

Batch:A2

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Experiment Number: 1

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Title of the Experiment: Study of various networking commands.

Theory: 1. Ping

The ping command is used to test connectivity between two hosts. It sends ICMP echo request messages to the destination. The destination host replies with ICMP reply messages. If the ping command gets a reply from the destination host, it displays the reply along with round-trip times.

The ping command uses the following syntax.
ping destination host IP or name

The following command tests connectivity between the host computer and Google's server.
ping google.com

2. Ipconfig

This command displays all current TCP/IP network configuration values and refreshes Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings. This command is mainly used to view the IP addresses on the computers that are configured to obtain their IP address automatically.

The following table lists some important options of the ipconfig command.

Used without parameters

Displays the IP address, subnet mask, and default gateway for all adapters.

/all Displays the full TCP/IP configuration for all adapters. /renew [Adapter] Renews DHCP configuration for all adapters (if an adapter is not specified) or for a specific adapter if the Adapter parameter is included. /release [Adapter] Sends a DHCPRELEASE message to the DHCP server to release the current DHCP configuration and discard the IP address configuration for either all adapters (if an adapter is not specified) or for a specific adapter if the Adapter parameter is included. /flushdns Flushes and resets the contents of the DNS client resolver cache.

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3. Tracert

This command is used to diagnose path-related problems. On an IP network, routers exchange IP packets between the source and the destination. They take IP packets from the source host and forward them in a sequence until they reach the destination host. The

sequence of routers between the source and destination is known as the path. A path consists of all routers in a sequence that IP packets sent from the source host traverse to reach the destination host. The `tracert` command prints the path. If all routers on the path are functional, this command prints the full path. If a router is down on the path, this command prints the path up to the last operational router.

The `tracert` command uses the following syntax.

`tracert` Destination Name or IP address The following command traces the path to the host named `www.google.co.in`.

`tracert www.google.co.in`

The following table lists some important options of the `tracert` command.

Option Description -d Do not resolve the IP addresses of intermediate routers to their names. -h Specifies the maximum number of hops (routers) to search on the path. The default is 30 hops. -w Specifies the amount of time in milliseconds to wait for a reply message from the router. If not received within the time-out, an asterisk (*) is displayed. The default time-out is 4000 (4 seconds).

4. Arp

To send IP packets, a computer needs two addresses. These addresses are the MAC address and the IP address. A MAC address is the physical or hardware address of the NIC. An IP address is the logical or software address of NIC. If a computer knows the IP address of the destination computer but it does not know the MAC address of the destination computer, it uses the ARP protocol to know the MAC address of the destination computer. The ARP protocol broadcasts a given IP address over a local network. The corresponding host responds to the broadcast with its MAC address. To avoid repetition, ARP stores the answer in a table known as ARP table. ARP maintains a separate ARP table for each NIC. To view the ARP table, you can use the following command.

`arp` By default, this command displays the ARP table of the active NIC. If multiple NICs are installed on the computer, you can use the `-a` option with this command. If the `-a` option is used, the ARP command displays all ARP tables.

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To display the ARP cache entry for a specific IP address, specify the IP address with the `N` option. For example, the following command displays the ARP cache table for the interface that is assigned the IP address `192.168.42.171`.

`Arp -a -N 192.168.42.171`

5. Netstat

This command displays active connections, ports on which the computer is listening, Ethernet statistics, the IP routing table, and IP statistics.

The output of this command is organized in rows and columns. Each row represents a new connection or an entry in the output. It contains four columns. These columns provide the following information about the row.

Proto: - This column displays the name of the protocol (TCP or UDP).

Local Address: - This column displays the IP address of the local computer and the port number being used. If the port is not yet established, the port number is shown as an asterisk (*).

Foreign Address: - This column displays the IP address and port number of the remote computer to which the port is connected.

State: - This column displays the status of the connection.

1. Options and parameters The following table lists some common options of the netstat command.

Option Description -a Displays all active TCP connections and the TCP and UDP ports on which the computer is listening. -e Displays Ethernet statistics, such as the number of bytes and packets sent and received. -n Displays active TCP connections, however, addresses and port numbers are expressed numerically, and no attempt is made to determine names.

