



Text Part Number: 78-5376-07

Release Notes for MPLS Cisco IOS Release 11.1(28a)CT

February 25, 2002

This release note describes the MPLS (formerly Tag Switching) features and caveats that are supported in the Cisco IOS Release 11.1 CT, up to and including 11.1(28a)CT. Release 11.1 CT is a platform-specific software release that supports the MPLS feature for the

- Cisco 7500 series routers
- Cisco 7200 series routers
- Cisco 7000 series routers
- Cisco 7000 Series Route Switch Processor (RSP7000) and
- Cisco 7000 Series Chassis Interface (RSP7000CI).

Use these release notes in conjunction with the *Release Notes for Cisco IOS Release 11.1*, *Release Notes for Cisco 7000 Family for Cisco IOS Release 11.1 CA* and *Release Notes for Cisco 7000 Family for Cisco IOS Release 11.1 CC*. All features supported in Release 11.1, Release 11.1 CA, and Release 11.1 CC are supported in Release 11.1 CT. In addition to the caveats listed in the “Caveats” section, the software caveats that apply to Release 11.1, Release 11.1 CA, and Release 11.1 CC also apply to Release 11.1 CT.

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Introduction

Release 11.1(17)CT is the first release of this feature-specific Cisco IOS software. Release 11.1(28a)CT or later is available on Cisco Connection Online (CCO) only and cannot be ordered through manufacturing. CCO is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services. For more information on Release 11.1 CT, refer to the "Release 11.1 CT Migration Guide" design implementation guide, "Cisco IOS Software Release 11.1 CT New Features product bulletin #757, and "Cisco IOS Software Release 11.1 CT Ordering Procedures and Platform Hardware Support" product bulletin #756 located on CCO.

Cisco Systems provides several software releases based on a single version of Cisco IOS software. Release 11.1 is a major release and Release 11.1(17) is maintenance release. Maintenance releases of the major software deliver fixes to software defects only, thus providing the most stable software for your network, for the features you need. In addition to the major software release, there are several Early Deployment (ED) releases. One ED release, Release 11.1 CT, delivers fixes for software defects and support for the new features for the Cisco 7000 family. 11.1 CT is an ED release, based on Release 11.1 CC, which provides the MPLS feature in addition to the 11.1 CC feature set.

Detailed software configuration information on the new MPLS feature and Cisco IOS commands supported by Release 11.1 CT is available on a Documentation CD-ROM and on the Web at <http://www.cisco.com>. For more information, refer to the "Related Documentation" section later in this document.

This document will be updated as additional releases of Release 11.1 CT are made available to support new hardware and software features.

System Requirements

This section describes the system requirements for the Cisco IOS Release 11.1 CT software and includes the following sections:

- Memory Requirements
- Supported Hardware
- Determining Your Cisco IOS Software Release

Memory Requirements

Table 1 describes the memory requirements for the feature sets for the Cisco 7000 family of routers supported by Cisco IOS Release 11.1 CT. The following list contains additional important information for Release 11.1 CT:

- Cisco 7200 series routers are shipped with an 8-, 16-, or 20-MB Flash memory card. Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and RSP7000CI are shipped with a 16- or 20-MB Flash memory card.
- All feature sets for Cisco 7500 series and Cisco 7000 series routers with RSP7000 and RSP7000CI include VIP support.
- The Cisco 7200 series boot image has been changed to a self-decompressing compressed image, because the uncompressed boot image exceeds 4 MB.
- For port adapter hardware and memory configuration guidelines for the Cisco 7200 series routers, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*.
- If you configure Cisco Express Forwarding (CEF) or Distributed CEF (DCEF) on Cisco 7500 series routers, use the following minimum memory requirements. For more information, refer to the CEF feature module.
 - If there are fewer than 10,000 routes, you need a minimum of 32 MB on the RSP and 16 MB on the VIP2-20.
 - If there are fewer than 20,000 routes, you need a minimum of 64 MB on the RSP and 16 MB on the VIP2-20.
 - If there are more than 20,000 routes, you need a minimum of 128 MB for the RSP and 32 MB on the VIP2-40.

