

Chapter 1

1.A: The earliest wireless communication is pre-industrialized to make it simple, using semaphores, pyrotechnics to deliver simple signals. In the 19th century as a telecommunications presence. 1873 proposed electromagnetic field theory, invented radio in 1895, the first communication satellite in 1958, the first simulated cellular network in 1981, the establishment of digital cellular networks in Europe in 1988, the publication of wireless local area network in 1997

2.A: Cellular network, Mobile management, Mobile IP, WI-FI, WiMAX, Self - organizing network, Wireless network security, Wireless Personal Area Network, Sensor network, Internet of Things, Software defined network

Chapter 2
1. A: 1. Wireless media do not need to set up or laying cables and fiber. 2. Through the atmosphere to propagate. 3. Non-boot connection

2.A: Licensed band is a way to ensure that wireless operations do not interfere with each other. Unlicensed band does not require any permission, as long as the product and the user comply with the provisions of the non-authorized band.

3.A: 1 Free space propagation loss. 2. Atmospheric, rain, cloud, snow, fog and other absorption and scattering losses caused. 3. Satellite mobile communication system received shadow shading loss.

4.A: When the size of the obstacle is greater than the wavelength of the electromagnetic wave, reflection occurs. When the propagation path between the transmitter and the receiver is blocked by a sharp edge, diffraction occurs. When the size of the object is the order of the wavelength of the electromagnetic wave or less, and the number of such obstacle objects per unit volume is very large, scattering occurs

5.A: Reflecting outdoors is not the main mechanism. Diffraction in the indoor relative to the reflection is weak. Outdoor scattering more.

6.A: Pass loss is the ratio of receiving power to the amount of transmitting power, and decreases with increasing height and less obstacle. The antenna gain quantifies the degree to which an antenna concentrates the input power.

7.A: Free space modeling :

Pass loss : $L_p[dB] = 32.45 + 20lgf_c[MHz] + 20lgd[km]$

Receiving power : $10lgP_r = 10lgP_0 - 20lgd$

transmission delays: $\tau = \frac{D}{c} = 3dms$

Two-ray modeling:

Pass loss :

$$L = lgP_t - lgP_r = 4lgd - lgG_t - lgG_r - 2lg h_b - 2lg h_m$$

Receiving power : $10lgP_r = 10lgP_0 - 10\alpha lg(d)$

transmission delays: $\tau = \frac{D}{c} = 3dms$

8. A: In the mobile communication propagation environment, the signal strength received from the same distance from the transmitter is different, and the change in signal strength due to the position change is called shadow fading or slow fading.

9.A: Taking into account the shadow fading, the path loss formula increases the immediate component, as follows:

$$L_p = L_0 + 10\alpha lgD + X$$

9.A: Okumura-Hata pass loss model

$$L_p(d) = \begin{cases} A + Blgd & (city) \\ A + Blgd - C & (suburbs) \\ A + Blgd - D & (Openenvironment) \end{cases}$$

$$A = 69.55 + 26.1lgf_c - 13.82lg h_b - a(h_m)$$

$$B = 44.9 - 6.55lg h_b$$

$$C = 5.4 + 2[lg(f_c/28)]^2$$

$$D = 40.94 + 4.78(lg f_c)^2 - 18.33lg f_c$$

For big city

$$a(h_m) = \begin{cases} 8.29[lg(1.54h_m)]^2 - 1.1 & (f_c \leq 200MHz) \\ 3.2[lg(1.75h_m)]^2 - 4.97 & (f_c \geq 200MHz) \end{cases}$$

For Small and medium sized cities

$$a(h_m) = (1.1lgf_c - 0.7)h_m - (1.56lgf_c - 0.8)$$

10.A: Small-scale fading is that the rapid changes in the received wireless signal over a short period of time or within a short distance range.

Multipath fading and Doppler effects lead to rapid fluctuations in amplitude

Multipath fading: The signal is superimposed by different paths

Doppler shift and spectrum: As a result of the mobility of the terminals of the transmitter towards or away from the base station

11. A: Rayleigh distribution is often used for the envelope distribution of multipath fading received signals

12. A: Doppler shift and spectrum:

The wavelength of the object radiation changes due to the relative movement of the wave source and the observer. In front of the wave of motion, the wave is compressed, the wavelength becomes shorter and the frequency becomes higher.

