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Release Notes for Cisco 6400 NRP for Cisco IOS Release 12.0(5)DC

February 16, 2002

These release notes for the Cisco 6400 node route processor (NRP) support Cisco IOS Release 12.0DC, up to and including Release 12.0(5)DC1. These release notes are updated as needed to describe new features, memory requirements, hardware support, software platform deferrals, and changes to the microcode or modem code and related documents.

For a list of the software caveats that apply to Release 12.0(5)DC1, see the “Caveats” section on page 6 and *Caveats for Cisco IOS Release 12.0 T*. The caveats document is updated for every maintenance release and is located on Cisco Connection Online (CCO) and the Documentation CD-ROM.

Use these release notes in conjunction with the cross-platform *Release Notes for Cisco IOS Release 12.0* located on Cisco Connection Online (CCO) and the Documentation CD-ROM.

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System Requirements

This section describes the system requirements for the Cisco 6400 UAC NRP and includes the following sections:

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Memory Requirements

Table 1 describes the memory requirements for the Cisco 6400 NRP.

Table 1 Cisco 6400 NRP Memory Requirements

Platforms	Image Name	Minimum Required Flash Disk	Required Main Memory	Runs from
Cisco 6400 NRP	c6400r-g4p5-mz	8 MB Flash	64 MB DRAM	RAM
Cisco 6400 NRP with Web-based service selection	c6400r-g4p5-mz	16 MB Flash	64 MB DRAM	RAM

Hardware Supported

Cisco IOS Release 12.0(5)DC1 supports the Cisco 6400 NRP. For detailed descriptions of the new hardware features, see the “New and Changed Information” section on page 4.

Software Compatibility

Cisco IOS Release 12.0(5)DC1 works with the Cisco Service Selection Dashboard, version 2.1.

A Cisco 6400 NRP with Release 12.0(5)DC1 software requires the use of Cisco IOS Release 12.0(4)DB or greater for the Cisco 6400 node switch processor (NSP). If you want to use the combined network management Ethernet (NME) interface features, you must use Cisco IOS Release 12.0(5)DB for the NSP. For information about Release 12.0DB for the NSP, see *Release Nodes for Cisco 6400 Node Switch Processor (NSP) for Cisco IOS Release 12.0(5)DB*.

Determining Your Software Release

To determine the version of Cisco IOS software currently running on your router, log on to the Cisco 6400 NRP and enter the **show version EXEC** command:

```
router> show version
```

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

```
Cisco Internetwork Operating System Software  
IOS (tm) 6400 Software (c6400r-g4p5-mz), Version 12.0(5)DC.....
```

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

Feature Set Tables

The Cisco IOS 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. The following section lists the feature set matrix and the features supported by each feature set. The Cisco 6400 NRP can only use a single image called c6400r-g4p5-mz. Table 2 lists features supported by the Cisco 6400 NRP image.

Note This feature set table contains only a selected list of features. This table is not a cumulative or complete list of all the features in this image.

Table 2 Feature List for the Cisco 6400 NRP

Layer 2 and Layer 3 Protocols

ARP

IPCP

IP forwarding

IP host

IP multicast

PPP over ATM

PPP over Ethernet

Routed RFC1483 encapsulation

TCP

Telnet

TFTP

UDP

Transparent bridging

VLAN

Layer 3 Routing Protocols

EIGRP

IS-IS

OSPF

PIM

RIP

Network Management, Security

AAA

CHAP

FTP

PAP

RADIUS

SNMP

TACACS

LAN Interfaces

Table 2 Feature List for the Cisco 6400 NRP (continued)

ATM

Ethernet (10BaseT)

Fast Ethernet (100BaseTX)

New and Changed Information

The following sections list the new features supported by the Cisco 6400 NRP in Cisco IOS Release 12.0(5)DC1.

New Hardware and Software Features in Release 12.0(5)DC1

No new hardware or software features are supported in Cisco IOS Release 12.0(5)DC1.

