



Configuring Dense Wavelength Division Multiplexing Controllers on Cisco IOS XR Software

This module describes the configuration of dense wavelength division multiplexing (DWDM) controllers on the Cisco CRS-1 Router.

DWDM is an optical technology that is used to increase bandwidth over existing fiber-optic backbones. DWDM can be configured on supported 10-Gigabit Ethernet (GE) or Packet-over-SONET/SDH physical layer interface modules (PLIMs). After you configure the DWDM controller, you can configure an associated POS or 10-Gigabit Ethernet interface.

Feature History for Configuring DWDM Controller Interfaces

Release	Modification
Release 3.3.0	This feature was introduced on the Cisco CRS-1 Router. Support was added for the Cisco 1-Port OC-768c/STM-256c DWDM PLIM and Cisco 4-Port 10-Gigabit Ethernet DWDM PLIM.
Release 3.4.0	Support was added for user configuration of the laser, TTI strings, and BDI insertion, as well as performance monitoring.
Release 3.9.1	Support for IPoDWDM was added.

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Prerequisites for Configuring DWDM Controller Interfaces

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Before configuring a DWDM controller, be sure that you have installed one of the following cards that support DWDM:

- Cisco 1-Port OC-768c/STM-256c DWDM PLIM
- Cisco 4-Port 10-Gigabit Ethernet DWDM PLIM

New DWDM Configuration Requirement

Cisco IOS XR Software Release 3.9.0 introduces new commands in addition to an important change to the default laser state for all of the DWDM physical layer interface modules (PLIMs) supported on the Cisco CRS-1 router, which impacts the required configuration to support those cards.

This change affects all models of the following hardware on the Cisco CRS-1 router:

- Cisco 1-Port OC-768c/STM-256c DWDM PLIM
- Cisco 4-Port 10-Gigabit Ethernet DWDM PLIM

Summary of Important DWDM Changes in Cisco IOS XR Software Release 3.9.0 and Later Releases

- The **laser off** and **shutdown (DWDM)** commands are replaced by the **admin-state out-of-service** command.
- The default state of the laser has changed from “On” to “Off” for all PLIMs. Therefore, the laser for all DWDM controllers must explicitly be turned on using the **admin-state in-service** command in DWDM configuration mode.

Information About the DWDM Controllers

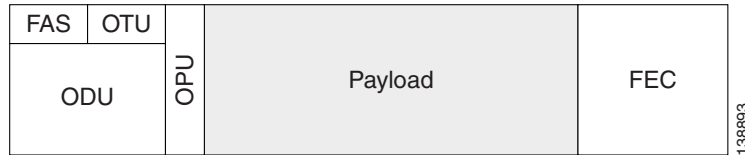
DWDM support in Cisco IOS XR software is based on the Optical Transport Network (OTN) protocol that is specified in ITU-T G.709. This standard combines the benefits of SONET/SDH technology with the multiwavelength networks of DWDM. It also provides for forward error correction (FEC) that can allow a reduction in network costs by reducing the number of regenerators used.

To enable multiservice transport, OTN uses the concept of a wrapped overhead (OH). To illustrate this structure:

- Optical channel payload unit (OPU) OH information is added to the information payload to form the OPU. The OPU OH includes information to support the adaptation of client signals.
- Optical channel data unit (ODU) OH is added to the OPU to create the ODU. The ODU OH includes information for maintenance and operational functions to support optical channels.
- Optical channel transport unit (OTU) OH together with the FEC is added to form the OTU. The OTU OH includes information for operational functions to support the transport by way of one or more optical channel connections.

- Optical channel (OCh) OH is added to form the OCh. The OCh provides the OTN management functionality and contains four subparts: the OPU, ODU, OTU, and frame alignment signal (FAS). See [Figure 13](#).

Figure 13 OTN Optical Channel Structure



Information about IPoDWDM

Cisco IOS XR software includes the IP over Dense Wavelength Division Multiplexing (IPoDWDM) feature.

