



# Installing MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L Cards in the Cisco ONS 15454 SONET/SDH

---

**Product Names:** 15454-10DME-C=, 15454-10DME-L=

This document provides a card description, specifications, and installation procedure for the MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards. These cards are compatible with the ONS 15454 SONET (ANSI) and the ONS 15454 SDH (ETSI) shelf assemblies. As appropriate use this document in conjunction with the *Cisco ONS 15454 DWDM Procedure Guide*, the *Cisco ONS 15454 DWDM Reference Manual*, and the *Cisco ONS 15454 DWDM Troubleshooting Guide*.



**Note**

---

“MXP\_MR\_10DME\_C” is the card name that appears in Cisco Transport Controller (CTC); the same card is named “10DME-C” on the physical faceplate. “MXP\_MR\_10DME-L” is the name that appears in CTC; the same card is named “10DME-L” on the physical faceplate.

---

This document contains the following sections:

- [MXP\\_MR\\_10DME\\_C and MXP\\_MR\\_10DME\\_L Card Description, page 2](#)
- [MXP\\_MR\\_10DME\\_C Card Specifications, page 10](#)
- [MXP\\_MR\\_10DME\\_L Card Specifications, page 12](#)
- [Install the MXP\\_MR\\_10DME\\_C and MXP\\_MR\\_10DME\\_L Cards, page 15](#)
- [Related Documentation, page 17](#)
- [Obtaining Documentation, page 17](#)
- [Documentation Feedback, page 18](#)
- [Cisco Product Security Overview, page 19](#)
- [Obtaining Technical Assistance, page 20](#)
- [Obtaining Additional Publications and Information, page 21](#)



---

**Corporate Headquarters:**  
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

© 2005 Cisco Systems, Inc. All rights reserved.

# MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L Card Description

The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L muxponder cards aggregate a mix of storage access networking (SAN) service client inputs (GE, FICON, and Fibre Channel) into one 10.0 Gbps STM-64/OC-192 DWDM signal on the trunk side. The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards pass all SONET/SDH overhead bytes transparently. Each card provides one long-reach STM-64/OC-192 port and is compliant with Telcordia GR-253-CORE and ITU-T G.957. You can install MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards in Slots 1 to 6 and 12 to 17. Each ONS 15454 shelf assembly can accommodate up to 12 cards.



**Note**

On the card faceplates, the MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards are displayed as 10DME\_C and 10DME\_L, respectively.



**Note**

The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards are not compatible with the MXP\_2.5G\_10G card, which does not support full optical transparency.

## Feature Summary

For detailed information about card features refer to the *Cisco ONS 15454 DWDM Reference Manual*.

The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards have the following high-level features:

- Onboard E-FEC processor: The processor supports both standard RS (specified in ITU-T G.709) and E-FEC, which allows an improved gain on trunk interfaces with a resultant extension of the transmission range on these interfaces. The E-FEC functionality increases the correction capability of the transponder to improve performance, allowing operation at a lower OSNR compared to the standard RS (237,255) correction algorithm. A new BCH algorithm implemented in E-FEC allows recovery of an input BER up to 1E-3.
- Pluggable client interface optic modules: The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards have modular interfaces. Two types of optics modules can be plugged into the card. These include an OC-48/STM 16 SR-1 interface with a 7-km (4.3-mile) nominal range (for short range and intra-office applications) and an IR-1 interface with a range up to 40 km (24.9 miles). SR-1 is defined in Telcordia GR-253-CORE and in I-16 (ITU-T G.957). IR-1 is defined in Telcordia GR-253-CORE and in S-16-1 (ITU-T G.957).
- Y-cable protection: Supports Y-cable protection between the same card type only, on ports with the same port number and signal rate. See the *Cisco ONS 15454 DWDM Reference Manual* for more detailed information.
- High level provisioning support: The cards are initially provisioned using Cisco MetroPlanner software. Subsequently, the card can be monitored and provisioned using CTC software.
- Automatic laser shutdown: A safety mechanism used in the event of a fiber cut.
- Link monitoring and management: The cards use standard OC-48 OH bytes to monitor and manage incoming interfaces. The cards pass the incoming SDH/SONET data stream and its OH bytes transparently.
- Control of layered SONET/SDH transport overhead: The cards are provisionable to terminate regenerator section overhead. This is used to eliminate forwarding of unneeded layer overhead. It can help reduce the number of alarms and help isolate faults in the network.

- Automatic timing source synchronization: The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards normally synchronize from the TCC2/TCC2P card. If for some reason, such as maintenance or upgrade activity, the TCC2/TCC2P is not available, the cards automatically synchronize to one of the input client interface clocks.
- Configurable squelching policy: The cards can be configured to squelch the client interface output if there is LOS at the DWDM receiver or if there is a remote fault. In the event of a remote fault, the card manages MS-AIS insertion.
- The cards are tunable across the full C band (MXP\_MR\_10DME\_C) or full L band (MXP\_MR\_10DME\_L), thus eliminating the need to use different versions of each card to provide tunability across specific wavelengths in a band.

