ARYAN SCHOOL OF ENGINEERING & ECHNOLOGY

BARAKUDA, PANCHAGAON, BHUBANESWAR, KHORDHA-752050

LECTURE NOTE

SUBJECT NAME- MOBILE COMPUTING

BRANCH-COMPUTER SCIENCE ENGG.

SEMESTER-5TH SEM

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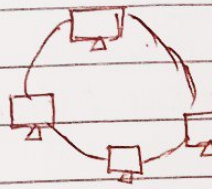
- Network :-

A network consist of two or more computers that are linked in order to share resources (such as printers and CDs), exchange files or allow electronic communications the computers on a network may be ~~network~~ linked through cables, telephone lines, radio waves, satellites or infrared light beams.

- Features of Computer Networks :-

Communication Speed :-


(Computer Networks)

Network provides us to communicate over the network in a fast and efficient manner.

File sharing :-

Computer network provides us to share the files with each other.

Back up :-

Since the files are stored in main server which is centrally located. Therefore, it is easy to take the backups from the main server.

Software and Hardware sharing :-

We can install the applications on the main server, therefore, the user can access the applications centrally, so, we do not need to install the software on every machine.

Scalability :-

Scalability means that we can add the new components to the network.

Reliability :-

Computer network can use the alternative source for the data communication in case of any hardware failure.

Security :-

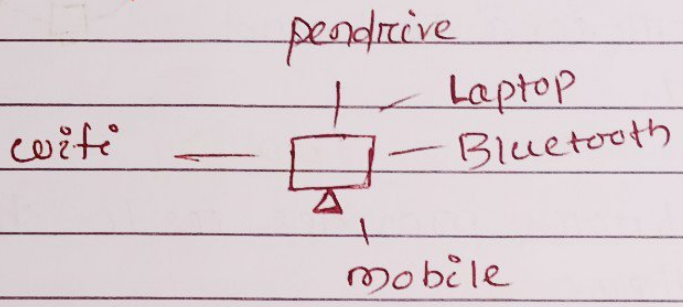
Network allows the Security by ensuring that the user has the right to access the contain Failes and applications.

Network Devices :-

HuB, Switch, Bridge, Gateway, modem, Router etc.

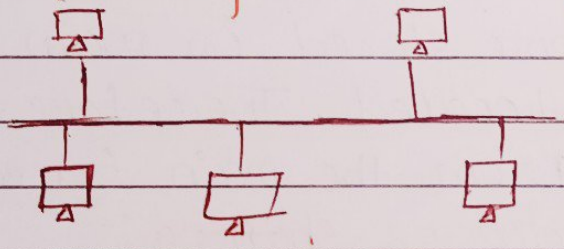
Network types :-

(1) PAN (personal Area Network) :-



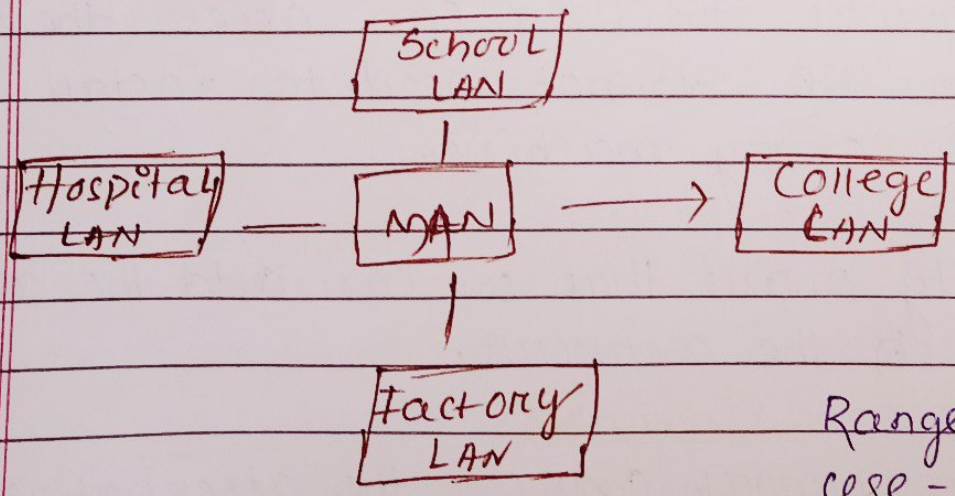
Range < 10m
use - (Home, Personal use)

(2) LAN - (Local Area Network)



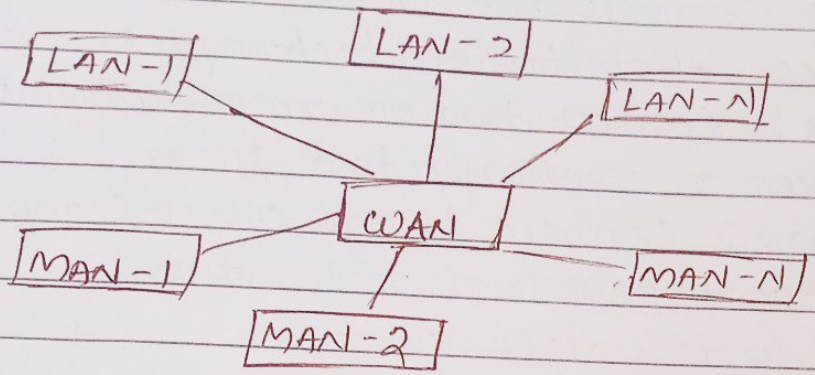
Range < 150 meter
use → Office

(3) MAN :- (Metropolitan Area Network)



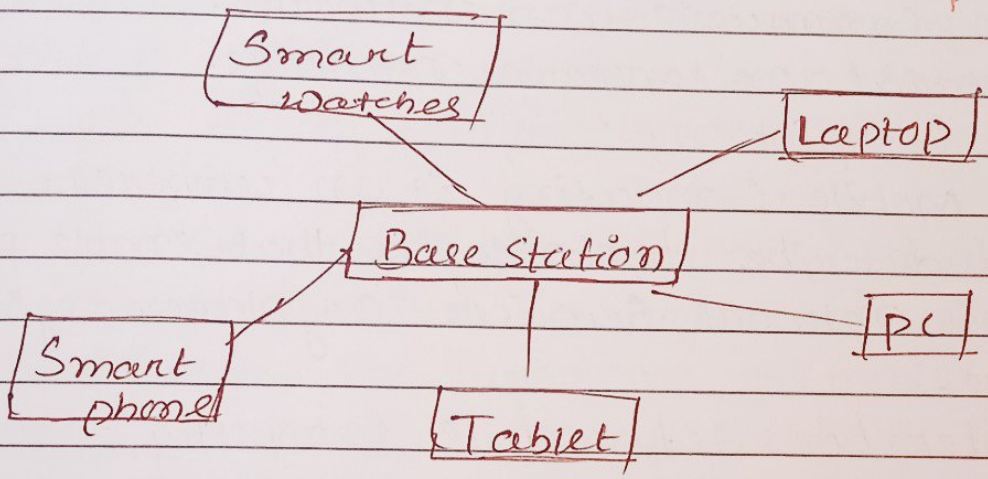
Range - < 50km
use - with in city

(4) WAN - (Wide Area Network) :-



Range :- <Not Fixed>
use - use for contries or All around world.

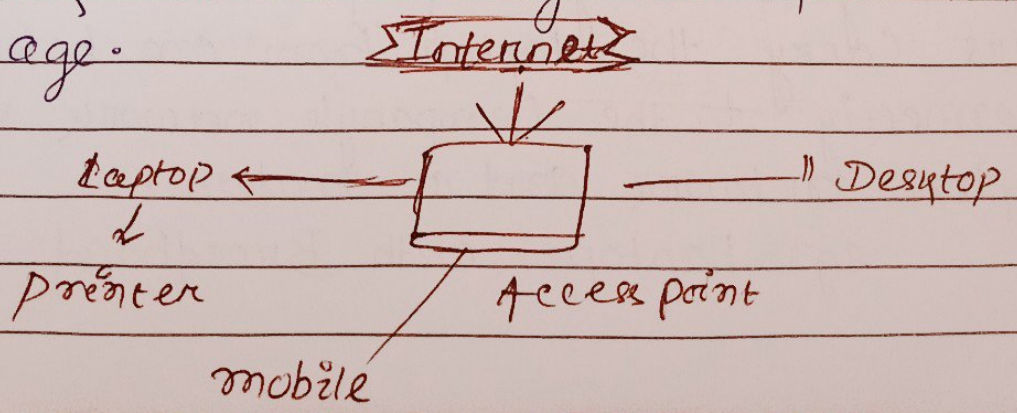
(5) WLAN :- (Wireless local Area Network)



Range - 50 meters to 150 meters
use - home, campus, office building

Wireless Networks :-

Computer network that are not connected by cables are called wireless networks. They generally use radio waves for Communication bet^n the network nodes. They allow devices to be connected to the network while roaming around within the network coverage.



Types of wireless networks :-

→ wireless LANs :- Connects two or more network devices using wireless distribution techniques.
→ wireless mans :- Connect two or more wireless LANs Speading over a metroplitan area.
→ wireless wans :- Connect Large areas Compriseing LANs, MANs and personal networks.

Examples of wirless networks :-

→ Mobile phone networks.
→ wireless Senor networks
→ Satellite communication networks.
→ Terestrial microwave networks.

Mobile Computering :-

Mobile Computeing is an umberella term used to describe technologies that enable people to access network Services anyplace, anytime, anywhere.

✓ Characterstics of mobile Computig :-

Fixed and wired :-

This Configuration describes the typical desktop Computer in an office. Neither weight nor power Consumption of the devices allow For mobile useage the devices use fixed networks For performace reasons.

eg :- Desktop Computer

Mobile and wired :-

Many of today's laptop fall in to this category users Carry the laptop from one hotel to the next reconnectig to the Company's network via the telephone network and a modem.

eg :- Laptope with Broadband

Fixed and wireless:-

This mode is used for installing networks e.g. in historical wires or at trade shows to ensure fast network setup.

eg:- Temporary setup.

Mobile and wireless:-

This is the most interesting case. No cable restricts the user, who can roam between different wireless networks most technologies discussed in this book deal with this types of device and the networks supporting them. Today's most successful example for this category is GSM with more than 800million users.

eg:- Laptop with WLAN

Application of mobile computing:-

In many fields of work the ability to keep on the move is vital in order to optimise time efficiently. The importance of mobile computers has been highlighted in many fields of which a few are described below.

(a) Vechiles:-

music, news, road conditions, weather reports and other broadcast information are received via digital audio broadcasts with 1.5 m bits for personal communication, ~~write~~ a universal mobile telecommunications system phone might be available offering voice and data connectivity with 384 kbits. The current position of the car is determined via the global positioning system.

(b) Emergencies:-

An ambulance with a high quality wireless connection to a hospital can carry vital information about injured persons to the hospital from the scene of the accident. All the necessary steps for this particular type of accident can be prepared and specialists can be consulted for an early diagnosis.

(c) Bussiness:-

Managers can use mobile computers say. critical presentations to major customers. They can access the latest market share information. At a small recess, they can revise the presentation to take advantage for this information. They can communicate with the office about possible new offers and call meeting for discussing responds to the new proposals. Therefore mobile computers can be verage competitive advantages.

(d) Credit Card verification:-

At point of sale terminals in shops and supermarkets, when customers use credit cards for translations. the inter communication required between the bank central computer and postterminal in order to effect verification of the card useage, can take place quickly and securely over cellular channels using a mobile computer unit.

(e) Replacement of wired networks:-

wireless networks also be used to replace wired networks. eg:- remote sensors, for tradeshows or in historic buildig due to economic reasons, it is often impossible to wire group detection or to provide environmental information.

(f) Infotainment :-

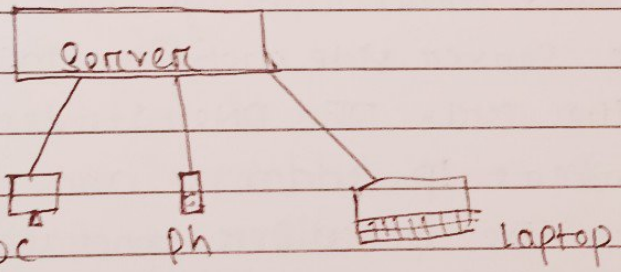
Wireless networks can provide up-to-date information at any appropriate location. The travel guide might tell you something about the history of a building (knowing via GPS, contact to a local base station) down-loading information about a concert in the building at the same evening via a Local wireless Network. Another growing field of wireless network applications lies in entertainment and games to enable. eg :- ad-hoc gaming network.

Chp-2 :- Introduction to mobile Development Framework :-

✓ C/S Architecture :-

→ It stands for client-Server architecture.

→ Client Server architecture also known as request-response architecture. In this architecture client makes a request to the server, as server will fulfill the response.



Advantages :-

→ It has a Centralized System from which data can be easily backed up.

→ Security is better in this network.

→ Entire System is maintained by the Server.

→ It also increases the speed of resource sharing.

→ In case of Server failure entire network will be failed.
→ Server maintance cost is high once developed over a network. It's considered a form of distributed computing System because the components are doing their work independly of one another.
→ In a client / Server architechture the Sever acts as the product and client acts as a consumer.
→ Client / Server architectured works when the client computer Sends a resource of process request to the Server over the network Connection which is then processed and delivered to the client.
→ A Server Computer can manage Several clients Simultaneously where as one client can be connected to Several Servers at a time, each providing a different Set of Services.

• Example of C/S Communications:-

Here's an example of how clients / Servers Communication work. In an average use of a browser to access a Server side website, the user or clients enters the URL. The DNS Server looks up the web Servers Ip address and gives it to the browser. The browser generates an HTTP or HTTPS request and the Server, as the producer, Sends the files. The client, as the consumer, receives them and then typically, Sends follow up requests.

Types of C/S Architecture:-

(1) 1 Tier Architecture
(2) 2 Tier Architecture
(3) 3 Tier Architecture
(4) N Tier Architecture

(i) 1 Tier Architecture:-

In the 1 tier Architecture, all client/Server configuration setting, user interface environment datalogic, marketing logic system are existed on the same system.

(ii) 2 Tier Architecture:-

In this architecture, client and Server machine are connected directly incorporation because of client is firing any input for server terminal then in between should not any intermediate so it delivers the O/P with faster rate.

(iii) 3 Tier Architecture:-

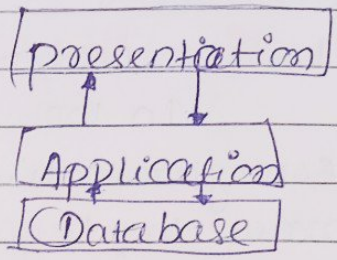
In this Architecture, middle ware is needed because of client machine sends the request to the Server machine then firstly this request is received by middle layer and finally the request is obtained to the Server.

(2) (iv) N Tier Architecture:-

- This architecture is also known as the "multi-tier Architecture" so it is scaled form of 3-tier architecture In this architecture, entire presention, application, processing and data management functions are isolated from each other.
- N tier architecture would involve dividing an applications into three different tiers. These would be. (a) Logic tier
  (b) the presentation tier
  (c) The data tier.

(1) Presentation tier :-

The top-most level of the application is the user interface. Then main function of the interface is to translate tasks and results to something the user can understand.



(2) Logic Tier :-

The layer coordinates the application. processes commands, makes logical decision and evaluation. and performs calculations. It also moves and proces data between the two Surrounding layers.

(3) Data Tier :-

Here information is stored and required from a database or file System. The information is then passed back to the logic tier for processing and then eventually back to user.

Advantages of 3-tier architecture :-

Scalable :- Scale Separate tiers without touching other tiers.

Individual management :- prevents cascade effects isolated maintance.

Flexible :- expands in any way according to requirement

Secure :- Each their can be Secured Separately and in different ways.

Power and lighting:-

→ The power requirement for a computer room are based on the quantity and type and types of equipment installed.

→ The designers must consider

WWW:-

→ World wide web which is also known as a web is a collection of websites or webpages stored in web servers and connected to local computers through the internet.

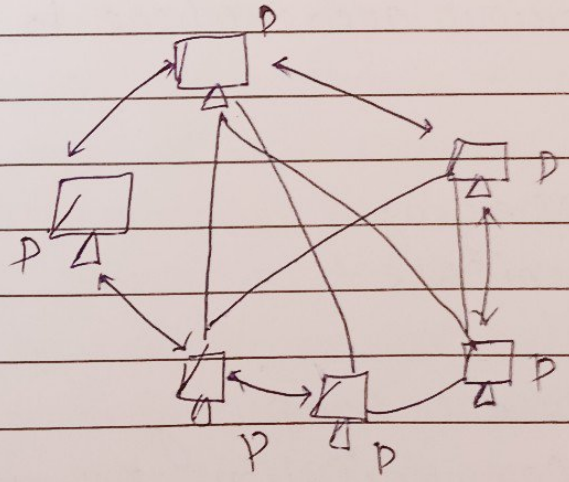
→ These website contain text types, digital images, audio, video etc.

→ user can access the content of these sites from any part of the world over the internet using their devices such as computers, laptops, cell phones etc.

→ The www along with internet, enables the retrieval and display of text and media to your device.

- Peer to peer Networks:-

In the peer to peer network all peers means all computers which are linked with each other through internet P2P network has not any central server. So each user is capable to share any types of files on any peer over this network on other words. You can say that every peer on this P2P N/w plays role as Server as well as Client.



→ In p2p network three methode are used for connecting multiple computers system like as basic method is to use USB to make connection between two peers. Second method is to use protocoles which help to control all connections between servers terminals on the internet.

Ppeer to peer Architecture :-

peer to peer archiecture is mostly implemented over the computer networking archicture because in this system every work station and other nodes have equally abilities and responsibilities as well as and in this archicture, few computers system are dedicated to sever anthere. P2P archicture is mostly suitable for small region area like as house and shall office vegion because in this network every computer plays the role as independent workstation and it can save all data in own hard disk.

→ p2p archistecture is designed with using of single software program where every piece of program performs their all tayes as both clint and servers along with similar reponsibilities and capabilities.

Application of peer to peer :-

-Architecture :-

There are various areas where to use peer to peer network.

- File sharing.
- Instant messaging
- Voice communicate
- Collboration
- High performance computig
- Search and communication network.

Advantages of Peer to Peer Network :-

- It doesn't require any network operating system.
→ All workstations are capable to access any types of files, so doesnot require any costly server.
→ All users have own permission that they can share any file over the network. So, doesn't need any well trained staff for operating this p2p network.
→ p2p network is more protective.

Disadvantages of p2p network :-

→ Every Computer system contains unique password over the whole network.
→ It does not contain any center medium of data stroage of file archiving.
→ Slow performance because every computer is accessed by other user.

Mobile Agents :-

In mobile computing mobile agents are the composition of computer software and data that can autonomously move from one computer to another computer and continue its execution on destination computer.

→ In other words, you can say that an mobile agent is an autonomous program that is capable of moving from host to host in a network and interact with resources and other agents.
→ In this progress, the chance of data lose is Searche because the state of the running program is saved and than transported to the new host.
→ It allows the programs to continue execution from where it left off before migration.
→ The most significant advantage of mobile agents is the possibility of moving complex processing but to the location where you have enormous amounts of data and that have to be processed.

→ Mobile agents are also called as transportable agents. They are classified in to two types.

Advantages of Mobile Agents :-

The following are some advantages of mobile agents over conventional agents :-

→ Mobile Agents are autonomous and self-driven in nature.
→ They are maintance Friendly or easily maintainable.
→ They are fault-tolerant, It means they are able to operate without an active connection between client and Server.
→ They reduce the compilation time.
→ They provide less delay in the network.
→ They provide fewer loads on the network.

Disadvantages of mobile agent :-

- The most significant disadvantages of mobile agents is their security. They are less Secured.

Applications of mobile Agents :-

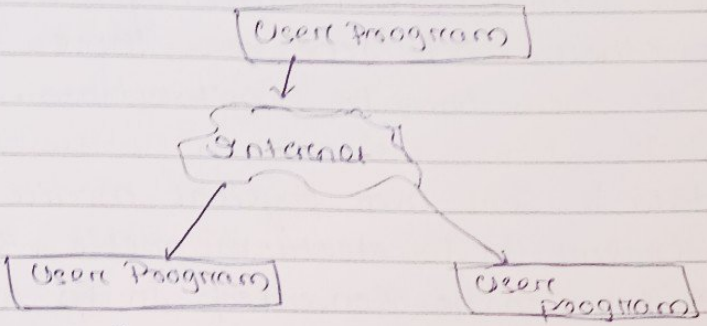
→ Mobile agents are applied in a wide range of domains such as E-commerce, traffic control, network management, robotics, data-intesive application etc.
→ Mobile agents with pre-define path :- They have a static migration path.
→ Mobile agents with undefind path :- ie Roamer :- They have dyanic migration path. The mobile agents choose their path according to the present network condition.

Life cycle of mobile agent :-

The life cycle of mobile agents ensures the following cond^n.

- They can adapt to the enviroment for e.g- either home or foregin environment.

- They are capable of switching among the position of one node to another.
- They are autonomous and focussed on the final output.



→ Basically, it is just like a conductor and the resonant device, which works on a very narrow frequency band.

Signal propagation :-

This is the moment of radio waves from a transmitter to a receiver. When the waves travel (propagate) from one point to another, they are, like light waves, affected by different phenomena such as light reflection, absorption or scattering.

Chp-2 → They are also in grid computing, parallel computing, distributed computing and mobile computing etc.

Chp-3 Wireless Transmission :-

→ wireless transmission is a form of unguided media. wireless communication involves no physical link established between two or more devices. Communicating wirelessly.

→ wireless signals are spread over in the air are received and interpreted by appropriate antennas.

→ A little part of electromagnetic spectrum can be used for wireless transmission.

→ when an antenna is attached to electrical circuit of a computer or wireless device, it converts the digital data in to wireless signals and spread all over within the frequency range. The recept on the other and receives these signals and converts them back to digital data.

Signals :-

→ when data is sent over physical medium it need to first, convert in to electromagnetic signal.
→ Data it self can be converted in to analog & digital.
→ Analog Signal - human voice
→ Digital " - file on disk

Digital Signal :-

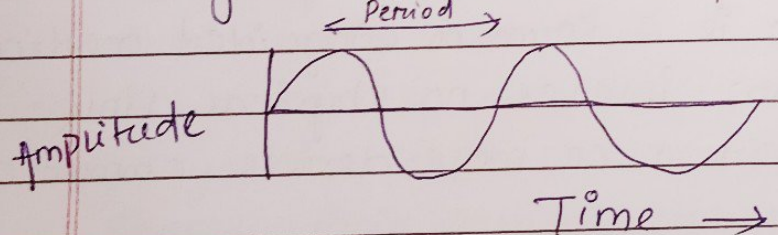
It is discrete in nature and represent sequence of voltage pulse. They are used within circuitary of computer signal.

Analog Signal :-

It is analises wave form in nature and represent by continous electromagnetic wave.

period :-

period refers to the amount of time, in seconds a signal needs to complete 1 cycle.



frequency :-

→ A number of periods in one second, inverse of period.
→ It is measure in Hz.

~~~~ - High frequency radio wave
~~~~ - Low " "

Bandwidth :-

→ The maximum amount of data transmitted over an internet connection in a given amount of time. Bandwidth is often mistaken for internet speed when it's actually the volume of information that can be sent over a connection in a measured amount of time.

→ It is calculated in megabites per second (mbps), (kbps) & (Bps).

② Antenna :-

Antenna is a device that is used for transmitting and receiving signal, which represents some information. It was invented in year 1888 by Germans. They are designed for wireless communication and have the capability to propagate both radio and microwave signals.

Signal propagation :-

This is the movement of radio waves from a transmitter to a receiver. When the waves travel (propagate) from one point to another, they are, like light waves, affected by different phenomena such as light reflection, absorption or scattering.

Multiplexing :-

→ Multiplexing is a technique used to combine and send the multiple data streams over a single medium. The process of combining of the data streams is known as multiplexing and hard ware used for multiplexing is known as a multiplexer.

→ It is used for telephony, data communications, and audio/video broadcasting.

Modulation :-

Modulations is the process of converting data in to radio waves by adding information to an electronic or optical carrier signal. A carrier signal is one with a steady wave from. Constant height, or amplitude, and frequency.

Spread Spectrum :-

→ Spread Spectrum is a technique used for wireless communications in take communication and radio communication. In this technique, the frequency of transmitted signal, or acoustic signal, is deliberately varied and generates a much greater bandwidth than the signal would have if the frequency were not varied.

→ In other words; "~~Spread~~ spread spectrum" is a technique in which the transmitted signals of specific frequencies are varried slightly to obtain greater bandwith as compared to initial bandwidth.

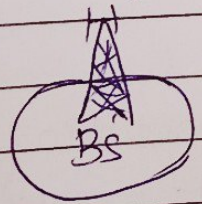
→ Now, spread spectrum technology is widely used in radio signal transmission because it can easily reduce noise and other signal issues.

② Cellular System :-

→ Early wireless system had a high-power transmitter, covering the entire service area. This required a very huge amount of power and was not suitable for many partical reasons.

→ The cellular system replaced a large zone with a number of smaller hexagonal cells with a signal BS covering a fraction of the area.

→ Evolution of such a cellular system is shown in given Fig. with all wireless devices located in a cell being served by a Base station.



Early wireless system large zone.

Module 04

Medium Access control :-

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

→ It is responsible for flow control and multiplexing for transmission medium.

→ It controls the transmission of data packets via remotely shared channels. It sends data over the network interface card.

MAC layer in the OSI model :-

→ The open system interconnection (OSI) model is a layered networking framework that conceptualizes how communications should be done between heterogeneous system. The data link layer is the second lowest layer. It is divided in to two layers.

Application layer
presentation layer
Session layer
Transport layer
Network layer — llc sub layer
Data link layer — mac sub layer
physical layer

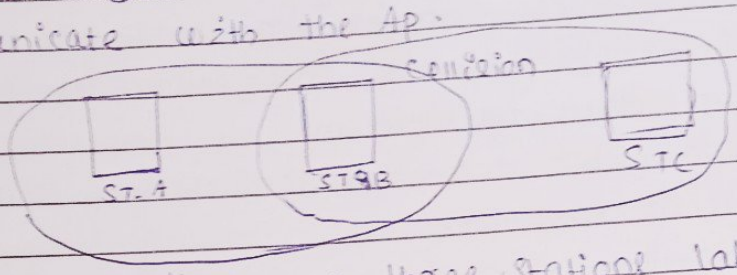
physical link

Hidden Terminal Problem :-

→ In wireless LANs, the hidden terminal problem is a transmission problem that arises when two or more stations who are out of range of each other transmit simultaneously to a common recipient.

→ This is prevent in decentralised systems where there are no any entity for controlling transmission. This occurs when a station is visible from a wireless

access point. But is hidden from other stations that communicate with the AP.



→ Suppose that there are three stations labelled STA, STB and STC. where STA and STC are transmitting while STB is receiving.

→ The stations are in a configuration such that the two transmitters STA and STC are not in the radio range of each other.

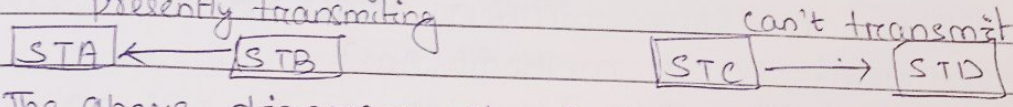
→ The above diagram shows that station STA starts transmitting to station STB. Since station STC is out of range of STA, it perceives that the channel is free and starts transmitting to STB. The frames received by STC are garbled and collision occurs. This situation is known as the hidden terminal problem.

Exposed Terminal problem :-

In WLANs, the terminal problem is a transmission problem that arises when transmitting station is prevented from sending frames due to interference with another transmitting station. This is prevalent in decentralised system is where there are n't any entity for controlling transmissions. This occurs when a station is visible from a wireless access point but not from other stations that communicate with the AP.

→ Suppose that there are four stations labelled STA, STB, STC and STD. where STB and STC are transmitting while STA and STD are received at same sort of time.

→ The stations are in a configuration such that the two receivers STA and STD are out of range of each other. But the two transmitters STB and STC are in radio range of each other.



→ The above diagram shows that a transmission is going on from STB to STA. STC falsely concludes that the above transmission will cause interface and so stop its transmission attempts to STD. However, the interfaces would not have occured since the transmission from STC to STD is out of range of STB, this prevention of transmission is called exposed terminal.

Basic Access Method :-

→ An access method is a software component, operating system service or network interface that handles the storage/retrieval and sending/receipt of data.

→ Access methods provide a convenient service to programmers for managing data storage and transmission.

→ while providing the programmer with flexibility, the abstraction hides the many details regarding low-level disk access and communicate protocol operations.

→ Access methods include internal structures to organize data as data sets. System-provided programs or macros to define data sets, and utility programs for data set processing. Error detection and correction capabilities are also provided.

Storage :- Oriented access method.

- Basic direct access method
- Basic ~~direct~~ sequential access method.
- Basic partitioned access method.
- Queued sequential access method.
- Object access method.

• Network-Oriented access method:-
→ Basic telecommunications access method (BTAM)
→ Queued teleprocessing access method (QTAM)
→ Tele communication access method (TCAM)
→ virtual tele communication access method (VTAM)
→ channeled access method (CAM)

Near and Far Terminals:-

→ Consider the situation as A & B are both sending with same transmission power. As signal with same transmission power. As signal strength decreases proportionally to the square of distance between them. Be singal drowns As signal.
→ As a result, C can't receive A transmission.
→ Now think of C as being an arbiter for sending rights. In this case, terminal B would already drown out terminal A on physical layer. C in return would have no chance of applying a fair scheme as it would only hear B.
→ Then near far effect is a server problem of wireless network using CDM. All signals should arrive with more or less the same strength.
→ Otherwise a person standing closer to somebody could always speak louder than a person farther away.

SDMA:-

Spatial division multiple access (SDMA) is a channel access method used in mobile communication system's which reuses the same set of cell phone frequencies in a given service area. Two cells or two small regions can make use of the same set of frequencies of they are separated by an allowable dist? (called the reuse dist?)

FDMA (Frequency Division Multiple Access) :-

→ FDMA assign individual channels to individual users.
→ Each user is allocated a unique freq. bandes channel.
→ These channels are assigned on demand to users who request service.
→ During the period of the call, no other user can share the same channel.
→ The FDMA channel carries only one phone circuit at a time.
→ If an FDMA channel is not in use, than it sites idle and can't be used by other users.
→ FDMA requires tight RF filtering to minimize adjacent channel interface.

TDMA (Time Division multiple Access) :-

→ Time division multiple access is a digital modulation technique used in digital cellular telephone and mobile radio communication.
→ TDMA is one of two ways to devide the limited spectrum available over a radio frequency cellular channel.
→ The other is known as frequency division multiple users to share the same frequency by dividing each cellular channel in to different timeslots.
→ In effect, asingle frequency supports multiple and simultaneous data channels. so with a two-time slot TDMA. two users can share the same frequency. with a three-time slot TDMA. three users can share the same frequency and so on.

CDMA (Code Division multiple Access):-

→ CDMA is a channel access method used by several radio communication technology. It is a digital cellular technology and an ex. of multiple access. It is generally used for mobile communication.

→ multiple access means that several transmitters can send information simultaneous over a single communication channels.

→ In this system, different CDMA codes are assigned to different users and the user can access the whole bandwith for the entire duration.

→ It optimizes the users of available bandwidth as it transmits over the entire frequency range and doesn't limit the user's frequency range.

→ Thus CDMA allows several users to share a band of frequencies without undue interface bet^n the users. It is used as a access method in many mobile phone standards.

Advantages:-

- Provides connectivity b/w computers over short distance using wireless medium.
- Coverage area: Less than few hundred feet.
- Costly & when wiring is expensive or difficult.
- When temp access is needed.

Components:-

Access point:-

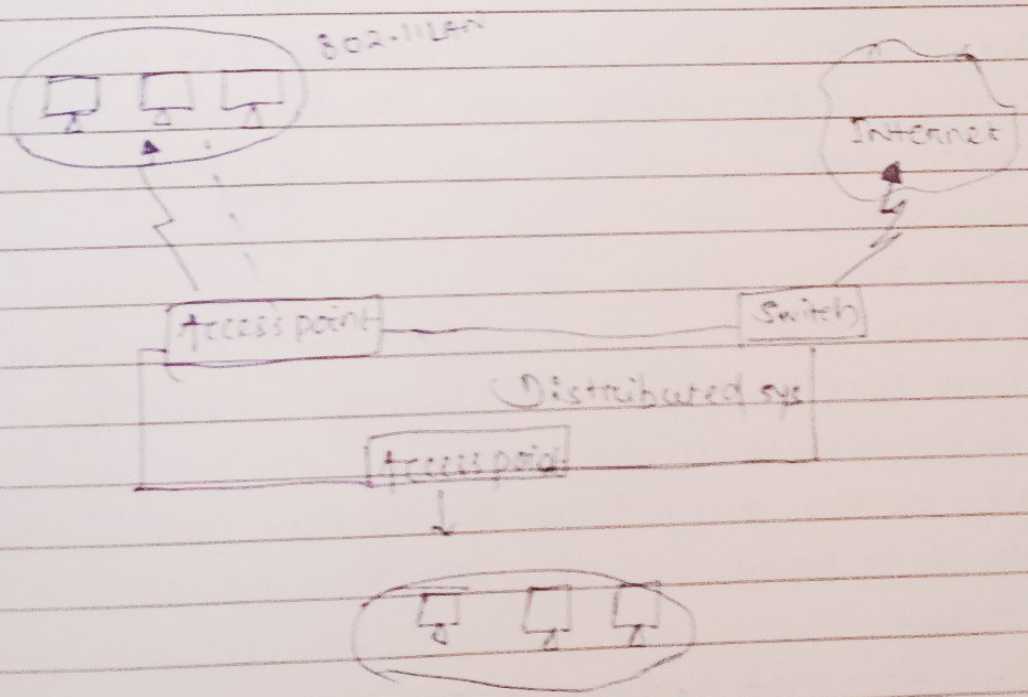
- Radio receiver / transmitter.
- Connects to wired / NW.
- Exchanges signal with wireless LAN card.
- Small groups of users are supported.

Wireless LAN card:-

- WLAN adapters

Bridges:-

Used for connecting two LANs.



Infrared :-

Infrared is a wireless mobile technology used for device communication over short rayes. IR Communication has major limitations because it requir line of site, has a short transmission range and is unable to penetrate walls. IR transceive are quite cheep and Server as short range communication solutions.

Radio frequency :-

→ A radio frequency signal refers to a wireless electromagn signal used as a form of communication, of one is discu wireless electronics.

→ Radio waves are a form of electromagnetic radiation w identified radio frequencies that range from 3KHz-t 300 GHz.

Advantages of Infrared wireless Technology :-

→ They are very fast.

→ They are extremely reliable.

→ They can cover a wide range of area without any faults.

Disadvantages of Infrared wireless Technology:-

→ The cost of installment is extremely high.

→ Not all the devices are capable of receiving the signal produced by it.

Advantages of RF:-

→ It has different penetration through the walls of the buildings or houses based on the frequency. Hence used for radio and television transmission and for cellular mobile phone service.

→ Used in various medical applications. It is used in Diathermy instrument for surgery. It is used in MRI for taking images of human body. It is also used for skin tightening.

→ It is used in radars for object detection.

→ It is used for satellite communication.

Disadvantages of RF:-

→ Uncontrolled radiation of RF affects pre-adolescent childrens, elderly humans, patients, small birds, small insects etc.

→ The areas near RF cellular towers have been observed with more lightening compare to other areas.

Timing Synchronization function:-

→ TSF is specified in IEEE 802.11 wireless local area Network (WLAN) standard to fulfill timing synchronization among users.

→ T TSF keeps the timers for all stations in the same basic service set (BSS) synchronization.

→ All stations shall maintain a local TSF timer. Each mobile host maintains a TSF timer with modules 2^64 counting in increments of microseconds.

→ The TSF is based on a 1 mHz clock and "ticks" in micro seconds.
→ On a commercial level industry vendors assure the 802.11 TSF's synchronization to be within 4 micro second.

Power Management:-

→ Most clients in WLAN are portable devices to conserve battery power, they can go in to sleep mode.
→ when a client is part of a WLAN, it must remain fully powered.
→ power management allows the mobile client to shutdown its radio to save energy.

Roaming:-

Roaming refers to a wireless network service extension in an area that differs from the registred home network location. Roaming enables a mobile device to access the internet and other mobile service when out of its normal coverage area. It also gives a mobile device, the ability to move from one access point the to another. Roaming is divided from real-time optimally adapting mesh (ROAM)

Bluetooth overview:-

The android platform includes supports for the bluetooth network stack, which allows a device to wirelessly exchange data with other bluetooth devices. The app frame work provides access to the bluetooth functionality through bluetooth APIs. These APIs let apps connect to other bluetooth devices. enabling point-to-point and multipoint wireless features.

Using the Bluetooth APIs, an app can perform the following:

- Scan for other Bluetooth devices.
- Query the local bluetooth adapter for paired Bluetooth devices.
- Establish RFCOMM channels.
- Connect to other devices through service discovery.
- Transfer data to and from other devices.
- Manage multiple connections.

Chap-6 Ubiquitous networking:

- Ubiquitous networking is the pervasion of communication enter-infrastructure and wireless technologies throughout the environment such that they enable continuous connectivity.
- Ubiquitous networking also known as pervasive networking, is the distribution of communications infrastructure and wireless technologies throughout the environment to enable continuous connectivity.

Mobile Communication:

Mobile communication is talking, hearing or sending data or image files over a wireless network.

Cell:

A basic geographical unit of a cellular communication system.

- All cells must be symmetrical in shapes.
- The area b/w the cells will not get covered by the Base station.
- Hexagon is the highest area as compare to circle, Square and equilateral Triangle. Thus we divide the ci geographical area in to hexagonal cells.

Cluster:-

→ A group of cell is called as a cluster.
→ Size is not fixed.
→ Depends on the requirement of the area.

Mobile phone System:-

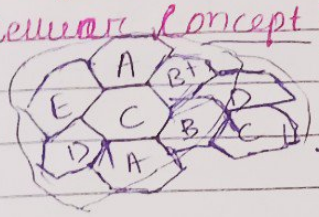
MS - mobile station
BTS - Base Transreceiver station
BSC - Base station controller
MSC - Mobile switching center.

In this diagram MS is nothing but the mobile phone of a user. Every cell has its base transreceiver station at it's centre. When a cell is setup the first signal is sent to base transreceiver station of the cell for this BTS 1, it goes to the BSC 1 (controle the working of all the base station).

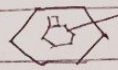
From BSC 1 is the master control of the entire system. These MSCs are different form different areas. Form of Area 1 the signal is transmitted to MAC of Area 2 where it follows the reverse sequence. As MAC 2 to BSC 2 and BSC 2 to BTS and From BTS to MS.

Chapter 6

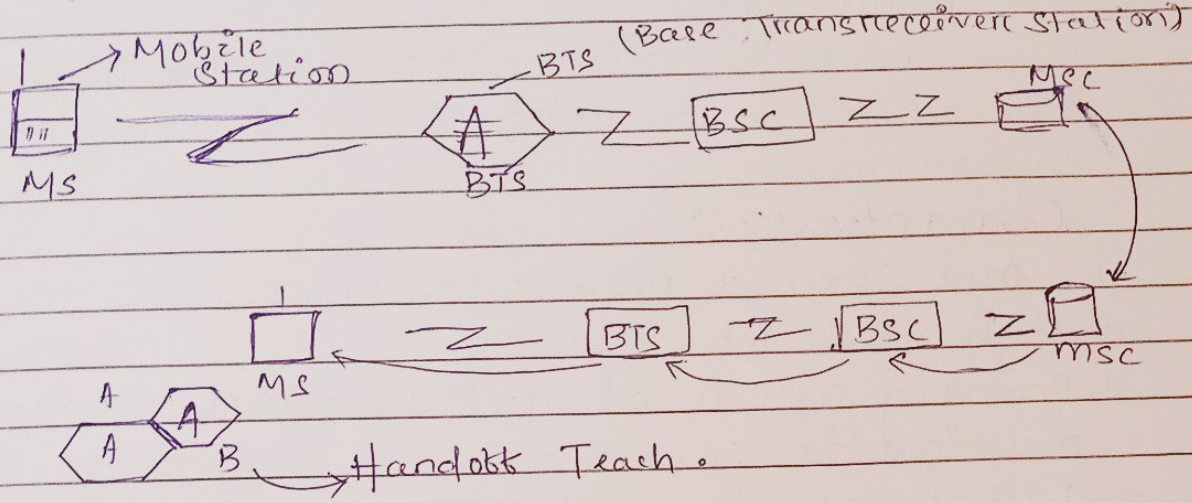
Cellular Concept :-



cluster
cells
- frequency reuse



Microcell
R/2



Handoff Teach.

(a) 1G Technology :-

→ It is the 1st generation of wireless mobile communication where analog signal were used to transmit date.

→ It was introduced in us in early 1980 and designed exclusively of voice commiunication.

Characteristics :-

→ Speed up to 2.7 Kbps.

→ poor voice quality.

→ Large phone with limited battery life.

→ No data security.

2G Technology :-

→ It is second generation of mobile telephone which is used digital signal of first time.

→ It was Lunched in finland in 1991 used GSM Ten.

Characteristics :-

→ Data speed up to 64 Kbps

→ Test and multimedia messaging possive.

→ Better quality than 1G.

when GPRS technology was introduced. It enabled web browsing, e-mail services and fast upload/ download speed.

2G + GPRS → 2.5G

3G Technology:-

Third generation mobile telephone began with the start of new millennium & added major advancement.

Characteristics:-

→ Data Speed of 144 Kbps to 2 mbps
→ High speed web browsing.
→ Running web based applications like videocon from multimedia email etc.
→ Fast & Easy transfer to audio and vedio files.
→ 3D Gamming.

3rd Generation Mobile Communication:-

→ 3G is the third generation of wireless mobile telecommunications technology. It is the upgrade over 2G, 2.5G, GPRS and 2.75G EDGE networks, offering faster data transfer and better voice quality.
→ 3G telecommunication networks supports services that provide an information transfer rate of at least 144 Kbits.

Advantages of 3G Mobile Communications:-

→ New radio Spectrum to retieve overcrowding in existing System.
→ More bandwidth Security reliability.
→ Interoperability between Service provide.

(or) Universal Mobile Telecommunication System:-

The UMTS is a broadband, packet based, 3G mobile cellular system based upon GSM standards. The specifications of UMTS covers the entire network system, including the radio access network, the core network and user authentication.

Features:-

→ UMTS is a component of IMT-2000 standard of the international Telecommunication union (ITU) developed by 3GPP.
→ It uses wideband code division multiple access (W-CDMA) air interface.
→ It provides transmission of text digitized voice, video and multimedia.
→ It provides high ~~data~~ bandwidth to mobile operators.
→ It gives a high data rate of 2mbps for high-speed Downlink packet Access (HSDPA) handsets, the data rate is as high as 7.2 mbps in the down link conaction.
→ It is also known as freedom of mobile multimedia Access (FOMA)

(or) Mobile Ip:- Chap-7

Mobile Ip enables the transfer of information to and from mobile computers such as Laptops and wireless communications. The mobile computer can change its location to a foreign network and still access and communicate with and through the mobile computer's home networks.

Working with MobileIp :

→ Mobile Ip enables routing of Ip datagrams to mobile nodes. The mobile nodes home address always identifies the mobile nodes regardless of the current point of attachment to the Internet or an organization's network.

→ When away from home a care of address associates the mobile nodes with its home address by providing information about the mobile nodes current point of attachment to the Internet or an organization's network.

→ Mobile Ipuses a registration mechanism to register the care of address with a home agent.

→ The home agent redirects datagrams from the home network to the care of address by ~~Construsting~~ a new Ip header that contains the mobile nodes care of address as the destination Ip address.

Mobile Ip Entities :- (chap-7)

Mobile Ip introduces the following new functional entities.

→ Mobile Nodes (MN) - Host or Router that changes its points of attachment from one network to another.

→ Home Agent (HA) :- Router on a mobile nodes home network that intercepts datagrams destined for the mobile nodes, and delivers them through the care-of-address. The home agent also maintains current location information for the mobile nodes.

→ Foreign Agent (FA) :- Router on a mobile holdes visited network that provides routing services to the mobile nodes while mobile nodes is registered.

Ipv6 :-

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IpV6 :-

Internet protocol version 6(IpV6) is the latest version of the internet protocol after IpV4. This communication protocol provides identification and local systems for computers on the network and routes communications on the internet.

IpV6 main features :-

1. **Layer Address Space :-**

Compared with IpV4, IpV6 uses 4 times more bits to address devices on the internet, which will provide an address space for approximately 3.4×10^{38} devices. This address space can meet the aggressive requirement for every thing in the world.

2. **Simplified Header :-**

The IpV6 header was designed to be less complex and easier to process than the IpV6 header by moving all unnecessary information and options (which are present in IpV4 header) to the end of the IpV6 header.

3. **End-to-End Connectivity :-**

Now, each system has a unique Ip address and can traverse the internet without using NAT or other translating ~~communication~~ components. After IpV6 is fully implemented, each host can directly access other host on the internet, but it will encounter some restrictions, such as fire walls and organizational policies.

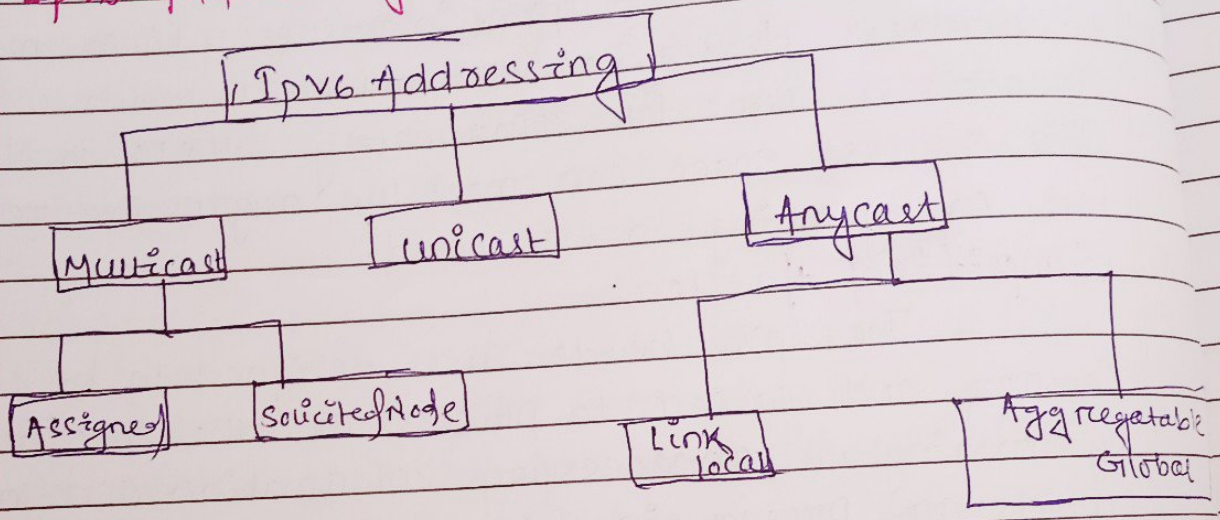
4. **Auto-Configuration :-**

IpV6 Supports stateful and stateless auto-configuration modes of its host device. In this way, no DHCP Server will not cause inter-segment communication to stop.

5. Faster forwarding / Routing :-

This simplified header puts all unnecessary information at the end of the header. The first parts of the header contains enough information to enable the routers to make routing decisions as quickly as possible. Can make routing decisions at the mandatory header.

IpV6 Address Types :-



IpV6 address are 128 bit - Long and are identifiers for individual interfaces and set of interfaces. IpV6 address of all types are assigned to interfaces not nodes (hosts and routers). Because each interface belong to a signal node, any of that's nodes interface unicast address can be used as an identifier for the node. A signle inteface can be assigned multiple IpV6 addresses of any type.

The three types of IpV6 address are unicast, anycast, multicast.

→ Unicast addresses identify a single interface.

→ Anycast address identify a set of interfaces in such a way that a packet sent to an anycast address is delivered to a member of the set.

→ Multicast address identify a group of interface in such a way that a packet sent to a multicast address is delivered to all of the interfaces in the group.
→ IpV6 has no broadcast address. Multicast address took over.

Messaging Service :- (Chap-10)

SMS :-

→ Sms stands for "short Message Service" sms is used to send text message to mobile phones.
→ The message can typically be up to 160 characters in length, through some Serivices use 5-bit mode which supports 224 characters.
→ Sms was originally created for phones that use Gsm (Global System for mobile) communication but now all the major cell phone systems support it.
→ While sms is most commonly used for text messaging bet friends or co-workers. It has several other uses as well for example, Subscription sms services can transmit weather, news, supports updates, and stock quotes to users phone.
→ Sms can also notify employees of sales inquiries, service stops, and other information pertinent to their business.
→ Doctors can receive sms messages regarding patient med emergencies.

MMS (Multimedia Messaging Service) :-

→ MMs stands for multimedia messaging service. It is the standard way to send messages from one device to another through a network.

→ As the name multimedia, we can suggest from it that it not only for sending text messages, we can also send multimedia like images, audio clips and media clips and many more things.

→ It is the extension used for SMS (short message service) where we send and receive text messages only with the limition of only 160 characters in one SMS.

→ Most of the Smartphones support MMS messaging now a days. Basically it is the advanced version of the text messaging with the additional feature of multimedia.

for eg:- if you type a text-only message it will deliver as an SMS but if you include images and other media you want than it will be delived as an MMS and vice-versa.

Multimedia transmission over wireless:-

→ The goal of multimedia transport protocols is to transmit multimedia signal from one point to another point. These points are connected by communication network employing specific protocols.

→ Generally, multimedia original signals are encoded to reduced the bit rate.

→ when the encoded stream is to be sent to another location in the network, the transport protocols are responsible for the packetization and delivery of that stream.

→ At the other side, the encoded multimedia stream is to be sent to another location in the network the transport

→ At the otherside, the encoded multimedia stream is reconstructed from the stream of delivered packets and them decoded to produce a usebul multimedia signal to be played back or store for further use.
→ The internet protocol is a packet-based network protocal used to exchange data over network.

Chap-7 :-

Mobile IPV6 Address Scope :-

Each IPV6 address has a specific scope in which it is defiend. A scope is a topological area with in defined which the IPV6 address can be used as a unique identifier for an interface or a set of interfaces. The scope for an interface IP address is encoded as part of the address it self. A unicast address can have a link-local or global scope. Amulticast address supports.

→ Interface-Local
→ Link-Local
→ Subnet-Local
→ Admin-Local
→ Site-Local
→ site-local
→ Organization-local
→ global-scops.

A scope zone is an instance of a given scope. For instace, a link and all directly attached interfac Comprise a single-link Local Scope zone. A scope zone has the following properties.

→ A scope zone consists of a configuous set of Interfaces and the links to which the interfaces are attached.

→ An interface can belong to only one scope zone of each possible scope.
→ A node can be connected to more than one Scope Zone of a given scope. for instance a node can be connected to multiple line local scope zone if it is attached to more than one lan.
→ The scope zone for an Ipv6 address is not encoded with in the address it self. but is instead determined by the interface over which the packet it set or received.
→ There is a single scope zone for Ipv6 address of global scope which compriess all interfaces and lines in the internet.
→ Address of given scope can be reused in different scope zone.

Mobile operation:-

Mobile Ip uses a registation Mechanism to register the care of address with a home agent. The home agent redirects datagrams from the home network to the care-of address by constructing a new Ip header that contains the mobile nodes care of address as the destination Ip address. Both Networks Support Mobile Ip.

Module-4

GSM :-

GSM (Global system for mobile communication) is a digital mobile Network that is widely used by mobile phones users in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephone technology. TDMA, GSM and code-division multiple access (CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each its own time slot. It operates at either the 900 megahertz (mHz) or 1800 mHz frequency band.

→ GSM, together with other technologies, is part of the evolution of wireless mobile telecommunications that includes High speed circuit-switched Data, General packet Radio Service, Enhanced Data GSM Environment and Universal mobile Telecommunications Service.

General packet Radio Service :-