Achievable

CCNA DUMP SHEET

# Network fundamentals

## The exam

- **Exam:** 200-301 CCNA, version 1.1 (testing ends Feb 2, 2027)
- **Length:** 120 minutes, about 100-120 questions (unofficial)
- **Question types:** multiple choice, drag-and-drop, simulation
- **Passing score:** not published by Cisco

| Network Fundamentals | Network Access | IP Connectivity | IP Services | Security Fundamentals | Automation and Programmability |
|---|---|---|---|---|---|
| 20% | 20% | 25% | 10% | 15% | 10% |

## Network components

| | |
|---|---|
| Router | Layer 3. Routes packets between networks |
| Layer 2 switch | Forwards frames inside a LAN by MAC address |
| Layer 3 switch | Multi-layer: also routes between IP networks |
| Access point | Layer 2. Joins wireless endpoints to the wired LAN |
| WLC | Wireless LAN controller: manages APs centrally |
| SDN controller | Manages network logic and policy centrally |
| Firewall | Blocks unauthorized traffic from untrusted networks |
| NGFW | Firewall plus IPS, application control, URL filtering |
| IPS | Blocks malicious traffic in real time; IDS only alerts |
| Endpoint | Host at the network edge: PC, phone, printer, IoT |
| Server | Endpoint providing services and data to other hosts |
| PoE | Power and data over one Ethernet cable |

## Layers and encapsulation

| TCP/IP layer | No. | Unit | Address |
|---|---|---|---|
| Application | 7 | Data | None |
| Transport | 4 | Segment, UDP datagram | Port |
| Network | 3 | Packet | IP (logical) |
| Data Link | 2 | Frame | MAC (physical) |
| Physical | 1 | Bits | None |

- **OSI:** 7 layers. **TCP/IP:** 5; Application spans OSI Session (5), Presentation (6), Application (7)
- **Sender moves down:** data → segment → packet → frame → bits. **Receiver** moves up
- **At each router:** IP addresses stay end to end, both MAC addresses are rewritten
- **Devices:** routers at Layer 3, switches and APs at Layer 2
- **IEEE standards:** 802.3 is Ethernet, 802.11 is Wi-Fi
- **IP address:** static or DHCP. **MAC address:** tied to the adapter
- **Troubleshooting:** start at Physical and work up

## TCP vs. UDP

| | TCP | UDP |
|---|---|---|
| Connection | Connection-oriented | Connectionless |
| Setup | Session first | No session |
| Delivery | Reliable, with ACKs | Unreliable, no ACKs |
| Lost data | Retransmitted | Not retransmitted |
| Order | Sequence numbers | No sequence numbers |
| Flow control | Yes | No |
| Errors | Checksum, retransmits | Checksum, detects only |
| Overhead | More, adds latency | Less, low latency |
| Used by | Web, email, file transfer | Voice, video, TFTP, NTP |

- **3-way handshake:** client SYN, server SYN-ACK, client ACK
- **SYN** carries the initial sequence number
- **Flow control:** the receiver tells the sender to slow down
- **Out of order:** TCP detects it by sequence number, UDP cannot
- **Why UDP:** voice and video want low latency, accept some loss

## Port numbers

| Port | Transport | Application | Port | Transport | Application | Port | Transport | Application |
|---|---|---|---|---|---|---|---|---|
| 20, 21 | TCP | FTP | 53 | TCP, UDP | DNS | 123 | UDP | NTP |
| 22 | TCP | SSH | 67, 68 | UDP | DHCP | 161, 162 | UDP | SNMP |
| 23 | TCP | Telnet | 69 | UDP | TFTP | 443 | TCP | HTTPS |
| 25 | TCP | SMTP | 80 | TCP | HTTP | 514 | UDP | Syslog |

- **Range:** 0-65535. **Well-known:** 0-1023, where servers listen
- **Registered:** 1024-49151. **Ephemeral:** 49152-65535, for clients
- **Source, destination:** from the sender's side; they swap on the reply
- **Socket:** IP address and port together, as in 192.168.1.100:80