Midterm Exam

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April 29, 2017

Chapter 1

1 1831 Faraday Electromagnetic induction law; 1837 Morse telegraph; 1876 Bale Phone; 1895 Marconi radio; 1988 GSM;

2 Cellular networks;WLAN;bluetooth;Mobile management;

Chapter 2

1 propagation disitance of wired media is limited by wire length, while wireless media can propagate in air.

2 liscensed band:special usage;unlicensed band:free for other usage.

3 Frequency,medium,obstacle

4 reflection: when encountering obstacle, change direction; diffraction: diffuse when crossing small orifice; scattering: direction lightly changed when medium is not self;

5 indoor: mainly reflection,diffraction at door frame. outdoor: reflection at buildings and Ionosphere, scattering in atmosphere.

6 $P_r = P_t G \frac{h_m h_b}{d^4}$

7 free space:$P_r = 10 lg \frac{P_t G}{l}$ delay $\delta t = \frac{l}{c}$; two-ray:$P_r = 10 lg P_0 d^{-\alpha}$ delay $\delta t = \frac{l}{c}$;

8 $L_p = L_0 + 10\alpha \lg D + X$

9 in city,$L_p = A + B \lg d$;in urban,$L_p = A + B \lg d - C$;in open space,$L_p = A + B \lg d - D$.$A = 69.55 + 26.16 \lg f_c - 13.82 \lg h_b - a(h_m)$,$B = 44.9 - 6.55 \lg h_b$,$C = 5.4 + 2(\lg \frac{f_c}{28})^2$

10

11 multipath/small-scale fading: Cause sharp change in phases. Doppler shift: cause deviation of frequency.

12 Doppler shift:when sender and receive move relatively,frequency deviation comes into being.

$v(t) = \frac{Vf}{c} cos\theta$

13 $f = f_0 + \frac{Vf}{c} cos\theta$

14 $LCR = \sqrt{2\pi} f_d \rho e^{-\rho^2}$ $AFD = \frac{1}{LCR}$

Chapter 3 and 4

1 data rate increase, connect to Internet with mobilephone, can transmit video information.

2 $C = MJN$

3 $q = (N_I \times \frac{S}{I})^{\frac{1}{k}} = \sqrt{3N}$

4 base stations:station that relay signals;uplink:station on ground send signal to satellite;downlink:satellite send signal to ground station;cell:a cellular district;mobile switching centers:a center to control switches.

5 VLR:provide a database for visitors;HLR:save data

6 handoff:keep communication when a node moves across cells. location:obtain the location of users.

7 Higher data rate;more stable;can browse web page;can transmit video.

8 Their purpose is to improve transmit efficiency.difference:CDMA is code division,TDMA is time division.

9 SGSN:serving GRRS support node.
GGSN:gateway GRRS support node.

10 WCDMA,CDMA2000,TD-CDMA.

11 combination of wireless communication and Internet media.

12 potential rate:150kbps;bandwith:1.6Mhz;frequency:450MHz.

13 TDMA:2G communication; CDMA:3G communication.

14

Chapter 5

1 Mobile Cloud Computing, Mobile Web Pages, Pervasive Computing

Chapter 6

1 Determine the appropriate threshold of signal strength to handoff; Determine whether to do quick handoff according to the speed of mobile station; Find the new base station that can give stronger signal Build connection with new base station; Cut off connection with the original station.

2 intra-switch handoff happens in one MSC(Mobile switching center)inter-switch handoff happens between two MSC.

3 MCHO: Mobile Controlled Handoff. NCHO: Network Controlled Handoff. MAHO: Mobile Assisted Handoff,

4 Hard handoffs: adv.: dont need to change channel; disad.: communication should be cut off temporarily; Soft handoffs: adv.: communication can be maintained; disadv.: will take up more channel resources.

5 Mobile devices detect signal strength from base station automatically, and feedback to base station.

6 Straight-line: linear function model. Fluid flow: A model used to describe fluid flowing in container.

7

8 If MSC found that signal strength from a mobile station is decreasing, and meanwhile there is no cell in this MSC that has a stronger signal, then inter-switch handoff should be happened,

9

10 If a cell split to several smaller cells, though system capacity and transmit power can be improvedthe handoff will be carried out more frequently.

11 It consists of cellular network and WLAN(Wireless Local Area Networks).

12 location update: when the coding detected is different from last time, location should be updatedit consists of 2 stepsAuthentication and database update. Service delivery: Mobile devices initialization; give a call; call delivery; Receive call; keep call; handoff when cell change;

13 time-based: detect location at regular time, its easy to manage but doesnt work when users move fast; movement-based: detect location based on users movement. Its flexible .When users are static, detect frequency can be decreased. distance-based: accurate but need more resources.

14

Chapter 7

1 A permanent IP address allow me to have a fixed IP address when a node change link.

2 MN: Mobile Node; HA: Home Agent; FA: Foreign Agent; COA: Care-of Address; CN: Communication Node;

3 with: HA Intercept data, and encapsulate data using reverse tunneling, then send to CoA Without: HA send data to MN directly

4

5 Mobile node initiates registration when link change. Then Mobile node broadcast to home network for registration. After that, Foreign agent will generate a Care-of Address and notice the home agent.

6 When errors take place in a registration, die out automatically and then re-register can correct the errors.

7

8

9 Noise too loud or be refused by agent.

10 IP in IP encapsulation: the whole IP data pack be encapsulated directly. Minimum encapsulation: new IP head be inserted between original IP head and IP load. General routing encapsulation: data for a protocol be encapsulated in data for another protocol.

