Configuring Card Port Protection on the ML-MR-10 Card

This chapter describes card and port protection (CPP) for the ML-MR-10 card and how to configure CPP using the Cisco IOS command line interface (CLI). For information on ML-MR-10 card features, refer Chapter 3, "ML-Series Card Overview."

This chapter contains the following major sections:

Understanding CPP

ML-MR-10 cards can be configured for CPP using a pair of identical ML-MR-10 cards located on the same ONS 15454 chassis. Individual ports can be either CPP protected or unprotected. EtherChannels with or without link aggregation control protocol (LACP) can be configured for CPP or may remain unprotected. Each EtherChannel can aggregate a maximum of 10 physical members.

For additional information about LACP and EtherChannel, refer Chapter 13, "Configuring Link Aggregation."

In CPP, each Gigabit Ethernet port located at the front of an ML-MR-10 card is protected using the same port number of the protecting ML-MR-10 card. For example, Port 1 of Card A is protected by Port 1 of Card B. The ports must be configured in the same way; that is, their interfaces must have the same attributes, such as, link speed and mode (full or half duplex).

Note   Load balancing across members of the port-channel on the same card is supported irrespective of CPP configuration.

Note   The two cards in the protection group are not verified for configuration consistency.

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01 **32-1**

POS interfaces on the ML-MR-10 card can be configured for CPP. For example, POS0 on CPP Card A will protect POS0 on peer CPP Card B and so on.

With POS interfaces, CPP can do the following:

- Aggregate Traffic from Front Ports and POS Interface to RPR
- Aggregate Traffic from POS Interfaces to Front Ports

Aggregate Traffic from Front Ports and POS Interface to RPR

The RPR interface aggregates traffic from the front ports (Gigabit Ethernet or port-channel interfaces) and the POS interface on the ML-MR-10 card (Figure 32-1). To achieve this, two ML-MR-10 cards that are present on the same ONS 15454 chassis are configured as CPP peer cards. To protect POS interfaces, a protection group is created and POS interfaces are added to the group. The same numbered POS ports on the front port of the ML-MR-10 cards are protected on the peer cards. In Figure 32-1, the POS port on the ML-MR-10 Card A and ML-MR-10 Card B receives traffic from an ONS 15310-MA through a protected circuit and aggregates it to the front port of the Gigabit Ethernet (GE0).

To configure a POS interface, refer to the "Configuring the POS Interfaces (ML100T-12, ML100X-8, ML1000-2, and ML-MR-10)" section on page 6-11.

Figure 32-1 *RPR Aggregating Traffic from the Gigabit Ethernet Front Ports and POS Interfaces*

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-2
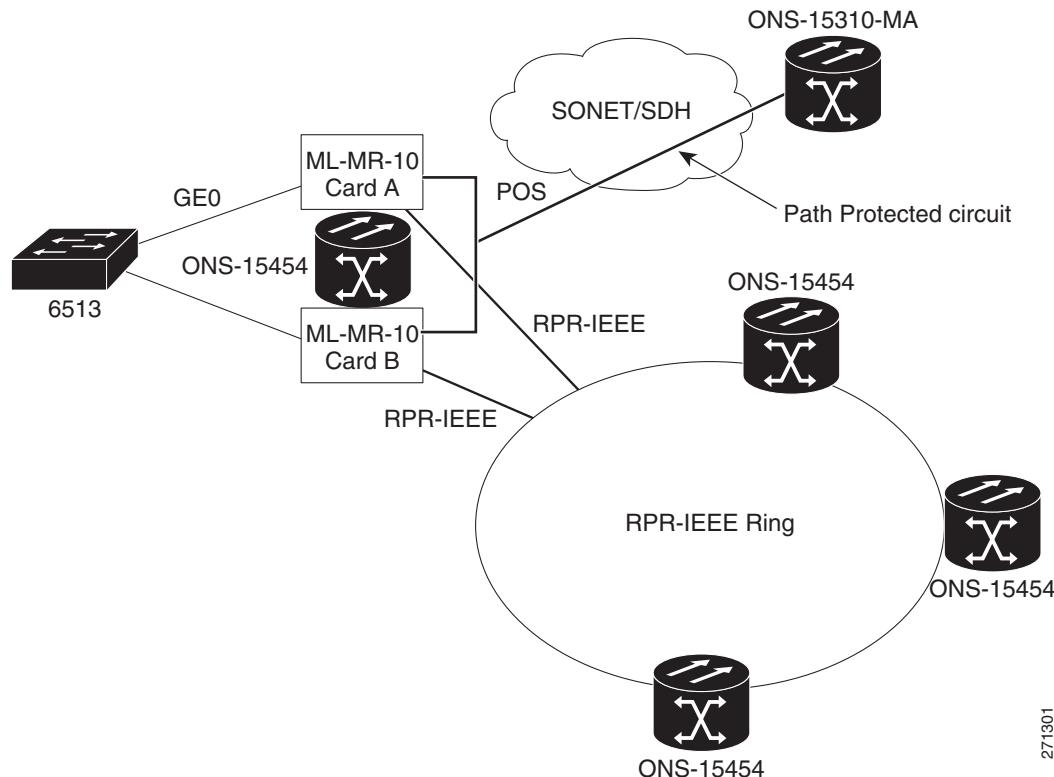
78-19875-01

Aggregate Traffic from POS Interfaces to Front Ports

The CPP provisioned ML-MR-10 card aggregates traffic from multiple POS interfaces via the front port (Gigabit Ethernet or port-channel interfaces). For example, if CE-MR-6 and CE-MR-10 cards are installed at multiple cell tower locations, a protected circuit is provisioned between the POS port of CE-MR-6 and CE-MR-10 cards to the POS port of CPP provisioned ML-MR-10 card. The ML-MR-10 card is located near the switching site. The ML-MR-10 card aggregates the POS traffic from multiple cell tower locations and passes it on to the switching site via the front port. Figure 32-2 depicts this scenario, where traffic from an ONS 15310-MA (with the CE-MR-6 card) and ONS 15454 (with the CE-MR-10 card) is routed through the path protected circuit provisioned to the POS0 and POS1 ports of the ML-MR-10 Card A and ML-MR-10 Card B, which aggregates traffic to the front port of the GE0.

Figure 32-2   Gigabit Ethernet Front Port Aggregating Traffic from POS Interfaces
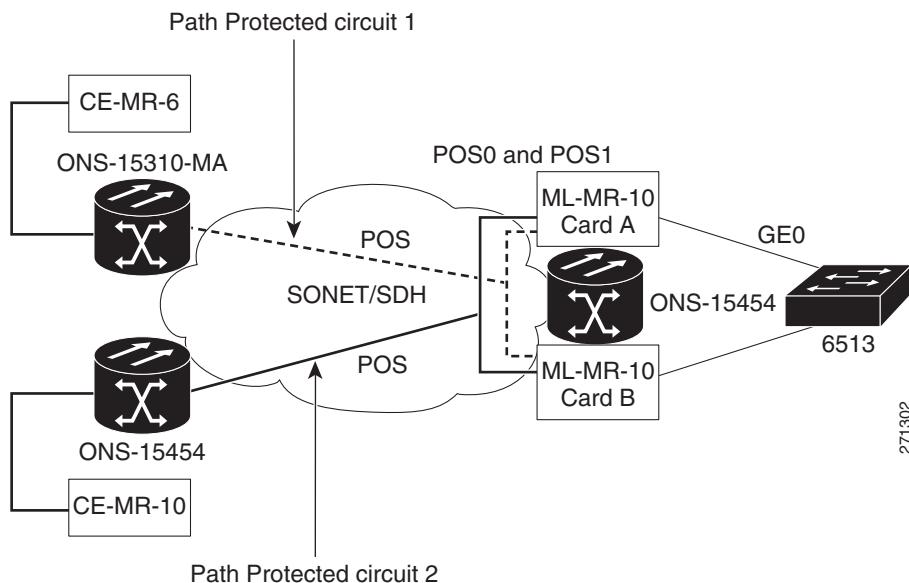
When aggregating traffic from POS interfaces to front ports, if any member interface fails the protection group switches the whole group. For example, when GE0 fails on Card A, all the interfaces belonging to this group (GE0, POS0, and POS1) will switch to Card B. In order to configure this per group switching behavior you need to configure, the '**protection fail-action group-switch**' command.

