MOBILE COMPUTING

5TH SEMESTER

LECTURE NOTES

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Mobile computing

Date- 13/9/22

* Mobility means freely move.

Wireless network & mobile computing

Capable of move is called mobile.

→ capable of moving or being move i.e. called mobile.

Mobile phone

* A mobile phone can be used to communicate over long distances without wire.
* It works by communicating with a near by best station which connect it the main phone network.

Computing

Computing is any activity that uses computers to manage process & communication information.

Defination of mobile computing

Mobile computing is a technique that allows transmission of a data, voice & video through via a computer.

* Mobile computing is a reading term that refers to a verity of devices that allows people to access the data & information from where over they are.⇒

Feature of mobile computing

* includes
  1. Batteries
  2. Video camera
  3. camera
  4. voice record
  5. News player
  6. Easy to handle & carry the small devices.

* Data can be transfer easily.
* Having fast processing speed.
* Collect simulated data to current join in time.
* Good battery like
* Huge memory capacity.

Network

A network consists of two or more computers that are linked in ordered to share resources, exchange files or allow electronic communications.

Types of computer network

① LAN (Local area network
② MAN (Metropolitan area network)
③ WAN (wide area network)

Feature of computer Network

* communication speed
* File sharing
* Back & roll back is easy
* Software & hardware sharing
* Security.

Computer network architecture

It is defined as the physical & logical design of software hardware, protocols & media of the transmission of data.

Types of network architecture

There are two types of network architecture is used

* pear to pear
* Client or server network.

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Peer to pear Network

* It is less costly as it doesn't connect any dedicated server.
* If one computer stop working but other Computer will not stop working.
* It is easy to setup & maintain as each computer manages itself.

Client & server Network

* A client or server network contest the centralized system. Therfore we can back up data easily.
* It has a dedicated server that ~~increase~~ Improve the overal performance of the whole system.
* Security is better in client or server network as a signal server administator Share resources.

* It also increses the speed of sharing resources.

Computernetwork component

① hub
② switch
③ router
④ Bridge
⑤ Gate way

Transmission media:-

① coaxial cable
② Twisted pair cable
③ fiber optics cable

wireless & unguided media

* wireless network are computer network that are connected by cables of any type.
* The use of a wireless network enable enterprises to avoid to the costly process of introducing cables into building as a connecting between different equipment collection.

Types of wireless transmission media

→ of use in communication include
① infrared transmission media
② Broadcast radio
③ cellular radio
④ microwave transmission media
⑤ communication satelite

* The wirless transmission. Date - 20/9/22
media that send signal infrared transmission.
The process of sending & receiving signal through wireless network involves 2 devices
① Transmiter
② Receiver.

Receiver

The receiver pick up the waves with its antenna and terms the electric signal back into sound. where it can be hear.

Transmitter

It is an electronics device used in telecommunications to produce radio waves in order to transmit or send data with aid of an anteena.

* The transmiter is able to generate radio fregency alternating current i,e, then appy to antenna, which in term radiates this are radio waves.

wireless network

A wireless network refers to a computer network that makes use of radio frequency connections between nodes in the network

* wireless are popular solution for home buisness & for tele communication network.

* An electromagnetic field are generated when an radio frequency current is supply to an antenna that can then spread process.

* If you are downloading large file then where wire connection & faster than wireless.

* when using 802.11 N Router the speed of the wire connection was only 50% faster than the wireless.

Types of wireless network

There are 3 types of wireless network

① wireless LAN
② wireless MAN
③ wireless WAN

wireless LAN

connects two or more network devices using wireless distribution techniques;

wireless WAN

connect large areas comparising LANs, MANS and personal networks.

Wireless MAN

connets two or more wireless MAN. Spreading over a metropalitan area network.

Advantages of wireless connection

* it provided clutter free desk due to the absence of wire & cable.
* it increses the mobility of network devices connected to the system. since the device need to be connect to each other.
* Accessing network devices from any location within the network with coverag or wifi hotspot becomes convinient since laying out cables is not needed.

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* Insatltion & set up of wireless network are easier.
* New devices can easily connected to the exiting set up. since they need not the wire to the present equipment that can be added and remove can very considerabe. since they are not limitted by the cable capacity this make wireless network very scalable.

* wireless network required very limited or no wire. thus it reduces to the equipment & set up cost.

Mobile computing

mobile computing consist of two terms mobile & computing.

* mobile means not stationary & computing means is the activity, developing & using computer tech. including hardware & software.
* Thus mobile computing is a tech. that allow any time, any where, & every where computing.
* It is can be defined as a computing enviroment over phisical mobility such that user of a mobile computing environment will be able to access that are information or other logical object from any device.

* mobile computing system allows to user the perform the task from any where using a computing device.

* To make an computing environment existing it is necessary that the communication is spread over both wire & wireless media.

* mobile computing is the process of communication on a mobile device. each such computing a set up distributed computing system. service providers or servers participate connect & synchronize through mobile communication protocol.

Characteristics of mobile computing

⇒ Potability
The ability to move a device within a learning environment or two differents environments.

⇒ Social interactivity
The ability to share data & collaboration between users.

Contest sensitivity

The ability to gather or respond to real & simulated data unit to a current location, environment or time.

Connectivity

The ability to be digital connected for the purpose of communication of data that eny environment.

Small size

mobile devices are also known as hand held palm tops & smart phones due to their roughly phone line dimension

Indivisual

The ability to use the technology to provide scaffolding on difficult activity & lesson customisation for indivisual learners.

Wireless communication

mobile devices are typically capable of communication and with other similar devices with stationary computers & system with network and portable phones.

Unit-2

Application of mobile computing

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* There are some significant field in which mobile computing general use for

① wave & internet access
② Global position system
③ Emergency service
④ Entertainment services
⑤ Educational services

Other applications are :-

Traffic

During travelling in traffic if you latest news & which it feel more tress in driving then can play music & other important boarcast data are received through digital audio broadcasting.

Emergency situations

To play vital road in medical sector to can higher an ambulance with great quality wireless connection & help of this can carry significant information about injured persons.

use in Bubsiness

Help of video conference with discuss the at topic without any abstract at any time with the other sides. ib travelling sales man works to company accessing database per requirment that can be retrive data on his wireless device & maintain the consistancy companies data baso.

Credit card verification

Bank confer computer they over protected cellular network verify the credientify information of card firstly. gb match thes processed furdher otherwise define get boost of up speed of transaction process & received the all defails.

Replacement of fix Network

wire network has been replacement in wireless network that is source remote sencers & historical buildings. In wired network wheather broadcasting artwayy defection & to get environment data are imposible. It possible only adopting replacement of fix network

is this computing.

Advantages of mobile computing

→ Easy to operate.
→ Touch screen.
→ wireless
→ Ligate weight
→ Easy to carry
→ Any where access facility
→ Increasing productivity.
→ Entertainment
→ portability
→ cloud computing

Disadvantages of mobile computing

→ Battery consumption bistnance
→ Interconence is persited in shilding
→ Is ebbicient Bandwidth to transsmission
→ Network stability
→ protection constrents.

Chapter-2

Date- 23/9/23

Introduction to mobile development frame work

Client server architecture

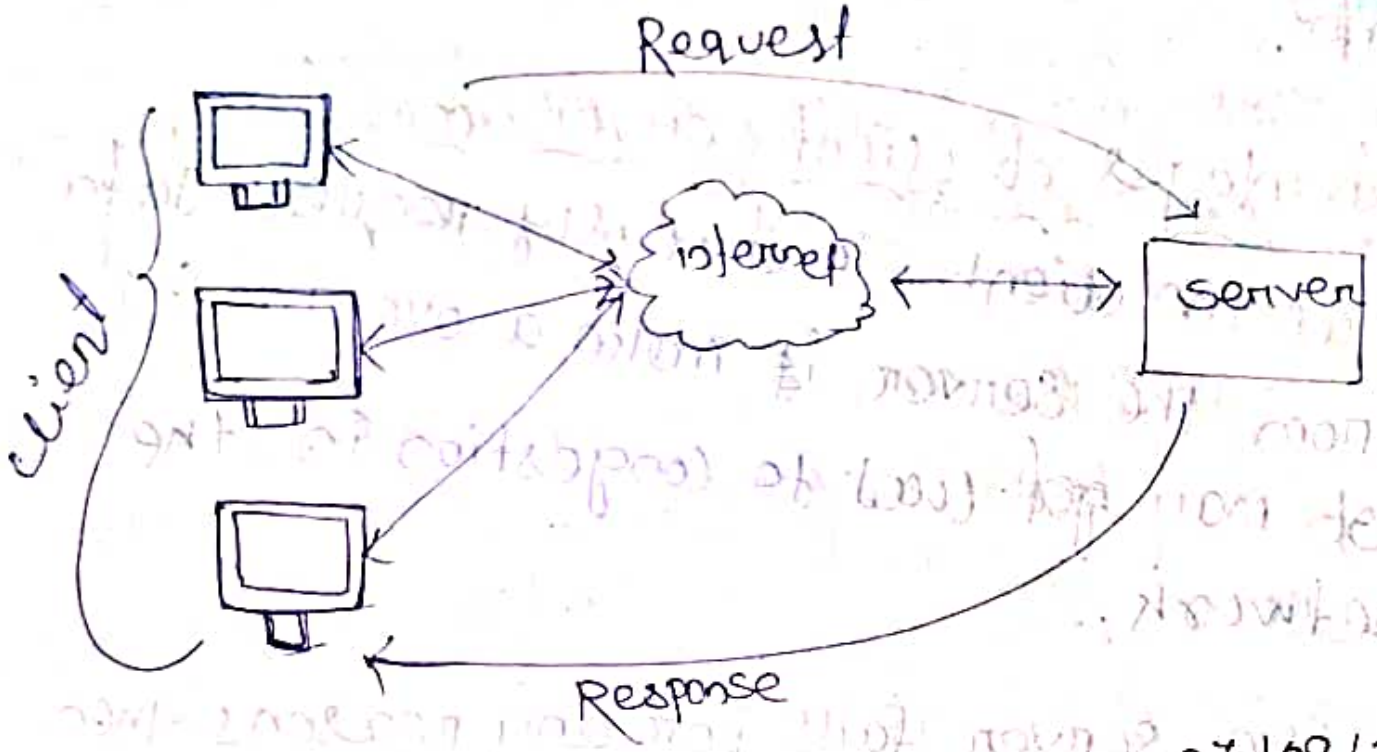
⇒ It is of a computer network in which many clients or (remote processors) request & receive service from a centra-lize server or (host computer)

⇒ client computer provide an interface to allow a computer user to request services of the server & to display the results the server refurs's.

