Mobile Computing

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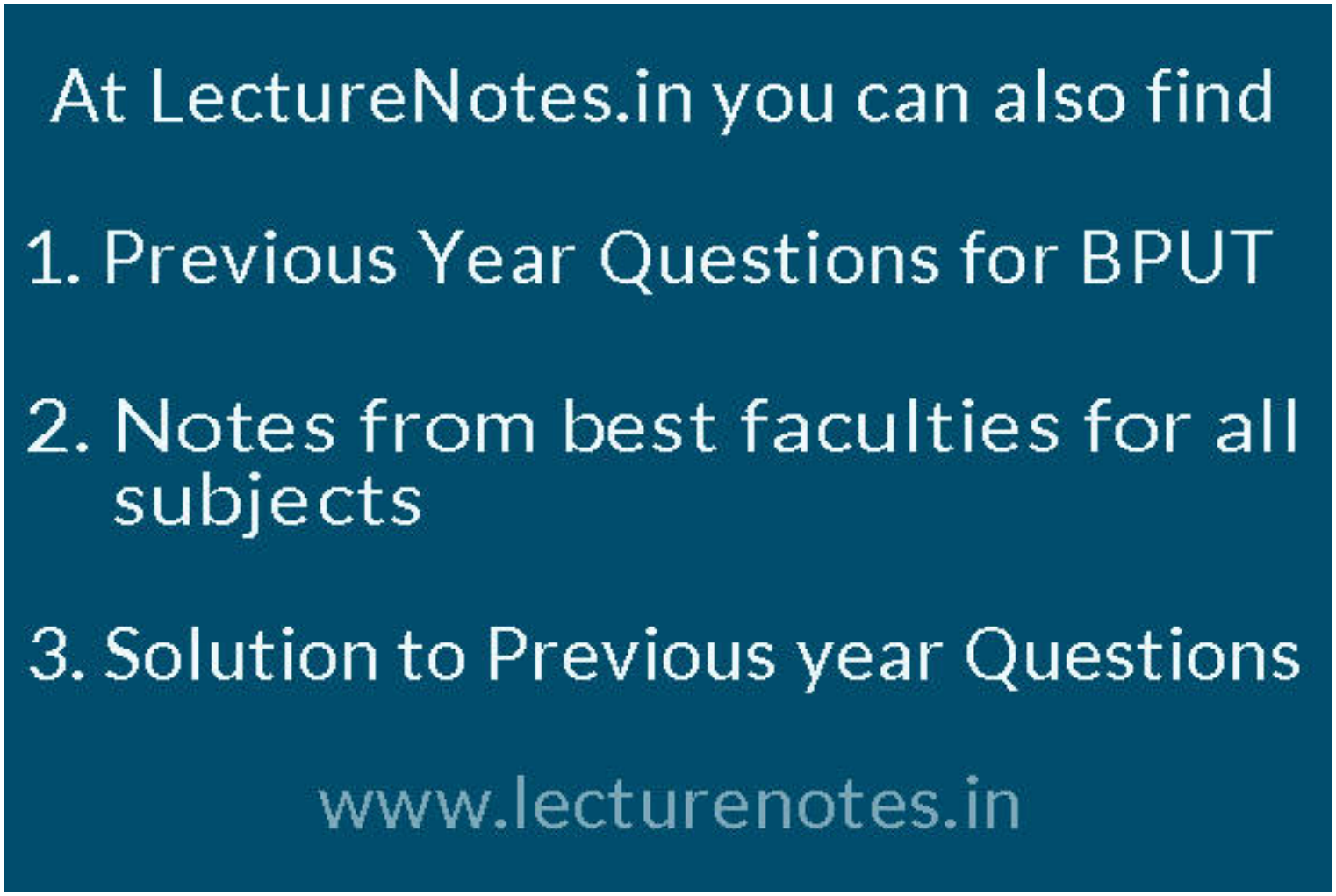

Mobile Computing

Topic:

Introduction To Personal Communications Services (PCS)

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PCS

2/8/2014

:- Personal Communication System :-

Features

- → Multiple environment
- → Multimedia services with high quality
- → Multiuser type
- → Global roaming capability
- → Single personal telecomm number (PTN)
- → Very high capacity
- → Universal handset
- → Service security.

Multiple environment :-

This system can operate in all types of environment ie terestrial comm, satellite comm, mobile comm, PDN etc.

Multimedia Services with high quality-

In different environment BW limitation is different with each other.

⇒ This system is compatable with all types of environment, QoS should not be degraded.

⇒ QoS should be high.

Multiuser type

The device for such type of system must be used by a number of users for a number of purpose.

Global roaming technology

Since all environments, are connected with a single MSC, there will be no concept

of individual roaming.

⇒ So the system is capable of global roaming

Single Personal telecomm no number (PTN)

Since this system combines a number of environment, only one personal telecomm number (PTN is required.

⇒ This is a unique no and it keeps all sorts of information about the user.

Very high capacity -

This system is the combination of all types of environments

⇒ So the number of users in this case is very very high in comparision with other environment

Universal Handset

Since the system is compatible with all other environment, the equipment which is used for PCS should work in all environments.

Service Security

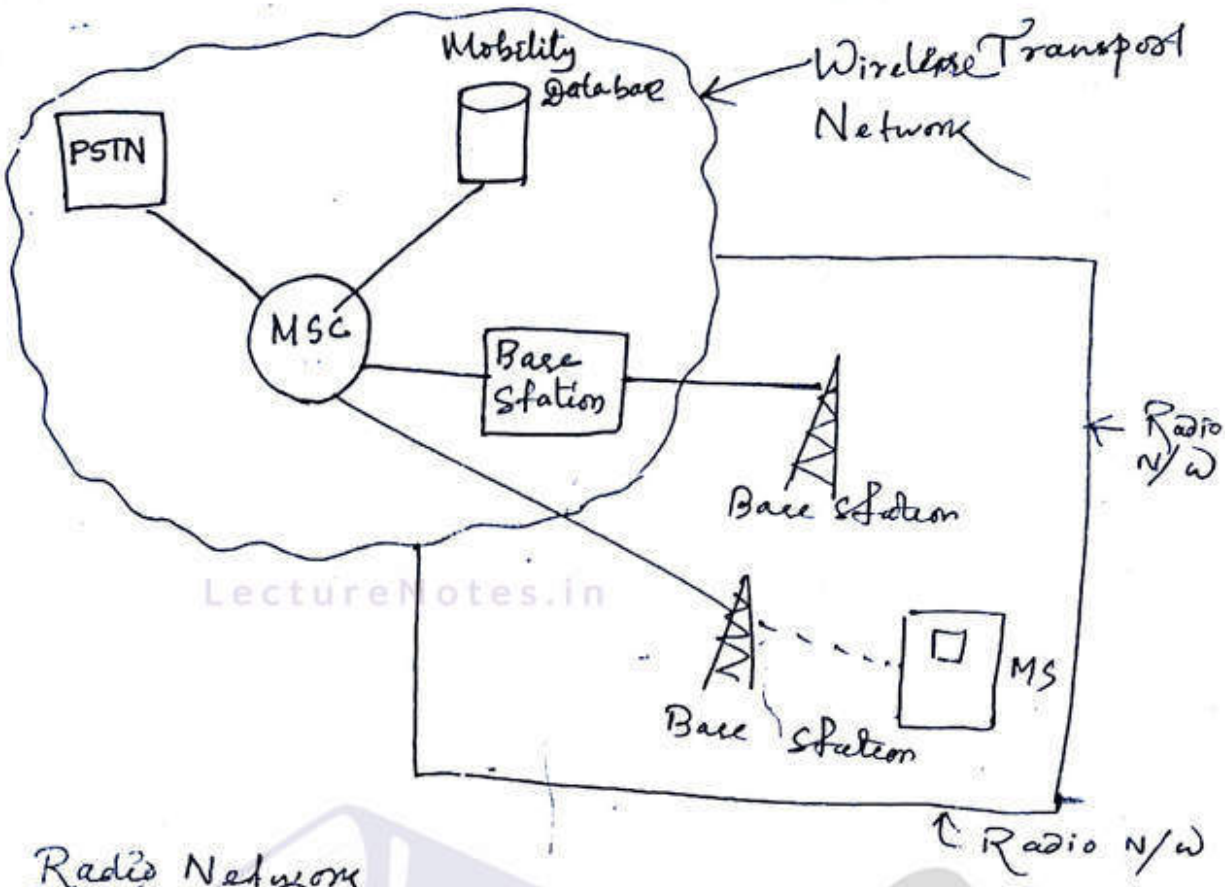
Since PCS is compatible with all other environments there are a huge no of security issues which are related with the environment comes into picture

Architecture of PCS 4/8/2012

Basically architecture of PCS is divided into two parts

→ Radio N/Ws

→ Wireline transport Network



Radio Network

⇒ It consists of base station and mobile station like GSM.

⇒ The MS is compatible with all types of environment

⇒ It is different from other mobile system which is used in GSM

⇒ The medium used between base system and mobile system is wireless.

⇒ The coverage area of base system is known as radio N/W

⇒ All the base systems are connected with MSC through wireline.

Wireline Transport N/W

⇒ This is an important part of PCS.

⇒ In this category MSC keeps all information like GSM.

⇒ HLR keeps all basic information and VLR keeps all temporary information.
⇒ All base stations are connected with MSC directly & indirectly.
⇒ So MSC keeps all information regarding base station.
⇒ MSC is also connected with other terrestrial N/W as well as satellite N/W directly.
⇒ No gateway is required for interconnection in between the different N/W.
⇒ MSC keeps all information regarding other N/W.
⇒ If mobile station changes its position from one MSC to another MSC then roaming concept comes out.

MOBILITY MANAGEMENT OF PCS

⇒ Mobility mgt. means mobility of mobile station at roaming and and at the time of call setting up.
⇒ Mobility mgt. based upon two basic concepts
i) Hand off (same as handoff of GSM)
ii) Call setup.

Call Setup

⇒ Whenever a MS changes its position from one BTS to another BTS, at that time this scenario comes into picture.
⇒ Before establishment of the link inbetween MS and new BTS all informations should be sent to the MSC and there should be the upgradation regarding this.

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Mobile Computing

Topic:

Global System For Mobile Communication (GSM) System Overview And General Packet Radio Services (GPRS)

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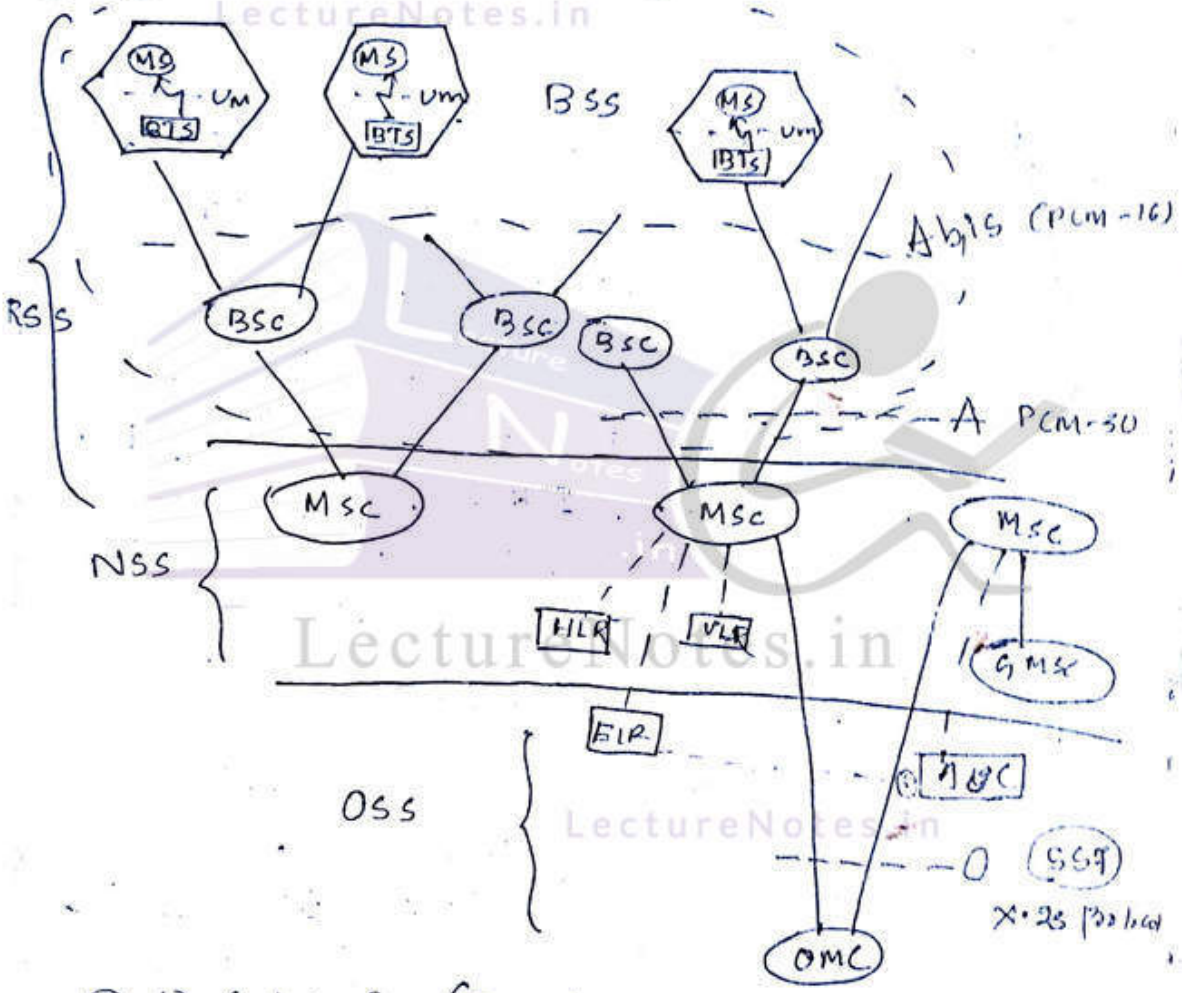
Module-I

1/7/2014

GSM (Global System for Mobile Communication)

GSM-900 (India) - 25 MHz
GSM-1800 (US)
GSM-1900 (Railway comm^{n} / GSM Rail)

Architecture =



Radio Sub system (RSS)

Basically in this category base subsystem (BSS) exist.

BSS consists of BSCs, BTSs and no of mobile station.

MS - station
Mobile containg
↑
SIM (subscribes Identity module)

ii) Power Supply
iii) Tiny Os

⇒ SIM contains an unique serial number,
MSISDN no.
Personal Identification Number (PIN)
Pin Unblock Key (PUK)

⇒ SIM contains basic information of the user. 2/4/2014
MS contains Unique Equipment Identity for its identification all over world named as IMEI.

⇒ MS contains a unique MSISDN

⇒ The SIM keeps the basic information of user as well as personal identification number (PIN), PIN unblocking Key (PUK), CIPHER key. for coding, location area identification (LAI), temporary Mobile Subscriber Identity (TMSI) identity etc.

BTS (Base Transceiver System)

⇒ BTS is the interconnecting device inbetween wireless medium and wired medium.

⇒ The interface between BTS and MSC is Um.

⇒ The concept of this interface is packet switching.

⇒ Sectorial antenna has connected with the BTS for transmitting and receiving purpose.

⇒ The height of the antenna which decides the coverage area

BSC (Base Station Controller)

⇒ It controls the BTSs which are connected with it through Abis interface.

⇒ Abis interface is based upon circuit switching concept, so

⇒ It is also known as PCM 16.

⇒ 16 numbers of 64 Kbps data can be transmitted through this interface.

⇒ BSC keeps all the information of all BTSs.

⇒ It keeps Location area (LA) of MS, TMSI of MS, MSISDN of MS etc.

Network & Switching Subsystem (NSS)

⇒ In this category BSC has connected with MSC through A interface.

⇒ This interface is based upon the circuit switching concept.

⇒ It is also named as PCM-30.

⇒ Data rate is 2.048 MBPS.

⇒ 30 numbers of 64 KBPS data can be transmitted

MSC (Mobile Switching Centre)

⇒ MSC contains all the information of all MS, BTS, & BSs.

⇒ BSC & MSC are interconnected through an interface.

⇒ MSC keeps IMEI, IMSI, MSISDN, IMSI (International Mobile Subscriber Identity).

⇒ MSC contains two basic registers for keeping the important information of subscribers.

HLR & VLR.

HLR (Home Location Register)

⇒ HLR contains all types of information of MS.

⇒ HLR gives the information regarding Location area, registration, authentication etc.
⇒ When MS temporarily leaves the MSC, then temporary information of that corresponding MS has transfered to desired VLR from HLR.

VLR (Visitor Location Register)
⇒ VLR keeps temporary information of visiting MS
⇒ When MS leaves that MSC, all the information from VLR is removed.
⇒ Basically it keeps TMSI, LAI etc.

OSS (Operation & Maintainance Subsystem)
Generally it contains OMC, AuC, EIR.

OMC (Operation & maintainance System)
⇒ OMC is required for traffic monitoring, billing & accounting etc.
⇒ OMC & MSC is interconnected through O interface.
⇒ SS7 concept has used in this interface
⇒ X.25 protocol is required for the switching.

