INSTITUTE OF ENGINNERING , CENTRAL CAMPUS,PULCHOWK

COMPUTER NETWORK

LAB #2

Study of Basic Networking Commands

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Study of Basic Networking Commands

2 Objective

- To be familiar with basic networking commands and their uses

3 Requirement

- Computer with Internet Connectivity

4 Procedure

This lab session is code along so , we coded along with the instructor and noted the output of some useful network command . Command line interface ”CMD” for windows and for Linux ”Terminal” is used . Some code used are same and some differ as per the platforms. We study different command and their varient/parameters some of them are :-

- ipconfig
- ping
- getmac
- tracert
- arp
- hostname
- netstat
- route

5 Exercises

5.1 Question -1

Explain the following commands briefly with their functions and few syntaxes.

1. **IPCONFIG:** As per the Documentation provided in Microsoft website it displays all TCP/IP current setup and refreshes DHCP and DNS settings. with the help of command prompt help statement all syntaxes and some of the function are listed below.

   Command used:-**ipconfig /?**

```
USAGE:
    ipconfig [/allcompartments] [/? | /all |
                                 /renew [adapter] | /release [adapter] |
                                 /renew6 [adapter] | /release6 [adapter] |
                                 /flushdns | /displaydns | /registerdns |
                                 /showclassid adapter |
                                 /setclassid adapter [classid] |
                                 /showclassid6 adapter |
                                 /setclassid6 adapter [classid] ]

where
    adapter             Connection name
                       (wildcard characters * and ? allowed, see examples)

    Options:
       /?               Display this help message
       /all             Display full configuration information.
       /release         Release the IPv4 address for the specified adapter.
       /release6        Release the IPv6 address for the specified adapter.
       /renew           Renew the IPv4 address for the specified adapter.
       /renew6          Renew the IPv6 address for the specified adapter.
       /flushdns        Purges the DNS Resolver cache.
       /registerdns     Refreshes all DHCP leases and re-registers DNS names
       /displaydns      Display the contents of the DNS Resolver Cache.
       /showclassid     Displays all the dhcp class IDs allowed for adapter.
       /setclassid      Modifies the dhcp class id.
       /showclassid6    Displays all the IPv6 DHCP class IDs allowed for adapter.
       /setclassid6     Modifies the IPv6 DHCP class id.


The default is to display only the IP address, subnet mask and
default gateway for each adapter bound to TCP/IP.

For Release and Renew, if no adapter name is specified, then the IP address
leases for all adapters bound to TCP/IP will be released or renewed.

For Setclassid and Setclassid6, if no ClassId is specified, then the ClassId is
    removed.

Examples:
    > ipconfig                      ... Show information
    > ipconfig /all                 ... Show detailed information
    > ipconfig /renew               ... renew all adapters
    > ipconfig /renew EL*           ... renew any connection that has its
                                        name starting with EL
    > ipconfig /release *Con*       ... release all matching connections,
                                        eg. "Wired Ethernet Connection 1" or
                                            "Wired Ethernet Connection 2"
    > ipconfig /allcompartments     ... Show information about all
                                        compartments
    > ipconfig /allcompartments /all ... Show detailed information about all
                                        compartments
```

Output 1: ipconfig Syntaxes and Uses

2. **PING:** It is used along with url or Ip address. Source device will send packets,Internet Control Message Protocol (ICMP), to destination and waits for response. If the destination device responds it shows the round trip time in ms.Ping has various uses in troubleshoot Connectivity and name resolution. generally used to test whether the targeted domain or Ip has access to internet and if it loose any packet during transfer. All ping syntaxes ,parameters and its uses are listed below:

   Command used:-**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.
```

Output 2: ping Syntaxes and Uses

3. **GETMAC:** This command retrieves the MAC (Media Access Control) Address or Physical Address of connected adapters . This command can also obtain the MAC address of Remote device/computer too. All getmac syntaxes ,parameters and its uses are listed below:

   Command used:-**getmac /?**

```
GETMAC [/S system [/U username [/P [password]]]] [/FO format] [/NH] [/V]

Description:
    This tool enables an administrator to display the MAC address
    for network adapters on a system.

Parameter List:
    /S     system            Specifies the remote system to connect to.

    /U     [domain\]user     Specifies the user context under
                             which the command should execute.

    /P     [password]        Specifies the password for the given
                             user context. Prompts for input if omitted.

    /FO    format            Specifies the format in which the output
                             is to be displayed.
                             Valid values: "TABLE", "LIST", "CSV".
```

```
    /NH                     Specifies that the "Column Header" should
                            not be displayed in the output.
                            Valid only for TABLE and CSV formats.

    /V                      Specifies that verbose output is displayed.

    /?                      Displays this help message.

Examples:
    GETMAC /?
    GETMAC /FO csv
    GETMAC /S system /NH /V
    GETMAC /S system /U user
    GETMAC /S system /U domain\user /P password /FO list /V
    GETMAC /S system /U domain\user /P password /FO table /NH
```

Output 3: getmac Syntaxes and Uses

4. **TRACERT:** It shows different information about the path taken by packets to reach the destination. Each packets has TTL which decreases as it passes the Routers. All tracert syntaxes ,parameters and its uses are listed below:

   Command used:-**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.
```

Output 4: tracert Syntaxes and Uses

5. **ARP:** ARPAddress Resolution Protocol is used to pair MAC address with Ip address and save for future uses. This command has ability to display and modify the Cache of Address translation table if needed. All arp syntaxes ,parameters and its uses are listed below:

   Command used:-**arp /?**

```
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
                table are displayed.
  -g            Same as -a.
  -v            Displays current ARP entries in verbose mode.  All invalid
                entries and entries on the loop-back interface will be shown.
  inet_addr     Specifies an internet address.
  -N if_addr    Displays the ARP entries for the network interface specified
                by if_addr.
  -d            Deletes the host specified by inet_addr. inet_addr may be
                wildcarded with * to delete all hosts.
  -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.
  eth_addr      Specifies a physical address.
  if_addr       If present, this specifies the Internet address of the
                interface whose address translation table should be modified.
                If not present, the first applicable interface will be used.
Example:
  > arp -s 157.55.85.212   00-aa-00-62-c6-09  .... Adds a static entry.
  > arp -a                                    .... Displays the arp table.
```

Output 5: arp Syntaxes and Uses

6. **HOSTNAME:** Hostname is the device name in the network so this command displays the hostname of the device. it doesn't have any other parameter other than help.

