LEARNING MATERIAL

On

MOBILE COMPUTING

(For 5th semester CSE)

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-: Computing Introduction :-

→ A technology that is capable of providing an environment which enables users to transmit data from one device to other device without the use of any physical (link) capables is known as mobile computing.

→ It means, data transmission is done wireless-ly with the help of wireless device such as mobile, Laptops etc.

→ whenever any device ~~that~~ is connected to a network without being connected pysically over a link or cable, data trecanemission such as messages, voice recording, videos etc. can be done be done by using the concept of mobile.

→ Thus having some big coverage diameter, it is one of the fastest and most reliable sectors of computing technology field.

* Mobile communication
* Mobile hardware
* Mobile software.

Mobile communication :-

→ The mobile communication in this case refers to the infrastructure put in place to ensure that seamless and reliable communication goes on. These would include devices such as protocols, services, bandwidth, and portal necessary to facilitate and support the state services. The data format is also defined at this stage.

Important Question (2019, 2017(W), 2016, 2017(S))

(1) Define mobile computing, explain different dimensions of mobile computing and its application. (10M)

(2) Write down the characteristics of mobile computing. (5M, 2M, 10M)

(3) What is Network. (2M)

IMP Note:-

→ Network & Types of Network.
→ Details about Wireless Network.
→ What is Mobile computing ? its Dimension.
→ Characteristics of Mobile computing.
→ Application of mobile computing.

1st CHAPTER

Introduction to Wireless Network & Mobile computing

Network:—

- A Network is a communication system that enables computer users to share computers equipment, applies, inos s/w, data and information.
- Now a days we find network everywhere in office, institution etc.
- Networks are used to transmit information ~~by are used to transmit information by~~ with the were or wireless communication media.
- Wired media use cables such as co-axial twisted pair and optic fibre.
- Wireless communication, networks use spread technology.
- In such a network data is transmitted by means of reliable high frequency radio signals.
- The were based technology was used for connecting computers.

→ The most common type of network in order of scale from less no. of computer and geographical area coverage.

(i) Personal area network (PAN)
(ii) Local area network (LAN)
(iii) Metro politan area network (MAN)
(iv) Wide area network (WAN)

(i) Personal Area Network (PAN) :-

A personal area network is a computer network used for communication among computer device closed to one person.

example :-

Printers, FAX, telephone etc.

(ii) Local Area Network (LAN) :-

A - network covering a small geographical are like, home, office, building in a wire pes are typically connected by CAT-5

→ All the computers interconnected local device that is printers and Severers for to connected to the internet.

→ As it is a small geographical reange it has get higher data transfer.

(iii) Metro-politan Area Network :-

→ A Metropolitan is a network that connect two or more local area networks together but does not exchange beyond the boundary of the exidiate town or city.

→ Optic fibre is used for data transfer.

→ Router, switches, hubs are connected to create a MAN.

(iv) Wide-Area Network :-

→ A wide area network is a data communicatio network that covers a relatively broad geographical area that is one city to another and one country to another and that often uses transmission facilities ~~Packet~~ Provided by common carriers such as telephone circuit ~~connection~~ line.

(v) Wireless Network :-

→ Wireless network is a telecommunication network in which the device are implemented without the use of wires.

→ Wireless network are implemented with information transmission system that was ~~used~~ electro magnetico. wave such as radiowave.

=> The term wireless technology is generally use for mobile IT equipment.

=> It include cellural phone, PDA (Personal Digital assitance) and wireless networking.

=> Other example of wireless technology, wireless keyboard, sadellite television, cardless phone.

(2) A process network allows us to connect our computer to a network using readio waves instead of wires.

→ In traditional wire network user can't access the application when is maving as he is not connected to the network through wire.

→ Unlike ethernet which uses wires, wireless networking uses the air is the medium to transport data.

→ There are limitation of wireless network as can't utilization services to unless he is physical connected to the local area network.

→ The following situation justify the use of wireless technology

(1) To span a destance beyond the capacities of different typecal cabling.

(2) To avoid ab such as physical structures etc.
(3) To link portable or temporary wire station.
(4) To provide a back up communication link in case of normal network failure.
(5) To overcome situation where natural cabling is difficult.
(6) To remotely connect mobile users on network.
(7) Wireless communication involves radio frequency communication microwave communication through high directional communication antenas in short range communication.

Common Example of Wireless Network :-

⇒ Cellular phones
⇒ Pagers
⇒ IPS
⇒ Cordless computer peripherals.
⇒ Cordless telephone satellite.

Mobile computing :-

→ Mobile computing is a computing environment over physical mobility.
→ The users of a mobile computing environment is able to access the data information or other logical objects from any device in the network while on mobility.

⇒ The mobile computing is accomplished using a combination of computer H/w. system and application software and some from of communication media.

Dimension of Mobile Computing :-

→ It is obvious that any mobile computing system can also be stationary.

→ It is stationary if you stop move.

→ We take a look at the dimension which make a system mobile.

→ (i) Location Awareness
(ii) Quality of service
(iii) Limited device storage capability.
(iv) Limited power supply.
(v) Support for wide variety of user interface.

(i) Location Awareness :-

→ A mobile device is not always at the same place.

→ It's place is not fixed.

→ Maintaining the location of user, is a big challenge for the application developer.

→ There are variety of methods for collecting data of location of user and device.

(ii) Quality of Service :-

→ Using any type of network whether wire or wireless mobility means loss of network connectivity and (Movement means increase in physical disconnection from Network.

→ Due to which quality of service degreeds.

→ However the quality of service in designing the mobile application takes care.

(iii) Limited Device Storage capacity :-

→ All mobile device are having limited storage capacity.

→ If the device have large capacity for storing then its size would increase not prefercable.

→ Now a days mechanics are imposing more processing power and storage capacity into smaller chips.

(iv) Limited Power Supply :-

→ We have seen that size of the biggest. The mobile devices are totally based on battery power which provides low power supply.

(v) Support For Wide Varrity of User Interface

→ Mobile application can also be handle from the stationary devices like PC.

→ The keyboard, mouse and monitor have proved to very efficient user interface for such type of application.
→ The other interfaces include touchpad, smaller displayed and pointing devices etc.

Mobile Computing Characteristic :-

Mobile computing environment support the following characteristics:

(1) User mobility
(2) Network Mobility
(3) Bearer Mobility
(4) Device Mobility
(5) Session mobility
(6) Service Mobility

(1) User Mobility :-

→ User should be able to move form one physical location to another and use the some service without any interuption.

Example :- User moves from India to USA and uses the internet to access his application the same way the uses in the office.

(2) Network Mobility :-

→ User should be able to move from one network to another and the same service.

Example:-

User moves from London to New Delhi and uses the same GSM phone to access the application through ~~Way~~ WAP.

(3) Bearer Mobility :-

→ User should be able to move from one bearer to another and use the same service.

Example :-

User was using a service through work bearer in his some network in Banglore he move to Chennai where ~~Wap~~ WAP is not supported to switched over to voice or SMS bearer to access the ~~sam~~ some network.

(4) Device Mobility :-

→ User should be able to move from one devices to another and use the same device.

Example :-

User Uses his destop at his office and during the day work outside his office uses his PAMTP or laptop to access the same application.

(5) Session Mobility :-

→ User Session should be moved from one environment to another.

Example :-

→ User was using the service through CDMA network he entered into the basement and got disconnect from the network. He then goes to his office and uses his desktop. The unfinish session moves from mobile device to desktop.

(VI) Service Mobility :-

→ User should be able to move from one server to another.

Example :-

→ User is writting mail for getting some information he switches for the some other application and return back to send the mail.

Applications OF Mobile Computing :-

→ The users might want available while they are on mobile include :

* Flight, directions, and traffic information
* Movie listings
* News
* Weather
* Reading email
* Retail
* Warehousing
* Healthcare

* Real Estate
* Field Service
* Field Sales
* Hospitality
* Vending.

⇒ All the applications must provide high value with a minimum of typing. This eventually leads to location-based services.

→ Wireless coverage of lecture theatres will allow experimentation using novel teaching methods and proving better support for conferences. The use of mobile devices in offices is now fairly commonplace; however such a diverse test-bed offers many new opportunities for experimentation.

⇒ Though mainly concerned with mobile systems the project will also deploy services to homes and university residences. ...we aren't always mobile! There are many situations where wireless access would make life easier, including home working, database access, or just for entertainment. Another aspect of the project will be to extent our previous work on content aware systems to many environments, including the same.

→ We already have a wireless network around the city providing tourist information. The system also allows families to keep in touch as they roam. checking lecture times while on the move or downloading an e-book while relaxing our city. wide in a cafe.... wireless coverage of leisure areas is also high on our list. Extending our city wide wireless network would allow new services such as instant price comparision and access to product information. the use of wireless technology.

* To span a distance beyond the capabilities of typical cabling.
* To avoid obstacles such as physical structures etc.
* To provice a backup communication link in case of normal network failure.
* To link portable or temporary workstations
* To overcome situations where normal cabling is difficult or financially im-practical.
* To remotely connect mobile users or networks.

Wireless communication involves :-

* Radio frequency communication.

* Microwave communication, for example long-range-line-of-sight via highly directional antennas, or short-range communication, ~~for example from~~ or.

* Infrared (IR) short-range communication, for example from remote controls or via IRDA.

* In wireless communication, electromagnetic wave (rather than some form of wire) carry the data signals, common examples of wireless equipment in use today include.

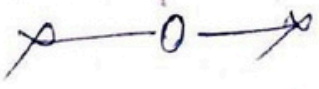
→ Cellular phones and pagers: provide connectivity for portable and mobile applications both personal and business.

→ Global positioning system (GPS): allows drivers of cars and trucks, captains of boats and ships and pilots of aircraft to ascertain their location anywhere on earth.

→ ~~Corel~~ cordless computer peripherals:- the cordless mouse is a common example: keyboard and printers can also be linked to a computer via wireless.

→ cordless telephone sets: these are limited-range devices, not to be confused with cell phones.

→ Satellite television: allows viewers in almost any location to select from hundreds of channels.



-: CHAPTER 2 :-

Introduction to Mobile Development Framework

C/S Architecture :-

⇒ C/S Architecture were the 1st network based on computing architecture to become commercially available.

⇒ In a client server (C/S) model, there are two different programs residing in separates mechanics.

⇒ One is said to be the client & others said to be the server.

⇒ Because client generate the request & the server solve the client request.

⇒ The c/s architechture predetermind that the client can do more than just being hardware with no computing power.

⇒ A server may receive request from many difference clients in very short period of time.

⇒ Because the computer can perform a limited no. of task at any moment.

⇒ It realise on scheduling system to priorities incoming request from clients in order to accomended them all in term, to prevent in proper use & maximize up time the server

s/w limits how a client use the servers resources.

=> Modern client server architecture includes data base in the server side.

=> These database can be used by client by using some connectivity protocal.

n-tier architecture :—

=> n-tier data application are data application that are separated into multiple tier also called distributed application or multiplied application.

=> Tier usually means physical development computer.

=> Usually a individual running server is one tier.

=> The simplers example of tier architecture that one-tier, two-tier, & three tier.

One-tier :—

=> One-tier architecture is the simplest single tier on the single user & it is the equivalent of running application on a personal computer.

=> All the required components to run the application or located within it user interface business logic & data storage are all located on the same machine.

⇒ They are easiest to design but the last capable because they are not a part of n/w They are useless of designing web application.

Two-tier :-

⇒ Two-tier architecture supply a basic n/w between a client and a server.

Example :-

⇒ The basic web model is a two-tier architecture A web browser makes a request from web server, which then processes the request & return the desire resource in this case web page.

⇒ This approach improves scalability & devides the use interface from the database.

Three-tier :-

⇒ Three-tier achitechture is most commonly used to built web application.

⇒ In this model the browser as like a client.

