



# Cisco Prime Optical 9.6 ML Provisioning Methodology

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This document describes the methodology that Cisco Prime Optical 9.6 uses to provision ML-series cards.

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## Introduction

Cisco Prime Optical (formerly Cisco Transport Manager) is a carrier-class, multitechnology management system that integrates the end-to-end management of traditional transport networks and new carrier packet transport networks. It can help maintain the integrity of existing services, plus deliver interactive, content-based services and high-bandwidth applications.

Cisco Prime Optical manages the entire Cisco optical portfolio, including:

- Metro core
- Metro dense wavelength-division multiplexing (DWDM)
- Metro edge and access products
- New Carrier Packet Transport (CPT) System products

Prime Optical also serves as a foundation for integration into a larger overall Operations Support System (OSS) environment by providing northbound gateway interfaces to higher-layer management systems.

Prime Optical supports data service provisioning over ML-series cards. Data service provisioning consists of provisioning the Layer 2 topology using optical circuits, and then provisioning the Layer 2 service on top of the Layer 2 topology.

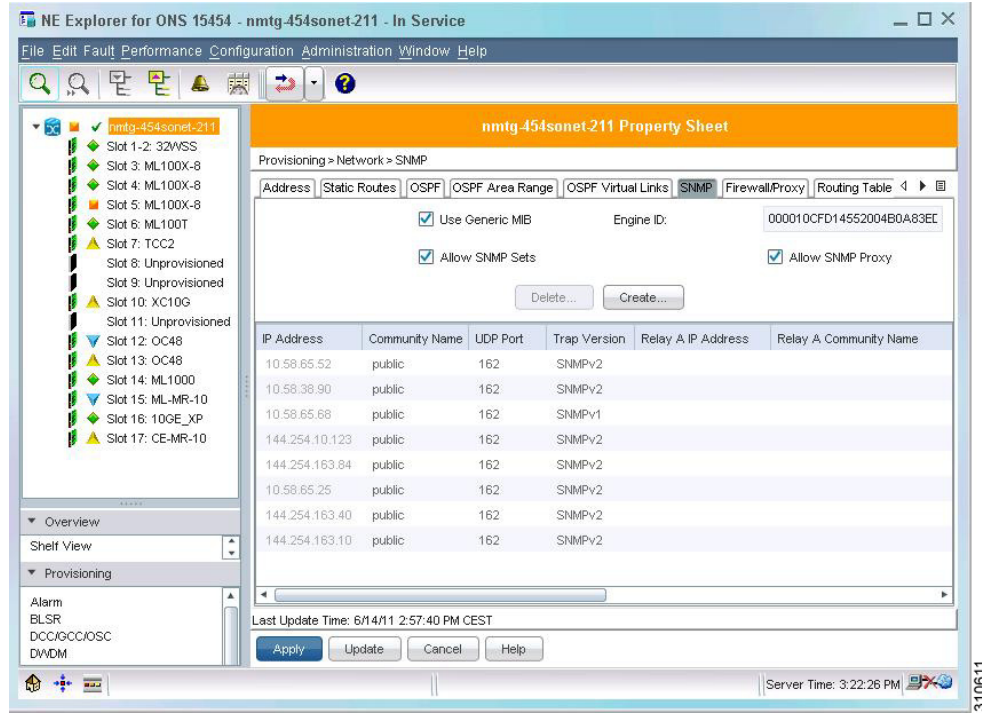
Alarm notification and performance monitoring features on data cards (ML-series cards) are SNMP-based. To allow Prime Optical to support alarm and event notification and performance monitoring on data cards, the SNMP trap forwarding mechanism must be set up on each node of the data card.

This document provides the set of Cisco IOS commands issued by Prime Optical during Layer 2 topology and Layer 2 service provisioning, including provisioning of interface ports for ML data cards. The syntax used for the commands must be respected for services provisioned directly using Cisco IOS so that Prime Optical recognizes the provisioned services.

## SNMPv1 and SNMPv2 Trap Destination Setup

For the cards to have full Prime Optical support, the SNMP trap destination must be set up for each node where there is a data card inserted:

- The NE containing the ML-series card must have a valid SNMP community string. If the SNMP community string is not valid, a resynchronization failure occurs and is logged in the Audit Log.
- The Cisco IOS startup-config file must contain the **snmp-server enable traps** command to receive traps from ML-series cards. See [Overview, page 5](#) for more information.
- You must force resynchronization on the NE by marking it as Out of Service (OOS), and then back In Service (IS) when you change the trap destination in either Cisco Transport Controller (CTC) or Prime Optical. This operation forces the registration of ML-series cards for traps.
- You must set up the trap destination based on the SNMP version (SNMPv1 or SNMPv2) and the gateway NE/end NE (GNE/ENE) configuration of the node. Set the trap destination in the NE Explorer window (see [Figure 1](#)).

**Figure 1** NE Explorer—SNMPv1 and SNMPv2 Trap Destination Setup

The following table lists the possible SNMP configurations.

**Table 1** SNMP Configurations

Node Setup	Allow SNMP Set	Use Generic MIB	Allow SNMP Proxy	IP Address	Community Name	UDP Port	Trap Version	Relay A IP Address
<b>SNMPv1—NE R7.0 and later</b>								
GNE	Enable	Enable	Enable	Prime Optical server IP address	Public	162	SNMPv1	—
ENE (with relay)	Enable	Enable	Enable	Prime Optical IP address	Public	162	SNMPv1	Active GNE's IP address
ENE (without relay)	Enable	Enable	Enable	GNE IP address	Public	391	SNMPv1	—
<b>SNMPv2—NE R7.0 and later</b>								
GNE	Enable	Enable	Enable	Prime Optical server IP address	Public	162	SNMPv2	—
ENE (with relay)	Enable	Enable	Enable	Prime Optical server IP address	Public	162	SNMPv2	Active GNE's IP address

**Table 1** *SNMP Configurations (continued)*

Node Setup	Allow SNMP Set	Use Generic MIB	Allow SNMP Proxy	IP Address	Community Name	UDP Port	Trap Version	Relay A IP Address
ENE (without relay)	Enable	Enable	Enable	GNE IP address	Public	391	SNMPv2	—
<b>SNMPv1—NE releases earlier than R7.0</b>								
GNE	Enable	Enable	Enable	Prime Optical server IP address	Public	162	SNMPv1	—
ENE (with relay)	Enable	Enable	Enable	Prime Optical server IP address	Public	162	SNMPv1	Active GNE's IP address
ENE (without relay)	Enable	Enable	Enable	GNE IP address	Public	391	SNMPv1	—
<b>SNMPv2—NE releases earlier than R7.0</b>								
GNE	Enable	Enable	Enable	Prime Optical server IP address	Public	162	SNMPv2	—
ENE (with relay)	Enable	Enable	Enable	Prime Optical server IP address	Public	162	SNMPv2	Active GNE's IP address
ENE (without relay)	Not supported.							

When setting up an SNMPv1 or SNMPv2 trap destination:

1. Delete the GNE and ENE's SNMP trap destinations before performing GNE-ENE role changes. After a GNE-ENE role switch is complete, add the new SNMP trap destinations according to the new GNE-ENE roles.
2. If the ENE does not contain the GNE's SNMP community string, mark the ENE as Out of Service and then In Service.
3. Do not use an ONS 15600 as the GNE and an ONS 15454 as the ENE.
4. The GNE-ENE SNMP community string must be *Public*.

## SNMPv3 Configuration

Prime Optical supports SNMPv3 on CTC-based release 9.6 NEs. (SNMPv3 is not supported on ONS 15305, ONS 15305 CTC, or ONS 15327 NEs.)

As is the case for SNMPv1 and SNMPv2, to support SNMPv3, NEs with ML-series cards must have a valid SNMP configuration to guarantee correct initialization and management of Layer 2 parameters. If the SNMP configuration is invalid, the Audit Log records a resynchronization failure.

Configuring SNMPv3 is more complex than configuring SNMPv1 or SNMPv2, because the following tables must be filled in:

- SNMPv3 NE User table—The SNMP users for each NE.
- SNMPv3 User Group table—The grouping of NE SNMP users.
- SNMPv3 Group View table—A view for any SNMPv3 user grouping.
- SNMPv3 NE Trap Destination table—The SNMP trap configuration.
- SNMPv3 NE Notification Filter table—The SNMP trap filtering, if needed.
- SNMPv3 NE Proxy Forwarder table—The GNE/ENE GET/SET forwarding configuration.
- SNMPv3 NE Proxy Trap Forwarder table—The GNE/ENE trap forwarding configuration.

For details about configuring SNMPv3, see the section “Managing SNMPv3—CTC-Based Release 9.6 NEs” in Chapter 8, “Managing Security” in the [Cisco Prime Optical 9.6 User Guide](#).

## Overview

A Layer 2 topology can be a point-to-point optical circuit; Resilient Packet Ring (RPR) or an IEEE802.17 RPR consisting of a chain of optical circuits; or hub and spoke, consisting of multiple optical circuits connected in a hub-and-spoke fashion. Hub-and-spoke topologies are supported as multiple point-to-point topologies.

For a point-to-point topology, the following card combinations are supported:

- ML-1000-2/ML-100T-12/ ML-100T-8/ML-100-FX to ML-1000-2/ML-100T-12/ML-100T-8/ML-100-FX card
- ML-1000-2/ML-100T-12/ ML-100T-8/ML-100-FX to CE-100T-8/CE-1000-4/CE-MR-6/CE-MR-10 card
- ML-1000-2/ ML-100T-12/ML-100T-8/ML-100-FX to OC-N/STM-N/MRC/CTX card
- ML-1000-2/ML-100T-12/ML-100T-8/ML-100-FX to G-series card
- ML-1000-2/ML-100T-12/ML-100T-8/ML-100-FX to E-series card with LEX encapsulation (ONS 15327 NEs only)

When deployed as hub and spoke, the ML-series card can be placed at the spoke locations, with the G-series card providing an extension of the traffic to a Cisco 7600, which forms the hub of the architecture. This arrangement provides a cost-effective way to interface to the Cisco 7600. Alternatively, the ML-series card can be deployed at both the hub and the spoke sites.

When deployed as an RPR or DOT17RPR, all sites contain ML-series cards (ML-1000-2, ML-100T-12, or ML-100T-8). A minimum of two ML-series cards is required to configure an RPR.

You use Prime Optical to provision ML-series cards by opening a Telnet session to each card. Before doing this, provision each ML-series card and create a password configuration that allows you to use Prime Optical to log in. For this purpose, a barebone file is provided on the Prime Optical server disk (Disk 1).

A different file is provided for the following cards:

- ONS 15310 ML (*bareboneCLI\_Generic.txt*)
- ONS 15454 ML base microcode (*barebone15454CLI\_Security.txt*)
- ONS 15454 ML enhanced microcode (*barebone15454CLI\_Enhanced\_Security.txt*)

**Note**

- If you want to create a new topology or add a new ML card to an existing RPR topology, you must first download a new barebone file to the ML card, thereby reinitializing the card.
- You can download a barebone file to multiple ML cards. For details, see the section “Initializing ML-Series Cards” in Chapter 7, “Provisioning Services and Connections” in the [Cisco Prime Optical 9.6 User Guide](#).

**Caution**

Do not remove any of the information from the barebone file provided by Prime Optical. You can customize the username and password, but do not remove them; the username cannot be blank. Do not add the **enable password** *password* command, because Prime Optical cannot interactively enable a password.

Reset the ML-series card after loading the barebone file and wait for 5 minutes before provisioning topologies and services. The login and password are reported in the Control Panel window. You can create other profiles on ML-series cards by using the IOS Users table (available under **Administration > CTC-Based NEs > IOS Users Table**).

After entering command-line interface (CLI) commands through the Telnet session, Prime Optical issues a **write** or **copy run start** command to write the Cisco IOS configuration file to the Timing, Communications and Control (TCC) flash. When the Cisco IOS configuration file is written to the TCC flash (by Prime Optical or by another user), Prime Optical is notified. To verify that Prime Optical has been notified, enter the **write** command after any CLI change.

Prime Optical provides a GUI wizard to facilitate provisioning of L2 topologies and related L1 circuits. See the section “Provisioning Data Services” in Chapter 7, “Provisioning Services and Connections” in the [Cisco Prime Optical 9.6 User Guide](#). Create an RPR or point-to-point topology involving some of the ML-series cards in the network. Based on the L2 topology circuit type and size that you specify, Prime Optical creates related L1 circuits and installs a base card configuration on each ML-series card in the RPR ring.

The Create Layer 2 Service wizard guides you through the VLAN creation. There is no CLI to create a circuit VLAN. An RPR supports from 1 to 4095 VLANs, and these VLANs are enabled at all times. All that is required is to configure the endpoint to connect a ring VLAN to a port VLAN that is either an Ethernet port or a port channel. Only ML devices are supported on an RPR.

Point-to-point topologies are supported for ML-ML, ML-G1000, ML-OC, and ML-CE cards. Point-to-point topology creation is similar to RPR creation in that based on the L2 topology circuit type and size that you specify, Prime Optical creates related L1 circuits and installs a base card configuration on each ML-series card in the point-to-point topology.

**Note**

To remove NEs from an L2 topology, mark the NEs Out of Service, and wait an appropriate amount of time for the L2 topology and corresponding links to be automatically deleted. Once automatic deletion is confirmed, delete the NEs.

