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Bh.Notes: WT

IT Semester 6

**A series of Important Concepts/Questions
highly recommended for MU Exam**

'C' SCHEME - 2019-2020

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Q1. Explain the evolution of cellular systems highlighting

1G/2G/3G. (P4-Appeared 1 time) (5-10M)

Ans :1G

- The very first generation of commercial cellular network was introduced in the late 70's with fully implemented standards being established throughout the 80's. The radio signals used by 1G are analogue, meaning the voice of a call is modulated to a higher frequency rather than being encoded to digital signals.
- Analogue signals degrade over time and space meaning that voice data can very often lack quality within a call. In comparison, digital is a representation of analogue stored as signals, meaning larger amounts of data can be carried more effectively.

2G

- The second generation saw the introduction of GSM (Global System for Mobile Communication) technologies as a standard in the early 90's. It allowed for digital voice and data to be sent across the network and allowed users to roam for the first time.
- 2G also used Signalling and Data Confidentiality and Mobile Station Authentication to ensure improved security and privacy of telephone calls.
- The advance in technology from 1G to 2G introduced many of the fundamental services that we still use today, such as SMS, internal roaming, conference calls, call hold and billing based on services e.g. charges based on long distance calls and real time billing.

2.5G

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- Between the year 2000 and 2003, an upgrade in technologies introduced the packet network which provided high speed data transfer and internet access and became known as 2.5G.
- The standards included GPRS (General Packet Radio Service) and EDGE (Enhanced Data Rates in GSM).
- GPRS supports flexible data transmission rates and provides continuous connection with the network. It also allows for the service provider to charge for the amount of data that is sent rather than their connection time.

3G

- Introduced commercially in 2001, the goals set out for third generation mobile communication were to facilitate greater voice and data capacity, support a wider range of applications, and increase data transmission at a lower cost.
- For the first time, this generation supported high speed wide band internet access as well as fixed wireless internet access and allowed for video calls, chatting and conferencing, mobile TV, video on demand services, navigational maps, email, mobile gaming, music and digital services such as movies.

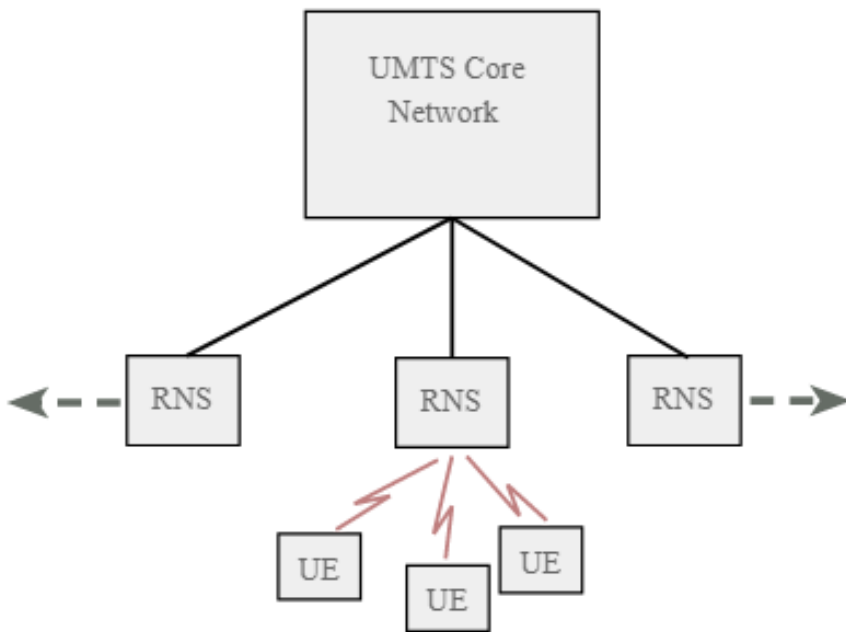
Significantly greater security features were introduced within 3G, including Network Access and Domain Security and Application Security.

Q2. UMTS architecture.(P3-Appeared 3 time)(5-10M)

Ans :The UMTS network architecture can be divided into three main elements:

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- **User Equipment (UE):** The User Equipment or UE is the name given to what was previously termed the mobile, or cellphone.
- The new name was chosen because of the considerably greater functionality that the UE could have. It could also be anything between a mobile phone used for talking to a data terminal attached to a computer with no voice capability.
- **Radio Network Subsystem (RNS):** The RNS also known as the UMTS Radio Access Network, UTRAN, is the equivalent of the previous Base Station Subsystem or BSS in GSM. It provides and manages the air interface for the overall network.
- **Core Network:** The core network provides all the central processing and management for the system. It is the equivalent of the GSM Network Switching Subsystem or NSS.

The core network is then the overall entity that interfaces to external networks including the public phone network and other cellular telecommunications networks.

