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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 Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings. ipconfig displays Internet Protocol version 4 (IPv4) and version 6 (IPv6) addresses. Subnet mask, and default gateway for all adapters.

No.	Option	Description
1	ipconfig/all	Display full configuration information.
2	ipconfig/release	Release the IPv4 address for the specified adapter.
3	ipconfig/displaydns	Display the contents of the DNS Resolver Cache.
4	ipconfig/allcompartments	Show information about all compartments.
5	ipconfig/renew6	It is used to renew the IPv6 address for the specified adapter.

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Implementation:

```
C:\Windows\System32>ipconfig /all

Windows IP Configuration

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

Ethernet adapter Ethernet 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : ExpressVPN TAP Adapter
   Physical Address. . . . . . . . . : 00-FF-3F-7E-92-72
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Ethernet adapter Ethernet:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Realtek PCIe GbE Family Controller
   Physical Address. . . . . . . . . : BC-E9-2F-EF-A2-69
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 7:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #9
   Physical Address. . . . . . . . . : DA-C0-A6-0D-D0-75
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 8:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #10
   Physical Address. . . . . . . . . : FA-C0-A6-0D-D0-75
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::1bc6:58a2:831f:f981%4(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.137.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :
   NetBIOS over Tcpip. . . . . . . . : Enabled

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Realtek RTL8821CE 802.11ac PCIe Adapter
   Physical Address. . . . . . . . . : D8-C0-A6-0D-D0-75
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::c86b:b037:3aa4:e4a5%25(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.1.8(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : 29 July 2025 22:45:25
   Lease Expires . . . . . . . . . . : 31 July 2025 14:01:05
   Default Gateway . . . . . . . . . : fe80::1%25
                                       192.168.1.1
   DHCP Server . . . . . . . . . . . : 192.168.1.1
   DHCPv6 IAID . . . . . . . . . . . : 601407654
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-26-8B-5C-B1-BC-E9-2F-EF-A2-69
   DNS Servers . . . . . . . . . . . : fe80::1%25
                                       192.168.1.1
                                       fe80::1%25
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

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```
C:\Windows\System32>ipconfig /release

Windows IP Configuration

No operation can be performed on Ethernet 2 while it has its media disconnected.
No operation can be performed on Ethernet while it has its media disconnected.
No operation can be performed on Local Area Connection* 7 while it has its media disconnected.

Ethernet adapter Ethernet 2:

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

Ethernet adapter Ethernet:

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

Wireless LAN adapter Local Area Connection* 7:

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

Wireless LAN adapter Local Area Connection* 8:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::1bc6:58a2:831f:f981%4
   IPv4 Address. . . . . . . . . . . : 192.168.137.1
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::c86b:b037:3aa4:e4a5%25
   Default Gateway . . . . . . . . . : fe80::1%25
```

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```
C:\Windows\System32>ipconfig /displaydns

Windows IP Configuration

    lookup.gpoppa.com
    ----------------------------------------
    Record Name . . . . . : lookup.gpoppa.com
    Record Type . . . . . : 1
    Time To Live  . . . . : 40491
    Data Length . . . . . : 4
    Section . . . . . . . : Answer
    A (Host) Record . . . : 150.136.229.233


    monitor.repocket.com
    ----------------------------------------
    Record Name . . . . . : monitor.repocket.com
    Record Type . . . . . : 1
    Time To Live  . . . . : 40264
    Data Length . . . . . : 4
    Section . . . . . . . : Answer
    A (Host) Record . . . : 104.26.14.136


    watson.events.data.microsoft.com
    ----------------------------------------
    Record Name . . . . . : watson.events.data.microsoft.com
    Record Type . . . . . : 5
    Time To Live  . . . . : 40078
    Data Length . . . . . : 8
    Section . . . . . . . : Answer
    CNAME Record  . . . . : blobcollectorcommon.trafficmanager.net


    Record Name . . . . . : blobcollectorcommon.trafficmanager.net
    Record Type . . . . . : 5
    Time To Live  . . . . : 40078
    Data Length . . . . . : 8
    Section . . . . . . . : Answer
    CNAME Record  . . . . : onedsblobprdeus17.eastus.cloudapp.azure.com


    Record Name . . . . . : onedsblobprdeus17.eastus.cloudapp.azure.com
    Record Type . . . . . : 1
    Time To Live  . . . . : 40078
    Data Length . . . . . : 4
    Section . . . . . . . : Answer
    A (Host) Record . . . : 20.42.65.92
```

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```
C:\Windows\System32>ipconfig /allcompartments

Windows IP Configuration


================================================================================
Network Information for Compartment 1 (ACTIVE)
================================================================================

Ethernet adapter Ethernet 2:

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

Ethernet adapter Ethernet:

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

Wireless LAN adapter Local Area Connection* 7:

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

Wireless LAN adapter Local Area Connection* 8:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::1bc6:58a2:831f:f981%4
   IPv4 Address. . . . . . . . . . . : 192.168.137.1
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::c86b:b037:3aa4:e4a5%25
   IPv4 Address. . . . . . . . . . . : 192.168.1.8
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::1%25
                                       192.168.1.1
```

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```
C:\Windows\System32>ipconfig /renew6

Windows IP Configuration

No operation can be performed on Ethernet 2 while it has its media disconnected.
No operation can be performed on Ethernet while it has its media disconnected.
No operation can be performed on Local Area Connection* 7 while it has its media disconnected.

