



# CHAPTER 1

## Functionality

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## About Cisco Unified Videoconferencing 3500 Gateway Products

The Cisco Unified Videoconferencing 3500 Gateway series consists of these products:

- Cisco Unified Videoconferencing 3527 PRI Gateway

The Cisco Unified Videoconferencing 3527 PRI Gateway enables audio, video, and data communication between H.320 endpoints that connect through ISDN, and H.323 endpoints that connect through a packet-based network. For voice-over-IP, the gateway enables PSTN voice callers to connect from the ISDN network to IP voice callers. The Cisco Unified Videoconferencing 3527 PRI Gateway supports one PRI ISDN port.

- Cisco Unified Videoconferencing 3522 BRI Gateway

The Cisco Unified Videoconferencing 3522 BRI Gateway enables audio, video and data communication between H.320 endpoints that connect through Integrated Services Digital Network (ISDN), and H.323 endpoints that connect through a packet-based network. For voice-over-IP, the gateway enables Public Switched Telephone Network (PSTN) voice callers to connect with IP voice callers. The Cisco Unified Videoconferencing 3522 BRI Gateway supports up to four BRI ISDN ports.

# About Gateway Features

Table 1-1 lists the major features of the Cisco Unified Videoconferencing 3500 Gateway.

**Table 1-1 Gateway Feature Summary**

Feature	Description
Interoperability	The gateway provides a high degree of interoperability with other H.323 compliant gateways, gatekeepers, terminals, proxy, and Multipoint Control Unit (MCU) products by being based on the H.320 standard and H.323 protocol stack.
Web-based management	The gateway features the gateway interface. This is a web interface used to configure and monitor the gateway. You can view and modify all aspects of the gateway configuration from a remote location using a Java-enabled web browser.
SNMP management	The gateway features Simple Network Management Protocol (SNMP) management that supports all aspects of monitoring, diagnostics, configuration, and trapping.
Diagnostics	The gateway features front and rear panel LED indicators that display status for the unit. You can also access remote diagnostics of the unit through the gateway interface, Telnet, SNMP, or a serial port.
Network load balancing	The gateway supports load balancing on the network by communicating with a gatekeeper through H.323 RAI (Resource Available Indication)/RAC (Resource Available Confirmation) messages.
T.120 data collaboration	The gateway supports data transfers in calls between ISDN and IP by using high speed T.120 in HMLP and VarMLP formats.
Quality of service (QoS)	The gateway features configurable coding of media packets to achieve QoS routing priority on the Internet Protocol (IP) network. The Type of Service (ToS) bits of the IP datagram header can be configured for priority level.
Dial plan	The gateway supports a simplified dial plan for outbound dialing using a single universal prefix. Using the dial plan, the gateway automatically detects the capabilities received in the Setup message from the IP endpoint and sets the same bit rate for the ISDN (or serial interface) side of the call.
Direct dialing and call routing	The gateway dial plan supports these direct dialing and call routing facilities: <ul style="list-style-type: none"> <li>• Direct Inward Dialing (DID) <ul style="list-style-type: none"> <li>– Multiple Subscriber Network (MSN)</li> <li>– Q.931 Sub-addressing Information Element</li> </ul> </li> </ul> Internal and External Interactive Voice Response (IVR) <ul style="list-style-type: none"> <li>• TCS4</li> <li>• Default extension</li> </ul>
Access control	The gateway features password-controlled access to the gateway interface. You can define up to ten different administrator access profiles for the gateway.
DTMF translation	The gateway supports translation between in-band Dual Tone Multi-Frequency (DTMF) signals (on the ISDN side) and out-of-band H.245 messages (on the IP side). DTMF translation occurs for voice and video calls.