## Signal Types

The cards support aggregation of the following signal types:

- 1-Gigabit Fibre Channel
- 2-Gigabit Fibre Channel
- 4-Gigabit Fibre Channel
- 1-Gigabit Ethernet
- 1-Gigabit ISC-Compatible (ISC-1)
- 2-Gigabit ISC-Peer (ISC-3)



**Note**

Because the client payload cannot oversubscribe the trunk, a maximum of 10-Gbps of mixed client signals can be accepted.

## Digital Wrapper

The digital wrapper function (ITU-T G.709-compliant) formats the DWDM wavelength so that it can be used to set up generic communication channels (GCCs) for data communications, enable forward error correction (FEC), or facilitate performance monitoring (PM). The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards work with the OTN devices defined in ITU-T G.709. The cards support ODU1-to-OTU2 multiplexing, which is an industry standard method for asynchronously mapping a SONET/SDH payload into a digitally wrapped envelope.

## Client and Trunk Ports

The MXP\_MR\_10DME\_C card features a tunable 1550-nm C-band laser on the trunk port. The laser is tunable across 82 wavelengths on the ITU grid with 50-GHz spacing between wavelengths. The MXP\_MR\_10DME\_L features a tunable 1580-nm L-band laser on the trunk port. The laser is tunable across 80 wavelengths on the ITU grid, also with 50-GHz spacing. Each card features four 1310-nm lasers on the client ports and contains five transmit and receive connector pairs (labeled) on the card faceplate. The cards uses dual LC connectors on the trunk side and uses small-form factor pluggable (SFP) modules on the client side for optical cable termination.

## Data Rates

Table 1 shows the input data rate for each client interface and the encapsulation method. The current version of the GFP-T G.7041 supports transparent mapping of 8B/10B block-coded protocols, including Gigabit Ethernet, Fibre Channel, ISC, and FICON.

In addition to the GFP mapping, 1-Gbps traffic on Port 1 or 2 of the high-speed SERDES is mapped to an STS-24c channel. If two 1-Gbps client signals are present at Port 1 and Port 2 of the high-speed SERDES, the Port 1 signal is mapped into the first STS-24c channel and the Port 2 signal into the second STS-24c channel. The two channels are then mapped into an OC-48 trunk channel.

**Table 1** *MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L Client Interface Data Rates and Encapsulation*

Client Interface	Input Data Rate	GFP-T G.7041 Encapsulation
2G FC	2.125 Gbps	Yes
1G FC	1.06 Gbps	Yes
2G FICON/2G ISC-Compatible (ISC-1)/ 2G ISC-Peer (ISC-3)	2.125 Gbps	Yes
1G FICON/1G ISC-Compatible (ISC-1)/ 1G ISC-Peer (ISC-3)	1.06 Gbps	Yes
Gigabit Ethernet	1.25 Gbps	Yes

There are two FPGAs on each MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L, and a group of four ports is mapped to each FPGA. Group 1 consists of Ports 1 through 4, and Group 2 consists of Ports 5 through 8. Table 2 shows some of the mix and match possibilities on the various client data rates for Ports 1 through 4 and Ports 5 through 8. An X indicates that the data rate is supported in that port.

**Table 2** *Supported Client Data Rates for Ports 1 through 4*

Port (Group 1)	Port (Group 2)	Gigabit Ethernet	1G FC	2G FC	4G FC
1	5	X	X	X	X
2	6	X	X	—	—
3	7	X	X	X	—
4	8	X	X	—	—

## Performance Monitoring

GFP-T PM is available through RMON and trunk PM is managed according to Telcordia GR-253-CORE and ITU G.783/826. Client PM is achieved through RMON for FC and GE.

## Distance Extension

A buffer-to-buffer credit management scheme provides FC flow control. With this feature enabled, a port indicates the number of frames that can be sent to it (its buffer credit), before the sender is required to stop transmitting and wait for the receipt of a “ready” indication. The MXP\_MR\_10DME\_C and

MXP\_MR\_10DME\_L cards support FC credit-based flow control with a buffer-to-buffer credit extension of up to 1600 km (994.1 miles) for 1G FC, up to 800 km (497.1 miles) for 2G FC, or up to 400 km (248.5 miles) for 4G FC. The feature can be enabled or disabled.

## Feature Summary

For detailed information about card features refer to the *Cisco ONS 15454 DWDM Reference Manual*.

