

## LAB2:NETWORK COMMAND FOR TESTING AND TERMINOLOGY

### OBJECTIVE:

- To understand the purpose of common network commands used for testing and troubleshooting.
- To learn the syntax and usage of essential network diagnostic commands.
- To analyze network connectivity and identify communication issues.

### REQUIRED COMPONENTS:

- A computer with command line interface (CLI) access
- Network connection (wired or wireless)

### THEORY:

#### Network Commands:

Network commands are essential tools used to test, monitor, and troubleshoot network connectivity and performance issues. These commands allow users and network administrators to check whether devices are properly connected to a network, verify IP configuration details, and identify problems such as packet loss, incorrect routing, or DNS resolution failures.

Network configuration commands such as ipconfig/ifconfig, route print, and getmac display essential details including IP address, subnet mask, default gateway, routing table, and MAC addresses of network interfaces. These details are crucial for verifying correct network setup and diagnosing configuration-related problems.

Overall, understanding these network commands is important for effective network troubleshooting, ensuring reliable communication, and maintaining proper network performance.

## SYNTAX AND USAGE OF COMMON NETWORK COMMANDS:

### 1) ping:

- o Syntax: ping [hostname or IP address]
- o Usage: Tests the reachability of a host on an IP network and measures the round-trip time for messages sent from the originating host to a destination computer.

```
Microsoft Windows [Version 10.0.26200.7623]
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C:\Windows\System32>echo Sudip
Sudip

C:\Windows\System32>ping www.google.com

Pinging www.google.com [2404:6800:4002:831::2004] with 32 bytes of data:
Reply from 2404:6800:4002:831::2004: time=47ms
Reply from 2404:6800:4002:831::2004: time=23ms
Reply from 2404:6800:4002:831::2004: time=18ms
Reply from 2404:6800:4002:831::2004: time=18ms

Ping statistics for 2404:6800:4002:831::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 18ms, Maximum = 47ms, Average = 26ms

C:\Windows\System32>
```

### 2) ipconfig (Windows) / ifconfig (Linux):

- o Syntax: ipconfig or ifconfig
- o Usage: Displays all current TCP/IP network configuration values and refreshes DHCP and DNS settings.

```
C:\Windows\System32>ipconfig
Windows IP Configuration

Wireless LAN adapter Local Area Connection* 3:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . :

Wireless LAN adapter Local Area Connection* 4:
  Connection-specific DNS Suffix . :
  Link-local IPv6 Address . . . . . : fe80::774e:9361:1814:682%13
  IPv4 Address. . . . . : 192.168.1.137.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . :

Wireless LAN adapter Wi-Fi:
  Connection-specific DNS Suffix . . . . . : worldlink.com.np
  IPv6 Address. . . . . : 2400:1a00:3b2f:f514:7946:568f:c6d2:39bc
  Temporary IPv6 Address. . . . . : 2400:1a00:3b2f:f514:c052:c181:d710:d0df
  Link-local IPv6 Address . . . . . : fe80::bbd7:b39b:11b:a341%17
  IPv4 Address. . . . . : 192.168.1.82
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : fe80::1%17
                                192.168.1.254

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

C:\Windows\System32>i
```

### 3) tracert (Windows) / traceroute (Linux):

- o Syntax: tracert [hostname or IP address] or traceroute [hostname or IP address]
- o Usage: Determines the route taken by packets to reach a specific host by listing all the intermediate routers.

```
C:\Windows\System32>tracert google.com

Tracing route to google.com [2404:6800:4002:81b::200e]
over a maximum of 30 hops:

 1   1 ms    1 ms    1 ms  2400:1a00:3b2f:f514::1
 2   8 ms    6 ms    5 ms  2400:1a00:3b02::1
 3   *        *        * Request timed out.
 4   6 ms    4 ms    5 ms  2400:1a00:0:41::170
 5   6 ms    9 ms    7 ms  2400:1a00:0:41::128
 6   8 ms    9 ms    7 ms  2400:1a00:dccc:1:72:9:128:67
 7   27 ms   36 ms   21 ms  2404:d180:1a::15
 8   20 ms   17 ms   17 ms  2001:4860:1:1::126a
 9   21 ms   19 ms   21 ms  2001:4860:0:1::7819
10   21 ms   19 ms   21 ms  2001:4860:0:1::53ab
11   20 ms   19 ms   20 ms  del11s16-in-x0e.1e100.net [2404:6800:4002:81b::200e]

Trace complete.
```