IPoDWDM is supported on the following hardware devices:

- Cisco 1-Port OC-768c/STM-256c DWDM PLIM
- Cisco 4-Port 10-Gigabit Ethernet DWDM PLIM

The Cisco CRS-1 Series 10 Gigabit Ethernet DWDM PLIM supports the following hardware features:

- Four line-rate 10 Gigabit Ethernet full duplex interfaces
- Per-port flexibility for optical reach - selected using the appropriate XENPAK pluggable optical modules
- Compatible with all Cisco CRS-1 Series chassis
- Supports in-use insertion and removal without the need to power down the chassis
- Simple configuration, monitoring, and maintenance

IPoDWDM currently provides the following software features:

- Proactive Maintenance
- Shared Risk Link Group (SRLG)

Proactive Maintenance

Proactive maintenance automatically triggers Forward Error Correction-Fast Re-Route (FEC-FRR). Proactive maintenance requires coordinated maintenance between Layer 0 (L0) and Layer 3 (L3). L0 is the DWDM optical layer. FEC-FRR is an L3 protection mechanism. FEC-FRR detects failures before they happen and corrects errors introduced during transmission or that are due to a degrading signal.

Shared Risk Link Group (SRLG)

The Shared Risk Link Group (SRLG) provides shared risk information between the DWDM optical layer (L0) and the router layer (L3), and the applications that use the shared risk information. An SRLG is a set of links that share a resource whose failure may affect all links in the set.

System administrators can configure the following IPoDWDM features:

- Shared Risk Link Group (SRLG) and Optical Layer DWDM port, see [Configuring the SRLG and Optical Layer DWDM Ports](#), page 306.

- Administrative state of DWDM optical ports, see [Configuring the Administrative State of DWDM Optical Ports](#), page 308.
- FEC-FRR trigger threshold, window size, revert threshold, and revert window size, see [Configuring Proactive FEC-FRR Triggering](#), page 310.

FEC-FRR Triggering

FEC-FRR can be configured to be triggered by the following alarms:

- ais – Alarm Indication Signal (AIS)
- bdi – Backward Defect Indication (BDI)
- *bdiO – Backward Defect Indication - Overhead (BDI-O)
- *bdiP – Backward Defect Indication - Payload (BDI-P)
- *deg – Degraded (DEG)
- lck – Locked (LCK)
- lof – Loss of Frame (LOF)
- lom – Loss of Multi Frame
- los – Loss of Signal (LOS)
- *losO – Loss of Signal - Overhead (LOS-O)
- *losP – Loss of Signal - Payload (LOS-P)
- oci – Open Connection Indication (OCI)
- plm – Payload Mismatch (PLM)
- *ssf – Server Signal Failure (SSF)
- *ssfO – Server Signal Failure - Overhead (SSF-O)
- *ssfP – Server Signal Failure - Payload (SSF-P)
- tim – Trace Identifier Mismatch (TIM)

Signal Logging

DWDM statistic data, such as EC, UC and alarms, are collected and stored in the log file on the DWDM line card.

How to Configure DWDM Controllers

The DWDM controllers are configured in the physical layer control element of the Cisco IOS XR software configuration space. This configuration is done using the **controller dwdm** command, and is described in the following tasks:

- [Configuring the Optical Parameters](#), page 297
- [Configuring G.709 Parameters](#), page 299



Note

All interface configuration tasks for the POS or Gigabit Ethernet interfaces still must be performed in interface configuration mode.

Configuring the Optical Parameters

This task describes how to configure the receive power threshold and the wavelength parameters for the DWDM controller. You should verify that the optical parameters are configured correctly for your DWDM installation and if necessary, perform this task.

Prerequisites

The **rx-los-threshold**, **wavelength** and **transmit-power** commands can be used only when the controller is in the shutdown state. Use the **shutdown** command.

Restrictions

The transmit power level and receive LOS threshold are configurable only on the Cisco Cisco 1-Port OC-768c/STM-256c DWDM PLIM.

SUMMARY STEPS

1. **configure**
2. **controller dwdm** *interface-path-id*
3. **admin-state** {**maintenance** | **out-of-service**}
4. **commit**
5. **rx-los-threshold** *power-level*
6. **wavelength** *channel-number*
7. **transmit-power** *power-level*
8. **end**
or
commit
9. **admin-state in-service**
10. **show controllers dwdm** *interface-path-id* [**optics** | **wavelength-map**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/RP0/CPU0:Router# <code>configure</code>	Enters global configuration mode.
Step 2	controller dwdm <i>interface-path-id</i> Example: RP/0/RP0/CPU0:Router(config)# <code>controller dwdm 0/1/0/0</code>	Specifies the DWDM controller name in the notation <i>rack/slot/module/port</i> and enters DWDM configuration mode.