   Command used:-**hostname /?**

```
Prints the name of the current host.

hostname
```

Output 6: hostname Syntaxes and Uses

7. **NETSTAT:** It shows the statistics about the connected network and devices. It informs about the current Working TCP/Ip Connection including ports and addresses. It displays the open ports or ports listening (can establish connection). All netstat syntaxes ,parameters and its uses are listed below: Command used:-**netstat /?**

```
Displays protocol statistics and current TCP/IP network connections.

NETSTAT [-a] [-b] [-e] [-f] [-n] [-o] [-p proto] [-r] [-s] [-t] [-x] [-y] [interval]

  -a            Displays all connections and listening ports.
  -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 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.
  -e            Displays Ethernet statistics. This may be combined with the -s
                option.
  -f            Displays Fully Qualified Domain Names (FQDN) for foreign
                addresses.
  -n            Displays addresses and port numbers in numerical form.
  -o            Displays the owning process ID associated with each connection.
  -p proto      Shows connections for the protocol specified by proto; proto
                may be any of: TCP, UDP, TCPv6, or UDPv6.  If used with the -s
                option to display per-protocol statistics, proto may be any of:
                IP, IPv6, ICMP, ICMPv6, TCP, TCPv6, UDP, or UDPv6.
  -q            Displays all connections, listening ports, and bound
                nonlistening TCP ports. Bound nonlistening ports may or may not
                be associated with an active connection.
  -r            Displays the routing table.
  -s            Displays per-protocol statistics.  By default, statistics are
                shown for IP, IPv6, ICMP, ICMPv6, TCP, TCPv6, UDP, and UDPv6;
                the -p option may be used to specify a subset of the default.
  -t            Displays the current connection offload state.
  -x            Displays NetworkDirect connections, listeners, and shared
                endpoints.
  -y            Displays the TCP connection template for all connections.
                Cannot be combined with the other options.
  interval      Redisplays selected statistics, pausing interval seconds
                between each display.  Press CTRL+C to stop redisplaying
                statistics.  If omitted, netstat will print the current
                configuration information once.
```

Output 7: netstat Syntaxes and Uses

8. **ROUTE:** It has ability to print the content in IP routing tables and modify it if needed. All route syntaxes ,parameters and its uses are listed below:
Command used:-**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.

  command       One of these:
                  PRINT     Prints  a route
                  ADD       Adds    a route
                  DELETE    Deletes a route
                  CHANGE    Modifies an existing route
  destination   Specifies the host.
  MASK          Specifies that the next parameter is the 'netmask' value.
  netmask       Specifies a subnet mask value for this route entry.
                If not specified, it defaults to 255.255.255.255.
  gateway       Specifies gateway.
  interface     the interface number for the specified route.
  METRIC        specifies the metric, ie. cost for the destination.

All symbolic names used for destination are looked up in the network database
file NETWORKS. The symbolic names for gateway are looked up in the host name
database file HOSTS.

If the command is PRINT or DELETE. Destination or gateway can be a wildcard,
(wildcard is specified as a star '*'), or the gateway argument may be omitted.

If Dest contains a * or ?, it is treated as a shell pattern, and only
matching destination routes are printed. The '*' matches any string,
and '?' matches any one char. Examples: 157.*.1, 157.*, 127.*, *224*.

Pattern match is only allowed in PRINT command.
Diagnostic Notes:
    Invalid MASK generates an error, that is when (DEST & MASK) != DEST.
    Example> route ADD 157.0.0.0 MASK 155.0.0.0 157.55.80.1 IF 1
             The route addition failed: The specified mask parameter is invalid. (
    Destination & Mask) != Destination.

Examples:

    > route PRINT
    > route PRINT -4
    > route PRINT -6
    > route PRINT 157*            .... Only prints those matching 157*

    > route ADD 157.0.0.0 MASK 255.0.0.0  157.55.80.1 METRIC 3 IF 2
              destination^      ^mask      ^gateway     metric^    ^
                                                        Interface^
      If IF is not given, it tries to find the best interface for a given
      gateway.
    > route ADD 3ffe::/32 3ffe::1

    > route CHANGE 157.0.0.0 MASK 255.0.0.0 157.55.80.5 METRIC 2 IF 2

      CHANGE is used to modify gateway and/or metric only.

    > route DELETE 157.0.0.0
    > route DELETE 3ffe::/32
```

Output 8: route Syntaxes and Uses

5.2 Question -2

Note down the observation of each steps with necessary commands specified in activities B mentioned above and comment on it.

1. **Using ipconfig:**

   (a) **ipconfig:** Displays Windows ip configuration including IPv6/v4 address ,Subnet mask ,default gateway etc.

```
Windows IP Configuration


Ethernet adapter Ethernet:

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

Ethernet adapter vEthernet (Wi-Fi):

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::94d1:bb0e:6371:8d5c%68
   IPv4 Address. . . . . . . . . . . : 172.24.128.1
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :

Ethernet adapter Ethernet 3:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::a45b:94c3:4b24:c7c9%17
   IPv4 Address. . . . . . . . . . . : 192.168.56.1
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

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  . :

Ethernet adapter Ethernet 2:

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

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . : domain.name
   Link-local IPv6 Address . . . . . : fe80::b005:433c:267:66f8%4
   IPv4 Address. . . . . . . . . . . : 192.168.10.106
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::aa32:9aff:fe02:3506%4
                                       192.168.10.1

Ethernet adapter vEthernet (Ethernet):

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::ed9c:ca62:7dc5:3d7d%27
   IPv4 Address. . . . . . . . . . . : 172.27.224.1
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :

Ethernet adapter vEthernet (Ethernet 2):

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::6153:c670:6f72:17cc%37
   IPv4 Address. . . . . . . . . . . : 192.168.96.1
```

```
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :

Ethernet adapter vEthernet (Ethernet 3):

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::86f:1a00:39b4:de89%45
   IPv4 Address. . . . . . . . . . . : 172.28.144.1
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :
```

Output 9: ipconfig

(b) **ipconfig/all:** Similar to *ipconfig* but with additional information like Description, DHCP, Physical Address, Dns server etc.

