Date: 04/06/2025

Lab Practical #01:

Study of basic networking commands and IP configuration.

Practical Assignment #01:

1. Perform and explain various networking commands listed below:
    - i.   ipconfig
    - ii.   ping
    - iii. getmac
    - iv.   systeminfo
    - v.   traceroute / tracert
    - vi.   netstat
    - vii. nslookup
    - viii. hostname
    - ix.   pathping
    - x.   arp

1. ipconfig

Description:

> **Displays all current TCP/IP network configuration values and refreshes DHCP and DNS settings.**

No.	Option	Description
1	/all	Displays full configuration information.
2	/release	Releases the IP address for the specified adapter.
3	/renew	Renews the IP address for the specified adapter.
4	/flushdns	Clears the DNS Resolver cache.
5	/displaydns	Displays the contents of the DNS Resolver cache.

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```
C:\Users\WELCOME>ipconfig /all

Windows IP Configuration

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

Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
   Physical Address. . . . . . . . . : 40-EC-99-08-CF-00
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
   Physical Address. . . . . . . . . : 42-EC-99-08-CF-FF
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Intel(R) Wireless-AC 9560
   Physical Address. . . . . . . . . : 40-EC-99-08-CF-FF
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::a9e0:8d85:6a75:fb19%11(Preferred)
   IPv4 Address. . . . . . . . . . . : 10.120.16.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.0.0
   Lease Obtained. . . . . . . . . . : 04 June 2025 02:21:48 PM
   Lease Expires . . . . . . . . . . : 05 June 2025 02:21:47 PM
   Default Gateway . . . . . . . . . : 10.120.1.1
   DHCP Server . . . . . . . . . . . : 10.120.1.1
   DHCPv6 IAID . . . . . . . . . . . : 104918169
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-27-F6-19-7E-40-EC-99-08-CF-FF
   DNS Servers . . . . . . . . . . . : 10.120.1.1
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

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```
C:\Users\WELCOME>ipconfig /release

Windows IP Configuration

No operation can be performed on Local Area Connection* 1 while it has its media disconnected.

Wireless LAN adapter Local Area Connection* 1:

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

Wireless LAN adapter Local Area Connection* 2:

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

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::a9e0:8d85:6a75:fb19%11
   Default Gateway . . . . . . . . . :
```

```
C:\Users\WELCOME>ipconfig /renew

Windows IP Configuration

No operation can be performed on Local Area Connection* 1 while it has its media disconnected.
No operation can be performed on Local Area Connection* 2 while it has its media disconnected.

Wireless LAN adapter Local Area Connection* 1:

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

Wireless LAN adapter Local Area Connection* 2:

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

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::a9e0:8d85:6a75:fb19%11
   IPv4 Address. . . . . . . . . . . : 10.120.16.1
   Subnet Mask . . . . . . . . . . . : 255.255.0.0
   Default Gateway . . . . . . . . . : 10.120.1.1
```

```
C:\Users\WELCOME>ipconfig /flushdns

Windows IP Configuration

Successfully flushed the DNS Resolver Cache.
```

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```
C:\Users\WELCOME>ipconfig /displaydns

Windows IP Configuration
```

2. ping
Description:

Sends ICMP Echo Request messages to verify if a host is reachable over the network.

No.	Option	Description
1	-t	Pings the target until stopped manually.
2	-n count	Specifies the number of Echo Request messages to send.
3	-l size	Sends packets with a custom byte size.
4	-4	Forces using IPv4.
5	-a	Resolve addresses to hostnames.

Implementation:

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```
C:\Users\WELCOME>ping -t google.com

Pinging google.com [2404:6800:4009:823::200e] with 32 bytes of data:
Reply from 2404:6800:4009:823::200e: time=76ms
Reply from 2404:6800:4009:823::200e: time=87ms
Reply from 2404:6800:4009:823::200e: time=110ms
Reply from 2404:6800:4009:823::200e: time=93ms
Reply from 2404:6800:4009:823::200e: time=117ms
Reply from 2404:6800:4009:823::200e: time=108ms
Reply from 2404:6800:4009:823::200e: time=84ms
Reply from 2404:6800:4009:823::200e: time=105ms
Reply from 2404:6800:4009:823::200e: time=131ms
Reply from 2404:6800:4009:823::200e: time=106ms
Reply from 2404:6800:4009:823::200e: time=85ms
Reply from 2404:6800:4009:823::200e: time=106ms
Reply from 2404:6800:4009:823::200e: time=89ms
Reply from 2404:6800:4009:823::200e: time=109ms
Reply from 2404:6800:4009:823::200e: time=88ms
Reply from 2404:6800:4009:823::200e: time=77ms
Reply from 2404:6800:4009:823::200e: time=96ms
Reply from 2404:6800:4009:823::200e: time=82ms

Ping statistics for 2404:6800:4009:823::200e:
    Packets: Sent = 18, Received = 18, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 76ms, Maximum = 131ms, Average = 97ms
Control-C
^C
```