New Software Features in Release 12.0(5)DC

Layer 2 Tunnel Protocol

The Cisco 6400 NRP supports the use of layer 2 tunnel protocol (L2TP), an extension to the PPP protocol used for virtual private networks (VPNs). Release 12.0(5)DC supports L2TP with up to 400 sessions and up to 25 tunnels. For more information about L2TP, see the *Layer 2 Tunnel Protocol* feature module.

Note Layer 2 forwarding (L2F) is not supported in Release 12.0(5)DC for the Cisco 6400 NRP.

Combined Network Management Ethernet Interface

The combined network management Ethernet (NME) interface allows the entire Cisco 6400 system, including the NSP and all installed NRPs, to be managed through a single Ethernet interface. The NME interface eliminates the need for Ethernet cables and connections on individual NRPs.

Use of the combined NME interface requires Cisco IOS Release 12.0(5)DB for the NSP. See “Software Compatibility” section on page 2 for more information.

For more information about using the combined NME interface, see “Configuring the NSP” and “Configuring the NRP” in the *Cisco 6400 UAC Software Configuration Guide*.

RADIUS VC Logging

RADIUS Virtual Circuit (VC) Logging allows the Cisco 6400 Universal Access Concentrator to accurately record the virtual path interface (VPI) and virtual circuit interface (VCI) of an incoming subscriber session. With RADIUS VC Logging enabled, the RADIUS network access server (NAS) port field is extended and modified to carry VPI/VCI information. This information is logged in the RADIUS accounting record created at session startup. For more information about RADIUS VC logging, see the *RADIUS VC Logging* feature module.

IPCP Subnet Mask Support

IP Control Protocol (IPCP) subnet mask support allows customer premise equipment (CPE) to connect to the Cisco 6400 NRP and obtain an IP address and subnet mask range which it can use to populate its DHCP server database. To enable IPCP subnet mask support, you must specify a value for the **Framed-IP-Netmask** attribute (IETF RADIUS attribute 9) in the RADIUS user profile.

Using IPCP, the Cisco 6400 brings up PPP sessions with the CPE and authenticates each CPE as a separate user. The Cisco 6400 adds a static route for the IP address with the mask specified. If the netmask is specified in the user profile, the Cisco 6400 passes the IP netmask value and the IP address to the CPE during IPCP negotiation. The CPE uses the netmask to calculate an IP address pool from which IP addresses are assigned to PCs using the access link.

ATM Routed Bridge Encaps

The ATM routed bridge encaps feature on the Cisco 6400 NRP is used to route IP over bridged RFC 1483 Ethernet traffic from a stub bridged LAN. Bridged IP packets received on an ATM interface configured in route-bridged mode are routed via the IP header. Such interfaces take advantage of the characteristics of a stub LAN topology and offer increased performance and flexibility over integrated routing and bridging (IRB). For more information about ATM routed bridge encaps, see the *ATM Routed Bridge Encaps* feature module.

Service Selection Gateway Features

Enhancements to the Cisco 6400 NRP Service Selection Gateway (SSG) include IOS network address translation (NAT), support for Cisco Express Forwarding (CEF), VPI/VCI indexing to service profile, and RADIUS interim accounting record generation. For more information about SSG enhancements, see the *Node Route Processor-Service Selection Gateway Enhancements* feature module.

New Software Features in Release 12.0(3)DC

Point-to-Point Protocol over Ethernet

The Cisco 6400 NRP now supports Point-to-Point Protocol over Ethernet (PPPoE), which allows you to configure PPP over Ethernet on ATM using a virtual circuit (VC) multiplexed encapsulation mode. Using a PPPoE client, a PPP session can be initiated on a simple bridged Ethernet connected client through a standard Digital Subscriber Line (DSL) modem. The session is transported over the ATM DSL link via RFC 1483 Ethernet bridged frames and terminated in the Cisco 6400 NRP. The Cisco 6400 NRP does not support PPPoE on the Fast Ethernet port.

