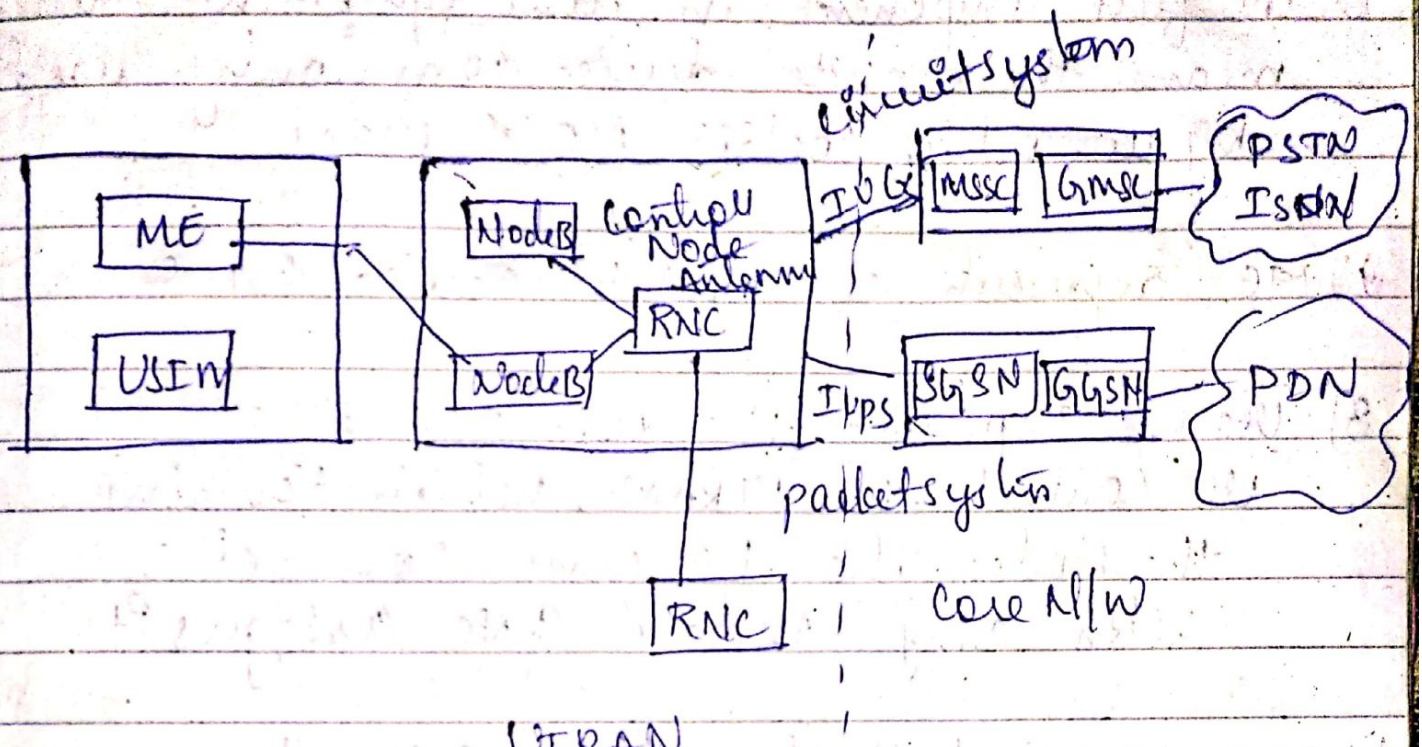
Mobile Communication



ME - mobile Equipment
USIM - User simcard.
RNC - Radio Network controller
MSC - mobile switching center
GMSC - Gateway MSC.
UTRAC - Union terrestrial RAL.
PDN - public Data Network.
PSTN → public switch telephone Network.
ISDN - Integrated Service digital Network
SGSN - Serving GPRS Support Node
GGSN
UMTS - Universal mobile Telecommunication System

1) The first component is user Equipment which means the mobile device commonly used by us. which contain ME & USIM

2) ME Represents the mobile device & the

3) USIM represent the user Subscriber UE contact the UTRAN, which contains the Nodes. the UE can connect with any node & RNC assigns it.

4) RNC assigns/ decides that whether to choose CUSC or CUPS. CUCS means Circuit switch technique & CUPS means packet switch technique. (RNC checks either you want call service or Internet service.