11. Reverse tunneling is a data encapsulation technology. By this technology, the original IP package would be encapsulated in data payload of another data package. IP address would be grouped and encapsulated respectively at the beginning of tunneling, and would be split at the end of tunneling.

12

13

Chapter 8

1 DCF: Distributed coordination function; PCF: Point coordination function; DIFS: DCF Interframe Spacing; SIFS: Short interframe space; PIFS: PCF

Interframe Space

2

3 802.11e :a standard that defined quality-of-service of Wireless Local Area Networks; EDCA: Enhanced Distributed Channel Access; HCF: Hybrid Coordination Function;

4 ad-hoc: no center, Self-organized, Multi-hop routing, Dynamic topology. Only contains STA; Infrastructure: contains STA and AP;

5

6

7 LLC:Logic Link Control; MAC: Media Access Control; PLCP: Physical Layer Convergence Protocol; PMD: Physical Media Dependent.

8 infrared:need specific device to receive;radio:transmit by electromagnetic wave, further transmission distance.

9 802.11, 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac, 802.11ad.

10 depends on AIFS(arbitration inter-frame space),the shorter AIFS is, the higher priorities it has.

11 DCF,PCF

12

13

14 NAV reflect the level of busyness of channel, if it was missing, conflict may increase.

15 All supported. 802.11:INORA and SWAN;infrastructure mode:PCF and HCF;ad-hoc mode:INORA and SWAN.

16 to avoid information errors happen.

17 ad-hoc:every station in a basic service area keeps a copy of TSF.

18 Beacons will be sent regularly.

19 It works,but can have more deviation.

20 Power management could help save energy.

21 infrastructure:when not busy,it is allowed to sleep; Ad-hoc:stations wake up when beacons come.

22 ATIM: the time when stations declare whether they have buffered packets.DTIM:when multicast frames will be sent.

23 distributed,terminal implementation.

24 capacity is limited,message should be fragmented to send.

25 control which mode the station work in.

26 one address is too limited to store information like Dest PAN ID,Dest address,source PAN ID and so on.

27 802.11a use OFDM(Orthogonal Frequency Division Multiplexing).

28 to keep information private.

29 2 ways:Open System authentication and Shared key authentication.

30

31 if the destination is matched,then the WEP key will be delivered.

32 WEP:convenient but have risks to be crack violently;MAC

ltering:MAC address couled be attacked.Captive portals:have risks to be invaded from other users.

33 Active:clients detect request and response;passive:depends on channel beacons.

34 by the standard EDCA(Enhanced Distributed Channel Access)

35

Chapter 9

1 High data rate;stable;long transmission distance.

2 large range frequency and multiple antenna support.

3 divede channel into several sub-channel, convert data signal into slower parallel data signal.Then modulate the parallel signal onto sub-channel.

Chapter 10

1 Infrastructure:need fixed control center,poor ability of self-organization.Ad-hoc:Self-access,dynamic topology.

2 scale is related to transmitter,relationship is related to receiver.

3 a region that have large transmission capacity.

4

5 hidden:can't be detected by transmitter;exposed:can be detected by transmitter.

Chapter 11

1 Encryption mechanism and certification mechanism.

2 EAPOL Start frame to certifier;Certifiers send request;Applicants response;certifier sends the authentication result to the applicant;

3 WAPI contains ASU(authentication service unit) on the basis of WEP;802.11i use 2 new encryption mechanisms:TKIP and CCMP.

Chapter 12

1 longer transmission distance and lower power consumption;

2 Active state,Sniff state,Hold state,Park state.

3 Reader:deal with two-way communication with the electronic tag;

electronic tag:communicate with reader.

4 Chip technology,Antenna Design Technology,Packaging technology,RFID anti-collision technology.

5 Logistics transportation management;retail merchandise ;Manufacturing industry field.

Chapter 13

1 Sensor networks:collect information;base station:relay signal; monitoring station:monitor performance of base station.

2 Self-identification;Self-diagnosis;synchronization.

3 Biological environment monitoring system;Intelligent dust;Remote health monitoring.

4 sprinkle with planes or set up manually.

5 data rate:40kb/s;distance:1000 ft;programming flash memory:128KB;measuring flash memory:512KB;EEPROM:4KB.

6

7 nuclear energy;solar energy.

Chapter 14

1 RFID;sensor network;nanotechnology;intelligent technology;

2 Secure;high transmission rate;low cost;

3 BLE focus on low energy consumption,so its accuracy is poorer than tranditional bluetooth;

4

5 features:low energy consumption;small size;stable.

applications:used for health care; location in navigation.

Chapter 15

1 SDN(Software Defined Network) is a programmable network architecture.

2 Separattion of control layer and forwarding layer.

3 Overlay;Service Function Chaining;flow visualization;cloud security.

4 separate control structure and physical structure,thus more flexible;less cost.

Chapter 16,17 and 18

1 Motor;camera;GPS;microphone;various sensors;WiFi;Ethernet support.

2 Auxiliary driving;voice control;interact depthly.

Auxiliary driving:the car could correct driving direction according to the maps and traffic conditions.

Chapter 19

1 SISO use single antenna to input and output;MIMO use mutiple antennas to input and output.

2

3 Space diversity:Repeat transmission to decrease BER;

space-multiplexing:multiplex antenna to increase transmission efficiency.

4 Distributed MIMO;Multi-user MIMO;Networked MIMO.

Networked MIMO:base station use distribute structure,networked MIMO excels in overcoming interference inside cell.

Chapter 21 and 22

1 Security in value:value fluctuate fiercely.

Security in account:have risks to be stolen.

2 Black and white grid to store information;location point;fault tolerance mechanism.