CPP can be implemented on the POS interfaces where traffic is routed on the same ML-MR-10 card with some of the POS ports and front ports aggregating traffic to the RPR interface, while other POS ports are aggregating traffic to different front ports. To configure this, the POS interfaces must be protected.

To provide protection for POS interfaces, the circuits are provisioned as path protected circuits to source and/or destination, that is, single/dual source and single/dual destination, on the CPP peer cards. For step-by-step instructions to create dual source and dual destination circuits, refer to the "Create Circuits and VT Tunnels" chapter of the *Cisco ONS 15454 Procedure Guide* or the "Create Circuits and Low-Order Tunnels" chapter of the *Cisco ONS 15454 SDH Procedure Guide*.

To enable protection, configure a protection group. Multiple protection groups are supported on the ML-MR-10 card. The ML-MR-10 card has a maximum of 10 front ports and one RPR interface; a traffic pattern can be set for 10 individual POS interfaces to send traffic to 10 front ports separately; and another POS interface to send traffic to the RPR interface simultaneously. To achieve this, a maximum of 11 protection groups must be created in a single ML-MR-10 card. You can specify any of the 26 POS interfaces for this, which are numbered POS0 through POS25.

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-3

To create multiple protection groups, see "Configuring CPP Redundancy" section on page 32-7.

Note Unprotected ports can co-exist on the same ML-MR-10 card.

Protection groups are created based on the switching behavior. The groups can switch on a per-port basis or at a group level, where all members switch even if one member fails.

Two types of traffic flow can be protected on an ML-MR-10 card:

- Traffic from Gigabit Ethernet to RPR and POS to RPR—RPR aggregates traffic from multiple front ports (Gigabit Ethernet or port-channel interface) and the POS interface. If the front port or the POS interface fails, only the failed port switches to the corresponding port on the peer card.

- Traffic from POS to Gigabit Ethernet/port-channel interface—A single front port aggregates traffic from multiple POS interfaces. If the front port fails or is shut down, the whole group switches to the peer card.

Of the eleven protection groups that can be configured, only one group can be created to support traffic from Gigabit Ethernet to RPR and POS to RPR. Ten individual groups to support traffic from POS to Gigabit Ethernet/port-channel interfaces can be configured on the ML-MR-10 card.

Note A Gigabit Ethernet, POS, port-channel, or RPR-IEEE interface cannot be part of more than one protection group at a time.

Note If a POS interface on which no circuit has been provisioned is added to a group configured with 'protection fail-action group-switch', then the group will attempt to switch if it is in Active state. This can lead to traffic hit on other members of the same group. Hence users should add only those POS interfaces, which are in UP state to such protection groups.

26 POS interfaces can be created through Cisco Transport Controller (CTC)/TL1. However, the default number that can be created through the Cisco IOS CLI is 18. The POS ports are numbered POS0 through POS25.

CPP Switching Parameters

In CPP, two ML-MR-10 cards are configured as peers. A card becomes active or standby under the following conditions:

- When both cards are booted, the first card to come up becomes active and the other card coming up second becomes the standby.

- If both cards come up simultaneously, the card with a lower slot number becomes active and the card with the higher slot number becomes the standby.

If the RPR-IEEE interface goes down or if the front ports do not come up, the active ML-MR-10 card sends a message to the standby card to become active. If the standby card does not become active, both the cards go to pending active state and neither cards perform protection. When an RPR-IEEE interface and a protected front port or port-channel interface comes up for either card, that card becomes active.

Note The two CPP peer nodes appear as two separate RPR stations in the RPR-IEEE topology.

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-4

78-19875-01

The active card or port signals the standby card to activate under certain conditions. These conditions and the resulting outcome is described in Table 32-1.

Table 32-1   ML-MR-10 Card Switching Conditions and Outcome

Card Condition	Outcome
Failed Ethernet link	Switches all the traffic to the peer port on the peer CPP card
The user shuts down the Ethernet interface	Switches all the traffic to the peer port on the peer CPP card
ML-MR-10 card crashes, reloads, or resets	Switches all the protected ports and card to the peer CPP card
RPR-IEEE interface is shut down, or all front ports are shut down	Switches all the protected ports and card to the peer CPP card **Note** Groups configured for per group switching will not be affected by RPR-IEEE interface switching.
All the port-channel members go down	Switches the port-channel to the peer port-channel interface on the peer CPP card
CPP is disabled or unconfigured	Switches all the protected ports and the CPP card state to the peer CPP card

The standby card becomes active if:

- The active card explicitly requests takeover.
- The active card's periodic heartbeat is missed consecutively twice.

Note   The active card's heartbeat can be interrupted if it is pulled or if it crashes.

The active card does not recover control of a port from the nonreverting standby card when the front port Ethernet comes back. The active card regains control when the corresponding port fails on the standby card. Similarly, a failed active card cannot recover control from the peer card when the front port Ethernet or RPR-IEEE interface comes up. It becomes active only when the peer card fails or all the front ports of the peer card go down. Unprotected ports are not affected by the state of the protected ports or the CPP card state or any switchover, unless the RPR-IEEE interface goes down. The traffic going through this RPR-IEEE interface then goes down.

Note   The state (active/standby) of the port is independent of the state of the card.

At any given time, a port can be in a transition state other than active or standby. For example:

- A port can temporarily be in a no-control state if it was active but is not yet in the standby mode.
- A port can wait in a no-control state when neither card can claim active control over it.

Improving Switching Time with Standby Up State

By default, the standby front ports (Gigabit Ethernet or port-channel interfaces) state is turned OFF on the CPP-configured ML-MR-10 cards. This is done to prevent the client device from load balancing traffic in case the client device has port-channel configuration. However during protection switchover,

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-5

this mechanism of keeping the standby port state OFF affects the traffic restoration time as additional time is needed to turn the new active interface ON. It also prevents monitoring the health of the standby link.

In order to improve switch times and also to help monitor the standby link, a new CLI '**protection-group** <*group_num*> **standby-on**' is introduced specifically for front ports. When this command is configured it will not force the standby port to OFF state. This command can only configure Gigabit Ethernet and port-channel interfaces that do not have the LACP configured.

This feature cannot be used if the client has port-channel configured because the client will start load balancing traffic when the standby link comes up causing blackholing of traffic.

To provision this feature the client must have the two links (which connect to the CPP-configured ML-MR-10 card peers) configured in the same VLAN (Figure 32-3).

Figure 32-3   Individual Interfaces Configured in the Same VLAN on a Client
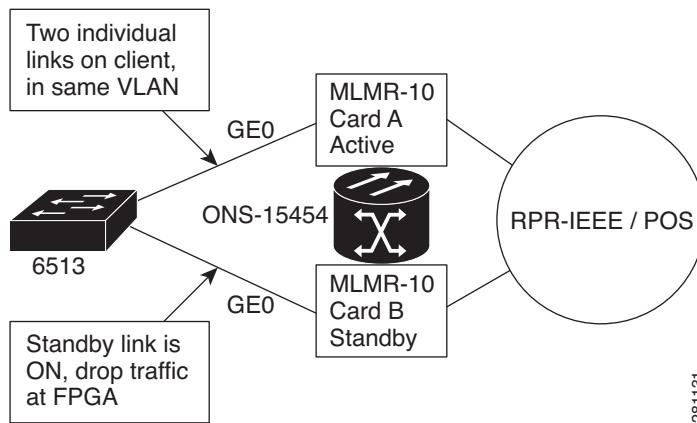
With this configuration, the client may initially flood unicast traffic on to both the ML-MR-10 card CPP peer interfaces; however the standby CPP interface will drop these packets internally in the FPGA, and only the active ML-MR-10 card interface will switch this traffic. Eventually, after MAC learning, the unicast traffic will converge on to the active link. In case of multicast or broadcast traffic, the client will always send traffic on both the available links. In this case also the standby CPP interface will drop these packets internally in the FPGA, and only the active ML-MR-10 card interface will switch this traffic.

