



A resource for packet-switched
conversational protocols

Introduction to H.323

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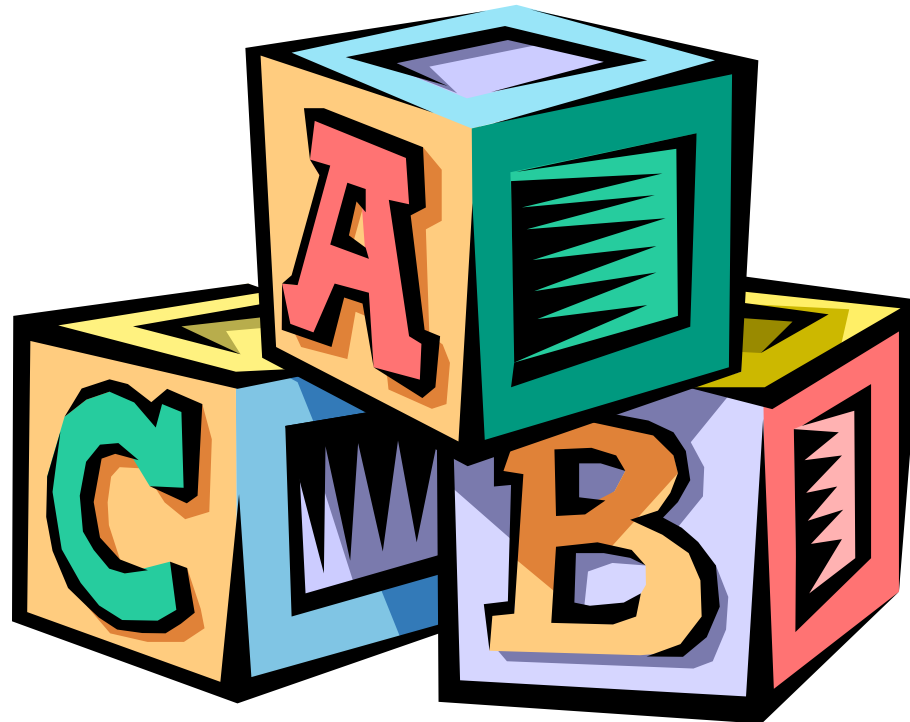
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Topics Covered

- The Basics of H.323
- The Protocols
- Past to Present
- H.323 Version 4
- The Future

NOTE: Acronyms used in this presentation are shown at the end for reference

The Basics of H.323



What is H.323?

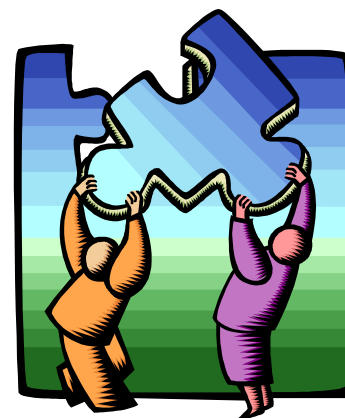
- H.323* is a multimedia conferencing protocol, which includes voice, video, and data conferencing, for use over packet-switched networks

* 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

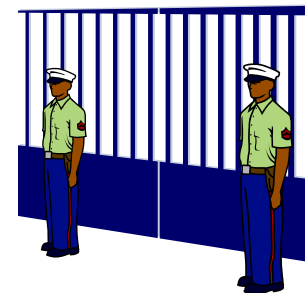


Gateways



- 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, other H.323 networks (proxy), etc.

Gatekeeper



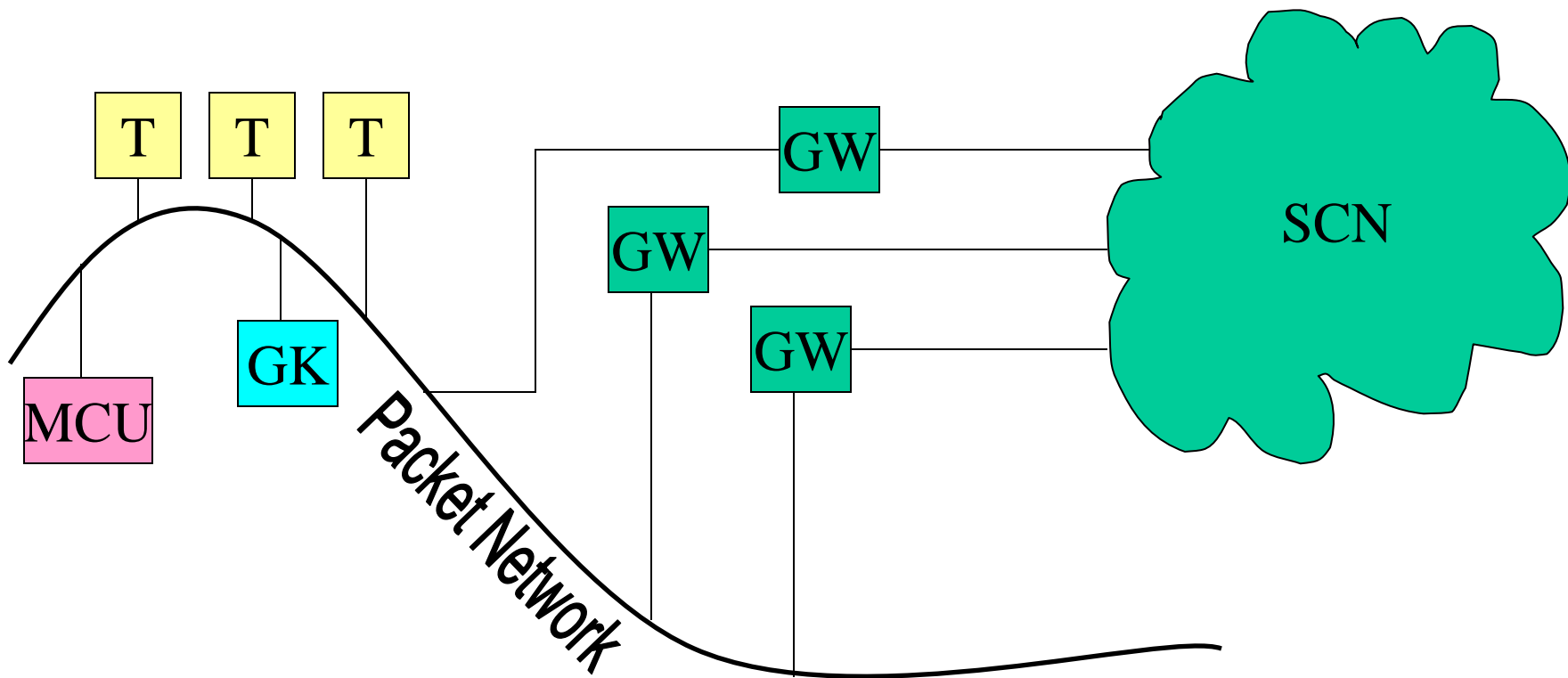
- The Gatekeeper is an *optional* component in the H.323 system which is used for admission control and address resolution
- The gatekeeper may allow calls to be placed directly between endpoints or it may route the call signaling through itself to perform functions such as follow-me/find-me, forward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

