



Managing DWDM Networks

The Cisco IP over dense wavelength division multiplexing (IPoDWDM) solution enables the convergence of the IP and DWDM core networks of the service providers. It increases service flexibility, operational efficiency and reliability while lowering operating expenses (OpEx) and capital expenditures (CapEx).

Prime Network discovers and displays the following DWDM attributes in the Physical Inventory tree of the Vision client:

- DWDM controllers. The controller location is same as the DWDM interface.
- Loopback information for the DWDM controller.
- DWDM controller status.
- DWDM port properties—Wavelength, Laser Status, Tx Power, and Rx Power.
- DWDM controller card status (G.709 status).

Prime Network also provides commands that support DWDM and Synchronous Optical Network (SONET) controllers. These commands help in configuring the device and in displaying device details. The commands are described in [Configuring and Viewing DWDM, page 17-14](#). (For information on the SONET commands, see [Configuring Clock, page 27-55](#).)

The following topics describe how you can view and monitor IP over dense wavelength division multiplexing (DWDM) properties configured on network elements by using the Vision client. If you cannot perform an operation that is described in these topics, you may not have sufficient permissions; see .

- [Viewing DWDM in Physical Inventory, page 17-2](#)
- [Viewing G.709 Properties, page 17-4](#)
- [Viewing Performance Monitoring Configuration, page 17-10](#)
- [Configuring and Viewing DWDM, page 17-14](#)

Viewing DWDM in Physical Inventory

The Vision client enables you to monitor a variety of DWDM properties in physical inventory, including forward error correction (FEC), G.709 status, and performance monitoring parameters.

To view DWDM properties in physical inventory:

- Step 1** In the Vision client, double-click the device on which DWDM is configured.
- Step 2** In the inventory window, choose **Physical Inventory > Chassis** and navigate to the interface configured for DWDM. DWDM details are displayed in the DWDM area in the content pane as shown in [Figure 17-1](#).

Figure 17-1 DWDM Properties in Physical Inventory

The screenshot displays the Cisco Prime Network 4.1 Vision client interface. The left pane shows a tree view of the physical inventory, with the following structure:

- Shelf 0
 - Slot 4: Card - 8-10GBE
 - TenGigE0/4/0/0
 - TenGigE0/4/0/1
 - TenGigE0/4/0/2
 - TenGigE0/4/0/3
 - TenGigE0/4/0/4
 - TenGigE0/4/0/5
 - TenGigE0/4/0/6
 - TenGigE0/4/0/7
 - Slot 5: Card - CRS-MSC
 - Slot 10: Card - 10C768-ITU/C
 - POS0/5/0/0
 - Slot 5: Card - CRS-MSC
 - Slot 10: Card - CRS1-STP-800
 - Subslot 1: Subcard - SPA-1
 - TenGigE0/10/1/0
 - Slot 10: Card - CRS-MSC
 - Slot 13: Card - 40C192-POS/D
 - Slot 13: Card - CRS-MSC
 - Slot 14: Card - 16OC48-POS/D
 - Slot 14: Card - CRS-MSC
 - 0/F0/*: CRS-16-LCC-FAN-CT
 - 0/F0/*: CRS-16-LCC-FAN-CT
 - Rack-0 - Fan Tray Upper: CRS-
 - Rack-0 - Fan Tray Lower: CRS-
 - 0/AM0/*: CRS-16-ALARM
 - 0/AM1/*: CRS-16-ALARM

The right pane displays the configuration and status for the selected interface, OC768:

OC768

Admin Status:	Up	Oper Status:	Up
Port Type:	SONET	Last Changed:	24-Jun-11 11:27:27
Scrambling:		Maximum Speed:	39.813 Gbps
Loopback:	None	MTU:	4474
Clocking:	Unknown	Specific Type:	OC768
Internal Port:	false	Ss Ctps Table Size:	0