Ethernet adapter Ethernet 2:

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

Ethernet adapter Ethernet:

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

Wireless LAN adapter Local Area Connection* 7:

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

Wireless LAN adapter Local Area Connection* 8:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::1bc6:58a2:831f:f981%4
   IPv4 Address. . . . . . . . . . . : 192.168.137.1
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::c86b:b037:3aa4:e4a5%25
   IPv4 Address. . . . . . . . . . . : 192.168.1.8
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::1%25
                                       192.168.1.1
```

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2. ping

Description:

The ping command is a utility used to test the reachability of a host on an IP network and to measure the round-trip time for messages sent from the originating host to destination computer. It's commonly used for network diagnostics and trouble shooting.

No.	Option	Description
1	ping -t google.com	Ping the specified host until stopped.
2	ping -a google.com	Resolve addresses to hostnames.
3	ping -n count google.com	Number of echo requests to send.
4	ping -l 16 google.com	Send buffer size.
5	ping -r 6 google.com	Record route for count hops.

Implementation:

```
C:\Windows\System32>ping -t google.com

Pinging google.com [142.250.70.110] with 32 bytes of data:
Reply from 142.250.70.110: bytes=32 time=34ms TTL=116
Reply from 142.250.70.110: bytes=32 time=64ms TTL=116
Reply from 142.250.70.110: bytes=32 time=33ms TTL=116
Reply from 142.250.70.110: bytes=32 time=34ms TTL=116
Reply from 142.250.70.110: bytes=32 time=41ms TTL=116
Reply from 142.250.70.110: bytes=32 time=34ms TTL=116
Reply from 142.250.70.110: bytes=32 time=30ms TTL=116
Reply from 142.250.70.110: bytes=32 time=45ms TTL=116
Reply from 142.250.70.110: bytes=32 time=27ms TTL=116
Reply from 142.250.70.110: bytes=32 time=30ms TTL=116
Reply from 142.250.70.110: bytes=32 time=31ms TTL=116

Ping statistics for 142.250.70.110:
    Packets: Sent = 11, Received = 11, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 27ms, Maximum = 64ms, Average = 36ms
Control-C
^C
```

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```
C:\Windows\System32>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=125ms TTL=116
Reply from 142.250.70.110: bytes=32 time=49ms TTL=116
Reply from 142.250.70.110: bytes=32 time=61ms TTL=116
Reply from 142.250.70.110: bytes=32 time=49ms 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 = 49ms, Maximum = 125ms, Average = 71ms
```

```
C:\Windows\System32>ping -n 7 google.com

Pinging google.com [142.250.70.110] with 32 bytes of data:
Reply from 142.250.70.110: bytes=32 time=29ms TTL=116
Reply from 142.250.70.110: bytes=32 time=26ms TTL=116
Reply from 142.250.70.110: bytes=32 time=27ms TTL=116
Reply from 142.250.70.110: bytes=32 time=26ms TTL=116
Reply from 142.250.70.110: bytes=32 time=35ms TTL=116
Reply from 142.250.70.110: bytes=32 time=29ms TTL=116
Reply from 142.250.70.110: bytes=32 time=68ms TTL=116

Ping statistics for 142.250.70.110:
    Packets: Sent = 7, Received = 7, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 26ms, Maximum = 68ms, Average = 34ms
```

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```
C:\Windows\System32>ping -l 16 google.com

Pinging google.com [142.251.222.78] with 16 bytes of data:
Reply from 142.251.222.78: bytes=16 time=48ms TTL=118
Reply from 142.251.222.78: bytes=16 time=20ms TTL=118
Reply from 142.251.222.78: bytes=16 time=21ms TTL=118
Reply from 142.251.222.78: bytes=16 time=19ms TTL=118

Ping statistics for 142.251.222.78:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 19ms, Maximum = 48ms, Average = 27ms
```

```
C:\Windows\System32>Ping -r 6 google.com

Pinging google.com [216.58.203.46] with 32 bytes of data:
Reply from 216.58.203.46: bytes=32 time=42ms TTL=120
Reply from 216.58.203.46: bytes=32 time=32ms TTL=120
Reply from 216.58.203.46: bytes=32 time=35ms TTL=120
Reply from 216.58.203.46: bytes=32 time=34ms TTL=120

Ping statistics for 216.58.203.46:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 32ms, Maximum = 42ms, Average = 35ms
```

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3. getmac

Description:

The getmac command is used in Windows operation system to display the Media Access Control (MAC) addresses of network interfaces. It provides information about the MAC addresses for all network adapters, including both physical and virtual network interfaces, and is useful for network troubleshooting and configuration tasks. The command can be run in the Command Prompt and Also supports various options for customizing the output.

No.	Option	Description
1	getmac	This tool enables an administrator to display the mac address network adapters on the system.
2	getmac /v	Specifies the verbose output is displayed.
3	getmac /nh	Specifies that the "Column Header" should not be displayed in the output. Valid only for TABLE and CSV formats.
4	getmac /fo Format	Specifies the format in which the output is to be displayed. Values: 'table', 'list', 'csv'.
5	getmac /?	Displays the help message and various options available.

Implementation:

```
C:\Windows\System32>getmac

Physical Address    Transport Name
=================== ============================================================
00-FF-3F-7E-92-72   Media disconnected
D8-C0-A6-0D-D0-75   \Device\Tcpip_{ECE01C2F-6563-43BA-803E-64552C616AF7}
BC-E9-2F-EF-A2-69   Media disconnected
FA-C0-A6-0D-D0-75   \Device\Tcpip_{0D8E5D49-0093-4A4F-919B-2EC25D453CA2}
```

```
C:\Windows\System32>getmac /v

Connection Name Network Adapter Physical Address    Transport Name
=============== =============== =================== ============================================================
Ethernet 2      ExpressVPN TAP  00-FF-3F-7E-92-72   Media disconnected
Wi-Fi           Realtek RTL8821 D8-C0-A6-0D-D0-75   \Device\Tcpip_{ECE01C2F-6563-43BA-803E-64552C616AF7}
Ethernet        Realtek PCIe Gb BC-E9-2F-EF-A2-69   Media disconnected
Local Area Conn Microsoft Wi-Fi FA-C0-A6-0D-D0-75   \Device\Tcpip_{0D8E5D49-0093-4A4F-919B-2EC25D453CA2}
```