**Table 1-1 Gateway Feature Summary (continued)**

Feature	Description
Dual video	The gateway supports H.239 standards-based dual video and TANDBERG DuoVideo technology. Dual video streams enable a screen to carry video images from one source while simultaneously displaying images from a second source.
Conceal caller ID	The gateway supports a conceal caller ID feature that instructs the gatekeeper to conceal the identity of the calling endpoint on the IP or ISDN network, whether the presentation restricted feature is enabled or not.
H.323 fast start	The gateway H.323 fast start feature enables endpoints to join a voice conference in the gateway more quickly.
ISDN rollover (available in Cisco Unified Videoconferencing 3527 PRI Gateway only)	The gateway features ISDN rollover. In this feature, the gateway sends a “busy out” channel request to the PSTN switch when the current PRI connection is left with less than a predefined number of available B channels. The PSTN switch “rolls over” to the next available gateway.
Network Specific Facility (available in Cisco Unified Videoconferencing 3527 PRI Gateway only)	The gateway provides support for Network Specific Facility Information Elements (NSF IEs) which enable system administrators to specify to service providers the equipment, service, or network through which they want a call routed.
ISDN connection failure	The gateway responds to ISDN connection failure events, by unregistering from its gatekeeper. The gatekeeper is forced to send new IP-to-ISDN calls through a different gateway, thus ensuring high call completion rates. The gateway re-registers to the gatekeeper when the ISDN connection is restored.
Downspeeding	The gateway features downspeeding functionality. In the downspeeding feature, the gateway attempts to reconnect a disconnected video call either at a lower bandwidth or as a voice call. Downspeeding contributes to a higher percentage of call completion on the network. The gateway supports downspeeding at call setup and in mid-call.
Multiple trap server support	The gateway supports up to three SNMP trap servers.
H.239 support	The gateway supports the H.239 protocol in ISDN-to-IP calls and in IP-to-ISDN calls.
Encryption support	The gateway supports H.235-compliant AES 128 encryption for calls over IP networks, and H.233 and H.234-compliant AES 128 encryption for calls over ISDN networks.
H.243 Conference Control support	The gateway supports the H.243 protocol in ISDN-to-IP calls and in IP-to-ISDN calls. The gateway identifies the protocol version that an IP endpoint uses and sends H.239 capabilities only to those endpoints working with protocol version 4.0 or later.
Peer-to-peer connectivity	The gateway supports connectivity to the IP network through a gatekeeper, or directly to a peer device such as Cisco Unified Communications Manager.
IP network connections	The gateway has one 10/100Base-T Ethernet IP port (on the front panel) and connects to an IP segment through a direct connection to a network switch.

Table 1-2 lists features for specific Cisco gateways.

**Table 1-2 Cisco Gateway Feature Specifics**

<b>Feature</b>	<b>Cisco Unified Videoconferencing 3527 PRI Gateway</b>	<b>Cisco Unified Videoconferencing 3522 BRI Gateway</b>
Supported ports	1 PRI ISDN port	4 BRI ISDN ports
Supported video conferencing protocols	H.320, H.323 (using Cisco Stack v4.0)	
Supported audio codecs	The term <i>audio transcoded video calls</i> refers to the process whereby an <i>audio</i> stream in a multimedia call can be transcoded from one codec type to another. Basic and advanced audio coding supported codecs: G.711, G.722, G.722.1, G.723.1, G.728	
Audio Transcoding	G.711 (ISDN) <> G.723.1 (IP) for up to 30 voice channels. G.711 (IP) <> G.728 (ISDN) for up to 20 audio transcoded video channels. The gateway automatically performs A-Law G.711-to-μ-Law G.711 translation between the IP and ISDN sides if needed. <b>Note</b> When your Cisco unit includes both a gateway and a MCU, G.728 transcoding is supported on the MCU only.	G.711 (ISDN) <> G.723.1 (IP) for up to 8 voice channels. G.711 (IP) <> G.728 (ISDN) for up to 8 audio transcoded video channels.
Supported video protocols	H.261, H.263, H.263+ (Annexes F, J and N), H.263++ (Annex W), H.264	
Supported video resolutions	VGA, XGA, SVGA, SIF, 4SIF, CIF, QCIF, 4CIF, 16CIF	
Supported bandwidths (Kbps)	56, 64, 112, 128, 168, 192, 224, 256, 280, 320, 336, 384, 448, 512, 672, 768, 1288, 1472, 1680 and 1920	56, 64, 112, 128, 224, 256, 336, 384 and 512
	<b>Note</b> Bandwidth rates of 256 Kbps and up support the G.722 audio codec.	
Call handling capabilities	For 1 x PRI T1 line: 23 ports (voice) 23 ports 1B (video and data) 11 ports 2B (video and data) 3 ports 6B (video and data) For 1 x PRI E1 line: 30 ports (voice) 30 ports 1B (video and data) 15 ports 2B (video and data) 5 ports 6B (video and data)	For 4 x BRI lines: 8 voice-only calls or 8 video calls or any combination of the two: 1 call x 512 Kbps 1 call x 384 Kbps + 2 calls x 256 Kbps 4 calls x 128 Kbps 8 calls x 64 Kbps
Line quality	Supports line echo cancellation, H.323 Fast Start and DTMF detection for voice and video calls.	

