MC·Assignment·1   Haren Akila

2651-18-733-162

2) Mobile computing is a tech that allows t mission of data. voice & video thru a computer or any other wireless enabled device w/o having to be conn. to a fixed link.

Eg : TETRA

3) Applications of wireless n/w.

· Vehicles:
     Most of the cars use wireless comm. Networks with a fixed infrastructure will be interconnected with TETRA & wireless LAN's

· Emergencies:
     An ambulance w/ a high-quality wireless comm. to a hospital helps in sending imp. info to hospital.

- Bussiness:
     A trav. salesman needs instant access to company db to ensure that their files reflect the curr. situation & enable company to keep track.

- Infotainment

3) Path loss is the loss of power of an RF signal propagating through space. Expressed in dB and it's dependant on the dist. b/w transmitting and receiving antennas

Signal propagation effects:

- Attenuation: strength of signal falls w/ distance. The extent of attenuati is a func of dist., medium and the freq. as well

- Reflection of signals

- Refraction: Occurs as the velocity of the electromag. waves depends on density of medium.

- Scattering: takes place when an obstacles size is in order of the wave length or less than it

- Diffraction: occurs when the signal encounters an edge or a corner whose size larger than its wavelength

- Multi-path propagation:
  Most severe radio channel impairments

- Delay spread: (real)
  Due to finite speed of light, signals trav. across diff. path within diff. lengths arrive at the receiver on diff. times, this is done to multi-path propagation

- Fading: Refers to variation of signal w.r.t time/distance
  two kinds long-term & short-term fading

- Doppler shift: Due to moving sender/receiver.

7) Multiplexing describes how several users can share a medium with min. or no interference i.e. provides multiple use of shared medium.
Modulation is the process of taking info. from a msg. source in a suitable manner for transmission. It translates baseband signal onto a radio carrier at frequencies that're very high compared to baseband frequency.

8) Types of multiplexing:

- Frequency Div. Multiplexing:

FDM sep. whole spectrum into smaller freq. bands. Each channel gets a certain band of the spectrum allocated. Guard spaces are needed to avoid freq. band overlap. Doesn't need co-od b/w receiver & sender. Used for radiostations within the same region.

- Time Div. Multiplexing:

Here a channels gets the whole spectrum for a certain amount of time. i.e, all senders use same freq., but at diff. time. To avoid overlap precise sync. is ~~necessary~~ necessary.

- Time & freq. div. Multiplexing:

In this, a channel uses a freq. band for a given amount of time. Guard spaces are needed

Eg: GSM.

- Code division multiplexing:

First used in military app. due to security features. All channels use same freq. at same time, each channel is given its own code. guard spaces are maintained using the codes w/ apt. dist. in code space called the orthogonal codes.

i) Spread spectrum is a technique in which the transmitted signals of specific freq. are varied slightly to obtain greater bandwidth as compared to initial bandwidth.

- Freq. hopping spread spectrum:

This allows us to utilize b/w properly & max. In this, whole available bandwidth is div. into many channels & spread b/w channels, arranged continuously. Freq. slots are selected randomly & freq. signals are trans. acc. to occupancy

Senders & receivers keep hopping on channels for a particular amount of time.

Two types slow & fast hopping.

- Direct Sequence Spread Spectrum:

Primarily used to reduce overall signal interference in telecomm. DSSS makes transmitted signal wider in bandwidth than the info b/w

Two types wide & narrow band spread spectrum.

ii) Adv. of spread spectrum:
- cross talk elimination.
- better output.
- better security.
- noise reduction
- longer operative distances.

q) DSSS:

This system takes a user bit stream & perform an XOR w/ a pseudo random number called the chipping sequence

Each user bit has a ~~constant~~ duration t_b, the chipping sequence consists of smaller pulses called chips, with a duration t_c.

If the seq. is gen. properly then it's called pseudo raise sequence.

- DSSS transmitter:

Spreads the user data with the chipping seq. The spread signal is then modulated w/ a radio carrier, the radio carrier then shifts this signal to the carrier freq., this signal is then transmitted

- DSSS receiver:

Performs inverse func. to the transmitter modulation steps

2) Cellular system w/ 3 & 7-cell cluster:
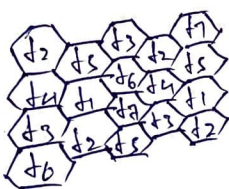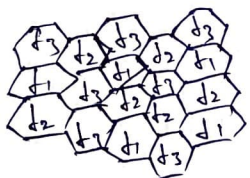
In abv. fig., cells are combined in cluster on left side, 3 cells form a cluster on right side 7 cells form a cluster.

