Date: 29/06/ 2025

Practical Assignment #01:

Perform and explain various networking commands and IP configuration

1. Ipconfig
2. Ping
3. Getmac
4. Systeminfo
5. Traceroute / tracert
6. Netstat
7. Nslookup
8. Hostname
9. Pathping
10. Arp

1. ipconfig

Description:

The ipconfig command displays all **current TCP/IP network** configuration values and refreshes **Dynamic Host Configuration Protocol (DHCP)** and **Domain Name System (DNS)** settings.

No.	Option	Description
1	**Ipconfig/all**	The ipconfig /all command in Windows is a powerful diagnostic tool that displays detailed network configuration information for all network adapters on your system.
2	**Ipconfig/release**	Releases the current IP address configuration assigned by the DHCP server.
3	**Ipconfig/renew**	Renews the IP address configuration from the DHCP server.
4	**Ipconfig/flushdns**	Clears the DNS resolver cache.
5	**Ipconfig/displaydns**	Shows the contents of the DNS resolver cache.

Implementation:

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```
C:\Users\ASUS>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::6b2d:8141:7216:6c23%16
   Default Gateway . . . . . . . . . :
```

```
C:\Users\ASUS>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::6b2d:8141:7216:6c23%16
   IPv4 Address. . . . . . . . . . . : 192.168.0.112
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.0.1
```

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

Windows IP Configuration

Successfully flushed the DNS Resolver Cache.
```

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

Windows IP Configuration

    activity.windows.com
    ----------------------------------------
    Record Name . . . . . : activity.windows.com
    Record Type . . . . . : 5
    Time To Live  . . . . : 8158
    Data Length . . . . . : 8
    Section . . . . . . . : Answer
    CNAME Record  . . . . : activity-consumer.trafficmanager.net


    Record Name . . . . . : activity-consumer.trafficmanager.net
    Record Type . . . . . : 1
    Time To Live  . . . . : 8158
    Data Length . . . . . : 4
    Section . . . . . . . : Answer
    A (Host) Record . . . : 20.44.229.112
```

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

Windows IP Configuration

   Host Name . . . . . . . . . . . . : DESKTOP-VISHAL
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Mixed
   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. . . . . . . . . : 30-E3-A4-27-B2-45
   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. . . . . . . . . : 32-E3-A4-27-B2-44
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Intel(R) Wi-Fi 6E AX211 160MHz
   Physical Address. . . . . . . . . : 30-E3-A4-27-B2-44
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::6b2d:8141:7216:6c23%16(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.0.112(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : 08 July 2025 16:40:38
   Lease Expires . . . . . . . . . . : 09 July 2025 16:40:38
   Default Gateway . . . . . . . . . : 192.168.0.1
   DHCP Server . . . . . . . . . . . : 192.168.0.1
   DHCPv6 IAID . . . . . . . . . . . : 254862244
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2E-F6-5D-96-00-FD-6B-09-1F-79
   DNS Servers . . . . . . . . . . . : 192.168.0.1
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

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2. ping

Description:

The ping command is used to test the **connectivity** between your computer and another host (like a website or IP address). It sends **ICMP** Echo Request packets and listens for replies.

No.	Option	Description
1	**Ping <>-t**	Pings the target continuously until stopped manually
2	**Ping<>-n <count>**	Specifies the number of Echo Requests to send (default is 4).
3	**Ping<>-l <size>**	Sets the size (in bytes) of the ping packet (default is 32 bytes).
4	**Ping<>-a**	Resolves the IP address to a hostname, if possible.
5	**Ping<> -4**	Force using IPv4.

Implementation:

```
C:\Users\ASUS>ping google.com -i 10

Pinging google.com [142.251.221.238] with 32 bytes of data:
Reply from 142.251.221.238: bytes=32 time=29ms TTL=117
Reply from 142.251.221.238: bytes=32 time=42ms TTL=117
Reply from 142.251.221.238: bytes=32 time=18ms TTL=117
Reply from 142.251.221.238: bytes=32 time=17ms TTL=117

Ping statistics for 142.251.221.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 17ms, Maximum = 42ms, Average = 26ms
```

```
C:\Users\ASUS>ping google.com -a

Pinging google.com [142.251.221.238] with 32 bytes of data:
Reply from 142.251.221.238: bytes=32 time=22ms TTL=117
Reply from 142.251.221.238: bytes=32 time=21ms TTL=117
Reply from 142.251.221.238: bytes=32 time=20ms TTL=117
Reply from 142.251.221.238: bytes=32 time=21ms TTL=117

