

Cheat Sheet for comprehensive CIW Network Technology Associate

Networking Fundamentals

OSI Model

- **7 Layers:**
 - **7. Application** (HTTP, FTP)
 - **6. Presentation** (Encryption, Compression)
 - **5. Session** (Session Management)
 - **4. Transport** (TCP, UDP)
 - **3. Network** (IP, Routing)
 - **2. Data Link** (MAC, Ethernet)
 - **1. Physical** (Cables, Signals)

TCP/IP Model

- **4 Layers:**
 - **4. Application** (HTTP, FTP)
 - **3. Transport** (TCP, UDP)
 - **2. Internet** (IP)
 - **1. Network Access** (Ethernet, MAC)

IP Addressing

IPv4 Addressing

- **Format:** `xxx.xxx.xxx.xxx` (0-255)
- **Classes:**
 - **A:** `0.0.0.0` to `127.255.255.255`
 - **B:** `128.0.0.0` to `191.255.255.255`
 - **C:** `192.0.0.0` to `223.255.255.255`
 - **D (Multicast):** `224.0.0.0` to `239.255.255.255`

- **E (Reserved):** `240.0.0.0` to `255.255.255.255`

IPv6 Addressing

- **Format:** `xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx`

- **Shortening Rules:**

- Leading zeros in a group can be omitted.
- Consecutive groups of zeros can be replaced with `::` (once per address).

Subnetting

Subnet Mask

- **CIDR Notation:** `/24` (255.255.255.0)

- **Common Masks:**

- `/24`: 255.255.255.0 (254 hosts)
- `/16`: 255.255.0.0 (65,534 hosts)
- `/8`: 255.0.0.0 (16,777,214 hosts)

Subnet Calculation

- **Formula:** $2^n - 2$ (n = number of host bits)

- **Example:**

- `/26` (255.255.255.192)
- Hosts: $2^6 - 2 = 62$

Network Devices

Routers

- **Function:** Connects different networks.
- **Configuration:** Static/Dynamic Routing, NAT, Firewall.

Switches

- **Function:** Connects devices within a network.
- **Types:** Unmanaged, Managed, Layer 2, Layer 3.

Hubs

- **Function:** Connects devices, broadcasts to all ports.
- **Drawback:** No collision detection.

Access Points

- **Function:** Provides wireless access to a wired network.
- **Configuration:** SSID, Security (WPA2, WPA3).

Protocols

TCP (Transmission Control Protocol)

- **Features:** Connection-oriented, Reliable, Flow Control.
- **Ports:** HTTP (80), HTTPS (443), FTP (21), SSH (22).

UDP (User Datagram Protocol)

- **Features:** Connectionless, Unreliable, Faster.
- **Ports:** DNS (53), DHCP (67, 68), SNMP (161).

ICMP (Internet Control Message Protocol)

- **Commands:** `ping`, `tracert`.
- **Messages:** Echo Request, Echo Reply, Destination Unreachable.

Network Configuration

IP Configuration

- **Windows:** `ipconfig`
- **Linux:** `ifconfig` or `ip addr`

Routing Configuration

- **Windows:** `route print`
- **Linux:** `route -n` or `ip route`

DNS Configuration

- **Windows:** `nslookup`
- **Linux:** `dig` or `host`

Network Security

Firewalls

- **Types:** Hardware, Software, Host-based.
- **Functions:** Packet Filtering, Stateful Inspection, Application Layer Filtering.

VPN (Virtual Private Network)

- **Types:** Remote Access, Site-to-Site.
- **Protocols:** PPTP, L2TP, OpenVPN.

Encryption

- **Types:** Symmetric (AES), Asymmetric (RSA).
- **Protocols:** SSL/TLS, IPSec.

Troubleshooting

Common Issues

- **No Internet Access:** Check IP, DNS, Gateway.
- **Slow Network:** Check Bandwidth, Latency, Congestion.
- **Packet Loss:** Check Cable, Switch, Router.

Tools

- **Ping:** Test connectivity.
- **Traceroute:** Trace path to destination.
- **Wireshark:** Network protocol analyzer.

Examples

IPv4 Subnetting Example

- **IP:** 192.168.1.0/24
- **Subnet Mask:** 255.255.255.0
- **Hosts:** 254

IPv6 Shortening Example

- **Original:** `2001:0db8:0000:0000:0000:ff00:0042:8329`
- **Shortened:** `2001:db8::ff00:42:8329`

Tips and Tricks

Network Diagrams

- **Tools:** Visio, Lucidchart, Draw.io.
- **Elements:** Routers, Switches, PCs, Servers.

Backup Configuration

- **Router/Switch:** `copy running-config startup-config`
- **Linux:** `rsync`, `scp`

Monitoring

- **Tools:** Nagios, Zabbix, PRTG.
- **Metrics:** CPU, Memory, Bandwidth.

Summary

- **OSI vs TCP/IP:** 7 layers vs 4 layers.
- **IP Addressing:** IPv4 (xxx.xxx.xxx.xxx) vs IPv6 (xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx).
- **Subnetting:** CIDR notation, subnet mask, host calculation.
- **Network Devices:** Routers, Switches, Hubs, Access Points.
- **Protocols:** TCP, UDP, ICMP.
- **Configuration:** IP, Routing, DNS.
- **Security:** Firewalls, VPN, Encryption.
- **Troubleshooting:** Ping, Traceroute, Wireshark.
- **Examples:** IPv4 subnetting, IPv6 shortening.
- **Tips:** Network diagrams, backup configuration, monitoring.

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