What is H.323

H.323 is a standard that specifies the components, protocols and procedures that provide multimedia communication services—real-time audio, video, and data communications—over packet networks, including Internet protocol (IP)–based networks.

H.323 is part of a family of ITU–T recommendations called H.32x that provides multimedia communication services over a variety of networks.

H.323 can be applied in a variety of mechanisms—audio only (IP telephony); audio and video (videotelephony); audio and data; and audio, video and data.

H.323 versions

The H.323 standard is specified by the ITU–T Study Group 16:

Version 1:

» *provide a non guaranteed quality of service (QoS)*

Version 2:

» *introduces new functionality within existing protocols, as well as new protocols*

– Security, Fast Connect, Supplementary Services namely Call Transfer and Call Diversion, Tunneling, Call Identifier, QoS structures added to set QoS parameters, and many more

Version 3:

» *new Annexes to H.323 and H.225.0 that add considerable value to the overall H.323 system architecture*

Version 4:

» *includes reliability, scalability, and flexibility*

H.323 Elements

Terminals –

» *can either be a personal computer (PC) or a stand-alone device*

» *supports audio communications and can optionally support video or data communications*

Gateways –

» *provides connectivity between an H.323 network and a non–H.323 network by translating protocols for call setup and release, converting media formats between different networks, and transferring information between the networks connected by the gateway*

» *however, a gateway is not required for communication between two terminals on an H.323 network*

H.323 Elements (cont.)

Gatekeepers –

» *considered as the brain of the H.323 network and are the focal point for all calls within the H.323 network*

» *provide important services such as addressing, authorization and authentication of terminals and gateways; bandwidth management; accounting; billing; and charging. Gatekeepers may also provide call routing services*

» *however, their requirement is not mandatory*

Multipoint Control Units –

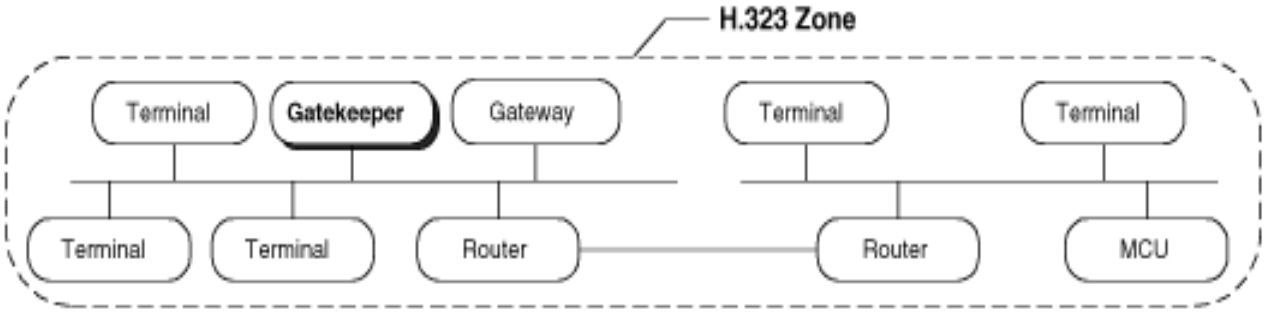
» *provide support for conferences of three or more H.323 terminals*

» *manage conference resources, negotiate between terminals for the purpose of determining the audio or video coder/decoder (CODEC) to use, and may handle the media stream*

Gatekeepers, gateways, and MCUs are logically separate components of the H.323 standard but can be implemented as a single physical device.

H.323 Zone

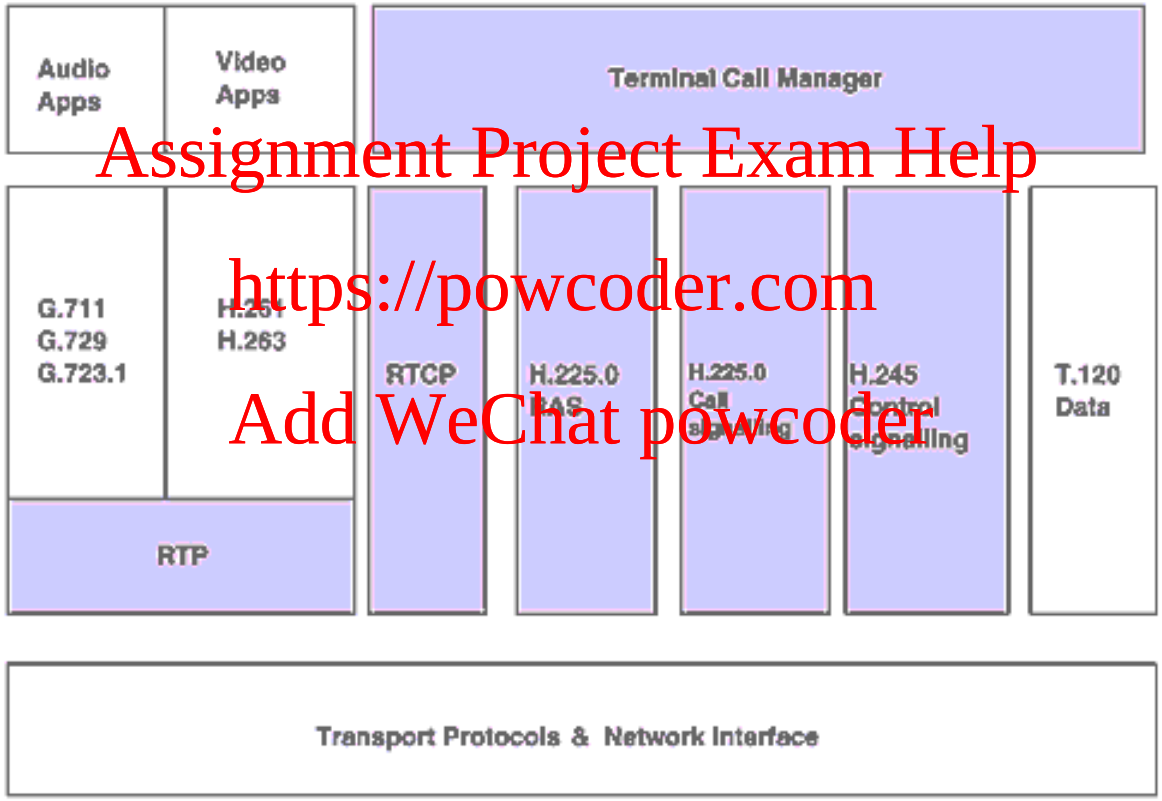
- is a collection of all terminals, gateways, and MCUs managed by a single gatekeeper
- includes at least one terminal and may include gateways or MCUs.
- has only one gatekeeper
- may be comprised of multiple network segments that are connected using routers or other devices.



