**Networking Commands Reference Guide**

**Basic Router Configuration Commands**

**1. Initial Setup Commands**

Router> enable

Router# configure terminal

Router(config)# hostname R1

R1(config)# enable secret class

* **enable**: Enter privileged EXEC mode
* **configure terminal**: Enter global configuration mode
* **hostname**: Set router name
* **enable secret**: Set encrypted password for privileged mode

**2. Security Configuration**

R1(config)# line console 0

R1(config-line)# password cisco

R1(config-line)# login

R1(config-line)# logging synchronous

R1(config-line)# exit

R1(config)# line vty 0 4

R1(config-line)# password cisco

R1(config-line)# login

R1(config-line)# transport input ssh telnet

R1(config-line)# exit

R1(config)# service password-encryption

* **line console 0**: Configure console line
* **line vty 0 4**: Configure virtual terminal lines (Telnet/SSH)
* **password**: Set line password
* **login**: Enable password checking
* **logging synchronous**: Prevent console messages from interrupting commands
* **transport input**: Specify allowed protocols for remote access
* **service password-encryption**: Encrypt all passwords in configuration

**3. Banner Configuration**

R1(config)# banner motd #

Enter TEXT message. End with a new line and the #

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

WARNING: Unauthorized access is prohibited!

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#

* **banner motd**: Set message of the day banner

**4. Interface Configuration**

R1(config)# interface gigabitethernet 0/0/0

R1(config-if)# description Link to LAN 1

R1(config-if)# ip address 10.0.1.1 255.255.255.0

R1(config-if)# no shutdown

R1(config-if)# exit

* **interface**: Enter interface configuration mode
* **description**: Add interface description
* **ip address**: Configure IPv4 address and subnet mask
* **no shutdown**: Enable the interface

**5. IPv6 Configuration**

R1(config)# ipv6 unicast-routing

R1(config-if)# ipv6 address 2001:db8:acad:1::1/64

R1(config-if)# ipv6 address fe80::1:a link-local

* **ipv6 unicast-routing**: Enable IPv6 routing globally
* **ipv6 address**: Configure IPv6 address
* **link-local**: Configure IPv6 link-local address

**6. Save Configuration**

R1# copy running-config startup-config

* **copy running-config startup-config**: Save current configuration to NVRAM

**Verification Commands**

**7. Interface Verification**

R1# show ip interface brief

R1# show interfaces

R1# show ip interface

R1# show running-config interface gigabitethernet 0/0/0

* **show ip interface brief**: Display interface status and IP addresses
* **show interfaces**: Display detailed interface information
* **show ip interface**: Display IP-specific interface information
* **show running-config interface**: Display interface configuration

**8. General Verification**

R1# show running-config

R1# show startup-config

R1# show version

R1# show cdp neighbors

* **show running-config**: Display current configuration
* **show startup-config**: Display saved configuration
* **show version**: Display system information
* **show cdp neighbors**: Display directly connected Cisco devices

**9. Filtering Output**

R1# show running-config | section ip route

R1# show ip route | include 192.168.1.0

R1# show ip route | exclude C

R1# show ip route | begin Gateway

* **| section**: Display entire section starting with expression
* **| include**: Display only lines matching expression
* **| exclude**: Hide lines matching expression
* **| begin**: Display from line matching expression onward

**Static Routing Commands**

**10. Basic Static Routes**

R1(config)# ip route 172.16.1.0 255.255.255.0 172.16.2.2

R1(config)# ip route 192.168.1.0 255.255.255.0 s0/1/0

R1(config)# ip route 192.168.2.0 255.255.255.0 s0/1/0 172.16.2.2

* **ip route network subnet-mask next-hop**: Next-hop static route
* **ip route network subnet-mask exit-interface**: Directly connected static route
* **ip route network subnet-mask exit-interface next-hop**: Fully specified static route

**11. Default Static Routes**

R1(config)# ip route 0.0.0.0 0.0.0.0 172.16.2.2

* **ip route 0.0.0.0 0.0.0.0**: Configure IPv4 default route (quad-zero route)