5) CUSS used for call & connect to PSTN & ISDN (local or International calls).

6) MSC & GMSC are used to to provide the call services

7) SGSN & GGSN are the Gateways used to connect PDN.

Applications

(a)

1] Vehicals :- For personal communication a UMTS phone might be available offering voice & data connectivity with 384 kbps.

2] For Remote areas, Satellite communication can be used, while the current position of the car is determined by a GPS.

3] Cars with this technology are already available, in future cars will also inform other cars about the accidents via Networks to help them slow down in time, Even before the driver can recognise an accident.

4] Buses, trucks & trains are already transmitting their maintainence & logistics info to their home base which helps to improve organisation & saves time & money.

5] incase of an accident, not only will the airbag is triggered, but the police & Ambulance service will be informed through the Emergency call to a service provider.

(b) Business → A travelling salesmen to day needs instant access to the companies db Ensure that current situation, Enable the company to keep track of all activities of travelling Employees.

(c) Replacement of Wired Network :- Due to the Economic reason for it is often impossible to wire remote sensors for weather forecast, Earthquakes, detection also provide Environment Inf^n wireless connections.

Eg:- Satellite can help in this situation many computers use WLANs or Replace for cabelling.

(d) Emergency :- Vital inf^n about injured persons can be sent to the hospital from the scene of the accident. Wireless Networks are only the means of communication in case of Natural disaster such as flood, EarthQuakes.

(e) Infotainment :- Static inf^n might be loaded via CD-Rom, DVD even at the wired Internet but Wireless Networks can be provided up to date information at any location the travel guide. might tell you something about the

history of building (knowing via gps) contact to a local base station or track location where you are downloading inf? about the concerned in the building at the same via local wireless Network.

6) Location Dependent Service:- location aware service, if you want to print a document sitting the lobby of hotel using your laptop, if your drop the doc over the printer icon, but there is a no printer attached to it then such con, there could be the service on hotel announcing that standard laser printer is available on hotel meeting room, your pc might then transmit a personal profile to your hotel which the charges of printing.

Information Services :- while walking around the city you could use wireless travel guide to pull inf? from a service about the location, a service could also put active inf? on your travel guide.

(7) mobile & wireless devices :- mobile phone the traditional mobile phone had a black white display to sent receive voice or short message today mobile phones migrate towards PDAs to show mobile phones will full graphic display touch screen & internet are easily available.

(8) pocket comp → the Next Step towards pocket computer offering time keyboard. color display, simple version of program found on desktop comp (text processing, spread sheets).

→ Note book / laptop
→ personal digital assistant

History

Small service area by reusing frequency this Enchanced the traffic capacity of mobile phone.

The requested the FCC (Federal communication commission) in us to allocate large radio frequency so that that can be used for widespread mobile phone services.

Around 1958 a first wireless communication was commissioned in gumany called as A-Netz which used analog technology about 16mb. This communication allowed only out going call & the connection was setup from the mobile station only.

There was a new evaluation of A-Netz wireless.

This Net system made a possible communication to receive a call, fix telephone line Network if only the location of mobile station was known in 1983 first commercial analog service called Amps.

Amps:- Amps was made available commercially in Chikago, which was the first cellular mobile Network in the world.

all around the world Each Nation started to have analog mobile System. These System made individually where. Mutually incompatible as Equipment where limited to National boundaries The four Subscriber was not able to operate the mobile Equipment in another Network of other country.

→ Hence this incompatibility needs Evolve a standard for mobile phone technology & this form a study group called Gsm to develop a standard for mobile System.

→ in 1990 the phase I of GSM specifications was published which were used to start Gsm service around 1991. this GSM Specifications was popular outside Europe & hence gain the Name global renaming the service as global System for me.

(3)

* Evolution of wireless technology

The first technology used was Named as 1G wireless technology.

(1G) Analog technology.

1G technology (Analog technology)

This involved the usage of FDMA (Frequency division multiple axcis) technology for modulation. 2

2G technology (digital technology)

This involved a usage of combine TDMA (Time division multiple axcis) & FDMA technology.
Eg:- Gsm services, This technology also digitised the voice over a circuit. In both the technology a data was transmitted over circuit & was called as CSD (Circuit Switch Data).

