

---

## DHCP MCQs (Mix of Easy to Strict – Exam Style)

*Each MCQ includes 4 options and the correct answer.*

---

### 1. What is the main function of DHCP in a network?

- A) Encrypt data packets
- B) Assign IP configuration parameters automatically
- C) Block unauthorized devices
- D) Monitor bandwidth usage

Correct Answer: B

---

### 2. What is the correct sequence of the DORA process in DHCP?

- A) Request, Discover, Offer, Acknowledge
- B) Discover, Request, Offer, Acknowledge
- C) Discover, Offer, Request, Acknowledge
- D) Offer, Discover, Acknowledge, Request

Correct Answer: C

---

### 3. Which type of message is sent by a client to initiate the DHCP process?

- A) DHCP OFFER
- B) DHCP DISCOVER
- C) DHCP REQUEST
- D) DHCP ACK

Correct Answer: B

---

### 4. Which of the following is stored in the DHCP database after successful lease?

- A) MAC address and OS name
- B) Hostname and protocol type
- C) IP address and client information

D) DNS logs

**Correct Answer: C**

---

**5. What does T1 timer represent in DHCP lease renewal?**

A) 25% of lease time

B) 75% of lease time

C) 87.5% of lease time

D) 50% of lease time

**Correct Answer: D**

---

**6. What happens if the DHCP server is offline during the client's startup but the lease is still valid?**

A) Client auto-configures APIPA

B) Client sends a DHCP Discover again

C) Client pings the previous gateway

D) Client is assigned a new IP

**Correct Answer: C**

---

**7. Which IP address range does APIPA use?**

A) 192.168.0.0 – 192.168.255.255

B) 10.0.0.0 – 10.255.255.255

C) 169.254.0.0 – 169.254.255.254

D) 172.16.0.0 – 172.31.255.255

**Correct Answer: C**

---

**8. DHCP uses which transport layer protocol and port?**

A) TCP, Ports 20 and 21

B) UDP, Ports 67 and 68

C) ICMP, Port 7

D) HTTP, Port 80

**Correct Answer: B**

---

## **9. What is a DHCP Scope?**

- A) Time range for DHCP leasing
- B) Range of ports used by DHCP
- C) A range of IPs available for assignment
- D) List of MAC addresses of authorized clients

**Correct Answer: C**

---

## **10. When does the T2 timer start during DHCP lease?**

- A) 25% of lease time
- B) 50% of lease time
- C) 87.5% of lease time
- D) At lease expiry

**Correct Answer: C**

---

Would you like me to continue with 10 more DHCP MCQs (medium to difficult), or should I now switch to **NAT MCQs**?

---

## **11. Which of the following is true about DHCP lease time?**

- A) It is a static configuration set once per device.
- B) It defines how long a client can use the assigned IP address.
- C) It is only applicable to wired networks.
- D) It cannot be changed after assignment.

**Correct Answer: B**

---

## **12. Fill in the blank: During the lease renewal process, the DHCP client sends the renewal request to the server using \_\_\_\_\_.**

- A) Broadcast
- B) Multicast
- C) Unicast
- D) Anycast

**Correct Answer: C**

---

**13. Which of the following best explains the purpose of APIPA?**

- A) To assign routable IP addresses in large networks
- B) To assign DNS names when DHCP fails
- C) To assign an IP address when no DHCP server is available
- D) To prevent duplicate IP addresses

**Correct Answer: C**

---

**14. In a network, a device fails to obtain an IP address and is assigned 169.254.22.5. What has likely occurred?**

- A) DNS server failure
- B) IP conflict
- C) DHCP server is unavailable
- D) Subnet mask mismatch

**Correct Answer: C**

---

**15. What is the main reason for using DHCP over manual IP configuration?**

- A) DHCP increases internet speed
- B) DHCP allows easier IP address management
- C) DHCP encrypts data
- D) DHCP reduces hardware requirements

**Correct Answer: B**

---

**16. Scenario: A DHCP client sends a request to renew its lease at 60% of the lease period. Which timer is being used?**

- A) T0
- B) T1
- C) T2
- D) T3

**Correct Answer: B**

---

**17. If a client receives no ACK from the DHCP server after sending DHCP REQUEST, what happens?**

- A) Client will use APIPA immediately
- B) Client retries the entire DORA process
- C) Client continues to use the previous IP forever
- D) Client shuts down network interface

**Correct Answer: B**

---

**18. Which component is NOT typically included in a DHCP OFFER?**

- A) Subnet Mask
- B) Gateway Address
- C) MAC Address of Client
- D) IP Address for Lease

**Correct Answer: C**

---

**19. What does a DHCPACK message indicate in the DORA process?**

- A) The server is unavailable
- B) The client has been denied an address
- C) Final approval of lease assignment
- D) That the client must retry the request

**Correct Answer: C**

---

**20. A DHCP client is unable to contact a DHCP server and does not get any IP address.  
What is the fallback IP range used by Windows clients?**

- A) 192.168.1.1 – 192.168.1.254
- B) 172.16.0.1 – 172.16.0.254
- C) 169.254.0.1 – 169.254.255.254
- D) 10.0.0.1 – 10.0.0.254

**Correct Answer: C**

---

---

**NAT MCQs (1–30)**

*Each MCQ has one correct answer, labeled below the question.*

---

### **1. What does NAT stand for?**

- A) Network Access Translation
- B) Network Address Translation
- C) Node Address Transfer
- D) Name Address Tunnel

**Correct Answer: B**

---

### **2. What is the primary function of NAT?**

- A) Encrypt internet traffic
- B) Resolve domain names
- C) Replace IP addresses at network boundaries
- D) Route packets faster

**Correct Answer: C**

---

### **3. Which of the following IP address ranges is used for private networks?**

- A) 8.8.8.8 – 8.8.8.255
- B) 169.254.0.0 – 169.254.255.255
- C) 192.168.0.0 – 192.168.255.255
- D) 100.100.0.0 – 100.100.255.255

**Correct Answer: C**

---

### **4. Which NAT method allows many internal private IPs to share a single public IP?**

- A) Static NAT
- B) Dynamic NAT
- C) NAPT / PAT
- D) DNS forwarding

**Correct Answer: C**

---

### **5. What does a NAT device do when a private host sends a packet to the public Internet?**

- A) Changes MAC address
- B) Blocks packet

- C) Replaces source IP and port
  - D) Compresses payload
- Correct Answer: C**
- 

**6. Which type of NAT creates a one-to-one mapping between private and public IP addresses?**

- A) NAPT
  - B) Static NAT
  - C) Dynamic NAT
  - D) Load-balanced NAT
- Correct Answer: B**
- 

**7. Which NAT feature is specifically useful during ISP migration?**

- A) Static NAT
  - B) NAPT
  - C) Load balancing
  - D) Dynamic NAT with pooling
- Correct Answer: A**
- 

**8. Which type of NAT is used when the mapping of IPs is created dynamically from a pool of public addresses?**

- A) Static NAT
  - B) IP masquerading
  - C) Dynamic NAT
  - D) SNAT
- Correct Answer: C**
- 

**9. What does PAT stand for in the context of NAT?**

- A) Port Address Translation
  - B) Packet Authentication Tunnel
  - C) Private Address Tokenization
  - D) Port Allocation Technology
- Correct Answer: A**

---

**10. NAT breaks which fundamental property of the Internet?**

- A) IPv4 addressing
- B) DNS resolution
- C) End-to-end connectivity
- D) Network routing

**Correct Answer: C**

---

**11. What happens if different IP fragments are translated to different public IPs or ports?**

- A) Increased speed
- B) Connection is preserved
- C) Packet loss or corruption
- D) Faster routing