⇒ client server is a computing model in which the server host, deliver & manages most of the resources & services to be consumed by the client. This type of architecture as one or more client computers connected to a central server over a network or internet connection

⇒ The client server computing works with a system of request & responds.

⇒ The client & server is follows a a common communication protocol so they can easily interactive with each other.



Advantages of client server computing 27/09/22

⇒ All the required data is concerned in a single place i,e, called server. It is easy to protect the data & provide authorization & authentication.

⇒ The server needn't located physically closed the clients yet the data can be accessed efficiently.

⇒ It is easy to replace, upgrade or relocate the nodes in the client server model because all the nodes are independent &

request data only for the server.

→ All the nodes i.e. clients & servers may not be build on similar platform. yet they can easily facilited the transfer of data.

Disadvantages of client server computing

→ If all the client simultaneously request data from the server it make a overloades it may lead to congestion in the network..

→ If the server fails for any reasons then none of the request of the client can be fulfil. This leads of failure of the client server network

→ The cost of setting & maintaining the client server model is quite hard.

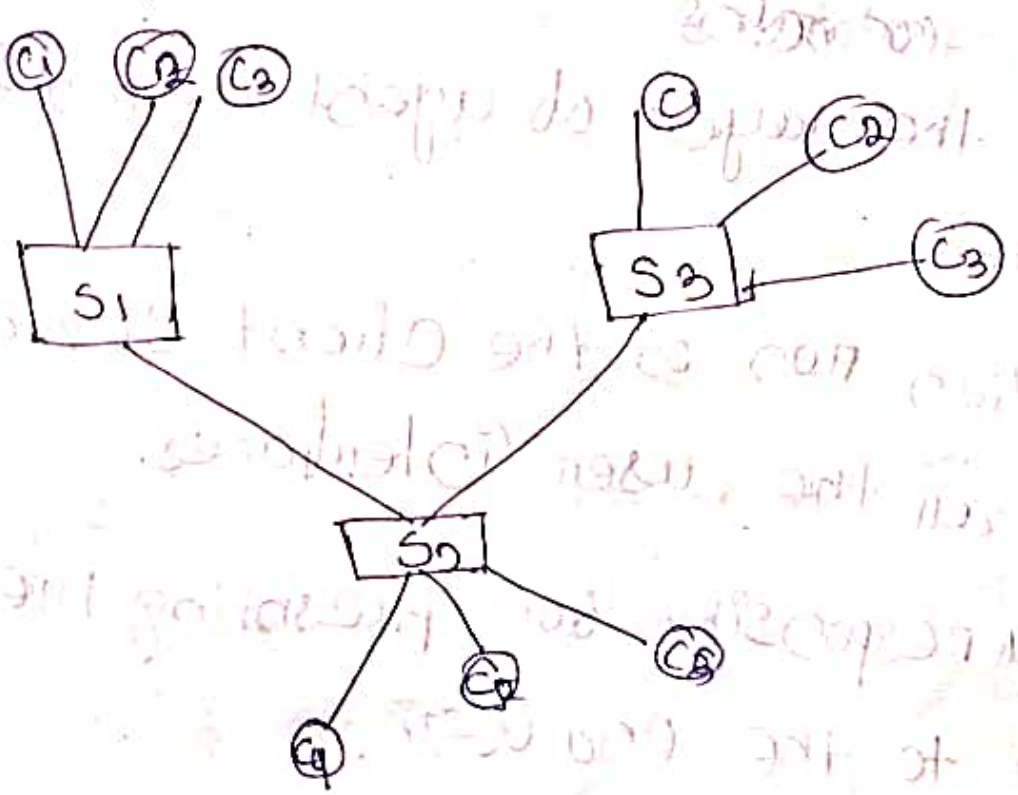
3 tier architecture

It is usualy divided in application in to 3 tires

① presentation tier
② Logic n-tier
③ data n-tier

It is also called multi-tier architecture.

→ It is a client server architecture is the function such as:- presentations, application processing & data management are physically separated. By separating an application into tire development obtain the option of changing or adding a specific layer instead of re-working the entire application. It provides a model by which developers can create flexible & re-usea -ble applications.



presentation tier

→ It is the top most level of the application by which users can access directly such as web page or operating system or GUI. the pri

→ The primary purpose of this layer is to translate the task & result to something that user can understand.

→ It communicate with other tire so that is place the result to the browser or client tier & the other tower is the network.

~~Application tier~~ (~~Business logic tier or middle tier~~)

~~Data tier~~ ~~entities~~

→ This is the layer of agent application or system

→ Application run on the client device & offer all the user interfaces.

→ It is all responsible for presenting the information to the end user.

→ Human use audio or video to receive

information for the machine.

→ Information is given to the system for the keyboard, lightpen it includes web browsers.

Application tier (Business logic/tier or middle tier)
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→ Application tier coordinate the application, process the commands, makes logical decission evalutions & performs calculations.
error detect

⇒ It controls application functionality by performing detail processing. It also moves & process data betn the 2 surrounding layers.

Data tier

→ In this layer information is store & retrive from the database or file system. the information is then passedback for processing & then back user it includes data persitences of mechanism (Data base server, & file share) & provide API (Application programming interfaces)

which provides method of managing the Store data.

Advantages of thick client

→ Better performance than a thin client approach & simpler to manage than a thick client to approach.

→ Enhances the usability & scalability as demands increase, extra Server can be added.

→ provides multi threading support & also reduces network traffic.

→ provides maintainability & flexibility.

Disadvantages

→ Non-Satisfactory testability due to lack of testing tools.

→ more critical Server reliability & availability.

Benifits of N-tier architecture

There are several benifits to using n-tire architecture for your software this are

Secure

we can secure each of 3 tier seperately using different method.

Easy to manage

we can manage each tier separatly adding or modifing each tier without affecting to the other tier.

Scalable

if we need to add more resources we can do it per tier without affecting the other tiers.

flexible

apart from isolated scalability we can also expand each tier in any manner. that your requirments detected.

Easy to new feature

a new feature you can add it to the appropriat tier without

accessing to the other tier.

Easy to reuse

Because this application is divided into independent tier we can easy reuse each tier for other software projects.

Advantages of n-tier architecture:-

Centralization of control:-

Access resources & integrated of the data as control is by the dedicated server so that the program or an authorized client can't damage the system.

Scallability:-

→ It can increase the capacity of client & server separately.

→ Back up and network security is control centrally.

→ Users can access share data which is centrally controled.

Pear to pear architecture (P2P)

→ A P2P architecture consist of D-centralized network or pear (system) that are both client & server.

→ P2P network distribute the work-load between peers & all peers contributes & consume resources with is the network without the need for a centralized server.

→ In the common client server architecture multiple client communicate a central server but P2P architecture is completely 'D'-centralized.

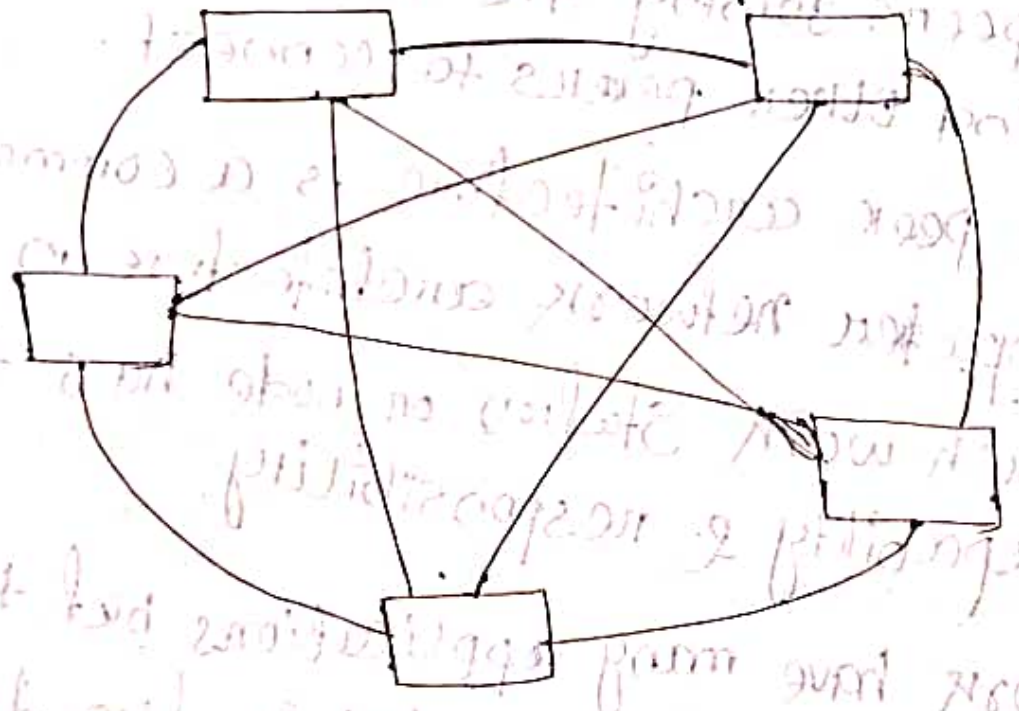
→ P2P architecture works page when there are a lots of activity peers in an active network so new peers joining the network can easily find other peers to connect.

