

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.

```
C:\Users\Admin>ping youtube.com

Pinging youtube.com [74.125.200.136] with 32 bytes of data:
Reply from 74.125.200.136: bytes=32 time=93ms TTL=105
Reply from 74.125.200.136: bytes=32 time=92ms TTL=105
Reply from 74.125.200.136: bytes=32 time=93ms TTL=105
Reply from 74.125.200.136: bytes=32 time=93ms TTL=105

Ping statistics for 74.125.200.136:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 92ms, Maximum = 93ms, Average = 92ms
```

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:\Users\Admin>ipconfig

Windows IP Configuration

Unknown adapter Local Area Connection:
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* 12:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . .

Wireless LAN adapter Wi-Fi:
Connection-specific DNS Suffix . . .
Link-local IPv6 Address . . . . . : fe80::7439:418f:de16:2253%11
IPv4 Address. . . . . : 192.168.100.133
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::1%11
                                         192.168.100.1

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

Ethernet adapter vEthernet (Default Switch):
Connection-specific DNS Suffix . . .
Link-local IPv6 Address . . . . . : fe80::e486:7deb:6cb3:7a43%26
IPv4 Address. . . . . : 172.30.176.1
Subnet Mask . . . . . : 255.255.240.0
Default Gateway . . . . . :
```

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:\Users\Admin>tracert youtube.com

Tracing route to youtube.com [74.125.200.136]
over a maximum of 30 hops:

 1   2 ms    219 ms      6 ms  192.168.100.1
 2   16 ms     10 ms     11 ms  100.80.0.1
 3   12 ms     10 ms     10 ms  100.99.99.11
 4   10 ms     10 ms     10 ms  103.175.92.9
 5   14 ms     13 ms     14 ms  103.175.92.31
 6   *         *         * Request timed out.
 7   28 ms     27 ms     28 ms  142.250.174.2
 8   23 ms     23 ms     22 ms  142.250.208.225
 9   26 ms     41 ms     27 ms  192.178.82.238
10   35 ms     33 ms     37 ms  192.178.252.111
11   69 ms     69 ms     76 ms  142.251.227.238
12   95 ms     92 ms     99 ms  209.85.247.227
13   95 ms     97 ms     98 ms  142.251.252.39
14   94 ms     96 ms     99 ms  216.239.35.145
15   *         *         * Request timed out.
16   *         *         * Request timed out.
17   *         *         * Request timed out.
18   *         *         * Request timed out.
19   *         *         * Request timed out.
20   *         *         * Request timed out.
21   *         *         * Request timed out.
22   *         *         * Request timed out.
23   *         *         * Request timed out.
24  100 ms    100 ms    100 ms  sa-in-f136.1e100.net [74.125.200.136]

Trace complete.
```

netstat

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

```
C:\Users\Admin>netstat -a
```

Active Connections

Proto	Local Address	Foreign Address	State
TCP	0.0.0.0:135	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:445	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:2179	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:2869	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:3306	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:5040	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:33060	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:47546	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:49664	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:49665	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:49666	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:49667	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:49668	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:49672	Siddharth-Acharya:0	LISTENING
TCP	0.0.0.0:49673	Siddharth-Acharya:0	LISTENING
TCP	127.0.0.1:3000	Siddharth-Acharya:0	LISTENING
TCP	127.0.0.1:3001	Siddharth-Acharya:0	LISTENING
TCP	127.0.0.1:3001	Siddharth-Acharya:50668	ESTABLISHED
TCP	127.0.0.1:3001	Siddharth-Acharya:51905	ESTABLISHED
TCP	127.0.0.1:3001	Siddharth-Acharya:51906	ESTABLISHED
TCP	127.0.0.1:13367	Siddharth-Acharya:0	LISTENING
TCP	127.0.0.1:15292	Siddharth-Acharya:0	LISTENING
TCP	127.0.0.1:15393	Siddharth-Acharya:0	LISTENING

```
C:\Users\Admin>netstat -n
```

Active Connections

Proto	Local Address	Foreign Address	State
TCP	127.0.0.1:3001	127.0.0.1:50668	ESTABLISHED
TCP	127.0.0.1:3001	127.0.0.1:51905	ESTABLISHED
TCP	127.0.0.1:3001	127.0.0.1:51906	ESTABLISHED
TCP	127.0.0.1:49670	127.0.0.1:49671	ESTABLISHED
TCP	127.0.0.1:49671	127.0.0.1:49670	ESTABLISHED
TCP	127.0.0.1:50668	127.0.0.1:3001	ESTABLISHED
TCP	127.0.0.1:51905	127.0.0.1:3001	ESTABLISHED
TCP	127.0.0.1:51906	127.0.0.1:3001	ESTABLISHED
TCP	127.0.0.1:56414	127.0.0.1:58405	ESTABLISHED
TCP	127.0.0.1:58405	127.0.0.1:56414	ESTABLISHED
TCP	127.0.0.1:62931	127.0.0.1:62932	ESTABLISHED
TCP	127.0.0.1:62932	127.0.0.1:62931	ESTABLISHED
TCP	127.0.0.1:62933	127.0.0.1:62934	ESTABLISHED
TCP	127.0.0.1:62934	127.0.0.1:62933	ESTABLISHED
TCP	127.0.0.1:62953	127.0.0.1:62954	ESTABLISHED
TCP	127.0.0.1:62954	127.0.0.1:62953	ESTABLISHED
TCP	127.0.0.1:62955	127.0.0.1:62956	ESTABLISHED
TCP	127.0.0.1:62956	127.0.0.1:62955	ESTABLISHED
TCP	192.168.100.133:49442	4.213.25.242:443	ESTABLISHED
TCP	192.168.100.133:51427	163.70.145.63:443	ESTABLISHED
TCP	192.168.100.133:51735	163.70.145.13:443	ESTABLISHED
TCP	192.168.100.133:51761	18.97.36.13:443	ESTABLISHED
TCP	192.168.100.133:51948	8.8.8.8:53	TIME_WAIT
TCP	192.168.100.133:51949	8.8.8.8:53	TIME_WAIT
TCP	192.168.100.133:51951	8.8.8.8:53	TIME_WAIT
TCP	192.168.100.133:51952	8.8.8.8:53	TIME_WAIT
TCP	192.168.100.133:51953	8.8.8.8:53	TIME_WAIT
TCP	192.168.100.133:51954	8.8.8.8:53	TIME_WAIT
TCP	192.168.100.133:51955	34.84.0.87:443	ESTABLISHED
TCP	192.168.100.133:51959	8.8.8.8:53	TIME_WAIT
TCP	192.168.100.133:51960	8.8.8.8:53	TIME_WAIT
TCP	192.168.100.133:52533	43.228.194.51:443	ESTABLISHED
TCP	192.168.100.133:52745	172.64.148.235:443	ESTABLISHED
TCP	192.168.100.133:53527	163.70.145.57:443	ESTABLISHED
TCP	192.168.100.133:54037	18.97.36.5:443	ESTABLISHED
TCP	192.168.100.133:54284	163.70.145.13:443	ESTABLISHED
TCP	192.168.100.133:54693	54.80.219.230:443	ESTABLISHED
TCP	192.168.100.133:55773	20.189.173.23:443	ESTABLISHED
TCP	192.168.100.133:55775	74.125.24.188:5228	ESTABLISHED
TCP	192.168.100.133:56052	18.97.36.13:443	ESTABLISHED
TCP	192.168.100.133:56351	57.144.146.192:443	ESTABLISHED
TCP	192.168.100.133:56411	8.8.8.8:53	TIME_WAIT

nslookup

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

```
C:\Users\Admin>nslookup www.youtube.com
Server: dns.google
Address: 8.8.8.8

Non-authoritative answer:
Name: youtube-ui.l.google.com
Addresses: 2404:6800:4003:c05::88
           2404:6800:4003:c05::be
           2404:6800:4003:c05::5d
           2404:6800:4003:c22::be
           172.217.194.91
           172.253.118.136
           74.125.24.93
           142.251.10.91
           172.253.118.93
           172.253.134.190
           74.125.24.91
           172.217.194.93
           172.217.194.136
           142.251.10.190
           142.251.10.93
           172.253.118.190
           74.125.24.136
           172.217.194.190
           74.125.24.190
           172.253.118.91
Aliases: www.youtube.com
```

`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:\Users\Admin>arp -a

Interface: 192.168.100.133 --- 0xb
  Internet Address      Physical Address      Type
  192.168.100.1          34-6a-c2-75-d0-69    dynamic
  192.168.100.255        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: 172.30.176.1 --- 0x1a
  Internet Address      Physical Address      Type
  172.30.191.255         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
  239.192.152.143        01-00-5e-40-98-8f    static
  239.255.255.250        01-00-5e-7f-ff-fa    static
  255.255.255.255        ff-ff-ff-ff-ff-ff    static
```

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:\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.

