Aim: Understanding of basic network commands

Theory:

a) **Ping:** It is used to test the ability of the source computer to reach a specified destination computer. It's a simple way to verify that a computer can communicate with another computer or network device.
The full form of Ping is Packet Internet or Inter-Network Groper.
How to run Ping command:
1. First open the cmd (command prompt).
2. Type "ping" in the black box and hit the space bar.
3. Type the IP address you'd like to ping (e.g., ping www.google.com)
4. Review the ping results displayed.

-n : The -n option tells the ping command to send 5 ICMP (Internet Control Message Protocol) Echo Requests instead of the default of 4.

```
C:\Users\shubh>ping -n 5 www.amazon.com

Pinging d3ag4hukkh62yn.cloudfront.net [108.158.65.52] with 32 bytes of data:
Reply from 108.158.65.52: bytes=32 time=3ms TTL=249
Reply from 108.158.65.52: bytes=32 time=6ms TTL=249
Reply from 108.158.65.52: bytes=32 time=4ms TTL=249
Reply from 108.158.65.52: bytes=32 time=4ms TTL=249
Reply from 108.158.65.52: bytes=32 time=3ms TTL=249

Ping statistics for 108.158.65.52:
    Packets: Sent = 5, Received = 5, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 6ms, Average = 4ms
```

-l : The -l sets the packet size for each request to 1200 bytes instead of the default of 32 bytes

```
C:\Users\shubh>ping -l 1278 www.yahoo.com

Pinging new-fp-shed.wg1.b.yahoo.com [202.165.107.49] with 1278 bytes of data:
Reply from 202.165.107.49: bytes=1278 time=68ms TTL=50
Reply from 202.165.107.49: bytes=1278 time=68ms TTL=50
Reply from 202.165.107.49: bytes=1278 time=67ms TTL=50
Reply from 202.165.107.49: bytes=1278 time=68ms TTL=50

Ping statistics for 202.165.107.49:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 67ms, Maximum = 68ms, Average = 67ms
```

-t : The -t command ping indefinitely times. We can interrupt the ping manually with Ctrl+C

```
C:\Users\shubh>ping -t www.google.com

Pinging www.google.com [172.217.27.196] with 32 bytes of data:
Reply from 172.217.27.196: bytes=32 time=5ms TTL=59
Reply from 172.217.27.196: bytes=32 time=4ms TTL=59
Reply from 172.217.27.196: bytes=32 time=4ms TTL=59
Reply from 172.217.27.196: bytes=32 time=6ms TTL=59
Reply from 172.217.27.196: bytes=32 time=4ms TTL=59
Reply from 172.217.27.196: bytes=32 time=4ms TTL=59
Reply from 172.217.27.196: bytes=32 time=5ms TTL=59
Reply from 172.217.27.196: bytes=32 time=4ms TTL=59
```

-i : We can increase and decrease ping time interval using -i.

```
C:\Users\shubh>ping -i 255 www.google.com

Pinging www.google.com [172.217.27.196] with 32 bytes of data:
Reply from 172.217.27.196: bytes=32 time=3ms TTL=59
Reply from 172.217.27.196: bytes=32 time=3ms TTL=59
Reply from 172.217.27.196: bytes=32 time=4ms TTL=59
Reply from 172.217.27.196: bytes=32 time=3ms TTL=59

Ping statistics for 172.217.27.196:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 4ms, Average = 3ms
```

-s : Specifies that the Internet Timestamp option in the IP header is used to record the time of arrival for the Echo Request message and corresponding Echo Reply message for each hop. **The Count must be a minimum of 1 and a maximum of 4**

```
C:\Users\shubh>ping -s 4 www.google.com

Pinging www.google.com [142.251.42.36] with 32 bytes of data:
Reply from 142.251.42.36: bytes=32 time=22ms TTL=59
Reply from 142.251.42.36: bytes=32 time=9ms TTL=59
Reply from 142.251.42.36: bytes=32 time=14ms TTL=59
Reply from 142.251.42.36: bytes=32 time=8ms TTL=59

Ping statistics for 142.251.42.36:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 8ms, Maximum = 22ms, Average = 13ms
```

b) 'ipconfig': Displays all current TCP/IP network configuration values and refreshes Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings. Used without parameters, **ipconfig** displays Internet Protocol version 4 (IPv4) and IPv6 addresses, subnet mask, and default gateway for all adapters.