Compute as follows:

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

13.A: Rayleigh distributions.

$$f_{ray}(r) = \exp\left(-\frac{r^2}{2\sigma^2}\right), r \geq 0$$

The intermediate value R_m in the sampling range is satisfied

$$R_m = 1.777\sigma$$

Ricean distributions:

$$f_{ric}(r) = \frac{r}{\sigma^2} \exp\left(-\frac{(r^2 + \alpha^2)}{2\sigma^2}\right) I_0\left(\frac{\alpha r}{\sigma^2}\right), r \geq 0, \alpha \geq 0$$

14.A: The average LCR at envelope level, R , is defined as the rate at which a fading signal envelope crosses level R in a positive (or negative) going direction. Denoting the signal envelope ρ and its time derivative by $\dot{\rho}$ and $\dot{\rho}'$, respectively, the average NR, is given by [4]

$$N_R = \int_0^\infty \dot{\rho} f(R, \dot{\rho}) d\dot{\rho}$$

Where $f(r, \dot{r})$ is the joint probability density function (JPDF) of r and \dot{r} . The AFD is defined as the average time that the fading envelope remains below a specified level after crossing that level in a downward direction and is given by [4]

$$T_R = P_r(r \leq R) / N_R$$

Chapter 3 and 4

1.A: 3G mobile communication network is a global multimedia mobile communication, can achieve global roaming, so that any time, any place, any person between the exchange possible

2.A: without the interference, the higher transmitting power, the larger cell radius are, and the larger system capacity is.

3.A: When the mobile station is located at the cell boundary, it will experience the worst case of co-channel interference in the forward channel. If a better approximation of the distance between the mobile station and the first layer interfering with the base station

$$\frac{S}{I} = \frac{R^{-k}}{2(D-R)^{-k} + 2D^{-k} + 2(D+R)^{-k}}$$

4.A: The base station is fixed in one place for high power multichannel bi-directional radios.

The uplink refers to the physical channel from the mobile station to the base station.

The downlink refers to the physical channel from the base station to the mobile station

Each cell has a base station

The location area is a collection of a group of cells in a mobile communication system and is an important part of mobility management of mobile stations (or mobile phones)

MSC is the core of the network, it completed the most basic exchange function, that is, to achieve mobile users and other network users between the communication connection

5.A: The current wireless network architecture divided into three layers: Physical network layer, Intermediate environment layer, Application network layer.

VLR is a dynamic database that stores the information of the MS (collectively referred to as the customer), the information needed for the outgoing call, and the information about the user's contracted service and the additional service.

HLR is a database responsible for mobile user management, permanent storage and record the area of the user's contract data, and dynamically update the user's location information in order to call the service to provide the user's network routing.

6.A: Handoff management: The identification of the new base station and the channel allocation of the data and control signals at the new base station

Location management: When entering a foreign network, it is necessary to register with its home agent through a foreign agent

7.A: 3G and 2G difference is that the transmission of sound and data on the speed of the upgrade

8.A: 2G: The signals sent from the base stations to the plurality of mobile terminals are arranged in a predetermined time slot, and each mobile terminal can receive and receive signals sent to it in the combined signal as long as they are received within the designated time slot.

3G: The transmission signal frequency is encoded according to the specified type, so only the receiver with the frequency response code can intercept the signal

9. A: Through the Gb interface and GERAN network BSC connection, or through the Iu-PS port and UTRAN network RNC connection, the mobile data management, such as user identification, encryption, compression and other functions; through the Gr interface and HLR connected to the user database Access and access control; it also through the Gn interface and GGSN connected to provide IP packets to the wireless unit between the transmission path and protocol conversion and other functions; SGSN can also be connected through the Gs port to support data services and circuit services Work together (save air port signaling), through the Gd port and SMS-GMSC connection to support through the SGSN SMS send and receive and other functions

10.A: WCDMA, CDMA2000, TD-SCDMA

11.A: 1. The spectrum resources of the high frequency band are applied

2. It can handle images, music, video streaming and other media forms, including web browsing, teleconferencing, e-commerce and other information services