**12. Floating Static Routes**

R1(config)# ip route 0.0.0.0 0.0.0.0 172.16.2.2

R1(config)# ip route 0.0.0.0 0.0.0.0 10.10.10.2 5

* **ip route network subnet-mask next-hop administrative-distance**: Configure floating static route with higher AD

**13. Static Host Routes**

Branch(config)# ip route 209.165.200.238 255.255.255.255 198.51.100.2

* **ip route host-ip 255.255.255.255**: Configure static route to specific host

**14. IPv6 Static Routes**

R1(config)# ipv6 route 2001:db8:acad:4::/64 2001:db8:acad:3::2

R1(config)# ipv6 route ::/0 2001:db8:acad:3::2

* **ipv6 route**: Configure IPv6 static routes
* **::/0**: IPv6 default route

**Routing Table Verification**

**15. Routing Table Commands**

R1# show ip route

R1# show ip route static

R1# show ip route 192.168.1.0

R1# show ipv6 route

* **show ip route**: Display IPv4 routing table
* **show ip route static**: Display only static routes
* **show ip route network**: Display specific route information
* **show ipv6 route**: Display IPv6 routing table

**Dynamic Routing - RIP Configuration**

**16. RIP Configuration**

R1(config)# router rip

R1(config-router)# version 2

R1(config-router)# network 10.0.0.0

R1(config-router)# network 172.16.0.0

R1(config-router)# no auto-summary

R1(config-router)# passive-interface gigabitethernet 0/0/0

R1(config-router)# default-information originate

* **router rip**: Enter RIP configuration mode
* **version 2**: Use RIPv2
* **network**: Advertise network in RIP
* **no auto-summary**: Disable automatic summarization
* **passive-interface**: Prevent RIP updates on interface
* **default-information originate**: Propagate default route

**17. RIP Verification**

R1# show ip protocols

R1# show ip rip database

* **show ip protocols**: Display routing protocol information
* **show ip rip database**: Display RIP database

**OSPF Configuration**

**18. OSPF Basic Configuration**

R1(config)# router ospf 1

R1(config-router)# network 10.1.0.0 0.0.255.255 area 0

R1(config-router)# network 172.16.1.0 0.0.0.255 area 0

R1(config-router)# passive-interface gigabitethernet 0/0/0

* **router ospf process-id**: Enter OSPF configuration mode
* **network address wildcard-mask area**: Advertise network in OSPF area
* **passive-interface**: Stop OSPF hellos on interface but advertise network

**19. OSPF Router ID**

R1(config-router)# router-id 1.1.1.1

* **router-id**: Manually set OSPF router ID

**20. OSPF Cost Configuration**

R1(config-router)# auto-cost reference-bandwidth 1000

R1(config-if)# bandwidth 128

R1(config-if)# ip ospf cost 65

* **auto-cost reference-bandwidth**: Set reference bandwidth (in Mb/s)
* **bandwidth**: Set interface bandwidth for cost calculation
* **ip ospf cost**: Manually set OSPF cost

**21. OSPF Verification**

R1# show ip ospf neighbor

R1# show ip ospf

R1# show ip ospf interface

R1# show ip ospf database

* **show ip ospf neighbor**: Display OSPF neighbors
* **show ip ospf**: Display OSPF process information
* **show ip ospf interface**: Display OSPF interface information
* **show ip ospf database**: Display OSPF link-state database

**Troubleshooting Commands**

**22. Connectivity Testing**

R1# ping 192.168.1.1

R1# ping 192.168.1.1 source gigabitethernet 0/0/0

R1# traceroute 192.168.1.1

* **ping**: Test Layer 3 connectivity
* **ping source**: Ping from specific interface
* **traceroute**: Show path to destination

**23. Extended Ping**

R1# ping

Protocol [ip]:

Target IP address: 192.168.1.1

Repeat count [5]: 10

Datagram size [100]: 1500

Timeout in seconds [2]: 5

Extended commands [n]: y

Source address or interface: 10.1.1.1

* **ping** (without destination): Enter extended ping mode for additional options