Border Elements

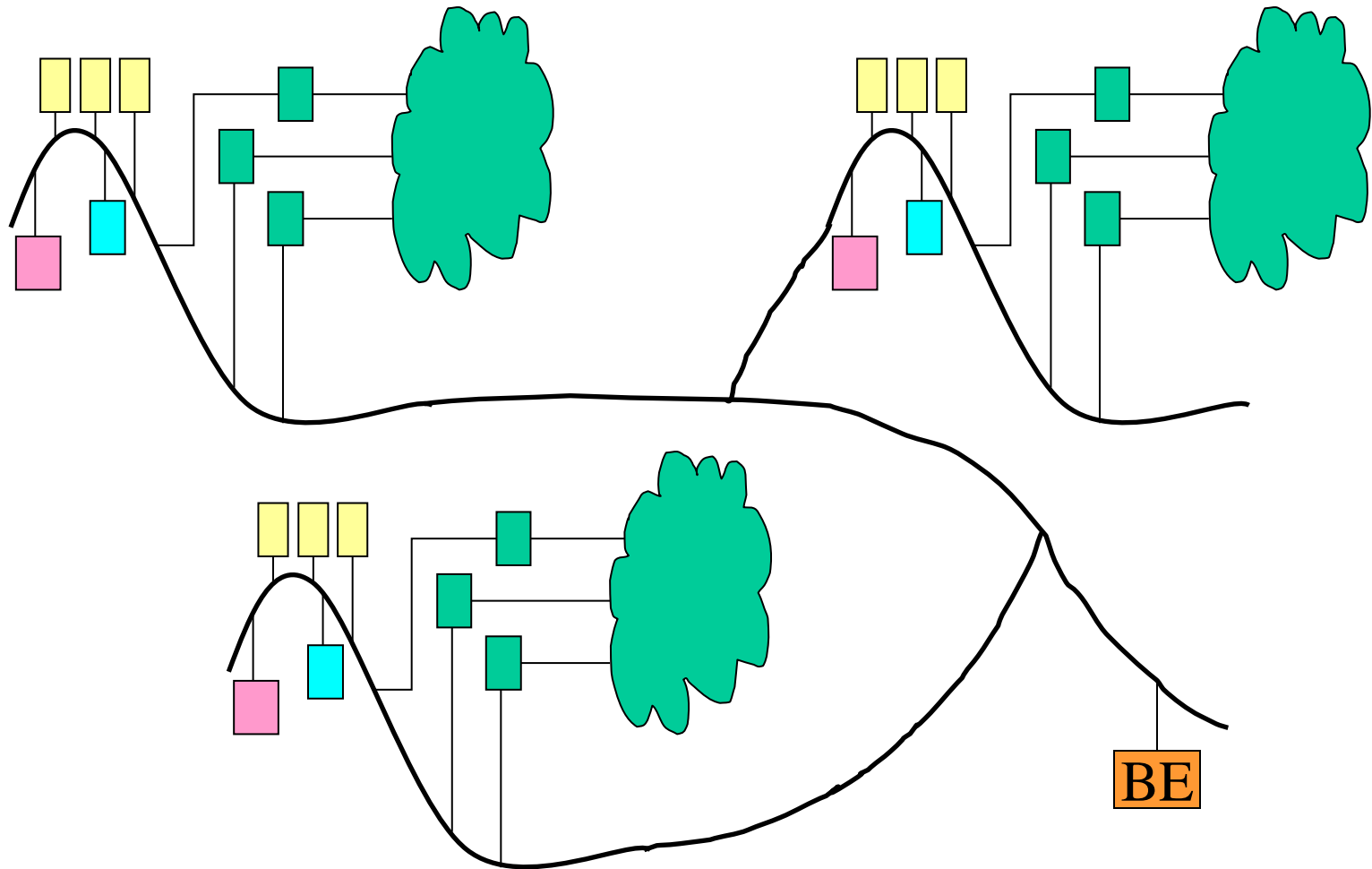


- Border Elements, which are often co-located with a Gatekeeper, exchange addressing information and participate in call authorization between administrative domains
- Border Elements may aggregate address information to reduce the volume of routing information passed through the network
- Border elements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

