Technology behind the:

Video Over IP
For Cyber Seminars and TeleCollaboration

Hands-on workshop

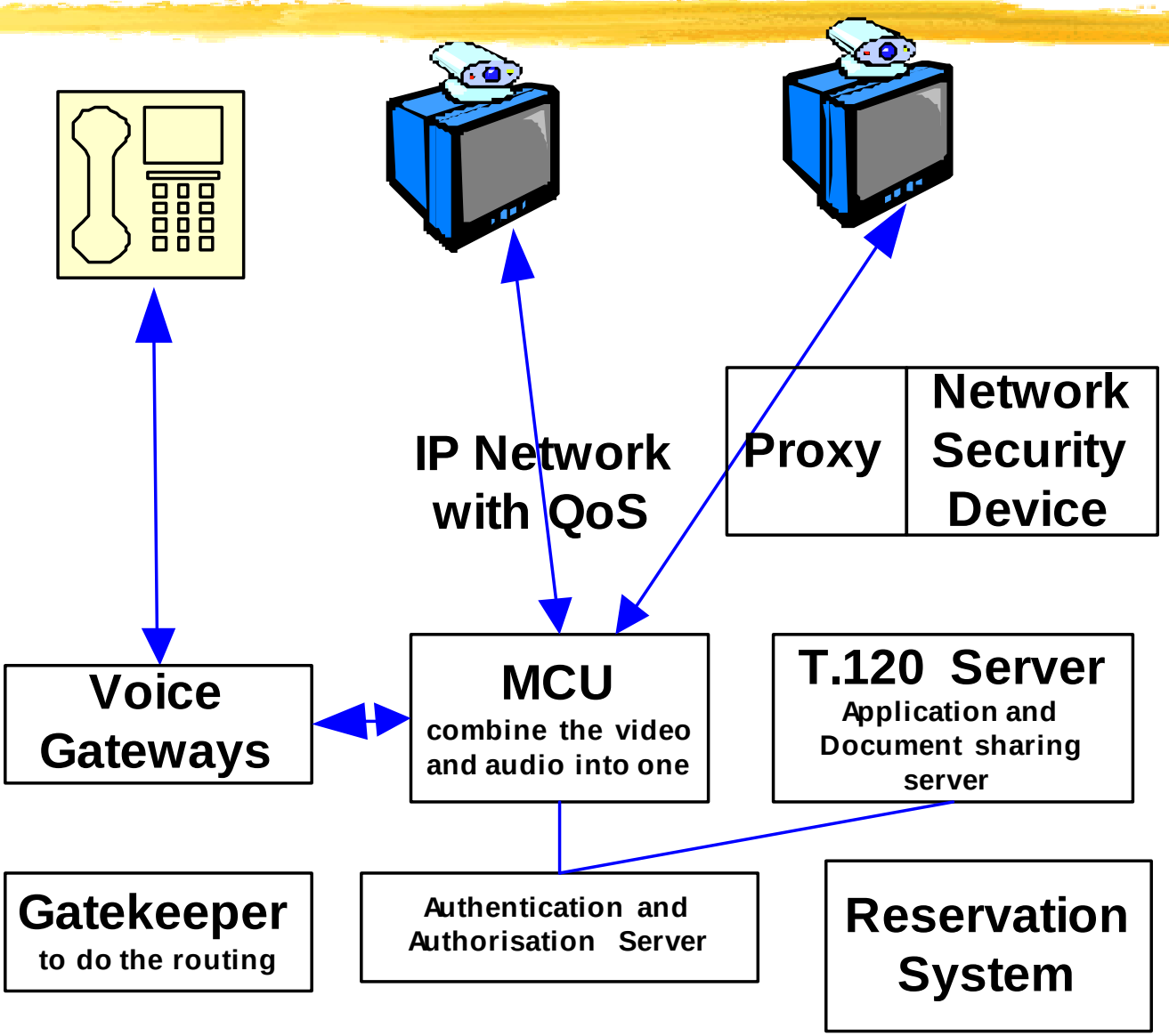
Author Stephen Kingham

- Staff invited to Tele-collaboration Program (TcP) workshop. Staff are invited to attend a workshop on 8-9 October at CTIP, Lindfield, to formulate a detailed research plan for tele-collaboration within CSIRO. Tele-collaboration is a rapidly emerging tool within the international scientific community (for further info visit the Access <http://www.accessgrid.org/> Grid website). The TcP is an initiative of the ICT <http://www.cat.csiro.au/cmst/ict/> Science Investment Focus Group and targets the next generation of collaborative technologies and how best to apply them both within and outside CSIRO. Please contact Kevin Smith <mailto:Kevin.Smith@csiro.au> , if you'd like to attend.

