GSM Network and Services

GSM Introduction

History and evolution

- First generation analog systems
  - NMT (Scandinavia), TACS (UK), C-Netz (Germany), AMPS (US)
- Problems
  - Non compatible
  - No roaming between networks
  - Different frequency allocations
  - Analog (is this a problem?)

CEPT – Conf. Of European Post and Telegraphs

- 1982 - forms the Groupe Special Mobile (GSM) to define the next generation mobile system. The networks should solve:
  - roaming
  - speech quality
  - spectral efficiency
  - low cost
  - small size
  - new services, ISDN compatibility

State of the art 1984

But first .....

- What frequencies should be used?
- The frequency plan for Sweden www.pts.se is a 140 page document with a couple of thousand entries ranging from 9KHz to 275GHz. Take ten of these national plans and try to find some space.
- Finding a frequency band and freeing it up for a new service takes time.
- This is a process where you have to think ten years ahead.

Frequency

- The GSM system was allocated a 2x25MHz space in the 900-band. This could be compared to the 2x4.5MHz allocated for NMT450.
- Later GSM was allocated 2x75MHz in the 1800-band.
- GSM has also been implemented on the 1900-band (PCS) and the 850-band (TDMA).
- The UMTS system has been allocated a 155MHz band.

ETSI – European Telecom. Stand. Inst.

- Formed in 1988 as a collaboration between European national standardizations bodies, telecom authorities, operators, etc.
- Took over the GSM (now called Global System for Mobile communication) standardizations in 1989.
- In 1990 the first GSM specification was released - 6000 pages.
- In 1991 first operator, Radiolinja Finland, launched a GSM network.

What the press said

- *“Complete confusion around the new European digital mobile system GSM. The so important launch on the market of a new expensive system looks like a failure.” Affärsvärlden - 92*
- *“It will be hard for GSM to win market shares, everyone will continue to use their existing system, NMT” Svenska Dagbladet - 94*

Evolution in Europe

- By mid 1990, there were more GSM subscribers than analog subscribers. Today it is very hard to find a analog network in operation in Europe.
- The success of GSM:
  - deregulation of the telecom market
  - roaming between operators
  - mass-production of terminals

Evolution in the US

- AMPS (advanced mobile phone system) an analog standard is still available and operates in the 850-band
- iDEN, a TDMA system by Motorola, operates in the 800- and 900-band.
- In 1994 FCC allocated spectrum in the 1900-band for PCS (Personal Communication System).
- Several standards evolved:
  - TDMA (digital AMPS), uses time division multiple access, similar to GSM
  - cdmaOne, by Qualcom, uses code division multiple access
  - GSM adapted for the 1900-band

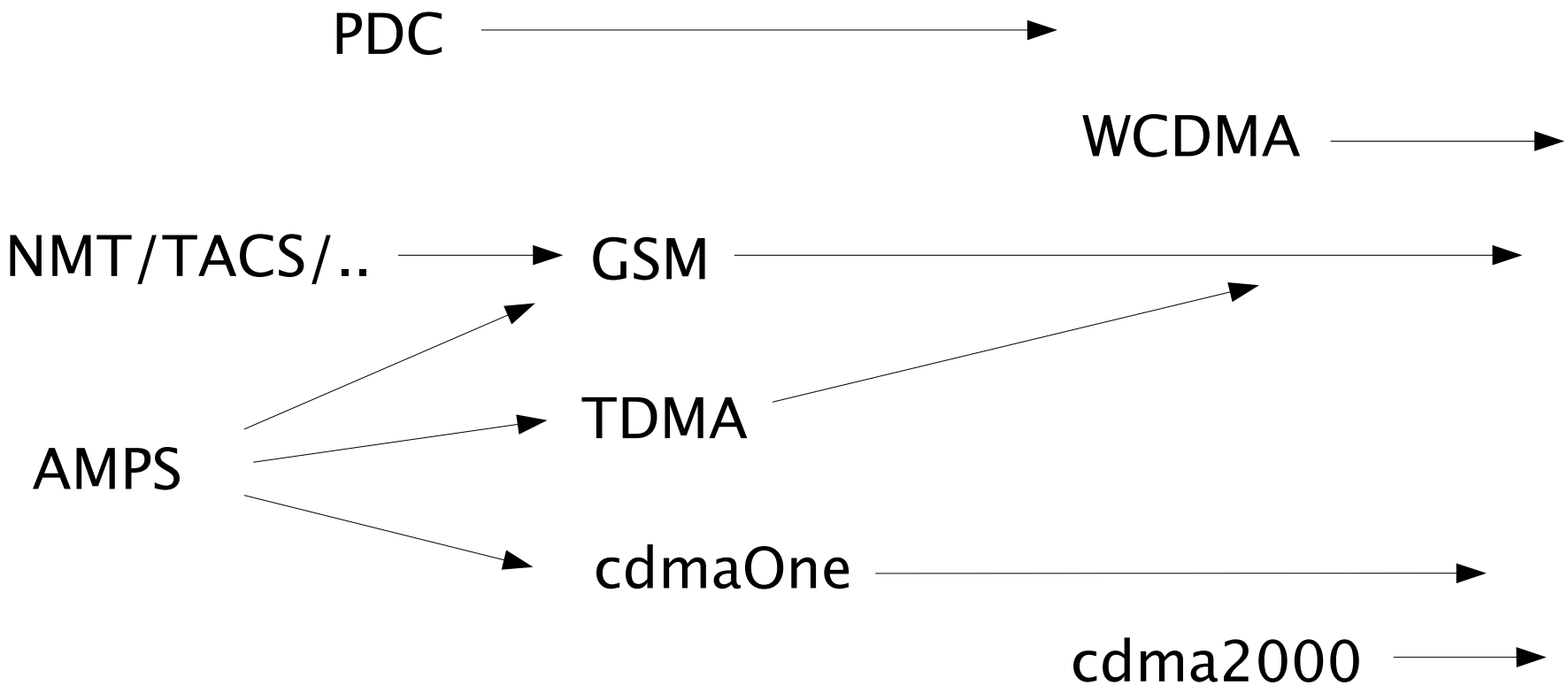
3GPP – Third generation Partnership Program