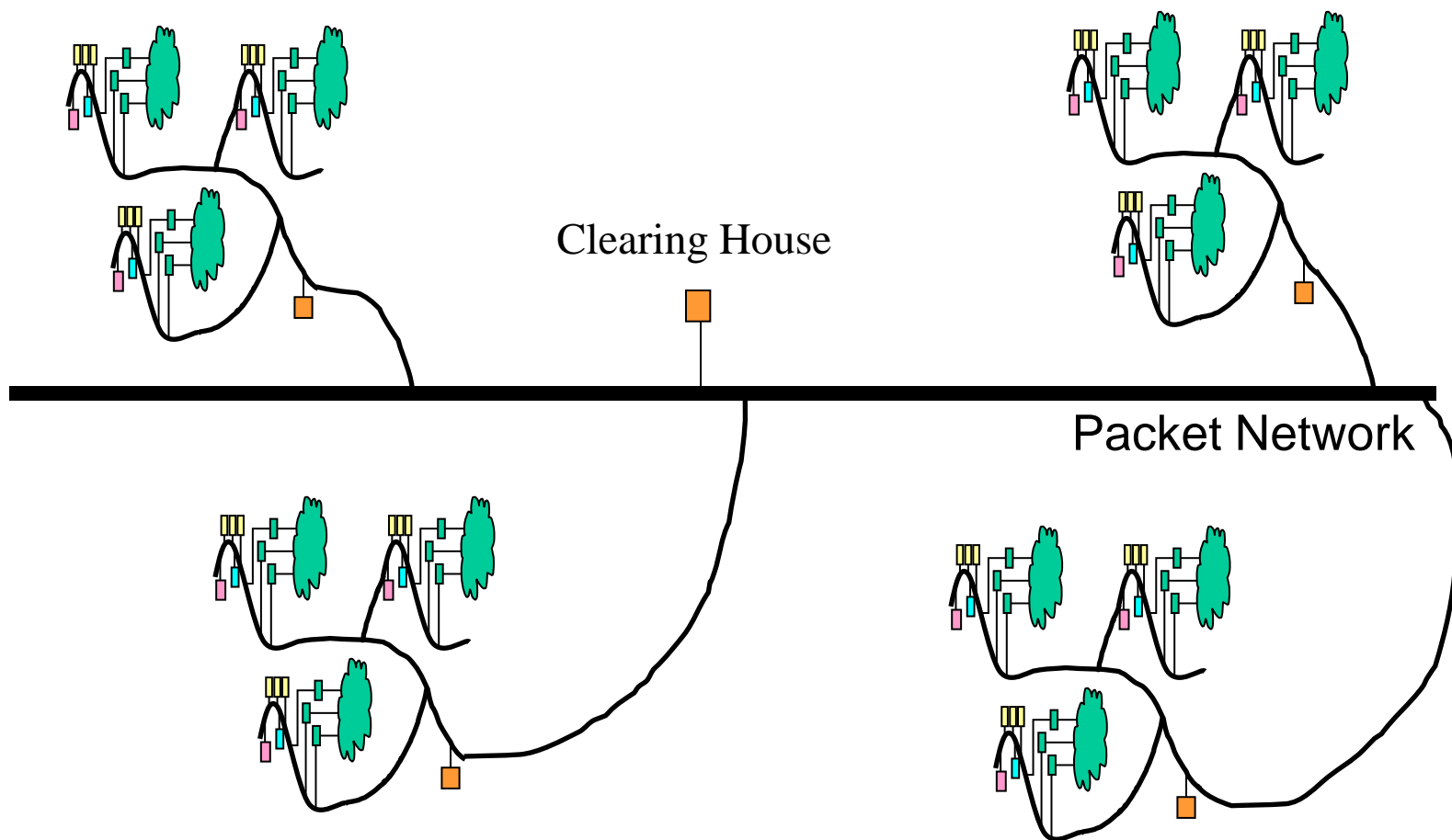
The Zone



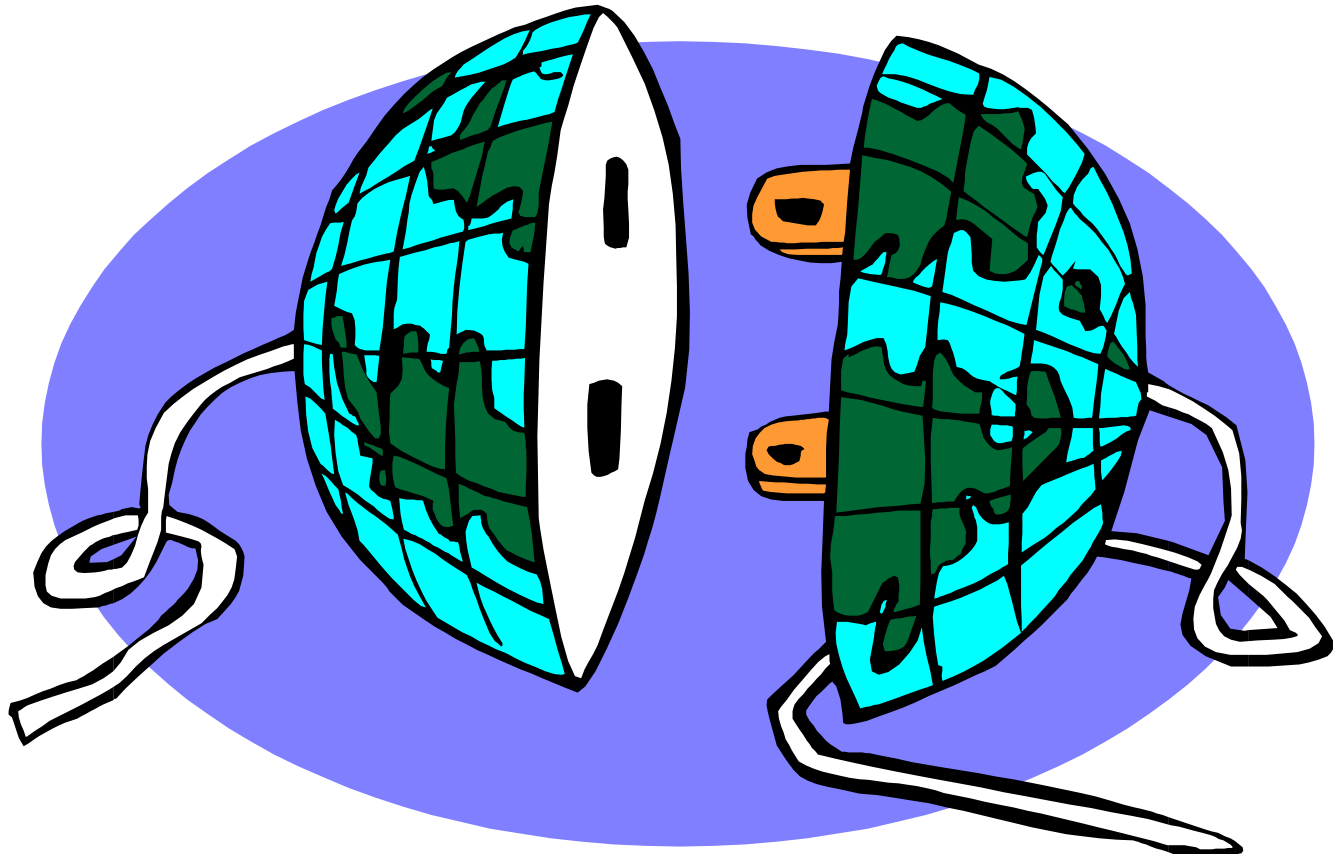
A Single Administrative Domain



Multiple Administrative Domains



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 and communication between endpoints (Call Signaling) and the Gatekeeper (RAS)
- Annex G/H.225.0 defines communication between Border Elements
- H.245 is the conference control protocol

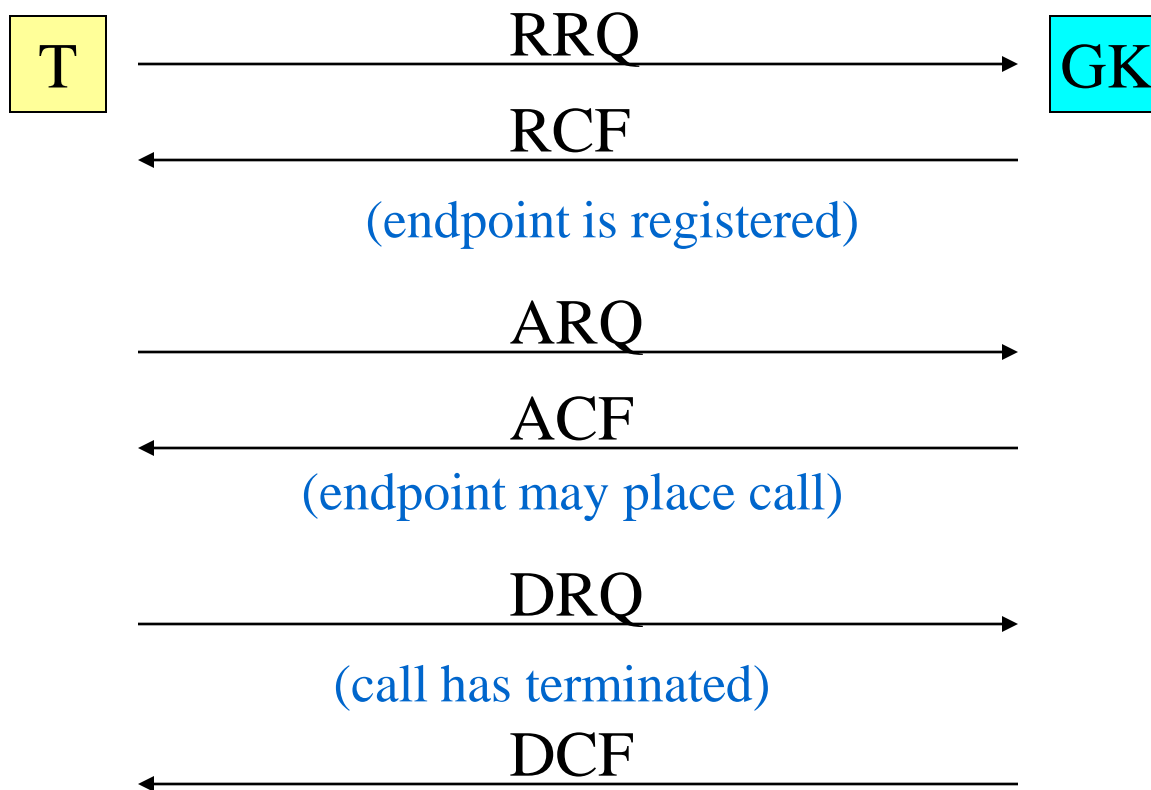
The Protocols (cont)

- RTP/RTCP is used for audio and video
- H.450.x is a series of supplementary service protocols
- T.120 specifies how to do data conferencing
- 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