⇒ Middle ware or an application server contains the business logic & database server handle data functions.

⇒ This approach separate business logic from display one data.

⇒ Usually n-tier architecture begins as a 3-tier model & its expanded.

⇒ Same layer in 3-tier can be brooken further into more layers.

⇒ Those broken layers may be able to reun in more times.

Example :-

⇒ Application layer can be broken into business layer or presentation layer can be broken into on order to a complete n-tier architecture, client present layer business layer & data layer should be able to reun separate computers.

⇒ Today a large portion of emphastrectcure is based on n-tier architecture.

n-tier Architecture & WOW :-

=> The web is actually client server mechanism where the c/s communicate through HTTP.

=> The clients are the browsers which interact the user interface in HTML.

=> The servers are web servers which solve the clients request coming from HTTP with HTML server.

=> One the best example of n-tier architecture in web application is the popular shopping card web application the client tier interacts with the user through GUI & with the application & the application software.

=> In web application this client tier is a web browser.

=> In a shopping card web application the presentation tier displays information related.

to such services as browsing, purchasing & shopping card contents.

⇒ It communicates with other tier by outputing result to the browsers tier & all other tier in the network.

Peer-Peer Architecture :—

⇒ n-tier architecture with all of their benefit don't address several dimensions of mobility.

⇒ n-tier architecture requeired that the user that connected to the network because the servers some where as a network.

⇒ The data interchange is not possible between clients.

⇒ Here "let alone explore" content total.

⇒ Peer-to-peer architecture is a type of network in which each work station has equivalent capacities & capabilities & responsibity. This refers from client server architecture.

⇒ Where some computers are dedicated to solving the others.

⇒ Peer-to-peer may also be used to refer to a single software program design, so that each instance of program may at as both client & server. With the same responsibilities and status.

=> Peer-to-peer networks are generally simpler but they usually don't offer the same performance with heavy load.

=> Peer-to-peer is not popularly home users but many small business have come to depend cost efficient solution for sharing files with co-works and client.

=> Peer-to-peer promotes the freedom of working together where we are not physical located on the same office.

=> In just second updated files and data can be shared with all participant refers to file can be block on security.

=> One could can video the p-to-p architecture as placing a server model as well as a client module of each computer.

=> Thus each computer can access service from the software module on another computer as well as providing service to the other computer

=> The advantages of peer-to-peer include

* No needs for networks administrator
* Network is fast in expensive to set up and maintain.
* Each PC can make backup copies it its data to other PC for security.
* It is the easiest type of network to to build and is perfect for home and office cases.

Mobile Agent Architecture :-

=> Mobile Agent based software system have totally different architecture from client server & n-tier system.

=> They have following properties.

=> They are the programs which hide data & code which are transported from client machine to remote server for execute.

=> They execute asynchronous.

=> The term mobile agent have more relation with mobile device or any other aspect of mobility.

=> Their software components which move from servers to servers in a network while keeping the set of application n-tier.

=> Mobile agents can manage the own life cycle this means that we don't have load unload application manually or store many application on the device

=> Hence the use of CPU and other resources are minimized & completes.

DMP Question (2019, 2017(W), 2017(C), 2016)

* Explain peer-to-peer architecture and it working principle. (5M, 10M)
* Explain mobile agent architecture. (5M).
* what is C/S architecture. (3M).

Chapter - 3
Wireless Transmission

Introduction:-

It is a form of unguided media.

=> Wireless communication involves no physical link established between two or more devices communicating wireless.

=> Wireless signal are spread over in the air & received & interepreted by appropcated antennas.

=> Wireless communication means transmitting receiving voice & data using electromagnetic wave in a open space.

=> The information from sender to receiver to carried over a well define frequency band (channel).

=> Each channel has a fixed frequency bandwidth & capacity.

=> Different channels can be used to transmit information in parallel & independently.

Signals:-

=> Signals are the physical representation of data.

=> When users of a communication system once to exchange data this is made possible through transmission of signal.

=> Signals and functions of time & location.

=> Signal parameter represent a data value.

=> Data can be analog & digital.

Analog Signals :-

=> Analog signals are continuous electrical signal that varies in time.

=> A simple annalog signal is sinewave.

=> A composite analog signal is compose multiple sinewave.

=> The sinewave is the most fundamental forem of periodic analog signals.

=> A periodic signal complete a patter within a time frame is called a periodic and this pattern is repeated over subsiguent identical period.

Digital Signal :-

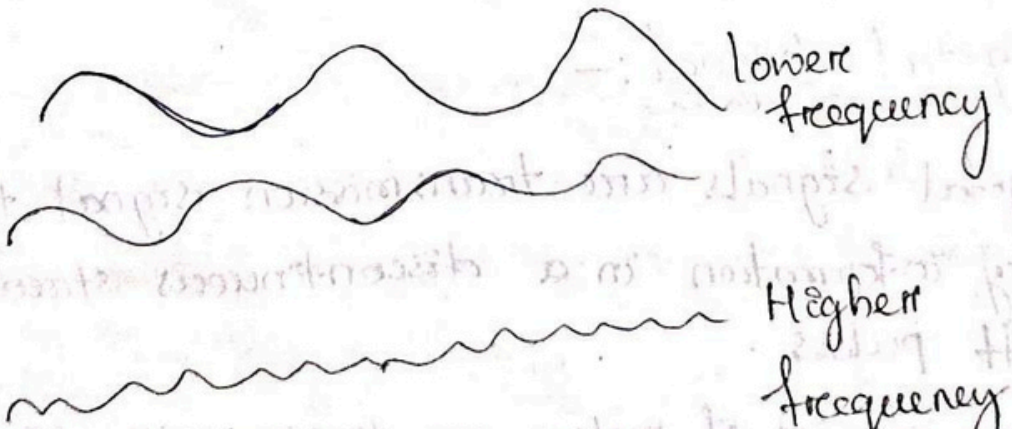
=> Digital signals are transmission signal that carry information in a discontinuous stream of on/off pulses.

=> They consist of pulses or digits with discrete level or values.

=> The value of each pulses is constant.
=> Digital signals are two amplitude labels called nodes.
=> The value of which are specified one or two possibility such as one or zero high or low and true or false.

Period and Frequency :-

=> Period refers to the amount of time in second signal needs to complete one, cycle.
=> frequency is the measurement of the no. of occurance of a repeated event for unit of time.
=> It can also be defined as no. of period in one second.
=> The result measured in Hz.
=> 1 Hz means that one event repeat once per/ second.
=> 2 Hz means twice per second.



(Sinewave of different frequency)

Bandwidth :-

=> The range of frequency that medium can pass is called is bandwidth.

=> It is a property of the medium.

=> It is the difference between the higher and lower frequency, that is medium can satisfy pass.

Example

=> If a medium can pass frequencies between 1000 and 5000 its bandwidth is 5000 - 1000 = 4000 Hz.

=> We can say that we need a medium with a bandwith of 4000 Hz. If you want to send signal without lossing a significat part.

Antennas :-

=> An antenna is a drive designed for converting energy one form to anathor to transmit and receive radios.

=> Antennas are used system such as readio and TV broadcasting. wireless LAN, space explossion

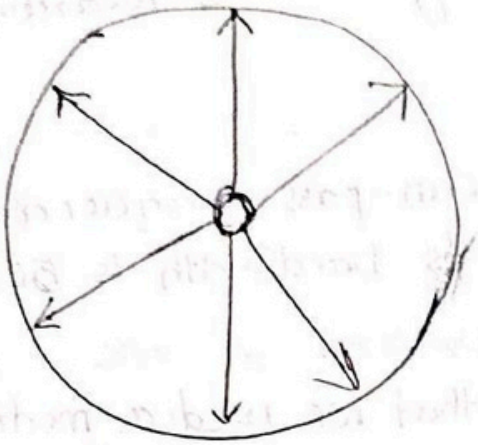
=> Antennas are practical uses for the transmission and receives of radio frequency signal, which can travel overe grid ~~because~~ distance at the speed of light.

There are two types of antennas These are

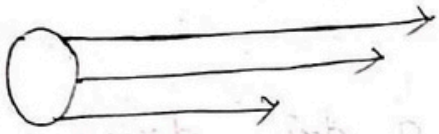
(i) Omni directional

(ii) Directional

(i) Omni Directional Radio propagation :-



(ii) Directional Radio Propagation :-



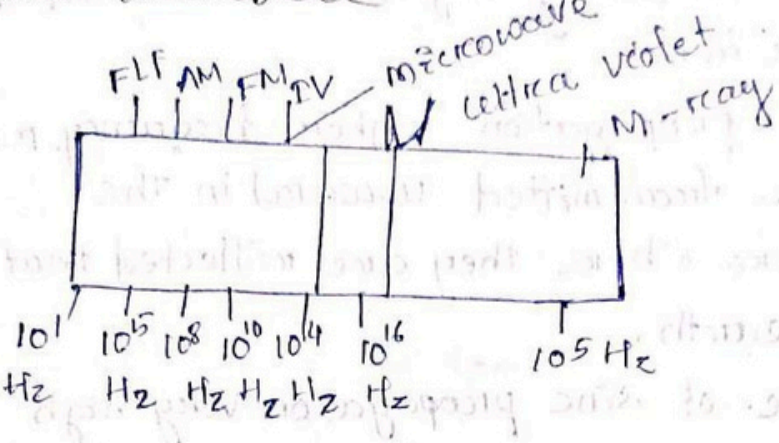
⇒ A truely omni directional antenna transmit its power in all direction where as directional antenna most of its power in one direction.

⇒ A directional antenna has more gain than omni directional type and its capability of propagating the signal further because of focuses the power in single direction.

⇒ Long distance transmission requires high power and directive radiation pattern.

=> Wireless LAN and WAN used omni-directional antenna and wireless MAN use anntennas that are directive.

Signal Propagation:-



=> The electromagnetic spectrum classifies electromagnet energy according to frequency.

=> Signal propagation is nothing but travelling of signals through some medium in case of both wire & wireless n/w.

=> Transmission media is of 2 type
(i) Guided Transmission media
(ii) Unguided Transmission media.

=> In case of guided media it is through various types of cable co-axial cable twisted pair cable etc.

=> In case of unguided media signal travel through air. There is ground propagation skey propagation line to line propagation.

=> In case of ground propagation radio wave travels thorough lowest part of atmosphere. touching the earth.

=> The low frequency signal are transmit in all the direction.

=> In sky propagation higher frequency radio wave are transmitted upward in the atmosphere where they are reflected that toward earth.

=> In line of sine propagation very high frequency signal are transmitted line from antenna to antenna.

Multiplexing :-

=> In telecomunication and computer network multiplexing is method in which multiple signal are combine into one signal over a share medium.

=> Multiplexing is some time refer to as many into one.

=> example

=> Ten people in the office share communication medium (wire) to converse at the same times.

=> If all want to talk at the same time there will be some interfereence between the

conversation talking place. To reduce the interference they may devide themselves into 3 groups such that the conversation is betn two pair of people.

=> If the pairs continue talking setting next to each other the interference would still be present.

=> The best way for each pair to converse with minimal interference would be sit few fit away from each other pair and converse.

=> They would still be sharing the some medium for their conversation but the physical space in the room would be devide for each conversation.

=> This is an example SDM.

=> The pair could also try conversing ~~as~~ using different, pitch tones (some medium with diff^{n} frequency) this will require filters such that each pair hear his own conversation but not that for others.

=> This is an example of FDM.

=> Anathor option could be for the pairs to converse in time sharing the some medium and have time while to say something and give other a chance to talk too.

=> This will continue until the message of conversation is over for a pair.

=> This is an example of TDM.

Modulation

=> Size of antenna require for wireless communication is inversely propotional to the frequency of the transmitted signal.

=> So we can take the conclusion that low frequency signal need very large antenna for their transmission due to the properties of signal Propagation medium very low frequency signal can not be transmitted across long distance without the less in signal strength.

