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Computer Network (01CE0410)

Lab Manual (2024-25)

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Practical 3: Demonstrate basic networking commands and Network configuration commands.

1. ipconfig – Displays basic IP configuration details of the system's network adapters.

```
C:\Windows\system32\cmd.exe

Microsoft Windows [Version 10.0.19045.4598]
(c) Microsoft Corporation. All rights reserved.

C:\Users\student>ipconfig

Windows IP Configuration


Ethernet adapter Ethernet 2:

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

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::5649:3dcc:cfa6:9a23%14
   IPv4 Address. . . . . . . . . . . : 172.21.31.141
   Subnet Mask . . . . . . . . . . . : 255.255.254.0
   Default Gateway . . . . . . . . . : 192.168.16.3

Ethernet adapter VMware Network Adapter VMnet1:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::3161:aa1c:18f:4bd7%16
   IPv4 Address. . . . . . . . . . . : 192.168.209.1
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

Ethernet adapter VMware Network Adapter VMnet8:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::2602:103:6ce5:ef9e%13
   IPv4 Address. . . . . . . . . . . : 192.168.223.1
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

C:\Users\student>
```

2. ipconfig /all – Shows detailed information about all network interfaces, including MAC addresses and DNS servers.

3. **hostname – Displays the computer's hostname (system name) on the network.**


```
C:\Windows\system32\cmd.exe
C:\Users\student>hostname
MC220-CL141

C:\Users\student>_
```

4. **getmac – Displays the MAC address of the network interfaces on the system.**


```
C:\Windows\system32\cmd.exe
C:\Users\student>getmac

Physical Address     Transport Name
==================   =========================================================
8C-EC-4B-96-63-65    \Device\Tcpip_{AE6BAFD8-BF3F-407C-BC8F-959957514E44}
00-50-56-C0-00-01    \Device\Tcpip_{E630B2C5-8531-4353-9D41-18D3C063D040}
00-50-56-C0-00-08    \Device\Tcpip_{AC00086E-422C-451D-9EFD-9755656FF548}
00-FF-3B-3D-0B-B1    Media disconnected

C:\Users\student>
```

5.systeminfo – Provides detailed information about the system configuration, including OS, memory, and network adapter info.

6.ping – Sends an ICMP echo request to check connectivity to a remote host.

```
C:\Windows\system32\cmd.exe

C:\Users\student>ping www.google.com

Pinging www.google.com [142.250.192.4] with 32 bytes of data:
Reply from 142.250.192.4: bytes=32 time=15ms TTL=58
Reply from 142.250.192.4: bytes=32 time=15ms TTL=58
Reply from 142.250.192.4: bytes=32 time=15ms TTL=58
Reply from 142.250.192.4: bytes=32 time=15ms TTL=58

Ping statistics for 142.250.192.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 15ms, Maximum = 15ms, Average = 15ms
```

7. ping {ip addr} – Pings a specific IP address to test connectivity to that address.

```
C:\Windows\system32\cmd.exe

C:\Users\student>ping 142.250.192.4

Pinging 142.250.192.4 with 32 bytes of data:
Reply from 142.250.192.4: bytes=32 time=15ms TTL=58
Reply from 142.250.192.4: bytes=32 time=15ms TTL=58
Reply from 142.250.192.4: bytes=32 time=15ms TTL=58
Reply from 142.250.192.4: bytes=32 time=15ms TTL=58

Ping statistics for 142.250.192.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 15ms, Maximum = 15ms, Average = 15ms

C:\Users\student>
```

8. tracert – Traces the route packets take to reach a destination, showing the hops along the way.

```
C:\Users\student>tracert www.google.com

Tracing route to www.google.com [142.250.192.4]
over a maximum of 30 hops:

  1      6 ms      7 ms      5 ms  172.21.30.1
  2     <1 ms     <1 ms     <1 ms  192.168.15.91
  3      1 ms     <1 ms     <1 ms  119.160.199.81
  4      2 ms      2 ms      1 ms  10.50.79.1
  5     15 ms     15 ms     15 ms  10.250.10.205
  6     16 ms     16 ms     16 ms  72.14.202.41
  7     17 ms     15 ms     22 ms  74.125.37.7
  8     15 ms     15 ms     15 ms  108.170.231.79
  9     14 ms     14 ms     14 ms  bom12s14-in-f4.1e100.net [142.250.192.4]

Trace complete.
```