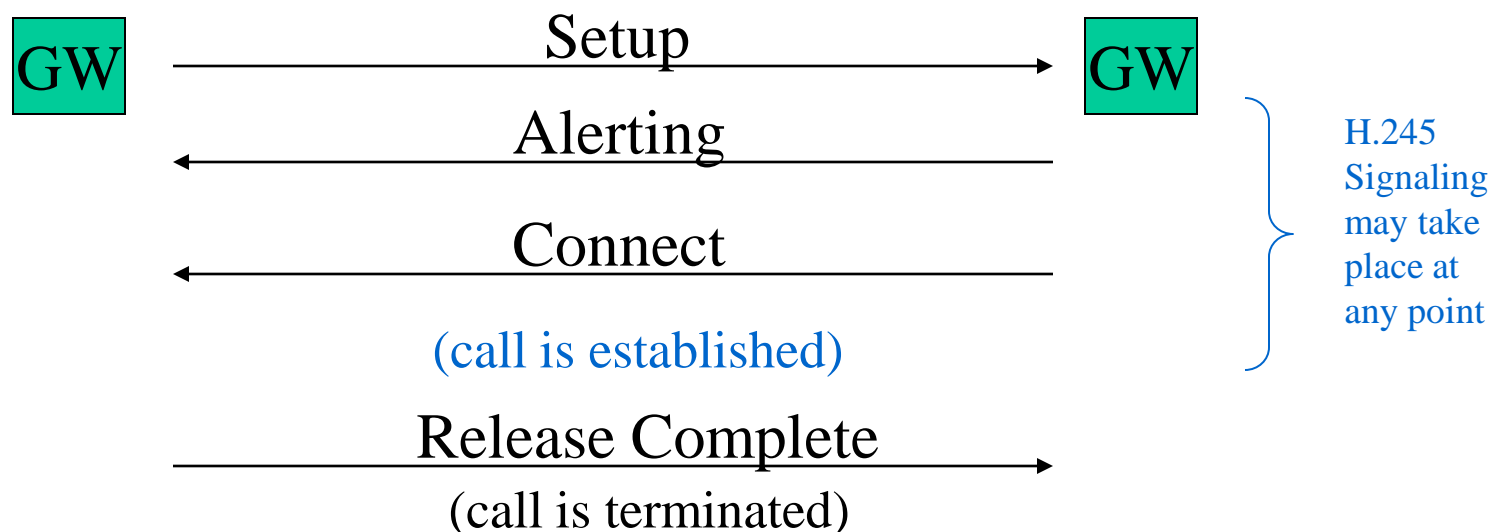
- Allows an endpoint to request authorization to place or accept a call
- Allows a Gatekeeper to control access into out of the Zone
- Allows the Gatekeeper to communicate the address of other endpoints

Registration, Admission, and Status – RAS (cont)