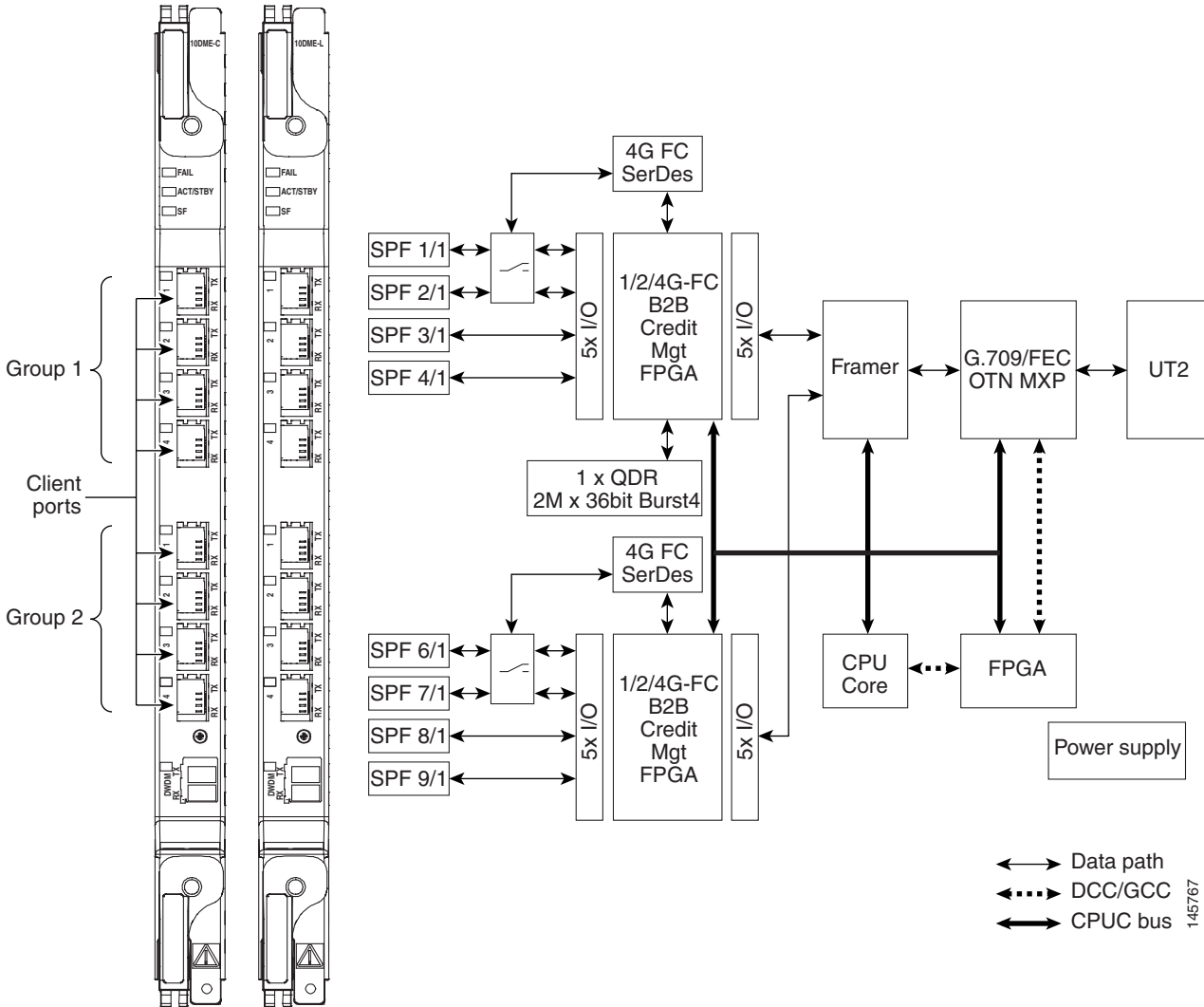
The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards have the following high-level features:

- **Onboard E-FEC processor:** The processor supports both standard RS (specified in ITU-T G.709) and E-FEC, which allows an improved gain on trunk interfaces with a resultant extension of the transmission range on these interfaces. The E-FEC functionality increases the correction capability of the transponder to improve performance, allowing operation at a lower OSNR compared to the standard RS (237,255) correction algorithm. A new BCH algorithm implemented in E-FEC allows recovery of an input BER up to 1E-3.
- **Pluggable client interface optic modules:** The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards have modular interfaces. Two types of optics modules can be plugged into the card. These include an OC-48/STM 16 SR-1 interface with a 7-km (4.3-mile) nominal range (for short range and intra-office applications) and an IR-1 interface with a range up to 40 km (24.9 miles). SR-1 is defined in Telcordia GR-253-CORE and in I-16 (ITU-T G.957). IR-1 is defined in Telcordia GR-253-CORE and in S-16-1 (ITU-T G.957).
- **Y-cable protection:** Supports Y-cable protection between the same card type only, on ports with the same port number and signal rate. See the *Cisco ONS 15454 DWDM Reference Manual* for more detailed information.
- **High level provisioning support:** The cards are initially provisioned using Cisco MetroPlanner software. Subsequently, the card can be monitored and provisioned using CTC software.
- **ALS:** A safety mechanism used in the event of a fiber cut. For details regarding ALS provisioning for the MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards, see the *Cisco ONS 15454 DWDM Procedure Guide*.
- **Link monitoring and management:** The cards use standard OC-48 OH bytes to monitor and manage incoming interfaces. The cards pass the incoming SDH/SONET data stream and its OH bytes transparently.
- **Control of layered SONET/SDH transport overhead:** The cards are provisionable to terminate regenerator section overhead. This is used to eliminate forwarding of unneeded layer overhead. It can help reduce the number of alarms and help isolate faults in the network.
- **Automatic timing source synchronization:** The MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards normally synchronize from the TCC2/TCC2P card. If for some reason, such as maintenance or upgrade activity, the TCC2/TCC2P is not available, the cards automatically synchronize to one of the input client interface clocks.
- **Configurable squelching policy:** The cards can be configured to squelch the client interface output if there is LOS at the DWDM receiver or if there is a remote fault. In the event of a remote fault, the card manages MS-AIS insertion.
- **The cards are tunable across the full C band (MXP\_MR\_10DME\_C) or full L band (MXP\_MR\_10DME\_L), thus eliminating the need to use different versions of each card to provide tunability across specific wavelengths in a band.**

# Faceplates

Figure 1 shows the MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L faceplates and block diagram.