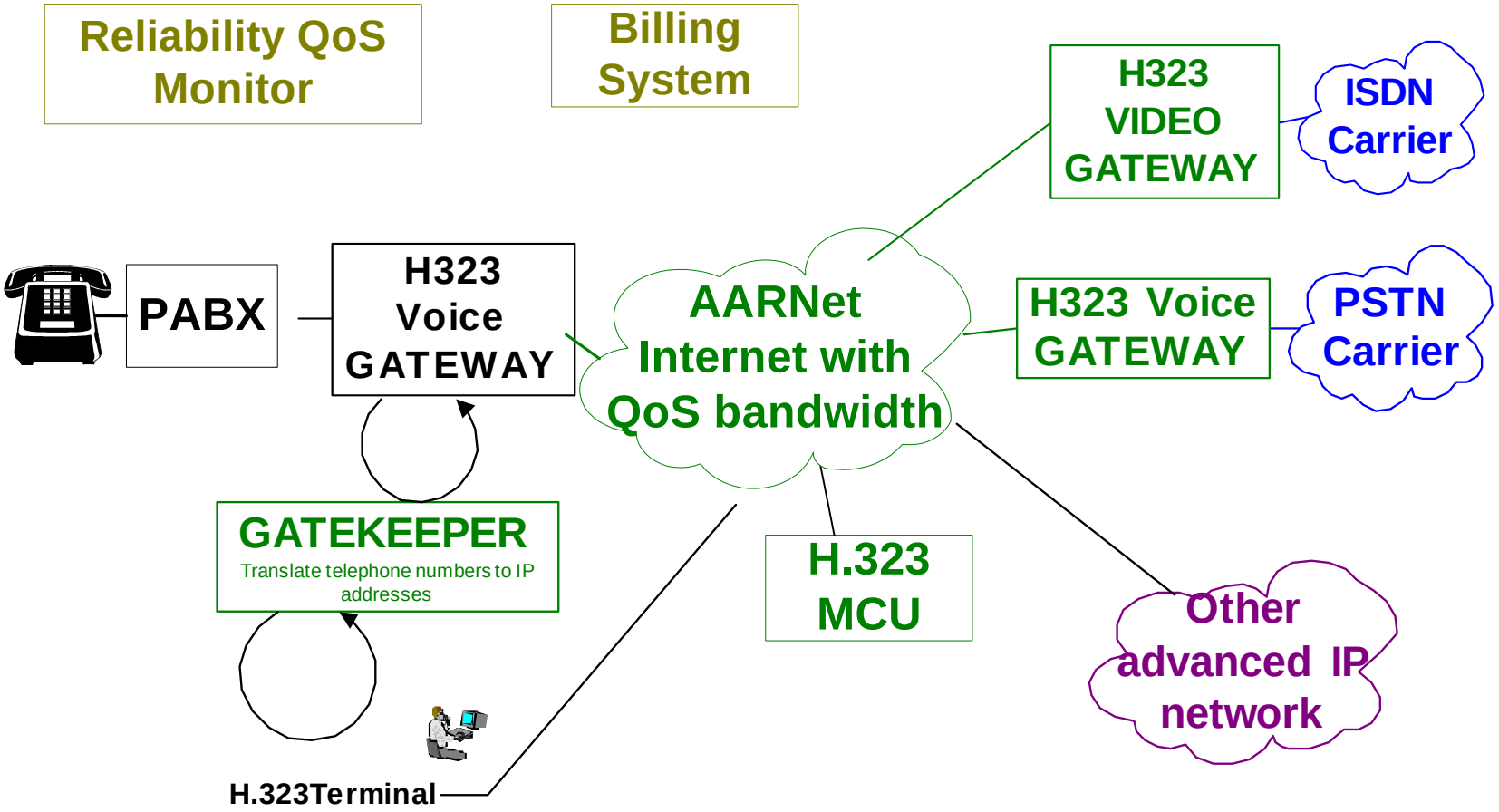
Overseas

- USA makes extensive use of Video over IP
  - www.ViDe.net
  - www.internet2.edu Commons
  - Regular online seminars
  - Conferences are all broadcasted
- www.aarnet.edu.au/rd/video perhaps one day a service?????
- AARNet Video Working Group
- Email list(s) in AARNet

The Technology



AARNet VoIP building blocks



Based on ITU H.323 standards

Author Stephen Kingham

H.323

- Definition: a multimedia standard that provides a foundation to transport voice, *video* and data communications in an IP based network.
- H.323 Zone
  - Collection of terminals, gateways, MCUs registered with a single gatekeeper.

Source Wlat Magneson, TAMU and chair Internet2 VoIP WG

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H.323 Equipment

- Gatekeeper
  - Device that provides address translation (979-845-5588 to 128.194.17.5)
  - access control for H.323 terminals and gateways
  - manage bandwidth allocation
- Gateway
  - Device that connects H.323 voice network to non-H.323 voice network (SIP or PSTN)
  - Allows H.323 terminals to communication with non-H.323 terminals

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H.323 Equipment

- MCU (multipoint control unit)
  - MC – multipoint controller
    - Routes call and control signaling to ensure endpoint compatibility
  - MP – multipoint processor
    - Switches, mixes and processes voice and video streams to conferencing equipment

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H.323 Equipment

- Terminal
  - An endpoint that supports 2-way streaming with another H.323 terminal or gateway
  - Originates and terminates calls

