



Release Notes for Cisco Multi-Processor WAN Application Module for Cisco IOS Release 12.2(9)ZA

January 16, 2003

Cisco IOS Release 12.2(9)ZA

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These release notes are for the Cisco Multi-Processor WAN Application Module (MWAM) for Cisco IOS Release 12.2(9)ZA. These release notes are updated as needed to describe new features, memory requirements, hardware support, software platform deferrals, and changes to the microcode and related documents.

For a list of the software caveats that apply to Cisco IOS Release 12.2(9)ZA, see the [“Caveats in Cisco IOS Release 12.2\(9\)ZA” section on page 10](#).

To review the release notes for Cisco IOS Release 12.2, go to www.cisco.com and click **Technical Documents**. Select **Release 12.2** from the Cisco IOS Software drop-down menu. Then click **Cisco IOS Release Notes > Cisco IOS Release 12.2**.

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

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Introduction

The Cisco Multi-Processor WAN Application Module (MWAM) is a Cisco IOS application module that you can install into the Catalyst 6500 series switch. The module allows you to run multiple instances of Cisco Mobile Wireless applications, such as the Cisco Packet Data Serving Node (PDSN), or the Cisco Mobile Wireless Home Agent (HA). Other applications will be added in future releases.

Each MWAM card contains three processor complexes (PCs), with two CPUs each, that are used to run IOS. Each CPU can be used to run an independent IOS image. The interfaces used by these IOS instances are gigabit ethernet 802.1Q trunk ports, which carry VLAN encapsulated traffic to and from the network through the Catalyst 6500 switch fabric. Each processor complex (housing two IOS instances) shares one gigabit ethernet interface.

Currently, an MWAM card running either PDSN or HA can run up to five instances of IOS simultaneously. Each MWAM card is dedicated to run one function only, PDSN or HA. The Catalyst 6500 chassis can house up to six MWAM cards.

The implementation of the MWAM running the Cisco PDSN or Mobile Wireless Home Agent requires the following components:

- Cisco Multi-Processor WAN Application Module
- Cisco IOS Release 12.2(9)ZA on the Catalyst 6500 Series Supervisor 2/MSFC2
- Cisco 6509 Catalyst Switch
- A IPSec VPN Acceleration Services Module for IPSec services (required only for IPSec)
- Cisco IOS Release 12.2(8)ZB that contains either the PDSN or Mobile Wireless Home Agent applications

**Note**

If you plan to deploy IPSec services, be aware that the IPSec VPN Acceleration Services Module requires 512-MB DRAM on the MSFC2

System Configuration Requirements

The MWAM requires the following system configuration:

- Cisco IOS 12.2(9)ZA Supervisor image be installed on the Supervisor Engine 2.
Refer to the *Release Notes for Cisco IOS Release 12.2(9)ZA on the Catalyst 6500 Series and Cisco 7600 Series Supervisor Engine and MSFC* for specific information about the Supervisor Engine 2.
Refer to the *Cisco Multi-Processor WAN Application Module Installation and Configuration Notes* for specific information about configuring the MWAM.

Memory Requirements

The Catalyst 6500 series MWAM memory is not configurable.

Supported Hardware

Before you can use the Catalyst 6500 series MWAM Module, you must have a Supervisor Engine 2 with an MSFC 2, and any module with ports to connect server and client networks.


Note

Release 12.2(9)ZA does not support OSMs or the FlexWAN module because of open caveats CSCdx94072, CSCdx83584, CSCdx57576, CSCdx60406, CSCdx69921, and CSCdx63685.