Figure 1 MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L Faceplates and Block Diagram



# Wavelength Identification

The card uses trunk lasers that are wavelocked, which allows the trunk transmitter to operate on the ITU grid effectively. Both the MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards implement the UT2 module. The MXP\_MR\_10DME\_C card uses a C-band version of the UT2 and the MXP\_MR\_10DME\_L card uses an L-band version.

Table 3 describes the required trunk transmit laser wavelengths for the MXP\_MR\_10DME\_C card. The laser is tunable over 82 wavelengths in the C band at 50-GHz spacing on the ITU grid.

**Table 3** MXP\_MR\_10DME\_C Trunk Wavelengths

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
1	196.00	1529.55	42	193.95	1545.72
2	195.95	1529.94	43	193.90	1546.119
3	195.90	1530.334	44	193.85	1546.518
4	195.85	1530.725	45	193.80	1546.917
5	195.80	1531.116	46	193.75	1547.316
6	195.75	1531.507	47	193.70	1547.715
7	195.70	1531.898	48	193.65	1548.115
8	195.65	1532.290	49	193.60	1548.515
9	195.60	1532.681	50	193.55	1548.915
10	195.55	1533.073	51	193.50	1549.32
11	195.50	1533.47	52	193.45	1549.71
12	195.45	1533.86	53	193.40	1550.116
13	195.40	1534.250	54	193.35	1550.517
14	195.35	1534.643	55	193.30	1550.918
15	195.30	1535.036	56	193.25	1551.319
16	195.25	1535.429	57	193.20	1551.721
17	195.20	1535.822	58	193.15	1552.122
18	195.15	1536.216	59	193.10	1552.524
19	195.10	1536.609	60	193.05	1552.926
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.134
23	194.90	1538.186	64	192.85	1554.537
24	194.85	1538.581	65	192.80	1554.940
25	194.80	1538.976	66	192.75	1555.343
26	194.75	1539.371	67	192.70	1555.747
27	194.70	1539.766	68	192.65	1556.151
28	194.65	1540.162	69	192.60	1556.555
29	194.60	1540.557	70	192.55	1556.959
30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.173
33	194.40	1542.142	74	192.35	1558.578
34	194.35	1542.539	75	192.30	1558.983
35	194.30	1542.936	76	192.25	1559.389

**Table 3** *MXP\_MR\_10DME\_C Trunk Wavelengths (Continued)*

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
36	194.25	1543.333	77	192.20	1559.794
37	194.20	1543.730	78	192.15	1560.200
38	194.15	1544.128	79	192.10	1560.606
39	194.10	1544.526	80	192.05	1561.013
40	194.05	1544.924	81	192.00	1561.42
41	194.00	1545.32	82	191.95	1561.83

Table 4 describes the required trunk transmit laser wavelengths for the MXP\_MR\_10DME\_L card. The laser is fully tunable over 80 wavelengths in the L band at 50-GHz spacing on the ITU grid.

**Table 4** *MXP\_MR\_10DME\_L Trunk Wavelengths*

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
1	190.85	1570.83	41	188.85	1587.46
2	190.8	1571.24	42	188.8	1587.88
3	190.75	1571.65	43	188.75	1588.30
4	190.7	1572.06	44	188.7	1588.73
5	190.65	1572.48	45	188.65	1589.15
6	190.6	1572.89	46	188.6	1589.57
7	190.55	1573.30	47	188.55	1589.99
8	190.5	1573.71	48	188.5	1590.41
9	190.45	1574.13	49	188.45	1590.83
10	190.4	1574.54	50	188.4	1591.26
11	190.35	1574.95	51	188.35	1591.68
12	190.3	1575.37	52	188.3	1592.10
13	190.25	1575.78	53	188.25	1592.52
14	190.2	1576.20	54	188.2	1592.95
15	190.15	1576.61	55	188.15	1593.37
16	190.1	1577.03	56	188.1	1593.79
17	190.05	1577.44	57	188.05	1594.22
18	190	1577.86	58	188	1594.64
19	189.95	1578.27	59	187.95	1595.06
20	189.9	1578.69	60	187.9	1595.49
21	189.85	1579.10	61	187.85	1595.91
22	189.8	1579.52	62	187.8	1596.34
23	189.75	1579.93	63	187.75	1596.76

**Table 4** MXP\_MR\_10DME\_L Trunk Wavelengths (Continued)

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
24	189.7	1580.35	64	187.7	1597.19
25	189.65	1580.77	65	187.65	1597.62
26	189.6	1581.18	66	187.6	1598.04
27	189.55	1581.60	67	187.55	1598.47
28	189.5	1582.02	68	187.5	1598.89
29	189.45	1582.44	69	187.45	1599.32
30	189.4	1582.85	70	187.4	1599.75
31	189.35	1583.27	71	187.35	1600.17
32	189.3	1583.69	72	187.3	1600.60
33	189.25	1584.11	73	187.25	1601.03
34	189.2	1584.53	74	187.2	1601.46
35	189.15	1584.95	75	187.15	1601.88
36	189.1	1585.36	76	187.1	1602.31
37	189.05	1585.78	77	187.05	1602.74
38	189	1586.20	78	187	1603.17
39	188.95	1586.62	79	186.95	1603.60
40	188.9	1587.04	80	186.9	1604.03

## Card-Level Indicators

Table 5 describes the three card-level LEDs on the MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards.