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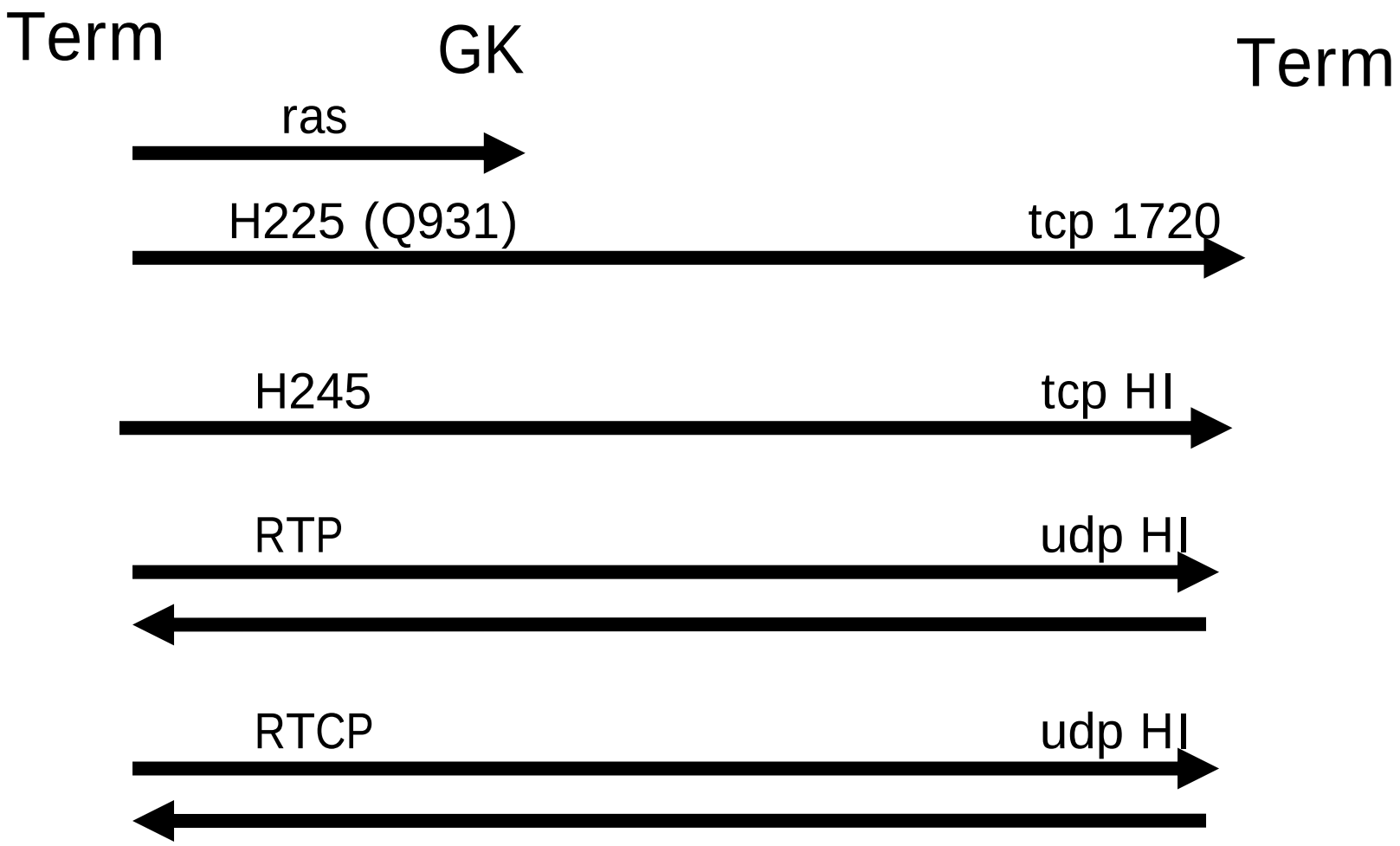
H.323 protocol flow via Gatekeepers (direct mode)