	Command or Action	Purpose
Step 3	<p>admin-state {<i>maintenance</i> <i>out-of-service</i>}</p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# admin-state maintenance</p>	Specifies the DWDM interface administrative state. You must put the controller in maintenance or out-of-service state before you can use the DWDM configuration commands.
Step 4	<p>commit</p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# commit</p>	Saves configuration changes. This performs the shutdown from the previous step. When the controller has been shut down, you can proceed with the configuration.
Step 5	<p>rx-los-threshold <i>power-level</i></p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# rx-los-threshold -10</p>	Configures the transponder receive power threshold. Values are in units of 0.1 dBm and can range from -350 to 50. This corresponds to a range of -35 dBm to 5 dBm.
Step 6	<p>wavelength <i>channel-number</i></p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# wavelength 1</p>	<p>Configures the channel number corresponding to the first wavelength. Values can range from 1 to 185, but not all channels are supported on all PLIMs. Use the show controller dwdm command with the wavelength-map keyword to determine which channels and wavelengths are supported on a specific controller.</p> <p>Note There is no cross-checking to determine if the chosen wavelength is being used on another port on the same PLIM or on another PLIM in the system.</p>
Step 7	<p>transmit-power <i>power-level</i></p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# transmit-power 10</p>	Configures the transponder transmit power. Values are in units of 0.1 dBm and can range from -190 to +10. This corresponds to a range of -19 dBm to +1 dBm.
Step 8	<p>end or commit</p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# end or RP/0/RP0/CPU0:Router(config-dwdm)# commit</p>	<p>Saves configuration changes.</p> <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: <ul style="list-style-type: none"> Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. Entering no exits the configuration session and returns the router to EXEC mode without committing the configuration changes. Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes. Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.

	Command or Action	Purpose
Step 9	<code>admin-state in-service</code> Example: RP/0/RP0/CPU0:Router(config-dwdm)# admin-state in-service	Places the DWDM port in In Service (IS) state, to support all normal operation.
Step 10	<code>show controllers dwdm interface-path-id [optics wavelength-map]</code> Example: RP/0/RP0/CPU0:Router# show controller dwdm 0/1/0/0 optics	Displays the output power level, input power level, wavelength, and laser bias current monitoring information.

Troubleshooting Tips

You will get an error message if you try to commit configuration changes to the controller when it is in the up state. You must use the **admin-states maintenance** or **admin-states out-of-service** command before you can use the DWDM configuration commands.

Configuring G.709 Parameters

This task describes how to customize the alarm display and the thresholds for alerts and forward error correction (FEC). You need to use this task only if the default values are not correct for your installation.

Prerequisites

The **g709 disable**, **loopback**, and **g709 fec** commands can be used only when the controller is in the shutdown state. Use the **admin-state** command.

SUMMARY STEPS

1. **configure**
2. **controller dwdm** *interface-path-id*
3. **admin-state maintenance**
or
admin-state out-of-service
4. **commit**
5. **g709 disable**
6. **loopback** {internal | line}
7. **g709 fec** {disable | enhanced | standard}
8. **g709** {odu | otu} report *alarm* disable
9. **g709 otu overhead tti** {expected | sent} {ascii | hex} *tti-string*
10. **end**
or
commit

11. `admin-state in-service`
12. `show controllers dwdm interface-path-id g709`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>configure</code> Example: RP/0/RP0/CPU0:Router# <code>configure</code>	Enters global configuration mode.
Step 2	<code>controller dwdm interface-path-id</code> Example: RP/0/RP0/CPU0:Router(config)# <code>controller dwdm 0/1/0/0</code>	Specifies the DWDM controller name in the notation <i>rack/slot/module/port</i> and enters DWDM configuration mode.
Step 3	<code>admin-state maintenance</code> or <code>admin-state out-of-service</code> Example: RP/0/RP0/CPU0:Router(config-dwdm)# <code>admin-state out-of-service</code>	Disables the DWDM controller. You must disable the controller before you can use the DWDM configuration commands.
Step 4	<code>commit</code> Example: RP/0/RP0/CPU0:Router(config-dwdm)# <code>commit</code>	Saves configuration changes. This performs the shutdown from the previous step. When the controller has been shut down, you can proceed with the configuration.
Step 5	<code>g709 disable</code> Example: RP/0/RP0/CPU0:Router(config-dwdm)# <code>g709 disable</code>	(Optional) Disables the G.709 wrapper. The wrapper is enabled by default. Note The <code>g709 disable</code> command is available on the Cisco 4-Port 10-Gigabit Ethernet DWDM PLIM only.
Step 6	<code>loopback {internal line}</code> Example: RP/0/RP0/CPU0:Router(config-dwdm)# <code>loopback internal</code>	(Optional) Configures the DWDM controller for loopback mode.
Step 7	<code>g709 fec {disable standard}</code> Example: RP/0/RP0/CPU0:Router(config-dwdm)# <code>g709 fec disable</code>	(Optional) Configures the forward error correction mode (FEC) for the DWDM controller. By default, enhanced FEC is enabled.
Step 8	<code>g709 {odu otu} report alarm disable</code> Example: RP/0/RP0/CPU0:Router(config-dwdm)# <code>g709 odu bdi disable</code>	(Optional) Disables the logging of selected optical channel data unit (ODU) alarms or optical channel transport unit (OTU) alarms to the console for a DWDM controller. By default, all alarms are logged to the console.

