Lecture1– History of Mobile Communications

Asad Ali

Origins of Mobile Communications

- In the mid-1860s, the Scottish mathematician James Clerk Maxwell produced a pair of equations whose solution predicted electromagnetic waves propagating at the speed of light
- It took 20 years to verify this prediction in the laboratory, and another 20 years for the first “mobile” application to take place.

Origins of Mobile Communications

- In September of 1899, Guglielmo Marconi ushered in the era of practical mobile radio communication with his historical radio telegraph transmissions from a ship in New York Harbor to the Twin Lights in Highlands New Jersey

- Within a year, Marconi had added filtering to create separable channels, and thus to allow multiple simultaneous transmissions in the same area. Within three years, he was able to cross the Atlantic with a radio transmission, and radio telegraphy was soon used on many ocean-going vessels (most notably, it was used to report the sinking of the Titanic in 1912)

Origins of Mobile Communications

- Analog (voice) transmission was used as early as 1905, but early work was driven primarily by military applications, and it was not until 1919 that an experimental ship-to-shore radiotelephone service was initiated.
- Commercial radiotelephony for passengers on ships in the Atlantic was begun in 1929. By this time, radios were small and rugged enough to be installed in automobiles, and the first “land mobile” radio system was put into operation by the Detroit police in 1928

Origins of Mobile Communications

- By 1934, there were 194 municipal police systems and 58 state police radio stations serving more than 5000 radio-equipped police cars. The age of mobile radio had begun.

Early Mobile Telephony

- Spectrum that could be exploited for practical systems was always in short supply, and mobile communication services were in competition with military and broadcast services for the available channels.
- As a result, most mobile radio channels were devoted to emergency and public service uses until
- the cellular revolution began some years later

Early Mobile Telephony

- Despite these difficulties, an early mobile telephone service was initiated in 1947, using several channels at 35 MHz. Additional channels were soon allocated at 150 MHz, and later at 450 MHz.
- Early mobile telephone systems resembled broadcast systems, in that powerful transmitters were used to cover a distance of 20-30 miles from a high tower or rooftop

Early Mobile Telephony

- The reuse of any channel for a different call required separations of more than 50 miles. The New York channels were reused in Philadelphia, so that each city and its suburbs were limited to about 40 simultaneous calls.
- The demand for service was great, resulting in severely overloaded channels and long waiting lists for service. As a practical matter, people with an important need for service (e.g., doctors) were given preferential treatment, and the average person might face the discouraging reality that his position on the list was actually becoming worse over time

Short History of Mobile Communications

- 1958 in Germany, the A1 net was established.
- In 1970 it has had a coverage of 80% of the area and 95% of the population in Germany.
- In 1972 an new net was established
- 1986 the network was working to full capacity of 27’000

Short History of Mobile Communications

- 1986 the third analog network was established. The limitation was by 400’000 users in Germany.
- In 1982 the European Conference of Postal and Telecommunications Administrations founded a working group.
- In 1987 the ***G****lobal* ***S****ystem for* ***M****obile communications* standard was available
- In 1991 in Switzerland the first devices are presented
- In 1995 *SMS* was available

GSM

- The DCS-900 standard has 124 channels
- The DCS-1800 (established in 1995) has 372 channels.
- Each channel has 8 slots
- Each slot has a capacity of 9600 bit/s

HSCSD, GPRS and EDGE

- *HSCSD* stands for ***H**igh **S**peed **C**ircuit **S**witched **D**ata*
  – Use more slots for one connection
  – Uses simple error correction and has a speed of 14400 bit/s

- *GPRS* stands for ***G**eneral **P**acket **R**adio **S**ervices*
  – It has different service classes and the user is **always online**

- *Edge* stands for ***E**nhanced **D**ata Rates for **G**SM **E**volution*
  – It accelerates the data communication up to 473,6 kbit/s
  – It needs new technology on the operator side

UMTS

- *UMTS* stands for ***U****niversal* ***M****obile* ***T****elecommunication* ***S****ervice*
  - – The maximum data transmission rate is 2 Mbit/s
  - – Simpler extension of the net
  - – Break-through of the technology in the year 2010

SMS, MMS and WAP

- *SMS* stands for ***S**hort **M**essage **S**ervice*
  - The message payload is 140 bytes
  - By 2004 more 500 billion messages were sent per year.
  - In the year 2000 just 17 billion were sent.
  - The most frequenter texters are in Singapore. About 2300 SMS per year in 2003

SMS, MMS and WAP

- *MMS* stands for ***M****ultimedia* ***M****essaging* ***S****ystem*
  - *MMS* was originally developed for *3G*
- *WAP* stands for ***W****ireless* ***A****pplication* ***P****rotocol*