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Q3.What is the spread spectrum? Explain FHSS in detail(P4–Appeared 1 time)(5–10M)

Ans :Spread spectrum is a technique used for transmitting radio or telecommunications signals. The term refers to the practice of spreading the transmitted signal to occupy the frequency spectrum available for transmission.

- The advantages of spectrum spreading include noise reduction, security and resistance to jamming and interception.
- Frequency hopping spread spectrum (FHSS) is a method of transmitting radio signals by shifting carriers across numerous channels with pseudorandom sequence which is already known to the sender and receiver
- Frequency hopping spread spectrum is defined in the 2.4 GHz band and operates in around 79 frequencies ranging from 2.402 GHz to 2.480 GHz. Every frequency is GFSK modulated with channel width of 1MHz and rates defined as 1 Mbps and 2 Mbps respectively.
- Frequency hopping spread spectrum is a robust technology with only very little influence from reflections, noise and other environmental factors. The active system numbers in the same geographical areas is higher than an equivalent number for direct sequence spread spectrum systems. Thus it is suited well for installations designed to cover large areas where numerous co-located systems are needed.
- They are also used in cellular deployments for fixed broadband wireless access where direct sequence spread spectrum cannot be used.

A variation of frequency hopping spread spectrum is adaptive frequency hopping spread spectrum that improves resistance to radio frequency interference by avoiding crowded frequency in hopping sequence.

Q4.Short note on Wi-max.(P4-Appeared 1 time)(5-10M)

Ans :WiMAX:

- i. The 'World Interoperability for MicroAccess, Inc. (WiMAX)' forum, an industry group, focuses on creating advanced technology solutions for high speed wide area internet access.
- ii. The WiMAX product certification program ensures interoperability between WiMAX equipment from vendors worldwide.
- iii. WiMAX can serve as a backbone for 802.11 hotspots for connecting to the internet. Alternatively, users can connect mobile devices such as laptops and handsets directly to WiMAX base stations. Mobile devices connected directly can achieve a range of 4 to 6 miles.
- iv. There are 2 types of WiMAX, fixed WiMAX(IEEE 802.16d-2004) and mobile WiMAX(IEEE802.16e-2005). Fixed WiMAX is a point-to-multipoint technology, whereas mobile WiMAX is a multipoint-to-multipoint technology, similar to that of a cellular infrastructure.

Some of the salient features supported by WiMAX are:

- i. High data rates: - WiMAX can typically support data rates from 500 Kbps to 2 Mbps. - The inclusion of multi-input multi-output(MIMO) antenna techniques along with flexible sub-channelization schemes, advanced coding and modulation all enable mobile to support peak downlink data rates of 63 Mbps per

sector and peak uplink data rates of up to 28 Mbps per sector in a 10 MHz channel.

ii. Quality of service (QoS):

- WiMAX has clearly defined QoS classes for applications with different requirements such as VoIP, real time video streaming, file transfer and web traffic.

iii. Scalability:

- Mobile WiMAX is designed to be able to work in different channelization from 1.25 to 20 MHz to comply with varied world-wide requirements.

iv. Security:

- There is support for a diverse set of user credentials like SIM/USIM cards, smart cards, digital certificates, username/password schemes.
- All this is based on relevant 'extensible authentication protocol (EAP)' methods for credential type.

v. Mobility:

- Mobile WiMAX supports optimized handoff schemes with latencies less than 50ms to ensure that real time applications such as VoIP can be performed without service degradation.

Flexible key management schemes assume that security is maintained during handoff.

Q5. Discuss and compare between MANET & VANET architecture with its applications. (P4-Appeared 1 time) (5-10M)

Ans :

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S.No.	MANET	VANET
1	Production cost of MANET is cheap as compared to VANET	Much Expensive
2	Mobility of MANET is low as it makes it difficult for the network to enable the serving networks to locate a mobile subscriber's point.	High Mobility, as serving networks to locate a mobile subscriber's point is easy.
3	Change in network topology orientation is slow.	Frequent and very fast change of network topology,
4	Sparse node density.	Node density is a frequent variable.
5	MANET HAVE 100 Kbps bandwidth available.	VANET bandwidth is 1000 Kps.
6	It ranges Upto 100 m.	500 m range available in VANET.
7	MANET node lifetime depends on power resources.	Depends on lifetime vehicle.

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8	MANET has medium reliability.	High reliability of VANET.
9	Movement of the nodes affects the operation of a MANET as node movement MANETs need to rely on robust routing protocols. And this MANET has random node movement.	Regular, moving pattern of nodes.
10	Attribute Based addressing scheme.	Location Bases addressing scheme.
11	Position acquisition is obtained using Ultrasonic.	VANET maintains position acquisition by using GPS, RADAR.
12	Availability of Multi-hop Routing	Weakly available Multi-hop Routing.