	Command or Action	Purpose
Step 9	<pre>g709 otu overhead tti {expected sent} {ascii hex} tti-string</pre> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# g709 otu overhead tti expected ascii test OTU 5678</p>	Configures a transmit or expected Trail Trace Identifier (TTI) that is displayed in the show controller dwdm command.
Step 10	<pre>end or commit</pre> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# end or RP/0/RP0/CPU0:Router(config-dwdm)# commit</p>	<p>Saves configuration changes.</p> <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: <ul style="list-style-type: none"> Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. Entering no exits the configuration session and returns the router to EXEC mode without committing the configuration changes. Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes. Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.
Step 11	<pre>admin-state in-service</pre> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# admin-state in-service</p>	Places the DWDM port in In Service (IS) state, to support all normal operation.
Step 12	<pre>show controllers dwdm interface-path-id g709</pre> <p>Example: RP/0/RP0/CPU0:Router# show controller dwdm 0/1/0/0 optics</p>	Displays the G.709 Optical Transport Network (OTN) protocol alarms and counters for Bit Errors, along with the FEC statistics and threshold-based alerts.

What to Do Next

All interface configuration tasks for the POS or Gigabit Ethernet interfaces still must be performed in interface configuration mode. Refer to the corresponding modules in this book for more information.

How to Perform Performance Monitoring on DWDM Controllers

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.

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.

Performance monitoring is described in the following task:

- [Configuring DWDM Controller Performance Monitoring, page 302](#)

Configuring DWDM Controller Performance Monitoring

This task describes how to configure performance monitoring on DWDM controllers and how to display the performance parameters.

SUMMARY STEPS

1. **configure**
2. **controller dwdm** *interface-path-id*
3. **pm** {15-min | 24-hour} **fec threshold** {ec-bits | uc-words} *threshold*
4. **pm** {15-min | 24-hour} **optics threshold** {lbc | opr | opt} {max | min} *threshold*
5. **pm** {15-min | 24-hour} **otn threshold** *otn-parameter threshold*
6. **pm** {15-min | 24-hour} **fec report** {ec-bits | uc-words} **enable**
7. **pm** {15-min | 24-hour} **optics report** {lbc | opr | opt} {max-tca | min-tca} **enable**
8. **pm** {15-min | 24-hour} **otn report** *otn-parameter enable*
9. **end**
or
commit
10. **show controllers dwdm** *interface-path-id* **pm history** [15-min | 24-hour | fec | optics | otn]
11. **show controllers dwdm** *interface-path-id* **pm interval** {15-min | 24-hour} [fec | optics | otn] *index*

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>configure</p> <p>Example: RP/0/RP0/CPU0:Router# configure</p>	Enters global configuration mode.
Step 2	<p>controller dwdm interface-path-id</p> <p>Example: RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/0</p>	Specifies the DWDM controller name in the notation <i>rack/slot/module/port</i> and enters DWDM configuration mode.
Step 3	<p>pm {15-min 24-hour} fec threshold {ec-bits uc-words} threshold</p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min fec threshold ec-bits 49000000 RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min fec threshold uc-words xxxxxx</p>	Configures a performance monitoring threshold for specific parameters on the FEC layer.
Step 4	<p>pm {15-min 24-hour} optics threshold {lbc opr opt} {max min} threshold</p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics threshold opt max xxx RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics threshold lbc min xxx</p>	Configures a performance monitoring threshold for specific parameters on the optics layer.

