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Date: 04/06/2025

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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:

Ipconfig displays all current TCP/IP network configuration values. It shows IP address, subnet mask, and default gateway for all adapters.

No.	Option	Description
1	/all	Display full configuration information.
2	/release	Release the IPV4 address for specific for the specific adapter.
3	/renew	Renew the IPv4 address for the specified adapter.
4	/flushhdns	Purges the DNS Resolver cache.
5	/displaydns	Display the contents of the DNS Resolver Cache.

Date: 04/06/2025

Implementation:

```
C:\Users\HP>ipconfig

Windows IP Configuration


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::2784:867b:1d4b:f9b2%15
   IPv4 Address. . . . . . . . . . . : 10.20.64.251
   Subnet Mask . . . . . . . . . . . : 255.255.0.0
   Default Gateway . . . . . . . . . : 10.20.1.1

Ethernet adapter Bluetooth Network Connection:

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

2. ping

Description:

Ping checks the connection between the source host and a destination IP or domain

No.	Option	Description
1	-t	Ping the specified host until stopped.
2	-a	Resolve addresses to hostnames.
3	-n count	Number of echo requests to send.
4	-l size	Send buffer size.
5	-i TTL	Time To Live.

Date: 04/06/2025

Implementation:

```
C:\Users\HP>ping google.com

Pinging google.com [142.251.221.238] with 32 bytes of data:
Reply from 142.251.221.238: bytes=32 time=29ms TTL=118
Reply from 142.251.221.238: bytes=32 time=22ms TTL=118
Reply from 142.251.221.238: bytes=32 time=25ms TTL=118
Reply from 142.251.221.238: bytes=32 time=23ms TTL=118

Ping statistics for 142.251.221.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 29ms, Average = 24ms
```

3. getmac

Description:

Getmac displays the MAC addresses for all network adapter on the system

No.	Option	Description
1	/S system	Specifies the remote system to connect to.
2	/U [domain\]user	Specifies the user context under which the command should execute.
3	/P [password]	Specifies the password for the given context. Prompts for input if omitted.
4	/FO format	Specifies the format in which the output is to be displayed.
5	/V	Specifies that verbose output is displayed.

Implementation:

```
C:\Users\HP>getmac

Physical Address      Transport Name
==================    ========================================================
1C-CE-51-31-3A-56     \Device\Tcpip_{D114CF22-D9E4-4084-82C2-E83B88D7E624}
1C-CE-51-31-3A-57     Media disconnected
```

4. systeminfo

Description:

Systeminfo provides detailed configuration information about the computer and its OS.

No.	Option	Description
1	/S system	Specifies the remote system to connect to.

2	/U	[domain\]user	Specifies the user context under which the command should execute.
3	/P	[password]	Specifies the password for the given context. Prompts for input if omitted.
4	/FO	format	Specifies the format in which the output is to be displayed.
5	/NH		Specifies that the "Column Header" should not be displayed in the output.

Implementation:

```
C:\Users\HP>systeminfo

Host Name:                 HARMIK
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:          HP
Registered Organization:   HP
Product ID:                00342-42677-58718-AAOEM
Original Install Date:     17-12-2024, 16:19:13
System Boot Time:          02-06-2025, 21:29:02
System Manufacturer:       HP
System Model:              HP Laptop 15-fd1xxx
System Type:               x64-based PC
Processor(s):              1 Processor(s) Installed.
                           [01]: Intel64 Family 6 Model 186 Stepping 3 GenuineIntel ~1800 Mhz
BIOS Version:              AMI F.02, 24-04-2024
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:     16,025 MB
Available Physical Memory: 10,016 MB
Virtual Memory: Max Size:  17,049 MB
Virtual Memory: Available: 10,783 MB
Virtual Memory: In Use:    6,266 MB
Page File Location(s):     C:\pagefile.sys
Domain:                    WORKGROUP
Logon Server:              \\HARMIK
Hotfix(s):                 3 Hotfix(s) Installed.
                           [01]: KB5056579
                           [02]: KB5058499
                           [03]: KB5059502
Network Card(s):           1 NIC(s) Installed.
                           [01]: Realtek RTL8852BE WiFi 6 802.11ax PCIe Adapter
                                 Connection Name: Wi-Fi
                                 DHCP Enabled:    Yes
                                 DHCP Server:     10.20.1.1
                                 IP address(es)
                                 [01]: 10.20.64.251
                                 [02]: fe80::2784:867b:1d4b:f9b2
Virtualization-based security: Status: Running
                           Required Security Properties:
                           Available Security Properties:
                                 Base Virtualization Support
                                 Secure Boot
                                 DMA Protection
                                 UEFI Code Readonly
                                 SMM Security Mitigations 1.0
                                 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.
```

Date: 04/06/2025

5. traceroute / tracert

Description:

Shows the path the packets take to a destination.

No.	Option	Description
1	-d	Do not resolve addresses to hostnames.
2	-h maximum_hops	Maximum number of hops to search for target.
3	-j host-list	Loose source route along host-list (IPv4-only).
4	-4	Force using IPv4.
5	-6	Force using IPv6.

Implementation:

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

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

  1     2 ms     2 ms     6 ms  10.20.1.1
  2     3 ms     4 ms     3 ms  static.ill.117.250.171.130.bsnl.co.in [117.250.171.130]
  3     *        *        *     Request timed out.
  4     *        *        *     Request timed out.
  5    31 ms    18 ms    21 ms  142.250.161.230
  6    18 ms    21 ms    24 ms  192.178.111.159
  7    35 ms    16 ms    24 ms  108.170.234.157
  8    50 ms    21 ms    22 ms  pnbomb-bk-in-f14.1e100.net [142.251.221.238]

Trace complete.
```

6. netstat

Description:

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

No.	Option	Description
1	-a	Displays all connections and listening ports.
2	-b	Displays the executable involved in creating each connection or listening port. In some cases well-known executables host multiple independent components, and in these cases the sequence of components involved in creating the connection or listening port is displayed. In this case the executable name is in [] at the bottom, on top is the component it called, and so forth until TCP/IP was reached. Note that this option can be time-consuming and will fail unless you have sufficient permissions.

