



CHAPTER 27

Internet Protocol Over Dense Wave Division Multiplexing

This chapter describes the level of support that Cisco ANA provides for IPoDWDM, as follows:

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Technology Description

IPoDWDM

IPoDWDM is a network architecture approach that integrates layer 1 (optical) and layer 3 (IP) technologies by combining DWDM transponder features and functions into the router interface. Instead of being limited to a short-reach gray wavelength, the router is able to emit a tunable, ITU-grid compatible colored wavelength, with G.709 Digital Wrapper and Enhanced Forward Error Correction (EFEC) functions. This combination provides multiple advantages, including savings in capital and operational expenditures due to the elimination of multiple transponder shelves, cross-connect shelves, and associated short-reach interfaces. The total number of optical-electronic components is reduced by 50 percent, further lowering costs, improving availability, lowering the time needed to provision services on the network, and increasing mean time between failures (MTBF). It also halves the number of patch cables needed at the terminating sites, reduces power consumption, and shrinks the overall physical footprint of the equipment.



Note

Cisco ANA version 3.6.6 and later provides support for IPoDWDM only on CRS-1 devices running IOS-XR software.

Information Model Objects (IMOs)

This section describes the following IMOs:

- [DWDM Interface](#)
- [DWDM G709 Information](#)
- [DWDM PM Settings](#)

DWDM Interface

The [DWDM Interface](#) object represents a DWDM controller physical termination point. It is accessed by the [Module](#) containing it.

Table 27-1 *DWDM Interface (IDWDM)*

Attribute Name	Attribute Description	Scheme	Polling Interval
Location	Indicates the port location on which the controller resides. It is the postfix of the Physical Port which has this DWDM controller.	IPCore	Configuration
Loopback	Transponder loopback setting (<i>none, internal, line</i>).	IPCore	Configuration
ControllerStatus	Status of the controller status (<i>up, down</i>).	IPCore	Configuration
WavelengthBand	Indicates the wavelength band (<i>C-band, L-band</i>).	IPCore	Configuration
Channel	The Multisource Agreement (MSA) ITU channel number. The ITU channel number is an integer from 1 to 83 (for the C-band) or from 106 to 185 (for the L-band).	IPCore	Configuration
Frequency	Frequency of the channel, in terahertz.	IPCore	Configuration
Wavelength	Wavelength corresponding to the channel number, in nanometers.	IPCore	Configuration
OpticsType	Indicates the optics type of the DWDM controller (<i>DWDM, Cisco 10Gb DWDM, LR-2/L-64.2a (80km), 10Gb MSA WDM (65km)</i> , and so on).	IPCore	Configuration
TxPower	Transmit power level. 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.	IPCore	Configuration
RxPower	Receive power level. Values are in units of 0.1 dBm and can range from -200 to 0. This corresponds to a range of -20 dBm to 0 dBm.	IPCore	Configuration
RxLosThreshold	Indicates the transponder receive power LOS threshold value (in units of 0.1dBm).	IPCore	Configuration
G709Info	The raw string output value of G709 status, as retrieved using the command line interface (CLI).	IPCore	Configuration
PMSettings	An array of one or more instances of DWDM PM Settings objects	IPCore	Configuration

DWDM G709 Information

The [DWDM G709 Information](#) object represents the G709 wrapper data for a [DWDM Interface](#) on a DWDM controller.

