IP Telephony and Network Convergence

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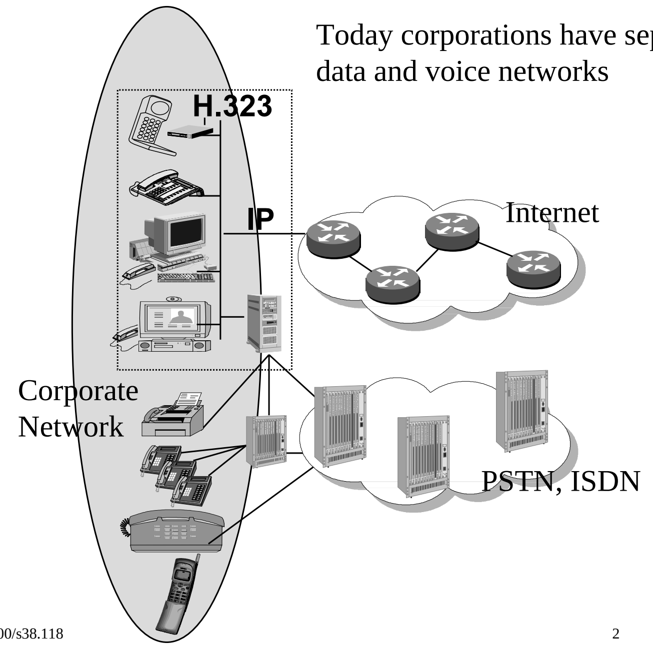
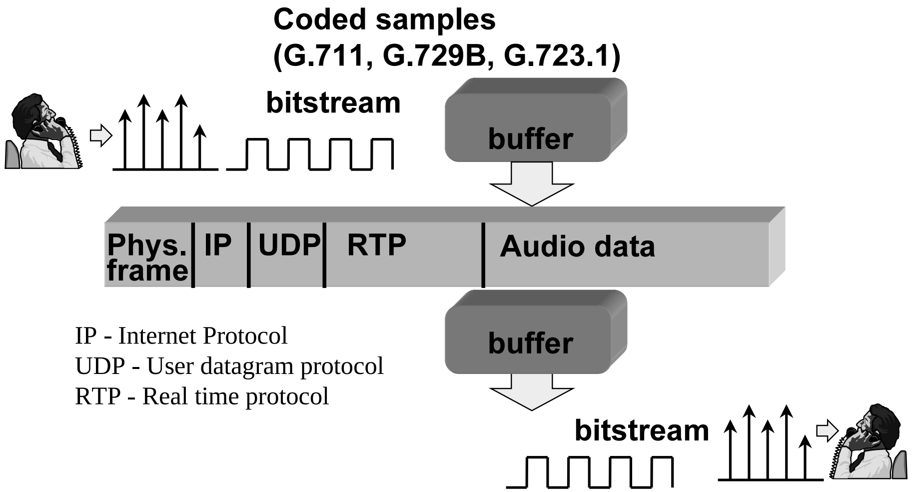
Today corporations have separate data and voice networks

