



Tunneled GR-303 Support for the Cisco Cable Modem

Feature History

Release	Modification
Release 12.2(15)T	This feature was introduced on the Cisco uBR925 cable access router.

This feature module describes the Tunneled GR-303 Support for the Cisco Cable Modem feature for the Cisco uBR925 cable access routers, which is introduced in Cisco IOS Release 12.2(15)T. It includes information on the benefits of the feature, the supported platforms, prerequisites for using the feature, and instructions on how to configure the feature.

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Feature Overview

The Tunneled GR-303 Support for the Cisco Cable Modem feature enables the Cisco uBR925 cable access router to send and receive call control messages using GR-303 signaling, in addition to the MGCP signaling that was previously supported. GR-303 is a Telcordia/Bellcore standard for signaling between a Class 5 (SESS) switch and a remote digital terminal (RDT), such as the Cisco 6732 Multiservice Access Platform. This allows the Cisco uBR925 router to support advanced call features such as Caller ID and Call Waiting, using both GR-303 and MGCP signaling.

When the Tunneled GR-303 Support for the Cisco Cable Modem is enabled, the Cisco uBR925 router uses both MGCP and GR-303 signaling to set up and tear down calls, as well as to report on-hook and off-hook transitions. Both control signals are sent simultaneously as follows:

- MGCP signaling is sent between the Cisco uBR925 router (acting as the residential gateway) and the trunking gateway (such as the Cisco AS5300 and Cisco 3600 platforms). This signaling is unchanged from previous Cisco IOS releases and is defined by the MGCP v0.1 specification.
- GR-303 signaling is sent in the form of ABCD bits, which are four specific framing bits of a TDM signal that convey inband signaling. When local events occur, the Cisco uBR925 router first converts the corresponding ABCD bits into Named Signaling Events (NSE) and then transmits them to a GR-303 gateway using the Real-time Transport Protocol (RTP). The GR-303 gateway then transmits the GR-303 signals to the Class 5 switch.

Similarly, when remote events occur, the Class 5 switch sends the GR-303 signals to the voice-enabled Cisco 6732 RDT, which then transmits them to the Cisco uBR925 router as NSE events in RTP packets. The Cisco uBR925 router translates the NSE events to ABCD bits and reacts accordingly. This signaling is defined by the GR-303 specification and RFC 2833.

[Table 1](#) shows the ABCD bits supported by the Tunneled GR-303 Support for the Cisco Cable Modem and how they are encoded as NSE events.

Table 1 GR-303 ABCD to NSE Encodings

Event Description	Direction ¹	GR-303 Signal	ABCD Encoding	NSE Encoding
Ring	Incoming	RNG	0000	10010000
Idle	Incoming	LCF	0101	10010101
On-Hook Transition	Outgoing	LO	0101	10010101
Power Cut Off	Incoming	LCFO	1111	10011111
Off-Hook Transition	Outgoing	LC	1111	10011111

1. The direction is from the perspective of the Cisco uBR925 cable access router.

Benefits

Concurrent Use of GR-303 and MGCP Protocols

The Tunneled GR-303 Support for the Cisco Cable Modem feature allows the Cisco uBR925 router to interoperate with both MGCP gateways as well as with GR-303 gateways and Class 5 switches. This allows VoIP capabilities to be added to existing PTSN networks without disrupting existing services.

Migration Path

Systems using the existing MGCP protocol can easily incorporate GR-303 signaling.

Multiple Protocol Support and Investment Protection

The Tunneled GR-303 Support for the Cisco Cable Modem feature can be added to existing Cisco uBR925 routers by a software-only upgrade. Adding GR-303 signaling can be done to existing GR-303 capable networks without hardware upgrades.

Preservation of Existing GR-303 and Class 5 Equipment

Adding GR-303 support allows the Cisco uBR925 router to interoperate with existing Class 5 switch hardware and software.

Restrictions

The Tunneled GR-303 Support for the Cisco Cable Modem 0.1 feature is supported only when MGCP call control signaling is enabled and configured. This feature cannot be used when the SGCP or H.323 signaling protocols are used.

This feature requires a GR-303 gateway, such as the Cisco 6732 Multiservice Access Platform, that feeds into a Class 5 carrier switch.

Related Features and Technologies

Data-Over-Cable System Interface Specification (DOCSIS)

Voice over Internet Protocol (VoIP)

Related Documents

In addition to this document, the following documents are available on CCO and the Documentation CD-ROM:

- *Cisco uBR925 Cable Access Router Software Configuration Guide*
- *Media Gateway Control Protocol Residential Gateway Support*
- *Release Notes for Cisco uBR925 Cable Access Router*

Supported Platforms

In Cisco IOS Release 12.2(10)T, the GR-303 for MGCP Support feature is supported on the following platform:

- Cisco uBR925 cable access router

This feature is expected to be supported on other Cisco cable CPE devices that provide voice services, when those additional platforms are released.

