

Chapter (9) → Satellite Communication.

1) Satellite-Related Terms :

- 1- earth stations
- 2- uplink
- 3- downlink
- 4- Transponder

2) ways to categorize communication satellites :

- 1- coverage Area
- 2- service type
- 3- general usage

FSS BSS MSS

3) Classification of satellite orbits :

- 1- circular or elliptical orbit
- 2- orbit around earth in different planes
- 3- Altitude of satellites → GEO (geostationary orbit)
↳ MEO (Medium earth orbit)
↳ LEO (Low earth orbit)

4) Geometry Terms :

- 1- elevation angle
- 2- minimum elevation angle
- 3- coverage angle

5) Reasons affecting minimum elevation angle :

- 1- Buildings, Trees --
- 2- Atmosphere attenuation is greater at low angles
- 3- Electrical Noise.

6) Advantages of GEO orbit :

- 1- No problem with frequency changes
- 2- high coverage area
- 3- Tracking of the satellite is simplified

7) Disadvantages of GEO orbit :

- 1- weak signal after traveling over 35000 km
- 2- polar regions are poorly served
- 3- signal sending delay is substantial

8) LEO Characteristics :

- 1- circular orbit under 2000 km
- 2- orbit period (1.5 - 2 hours)
- 3- Maximum visible time up to 20 min
- 4- Round-trip signal prop. delay less than 20ms
- 5- sys must cope with large doppler shifts
- 6- Diameter of coverage is 8000 km

9) LEO Categories : → Big LEO's
↳ Little LEO's

10) MEO characteristics :

- 1- circular orbit in the range (5000 - 12000 km)
- 2- orbit period (6 hours)
- 3- Diameter of coverage (10000 to 15000 km)
- 4- Round-trip signal prop delay less than 50 ms
- 5- Maximum visible time is a few hours.

11) Satellite link performance factors :

- 1- distance between earth station antenna and satellite antenna
- 2- For downlink → terrestrial distance
- 3- Atmospheric attenuation

12) Capacity Allocation Strategies :

- 1- (FDMA) Freq. division multiple Access
- 2- (TDMA) Time " " "
- 3- (CDMA) Code " " "

13) Factors which limit the # of subchannels provided via FDMA :

- 1- crosstalk
- 2- Thermal noise
- 3- Intermodulation noise

14) Forms of FDMA → FAMA ↳ DAMA

15) FAMA characteristics :

- logical links between stations are pre assigned
- multiple stations access the satellite by using different freq bands.
- uses considerable bandwidth

16) Reasons for increasing use of TDM

Techniques :

- cost of digital components continues to drop
- advantages of digital components (error correction)
- increased efficiency of TDM (intermodulation noise decrease)

Chapter 10 Cellular wireless Networks.

Approaches to cope with increasing capacity:

- 1- adding new channels
- 2- freq borrowing
- 3- cell splitting
- 4- Cell sectoring
- 5- Microcells.

Steps in MTSSO controlled call between mobile users:

- 1- mobile unit initialization
- 2- mobile originated call
- 3- Paging
- 4- call accepted
- 5- ongoing call
- 6- handoff

Additional Functions in an MTSSO controlled call:

- 1- call Blocking
- 2- call termination
- 3- call drop
- 4- calls to/from fixed and remote mobile subscriber

Mobile Radio Prop. effects:

- 1- signal strength
- 2- fading

Handoff performance Metrics:

- 1- call Blocking probability
- 2- call blocking "
- 3- " completion "
- 4- probability of unsuccessful handoff.

Handoff strategies used to determine instant of handoff:

- 1- Relative signal strength
- 2- " " " with threshold
- 3- " " " with hysteresis
- 4- " " " - threshold and hysteresis
- 5- prediction techniques.

Types of power control:

- ↳ open-loop
- ↳ closed-loop

Traffic Intensity

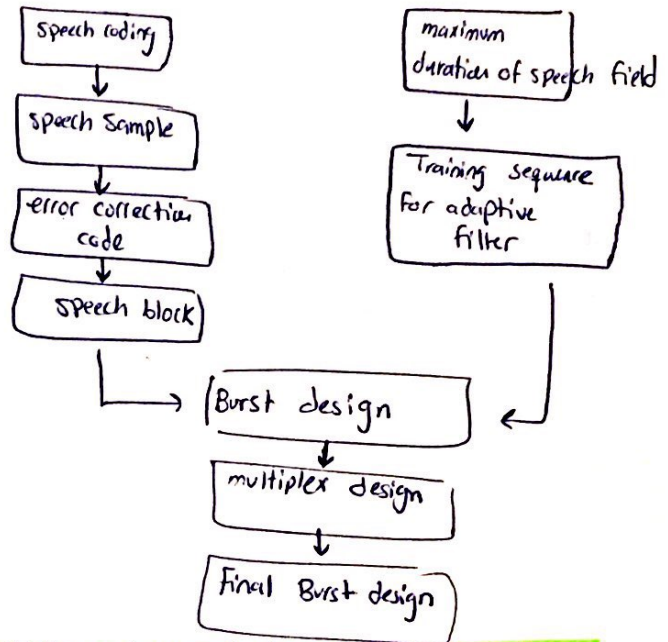
$A = \lambda h$

average # of calls mean rate of calls mean holding time

Differences Between first and second generation systems:

- ① digital traffic channels
- ② Encryption
- ③ Error detection and correction
- ④ channel access

Steps in design of TDMA Timeslot:



Mobile switching Center (MSC) Databases:

- 1- Home location register (HLR)
- 2- visitor " " (VLR)
- 3- Authentication center database (AuC)
- 4- Equipment identity register database (EIR)