DWDM

Location:	0/5/0/0	Controller Status:	Up
Loopback:	None	Frequency:	195.55THz
Port Type:	DWDM	MSA ITU Channel:	12
Rx Power:	-26.36 dBm	Tx Power:	0.03 dBm
Rx LOS Threshold:	-19.5 dBm	Wavelength:	1533.073nm
Wavelength Band:	C-Band	Optics Type:	DWDM

G709 Status: Up **OTU Detected Alarms:** BDI

ODU Detected Alarms: AIS **OTU Detected Alerts:**

ODU Detected Alerts:

FEC Info: FEC Mode = Enhanced
Remote FEC mode=Unknown
FEC Mismatch Counter = 1234

At the bottom of the interface, there is a search bar, navigation tabs (Tickets, Network Events, Provisioning Events), and system status indicators (Memory: 5%, Connected).

Table 17-1 describes the information displayed for DWDM.

Table 17-1 DWDM Properties in Physical Inventory

Field	Description
Location	Physical interface using the format <i>rack/slot/module/port</i> where: <ul style="list-style-type: none"> <i>rack</i> is the chassis number of the rack. <i>slot</i> is the physical slot number of the line card. <i>module</i> is the module number. A physical layer interface module (PLIM) is always 0. Shared port adapters (SPAs) are referenced by their subslot number. <i>port</i> is the physical port number of the interface.
Controller Status	Status of the controller: Up or Down.
Loopback	Whether or not the DWDM controller is configured for loopback mode.
Frequency	Frequency of the channel in terahertz.
Port Type	The port type. In this case, DWDM.
MSA ITU Channel	Multi Source Agreement (MSA) ITU channel number.
Rx Power	Actual optical power at the receiving port.
Tx Power	Value of the transmit power level.
Rx LOS Threshold	Number of optical channel transport unit (OTU) loss of signal (LOS) alarms. If the receive optical power is less than or equal to this defined threshold, the optical LOS alarm is raised.
Wavelength	Wavelength corresponding to the channel number in nanometers.
Wavelength Band	Indicates the wavelength band: C-band or L-band.
Optics Type	Indicates the optics type: GE or DWDM.
G709 Properties	
G709 Status	Whether the G.709 wrapper is enabled or disabled: Up or Down.
OTU Detected Alarms	OTU overhead alarms.
ODU Detected Alarms	Optical channel data unit (ODU) alarms.
OTU Detected Alerts	OTU alerts.
ODU Detected Alerts	ODU alerts.
FEC Info	Indicates the: <ul style="list-style-type: none"> FEC mode of the controller: Disabled, Enhanced, Standard, or Unknown. FEC mode on the remote device: Disabled, Enhanced, Standard, or Unknown. Number of sync word mismatches found during the tracking phase.
G709 Details	Click to view G709 properties. For more information, see Viewing G.709 Properties, page 17-4 .

Table 17-1 DWDM Properties in Physical Inventory (continued)

Field	Description
PM 15-min Settings	Click to view 15-minute performance monitoring properties. For more information, see Viewing Performance Monitoring Configuration, page 17-10 .
PM 24-hour Settings	Click to view 24-hour performance monitoring properties. For more information, see Viewing Performance Monitoring Configuration, page 17-10 .

Viewing G.709 Properties

The Telecommunication Standardization Sector (ITU-T) Recommendation G.709 provides a standardized method for transparently transporting services over optical wavelengths end to end. A significant component of G.709 is the FEC code that improves performance and extends the distance that optical signals can span.

To view G.709 properties:

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- Step 1** In the Vision client, double-click the device on which DWDM is configured.
 - Step 2** In the inventory window, choose **Physical Inventory > Chassis** and navigate to the interface configured for DWDM.
 - Step 3** In the content pane, click **G709 Details**. [Figure 17-2](#) and [Figure 17-3](#) provide examples of the G709 Info Properties windows. Most devices provide the information shown in [Figure 17-2](#).