12.A: GPRS refers to the high-speed packet communication service provided on the basis of the European GSM network. It to GSM's maximum data communication speed from 9600bit/sec to 171.2Kbit/s. EDGE is a faster GPRS follow-up technology. It is said that EDGE communication speed up to 384Kbit/s ~ 500Kbit/s between

Bandwidth 1.25MHz

Operation frequencies about 2000Mhz

13.A: Broadband internet access, Mobile business, video call, Mobile TV, Wireless search

14.A: CDMA2000 All-IP overall network architecture part of the wireless access network and the core part of the core network evolution and the evolution of the wireless access network is independent

Chapter 5

1.A: 1. Mobile cloud computing 2. Move web pages. 3. Mobile access. 4. Pervasive computing

Chapter 6
1.A: The MSC assigns voice and signaling signals to the new base station channel, which requires the mobile station to identify the new base station and to measure the signal strength.

2.A: Inter-switch 1. If during ongoing call mobile unit moves from one cellular system to a different

cellular system which is controlled by different MTSO, a handoff procedure which is used to avoid dropping of call is referred as Inter System Handoff.

2. An MTSO engages in this handoff system. When a mobile signal becomes weak in a given cell and MTSO can not find other cell within its system to which it can transfer the call then it uses Inter system handoff. 3. Before implementation of Inter System Handoff MTSO compatibility must be checked and in Inter System Handoff local call may become long distance call.

Intra : 1. If during ongoing call mobile unit moves from one cellular system to adjacent cellular system which is controlled by same MTSO, a handoff procedure which is used to avoid dropping of call is referred as Intra System Handoff. 2. An MTSO engages in this handoff system. When a mobile signal becomes weak in a given cell and MTSO finds other cell within its system to which it can transfer the call then it uses Intra system handoff. 3. In Intra System Handoff local calls always remain local call only since after handoff also the call is handled by same MTSO.

3.A: Mobile-Controlled handoff (MCHO)

Network-controlled handoff(NCHO)

Mobile-Assisted handoff(MAHO)

4.A: Hard handoff : In the second connection comes, the first connection will be pinched off (usually intolerable)

Soft handoff: the cell with the best signal quality will be used as the first call. Integrate all information to get a better signal

5.A: Monitor the change in signal strength between the base unit and the mobile unit, and once the change exceeds the threshold, the handover is performed.

6.A: straight-line: Once a movement direction is chosen, the node moves in a straight line until the direction changes.

Fluid flow: if the Gauss-Markov Model has strong memory, the velocity of mobile node at time slot is same as its previous velocity. In the nomenclature of vehicular traffic theory, this is the Fluid flow model.

7.A: We derive theoretical expressions for the rates of all handoff types experienced by an active user with arbitrary movement trajectory. Empirical study using real user mobility trace data and extensive simulation are conducted, demonstrating the correctness and usefulness of our analysis.

8.A: If during ongoing call mobile unit moves from one cellular system to a different cellular system which is controlled by different MTSO, a handoff procedure which is used to avoid dropping of call is referred as Inter System Handoff; And a handoff procedure which is used to avoid dropping of call is referred as Intra System Handoff.

9.A:

COROLLARY 1.

$$H_{k,j}(v) = \begin{cases} \frac{1}{2} \mu_1 (\mathbf{T}_{k,j}^{(1)}) v, & \text{if } k \neq j, \\ \frac{1}{2} \mu_1 (\mathbf{T}_{k,j}^{(2)}) v, & \text{if } k = j. \end{cases} \quad (30)$$

Note that the above handoff rates are instantaneous rates. Hence, our analysis allows time-varying velocity for the UEs, in which case the handoff rates are also time varying.

10.A: The small cell makes the handoff rate higher.

11.A: A two-tier architecture is a software architecture in which a presentation layer or interface runs on a client, and a data layer or data structure gets stored on a server.

12.A: When the mobile unit is powered on or off, the cellular network will ask it to report its location and also require it to report its location within a certain interval. Service Provided: The cellular network searches the available access interface of the called user. If successful, the caller will send feedback to end the service delivery.