```
C:\Users\WELCOME>ping /n 4 google.com

Pinging google.com [142.250.70.110] with 32 bytes of data:
Reply from 142.250.70.110: bytes=32 time=23ms TTL=116
Reply from 142.250.70.110: bytes=32 time=25ms TTL=116
Reply from 142.250.70.110: bytes=32 time=22ms TTL=116
Reply from 142.250.70.110: bytes=32 time=22ms TTL=116

Ping statistics for 142.250.70.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 25ms, Average = 23ms
```

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```
C:\Users\WELCOME>ping /l 64 google.com

Pinging google.com [142.250.70.110] with 64 bytes of data:
Reply from 142.250.70.110: bytes=64 time=25ms TTL=116
Reply from 142.250.70.110: bytes=64 time=24ms TTL=116
Reply from 142.250.70.110: bytes=64 time=31ms TTL=116
Reply from 142.250.70.110: bytes=64 time=23ms TTL=116

Ping statistics for 142.250.70.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 23ms, Maximum = 31ms, Average = 25ms
```

```
C:\Users\WELCOME>ping -4 google.com

Pinging google.com [142.250.183.110] with 32 bytes of data:
Reply from 142.250.183.110: bytes=32 time=59ms TTL=112
Reply from 142.250.183.110: bytes=32 time=63ms TTL=112
Reply from 142.250.183.110: bytes=32 time=57ms TTL=112
Reply from 142.250.183.110: bytes=32 time=95ms TTL=112

Ping statistics for 142.250.183.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 57ms, Maximum = 95ms, Average = 68ms
```

```
C:\Users\WELCOME>ping /a google.com

Pinging google.com [142.250.70.110] with 32 bytes of data:
Reply from 142.250.70.110: bytes=32 time=15ms TTL=117
Reply from 142.250.70.110: bytes=32 time=17ms TTL=117
Reply from 142.250.70.110: bytes=32 time=16ms TTL=117
Reply from 142.250.70.110: bytes=32 time=15ms TTL=117

Ping statistics for 142.250.70.110:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 15ms, Maximum = 17ms, Average = 15ms
```

3. getmac
Description:
Displays the MAC address of the system's network interfaces.

No.	Option	Description

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1	/v	Shows verbose output with more details.
2	/fo table	Displays output in table format.
3	/fo list	Displays output in list format.
4	/fo csv	Displays output in CSV format.
5	/nh	Hides the column headers in the output.

Implementation:

```
C:\Users\WELCOME>getmac /v

Connection Name Network Adapter Physical Address    Transport Name
=============== =============== ================== ======================================================
Ethernet        Realtek PCIe Gb 04-BF-1B-5B-8B-24  Media disconnected
Wi-Fi 2         Intel(R) Wi-Fi  78-AF-08-18-AC-68  \Device\Tcpip_{7E118522-0AC2-4C9A-9566-F14BE7A7CB12}
```

```
C:\Users\WELCOME>getmac /fo table

Physical Address    Transport Name
================== =======================================================
04-BF-1B-5B-8B-24  Media disconnected
78-AF-08-18-AC-68  \Device\Tcpip_{7E118522-0AC2-4C9A-9566-F14BE7A7CB12}
```

```
C:\Users\WELCOME>getmac /fo list

Physical Address: 04-BF-1B-5B-8B-24
Transport Name:   Media disconnected

Physical Address: 78-AF-08-18-AC-68
Transport Name:   \Device\Tcpip_{7E118522-0AC2-4C9A-9566-F14BE7A7CB12}
```

```
C:\Users\WELCOME>getmac /fo csv
"Physical Address","Transport Name"
"04-BF-1B-5B-8B-24","Media disconnected"
"78-AF-08-18-AC-68","\Device\Tcpip_{7E118522-0AC2-4C9A-9566-F14BE7A7CB12}"
```

```
C:\Users\WELCOME>getmac /nh

04-BF-1B-5B-8B-24   Media disconnected
78-AF-08-18-AC-68   \Device\Tcpip_{7E118522-0AC2-4C9A-9566-F14BE7A7CB12}
```

4. systeminfo
Description:

Provides detailed configuration information about the computer and its OS.

No.	Option	Description
1	(no option)	Shows all system information.