H.323 Protocols

- **H.225: registration, admission, and status (RAS)**
- **H.225: call signaling**
- **H.245: control signaling**
- **real-time transfer protocol (RTP)**
- **real-time control protocol (RTCP)**
- **H.235: security for H.323 terminals**
- **H.246: H.323/PSTN Interworking**
- **H.450: Supplementary services**
- **Q.931: call setup**
- **Q.932: supplementary services**

H.323 Terminal-Side Protocol Stack



H.323 Terminal-Side Protocol Stack

Audio CODEC

» *must have at least one audio CODEC support*

H.225 Registration, Admission, and Status

» *protocol between endpoints (terminals and gateways) and gatekeepers*

» *used to perform registration, admissions control, bandwidth changes, status, and disengage procedures between endpoints and gatekeepers*

» *RAS signaling channel used to exchange RAS messages, is opened between an endpoint and a gatekeeper prior to the establishment of any other channels.*

H.323 Terminal-Side Protocol Stack

H.225 Call Signaling

» *used to establish a connection between two H.323 endpoints by exchanging H.225 protocol messages on the call-signaling channel*

» *call-signaling channel is opened between two H.323 endpoints or between an endpoint and the gatekeeper*

H.245 Control Signaling

» *used to exchange end-to-end control messages related to*

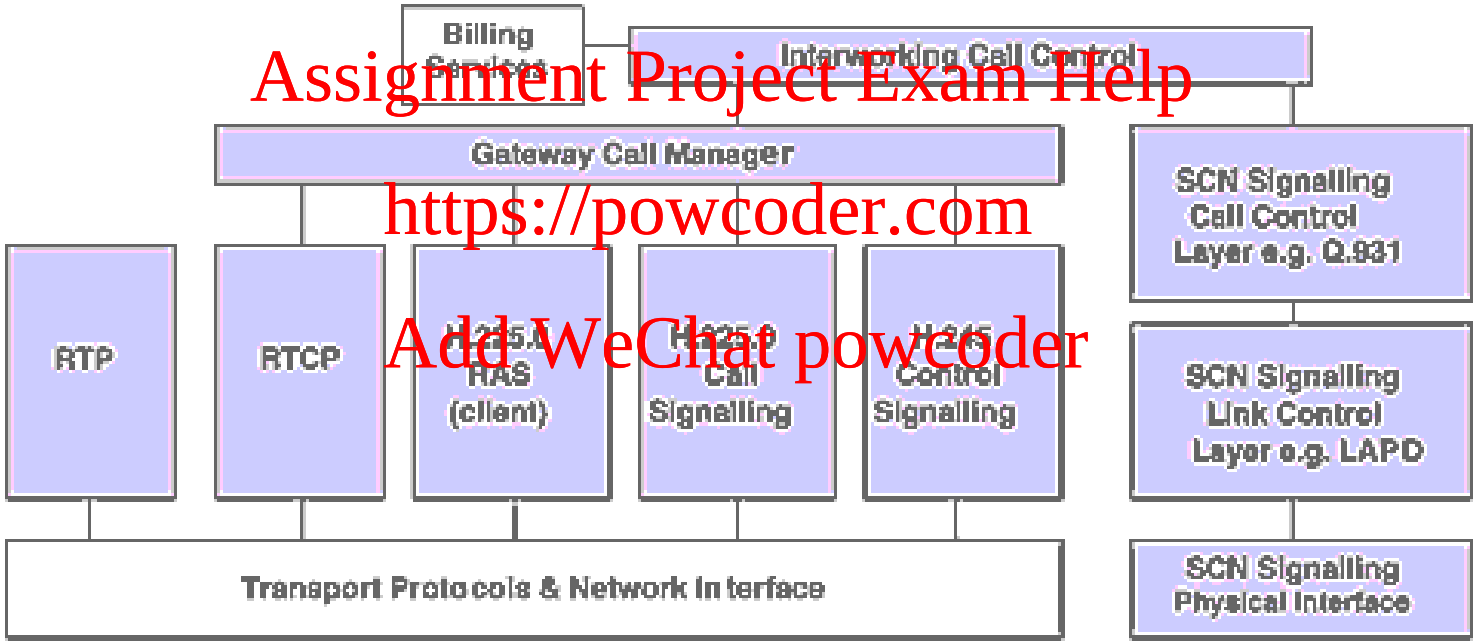
– capabilities exchange

– opening and closing of logical channels used to carry media streams

– flow-control messages

– general commands and indications

H.323 Gateway Protocol Stack



H.323 Gateway Protocol Stack

H.245 control signaling for exchanging capabilities,

H.225 call signaling for call setup and release,

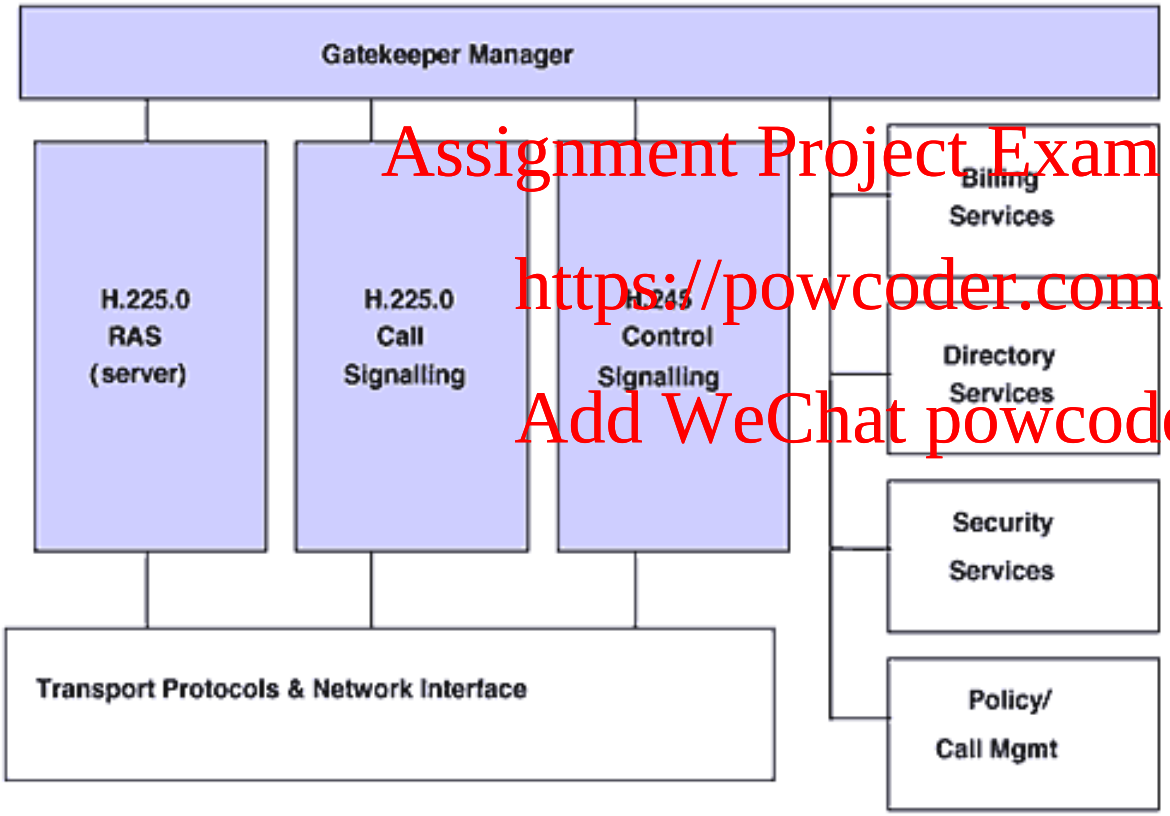
H.225 RAS for registration with the gatekeeper,

SCN–specific protocols (e.g., ISDN and SS7 protocols) on SCN side