	Command or Action	Purpose
Step 5	<pre>pm {15-min 24-hour} otn threshold otn-parameter threshold</pre> <p>Example:</p> <pre>RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min otn threshold bbe-pm-ne xxx RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min otn threshold es-sm-fe xxx</pre>	<p>Configures a performance monitoring threshold for specific parameters on the optical transport network (OTN) layer. OTN parameters can be as follows:</p> <ul style="list-style-type: none"> • bbe-pm-fe—Far-end path monitoring background block errors (BBE-PM) • bbe-pm-ne—Near-end path monitoring background block errors (BBE-PM) • bbe-sm-fe—Far-end section monitoring background block errors (BBE-SM) • 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) • 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) • bber-sm-ne—Near-end section monitoring background block errors ratio (BBER-SM) • es-pm-fe—Far-end path monitoring errored seconds (ES-PM) • es-pm-ne—Near-end path monitoring errored seconds (ES-PM) • es-sm-fe—Far-end section monitoring errored seconds (ES-SM) • es-sm-ne—Near-end section monitoring errored seconds (ES-SM) • esr-pm-fe—Far-end path monitoring errored seconds ratio (ESR-PM) • esr-pm-ne—Near-end path monitoring errored seconds ratio (ESR-PM) • esr-sm-fe—Far-end section monitoring errored seconds ratio (ESR-SM) • esr-sm-ne—Near-end section monitoring errored seconds ratio (ESR-SM) • fc-pm-fe—Far-end path monitoring failure counts (FC-PM) • fc-pm-ne—Near-end path monitoring failure counts (FC-PM) • fc-sm-fe—Far-end section monitoring failure counts (FC-SM) • fc-sm-ne—Near-end section monitoring failure counts (FC-SM)

	Command or Action	Purpose
		<ul style="list-style-type: none"> • ses-pm-fe—Far-end path monitoring severely errored seconds (SES-PM) • ses-pm-ne—Near-end path monitoring severely errored seconds (SES-PM) • ses-sm-fe—Far-end section monitoring severely errored seconds (SES-SM) • 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) • 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) • sesr-sm-ne—Near-end section monitoring severely errored seconds ratio (SESr-SM) • uas-pm-fe—Far-end path monitoring unavailable seconds (UAS-PM) • uas-pm-ne—Near-end path monitoring unavailable seconds (UAS-PM) • uas-sm-fe—Far-end section monitoring unavailable seconds (UAS-SM) • uas-sm-ne—Near-end section monitoring unavailable seconds (UAS-SM)
<p>Step 6</p>	<pre>pm {15-min 24-hour} fec report {ec-bits uc-words} enable Example: RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min fec report ec-bits enable RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min fec report uc-words enable</pre>	<p>Configures threshold crossing alert (TCA) generation for specific parameters on the FEC layer.</p>
<p>Step 7</p>	<pre>pm {15-min 24-hour} optics report {lbc opr opt} {max-tca min-tca} enable Example: RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics report opt enable RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics report lbc enable</pre>	<p>Configures TCA generation for specific parameters on the optics layer.</p>

	Command or Action	Purpose
Step 8	<pre>pm {15-min 24-hour} otn report otn-parameter enable</pre> <p>Example:</p> <pre>RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min otn report bbe-pm-ne enable RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min otn report es-sm-fe enable</pre>	Configures TCA generation for specific parameters on the optical transport network (OTN) layer. OTN parameters are shown in Step 5 .
Step 9	<pre>end or commit</pre> <p>Example:</p> <pre>RP/0/RP0/CPU0:Router(config-dwdm)# end or RP/0/RP0/CPU0:Router(config-dwdm)# commit</pre>	<p>Saves configuration changes.</p> <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. Entering no exits the configuration session and returns the router to EXEC mode without committing the configuration changes. Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes. Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.

Configuring IPoDWDM

This section provides the following configuration procedures:

- [Configuring the SRLG and Optical Layer DWDM Ports, page 306](#)
- [Configuring the Administrative State of DWDM Optical Ports, page 308](#)
- [Configuring Proactive FEC-FRR Triggering, page 310](#)

Configuring the SRLG and Optical Layer DWDM Ports

Use the following procedure to configure the Shared Risk Link Group (SRLG) and Optical Layer DWDM ports.

SUMMARY STEPS

1. **configure**
2. **controller dwdm** *interface-path-id*
3. **network srlg** *value1 value2 value3*
4. **network port id** *id-number*
5. **network connection id** *id-number*
6. **end**
or
commit

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/RP0/CPU0:Router# config	Enters global configuration mode.
Step 2	controller dwdm <i>interface-path-id</i> Example: RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1	Specifies the DWDM controller and enters DWDM controller mode.
Step 3	network srlg <i>value1 value2 value3</i> Example: RP/0/RP0/CPU0:Router(config-dwdm)# network srlg value1 value2 value3	Configures the Shared Risk Link Group (SRLG).
Step 4	network port id <i>id-number</i> Example: RP/0/RP0/CPU0:Router(config-dwdm)# network port id 1/0/1/1	Assigns an identifier number to a port for the Multi Service Transport Protocol (MSTP).