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2		
3		
4		
5		

Implementation:

```
C:\Users\WELCOME>systeminfo

Host Name:                 MALAY
OS Name:                   Microsoft Windows 11 Home Single Language
OS Version:                10.0.26100 N/A Build 26100
OS Manufacturer:           Microsoft Corporation
OS Configuration:          Standalone Workstation
OS Build Type:             Multiprocessor Free
Registered Owner:          WELCOME
Registered Organization:   N/A
Product ID:                00327-35879-67504-AAOEM
Original Install Date:     31-12-2024, 09:40:10 PM
System Boot Time:          04-06-2025, 02:21:22 PM
System Manufacturer:       LENOVO
System Model:              81WB
System Type:               x64-based PC
Processor(s):              1 Processor(s) Installed.
                           [01]: Intel64 Family 6 Model 142 Stepping 12 GenuineIntel ~1508 Mhz
BIOS Version:              LENOVO DXCN45WW, 13-06-2023
Windows Directory:         C:\WINDOWS
System Directory:          C:\WINDOWS\system32
Boot Device:               \Device\HarddiskVolume5
System Locale:             en-us;English (United States)
Input Locale:              00004009
Time Zone:                 (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:     8,027 MB
Available Physical Memory: 2,057 MB
Virtual Memory: Max Size:  14,427 MB
Virtual Memory: Available: 5,997 MB
Virtual Memory: In Use:    8,430 MB
Page File Location(s):     C:\pagefile.sys
Domain:                    WORKGROUP
Logon Server:              \\MALAY
Hotfix(s):                 3 Hotfix(s) Installed.
                           [01]: KB5054979
                           [02]: KB5058411
                           [03]: KB5058523
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```
Network Card(s):              1 NIC(s) Installed.
                              [01]: Intel(R) Wireless-AC 9560
                                      Connection Name: Wi-Fi
                                      DHCP Enabled:    Yes
                                      DHCP Server:     10.120.1.1
                                      IP address(es)
                                      [01]: 10.120.16.1
                                      [02]: fe80::a9e0:8d85:6a75:fb19
Virtualization-based security: Status: Running
                              Required Security Properties:
                              Available Security Properties:
                                      Base Virtualization Support
                                      Secure Boot
                                      DMA Protection
                                      SMM Security Mitigations 1.0
                                      Mode Based Execution Control
                              Services Configured:
                                      Hypervisor enforced Code Integrity
                              Services Running:
                                      Hypervisor enforced Code Integrity
                              App Control for Business policy: Enforced
                              App Control for Business user mode policy: Off
                              Security Features Enabled:
Hyper-V Requirements:         A hypervisor has been detected. Features required for Hyper-V will not be displayed.
```

5. traceroute / tracert

Description:

Traces the path that packets take to reach a network host.

No.	Option	Description
1	-d	Prevents resolving IPs to hostnames.
2	-h <max>	Sets the maximum number of hops.
3	-w <timeout>	Sets the timeout in milliseconds.
4	-4	Forces using IPv4.
5	-6	Forces using IPv6.

Implementation:

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```
C:\Users\WELCOME>tracert /d google.com

Tracing route to google.com [142.251.221.238]
over a maximum of 30 hops:

  1     3 ms      1 ms      1 ms   10.120.1.1
  2     4 ms      2 ms      2 ms   117.250.171.130
  3     *         *         *      Request timed out.
  4     *         *         *      Request timed out.
  5    16 ms     15 ms     15 ms   142.250.161.230
  6    16 ms     14 ms     14 ms   192.178.111.159
  7    17 ms     14 ms     13 ms   108.170.234.157
  8    16 ms     29 ms     18 ms   142.251.221.238

Trace complete.
```

```
C:\Users\WELCOME>tracert /h 10 google.com

Tracing route to google.com [142.251.221.238]
over a maximum of 10 hops:

  1     3 ms     1 ms     1 ms   10.120.1.1
  2     6 ms     3 ms     3 ms   static.ill.117.250.171.130.bsnl.co.in [117.250.171.130]
  3     *        *        *      Request timed out.
  4     *        *        *      Request timed out.
  5    19 ms    15 ms    14 ms   142.250.161.230
  6    16 ms    15 ms    19 ms   192.178.111.159
  7    17 ms    35 ms    14 ms   108.170.234.157
  8    18 ms    15 ms    15 ms   pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Trace complete.
```

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```
C:\Users\WELCOME>tracert -w 2 google.com

Tracing route to google.com [142.251.221.238]
over a maximum of 30 hops:

  1     2 ms     1 ms     1 ms  10.120.1.1
  2     4 ms     3 ms     *     103.70.32.145
  3     6 ms     5 ms     3 ms  10.1.252.37
  4    19 ms    21 ms    18 ms  103.156.182.9
  5    19 ms    22 ms    18 ms  142.251.76.33
  6    19 ms    19 ms    19 ms  108.170.234.157
  7    21 ms    22 ms    20 ms  pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Trace complete.
```

```
C:\Users\WELCOME>tracert -4 google.com

Tracing route to google.com [142.251.221.238]
over a maximum of 30 hops:

  1     1 ms     1 ms     1 ms  10.120.1.1
  2    10 ms     3 ms     4 ms  103.70.32.145
  3     4 ms     4 ms     4 ms  10.1.252.37
  4    19 ms    19 ms    19 ms  103.156.182.9
  5    23 ms    19 ms    20 ms  142.251.76.33
  6    20 ms    25 ms    20 ms  108.170.234.157
  7    21 ms    21 ms    20 ms  pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Trace complete.
```

```
C:\Users\WELCOME>tracert -6 google.com

Tracing route to google.com [2404:6800:4009:823::200e]
over a maximum of 30 hops:

  1    16 ms     9 ms    15 ms  2409:40c1:3101:6088::41
  2    47 ms    25 ms    28 ms  2405:200:5210:5:3924:110:3:307
  3     *        *        *     Request timed out.
  4     *        *        *     Request timed out.
  5     *        *        *     Request timed out.
  6    71 ms    37 ms    28 ms  2405:200:801:2e00::84
  7     *        *        *     Request timed out.
  8     *        *        *     Request timed out.
  9   122 ms    67 ms    68 ms  2405:200:802:760::8
 10   115 ms    94 ms    78 ms  2405:200:802:760::8
 11     *        *        *     Request timed out.
 12   104 ms    73 ms    77 ms  2404:6800:8281:240::1
 13   131 ms    71 ms    77 ms  2404:6800:8281:240::1
 14     *        *        *     Request timed out.
 15     *      116 ms     *     2001:4860:0:1::7976
 16    79 ms    78 ms    78 ms  2001:4860:0:1::8767
 17   108 ms    72 ms    78 ms  2001:4860:0:1::f69
 18   102 ms    78 ms    85 ms  bom12s13-in-x0e.1e100.net [2404:6800:4009:823::200e]

Trace complete.
```