A gateway

- *» translates H.245 and H.225 protocols in a transparent fashion to the respective counterparts on the non–H.323 network and vice versa*
- *» also performs call setup and clearing on both the H.323–network side and non–H.323–network side*
- *» translates between audio, video, and data formats, if needed*
- *» is a logical component of H.323 and can be implemented as part of a gatekeeper*

H.323 Gatekeeper Components



H.323 networks that contain IP–telephony gateways should also contain a gatekeeper to translate incoming E.164 telephone addresses into transport addresses.

A gatekeeper is a logical component of H.323 but can be implemented as part of a gateway.

H.323 GateKeeper

Required Gatekeeper Functions

Address Translation

» *translates the E.164 telephone number (e.g., 310-442-9222) originating outside the H.323 network into the network address (e.g. 204.252.32:456 for an IP–based network) for the destination terminal*

» *translates an alias originating within an H.323 network into the network address*

Admissions Control

» *Authorization of LAN access using Admission Request, Confirm and Reject (ARQ/ARC/ARJ) RAS messages. LAN access may be based on call authorization, bandwidth, or some other criteria.*

» *Admissions Control may also be a null function which admits all requests.*

H.323 GateKeeper

Required Gatekeeper Functions

Bandwidth Control

» *Support for Bandwidth Request, Confirm and Reject (BRQ/BCF/BRJ) RAS messages. This may be based on bandwidth management.*

» *Bandwidth Control may also be a null function which accepts all requests for bandwidth changes.*

Zone Management

» *The Gatekeeper provides the above functions for terminals, MCUs, and Gateways which have registered within its Zone of control.*

