



Overview of H.323

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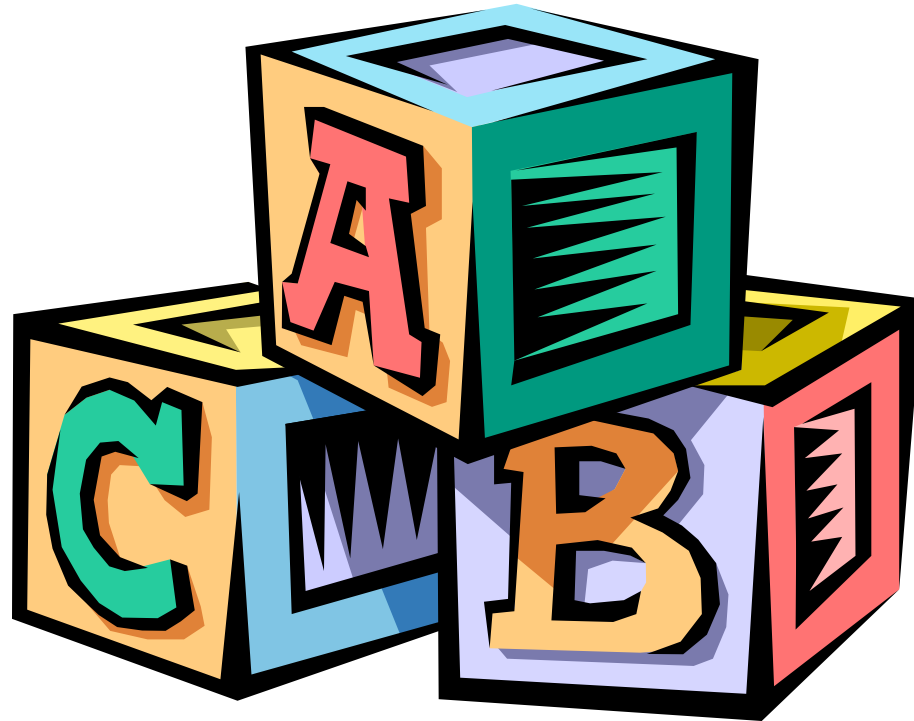
H.323

Executive Summary

- H.323 was first approved in February 1996, the same month that the first SIP draft was published
- Designed to operate over complex networks, such as the Internet
- Although base-level functionality required only voice, video dominated early implementations remains a major strength of H.323
- First standards-based “Voice over IP”
- Today, H.323 is the most widely deployed standards-based voice and videoconferencing standard for packet-switched networks, with literally billions of minutes of billable traffic every month
- ITU-T has now published H.323v6



The Basics of H.323



What is H.323?

- H.323* is a multimedia conferencing protocol, which includes voice, video, and data conferencing, for use over packet-switched networks

* H.323 is “ITU-T Recommendation H.323: Packet-based multimedia communications systems”

Elements of an H.323 System

- Terminals
- Multipoint Control Units (MCUs)
- Gateways
- Gatekeeper
- Border Elements

Referred to as
“endpoints”




Terminals

- Telephones
- Video phones
- IVR devices
- Voicemail Systems
- “Soft phones” (e.g., NetMeeting®)



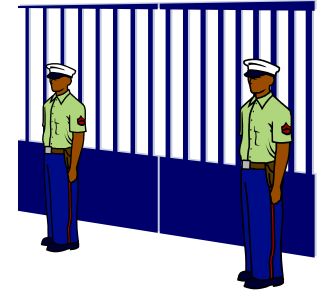
MCUs

- Responsible for managing multipoint conferences (two or more endpoints engaged in a conference) 
- The MCU contains a Multipoint Controller (MC) that manages the call signaling and may optionally have Multipoint Processors (MPs) to handle media mixing, switching, or other media processing



Gateways

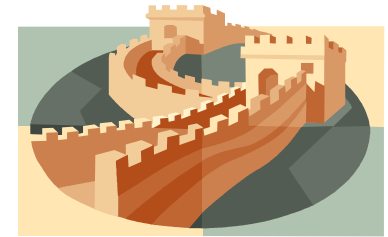
- The Gateway is composed of a “Media Gateway Controller” (MGC) and a “Media Gateway” (MG), which may co-exist or exist separately
- The MGC handles call signaling and other non-media-related functions
- The MG handles the media
- Gateways interface H.323 to other networks, including the PSTN, H.320 systems, and other H.323 networks (proxy)



