CHAPTER 1

Introduction

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This chapter provides an overview of the H.323 standard and the video infrastructure components used to build an H.323 videoconferencing network. It describes the basics of the H.323 video standard and infrastructure components used throughout this guide.

H.323 Basics

The H.323 standard provides a foundation for audio, video, and data communications across Internet Protocol (IP) networks. H.323 is an umbrella recommendation from the International Telecommunications Union (ITU) that sets standards for multimedia communications over local area networks (LANs). The H.323 standard is part of a larger range of videoconferencing standards (H.32*x*) for videoconferencing over various network media. For example, H.320 supports videoconferencing over Integrated Services Digital Network (ISDN), H.321 supports videoconferencing over Asynchronous Transfer Mode (ATM), H.324 supports videoconferencing over standard Plain Old Telephone Service (POTS) lines, and H.323 supports videoconferencing over IP LANs.

The H.323 specification consists of multiple protocols, including:

- H.245 — Provides control signaling used to exchange end-to-end control messages. These control messages carry information relating to:
  - Capabilities exchange
  - Opening and closing of logical channels used to carry media streams
  - Flow control messages
  - General commands and indications
- H.225 — Provides registration, admission, and status (RAS), which is the protocol used between H.323 devices and the gatekeeper for device registration. The RAS protocol is used to perform registration, admission control, bandwidth utilization updates, status, and disengagement procedures between H.323 devices and the gatekeeper. H.225 is also used during call setup to open a call signaling channel using standard Q.931 messaging protocol.
- H.235 — Provides security by passing tokens in H.225 and H.245 call signaling. It is commonly used for authentication and authorizing calls and for establishing encrypted channels for media of the calls.
- H.239 — Provides data sharing capabilities between video endpoints that can be used to share a PC desktop.

- H.460.17, H.460.18, and H.460.19 — Is used for NAT traversal between endpoints and gatekeepers. H.460.17 provides tunneling of call control signaling in Q.931 over TCP with the gatekeeper. H.460.18 uses extra signaling in RAS with service control indication (SCI) and service control response (SCR) messages, so that inside devices open pinholes from inside for calls using RAS Facility messages. H.460.19 uses empty RTP packets to open pinholes for incoming media.

Table 1-1 lists some of the standards supported by the H.323 specification.

Table 1-1 Protocols Supported by the H.323 Standard

Standard	Supported Functions
H.225	RAS, call setup, and tear down (Q.931 call establishment)
H.235	Security and encryption for H.323
H.245	Call control signaling
T.120	Data sharing for H.320 calls
H.239	Desktop sharing with H.323 calls
H.281	Far End Camera Control (FECC) for H.320 calls
Annex Q	FECC for H.323 calls
H.261 H.263 H.264	Video codecs
G.711 G.722 G.723 G.728 G.729 iLBC AAC-LC AAC-LD	Audio codecs

Videoconferencing with H.323

Historically, videoconferencing was done primarily over ISDN and time division multiplexed (TDM) networks using standard H.320. Running interactive video over data networks was not an option due to video's shared media characteristics, connectionless nature, and lack of guaranteed data flows. With the introduction of switched LAN networks, high-end routers, and Layer 2 and Layer 3 quality of service (QoS), delivering interactive video over IP is now a reality. Today there is a large installed base of H.320 networks that incur large monthly access and switched usage charges. With the current advances to the IP networks, it is now possible to run interactive video over an IP network, thus reducing cost with converged voice, video, and data traffic over a common path. H.323 builds on top of existing IP data networks, scaling to larger deployments and providing greater features. The data sharing capability, remote camera control and enhanced high resolution and high fidelity codecs provide much better video conferencing experience with the endpoints available today. The adoption of videoconferencing to save travel time and costs has attributed to an increase in deployments of video endpoints and videoconferencing devices.