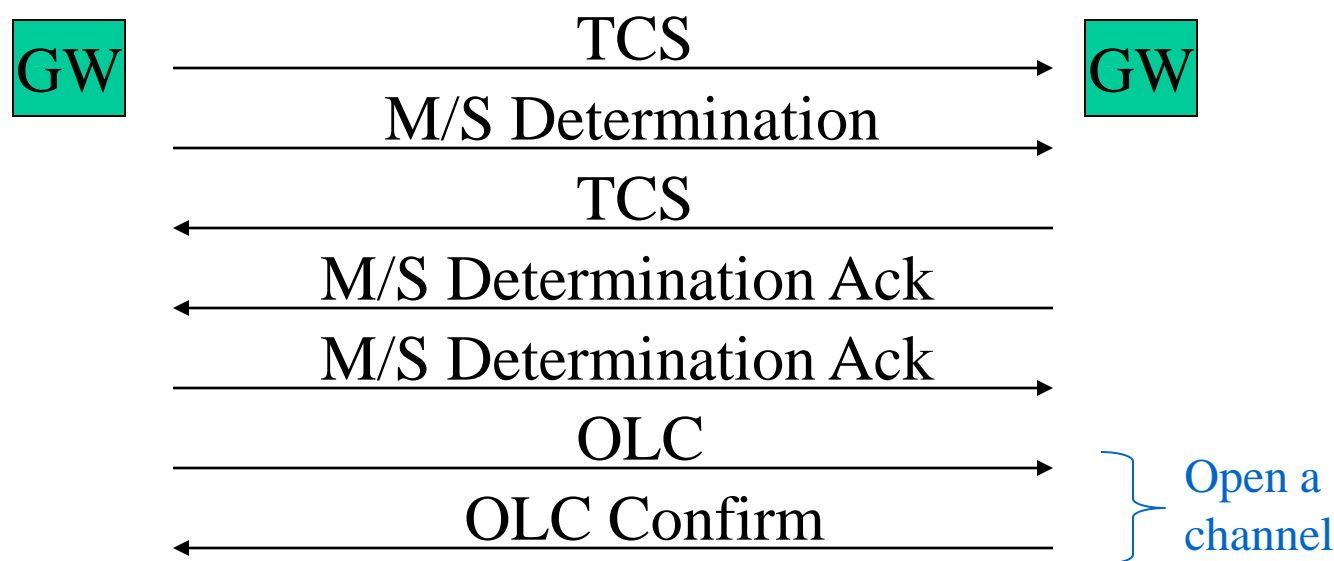
H.225.0 Call Signaling

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

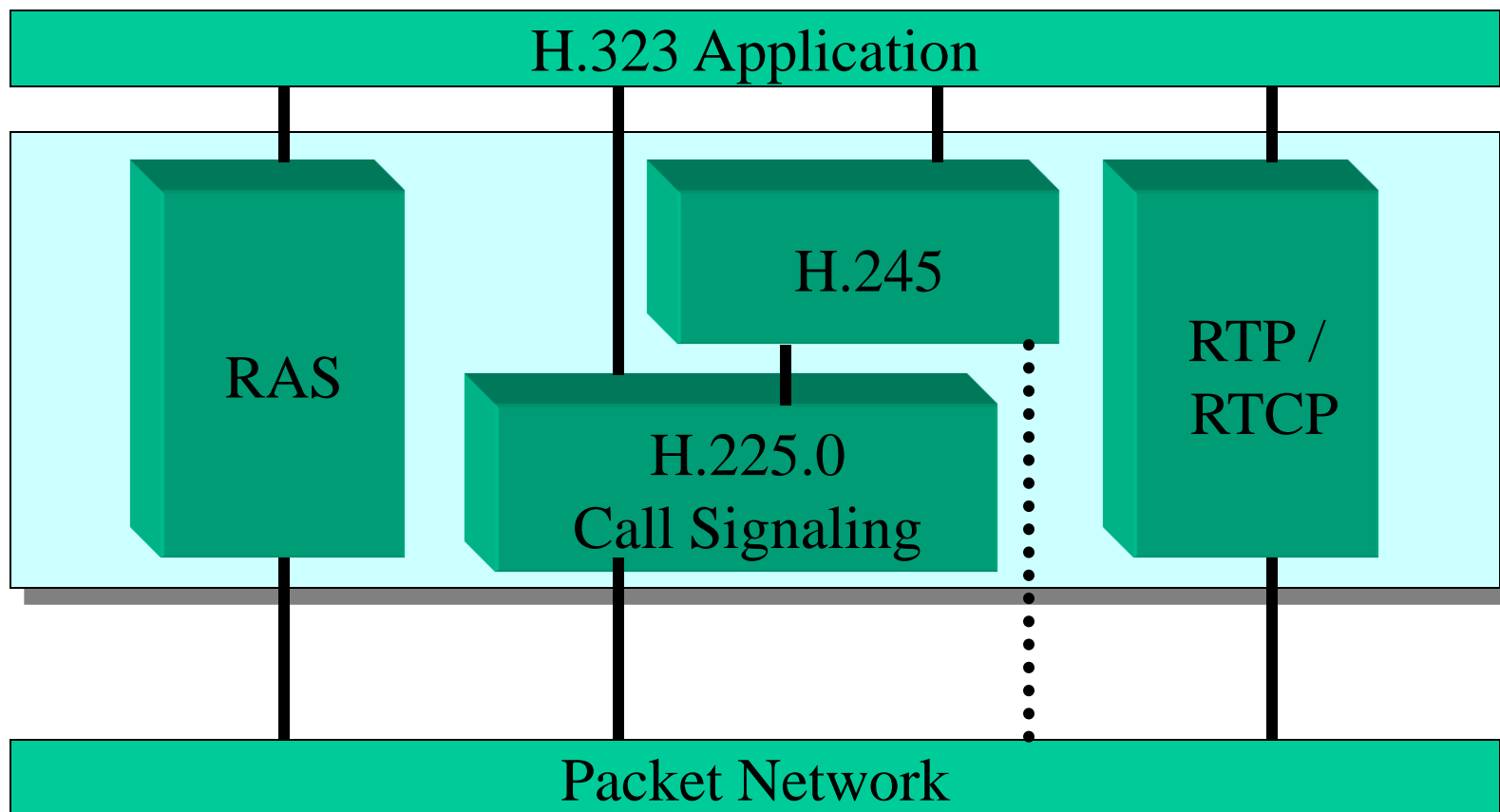


H.245 Signaling

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



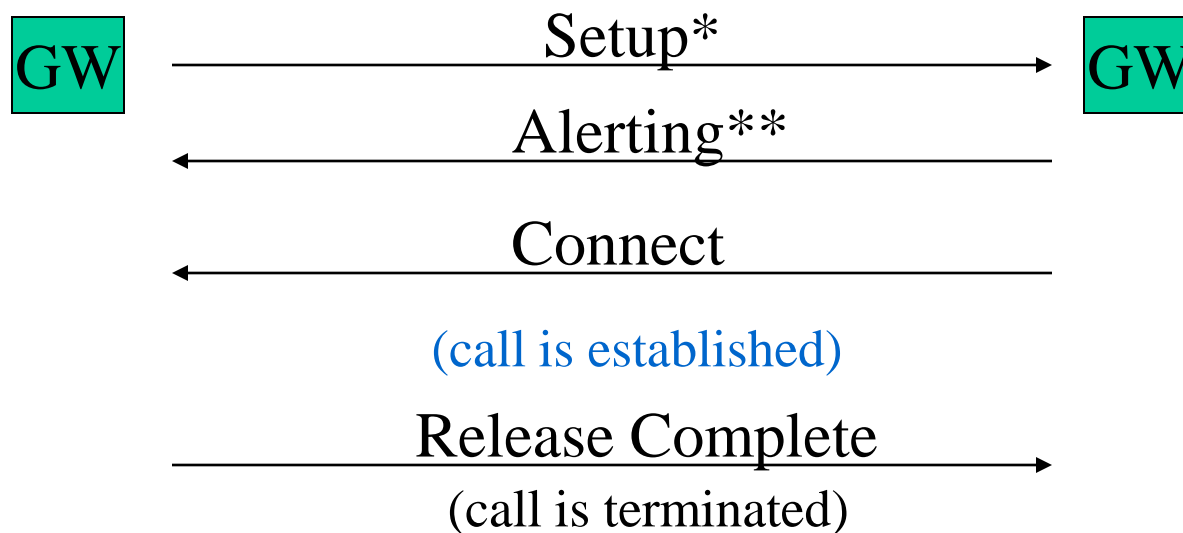
An H.323 Stack



Fast Connect

- Fast Connect is a procedure introduced to speed up connections by proposing channels in the Setup, rather than going through the H.245 procedures
- For most point to point calls that use Fast Connect, H.245 is only necessary for DTMF relay

Fast Connect (cont)

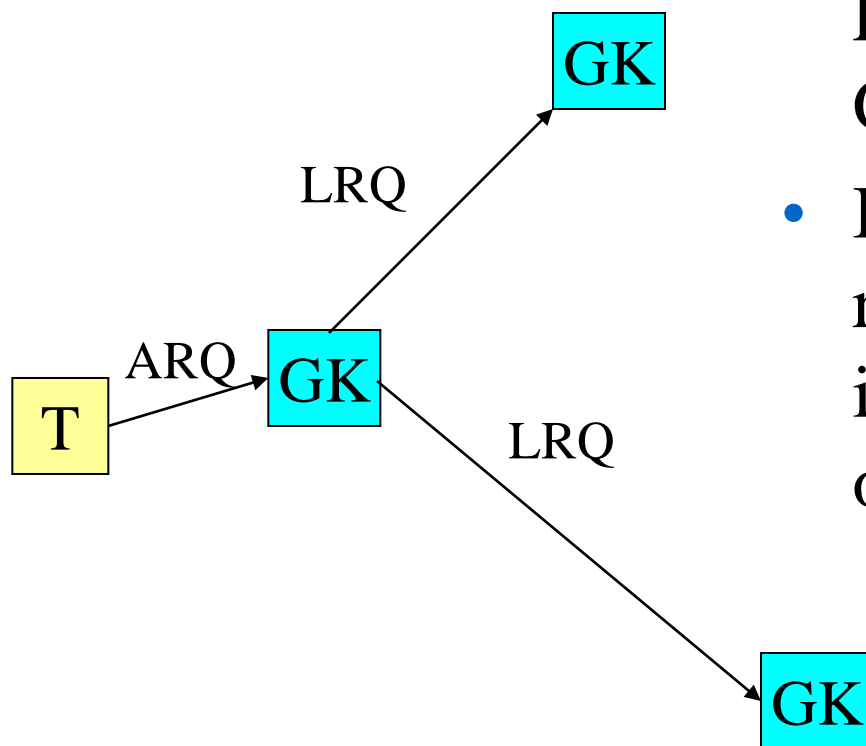


- * The Setup message will contain channel proposals (OLCs)
- ** The Call Proceeding, Alerting, Connect or other messages from called endpoint will contain accepted proposals or an explicit rejection

Resolving Addresses

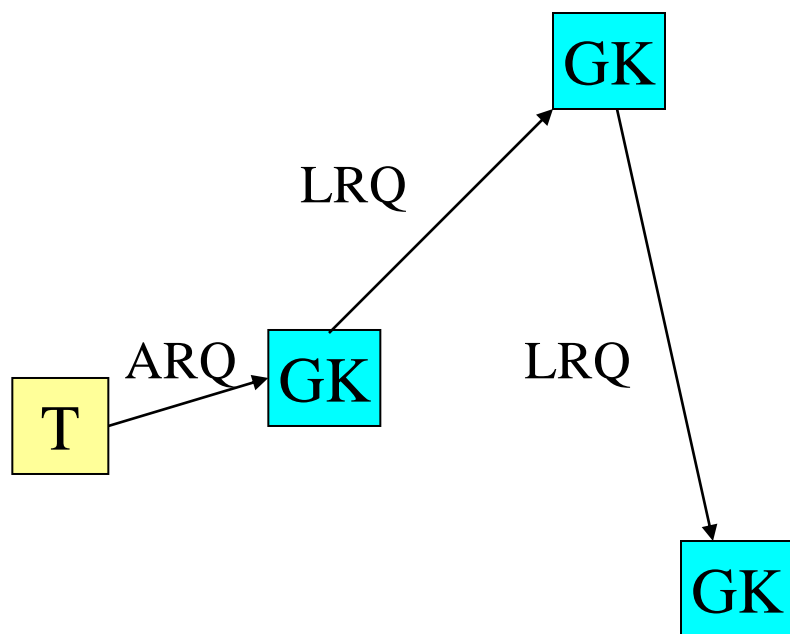
- A Gatekeeper may resolve addresses in a number of ways
 - Sending an Location Request (LRQ) messages to another Gatekeeper
 - Accessing a BE (often co-located)
 - Accessing a database
- Border Elements may query other border elements and may exchange address information outside the context of a call

