**From "CHAP01.pdf":**

1. **What are the three general areas covered in the scope of this course?**
   * Data communications, networking, and protocols.
2. **Explain the primary focus of data communications.**
   * Deals with the transmission of signals in a reliable and efficient manner.
3. **How has the increasing use of optical fiber and high-speed wireless affected network capacity and transmission prices?**
   * Brought transmission prices down and greatly increased capacity.
4. **What does the term "Everything over IP" imply for today's networks?**
   * The Internet, Web, and associated applications are dominant.
5. **Discuss the impact of smartphones and cloud computing on the evolution of business networks.**
   * Smartphones and cloud computing are driving business network evolution.
6. **In what ways have personal computers and microcomputer workstations become essential tools for office workers?**
   * They are essential tools, driving the need for higher-speed LANs.
7. **Describe the changes in corporate data traffic patterns that are driving the need for high-speed WANs.**
   * Changes include increased telecommuting, intranet computing, and data-intensive applications.
8. **How has the rapid conversion of consumer electronics to digital technology influenced Internet and corporate intranets?**
   * It's dramatically increasing image and video traffic.
9. **What is "convergence" in the context of data communication, and what technologies are merging?**
   * Merger of telephony and information technologies, involving moving voice into a data infrastructure.
10. **Explain the role of packet-based transmission using IP as the foundation of convergence.**
    * It increases the function and scope of infrastructure and applications.
11. **What is the main purpose of communication?**
    * To transfer information from a source to a recipient.
12. **Briefly describe the function of each component in a basic communication system: source, transmitter, channel, receiver, and recipient.**
    * Source: generates data; Transmitter: encodes and sends; Channel: medium; Receiver: decodes; Recipient: destination.
13. **What is the role of a transmitter in a communication system, and what process takes place there?**
    * Couples message onto the channel; modulation.
14. **Outline the steps involved in digital communication at the transmitter.**
    * Analog to digital conversion, encoding, modulation, etc.
15. **Differentiate between hardwire and softwire channels, providing examples of each.**
    * Hardwire: physical media (e.g., cables); Softwire: wireless media (e.g., air).
16. **What is the main function of the receiver?**
    * To extract the signal and convert it to a suitable form.
17. **Summarize the processes that occur in the receiver during digital communication.**
    * Demodulation, decoding, etc.
18. **In the context of the Internet, what are hosts or end systems?**
    * Connected computing devices.
19. **Describe the role of packet switches in the Internet.**
    * Forward packets.
20. **What is the Internet, from a "nuts and bolts" view?**
    * Billions of connected devices, links, and switches.
21. **Explain the function of protocols in the Internet, giving examples.**
    * Control sending/receiving of messages (e.g., TCP, IP, HTTP).
22. **What are Internet standards, and who governs them?**
    * RFC documents; IETF governs them.
23. **How does the Internet provide services to applications from a service view?**
    * Provides infrastructure and programming interface.
24. **Compare and contrast human protocols and network protocols.**
    * Human protocols involve people; network protocols involve machines.
25. **What is the significance of RFC and IETF in the context of Internet standards?**
    * RFCs are the official standards, developed by the IETF.
26. **Describe the two main parts of the network structure.**
    * Network edge and network core.
27. **What are access networks, and give three examples?**
    * Connect end systems to the edge router (e.g., residential, institutional, mobile).
28. **What key factors should be considered when evaluating access networks?**
    * Bandwidth and shared/dedicated access.
29. **Explain how DSL technology enables data and voice to be transmitted simultaneously over existing telephone lines.**
    * Uses different frequencies for data and voice.
30. **How does a cable network transmit data and TV signals?**
    * Transmits them at different frequencies.
31. **What is HFC, and how does it differ from DSL in terms of access?**
    * Hybrid Fiber Coax; shares access, unlike DSL's dedicated access.
32. **Contrast Passive Optical Networks (PON) and Active Optical Networks (AON) in FTTH deployments.**
    * PON uses optical splitters; AON uses powered switching equipment.
33. **Describe the components typically found in a home network.**
    * Modem, router, wired Ethernet, wireless access point.
34. **What are the typical transmission rates of Ethernet in enterprise access networks?**
    * 10 Mbps, 100 Mbps, 1 Gbps, 10 Gbps.
35. **How do wireless LANs connect end systems to routers, and what are common WiFi standards?**
    * Via access points; 802.11b/g/n (WiFi).
36. **Explain the process by which a host sends packets of data into an access network.**
    * Breaks data into packets and transmits them.
37. **Define "physical media" and differentiate between guided and unguided media, providing examples.**
    * What lies between transmitter/receiver; Guided (e.g., copper), Unguided (e.g., radio).
38. **What are the characteristics and categories of twisted pair cables?**
    * Two insulated wires twisted together; Categories 5 and 6.
39. **What are the key features of coaxial cable and fiber optic cable as physical media?**
    * Coaxial: concentric conductors, bidirectional; Fiber: glass/plastic, light pulses.
40. **Discuss the properties of radio waves as a physical medium and list different types of radio links.**
    * Unguided, electromagnetic spectrum; Terrestrial microwave, LAN, cellular, satellite.
41. **In the context of the network core, explain the concept of packet switching.**
    * Messages are broken into packets and forwarded.
42. **What is the "store-and-forward" mechanism in packet switching, and what is its impact on transmission delay?**
    * Packet must arrive before forwarding; introduces delay.
43. **Describe the queuing and loss phenomena in packet switching networks.**
    * Packets queue if arrival rate exceeds transmission rate; packets are lost if the buffer is full.
44. **What are the two primary functions of the network core, and how do they differ?**
    * Forwarding (moving packets) and Routing (determining routes).
45. **How does circuit switching differ from packet switching in resource allocation and performance?**
    * Circuit switching allocates dedicated resources; packet switching shares them.
46. **Explain Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM) in circuit switching.**
    * FDM: frequency bands allocated; TDM: time slots allocated.
47. **Discuss the advantages and potential drawbacks of packet switching.**
    * Advantages: resource sharing, simple; Drawbacks: congestion, delay.
48. **Provide a high-level overview of the structure of the Internet as a "network of networks".**
    * End systems connect to access ISPs, which interconnect.
49. **What are access ISPs, and how do they fit into the Internet structure?**
    * Provide Internet access; connect end users to the Internet.
50. **Briefly explain the role of Tier-1 ISPs and content provider networks in the Internet.**
    * Tier-1 ISPs: backbone; Content providers: run their own networks.