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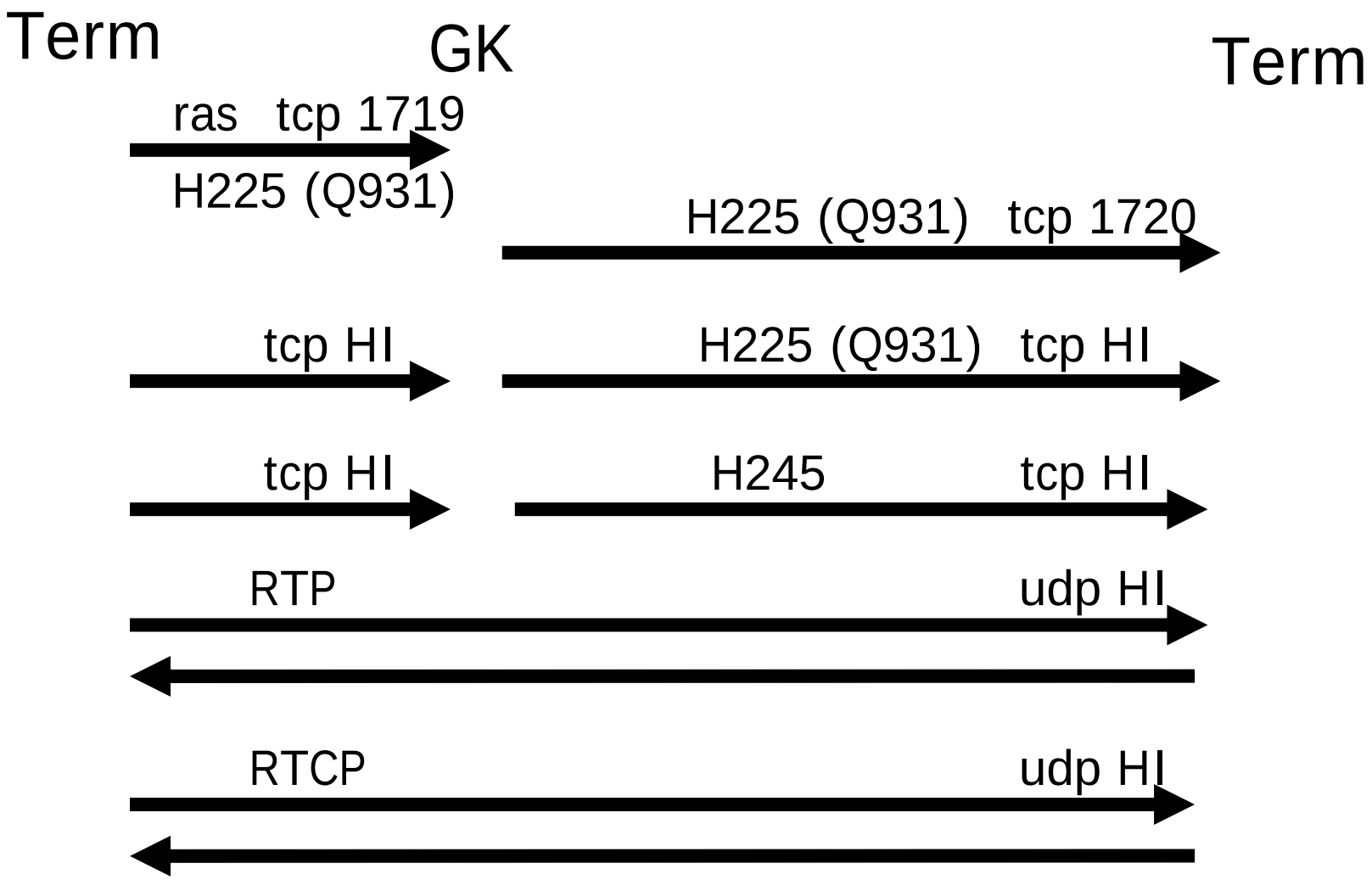
H.323 protocol flow via Gatekeepers (routed mode)



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Security

- H.323 generally needs all UDP and TCP open on ports greater than 1023.
- MCU is on the outside
- Put dedicated Video Terminals on the outside
- Allow workstations to INITIATE H.323 from inside to the OUTSIDE.
- H.323 CAN WORK THOUGH Cisco PIX (only just recently).

H.323 – H.225 RAS Messages

- ARQ – admission request
  - Gateway A requests admission to make a call.
- ACF – admission confirm
  - Gatekeeper A responds with IP address of destination gateway.

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H.323 – H.225 RAS Messages

- LRQ – location request
  - Gatekeeper A requests contact information from directory gatekeeper.
- LCF – location confirm
  - Gatekeeper B returns IP address of destination gateway to gatekeeper A.

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H.323 – H.225 RAS Messages

- Request in Progress
  - RIP
- Bandwidth change
  - BRQ, BCF, BRJ
- Resource Availability
  - RAI (Indicator)
  - RAC (Confirm)

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H.323 – H.225 RAS Messages

- Gatekeeper Discovery
  - GRQ, CCF, GRJ
- Terminal/Gateway Registration
  - RRQ, RCF, RRJ
- Terminal/Gateway Registration
  - URQ, UCF, URJ
- Disengage
  - DRQ, DCF, DRJ

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H.323 – H.225 RAS Messages

- Status Queries
  - IRQ – info request
  - IRR – info request response
  - IACK – info request ACK
  - INACK - info request NACK

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H.323 – Q.931

- Q.931 is a signaling protocol used to setup and terminate H.323 connections between endpoints.