Figure 17-2 DWDM G709 Properties Window—Example 1

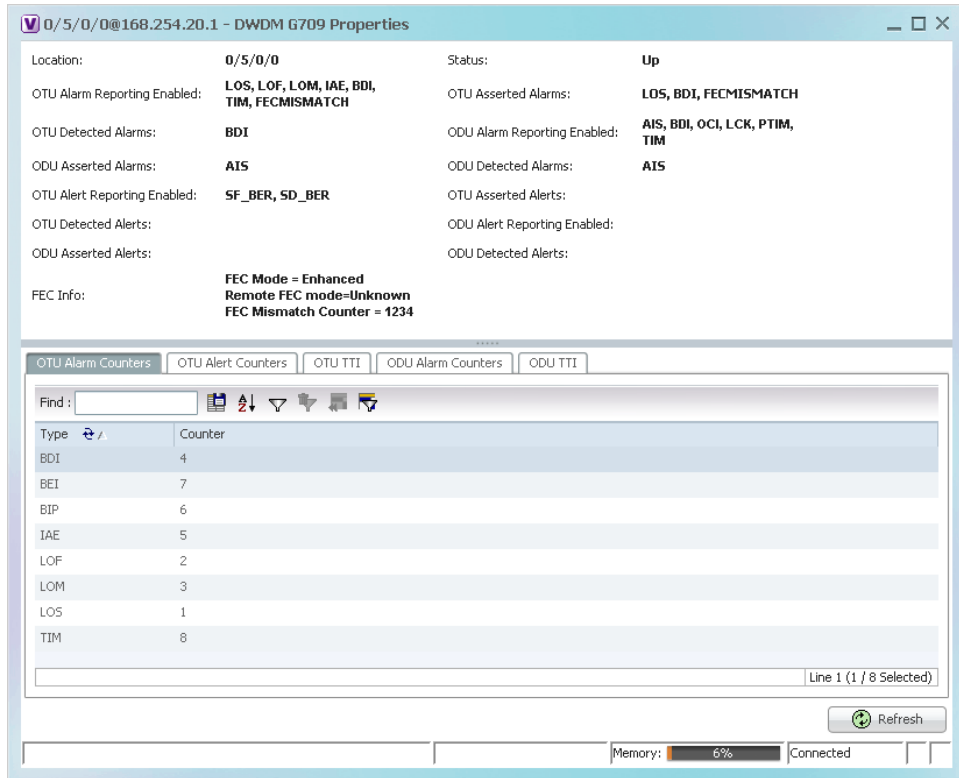


Figure 17-3 shows the tabs that are displayed for devices such as the Cisco 7600 series, where the ODU Alert Counters tab is displayed, but the the ODU TTI and OTU TTI tabs are *not* displayed.