→ Peer to peer architecture is a commonly used computer network architecture in which each work station or node has the same capability & responsibility.

→ P2P network have many applications but the most common is for content distribution this include software publication & distribute content delivery network, streaming media, peer casting for multicasting streams which facility on-demand content delivery

of other application involves science networking search & communication network that can be reassemble latter.

* This way the large no. peer can work simultaneously on task & each peer has less work to do. The case of P2P file sharing a file can be broken down. So that a peer can download many chunks of the file from different peer at the same time.



(P2P architecture)

* There are 3 model of unstructured P2P computer network architecture.

① pure P2P
② hybrid P2P
③ centralized P2P.

Some uses of P2P architecture

① file sharing
② Instant messaging
③ Voice communication
④ collaboration
⑤ High performance computing.

Some example of P2P architecture

① Napster
It was shutdown in 2001 since they used a centralized tracking server.

ii) Bittorrent (file sharing)
popular P2P file sharing protocol usually associated with privacy.

(iii) Skype

It used to use proprietary hybrid P2P protocol how user client server model other microsoft associated.

(iv) Bitcoin

P2P cryptocurrency without a central monitary authority.

Advantages of P2P architecture 12/10/22

→ There is no central server to pay for so this type of network can more economical.

→ There is no need for a networking operating system thus lowering cost even further.

→ There is no single point of failure unless is the very unlight case that the network is very small.

→ Each computer P2P network manages itself show the network is quite easy to setup & maintain.

→ In the client server network the server handel all the request of the client. This proviser is not required in P2P computing & the cost of the server is saved.

→ Easy to scale the P2P network & add more nodes this only increases the data sharing capacity of the system.

→ None of the nodes in the P2P network are dependent on the other for their functioning

Disadvantages

→ It is difficult to backup the data as it is stored in different computer system & there is no central server.

→ It is difficult to provide over all security in the peer to peer network as each system is independent & contains its own data.

WWW (World wide web)

→ www which is also known web it a collection data stored in web server & connected to local computer through the internet.

→ This website contain text pages, digital image, redio audio etc.

→ The user can access contain ob this sight from any part of the world.

→ The over internet using their devices such as:- computer, laptop & cell phone.

→ The www allow with internet enables the web access & display text media your devices.

→ The building blocks of web & web page which are format in HTML & connected by link called hypertext & hyper link & access by HTTP.

→ These link are electronics connection that link related pices of information, so that user can access the desire information quichly.

→ Eptics data application are data application that are separated into

multiple tier also called distributed application & multitier application.

→ Entire application separate processing into discript tier that are distributed betn the client & server.

→ When you develop application that access data you should have a clear separation betn the various tier that make-up the application.

For example

The presentation tier might be a windows form application, where as the data access logic might be a class library located in the middle tier. Additionally the presentation layer might communicate with the data access logic in the middle tier through a service such as a web services.

→ Separating application components the separate tier increase the maintainability & scalability of the applications.

→ It does this by enabling easier adoption of new technology that can be applied to single tier without the requirement to redesign the whole solution.

Mobile agent architecture: 13.10.22

→ A mobile agent is a composition of computer software & data. which is able to move from one computer to another automatically & continue it execution on the destination computer.

→ mobile agent is a process that can transport its state from one environment to another with its data intact & be able to perform appropriately in the new environment. mobile agent decide when & where to move.

→ when a mobile agents decides to move it self it own state transports. This save state to the new host & resume execution from the same state.

⇒ A mobile agent is a specific form of mobile code within the bined of code

mobility. However instruct to the remote evaluation & code & demand programming paradism & mobile agent adopting in that they can choose to migrate between computers at any time during their execution.

→ This makes them a powerful tool for implementing distributed application in a computer network.

There are two types of mobile agent

→ The classification in based on their migration path.

① mobile agents with predebined path: these have a static migration path.

② Free roaming mobile agent :- these have a dynamic migration path.

Computation Bundles

Converts computional client or server round trips to relocated data bundles reducing network load.

Parallel processing

Asynchronous execution on multiple data originious network host.

Dynamic adaptation

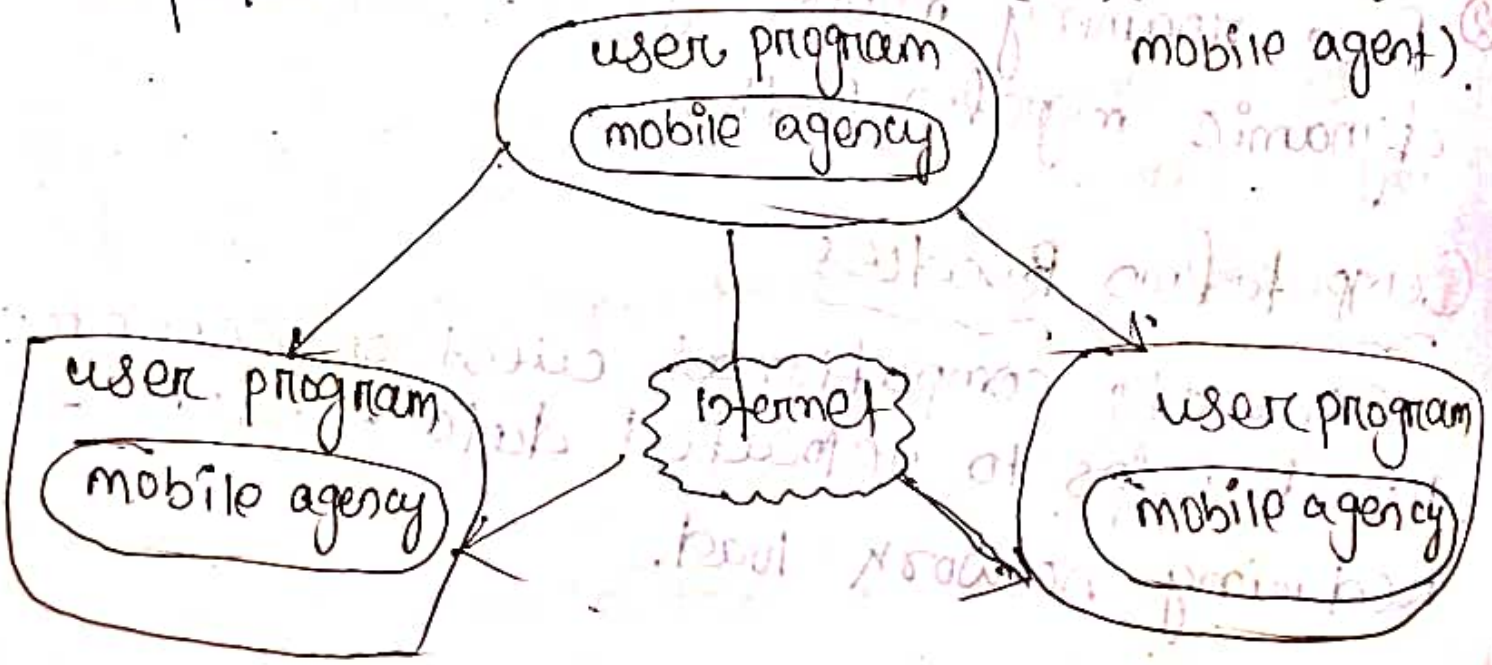
Actions are dependent on the state of the host environment.

Flexible Maintanance

→ To change an agent action only the source (rather than the compulest host).

→ Bandwidth conversion which is conversion a bandwidth of one host to another host - Reduces computation time.

(Life cycle of mobile agent)



The life cycle of mobile agent ensures the following conditions:-

(i) They can adopt to the environment:
ex// either home or foreign environment.

(ii) They are capable of switching among the position of one node to another.

(iii) They are autonomus & focussed on the final output.

Disadvantages of mobile agent

The most significant disadvantages of mobile agent is their security. They are less secure.

Applications of mobile agent

18-10-22

→ mobile agents are applied in a wide range of domains such as E commorce, trabbic control, network arrangement, Robotics data intensive applications.

→ They are also used in grid computing, parallel computing, distributed competing & mobile computing.

Chapter-3

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Wireless Transmission

wireless network is the form of unguided transmission media. when an antenna is attach to electrical circuit of a computer or wireless device it converts a digital data into wireless signal & spread all over with in its frequency range.

→ The process of sending & receiving radio signal through wireless ~~med~~ network involves two devices that is ① Transmitter
② Receiver.

Transmitter

The transmitter which ~~encode~~ imparts a message into an optical signal

Receiver

The Receiver picks up the waves with its antenna or reels on the turns the electric signal back into sound where it can be hear.

physical represents of data is called signal.

→ wireless signal are electromagnetic travelling through

→ These are perform when electric energy travel thrugh a piece of metal for example → A wire or antenna & waves are perform arround that piece of metal. this waves can travel

→ wire are important because they can transfor information by audio, video & our voice & data without the use & that makes them very useful.

Types of Wireless Signals

There are many types of wireless technology we make is similar familar with ! AM or FM radio, television, cellular phones, wifi satelite such as GPS. (Global positioning system) & Bluefooth. These are some most common signals.

Frequency

wireless signal occupies specturm or wide range of frequency. the rate as which the signal vibrates

→ If the signal vibrates very slowly it has slow frequency. If the signal vibrate very quickly it has high frequency.