**Table 5** MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card’s processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	If the ACT/STBY LED is green, the card is operational (one or more ports active) and ready to carry traffic. If the ACT/STBY LED is amber, the card is operational and in standby (protect) mode.
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card’s ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

## Port-Level Indicators

Table 6 describes the port-level LEDs on the MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L cards.

**Table 6** MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L Port-Level Indicators

Port-Level LED	Description
Port LED (eight LEDs, four for each group, one for each SFP)	When green, the port LED indicates that the client port is either in service and receiving a recognized signal (that is, no signal fail), or Out of Service and Maintenance (OOS,MT or locked, maintenance) and the signal fail and alarms are being ignored.
Green/Red/Amber/Off	When red, the port LED indicates that the client port is in service but is receiving a signal fail (LOS).  When amber, the port LED indicates that the port is provisioned and in a standby state.  When off, the port LED indicates that the SFP is either not provisioned, out of service, not properly inserted, or the SFP hardware has failed.
Green DWDM LED	The green DWDM LED indicates that the DWDM port is in service and that it is receiving a recognized signal.

## MXP\_MR\_10DME\_C Card Specifications

The MXP\_MR\_10DME\_C card has the following specifications:

- Payload configuration
  - FC1G—Fibre Channel 1.06 Gbps
  - FC2G—Fibre Channel 2.125 Gbps
  - FC4G—Fibre Channel 4.25 Gbps
  - FICON1G—Fiber CON 1.06 Gbps (IBM signal)
  - FICON2G—Fiber CON 2.125 Gbps (IBM signal)
  - FICON4G—Fiber CON 4.25 Gbps (IBM signal)
  - ONE\_GE—One Gigabit Ethernet 1.125 Gbps
  - Mixed configurations up to maximum line rate of 10.0 Gbps. See the *Cisco ONS 15454 DWDM Reference Manual* for more information on mixed-mode operation.
- Client ports: 8x SFP
- Line (trunk side)
  - Bit rate: 2.488 Gbps for OC-48/STM-16, 9.952 Gbps for OC-192/STM-64
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode or 850-nm multimode
  - Loopback modes: Terminal and facility



**Caution**

You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP\_MR\_10DME\_C card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP\_MR\_10DME\_C cards. Using direct fiber loopbacks causes irreparable damage to the MXP\_MR\_10DME\_C cards.

- Connectors: LC
- Compliance: Telcordia GR-253-CORE, Telcordia GR-2918-CORE, Issue 2, ITU-T G.957, and ITU-T 100-GHz grid standard G.692
- Transmitter (trunk side)
  - Minimum output power: +3 dBm
  - Maximum output power: +6 dBm
  - Minimum SMSR: 30 dB
  - Minimum optical extinction ratio: 10 dB
  - 41 wavelength tunability at 100-GHz spacing
  - Receiver maximum return reflectance (Rx return loss): -27 dB
  - Chromatic dispersion allowance: 5400 ps/nm, giving an optical power penalty < 2.0 dB
  - Minimum side mode suppression ratio: 30 dB
  - Wavelength stability (drift): +/- 25 picometers (pm)



**Note**

An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Receiver (trunk side)

**Table 7 MXP\_MR\_10DME\_C Receiver Trunk Side Specifications**

FEC Applications	OSNR <sup>1</sup>	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity	Chromatic Dispersion Tolerance	Power Penalty	OSNR Penalty
None	23 dB	<10 exp - 12	—	-8 to -20 dBm	+/- 1200 ps/nm	2 dBm	—
	19 dB	<10 exp - 12	—	-9 to -22 dBm	+/- 1000 ps/nm	2 dBm	—
FEC	10 dB	<10 exp - 5	<10 exp - 15	-8 to -18 dBm	+/- 800 ps/nm	—	1.5 dB
Enhanced FEC	19 dB	<10 exp - 4	<10 exp - 15	-8 to -26 dBm	+/- 800 ps/nm	2 dBm	2 dB
	8 dB	<10 exp - 4	<10 exp - 15	-8 to -18 dBm	+/- 800 ps/nm	2 dBm	1.5 dB

1. OSNR defined with 0.5 nm RBW

- Line (client side)
  - Bit rate: 1.06 Gbps to 2.125 Gbps per client
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode or 850-nm multimode
  - Maximum chromatic dispersion allowance: 1600 ps/nm