```
Windows IP Configuration

   Host Name . . . . . . . . . . . . : AMRIT
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : domain.name

Ethernet adapter Ethernet:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Killer E2400 Gigabit Ethernet Controller
   Physical Address. . . . . . . . . : 3C-2C-30-A0-BC-A7
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Ethernet adapter vEthernet (Wi-Fi):

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Hyper-V Virtual Ethernet Adapter #4
   Physical Address. . . . . . . . . : 00-15-5D-05-E3-12
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::94d1:bb0e:6371:8d5c%68(Preferred)
   IPv4 Address. . . . . . . . . . . : 172.24.128.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :
   DHCPv6 IAID . . . . . . . . . . . : 1140856157
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-26-C9-D7-3C-3C-2C-30-A0-BC-
    A7
   DNS Servers . . . . . . . . . . . : fec0:0:0:ffff::1%1
                                       fec0:0:0:ffff::2%1
                                       fec0:0:0:ffff::3%1
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter Ethernet 3:

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : VirtualBox Host-Only Ethernet Adapter
   Physical Address. . . . . . . . . : 0A-00-27-00-00-11
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::a45b:94c3:4b24:c7c9%17(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.56.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :
   DHCPv6 IAID . . . . . . . . . . . : 386531367
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-26-C9-D7-3C-3C-2C-30-A0-BC-
    A7
   DNS Servers . . . . . . . . . . . : fec0:0:0:ffff::1%1
                                       fec0:0:0:ffff::2%1
                                       fec0:0:0:ffff::3%1
   NetBIOS over Tcpip. . . . . . . . : Enabled

Wireless LAN adapter Local Area Connection* 1:
```

```
   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Microsoft Wi-Fi Direct Virtual Adapter
   Physical Address. . . . . . . . . : 48-A4-72-53-1A-20
   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. . . . . . . . . : 4A-A4-72-53-1A-1F
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Ethernet adapter Ethernet 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Windscribe VPN
   Physical Address. . . . . . . . . : 00-FF-19-F6-C3-F4
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . : domain.name
   Description . . . . . . . . . . . : Intel(R) Wireless-AC 9560 160MHz
   Physical Address. . . . . . . . . : 48-A4-72-53-1A-1F
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::b005:433c:267:66f8%4(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.10.106(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Friday, October 30, 2020 11:24:08 AM
   Lease Expires . . . . . . . . . . : Friday, October 30, 2020 5:21:13 PM
   Default Gateway . . . . . . . . . : fe80::aa32:9aff:fe02:3506%4
                                       192.168.10.1
   DHCP Server . . . . . . . . . . . : 192.168.10.1
   DHCPv6 IAID . . . . . . . . . . . : 55092338
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-26-C9-D7-3C-3C-2C-30-A0-BC-
    A7
   DNS Servers . . . . . . . . . . . : 9.9.9.9
                                       8.0.0.8
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter vEthernet (Ethernet):

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Hyper-V Virtual Ethernet Adapter
   Physical Address. . . . . . . . . : 00-15-5D-EA-5B-33
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::ed9c:ca62:7dc5:3d7d%27(Preferred)
   IPv4 Address. . . . . . . . . . . : 172.27.224.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :
   DHCPv6 IAID . . . . . . . . . . . : 452990301
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-26-C9-D7-3C-3C-2C-30-A0-BC-
    A7
   DNS Servers . . . . . . . . . . . : fec0:0:0:ffff::1%1
                                       fec0:0:0:ffff::2%1
                                       fec0:0:0:ffff::3%1
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter vEthernet (Ethernet 2):

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Hyper-V Virtual Ethernet Adapter #2
   Physical Address. . . . . . . . . : 00-15-5D-86-6B-83
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
```

```
   Link-local IPv6 Address . . . . . : fe80::6153:c670:6f72:17cc%37(Preferred)
   IPv4 Address. . . . . . . . . . . : 192.168.96.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :
   DHCPv6 IAID . . . . . . . . . . . : 620762461
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-26-C9-D7-3C-3C-2C-30-A0-BC-
    A7
   DNS Servers . . . . . . . . . . . : fec0:0:0:ffff::1%1
                                       fec0:0:0:ffff::2%1
                                       fec0:0:0:ffff::3%1
   NetBIOS over Tcpip. . . . . . . . : Enabled

Ethernet adapter vEthernet (Ethernet 3):

   Connection-specific DNS Suffix  . :
   Description . . . . . . . . . . . : Hyper-V Virtual Ethernet Adapter #3
   Physical Address. . . . . . . . . : 00-15-5D-9B-E5-4C
   DHCP Enabled. . . . . . . . . . . : No
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::86f:1a00:39b4:de89%45(Preferred)
   IPv4 Address. . . . . . . . . . . : 172.28.144.1(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . :
   DHCPv6 IAID . . . . . . . . . . . : 754980189
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-26-C9-D7-3C-3C-2C-30-A0-BC-
    A7
   DNS Servers . . . . . . . . . . . : fec0:0:0:ffff::1%1
                                       fec0:0:0:ffff::2%1
                                       fec0:0:0:ffff::3%1
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

Output 10: ipconfig/all

2. **Using ping:**

   (a) **Obtain the IP address of your default gateway (refer qu. 1) and ping to that IP address.:**