Ping statistics for 142.251.221.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum = 22ms, Average = 21ms
```

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```
C:\Users\ASUS>ping google.com -n 10

Pinging google.com [142.251.221.238] with 32 bytes of data:
Reply from 142.251.221.238: bytes=32 time=23ms TTL=117
Reply from 142.251.221.238: bytes=32 time=20ms TTL=117
Reply from 142.251.221.238: bytes=32 time=18ms TTL=117
Reply from 142.251.221.238: bytes=32 time=17ms TTL=117
Reply from 142.251.221.238: bytes=32 time=19ms TTL=117
Reply from 142.251.221.238: bytes=32 time=20ms TTL=117
Reply from 142.251.221.238: bytes=32 time=18ms TTL=117
Reply from 142.251.221.238: bytes=32 time=36ms TTL=117
Reply from 142.251.221.238: bytes=32 time=90ms TTL=117
Reply from 142.251.221.238: bytes=32 time=21ms TTL=117

Ping statistics for 142.251.221.238:
    Packets: Sent = 10, Received = 10, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 17ms, Maximum = 90ms, Average = 28ms
```

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

Pinging google.com [142.251.221.238] with 32 bytes of data:
Reply from 142.251.221.238: bytes=32 time=111ms TTL=117
Reply from 142.251.221.238: bytes=32 time=122ms TTL=117
Reply from 142.251.221.238: bytes=32 time=139ms TTL=117
Request timed out.

Ping statistics for 142.251.221.238:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 111ms, Maximum = 139ms, Average = 124ms
```

```
C:\Users\ASUS>ping -w 1000 google.com

Pinging google.com [142.251.221.238] with 32 bytes of data:
Reply from 142.251.221.238: bytes=32 time=19ms TTL=117
Reply from 142.251.221.238: bytes=32 time=18ms TTL=117
Reply from 142.251.221.238: bytes=32 time=18ms TTL=117
Reply from 142.251.221.238: bytes=32 time=81ms TTL=117

Ping statistics for 142.251.221.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 18ms, Maximum = 81ms, Average = 34ms
```

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3. getmac

Description: Displays the **MAC addresses** of all network adapters on the system.

No.	Option	Description
1	**getmac**	Intended to display all available MAC addresses and their corresponding transport names for every network interface.
2	**getmac/v**	Enables verbose mode showing more detailed adapter information.
3	**getmac/fo llist**	Formats output as a list for easier readability
4	**getmac/fo table**	Formats output as a table.
5	**getmac/nh**	Omits column header from output

Implementation:

```
::\Users\ASUS>getmac/v

:onnection Name Network Adapter Physical Address    Transport Name

:============== ============== ================== ========================================
:==================
/i-Fi           Intel(R) Wi-Fi  30-E3-A4-27-B2-44   \Device\Tcpip_{B5604D8A-56B6-4036-AA0D-
.45F7FF9C66A}
```

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

Physical Address: 30-E3-A4-27-B2-44
Transport Name:   \Device\Tcpip_{B5604D8A-56B6-4036-AA0D-145F7FF9C66A}
```

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

Physical Address    Transport Name
=================== ==========================================================
30-E3-A4-27-B2-44   \Device\Tcpip_{B5604D8A-56B6-4036-AA0D-145F7FF9C66A}
```

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

30-E3-A4-27-B2-44    \Device\Tcpip_{B5604D8A-56B6-4036-AA0D-145F7FF9C66A}
```

```
C:\Users\ASUS>getmac

Physical Address    Transport Name
=================== ==========================================================
30-E3-A4-27-B2-44   \Device\Tcpip_{B5604D8A-56B6-4036-AA0D-145F7FF9C66A}
```

4. Systeminfo

Description: Displays **comprehensive information** about the computer system, including OS version, hardware details, and installed updates.

No.	Option	Description
1	**/s <computer>**	Executes the command on a remote computer. Requires appropriate permissions.
2	**/u <domain/use>**	Specifies the user context for the remote system. Must be used with /s.
3	**/p <password>**	Supplies the password for the user
4	**/fo table**	Formats output as a table.
5	**/nh**	Omits column header from output

Implementation:

```
C:\Users\ASUS>Systeminfo | findstr "Total Physical"
Total Physical Memory:         16,050 MB
Available Physical Memory:     7,951 MB
```

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```
C:\Users\ASUS>Systeminfo/s DESKTOP-VISHAL

