
1. OSI vs TCP/IP Layer

- **OSI Model (7 layer):**
 1. **Physical** – kabel, sinyal. (alat: hub, repeater)
 2. **Data Link** – MAC address, Ethernet, VLAN. (alat: switch).
 3. **Network** – IP, routing. (alat: router).
 4. **Transport** – TCP, UDP.
 5. **Session** – komunikasi antar aplikasi.
 6. **Presentation** – format data (enkripsi, kompresi).
 7. **Application** – HTTP, FTP, DNS.
- **TCP/IP Model (4 layer):**
 1. **Network Access** (Physical + Data Link)
 2. **Internet** (Network)
 3. **Transport** (Transport)
 4. **Application** (Session + Presentation + Application)

Contoh Protokol:

- Physical: Ethernet
 - Data Link: ARP
 - Network: IP, ICMP
 - Transport: TCP, UDP
 - Application: HTTP, FTP, DNS
-

2. Encapsulation & Decapsulation

- **Encapsulation:** Data → Segment → Packet → Frame → Bits.
- **Decapsulation:** Kebalikannya saat data diterima.
- **Header ditambahkan di setiap layer:**
 - Transport: TCP/UDP header
 - Network: IP header
 - Data Link: Ethernet header + FCS

Ethernet & LAN

- **Ethernet:** Protokol standar untuk LAN (Layer 2).
 - **LAN:** Jaringan lokal (kantor, rumah), berbasis Ethernet.
 - **Frame Ethernet:**
 - **Header:** Destination MAC | Source MAC | Type
 - **Data:** Payload
 - **FCS:** Frame Check Sequence (cek error).
-

3. LAN, MAN, WAN + Topologi

- **LAN:** Jaringan lokal (kantor, rumah).
 - **MAN:** Jaringan antar kota.
 - **WAN:** Jaringan global (Internet).
 - **Topologi:**
 - Star (paling umum), Bus, Ring, Mesh, Hybrid.
-

4. Fungsi Perangkat

- **Switch:** Layer 2, forward berdasarkan MAC.
 - **Router:** Layer 3, forward berdasarkan IP.
 - **Firewall:** Filter traffic (security).
-

5. TCP Handshake & TCP vs UDP

- **TCP 3-way handshake:**
 1. SYN → 2. SYN-ACK → 3. ACK.
 - **TCP vs UDP:**
 - TCP: reliable, connection-oriented (HTTP, FTP).
 - UDP: fast, connectionless (DNS, VoIP).
-

6. Huawei VRP & User Level

- **Mode CLI:**

- User View → System View → Interface View.
 - **Command dasar:** [Huawei] sysname R1 [Huawei] interface GigabitEthernet 0/0/1 [Huawei-GigabitEthernet0/0/1] ip address 192.168.1.1 24
 - **User Level:**
 - 0 (monitor), 1 (user), 2 (operator), 3–15 (admin).
-

7. Subnetting & Broadcast Address

IP: 192.168.10.0/26

Step 1: Subnet mask

- /26 → 26 bit untuk network.
- 11111111.11111111.11111111.11000000 → /26
- Subnet mask = 255.255.255.192 (karena 192 = 11000000).

Step 2: Hitung jumlah host

- Host bits = 32 - 26 = 6.
- Jumlah host = $2^6 - 2 = 64 - 2 = 62$.

Step 3: Hitung blok size

- Oktet terakhir mask = 192.
- Blok size = 256 - 192 = 64.
- Artinya setiap subnet punya 64 alamat IP.

Step 4: Tentukan range

- Subnet pertama: 192.168.10.0 – 192.168.10.63
 - Network address = 192.168.10.0
 - Broadcast address = 192.168.10.63
 - Host range = 192.168.10.1 – 192.168.10.62
- Subnet kedua: 192.168.10.64 – 192.168.10.127
 - Network = 192.168.10.64
 - Broadcast = 192.168.10.127
 - Host range = 192.168.10.65 – 192.168.10.126

Contoh :

0, 16, 32, 48, 64, 80, ...

