



# IP over Data Communication Channel (DCC)

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## Feature History

Release	Modification
12.0(19)SP	This feature was introduced on Cisco 10720 Internet Routers.

This feature module describes the IP over Data Communication Channel (DCC) network management feature and how to configure it in networks consisting of Cisco 12000 series Internet Routers, the Cisco ONS 15104 OC-48/STM-16 Bidirectional Regenerator, and Cisco 10720 Internet Routers.

This document includes the following sections:

- [Feature Overview, page 1](#)
- [Supported Platforms, page 3](#)
- [Supported Standards, MIBs, and RFCs, page 4](#)
- [Prerequisites, page 4](#)
- [Configuration Tasks, page 5](#)
- [Configuration Examples, page 7](#)
- [Command Reference, page 20](#)
- [Glossary, page 21](#)

## Feature Overview

The IP over DCC feature uses the SONET/SDH Operation Administration and Maintenance (OAM) channel to manage devices that support Synchronous Optical Network (SONET)/Synchronous Digital Hierarchy (SDH) interfaces. SONET/SDH standards support extensive operations, administration, management, and provisioning (OAM&P) capabilities.

The following overhead bytes are specified in the standards as the OAM channels that carry management information, alarms, and management commands:

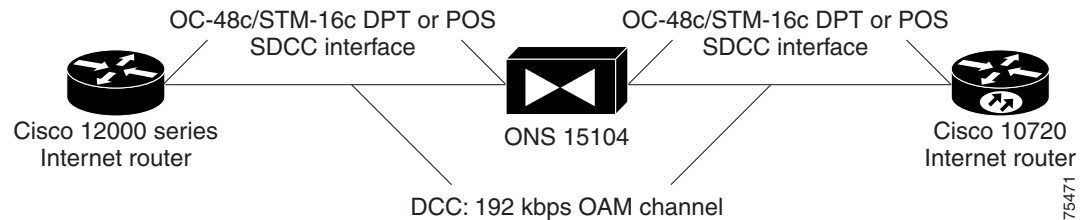
- D1 to D3 bytes of the Section overhead
- D4 to D12 bytes of the Line overhead

These overhead bytes are referred to as the data communication channel (DCC). The Line-level DCC is a 576 kbps OAM channel; the Section-level DCC is a 192 kbps OAM channel.

As supported in the Cisco 12000 series, Cisco ONS 15104, and Cisco 10720, the IP over DCC feature uses the data communications channel to access network devices that are connected through SONET/SDH interfaces for IP management access.

Although the NSIF standard (NSIF-DN-0101-001) specifies PPP over High-Level Data Link Control (HDLC) encapsulation for IP over DCC, the Cisco 12000 series and 10720 Internet Routers and the ONS 15104 all support compatible HDLC encapsulation on their OC-48 Dynamic Packet Transport (DPT) and Packet-over-SONET (POS) interfaces.

**Figure 1 IP over DCC Implemented on Cisco 12000 Series, 10720, and ONS 15104 Devices**



As shown in [Figure 1](#), the logical interface for DCC channels is called a SONET data communications channel (SDCC). On the Cisco 12000 series, ONS 15104, and Cisco 10720, each SDCC interface is assigned an IP address. The Routing Information Protocol (RIP) is used as the routing protocol for the IP management network.

This document describes how to configure the IP over DCC feature on Cisco 12000 series and 10720 Internet Routers used with ONS 15104 Bidirectional Regenerators in network configurations. For information about how to configure IP over DCC on other routers (such as Cisco 7300 and 7600 series Internet Routers), refer to the appropriate product documentation.

Use IP over DCC is to access the ONS 15104 over the DCC channel for management purposes, including:

- Remote configuration and troubleshooting
- Collecting alarms and other management information

See the [“Configuration Examples” section on page 7](#) for sample network implementations and examples of how to configure Cisco 12000 series, Cisco 10720, and ONS 15104 devices.

## Benefits

### Network Management over OC-48 DPT/POS Interfaces

OC-48/STM-16 interfaces on Cisco 12000 series and 10720 Internet Routers and ONS 15104 optical platforms allow you to use the data communication channel of the SONET/SDH layer to manage network devices.

## Restrictions

### SDCC Networks Must be Configured on Different Subnets

When a Cisco 12000 series or 10720 Internet Router has SDCC interfaces configured on both Side A and Side B, the two SDCC networks must be configured on different subnets.

### Different Types of Encapsulation Supported on Other Cisco Products

Table 1 shows the different types of encapsulation supported on Cisco routers and optical platforms that support IP over DCC. If devices in a network configuration do not support the same type of encapsulation, the IP over DCC feature will not be compatible across these platforms.

**Table 1** *Types of Encapsulation Supported for IP over DCC on Cisco Routers and Optical Platforms*

Cisco Router or Optical Platform	Encapsulation Supported
Cisco 10720 Internet Routers	HDLC only
Cisco 12000 Series Internet Routers	HDLC only
Cisco ONS 15104 OC-48/STM-16 Bidirectional Regenerator	HDLC only
Cisco ONS 15454 SONET Multiservice Platform	PPP over HDLC only

## Related Features and Technologies

- Simple Network Management Protocol (SNMP)
- Trivial File Transfer Protocol (TFTP)

## Related Documents

- *Cisco IOS Configuration Fundamentals Configuration Guide*, Release 12.0
- *Cisco IOS Configuration Fundamentals Command Reference*, Release 12.0
- *Network Protocols Command Reference, Part 1*, Release 11.3

## Supported Platforms

- Cisco 10720 Internet Routers
- Cisco 12000 series Internet Routers
- Cisco ONS 15104 Optical Transport Platform
- Cisco ONS 15454 Optical Transport Platform

### Determining Platform Support Through Cisco 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 Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

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

To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](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>.

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

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

#### **Availability of Cisco IOS Software Images**

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

## Supported Standards, MIBs, and RFCs

#### **Standards**

No new or modified standards are supported by this feature.

#### **MIBs**

No new or modified MIBs are supported by this feature.

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**

No new or modified RFCs are supported by this feature.