```
C:\Windows\System32>getmac /nh

00-FF-3F-7E-92-72   Media disconnected
D8-C0-A6-0D-D0-75   \Device\Tcpip_{ECE01C2F-6563-43BA-803E-64552C616AF7}
BC-E9-2F-EF-A2-69   Media disconnected
FA-C0-A6-0D-D0-75   \Device\Tcpip_{0D8E5D49-0093-4A4F-919B-2EC25D453CA2}
```

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```
C:\Windows\System32>getmac /fo table

Physical Address    Transport Name
=================== ==========================================================
00-FF-3F-7E-92-72   Media disconnected
D8-C0-A6-0D-D0-75   \Device\Tcpip_{ECE01C2F-6563-43BA-803E-64552C616AF7}
BC-E9-2F-EF-A2-69   Media disconnected
FA-C0-A6-0D-D0-75   \Device\Tcpip_{0D8E5D49-0093-4A4F-919B-2EC25D453CA2}
```

```
C:\Windows\System32>getmac /?

GETMAC [/S system [/U username [/P [password]]]] [/FO format] [/NH] [/V]

Description:
    This tool enables an administrator to display the MAC address
    for network adapters on a system.

Parameter List:
    /S      system          Specifies the remote system to connect to.

    /U      [domain\]user   Specifies the user context under
                            which the command should execute.

    /P      [password]      Specifies the password for the given
                            user context. Prompts for input if omitted.

    /FO     format          Specifies the format in which the output
                            is to be displayed.
                            Valid values: "TABLE", "LIST", "CSV".

    /NH                     Specifies that the "Column Header" should
                            not be displayed in the output.
                            Valid only for TABLE and CSV formats.

    /V                      Specifies that verbose output is displayed.

    /?                      Displays this help message.

Examples:
    GETMAC /?
    GETMAC /FO csv
    GETMAC /S system /NH /V
    GETMAC /S system /U user
    GETMAC /S system /U domain\user /P password /FO list /V
    GETMAC /S system /U domain\user /P password /FO table /NH
```

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4. systeminfo

Description:

The systeminfo command in Windows is used to display detailed configuration information about a computer and its operating system. It provides data such as the OS version, system manufacturer, processor type, BIOS version, memory, network adapter details, and more. This command is useful for diagnosing system issues, performing audits, and gathering information for support purposes.

No.	Option	Description
1	systeminfo	This tool displays operating system configuration information for a local or remote machine, including service pack levels.
2	systeminfo /nh	Specifies that the "Column Header" should not be displayed in the output. Valid only for TABLE and CSV formats.
3	systeminfo /fo Format	Specifies the format in which the output is to be displayed. Value: 'table', 'list', 'csv'.
4	systeminfo /?	Displays the help message and options.

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Implementation:

```
C:\Windows\System32>systeminfo

Host Name:                     DRASHTI
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:              kuldeeprathod1043@gmail.com
Registered Organization:       HP
Product ID:                    00327-36215-31348-AAOEM
Original Install Date:         22-12-2024, 23:00:48
System Boot Time:              29-07-2025, 22:44:46
System Manufacturer:           HP
System Model:                  HP Laptop 15s-du2xxx
System Type:                   x64-based PC
Processor(s):                  1 Processor(s) Installed.
                               [01]: Intel64 Family 6 Model 126 Stepping 5 GenuineIntel ~991 Mhz
BIOS Version:                  Insyde F.66, 10-05-2024
Windows Directory:             C:\WINDOWS
System Directory:              C:\WINDOWS\system32
Boot Device:                   \Device\HarddiskVolume4
System Locale:                 en-us;English (United States)
Input Locale:                  00004009
Time Zone:                     (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:         12,070 MB
Available Physical Memory:     6,309 MB
Virtual Memory: Max Size:      13,926 MB
Virtual Memory: Available:     7,805 MB
Virtual Memory: In Use:        6,121 MB
Page File Location(s):         D:\pagefile.sys
Domain:                        WORKGROUP
Logon Server:                  \\DRASHTI
Hotfix(s):                     3 Hotfix(s) Installed.
                               [01]: KB5056579
                               [02]: KB5053598
                               [03]: KB5064485
Network Card(s):               4 NIC(s) Installed.
                               [01]: ExpressVPN TAP Adapter
                                     Connection Name: Ethernet 2
                                     Status:          Media disconnected
                               [02]: Realtek RTL8821CE 802.11ac PCIe Adapter
                                     Connection Name: Wi-Fi
                                     DHCP Enabled:    Yes
                                     DHCP Server:     192.168.1.1
                                     IP address(es)
                                     [01]: 192.168.1.10
                                     [02]: fe80::c86b:b037:3aa4:e4a5
                               [03]: Realtek PCIe GbE Family Controller
                                     Connection Name: Ethernet
                                     Status:          Media disconnected
                               [04]: Microsoft Wi-Fi Direct Virtual Adapter
                                     Connection Name: Local Area Connection* 8
                                     DHCP Enabled:    No
                                     IP address(es)
                                     [01]: 192.168.137.1
                                     [02]: fe80::1bc6:58a2:831f:f981
Virtualization-based security: Status: Not enabled
                               App Control for Business policy: Enforced
                               App Control for Business user mode policy: Off
                               Security Features Enabled:
Hyper-V Requirements:          VM Monitor Mode Extensions: Yes
                               Virtualization Enabled In Firmware: Yes
                               Second Level Address Translation: Yes
                               Data Execution Prevention Available: Yes
```

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```
C:\Windows\System32>systeminfo /fo list