How to run the ipconfig command:

1. To use the Ip config command we will need to open Command Prompt or Power Shell.
2. Type ipconfig and press enter
3. This will show you the basic network information from your network adapters

/all : Displays the full TCP/IP configuration for all adapters. Adapters can represent physical interfaces, such as installed network adapters, or logical interfaces, such as dial-up connections.

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

Windows IP Configuration

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

Wireless LAN adapter Local Area Connection* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
   Physical Address. . . . . . . . . : 6C-94-66-95-5B-E7
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Local Area Connection* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter #2
   Physical Address. . . . . . . . . : 6E-94-66-95-5B-E6
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Intel(R) Wireless-AC 9560
   Physical Address. . . . . . . . . : 6C-94-66-95-5B-E6
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::dd8c:c68a:5dc3:fb8a%8(Preferred)
```

/displaydns: Displays the contents of the DNS client resolver cache, which includes both entries preloaded from the local Hosts file and any recently obtained resource records for name queries resolved by the computer. The DNS Client service uses this information to resolve frequently queried names quickly, before querying its configured DNS servers.

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

Windows IP Configuration

    hbopenbid.pubmatic.com
    ----------------------------------------
    Record Name . . . . . : hbopenbid.pubmatic.com
    Record Type . . . . . : 1
    Time To Live  . . . . : 8797
    Data Length . . . . . : 4
    Section . . . . . . . : Answer
    A (Host) Record . . . : 103.231.98.193


    c2shb.ssp.yahoo.com
    ----------------------------------------
    Record Name . . . . . : c2shb.ssp.yahoo.com
    Record Type . . . . . : 1
    Time To Live  . . . . : 8796
    Data Length . . . . . : 4
    Section . . . . . . . : Answer
    A (Host) Record . . . : 13.250.173.68


    config.teams.microsoft.com
    ----------------------------------------
    Record Name . . . . . : config.teams.microsoft.com
    Record Type . . . . . : 1
    Time To Live  . . . . : 6193
    Data Length . . . . . : 4
    Section . . . . . . . : Answer
    A (Host) Record . . . : 52.113.194.132
```

/flushdns: Flushes and resets the contents of the DNS client resolver cache. During DNS troubleshooting, you can use this procedure to discard negative cache entries from the cache, as well as any other entries that have been added dynamically.

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

Windows IP Configuration

Successfully flushed the DNS Resolver Cache.
```

/allcompartments: It shows the output from my test server, which contains a single network adapter.

```
C:\Users\shubh>ipconfig /allcompartments

Windows IP Configuration


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

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::dd8c:c68a:5dc3:fb8a%8
   IPv4 Address. . . . . . . . . . . : 192.168.0.105
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.0.1

Ethernet adapter vEthernet (WSL):

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::5a8a:87fa:889b:8d00%29
   IPv4 Address. . . . . . . . . . . : 172.30.32.1
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :
```

/release: This parameter sends a request to the DHCP server to abandon the active lease(s) and removes it (or them) from your system.

```
C:\Users\shubh>ipconfig /release

Windows IP Configuration

No operation can be performed on Local Area Connection* 1 while it has its media disconnected.
No operation can be performed on Local Area Connection* 2 while it has its media disconnected.

Wireless LAN adapter Local Area Connection* 1:

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

Wireless LAN adapter Local Area Connection* 2:

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

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::dd8c:c68a:5dc3:fb8a%8
   Default Gateway . . . . . . . . . :

Ethernet adapter vEthernet (WSL):

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::5a8a:87fa:889b:8d00%29
   IPv4 Address. . . . . . . . . . . : 172.30.32.1
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :
```

Tracert: This diagnostic tool determines the path taken to a destination by sending Internet Control Message Protocal (ICMP) echo Request or ICMPv6 messages to the destination with incrementally increasing time to live (TTL) field values.

tracert <domain> : Traces the path from the local host to the specified domain.

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

Tracing route to google.com [142.250.76.174]
over a maximum of 30 hops:

  1     1 ms     1 ms     1 ms  dlinkrouter [192.168.0.1]
  2     8 ms     2 ms     2 ms  103.6.185.194
  3     8 ms     2 ms     2 ms  172.168.40.157
  4     7 ms    13 ms     4 ms  10.10.148.253
  5     7 ms     2 ms     2 ms  103.39.246.254
  6     4 ms     6 ms     3 ms  103.39.246.253
  7     7 ms     4 ms     4 ms  103.49.243.202
  8     7 ms     4 ms     6 ms  74.125.37.7
  9    10 ms     5 ms     4 ms  216.239.46.137
 10     9 ms     3 ms     3 ms  google.com [142.250.76.174]

Trace complete.
```

