Release Notes for Cisco ONS 15530 for Cisco IOS Release 12.2(25)SV2

This document describes caveats for Cisco IOS Release 12.2(25)SV2 for the Cisco ONS 15530.

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Contents

This document includes the following information:

Introduction

The Cisco ONS 15530 is a DWDM multiservice aggregation platform that maximizes the carrying capacity of fiber by performing service aggregation of protocols such as ESCON, Fibre Channel, FICON, and Gigabit Ethernet. With the Cisco ONS 15530, users can take advantage of the availability of dark fiber to build a common infrastructure that supports data, SAN (storage area networking), and

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

TDM (time-division multiplexing) traffic. For more information about DWDM technology and applications, refer to the *Introduction to DWDM Technology* publication and the *Cisco ONS 15530 Planning Guide*.

System Requirements

This section describes the system requirements for the Cisco ONS 15530 and includes the following sections:

Memory Requirements

The DRAM memory configuration is 64 MB, which is the default for the Cisco ONS 15530.

Hardware Supported

Table 1 lists the hardware components supported on the Cisco ONS 15530 and the minimum software version required. See the "Determining the Software Version" section on page 13.

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements

Component	Part Number	Description	Minimum Software Version Required[1]
Chassis	15530-CHAS-N	15530-CHAS-N chassis, NEBS version	12.1(10)EV1
	15530-CHAS-E	15530-CHAS-E chassis, ETSI version	12.1(10)EV1
Power supplies	15530-PWR-AC	120 to 240 VAC power supply	12.1(10)EV1
	15530-PWR-DC	Power supply –48 VDC	12.1(10)EV1
CPU switch module	15530-CPU	ONS 15530 CPU switch module	12.1(10)EV1
Carrier motherboard	15530-LCMB-0100	Carrier motherboard (supports OSC, WB-VOA, and PB-OE modules)	12.1(10)EV1

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
OADM modules without OSC	15530-MDXA-04A0	4-channel Band A	12.1(10)EV1
	15530-MDXA-04B0	4-channel Band B	12.1(10)EV1
	15530-MDXA-04C0	4-channel Band C	12.1(10)EV1
	15530-MDXA-04D0	4-channel Band D	12.1(10)EV1
	15530-MDXA-04E0	4-channel Band E	12.1(10)EV1
	15530-MDXA-04F0	4-channel Band F	12.1(10)EV1
	15530-MDXA-04G0	4-channel Band G	12.1(10)EV1
	15530-MDXA-04H0	4-channel Band H	12.1(10)EV1
OADM modules with OSC	15530-MDXB-04A0	4-channel Band A	12.1(10)EV1
	15530-MDXB-04B0	4-channel Band B	12.1(10)EV1
	15530-MDXB-04C0	4-channel Band C	12.1(10)EV1
	15530-MDXB-04D0	4-channel Band D	12.1(10)EV1
	15530-MDXB-04E0	4-channel Band E	12.1(10)EV1
	15530-MDXB-04F0	4-channel Band F	12.1(10)EV1
	15530-MDXB-04G0	4-channel Band G	12.1(10)EV1
	15530-MDXB-04H0	4-channel Band H	12.1(10)EV1
MM transponder line cards with splitter	15530-TSP1-0111	Ch 1-2—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-0311	Ch 3-4—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-0511	Ch 5-6—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-0711	Ch 7-8—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-0911	Ch 9-10—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1111	Ch 11-12—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1311	Ch 13-14—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1511	Ch 15-16—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1711	Ch 17-18—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1911	Ch 19-20—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2111	Ch 21-22—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2311	Ch 23- 24—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2511	Ch 25-26—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2711	Ch 27-28—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2911	Ch 29-30—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-3111	Ch 31-32—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
MM transponder line cards without splitter	15530-TSP1-0121	Ch 1-2—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-0321	Ch 3-4—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-0521	Ch 5-6—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-0721	Ch 7-8—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-0921	Ch 9-10—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1121	Ch 11-12—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1321	Ch 13-14—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1521	Ch 15-16—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1721	Ch 17-18—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-1921	Ch 19-20—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2121	Ch 21-22—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2321	Ch 23- 24—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2521	Ch 25-26—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2721	Ch 27-28—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-2921	Ch 29-30—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1
	15530-TSP1-3121	Ch 31-32—1310-nm MM 16 to 622 Mbps with SC	12.1(10)EV1

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
SM transponder line cards with splitter	15530-TSP1-0112	Ch 1-2—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-0312	Ch 3-4—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-0512	Ch 5-6—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-0712	Ch 7-8—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-0912	Ch 9-10—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1112	Ch 11-12—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1312	Ch 13-14— 1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1512	Ch 15-16—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1712	Ch 17-18—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1912	Ch 19-20—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2112	Ch 21-22—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2312	Ch 23- 24—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2512	Ch 23- 24—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2712	Ch 25-26—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2912	Ch 27-28—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-3112	Ch 29-30 —1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
SM transponder line cards without splitter	15530-TSP1-0122	Ch 1-2—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-0322	Ch 3-4—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-0522	Ch 5-6—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-0722	Ch 7-8—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-0922	Ch 9-10—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1122	Ch 11-12—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1322	Ch 13-14—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1522	Ch 15-16—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1722	Ch 17-18—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-1922	Ch 19-20—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2122	Ch 21-22—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2322	Ch 23- 24—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2522	Ch 23- 24—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2722	Ch 25-26—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-2922	Ch 27-28—1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
	15530-TSP1-3122	Ch 29-30 —1310-nm SM 16 Mbps to 2.5 Gbps with SC	12.1(10)EV1
Aggregation cards	15530-LCMB-0200	ONS 15530 10-port ESCON aggregation card	12.1(10)EV1
	15530-FCGE-8P	ONS 15530 8-port Fibre Channel/Gigabit Ethernet aggregation card	12.1(12c)EV
	15530-FC-4P	ONS 15530 4-port 1-Gbps/2-Gbps FC aggregation card	12.2(23)SV