Gatekeeper

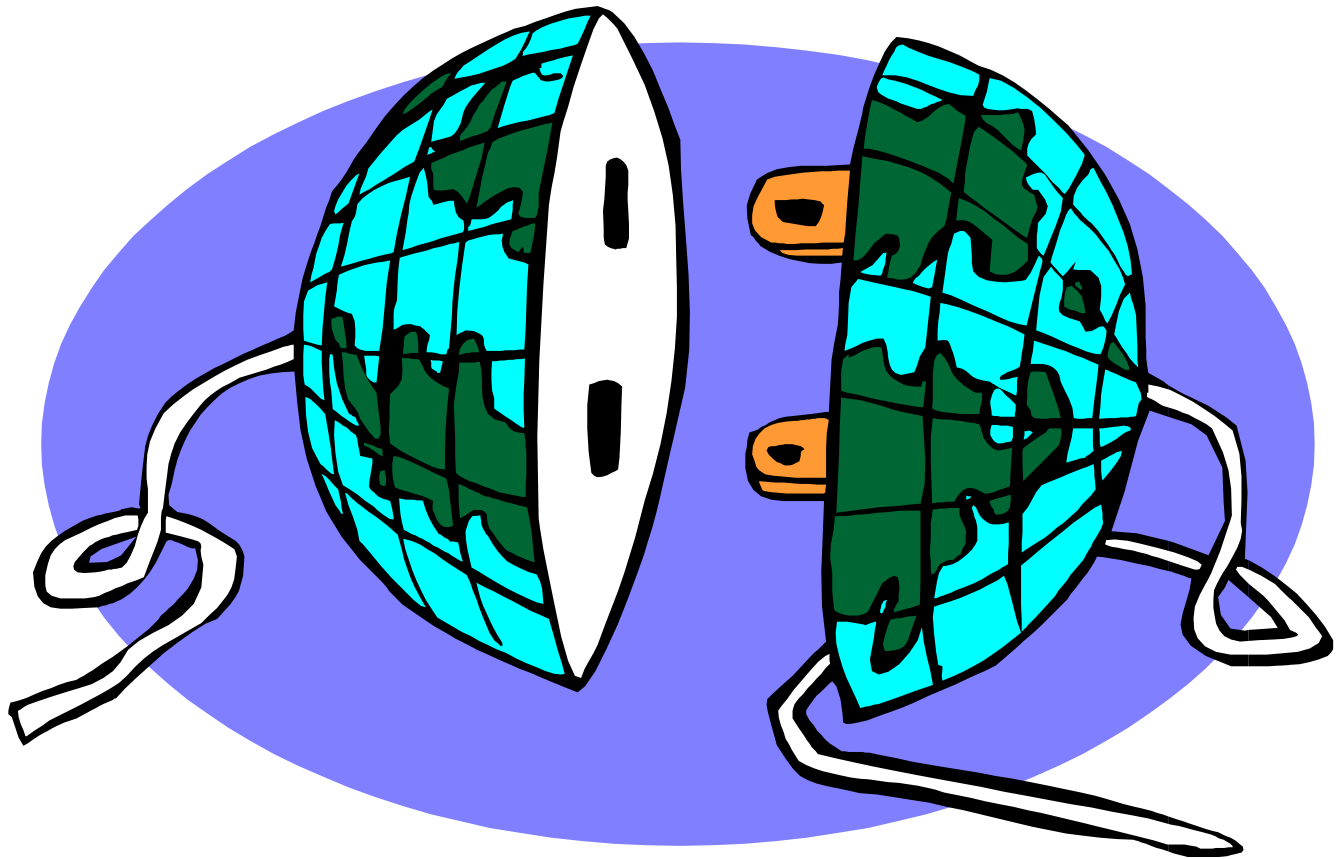
- The Gatekeeper is an *optional* component in the H.323 system which is primarily used for admission control and address resolution
- The gatekeeper may allow calls to be placed directly between endpoints or it may route the call signaling through itself to perform functions such as follow-me/find-me and forward on busy

Border Elements and Peer Elements



- Peer Elements, which are often co-located with a Gatekeeper, exchange addressing information and participate in call authorization within and between administrative domains
- Peer Elements may aggregate address information to reduce the volume of routing information passed through the network
- Border Elements are a special type of Peer Element that exists between two administrative domains
- Border Elements may assist in call authorization/authentication directly between two administrative domains or via a clearinghouse

The Protocols



The Protocols (cont)