Host Name:                     DESKTOP-VISHAL
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:              ASUS
Registered Organization:       N/A
Product ID:                    00342-42731-17942-AAOEM
Original Install Date:         07-02-2025, 01:31:55
System Boot Time:              08-07-2025, 16:40:12
System Manufacturer:           ASUSTeK COMPUTER INC.
System Model:                  Vivobook_ASUSLaptop K3605ZF_K3605ZF
System Type:                   x64-based PC
Processor(s):                  1 Processor(s) Installed.
                               [01]: Intel64 Family 6 Model 154 Stepping 3 GenuineIntel ~2500 Mhz
BIOS Version:                  American Megatrends International, LLC. K3605ZF.311, 24-05-2024
Windows Directory:             C:\Windows
System Directory:              C:\Windows\system32
Boot Device:                   \Device\HarddiskVolume1
System Locale:                 en-us;English (United States)
Input Locale:                  00004009
Time Zone:                     (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:         16,050 MB
Available Physical Memory:     7,933 MB
Virtual Memory: Max Size:      17,074 MB
Virtual Memory: Available:     7,692 MB
Virtual Memory: In Use:        9,382 MB
Page File Location(s):         C:\pagefile.sys
Domain:                        WORKGROUP
Logon Server:                  \\DESKTOP-VISHAL
Hotfix(s):                     3 Hotfix(s) Installed.
                               [01]: KB5056579
                               [02]: KB5060842
                               [03]: KB5059502
Network Card(s):               1 NIC(s) Installed.
                               [01]: Intel(R) Wi-Fi 6E AX211 160MHz
                                     Connection Name: Wi-Fi
                                     DHCP Enabled:    Yes
                                     DHCP Server:     192.168.0.1
                                     IP address(es)
                                     [01]: 192.168.0.112
                                     [02]: fe80::6b2d:8141:7216:6c23
Virtualization-based security: Status: Running
                               Required Security Properties:
                               Available Security Properties:
                                     Base Virtualization Support
                                     Secure Boot
                                     DMA Protection
                                     UEFI Code Readonly
                                     Mode Based Execution Control
                                     APIC Virtualization
                               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.
```

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```
:\Users\ASUS>Systeminfo/s DESKTOP-VISHAL /u WORKGROUP
/ARNING: User credentials cannot be used for local connections

Host Name:                     DESKTOP-VISHAL
)S Name:                       Microsoft Windows 11 Home Single Language
)S Version:                    10.0.26100 N/A Build 26100
)S Manufacturer:               Microsoft Corporation
)S Configuration:              Standalone Workstation
)S Build Type:                 Multiprocessor Free
Registered Owner:              ASUS
Registered Organization:       N/A
Product ID:                    00342-42731-17942-AAOEM
)riginal Install Date:         07-02-2025, 01:31:55
System Boot Time:              08-07-2025, 16:40:12
System Manufacturer:           ASUSTeK COMPUTER INC.
System Model:                  Vivobook_ASUSLaptop K3605ZF_K3605ZF
System Type:                   x64-based PC
Processor(s):                  1 Processor(s) Installed.
                               [01]: Intel64 Family 6 Model 154 Stepping 3 GenuineIntel ~2500 Mhz
3IOS Version:                  American Megatrends International, LLC. K3605ZF.311, 24-05-2024
/indows Directory:             C:\Windows
System Directory:              C:\Windows\system32
Boot Device:                   \Device\HarddiskVolume1
System Locale:                 en-us;English (United States)
[nput Locale:                  00004009
Time Zone:                     (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:         16,050 MB
Available Physical Memory:     7,892 MB
/irtual Memory: Max Size:      17,074 MB
/irtual Memory: Available:     7,636 MB
/irtual Memory: In Use:        9,438 MB
Page File Location(s):         C:\pagefile.sys
)omain:                        WORKGROUP
.ogon Server:                  \\DESKTOP-VISHAL
Hotfix(s):                     3 Hotfix(s) Installed.
                               [01]: KB5056579
                               [02]: KB5060842
                               [03]: KB5059502
Network Card(s):               1 NIC(s) Installed.
                               [01]: Intel(R) Wi-Fi 6E AX211 160MHz
                                     Connection Name: Wi-Fi
                                     DHCP Enabled:    Yes
                                     DHCP Server:     192.168.0.1
                                     IP address(es)
                                     [01]: 192.168.0.112
                                     [02]: fe80::6b2d:8141:7216:6c23
/irtualization-based security: Status: Running
                               Required Security Properties:
                               Available Security Properties:
                                     Base Virtualization Support
                                     Secure Boot
                                     DMA Protection
                                     UEFI Code Readonly
                                     Mode Based Execution Control
                                     APIC Virtualization
                               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.
```

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```
C:\Users\ASUS>Systeminfo /fo list