-o Displays active TCP connections and includes the process ID (PID) for each connection. -p Shows connections for the protocol specified by Protocol. In this case, the Protocol can be TCP, UDP, tcpv6, or udpv6. -s Displays statistics by protocol. By default, statistics are shown for the TCP, UDP, ICMP, and IP protocols. -r Displays the contents of the IP routing table.

-t Displays active TCP connections. -x Displays active UDP connections.

-P Displays active connections for the protocol specified by Protocol. In this case, the Protocol can be TCP, UDP, tcpv6, or udpv6. -s Displays statistics by protocol. By default, statistics are shown for the TCP, UDP, ICMP, and IP protocols. -r Displays the contents of the IP routing table.

Output:

PING

```
C:\Users\ARYA>ping 10.0.43.34 -n 6

Pinging 10.0.43.34 with 32 bytes of data:
Reply from 10.0.43.34: bytes=32 time<1ms TTL=128
Reply from 10.0.43.34: bytes=32 time<1ms TTL=128
Reply from 10.0.43.34: bytes=32 time<1ms TTL=128
Reply from 10.0.43.34: bytes=32 time<1ms TTL=128
Reply from 10.0.43.34: bytes=32 time<1ms TTL=128
Reply from 10.0.43.34: bytes=32 time<1ms TTL=128

Ping statistics for 10.0.43.34:
    Packets: Sent = 6, Received = 6, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\ARYA>
```

```

C:\Users\ARYA>ping fe80::c471:bd79:30bc:4741%11 -6

Pinging fe80::c471:bd79:30bc:4741%11 with 32 bytes of data:
Reply from fe80::c471:bd79:30bc:4741%11: time<1ms
Reply from fe80::c471:bd79:30bc:4741%11: time<1ms
Reply from fe80::c471:bd79:30bc:4741%11: time<1ms
Reply from fe80::c471:bd79:30bc:4741%11: time<1ms

Ping statistics for fe80::c471:bd79:30bc:4741%11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

```

IPCONFIG

```

C:\Users\ARYA>ipconfig /allcompartments

Windows IP Configuration

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

Ethernet adapter Ethernet:

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

Unknown adapter ProtonVPN TUN:

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

Unknown adapter Local Area Connection:

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

Wireless LAN adapter Local Area Connection* 10:

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

Wireless LAN adapter Local Area Connection* 11:

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

Ethernet adapter Bluetooth Network Connection:

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

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . : SVW.local
    Link-local IPv6 Address . . . . : fe80::c471:bd79:30bc:4741%11
    IPv4 Address. . . . . : 10.0.43.34
    Subnet Mask . . . . . : 255.255.128.0
    Default Gateway . . . . . : 10.0.0.1

```

```

C:\Users\ARYA>ipconfig /all

Windows IP Configuration

    Host Name . . . . . : LAPTOP-6CRPCM93
    Primary Dns Suffix . . . . . :
    Node Type . . . . . : Hybrid
    IP Routing Enabled. . . . . : No
    WINS Proxy Enabled. . . . . : No
    DNS Suffix Search List. . . . . : SW.local

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :
    Description . . . . . : Killer E2600 Gigabit Ethernet Controller
    Physical Address. . . . . : 08-8F-C3-16-CE-D3
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

Unknown adapter ProtonVPN TUN:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :
    Description . . . . . : ProtonVPN Tunnel
    Physical Address. . . . . :
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . : Yes

Unknown adapter Local Area Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :
    Description . . . . . : TAP-ProtonVPN Windows Adapter V9
    Physical Address. . . . . : 00-FF-74-58-8C-8A
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 10:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . :
    Description . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
    Physical Address. . . . . : 76-4C-A1-75-97-2D
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 11:

    Media State . . . . . : Media disconnected

```

ARP

```

C:\Users\ARYA>arp -a

Interface: 10.0.43.34 --- 0xb

    Internet Address      Physical Address      Type
    10.0.0.1              6c-b2-ae-8b-60-fc    dynamic
    10.0.41.198           cc-6b-1e-42-d3-a5    dynamic
    10.0.42.77            10-02-b5-df-81-0d    dynamic
    10.0.43.195           ec-2e-98-df-0d-65    dynamic
    10.0.45.145           d8-c0-a6-39-62-c7    dynamic
    10.0.45.176           d8-c0-a6-3e-9a-37    dynamic
    10.0.46.153           20-1e-88-0b-7d-e0    dynamic
    10.0.47.21            90-78-41-cd-2e-27    dynamic
    10.0.127.255          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
    224.0.1.60            01-00-5e-00-01-3c    static
    224.77.77.77          01-00-5e-4d-4d-4d    static
    239.192.152.143       01-00-5e-40-98-8f    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