**Administrative Distance and Metrics**

**24. Route Source Codes**

* **L**: Local route (AD = 0)
* **C**: Connected route (AD = 0)
* **S**: Static route (AD = 1)
* **O**: OSPF route (AD = 110)
* **R**: RIP route (AD = 120)
* **D**: EIGRP route (AD = 90)

**25. Understanding Route Entries**

Example route entry: O 192.168.2.0/24 [110/65] via 172.16.2.2, 00:30:15, Serial0/1/0

* **O**: Route source (OSPF)
* **192.168.2.0/24**: Destination network/prefix length
* **[110/65]**: [Administrative Distance/Metric]
* **via 172.16.2.2**: Next-hop IP address
* **00:30:15**: Time since last update
* **Serial0/1/0**: Exit interface

**Command Order for Initial Router Setup**

1. enable - Enter privileged mode
2. configure terminal - Enter configuration mode
3. hostname RouterName - Set hostname
4. enable secret password - Set privileged password
5. service password-encryption - Encrypt passwords
6. Configure console and VTY lines
7. Set banner
8. Configure interfaces with IP addresses
9. no shutdown on interfaces
10. Configure routing (static or dynamic)
11. Set passive interfaces if needed
12. copy running-config startup-config - Save configuration
13. Verify with show commands
14. Test connectivity with ping and traceroute

This reference guide covers the essential commands from all modules in logical order of typical network configuration and troubleshooting workflows.

**Networking Commands Reference Guide**

**VLAN Commands**

**VLAN Creation and Management**

Switch(config)# vlan [vlan-id]

**Purpose:** Creates a VLAN with specified ID  
**Example:** Switch(config)# vlan 20

Switch(config-vlan)# name [vlan-name]

**Purpose:** Assigns a name to the VLAN  
**Example:** Switch(config-vlan)# name student

Switch(config)# no vlan [vlan-id]

**Purpose:** Deletes a VLAN  
**Example:** Switch(config)# no vlan 20

**VLAN Port Assignment**

Switch(config-if)# switchport mode access

**Purpose:** Sets the port to access mode  
**Example:** Applied to interface before VLAN assignment

Switch(config-if)# switchport access vlan [vlan-id]

**Purpose:** Assigns the port to a specific VLAN  
**Example:** Switch(config-if)# switchport access vlan 20

Switch(config-if)# switchport voice vlan [vlan-id]

**Purpose:** Assigns voice VLAN to a port  
**Example:** Switch(config-if)# switchport voice vlan 99

Switch(config-if)# no switchport access vlan

**Purpose:** Removes VLAN assignment (returns to VLAN 1)  
**Example:** Used to reset port VLAN membership

**VLAN Verification Commands**

Switch# show vlan [brief | id vlan-id | name vlan-name | summary]

**Purpose:** Displays VLAN information  
**Example:** Switch# show vlan brief

Switch# show interfaces [interface-id] switchport

**Purpose:** Shows interface switchport configuration  
**Example:** Switch# show interfaces fa0/18 switchport

Switch# delete flash:vlan.dat

**Purpose:** Deletes all VLANs (requires reload)  
**Example:** Used for factory reset

**Trunk Configuration Commands**

**Basic Trunk Setup**

Switch(config-if)# switchport mode trunk

**Purpose:** Sets port to permanent trunking mode  
**Example:** Switch(config-if)# switchport mode trunk

Switch(config-if)# switchport trunk native vlan [vlan-id]

**Purpose:** Sets native VLAN for trunk  
**Example:** Switch(config-if)# switchport trunk native vlan 99

Switch(config-if)# switchport trunk allowed vlan [vlan-list]

**Purpose:** Specifies allowed VLANs on trunk  
**Example:** Switch(config-if)# switchport trunk allowed vlan 10,20,30,99