Table 1-2 Cisco Gateway Feature Specifics (continued)

Feature	Cisco Unified Videoconferencing 3527 PRI Gateway	Cisco Unified Videoconferencing 3522 BRI Gateway
IP network connection	I10/100Base-T Ethernet IP UTP connection (on the front panel).	
Serial control port (DB-9) connection	RS-232 DTE 9-pin D-type connection on front panel for connection to a PC terminal or an external modem.	
Supported signaling protocols	5ESS and 4ESS, DMS100, National ISDN, Euro-ISDN, VN6 Dialing (France), NTT (Japan), Hong Kong Dialing (Hong Kong), Support for Taiwan PRI system.	DMS100, National ISDN, 5ESS Custom/Multipoint (US, Taiwan) 5ESS PTP (US, Taiwan) ETSI (France, Europe, Taiwan, Hong Kong) ETSI PTP (France, Europe, Taiwan) VN6 Dialing (France) Austel 1 Dialing (Australia) KDD, NTT (Japan) Hong Kong Dialing (Hong Kong).
PRI interface	Configurable E1/T1 PRI network interface.  Support for fractional E1/T1 channel selection.  Configurable as terminal side (TE) or network side (NT) device.  Configurable Long Haul PRI module (supported in Japan only).	N/A
Switch information	Numbering Plan Identifier (NPI), Type of Number (TON) and Network Specific Facility (NSF) information elements are configurable per PRI port.	N/A
Bonding calls	Internal Imux providing calls at 128 Kbps (2B) up to full PRI of 1472 Kbps (23B) for T1 and up to full PRI of 1920 Kbps (30B) for E1 using bonding mode 1.  Parallel dialing for bonded calls.	Internal Imux providing calls at 128 Kbps (2B) up to 512 Kbps (8B) using bonding mode 1.
Internal IVR capacity	30 simultaneous calls	8 simultaneous calls