- H.323 is a “framework” document that describes how the various pieces fit together
- H.225.0 defines the call signaling between endpoints and the Gatekeeper
- RTP/RTCP (RFC 3550) is used to transmit media such as audio and video over IP networks
- H.225.0 Annex G and H.501 define the procedures and protocol for communication within and between Peer Elements
- H.245 is the protocol used to control establishment and closure of media channels within the context of a call and to perform conference control

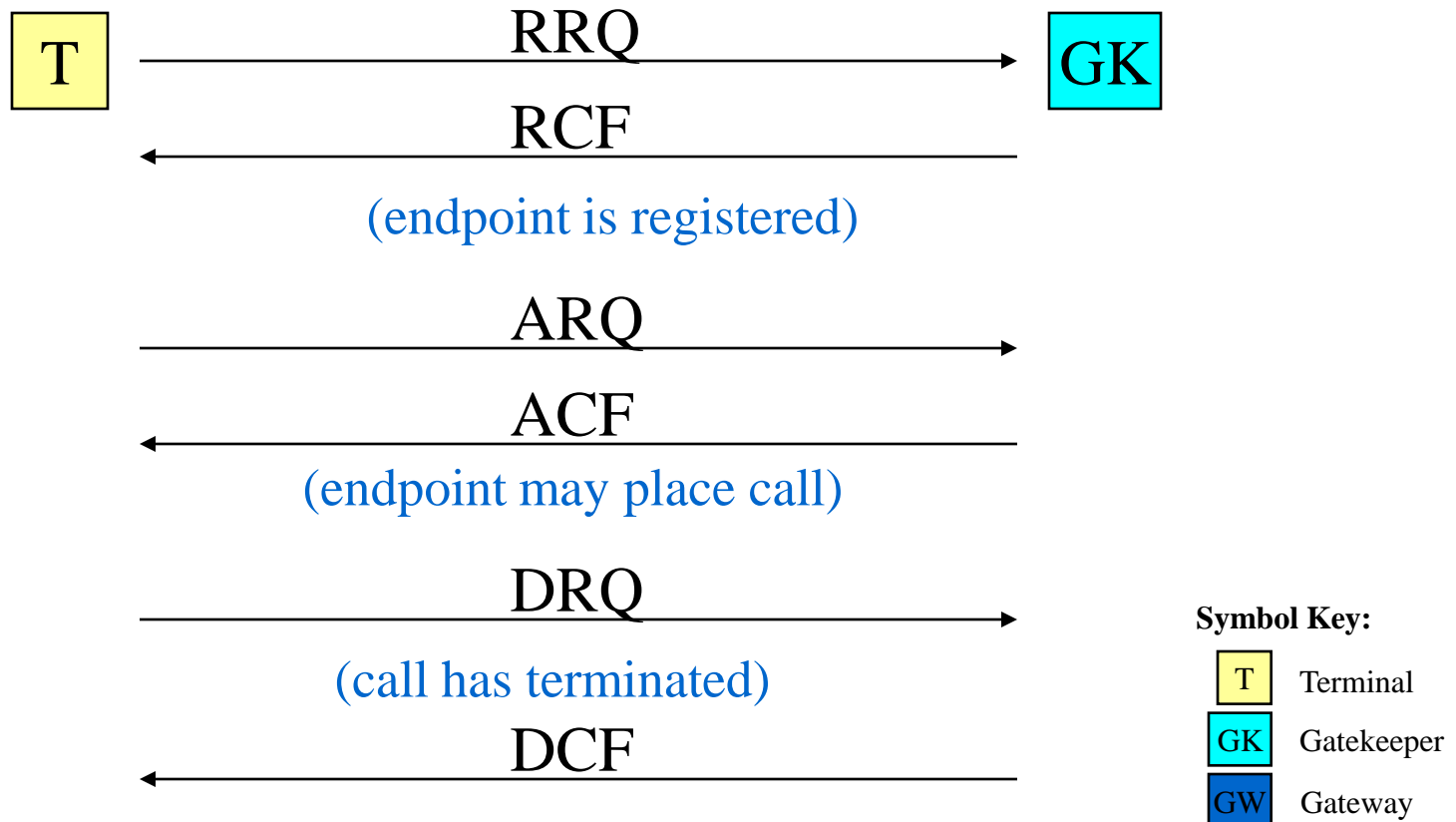
The Protocols (cont)