Host Name:                     DESKTOP-VISHAL
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:              ASUS
Registered Organization:       N/A
Product ID:                    00342-42731-17942-AAOEM
Original Install Date:         07-02-2025, 01:31:55
System Boot Time:              08-07-2025, 16:40:12
System Manufacturer:           ASUSTeK COMPUTER INC.
System Model:                  Vivobook_ASUSLaptop K3605ZF_K3605ZF
System Type:                   x64-based PC
Processor(s):                  1 Processor(s) Installed.
                               [01]: Intel64 Family 6 Model 154 Stepping 3 GenuineIntel ~2500 Mhz
BIOS Version:                  American Megatrends International, LLC. K3605ZF.311, 24-05-2024
Windows Directory:             C:\Windows
System Directory:              C:\Windows\system32
Boot Device:                   \Device\HarddiskVolume1
System Locale:                 en-us;English (United States)
Input Locale:                  00004009
Time Zone:                     (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:         16,050 MB
Available Physical Memory:     7,862 MB
Virtual Memory: Max Size:      17,074 MB
Virtual Memory: Available:     7,600 MB
Virtual Memory: In Use:        9,474 MB
Page File Location(s):         C:\pagefile.sys
Domain:                        WORKGROUP
Logon Server:                  \\DESKTOP-VISHAL
Hotfix(s):                     3 Hotfix(s) Installed.
                               [01]: KB5056579
                               [02]: KB5060842
                               [03]: KB5059502
Network Card(s):               1 NIC(s) Installed.
                               [01]: Intel(R) Wi-Fi 6E AX211 160MHz
                                     Connection Name: Wi-Fi
                                     DHCP Enabled:    Yes
                                     DHCP Server:     192.168.0.1
                                     IP address(es)
                                     [01]: 192.168.0.112
                                     [02]: fe80::6b2d:8141:7216:6c23
Virtualization-based security: Status: Running
                               Required Security Properties:
                               Available Security Properties:
                                     Base Virtualization Support
                                     Secure Boot
                                     DMA Protection
                                     UEFI Code Readonly
                                     Mode Based Execution Control
                                     APIC Virtualization
                               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.
```

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5. traceroute/tracert

Description: Shows the path that packets take from your computer to a destination host. Useful for diagnosing network routing issues.

No.	Option	Description
1	-d	Do not resolve addresses to hostnames
2	-h <maximum>	Sets maximum number of hops to search for the target. Default is 30.
3	-j <host>	Uses loose source routing along the specified hosts
4	-w <timeout>	Wait time (in milliseconds) for each reply.
5	-4 or -6	Wait time (in milliseconds) for each reply.

Implementation:

```
C:\Users\ASUS>tracert -d www.google.com

Tracing route to www.google.com [142.250.70.68]
over a maximum of 30 hops:

  1     2 ms     1 ms     1 ms  192.168.0.1
  2     2 ms   204 ms     1 ms  192.168.10.5
  3     5 ms     5 ms     7 ms  103.190.7.33
  4     8 ms     4 ms     4 ms  103.81.117.9
  5    94 ms     7 ms     7 ms  10.52.18.1
  6    18 ms    20 ms    25 ms  72.14.218.56
  7    21 ms    23 ms    18 ms  142.251.76.33
  8    30 ms    18 ms    27 ms  192.178.86.201
  9    20 ms    19 ms    19 ms  142.250.70.68

Trace complete.
```

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

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

  1    13 ms     7 ms     4 ms  192.168.0.1
  2     8 ms     5 ms     4 ms  192.168.10.5
  3    78 ms    81 ms    83 ms  103.190.7.33
  4    17 ms    29 ms     7 ms  103.81.117.9
  5    87 ms    86 ms   131 ms  10.52.18.1
  6   121 ms   129 ms   134 ms  72.14.218.56
  7   155 ms    86 ms    23 ms  142.251.76.33
  8   171 ms   163 ms     *     108.170.234.157
  9    20 ms    21 ms    18 ms  pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Trace complete.
```

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```
C:\Users\ASUS>tracert -j google.com

Tracing route to google.com [142.251.42.78]
over a maximum of 30 hops:

  1  192.168.0.1  reports: Invalid source route specified.

Trace complete.
```

```
C:\Users\ASUS>tracert -h 15 google.com

Tracing route to google.com [142.251.42.78]
over a maximum of 15 hops:

  1     6 ms     3 ms     1 ms  192.168.0.1
  2     3 ms     3 ms     1 ms  192.168.10.5
  3   151 ms   129 ms    14 ms  103.190.7.33
  4     8 ms     4 ms     5 ms  103.81.117.9
  5     9 ms     7 ms     3 ms  10.52.18.1
  6    18 ms    22 ms    18 ms  72.14.218.56
  7    18 ms    17 ms    19 ms  72.14.239.103
  8    38 ms    25 ms    22 ms  142.251.69.105
  9    90 ms   173 ms   178 ms  bom12s21-in-f14.1e100.net [142.251.42.78]

Trace complete.
```

```
C:\Users\ASUS>tracert -w 1000 google.com

Tracing route to google.com [142.251.42.78]
over a maximum of 30 hops:

  1     2 ms     3 ms     2 ms  192.168.0.1
  2     9 ms     2 ms     2 ms  192.168.10.5
  3    62 ms    60 ms    52 ms  103.190.7.33
  4     9 ms    26 ms     6 ms  103.81.117.9
  5   163 ms   135 ms   157 ms  10.52.18.1
  6    92 ms   106 ms   134 ms  72.14.218.56
  7    25 ms    22 ms    21 ms  72.14.239.103
  8   133 ms   105 ms   122 ms  142.251.69.105
  9     *      232 ms   383 ms  bom12s21-in-f14.1e100.net [142.251.42.78]