	Command or Action	Purpose
Step 5	<p>network connection id <i>id-number</i></p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# network connection id 1/1/1/1</p>	Configures a connection identifier for the Multi Service Transport Protocol (MSTP).
Step 6	<p>end or commit</p> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# end RP/0/RP0/CPU0:Router(config-dwdm)# commit</p>	<p>Saves configuration changes.</p> <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. Entering no exits the configuration session and returns the router to EXEC mode without committing the configuration changes. Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes. Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.

Configuring the Administrative State of DWDM Optical Ports

Use the following procedure to configure the administrative state and optionally set the maintenance embargo flag.

SUMMARY STEPS

- configure**
- controller dwdm** *interface-path-id*
- admin-state** {in-service | maintenance | out-of-service}
- exit**
- interface pos** *interface-path-id*
or
interface tengige *interface-path-id*
- maintenance disable**
- end**
or
commit

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/RP0/CPU0:Router# config	Enters global configuration mode.
Step 2	controller dwdm interface-path-id Example: RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1	Specifies the DWDM controller and enters DWDM controller mode.
Step 3	admin-state {in-service maintenance out-of-service} Example: RP/0/RP0/CPU0:Router(config-dwdm)# admin-state maintenance	Specifies the transport administration state.
Step 4	exit Example: RP/0/RP0/CPU0:Router(config-dwdm)# exit	Exits to the previous mode.
Step 5	interface pos interface-path-id or interface tengige interface-path-id Example: RP/0/RP0/CPU0:Router(config)# interface pos 1/0/1/1 or RP/0/RP0/CPU0:Router(config)# interface tengige 1/0/1/1	Specifies the interface and enters interface configuration mode.

	Command or Action	Purpose
Step 6	maintenance disable Example: RP/0/RP0/CPU0:Router(config-if)# maintenance disable	Provisions the maintenance embargo flag, which prevents maintenance activities from being performed on an interface.
Step 7	end or commit Example: RP/0/RP0/CPU0:Router(config-dwdm)# end RP/0/RP0/CPU0:Router(config-dwdm)# commit	Saves configuration changes. <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. Entering no exits the configuration session and returns the router to EXEC mode without committing the configuration changes. Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes. Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.

Configuring Proactive FEC-FRR Triggering

Use the following procedure to configure automatic triggering of Forward Error Correction-Fast Re-Route (FEC-FRR).

SUMMARY STEPS

- configure**
- controller dwdm** *interface-path-id*
- proactive**
- logging signal** *file-name*
- proactive trigger threshold** *x-coefficient y-power*
- proactive trigger window** *window*
- proactive revert threshold** *x-coefficient y-power*
- proactive revert window** *window*
- end**
or
commit

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure Example: RP/0/RP0/CPU0:Router# config	Enters global configuration mode.
Step 2	controller dwdm interface-path-id Example: RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1	Specifies the DWDM controller and enters DWDM controller mode.
Step 3	proactive Example: RP/0/RP0/CPU0:Router(config-dwdm)# proactive enable	Enables automatic triggering of FEC-FRR.
Step 4	logging signal file-name Example: RP/0/RP0/CPU0:Router(config-dwdm)# logging signal LogFile1	Enables 10 millisecond proactive monitoring of FEC-FRR.
Step 5	proactive trigger threshold x-coefficient y-power Example: RP/0/RP0/CPU0:Routerconfig-dwdm)# proactive trigger threshold 1 9	Configures the trigger threshold of FEC-FRR in the form of xE-y.
Step 6	proactive trigger window window Example: RP/0/RP0/CPU0:Router(config-dwdm)# proactive trigger window 10000	Configures the trigger window (in milliseconds) in which FRR may be triggered.
Step 7	proactive revert threshold x-coefficient y-power Example: RP/0/RP0/CPU0:Router(config-dwdm)# proactive revert threshold 1 9	Configures the revert threshold (in the form of xE-y) to trigger reverting from the FEC-FRR route back to the original route.

	Command or Action	Purpose
Step 8	<pre>proactive revert window window</pre> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# proactive revert window 600000 </p>	Configures the revert window in which reverting from the FEC-FRR route back to the original route is triggered.
Step 9	<pre>end</pre> <p>or</p> <pre>commit</pre> <p>Example: RP/0/RP0/CPU0:Router(config-dwdm)# end</p> <pre>RP/0/RP0/CPU0:Router(config-dwdm)# commit</pre>	<p>Saves configuration changes.</p> <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> Entering yes saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. Entering no exits the configuration session and returns the router to EXEC mode without committing the configuration changes. Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes. Use the commit command to save the configuration changes to the running configuration file and remain within the configuration session.