H.323 GateKeeper

Optional Gatekeeper Functions

Call-Control Signaling

» *route call-signaling messages between H.323 endpoints*

» *Alternatively, the gatekeeper may allow the endpoints to send H.225 call-signaling messages directly to each other*

Call Authorization

» *gatekeeper may accept or reject the call, according to the H.225 specification*

Call Management

» *may maintain information about all active H.323 calls so that it can control its zone by providing the maintained information to the bandwidth-management function or by rerouting the calls to different endpoints to achieve load balancing*

H.225 Registration, Admission, and Status

- RAS messages are carried on unreliable RAS channel. Hence, RAS message exchange may be associated with timeouts and retry counts.
- H.225 RAS is used between H.323 endpoints (terminals and gateways) and gatekeepers for the following:

Gatekeeper Discovery

» *used by the H.323 endpoints to determine the gatekeeper with which the endpoint must register*

» *In static discovery, the endpoint knows the transport address of its gatekeeper a priori*

» *In dynamic method, endpoint multicasts a GRQ message on the gatekeeper's discovery multicast address: "Who is my gatekeeper?"*

One or more gatekeepers may respond with a GCF message: "I can be your gatekeeper."

H.225 Registration, Admission, and Status

Endpoint Registration

» *the endpoints join a zone and inform the gatekeeper of the zone's transport and alias addresses*

– e.g. associate 212 NXX XXXX with IP address 12.10.2.2

» *uses Registration Request (RRQ) and Registration Confirm/Reject (RCF/RRJ) messages*

Endpoint Location

» *the transport address of an endpoint is determined and given its alias name or E.164 address*

– endpoint requests for "Where is 932-555-9348?" using Location Request (LRQ), gatekeeper replies with "At this IP address" using Location Confirmation (LCF)

H.225 Call Signaling

Call signaling involves the exchange of H.225 protocol messages over a reliable call-signaling channel (eg TCP)

no gatekeeper in the H.323 network: H.225 messages exchanged directly between the endpoints

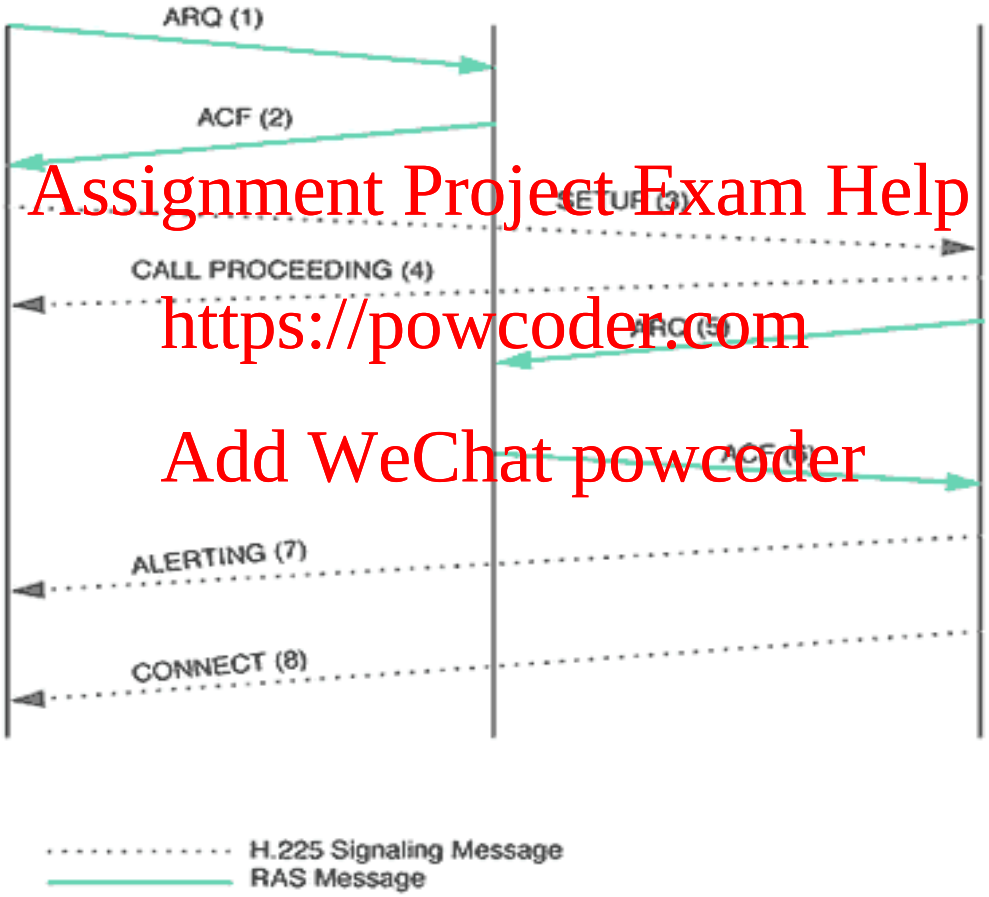
gatekeeper exists in the network:

- direct call signaling: messages exchanged either directly between the endpoints

- gatekeeper-routed call signaling: messages exchanged after being routed through the gatekeeper

- method chosen is decided by the gatekeeper during RAS–admission message exchange (ARQ/ACF messages)

H.225 Call Establishment using Direct Call Signaling



H.225 Call Establishment using Gatekeeper Routed Call Signaling

H.245 Control Signaling

- *After call setup, all communications are over logical channels*
- *H.245 defines procedures for managing logical channels*
- *Logical channel 0 is for H.245 control – open for the duration of the call*
- *Multiple logical channels of varying types (video, audio, data) are allowed for a single call*