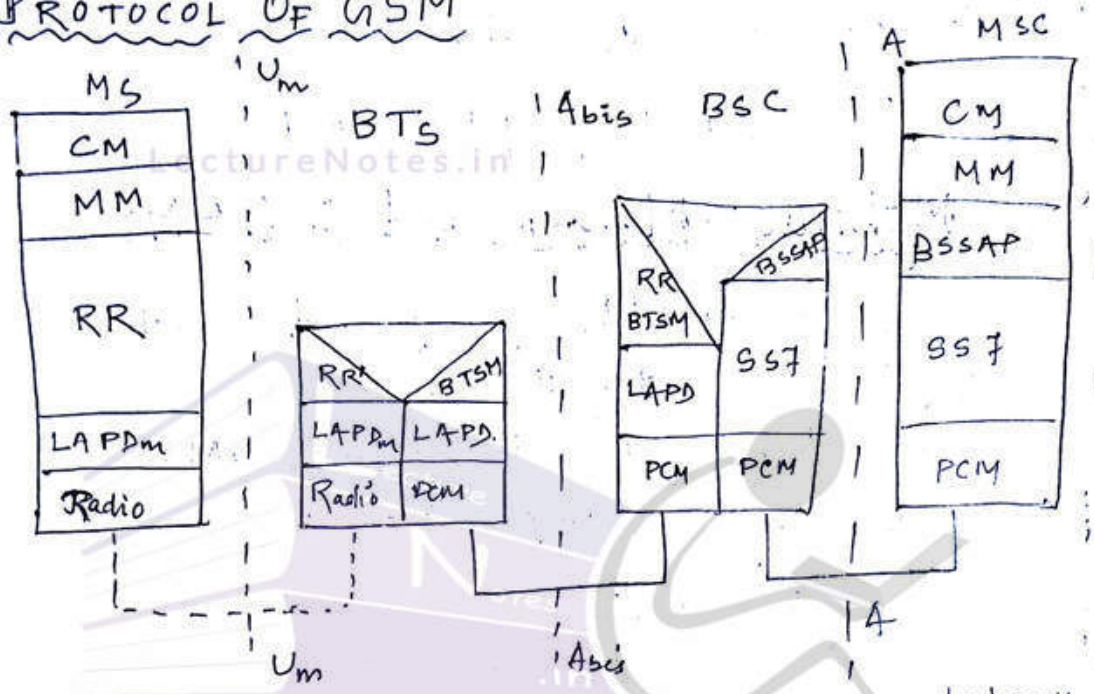
AuC (Authentication Centre) 3/7/2014
⇒ This centre verifies the authenticity of the user.
⇒ It contains CIPHER Key(Kc), IMEI, IMSI, TMSI.

EIR (Equipment Identity Register)
This register contains two types of list
1) Grey list
2) Black list
⇒ The MS which is used in criminal activity its IMEI has stored in black list.

⇒ The device which is black listed they can not be further used.

⇒ The device which is grey listed, there are authenticated and service can provided to this devices.

PROTOCOL OF GSM



05/7/20M

OSI

All the logical analysis can be done with the help of a model named as OSI Model.

It consists of 7 layers.

- User layer (3 layers)
- Physical layer (Lower layer)

CM - Call Management
MM - Mobility Management
RR - Radio resource
LAPDm - Link Access Procedure of D layer for mobile

Radio - Physical/radio layer

RR - Radio resource of BTS

BTSM - BTS management

LAPD - Link access procedure for D layer

BSSAP - BSS application

SS7 - Signalling system no 7.

Mobility Management in GSM:

In the mobility management, first priority is given to authentication.

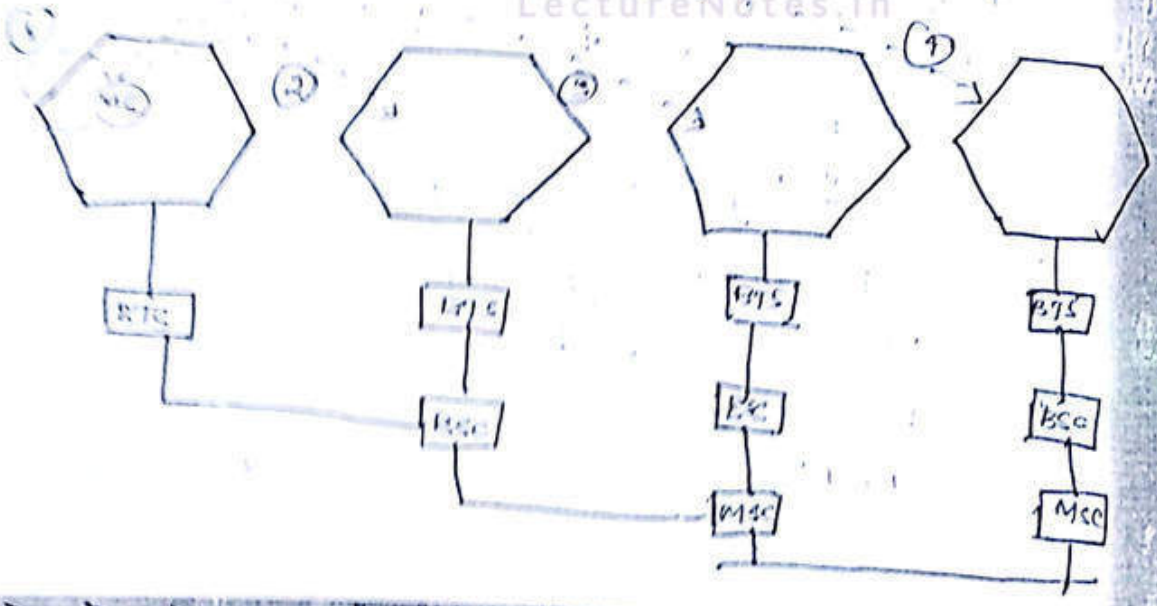
This layer keeps IMEI, IMSI, TMSI etc.

This layer is responsible for

1) Authentication
2) Channel Allocation
3) Call establishment

The logical behaviour of this layer is same in both MS & MSC.

GSM Handover



Handover is categorised in 4 steps.

(I) Intra BTS

(II) Intra BSC / Inter BTS

(III) Intra MSC / Inter BSC

(IV) Inter MSC

Intra BTS

In this category MS changes its position inside the single BTS, so there will be no extra link will be provided for this type of handoff over.

Intra BSC

In this category the MS changes its position from one BTS to another BTS which are under single BSC.

⇒ When ever MS changes its position a new link has established inbetween MS and new BTS, similarly old link inbetween MS & old BTS has dropped.

7/4/2014

Intra MSC

In this category the MS changes its position from one BSC to another BSC which is controlled by a single MSC.

In this operation MSC keeps all the information about MS like hand off, LAI (Location Area Identification), TMSI etc.

When MS changes its position from one BSC to another BSC through the concerned BTS, during this period old BTS sends the information regarding movement of MS

⇒ The MSC sends the instruction to the desired new BTS through corresponding BSC for keeping a channel free.

⇒ When MS enters into the coverage area of new BTS then the free channel will assign to the MS.

⇒ Here the channel assignment is dedicated channel assigament.

Inter MSC

In this category MS changes its position from one MSC to another MSC.

⇒ When MS leaves the old MSC and enters into the new MSC, at that time the new MSC retrives the temporary information of MS like TMSI, IMSI from the HLR of old MSC.

⇒ The above temporary information have stored temporarily in the VLR of new MSC.

⇒ Such analyses is also known as roaming.

General Packet Radio Services (GPRS)

* Comparision between GPRS & Bluetooth

GPRS	Bluetooth
→ This technique is associated with GSM technique.	→ This is a complete new technique which is not associated with GSM
→ GPRS is the additional feature of GSM	→ Bluetooth is the additional feature of MS
→ Data can be ~~retrieved~~ transmitted/recive from other servers.	→ Data can be transmitte or received in the particular N/W which have formed by the ~~necessa~~ required devices.
→ No synchronisation is required.	→ Synchronisation is mandat
→ Users are unlimited	→ users are limited. (may 7)
→ Data Tx & Rx is secured	→ Data Tx & Rx is unsecure

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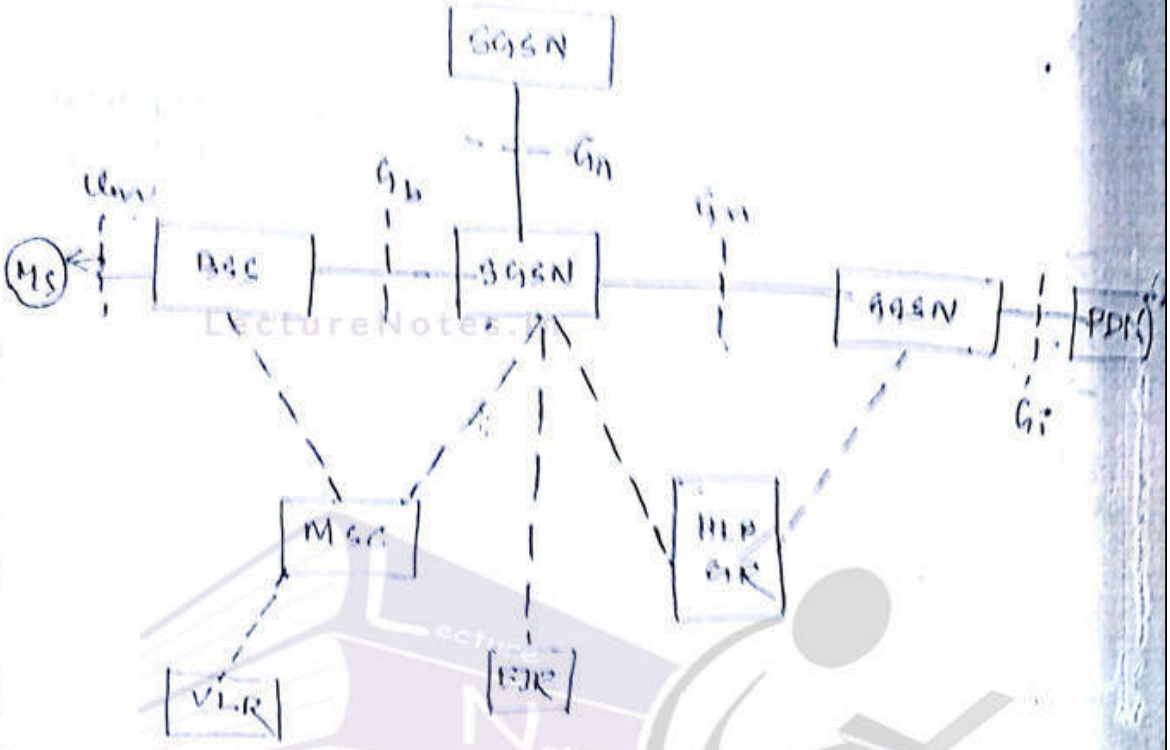
Architecture of GPRS



⇒ There are two different nodes present in the GPRS.

i) GGSN (Gate Way GPRS Serving Node)

ii) SGSN (Serving GPRS Node)

⇒ GGSN is meant for establishing the link interface MSC and other packet data N/W (PDN).

⇒ SGSN is required for establishment of the link in between the internal architecture.

⇒ All the internal nodes are interconnected through GSN 'Gn' interface.

⇒ GGSN has connected with other packet data N/W through 'Gi' interface.

⇒ SGSN has interconnected with BSS through Gb interface.

⇒ GGSN

⇒ This node tunneling the data by encapsulation.

⇒ Whenever any information is required from other PDN, then the information will convert into packet format at GGSN.

⇒ This node keeps the information of about Rx, the data rate of Tx & Rx, format of the packet, delivering of the packets etc.

⇒ GGSN is connected with PDN through Gi interface and GGSN is connected with SGSN through Gn interface.

⇒ The above two interfaces based upon (Gi, Gn) the concept of packet switching.

SGSN

⇒ This node is the medium in between GGSN and BSS, MSC & GGSN.

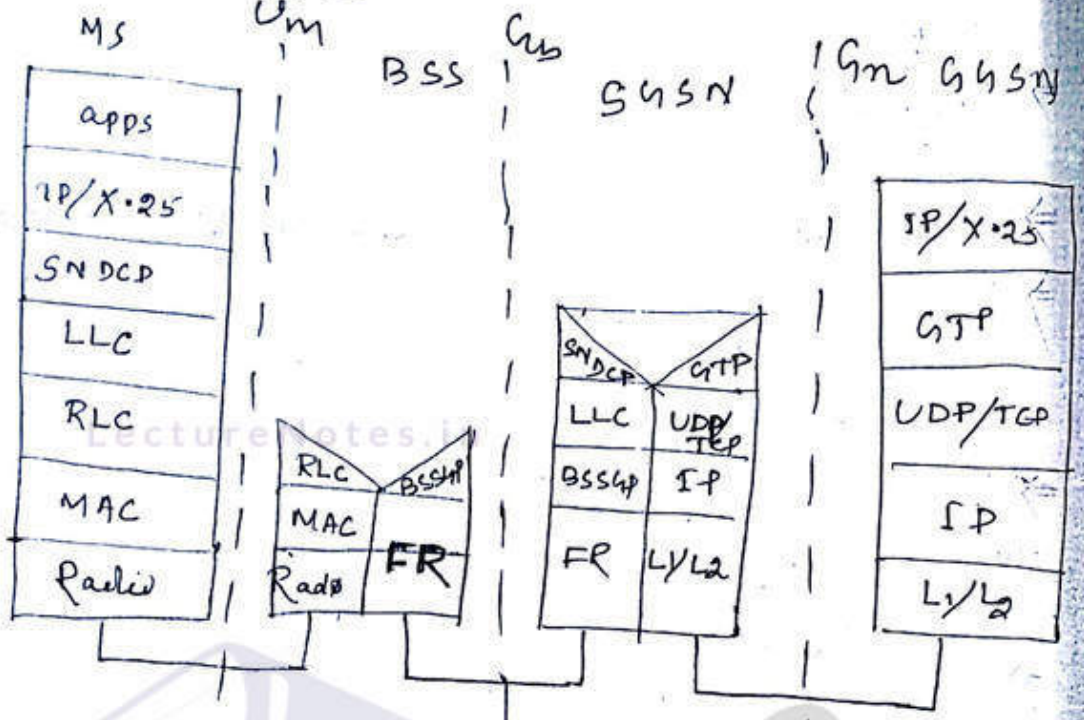
⇒ Due to this node, all the information are converted into packet format inside the N/w.

⇒ For this purpose, this node keeps the information about MS like LAI, TMSI, Users information,

⇒ This node keeps the information regarding data rate of the N/w itself.

⇒ The details information regarding the users has stored in the HLR or the register named as GPRS register (GR).

PROTOCOLS of GPRS



MAC - Medium Access Control.
RLC - Radio link control / RLP-Protocol
LLC - Logical link Controller
SNDCP - Sub N/W Dependent Convergence Protocol
IP - Internet Protocol

There are 4 types of IP address Class A, B, C, D & each is unique - Each stage of IP address contain 8 bit.
Max IP address 255.255.255.255.

9/4/20M

Bluetooth

Advantages of WPAN (Wireless Personal Area N/W)
Wireless Piconet

→ Connection with peripheral devices

Peripheral devices such as printer, monitor, measuring equipments can be connected with other devices or other system through wireless comm^{n}.

⇒ Bridge n/w formation:-

Bridge N/w can be formed by using wireless comm technique.

⇒ Power Consumption:-

Power requirement is low.

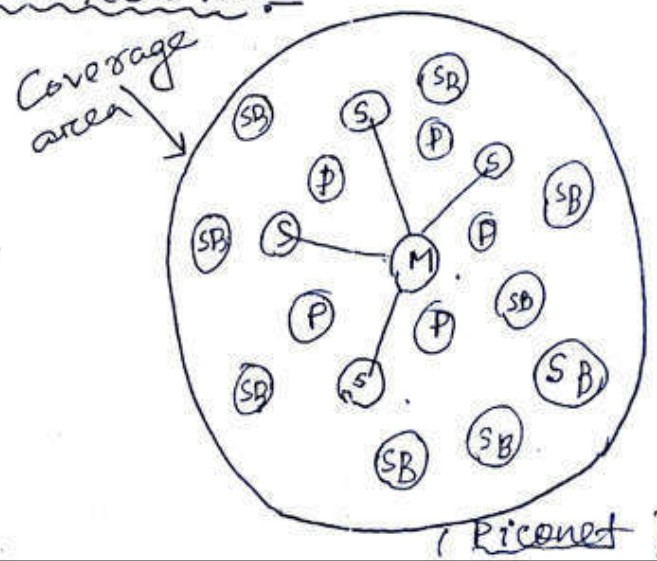
BLUETOOTH

Dt: 09/07/2014

Features of bluetooth.

⇒ It consists 79 no of channels.
⇒ Carrier spacing is 1MHz.
⇒ Operating frequency is 2.4 GHz.
⇒ In the bluetooth hopping speed is 1600 hops/sec.
⇒ FHSS concept is used in one N/w.
⇒ FH-CDMA is used in interconnection between the N/w.
⇒ Data rate will decrease by increasing the no of N/ws.
⇒ There are two basic concept of bluetooth
  1. Piconet
  2. Scatternet.

Architecture:-



(Piconet)

M - Master
S - Slave
P - devices wanted to pair-pair
SB - devices not interested in pairing - stand by device

⇒ Master and slave concept have adopted in this PICONET structure.

⇒ The circle indicates the coverage area of master.

⇒ The device which initiates to establish PICONET is known as MASTER.

⇒ The device which are connected with the MASTER is called SLAVE.

⇒ The device which are ready to connect with the master is known as PARK device.

⇒ The device which are in coverage area but dont want to connect with master is known as STANDBY (SB) device.

⇒ Before Tx & Rx of information inbetween MASTER & SLAVE, they should synchronized with each other that means clock speed of hopping speed should be same.

⇒ MASTER sends the clock speed first.

⇒ SLAVE should synchronise their internal clock speed with the clock speed of MASTER. So, SLAVE device is also called as active member devices.

⇒ There are 3 bit address for active member. This address is called as AMA (Active member Address).

⇒ Maximum no of devices can form a PICONET (1 - master, 7 - slave).

⇒ There are 8 no of AMA.

⇒ There are 8 bit address for park devices and it is called as PMA (Park member address).

⇒ More than 200 devices can be in PARK mode.