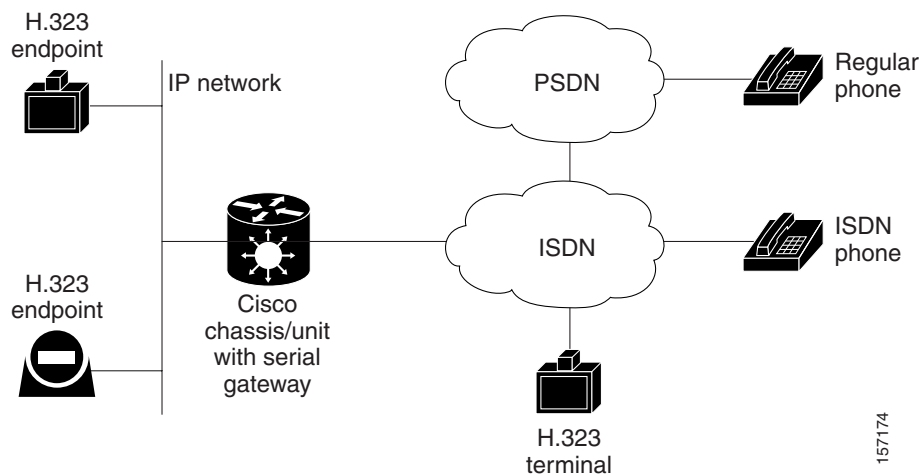
# About Cisco Unified Videoconferencing 3500 Gateway Applications and Topologies

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## About Multimedia Conferencing

The Cisco PRI gateway and BRI gateway enable H.323 endpoints on the IP network to communicate with an H.320 terminal, an ISDN phone, or a regular phone on a circuit-switched public network without having to connect directly to these networks. The gateway allows all IP network terminals to support video conferences without connecting every desktop computer to an ISDN line (see [Figure 1-1](#)).

**Figure 1-1** *Multimedia Conferencing through the Gateway*



Typical multimedia conferencing applications include:

- Business video conferencing
- Distance learning
- Telemedicine
- Video-enabled call centers
- Telecommuting

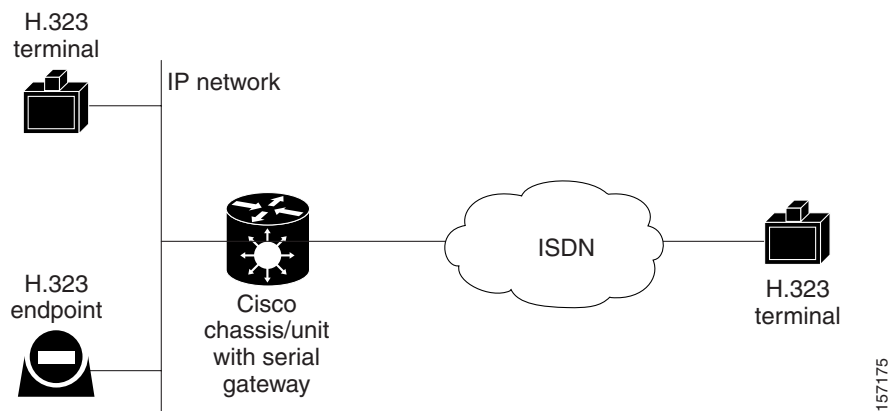
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## About Point-to-Point Conferencing

The Cisco BRI gateway enables direct video, voice, and data communication between an H.320 (ISDN) terminal and H.323 (IP) terminals at bandwidths of up to 512 Kbps (4 BRI lines) using bonding mode 1 (see [Figure 1-2](#)).

The Cisco PRI gateway enables direct video, voice, and data communication between an H.320 (ISDN) terminal and H.323 (IP) terminals at bandwidths of up to 1472 Kbps (23B bonding for T1) and up to 1920 Kbps (30B bonding for E1).