Using LRQs



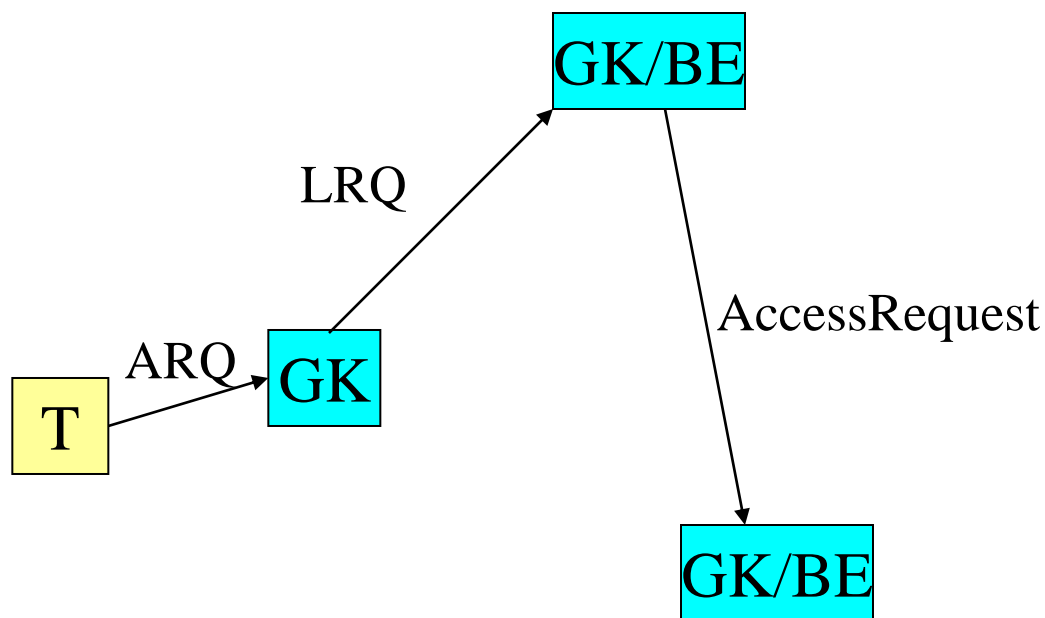
- A Gatekeeper may send an LRQ to one or more Gatekeepers
- It may accept any LCF response and utilize that information to satisfy the original ARQ

Using LRQs with Hierarchical Gatekeepers (cont)



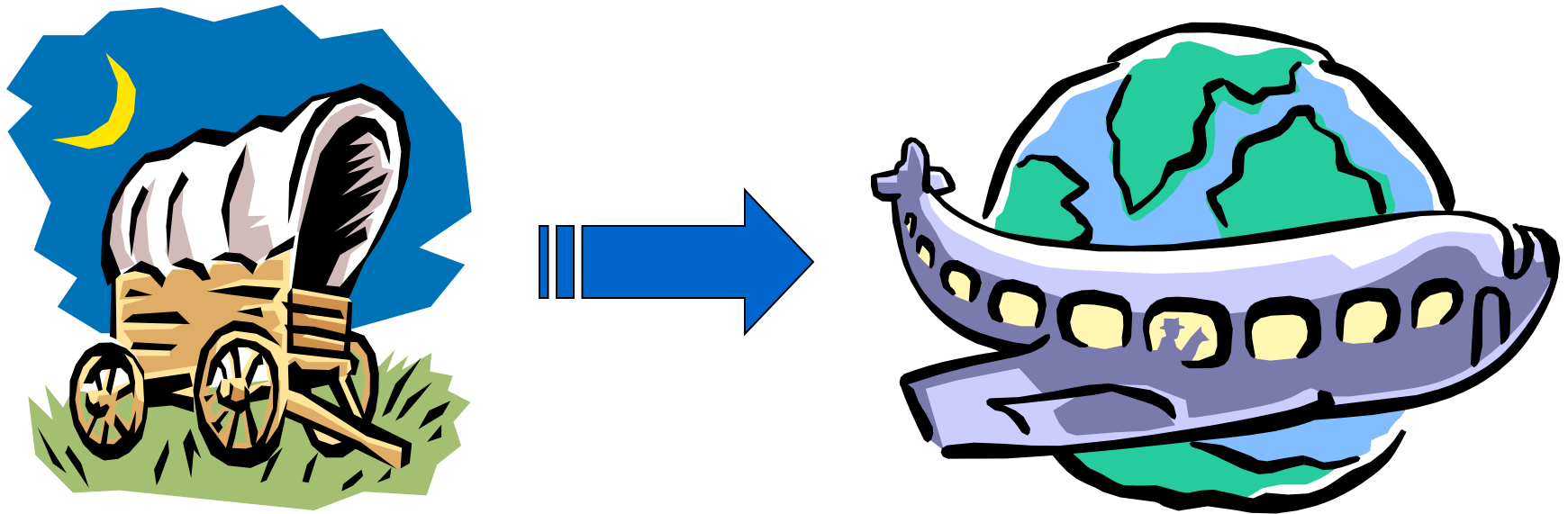
- A Gatekeeper may forward an LRQ received on to another Gatekeeper in order to resolve the address
- The response may be directed back to the originating Gatekeeper or the intermediate Gatekeeper

Using a Border Element



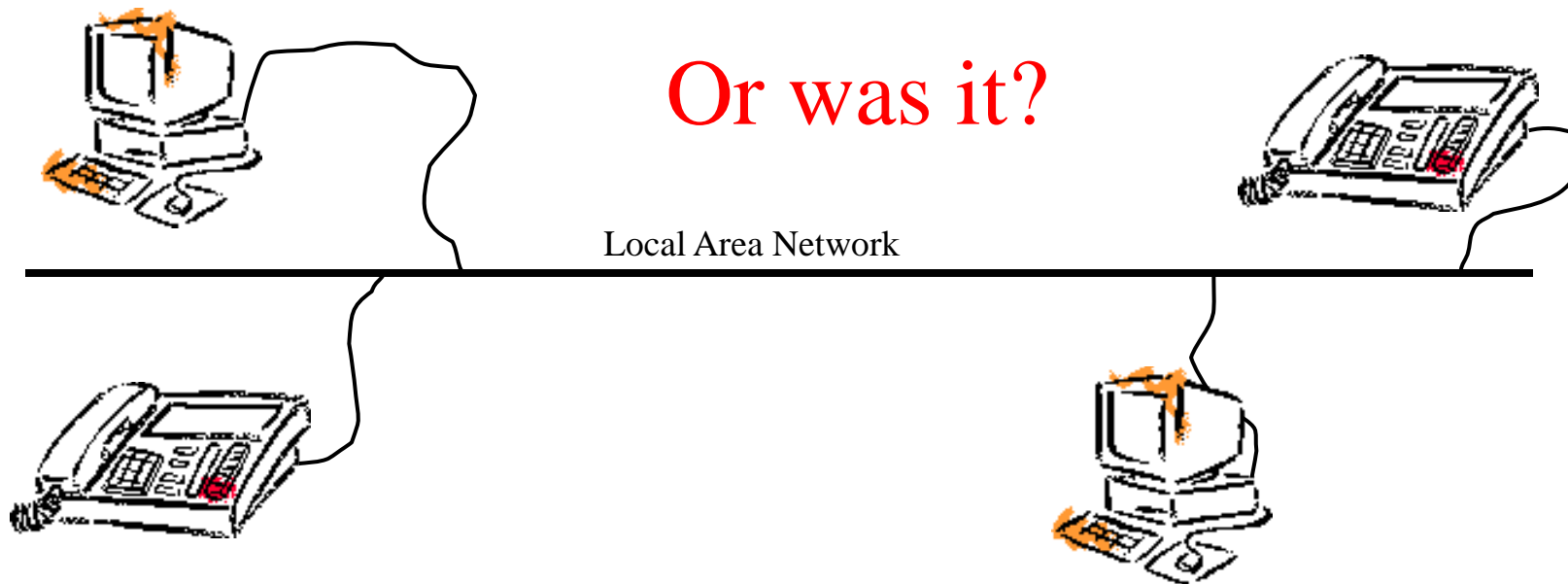
- As with hierarchical Gatekeepers, Border Elements may send `AccessRequest` messages to other Border Elements and indicate where to send a reply
- Border Elements may also reply directly to a request by utilizing address information cached from previous exchanges with other Border Elements

