

Mid Term Exam

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Chapter1 1.The first professional wireless network was developed under the brand ALOHAnet in 1969 at the University of Hawaii and became operational in June 1971. The first commercial wireless network was the WaveLAN product family, developed by NCR in 1986. 2.Wi-Fi; mobility network; IP address; WiMAX; Wireless Network Security; Internet; Software Defined Network.

Chapter2 1.Wired internet is where a physical wire is connecting you to the internet, such as a Ethernet cable going into the Ethernet port on the back of your computer. Wireless internet uses digital radio signals in the air to transfer data from a wireless router to a computer with a wireless adapter (built in or external. H 2. Licensed band:1GHz, 2 GHz, 5GHz and 28-60GHz IR ;unlicensed band:ISM, U-NII. 3.Terrain(indoor and outdoor); operating frequency (low or high); the velocity of the mobile terminals; interference source. 4.Reflection: when the obstacle's size is larger than wavelength; Diffraction: when the route from sender to receiver are blocked by sharp fringe; Scattering: when the size of matter is smaller than wavelength. (5)Reflection mainly appears indoor, while diffraction and scattering often happen outdoor. 6. $P_r = G_t \cdot G_r \cdot P_t / L$; $G = 4\pi \cdot A_e / \lambda^2$; $P_r / P_t = G_t \cdot G_r \cdot h_b^2 \cdot h_m^2 / d^4$ 7.In free space modeling, $10 \lg P_r = 10 \lg P_0 - 20 \lg d$; $L_p \text{ [dB]} = 32.45 + 20 \lg f_c \text{ [MHz]} + 20 \lg d \text{ [km]}$. In two-ray modeling, $10 \lg P_r = 10 \lg P_0 - 10 \lg d$; $L_p = L_0 + 10 \lg D + X$. 8.In a wireless communication system, slow fading can be caused by events such as shadows, where larger obstructions mask the main signal path between the transmitter and the receiver, and the received power is reduced. As the distance changes, the power of the slow down, so called slow fading. So it's called slow fading. It will cause the effect like Near-far problem, shadow effect. 9. $L_p = L_0 + 10 \lg D + X$ 10. sorry I can't found it. 11.Multipath fading occurs in any environment where there is multipath propagation and there is some movement of elements within the radio communications system. The Doppler shift is the change in frequency of a wave for an observer moving relative to the source of the

wave. 12.Rayleigh distribution $f(x) = \frac{x}{\sigma^2} e^{-\frac{x^2}{2\sigma^2}}, x > 0$ Ricean distribution:

$p(R) = \frac{R}{\sigma^2} \exp\left(-\frac{R^2 + A^2}{2\sigma^2}\right) \cdot I_0\left(\frac{RA}{\sigma^2}\right)$ 13.Dopplershift: $f_d = \frac{1}{2\pi} \frac{\Delta\varphi}{\Delta t} = \frac{v}{\lambda} \cos\theta$ 14.Rayleigh

distribution $f(x) = \frac{x}{\sigma^2} e^{-\frac{x^2}{2\sigma^2}}, x > 0$ Ricean distribution: $p(R) = \frac{R}{\sigma^2} \exp\left(-\frac{R^2 + A^2}{2\sigma^2}\right) \cdot I_0\left(\frac{RA}{\sigma^2}\right)$ 15. .sorry I can't find it.

Chapter 3&4 1.The license fee to be paid for 3G network is much higher as compared to 2G networks. The network construction and maintenance of 3G is much costlier than 2G networks. Also from the customers point of view the expenditure for 3G network will be excessively high if they make use of the various applications of 3G. 2. C = MJN 3. sorry I can't find it. 4.Base station: in wireless communications it is a transceiver connecting a number of other devices to one another and/or to a wider area.Uplink: Pertaining to GSM and cellular networks, the radio uplink is the transmission path from the mobile station (cell phone) to a base station (cell site). phone.Cells: The cellular network is distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. 5.Current wireless network architecture contains: HIR; BSS; UTRAN; VLR and others. VLR saves the information of a user tour to the area, and HIR contains the detailed information of users who are in the locating area. 6.Mobile switching center and mobile host. 7.Increasing the speed of transferring information and providing more web functions. 8.TDMA&CDMA help all users' phones have a channel to communicate without interfering. 9.SGSN/GGSN accomplish the function of Packet Service, contains User Data Management, Mobile Session Management, Route, Wireless Source Management. MSC/GMSC/HLR provide Channel Dispose, User Data Management and others.10.WCDMA; CDMA2000; TD-SCDMA. 11.WCDMA: no GPS; 5MHz; 3.84Mcps; CDMA2000: GPS; 1.25mHz;

1.2288Mcps. 12.Mobile phone games; cell phone business; Internet Surfing and so on. 13.SB based on combination of DiffServ. And IntServ. Models for 3G. DSB is the second based on LANs. Last is AIP, which is combined by ISB and DSB.

Chapter 5 1. Virtual realistic 2. Cloud computing 3.Deep learning and machine learning.