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6. netstat

Description:

Displays network connections, routing tables, interface stats, etc.

No.	Option	Description
1	-a	Displays all connections and listening ports.
2	-n	Displays addresses and port numbers numerically.
3	-o	Displays owning process ID associated with each connection.
4	-e	Displays Ethernet statistics.
5	-s	Displays per-protocol statistics.

Implementation:

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

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            Malay:0                LISTENING
  TCP    0.0.0.0:445            Malay:0                LISTENING
  TCP    0.0.0.0:3306           Malay:0                LISTENING
  TCP    0.0.0.0:5040           Malay:0                LISTENING
  TCP    0.0.0.0:33060          Malay:0                LISTENING
  TCP    0.0.0.0:49664          Malay:0                LISTENING
  TCP    0.0.0.0:49665          Malay:0                LISTENING
  TCP    0.0.0.0:49666          Malay:0                LISTENING
  TCP    0.0.0.0:49667          Malay:0                LISTENING
  TCP    0.0.0.0:49668          Malay:0                LISTENING
  TCP    0.0.0.0:49683          Malay:0                LISTENING
  TCP    10.120.16.93:139       Malay:0                LISTENING
  TCP    10.120.16.93:49686     4.213.25.241:https     ESTABLISHED
  TCP    10.120.16.93:49767     4.213.25.241:https     ESTABLISHED
  TCP    10.120.16.93:49937     13.107.253.48:https    CLOSE_WAIT
  TCP    10.120.16.93:50202     whatsapp-chatd-edge-shv-01-bom2:5222  ESTABLISHED
  TCP    10.120.16.93:50582     20.42.65.88:https      TIME_WAIT
  TCP    10.120.16.93:50596     pnbomb-ba-in-f14:https  TIME_WAIT
  TCP    10.120.16.93:50599     dns:https              TIME_WAIT
  TCP    10.120.16.93:50602     20.189.173.2:https     ESTABLISHED
  TCP    10.120.16.93:50603     dns:https              TIME_WAIT
  TCP    10.120.16.93:50605     server-13-227-249-22:https  TIME_WAIT
  TCP    10.120.16.93:50608     20.189.173.28:https    ESTABLISHED
  TCP    10.120.16.93:50611     52.123.128.14:https    ESTABLISHED
  TCP    10.120.16.93:50612     pnbomb-ba-in-f14:https  TIME_WAIT
  TCP    10.120.16.93:50613     pnbomb-ba-in-f14:https  TIME_WAIT
  TCP    10.120.16.93:50614     ip-66-117-22-113:https  ESTABLISHED
  TCP    127.0.0.1:5939         Malay:0                LISTENING
  TCP    127.0.0.1:19293        Malay:0                LISTENING
  TCP    127.0.0.1:27017        Malay:0                LISTENING
  TCP    127.0.0.1:49670        Malay:49671            ESTABLISHED
  TCP    127.0.0.1:49671        Malay:49670            ESTABLISHED
  TCP    127.0.0.1:49672        Malay:49673            ESTABLISHED
  TCP    127.0.0.1:49673        Malay:49672            ESTABLISHED
  TCP    127.0.0.1:49742        Malay:0                LISTENING
```