9. route print – Displays the routing table, showing routes and associated network interfaces.

```
C:\Windows\system32\cmd.exe

C:\Users\student>route print
===========================================================================
Interface List
  5...00 ff 3b 3d 0b b1 ......Sophos TAP Adapter
 14...8c ec 4b 96 63 65 ......Realtek PCIe GbE Family Controller
 16...00 50 56 c0 00 01 ......VMware Virtual Ethernet Adapter for VMnet1
 13...00 50 56 c0 00 08 ......VMware Virtual Ethernet Adapter for VMnet8
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0     192.168.16.3    172.21.31.141    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
      172.21.30.0    255.255.254.0         On-link    172.21.31.141    281
    172.21.31.141  255.255.255.255         On-link    172.21.31.141    281
    172.21.31.255  255.255.255.255         On-link    172.21.31.141    281
    192.168.209.0    255.255.255.0         On-link    192.168.209.1    291
    192.168.209.1  255.255.255.255         On-link    192.168.209.1    291
  192.168.209.255  255.255.255.255         On-link    192.168.209.1    291
    192.168.223.0    255.255.255.0         On-link    192.168.223.1    291
    192.168.223.1  255.255.255.255         On-link    192.168.223.1    291
  192.168.223.255  255.255.255.255         On-link    192.168.223.1    291
        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    192.168.209.1    291
        224.0.0.0        240.0.0.0         On-link    192.168.223.1    291
        224.0.0.0        240.0.0.0         On-link    172.21.31.141    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    192.168.209.1    291
  255.255.255.255  255.255.255.255         On-link    192.168.223.1    291
  255.255.255.255  255.255.255.255         On-link    172.21.31.141    281
===========================================================================
Persistent Routes:
  Network Address          Netmask  Gateway Address  Metric
          0.0.0.0          0.0.0.0     192.168.16.3  Default
===========================================================================
```

```
IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination        Gateway
  1    331 ::1/128                     On-link
 16    291 fe80::/64                   On-link
 13    291 fe80::/64                   On-link
 14    281 fe80::/64                   On-link
 13    291 fe80::2602:103:6ce5:ef9e/128
                                       On-link
 16    291 fe80::3161:aa1c:18f:4bd7/128
                                       On-link
 14    281 fe80::5649:3dcc:cfa6:9a23/128
                                       On-link
  1    331 ff00::/8                    On-link
 16    291 ff00::/8                    On-link
 13    291 ff00::/8                    On-link
 14    281 ff00::/8                    On-link
===========================================================================
Persistent Routes:
  None

C:\Users\student>
```

10. pathping – Combines the functionality of ping and tracert, providing packet loss and latency information at each hop.

```
C:\Windows\system32\cmd.exe

C:\Users\student>pathping www.google.com

Tracing route to www.google.com [142.250.192.4]
over a maximum of 30 hops:
  0  MC220-CL141.mefgi.com [172.21.31.141]
  1  172.21.30.1
  2  192.168.15.91
  3  119.160.199.81
  4  10.50.79.1
  5  10.250.10.205
  6  72.14.202.41
  7  74.125.37.7
  8  108.170.231.79
  9  bom12s14-in-f4.1e100.net [142.250.192.4]

Computing statistics for 225 seconds...
            Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                            MC220-CL141.mefgi.com [172.21.31.141]
                                0/ 100 =  0%   |
  1    5ms     0/ 100 =  0%    0/ 100 =  0%   172.21.30.1
                                0/ 100 =  0%   |
  2    0ms     0/ 100 =  0%    0/ 100 =  0%   192.168.15.91
                                0/ 100 =  0%   |
  3    1ms     0/ 100 =  0%    0/ 100 =  0%   119.160.199.81
                                0/ 100 =  0%   |
  4    1ms     0/ 100 =  0%    0/ 100 =  0%   10.50.79.1
                                0/ 100 =  0%   |
  5   15ms     0/ 100 =  0%    0/ 100 =  0%   10.250.10.205
                                0/ 100 =  0%   |
  6   20ms     0/ 100 =  0%    0/ 100 =  0%   72.14.202.41
                                0/ 100 =  0%   |
  7   15ms     0/ 100 =  0%    0/ 100 =  0%   74.125.37.7
                                0/ 100 =  0%   |
  8   15ms     0/ 100 =  0%    0/ 100 =  0%   108.170.231.79
                                0/ 100 =  0%   |
  9   15ms     0/ 100 =  0%    0/ 100 =  0%   bom12s14-in-f4.1e100.net [142.250.192.4]

Trace complete.

C:\Users\student>_
```

11. arp -a – Displays the current ARP (Address Resolution Protocol) table, mapping IP addresses to MAC addresses.

```
C:\Windows\system32\cmd.exe

C:\Users\student>arp -a

Interface: 192.168.223.1 --- 0xd
  Internet Address        Physical Address      Type
  192.168.223.254         00-50-56-ef-db-10     dynamic
  192.168.223.255         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: 172.21.31.141 --- 0xe
  Internet Address        Physical Address      Type
  172.21.30.1             00-19-e8-f8-26-4f     dynamic
  172.21.31.255           ff-ff-ff-ff-ff-ff     static
  192.168.16.3            00-19-e8-f8-26-4f     dynamic
  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

Interface: 192.168.209.1 --- 0x10
  Internet Address        Physical Address      Type
  192.168.209.254         00-50-56-f2-2b-de     dynamic
  192.168.209.255         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

C:\Users\student>
```

12. nslookup – Queries DNS servers to obtain domain name or IP address information.

```
C:\Windows\system32\cmd.exe
C:\Users\student>nslookup www.google.com
Server:  ADS-PRIMARY101.mefgi.com
Address:  192.168.12.101

Non-authoritative answer:
Name:    www.google.com
Addresses:  2404:6800:4009:827::2004
          142.250.192.4

C:\Users\student>
```

13. netstat – Displays active network connections, listening ports, and routing table.

```
C:\Windows\system32\cmd.exe

C:\Users\student>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:49671        MC220-CL141:49672      ESTABLISHED
  TCP    127.0.0.1:49672        MC220-CL141:49671      ESTABLISHED
  TCP    127.0.0.1:50918        MC220-CL141:60110      ESTABLISHED
  TCP    127.0.0.1:60110        MC220-CL141:50918      ESTABLISHED
  TCP    172.21.31.141:50861    ADS-PRIMARY101:microsoft-ds  ESTABLISHED
  TCP    172.21.31.141:50869    20.198.119.84:https    ESTABLISHED
  TCP    172.21.31.141:51082    a23-38-59-250:http     CLOSE_WAIT
  TCP    172.21.31.141:51127    13.107.213.254:https   CLOSE_WAIT
  TCP    172.21.31.141:51435    sb-in-f188:5228        ESTABLISHED
  TCP    172.21.31.141:53053    42.106.164.154:https   CLOSE_WAIT
  TCP    172.21.31.141:53057    20.140.56.69:https     CLOSE_WAIT
  TCP    172.21.31.141:53058    13.107.246.48:https    CLOSE_WAIT
  TCP    172.21.31.141:53201    bom12s17-in-f14:https  ESTABLISHED
  TCP    172.21.31.141:53202    bom07s30-in-f14:https  ESTABLISHED
  TCP    172.21.31.141:53204    pnbomb-ad-in-f10:https  ESTABLISHED
  TCP    172.21.31.141:53211    pnbomb-ac-in-f3:https   ESTABLISHED
  TCP    172.21.31.141:53213    pnbomb-ad-in-f10:https  ESTABLISHED
  TCP    172.21.31.141:53260    lb-140-82-113-22-iad:https  ESTABLISHED
  TCP    172.21.31.141:53262    bom12s19-in-f10:https  ESTABLISHED
  TCP    172.21.31.141:53270    cdn-185-199-109-133:https  ESTABLISHED
  TCP    172.21.31.141:53275    pnbomb-ab-in-f14:https  ESTABLISHED
  TCP    172.21.31.141:53276    pnbomb-ac-in-f10:https  ESTABLISHED
  TCP    172.21.31.141:53285    52.168.112.67:https    ESTABLISHED
  TCP    172.21.31.141:53287    ADS-SERVER:epmap       TIME_WAIT
  TCP    172.21.31.141:53288    ADS-SERVER:49693       TIME_WAIT
  TCP    172.21.31.141:53289    20.207.73.85:https     ESTABLISHED
  TCP    172.21.31.141:53290    bom07s30-in-f14:https  ESTABLISHED
  TCP    172.21.31.141:53292    20.207.73.82:https     ESTABLISHED
  TCP    172.21.31.141:53293    s3-1-w:https           CLOSE_WAIT
  TCP    172.21.31.141:53294    bom07s32-in-f10:https  ESTABLISHED
  TCP    172.21.31.141:53296    lb-140-82-114-25-iad:https  ESTABLISHED

C:\Users\student>_
```
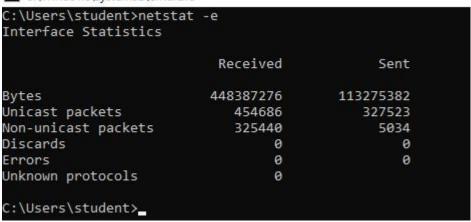
14. netstat -a – Shows all active connections and listening ports.