Figure 17-3 DWDM G709 Properties Window – Example 2

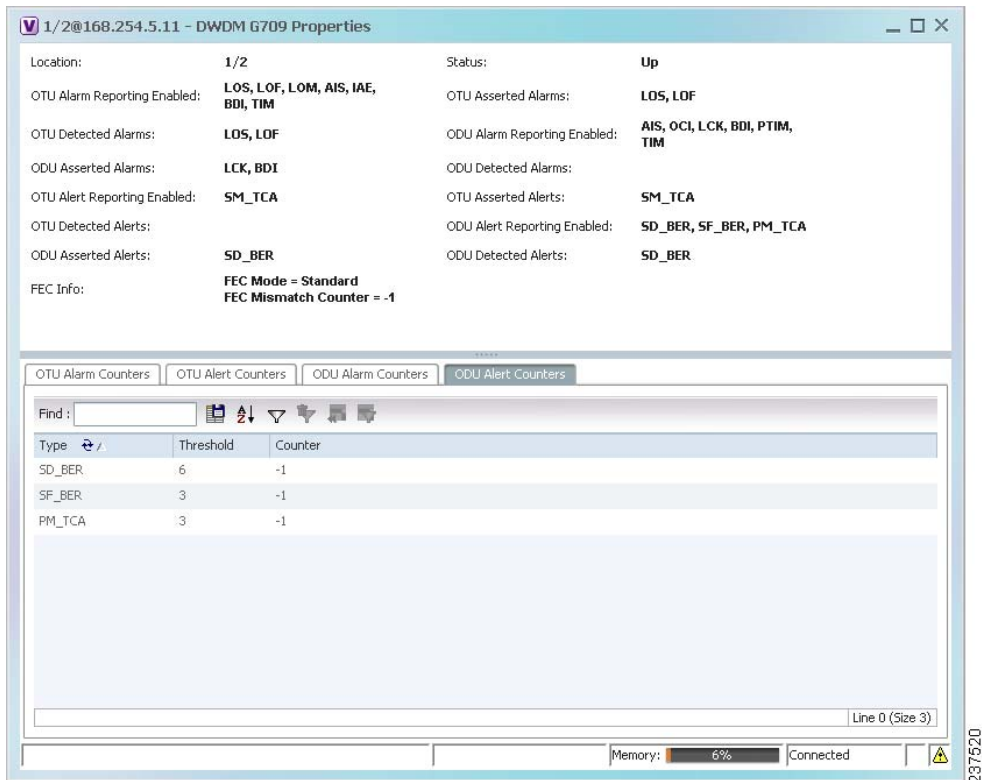


Table 17-2 describes the fields that are displayed above the tabs in the G709 Info Properties window.

Table 17-2 DWDM G709 Properties Window

Field	Description
Location	Physical interface using the format <i>rack/slot/module/port</i> where: <ul style="list-style-type: none"> <i>rack</i> is the chassis number of the rack. <i>slot</i> is the physical slot number of the line card. <i>module</i> is the module number. A physical layer interface module (PLIM) is always 0. Shared port adapters (SPAs) are referenced by their subslot number. <i>port</i> is the physical port number of the interface.

Table 17-2 DWDM G709 Properties Window (continued)

Field	Description
OTU Alarms	
OTU Alarm Reporting Enabled for	The types of alarms enabled for reporting: <ul style="list-style-type: none"> • AIS—Alarm indication signal (AIS) alarms. • BDI—Backward defect indication (BDI) alarms. • BEI—Backward error indication (BEI) alarms. • BIP—Bit interleaved parity (BIP) alarms. • FECMISMATCH—FEC mismatch alarms. • IAE—Incoming alignment error (IAE) alarms. • LOF—Loss of frame (LOF) alarms. • LOM—Loss of multiple frames (LOM) alarms. • LOS—Loss of signal (LOS) alarms. • TIM—Type identifier mismatch (TIM) alarms.
OTU Asserted Alarms	OTU alarms indicated to be reported by the user.
OTU Detected Alarms	OTU alarms detected by the hardware.
ODU Alarms	
ODU Alarm Reporting Enabled for	The types of ODU alarms enabled for reporting: <ul style="list-style-type: none"> • AIS—Incoming SONET AIS error status. • BDI—Path termination BDI error status. • BEI—Backward error indication (BEI) error status. • BIP—Bit interleaved parity (BIP) error status. • LCK—Upstream connection locked (LCK) error status. • OCI—Open connection indication (OCI) error status. • PTIM—Payload TIM error status. • TIM—Data stream TIM error status.
ODU Asserted Alarms	ODU alarms indicated to be reported by the user.
ODU Detected Alarms	ODU alarms detected by the hardware.

Table 17-2 DWDM G709 Properties Window (continued)

Field	Description
OTU Alerts	
OTU Alert Reporting Enabled for	The types of alerts enabled for reporting: <ul style="list-style-type: none"> • SD-BER—Section Monitoring (SM) bit error rate (BER) is in excess of the signal degradation (SD) BER threshold. • SF-BER—SM BER is in excess of the signal failure (SF) BER threshold. • PM-TCA—Performance monitoring (PM) threshold crossing alert (TCA). • SM-TCA—SM threshold crossing alert.
OTU Asserted Alerts	OTU alerts indicated to be reported by the user.
OTU Detected Alerts	OTU alerts detected by the hardware.
ODU Alerts	
ODU Alert Reporting Enabled for	The types of ODU alerts enabled for reporting: <ul style="list-style-type: none"> • SD-BER—SM BER is in excess of the SD BER threshold. • SF-BER—SM BER is in excess of the SF BER threshold. • PM-TCA—PM threshold crossing alert. • SM-TCA—SM threshold crossing alert.
ODU Asserted Alerts	ODU alerts indicated to be reported by the user.
ODU Detected Alerts	ODU alerts detected by the hardware.
Other	
FEC Info	FEC properties: <ul style="list-style-type: none"> • FEC mode for the controller—Disable, Enhanced, Standard, or Unknown. • Remote FEC mode—FEC mode on the remote device: Disabled, Enhanced, Standard, or Unknown. • FEC mismatch counter—Number of sync word mismatches found during the tracking phase.
Status	G.709 wrapper administrative status: Up or Down.