13.A: time-based: update at constant time intervals. This saves user computation, but increases overhead significantly if the user does not move movement-based: update each time they traverse a certain number of cells. better than the time-based scheme, unless the users were constantly moving. distance-based: update if the user moved a certain radial length of distance. it requires the cellular device to keep track of such distances, which added much computational complexity.

14. In the pointer-forward scheme, a pointer chain between access routers is established to reduce the binding update traffic to the mobility anchor point. In addition, a mobile node (MN) performs a binding update to the correspondent node depending on its mobility. Specifically, an on-link care-of address is chosen for the MN with low mobility, whereas a regional care-of address is selected for the MN with high mobility.

Chapter 7

1. Once the user's location changes, a new address is required, but most of the network data is transmitted over TCP. Changing the IP address will create a new connection accordingly, resulting in application interruption and loss of data. In addition, the user will be assigned a foreign address to replace the local address, then use the field address will make it difficult for users to access the local network.

2. MN: The location is often changed, that is, nodes that are often switched from one link to another (host)

HA: A node on the mobile node's home link, which is used to keep the location information of the mobile node. When the mobile node goes out, it is responsible for forwarding the packet sent to the mobile node to the mobile node

FA: A router on the local link where the mobile node is located. When the handover address of the mobile node is provided by it, it is used to notify the home agent of the mobile node of the default address, the default router for the mobile address, and the home agent The tunnel packet is decapsulated and delivered to the communication node.

COA: An IP address associated with the node when the mobile node switches to the foreign link. When the mobile node and other nodes communicate, do not directly use the care-of address to do the destination address or source address, but if there is no care of the address can not maintain communication. When the home agent forwards data to the mobile node, use the care-of address to make the exit address of the tunnel. The care-of address can be divided into two types: the care-of address and the proxy-based address.

CN: A communication object for a mobile node

3. intermediate routers might check for a topologically correct source address. If an intermediate router does check, you should set up a reverse tunnel. By setting up a reverse tunnel from the mobile node's care-of address to the home agent, you ensure a topologically correct source address for the IP data packet.

4. When visiting a foreign network, the request forwarding service informs their home agent that their current care-of address renewal registration, due to a reduced registration return registration

5. To remove the unnecessary MN after a period of time.

6. The limited lifetime allows the mobile node to register with its home agent using the registration request message so that its home agent can create or modify the mobility binding of the mobile node

country or many field offices around the world. In general, advertising agencies will be able to manage an account, provide creative services, and purchase media access for customers.

8. IP-in-IP encapsulation: the external head added the SourceIP, the tunnel entry point and destination,

The exit point of the tunnel. When this is done, the internal packets are unmodified (except TTL fields). The "no fragmentation" and "service type" fields should be copied to external packets. Minimal wrapper: Defines the minimum forwarding header for a packet that is not fragmented before encapsulation. The use of this packaging method is optional. When the original datagram has been fragmented, the minimum encapsulation shall not be used, Universal Routing Encapsulation: A wide variety of network layer protocols can be encapsulated within a virtual point-to-point link over an Internet protocol network.

9. When you access the port of the server component. The server component controls the client component to create a reverse tunnel connection to the server component. The firewall / gateway / router does not restrict this. The client component can then receive data from the server component and forward the port to the application on the computer behind the firewall / gateway / router. This is the basic idea of a reverse tunnel that allows you to access certain applications that can not be accessed directly.

10. Because we can not connect directly to the client computer from an external connection. The tunnel is the best way to punch.

11. X11 applications tunneled via SSH, and VNC sessions.

Chapter 8

1. PCF is a media access control (MAC) technology used in IEEE 802.11-based WLANs. It resides in a point coordinator, also known as an access point (AP), to coordinate communication within a network. AP waits for PIFS duration, not DIFS duration to master the channel. PIFS is less than DIFS duration, so the point coordinator always has access channel priority. DCF is the fundamental MAC technique of the IEEE 802.11 based WLAN standard. DCF employs a CSMA/CA with binary exponential backoff algorithm.

SIFS (Short Inter-frame Space)

DIFS (DCF Interframe Space)

PIFS (PCF Interframe Space)

2. DCF also has an optional virtual carrier sense mechanism that exchanges short Request-to-send (RTS) and Clear-to-send (CTS) frames between source and destination stations during the intervals between the data frame transmissions.