Trace complete.
```

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6. netstat

Description: Shows **connections** and listening port

No.	Option	Description
1	-a	Shows all connections and listening port
2	-b	Displays the executable the behind each connection (needs admin)
3	-n	Shows aaddresses and port as numbers
4	-o	Includes the Process ID\ of each connection
5	-e	WDisplays Ethernet stats like bytes sent/received

Implementation:

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

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:445            DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:5040           DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49664          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49665          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49668          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49669          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49678          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49696          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49697          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49698          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49699          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49700          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49701          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49702          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49703          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49704          DESKTOP-VISHAL:0       LISTENING
  TCP    0.0.0.0:49705          DESKTOP-VISHAL:0       LISTENING
  TCP    127.0.0.1:24830        DESKTOP-VISHAL:0       LISTENING
  TCP    127.0.0.1:27017        DESKTOP-VISHAL:0       LISTENING
  TCP    127.0.0.1:49690        DESKTOP-VISHAL:49691   ESTABLISHED
  TCP    127.0.0.1:49691        DESKTOP-VISHAL:49690   ESTABLISHED
  TCP    127.0.0.1:49692        DESKTOP-VISHAL:49693   ESTABLISHED
  TCP    127.0.0.1:49693        DESKTOP-VISHAL:49692   ESTABLISHED
  TCP    127.0.0.1:49694        DESKTOP-VISHAL:49695   ESTABLISHED
  TCP    127.0.0.1:49695        DESKTOP-VISHAL:49694   ESTABLISHED
  TCP    127.0.0.1:49712        DESKTOP-VISHAL:49713   ESTABLISHED
  TCP    127.0.0.1:49713        DESKTOP-VISHAL:49712   ESTABLISHED
  TCP    192.168.0.112:51418    52.109.56.129:https    TIME_WAIT
  TCP    192.168.0.112:51419    52.109.56.129:https    TIME_WAIT
  TCP    192.168.23.212:139     DESKTOP-VISHAL:0       LISTENING
  TCP    [::]:135               DESKTOP-VISHAL:0       LISTENING
  TCP    [::]:445               DESKTOP-VISHAL:0       LISTENING
  TCP    [::]:49664             DESKTOP-VISHAL:0       LISTENING
  TCP    [::]:49665             DESKTOP-VISHAL:0       LISTENING
  TCP    [::]:49668             DESKTOP-VISHAL:0       LISTENING
  TCP    [::]:49669             DESKTOP-VISHAL:0       LISTENING
  TCP    [::]:49678             DESKTOP-VISHAL:0       LISTENING
  TCP    [::]:49696             DESKTOP-VISHAL:0       LISTENING
  TCP    [::1]:49679            DESKTOP-VISHAL:0       LISTENING
```

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```
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:49410  [2603:1040:a06:6::2]:https  ESTABLISHED
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:49411  [2603:1040:a06:6::2]:https  ESTABLISHED
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51424  [64:ff9b::2a6a:a2cb]:http  TIME_WAIT
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51425  [2400:5200:402:3::17cd:50c3]:http  TIME_WAIT
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51426  [64:ff9b::142c:e570]:https  TIME_WAIT
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51427  [64:ff9b::14f7:b8c5]:https  TIME_WAIT
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51428  [64:ff9b::14f7:b8c5]:https  TIME_WAIT
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51429  bingforbusiness:https  ESTABLISHED
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51432  [2603:1040:5:3::16]:https  ESTABLISHED
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51433  [2603:1040:5:3::16]:https  ESTABLISHED
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51434  [64:ff9b::34a8:75a9]:https  TIME_WAIT
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51435  sd-in-f188:5228        ESTABLISHED
TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51436  [64:ff9b::34bb:4f6d]:https  ESTABLISHED
UDP    0.0.0.0:5050           *:*
UDP    0.0.0.0:5353           *:*
UDP    0.0.0.0:5353           *:*
UDP    0.0.0.0:5353           *:*
UDP    0.0.0.0:5353           *:*
UDP    0.0.0.0:5353           *:*
UDP    0.0.0.0:5353           *:*
UDP    0.0.0.0:5353           *:*
UDP    0.0.0.0:5355           *:*
UDP    0.0.0.0:49665          *:*
UDP    0.0.0.0:52266          *:*
UDP    127.0.0.1:1900         *:*
UDP    127.0.0.1:49664        127.0.0.1:49664
UDP    127.0.0.1:59725        *:*
UDP    192.168.23.212:137     *:*
UDP    192.168.23.212:138     *:*
UDP    192.168.23.212:1900    *:*
UDP    192.168.23.212:59724   *:*
UDP    [::]:5353              *:*
UDP    [::]:5353              *:*
UDP    [::]:5353              *:*
UDP    [::]:5353              *:*
UDP    [::]:5355              *:*
UDP    [::]:49665             *:*
UDP    [::]:52266             *:*
UDP    [::1]:1900             *:*
UDP    [::1]:59723            *:*
UDP    [fe80::6b2d:8141:7216:6c23%16]:546  *:*
UDP    [fe80::6b2d:8141:7216:6c23%16]:1900  *:*
UDP    [fe80::6b2d:8141:7216:6c23%16]:59722  *:*
```