**From "2025AssignmentNo 2.docx":**

1. **Which three acronyms/initialisms represent standards organizations?**
   * IEEE, IETF, IANA
2. **What type of communication will send a message to all devices on a local area network?**
   * Broadcast
3. **In computer communication, what is the purpose of message encoding?**
   * To convert information to the appropriate form for transmission
4. **Which message delivery option is used when all devices need to receive the same message simultaneously?**
   * Broadcast
5. **What are two benefits of using a layered network model?**
   * It assists in protocol design; It prevents technology in one layer from affecting other layers.

**1. According to the lecture, what are the three general areas covered in the scope of this course?**

* Answer: The three general areas covered in the scope of this course are data communications, networking, and protocols.

**2. Explain the primary focus of data communications.**

* Answer: Data communications primarily deals with the transmission of signals in a reliable and efficient manner.

**3. How has the increasing use of optical fiber and high-speed wireless affected network capacity and transmission prices?**

* Answer: The increasing use of optical fiber and high-speed wireless has brought transmission prices down and greatly increased capacity.

**4. What does the term "Everything over IP" imply for today's networks?**

* Answer: "Everything over IP" implies that the Internet, the Web, and associated applications have emerged as dominant features for both business and personal network landscapes.

**5. Discuss the impact of smartphones and cloud computing on the evolution of business networks.**

* Answer: Smartphones have become drivers of the evolution of business networks and their use, and enterprise applications are now routinely delivered on mobile devices. Cloud computing is also being embraced.

**6. In what ways have personal computers and microcomputer workstations become essential tools for office workers?**

* Answer: Personal computers and microcomputer workstations have become an essential tool for office workers, driving the need for higher-speed LANs to support requirements like centralized server farms, power workgroups, and high-speed local backbones.

**7. Describe the changes in corporate data traffic patterns that are driving the need for high-speed WANs.**

* Answer: Changes in corporate data traffic patterns driving the need for high-speed WANs include the growing use of telecommuting, changes in application structure (intranet computing), more reliance on personal computers, workstations, and servers, more data-intensive applications, increased need for Internet access, more unpredictable traffic patterns, increased average traffic load, and more data transported off-premises.

**8. How has the rapid conversion of consumer electronics to digital technology influenced Internet and corporate intranets?**

* Answer: The rapid conversion of consumer electronics to digital technology is dramatically increasing image and video traffic carried by networks. Digital versatile disks (DVDs) are being incorporated into websites, and digital camcorders have made it easier to make digital video files for corporate and Internet websites.

**9. What is "convergence" in the context of data communication and what technologies are merging?**

* Answer: "Convergence" is the merger of previously distinct telephony and information technologies and markets. It involves moving voice into a data infrastructure and integrating voice and data networks.

**10. Explain the role of packet-based transmission using IP as the foundation of convergence.**

* Answer: Packet-based transmission using the Internet Protocol (IP) is the foundation of convergence, increasing the function and scope of both the infrastructure and the application base.

