9. Network Commands

a) ping

The ping command is a network utility used to test the reachability and latency of a network host by sending Internet Control Message Protocol (ICMP) echo request packets and measuring the time it takes for a response.

```
C:\Users\MITS>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.
```

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

Pinging google.com [142.250.183.238] with 32 bytes of data:
Reply from 142.250.183.238: bytes=32 time=39ms TTL=112
Reply from 142.250.183.238: bytes=32 time=33ms TTL=112
Reply from 142.250.183.238: bytes=32 time=38ms TTL=112
Reply from 142.250.183.238: bytes=32 time=33ms TTL=112

Ping statistics for 142.250.183.238:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 33ms, Maximum = 39ms, Average = 35ms
```

```
C:\Users\MITS>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=21ms TTL=58
Reply from 8.8.8.8: bytes=32 time=20ms TTL=58
Reply from 8.8.8.8: bytes=32 time=22ms TTL=58
Reply from 8.8.8.8: bytes=32 time=20ms TTL=58

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum = 22ms, Average = 20ms
```

b) route

The route command is used to view and manipulate the IP routing table in Unix-like and Microsoft Windows operating systems, allowing you to manually configure routes for network traffic.

```
C:\Users\MITS>route

Manipulates network routing tables.

ROUTE [-f] [-p] [-4|-6] command [destination]
                  [MASK netmask]  [gateway] [METRIC metric]  [IF interface]

  -f           Clears the routing tables of all gateway entries.  If this is
               used in conjunction with one of the commands, the tables are
               cleared prior to running the command.

  -p           When used with the ADD command, makes a route persistent across
               boots of the system. By default, routes are not preserved
               when the system is restarted. Ignored for all other commands,
               which always affect the appropriate persistent routes.

  -4           Force using IPv4.

  -6           Force using IPv6.
```

```
C:\Users\MITS>route print
===========================================================================
Interface List
  9...74 56 3c a5 e4 cf ......Realtek PCIe GbE Family Controller
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0       10.76.0.1       10.76.8.31    281
       10.76.0.0    255.255.224.0         On-link        10.76.8.31    281
      10.76.8.31  255.255.255.255         On-link        10.76.8.31    281
    10.76.31.255  255.255.255.255         On-link        10.76.8.31    281
        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
        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        10.76.8.31    281
  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        10.76.8.31    281
===========================================================================
Persistent Routes:
  Network Address          Netmask  Gateway Address  Metric
          0.0.0.0          0.0.0.0       10.76.0.1  Default
===========================================================================

IPv6 Route Table
===========================================================================
```

c) nslookup

The nslookup command is a command-line tool used to query the Domain Name System (DNS) to obtain information about domain names and IP addresses, helping with troubleshooting and understanding DNS records.

```
C:\Users\MITS>nslookup
Default Server:  dns.google
Address:  8.8.8.8

>
```

d) ipconfig

The ipconfig command is a command-line utility that provides information about your computer's network settings. It's short for Internet Protocol Configuration.

```
C:\Users\MITS>ipconfig

Windows IP Configuration


Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::609:c9d0:7f73:348e%9
   IPv4 Address. . . . . . . . . . . : 10.76.8.31
   Subnet Mask . . . . . . . . . . . : 255.255.224.0
   Default Gateway . . . . . . . . . : 10.76.0.1
```

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

Windows IP Configuration

   Host Name . . . . . . . . . . . . : DESKTOP-NVDO3GM
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Realtek PCIe GbE Family Controller
   Physical Address. . . . . . . . . : 74-56-3C-A5-E4-CF
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::609:c9d0:7f73:348e%9(Preferred)
   IPv4 Address. . . . . . . . . . . : 10.76.8.31(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.224.0
   Default Gateway . . . . . . . . . : 10.76.0.1
   DHCPv6 IAID . . . . . . . . . . . : 158619196
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-2D-25-93-36-74-56-3C-A5-E4-CF
   DNS Servers . . . . . . . . . . . : 8.8.8.8
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

e) tracert

The tracert command is used to trace the route an IP packet takes to a destination. It's a network testing tool that comes with most operating systems. Tracert sends UDP probe packets with a small TTL, with routers decrementing TTL. If TTL = 1, the router sends an ICMP "time exceeded" message to the source.