```
TCP    127.0.0.1:49886          Malay:0                LISTENING
TCP    [::]:135                 Malay:0                LISTENING
TCP    [::]:445                 Malay:0                LISTENING
TCP    [::]:3306                Malay:0                LISTENING
TCP    [::]:33060               Malay:0                LISTENING
TCP    [::]:49664               Malay:0                LISTENING
TCP    [::]:49665               Malay:0                LISTENING
TCP    [::]:49666               Malay:0                LISTENING
TCP    [::]:49667               Malay:0                LISTENING
TCP    [::]:49668               Malay:0                LISTENING
TCP    [::]:49683               Malay:0                LISTENING
TCP    [::1]:42050              Malay:0                LISTENING
TCP    [::1]:49669              Malay:0                LISTENING
UDP    0.0.0.0:5050             *:*
UDP    0.0.0.0:5353             *:*
UDP    0.0.0.0:5355             *:*
UDP    0.0.0.0:60495            *:*
UDP    0.0.0.0:62000            *:*
UDP    10.120.16.93:137         *:*
UDP    10.120.16.93:138         *:*
UDP    10.120.16.93:1900        *:*
UDP    10.120.16.93:5353        *:*
UDP    10.120.16.93:58859       *:*
UDP    127.0.0.1:1900           *:*
UDP    127.0.0.1:10010          *:*
UDP    127.0.0.1:49664          127.0.0.1:49664
UDP    127.0.0.1:58860          *:*
UDP    127.0.0.1:65089          *:*
UDP    [::]:5353                *:*
UDP    [::]:5355                *:*
UDP    [::]:60496               *:*
UDP    [::]:62000               *:*
UDP    [::1]:1900               *:*
UDP    [::1]:5353               *:*
UDP    [::1]:58858              *:*
UDP    [fe80::a9e0:8d85:6a75:fb19%11]:1900   *:*
UDP    [fe80::a9e0:8d85:6a75:fb19%11]:58857  *:*
```

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

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    10.120.16.93:49686     4.213.25.241:443       ESTABLISHED
  TCP    10.120.16.93:49767     4.213.25.241:443       ESTABLISHED
  TCP    10.120.16.93:49937     13.107.253.48:443      CLOSE_WAIT
  TCP    10.120.16.93:50202     163.70.143.61:5222     ESTABLISHED
  TCP    10.120.16.93:50608     20.189.173.28:443      TIME_WAIT
  TCP    10.120.16.93:50617     132.196.154.22:80      TIME_WAIT
  TCP    10.120.16.93:50619     13.107.253.68:443      CLOSE_WAIT
  TCP    10.120.16.93:50620     13.107.253.68:443      CLOSE_WAIT
  TCP    10.120.16.93:50622     20.189.172.32:443      TIME_WAIT
  TCP    10.120.16.93:50623     172.64.41.3:443        TIME_WAIT
  TCP    10.120.16.93:50624     142.250.67.174:443     TIME_WAIT
  TCP    10.120.16.93:50625     52.109.124.29:443      TIME_WAIT
  TCP    10.120.16.93:50626     8.8.8.8:443            TIME_WAIT
  TCP    10.120.16.93:50627     8.8.8.8:443            TIME_WAIT
  TCP    10.120.16.93:50628     52.109.124.29:443      TIME_WAIT
  TCP    10.120.16.93:50629     8.8.8.8:443            TIME_WAIT
  TCP    10.120.16.93:50630     3.165.190.117:443      TIME_WAIT
  TCP    10.120.16.93:50631     52.109.124.29:443      TIME_WAIT
  TCP    10.120.16.93:50633     142.250.67.174:443     TIME_WAIT
  TCP    10.120.16.93:50635     172.64.41.3:443        TIME_WAIT
  TCP    10.120.16.93:50636     172.64.151.87:443      TIME_WAIT
  TCP    10.120.16.93:50637     142.250.67.174:443     TIME_WAIT
  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    127.0.0.1:49672        127.0.0.1:49673        ESTABLISHED
  TCP    127.0.0.1:49673        127.0.0.1:49672        ESTABLISHED
```

```
C:\Users\WELCOME>netstat -o

Active Connections

  Proto  Local Address          Foreign Address        State           PID
  TCP    10.120.16.93:49686     4.213.25.241:https     ESTABLISHED     4748
  TCP    10.120.16.93:49767     4.213.25.241:https     ESTABLISHED     6400
  TCP    10.120.16.93:49937     13.107.253.48:https    CLOSE_WAIT      10340
  TCP    10.120.16.93:50202     whatsapp-chatd-edge-shv-01-bom2:5222  TIME_WAIT      0
  TCP    10.120.16.93:50619     13.107.253.68:https    CLOSE_WAIT      10340
  TCP    10.120.16.93:50620     13.107.253.68:https    CLOSE_WAIT      10340
  TCP    10.120.16.93:50639     172.64.41.3:https      TIME_WAIT       0
  TCP    10.120.16.93:50640     bom12s09-in-f14:https  TIME_WAIT       0
  TCP    10.120.16.93:50643     pnbomb-ab-in-f14:https  TIME_WAIT      0
  TCP    10.120.16.93:50667     20.190.146.39:https    TIME_WAIT       0
  TCP    10.120.16.93:50669     199.232.214.172:http   TIME_WAIT       0
  TCP    10.120.16.93:50690     20.190.146.32:https    TIME_WAIT       0
  TCP    10.120.16.93:50692     199.232.210.172:http   TIME_WAIT       0
  TCP    10.120.16.93:50694     dns:https              TIME_WAIT       0
  TCP    10.120.16.93:50697     52.109.56.129:https    TIME_WAIT       0
  TCP    10.120.16.93:50698     server-18-165-183-119:https  ESTABLISHED  15376
  TCP    10.120.16.93:50699     52.109.56.129:https    TIME_WAIT       0
  TCP    10.120.16.93:50700     52.109.56.129:https    TIME_WAIT       0
  TCP    10.120.16.93:50703     ec2-54-185-117-17:https  CLOSE_WAIT    15376
  TCP    10.120.16.93:50704     52.123.128.14:https    ESTABLISHED     4604
  TCP    10.120.16.93:50705     162.159.61.3:https     ESTABLISHED     15376
  TCP    10.120.16.93:50706     bom12s11-in-f14:https  ESTABLISHED     15376
  TCP    10.120.16.93:50707     40.79.150.120:https    TIME_WAIT       0
  TCP    10.120.16.93:50708     ip-66-117-22-191:https  ESTABLISHED    17268
  TCP    127.0.0.1:49670        Malay:49671            ESTABLISHED     6380
  TCP    127.0.0.1:49671        Malay:49670            ESTABLISHED     6380
  TCP    127.0.0.1:49672        Malay:49673            ESTABLISHED     6380
  TCP    127.0.0.1:49673        Malay:49672            ESTABLISHED     6380

C:\Users\WELCOME>netstat -e
Interface Statistics

                         Received            Sent

Bytes                    1443422898       112750284
Unicast packets             613506           436914
Non-unicast packets         375270             4668
Discards                         0                0
Errors                           0                0
Unknown protocols                0
```