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
Muxponders	15530-MSMP-0112	Multi service muxponder splitter ch 1/2	12.2(25)SV
	15530-MSMP-0122	Multi service muxponder nsplitter ch 1/2	12.2(25)SV
	15530-MSMP-0312	Multi service muxponder splitter ch 3/4	12.2(25)SV
	15530-MSMP-0322	Multi service muxponder nsplitter ch 3/4	12.2(25)SV
	15530-MSMP-0512	Multi service muxponder splitter ch 5/6	12.2(25)SV
	15530-MSMP-0522	Multi service muxponder nsplitter ch 5/6	12.2(25)SV
	15530-MSMP-0712	Multi service muxponder splitter ch 7/8	12.2(25)SV
	15530-MSMP-0722	Multi service muxponder nsplitter ch 7/8	12.2(25)SV
	15530-MSMP-0912	Multi service muxponder splitter ch 9/10	12.2(25)SV
	15530-MSMP-0922	Multi service muxponder nsplitter ch 9/10	12.2(25)SV
	15530-MSMP-1112	Multi service muxponder splitter ch 11/12	12.2(25)SV
	15530-MSMP-1122	Multi service muxponder nsplitter ch 11/12	12.2(25)SV
	15530-MSMP-1312	Multi service muxponder splitter ch 13/14	12.2(25)SV
	15530-MSMP-1322	Multi service muxponder nsplitter ch 13/14	12.2(25)SV
	15530-MSMP-1512	Multi service muxponder splitter ch 15/16	12.2(25)SV
	15530-MSMP-1522	Multi service muxponder nsplitter ch 15/16	12.2(25)SV
	15530-MSMP-1712	Multi service muxponder splitter ch 17/18	12.2(25)SV
	15530-MSMP-1722	Multi service muxponder nsplitter ch 17/18	12.2(25)SV
	15530-MSMP-1912	Multi service muxponder splitter ch 19/20	12.2(25)SV
	15530-MSMP-1922	Multi service muxponder nsplitter ch 19/20	12.2(25)SV
	15530-MSMP-2112	Multi service muxponder splitter ch 21/22	12.2(25)SV
	15530-MSMP-2122	Multi service muxponder nsplitter ch 21/22	12.2(25)SV
	15530-MSMP-2312	Multi service muxponder splitter ch 23/24	12.2(25)SV
	15530-MSMP-2322	Multi service muxponder nsplitter ch 23/24	12.2(25)SV
	15530-MSMP-2512	Multi service muxponder splitter ch 25/26	12.2(25)SV
	15530-MSMP-2522	Multi service muxponder nsplitter ch 25/26	12.2(25)SV
	15530-MSMP-2712	Multi service muxponder splitter ch 27/28	12.2(25)SV
	15530-MSMP-2722	Multi service muxponder nsplitter ch 27/28	12.2(25)SV
	15530-MSMP-2912	Multi service muxponder splitter ch 29/30	12.2(25)SV
	15530-MSMP-2922	Multi service muxponder nsplitter ch 29/30	12.2(25)SV
	15530-MSMP-3112	Multi service muxponder splitter ch 31/32	12.2(25)SV
	15530-MSMP-3122	Multi service muxponder nsplitter ch 31/32	12.2(25)SV

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
2.5-Gbps ITU trunk cards	15530-ITU3-0110	ONS 15530 Ch 1/2 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-0310	ONS 15530 Ch 3/4 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-0510	ONS 15530 Ch 5/6 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-0710	ONS 15530 Ch 7/8 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-0910	ONS 15530 Ch 9/10 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-1110	ONS 15530 Ch 11/12 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-1310	ONS 15530 Ch 13/14 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-1510	ONS 15530 Ch 15/16 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-1710	ONS 15530 Ch 17/18 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-1910	ONS 15530 Ch 19/20 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-2110	ONS 15530 Ch 21/22 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-2310	ONS 15530 Ch 23/24 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
	15530-ITU3-2510	ONS 15530 Ch 25/26 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-2710	ONS 15530 Ch 27/28 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-2910	ONS 15530 Ch 29/30 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-3110	ONS 15530 Ch 31/32 2.5-Gbps ITU trunk card MU with splitter	12.1(12c)EV
	15530-ITU3-0120	ONS 15530 Ch 1/2 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-0320	ONS 15530 Ch 3/4 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-0520	ONS 15530 Ch 5/6 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-0720	ONS 15530 Ch 7/8 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-0920	ONS 15530 Ch 9/10 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-1120	ONS 15530 Ch 11/12 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-1320	ONS 15530 Ch 13/14 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-1520	ONS 15530 Ch 15/16 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-1720	ONS 15530 Ch 17/18 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-1920	ONS 15530 Ch 19/20 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-2120	ONS 15530 Ch 21/22 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-2320	ONS 15530 Ch 23/24 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-2520	ONS 15530 Ch 25/26 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-2720	ONS 15530 Ch 27/28 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-2920	ONS 15530 Ch 29/30 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV
	15530-ITU3-3120	ONS 15530 Ch 31/32 2.5-Gbps ITU trunk card MU without splitter	12.1(12c)EV

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
10-Gbps ITU trunk cards with splitter (1550 nm)	15530-ITU2-0110	CH 1—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-0210	CH 2—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-0310	CH 3—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-0410	CH 4—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-0510	CH 5—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-0610	CH 6—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-0710	CH 7—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-0810	CH 8—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-0910	CH 9—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1010	CH 10—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1110	CH 11—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1210	CH 12—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1310	CH 13—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1410	CH 14—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1510	CH 15—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1610	CH 16—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1710	CH 17—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1810	CH 18—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-1910	CH 19—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2010	CH 20—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2110	CH 21—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2210	CH 22—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2310	CH 23—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2410	CH 24—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2510	CH 25—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2610	CH 26—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2710	CH 27—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2810	CH 28—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-2910	CH 29—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-3010	CH 30—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-3110	CH 31—10-Gbps ITU trunk card with splitter	12.1(10)EV1
	15530-ITU2-3210	CH 32—10-Gbps ITU trunk card with splitter	12.1(10)EV1

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
10-Gbps ITU trunk cards without splitter (1550 nm)	15530-ITU2-0120	CH 1—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-0220	CH 2—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-0320	CH 3—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-0420	CH 4—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-0520	CH 5—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-0620	CH 6—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-0720	CH 7—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-0820	CH 8—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-0920	CH 9—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1020	CH 10—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1120	CH 11—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1220	CH 12—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1320	CH 13—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1420	CH 14—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1520	CH 15—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1620	CH 16—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1720	CH 17—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1820	CH 18—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-1920	CH 19—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2020	CH 20—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2120	CH 21—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2220	CH 22—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2320	CH 23—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2420	CH 24—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2520	CH 25—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2620	CH 26—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2720	CH 27—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2820	CH 28—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-2920	CH 29—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-3020	CH 30—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-3120	CH 31—10-Gbps ITU trunk card without splitter	12.1(10)EV1
	15530-ITU2-3220	CH 32—10-Gbps ITU trunk card without splitter	12.1(10)EV1
10-GE uplink card	15530-10GE-UPLINK	ONS 15530 10-Gbps uplink, 1310nm with SC	12.1(10)EV1
WB-VOA module	15500-VOA-0100	Single wide-band variable optical attenuator	12.1(10)EV1
	15500-VOA-0200	Dual wide-band variable optical attenuator	12.1(10)EV1