```
C:\Users\Admin>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.

```
C:\Users\Admin>pathping www.youtube.com

Tracing route to youtube-ui.l.google.com [172.253.118.136]
over a maximum of 30 hops:
  0  Siddharth-Acharya [192.168.100.133]
  1  192.168.100.1
  2  100.80.0.1
  3  100.99.99.11
  4  103.175.92.9
  5  103.175.92.31
  6  103.225.212.15
  7  142.250.174.2
  8  192.178.83.35
  9  216.239.54.92
 10  142.251.239.233
 11  142.251.227.234
 12  209.85.242.157
 13  209.85.255.128
 14  72.14.232.105
 15  *           *
Computing statistics for 350 seconds...
      Source to Here   This Node/Link
Hop  RTT     Lost/Sent = Pct  Lost/Sent = Pct  Address
  0          0/ 100 =  0%          0/ 100 =  0%  Siddharth-Acharya [192.168.100.133]
  1  13ms    0/ 100 =  0%          0/ 100 =  0%  | 192.168.100.1
  2  17ms    0/ 100 =  0%          0/ 100 =  0%  | 100.80.0.1
  3  ---    100/ 100 =100%          100/ 100 =100% 100.99.99.11
  4  20ms    0/ 100 =  0%          0/ 100 =  0%  | 103.175.92.9
  5  20ms    0/ 100 =  0%          0/ 100 =  0%  | 103.175.92.31
  6  38ms    0/ 100 =  0%          0/ 100 =  0%  | 103.225.212.15
  7  32ms    0/ 100 =  0%          0/ 100 =  0%  | 142.250.174.2
  8  31ms    0/ 100 =  0%          0/ 100 =  0%  | 192.178.83.35
  9  32ms    0/ 100 =  0%          0/ 100 =  0%  | 216.239.54.92
 10  ---   100/ 100 =100%          100/ 100 =100% 142.251.239.233
  11  74ms    0/ 100 =  0%          0/ 100 =  0%  | 142.251.227.234
  12  ---   100/ 100 =100%          100/ 100 =100% 209.85.242.157
  13  103ms   0/ 100 =  0%          0/ 100 =  0%  | 209.85.255.128
  14  101ms   0/ 100 =  0%          0/ 100 =  0%  72.14.232.105

Trace complete.
```

route print

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

```
C:\Users\Admin>route print
=====
Interface List
 4...00 ff 21 f8 90 63 ....TAP-Windows Adapter V9
 13...e0 d0 45 fc d8 c6 ....Microsoft Wi-Fi Direct Virtual Adapter #3
 23...e2 d0 45 fc d8 c5 ....Microsoft Wi-Fi Direct Virtual Adapter #4
 11...e0 d0 45 fc d8 c5 ....Intel(R) Wi-Fi 6E AX210 160MHz
 1........................Software Loopback Interface 1
 26...00 15 5d 64 85 00 ....Hyper-V Virtual Ethernet Adapter
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask        Gateway       Interface Metric
          0.0.0.0        0.0.0.0    192.168.100.1  192.168.100.133    55
         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
    172.30.176.0   255.255.240.0   On-link      172.30.176.1    5256
    172.30.176.1   255.255.255.255   On-link      172.30.176.1    5256
 172.30.191.255   255.255.255.255   On-link      172.30.176.1    5256
    192.168.100.0   255.255.255.0   On-link      192.168.100.133    311
 192.168.100.133   255.255.255.255   On-link      192.168.100.133    311
 192.168.100.255   255.255.255.255   On-link      192.168.100.133    311
    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      172.30.176.1    5256
    224.0.0.0        240.0.0.0   On-link      192.168.100.133    311
 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      172.30.176.1    5256
 255.255.255.255   255.255.255.255   On-link      192.168.100.133    311
=====
Persistent Routes:
  None

IPv6 Route Table
=====
Active Routes:
If Metric Network Destination      Gateway
 11     311 ::/0                fe80:::1
  1     331 ::1/128             On-link
 26     5256 fe80::/64           On-link
 11     311 fe80::/64           On-link
 11     311 fe80::7439:418f:de16:2253/128
                                         On-link
 26     5256 fe80::e486:7deb:6cb3:7a43/128
                                         On-link
  1     331 ff00::/8             On-link
 26     5256 ff00::/8             On-link
 11     311 ff00::/8             On-link
=====
Persistent Routes:
  None
```

getmac

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

```
C:\Users\Admin>getmac

Physical Address      Transport Name
=====
00-FF-21-F8-90-63    Media disconnected
E0-D0-45-FC-D8-C5   \Device\Tcpip_{6D85EB9B-9CF6-4220-9D52-A5CE24852D00}
```

nbtstat

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

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. Mastery of these commands is crucial for network administrators and IT professionals to maintain network health and performance.