



CHAPTER 18

Telco Return for the Cisco CMTS

Revised: February 5, 2007, OL-1467-08

The Telco Return feature allows service providers to offer Data-over-Cable Service Interface Specification (DOCSIS) 1.0 internet access over a one-way cable network. Downstream data is sent to the telco return cable modems over the cable network, while upstream data is sent from the cable modem to the headend over a separate dial-up connection.

Feature Specifications for Telco Return

Feature History

Release	Modification
12.0(4)XI	This feature was introduced for Cisco uBR7200 series routers.
12.1(2)EC	The cable telco-return registration-ip command was introduced.
12.1(5)EC	Support was added for the Cisco uBR7111 and Cisco uBR7114 routers.

Supported Platforms

Cisco uBR7100 series, Cisco uBR7200 series universal broadband routers.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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Prerequisites for Telco Return

The Telco Return feature has the following prerequisites and requirements:

- The Cisco CMTS router must be running a Cisco IOS Release 12.1 EC software image that contains a “t” in the filename.
- The Cisco CMTS must be using a DOCSIS-compliant cable interface line card. The Cisco uBR-MC11C cable interface line card (which has only one upstream port) is sufficient for cable plants that will never be upgraded from one-way-only operation. If, however, you plan to upgrade your plant to two-way operation, consider installing other cable interface cards, such as the Cisco uBR-MC16C or Cisco uBR-MC28C card, so as to simplify the conversion process when two-way operation is implemented.
- The downstream cable plant must meet DOCSIS specifications.
- The headend is wired for narrowcast downstream data transmission.
- You have assigned downstream frequencies.
- All equipment needed to support upstream traffic over the PSTN, as well as to monitor telco return service features, is installed. Key components include:
 - Dial-up access server (for example, the Cisco AS5300 or Cisco AS5800)
 - RADIUS dial security server
- Upstream data from a PC through the CM to the Internet is carried over a dial-up connection. This dial-up connection can include a log or security server.
- All third-party, telco return cable modems are DOCSIS-compliant and configured for telco return.
- Dynamic Host Configuration Protocol (DHCP) and DOCSIS configuration files have been created and pushed to appropriate servers so that each cable modem, when initialized, can transmit a DHCP request, receive an IP address, obtain TCP/IP and Time-of-Day (ToD) server addresses, and download a DOCSIS configuration file.
- The DOCSIS configuration files being used for telco return cable modems should include the relevant telco return Type/Length/Value (TLV) fields.
- The customer premises equipment (CPE) (telco return cable modem or PCs) should meet the requirements for your network and server offerings.

Restrictions for Telco Return

- DOCSIS Baseline Privacy Interface (BPI) encryption is not supported over the telco return path.
- EuroDOCSIS cable interfaces (Cisco uBR-MC16E cable interface line card and Cisco uBR7111E/Cisco uBR7114E routers) do not support Telco Return operations.
- Cisco IOS Release 12.2 BC does not support Telco Return operations.
- Some vendors’ telco return cable modems cannot receive traffic over the same downstream channel as cable modems operating on a two-way data system. In these instances, segment your cable plant to allow more than one downstream channel.
- A DOCSIS ping (which is sent using the **ping docsis** command) cannot be used with telco return modems. An IP ping, however, can still be used.
- The **show cable flap-list** command does not display telco return cable modems.
- The **clear cable modem reset** command has no affect on telco return cable modems.

Information about Telco Return

This section contains the following information that describes the Telco Return feature:

- [Feature Overview, page 18-3](#)
- [DOCSIS Cable Plants, page 18-3](#)
- [Telco Return Operation, page 18-4](#)
- [Benefits, page 18-6](#)

Feature Overview

The DOCSIS specifications included optional support for Telco Return operations, which allows service providers to offer Internet data connectivity to cable customers who are still on cable plants that do not yet support two-way operations. Service providers can immediately provide data connectivity to their customers as they incrementally upgrade their cable plants to support two-way connections.