**Figure 1-2** Point-to-Point Conferencing through the Gateway

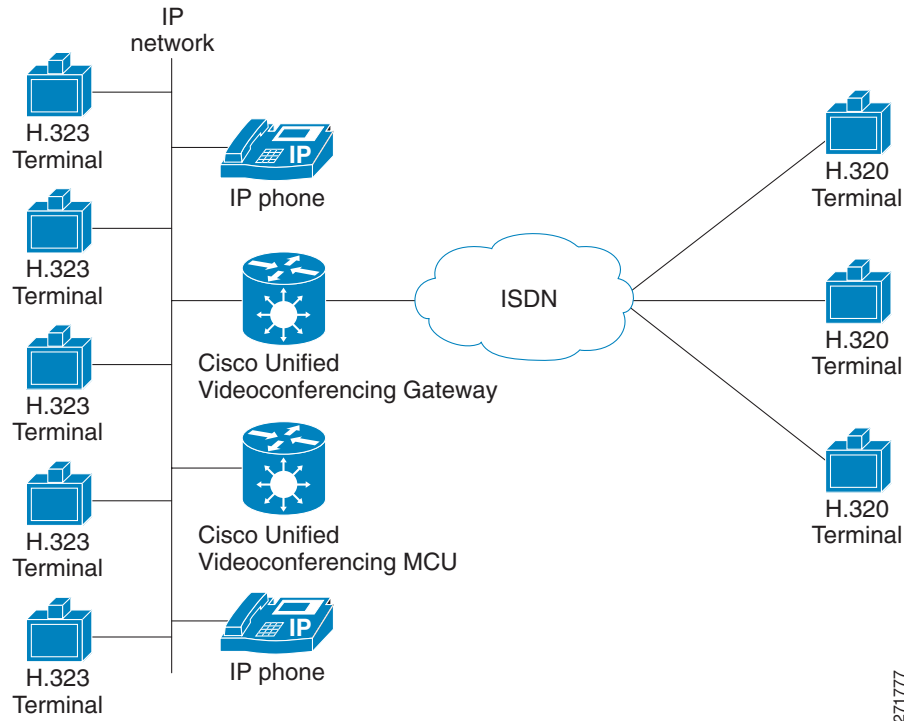


## About Multipoint Conferencing

Together with the Cisco MCU, the Cisco PRI gateway and BRI gateway enable H.320 ISDN terminals to participate in a mixed ISDN-IP multipoint multimedia conference with IP network endpoints (see [Figure 1-3](#)).

For example, when an H.320 ISDN terminal wants to participate in a multipoint conference with H.323 IP endpoints, the H.320 ISDN terminal can either join the multipoint conference by dialing to the gateway, or be invited into the conference by one of the participating IP endpoints. In either case, the gateway connects the ISDN terminal to the Cisco MCU, enabling it to participate in the multipoint conference.

Figure 1-3 Mixed ISDN-IP Multipoint Multimedia Conference



## About Gateway IP Network Connections

The Cisco PRI gateway and BRI gateway feature one 10/100Base-T Ethernet IP port (on the front panel) and connect to an IP segment through a direct connection to a network switch.

## About Gateway ISDN Network Connections

The Cisco BRI gateway features four BRI ISDN connections. Each BRI line provides two B channels and one D signalling channel.

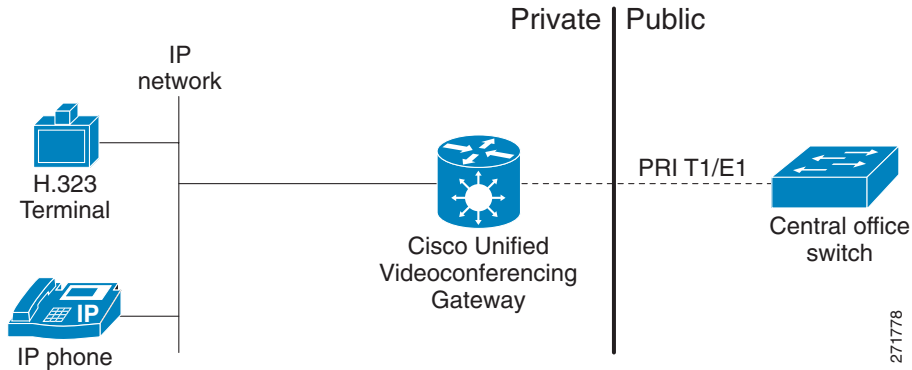
The Cisco PRI gateway features configurable E1/T1 PRI ISDN connections. When configured as an E1 connection, each port provides 30 B channels and one D signaling channel. When configured as a T1 connection, each port provides 23 B channels and one D signaling channel. The type of line available depends on your local ISDN provider. You configure the gateway PRI port to an E1 or T1 interface accordingly. In addition, you can choose to activate only specific channels by using fractional channel selection.