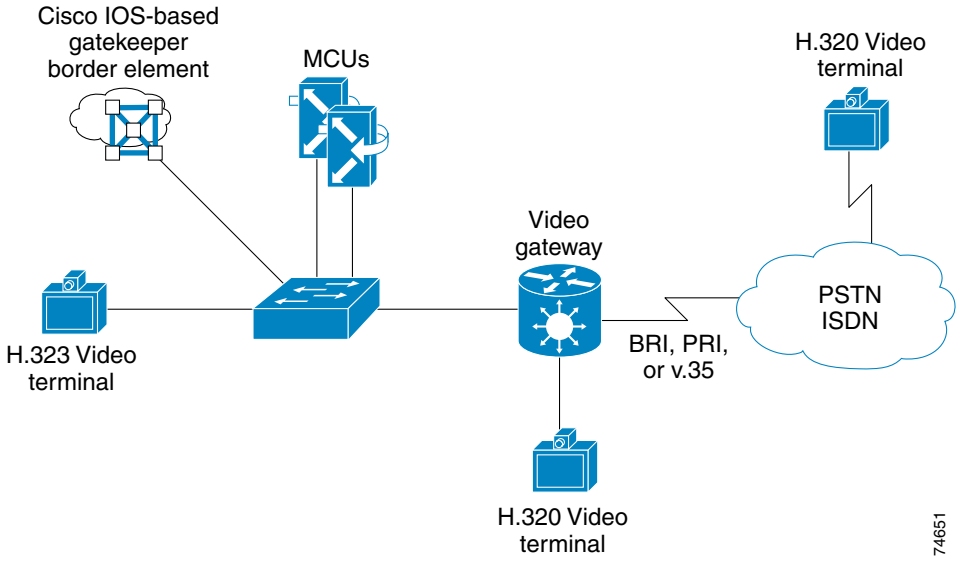
H.323 Videoconferencing Components

Five components make up an H.323 videoconferencing network:

- Video Terminal, page 1-4
- Gatekeeper, page 1-4
- Gateway, page 1-5
- Multipoint Control Unit (MCU), page 1-6
- Border Element, page 1-7

Cisco offers product solutions for all the above components except video terminals, which are covered in detail in *Chapter 8, Video Infrastructure*. Figure 1-1 illustrates a typical H.323 videoconferencing network.

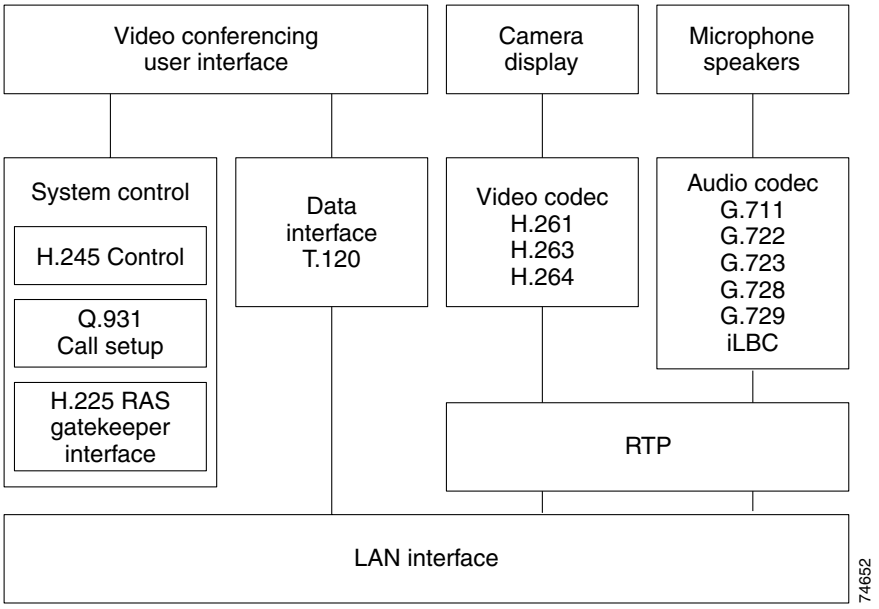
Figure 1-1 H.323 Videoconferencing Infrastructure Components



Video Terminal

Video terminals come in many forms. Some can be connected directly to the ISDN PSTN video network, while some include video systems installed on PCs as standalone desktop terminals and group-focused shared conference room devices with Ethernet for network connectivity. Figure 1-2 illustrates the functional components in an H.323 video terminal.