```
C:\Users\ASUS>netstat -b
The requested operation requires elevation.
```

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

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:49690        127.0.0.1:49691        ESTABLISHED
  TCP    127.0.0.1:49691        127.0.0.1:49690        ESTABLISHED
  TCP    127.0.0.1:49692        127.0.0.1:49693        ESTABLISHED
  TCP    127.0.0.1:49693        127.0.0.1:49692        ESTABLISHED
  TCP    127.0.0.1:49694        127.0.0.1:49695        ESTABLISHED
  TCP    127.0.0.1:49695        127.0.0.1:49694        ESTABLISHED
  TCP    127.0.0.1:49712        127.0.0.1:49713        ESTABLISHED
  TCP    127.0.0.1:49713        127.0.0.1:49712        ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:49410  [2603:1040:a06:6::2]:443  ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:49411  [2603:1040:a06:6::2]:443  ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51426  [64:ff9b::142c:e570]:443  TIME_WAIT
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51429  [64:ff9b::d6b:69e]:443  TIME_WAIT
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51432  [2603:1040:5:3::16]:443  TIME_WAIT
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51433  [2603:1040:5:3::16]:443  ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51434  [64:ff9b::34a8:75a9]:443  TIME_WAIT
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51435  [2404:6800:4003:c0f::bc]:5228  ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51436  [64:ff9b::34bb:4f6d]:443  ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51439  [64:ff9b::dcc:6a22]:443  ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51441  [2603:1040:a06:8::1f2]:443  ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51442  [64:ff9b::14bd:ad11]:443  ESTABLISHED
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51443  [64:ff9b::14bd:ad11]:443  ESTABLISHED
```

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

Active Connections

  Proto  Local Address          Foreign Address        State           PID
  TCP    127.0.0.1:49690        DESKTOP-VISHAL:49691   ESTABLISHED     1448
  TCP    127.0.0.1:49691        DESKTOP-VISHAL:49690   ESTABLISHED     1448
  TCP    127.0.0.1:49692        DESKTOP-VISHAL:49693   ESTABLISHED     3092
  TCP    127.0.0.1:49693        DESKTOP-VISHAL:49692   ESTABLISHED     3092
  TCP    127.0.0.1:49694        DESKTOP-VISHAL:49695   ESTABLISHED     1692
  TCP    127.0.0.1:49695        DESKTOP-VISHAL:49694   ESTABLISHED     1692
  TCP    127.0.0.1:49712        DESKTOP-VISHAL:49713   ESTABLISHED     5908
  TCP    127.0.0.1:49713        DESKTOP-VISHAL:49712   ESTABLISHED     5908
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:49410  [2603:1040:a06:6::2]:https  ESTABLISHED     6624
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:49411  [2603:1040:a06:6::2]:https  ESTABLISHED     6624
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51429  bingforbusiness:https  TIME_WAIT       0
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51432  [2603:1040:5:3::16]:https  TIME_WAIT       0
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51433  [2603:1040:5:3::16]:https  ESTABLISHED     19136
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51435  sd-in-f188:5228        ESTABLISHED     6296
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51436  [64:ff9b::34bb:4f6d]:https  ESTABLISHED     6148
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51439  ec2-13-204-106-34:https  ESTABLISHED     6640
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51441  [2603:1040:a06:8::1f2]:https  ESTABLISHED     6296
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51442  [64:ff9b::14bd:ad11]:https  ESTABLISHED     6296
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51443  [64:ff9b::14bd:ad11]:https  ESTABLISHED     6296
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51444  [64:ff9b::142c:e570]:https  ESTABLISHED     4428
  TCP    [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]:51445  [64:ff9b::142c:e570]:https  ESTABLISHED     4428
```

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```
C:\Users\ASUS>netstat -e
Interface Statistics

                           Received            Sent

Bytes                    2627850          894540
Unicast packets             3444            2988
Non-unicast packets           18             666
Discards                       0               0
Errors                         0               0
Unknown protocols              0
```

7. nslookup

Description: Launches interactive mode to **query DNS** manually

No.	Option	Description
1	**<hostname>**	Returns IP address of the given domain name
2	**Server <DNS>**	Sets the DNS server to use for lookups in interactive mode
3	**set type=MX**	Queries Mail Exchange (MX) records
4	**Set type=NS**	Queries Name Server (NS) records
5	**Set type=A**	Queries IPv4 address (A) record

Implementation:

```
C:\Users\ASUS>nslookup -type=any openai.com
Server:  UnKnown
Address:  192.168.23.136

*** UnKnown can't find openai.com: Query refused
```

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```
C:\Users\ASUS>nslookup google.com
Server:  UnKnown
Address:  192.168.23.136

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:823::200e
          142.250.182.46
```

```
C:\Users\ASUS>nslookup 8.8.8.8
Server:  UnKnown
Address:  192.168.23.136

Name:    dns.google
Address:  8.8.8.8
```

```
C:\Users\ASUS>nslookup -type=mx gmail.com
Server:  UnKnown
Address:  192.168.23.136

Non-authoritative answer:
gmail.com       MX preference = 30, mail exchanger = alt3.gmail-smtp-in.l.google.com
gmail.com       MX preference = 10, mail exchanger = alt1.gmail-smtp-in.l.google.com
gmail.com       MX preference = 40, mail exchanger = alt4.gmail-smtp-in.l.google.com
gmail.com       MX preference = 5, mail exchanger = gmail-smtp-in.l.google.com
gmail.com       MX preference = 20, mail exchanger = alt2.gmail-smtp-in.l.google.com
```

