

Computer Networking Lab

Assignment No 02

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Networking Commands

Windows Commands:

1. ipconfig:

- Function: Displays the IP configuration for all network interfaces on a Windows machine, including IP address, subnet mask, and default gateway.

```
C:\Users\harsh>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 10:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter WiFi:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::5bc6:ef97:1cbc:115c%8
    IPv4 Address. . . . . : 10.40.5.223
    Subnet Mask . . . . . : 255.255.224.0
    Default Gateway . . . . . : 10.40.0.2

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :
```

2. ping:

- Function: Sends ICMP Echo Request messages to a specified network host to check network connectivity.

```
C:\Users\harsh>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=8ms TTL=113
Reply from 8.8.8.8: bytes=32 time=8ms TTL=113
Reply from 8.8.8.8: bytes=32 time=65ms TTL=113
Reply from 8.8.8.8: bytes=32 time=8ms TTL=113

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 8ms, Maximum = 65ms, Average = 22ms
```

3. tracert:

- Function: Traces the route that packets take to reach a destination, showing the IP addresses of the routers along the way.

tracert <hostname or IP address>

```
Tracing route to dns.google [8.8.8.8]
over a maximum of 30 hops:

  1      1 ms      1 ms      4 ms  10.40.0.2
  2     21 ms      1 ms      1 ms  172.16.16.1
  3      2 ms      1 ms      1 ms  112.133.247.221
```

4. nslookup:

- Function: Performs DNS (Domain Name System) queries to retrieve information about domain names, IP addresses, and mail servers.

nslookup <hostname>

```
C:\Users\harsh>nslookup
Default Server:  one.one.one.one
Address:  1.1.1.1
```

5. netstat:

- Function: Displays active network connections, listening ports, and other network-related information.

netstat -a

```
C:\Users\harsh>netstat

Active Connections

Proto Local Address           Foreign Address         State
TCP   10.40.5.223:49675       1.2.3.4:9922           ESTABLISHED
TCP   10.40.5.223:49701       20.212.88.117:https     ESTABLISHED
TCP   10.40.5.223:49965       sh-in-f188:5228        ESTABLISHED
TCP   10.40.5.223:49980       52.111.244.0:https      ESTABLISHED
TCP   10.40.5.223:50101       sc-in-f188:5228        ESTABLISHED
TCP   10.40.5.223:50178       1:https                ESTABLISHED
TCP   10.40.5.223:50206       20.198.119.143:https    ESTABLISHED
TCP   10.40.5.223:50282       52.108.9.12:https       ESTABLISHED
```

6. arp:

- Function: Displays and modifies the ARP (Address Resolution Protocol) cache, showing the mapping between IP addresses and MAC addresses.

arp -a

```
C:\Users\harsh>arp -a

Interface: 10.40.5.223 --- 0x8
Internet Address      Physical Address        Type
10.40.0.2             00-04-96-a1-fb-0b      dynamic
10.40.6.25            3c-55-76-a8-01-c3      dynamic
10.40.9.189           b8-bc-5b-df-1b-b8      dynamic
10.40.9.200           b8-bc-5b-df-19-ec      dynamic
224.0.0.2             01-00-5e-00-00-02      static
224.0.0.22           01-00-5e-00-00-16      static
224.0.0.251          01-00-5e-00-00-fb      static
224.0.0.252          01-00-5e-00-00-fc      static
239.255.255.250       01-00-5e-7f-ff-fa      static
255.255.255.255       ff-ff-ff-ff-ff-ff      static
```

7. route:

- Function: Displays and modifies the local IP routing table, showing the routing information for network destinations.

route

```
C:\Users\harsh>route

Manipulates network routing tables.

ROUTE [-f] [-p] [-4|-6] command [destination]
                                [MASK netmask] [gateway] [METRIC metric] [IF interface]

-f          Clears the routing tables of all gateway entries. If this is
            used in conjunction with one of the commands, the tables are
            cleared prior to running the command.

-p          When used with the ADD command, makes a route persistent across
            boots of the system. By default, routes are not preserved
            when the system is restarted. Ignored for all other commands,
            which always affect the appropriate persistent routes.

-4          Force using IPv4.

-6          Force using IPv6.

command    One of these:
            PRINT      Prints a route
            ADD        Adds a route
            DELETE     Deletes a route
            CHANGE     Modifies an existing route
```