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
Single-band PB-OE module	15500-PEQ-01A0	Single-band optical equalizer Band A	12.1(10)EV1
	15500-PEQ-01B0	Single-band optical equalizer Band B	12.1(10)EV1
	15500-PEQ-01C0	Single-band optical equalizer Band C	12.1(10)EV1
	15500-PEQ-01D0	Single-band optical equalizer Band D	12.1(10)EV1
	15500-PEQ-01E0	Single-band optical equalizer Band E	12.1(10)EV1
	15500-PEQ-01F0	Single-band optical equalizer Band F	12.1(10)EV1
	15500-PEQ-01G0	Single-band optical equalizer Band G	12.1(10)EV1
	15500-PEQ-01H0	Single-band optical equalizer Band H	12.1(10)EV1
Dual-band PB-OE module	15500-PEQ-02AB	Dual band optical equalizer Band AB	12.1(10)EV1
	15500-PEQ-02CD	Dual band optical equalizer Band CD	12.1(10)EV1
	15500-PEQ-02EF	Dual band optical equalizer Band EF	12.1(10)EV1
	15500-PEQ-02GH	Dual band optical equalizer Band GH	12.1(10)EV1
Protection switch module	15530-PSM-01	ONS 15530 protection switch module	12.1(12c)EV
Pluggable SFPs	15500-XVRA-08D1	T1 1.544-Mbps	12.2(25)SV
	15500-XVRA-09D1	E1 2.048-Mbps	12.2(25)SV
	15500-XVRA-10A1	Low band (16 to 200 Mbps) variable rate, MM (1310 nm) with LC	12.1(12c)EV3
	15500-XVRA-10A2	HT[2] low band 8 to 200 Mbps	12.2(25)SV
	15500-XVRA-10B1	Low band (16 to 200 Mbps) variable rate, SM (1310 nm) with LC	12.1(12c)EV3
	15500-XVRA-10B2	HT low band 8 to 200-Mbps	12.2(25)SV
	15500-XVRA-10E11	SDI & DVB-ASI	12.2(25)SV
	15500-XVRA-11A2	HT mid band 200 to 622-Mbps	12.2(25)SV
	15500-XVRA-11B1	Mid band (200 to 1250 Mbps) variable rate, SM (1310 nm) with LC	12.1(12c)EV3
	15500-XVRA-11B2	HT mid band 200 to 1.25-Gbps	12.2(25)SV
	15500-XVRA-12B1	HT high band 1.062 to 2.488 Gbps	12.1(12c)EV3
	15500-XVRA-02C1	Gigabit Ethernet[3], Fibre Channel (1 Gbps)[4], FICON (1 Gbps), MM	12.1(12c)EV
	15500-XVRA-03B1	Gigabit Ethernet[5], Fibre Channel (1 Gbps)[6], FICON (1 Gbps), ISC-3 links compatibility mode, SM	12.1(12c)EV
	15500-XVRA-03B2	Fibre Channel (1-Gbps and 2-Gbps) , SM	12.1(12c)EV
	15454-SFP-GEFC-SX	Fibre Channel (2-Gbps), Fibre Channel (1-Gbps), 1000BASE-LX Ethernet, MM	12.2(25)SV
	15500-XVRA-11D1	Fast Ethernet (125 Mbps) Gigabit Ethernet (1.25 Gbps)	12.2(25)SV
SFP cable	SMB/BNC	MINISMB/BNC=	12.2(25)SV

Table 1 Cisco ONS 15530 Supported Hardware and Minimum Software Requirements (Continued)

Component	Part Number	Description	Minimum Software Version Required[1]
AC cables	15500-CAB-AC=	AC North America (spare)	12.1(10)EV1
	15500E-CAB-ACA=	ONS 15530 ETSI AC cable, Australia (spare)	12.1(10)EV1
	15500E-CAB-ACE=	ONS 15530 ETSI AC cable, Europe (spare)	12.1(10)EV1
	15500E-CAB-ACU=	ONS 15530 ETSI AC cable, UK (spare)	12.1(10)EV1
	15500E-CAB-ACI=	ONS 15530 ETSI AC cable, Italy (spare)	12.1(10)EV1
	15500E-CAB-ACR=	ONS 15530 ETSI AC cable, Argentina (spare)	12.1(10)EV1
Blank panel cover	15530-COV-MUX=	OADM blank panel cover	12.1(10)EV1
	15530-COV-SLOT=	Full slot panel cover	12.1(10)EV1
	15530-COV-PWR=	Power supply blank panel cover	12.1(10)EV1
	15530-COV-OSC=	OSC blank panel cover	12.1(10)EV1
Fan assembly	15530-FT01=	Fan assembly (spare)	12.1(10)EV1
Air ramp baffle	15530-BAF-E=	Air baffle (spare) for 15530-CHAS-E chassis	12.1(10)EV1
CompactFlash card	MEM-15530FLC32M=	CompactFlash card 32 MB	12.1(10)EV1
Rack mount kit	15530-RKMT-E=	Chassis rack mount kit for 15530-CHAS-E	12.1(10)EV1
	15530-RKMT-N23=	Chassis rack mount kit for 15530-CHAS-N (23 inch rack)	12.1(10)EV1
	15530-RKMT-N19=	Chassis rack mount kit for 15530-CHAS-N (19 inch rack)	12.1(10)EV1

1. The software version listed might be deferred.
2. HT = high temperature.
3. 1000BASE-SX.
4. FC-0-100-M5-SN-S and FC-0-100-M6-SN-S standards.
5. 1000BASE-LX.
6. FC-0-100-SM-LC-S standard.

Determining the Software Version

Note We strongly recommend that you use the latest available software release for all Cisco ONS 15530 hardware.

To determine the version of Cisco IOS software currently running on a Cisco ONS 15530 system, log in to the system and enter the **show version** EXEC command. The following sample output is from the **show version** command. The software version number is shown on the second line of the sample output.

```
Switch# show version
Cisco Internetwork Operating System Software
IOS (tm) ONS-15530 Software (ONS15530-I-M), Version 12.2(25)SV
<Information deleted>
```

Upgrading the System Image

To ensure proper system functioning, follow the system image upgrading procedure described in the *Cisco ONS 15530 Software Upgrade Guide*.

You can find the system images for the Cisco ONS 15530 at the following URL:

http://www.cisco.com/kobayashi/sw-center/sw-optical.shtml

Note Always set the configuration register to 0x2102 when upgrading the system image using the **config-reg 0x2102** command in configuration mode.

Caution Improper system image upgrades can affect system functioning and redundancy. Always follow the recommended upgrade procedures.

Feature Set Table

The Cisco IOS Release software is packaged in feature sets (also called software images) depending on the platform. Each feature set contains a specific set of Cisco IOS features. Table 2 lists the Cisco IOS software feature sets available for the Cisco ONS 15530.