3. 802.11e defines a set of quality of service (QoS) enhancements for wireless LAN applications through modifications to the Media Access Control (MAC) layer.

HCF: hybrid coordination function, EDCA: Enhanced Distributed Channel Access

4. Wi-Fi networks in infrastructure mode are typically created by Wi-Fi routers, and ad-hoc networks are typically short-time networks created by laptops or other devices. The infrastructure model requires centralized access points, and devices on the wireless network are directly connected to each other.

5. infrastructure mode: Wi-Fi routers act as a centralized access point.

ad hoc mode: Two laptops with NIC in which one of them has access to the Internet.

6. 802.11 is the wifi protocol in the data link layer. TCP / IP protocol in the transport layer and network

Floor. The TCP / IP protocol conforms to the 802.11 standard running on the WLAN.

7. LLC: Identifies the prototype of the network layer and packages them. MAC (Media Access Control): Use the distribution channel when there

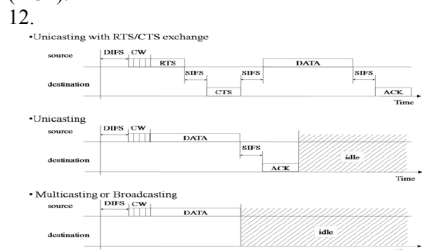
is competition in the public channel. PLCP (physical layer fusion processing): build frames before transmission. PMD (Physical Medium Dependent): transmission frame.

8. Infrared wireless network: use infrared as a transmission medium. However, you must point them directly to the device you want to control. Radio Wireless Network: Use radio as the transmission medium. It allows you to place the device behind an obstacle.

9. frequency hopping (802.11 FHSS) and direct sequence (802.11 DSSS).

10. HIPERLAN 1 provides five different priorities for the packets to be sent. After a node is sent, many other nodes can compete to send permissions. The first goal of the priority phase is to ensure that nodes with no lower priority can access the media and packets with higher priority wait at other nodes. The mechanism always allows nodes with higher priority access to the media, regardless of the lower priority of the load.

11. we have considered four wireless LAN access methods: the IEEE 802.11 Distributed Coordination Function (DCF) Point coordination function (PCF) the hybrid coordination function (HCF).



13. In a computer network, multicast (one-to-many or many-to-many allocation) is group communication, where the information is simultaneously addressed to a group of target computers. Group communication can be application layer multicast or network assisted multicast, which enables the source to be effectively sent to a group in a single transmission. In a computer network, unicast transmission is the sending of messages to a single network destination identified by a unique address.

14. To ensure whether the medium is busy or idle.

15. QoS is supported in 802.11.

16. A Timing Synchronization Function (TSF) keeps the timers for all stations in the same Basic Service Set (BSS) synchro-nized.

17. Timing synchronization is achieved through the station periodically through beacon frame exchange timing information. In (Below) BSS, the AP sends TSF information in the beacon. In the Independent Basic Service Group (IBSS, ad-hoc), each station competes to send beacons.

18. Beacon contains a timestamp. On receiving a beacon, STA adopts beacon's coming if T(beacon) > T(STA)

Clock move only forward

19. There are many reasons for PC power management that requires a computer system, in particular: reducing overall power consumption, portable and embedded systems to extend battery life, reduce thermal requirements, reduce noise, reduce energy and cooling operating costs.

20. DTIM beacon frame synchronization timer and informs the Wi-Fi client whether there is any buffered unicast traffic. At the end of the beacon interval, the Wi-Fi client starts to open the so-called notification communication message (ATIM) window. The access point then uses the ATIM window to send the beacon frame.

21. Saving battery as much as possible is very important.

22. Most wireless LANs are based on the IEEE 802.11 standard [Ieee802.11] depicted in Fig. 1 and Fig. 2. This standard is also known as WiFi

(Wireless Fidelity), and provides functionality for wireless devices to communicate in a way similar to the way they would on a traditional wired LAN. Devices in these networks normally operate at a higher data rate than for devices existing in a WPAN. They are usually made to communicate over longer distances as well. Because of this higher data rate and longer communication range (higher transmission power), they also tend to consume more power. To reduce the power consumed, a power management scheme known as PSM is built into the 802.11 standard. Section 4.1 talks about this power management scheme in more detail.