Host Name:                     DRASHTI
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:              kuldeeprathod1043@gmail.com
Registered Organization:       HP
Product ID:                    00327-36215-31348-AAOEM
Original Install Date:         22-12-2024, 23:00:48
System Boot Time:              29-07-2025, 22:44:46
System Manufacturer:           HP
System Model:                  HP Laptop 15s-du2xxx
System Type:                   x64-based PC
Processor(s):                  1 Processor(s) Installed.
                               [01]: Intel64 Family 6 Model 126 Stepping 5 GenuineIntel ~991 Mhz
BIOS Version:                  Insyde F.66, 10-05-2024
Windows Directory:             C:\WINDOWS
System Directory:              C:\WINDOWS\system32
Boot Device:                   \Device\HarddiskVolume4
System Locale:                 en-us;English (United States)
Input Locale:                  00004009
Time Zone:                     (UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi
Total Physical Memory:         12,070 MB
Available Physical Memory:     5,184 MB
Virtual Memory: Max Size:      13,926 MB
Virtual Memory: Available:     6,645 MB
Virtual Memory: In Use:        7,281 MB
Page File Location(s):         D:\pagefile.sys
Domain:                        WORKGROUP
Logon Server:                  \\DRASHTI
Hotfix(s):                     3 Hotfix(s) Installed.
                               [01]: KB5056579
                               [02]: KB5053598
                               [03]: KB5064485
Network Card(s):               4 NIC(s) Installed.
                               [01]: ExpressVPN TAP Adapter
                                     Connection Name: Ethernet 2
                                     Status:          Media disconnected
                               [02]: Realtek RTL8821CE 802.11ac PCIe Adapter
                                     Connection Name: Wi-Fi
                                     DHCP Enabled:    Yes
                                     DHCP Server:     192.168.1.1
                                     IP address(es)
                                     [01]: 192.168.1.10
                                     [02]: fe80::c86b:b037:3aa4:e4a5
                               [03]: Realtek PCIe GbE Family Controller
                                     Connection Name: Ethernet
                                     Status:          Media disconnected
                               [04]: Microsoft Wi-Fi Direct Virtual Adapter
                                     Connection Name: Local Area Connection* 8
                                     DHCP Enabled:    No
                                     IP address(es)
                                     [01]: 192.168.137.1
                                     [02]: fe80::1bc6:58a2:831f:f981
Virtualization-based security: Status: Not enabled
                               App Control for Business policy: Enforced
                               App Control for Business user mode policy: Off
                               Security Features Enabled:
Hyper-V Requirements:          VM Monitor Mode Extensions: Yes
                               Virtualization Enabled In Firmware: Yes
                               Second Level Address Translation: Yes
                               Data Execution Prevention Available: Yes
```

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```
C:\Windows\System32>systeminfo /fo csv
"Host Name","OS Name","OS Version","OS Manufacturer","OS Configuration","OS Build Type","Registered Owner","Registered Organization","Product ID","Original I
nstall Date","System Boot Time","System Manufacturer","System Model","System Type","Processor(s)","BIOS Version","Windows Directory","System Directory","Boot
 Device","System Locale","Input Locale","Time Zone","Total Physical Memory","Available Physical Memory","Virtual Memory: Max Size","Virtual Memory: Available
","Virtual Memory: In Use","Page File Location(s)","Domain","Logon Server","Hotfix(s)","Network Card(s)","Virtualization-based security","Hyper-V Requirement
s"
"DRASHTI","Microsoft Windows 11 Home Single Language","10.0.26100 N/A Build 26100","Microsoft Corporation","Standalone Workstation","Multiprocessor Free","ku
ldeeprathod1043@gmail.com","HP","00327-36215-31348-AAOEM","22-12-2024, 23:00:48","29-07-2025, 22:44:46","HP","HP Laptop 15s-du2xxx","x64-based PC","1 Process
or(s) Installed.,[01]: Intel64 Family 6 Model 126 Stepping 5 GenuineIntel ~991 Mhz","Insyde F.66, 10-05-2024","C:\WINDOWS","C:\WINDOWS\system32","\Device\Har
ddiskVolume4","en-us;English (United States)","00004009","(UTC+05:30) Chennai, Kolkata, Mumbai, New Delhi","12,070 MB","4,752 MB","13,926 MB","5,808 MB","8,1
18 MB","D:\pagefile.sys","WORKGROUP","\\DRASHTI","3 Hotfix(s) Installed.,[01]: KB5056579,[02]: KB5053598,[03]: KB5064485","4 NIC(s) Installed.,[01]: Express\
PN TAP Adapter,      Connection Name: Ethernet 2,      Status:          Media disconnected,[02]: Realtek RTL8821CE 802.11ac PCIe Adapter,      Connection Nam
e: Wi-Fi,      DHCP Enabled:    Yes,      DHCP Server:     192.168.1.1,      IP address(es),      [01]: 192.168.1.10,      [02]: fe80::c86b:b037:3aa4:e4a5,[0
3]: Realtek PCIe GbE Family Controller,      Connection Name: Ethernet,      Status:          Media disconnected,[04]: Microsoft Wi-Fi Direct Virtual Adapter
,      Connection Name: Local Area Connection* 8,      DHCP Enabled:    No,      IP address(es),      [01]: 192.168.137.1,      [02]: fe80::1bc6:58a2:831f:f9
81","Status: Not enabled,App Control for Business policy: Enforced,App Control for Business user mode policy: Off,Security Features Enabled:","VM Monitor Mod
e Extensions: Yes,Virtualization Enabled In Firmware: Yes,Second Level Address Translation: Yes,Data Execution Prevention Available: Yes"
```

```
C:\Windows\System32>systeminfo /?

SYSTEMINFO [/S system [/U username [/P [password]]]] [/FO format] [/NH]

Description:
    This tool displays operating system configuration information for
    a local or remote machine, including service pack levels.

Parameter List:
    /S      system          Specifies the remote system to connect to.

    /U      [domain\]user   Specifies the user context under which
                            the command should execute.

    /P      [password]      Specifies the password for the given
                            user context. Prompts for input if omitted.

    /FO     format          Specifies the format in which the output
                            is to be displayed.
                            Valid values: "TABLE", "LIST", "CSV".

    /NH                     Specifies that the "Column Header" should
                            not be displayed in the output.
                            Valid only for "TABLE" and "CSV" formats.

    /?                      Displays this help message.

Examples:
    SYSTEMINFO
    SYSTEMINFO /?
    SYSTEMINFO /S system
    SYSTEMINFO /S system /U user
    SYSTEMINFO /S system /U domain\user /P password /FO TABLE
    SYSTEMINFO /S system /FO LIST
    SYSTEMINFO /S system /FO CSV /NH
```

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5. traceroute / tracert

Description:

The traceroute/tracert on Windows command is a network diagnostic tool used to track the path packets take from a source to a destination. It identifies each hop along the route and measures the transit delays of packets across the network. This helps in pinpointing network congestion or failures.

No.	Option	Description
1	tracert -d	Do not resolve addresses to hostnames.
2	tracert -4	Forced to use IPv4.
3	tracert -6	Forced to use IPv6.
4	tracert -w timeout	Specifies the time in milliseconds, of waiting for each reply before timeout, allowing users to adjust the sensitivity of the response time for each hop in the trace route.
5	tracert -h maximum_hops	Sets the maximum number of hops (steps) the traceroute will take in its attempts to reach the destination. Allowing users to limit the scope of the trace.