# CLI Configuration Details

Note the following CLI conventions:

- Notes are reported within brackets ( *[ ]* ). For example:  
*[notes]*
- Optional commands or parameters are reported within brackets ( *[ ]* ). For example:  
*[match any]*
- Configurable parameters are reported within left and right angle brackets (< > ). For example:  
*parameter*
- Multiple parameters or commands are enclosed within braces ( { } ) and separated by a vertical bar ( | ). For example:  
*{parameter\_1 | parameter\_2 | parameter\_3}*

## Base Card Configuration

The base card configuration is a set of commands entered during the L2 topology creation. The parameters are defined in the Create Layer 2 Topology wizard > Layer 2 Topology Bandwidth pane (see [Figure 2](#)).



### Note

Prime Optical supports the setting of a single **match cos** command for each **class-map** command. If another **match cos** command is present on the card, Prime Optical recognizes this additional **match cos** command incorrectly and displays a null string in the GUI. This additional **match cos** command must be removed during a modify bandwidth operation.

**Figure 2** Create Layer 2 Topology Wizard

**Create Layer 2 Topology**

Navigation Pane

- 1. Layer 2 Topology Information
- 2. NE Selection
- 3. Card Selection
- 4. Layer 2 Topology Bandwidth**
- 5. RPR Circuit Segment Details
- VCAT Attribute - Test
- Routing Preferences - Test
- Manual Provisioning - Test
- Route Constraints - Test
- VT Circuit Options - Test
- VT Grooming Node Selection
- Review Route - Test

**Layer 2 Topology Bandwidth**

Multicast Priority Queuing

Multicast Group 1

☒ Enable Multicast Group 1

Multicast Group 1 (%): 1

Class of Service: 4

Multicast Group 2

☐ Enable Multicast Group 2

Multicast Group 2 (%):

Class of Service:

Low Latency Queue (%): Unlimited

Class of Service: 5

SP Management (%): 5

Class of Service: 6,7

Committed Rate (%): 80

Class of Service: 1,2

AVVID Control (%): 4

Class of Service: 3

Default Best Effort (%): 9

Available (%): 0 (Excluding Low Latency Queue)

CoS Commit: 2 (CoS below the CoS Commit value is discard eligible)

**Layer 2 Topology Summary**

Selected RPR Node/Slot (Cards): 15454-ANSI-68-28/1(ML100X-8),15454-ANSI-68-29/17(ML100T)

Pt-to-Pt Source Node: N/A

Maximize << Back Next >> Cancel Help

## RPR Base Card Configuration

To create an RPR topology, you must apply the base card configuration to all ML-series cards in the RPR. The ring is not functional and is reported as *L2 Not Ready* until the base card configuration is applied to all cards. You can select an *L2 Not Ready* RPR in the L2 Topology table and enable the L2 service provisioning by choosing **Configuration > Enable L2 Service**.



### Caution

If the state is reported as *L2 Not Ready*, the base card configuration is missing. Choose **Configuration > Enable L2 Service** to apply the base configuration to the card. This operation affects traffic if the service has already been provisioned on the card.

Prime Optical defines the unique card number within the ring. The actual range is from 1 to 251 in any order. Refer to the NE hardware documentation for the number of ML-series cards allowed per RPR.

```
cos priority-multicast Class of Service percent Multicast Group %1 [If Multicast Group 1
has been enabled]
cos priority-multicast Class of Service percent Multicast Group %2 [If Multicast Group 2
has been enabled]
class-map match-any SP_MANAGEMENT [If SP Management (%) is greater than 0]
  match cos SP Management Class of Service [If SP Management (%) is greater than 0]
class-map match-any AVVID_VOICE_VIDEO
  match cos Low Latency Queue Class of Service
class-map match-any AVVID_CONTROL [If AVVID Control (%) is greater than 0]
  match cos AVVID Control Class of Service [If AVVID Control (%) is greater than 0]
class-map match-any CIR [If Committed Rate (%) is greater than 0]
  match cos Committed Rate Class of Service [If Committed Rate (%) is greater than 0]
```

```

class-map match-all BEST_EFFORT
    match any

Policy-map POLICY_QOS_OUT
    class SP_MANAGEMENT [If SP Management (%) is greater than 0]
        bandwidth percent SP Management (%) [If SP Management (%) is greater than 0]
    class AVVID_VOICE_VIDEO
        Priority 8 [Fixed values are not configurable]
    class AVVID_CONTROL
        bandwidth percent AVVID Control (%) [If AVVID Control (%) is greater than 0]
    class CIR [If Committed Rate (%) is greater than 0]
        bandwidth percent Committed Rate (%) [If Committed Rate (%) is greater than 0]
    class BEST_EFFORT
        Bandwidth percent Default Best Effort (%)

Cos commit CoS Commit

Vlan dot1q tag native

L2protocol-tunnel cos 2 [Fixed value]

interface SPR1
    Spr station-id Card# [The valid range is from 1 to 254; it is not Spr node Card#]
    [The following commands are not issued by Prime Optical; rather, these are default ML settings]
    no ip address
    no keep alive
    hold-queue 150 in

Interface {FastEthernetN|GigabitEthernetM} [N=0 to 11 and M=0,1]
    no ip route-cache

interface POS0
    Spr-intf-id 1
    Service-policy output POLICY_QOS_OUT
    [The following commands are not issued by Prime Optical; rather, these are default ML settings]
    No ip address
    No ip route-cache
    Crc 32

interface POS1
    Spr-intf-id 1
    Service-policy output POLICY_QOS_OUT
    [The following commands are not issued by Prime Optical; rather, these are default ML settings]
    No ip address
    No ip route-cache
    Crc 32

```

**Note**

- Cisco IOS software supports multiple **match cos** commands for each **class-map** command, but Prime Optical supports only one for each.
- The multicast/broadcast feature applies only to RPR topologies and requires the ONS 15310 R5.0 or ONS 15454 R5.0 or later.

## Point-to-Point Base Card Configuration

For a point-to-point topology involved in at least one ML-series card, the other card can be ML, CE, OC, or G1000. The point-to-point base card configuration must be applied only on the ML-series card(s) involved in the topology.



### Note

- Prime Optical does not enable spanning tree. Therefore, verify that there are no Layer 2 loops formed by bridged connections outside the ML network. Layer 2 loops in a network without spanning tree enabled might cause network instability.
- If a G1000 card is one endpoint in the point-to-point topology, a Network-to-Network Interface (NNI) connection is assumed. That is, the class of service (CoS) coming into the G1000 is trusted (not overwritten).

```

cos priority-multicast Class of Service percent Multicast Group %1 [If Multicast Group 1
has been enabled]
cos priority-multicast Class of Service percent Multicast Group %2 [If Multicast Group 2
has been enabled]
class-map match-any SP_MANAGEMENT [If SP Management (%) is greater than 0]
    match cos SP Management Class of Service [If SP Management (%) is greater than 0]
class-map match-any AVVID_VOICE_VIDEO
    match cos Low Latency Queue Class of Service
class-map match-any AVVID_CONTROL [If AVVID Control (%) is greater than 0]
    match cos AVVID Control Class of Service [If AVVID Control (%) is greater than 0]
class-map match-any CIR [If Committed Rate (%) is greater than 0]
    match cos Committed Rate Class of Service [If Committed Rate (%) is greater than 0]
class-map match-all BEST_EFFORT
    match any

Policy-map POLICY_QOS_OUT
    class SP_MANAGEMENT [If SP Management (%) is greater than 0]
        bandwidth percent SP Management (%) [If SP Management (%) is greater than 0]
    class AVVID_VOICE_VIDEO
        Priority 8 [Fixed values are not configurable]
    class AVVID_CONTROL
        bandwidth percent AVVID Control (%) [If AVVID Control (%) is greater than 0]
    class CIR [If Committed Rate (%) is greater than 0]
        bandwidth percent Committed Rate (%) [If Committed Rate (%) is greater than 0]
    class BEST_EFFORT
        Bandwidth percent Default Best Effort (%)

Cos commit CoS Commit

Vlan dot1q tag native

l2protocol-tunnel cos 2 [Fixed value]

[The following commands are not issued by Prime Optical; rather, these are default ML
settings]
Interface {FastEthernetN|GigabitEthernetM} [N=0 to 11 and M=0,1]
    no ip route-cache

interface POS0
    service-policy output POLICY_QOS_OUT
    Crc {16|32} [Crc 16 between ML and E-series; otherwise Crc 32]
    [The following commands are not issued by Prime Optical; rather, these are default ML
settings]
    No ip address
    No ip route-cache

```

```

interface POS1
  service-policy output POLICY_QOS_OUT
  Crc {16|32} [Crc 16 between ML and E-series; otherwise Crc 32]
  [The following commands are not issued by Prime Optical; rather, these are default ML
  settings]
  No ip address
  No ip route-cache

```

**Note**

Cisco IOS software supports multiple **match cos** commands for each **class-map** command, but Prime Optical supports only one for each.

## Packet over SONET, Ethernet, and Shared Packet Ring Port Provisioning

You can use the Create Layer 2 Service wizard, Modify Ports dialog box, Modify VLANs dialog box, Add L2 Service Drops wizard, or Modify L2 Drops wizard to provision the parameters described in the following table.

**Table 2** Port Provisioning Parameter Support

Card and Port Types		MTU Size	Speed	Duplex	Flow Control (Send)	Flow Control (Receive)	Enable (No Shutdown)/Disable (Shutdown)
ML100T card	Ether	Supported	Supported	Supported	Supported	Not supported	Supported
	PoS <sup>1</sup>	Supported only for PTP	Not supported	Not supported	Not supported	Not supported	Supported
	SPR <sup>2</sup>	Supported only for RPR	Not supported	Not supported	Not supported	Not supported	Not supported
ML1000 (Ether) card	Ether	Supported	Supported only for Auto	Supported only for Auto	Supported	Supported	Supported
	PoS	Supported only for PTP	Not supported	Not supported	Not supported	Not supported	Supported
	SPR	Supported only for RPR	Not supported	Not supported	Not supported	Not supported	Not supported
ML100FX card	Ether	Not supported	Only 100 is supported	Only Full is supported	Supported	Not supported	Supported
	PoS	Supported only for PTP	Not supported	Not supported	Not supported	Not supported	Supported
	SPR	Supported only for RPR	Not supported	Not supported	Not supported	Not supported	Not supported

**Table 2**      **Port Provisioning Parameter Support (continued)**

Card and Port Types		MTU Size	Speed	Duplex	Flow Control (Send)	Flow Control (Receive)	Enable (No Shutdown)/Disable (Shutdown)
ML100T-8 card	Ether	Not supported	Supported	Supported	Supported	Not supported	Supported
	PoS	Not supported	Not supported	Not supported	Not supported	Not supported	Supported
	SPR	Only 1500 is supported	Not supported	Not supported	Not supported	Not supported	Not supported

1. PoS = Packet over SONET.

2. SPR = Shared Packet Ring.

Ethernet port provisioning involves configuring the following parameters (see [Figure 3](#)):

- **Enable/Disable Ethernet Ports (Administrative State/Link Control)**—The ability to enable or disable an Ethernet port at any time is independent of other port provisioning. Prime Optical automatically disables a port when the last connection is removed.
- **MTU Size**—Maximum transmission unit (MTU) is the maximum packet size, in bytes, that a particular interface can handle.
- **Speed**—Select the speed from the drop-down list, which displays three values: 10, 100, and Auto. For an ML1000 card, Auto is the only supported option.
- **Flow Control (Send)**—Select the Flow Control (send) value from the drop-down list, which displays three values: Off, On, and Desired. These values are supported by both Fast Ethernet and Gigabit Ethernet (GE) ports.

PoS port provisioning involves configuring the following parameters (see [Figure 3](#)):

- **Enable (No Shutdown)/Disable (Shutdown)**—The ability to enable or disable a PoS port at any time is independent of other port provisioning. When the PoS port that is shut down is related to the L2 topology, the topology goes into *wrap* state. Prime Optical automatically sends an alarm indicating that the L2 topology has entered wrap state.
- **MTU Size**—Maximum packet size, in bytes, that a particular interface can handle.

**Figure 3** Create Layer 2 Service—Modify Port Properties

**Create Layer 2 Service**

Service Drops Configuration

Service Drops | Port Attributes

Modify Port Properties

	Speed	Duplex	Flow Control (send)	Flow Control (receive)
	100	auto	desired	desired
	100	auto	desired	desired
	100	auto	desired	desired

off  
on  
desired

Layer 2 Service Summary

Layer 2 Topology Name: Test

Service Provider VLAN ID: 2

Customer ID:

Service ID:

<< Back Next >> Finish Cancel Help

310273

## Enable

```
Interface {FastEthernetN|GigabitEthernetM} [N = 0 to 11 and M = 0,1]
  No shutdown
```

## Disable

```
Interface {FastEthernetN|GigabitEthernetM} [N = 0 to 11 and M = 0,1]
  shutdown
```

## MTU Provisioning

```
Interface {FastEthernetN|GigabitEthernetM} [N = 0 to 11 and M = 0,1]
  mtu MTU [MTU = 64 to 9000]
```

## Speed Provisioning

```
Interface {FastEthernetN|GigabitEthernetM} [N = 0 to 11 and M = 0,1]
  speed Speed [Speed = 10/100/auto]
```

## Duplex Provisioning

```
Interface {FastEthernetN|GigabitEthernetM} [N = 0 to 11 and M = 0,1]
duplex Duplex [Duplex = half/full/auto]
```

## Flow Control (Send) Provisioning

```
Interface {FastEthernetN|GigabitEthernetM} [N = 0 to 11 and M = 0,1]
flowcontrol send Flow Control(send) [Flow Control = desired/off/on]
```

## Enable (No Shut)

```
Interface {POSN} [N = 0 or 1]
No shutdown
```

## Disable (Shutdown)

```
Interface {POSN} [N = 0 or 1]
shutdown
```

## MTU Provisioning

```
Interface {POSN} [N = 0 or 1]
mtu MTU [MTU = 64 to 9000]
```

## Port Channel Provisioning

ML-series cards offer port channel (also known as *link aggregation*) for Gigabit Ethernet and Fast Ethernet ports.