- Subnet : 192.168.7.32/28
 - $32-28 = 4$
 - $2^4 = 16$
 - Network = 192.168.7.32
 - Broadcast = $32 + 16 - 1 = 47 \rightarrow 192.168.7.47$
 - Host range = 192.168.7.33 - 192.168.7.46
 - Jumlah host = $16 - 2 = 14$ host
-

8. Static vs Dynamic Routing

- **Static:** manual, cocok untuk jaringan kecil.
 - **Dynamic:** otomatis (OSPF, RIP).
 - Command static: ip route-static 10.0.0.0 255.255.255.0 192.168.1.1
-

9. OSPF

- **Packet Types:** Hello, DD, LSR, LSU, LSAck.
 - **Adjacency Steps:**
 - Init → 2-Way → Exstart → Exchange → Loading → Full.
 - **Konsep:**
 - Area, Router ID, Cost, DR/BDR.
-

10. Route Selection

- **Preference:** nilai kecil lebih disukai.
 - **Cost/Metric:** jalur dengan cost terendah.
 - **Longest Match:** mask paling panjang menang.
-

11. CIDR & Route Summarization

- CIDR = Classless Inter-Domain Routing → pakai prefix (/22, /24).
- Summarization = gabungkan beberapa network jadi satu prefix.

Contoh Soal

Gabungkan:

- 192.168.0.0/24
- 192.168.1.0/24
- 192.168.2.0/24
- 192.168.3.0/24

Langkah 1: Konversi ke biner

- $192.168.0.0 = 11000000.10101000.00000000.00000000$
- $192.168.3.0 = 11000000.10101000.00000011.00000000$

Langkah 2: Cari bit yang sama

- Sama sampai bit ke-22.
- Jadi prefix = /22.

Langkah 3: Summary route

- $192.168.0.0/22 \rightarrow$ mencakup $192.168.0.0 - 192.168.3.255$.

Tips cepat:

- 4 subnet /24 \rightarrow summary /22.
- 8 subnet /24 \rightarrow summary /21.

Latihan Cepat

Gabungkan:

- 10.0.8.0/24
- 10.0.9.0/24
- 10.0.10.0/24
- 10.0.11.0/24 \rightarrow Summary = 10.0.8.0/22.

12. Collision Domain vs Broadcast Domain

- Collision: satu segmen fisik (hilang dengan switch).
- Broadcast: satu VLAN (hilang dengan router).

13. Ethernet Frame & MAC

- Format: D.MAC | S.MAC | Type | Data | FCS.
 - MAC: 48-bit, unik per NIC.
-

14. VLAN & Interface Types

- Tagging: **802.1Q** (TPID 0x8100).
 - Interface:
 - Access (1 VLAN), Trunk (multi VLAN), Hybrid (flexibel).
-

15. STP & RSTP

- **STP:**
 - Root bridge election (BID terkecil).
 - Port roles: Root, Designated, Alternate.
 - Port states: Blocking, Listening, Learning, Forwarding.
 - **RSTP:**
 - Konvergensi cepat.
 - Port states: Discarding, Learning, Forwarding.
-

16. Inter-VLAN Routing

- **Router-on-a-Stick:** interface GigabitEthernet0/0/1.10 dot1q termination vid 10 ip address 192.168.10.1 24 arp broadcast enable
 - **Layer 3 Switch:** interface vlanif 10 ip address 192.168.10.1 24
-

17. NAT vs NAPT

- NAT: ubah IP.
 - NAPT: ubah IP + port (banyak private IP → satu public IP).
-

18. Jenis Address

- **MAC Address:** Alamat fisik (48 bit, tertanam di NIC).

- **IP Address:** Alamat logis (IPv4 32 bit, IPv6 128 bit).
 - **Unicast:** 00 (bit pertama 0).
 - **Multicast:** 01 (bit pertama 1).
 - **Broadcast:** FF-FF-FF-FF-FF-FF.
-

19. IPv4 vs IPv6

- IPv4: 32 bit, format dotted decimal.
 - IPv6: 128 bit, format heksadesimal, lebih banyak alamat.
-

20. VLAN

- **Virtual LAN:** Memisahkan broadcast domain.
 - Tagging: **802.1Q** (TPID 0x8100, VLAN ID 12 bit).
 - Interface:
 - **Access:** 1 VLAN.
 - **Trunk:** Multi VLAN.
 - **Hybrid:** Bisa tagged/untagged.
-