H.245 messages

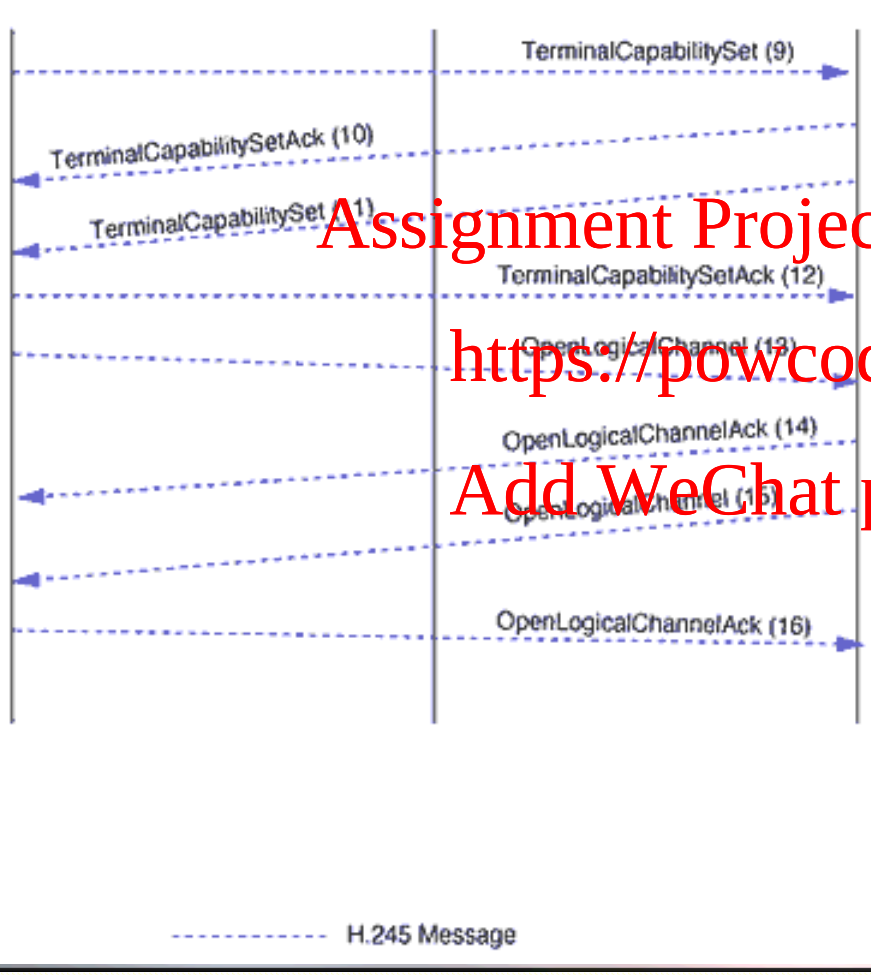
Capabilities Exchange for Call Negotiation

- » *identifies capabilities of participating endpoints*
- » *may identify options and valid combinations of capabilities: e.g. 1 video channel and 1 audio channel*
- » *all conference entities receive these H.245 messages*

Logical Channel Signaling

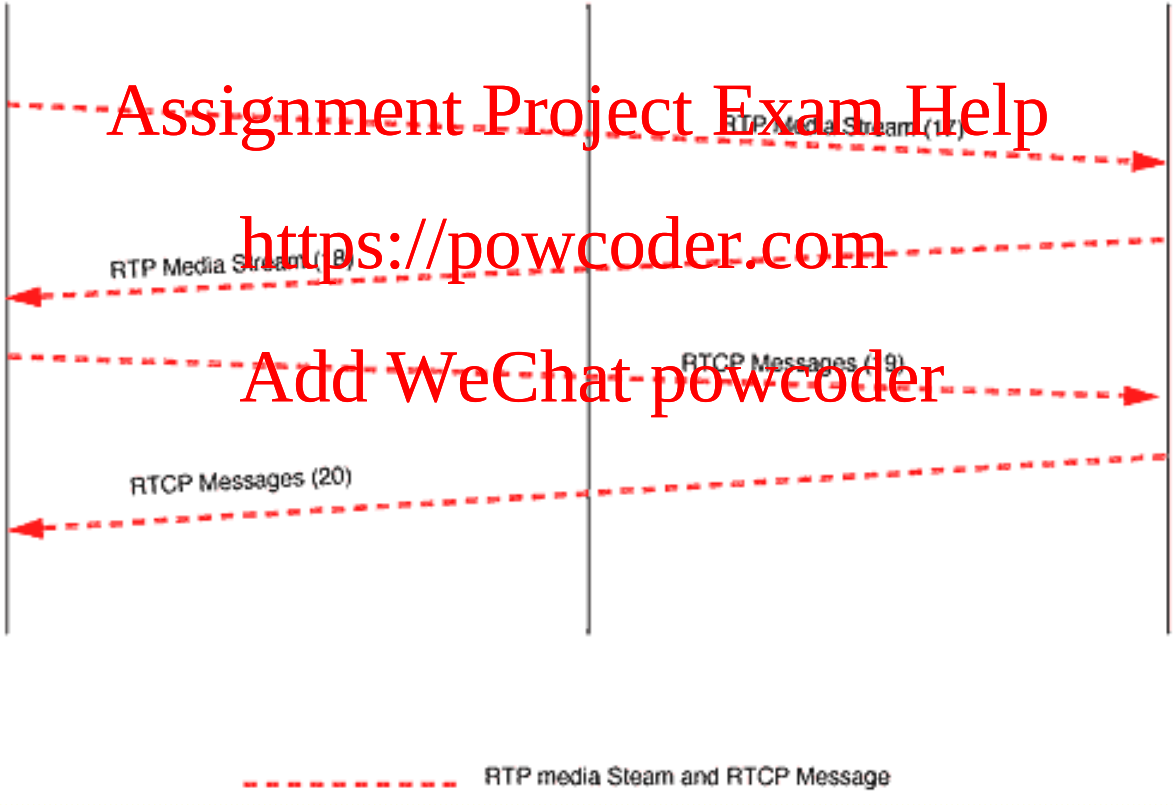
- » *to open or close a logical channel;*
- » *a logical channel is unidirectional.*