Port channel is a trunking technology that groups together multiple, full-duplex, IEEE 802.3 Gigabit Ethernet/Fast Ethernet interfaces to provide fault-tolerant, high-speed links between switches, routers, and servers.

## Creating or Modifying a Port Channel

```
interface port-channel channel-ID
[no] shutdown
mtu MTU-value [The range is from 64 to 9000]
hold-queue HI-queue-value in [The range is from 0 to 4096]
hold-queue HO-queue-value out [The range is from 0 to 4096]
```

## Deleting a Port Channel

```
no interface port-channel channel-ID
```

## Creating or Modifying a Port Channel Member

```
interface { FastEthernetN | GigabitEthernetM } [N=0 to 11, and M=0,1]
no ip address
no mtu
no shutdown
channel-group channel-ID { mode [active | passive] }
lacp port-priority port-priority [The range is from 1 to 65535]
```

## Deleting a Port Channel Member

```
interface { FastEthernetN | GigabitEthernetM } [N=0 to 11, and M=0,1]
no channel-group channel-ID
no lacp port-priority
shutdown
```

# IEEE 802.17 RPR Base Card Configuration

The base card configuration is a set of commands you enter when creating the Layer 2 topology. Use the Create Layer 2 Topology wizard > Layer 2 Topology Bandwidth pane (see Figure 4) to define parameters for IEEE 802.17 RPR provisioning.

**Figure 4** Create Layer 2 Topology Wizard—IEEE 802.17 RPR Topology Creation

**Create Layer 2 Topology**

Navigation Pane:

- 1. Layer 2 Topology Information
- 2. NE Selection
- 3. Card Selection
- 4. Layer 2 Topology Bandwidth
- 5. RPR Circuit Segment Details
- 6. VCAT Attribute
- 7. Routing Preferences
- Manual Provisioning
- Route Constraints
- VT Circuit Options
- VT Grooming Node Selection
- Review Route

**Layer 2 Topology Bandwidth**

Class A (In Mbps):  Fairness Mode:

Class A1 (In Mbps):  Protection Frame:

Class B-CIR (In Mbps):

**Classmap Configuration**

Low Latency Queue:  Class of Service:

SP Management:  Class of Service:

Committed Rate:  Class of Service:

AVVID Control:  Class of Service:

Default Best Effort:  (CoS below the CoS Commit value is discard eligible)

CoS Commit:

**Layer 2 Topology Summary**

Selected RPR Node/Slot (Cards): 15454-ANSI-68-36/16(ML1000);15454-ANSI-68-37/17(ML100T)

RPR Source Node: N/A

Maximize << Back Next >> Cancel Help

To create an RPR topology, apply the base card configuration to all ML-series cards in the RPR. The topology is reported as *L2 Not Ready* until the base card configuration is applied to all cards. Select an *L2 Not Ready* RPR in the L2 Topology table and choose **Configuration > Enable L2 Service** to enable the L2 service provisioning.

The IEEE 802.17 policy map configuration differs from the policy map configuration in the Cisco RPR. ML-series cards in 802.17 RPR mode support the following traffic classes:

- Class A (A0/A1)
  - Class A0/A1 traffic is guaranteed low-latency traffic.
  - Class A0 conforms to the reserved rate on the ring.
  - Class A1 does not use the reserved bandwidth.
- Class B (B-CIR/B-EIR)
  - Traffic that conforms to the B committed information rate (CIR) is not fairness-eligible.
  - Class B EIR traffic is fairness-eligible; it is distinguished from class C traffic at the add node only.
- Class C traffic is best effort; it is always fairness-eligible.

You can modify the CoS value; the range is from 0 to 7.

Use the following commands to create the IEEE 802.17 RPR:

```
[Class map configuration]
class-map match-any AVVID_VOICE_VIDEO
match cos Low Latency Queue Class of Service

class-map match-any SP_MANAGEMENT
match cos SP Management Class of Service

class-map match-any CIR
match cos Committed Rate Class of Service

class-map match-any AVVID_CONTROL
match cos AVVID Control Class of Service

class-map match-all BEST_EFFORT
match any

[Policy map configuration]
policy-map POLICY_QOS_OUT
class AVVID_VOICE_VIDEO
set rpr-ieee service-class Low Latency Queue [Possible values are a, b, c]
class AVVID_CONTROL
set rpr-ieee service-class AVVID Control [Possible values are a, b, c]
class SP_MANAGEMENT
set rpr-ieee service-class SP Management [Possible values are a, b, c]
class CIR
set rpr-ieee service-class Committed Rate [Possible values are a, b, c]
class BEST_EFFORT
set rpr-ieee service-class Default Best Effort [Possible values are a, b, c]

[Absolute bandwidth configuration]
interface rpr-ieee 0
rpr-ieee protection pref jumbo
rpr-ieee tx-traffic rate-limit reserved Class A east [Class A range is from 0 to 48 Mb/s]
rpr-ieee tx-traffic rate-limit reserved Class A west [Class A range is from 0 to 48 Mb/s]
rpr-ieee tx-traffic rate-limit high Class A1 east [Class A1 range is from 1 to 48 Mb/s]
rpr-ieee tx-traffic rate-limit high Class A1 west [Class A1 range is from 1 to 48 Mb/s]
rpr-ieee tx-traffic rate-limit medium Class B-CIR east [Class B-CIR range is from 1 to 48 Mb/s]
rpr-ieee tx-traffic rate-limit medium Class B-CIR west [Class B-CIR range is from 1 to 48 Mb/s]
service-policy output POLICY_QOS_OUT
```

**Note**

The Protection Frame field is always *Jumbo*; no other configurable options are supported. The Fairness Mode field is always *Aggressive*.

In the commands listed above, the upper limit of the range value depends on the circuit size. For example, if  $x$  is the maximum range value in megabits per second (Mb/s):

- FOR\_STS1 circuit,  $x = 48$
- FOR\_STS3c\_VC4 circuit,  $x = 149$
- FOR\_STS6c\_VC4\_2c circuit,  $x = 299$
- FOR\_STS9c\_VC4\_3c circuit,  $x = 488$
- FOR\_STS12c\_VC4\_4c circuit,  $x = 598$
- FOR\_STS24c\_VC4\_8c circuit,  $x = 1196$
- FOR\_STS9c\_VC4\_3c circuit, COMMITTED bandwidth,  $x = 499$
- FOR\_STS12c\_VC4\_4c circuit, COMMITTED bandwidth,  $x = 599$
- BW\_FOR\_STS24c\_VC4\_8c circuit, COMMITTED bandwidth,  $x = 1198$

## Protection Support on ML-Series Cards

You can select IEEE 802.17 RPR ML1000 cards for protection in the Create Layer 2 Topology wizard > Card Selection pane (see [Figure 5](#)).

To choose a working card, select any card in the Available Cards list and click **Add Working**.

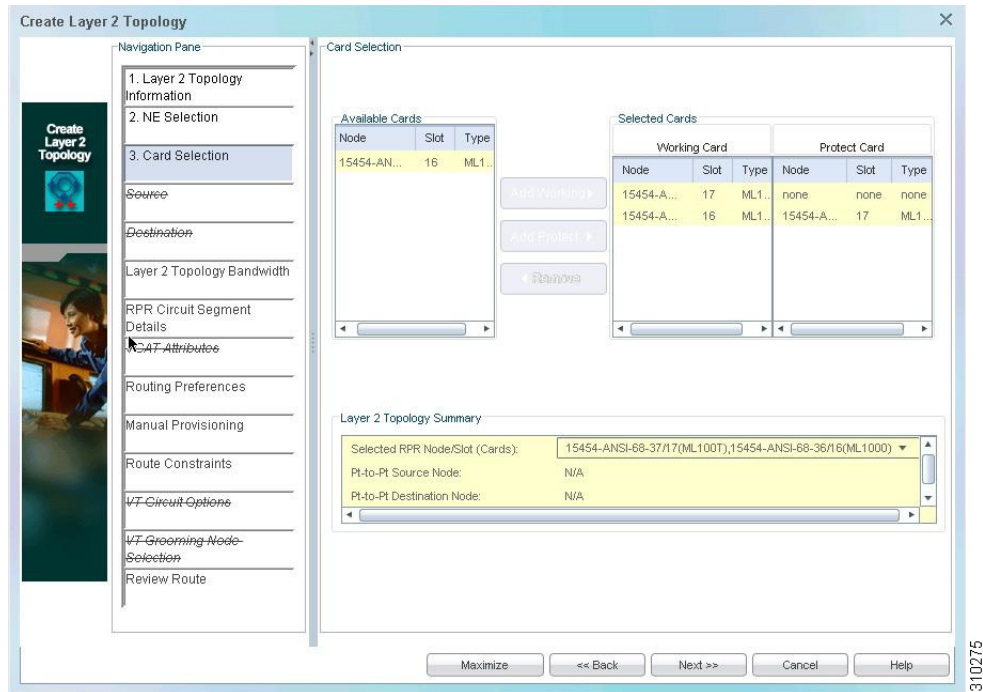
To choose a protection card for a working card:

1. Select the working card.
2. Select the protection card from the Available Cards list.
3. Click **Add Protect**.

**Note**

Protection is supported only on ML1000 cards; a working ML1000 card can be protected only by another ML1000 card.

**Figure 5** Card Selection—Create Layer 2 Topology Wizard (IEEE 802.17 RPR)



After you select the protection, commands are issued on the active and protection ML1000 cards, as follows:

- MAC addresses are configured on both the active and protection cards for the IEEE RPR interface:

- Active card protection configuration

```
interface RPR-IEEE0
mac-address MAC address of the interface [MAC address range is from 0000.1111.1111
to 0000.9999.9999]
```

- Protection card protection configuration

```
interface RPR-IEEE0
mac-address MAC address of the interface [MAC address range is from 0000.1111.1111
to 0000.9999.9999]
```

- After the MAC address is configured, the following commands are present on the active and protection cards:

- Active card protection configuration

```
interface RPR-IEEE0
rpr-ieee ri mode primary peer MAC address of the active card [MAC address range is
from 0000.1111.1111 to 0000.9999.9999]
```

- Protection card protection configuration

```
interface RPR-IEEE0
rpr-ieee ri mode secondary peer MAC address of the protection card [MAC address
range is from 0000.1111.1111 to 0000.9999.9999]
```



**Note**

Any MAC address with the first four digits beginning with 11 (11xx.xxxx.xxxx) is a malformed address and is denied; for example, 1100.2222.3333.

When changing ML1000 GE port states in a scenario with 802.17 RPR redundant interconnect protection configured, the primary ML card remains active if at least one GE port is up. Conversely, if all GE ports are down, the redundant interconnect protection is triggered and the IEEE 0 interface shuts down on the primary card. When the IEEE 0 interface shuts down, the L2 topology state changes to *Steering*.

# Wrap Status

When a PoS port in a Cisco RPR L2 topology shuts down, Prime Optical raises an alarm to indicate that the L2 topology has entered the corresponding protection state, which is referred to as the *wrap* state. The status of the Layer 2 topology changes from the original state (*Complete* or *Incomplete*) to *Complete-Wrapped* or *Incomplete-Wrapped* (see [Figure 6](#)).

**Figure 6** Layer 2 Topology Table—Complete-Wrapped State

Layer 2 Topology Name	Layer 2 Topology Alias	Description	Type	Size	State	L1 Protection	Op
ck2	ck2		RPR	STS-1	Complete-Wrapped	Unprotected	IS-
Ring	Ring_2CTML2		RPR	STS-1	Complete	Unprotected	OC

Column Name	Value
Layer 2 Topology Name	ck2
Layer 2 Topology Alias	ck2
Description	
Layer 2 Topology Type	RPR
Layer 2 Topology Size	STS-1

Page 1 (2 rows in the table) | Server Time: 3:36:44 PM

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The Alarm Browser (see [Figure 7](#)) displays a *wrapped-state* alarm.

**Figure 7** Alarm Browser—Complete-Wrapped State

ID	PS	Ack	Note	Alias ID	Probable Cause	Condition	Affected Of
3991	MN			nmtg-454sonet-209	Loss Of Signal	LOS	BITS-2
3990	MN			nmtg-454sonet-209	Loss Of Signal	LOS	BITS-1
3989	MN			nmtg-454sonet-209	Battery Failure	BAT-FAIL	PVR-B
3988	MN			nmtg-454sonet-209	Protection Unit Not Available	PROTNA	SLOT-11
4049	VWR			nmtg-454sonet-209	RPR Wrapped	RPRW	VFAC-3-1
4037	VWR			nmtg-454sonet-211	Payload Defect Indication - Path	PDI-P	STS-12-1-3
4036	VWR			nmtg-454sonet-211	Audit Log 100 Percent Full - Old...	AUD-LOG-LOSS	SYSTEM
4029	VWR			nmtg-454sonet-211	Free Running Synchronization ...	FRNGSYNC	SYNC-NE
4024	VWR			nmtg-454sonet-211	Alarms Suppressed For Mainte...	AS-MT	FAC-17-2

Column Name	Value
Alarm ID	4049
Perceived Severity	Warning
Acknowledged	No
Note	

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**Note**

For alarms and circuits on ML cards that are configured with card mode 802.17 RPR, the ML card ports are referred to as port 0 for RPR-WEST and port 1 for RPR-EAST. This is also true when Prime Optical communicates through the GateWay/CORBA interface.

## Steering Status

When an RPR-EAST or RPR-WEST port in a standard 802.17 RPR shuts down, Prime Optical raises an alarm to indicate that the L2 topology has entered the corresponding protection state, which is referred to as the *Steering* state. The status of the Layer 2 topology changes from the original state (*Complete* or *Incomplete*) to *Complete-Steering* or *Incomplete-Steering* (see [Figure 8](#)).