Figure 1-2 Functional Components of a Video Terminal



Note Some video endpoints support streaming with Real Time Streaming Protocol (RTSP), which can enable a larger number or participants to view the call.

Gatekeeper

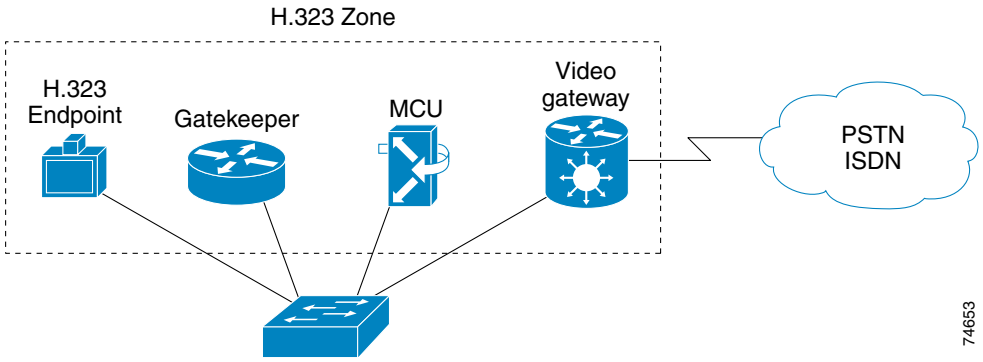
The gatekeeper is one of the most important components of an H.323 videoconferencing network. Although the H.323 standard lists the gatekeeper as an optional device, you cannot build a scalable video network without the application controls the gatekeeper provides. Each video infrastructure component registers with the gatekeeper. The gatekeeper performs all address resolution, bandwidth management, admission control, zone management, and intra-zone and inter-zone call routing.

A zone is a logical grouping of H.323 infrastructure components registered to, and managed by, a single gatekeeper. Zones are not dependent on physical network topology or IP subnets. Zones may span one or more network segments or IP subnets, and they are simply a logical grouping of devices. As such, zones can be defined based on geographical proximity, bandwidth availability, or other criteria. A *via-zone* is another type of zone that contains a Cisco Unified Border Element so that the gatekeeper can include it in the call, depending on the configuration.

The most fundamental function of a gatekeeper is to provide address resolution, thus allowing terminals, gateways, and Multipoint Control Units (MCUs) to be addressed using the international E.164 address standard and/or an H.323 alias. Each endpoint that is registered to a gatekeeper must be assigned a unique E.164 address (numeric identifier). As a result, zone prefixes are used in the H.323 video network to identify zones, similar to the use of area codes in telephony systems.

Throughout this document are example topologies that are based on single-zone and multi-zone configurations. For example, Figure 1-3 illustrates a single zone.