Step 4 To view additional G.709 properties, click the required tab. [Table 17-3](#) describes the information displayed in each tab. The information that is displayed depends on the selected network element.

Table 17-3 G709 Properties Window Tabs

Field	Description
OTU Alarm Counters Tab	
Type	Type of OTU alarm, such as BDI or BEI.
Counter	Number of alarms reported for each alarm type.

Table 17-3 G709 Properties Window Tabs (continued)

Field	Description
OTU Alert Counters Tab	
Type	Type of OTU alert, such as SD-BER or SF-BER.
Threshold	Threshold set for the type of alert.
Counter	Number of alerts reported for each alert type. A value of -1 indicates that no value has been set up.
ODU Alarm Counters Tab	
Type	Type of ODU alarm, such as AIS or BDI.
Counter	Number of alarms reported for each alarm type.
OTU TTI Tab	
(Displayed for most devices but not for those such as the Cisco 7600 series))	
Type	Type of OTU Trail Trace Identifier (TTI) configured: <ul style="list-style-type: none"> • Expected • Received • Sent
String Type	For each TTI type, the type of string: <ul style="list-style-type: none"> • ASCII • Hexadecimal
TTI String	For each TTI type, the specific TTI string configured.
ODU TTI Tab	
(Displayed for most devices but not for those such as the Cisco 7600 series)	
Type	Type of ODU TTI configured: <ul style="list-style-type: none"> • Expected • Received • Sent
String Type	For each TTI type, the type of string: <ul style="list-style-type: none"> • ASCII • Hexadecimal
TTI String	For each TTI type, the specific TTI string configured.

Table 17-3 G709 Properties Window Tabs (continued)

Field	Description
ODU Alert Counters Tab	
(Displayed for devices such as the Cisco 7600 series.)	
Type	Type of OTU alert, such as SD-BER or SF-BER.
Threshold	Threshold set for the type of alert.
Counter	Number of alerts reported for each alert type. A value of -1 indicates that no value has been set up.

Step 5 To close the G709 Info Properties window, click the upper right corner.

Viewing Performance Monitoring Configuration

Performance monitoring parameters are used to gather, store, set thresholds for, and report performance data for early detection of problems. Thresholds are used to set error levels for each performance monitoring parameter. During the accumulation cycle, if the current value of a performance monitoring parameter reaches or exceeds its corresponding threshold value, a threshold crossing alert (TCA) can be generated. The TCAs provide early detection of performance degradation.

The Vision client enables you to view the configuration settings for performance monitoring. Performance monitoring statistics are accumulated on a 15-minute basis, synchronized to the start of each quarter-hour. They are also accumulated on a daily basis starting at midnight. Historical counts are maintained for thirty-three 15-minute intervals and two daily intervals.

To view performance monitoring configuration settings:

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- Step 1** In the Vision client, double-click the device on which DWDM is configured.
- Step 2** In the inventory window, choose **Physical Inventory > Chassis** and navigate to the interface configured for DWDM.
- Step 3** In the content pane, select the performance monitoring configuration settings you want to view:
- To view the performance monitoring 15-minute configuration settings, click **PM 15-min Settings**.
 - To view the performance monitoring 24-hour configuration settings, click **PM 24-hour Settings**.

The Client DWDM PM Settings Properties window is displayed as shown in [Figure 17-4](#).