**Figure 8** Layer 2 Topology Table—Complete-Steering State

Layer 2 Topology Name	Layer 2 Topology Alias	Description	Type	Size	State	L1 Protection	Operational State
ck2	ck2		RPR	STS-1	Complete-Wrapped	Unprotected	OOS
RPR_802.17	RPR_802.17.1 CTML2		RPR_DOT...	STS-1	Complete-Steering	Unprotected	IS
Ring	Ring.2CTML2		RPR	STS-1	Complete-Wrapped	Unprotected	OOS

The Alarm Browser (see [Figure 9](#)) displays an *RPR Protection Is Active* alarm.

**Figure 9** Alarm Browser—Complete-Steering State

ID	PS	Ack	Note	Alias ID	Probable Cause	Condition	Affected Object	Module Name	Phy
1241	MN			15454-ANSI-68-34	Protection Unit Not Available	PROTNA	SLOT-7	TCC	Slc
1240	MN			15454-ANSI-68-36	Loss Of Signal	LOS	BITS-1	SYSTEM	Ch
1237	MN			15454-ANSI-68-37	Protection Unit Not Available	PROTNA	SLOT-7	TCC	Slc
1236	MN			15454-ANSI-68-36	Protection Unit Not Available	PROTNA	SLOT-7	TCC	Slc
3107	WR			15454-ANSI-68-37	RPR Protection Is Active	RPR-PROT-ACTIVE	RPRIF-17-0	ML100T	Slc
3106	WR			15454-ANSI-68-37	RPR Signal Failure	RPR-SF	VFAC-17-1	ML100T	Slc
3105	WR			15454-ANSI-68-37	RPR Signal Failure	RPR-SF	VFAC-17-0	ML100T	Slc
2979	WR			15454-ANSI-68-28	Payload Defect Indication - Path	PDI-P	STS-5-1-2	OC48	Slc
2973	WR			15454-ANSI-68-28	RPR Wrapped	RPRVW	VFAC-17-1	ML100T	Slc
2971	WR			15454-ANSI-68-28	RPR Wrapped	RPRVW	VFAC-17-0	ML100T	Slc
2965	WR			15454-ANSI-68-28	RPR Wrapped	RPRVW	VFAC-2-1	ML100T	Slc

**Note**

For Cisco RPRs, the L2 protection state (*Wrapped* or *Steering*) is not reflected in the L2 topology state through Prime Optical GateWay/CORBA.

## Creating Service Connections

Prime Optical contains an L2 service provisioning wizard to facilitate provisioning of VLANs over a defined L2 topology. You can define each Ethernet port as User-Network Interface (UNI) or Network-Network Interface (NNI). VLANs on an Ethernet port are referred to as *port VLANs*. VLANs on PoS and SPR ports (and their connected circuits) are referred to as *service provider VLANs* (or *circuit VLANs*).

You cannot mix NNI and UNI connections on the same port. Prime Optical supports the following types of service configurations:

- UNI QinQ Access (user VLAN and protocol transparency)—Cannot be combined with other connection types on the same port.

- UNI dot1q Access—Select an unused port VLAN from 1 to 4095. It can be combined with untagged connections on the same port. Each port VLAN can be used for only one connection.
- UNI Untagged Access—Configure as Dot1q Access with port VLAN 1.
- NNI dot1q Access—Select an unused port VLAN from 1 to 4095. It can be combined with untagged connections on the same port. Each port VLAN can be used for only one connection.

The circuit VLAN range is from 1 to 4095. On an RPR, all valid circuit VLANs can be used; however, due to limited bridge group resources, each ML-series card can access only 255 circuit VLANs. Due to limited card-level bridge group resources, only 255 circuit VLANs can be used on a point-to-point circuit.

**Note**

VLAN ID 1 is reserved for untagged VLANs.

For VLAN configurations, the port channel interface is treated as a new, single logical interface, even though it consists of multiple interfaces. The following Cisco IOS commands are sent to the ML card to configure the IEEE 802.1Q encapsulation on the port channel interface. (IEEE 802.1Q encapsulation is the only supported encapsulation type in link aggregation.)

```
interface port-channel port-channel-ID.VLAN-number
encapsulation dot1Q VLAN-number
bridge-group bridge-group-number
```

Port channel drops are of NNI type; therefore, no QoS policies are associated to port channel drops, as is true for any other NNI Ethernet drops.

## Using the Quality of Service Policy Template

You must configure the following information in the L2 service provisioning and quality of service (QoS) profile wizards:

- Port (FastEthernetM [FEM] or GigabitEthernetN [GIGEN] with M=0 to 11 and N=0,1)
- Service connection type (UNI QinQ, UNI dot1Q, UNI untagged, or NNI dot1Q)
- QoS parameters (selection of the QoS profile name defined in the QoS profile)

Prime Optical assigns an unused bridge group (BG) to the card. The range is from 1 to 255.

The following table lists the configuration information for a best-effort QoS profile. You can select the predefined profile and customize it, or create a new customized profile by using the Advanced option.

**Table 3 Configuration Settings for the Best-Effort QoS Profile**

QoS Template Name	
Best_Effort	
QoS Template Type	
Best Effort	
QoS Policy	Setting
Match Any	True
Match IP	False
IP Precedence Value	N/A

**Table 3** Configuration Settings for the Best-Effort QoS Profile (continued)

Match CoS	False
CoS Value	N/A
Match DSCP	False
DSCP Value	N/A
AND	N/A
CIR Type	N/A
Committed Rate	N/A
Committed Burst	N/A
Committed CoS Marking	Mark CoS
Committed CoS Value	0
Excess Traffic	Allow
Peak Rate	N/A
Peak Burst	N/A
Excess CoS Marking/Value	0
Violations	N/A
Violate CoS	N/A
Best Effort Type	Line Rate
Max Rate	96 kb/s
Max Burst	8000 bytes

The following table lists the configuration information for the committed information rate/peak information rate (CIR/PIR) QoS profile. You can select the predefined profile and customize it, or create a new customized profile by using the Advanced option.

**Note**

If you select the CIR/PIR profile and want to modify it, you must configure your own advanced service before you can set the CIR type to Rate\_Limited, CIR=PIR, and CIR Burst=PIR Burst.

**Table 4** Configuration Settings for the CIR/PIR QoS Profile

<b>QoS Template Name</b>	
CIR_PIR	
<b>QoS Template Type</b>	
Advanced	
<b>QoS Policy</b>	<b>Setting</b>
Match Any	True
Match IP	False
IP Precedence Value	N/A
Match CoS	False
CoS Value	N/A

**Table 4** Configuration Settings for the CIR/PIR QoS Profile (continued)

Match DSCP	False
DSCP Value	N/A
AND	N/A
CIR Type	Rate_Limited
Committed Rate	96 kb/s
Committed Burst	8000 b/s
Committed CoS Marking	Mark CoS
Committed CoS Value	2
Excess Traffic	Allow
Peak Rate	96 kb/s
Peak Burst	8000 b/s
Excess CoS Marking/Value	2
Violations	Allow
Violate CoS	2
Best Effort Type	N/A
Max Rate	N/A
Max Burst	N/A

Prime Optical allows you to define a QoS policy template, starting with the preceding predefined policies and customizing them within the following predefined ranges:

- CIR\_PIR
  - CIR—96,000 to 800,000,000 bits per second (b/s).
  - Max CIR Burst—8000 to 64000 bytes.
  - PIR—96,000 to 800,000,000 b/s. Cannot be less than CIR.
  - Max PIR Burst—8000 to 64000 bytes. Cannot be less than Max CIR Burst.
  - Traffic matching criteria is *match-all*.
  - Only one policy is allowed.
- Best\_Effort
  - Line Rate—CIR is 96000 b/s and CIR Burst is 8000 bytes.
  - Rate Limited—You configure the CIR and CIR Burst.
  - Traffic matching criteria is *match-all*.
  - Only one policy is allowed.

You can create your own advanced QoS policy by entering the customized QoS configuration based on the following parameters:

- Traffic matching criteria.
- CoS—The range is from 0 to 7.
- DSCP—The range is from 0 to 63.

- IP Precedence—The range is from 0 to 7.
- CoS transmit values for CIR/PIR.
- Exceed action and violate action and their CoS transmit values.
- Up to eight QoS classes can be configured.

You must configure the following information in the L2 service provisioning and QoS profile wizards:

- Port (FastEthernetM [FEM] or GigabitEthernetN [GIGEN] with M=0 to 11 and N=0,1).
- Service connection type (UNI QinQ, UNI dot1Q, UNI untagged, or NNI dot1Q).
- QoS parameters (selection of the QoS profile name defined in the QoS profile).

Prime Optical assigns an unused bridge group to the card. The range is from 1 to 255.



#### Note

The CLI commands in this section are written for services defined on the RPR topology. For services defined on point-to-point circuits, replace **int spr 1** with **int pos 0** or **int pos 1**, depending on which PoS will carry the service. The **bridge x protocol** command is never issued. Spanning tree is not enabled for RPR or point-to-point circuits. The **L2protocol-tunnel all** command is expanded to three separate lines when saved by the Cisco IOS router.

For any drop-applied QoS profile, Prime Optical checks the available bandwidth and generates an error message if:

- $totalBW > GE\_TOTBW$  (GE interfaces  $GE\_TOTBW = 1\text{ Gb/s}$ )
- $totalBW > FE\_TOTBW$  (FE interfaces  $FE\_TOTBW = 100\text{ Mb/s}$ )

where the parameter *totalBW* is calculated as the sum of:

- New CIR bandwidth reserved for applying the profile
- CIR bandwidth already reserved on the selected drop by the previously created L2 service
- Bandwidth reserved for multicast groups during topology creation

For each selected service drop, the configuration is done in three steps:

1. Class map configuration (not required for NNI-configured ports).
2. Policy map configuration (through QoS profiles; not required for NNI-configured ports).
3. Interface configuration (through the Create Layer 2 Service wizard).

The following sections describe the commands for each step.

# 1. Class Map Configuration

## Configuring CIR/PIR Class Map

*[Class map configuration for CIRPIR]*

```
Class-map match-all CLASS_BG BG_CIRPIR
  match bridge-group BG
```

## Configuring Best-Effort Class Map

*[Class map configuration for BESTEFFORT]*

```
Class-map match-all CLASS_BG BG_BESTEFFORT
  match bridge-group BG
```

## Configuring Advanced Class Map

Figure 10 and Figure 11 show how to use the Create QoS Profile wizard to configure an advanced QoS profile.

**Figure 10** *Create QoS Profile Wizard—Advanced Class Map Configuration (1 of 2)*

The screenshot shows the 'Create QoS Profile' wizard window. The 'Profile Name' field is empty. The 'Profile Type' is set to 'Advanced'. The 'Description' field is empty. The 'Policing' section is expanded, showing the 'Classification' tab. Under 'Classification', the 'Match Any' checkbox is checked. Below it, there are three unchecked checkboxes: 'Match DSCP', 'Match IP Precedence', and 'Match CoS'. To the right of these checkboxes, there is a section titled 'Select AND or OR logic for multiple traffic classifications' with two radio buttons: 'AND' (selected) and 'OR'. Below this section are four buttons: 'Add', 'Remove', 'Modify', and 'Reset'. At the bottom of the window, there is a table with the following headers: 'Match...', 'Match D...', 'DSCP Value', 'Match IP', 'IP Value', 'Match CoS', 'CoS Value', 'AND /...', and 'CIR 1'. The table is currently empty. At the very bottom of the window are three buttons: 'Save', 'Cancel', and 'Help'.

**Figure 11** Create QoS Profile Wizard—Advanced Class Map Configuration (2 of 2)

**Create Layer 2 Service**

QoS Parameters

Profile Custom QoS

Load From QoS Profile: Best\_Effort

Match-...	Match D...	DSCP Val...	Match IP	IP Value	Match CoS	CoS Value
true	false		false		false	

Layer 2 Service Summary

Layer 2 Topology Name: Test

Service Provider VLAN ID: 2

<< Back Next >> Finish Cancel Help

Enter the following commands to create a QoS profile with advanced OR selection:

*[Class map configuration for ADVANCED OR selection]*

*class-map match-any CLASS\_BG BG\_ADVANCED\_Service Drop Port\_N [N number of policies will be configured on the Service Drop Port=0,1 for GigaEthernet and Service Drop Port=0 to 11 for FastEthernet]*

*[match ip dscp Match DSCP]*

*[If Match DSCP has been selected, the valid range is from 0 to 63]*

*[match ip precedence Match IP Precedence]*

*[If Match IP Precedence has been selected, the valid range is from 0 to 7]*

*[match cos Match CoS]*

*[If Match CoS has been selected, the valid range is from 0 to 7]*



#### Note

A profile with OR conditions can be applied only to a port with a single bridge group configured. Prime Optical excludes the match bridge group statement from the OR class maps and applies class match-any.

## 2. QoS Profile Configuration

### CIR/PIR QoS Profile

Figure 12 is an example of how to create a CIR/PIR QoS profile.

**Figure 12** Create QoS Profile Wizard—CIR/PIR

The figure displays three sequential screenshots of the 'Create QoS Profile' wizard, specifically for a CIR/PIR profile. Each window has a title bar 'Create QoS Profile' and a close button 'X'.