Past to Present



Past to Present

- The first version of H.323 protocol was published in 1996 and was “designed for local area networks”



Past to Present

- The first thing companies tried to do was use H.323 in wide area networks, large private VoIP networks, and the Internet
 - Guess what?
 - It worked very well



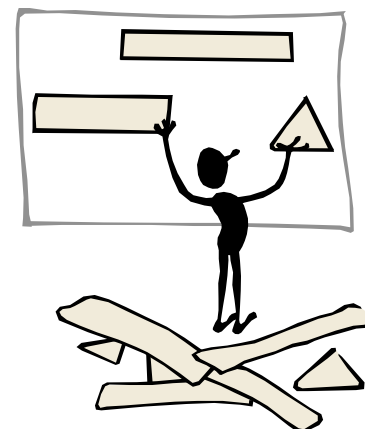
Past to Present

- H.323 was an early adopter of such IETF protocols as RTP, which proved its ability to carry real-time audio and video over IP networks that span the globe
- Indeed, H.323 was much more than a LAN protocol



Past To Present

- Recognizing the fact that H.323 was much more than a LAN protocol, the name was changed in H.323 Version 2 (1998)
- Enhancements were made, including:
 - Security
 - Performance
 - Supplementary Services
 - Scalability



Past to Present

- H.323 version 3 introduced a few modest improvements, mostly geared for better PSTN integration and scalability
- New annexes were introduced:
 - Annex E/H.323 – UDP signaling
 - Annex F/H.323 – Simple endpoint type
 - Annex G/H.225.0 – Communication between administrative domains

H.323

Version 4

H.323 Version 4

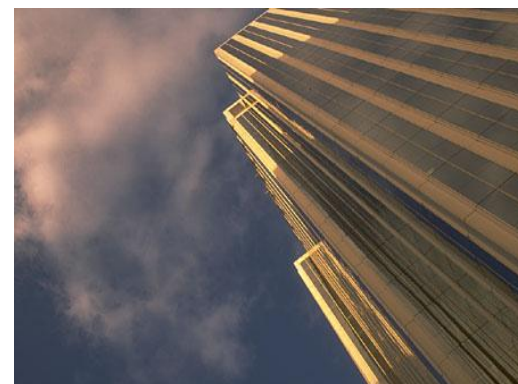
- H.323 version 4 was approved November 17, 2000 and brings a number of enhancements to H.323. Areas of focus include:
 - Scalability
 - Services
 - “Must Have” Features
 - Generic Extensibility Framework



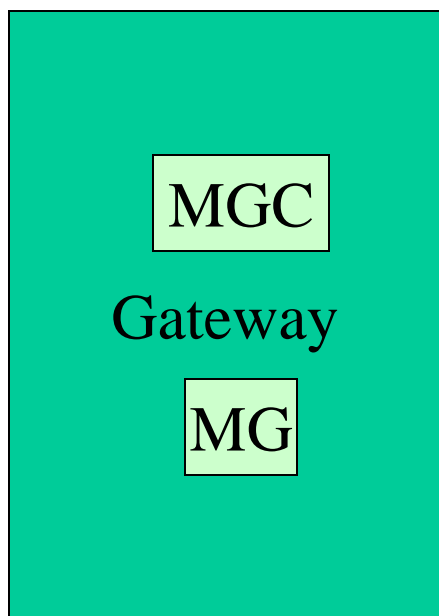
Scalability

- Gateway decomposition with H.248
- Additive Registrations
- Alternate Gatekeepers*
- Endpoint Capacity Reporting

* Code points for alternate gatekeepers were first introduced in H.323v2, but not documented. H.323 version 4 fully defines the procedure.

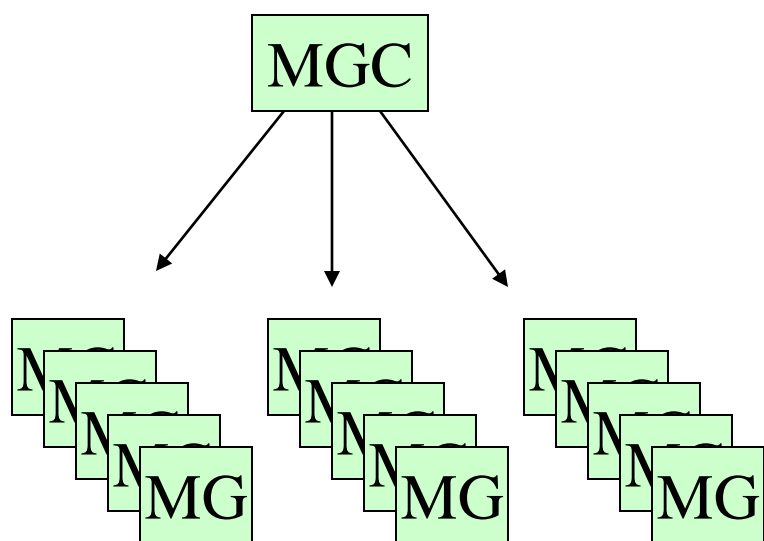


The Composite Gateway



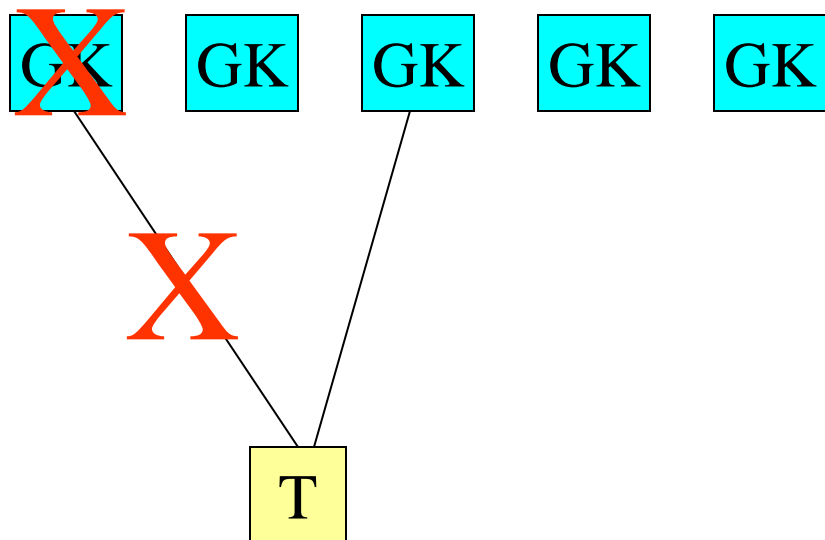
- Traditional Gateways were designed in such a way that both media and call control were handled by the same box
- The two components are referred to as the Media Gateway Controller (MGC) and Media Gateway (MG)