## Prerequisites

- The Routing Information Protocol (RIP) and IP routing must be enabled on each Cisco 12000 series and Cisco 10720 Internet Router, and on each Cisco ONS 15104 to be managed through IP over DCC.
- SDCC interfaces must be configured on each Cisco 12000 series and Cisco 10720 Internet Router, and on each Cisco ONS 15104 to achieve interoperability.
- You must connect the Cisco 12000 series Internet Router to the IP management network using the management port, Ethernet0 (E0), on the router.

## Configuration Tasks

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

- [Configuring a Cisco 12000 Series or Cisco 10720 Internet Router for IP over DCC](#) (required)
- [Configuring a Cisco ONS 15104 Bidirectional Regenerator for IP over DCC](#) (required)

### Configuring a Cisco 12000 Series or Cisco 10720 Internet Router for IP over DCC

After you install Cisco 12000 series or Cisco 10720 Internet Routers, you must configure and activate their SDCC network interfaces to permit remote management and interoperability with the Cisco ONS 15104.

To configure a Cisco 12000 series or Cisco 10720 Internet Router to use IP over DCC and be managed remotely through in-band SDCC links, use the following commands starting in global configuration mode:

	Command	Purpose
<b>Step 1</b>	Router(config)# <b>sdcc enable</b>	Enables SDCC configuration mode.
<b>Step 2</b>	Router(config)# <b>interface sdcc slot/port</b>	Enters interface configuration mode for the logical SDCC associated with the specified DPT or POS port.
<b>Step 3</b>	Router(config-if)# <b>ip address ip-address subnet-mask</b>	Assigns an IP address and IP subnet mask to the SDCC interface.
<b>Step 4</b>	Router(config-if)# <b>no keepalive</b>	Disables the keepalive sequence.
<b>Step 5</b>	Router(config-if)# <b>no shutdown</b>	Activates the SDCC interface and prevents data traffic shutdowns.
<b>Step 6</b>	Router(config-if)# <b>exit</b>	Exits interface configuration mode.
<b>Step 7</b>	Router(config)# <b>ip routing</b>	Enables IP routing.
<b>Step 8</b>	Router(config)# <b>router rip</b>	Enables a RIP routing process and enters router configuration mode.
<b>Step 9</b>	Router(config-router)# <b>network network-number</b>	Associates a network with the RIP routing process.
<b>Step 10</b>	Router(config-router)# <b>end</b>	Exits router configuration mode.



#### Note

Note the following differences between the SDCC configuration on a POS and a DPT interface:

- When an SDCC interface is configured on a DPT interface, it automatically creates SDCC interfaces on both Side A and Side B of the DPT interface. Enable only the SDCC interfaces that are necessary.
- On a Cisco 12000 series Internet Router, if a DPT interface is 4/0, the SDCC interfaces that are created are 4/0 and 5/0.
- On a Cisco 10720 Internet Router, the DPT interface is always SRP 1/1; the SDCC interfaces are always 1/1 and 1/2.

## Configuring a Cisco ONS 15104 Bidirectional Regenerator for IP over DCC

After you install a Cisco ONS 15104 Bidirectional Regenerator, you must configure and activate its two SDCC network interfaces to permit remote management and interoperability with other SONET standards-based network devices, such as Cisco 12000 series and Cisco 10720 Internet Routers.

To configure a Cisco ONS 15104 Bidirectional Regenerator to use IP over DCC and be managed remotely through in-band SDCC links, use the following commands starting in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>interface sdcc0</b>	Enters interface configuration mode for the first SDCC interface on the Cisco ONS 15104.
Step 2	Router(config-if)# <b>ip address</b> <i>ip-address mask</i>	Assigns an IP address and IP subnet mask to the SDCC interface.
Step 3	Router(config-if)# <b>no keepalive</b>	Disables the keepalive sequence.
Step 4	Router(config-if)# <b>no shutdown</b>	Activates the SDCC interface and prevents data traffic shutdowns.
Step 5	Router(config-if)# <b>exit</b>	Exits SDCC interface configuration mode.
Step 6	Router(config)# <b>interface sdcc1</b>	Enters interface configuration mode for the second SDCC interface on the ONS 15104.
Step 7	Router(config-if)# <b>ip address</b> <i>ip-address mask</i>	Assigns an IP address and IP subnet mask to the SDCC interface.
Step 8	Router(config-if)# <b>no keepalive</b>	Disables the keepalive sequence.
Step 9	Router(config-if)# <b>no shut</b>	Activates the SDCC interface and prevents data traffic shutdowns.
Step 10	Router(config-if)# <b>exit</b>	Exits SDCC interface configuration mode.
Step 11	Router(config)# <b>ip route</b> <i>prefix mask address</i>	Configures a static route by specifying the IP route prefix and prefix mask for the destination IP management network, and the IP address of the router interface to use.
Step 12	Router(config)# <b>router rip</b>	Enables a RIP routing process and enters router configuration mode.
Step 13	Router(config-router)# <b>network</b> <i>network-number</i>	Associates a network with the RIP routing process.
Step 14	Router(config-router)# <b>end</b>	Exits router configuration mode.

## Verifying SDCC Interface Configuration on a Cisco 12000 Series or Cisco 10720 Internet Router

To verify an SDCC interface configuration on a Cisco 12000 series or Cisco 10720 Internet Router, use the **show interface sdcc slot/port** command in EXEC mode:

```
12000-X# show interface sdcc 8/0
SDCC8/0 is administratively down, line protocol is down
  Hardware is SDCC
  MTU 1500 bytes, BW 192 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, crc 32, loopback not set
  Keepalive set (10 sec)
  Last input never, output never, 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
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 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
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
```

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## Verifying SDCC Interface Configuration on a Cisco ONS 15104

To verify an SDCC interface configuration on a Cisco ONS 15104, use the **show run interface sdccnumber** command in EXEC mode:

```
15104-A# show run interface sdcc0
interface SDCC0
bandwidth 192
ip address 10.a.b.c 255.255.255.0
ip directed-broadcast
keepalive
crc 32
```

---

## Configuration Examples

This section provides examples of how to configure the IP over DCC feature with ONS 15104 Bidirectional Regenerators in the following network configurations:

- [Cisco 12000 Series Internet Routers with Packet-over-SONET Links, page 7](#)
- [Cisco 12000 Series Internet Routers in a DPT Ring, page 11](#)
- [Cisco 12000 Series and Cisco 10720 Internet Routers in a DPT Ring, page 14](#)
- [Cisco 10720 Internet Routers in a DPT Ring, page 17](#)