- H.450.x is a series of supplementary service protocols
- H.460.x is a series of version-independent extensions to the base H.323 protocol
- T.120 specifies how to do data conferencing
- T.38 defines how to relay fax signals
- V.150.1 defines how to relay modem signals
- H.235 defines security within H.323 systems
- X.680 defines the ASN.1 syntax used by the Recommendations
- X.691 defines the Packed Encoding Rules (PER) used to encode messages for transmission on the network

Registration, Admission, and Status - RAS

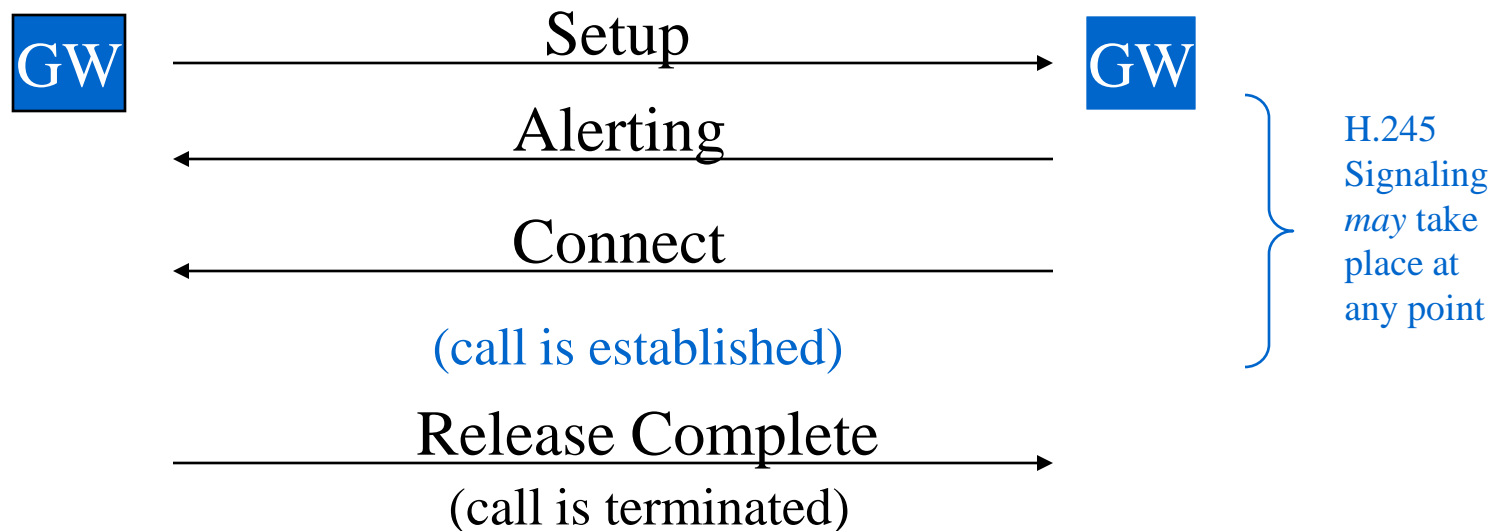
- Defined in H.225.0
- Allows an endpoint to request authorization to place or accept a call
- Allows a Gatekeeper to control access to and from devices under its control
- Allows a Gatekeeper to communicate the address of other endpoints
- Allows two Gatekeepers to easily exchange addressing information

Registration, Admission, and Status – RAS (cont)



