Cheat Sheet for comprehensive CompTIA Network+

Network Fundamentals

- **OSI Model**

  - **Layers**: 7 layers (Physical, Data Link, Network, Transport, Session, Presentation, Application)

  - **Functions**:

    - **Physical**: Transmits raw bit stream over physical medium

    - **Data Link**: Provides node-to-node data transfer

    - **Network**: Manages logical addressing and routing

    - **Transport**: Ensures end-to-end communication

    - **Session**: Manages sessions between applications

    - **Presentation**: Translates data between network and application formats

    - **Application**: Provides network services to applications

- **TCP/IP Model**

  - **Layers**: 4 layers (Network Access, Internet, Transport, Application)

  - **Mapping to OSI**:

  - Network Access (Physical + Data Link)
  - Internet (Network)
  - Transport (Transport)
  - Application (Session + Presentation + Application)

Network Devices

- **Hub**

  - **Function**: Repeats signal to all ports

  - **Type**: Layer 1 (Physical)

- **Switch**

  - **Function**: Forwards frames to specific ports

- **Type**: Layer 2 (Data Link)

- **Features**: MAC address table, VLAN support

- **Router**

  - **Function**: Routes packets between networks

  - **Type**: Layer 3 (Network)

  - **Features**: Routing tables, NAT, Firewall

- **Firewall**

  - **Function**: Controls network traffic based on rules

  - **Types**:

    - **Packet Filtering**: Filters packets based on header info

    - **Stateful Inspection**: Tracks connection state

    - **Proxy**: Acts as intermediary for client requests

Network Addressing
- **IP Addressing**

  - **IPv4**: 32-bit address (e.g., 192.168.1.1)

  - **IPv6**: 128-bit address (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334)

  - **CIDR Notation**: 192.168.1.0/24

- **Subnetting**

  - **Subnet Mask**: Defines network and host portions

  - **Example**: 255.255.255.0 (/24)

  - **Calculations**:

    - **Hosts**: 2^(32-subnet bits) - 2

    - **Subnets**: 2^subnet bits

Protocols
- **TCP (Transmission Control Protocol)**

  - **Features**: Connection-oriented, reliable, flow control

- **Ports**: 20 (FTP Data), 21 (FTP Control), 22 (SSH), 23 (Telnet), 25 (SMTP), 80 (HTTP), 443 (HTTPS)

- **UDP (User Datagram Protocol)**

- **Features**: Connectionless, unreliable, fast

- **Ports**: 53 (DNS), 67/68 (DHCP), 123 (NTP)

- **ICMP (Internet Control Message Protocol)**

- **Functions**: Error reporting, diagnostics (e.g., Ping, Traceroute)

Network Services
- **DNS (Domain Name System)**

- **Function**: Translates domain names to IP addresses

- **Records**:

  - **A**: IPv4 address

  - **AAAA**: IPv6 address

  - **CNAME**: Canonical name

  - **MX**: Mail exchange

- **DHCP (Dynamic Host Configuration Protocol)**

- **Function**: Assigns IP addresses and other network configurations

- **Process**: Discover, Offer, Request, ACK

- **NTP (Network Time Protocol)**

- **Function**: Synchronizes time across network devices

Network Security
- **Encryption**

- **Types**:

  - **Symmetric**: Same key for encryption and decryption

  - **Asymmetric**: Public and private keys

- **Algorithms**:

- **Symmetric**: AES, DES, 3DES

- **Asymmetric**: RSA, ECC

- **VPN (Virtual Private Network)**

 - **Types**:

   - **Site-to-Site**: Connects entire networks

   - **Remote Access**: Connects individual devices

 - **Protocols**: IPSec, SSL/TLS, PPTP

- **Authentication**

 - **Methods**:

   - **Single-Factor**: Username/Password

   - **Multi-Factor**: Combines two or more factors (e.g., Password + OTP)

 - **Protocols**: RADIUS, TACACS+

Troubleshooting
- **Common Issues**

 - **Connectivity**: Ping, Traceroute

 - **Performance**: Network Monitor, Wireshark

 - **Configuration**: Show running-config, Show interface

- **Tools**

 - **Ping**: Tests connectivity to a host

 - **Traceroute**: Shows path packets take to reach destination

 - **Wireshark**: Network protocol analyzer

 - **Netstat**: Displays network connections and statistics

Best Practices
- **Documentation**

 - **Network Diagrams**: Physical and logical

 - **Configuration Backups**: Regularly backup device configurations

- **Monitoring**

  - **SNMP (Simple Network Management Protocol)**: Monitors network devices

  - **Syslog**: Centralized logging of events

- **Updates**

  - **Firmware**: Regularly update network device firmware

  - **Security Patches**: Apply security patches promptly

Examples
- **Subnetting Example**

  - **IP**: 192.168.1.0/24

  - **Subnet Mask**: 255.255.255.0

  - **Hosts**: 254 (2^8 - 2)

- **DNS Record Example**

  - **Domain**: example.com

  - **A Record**: 192.168.1.1

  - **MX Record**: mail.example.com

- **VPN Configuration Example**

  - **Site-to-Site**: Configure IPSec between two routers

  - **Remote Access**: Set up SSL VPN for remote users

Summary
- **Key Points**

- Understand OSI and TCP/IP models
- Know common network devices and their functions
- Master IP addressing and subnetting
- Learn essential protocols and network services
- Implement strong network security practices
- Use troubleshooting tools effectively
- Follow best practices for documentation and monitoring

This cheat sheet provides a comprehensive overview of essential concepts for the CompTIA Network+ certification. Use it as a quick reference to reinforce your knowledge and prepare for the exam.

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