   My default gateway Ip address is 192.168.10.1 so command is *ping*192.168.10.1. It display the round trip time to and from my default gateway (Router). It also displays no of data sent and received along with loss.

```
Pinging 192.168.10.1 with 32 bytes of data:
Reply from 192.168.10.1: bytes=32 time=2ms TTL=30
Reply from 192.168.10.1: bytes=32 time=2ms TTL=30
Reply from 192.168.10.1: bytes=32 time=2ms TTL=30
Reply from 192.168.10.1: bytes=32 time=13ms TTL=30

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 13ms, Average = 4ms
```

Output 11: ping Default Gateway

   (b) **ping "your ISP":** My ISP is Vianet so I should use *ping vianet.com.np*

```
Pinging vianet.com.np [110.44.112.54] with 32 bytes of data:
Reply from 110.44.112.54: bytes=32 time=3ms TTL=61
Reply from 110.44.112.54: bytes=32 time=3ms TTL=61
Reply from 110.44.112.54: bytes=32 time=4ms TTL=61
Reply from 110.44.112.54: bytes=32 time=4ms TTL=61

Ping statistics for 110.44.112.54:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 4ms, Average = 3ms
```

Output 12: ping vianet.com.np

(c) **ping google.com:**

```
Pinging google.com [172.217.167.174] with 32 bytes of data:
Reply from 172.217.167.174: bytes=32 time=62ms TTL=116
Reply from 172.217.167.174: bytes=32 time=64ms TTL=116
Reply from 172.217.167.174: bytes=32 time=62ms TTL=116
Reply from 172.217.167.174: bytes=32 time=63ms TTL=116

Ping statistics for 172.217.167.174:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 62ms, Maximum = 64ms, Average = 62ms
```

Output 13: ping google.com

(d) **ping 103.5.150.3:**

```
Pinging 103.5.150.3 with 32 bytes of data:
Reply from 103.5.150.3: bytes=32 time=11ms TTL=56
Reply from 103.5.150.3: bytes=32 time=4ms TTL=56
Reply from 103.5.150.3: bytes=32 time=4ms TTL=56
Reply from 103.5.150.3: bytes=32 time=4ms TTL=56

Ping statistics for 103.5.150.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 4ms, Maximum = 11ms, Average = 5ms
```

Output 14: ping 103.5.150.3

3. **Using getmac:**

(a) **getmac:** It displays MAC address (physical address) for all the available Network Adapters in the system . It also display the mac address assigned for virtual adapter created by Virtual machine and VPN's in the system.

```
Physical Address    Transport Name
=================== ============================================================
00-FF-19-F6-C3-F4   Media disconnected
48-A4-72-53-1A-1F   \Device\Tcpip_{158893BC-53E1-4BDF-B222-4D6FF103BEE2}
3C-2C-30-A0-BC-A7   Media disconnected
0A-00-27-00-00-11   \Device\Tcpip_{97D72D2E-0627-4769-87AB-8BFF95B762ED}
00-15-5D-EA-5B-33   \Device\Tcpip_{E484151D-D408-4F26-9881-C2D08230C10F}
00-15-5D-86-6B-83   \Device\Tcpip_{117E296B-1FD1-423E-B3C5-4EAE07DF6B89}
00-15-5D-9B-E5-4C   \Device\Tcpip_{5D8ED97A-E288-402C-A7A5-4ED35BDFA62B}
00-15-5D-05-E3-12   \Device\Tcpip_{AF8E9B37-F82A-4B8A-BC33-7AE57DA0170E}
```

Output 15: getmac

4. **Using tracert:**

(a) **Obtain the IP address of your default gateway (refer qu. 1) and use tracert to that IP address.:**
My default gateway ip(Router) is 192.168.10.1 so below is the output of the tracert command on Router.

```
Tracing route to 192.168.10.1 over a maximum of 30 hops

  1     3 ms     3 ms     2 ms  192.168.10.1

Trace complete.
```

Output 16: tracert Deafault Gateway

(b) **tracert "your ISP":**

```
Tracing route to vianet.com.np [110.44.112.54]
over a maximum of 30 hops:

  1     2 ms     1 ms     4 ms  192.168.10.1
  2     4 ms     3 ms     3 ms  103.10.30.153
  3     4 ms     3 ms     4 ms  103.10.28.3
  4     5 ms     4 ms     4 ms  110.44.112.54

Trace complete.
```

Output 17: tracert ISP

(c) **tracert google.com:**

```
Tracing route to google.com [172.217.167.174]
over a maximum of 30 hops:

  1     1 ms     1 ms     2 ms  192.168.10.1
  2     5 ms     4 ms     6 ms  103.10.30.153
  3     4 ms     3 ms     3 ms  103.10.29.1
  4     4 ms     3 ms     4 ms  ae0-bg1.vianet.com.np [110.44.112.65]
  5     7 ms     6 ms     6 ms  125.16.219.33
  6    50 ms    49 ms    57 ms  182.79.142.206
  7    58 ms    58 ms    57 ms  72.14.208.234
  8    61 ms    62 ms    61 ms  72.14.239.61
  9    58 ms    57 ms    60 ms  108.170.253.121
 10    62 ms    62 ms    62 ms  172.253.72.137
 11    59 ms    60 ms    62 ms  172.253.74.112
 12    57 ms    58 ms    58 ms  108.170.248.177
 13    55 ms    60 ms    56 ms  108.170.232.205
 14    57 ms    57 ms    57 ms  bom12s01-in-f14.1e100.net [172.217.167.174]

Trace complete.
```

Output 18: tracert google.com

(d) **tracert 103.5.150.3:**

```
Tracing route to 103.5.150.3 over a maximum of 30 hops

  1     2 ms     2 ms     2 ms  192.168.10.1
  2     4 ms     4 ms     3 ms  103.10.30.153
  3     4 ms     3 ms     3 ms  103.10.28.2
  4     5 ms     5 ms     4 ms  198-32-231-15.setg.net [198.32.231.15]
  5    46 ms     5 ms     5 ms  ptn.core-snd.core.ntc.net.np [202.70.93.81]
  6    57 ms   109 ms    25 ms  202.70.93.94
  7     4 ms     4 ms     4 ms  202.70.79.97
  8     4 ms     4 ms     4 ms  103.5.150.3

Trace complete.
```