**11. What is the main purpose of communication?**

* Answer: The main purpose of communication is to transfer information from a source to a recipient via a channel or medium.

**12. Briefly describe the function of each of the following components in a basic communication system: source, transmitter, channel, receiver, and recipient.**

* Answer:
  + Source: Generates the data to be transmitted.
  + Transmitter: Encodes and couples the message onto the channel.
  + Channel: The medium through which the signal travels.
  + Receiver: Decodes the signal to recover the message.
  + Recipient: The destination of the communication.

**13. What is the role of a transmitter in a communication system, and what process takes place there?**

* Answer: The transmitter couples the message onto the channel in the form of a transmitted signal. Modulation takes place in the transmitter.

**14. Outline the steps involved in digital communication at the transmitter.**

* Answer: Digital communication at the transmitter involves analog to digital conversion, source encoding, channel encoding, scrambling, encryption, multiplexing, and modulation.

**15. Differentiate between hardwire and softwire channels, providing examples of each.**

* Answer:
  + Hardwire channels: Physical media such as coaxial cables, fiber optic cables, waveguides, and twisted-pair telephone lines.
  + Softwire channels: Wireless media such as air, vacuum, and seawater.

**16. What is the main function of the receiver?**

* Answer: The main function of the receiver is to extract the desired signal from the received signal and convert it to a form suitable for the output transducer. It demodulates the received signal.

**17. Summarize the processes that occur in the receiver during digital communication.**

* Answer: Processes in the receiver during digital communication include demodulation, de-multiplexing, channel decoding, source decoding, descrambling, and decryption.

**18. In the context of the Internet, what are hosts or end systems?**

* Answer: In the context of the Internet, hosts or end systems are the computing devices connected to the internet.

**19. Describe the role of packet switches in the Internet.**

* Answer: Packet switches forward packets (chunks of data) in the Internet. Routers and switches are examples of packet switches.

**20. What is the Internet, from a "nuts and bolts" view?**

* Answer: From a "nuts and bolts" view, the Internet is billions of connected computing devices (hosts/end systems) running network applications, connected by communication links (fiber, copper, radio, satellite) and packet switches (routers and switches).

**21. Explain the function of protocols in the Internet, giving examples.**

* Answer: Protocols control the sending and receiving of messages. Examples include TCP, IP, HTTP, Skype, and 802.11.

**22. What are Internet standards and who governs them?**

* Answer: Internet standards are formal specifications for communication. They are defined in Request for Comments (RFC) documents and developed by the Internet Engineering Task Force (IETF).

**23. How does the Internet provide services to applications from a service view?**

* Answer: From a service view, the Internet is an infrastructure that provides services to applications like the Web, VoIP, email, games, and e-commerce. It also provides a programming interface to applications, enabling them to connect to the Internet.

**24. Compare and contrast human protocols and network protocols.**

* Answer:
  + Human protocols: Involve specific messages and actions taken when messages are received (e.g., "What's the time?", introductions).
  + Network protocols: Govern all communication activity in the Internet, defining the format and order of messages and actions taken on message transmission and receipt; they are executed by machines rather than humans.

**25. What is the significance of RFC and IETF in the context of Internet standards?**

* Answer: RFC (Request for Comments) documents are the official publications of the Internet Engineering Task Force (IETF) and contain technical specifications and standards for the Internet. IETF is the body that develops and publishes these standards.

**26. Describe the two main parts of the network structure.**

* Answer: The two main parts of the network structure are the network edge and the network core.

**27. What are access networks and give three examples?**

* Answer: Access networks connect end systems to the edge router. Examples include residential access networks, institutional access networks, and mobile access networks.

**28. What key factors should be considered when evaluating access networks?**

* Answer: Key factors to consider when evaluating access networks are bandwidth (bits per second) and whether the access is shared or dedicated.

**29. Explain how DSL technology enables data and voice to be transmitted simultaneously over existing telephone lines.**

* Answer: DSL technology uses existing telephone lines to the central office DSLAM, transmitting data and voice at different frequencies over the same line.

**30. How does a cable network transmit data and TV signals?**

* Answer: Cable networks transmit data and TV signals at different frequencies over a shared cable distribution network.

**31. What is HFC, and how does it differ from DSL in terms of access?**

* Answer: HFC stands for Hybrid Fiber Coax. Unlike DSL, which has dedicated access to the central office, HFC networks involve homes sharing access to the cable headend.

**32. Contrast Passive Optical Networks (PON) and Active Optical Networks (AON) in FTTH deployments.**

* Answer:
  + PON (Passive Optical Network): Uses optical splitters to separate and collect optical signals, without electrically powered switching equipment.
  + AON (Active Optical Network): Uses electrically powered switching equipment like routers or switch aggregators to manage signal distribution and direct signals to specific customers.