H.245 control signaling flows

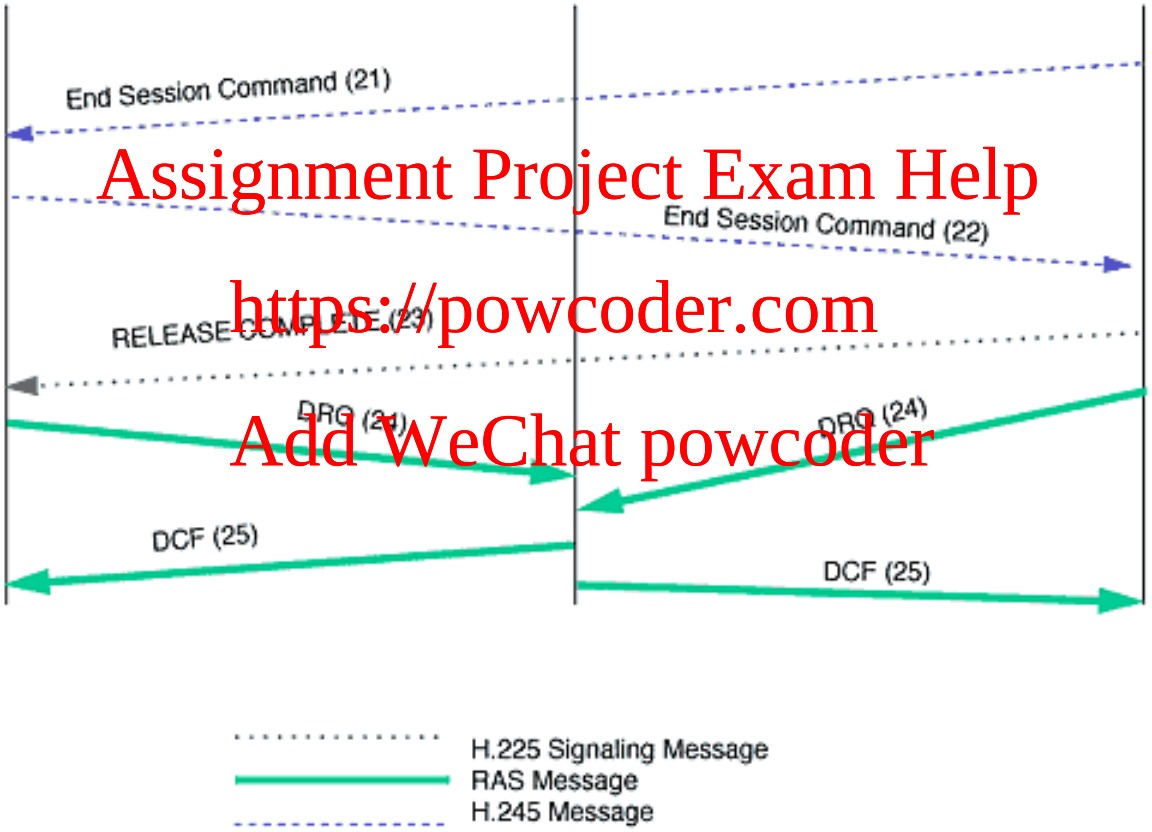


- openLogicalChannel (13, 15) message includes the transport address of the RTCP channel
- Included in the openLogicalChannelAck(14, 16) message are the RTP transport address allocated by T2 to be used by the T1 for sending the RTP media stream