- Loopback modes: Terminal and facility
- Connectors: LC
- Compliance: Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.957
- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: 1290 to 1330 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: DFB laser
- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER  $1 * 10 \text{ exp} - 12$
  - Minimum receiver level: -14 dBm at BER  $1 * 10 \text{ exp} - 12$
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER =  $1 * 10 \text{ exp} - 12$
  - Receiver input wavelength range: 1290 to 1605 nm
- Environmental
  - Operating temperature: -5 to +40 degrees Celsius (+23 to +104 degrees Fahrenheit)
  - Operating humidity: 5 to 85 percent, noncondensing
  - Power consumption (maximum): 60 W, 1.25 A at -48 V, 204 BTU/hr
- Environmental
  - Operating temperature: -5 to +40 degrees Celsius (+23 to +104 degrees Fahrenheit)
  - Operating humidity: 5 to 85 percent, noncondensing
  - Power consumption (maximum): 60 W, 1.25 A at -48 V, 204 BTU/hr
- Dimensions
  - Height: 12.650 in. (321.3 mm)
  - Width: 0.716 in. (18.2 mm)
  - Depth: 9.000 in. (228.6 mm)
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 2.25 lb (1.02 kg)

## MXP\_MR\_10DME\_L Card Specifications

The MXP\_MR\_10DME\_L card has the following specifications:

- Payload configuration
  - FC1G—Fibre Channel 1.06 Gbps
  - FC2G—Fibre Channel 2.125 Gbps
  - FC4G—Fibre Channel 4.25 Gbps
  - FICON1G—Fiber CON 1.06 Gbps (IBM signal)

- FICON2G—Fiber CON 2.125 Gbps (IBM signal)
- FICON4G—Fiber CON 4.25 Gbps (IBM signal)
- ONE\_GE—One Gigabit Ethernet 1.125 Gbps
- Mixed configurations up to maximum line rate of 10.0 Gbps. See the *Cisco ONS 15454 DWDM Reference Manual* for more information on mixed-mode operation.
- Client ports: 8x SFP
- Line (trunk side)
  - Bit rate: 2.488 Gbps for OC-48/STM-16, 9.952 Gbps for OC-192/STM-64
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode or 850-nm multimode
  - Loopback modes: Terminal and facility

**Caution**


---

You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP\_MR\_10DME\_L card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP\_MR\_10DME\_L cards. Using direct fiber loopbacks causes irreparable damage to the MXP\_MR\_10DME\_L cards.

---

- Connectors: LC
- Compliance: Telcordia GR-253-CORE, Telcordia GR-2918-CORE, Issue 2, ITU-T G.957, and ITU-T 100-GHz grid standard G.692
- Transmitter (trunk side)
  - Minimum output power: +3 dBm
  - Maximum output power: +6 dBm
  - Minimum SMSR: 30 dB
  - Minimum optical extinction ratio: 10.5 dB
  - 40 wavelength tunability at 100-GHz spacing, 80 wavelength tunability at 50-GHz spacing
  - Receiver maximum return reflectance (Rx return loss): -27 dB
  - Chromatic dispersion allowance: 5400 ps/nm, giving an optical power penalty < 2.0 dB
  - Minimum side mode suppression ratio: 30 dB
  - Wavelength stability (drift): +/- 25 picometers (pm)

**Note**


---

An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

---

- Receiver (trunk side)

**Table 8** MXP\_MR\_10DME\_L Receiver Trunk Side Specifications

FEC Applications	OSNR <sup>1</sup>	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity	Chromatic Dispersion Tolerance	Power Penalty	OSNR Penalty
None	23 dB	<10 exp – 12	—	–8 to –19 dBm	+/- 1200 ps/nm	2 dBm	—
	19 dB	<10 exp – 12	—	–9 to –19 dBm	+/- 1000 ps/nm	2 dBm	—
FEC	10 dB	<10 exp – 5	<10 exp – 15	–8 to –18 dBm	+/- 800 ps/nm	—	1.5 dB
Enhanced FEC	19 dB	<10 exp – 4	<10 exp – 15	–8 to –26 dBm	+/- 800 ps/nm	—	2 dB
	8 dB	<10 exp – 4	<10 exp – 15	–8 to –18 dBm	+/- 800 ps/nm	—	1.5 dB

1. Optical Signal-to-Noise ratio (OSNR) defined with 0.5 nm Resolution Bandwidth (RBW)

- Line (client side)
  - Bit rate: 1.06 Gbps to 2.125 Gbps per client
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode or 850-nm multimode
  - Maximum chromatic dispersion allowance: 1600 ps/nm
  - Loopback modes: Terminal and facility
  - Connectors: LC
  - Compliance: Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.957
- Transmitter (client side)
  - Maximum transmitter output power: –1 dBm
  - Minimum transmitter output power: –6 dBm
  - Center wavelength: 1290 to 1330 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: DFB laser
- Receiver (client side)
  - Maximum receiver level: –1 dBm at BER 1 \* 10 exp – 12
  - Minimum receiver level: –14 dBm at BER 1 \* 10 exp – 12
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER = 1 \* 10 exp – 12
  - Receiver input wavelength range: 1290 to 1605 nm
- Environmental
  - Operating temperature: –5 to +40 degrees Celsius (+23 to +104 degrees Fahrenheit)
  - Operating humidity: 5 to 85 percent, noncondensing
  - Power consumption (maximum): 60 W, 1.25 A at –48 V, 204 BTU/hr
- Environmental
  - Operating temperature: –5 to +40 degrees Celsius (+23 to +104 degrees Fahrenheit)
  - Operating humidity: 5 to 85 percent, noncondensing

- Power consumption (maximum): 60 W, 1.25 A at -48 V, 204 BTU/hr
- Dimensions
  - Height: 12.650 in. (321.3 mm)
  - Width: 0.716 in. (18.2 mm)
  - Depth: 9.000 in. (228.6 mm)
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 2.25 lb (1.02 kg)

## Install the MXP\_MR\_10DME\_C and MXP\_MR\_10DME\_L Cards

  
Warning

**During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.** Statement 94

  
Warning

**Class I (CDRH) and Class 1M (IEC) laser products.** Statement 1055

  
Warning

**Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 272



Note

If protective clips are installed on the rear connectors of the cards, remove the clips before installing the cards.