Table 1 Supported Hardware for the MWAM Application Module

Product Number (append with “=” for spares)	Power Required ¹	Product Description	Minimum Software Version
Supervisor Engine 2, PFC2, and MSFC2			
WS-X6K-S2U-MSFC2	3.46A	Supervisor Engine 2 with ROMMON version 6.1(3) or later, 32-MB bootflash device, 256-MB DRAM, dual-port 1000BASE-X GBIC ² uplinks, QoS port architecture (Rx/Tx): 1p1q4t/1p2q2t , Policy Feature Card 2 (PFC2), and Multilayer Switch Feature Card 2 (MSFC2)	12.1(5c)EX IOS Release 12.2(9)ZA
WS-X6K-S2-MSFC2	3.46A	Supervisor Engine 2 with ROMMON version 6.1(2) or later, 16-MB bootflash device, 128-MB DRAM, dual-port 1000BASE-X GBIC uplinks, QoS port architecture (Rx/Tx): 1p1q4t/1p2q2t , Policy Feature Card 2 (PFC2), and Multilayer Switch Feature Card 2 (MSFC2)	12.1(5c)EX
Note Memory and ROMMON can be upgraded (see the “Memory Requirements” section in the <i>Release Notes for Cisco IOS Release 12.2(9)ZA on the Catalyst 6500 Series and Cisco 7600 Series Supervisor Engine and MSFC</i>)			
Distributed Forwarding Card			
WS-F6K-DFC	2.10A	Distributed Forwarding Card (DFC) with 128-MB DRAM, for use on fabric-enabled modules (cannot be installed on fabric-enabled modules that have the WS-F6K-VPWR voice power module installed)	12.1(5c)EX
Note Requires Switch Fabric Module.			
Switch Fabric Modules			
Note Except in the WS-C6513 chassis, WS-C6500-SFM2 and WS-C6500-SFM can be used together to provide redundancy.			
WS-C6500-SFM2	2.79A	Switch Fabric Module, version 2, to support fabric-enabled modules Note Supports all chassis.	12.1(8a)E
WS-C6500-SFM	2.79A	Switch Fabric Module to support fabric-enabled modules Note Does not support the WS-C6513 chassis.	12.1(5c)EX

Table 1 Supported Hardware for the MWAM Application Module (continued)

Product Number (append with “=” for spares)	Power Required ¹	Product Description	Minimum Software Version
IPSec Virtual Private Network (VPN) Acceleration Services Module			
WS-SVC-IPSEC1 Note Requires IPSec image c6k222-jk9sv-mz	3.40A	Gigabit Ethernet IPSec cryptographic module, fabric-enabled	12.2(9)ZA
Multi-Processor WAN Application Module			
WS-SVC-MWAM-1	3.57A	Multi-Processor WAN Application Module (MWAM) with 512-MB DRAM	12.2(9)ZA
Gigabit Ethernet Switching Modules			
WS-X6816-GBIC	5.94A	16-port Gigabit Ethernet GBIC, fabric-enabled, dual switch fabric interfaces, WS-F6K-DFC-equipped, QoS port architecture (Rx/Tx): 1p1q4t/1p2q2t Note Requires Switch Fabric Module. In WS-C6513 chassis, supported only in slots 9 through 13.	12.1(5c)EX
WS-X6516-GBIC	3.40A	16-port Gigabit Ethernet GBIC, fabric-enabled, QoS port architecture (Rx/Tx): 1p1q4t/1p2q2t	12.1(5c)EX
WS-X6416-GBIC	2.81A	16-port Gigabit Ethernet GBIC, QoS port architecture (Rx/Tx): 1p1q4t/1p2q2t	12.1(5c)EX
WS-X6416-GE-MT	2.50A	16-Port Gigabit Ethernet MT-RJ, QoS port architecture (Rx/Tx): 1p1q4t/1p2q2t	12.1(5c)EX
WS-X6316-GE-TX	5.15A	16-port Gigabit Ethernet RJ-45, QoS port architecture (Rx/Tx): 1p1q4t/1p2q2t	12.1(5c)EX
WS-X6408A-GBIC	2.00A	8-port Gigabit Ethernet GBIC QoS port architecture (Rx/Tx): 1p1q4t/1p2q2t	12.1(5c)EX
WS-X6408-GBIC	2.00A	8-port Gigabit Ethernet GBIC QoS port architecture (Rx/Tx): 1q4t/2q2t	12.1(5c)EX
Fast Ethernet Switching Modules			
WS-X6324-100FX-SM WS-X6324-100FX-MM	1.52A 1.52A	24-port 100FX Ethernet single mode and multimode MT-RJ with 128-KB per-port packet buffers QoS port architecture (Rx/Tx): 1q4t/2q2t	12.1(5c)EX
WS-X6224-100FX-MT	1.90A	24-port 100FX Ethernet Multimode MT-RJ QoS port architecture (Rx/Tx): 1q4t/2q2t	12.1(5c)EX
Ethernet/Fast Ethernet (10/100) Switching Modules			
WS-X6548-RJ-45	2.90A	48-port 10/100TX RJ-45, fabric enabled, QoS port architecture (Rx/Tx): 1p1q0t/1p3q1t	12.1(8a)E
WS-X6348-RJ-45 WS-X6348-RJ-45V	2.39A 2.39A ³	48-port 10/100TX RJ-45, 128-KB per-port packet buffers, QoS port architecture (Rx/Tx): 1q4t/2q2t	12.1(5c)EX
WS-X6248-RJ-45	2.69A	48-port 10/100TX RJ-45, QoS port architecture (Rx/Tx): 1q4t/2q2t	12.1(5c)EX