**Dynamic Trunking Protocol (DTP)**

Switch(config-if)# switchport mode dynamic auto

**Purpose:** Port becomes trunk if neighbor is trunk/desirable  
**Example:** Default on many Cisco switches

Switch(config-if)# switchport mode dynamic desirable

**Purpose:** Actively negotiates to become trunk  
**Example:** Initiates trunk negotiation

Switch(config-if)# switchport nonegotiate

**Purpose:** Disables DTP negotiation  
**Example:** Used for security best practices

**Trunk Verification**

Switch# show interfaces trunk

**Purpose:** Shows trunk interfaces and their status  
**Example:** Displays trunking mode, native VLAN, allowed VLANs

Switch# show dtp interface [interface-id]

**Purpose:** Shows DTP information for interface  
**Example:** Switch# show dtp interface fa0/1

**Inter-VLAN Routing Commands**

**Router-on-a-Stick Configuration**

Router(config)# interface [interface-id].[subinterface-id]

**Purpose:** Creates subinterface for VLAN routing  
**Example:** Router(config)# interface g0/0/1.10

Router(config-subif)# encapsulation dot1q [vlan-id] [native]

**Purpose:** Configures 802.1Q encapsulation for VLAN  
**Example:** Router(config-subif)# encapsulation dot1q 10

Router(config-subif)# ip address [ip-address] [subnet-mask]

**Purpose:** Assigns IP address to subinterface  
**Example:** Router(config-subif)# ip address 192.168.10.1 255.255.255.0

**Layer 3 Switch Configuration**

Switch(config)# interface vlan [vlan-id]

**Purpose:** Creates Switch Virtual Interface (SVI)  
**Example:** Switch(config)# interface vlan 10

Switch(config)# ip routing

**Purpose:** Enables IP routing on Layer 3 switch  
**Example:** Required for inter-VLAN routing

Switch(config-if)# no switchport

**Purpose:** Converts Layer 2 port to Layer 3 routed port  
**Example:** Used to connect to other Layer 3 devices

**Inter-VLAN Routing Verification**

Router# show ip route

**Purpose:** Displays routing table  
**Example:** Shows connected VLAN networks

Router# show ip interface brief

**Purpose:** Shows interface status and IP configuration  
**Example:** Verifies subinterface status

**Access Control List (ACL) Commands**

**Standard ACL Configuration**

Router(config)# access-list [1-99] [permit|deny] [source] [wildcard-mask]

**Purpose:** Creates standard ACL entry  
**Example:** Router(config)# access-list 10 deny 192.168.1.0 0.0.0.255

Router(config)# ip access-list standard [name]

**Purpose:** Creates named standard ACL  
**Example:** Router(config)# ip access-list standard BLOCK\_SALES

**Extended ACL Configuration**

Router(config)# access-list [100-199] [permit|deny] [protocol] [source] [dest] [operator port]

**Purpose:** Creates extended ACL entry  
**Example:** Router(config)# access-list 100 deny tcp 192.168.1.0 0.0.0.255 any eq 80

Router(config)# ip access-list extended [name]

**Purpose:** Creates named extended ACL  
**Example:** Router(config)# ip access-list extended WEB\_FILTER

**ACL Application**

Router(config-if)# ip access-group [acl-number|name] [in|out]

**Purpose:** Applies ACL to interface  
**Example:** Router(config-if)# ip access-group 10 in

Router(config-line)# access-class [acl-number] [in|out]

**Purpose:** Applies ACL to VTY lines (Telnet/SSH)  
**Example:** Router(config-line)# access-class 10 in

**ACL Verification and Management**

Router# show access-lists [acl-number|name]

**Purpose:** Displays ACL configuration and statistics  
**Example:** Router# show access-lists 10

Router# show ip access-lists

**Purpose:** Shows IP ACLs only  
**Example:** Displays all IP-based ACLs

Router(config)# no access-list [acl-number]

**Purpose:** Removes entire ACL  
**Example:** Router(config)# no access-list 10

**ACL Editing with Sequence Numbers**

Router(config-std-nacl)# [sequence-number] [permit|deny] [source]

**Purpose:** Adds ACL entry with specific sequence number  
**Example:** Router(config-std-nacl)# 15 permit 192.168.2.0 0.0.0.255