23. DTIM transmitted less frequently (every DTIM interval), for sending buffered broadcast packets. ATIM transmitted in ATIM-Window by station who want to send buffered packets, structured the same as TIM

24. In 802.11 networks, a handover means reassociating with the new AP.

25. IP fragmentation is an Internet Protocol (IP) process that breaks down a datagram into smaller fragments (fragments) so that a link can be formed through a link with a maximum transmission unit (MTU) that is smaller than the size of the original datagram Grouping. Fragments are reorganized by the receiving host.

26. The MAC frame format comprises a set of fields that occur in a fixed order in all frames. The figure below depicts the generic MAC frame format as defined in IEEE 802.11 MAC specifications.

The fields Address field 2 and 3, sequence control field, address-4, frame body are present in particular frame types only. They do not exist in all the frames. Each of these fields are defined below.



27. The difference to be understood is that one (or both) of these devices may not be the actual source or destination of L2 traffic when the 802.11 device is sending to the receiving device. So this can create situations where four different addresses are required:

- Transmitter Address (TA)
- Receiver Address (RA)
- Source Address (SA)
- Destination Address (DA)

28. IEEE 802.11a-1999 or 802.11a is a revision of the IEEE 802.11 wireless LAN specification for the definition of Orthogonal Frequency Division Multiplexing (OFDM) communication systems. It was originally designed to support wireless communications in the United States under the Unregulated National Information Infrastructure (U-NII) band (in the frequency range 5-6 GHz) specified by the United States under Chapter 15, Section 15.407 of the Federal Regulations.

29. On behalf of "cable equivalent confidentiality". WEP is a Wi-Fi network security protocol. Since the wireless network transmits data over radio waves, it is easy to intercept data or "eavesdropping" on wireless data transmissions. The goal of WEP is to make the wireless network as secure as a wired network, such as a network connected via an Ethernet cable.

30. The standard 64-bit WEP uses a 40-bit key (also known as WEP-40), which is connected to the 24-bit initialization vector (IV) to form an RC4 key. In drafting the original WEP standards, the US government's restrictions on export restrictions on encryption technology limit the critical scale. Once the limit is removed, the manufacturer of the access point uses the 104-bit key size (WEP-104) to implement the extended 128-bit WEP protocol.

31. In Open System authentication, the WLAN client need not provide its credentials to the

Access Point during authentication. Any client can authenticate with the Access Point and then attempt to associate. In effect, no authentication occurs. Subsequently, WEP keys can be used for encrypting data frames. At this point, the client must have the correct keys.

32. At first glance, it might seem as though Shared Key authentication is more secure than Open System authentication, since the latter offers no real authentication. However, it is quite the reverse. It is possible to derive the keystream used for the handshake by capturing the challenge frames in Shared Key authentication. [10] Therefore, data can be more easily intercepted and decrypted with Shared Key authentication than with Open System authentication. If privacy is a primary concern, it is more advisable to use Open System authentication for WEP authentication, rather than Shared Key authentication; however, this also means that any WLAN client can connect to the AP. (Both authentication mechanisms are weak; Shared Key WEP is deprecated in favor of WPA/WPA2.)

33. WEP/WPA

- As explained, they only provide confidentiality at the network level, they do not tell us who is connected

MAC filtering

- Problem: doesn't identify a person

- Easily spoofed, and not a secret information

IP address

- Doesn't restrict physical access to the medium - Easily spoofed

34. Active scanning occurs when the client changes its IEEE 802.11 radio to the channel being scanned, broadcasts a probe request, and then waits to hear any probe responses (or periodic beacons) from APs on that channel (with a matching SSID). Passive scanning is performed by simply changing the clients IEEE 802.11 radio to the channel being scanned and waiting for a periodic beacon from any APs on that channel.

35. SIFS > PIFS > DIFS

36. A combination of both may be useful. 802.1x everywhere is possible, on LAN/WLAN (dedicated SSID). Guest"-style captive portal for the rest (different SSID). Captive portal remains more intuitive for first time users

Chapter 9

1. WiMAX technology to provide high-speed connection for the Internet, the data transmission distance up to 50km, with QoS protection, high transmission rate, business diversity. Using OFDM / OFDMA, AAS, MIMO, and other advanced technology to achieve the broadband business mobile.