#### 4) netstat:

- o Syntax: netstat -a or netstat -n
- o Usage: Displays active TCP connections, ports on which the computer is listening, Ethernet statistics, and more.

```
C:\Windows\System32>netstat -a

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:445            LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:2869           LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:4343           LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:4449           LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:5040           LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:5141           LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:7250           LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:7680           LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:46760          LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:49664          LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:49665          LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:49668          LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:49669          LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:49670          LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:55808          LAPTOP-0JAVETO0:0    LISTENING
  TCP    0.0.0.0:58995          LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:5141          LAPTOP-0JAVETO0:54502  ESTABLISHED
  TCP    127.0.0.1:9993          LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:15152         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:19443         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:45112         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:46753         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:46933         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:46933         LAPTOP-0JAVETO0:60788  ESTABLISHED
  TCP    127.0.0.1:49676         LAPTOP-0JAVETO0:49677  ESTABLISHED
  TCP    127.0.0.1:49677         LAPTOP-0JAVETO0:49676  ESTABLISHED
  TCP    127.0.0.1:49686         LAPTOP-0JAVETO0:49687  ESTABLISHED
  TCP    127.0.0.1:49687         LAPTOP-0JAVETO0:49686  ESTABLISHED
  TCP    127.0.0.1:49690         LAPTOP-0JAVETO0:49691  ESTABLISHED
  TCP    127.0.0.1:49691         LAPTOP-0JAVETO0:49690  ESTABLISHED
  TCP    127.0.0.1:49692         LAPTOP-0JAVETO0:49693  ESTABLISHED
  TCP    127.0.0.1:49693         LAPTOP-0JAVETO0:49692  ESTABLISHED
  TCP    127.0.0.1:51779         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:51779         LAPTOP-0JAVETO0:60789  ESTABLISHED
  TCP    127.0.0.1:51780         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:51781         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:51782         LAPTOP-0JAVETO0:0    LISTENING
  TCP    127.0.0.1:53934         LAPTOP-0JAVETO0:53935  ESTABLISHED
  TCP    127.0.0.1:53935         LAPTOP-0JAVETO0:53934  ESTABLISHED
```

5) nslookup:

- o Syntax: nslookup [hostname]
- o Usage: Queries the Domain Name System (DNS) to obtain domain name or IP address mapping information.

```
Microsoft Windows [Version 10.0.26200.7623]
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C:\Windows\System32>nslookup www.google.com
Server:  vip6-safenet-kmd01.wlink.com.np
Address: 2400:1a00:0:32::165

Non-authoritative answer:
Name:    www.google.com
Addresses: 2404:6800:4002:831::2004
          142.251.223.132

C:\Windows\System32>
```

6) arp:

- o Syntax: arp -a
- o Usage: Displays and modifies the IP-to-Physical (MAC) address translation table used by the Address Resolution Protocol (ARP).

```
C:\Windows\System32>arp -a

Interface: 192.168.137.1 --- 0xd
  Internet Address      Physical Address      Type
  192.168.137.255        ff-ff-ff-ff-ff-ff    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

Interface: 192.168.1.82 --- 0x11
  Internet Address      Physical Address      Type
  192.168.1.72           fa-9d-e9-04-0f-f0    dynamic
  192.168.1.156            a8-3b-76-5f-68-71    dynamic
  192.168.1.254            d8-b0-20-09-8d-a0    dynamic
  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

C:\Windows\System32>
```

## 7) telnet:

- o Syntax: telnet [hostname or IP address] [port]
- o Usage: Connects to a remote host using the Telnet protocol, useful for testing connectivity to specific ports.

```
C:\Windows\System32>telnet 142.250.191.14 43
Connecting To 142.250.191.14....
```



8) getmac:

- o Syntax: getmac
- o Usage: Displays the MAC addresses for network adapters on the local machine.

```
C:\Windows\System32>getmac

Physical Address      Transport Name
-----
E4-60-17-04-8D-D7    \Device\Tcpip_{A1A5D5B7-A43C-47D2-8DAE-38E5053181AF}
74-D4-DD-36-82-63    Media disconnected
E6-60-17-04-8D-D7    \Device\Tcpip_{7090D06C-A97E-4BBD-8873-2C988A721CB5}

C:\Windows\System32>
```

## 9) netsh wlan (Windows):

- Syntax: netsh wlan show profiles or netsh wlan connect name=[profile name]
- Usage: Manages wireless network profiles and connections on Windows systems.

```
C:\Windows\System32>netsh
netsh>wlan show profiles

Profiles on interface Wi-Fi:

Group policy profiles (read only)
-----
<None>

User profiles
-----
All User Profile      : KRITESH_2224
All User Profile      : Computer_Lab
All User Profile      : TP-Link_06C4_5G
All User Profile      : DESKTOP-N8C8UI7_1775
All User Profile      : -->Hi<--
All User Profile      : ASUS_1508
All User Profile      : sudipmahato02_flahn_5
All User Profile      : sudipmahato02_flahn_2
All User Profile      : Dharan_5
All User Profile      : Dharan_2.4
All User Profile      : TP-Link_4E36
All User Profile      : Regal_2.4
All User Profile      : Regal_5G
All User Profile      : TP-Link_4E36_5G
All User Profile      : rojankhadgi_5
All User Profile      : Himalaya01
All User Profile      : HIMALAYA
All User Profile      : Redmi_Note_9_Pro_Max
All User Profile      : CodeYatra
All User Profile      : 21_din_mey_paisey_double
All User Profile      : Nischal064_5
All User Profile      : PEACE_ZONE_3rd_5G
All User Profile      : PEACE_ZONE_2nd_2G
All User Profile      : Qmax
All User Profile      : !!Free_WorldLink_Wi-Fi!!
All User Profile      : ALHN-8FE2
All User Profile      : NTFiber-F56D
All User Profile      : ALHN-8FE2-5
All User Profile      : gracecomputer_5
```