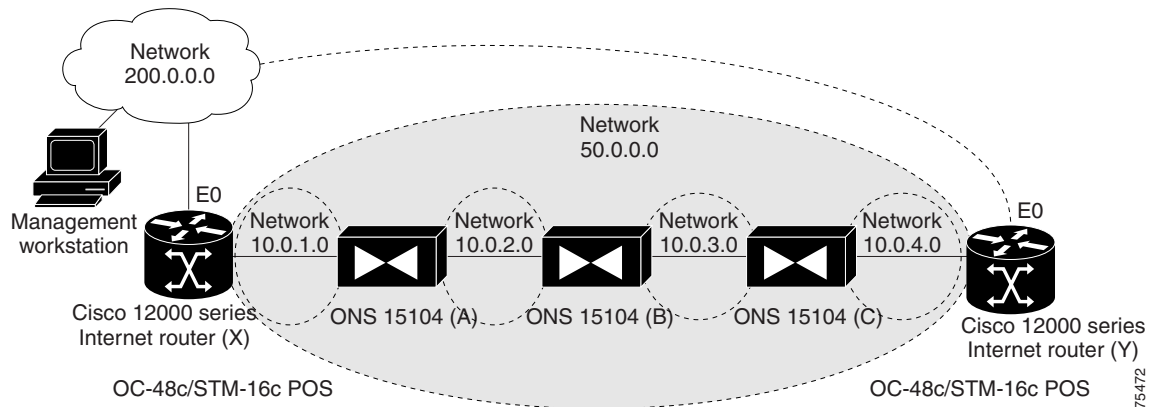
## Cisco 12000 Series Internet Routers with Packet-over-SONET Links

This example shows how to configure IP over DCC in a network segment with Cisco 12000 series Internet Routers connected through an OC-48/STM-16 POS link with ONS 15104s as shown in [Figure 2](#). The Cisco ONS 15104s are implemented in this segment to extend the reach between the two 12000s located more than 50 miles (80 km) apart. The network consists of three separate parts:

- An IP network (50.0.0.0/24) between the two Cisco 12000 series Internet Routers, running OSPF (or any Interior Gateway Protocol (IGP) as the routing protocol
- An IP Management network (10.0.0.0/24) configured over the span of the OC-48 SDCC interfaces of the Cisco 12000 series Internet Router and Cisco ONS 15104 router, running RIP as the routing protocol

- A second IP Management network (200.0.0.0/24) used for management access to the Cisco 12000 through its Ethernet management port. A set of static routes are used for communication between the management workstation and the Cisco 12000 series Internet Routers or Cisco ONS 15104s.

**Figure 2** Configuring Cisco 12000 Series Internet Routers with Packet-over-SONET Links for IP over DCC



In this example, the DCC link is created between the two Cisco 12000 series Internet Routers by passing through the Cisco ONS 15104s. Management access to the Cisco ONS 15104 is available through the DCC link from either of the Cisco 12000 series Internet Routers.

Please note the following caveats with this configuration:

- The Cisco ONS15104 only supports RIP as the routing protocol.



**Note** This restriction only applies to the SDCC link sequence.

- Cisco Express Forwarding (CEF) must be enabled on the Cisco 12000 Ethernet port (on the Route Processor car, Ethernet 0 interface) to allow communication between the line cards and the Ethernet 0 interface.
- Cisco recommends that you do not redistribute RIP into the Cisco 12000 series Internet Router for the following reasons:
  - The networks on either side of the Cisco 12000 series Internet Router can view this link as an alternate path. As a result, OC-48 traffic may be sent through the SDCC interface, which runs at 192 kbps.
  - If you do not set up the necessary filtering configurations, the network may be visible outside of the 50.0.0.0 network.
- There are three alternative ways in which you can configure the SDCC network with cascading Cisco ONS 15104s in a span. Take into account the advantages and disadvantages of each approach according to your network design:
  - You configure all Cisco ONS 15104s in one flat subnet.
 

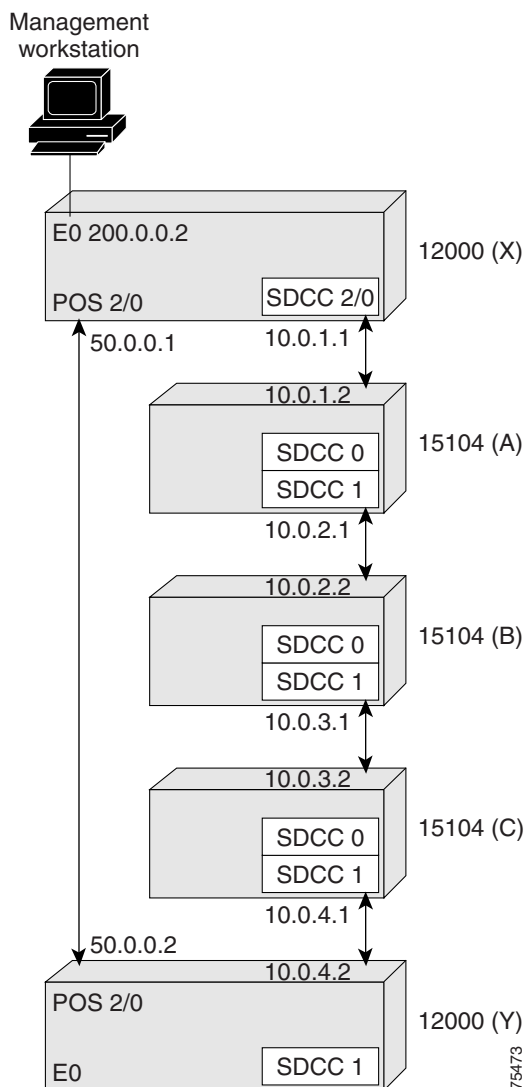
Although this is simple to configure, a DCC traffic source does not know the destination device. As a result, DCC traffic is handled in the same way as on a LAN, and is sent to each Cisco ONS 15104, which is an inefficient use of bandwidth.
  - You can configure each span as a different subnet (as in the example in this section).

If you cascade more than 15 Cisco ONS 15104s in a span, the Cisco ONS 15104 configuration is more complex. However, the RIP protocol directs traffic to only one destination, resulting in an efficient use of bandwidth.