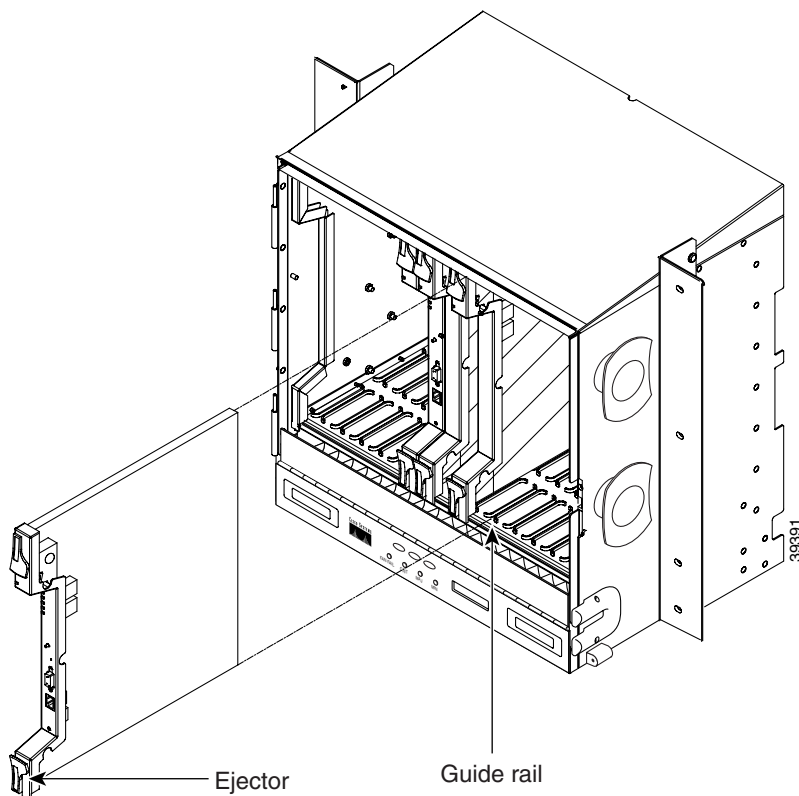


Note

If you install a card incorrectly, the FAIL LED flashes continuously.

[Figure 2](#) shows general card installation.

**Figure 2** Installing a Card in the Cisco ONS 15454 SONET (ANSI) Shelf Assembly



- 
- Step 1** Display the card installation plan for the node using one of the following sources:
- The Cisco MetroPlanner Site Dialog window for the node you are provisioning.
  - CTC node view with slots preprovisioned based on the Cisco MetroPlanner Site Dialog window.
  - Written slot plan. The plan must be based on the Cisco MetroPlanner Site Dialog window for your installation.
- Step 2** Remove the card from its packaging, then remove the protective clips from the card's rear connectors.
- Step 3** Open the card latches/ejectors.
- Step 4** Use the latches/ejectors to firmly slide the card along the guide rails until the card plugs into the receptacle at the back of the slot.
- Step 5** Verify that the card is inserted correctly and close the latches/ejectors on the card.




---

**Note** It is possible to close the latches and ejectors when the card is not completely plugged into the chassis. Ensure that you cannot insert the card any further.

---

- Step 6** Verify the LED activity:
- The red FAIL LED turns on for 20 to 30 seconds.
  - The red FAIL LED blinks for 35 to 45 seconds.
  - All LEDs blink once and turn off for 5 to 10 seconds.

- The ACT or ACT/STBY LED turns on. The SF LED can persist until all card ports connect to their far-end counterparts and a signal is present.

**Step 7** If the card does not boot up properly, or the LED activity does not occur as described in [Step 6](#), check the following:

- When a physical card type does not match the type of card provisioned for that slot in CTC, the card might not boot. If the card does not boot, open CTC and ensure that the slot is not provisioned for a different card type before assuming that the card is faulty.
- If the red FAIL LED does not turn on, check the power.
- If you insert a card into a slot provisioned for a different card, all LEDs turn off.
- If the red FAIL LED is on continuously or the LEDs behave erratically, the card is not installed properly. Remove the card and repeat Steps 3 to 6.

**Stop. You have completed this procedure.**

---

## Related Documentation

- *Cisco ONS 15454 DWDM Reference Manual*
- *Cisco ONS 15454 DWDM Procedure Guide*
- *Cisco ONS 15454 DWDM Troubleshooting Guide*
- *Cisco MetroPlanner DWDM Operations Guide*

## Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

### Cisco.com

You can access the most current Cisco documentation at this URL:

<http://www.cisco.com/techsupport>

You can access the Cisco website at this URL:

<http://www.cisco.com>

You can access international Cisco websites at this URL:

[http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml)

## Product Documentation DVD

Cisco documentation and additional literature are available in the Product Documentation DVD package, which may have shipped with your product. The Product Documentation DVD is updated regularly and may be more current than printed documentation.