Supported Standards, MIBs, and RFCs

Standards

- Telcordia GR-303, Integrated Digital Loop Carrier (IDLC) System Generic Requirements, Objectives and Interface, December 1998
- Media Gateway Control Protocol (MGCP) Version 0.1 (IETF Internet Draft)
- RTP Payload for DTMF Digits, Telephony Tone, and Telephony Signals, draft-ietf-avt-tones-02.txt
- Simple Gateway Control Protocol (SGCP) Version 1.1, July 1998

MIBs

No new MIBs or MIB objects are supported by the Tunneled GR-303 Support for the Cisco Cable Modem feature. For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on CCO at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

- [RFC 1889, RTP: A Transport Protocol for Real-Time Applications, January 1996](#)
- [RFC 2131, Dynamic Host Configuration Protocol, March 1997](#)
- [RFC 2132, DHCP Options and BOOTP Vendor Extensions, March 1997](#)
- [RFC 2705, Media Gateway Control Protocol \(MGCP\) Version 1.0, October 1999](#)
- [RFC 2805, Media Gateway Control Protocol Architecture and Requirements](#)
- [RFC 2833, RTP Payload for DTMF Digits, Telephony Tones and Telephony Signals, May 2000](#)

Prerequisites

The Tunneled GR-303 Support for the Cisco Cable Modem feature has the following prerequisites:

- Cisco IOS Release 12.2(10)T or greater
- The Cisco IOS image must support the MGCP signaling protocol for Voice over IP (VoIP) calls
- The voice ports must be configured for the MGCP signaling protocol; if a voice port will not use MGCP or GR-303 signaling, it must be disabled
- Cisco Network Registrar must be used to enable the Tunneled GR-303 Support for the Cisco Cable Modem feature by sending DHCP option 14 as part of the Cisco uBR925 router's DHCP provisioning. Cisco Network Registrar is a bundled component of Cisco Subscriber Registration Center (CSRC).

Configuration Tasks

See the following sections for configuration tasks for the Tunneled GR-303 Support for the Cisco Cable Modem feature. Each task in the list indicates if the task is optional or required.

- Configure voice ports for the MGCP signaling protocol—required
- Enable the Tunneled GR-303 Support for the Cisco Cable Modem feature using DHCP option 14 (Merit Dump File)—required

Configuring Voice Ports for the MGCP Signaling Protocol

You must do the following to configure the Cisco uBR925 router for MGCP routing of voice calls:

- Enable MGCP operation on the Cisco uBR925 router.
- Specify the MGCP call agent's IP address.
- Configure the local dial-peers to be MGCP applications.



Note

The above tasks are automatically done by the Cisco Network Registrar (CNR). However, you must specify the IP address for the call agent in the MeritDump string for the Cisco uBR925 router.

- Optionally specify the MGCP packages to be supported.
- Optionally change a number of MGCP parameters.

**Note**

No configuration of remote dial-peers is needed when using MGCP.

This configuration is the same as for any other MGCP configuration. For the steps required, see the *MGCP 1.0 Including NCS 1.0 and TGCP 1.0 Profiles* feature module, available on CCO and the Documentation CD-ROM.

Enabling Tunneled GR-303 Support for the Cisco Cable Modem Using DHCP Option 14

The Tunneled GR-303 Support for the Cisco Cable Modem feature does not introduce any new Cisco IOS CLI commands. Instead, this feature is enabled by using DHCP option 14 (Merit Dump File) to send the appropriate VoIP configuration information to the Cisco uBR925 cable access router.

The GR-303 configuration information is contained in an ASCII text string that has 13 fields separated by a pipe (|) symbol. The string has a maximum length of 255 characters and must be in the following format:

```
G|JBN|JBM|ABCDJB|TOSRTP|TOSTS|TOSHSD|P0|FQDN|CWCID|P1|FQDN|CWCID
```

[Table 2](#) lists the fields that must appear in this string:

Table 2 *DHCP Option 14 Field Descriptions*

Field Name	Description	Possible Values
G	Indicates that this string is for the GR-303 configuration.	G or g
JBN	Nominal jitter buffer, in milliseconds	0–999
JBM	Maximum jitter buffer, in milliseconds	0–999
ABCDJB	Jitter buffer for ABCD bits, in milliseconds	0–999
TOSRTP	Type of Service (ToS) bits for RTP bearer IP packets	0–7
TOSTS	ToS bits for GR-303 telephony signaling IP packets	0–7
TOSHSD	ToS bits for high-speed data IP packets	0–7
P0	Port ID number for voice port V1	P0
FQDN	Fully qualified domain name (FQDN) for the Call Processing Adjunct (CPA) acting as the signaling gateway for this port	hostname for the CPA
CWCID	Indicates whether call waiting on caller ID is enabled for this port	0=Disabled 1= Enabled
P1	Port ID number for voice port V2	P1
FQDN	Fully qualified domain name (FQDN) for the Call Processing Adjunct (CPA) acting as the signaling gateway for this port	hostname for the CPA
CWCID	Indicates whether call waiting on caller ID is enabled for this port	0=Disabled 1= Enabled

**Note**

The DHCP option 14 string is required. If either the V1 or V2 port is not configured with this string, that port must be disabled when using the Tunneled GR-303 Support for the Cisco Cable Modem feature.

