Lab 2: Network Commands for Testing and Troubleshooting

Objective:

To familiarize with essential network commands used for testing and troubleshooting network connectivity issues.

Required Tools:

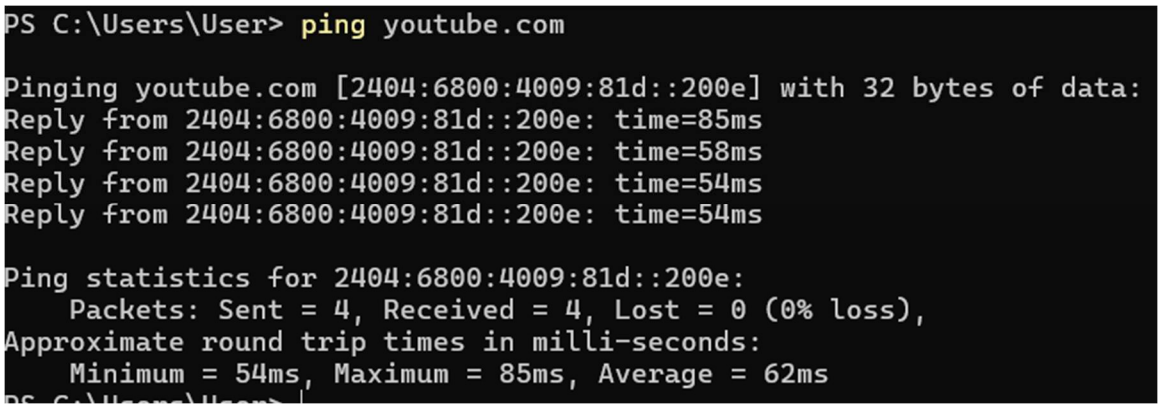
- A computer with command line interface (CLI) access
- Network connection (wired or wireless)

Network Commands:

Syntax and Usage of Common Network Commands:

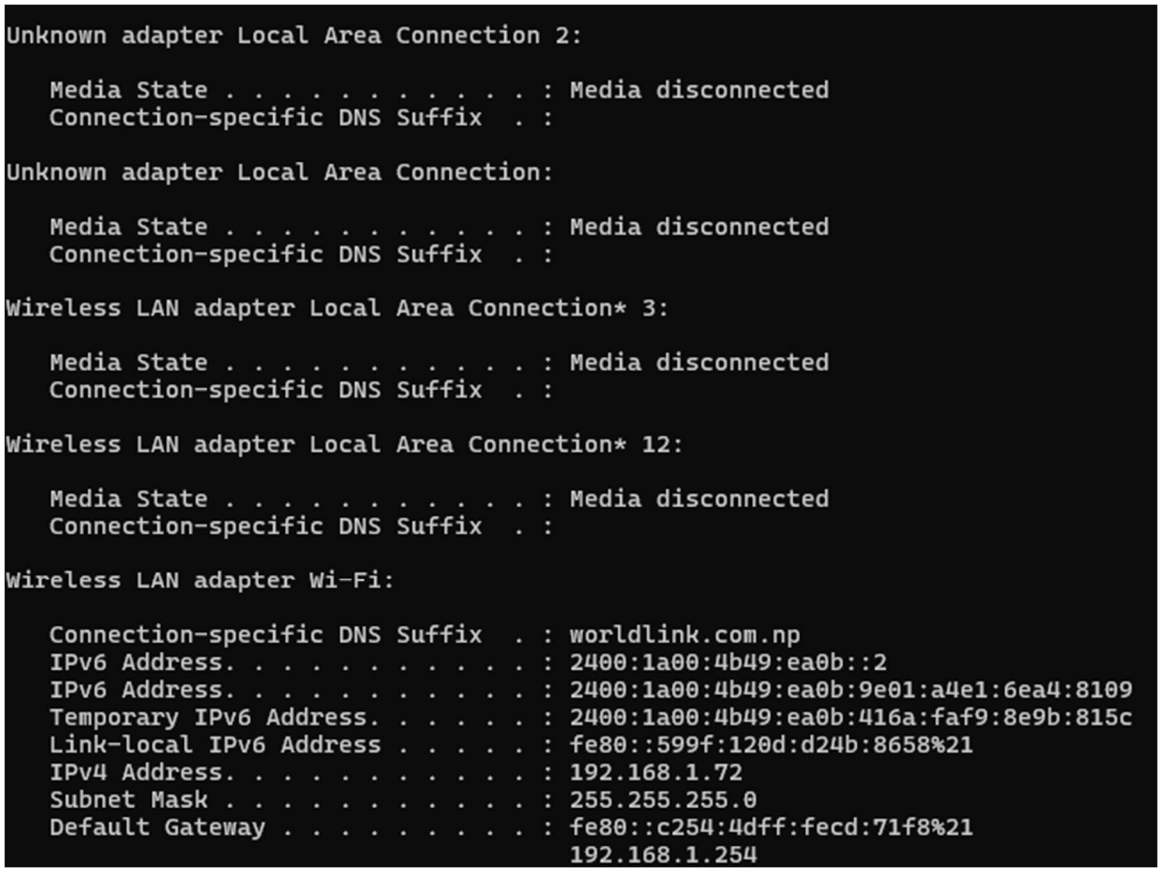
ping

- 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.



ipconfig (Windows) / ifconfig (Linux)

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



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.

```
PS C:\Users\User> tracert youtube.com

Tracing route to youtube.com [2404:6800:4009:80b::200e]
over a maximum of 30 hops:

  1     3 ms     2 ms     2 ms  2400-1a00-4b49.ip6.wlink.com.np [2400:1a00:4b49:ea0b:c254:4dff:fecd:71f8]
  2    13 ms   102 ms    38 ms  2400-1a00-4b04.ip6.wlink.com.np [2400:1a00:4b04::1]
  3     *        *        *     Request timed out.
  4     *        *        *     Request timed out.
  5     7 ms     8 ms     7 ms  2400:1a00:0:41::170
  6    55 ms     *        9 ms  2400:1a00:0:41::128
  7     8 ms    11 ms     9 ms  2400:1a00:dccc:1:72:9:128:67
  8     *        *        *     Request timed out.
  9    80 ms   101 ms    72 ms  2001:4860:1:1::126a
 10   102 ms    99 ms     *     2001:4860:0:1::2a9f
 11    78 ms   100 ms   102 ms  2001:4860:0:1::77b0
 12     *        *        *     Request timed out.
 13    98 ms   100 ms   101 ms  2001:4860::c:4004:53bf
 14   113 ms   100 ms    99 ms  2001:4860::9:4001:7734
 15   123 ms     *      151 ms  2001:4860:0:1::9de9
 16    64 ms   101 ms     *     2001:4860:0:1::269d
 17    98 ms   100 ms     *     pnbomb-ba-in-x0e.1e100.net [2404:6800:4009:80b::200e]
 18    86 ms    48 ms   101 ms  pnbomb-ba-in-x0e.1e100.net [2404:6800:4009:80b::200e]
```

netstat

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

```
PS C:\Users\User> netstat -a

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            LAPTOP-G1EA03BS:0      LISTENING
  TCP    0.0.0.0:445            LAPTOP-G1EA03BS:0      LISTENING
  TCP    0.0.0.0:5040           LAPTOP-G1EA03BS:0      LISTENING
  TCP    0.0.0.0:49664          LAPTOP-G1EA03BS:0      LISTENING
  TCP    0.0.0.0:49665          LAPTOP-G1EA03BS:0      LISTENING
  TCP    0.0.0.0:49666          LAPTOP-G1EA03BS:0      LISTENING
  TCP    0.0.0.0:49667          LAPTOP-G1EA03BS:0      LISTENING
  TCP    0.0.0.0:49668          LAPTOP-G1EA03BS:0      LISTENING
  TCP    0.0.0.0:49669          LAPTOP-G1EA03BS:0      LISTENING
  TCP    127.0.0.1:27017        LAPTOP-G1EA03BS:0      LISTENING
  TCP    127.0.0.1:45112        LAPTOP-G1EA03BS:0      LISTENING
  TCP    127.0.0.1:52791        LAPTOP-G1EA03BS:52792  ESTABLISHED
  TCP    127.0.0.1:52792        LAPTOP-G1EA03BS:52791  ESTABLISHED
  TCP    127.0.0.1:52793        LAPTOP-G1EA03BS:52794  ESTABLISHED
  TCP    127.0.0.1:52794        LAPTOP-G1EA03BS:52793  ESTABLISHED
  TCP    127.0.0.1:65236        LAPTOP-G1EA03BS:65237  ESTABLISHED
  TCP    127.0.0.1:65237        LAPTOP-G1EA03BS:65236  ESTABLISHED
  TCP    127.0.0.1:65238        LAPTOP-G1EA03BS:65239  ESTABLISHED
  TCP    127.0.0.1:65239        LAPTOP-G1EA03BS:65238  ESTABLISHED
  TCP    192.168.1.72:139       LAPTOP-G1EA03BS:0      LISTENING
  TCP    192.168.1.72:62578     server-108-158-61-114:https  ESTABLISHED
  TCP    192.168.1.72:62697     lb-140-82-114-25-iad:https  ESTABLISHED
  TCP    192.168.1.72:64806     20.44.229.112:https    TIME_WAIT
  TCP    192.168.1.72:64813     20.42.65.90:https      ESTABLISHED
  TCP    [::]:135               LAPTOP-G1EA03BS:0      LISTENING
  TCP    [::]:445               LAPTOP-G1EA03BS:0      LISTENING
  TCP    [::]:49664             LAPTOP-G1EA03BS:0      LISTENING
  TCP    [::]:49665             LAPTOP-G1EA03BS:0      LISTENING
  TCP    [::]:49666             LAPTOP-G1EA03BS:0      LISTENING
  TCP    [::]:49667             LAPTOP-G1EA03BS:0      LISTENING
  TCP    [::]:49668             LAPTOP-G1EA03BS:0      LISTENING
  TCP    [::]:49669             LAPTOP-G1EA03BS:0      LISTENING
  TCP    [::1]:42050            LAPTOP-G1EA03BS:0      LISTENING
  TCP    [2400:1a00:4b49:ea0b:416a:faf9:8e9b:815c]:55781  del12s03-in-x0a:https  TIME_WAIT
  TCP    [2400:1a00:4b49:ea0b:416a:faf9:8e9b:815c]:56934  [2603:1040:a06:6::2]:https  ESTABLISHED
  TCP    [2400:1a00:4b49:ea0b:416a:faf9:8e9b:815c]:58415  [2a06:98c1:3107::6812:2715]:https  ESTABLISHED
  TCP    [2400:1a00:4b49:ea0b:416a:faf9:8e9b:815c]:64808  [2600:1f18:2092:1a03:5bde:30e2:732d:5e5b]:https  ESTABLISHED
  UDP    0.0.0.0:500            *:*
```

```
PS C:\Users\User> netstat -n

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:52791        127.0.0.1:52792        ESTABLISHED
  TCP    127.0.0.1:52792        127.0.0.1:52791        ESTABLISHED
  TCP    127.0.0.1:52793        127.0.0.1:52794        ESTABLISHED
  TCP    127.0.0.1:52794        127.0.0.1:52793        ESTABLISHED
  TCP    127.0.0.1:65236        127.0.0.1:65237        ESTABLISHED
  TCP    127.0.0.1:65237        127.0.0.1:65236        ESTABLISHED
  TCP    127.0.0.1:65238        127.0.0.1:65239        ESTABLISHED
  TCP    127.0.0.1:65239        127.0.0.1:65238        ESTABLISHED
  TCP    192.168.1.72:62578     108.158.61.114:443     ESTABLISHED
  TCP    192.168.1.72:62697     140.82.114.25:443      ESTABLISHED
  TCP    192.168.1.72:64813     20.42.65.90:443        TIME_WAIT
  TCP    [2400:1a00:4b49:ea0b:416a:faf9:8e9b:815c]:56934  [2603:1040:a06:6::2]:443  ESTABLISHED
  TCP    [2400:1a00:4b49:ea0b:416a:faf9:8e9b:815c]:58415  [2a06:98c1:3107::6812:2715]:443  ESTABLISHED
  TCP    [2400:1a00:4b49:ea0b:416a:faf9:8e9b:815c]:64808  [2600:1f18:2092:1a03:5bde:30e2:732d:5e5b]:443  ESTABLISHED
```