=> On the reverse side in the case of medium range or short range signals like voice, music etc.

=> The radio transmission is not practical.

=> Modulation is required to effective wireless transmission by increasing the compatibility of the transmitted signal and the medium of transmission.

=> Signal consist of 2 components.

(i) Information signal

(ii) Carrier Signal

=> The transmission of any signal over same communication medium usually involves modulation of a carrier so their transmission the information signal and carrier signal are combine and the process of combining two signal is called modulation.

=> A device that performs modulation is known as a modulator.

=> A device that performs the reverse operation of modulation is known as demodulator.

=> A device that can do both operation is called modem.

=> A high frequency wave which carried the information through a medium is called carrier.

=> The information is superimposed in the carrier wave by modulation.

=> Modulation is of 2 types.

(1) Analog Modulation

(2) Digital Modulation

Analog Modulation

=> In the modulating signals amplitude varies continuously with time it is said to be analog signal and the modulation is referred to as analog modulation.

Type :- AM, FM, SM

* Digital Modulation :-

=> In the case where the modulating signal may vary its amplitude only between a finite no. of various and the changes may occur only at discrete moments in time the modulating signals called to be digital signal and the modulation is referred to as digital.

OR =>

Type :- Ask, FSK, PSK

Spread Spectrum :-

=> In telecommunication a band (frequency band) is a specific range of frequencies in the radio frequency spectrum (RFS).

=> Which is devided among ranges from very low frequency to extremly high frequency.

=> Each band has a defined upper and lower frequency limit.

=> Because two radio transmitter sharing the same frequency band will cause interference.

=> Band use is regulated internationel use of radio spectrum is regulated by the internationa telecommunication union (ITU).

=> Domestic use of the radio spectrum is regulated by national agencies such as Federal Communication commission (FCC).

=> Regulatory organisation assign each transmission source a band operation a transmitter radiation pattern and a maximum transmitting power.

=> Spread spectrum is a radio frequency communication system in which the base band signal bandwidth is internationally spread, over a wider bandwidth, and appears as a noise.

=> The ratio between the spread bandband and original signal is called processing gain.

=> Typical spread spectrum processing gain vary from 1000 b to 6000 b.

=> In spread spectrum the transmission signal bandwidth is much higher than the information bandwidth.

=> All spread spectrum can be view as two steps modulation process.

* First data to be transmitted is modulated.
* Second the carrier modulated spreadcode causing it to be spread out over a large bandwidth.

Cellular System :-

=> Wireless communication technology in which several small exchanges called cells equitied with low power radio antennas are inter connected to central exchanges.

=> As a receiver moves from one place to the next its identity, location and radio frequency is handover by one cell to another without interrupting a cell.

=> A cellular mobile communication system uses a large no. of low power wireless transmitters to create cells.

=> Increase in demand and the poor quality of existing service led mobile, good service

Provider to research ways to improve the quality of service and to support more users on their system.

=> Because the frequency is available for mobile cellular use was limited efficient use of required frequency was need for mobile cellular coverage.

=> In order to work properly a cellular system must verify the following two main conditions.

(i) Power level of a transmitter within a signal cell must be limited in order to reduce the interference.

(ii) Neighbouring cell can not share the same channels in order to reduce the interference the frequencies must use only a certain pattern.

Important Questions :-

(1) Define modulation, explain modulation type.

(2) Define multiplexing and its various types of multiplexing technique.

(3) Define signal propagation.

(4) What do you mean by signal reuse?

(5) Spread Spectrum?

(6) What is multiplexing?

(7) What is antenna and explain its types with diagram?

(8) Explain Cellular System.

Chapter-4

Medium Access Control :-

Introduction :-

=> When the number of signal sources attempt to access a wireless medium simultaneously networks encounters the problem to receiving signals from each radio carrier distinguishly it is because of the signals send to interfere with each other when they are transferred simultaneously through the medium.

=> Also network encounter the problems of signals from hidden & expose terminal as well as near and far terminals.

=> To overcome this problem communication system receive extract signals from various terminal in presence of signals devided int different cells. time slots frequency and code.

=> CDM is a big step forward for medium always control during access to the transmission medium by multiple wireless system at a given instant and frequency bands.

Motivation for a Specialised Medium Access Control :-

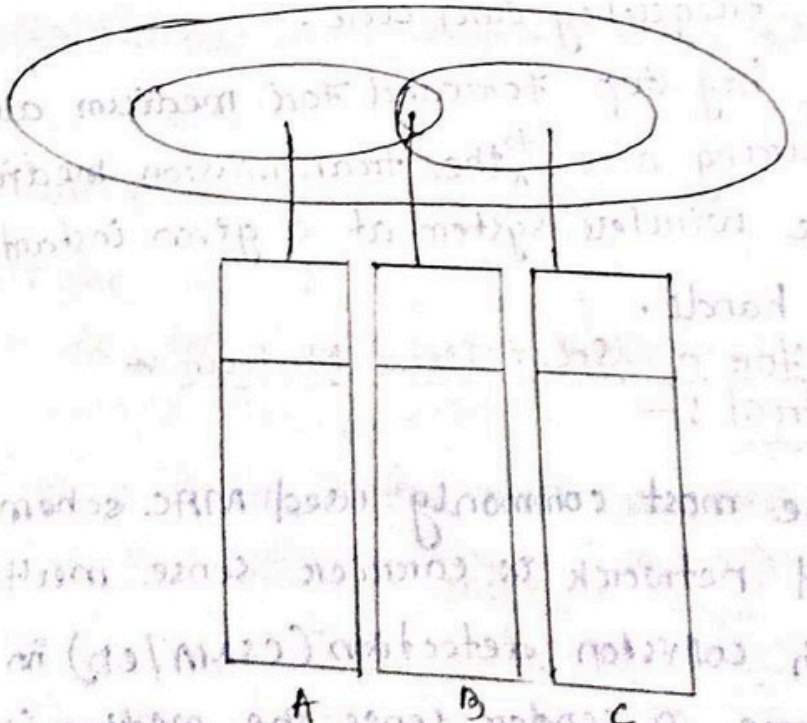
=> Once of the most commonly used MAC schemes for wired network is carrier sense multiple access with collision detection (CSMA/CD) in these scheme a sender sense the medium (wire) to see of it is free.

=> If the medium is busy the sender waits until it is free if the medium is free the sender starts transmitting data & continous to listen to the medium.

=> If the sender detects the collision while sender is step of once send A pairing signal but these scheme does not work within wireless network because the problems are signal strength decreases proportional to the.

=> The sender would apply as a in (carrier sense/ carrier detection) but the collision happens at the receiver. It might be a case that a sender can not hear the collision detection (CD) does not work.

=> Further more is might not work for example if the terminal is hidden.



Hidden and Exposed Terminals :-

=> When these problem does not occur in wireless LAN.
=> consider the scenerio with three mobile phones the transmission range of A reaches B but not C.
=> The detection range does not reach C. The transmission range of C reaches B but not A.
=> Finally the transmission range of B reaches both 'A' & 'C'.
=> 'A' can not detect 'C' & 'C' can not detect 'A'.

Hidden Terminals :-

=> 'A' sends to B, C cannot hear.
=> C wants to send to 'B', 'C' senses a free medium & start transmitting.
=> collision at B occurs 'A' cannot detect the collision & contineous with its transmission to 'B'.
=> 'A' is hidden from 'C' & vice versa while hidden terminal case collision.

Exposed Terminals :-

=> 'B' sends to 'A', 'C' wants to send anathore terminal not 'A' or 'B' outside the range of A, B & C.
=> C senses the carrier and defects the carrier busy C postponded its transmissions until it detects the medium as being ideal 'A'.
=> But A is outside radio range of 'C' waiting is not necessary. 'C' is exposed to 'D'.

=> Hidden terminals cause collision where as expose terminal cause unnessarcy delay.

Near & Fare Terminals :-

=> Consider the above situation were both sending with the same transmission power.

=> Signal Strength decreases protectional to the square of the distance & 'B' signal drowns out 'A'. signal making 'C' anable to receive 'A' transmission.

=> If 'e' is an arbitan for sending rights B drown out 'A' signal in the physical layer making 'C' unables to hear out 'A'

=> A the near & far effect is server problem of wireless network using CDMN.

=> All signal should arrive at the receiver with more or less the same strength for which pescribed power centreal is to be implementex.

The Basic Access Method :-

=> The basic access mechanism is carrier sense multiple access it has two flavour.

* Carrier sense multiple access with collision Avoidance (CSMA/CA).
* Carrier sense multiple access with collission Detection (CSMA/CD)

=> CSMA protocal works as follows.

(i) A station which wants to transmit data senses to the medium. If the medium is busy then the station will cause its transmission for sometime.

(ii) If the medium is sense free. than the station is allowed to transmit. These kind of protocal is very effective when the medium is not heavily loaded.

(iii) As it allows the station is transmit with minimum delay but there is always a chance of station transmitting of the save time.

Problems in Wireless network :-

=> Signal strength decreases as the distance encreases. The sensor would apply SSCA/CD. but the collision happends at the receiver due to a second sender.

=> It might be the case that a sender cannot hear the collision that is CD does not work further is might not work if the terminal is hidden the collision is CSMA/CA.

CSMA/CD :-

=> A sender sences the medium to see it if is free if the medium is busy the sender waits with it is free.

=> If the medium is free the sender starts transmitting data and continuous to listen the medium.

=> If the sender detects the collision while sending it stops at once.

CSMA/CA :-

=> A sender senses the medium to see if

=> It uses two short signaling packet for collision avoidance their are request to send (RTS) and clear to send CTs) the sender request the right to send from a receiver with short RTS packet and before it send a data packets.

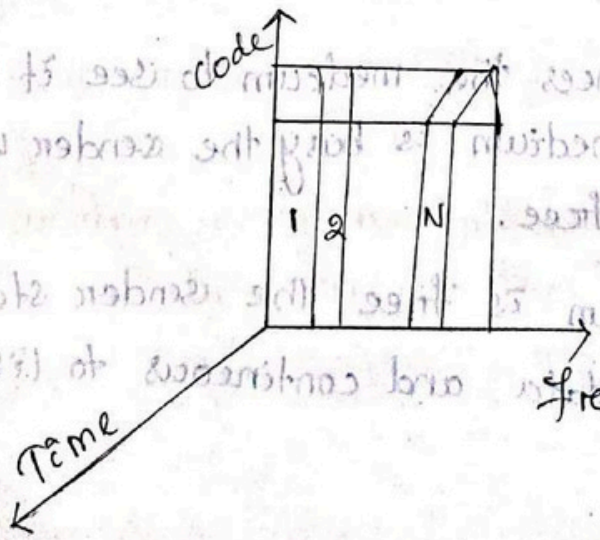
=> The receiver grants the right to send as soon as ready to receive.

=> Signalling packets contain sender address receiver address & packet strength.

=> It avoid the problem of hidden & expose terminal.

FDMA :-

(Frequency division Multiplexing Access)



=> It is one of the most multiplexing techniques the available frequency bandes devided into channels of equally bandwidth so that each communication is carried in a different frequency.

=> In, FDMA is a method employed to permit several users in transmit simultineously on on satellite transponter by assigning a specific frequency with in the channel to each user.

=> Each conversation gets its own unique radio channel each user is allocated two channel one for uplink another for downlink communication.