→ frequency is measured in hertz (Hz) which is the count of how quickly a signal changes in every second.

ex// FM radio signal vibrate around 200million 3 time every second. since communication signal often very high frequency.

Measurment of frequency

① millions on vibration in a second is mega-hertz (MHz)

② Billions on vibration in second is Gigahertz (GHz).

③ 1000 megahertz is 1 Gigahertz.

→ wifi uses to band & higher frequencies 2.4 & 5 Gigahertz (GHz).

Definition of period 19.10.22

→ Period refers to the amount of time in sec. a signal needs to complite one cycle.

→ frequency refers to the No. of periods in one second.

→ The data rate for 2.4 gigahertz operation is 250 KBPS (kilobytg persecond). 4 Data bits are transfor during each simbol period.

→ A simbol period is therefore 16 microsecond.

→ It represent an estimation of the probality that a multicast data frame transmited with the rate will be receive by STAs of the multicast group.

Bandwidth

① Network bandwidth is the capacity of a wire or wireless network communication link to transfer the maximum amount of data from one point to there over a computer network or Internet connection.

for a given amount of time usually one second.

→ Bandwidth is not measure of network speed of the more bandwidth a data connection is more data it can send & receive at one time

→ while bandwidth with traditional expressed in bits per second (Bps)

→ modern network link have greater capacity which is typically measure with millions bits per second (mbps) or billions of bits per second (Bbps)

→ In wireless networks bandwidth is defined as the spectrum of frequencies that operater licences from the federal communication commition & the national communications administration for use in mobile services of us.

Antenna

wireless routers have diff. types of antenna

→ An Antenna is a metalic structure that captures an or transmits radio electro-

magnetic waves.

→ Anteenas comes in all shapes & sizes, ~~from~~ from little one that can be found on our roof to watch tv. to really big once that capture signal from satellites millions of miles away.

→ There are many specific types of anteena but three basic types are used are most of the time & will be useful in building a wireless network

D- 20-10-22

Types of anteena

The anteenas are categories based on the direction of the radions immediately by them. The three measure types of anteena based on their directions are

① omni-directional ~~anteenas~~ Anteena
② semi-directional Anteena
③ directional - Anteena

Omni directional Anteena

→ This anteena radiations radio power equally in all directions.

→ The power emidiale is perpendicular to the ~~access~~ axis of it is commonly used in application that require communication with multipul devices

→ when a node has an omnidirectional anteena attached can send & receive wireless signal in all direction around in eavary.

~~→ The signal is actualy strength out to the anteena~~

⇒ The signal is actual strength of weak signal comes out of the anteena.

→ Of you don't have to as much planning to connect with multipie node or building if there is enough signal there 21-10-22

Should connect omni directional Anteena to all directionay strengthanteena with the drop back of trasmiting a weaker signal

→ since the singal is going in an directionas distance very fast.

→ It nodes & clients are bar away they may not connect way. If there are only nodes & clients are one direction at the router then the signals are going in the opposite directions are wasted.

Semi-directional Anteena

⇒ This anteenas also radiate the power in a particular direction providing the radiations across a large area. It is generally a point to point communication used for short to medium distance communication.

Directional Anteena

The directional anteena radiation power in a specific directional. The power radiates thus first a strong bean. It prevents the radiation from any interbarence due to the radiation in a particular direction. It has narrow beam & dubble gane as compare to the omni directional anteena.

→ The application of directional anteena GPS & cellural anteena network.

→ When a node has directional anteena, has the wireless signal is very strong in one direction And have a very weak or no signal in every other direction.

→ there are 2 main types of anteena:

① sector anteena
② focus anteena

Sector anteena

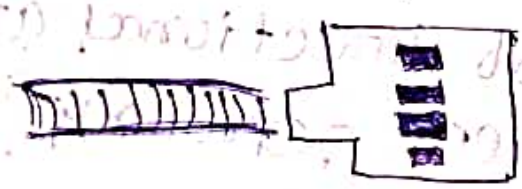
Sector anteenas send out a pie shape adge of signal.

→ It can be normally any where between 30° & 120° wide.

→ these are often long rectangular or anteena that are separate or integrated into our router.

focused anteena

It can be a focused anteena send out a narrow beam of signal.



These are around 5 to 10 degree wide
→ But it can be a little wider as well these are upon dises or have a mess bowl or reblecting signal we send them.

Advantage of Directional Anteena

→ using d. anteena has the benifit of increseasing a distance a signal will travel in one directions.
→ while reducing in all direction since the signal is all going one way.
→ the power that would be send out in all directio in which omni-directional node is now focused increasing the power in that direction.

D1 - 25-10-22

Disadvantages of Directional Anteena

→ Directional Anteena as also have the draw back of requireing more planning to create link in your negibour who since your are dibinding & limiting the areas where wire -less signals so you need to thing about how thesesignals cover your neighbourwood.

→ If there are areas that are then left out how will thoes areas be included in the network

Modulation

→ In addition to having different signal can be different in the wave they can convey information. A wireless signals needs to be modulated or changes to same information.

→ Mixing of low frequency signal with a high frequency carry of signal is called modulation. In otherwords modulation is the process of converting one form of signal into another form of signals.

✓ Analog signal to Digital Signal & Digital Signal to Analog signal.

Need for modulation / use of modulation

modulation is used to make the message carring signal strong to be transmitted over a long distance & establish a reliable communication.

→ A high frequency signal can travel to a longer distances without getting affected by external disturbances. To modulation these high frequency signal are used as a carrier signal to transmit the message signal this process is called modulation.

→ Another result to modulate a signal is to allow a smaller antenna needs to be about one to ten the length of the wave length of the signal to be efficient.

→ Modulation convert the lowe frequency signal into a much higher frequency signal which as much smaller wavelength & a smaller antenna.

Advantages of Modulation

→ Range of communication has increases.
→ Reception quality immensely improves.
→ Receivers are allowed to adjust the bandwidth
→ multiplexing of signal occurs
→ No signal mixing occurs

Types of Modulation

Primarily modulation can be classified in 2 types -
① Digital modulation
② Analog modulation.

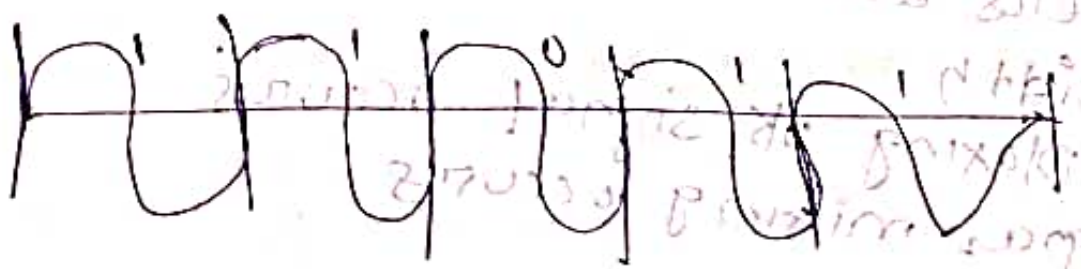
Digital modulation

It is a technique in which digital signals or data can be converted into analog signals. for ex- Baseband signals.
Digital modulation can be classified into 4 types.

① Amplitude shiftkey modulation
② Minimum shiftkey modulation
③ frequency shiftkey modulation.
④ Phase shiftkey modulation

Amplitude shiftkey modulation

In this shiftkey (ASK) modulation the amplitude is represented in 1. As if the Amplitude doesn't emit it is represented by 0.



→ Using amplitude shiftkey modulation is very simple & it requires very low bandwidth.

→ Amplitude shiftkey modulation is vulnerable to interference & deduction.

Minimum shiftkey modulation

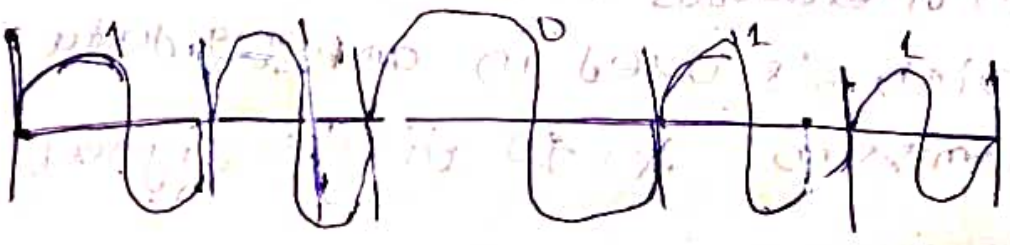
→ The msk is the most effective technique of modulation & can be implimented for almost every stream of bits. It is easy & effective than amplitude shiftkeys, frequency shiftkey & phase shiftkey.

→ It is mostly use because of it ability & flexibility to handle one & zero transition of binary bits.

Frequency shiftkey modulation

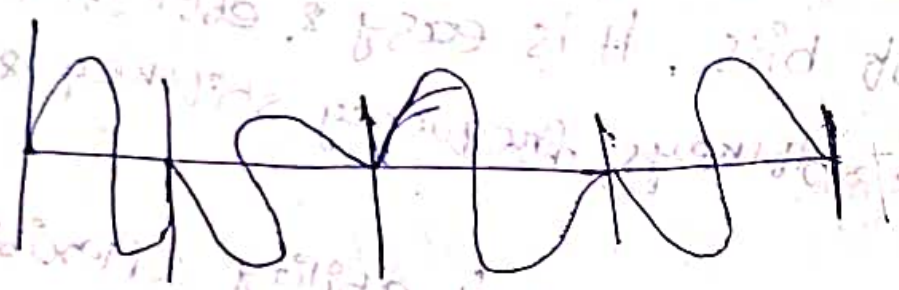
This modulation different notation f_1 & f_2 are use for different frequencies. Here F_1 is uses to represent bit 1 & F_2 bit 0

→ It is also a simple modulation technique but uses different frequencies for diffrent bit. Bandwidth requirements became high



Phase shiftkey modulation

This modulation the phase difference is used to differentiate bet the 1 & 0 bits. If the bit is one a simple wave is drone & if the bits becomes 0 the phase of the wave is shifted by 180° or π.



↳ Phase shiftkey modulation is more complicated than Amplitude shiftkey & frequency shiftkey.

Analog modulation

This is a process of transforming analog low frequency baseband signal such as an audio or TV signal over a higher frequency carrier signal such as radio frequency band.

↳ Baseband signals are always analog so this modulation. In otherwords this modulation is a technique which is used in analog data signal transmission & to digital signal.

AB. example of analog modulation is boardcast signal.

→ There are 3 properties of a carried signal of an analog signal that is

① Amplitude
② Frequency
③ phase

So the analog modulation can be classified into 3 types ~~first~~ first one is → Amplitude modulation
→ Frequency modulation
→ phase modulation

Amaplitude modulation

→ AM is a technique that is used in electronic communication. it is most commonly use for transmitting messages with a radio carrier wave.

Frequency modulation

FM is the process of encoding the information in a carrier wave by varying the instanious frequency of the carrier signal according to the instanious amplitude of the message signal.

Ex// FM radio boardcasting.

Phase modulation

→ It is the technique of varying the carrier signal instanious phase according to the instanious amplitude of the message signal.

→ It encodes the msg signals are changes occured in the instanious phase of a carrier signal.

→ Phase modulation is mostly use in wifi, GSM & satelite television.

Advantages of phase modulation

→ Phase modulation is mainly used for transmitting radio waves. It is also used in many digital transmission coding schemes and technologies such as wi-fi, GSM & satelite television.

→ In PM, modulation and Demodulation do not receive any channel noise.

Disadvantages of phase modulation

The PM modulation & Demodulation consist of a complicated circuit than AM & FM.

Advantages of frequency modulation

→ Frequency modulation is widely used for FM radio broadcasting.

→ It is also used in telemetry, sound synthesis, seismic prospecting, radar, and monitoring newborns for seizures via EEG, two way radio systems, magnetic tape-recording systems & Some video-transmission systems.

→ The main advantages of using frequency modulation in radio transmission is that it has a larger signal-to-noise ratio. That's why it rejects radio frequency interference better than an equal power amplitude modulation (AM) signal. This is the main reason why most music radio Channels prefer to broadcast over FM radio.

→ In FM, modulation & demodulation do not receive any channel noise.

Disadvantages of frequency modulation

→ FM consists of a complicated circuit than AM for modulation & demodulation.

Advantages of Amplitude Modulation

→ Amplitude modulation is easy to implement. It is simplest type of modulation.

→ Amplitude modulation, we can easily do demodulation by using few components and a circuit.

→ The hardware design of both the transmitter & receiver is very simple that's why it is cost-effective.

→ The receiver used for Amplitude modulation is very cheap.

Disadvantages of Amplitude modulation

→ Amplitude Modulation is not a very power efficient technique.

→ Amplitude modulation requires a very high bandwidth that is equivalent to that of the highest audio frequency.

→ Amplitude modulation is very susceptible to noise.

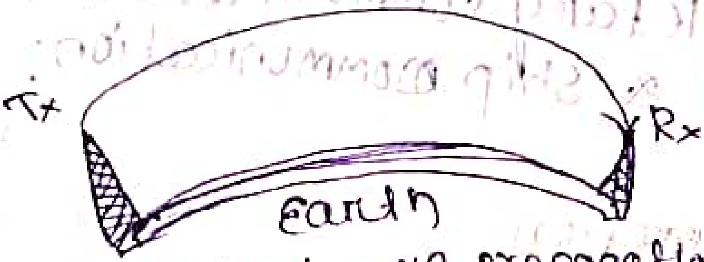
Date-2-11-22

Signal purpagation

This is the movement of radio waves from a transmitter to receiver when the waves travel from one point to another they a like light waves abbected by different phenomina such as:- light reflection, absorption or scattering. Wireless transmission propagate in 3 types.

- Ground wave propagation
- Sky wave propagation
- Line of sight propagation

Ground wave propagation



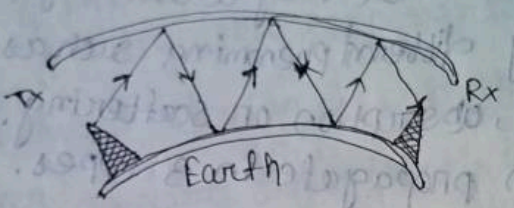
Ground wave propagation

frequency up to about 2 mHz for in this category of propagate mHz. Here waves follow curve this is due to electromagnetic waves. Induce current the eart surface.

→ This cause wavefront to bend towards the Earth & follow or propagate earth surface. Typical application include Am radio, boardcasting, direction finding

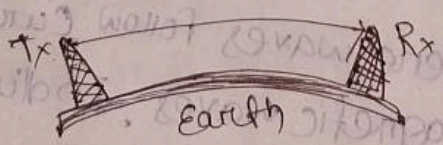
Submarine communication, home control system, analong telephone lice, long range navigation or more.

Skywave propagation



frequency bet? 2 mzH to 30 mzH fall in this catagory propagation. Here inasphere above the earth surface reflect the transmitted wave & hence it gets propagated due to reflection. Typical application include CB radio, International boardcasting, milefary communication & long range aircraft & ship communication.

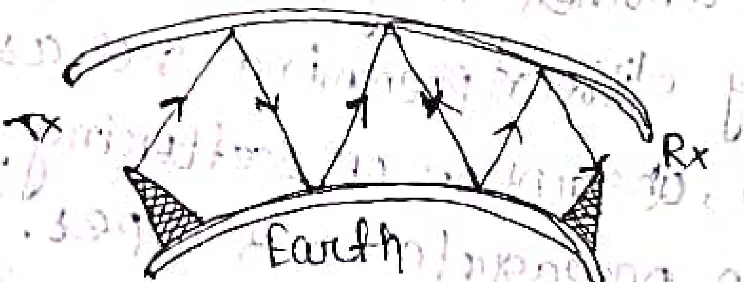
Line of sight propagation



Frequency above 30 mzH fall in this categori of propagation here signal above 30 mzH are not reflected by inosphere & here it is transmi

Submarine communication, home control system, and long telephone tice, long range navigation or more.

Skywave propagation



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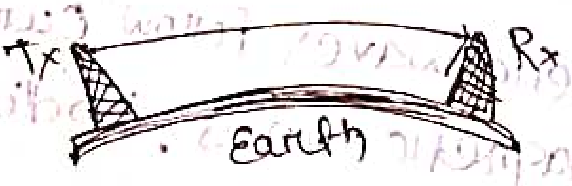
Line of sight propagation



Frequency above 30 mzH fall in this categori of propagation here signal above 30 mzH are not reflected by inosphere & here it is transmi

based on line of sight concept.

→ For satelite app. it is transmitted from earth station antenna to the satelite antenna. For groundbase wireless link, communication happens when both the transmitted antenna are in the line of sight of each other. Typical app. include FM radio, optical communication, infrared trans, teresterial link, radar, cellular broadcasting.

Dt = 5-11-22

Transmission limitation

The various limitations that affect electromagnetic wave transmission

(i) Attenuation

The strength of signal balse with the distance over transmission medium. The extend of attenuation is a function is distance, transmission medium as well as the frequency of the underline transmission.

(ii) Distortion

Since singnals are diff frequency attenuate to diff extends a signal comprising of components over a range of frequencies gets distorted. That is the safe of the receive signal changes.

(iii) Despersion

It is the phenomenon of spreading of a burst of electromagnetic energy during propagation. Brust of data send in rapid succession tend to merge due to Despersion.

(iv) Noise

The most pervasive from of noise is thermal noise. Thermal noise is due to agitation of electrons & it is uniformly distributed accross the frequency sprecturm.

→ Noise includes inter-modulation noise (caused by the signal produce at freaquencyes that are sumes or differences carrier frequencies)

(v) Cross talk :- (Interference bet^n two signals)

→ impules Noise :- Irregular of pauses of high energy caused by electromagnetic disturbances. while an impulse noise may not have a significant impact of an analog data. It has a noticiable effect on digital data. Causing brust errors.

Fading

Fading refers to the various of the signal strength with respect two type of distance & is widely prevalent in wireless trans-missions. The most common cause of fading of wireless environment are multipath propagation & mobility.

Multipath propagation :- In wireless media signal propagate using 3 principles which are

(i) Reflecting.
(ii) Scattering
(iii) Diffraction.

Reflection

Reflection occurs when the signal encounters a large solid surface whose size much larger than the wavelength of the signal.

Diffraction

It occurs when the signal encounters an edge of the corner whoes size is larger than a wavelength of the signal i.e. an edge of the wall.

Scattering

Scatters occurs when the signal encounters small object of size smaller than the wave length of the signals

→ It waves are produce by rough surface small object or by other irregularity of the channel

9-11-2022

Multiplexing

It is a technique but which different analog & digital strings of transsion can be simultaneously process a share link. It is a technique we use in the area of electronic & signal processing.

Ex//

multiplexing in the telecommunication fields where several telephone calls may be carried using one wire.

→ multiplexing is the method that can be used multiple analog or digital signal into one signal over a share medium.

Keypoints of multiplexing:-

multiplexing is a technique that allow multiple simultanious signal, analog & digital signal transmission accross a single data link.

→ The main motive behind the development & multiplexing is to provide simple & easy communication, proper resource sharing & it's utilization this is the best way to utilize & shared a limited resources equal among multiple devices

→ multiplexing can be classified into 4 types:-

① Frequency division multiplexing (FDM)
② Time division multiplexing (TDM)
③ code division multiplexing (CDM)
④ Space division multiplexing (SDM)

FDM

→ It is inherently an analog technology as the names specifies in FDM the frequency dimensio Spectrum is split into smaller frequency bands.

→ It combine several smaller distinct frequency ranges signal into one medium & sends them over a single medium in FDM signals are electrical signals.

E.g. It is a common application that are used in traditional radio & TV broad casting mobile or satellite station communication or cable TV.

→ an FDM several frequency band can work simultaniously without any time constraint.

Advantages

The concept of FDM applies to both analog & digital signal.

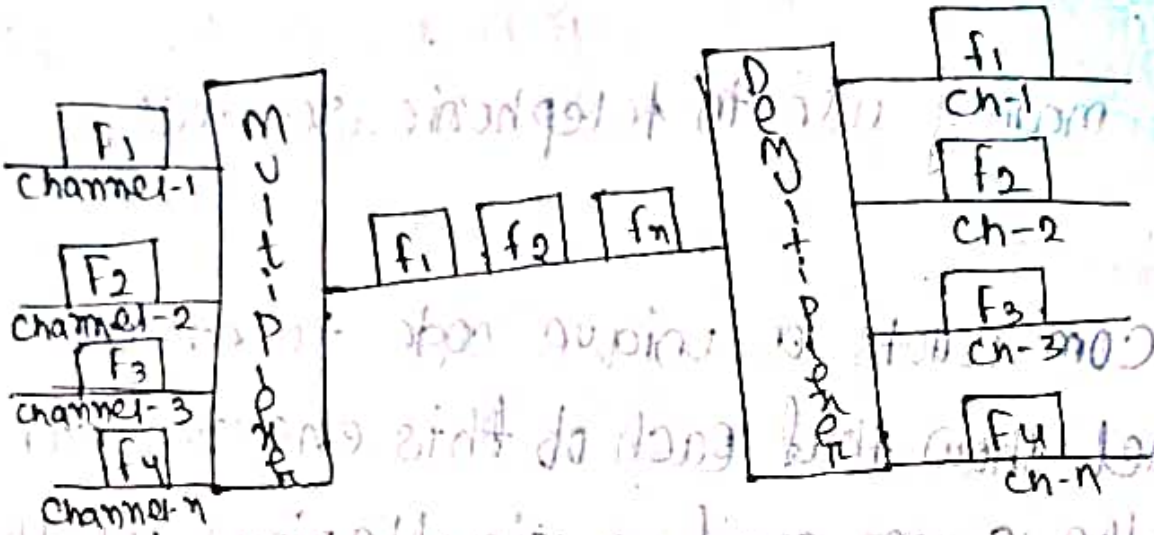
→ It facilities you to send multiple signal simultaniously with in a single connection.

Disadvantages

→ It is less flexible

→ In FDM the bandwidth may be wastages. high.

Diagram



TDM

→ The TDM is a digital or analog technology that use time a instead of space or frequency to separa the different data streams.

→ It is used for a specific among of time in which whole spectrum is used.

→ The time signal are assigned into individual user & are rotate at regular intervals.

Advantages

→ It facilitate a single user at a time.

→ It is less complicated & has a more flexible architecture.

Disadvantages

→ It is not easy to implement.

uses

It is mainly use in telephonic services.

CDM

The com allots a unique code to every channel show that each of this channel can use the same spectrum simultanious at the same time.

Advantages

→ It is highly efficient.
→ It phases fewer interences.

Disadvantages

→ The data transmission rate is low.
→ It is complex.

uses

→ It is mainly use in cellphone spectrum technology (2G, 3G, etc).

SDM

→ The SDM is called a combination of frequency division multiplexing or TDM is passes messages or data parallel with the use of specific frequency it means a perticular channel will be used gains a specific frequency band for some amount of line.

Advantages

→ In SDM the data transmission rate is high.

→ It uses time & frequency bands at its maximum potential.

Disadvantages

→ An inborence may occure.

→ It phase high inberience losses

Uses

→ It is used in GSM(Global service for mobile technology)

Spread spectrum SMP

→ It is a technology used for wireless communication in telecommunication & radio communication.

→ In this technique the frequency of the transmission signal i.e, electromagnetic

Signal or acoustic signal is deliverately varied & generates a much greater bandwidth than the signal would have if its frequency wires not varied.

→ In otherwords spread spectrum is a technique in which transmission signal or specific frequency are varied slitely to obtain greater bandwidth as compair to initial bandwidth. It is widely use in radio signal transmission because it can easily reduce noise & other signal issues.

Reasons used for spread spectrum:-

→ If Spread spectrum signal are distributed over a wide range of frequency & then collected & receive back to the receiver & other hand wide band signal are noise like & challenging to detect.

→ Initially the spread spectrums adopted in military application because of it's registance to Jumping & difficulty in interacting.

→ Now this is also used in commercial wireless communication.

→ It is most prefer because of its useful bandwidth utilization ability.

Uses of spread spectrum

→ There are many reason of use this for wireless communication.

① It can limit power flux density.
② It can enable multiple access communication.
③ It can succesfully establish a secure medium of communication.
④ It can increase the resistance to natural interference jamming to prevant detection.

Types of spread spectrum

1- Frequency hopping spread spectrum (FHSS)
2- Direct sequence spread spectrum (DSSS)

Frequency hopping spread spectrum D-17-11-22

The FHSS allows us to utilize bandwidth properly & maximum. In this technique the hole available bandwidth devided into many channels & spreed btn channel arrange continuesly.

→ The frequency slots are selected randomly & frequency signal are transmitted accordingly their occupaied.

→ the transmiter or receivers keep on hopping on channels available for a perticular amount of time in miliseconds So, we can see that it implement the frequency division multiblexing & time division multiblexing simunstaneous FHSS.

→ The FHSS can also be dessibioed in two types ① Slow Hopping
② Fast Hopping

Slow hopping :- A slow hopping multiple bits are transmitted on a specibic frequency or same frequency.

Fast hopping :- In fast hopping intivision bits are split & then transmitted on different frequencies.

Advantages of frequence hopping spread

→ The FHSS signals are highly registance to narrow band Interference because the signal hoppes to a different frequency band

→ It is highly secure. It signals are very difficult to interset if the

that's why it's Prefore to use millter services.

Directsequence Spread specturm (DSSS)

→ DSSS is a spread secturm modulation technique primary used to reduce overall signal interferance in telecommunication.

→ It make the transmitted signal wider in bandwidth. The message bit are moduleted by bit ~~modulat~~ sequencing process known as spreading sequences process. This spreading sequences It has a much suter duration than the original message bit.

Features

In DSSS technique the data that needs to be transmitted is split into smaller blocks. After that each data block attach with a high data rate bite sequence. And is transmitted in the sender end to receiver end.

- Data blocks are recombine again to generate the original data & the receivers end. which was send by the sender with the help of data rate bit sequence.
- If some how data is lost then data blocks also be recovered with those data rate bits.
- The main adv. of spliting the data is smaller block is that it is to noise & un intensional inberance.
- The DSSS also be classified into 2 types. ① wideband spread spectrum.
  ② narrow band spread spectrum.

① Narrow band spread spectrum

narrow band includes a modulation technique in which a signal is transmitted as a radio frequency signals at or with in a

frequency band.

→ Spread spectrum includes a modulation techniq in which a signal is transmitted as an radio frequenc signal spread over a range of frequencies.

wideband spread spectrum

Spread spectrum generally makes uses of a sequential noise like signal structure to spread the signal normally narrow band int. signal over a relatively wide-band band of frequencies.

→ The receiver collect the receive signal to retrive to original information signals.

Difference betn wideband or narrow band.

→ narrow band system typical have lower data rate transmitted where as wide-band system support relatively nigher data rate transmitting.

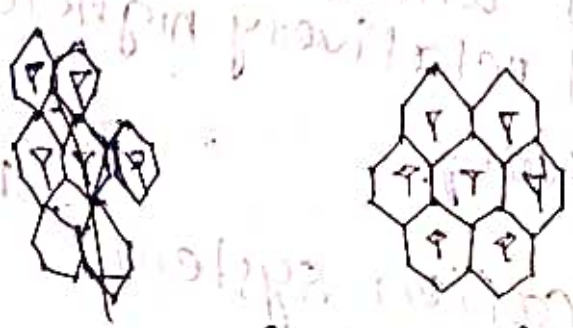
Cellular communication system

This systems are wideles mobile communica system that divided large geographic area in to smaller section or cells

each with a ~~area~~ low power wireless transmitter for the purpose of the optimizing of the users of a limited number of frequencies.

→ The cellular system replace in a large zone with a no. of smaller ~~exami~~ hexagonal cell with a single, ~~base station~~ base station covering a fraction of the area.

→ with all wireless receivers located in a cell being served by a base-station



Cellular system
Smaller zone

consist of some major componet. that work together to provide mobile service

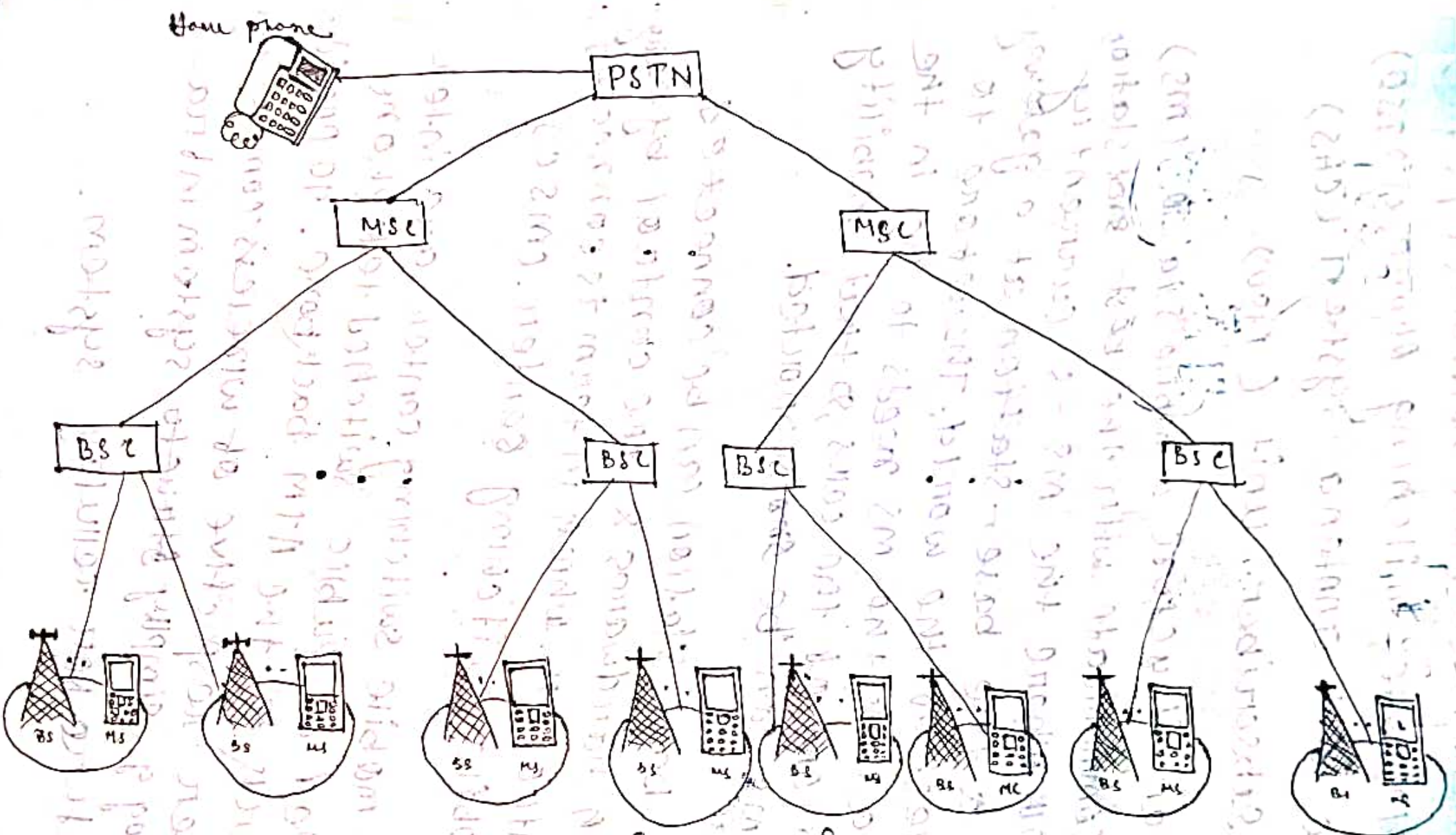
to subscribers

① Public switched telephone network (PSTN)
② mobile telephone switching office (MTSO)
③ Cell site with antena system (CAS)
④ mobile subscriber unit (MSU)

on a cellular structure a mobile station (MS) need to communicate with the best station of the cell where the MS is currently located & the base-station at a gateway to the rest of the world. Therefore to provide a link the MS needs to be in the area of one of the cells, so that mobility of the MS can be supported.

→ Several base-station can be connected through hardwares & are control by every b.s controller. which in term is connected to a mobile switching center. (MSC)

→ Several mobile switching center are interconnected a public switched telephone network & the ATM backbone. To provide a better respective of wireless communication technology simply structure system infra-structure for cellular system.



Cellular System Infrastructure

Ch-4 D- 23-11-22

Medium access control :

(MAC)

→ The medium access control is a sublayer of the data link layer of the open system interconnection reference model for data transmission.

→ It is responsible for flow control & multiplexing for transmition media. It controls transmition of data packet via remotely shared channel.

→ It is a hardware identification no. that identifyes each device connected to a network.

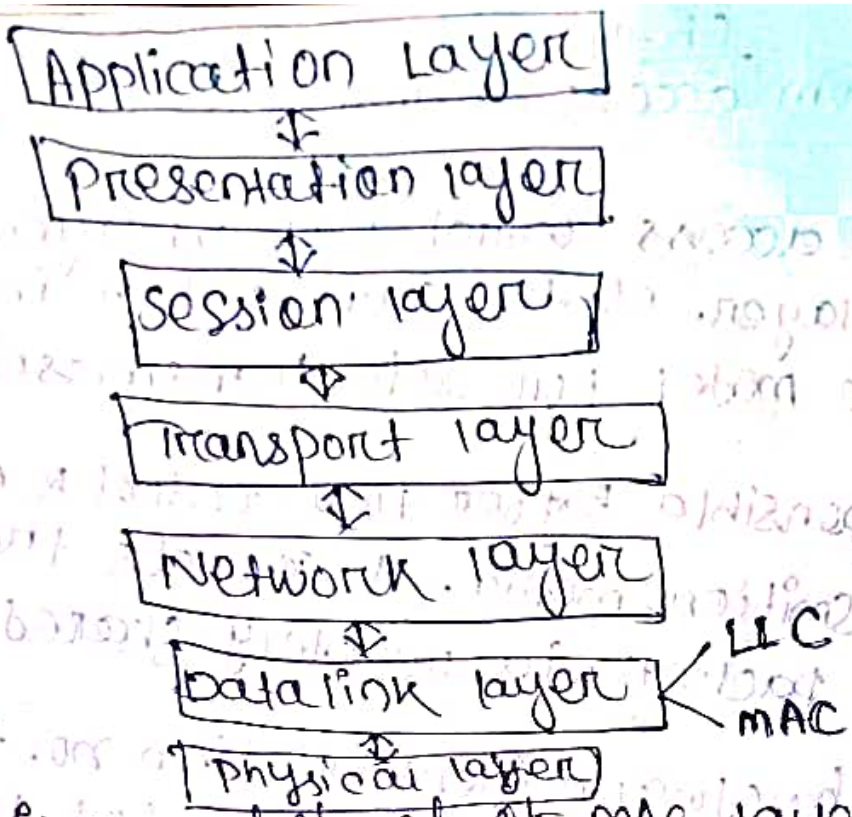
→ The MAC address is embbed into network interface cards in your computer such as ethernet card / WiFi card. A time of manufacturing by the vendor so it can't be change.

Functions of MAC Layer

→ The data link layer is 2nd lowest layer in OSI model. It is divided into 2 sub layer

① Logical link control sublayer (LLC)

② Medium access control sublayer (MAC)



It provides a abstract of MAC layer to the LLC & upperlayers of the OSI network.

→ It is responsible for encapsulating frames so, that theriel suitable for transmission via for physical medium.

→ It resolves the addressing of source station as well as the destination system or group of destination station.

It performs multiple access resolution when more than one data frame is to be transmitted. It determine the channel access method for transmission.

→ It is also perform collisions resolutions & initiating retransmissions in case of collisions.

→ It generates the frame check sequences & thus contributes the protection again the transmission error.

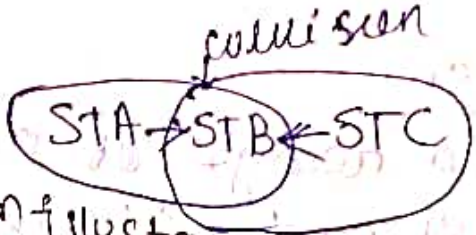
D-29-11-22

Hidden terminal (2 mrk)

The hidden terminal problem is a transmission problem that arises when 2 or more station who are out of range of each other transmit simultaneously. to common recipient.

→ This is prevalent in de-centralized system where there are not any entity for controlling transmission

→ This occurs when a station is visible from a wireless access point but it hidden for other stations that communicate with AP.



problem illustration

Suppose there are 3 station labelled

① STA
② STB
③ STC

where STA & STC are transmitting while STB is receiving.

→ The station are in a configuration ~~there~~ such that the two transmiter STA & STC are not in the radio range of each other

→ The station STA start transmission to this station STB. Since STC is out of radio range in out of Radio Range of STA. STA persive that the channel is free & start transmitting to STB the frames received by STC are garvled & collision occurs. This situation is know as hidden terminal problem.

2 marks

→ Two nodes that are outside each other range perform simustanious transmission to a node i.e, within the range of each other, hence there is a packet collision that is called hidden terminal problem.

Exposed terminal problem

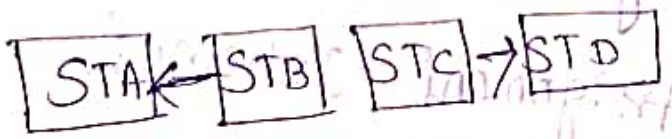
The node is within the range of node i.e, transmitting & it can't transmit to any node i.e, called exposed terminal problem.

→ The exposed terminal problem is a transmission problem that arises when a transmitting station is prevented from sending frames due to interferance with another transmitting station. This is prevelant in de-centralized system where there aren't any entity for controlling transmission.

→ This occurs when a station is visible from access point but not for other stations that communicate with AP.

Problem illustation

→ Suppose there are 4 station label :- STA, STB, STC, STD. where STB & STC are transmitter while STA & STD are receiver at some slot of time



The stations are in a configuration such that the two receiver STA & STD are out of radio range of each other. But the 2 transmitters STB & STC are in radio range of each other.