```

```

C:\WINDOWS\system32>arp -s 157.55.85.212 00-aa-00-62-c6-09

C:\WINDOWS\system32>arp -a

Interface: 10.0.43.34 --- 0xb
  Internet Address      Physical Address        Type
  10.0.0.1              6c-b2-ae-8b-60-fc      dynamic
  10.0.41.198           cc-6b-1e-42-d3-a5      dynamic
  10.0.42.77            10-02-b5-df-81-0d      dynamic
  10.0.43.195           ec-2e-98-df-0d-65      dynamic
  10.0.45.145           d8-c0-a6-39-62-c7      dynamic
  10.0.45.176           d8-c0-a6-3e-9a-37      dynamic
  10.0.46.153           20-1e-88-0b-7d-e0      dynamic
  10.0.47.21            90-78-41-cd-2e-27      dynamic
  10.0.127.255          ff-ff-ff-ff-ff-ff      static
  157.55.85.212         00-aa-00-62-c6-09      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
  224.0.1.60            01-00-5e-00-01-3c      static
  224.77.77.77          01-00-5e-4d-4d-4d      static
  239.192.152.143       01-00-5e-40-98-8f      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

```

NETSTAT

```

C:\WINDOWS\system32>netstat -i

Active Connections

  Proto  Local Address          Foreign Address         State           Time in State (ms)
  TCP    127.0.0.1:58492         checkhost:65001         ESTABLISHED     1298559
  TCP    127.0.0.1:58500         checkhost:58542         ESTABLISHED     1287807
  TCP    127.0.0.1:58542         checkhost:58500         ESTABLISHED     1287807
  TCP    10.0.43.34:58580        server-108-158-245-53:https CLOSE_WAIT      1042156
  TCP    10.0.43.34:58595        lb-140-82-113-26-iad:https ESTABLISHED     1281153
  TCP    10.0.43.34:58617        ec2-54-236-171-165:https ESTABLISHED     1278259
  TCP    10.0.43.34:58661        20.198.119.143:https    ESTABLISHED     1271401
  TCP    10.0.43.34:58725        52.184.81.210:https     CLOSE_WAIT      1126247
  TCP    10.0.43.34:58726        52.184.81.210:https     CLOSE_WAIT      1122336
  TCP    10.0.43.34:58727        52.184.81.210:https     CLOSE_WAIT      1126778
  TCP    10.0.43.34:58728        52.184.81.210:https     CLOSE_WAIT      1130065
  TCP    10.0.43.34:58776        aeab55d76dd13c9bb:https ESTABLISHED     1181332
  TCP    10.0.43.34:58809        52.98.123.210:https     ESTABLISHED     1145150
  TCP    10.0.43.34:58834        ec2-44-195-193-49:https ESTABLISHED     1108551
  TCP    10.0.43.34:58841        ec2-52-44-210-168:https ESTABLISHED     1069105
  TCP    10.0.43.34:58856        bom12s13-in-f14:https  ESTABLISHED     1032738

```

```

C:\WINDOWS\system32>netstat -e -s
Interface Statistics

                Received                Sent
Bytes           206794548             58165116
Unicast packets    213156             151098
Non-unicast packets 357276             1890
Discards          0
Errors            0
Unknown protocols 0

IPv4 Statistics

Packets Received           = 2188597
Received Header Errors     = 0
Received Address Errors    = 95442
Datagrams Forwarded        = 0
Unknown Protocols Received = 62
Received Packets Discarded = 196147
Received Packets Delivered = 2029624
Output Requests            = 1451479
Routing Discards           = 0
Discarded Output Packets   = 1893
Output Packet No Route     = 221
Reassembly Required        = 135
Reassembly Successful      = 66
Reassembly Failures        = 0
Datagrams Successfully Fragmented = 0

```

TRACERT

```

C:\WINDOWS\system32>tracert -h 5 www.google.com

Tracing route to www.google.com [142.250.183.196]
over a maximum of 5 hops:

  1  119 ms    22 ms     8 ms  10.0.0.1
  2   31 ms     1 ms     1 ms  172.30.250.250
  3   12 ms     3 ms     4 ms  182.73.90.241
  4    5 ms     4 ms     4 ms  116.119.106.214
  5   27 ms     5 ms    11 ms  72.14.212.48

Trace complete.