⇒ Park mode can be converted into slave mode only when the PARK is synchronized with MASTER.

⇒ Data rate depends upon the clock speed of Master.

⇒ If no of channel increases, data rate decreases.

Simultaneously max no of piconet can be formed (200 C_2H_2-).

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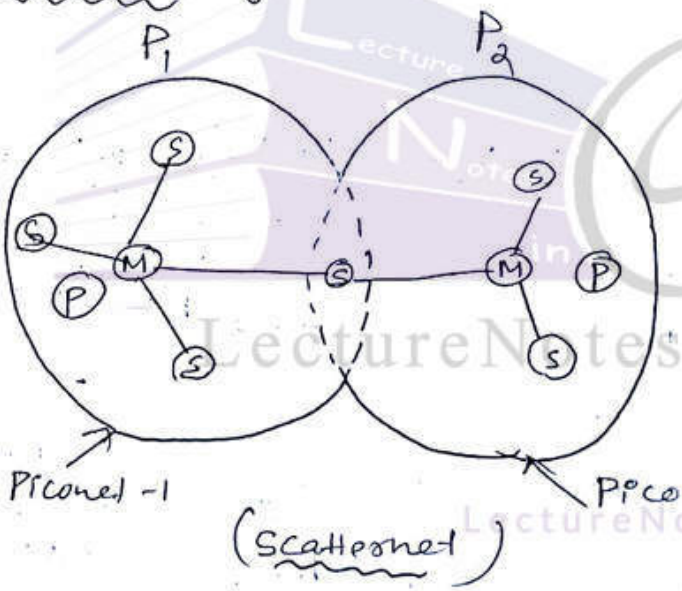
Scatternet



(Scatternet)

⇒ The interconnection between two piconet is called as scatternet.

⇒ Max. 79 channels can be used in scatternet

⇒ Transferring of data from one piconet to another piconet can be done by using FH-CDMA concept

⇒ Minimum one no of slave should be there which is common for both piconet

⇒ This slave is synchronised with master of both piconet

⇒ Master of P_1 sends its data to common slave and that common slave sends the data to the master of P_2

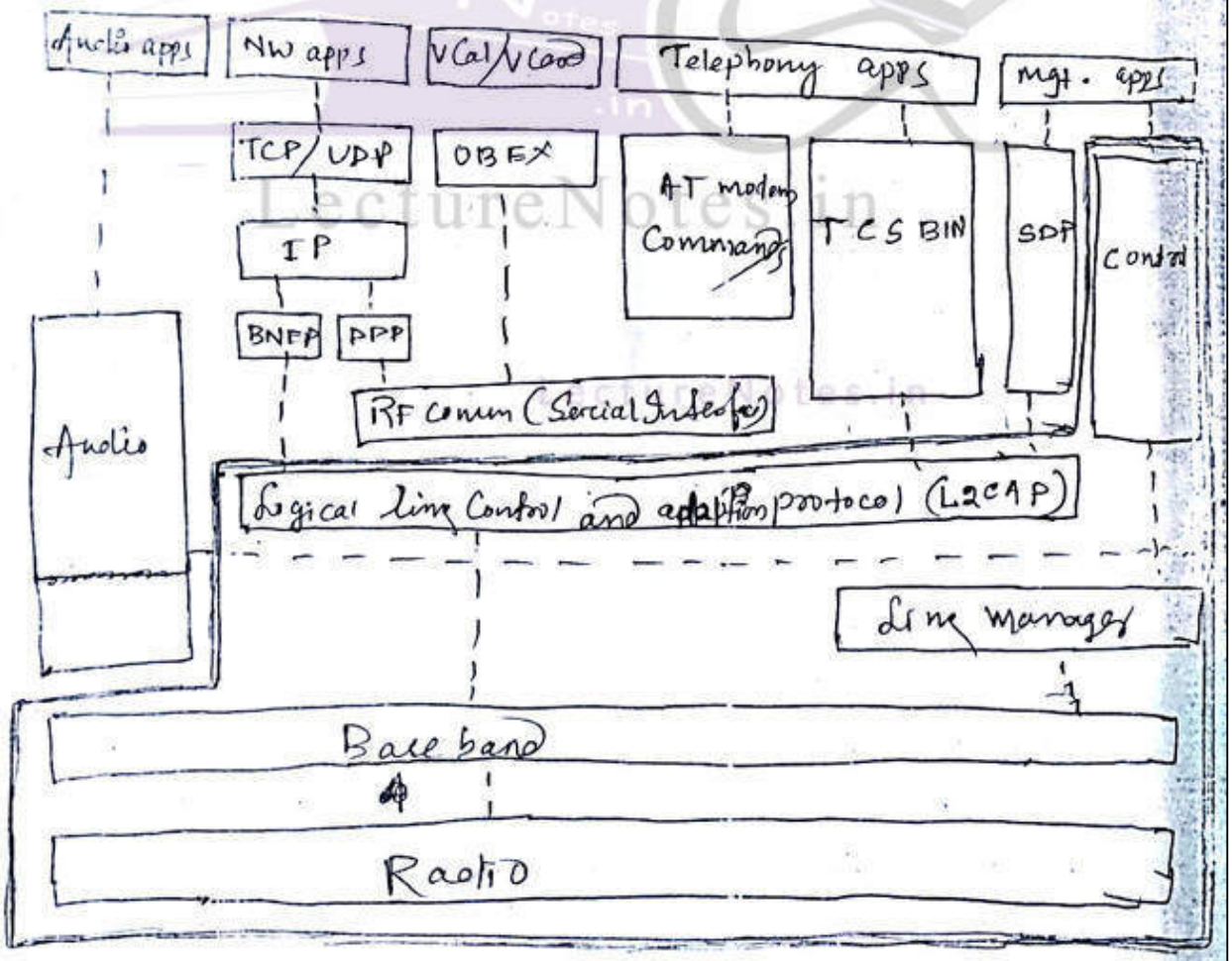
⇒ So in this concept slave can be a master and master can be a slave

⇒ Scatternet can be formed between more than two piconets.

⇒ The data rate in both piconets may decrease if size of the scatternet is increased

⇒ The data rate of common slave is lower in comparision to but with other slave

Protocol of Bluetooth



Radio →

⇒ This layer is responsible for correct selection, conversion of electrical signal to RF and vice versa, channel characteristics etc.

⇒ Also responsible for power control.

Baseband ⇒

This layer is responsible for data format for Tx & Rx, coding technique, synchronisation bet^n the packets, data acquisition,

Link Manager ⇒

⇒ This layer is responsible for processing of data flow.

⇒ This is the medium in bet^n controlling layer and base band layer.

⇒ It is responsible for establishment of link

⇒ This layer is also responsible for arranging the data in desired packet format.

It is also responsible for synchronisation.

Logical link control & adaption protocol ⇒

This layer is the controller of all sorts of logical link.

⇒ This layer is responsible for synchronisation, correct spacing, data format, logical transmission control (LTC) etc.

Control ⇒

⇒ This layer is the most important layer in bluetooth.

⇒ This layer controls all types of app^n layer, all link mgt. layer, all types of radio layer etc.

⇒ This layer controls data rate, other services, modulation techniques.

14/7/2014

WIRELESS LAN (WLAN)

Advantage

* Flexibility →

Wireless LAN is more flexible in comparison with LAN.

⇒ The device can be used at any place.

* Planning :-

⇒ For establishment of WLAN, planning is not required

⇒ Installation of cable is not required.

⇒ Since there is no physical connection, it can be used anywhere.

* Design :-

⇒ Since planning is not required, design is also not necessary.

⇒ The n/w becomes simplest.
establishment of N/w is very easy.

* Robustness :-

⇒ WLAN can survive at any condition of nature.

⇒ Due to the natural calamity, if there will no infrastructure, still then comm can possible due to WLAN.

*Cost:-

Since planning & design are not mandatory, WLAN is costeffective.

Disadvantages :-

* Quality of Service (QOS)

⇒ Since the medium is wireless, channel BW is less.

⇒ Data rate is approximately 115 Kbps.

* Safety & Security

For safety purpose, ISM 2.4 GHz is used for comm^n.

⇒ Since medium is wireless, Tx or Rx is not secured.

* Restriction -

In WLAN, frequency of operation is high, whereever high frequency operation is high at that time interference occurs due to the WLAN.

Infrared	WLAN
→ coverage area less.	→ Coverage area is more
→ line of sight (LOS) of comm^n is mandatory.	→ LOS is not mandatory.
→ If there is any obstacle in betⁿ Tx & Rx, comm^n fails.	→ Since high frequency penetrate wall, trees, buildings or any insulator there will be no obstacle in betⁿ Tx & Rx
→ Infra red is more dangerous for health.	→ It is not hazardous.

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Architecture of WLAN (IEEE 802.11)

Based upon the infrastructure, architecture is divided into two categories.

i) Infrastructure based N/w.

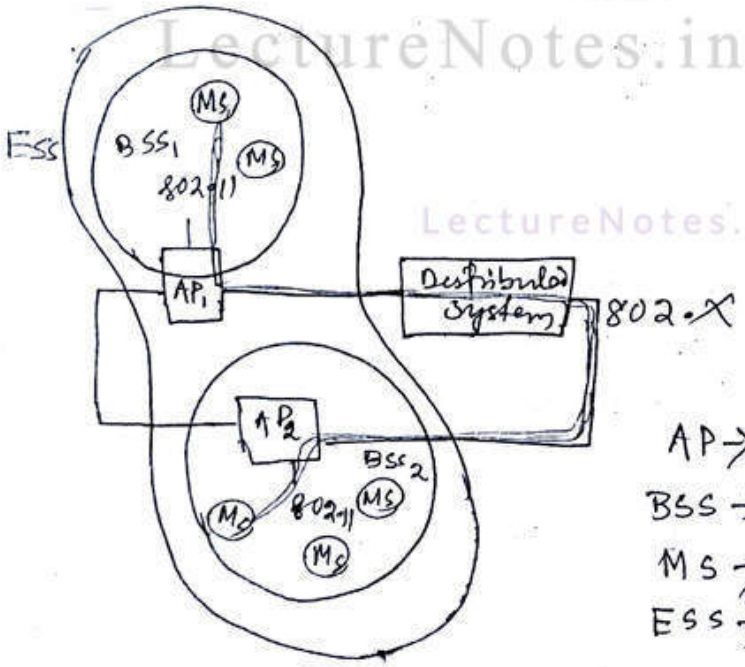
ii) Ad-hoc N/w.

All these above are standarized IEEE 802.11.

IEEE 802.3 is for LAN. (RJ 45)
802.5 is for RJ 78.
802.11 is for WLAN
802.11b is for Bluetooth.
802.11p is for VANET
802.11h is for MANET
802.11 ifgj is for TV wi-fi

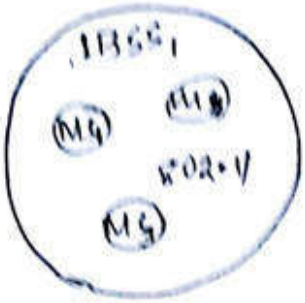
Infrastructure based N/w

15/7/2014



AP → Access Point
BSS → Basic Service Set.
MS → Mobile devices
ESS → Extended Service Set.
IBSS → Independent Basic Service Set

Ad-hoc N/w



There are two basic disadvantages in adhoc N/w

i) Hidden terminal problem

ii) Exposed terminal problem

Concept of Infrastructure based N/w

⇒ Users are interconnected with each other through a node is called as access point.

⇒ The medium between access point of users is wireless medium.

⇒ The standardization for the medium is IEEE 802.11.

⇒ The coverage area of the access point is known as BSS.

⇒ The access points are interconnected through with each other through wire/ethernet cable.

⇒ The standarization of this one is IEEE 802.x

⇒ The interconnection between access points are known as FSS.

⇒ All access points are interconnected by distributed system.

⇒ The distribution system is connected to servers.

⇒ MS_1 of BSS_1 can connect with MS_1 of BSS_2 through access points, distribution system, internal server.

⇒ Each access point has individual access point ID.

⇒ This ID is unique in that N/w.

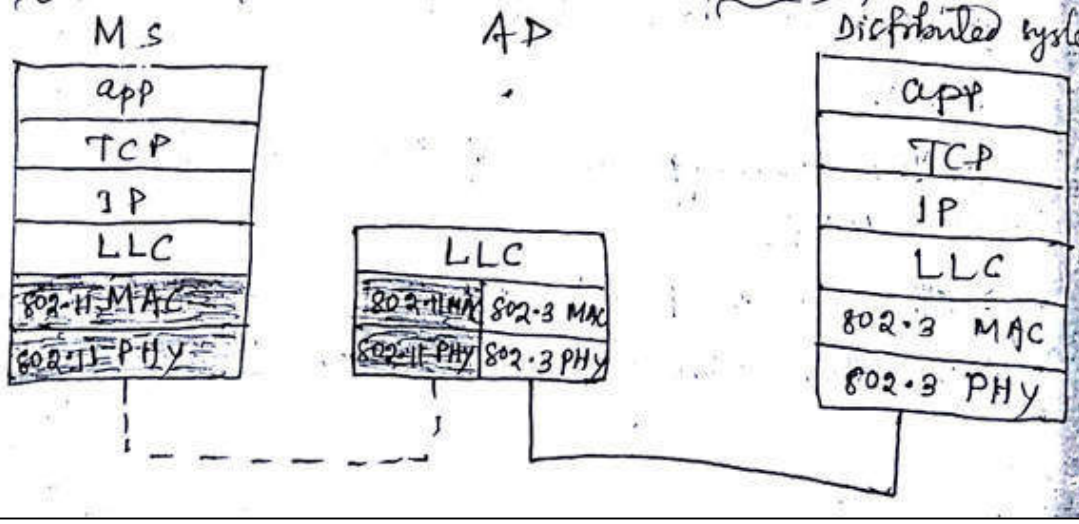
⇒ The data from MS can transfer to the access point in packet formats.

⇒ The switching concept in between MS & access point is Packet Switching.

⇒ The switching concept in between access points are circuit switching.

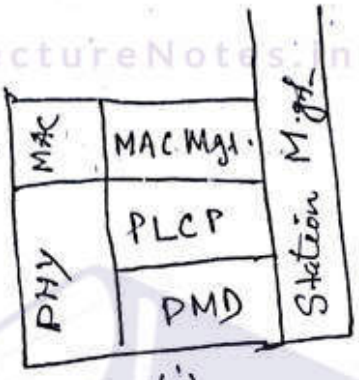
⇒ For deployment of access point, distributed system, infrastructure is required.

Protocol of Infrastructure based N/w



PHY - Physical Layer
MAC - Medium Access Control
LLC - Logical Link Control
IP - Internet Protocol.
TCP - Transmission Control Protocol.
APP - Application Layer

16/7/2014



(i)

Physical Layer

⇒ The responsibility of this layer is carrier selection, type of modulation, carrier choosen etc.

⇒ The physical layer is divided into two part.
i) PLCP (Physical Layer Convergence Protocol)
ii) PMD (Physical Medium Deponent).

⇒ The physical layer is controlled by physical mgt. protocol & MAC layer is controlled by MAC mgt. protocol.

⇒ MAC management is responsible for data fragmentation, data packet format, synchronization etc.

⇒ PLCP of physical layer is responsible for sensing of carrier signal & it is called as carrier channel assesment (CCA).

⇒ The CCA is responsible for carrier generation.
⇒ PLCP is also responsible for physical service provider assesment (SPA)
⇒ PMD layer is responsible for encoding or decoding, modulation technique, compatibility with RF channel etc.
⇒ For modulation in physical layer basically Spread Spectrum Technique has used.
⇒ Spreading occcurs with the help of pseudo noise (PN) codes.
⇒ There are two types of spread spectrum
  i) Frequency Hopping SS (FHSS)
  ii) Direct Sequence SS (DSSS)
⇒ Physical management controls all such things.
⇒ Physical management & MAC management is controlled by the station management layer.

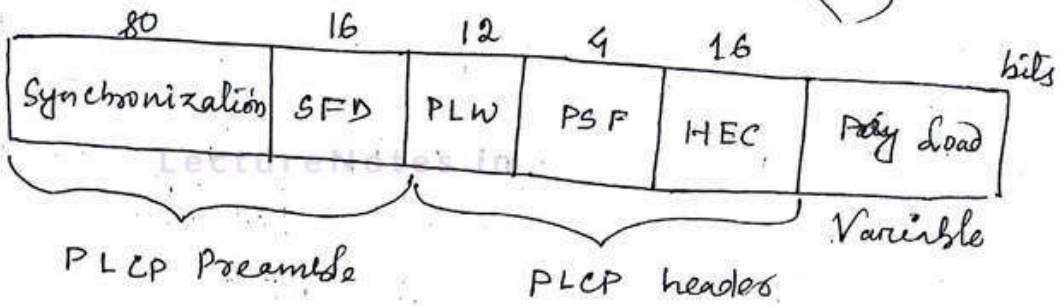
Frequency Hopping Spread Spectrum

⇒ There are 79 channels available for FHSS.
⇒ Each channel has 1MHz BW.
⇒ Power controller controls the power requirements
⇒ In USA power requirement for FHSS is 1W.
⇒ Except USA power requirement is 100mW throughout the world.
⇒ GFSK modulation technique has used in FHSS.
⇒ For 2-level GFSK data rate is 1Mbps & for 4-level data rate is 2Mbps.

⇒ Total FHSS frame is divided into two parts.

i) Header Level
ii) Data Level.

⇒ For detection and correction of error, error correction method has used. (CRC - Cyclic Redundancy Check)



(FHSS frame)

Header field contains 128 bits

Synchronization

⇒ This field contains 80 bit.

⇒ This field is required for synchronization of packet & the field format is 010101.....

SFD (Start frame delimeter)

⇒ This field contains 16 bit.