For more information about PPPoE, see the *PPP over Ethernet* feature module.

Node Route Processor—Service Selection Gateway

The Node Route Processor-Service Selection Gateway (NRP-SSG) is a switching solution for service providers who offer intranet, extranet and Internet connections to subscribers using high-speed data circuit equipment (DCE) such as Asymmetric Digital Subscriber Line (ADSL) equipment to allow simultaneous access to network services. The NRP-SSG allows the Cisco 6400 to act as a central control point for Layer 2 and Layer 3 services. This can include services available through ATM VCs, virtual private dial-up networks (VPDNs) or normal routing methods. The NRP-SSG feature is designed to work with the Cisco Service Selection Dashboard version 2.1 for Layer 3 services available on CCO.

For more information about the Service Selection Gateway, see the *Node Route Processor—Service Selection Gateway* feature module

Caveats

This section contains open caveats for the current Cisco 6400 NRP release only. Caveats in Cisco IOS Release 12.0 also apply to Release 12.0(5)DC1. For information about caveats in the Cisco IOS Release 12.0, refer to the “Caveats” sections in the *Cross-Platform Release Notes for Cisco IOS Release 12.0* document located on CCO and the Documentation CD-ROM.

In addition, caveats from Cisco IOS Release 11.3(9)DB and 12.0(3)DC also apply to Release 12.0(5)DC1. Information regarding these caveats can be found in *Release Notes for Cisco 6400 NRP for Cisco IOS Release 11.3(9)DB* and *Release Notes for Cisco 6400 NRP for Cisco IOS Release 12.0(3)DC*, respectively.

Open Caveats - Release 12.0(5)DC1

There are no open caveats specific to Cisco IOS Release 12.0(5)DC1 that require documentation in the release notes.

Resolved Caveats - Release 12.0(5)DC1

All the caveats listed in this section are resolved in Release 12.0(5)DC1. This section describes severity 1, 2, and selected severity 3 caveats.

- 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>

Open Caveats - Release 12.0(5)DC

This section describes possibly unexpected behavior by Release 12.0(5)DC. This section describes severity 1, 2, and selected severity 3 caveats.

- CSCdm36166

Downloading an invalid next hop table (NHT) profile generates an error message indicating that the download failed, even though it may actually have succeeded. If an NHT is not specified correctly in a profile, an error message will indicate the NRP-SSG has failed to download the NHT. A partial NHT may be created in the NRP-SSG system. The NHT can be displayed with the `show ssg next-hop` command. When this happens, the administrator should modify the NHT profile to fix any errors.

- CSCdm54456

During the processing of an interrupt, the NRP attempted to generate an SNMP trap. This is not allowed. The system will continue to operate.

- CSCdm63365

An error was identified (and temporarily corrected) within a software component in the NRP. The NRP will continue operate.

- CSCdm80458

When you inspect the output of the **show interface virtual-access** command, you may see 0 bits or packets per second as input/output rate, although the input/output packets/bytes are not 0.

An example:

```
#show interface virtual-access 4
...
5 minute input rate 3000 bits/sec, 4 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
5358 packets input, 397079 bytes, 0 no buffer
302 packets output, 19037 bytes, 0 underruns
```

This is caused by low traffic rate (less than 1kbits/sec or less than 1packet/sec). With integer division, the output becomes 0.

- CSCdm91371

SSG parses the format **<username>@<domain>** to handle SSG PTA user logins. Any SSG username that includes the @ character as part of the name will confuse SSG and result in expected behavior.

One scenario would be:

username = cbt@@ (cbt@@ would be in AAA server)

SSG parses it as

username = cbt domain = @

SSG thinks that this is a PTA login and try to authenticate the @ character as the domain (service) with the AAA server. AAA server rejects and SSG fails the user login. IOS takes over and authenticates **cbt@@**.