2. The transport convergence sublayer is responsible for receiving the MAC layer data unit encapsulation transfer convergence sublayer data unit, and the implementation of the corresponding access scheme and synchronization control logic, the physical media dependent sub-layer mainly performs channel coding, modulation and other functions. It supports the coordination between MAC layer and physical layer channel management information, not only can support the transmission of adaptive burst traffic data, but also supports the dynamic adjustment of transmission parameters such as mediation coding mode and transmitting power.

3. OFDM divides the channel into a number of orthogonal subchannels, converts the high speed data signal into parallel low speed sub-data streams, and modulates the transmission to each subchannel. The quadrature signal can be separated by the relevant technique at the receiving end, which can reduce the mutual interference between the subchannels. The signal bandwidth on each subchannel is less than the associated bandwidth of the channel, so that each subchannel can be seen as flat fading, so that inter-symbol interference can be eliminated. And

since the bandwidth of each subchannel is only a fraction of the original channel bandwidth, channel equalization becomes relatively easy.

Chapter 10

1. One is the traditional ap mode, after opening only one center, the other nodes access to the center point through the center point of data exchange, one is the ad hoc network mode, the points are equal, any point can be and other Node to communicate, do not need the center point

2. Define the number of nodes N , n_i ($1 \leq i \leq N$) that node i , d_{ij} said the distance between nodes i and j . R_t denotes the node transmission distance, R_I denotes the interference distance, $R_I > R_t$, $R_I = Q R_t$. In the case of using the same channel. The following two conditions are met, then node i and j can be transmitted successfully:

i) $d_{ij} \leq R_t$

ii) No node node $d_{kj} \leq R_I$ does not perform data transmission

3. The IEEE 802.11 MAC protocol specifies that all users share a channel. When the neighboring users to send messages at the same time will produce inter-user interference, so that the entire network performance deterioration. An effective solution is to set the exclusion range or time division multiplexing.

4. Upper bound: all data is transmitted at a balanced pace. Lower bound: path reuse in unexpected cases

5. The existence of "hidden terminal" and "exposed terminal" will cause the disorderly contention and waste of ad hoc network time slot resources, increase the probability of data collision, and seriously affect the network throughput, capacity and data transmission delay. In an ad hoc network, when a terminal transmits information in a time slot, a slot contention conflict occurs if its hidden terminal transmits information while the time slot occurs.

Chapter 11

1. (1) request the workstation to send the authentication frame. (2) AP received, return a verification frame, (3) If the status code in step (2) = "successful", the requesting workstation will obtain the challenge text from the frame and encrypt it with the shared key WEP algorithm, and then send an authentication management frame (4) AP receives the third frame, using the shared key to decrypt the query text

2. Port-based network access control refers to the use of physical layer characteristics of the device connected to the LAN interface for authentication. If the authentication is successful, the device is allowed to access the LAN resource, otherwise prohibiting the device from accessing the LAN resource.

3. (1) WEP: Authentication status is unidirectional, resulting in potentially impoverished AP. The WEP protocol authentication method is invalid for listening attacks.

(2) WAPI: add a certification infrastructure WAI used to achieve the user's identity authentication.

(3) IEEE 802.11i: the IEEE802.1X protocol into the WLAN security mechanism, enhanced WLAN identity authentication and access control capabilities; increased key management mechanism.

Chapter 12

1. The biggest feature is the low power consumption, very low running and standby power consumption, you can make a coin battery for several years

2. Page, Page Scan, Inquiry, Inquiry Scan.

3. RFID Tag, RFID Tag reader, Reader application software system

4. Tag the energy supply, Tag-to-reader data transfer, The integrity and security of data transmission

5. School card, Enterprise door card, Electronic license plate.

Chapter 13

1. WSN consists of "nodes" - from several to several hundred or even thousands, each node is connected to a (or sometimes) sensor. Organize nodes in different topologies to build sensor networks. The sensor network acquires data from the detection area and preprocesses the data

2. The sensor node's hardware typically consists of four parts: power and power management modules, sensors, microcontrollers, and wireless transceivers.