**33. Describe the components typically found in a home network.**

* Answer: Components typically found in a home network include a cable or DSL modem, a router (often with firewall and NAT), wired Ethernet, and a wireless access point.

**34. What are the typical transmission rates of Ethernet in enterprise access networks?**

* Answer: Typical transmission rates of Ethernet in enterprise access networks are 10 Mbps, 100 Mbps, 1 Gbps, and 10 Gbps.

**35. How do wireless LANs connect end systems to routers, and what are common WiFi standards?**

* Answer: Wireless LANs connect end systems to a router via a base station or access point. Common WiFi standards include 802.11b/g/n, with transmission rates up to 450 Mbps.

**36. Explain the process by which a host sends packets of data into an access network.**

* Answer: A host takes an application message, breaks it into smaller chunks called packets of length L bits, and transmits the packets into the access network at a transmission rate R.

**37. Define "physical media" and differentiate between guided and unguided media, providing examples.**

* Answer: Physical media is what lies between the transmitter and receiver.
  + Guided media: Signals propagate in solid media (e.g., copper, fiber, coax).
  + Unguided media: Signals propagate freely (e.g., radio waves).

**38. What are the characteristics and categories of twisted pair cables?**

* Answer: Twisted pair cables consist of two insulated copper wires twisted together. Categories include Category 5 (up to 1 Gbps Ethernet) and Category 6 (10 Gbps).

**39. What are the key features of coaxial cable and fiber optic cable as physical media?**

* Answer:
  + Coaxial cable: Has two concentric copper conductors, is bidirectional, and supports broadband transmission.
  + Fiber optic cable: Uses glass or plastic fibers to carry light pulses, supports high-speed operation, and has a low error rate.

**40. Discuss the properties of radio waves as a physical medium and list different types of radio links.**

* Answer: Radio waves are an unguided medium where signals are carried in the electromagnetic spectrum. They are bidirectional but affected by reflection, obstruction, and interference. Types of radio links include terrestrial microwave, LAN (WiFi), wide-area (cellular), and satellite.

**41. In the context of the network core, explain the concept of packet switching.**

* Answer: In packet switching, hosts break application-layer messages into packets, and these packets are forwarded from one router to the next across links on the path from source to destination. Each packet is transmitted at the full link capacity.

**42. What is the "store-and-forward" mechanism in packet switching, and what is its impact on transmission delay?**

* Answer: In the store-and-forward mechanism, the entire packet must arrive at a router before it can be transmitted on the next link. This introduces a transmission delay equal to L/R, where L is the packet length and R is the link bandwidth.

**43. Describe the queuing and loss phenomena in packet switching networks.**

* Answer: In packet-switching networks, if the arrival rate of packets to a link exceeds the transmission rate, packets will queue, waiting to be transmitted. If the queue's buffer fills up, packets can be dropped (lost).

**44. What are the two primary functions of the network core, and how do they differ?**

* Answer: The two primary functions of the network core are:
  + Forwarding: Moving packets from a router's input to the appropriate output.
  + Routing: Determining the source-destination route taken by packets.

**45. How does circuit switching differ from packet switching in resource allocation and performance?**

* Answer: circuit switching, end-to-end resources are allocated and reserved for a "call" between source and destination In, providing dedicated resources and guaranteed performance. In contrast, packet switching shares resources and can experience congestion, leading to potential delays and loss.

**46. Explain Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM) in circuit switching.**

* Answer:
  + FDM (Frequency Division Multiplexing): Frequency bands are allocated to different users.
  + TDM (Time Division Multiplexing): Time slots are allocated to different users.

**47. Discuss the advantages and potential drawbacks of packet switching.**

* Answer:
  + Advantages: Great for bursty data due to resource sharing and simpler implementation (no call setup).
  + Drawbacks: Potential for excessive congestion, leading to packet delay and loss.

**48. Provide a high-level overview of the structure of the Internet as a "network of networks".**

* Answer: The Internet is a "network of networks," where end systems connect to the Internet via access ISPs, and these access ISPs interconnect to allow any two hosts to send packets to each other. This structure involves various tiers of ISPs and content provider networks.

**49. What are access ISPs and how do they fit into the Internet structure?**

* Answer: Access ISPs (Internet Service Providers) provide internet access to end systems (residential, company, and university ISPs). They form the base level of the Internet structure, connecting end users to the broader Internet.

**50. Briefly explain the role of Tier-1 ISPs and content provider networks in the Internet.**

* Answer:
  + Tier-1 ISPs: Large commercial ISPs (e.g., Level 3, Sprint, AT&T) that form the backbone of the Internet, providing national and international coverage.
  + Content provider networks: Networks (e.g., Google, Microsoft, Akamai) that may run their own networks to bring services and content closer to end users, often bypassing higher-tier ISPs.

Sources and related content