Figure 17-4 Client DWDM PM Settings Properties Window

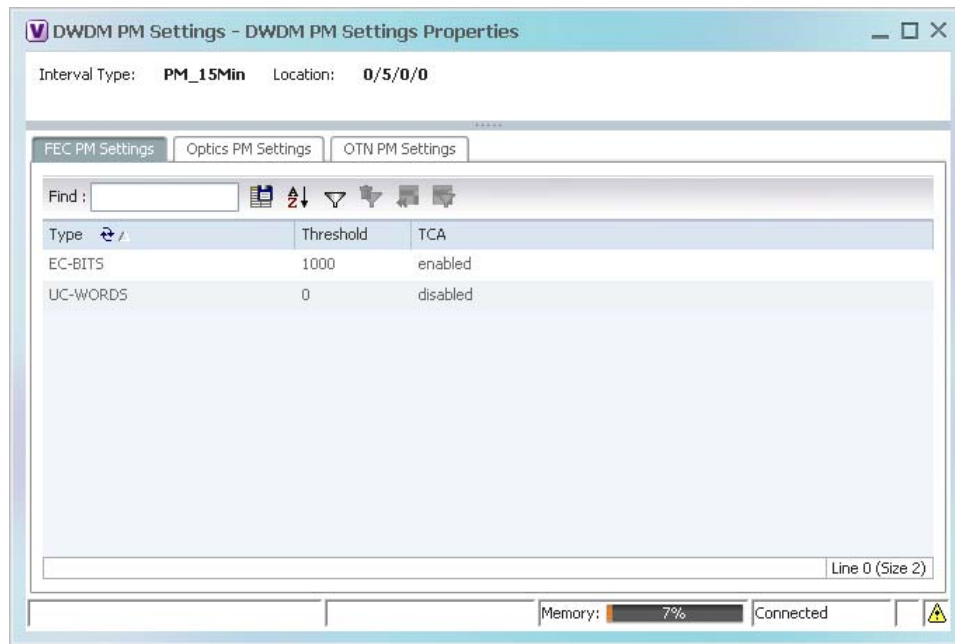


Table 17-4 describes the information displayed above the tabs in the Client DWDM PM Settings Properties window and in each of the tabs.

Table 17-4 Client DWDM PM Settings Properties Window and Tabs

Field	Description
Interval Type	The performance monitoring interval, either 15 minutes or 24 hours.
Location	Physical interface using the format <i>rack/slot/module/port</i> where: <ul style="list-style-type: none"> <i>rack</i> is the chassis number of the rack. <i>slot</i> is the physical slot number of the line card. <i>module</i> is the module number. A physical layer interface module (PLIM) is always 0. Shared port adapters (SPAs) are referenced by their subslot number. <i>port</i> is the physical port number of the interface.
FEC PM Settings Tab	
Type	FEC performance monitoring parameter being tracked: <ul style="list-style-type: none"> EC-BITS—The number of bit errors corrected (EC-BITS) in the DWDM trunk line during the performance monitoring time interval. UC-WORDS—The number of uncorrectable words (UC-WORDS) detected in the DWDM trunk line during the performance monitoring time interval.
Threshold	Threshold for the performance monitoring parameter.
TCA	Whether TCA generation for the specified parameter on the DWDM controller is enabled or disabled.

Table 17-4 Client DWDM PM Settings Properties Window and Tabs (continued)

Field	Description
Optics PM Settings Tab	
Type	Optics performance monitoring parameter being tracked: <ul style="list-style-type: none"> • LBC—Laser bias current. • OPR—Optical power on the unidirectional port. • OPT—Transmit optical power in dBm.
Max Threshold	Maximum threshold configured for the parameter.
Max TCA	If enabled, indicates a TCA is generated if the value of the parameter exceeds the maximum threshold during the performance monitoring period. If disabled, TCAs are not generated if the maximum threshold is exceeded.
Min Threshold	Minimum threshold configured for the parameter.
Min TCA	If enabled, indicates a TCA is generated if the value of the parameter drops below the minimum threshold during the performance monitoring period. If disabled, TCAs are not generated if the value drops below the minimum threshold.

