

Cheat Sheet for comprehensive Cisco Certified Network Associate (CCNA)

Networking Fundamentals

- OSI Model Layers

- **Layer 7: Application** - User interface, protocols (HTTP, FTP)
- **Layer 6: Presentation** - Data formatting, encryption (SSL/TLS)
- **Layer 5: Session** - Session management (NetBIOS)
- **Layer 4: Transport** - End-to-end communication (TCP, UDP)
- **Layer 3: Network** - Logical addressing (IP, ICMP)
- **Layer 2: Data Link** - Physical addressing (MAC, ARP)
- **Layer 1: Physical** - Physical medium (cables, connectors)

- TCP/IP Model

- **Application** - Application, Presentation, Session (HTTP, FTP)
- **Transport** - Transport (TCP, UDP)
- **Internet** - Network (IP, ICMP)
- **Network Access** - Data Link, Physical (Ethernet, ARP)

IP Addressing and Subnetting

- IPv4 Addressing

- **Format:** 32 bits, dotted-decimal (e.g., 192.168.1.1)
- **Classes:** A (1-126), B (128-191), C (192-223), D (224-239), E (240-255)
- **Private Addresses:**
 - Class A: 10.0.0.0/8
 - Class B: 172.16.0.0/12
 - Class C: 192.168.0.0/16

- Subnetting

- **Subnet Mask:** Defines network and host portions (e.g., 255.255.255.0)

- **CIDR Notation:** /24 (255.255.255.0), /16 (255.255.0.0)
- **Subnetting Steps:**
 1. Determine number of subnets needed.
 2. Calculate subnet mask.
 3. Identify subnet and broadcast addresses.
 4. Assign IP addresses to devices.
- **Example:** Subnet 192.168.1.0/24 into 4 subnets
- **New Subnet Mask:** /26 (255.255.255.192)
- **Subnets:** 192.168.1.0/26, 192.168.1.64/26, 192.168.1.128/26, 192.168.1.192/26

Routing Protocols

- Static Routing

- **Command:** ``ip route <destination_network> <subnet_mask> <next_hop_ip>``
- **Example:** ``ip route 192.168.2.0 255.255.255.0 192.168.1.2``

- Dynamic Routing

- RIP (Routing Information Protocol)

- **Version:** RIPv1 (Classful), RIPv2 (Classless)

- **Command:** ``router rip`, `version 2`, `network <network_address>``

- OSPF (Open Shortest Path First)

- **Command:** ``router ospf <process_id>`, `network <network_address> <wildcard_mask> area <area_id>``

- EIGRP (Enhanced Interior Gateway Routing Protocol)

- **Command:** ``router eigrp <as_number>`, `network <network_address> <wildcard_mask>``

Switching and VLANs

- VLANs (Virtual LANs)

- **Creation:** ``vlan <vlan_id>`, `name <vlan_name>``

- **Interface Assignment:** `interface <interface_id>`, `switchport mode access`, `switchport access vlan <vlan_id>`
- **Trunking:** `interface <interface_id>`, `switchport mode trunk`, `switchport trunk allowed vlan <vlan_list>`
- **STP (Spanning Tree Protocol)**
 - **Modes:** PVST+, Rapid PVST+, MST
 - **Root Bridge:** `spanning-tree vlan <vlan_id> root primary`
 - **PortFast:** `spanning-tree portfast` (on access ports)

Access Control Lists (ACLs)

- Standard ACLs

- **Creation:** `access-list <acl_number> {permit|deny} <source_address> <wildcard_mask>`
- **Example:** `access-list 1 permit 192.168.1.0 0.0.0.255`
- **Application:** `interface <interface_id>`, `ip access-group <acl_number> {in|out}`

- Extended ACLs

- **Creation:** `access-list <acl_number> {permit|deny} <protocol> <source_address> <wildcard_mask> <destination_address> <wildcard_mask> [operator port]`
- **Example:** `access-list 100 permit tcp 192.168.1.0 0.0.0.255 host 192.168.2.1 eq 80`

NAT (Network Address Translation)

- Static NAT

- **Command:** `ip nat inside source static <local_ip> <global_ip>`
- **Interface Configuration:** `interface <interface_id>`, `ip nat {inside|outside}`