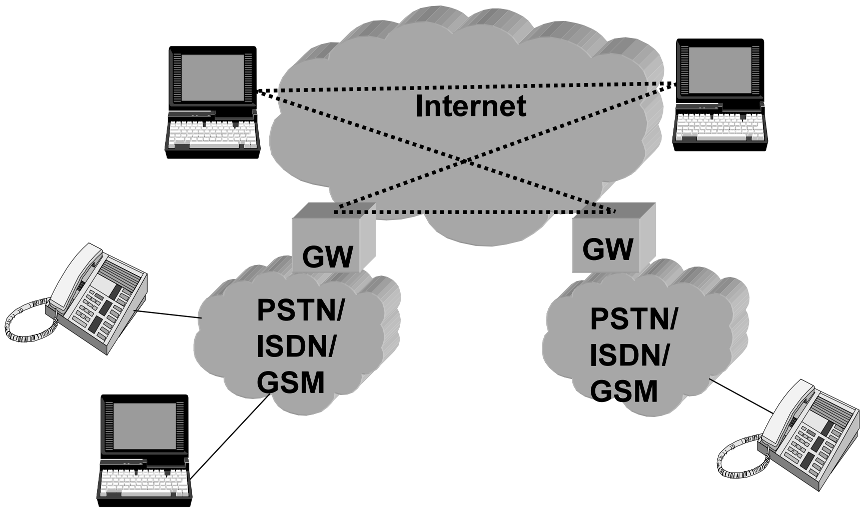


VoIP in action



IP - Internet Protocol
UDP - User datagram protocol
RTP - Real time protocol

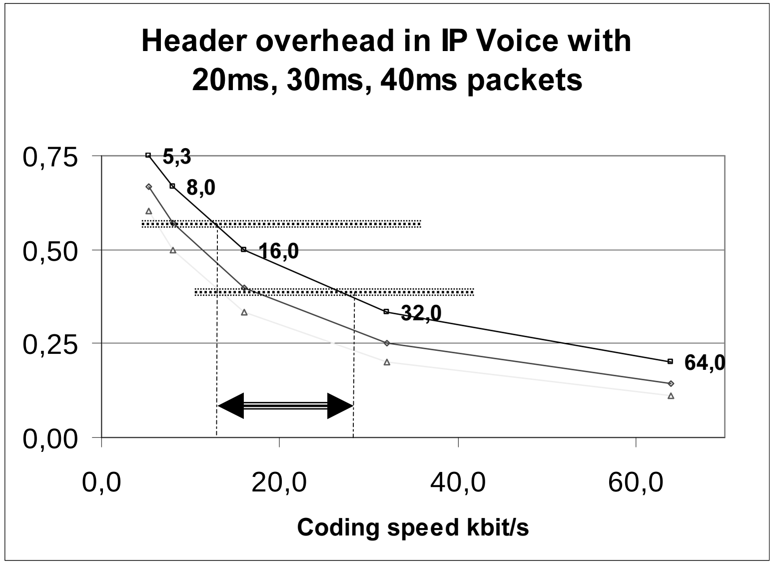
Voice over IP



Why VoIP when ISDN/GSM works perfectly well?

Note: Voice still brings 90% of operator revenues!

- Maintaining two networks is expensive.
- Data traffic grows >30%/year, Voice ca. 5% and the volumes are approximately equal now. If this trend remains, in 2010 voice will be 10%, data will be 90%.
- Cost of transmission goes down very fast: xDSL, SDH, WDM - it is difficult to take full benefit of this trend using circuit switching: only one voice sample can be switched at a time: 8 bit sample vs e.g. 20 ms sample => 1 Gbit router is less expensive than 1 Gbit circuit switch.
- More processing can be pushed to terminals -> consumer market economics
- Convergence of Voice and Data can give service benefits.



Interoperability Issues

- Signaling and Call control
- Quality of Service

Phase 1 --->

- Telephony Routing and addressing
  – Input Information gathering
  – Alternative routing over IP

Phase 2 -->

- Service Management in the hybrid network

Phase 3

So, what about header overhead?

- It seems to make sense to choose voice coding speed around 15…30 kbit/s
- Bandwidth requirement can be reduced by header reduction in access and by silence detection in the backbone.
- IP still requires less than 64 kbit/s!

How to provide SCN-like QoS over IP?

- Integrated Services (use RSVP to make reservations in routers for each call!) changes Routers into SCN-Exchange -like systems. Does not scale well.
- DiffServ or MPLS enchanced with QoS support
  - mark voice packets with higher than BE priority at ingress
  - priority queuing in transit nodes
  - How to prevent voice from blocking BE traffic?
  - How to do Service Management?
  - Voice packets have high overhead - how to minimize?
- Overprovisioning for voice

Signalling alternatives

In Terminals ⟵ Intelligence ⟶ In Network

SIP	H.323	Megaco/H.248/MGCP
- ascii based - devil in details - also NNI coming - Bakeoffs drive vendor interopera-bility	- Inherits ISDN - complex - still few services - Vendor Interop has been announ-ced	- newest - seems to be quality spec. - architecture holds promise - Interoperability?

SIGTRAN(IETF) works on ISUP over SCTP over IP
- many (netheads) view this as an interim solution!