Table 27-2 *DWDM G709 Information (IDwdmG709Info)*

Attribute Name	Attribute Description	Scheme	Polling Interval
Location	The location of the DWDM controller.	IPCore	Configuration
Status	The administrative status of the DWDM controller.	IPCore	Configuration
OtuAlarmCounters	A list of OTU alarm counters. Each entry has a counter value and an alarm type (<i>AIS</i> , <i>BDI</i> , <i>BEI</i> , <i>BIP</i> , <i>FECMISMATCH</i> , <i>IAE</i> , <i>LOF</i> , <i>LOM</i> , <i>LOS</i> , <i>TIM</i>).	IPCore	Configuration
OduAlarmCounters	A list of ODU alarm counters. Each entry has a counter value and an alarm type (<i>AIS</i> , <i>BDI</i> , <i>BEI</i> , <i>BIP</i> , <i>LCK</i> , <i>OCI</i> , <i>PTIM</i> , <i>TIM</i>).	IPCore	Configuration
OtuAlarmReporting	A list of OTU alarm types in the DWDM controller which are enabled to report in the command line interface (CLI).	IPCore	Configuration
OduAlarmReporting	A list of ODU alarm types in the DWDM controller which are enabled to report in the CLI.	IPCore	Configuration
OtuAssertedAlarms	A list of asserted OTU alarm types in the DWDM controller.	IPCore	Configuration
OduAssertedAlarms	A list of asserted ODU alarm types in the DWDM controller.	IPCore	Configuration
OtuDetectedAlarms	A list of detected OTU alarm types in the DWDM controller.	IPCore	Configuration
OduDetectedAlarms	A list of detected ODU alarm types in the DWDM controller.	IPCore	Configuration
OtuAlertCounters	A list of OTU alert counters. Each entry has a counter value and an alarm type (<i>SD_BER</i> , <i>SF_BER</i> , <i>PM_TCA</i> , <i>SM_TCA</i>).	IPCore	Configuration
OtuAlertReporting	A list of OTU alert types in the DWDM controller which are enabled to report in CLI.	IPCore	Configuration
OtuAssertedAlerts	A list of asserted OTU alert types in the DWDM controller.	IPCore	Configuration
OtuDetectedAlerts	A list of detected OTU alert types in the DWDM controller.	IPCore	Configuration
OduAlertCounters	A list of ODU alert counters. Each entry has a counter value and an alarm type (<i>D_BER</i> , <i>SF_BER</i> , <i>PM_TCA</i> , <i>SM_TCA</i>).	IPCore	Configuration
OduAlertReporting	A list of ODU alert types in the DWDM controller which are enabled to report in CLI.	IPCore	Configuration
OduAssertedAlerts	A list of asserted ODU alert types in the DWDM controller.	IPCore	Configuration
OduDetectedAlerts	A list of detected ODU alert types in the DWDM controller.	IPCore	Configuration
OtuTTI	The OTU trail trace identifier. It contains the TTI type (<i>SENT</i> , <i>EXPECTED</i> , <i>RECEIVED</i>), the stringType (<i>ASCII</i> , <i>HEX</i>), and the string value.	IPCore	Configuration
OduTTI	The ODU trail trace identifier.	IPCore	Configuration
FecInfo	The FEC data in the G709 wrapper. It contains the FECMode, RemoteFECMode, ecTCA, ucTCA, ecCounter, and ucCounter.	IPCore	Configuration

DWDM PM Settings

The [DWDM PM Settings](#) object contains the PM setting for the threshold crossing alarm (TCA) values and the threshold values on a DWDM controller.

Table 27-3 DWDM PM Settings (IDwdmPmSettings)

Attribute Name	Attribute Description	Scheme	Polling Interval
Location	The Location of the DWDM controller.	IPCore	Configuration
IntervalType	The sampling interval type (<i>15_min</i> , <i>24_hour</i>).	IPCore	Configuration
FecPmSettings	The FEC type (<i>EC-BITS</i> , <i>UC_WORDS</i>), TCA, and threshold values.	IPCore	Configuration
OpticsPmSettings	The optics PM type (<i>LBC</i> , <i>OPR</i> , <i>OPT</i>), maxTCA, minTCA, maxThreshold, minThreshold, and thresholdUnit.	IPCore	Configuration
OtnPmSettings	The OTN PM type, TCA, and threshold value. Possible values of the OTN PM type are <i>BBE_PM_FE</i> , <i>BBE_PM_NE</i> , <i>BBE_SM_FE</i> , <i>BBE_SM_NE</i> , <i>BBER_PM_FE</i> , <i>BBER_PM_NE</i> , <i>BBER_SM_FE</i> , <i>BBER_SM_NE</i> , <i>ES_PM_FE</i> , <i>ES_PM_NE</i> , <i>ES_SM_FE</i> , <i>ES_SM_NE</i> , <i>ESR_PM_FE</i> , <i>ESR_PM_NE</i> , <i>ESR_SM_FE</i> , <i>ESR_SM_NE</i> , <i>FC_PM_FE</i> , <i>FC_PM_NE</i> , <i>FC_SM_FE</i> , <i>FC_SM_NE</i> , <i>SES_PM_FE</i> , <i>SES_PM_NE</i> , <i>SES_SM_FE</i> , <i>SES_SM_NE</i> , <i>SESR_PM_FE</i> , <i>SESR_PM_NE</i> , <i>SESR_SM_FE</i> , <i>SESR_SM_NE</i> , <i>UAS_PM_FE</i> , <i>UAS_PM_NE</i> , <i>UAS_SM_FE</i> , <i>UAS_SM_NE</i> .	IPCore	Configuration

Vendor-Specific Inventory and IMOs

There are no vendor-specific inventory or IMOs for this technology. Currently, only the Cisco CRS-1 device running IOS-XR is supported.

Network Topology

There is no network topology to be discovered specifically for IPoDWDM. The command line interface (CLI) is used to discover physical inventory attributes for DWDM controllers in the chassis. Cisco ANA models them as it does other physical ports.

Service Alarms

The following alarms are supported for this technology:

- DWDM Controller up/down
- DWDM G709 Wrapper up/down

For detailed information about alarms and correlation, see the [Cisco Active Network Abstraction 3.7 User Guide](#).