In a Telco Return configuration, the subscriber uses a telco return cable modem that receives downstream traffic over the cable network, but transmits the upstream traffic over a dial-up connection that is made using the local Public Switched Telephone Network (PSTN). The telco return cable modem makes the dial-up connection using a standard telephone modem, which can be either internal or external, depending on the type and model of the cable modem being used.

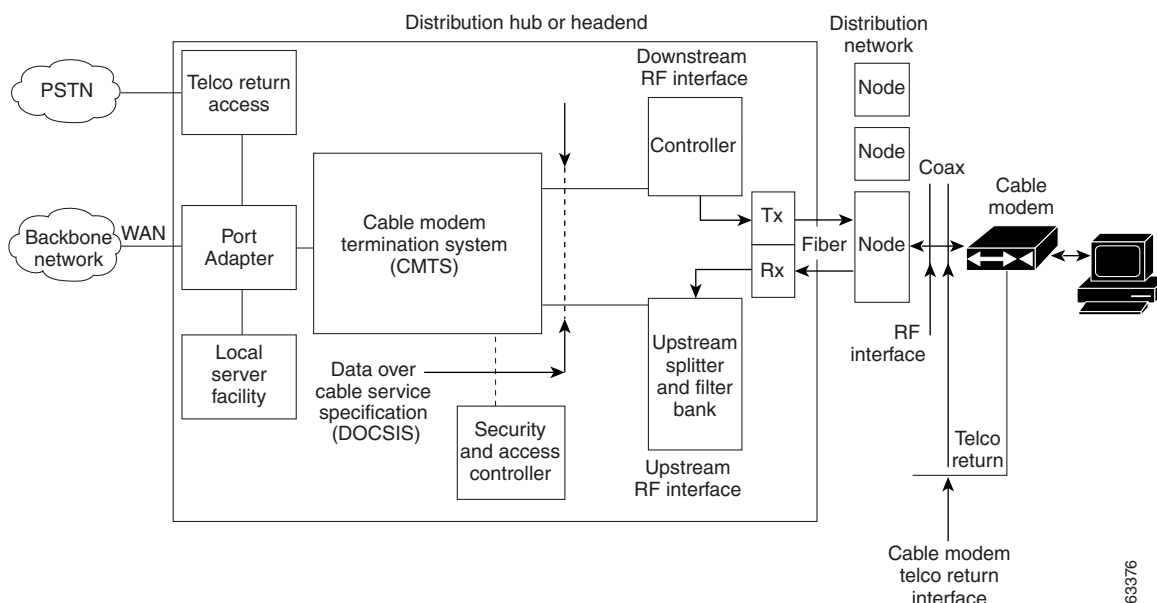
Telco Return operations is made possible by the fact that most Internet sessions are asymmetrical, with approximately 80 to 90% of the total traffic being transmitted in the downstream direction from the headend to the cable modem. The upstream transmits a much smaller volume of traffic, so Telco Return customers can still have broadband-quality Internet access.

**Note**

To support telco return operations, the subscriber must be using a DOCSIS-compliant telco return cable modem

DOCSIS Cable Plants

DOCSIS-compliant cable plants can support both two-way and telco return connections over the same cable network. [Figure 18-1](#) illustrates a typical DOCSIS cable network that supports both two-way and telco return cable modems.

Figure 18-1 DOCSIS Two-Way and Telco Return Architecture

Typically, the headend uses high-speed WAN links, such as a fiber backbone, to connect to the Internet backbone network. The Cable Modem Termination System (CMTS) at the headend is responsible for routing traffic between the backbone network and cable network.

Two-way and telco return operations on the downstream use the same facilities and servers at the headend. In both cases, the CMTS routes traffic over the cable interface to the appropriate cable modems.