✎
Note   This CLI is not applicable when LACP is configured because the standby interfaces are not forced down when LACP is enabled.

Error Reporting

CTC displays the CPP protection group status. When communication between the ML-MR-10 card and the TCC2/TCC2P card goes down and the card fails to send alarms to the TCC2/TCC2P card, error messages are displayed on the Cisco IOS console.

CTC displays the following CPP states :

- Group CPP state: Unprotected, Down, Active, or Standby

- Port CPP state: Unprotected, Down, Active, or Standby

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-6

78-19875-01

CPP Alarms

The following port-channel interface alarms will be reported across the members of the port-channel:

- CPP-PEER-NO-RESP: This is a peer-card-not-responding alarm and is raised if an active CPP port does not receive any heartbeat response from its peer card. This occurs if the peer card is not present in the ONS 15454 chassis, or if the peer card is not configured for protection, or if the peer card has reset. This alarm is raised against all ports of the ML-MR-10 card belonging to a particular group.

- CPP-INCAPABLE: This is a card-port-protection-incapable alarm and is raised when the ML-MR-10 card or port is unable to provide protection. This condition occurs when the RPR-IEEE interface on the ML-MR-10 card is down, or when the CPP peer slot number is not configured from the Cisco IOS command line interface. For groups aggregating traffic from POS interfaces to front ports (per group switch behavior), this alarm will also occur if the user shuts down the member interfaces.

These alarms are reported against all the ports belonging to a particular group. The ports can be can be any combination of the Gigabit Ethernet, POS, or RPR.

Whenever there is a change in the state of the protection group or port, a message is logged in the Cisco IOS console indicating the new state.

For additional information on CPP alarms, refer to the "Alarm Troubleshooting" chapter in the *Cisco ONS 15454 Troubleshooting Guide* or the *Cisco ONS 15454 SDH Troubleshooting Guide* for detailed information.

Configuring CPP Redundancy

Table 32-2 describes commands that are related to CPP. For additional information on Cisco IOS commands used in this chapter, refer to the *Cisco IOS Command Reference* publication and the "Command Reference" section on page B-1.

Note   When a node is configured for CPP, the VLANs configured on the CPP nodes must operate with the "service advertisement" option. This enables the remote nodes to send the corresponding VLAN traffic to the CPP card that has the active port.

Table 32-2   Commands Related to CPP

Command	Purpose
`protection group`	Creates a protection group entity. The card then goes to the config-prot mode.
`[no] protection group enable`	Disables a protection group to facilitate troubleshooting or maintenance.
`protection peer slot slot_num`	Specifies the slot number of the CPP peer card.
`[no] protection-group group_num`	Adds or deletes a Gigabit Ethernet, port-channel, RPR-IEEE, or POS interface from the group.
`[no] protection-group <group_num> standby-on`	Keeps the STANDBY interfaces ON or OFF.
`[no] protection fail-action group-switch`	Activates or deactivates the switching behavior of the protection group when a single member interface fails.

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-7

Table 32-2   Commands Related to CPP (continued)

Command	Purpose
`show protection interface`	Displays protection configuration and status of an interface.
`show protection {detail	group}`	Displays configuration and status of the protection group.

To create single/multiple CPP protection groups, perform the following procedure, beginning in the global configuration mode. The protection group status is enabled by default.

	Command	Purpose
Step 1	`Router(config)# protection group number`	Creates a protection group entity.
Step 2	`Router(config-prot)# protection peer slot slot-number`	Identifies the redundant card.
Step 3	`Router(config-prot)# end`	Exits to privileged EXEC mode.
Step 4	`Router# copy running-config startup-config`	(Optional) Saves configuration changes to NVRAM.

By default, ports are unprotected. Individual ports that are not added in the protection group continue to function as unprotected ports. The ports can be used to carry data traffic but will not be protected.

The ports can be used to carry data traffic using Ethernet Flow Point (EFP) configuration but will not be protected. Ensure that protected ports and unprotected ports are configured consistently across CPP peer cards. If protected ports with identical numbers on both CPP peers go to the active state, the card with lower slot number is given precedence.

Note The configuration of default EFPs does not work on nodes that are configured for CPP. Untagged, double-tagged, and default services will also not work since the "service advertisement" mechanism is not supported for these EFP configuration options. This is applicable only when the RPR-IEEE interface is aggregating traffic.

As the ML-MR-10 card has a maximum of 10 front ports and one RPR-IEEE interface, a traffic pattern can be set for 10 individual POS interfaces to send traffic to 10 front ports separately; and another POS interface to send traffic to the RPR-IEEE interface simultaneously. To achieve this functionality a maximum of 11 protection groups must be created in a single ML-MR-10 card.

To disable the group for troubleshooting purposes, enter the following command in the interface configuration mode:

`Router(config-prot)# no protection group enable`

For information on other port configuration tasks, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide*.

To assign Ethernet interfaces to the EtherChannel, perform the following procedure, beginning in global configuration mode:

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-8

78-19875-01

	Command	Purpose
Step 1	Router(config)# **interface gigabitethernet** *number*	Specifies the Gigabit Ethernet interface configuration mode that will be assigned to the EtherChannel. You can assign the Gigabit Ethernet interface to the EtherChannel. Repeat this step for each interface you want to assign.
Step 2	Router(config-if)# **channel-group** *channel-number*	Assigns a Gigabit Ethernet interfaces to the EtherChannel. The channel number must be the same channel number you assigned to the EtherChannel interface.
Step 3	Router(config-if)# **end**	Exits to privileged EXEC mode.
Step 4	Router# **copy running-config startup-config**	(Optional) Saves configuration changes to NVRAM.

To protect port-channel interfaces using CPP, perform the following procedure:

	Command	Purpose
Step 1	Router(config)# **interface portchannel** *number*	Enters the port-channel interface configuration mode.
Step 2	Router(config-if)# **protection-group** *number*	Configures the port-channel as a CPP protected port.
Step 3	Router(config-if)# **end**	Exits to privileged EXEC mode.
Step 4	Router# **copy running-config startup-config**	(Optional) Saves configuration changes to NVRAM.

> **Note** A protection group configuration can similarly be applied to RPR-IEEE and Ethernet ports.

To protect POS interfaces using CPP, perform the following procedure:

	Command	Purpose
Step 1	Router(config)# **interface pos** *number*	Enters the POS interface configuration mode.
Step 2	Router(config-if)# **protection-group** *number*	Configures the POS as a CPP protected port.
Step 3	Router(config-if)# **end**	Exits to privileged EXEC mode.
Step 4	Router# **copy running-config startup-config**	(Optional) Saves configuration changes to NVRAM.

CPP Configuration Example

In Figure 32-4, ML-MR-10 Node 1 (CPP-Group 1 Slot-6) and ML-MR-10 Node 1 (CPP-Group 1 Slot-12) are CPP peers on an ONS 15454.

There can be many such CPP groups on a single node or in an RPR-IEEE ring. However, the CPP peers must be located on a common node. The configuration example in Figure 32-4 illustrates various types of protection. A CPP protection group can be configured on a physical (Gigabit Ethernet) interface, logical (port-channel) interface, or a POS interface. There can be a combination of interface types on a protection group. The redundancy of each protected interface is maintained during failure, on a peer card

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-9

with the port numbers of respective (physical/logical) interfaces. Initially, the protected interfaces (that are part of the active card) come up if the physical link's state is up. Based on the status of the link, a port can be in standby or active mode irrespective of the CPP group state.