Configuration Examples

This section includes the following examples:

- [Turning On the Laser: Example, page 312](#)
- [Turning Off the Laser: Example, page 313](#)
- [DWDM Controller Configuration: Examples, page 313](#)
- [DWDM Performance Monitoring: Examples, page 313](#)
- [IPoDWDM Configuration: Examples, page 314](#)

Turning On the Laser: Example



Note

This is a required configuration beginning in Cisco IOS XR Software Release 3.9.0. The DWDM cards will not operate without this configuration.

The following example shows how to turn on the laser and place a DWDM port in In Service (IS) state:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1
RP/0/RP0/CPU0:Router(config-dwdm)# admin-state in-service
RP/0/RP0/CPU0:Router(config-dwdm)# commit
```

Turning Off the Laser: Example



Note

This configuration replaces the **laser off** and **shutdown (DWDM)** configuration commands.

The following example shows how to turn off the laser, stop all traffic and place a DWDM port in Out of Service (OOS) state:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1
RP/0/RP0/CPU0:Router(config-dwdm)# admin-state out-of-service
RP/0/RP0/CPU0:Router(config-dwdm)# commit
```

DWDM Controller Configuration: Examples

The following example shows how to bring the DWDM controller down before using the configuration commands:

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/0/0/0
RP/0/RP0/CPU0:Router(config-dwdm)# maintenance out-of-service
RP/0/RP0/CPU0:Router(config-dwdm)# commit
RP/0/RP0/CPU0:Router(config-dwdm)# rx-los-threshold 0
RP/0/RP0/CPU0:Router(config-dwdm)# wavelength 1
RP/0/RP0/CPU0:Router(config-dwdm)# transmit-power 0
RP/0/RP0/CPU0:Router(config-dwdm)# maintenance in-service
RP/0/RP0/CPU0:Router(config-dwdm)# end
Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: y

RP/0/RP0/CPU0:Oct 15 12:35:54.299 : config[65732]: %MGBL-LIBTARCFG-6-COMMIT :
Configuration committed by user 'lab'. Use 'show configuration commit changes
1000000312' to view the changes.
RP/0/RP0/CPU0:Oct 15 12:35:54.403 : config[65732]: %MGBL-SYS-5-CONFIG_I : Configured from
console by lab
```

The following example shows how to customize the alarm display and the thresholds for alerts and forward error correction (FEC):

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/0
RP/0/RP0/CPU0:Router(config-dwdm)# maintenance out-of-service
RP/0/RP0/CPU0:Router(config-dwdm)# commit
RP/0/RP0/CPU0:Router(config-dwdm)# g709 disable
RP/0/RP0/CPU0:Router(config-dwdm)# loopback internal
RP/0/RP0/CPU0:Router(config-dwdm)# g709 fec standard
RP/0/RP0/CPU0:Router(config-dwdm)# g709 odu bdi disable
RP/0/RP0/CPU0:Router(config-dwdm)# maintenance in-service
RP/0/RP0/CPU0:Router(config-dwdm)# commit
```

DWDM Performance Monitoring: Examples

The following example shows how to configure performance monitoring for the optics parameters and how to display the configuration and current statistics:

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/2/0/0

RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics threshold opt max 2000000
```

```
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics threshold opt min 200
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics threshold lbc max 3000000
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics threshold lbc min 300
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics threshold opr max 4000000
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics threshold opr min 400
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics report opt max-tca enable
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics report opt min-tca enable
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics report opr max-tca enable
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics report opr min-tca enable
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics report lbc max-tca enable
RP/0/RP0/CPU0:Router(config-dwdm)# pm 15-min optics report lbc min-tca enable
RP/0/RP0/CPU0:Router(config-dwdm)# exit
RP/0/RP0/CPU0:Router(config)# exit
```

Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:y

```
LC/0/2/CPU0:Jul 12 04:10:47.252 : plim_4p_10ge_dwdm[194]: %L1-PMENGINE-4-TCA : Port DWDM
0/2/0/0 reports OPTICS TX-PWR-MIN(NE) PM TCA with current value 0, threshold 200 in
current 15-min interval window
LC/0/2/CPU0:Jul 12 04:10:47.255 : plim_4p_10ge_dwdm[194]: %L1-PMENGINE-4-TCA : Port DWDM
0/2/0/0 reports OPTICS RX-PWR-MIN(NE) PM TCA with current value 68, threshold 400 in
current 15-min interval window
RP/0/RP1/CPU0:Jul 12 04:09:05.443 : config[65678]: %MGBL-CONFIG-6-DB_COMMIT :
Configuration committed by user 'lab'. Use 'show configuration commit changes 1000000001'
to view the changes.
RP/0/RP1/CPU0:Jul 12 04:09:05.604 : config[65678]: %MGBL-SYS-5-CONFIG_I : Configured from
console by lab
```