```
C:\Users\MITS>tracert

Usage: tracert [-d] [-h maximum_hops] [-j host-list] [-w timeout]
               [-R] [-S srcaddr] [-4] [-6] target_name

Options:
    -d                 Do not resolve addresses to hostnames.
    -h maximum_hops    Maximum number of hops to search for target.
    -j host-list       Loose source route along host-list (IPv4-only).
    -w timeout         Wait timeout milliseconds for each reply.
    -R                 Trace round-trip path (IPv6-only).
    -S srcaddr         Source address to use (IPv6-only).
    -4                 Force using IPv4.
    -6                 Force using IPv6.
```

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

Tracing route to google.com [142.250.182.14]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  10.76.0.1
  2     2 ms     2 ms     2 ms  103.214.233.1
  3     2 ms     3 ms     4 ms  103.214.235.243
  4    23 ms    22 ms    21 ms  114.134.16.50.static-kerala.powertel.in [114.134.16.50]
  5     *        *        *     Request timed out.
  6     *        *        *     Request timed out.
  7     *        *        *     Request timed out.
  8    22 ms    23 ms    22 ms  172.253.69.51
  9    19 ms    19 ms    20 ms  142.251.55.217
 10    17 ms    17 ms    16 ms  maa05s18-in-f14.1e100.net [142.250.182.14]

Trace complete.
```

f) arp

The arp command is used to display and modify the Address Resolution Protocol (ARP) cache, which maps IP addresses to MAC addresses on a local network. You can use it to view the ARP table, add entries, delete entries, or flush the entire table.

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

Interface: 10.76.8.31 --- 0x9
  Internet Address      Physical Address      Type
  10.76.0.1             70-4c-a5-36-de-7e     dynamic
  10.76.1.179           ac-ac-e2-d7-7c-ee     dynamic
  10.76.2.231           44-8a-5b-72-4e-94     dynamic
  10.76.3.61            98-e7-43-3e-3c-76     dynamic
  10.76.3.91            40-ed-00-2c-cf-bb     dynamic
  10.76.3.99            a0-ce-c8-dc-3f-95     dynamic
  10.76.4.10            f4-a9-97-e9-ec-47     dynamic
  10.76.8.4             4c-cc-6a-58-dd-a6     dynamic
  10.76.8.24            e0-be-03-93-d1-dd     dynamic
  10.76.8.28            e0-be-03-93-d1-d9     dynamic
  10.76.8.38            f4-b5-20-4f-64-f6     dynamic
  10.76.8.40            f4-b5-20-4e-79-f7     dynamic
  10.76.8.45            e0-be-03-93-d1-ee     dynamic
  10.76.8.50            74-56-3c-b1-ac-b7     dynamic
  10.76.31.255          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
  224.0.0.252           01-00-5e-00-00-fc     static
  224.0.1.140           01-00-5e-00-01-8c     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
```

g) nbtstat

The nbtstat command is a Windows command-line utility used to display NetBIOS over TCP/IP (NetBT) protocol statistics, NetBIOS name tables, and the NetBIOS name cache, primarily for troubleshooting NetBIOS name resolution problems.

```
C:\Users\MITS>nbtstat -r

    NetBIOS Names Resolution and Registration Statistics
    ----------------------------------------------------

    Resolved By Broadcast     = 1
    Resolved By Name Server   = 0

    Registered By Broadcast   = 84
    Registered By Name Server = 0

    NetBIOS Names Resolved By Broadcast
-----------------------------------------------
           DESKTOP-5P16CSJ
```

```
C:\Users\MITS>nbtstat -n

Ethernet:
Node IpAddress: [10.76.8.31] Scope Id: []

                NetBIOS Local Name Table

       Name               Type         Status
    ---------------------------------------------
    DESKTOP-NVDO3GM<20>  UNIQUE      Registered
    DESKTOP-NVDO3GM<00>  UNIQUE      Registered
    WORKGROUP      <00>  GROUP       Registered
```

h) hostname

The hostname command is used to view or change the name of a computer or network server. It can also be used to check a computer's IP address.

```
C:\Users\MITS>hostname
DESKTOP-NVDO3GM
```

i) pathping

The pathping command in Windows combines the functionality of ping and tracert to trace the path to a destination and measure latency and packet loss along each hop. It's used for network troubleshooting to identify potential bottlenecks or issues.

```
C:\Users\MITS>pathping

Usage: pathping [-g host-list] [-h maximum_hops] [-i address] [-n]
                [-p period] [-q num_queries] [-w timeout]
                [-4] [-6] target_name

Options:
    -g host-list     Loose source route along host-list.
    -h maximum_hops  Maximum number of hops to search for target.
    -i address       Use the specified source address.
    -n               Do not resolve addresses to hostnames.
    -p period        Wait period milliseconds between pings.
    -q num_queries   Number of queries per hop.
    -w timeout       Wait timeout milliseconds for each reply.
    -4               Force using IPv4.
    -6               Force using IPv6.
```

j) getmac

The getmac command displays the Media Access Control (MAC) addresses for each network adapter

```
C:\Users\MITS>getmac

Physical Address    Transport Name
=================== ============================================================
74-56-3C-A5-E4-CF   \Device\Tcpip_{5BB7367C-AF74-496C-9196-8969D97D0817}
```