Router(config-std-nacl)# no [sequence-number]

**Purpose:** Removes specific ACL entry  
**Example:** Router(config-std-nacl)# no 10

**Network Address Translation (NAT) Commands**

**Static NAT Configuration**

Router(config)# ip nat inside source static [local-ip] [global-ip]

**Purpose:** Creates one-to-one static NAT mapping  
**Example:** Router(config)# ip nat inside source static 192.168.1.10 209.165.200.5

Router(config-if)# ip nat inside

**Purpose:** Designates interface as NAT inside  
**Example:** Applied to LAN interface

Router(config-if)# ip nat outside

**Purpose:** Designates interface as NAT outside  
**Example:** Applied to WAN interface

**Dynamic NAT Configuration**

Router(config)# ip nat pool [name] [start-ip] [end-ip] netmask [netmask]

**Purpose:** Creates NAT address pool  
**Example:** Router(config)# ip nat pool POOL1 209.165.200.1 209.165.200.10 netmask 255.255.255.0

Router(config)# ip nat inside source list [acl] pool [pool-name]

**Purpose:** Binds ACL to NAT pool  
**Example:** Router(config)# ip nat inside source list 1 pool POOL1

**Port Address Translation (PAT)**

Router(config)# ip nat inside source list [acl] interface [interface] overload

**Purpose:** Configures PAT using interface address  
**Example:** Router(config)# ip nat inside source list 1 interface serial0/0/0 overload

Router(config)# ip nat inside source list [acl] pool [pool-name] overload

**Purpose:** Configures PAT using address pool  
**Example:** Router(config)# ip nat inside source list 1 pool POOL1 overload

**NAT Verification and Troubleshooting**

Router# show ip nat translations [verbose]

**Purpose:** Shows active NAT translations  
**Example:** Displays current translation table

Router# show ip nat statistics

**Purpose:** Shows NAT statistics and configuration  
**Example:** Displays hit/miss counts, pool usage

Router# clear ip nat translation \*

**Purpose:** Clears all dynamic NAT entries  
**Example:** Used for troubleshooting

Router# clear ip nat translation inside [global-ip] [local-ip]

**Purpose:** Clears specific NAT translation  
**Example:** Router# clear ip nat translation inside 209.165.200.1 192.168.1.10

Router# debug ip nat

**Purpose:** Shows real-time NAT translation process  
**Example:** Used for troubleshooting NAT issues

**General Verification Commands**

**Interface and Connectivity**

Router# show running-config

**Purpose:** Shows current configuration  
**Example:** Displays all configured settings

Router# show interfaces [interface-id]

**Purpose:** Shows interface status and statistics  
**Example:** Router# show interfaces g0/0/1

Router# ping [ip-address]

**Purpose:** Tests connectivity to remote host  
**Example:** Router# ping 192.168.1.1

Router# traceroute [ip-address]

**Purpose:** Shows path packets take to destination  
**Example:** Router# traceroute 8.8.8.8

**Configuration Management**

Router# copy running-config startup-config

**Purpose:** Saves current configuration  
**Example:** Preserves configuration after reload

Router# reload

**Purpose:** Restarts the device  
**Example:** Used after configuration changes

Router(config)# no [command]

**Purpose:** Removes or negates a command  
**Example:** Router(config)# no ip nat inside source static 192.168.1.10 209.165.200.5

**Wildcard Mask Keywords**

**Special Wildcard Masks**

host [ip-address]

**Purpose:** Matches single host (equivalent to 0.0.0.0 wildcard)  
**Example:** access-list 10 permit host 192.168.1.10

any

**Purpose:** Matches any address (equivalent to 0.0.0.0 255.255.255.255)  
**Example:** access-list 10 permit any

**Common Wildcard Calculations**

* Single host: 0.0.0.0
* /24 subnet: 0.0.0.255
* /16 subnet: 0.0.255.255
* /8 subnet: 0.255.255.255
* Any address: 255.255.255.255

**Note:** Wildcard mask = 255.255.255.255 - subnet mask