3G technology (Gsm)

This used the spread spectrum techniques for media access & Encoding in this network for data & Voice packets were used.

Eg:- UMTS & CDMA 2000.
as all the technology were making a mark they become more popular in LAN, MAN & also formed as PAN

Some Open research topics

(1) Interference

Radio transmission cannot be protected against interference using shielding as this is done in coaxial cable or shielded Twisted pair. eg:- Electrical Engines & light way cost Severe interference & result in higher low rates for transmitted data or higher bits error rates respectively.

(2) Low Band width

Although they are continously increasing transmission rates are still very low for wireless devices compared to desktop systems. Local Wireless systems reach some mbps while wide area system only offers some 10kbps. One task would involve adopting application used with high bandwidth connections to the New Environment so that the user can continue using the same application when moving from desktop outside the building.

(3) Low Security Simpler attack

Not only can portable device can be Stolen more easily, but the radio Interphase also prone to the danger of eaves dropping wireless access must always include Encryption authentication & other security mechanism that must be efficient & simple to use.

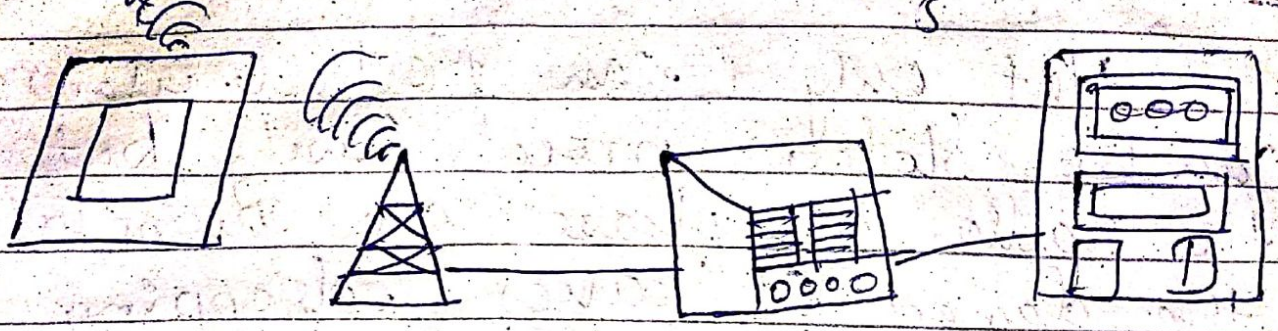
Regulation & Spectrum

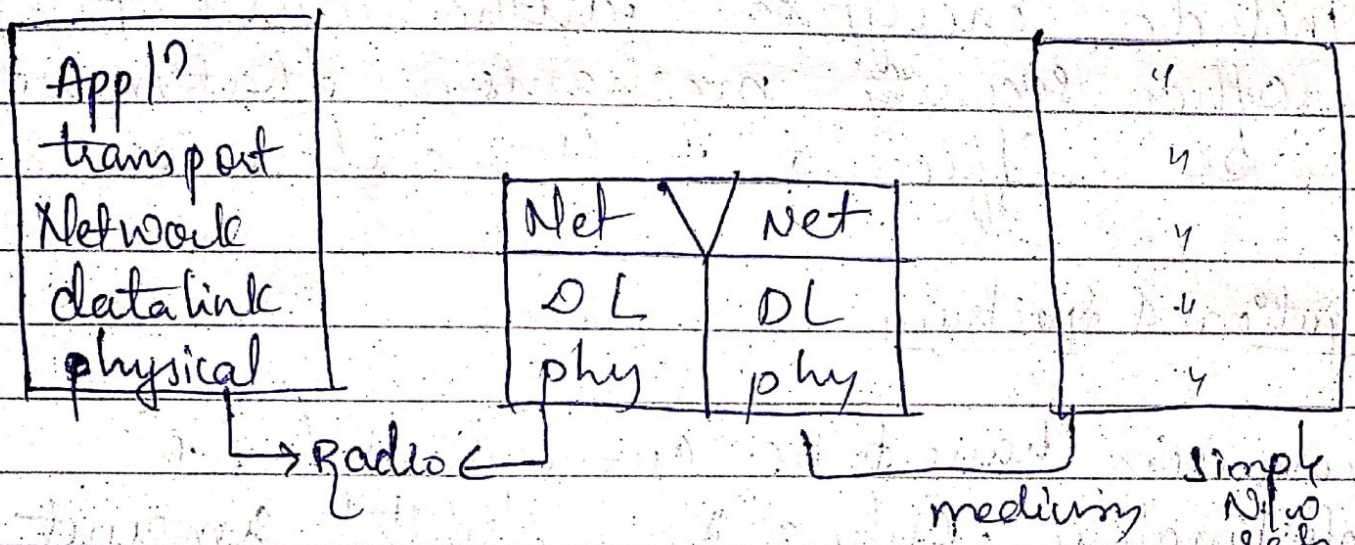
Frequencies have to be co-ordinated; & Unfortunately, only a very limited amount of frequencies are available (due to the technical & political reasons)
a Serious problem for communication protocols used in todays Internet is big Variation in link characteristics. In wireless System delays of Seconds seconds can occur & links offer difference Service Quality depending on the direction to & from the wireless device.