Command Reference

The Tunneled GR-303 Support for the Cisco Cable Modem feature does not support any new or modified commands. All commands used with this feature are documented in the Cisco IOS Release 12.2 T command reference publications.

Configuration Examples

The following sections show examples of an MGCP configuration file and a DHCP option 14 configuration string.

Example MGCP Configuration File

[Example 1](#) shows one sample configuration file for a Cisco uBR925 router configured in DOCSIS-bridging mode that uses MGCP for controlling its voice calls. The relevant commands are shown in bold. For additional configurations and more information, see the *MGCP 1.0 Including NCS 1.0 and TGCP 1.0 Profiles* feature module, available on CCO and the Documentation CD-ROM.

Example 1 Example MGCP Configuration

```

version 12.1
no service pad
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname uBR925
!
!
clock timezone - 0 6
ip subnet-zero
no ip routing
ip domain-name cisco.com
ip name-server 10.0.0.32
!
mgcp
mgcp call-agent 10.186.1.36
mgcp modem passthru ca
mgcp package-capability dtmf-package
mgcp package-capability line-package
mgcp default-package line-package
!
xgcp snmp sgcp
!
!
voice-port 0
!
voice-port 1
!
dial-peer voice 100 pots
  application MGCPAPP
  port 0
!
dial-peer voice 101 pots
  application MGCPAPP

```

```

port 1
!
process-max-time 200
!
interface Ethernet0
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 bridge-group 59
 bridge-group 59 spanning-disabled
!
interface cable-modem0
 ip address docsis
 no ip directed-broadcast
 no ip route-cache
 no ip mroute-cache
 bridge-group 59
 bridge-group 59 spanning-disabled
!
ip classless
no ip http server
no service finger
!
!
line con 0
 transport input none
line vty 0 4
 login
!
end

```

Example DHCP Option 14 Configuration

[Example 2](#) shows a typical configuration string that would be sent using DHCP option 14 to enable and configure the Tunneled GR-303 Support for the Cisco Cable Modem feature:

Example 2 Sample DHCP Option 14 Configuration String

```
G|200|600|200|7|5|3|0|sig1-gateway.cisco.com|0|1|sig2-gateway.cisco.com|1
```

This string configures the Cisco uBR925 cable access router for the following values:

- Nominal jitter buffer of 200 milliseconds
- Maximum jitter buffer of 600 milliseconds
- ABCD jitter buffer of 200 milliseconds
- ToS bits for RTP packets are set with a precedence of 7
- ToS bits for telephony signaling packets are set with a precedence of 5
- ToS bits for high-speed data packets are set with a precedence of 3
- Voice port V1 is configured to use the signaling gateway at sig1-gateway.cisco.com, and call waiting on caller ID is disabled.
- Voice port V2 is configured to use the signaling gateway at sig2-gateway.cisco.com, and call waiting on caller ID is enabled.

Glossary

- **ABCD**—Inband signaling bits taken from the frames used in telephony signals for call control. In GR-303 signaling, the information conveyed by the ABCD bits is translated to NSE signals and transported using RTP packets.
- **Call Agent**—An intelligent entity in an IP telephony network which handles call control in an MGCP model voice over IP network. A call agent is also known as a media gateway controller (MGC).
- **CPA**—Call Processing Adjunct. The signaling gateway that processes call control signals for a residential gateway (RGW) such as the Cisco uBR925 cable access router.
- **DHCP**—Dynamic Host Configuration Protocol. A protocol that supplies an IP address and other configuration to an IP device at system startup or reset.
- **FQDN**—Fully Qualified Domain Name.
- **GR-303**—Refers to the Telcordia (formerly Bellcore) specification: GR-303, Integrated Digital Loop Carrier (IDLC) System Generic Requirements, Objectives and Interface, December 1998.
- **Media Gateway**—Equipment that provides call handling between the PSTN or a PBX and a VoIP network or an NAS. The Media Gateway is controlled by a Call Agent via MGCP.
- **Media Gateway Controller**—Another term for Call Agent.
- **MGCP**—Media Gateway Control Protocol.
- **NSE**—Named Signaling Events. Defined in RFC 2833. When using GR-303 signaling, NSE signals are converted to and from ABCD bit signaling.
- **POTS**—Plain Old Telephone Service.
- **PSTN**—Public Switched Telephone Network.
- **Residential Gateway (RGW)**—Customer premises equipment running XGCP that has connections to the VoIP network and connections to user telephony equipment.
- **RTP**—Real-time Transport Protocol. Conveys state change information. In the case of GR-303 signaling, ABCD bits are converted to NSE signals and transported by RTP packets.
- **SGCP**—Simple Gateway Control Protocol.
- **SS7**—Signaling System 7.
- **ToS**—Type of Service. A 3-bit value in IP packets indicating the precedence of the packet.
- **VoIP**—Voice over Internet Protocol.
- **XGCP**—SGCP or MGCP Protocol.