Table 1 Supported Hardware for the MWAM Application Module (continued)

Product Number (append with “=” for spares)	Power Required¹	Product Description	Minimum Software Version
WS-X6248A-TEL	2.69A	48-port 10/100TX RJ-21, 128-KB per-port packet buffers, QoS port architecture (Rx/Tx): 1q4t/2q2t	12.1(5c)EX
WS-X6248-TEL	2.69A	48-port 10/100TX RJ-21, QoS port architecture (Rx/Tx): 1q4t/2q2t	12.1(5c)EX
Ethernet Switching Modules			
WS-X6024-10FL-MT	1.52A	24-port 10BASE-FL MT-RJ, QoS port architecture (Rx/Tx): 1q4t/2q2t	12.1(5c)EX
Optical Services Modules			
Not supported in Release 12.2(9)ZA (CSCdx94072, CSCdx83584, CSCdx57576, CSCdx60406, CSCdx69921, CSCdx63685)			
OC-48 Packet over SONET (OSM-1OC48-POS)			
OC-12 Packet over SONET (OSM-4OC12-POS)			
OC-3 Packet over SONET (OSM-16OC3-POS)			
OC-48 Channelized (OSM-1CHOC48/T3)			
OC-12 Channelized (OSM-4CHOC12/T3)			
FlexWAN Module —WS-X6182-2PA			
Not supported in Release 12.2(9)ZA (CSCdx94072, CSCdx83584, CSCdx57576, CSCdx60406, CSCdx69921, CSCdx63685)			
Content Switching Module			
WS-X6066-SLB-APC	3.00A	Content Switching Module	12.1(8a)E
7603 Power Supplies			
PWR-950-AC		950W (21.89A) AC power supply	12.1(8a)E3
PWR-950-DC		950W (21.89A) DC power supply	
Power Supplies			
WS-CAC-4000W		4000W (95.70A) AC power supply	12.1(5c)EX
WS-CAC-2500W		2500W (55.50A) AC power supply	12.1(5c)EX
WS-CDC-2500W		2500W (55.50A) DC power supply	12.1(5c)EX
WS-CAC-1300W		1300W (27.46A) AC power supply	12.1(5c)EX
WS-CDC-1300W		1300W (27.46A) DC power supply	12.1(5c)EX
WS-CAC-1000W		1000W (21.40A) AC power supply	12.1(5c)EX
Modular Chassis			
CISCO7603		Cisco 7603 chassis: <ul style="list-style-type: none"> • 3 slots • 64 chassis MAC addresses • Does not support SFM or WS-X6816-GBIC 	12.1(8a)E3
OSR-7609		Cisco 7609 chassis: <ul style="list-style-type: none"> • 9 vertical slots • 1024 chassis MAC addresses • Supported only with Supervisor Engine 2 	12.1(8a)E3

Table 1 Supported Hardware for the MWAM Application Module (continued)

Product Number (append with "=" for spares)	Power Required ¹	Product Description	Minimum Software Version
WS-C6513		Catalyst 6513 chassis: <ul style="list-style-type: none"> • 13 slots • 64 chassis MAC addresses 	12.1(8a)E
WS-C6509-NEB		Catalyst 6509-NEB chassis: <ul style="list-style-type: none"> • 9 vertical slots • 1024 chassis MAC addresses 	12.1(5c)EX
WS-C6009		Catalyst 6009 chassis: <ul style="list-style-type: none"> • 9 slots • 1024 chassis MAC addresses 	12.1(5c)EX
WS-C6509		Catalyst 6509 chassis: <ul style="list-style-type: none"> • 9 slots • 1024 chassis MAC addresses 	12.1(5c)EX
WS-C6006		Catalyst 6006 chassis: <ul style="list-style-type: none"> • 6 slots • 1024 chassis MAC addresses 	12.1(5c)EX
WS-C6506		Catalyst 6506 chassis: <ul style="list-style-type: none"> • 6 slots • 1024 chassis MAC addresses 	12.1(5c)EX
WS-C6503		Catalyst 6503 chassis: <ul style="list-style-type: none"> • 3 slots • 64 chassis MAC addresses • Does not support SFM 	12.2(9)YO1

1. Use the values in this column to determine the exact power requirements for your configuration to ensure that you are within the power budget. Enter the **show power** command to display current system power usage.
2. GBIC = Gigabit Interface Converter.
3. The WS-F6K-VPWR voice power module is not supported and does not turn on.