Tracert -d <domain> : Traces the path without resolving the IP addresses of the intermediate hops to hostnames.

```
C:\Users\shubh>tracert -d facebook.com

Tracing route to facebook.com [157.240.16.35]
over a maximum of 30 hops:

  1     1 ms     1 ms     1 ms  192.168.0.1
  2    10 ms     3 ms     1 ms  103.6.185.194
  3    10 ms     3 ms     2 ms  172.168.40.157
  4    13 ms     *        7 ms  10.10.148.253
  5     9 ms     2 ms     2 ms  103.39.246.254
  6     *        *       10 ms  103.39.246.253
  7    24 ms    24 ms    18 ms  103.27.170.158
  8    51 ms     *        8 ms  157.240.53.67
  9     8 ms     4 ms     4 ms  157.240.38.143
 10    12 ms     4 ms     5 ms  157.240.16.35

Trace complete.
```

tracert -h <max_hops> <domain> : Specifies the time-out in milliseconds to wait for a response from each hop.

```
C:\Users\shubh>tracert -h 5 tsec.org

Tracing route to tsec.org [34.102.136.180]
over a maximum of 5 hops:

  1     1 ms     1 ms     1 ms  dlinkrouter [192.168.0.1]
  2     7 ms     2 ms     2 ms  103.6.185.194
  3     8 ms     3 ms     3 ms  172.168.40.157
  4     8 ms     5 ms     4 ms  10.10.148.253
  5     7 ms     2 ms     2 ms  103.39.246.254

Trace complete.
```

Tracert -j <host-list> <domain> : Traces the path and lists the IP addresses of the intermediate hops in the specified loose source route.

```
C:\Users\shubh>tracert -j 192.168.0.1 103.6.185.194 google.com

Tracing route to google.com [142.250.67.206]
over a maximum of 30 hops:

  1     *        *        *     Request timed out.
  2     *        *        *     Request timed out.
  3     *        *        *     Request timed out.
  4     *        *        *     Request timed out.
  5     *        *        *     Request timed out.
  6     *        *        *     Request timed out.
  7     *        *     ^C
```

Nslookup: Displays information that you can use to diagnose Domain Name System (DNS) infrastructure. The nslookup command-line tool has two modes: interactive and noninteractive.

Nslookup <hostname>: This performs a lookup of the IP address associated with the specified hostname.

```
C:\Users\shubh>nslookup www.google.com
Server:  dlinkrouter
Address:  192.168.0.1

Non-authoritative answer:
Name:    www.google.com
Addresses:  2404:6800:4009:830::2004
          142.251.42.36
```

nslookup <IP address> : This performs a reverse lookup of the hostname associated with the specified IP address.

```
C:\Users\shubh>nslookup 142.251.42.36
Server:  dlinkrouter
Address:  192.168.0.1

Name:    www.google.com
Address:  142.251.42.36
```

Nslookup -a <hostname>: This performs a lookup of all addresses associated with the specified hostname.

```
C:\Users\shubh>nslookup -a google.com
*** Invalid option: a
Server:  dlinkrouter
Address:  192.168.0.1

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:81a::200e
          142.250.66.14
```

Nslookup -d2: This enables debug mode, which provides verbose output during the lookup process.

```
C:\Users\shubh>nslookup -d2 google.com
------------
SendRequest(), len 42
    HEADER:
        opcode = QUERY, id = 1, rcode = NOERROR
        header flags:  query, want recursion
        questions = 1,  answers = 0,  authority records = 0,  additional = 0

    QUESTIONS:
        1.0.168.192.in-addr.arpa, type = PTR, class = IN

------------
------------
Got answer (67 bytes):
    HEADER:
        opcode = QUERY, id = 1, rcode = NOERROR
        header flags:  response, want recursion
        questions = 1,  answers = 1,  authority records = 0,  additional = 0

    QUESTIONS:
        1.0.168.192.in-addr.arpa, type = PTR, class = IN
    ANSWERS:
    ->  1.0.168.192.in-addr.arpa
        type = PTR, class = IN, dlen = 13
        name = dlinkrouter
        ttl = 10000 (2 hours 46 mins 40 secs)

------------
Server:  dlinkrouter
Address:  192.168.0.1
```