**Correct Answer: C**

---

**12. Which command is used in Linux to configure NAT using iptables for IP masquerading?**

- A) iptables -A NAT
- B) iptables -t nat -A POSTROUTING -j MASQUERADE
- C) iptables -t NAT -R
- D) ipconfig /masq

**Correct Answer: B**

---

**13. In a NAT configuration, what does SNAT stand for?**

- A) Static NAT
- B) Secure NAT
- C) Source NAT
- D) Server NAT

**Correct Answer: C**

---

**14. Which field in the IP header must be recalculated after NAT modifies the address?**

- A) Source MAC
- B) Destination port
- C) Header checksum
- D) TTL

**Correct Answer: C**

---

**15. Which port range is commonly used in PAT to distinguish multiple flows?**

- A) 20–25
- B) 80–8080
- C) 1024–65535
- D) 0–255

**Correct Answer: C**

---

**16. Load balancing with NAT works by:**

- A) Assigning equal bandwidth to users
- B) Forwarding to the server with the lowest IP
- C) Rotating destination IPs in a round-robin manner
- D) Changing MAC addresses

**Correct Answer: C**

---

**17. What does a NAT translation table store?**

- A) Hostnames and DNS records
- B) TCP window sizes
- C) Private-public IP and port mappings
- D) Gateway MAC addresses

**Correct Answer: C**

---

**18. Which of the following best describes IP masquerading?**

- A) NAT with dynamic IP rotation
- B) One-to-one IP mapping
- C) Using port numbers to differentiate private IPs
- D) Assigning MAC addresses to IPs

**Correct Answer: C**

---

**19. FTP is problematic with NAT because:**

- A) It uses TCP only
- B) It encrypts payload
- C) It embeds IP addresses in the data payload
- D) It operates on port 443

**Correct Answer: C**

---

**20. In NAT-enabled FTP communication, what must the NAT device do?**

- A) Drop FTP connections
- B) Translate IP in the TCP header only
- C) Inspect and rewrite IPs inside FTP payloads
- D) Disable port translation

**Correct Answer: C**

---

**21. The biggest security advantage of NAT is:**

- A) Preventing data loss
- B) Encrypting traffic
- C) Hiding internal IPs from the public network
- D) Blocking all ICMP traffic

**Correct Answer: C**

---

**22. What is the main limitation of using NAT for peer-to-peer applications?**

- A) It reduces bandwidth
- B) IP addresses are invalid
- C) It prevents direct incoming connections
- D) It increases latency

**Correct Answer: C**

---

**23. The NAT operation that happens when packets are entering the network is called:**

- A) POSTROUTING
- B) SNAT

C) PREROUTING

D) TUNNELING

**Correct Answer: C**

---

**24. In iptables, what is the purpose of DNAT?**

A) Assign a new gateway

B) Modify packet TTL

C) Change destination address

D) Disable NAT

**Correct Answer: C**

---

**25. Why can NAT reduce application performance?**

A) Because NAT compresses traffic

B) Due to packet fragmentation and checksum recalculation

C) It blocks DNS resolution

D) It converts TCP to UDP

**Correct Answer: B**

---

**26. PAT is especially useful when:**

A) Each private device requires a public IP

B) DNS is not available

C) One public IP must support many internal devices

D) Load balancing is unnecessary

**Correct Answer: C**

---

**27. In NAT configuration, a pool of addresses is useful when:**

A) Only one internal host is online

B) The private network is very small

C) Many internal devices share a limited number of public IPs

D) Every internal host has a static IP

**Correct Answer: C**

---

**28. In NAT with load balancing, incoming requests are typically forwarded to:**

- A) DNS servers
- B) Internal servers using round-robin
- C) Routers
- D) External public IPs

**Correct Answer: B**

---

**29. What problem does NAT solve when changing ISPs?**

- A) DNS caching
- B) Reassigning IPs manually
- C) Automatic public IP mapping
- D) Assigning default gateway

**Correct Answer: B**

---

**30. What is the disadvantage of using NAT with applications that carry IPs in the application layer?**

- A) NAT ignores those applications
- B) NAT blocks application ports
- C) NAT must inspect and rewrite application payloads
- D) NAT replaces MAC addresses

**Correct Answer: C**

---

## **CN – PART 01**

---

## Topic 1 Summary: *Principles of Network Applications*

This topic introduces the foundational ideas of the application layer in networking. Key points include:

- **Client-Server vs Peer-to-Peer architectures**
  - **Sockets:** Interfaces for sending and receiving data
  - **Transport Layer Services:** TCP vs UDP and what applications need
  - **Application-Layer Protocols:** Define message types, formats, semantics, and rules
  - **Identifiers:** IP + Port used to identify communicating processes
  - **Common Internet Applications:** Web, email, VoIP, video streaming
  - **Service requirements:** Timing, reliability, throughput, and security vary by application
- 

## 20 MCQs on "Principles of Network Applications"

---

### Easy Level

1. **Which of the following is a client-server application?**
  - A. BitTorrent
  - B. Skype
  - C. HTTP
  - D. Gnutella

**Answer: C**
2. **Which protocol provides unreliable data transfer?**
  - A. TCP
  - B. HTTP
  - C. FTP
  - D. UDP

**Answer: D**
3. **Which of the following must a process have to receive a message?**
  - A. Username
  - B. IP Address only
  - C. Hostname only
  - D. IP Address and Port Number

**Answer: D**
4. **In the application layer, the term ‘socket’ refers to:**
  - A. Port number
  - B. Network cable
  - C. Interface between process and transport layer
  - D. IP address

**Answer: C**

5. Which of these is NOT a transport layer service requirement?

- A. Delay
- B. Jitter
- C. Encryption
- D. Message length

Answer: D

---

## Medium Level

6. In a P2P architecture, each peer acts as:

- A. Client only
- B. Server only
- C. Both client and server
- D. None

Answer: C

7. Which application typically uses TCP for data transfer?

- A. YouTube
- B. HTTP
- C. DNS
- D. Zoom

Answer: B

8. Which of the following protocols is proprietary?

- A. SMTP
- B. HTTP
- C. FTP
- D. Skype

Answer: D

9. Which of these is an open protocol?

- A. Zoom
- B. Skype
- C. SMTP
- D. WhatsApp

Answer: C

10. What kind of communication happens between two processes on different hosts?

- A. Remote procedure call
- B. Message passing
- C. Shared memory
- D. Internal process exchange

Answer: B

---

## Difficult/Tricky

- 11. Which of the following correctly matches the service requirement for interactive games?**
- A. Loss-tolerant, high throughput
  - B. No loss, no delay
  - C. Loss-tolerant, low delay
  - D. No loss, high delay
- Answer: C**
- 12. Why do network core devices not run user applications?**
- A. Because they lack memory
  - B. They are not user-accessible
  - C. Their role is limited to routing and switching
  - D. They are on a different layer
- Answer: C**
- 13. Which of the following is NOT a characteristic of TCP?**
- A. Reliable
  - B. Connection-oriented
  - C. Fast
  - D. Congestion control
- Answer: C**
- 14. In what scenario is UDP preferred over TCP?**
- A. File transfer
  - B. Email communication
  - C. Live video streaming
  - D. Remote login
- Answer: C**
- 15. Why is IP address alone insufficient to identify a process?**
- A. Because it can change
  - B. Because multiple processes may run on one host
  - C. Because it's not human-readable
  - D. Because it is encrypted
- Answer: B**
- 



### Mixed/Scenario-Based, True-False, Fill-in-the-Blank

- 16. (True/False):** In the client-server model, clients can also act as servers.
- Answer: False**
- 17. (True/False):** Applications like Skype use both client-server and P2P architecture.
- Answer: True**
- 18. Fill in the blank:** The \_\_\_\_\_ protocol offers reliable data transfer, flow control, and congestion control.
- Answer: TCP**
- 19. Match the following:**

| App              | Requirement                    |
|------------------|--------------------------------|
| a) Web           | 1. No loss, not time-sensitive |
| b) Audio call    | 2. Loss-tolerant, low delay    |
| c) File Transfer | 3. 100% reliable transfer      |