```
RP/0/RP0/CPU0:Router# show controllers dwdm 0/2/0/0 pm interval 15-min optics 0
```

```
Optics in the current interval [ 4:15:00 - 04:26:02 Wed Jul 12 2006]
      MIN      AVG      MAX  Threshold TCA  Threshold TCA
      (min)    (enable) (max) (enable)
LBC[mA ] : 3605   4948   6453    300      YES    3000000   YES
OPT[uW]  : 2593   2593   2593    200      YES    2000000   YES
OPR[uW]  : 69     69     70     400      YES    4000000   YES
```

IPoDWDM Configuration: Examples

This section includes the following examples:

- [SRLG and Optical Layer DWDM Port Configuration: Examples, page 314](#)
- [Administrative State of DWDM Optical Ports Configuration: Examples, page 315](#)
- [Proactive FEC-FRR Triggering Configuration: Examples, page 315](#)

SRLG and Optical Layer DWDM Port Configuration: Examples

The following example shows how to configure a Shared Risk Link Group (SRLG) and Optical Layer DWDM ports.

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1
RP/0/RP0/CPU0:Router(config-dwdm)# network srlg value1 value2 value3
RP/0/RP0/CPU0:Router(config-dwdm)# network port id 1/0/1/1
RP/0/RP0/CPU0:Router(config-dwdm)# network connection id 1/1/1/1
```

Administrative State of DWDM Optical Ports Configuration: Examples

The following examples show how to configure the administrative state and optionally set the maintenance embargo flag:

For POS Interface

```
RP/0/0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1
RP/0/0/CPU0:Router(config-dwdm)# admin-state in-service
RP/0/0/CPU0:Router(config)# exit
RP/0/RP0/CPU0:Router(config)# interface pos 1/0/1/1
RP/0/0/CPU0:Router(config-if)# maintenance disable
RP/0/0/CPU0:Router(config-if)# commit
```

For TenGigabit Interface

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1
RP/0/RP0/CPU0:Router(config-dwdm)# admin-state in-service
RP/0/RP0/CPU0:Router(config-dwdm)# exit
RP/0/RP0/CPU0:Router(config)# interface tengige 1/0/1/1
RP/0/RP0/CPU0:Router(config-if)# maintenance disable
RP/0/RP0/CPU0:Router(config-if)# commit
```

Proactive FEC-FRR Triggering Configuration: Examples

The following example shows how to configure automatic triggering of Forward Error Correction-Fast Re-Route (FEC-FRR):

```
RP/0/RP0/CPU0:Router# configure
RP/0/RP0/CPU0:Router(config)# controller dwdm 0/1/0/1
RP/0/RP0/CPU0:Router(config-dwdm)# proactive
RP/0/RP0/CPU0:Router(config-dwdm)# logging signal LogFile1
RP/0/RP0/CPU0:Router(config-dwdm)# proactive trigger threshold 1 9
RP/0/RP0/CPU0:Router(config-dwdm)# proactive trigger window 10000
RP/0/RP0/CPU0:Router(config-dwdm)# proactive revert threshold 1 9
RP/0/RP0/CPU0:Router(config-dwdm)# proactive revert window 600000
```

Additional References

The following sections provide references related to DWDM controller configuration.

Related Documents

Related Topic	Document Title
Cisco IOS XR master command reference	<i>Cisco IOS XR Master Commands List</i>
Cisco IOS XR interface configuration commands	<i>Cisco IOS XR Interface and Hardware Component Command Reference</i>

Related Topic	Document Title
Initial system bootup and configuration information for a router using Cisco IOS XR software	<i>Cisco IOS XR Getting Started Guide</i>
Cisco IOS XR AAA services configuration information	<i>Cisco IOS XR System Security Configuration Guide</i> and <i>Cisco IOS XR System Security Command Reference</i>

Standards

Standards	Title
ITU-T G.709/Y.1331	Interfaces for the optical transport network (OTN)

MIBs

MIBs	MIBs Link
—	To locate and download MIBs for selected platforms using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL: http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml
OTN-MIB	IPoDWDM MIB

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport