

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:

- Syntax: ping [hostname or IP address]
- 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):

- Syntax: ipconfig or ifconfig
- 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. . . . . : 192.168.137.1
    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):

- Syntax: tracert [hostname or IP address] or traceroute [hostname or IP address]
- 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:

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

Trace complete.

```

4) netstat:

- Syntax: netstat -a or netstat -n
- 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-0JAVET00:0	LISTENING
TCP	0.0.0.0:445	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:2869	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:4343	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:4449	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:5040	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:5141	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:7250	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:7680	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:46760	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:49664	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:49665	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:49668	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:49669	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:49670	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:55808	LAPTOP-0JAVET00:0	LISTENING
TCP	0.0.0.0:58995	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:5141	LAPTOP-0JAVET00:54502	ESTABLISHED
TCP	127.0.0.1:9993	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:15152	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:19443	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:45112	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:46753	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:46933	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:46933	LAPTOP-0JAVET00:60788	ESTABLISHED
TCP	127.0.0.1:49676	LAPTOP-0JAVET00:49677	ESTABLISHED
TCP	127.0.0.1:49677	LAPTOP-0JAVET00:49676	ESTABLISHED
TCP	127.0.0.1:49686	LAPTOP-0JAVET00:49687	ESTABLISHED
TCP	127.0.0.1:49687	LAPTOP-0JAVET00:49686	ESTABLISHED
TCP	127.0.0.1:49690	LAPTOP-0JAVET00:49691	ESTABLISHED
TCP	127.0.0.1:49691	LAPTOP-0JAVET00:49690	ESTABLISHED
TCP	127.0.0.1:49692	LAPTOP-0JAVET00:49693	ESTABLISHED
TCP	127.0.0.1:49693	LAPTOP-0JAVET00:49692	ESTABLISHED
TCP	127.0.0.1:51779	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:51779	LAPTOP-0JAVET00:60789	ESTABLISHED
TCP	127.0.0.1:51780	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:51781	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:51782	LAPTOP-0JAVET00:0	LISTENING
TCP	127.0.0.1:53934	LAPTOP-0JAVET00:53935	ESTABLISHED
TCP	127.0.0.1:53935	LAPTOP-0JAVET00:53934	ESTABLISHED

5) nslookup:

- Syntax: nslookup [hostname]
- 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:

- Syntax: arp -a
- 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>

```

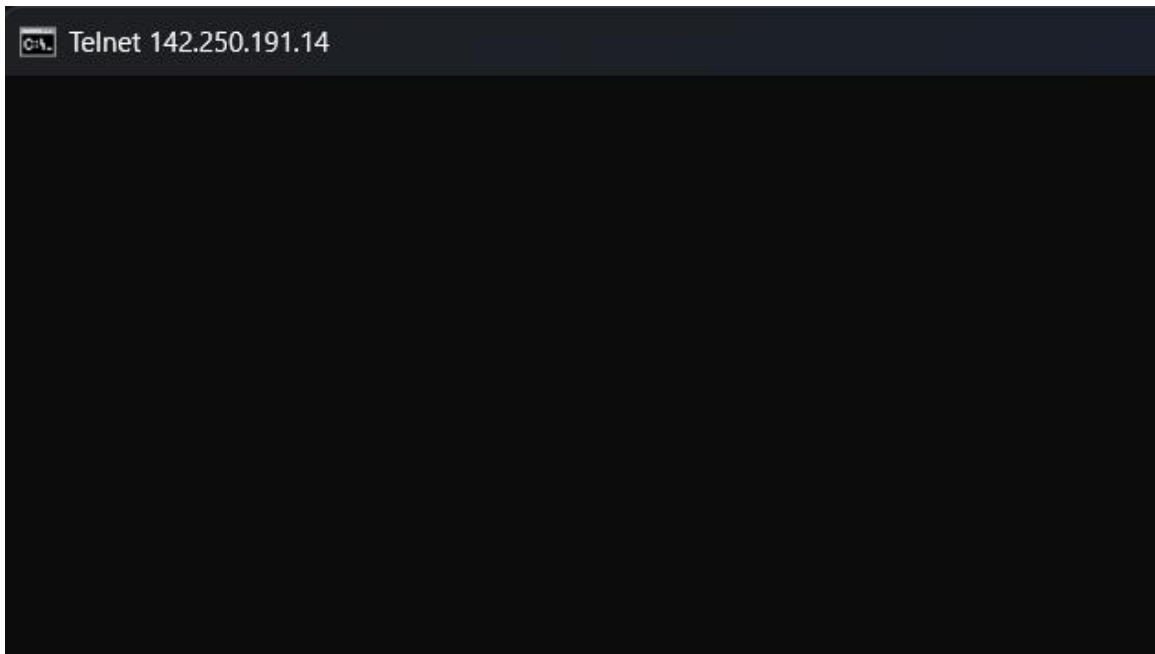
7) telnet:

- Syntax: telnet [hostname or IP address] [port]
- 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:

- Syntax: getmac
- 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\NPF{A1A5D5B7-A43C-47D2-8DAE-38E5053181AF}
74-D4-DD-36-82-63   Media disconnected
E6-60-17-04-8D-D7   \Device\NPF{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:

- Syntax: route print
- 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:

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

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

Ethernet:

Node IpAddress: [0.0.0.0] Scope Id: []

No names in cache

Wi-Fi:

Node IpAddress: [192.168.1.82] Scope Id: []

NetBIOS Local Name Table

Name	Type	Status
LAPTOP-0JAVET00<00>	UNIQUE	Registered
WORKGROUP <00>	GROUP	Registered
LAPTOP-0JAVET00<20>	UNIQUE	Registered

Local Area Connection* 3:

Node IpAddress: [0.0.0.0] Scope Id: []

No names in cache

Local Area Connection* 4:

Node IpAddress: [192.168.137.1] Scope Id: []

NetBIOS Local Name Table

Name	Type	Status
LAPTOP-0JAVET00<00>	UNIQUE	Registered
WORKGROUP <00>	GROUP	Registered
LAPTOP-0JAVET00<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.