SIP - Session Initiation Protocol, H.323 - ITU-T specs for conferencing and voice over IP, Megaco - Media Gateway Control Protocol, ISUP - ISDN User Part, SCTP - Signalling Control Transport Protocol ("TCP optimised for signalling transport")

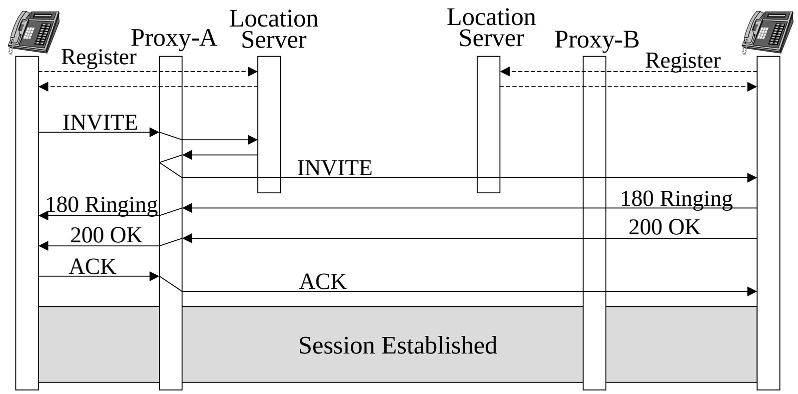
How is IP Telephony different from Circuit switched telephony?

IP Telephony
- Voice in 10…40 ms samples, Bits in a sample can be switched in parallel
- No single coding standard
- End-to-End delay is big challenge
- Terminals are intelligent - consumer market economics
- Call control is separate from voice path - first find out whether parties want and can talk, if yes, set-up the voice path

Circuit Telephony
- Voice sample = 8 bits
- A- and μ -law PCM voice standard
- Reference connection gives network design guidelines => end-to-end delay is under control
- Wireline telephones are dumb. Cellular phones are pretty smart
- Call control is tied to the voice path - IN is used to add service processing on the side.

Note: Using todays technology IP Telephony is not less expensive in replacement nor green field investments in Corporate networks!

SIP call setup example

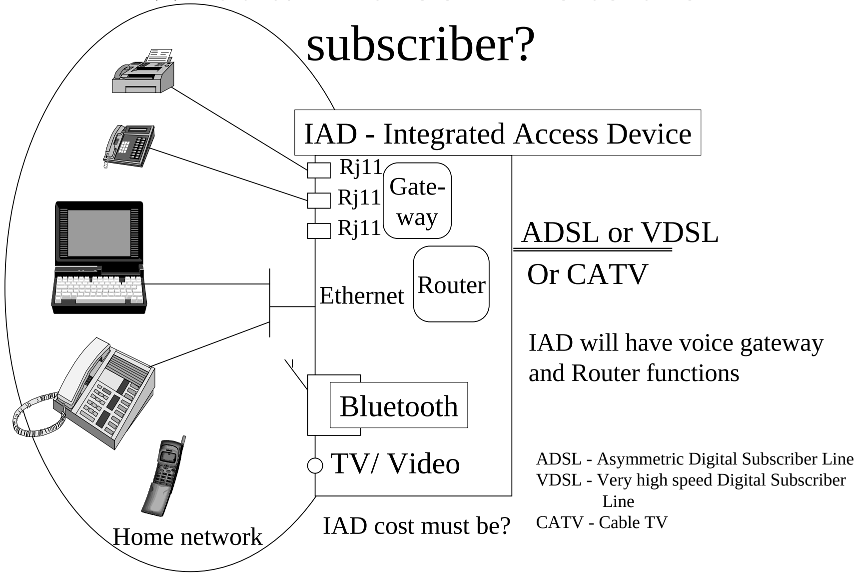


- Features: SIP is ASCII and similar to html/http
- "Location server" (includes DNS and) translates telephone numbers to IP address
- Proxy-B may need to be consulted. Instead of proxies, redirect servers may be used

Conclusions

- IP Telephony will become mainstream in the first 10 years of your professional lives
- Technology is not ready yet - more research and a lot of product development is needed
- ISDN/IN will not disappear overnight -> Interoperability of networks and services is key to convergence

What will it look like to the subscriber?



What is convergence?

- Between data, voice and video services and networks
- Digital packet switching technology forms the basis for data, voice and video services
- All services have digital content
- Any network can be used to carry any service
- Any device (phone, PC, TV) can be used to access any service.

Roadmap to the Future