- You can configure two or more spans together in a single subnet.

This approach results in all the advantages and disadvantages described in the preceding two alternatives.

**Figure 3 Sample Cisco 12000 IP Network Configuration with IP over DCC**



#### Cisco 12000 Router - X

```
12000-X# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
12000-X(config)# sdcc enable
12000-X(config)# interface sdcc 2/0
12000-X(config-if)# ip address 10.0.1.1 255.255.255.0
12000-X(config-if)# no keepalive
12000-X(config-if)# no shut
12000-X(config-if)# exit
```

```

12000-X(config)# ip routing
12000-X(config)# router rip
12000-X(config-router)# network 10.0.0.0
12000-X(config-router)# end

```

### Cisco ONS 15104 - A

```

15104-A# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-A(config)# interface sdcc 0
15104-A(config-if)# ip address 10.0.1.2 255.255.255.0
15104-A(config-if)# no keep
15104-A(config-if)# no shut
15104-A(config-if)# exit
15104-A(config)# interface sdcc 1
15104-A(config-if)# ip address 10.0.2.1 255.255.255.0
15104-A(config-if)# no keep
15104-A(config-if)# no shut
15104-A(config-if)# exit
15104-A(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-A(config)# router rip
15104-A(config-router)# network
15104-A(config-router)# network 10.0.0.0
15104-A(config-router)# end

```

### Cisco ONS 15104 - B

```

15104-B# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-B(config)# interface sdcc 0
15104-B(config-if)# ip address 10.0.2.2 255.255.255.0
15104-B(config-if)# no keep
15104-B(config-if)# no shut
15104-B(config-if)# exit
15104-B(config)# interface sdcc 1
15104-B(config-if)# ip address 10.0.3.1 255.255.255.0
15104-B(config-if)# no keep
15104-B(config-if)# no shut
15104-B(config-if)# exit
15104-B(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-B(config)# router rip
15104-B(config-router)# network
15104-B(config-router)# network 10.0.0.0
15104-B(config-router)# end

```

### Cisco ONS 15104 - C

```

15104-C# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-C(config)# interface sdcc 0
15104-C(config-if)# ip address 10.0.3.2 255.255.255.0
15104-C(config-if)# no keep
15104-C(config-if)# no shut
15104-C(config-if)# exit
15104-C(config)# interface sdcc 1
15104-C(config-if)# ip address 10.0.4.1 255.255.255.0
15104-C(config-if)# no keep
15104-C(config-if)# no shut
15104-C(config-if)# exit
15104-C(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-C(config)# router rip
15104-C(config-router)# network
15104-C(config-router)# network 10.0.0.0
15104-C(config-router)# end

```

**Cisco 12000 Router - Y**

```

12000-Y# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
12000-Y(config)# sdcc enable
12000-Y(config)# interface sdcc 2/0
12000-Y(config-if)# ip address 10.0.4.2 255.255.255.0
12000-Y(config-if)# no keepalive
12000-Y(config-if)# no shut
12000-Y(config-if)# exit
12000-Y(config)# ip routing
12000-Y(config)# router rip
12000-Y(config-router)# network 10.0.0.0
12000-Y(config-router)# end

```

## Cisco 12000 Series Internet Routers in a DPT Ring

This example shows how to configure IP over DCC in a DPT ring (see [Figure 4](#)) that consists of Cisco 12000 series Internet Routers connected through an OC-48/STM-16 DPT link with Cisco ONS 15104s.

The Cisco ONS 15104s are implemented in this segment to extend the reach between the two Cisco 12000 series Internet Routers that are located over 50 miles (80 km) apart. This example is the same as the preceding example in “[Cisco 12000 Series Internet Routers with Packet-over-SONET Links](#)” with the exception that a DPT link is used instead of a POS link.

**Figure 4** Configuring Cisco 12000 Series Internet Routers with IP over DCC in a DPT Ring

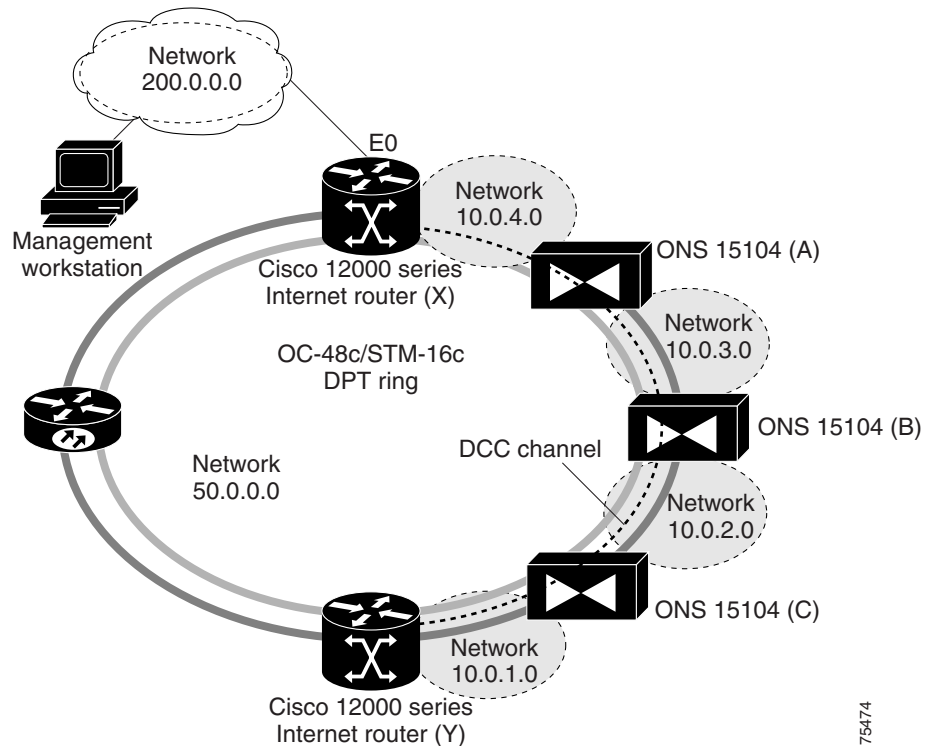
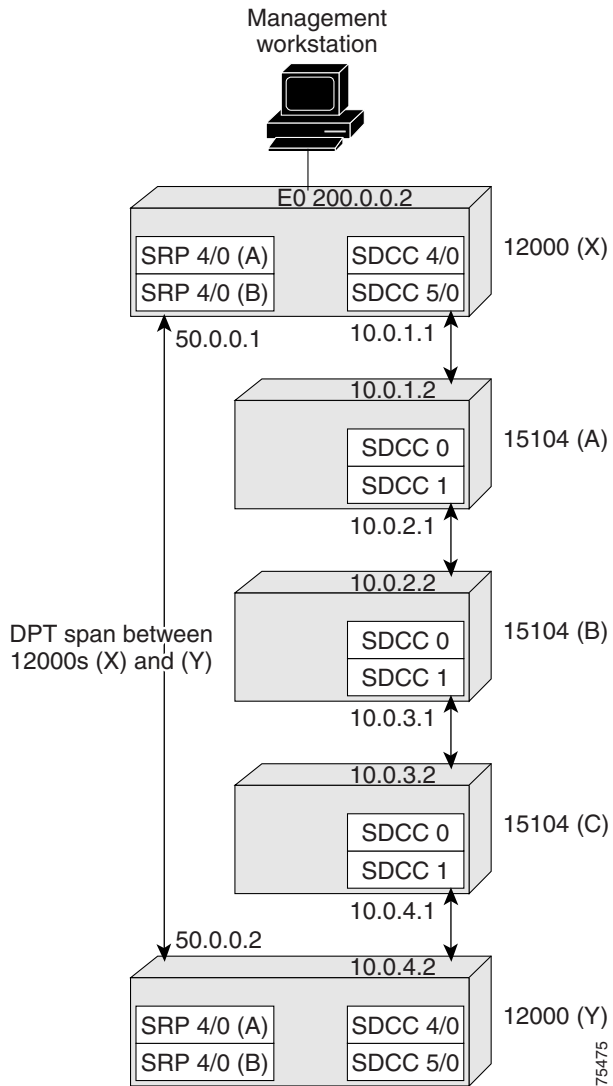