21. STP (Spanning Tree Protocol)

- Fungsi: **mencegah looping** dengan memblok jalur redundant.
 - **Root Bridge:** BID terkecil (Priority + MAC).
 - **Port Roles:** Root, Designated, Alternate.
 - **Port States:** Blocking, Listening, Learning, Forwarding.
 - **RSTP:** Konvergensi cepat (Discarding, Learning, Forwarding).
-

22. Routing

- **Direct:** Otomatis untuk jaringan langsung.
- **Static:** Manual, cocok untuk jaringan kecil.
- **Dynamic:** OSPF, RIP.
- **OSPF:**

- Packet types: Hello, DD, LSR, LSU, LSAck.
 - Adjacency steps: Init → 2-Way → Exstart → Exchange → Loading → Full.
-

23. Collision vs Broadcast Domain

- **Collision domain:** Tabrakan → solusi: switch.
 - **Broadcast domain:** Semua host dalam VLAN → solusi: router/VLAN.
-

24. NIC, LLC, SNAP

- **NIC:** Network Interface Card (alamat MAC).
 - **LLC:** Logical Link Control (kontrol komunikasi).
 - **SNAP:** Subnetwork Access Protocol (identifikasi protokol).
 - **FCS:** Frame Check Sequence (cek error).
-

25. Inter-VLAN Routing

- **Router-on-a-Stick:**

```
interface GigabitEthernet0/0/1.10
```

```
dot1q termination vid 10
```

```
ip address 192.168.10.1 24
```

```
arp broadcast enable
```

- **Layer 3 Switch:**

```
interface vlanif 10
```

```
ip address 192.168.10.1 24
```

1. What is the disadvantage of a tree network?

- A. Nodes at higher layers will cause more serious network problems if they become faulty.
- B. The tree network uses a hierarchical star structure.
- C. The tree network can quickly connect multiple star networks together.
- D. It is easy to expand the network scale.



2. Which functions does a firewall provide?

- A. Isolates networks of different security levels.
- B. Uses security policies to implement access control between networks of different security levels.
- C. Implements remote access.
- D. Implements data encryption and virtual private network services.
- E. Implements network address translation.



3. A star network is robust and therefore not prone to faults.

- Right

- Wrong



4. A router can break broadcast domains.

- Right



- Wrong

1. The Open System Interconnection (OSI) reference model divides a network into seven layers. Which of the following lists the seven layers in the correct order, from bottom to top?

- A. Physical layer, data link layer, network layer, transport layer, session layer, presentation layer, and application layer
- B. Physical layer, data link layer, network layer, session layer, transport layer, presentation layer, and application layer
- C. Physical layer, data link layer, network layer, transport layer, presentation layer, session layer, and application layer
- D. Physical layer, data link layer, transport layer, network layer, session layer, presentation layer, and application layer



2. Which of the following port numbers is used by Telnet?

- A. 6

- B. 23



- C. 17

- D. 21

3. What are functions of the network layer?

- A. Provide logical addresses for network devices. ✓
- B. Set up connections between processes on hosts.
- C. Send packets from source hosts to destination hosts. ✓
- D. Route and forward data packets. ✓

4. Which of the following statements are true about the layers in the OSI reference model?

- A. Application layer: provides network services for applications and is closest to end users. ✓
- B. Session layer: establishes, manages, and terminates sessions between entities. ✓
- C. Network layer: defines logical addresses for routers to determine paths and transmits data from source networks to destination networks. ✓
- D. Transport layer: implements connection-oriented and non-connection-oriented data transmission, as well as error detection before retransmission. ✓

5. A MAC address is 48 bits (6 bytes) in length and consists of 12 hexadecimal digits.

- Right ✓
- Wrong

6. An ARP Reply packet is broadcast so that all hosts can receive it.

- Right
- Wrong ✓

7. Common data link layer protocols include Ethernet, PPPoE, and PPP.

- Right ✓
- Wrong

1. Which of the following statements about command functions is false?

- A. <Huawei>undo //Deletes a file. ✓
- B. <Huawei>pwd //Displays the current directory.
- C. <Huawei>dir //Displays information about files in the current directory.
- D. <Huawei>more //Displays the content of a text file.