**Correct Match:**

a → 1  
b → 2  
c → 3

**Answer: a→1, b→2, c→3**

**20. Which of the following is NOT part of an application-layer protocol specification?**

- A. Message types
- B. Message format
- C. Link-layer encoding
- D. Communication rules

**Answer: C**

---

Topic 2 Summary: *Web and HTTP*

This section explains how web-based communication happens using the **HyperText Transfer Protocol (HTTP)**. Key ideas include:

- **HTTP is a stateless, client-server protocol** used to transfer web resources (HTML, images, etc.).
  - **HTTP uses TCP**, typically on **port 80**.
  - There are **two types of HTTP connections**:
    - **Non-persistent**: One object per TCP connection.
    - **Persistent (HTTP/1.1)**: Multiple objects over one connection.
  - **HTTP Methods**: GET, POST, PUT, HEAD
  - **HTTP request/response messages**: ASCII-based with headers, status codes (like 200 OK, 404 Not Found).
  - **Cookies**: Used to maintain state between HTTP requests.
  - **Web caching** reduces load time and bandwidth.
  - **Conditional GET** and **HTTP/2** enhancements improve performance.
- 

 20 MCQs on *Web and HTTP*

---

## Easy Level

1. **HTTP is an example of which type of protocol?**
    - A. Transport-layer protocol
    - B. Network-layer protocol
    - C. Application-layer protocol
    - D. Data-link layer protocol

**Answer: C**
  2. **Which transport layer protocol does HTTP use?**
    - A. UDP
    - B. TCP
    - C. ICMP
    - D. IP

**Answer: B**
  3. **What is the default port for HTTP?**
    - A. 25
    - B. 53
    - C. 80
    - D. 110

**Answer: C**
  4. **Which HTTP method is used to request data from a specified resource?**
    - A. PUT
    - B. POST
    - C. GET
    - D. DELETE

**Answer: C**
  5. **Which of the following makes HTTP stateless?**
    - A. HTTP encrypts all messages
    - B. Each HTTP request is independent
    - C. HTTP uses UDP
    - D. HTTP maintains client history

**Answer: B**
- 

## Medium Level

6. **Which line contains the HTTP method and requested resource?**
  - A. Request header
  - B. Status line
  - C. Request line
  - D. Entity body

**Answer: C**
7. **Which HTTP method uploads a new file or replaces existing file?**
  - A. GET

- B. POST
- C. PUT
- D. HEAD

Answer: C

8. In non-persistent HTTP, how many RTTs are needed per object?

- A. 0
- B. 1
- C. 2
- D. 3

Answer: C

9. What happens in HTTP when the server is “stateless”?

- A. It remembers all previous requests
- B. It keeps session data in memory
- C. It does not maintain info on past requests
- D. It uses cookies by default

Answer: C

10. Which header is used in a conditional GET request?

- A. Cookie
- B. If-Modified-Since
- C. ETag
- D. Accept

Answer: B

---

## Difficult/Tricky

11. Which statement is FALSE about persistent HTTP (HTTP/1.1)?

- A. Multiple objects sent in one TCP connection
- B. Server closes connection after each object
- C. Reduces latency compared to non-persistent
- D. Allows parallel transfers in fewer TCP connections

Answer: B

12. Which response status code means “Moved Permanently”?

- A. 200
- B. 400
- C. 301
- D. 404

Answer: C

13. Which of the following fields in an HTTP message is mandatory?

- A. Cookie
- B. Host
- C. User-Agent
- D. Accept-Encoding

Answer: B

**14. Why does HTTP/2 divide objects into frames?**

- A. For encryption
- B. To reduce congestion
- C. To prevent head-of-line blocking
- D. To ensure persistent connection

**Answer: C**

**15. What does HTTP response code 304 signify?**

- A. Not Modified
- B. Bad Request
- C. Forbidden
- D. Internal Server Error

**Answer: A**

---

 **Mixed/Scenario-Based, True/False, Matching**

**16. (True/False): HTTP messages are binary encoded.**

**Answer: False**

**17. (True/False): POST method includes user input in the URL.**

**Answer: False**

**18. Fill in the blank: The HTTP status code 404 means \_\_\_\_\_.**

**Answer: Not Found**

**19. Match the HTTP status codes:**

| Code   | Meaning                  |
|--------|--------------------------|
| A) 200 | 1. Not Found             |
| B) 404 | 2. OK                    |
| C) 301 | 3. Moved Permanently     |
| D) 505 | 4. Version Not Supported |

**Answer: A→2, B→1, C→3, D→4**

**20. Which of the following is NOT a benefit of web caching?**

- A. Reduces access link congestion
- B. Reduces server load
- C. Reduces client-side storage
- D. Speeds up object delivery

**Answer: C**

---

## Topic 3 Summary: *E-Mail – SMTP, IMAP*

This section explores how email works over the Internet. It introduces the major components and protocols:

- **Major components:**
    - **User Agent (UA):** Reads, composes, sends (e.g., Outlook, Gmail)
    - **Mail Servers:** Store and forward email messages
    - **SMTP (Simple Mail Transfer Protocol):** Used to send messages between servers (uses TCP port 25)
  - **SMTP** is a **push protocol**; messages go directly from sender's server to receiver's.
  - SMTP uses **ASCII text commands, persistent connections, and 7-bit encoding.**
  - **Mail Access Protocols:**
    - **IMAP:** Stores mail on the server; supports folders, multiple devices.
    - **POP:** Downloads and possibly deletes mail from the server.
    - Webmail (e.g., Gmail) often uses SMTP + IMAP/POP behind the scenes.
  - **Message format:** Defined by RFC 2822 — headers (To, From, Subject) + body.
- 

## 20 MCQs on *E-mail: SMTP, IMAP*

---

### Easy Level

1. **Which of the following is used to transfer emails between mail servers?**
  - A. IMAP
  - B. POP
  - C. SMTP
  - D. HTTP

 **Answer: C**
2. **SMTP uses which transport layer protocol?**
  - A. UDP
  - B. TCP
  - C. FTP
  - D. ICMP

 **Answer: B**
3. **Which port is used by SMTP?**
  - A. 110
  - B. 53
  - C. 25
  - D. 80

 **Answer: C**
4. **Which protocol allows accessing emails from multiple devices without deleting them from the server?**

- A. POP
- B. IMAP
- C. SMTP
- D. FTP

**Answer: B**

5. Which of the following is a user agent?

- A. SMTP
- B. Gmail
- C. TCP
- D. DNS

**Answer: B**

---

## Medium Level

6. Which command in SMTP indicates the start of the message body?

- A. HELO
- B. MAIL FROM
- C. DATA
- D. RCPT TO

**Answer: C**

7. Which of the following is TRUE about IMAP?

- A. It deletes mail after downloading
- B. It is used to send mail
- C. It stores mail on the server
- D. It is a push protocol

**Answer: C**

8. In the SMTP dialogue, what does the response “250 OK” mean?

- A. Message delivery failed
- B. Command was successful
- C. Bad request
- D. Server not found

**Answer: B**

9. Which of the following is NOT part of the SMTP handshaking process?

- A. HELO
- B. MAIL FROM
- C. GET
- D. RCPT TO

**Answer: C**

10. Which standard defines the syntax of an email message?

- A. RFC 5321
- B. RFC 959
- C. RFC 3501

D. RFC 2822

Answer: D

---

 **Difficult/Tricky**

11. Which of the following best explains “client push” in SMTP?

- A. Client requests email from server
- B. Server pushes email to client
- C. Client initiates sending of email to server
- D. Email sent only via POP

Answer: C

12. What separates the header and body in an email message?

- A. CRLF.CRLF
- B. 7-bit encoding
- C. A blank line
- D. END command

Answer: C

13. What is the correct sequence of an SMTP email exchange?

- A. MAIL FROM → RCPT TO → DATA
- B. HELO → DATA → RCPT TO
- C. HELO → RCPT TO → MAIL FROM
- D. DATA → MAIL FROM → RCPT TO

Answer: A

14. Which protocol would most likely be used by Gmail’s server to retrieve a message for the browser interface?

- A. SMTP
- B. POP
- C. IMAP
- D. TCP

Answer: C

15. Which of the following is NOT true about SMTP?

- A. Uses persistent connections
- B. Supports binary data transfer
- C. Relies on ASCII format
- D. Uses port 25

Answer: B

---

 **Mixed/Scenario-Based, Matching, T/F, Fill-in-the-Blank**

16. (**True/False**): SMTP supports message transfer only if both servers are online simultaneously.