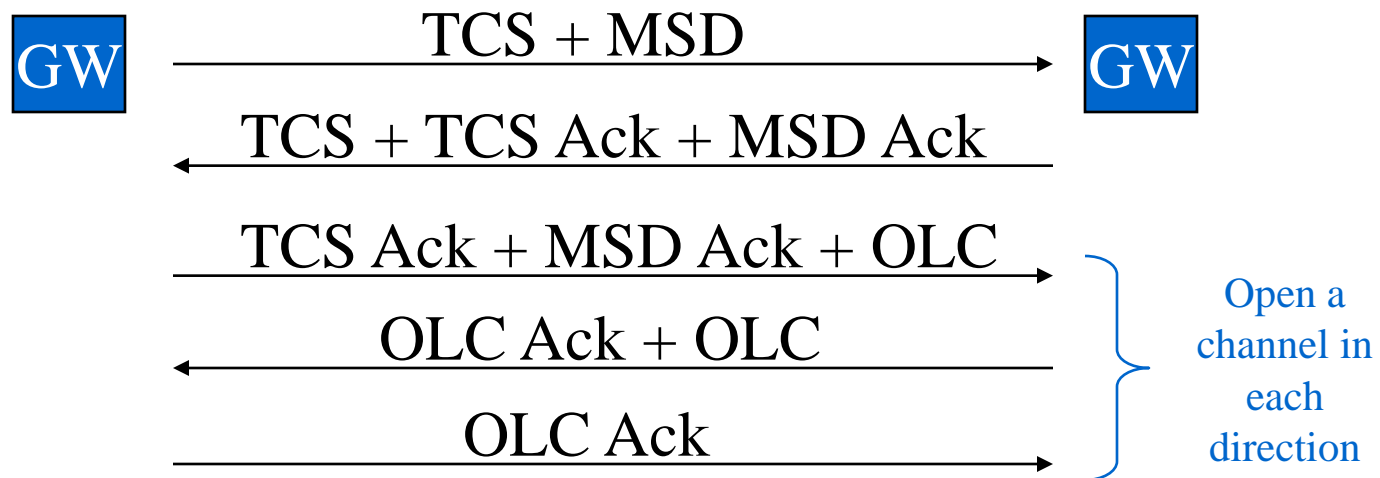
H.225.0 Call Signaling

- Allows an endpoint to initiate and terminate a call with another endpoint



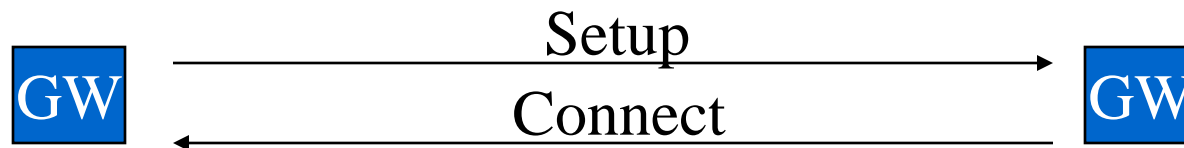
H.245 Signaling

- H.245 is used to negotiate capabilities and to control aspects of the conference between two or more endpoints