Table 2 Feature Sets Supported by the Cisco ONS 15530

Feature Set	Introduced in This Release
Inband message channel	12.1(10)EV2
Gigabit Ethernet	12.1(10)EV2
Fast Ethernet	12.1(10)EV2
Ethernet	12.1(10)EV2
ATM OC-3/STM-1, OC-12/STM-4, and OC-48/STM-16	12.1(10)EV2
SONET[1]/SDH[2]	12.1(10)EV2
POS[3]	12.1(10)EV2
IBM Sysplex coupling link	12.1(10)EV2
Fibre Channel (1 Gbps)	12.1(10)EV2
Fibre Channel (2 Gbps)	12.1(10)EV2
FDDI[4]	12.1(10)EV2
ESCON[5] aggregation (2.5 Gbps)	12.1(10)EV2
FICON[6] (1 Gbps)	12.1(10)EV2
FICON (2 Gbps)	12.1(10)EV2
Token ring	12.1(10)EV2
SNMP	12.1(10)EV2
CiscoView	12.1(10)EV2

Table 2 Feature Sets Supported by the Cisco ONS 15530 (Continued)

Feature Set	Introduced in This Release
Cisco Transport Manager	12.1(10)EV2
IP packets	12.1(10)EV2
OSCP[7]	12.1(10)EV2
APS[8] channel protocol	12.1(10)EV2
Point-to-point	12.1(10)EV2
Hubbed ring	12.1(10)EV2
Meshed ring	12.1(10)EV2
IBM Sysplex ETR/CLO[9]	12.1(10)EV2
1-Gbps Fibre Channel/FICON aggregation into 2.5 Gbps transponder modules	12.1(12c)EV
1-Gbps IBM Sysplex Coupling Link aggregation into 2.5 Gbps transponder modules	12.2(18)SV
Gigabit Ethernet aggregation (2.5 Gbps)	12.1(12c)EV
Buffer credit support on the 8-port FC/GE aggregation card	12.2(18)SV
2-Gbps Fibre Channel protocol monitoring on transponder line cards	12.2(18)SV
2-Gbps FICON protocol monitoring on transponder line cards	12.2(18)SV
Functional image version diagnostics	12.2(18)SV
Autonegotiation for Gigabit Ethernet between the 8-port FC/GE aggregation card and the client equipment	12.2(18)SV
ISC links compatibility mode aggregation (2.5 Gbps) for the 8-port FC/GE aggregation card	12.2(18)SV
2-Gbps ISC links peer mode protocol monitoring on transponder line cards	12.2(22)SV
ISC links compatibility mode aggregation (2.5 Gbps) on the 4-port 1-Gbps/2-Gbps FC aggregation card	12.2(23)SV
1-Gbps and 2-Gbps ISC-3 peer mode support on the 4-port 1-Gbps/2-Gbps FC aggregation card	12.2(23)SV
2-Gbps Fibre Channel/FICON aggregation into 2.5-Gbps signals on 4-port 1-Gbps/2-Gbps FC aggregation cards	12.2(23)SV
Buffer credit support on the 4-port 1-Gbps/2-Gbps FC aggregation card	12.2(23)SV
1-Gbps ISC links peer mode on the transponder line card	12.2(23)SV
SSHv1 client and server support	12.2(24)SV
SNMPv3 support	12.2(24)SV
Counter preservation on CPU switch module switchovers	12.2(24)SV
1-Gbps peer mode ISC-3 on the 8-port FC/GE aggregation card	12.2(24)SV
8-port multi-service muxponder	12.2(25)SV

1. SONET = Synchronous Optical Networking
2. SDH = Synchronous Digital Hierarchy
3. POS = Packet over SONET

4. FDDI = Fiber Distributed Data Interface
5. ESCON = Enterprise Systems Connection
6. FICON = Fiber Connection
7. OSCP = Optical Supervisory Channel Protocol
8. APS = Automatic Protection Switching
9. ETR/CLO = external timer reference/control link oscillator

New and Changed Information

This section lists new features that appear in this and previous releases of Cisco IOS Release 12.2. The new features are sorted by release number.

New Features in Release 12.2(25)SV

The following new hardware is available for the Cisco ONS 15530 in Cisco IOS Release 12.2(25)SV:

- 8-port multi-service muxponder

New Features in Release 12.2(24)SV

The following new software features are available for the Cisco ONS 15530 in Cisco IOS Release 12.2(24)SV:

- SSHv1 client and server support
- SNMPv3 support
- Counter preservation on CPU Switchovers
- ISC-3 1-Gbps (peer mode) support on the 8-port FC/GE aggregation card

New Features in Release 12.2(23)SV

The following new hardware is available for the Cisco ONS 15530 in Cisco IOS Release 12.2(23)SV:

- 4-port 1-Gbps/2-Gbps FC aggregation card

The following new software feature is available for the Cisco ONS 15530 in Cisco IOS Release 12.2(23)SV:

- 1-Gbps ISC-3 peer mode support on all ISC interfaces, except the 8-port FC/GE aggregation card

New Features in Release 12.2(22)SV

The following new software feature is available for the Cisco ONS 15530 in Cisco IOS Release 12.2(22)SV:

- 2-Gbps ISC peer mode protocol monitoring on 2.5-Gbps transponder line cards

New Features in Release 12.2(18)SV2

No new features are available for this release.

New Features in Release 12.2(18)SV1

No new features are available for this release.

New Features in Release 12.2(18)SV

The following new software features are available for the Cisco ONS 15530 in Cisco IOS Release 12.2(18)SV:

- Autonegotiation between the 8-port FC/GE aggregation card and the client equipment for Gigabit Ethernet traffic

  Note The 8-port FC/GE aggregation card does not support end-to-end pass through of autonegotiation parameters in functional image release 2.29 or earlier. End-to-end negotiation is supported in functional image release 2.30 or later.

- ISC links compatibility mode aggregation (2.5 Gbps)
- Buffer credits for Fibre Channel distance extension
- 2-Gbps Fibre Channel protocol monitoring on 2.5-Gbps transponder modules

  Note 2-Gbps Fibre Channel protocol monitoring requires transponder functional image release 1.A3.

- 2-Gbps FICON protocol monitoring on 2.5-Gbps transponder modules

  Note 2-Gbps Fibre Channel protocol monitoring requires transponder functional image release 1.A3.

- Data file with upgrade information for the ROMMON and functional images
- **show upgrade-info functional-image** command
- **negotiation auto** command
- **flow control** command

Caveats

This section describes open and resolved severity 1 and 2 caveats and some severity 3 caveats. The "Open Caveats" section lists open caveats that apply to the current release and may apply to previous releases. The "Resolved Caveats" sections list caveats resolved in a particular release, but open in previous releases.

Resolved Caveats in Release 12.2(25)SV2

- CSCef68324

  Cisco Internetwork Operating System (IOS) software is vulnerable to a Denial of Service (DoS) and potentially an arbitrary code execution attack from a specifically crafted IPv6 packet. The packet must be sent from a local network segment. Only devices that have been explicitly configured to process IPv6 traffic are affected. Upon successful exploitation, the device may reload or be open to further exploitation.

  Cisco has made free software available to address this vulnerability for all affected customers.

  More details can be found in the security advisory that is posted at http://www.cisco.com/warp/public/707/cisco-sa-20050729-ipv6.shtml.

Open Caveats in Release 12.2(25)SV

- CSCdz59146

  Symptom: The ethernetdcc interface loses connectivity when splitter protection is configured and the waveethernetphy interface is shut down while the protection wavepatch interface is active and the working wavepatch interface is down.

  Workaround: Do not shut down the waveethernetphy interface when the working wavepatch interface is down.

- CSCec25368

  Symptom: The values returned for entPhysicalVendorType and entPhysicalName are wrong when a low-band single-mode SFP is present in an ESCON aggregation card. The values returned show a low-band multimode SFP instead.