- Dynamic NAT

- **Pool Creation:** `ip nat pool <pool_name> <start_ip> <end_ip> netmask <subnet_mask>`
- **ACL Association:** `ip nat inside source list <acl_number> pool <pool_name>`

- PAT (Port Address Translation)

- **Command:** `ip nat inside source list <acl_number> interface <interface_id> overload`

DHCP (Dynamic Host Configuration Protocol)

- DHCP Server Configuration

- **Pool Creation:** `ip dhcp pool <pool_name>`
- **Network Configuration:** `network <network_address> <subnet_mask>`
- **Default Gateway:** `default-router <gateway_ip>`
- **DNS Server:** `dns-server <dns_ip>`

- DHCP Relay

- **Command:** `interface <interface_id>, ip helper-address <dhcp_server_ip>`

Security Features

- SSH Configuration

- **Command:** `ip domain-name <domain_name>, crypto key generate rsa, username <username> privilege 15 secret <password>`
- **SSH Access:** `line vty 0 4, login local, transport input ssh`

- Port Security

- **Command:** `interface <interface_id>, switchport port-security, switchport port-security maximum <number>, switchport port-security violation {shutdown|restrict|protect}`

Troubleshooting Commands

- **Ping:** `ping <destination_ip>`
- **Traceroute:** `traceroute <destination_ip>`
- **Show Commands**
 - **Interfaces:** `show ip interface brief`
 - **Routing Table:** `show ip route`
 - **ARP Table:** `show ip arp`
 - **ACLs:** `show access-lists`
 - **NAT:** `show ip nat translations`
 - **DHCP:** `show ip dhcp binding`

Configuration Management

- Saving Configuration

- **Command:** `write memory` or `copy running-config startup-config`

- Backup and Restore

- **Backup:** `copy running-config tftp://<tftp_server_ip>/<filename>`
- **Restore:** `copy tftp://<tftp_server_ip>/<filename> running-config`

Common Shortcuts and Tips

- **Tab Completion:** Use `Tab` key for command completion.
- **History:** Use `Ctrl+P` (previous) and `Ctrl+N` (next) to navigate command history.
- **Abbreviations:** Use minimal command abbreviations (e.g., `sh run` for `show running-config`).
- **Context-Sensitive Help:** Use `?` for context-sensitive help.
- **Error Correction:** Use `Ctrl+Shift+6` to cancel long-running commands.

Example Configuration

```
Router(config)# interface GigabitEthernet0/1
Router(config-if)# ip address 192.168.1.1 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# ip route 192.168.2.0 255.255.255.0 192.168.1.2
Router(config)# access-list 1 permit 192.168.1.0 0.0.0.255
Router(config)# interface GigabitEthernet0/1
Router(config-if)# ip access-group 1 in
Router(config-if)# exit
Router(config)# ip nat inside source static 192.168.1.10 203.0.113.10
Router(config)# interface GigabitEthernet0/1
Router(config-if)# ip nat inside
Router(config-if)# exit
Router(config)# interface GigabitEthernet0/2
Router(config-if)# ip nat outside
Router(config-if)# exit
Router(config)# ip dhcp pool LAN_POOL
Router(dhcp-config)# network 192.168.1.0 255.255.255.0
Router(dhcp-config)# default-router 192.168.1.1
Router(dhcp-config)# dns-server 8.8.8.8
Router(dhcp-config)# exit
Router(config)# interface GigabitEthernet0/1
Router(config-if)# ip helper-address 192.168.1.1
Router(config-if)# exit
Router(config)# ip domain-name example.com
```

```
Router(config)# crypto key generate rsa
Router(config)# username admin privilege 15 secret cisco123
Router(config)# line vty 0 4
Router(config-line)# login local
Router(config-line)# transport input ssh
Router(config-line)# exit
Router(config)# write memory
```

Summary

- **Fundamentals:** OSI and TCP/IP models.
- **IP Addressing:** IPv4, subnetting, CIDR.
- **Routing:** Static, dynamic (RIP, OSPF, EIGRP).
- **Switching:** VLANs, STP.
- **Security:** ACLs, NAT, DHCP, SSH.
- **Troubleshooting:** Ping, traceroute, show commands.
- **Configuration:** Saving, backup, shortcuts.

This cheat sheet provides a comprehensive overview of essential CCNA topics, commands, and best practices. Use it as a quick reference guide during your studies and practical implementations.

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