Result: SSG user is wrongly authenticated by IOS. Traffic would not go through SSG data path.

Work Around: Do not include the @ character as part of username.

- CSCdp08813

RADIUS authentication for L2TP does not work with the standard configuration. To workaround this issue, add a local VPDN group in the NRP configuration, such as the following:

```
vpdn-group 2
 request-dialin
  protocol l2tp
  domain hkt.com
 initiate-to ip 10.100.100.2
 local name NRP
 l2tp tunnel password 7 01000307490E12
```

The VPDN group does not need to contain valid information; this merely serves as a workaround.

- CSCdp17759

SSG performance is currently low for traffic using SSG services, due to extra overhead on top of IOS data path, added by SSG implementation. We have some significant improvement since this DDTS was filed, but the current number is not available yet.

- CSCdp18761

The SSG algorithm to search through the hostobject table is not fully optimized, so performance may decline as the number of users increases. This only happens to bridge users. PPP users (PPPoA, PPPoE) should not see this degradation.

- CSCdp19647

After all the users log off a specific service, the service object gets cleared but the SSG subblock associated with the IDB is not reset. As a result, all the traffic coming from the interface will still be treated by SSG as downstream traffic, which may or may not affect real deployment at all. As a workaround, reload the NRP, or enter the following command:

```
ssg bind direction uplink atm0/0/0.1
```

- CSCdp21381

If you enter an **erase nvram:** or **erase startup-config** command on the LAC, and then configure PPPoE and L2TP, L2TP tunnels or sessions will not be created between the LAC and L2TP. In this case, please save the configuration to the NVRAM and then reload the NRP.

- CSCdp22823

After performing a **shutdown** followed by a **no shutdown** on the LAC PPPoA interface, L2TP sessions do not stabilize when console logging is enabled. To workaround this issue, avoid console logging while image is in a fully loaded environment.

- CSCdp24260

PPPoA sessions between the client and NAS drop when bringing down a PVC on the home gateway. This may occur when a large number of PPPoA sessions are configured between clients and the NAS. To workaround this issue, turn off PPP keepalive packets.

- CSCdp27025

In rare instances, PPPoE sessions running on UBR PVCs may be dropped. This happens when CEF is enabled. The ATM layer may drop ECHO packets when the ATM (SAR) transmit queue is full.

- CSCdp28380

Windows NT platforms may not receive multicast packets from NRP when using ATM routed bridge encaps.

- CSCdp29451

Changing service binding during the usage of the service may cause inconsistency in the internal service binding table and break SSG forwarding table. To workaround this issue, avoid changing service binding in dynamic.

- CSCdp32057

If you configure 6400 with redundant NSPs and NRPs configured as LAC, L2TP tunnel may drop if NSP has a switchover and there is traffic going on the tunnels. When this happens, the L2TP tunnels or sessions may never recover. To recover such a failure, you may have to reboot NRPs.

- CSCdp34180

If you configure a PPPoE session from one NRP to another NRP, and put the PPPoE session into a bridge group on both NRPs, the client NRP may have a "software-forced reload" when you ping through the PPPoE session.

Resolved Caveats - Release 12.0(5)DC

All the caveats listed in this section are resolved in Release 12.0(5)DC. This section describes severity 1, 2, and selected severity 3 caveats.

- CSCdk75123
Occasionally, after receiving high rates of traffic over the ATM PVC between the NSP and NRP, the NRP counters may show incorrect packet counts.
- CSCdm37765
Transparent passthrough (TPT) filter and NHT download information message should be sent to the logging location. The NRP-SSG notifies the administrator about the status of TPT filters and NHT download. The information messages are not directed to the configured logging location.
- CSCdm39091
If a PPPoE client is attached to the Fast Ethernet 0/0/0 port on the NRP-SSG, a crash will occur. Since PPPoE clients are not supported on the Ethernet ports, do not attach PPPoE subscribers on these ports.
- CSCdm34187
If a subscriber is attached to the NRP-SSG via PPP over ATM and disconnects, the **show users** command displays the username that was logged in until that virtual-access interface is reused.
- CSCdm34130
PPP over ATM subscribers will be displayed as X.25 when executing the **show user** command from the command-line interface. This is purely cosmetic and does not affect functionality.
- CSCdm89428
If you run PPPoE sessions to NRP and then forward the PPP sessions to a LNS with L2TP tunnel, the session will drop if the traffic is too heavy.