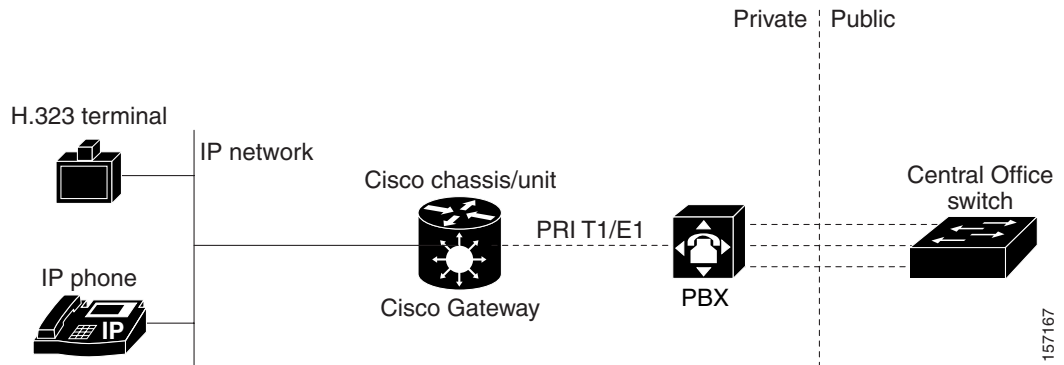
## PRI Gateways

You can connect the PRI gateway directly to a PRI line provided by your local ISDN provider (as shown in Figure 1-4), or to a local private branch exchange (PBX) that provides the PRI connection (as shown in Figure 1-5).

**Figure 1-4** Connecting the PRI Gateway Directly to a Central Office Switch



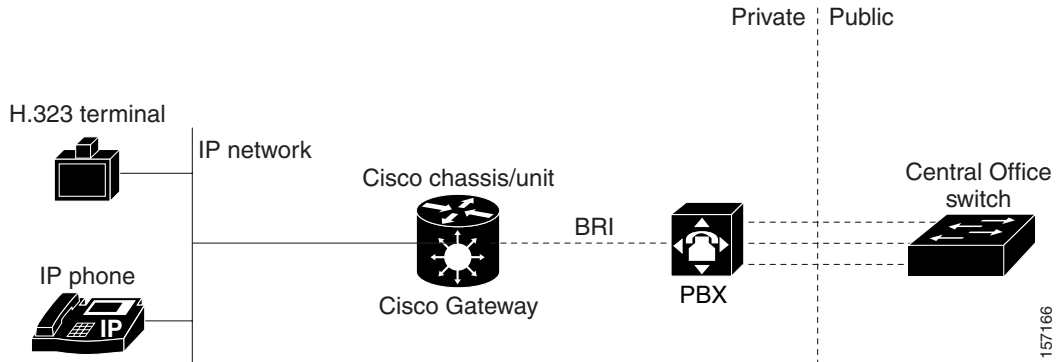
**Figure 1-5** Connecting the PRI Gateway to a PBX that Provides a PRI Line