Table 17-4 Client DWDM PM Settings Properties Window and Tabs (continued)

Field	Description
OTN PM Settings Tab	
Type	<p>OTN performance monitoring parameter being tracked:</p> <ul style="list-style-type: none"> • bbe-pm-fe—Far-end path monitoring background block errors (BBE-PM). Indicates the number of background block errors recorded in the optical transport network (OTN) path during the performance monitoring time interval. • bbe-pm-ne—Near-end path monitoring background block errors (BBE-PM). • bbe-sm-fe—Far-end section monitoring background block errors (BBE-SM). Indicates the number of background block errors recorded in the OTN section during the performance monitoring time interval. • bbe-sm-ne—Near-end section monitoring background block errors (BBE-SM). • bber-pm-fe—Far-end path monitoring background block errors ratio (BBER-PM). Indicates the background block errors ratio recorded in the OTN path during the performance monitoring time interval. • bber-pm-ne—Near-end path monitoring background block errors ratio (BBER-PM). • bber-sm-fe—Far-end section monitoring background block errors ratio (BBER-SM). Indicates the background block errors ratio recorded in the OTN section during the performance monitoring time interval. • bber-sm-ne—Near-end section monitoring background block errors ratio (BBER-SM). • es-pm-fe—Far-end path monitoring errored seconds (ES-PM). Indicates the errored seconds recorded in the OTN path during the performance monitoring time interval. • es-pm-ne—Near-end path monitoring errored seconds (ES-PM). • es-sm-fe—Far-end section monitoring errored seconds (ES-SM). Indicates the errored seconds recorded in the OTN section during the performance monitoring time interval. • es-sm-ne—Near-end section monitoring errored seconds (ES-SM). • esr-pm-fe—Far-end path monitoring errored seconds ratio (ESR-PM). Indicates the errored seconds ratio recorded in the OTN path during the performance monitoring time interval. • esr-pm-ne—Near-end path monitoring errored seconds ratio (ESR-PM). • esr-sm-fe—Far-end section monitoring errored seconds ratio (ESR-SM). Indicates the errored seconds ratio recorded in the OTN section during the performance monitoring time interval. • esr-sm-ne—Near-end section monitoring errored seconds ratio (ESR-SM). • fc-pm-fe—Far-end path monitoring failure counts (FC-PM). Indicates the failure counts recorded in the OTN path during the performance monitoring time interval. • fc-pm-ne—Near-end path monitoring failure counts (FC-PM). • fc-sm-fe—Far-end section monitoring failure counts (FC-SM). Indicates the failure counts recorded in the OTN section during the performance monitoring time interval. • fc-sm-ne—Near-end section monitoring failure counts (FC-SM).

Table 17-4 Client DWDM PM Settings Properties Window and Tabs (continued)

Field	Description
Type (cont.)	<ul style="list-style-type: none"> • ses-pm-fe—Far-end path monitoring severely errored seconds (SES-PM). Indicates the severely errored seconds recorded in the OTN path during the performance monitoring time interval. • ses-pm-ne—Far-end path monitoring severely errored seconds (SES-PM). • ses-sm-fe—Far-end section monitoring severely errored seconds (SES-SM). Indicates the severely errored seconds recorded in the OTN section during the performance monitoring time interval. • ses-sm-ne—Near-end section monitoring severely errored seconds (SES-SM). • sesr-pm-fe—Far-end path monitoring severely errored seconds ratio (SESR-PM). Indicates the severely errored seconds ratio recorded in the OTN path during the performance monitoring time interval. • sesr-pm-ne—Near-end path monitoring severely errored seconds ratio (SESR-PM). • sesr-sm-fe—Far-end section monitoring severely errored seconds ratio (SESR-SM). Indicates the severely errored seconds ratio recorded in the OTN section during the performance monitoring time interval. • sesr-sm-ne—Near-end section monitoring severely errored seconds ratio (SESR-SM). • uas-pm-fe—Far-end path monitoring unavailable seconds (UAS-PM). Indicates the unavailable seconds recorded in the OTN path during the performance monitoring time interval. • uas-pm-ne—Near-end path monitoring unavailable seconds (UAS-PM). • uas-sm-fe—Far-end section monitoring unavailable seconds (UAS-SM). Indicates the unavailable seconds recorded in the OTN section during the performance monitoring time interval. • uas-sm-ne—Near-end section monitoring unavailable seconds (UAS-SM).
Threshold	Threshold configured for the parameter.
TCA	If enabled, indicates a TCA is generated if the value of the parameter crosses the threshold during the performance monitoring period. If disabled, TCAs are not generated if the value crosses the threshold.