⇒ This field initiates the packet format and the field format is 0000111100110100.

PLW (PLCP - PDU length word)

This field is responsible for size of data fragmentation/packet.

The length of the field is 12 bit. (0 - 4095)

It varies from 0 to 4095.

PSF (PLCP Size Frame).

This field is responsible for data rate.

⇒ If the field is 0000, then the data rate is 1Mbps.

⇒ If the field is 0010, the data rate is 2Mbps.

⇒ If the field is 1111, the data rate is 8.5 Mbps.

HEC (Header Error Check).

⇒ This field is responsible for error detection and correction.

⇒ CRC Method (Cyclic Redundancy Check) is used for error correction & detection.

⇒ The polynomial used for HEC is

$$H(x) = x^{16} + x^{12} + x^5 + x^1 + 1$$

21/7/2014

Assignment-1

Q.1 Discuss the physical frame format of IEEE 802.11 using the spread spectrum technique which separates by frequency.

Q.2 How many types of wireless N/ws are there? Explain with the help of suitable diagram

Q.3 Explain the GPRS architecture and describe the operation of its node.

Q.4 Give the comparision between Infrastructure mode & adhoc mode in WLAN

Frame Structure of DSSS

Features

⇒ In this technique, a noise code is used for scrambling of data.

⇒ The length of the code is 11 bit.

⇒ The size of the data changes w.r.t. to PN sequence code.

⇒ Since data is scrambling, possibility of addition of noise is more.

⇒ There are two types of modulation technique is used in this case.

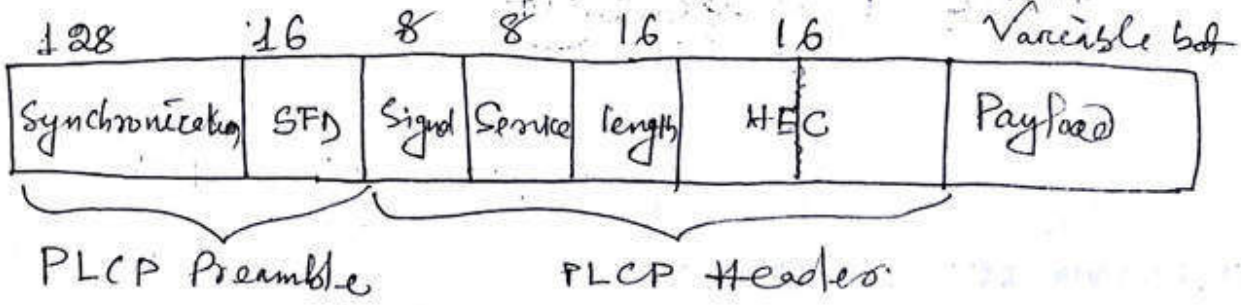
⇒ Data rate is also varied w.r.t. the modulation technique.

⇒ If modulation technique is DBPSK, data rate is 1Mbps.

⇒ If modulation technique is DQPSK, data rate is 2Mbps.

⇒ For error detection and correction, some error bit is also added with the data.

Frame Structure



Synchronization

⇒ This field is required for synchronization, energy detection, packet information etc.

SFD (Start frame delimeter)

This field initializes the payload field, and the structure of this field is 1111001110100000

Signal -

This field indicates the data rate of DSSS.

Datarate = 1Mbps, if DBPSK is used.

Data rate = 2Mbps, if DQPSK is used.

Service :-

This field is meant for future

length :-

⇒ This field indicates the length of the packet.

⇒ The range of the field is 0 - 65535

HEC (Header Error check)

⇒ This field is responsible for detection and correction of error.

⇒ The CRC technique is used.

⇒ 16 bit Polynomial is used for HEC.

MAC Management

Features

This protocol is heart of WLAN protocol.

This layer controls almost all sublayer.

There are four nos of basic section

Synchronisation

Power management

Roaming

Management Information Base (MIB)

This controlling layer controls access points, BSSs, ESSs,

Synchronization

This field synchronizes all the sublayers so that proper transmission and reception is possible.

Power management

This layer manages the power requirement generally 1W is used in USA, 10mW used in European country, 100mW used in African & Asian countries.

Roaming

This field keeps all the information regarding changing of access point & distribution system,

MIB

This field contains management information of all above fields.

It keeps all the information regarding all MS all access points, all distribution system etc.

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Mobile Computing

Topic:

Mobile IP.

Contributed By:

Kaibalya Sethi

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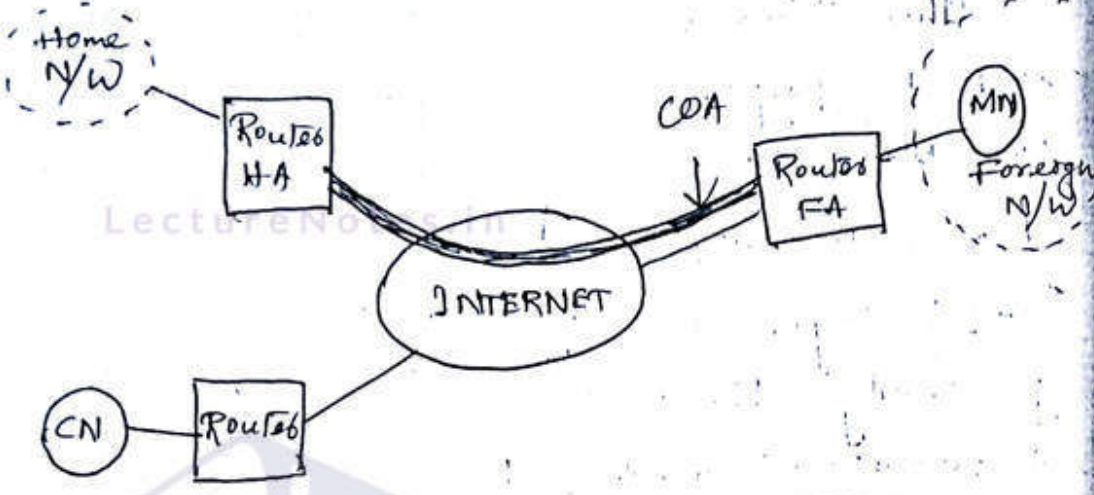
MOBILE IP

20/7/2014

- Wireless Application Protocol (WAP)

Entities of Mobile IP



Mobile Node (MN)

It is one end of the comm^{n}.

→ Generally we assume MN means a mobile device.

Foreign N/W

→ This N/W is a temporary n/w.

→ The mobile node visit this N/W temporarily.

→ This N/W keeps the temporary information of MN.

Foreign Agent

This helps the mobile node for Tx & Rx of information.

If it is present in the foreign N/W, it is known as foreign agent.

This FA provides temporary information of MN to the foreign N/W

Home Agent (HA) :-

⇒ It provides detail information of MN to home n/w.

⇒ Without FA / HA, Tx & Rx is not possible. Both agents keeps the information regarding no of packet, synchronization of packet, Tx of packet and also delivery of packets.

Correspondent Node (CN)

⇒ This node is the partner of MN so that communication is possible.

⇒ The home n/w keeps all information of about the partner node (CN).

Router HA / Router FA

These are the routers of home n/w & foreign n/w respectively.

They will provide the dedicated link for comm^{n} purpose.

COA (Care of Address)

This address ensures the Tx & Rx of information

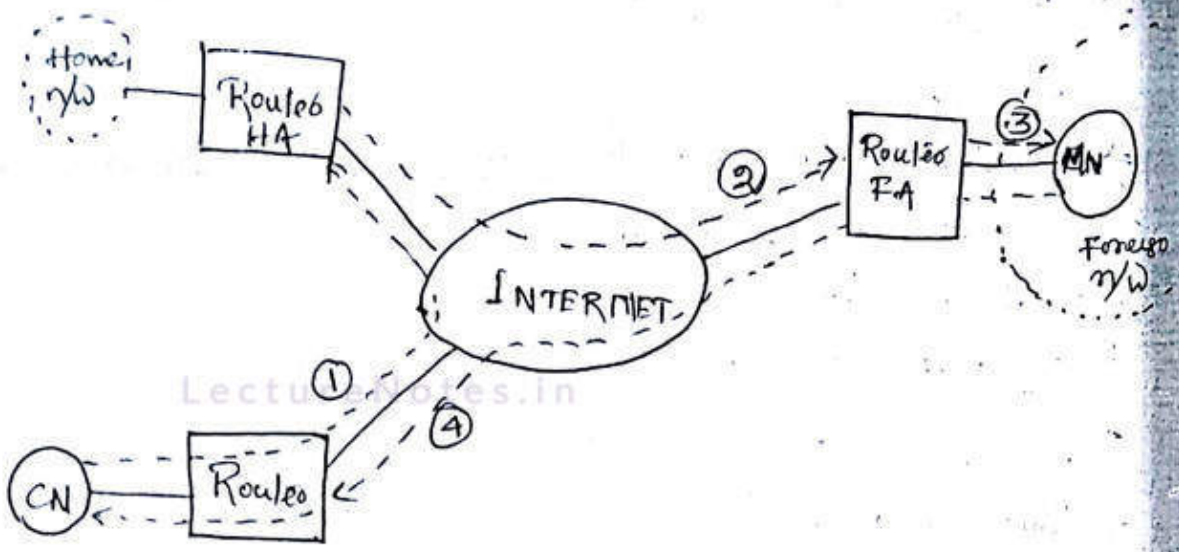
There are two types of COA

1) Foreign Agent COA = belongs to foreign n/w
   - It keeps the address of foreign N/w.

2) Home Agent COA = belongs to home N/w
   - Keeps the address of home n/w

10 IP Packet delivery

26/7/2014



⇒ Mobile Node (MN) is not present in the home n/w.

⇒ MN is in foreign N/w.

⇒ All the information regarding MN has stored in Router FA.

⇒ Home N/w has no location information regarding MN.

⇒ For comm^n betⁿ CN & MN, there must be a dedicated link.

⇒ The link can be established as follows.

Path -1

⇒ CN sends request for location information to the home n/w that means it sends the IP address of MN.

Path -2

⇒ Since, there are no information regarding MN at home N/w, it sends a request to the foreign N/w through router FA.

⇒ The IP address of MN is encapsulated by COA (Care of Address).
⇒ Foreign agent router FA decapsulated the received information.

Path-3

⇒ Router FA sends a request for location information of MN to the foreign N/w.
⇒ After getting the location information from foreign N/w, the router FA sends these location information to home N/w through router HA.
⇒ Home N/w sends the location information to the correspondent Node.
⇒ Now the correspondent node is available with the location information of MN.

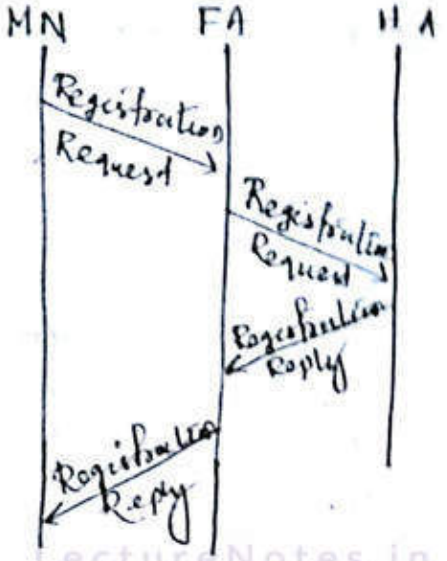
Path 4.

After getting location information of MN, ~~CN~~ a dedicated link can be established between MN & CN directly.
⇒ After establishment of link, information can be transmitted & received by the node.

Agent Registration

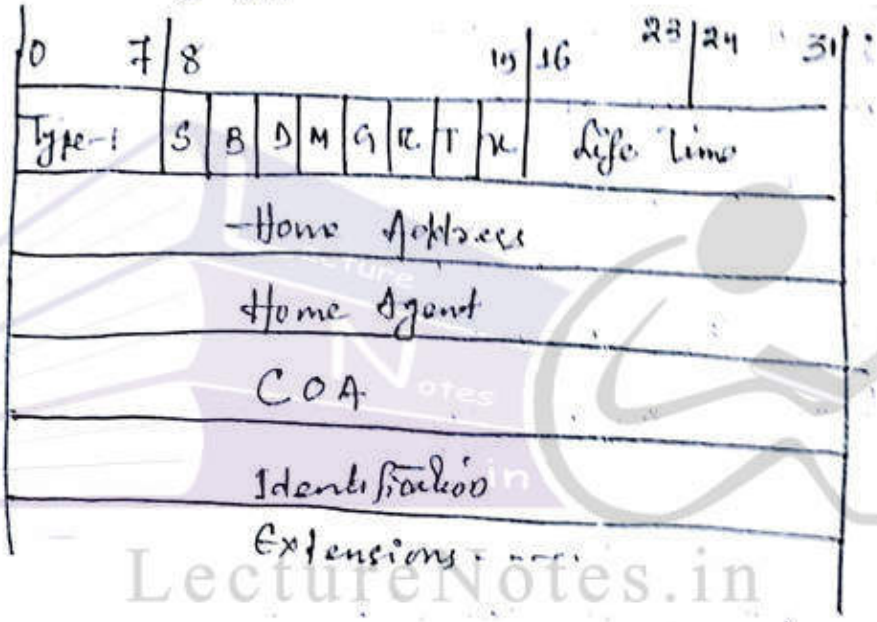
28/7/2014

⇒ For completion of the registration process, the mobile node sends a request ie. Binding Request which is the IP address.
⇒ Similarly registration confirmation should sent from the N/w that may be home/foreign



(Fig-II)

(Fig-II)



(Fig-III)

This reply is known as Binding Acknowledgement.

⇒ Fig i' indicates that MN is present in foreign n/w.

⇒ Foreign n/w has no information regarding MN.

⇒ Mobile node (MN) registered itself under foreign N/W by sending binding request.

⇒ Binding request is nothing but the IP address of MN.

⇒ The foreign N/W sends that binding request to the home N/W by encapsuting with COA.
⇒ After registration home N/W sends binding reply to the ham foreign N/W.
⇒ The foreign N/W also sends registration confirmation to the MN.
⇒ In fig- 'ii', MN is present under home n/w.
⇒ So for registration purpose MN sends binding request to the home n/w directly.
⇒ After completion of registration process, the home n/w sends the registration confirmation or binding reply to MN.
⇒ Fig 3 gives a brief idea about the registration of MN.
⇒ ~~The~~ registration process contains 32 bit.
⇒ First 8 bit ($D_0 - D_7$) indicates the type of registration.
⇒ Type-1 is meant for registration request & Type-0 meant for Reply.
⇒ The last 16 bit ($D_{16} - D_{31}$) indicates the validity of MN.
⇒ This field contains the duration of registration.
⇒ The lifetime of the MN depends upon the activation of no of bits in lifetime field.

⇒ For synchronization, Tx, Rx, etc can be controlled by the middle field.

It will be divided into following subfields

S-bit - It specifies the priority of mobile binding (binding req/reply)

B-field - It indicates the received packets by home N/w from MN.

D-field - It indicates the behaviour.

M-field & G-field - It indicates the minimal encapsulation

T field - It indicates reverse tunneling

X & x field - It indicates It set to be zero

⇒ Home Address keeps the IP address of MN

⇒ Home Agent keeps the temporary information of mobile IP for coming purpose.

⇒ COA - This field is 64 bit address, when there will be interaction in b/n two different N/w then this field will more active.

⇒ Identification - This field verifies the authentication of MN.

⇒ Extension - This field is meant for future service.

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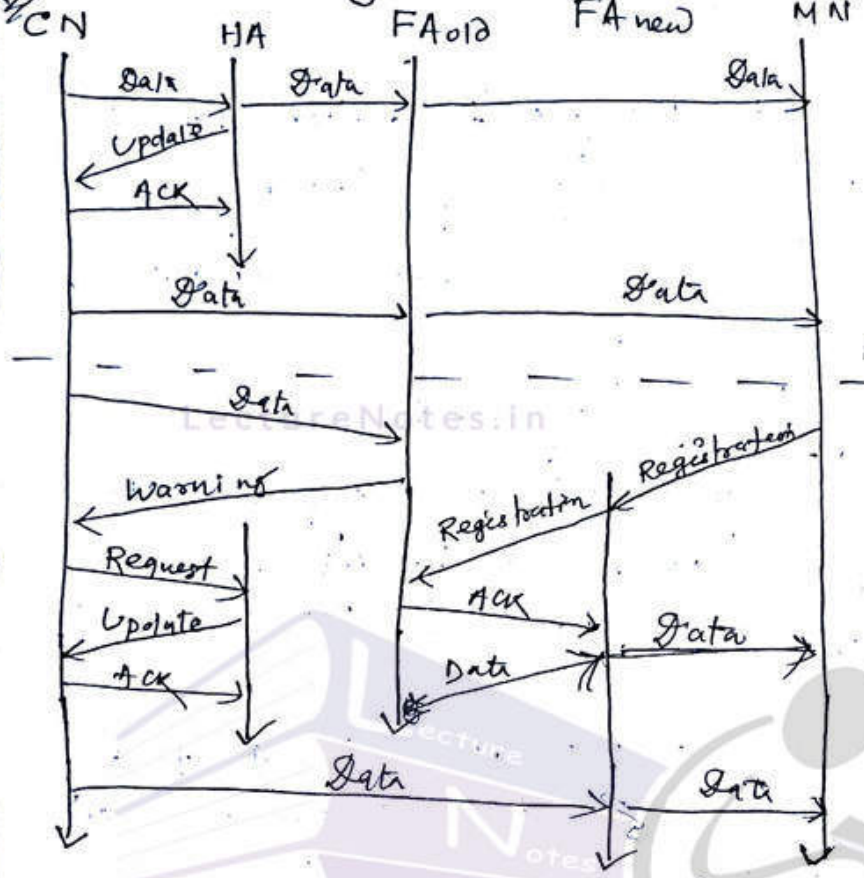
Tunneling

Optimization in Mobile IP

29/7/2012



⇒ The explanation based upon four basic concepts

- → Binding Request.
- → Binding Update
- → Binding Acknowledgement
- → Binding Warning

Binding Request

When CN updates itself about the location of MN at that time it sends a request to the home agent (HA) for location information of MN.