Shared medium

Radio access is always released via shared medium as it is Impossible to have a separate wire between Sender & Each receiver, different competetors have to fight for the medium.

A simplified referenced model 40 35 5





The Basic reference model used to used model structure communication system. fig shows a personal digital assistant (PDA) which provides an eg for wireless & portable device. This PDA communicates with the base Station in the middle of picture. The base Station consist of radio trans-receiver (Sender & receiver) & an interworking unit connecting the wireless link with the fix link. The communication partners of the PDA, a conventional computer as shown on the right hand side.

End system such as PDA & Comp in the eg, need a full protocol Stack

comprising the Appln, transport, Network, datalink, physical, application of End System communicates with the Each other, using the lower layer services. Intermediate System such as Introducing units do not necessarily need all of the layers. This is the lowest layer in OS & responsible for conversion of Stream of bit into signal that be can transmitted on the sender side. The physical layer of the receiver then transforms signals back into the bit streams. for wireless communication the physical layer responsible for frequency selection generation of carrier frequency, signal detection, modulation of data on the carrier frequency & Encryption

Data link layer

The main task of this layer include accessing the medium, multiplexing of different data stream, correction of transmission error data link layer performs, The most reliable node to node delivary of data form frames from the packets that receive from Network layer & gives into the physical layer. it also synchronises the info which is to be

- **Physical layer**: This is the lowest layer in a communication system and is responsible for the conversion of a stream of bits into signals that can be transmitted on the sender side. The physical layer of the receiver then transforms the signals back into a bit stream. For wireless communication, the physical layer is responsible for frequency selection, generation of the carrier frequency, signal detection (although heavy interference may disturb the signal), modulation of data onto a carrier frequency and (depending on the transmission scheme) encryption. These features of the physical layer are mainly discussed in chapter 2, but will also be mentioned for each system separately in the appropriate chapters.
- **Data link layer**: The main tasks of this layer include accessing the medium, multiplexing of different data streams, correction of transmission errors, and synchronization (i.e., detection of a data frame). Chapter 3 discusses different medium access schemes. A small section about the specific data link layer used in the presented systems is combined in each respective chapter. Altogether, the data link layer is responsible for a reliable point-to-point connection between two devices or a point-to-multipoint connection between one sender and several receivers.
- **Network layer**: This third layer is responsible for routing packets through a network or establishing a connection between two entities over many other intermediate systems. Important topics are addressing, routing, device location, and handover between different networks. Chapter 8 presents several solutions for the network layer protocol of the internet (the Internet Protocol IP). The other chapters also contain sections about the network layer, as routing is necessary in most cases.
- **Transport layer**: This layer is used in the reference model to establish an end-to-end connection. Topics like quality of service, flow and congestion control are relevant, especially if the transport protocols known from the Internet, TCP and UDP, are to be used over a wireless link.
- **Application layer**: Finally, the applications (complemented by additional layers that can support applications) are situated on top of all transmission-oriented layers. Topics of interest in this context are service location, support for multimedia applications, adaptive applications that can handle the large variations in transmission characteristics, and wireless access to the world wide web using a portable device. Very demanding applications are video (high data rate) and interactive gaming (low jitter, low latency).

ex:- SCTP? - WAP

1.6 Overview

The whole book is structured in a bottom-up approach as shown in Figure 1.7. Chapter 2 presents some basics about wireless transmission technology. The topics covered include: frequencies used for communication, signal characteristics, antennas, signal propagation, and several fundamental multiplexing and modulation schemes. This chapter does not require profound knowledge of electrical engineering, nor does it explore all details about the underlying physics of wireless communication systems. Its aim is rather to help the reader understand the many design decisions in the higher layers of mobile communication systems.