Figure 32-4   *CPP Configuration Example*
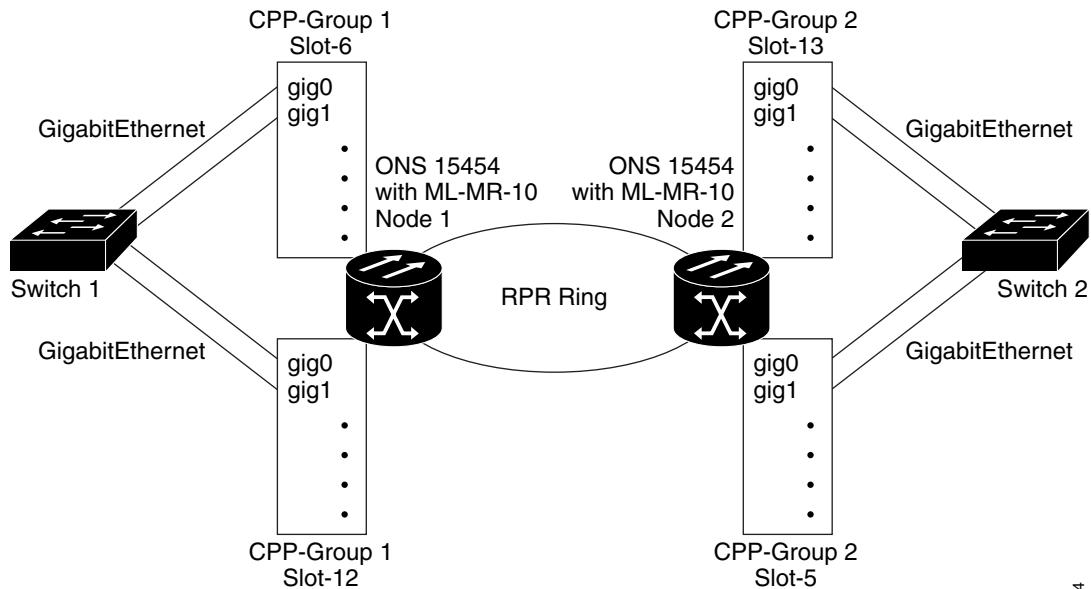
Note   In any protection type that is configured to aggregate traffic from front ports and POS to the RPR, the RPR-IEEE interface must be part of the protection group.

As shown in Figure 32-4, the configuration of GE0 on CPP-Group 1 Slot-6 protects GigabitEthernet0 on CPP-Group 1 Slot-12 and vice versa. Configuration consistency must be maintained between CPP peer cards. The following configuration for CPP-Group 1 Slot-6.

Example 32-1   Creating CPP Protection on Physical Interfaces

```
!
protection group 1
    protection peer slot 12
 !
 !
interface GigabitEthernet0
    no ip address
    no keepalive
    duplex auto
    speed auto
    negotiation auto
    protection-group 1
    service instance 5 ethernet
        encapsulation dot1q 5
        bridge-domain 5
!
interface RPR-IEEE0
    no ip address
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-10

78-19875-01

```
                    protection-group 1
                    no rpr-ieee sas
                    rpr-ieee protection pref jumbo
                    service instance 5 ethernet
                        encapsulation dot1q 5
                        rpr-destination service-advertisement
                        bridge-domain 5
 !
!
end
```

The following configuration is for CPP-Group 1 Slot-12.

```
protection group 1
    protection peer slot 6
 !
interface GigabitEthernet0
    no ip address
    no keepalive
    duplex auto
    speed auto
    negotiation auto
    protection-group 1
    service instance 5 ethernet
        encapsulation dot1q 5
        bridge-domain 5
!
interface RPR-IEEE0
    no ip address
    protection-group 1
    no rpr-ieee sas
    rpr-ieee protection pref jumbo
    service instance 5 ethernet
        encapsulation dot1q 5
        rpr-destination service-advertisement
        bridge-domain 5
!
!
end
```

As shown in Figure 32-4, the port-channel 5 on CPP-Group 1 Slot-6 protects port-channel 5 on
CPP-Group 1 Slot-12 and vice versa. Ensure that configuration consistency is maintained between CPP
peer cards. The following configuration is for CPP-Group 1 Slot-6.

Example 32-2   Create CPP Protection on a Port-Channel

```
!
protection group 1
    protection peer slot 12
 !
 !
 interface Port-channel5
    no ip address
    no negotiation auto
    protection-group 1
    load-balance src-dst-mac
    hold-queue 0 in
    service instance 5 ethernet
        encapsulation dot1q 5
        bridge-domain 5
 !
    service instance 6 ethernet
        encapsulation dot1q 6
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-11

```
            bridge-domain 6
 !
 !
interface GigabitEthernet0
    no ip address
    no keepalive
    duplex auto
    speed auto
    negotiation auto
    channel-group 5
 !
interface GigabitEthernet1
    no ip address
    no keepalive
    duplex auto
    speed auto
    negotiation auto
    channel-group 5
 !
interface RPR-IEEE0
    no ip address
    protection-group 1
    no rpr-ieee sas
    rpr-ieee protection pref jumbo
    service instance 5 ethernet
        encapsulation dot1q 5
        rpr-destination service-advertisement
        bridge-domain 5
 !
    service instance 6 ethernet
        encapsulation dot1q 6
        rpr-destination service-advertisement
        bridge-domain 6
 !
 !
end
```

The following configuration is for CPP-Group 1 Slot-12.

```
!
protection group 1
    protection peer slot 6
 !
 !
 interface Port-channel5
    no ip address
    no negotiation auto
    protection-group 1
    load-balance src-dst-mac
    hold-queue 0 in
    service instance 5 ethernet
        encapsulation dot1q 5
        bridge-domain 5
 !
    service instance 6 ethernet
        encapsulation dot1q 6
        bridge-domain 6
 !
 !
interface GigabitEthernet0
    no ip address
    no keepalive
    duplex auto
    speed auto
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-12

78-19875-01

```
        negotiation auto
        channel-group 5
!
interface GigabitEthernet1
    no ip address
    no keepalive
    duplex auto
    speed auto
    negotiation auto
    channel-group 5
!
interface RPR-IEEE0
    no ip address
    protection-group 1
    no rpr-ieee sas
    rpr-ieee protection pref jumbo
    service instance 5 ethernet
        encapsulation dot1q 5
        rpr-destination service-advertisement
        bridge-domain 5
 !
 service instance 6 ethernet
        encapsulation dot1q 6
        rpr-destination service-advertisement
        bridge-domain 6
 !
!
end
```

The configuration of CPP protection on a port-channel with LACP is same as the configuration shown in Example 32-2. The only difference is that the configuration of member Gigabit Ethernet interfaces, as shown in Example 32-3.

For more information on LACP configuration, refer Chapter 10, "Configuring Link Aggregation."

Example 32-3   Create CPP Protection on Port-Channel with LACP

```
!
interface GigabitEthernet0
    no ip address
    no keepalive
    duplex auto
    speed auto
    negotiation auto
    channel-group 5 mode active
!
interface GigabitEthernet1
    no ip address
    no keepalive
    duplex auto
    speed auto
    negotiation auto
    channel-group 5 mode active
!
end
```

The following example shows a CPP configuration where RPR is aggregating traffic from front ports and from a POS interface. The example covers plain Gigabit Ethernet interface, port-channel interface without LACP configured, and port-channel interface with LACP configured. CPP configuration includes peers in Slot 6 and Slot 13. The following configuration is for Slot-6.

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-13

Example 32-4   Create CPP Where RPR is Aggregating Traffic From Front Ports and From POS Interface

```
!
protection group 1
        protection peer slot 13
!
interface Port-channel1
    no ip address
    no negotiation auto
    protection-group 1
    load-balance src-dst-mac
    service instance 20 ethernet
        encapsulation dot1q 20
         bridge-domain 20
    !
!
interface Port-channel2
    no ip address
    no negotiation auto
    protection-group 1
    load-balance src-dst-mac
    service instance 30 ethernet
        encapsulation dot1q 30
         bridge-domain 30
    !
!
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
    negotiation auto
    protection-group 1
    no keepalive
    service instance 10 ethernet
        encapsulation dot1q 10
         bridge-domain 10
    !
!
interface GigabitEthernet1
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 1
    no keepalive
!
interface GigabitEthernet2
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 2 mode active
    no keepalive
!
interface POS0
    no ip address
    protection-group 1
    pos mode gfp
    service instance 40 ethernet
        encapsulation dot1q 40
         bridge-domain 40
    !
!
interface RPR-IEEE0
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-14