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H.323 – Q931 Messages

- Setup
  - Indicates H.323 party wants to setup a connection to called party
- Call Proceeding
  - Call has been established, no more call establishment information will be accepted
- Alerting
  - Called user has been alerted, (phone is ringing)
- Connect
  - Acceptance of call by called party

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H.323 – Q.931 Messages

- Status
  - Sent when unknown call signaling message or a status inquiry message is received
- Status Inquiry
  - Requests a call's status
- Release and Release Complete
  - H.225 (Q.931) call has been released, signaling channel is now open

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H.323 – H.245

- Establishes logical channels for transmission of H.323 data
- Negotiates:
  - channel usage
  - master/slave configuration
  - flow control
  - Codec
- H.245 ports
  - 1024-5000 TCP in Cisco implementation

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H.323 – H.245 Messages

- Master/Slave Determination
  - Determines which terminal will be master which will be slave in the call
- Terminal Capability Set
  - Contains information on a terminal's ability to send and receive multimedia streams
- Open Logical Channel
  - Opens logical channel for transport of multimedia data
- Close Logic Channel
  - Closes the logical channel between two endpoints

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H.323 – H.245 Messages

- Request Mode
  - Receive terminal requests type of transportation from a transmit terminal
  - Types of Modes:
    - Video
    - Audio
    - Data
    - Encryption

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H.323 – H.245 Messages

- Send Terminal Capacity Set
  - Instructs far-end terminal to send transmit and receive capabilities
- End Session Command
  - Indicates the end of the H.245 session

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Interaction with ISDN

- No VIDEO over IP to VIDEO over ISDN Gateway in AARNet or CSIRO
- Do we want one, answer seems to be Yes.
- How to bill for it?

how to install and configure different terminals:

- Microsoft Netmeeting
- GnomeMeeting
- Polycom Via Video
- Polycom View Station
- Any other H.323 device we can, or you can, bring along, Tandburg, VCON, VTEL, Picturtel 900
- Telephones
- VoIP connected PABXs

Video over IP conferencing unit (MCU)

- What is installed: Radvision ViaIP400 (Cisco 3540 is a re-badge of same).
- Pilot unit was a Radvision OnLAN H323 (Cisco 3510 is a re-badge of same) as is discontinued.
- Watch out for Radvision ViaIP100!!!!

- Other manufacturer is Polycom (na Accord), AARNet
- CuCeeMe reborn
- H323 Open project.

Video over IP conferencing unit (MCU)

- Two configuration interfaces: Configuration, and Control
- different types of conferences available
- numbering plan is the International E164 (telephone numbers)
- setting up password (PINs) done through “conference control”

Speech Codec Comparison

Codec	TypeRate	Algorithmic Delay(ms)	
G.711	A-Law / μ-Law	64	0
G.722	SB-ADPCM	64/ 56/ 48	0
G.723.1/	AMP-MLQ/ACELP*	6.3/ 5.3	37.5
G.726	ADPCM	16/ 24/ 32/ 40	0
G.727	Embedded ADPCM	16/ 24/ 32/ 40	0
G.728	LD-CELP	16	< 2
G.729	CS-ACELP	8	15
G.729	ACS-ACELP	8	15
G.729	BCS-ACELP*	8	15
G.729	ABCS-ACELP*	8	15

Video Codec Comparison

Codec	
H.261	Common
H.263	Can do 4 times CIF

Video Codec Comparison

	CCIR 601 525/60 NTSC	625/50 PAL/SECAM	CIF	Q CIF
Luminance resolution	720 x 485	720 x 576	352 x 288	176 x 144
Chrominance resolute.	360 x 485	176 x 144	88 x 72	88 x 72
Colour Subsampling	4:2:2	4:2:2		
Fields/sec	60	50	30	30
Interlacing	Yes	Yes	No	No

