**📘 Networking in Linux – Complete Step-by-step Guide**

**1. 🔹 Networking Basics**

* Networking म्हणजे दोन किंवा अधिक systems मध्ये data exchange.
* Linux मध्ये networking control करायला मुख्य tools आहेत:
  + ip, ifconfig (deprecated but still used),
  + nmcli (NetworkManager),
  + config files: /etc/sysconfig/network-scripts/, /etc/network/interfaces (Debian).

**2. 🔹 Check Current Network Configuration**

# Show all interfaces

ip addr show

ifconfig -a # old command

# Check routing table

ip route show

netstat -rn # deprecated

# Check DNS settings

cat /etc/resolv.conf

# Ping test

ping -c 4 8.8.8.8 # by IP

ping -c 4 google.com # by hostname

✅ Interview Q: Difference between IP address and MAC address?  
👉 **Ans:** IP = logical, changes as per network; MAC = physical, unique to NIC.

**3. 🔹 Assign IP Address**

**Temporary (lost after reboot):**

# Assign IP manually

ip addr add 192.168.1.100/24 dev eth0

# Set default gateway

ip route add default via 192.168.1.1

**Permanent (RHEL/CentOS):**

File: /etc/sysconfig/network-scripts/ifcfg-eth0

TYPE=Ethernet

BOOTPROTO=static

NAME=eth0

DEVICE=eth0

ONBOOT=yes

IPADDR=192.168.1.100

NETMASK=255.255.255.0

GATEWAY=192.168.1.1

DNS1=8.8.8.8

DNS2=1.1.1.1

# Restart network

nmcli con reload

systemctl restart NetworkManager

**Debian/Ubuntu:**

File: /etc/network/interfaces

auto eth0

iface eth0 inet static

address 192.168.1.100

netmask 255.255.255.0

gateway 192.168.1.1

dns-nameservers 8.8.8.8 1.1.1.1

systemctl restart networking

✅ Interview Q: What is difference between static and dynamic IP?  
👉 **Ans:** Static = fixed, manual; Dynamic = auto-assigned via DHCP.

**4. 🔹 Configure Hostname**

# Show hostname

hostnamectl

# Set hostname

hostnamectl set-hostname server01

# Update /etc/hosts for local resolution

echo "192.168.1.100 server01" >> /etc/hosts

**5. 🔹 Network Troubleshooting Tools**

ping google.com # Check connectivity

traceroute google.com # Path taken to destination

mtr google.com # Continuous traceroute

netstat -tulnp # Show listening ports

ss -tulnp # Replacement of netstat

telnet <ip> <port> # Check if port is open

curl -I http://google.com # Check HTTP response

dig google.com # Check DNS resolution

✅ Interview Q: How to check which process is using a port?  
👉 lsof -i :8080 OR ss -tulnp | grep 8080

**6. 🔹 Firewall Configuration**

**Firewalld (RHEL/CentOS 7/8)**

# Check status

systemctl status firewalld

# Allow service/port

firewall-cmd --permanent --add-service=http

firewall-cmd --permanent --add-port=8080/tcp

# Reload firewall

firewall-cmd --reload

**UFW (Ubuntu/Debian)**

# Enable UFW

ufw enable

# Allow traffic

ufw allow 22/tcp

ufw allow 80,443/tcp

# Check rules

ufw status

**7. 🔹 DNS Configuration**

File: /etc/resolv.conf

nameserver 8.8.8.8

nameserver 1.1.1.1

For permanent config (RHEL):

nmcli con mod eth0 ipv4.dns "8.8.8.8 1.1.1.1"

nmcli con up eth0

**8. 🔹 Bonding / Teaming (High Availability NICs)**

**Bonding** combines multiple NICs into one for redundancy/load-balancing.  
File: /etc/sysconfig/network-scripts/ifcfg-bond0

DEVICE=bond0

NAME=bond0

TYPE=Bond

BONDING\_MASTER=yes

IPADDR=192.168.1.200

NETMASK=255.255.255.0

GATEWAY=192.168.1.1

ONBOOT=yes

BOOTPROTO=static

BONDING\_OPTS="mode=1 miimon=100"

Slave config (ifcfg-eth0, ifcfg-eth1):

MASTER=bond0

SLAVE=yes

ONBOOT=yes

✅ Modes:

* **mode=0** – round robin
* **mode=1** – active-backup
* **mode=4** – LACP (802.3ad)

**9. 🔹 Interview Questions**

1. **What is difference between TCP and UDP?**
   * TCP = connection-oriented, reliable, slow (HTTP, SSH).
   * UDP = connectionless, fast, unreliable (DNS, Streaming).
2. **How to check default gateway?**
   * ip route | grep default
3. **What is MTU? How to change it?**
   * MTU = Maximum Transmission Unit.
   * Change: ip link set dev eth0 mtu 1400
4. **How to persistently disable IPv6?**
   * Add in /etc/sysctl.conf:
   * net.ipv6.conf.all.disable\_ipv6 = 1
   * net.ipv6.conf.default.disable\_ipv6 = 1

Then run sysctl -p

📌 **Checklist after Networking Changes:**

* Run ip addr and confirm IP is applied.
* Test gateway: ping -c 4 <gateway>.
* Test external: ping -c 4 8.8.8.8.
* Test DNS: ping google.com.
* Verify services running: ss -tulnp.