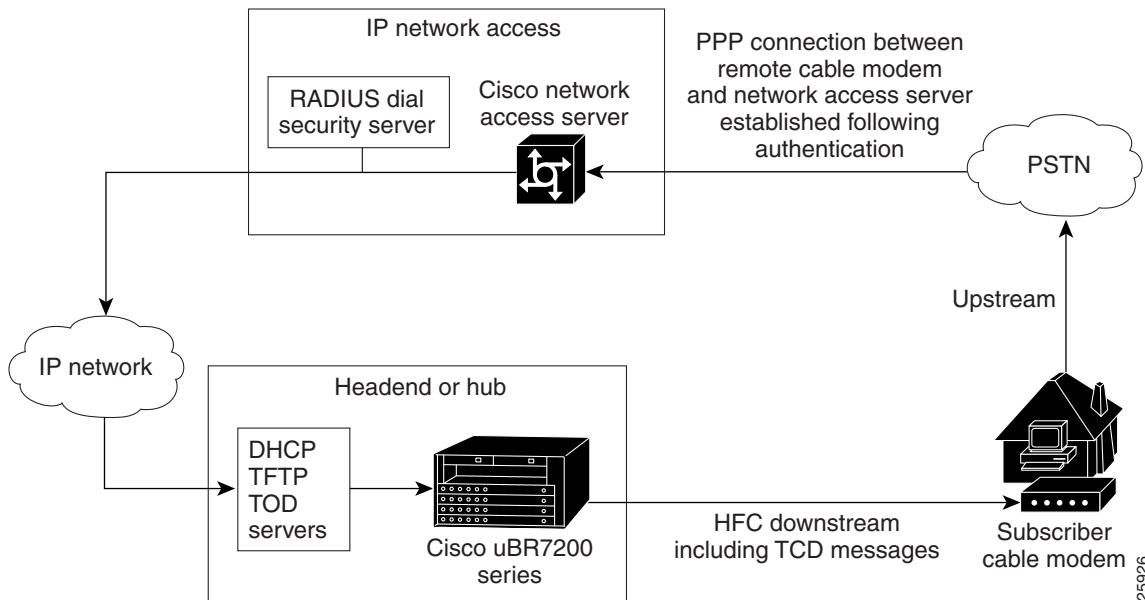
For upstream traffic, the two-way cable modems transmit over the same coaxial cable network that is used for the downstream (although using different frequencies). Telco Return cable modems, however, use a dial-up modem connection to connect to the PSTN, which routes the upstream traffic to a Remote Authentication Dial In User Service (RADIUS) server at the headend. This server in turn forwards the traffic to the appropriate destination, either on the Internet or cable network.

**Note**

Some brands of telco return cable modems cannot receive traffic over the same downstream channel as cable modems operating on a two-way data system. To accommodate both two-way and telco return operation, segment your cable plant so that it uses multiple downstream channels, with at least one downstream channel dedicated for telco return cable modems.

Telco Return Operation

To support Telco Return operations, the Cisco CMTS must interoperate with both the cable network, and a RADIUS authentication system that is connected to the local PSTN. [Figure 18-2](#) illustrates a typical telco return configuration.

Figure 18-2 Typical Telco Return Network

To coordinate the telco return traffic between the cable and PSTN/RADIUS networks, the Cisco CMTS transmits Telephony Channel Descriptor (TCD) messages along with the other downstream traffic. The TCD messages contain the routing and other information that the telco return cable modem needs to access the headend through the PSTN.

In particular, the TCD messages contain at least one (and up to five) Service Provider Descriptors (SPD). Each SPD contains dialing and authentication information that the telco return cable modem should use when it creates a dial-up Point-to-Point Protocol (PPP) connection with the network access server (NAS) that provides the upstream access to the Internet and headend networks.

At minimum, the SPD contains the following three elements that are critical in creating the dial-up upstream connection:

- At least one, and up to three, dial-up telephone numbers for the telco return cable modem to use when using the PSTN to connect to the headend's network access server.
- Username to be used for the PPP authentication procedure.
- Password to be used for the PPP authentication procedure.

When the telco return cable modem establishes the dial-up connection, it sends the username and password to the RADIUS server for network authentication. If access is granted, the network server creates the PPP session that will be used for upstream traffic.

The telco return cable modem maintains the dial-up connection as long as necessary. If the connection times out because of inactivity or because of noise problems on the PSTN, the telco return cable modem uses the information from the SPD to automatically redial the appropriate number and reestablish the dial-up connection.