Determining the Software Version

To determine the version of Cisco IOS software copied on the RPM-PR, access the CLI of the RPM-PR and enter the **show version** command:

```
router# show version
Cisco Internetwork Operating System Software
IOS (tm) MWAM Software (MWAM-JS-M), Version 12.2(9)ZA, EARLY DEPLOYMENT RELEASE
SOFTWARE (fc1)
```

Loading and Maintaining Images

The Supervisor II must have a Cisco IOS running on the Supervisor Engine 2 and MSFC that supports the MWAM. The Catalyst Operating System image is not supported. For more information on the Supervisor II for the MWAM, refer to the following publication:

http://www.cisco.com/univercd/cc/td/doc/product/lan/cat6000/reInotes/122_8ZA.htm

The application software bundle is copied to the Processor Complex compact flash for use by the MWAM. This process involves booting the MWAM card from the MP partition, using the standard IOS **copy** command to store the image in the compact flash card, and then resetting the MWAM to load the new image. All IOS images on the MWAM card will be the same.

Loading the IOS Image to MWAM

The image download process automatically loads an IOS image onto the three Processor complexes on the MWAM. Complexes 1 and 2 will run two instances of the same IOS image, and Complex 0 will run one instance of the same IOS image.

Upgrading the Image




Note

The total time to upgrade the image can be as much as 30 minutes.

To upgrade an Application image, you will need a compact flash card that has the MP partition from the current image (or later), and a recent supervisor image. To locate the images, please go to the Software Center at Cisco.com (<http://www.cisco.com/public/sw-center/>).

To perform the upgrade perform the following tasks:

	Command	Purpose
Step 1	Router# hw module mod reset cf:1	Boots the maintenance partition (MP) on the module.
Step 2	Router# show module	Verify that the MP has booted.
Step 3	Router# copy tftp:absolute-path/filename pclc#slot-fs:	Downloads the application image to the MWAM through the supervisor engine console.  Note The upgrade file uses a special format that makes this process slow.
Step 4	Router# hw module mod reset cf:4	Reboot the MWAM card back to partition cf:4 and you have an upgraded image.

This example show how to upgrade the MWAM image:

```
Router# hw module 4 reset cf:1

Router# show module

Router# copy tftp:absolute-path/filename pcli#4-fs:
Upgrade has started
Do not reset the card till upgrade is complete
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

> [OK - 29048727/58096640 bytes]

> 29048727 bytes copied in 1230.204 secs (23616 bytes/sec)
router #
> 2d21h: %SVCLC-SP-5-STRRECVD: mod 3: <Application upgrade has started>
> 2d21h: %SVCLC-SP-5-STRRECVD: mod 3: <Do not reset the module till upgrade completes!!>
> router #

> 2d21h: %SVCLC-SP-5-STRRECVD: mod 3: <Application upgrade has succeeded>
> 2d21h: %SVCLC-SP-5-STRRECVD: mod 3: <You can now reset the module

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Upgrade is complete
You can reset the blade
```



Caution

In order to know when it is safe to reboot the MWAM card, Cisco recommends that you globally configure the **logging console** command on the supervisor so that you can see all of the output detail of the upgrade procedure.

Upgrading a Spare MWAM Card



Note

Spare MWAM cards boot directly to the MP, rather than the AP. You first need to acquire a software license for the application, and then install the software on the MWAM.

The procedure to upgrade a spare MWAM card is the same as the regular card. The only difference is that instead of manually rebooting to cf:1 (the MP), you will start from there and download and reboot to cf:3.

Upgrading to a New Software Release

For information about copying Cisco IOS images to MWAM memory, see the *Cisco Multi-Processor WAN Application Module Installation and Configuration Notes*.

For general information about upgrading to a new Cisco IOS software release, refer to Software Installation and Upgrade Procedures located at the following URL:

http://www.cisco.com/warp/public/130/upgrade_index.shtml

New Features in the MWAM with Cisco IOS Release 12.2(9)ZA Software

The Cisco Multi-Processor WAN Application Module is an application module that you can install into the Catalyst 6500 series switch.