**Top Left Screenshot (Classification Tab):**

- Profile Name:
- Profile Type:  Description:
- Policing:
  - Classification (selected), Committed Traffic, Excess Traffic, Violations, Best Effort
  - ☒ Match Any
  - ☐ Match DSCP
  - ☐ Match IP Precedence
  - ☐ Match CoS
  - Select AND or OR logic for multiple traffic classifications:
    - ☒ AND
    - ☐ OR
- Buttons: Add, Remove, Modify, Reset
- Match criteria table: Match-..., Match D..., DSCP Val..., Match IP, IP Value, Match CoS, CoS Value, AND / ..., CIR T
- Buttons: Save, Cancel, Help

**Top Right Screenshot (Committed Traffic Tab):**

- Profile Name:
- Profile Type:  Description:
- Policing:
  - Classification, Committed Traffic (selected), Excess Traffic, Violations, Best Effort
  - ☒ Line Rate ☐ Rate Limited
  - Committed Rate:  Kbps
  - Committed Burst Size:  Kbytes
  - Committed CoS Marking:
    - ☐ Trust
    - ☒ Mark CoS
- Buttons: Add, Remove, Modify, Reset
- Match criteria table: Match-..., Match D..., DSCP Val..., Match IP, IP Value, Match CoS, CoS Value, AND / ..., CIR T
- Buttons: Save, Cancel, Help

**Bottom Screenshot (Excess Traffic Tab):**

- Profile Name:
- Profile Type:  Description:
- Policing:
  - Classification, Committed Traffic, Excess Traffic (selected), Violations, Best Effort
  - ☐ Discard ☒ Allow
  - Peak Rate:  Kbps
  - Peak Burst:  Kbytes
  - Excess CoS Marking:
    - ☐ Trust
    - ☒ Mark CoS
- Buttons: Add, Remove, Modify, Reset
- Match criteria table: Match-..., Match D..., DSCP Val..., Match IP, IP Value, Match CoS, CoS Value, AND / ..., CIR T
- Buttons: Save, Cancel, Help

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Enter the following commands for policy map configuration of a CIR/PIR QoS profile:

*[Policy map configuration command for the CIR/PIR QoS profile]*

```
Policy-map POLICY_{GIGE|FE}port_IN  
  Class CLASS_BG BG_CIRPIR
```

*[1. Case Line Rate selection]*

```
Police 96000 8000 conform-action set-cos-transmit 2 exceed-action set-cos-transmit 2
```

*[2. Case Rate Limited selection Excess Traffic Discarded]*

```
Police Committed Rate Committed Burst Size conform-action set-cos-transmit 1  
exceed-action drop
```

*[3. Case Rate Limited selection Excess Traffic Allowed]*

```
Police Committed Rate Committed Burst Size Peak Burst pir Peak Rate conform-action  
set-cos-transmit 2 exceed-action set-cos-transmit 1 violate-action drop
```

## Best-Effort QoS Profile

Figure 13 is an example of how to create a best-effort QoS profile.

**Figure 13** Create QoS Profile Wizard—Best Effort

The figure consists of three screenshots of the 'Create QoS Profile' wizard, specifically the 'Best Effort' configuration page. The wizard is titled 'Create QoS Profile' and has a close button (X) in the top right corner. The 'Profile Name' is 'New\_Profile' and the 'Profile Type' is 'Best\_Effort'. The 'Description' field is empty.

The 'Policing' section has five tabs: 'Classification', 'Committed Traffic', 'Excess Traffic', 'Violations', and 'Best Effort'. The 'Classification' tab is selected in all three screenshots. In the first two screenshots, the 'Match Any' checkbox is checked, and the 'Match DSCP', 'Match IP Precedence', and 'Match CoS' checkboxes are unchecked. The 'Select AND or OR logic for multiple traffic classifications' section shows 'AND' selected and 'OR' unselected. The 'Best Effort CoS Marking' section shows 'Trust' selected and 'Mark CoS' unselected, with a dropdown menu set to '0'. The 'Rate Limited' section is visible in the third screenshot, showing 'Line Rate' selected and 'Rate Limited' unselected, with 'Max Rate' set to '1' and 'Mbps' selected, and 'Max Burst' set to '8' and 'Kbytes' selected.

At the bottom of each screenshot, there are buttons for 'Add', 'Remove', 'Modify', and 'Reset'. Below these buttons is a table with columns: 'Match...', 'Match D...', 'DSCP Val...', 'Match IP', 'IP Value', 'Match CoS', 'CoS Value', 'AND / ...', and 'OR T'. The table is empty in all three screenshots. At the bottom of the wizard, there are 'Save', 'Cancel', and 'Help' buttons.

Enter the following commands to create a best-effort QoS profile:

```
[Policy map configuration for the BESTEFFORT QoS profile]
```

```
Policy-map POLICY_{GIGE|FE}port_IN
```

```
Class CLASS_BG BG_BESTEFFECT
```

[1. Case Line Rate selection]

```
Police 96000 8000 conform-action set-cos-transmit 0 exceed-action set-cos-transmit 0
```

[2. Case Rate Limited selection]

```
Police Max Rate Max Burst conform-action set-cos-transmit 0 exceed-action drop
```

## Advanced QoS Profile

Figure 14 is an example of how to create an advanced QoS profile.

**Figure 14** Create QoS Profile Wizard—Advanced

The figure displays three screenshots of the 'Create QoS Profile' wizard, illustrating the configuration steps for an advanced QoS profile. Each window shows the 'Profile Name' as 'New\_Profile' and 'Profile Type' as 'Advanced'.

**Top Left Screenshot (Committed Traffic Tab):** The 'Policing' section shows 'Line Rate' selected. The 'Committed Rate' is set to 96 Kbps and 'Committed Burst Size' is 8 Kbytes. Under 'Committed CoS Marking', 'Trust' is selected.

**Top Right Screenshot (Excess Traffic Tab):** The 'Policing' section shows 'Allow' selected. The 'Peak Rate' is set to 96 Kbps and 'Peak Burst' is 8 Kbytes. Under 'Excess CoS Marking', 'Mark CoS' is selected with a value of 0.

**Bottom Screenshot (Violations Tab):** The 'Policing' section shows 'Allow' selected. Under 'Violations CoS Marking', 'Mark CoS' is selected with a value of 0.

Each window includes a table for matching criteria with columns: Match..., Match D..., DSCP Val..., Match IP, IP Value, Match CoS, CoS Value, AND / ..., and CIR T. The bottom window also shows a 'Save' button.

*[Policy map configuration for the ADVANCED QoS profile]*

```
Policy-map POLICY_{GIGE|FE}port_IN
  Class CLASS_BG BG_ADVANCED_Service Drop Port_N
    [N number of policies will be configured on the Service Drop Port = 0,1 for Gigabit Ethernet and Service Drop Port = 0 to 11 for Fast Ethernet.]

    police Committed Rate Committed Burst Size [Peak Rate pir Peak Burst] conform-action
    {transmit|set-cos-transmit Committed CoS Marking Value} [exceed-action
    {drop|set-cos-transmit Excess CoS Marking Value}][violate-action
    {drop|set-cos-transmit Violation CoS Marking Value}]

    [[Peak Rate pir Peak Burst] is applied only if Excess Traffic is Allowed.]
    [exceed-action drop is applied only if Excess Traffic is Discarded.]
    [Trust option is never selectable for Excess Traffic or Violation tab. Mark CoS option is always used when the Excess or Violations is Allowed.]
    [violation-action drop is applied only if Excess Traffic is Allowed and Violate Traffic is Discarded.]
```

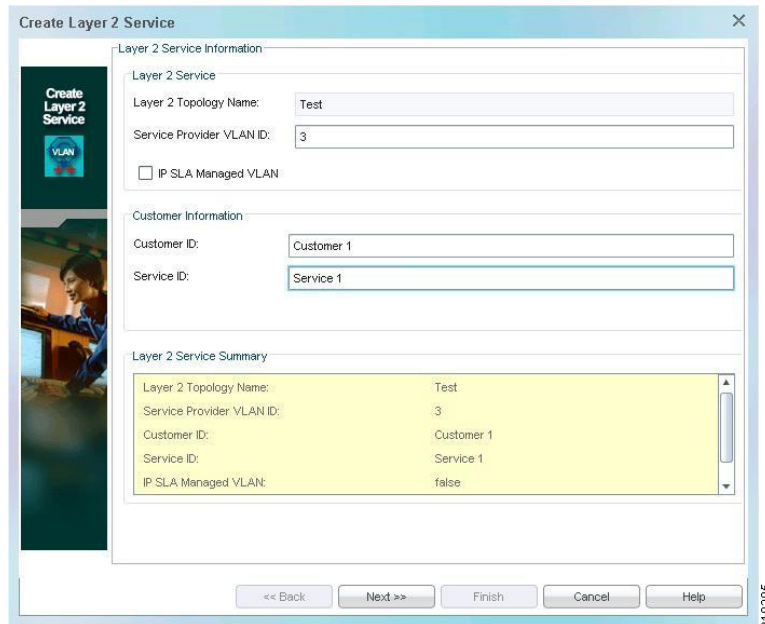
## Bandwidth Data Service Provisioning

In the **Control Panel > NE Service > CTC-Based SONET NEs** or **CTC-Based SDH NEs**, select the **Enable Bandwidth DSP** check box to enable the bandwidth data service provisioning check during L2 service provisioning. The bandwidth utilization report shows available and used bandwidth for each L2 topology. Use this report during L2 service provisioning to verify whether the requested CIR is available on the topology. An error is returned if there is not enough bandwidth available for a drop port.

## 3. Interface Configuration

### Adding UNI QinQ Access

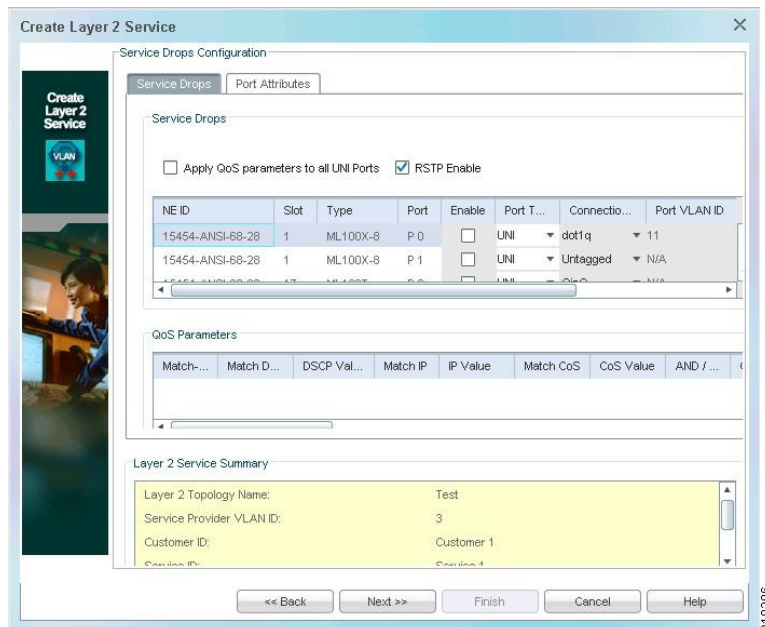
Any port with *mode dot1q-tunnel* is a UNI QinQ access connection. [Figure 15](#) and [Figure 16](#) show how to add UNI QinQ access using the Create Layer 2 Service wizard.

**Figure 15** Create Layer 2 Service Wizard—Adding UNI QinQ Access


The screenshot shows the 'Create Layer 2 Service' wizard. The 'Layer 2 Service Information' tab is active. The 'Layer 2 Service' section has 'Layer 2 Topology Name' set to 'Test' and 'Service Provider VLAN ID' set to '3'. The 'IP SLA Managed VLAN' checkbox is unchecked. The 'Customer Information' section has 'Customer ID' set to 'Customer 1' and 'Service ID' set to 'Service 1'. The 'Layer 2 Service Summary' section displays the following information:

Layer 2 Topology Name:	Test
Service Provider VLAN ID:	3
Customer ID:	Customer 1
Service ID:	Service 1
IP SLA Managed VLAN:	false

At the bottom, there are navigation buttons: '<< Back', 'Next >>', 'Finish', 'Cancel', and 'Help'.

**Figure 16** Create Layer 2 Service Wizard—Configuring Service Drops


The screenshot shows the 'Create Layer 2 Service' wizard with the 'Service Drops Configuration' tab active. The 'Service Drops' section has the 'Apply QoS parameters to all UNI Ports' checkbox unchecked and the 'RSTP Enable' checkbox checked. Below this is a table with the following data:

NE ID	Slot	Type	Port	Enable	Port T...	Connectio...	Port VLAN ID
15454-ANSI-68-28	1	ML100X-8	P 0	<input type="checkbox"/>	UNI	dot1q	11
15454-ANSI-68-28	1	ML100X-8	P 1	<input type="checkbox"/>	UNI	Untagged	N/A

The 'QoS Parameters' section is empty. The 'Layer 2 Service Summary' section displays the following information:

Layer 2 Topology Name:	Test
Service Provider VLAN ID:	3
Customer ID:	Customer 1
Service ID:	Service 1

At the bottom, there are navigation buttons: '<< Back', 'Next >>', 'Finish', 'Cancel', and 'Help'.