The Decomposed Gateway



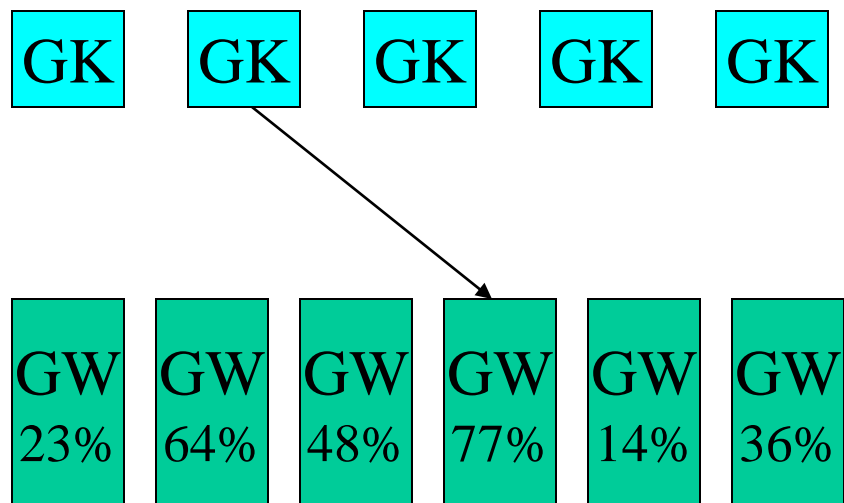
- The decomposed Gateway separates the MGC function and the MG function
- Multiple MGs may exist to allow the Gateway to scale to support much more capacity than a composite Gateway
- Communication between the MGC and MGs is done through H.248

Alternate Gatekeepers



- By using Alternate Gatekeepers, endpoints are able to continue functioning in the face of one or more failures
- *Never Lose a Call!*

Endpoint Capacity Reporting



The GK selects the GW with the most capacity. *Note that H.323 endpoints report capacity in absolute terms, not in percentages.*

- By utilize endpoint capacity reporting, Gatekeepers may select an endpoint that is best capable of handling the call
- This is extremely useful for large scale deployments of Gateways and is also useful in call center applications
- *Never Lose a Call!*

Services

- Annex K – Services via HTTP
- Annex L – Stimulus Control
- H.450.8 – Name identification
- H.450.9 – Call Completion



“Must Have” Features

- Usage reporting
- Caller Identification
- Alias mapping
- Better bandwidth management (multicast)
- Fax enhancements
- Tunneling other protocols (Annex M.x)
- H.323-specific URL
- Call credit-related capabilities
- DTMF relay via RTP (RFC 2833)



Generic Extensibility Framework

- The Generic Extensibility Framework (GEF) introduces a new means by which H.323 may be further enhanced or extended with optional features, which does not require changes to the current ASN.1 syntax
- Work has already begun
 - Robustness procedures (Annex R)
 - Local number portability

Going Forward



Wide Support

- Where would a protocol be without wide industry support?
- Many equipment manufacturers, software vendors, and service providers have built products and services supporting H.323
- A number of organizations, such as ETSI's Project TIPHON, IMTC, and others have contributed to H.323's success

Strength in Numbers

Accord Networks	Cirilium	Hughes Software Systems	Motorola	Ridgeway Systems
Aethra	Cisco Systems	iBasis	MultiTech Systems	Siemens
AG Communications	Clarent	IBM	Natural MicroSystems	Smith Micro
Agilent	Comverse	Inalp Networks	NetSpeak WebPhone	Sorenson Vision
Anatel	Data Connection	Inari Inc.	Netergy Networks	Swyx
Aspect	Delta Information Systems	Innovaphone	Network Associates	Symbol Technologies
Atlantic	Dialogic	Intel	NexTone	Telxon
Avaya	Dialpad	ISPhone	Nuera Communications	TINY
Axent	E-Tech Canada Ltd.	ITXC	Nx Networks	Teles
Brooktrout Technology	Elemedia	Ji-Tong Communications	OKI	Trillium
CUseeMe	Equivalence	Komodo Technology	Packetizer	Unylogix
Callserve	e-tel	Lotus	Pagoo	VCON
Catapult	eZenia!	Lucent	PictureTel	VegaStream
CheckPoint	FVC	Macchina	Polycom	VIVE Technologies
China Netcom	Genuity	Madge Networks	RADCom	VTEL
China Telecom	HearMe	Microsoft	RADVision	VocalTec
China Unicom	Huawei			WowRing
				Zydacron

CHINA



Where's the Multimedia?

- But why aren't video and data conferencing systems and applications more prevalent?
 - VoIP
 - VoIP
 - VoIP



The Market Today



- Today, the biggest market for H.323 applications is Voice over IP. Why?
 - Low bit-rate Internet connections make video and data intensive applications less appealing
 - It's a young industry– and with all such industries, it takes time to mature good products
 - Companies can provide VoIP services today at a low cost and provide new competition to the incumbent carriers

The Changing Market

- Tomorrow, expect to see video and data conferencing to become more pervasive
 - Broadband connectivity is making it possible
 - Video and data are logically the next services customers expect to find in conference rooms and on their computer screens



Beyond Voice over IP

- Voice over IP opens the door to the next generation of communication products
- It will take some time to migrate the world from PSTN to IP networks
 - H.323 provides excellent interworking between IP networks and the PSTN
 - H.323 provides a strong foundation for new multimedia products and services

IP Telephony

IP Telephony with H.323 truly means
Multimedia over IP

IP Telephony is not Just a Research Topic Anymore

- IP Telephony, once only a research topic for some, is now real... there are many deployed products and services that offer IP Telephony services
- New kinds of services are now available to customers using IP Telephony that were never possible before



H.323 Makes It All Possible

- H.323 makes it possible to create and deploy new services quickly and to take advantage of multimedia capabilities
- These services can embrace audio, video, and data conferencing
 - Application Sharing
 - Instant Messaging
 - Web Call Parking
 - Voicemail Anywhere
 - Services!
- Electronic Whiteboard
- Click to Dial
- Call No-Waiting
- Unified Messaging
- Services!

- File Transfer
- Internet Call Waiting
- Ad-Hoc Conferencing
- Service Portability
- Services!

Why H.323 for the Service Provider?

- H.323 is a proven technology that is utilized in large networks, such as Genuity, iBasis, ITXC, China Unicom, and others
- Excellent integration with the PSTN
- Gateways and residential devices are *in use today*

Why H.323 in the Enterprise?

- Multimedia conferencing devices show the real potential of H.323 and multimedia communication
- With H.323 in the service provider network, H.323 is a logical choice for the enterprise
- The enterprise customer wants voice, video, and data conferencing capabilities

THANK

YOU!

Acronyms

- ARQ – H.225.0 Admission Request message
- BE – Border Element
- ETSI TIPHON – European Telecommunications Standards Institute’s project “Telecommunications And Internet Protocol Harmonization Over Networks”
- GEF – Generic Extensibility Framework
- GK – Gatekeeper
- GW – Gateway
- IETF – Internet Engineering Task Force

Acronyms

- IMTC – International Multimedia Telecommunications Consortium
- IP – Internet Protocol
- IVR – Interactive Voice Response
- LAN – Local Area Network
- LRQ – H.225.0 Location Request message
- MCU – Multipoint Control Unit
- MC – Multipoint Controller
- MG – Media Gateway

Acronyms

- MGC – Media Gateway Controller
- MP – Multipoint Processor
- M/S – Master/Slave
- OLC – H.245 Open Logical Channel message
- PSTN – Public Switched Telephone Network
- RFC – Request for Comments
- RTP – Real-Time Transport Protocol
- T – Terminal
- TCS – H.245 Terminal Capability Set message

Acronyms

- UDP – User Datagram Protocol
- URL – Uniform Resource Locator
- VoIP – Voice over IP