Related Documentation

This section describes the documentation related to the Cisco 6400 UAC NRP, typically including hardware installation guides, software installation guides, Cisco IOS configuration and command references, system error messages, and feature modules that are updates to the Cisco IOS documentation set. Documentation is available as printed manuals or electronic documents, except for the feature modules that are available online only.

You can find the most up-to-date documentation on the Web via Cisco Connection Online (CCO) and the Documentation CD-ROM. These electronic documents might contain updates and modifications made after the hard copy documents were printed.

These release notes should be used with the documents listed in the following sections:

- Platform Documents, page 9
- Feature Modules, page 11
- Cisco IOS Software Document Set, page 11

Platform Documents

The documents listed in Table 3 are available for the Cisco 6400 UAC. These documents are also available online at Cisco Connection Online (CCO) and on the Documentation CD-ROM.

To access Cisco 6400 documentation on CCO, follow this path:

Service and Support: Technical Documents: Documentation Home Page: DSL Products: Cisco 6400

Related Documentation

To access Cisco 6400 documentation on the Documentation CD-ROM, follow this path:

DSL Products: Cisco 6400

Table 3 Platform Documents for the Cisco 6400 Universal Access Concentrator

Document Title	Chapter Topics
<i>Cisco 6400 UAC Hardware Installation Guide</i>	About This Manual Hardware Description Preparing for Installation Installing the Cisco 6400 Troubleshooting Maintaining the Cisco 6400 System Specifications Glossary Configuration Worksheets Installing the AC-Input Power Shelf and Power Supply
<i>Cisco 6400 UAC Site Planning Guide</i>	About This Guide Cisco 6400 Overview Site Planning Considerations System Specifications Cabling Specifications Glossary
<i>Regulatory Compliance and Safety Information for the Cisco 6400</i>	Overview of the Cisco 6400 Universal Access Concentrator General Documentation Information Agency Approvals Translated Safety Warnings Cisco Connection Online
<i>Cisco 6400 UAC Software Configuration Guide and Command Reference</i>	About This Guide Product Overview and Configuration Cisco IOS Software Fundamentals Using the Web Console Configuring the NSP Configuring System Features Configuring the NRP Configuring Interfaces Command Reference MIB Information Resolving Error Messages Glossary
<i>Cisco 6400 UAC FRU Installation and Replacement</i>	Tools and Equipment Required General Safety Precautions and Maintenance Guidelines Replacing the Front Cover Powering Down the System Backing Up the PCMCIA Card Maintaining the Air Filter Replacing an NSP Module Replacing an NRP Module Installing or Replacing a Half-Height NLC Replacing a PEM Replacing the Blower Module and Fans Verifying Plug-In Module and Component Installation

Feature Modules

Feature modules describe new features supported by Release 12.0(5)DC1. Feature modules are available online only. In the next printing of the Cisco IOS documentation set, feature modules will be included as updates to the Cisco IOS Documentation set. Each feature module consists of a brief overview of the feature, benefits, configuration tasks, and a command reference.

- To reach the feature modules on the CCO home page, click on this path:

Service & Support: Technical Documents: Documentation Home Page: Cisco IOS Software Configuration: Cisco IOS Release 12.0: New Feature Documentation: New Features in 12.0-Based Limited Lifetime Releases: New Features in Release 12.0DC: New Features in Release 12.0(5)DC1

- To reach the feature modules on the Documentation CD-ROM, click on this path:

Cisco Product Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0: New Feature Documentation: New Features in 12.0-Based Limited Lifetime Releases: New Features in Release 12.0DC: New Features in Release 12.0(5)DC1

Cisco IOS Software Document Set

The Cisco IOS software documentation set consists of the Cisco IOS configuration guides, Cisco IOS command references, and several other supporting documents. These documents are shipped with your order in electronic form on the Documentation CD-ROM, unless you specifically ordered the printed versions.