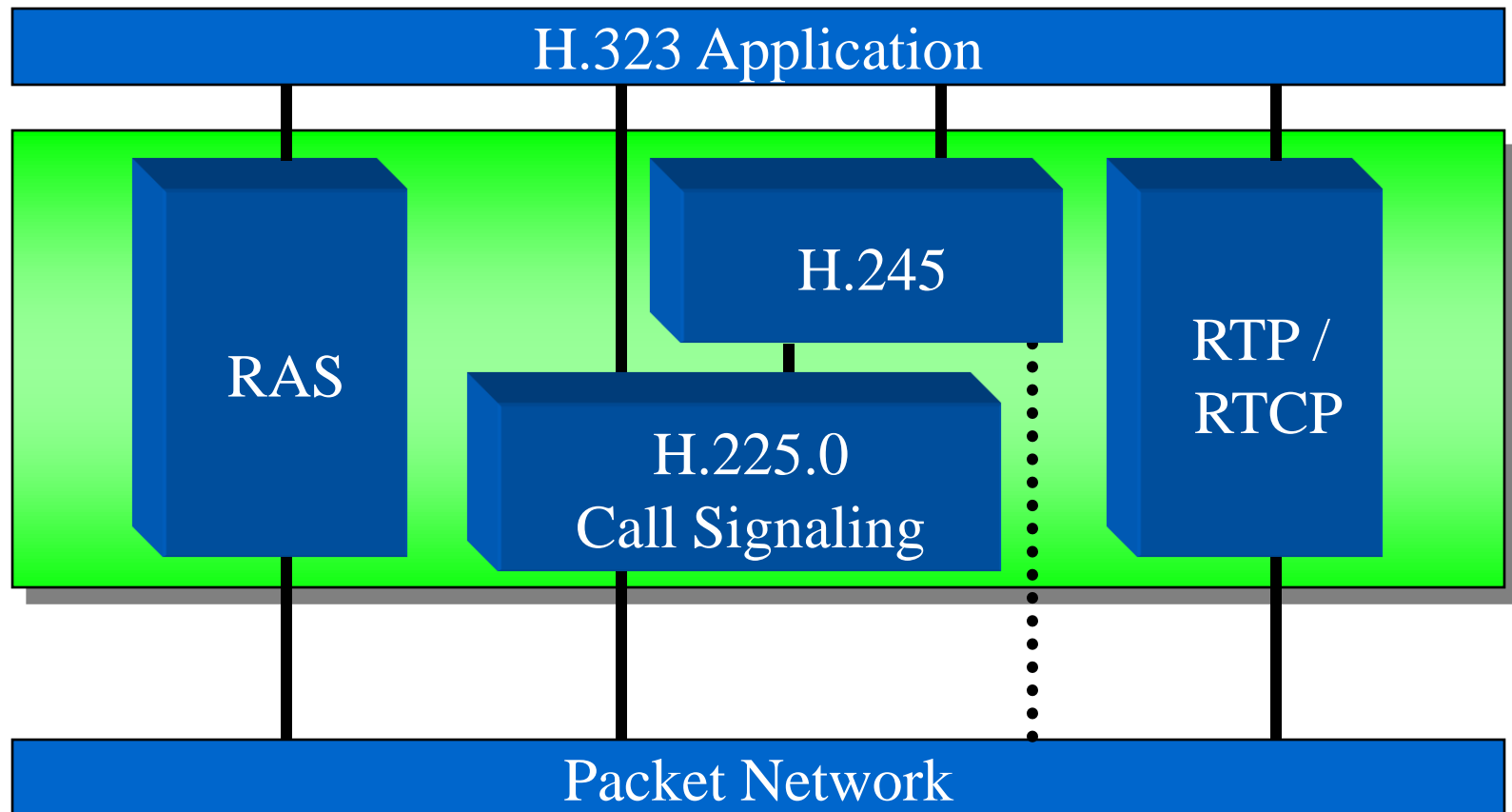


Fast Connect and H.245

- Some H.323 calls do not utilize the rich capabilities offered by H.245 and simply media channels using the “Fast Connect” procedures
- In this mode, a call may be established with as few as two messages (Setup / Connect)