```
C:\Users\ASUS>nslookup -type=ns wikipedia.org
Server:  UnKnown
Address:  192.168.23.136

Non-authoritative answer:
wikipedia.org   nameserver = ns1.wikimedia.org
wikipedia.org   nameserver = ns2.wikimedia.org
wikipedia.org   nameserver = ns0.wikimedia.org
```

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8. hostname

Description: Displays the current **hostname** of your machine.

No.	Option	Description
1	**Hostname**	Shows current hostname

Implementation:

```
C:\Users\ASUS>hostname
DESKTOP-VISHAL
```

9. pathping

Description: Pathping is a **network diagnostic tool** in windows that combines the feature of **both ping and tracert.**

No.	Option	Description
1	**/h**	Skips resolving IPs to hostname
2	**/h <hops>**	Sets max number of hops
3	**/q <quries>**	Number of pings per hop
4	**/w <timeout>**	Wait time per reply in ms
5	**/4 or /6**	Force IPv4 or IPv6 usage

Implementation:

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```
C:\Users\ASUS>pathping /w 2000 google.com

Tracing route to google.com [2404:6800:4002:819::200e]
over a maximum of 30 hops:
  0  DESKTOP-VISHAL [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]
  1  2402:3a80:4411:a869::3d
  2  fd00:192:168:173::209
  3  fd00:192:168:173::209
  4  fd00:192:168:203::1
  5  fd00:192:168:203::2
  6  2400:5200:1400:9f::2c
  7  voda-india-gw.it.cw.net [2001:5008:100:13::2]
  8  2001:4860:1:1::fe8
  9  2404:6800:80fd::1
 10  2001:4860:0:1::18f2
 11  2001:4860:0:1::876a
 12  2001:4860::9:4001:ddce
 13  2001:4860::c:4004:2137
 14  2001:4860::9:4001:67bc
 15  tzdelb-az-in-x0e.1e100.net [2404:6800:4002:819::200e]

Computing statistics for 375 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           DESKTOP-VISHAL [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]
                                    0/ 100 =  0%   |
  1    3ms     0/ 100 =  0%     0/ 100 =  0%  2402:3a80:4411:a869::3d
                                    0/ 100 =  0%   |
  2   40ms     1/ 100 =  1%     1/ 100 =  1%  fd00:192:168:173::209
                                    0/ 100 =  0%   |
  3   35ms     1/ 100 =  1%     1/ 100 =  1%  fd00:192:168:173::209
                                    0/ 100 =  0%   |
  4   34ms     1/ 100 =  1%     1/ 100 =  1%  fd00:192:168:203::1
                                    0/ 100 =  0%   |
  5   32ms     1/ 100 =  1%     1/ 100 =  1%  fd00:192:168:203::2
                                    0/ 100 =  0%   |
  6   33ms     1/ 100 =  1%     1/ 100 =  1%  2400:5200:1400:9f::2c
                                    0/ 100 =  0%   |
  7  217ms     0/ 100 =  0%     0/ 100 =  0%  voda-india-gw.it.cw.net [2001:5008:100:13::2]
                                    0/ 100 =  0%   |
  8   53ms     0/ 100 =  0%     0/ 100 =  0%  2001:4860:1:1::fe8
                                    1/ 100 =  1%   |
  9  ---     100/ 100 =100%    99/ 100 = 99%  2404:6800:80fd::1
                                    0/ 100 =  0%   |
 10  ---     100/ 100 =100%    99/ 100 = 99%  2001:4860:0:1::18f2
                                    0/ 100 =  0%   |
 11  ---     100/ 100 =100%    99/ 100 = 99%  2001:4860:0:1::876a
                                    0/ 100 =  0%   |
 12  ---     100/ 100 =100%    99/ 100 = 99%  2001:4860::9:4001:ddce
                                    0/ 100 =  0%   |
 13  ---     100/ 100 =100%    99/ 100 = 99%  2001:4860::c:4004:2137
                                    0/ 100 =  0%   |
 14  ---     100/ 100 =100%    99/ 100 = 99%  2001:4860::9:4001:67bc
                                    0/ 100 =  0%   |
 15   72ms     1/ 100 =  1%     0/ 100 =  0%  tzdelb-az-in-x0e.1e100.net [2404:6800:4002:819::200e]

Trace complete.
```

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```
C:\Users\ASUS>pathping /h 2 google.com

Tracing route to google.com [2404:6800:4002:825::200e]
over a maximum of 2 hops:
  0  DESKTOP-VISHAL [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]
  1  2402:3a80:4411:a869::3d
  2  fd00:192:168:173::209