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```
C:\Users\WELCOME>netstat -s

IPv4 Statistics

  Packets Received                      = 124908
  Received Header Errors                = 0
  Received Address Errors               = 0
  Datagrams Forwarded                   = 0
  Unknown Protocols Received            = 1
  Received Packets Discarded            = 12454
  Received Packets Delivered            = 119778
  Output Requests                       = 82816
  Routing Discards                      = 0
  Discarded Output Packets              = 19
  Output Packet No Route                = 2
  Reassembly Required                   = 0
  Reassembly Successful                 = 0
  Reassembly Failures                   = 0
  Datagrams Successfully Fragmented     = 0
  Datagrams Failing Fragmentation       = 0
  Fragments Created                     = 0

IPv6 Statistics

  Packets Received                      = 8408
  Received Header Errors                = 0
  Received Address Errors               = 0
  Datagrams Forwarded                   = 0
  Unknown Protocols Received            = 0
  Received Packets Discarded            = 3983
  Received Packets Delivered            = 8612
  Output Requests                       = 359
  Routing Discards                      = 0
  Discarded Output Packets              = 0
  Output Packet No Route                = 0
  Reassembly Required                   = 0
  Reassembly Successful                 = 0
  Reassembly Failures                   = 0
  Datagrams Successfully Fragmented     = 0
  Datagrams Failing Fragmentation       = 0
  Fragments Created                     = 0
```

7. nslookup

Description:

Queries the DNS to obtain domain name or IP address mapping.

Date: 04/06/2025

No.	Option	Description
1	<domain>	Retrieves IP address for the domain.
2	<IP>	Retrieves domain name for the given IP (reverse lookup).
3	set type=MX	Retrieves Mail Exchange records.
4	set type=NS	Retrieves Name Server records.
5	server <IP>	Specifies DNS server for the query.

Implementation:

```
C:\Users\WELCOME>nslookup google.com 1.1.1.1
Server:  one.one.one.one
Address:  1.1.1.1

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:80b::200e
          142.251.42.14
```

```
C:\Users\WELCOME>nslookup 8.8.8.8
Server:  UnKnown
Address:  192.168.102.69

Name:    dns.google
Address:  8.8.8.8
```

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```
C:\Users\WELCOME>nslookup -type=mx google.com
Server:  UnKnown
Address:  192.168.102.69

Non-authoritative answer:
google.com      MX preference = 10, mail exchanger = smtp.google.com
```

```
C:\Users\WELCOME>nslookup -type=ns google.com
Server:  UnKnown
Address:  192.168.102.69

Non-authoritative answer:
google.com        nameserver = ns2.google.com
google.com        nameserver = ns3.google.com
google.com        nameserver = ns1.google.com
google.com        nameserver = ns4.google.com

ns1.google.com   internet address = 216.239.32.10
ns1.google.com   AAAA IPv6 address = 2001:4860:4802:32::a
ns4.google.com   internet address = 216.239.38.10
ns4.google.com   AAAA IPv6 address = 2001:4860:4802:38::a
ns2.google.com   internet address = 216.239.34.10
ns2.google.com   AAAA IPv6 address = 2001:4860:4802:34::a
ns3.google.com   internet address = 216.239.36.10
ns3.google.com   AAAA IPv6 address = 2001:4860:4802:36::a
```

```
C:\Users\WELCOME>nslookup
Default Server:  UnKnown
Address:  192.168.102.69

> server 8.8.8.8
Default Server:  dns.google
Address:  8.8.8.8
```

8. hostname
Description:
>   **Displays the current name of the computer.**

No.	Option	Description
1	(no option)	Prints current hostname.
2		

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3			
4			
5			

Implementation:

```
C:\Users\WELCOME>hostname
Malay
```

9. pathping
Description:

Combines the functions of ping and tracert to provide information on packet loss at each hop.

No.	Option	Description
1	-n	Prevents resolving hostnames.
2	-h <max>	Sets maximum number of hops.
3	-g <host-list>	Specifies loose source route along host list.
4	-p <ms>	Wait time between pings.
5	-q <num>	Number of queries per hop.

Implementation:

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```
C:\Users\WELCOME>pathping -n google.com

Tracing route to google.com [142.251.221.238]
over a maximum of 30 hops:
  0  10.120.16.93
  1  10.120.1.1
  2  103.70.32.145
  3  10.1.252.37
  4  103.156.182.9
  5  142.251.76.33
  6  108.170.234.157
  7  142.251.221.238

Computing statistics for 175 seconds...
            Source to Here   This Node/Link
Hop   RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                            10.120.16.93
                                 0/ 100 =  0%   |
  1    3ms      0/ 100 =  0%     0/ 100 =  0%  10.120.1.1
                                 0/ 100 =  0%   |
  2    4ms      0/ 100 =  0%     0/ 100 =  0%  103.70.32.145
                                 0/ 100 =  0%   |
  3    ---    100/ 100 =100%   100/ 100 =100%  10.1.252.37
                                 0/ 100 =  0%   |
  4   20ms      0/ 100 =  0%     0/ 100 =  0%  103.156.182.9
                                 0/ 100 =  0%   |
  5   22ms      0/ 100 =  0%     0/ 100 =  0%  142.251.76.33
                                 0/ 100 =  0%   |
  6   25ms      1/ 100 =  1%     1/ 100 =  1%  108.170.234.157
                                 0/ 100 =  0%   |
  7   20ms      0/ 100 =  0%     0/ 100 =  0%  142.251.221.238

Trace complete.
```

```
C:\Users\WELCOME>pathping -h 10 google.com

Tracing route to google.com [142.251.221.238]
over a maximum of 10 hops:
  0   Malay [10.120.16.93]
  1   10.120.1.1
  2   103.70.32.145
  3   10.1.252.37
  4   103.156.182.9
  5   142.251.76.33
  6   108.170.234.157
  7   pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Computing statistics for 175 seconds...
              Source to Here   This Node/Link
Hop   RTT    Lost/Sent = Pct   Lost/Sent = Pct  Address
  0                                             Malay [10.120.16.93]
                                 0/ 100 =  0%   |
  1    2ms      0/ 100 =  0%     0/ 100 =  0%   10.120.1.1
                                 0/ 100 =  0%   |
  2    4ms      0/ 100 =  0%     0/ 100 =  0%   103.70.32.145
                                 0/ 100 =  0%   |
  3    ---    100/ 100 =100%   100/ 100 =100%   10.1.252.37
                                 0/ 100 =  0%   |
  4    20ms     0/ 100 =  0%     0/ 100 =  0%   103.156.182.9
                                 0/ 100 =  0%   |
  5    22ms     0/ 100 =  0%     0/ 100 =  0%   142.251.76.33
                                 0/ 100 =  0%   |
  6    22ms     0/ 100 =  0%     0/ 100 =  0%   108.170.234.157
                                 0/ 100 =  0%   |
  7    20ms     0/ 100 =  0%     0/ 100 =  0%   pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Trace complete.
```

```
C:\Users\WELCOME>pathping -g 10.120.1.1 8.8.8.8 google.com

Tracing route to google.com [142.250.70.110]
over a maximum of 30 hops:
  0   Malay [10.120.16.93]
  1    *        *         *
Computing statistics for 0 seconds...
              Source to Here   This Node/Link
Hop   RTT    Lost/Sent = Pct   Lost/Sent = Pct  Address
  0                                             Malay [10.120.16.93]

Trace complete.
```

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```
C:\Users\WELCOME>pathping -p 500 google.com

Tracing route to google.com [142.251.221.238]
over a maximum of 30 hops:
  0  Malay [10.120.16.93]
  1  10.120.1.1
  2  103.70.32.145
  3  10.1.252.37
  4  103.156.182.9
  5  142.251.76.33
  6  108.170.234.157
  7  pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Computing statistics for 350 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           Malay [10.120.16.93]
                               0/ 100 =  0%   |
  1    2ms     0/ 100 =  0%    0/ 100 =  0%   10.120.1.1
                               0/ 100 =  0%   |
  2    4ms     1/ 100 =  1%    1/ 100 =  1%   103.70.32.145
                               0/ 100 =  0%   |
  3    ---   100/ 100 =100%  100/ 100 =100%   10.1.252.37
                               0/ 100 =  0%   |
  4   20ms     3/ 100 =  3%    3/ 100 =  3%   103.156.182.9
                               0/ 100 =  0%   |
  5   22ms     2/ 100 =  2%    2/ 100 =  2%   142.251.76.33
                               0/ 100 =  0%   |
  6   21ms     0/ 100 =  0%    0/ 100 =  0%   108.170.234.157
                               1/ 100 =  1%   |
  7   20ms     1/ 100 =  1%    0/ 100 =  0%   pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Trace complete.
```

```
C:\Users\WELCOME>pathping -q 3 google.com

Tracing route to google.com [142.250.70.110]
over a maximum of 30 hops:
  0  Malay [10.120.16.93]
  1  10.120.1.1
  2  103.70.32.145
  3  10.1.252.37
  4  103.156.182.9
  5  142.251.76.33
  6  192.178.86.239
  7  pnbomb-ac-in-f14.1e100.net [142.250.70.110]

Computing statistics for 5 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                            Malay [10.120.16.93]
                              0/   3 =  0%   |
  1    3ms     0/   3 =  0%   0/   3 =  0%  10.120.1.1
                              0/   3 =  0%   |
  2    5ms     0/   3 =  0%   0/   3 =  0%  103.70.32.145
                              0/   3 =  0%   |
  3   ---      3/   3 =100%   3/   3 =100%  10.1.252.37
                              0/   3 =  0%   |
  4   20ms     0/   3 =  0%   0/   3 =  0%  103.156.182.9
                              0/   3 =  0%   |
  5   21ms     0/   3 =  0%   0/   3 =  0%  142.251.76.33
                              0/   3 =  0%   |
  6   ---      3/   3 =100%   3/   3 =100%  192.178.86.239
                              0/   3 =  0%   |
  7   21ms     0/   3 =  0%   0/   3 =  0%  pnbomb-ac-in-f14.1e100.net [142.250.70.110]

Trace complete.
```

10. arp

Description:

Displays and modifies the ARP (Address Resolution Protocol) cache.

No.	Option	Description
1	-a	Displays current ARP entries.
2	-g	Displays current ARP entries (same as -a).
3	-d <IP>	Deletes ARP entry for the specified IP address.
4	-s <IP> <MAC>	Adds a static ARP entry.
5	-v	Shows verbose output.

Implementation:

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

Interface: 10.120.16.93 --- 0xb
  Internet Address      Physical Address      Type
  10.120.1.1            7c-5a-1c-ce-2f-57     dynamic
  10.120.15.180         f6-94-f6-3d-3f-bd     dynamic
  10.120.255.255        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
```

```
C:\Users\WELCOME>arp -g

Interface: 10.120.16.93 --- 0xb
  Internet Address      Physical Address      Type
  10.120.1.1            7c-5a-1c-ce-2f-57     dynamic
  10.120.15.180         f6-94-f6-3d-3f-bd     dynamic
  10.120.21.181         e0-d0-45-9c-d8-0d     dynamic
  10.120.255.255        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
```

```
C:\Windows\System32>arp -d 10.120.1.1
```

```
C:\Windows\System32>arp -s 192.168.1.100 00-aa-bb-cc-dd-ee
```

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

Displays and modifies the IP-to-Physical address translation tables used by
address resolution protocol (ARP).

ARP -s inet_addr eth_addr [if_addr]
ARP -d inet_addr [if_addr]
ARP -a [inet_addr] [-N if_addr] [-v]

  -a          Displays current ARP entries by interrogating the current
              protocol data.  If inet_addr is specified, the IP and Physical
              addresses for only the specified computer are displayed.  If
              more than one network interface uses ARP, entries for each ARP
              table are displayed.
  -g          Same as -a.
  -v          Displays current ARP entries in verbose mode.  All invalid
              entries and entries on the loop-back interface will be shown.
  inet_addr   Specifies an internet address.
  -N if_addr  Displays the ARP entries for the network interface specified
              by if_addr.
  -d          Deletes the host specified by inet_addr. inet_addr may be
              wildcarded with * to delete all hosts.
  -s          Adds the host and associates the Internet address inet_addr
              with the Physical address eth_addr.  The Physical address is
              given as 6 hexadecimal bytes separated by hyphens. The entry
              is permanent.
  eth_addr    Specifies a physical address.
  if_addr     If present, this specifies the Internet address of the
              interface whose address translation table should be modified.
              If not present, the first applicable interface will be used.
Example:
  > arp -s 157.55.85.212   00-aa-00-62-c6-09  .... Adds a static entry.
  > arp -a                                    .... Displays the arp table.
```