Enter the following commands to configure an interface:

```
[Interface configuration]
```

```
Interface {GigabitEthernetport|FastEthernetport}
```

```
Description QoS profile name
```

```
[Prime Optical issues the l2protocol-tunnel all command and the result is the following set of commands]
```

```
l2protocol-tunnel cdp
```

```

l2protocol-tunnel stp
l2protocol-tunnel vtp
no cdp enable

Mode dot1q-tunnel
Bridge-group BG
Service-policy input POLICY_{GIGE|FE}port_IN
Service-policy output POLICY_QOS_OUT
[The following commands are not issued by Prime Optical; rather, these are default ML
settings]
Bridge-group BG spanning-disable

Interface SPR1.Service Provider VLAN
Encapsulation dot1q Service Provider VLAN
Bridge-group BG
[The following commands are not issued by Prime Optical; rather, these are default ML
settings]
Bridge-group BG spanning-disable

```

## Removing UNI QinQ Access

Enter the following commands to delete a UNI QinQ drop:

*[Note the reverse order of commands]*

```

Interface SPR1.Service Provider VLAN
  No Bridge-group BG
  No Encap dot1q Service Provider VLAN
No Interface SPR1.Service Provider VLAN [Ignore the warning message]
Interface {GigabitEthernetport|FastEthernetport}
  No Bridge-group BG
  No Mode dot1q-tunnel
  No L2protocol-tunnel all
  No description
No class-map CLASS_BG BG_{CIRPIR|BESTEFFORT|ADVANCED_Service Drop Port_N}
[For Advanced QoS, remove all of the N number of class maps]

[When removing the last connection from a port]
No Policy-map POLICY_{GIGE|FE}port_IN
No Service-policy output POLICY_QOS_OUT

```

## Adding UNI dot1Q Access

Figure 17 is an example of the Create Layer 2 Service wizard for adding UNI dot1Q access.

**Figure 17** Create Layer 2 Service Wizard—Adding UNI dot1Q Access

**Create Layer 2 Service**

Service Drops Configuration

Service Drops

☐ Apply QoS parameters to all UNI Ports ☐ RSTP Enable

Type	Port	Enable	Port T...	Connectio...	Port VLAN ID	CoS Accoun...	RSTP
ML100X-8	P 0	<input type="checkbox"/>	UNI	QinQ	N/A	<input type="checkbox"/>	<input type="checkbox"/>
ML100X-8	P 1	<input type="checkbox"/>	UNI	QinQ	N/A	<input type="checkbox"/>	<input type="checkbox"/>

QoS Parameters

Match-...	Match D...	DSCP Val...	Match IP	IP Value	Match CoS	CoS Value	AND / ...

Layer 2 Service Summary

Layer 2 Topology Name:	Test
Service Provider VLAN ID:	3
Customer ID:	Customer 1
Service ID:	Service 1

<< Back Next >> Finish Cancel Help

The port is recognized as UNI if you enter the **service-policy input** command on the port interface; otherwise, the port is recognized as NNI. Every subinterface is a dot1q connection. The classification of UNI versus NNI is based on the port-level parsing. A connection is untagged if you enter the **encap dot1q 1** command. The multiple class map and QoS policy configurations for advanced QoS are similar to the QinQ Access example shown in Figure 17.

Enter the following commands to create a UNI Dot1q:

*[Interface configuration]*

*[First time only; first dot1q on this UNI port]*

```
Interface {GigabitEthernetport|FastEthernetport}
  Service-policy input POLICY_{GIGE|FE}port_IN
  Service-policy output POLICY_QOS_OUT
```

```
Interface {FastEthernetport|GigabitEthernetport}.Port VLAN
  Description QoS profile name
  Encapsulation dot1q Port VLAN
  Bridge-group BG
```

*[In the following command executed by Prime Optical, RSTP is not enabled]*

```
Bridge-group BG spanning-disable
```

```

Interface SPR1.Service Provider VLAN
  Encapsulation dot1q Service Provider VLAN
  Bridge-group BG
  [In the following command executed by Prime Optical, RSTP is not enabled]
  Bridge-group BG spanning-disable

```

## Removing UNI dot1Q Access

Enter the following commands to delete a UNI Dot1q:

*[Note the reverse order of commands]*

```

Interface SPR1.Service Provider VLAN
  No Bridge-group BG
No Encap dot1q Service Provider VLAN
No Interface SPR1.Service Provider VLAN [Ignore the warning message]
Interface port.Port VLAN
  No Bridge-group BG
  No Encap dot1q Port VLAN
  No description
No Interface port.Port VLAN [Ignore the warning message]
Policy-map POLICY_{GIGE|FE}port_IN
  No Class BG BG_{CIRPIR|BESTEFFORT|ADVANCED_Service Drop Port_N}
  [For Advanced QoS, remove all of the N number of class maps]

No class-map CLASS_BG BG_{CIRPIR|BESTEFFORT|ADVANCED_Service Drop Port_N}
[For Advanced QoS, remove all of the N number of class maps]

[When removing the last connection from a port]
No Policy-map POLICY_{GIGE|FE}port_IN
No Service-policy output POLICY_QOS_OUT

```

## Adding UNI Untagged Access

UNI untagged access is similar to UNI dot1Q access with port VLAN ID = 1.

## Adding NNI dot1Q Access

Enter the following commands to create an NNI Dot1Q:

*[Interface configuration]*

*[First time only; first connection on this port]*

```

Interface {FastEthernetport|GigabitEthernetport}
  Service-policy output POLICY_QOS_OUT

Interface {FastEthernetport|GigabitEthernetport}.Port VLAN
  Encap dot1q Port VLAN

Bridge-group BG
Interface spr 1.Server Provider VLAN
  Encap dot1q Server Provider VLAN
  Bridge-group BG

```

## Removing NNI dot1Q Access

Enter the following commands to delete an NNI Dot1Q:

*[Note the reverse order of commands]*

```

Interface spr 1.Server Provider VLAN
  No Bridge-group BG
  No Encap dot1q Server Provider VLAN
No Interface spr 1.Circuit VLAN [Ignore the warning message]
Interface port.Port VLAN
  No Bridge-group BG
  No Encap dot1q Port VLAN
No Interface {FastEthernetport|GigabitEthernetport}.Port VLAN [Ignore the warning message]

[When removing the last connection from a port]
No Service-policy output POLICY_QOS_OUT

```

## IP Service-Level Agreement on ML-Series Cards

IP SLA is an application embedded in Cisco IOS, which enables you to monitor service-level agreements (SLAs) on IP networks. Service levels are measured by downtime, bandwidth, latency, jitter, packet loss, and so on. Using the IP SLA application, you can verify service guarantees, increase network reliability by validating network performance, proactively identify network issues, and increase return on investment (ROI) by easing the deployment of new IP services.

IP SLA can be configured only on ML-series cards participating in point-to-point and RPR L2 topologies.



### Note

IP SLA is not supported on 802.17 RPR.

Three steps are required to enable IP SLA features:

1. [Create a Managed VLAN, page 37.](#)
2. [Create an IP SLA Session, page 39.](#)
3. [Manage the IP SLA Session, page 42.](#)

## 1. Create a Managed VLAN

Create a managed VLAN by selecting **IP SLA Managed VLAN** in the Layer 2 Service wizard (see [Figure 18](#)) to create a managed VLAN. You can create managed VLANs only on already existing point-to-point and RPR L2 topologies.

**Figure 18**      **Layer 2 Service Wizard—Managed VLAN-Enable**

**Create Layer 2 Service**

Layer 2 Service Information

Layer 2 Service

Layer 2 Topology Name: Test

Service Provider VLAN ID: 3

☒ IP SLA Managed VLAN

Customer Information

Customer ID: Customer 1

Service ID: Service 1

Layer 2 Service Summary

Layer 2 Topology Name:	Test
Service Provider VLAN ID:	3
Customer ID:	Customer 1
Service ID:	Service 1
IP SLA Managed VLAN:	true

<< Back   Next >>   Finish   Cancel   Help

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In the Service Drops Configuration pane > IP SLA tab (see [Figure 19](#)), IP addresses are automatically generated and assigned to all of the service drop points that Prime Optical manages.

**Figure 19** Create Layer 2 Service Wizard—IP SLA

**Create Layer 2 Service**

Service Drops Configuration

Service Drops | Port Attributes | **IP SLA**

Configure IP SLA Parameters

NE ID	Slot	Type	IP Address	Subnet	Protocol
15454-A...	1	ML100X-8	192.168.0.1	255.255.0.0	RIP
15454-A...	17	ML100T	192.168.0.2	255.255.0.0	RIP
15454-A...	17	ML100T	192.168.0.3	255.255.0.0	RIP

Layer 2 Service Summary

Layer 2 Topology Name: Test

Service Provider VLAN ID: 3

Customer ID: Customer 1

Service IP: Service 1

<< Back | Next >> | Finish | Cancel | Help

For information about commands that are issued based on the provisioning in the Service Drops and Port Attributes tabs, see [Creating Service Connections](#), page 21.

The following commands are issued when you assign an IP address to the service drop and specify the routing protocol.

#### IP Address Assignment

```
ip address IP Address Subnet [IP Address range is from 192.168.0.1 to 192.168.255.255.
Subnet value is 255.255.0.0.]
```

#### Routing Protocol Assignment

```
bridge bridgegroupno route ip [Unique bridgegroupno is created by Prime Optical. The
range is from 1 to 255.]
```

## 2. Create an IP SLA Session

Create an IP SLA session between a pair of ML-series cards, or between an ML-series card and non-ML IP addresses. Select either Cisco-supported service points or external-destination IP addresses.

You can use the VLAN table (when a managed VLAN is selected) with the Create IP SLA wizard (see [Figure 20](#)) to provision the IP SLA session.

**Figure 20**      **Create IP SLA Wizard**

**Create IP SLA**

**IP SLA Information**

Service Provider VLAN ID: 3

IP SLA ID: 2

Source IP Address: 192.168.0.1

Destination IP Address: 192.168.0.2

☐ External Destination IP Address

Probe Type: Jitter

☐ Enable IP SLA

**IP SLA Summary**

Service Provider VLAN ID:	3
IP SLA ID:	1
Service IP Address:	192.168.0.1
Destination IP Address:	192.168.0.2
Type Of Probing:	Jitter
Destination Port	2000
Number Of Packets	20
Interval (in millisecond)	20

<< Back   Next >>   Finish   Cancel   Help

**Note**

Prime Optical does not validate nonsupported external destination addresses. Ensure that the external destination is valid and that it responds to a **ping** command.

Prime Optical automatically generates the IP SLA ID. The service drop points are displayed in the source and destination points, and you can pick up any drop point. You can specify a non-Prime Optical supported destination. IP SLA can be enabled during or after creation of the IP SLA session.

**Note**

The source and destination port cannot be the same.

Two types of probes are supported: *jitter* and *echo*. Based on the probe type you select in the Create IP SLA wizard, you must enter additional information.

- If you select the jitter probe, enter a value for the following attributes (see [Figure 21](#)):
  - Destination Port—1 through 65535
  - NoOfPackets—1 through 60000
  - Interval—1 through 60000 (in milliseconds)
  - TOS (Type of Service)—0 through 255
  - Operation Frequency—1 through 604800 (seconds)

**Figure 21** Create IP SLA Wizard—Jitter Probe

**Create IP SLA**

**Jitter Information**

**Jitter Attributes**

Destination Port	2000
Number Of Packets	20
Interval (in millisecond)	20
Operation Frequency (in second)	60
TOS	5

**IP SLA Summary**

Service Provider VLAN ID:	3
IP SLA ID:	2
Service IP Address:	192.168.0.1
Destination IP Address:	192.168.0.2
Type Of Probing:	Jitter
Destination Port	2000
Number Of Packets	20
Interval (in millisecond)	20

<< Back Finish Cancel Help

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Prime Optical issues the following commands on the source:

```
rtr IPSLA ID [IPSLA ID number range is from 1 to 2147483647]
type jitter dest-ipaddr Destination IP Address dest-port Destination Port num-packets
Number of Packets interval Interval
tos TOS frequency Operation Frequency
```

The RTR responder is then configured on the destination for jitter operation. For a Prime Optical-supported destination (any ML-series cards), Prime Optical issues the following command on the destination:

```
rtr (responder)
```

**Note**

For the IP SLA session to work correctly on a destination that Prime Optical does not support, you must enter the **rtr (responder)** command on the destination.

- If you select the echo probe, no additional information is required and Prime Optical issues the following commands on the source:

```
rtr IPSLA ID [IP SLA number range is from 1 to 2147483647]

type echo protocol ipIcmpEcho Destination IP Address source-ipaddr Source IP Address
[Destination IP Address could be a Prime Optical-managed ML card or an external
device. Source IP Address is always a Prime Optical-managed ML card.]
```

**Note**

Performance monitoring is disabled for the IP SLA echo operation. If you select an echo row in the IP SLA performance monitoring (PM) table, the Performance menu is disabled.

### 3. Manage the IP SLA Session

To begin collecting, enable the IP SLA session. The operation ends after 3600 seconds, but you can restart it from the Restart IP SLA menu.

Use the IP SLA table (see [Figure 22](#)) to enable, restart, and delete IP SLA.

**Figure 22** IP SLA Table

IP SLA	NE ID	Slot Number	Equipment Type	Host IP Address	Destination IP Address	Operation Type	Operation Status
3	15454-ANSI-68-28	1	ML100X-8	192.168.0.1	192.168.0.3	jitter	Enabled
2	15454-ANSI-68-28	1	ML100X-8	192.168.0.1	192.168.0.2	jitter	Disabled

Column Name	Value
IP SLA Number	2
NE ID	15454-ANSI-68-28
Slot Number	1
Equipment Type	ML100X-8
Host IP Address	192.168.0.1

Use the following commands to enable, restart, and delete IP SLA:

#### Enable IP SLA

```
rtr schedule IPSLA ID start-time now [IP SLA Number range is from 1 to 2147483647]
```

#### Restart IP SLA

```
rtr restart IPSLA ID [IP SLA Number range is from 1 to 2147483647]
```

#### Delete IP SLA

```
No rtr IPSLA ID [IP SLA Number range is from 1 to 2147483647]
```

**Note**

The MIB uses SNMP to retrieve PM statistics on IP SLA.

The following table lists the PM data retrieved on IP SLA for jitter. To view the statistics, choose **IP SLA Table > Performance** (see [Figure 22](#)).