78-19875-01

```
                           no ip address
                           protection-group 1
                           no rpr-ieee sas
                           service instance 10 ethernet
                                encapsulation dot1q 10
                                rpr-destination service-advertisement
                                 bridge-domain 10
                           !
                           service instance 20 ethernet
                                encapsulation dot1q 20
                                rpr-destination service-advertisement
                                 bridge-domain 20
                           !
                           service instance 30 ethernet
                                encapsulation dot1q 30
                                rpr-destination service-advertisement
                                 bridge-domain 30
                      !
                           service instance 40 ethernet
                                encapsulation dot1q 40
                                rpr-destination service-advertisement
                                 bridge-domain 40
                 !
```

The following configuration is for Slot-13.

```
!
protection group 1
         protection peer slot 6
!
interface Port-channel1
     no ip address
     no negotiation auto
     protection-group 1
     load-balance src-dst-mac
     service instance 20 ethernet
          encapsulation dot1q 20
            bridge-domain 20
     !
!
interface Port-channel2
     no ip address
     no negotiation auto
     protection-group 1
     load-balance src-dst-mac
     service instance 30 ethernet
          encapsulation dot1q 30
            bridge-domain 30
     !
!
interface GigabitEthernet0
     no ip address
     speed auto
     duplex auto
     negotiation auto
     protection-group 1
     no keepalive
     service instance 10 ethernet
          encapsulation dot1q 10
            bridge-domain 10
     !
!
interface GigabitEthernet1
     no ip address
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1 ■

78-19875-01

32-15

```
        speed auto
        duplex auto
        negotiation auto
        channel-group 1
        no keepalive
!
interface GigabitEthernet2
        no ip address
        speed auto
        duplex auto
        negotiation auto
        channel-group 2 mode active
        no keepalive
!


interface POS0
     no ip address
    protection-group 1
     pos mode gfp
     service instance 40 ethernet
           encapsulation dot1q 40
            bridge-domain 40
       !
interface RPR-IEEE0
     no ip address
     protection-group 1
     no rpr-ieee sas
     service instance 10 ethernet
           encapsulation dot1q 10
           rpr-destination service-advertisement
            bridge-domain 10
       !
     service instance 20 ethernet
           encapsulation dot1q 20
           rpr-destination service-advertisement
            bridge-domain 20
       !
     service instance 30 ethernet
           encapsulation dot1q 30
           rpr-destination service-advertisement
            bridge-domain 30
       !
     service instance 40 ethernet
           encapsulation dot1q 40
           rpr-destination service-advertisement
            bridge-domain 40
       !
```

Example 32-5 shows a CPP configuration where RPR is aggregating traffic from the front ports and the POS interface. In this example '**protection-group** <*group_num*> **standby-on**' is enabled on Gigabit Ethernet and port-channel interface. This configuration covers the plain Gigabit Ethernet interface and port-channel interface without LACP configured. CPP configuration includes peers in Slot 6 and Slot 13. The following configuration is for Slot-6.

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-16

78-19875-01

Example 32-5   Create CPP with Gigabit Ethernet Interface and Port-Channel Interface with standby-on Configuration

```
!
protection group 1
        protection peer slot 13
!
interface Port-channel1
    no ip address
    no negotiation auto
    protection-group 1
    protection-group 1 standby-on
    load-balance src-dst-mac
    service instance 20 ethernet
        encapsulation dot1q 20
         bridge-domain 20
        !

!
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
    negotiation auto
    protection-group 1
    protection-group 1 standby-on
    no keepalive
    service instance 10 ethernet
        encapsulation dot1q 10
         bridge-domain 10
    !
!
interface GigabitEthernet1
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 1
    no keepalive
!
interface POS0
    no ip address
    protection-group 1
    pos mode gfp
    service instance 40 ethernet
        encapsulation dot1q 40
         bridge-domain 40
    !

interface RPR-IEEE0
    no ip address
    protection-group 1
    no rpr-ieee sas
    service instance 10 ethernet
        encapsulation dot1q 10
        rpr-destination service-advertisement
         bridge-domain 10
    !
    service instance 20 ethernet
        encapsulation dot1q 20
        rpr-destination service-advertisement
         bridge-domain 20
    !
!
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-17

```
            service instance 40 ethernet
                encapsulation dot1q 40
                rpr-destination service-advertisement
                 bridge-domain 40
            !
```

The following example shows the configuration for Slot-13.

```
!
protection group 1
        protection peer slot 6
!
interface Port-channel1
    no ip address
    no negotiation auto
    protection-group 1
    protection-group 1 standby-on
    load-balance src-dst-mac
    service instance 20 ethernet
        encapsulation dot1q 20
         bridge-domain 20
    !
!
!
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
    negotiation auto
    protection-group 1
    protection-group 1 standby-on
    no keepalive
    service instance 10 ethernet
        encapsulation dot1q 10
         bridge-domain 10
    !
!
interface GigabitEthernet1
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 1
    no keepalive
!
interface POS0
    no ip address
    protection-group 1
    pos mode gfp
    service instance 40 ethernet
        encapsulation dot1q 40
         bridge-domain 40
    !
interface RPR-IEEE0
    no ip address
    protection-group 1
    no rpr-ieee sas
    service instance 10 ethernet
        encapsulation dot1q 10
        rpr-destination service-advertisement
         bridge-domain 10
 !
    service instance 20 ethernet
        encapsulation dot1q 20
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-18

78-19875-01

```
                        rpr-destination service-advertisement
                         bridge-domain 20
                    !
                service instance 40 ethernet
                        encapsulation dot1q 40
                        rpr-destination service-advertisement
                         bridge-domain 40
                    !
```

Example 32-6 shows the CPP configuration where Gigabit Ethernet is aggregating traffic from POS0 and POS1 interfaces. CPP configuration includes peers in Slot 6 and Slot 13. The following configuration is for Slot-6.

Example 32-6   Create CPP with Gigabit Ethernet Aggregating Traffic from POS0 and POS1 Interfaces

```
!
protection group 1
        protection peer slot 13
        protection fail-action group-switch
!
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
    negotiation auto
    protection-group 1
    no keepalive
    service instance 10 ethernet
        encapsulation dot1q 10
         bridge-domain 10
    !
    service instance 20 ethernet
        encapsulation dot1q 20
         bridge-domain 20
    !
interface POS0
    no ip address
    protection-group 1
    pos mode gfp
    service instance 10 ethernet
        encapsulation dot1q 10
         bridge-domain 10
    !
interface POS1
    no ip address
    protection-group 1
    pos mode gfp
    service instance 20 ethernet
        encapsulation dot1q 20
         bridge-domain 20
    !
```

The following configuration is for Slot-13.

```
!
protection group 1
        protection peer slot 6
        protection fail-action group-switch
!
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-19

```
                    negotiation auto
                    protection-group 1
                    no keepalive
                    service instance 10 ethernet
                         encapsulation dot1q 10
                          bridge-domain 10
                    !
                    service instance 20 ethernet
                         encapsulation dot1q 20
                          bridge-domain 20
                    !
interface POS0
        no ip address
        protection-group 1
        pos mode gfp
        service instance 10 ethernet
             encapsulation dot1q 10
              bridge-domain 10
        !
interface POS1
        no ip address
        protection-group 1
        pos mode gfp
        service instance 20 ethernet
             encapsulation dot1q 20
              bridge-domain 20
        !
```

Example 32-7 shows the CPP configuration where GE0 is aggregating traffic from POS0 and POS1 interfaces. GE0 has '**protection-group** <*group_num*> **standby-on**' configured. CPP configuration includes peers in Slot 6 and Slot 13. The following configuration is for Slot-6.