Q6. Short note on Zigbee architecture. (P4–Appeared 1 time) (5–10M)

Ans : Zigbee Technology is a Wireless Communication Standard that defines a set of protocols for use in low data rate, short to medium range wireless networking devices like sensors and control networks.

- The target of Zigbee Technology is low cost, low power, battery operated wireless sensors that do not need to constantly update its

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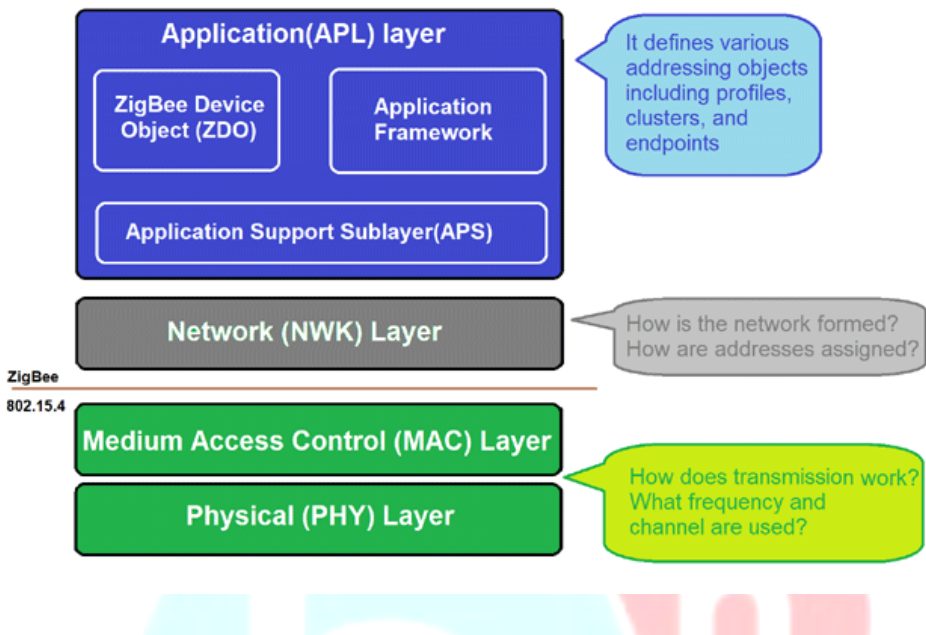
status and also allows sleep mode or low power mode for its electronics and radio.

- Zigbee Technology is based on IEEE 802.15.4 Standard and the Zigbee devices operate in the unlicensed 2.4 GHz ISM Band (ISM – Industrial, Scientific and Medical).

ZigBee Architecture:

There are four major layers available in ZigBee stack which are physical layer, Media access layer, Network layer and application layer.

- Application layer defines various addressing objects including profiles, clusters, and endpoints. You can see the ZigBee stack layers in the figure above.
- Network layer: It adds routing capabilities that allows RF data packets to traverse multiple devices (multiple "hops") to route data from source to destination (peer to peer).
- The MAC layer manages RF data transactions between neighboring devices (point to point). The MAC includes services such as transmission retry and acknowledgment management and collision avoidance techniques.
- Physical layer: It defines how devices are connected to make a network; it defines the output power, number of channels and transmission rate. Most ZigBee applications operate on the 2.4 GHz ISM band at a 250kbps data rate.



Q7. Short note on Network Mobility Services.(P4-Appeared 1 time) (5-10M)

Ans :Network Mobility Services Protocol (NMSP) manages communication between the mobility service engine and the wireless controller. Transport of telemetry, emergency, and RSSI values between the mobility service and the controller is managed by this protocol. Below diagram shows how NMSP fit in Cisco Unified Wireless Network (CUWN) setup

- Cisco Network Mobility Services Protocol (NMSP) is a secure two-way protocol that can be run over a connection-oriented (TLS) or HTTPS transport.
- The wireless infrastructure runs the NMSP server and Cisco Connected Mobile Experiences(Cisco CMX) acts as an NMS client. The controller supports multiple services and multiple Cisco CMXs can connect to the NMS server to get the data for the services

(location of wireless devices, probe RSSI, hyperlocation, wIPS, and so on.) over the NMSP or HTTPS session.

- NMSP defines the intercommunication between Cisco CMX and the controller. Cisco CMX communicates to the controller over a routed IP network. Both publish-subscribe and request-reply communication models are supported. Typically, Cisco CMX establishes a subscription to receive services data from the controller in the form of periodic updates.
- The controller acts as a data publisher, broadcasting services data to multiple CMXs. Besides subscription, Cisco CMX can also send requests to the controller, causing the controller to send a response back.

The following is a list of the Network Mobility Services Protocol features:

- NMSP is disabled by default.
- NMSP communicates with Cisco CMX using TCP, and uses TLS for encryption.

Wireless intrusion prevention system (wIPS) is supported only over TCP and TLS.

Q8. more questions are available in Brainheaters app....

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