Output 19: tracert 103.5.150.3

5. **Using arp:**

(a) **arp -a:** Display ARP table

```
Interface: 192.168.10.106 --- 0x4
  Internet Address      Physical Address      Type
  192.168.10.1          a8-32-9a-02-35-06     dynamic
  192.168.10.255        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
```

```
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static

Interface: 192.168.56.1 --- 0x11
  Internet Address      Physical Address      Type
  192.168.56.255        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
  239.255.255.250       01-00-5e-7f-ff-fa     static

Interface: 172.27.224.1 --- 0x1b
  Internet Address      Physical Address      Type
  172.27.239.255        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
  239.255.255.250       01-00-5e-7f-ff-fa     static

Interface: 192.168.96.1 --- 0x25
  Internet Address      Physical Address      Type
  192.168.111.255       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

Interface: 172.28.144.1 --- 0x2d
  Internet Address      Physical Address      Type
  172.28.159.255        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
  239.255.255.250       01-00-5e-7f-ff-fa     static

Interface: 172.24.128.1 --- 0x44
  Internet Address      Physical Address      Type
  172.24.143.255        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
  239.255.255.250       01-00-5e-7f-ff-fa     static
```

Output 20: arp -a

(b) **Use ping to any another device within your network such as another computer or laptop or mobile phone or tablet etc. and again use arp –a (if there are multiple devices in your network you can ping one by one by observing the output of arp -a after each ping)**

I am pinging my phone with Ip asssigned 192.168.10.102 and physical address d8:0b:9a:3a:37:f4. I also pinged another device with 192.168.10.104 and MAC address ec:35:86:7e:4e:30. In ARP table both the devices are visible with their corresponding MAC address just after my default gateway 192.168.10.1 with type Dynanic

*** Only changes from arp -a are included in output

```
Interface: 192.168.10.106 --- 0x4
  Internet Address      Physical Address      Type
  192.168.10.1          a8-32-9a-02-35-06     dynamic
  192.168.10.102        d8-0b-9a-3a-37-f4     dynamic
  192.168.10.104        ec-35-86-7e-4e-30     dynamic
  192.168.10.255        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
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

Output 21: arp -a after pinging another device

6. **Using hostname:**

   (a) **hostname:** Displays my System Hostname.

```
AMRIT
```

Output 22: hostname

7. **Using netstat:**

   (a) **netstat -a:** Display all connection and listening Ports
   *** some entries are deleted to meet the memory requirement for TEX.

```
Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            AMRIT:0                LISTENING
  TCP    0.0.0.0:445            AMRIT:0                LISTENING
  TCP    0.0.0.0:50246          AMRIT:0                LISTENING
  TCP    0.0.0.0:62227          AMRIT:0                LISTENING
  TCP    127.0.0.1:6463         AMRIT:0                LISTENING
  TCP    127.0.0.1:28385        AMRIT:0                LISTENING
  TCP    127.0.0.1:28390        AMRIT:0                LISTENING
  TCP    172.28.144.1:139       AMRIT:0                LISTENING
  TCP    192.168.10.106:139     AMRIT:0                LISTENING
  TCP    192.168.10.106:50183   sc-in-f188:5228        ESTABLISHED
  TCP    192.168.10.106:50718   edge-star-shv-01-hkg4:https  ESTABLISHED
  TCP    192.168.10.106:50985   stackoverflow:https    ESTABLISHED
  TCP    192.168.10.106:51569   162.159.133.234:https  ESTABLISHED
  TCP    192.168.10.106:52390   server-13-227-141-197:https  TIME_WAIT
  TCP    192.168.10.106:52391   162.159.135.232:https  ESTABLISHED
  TCP    192.168.10.106:52426   162.159.135.232:https  ESTABLISHED
  TCP    192.168.10.106:52427   server-13-227-141-197:https  ESTABLISHED
  TCP    192.168.10.106:64971   40.119.211.203:https   ESTABLISHED
  TCP    192.168.56.1:139       AMRIT:0                LISTENING
  TCP    192.168.96.1:139       AMRIT:0                LISTENING
  TCP    [::]:135               AMRIT:0                LISTENING
  TCP    [::]:445               AMRIT:0                LISTENING
  TCP    [::]:50246             AMRIT:0                LISTENING
  TCP    [::]:62227             AMRIT:0                LISTENING
  TCP    [::1]:57406            AMRIT:0                LISTENING
  UDP    0.0.0.0:1900           *:*
  UDP    0.0.0.0:3702           *:*
  UDP    0.0.0.0:3702           *:*
  UDP    0.0.0.0:5353           *:*
  UDP    0.0.0.0:5353           *:*
  UDP    0.0.0.0:5353           *:*
  UDP    0.0.0.0:5355           *:*
  UDP    0.0.0.0:51967          *:*
  UDP    0.0.0.0:56378          *:*
  UDP    0.0.0.0:63801          *:*
  UDP    127.0.0.1:1900         *:*
  UDP    127.0.0.1:54174        *:*
  UDP    127.0.0.1:54864        *:*
  UDP    192.168.10.106:1900    *:*
  UDP    192.168.10.106:2177    *:*
  UDP    192.168.10.106:54863   *:*
  UDP    192.168.56.1:137       *:*
  UDP    192.168.56.1:138       *:*
  UDP    192.168.56.1:1900      *:*
  UDP    192.168.56.1:2177      *:*
  UDP    192.168.56.1:54862     *:*
  UDP    192.168.96.1:137       *:*
  UDP    192.168.96.1:138       *:*
  UDP    192.168.96.1:1900      *:*
```

