Internet Telephony

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Goals

- understand motivations and trade-offs

- technical details of major technologies:

  – Internet access

  – telephone system

  – media transport

  – signaling

  – services

Day one, morning: Internet telephony introduction

- motivation for Internet telephony

  – transmission efficiency

  – OAM integration

  – services

- short summary of the existing PSTN (SS7)

  – digital transmission and switching

  – SS7 architecture: SSP, SCP, ...

  – SS7 protocol stack: MTP, ISUP, TCAP

Day one, afternoon: IP networks

- review of IP networks

  - infrastructure: Sonet, ADSL, cable modems

  - IPv4

  - Domain Name System (DNS)

  - routing

  - UDP and TCP

  - applications review: web and email

- IPv6

  - motivation and design considerations

  - packet format

  - transition

Day two, morning: Signaling

- signaling

  - role of signaling

  - SIP architecture: user agents, proxies and redirect servers

  - SIP forking, security

  - H.323 architecture

  - interaction of signaling and resource reservation

- Internet telephony services

- SIP services

- cgi-bin, Call Processing Language (CPL)

Afternoon: Lab (Internet telephony experiments).

Day three, morning: operational issues

- Internet telephony device control

  - motivation and architecture

  - MGCP

- Internet fax: real-time, near real-time

- Interoperation with the PSTN

  - architectures: bridging or tunneling

  - SIP-to-ISUP translation

  - E.164 address mapping

Day three, morning: operational issues

- Gateway location

  - motivation and architecture

  - BGP and other approaches

- Billing and operational issues

  - Billing for what and where?

  - Emergency services

  - Operator services

  - Intercepts

Day three, afternoon: audio/video

- audio/video codings

  - audio coding techniques: sample vs. frame

  - impairments for packet audio

  - uncompress digital video formats: YUV, CIF, ...

  - JPEG

  - MPEG

- quality of service constraints and impairments

  - packet loss

  - packet delay: causes and requirements

  - delay jitter

  - QOS compensation mechanisms

Day three, afternoon: audio/video

- packet scheduling and resource reservation

  - traffic policing: GCRA and token buckets

  - packet scheduling: priority and WFQ

  - receiver-oriented resource reservation: RSVP

  - sender-oriented resource reservation: YESSIR

  - Diff-Serv

- RTP

  - motivation

  - packet formats for data

  - RTCP for QOS feedback and audience size estimation

  - media synchronization

More information

Internet and telecom statistics:
    http://www.cs.columbia.edu/˜hgs/internet

Papers: http://www.cs.columbia.edu/˜hgs/research/irt

RTP: http://www.cs.columbia.edu/˜hgs/rtp

RTSP: http://www.cs.columbia.edu/˜hgs/rtsp

SIP: http://www.cs.columbia.edu/˜hgs/sip