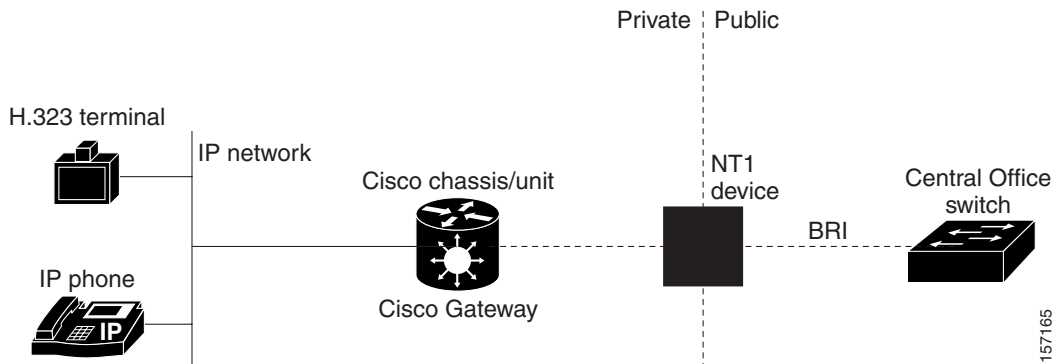
## BRI Gateways

You can connect the BRI gateway to a local private branch exchange (PBX) that provides the BRI connection (as shown in [Figure 1-6](#)), or to a public phone network using an NT1 device (as shown in [Figure 1-7](#)).

**Figure 1-6** Connecting the BRI Gateway Directly to a PBX that Provides a BRI Line



**Figure 1-7** Connecting the BRI Gateway Directly to a Central Office Switch



# About Cisco Unified Videoconferencing 3500 Gateway Functionality

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## About PRI Gateway Call Handling Capacity

Table 1-3 lists the maximum call handling capacity of the PRI gateway for different types of calls.

**Table 1-3** PRI Gateway Call Handling Capacity

Call Type	Maximum Number of Calls Using 1 x E1 PRI Line	Maximum Number of Calls Using 1 X T1 PRI Line
voice (64 Kbps)	30	23
2B video (128 Kbps)	15	11
6B video (384 Kbps)	5	3
12B video (768 Kbps)	2	1



**Note**

Enabling ISDN-to-IP DTMF detection in the PRI gateway for video calls reduces the number of supported calls by half.

## About BRI Gateway Call handling Capacity

Table 1-4 lists the maximum call handling capacity of the BRI gateway for four BRI lines, eight voice-only calls, or eight video calls, or any combination of the two.

**Table 1-4** BRI Gateway Call Handling Capacity

Number of Calls	Capacity
1	384 Kbps+ or 412 Kbps
2	256 Kbps
4	128 Kbps
8	64 Kbps

## About Gateway Call Bandwidth Overhead

According to the H.320 standard, the available bandwidth allocated to a call at any given bit rate will always be slightly less than the stated maximum for the following reasons:

- All stated maximum call bandwidths include provision for control, audio, video, and data traffic.
- Video traffic on the ISDN side contains additional bits for error correction purposes which also consume bandwidth. Video traffic on the IP side does not include this additional load.
- Opening an audio channel further reduces the bandwidth available to the video traffic.

For example, a call at 384 Kbps actually has only 363 Kbps available to it. Control and error correction account for the remaining 21 Kbps.

## Resource Allocation across E1/T1 Lines

The gateway can allocate bandwidth resources to calls across separate E1 or T1 connections to maximize bandwidth capacity in cases where there is not enough capacity for a call on a single E1 or T1 connection, but where sufficient capacity does exist when remaining capacity on both E1/T1 lines is combined.

For example, a gateway using two T1 lines can support three 6B calls on each T1 line, with 320 Kbps spare capacity per line:

- Each T1 line provides 23 B channels.
- Each B channel supports 64 Kbps
- Each T1 line supports  $23 \times 64 = 1472$  Kbps
- Each 6B call requires  $6 \times 64 = 384$  Kbps
- Each T1 line supports  $1472/384 = 3$  6B calls + 320 Kbps spare

The gateway processes an additional 6B call requiring a further 384 Kbps by taking bandwidth resources from each of the two T1 lines, both of which have 320 Kbps available. In this way, the gateway spreads the call over both T1 lines.

## About Peer-to-Peer Connectivity

The gateway supports the following types of connectivity to the IP network

- Through a gatekeeper
- Directly to a peer device such as Cisco Unified Communications Manager without the need for a gatekeeper.