**Answer: True**

17. (**True/False**): POP3 is preferred when users want to maintain multiple folders on the server.

**Answer: False**

18. **Fill in the blank:** In SMTP, the command to begin sending message content is \_\_\_\_\_.

**Answer: DATA**

19. **Match the protocol to its function:**

| Protocol | Function |
|----------|----------|
|----------|----------|

A) SMTP 1. Send email between servers

B) POP 2. Downloads and deletes mail

C) IMAP 3. Manage mail on the server

**Answer: A→1, B→2, C→3**

20. **In an SMTP conversation, which command ends the connection?**

- A. QUIT
- B. END
- C. EXIT
- D. FINISH

**Answer: A**

---

**Topic 4 Summary: Domain Name System (DNS)**

DNS is a **distributed application-layer protocol** that maps **hostnames** (e.g., [www.google.com](http://www.google.com)) to **IP addresses** (e.g., [142.250.190.68](http://142.250.190.68)).

**Key Concepts:**

- **Why DNS?** IP addresses are hard to remember, but hostnames are easy for humans.
- **DNS Structure:**
  - Distributed and hierarchical
  - Includes **Root**, **TLD**, and **Authoritative** servers
  - **Local DNS** servers cache recent lookups
- **DNS Records (RRs):**
  - A: maps name to IP
  - NS: maps domain to name server

- CNAME: alias to canonical name
  - MX: mail server info
  - **DNS Queries:**
    - **Iterative:** server responds with next server to query
    - **Recursive:** server gets the answer on behalf of client
  - **Caching:** Improves performance; entries expire after TTL
  - **Security Concerns:**
    - DDoS, DNS spoofing, cache poisoning
    - Solution: DNSSEC (authentication and integrity)
- 

## 20 MCQs on *Domain Name System (DNS)*

---

### Easy Level

1. **What is the primary function of DNS?**
  - A. Encrypt data
  - B. Send emails
  - C. Translate domain names to IP addresses
  - D. Compress web content

**Answer: C**
2. **Which DNS record maps a hostname to an IP address?**
  - A. CNAME
  - B. A
  - C. MX
  - D. NS

**Answer: B**
3. **What type of server is responsible for top-level domains like .com, .org?**
  - A. Authoritative server
  - B. Root server
  - C. Local server
  - D. TLD server

**Answer: D**
4. **What does TTL in DNS stand for?**
  - A. Total Time Left
  - B. Time to Load
  - C. Time to Live
  - D. Transfer to Local

**Answer: C**
5. **Which organization manages DNS root servers?**
  - A. IEEE
  - B. ICANN
  - C. IETF

D. ITU

Answer: B

---

## Medium Level

6. Which type of query requires the DNS server to fully resolve the name before replying?
    - A. Iterative
    - B. Recursive
    - C. Caching
    - D. Static

Answer: B
  7. Which record type is used to map an alias to a canonical name?
    - A. A
    - B. MX
    - C. NS
    - D. CNAME

Answer: D
  8. What happens if a DNS server doesn't know an answer in an iterative query?
    - A. It drops the query
    - B. It forwards it to root
    - C. It gives the next DNS server to contact
    - D. It returns error 404

Answer: C
  9. Which DNS record identifies the mail server for a domain?
    - A. MX
    - B. NS
    - C. A
    - D. CNAME

Answer: A
  10. How does DNS improve performance using caching?
    - A. Reduces file sizes
    - B. Encrypts requests
    - C. Stores previous lookups
    - D. Connects directly to IP

Answer: C
- 

## Difficult/Tricky

11. Which of the following statements is FALSE about DNS?
  - A. DNS uses both TCP and UDP

- B. DNS is a centralized protocol
- C. DNS entries have TTL
- D. DNS uses hierarchical structure

**Answer: B**

**12. Which of the following are authoritative for a domain?**

- A. Root servers
- B. TLD servers
- C. Organization's own DNS servers
- D. ISP DNS cache

**Answer: C**

**13. In recursive DNS, which server bears the resolution burden?**

- A. The client
- B. The root server
- C. The local DNS server
- D. The authoritative DNS server

**Answer: C**

**14. Which record format is correct for a DNS resource record?**

- A. (IP, Port, Type, TTL)
- B. (Name, Value, Type, TTL)
- C. (Domain, Host, Zone)
- D. (Key, Value, Status)

**Answer: B**

**15. What is the function of DNSSEC?**

- A. Encrypt DNS messages
- B. Sign DNS responses for integrity
- C. Prevent DDOS attacks
- D. Shorten DNS lookup time

**Answer: B**

---

 **Mixed/Matching, T/F, Scenario-Based**

**16. (True/False): Local DNS servers are part of the DNS hierarchy.**

**Answer: False**

**17. (True/False): A CNAME record can point to another CNAME.**

**Answer: False** (Best practice is to point to an A record)

**18. Fill in the blank: DNS uses port number \_\_\_\_\_ for standard queries.**

**Answer: 53**

**19. Match the DNS component to its function:**

| <b>Component</b> | <b>Function</b> |
|------------------|-----------------|
|------------------|-----------------|

A) Root      1. Last-resort resolver

| Component        | Function                           |
|------------------|------------------------------------|
| B) TLD           | 2. Handles domains like .com, .edu |
| C) Authoritative | 3. Stores final name-IP pair       |

**Answer:** A→1, B→2, C→3

**20. A user types `www.abc.com`. The query passes through root and `.com` TLD, but fails at the authoritative server. What could be the issue?**

- A. DNS uses TCP
- B. DNS caching is disabled
- C. No A record exists for abc.com
- D. TTL has expired

**Answer: C**

---

Topic 5 Summary: *P2P Applications and File Sharing (BitTorrent)*

This topic explains the **Peer-to-Peer (P2P)** model where users (peers) share resources directly with each other, without centralized servers.