Chapter 6 1.When the mobile station is moving from one base station to another base station, the MSC needs to allocate the voice and signaling signals to the new base station channel. The handoff process requires the mobile station to identify the new base station and measure the signal strength. 2.The quality of the channel being in use constantly varies with the movement of the mobile unit. It is thus necessary to perform switching of channels.This channel switching is known as "intra-cell handoff" in contrast with "inter-cell handoff" in which the channel switching takes place between adjacent cell sites when the mobile unit is moving across a cell border. 3.MCHO: network makes decision, used in CT-2 and AMPS; NCHO: mobile decides for itself;MAHO: the mobile provides the data for the network to make decisions. 4.The hard hand-off's one call uses only one channel. The soft hand-off's connection to the source cell is broken only when a reliable connection to the target cell has been established 5.The base station sends a message and waits for the feed-back. Interval is $2 \cdot n \cdot T$ 6. Straight-line model means that using a microscopic traffic flow model to represent traffic. Fluid model means sending out messages and wait for the response. 7. sorry, I can't

$$H_{kj}(R_0) \triangleq \frac{1}{\pi} F(\beta_{kj}) \beta_{kj} \frac{pdf_{R_j, R_0 \beta_{jk}}}{cdf_{R_j, R_0 \beta_{jk}}}$$

$$F(\beta) \triangleq \frac{q}{\beta^2} \int_0^\pi \sqrt{(\beta^2 + 1) - 2\beta \cos(\theta)} d\theta. \quad 10.$$

find it 8. switch inside the cells; inter: switch among different cells. 9.

To subdivide the congestive cells into subcells, thus they can own their BS. 11. it can make an networks interact with other networks. 12. Location update: enables mobile services to inform cellular systems; Service delivery: defines the business of IT. 13. Time-based:easy to manage,can set different T; Movement-based: error might appear while travelling around boundary; Distance-based: simple. 14. pointer-forward scheme:to minimize network signaling cost from mobility management operation.

Chapter 7 1. So as to acquire a permanent address on the internet. 2.MN = Mobile Node; HA = Home Agent; FA: Foreign Agent; COA = Care of Address; CN = Correspondent Node. 3..FA utilize reverse tunneling by tunneling the MN's packets to HA. 4. Cannot find.5. FA adds registered MN to the visitor table and relays registration requests between MN and HA. 6. so that if a registration might have error, it will not occupy the service too long. 7. cannot find 8.cannot find 9. mobile node might fail authentication. 10. Cannot find. 11 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.

Chapter 8 1. DCF = Distributed Coordination Function; PCF = Point Coordination Function; DIFS = DCF Inter Frame Space; SIFS = Short Inter Frame Space; PIFS = PCF Inter Frame Space. 2. DCF gets an selective virtual carrier sense mechanism which enables it to exchange short RTS and CTS frames. 3. 802.11e = a proposed enhancement to the 802.11a and 802.11b wireless LAN (WLAN) specifications; EDCA = Enhanced Distributed Channel Access; HCF = Hybrid Coordination Function. 4. Infrastructure:communicate indirectly, through centralized access points. Ad-hoc: peer to peer. 5. Infrastructure: BS:connects mobiles into wired network,handoff: mobile changes base station. Adhoc does not seem to need any other element to facilitate communication. 6. Cannot find. 7. Cannot find. 8. Compared to the infrared wireless networks, the radio wireless networks have a longer bandwidth. 9. PLCP PMD are in 802.11 standards so far. 10. The 802.11 defines the signal character and modulation ways. 11.Code-division, frequency-division and time-division transfer data bits to receiver by division. 12. Sorry I can't find it.13.Unicast of any to be transmitted over WIFI are at much higher rates than multicasts. 14.NAV is a logical abstraction which limits the need for physical carrier-sensing to save power. 15.QoS is supported in 802.11 in both modes by measuring quality of service like bit rate. 16.802.11 needs synchronization to fulfill timing-synchronization among users. 17. Timing synchronizing. 18.Frames are transmitted periodically to announce the presence of a wireless LAN not PLCP. 19. Clock synchronization is

essential for power management protocol in a multi-hop MANET. 20. The power cannot be inefficient to the mobile devices, so we need power Management. 21. The transmitter and receiver will be awake and asleep switch every small time period: in ad-hoc mode, the frequency may be higher to suit the high mobility. 22. ATIM is a management frame with no frame body. When a STA receives ATIM, the formally dozing station must begin the process of retrieving buffered frame from the stations that transmit the ATIM. DTIM beacon is identical to the ordinary beacon. 23. Handover operations between APs in IEEE802.11 is entirely driven by STA. 24. A message's length may not suit a package, so we fragment it to use standard to transmit. 25. The MAC header contain the message's source and destination. 26. A sector can access multiple users, each user can take multiple user terminals. 27. The IEEE 802.11a standard is a follow-on standard for the IEEE802.11b standard, which adopts OFDM while b adopts DSSS. 28. Wireless LANs are at least as secure as limited local area networks. 29. Making the difficulty of attacking wireless LAN and attack the limited local area network is very difficult. 30. This depends on the specific modification. 31. Standard 64-bit WEP uses a 40 bit key (also known as WEP-40), which is concatenated with a 24-bit initialization vector (IV) to form the RC4 key. 32. WEP provide data confidentiality comparable to that of a traditional wired network. Mac filtering is effective in wired network, but not effective in wireless network. Captive portal is mainly used in wireless open networks. 33. During an active scan, the client radio transmits a probe request and listens for a probe response from an AP. With a passive scan, the client radio listens on each channel for beacons sent periodically by an AP. 34. 802.11 for data and videos, 802.11ac for videos and 802.11ad for uncompressed video. 35. This depends on the specific combination.