**Note**

Some telco return cable modems require that the user manually dial the telephone number to establish the dial-up connection.

Benefits

- Allows cable companies to offer Internet access services to their subscribers without first upgrading their plant to support two-way operations.
- Allows service providers to support their cable subscribers without replacing existing hardware.
- Service providers can begin providing cable access using low-density cable interface cards because upstream ports are not required. As the cable plant is upgraded to two-way operations, the cable interface line cards can be upgraded as needed.

How to Configure the Telco Return Feature

To enable and configure Telco Return operations on a cable interface, use the following procedures:

- [Enabling Telco Return, page 18-6](#)
- [Configuring the Service Provider Descriptor Attributes, page 18-7](#)
- [Configuring the Registration IP Address \(optional\), page 18-10](#)

Enabling Telco Return

To enable telco return on the Cisco CMTS, perform the following steps beginning in EXEC mode:

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `interface cable x/y`
4. `cable telco-return enable`
5. `cable telco-return interval seconds`
6. `exit`
7. `exit`

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable Router#	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal Router(config)#	Enters global configuration mode.

	Command or Action	Purpose
Step 3	interface cable <i>x/y</i> Example: Router(config)# interface cable 4/0 Router(config-if)#	Enters cable interface configuration mode for the specified cable interface.
Step 4	cable telco-return enable Example: Router(config-if)# cable telco-return enable Router(config-if)#	Enables telco return operations on this cable interface.
Step 5	cable telco-return interval <i>seconds</i> Example: Router(config-if)# cable telco-return interval 10 Router(config-if)#	(Optional) Sets the interval, in seconds, for sending Telephony Channel Descriptor (TCD) and Termination System Information (TSI) messages to the downstream cable modems. The valid range for <i>seconds</i> is 2 to 60 seconds, with a default of 2.
Step 6	exit Example: Router(config-if)# exit Router(config)#	Exits interface configuration mode.
Step 7	exit Example: Router(config)# exit Router#	Exits global configuration mode.

Configuring the Service Provider Descriptor Attributes

To configure the telephony attributes for a Service Provider Descriptor (SPD), perform the following steps, beginning in EXEC mode. Up to five SPDs can be defined on each cable interface (but only one SPD per cable interface is active at any one time).

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface cable *x/y***
4. **cable telco-return spd *spd-number* phonenum *dial-string***
5. **cable telco-return spd *spd-number* username *login-string***
6. **cable telco-return spd *spd-number* password *password-string***
7. **cable telco-return spd *spd-number* radius realm *string***
8. **cable telco-return spd *spd-number* ppp-authenticate [both | chap | pap]**
9. **cable telco-return spd *spd-number* dhcp-authenticate**

10. **cable telco-return spd** *spd-number* **dhcp-server** *ip-address*
11. **cable telco-return spd** *spd-number* **dial-timer** *seconds*
12. **cable telco-return spd** *spd-number* **threshold** *threshold*
13. **cable telco-return spd** *spd-number* **service-provider** *string*
14. **cable telco-return spd** *spd-number* **factory-default**
15. **cable telco-return spd** *spd-number* **manual-dial**
16. **exit**
17. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable Router#	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal Router(config)#	Enters global configuration mode.
Step 3	interface cable <i>x/y</i> Example: Router(config)# interface cable 4/0 Router(config-if)#	Enters cable interface configuration mode for the specified cable interface.
Step 4	cable telco-return spd <i>spd-number</i> phonenum <i>dial-string</i> Example: Router(config-if)# cable telco-return spd 2 phonenum 15105551212 Router(config-if)#	Specifies the telephone number that the telco return CM uses when connecting to the headend's network access server. <i>spd-number</i> = ID for this SPD. The valid range is 1 to 5, with no default. <i>dial-string</i> = Actual telephone number to be dialed. Enter only digits, without any spaces, hyphens, or other special characters. Note Optionally repeat this command to specify a maximum of three phone numbers.
Note Use the same <i>spd-number</i> value for all of the following commands in this procedure.		
Step 5	cable telco-return spd <i>spd-number</i> username <i>login-string</i> Example: Router(config-if)# cable telco-return spd 2 username joeuser123 Router(config-if)#	Specifies the user name that the cable modem uses during initialization to establish the Point-to-Point Protocol (PPP) connection.