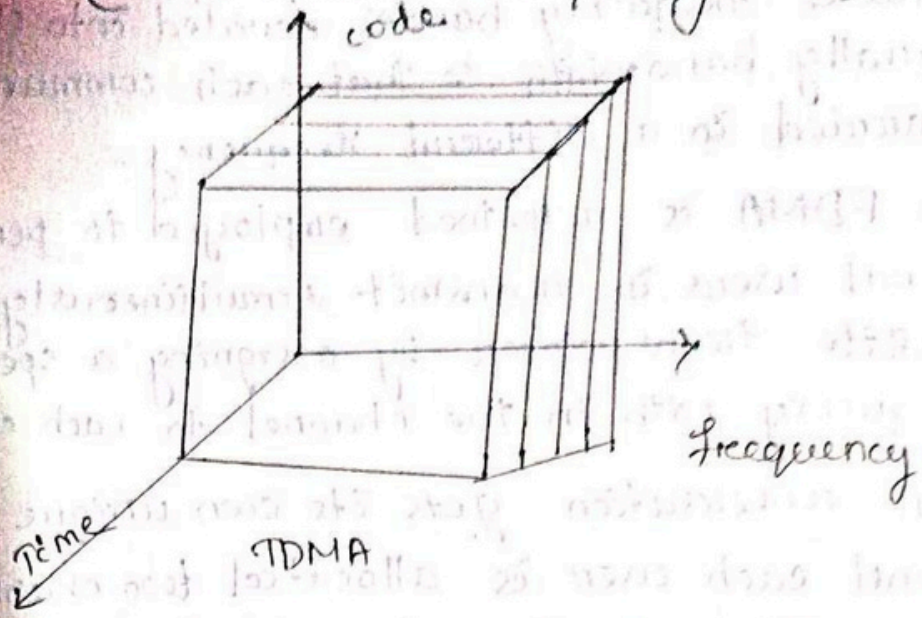
=> No other user is allocated the same channel at the same time.

=> These multiplexing technique is used in all the first generation analog mobile networks like AMPS (Advance mobile phone system) in USA.

=> These scheme is also has disadvantages assigning a separate frequency for each possible communication would be a trendials wast of frequency resources.

=> Additionaly the fixed assignment of a frequency to the sender makes the scheme very inflexible & limits the no. of sender.

TDMA (Time Division Multiplexing Access)



TDMA

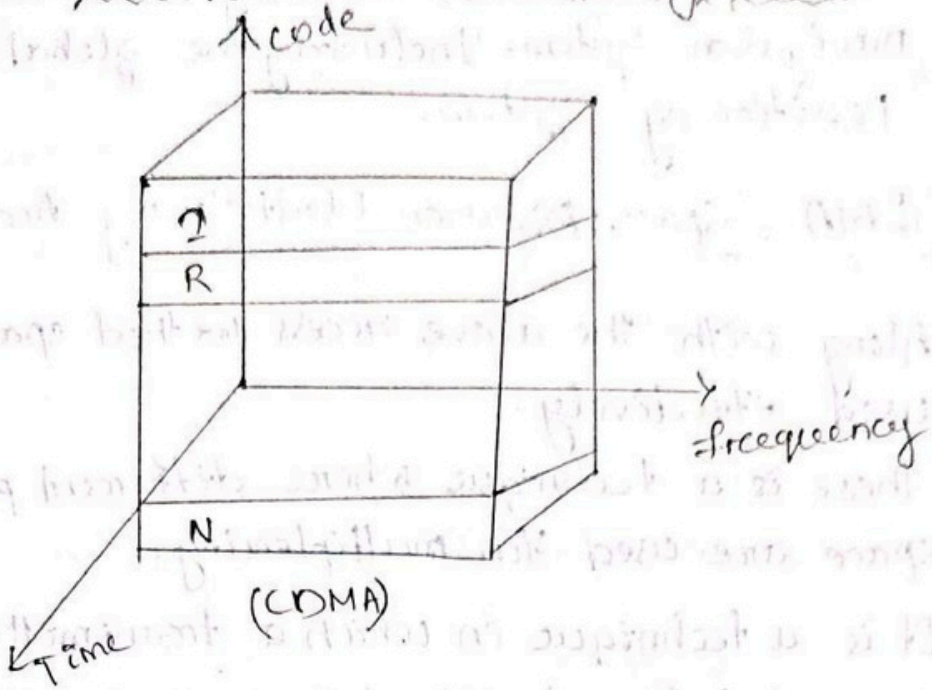
=> A more flexible multiplexing scheme for typical mobile communicate is Time Division multiplexing.

=> It allows several users to share the same frequency channel by dividing the signal into different time slots & i.e each channel is spit up into time segments and a transmitter is given exclussive use of one or more channels only at particular time period.

=> Listening to different frequencies at the same time is quite difficult but listening to many channels separated in time at the same frequency is simple (possible)

=> TDMA is used in the digital 2G cellular system such as global system for mobile communication (GSM) it is also used extensively in satelite system.

CDMA (code devission Multiplexing Access):-



=> CDMA is base- broad band system & hence functionally different from TDMA & FDMA.

=> FDMA & TDMA transmit a strong signal in a narrow frequency band.

=> CDMA transmit a relatively technique where each subscriber uses the whole system bandwidth.

=> Unlike TDMA & FDMA where frequency or time slot is assigned exclussively to a subscriber.

=> In CDMA all subscriber in a cell use the same frequency band simultaneously. The separate the signals each subscriber it is assigned a separate code called chip.

=> CDMA system apply codes with contain characterestics to the transmission to separate different users in code space & to enable access to a shared medium without interference.

=> CDMA has been used in many communication & navigation system. Including the global possitioning system.

SDMA (Space Division Multiplexing Access):-

=> Along with the above access method space are used effectively.

=> These is a technique where different parts of space are used for multiplexing.

=> It is a technique in which a transmitter transmits the modulated signal & accesses a act of space such that both the signals can propagate on the separated space to the without effecting each other.

=> It is used to radio transmission & is more useful in satelite communication.

CHAPTER-5

(Wireless LANs

(Wireless LAN and communication :-

=> Wireless communication allows information exchange between two devices without the use of wires or cables.

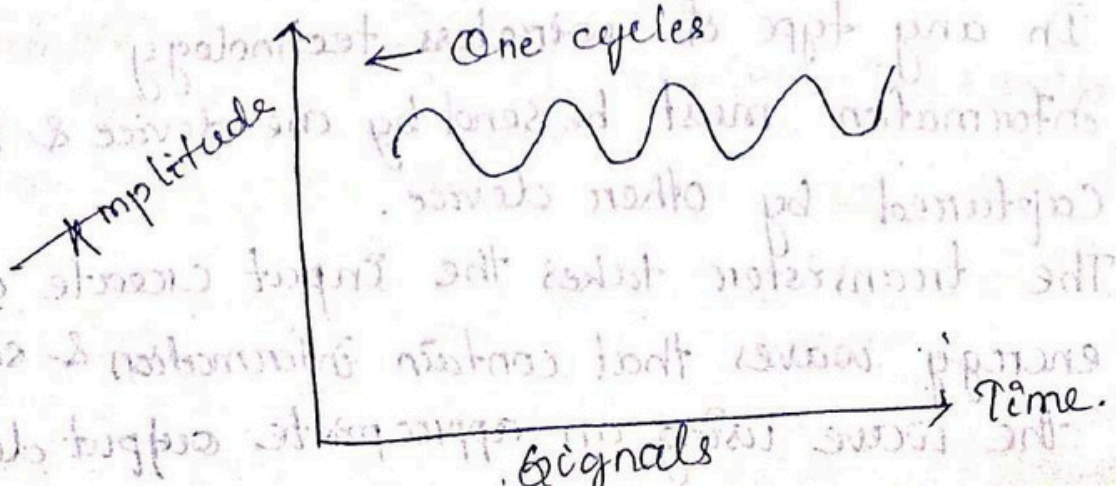
=> A wireless LAN or WLAN is a wireless local area network that users radio waves as if carrier to give a surrounding area.

=> Areas may range from a single room to an entire campus.

=> WLAN become popular in the home due to easy installation & use, it allow users to move around in a confined are when they are still connected to a network.

=> WLAN transits information by three main ways these are.

(i) Micro wave
(ii) Spread Spectrum
(iii) Infrared.



=> It shows typical electromagnetic wave when a Vertical axis represent the amplitude or strength of the wave.

=> and Horizontal axis represents time.

=> In relation as electromagnetic energy frequency is the number of cycles a wave complete in one second. It is expressed in Hz. (Hertz) which equal to one cycle per second.

=> commonly indicated by prefixes such as Kilo hertz (KHz), Mega(MHz), Giga Hertz (GHz) directly related to the amount of information that can be transmitted in the wave.

=> The term wave length is used almost interchangedibly with frequency in relation to electromagnetic energy wave length is the shortest distance at which the wave pattern fully repeats itself..

=> It is expressed in metres commonly indicated by prefixes such as KM, MM etc inversely proposnal to frequency

=> In any type of wireless technology information must be send by one device & by captured by other device.

=> The transister takes the input create an energy waves that contain information & send the wave using an appropriate output device.

example

A radio transmitter outputs its energy waves using an antenna When an infrared transmitter uses an antenna light. The electromagnetic energy wave are captured by the receiver which than processes the wave to get an output the information in its original form.

=> Any wireless device having the mechanism to both transmit energy signals.

Infrared:-

=> Infrared is electromagnetic radiation with wave length longer than visible light shorter than radio waves.

=> Infrared radiation is the region of the electromagnetic spectrum between microwave & visible eight.

=> In infrared communication an LED transmits the infrared signal as brust of non visible light at the receiving end a photo diode detects and captured the light pulses which are they processed to retrive the information they contains.

example

Mouse, head, phone, security system etc.

Radio frequency :-

=> Radio frequency (RF) refers to that portion of the ~~electromagnetic~~ electromagnetic spectrum in which electromagnetic waves can be generated by alternating current which is feed to an antenna.

example

When we listen to a radio station & the announcer or stage 92.7 big FM but the announcer means is that you are listening to a radio station broad casting. an FM radio listening at a frequency of 92 MHz with FCCC comittion assigned cost name of big FM so 92.7 MHz means that the station is oscilating as a frequency of 92 X 1000 X 1000 /sec.

=> Mega Hertz (MHz) means millions of cycles per seconds so. 91.5 MHz means that the transmitter at the radio station is oscilating at the frequency of 91500.000 cycles per seconds.

IR Advantages :-

=> Low power requirements ideal for Laptop, telephone & PDA.

=> No circuitary cost simple circuitary.

=> No special HICN is required can be incorporated integrated circuit of a product.

=> Portable free interaction regulating constaint.
=> IRDA functional devices will ideally be usable by international traveller no matter where they may be.
=> High noise protective Not as likely to have interface from signals to other devices.

IR Disadvantages:-
=> line of sight is required that is the transmitter & receiver must almost directly aligned to communication.
=> Blocked by common material people walls, plants etc, can block communication.
=> Short range :- Performs drops with longer distance.
=> Light weather sensitive :- Direct sun light rain, dust, pollution can effect transmission.
=> Speed :- Data rate transmission is lower than typical wire transmission.

RF advantages
=> line of sight is not required.
=> Not block by common materials :- can pentrate most solids & pass through wall.
=> Longer range
=> Not light sensitive.
=> Not as sensitive to weather Enviromental conditions.