### Key Concepts:

- **No always-on server:** Peers connect, request, and share data among themselves.
  - **Self-scalability:** More peers = more capacity.
  - **Peers are intermittently connected** and have dynamic IPs.
  - **BitTorrent:**
    - File is split into chunks.
    - Peers download and upload chunks to/from others.
    - **Tracker** keeps track of all peers in a torrent.
    - **Tit-for-Tat** strategy: Peers prioritize others who send data to them.
    - **Optimistic unchoking:** Randomly send data to a new peer periodically.
  - **Client-server vs P2P distribution:**
    - P2P is **faster** and **scales better** as N increases.
- 

 20 MCQs on *P2P Applications & BitTorrent*

---

 **Easy Level**

1. Which of the following is a P2P application?
    - A. Gmail
    - B. Netflix
    - C. BitTorrent
    - D. Amazon

Answer: C
  2. In P2P architecture, which statement is TRUE?
    - A. Central server distributes files
    - B. Peers do not share files
    - C. Peers are both clients and servers
    - D. Data always flows through a proxy

Answer: C
  3. What is a “chunk” in BitTorrent?
    - A. A command
    - B. A tracker message
    - C. A piece of a file
    - D. A user profile

Answer: C
  4. Which component tracks the participating peers in a torrent?
    - A. Index server
    - B. Tracker
    - C. Router
    - D. Hostname resolver

Answer: B
  5. What is the strategy called where peers send data to those who send to them?
    - A. Round robin
    - B. Pull strategy
    - C. Tit-for-tat
    - D. Push-pull

Answer: C
- 

## Medium Level

6. In BitTorrent, a peer can receive chunks from:
  - A. The server only
  - B. Any other peer in the torrent
  - C. A central node
  - D. Only its ISP

Answer: B
7. Which of the following best describes “self-scalability” in P2P?
  - A. Fixed network capacity
  - B. Each new peer reduces download rate
  - C. Each new peer adds upload capacity

- D. Centralized control  
 **Answer: C**
8. What does “optimistic unchoking” achieve in BitTorrent?  
A. Reduces memory usage  
B. Helps discover better peers  
C. Slows down old peers  
D. Enforces encryption  
 **Answer: B**
9. What happens if a peer leaves a torrent after downloading the full file?  
A. It continues to upload chunks  
B. It becomes a tracker  
C. It no longer participates  
D. It compresses the file  
 **Answer: C**
10. What is “churn” in a P2P network?  
A. Process of encoding chunks  
B. Server shutdown  
C. Peers joining and leaving frequently  
D. DNS resolution time  
 **Answer: C**
- 

## ● Difficult/Tricky

11. Which of the following equations represents P2P distribution time?  
A.  $D = F / u$   
B.  $D > \max\{F/us, F/dmin, NF/(us + \sum ui)\}$   
C.  $D = NF/us$   
D.  $D = F / (us + ui)$   
 **Answer: B**
12. Which of the following describes BitTorrent’s behavior best?  
A. Fetches entire file from a single peer  
B. Prioritizes popular files  
C. Downloads chunks from multiple peers simultaneously  
D. Waits for server approval  
 **Answer: C**
13. What is the first thing a new peer does when joining a torrent?  
A. Sends chunk  
B. Connects to server  
C. Registers with tracker  
D. Closes port  
 **Answer: C**
14. Why do peers periodically reevaluate their top 4 partners?  
A. To refresh connections

- B. To prioritize peers sending fastest
- C. To block inactive users
- D. To balance CPU usage

**Answer: B**

**15. Which of the following is NOT an advantage of P2P over client-server?**

- A. No single point of failure
- B. Higher scalability
- C. Guaranteed data integrity
- D. Bandwidth increases with more peers

**Answer: C**

---

 **Mixed/Scenario-Based, T/F, Matching**

**16. (True/False):** In BitTorrent, all peers are equal and have the same upload speed.

**Answer: False**

**17. (True/False):** BitTorrent's tit-for-tat prevents free-riding behavior.

**Answer: True**

**18. Fill in the blank:** BitTorrent uses a \_\_\_\_\_ to keep track of peers in a torrent.

**Answer: Tracker**

**19. Match the concept with description:**

| Concept        | Description                                |
|----------------|--|
| A) Tracker     | 1. Monitors all peers in a torrent         |
| B) Chunk       | 2. Small file segment                      |
| C) Tit-for-Tat | 3. Sends data only to top-performing peers |

**Answer: A→1, B→2, C→3**

**20. Which of the following best explains “rarest-first” chunk strategy?**

- A. Peers ask for the chunk closest to them
- B. Peers request chunks they already have
- C. Peers request chunks that are least available
- D. Chunks are sent only to seeders

**Answer: C**

---

## Topic 6 Summary: *Video Streaming & CDNs*

This section explains how large-scale video content (like Netflix, YouTube) is streamed to millions of users efficiently.

### **Key Concepts:**

- **Streaming Types:**
  - **Stored video streaming:** Pre-recorded video served to clients.
  - **Live streaming:** Real-time content sent over the Internet.
- **Challenges:**
  - Bandwidth variation
  - Delay & jitter
  - Packet loss
  - Heterogeneous devices (e.g., mobile vs. desktop)
- **Client-side Buffering:** Used to smooth out delay/jitter.
- **DASH (Dynamic Adaptive Streaming over HTTP):**
  - Video split into chunks at various bitrates
  - Client selects highest sustainable quality dynamically
  - **Manifest file** lists available chunk URLs
- **CDNs (Content Distribution Networks):**
  - Distribute content across **geographically distributed servers**
  - Reduce load, delay, and congestion
  - Two approaches:
    - **Deep:** Push CDN servers into local ISPs
    - **Bring-home:** Large data centers near edge
- **OTT:** “Over-the-top” platforms like Netflix that use public Internet for video delivery.

---

## 20 MCQs on *Video Streaming & CDNs*

---

### **Easy Level**

1. **What does DASH stand for?**
  - A. Dynamic Assignment of Stream Hosts
  - B. Dynamic Adaptive Streaming over HTTP
  - C. Data Allocation Stream Handler
  - D. Distributed Access Streaming Hub

**Answer: B**
2. **What is the function of a manifest file in DASH?**
  - A. Encrypt video
  - B. Track user data
  - C. List available video chunks and qualities

- D. Cache streaming content  
 **Answer: C**
3. Which of these is a challenge in video streaming?  
A. High storage cost  
B. DNS spoofing  
C. Network jitter and delay  
D. File fragmentation  
 **Answer: C**
4. Which component helps reduce delay in video delivery?  
A. Firewall  
B. DNS  
C. CDN  
D. SMTP  
 **Answer: C**
5. What does “buffering” help prevent during streaming?  
A. Piracy  
B. Drop in resolution  
C. Playout interruptions  
D. Duplicate frames  
 **Answer: C**
- 

## Medium Level

6. Which is NOT true about DASH?  
A. Client selects which chunk to request  
B. Client always requests the lowest quality  
C. Video is encoded at multiple rates  
D. Chunks are stored at different URLs  
 **Answer: B**
7. What is a major benefit of CDNs?  
A. Prevent IP conflicts  
B. Increase packet sizes  
C. Reduce latency and load on central servers  
D. Secure FTP transmission  
 **Answer: C**
8. What kind of playout constraint is important for streaming?  
A. Static buffer usage  
B. Continuous video display  
C. Exact IP matching  
D. DNS caching  
 **Answer: B**
9. What is the major issue with using a single mega-server for streaming?  
A. Too much memory usage

- B. Audio loss
- C. Bottlenecks and single point of failure
- D. Slow database access

**Answer: C**

**10. Which strategy is used in deep CDN placement?**

- A. Place servers in core of the Internet
- B. Place servers close to users at ISPs
- C. Centralize all content at one data center
- D. Delay-based routing

**Answer: B**

---

 **Difficult/Tricky**

**11. Which statement about OTT platforms is FALSE?**

- A. They rely on dedicated telecom infrastructure
- B. They operate over public Internet
- C. Examples include Netflix, YouTube
- D. Use CDNs to deliver content

**Answer: A**

**12. What does client “intelligence” in DASH help with?**

- A. Reduces chunk size
- B. Improves DNS resolution
- C. Dynamically adjusts bitrate based on network
- D. Caches entire video

**Answer: C**

**13. What causes buffer starvation during video playback?**

- A. Too large buffer
- B. Client-side storage
- C. Low bandwidth and late chunk arrival
- D. High-quality audio

**Answer: C**

**14. How does playout buffering solve jitter?**

- A. By modifying packet headers
- B. By adjusting audio delay
- C. By storing video data temporarily before play
- D. By removing low-quality chunks

**Answer: C**

**15. What is the advantage of using “Bring-home” CDN model?**

- A. High local delivery speed
- B. Cheap file compression
- C. Random access of segments
- D. In-built encryption

**Answer: A**

---

## Mixed/Matching, T/F, Scenario-Based

16. (True/False): DASH video segments are encoded in only one bitrate.