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

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:80             MC220-CL141:0          LISTENING
  TCP    0.0.0.0:135            MC220-CL141:0          LISTENING
  TCP    0.0.0.0:445            MC220-CL141:0          LISTENING
  TCP    0.0.0.0:902            MC220-CL141:0          LISTENING
  TCP    0.0.0.0:912            MC220-CL141:0          LISTENING
  TCP    0.0.0.0:3389           MC220-CL141:0          LISTENING
  TCP    0.0.0.0:5040           MC220-CL141:0          LISTENING
  TCP    0.0.0.0:5560           MC220-CL141:0          LISTENING
  TCP    0.0.0.0:5580           MC220-CL141:0          LISTENING
  TCP    0.0.0.0:5800           MC220-CL141:0          LISTENING
  TCP    0.0.0.0:5900           MC220-CL141:0          LISTENING
  TCP    0.0.0.0:7680           MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49664          MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49665          MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49666          MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49667          MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49668          MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49669          MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49670          MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49673          MC220-CL141:0          LISTENING
  TCP    0.0.0.0:49674          MC220-CL141:0          LISTENING
  TCP    127.0.0.1:4502         MC220-CL141:0          LISTENING
  TCP    127.0.0.1:49671        MC220-CL141:49672      ESTABLISHED
  TCP    127.0.0.1:49672        MC220-CL141:49671      ESTABLISHED
  TCP    127.0.0.1:50918        MC220-CL141:60110      ESTABLISHED
  TCP    127.0.0.1:60110        MC220-CL141:0          LISTENING
  TCP    127.0.0.1:60110        MC220-CL141:50918      ESTABLISHED
  TCP    172.21.31.141:139      MC220-CL141:0          LISTENING
  TCP    172.21.31.141:50861    ADS-PRIMARY101:microsoft-ds  ESTABLISHED
  TCP    172.21.31.141:50869    20.198.119.84:https    ESTABLISHED
  TCP    172.21.31.141:51082    a23-38-59-250:http     CLOSE_WAIT
  TCP    172.21.31.141:51127    13.107.213.254:https   CLOSE_WAIT
  TCP    172.21.31.141:51435    sb-in-f188:5228        ESTABLISHED
  TCP    172.21.31.141:53053    42.106.164.154:https   CLOSE_WAIT
  TCP    172.21.31.141:53057    20.140.56.69:https     CLOSE_WAIT
  TCP    172.21.31.141:53058    13.107.246.48:https    CLOSE_WAIT
  TCP    172.21.31.141:53201    bom12s17-in-f14:https  ESTABLISHED
  TCP    172.21.31.141:53202    bom07s30-in-f14:https  ESTABLISHED
  TCP    172.21.31.141:53204    pnbomb-ad-in-f10:https  ESTABLISHED
  TCP    172.21.31.141:53211    pnbomb-ac-in-f3:https  ESTABLISHED
```

15. netstat -e – Displays Ethernet statistics, such as the number of bytes and packets sent/received.

```
C:\Windows\system32\cmd.exe

C:\Users\student>netstat -e
Interface Statistics

                           Received            Sent

Bytes                     448387276       113275382
Unicast packets              454686          327523
Non-unicast packets          325440            5034
Discards                          0               0
Errors                            0               0
Unknown protocols                 0

C:\Users\student>
```

16. ipconfig /flushdns – Clears the DNS resolver cache to force fresh DNS lookups.

```
C:\Windows\system32\cmd.exe

C:\Users\student>ipconfig/flushdns

Windows IP Configuration

Successfully flushed the DNS Resolver Cache.

C:\Users\student>
```

17. nbtstat -r – Displays NetBIOS over TCP/IP statistics, including the resolution of names from the NetBIOS name cache.

```
C:\Windows\system32\cmd.exe

C:\Users\student>nbtstat -r

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

    Resolved By Broadcast     = 0
    Resolved By Name Server   = 0

    Registered By Broadcast   = 13
    Registered By Name Server = 0

C:\Users\student>
```