```
  UDP    192.168.96.1:2177      *:*
  UDP    192.168.96.1:54866     *:*
  UDP    [::]:3702              *:*
  UDP    [::]:51968             *:*
  UDP    [::]:56379             *:*
  UDP    [::1]:1900             *:*
  UDP    [::1]:54857            *:*
  UDP    [fe80::86f:1a00:39b4:de89%45]:1900  *:*
  UDP    [fe80::b005:433c:267:66f8%4]:1900  *:*
  UDP    [fe80::b005:433c:267:66f8%4]:2177  *:*
  UDP    [fe80::b005:433c:267:66f8%4]:54856  *:*
  UDP    [fe80::ed9c:ca62:7dc5:3d7d%27]:1900  *:*
  UDP    [fe80::ed9c:ca62:7dc5:3d7d%27]:2177  *:*
  UDP    [fe80::ed9c:ca62:7dc5:3d7d%27]:54858  *:*
```

Output 23: netstat -a

(b) **netstat -e:** Display ethernet statistics like Size of packet received and send in Bytes, errors uni and non- unicast packets etc.

```
Interface Statistics

                           Received            Sent

Bytes                    3072832490       202837749
Unicast packets             4973206         1156428
Non-unicast packets          147532           80062
Discards                          0               0
Errors                            0               0
Unknown protocols                 0
```

Output 24: netstat -e

(c) **netstat -r:** Display Interface list along with IPv6 and IPv4 Routing table.

```
===========================================================================
Interface List
  8...3c 2c 30 a0 bc a7 ......Killer E2400 Gigabit Ethernet Controller
 68...00 15 5d 05 e3 12 ......Hyper-V Virtual Ethernet Adapter #4
 17...0a 00 27 00 00 11 ......VirtualBox Host-Only Ethernet Adapter
 20...48 a4 72 53 1a 20 ......Microsoft Wi-Fi Direct Virtual Adapter
 21...4a a4 72 53 1a 1f ......Microsoft Wi-Fi Direct Virtual Adapter #2
  5...00 ff 19 f6 c3 f4 ......Windscribe VPN
  4...48 a4 72 53 1a 1f ......Intel(R) Wireless-AC 9560 160MHz
  1...........................Software Loopback Interface 1
 27...00 15 5d ea 5b 33 ......Hyper-V Virtual Ethernet Adapter
 37...00 15 5d 86 6b 83 ......Hyper-V Virtual Ethernet Adapter #2
 45...00 15 5d 9b e5 4c ......Hyper-V Virtual Ethernet Adapter #3
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0     192.168.10.1   192.168.10.106     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
     172.24.128.0    255.255.240.0         On-link      172.24.128.1    271
     172.24.128.1  255.255.255.255         On-link      172.24.128.1    271
   172.24.143.255  255.255.255.255         On-link      172.24.128.1    271
     172.27.224.0    255.255.240.0         On-link      172.27.224.1   5256
     172.27.224.1  255.255.255.255         On-link      172.27.224.1   5256
   172.27.239.255  255.255.255.255         On-link      172.27.224.1   5256
     172.28.144.0    255.255.240.0         On-link      172.28.144.1   5256
     172.28.144.1  255.255.255.255         On-link      172.28.144.1   5256
   172.28.159.255  255.255.255.255         On-link      172.28.144.1   5256
     192.168.10.0    255.255.255.0         On-link    192.168.10.106    296
   192.168.10.106  255.255.255.255         On-link    192.168.10.106    296
   192.168.10.255  255.255.255.255         On-link    192.168.10.106    296
     192.168.56.0    255.255.255.0         On-link      192.168.56.1    281
     192.168.56.1  255.255.255.255         On-link      192.168.56.1    281
```

```
    192.168.56.255  255.255.255.255         On-link      192.168.56.1    281
      192.168.96.0    255.255.240.0         On-link      192.168.96.1   5256
      192.168.96.1  255.255.255.255         On-link      192.168.96.1   5256
  192.168.111.255  255.255.255.255         On-link      192.168.96.1   5256
        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      192.168.56.1    281
        224.0.0.0        240.0.0.0         On-link    192.168.10.106    296
        224.0.0.0        240.0.0.0         On-link      172.27.224.1   5256
        224.0.0.0        240.0.0.0         On-link      172.28.144.1   5256
        224.0.0.0        240.0.0.0         On-link      172.24.128.1    271
        224.0.0.0        240.0.0.0         On-link      192.168.96.1   5256
  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      192.168.56.1    281
  255.255.255.255  255.255.255.255         On-link    192.168.10.106    296
  255.255.255.255  255.255.255.255         On-link      172.27.224.1   5256
  255.255.255.255  255.255.255.255         On-link      172.28.144.1   5256
  255.255.255.255  255.255.255.255         On-link      172.24.128.1    271
  255.255.255.255  255.255.255.255         On-link      192.168.96.1   5256
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  4    296 ::/0                     fe80::aa32:9aff:fe02:3506
  1    331 ::1/128                  On-link
 17    281 fe80::/64                On-link
  4    296 fe80::/64                On-link
 27   5256 fe80::/64                On-link
 45   5256 fe80::/64                On-link
 68    271 fe80::/64                On-link
 37   5256 fe80::/64                On-link
 45   5256 fe80::86f:1a00:39b4:de89/128
                                    On-link
 37   5256 fe80::6153:c670:6f72:17cc/128
                                    On-link
 68    271 fe80::94d1:bb0e:6371:8d5c/128
                                    On-link
 17    281 fe80::a45b:94c3:4b24:c7c9/128
                                    On-link
  4    296 fe80::b005:433c:267:66f8/128
                                    On-link
 27   5256 fe80::ed9c:ca62:7dc5:3d7d/128
                                    On-link
  1    331 ff00::/8                 On-link
 17    281 ff00::/8                 On-link
  4    296 ff00::/8                 On-link
 27   5256 ff00::/8                 On-link
 45   5256 ff00::/8                 On-link
 68    271 ff00::/8                 On-link
 37   5256 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