All cells in a cluster use disjointed sets of f freq. On left side, one cell in cluster uses f_1, othe uses f_2 and third cell uses f_3.

sectorized antennas:

To reduce interference & under certain traffic conditions, sectorized antennas can be used.

- Fixed Channel Allocation:
Here certain frequencies are assigned to a certain cell, but if load varies it's not efficient.

- Borrowing Channel Allocation:
Cells w/ more traffic are dynamically alloted more frequency by borrowing from one w/ lighter load

- Dynamic Channel Allocation:
Here channels are assigned dynamically. More capacity is provided for cells w/ heavy load.

13 & 17) GSM offers several security services using confidential info. stored in the AuC & individual SIM

- Access control & authentication:
First step includes the authentication of a valid user for the SIM, user needs a secret PIN to access the SIM. Before a sub. can use any service from GSM n/w, he or she must be authenticated. Authentication is based on SIM, which stores authentication key K_i, the user identification IMSI.

- Encryption:
To ensure privacy, all messages containing user-related info are encrypted in GSM over the air interface. After authentication ns & BSS can start using encryption by applying the cipher key K_c, which is gen. using the individual Key K_i & a random value by applying algo A8.

4) DECT stands for digitally enhanced cordless tele communication.

DECT replaced older analog cordless system such as CTI & CTI+. These older sys. ensured security only to a limited extent as they didn't encrypt the data and had relatively low capacity. DECT is mainly used in offices, on campus, at trade shows or in homes. DECT can also be used to bridge the last few hundred meters b/w new n/w operator & customer. Works at a freq. range of 1880-1990 MHz offering 120 full duplex channels.

System architecture:

Diff. DECT entities can be integrated into one physical unit, these entities can be distributed, replicated etc
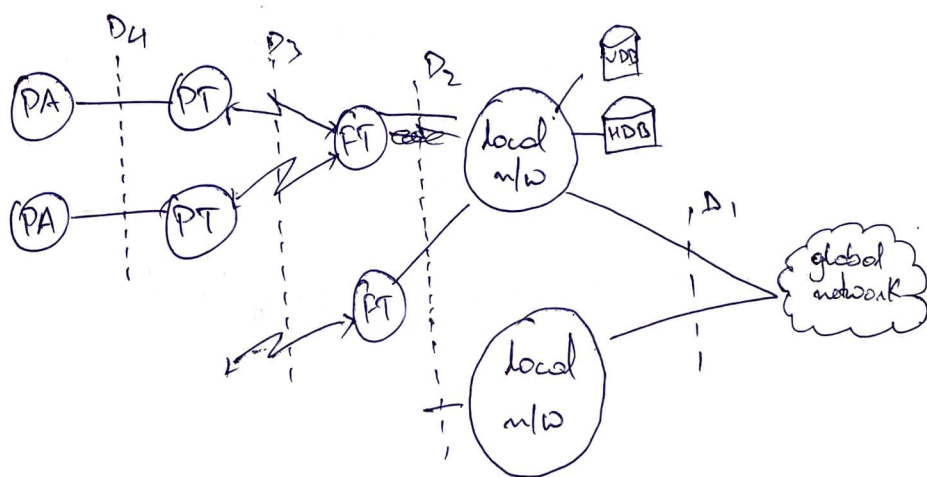
A global n/w conn. local comm. structure to outsid world & offers services via interface D1. Global n/w could ISDN, PSTN, PLMN.

The services offered by these include t-port of data, t-lation of address and routing data b/w local n/w.

local n/w offer services like simple switching, intelligent call forwarding, address translation etc.

DECT core has fixed & portable radio termination & basically only provides multiplexing service. Additionally several portable applications (PA) can be implemented on a device.

5) If a satellite offers ISLs, traffic can be routed b/w the satellites, if not, all traffic is relayed to earth & relayed back to satellite. Assume 2 users of a satellite n/w exchange data, If ISL is supported, thene one user sends the data & satellite forwards it to the one responsible for the receiver via other satellite. This last satellite now sends data down to earth, thus it has only one uplink & downlink. This reduces no. of gateways on earth.

If ISLs aren't supported, user sends data to satellite, which then forwards it to gateway on earth & is routed in fixed n/w as usual until another gateway is reached, then it's sent to satellite which forwards the to receiver, thus it has 2 uplink & downlinks.

Depending on orbit & speed of routing in sat n/w compared to terrestrial the solution w/ ISL offers lower latency.

8) The uplink frequency band for GSM is 890.2 & 915 MHz while all the dowlinks use 935.2 to 960 MHz frequency band.

2) Adv. of WLAN:

- Reliable communication
- Versatile way of comm.
- Easy to feature or remove a workstation.
- Provides high rate.
- Easy installation.