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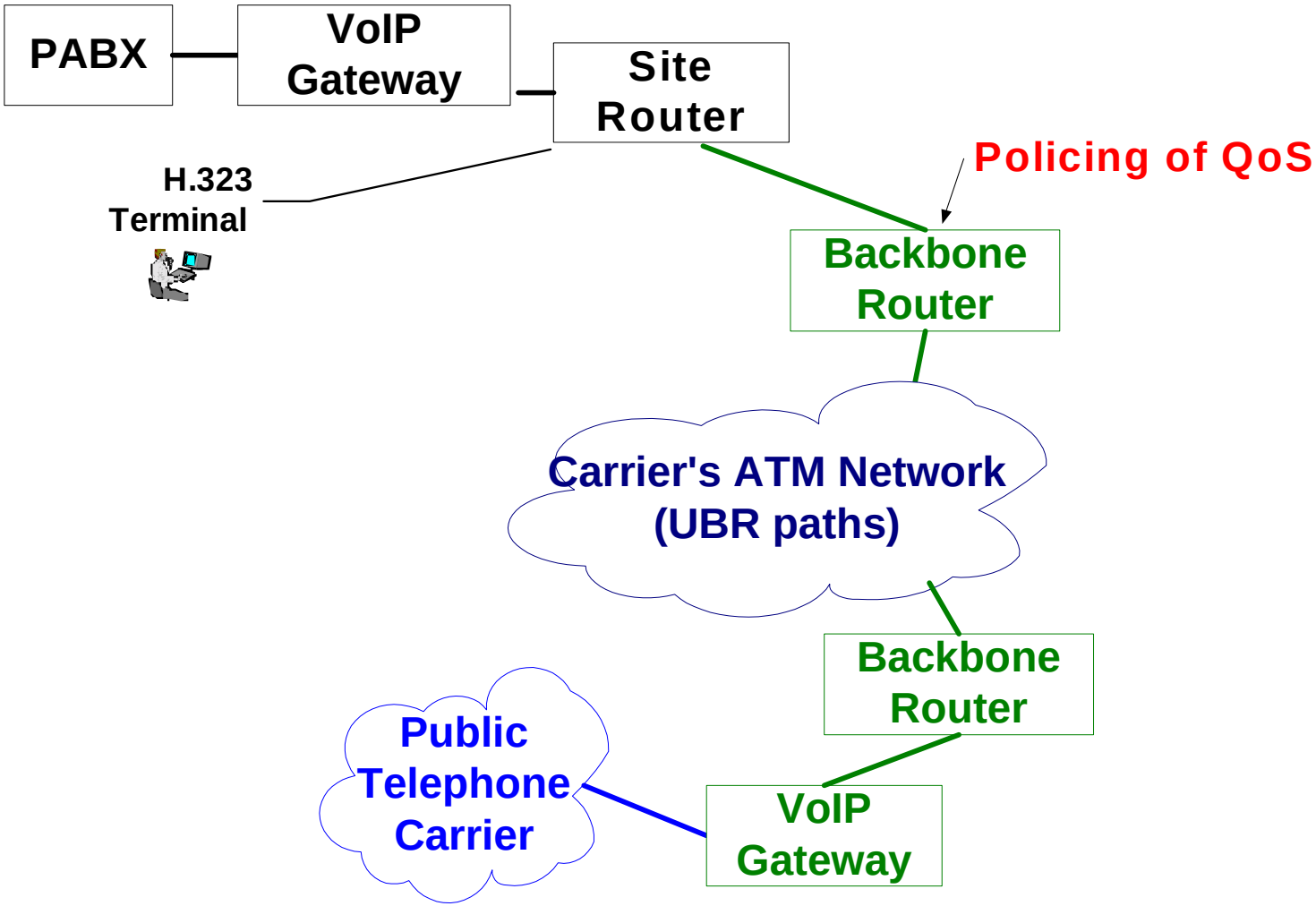
QoS

- Engineer your network well!
- Half/Full Duplex miss-matches very common and deadly
- Use TOS = 4 for Video
- TOS=5 is used for commodity Telephone traffic.

- Where does VoIPMonitor fit?