Example 32-7   Create CPP with Gigabit Ethernet Aggregating Traffic from POS0/POS1 Interfaces with standby-on on Gigabit Ethernet Ports

```
!
protection group 1
        protection peer slot 13
        protection fail-action group-switch
!
interface GigabitEthernet0
        no ip address
        speed auto
        duplex auto
        negotiation auto
        protection-group 1
        protection-group 1 standby-on
        no keepalive
        service instance 10 ethernet
             encapsulation dot1q 10
              bridge-domain 10
        !
        service instance 20 ethernet
             encapsulation dot1q 20
              bridge-domain 20
 !
interface POS0
        no ip address
        protection-group 1
        pos mode gfp
        service instance 10 ethernet
             encapsulation dot1q 10
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-20

78-19875-01

```
            bridge-domain 10
        !
interface POS1
    no ip address
    protection-group 1
    pos mode gfp
    service instance 20 ethernet
        encapsulation dot1q 20
         bridge-domain 20
    !
```

The following configuration is for Slot-13.

```
!
protection group 1
        protection peer slot 6
        protection fail-action group-switch
!
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
    negotiation auto
    protection-group 1
    protection-group 1 standby-on
    no keepalive
    service instance 10 ethernet
        encapsulation dot1q 10
         bridge-domain 10
    !
    service instance 20 ethernet
        encapsulation dot1q 20
         bridge-domain 20
    !
interface POS0
    no ip address
    protection-group 1
    pos mode gfp
    service instance 10 ethernet
        encapsulation dot1q 10
         bridge-domain 10
    !
interface POS1
    no ip address
    protection-group 1
    pos mode gfp
    service instance 20 ethernet
        encapsulation dot1q 20
         bridge-domain 20
    !
```

Example 32-8 shows the CPP configuration where the port-channel (non-LACP) is aggregating traffic from POS0 and POS1 interfaces. CPP configuration includes peers in Slot 6 and Slot 13. The following configuration is for Slot-6.

Example 32-8   Create CPP with Port-Channel (non-LACP) Aggregating Traffic from POS0 and POS1 Interfaces

```
!
protection group 1
        protection peer slot 13
        protection fail-action group-switch
!
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-21

```
interface Port-channel1
    no ip address
    no negotiation auto
    protection-group 1
    load-balance src-dst-mac
    service instance 10 ethernet
        encapsulation dot1q 10
          bridge-domain 10
    !
    service instance 20 ethernet
        encapsulation dot1q 20
          bridge-domain 20
    !
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 1
    no keepalive
end
!
interface GigabitEthernet1
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 1
    no keepalive
    !
interface POS0
    no ip address
    protection-group 1
    pos mode gfp
    service instance 10 ethernet
        encapsulation dot1q 10
          bridge-domain 10
    !
interface POS1
    no ip address
    protection-group 1
    pos mode gfp
    service instance 20 ethernet
        encapsulation dot1q 20
          bridge-domain 20
    !
```

The following configuration is for Slot-13.

```
!
protection group 1
        protection peer slot 6
        protection fail-action group-switch
!
interface Port-channel1
    no ip address
    no negotiation auto
    protection-group 1
    load-balance src-dst-mac
    service instance 10 ethernet
        encapsulation dot1q 10
          bridge-domain 10
    !
    service instance 20 ethernet
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-22

78-19875-01

```
            encapsulation dot1q 20
             bridge-domain 20
        !
interface GigabitEthernet0
     no ip address
     speed auto
     duplex auto
     negotiation auto
     channel-group 1
     no keepalive
end
!
interface GigabitEthernet1
     no ip address
     speed auto
     duplex auto
     negotiation auto
     channel-group 1
     no keepalive
end
!
interface POS0
     no ip address
     protection-group 1
     pos mode gfp
     service instance 10 ethernet
         encapsulation dot1q 10
          bridge-domain 10
     !
interface POS1
     no ip address
     protection-group 1
     pos mode gfp
     service instance 20 ethernet
         encapsulation dot1q 20
          bridge-domain 20
     !
```

Example 32-9 shows the CPP configuration where the port-channel (with LACP) is aggregating traffic from POS0 and POS1 interfaces. CPP configuration includes peers in Slot 6 and Slot 13. The following configuration is for Slot-6.

Example 32-9   Create CPP with Port-Channel (with LACP) Aggregating Traffic from POS0 and POS1 Interfaces

```
!
protection group 1
        protection peer slot 13
        protection fail-action group-switch
!
interface Port-channel1
     no ip address
     no negotiation auto
     protection-group 1
     load-balance src-dst-mac
     service instance 10 ethernet
         encapsulation dot1q 10
          bridge-domain 10
     !
     service instance 20 ethernet
         encapsulation dot1q 20
          bridge-domain 20
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-23

```
!
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 1 mode active
    no keepalive
!
interface GigabitEthernet1
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 1 mode active
    no keepalive
!
  interface POS0
  no ip address
  protection-group 1
  pos mode gfp
  service instance 10 ethernet
      encapsulation dot1q 10
        bridge-domain 10
  !
!
interface POS1
    no ip address
    protection-group 1
    pos mode gfp
    service instance 20 ethernet
       encapsulation dot1q 20
       bridge-domain 20
    !
```

The following configuration is for Slot-13.

```
  !
  protection group 1
      protection peer slot 6
      protection fail-action group-switch
  !
interface Port-channel1
    no ip address
    no negotiation auto
    protection-group 1
    load-balance src-dst-mac
    service instance 10 ethernet
       encapsulation dot1q 10
       bridge-domain 10
    !
    service instance 20 ethernet
       encapsulation dot1q 20
       bridge-domain 20
    !
interface GigabitEthernet0
    no ip address
    speed auto
    duplex auto
    negotiation auto
    channel-group 1 mode active
    no keepalive
!
interface GigabitEthernet1
    no ip address
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-24

78-19875-01

```
        speed auto
        duplex auto
        negotiation auto
        channel-group 1 mode active
        no keepalive
    !
    interface POS0
        no ip address
        protection-group 1
        pos mode gfp
        service instance 10 ethernet
            encapsulation dot1q 10
              bridge-domain 10
        !
    !
    interface POS1
        no ip address
        protection-group 1
        pos mode gfp
        service instance 20 ethernet
            encapsulation dot1q 20
            bridge-domain 20
        !
    !
```

Monitoring and Verifying CPP

After CPP is configured, you can monitor and verify the protection group state and the CPP interface states of the current protection group using the **show protection detail** command.

Note   When a failure occurs and the card switches to its peer CPP card, a drop in traffic is observed on the RPR-IEEE if it is oversubscribed.

Example 32-10 show protection detail Command

```
Router# show protection detail
Protection Group: 1
====================
Peer Slot Number     : 12
Group State          : Active
Group FSM State      : Active (Group is Active)
Peer                 : Present
Fail Action Group XSwitch : No
RPR0 interface       : UP

Interface            State
---------            -------
Port-channel5         Active
Router#
```

Example 32-11 shows how you can verify the state of the physical interface.

Example 32-11 show protection interface Command

```
Router# show protection interface port-channel 5
Interface Port-channel5:
==========================
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-25

```
Group         : 1
Port State    : Active
Port FSM State : Active (Port is Active)
LACP not configured

MEMBER INTERFACE    LINK FORCED DOWN    LINK STATUS
-----------------------------------------------------------
GigabitEthernet0    No                  UP
GigabitEthernet1    No                  UP
GigabitEthernet2    No                  UP
GigabitEthernet3    No                  UP
```

shows how you can verify the state of the CPP with a Gigabit Ethernet interface, a port-channel interface without LACP, and a port-channel interface with LACP.