⇒ This request is known as binding request.

⇒ It can be sent ove COA.

Binding Update :

⇒ When MN changes its location, then it sends the information regarding above.

⇒ This information is known as update information or binding object.

Binding Acknowledgement

⇒ When any N/w, (CN/F) reply to MN or CN then it is known as binding acknowledgement.

Binding Warning

⇒ If there will be the missing of any one from above three, then a warning message has sent from n/w to node.

⇒ Such warning message is known as binding warning.

In the above figure, top part says the existance of the link previously.

Similarly bottom part says the establishment of new link after MN changes its location.

1) Initially there will be a dedicated link in between CN and FA_{old}, FA_{old} & MN.

2) In the mean time, MN changes its position from FA_{old} to FA_{new}. and there will be no updation information at CN.

iii) Before establishment of new link subject CN & FAnew, MN should registers itself under FAnew.

iv) For this registration MN sends a binding request to FAnew for getting a link.

v) Similarly FAnew sends a binding request to FA old regarding the position change of MN.

vi) The FA old update itself and sends a binding reply to FA new and FAnew also sends a binding reply to MN.

vii) Now the position of MN under FA new is updated

viii) During this time CN sends a binding request for location information of MN to HA.

ix) HA updates itself regarding the location changes of MN.

x) HA sends a binding reply regarding new location of MN to CN.

xi) Now CN updates itself regarding the new location of MN.

xii) If CN will not update itself then the home n/w sends a binding warning message to CN for updation.

xiii) If updation completes at each node and network, then a dedicated link will establish in between CN – FAnew – MN.

IP version 6 (IPv6)

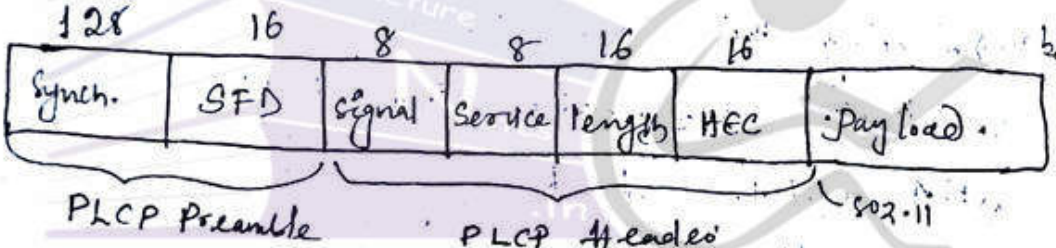
⇒ Now a days for mobile internet we are using IPv6 generally.

⇒ In IPv4, for registration process, there are different message for different purpose and all messages are mandatory for the registration process.

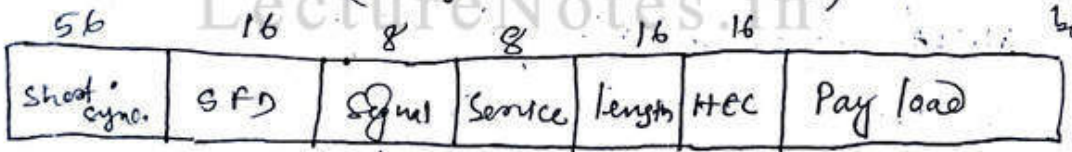
⇒ In IPv6 for registration process, there are a single message which is the combination of all type.

802.11b

30/7/2014



(Long PLCP - PPDU frame)

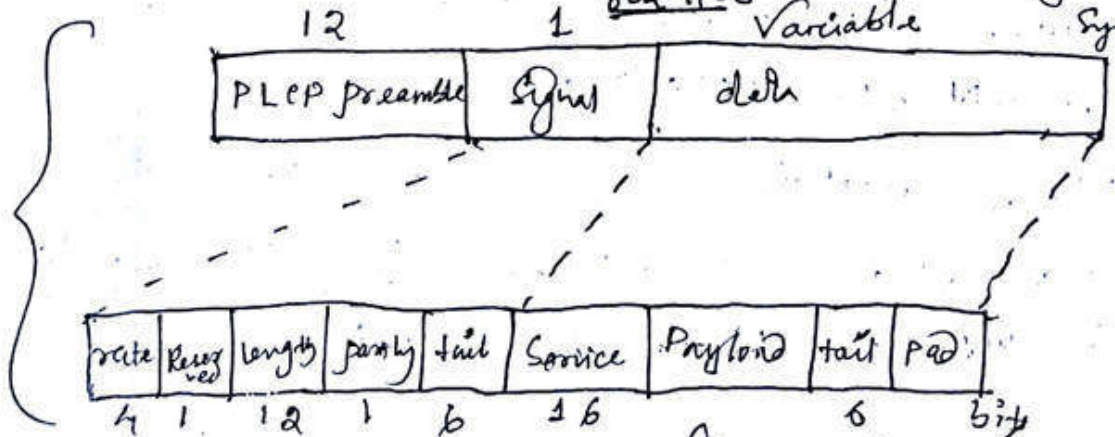


(Short PLCP - PPDU frame) (802.11b)

(Data rate = 11 mbps)

→ Same as Frame structure of 255 long bits

802.11a



(802.11a)

⇒ The frame structure of physical layer is divided into three fields.
⇒ It contains a number of symbol.
⇒ In this case 1 symbol = 24 bit.

PLCP Preamble

⇒ PLCP preamble field initiates the structure of the frame.
⇒ It is responsible for synchronization, data encapsulation, modulation etc.
⇒ It contains 12 symbols

Signal field

Signal field is the various information about payload.
Further it is divided into different sub field

Rate -

⇒ It indicates the data rate
⇒ It contains 4-bit
⇒ When field is 1111, the data rate is max, ie 11 Mbps.
⇒ When field is 0000, data rate is min ie. 1 Mbps

Reserved

⇒ Reserved field is meant for future.
⇒ It may be modified further in future.

Length

⇒ Length field indicates the size of the payload interms of bytes.
⇒ Depending upon this field, ~~payload~~ data in Payload field can converted into the packet format

Parity

⇒ This field is meant for error detection & correction.

⇒ In 802.11 a even parity is used.

Tail

⇒ This field indicates the finalization of signal field.

⇒ It contains 6 bits.

Data field

Data field is further divided into subfields

Service –

⇒ This field initialize the packet format of payload

⇒ It keeps the synchronization, packet format and modulation technique of payload field.

Tail –

This field indicates the finalization of data field.

Pad

This field is the guard field inbetween the frames

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Mobile Computing

Topic:

Wireless Application Protocol (WAP)

Contributed By:

Kaibalya Sethi

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Module-2

Wireless Application Protocol (WAP)

⇒ WAP is a logical platform, which is developed by WAP forum.
⇒ It helps us to get various service through wireless comm.
⇒ It can be analyzed by OSI model (operating System Interface).
⇒ WAP has developed under the jurisdiction of WAP forum.

WAP FORUM

It is an organisation developed on 1997 by Motorola, Ericcon, Nokia, & Phone.com

16/8/14

⇒ This forum consists of 2 types of member.
- Full member
- Temporary member.

⇒ Full members have rights for casting of the vote for choosing their board of director.
⇒ Temporary members have no permission for casting the vote.
⇒ They are permitted to purchase only some application.
⇒ Temporary members follows the rules & regulations of work forum that has designed by full members.
⇒ Full members can design h/w, s/w, applications etc.

Advantage :-

⇒ The board of directors is elected by the full members of manage the direction & policies of the forum.

⇒ The specification committee is nominated by the board of directors.

⇒ It manage the day today technical operation of forum.

⇒ The architecture group includes members of forum & a large number.

Advantage of WAP architecture :-

The board of directors

⇒ It maintains the technical architecture of forum standard.

⇒ The specification working groups manage various areas of work specification.

⇒ Since the logical structure of WAP architecture is layering wise its analysis becomes easy.

⇒ Layering structure allows the design of each protocol to revolve independently of other protocol

⇒ Expert group meets to discuss various topics from the multiple areas of specification.

⇒ Each layer assumes that the layer below has a particular set of capabilities and provides a ~~particular set of~~ c. to the layer above of.

⇒ Layering allows subset of the standard to be implemented.

⇒ Layering permits effective bridging to internet

Protocol used over both internet & www are layered.

⇒ Layering supports the principle of separability.

⇒ Functionally it is distributed among different elements of N/W infrastructure.

Disadvantages of WAP Architecture

⇒ Layer protocol implementation is more difficult to optimize & maintain.

⇒ Layered protocol tends to be less efficient.

WAP Specification :-

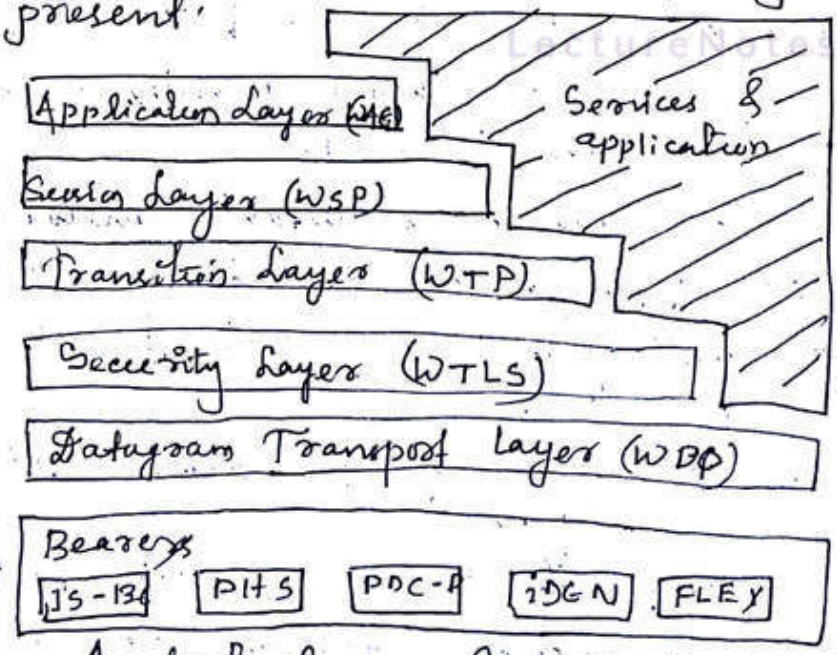
⇒ A programming model based on www programming model.

⇒ A mark up language is wireless mark up language (WML).

⇒ A specification of small browser suitable for mobile & various small wireless terminals.

⇒ A light weight communication protocol stack is there.

⇒ A frame work wireless telephony application is present.



Architecture of WAP

WAE – Wireless Application Environment
WSP – Wireless Session Protocol.
WTP – Wireless Transaction Protocol:
WTLS – Wireless Transition Layer security
WDP – Wireless datagram protocol.
Bearers – Bearer adoption service protocol

20/8/2014

Bearer Adoption Protocol:-

⇒ This layer is the first layer in logical architecture/OSI model of WAP.
⇒ Since this layer is the first layer, it may be called as the physical layer of WAP architecture.
⇒ This is an important layer in this model.
⇒ This layer is common for analog comm^n system (AMPS) (Analog Mobile Phone System) and also compatible with digital comm^n system.
⇒ This layer provides a various numbers of services.
⇒ This layer is responsible for modulation technique which is required for wireless comm^n.
⇒ In AMPS, both information and carrier are in analog domain. so bearer layer provides the appropriate carrier signal in analog mode.
⇒ This layer also provides a suitable analog modulation technique for different wireless services.
⇒ Similarly this layer is responsible for CDMA technique where ever it is required.
⇒ So for this a number of pseudonoise sequence has generated in this layer.
⇒ If it is compatible with GSM, then a particular carrier frequency which is used in GSM that has

generated in this layer.

⇒The GSM is also named as IS-95, IS-136, IS-1800 etc.

⇒Due to this protocol layer, the other layers can interface with the concerned n/w devices.

⇒This layer is also compatible with WLL technology.

⇒This physical layer is very much familiar with PSTN also.

⇒Whereever wireless technology are in concerned the concept of bearer adoption protocol comes into the picture.

⇒There will be no direct link betn wireless service and this physical layer.

⇒The main feature of this layer is its security

⇒This layer provides maximum security in wireless comm^n.

6/9/2014

Wireless Datagram Transport Layer / WDP

⇒WDP is used to hide some differences between the underlaying various bearer networks.

⇒It is not a traditional protocol rather than it can be known as service abstraction.

⇒This layer is responsible for ensuring that the common service abstraction provided over the full range of supported bearer networks

⇒The WDP service abstraction is a datagram service, which simply enables one end point to send a message point to point to another end point in the n/w.

⇒ This service abstraction neither guarantees the reliability and security of the transmission nor generates the ordering and time line of the data arrival at the station.

⇒ The WDP specification make direct use of the bearer n/w protocol.

⇒ The higher level WDP protocol in WAP may provide some duplicate functionalities which waste some additional BW in providing capabilities already available from the bearer protocol.

⇒ The interoperability benefits of the WDP abstraction is cheaper than other bearer n/w protocol.

⇒ Due to some fundamental features this protocol is also named as service protocol.

Features

⇒ The datagram abstraction guaranted by WDP is rather limiting the other protocols

⇒ The service protocol provides some additional capabilities in a layered fashion for use by the application environment.

⇒ The service layers are protocols in traditional nature ie. each defines a set of packet formats and a protocol state machine that determines when each type of packet should be transmitted, because these protocols are deployed over WDP, they are designed

and implemented independently of the underlaying bearer n/w.

⇒ The service protocol generally includes 3 diff. protocol layers -

1. Wireless Transport layer Security (WTLS)
2. Wireless Transaction protocol (WTP)
3. Wireless Session Protocol (WSP)

Security layer (WTLS)

⇒ This layer is responsible for providing security in between WDP and WTP.

⇒ It provides authentification using specially optimized client and server certificate that demand less BW than traditional X.509 certificates send over the internet.

8/9/2014

⇒ This protocol defend against various security attacks including replay attacks in which a third party attempts to access services by the replaying request and responses generated by client during the session.

⇒ WTLS helps to depend against denial of service attacks.

- In such type of attack, a third party bombbard a client or server, with a sequence of invalid packets.

⇒ This protocol layer is best suited for detecting and discarding the received illegal packets.

⇒ This protocol layer is an optional layer of WAP stack.
⇒ This protocol layer has minimum bandwidth.

Wireless Transaction Protocol (WTP)

⇒ Like TCP/IP in internet, this layer is loosely modelled in WAP.
⇒ WTP introduced the word Transaction, it says an explicit pairing betⁿ client request and server response.
⇒ It does not contain stream of transmitted data, stream of connection, stream of losses.
⇒ It only contains only the information which contains the transaction streams.
⇒ WTP supports reliable message exchange between the device and server by transmitting acknowledgement messages to confirm the the data received by the receiver and by retransmitting data that has not been acknowledged by the receiver.
⇒ This protocol reduces its BW requirement by permitting piggybacking of fresh data with each acknowledgement data that is send

Wireless Session Protocol (WSP)

⇒ Wireless session protocol layer of the WAP stack supports efficient, long term conversation between two application peers.

⇒ It also supports operation of a WAP micro-browser running on the client device and communicating over the low BW, high latency wireless n/w.

⇒ Typically a WAP gateway transforms WSP request received over the air into http request sent over the internet.

⇒ Similarly the gateway transforms http request received over the internet into WSP responses sent over the air.

⇒ There are some basic limitation in WSP.

1. Session
2. Modularity
3. Binary encoding

Session :-

⇒ WSP establishes a long lived session between the client and the WAP gateways

⇒ The session provides a content within which several requests and responses are exchanged.

⇒ WSP session should not be described in the same terms as HTTP session.

The session may even survive across power

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cycle of client device

⇒ When the WSP session is being established, the client and gateway exchange a set of HTTP headers that they cache for the duration of the session

⇒ The header caching is associated with a significant BW saving, because most HTTP headers do not change across subsequent requests and responses.

Modularity:

⇒ Modularity is the basic WSP protocol supports the same request and response operation as HTPP known as Get and Post.

⇒ It has some basic parameter, one is

→ extended method
→ protocol parameter
→ protocol feature

⇒ This WSP protocol is negotiable in nature.

⇒ It can support a fairly broad range of application styles from the browser request and response model to more sophisticated Push, message based transaction model

9/9/2014

Wireless Application Environment (WAE)

⇒ This protocol is very much essential in WAP base.

⇒ The responsibility of this environment is it receives the appropriate queries from the user side and deliver the appropriate output / response.

⇒ This environment consists of a set of standards that collectively define a group of recognized format for downloadable contents and applications.

⇒ As well as instructions on how application servers should deliver the information to the WAP environment.

⇒ The WAE remains largely independent of the WAP service protocols and adoption layers standard.

⇒ WAP base content can be downloaded to a WAP application environment running over a standard internet protocol suit.

Wireless Mark up Language (WML)

⇒ This language is basically required for small display device where a tiny OS is present.

⇒ The WML is a content format designed for used by small screen devices that do not have a rich input mechanism.

⇒ WML is designed to allow the device to perform local processing that reduces the number of n/w interactions required to retrive content while the user is navigating through content.

⇒ WML desires or WML consumes a less BW and high latency.

⇒ There are various attributes in WML.

1. A deck card document structure
2. An intradec & inter dec navigation model
3. Document catching model
4. Device independent man m/c interface.
5. State management model
6. Layout and images
7. Wireless Mark up Language Script. (WML binary)

1 deck card document structure

10/9/20

WML URL references a document, known as a deck.