Documentation Modules

Each module in the Cisco IOS documentation set consists of two books: a configuration guide and a corresponding command reference. Chapters in a configuration guide describe protocols, configuration tasks, and Cisco IOS software functionality and contain comprehensive configuration examples. Chapters in a command reference provide complete command syntax information. Each configuration guide can be used in conjunction with its corresponding command reference.

To reach these documents on CCO, click on this path:

Service and Support: Technical Documents: Documentation Home Page: Cisco IOS Software Configuration: Cisco IOS Release 12.0: Configuration Guides and Command References

To reach these documents on the Documentation CD-ROM, click on this path:

Cisco IOS Software Configuration: Cisco IOS Release 12.0: Cisco IOS Release 12.0 Configuration Guides and Command References

To access documentation related to an index entry, click on the page number following the entry.

Release 12.0 Documentation Set

Table 4 details the contents of the Cisco IOS Release 12.0 software documentation set. The document set is available in electronic form, and also in printed form upon request.

Note The most current Cisco IOS documentation can be found on the latest Documentation CD-ROM and on the Web. These electronic documents might contain updates and modifications made after the paper documents were printed.

Related Documentation

To access the Cisco IOS documentation set on CCO, follow this path:

Service and Support: Technical Documents: Documentation Home Page: Cisco IOS Software Configuration: Cisco IOS Release 12.0

You can reach the Cisco IOS documentation set on the Documentation CD-ROM at:

Cisco Product Documentation: Cisco IOS Software Configuration: Cisco IOS Release 12.0

Table 4 Cisco IOS Software Release 12.0 Documentation Set

Books	Chapter Topics
<ul style="list-style-type: none">• <i>Configuration Fundamentals Configuration Guide</i>• <i>Configuration Fundamentals Command Reference</i>	Configuration Fundamentals Overview Cisco IOS User Interfaces File Management System Management
<ul style="list-style-type: none">• <i>Bridging and IBM Networking Configuration Guide</i>• <i>Bridging and IBM Networking Command Reference</i>	Transparent Bridging Source-Route Bridging Token Ring Inter-Switch Link Remote Source-Route Bridging DLSw+ STUN and BSTUN LLC2 and SDLC IBM Network Media Translation DSPU and SNA Service Point SNA Frame Relay Access Support APPN Cisco Database Connection NCIA Client/Server Topologies Cisco Mainframe Channel Connection Airline Product Set
<ul style="list-style-type: none">• <i>Dial Solutions Configuration Guide</i>• <i>Dial Solutions Command Reference</i>	X.25 over ISDN Appletalk Remote Access Asynchronous Callback, DDR, PPP, SLIP Bandwidth Allocation Control Protocol ISDN Basic Rate Service ISDN Caller ID Callback PPP Callback for DDR Channelized E1 & T1 Dial Backup for Dialer Profiles Dial Backup Using Dialer Watch Dial Backup for Serial Lines Peer-to-Peer DDR with Dialer Profiles DialOut Dial-In Terminal Services Dial-on-Demand Routing (DDR) Dial Backup Dial-Out Modem Pooling Large-Scale Dial Solutions Cost-Control Solutions Virtual Private Dialup Networks Dial Business Solutions and Examples
<ul style="list-style-type: none">• <i>Cisco IOS Interface Configuration Guide</i>• <i>Cisco IOS Interface Command Reference</i>	Interface Configuration Overview LAN Interfaces Logical Interfaces Serial Interfaces

Table 4 Cisco IOS Software Release 12.0 Documentation Set (continued)