The Product Documentation DVD is a comprehensive library of technical product documentation on portable media. The DVD enables you to access multiple versions of hardware and software installation, configuration, and command guides for Cisco products and to view technical documentation in HTML. With the DVD, you have access to the same documentation that is found on the Cisco website without being connected to the Internet. Certain products also have .pdf versions of the documentation available.

The Product Documentation DVD is available as a single unit or as a subscription. Registered Cisco.com users (Cisco direct customers) can order a Product Documentation DVD (product number DOC-DOCDVD=) from Cisco Marketplace at this URL:

<http://www.cisco.com/go/marketplace/>

## Cisco Optical Networking Product Documentation CD-ROM

Optical networking-related documentation, including Cisco ONS 15xxx product documentation, is available in a CD-ROM package that ships with your product. The Optical Networking Product Documentation CD-ROM is updated periodically and may be more current than printed documentation.

## Ordering Documentation

Beginning June 30, 2005, registered Cisco.com users may order Cisco documentation at the Product Documentation Store in the Cisco Marketplace at this URL:

<http://www.cisco.com/go/marketplace/>

Nonregistered Cisco.com users can order technical documentation from 8:00 a.m. to 5:00 p.m. (0800 to 1700) PDT by calling 1 866 463-3487 in the United States and Canada, or elsewhere by calling 011 408 519-5055. You can also order documentation by e-mail at [tech-doc-store-mkpl@external.cisco.com](mailto:tech-doc-store-mkpl@external.cisco.com) or by fax at 1 408 519-5001 in the United States and Canada, or elsewhere at 011 408 519-5001.

## Documentation Feedback

You can rate and provide feedback about Cisco technical documents by completing the online feedback form that appears with the technical documents on Cisco.com.

You can send comments about Cisco documentation to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems  
Attn: Customer Document Ordering  
170 West Tasman Drive  
San Jose, CA 95134-9883

We appreciate your comments.

# Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

[http://www.cisco.com/en/US/products/products\\_security\\_vulnerability\\_policy.html](http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html)

From this site, you can perform these tasks:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories and notices for Cisco products is available at this URL:

<http://www.cisco.com/go/psirt>

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

[http://www.cisco.com/en/US/products/products\\_psirt\\_rss\\_feed.html](http://www.cisco.com/en/US/products/products_psirt_rss_feed.html)

## Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you might have identified a vulnerability in a Cisco product, contact PSIRT:

- Emergencies—[security-alert@cisco.com](mailto:security-alert@cisco.com)

An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.

- Nonemergencies—[psirt@cisco.com](mailto:psirt@cisco.com)

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532



**Tip**

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.x.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:

[http://www.cisco.com/en/US/products/products\\_security\\_vulnerability\\_policy.html](http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html)

The link on this page has the current PGP key ID in use.

# Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Technical Support & Documentation website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

## Cisco Technical Support & Documentation Website

The Cisco Technical Support & Documentation website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, at this URL:

<http://www.cisco.com/techsupport>

Access to all tools on the Cisco Technical Support & Documentation website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

<http://tools.cisco.com/RPF/register/register.do>

**Note**

Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support & Documentation website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

## Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)

EMEA: +32 2 704 55 55

USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

## Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

## Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:  
<http://www.cisco.com/go/marketplace/>
- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:  
<http://www.ciscopress.com>
- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:  
<http://www.cisco.com/packet>
- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

<http://www.cisco.com/go/iqmagazine>

or view the digital edition at this URL:

<http://ciscoiq.texterity.com/ciscoiq/sample/>

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

<http://www.cisco.com/ipj>

- Networking products offered by Cisco Systems, as well as customer support services, can be obtained at this URL:

<http://www.cisco.com/en/US/products/index.html>

- Networking Professionals Connection is an interactive website for networking professionals to share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

<http://www.cisco.com/discuss/networking>

- World-class networking training is available from Cisco. You can view current offerings at this URL:

<http://www.cisco.com/en/US/learning/index.html>

---

This document is to be used in conjunction with the documents listed in the “[Related Documentation](#)” section

CCVP, the Cisco logo, and Welcome to the Human Network are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn is a service mark of Cisco Systems, Inc.; and Access Registrar, Aironet, Catalyst, CCDA, CCDP, CCIE, CCIP, CCNA, CCNP, CCSP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Enterprise/Solver, EtherChannel, EtherFast, EtherSwitch, Fast Step, Follow Me Browsing, FormShare, GigaDrive, HomeLink, Internet Quotient, IOS, iPhone, IP/TV, iQ Expertise, the iQ logo, iQ Net Readiness Scorecard, iQuick Study, LightStream, Linksys, MeetingPlace, MGX, Networkers, Networking Academy, Network Registrar, PIX, ProConnect, ScriptShare, SMARTnet, StackWise, The Fastest Way to Increase Your Internet Quotient, and TransPath are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or Website are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0711R)

© 2005 Cisco Systems, Inc. All rights reserved.

♻️ Printed in the USA on recycled paper containing 10% postconsumer waste.