Computing statistics for 50 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                          DESKTOP-VISHAL [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]
                                   0/ 100 =  0%   |
  1    3ms     0/ 100 =  0%     0/ 100 =  0%  2402:3a80:4411:a869::3d
                                   0/ 100 =  0%   |
  2   30ms     0/ 100 =  0%     0/ 100 =  0%  fd00:192:168:173::209

Trace complete.
```

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```
C:\Users\ASUS>pathping /q 2 google.com

Tracing route to google.com [2404:6800:4002:825::200e]
over a maximum of 30 hops:
  0  DESKTOP-VISHAL [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]
  1  2402:3a80:4411:a869::3d
  2  fd00:192:168:173::209
  3  fd00:192:168:173::209
  4  fd00:192:168:203::1
  5  fd00:192:168:203::2
  6  2400:5200:1400:9f::2c
  7  voda-india-gw.it.cw.net [2001:5008:100:13::2]
  8  2001:4860:1:1::fe8
  9  2404:6800:8013::1
 10  2001:4860:0:1::2038
 11  2001:4860:0:1::876a
 12  2001:4860::9:4001:7734
 13  2001:4860::9:4001:67bd
 14  2001:4860:0:1::78bd
 15  2001:4860:0:1::539b
 16  del12s08-in-x0e.1e100.net [2404:6800:4002:825::200e]

Computing statistics for 8 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                          DESKTOP-VISHAL [2402:3a80:4411:a869:c0dd:a1c8:bfe6:dce2]
                                       0/   2 =  0%   |
  1    4ms     0/   2 =  0%     0/   2 =  0%  2402:3a80:4411:a869::3d
                                       0/   2 =  0%   |
  2  248ms     0/   2 =  0%     0/   2 =  0%  fd00:192:168:173::209
                                       0/   2 =  0%   |
  3  615ms     0/   2 =  0%     0/   2 =  0%  fd00:192:168:173::209
                                       0/   2 =  0%   |
  4  492ms     0/   2 =  0%     0/   2 =  0%  fd00:192:168:203::1
                                       0/   2 =  0%   |
  5  421ms     0/   2 =  0%     0/   2 =  0%  fd00:192:168:203::2
                                       0/   2 =  0%   |
  6  334ms     0/   2 =  0%     0/   2 =  0%  2400:5200:1400:9f::2c
                                       0/   2 =  0%   |
  7  640ms     0/   2 =  0%     0/   2 =  0%  voda-india-gw.it.cw.net [2001:5008:100:13::2]
                                       0/   2 =  0%   |
  8  307ms     0/   2 =  0%     0/   2 =  0%  2001:4860:1:1::fe8
                                       0/   2 =  0%   |
  9  ---       2/   2 =100%     2/   2 =100%  2404:6800:8013::1
                                       0/   2 =  0%   |
 10  ---       2/   2 =100%     2/   2 =100%  2001:4860:0:1::2038
                                       0/   2 =  0%   |
 11  ---       2/   2 =100%     2/   2 =100%  2001:4860:0:1::876a
                                       0/   2 =  0%   |
 12  ---       2/   2 =100%     2/   2 =100%  2001:4860::9:4001:7734
                                       0/   2 =  0%   |
 13  ---       2/   2 =100%     2/   2 =100%  2001:4860::9:4001:67bd
                                       0/   2 =  0%   |
 14  ---       2/   2 =100%     2/   2 =100%  2001:4860:0:1::78bd
                                       0/   2 =  0%   |
 15  ---       2/   2 =100%     2/   2 =100%  2001:4860:0:1::539b
                                       0/   2 =  0%   |
 16  484ms     0/   2 =  0%     0/   2 =  0%  del12s08-in-x0e.1e100.net [2404:6800:4002:825::200e]

Trace complete.
```

Date: 29/06/ 2025

```
C:\Users\ASUS>pathping /4 google.com

Tracing route to google.com [142.250.194.238]
over a maximum of 30 hops:
  0  DESKTOP-VISHAL [192.168.23.212]
  1  192.168.23.136
  2     *        *        *
Computing statistics for 25 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           DESKTOP-VISHAL [192.168.23.212]
                                    0/ 100 =  0%   |
  1    4ms     0/ 100 =  0%     0/ 100 =  0%  192.168.23.136

Trace complete.
```

10. arp

Description: Arp stands for Address Resolution Protocol.It's a network utility used to **map IP addresses to MAC addresses** on local network.

No.	Option	Description
1	Arp-a	Displays the current ARP cache
2	Arp-d<IP>	Deletes the ARP entry for the specified IP
3	Arp -s<IP><MAC>	Adds a static ARP entry

Implementation:

```
C:\Users\ASUS>arp -s 192.168.1.10 00-14-22-01-23-45
The ARP entry addition failed: The requested operation requires elevation.
```

Date: 29/06/ 2025

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

Interface: 192.168.23.212 --- 0x10
  Internet Address      Physical Address      Type
  192.168.23.136        d6-7d-39-aa-13-eb     dynamic
  192.168.23.255        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\ASUS>arp -d 192.168.1.10
The ARP entry deletion failed: The requested operation requires elevation.
```