TDMA format:

- ① Trial bits
- ② Encrypted bits
- ③ stealing bit
- ④ Training sequence
- ⑤ guard bits

Functions provided by protocols:

- 1- Radio resource Management
- 2- Mobility Management
- 3- Connection
- 4- Mobile Application Part
- 5- BTS Management

Advantages of CDMA Cellular

- ① freq. diversity
- ② multipath resistance
- ③ privacy
- ④ graceful degradation

Types of channels supported by forward link:

- ① pilot (channel 0)
- ② synchronization (channel 32)
- ③ paging (channels 1 to 7)
- ④ Traffic (channels 8 to 31 and 33 to 63)

16] MAC Management Messages :

- 1- Dynamic services change request, response and acknowledge
- 2- Dynamic service deletion request and response
- 3- multicast Polling assignment request and response
- 4- Downlink data grant type request
- 5- ARQ acknowledgement.

Chapter 12] Mobile IP and WAP

1] Capabilities of Mobile IP : *

- ① Discovery
- ② Registration
- ③ Tunneling

2] Types of Authentication Extensions :

- ① Mobile-home
- ② Mobile-foreign
- ③ foreign-home

3] Mobile IP encapsulation options :

- ① IP within IP
- ② minimal encapsulation
- ③ Generic routing encapsulation (GRE)

4] WML script Features : *

- Java-script-based scripting language.
- procedural logic
- Event-based
- Compiled implementation
- Integrated into WAE.

5] WSP (Wireless Session Protocol) provides apps :

- ~~connection~~ * connection-oriented session service
- * Connectionless session service

6] WSP Transaction Types :

- ① session establishment
- ② session termination
- ③ session suspend and resume
- ④ Transaction.
- ⑤ confirmed data push.
- ⑥ Nonconfirmed data push.

7] WTP Transaction Classes :

- class(0) → Unreliable invoke message with no result message.
- class(1) → Reliable invoke message with no result message.
- class(2) → Unreliable invoke message with one reliable result message.

8] WTP PDU Types :

- ① Invoke PDU
- ② segmented invoke PDU
- ③ Result PDU
- ④ Abort PDU
- ⑤ ACK PDU
- ⑥ Negative ACK PDU

9] Wireless Transport Layer Security Features : (WTLS)

- ① Data Integrity
- ② Privacy
- ③ Authentication
- ④ Denial-of-service protection.

10] WTLS higher layer protocol :

- The handshake protocol
- ↳ The change cipher spec protocol
- ↳ The Alert protocol

11] Phases of the handshake protocol exchange :

- 1st phase → used to initiate a logical connection and establish security capabilities
- 2nd phase → used for server authentication and key exchange
- 3rd phase → used for client authentication and key exchange
- 4th phase → completes the setting up of a secure connection.

12] Wireless Control message protocol (WCMP)

- 1- performs the same support function for WDP as ICMP does for IP
- 2- used in environments that don't provide IP
- 3- used by wireless nodes and WAP gateways to report errors.
- 4- used for informational purposes.

16] CDMA Design Considerations :

- Bandwidth
- Multirate
- chip rate

* Chapter 11] Cordless systems and Wireless Local Loop.

1] Cordless system Operating Environments:

- 1- Residential
- 2- office
- 3- Telepoint

2] Design Consideration for cordless standards:

- 1- Modest Range of handset from base station
- 2- Inexpensive handset and base station
- 3- Freq. flexibility is limited.

Time division Duplex (TDD)

- simple TDD
- TDMA TDD

3] Simple TDD : *

- effective bits transmitted per second $R = \frac{B}{2}(T_b + T_p + T_g)$

- Actual data Rate $\rightarrow A = B/T_b$

$$\text{So, } A = 2R \left[1 + \frac{T_p + T_g}{T_b} \right]$$

4] Advantages of TDMA/TDD :-

- 1] Improved capacity Allocation
- 2] Improved ability to cope with fast fading.

5] Field logical control channels :

Q, M, N, C channels.

6] B Field \rightarrow protected mode
 \rightarrow unprotected mode.

7] DECT protocol Architecture

\rightarrow physical layer

\rightarrow Medium access control (MAC) layer \rightarrow Broadcast

\rightarrow Data link control layer

\rightarrow connectionless
 \rightarrow Connection oriented

8] Advantages of WLL over wired :

- 1] Cost (wireless is less expensive)
- 2] Installation time
- 3] selective Installation

9] Fresnel Zone

$$R = \sqrt{\frac{\lambda SD}{S+D}}$$

10] Effect of Rain *

$$A = a R^b$$

\rightarrow attenuation
 \rightarrow rain rate

11] Effects of Vegetation :

- 1] Trees near subscriber sites cause multipath fading
- 2] multipath effects variable due to wind
- 3] multipath effects from Trees are diffraction and scattering.
- 4] Measurements in orchards found considerable att. values

12] Advantages of MMDS :

- 1] MMDS signals have larger wavelengths and can travel without losing power.
- 2] equipments at lower frequencies is less expensive.
- 3] MMDS signals don't get blocked as easily by objects and less susceptible to rain absorption

13] Advantages of LMDS :

- 1- high data rates
- 2- Capable of providing video, telephony and data.
- 3- low cost in comparison with cable alternative

14] IEEE 802.16.1 Services :

- 1] Digital audio/video multicast
- 2] ATM
- 3] Frame relay
- 4] Back-haul
- 5] digital telephony
- 6] IP
- 7] Bridged LAN

15] IEEE 802.16.3 Services :

- 1] voice transport
- 2] Data Transport
- 3] Bridged LAN