8. nbtstat:

- Function: Displays NetBIOS (Network Basic Input/Output System) over TCP/IP statistics, including NetBIOS name resolution.

nbtstat -a <hostname or IP address>

```

C:\Users\harsh>nbtstat

Displays protocol statistics and current TCP/IP connections using NBT
(NetBIOS over TCP/IP).

NBTSTAT [ [-a RemoteName] [-A IP address] [-c] [-n]
          [-r] [-R] [-RR] [-s] [-S] [interval] ]

-a  (adapter status) Lists the remote machine's name table given its name
-A  (Adapter status) Lists the remote machine's name table given its
                        IP address.
-c  (cache)          Lists NBT's cache of remote [machine] names and their IP addresses
-n  (names)          Lists local NetBIOS names.
-r  (resolved)       Lists names resolved by broadcast and via WINS
-R  (Reload)         Purges and reloads the remote cache name table
-S  (Sessions)       Lists sessions table with the destination IP addresses
-s  (sessions)       Lists sessions table converting destination IP
                        addresses to computer NETBIOS names.
-RR (ReleaseRefresh) Sends Name Release packets to WINS and then, starts Refresh

RemoteName  Remote host machine name.
IP address  Dotted decimal representation of the IP address.
interval    Redisplays selected statistics, pausing interval seconds
            between each display. Press Ctrl+C to stop redisplaying
            statistics.

```

9. ipconfig /all:

- Function:Provides a detailed view of the IP configuration for all network interfaces, including additional information such as DHCP lease details and DNS server addresses.

ipconfig /all

```

C:\Users\harsh> ipconfig /all

Windows IP Configuration

Host Name . . . . . : MiksuHarsh17
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Ethernet:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Killer E2600 Gigabit Ethernet Controller
Physical Address. . . . . : 08-8F-C3-5D-EB-F7
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 1:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
Physical Address. . . . . : B0-3C-DC-E9-59-B8
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 10:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
Physical Address. . . . . : B2-3C-DC-E9-59-B7
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter WiFi:

Connection-specific DNS Suffix . :
Description . . . . . : Killer(R) Wi-Fi 6 AX1650i 160MHz Wireless Network Adapter (201NGW)
Physical Address. . . . . : B0-3C-DC-E9-59-B7
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

```

10. netsh:

- Function: A versatile command-line tool for configuring and troubleshooting network settings. It allows you to manage various network aspects, including interfaces, firewalls, and routing.

netsh interface show interface

```

C:\Users\harsh>netsh interface show interface

```

Admin State	State	Type	Interface Name
Enabled	Connected	Dedicated	WiFi
Enabled	Disconnected	Dedicated	Ethernet

11. pathping:

- Function: Combines the functionality of tracert and ping, providing a detailed analysis of the network path and packet loss between the source and destination.

pathping <hostname or IP address>

```
C:\Users\harsh>pathping

Usage: pathping [-g host-list] [-h maximum_hops] [-i address] [-n]
               [-p period] [-q num_queries] [-w timeout]
               [-4] [-6] target_name

Options:
  -g host-list      Loose source route along host-list.
  -h maximum_hops  Maximum number of hops to search for target.
  -i address        Use the specified source address.
  -n               Do not resolve addresses to hostnames.
  -p period         Wait period milliseconds between pings.
  -q num_queries    Number of queries per hop.
  -w timeout        Wait timeout milliseconds for each reply.
  -4               Force using IPv4.
  -6               Force using IPv6.
```

Linux Commands:

1. ifconfig:

- Function: Displays information about network interfaces, including IP address, MAC address, and network-related statistics.

ifconfig

2. ping:

- Function: Sends ICMP Echo Request messages to a specified network host for testing network connectivity.