Nslookup -query=mx <domain>: This performs a lookup of the mail exchange (MX) records associated with the specified domain, which are used to route email for that domain.

```
C:\Users\shubh>nslookup -query=mx google.com
Server:  dlinkrouter
Address:  192.168.0.1

DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
    timeout was 2 seconds.
*** Request to dlinkrouter timed-out
```

Netstat : Netstat stands for “network statistics”. If you’re having difficulties accessing the internet, the netstat command can help you identify where the problem lies. Netstat will display all of your computer’s active network connections and the status of those connections. If a connection is not working, netstat can often provide more information about why it is not working.

Netstat can also be used to monitor your computer for security threats.

How do I run netstat command?

Step 1: Open the start menu, type cmd into the search box, and press Enter to launch the command prompt.

Step 2: Type netstat at the prompt and press Enter. The netstat command will now display a list of all active network connections.

'netstat -a' : Shows all active connections and listening ports on the computer

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

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:445            ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:5040           ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:6646           ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:49664          ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:49665          ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:49666          ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:49667          ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:49668          ShubhamTSEC:0          LISTENING
  TCP    0.0.0.0:49669          ShubhamTSEC:0          LISTENING
  TCP    127.0.0.1:54386        ShubhamTSEC:54387      ESTABLISHED
  TCP    127.0.0.1:54387        ShubhamTSEC:54386      ESTABLISHED
  TCP    127.0.0.1:54388        ShubhamTSEC:54389      ESTABLISHED
  TCP    127.0.0.1:54389        ShubhamTSEC:54388      ESTABLISHED
  TCP    172.30.32.1:139        ShubhamTSEC:0          LISTENING
  TCP    192.168.0.105:139      ShubhamTSEC:0          LISTENING
  TCP    192.168.0.105:49432    20.198.119.143:https   ESTABLISHED
```

'netstat -e' : Displays Ethernet statistics, including the number of bytes and packets sent and received.

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

                           Received            Sent

Bytes                    2510274032       810194256
Unicast packets            11065308         4393920
Non-unicast packets            5090           34858
Discards                          0               0
Errors                            0               0
Unknown protocols                 0
```

'netstat -n' : Shows active connections and their associated IP addresses and port numbers. The '-n' option causes 'netstat' to display addresses and port numbers in numerical form, rather than resolving them to hostnames and service names.

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

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:54386        127.0.0.1:54387        ESTABLISHED
  TCP    127.0.0.1:54387        127.0.0.1:54386        ESTABLISHED
  TCP    127.0.0.1:54388        127.0.0.1:54389        ESTABLISHED
  TCP    127.0.0.1:54389        127.0.0.1:54388        ESTABLISHED
  TCP    192.168.0.105:49432    20.198.119.143:443     ESTABLISHED
  TCP    192.168.0.105:56770    54.226.43.194:443      ESTABLISHED
  TCP    192.168.0.105:57126    20.198.118.190:443     ESTABLISHED
  TCP    192.168.0.105:57598    104.18.18.71:443       ESTABLISHED
  TCP    192.168.0.105:57627    20.189.173.6:443       TIME_WAIT
  TCP    192.168.0.105:57629    20.219.30.91:443       ESTABLISHED
  TCP    192.168.0.105:57630    13.107.42.12:443       ESTABLISHED
  TCP    192.168.0.105:57631    52.98.123.194:443      ESTABLISHED
  TCP    192.168.0.105:57632    20.189.173.6:443       SYN_SENT
```

‘**netstat -o’ :** Shows the process Id (PID) of each active connection, allowing you to see which process is responsible for each connection.

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

Active Connections

  Proto  Local Address          Foreign Address        State           PID
  TCP    127.0.0.1:54386        ShubhamTSEC:54387      ESTABLISHED     30024
  TCP    127.0.0.1:54387        ShubhamTSEC:54386      ESTABLISHED     30024
  TCP    127.0.0.1:54388        ShubhamTSEC:54389      ESTABLISHED     30024
  TCP    127.0.0.1:54389        ShubhamTSEC:54388      ESTABLISHED     30024
  TCP    192.168.0.105:49432    20.198.119.143:https   ESTABLISHED     4876
  TCP    192.168.0.105:56770    ec2-54-226-43-194:https  ESTABLISHED     30024

  TCP    192.168.0.105:57126    20.198.118.190:https   ESTABLISHED     2328
  TCP    192.168.0.105:57598    104.18.18.71:https     ESTABLISHED     45748
  TCP    192.168.0.105:57630    1drv:https             ESTABLISHED     2328
  TCP    192.168.0.105:57631    substrate:https        TIME_WAIT       0
  TCP    192.168.0.105:57632    20.189.173.6:https     ESTABLISHED     2328
  TCP    192.168.0.105:57633    20.189.173.6:https     ESTABLISHED     34932
  TCP    192.168.0.105:57634    52.109.56.83:https     TIME_WAIT       0
```