  Workaround: None.

- CSCee56524

  Symptom: Tracebacks related to CPU switch module hog issues occur after installing an 8-port multi-service muxponder after booting up the box.

  Workaround: Reboot the system after the muxponder is inserted.

- CSCee70185

  Symptom: An informational warning is issued instead of a critical alarm when the line cards are shut down in response to a multiple fan failure event after issuing the **environment-monitor shutdown fan** command.

  Workaround: None.

- CSCee84190

  Symptom: CRC-errored, dropped, out-of-order, or duplicated frames might be transmitted by ports on 4-port 1-Gbps/2-Gbps FC aggregation cards that have symmetric-mode flow-control configured and active if the client device connected to the remote port is operating in asymmetric credit mode.

  The remote peer Cisco ONS 15530 logs the EXCESS_FRAME_ALM alarm message during or prior to the occurrence of the errors if conditions with potential to cause the error are detected on the link.

  Conditions: This defect note is only applicable if all of the following conditions are true:

  – Flow control is disabled and the link runs error-free.

- Flow control is enabled and the client device sees errors transmitted from the port on the 4-port 1-Gbps/2-Gbps FC aggregation card.
- Symmetric mode is configured on the 4-port 1-Gbps/2-Gbps FC aggregation card, and you see flow-control (symmetric) in the **show interface** command output.
- The peer card is a 4-port 1-Gbps/2-Gbps FC aggregation card, and the EXCESS_FRAME_ALM alarm is detected on the remote peer Cisco ONS 15530.
- Buffer credit sizes are configurable and readable on the end clients, and the credit numbers on both ends are not the same.
- The transmitted errors are not traceable to Tx CRC errors on the interface.
- The transmitted errors are not traceable to hardware data parity errors (`QDR PARITY error count`) in the **show controller** command output.

Workaround: Configure asymmetric mode on all of the 4-port 1-Gbps/2-Gbps FC aggregation card ports in the affected link. (Symmetric mode is the factory default.) Or, wherever feasible, configure equal buffer credits on the client devices at both ends of the FC/FICON link. Either symmetric or asymmetric mode configuration on the 4-port 1-Gbps/2-Gbps FC aggregation card work well.

- CSCef74226

  Symptom: When upgrading from Cisco IOS Release 12.1(10)EV4 or Cisco IOS Release 12.1(12c)EV to a later image using standard CPU switch module switchover procedure, the high water mark threshold for the ESCON aggregation card is not programmed to the new value. This might cause higher than expected delays on ESCON streams.

  Workaround: Use the **escon write** *<slot_no> 0x1C4 0x40* command to set the high water mark to the correct value for all ports on the ESCON aggregation card. Use the **show controller** *port x/y/z* command to display the new value.

- CSCef12108

  Symptom: The Cisco ONS15530 might not allow you to connect to the standby CPU switch module due to an authentication failure. This occurs when AAA or a local database is used for user authentication as this information (AAA or local database) is not replicated from the active to the standby CPU switch module.

  Workaround: None.

- CSCef18814

  Symptom: Higher than expected delays are seen when operations are performed over an end-to-end DWDM link using the Cisco ONS 15530 system and the ESCON aggregation card. This condition is seen when using the Cisco IOS Release 12.1(10)EV4 image. It may also be seen when migrating from Release 12.1(10)EV4 to later Cisco IOS images.

  Workaround: Upgrade the software image and program the correct value by using the following procedure:

  1. Read register 0x1C4 by issuing the **escon read <slot> 0x1C4** command for each 10-port ESCON aggregation card.

  2. Write the correct value of 0x40 to register 0x1C4 by issuing the **escon write <slot> 0x1C4 0x40** commands for each 10-port ESCON aggregation card.

  3. Re-read 0x1C4 (as done in Step 1) to verify that the register was properly programmed.

  ```
  Switch# escon read <slot> 0x1C4
  ```

- CSCef87165

  Symptom: An end-to-end link will remain down even if the initial condition that caused the fault is rectified if speed negotiation is enabled on the Fibre Channel switches, FLC is enabled on the corresponding multirate interfaces, and if the link between any one of the multirate interfaces and the FC switch goes down

  Workaround:Disable FLC on the multirate interfaces.

- CSCef97070

  Symptom: The APS switch time is greater then 50 ms

  Workaround: None.

- CSCeg02766

  Symptom: The standby CPU switch module crashes in the scheduler.

  Workaround: None.

- CSCeg02811

  Symptom: Power-on diagnostic loopback tests may report failure when the system is booted immediately after an 8-port FC/GE aggregation card power-cycle.

  Workaround: None.

- CSCeg06084

  Symptom: When autonegotiation is enabled on the CuFE multirate port and the peer device is hardcoded to 100 Mbps full duplex, the link might not come up.

  Workaround: Issue the **no negotiation auto** command to disable autonegotiation on the CuFE port on the 8-port multi-service muxponder.

- CSCeg09522

  Symptom: When migrating from Release 12.2(23)SV to Release 12.2(25)S1 the following may be seen:

  – Cross-connect connections to waveethernetphy subinterfaces are replaced by cross-connections to non-exsistant tengigphy subinterfaces.

  – The cross-connections might not be removeable using the Cisco IOS CLI.

  Workaround: If you are not able to remove the invalid cross-connect configuration, perform the following steps:

  1. OIR the client card.

  2. Issue the **write memory** command to save the configuration.

  3. Reload the switch.

  4. Insert the card after the switch boots up.

  5. Configure the cross-connection.

- CSCeg11241

  Symptom: The variable rate high-band single mode SFP (15500-XVRA-12B1) is reported as "unknown" in the system status outputs such as **show interface** and **show controller**. The Cisco IOS software allows the interface configuration to proceed normally and traffic is not affected. Traffic flows normally once the port configuration is completed.

  Workaround: None.

- CSCeg23905

  Symptom: A terminal loopback on a multirate interface might not work if the interface is in Loss of Light condition.

  Workaround:Clear the Loss of Light condition and then configure terminal loopback.

- CSCeg27643

  Symptom: After a CPU switch module switchover, the trunk trasmit laser comes up even if it was shut down before the switchover. The laser shutdown configuration is present in the running configuration, but the laser is still enabled.

  Workaround: Issue the **laser shutdown** command again after the switchover.

- CSCeg32098

  Symptom: The AMI linecoding and the line build out options to sepecify the cable length are not available for T1 and E1 encapsulations of multirate interfaces.

  Workaround: None.

- CSCeg38355

  Symptom: The standby CPU switch module might reload when you upgrade from Release 12.2(24)SV to Release 12.2(25)SV if you are using an 8-port GE/FC aggregation card with the counter synchronization feature enabled.

  Workaround: Disable counter synchronization on the primary CPU switch module running Release 12.2(24)SV and then download Release 12.2(25)SV onto the standby CPU switch module.