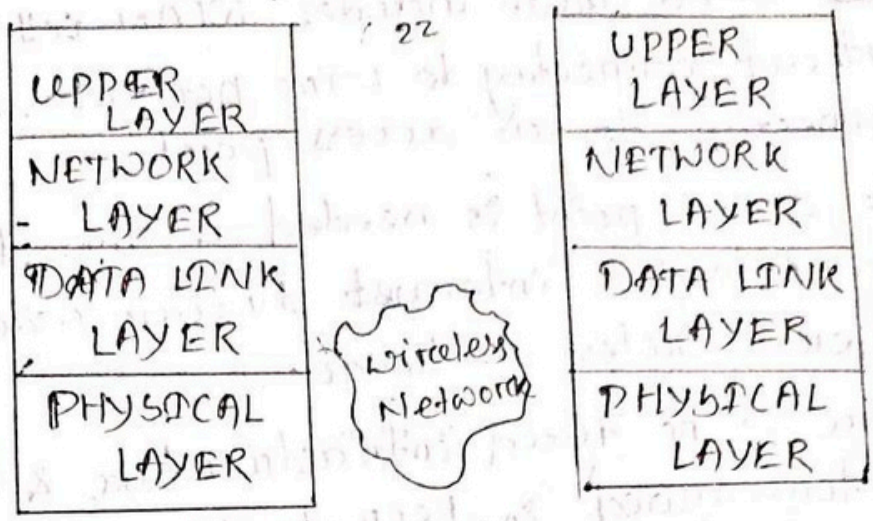
RF Disadvantages :-

=> Higher cost than infrared.
=> Federal communication comission :- licence required for some product.
=> Low speed Data rate transmission is lower than wire & infrared transmission.
=> lack of security :- Easier to hear a conversation of transmission since signals are spread out in space rather than confined than a wire.
=> Interference :- communication devices using similar frequencies wireless phone, scanner, & personal locators can interference with transmitter.

Wireless Network Architecture :-

=> Network performs many functions to transfer information from source to destination. These are.
(i) Medium provides the path for data to flow
(ii) Medium access technique provide the sharing of a common medium.
(iii) Sychronisation & error contend mechanism ensure the transister the data properly.
(iv) Routing mechanism move the data from originating source to the destination property.

Logical Architecture of Wireless Network



⇒ Logical Architecture defines the n/w protocal rules by which two entities communicate.

⇒ The most popular standard logical architecture is even Layer Open system interconnection, model i.e OSI Model.

⇒ Wireless n/w do not concern with all seven OSI Layer the function only within physical Layer & Data link Layer.

Types of WLAN (Wireless LAN) :-

There are two types of WLAN these are;

(i) Ad-hoc mode
(ii) Infrastructure mode.

(i) Ad-hoc mode :-

=> The ad-hoc mode includes WLAN cell interacting without connecting to wire network i.e without connection to an access point.

=> No access point is needed & the device might connect to the internet through wire or other wireless technique.

=> There is no fixed infrastructure & information is forwarded in peer-to-peer mode.

Infrastructure mode :-

=> Wireless access point can be compared with an ethernet hub or switch & it used to participate on network all communication occurs through access point.

=> communication typically take place only between the wireless nodes and access points not directly between the wireless node.

=> Access point acts as a bridge Access point with a fixed network can connect several wireless network to form a large network beyond the actual radio coverage.

example

=> Cellular phones & satelite based cellular phones are typically infrastructure based network.

ii) => The infrastructure mode include one or several interconnect WLAN cells.

i) -> Which are connected to a fixed net-through access point.

Adhoc Mode :-

- Each node can directly communicate with other another node.
- Nodes can communicate if they reach other physically or if other node forward the message.
- This network structure may operate in a stand alone fashion.
- Each node is equiped in wireless transitter & receiver with appropriate antenna.

IEEE 802.11

- 802.11 and 802.11x refers to a family of specifications developed by the IEEE for wireless LAN (WLAN) technology.

802.11 specifies an over the air interface between a wireless clients.

There are several specifications on the 802.11 family.

- 802.11 :- applies to wireless LANs and provides or 2 Mbps transmission in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).

* 802.11a :- an extension to 802.11 ~~high rate or (wi-fi) an extension to 802.11~~ that applies to wireless LANs and provides up to 54 Mbps in the 5Hz band.

* 802.11b :- (also referred to as 802.11 high rate or ~~Wi-fi~~ Wi-fi) an extension to 802.11 that applies to wireless LANs and provides 11 Mbps transmission (with a fall back to 5.5, 2 and 1-Mbps) in the 2.4 GHz band.

* 802.11e :- a wireless draft standard that that defines the quality of service (QOS) support for LANs and ~~provides~~ it is an enhancement to the 802.11a and 802.11b wireless LAN (WLAN) specification.

* 802.11g :- applies to wireless LANs and is used for transmission over short distances at up 54 Mbps in the 2.4 GHz band.

* 802.11n :- 802.11n builds upon previous 802.11 standards by adding multiple input multiple output (MIMO) The real speed would be 100 Mbits (even 250 Mbit/s in PHY level) and so up to 4-5 times faster than 802.11g.

* 802.11ae :- 802.11ae builds upon previous 802.11 standards particularly the 802.11n standard to deliver data rates of 4133 Mbps per spatial stream or 1.3 Gbps in a three antenna (three stream) design.

* 802.11 ad wave 2 :- 802.11 ae wave 2 is an update for the original 802.11 ae spec that uses MUMIMO technology and other advancements to help increase theoratical maximum wireless speeds for the spec to 6.93 Gbps.

* 802.11 ad :- 802.11 ad is a wireless specification on under development that will operate in the 60 GHz frequency band and offer much higher transfer rates than previous 802.11 specs with a theoratical maximum transfer rate of up to 7 Gbps (Gigabits per second).

* 802.11 ab :- 802.11 π also ~~called~~ known as Wi-fi Halow, 802.11 ab is the first Wi-fi specification to operate in frequency band below one giga hertz (900 MHz) and it has arrange of nearly twice that of other Wi-fi technologies.

* 802.11 π :- 802.11 π also called fast Basic service set (Bs) Transition, supports vo Wi-fi handoff between access points to enable VOIP roaming on a Wi-fi network with 802.1x authoticatin.

* 802.1x :- Not to be confused with ~~802.11~~ 802.11 x (which is the term used to describe the family of 802.11 standard) 802.1x is an IEEE standard for port based Network access control that allows network adminstrators is restricted use of IEEE 802 LAN service

access point to secure communication between authenticated and authorized devices.

MAC layer :-

=> The Media Access Control layer is one of two sublayer that Make up the data link layer of the OSI model The MAC layer is responsible for moving data packets to and from one Network Interface card (NICs) to another accross a shared channel.

=> The medium access layer was made necessary by system, that share a common communications medium.

=> The MAC layer is the 'low' part of the second OSI Layer, the layer of the "data link".

Security :-

=> Mobile security is the protection of smartphones, tablets, Laptops and other portable computing devices and the networks they connect to, from the arcts and Vulnecarbilites associated with wireless computing. Mobile, seccurity is also known as wireless security.

=> Securing mobile devices has become increasingly important in recent years as the numbers of the device in operation and the uses to which they are put have expanded dramatically.

Synchronization :-

=> In computer science, synchronization refers to one of two distinct but related concepts synchronization of processes, and synchronization of data.

=> Process synchronization refers to the idea that multiple processes are to join up or handshake at a certain point, in order to reach an agreement or commit to a certain sequence of action.

=> Data synchronization refers to the idea of keeping multiple copies of a database in coherence with one another, or to maintain data integrity.

=> Process synchronization primitives are commonly used to implement data synchronization.

Power Management :-

=> Power management is a computing device feature that allows users to control the amount of electrical power consumed by an underlying device, with minimal impact on performance. It enables the switching of devices in various power modes, each with different power usage characteristics related to device performance.

Roaming :-

⇒ It is the process of moving from one cell to another cell without loosing connection. A client can switch between access points. while physically moving or because of load balancing between access points. client is not restricted to being stationary. usually this is completely transparent to the user they are not aware that a different access point is being used from area to area.

⇒ Some access point configuration require security authentification when swapping access point is ~~being~~ usually in form of Password dialog box Access points required to have overlapping wireless areas to achieve this, A user can move from Area to Area 2 transparently.

⇒ The wireless networcking hardware automatically swaps to the Access point with best signal. Not ~~all~~ all access points are capable of being configured to support roaming.

⇒ As the client physically gets closer to another access point, the signal strength from the first will drop while the signal strength from the ~~another~~ other will increase. At one point, the signal strengths of the two will be equal but then the other will have the strongest signal and the client should roam to the next access Point.

For the client to cable to roam interception) it is neceesary for to.

* Be connected to the same IP subnet so the client will not have to change IP address.
* Have the same SSID (service set identifier) to identify the wireless network.
* Have the same WEP (Wired equivalent privacy.) keys so that the client knows to encrypt the data.

Bluetooth :—

* It is an emerging technology and the global initiative taken by Emisson, IBM, Intel and Nokia to set a standard for cable free connectivity between mobile phones, mobile PCs handled computers and other peripherals.
* Bluetooth radio technology built into both the mobile telephone and the laptop could replace the traditional (serial) cable used today to connect these devices printers, keyboard, Mouse, Joy stick or any other digital device can be part of Bluetooth system.
* Beyond facilitating the replacement of cables Bluetooth technology can also act as a universal medium to bridge the existing data networks, a peripheral interface for existing devices, and a mechanism to form small private ad-hoc grouping of connected devices away from fixed network infrastructures.

=> The bluetooth technology achieves its goal by embedding small, inexpensive, short-range radio transceivers either into the devices that are available today, directly on through an adapter such as a pc card.

=> Two Bluetooth devices can talk to each other when they come within a range of 10 meters to each other. Due to their dependance on a radio link bulue-tooth devices do not require a line of sight connection in order to communicate.

=> Therefore a laptop could print information on a printer in the act joining room. Bluetooth's main strength is its ability to simultaneously handle both data and voice transmission. It can operate in a noisy radio frequency enviroment.

---* End *---

CHAPER - 6

UNIBIQUITOUS Wireless COMMONICATION

Introduction

Ubiquitous computing is a concept in s/w engg & computer science where computing is made to appear any time and every where computing is made to appear any time and every where. In constract to desktop computing ubiquitous computing can occure using any device in any location & in any foremat.

By using a small radio treansmitter & a building full of special sensors our be any where we are not just of our work stations. At the press of a botton The computers the combridge researchs have designed the system to work for other devices, including phones & digital cameras.

The expoential growth of the internet has dimirished the difficulties associated with communication between distance places allowing to participate in the digital economy regardless of their geographical limitations.

Delelopment in wireless tech are freeing People from using wires from communications have converted. Mobile phones in a commodity rather than a luxury item.

The idea of any time by anyting & anyone. or networking tech, referred to as a ubiquites

networking. The origin of the term "ubiquitous networking. The origin of the term "ubiquitous" as latin meaning as "being every where especially at the same time" the concept of ubiquitos networking originated from the ubiquitous computing, which was aimed to "make many computers available throughout the physical env, while making them effectively invisible to user"

=> Four main objectives of ubiquitous networking as follows.

=> Freed from networking constaints concerning capacity location & different link UPs.

=> Freed from the constaints of terminal limitations.

=> Freed from the constraints of network risk.

Scenario of Mobile Communication:-

=> The mobile industry has witnessed explosive growth in no. of suscribers particularly over the past few years. However, while usage measured in terms of the no. of wireless minutes increasing the price per minute for these services is falling.

=> This means that average revenue per user (ARPU) is shrinking running a protitable business with stagant or even deeling ARPC is one of the fundamental challenges

mobile carries are facing today. The industry is addressing this challenge in two ~~key~~ ways.

(1) By adding new services or new user experiences for which mobile subscribers are willing to pay.

(2) By reducing operating expenses (OPEX) at the top of the list is the wireline infrastructure that mobile operators have to maintain regardless of whether they own or lease lines.

* There are two primary system in the wireless industry.

(i) Glow system for mobile communication (GSM)

(ii) Code division multiple access (CDMA)

=> Today voice still accounts for the majority of overall cellular traffic, with wireless data exceeding more than 10 percent of mobile operater average revenue per user (ARPU) Mobile operator ARPU is unde pressure due to price & tech competition from both wireline & emerging service. although mobile operator ARPU for voice service is declinning, the ARPU for data revenues is growing at a healthy rate.