2. Which of the following are types of storage device?

- | | |
|--|---|
| <input checked="" type="checkbox"/> A. SDRAM | ✓ |
| <input checked="" type="checkbox"/> B. Flash | ✓ |
| <input checked="" type="checkbox"/> C. NVRAM | ✓ |
| <input checked="" type="checkbox"/> D. SD card | ✓ |
| <input checked="" type="checkbox"/> E. USB flash drive | ✓ |

3. Which of the following functions are provided by the VRP?

- | | |
|---|---|
| <input checked="" type="checkbox"/> A. Provides a unified user interface and a unified management interface. | ✓ |
| <input checked="" type="checkbox"/> B. Implements functions of the control plane and defines interface standards of the forwarding plane. | ✓ |
| <input checked="" type="checkbox"/> C. Implements communication between the device forwarding plane and VRP control plane. | ✓ |
| <input checked="" type="checkbox"/> D. Eliminates the differences between the link layer and network layer of each product. | ✓ |

4. There are two commonly used device management modes: CLI and web system.

- | | |
|--|---|
| <input checked="" type="radio"/> Right | ✓ |
| <input type="radio"/> Wrong | |

1. Which of the following is a private IP address?

- | | |
|--|---|
| <input type="radio"/> A. 192.169.16.1 | |
| <input checked="" type="radio"/> B. 172.17.1.254 | ✓ |
| <input type="radio"/> C. 239.0.0.8 | |
| <input type="radio"/> D. 172.32.16.254 | |

2. How many IP addresses are available in network segment 172.16.0.0/30?

- | | |
|---------------------------------------|---|
| <input type="radio"/> A. 1 | |
| <input type="radio"/> B. 4 | |
| <input checked="" type="radio"/> C. 2 | ✓ |
| <input type="radio"/> D. 8 | |

3. Which of the following ICMP packets is used to detect the connectivity between the source and destination IP addresses?

- | | |
|--|---|
| <input type="radio"/> A. ICMP Redirect | |
| <input checked="" type="radio"/> B. ICMP Echo | ✓ |
| <input type="radio"/> C. ICMP port unreachable | |
| <input type="radio"/> D. ICMP host unreachable | |

4. Which of the following IP addresses can be manually configured and used by host interfaces?

- A. 10.2.3.4
- B. 127.0.0.1
- C. 224.0.0.18
- D. 192.168.100.254



5. The router discards packets with a TTL value of 0.

- Right
- Wrong



1. Which of the following fields is not included in the output of the display ip routing-table command?

- A. Destination/Mask
- B. Proto
- C. Interface
- D. AdvRouter



2. What is the default preference of static routes?

- A. 150
- B. 10
- C. 60
- D. 0



3. According to the longest match rule, which of the following routes will the data packet destined for 172.16.10.1 match?

- A. 172.16.10.2/32
- B. 172.16.10.0/24
- C. 172.16.0.0/16
- D. 172.17.10.0/24



4. Which of the following are link-state routing protocols?

- A. BGP
- B. IS-IS
- C. OSPF
- D. Static route



5. The summary route of 172.16.1.0/24, 172.16.2.0/24, and 172.16.5.0/24 is 172.16.0.0/22.

Right

Wrong



1. Which of the following packets are used by OSPF to discover and maintain neighbor relationships?

A. LSR

B. DD

C. Hello



D. LSU

2. By default, what are the OSPF cost values of a serial port working at 1.544 Mbit/s, FE interface, and GE interface, respectively?

A. 64, 10, 1

B. 640, 10, 1

C. 64, 10, 1

D. 64, 1, 1



3. Which of the following tables is used by OSPF to store link status information?

A. OSPF LSDB



B. OSPF peer table

C. OSPF routing table

D. OSPF adjacency table

4. Which of the following are OSPF network types?

A. P2P



B. Broadcast



C. NBMA



D. P2MP



5. On an MA network, the final state of the OSPF neighbor relationship between DR others is 2-way.

Right



Wrong

1. What type of MAC address is 01-00-5e-00-00-01?

- A. Unicast MAC address
- B. Multicast MAC address ✓
- C. Broadcast MAC address
- D. Anycast MAC address

2. Which of the following actions does a switch take by default after it receives an unknown unicast frame?

- A. Learns the mapping between the source MAC address and interface that receives this data frame, and discards this data frame.
- B. Learns the mapping between the source MAC address and interface that receives this data frame, and floods this data frame. ✓
- C. Learns the mapping between the source MAC address and interface that receives this data frame, and forwards this data frame based on the MAC address table.
- D. Does not learn the mapping between the source MAC address and interface that receives this data frame, and forwards this data frame based on the MAC address table.