Figure 5 Sample Cisco 12000 DPT Ring Configuration with IP over DCC

**Cisco 12000 Router - X**

```

12000-X# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
12000-X(config)# sdcc enable
12000-X(config)# interface sdcc 5/0
12000-X(config-if)# ip address 10.0.1.1 255.255.255.0
12000-X(config-if)# no keepalive
12000-X(config-if)# no shut
12000-X(config-if)# exit
12000-X(config)# ip routing
12000-X(config)# router rip
12000-X(config-router)# network 10.0.0.0
12000-X(config-router)# end

```

**Cisco ONS 15104 - A**

```

15104-A# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-A(config)# interface sdcc 0

```

```
15104-A(config-if)# ip address 10.0.1.2 255.255.255.0
15104-A(config-if)# no keep
15104-A(config-if)# no shut
15104-A(config-if)# exit
15104-A(config)# interface sdcc 1
15104-A(config-if)# ip address 10.0.2.1 255.255.255.0
15104-A(config-if)# no keep
15104-A(config-if)# no shut
15104-A(config-if)# exit
15104-A(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-A(config)# router rip
15104-A(config-router)# network
15104-A(config-router)# network 10.0.0.0
15104-A(config-router)# end
```

### Cisco ONS 15104 - B

```
15104-B# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-B(config)# interface sdcc 0
15104-B(config-if)# ip address 10.0.2.2 255.255.255.0
15104-B(config-if)# no keep
15104-B(config-if)# no shut
15104-B(config-if)# exit
15104-B(config)# interface sdcc 1
15104-B(config-if)# ip address 10.0.3.1 255.255.255.0
15104-B(config-if)# no keep
15104-B(config-if)# no shut
15104-B(config-if)# exit
15104-B(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-B(config)# router rip
15104-B(config-router)# network
15104-B(config-router)# network 10.0.0.0
15104-B(config-router)# end
```

### Cisco ONS 15104 - C

```
15104-C# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-C(config)# interface sdcc 0
15104-C(config-if)# ip address 10.0.3.2 255.255.255.0
15104-C(config-if)# no keep
15104-C(config-if)# no shut
15104-C(config-if)# exit
15104-C(config)# interface sdcc 1
15104-C(config-if)# ip address 10.0.4.1 255.255.255.0
15104-C(config-if)# no keep
15104-C(config-if)# no shut
15104-C(config-if)# exit
15104-C(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-C(config)# router rip
15104-C(config-router)# network
15104-C(config-router)# network 10.0.0.0
15104-C(config-router)# end
```

### Cisco 12000 Router - Y

```
12000-Y# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
12000-Y(config)# sdcc enable
12000-Y(config)# interface sdcc 4/0
12000-Y(config-if)# ip address 10.0.4.2 255.255.255.0
12000-Y(config-if)# no keepalive
12000-Y(config-if)# no shut
```

```

12000-Y(config-if)# exit
12000-Y(config)# ip routing
12000-Y(config)# router rip
12000-Y(config-router)# network 10.0.0.0
12000-Y(config-router)# end