Chapter 3 presents a broad range of media access technologies. It explains why media access technologies from fixed networks often cannot be applied to wireless networks, and shows the special problems for wireless terminals accessing 'space' as the common medium. The chapter shows access methods for different purposes, such as wireless mobile phones with a central base station that can control the access, or completely decentralized ad-hoc networks without any dedicated station. This chapter shows how the multiplexing schemes described in chapter 2 can now be used for accessing the medium. Special focus is on code division multiple access (CDMA), which is one of the important access methods for many new systems. Further topics are variants of Aloha and reservation schemes known from satellite networks.

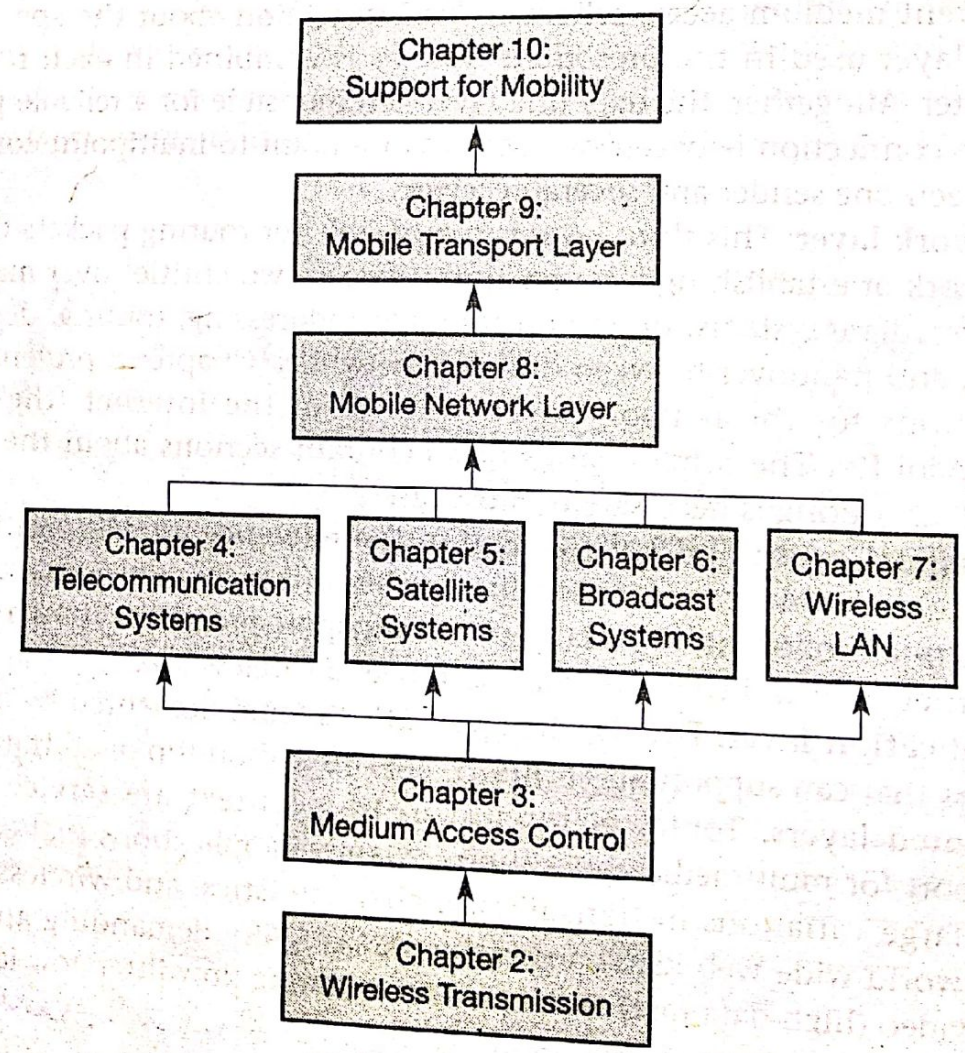


Figure 1.7 Overview of the book's structure