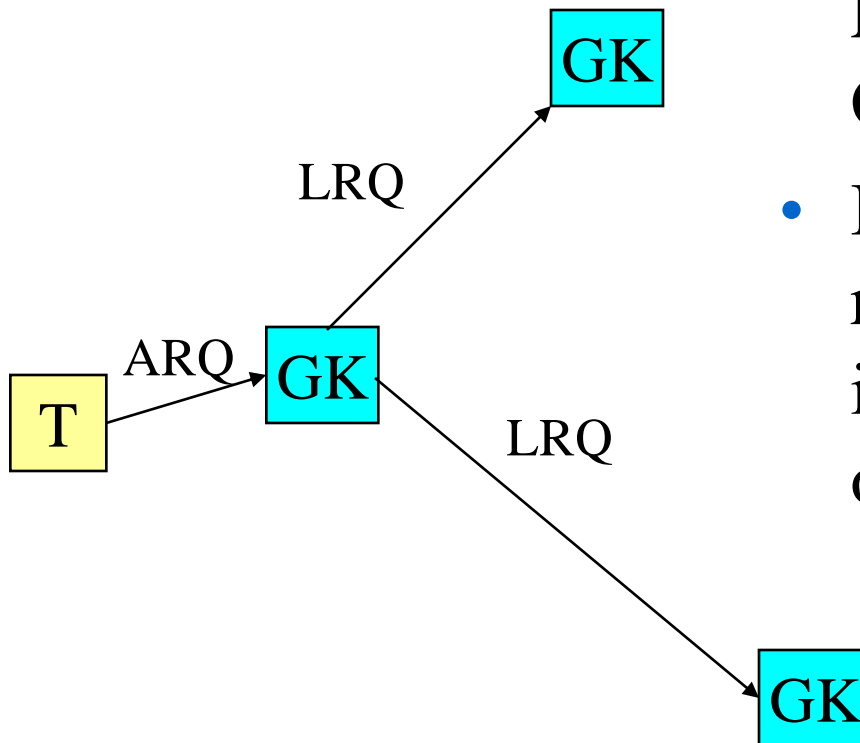
An H.323 Stack



Resolving Addresses

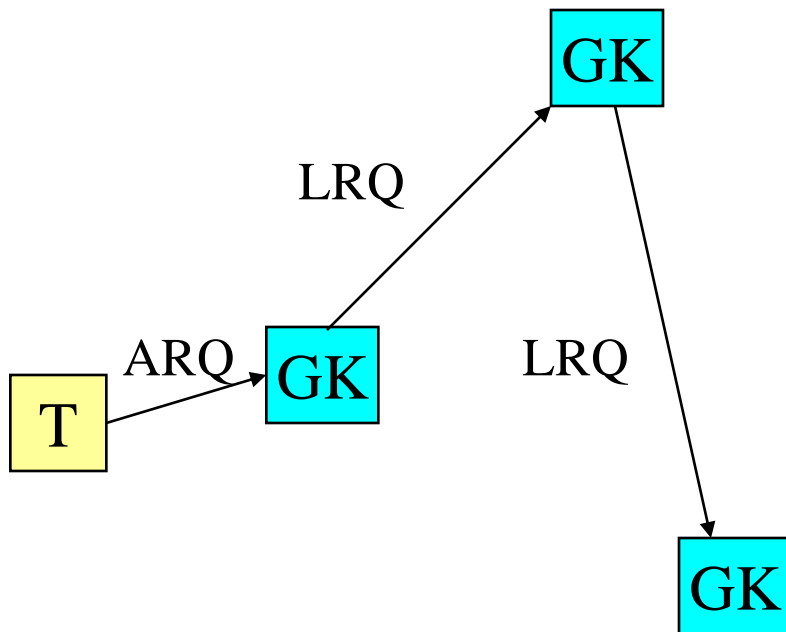
- A Gatekeeper may resolve addresses in a number of ways
 - Sending a Location Request (LRQ) message to another Gatekeeper
 - Accessing a Peer Element
 - Accessing a back-end database (e.g., LDAP)
- Gatekeepers and Peer Elements may query other Gatekeepers and Peer Elements and may exchange address information outside the context of a call
- Since a Gatekeeper is not required, endpoints may resolve addresses themselves using, for example, DNS, LDAP, or a local “phonebook” containing static IP addresses

Using LRQs



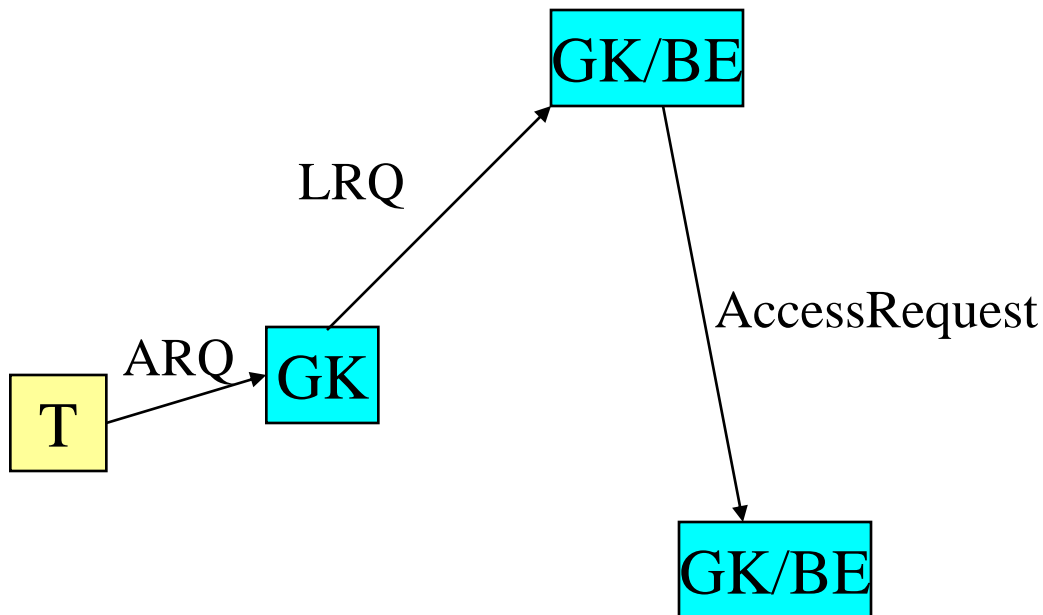
- A Gatekeeper may send an LRQ to one or more Gatekeepers
- It may accept any LCF response and utilize that information to satisfy the original ARQ

Using LRQs with Hierarchical Gatekeepers (cont)



- A Gatekeeper may forward an LRQ received on to another Gatekeeper in order to resolve the address
- The response may be directed back to the originating Gatekeeper or the intermediate Gatekeeper

Using a Border Element



- As with hierarchical Gatekeepers, Border Elements may send `AccessRequest` messages to other Border Elements and indicate where to send a reply
- Border Elements may also reply directly to a request by utilizing address information cached from previous exchanges with other Border Elements