‘**netstat -s’ :** Displays a summary of all network statistics, including information on the number of segments received, errors, and more.

```
C:\Users\shubh>netstat -s

IPv4 Statistics

  Packets Received                    = 9492699
  Received Header Errors              = 0
  Received Address Errors             = 419
  Datagrams Forwarded                 = 0
  Unknown Protocols Received          = 0
  Received Packets Discarded          = 30598
  Received Packets Delivered          = 5788076
  Output Requests                     = 3100973
  Routing Discards                    = 0
  Discarded Output Packets            = 91
  Output Packet No Route              = 112
  Reassembly Required                 = 0
  Reassembly Successful               = 0
  Reassembly Failures                 = 0
  Datagrams Successfully Fragmented   = 0
  Datagrams Failing Fragmentation     = 0
  Fragments Created                   = 0

IPv6 Statistics

  Packets Received                    = 1673
  Received Header Errors              = 0
  Received Address Errors             = 672
  Datagrams Forwarded                 = 0
  Unknown Protocols Received          = 0
  Received Packets Discarded          = 0
  Received Packets Delivered          = 2843
  Output Requests                     = 2986
  Routing Discards                    = 0
  Discarded Output Packets            = 0
  Output Packet No Route              = 0
  Reassembly Required                 = 0
  Reassembly Successful               = 0
  Reassembly Failures                 = 0
  Datagrams Successfully Fragmented   = 0
  Datagrams Failing Fragmentation     = 0
```

Route command : The ‘route’ command is used to manipulate the IP routing table in Windows.

With the ‘route’ command, you can view the current routing table, add new routes, modify existing routes, and delete routes.

The ‘route’ command is often used in advanced network configuration scenarios, such as setting up VPN connections, specifying custom routes for specific networks, or resolving connectivity issues.

How to use route command in windows?

Step 1 : Open the command prompt.

Step 2 : Write 'route' in the command prompt, you will see many options will be showing there after clicking enter. Now you can run your command according to your requirement.

'route print' : Displays the current routing table on the computer, including information on the network interfaces, destinations, and gateways.

```
C:\Users\shubh>route print
===========================================================================
Interface List
 29...00 15 5d a4 42 d9 ......Hyper-V Virtual Ethernet Adapter
  4...6c 94 66 95 5b e7 ......Microsoft Wi-Fi Direct Virtual Adapter
  2...6e 94 66 95 5b e6 ......Microsoft Wi-Fi Direct Virtual Adapter #2
  8...6c 94 66 95 5b e6 ......Intel(R) Wireless-AC 9560
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0      192.168.0.1    192.168.0.105     40
        127.0.0.0        255.0.0.0         On-link         127.0.0.1    331
        127.0.0.1  255.255.255.255         On-link         127.0.0.1    331
  127.255.255.255  255.255.255.255         On-link         127.0.0.1    331
      172.30.32.0    255.255.240.0         On-link       172.30.32.1    271
      172.30.32.1  255.255.255.255         On-link       172.30.32.1    271
    172.30.47.255  255.255.255.255         On-link       172.30.32.1    271
      192.168.0.0    255.255.255.0         On-link     192.168.0.105    296
    192.168.0.105  255.255.255.255         On-link     192.168.0.105    296
    192.168.0.255  255.255.255.255         On-link     192.168.0.105    296
        224.0.0.0        240.0.0.0         On-link         127.0.0.1    331
        224.0.0.0        240.0.0.0         On-link     192.168.0.105    296
        224.0.0.0        240.0.0.0         On-link       172.30.32.1    271
  255.255.255.255  255.255.255.255         On-link         127.0.0.1    331
  255.255.255.255  255.255.255.255         On-link     192.168.0.105    296
  255.255.255.255  255.255.255.255         On-link       172.30.32.1    271
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  1    331 ::1/128                  On-link
  8    296 fe80::/64                On-link
 29    271 fe80::/64                On-link
 29    271 fe80::5a8a:87fa:889b:8d00/128
                                    On-link
  8    296 fe80::dd8c:c68a:5dc3:fb8a/128
                                    On-link
  1    331 ff00::/8                 On-link
  8    296 ff00::/8                 On-link
 29    271 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

'route add <destination> mask <subnet mask> <gateway>' : Adds a new route to the routing table, specifying the destination network, subnet mask, and gateway.