- CSCin79007

  Symptom: Even though forward laser control is not configured, the client laser is disabled if an OIR is performed when a keepalive timeout exists on the twogigabitphy interface. The laser is enabled when the keepalive timeout condition is cleared, but it is disabled whenever a keepalive timeout condition is asserted. The client laser shuts down because the keepalive timeout should only be seen under the following conditions:

  – The portgroup is not cross-connected to a trunk port.

  – Forward laser control (FLC) is configured on the client interface.

  Condition: This behavior is seen only on the x/0/0 twogigabitphy interface of the 4-port 1-Gbps/2-Gbps FC aggregation card if it is removed and reinserted when the interface is in keepalive timeout condition.

  Workaround: Change the encapsulation to a different value and then change back to the required encapsulation value.

- CSCin81342

  Symptom: During a CPU switch module switchover, transparent transponders might experience temporary traffic interruption until the switchover is completed. The behavior is intermittent and not all transponders in a given chassis may be affected. This interruption might happen for the following types of protocol encapsulations:

  – ETR/CLO

  – 100 Mbps Fast Ethernet / FDDI

  – ESCON/SBCON

  – 1-Gbps FC/FICON

  – 1-Gbps ISC ((ISC-1, ISC-3 peer mode, 1 Gbps)

  – 2-Gbps FC/FICON

– 2-Gbps ISC (ISC-3 peer mode, 2 Gbps).

Workaround: None.

- CSCin81028

  Symptom: Terminal and facility loopback do not work on the multirate interfaces after a CPU switch module switchover.

  Workaround: Reconfigure the client encapsulation.

- CSCin82637

  Symptom: Version compatibility check is not performed on the mux/demux modules and PSM. No warning is issued if there is a version mismatch in hardware and software.

  Workaround: None.

- CSCin83351

  Symptom: A change in the line vty password on a Cisco ONS 15530 active CPU switch module might not be reflected on the standby CPU switch module.

  Workaround: Reload the standby CPU switch module after the configuration change.

- CSCin84283

  Symptom: The **show facility-alarm** command output shows the "Unknown SFP" alarm, even though the SFP inserted is valid and traffic is not impacted.

  Workaround: None.

Resolved Caveats in Release 12.2(25)SV

- CSCin76822

  Symptom: If a failed subcard is replaced by a new one, the **show diag online** output continues to indicate that there was a 'previous failure' for this subcard. This should have been cleared when the new card was inserted. This is specific to subcards, for motherboards the older failures are cleared when a new card is inserted.

  Workaround: None.

Resolved Caveats in Release 12.2(24)SV

- CSCdz82276

  Symptom: A warning is issued if the card has an unknown functional image. Version compatibility checks need to be performed during system initialization. The hardware version compatibility should identify any mismatch between functional image versions and hardware versions. The software version compatibility should identify any mismatch between functional image and software image.

- CSCea52092

  Symptom: After booting the system, optical power coming out of the OSC module seems to be null even though the laser is enabled.

  Workaround: Perform an online removal and insertion of the OSC module or carrier motherboard.

- CSCec45305

  Symptom: If the transparent interface on a multimode transponder line card is configured for Sysplex ETR traffic (**encap sysplex etr** command), the **show interfaces transparent** command output shows that forward laser control is set to off. Forward laser control is automatically enabled for Sysplex ETR.

  Workaround: Add client input traffic and the trunk side laser will function.

- CSCec78648

  Symptom: The **show redundancy** command is not valid on specific versions of the Cisco ONS 15530 software but the choice still exists.

  Workaround: Use the **show redundancy summary** command.

- CSCed28094

  Symptom: End-to-end GE autonegotiation is not supported by the 8-port FC/GE aggregation card.

  Link defects such as a broken fiber from the 8-port FC/GE aggregation card to the client device at one end, which are not directly detected by the Cisco ONS 15530 and cause the client at one end to initiate autonegotiation, are not propagated to the client at the other end.

  Any upper-layer processes that depend on bidirectional defect detection and propagation at the transport level might fail for certain classes of link defects.

  Workaround: None.

  Resolution: Upgrade the 8-port FC/GE aggregation card functional image to Release 2.30 or later.

- CSCee22677

  Symptom: When a Cisco ONS 15530 is connected to a Catalyst 450x through the gigabitphy interface of the 8-port FC/GE aggregation card, it is possible that the link will remain down after the link goes down on any reason. Conditions for this to happen are as follows:

  – Auto negotiation is disabled on both the GE interfaces, the Catalyst 4000 interface and the gigabitphy interface of the 8-port FC/GE aggregation card on the Cisco ONS 15530.

  – FLC is enabled on the gigabitphy interface.

  Workaround: Enable autonegotiation on the GE interface level of the Catalyst 4500 at no speed nonegotiate and at negotiation auto for the Cisco ONS 15530.

- CSCee50294

  Symptom: Cisco IOS® devices running branches of Cisco IOS version 12.2S that have Dynamic Host Configuration Protocol (DHCP) server or relay agent enabled, even if not configured, are vulnerable to a denial of service where the input queue becomes blocked when receiving specifically crafted DHCP packets. Cisco is providing free fixed software to address this issue. There are also workarounds to mitigate this vulnerability. This issue was introduced by the fix included in CSCdx46180 and is being tracked by Cisco Bug ID CSCee50294.

  This advisory is available at

  http://www.cisco.com/warp/public/707/cisco-sa-20041110-dhcp.shtml .

  Workaround: None.

- CSCee75578

  Symptom: The GE optical link fails to come up between two Catalyst 65xx 8-port GBIC modules through the Cisco ONS155xx transparent transponders when Forward Laser Control (FLC) is enabled on the system. The link fails to come up irrespective of the type of protection scheme.

  Workaround: Use a 16-port GBIC module on the Catalyst 65xx or deactivate FLC on the ONS155xx.

- CSCef28950

  Symptom: The frame and bit 5-minute input and output rates are missing in the **show interface** command output of twogigabitphy interfaces on the 4-port 1-Gbps/2-Gbps FC aggregation cards configured for encapsulation for Sysplex ISC.

  Workaround: None.

- CSCef28967

  Symptom: Tx CRC counts are displayed in the **show interface** command output of twogigabitphy interfaces on the 4-port 1-Gbps/2-Gbps FC aggregation cards configured for encapsulation for Sysplex ISC, even though these counts are not monitored.

  Workaround: Ignore the Tx CRC count in the **show interface** command output for ISC encapsulation.

- CSCin69960

  Symptom: A receive failure might display a message that the laser if shut due to forward laser control.

  Workaround: None.

Resolved Caveats in Release 12.2(23)SV

- CSCed38657

  Symptom: DWDM links set at a 196.608-Mbps rate, or an uncommon rate close to this, may not work properly on the 2.5-Gbps transponder line card. Link initialization failures and bit errors may occur.

  Workaround: None.

- CSCee24673

  Symptom: High capacity counters are not implemented but are needed.

  Workaround: None.

- CSCee34107

  Symptoms: APS behavior for the **aps clear** command is inconsistent with the standard behavior when the following conditions occur:

  – Traffic runs from the working link (link A) and you perform a manual switch to the protected link (link B), causing traffic to switch to link B.