H.323 Media Stream and Media Control Flows



H.323 Call Release



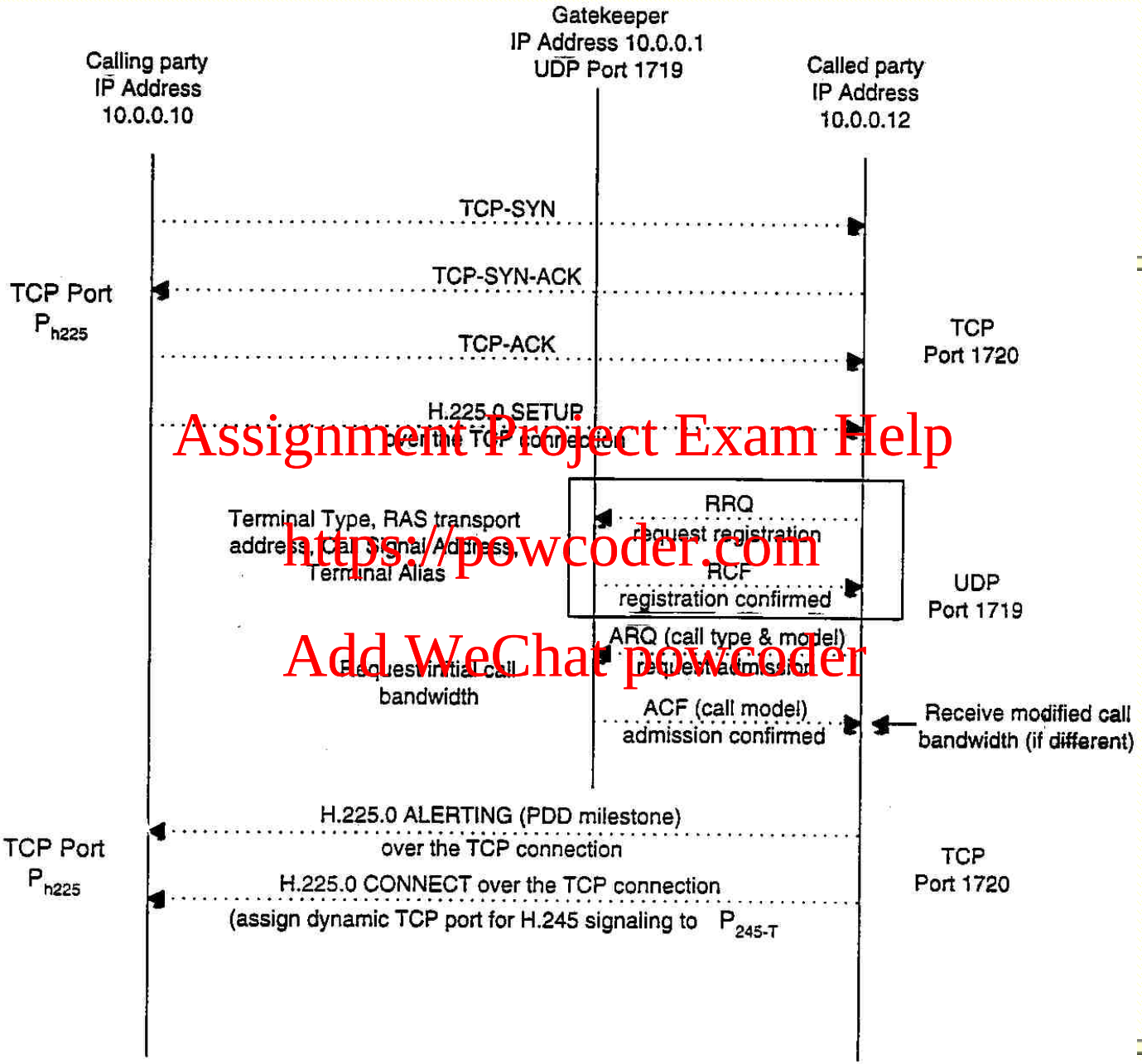


FIGURE 1.12 H.323 Call Setup, Phase A