3. Which of the following ARP packets is used to request the MAC address corresponding to an IP address?

- A. ARP Request ✓
- B. ARP Reply
- C. RARP Request
- D. RARP Reply

4. Which of the following fields are contained in an Ethernet frame in the IEEE 802.3 format?

- A. Length ✓
- B. Destination MAC ✓
- C. Source MAC ✓
- D. FCS ✓

5. A switch floods unknown unicast frames and frames whose destination MAC address is a broadcast MAC address.

- Right ✓
- Wrong

1. What is the TPID value of an 802.1Q-tagged frame?

- A. 0x0800
- B. 0x8847
- C. 0x8100 ✓
- D. 0x0806

2. Which of the following is a valid VLAN ID?

- A. 0
- B. 4095
- C. 65536
- D. 4094



3. Based on which of the following cannot VLANs be assigned?

- A. Interface
- B. MAC address
- C. Subnet
- D. Transport-layer protocol



4. Which of the following interfaces can process data frames carrying multiple VLAN tags?

- A. Access
- B. Bridge
- C. Trunk
- D. Hybrid



5. An access interface cannot process VLAN-tagged data frames, and immediately discards them upon receipt.

- Right
- Wrong



1. The bridge IDs of SW1, SW2, SW3, and SW4 are 4096.4c1f-aabc-102a, 4096.4c1f-aabc-102b, 4096.4c1f-aabc-001a and 8192.4c1f-aabc-112b, respectively. If the four switches are on the same Layer 2 network and have STP enabled, which switch acts as the root bridge?

- A. SW1
- B. SW3
- C. SW2
- D. SW4



2. What is the default Forward Delay value in STP?

- A. 30s
- B. 15s
- C. 20s
- D. 2s



3. The root ID, bridge ID, interface ID, and root path cost (RPC) are the main fields used to determine priorities of configuration BPDU. To select a superior configuration BPDU, in which of the following sequences does a switch compare these fields?

- A. Interface ID, root ID, bridge ID, and RPC
- B. RPC, root ID, bridge ID, and interface ID
- C. Root ID, bridge ID, interface ID, and RPC
- D. Root ID, RPC, bridge ID, and interface ID



4. Which of the following fields are contained in a configuration BPDU?

- A. Forward Delay
- B. Port ID
- C. Root ID
- D. Bridge ID



5. By default, a switch runs RSTP.

- Right
- Wrong



1. To implement inter-VLAN communication through sub-interfaces, which of the following commands needs to be configured for VLAN termination on the sub-interfaces?

- A. port default vlan vlan-id
- B. port trunk pvid vlan-id
- C. dot1q termination vid vlan-id
- D. port link-type hybrid vlan-id



2. Which of the following statements about a Layer 3 switch is false?

- A. Layer 3 switch can forward packets only at Layer 3.
- B. Layer 3 switch can route packets through VLANIF interfaces.
- C. Layer 3 switch can forward packets at both Layer 2 and Layer 3.
- D. Layer 3 switch can route packets through Layer 3 physical interfaces.



3. Which of the following statements is false about routing on Layer 3 switches?

- A. If a Layer 3 switch finds that the destination MAC address of a received data frame is the MAC address of its VLANIF interface, it sends the data frame to its routing module for further processing.
- B. If the routing module of a Layer 3 switch finds that the destination IP address is not the IP address of a local interface on the switch, it looks up a routing entry matching this IP address in the routing table.
- C. Layer 3 switch forwards the packet to the next hop specified in the matching routing entry, without re-encapsulating the data frame. ✓
- D. When routing a packet at Layer 3, a Layer 3 switch replaces the source and destination MAC addresses of the packet.

4. If sub-interfaces are configured to implement inter-VLAN communication, which of the following interfaces should be configured to connect a switch to a router?

- A. Hybrid ✓
- B. Trunk ✓
- C. Bridge
- D. Access

5. During Layer 3 communication, the source and destination MAC addresses of a packet are changed each time it passes through a Layer 3 device.

- Right ✓
- Wrong