  – You enter the **aps clear** command for the aps-group; link A becomes active, regardless of whether the APS group is configured revertively or nonrevertively.

  Workaround: None.

- CSCee59383

  Symptom: The entitySensorMIB is not implemented.

Workaround: None.

- CSCeb70408

  Symptom: The IDPROM values from the high band single-mode SFPs are not readable. The SFPs cannot be configured and cannot be used.

  Workaround: None.

- CSCin73872

  Symptom: The command for configuring optical thresholds on a voain interface is broken in Cisco IOS Release 12.2(22)SV for the Cisco ONS 15530. The command should be in the form:

  optical threshold power receive after-attenuation [low|high] [alarm|warning] <val>

  But in Cisco IOS release 12.2(22)SV only the following command can be specified in the interface configuration mode:

  optical threshold power receive [low|high] [alarm|warning] <val>

  The command is stored in an earlier format in the running configuration for the interface; hence upon reloading the chassis these threshold configurations are lost.

  Workaround: Configure the optical threshold using this format:

  optical threshold power receive [low|high] [alarm|warning] <val>

  If the chassis has to be reloaded, then reconfigure the threshold command again when the box is rebooted.

- CSCin78329

  Symptom: Power-on diagnostics may fail the credit-buffer-memory test for the 8-port FC/GE aggregation card on the first boot after power cycling the box. Subsequent reboots without power cycling pass the test. These test failures are spurious and can be ignored.

  Workaround: Upgrade your Cisco ONS 15530 software to Cisco IOS Release 12.2(23)SV or later.

Resolved Caveats in Release 12.2(22)SV

- CSCec14447

  Symptom: The 8-port GE/FC aggregation card laser is not in the proper state when a Tx-CRC threshold has been exceeded and FLC is configured.

  Workaround: Issue the **shutdown**/**no shutdown** command sequence on the affected interface.

- CSCec42573

  Symptom: In a y-cable APS configuration, interfaces on the 8-port GE/FC aggregation card configured for FICON encapsulation change to GE encapsulation when the saved configuration file is copied to the running configuration.

  Workaround: Change the encapsulation back to FICON.

- CSCed33451

  Symptom: After configuring a patch between a wavepatch interface and a wdmrelay interface, issuing a **show connect intermediate** command results in spurious memory access.

  Workaround: Do not issue the **show connect intermediate** command when a patch between a wavepatch interface and a wdmrelay interface is configured.

- CSCed33852

  Symptom: The system might reload unexpectedly when a faulty optical add/drop multiplexer (OADM) module is present in the chassis.

  Workaround: Replace the faulty OADM module.

- CSCin64935

  Symptom: A system might reload unexpectedly when you perform an online removal and reinsertion of a wide-band variable optical attenuator (WB-VOA) module.

  Workaround: Do not remove and reinsert a WB-VOA module.

- CSCin65618

  Symptom: The system might reload unexpectedly when you configure the alarm threshold on a waveethernetphy interface of a 2.5-Gbps ITU trunk card.

  This symptom occurs after the following steps:

  1. Configure an alarm threshold list with code violation running disparity (CVRD) signal degrade and failure thresholds and apply it to the waveethernetphy interface.
  2. Remove the 2.5-Gbps ITU trunk card, remove the threshold configurations from the threshold list, and reinsert the 2.5-Gbps ITU trunk card.
  3. Remove the 2.5-Gbps ITU trunk card again, configure a CVRD degrade threshold, remove the threshold list, and reinsert the 2.5-Gbps ITU trunk card.

  After you have performed these steps, the shelf reloads.

  Workaround: None.

- CSCin66424

  Symptom: An APS switchover from a working interface to a protect interface might not occur for the following modules:

  – 10-Gbps uplink card

  – 10-Gbps ITU trunk card

  – 2.5-Gbps ITU trunk card

  This symptom occurs with the following configurations:

  – The card is configured for switch fabric based line card protection.

  – The interfaces of the card have threshold groups that are configured for converged data link header error checksum (CDL HEC) errors or cyclic redundancy check (CRC) errors, or both.

  – The CDL HEC error thresholds or CRC error thresholds, or both, are exceeded.

  Workaround: Do not configure CDL HEC error thresholds, CRC error thresholds, or both. Instead, configure code violation running disparity (CVRD) error thresholds. In a configuration in which an APS switchover of a working interface to a protect interface is based on CDL HEC error thresholds, CRC error thresholds, or both, there is no workaround.

- CSCin68117

  Symptom: The CLI does not support patch configurations between oscfilter interfaces and voaout interfaces.

  Workaround: None.

- CSCeb18103

  Symptom: OSC wave interface that is configured for laser safety control does not recover when the OSC link is down because of Loss of Light.

  This occurs after the following sequence of events:

  – The OSC wave interface is not configured with laser safety control.

  – The OSC wave interface goes down with a Loss of Light condition.

  – The OSC wave interfaces at both ends are configured for LSC, with more than 3 seconds elapsed between the configurations.

  – The Loss of Light failure is resolved.

  This problem does not appear if laser safety control is configured when the OSC wave interface is up.

  Workaround: None.

  Resolution: Upgrade the Cisco ONS 15540 mux/demux motherboard functional image to release 2.67 or later.

- CSCea52092

  Symptom: An optical supervisory channel (OSC) module may not provide power even though the laser is enabled after you have booted the shelf.

  Workaround: Remove and reinsert the carrier motherboard.

- CSCin60562

  Symptom: If a row is created in cApsChanConfigTable using createAndWait, a set operation on an instance of cApsChanConfigIfIndex might modify another instance of that object.

  Workaround: Use createAndGo to create the row.

Resolved Caveats in Release 12.2(18)SV2

- CSCeb87507

  Symptom: In some instances the system crashes when it attempts to parse IP SNMP related commands.

  Workaround: None.

- CSCed05346

  Symptom: Bidirectional APS fails when the ethernetdcc interface is used as a message channel for trunk based protection if the PSM is connected directly to a wavepatch interface on an ITU trunk card or transponder line card rather than to the wdm interface on an OADM module.

  Workaround: None.

- CSCed22589

  Symptom: Link initialization failure due to Loss of Lock might occur for ESCON traffic on some transponder line cards due to a transient failure of the clock recovery unit. Only some transponder line cards are susceptible to this failure and not all. This is an initialization failure and not a run-time failure.

  Workaround: None.

Resolved Caveats in Release 12.2(18)SV1

- CSCdz64021

  Symptom: While performing an online removal and insertion of a protection card in a y-cable configuration, the local and remote working ports are flooded with CRC errors.

  Workaround: Disconnect the standby branch of the y-cable configuration during the insertion of the standby line card or SFP optics.

- CSCec28182

  Symptom: Tracebacks related to CPU switch module hog issues are seen when reprogramming the 2.5-Gbps transponder line card functional image.

  Workaround: None.

