Standards for IP-telephony

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- Introduction, definitions
- Reference configurations
- Technical challenges
- ITU-T IP-project
- Exemples of ITU-standards (H.248, H.323)
- Conclusions
Standards for IP-telephony

- References:
  - Workshop Background issues paper (ITU-SPU)
  - IP-Project (ITU-T/SG13, Report COM13-R68)
  - MEDIACOM 2004 Project (ITU-T SG16, Report COM16- R61)
  - ETSI/TIPHON-Project

Definitions

- IP-telephony
  - services: telephony (incl. Data, fax,..)
  - infrastructure: IP-networks involved
  - objectives: cost reduction, integration of terminals and services
  - market segment: focus residential customers

- Voice over IP
  - services: voice communications
  - infrastructure: IP-network (“Intranet”)
  - objective: cost reduction, integration of terminals and services
  - market segment: focus business customers
Definitions

- **Circuit switching (CS)**
  - Connection oriented: logical connection for the duration of a call
  - Implementations:
    - Public Switched Network (PSTN): analog
    - Integrated Services Digital Network (ISDN): digital
  - Signalling systems:
    - Analog: CCITT-SS# ..... 6
    - Digital: ITU-SS#7
  - Key Performance parameters:
    - Analog: delay, noise
    - Digital: bit errors, phase jitter and wander (phase variations)

- **Packet switching**
  - Connectionless: no logical connection, packets take different routes between the two users
  - Packet switched network X.25: first generation of packet switched data networks (ITU-Recs X......, 197..)
  - IP networks: switching of packets with variable length
  - Signalling systems: IP-Protocol
  - Key Performance parameters:
    - Packet delay, packet loss, bit errors, phase jitter and wander
Definitions

- **Asynchronous Transport Mode (ATM)**
  - Fixed cell size (cell=packet)
  - Connection oriented: logical path, cells take a given route between the two users
  - Flexible Bandwidth allocation
  - Key Performance parameters: cell delay, cell loss, bit errors, phase jitter and wander
  - Applications: mainly in backbone networks (e.g. IP over ATM)

Scenario 1: IP to SCN

**Originator: H.323 Terminal**

**Issues:**

- How to find appropriate gatekeepers & gateways? (Least-Cost-Routing)
- How do service-providers assure quantifiable QoS across different networks?

**Target: SCN Terminal**

- Authentication & Authorization of Internet users
- SS7 interworking
Scenario 2: SCN to IP

Issues:
- How to translate E.164 numbers into IP addresses? (in other words, how do we find the home-gatekeeper?)
- How to accommodate Roaming IP users?

Source: ETSI project TIPHON

Scenario 3: SCN to IP to SCN

Issues:
- Support of 1 stage dialling
- Finding Gatekeepers & Gateways (Least cost routing)
- How to support Network-to-Network information (NNI)?

Source: ETSI project TIPHON
Scenario 4: IP to SCN to IP

Issues:
• How to communicate the remote party’s IP address via the SCN?

Source: ETSI project TIPHON

Technical Challenges IP-telephony

- Services and applications:
- IP telephony: voice service built on top on data communications
- New possibilities through:
  - Combination voice, date, fax, video
  - Improve quality of speech and sound
  - Integrated massaging systems
  ****
- Mix of real-time and store-and-forward services!
**Technical Challenges IP-telephony**

- **Packet loss:**
  - typical performance question in packet-switched network
  - due to congestion in routers (queuing!)
  - critical for voice communications
  - several techniques to reduce packet loss and to decrease the effects of packet losses

- **Packet delay (incl. Jitter/wander):**
  - critical for voice communications
  - long delay: echo, half-duplex mode

- **Sources of delay in IP-networks:**
  - codec (0 - 40 ms)
  - serialisation delay (< 0.1 ms)
  - queuing delay (routers/gateways)
  - propagation delay (critical for satellites links)

- **Solutions:** priority mechanisms (DiffServ, RSVP, buffers, )
IP-related activities in ITU-T

- Work performed until 1998 under the GII umbrella (specific Project I.1 on IP questions)
- IP project (1998, lead SG13 “General Network Aspects)
- 12 work areas identified (I):
  - Integrated architecture [A1]
  - Impact to telecommunications access infrastructures of access to IP applications [A2]
  - Interworking between IP based network and switched-circuit networks, including wireless based networks [A3]

- Multimedia applications over IP [A.4]
- Numbering and Addressing [A.5]
- Transport for IP-structured signals [A.6]
- Signalling support, IN and routing for services on IP-based networks [A.7]
- Performance [A.8]
IP-related activities in ITU-T

- 12 work areas identified (III):
  - Integrated management of telecom and IP-based networks [A.9]
  - Security aspects [A.10]
  - Network capabilities including requirements for resources management [A.11]
  - Operations and maintenance for IP [A.12]
H.323 System Elements

- Terminal
- Gatekeeper
- Packet Network
- Gateway
- MCU

H.248: Trunk Gateway Example

- MGC
- MG
- SGW
- SS7 (ISUP)
Standards for IP-telephony

Conclusions:
- IP-telephony is a new technology « voice on top of data «
- Key issues are:
  - Interworking
  - Evolution
  - QoS issues