⇒ This deck is actually a collection of pages or cards.

⇒ The entire deck is downloaded to the client, only one card at a time is displayed on the client device.

⇒ Consequently, the cards contain a relatively small amount of data.

⇒ The deck of card models allow multiple small screen pages of content to be retrived in a single n/w interaction.

An intradec & interdec model :-

⇒ Each card within a deck is assigned a unique name.

⇒ Navigation commands and anchors within a card may therefore reference any other card in that deck or an arbitary card within another deck.

⇒ The browser maintains a history stack in a format last-in first-out (LIFO).

⇒ Navigation command within a card may instruct the browser to pop the history stack, thereby displaying the most recently visited card on the history stack.

Document Caching Model :-

⇒ When delivering a document to the client, the server can designate how long the document may be safely catch before it must be

refreshed by the servers

⇒ This caching model is essentially the same as that used by HTTP Version 1.1 over the internet.

⇒ Unlike internet attached devices that can run a time synchronization protocol such that NTP however mobile phones are not assured of always having the current time.

⇒ The WAP caching specification addresses the issue by providing a mechanism through which the client can retrive an approximation of the current time from WAP gateway.

Device independent man. m/c interface

⇒ Mobile internet devices may have vastly different user i/p capabilities ranging from a complete key board of a desktop/laptop. to a numeric key pad on a cellular device.

⇒ To avoid being restricted, a particular class of devices WML provides an abstract user interface model that allows each device to choose the best way to present the content to the user.

⇒ This protocol has some basic features

⇒ browser supported timers & Timer events

⇒ Input form

⇒ Soft-key

State management Model

In this model, a set of attributes or valuable pairs of some important functions have considered.

⇒ Commands embedded within the WML document can read and write the variables which are used in those important function.

⇒ A new variable is created when it is written for first time.

⇒ The browser state represents a valuable way for communicating information not only bet the card in a single deck but also across multiple decks.

Layout and Image

This layer includes the various fundamental approaches like line breaking, table, bold face, italic, underline, big font, and small font etc.

⇒ WML also supports inline script.

⇒ It enables a number of powerful applications to be deployed on the client without the use of any scripting logic.

⇒ WAP includes a scripting Language called as WML beinary script.

Wireless Mark Up Language script

⇒ This language defines the format of the downloadable client logic that can be executed within the client browser.

This script can be used for many purposes

- Checking the validity of user i/p in WML field
- Application controlled selecting & navigating of URL
- Generating dialouges dynamically to the user without the need to perform a n/w round trip.

13/9/2014

WLL

Features :-

⇒ By using this technology PSTN switching centre can be accessed through wireless conn^{n} by the user.

⇒ This is the moderate technology bet^{n} PSTN and mobile technology.

⇒ Like wireless conn^{n} for WLL device, there is a control unit named as WANU (Wireless Access N/w Unit)

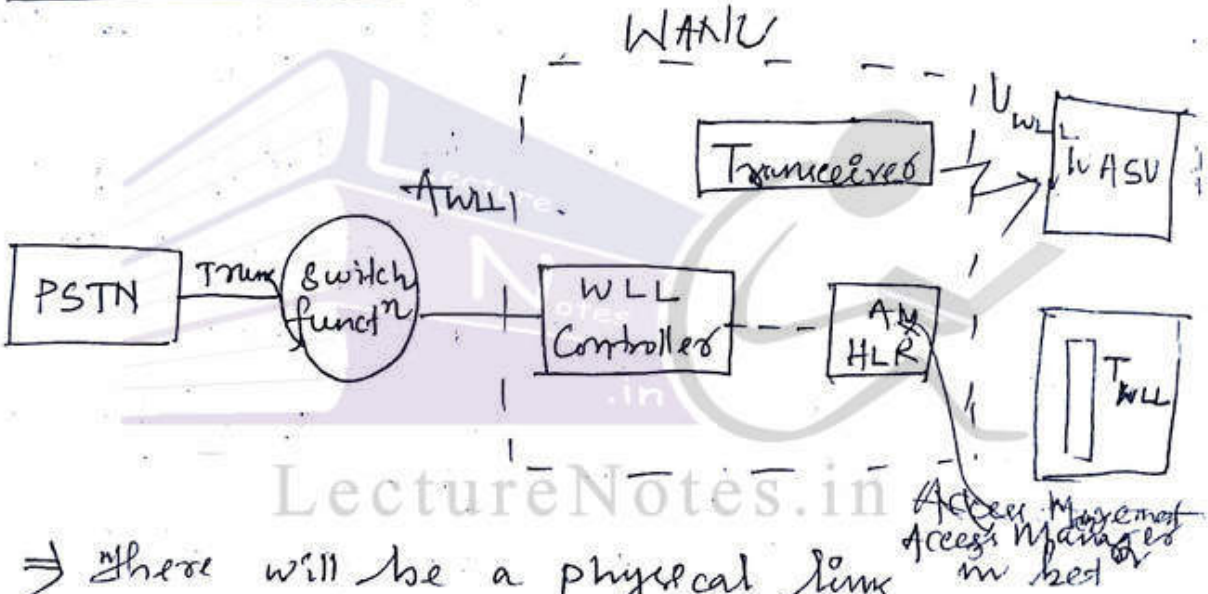
For using of these technology, there is a separate device at the user end named

as WASU (Wireless Access Subscriber Unit).

⇒ User can access to WANU through wireless / air / radio frequency.

⇒ There will be a controller in WANU which controls the comm^n via radio channels named as RPCU (Radio Port Control Unit).

WLL Architecture



⇒ There will be a physical link WANU and PSTN through a switching centre.

⇒ This architecture is based upon three basic important feature.

i) WASU (Wireless Access Subscriber Unit)
ii) WANU (Wireless Access Network Unit)
iii) Switching function

⇒ There are also two basic interfaces

i) U_{WLL} for wireless interface
ii) A_{WLL} for wired interface

17/9/2014

⇒ The architecture is overally controlled by WANU.

⇒ WANU consists of BTS, one controller unit, and one storage unit for keeping the user information.

⇒ The controller (WLL controller) controls a number of BTSs.

⇒ WLL controller consists **RPCU** (Radio Port Control Unit), which is responsible for modulation, encoding and decoding and carrier selection etc.

⇒ BTS connects with WASU through U_{WLL} interface.

⇒ The WASU is a special type of device, which is not same as the PSTN device.

⇒ WLL user device performs modulation, demodulation, encoding, decoding etc.

⇒ This device is an indoor device which is connected with either indoor antenna or outdoor antenna.

⇒ The user information has kept by HLR in WANU.

⇒ This HLR is responsible for authentication, verification and validity also.

⇒ It is also named as AMHLR (Access Manager HLR).

⇒ This HLR gives the information regarding the locality area.

⇒ The user device of WLL is also named as WASU.

⇒ By using this special type of device only, we are able to use WLL Phone.

Advantage :-

Comparision with PSTN

⇒ By using wireless channel, we can access PSTN n/w.

⇒ Establishment of WLL n/w is easier than the establishment of PSTN n/w.

⇒ This technology supports both voice and text.

⇒ Billing process is comparision to PSTN.

⇒ Billing — process where are flexibility in

⇒ Since it is wireless comm°, the device which is used for the WLL, can be movable in the local area but that is not possible in case of PSTN.

Comparision with mobile

⇒ Where the establishment of PSTN n/w and mobile n/w is not possible, in that case WLL n/w is more advantageous.

Disadvantage

- The device is bulky.

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Mobile Computing

Topic:

Third Generation (3G) Mobile Services(IMT 2000), W-CDMA And CDMA 2000

Contributed By:

Kaibalya Sethi

Gandhi Institute for Technological Advancement(GITA)

IMT-2000 (International Mobile Telecommunication)

Features

⇒ It is an international body made for International Mobile Telecommunication Society.

⇒ The responsibility of this organisation is how mobile comm^n can be established throughout the world.

⇒ This organisation was found in year 2000.

⇒ It has very wide area visions.

Visions

⇒ Mobile n/w should establish in all over the world.

⇒ The large no of data can be send over through small BW.

⇒ The mobile comm^n can be implemented for all sector.

⇒ WCDMA is used for above purposes.

⇒ License free band (ISM band 2.4 GHz) should used for wireless comm^n.

⇒ All sorts of wireless comm^n like mobile comm^n, satellite comm^n, WLL, DECT, UTAN, should be interconnected with each other.

⇒ All sorts of information like audio, video, text, data, should be sent through a single channel.

⇒ There should be no roaming concept all over the world.

⇒ All terrestrial comm^{n} should interconnected with all types of wireless comm^{n}.

⇒ There should be a single receiver which can be used for all types of wired and wireless comm^{n}.

20/9/2014

WCDMA (Wideband CDMA)

Features

Basic concepts

⇒ In the WCDMA, BW is limited but users are unlimited.

⇒ In this technology BW will allocate to the user dynamically.

⇒ As per the requirement of the user, BW will decrease for increase.

⇒ BW can be changed by using of PN sequence code randomly.

(i) → Different types of channel

Basically there are two different types of channel.

Traffic control channel

Logical channel.

These channels are responsible for transmission control, security of information, allocation of BW etc.

Short & long Data Packet →

Data can be segmented into various packet formats.

The packets may be short or long duration

DS-CDMA (Data Sequence)

Packet duration is 10ms nominally.
Each packet contains 15 no. of frame having duration 0.66 ms

Modulation type is QPSK.

Chip Rate

The chip rate of WCDMA is very high i.e. 3.84 Mchips/sec. (MCPS).

Compatible with CDMA-2000

This technology is very much compatible with CDMA 2000.
So WCDMA can be used combined with CDMA 2000

User ~~Plan~~ plane

Using point of view, this technology is easier than other.
Cost can be reduced.

Multirate Transmission

In this technology data can be transmitted in various data rates.
Even if multirate Tx occurs, QoS is good.

Channel of WCDMA

Logical Channel →

This channel has assigned logically for transmission purpose.

It is divided into two types

→ Traffic channel
→ Control Channel.

Further logical traffic channel can be divided into various type.

⇒ Further logical control channel (BCC) can be divided into various type

→ BCCH (Broadcast Control Channel)
→ PCCH (Phasing control Channel)
→ CCCH (Common Control Channel)
→ DCCH (Dedicated control channel)
→ OCCCH (ODMA Comm control Channel)
→ ODCCH (ODMA Dedicated control Channel)

⇒ Further logical traffic channel is divided into following

→ DTCH (Dedicated Traffic Channel)
→ ODTCH (ODMA dedicated traffic Channel)

Various Parameters of WCDMA

Channel BW – 5MHz

Mode of operation – Duplex mode (FDD/TDD)

Downlink Array channel structure – Direct spread.

Chip Rate – 3.84 MCPS

Frame length – 10 ms

Spreading Modulation – BPSK – Uplink
Balanced QPSK – Downlink

Channel code – Turbo code & Convolution Code

Channel Multiplexing in downlink – Data & control channels are multiplexed in downlink

Channel multiplexing in uplink – Control & pilot channels are multiplexed in uplink.

Transmission Rate – There are multi transmission rate in WCDMA.

Spreading factor – 04 – 256 uplink
04 – 512 downlink

Power Control – open & fast close loop having freq 1.6 KHz

Hand over – Soft handover & inter frequency handover.

CDMA 2000

Features :-

⇒ This concept was developed in the year 2000, so it is called CDMA-200.

⇒ In this technology, more no of users can use the limited BW.

⇒ In 3-G comm^n, the features of CDMA-2000, has been implemented.

⇒ It is also known as IMT (International Mobile Telecommunication) Multicarrier (MC).

⇒ It's specification was developed by the 3rd generation project group 2, which is a partnership consisting of 5 nos of standard telecomm^n bodies. These are

- ARIB & TTC in Japan
- CWTS in China
- TTA in Korea
- TIA in North America.

⇒ This standard has used in CDMA-2000 1X, CDMA-2000 EVDO version 0, CDMA-2000 EVDO version A, CDMA-2000 EVDO version Beta.

⇒ The comm^n speed can enhance from 144Kbps to 2 Mbps.

⇒ In this technology, the information is divided into no of packets & these packets sent over the allocation b.w.

Various Layers :-

There are three basic layers in CDMA-2000.

- Layer 1 → Physical Layer
- Layer 2 → MAC Sublayer
- Layer 3 → Line Access Control Sublayer.

Physical Layer :-

⇒ This layer is responsible for interfacing carrier assignment, modulation & demod, encoding & decoding etc.

⇒ Transmitting & Receiving bits over the physical medium which is the air.

⇒ The bits are converted into waveforms by the various modulation scheme.

⇒ Carrying out coding function performs error control & detection at the bit & frame levels.

⇒ This layer contains various channels and it is called as physical channel & these are packets sent over the allocation BW.

are

⇒ Dedicated Physical channel (DPh ch)

Forward DPh ch

Reverse DPh ch.

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⇒ Common Physical channel (CPhCh)

1. Forward (CPhCh)
   - Pilot Channel
   - Common Auxiliary Pilot Channel
   - Common Assignment Channel
   - Paging Channel
   - Broadcast Control Channel
   - Common Control Channel.
   - Quick Paging Channel.
   - Common Power Control Chaund.
   - Packet Data control Channel.
2. Reverse Common Physical Channel (RCPhCh)
   - Access Channel
   - Reverse Common Control Chaund
   - Enhanced access Channel
   - Reverse Dedicated Control Channel
   - Reverse Paging channel.
   - Reverse Pilot channel
   - Channel Quality Indication Chaund
   - Acknowledgment channel.

MAC Sublayer :-

This layer is responsible for

i) Dedicated Channel Multiplexing
ii) Common channel Multiplexing
iii) Mapping b/w logical channel.
iv) Controlling the logical & physical chaund.

Parameters of CDMA-2000

Field	Value
Timing	Synchronous
Channel BW	1.25 MHz
Downlink RF channel structure	Direct Spread.
Chip rate	1.2288 MCPS
Roll up factor	Same with roll up factor of IS-95
Frame length	20 ms (or) 5 ms
Spreading Mod^n	balanced QPSK (downlink) Dual Channd BPSK with hybrid PSK (Uplink)
Data mod^n	QPSK (for downlink) BPSK (for uplink)
Coherent Detection	Pilot time multiplexed with PC & EIB for uplink & common continuous pilot & auxiliary pilot for downlink
Spreading factor	4 to 251
Channel Multiplexing in upleink	Control, Pilot, Fundamental, suplimental code multiplex.
power Control	Open loop & fast closed loop.
Multirate	Variable spreading & multicode.
Handover	Soft handover or interfreq. handover.
Transmit Diversity	orthogonal transmit diversity space time spreading

18/10/2014

JSP

JSP technology allows a dynamic web content to be created using mark-up template with embedded scripting.

Java Servlet :-

Java servlet provide a simple consistent mechanism for extending the functionality of a web server through the application modules implemented in Java.

Connector :-

The J2EE connector architecture allows the J2EE platform to be connected to heterogeneous enterprise information.

JDBC (Java Database connectivity)

This provides uniform interface to a wide range of relational database and provide a common base on which higher level tools and interface can be built.

Java message Services (JMS)

This specifies provides a standard Java. Java API for company messaging services for reliable query and subscribe the communication push pull technology

Java Transaction API)

These defines a high level transaction management specification for a resource manager and the transaction application in distributed system.

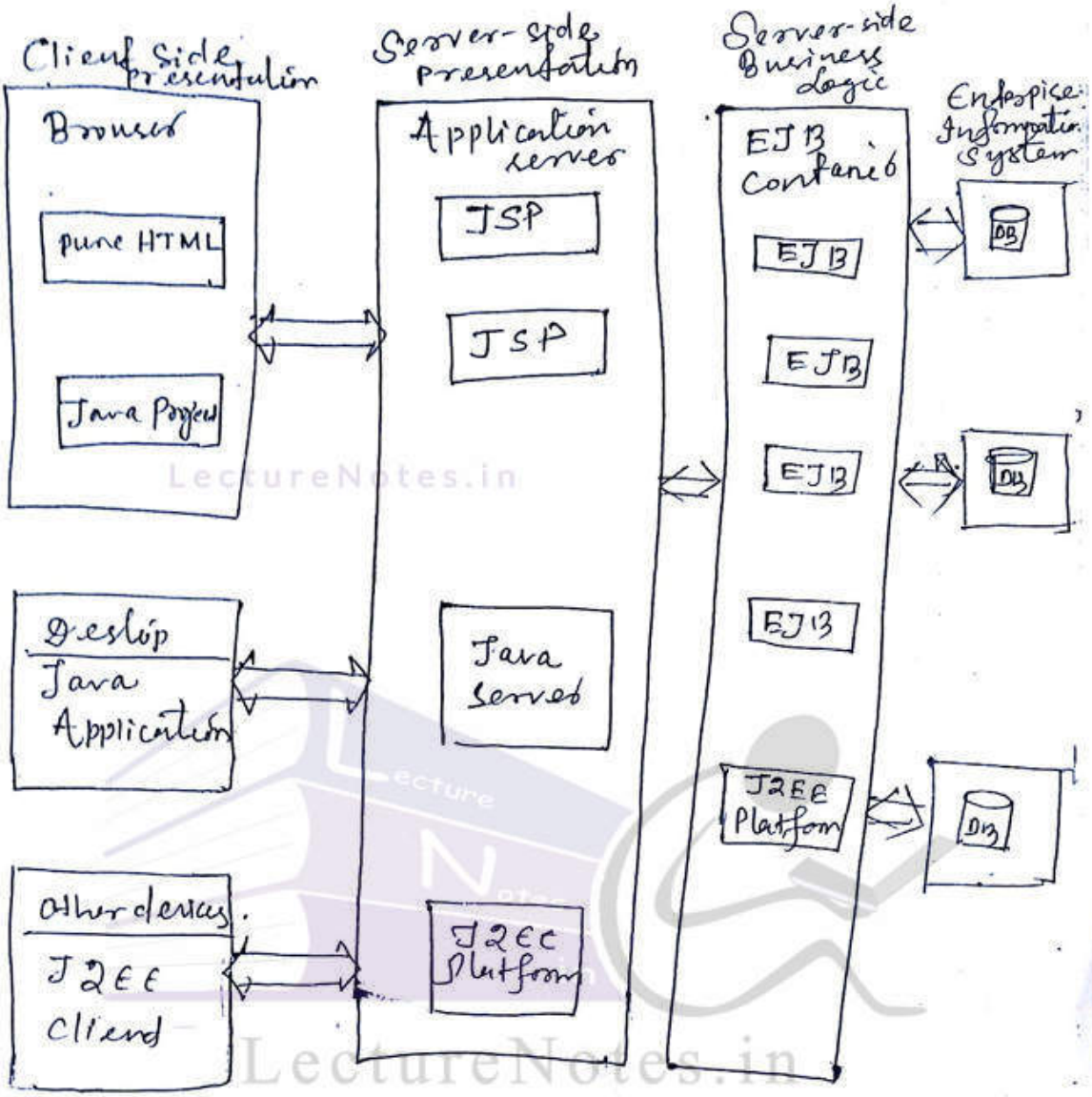
Java Transaction Services (JTS)

These API ensures the interoperability with the transaction resources such as transaction application, transaction application program, resource manager and transaction processing monitor.