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Implementation:

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

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

  1     6 ms     4 ms     4 ms  2409:40c1:3002:61f7::a4
  2   207 ms   178 ms   195 ms  2405:200:5210:5:3924:110:3:105
  3   223 ms   197 ms   143 ms  2405:200:5210:5:3925::1
  4     *        *        *     Request timed out.
  5     *        *        *     Request timed out.
  6    67 ms    40 ms    55 ms  2405:200:801:2e00::80
  7     *        *        *     Request timed out.
  8     *        *        *     Request timed out.
  9     *        *        *     Request timed out.
 10     *        *        *     Request timed out.
 11     *      682 ms     *     2404:6800:8095::1
 12     *      687 ms     *     2001:4860:0:1::1686
 13   342 ms     *        *     2001:4860:0:1::77d0
 14   700 ms   513 ms   424 ms  2001:4860::9:4001:d9e7
 15   294 ms   497 ms   116 ms  2001:4860::9:4001:ddce
 16    92 ms   126 ms   118 ms  2001:4860::9:4002:d931
 17   136 ms     *        *     2001:4860:0:1::1baf
 18   132 ms   146 ms   109 ms  2001:4860:0:1::4fe5
 19    96 ms   118 ms   120 ms  2404:6800:4009:80c::200e

Trace complete.
```

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

Tracing route to google.com [142.251.220.78]
over a maximum of 30 hops:

  1     7 ms     4 ms     4 ms  192.168.71.211
  2     *        *        *     Request timed out.
  3     *        *        *     Request timed out.
  4     *        *        *     Request timed out.
  5   212 ms    83 ms    43 ms  192.168.227.194
  6   221 ms   978 ms    60 ms  172.28.2.20
  7     *        *        *     Request timed out.
  8     *        *        *     Request timed out.
  9     *        *        *     Request timed out.
 10     *        *      277 ms  209.85.168.26
 11  1050 ms    61 ms    71 ms  142.251.225.207
 12   222 ms   162 ms    63 ms  142.250.214.105
 13    97 ms    63 ms    62 ms  hkg07s51-in-f14.1e100.net [142.251.220.78]

Trace complete.
```

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```
C:\Windows\System32>tracert -6 google.com

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

  1  Destination net unreachable.

Trace complete.
```

```
C:\Users\HP>tracert -h 5 google.com

Tracing route to google.com [2404:6800:4009:823::200e]
over a maximum of 5 hops:

  1    69 ms     5 ms     5 ms  2409:40c1:3002:61f7::a4
  2    59 ms    42 ms    27 ms  2405:200:5210:5:3924:110:3:105
  3   118 ms    62 ms    33 ms  2405:200:5210:5:3925::1
  4     *        *        *     Request timed out.
  5     *        *        *     Request timed out.

Trace complete.
```

```
C:\Users\HP>tracert -w 5 google.com

Tracing route to google.com [2404:6800:4009:803::200e]
over a maximum of 30 hops:

  1    10 ms     5 ms     5 ms  2409:40c1:3002:61f7::a4
  2    73 ms    67 ms    26 ms  2405:200:5210:5:3924:110:3:105
  3   155 ms     *      172 ms  2405:200:5210:5:3925::1
  4     *        *        *     Request timed out.
  5     *        *        *     Request timed out.
  6    69 ms    48 ms    36 ms  2405:200:801:2e00::84
  7     *        *        *     Request timed out.
  8     *        *        *     Request timed out.
  9     *        *        *     Request timed out.
 10    99 ms   107 ms   127 ms  2404:6800:80eb::1
 11     *       64 ms    49 ms  2001:4860:0:1::49e6
 12    71 ms    62 ms     *     2001:4860:0:1::8710
 13     *       65 ms     *     2001:4860:0:1::1baf
 14    55 ms    67 ms    50 ms  2001:4860:0:1::7b7f
 15     *      282 ms     *     bom07s11-in-x0e.1e100.net [2404:6800:4009:803::200e]
 16   177 ms   198 ms     *     bom07s11-in-x0e.1e100.net [2404:6800:4009:803::200e]
 17   160 ms   125 ms    78 ms  bom07s11-in-x0e.1e100.net [2404:6800:4009:803::200e]

Trace complete.
```

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6. netstat

Description:

The netstat command is a network utility that displays active network connections, routing tables, interface statistics, masquerade connections, and multicast memberships. It provides detailed information about the network status and is commonly used for troubleshooting and network monitoring. The command works across various operating systems, including Unix, Linux, and Windows.

No.	Option	Description
1	netstat -a	Displays all connections and listening ports.
2	netstat -e	Displays ethernet statistics.
3	netstat -f	Displays Fully Qualified Domain Names (FQDN) for foreign addresses.
4	netstat -i	Displays the time spent by a TCP connection in its current state.
5	netstat -n	Displays addresses and port numbers in numerical form.

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Implementation:

```
C:\Windows\System32>netstat -a

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            Drashti:0              LISTENING
  TCP    0.0.0.0:445            Drashti:0              LISTENING
  TCP    0.0.0.0:2869           Drashti:0              LISTENING
  TCP    0.0.0.0:5040           Drashti:0              LISTENING
  TCP    0.0.0.0:5357           Drashti:0              LISTENING
  TCP    0.0.0.0:7070           Drashti:0              LISTENING
  TCP    0.0.0.0:7250           Drashti:0              LISTENING
  TCP    0.0.0.0:9095           Drashti:0              LISTENING
  TCP    0.0.0.0:49664          Drashti:0              LISTENING
  TCP    0.0.0.0:49665          Drashti:0              LISTENING
  TCP    0.0.0.0:49666          Drashti:0              LISTENING
  TCP    0.0.0.0:49667          Drashti:0              LISTENING
  TCP    0.0.0.0:49668          Drashti:0              LISTENING
  TCP    0.0.0.0:49724          Drashti:0              LISTENING
  TCP    127.0.0.1:2015         Drashti:0              LISTENING
  TCP    127.0.0.1:9093         Drashti:0              LISTENING
  TCP    127.0.0.1:17400        Drashti:0              LISTENING
  TCP    127.0.0.1:19293        Drashti:0              LISTENING
  TCP    127.0.0.1:19294        Drashti:0              LISTENING
  TCP    127.0.0.1:27017        Drashti:0              LISTENING
  TCP    192.168.1.10:139       Drashti:0              LISTENING
  TCP    192.168.1.10:60584     relay-29350d34:https   ESTABLISHED
  TCP    192.168.1.10:60586     4.213.25.241:https     ESTABLISHED
  TCP    192.168.1.10:60595     a23-38-59-250:http     CLOSE_WAIT
  TCP    192.168.1.10:60764     40.100.141.162:https   ESTABLISHED
  TCP    192.168.1.10:60903     a23-212-254-51:https   CLOSE_WAIT
  TCP    192.168.1.10:60927     68.220.193.245:https   CLOSE_WAIT
  TCP    192.168.1.10:60953     whatsapp-chatd-edge-shv-01-bom2:http  TIME_WAIT
  TCP    192.168.1.10:61299     se-in-f188:5228        ESTABLISHED
  TCP    192.168.1.10:61308     51.132.193.104:https   TIME_WAIT
  TCP    192.168.137.1:139      Drashti:0              LISTENING
  TCP    [::]:135               Drashti:0              LISTENING
  TCP    [::]:445               Drashti:0              LISTENING
  TCP    [::]:2869              Drashti:0              LISTENING
  TCP    [::]:5357              Drashti:0              LISTENING
  TCP    [::]:7070              Drashti:0              LISTENING
  TCP    [::]:7250              Drashti:0              LISTENING
  TCP    [::]:9095              Drashti:0              LISTENING
  TCP    [::]:49664             Drashti:0              LISTENING
  TCP    [::]:49665             Drashti:0              LISTENING
  TCP    [::]:49666             Drashti:0              LISTENING
  TCP    [::]:49667             Drashti:0              LISTENING
  TCP    [::]:49668             Drashti:0              LISTENING
  TCP    [::]:49724             Drashti:0              LISTENING
  TCP    [::1]:24642            Drashti:0              LISTENING
  TCP    [::1]:49669            Drashti:0              LISTENING
  UDP    0.0.0.0:123            *:*
  UDP    0.0.0.0:500            *:*
  UDP    0.0.0.0:3702           *:*
  UDP    0.0.0.0:3702           *:*
  UDP    0.0.0.0:4500           *:*
  UDP    0.0.0.0:5050           *:*
  UDP    0.0.0.0:5353           *:*
  UDP    0.0.0.0:5355           *:*
  UDP    0.0.0.0:49894          *:*
  UDP    0.0.0.0:50001          *:*
  UDP    127.0.0.1:1900         *:*
  UDP    127.0.0.1:49664        127.0.0.1:49664
  UDP    127.0.0.1:57930        *:*
  UDP    192.168.1.10:137       *:*
  UDP    192.168.1.10:138       *:*
  UDP    192.168.1.10:1900      *:*
  UDP    192.168.1.10:57929     *:*
  UDP    192.168.137.1:67       *:*
  UDP    192.168.137.1:68       *:*
  UDP    192.168.137.1:137      *:*
  UDP    192.168.137.1:138      *:*
  UDP    192.168.137.1:1900     *:*
  UDP    192.168.137.1:57928    *:*
  UDP    [::]:123               *:*
  UDP    [::]:500               *:*
  UDP    [::]:3702              *:*
  UDP    [::]:3702              *:*
  UDP    [::]:4500              *:*
  UDP    [::]:5353              *:*
  UDP    [::]:5355              *:*
  UDP    [::]:49895             *:*
  UDP    [::1]:1900             *:*
  UDP    [::1]:57927            *:*
  UDP    [fe80::1bc6:58a2:831f:f981%4]:1900  *:*
  UDP    [fe80::1bc6:58a2:831f:f981%4]:57925  *:*
  UDP    [fe80::c86b:b037:3aa4:e4a5%25]:1900  *:*
  UDP    [fe80::c86b:b037:3aa4:e4a5%25]:57926  *:*
```

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```
C:\Windows\System32>netstat -e
Interface Statistics

                           Received            Sent

Bytes                    1136532318        46717583
Unicast packets             859470          410808
Non-unicast packets           3348           10083
Discards                         0               0
Errors                           0               0
Unknown protocols                0
```

```
C:\Windows\System32>netstat -f

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    192.168.1.10:60584     relay-29350d34.net.anydesk.com:https  ESTABLISHED
  TCP    192.168.1.10:60586     4.213.25.241:https     ESTABLISHED
  TCP    192.168.1.10:60595     a23-38-59-250.deploy.static.akamaitechnologies.com:http  CLOSE_WAIT
  TCP    192.168.1.10:60764     40.100.141.162:https   ESTABLISHED
  TCP    192.168.1.10:60903     a23-212-254-51.deploy.static.akamaitechnologies.com:https  CLOSE_WAIT
  TCP    192.168.1.10:60927     68.220.193.245:https   CLOSE_WAIT
  TCP    192.168.1.10:61299     se-in-f188.1e100.net:5228  ESTABLISHED
```

```
C:\Windows\System32>netstat -i

Active Connections

  Proto  Local Address          Foreign Address        State           Time in State (ms)
TCP    192.168.1.10:60584     relay-29350d34:https   ESTABLISHED        1947166
TCP    192.168.1.10:60586     4.213.25.241:https     ESTABLISHED        1946456
TCP    192.168.1.10:60595     a23-38-59-250:http     CLOSE_WAIT         1442765
TCP    192.168.1.10:60764     40.100.141.162:https   ESTABLISHED        1865122
TCP    192.168.1.10:60903     a23-212-254-51:https   CLOSE_WAIT         1499241
TCP    192.168.1.10:60927     68.220.193.245:https   CLOSE_WAIT         1491543
TCP    192.168.1.10:61299     se-in-f188:5228        ESTABLISHED        242562
```