```

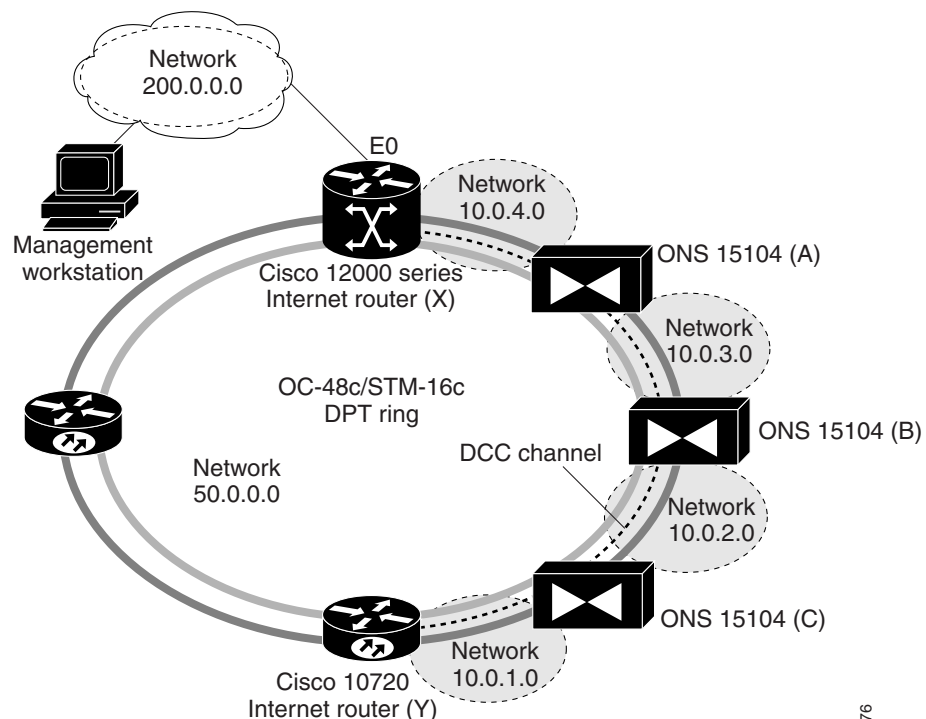
## Cisco 12000 Series and Cisco 10720 Internet Routers in a DPT Ring

This example shows how to configure IP over DCC in a DPT ring (see [Figure 6](#)) that consists of Cisco 12000 series and 10720 Internet Routers connected through an OC-48/STM-16 DPT link with Cisco ONS 15104s.

The IP network configuration is the same as the preceding example in “[Cisco 12000 Series Internet Routers in a DPT Ring](#)”:

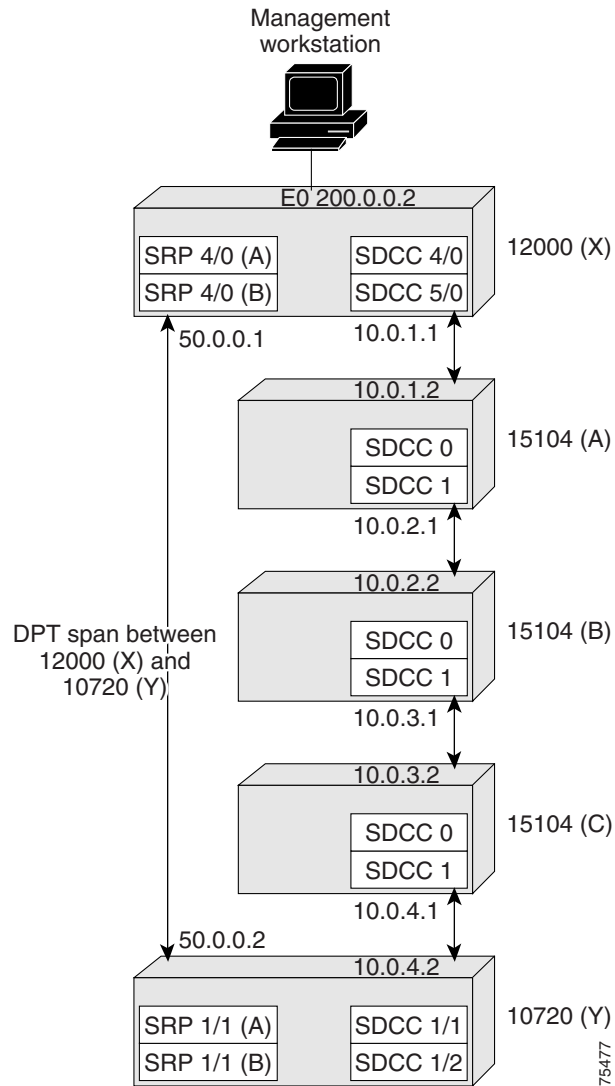
- The IP subnet of the DPT ring (50.0.0.0/24) runs OSPF as the routing protocol.
- The IP management network (10.0.0.0/24) is configured over the span of the OC-48 SDCC interfaces of the Cisco 12000 series Internet Router, Cisco 10720 Internet Routers, and Cisco ONS 15104s and runs RIP as the routing protocol.
- A second IP management network (200.0.0.0/24) is used to access the Cisco 12000 series Internet Router through its Ethernet port for management purposes. A set of static routes are used to communicate between the management workstation and the Cisco 12000 series Internet Router, Cisco 10720 Internet Routers, and Cisco ONS 15104s.

**Figure 6** Configuring Cisco 12000 Series and 10720 Internet Routers with IP over DCC in a DPT Ring



In this example, the DCC link is created between the Cisco 12000 series Internet Router and the Cisco 10720 Internet Router by passing through the Cisco ONS 15104s. Management access to the Cisco ONS 15104 is available from the Cisco 12000 series Internet Router through the DCC link.

Figure 7 Sample Cisco 12000/10720 DPT Ring Configuration with IP over DCC



### Cisco 12000 Router - X

```

12000-X# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
12000-X(config)# sdcc enable
12000-X(config)# interface sdcc 5/0
12000-X(config-if)# ip address 10.0.1.1 255.255.255.0
12000-X(config-if)# no keepalive
12000-X(config-if)# no shut
12000-X(config-if)# exit
12000-X(config)# ip routing
12000-X(config)# router rip
12000-X(config-router)# network 10.0.0.0
12000-X(config-router)# end

```

### Cisco ONS 15104 - A

```

15104-A# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-A(config)# interface sdcc 0

```

```

15104-A(config-if)# ip address 10.0.1.2 255.255.255.0
15104-A(config-if)# no keep
15104-A(config-if)# no shut
15104-A(config-if)# exit
15104-A(config)# interface sdcc 1
15104-A(config-if)# ip address 10.0.2.1 255.255.255.0
15104-A(config-if)# no keep
15104-A(config-if)# no shut
15104-A(config-if)# exit
15104-A(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-A(config)# router rip
15104-A(config-router)# network
15104-A(config-router)# network 10.0.0.0
15104-A(config-router)# end

```

### Cisco ONS 15104 - B

```

15104-B# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-B(config)# interface sdcc 0
15104-B(config-if)# ip address 10.0.2.2 255.255.255.0
15104-B(config-if)# no keep
15104-B(config-if)# no shut
15104-B(config-if)# exit
15104-B(config)# interface sdcc 1
15104-B(config-if)# ip address 10.0.3.1 255.255.255.0
15104-B(config-if)# no keep
15104-B(config-if)# no shut
15104-B(config-if)# exit
15104-B(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-B(config)# router rip
15104-B(config-router)# network
15104-B(config-router)# network 10.0.0.0
15104-B(config-router)# end