Books	Chapter Topics
<ul style="list-style-type: none"> • <i>Network Protocols Configuration Guide, Part 1</i> • <i>Network Protocols Command Reference, Part 1</i> 	<ul style="list-style-type: none"> IP Overview IP Addressing and Services IP Routing Protocols
<ul style="list-style-type: none"> • <i>Network Protocols Configuration Guide, Part 2</i> • <i>Network Protocols Command Reference, Part 2</i> 	<ul style="list-style-type: none"> AppleTalk Novell IPX
<ul style="list-style-type: none"> • <i>Network Protocols Configuration Guide, Part 3</i> • <i>Network Protocols Command Reference, Part 3</i> 	<ul style="list-style-type: none"> Network Protocols Overview Apollo Domain Banyan VINES DECnet ISO CLNS XNS
<ul style="list-style-type: none"> • <i>Security Configuration Guide</i> • <i>Security Command Reference</i> 	<ul style="list-style-type: none"> AAA Security Services Security Server Protocols Traffic Filtering and Firewalls IP Security and Encryption Passwords and Privileges Neighbor Router Authentication IP Security Options
<ul style="list-style-type: none"> • <i>Cisco IOS Switching Services Configuration Guide</i> • <i>Cisco IOS Switching Services Command Reference</i> 	<ul style="list-style-type: none"> Switching Services Switching Paths for IP Networks Virtual LAN (VLAN) Switching and Routing
<ul style="list-style-type: none"> • <i>Wide-Area Networking Configuration Guide</i> • <i>Wide-Area Networking Command Reference</i> 	<ul style="list-style-type: none"> Wide-Area Network Overview ATM Frame Relay SMDS X.25 and LAPB
<ul style="list-style-type: none"> • <i>Voice, Video, and Home Applications Configuration Guide</i> • <i>Voice, Video, and Home Applications Command Reference</i> 	<ul style="list-style-type: none"> Voice over IP Voice over Frame Relay Voice over ATM Voice over HDLC Frame Relay-ATM Internetworking Synchronized Clocks Video Support Universal Broadband Features
<ul style="list-style-type: none"> • <i>Quality of Service Solutions Configuration Guide</i> • <i>Quality of Service Solutions Command Reference</i> 	<ul style="list-style-type: none"> Policy-Based Routing QoS Policy Propagation via BGP Committed Access Rate Weighted Fair Queueing Custom Queueing Priority Queueing Weighted Random Early Detection Scheduling Signaling RSVP Packet Drop Frame Relay Traffic Shaping Link Fragmentation RTP Header Compression

Table 4 Cisco IOS Software Release 12.0 Documentation Set (continued)

Books	Chapter Topics
<ul style="list-style-type: none">• <i>Cisco IOS Software Command Summary</i>• <i>Dial Solutions Quick Configuration Guide</i>• <i>System Error Messages</i>• <i>Debug Command Reference</i>	

Service and Support

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.

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

Software Configuration Tips on the Cisco Technical Assistance Center Home Page

If you have a CCO login account you can access the following URL. It contains links and helpful tips on 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 CCO and click on this path:

Products & Technologies: Products: Technical Tips

The following sections are provided from the Technical Tips page:

- **Access Dial Cookbook**—Contains common configurations or recipes for configuring various access routes and dial technologies.
- **Field Notices**—Designed to provide notification of any critical issues regarding Cisco products. These notices include problem descriptions, safety or security issues, and hardware defects
- **Hardware**—Technical Tips related to specific hardware platforms
- **Hot Tips**—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 reach FAX-on-demand and receive documents at your FAX machine from the USA, call 888-50-CISCO (888-502-4726). From other areas, call 650-596-4408.
- **Internetworking Features**—Tips on using and deploying Cisco IOS software features and services
- **Sample Configurations**—Actual configuration examples—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, including Case Studies, References & RFCs, and Security Advisories.

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

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