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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	/flushdns	Purges the DNS Resolver cache.
5	/displaydns	Display the contents of the DNS Resolver Cache.



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Implementation:

```
C:\Users\smitm>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

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

Wireless LAN adapter Local Area Connection* 1:

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

Wireless LAN adapter Local Area Connection* 2:

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

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::5dea:fcad:487e:9b62%17
    IPv4 Address. . . . . : 10.20.64.157
    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  . :

C:\Users\smitm>
```

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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.

Implementation:

```
C:\Users\smitm>ping
```

```
Usage: ping [-t] [-a] [-n count] [-l size] [-f] [-i TTL] [-v TOS]
          [-r count] [-s count] [[-j host-list] | [-k host-list]]
          [-w timeout] [-R] [-S srcaddr] [-c compartment] [-p]
          [-4] [-6] target_name
```

Options:

-t	Ping the specified host until stopped. To see statistics and continue - type Control-Break; To stop - type Control-C.
-a	Resolve addresses to hostnames.
-n count	Number of echo requests to send.
-l size	Send buffer size.
-f	Set Don't Fragment flag in packet (IPv4-only).
-i TTL	Time To Live.
-v TOS	Type Of Service (IPv4-only. This setting has been deprecated and has no effect on the type of service field in the IP Header).
-r count	Record route for count hops (IPv4-only).
-s count	Timestamp for count hops (IPv4-only).
-j host-list	Loose source route along host-list (IPv4-only).
-k host-list	Strict source route along host-list (IPv4-only).
-w timeout	Timeout in milliseconds to wait for each reply.
-R	Use routing header to test reverse route also (IPv6-only). Per RFC 5095 the use of this routing header has been deprecated. Some systems may drop echo requests if this header is used.
-S srcaddr	Source address to use.
-c compartment	Routing compartment identifier.
-p	Ping a Hyper-V Network Virtualization provider address.
-4	Force using IPv4.
-6	Force using IPv6.



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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\smitm>getmac

Physical Address      Transport Name
=====
E8-9C-25-1C-DE-67    Media disconnected
CC-47-40-EC-64-10    Media disconnected
CC-47-40-EC-64-11    \Device\NPF{4357BE91-9B97-49E4-8671-1615C4D950EE}

C:\Users\smitm>
```

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.



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Implementation:

```
C:\Users\smitm>systeminfo

Host Name:                               LAPTOP-H4KQ788T
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:                       smitmarul226@gmail.com
Registered Organization:                N/A
Product ID:                             00356-24690-86646-AAOEM
Original Install Date:                  12/26/2024, 10:41:14 PM
System Boot Time:                       6/5/2025, 8:20:41 AM
System Manufacturer:                   ASUSTeK COMPUTER INC.
System Model:                           ASUS TUF Gaming F15 FX506HF_FX506HF
System Type:                            x64-based PC
Processor(s):                           1 Processor(s) Installed.
                                           [01]: Intel®64 Family 6 Model 141 Stepping 1 GenuineIntel ~2611 Mhz
BIOS Version:                           American Megatrends International, LLC. FX506HF.311, 4/22/2024
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:                  7,913 MB
Available Physical Memory:              2,209 MB
Virtual Memory: Max Size:               21,737 MB
Virtual Memory: Available:              12,659 MB
Virtual Memory: In Use:                 9,078 MB
Page File Location(s):                  C:\pagefile.sys
Domain:                                 WORKGROUP
Logon Server:                           \\LAPTOP-H4KQ788T
Hotfix(s):                              4 Hotfix(s) Installed.
                                           [01]: KB50556579
                                           [02]: KB5055627
                                           [03]: KB5058538
                                           [04]: KB5055659
Network Card(s):                        3 NIC(s) Installed.
                                           [01]: Realtek PCIe GbE Family Controller
                                           Connection Name: Ethernet
                                           Status: Media disconnected
                                           [02]: Bluetooth Device (Personal Area Network)
                                           Connection Name: Bluetooth Network Connection
                                           Status: Media disconnected
                                           [03]: MediaTek Wi-Fi 6 MT7921 Wireless LAN Card
                                           Connection Name: Wi-Fi
                                           DHCP Enabled: Yes
                                           DHCP Server: 10.20.1.1
                                           IP address(es)
                                           [01]: 10.20.64.157
                                           [02]: fe80::5dea:fcad:487e:9b62
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.
```

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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\smitm>tracert google.com
```

```
Tracing route to google.com [2404:6800:4009:808::200e]  
over a maximum of 30 hops:
```

```
  1      3 ms      4 ms      3 ms  2409:40c1:31c9:f8a9::e8
  2     110 ms     71 ms     77 ms  2405:200:5210:5:3924:110:3:603
  3      *         *         *    Request timed out.
  4      *         *         *    Request timed out.
  5      *         *         *    Request timed out.
  6     100 ms     60 ms     79 ms  2405:200:801:2e00::84
  7      *         *         *    Request timed out.
  8      *         *         *    Request timed out.
  9     67 ms     90 ms     66 ms  2404:6800:8281:340::1
 10     64 ms     56 ms     49 ms  2404:6800:8281:340::1
 11     65 ms     78 ms     94 ms  2001:4860:0:1::2130
 12     85 ms     58 ms     50 ms  2001:4860:0:1::4fe7
 13     42 ms     78 ms     69 ms  pnbomb-aw-in-x0e.1e100.net [2404:6800:4009:808::200e]
```

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



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

Implementation:

C:\Users\smitm>netstat

Active Connections

Proto	Local Address	Foreign Address	State
TCP	10.176.250.180:49410	4.213.25.242:https	ESTABLISHED
TCP	10.176.250.180:51123	relay-83281261:https	ESTABLISHED
TCP	127.0.0.1:1042	LAPTOP-H4KQ788T:49770	ESTABLISHED
TCP	127.0.0.1:1042	LAPTOP-H4KQ788T:49774	ESTABLISHED
TCP	127.0.0.1:6850	LAPTOP-H4KQ788T:50921	ESTABLISHED
TCP	127.0.0.1:9012	LAPTOP-H4KQ788T:49808	ESTABLISHED
TCP	127.0.0.1:13030	LAPTOP-H4KQ788T:49670	ESTABLISHED
TCP	127.0.0.1:13030	LAPTOP-H4KQ788T:51110	ESTABLISHED
TCP	127.0.0.1:13031	LAPTOP-H4KQ788T:49811	ESTABLISHED
TCP	127.0.0.1:49670	LAPTOP-H4KQ788T:13030	ESTABLISHED
TCP	127.0.0.1:49770	LAPTOP-H4KQ788T:1042	ESTABLISHED
TCP	127.0.0.1:49774	LAPTOP-H4KQ788T:1042	ESTABLISHED
TCP	127.0.0.1:49808	LAPTOP-H4KQ788T:9012	ESTABLISHED
TCP	127.0.0.1:49811	LAPTOP-H4KQ788T:13031	ESTABLISHED
TCP	127.0.0.1:50100	LAPTOP-H4KQ788T:50885	ESTABLISHED
TCP	127.0.0.1:50885	LAPTOP-H4KQ788T:50100	ESTABLISHED
TCP	127.0.0.1:50921	LAPTOP-H4KQ788T:6850	ESTABLISHED
TCP	127.0.0.1:51110	LAPTOP-H4KQ788T:13030	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:49411	[2603:1040:a06:6::1]:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51153	sb-in-f188:5228	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51401	whatsapp-cdn6-shv-01-hyd1:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51402	whatsapp-cdn6-shv-02-bom2:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51403	whatsapp-cdn6-shv-04-bom2:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51404	whatsapp-cdn6-shv-01-pnq1:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51405	whatsapp-cdn6-shv-02-bom1:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51406	whatsapp-cdn6-shv-01-bom1:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51407	whatsapp-cdn6-shv-01-bom2:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51408	whatsapp-cdn6-shv-03-bom2:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51409	whatsapp-cdn6-shv-02-pnq1:https	LAST_ACK
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51435	[2603:1046:1400:1::2]:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51437	[2603:1046:1400:1::2]:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51541	[64:ff9b::d59:b30e]:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51549	a-0003:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51555	[64:ff9b::d59:b30d]:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51556	[2603:1046:1406:1::30]:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51559	[2606:4700:8d72:7cbc:c259:ae6:5ff2:75c4]:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51560	[2606:4700:8d72:7cbc:c259:ae6:5ff2:75c4]:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51561	[2606:4700:8d72:7cbc:c264:ae4:5ff2:75c4]:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51566	[2606:4700:8d72:7cbc:c259:ae6:5ff2:75c4]:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51567	[2603:1046:1400:7]:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51569	[2606:4700:8d72:7cbc:c264:ae4:5ff2:75c4]:https	TIME_WAIT
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51588	whatsapp-chatd-edge6-shv-02-pnq1:5222	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51589	whatsapp-cdn6-shv-01-hyd1:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51590	whatsapp-cdn6-shv-02-pnq1:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51591	whatsapp-cdn6-shv-02-bom2:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51592	whatsapp-cdn6-shv-04-bom2:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51593	whatsapp-cdn6-shv-01-pnq1:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51594	whatsapp-cdn6-shv-02-bom1:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51595	whatsapp-cdn6-shv-03-bom2:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51596	whatsapp-cdn6-shv-01-bom2:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51597	whatsapp-cdn6-shv-01-bom1:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51598	[2405:200:1630:b57:face:b00c:3333:7020]:https	ESTABLISHED
TCP	[2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]:51599	[64:ff9b::14bd:ad19]:https	ESTABLISHED



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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\smitm>nslookup google.com
Server:  UnKnown
Address:  10.176.250.239

Non-authoritative answer:
Name:     google.com
Addresses: 2404:6800:4009:823::200e
          142.251.223.142
```

8. hostname

Description:

Display the name of the current system.

Implementation:

```
C:\Users\smitm>hostname
LAPTOP-H4KQ788T
```




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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.

Implementation:

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

Tracing route to google.com [2404:6800:4009:823::200e]
over a maximum of 30 hops:
  0  LAPTOP-H4KQ788T [2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]
  1  2409:40c1:31c9:f8a9::e8
  2  2405:200:5210:5:3924:110:3:603
  3  * * *
Computing statistics for 50 seconds...
Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0              0/ 100 = 0%      0/ 100 = 0%      LAPTOP-H4KQ788T [2409:40c1:31c9:f8a9:c1ca:c22d:a2b1:e4e2]
  1    3ms    0/ 100 = 0%      0/ 100 = 0%      2409:40c1:31c9:f8a9::e8
  2   69ms    0/ 100 = 0%      0/ 100 = 0%      2405:200:5210:5:3924:110:3:603

Trace complete.
```



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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\smitm>arp -a

Interface: 10.176.250.180 --- 0x11
Internet Address      Physical Address      Type
10.176.250.239        da-3d-1f-65-5c-96     dynamic
10.176.250.255        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
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
```