CISCO CWDM GBIC AND SFP SOLUTION

OVERVIEW

The Cisco® Coarse Wavelength-Division Multiplexing (CWDM) Gigabit Interface Converter (GBIC)/Small Form-Factor Pluggable (SFP) solution allows enterprise companies and service providers to provide scalable and easy-to-deploy Gigabit Ethernet and Fibre Channel services in their networks. The product set helps enable the flexible design of highly available, multiservice networks.

The Cisco CWDM GBIC/SFP solution is a convenient and cost-effective solution for the adoption of Gigabit Ethernet and Fibre Channel in campus, data-center, and metropolitan-area access networks.

The Cisco CWDM GBIC/SFP solution has two main components (Figure 1): a set of eight different pluggable transceivers (Cisco CWDM GBICs and Cisco CWDM SFPs), and a set of different Cisco CWDM passive multiplexer/demultiplexer or optical add/drop multiplexers (OADMs). A Cisco CWDM chassis enables rack-mounting up to two of the Cisco CWDM passives.

Figure 1. Cisco CWDM GBIC/SFP Solution

KEY FEATURES AND BENEFITS

Scalability

The Cisco CWDM GBIC/SFP solution helps enable the transport of up to eight channels (Gigabit Ethernet or Fibre Channel) over single-mode fiber strands.

Easy Deployment and Flexible Implementation

The Cisco CWDM GBIC (and Cisco CWDM SFP) fits into a standard GBIC (and SFP) port supporting the IEEE 802.3z standard on the supported Cisco Systems® platforms. The Cisco CWDM OADM is passive and requires no power. Neither the Cisco CWDM GBIC (nor Cisco CWDM SFP) nor the Cisco CWDM passives requires configuration.

The Cisco CWDM GBIC/SFP solution allows for a variety of network configurations—from multichannel point-to-point to hub and meshed-ring configurations.

High Availability

The Cisco CWDM GBIC/SFP solution takes advantage of a multichannel architecture and the inherent protection of ring architectures. The solution helps enable:

- Use of Layer 2 and Layer 3 redundancy and failover mechanisms at the channel endpoints (Cisco CWDM GBIC/SFP) to build highly available links
- Use of two-path link configurations in a ring architecture to provide protection from fiber cuts

Investment Protection

The Cisco CWDM GBIC/SFP solution helps enable enterprises and service providers to increase the bandwidth of an existing Gigabit Ethernet optical infrastructure without adding new fiber strands. The solution can be used in parallel with other Cisco GBIC and SFP devices on the same platform.

DEPLOYMENT SCENARIOS

Point-to-Point Configuration

In a point-to-point configuration (Figure 2), two endpoints are directly connected through a fiber link. The Cisco CWDM GBIC/SFP solution helps enable customers to add or drop as many as eight channels (Gigabit Ethernet or Fibre Channel) into a pair of single-mode fiber strands. As a result, the need for additional fiber is minimized. Redundant point-to-point links are possible by adding or dropping redundant channels into a second pair of single-mode fiber strands.

A single fiber point-to-point configuration also is possible (Figure 3). By using different wavelengths to transmit and receive signals, as many as four channels can be transported over a single fiber strand.

The main applications for the architecture are enterprise campus links and service provider point-of-presence (POP) or hub interconnects across a metropolitan (metro) area.

**Figure 2.** Point-to-Point Architecture (Dual-Fiber Link)
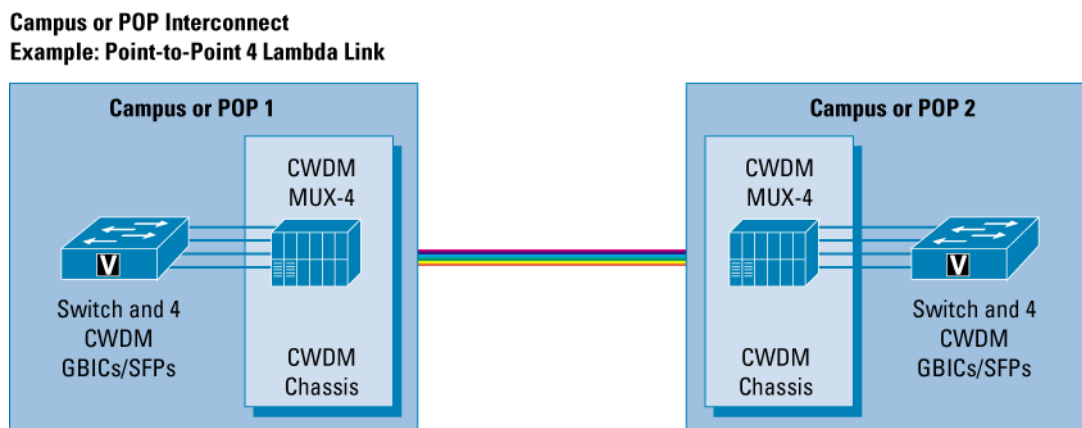
Figure 3. Point-to-Point Architecture (Single-Fiber Link)

