

Networking (Core)

Linux Commands Course · Section 12

Network Interfaces – ip a

Show all network interfaces and their IP addresses:

```
ip a
```

Example output:

```
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500  
    inet 192.168.1.10/24 brd 192.168.1.255 scope global eth0
```

- `eth0`, `wlan0` – interface names
- `inet` – IPv4 address
- `inet6` – IPv6 address
- `state` – interface status (UP/DOWN)

Bring an interface up or down (root required):

```
sudo ip link set eth0 up  
sudo ip link set eth0 down
```

Routing Table – ip r

View the system routing table:

```
ip r
```

Example output:

```
default via 192.168.1.1 dev eth0  
192.168.1.0/24 dev eth0 proto kernel scope link src 192.168.1.10
```

- **default via** → default gateway
- **dev eth0** → which interface is used
- **src** → local source IP

Add or delete temporary routes:

```
sudo ip route add 10.10.0.0/16 via 192.168.1.1  
sudo ip route del 10.10.0.0/16
```

Active Connections – ss (modern tool)

ss (socket statistics) shows open ports and connections.

```
ss -tulpn
```

- **t** → TCP
- **u** → UDP
- **l** → listening sockets
- **p** → show process using port
- **n** → show numeric addresses

Example:

```
Netid State  Recv-Q Send-Q Local Address:Port  Peer Address:Port  
Process  
tcp    LISTEN  0      128      0.0.0.0:22          0.0.0.0:*  
users: (("sshd",pid=745,fd=3))
```

Legacy tool (if available):

```
netstat -tulpn
```

Connectivity – ping

Test reachability of a host.

```
ping 8.8.8.8
```

Send a limited number of packets:

```
ping -c 4 example.com
```

Interrupt anytime with **Ctrl+C**.

Tracing Network Path – traceroute / tracert

Show each hop between you and a destination.


```
tracert example.com
```

If not installed, try:

```
tracert example.com
```

Output shows latency at each hop – useful for debugging routing or latency issues.

DNS Lookups – dig and host

 Query DNS records with **dig**


```
dig example.com
```

Show only the IP address:

```
dig +short example.com
```

Query specific record types:

```
dig example.com MX  
dig example.com NS
```

 Simple lookup with **host**

```
host example.com
```

Reverse lookup (IP → hostname):

```
host 8.8.8.8
```

HTTP & File Transfers – curl and wget

curl

Fetch a URL or API data:

```
curl https://example.com
```

Save output to a file:

```
curl -o page.html https://example.com
```

Show headers only:

```
curl -I https://example.com
```

Send JSON data to an API:

```
curl -X POST -H "Content-Type: application/json" -d '{"name":"test"}'  
https://api.example.com/data
```

wget

Download files from the web:

```
wget https://example.com/file.iso
```

Resume interrupted download:

```
wget -c https://example.com/file.iso
```


Remote Access – ssh

Securely log into another machine:

```
ssh user@192.168.1.50
```

Use a key file instead of a password:

```
ssh -i ~/.ssh/id_rsa user@host
```

Exit remote session with `exit` or `Ctrl+D`.

Copy files securely using SSH:

```
scp report.txt user@192.168.1.50:/home/user/
```

Copy entire directories recursively:

```
scp -r project/ user@host:/backup/
```

Legacy Tool – telnet

Used for basic connectivity testing (not secure).

```
telnet example.com 80
```

If it connects, the port is open.

Use only for debugging – not for remote login.

NetworkManager CLI – nmcli

nmcli manages network connections on systems using **NetworkManager**.

List all connections:

```
nmcli connection show
```

Show active interfaces:

```
nmcli device status
```

Bring a connection up or down:

```
sudo nmcli connection up "Wired connection 1"  
sudo nmcli connection down "Wired connection 1"
```

View details for a specific interface:

```
nmcli device show eth0
```

Set static IP (example):

```
sudo nmcli connection modify "Wired connection 1" ipv4.addresses  
192.168.1.20/24 ipv4.gateway 192.168.1.1 ipv4.method manual  
sudo nmcli connection up "Wired connection 1"
```

Recap

- `ip a`, `ip r` – view interfaces and routes
- `ss -tulpn` – active sockets and ports
- `ping`, `tracert`, `tracert` – connectivity testing
- `dig`, `host` – DNS queries
- `curl`, `wget` – HTTP and file transfers
- `ssh`, `scp`, `telnet` – remote access and copy
- `nmcli` – manage connections via NetworkManager

These tools form the backbone of network troubleshooting and configuration.