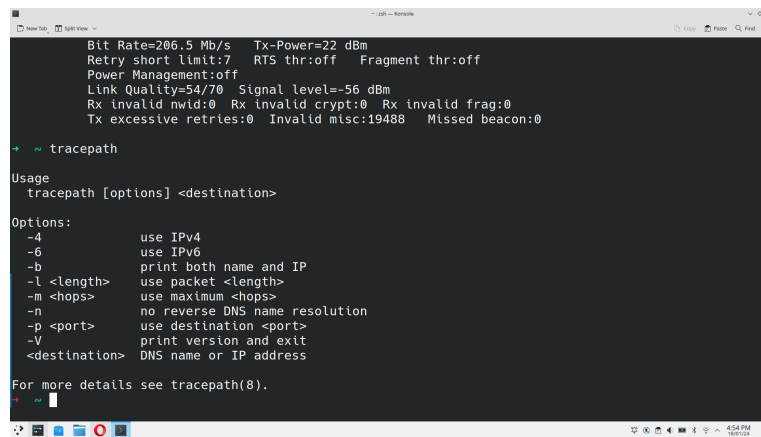
ping <hostname or IP address>

```
→ ~ ping 8.8.8.8
ping: connect: Network is unreachable
→ ~ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=57 time=68.9 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=57 time=44.0 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=57 time=37.3 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=57 time=35.5 ms
```

3. traceroute:

- Function: Traces the route taken by packets to reach a destination, displaying the IP addresses of routers along the path.

traceroute <hostname or IP address>



```
Bit Rate=206.5 Mb/s Tx-Power=22 dBm
Retry short limit:7 RTS thr:off Fragment thr:off
Power Management:off
Link Quality=54/70 Signal level=-56 dBm
Rx invalid mwid:0 Rx invalid crypt:0 Rx invalid frag:0
Tx excessive retries:0 Invalid misc:19488 Missed beacon:0

→ ~ tracepath

Usage
  tracepath [options] <destination>

Options:
  -4          use IPv4
  -6          use IPv6
  -b          print both name and IP
  -l <length> use packet <length>
  -m <hops>   use maximum <hops>
  -n          no reverse DNS name resolution
  -p <port>   use destination <port>
  -V          print version and exit
  <destination> DNS name or IP address

For more details see tracepath(8).
→ ~
```

4. dig:

- Function: A flexible tool for querying DNS servers, providing detailed information about domain names and DNS records.

dig <hostname>


```
dig
<<> DiG 9.18.21 <<>
;; global options: +cmd
;; Got answer:
-->HEADER<< opcode: QUERY, status: NOERROR, id: 38150
;; flags: qr rd ra; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:;, udp: 65494
;; QUESTION SECTION:
;
; IN NS
;
;; ANSWER SECTION:
517099 IN NS a.root-servers.net.
517099 IN NS b.root-servers.net.
517099 IN NS c.root-servers.net.
517099 IN NS d.root-servers.net.
517099 IN NS e.root-servers.net.
517099 IN NS f.root-servers.net.
517099 IN NS g.root-servers.net.
517099 IN NS h.root-servers.net.
517099 IN NS i.root-servers.net.
517099 IN NS j.root-servers.net.
517099 IN NS k.root-servers.net.
517099 IN NS l.root-servers.net.
517099 IN NS m.root-servers.net.

;; Query time: 43 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Thu Jan 18 16:54:47 IST 2024
;; MSG SIZE rcvd: 239
```

5. netcap:

-Function: Displays information about active network connections, listening ports, and routing tables.

```
enp2s0 no wireless extensions.

wlp0s20f3 IEEE 802.11 ESSID:"WCE WL-Fi 6"
Mode:Managed Frequency:5.805 GHz Access Point: BC:F3:10:F6:62:F4
+ NetworkManager
+ netcap
You may need to be root to get a full report
+ sudo netcap
[sudo] password for harshbanane17:
ppid pid acct command type port capabilities
1 572 root sshd tcp 22 full +
1 439 systemd-resolve systemd-resolve tcp 53 net_raw @+
1 439 systemd-resolve systemd-resolve tcp 53 net_raw @+
1 439 systemd-resolve systemd-resolve tcp 5355 net_raw @+
1 572 root sshd tcp6 22 full +
1 439 systemd-resolve systemd-resolve tcp6 5355 net_raw @+
1 439 systemd-resolve systemd-resolve udp 5353 net_raw @+
1 439 systemd-resolve systemd-resolve udp 5355 net_raw @+
1 439 systemd-resolve systemd-resolve udp 53 net_raw @+
1 318 systemd-network systemd-network udp 68 net_bind_service, net_broadcast, net_admin, net_raw @+
1 497 root NetworkManager udp 68 dac_override, kill, setgid, setuid, net_bind_service, net_admin, net_r
aw, sys_module, sys_chroot, audit_write +
1 439 systemd-resolve systemd-resolve udp6 5353 net_raw @+
1 439 systemd-resolve systemd-resolve udp6 5355 net_raw @+
1 497 root NetworkManager raw6 0 dac_override, kill, setgid, setuid, net_bind_service, net_admin, net_r
aw, sys_module, sys_chroot, audit_write +
1 318 systemd-network systemd-network raw6 0 net_bind_service, net_broadcast, net_admin, net_raw @+
1 567 root wpa_supplicant pkt wlp0s20f3 full +
1 567 root wpa_supplicant pkt face full +
1 318 systemd-network systemd-network pkt wlp0s20f3 net_bind_service, net_broadcast, net_admin, net_raw @+
```

6.arping:

-Function: Displays and manipulates the ARP cache, showing the mapping between IP addresses and MAC addresses.

```
~ ssh - Konsole
New Tab Split View
Copy Paste Find
~ arptables-nft
arptables v1.8.10 (nf_tables): no command specified
Try 'arptables -h' or 'arptables --help' for more information.
~ arping

Usage:
  arping [options] <destination>

Options:
  -f          quit on first reply
  -q          be quiet
  -b          keep on broadcasting, do not unicast
  -D          duplicate address detection mode
  -U          unsolicited ARP mode, update your neighbours
  -A          ARP answer mode, update your neighbours
  -V          print version and exit
  -c <count>  how many packets to send
  -w <timeout> how long to wait for a reply
  -i <interval> set interval between packets (default: 1 second)
  -I <device>  which ethernet device to use
  -s <source>  source IP address
  <destination> DNS name or IP address

For more details see arping(8).
~
```

7. route:

- Function: Displays and modifies the IP routing table, showing the routing information for network destinations.

route

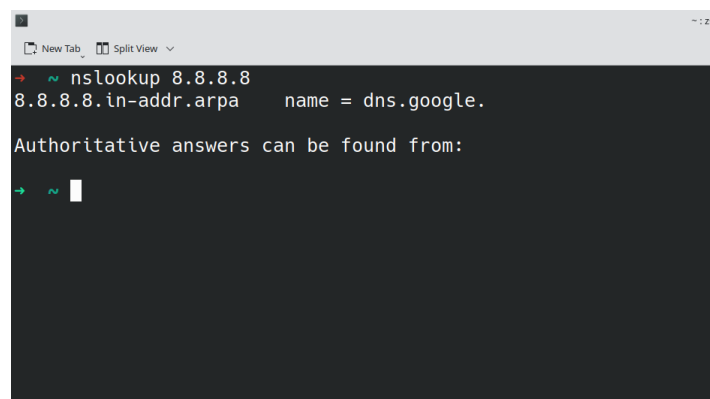
```
~ ssh - Konsole
New Tab Split View
Copy Paste Find
~ route

st      Gateway      Prefsrc      Protocol Scope  Dev      Table
efault  10.40.0.2     10.40.15.180 dhcp    wlp0s20f3
efault  10.40.0.2     10.40.5.223  dhcp    wlp0s20f3
0.40.0.0/19  10.40.0.2     10.40.5.223  kernel link  wlp0s20f3
0.40.0.2   10.40.0.2     10.40.15.180 dhcp    link  wlp0s20f3
92.168.1.8  10.40.0.2     10.40.15.180 dhcp    wlp0s20f3
0.40.5.223  10.40.0.2     10.40.5.223  kernel host  wlp0s20f3 local
0.40.15.180 10.40.0.2     10.40.5.223  kernel host  wlp0s20f3 local
0.40.31.255 10.40.0.2     10.40.5.223  kernel link  wlp0s20f3 local
27.0.0.0/8  127.0.0.1     127.0.0.1    kernel host  lo        local
27.0.0.1    127.0.0.1     127.0.0.1    kernel host  lo        local
27.255.255.255 127.0.0.1    127.0.0.1    kernel link  lo        local
~
```