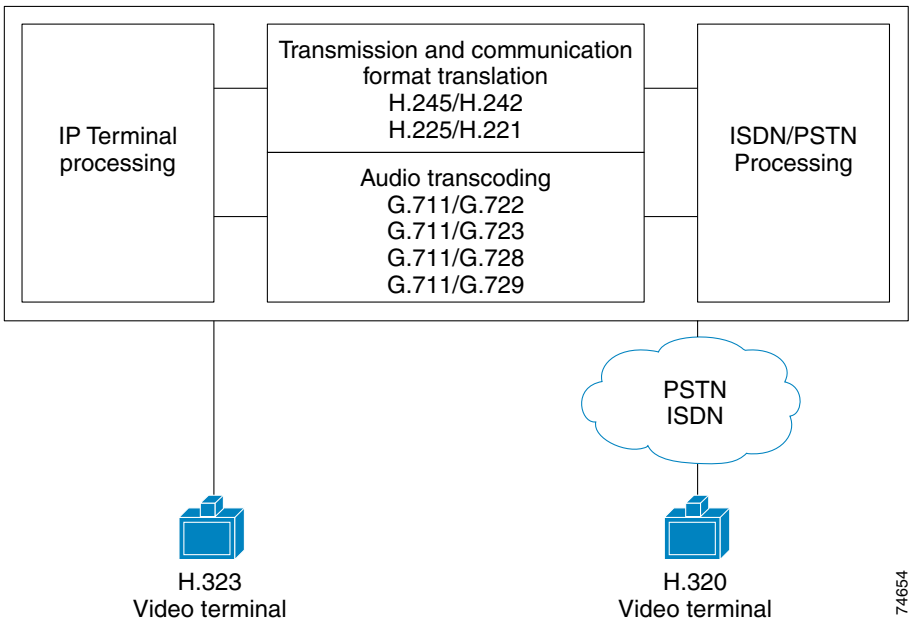
Figure 1-3 Single H.323 Zone



Gateway

Gateways provide interoperability between H.323 elements and an installed base of H.320 units. The H.323 gateway allows H.323 video terminals to communicate with other H.32*x* video terminals, such as H.320 and H.321 video terminals. Video gateways perform translation between different protocols, audio encoding formats, and video encoding formats that may be used by the various H.32*x* standards. For example, the ISDN H.320 standard uses the H.221 protocol for signaling, while the H.323 standard uses H.225. The gateway must translate between these two protocols to allow devices of different network media and protocols to communicate with each other. ISDN gateways can also support Interactive Voice Response (IVR), Direct Inward Dialing (DID), or TCS4 (ISDN H.320-based dialing) for video calls. Figure 1-4 illustrates the role of a gateway in an H.323 video network.

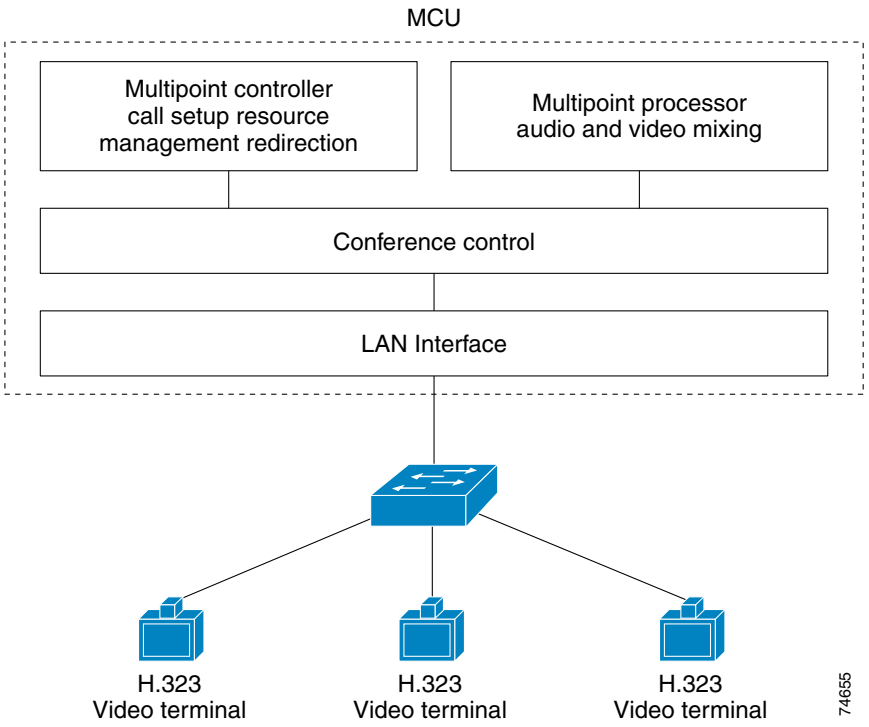
Figure 1-4 Functional Components of an H.323 Video Gateway