```

### Cisco ONS 15104 - C

```

15104-C# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-C(config)# interface sdcc 0
15104-C(config-if)# ip address 10.0.3.2 255.255.255.0
15104-C(config-if)# no keep
15104-C(config-if)# no shut
15104-C(config-if)# exit
15104-C(config)# interface sdcc 1
15104-C(config-if)# ip address 10.0.4.1 255.255.255.0
15104-C(config-if)# no keep
15104-C(config-if)# no shut
15104-C(config-if)# exit
15104-C(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-C(config)# router rip
15104-C(config-router)# network
15104-C(config-router)# network 10.0.0.0
15104-C(config-router)# end

```

### Cisco 12000 Router - Y

```

10720-Y# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
10720-Y(config)# sdcc enable
10720-Y(config)# interface sdcc 1/1
10720-Y(config-if)# ip address 10.0.4.2 255.255.255.0
10720-Y(config-if)# no keepalive
10720-Y(config-if)# no shut

```

```

10720-Y(config-if)# exit
10720-Y(config)# ip routing
10720-Y(config)# router rip
10720-Y(config-router)# network 10.0.0.0
10720-Y(config-router)# end

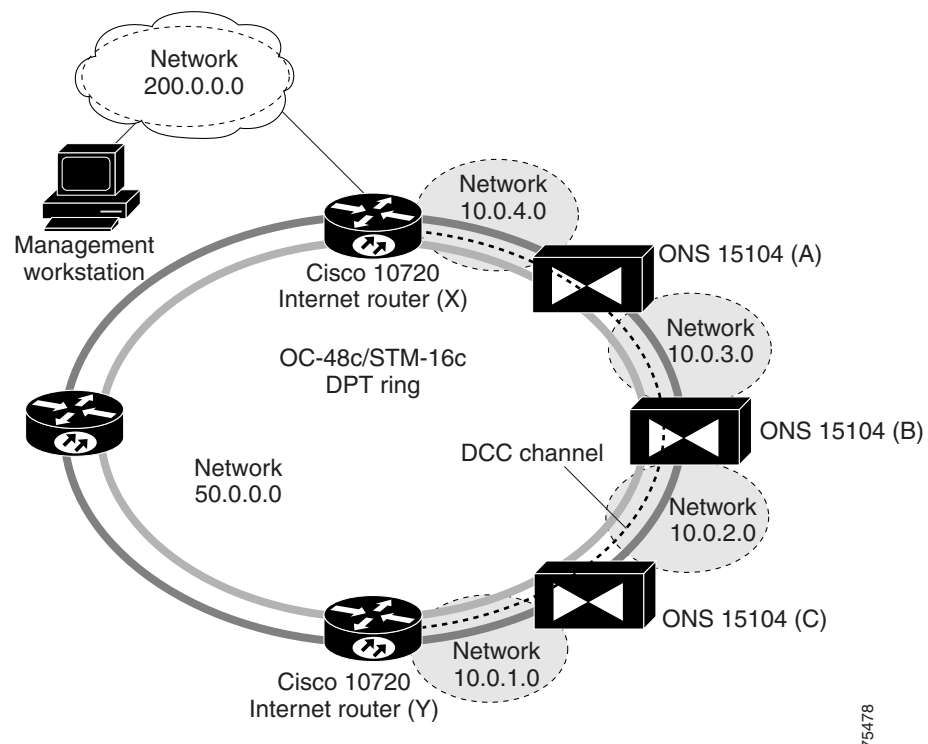
```

## Cisco 10720 Internet Routers in a DPT Ring

This example shows how to configure IP over DCC in a DPT ring (see [Figure 8](#)) that consists of Cisco 10720 Internet Routers connected through an OC-48/STM-16 DPT link with Cisco ONS 15104s in one span.

The IP network configuration is the same as the preceding example in “[Cisco 12000 Series and Cisco 10720 Internet Routers in a DPT Ring](#)” with the exception that the Cisco 10720 Internet Router does not support E0 out-of-band management access. The management access is, therefore, in-band and is part of the 50.0.0.0 network.

**Figure 8** Configuring Cisco 10720 Internet Routers with IP over DCC in a DPT Ring

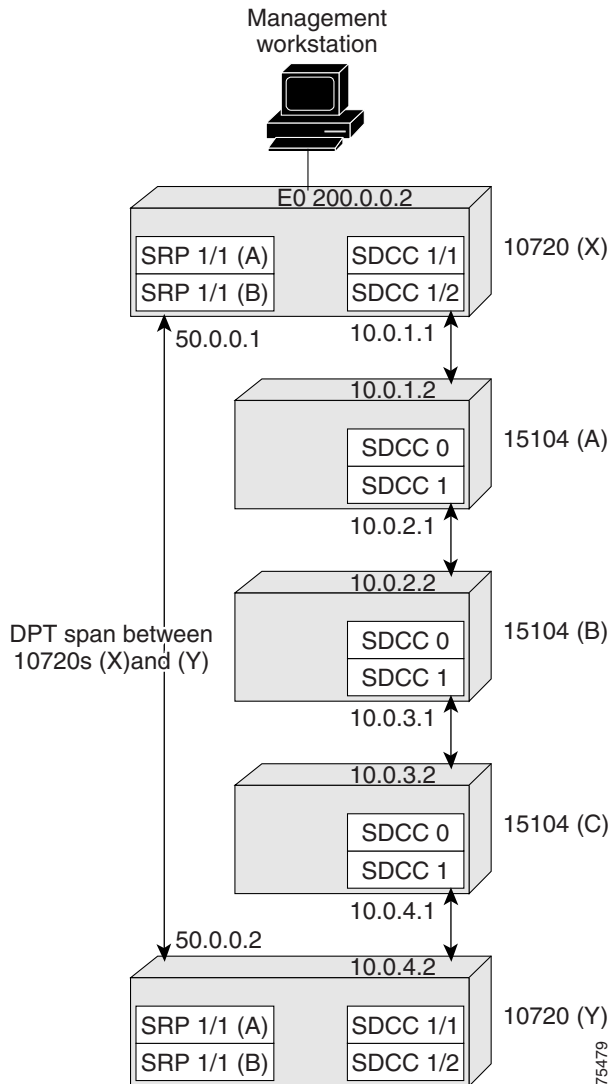


The IP network configuration also consists of:

- An IP subnet of the DPT ring (50.0.0.0/24) that runs OSPF as the routing protocol; the management station is also part of the same network.
- An IP Management network (10.0.0.0/24) configured over the span of the OC-48 SDCC interfaces of the Cisco 10720 Internet Routers and Cisco ONS 15104s.