H.323 Features



Advanced Videoconferencing

- Supports advanced videoconferencing features, including
 - Cascading MCUs
 - MCU control over audio and video mixing
 - Chair control
 - Far-end camera control

Supplementary Services

- Standard mechanisms to provide a variety of services, including
 - Call transfer
 - Call forward
 - Call park/pick-up
 - Call Hold
 - Call Waiting
 - Message Waiting Indication
 - Call Completion on Busy / No-Answer
 - Call Intrusion
- Support for HTTP-based service control (H.323 Annex K)

Dynamic Routing and Re-Routing

- Gatekeeper may provide multiple “routes” to a destination, including information such as:
 - Multiple destination addresses
 - Alternate “source” alias information
 - Source and destination circuit information
- H.460.8 allows an endpoint to re-query the gatekeeper for an alternate route in the event that the primary route is unavailable

Addressing

- Supports URLs, including the “h323” URL and “tel” URLs
- Supports dialed digits from a traditional telephone
- Supports various numbering types used in the PSTN

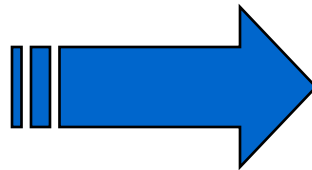
QoS

- H.460.9 allows an endpoint to report Quality of Service information to the Gatekeeper, aiding in determine how to route calls
- H.323 devices may utilize IETF standards for providing quality of service, including DiffServ and RSVP

Miscellaneous Capabilities

- Device Diagnostics: H.323 allows testing equipment to place “test calls” to a device and establish “media loops” in order to measure packet loss and delay
- Emergency Services
 - H.323 devices may indicate the priority of a call
 - Emergency call centers have the wherewithal to control how and when a call is released
- Support for user, terminal, and service mobility (H.510)
- Ability to tunnel any legacy protocol

On to Next Generation Network

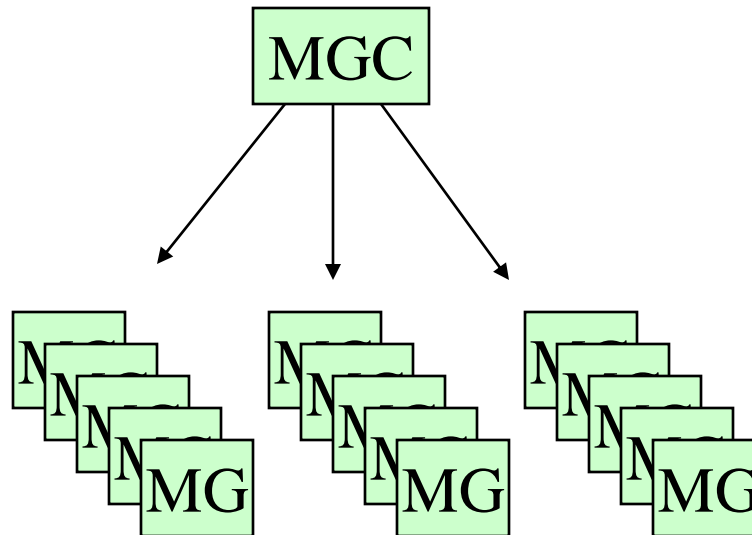


Scalability

- H.323 allows calls to be routed directly between endpoints without the need for an intermediate entity that maintains call state
- Ability to utilize network services for address resolution, including ENUM, LDAP, and DNS

Gateway Decomposition

- H.248.1 defines how to decompose an H.323 gateway into a Media Gateway Controller and one or more Media Gateways



Robustness

- Alternate gatekeepers
- Mechanisms for “failing over” to an alternate softswitch or other routing entity (H.323 Annex R)

Re-Routing Active Calls (H.460.15)

- Useful to allow “**session border controllers**” to participate in initial call setup (e.g., manipulate source or destination addresses) and then exit the call signaling path
- Allows devices to participate in signaling only when there is a need to exchange messages during a call (often only the beginning and the end of a call)

Flexibility

- Voice over IP (or any packet-based network)
- Videoconferencing
- Support for T.120 data conferencing
- Support for real-time text communication
- Support for fax and modem relay

Multimedia

- The most important aspect of the Next Generation Network is the ability to communicate in new ways
- Video will be a very important component
- H.323 has very strong support for video
- H.323 and T.120 allow users to work side by side on a document using voice, video, text, and application sharing technologies
- H.323 is “multimedia over IP”, ushering in the Next Generation Network that users are seeking