Java Mail

This API provides a set of abstract classes that models a mail system.

The API provides a platform and protocol independent framework to the built Java based mail application.



EJB – Enterprise Java Bin
J2EE – Advance Java

(J2EE Application Model)

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Mobile Computing

Topic:

Global Mobile Satellite Systems

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MODULE - III

Mobile SATELLITE COMMUNICATION

There are three orbits for mounting of satellite

a. GEO (Geo stationary Earth orbit)
b. MEO (Medium Earth Orbit)
c. LEO (Lower Earth orbit)

⇒ Minimum three satellites are required for covering of whole world earth.
⇒ Coverage of one global satellite is 42%.
⇒ Angle of global coverage is 17°.
⇒ Angle of zonal coverage is 3°.
⇒ Angle of spot coverage is 1°.

5/8/2014

Parameter	GEO	MEO	LEO
1. Distance	≈ 36K Km from surface of earth	≈ 10K-20K	≈ 500 - 2K km
2. Visibility	24 hrs	15-20 min	5-10 min
3. Installation cost	less cost	More than GEO,	more than GEO, MEO.
4. Lifetime	15-20 yrs	10-15 yrs	7-10 yrs.
5. Round trip delay	10-20 ms	5-10 ms	1-5 ms

Case studies of LEO

1) GLOBALSTAR
2) IRIDIUM

Case studies of MEO

1) ICO

GLOBALSTAR

Features :-

⇒ This system exist in LEO
⇒ This system is developed in 1991,
⇒ This system containg 48 numbers of satellite.
⇒ The basic idea of the system is when satellite communication becomes failure, terrestial comm can be used with the help of GLOBALSTAR system.
⇒ There are no intersatellite commiunication
⇒ All satellite will communicate to the earth station
⇒ This system is present at the altitude of 1414 Km.
⇒ All the satellites are arranged into 8 nos of circular plane.
⇒ Each plane contain 6 nos of satellites.
⇒ Each plane is inclined at an angle 52° each
⇒ The avg weight of the satellite is 450 kg.
⇒ The life time of the satellite in this system is 7.5 yrs

⇒ The length span of satellite is 7m.

⇒ There are 16 beam antenna pattern.

⇒ The foot print of one beam is 2250 km

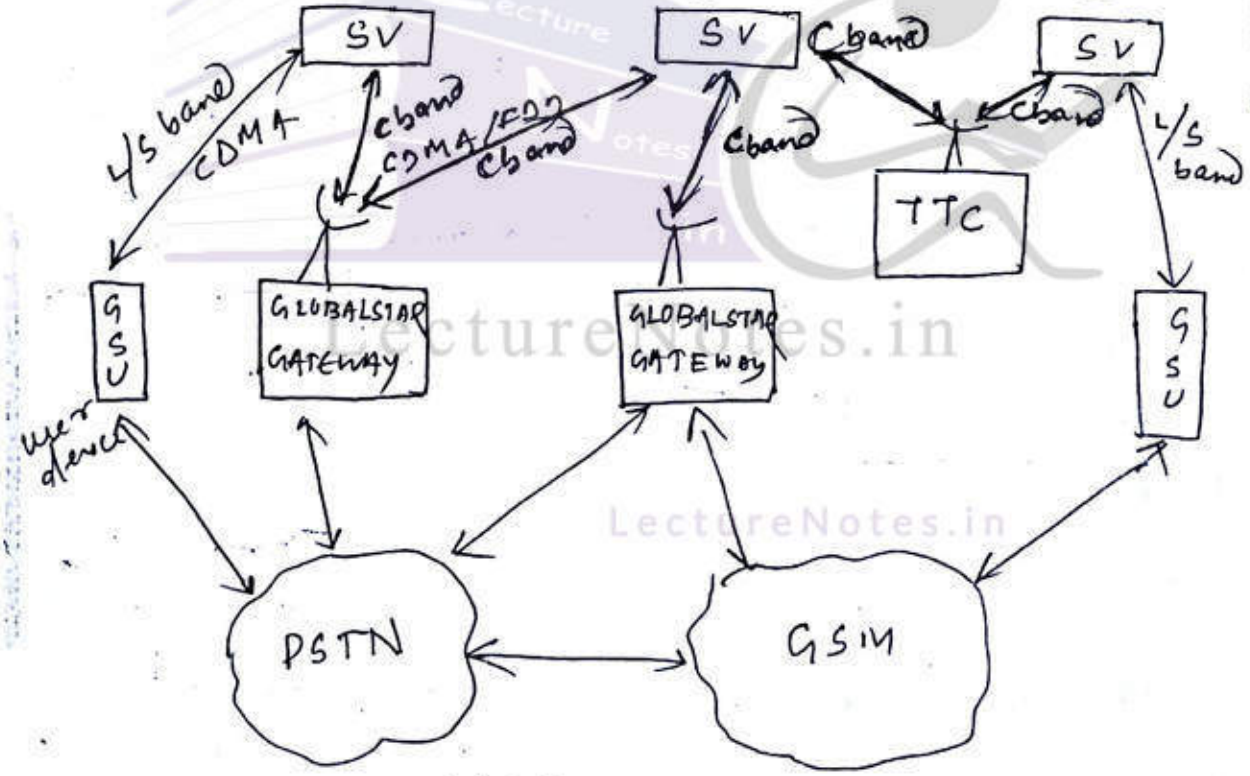
⇒ The comm^{n} technique in between satellite and user device (GSU Global-Star Subscribed Unit) is different from the comm^{n} technique used between satellite and earth station

⇒ Since there are no concept of inter satellite link, a number of transponder are present in ther satellite.

E|S|2014

Operation :-

Architecture of GLOBALSTAR



SV - Space Vehicle

GSU - GLOBALSTAR Subscribes unit

TTC - Telemetric Tracking control

⇒ This system is most effective when terrestrial comm fails.

⇒ All satellites are interconnected through earth stations.

⇒ There are two basic links in this system

1) Space Vehicle to Earth station (Gateway link)
2) Space vehicle to subscriber unit (Service link)

⇒ Operating freq. of SV to earth station

Space vehicle to Gateway - 6875.0 - 7055.0 MHz

Gateway to SV - 5091.0 - 5250.0 MHz.

C band (4-8 GHz) L band - 1-2 GHz S band - 2-4 GHz

⇒ Operating freq of SV to GSU

Subscriber to SV = 1610.0 - 1625.5 MHz (L band 1-2 GHz)

SV to subscriber = 2483.5 - 2500.0 MHz (S band)

⇒ For the service link access technique is CDMA.

⇒ For the Gateway link access technique is CDMA-FDD.

⇒ Modulation technique used is QPSK.

⇒ The subscriber unit in this system should compatible with satellite comm and terrestrial comm

⇒ It is a special type of subscriber unit.

⇒ There are four different types of Subscriber unit

1) Single mode - Global star only
2) Dual mode ← Globalstar and GSM

iii) Dual mode - Global star and GSM.

iv) Triple mode - Globalstar, CDMA & PSTN.

⇒ The terrestrial N/ws are interlinked with each other through any medium.

⇒ Similarly Gateways of Globalstar are interlinked to the terrestrial comm.

⇒ For longer distance comm the user depends upon a number of globalstar Gateways.

⇒ There are more than 1000 no of gateways for the system.

⇒ If one gateway failure, then link can be established by considering nearest gateway.

⇒ This system has divided into various regions for better comm purpose.

⇒ There are two basic channels in the system.

i) SOCC (Satellite Operation Control Centre)

ii) GOCC (Ground operation Control centre)

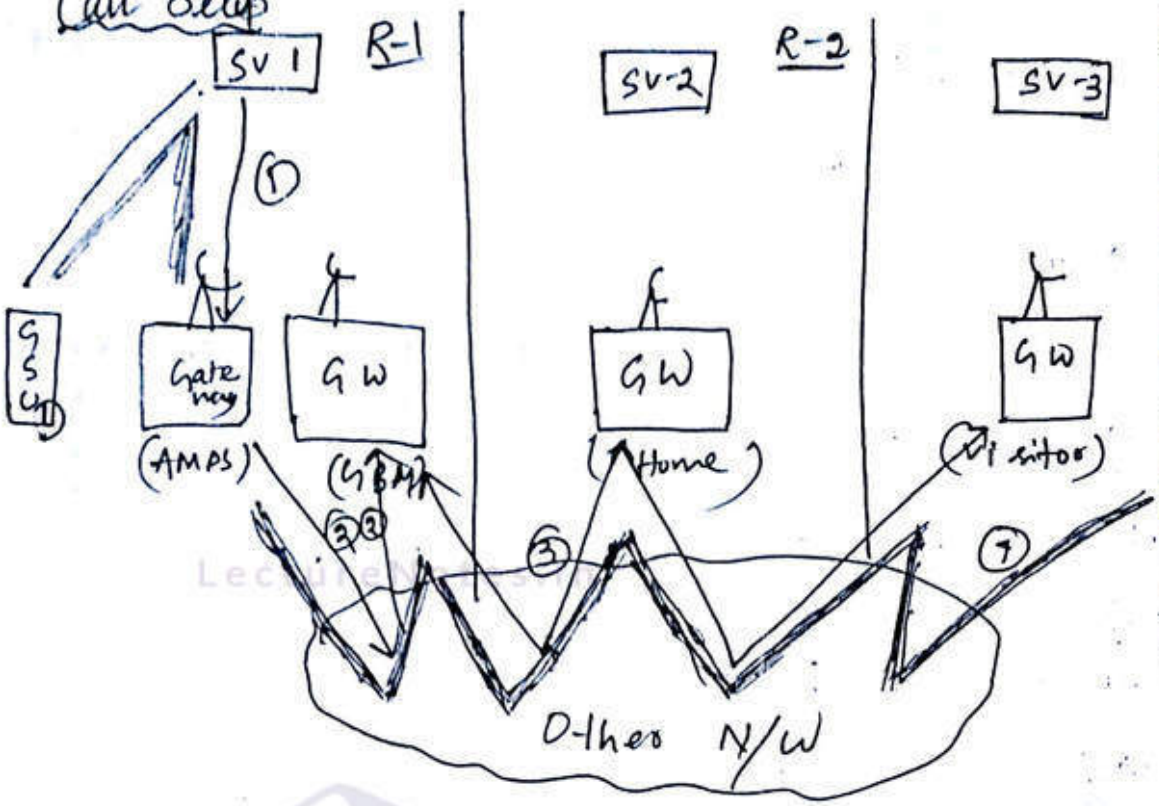
⇒ SOCC controls and tracks the space vehicle of various zones.

⇒ Similarly GOCC dynamically allocates the comm link in between the zone/region

Call Setup

Next Page

Call Setup



Path - 1

GSU1 sends a request to the AMPS gateway for location information of GSU2.

Path - 2

AMPS gateway sends a request to the GSM gateway through terrestrial line n/w for location information of GSU2

Path - 3

GSM gateway sends a request to home gateway through terrestrial line for location information of GSU2. and home gateway also pass that request to the concerned visitor gateway.

After getting the location information from visitor gateway, the home gateway sends an acknowledgement to the GSU2 through diff

gateways regarding the location information of GSU 2.

Path 4

After getting the location information of GSU 2, a Tx link can established between GSU 1 & GSU 2.

9/8/2014

IRIDIUM

Features:-

⇒ This system can is not the solution of terrestial comm^n system.

⇒ This system depends on terrestrial comm^n also but a new concept is adopted i.e inter satellite link (ISL) or inter satellite Comm^n.

⇒ This system has programmed by Motorola by considering 77 no of satellite.

⇒ After some upgradation of technology, the total no of satellite has reduced to 66.

⇒ The satellite has designed in such a manner that there are interlinks between them.

⇒ These satellites are deployed at an altitude of 756 Km.

⇒ These satellites are arranged in 6 nos of equivalent plane.

⇒ Each plane contains 11 no of satellites

⇒ The plane has arranged in such a manner that they will not crossover with each other.

⇒ They are very closer to each other at N pole

⇒ The adjacent planes are co-rotating each other except 1st plane and last plane

⇒ The 1st and last planes are counter rotating with each other.

⇒ The uniform spacing betⁿ the satellite in a plane is 32.7°.

⇒ The distance betⁿ co-rotating plane is 31.6°.

⇒ The distance betⁿ counter rotating plane is 22°.

Demerits
- In LEO altitude less, less space, placement difficult, so more cost

⇒ The satellite is equipped with 2 way, 4 no of commⁿ link for their neighbouring satellite and adjacent satellite

⇒ 2-way link consists of FDD concepts. The links in this system are dedicated/fixed.

Disad
⇒ If one satellite failures, then commⁿ can not be established

⇒ The coverage area of beam is 660 km for (48 beam pattern)

⇒ 2/3rd beams (32 beams) can be activated simultaneously and 16 no of beams can be reserved.

⇒ Hand-off is more in comparision with GLOBALSTAR.

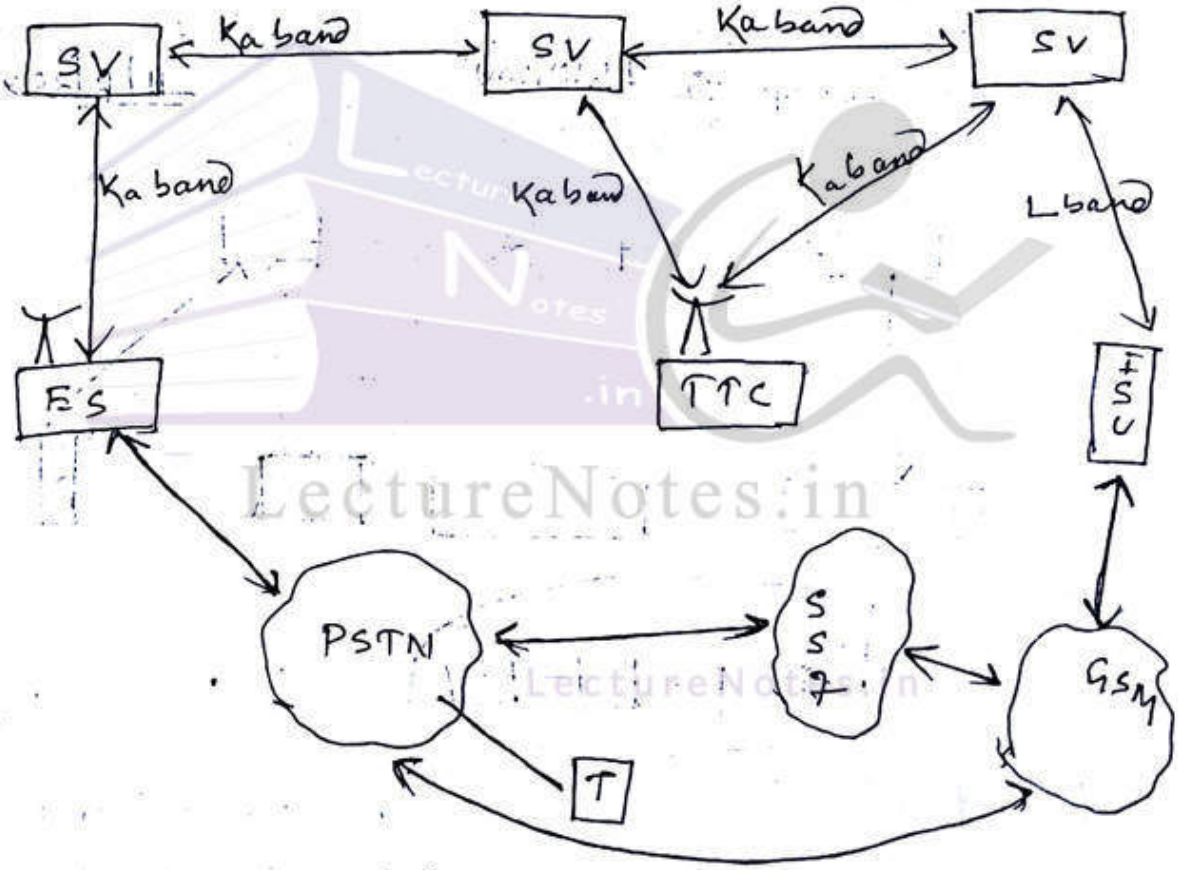
⇒ As per the necessity the required beam can be switched ON.

⇒ This concept is known as cell management.

⇒ The cell management concept is same as the cell management concept of GSM.