**Table 5** *PM-Related Data for Jitter*

Prime Optical Name	Field Supported
rttMonJitterStatsStartTimeIndex	The time at which the IP SLA was created.
rttMonJitterStatsCompletions	The number of jitter operations that were successful.
rttMonJitterStatsOverThresholds	The number of jitter operations that violate the threshold.
rttMonJitterStatsNumOfRTT	The number of successful round trips.
rttMonJitterStatsRTTSum	The sum of the round-trip values.
rttMonJitterStatsRTTSum2Low	The sum of the squares of the low round-trip values.
rttMonJitterStatsRTTSum2High	The sum of the squares of the high round-trip values.
rttMonJitterStatsRTTMin	The minimum number of round-trip times (RTTs) that were measured successfully.
rttMonJitterStatsRTTMax	The maximum number of RTTs that were measured successfully.
rttMonJitterStatsMinOfPositivesSD	The minimum positive jitter values from the source to the destination. Positive jitter values indicate delays in receiving time from one packet to another.
rttMonJitterStatsMaxOfPositivesSD	The maximum positive jitter values from the source to the destination.
rttMonJitterStatsNumOfPositivesSD	The number of jitter values from the source to the destination that are positive (that is, network latency increases for two consecutive test packets).
rttMonJitterStatsSumOfPositivesSD	The sum of the positive values.
rttMonJitterStatsSum2PositivesSDLow	The sum of the squares of the low positive values.
rttMonJitterStatsSum2PositivesSDHigh	The sum of the squares of the high positive values.
rttMonJitterStatsMinOfNegativesSD	The minimum negative jitter values from the source to the destination. The absolute value is given.
rttMonJitterStatsMaxOfNegativesSD	The maximum negative jitter values from the source to the destination. The absolute value is given.
rttMonJitterStatsNumOfNegativesSD	The number of jitter values from the source to the destination that are negative (that is, network latency decreases for two consecutive test packets).
rttMonJitterStatsSumOfNegativesSD	The sum of the negative values.
rttMonJitterStatsSum2NegativesSDLow	The sum of the squares of the negative low values.
rttMonJitterStatsSum2NegativesSDHigh	The sum of the squares of the negative high values.
rttMonJitterStatsMinOfPositivesDS	The minimum of all positive jitter values from packets sent from the destination to the source.
rttMonJitterStatsMaxOfPositivesDS	The maximum of all positive jitter values from packets sent from the destination to the source.
rttMonJitterStatsNumOfPositivesDS	The sum of numbers of all positive jitter values from packets sent from the destination to the source.
rttMonJitterStatsSumOfPositivesDS	The sum of RTTs of all positive jitter values from packets sent from the destination to the source.
rttMonJitterStatsSum2PositivesDSL	The sum of squares of RTTs of all positive jitter values from packets sent from the destination to the source (low-order 32 bits).

**Table 5** *PM-Related Data for Jitter (continued)*

Prime Optical Name	Field Supported
rttMonJitterStatsSum2PositivesDSHigh	The sum of the squares of RTTs of all positive jitter values from packets sent from the destination to the source (high-order 32 bits).
rttMonJitterStatsMinOfNegativesDS	The minimum of all negative jitter values from packets sent from the destination to the source.
rttMonJitterStatsMaxOfNegativesDS	The maximum of all negative jitter values from packets sent from the destination to the source.
rttMonJitterStatsNumOfNegativesDS	The sum of numbers of all negative jitter values from packets sent from the destination to the source.
rttMonJitterStatsSumOfNegativesDS	The sum of RTTs of all negative jitter values from packets sent from the destination to the source.
rttMonJitterStatsSum2NegativesDSLow	The sum of the squares of RTTs of all negative jitter values from packets sent from the destination to the source (low-order 32 bits).
rttMonJitterStatsSum2NegativesDSHigh	The sum of the squares of RTTs of all negative jitter values from packets sent from the destination to the source (high-order 32 bits).
rttMonJitterStatsPacketLossSD	The number of packets that were lost from the source to the destination.
rttMonJitterStatsPacketLossDS	The number of packets that were lost from the destination to the source.
rttMonJitterStatsPacketOutOfSequence	The number of packets that were returned out of order.
rttMonJitterStatsPacketMIA	The number of packets that were lost where the direction (source-to-destination or destination-to-source) cannot be determined.
rttMonJitterStatsPacketLateArrival	The number of packets that arrived after the timeout.
rttMonJitterStatsError	The number of times an operation could not be started due to other internal failures.
rttMonJitterStatsBusies	The number of times the operation could not be started because the previously scheduled run was not finished.
rttMonJitterStatsOWSumSD	The sum of one-way times from the source to the destination.
rttMonJitterStatsOWSum2SDLow	The sum of the squares of one-way times from the source to the destination (low-order 32 bits).
rttMonJitterStatsOWSum2SDHigh	The sum of the squares of one-way times from the source to the destination (high-order 32 bits).
rttMonJitterStatsOWMinSD	The minimum of all one-way times from the source to the destination.
rttMonJitterStatsOWMaxSD	The maximum of all one-way times from the source to the destination.
rttMonJitterStatsOWSumDS	The sum of one-way times from the destination to the source.
rttMonJitterStatsOWSum2DSLow	The sum of the squares of one-way times from the destination to the source (low-order 32 bits).
rttMonJitterStatsOWSum2DSHigh	The sum of the squares of one-way times from the destination to the source (high-order 32 bits).
rttMonJitterStatsOWMinDS	The minimum number of all one-way times from the destination to the source.
rttMonJitterStatsOWMaxDS	The maximum number of all one-way times from the destination to the source.

**Table 5** *PM-Related Data for Jitter (continued)*

Prime Optical Name	Field Supported
rttMonJitterStatsNumOfOW	The number of one-way times that were measured successfully.
rttMonJitterStatsOWMinSDNew	The minimum number of all one-way times from the source to the destination. Replaces deprecated rttMonJitterStatsOWMinSD.

## Enabling or Disabling Rapid Spanning Tree Protocol

You can enable Rapid Spanning Tree Protocol (RSTP) on UNI dot1Q, UNI Untagged, and NNI dot1Q ports by selecting the RSTP for the selected drop port and then checking the RSTP Enable check box (see [Figure 23](#)). To disable RSTP, select the RSTP for the selected drop port and uncheck the RSTP Enable check box.



### Note

RSTP can be enabled only on a drop where UNI/NNI dot1Q is selected and only on a subinterface (that is, UNI dot1Q drop) where no other QinQ drops were created for the same interface.

**Figure 23** *Create Layer 2 Service Wizard—RSTP Enable*

**Create Layer 2 Service**

Service Drops Configuration

Service Drops

☐ Apply QoS parameters to all UNI Ports ☒ RSTP Enable

Type	Port	Enable	Port T...	Connectio...	Port VLAN ID	CoS Accoun...	RSTP
ML100X-8	P 0	<input checked="" type="checkbox"/>	UNI	GinQ	N/A	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ML100X-8	P 1	<input checked="" type="checkbox"/>	UNI	GinQ	N/A	<input type="checkbox"/>	<input checked="" type="checkbox"/>

QoS Parameters

Match...	Match D...	DSCP Val...	Match IP	IP Value	Match CoS	CoS Value	AND / ...

Layer 2 Service Summary

Layer 2 Topology Name: Test

Service Provider VLAN ID: 3

Customer ID: Customer 1

Service ID: Service 1

<< Back Next >> Finish Cancel Help

Click **Next** to configure QoS parameters as required (see [Figure 24](#)).

**Figure 24** Create Layer 2 Service Wizard—QoS Parameters

**Create Layer 2 Service**

QoS Parameters

Profile Custom QoS

Load From QoS Profile Best\_Effort

Match-...	Match D...	DSCP Val...	Match IP	IP Value	Match CoS	CoS Value
true	false		false		false	

Layer 2 Service Summary

Layer 2 Topology Name: Test

Service Provider VLAN ID: 2

<< Back Next >> Finish Cancel Help

If the RSTP Enable check box is checked, Prime Optical issues the following command specified for adding a drop:

*[Configure RSTP; this command is issued once for VLANs]*  
 bridge BG protocol rstp

*[Enable RSTP on the selected drop]*  
 Interface {FastEthernetport|GigabitEthernetport}.Port VLAN  
 Bridge-group BG

The following command is issued when you disable RSTP from a drop:

*[Disable RSTP on the selected drop]*  
 Interface {FastEthernetport|GigabitEthernetport}.Port VLAN  
 Bridge-group BG  
 Bridge-group BG spanning-disabled *[Disable RSTP on the selected drop]*

**Note**

- Enabling or disabling RSTP on a port basis is not valid if you configured a bridge group to the main Ethernet interface. By default, the CLI disables the dot1Q drop in the card.
- If only the RSTP Enable check box is checked, the Spanning Tree Protocol remains disabled on the VLAN service drops.

# Enabling or Disabling Cisco Discovery Protocol

You can enable or disable Cisco Discovery Protocol (CDP) when:

- [Creating a Layer 2 Service, page 47](#)
- [Modifying Layer 2 Service Drops, page 47](#)
- [Modifying Drops, page 48](#)

## Creating a Layer 2 Service

In the Create Layer 2 Service wizard > Port Attributes tab > CDP drop-down list (see [Figure 25](#)), choose **enable** or **disable** to enable or disable CDP.

**Figure 25** Create Layer 2 Service Wizard—Enable or Disable CDP

The screenshot shows the 'Create Layer 2 Service' wizard window. The 'Port Attributes' tab is selected. A table titled 'Modify Port Properties' contains five rows of configuration options. The 'CDP' column for each row has a dropdown menu open, showing 'enable' and 'disable' options. Below the table is a 'Layer 2 Service Summary' section with fields for 'Layer 2 Topology Name' (Test), 'Service Provider VLAN ID' (4), and 'Customer ID' (Customer 2). At the bottom are navigation buttons: '<< Back', 'Next >>', 'Finish', 'Cancel', and 'Help'.

Speed	Duplex	Flow Control (send)	Flow Control (receive)	CDP
100	auto	desired	desired	enable
100	auto	desired	desired	enable
auto	auto	desired	desired	enable
auto	auto	desired	desired	enable
auto	auto	desired	desired	enable

Layer 2 Service Summary

Layer 2 Topology Name: Test

Service Provider VLAN ID: 4

Customer ID: Customer 2

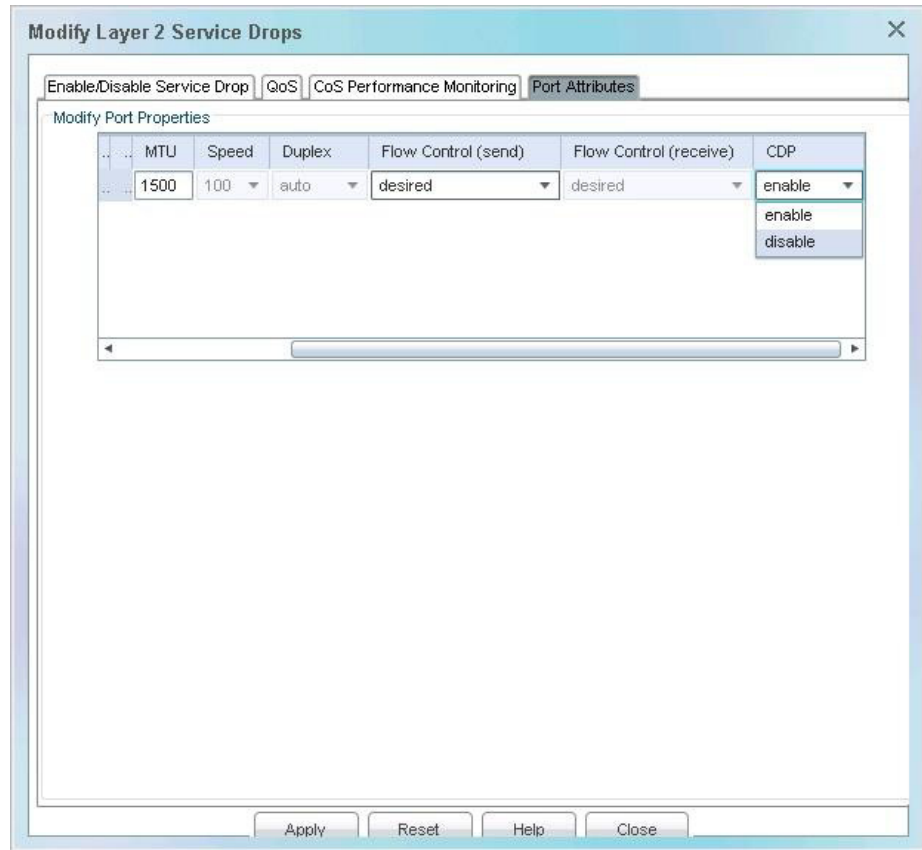
Service ID: Service 4

<< Back Next >> Finish Cancel Help

## Modifying Layer 2 Service Drops

In the Modify Layer 2 Service Drops wizard > Port Attributes tab > CDP drop-down list (see [Figure 26](#)), choose **enable** or **disable** to enable or disable CDP. Click **Apply**.

**Figure 26** *Modify Layer 2 Service Drops Wizard—Enable or Disable CDP*



## Modifying Drops

- Step 1** In the Domain Explorer window, choose **Configuration > CTC-Based SONET NEs or CTC-Based SDH NEs > L2 Topology Table**.
- Step 2** In the Layer 2 Topology table, choose **Configuration > Show L2 Services**.
- Step 3** In the L2 Services table, select a service; then, choose **Configuration > Show Drops**. The L2 Service Drop Ports table opens, listing all the drops in the selected service.