	Command or Action	Purpose
Step 6	cable telco-return spd <i>spd-number</i> password <i>password-string</i> Example: Router(config-if)# cable telco-return spd 2 password 9JwoKd7 Router(config-if)#	Specifies the password that the cable modem uses during initialization to establish the PPP connection.
Step 7	cable telco-return spd <i>spd-number</i> ppp-authenticate [<i>chap</i> <i>pap</i> <i>both</i>] Example: Router(config-if)# cable telco-return spd 2 ppp-authenticate chap Router(config-if)#	(Optional) Selects the authentication procedure that the cable modem should use to establish the PPP connection: • chap = Challenge Handshake Authentication Protocol (CHAP) • pap = Password Authentication Protocol (PAP) • both = (default) Both CHAP and PAP
Step 8	cable telco-return spd <i>spd-number</i> radius realm <i>string</i> Example: Router(config-if)# cable telco-return spd 2 radius-realm cisco Router(config-if)#	Specifies the RADIUS Realm string that the cable modem should use to construct a domain name to be used with the login name during the PPP authentication procedure.
Step 9	cable telco-return spd <i>spd-number</i> dhcp-authenticate Example: Router(config-if)# cable telco-return spd 2 dhcp-authenticate Router(config-if)#	(Optional) Requires that the cable modem use the Dynamic Host Configuration Protocol (DHCP) server that is specified with the cable telco-return spd dhcp-server command. The default is for the cable modem to use any available DHCP server.
Step 10	cable telco-return spd <i>spd-number</i> dhcp-server <i>ip-address</i> Example: Router(config-if)# cable telco-return spd 2 dhcp-server 192.168.100.213 Router(config-if)#	(Optional) Specifies the IP address of the DHCP server that the cable modem should use during its authentication and initialization process. The default is for the cable modem to use any available DHCP server.
Step 11	cable telco-return spd <i>spd-number</i> dial-timer <i>seconds</i> Example: Router(config-if)# cable telco-return spd 2 dial-timer 86400 Router(config-if)#	(Optional) Sets the number of seconds that the telephone connection is idle before the cable modem disconnects the call. The valid range is 0 through 4,294,967,295 seconds. The default is 0, which indicates that the dial-timer is not used and that inactive calls are not disconnected.
Step 12	cable telco-return spd <i>spd-number</i> threshold <i>threshold</i> Example: Router(config-if)# cable telco-return spd 2 threshold 3 Router(config-if)#	(Optional) Specifies the number of times that the cable modem attempts to dial the numbers specified by the cable telco-return spd phonenum command before declaring a connection failure. (The cable modem allows the remote end of the connection to ring 10 times before handing up.) The valid range is 1 through 255, with a default of 1.

	Command or Action	Purpose
Step 13	cable telco-return spd <i>spd-number</i> service-provider <i>string</i> Example: Router(config-if)# cable telco-return spd 2 service-provider CableProviderName Router(config-if)#	(Optional) Specifies that the cable modem should include the specified <i>string</i> in the Telephony Channel Descriptor (TCD) messages as the service provider's name.
Step 14	cable telco-return spd <i>spd-number</i> factory-default Example: Router(config-if)# cable telco-return spd 2 factory-default Router(config-if)#	(Optional) Indicates that the cable modem should use this SPD during the initialization process. The default is for the SPD not to be used during initialization. Note At least one and only one SPD must be defined as the factory-default on each cable interface.
Step 15	cable telco-return spd <i>spd-number</i> manual-dial Example: Router(config-if)# cable telco-return spd 2 manual-dial Router(config-if)#	(Optional) Allows the cable modem to operate in manual dial mode.
	Note Repeat Step 4 through Step 15 for each SPD to be configured (up to a maximum of 5 per cable interface).	
Step 16	exit Example: Router(config-if)# exit Router(config)#	Exits interface configuration mode.
Step 17	exit Example: Router(config)# exit Router#	Exits global configuration mode.