```
C:\Windows\System32>route add 192.168.100.0 mask 255.255.255.0 192.168.1.1
 OK!
```

'route delete <destination>' : Deletes an existing route from the routing table, specified by destination network.

```
C:\Windows\System32>route delete 192.168.100.0
 OK!
```

'route change <destination> mask <subnet mask> <gateway>' : Modifies an existing route in the routing table, changing the destination network, subnet mask, and/or gateway as specified.

```
C:\Windows\System32>route change 192.168.0.0 mask 255.255.255.0 192.168.0.105
 OK!
```

'route -p add <destination> mask <subnet mask> <gateway>' : Adds a persistent route to the routing table, which will persist across reboots of the computer. This is useful for configuring static routes that are always present on the system.

```
C:\Windows\System32>route -p add 192.168.100.0 mask 255.255.255.0 192.168.1.1
 OK!
```

Hostname: The 'hostname' command is used to display or set the hostname of a computer in windows 11. When run without any options, the 'hostname' command will display the current hostname of the computer.

How to implement hostname command?

Step 1: Open the command prompt

Step 2: Write the hostname in the command prompt and you will see the name of the host in command prompt.

'hostname' : Displays the hostname of the current computer.

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

'hostname <new-hostname>' : Changes the hostname of the current computer to the specified value. This change is not permanent and will be lost upon reboot.

```
C:\Windows\System32>hostname mycomputer
sethostname: Use the Network Control Panel Applet to set hostname.
hostname -s is not supported.
```

'hostname > filename': Writes the hostname of the current computer to a specified file.

```
C:\Users\shubh>hostname>python

C:\Users\shubh>
```

'hostname /?' : Displays the help information for the 'hostname' command.

```
C:\Users\shubh>hostname /?

Prints the name of the current host.

hostname
```

'arp -a' : Displays the current ARP (Address Resolution Protocol) cache, which maps IP addresses to MAC addresses on the local network.

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

Interface: 192.168.0.105 --- 0x8
  Internet Address      Physical Address      Type
  192.168.0.1           78-98-e8-2d-d8-f4     dynamic
  192.168.0.255         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: 172.30.32.1 --- 0x1d
  Internet Address      Physical Address      Type
  172.30.47.255         ff-ff-ff-ff-ff-ff     static
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
```

'arp -d <ip-address>' : Deletes a specific entry from the ARP cache, specified by IP address.

```
C:\Windows\System32>arp -d 192.168.0.1

C:\Windows\System32>
```

'arp -s <ip-address> <mac-address>' : Adds a new entry to the ARP cache, specifying the IP address and corresponding MAC address.

```
C:\Windows\System32>arp -s 192.168.1.200 00-0c-29-3b-f9-a4

C:\Windows\System32>
```

'arp -v' : Displays the ARP cache in verbose mode, including additional information such as the type of ARP entries (dynamic or static) and the interface used for each entry.

```
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
```

arp purge-delay: The arp purge-delay command delays the purging in the ARP entries in an ARP table/cache when the interface goes down or slows down. When the interface comes up within the delay time, the ARP entries are restored, and packet loss with ECMP (Equal Cost Multipath) is restricted.

```
C:\Windows\System32>arp purge-delay

C:\Windows\System32>
```

Curl (client URL): It is a command-line tool powered by the libcurl library to transfer data to and from the server using various protocols, such as HTTP, HTTPS, FTP, FTPS, IMAP, IMAPS, POP3, POP3S, SMTP, and SMTPS. It is highly popular for automation and scripts due to its wide range of features and protocol support.