**Figure 27** Layer 2 Service Drop Ports Table

NE ID	Slot	Port	Port VLAN ID	Interface Type	Port Type	Con Type	QoS Profile Name	Drop Status	CoS PM State	RSTP	IP
1545...	1	P 4	N/A	FE	UNI	GinQ	Best_Effort	Disabled	Disabled	Disabled	N
1545...	1	P 0	4	FE	UNI	dot1q	Best_Effort	Disabled	N/A	Disabled	N
1545...	17	P 4	N/A	FE	UNI	GinQ	Best_Effort	Disabled	Disabled	Disabled	N
1545...	17	P 0	4	FE	UNI	dot1q	Best_Effort	Disabled	N/A	Disabled	N
1545...	17	P 6	N/A	FE	UNI	GinQ	Best_Effort	Disabled	Disabled	Disabled	N
1545...	17	P 3	N/A	FE	UNI	GinQ	Best_Effort	Disabled	Disabled	Disabled	N

Column Name	Value
NE ID	15454-ANSI-68-28
Slot Number	1
Port	P 4
Port VLAN ID	N/A
Interface Type	FE

Page 1 (6 rows in the table) | Server Time: 3:33:29 PM

**Step 4** Choose **Configuration > Modify Ports**. The Modify Ports dialog box opens (see [Figure 28](#)).

**Figure 28** Modify Ports

**Modify Ports - Test**

NE/Slot

NE ID: 15454-ANSI-68-28 Slot: 1 (ML100X-8)

Enable/Disable Port

Ether PoS SPR

Flow Control(send)	Flow Control(receive)	CDP
	on	enable
	on	disable
		enable
		disable

Close Apply Help

**Step 5** In the Enable/Disable Port > CDP drop-down list, choose **enable** or **disable** to enable or disable CDP.

Prime Optical issues the following command when you enable CDP on a selected drop:

```
Interface {FastEthernetport|GigabitEthernetport}.Port-VLAN
```

```
cdp enable
```

Prime Optical issues the following command when you disable CDP on a selected drop:

```
Interface {FastEthernetport|GigabitEthernetport}.Port-VLAN
no cdp enable
```

## ML Management Troubleshooting

If a problem arises during the initial synchronization, you can resynchronize the Layer 2 topology by choosing **Configuration > Resync L2 Topology** in the Layer 2 Topology table (see [Figure 29](#)).



### Note

This feature only restarts the L2 topology resynchronization state. It does not forcefully apply any configuration on the ML-series card to complete the synchronization of the L2 topology.

Alternative methods of resynchronization are:

- Mark the NEs participating in the L2 topology as Out of Service, and then In Service.
- Restart the NE service.

Although effective, these methods cause a time lag that affects other functions, such as inventory collection and circuit discovery.

**Figure 29** *Layer 2 Topology Table—Resynchronize L2 Topology*

Layer 2 Topology Alias	Description	Type	Size	State	L1 Protection	Operations
16	VTI 5-2v	Point To P...	VTI 5-2v	Complete	Unprotected	IS
34	STS-1-2v	Point To P...	STS-1-2v	Complete	Unprotected	IS
15	VTI 5-2v	Point To P...	VTI 5-2v	Complete	Unprotected	IS
16	VTI 5-2v	Point To P...	VTI 5-2v	Complete	Unprotected	IS
13	VTI 5-2v	Point To P...	VTI 5-2v	Complete	Unprotected	IS
28a	VTI 5-2v	Point To P...	VTI 5-2v	Complete	Unprotected	IS
30a	VTI 5-3v	Point To P...	VTI 5-3v	Complete	Unprotected	IS
25a	VTI 5-2v	Point To P...	VTI 5-2v	Complete	Unprotected	IS
33	STS-1-2v	Point To P...	STS-1-2v	Complete	Unprotected	IS
Test#1	Test#1-CTM-2	RPR	STS-1	Complete	Unprotected	IS
20	VTI 5-2v	Point To P...	VTI 5-2v	Complete	Unprotected	IS

Column Name	Value
Layer 2 Topology Name	16
Layer 2 Topology Alias	16
Description	
Layer 2 Topology Type	Point To Point
Layer 2 Topology Size	VTI 5-2v

# ML Version Up

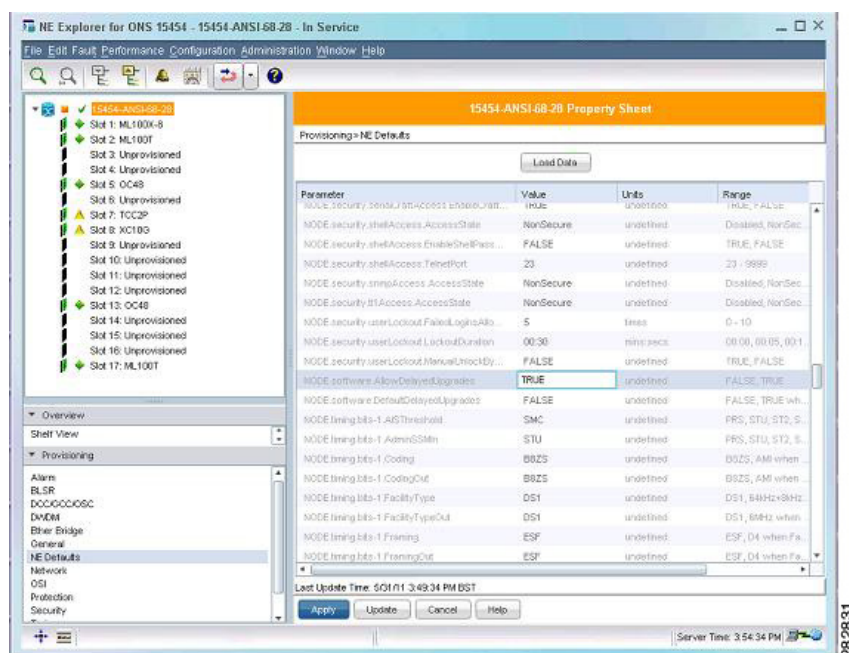
When you upgrade a node, you can choose to upgrade the software running on the ML-series cards at a later time. The Version Up feature allows you to delay upgrading the ML-series card, and to choose which ML-series card to upgrade to the new version. By using this feature, you can also view the state of the node with respect to the upgrade, which can be:

- Complete upgrade—All the non-ML and ML-series cards have been upgraded to the new software release.
- Partial upgrade—The ML-series cards have not all been upgraded to the new software release.

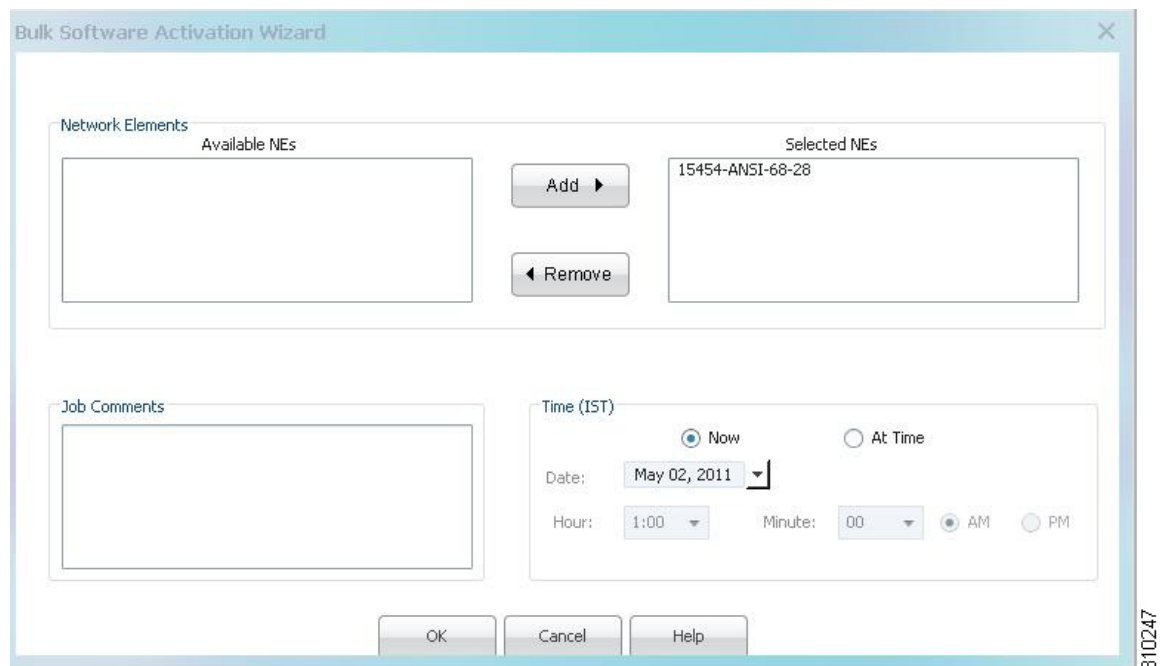
To enable the Version Up feature, complete the following steps:

1. Set the value for the parameter `NODE.Software.AllowDelayedUpgrade` in the Value column under the NE Defaults tab to **TRUE** (see [Figure 30](#)).

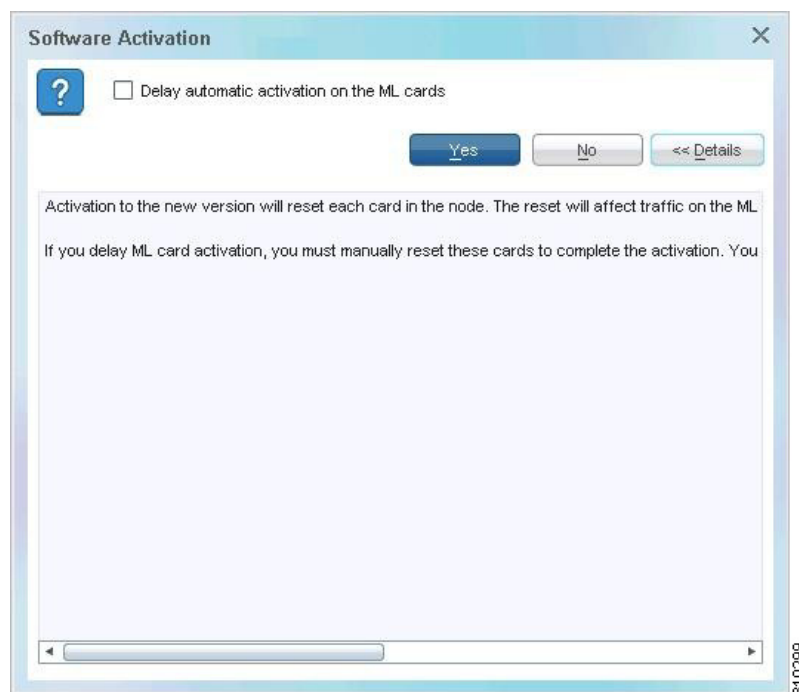
**Figure 30** NE Explorer—NE Defaults Tab



2. Activate the NE software. Use the Bulk Software Activation wizard to activate the NE software (see [Figure 31](#)). For specific instructions, see the section “Scheduling Bulk Software Activation” in Chapter 4, “Maintaining an Efficient Network” in the [Cisco Prime Optical 9.6 User Guide](#).

**Figure 31** Bulk Software Activation Wizard

During NE software activation, you are asked if you want to delay the software upgrade on the ML-series cards (see [Figure 32](#)). For specific instructions, see the section “Delaying Software Activation on the ML-Series Cards” in Chapter 4, “Maintaining an Efficient Network” in the *Cisco Prime Optical 9.6 User Guide*.

**Figure 32** Software Activation

**Note**

- While ML-series cards on the NE are waiting to be upgraded, all provisioning operations and software downloads on the NE are disallowed.
- You can upgrade the NE fully to the latest version by resetting all the ML-series cards to this version.

After a successful partial software activation on the NE, the NE Software table (see [Figure 33](#)) displays *True* in the Partial Upgrade column, which indicates that the activation is pending for ML-series cards.

3. Upgrade the ML-series cards to the current version by resetting them on the NE in either of the following ways:
  - Select multiple ML-series cards and choose **Edit > Reset ML Cards** in the NE Software table. For specific instructions, see the section “Activating a New NE Software Version on One or More ML-Series Card(s)” in Chapter 4, “Maintaining an Efficient Network” in the [Cisco Prime Optical 9.6 User Guide](#).
  - For individual ML-series cards, use the NE Explorer.

The Partial Upgrade column in the NE Software table displays *FALSE* when all ML-series cards are upgraded to the current version.

**Figure 33** NE Software Table—Reset ML Cards

Column Name	Value
NE Model Name	Cisco CNS 15454
Alias ID	nmtg-454sonet-210
Physical Location	
NE Type	Not Available
Active Software Filename	9.1.0 (09.10-009J-25.17)

## Enable L2 Service Command Enhancement

The enable L2 service command has been enhanced. (See the section “Enabling Layer 2 Services” in Chapter 7, “Provisioning Services and Connections” in the [Cisco Prime Optical 9.6 User Guide](#).)

The enable L2 service command is used only when the resynchronization status of the topology is *L2 Service Not Ready*, and its main purpose is to change the Layer 2 topology into a resynchronization status of *Complete* so that a VLAN can be created.

Instead of commanding the default base card configuration on all ML-series cards in the topology to be downloaded, this command downloads a customized base card configuration on only the selected Layer 2 topology ML-series cards that do not have the customized configuration and are in a synchronized configuration state (barebone file downloaded).

This command applies to point-to-point, Cisco RPR, and 802.17 RPR Layer 2 topologies.

## Related Documentation

See [Cisco Prime Optical 9.6 Documentation Overview](#) for a list of Prime Optical guides.

## Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

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