Campus or POP Interconnect
Example: Point-to-Point 4 Lambda Link
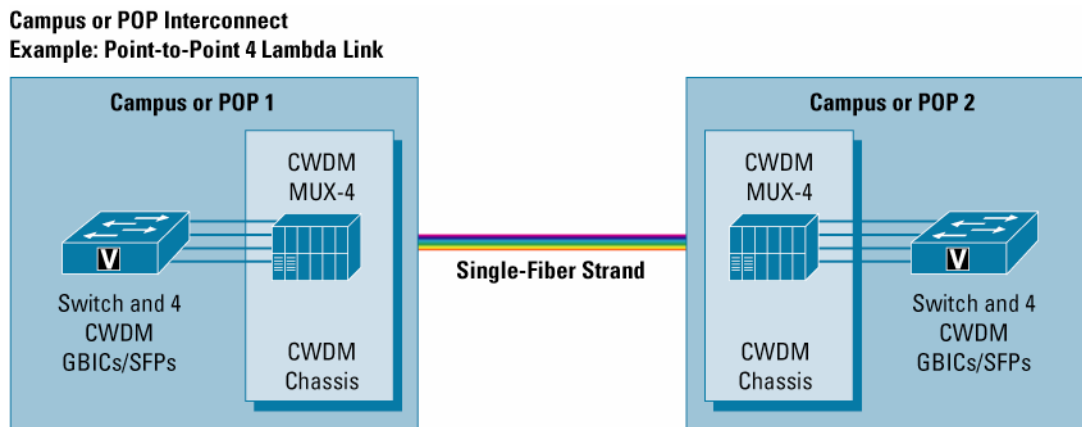
Hub-and-Spoke (Ring) Configuration

In a hub-and-spoke configuration (Figure 4), multiple nodes (spokes) are connected with a hub location through a ring of single-mode fiber. Each hub-node connection can consist of a single or multiple channels. Protection from fiber cuts in the ring is achieved by connecting the hub and nodes through both directions of the optical ring. Service provider metro access rings are the main applications for this architecture.

Figure 4. Hub-and-Spoke (Ring) Architecture
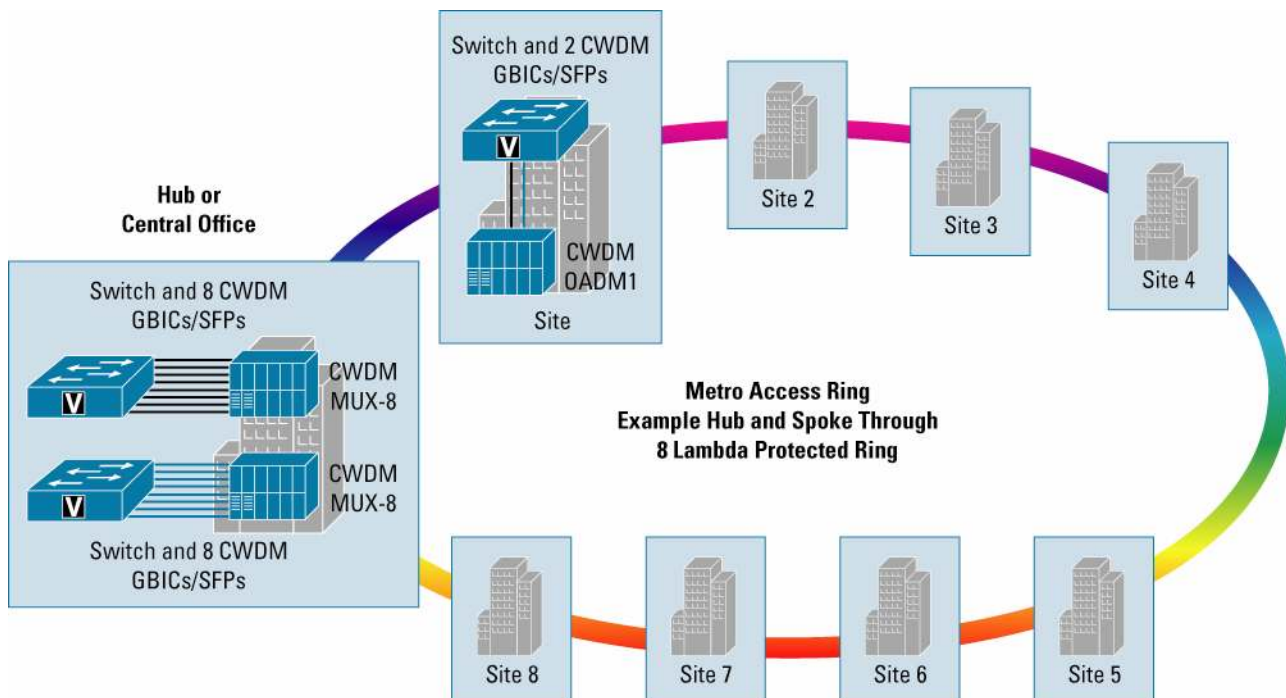
Mesh (Ring) Configuration

