

# Telecommunication systems

## Technical review

### ► Telecommunication systems in the past

#### ► Whistle

#### ► Runne

- Before Christ 1700, Babilon

- Before Christ 490: Marathone

- 1860-61. USA, Pony Express, 3200 km/10 day

#### ► Light / smoke

- Before Christ 1184: Aiszkülosz (Greek writer): „Agamemnon”

After Trója was occupied: The news was sent 600 km long using torch. The news arrived in one night!

- France: „teletype” pulpit.

1852: 556 pulpit, 4800 km network, between 29 towns and Paris!



- ▶ The modern telecommunication systems

- ▶ Telegraph:

- ▶ Samuel Finley Breeze Morse:  
1837: telegraph + Morse ABC

- ▶ Tape machine

- ▶ 1854: Davis Edwin Hughes. This was used in 1. World Wide War
  - ▶ Twisted metallic pair

- ▶ Pone

- ▶ Alexander Graham Bell: 1876
  - ▶ 1878: (manual) trunk exchange.
  - ▶ 1889. Almon B. Strowger: automat telephone exchange



## Telecommunication in Hungary

### ► First period: 1939-ig

#### ► Service:

- The new technologies was introduced first in USA. In Hungary these new technologies introduced only a few years later:

- Telegraph: 1837, USA 1844, Mo: 1846

- Telephone+ telephone exchange:: 1876-78, USA 1877-1878, Hun: 1881

- ***In 1938 there was around 10% coverage***

#### ► Dynamic growing industry:

- Tungsram

- Standard (International Telegraph and Telephone)

- Siemens

#### ► Research:

- International companies



## Telecommunication in Hungary

- ▶ Second period: 1945-1990
  - ▶ Serviceis: very slow progress
    - ▶ **1990: 10%-os coverage, cheapness**
  - ▶ Industry:
    - ▶ In 1990 there was arround 15 years backlog
    - ▶ 150 000 employee work in industry: Orion, Videoton, BHG
  - ▶ Research
    - ▶ Only researcher were up to date in theory but not in practice
    - ▶ Távközlési Kutatási Intézetet (TKI)
    - ▶ Post Kísérleti Intézet, PKI
    - ▶ Számítástechnikai és Automatizálási és Kutató Intézet, SZTAKI
    - ▶ Bay Zoltán, Kozma László



## Telecommunication in Hungary

### ▶ Third period: 1990 - 2000

#### ▶ Service:

- ▶ Fast progress
- ▶ *In 2000 the coverage was 40%, good condition*
- ▶ Mobil, VoIP, ... : fast spread

#### ▶ Industry and Research

- ▶ The importance of Software development is growing
- ▶ Industry in Hungary was growing: Ericsson, Hewlett-Packard, Lucent, Motorola, Nokia, Siemens, ...

# Telecommunication in Hungary

Fourth period: From 2000

## Growth and recession

- ▶ From 2000 recession in telecommunication
- ▶ Occasions:
  - ▶ Mobile industry achieved the wired telecommunication in 10 years
  - ▶ .com companies (informatika)
  - ▶ 2001.szept.11. (USA)
  - ▶ UMTS (EU) (= Universal Mobile Telecommunication System)

## Growth and recession

- ▶ UMTS: license
- ▶ Sale of license:
  - ▶ Companies get monopol or oligopol position
  - ▶ Companies pay for license

Germany	49,7 billion euro***	2.5% of GDP
England	38,2 billion euro	2.5% of GDP
Italy	12,5 billion euro	1.1% of GDP

\*\*\*kb. Magyarország éves GDP-je 2001-ben!

- ▶ In Hungary
  - ▶ T-Mobile 17 milliárd Ft, Pannon 19 mrd. Ft, Vodafone 16,5 mrd Ft. The licence is for 15 years



# Architecture

## Analog communication network

- ▶ receiver: sound wave  $\leftrightarrow$  electrical signal
- ▶ Switching system : electronic
- ▶ Transmission Path :
  - ▶ FDM (Frequency Division Multiplexing)
  - ▶ Milyen széles legyen egy beszédcsatorna?
  - ▶ Ears can hear 20 Hz -- 20 kHz-t
  - ▶ Maximum of speech signal 6-7 kHz
  - ▶ We need only 0,3 -- 3,4 kHz frequency band
  - ▶ 3,1 kHz + protection band = we use 4 kHz frequency band for speech transmission