Answer: False

17. (True/False): CDNs improve quality by dynamically changing content type.

Answer: False

18. Fill in the blank: In DASH, the client chooses the chunk based on \_\_\_\_\_ conditions.

Answer: bandwidth/network

19. Match the following:

| Component   | Description                           |
|-------------|---------------------------------------|
| A) DASH     | 1. Adaptive bitrate video protocol    |
| B) Manifest | 2. Lists chunk URLs and versions      |
| C) CDN      | 3. Geographically distributed servers |

Answer: A→1, B→2, C→3

20. A user watching Netflix sees constant buffering. What is the likely reason?

- A. Browser cache
- B. CDN malfunction
- C. Insufficient client bandwidth
- D. DNS loop

Answer: C

---

## CN-PART 03.

---

---

### ◆ Multiplexing & Demultiplexing — MCQs (21–40)

---

## ◆ Multiplexing & Demultiplexing — MCQs (1–20)

---

### 1. (Easy)

Which field in the transport-layer segment is primarily used for demultiplexing in UDP?

- A. Sequence Number
- B. Source Port Number
- C. Destination Port Number
- D. Window Size

**Answer:** C

---

### 2. (Easy)

In TCP, demultiplexing is done using which of the following?

- A. Destination port number only
- B. Source IP address only
- C. Source and destination IPs and port numbers
- D. Protocol type in IP header

**Answer:** C

---

### 3. (Medium)

What is the **primary purpose** of multiplexing at the transport layer?

- A. Encrypting data before transmission
- B. Routing data through optimal paths
- C. Sending data from multiple processes over a single host IP
- D. Blocking ports

**Answer:** C

---

### 4. (Medium)

Which of the following allows multiple applications to use the network simultaneously?

- A. DNS
- B. IP routing
- C. Multiplexing
- D. Load balancing

**Answer:** C

---

### 5. (Medium)

Which protocol uses **only the destination port number** for demultiplexing?

- A. TCP
- B. IP
- C. UDP
- D. ICMP

**Answer:** C

---

**6. (Hard)**

A server has 3 UDP sockets listening on port 8080. A client sends a datagram from three different IPs, all to port 8080. How many sockets at the server will handle these packets?

- A. 1
- B. 3
- C. 2
- D. 0

**Answer:** A

*(UDP uses destination port only; all directed to same socket)*

---

**7. (Easy)**

Demultiplexing maps segments to:

- A. Buffers
- B. Routers
- C. Sockets
- D. Applications

**Answer:** C

---

**8. (Medium)**

In TCP, what uniquely identifies a connection?

- A. Destination IP
- B. Source port only
- C. 4-tuple of IPs and ports
- D. MAC address and IP

**Answer:** C

---

**9. (Medium)**

Which of these statements about **TCP demultiplexing** is true?

- A. TCP does not use IP addresses
- B. TCP uses only destination port to identify sockets
- C. TCP requires all four values (source IP, dest IP, source port, dest port)

D. TCP works at the physical layer

**Answer:** C

---

**10. (Easy)**

Which layer is responsible for multiplexing/demultiplexing in the OSI model?

- A. Network
- B. Data Link
- C. Transport
- D. Application

**Answer:** C

---

**11. (Hard)**

A TCP segment arrives at a server. Destination port is 80. Which socket will it be delivered to?

- A. One with matching source port
- B. One with matching destination IP only
- C. One matching the 4-tuple
- D. Any socket bound to port 80

**Answer:** C

---

**12. (Medium)**

In connectionless demultiplexing, a UDP segment with destination port 53 will be delivered to:

- A. All sockets
- B. Socket bound to port 53
- C. Any socket with the same IP
- D. It will be dropped

**Answer:** B

---

**13. (Medium)**

When creating a **UDP socket**, what must the application specify?

- A. Destination IP only
- B. Host-local port number
- C. Checksum
- D. RTT

**Answer:** B

---

**14. (Hard)**

Which of the following **must be unique** to distinguish **TCP connections** on a server?

- A. Source IP only
- B. Source port only
- C. Destination port only
- D. Combination of source IP, source port

**Answer:** D

---

**15. (Easy)**

What is the purpose of port numbers in transport-layer segments?

- A. Control routing decisions
- B. Encrypt packets
- C. Identify application processes
- D. Allocate IP addresses

**Answer:** C

---

**16. (Medium)**

Which is **not required** for UDP demultiplexing?

- A. Destination IP
- B. Destination port
- C. Protocol field
- D. Source port

**Answer:** D

---

**17. (Hard)**

Which of these best describes **TCP connection-oriented demultiplexing**?

- A. Randomized port allocation
- B. Single socket for all connections
- C. Dedicated socket per client connection
- D. No sockets are used

**Answer:** C

---

**18. (Medium)**

A UDP segment arrives at a host with destination port 5000. No socket is bound to 5000. What happens?

- A. It is accepted by OS
- B. Delivered to port 0
- C. It is dropped

D. Sent to TCP

**Answer:** C

---

**19. (Easy)**

Which layer delivers segments to sockets based on header information?

- A. Transport
- B. Network
- C. Data Link
- D. Physical

**Answer:** A

---

**20. (Hard)**

Which of the following causes **UDP** to send multiple datagrams to the **same socket**?

- A. All datagrams have different source ports
- B. All datagrams have same destination port
- C. All datagrams have same payload
- D. Destination IPs are different

**Answer:** B

---

**21. (Easy)**

Which two layers are most involved in delivering a transport segment to the correct process?

- A. Physical and Data Link
- B. Network and Application
- C. Transport and Network
- D. Data Link and Application

**Answer:** C

---

**22. (Medium)**

Which of the following is a valid reason for using **multiplexing** in a transport protocol?

- A. To reduce the length of IP headers
- B. To enable multiple applications to share a network connection
- C. To enforce flow control
- D. To encrypt traffic

**Answer:** B

---

**23. (Medium)**

In TCP, what happens if two clients connect to the same server port?

- A. They share the same socket
- B. One is dropped
- C. Each gets its own connection identified by a unique 4-tuple
- D. The server cannot differentiate them

**Answer:** C

---

**24. (Hard)**

In UDP, what happens when segments from multiple different source ports but with the **same destination port** arrive at a host?

- A. They are sent to different sockets
- B. The OS crashes
- C. They are delivered to the same socket
- D. They are all dropped

**Answer:** C

---

**25. (Medium)**

Which is **true** regarding multiplexing at the transport layer?

- A. It requires every process to use a different protocol
- B. Each transport protocol uses the same socket
- C. It uses port numbers to differentiate processes
- D. It is only available in TCP

**Answer:** C

---

**26. (Hard)**

A segment arrives with:

- Src IP: 192.168.1.2
- Src port: 5000
- Dest IP: 192.168.1.10
- Dest port: 80

Which socket does TCP use to deliver this?

- A. Any socket listening on port 80
- B. Socket matching 192.168.1.2:5000 -> 192.168.1.10:80
- C. Socket with matching destination IP only
- D. None

**Answer:** B

---

**27. (Medium)**

Why is **demultiplexing** more complex in TCP than in UDP?