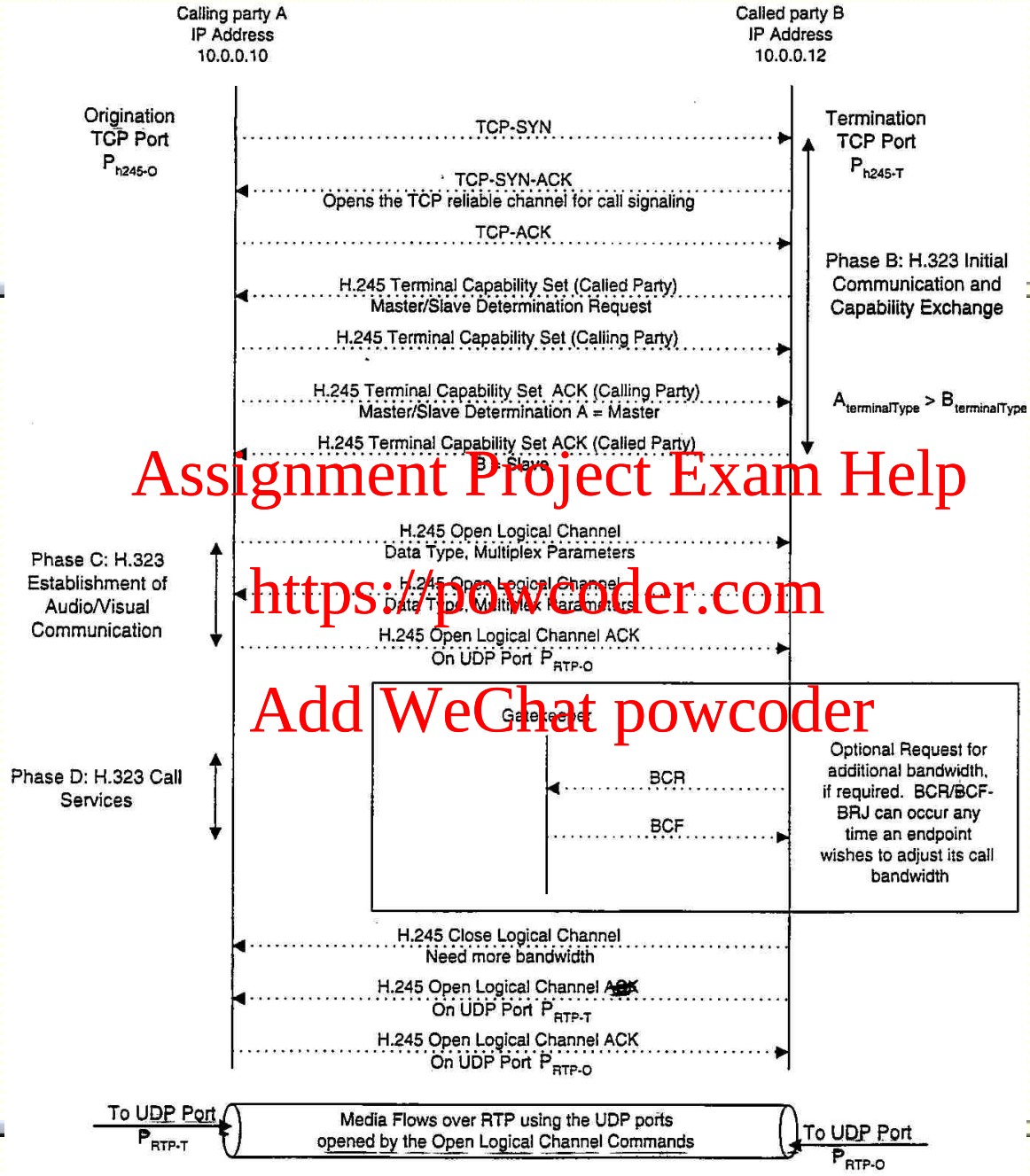


FIGURE 1.13 H.323 Call Setup, Phases B, C and D

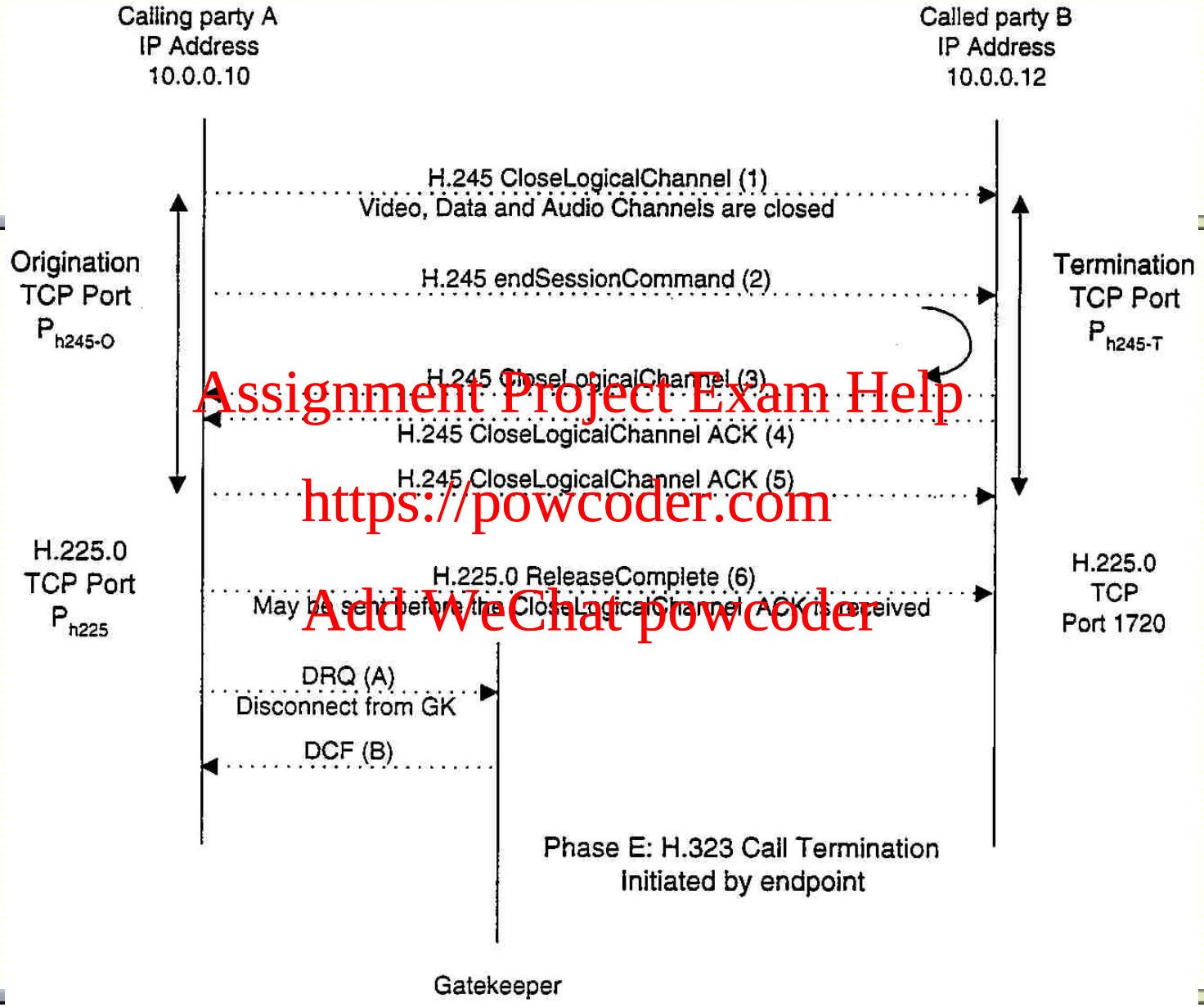


FIGURE 1.14 H.323 Call Setup, Phase E (Termination)