In this example, the DCC link is created between the two Cisco 10720 Internet Routers and passes through the Cisco ONS 15104s. Management access to the Cisco ONS 15104 is available from either of the Cisco 10720 Internet Routers through the DCC link

Figure 9 Sample Cisco 10720 DPT Ring Configuration with IP over DCC



### Cisco 10720 Router - X

```

10720-X# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
10720-X(config)# sdcc enable
10720-X(config)# interface sdcc 1/2
10720-X(config-if)# ip address 10.0.1.1 255.255.255.0
10720-X(config-if)# no keepalive
10720-X(config-if)# no shut
10720-X(config-if)# exit
10720-X(config)# ip routing
10720-X(config)# router rip
10720-X(config-router)# network 10.0.0.0
10720-X(config-router)# end
  
```

### Cisco ONS 15104 - A

```

15104-A# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-A(config)# interface sdcc 0
  
```

```
15104-A(config-if)# ip address 10.0.1.2 255.255.255.0
15104-A(config-if)# no keep
15104-A(config-if)# no shut
15104-A(config-if)# exit
15104-A(config)# interface sdcc 1
15104-A(config-if)# ip address 10.0.2.1 255.255.255.0
15104-A(config-if)# no keep
15104-A(config-if)# no shut
15104-A(config-if)# exit
15104-A(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-A(config)# router rip
15104-A(config-router)# network
15104-A(config-router)# network 10.0.0.0
15104-A(config-router)# end
```

### Cisco ONS 15104 - B

```
15104-B# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-B(config)# interface sdcc 0
15104-B(config-if)# ip address 10.0.2.2 255.255.255.0
15104-B(config-if)# no keep
15104-B(config-if)# no shut
15104-B(config-if)# exit
15104-B(config)# interface sdcc 1
15104-B(config-if)# ip address 10.0.3.1 255.255.255.0
15104-B(config-if)# no keep
15104-B(config-if)# no shut
15104-B(config-if)# exit
15104-B(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-B(config)# router rip
15104-B(config-router)# network
15104-B(config-router)# network 10.0.0.0
15104-B(config-router)# end
```

### Cisco ONS 15104 - C

```
15104-C# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
15104-C(config)# interface sdcc 0
15104-C(config-if)# ip address 10.0.3.2 255.255.255.0
15104-C(config-if)# no keep
15104-C(config-if)# no shut
15104-C(config-if)# exit
15104-C(config)# interface sdcc 1
15104-C(config-if)# ip address 10.0.4.1 255.255.255.0
15104-C(config-if)# no keep
15104-C(config-if)# no shut
15104-C(config-if)# exit
15104-C(config)# ip route 200.0.0.0 255.0.0.0 10.0.1.1
15104-C(config)# router rip
15104-C(config-router)# network
15104-C(config-router)# network 10.0.0.0
15104-C(config-router)# end
```

### Cisco 10720 Router - Y

```
10720-Y# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
10720-Y(config)# sdcc enable
10720-Y(config)# int
10720-Y(config)# interface sdcc 1/1
10720-Y(config-if)# ip address 10.0.4.2 255.255.255.0
10720-Y(config-if)# no keepalive
```

```
10720-Y(config-if)# no shut
10720-Y(config-if)# exit
10720-Y(config)# ip routing
10720-Y(config)# router rip
10720-Y(config-router)# network 10.0.0.0
10720-Y(config-router)# end
```

## Command Reference

No new or modified commands were introduced to support the IP over DCC feature. For information about all commands used with this feature, refer to the Cisco IOS Release 12.0 command reference publications.

# Glossary

**data communications channel**—See DCC.

**DCC**—data communications channel. An AT&T SONET term used to describe a channel contained within Section and Line overhead and used as an embedded operations channel to communicate to each network element.

**DPT**—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.

**HDLC**—High-Level Data Link Control. Bit-oriented synchronous data link layer protocol developed by ISO. Derived from SDLC, HDLC specifies a data encapsulation method on synchronous serial links using frame characters and checksums.

**IGP**—Interior Gateway Protocol. An Internet protocol used to exchange routing information within an autonomous system. Examples of common IGPs include IGRP, OSPF, and RIP.

**MIB**—Management Information Base. Database of network management information that is used and maintained by a network management protocol such as SNMP. The value of a MIB object can be changed or retrieved using SNMP commands, usually through a network management system (NMS). MIB objects are organized in a tree structure that includes public (standard) and private (proprietary) branches.

**OAM**—Operation, Administration, and Maintenance. ATM Forum specifies OAM cells used to monitor virtual circuits. OAM cells provide a virtual circuit-level loopback in which a router responds to the cells, demonstrating that the circuit is up and the router is operational.

**OSPF**—Open Shortest Path First protocol.

**POS**—Packet over SONET. A technology in which IP packets are mapped into SONET frames with intervening use of an ATM layer.

**PPP**—Point-to-Point Protocol. A successor to Serial Line IP (SLIP), PPP provides router-to-router and host-to-network connections over synchronous and asynchronous circuits.

**RIP**—Routing Internet Protocol. The most common IGP in the Internet. RIP uses hop count as a routing metric.

**SDCC**—SONET data communications channel.

**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 as STM-1.

**SNMP**—Simple Network Management Protocol. Network management protocol used almost exclusively in TCP/IP networks. SNMP provides a means to monitor and control network devices, and to manage configurations, statistics collection, performance, and security.

**SONET**—Synchronous Optical Network. High-speed (up to 2.5 Gbps) 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.

**TFTP**—Trivial File Transfer Protocol. Simplified version of FTP that allows files to be transferred from one computer to another over a network.