Output 25: netstat -r

8. **Using route:**

   (a) **route print:** Dispaly interface list along with IPv4 and IPv6 Routing Table.

```
===========================================================================
Interface List
  8...3c 2c 30 a0 bc a7 ......Killer E2400 Gigabit Ethernet Controller
 68...00 15 5d 05 e3 12 ......Hyper-V Virtual Ethernet Adapter #4
 17...0a 00 27 00 00 11 ......VirtualBox Host-Only Ethernet Adapter
 20...48 a4 72 53 1a 20 ......Microsoft Wi-Fi Direct Virtual Adapter
 21...4a a4 72 53 1a 1f ......Microsoft Wi-Fi Direct Virtual Adapter #2
  5...00 ff 19 f6 c3 f4 ......Windscribe VPN
  4...48 a4 72 53 1a 1f ......Intel(R) Wireless-AC 9560 160MHz
  1...........................Software Loopback Interface 1
 27...00 15 5d ea 5b 33 ......Hyper-V Virtual Ethernet Adapter
```

```
 37...00 15 5d 86 6b 83 ......Hyper-V Virtual Ethernet Adapter #2
 45...00 15 5d 9b e5 4c ......Hyper-V Virtual Ethernet Adapter #3
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0     192.168.10.1   192.168.10.106     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
     172.24.128.0    255.255.240.0         On-link      172.24.128.1    271
     172.24.128.1  255.255.255.255         On-link      172.24.128.1    271
   172.24.143.255  255.255.255.255         On-link      172.24.128.1    271
     172.27.224.0    255.255.240.0         On-link      172.27.224.1   5256
     172.27.224.1  255.255.255.255         On-link      172.27.224.1   5256
   172.27.239.255  255.255.255.255         On-link      172.27.224.1   5256
     172.28.144.0    255.255.240.0         On-link      172.28.144.1   5256
     172.28.144.1  255.255.255.255         On-link      172.28.144.1   5256
   172.28.159.255  255.255.255.255         On-link      172.28.144.1   5256
     192.168.10.0    255.255.255.0         On-link    192.168.10.106    296
   192.168.10.106  255.255.255.255         On-link    192.168.10.106    296
   192.168.10.255  255.255.255.255         On-link    192.168.10.106    296
     192.168.56.0    255.255.255.0         On-link      192.168.56.1    281
     192.168.56.1  255.255.255.255         On-link      192.168.56.1    281
   192.168.56.255  255.255.255.255         On-link      192.168.56.1    281
     192.168.96.0    255.255.240.0         On-link      192.168.96.1   5256
     192.168.96.1  255.255.255.255         On-link      192.168.96.1   5256
  192.168.111.255  255.255.255.255         On-link      192.168.96.1   5256
        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      192.168.56.1    281
        224.0.0.0        240.0.0.0         On-link    192.168.10.106    296
        224.0.0.0        240.0.0.0         On-link      172.27.224.1   5256
        224.0.0.0        240.0.0.0         On-link      172.28.144.1   5256
        224.0.0.0        240.0.0.0         On-link      172.24.128.1    271
        224.0.0.0        240.0.0.0         On-link      192.168.96.1   5256
  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      192.168.56.1    281
  255.255.255.255  255.255.255.255         On-link    192.168.10.106    296
  255.255.255.255  255.255.255.255         On-link      172.27.224.1   5256
  255.255.255.255  255.255.255.255         On-link      172.28.144.1   5256
  255.255.255.255  255.255.255.255         On-link      172.24.128.1    271
  255.255.255.255  255.255.255.255         On-link      192.168.96.1   5256
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  4    296 ::/0                     fe80::aa32:9aff:fe02:3506
  1    331 ::1/128                  On-link
 17    281 fe80::/64                On-link
  4    296 fe80::/64                On-link
 27   5256 fe80::/64                On-link
 45   5256 fe80::/64                On-link
 68    271 fe80::/64                On-link
 37   5256 fe80::/64                On-link
 45   5256 fe80::86f:1a00:39b4:de89/128
                                    On-link
 37   5256 fe80::6153:c670:6f72:17cc/128
                                    On-link
 68    271 fe80::94d1:bb0e:6371:8d5c/128
                                    On-link
 17    281 fe80::a45b:94c3:4b24:c7c9/128
                                    On-link
  4    296 fe80::b005:433c:267:66f8/128
                                    On-link
 27   5256 fe80::ed9c:ca62:7dc5:3d7d/128
                                    On-link
  1    331 ff00::/8                 On-link
 17    281 ff00::/8                 On-link
  4    296 ff00::/8                 On-link
```

```
 27    5256 ff00::/8                  On-link
 45    5256 ff00::/8                  On-link
 68     271 ff00::/8                  On-link
 37    5256 ff00::/8                  On-link
===========================================================================
Persistent Routes:
  None
```

