Command Line Tools Guide

traceroute / tracert

Purpose: Shows the path packets take to reach a destination.
Command:
```
traceroute google.com        # Linux/macOS
tracert google.com           # Windows
```
Example Output:
```
1  192.168.1.1     1.234 ms
2  10.23.0.1       5.678 ms
3  72.14.234.1     12.345 ms
```

ipconfig / ifconfig

Purpose: Displays IP configuration.
Command:
```
ipconfig              # Windows
ifconfig              # Linux/macOS
```
Example Output:
```
IPv4 Address. . . . . : 192.168.1.10
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . : 192.168.1.1
```

ping

Purpose: Tests if a host is reachable.
Command:
```
ping google.com
```
Example Output:
```
Reply from 142.250.190.14: bytes=32 time=14ms TTL=115
```

arp

Purpose: Views the ARP table.
Command:
```
arp -a
```
Example Output:
```
192.168.1.1     00-14-22-01-23-45     dynamic
```

nslookup / dig

Purpose: DNS lookups for domain resolution.
Command:
```
nslookup google.com
dig google.com           # Linux/macOS
```
Example Output:
```
Name:    google.com
Address: 142.250.190.14
```

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Resolving Names

Purpose: Name resolution (built into commands).
Command:
```
ping microsoft.com
```
Output Includes:
```
Pinging microsoft.com [40.76.4.15]
```

mtr / pathping

Purpose: Combines traceroute and ping.
Command:
```
mtr google.com          # Linux
pathping google.com     # Windows
```
Example Output:
```
Host              Loss%   Snt   Last   Avg  Best  Wrst
1. 192.168.1.1      0.0%    10    1.0    1.1   1.0   1.5
```

nmap

Purpose: Scans for open ports/services.
Command:
```
nmap 192.168.1.1
```
Example Output:
```
PORT     STATE SERVICE
22/tcp   open  ssh
80/tcp   open  http
```

route

Purpose: Displays/modifies routing table.
Command:
```
route print          # Windows
netstat -rn          # Linux/macOS
```
Example Output:
```
Network Destination    Netmask      Gateway
0.0.0.0              0.0.0.0      192.168.1.1
```

nbtstat

Purpose: Displays NetBIOS over TCP/IP.
Command:
```
nbtstat -n
```
Example Output:
```
Name             Type         Status
DESKTOP-XYZ      <00>  UNIQUE  Registered
```

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netstat

Purpose: Shows network connections.
Command:
  netstat -an
Example Output:
  TCP   0.0.0.0:80   0.0.0.0:0   LISTENING
  TCP   192.168.1.10:5043   93.184.216.34:443   ESTABLISHED

tcpdump

Purpose: Captures network traffic.
Command:
  sudo tcpdump -i eth0
Example Output:
  14:33:27.123456 IP 192.168.1.10 > 93.184.216.34: HTTP

ftp

Purpose: Connects to FTP server.
Command:
  ftp ftp.example.com
Example Output:
  Connected to ftp.example.com
  Name (ftp.example.com:user):

telnet

Purpose: Tests port connectivity.
Command:
  telnet google.com 80
Example Output:
  Trying 142.250.190.14...
  Connected to google.com.