Configuring the Registration IP Address (optional)

To specify an alternate registration IP address to be sent in Termination System Information (TSI) message, use the following procedure, beginning in EXEC mode. By default, the Cisco CMTS uses the IP address for the downstream cable interface as the registration address. Use this procedure to specify a different registration address.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface cable** *x/y*
4. **cable telco-return registration-ip** *ip-address*
5. **exit**

6. exit

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable Router#	Enables privileged EXEC mode. Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal Router(config)#	Enters global configuration mode.
Step 3	interface cable x/y Example: Router(config)# interface cable 4/0 Router(config-if)#	Enters cable interface configuration mode for the specified cable interface.
Step 4	cable telco-return registration-ip ip-address Example: Router(config-if)# cable telco-return registration-ip 10.10.10.119 Router(config-if)#	Specifies an alternate registration IP address that the cable modem should use in its Termination System Information (TSI) messages. By default, the cable modem uses the IP address for the downstream cable interface on the Cisco CMTS.
Step 5	exit Example: Router(config-if)# exit Router(config)#	Exits interface configuration mode.
Step 6	exit Example: Router(config)# exit Router#	Exits global configuration mode.

Monitoring Telco Return Operations

To display the telco return cable modems that are currently online, use the **show cable modem** command. For example:

Router# **show cable modem**

Interface	Prim Sid	Online State	Timing Offset	Rec Power	QoS	CPE	IP address	MAC address
Cable4/0/U0	2	online	2848	-0.50	5	1	10.2.0.3	0010.7b6b.53d5
Cable4/0/T	3	online	2853	0.25	2	1	10.2.0.101	0020.4001.4af6
Cable4/0/U0	4	online	2852	-0.75	5	1	10.2.0.6	0010.7b6b.7255

```

Cable4/0/U0 5   online    2850    0.25   5    1    10.2.0.7      0010.7b6b.5669
Cable4/0/U0 6   online    2851    0.00   2    1    10.2.0.4      0010.7b6b.53c9
Cable4/0/T  7   online    2849    0.50   2    0    10.2.0.102    0020.4001.4b32

```

Router#

The **show cable modem** command identifies telco return cable modems by displaying a “T” instead of an upstream port.

Configuration Examples

- [Typical Telco Return Example, page 18-12](#)
- [Minimal Telco Return Example, page 18-13](#)
- [Minimal RADIUS Configuration, page 18-13](#)

Typical Telco Return Example

The following excerpt from a configuration file shows a typical sample configuration that enables Telco Return operations on a cable interface:

```

!
interface cable 6/0
 ip address 172.16.1.1 secondary
 ip address 10.1.1.1
 no ip directed-broadcast
 ip helper-address 192.168.1.1
 no keepalive
 cable insertion-interval 500
 cable downstream annex B
 cable downstream modulation 64qam
 cable downstream interleave-depth 32
 cable downstream frequency 687000000
 cable upstream 0 frequency 13008000
 no cable upstream 0 shutdown
 cable telco-return enable
 cable telco-return spd 1 factory-default
 cable telco-return spd 1 phonenum 8005551212
 cable telco-return spd 1 phonenum 4085551212
 cable telco-return spd 1 phonenum 6505551212
 cable telco-return spd 1 service-provider norcal
 cable telco-return spd 1 dhcp-server 172.31.172.172
 cable telco-return spd 1 username joe
 cable telco-return spd 1 password testing
 cable telco-return spd 1 dhcp-authenticate
 cable telco-return spd 1 threshold 5
 cable telco-return spd 1 ppp-authenticate both
 cable telco-return spd 1 manual-dial
 cable telco-return spd 1 dial-timer 7200
 cable telco-return registration-ip 172.16.1.1