nslookup

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

```
PS C:\Users\User> nslookup www.github.com
Server:  vip6-safenet-kmd01.wlink.com.np
Address:  2400:1a00:0:32::165

Non-authoritative answer:
Name:    github.com
Address:  20.205.243.166
Aliases:  www.github.com
```

arp

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

```
PS C:\Users\User> arp -a

Interface: 192.168.1.72 --- 0x15
  Internet Address      Physical Address      Type
  192.168.1.254         c0-54-4d-cd-71-f8     dynamic
  192.168.1.255         ff-ff-ff-ff-ff-ff     static
  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
```

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:\Users\Admin>telnet www.youtube.com 80
'telnet' is not recognized as an internal or external command,
operable program or batch file.
```

//No output due to installation issue.

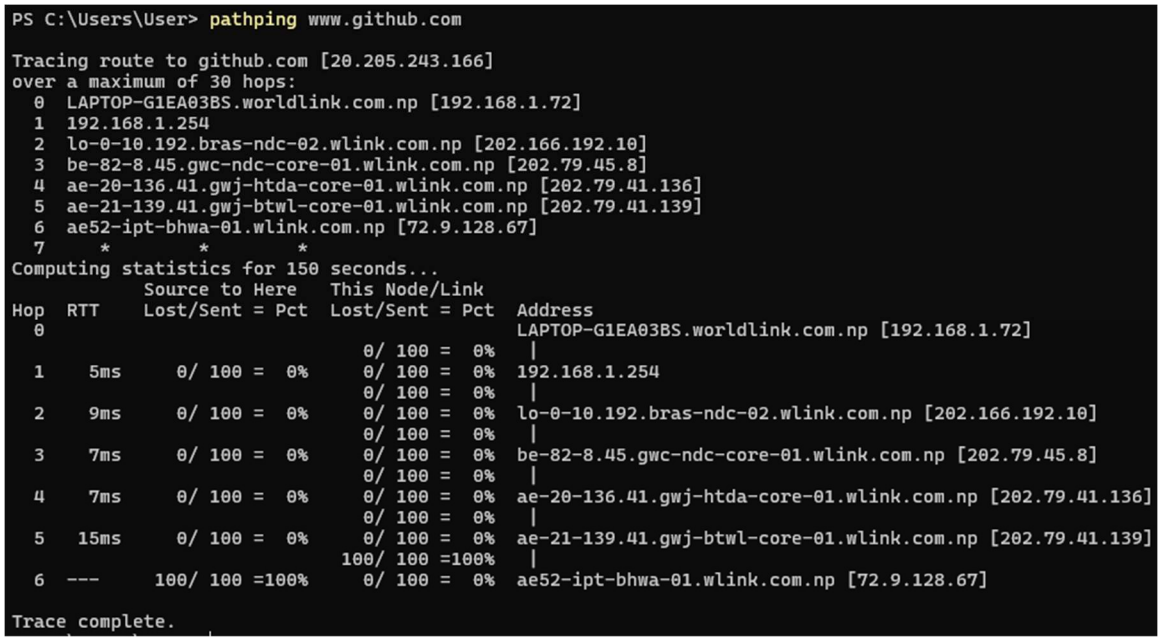
netsh wlan (Windows)

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