Quality of Service and Policing



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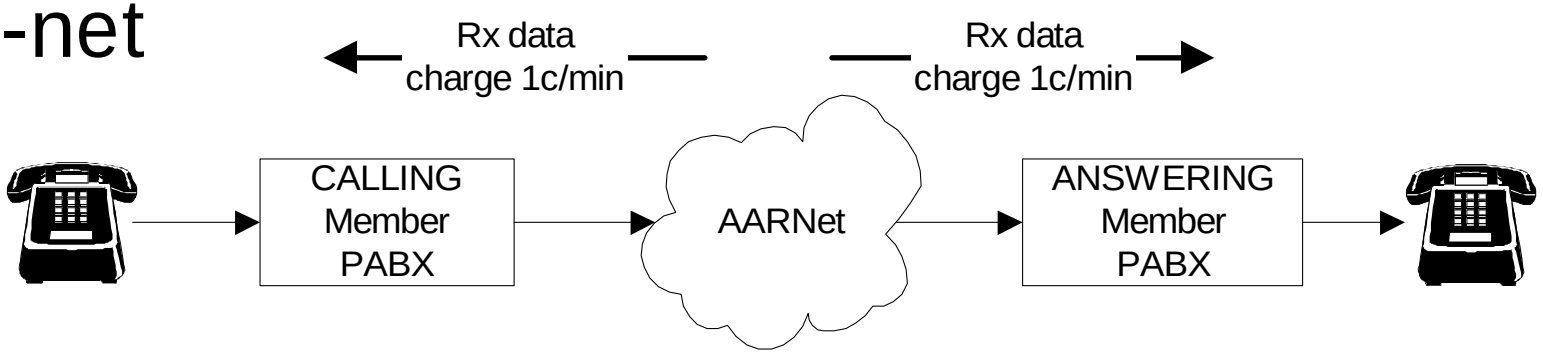
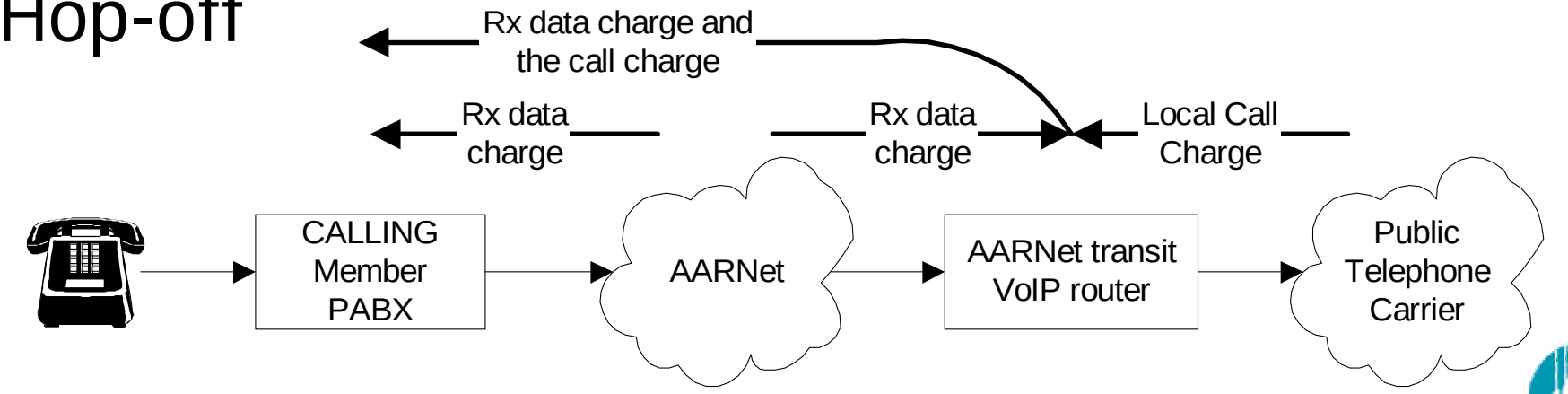
Basis of the Voice Charging Model (does not scale to Video)

See http://voip.aarnet.net.au/AARNet

On-net



Hop-off



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