8. nslookup:

- Function: A tool for querying DNS to obtain information about domain names and IP addresses.

nslookup <hostname>

A terminal window with a dark background and light green text. The prompt is '~'. The command 'nslookup 8.8.8.8' has been entered. The output shows '8.8.8.8.in-addr.arpa' and 'name = dns.google.'. Below this, it says 'Authoritative answers can be found from:' followed by a blank line and a cursor.

```
~ nslookup 8.8.8.8
8.8.8.8.in-addr.arpa    name = dns.google.

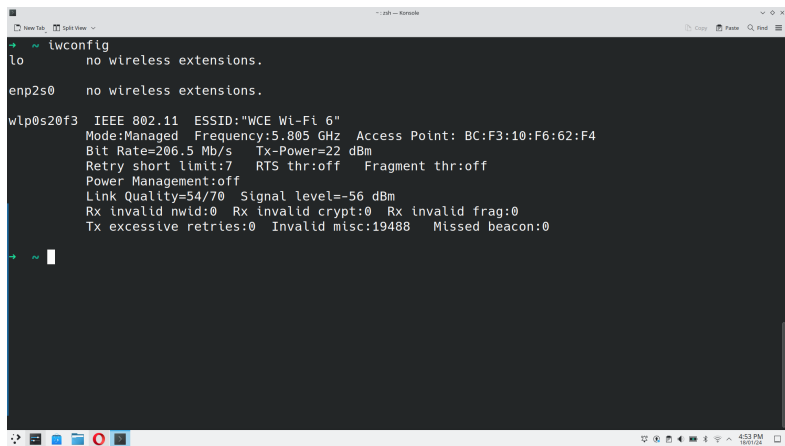
Authoritative answers can be found from:

~
```

9. iwconfig:

- Function: Displays information about wireless network interfaces, including details about the connection status, signal strength, and encryption.

iwconfig

A terminal window with a dark background and light green text. The prompt is '~'. The command 'iwconfig' has been entered. The output shows details for three interfaces: 'lo' (no wireless extensions), 'enp2s0' (no wireless extensions), and 'wlp0s20f3' (IEEE 802.11, ESSID: "WCE Wi-Fi 6", Mode: Managed, Frequency: 5.805 GHz, Access Point: BC:F3:10:F6:62:F4, Bit Rate: 206.5 Mb/s, Tx-Power: 22 dBm, Retry short limit: 7, RTS thr: off, Fragment thr: off, Power Management: off, Link Quality: 54/70, Signal level: -56 dBm, Rx invalid nwid: 0, Rx invalid crypt: 0, Rx invalid frag: 0, Tx excessive retries: 0, Invalid misc: 19488, Missed beacon: 0).

```
~ iwconfig
lo      no wireless extensions.

enp2s0  no wireless extensions.

wlp0s20f3 IEEE 802.11  ESSID:"WCE Wi-Fi 6"
Mode:Managed  Frequency:5.805 GHz  Access Point: BC:F3:10:F6:62:F4
Bit Rate=206.5 Mb/s   Tx-Power=22 dBm
  Retry short limit:7   RTS thr:off   Fragment thr:off
Power Management:on
Link Quality=54/70  Signal level=-56 dBm
Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
Tx excessive retries:0 Invalid misc:19488  Missed beacon:0

~
```

10. ss:

- Function:A replacement for netstat, ss provides detailed information about socket statistics, including listening ports, established connections, and more.

ss -a

These commands are fundamental for **network troubleshooting, diagnostics, and configuration** in both Windows and Linux environments.