3. Transmission line online monitoring system, Intelligent Monitoring and Alarming System for Substation Wireless sensor networks are key to improving the energy efficiency of existing buildings

4. The sensor network node broadcasts its status to the surroundings and receives status from other nodes for mutual detection. The sensor network nodes are organized into a connected network according to a certain topology (linear, star, tree, grid, etc.). Calculate the appropriate path on the constructed network to transmit the sensing data.

5. The communication distance of the network node is usually short. The node can communicate with the neighbor. If you want to communicate with nodes outside the coverage area, you need to route through the intermediate node

6. Transmission rate, transmission reliability and network lifetime are three basic but conflicting design goals in energy-constrained wireless sensor networks. When the transmission rate is reduced, the transmission reliability is significantly improved and the network lifetime is longer.

7. Environmental energy collection from external sources is used to power small, autonomous sensors, such as MEMS-based technology. It is very suitable for WSN.

Chapter 14

1. Bluetooth Low Energy, Body Area Network, cognitive radio

2. Good security, High processing gain, Multi-path resolution ability, High transfer rate, System capacity is large, Anti-jamming performance, Accurate positioning, Low cost

3. In summary, Bluetooth and Bluetooth Low Energy are used for very different purposes. Bluetooth can handle a lot of data, but consumes battery life quickly and costs a lot more. BLE is used for applications that do not need to exchange large amounts of data, and can therefore run on battery power for years at a cheaper cost.

4. CR can sense its environment and, without the intervention of the user, can adapt to the user's communications needs while conforming to FCC rules in the United States.

5. security, Interoperability, System devices, invasion of privacy, Sensor validation, Data consistency, Data Management.

Chapter 15

1. Software-defined networking (SDN) is an architecture purporting to be dynamic, manageable, cost-effective, and adaptable, seeking to be suitable for the high-bandwidth, dynamic nature of today's applications.

2. In order to realize the function of defining the network through software and programming the upper application, SDN conforms to the following working principle: one is stream-based data forwarding mechanism, two is based on central control routing mechanism, and three is application-oriented programming mechanism.

3. Software-defined mobile networking, SD-WAN is a Wide Area Network (WAN) managed using the principles of software-defined networking. Security using the SDN paradigm

4. As the traditional network device hardware dependence is relatively large, so in the software defined network network control and physical network topology separation, so get rid of hardware restrictions on the network architecture.

Chapter 16 17 18

1. Motor, camera, inertial navigator, range finder, infrared receiver, touch sensor, pressure sensor, Wi-Fi and Ethernet support, acceleration sensor, barometer, ultrasonic sensor

2. E-commerce, diagnosis, emergency rescue. CarNet.

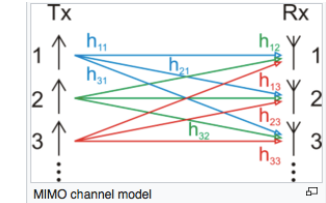
CarNet can be the user's smart phone and car system seamlessly, to achieve "people, cars, mobile phones," the interoperability between. Drivers can focus on Baidu map of the LBS platform, through the voice to complete the route planning, navigation and other functions, and based on geographical location access to the surrounding food and other life services information.

Chapter 19

1. In radio, MIMO is a method for multiplying the capacity of a radio link using multiple transmit and receive antennas to exploit multipath propagation

SISO (Single-Input Single-Output) There is only one transmission path between the transmitter and the receiver. The multipath effect seriously affects the communication quality and reliability.

2.



3. Space diversity is achieved by observing the data from different paths in the space. Different from space diversity, space multiplexing is used for high throughput.

4. OFDMA, OFDM, MIMO is also planned to be used in Mobile radio telephone standards such as recent 3GPP and 3GPP2. In 3GPP, High-Speed Packet Access plus (HSPA+) and Long Term Evolution (LTE) standards take MIMO into account.

Chapter 21 22

1. The value of Bitcoin fluctuations in large 2, once the wallet can not be lost 3-bit currency transactions are very safe. 4. The privacy of both parties to the transaction

2. The QR code, consisting of a square module, forms a square array with a coded area and a functional pattern consisting of a picture, a delimiter, a positioning pattern, and a correction pattern.