- CSCec36614

  Symptom: Performing an online removal and insertion on a tengigethernetphy interface or waveethernetphy interface when loopback is configured causes a loss of the loopback information on the hardware. However, the loopback CLI configuration is still present in the software.

  Workaround: Remove and reinsert the line card, and then issue the **loopback** command.

- CSCec59409

  Symptom: Issuing a **Ctrl-U** when connected to a raw TL1 port causes the system to crash.

  Workaround: If a TL1port is unused, apply an IP ACL to the management Ethernet interface that blocks the incoming TCP connections to ports 3082 and 3083.

- CSCec88050

  Symptom: Power-on diagnostics fail on the CPU switch module if a 2.5-ITU trunk card is installed in slot 1.

  Workaround: None.

Resolved Caveats in Release 12.2(18)SV

- CSCdu53656

  A Cisco device running Cisco IOS software and enabled for the Border Gateway Protocol (BGP) is vulnerable to a Denial of Service (DOS) attack from a malformed BGP packet. The BGP is not enabled by default, and must be configured to accept traffic from an explicitly defined peer. Unless the malicious traffic appears to be sourced from a configured, trusted peer, it would be difficult to inject a malformed packet. BGP MD5 is a valid workaround for this problem.

  Cisco has made free software available to address this problem. For more details, refer to this advisory, available at http://www.cisco.com/warp/public/707/cisco-sa-20040616-bgp.shtml.

- CSCdz89270

  Symptom: OFC (open fibre control) is not supported with Fibre Channel on the 8-port FC/GE aggregation card. The link might not initialize if an 8-port FC/GE aggregation card is used with older Fibre Channel equipment that employ OFC laser safety mechanisms.

  Workaround: None.

- CSCea28131

  A Cisco device running Cisco IOS software and enabled for the Border Gateway Protocol (BGP) is vulnerable to a Denial of Service (DOS) attack from a malformed BGP packet. The BGP is not enabled by default, and must be configured to accept traffic from an explicitly defined peer. Unless the malicious traffic appears to be sourced from a configured, trusted peer, it would be difficult to inject a malformed packet. BGP MD5 is a valid workaround for this problem.

  Cisco has made free software available to address this problem. For more details, refer to this advisory, available at http://www.cisco.com/warp/public/707/cisco-sa-20040616-bgp.shtml.

- CSCeb19410

  Symptom: An 8-port FC/GE aggregation card client interface laser may be off when it is configured in a disabled y-cable APS group.

  Workaround: Enable and then disable the APS group. This activates the client interface laser.

- CSCec03715

  Symptom: If the flow identifier on an esconphy interface is changed without deleting the old flow identifier, both the old and the new flow identifiers are present in the lookup table of the ESCON aggregation card. As a result, the old flow identifier cannot be reused on this ESCON aggregation card.

  Workaround: Perform an online removal and insertion of the ESCON aggregation card or issue the following sequence of commands in interface configuration mode:

  1. **no cdl flow identifier**
  2. **cdl flow identifier** [OLD IDENTIFIER]
  3. **no cdl flow identifier**
  4. **cdl flow identifier** [NEW IDENTIFIER]

- CSCec34628

  Symptom: Continuous optical power monitoring alarms cause memory leaks that lead to bus error exceptions and an unexpected reload.

  Workaround: None.

Limitations and Restrictions

This section provides limitations and restrictions for Cisco ONS 15530 hardware and software.

Transponder Line Cards

This section contains limitations and restrictions that apply to transponder line cards.

- CRC errors might occur with 2-Gbps Fibre Channel on single-mode transponders when high input power levels are received from the client laser sources.

  Data errors or link-down conditions for 2-Gbps Fibre Channel might occur when used with certain client laser sources. Transmitters in some client GBIC and SFP transceiver units might send large overshoots in optical power with signal bit transitions, causing momentary overload conditions on the transponder client side receiver. The average transmitted power level from the GBIC does not violate the overload specification of the transponder client side receiver, so a power meter does not detect the overload.

The workaround is to attenuate the signal from the client equipment to a recommended level of -12 dBm when transmitting 2-Gbps Fibre Channel services.

- Error-free transmission of some D1 video signals (defined by the SMPTE 259M standard) and test patterns (such as Matrix SDI) cannot be guaranteed by the Cisco 15500 Series because of the pathological pattern in D1 video. This well-known limitation is usually overcome by the D1 video equipment vendor, who uses a proprietary, second level of scrambling. No standards exist at this time for the second level of scrambling.

8-Port FC/GE Aggregation Card

This section contains limitation and restrictions that apply to 8-port FC/GE aggregation cards.

- IFCCs (InterFace Control Checks) are generated while extending the distance between an IBM mainframe and IBM 9032 Model 5 ESCON Director through FICON using an 8-port FC/GE aggregation card on a Cisco ONS 15530. These IFCCs are seen on the host side. They occur when the port is configured for FICON without flow control enabled.

  The FICON bridge port (on the ESCON Director) expects to be connected directly to an N_Port of the host. Therefore, the bridge port expects the N_Port to send a minimum of six primitive signals (Idles and R_RDYs) between frames. Anything less than six primitive signals causes IFCCs to be generated on the ESCON Director, which in turn are logged on the host. The 8-port FC/GE aggregation card is pure transport and needs to delete and insert one IPG for frequency compensation. Hence, depending on the card, sometimes either five or seven idles are sent between frames. The 8-port FC/GE aggregation card cannot maintain six idles between every frame if the card is on slower side of the clock.

  The workaround is to enable flow control using the **flow control** command on the gigabitphy interfaces.

CPU Switch Modules

This section contains limitations and restrictions that apply to CPU switch modules.

- If both CPU switch modules are removed, all aggregation cards, OSC modules, transponder line cards, ITU trunk cards, and uplink cards are shut down.

Note Traffic on pass through optical channels (which passively pass through the OADM modules) are not affected by the removal of the CPU switch modules.

Related Documentation

Refer to the following documents for more information about the Cisco ONS 15530:

- *Regulatory Compliance and Safety Information for the Cisco ONS 15500 Series*
- *Cisco ONS 15530 Planning Guide*
- *Cisco ONS 15530 Hardware Installation Guide*
- *Cisco ONS 15530 Optical Transport Turn-Up and Test Guide*
- *Cisco ONS 15530 Cleaning Procedures for Fiber Optic Connections*

- *Cisco ONS 15530 Configuration Guide*
- *Cisco ONS 15530 Command Reference*
- *Cisco ONS 15530 System Alarms and Error Messages*
- *Cisco ONS 15530 Troubleshooting Guide*
- *Network Management for the Cisco ONS 15530*
- *Cisco ONS 15530 TL1 Commands*
- *MIB Quick Reference for the Cisco ONS 15500 Series*
- *Cisco ONS 15530 Software Upgrade 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/univercd/home/home.htm

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

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http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

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http://www.cisco.com/techsupport

Access to all tools on the Cisco Technical Support 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 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 TAC 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 TAC 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

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- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

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- The Cisco *Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

  http://cisco.com/univercd/cc/td/doc/pcat/

- *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

- *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

- 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.