Multipoint Control Unit (MCU)

Video terminals are generally point-to-point devices, allowing only two participants per conversation. A multipoint control unit (MCU) allows video conferences to be extended to three or more participants, and some video terminals also support multipoint calls. An MCU consists of a multipoint controller (MC) and a multipoint processor (MP). The MC manages all call setup control functions and conference resources as well as the opening and closing of media streams. The MP processes audio and video media streams only. Cisco MCUs can be stacked to allow more conferences or cascaded to allow larger conferences. Stacking and cascading are covered in detail in *Chapter 8, Video Infrastructure*. Figure 1-5 illustrates the function of an MCU.

Figure 1-5 Functional Components of an MCU

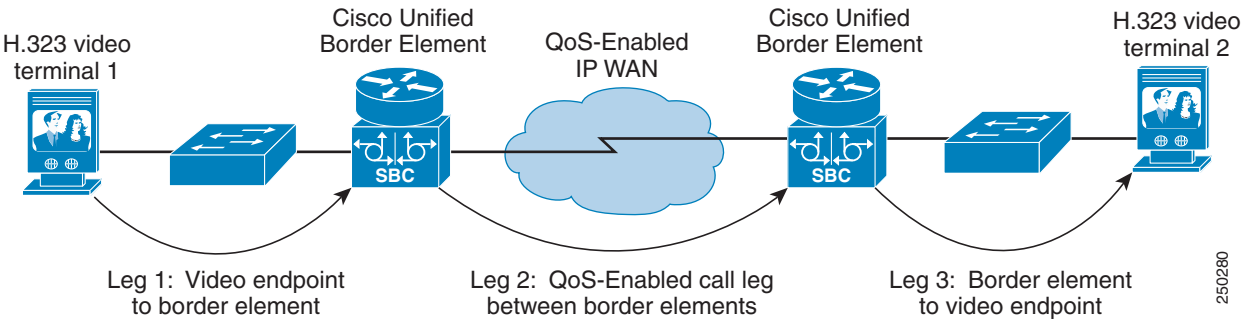


Border Element

The border element is a device that is used in the periphery of the network to separate two different networks, and it serves as a demarcation device. The border element can use H.323 or other protocols and is most commonly used for topology hiding and interworking. The border element can terminate H.323 calls from a local LAN or zone and establish sessions with H.323 endpoints located in other LANs or zones. In doing so, it provides network administrators with the ability to set and enforce quality of service (QoS) on inter-zone segments. The border element also provides a method of identifying H.323 videoconferencing connections for tunneling through firewalls and Network Address Translation (NAT) environments. Figure 1-6 illustrates a call passing through the border element over a WAN link.

The Cisco border element product is the Cisco Unified Border Element. (The Cisco Unified Border Element was previously named the IP-to-IP Gateway, which was a successor to the Cisco Multimedia Conference Manager (MCM) proxy.)

Figure 1-6 A Call Passing Through the Border Element over a WAN Link



Note Cisco Unified Communications Manager (Unified CM) supports voice and video and can be extended to support multimedia conferencing with Cisco Unified MeetingPlace solutions. These systems can be integrated with Cisco Unified Videoconferencing devices using gatekeepers and border element devices with H.323 protocol. For information on integrating Cisco Unified Video Gateways, MCUs, and Cisco Unified MeetingPlace with Unified CM, refer to the *Cisco Unified Communications SRND Based on Cisco Unified Communications Manager* available at http://www.cisco.com/go/ucsrnd.