```

Minimal Telco Return Example

The following excerpt from a configuration file shows the minimal configuration that is needed to enable Telco Return operations on a cable interface:

```
cable telco-return enable
cable telco-return spd 1 factory-default
cable telco-return spd 1 dhcp-authenticate
cable telco-return spd 1 dhcp-server 24.1.1.84
cable telco-return spd 1 ppp-authenticate chap
cable telco-return spd 1 phonenum 918005555555
cable telco-return spd 1 phonenum 18005555555
cable telco-return spd 1 username test
cable telco-return spd 1 password test
```

Minimal RADIUS Configuration

The following excerpt from a configuration file shows the minimal configuration that is needed to enable RADIUS support on the Cisco CMTS to allow the required authentication, authorization, and accounting (AAA) support:

```
aaa new-model
aaa authentication login default radius enable
aaa authentication login vty line
aaa accounting update newinfo
aaa accounting exec default start-stop radius
aaa accounting commands 15 default start-stop radius
aaa accounting network default start-stop radius
aaa accounting system default start-stop radius
```

Additional References

For additional information related to the Telco Return feature, refer to the following references:

Related Documents

Related Topic	Document Title
CMTS Command Reference	<i>Cisco Broadband Cable Command Reference Guide</i> , at the following URL: http://www.cisco.com/en/US/docs/ios/cable/command/reference/cbl_book.html
Cisco IOS Release 12.2 Command Reference	Cisco IOS Release 12.2 Configuration Guides and Command References, at the following URL: http://www.cisco.com/en/US/products/sw/iosswrel/ps1835/products_installation_and_configuration_guides_list.html http://www.cisco.com/en/US/products/sw/iosswrel/ps1835/prod_command_reference_list.html

Related Topic	Document Title
Cisco IOS Release 12.1 Multiservice Applications Information	<i>Cisco IOS Multiservice Applications Configuration Guide</i>, Release 12.1, at the following URL: http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121cgcr/multi_c/index.html <i>Cisco IOS Multiservice Applications Command Reference</i>, Release 12.1 Note This document has reached End of Life. For more information, see the following End-of-Life Announcement at the following URL: http://www.cisco.com/en/US/docs/ios/redirect/eol.html
AAA and RADIUS Configuration	For information on configuring the AAA and RADIUS servers, see the <i>Authentication, Authorization, and Accounting (AAA)</i> chapter in the Cisco IOS Security Configuration Guide, Release 12.2 at the following URL: http://www.cisco.com/en/US/docs/ios/12_2/security/configuration/guide/fsecur_c.html
Cisco uBR7100 Series Universal Broadband Router Documentation	<i>Cisco uBR7100 Series Universal Broadband Router Hardware Installation Guide</i>, at the following URL: http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr7100/hig7100/index.htm <i>Cisco uBR7100 Series Universal Broadband Router Software Configuration Guide</i>, at the following URL: http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr7100/scg7100/index.htm
Cisco uBR7200 Series Universal Broadband Router Documentation	<i>Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide</i>, at the following URL: http://www.cisco.com/en/US/docs/cable/cmts/ubr7200/installation/guide/ub72khig.html <i>Cisco uBR7200 Series Universal Broadband Router Software Configuration Guide</i>, at the following URL: http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_rout/cr72scg/index.htm

Standards

Standards ¹	Title
ANSI/SCTE 22-1 2002 (formerly SP-RFI-C01-011119)	Data-Over-Cable Service Interface Specification DOCSIS 1.0 Radio Frequency Interface (RFI) (http://www.cablelabs.com/cablemodem)
SP-CMTRI-I01-970804	Data-Over-Cable Service Interface Specification Cable Modem Telephony Return Interface Specification, version 1.0 (http://www.cablelabs.com/cablemodem)

1. Not all supported standards are listed.

MIBs

MIBs ¹	MIBs Link
No new or modified MIBs are supported by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

1. Not all supported MIBs are listed.

RFCs

Description	Link
RFC 2865	Remote Authentication Dial In User Service (RADIUS)
RFC 2866	RADIUS Accounting

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/cisco/web/support/index.html