Output 26: route print

(b) **route print -4:** Display only IPv4 Routing Table

```
===========================================================================
Interface List
  8...3c 2c 30 a0 bc a7 ......Killer E2400 Gigabit Ethernet Controller
 68...00 15 5d 05 e3 12 ......Hyper-V Virtual Ethernet Adapter #4
 17...0a 00 27 00 00 11 ......VirtualBox Host-Only Ethernet Adapter
 20...48 a4 72 53 1a 20 ......Microsoft Wi-Fi Direct Virtual Adapter
 21...4a a4 72 53 1a 1f ......Microsoft Wi-Fi Direct Virtual Adapter #2
  5...00 ff 19 f6 c3 f4 ......Windscribe VPN
  4...48 a4 72 53 1a 1f ......Intel(R) Wireless-AC 9560 160MHz
  1...........................Software Loopback Interface 1
 27...00 15 5d ea 5b 33 ......Hyper-V Virtual Ethernet Adapter
 37...00 15 5d 86 6b 83 ......Hyper-V Virtual Ethernet Adapter #2
 45...00 15 5d 9b e5 4c ......Hyper-V Virtual Ethernet Adapter #3
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0    192.168.10.1   192.168.10.106     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
     172.24.128.0    255.255.240.0         On-link      172.24.128.1    271
     172.24.128.1  255.255.255.255         On-link      172.24.128.1    271
   172.24.143.255  255.255.255.255         On-link      172.24.128.1    271
     172.27.224.0    255.255.240.0         On-link      172.27.224.1   5256
     172.27.224.1  255.255.255.255         On-link      172.27.224.1   5256
   172.27.239.255  255.255.255.255         On-link      172.27.224.1   5256
     172.28.144.0    255.255.240.0         On-link      172.28.144.1   5256
     172.28.144.1  255.255.255.255         On-link      172.28.144.1   5256
   172.28.159.255  255.255.255.255         On-link      172.28.144.1   5256
     192.168.10.0    255.255.255.0         On-link    192.168.10.106    296
   192.168.10.106  255.255.255.255         On-link    192.168.10.106    296
   192.168.10.255  255.255.255.255         On-link    192.168.10.106    296
     192.168.56.0    255.255.255.0         On-link      192.168.56.1    281
     192.168.56.1  255.255.255.255         On-link      192.168.56.1    281
   192.168.56.255  255.255.255.255         On-link      192.168.56.1    281
     192.168.96.0    255.255.240.0         On-link      192.168.96.1   5256
     192.168.96.1  255.255.255.255         On-link      192.168.96.1   5256
  192.168.111.255  255.255.255.255         On-link      192.168.96.1   5256
        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      192.168.56.1    281
        224.0.0.0        240.0.0.0         On-link    192.168.10.106    296
        224.0.0.0        240.0.0.0         On-link      172.27.224.1   5256
        224.0.0.0        240.0.0.0         On-link      172.28.144.1   5256
        224.0.0.0        240.0.0.0         On-link      172.24.128.1    271
        224.0.0.0        240.0.0.0         On-link      192.168.96.1   5256
  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      192.168.56.1    281
  255.255.255.255  255.255.255.255         On-link    192.168.10.106    296
  255.255.255.255  255.255.255.255         On-link      172.27.224.1   5256
  255.255.255.255  255.255.255.255         On-link      172.28.144.1   5256
  255.255.255.255  255.255.255.255         On-link      172.24.128.1    271
  255.255.255.255  255.255.255.255         On-link      192.168.96.1   5256
===========================================================================
Persistent Routes:
  None
```

Output 27: route print -4

(c) **route print -6:** Display only IPv6 Routing Table

```
===========================================================================
Interface List
  8...3c 2c 30 a0 bc a7 ......Killer E2400 Gigabit Ethernet Controller
 68...00 15 5d 05 e3 12 ......Hyper-V Virtual Ethernet Adapter #4
 17...0a 00 27 00 00 11 ......VirtualBox Host-Only Ethernet Adapter
 20...48 a4 72 53 1a 20 ......Microsoft Wi-Fi Direct Virtual Adapter
 21...4a a4 72 53 1a 1f ......Microsoft Wi-Fi Direct Virtual Adapter #2
  5...00 ff 19 f6 c3 f4 ......Windscribe VPN
  4...48 a4 72 53 1a 1f ......Intel(R) Wireless-AC 9560 160MHz
  1...........................Software Loopback Interface 1
 27...00 15 5d ea 5b 33 ......Hyper-V Virtual Ethernet Adapter
 37...00 15 5d 86 6b 83 ......Hyper-V Virtual Ethernet Adapter #2
 45...00 15 5d 9b e5 4c ......Hyper-V Virtual Ethernet Adapter #3
===========================================================================

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  4    296 ::/0                     fe80::aa32:9aff:fe02:3506
  1    331 ::1/128                  On-link
 17    281 fe80::/64                On-link
  4    296 fe80::/64                On-link
 27   5256 fe80::/64                On-link
 45   5256 fe80::/64                On-link
 68    271 fe80::/64                On-link
 37   5256 fe80::/64                On-link
 45   5256 fe80::86f:1a00:39b4:de89/128
                                    On-link
 37   5256 fe80::6153:c670:6f72:17cc/128
                                    On-link
 68    271 fe80::94d1:bb0e:6371:8d5c/128
                                    On-link
 17    281 fe80::a45b:94c3:4b24:c7c9/128
                                    On-link
  4    296 fe80::b005:433c:267:66f8/128
                                    On-link
 27   5256 fe80::ed9c:ca62:7dc5:3d7d/128
                                    On-link
  1    331 ff00::/8                 On-link
 17    281 ff00::/8                 On-link
  4    296 ff00::/8                 On-link
 27   5256 ff00::/8                 On-link
 45   5256 ff00::/8                 On-link
 68    271 ff00::/8                 On-link
 37   5256 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

Output 28: route print -6

5.3 Question -3

What is the actual IP address of your computer? Also find the Public IP address that is being used for your computer's Internet connectivity. Note down both the IP addresses.

Answer:

My actual ip of my computer is provided in ipconfig output i.e 192.168.10.106

```
Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . : domain.name
   Link-local IPv6 Address . . . . . : fe80::b005:433c:267:66f8%4
   IPv4 Address. . . . . . . . . . . : 192.168.10.106
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::aa32:9aff:fe02:3506%4
                                       192.168.10.1
```

Output 29: IP address of my PC

There are different methods and sites to find Public IP used for internet connectivity .

I choose nslookup command and used *nslookup myip.opendns.com resolver1.opendns.com* to generate following output . So, my public ip is 43.245.87.194 and confirmed with external sites too.

```
Server:  resolver1.opendns.com
Address:  208.67.222.222

Non-authoritative answer:
Name:    myip.opendns.com
Address:  43.245.87.194
```

Output 30: Public IP address

6 Conclusion

In this LAB -2 we get familiar with different network commands and their uses in Linux and windows platform. We learned 8 commands with majority of them having some additional argument. We learned to ping the computer or device in and outside the network. We learned to extract IP and MAC addresses of connected adapters . We also learned about ping , trace routing,ip configuration and many other tools useful for troubleshooting and connectivity. We familiarized ourself with public and private ip and methods to find them.