- A. TCP uses unreliable delivery
- B. TCP involves sequence numbers
- C. TCP uses a 4-tuple to identify sockets
- D. TCP uses fewer ports

**Answer:** C

---

**28. (Easy)**

The role of the **destination port number** in a transport layer segment is to:

- A. Specify how to route the segment
- B. Identify the receiving process
- C. Encrypt the payload
- D. Store the application data

**Answer:** B

---

**29. (Hard)**

If a host receives TCP segments on port 443 from 3 different clients, how many **distinct sockets** will it have?

- A. 1
- B. 3
- C. 2
- D. Depends on the OS

**Answer:** B

---

**30. (Medium)**

Which component is most responsible for **reassembling** segments into messages?

- A. Network layer
- B. Link layer
- C. Transport layer receiver
- D. Application layer

**Answer:** C

---

**31. (Medium)**

How does a server distinguish between two concurrent TCP connections to the same port?

- A. By client MAC address
- B. By different payloads
- C. By different 4-tuples

D. It cannot distinguish

**Answer:** C

---

**32. (Hard)**

Which of the following is **not a valid scenario** for TCP connection demultiplexing?

- A. Different source IPs and ports
- B. Same source port, same dest port, but different source IPs
- C. Same 4-tuple
- D. Different destination IPs but same source port

**Answer:** C

*(Same 4-tuple would not be treated as different connections)*

---

**33. (Medium)**

In **connectionless demultiplexing**, which field is **not used** to determine the socket?

- A. Source port
- B. Destination port
- C. Source IP
- D. Protocol type

**Answer:** A

---

**34. (Hard)**

A segment is received with a corrupted destination port. What happens?

- A. Delivered to default socket
- B. Dropped or results in error
- C. Delivered to source port
- D. OS sends ICMP error

**Answer:** B

---

**35. (Easy)**

Which protocol handles **unordered, unreliable** delivery?

- A. TCP
- B. UDP
- C. FTP
- D. HTTP

**Answer:** B

---

**36. (Medium)**

Which layer ultimately decides the **application process** that receives a message?

- A. Data Link
- B. Transport
- C. Physical
- D. Network

**Answer:** B

---

**37. (Hard)**

In a server with TCP sockets, what happens if a duplicate packet (with same 4-tuple) is received?

- A. It's dropped or ignored
- B. It's processed normally
- C. OS kills the socket
- D. Port is blocked

**Answer:** A

---

**38. (Medium)**

What is the function of the **socket API** in demultiplexing?

- A. It assigns IP addresses
- B. It handles DNS lookup
- C. It connects transport to application
- D. It logs transmission details

**Answer:** C

---

**39. (Medium)**

When multiple transport segments arrive, which ensures they're directed to the correct application?

- A. MAC addresses
- B. Port numbers
- C. IP TTL field
- D. Router buffer

**Answer:** B

---

**40. (Hard)**

Which of the following will lead to TCP creating a **new connection socket** on the server?

- A. Incoming segment matches all fields of an existing connection
- B. Incoming segment has a different destination IP
- C. Incoming segment has same destination port but different source IP/port

D. Incoming segment with invalid checksum

**Answer:** C

---

---

1. UDP (Connectionless Transport) — 20 MCQs

---

**1. (Easy)**

What type of protocol is UDP?

- A. Connection-oriented
- B. Reliable
- C. Connectionless
- D. Secure

**Answer:** C

---

**2. (Medium)**

What happens if a UDP segment is lost during transmission?

- A. It is retransmitted automatically
- B. The receiver sends a NAK
- C. It is lost permanently
- D. TCP handles the retransmission

**Answer:** C

---

**3. (Easy)**

UDP is best suited for which type of application?

- A. Email
- B. Video conferencing
- C. File transfer
- D. SSH

**Answer:** B

---

**4. (Hard)**

Which of the following is **not** a reason for choosing UDP over TCP?

- A. Low latency
- B. Smaller header overhead
- C. Reliability
- D. Simplicity

**Answer:** C

---

**5. (Medium)**

UDP uses which field to check for data corruption?

- A. TTL
- B. Sequence Number
- C. Checksum
- D. Window Size

**Answer:** C

---

**6. (Easy)**

What is the size of the UDP header (without data)?

- A. 16 bytes
- B. 8 bytes
- C. 20 bytes
- D. 4 bytes

**Answer:** B

---

**7. (Hard)**

Which UDP-based protocol adds **its own reliability** at the application layer?

- A. FTP
- B. HTTP/3
- C. SSH
- D. Telnet

**Answer:** B

---

**8. (Medium)**

Which statement is **true** for UDP?

- A. Establishes a connection before data transfer
- B. Provides sequencing
- C. Provides congestion control
- D. Sends each packet independently

**Answer:** D

---

**9. (Medium)**

Which of the following is **most vulnerable to packet loss**?

- A. UDP
- B. TCP

C. QUIC

D. SCTP

**Answer:** A

---

**10. (Easy)**

UDP is described as a:

- A. Best-effort protocol
- B. Lossless protocol
- C. Delay-tolerant protocol
- D. Reliable transport

**Answer:** A

---

**11. (Medium)**

Which application layer protocols commonly use UDP?

- A. SMTP and POP3
- B. SSH and SCP
- C. DNS and SNMP
- D. HTTP and HTTPS

**Answer:** C

---

**12. (Hard)**

If UDP checksum fails at the receiver, the segment is:

- A. Repaired
- B. Passed to TCP
- C. Dropped
- D. Reordered

**Answer:** C

---

**13. (Medium)**

What is the default behavior of UDP if the receiving application is not listening on the destination port?

- A. OS buffers the packet
- B. OS silently drops it
- C. A connection reset is sent
- D. It is forwarded to TCP

**Answer:** C

---

**14. (Easy)**

UDP provides:

- A. Packet ordering
- B. No delivery guarantee
- C. Acknowledgments
- D. Flow control

**Answer:** B

---

**15. (Hard)**

Which transport layer protocol is often used for **Voice over IP (VoIP)**?

- A. TCP
- B. UDP
- C. SCTP
- D. ICMP

**Answer:** B

---

**16. (Medium)**

Which of the following does UDP lack?

- A. Port numbers
- B. Source IP
- C. Flow control
- D. Destination address

**Answer:** C

---

**17. (Medium)**

In UDP, which of these must be implemented by the application for reliable delivery?

- A. Congestion control
- B. Error detection
- C. Segmentation
- D. Acknowledgment handling

**Answer:** D

---

**18. (Hard)**

What is the minimum length (in bytes) of a valid UDP datagram (header + data)?

- A. 4
- B. 8
- C. 12

D. 0

**Answer:** B

---

**19. (Easy)**

UDP is defined in which RFC?

- A. RFC 791
- B. RFC 793
- C. RFC 768
- D. RFC 2616

**Answer:** C

---

**20. (Medium)**

UDP uses which fields in the header?

- A. Sequence Number, Window Size
- B. Src Port, Dst Port, Length, Checksum
- C. ACK, FIN, Seq #
- D. TTL, Offset

**Answer:** B

---



2. Reliable Data Transfer Protocols (rdt1.0 to rdt3.0) — 20 MCQs

---

**1. (Easy)**

What is the goal of reliable data transfer protocols?

- A. Encrypt data
- B. Provide in-order, error-free delivery
- C. Reduce congestion
- D. Save memory

**Answer:** B

---

**2. (Medium)**

In rdt1.0, which assumption is made about the channel?

- A. Bit errors are possible
- B. Loss of packets
- C. Perfectly reliable
- D. Duplicate ACKs

**Answer:** C

---

**3. (Medium)**

Which mechanism is first introduced in rdt2.0?

- A. Sequence numbers
- B. ACK/NAK
- C. Congestion window
- D. Timer

**Answer:** B

---

**4. (Hard)**

Why is rdt2.0 **not sufficient** for reliable transfer?