⇒ There are three types of service link need in the system

Architecture of Iridium



ES - Earth Station
SV - Space Vehicle
TTC - Telemetric Tracking Control
ISU - Iridium Subscriber Unit
T - Telephone

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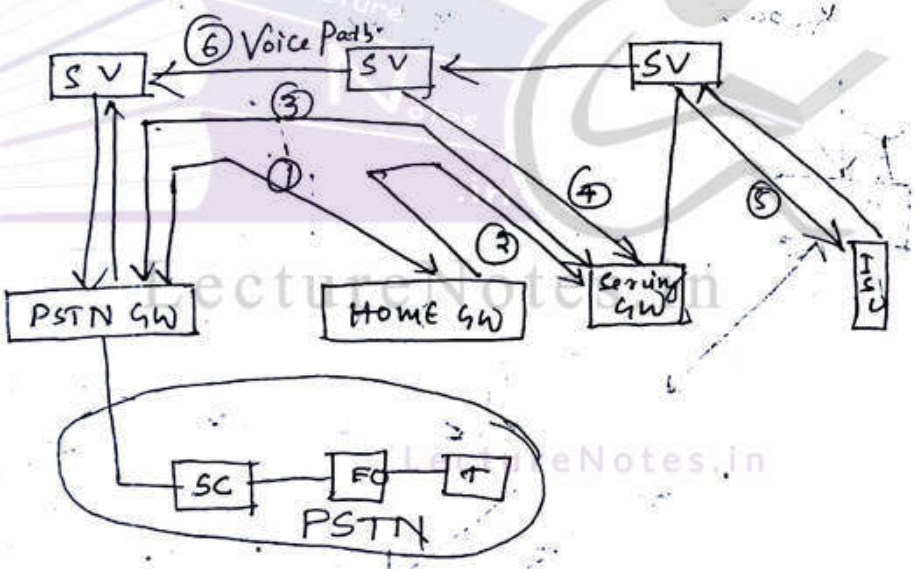
⇒ This iridium system has interfaced with terrestrial comm^n.
⇒ It is the revolutionary terrestrial comm^n system.
⇒ All the terrestrial N/W & satellite N/W are interconnected with each other.
⇒ There are three basic service links
(SV) Space Vehicle ⇔ Earth Station (ES)
(SV) Space vehicle ⇔ Traffic centre (TTC)
(SV) Space vehicle ⇔ ISU
L band is used for SV ⇔ ISU.
⇒ Ka band has used for SV ⇔ ES & SV ⇔ TTC

Call Setup in bet^n IRIDIUMS
Call set up bet^n PSTN & ISU :- 11/8/2014



The above fig. indicates the call set up process in bet^n two different N/W i.e PSTN to ISU and reverse.

Path-1
T/ PSTN N/W sends a request for authentication & location information of ISU to the home N/W

Path - 2

Since how N/w doesnot keep the location information of ISU. So if sends a request for location information of ISU to the concern serving gate way.

Path - 3

Serving gateway acknowledge the home gateway about the location information of ISU.

Path - 4

After confirmation of location information of ISU PSTN gateway sends a request to the serving gateway for establishment of voice link betn ISU and PSTN N/W through satellite.

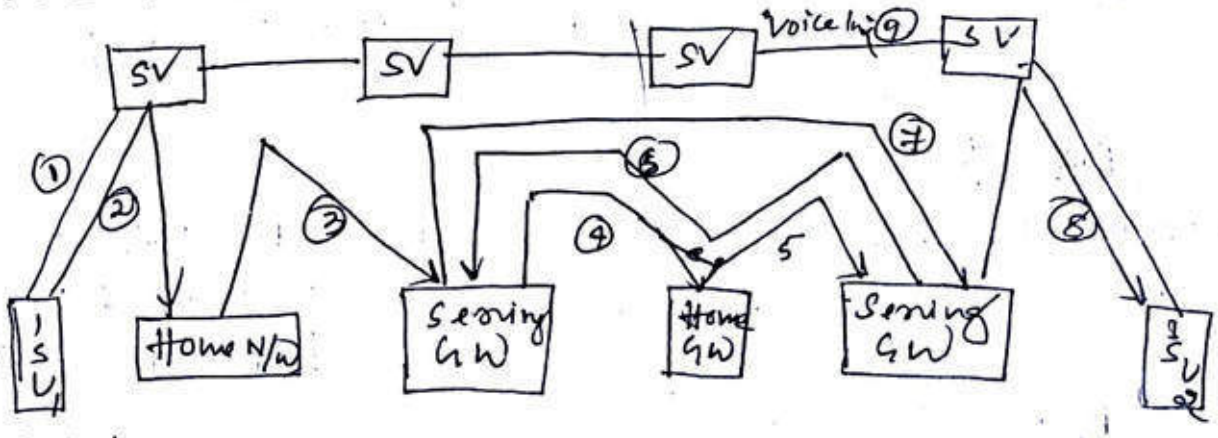
Path - 5

Serving gateway sends an alert ring to the ISU for establishment of voice link with PSTN N/W.

Path - 6

ISU receives the alert ring from serving gateway a dedicated voice link betn ISU & PSTN gateway established in betn

Call Setup betn ISU & ISU



Path - 1

ISU-1 doesnot know the location information of ISU-2. So if sends a request to the space

vehicle for establishment of connection with home gateway.

Path - 2

The request of ISU 1 forwarded to the home gateway.

Path - 3

Since home N/W doesn't have the location information of ISU 2, it sends a request to the serving gateway for location information of ISU 2.

Path - 4

Since the serving gateway doesn't have the location information of ISU 2, it sends a request to the respective home gateway of ISU 2.

Path - 5

Similarly the home gateway sends a request for location information of ISU 2 to the concerned service gateway.

Path - 6

The concerned serving gateway acknowledges about the location information of ISU 2 to the serving gateway of ISU - 1 through respective home gate way.

Path - 7

The serving gateway of ISU 1 sends a request for establishment of voice line to the serving gateway of ISU 2 to help ISU 1 of ISU 2

Path - 8

The serving gateway of ISU 2 sends an alert ring to the ISU 2.

Path - 9

After accepting the alerting by ISU2 the voice path / line can be established in between ISU2 & ISU1.

12/8/2014

ICO

Features:-

This system has placed in the medium Earth orbit (MEO).

⇒ This concept has developed in year 2000. ITU is regulating this system.

⇒ This system is not the solution of terrestrial comm^n.

⇒ This system gives some advantage, or put forward to the terrestrial comm^n upto mark.

⇒ This system supports both terrestrial and satellite comm^n.

⇒ The device which is used for the system should compatible with terrestrial N/w as well as satellite N/w.

⇒ This system is more advantageous where terrestrial comm^n is not available

⇒ The coverage area in this case is very high in comparision with other mobile satellite comm^n systems

⇒ When user moves in a faster speed at that time there are no ring failure in this case.

⇒ Comm^{n} can possible on the surface of earth as well as above the surface of earth (Aeroplane)
⇒ This system is situated in the intermediate circular orbit (ICO) of the earth.
⇒ This system contains 10 no of satellites at an altitude of 10,355 km from surface of earth
⇒ This satellites are divided into 2 no of circular plane having distance 45° from Equator (Approx).
⇒ The life span of satellite in this system is approx. 12 years.
⇒ The weight of satellite is approx. 2000 kg.
⇒ The TDMA technique has used for Tx & Rx purpose.
⇒ The earth station, meant for this system are interconnected with each other.
⇒ These Es are known as Satellite Access Node (SAN)
There are 12 no of SAN all over the world
⇒ Each SAN consists of multiple nos of antenna
⇒ Each SAN, each can connect with more than one no of satellite.
⇒ There are 163 beam antenna patter.
⇒ More than one satellite are in visibility range.
⇒ Since more than one satellite is in visible range, there are very high elevation angle.
⇒ Each SAN has more than one number of storing register for storing the information about user.
⇒ The storing reg^{s} are HLR, VLR, EIR etc.

⇒ HLR keeps the detail information of user and VLR keeps the temporary information of User.

⇒ The satellites in this system can be controlled by TT&C (Telemetric Tracking Control centre)

⇒ TT&C consists of SCC (Satellite Control centre.

⇒ SCC can control more than one satellite at a time.

⇒ 6 no of SAN on the earth form a group and connect with one SCC.

⇒ This satellite N/W as well as terrestrial N/W are controlled by the NCC (Network Control Centre (NCC)

⇒ The 12 no. of SAN has connected with one NCC.

⇒ There are two types of service links has used in this system

1) Space vehicle to user device.
2) Space Vehicle to SAN/ES device

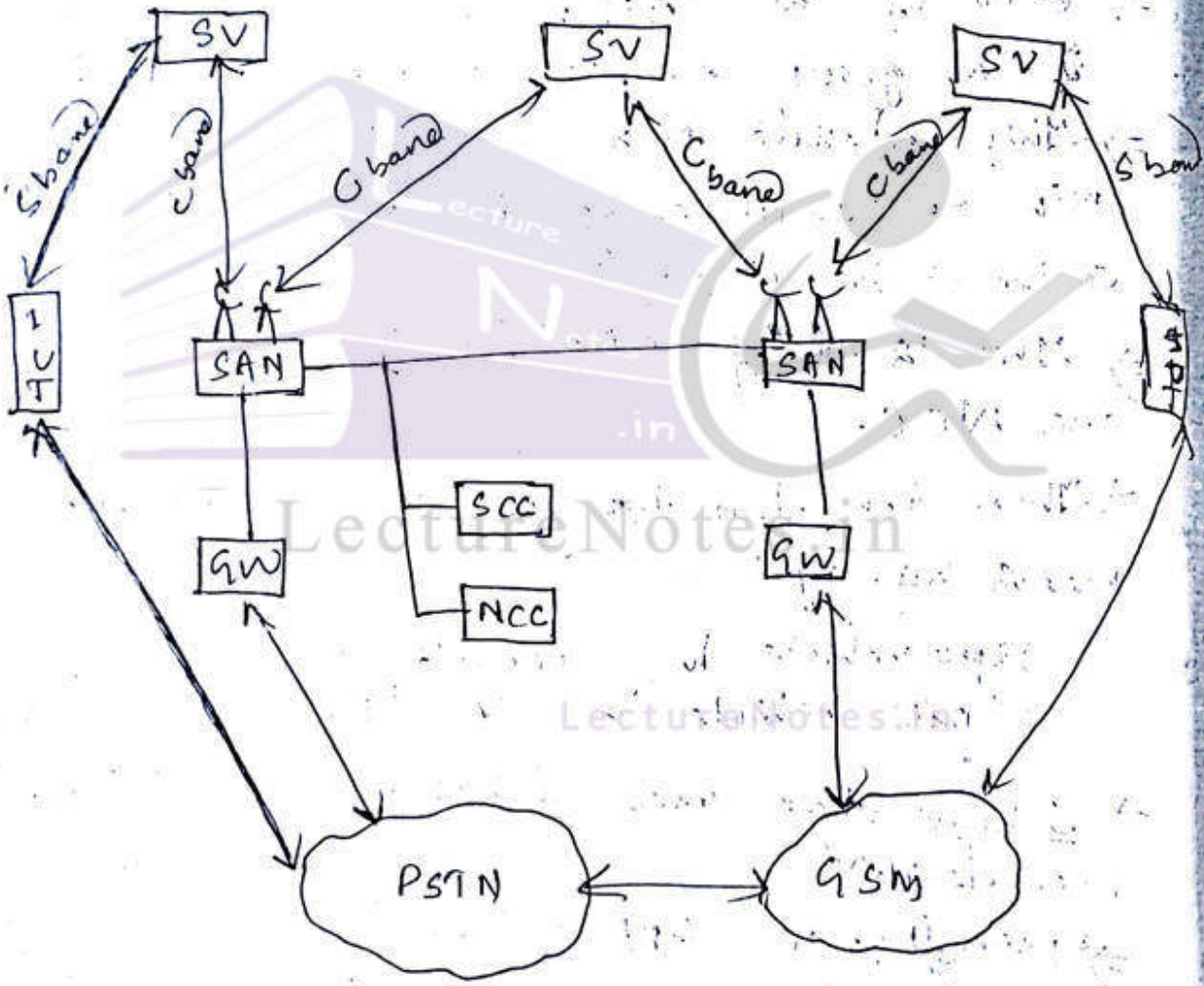
⇒ S band has used in between SV and IUD (ICO user device).

⇒ Uplink freq = 2170 - 2200 MHz
Downlink freq = 1980 - 2010 MHz.

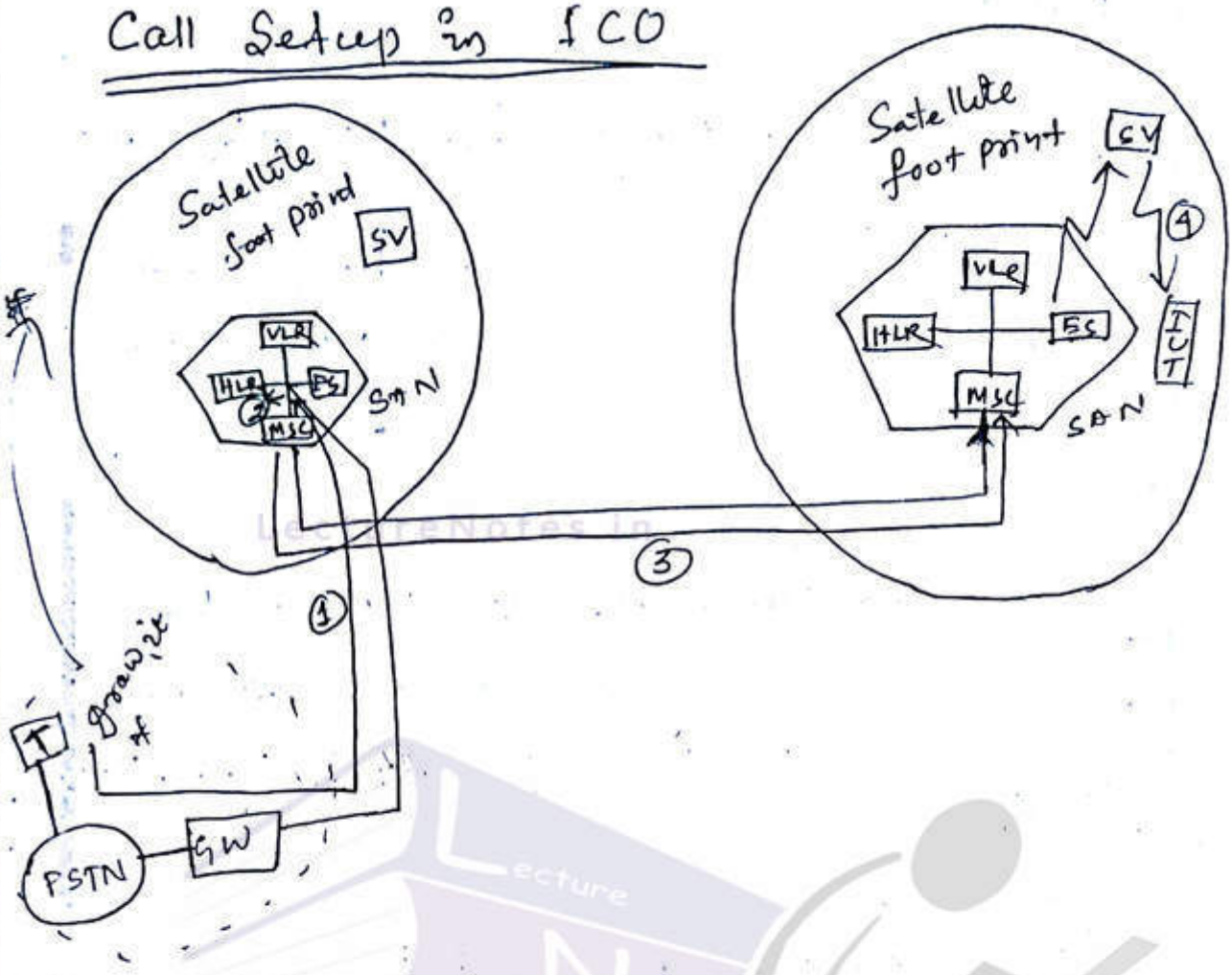
⇒ C band is used in bet SV and SAN
Uplink freq 5100 - 5250 MHz & downlink freq = 6935 - 7075 MHz.

→ In this system a special type of device is used for user
→ It is a dual mode device which supports satellite comm^n and terrestrial comm^n simultaneously
→ Low power battery is required for this.
→ The size of device is small (Pocket size) and the weight of device is 182 – 250 gm.

Architecture of ICO 13/8/2014



Call Setup in ICO



Path-1

1) Telephone from PSTN N/W sends a request to SAN for location information of IUT (ICO unit Terminal) through its concerned gateways.

By Path-2

⇒ For getting the location information of IUT SAN sends a request to its HLR.

⇒ HLR will collect the location information and send back to the PSTN N/W.

⇒ Now the PSTN N/W is updated regarding location information of IUT.

Path-3

The SAN which is connected with PSTN sends a request to the concern SAN for establishment of link with IUT

Path-4

The concerned SAN establish the link with IUT through satellite.

⇒ Now the comm^{n} link has developed between PSTN & IUT through satellite n/w & terrestrial n/w simultaneously.

Advantages

⇒ There are no ISN. (Inter satellite link)

⇒ Since coverage area is more Hand off is very less

⇒ Due to high elevation angle, 24 hrs visibility are there

Disadvantages

⇒ There must be the physical link inbetn all SANs which is costlier and difficult.

⇒ For establishment of link both satellite N/w & terrestrial N/w are required which is not possible always.

umbrella technique.

Anchor MSC -

(one MSC which controls all other small MSC.

Mindfire is a software service provider,
with unrelenting focus on optimal software development
and delivery.