Example 32-12 show Command - when Fail Action Group Switch is Disabled

```
MLMR-slot-6# show protection group 1

Protection Group: 1
===========================
Peer Slot Number       : 13
Group State            : Active
Port FSM State         : Active (Port is Active)
Peer                   : Present
Fail Action Group Switch : No
RPR0 interface         : UP

Interface         State
---------------------------
GigabitEthernet0    Active
Port-channel1       Active
Port-channel2       Active
POS0                Active

MLMR-slot-6# show protection interface gi0

Interface GigabitEthernet0:
===========================
Group         : 1
Port State    : Active
Port FSM State : Active (Port is Active)
Link not forced down, Link status: UP

MLMR-slot-6# show protection interface port-channel 1

Interface Port-channel1:
===========================
Group         : 1
Port State    : Active
Port FSM State : Active (Port is Active)
LACP not configured

MEMBER INTERFACE    LINK FORCED DOWN    LINK STATUS
-----------------------------------------------------------
GigabitEthernet1    No                  UP

MLMR-slot-6# show protection interface port-channel 2

Interface Port-channel2:
===========================
Group         : 1
Port State    : Active
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-26

78-19875-01

```
Port FSM State : Active (Port is Active)
LACP not forced down, LACP status UP

MEMBER INTERFACE    LINK FORCED DOWN    LINK STATUS
---------------------------------------------------------
GigabitEthernet2     No                      UP


MLMR-slot-6# show protection interface pos0

Interface POS0:
==========================
Group        : 1
Port State     : Active
Port FSM State : Active (Port is Active)
Link not forced down, Link status: UP

MLMR-slot-6# show protection interface rpr0

Interface RPR-IEEE0:
==========================
Group        : 1
Link status    : UP
MLMR-slot-6#
MLMR-slot-6#

MLMR-slot-13# show protection group 1

Protection Group: 1
====================
Peer Slot Number       : 6
Group State            : standby
Group FSM State        : standby (Group is standby)
Peer                   : Present
Fail Action Group Switch : No
RPR0 interface         : UP

Interface          State
---------          -------
GigabitEthernet0    standby
Port-channel1       standby
Port-channel2       standby
POS0                standby

MLMR-slot-13# show protection interface gi0

Interface GigabitEthernet0:
==========================
Group        : 1
Port State     : standby
Port FSM State : standby (Port is standby)
Link forced down, Link status: DOWN
MLMR-slot-13#sh protection interface port
MLMR-slot-13#sh protection interface port-channel 1

Interface Port-channel1:
==========================
Group        : 1
Port State     : standby
Port FSM State : standby (Port is standby)
LACP not configured

MEMBER INTERFACE    LINK FORCED DOWN    LINK STATUS
---------------------------------------------------------
GigabitEthernet1     Yes                     DOWN
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01   **32-27**

```
MLMR-slot-13# show protection interface port-channel 2

Interface Port-channel2:
===========================
Group         : 1
Port State    : standby
Port FSM State : standby (Port is standby)
LACP forced down, LACP status DOWN

MEMBER INTERFACE    LINK FORCED DOWN      LINK STATUS
----------------------------------------------------------
GigabitEthernet2    No                    UP

MLMR-slot-13# show protection interface pos 0

Interface POS0:
===========================
Group         : 1
Port State    : standby
Port FSM State : standby (Port is standby)
Link forced down, Link status: DOWN

MLMR-slot-13# show protection interface rpr0

Interface RPR-IEEE0:
===========================
Group         : 1
Link status   : UP
```

The following example shows how you can verify the state of the CPP with a Gigabit Ethernet interface and a port-channel interface without LACP.

Example 32-13 show Command - when Fail Action Group Switch is Disabled for Gigabit Ethernet and Port-Channel (without LACP)

```
!
MLMR-slot-6# show protection group 1

Protection Group: 1
====================
Peer Slot Number         : 13
Group State              : Active
Group FSM State          : Active (Group is Active)
Peer                     : Present
Fail Action Group Switch : No
RPR0 interface           : UP

Interface            State
---------            -------
GigabitEthernet0     Active
Port-channel1        Active
POS0                 Active

MLMR-slot-6# show protection interface gi0

Interface GigabitEthernet0:
===========================
Group         : 1
Port State    : Active
Port FSM State : Active (Port is Active)
Link not forced down, Link status: UP
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-28

78-19875-01

```
MLMR-slot-6# show protection interface port-channel 1

Interface Port-channel1:
===========================
Group        : 1
Port State   : Active
Port FSM State : Active (Port is Active)
LACP not configured

MEMBER INTERFACE    LINK FORCED DOWN     LINK STATUS
----------------------------------------------------------
GigabitEthernet1    No                   UP

MLMR-slot-6# show protection interface pos0

Interface POS0:
===========================
Group        : 1
Port State   : Active
Port FSM State : Active (Port is Active)
Link not forced down, Link status: UP

MLMR-slot-6# show protection interface rpr0

Interface RPR-IEEE0:
===========================
Group        : 1
Link status    : UP


MLMR-slot-13# show protection group 1

Protection Group: 1
====================
Peer Slot Number       : 6
Group State            : standby
Group FSM State        : standby (Group is standby)
Peer                   : Present
Fail Action Group Switch : No
RPR0 interface         : UP

Interface          State
---------          -------
GigabitEthernet0    standby
Port-channel1       standby
POS0                standby

MLMR-slot-13# show protection interface gi0

Interface GigabitEthernet0:
===========================
Group                          : 1
Port State                     : standby
Port FSM State                 : standby (Port is standby)
Link not forced down, Link status: UP

MLMR-slot-13# show protection interface port-channel 1

Interface Port-channel1:
===========================
Group        : 1
Port State   : standby
Port FSM State : standby (Port is standby)
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-29

```
                    LACP not configured

                    MEMBER INTERFACE    LINK FORCED DOWN    LINK STATUS
                    --------------------------------------------------------
                    GigabitEthernet1    No                  UP

MLMR-slot-13# show protection interface pos 0

Interface POS0:
===========================
Group        : 1
Port State   : standby
Port FSM State : standby (Port is standby)
Link forced down, Link status: DOWN

MLMR-slot-13# show protection interface rpr-IEEE 0

Interface RPR-IEEE0:
===========================
Group        : 1
Link status  : UP
```

Example 32-14 shows how you can verify the state of CPP with Gigabit Ethernet aggregating traffic from POS0 and POS1 interfaces.

Example 32-14 show Command - when Fail Action Group Switch is Enabled

```
MLMR-slot-6# show protection group 1

Protection Group: 1
====================
Peer Slot Number      : 13
Group State           : Active
Group FSM State       : Active (Group is Active)
Peer                  : Present
Fail Action Group Switch : Yes
All members forced down  : No

Interface          State
---------          -------
GigabitEthernet0    Active
POS0                Active
POS1                Active

MLMR-slot-6# show protection interface gi0

Interface GigabitEthernet0:
===========================
Group        : 1
Port State   : Active
Port FSM State : N/A
Link not forced down, Link status: UP
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-30

78-19875-01

```
MLMR-slot-6# show protection interface pos0

Interface POS0:
===========================
Group         : 1
Port State    : Active
Port FSM State : N/A
Link not forced down, Link status: UP

MLMR-slot-6# show protection interface pos1

Interface POS1:
===========================
Group         : 1
Port State    : Active
Port FSM State : N/A
Link not forced down, Link status: UP

MLMR-slot-13# show protection group 1

Protection Group: 1
===================
Peer Slot Number        : 6
Group State             : standby
Group FSM State         : standby (Group is standby)
Peer                    : Present
Fail Action Group Switch : Yes
All members forced down  : Yes


Interface          State
---------          -------
GigabitEthernet0    standby
POS0                standby
POS1                standby

MLMR-slot-13# show protection interface gi0

Interface GigabitEthernet0:
===========================
Group                  : 1
Port State             : standby
Port FSM State         : N/A
Link forced down, Link status: DOWN

MLMR-slot-13# show protection interface pos0

Interface POS0:
===========================
Group                  : 1
Port State             : standby
Port FSM State         : N/A
Link forced down, Link status: DOWN

MLMR-slot-13# show protection interface pos1

Interface POS1:
===========================
Group                  : 1
Port State             : standby
Port FSM State         : N/A
Link forced down, Link status: DOWN
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-31

Example 32-15 shows how you can verify the state of CPP with Gigabit Ethernet aggregating traffic from POS0/ POS1 interfaces with standby-on.