- Founded in 1998 the 3GPP took over from ETSI and is now the international collaboration that is handling the GSM standardization
- 3GPP also handles the standardizations on future, 3G, mobile networks that are based on or compatible with GSM.

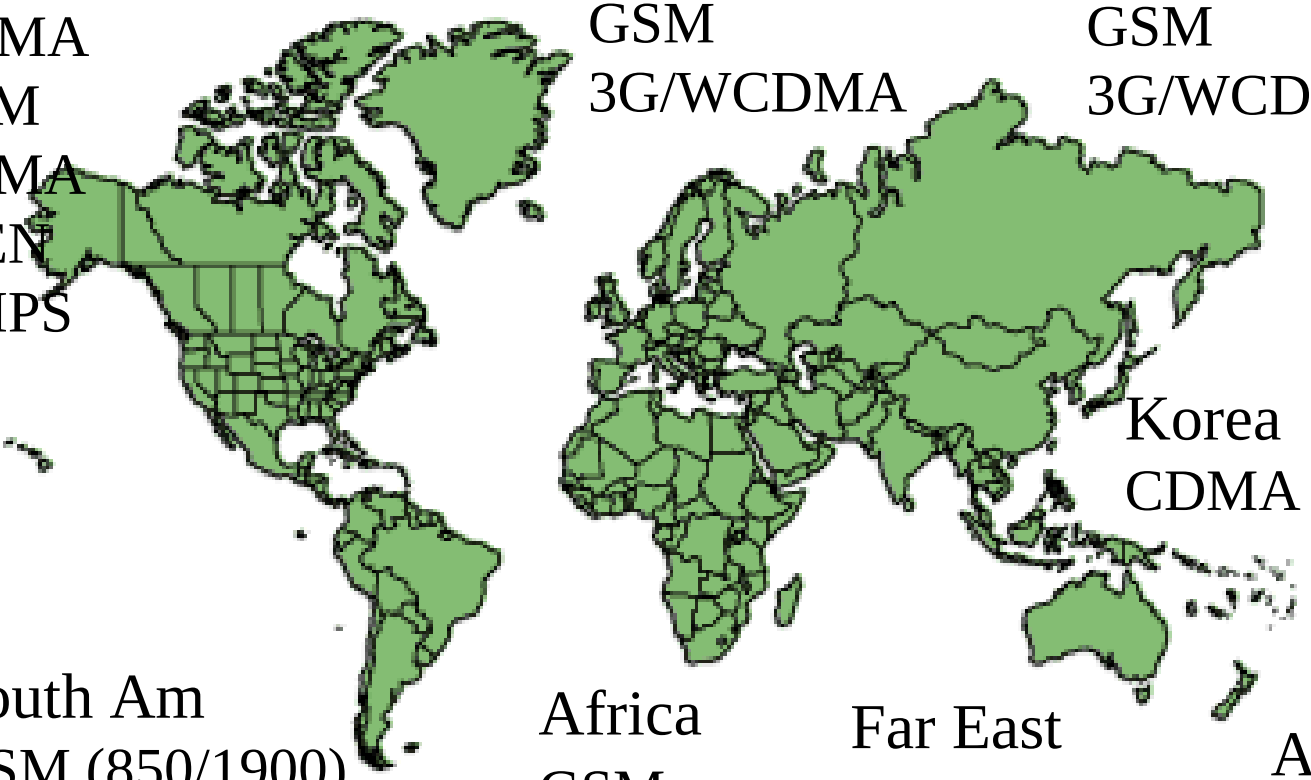
Other organizations

- GSM Association - www.gsmworld.org
  - trade organization that promotes GSM
- Open Mobile Alliance -www.openmobilealliance.org
  - alliance of operators and service developers
  - specify services on top of for example GSM