Mesh deployments are a combination of hub-and-spoke and point-to-point or even multiple point-to-point connections in parallel on the same optical link. Deployment of the maximum eight wavelengths allows for different combinations of these scenarios.

TECHNICAL SPECIFICATIONS

Cisco CWDM GBICs

The Cisco CWDM GBIC (Figure 5) is a hot-swappable input/output device that plugs into an 802.3z standards-compliant GBIC port or slot of a Cisco switch or router, linking the port with the fiber-optic network.

Figure 5. Cisco CWDM GBICs

Performance
- 1.25 Gbps full-duplex links
- Optical link budget of 30 decibels (dB)

Platform Support

The Cisco CWDM GBICs are supported across a variety of Cisco switches, routers, and optical transport devices. For more details, refer to the document Cisco CWDM GBIC Compatibility Matrix.

Connectors and Cabling
- Equipment: Standard GBIC interface
- Network: Dual SC/PC connector

Note: Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported.

Environmental Conditions and Power Requirements

The operating temperature range is between 32 and 122°F (0 and 50°C); storage temperature range is between –40 and 185°F (–40 and 85°C). Table 1 provides the electrical power interface details, and Table 2 describes optical parameters.

Table 1. Electrical Power Interface Data

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Current	Is		280	350	mA
Maximum Voltage	Vmax			6	V

Parameter	Symbol	Minimum	Typical	Maximum	Units
Surge Current	ISurge			400	mA
Input Voltage	Vcc	4.75	5	5.25	V

Optical Specifications

Table 2. Optical Parameters

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes and Conditions
Transmitter Center Wavelength	$wavelength_c$	(x–4)		(x + 7)	nm	Available center wavelengths are 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm
Side-Mode Suppression Ratio	SMSR	30			dB	
Transmitter Optical Output Power	P_{out}	+1.0	+3.0	+5.0	dBm	Average power coupled into single-mode fiber
Receiver Optical Input Power (Bit error rate [BER] <10–12 with pseudo-random bit sequence [PRBS] 2–7–1)	P_{in}	–29.0	–33.0	–7.0	dBm	@ 1.25 Gbps, 140°F (60°C) case temperature
Optical Input Wavelength	$wavelength_{in}$	1450		1620	nm	
Transmitter Extinction Ratio	OMI	9			dB	
Dispersion Penalty at 100 km				3	dB	@ 1.25 Gbps

Note: Parameters are specified over temperature and at end of life unless otherwise noted.

Note: When shorter distances of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver:

Warranty
- Standard warranty: 90 days
- Extended warranty (option): Cisco CWDM GBICs can be covered through a Cisco SMARTnet® support contract for the Cisco switch or router chassis

Ordering Information

Refer to Table 3 for details about ordering Cisco CWDM GBICs.

Table 3. Cisco CWDM GBIC Product Information

Product Number	Description	Color
CWDM-GBIC-1470=	Cisco 1000BASE-CWDM GBIC, 1470 nm	Gray
CWDM-GBIC-1490=	Cisco 1000BASE-CWDM GBIC, 1490 nm	Violet
CWDM-GBIC-1510=	Cisco 1000BASE-CWDM GBIC, 1510 nm	Blue

Product Number	Description	Color
CWDM-GBIC-1530=	Cisco 1000BASE-CWDM GBIC, 1530 nm	Green
CWDM-GBIC-1550=	Cisco 1000BASE-CWDM GBIC, 1550 nm	Yellow
CWDM-GBIC-1570=	Cisco 1000BASE-CWDM GBIC, 1570 nm	Orange
CWDM-GBIC-1590=	Cisco 1000BASE-CWDM GBIC, 1590 nm	Red
CWDM-GBIC-1610=	Cisco 1000BASE-CWDM GBIC, 1610 nm	Brown
CWDM-8GBIC-SET1=	Set of four pairs of Cisco 1000BASE-CWDM GBICs	2 gray, blue, yellow, or red
CWDM-8GBIC-SET2=	Set of four pairs of Cisco 1000BASE-CWDM GBICs	2 violet, green, orange, or brown

Regulatory and Standards Compliance

- Compatible with 1000BASE-X standard as specified in IEEE 802.3z
- Safety: Laser Class I 21CFR1040

Cisco CWDM SFPs

A Cisco CWDM SFP (Figure 6) is a hot-swappable input/output device that plugs into an SFP port or slot of a Cisco switch or router, linking the port with the fiber-optic network.