The following list notes the available features:

- Cisco IOS release 12.2(9)ZA on the MSFC2
- Cisco PDSN Release 1.2 on the MWAM—Cisco IOS 12.2(8)ZB
- Cisco Mobile Wireless Home Agent Release 1.2 on the MWAM—Cisco IOS 12.2(8)ZB

For detailed information about the Cisco PDSN and Mobile Wireless Home Agent features, see the Cisco publications at the following URLs:

Cisco PDSN:

<http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122newft/122limit/122z/122zb8/pdsn12/index.htm>

Cisco Mobile Wireless Home Agent:

<http://www.cisco.com/univercd/cc/td/doc/product/software/ios122/122newft/122limit/122z/122zb8/ha12/index.htm>

Limitations, Restrictions, and Important Notes

When working with an MWAM card, please take note of the following limitations, restrictions, and important notes:

- Only five (5) instances of a Cisco IOS image can be loaded on one MWAM card.
- You must use the 12.2(9) ZA image on the Supervisor 2/MSFC2.

Caveats in Cisco IOS Release 12.2(9)ZA

The following sections list and describe the open, resolved, closed, and unreproducible caveats for the Cisco MWAM in Cisco IOS Release 12.2(9)ZA. Only severity 1 through 3 caveats are included.

Caveats describe unexpected behavior in Cisco IOS software releases. Severity 1 caveats are the most serious caveats, severity 2 caveats are less serious, and severity 3 caveats are the least serious of these three severity levels.

Caveats in Cisco IOS Releases 12.2 and 12.2 T are also in Cisco IOS Release 12.2(8)MC2b. For information on caveats in Cisco IOS Release 12.2, see *Caveats for Cisco IOS Release 12.2*. For information on caveats in Cisco IOS Release 12.2 T, see *Caveats for Cisco IOS Release 12.2 T*. These two documents list severity 1 and 2 caveats and are located on CCO and the Documentation CD-ROM.



Note

If you have an account with Cisco.com, you can use Bug Navigator II to find caveats of any severity for any release. To reach Bug Navigator II, Login to Cisco.com and click **Software Center: Cisco IOS Software: Cisco Bugtool Navigator II**. Another option is to go directly to <http://www.cisco.com/support/bugtools>.

Open Caveats

The unresolved Multi-Processor WAN Application Module caveats in Release 12.2(9)ZA are as follows:

- There is a discrepancy between configuring the MWAM port and verifying statistics of the same MWAM port on the Supervisor.
There is no workaround. (CSCdz40257)
- On the MWAM PC, sho images may not display properly.
There is no work around. (CSCdz54411)
- Write memory starts to fail during bootup, and the NVRAM initialization fails.
A workaround is to reset the processor/card. (CSCdz62691)
- When traffic is sent to L2TP Tunnel service, Spurious memory access is seen.
There is no workaround. (CSCin24422)

Resolved Caveats

There are no resolved caveats in Release 12.2(9)ZA.

Closed Caveats

There are no closed caveats in Release 12.2(9)ZA.

Related Documentation

The following sections describe the documentation available related to the Cisco Multi-Processor WAN Application Module. These documents consist of hardware and software installation guides, Cisco IOS configuration guides and command references, system error messages, and other documents.

Documentation is available as printed manuals or electronic documents.

Platform-Specific Documents

These documents are available for the Cisco 6509 Catalyst Switch on Cisco.com and the Documentation CD-ROM:

- *Cisco Multi-Processor WAN Application Module Installation and Configuration Notes*
- Catalyst 6500 Series Hardware Documentation:
 - *Catalyst 6500 Series Switch Installation Guide*
 - *Catalyst 6500 Series Switch Module Installation Guide*
 - *Catalyst 6000 Series Switch Installation Guide*

And at the following URL:

- <http://www.cisco.com/univercd/cc/td/doc/product/lan/cat6000/index.htm>

Obtaining Documentation

These sections explain how to obtain documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at this URL:

<http://www.cisco.com>

Translated documentation is available at this URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which is shipped with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

Ordering Documentation

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:
http://www.cisco.com/cgi-bin/order/order_root.pl
- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:
<http://www.cisco.com/go/subscription>
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<http://www.cisco.com>

Technical Assistance Center

The Cisco Technical Assistance Center (TAC) is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two levels of support are available: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Cisco TAC inquiries are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

The Cisco TAC resource that you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

Cisco TAC Web Site

You can use the Cisco TAC Web Site to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to this URL:

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

All customers, partners, and resellers who have a valid Cisco service contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to this URL to register:

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

If you are a Cisco.com registered user, and you cannot resolve your technical issues by using the Cisco TAC Web Site, you can open a case online by using the TAC Case Open tool at this URL:

<http://www.cisco.com/tac/caseopen>

If you have Internet access, we recommend that you open P3 and P4 cases through the Cisco TAC Web Site.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses priority level 1 or priority level 2 issues. These classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer automatically opens a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to this URL:

<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled: for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). When you call the center, please have available your service agreement number and your product serial number.

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

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