'curl <url>' : Downloads the content of the specified URL and displays it in the console.

```
E:\>curl https://www.javatpoint.com/arp-commands
 <!DOCTYPE html><html lang="en"><head><meta http-equ
es/favicon2.png" />
<link rel="stylesheet" type="text/css" href="https:/
oint.com"><link rel="dns-prefetch" href="https://goo
ontent="#4CAF50" /><meta property="og:title" content
 connectors, Intranet, Modem, Uses Of Computer Netwo
<meta name="keywords" content="computer network tuto
```

'curl -o <filename> <url>' : Downloads the content of the specified URL and saves it to a file with the specified name.

```
E:\>curl -o helllo https://www.youtube.com/
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  753k    0  753k    0     0  1788k      0 --:--:-- --:--:-- --:--:-- 1790k

E:\>
```

'curl -I <url>' : Requests the HTTP headers of the specified URL, but not the actual content of the resource.

```
C:\Windows\System32\cmd.exe

E:\>curl -L https://www.javatpoint.com/arp-commands
 <!DOCTYPE html><html lang="en"><head><meta http-equiv="Content-Typ
><title>ARP Commands - javatpoint</title><link rel="SHORTCUT ICON"
mages/favicon2.png" />
<link rel="stylesheet" type="text/css" href="https://static.javatpo
 rel="dns-prefetch" href="https://clients1.google.com"><link rel="d
atpoint.com"><link rel="dns-prefetch" href="https://googleads.g.dou
" href="https://www.google.com"><link rel="dns-prefetch" href="http
lor" content="#4CAF50" /><meta property="og:title" content="ARP Com
```

'curl -v' : The 'curl -v' command is used to show verbose output of a curl request. This can be useful for debugging or seeing the details of a request.

```
E:\>curl -v https://www.javatpoint.com/arp-commands
*   Trying 104.21.23.133:443...
* Connected to www.javatpoint.com (104.21.23.133) port 443 (#0)
* schannel: disabled automatic use of client certificate
* ALPN: offers http/1.1
* ALPN: server accepted http/1.1
> GET /arp-commands HTTP/1.1
> Host: www.javatpoint.com
> User-Agent: curl/7.83.1
> Accept: */*
>
* Mark bundle as not supporting multiuse
< HTTP/1.1 200 OK
```

Whois : It allows you to perform lookup of owner information of a website by querying databases that store the registered users of a domain or IP address.

How to run whois command?

Step 1: Open the command prompt

Step 2: Run the whois command with some domain name e.g. cmd> whois google.com

'whois <domain>' : Retrieves the WHOIS information for the specified domain.

```
C:\Users\shubh>whois google.com

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Connecting to COM.whois-servers.net...
```

'whois -a <domain>' : Retrieves the WHOIS information for the specified domain, including the administrative and technical contact information.

```
C:\Users\shubh>whois -a googl.com

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Usage: whois [-v] domainname [whois.server]
 -v   Print whois information for referrals
 -nobanner
      Do not display the startup banner and copyright message.
```

'whois -r <domain>' : Retrieves the WHOIS information for the specified domain in a machine-readable format.

```
C:\Users\shubh>whois -r facebook.com

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Usage: whois [-v] domainname [whois.server]
 -v   Print whois information for referrals
 -nobanner
      Do not display the startup banner and copyright message.
```

'whois -h <server> <domain>' : Retrieves the WHOIS information for the specified domain from the specified WHOIS server.

```
C:\Users\shubh>whois -h googl.com

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Usage: whois [-v] domainname [whois.server]
 -v   Print whois information for referrals
 -nobanner
      Do not display the startup banner and copyright message.
```

'whois -v <domain>' : Retrieves the WHOIS information for the specified domain and displays it in verbose mode, including detailed information about the domain registrar and registration dates.

```
C:\Users\shubh>whois -v google.com

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Connecting to COM.whois-servers.net...
Server COM.whois-servers.net returned the following for GOOGLE.COM

   Domain Name: GOOGLE.COM
   Registry Domain ID: 2138514_DOMAIN_COM-VRSN
```