The Cisco CWDM SFPs are multirate parts that support both Gigabit Ethernet and Fibre Channel (1 gigabit and 2 gigabit).

Figure 6. Cisco CWDM SFPs

Performance

- Gigabit Ethernet 1.25 Gbps full-duplex links with an optical link budget of 29 dB
- Fibre Channel 1.06 and 2.12 Gbps full-duplex links with an optical link budget of 28 dB

Platform Support

The Cisco CWDM SFPs are supported across a variety of Cisco switches, routers, and optical transport devices. For more details, refer to the document Cisco CWDM SFP Compatibility Matrix.

Connectors and Cabling

- Equipment: Standard SFP interface
- Network: Dual LC/PC connector

Note: Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported.

Environmental Conditions and Power Requirements

- Operating temperature range: 32 to 122°F (0 to 50°C)
- Storage temperature range: –40 to 185°F (–40 to 85°C)

Table 4 describes the electrical power interface details, and Table 5 describes optical parameters.

Table 4. Electrical Power Interface Data

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Current	I_s		220	300	mA
Surge Current	I_{Surge}			+30	mA
Input Voltage	V_{max}	3.1	3.3	3.6	V

Table 5. Optical Parameters

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes and Conditions
Transmitter Center Wavelength	$wavelength_c$	(x–4)		(x + 7)	nm	Available center wavelengths are 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm
Side-Mode Suppression Ratio	SMSR	30			dB	
Transmitter Optical Output Power	P_{out}	0		5.0	dBm	Average power coupled into single-mode fiber
Receiver Optical Input Power (BER <10–12 with PRBS 2–7—1)	P_{in}	–28.0		–7.0	dBm	@ 2.12 Gbps, 140°F (60°C) case temperature
Receiver Optical Input Power (BER <10-12 with PRBS 2–7—1)	P_{in}	–29.0		–7.0	dBm	@ 1.25 Gbps, 140°F (60°C) case temperature
Receiver Optical Input Wavelength	$wavelength_{in}$	1450		1620	nm	
Transmitter Extinction Ratio	OMI	9			dB	
Dispersion Penalty at 100 km				3	dB	@ 2.12 Gbps
Dispersion Penalty at 100 km				2	dB	@ 1.25 Gbps

Note: Parameters are specified over temperature and at end of life unless otherwise noted.

Note: When shorter distances of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver.

Warranty

- Standard warranty: 90 days
- Extended warranty (option): Available under a Cisco SMARTnet support contract for the Cisco switch or router chassis

Ordering Information

Refer to Table 6 for details about ordering Cisco CWDM SFPs.

Table 6. Cisco CWDM SFP Product Information

Product Number	Description	Color
CWDM-SFP-1470=	Cisco CWDM 1470-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fibre Channel	Gray
CWDM-SFP-1490=	Cisco CWDM 1490-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fibre Channel	Violet
CWDM-SFP-1510=	Cisco CWDM 1510-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fibre Channel	Blue
CWDM-SFP-1530=	Cisco CWDM 1530-nm SFP; Gigabit Ethernet and 1 and 2-Gb Fibre Channel	Green
CWDM-SFP-1550=	Cisco CWDM 1550-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fibre Channel	Yellow
CWDM-SFP-1570=	Cisco CWDM 1570-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fibre Channel	Orange
CWDM-SFP-1590=	Cisco CWDM 1590-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fibre Channel	Red
CWDM-SFP-1610=	Cisco CWDM 1610-nm SFP; Gigabit Ethernet and 1 and 2 Gb Fibre Channel	Brown

Regulatory and Standards Compliance

- Compatible with 1000BASE-X standard as specified in IEEE 802.3z
- Compatible with Fibre Channel Draft Physical Interface Specification (FC-PI 10.0)
- Safety: Laser Class I 21CFR1040

ORDERING INFORMATION

To place an order, visit the [Cisco Ordering Home Page](#).

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FOR MORE INFORMATION

For more information about the Cisco CWDM products, visit
http://cco/en/US/partner/products/hw/modules/ps4999/products_data_sheet09186a00801a557c.html or contact your local Cisco account representative.

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