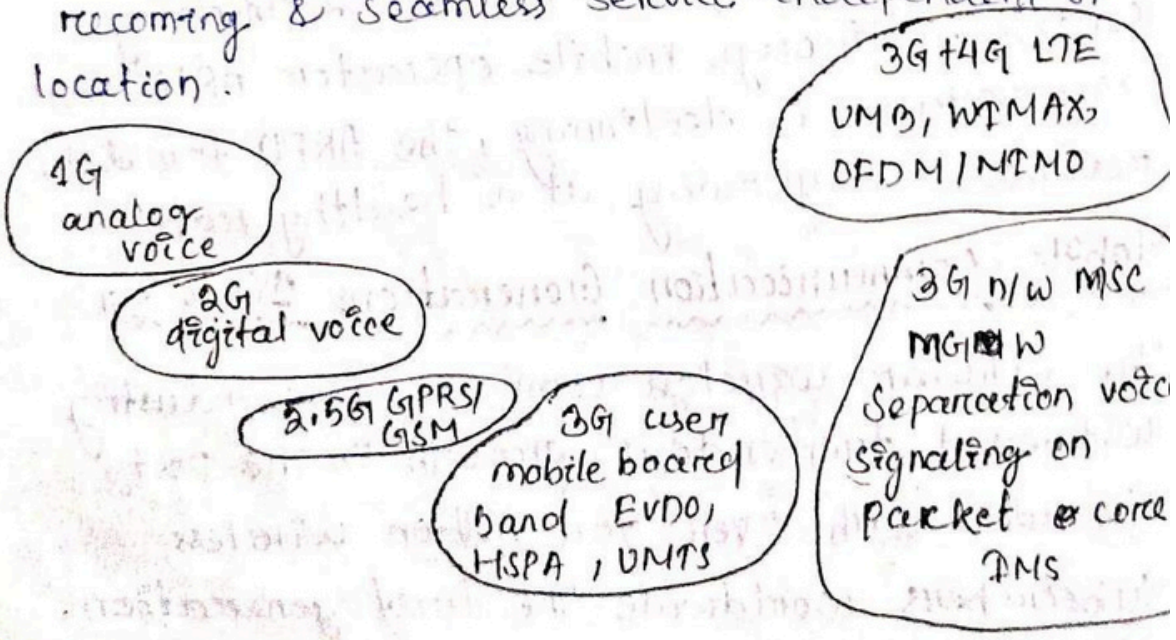
Mobile communication Generations 1G to 3G :-

=> The cellular wireless communication industry witnessed tremendous growth in the past decades with over ~~for~~ billion wireless subscribers worldwide. The first generation.

=> (1G) analog cellular systems supported voice communication with limited roaming. The 2nd generation (2G) digital systems promised higher capacity & better voice quality then did their analog counter parts more over roaming become more wide spread.

=> The two widely deployed second generation (2G) cellular systems are GSM & CDMA. As per the 1G analog system were primarily designed to support voice communication. In letter releases of these standards capacities were introduced to support data transmission.

=> Both the GSM & CDMA formed their own separate 3G. Partnership project standard bodies such as 3GPP & 3GPP2 are actively involved in driving the development of a next generation wireless system. The high level objective is to create high speed broad band & IP based mobile system featuring n/w to n/w interconnection feature service. transparency, global roaming & seamless service independent of location.



GPRS :- General Packet radio service
EVDO :- Evolution data optimized
HSPA :- High speed packet access
UMTS :- Universal mobile tele
MSC :- Media switching center
IMS :- Information Management system (use IP for packet comm in all known forms)
MGCN :- Media gateway
LTE :- Long term Evolution (commonly marked as 4G LTE).
UMB :- Ultra mobile broad band.
WIMax :- World wide interoperability for microwave access (is one of the hostest wireless technology today)
OFDM :- Orthogonal frequency division Multiplexing (It is a method of digital modulation in which signal split into several narrow band channel at different frequencies)
MIMO :- Multiple I/p multiple O/p

⇒ 3G short form of 3rd generation of mobile telecommunication tech. This is based on a set of standards in used for mobile service & n/ws that complete with the international Mobile telecommunication cenion. 3G finds application in wireless voice Video call & mobile TV.

⇒ A new generation of cellular Standards has appeared approximately every tenth year since 1G system introduced in 1981/1982 Each generation is characterized by new frequency bands higher data rate and

not backward, compatible transmission technology The 1st 3G n/w s ~~in 2008 through voice remains~~ the primary method were introduced in 1998 & 4th generation "4G" n/w s in 2008. Through voice remains the primary method of mobile communication a new generation of wireless tech as now. offering higher speed data multimedia capabilities.

3rd Generation Mobile communication system network :-

=> Cellular communication service initiates with 1G services delivery of voice from one mobile Phone to another. Next to 1G the 2G communication services enhance the service initiated one by one. But the 3G n/w enables a branch of services which ranges from audio/ video conferencing, internet chatting & much more services so user interaction with mobile not limited to talk but mobile become equipment to share feeling with others. as the usages grows of mobile market in direction to increase of services.

=> 3G operators purpose broad band services, such as internet connections, video telephony, clip download or television on a mobile phone. these services can be alternative for some users especially young people but at constant that for exceed that being purpose for 3G terminal

& service access. If the use of 3G by the majority of mobile phone subscriber is inevitable, the real take off as hoped by the operator that have ~~licenses n/w deployment~~ car invested huge amounts of money in the licenses n/w deployment can only occur in the coming months if real alternative services are proposed.

Universal Mobile telecommunication system (UMTS):-

Universal mobile telecommunication system (UMTS) is a 3G mobile communication system that provides a range of broadband services to the world of wireless & mobile communication. the UMTS delivers low cost preserves the global roaming capability of 2G GSM / GPRS n/ws provides new enhanced capabilities. The UMTS is designed to deliver pictures, graphics, video communications & other multimedia functions as well as voice & data to mobile wireless subscribers.

* UMTS offering a consistent sets of services to mobile computers & phone users no matter where they are located in the world. based on the global system for mobile ~~comm~~ communication (GSM) standard, UMTS endorsed by major. Standard bodies & manufactured is the planned

Standard for mobile users arround the world by 2002. once UMTS is fully implemented comp. Phone users can be consistently attached to the Internet as they roaming service, have to same of capabilities no matter where they travel to.

=> Today's cellular telephone systems are mainly circuit switched with connection always. dependent on circuit availability packet switched connectores using the Internet protocal means that a virtual connection in always available to any other end point in the n/w. higher bandwidth of UMTS also promises new services such as vode confrencing. UMTS permises to realize the virtual home env. eVHE in which roaming user have the same (services to which to the user is accustomed when at home or in the office, through a combination of transport terrestrial & satellite connection.

→o→.

CHAPTER-07

MOBILE IP

Overview

Mobile IP allows a host device to be identified by a single IP adress even thought the device may moves its pysical point of attachment from one network to anthor. Regarellss of movement between different networks, Connectivity at the different Roaming from a wired network to a wireless or wide-area network is also done with freedom.

A data connection between two and points through TCP/IP network requires a source IP adress source TCP part and a ~~target IP adress~~ TCP part. The combination of one IP adress of the host system combined with TCP part as the identification of a service becomes a point of attachement for an end point. Tcp part numbers application speefic varies from network to network. IP adress assigned to host from a set of adress assigned to a network.

This structure works well as long as the . is static and using desktop computer Now consider that the users mobile and he's using his laptop. As the users mobile an. the point of attecehement will change from one network to anthor terminate to the connection. Therefore the question is how to maintain the mobility during a live

connection. The technology to do so called mobile IP. mobile IP is most often found in wireless LAN environment where users need to carry their mobile devices across multiple LANs with different IP addresses.

A common analogy to explain mobile IP is when someone move his residence from one location to another person drops off new mailing address to new delhi post office. New Delhi post office mumbai post office of new mailing address when mumbai post mail to person New Delhi address.

Working with mobile IP

Internet protocol routers (device that connect two LANs) packets form a source end-points to a destination end-points through various routers. An IP address of a host can be considered to be a connection of network address and the node address let us assume a 'c' class IP adress 203.197.175.123 to be the mail server. we can assume that the first 24 bits 203.197.175 is the address of the network and the last 8 bits containg 123 is address of the host.

The network portion of an IP address is used by routers to deliver the packet to the last router in the chain to which the target computer is achieved. This last router then used the host portion (123 in this case) of the IP adress to deliver the IP packet to the identified by four identifies than contain the IP address and port number

number of the sender end-point and the IP address of and port number of the receiver end point

To ensure that the connection is not terminated while the user is moving. It is important thats all of these identifies remain constant. ports are application specific and generally constant However the IP address change from network. To fix this problem mobile IP allows the mobile node to use two IP address These IP address are home address and care of-address. The home address is static and known to everybody as the identify of the host. The care of-address change every time a new attachement is made. This is mobile node's location specific address when the mobile roaming and is attached to a foreign network the home agent recives all the packets for the mobile node current point of attachement. The node that is responsible for forwarding and managing the transparency is called home agent.

When ever the mobile node moves it registers its new care of address with its homeagent. The homeagent forwards that the packet to the foreeign network using the care of address becomes the destination IP address. This new header encapsulates the original packet causing the mobile node's home address to have no

impact on the encapsulated packet's routing this phenomenon is called Tunneling.

Mobile IP Entities

* Mobile Node (MN): It is a node that can change the point connection to the network without changing its IP address and maintain reach ability using the home address
* Home Agent (HA):- A router on the home link maintains registration of mobile nodes that are away from home and the different address that they are currently address with the home agent.
* Foreign Agent (FA):- It is a system in the current foreign network of the MN typically a router it is the default router for the MN (Mobile node).
* Care of-address (CA): An Address used by a MN while it is attached to a foreign link. A Mobile node can be assigned multiple care of-address is registered as the primary care-of address with the mobile node's home agent.
* Correspondent Node (CN):- A Node that communi. with a MN. It does not have to be mobile IP capable.
* Home address:- An address assigned to the mobile node when it is attached to the home link and through which the mobile node is

always reachable regardless of the its location.

*Home link: (HL): The link that is assigned the home subnet prefix from which the mobile node obtains the home address. The home agent resides on the home link.

* Foreign link (FL):- A link that is not the mobile Nodes home link.

Mobility Agent :-

A home agent is a router is a device that forword data pkts along network. It is connected two LAN. on the mobile node's home network that main-tains information about the mobile node's current location as identified in its care-of-address. The home agent uses tunneling meeh anism to forweard messages to the mobile node at its current location as identified in its location.

When a mobile device is away from its home network its is assigned a care of address, which is the static Ip address of a foreign agent on a visited network or a co-located care of address, which is a temporary IP address assigned to the mobile node. The mobility agent registeres the care of address with a home agent, which resides on the home network when a message for the mobile nodels delivered to the home network. the home agent intercepts the

message and tunnels it to the recipient at the care of address.

Components of mobile IP

Three main components of mobile IP are

* Discovering the care of address :- mobile node uses discovery procedure to identify prospective home and foregin agent.

* Registering the care of address :- mobile node uses an authenticated registration procedure to inform home agent of its care of address.

* Tunneling the care of address :- used to forward IP datagram, from a home address to a care-of address.

(Datagram is a self contained packet of data that carries with it the source and destination information. It travels from a source computer, (such as website server) to destination computer (user computer) via a packet switched network (such as Internet).

mobile IPV6 features :-

mobile IPV6 is an IETF (Internet Engineering Task force) is a large open international community of network designers standard that has added the roaming capabilities of mobile nodes in IPV6 network. The major benefit of this standard is that the mobile nodes (as IPV6 nodes) change there point of attachement to the IPV6 internet without changing their IP address. This allows mobile devices

to move from one network to another and still maintain existing connections. Although mobile IPv6 (Internet protocol version 6) is mainly targeted for mobile devices, it is equally applicable to wired environment.