```

```
C:\WINDOWS\system32>tracert -4 10.0.43.34

Tracing route to LAPTOP-6CRPCM93.SW.local [10.0.43.34]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms    LAPTOP-6CRPCM93.SW.local [10.0.43.34]

Trace complete.

C:\WINDOWS\system32>
```

NBTSTAT

```
C:\WINDOWS\system32>nbtstat -c

ProtonVPN TUN:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Local Area Connection:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Ethernet:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Wi-Fi:
Node IpAddress: [10.0.43.34] Scope Id: []

    No names in cache

Local Area Connection* 10:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Local Area Connection* 11:
Node IpAddress: [0.0.0.0] Scope Id: []
```



```

C:\Users\ARYA>nbtstat -n

ProtonVPN TUN:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Local Area Connection:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Ethernet:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Wi-Fi:
Node IpAddress: [192.168.1.26] Scope Id: []


        NetBIOS Local Name Table

        Name                Type             Status
        -----
        LAPTOP-6CRPCM93<20>  UNIQUE          Registered
        LAPTOP-6CRPCM93<00>  UNIQUE          Registered
        WORKGROUP             <00>            GROUP           Registered

Local Area Connection* 10:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Local Area Connection* 11:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

Bluetooth Network Connection:
Node IpAddress: [0.0.0.0] Scope Id: []

    No names in cache

```

```

C:\Users\ARYA>hostname
LAPTOP-6CRPCM93

C:\Users\ARYA>systeminfo

Host Name:                LAPTOP-6CRPCM93
OS Name:                   Microsoft Windows 11 Home Single Language
OS Version:                10.0.22000 N/A Build 22000
OS Manufacturer:          Microsoft Corporation
OS Configuration:          Standalone Workstation
OS Build Type:              Multiprocessor Free
Registered Owner:          ARYA
Registered Organization:    N/A
Product ID:                 00327-35940-07640-AAOEM
Original Install Date:      12-02-2022, 17:06:05
System Boot Time:           26-08-2022, 23:32:16
System Manufacturer:        Acer
System Model:               Nitro AN515-45
System Type:                x64-based PC
Processor(s):               1 Processor(s) Installed.
                           [01]: AMD64 Family 25 Model 80 Stepping 0 AuthenticAMD ~3201
BIOS Version:               Insyde Corp. V1.08, 21-07-2021
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:       15,724 MB
Available Physical Memory:    7,741 MB
Virtual Memory: Max Size:    23,916 MB
Virtual Memory: Available:    11,476 MB
Virtual Memory: In Use:       12,440 MB
Page File Location(s):       C:\pagefile.sys
Domain:                       WORKGROUP
Logon Server:                 \\LAPTOP-6CRPCM93
Hotfix(s):                    5 Hotfix(s) Installed.
                           [01]: KB5015732
                           [02]: KB5007575
                           [03]: KB5012170

```

Post Lab Question- Answers (If Any):

Questions

1. ICMP is used in Both Ping & Traceroute

- a) Ping
- b) Traceroute
- c) Ifconfig
- d) Both Ping & Traceroute

Ans: D

2. Route command is used to manipulate the TCP/IP routing table.

- a) route
- b) Ipconfig
- c) Ifconfig
- d) Traceroute

Ans: A

3. Select the false statement from the following.

- a) Nslookup is used to query a DNS server for DNS data
- b) Ping is used to check connectivity
- c) Pathping combines the functionality of ping with that of route
- d) Ifconfig can configure TCP/IP network interface parameters

Ans: a

CO:

CO1 . Understand the data communication systems, network topologies and network devices

CO2. Enumerate the layers of the OSI model and TCP/IP model, their functions and Protocol

Conclusion: I successfully understood different types of data communication systems and network commands that can be put to simple use.