Date: 04/06/2025

3	-c	Displays a list of processes sorted by the number of TCP or UDP ports currently consumed.
4	-d	Displays DSCP value assocated with each connection.
5	-e	Displays Ethernet statistics. This may be combined with the -s option.

Implementation:

```
C:\Users\HP>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    10.20.64.251:49458     4.213.25.240:https     ESTABLISHED
  TCP    10.20.64.251:51048     relay-b60e1e3a:https   ESTABLISHED
  TCP    10.20.64.251:51066     52.109.52.84:https     ESTABLISHED
  TCP    10.20.64.251:51088     ec2-35-157-11-229:https  CLOSE_WAIT
  TCP    10.20.64.251:51089     ec2-35-157-11-229:https  CLOSE_WAIT
  TCP    10.20.64.251:51094     4.213.25.240:https     ESTABLISHED
  TCP    10.20.64.251:51491     40.100.141.162:https   ESTABLISHED
  TCP    10.20.64.251:51492     40.100.141.162:https   ESTABLISHED
  TCP    10.20.64.251:51572     whatsapp-cdn-shv-01-bom2:https  CLOSE_WAIT
  TCP    10.20.64.251:51573     whatsapp-cdn-shv-02-pnq1:https  CLOSE_WAIT
  TCP    10.20.64.251:51574     whatsapp-cdn-shv-03-bom2:https  CLOSE_WAIT
  TCP    10.20.64.251:51575     117.198.142.227:https  CLOSE_WAIT
  TCP    10.20.64.251:51576     117.236.65.162:https   CLOSE_WAIT
  TCP    10.20.64.251:51579     52.105.230.53:https    TIME_WAIT
  TCP    10.20.64.251:51580     52.182.143.208:https   ESTABLISHED
  TCP    127.0.0.1:49706        Harmik:49707           ESTABLISHED
  TCP    127.0.0.1:49707        Harmik:49706           ESTABLISHED
  TCP    127.0.0.1:49709        Harmik:49710           ESTABLISHED
  TCP    127.0.0.1:49710        Harmik:49709           ESTABLISHED
  TCP    127.0.0.1:49711        Harmik:49712           ESTABLISHED
  TCP    127.0.0.1:49712        Harmik:49711           ESTABLISHED
```

7. nslookup

Description:

Query internet name servers to get domain name or IP address mapping.

No.	Option	Description
1	-g host-list	Loose source route along host-list.
2	-h maximum_hops	Maximum number of hops to search for target.
3	-i address	Use the specified source address.
4	-n	Do not resolve addresses to hostnames.
5	-p period	Wait period milliseconds between pings.

Implementation:

```
C:\Users\HP>nslookup google.com
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:80f::200e
            142.250.183.46
```

8. hostname

Description:

Display the name of the current system.

Implementation:

```
C:\Users\HP>hostname
Harmik
```

9. pathping

Description:

Combines the features of ping and tracert to identify network problems.

No.	Option	Description
1	-g host-list	Loose source route along host-list.
2	-h maximum_hops	Maximum number of hops to search for target.
3	-i address	Use the specified source address.
4	-n	Do not resolve addresses to hostnames.
5	-p period	Wait period milliseconds between pings.

Date: 04/06/2025

Implementation:

```
C:\Users\HP>pathping google.com

Tracing route to google.com [142.251.42.110]
over a maximum of 30 hops:
  0  Harmik [10.20.64.251]
  1  10.20.1.1
  2  static.ill.117.250.171.130.bsnl.co.in [117.250.171.130]
  3     *     218.248.255.22
  4     *       *        *
Computing statistics for 75 seconds...
            Source to Here    This Node/Link
Hop  RTT     Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                             Harmik [10.20.64.251]
                                23/ 100 = 23%    |
  1    8ms    23/ 100 = 23%     0/ 100 =  0%  10.20.1.1
                                 0/ 100 =  0%    |
  2    6ms    23/ 100 = 23%     0/ 100 =  0%  static.ill.117.250.171.130.bsnl.co.in [117.250.171.130]
                                 1/ 100 =  1%    |
  3   21ms    24/ 100 = 24%     0/ 100 =  0%  218.248.255.22

Trace complete.
```

10. arp

Description:

Displays and modifies the IP-to-Physical address translation table.

No.	Option	Description
1	-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	-g	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.
3	-v	Displays current ARP entries in verbose mode. All invalid entries and entries on the loop-back interface will be shown.
4	-d	Deletes the host specified by inet_addr. inet_addr may be wildcarded with * to delete all hosts.
5	-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.

Implementation:

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

Interface: 10.120.15.190 --- 0xf
  Internet Address        Physical Address      Type
  10.120.1.1              7c-5a-1c-ce-2f-57     dynamic
  10.120.255.255          ff-ff-ff-ff-ff-ff     static
  224.0.0.22              01-00-5e-00-00-16     static
  224.0.0.120             01-00-5e-00-00-78     static
  224.0.0.251             01-00-5e-00-00-fb     static
  224.0.0.252             01-00-5e-00-00-fc     static
  224.77.77.77            01-00-5e-4d-4d-4d     static
  239.255.102.18          01-00-5e-7f-66-12     static
  239.255.255.250         01-00-5e-7f-ff-fa     static
  255.255.255.255         ff-ff-ff-ff-ff-ff     static
```