX) {aaaa.bbbb.0010, IDLE, SHORT}, TTL 128
IPS messages transmitted
  Side A (Outer ring RX) {aaaa.bbbb.3333, IDLE, SHORT}, TTL 255
  Side B (Inner ring RX) {aaaa.bbbb.3333, IDLE, SHORT}, TTL 255
Router#
```

The following shows a DPT WAN card with a wrapped interface:

```
Router# show srp ips

IPS Information for Interface SRP2/0/0
MAC Addresses
  Side A (Outer ring RX) neighbor aaaa.bbbb.0010
  Side B (Inner ring RX) neighbor aaaa.bbbb.0010
  Node MAC address aaaa.bbbb.3333
IPS State
  Side A wrapped
  Side B wrapped
```

```
Side A (Inner ring TX) IPS pkt. sent every 1 sec. (next pkt. after 1 sec.)
Side B (Outer ring TX) IPS pkt. sent every 1 sec. (next pkt. after 1 sec.)
inter card bus enabled
IPS WTR period is 60 sec. (timer is inactive)
Node IPS State: wrapped
IPS Self Detected Requests          IPS Remote Requests
Side A SF                          Side A IDLE
Side B SF                          Side B IDLE
IPS messages received
Router#
```

## Configuration Examples

This section provides typical sample configurations for the Cisco uBR10-SRP-OC12SML DPT WAN card. The following is a portion of the configuration file for the Cisco uBR10012 router with two DPT WAN cards that are configured with an IP address but otherwise left with their default configurations:

```
interface SRP2/0/0
  ip address 192.168.10.10 255.255.255.0
  ip mtu 1500
  load-interval 30
  no keepalive
!

interface SRP4/0/0
  ip address 192.168.20.10 255.255.255.0
  ip mtu 1500
  load-interval 30
  no keepalive
!
```

The following is a portion of the configuration file for a DPT WAN card that has been configured with non-default values for the SRP interface parameters:

```
interface SRP2/0/0
  ip address 200.1.1.10 255.255.255.0
  ip mtu 1500
  load-interval 30
  srp count aaaa.bbbb.1111
  srp flag c2 200 a
  srp flag c2 200 b
  srp topology-timer 30
  srp ips timer 20 a
  srp ips timer 20 b
  srp deficit-round-robin input high deficit 30000
  srp tx-traffic-rate 300000
  srp priority-map receive high 7
  srp buffer-size receive high 32
  srp buffer-size receive medium 32
  cdp enable
```

## Command Reference

This section summarizes the interface configuration commands used to configure and monitor the Cisco uBR10-SRP-OC12SML DPT WAN card. [Table 3](#) lists the parameter, the interface configuration command used to alter it, and the default value of the parameter.



### Note

For complete information on these commands, see the software documents listed in the [Related Documents, page 9](#).

Table 3 DPT Adapter Interface Configuration Default Values

Parameter	Configuration Command	Valid Range	Default Value
Maximum transmission unit (MTU)	<b>mtu</b> <i>bytes</i>		9000 bytes
Buffer size	<b>srp buffer-size receive</b> [ <b>high</b>   <b>medium</b> ] <i>kbytes</i>	16 to 8192	high = 4096 kbytes, medium = 4096 kbytes, low = 8192 kbytes
Count packets on the basis of the source MAC address	<b>srp count</b> <i>mac-address</i>	48-bit MAC source address	<b>no srp count</b>
Deficit round robin	<b>srp deficit-round-robin</b> [ <b>input</b>   <b>output</b> ] [ <b>high</b>   <b>medium</b>   <b>low</b> ] [ <b>quantum</b> <i>value</i>   <b>deficit</b> <i>value</i> ]	<b>quantum</b> = 9216 to 32,767 <b>deficit</b> = 0 to 65,535	quantum = 9216, deficit = 16384
Flag	<b>srp flag</b> [ <b>c2</b> <i>value</i> ] [ <b>j0</b> <i>value</i> ] [ <b>s1s0</b> <i>value</i> ]	0x0 to 0xFF	<b>c2</b> set to 0x16, <b>j0</b> set to 0xCC, <b>s1s0</b> set to 0x00
Framing	<b>srp framing</b> [ <b>sdh</b>   <b>sonet</b> ] [ <b>a</b>   <b>b</b> ]	—	<b>sonet</b>
Internal-clock	<b>srp clock-source</b> [ <b>internal</b>   <b>line</b> ] [ <b>a</b>   <b>b</b> ]	—	<b>internal</b>
IPS	<b>srp ips</b> [ <b>request</b>   <b>wtr-timer</b> ] <i>value</i> <b>srp ips timer</b> <i>value</i> [ <b>a</b>   <b>b</b> ]	<b>request</b> = <b>timer</b> = 1 to 60 <b>wtr-timer</b> = 10 to 600	<b>timer</b> = 1 sec, <b>wtr-timer</b> = 60 sec
Loopback	<b>srp loopback</b> [ <b>internal</b>   <b>line</b> ] [ <b>a</b>   <b>b</b> ]	—	<b>no srp loopback</b> (loopback is disabled)
Priority map	<b>srp priority-map receive</b> { <b>high</b>   <b>medium</b>   <b>low</b> } <i>value</i> <b>srp priority-map transmit</b> { <b>high</b>   <b>medium</b> } <i>value</i>	1 to 8	receive high = 5, receive med = 3, transmit = 7
Reject	<b>srp reject</b> <i>mac-address</i>	48-bit MAC source address	—
Shutdown	<b>srp shutdown</b> [ <b>a</b>   <b>b</b> ]	—	<b>no srp shutdown</b> (SRP protocol is enabled)
Threshold	<b>srp threshold</b> [ <b>b1-tca</b>   <b>b2-tca</b>   <b>b3-tca</b>   <b>sd-ber</b>   <b>sf-ber</b> ] <i>rate</i> [ <b>a</b>   <b>b</b> ]	<i>rate</i> = 3 to 9	<b>sf-ber</b> = 3 all others = 6
Topology timer	<b>srp topology-timer</b> <i>value</i>	1 to 600	5 seconds
TX traffic rate	<b>srp tx-traffic-rate</b> <i>rate</i>	1 to 65535	10,000 kbps

# Glossary

- **ADM**—Add Drop Multiplexer. Device used to add or drop virtual channels from SONET/SDH into physical tributaries that connect across the ring.
- **DCC**—Data Country Code.
- **IPS**—Intelligent Protection Switch.
- **ITU-T**—International Telecommunication Union Telecommunication Standardization Sector (formerly the Consultative Committee for International Telegraph and Telephone [CCITT]).
- **MAC**—Media Access Control.
- **MIB**—Management Information Base.
- **OC-3/STM-1, OC-12c/STM-4c, OC-48c/STM-16c**, and so on—Optical Carrier specifications for SONET OC and SDH STM transmission rates.
- **OC-N**—SONET multiplexing measure: Optical Carrier Level N, where N indicates the number of 51.84 megabit per second channels.
- **OC-Nc/STM-Nc**—Designation in which a lowercase c after N indicates that N channels are concatenated into one logical channel having a bandwidth of N multiplied by the appropriate rate for SONET and SDH. For SONET N is defined as having the values 3, 12, 48, and 192; for SDH, the legal values are 1, 4, and 16.
- **SDH**—Synchronous Digital Hierarchy. International standard for optical digital transmission at hierarchical rates from 155.520 Mbps (STM-1) to 2.488 gigabits per second (Gbps) (STM-16) and higher.
- **SONET**—Synchronous Optical Network. An American National Standards Institute (ANSI) standard (T1.1051988) for optical digital transmission at hierarchical rates from 51.840 Mbps (OC-1) to 2.488 Gbps (OC-48) and higher.
- **SRP**—Spatial Reuse Protocol. A Layer 2 MAC protocol for use with SONET and SDH rings that runs over a dual-ring network topology and is characterized by shared media, statistical multiplexing, global fairness, and spatial reuse.
- **STM-N**—Synchronous Transport Module Level N. SDH multiplexing measure, where N indicates the number of 155.52 Mbps channels.

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This document is to be used in conjunction with the documents listed in the [“Related Documents” section on page 9](#)

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