Table 1 Memory Requirements for Cisco 7000 Family of Routers

Feature Set by Router	Image Name	Required Flash Memory	Required DRAM Memory ¹	Release 11.1 CC Runs From
Cisco 7200 Series				
Enterprise	c7200-j-mz and c7200-p-mz	16 MB	32 MB	RAM
Cisco 7500 Series and Cisco 7000 Series with RSP7000 and RSP7000CI				
Enterprise/VIP	rsp-jv-mz and rsp-pv-mz	16 MB	32 MB	RAM
Enterprise	rsp-j-mz and rsp-p-mz	16 MB	32 MB	RAM

¹ If you use a Cisco 7200/7500 router as a Label Switch Controller (LSC), you need a minimum of 64 MB DRAM.

Supported Hardware

Cisco IOS Release 11.1 CT supports the following platforms:

- Cisco 7200 series routers (including the Cisco 7202, Cisco 7204, and Cisco 7206)
- Cisco 7500 series routers (including the Cisco 7505, Cisco 7507, and Cisco 75013)
- Cisco 7000 series routers with RSP7000 and RSP7000CI (including the Cisco 7000 and Cisco 7010)

Table 2 lists the interfaces supporting MPLS on the Cisco 7000 family of routers.

Table 3 lists the port adapters supporting MPLS on the Cisco 7000 family of routers.

In each table, “Yes” means that a particular interface or port adapter is supported. “No” means that it is not.

All port adapters and interfaces supported in Release 11.1 CA and Release 11.1 CC are supported in Release 11.1 CT. For a complete list of the LAN interfaces and WAN data rates and interfaces supported on the Cisco 7000 family of routers, refer to the *Release Notes for Cisco 7000 Family for Cisco IOS Release 11.1 CC*.

Table 2 Interfaces Supporting MPLS on the Cisco 7000 Family of Routers

Interface	Cisco 7200 Series	Cisco 7500 Series and Cisco 7000 Series with RSP7000
ATM Interface Processor (AIP)	N/A	Yes
Ethernet Interface Processor (EIP)	N/A	Yes
Fast Ethernet Interface Processor (FEIP)	N/A	Yes
HSSI Interface Processor (HIP)	N/A	Yes
Packet OC-3 Interface Processor (POSIP)	N/A	Yes

Table 3 Port Adapters Supporting MPLS on the Cisco 7000 Family of Routers

Port Adapter	Cisco 7200 Series	Cisco 7500 Series and Cisco 7000 Series with RSP7000
ATM Port Adapter (PA-A1)	Yes	Yes
Enhanced 4-Port Synchronous Serial Port Adapter (PA-4T+)	Yes	Yes
Fast Ethernet Port Adapter (PA-FE)	Yes	Yes
Four-Port Ethernet Port Adapter (4EPA)	Yes	Yes
One-Port High-Speed Serial Interface (HSSI) Port Adapter (PA-H)	Yes	Yes
Synchronous Serial EIA/TIA-232 Port Adapter (PA-8T-232)	Yes	Yes
Synchronous Serial V.35 Port Adapter (PA-8T-V35)	Yes	Yes
Synchronous Serial X.21 Port Adapter (PA-8T-x21)	Yes	Yes
Two-Port HSSI Adapter (PA-2H)	Yes	Yes

Determining Your Cisco IOS Software Release

To determine the version of Cisco IOS software currently running on your router, log on to the Cisco router and enter the show version EXEC command:

```
Router> show version
```

An output appears similar to the following. The Cisco IOS version is in the second line.