## 10) route print:

- o Syntax: route print
- o Usage: Displays the current IP routing table on the local machine.

```
C:\Windows\System32>route print
=====
Interface List
  9...e4 60 17 04 8d d8 ....Microsoft Wi-Fi Direct Virtual Adapter #3
  13...e6 60 17 04 8d d7 ....Microsoft Wi-Fi Direct Virtual Adapter #4
  17...e4 60 17 04 8d d7 ....Intel(R) Wi-Fi 6 AX203
  15...74 d4 dd 36 82 63 ....Realtek PCIe GbE Family Controller
  1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask        Gateway       Interface Metric
          0.0.0.0      0.0.0.0    192.168.1.254  192.168.1.82    40
          127.0.0.0     255.0.0.0        On-link      127.0.0.1    331
          127.0.0.1   255.255.255.255        On-link      127.0.0.1    331
  127.255.255.255   255.255.255.255        On-link      127.0.0.1    331
          192.168.1.0   255.255.255.0        On-link    192.168.1.82    296
          192.168.1.82   255.255.255.255        On-link    192.168.1.82    296
  192.168.1.255   255.255.255.255        On-link    192.168.1.82    296
          192.168.137.0   255.255.255.0        On-link  192.168.137.1    281
          192.168.137.1   255.255.255.255        On-link  192.168.137.1    281
  192.168.137.255  255.255.255.255        On-link  192.168.137.1    281
          224.0.0.0      240.0.0.0        On-link      127.0.0.1    331
          224.0.0.0      240.0.0.0        On-link    192.168.1.82    296
          224.0.0.0      240.0.0.0        On-link  192.168.137.1    281
  255.255.255.255  255.255.255.255        On-link      127.0.0.1    331
  255.255.255.255  255.255.255.255        On-link    192.168.1.82    296
  255.255.255.255  255.255.255.255        On-link  192.168.137.1    281
=====
Persistent Routes:
  None
```

## 11) nbtstat:

- o Syntax: nbtstat -a [hostname]
- o Usage: Displays NetBIOS over TCP/IP statistics, including the NetBIOS name table of a remote computer.

```
C:\Windows\System32>nbtstat -n

Ethernet:
NodeIpAddress: [0.0.0.0] Scope Id: []
          No names in cache
```

```
Wi-Fi:
NodeIpAddress: [192.168.1.82] Scope Id: []

          NetBIOS Local Name Table
```

Name	Type	Status
LAPTOP-0JAVETO0<00>	UNIQUE	Registered
WORKGROUP      <00>	GROUP	Registered
LAPTOP-0JAVETO0<20>	UNIQUE	Registered

```
Local Area Connection* 3:
NodeIpAddress: [0.0.0.0] Scope Id: []

          No names in cache
```

```
Local Area Connection* 4:
NodeIpAddress: [192.168.137.1] Scope Id: []

          NetBIOS Local Name Table
```

Name	Type	Status
LAPTOP-0JAVETO0<00>	UNIQUE	Registered
WORKGROUP      <00>	GROUP	Registered
LAPTOP-0JAVETO0<20>	UNIQUE	Registered

```
C:\Windows\System32>
```

## 12) whois

- Syntax: whois [domain name]
- Usage: Retrieves registration information about a domain name from the WHOIS database.

// Some outputs were not displayed due to recognition error.

### PROCEDURE:

- Open the Command Line Interface (CLI) on the computer.
- Execute the ipconfig or ifconfig command to view the current network configuration.
- Run the remaining network commands as listed above.
- Observe and record the outputs generated by each command.

### OUTPUT:

The outputs of all executed commands are attached separately along with their respective syntax and usage descriptions. Some commands did not display output due to installation or recognition issues.

### CONCLUSION:

This lab successfully introduced various network commands used for testing and troubleshooting network connectivity issues. By using these commands, important information about network configuration, connectivity status, routing paths, and DNS resolution was obtained. The practical use of commands such as ping, ipconfig, tracert, and netstat helped in understanding how network problems can be identified and analyzed. Overall, this lab enhanced practical knowledge of network troubleshooting techniques and highlighted the importance of command-line tools in maintaining reliable and efficient network communication.