```
PS C:\Users\User> netsh wlan

The following commands are available:

Commands in this context:
?               - Displays a list of commands.
add             - Adds a configuration entry to a table.
connect         - Connects to a wireless network.
delete          - Deletes a configuration entry from a table.
disconnect      - Disconnects from a wireless network.
dump            - Displays a configuration script.
export          - Saves WLAN profiles to XML files.
help            - Displays a list of commands.
IHV             - Commands for IHV logging.
refresh         - Refresh hosted network settings.
reportissues    - Generate WLAN smart trace report.
set             - Sets configuration information.
show            - Displays information.
start           - Start hosted network.
stop            - Stop hosted network.

To view help for a command, type the command, followed by a space, and then
 type ?.
```

pathping

- Syntax: pathping [hostname or IP address]
- Usage: Combines the functionality of ping and tracert to provide information about network latency and packet loss at each hop.



route print

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

```
PS C:\Users\User> route print
===========================================================================
Interface List
  2...........................Windscribe Windtun420
 10...00 ff 3b ba 0c 9d ......Windscribe VPN
  6...02 45 e2 72 2f 65 ......Microsoft Wi-Fi Direct Virtual Adapter #3
  9...06 45 e2 72 2f 65 ......Microsoft Wi-Fi Direct Virtual Adapter #4
 21...00 45 e2 72 2f 65 ......Realtek 8822CE Wireless LAN 802.11ac PCI-E NIC
  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     192.168.1.72     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      192.168.1.72    296
     192.168.1.72  255.255.255.255         On-link      192.168.1.72    296
    192.168.1.255  255.255.255.255         On-link      192.168.1.72    296
        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      192.168.1.72    296
  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      192.168.1.72    296
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
 21   4136 ::/0                    fe80::c254:4dff:fecd:71f8
  1    331 ::1/128                 On-link
 21   4136 2400:1a00:4b49:ea0b::/64 On-link
 21     56 2400:1a00:4b49:ea0b::/64 fe80::c254:4dff:fecd:71f8
 21    296 2400:1a00:4b49:ea0b::2/128
                                   On-link
 21    296 2400:1a00:4b49:ea0b:416a:faf9:8e9b:815c/128
                                   On-link
 21    296 2400:1a00:4b49:ea0b:9e01:a4e1:6ea4:8109/128
                                   On-link
 21    296 fe80::/64               On-link
 21    296 fe80::599f:120d:d24b:8658/128
                                   On-link
  1    331 ff00::/8                On-link
 21    296 ff00::/8                On-link
===========================================================================
Persistent Routes:
  None
```

getmac

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

```
PS C:\Users\User> getmac

Physical Address    Transport Name
=================== ============================================================
00-FF-3B-BA-0C-9D   Media disconnected
N/A                 Media disconnected
00-45-E2-72-2F-65   \Device\Tcpip_{D6CBA662-9534-4F08-9B54-A2A59671CEAF}
```

nbtstat

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

```
PS C:\Users\User> nbtstat -a www.youtube.com

Local Area Connection 2:
Node IpAddress: [0.0.0.0] Scope Id: []

    Host not found.

Local Area Connection:
Node IpAddress: [0.0.0.0] Scope Id: []

    Host not found.

Wi-Fi:
Node IpAddress: [192.168.1.72] Scope Id: []

    Host not found.

Local Area Connection* 3:
Node IpAddress: [0.0.0.0] Scope Id: []

    Host not found.

Local Area Connection* 12:
Node IpAddress: [0.0.0.0] Scope Id: []

    Host not found.
```

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

1. Open the command line interface (CLI) on your computer.
2. Use the ipconfig or ifconfig command to check your current network configuration.
3. Usage of the commands are shown in the output files.

Output

All the outputs are attached with the syntax and usage of respective commands.

Conclusion

This lab provided hands-on experience with various network commands essential for diagnosing and troubleshooting network issues. We learned how to use these commands so we can use it in real practice easily.