Example 32-15 show Command - when Fail Action Group Switch is Enabled for Gigabit Ethernet

```
!
MLMR-slot-13# show protection group 1

Protection Group: 1
===================
Peer Slot Number      : 6
Group State           : standby
Group FSM State       : standby (Group is standby)
Peer                  : Present
Fail Action Group Switch : Yes
All members forced down  : Yes

Interface         State
---------         -------
GigabitEthernet0    standby
POS0                standby
POS1                standby

MLMR-slot-13# show protection interface gi0

Interface GigabitEthernet0:
==========================
Group                         : 1
Port State                    : standby
Port FSM State                : N/A
Link not forced down, Link status: UP

MLMR-slot-13# show protection interface gi0

Interface GigabitEthernet0:
==========================
Group                         : 1
Port State                    : standby
Port FSM State                : N/A
Link not forced down, Link status: UP

MLMR-slot-13# show protection interface pos0

Interface POS0:
==========================
Group                         : 1
Port State                    : standby
Port FSM State                : N/A
Link forced down, Link status: DOWN

MLMR-slot-13# show protection interface pos1

Interface POS1:
==========================
Group        : 1
Port State   : standby
Port FSM State : N/A
Link forced down, Link status: DOWN
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-32

78-19875-01

Example 32-16 shows how you can verify the state of CPP with port-channel (without LACP) aggregating traffic from POS0 and POS1 interfaces.

Example 32-16 show Command - when Fail Action Group Switch is Enabled for the Port-Channel (without LACP)

```
MLMR-slot-6# show protection group 1

Protection Group: 1
===================
Peer Slot Number       : 13
Group State            : Active
Group FSM State        : Active (Group is Active)
Peer                   : Present
Fail Action Group Switch : Yes
All members forced down  : No

Interface           State
---------           -------
Port-channel1       Active
POS0                Active
POS1                Active


MLMR-slot-6# show protection interface port-channel 1

Interface Port-channel1:
==========================
Group       : 1
Port State    : Active
Port FSM State : N/A
LACP not configured

MEMBER INTERFACE    LINK FORCED DOWN     LINK STATUS
-----------------------------------------------------------
GigabitEthernet1    No                   UP
GigabitEthernet0    No                   UP

MLMR-slot-6# show protection interface pos0

Interface POS0:
==========================
Group                      : 1
Port State                 : Active
Port FSM State             : N/A
Link not forced down, Link status: UP

MLMR-slot-6# show protection interface pos1

Interface POS1:
==========================
Group                      : 1
Port State                 : Active
Port FSM State             : N/A
Link not forced down, Link status: UP

MLMR-slot-13# show protection group 1

Protection Group: 1
===================
Peer Slot Number       : 6
Group State            : standby
Group FSM State        : standby (Group is standby)
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-33

```
Peer                  : Present
Fail Action Group Switch : Yes
All members forced down  : Yes


Interface          State
---------          -------
Port-channel1       standby
POS0                standby
POS1                standby


MLMR-slot-13# show protection interface port-channel 1

Interface Port-channel1:
==========================
Group        : 1
Port State    : standby
Port FSM State : N/A
LACP not configured

MEMBER INTERFACE    LINK FORCED DOWN     LINK STATUS
----------------------------------------------------------
GigabitEthernet1     Yes                  DOWN
GigabitEthernet0     Yes                  DOWN


MLMR-slot-13# show protection interface pos0

Interface POS0:
==========================
Group         : 1
Port State     : standby
Port FSM State : N/A
Link forced down, Link status: DOWN


MLMR-slot-13# show protection interface pos1

Interface POS1:
==========================
Group                    : 1
Port State               : standby
Port FSM State           : N/A
Link forced down, Link status: DOWN
```

Example 32-17 shows how you can verify the state of CPP with Gigabit Ethernet aggregating traffic from POS0/POS1 interfaces with standby-on.

Example 32-17 show Command - when Fail Action Group Switch is Enabled for Gigabit Ethernet and POS0 and POS1

```
MLMR-slot-13# show protection group 1

Protection Group: 1
====================
Peer Slot Number      : 6
Group State           : standby
Group FSM State       : standby (Group is standby)
Peer                  : Present
Fail Action Group Switch : Yes
All members forced down  : Yes


Interface          State
---------          -------
Port-channel1       standby
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-34

78-19875-01

```
POS0                standby
POS1                standby

MLMR-slot-13# show protection interface port-channel 1

Interface Port-channel1:
==========================
Group          : 1
Port State     : standbystandby
Port FSM State : N/A
LACP not configured

MEMBER INTERFACE    LINK FORCED DOWN     LINK STATUS
-----------------------------------------------------------
GigabitEthernet0    No                      UP
GigabitEthernet1    No                      UP

MLMR-slot-13# show protection interface pos 0

Interface POS0:
==========================
Group                     : GIGE0
Port State                : standby
Port FSM State            : N/A
Link forced down, Link status: DOWN

MLMR-slot-13# show protection interface pos 1

Interface POS1:
==========================
Group                     : GIGE1
Port State                : standby
Port FSM State            : N/A
Link forced down, Link status: DOWN
```

Example 32-18 shows how you can verify the state of CPP with port-channel (with LACP) aggregating traffic from POS0 and POS1 interfaces.

Example 32-18 show protection group Command - when Fail Action Group Switch is Enabled for Port-Channel (with LACP)

```
MLMR-slot-6# show protection group 1

Protection Group: 1
====================
Peer Slot Number        : 13
Group State             : Active
Group FSM State         : Active (Group is Active)
Peer                    : Present
Fail Action Group Switch : Yes
All members forced down  : No

Interface          State
---------          -------
Port-channel1      Active
POS0               Active
POS1               Active

MLMR-slot-6# show protection interface port-channel 1

Interface Port-channel1:
==========================
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

78-19875-01

32-35

```
Group          : 1
Port State     : Active
Port FSM State : N/A
LACP not forced down, LACP status UP

MEMBER INTERFACE    LINK FORCED DOWN    LINK STATUS
-----------------------------------------------------------
GigabitEthernet1    No                  UP
GigabitEthernet0    No                  UP


MLMR-slot-6# show protection interface pos0

Interface POS0:
===========================
Group                       : 1
Port State                  : Active
Port FSM State              : N/A
Link not forced down, Link status: UP


MLMR-slot-6# show protection interface pos1

Interface POS1:
===========================
Group                       : 1
Port State                  : Active
Port FSM State              : N/A
Link not forced down, Link status: UP


MLMR-slot-13# show protection group 1

Protection Group: 1
===================
Peer Slot Number        : 6
Group State             : standby
Group FSM State         : standby (Group is standby)
Peer                    : Present
Fail Action Group Switch : Yes
All members forced down  : Yes


Interface          State
---------          -------
Port-channel1      standby
POS0               standby
POS1               standby


MLMR-slot-13# show protection interface port-channel 1

Interface Port-channel1:
===========================
Group          : 1
Port State     : standby
Port FSM State : N/A
LACP forced down, LACP status DOWN

MEMBER INTERFACE    LINK FORCED DOWN    LINK STATUS
-----------------------------------------------------------
GigabitEthernet1    No                  UP
GigabitEthernet0    No                  UP


MLMR-slot-13# show protection interface pos0

Interface POS0:
===========================
Group          : 1
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1

32-36

78-19875-01

```
Port State     : standby
Port FSM State : N/A
Link forced down, Link status: DOWN

MLMR-slot-13# show protection interface pos1

Interface POS1:
===========================
Group          : 1
Port State     : standby
Port FSM State : N/A
Link forced down, Link status: DOWN
```

Cisco ONS 15454 and Cisco ONS 15454 SDH Ethernet Card Software Feature and Configuration Guide, Releases 9.0, 9.1, 9.2, and 9.2.1 ■

78-19875-01   **32-37**