Configuring and Viewing DWDM

The following commands can be launched from the inventory by right-clicking the appropriate node and choosing **Commands > Configuration**. Your permissions determine whether you can run these commands (see). To find out if a device supports these commands, see the [Cisco Prime Network 4.1 Supported Cisco VNEs](#).

Command	Navigation	Input Required and Notes
Controller Data	Show >	N/A; performed from command launch point
PM History Data		PM interval type: 15-min or 24-hour
		Interval number
RTPM Counters		PM interval type: 15-min or 24-hour
RTPM Threshold		PM interval type: 15-min or 24-hour
Wavelength Map		N/A; performed from command launch point
IM Trace Details		Card location (for example, 0/5/CPU0)
Device Log		N/A; performed from command launch point
Counters	Clear >	N/A; performed from command launch point
Channel	Configure >	Channel number
		Option: Set or reset channel
FEC Mode		G.709 FEC mode: Disabled, enhanced, or standard
G.709 ODU		ODU alarm type: ais, bdi, lck, oci, ptim, or tim
		Option: Enable or disable alarm type
G.709 OTU		OTU alarm type: bdi, fecmismatch, iae, lof, lom, los, sd-ber, sf-ber, or tim
		Option: Enable or disable alarm type

Command	Navigation	Input Required and Notes
G.709 TTI	Configure >	Optical channel unit type: ODU or OTU
		TTI type: Expected or sent
		TTI string type: ASCII or hex
		TTI string
		Option: Set or reset TTI string
G.709 Wrapper		Option: Disable or enable G.709 wrapper
Laser State		Laser state: Switch off or on
Loopback		Loopback value: Internal or line
		Option: Set or remove
PM FEC Data		PM interval type
		FEC alarm type:
		<ul style="list-style-type: none"> Ec-bits—Bit errors corrected (BIEC); the number of bit errors corrected in the DWDM trunk line during the performance monitoring time interval Uc-words—Uncorrectable words; the number of uncorrectable words detected in the DWDM trunk line during the performance monitoring time interval
		TCA options: Enable or disable TCA generation
	Threshold option. Set configures the value on the device; reset is the default. If you select blank, the threshold value is not used.	
	Threshold value	

Command	Navigation	Input Required and Notes
PM Optics Data	Configure >	PM interval: 15-min or 24-hour
		Optics alarm type: <ul style="list-style-type: none"> lbc—Laser bias current opr—Optical power on the unidirectional port opt—Transmit optical power in dBm
		Maximum TCA option: Enable or disable
		Maximum threshold option: Choosing Set configures the value on the device; Reset is the default. If you select blank, the threshold value is not used.
		Maximum threshold
		Minimum TCA option: enable or disable
		Minimum threshold option: Choosing Set configures the value on the device; Reset is the default. If you select blank, the threshold value is not used.
		Minimum threshold
		PM interval: 15-min or 24-hour
		OTN alarm type. For a list of types and their descriptions, see the OTN PN Settings Tab information in Table 17-4 on page 17-11 .
PM OTN Data		TCA option: Enable or disable
		Threshold option: Choosing Set configures the value on the device; Reset is the default. If you select blank, the threshold value is not used.
		Threshold value
Transmit Power		Transmit power in dBm
Rx LOS Threshold		Option: Set or reset transponder Tx threshold
		Rx LOS threshold value
		Option: Set or reset transponder Rx threshold