The above diagram shows that the transmission is going on from STB to STA, STC falsely concludes that the above transmission will cause interference & so stops it's

transmition attempts to STD. However the interberence would not have occured the transmission from STC to STD for out of radio range of STA. this prevention transmision is called exposed terminal problem.

→ the STC here request to send from STB but doesn't here clear to send from STA. So it is free to transmit STD.

D-30-11-22

The basic access method / Taxonomy MAC protocol

A Large number of mac protocols have purposed these MAC protocol can be broadly divided into 3 categories.

① Fixed assignment Schemes
② Random Assignment schemes.
③ Demand based schemes.

Fixed assignment schemes

The fixed assignment Schemes are usually called circuit switchs scheme is the fixed assignment scheme the resources required for a call for are assign for the entire

direction of the call.

2 Random assignment / Access scheme

→ The random assignment schemes & the reservation Scheme are called packet switches scheme.

→ The random assignment scheme are compare to the connectionless packets switching Scheme in this no resource reservation are made the ~~nodes~~ nodes simply start to transmit as soon as they have a packets to send.

Demand based scheme

→ In the reservation scheme a node make explicity reservation of the channel for an entire call before transmitting.

→ this is analogous to a connection based packet switching scheme.

→ The reservation based MAC schemes are suitable to handle calls with widely varying traffic characteristic.

→ Demand based scheme also known as reservation scheme.

Near or Far terminal

Near or Far terminal problem is the effect of a strong signal from a near signal source in making it hard for a receive to hear weaked signal from a further source due to adjacent channel interfaces, distortion, capture effect dynamic range limitation or the like.

Terminals A & B send & receives

→ signal strength decreases proportional to the square of the distance.

→ A & B send with similar signal strength.

→ The signal at terminal B, therefore, drown's out A's signal act C.

→ 'C' can not receive A if C. For example was an arbiter for sending rights, Terminal B would drawn out terminal A already on the physical layer.

→ Lack of fairness for any MAC layer scheme also server problem for CDMA (code division multiple Access) Networks.

→ prisise power control needed different signal strength monopoliza medium.

Access method

There are 4 types of access methods, such as
① SDMA (Space division multiple Access)
② FDMA (Frequency division multiple Access)
③ TDMA (Time Division multiple Access)
④ CDMA (code Division multiple Access)

① SDMA

→ Space division multiple Access (SDMA)
→ SDMA is used for allocating a separates
→ space to user in wireless network.
→ A typical application involves assigning a optional base station to a mobile phone user.
→ the mobile phone may receive several base station with diffent quality.
→ A MAC algorithm could now decide which base station is best, taking into account with Frequencies (FDM), Time Slot (TDM), or code (CDM) are still available depending upon technology.
→ Typically SDMA is never used in isolated but always in combination with one or more other schemes.

→ The basic for the SDMA algorithm is perform by cell & sectorized antennas which constitute the infrastructure implementing SDMA.
→ Segment space into section.
→ use directed antennas
→ cell structure.

FDMA

→ It stands for frequency division multiple Access.
→ FDMA assigned individual channels into individual user.
→ Each user is allocated a unifrequency, band or channel.
→ the channels are assigned on demand to user too request service.
→ During the period / time of the call no other user can share the same channel.
→ The FDMA channel is not in used then its ideal & cannot be used by other users.
→ FDMA requires tight RFC Radio frequency Filtering to minimize adjecent channel interface.

main features of FDMA

→ continous transmission
→ Narrow bandwidth
→ Low overhead.
→ Simple hardware at mobile unit & base Station :-
1) NO digital processing needed.
2) Ease of Framing & synchronize
→ FDMA can be used with both analog & digital signal.
→ FDMA requires higher-performing filters in the radio hardware in contrast to TDMA & CDMA.
→ FDMA is not valunerable to the timing problems that TDMA has.
→ Due to the frequency filtering, FDMA is not sensitive to near far problem.

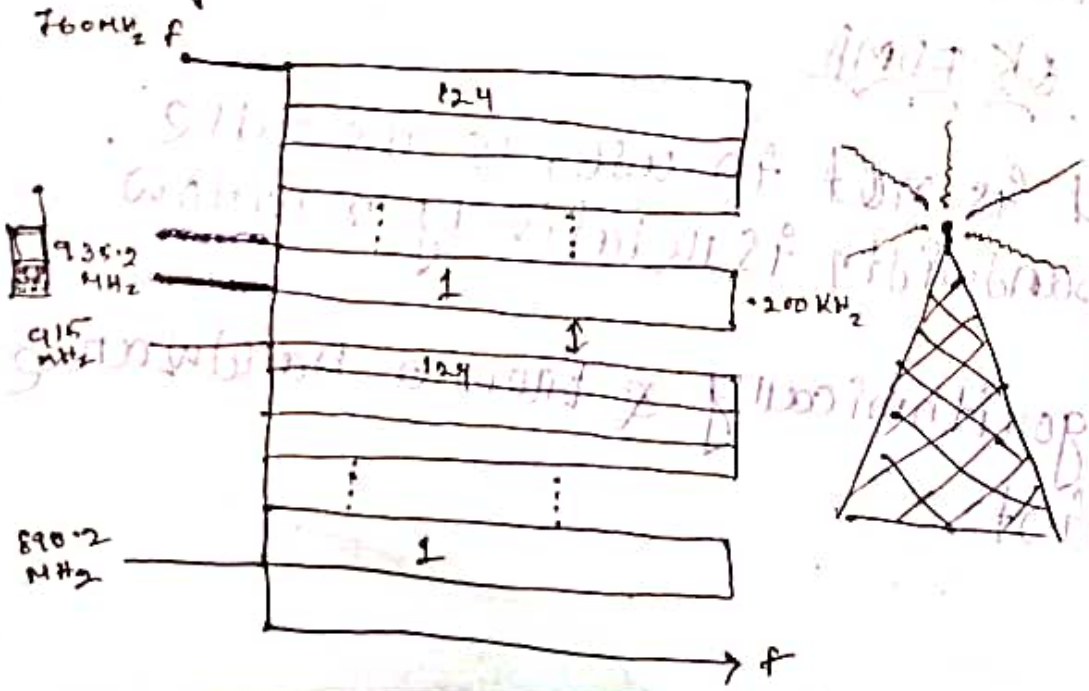
Advantages of FDMA

→ If channel is not in use, is its idle.
→ Channel bandwidth is relatively narrow (30 KHz)
→ Simple algorithmically & from a hardware stand point.

→ Fairly efficient when the no. of stations is small & the traffic is uniformly constant.
→ Capacity increase can be obtained by reducing the information bit rate & using efficient digital code.
→ No need for Network timing.
→ No restriction regarding the type of base-band or type of modulation.

Disadvantages of FDMA

→ The presence of guard bands.
→ Requires right RF filtering to minimize adjacent channel interface.
→ Maximum bit rate per channel is fixed.
→ Small inhibiting flexibility in bit rate capability.
→ Does not different significantly from analog system.



⑤ TDMA

→ It stands for time division multiple Access.
→ TDMA system divide the radio spectrum into time slot.
→ In each slot only one user is allowed to either transmit or receives.
→ Each user occupies a cyclically repeating time slot.
→ Transmission for any user is non-continous
→ Listening to different frequencies at the same time is quite difficult.

Main Feature of TDMA

→ Shares single carriers frequency with multiple users.
→ Non-continuous transmission. This results in low battery consumption since the subscriber. Transmitter can be turn off when not in use.
→ Slot can be assigned on demand in dynamic TDMA.
→ TDMA uses different time slots for transmitter & receiver thus duplexers are required.
→ Global systems for mobile communication uses the TDMA technique.

Advantages of TDMA

→ It carry data rate 64 kbps to 120 mbps
→ It provides the most cost effective technology to convert an data analog system to digital.
→ It provides the user with extended battery life & talktime.
→ TDMA Technology separate users according to time, it ensures that there will be no interference.
→ TDMA allows the operator to do services like - fax, voice band data & sms as well as timedia & video conference.

Disadvantages of TDMA

→ Each user has a pre-defined time slot when moving from one cell to other its an time slots is this cell are full the user disconnected.
→ It is subjected to multipath distortion a signal coming from a tower to a handset might come from any one of several direction.
→ It might have bounce of several difference building before arriving

④ CDMA

→ code division multiple access (CDMA) is a channel access method used by various radio communication technology.

→ CDMA is an ex- of multiple access where several transmitter carsend information simultaniously over a single communication channel.

→ This allows several user to share a band of Frequencies.

Advantages of CDMA

→ Improvement in capacity & security.

→ use of wide bandwidth.

→ improvement in hand over & hand off.

→ It has more number of users can share the same bandwidth.

→ It is well matched with other cellular technology.

Disadvantages of CDMA

→ The system is more complicated.

→ Guard band and Guard time both are required to be provided.

→ As the number of user increases the over all quality of service decreases.

working of CDMA

→ CDMA is entirely different approch from the time division multiple approach.

→ CDMA after digitalysing the data spread out the over the entire available bandwidth. multiple is over to each other a channel which is asign with a unique sequence code.

→ CDMA is bromat spread spectrum technique which means data can be send is small pieces over a number of frequencies available to use at any time specified range.

Difference bet^n FDMA & TDMA

FDMA	TDMA
→ Entire band of frequency is devided into multiple Rf channel each carries is allocated to different users	→ it entire bandwidth is shared among different subscriber at fixed predetermined or dynamically assigned time interval.

Difference bet^n CDMA & TDMA

CDMA	TDMA
Entire bandwidth is being used by user all the time each have there unique code to recover data.	It's entire bandwidth is shared among different subscriber at fixed determine or dynamically assigned time interval.