* Larger Address space:- unique Global address for each device.
* Scalable:- Run over multiple media i.e wireless LAN. Ethernet 5G.
* Auto configuration capabilities:- Network Plug and play.
* Fixed header format:- Fewer fields (8 as compared to 12 in IPv4)
* Security extension:- Internet level security in IPv6 header.
* Any cast address:- special type of address on IPv6
* Encapsulation:- IP layer authentication an encryption possible (Encryption is the conversion of data into a from that cannot be easily understood by anyone expet authorized parties)
* Quality of service and Flow lable:- Efficient routing for real time applications
* Elemination of triangle routing" for mobile IP (Data to proxy to host but it sends directly to host.
* All nodes can handle binding.

* small overhead for distributing bindings fixed head format.
* option extension headers not parsed (split) by intermediate routers anymore.

Mobile IPV6 Address types

IPV6 has three types of addresses

(i) Unicast adresses
(ii) Multicast Addresses
(iii) Anycast addresses

(i) Unicast Addresses

It is a communication between a single reciver A unicast address defines a single interface. A packet send to a unicast address is delivered to that specific computers.

(ii) multicast Addresses

It is commucation between a single host and multiple recivers. These addresses are used to define a set of interfaces that typically belong to different nodes instead of sust one when a packet is sent to a multicast address the protocol delivers the packet to all Interfaces identified by that address.

(iii) Anycast address :-

It is a commucation between a single sender and a list of addreses. These addresses are also assigned to more than one interface, belonging to different nodes. However a packet sent to an anycast address is delivered to sust one of the member inteface typically the nearest accroding to the routing protocals idea of distance Anycast addresses cannot be identified easily. They have the structure of normal

unicast addresses. and differ only by being injected into the routing protocal at multiple points on the network.

Mobile IPv6 Address Scope:

Mobile IPv6 have the following scopes

* Link local
* site local
* Global

* Link local :-

Used as an single link packet with link local source or destination addresses are not forwarded to other links. In other words it can only be used between nodes of the same link. It cannot be routed.

* site local :-

Used for a single site pocket with site local source or destination addresses are not forwarded to other sites. In other words it can only be used between nodes of the some site It cannot be routed outside the site.

* Global :-

A globally unqiue address packet global addresses can be forworded to any part of the global network.

Operation of mobile IP

A mobile mode listens for agents advertisement and then initiates registration If responding agentas the HA (Home agent). then mobile IP is not nessecary. After recaving

the registration request from a MN (mobile Node) the home agent acknowledges and registration is complete. Registration happens as often as MN change network. HA intercepts all packets destined for MN. This is simple, unless sending application is on or near the same network as the MN. There is a specific lefetime for service before a MN must register There is also a de-registration process with HA, if MN returns home. Home agent than encapsaleles all packets addressed to MN and forwards them to Foreign agent FA decapsulates all packets addressed to MN and forwareds them via hardware address (learned as part of registration) Note that the MN can perform FA functions if it acquires an IP address Bidirectional communications require tunneling in each direction.

Discovering Care-of-address

Agent discovery is the method by which a mobile node determines whether it is currently connected to its home network or to a foreign network and detects when it has moved from one network to another. HA and FA periodically send advertisement messages into their Physical subnets. MN listens to those messages and detects, if it is in the home or foreign network. mobile node reads a care of-address from the FA advertisement messages.

Registration of care-of-Address process:-

A mobile node registers whenever it detects that its point-of attachement to the network has changed from one link to

another. Because these registration are valid only for a specified lifetime a mobile node registers when it has not moved but when its existing registration is due to expire.

Mobile IP Tunneling:-

IP tunneling is the process of embeding one IP packet inside of another, for the purpose of simulating a physical connection between two remote networks across intermediate network. IP tunneling known IP packets to a mobile node when it is not in its home network. Home agent tunnels IP packets to the care-of-address.

x- end -x

CHAPTER - 8 & 9

MOBILE COMPUTING

* WORLD WIDE WEB (WWW)

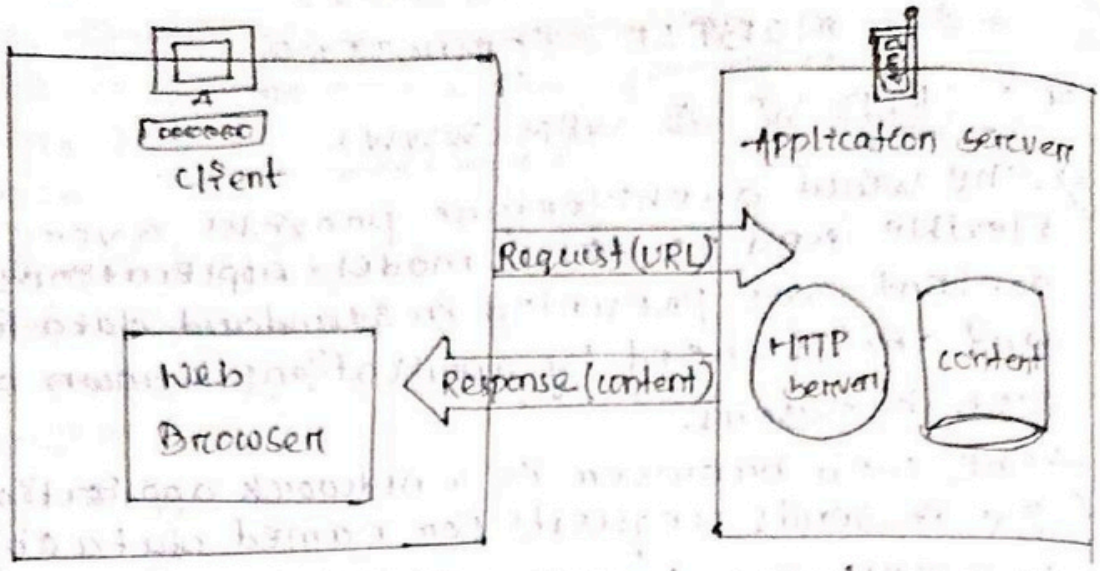
=> The WWW architecture provides a very flexible and powerful model. Applications and content are presented in standard data formats and are browsed by applications known as web browsers.

=> The web browser is a network application, i.e it sends requests for named data objects to a network server and the network server responds with the data encoded using the standard formats.

=> Standard naming model :- All servers and content on the www are named with an Internet Standard Uniform Resource Locator (URL).

=> Standard content formats :- All web browsers support a set of standard content formats these include the Hyper Text mark up Language (HTML), scripting language (Javascript), and a Large number of other formats.

=> Standard protocols :- Standard networking Protocols allow any web browser to communicate with any web server. The most commonly used Protocol on the WWW is the Hyper Text Transport protocol (HTTP), operating on top of the TCP/IP protocol suite



(WWW Architechture)

*(Wireless Application protocol (WAP)

=> WAP stands for wireless Application protocol

* wireless - Lacking or not requiring a wire or wires pertaining to radio transmission.

* Application - A computer program or piece of computer software that is designed to do a specific task.

* protocol - A set of technical rules about how information should be transmitted and received using computers.

=> WAP is the set of rules governing the transmission and reception of data by computer application on or via wireless devices like mobile phones.

=> WAP allows wireless devices to view specifically designed pages from the Internet using only

plain text and very simple black-and-white pictures.

* Need of WAP:

⇒ Having the performance and data transfer capacities of the common desktop computers in mind, the web designers constructed the Internet technology for devices as powerful as those computers.

⇒ Hand-held wireless devices have less powerful CPU, on low battery life, less memory, restricted power consumption smaller displays and different input devices.

* Benefits of WAP

⇒ It is device independent.
⇒ It is network independent.
⇒ WAP utilizes standard Internet markup language technology XML.
⇒ optimizing the content and are link protocols.

* Examples of Map use:-

⇒ Checking train table information
⇒ Ticket purchase.
⇒ Flight check in.
⇒ Viewing traffic information
⇒ Looking up phone numbers.

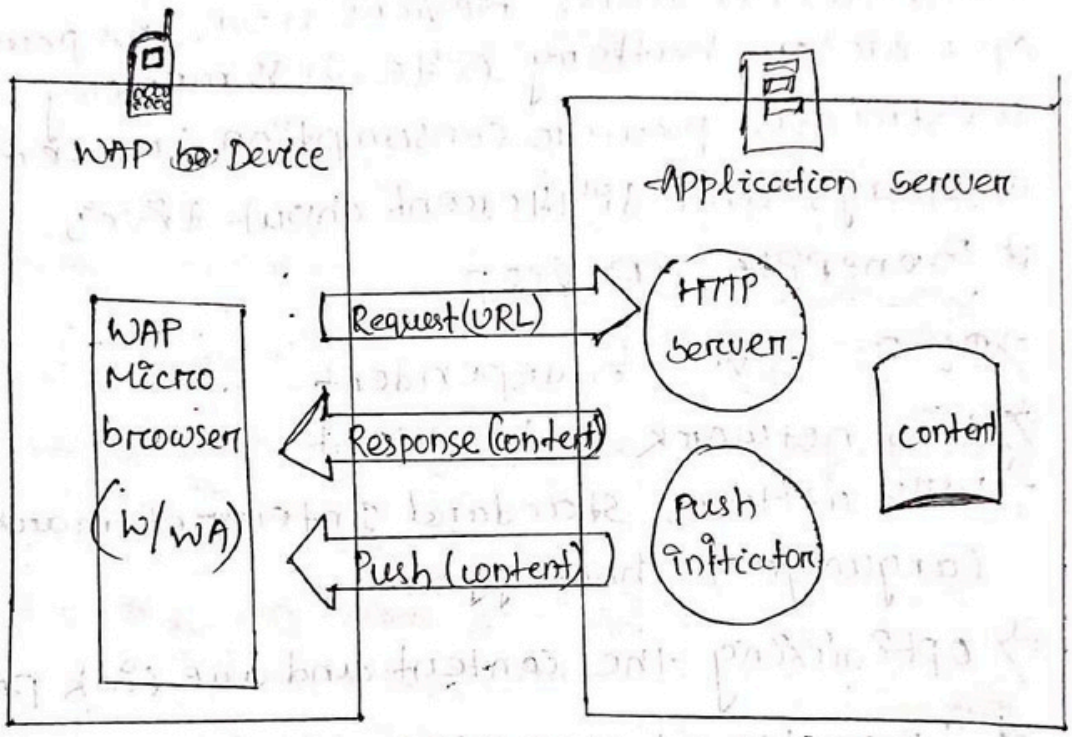
* WAP Architecture:-

⇒ The WAP programming model is the WWW Programming model with a few enhancement

optimizations and extensions have been made in order to match characteristics of the wireless environment.

=> The most significant enhancements (WAP has added to the programming model are push and Tele phony support.