Chapter 9 1. WiMAX has QoS guarantee, high transmission speed, variety of business, adopted advanced technologies such as OFDM/OFDMA/AAS/MIMO, and realized mobility of broadband service. 2. WMAN-SC; WMAN-SCa; WMAN-OFDM; WMAN-OFDMA. 3. OFDM divides the channel into a number of orthogonal subchannels, converts the high speed data signal into a parallel low speed sub-data stream, modulates the transmission to each subchannel. Chapter 10 1. One is the traditional ap mode, another one is the ad hoc network mode, 2. The following two conditions are met, then node i and j can be transmitted successfully: 1) $d_{ij} \leq R_{tli}$ No node node d $k_j \leq R_1$ does not perform data transmission 3. Neighboring users send messages at the same time will produce inter-user interference, so that the entire network performance deterioration. 4. For optimal throughput, the transmission rate of each node must be strictly controlled and carefully scheduled 5. Exposed terminal is covered by sending spots, and hidden terminal is hidden since the distance of mobile communication and obstacles.

Chapter 11 1. Workstation sends the authentication frame, and AP return a verification frame. Then AP will receive third frame, if it is same to the one it sent, then successful. 2. Applicants EAPOL Start frames to certifier, then certifier ask for applicants' identity information. And applicants sent the identity information, and certifier receives it. 3. WEP's core ins RC4 sequence coding algorithm and it has drawbacks such as one-sided authentication; WAPI is improved based on WEP, it contains ASU which is trusted third party, STA and AP which are two-way authentication; 802.11i is also improved based on WEP. It includes 802.1x into WLAN, enforce identity authentication in WLAN and apply two more encryption mechanisms: TKIP and CCMP.

Chapter 12 1. improvement of transmission distance (up to 60m) and reduction of power consumption. 2. Stand-by State, Intermediate State and Connecting State. 3. Reader: handle two-way communication with electronic tag, and it is RFID's system information control and processing center; Electronic tag: is used for communication with the reader. 4. Chip technology, RFID anti-collision technology, security privacy issues. 5. Logistics transportation management, retail merchandise and Manufacturing process.

Chapter 13 1. Cannot find. 2. Perceptual acquisition unit, Computing unit, Communication unit and Power unit. 3. Mobile: military use such as smart dust and C4ISR system; Stationary: medical and health use such as hospitalized patient management and remote health monitoring. 4. Aircraft sowing, artificial embedding or rocket ejection. 5. it subject to IEEE 802.15.4, and data rate reaches to 40kb/s, and the communication range is up to 1000 feet. 6. Cannot find 7. Battery or solar power supply

Chapter 14 1. Radio Frequency Identification (RFID) , Ultra Wideband (UWB) , Software Defined Radio (SDR) , Bluetooth Low Energy (BLE) Body Area Networks (BAN) , cognitive radio 2. Good security , High processing gain, Multi-path resolution , High transfer rate, System capacity, Strong anti-interference , low power consumption , positioning accuracy , a low cost of their own translation of 3 Based on traditional bluetooth, it simplifies the stack of protocol, set the speed of data transfer and power dissipation, so that the radio to capture or sense information from the environment. 4, Application: health care wireless access / identification system navigation and positioning services personal multimedia entertainment military and space applications their own translation Software-Defined Networking

Chapter 15 1. SDN achieve the separation of the control layer and the forwarding layer, and achieve centralized management and programmable network through standardization instead of IP. 2. Separation of data forwarding and control, network equipment control plane and data separation, network virtualization and open interface. 3. Traffic visualization, prevention of DDOS and cloud security. 4. Separation of network control and physical topology network makes SDN get rid of hardware restrictions on the network architecture.

Chapter 16, 17 & 18 1. Motor, various kinds of sensors, camera, micro-phones and network communication module. 2. Wireless sensor networks, automatic parking and self-driving car. Self-driving car.

Chapter 19 1. SISO uses a single antenna to send and a single antenna to receive. MIMO uses multiple antennas to send and multiple antennas to receive and thus there are multiple transmission paths between the transmitter and receiver. 2 Cannot find. 3. Space diversity: receive multiple copies of the same information through multiple channels. Space multiplexing: using multiple antennas at the receiving and transmitting ends, making the most of the multipath components in spatial propagation. 4. Multiuser MIMO, Networked MIMO and Distributed MIMO. Distributed MIMO Chapter 21 & 22 1. Security of monetary value: value usually fluctuates, and it's not safe. Account security: Users can generate a wallet. 2. Blank area, Position detection pattern, Positioning graphics and Data and error correction codewords.