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.1(28a)CT...
```

The output includes additional information such as processor revision numbers, memory amounts, hardware IDs, and partition information. To upgrade to a new software release, see the Cisco Connection Online section.

Cisco IOS Packaging

The following feature sets are available in Release 11.1 CT for the Cisco 7000 series routers with RSP7000 and RSP7000CI, Cisco 7200 series routers, and Cisco 7500 series routers. All features supported in Release 11.1 and Release 11.1 CA, and Release 11.1 CC are supported in Release 11.1 CT.

For information on these features, refer to *Release Notes for Cisco IOS Release 11.1* and *Release Notes for Cisco 7000 Family for Cisco IOS Release 11.1 CA*, and *Release Notes for Cisco 7000 Family for Cisco IOS Release 11.1 CC*.

Note All features in Release 11.1(17)CT are in all feature sets.

Cisco 7500 series routers and Cisco 7000 series routers with RSP7000 and RSP7000CI:

- Enterprise/VIP (rsp-jv-mz and rsp-pv-mz images)
- Enterprise (rsp-j-mz and rsp-p-mz images)

The Cisco 7200 series routers:

- Enterprise (c7200-j-mz and c7200-p-mz images)

Microcode Software

For Cisco 7500 series and Cisco 7000 series with RSP700 platforms, microcode software images are bundled with the Release 11.1 system software images (features sets). The only exception is the Channel Interface Processor (CIP) microcode, which is unbundled in all system software images.

All microcode, except CIP microcode, is bundled with each Release 11.1 CT software image that runs on Cisco 7500 series and Cisco 7000 series with RSP700 platforms. Bundling eliminates the need to store separate microcode images. When the router starts, the system software unpacks the microcode software bundle and loads the proper software onto all interface processor boards.

For a list of microcode versions, refer to the *Release Notes for Cisco 7000 Family for Cisco IOS Release 11.1 CC* publication.

New and Changed Information

The following sections list the new MPLS features that are available in Cisco IOS Release 11.1 CT. New hardware features are described in detail in the documentation that accompanies the hardware. Also, new hardware and new software features are described in feature modules that are available online only. Each feature module contains a brief description of the feature and new or modified Cisco IOS commands supported by the feature. For easy online access, these features are linked to the applicable Cisco IOS feature module (if one exists). Click on the link to open the feature module.

New Features in Release 11.1(28a)CT

There are no new features in this release.

New Features in Release 11.1(28)CT

There are no new features in this release.

New Features in Release 11.1(27)CT

There are no new features in this release.

New Features in Release 11.1(26)CT

There are no new features in this release.

New Features in Release 11.1(25)CT2

There are no new features in this release.

New Features in Release 11.1(25)CT1

There are no new features in this release.

New Features in Release 11. 1(25)CT

There are no new features in this release.

New Features in Release 11. 1(24)CT

There are no new features in this release.

New Features in Release 11.1(23)CT

There are no new features in this release.

New Features in Release 11.1(22)CT

There are no new features in this release.

New Features in Release 11.1(21)CT

There are no new features in this release.

New Features in Release 11.1(20)CT

There are no new features in this release.

New Features in Release 11.1(19)CT

In addition to the features in Release 11.1 CA and Release 11.1 CC, Release 11.1(19)CT supports the following new feature:

Label Switch Controller—The Label Switch Controller (LSC) with Cisco's BPX 8620 wide area switch and BPX 8650 IP+ATM switch delivers scalable integration of IP services over an ATM network. The LSC enables the BPX 8620 and 8650 to participate in an MPLS network, to be a direct peer with IP edge routers, and support the full suite of IP features available in Cisco IOS.

MPLS's highly scalable IP+ATM integration is created by the LSC using a direct peer relationship between the BPX 8620 or 8650 and IP edge routers. This removes the limit placed on the number of IP edge routers, seen in traditional IP over ATM networks, thus allowing service providers to keep pace with the growing demand for IP services. The LSC additionally supports the easy, quick, and direct implementation of advanced IP services over an ATM network of BPX 8620s and 8650s.

New Features in Release 11.1(18)CT

There are no new features in this release.

New Features in Release 11.1(17)CT

In addition to the features in Release 11.1 CA and Release 11.1 CC, Release 11.1(17)CT supports the following new feature:

MPLS—MPLS is a novel approach to network layer packet forwarding. The two main components of the MPLS architecture are forwarding and control. Forwarding is accomplished using simple label-swapping techniques. Control results from the use of the existing network layer routing protocols plus mechanisms for binding and distributing tags. MPLS retains the scaling properties of IP and can help improve the scalability of IP networks.

Important Notes

This section contains important information about the Cisco IOS Release 11.1 CT software.

- This release note lists the Cisco IOS release in which a port adapter or interface processor was first announced. However, the minimum or recommended release of Cisco IOS software required for a port adapter or interface processor might be a later release. The recommended release changes periodically, either to support new features or to correct problems.

The hardware documentation that ships with the port adapter or interface processor lists the minimum release of Cisco IOS required to support the port adapter, which might not be the Cisco IOS release currently running on your router. The hardware documentation is updated as often as possible to allow for changes in Cisco IOS requirements. Manufacturing always ships the current minimum Cisco IOS release with the port adapter or interface processor. The latest Cisco IOS software is available on CCO.

- MPLS on a router requires that Cisco Express Forwarding (CEF) be enabled.

Caveats

For a list of the caveats that apply to Release 11.1, Release 11.1 CA, and Release 11.1 CC, refer to the following publications:

- *Release Notes for Cisco IOS Release 11.1*,
- *Release Notes for Cisco 7000 Family for Cisco IOS Release 11.1 CA*
- *Release Notes for Cisco 7000 Family for Cisco IOS Release 11.1 CC*

The caveats that apply to Cisco IOS Release 11.1, Release 11.1 CA, and Release 11.1 CC apply to Release 11.1 CT.

Only serious caveats with release note attachments are described in these release notes. The complete caveats against Release 11.1 are available in the Cisco Documentation CD-ROM package. In the CD-ROM package, access the Cisco IOS 11.1 caveats in the Cisco IOS Release 11.1 database. If you have an account on Cisco Connection Online (CCO), you can view additional caveats using the bug search tools in the Bug Toolkit, such as the Bug Navigator.

Caveats for Release 11.1(17) through 11.1(28a)CT

This section describes unexpected behavior possible with Release 11.1(28a)CT. Unless otherwise noted, these caveats apply to all 11.1(17) releases up to and including 11.1(28a)CT

- CSCdm88958

When a user issues the **wr mem** command on a box configured for HSA with two RSP4s, the following message displays:

```
Router# write mem
Building configuration...
% Slave config write error (0)
% Slave config is not opened
[Ok]
```

Both Route/Switch Processors (RSPs) have 128 MB and are running the rsp-jv-mz.111-28.CC.bin image. This was not an issue when running RSPs with Release 11.1.24.1CC. This configuration has been tested on other routers with the same result.

- CSCdw65903

An error can occur with management protocol processing. Please use the following URL for further information:

<http://www.cisco.com/cgi-bin/bugtool/onebug.pl?bugid=CSCdw65903>

- CSCdw78210

Related to fixes in CSCdw65903 and outlined in:

<http://www.cisco.com/warp/public/707/cisco-malformed-snmp-msgs-pub.shtml>.

This defect may be seen when "debug snmp packets" is turned on and can result in tracebacks.

Caveats for Release 11.1(17) through 11.1(27)CT

There are no new caveats in this release.

Caveats for Release 11.1(17) through 11.1(26)CT

This section describes unexpected behavior possible with Release 11.1(26)CT. Unless otherwise noted, these caveats apply to all 11.1(17) releases up to and including 11.1(26)CT.

- CSCdk89962

Because of hardware issues, FIP may experience input stuck when Hot Standby Router Protocol (HSRP) is configured.

Workaround:

Reset the FIP when input stuck condition is detected.

- CSCdk41480

A router running CEF may experience spurious access while it is updating the FIB table. This condition is immediately corrected by IOS and has no impact on the operation of the router.

- CSCdm21161

When using VIP CE1/TE1, you may see RSP-3-INVRTN or RSP-3-NORESTART errors, followed by debug information, then a switching complex restart.

Caveats

This behavior often occurs when you are running images containing code changes for CSCdk67709.

Caveats for Release 11.1(17) through 11.1(25)CT2

- CSCdm40102

The **show ip cef xx** interface command does not show tag imposition for some Border Gateway Protocol (BGP) and recursive routes. This can cause a loss of connectivity.

- CSCdm54342

Dynamic status bits cleared during tag subblock IPC.

Workaround: Ensure correct status bits are overwritten in IPC handler.

- CSCdm56981

The **show tag xx** command causes bus errors. In the case where x/x had no CEF entry, the TFIB lookup routine would fail to initialize one of its return values, specifically a pointer to a tag_info. Bus error was on reference to this uninitialized pointer.

Caveats for Release 11.1(17) through 11.1(25)CT1

This section describes unexpected behavior possible with Release 11.1(25)CT1. Unless otherwise noted, this caveat applies to all 11.1(17) releases up to and including 11.1(25)CT1.

- CSCdm47748

A router with MPLS and IS-IS configured may crash due to a bus error with Release 11.1(25)CT. At the time of the crash the PC looks corrupted. The crash occurred after the following error message was displayed:

```
%UTIL-3-TREE: Data structure error--attempt to remove an unthreaded node from a tree
```

Caveats for Release 11.1(17) through 11.1(25)CT

This section describes unexpected behavior possible with Release 11.1(25)CT. Unless otherwise noted, this caveat applies to all 11.1(17) releases up to and including 11.1(25)CT.

- CSCdm01126

When configuring a VPI range for a tag edge router (TER) subinterface that is connected to another router or to a label switch controller (LSC), limit the range selected so that the total number of VPIs does not exceed 4. The following examples show acceptable ranges:

```
tag-switching atm vpi 2-5
tag-switching atm vpi 10-13
```

Caveats for Release 11.1(17) through 11.1(24)CT

This section describes unexpected behavior possible with Release 11.1(24)CT. Unless otherwise noted, this caveat applies to all 11.1(17) releases up to and including 11.1(24)CT.

- CSCdk82708

No label is created for the default route. Routing is possible, but requires each packet to go to the CPU (including the Cisco LightStream 1010 ATM switch).

The workaround is to enter the following command in global configuration mode:

```
tag-switching ip default-route
```

Caveats for Release 11.1(17) through 11.1(23)CT

There are no new caveats in this release.

Caveats for Release 11.1(17) through 11.1(22)CT

There are no new caveats in this release.

Caveats for Release 11.1(17) through 11.1(21)CT

There are no new caveats in this release.

Caveats for Release 11.1(17) through 11.1(20)CT

This section describes unexpected behavior possible with Release 11.1(20)CT. Unless otherwise noted, these caveats apply to all 11.1(17) releases up to and including 11.1(20)CT.

Miscellaneous

- CSCdk20289

On Cisco routers running Release 11.1CT, if the TSP tunnel feature or traffic engineering feature is in use, a change to the router TDP identifier might cause problems. In particular, traffic engineering routes may not be installed if the TDP identifier is changed. Under rare conditions, a change to the TDP identifier might cause an illegal memory reference and a system reload.

To avoid these problems, you should configure a loopback interface with an IP address, as recommended in 11.1CT documentation. The loopback interface IP address will be used as an unchanging TDP identifier.

- CSCdk29512

You use the interface level configuration command **ip broadcast-address** *address* to set the IP broadcast address on a point-to-point link. However, if you do, TDP discovery does not work over that interface.

The workaround is to revert to the default broadcast address using the command:

no ip broadcast-address

Caveats for Release 11.1(17) through 11.1(19)CT

This section describes unexpected behavior possible with Release 11.1(19)CT. Unless otherwise noted, these caveats apply to all 11.1 releases up to and including 11.1(19)CT. For additional caveats applicable to Release 11.1(19)CT, see the caveats sections for newer 11.1CT releases. The caveats for newer releases precede this section.

All the caveats listed in this section are resolved in release 11.1(20)CT.

Miscellaneous

- CSCdk18642

On Cisco routers running Release 11.1CT, if the LSP tunnel feature or traffic engineering feature is in use, a change to the router LDP identifier might cause problems. In particular, traffic engineering routes may not be installed if the LDP identifier is changed. Under rare conditions, a change to the TDP identifier might cause an illegal memory reference and a system reload.

To avoid these problems, you should configure a loopback interface with an IP address, as recommended in 11.1CT documentation. The loopback interface IP address is used as an unchanging LDP identifier.

- CSCdk20293

On Cisco routers running Release 11.1CT, if the LSP tunnel feature or traffic engineering feature is in use, a change to the router LDP identifier might cause problems. In particular, traffic engineering routes may not be installed if the LDP identifier is changed. Under rare conditions, a change to the LDP identifier might cause an illegal memory reference and a system reload.

To avoid these problems you should configure a loopback interface with an IP address, as recommended in 11.1CT documentation. The loopback interface IP address is used as an unchanging LDP identifier.

Caveats for Release 11.1(17) through 11.1(18)CT

There are no new caveats for this release.

Caveats for 11.1(17)CT

This section describes unexpected behavior possible with Release 11.1(17)CT.

All the caveats listed in this section are resolved in Release 11.1(18)CT.

Miscellaneous

- CSCdj83145

If you run MPLS on a Cisco 75xx with VIP cards, and do not enable distributed CEF switching, the VIP card crashes when it receives a tagged packet.

The workaround is to enable distributed CEF switching, using the configuration command `config# ip cef distributed switch`

Related Documentation

The Cisco IOS software documentation for the new MPLS feature in Release 11.1 CT is available online only. New features for Release 11.1 CT are documented in the section New and Changed Information, which include a brief description of the feature, configuration tasks, and new and changed Cisco IOS commands supported by the feature. This information supplements the Cisco IOS Release 11.1 configuration guide and command reference publications.

Cisco IOS Release 11.1 documents and Release 11.1 CC feature documents can be found on the Documentation CD-ROM and on CCO.

On the Documentation CD, the paths are

- Cisco Product Documentation, Cisco IOS Software Configuration, Cisco IOS Release 11.1, Release Note for Cisco IOS Release 11.1 CT and Feature Modules
- Cisco Product Documentation, Core/High-End Routers, Cisco IOS Software Release Notes and Documentation, Release Note for Cisco IOS Release 11.1 CT and Feature Modules

On Cisco Connection Online (CCO), at <http://www.cisco.com/>, the paths are:

- Cisco Connection Online, Products and Ordering, Documentation, Cisco Documentation, Cisco Product Documentation, Cisco IOS Software Configuration, Cisco IOS Release 11.1, Release Note for Cisco IOS Release 11.1 CT and Feature Modules
- Cisco Connection Online, Products and Ordering, Documentation, Cisco Documentation, Cisco Product Documentation, Core/High-End Routers, Cisco IOS Software Release Notes and Documentation, Release Note for Cisco IOS Release 11.1 CT and Feature Modules

For more information, refer to the “Documentation CD-ROM” and “Service and Support” sections later in this document.

Note Refer to the “New and Changed Information” section for a list of features.

Note You can obtain the most up-to-date Cisco IOS documentation on the latest Documentation CD-ROM and on the Web. These electronic documents contain updates and modifications made after the paper documents were printed.

In addition to the software documentation, hardware features also have an installation and configuration note that accompanies the hardware.

Service and Support

For service and support for a product purchased directly from Cisco, use CCO.

For service and support for a product purchased from a reseller, contact the reseller. Resellers offer a wide variety of Cisco service and support programs, which are described in the section “Service and Support” in the information packet shipped with your product.

Note If you purchased your product from a reseller, you can access CCO as a guest. CCO is the primary real-time support channel for Cisco Systems. Your reseller offers programs that include direct access to CCO services.

Software Configuration Tips on the Cisco TAC Home Page

The following URL contains links that you can use to access helpful tips for configuring your Cisco products:

http://www.cisco.com/kobayashi/serv_tips.shtml

This URL is subject to change without notice. If it changes, point your web browser to <http://www.cisco.com/>, and follow this path: Software & Support, Technical Tips (button on left margin).

“Hot Tips” are popular tips and hints gathered from the Cisco Technical Assistance Center (TAC). Most of these documents are available from the TAC FAX-on-demand service. To access FAX-on-demand and receive documents at your FAX machine from the USA, call 888-50-CISCO (888-502-4726). From other areas, call 415-596-4408.

The following sections are provided from the Technical Tips page:

- **Field Notices**—Designed to provide notification of any critical issues regarding Cisco products. These include problem descriptions, safety or security issues, and hardware defects.
- **Hardware**—Technical Tips related to specific hardware platforms.
- **Internetworking Features**—Tips on using and deploying Cisco IOS software features and services.
- **Sample Configurations**—Actual configuration examples complete with topology and annotations.
- **Software Products**—MultiNet & Cisco Suite 100, Network Management, Cisco IOS Software Bulletins, and CiscoPro Configurations.
- **Special Collections**—Other Helpful Documents, Frequently Asked Questions, Security Advisories, References & RFCs, Case Studies, and the CiscoPro Documentation CD-ROM.

Cisco Connection Online

Cisco Connection Online (CCO) is Cisco Systems’ primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco’s customers and business partners. CCO services include product information, product documentation, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously: a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and it is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- WWW: <http://www.cisco.com>
- WWW: <http://www-europe.cisco.com>
- WWW: <http://www-china.cisco.com>

- Telnet: cco.cisco.com
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

Note If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM, a member of the Cisco Connection Family, is updated monthly. Therefore, it might be more current than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription. You can also access Cisco documentation on the World Wide Web at <http://www.cisco.com>, <http://www-china.cisco.com>, or <http://www-europe.cisco.com>.

If you are reading Cisco product documentation on the World Wide Web, you can submit comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco. We appreciate your comments.

Open Source License Acknowledgements

The following notices pertain to this software license.

OpenSSL/Open SSL Project

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>).

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).

This product includes software written by Tim Hudson (tjh@cryptsoft.com).

License Issues

The OpenSSL toolkit stays under a dual license, i.e. both the conditions of the OpenSSL License and the original SSLeay license apply to the toolkit. See below for the actual license texts. Actually both licenses are BSD-style Open Source licenses. In case of any license issues related to OpenSSL please contact openssl-core@openssl.org.

OpenSSL License:

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This package is an SSL implementation written by Eric Young (ey@cryptsoft.com).

The implementation was written so as to conform with Netscapes SSL.

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