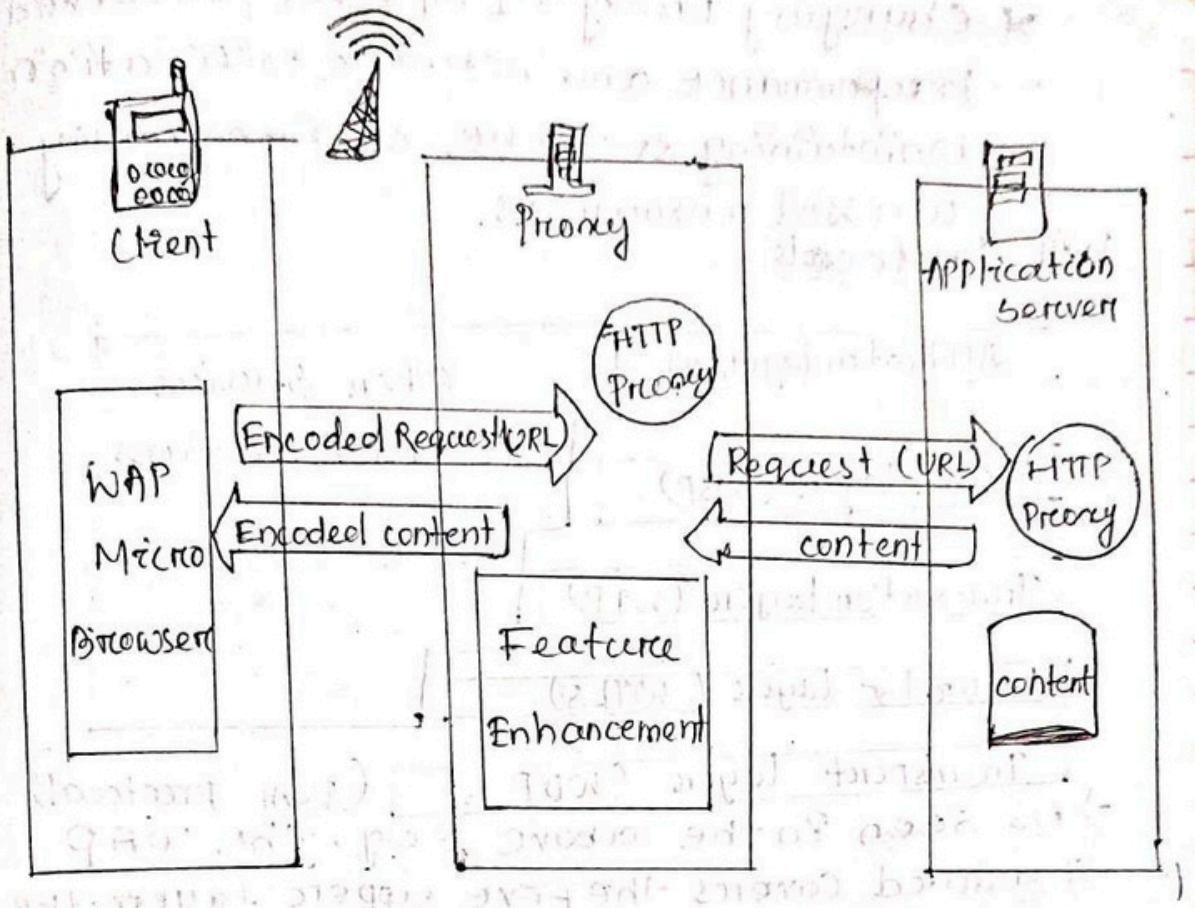
=> The classical request-response mechanism is commonly referred to as pull to contrast it with the push mechanism.



(WAP Architechture)

=> WAP content and applications are specified in a set of well-known content formats based on the familiar content formats.

=> The WAP micro in the wireless terminal co-ordinates the well interface and is analogous to standard web browser.



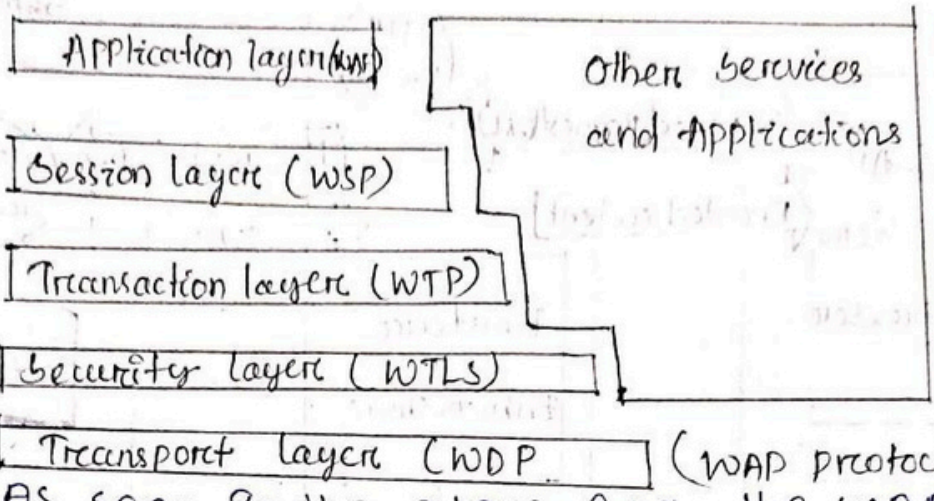
=> The three components of WAP architecture are: WAP client, WAP proxy or WAP Gateway and application servers.

=> WAP proxy provides various functions including:-

* Protocol Gateway :- Translate request from a wireless protocol stack to the www protocol Also performs DNS look up
* Content Encoders and Decoders :- Translate WAP content into a compact format due to slow underlying wireless link and vice versa.
* User Agent profile management :- Enable personalization and customization of the devices.

* changing proxy: Improves perceived performance and network utilization by maintaining a cache of frequently accessed resources.

WAP Protocols



(WAP protocol)

=> As seen in the above f.c.g, the WAP standard covers the five upper layer the network (Application, session, Transaiton, securesty and Transport layer)

1. Application layer:

=> This layer contains the wireless Application Enverenment (WAP)

=> It contain mobile device specefications and content development programming languages like WML.

2. Session layer:

=> This layer contains wireless session protocol (WSP).

=> It provides fast connetion suspension and re connetion

3. Transaction layer.

=> This layer contain wireless Transaction Protocol (WAP).

=> It runs on top of UDP (User Datagram protocol) and is a part of TCP/IP and offers transation support.

4. Security layer:

=> This layer contain wireless Transaction layer security (WTLS).

=> It offers data integrity, Privicy and authentication.

5. Transport Layer:

=> This layer contain wireless Datagram Protocol.

=> It presents consistent data format to higher layers of WAP protocol stack.

* WAP Transport Layer (wireless Datagram Protocol (WAP))

=> WAP is the Transport layer protocol in the WAP architeture.

=> It provids comonon interface to the security session and application layer.

=> In addition it allow these upper layers to function independenty of the underlying wireless network.

=> WDP offers to the upper layer invisible interface independent of the underlying network technology used.

=> UDP (User Datagram protocol) and WDP (Wireless Datagram protocol) are two protocol used to provide the datagram transport service in WAP archiseture.

* Wireless Markup Language (WML)

=> WML Formerly called HDML (Handheld Devices markup language) is a language

that allow the text portions of web pages to be presented on cellular telephones and personal digital assistants (PDA) via wireless access.

=> WML is part of the wireless application protocol (WAP) that is being proposed by several vendors to standard bodies.

=> The wireless application protocol works on top of standard data link protocols such as Global System for mobile communication, code-division multiple access and time division multiple access.

=> WML is an open language offered royalty-free. Specifications are available at phone.com's web-site.

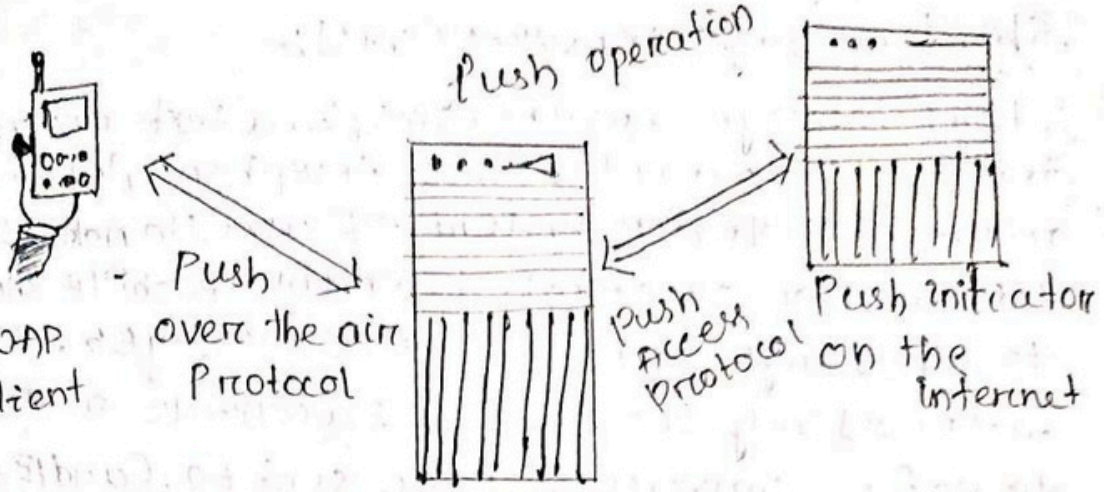
=> A filter program can be written or may be available from a vendor that will translate HTML pages into WML pages.

* WAP Push Architecture:

=> The WAP push framework allow information to be sent to a client device without user action.

=> In a client/server model, a client requests for a service or information from a server. The server then responds to this request by providing information back to the client this is referred to as pull technology.

=> Here the client pull the information from the server. In addition to this technology WAP provides other technology called push technology.



=> The push content is originated in a server in the Internet that needs to be delevered to mobile phone.

=> The push Initiator (PI) contacts the push proxy gateway (PPG) from the Internet side and deliver content to the destination client.

* I-mode

=> I-mode is the packet-based service for mobile phone offered by japan's one of the wireless technology.

=> first introduced in 1999, i-mobile was the worlds first smart phone for web browsing.

=> The ~~i-mobile~~ i-made wireless data service offers color and video over many phones.

=> It's mobile computing service enables user to do telephone banking, make airlene reservations conduct stock transactions send and receive e-mail and have access to the Internet.

CHAPTER-10

MESSAGING SERVICES

Short message services (SMS):-

⇒ Short message services (SMS) is a text messaging service component of most telephone, Internet and mobile device system. It uses standardized communication protocols to enable mobile devices to exchange short text messages. An intermediary service can facilitate a text to voice conversion to be sent to landlines.

⇒ SMS as used on modern devices, originated from radio telegraphy in radio memo pagers that used standardized phone protocols. These were defined in 1985 as part of the Global System for mobile communications (GSM) series of standards. The first SMS message was sent in 1992.

⇒ SMS was the most widly used data application at the end of 2010, with an estimated 3.5 billion active users, or about 50% of all mobile subscribers.

⇒ The protocols allowed users to send and receive message of up to 160 characters (when entirely alpha-numeric) to and from GSM mobile. Although most SMS messages are mobile to mobile text message, support.

⇒ The first sms capable phones were introduced around 2002 in conjuction with the first GSM networks. The Sony ericss T68i is widly believed to be the first MMS capable Cellphone, while many might North American

markets beginning in 2004 and 2005.

=> The most common use involes sending handsets media companies have from camera-equipped handsets. Utilized MMS on a commercial basic as a method of delivering scannable coupon codes, product image, videos and other information.

=> The 3GPP and WAP groups fostered the development of the MMS standard which is now contained by the open mobile Alliance (OMA).

Multimedia transmission over wireless:
Wireless Networks can be used to trans multimedia services consisting of voice, Data, video, ftp, and text. These network are required to provide desired qualities of service (QOS) to the various media with diverse flow characteristics. For example Packet loss ratio requirement for the service has expanded to include other mobile technologies such as ANSI CDMA networks and Digital AMPS.

=> SMS is also employed in mobile marketing a type of direct marketing. According to one market Research report, as of 2014, the global SMS messaging business was estimated to be worth over $100 billions, accounting for almost 50 percent of all the revenue generated by mobile messaging.

Multimedia messaging service (mms):-

=> multimedia messaging service (mms) is a standard way to send message that incould multimedia content to and from a mobile phone over a cellular network. users and providers may refer to such a message as a PXT, a picture message, or a multimedia message.

=> The mms standard extends the core SMS (short message service) capability, allowing the exchange of text messages greater than 160 characters in length. unlike text only, MMS can deliver a variety of media, incoulding up to forty seconds of video, one image, a slideshow of multiple image or audio.

or all loss sensitive services such as email and packet delary requirements or all delary sensitive servies as voice are to be satisfied simultaneously and adequately. For agiven imput traffic laad a certain amount of esources (e.g buffer space and link capacity) are needed to satisfy these Qos requirements Some of these resources may be scare and need to be managed well so that maximum amount of input load, with a required Qos requirement can be accomodated for a given amount of recources.

Thus it is required to develop simple and efficient resource management

protocols for these networks that can provide better use of network resources.