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

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    192.168.1.10:60584     148.113.16.192:443     ESTABLISHED
  TCP    192.168.1.10:60586     4.213.25.241:443       ESTABLISHED
  TCP    192.168.1.10:60595     23.38.59.250:80        CLOSE_WAIT
  TCP    192.168.1.10:60764     40.100.141.162:443     ESTABLISHED
  TCP    192.168.1.10:60903     23.212.254.51:443      CLOSE_WAIT
  TCP    192.168.1.10:60927     68.220.193.245:443     CLOSE_WAIT
  TCP    192.168.1.10:61299     142.251.12.188:5228    ESTABLISHED
```

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7. nslookup

Description:

Nslookup is a command-line network administration tool used to query Domain Name System (DNS) servers. It translates domain names into IP addresses and can also retrieve other DNS records, aiding in diagnosing and troubleshooting DNS issues. Available on various operating systems, it is commonly used to verify DNS configurations and resolve network connectivity problems.

No.	Option	Description
1	nslookup -debug	Print details of debug information.
2	nslookup -timeout=number	Set the time to wait for a reply from the DNS server.
3	nslookup -port=number	Specify the port number to use for the DNS query (default is 53).
4	nslookup -vc	Use a virtual circuit when sending requests to the server.
5	nslookup -tcp	Use TCP instead of UDP.

Implementation:

```
C:\Windows\System32>nslookup -debug
------------
Got answer:
    HEADER:
        opcode = QUERY, id = 1, rcode = NOERROR
        header flags:  response, auth. answer, want recursion, recursion avail.
        questions = 1,  answers = 1,  authority records = 0,  additional = 0

    QUESTIONS:
        1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.e.f.ip6.arpa, type = PTR, class = I
N
    ANSWERS:
    ->  1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.e.f.ip6.arpa
        name = gpon.net
        ttl = 0 (0 secs)

------------
Default Server:  gpon.net
Address:  fe80::1
```

```
C:\Windows\System32>nslookup -timeout=10 google.com
Server:  gpon.net
Address:  fe80::1

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:804::200e
          216.58.203.14
```

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```
C:\Windows\System32>nslookup -port=4 google.com
Server:  gpon.net
Address:  fe80::1

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:804::200e
          216.58.203.14
```

```
C:\Windows\System32>nslookup -vc google.com
Server:  UnKnown
Address:  fe80::1

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:804::200e
          216.58.203.14
```

```
C:\Windows\System32>nslookup -tcp google.com
*** Invalid option: tcp
Server:  gpon.net
Address:  fe80::1

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:804::200e
          216.58.203.14
```

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8. hostname

Description:

The hostname command in a Unix-like operating system is used to display or set the system's hostname. When executed without any arguments, it returns the current hostname of the machine. When used with options or an argument, it can change the hostname or provide more detailed information about the network configuration of the system.

No.	Option	Description
1	hostname	Prints the name of the current host.
2	hostname -a	This option is used to get the alias name of the host system (if any). It will return an empty line if no alias name is set (supported in Unix/Linux-based systems).
3	hostname -d	Used to always set a hostname (supported in Unix/Linux-based systems).
4	hostname -i	This option is used to get the IP (network) addresses (supported in Unix/Linux-based systems).
5	hostname -I	This option is used to get all IP (Network) addresses (supported in Unix/Linux-based systems).

Implementation:

```
C:\Windows\System32>hostname
Drashti
```

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9. pathping

Description:

Pathping is a network utility in Windows that combines the features of ping and tracert. It provides information about latency and packet loss at different points along a network path, helping diagnose network performance issues.

No.	Option	Description
1	pathping -h	Maximum number of hops to search for target.
2	pathping -n	Do not resolve addresses to hostnames.
3	pathping -w timeout	Wait timeout milliseconds for each reply.
4	pathping -4	Force using IPv4.
5	pathping -6	Force using IPv6.

Implementation:

```
C:\Windows\System32>pathping -h 10 google.com

Tracing route to google.com [216.58.203.14]
over a maximum of 10 hops:
  0  Drashti [192.168.1.10]
  1  gpon.net [192.168.1.1]
  2     *        *     182.237.14.17
  3  10.244.22.1 [10.244.22.1]
  4  103.241.47.61
  5  142.250.47.236
  6  74.125.37.7
  7  172.253.77.21
  8  bom12s04-in-f14.1e100.net [216.58.203.14]

Computing statistics for 200 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                          Drashti [192.168.1.10]
                                   0/ 100 =  0%   |
  1   24ms     0/ 100 =  0%     0/ 100 =  0%  gpon.net [192.168.1.1]
                                   0/ 100 =  0%   |
  2   29ms     1/ 100 =  1%     1/ 100 =  1%  182.237.14.17
                                   0/ 100 =  0%   |
  3   30ms     0/ 100 =  0%     0/ 100 =  0%  10.244.22.1 [10.244.22.1]
                                   0/ 100 =  0%   |
  4   38ms     0/ 100 =  0%     0/ 100 =  0%  103.241.47.61
                                   0/ 100 =  0%   |
  5   40ms     0/ 100 =  0%     0/ 100 =  0%  142.250.47.236
                                   0/ 100 =  0%   |
  6   29ms     0/ 100 =  0%     0/ 100 =  0%  74.125.37.7
                                   0/ 100 =  0%   |
  7   32ms     1/ 100 =  1%     1/ 100 =  1%  172.253.77.21
                                   0/ 100 =  0%   |
  8   44ms     0/ 100 =  0%     0/ 100 =  0%  bom12s04-in-f14.1e100.net [216.58.203.14]

Trace complete.
```

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```
C:\Windows\System32>pathping -n google.com

Tracing route to google.com [216.58.203.14]
over a maximum of 30 hops:
  0  192.168.1.10
  1  192.168.1.1
  2  182.237.14.17
  3  10.244.22.1
  4  103.241.47.61
  5  142.250.47.236
  6  74.125.37.7
  7  172.253.77.21
  8  216.58.203.14