Mobile evolution



Mobile world map



North Am
CDMA
GSM
TDMA
iDEN
AMPS
:
:

Europe
GSM
3G/WCDMA

China
GSM
3G/WCDMA

Japan
PHS
PDC
CDMA
3G/WCDMA

Korea
CDMA

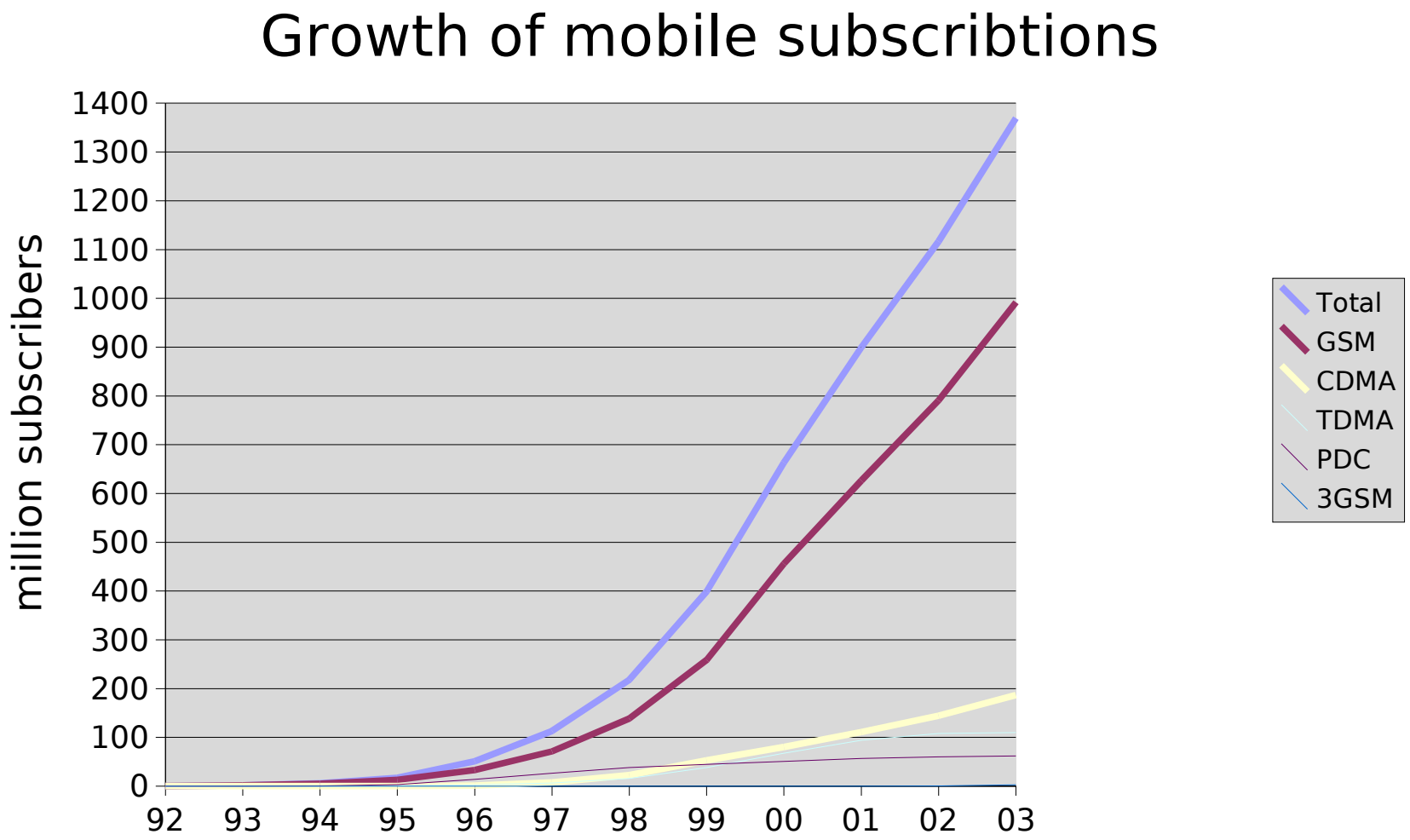
South Am
GSM (850/1900)
TDMA
iDEN

Africa
GSM

Far East
GSM

Australia
GSM

Some statistics - from GSM Alliance



GSM Phases

- The GSM was originally divided into phases describing when services should be in operations.
  - Phase 1: basic voice services
  - Phase 2: supplementary services
  - Phase 2+ : better codecs, broadcast, packet data, location, ...
- Phases helped operators to provide roaming of services and thus made adoption easier.

GSM releases

- In phase 2+, services are introduced in releases .
  - Today operators implement R99 or Rel-4.
  - Specifications are now finalized on Rel-6
- Specifications are grouped and numbered and the best way to learn the system is to look at the 3GPP website.