- A. Can't detect errors
- B. Doesn't use checksum
- C. Can't handle corrupted ACK/NAK
- D. Doesn't support flow control

**Answer:** C

---

**5. (Medium)**

How does rdt2.1 improve upon rdt2.0?

- A. Adds encryption
- B. Introduces timers
- C. Handles corrupted ACK/NAK with sequence numbers
- D. Switches to TCP

**Answer:** C

---

**6. (Easy)**

In rdt protocols, the sender and receiver are modeled using:

- A. Queues
- B. Finite state machines
- C. Threads
- D. Trees

**Answer:** B

---

**7. (Hard)**

Which protocol uses only **ACKs** and **no NAKs**?

- A. rdt2.1
- B. rdt3.0

C. rdt2.2

D. rdt1.0

**Answer:** C

---

**8. (Medium)**

In rdt3.0, what is the major added feature?

A. Sequence numbers

B. Handling packet loss via timeout

C. Sliding window

D. Port reuse

**Answer:** B

---

**9. (Medium)**

What is the issue with sending duplicate packets in rdt3.0?

A. Buffer overflow

B. Confuses sender

C. Causes delivery of same data multiple times

D. Receiver ignores duplicates using sequence numbers

**Answer:** D

---

**10. (Hard)**

What causes premature timeout in rdt3.0?

A. Corrupted ACK

B. Delayed ACK

C. Delayed data

D. Timer failure

**Answer:** B

---

**11. (Easy)**

Which rdt version uses timer-based retransmission?

A. rdt1.0

B. rdt2.0

C. rdt2.2

D. rdt3.0

**Answer:** D

---

**12. (Medium)**

Which component is common to rdt2.0, rdt2.1, and rdt2.2?

- A. Sequence number
- B. Negative Acknowledgment
- C. ACKs
- D. Timer

**Answer:** C

---

**13. (Hard)**

How does rdt2.2 ensure the same outcome as rdt2.1?

- A. By using TCP
- B. By using ACK with sequence number
- C. By using NAK with timer
- D. By duplicating data

**Answer:** B

---

**14. (Medium)**

If an ACK is corrupted, what happens in rdt2.1?

- A. Sender waits
- B. Sender retransmits packet
- C. Receiver resends ACK
- D. Connection is dropped

**Answer:** B

---

**15. (Easy)**

What type of error is rdt2.0 designed to handle?

- A. Packet loss
- B. Packet duplication
- C. Bit errors
- D. Port blocking

**Answer:** C

---

**16. (Hard)**

Why do we need **sequence numbers** in reliable data transfer?

- A. For encryption
- B. To detect port changes
- C. To identify duplicate or out-of-order packets

D. To calculate RTT

**Answer:** C

---

**17. (Medium)**

rdt3.0 solves which of the following issues?

- A. High bandwidth
- B. Congestion
- C. Lost packets
- D. Port reuse

**Answer:** C

---

**18. (Medium)**

Which protocol uses **stop-and-wait** behavior?

- A. rdt2.2
- B. rdt3.0
- C. TCP
- D. Go-Back-N

**Answer:** B

---

**19. (Hard)**

How does the receiver in rdt2.1 detect a duplicate packet?

- A. By checking IP header
- B. By sequence number comparison
- C. Using checksum
- D. Using ACK retransmission

**Answer:** B

---

**20. (Easy)**

Which protocol does **not** use ACKs at all?

- A. rdt1.0
- B. rdt2.0
- C. rdt3.0
- D. None

**Answer:** A

---

3. Pipelining (Go-Back-N & Selective Repeat) — 20 MCQs

---

**1. (Easy)**

Which of the following allows multiple unacknowledged packets in flight?

- A. Stop-and-Wait
- B. Go-Back-N
- C. rdt1.0
- D. UDP

**Answer:** B

---

**2. (Medium)**

In Selective Repeat, how does the receiver handle **out-of-order packets**?

- A. Drops them
- B. Buffers them
- C. Sends NAK
- D. Retransmits

**Answer:** B

---

**3. (Hard)**

Go-Back-N retransmits:

- A. Only the lost packet
- B. Only ACKs
- C. All unacknowledged packets starting from the lost one
- D. Nothing

**Answer:** C

---

**4. (Easy)**

Which field helps distinguish packets in pipelining protocols?

- A. Port number
- B. Sequence number
- C. IP address
- D. Header length

**Answer:** B

---

**5. (Medium)**

In Go-Back-N, what happens when a timeout occurs for packet N?

- A. Only N is retransmitted

- B. All packets from N onward are retransmitted
- C. Receiver sends ACK for N
- D. Connection closes

**Answer:** B

---

**6. (Hard)**

In Selective Repeat, what determines whether a received packet is valid?

- A. Destination port
- B. TCP header
- C. Sequence number within window
- D. RTT

**Answer:** C

---

**7. (Medium)**

What is the **main challenge** in Selective Repeat regarding buffer management?

- A. No congestion control
- B. Receiver can't distinguish duplicates if window too large
- C. TCP resets it
- D. TTL expires

**Answer:** B

---

**8. (Easy)**

Which protocol is more efficient in high-loss environments?

- A. Stop-and-Wait
- B. Go-Back-N
- C. Selective Repeat
- D. UDP

**Answer:** C

---

**9. (Medium)**

Go-Back-N uses a single:

- A. Timer for oldest unacked packet
- B. Timer per packet
- C. Port per segment
- D. Window per destination

**Answer:** A

---

**10. (Hard)**

What is the **maximum window size** for Selective Repeat if sequence number space is of size N?

- A. N
- B. N/2
- C. N+1
- D. 2N

**Answer:** B

---

**11. (Medium)**

Cumulative ACKs are used in:

- A. Go-Back-N
- B. Selective Repeat
- C. Stop-and-Wait
- D. rdt3.0

**Answer:** A

---

**12. (Medium)**

Which of the following causes **higher overhead** in sender logic?

- A. UDP
- B. Go-Back-N
- C. Selective Repeat
- D. TCP Reno

**Answer:** C

---

**13. (Hard)**

If receiver's buffer is full in Selective Repeat, it will:

- A. Drop all packets
- B. Send back ACKs only
- C. Drop out-of-window packets
- D. Switch to Go-Back-N

**Answer:** C

---

**14. (Easy)**

Go-Back-N is efficient when:

- A. Loss is rare
- B. Loss is frequent
- C. RTT is variable

D. Duplicate ACKs occur

**Answer:** A

---

**15. (Medium)**

Which protocol requires **per-packet timers**?

- A. Go-Back-N
- B. Selective Repeat
- C. rdt2.0
- D. UDP

**Answer:** B

---

**16. (Hard)**

Selective Repeat ensures in-order delivery by:

- A. Dropping out-of-order packets
- B. Buffering and reordering before passing to application
- C. Increasing window size
- D. Using UDP headers

**Answer:** B

---

**17. (Medium)**

Sender moves the window forward in Go-Back-N when:

- A. All packets are delivered
- B. It receives an ACK for the base packet
- C. Buffer is full
- D. RTT expires

**Answer:** B

---

**18. (Hard)**

Why does Selective Repeat require **twice the sequence number space** compared to Go-Back-N?

- A. To avoid ambiguity with wrapped sequence numbers
- B. To allow retransmission
- C. To handle TCP fast retransmit
- D. To reduce congestion

**Answer:** A

---

**19. (Easy)**

Which of the following does **not** use pipelining?

- A. Stop-and-Wait
- B. Go-Back-N
- C. Selective Repeat
- D. TCP

**Answer:** A

---

**20. (Medium)**

What happens if an ACK is lost in Go-Back-N?

- A. Sender retransmits the base packet and everything after
- B. No action needed
- C. Connection resets
- D. Receiver sends NAK

**Answer:** A

---