Computing statistics for 200 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           192.168.1.10
                                   0/ 100 =  0%   |
  1   13ms     0/ 100 =  0%     0/ 100 =  0%  192.168.1.1
                                   0/ 100 =  0%   |
  2   16ms     0/ 100 =  0%     0/ 100 =  0%  182.237.14.17
                                   0/ 100 =  0%   |
  3   17ms     0/ 100 =  0%     0/ 100 =  0%  10.244.22.1
                                   0/ 100 =  0%   |
  4   35ms     0/ 100 =  0%     0/ 100 =  0%  103.241.47.61
                                   0/ 100 =  0%   |
  5   37ms     0/ 100 =  0%     0/ 100 =  0%  142.250.47.236
                                   0/ 100 =  0%   |
  6   29ms     0/ 100 =  0%     0/ 100 =  0%  74.125.37.7
                                   0/ 100 =  0%   |
  7   32ms     0/ 100 =  0%     0/ 100 =  0%  172.253.77.21
                                   0/ 100 =  0%   |
  8   32ms     0/ 100 =  0%     0/ 100 =  0%  216.58.203.14

Trace complete.
```

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```
C:\Windows\System32>pathping -w 20 google.com

Tracing route to google.com [216.58.203.14]
over a maximum of 30 hops:
  0  Drashti [192.168.1.10]
  1     *     gpon.net [192.168.1.1]
  2  182.237.14.17
  3  10.244.22.1 [10.244.22.1]
  4  103.241.47.61
  5  142.250.47.236
  6  74.125.37.7
  7  172.253.77.21
  8  bom12s04-in-f14.1e100.net [216.58.203.14]

Computing statistics for 200 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           Drashti [192.168.1.10]
                                 0/ 100 =  0%   |
  1   15ms     1/ 100 =  1%     1/ 100 =  1%  gpon.net [192.168.1.1]
                                 0/ 100 =  0%   |
  2    9ms     5/ 100 =  5%     5/ 100 =  5%  182.237.14.17
                                 0/ 100 =  0%   |
  3   14ms     0/ 100 =  0%     0/ 100 =  0%  10.244.22.1 [10.244.22.1]
                                 3/ 100 =  3%   |
  4   25ms     6/ 100 =  6%     3/ 100 =  3%  103.241.47.61
                                 0/ 100 =  0%   |
  5   29ms     5/ 100 =  5%     2/ 100 =  2%  142.250.47.236
                                 0/ 100 =  0%   |
  6   25ms     8/ 100 =  8%     5/ 100 =  5%  74.125.37.7
                                 0/ 100 =  0%   |
  7   34ms     3/ 100 =  3%     0/ 100 =  0%  172.253.77.21
                                 5/ 100 =  5%   |
  8   30ms     8/ 100 =  8%     0/ 100 =  0%  bom12s04-in-f14.1e100.net [216.58.203.14]

Trace complete.
```

Date: 06 / 06 / 2025

```
C:\Windows\System32>pathping -4 google.com

Tracing route to google.com [142.250.67.238]
over a maximum of 30 hops:
  0  Drashti [192.168.1.10]
  1  gpon.net [192.168.1.1]
  2  182.237.14.17
  3  10.244.22.1 [10.244.22.1]
  4  103.241.47.61
  5  142.250.47.236
  6  142.251.76.23
  7  216.239.58.19
  8  bom07s24-in-f14.1e100.net [142.250.67.238]

Computing statistics for 200 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           Drashti [192.168.1.10]
                                     0/ 100 =  0%   |
  1   12ms     2/ 100 =  2%     2/ 100 =  2%  gpon.net [192.168.1.1]
                                     0/ 100 =  0%   |
  2   12ms     2/ 100 =  2%     2/ 100 =  2%  182.237.14.17
                                     0/ 100 =  0%   |
  3   19ms     0/ 100 =  0%     0/ 100 =  0%  10.244.22.1 [10.244.22.1]
                                     0/ 100 =  0%   |
  4   33ms     0/ 100 =  0%     0/ 100 =  0%  103.241.47.61
                                     0/ 100 =  0%   |
  5   33ms     0/ 100 =  0%     0/ 100 =  0%  142.250.47.236
                                     0/ 100 =  0%   |
  6   31ms     1/ 100 =  1%     1/ 100 =  1%  142.251.76.23
                                     0/ 100 =  0%   |
  7   31ms     3/ 100 =  3%     3/ 100 =  3%  216.239.58.19
                                     0/ 100 =  0%   |
  8   31ms     0/ 100 =  0%     0/ 100 =  0%  bom07s24-in-f14.1e100.net [142.250.67.238]

Trace complete.
```

```
C:\Windows\System32>pathping -6 ipv6.google.com

Tracing route to ipv6.l.google.com [2404:6800:4009:808::200e]
over a maximum of 30 hops:
  0  Drashti [fe80::c86b:b037:3aa4:e4a5%25]
  1  Destination net unreachable.

Computing statistics for 25 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           Drashti [fe80::c86b:b037:3aa4:e4a5%25]
                                   100/ 100 =100%   |
  1  ---     100/ 100 =100%     0/ 100 =  0%  Drashti [::]

Trace complete.
```

Date: 06 / 06 / 2025

10.arp

Description:

ARP (Address Resolution Protocol) is a networking protocol used to map an IP address to a physical machine address (MAC Address) that is recognized in the local network. It operates at the data link layer of the OSI model and helps devices communicate within a network by maintaining a table of IP addresses and their corresponding MAC Addresses.

No.	Option	Description
1	arp -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.
2	arp -v	Displays current ARP entries in verbose mode. All invalid entries and entries on the loop-back interface will be shown.
3	arp -d	Display or manipulate ARP entries for a specific network interface.
4	arp -n	Show IP addresses in numerical format instead of trying to resolve hostnames (Not valid in Windows).
5	arp -Eth_addr	Specifies a physical address (Not valid in Windows).

Implementation:

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

Interface: 192.168.137.1 --- 0x4
  Internet Address      Physical Address      Type
  192.168.137.255       ff-ff-ff-ff-ff-ff     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.1.10 --- 0x19
  Internet Address      Physical Address      Type
  192.168.1.1           a8-02-db-85-86-4e     dynamic
  192.168.1.255         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
```

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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.
```

```
C:\Windows\System32>arp -a 192.168.1.1 -v

Interface: 192.168.1.10 --- 0x19
  Internet Address      Physical Address      Type
  192.168.1.1           a8-02-db-85-86-4e     dynamic
```