LAB 2:

Network commands for testing and trouble shooting

OBJECTIVES:

- To learn and understand various network commands used for testing and troubleshooting network connectivity.
- To study the working and output of basic network diagnostic commands in the Windows operating system.

THEORY:

• Requirement – Windows Operating System

Network commands are essential tools used for testing, monitoring, and troubleshooting computer networks. These commands help network administrators and users identify connectivity issues, IP configuration problems, routing errors, and communication failures. In the Windows operating system, these commands are executed using the Command Prompt (CMD).

Some network commands are:

1. Ping
2. tracert
3. ipconfig
4. nslookup
5. netstat-a
6. pathping
7. route
8. arp-a
9. hostname
10. getmac
11. nbstat

1. Ping

syntax**: ping<ip address domain>**

```
PS C:\Users\Sushant> ping www.google.com

Pinging www.google.com [2404:6800:4002:803::2004] with 32 bytes of data:
Reply from 2404:6800:4002:803::2004: time=27ms
Reply from 2404:6800:4002:803::2004: time=26ms
Reply from 2404:6800:4002:803::2004: time=24ms
Reply from 2404:6800:4002:803::2004: time=24ms

Ping statistics for 2404:6800:4002:803::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 24ms, Maximum = 27ms, Average = 25ms
```

Ping command is used to test connectivity between the local computer and a remote host. It check whether the destination is reachable

2. Tracet

Syntax**: tracet Domain_name**

```
PS C:\Users\Sushant> tracert www.google.com

Tracing route to www.google.com [2404:6800:4002:803::2004]
over a maximum of 30 hops:

  1     1 ms     2 ms     2 ms  2400-1a00-4b49.ip6.wlink.com.np [2400:1a00:4b49:e850::1]
  2     6 ms     7 ms     6 ms  2400-1a00-4b04.ip6.wlink.com.np [2400:1a00:4b04::1]
  3     *        *        *     Request timed out.
  4     4 ms     *        *     2400:1a00:0:40::170
  5     7 ms     6 ms     7 ms  2400:1a00:0:41::170
  6     7 ms     7 ms     7 ms  2400:1a00:0:41::128
  7    10 ms     8 ms     9 ms  2400:1a00:dccc:1:72:9:128:67
  8     *        *        *     Request timed out.
  9    25 ms    24 ms    24 ms  2001:4860:1:1::126a
 10    27 ms    27 ms    24 ms  2001:4860:0:1::2a9f
 11    26 ms    24 ms    26 ms  2001:4860:0:1::5505
 12    25 ms    23 ms    24 ms  del03s05-in-x04.1e100.net [2404:6800:4002:803::2004]
```

The tracert command traces the path taken by packets from the source to destination ond shows each router along the route.

3. ipconfig

Syntax :**ipconfig**

```
PS C:\Users\Sushant> ipconfig

Windows IP Configuration


Wireless LAN adapter Local Area Connection* 9:

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

Wireless LAN adapter Local Area Connection* 10:

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

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . : worldlink.com.np
   IPv6 Address. . . . . . . . . . . : 2400:1a00:4b49:e850:7b41:c0e3:2fd5:bcb8
   Temporary IPv6 Address. . . . . . : 2400:1a00:4b49:e850:c171:1b3b:d540:2ef3
   Link-local IPv6 Address . . . . . : fe80::10f3:940b:842a:a457%18
   IPv4 Address. . . . . . . . . . . : 192.168.1.75
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::1%18
                                       192.168.1.254

Ethernet adapter Bluetooth Network Connection:

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

Ethernet adapter Ethernet:

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

The ipconfig command displays the Ip contiguration details of the system,such as IP address, subnet mask, default gateway, and DNS servers.

4. nslookup

Syntax: **nslookup domain_name**

```
PS C:\Users\Sushant> nslookup www.google.com
Server:  vip6-safenet-kmd01.wlink.com.np
Address:  2400:1a00:0:32::165

Non-authoritative answer:
Name:    www.google.com
Addresses:  2404:6800:4002:803::2004
          142.251.43.164
```

The nslookup command displays DNS-related information of a system, such as the IP address of a domain name and the details of the DNS server used for name resolution.

5. netstat -a

Syntax: **netstat – a**

```
PS C:\Users\Sushant> netstat -a

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:445            DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:5040           DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:5357           DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:7680           DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:12177          DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:49664          DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:49665          DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:49666          DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:49667          DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:49668          DESKTOP-EQUT1I0:0      LISTENING
  TCP    0.0.0.0:49671          DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:1042         DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:1042         DESKTOP-EQUT1I0:65357  ESTABLISHED
  TCP    127.0.0.1:1042         DESKTOP-EQUT1I0:65358  ESTABLISHED
  TCP    127.0.0.1:1043         DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:5939         DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:7778         DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:9012         DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:9013         DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:9014         DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:13030        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:13030        DESKTOP-EQUT1I0:49733  ESTABLISHED
  TCP    127.0.0.1:13031        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:13032        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:22112        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:22112        DESKTOP-EQUT1I0:64133  ESTABLISHED
  TCP    127.0.0.1:24830        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:27017        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:45112        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:49733        DESKTOP-EQUT1I0:13030  ESTABLISHED
  TCP    127.0.0.1:50100        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:50100        DESKTOP-EQUT1I0:51994  ESTABLISHED
  TCP    127.0.0.1:50923        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:51100        DESKTOP-EQUT1I0:0      LISTENING
  TCP    127.0.0.1:51994        DESKTOP-EQUT1I0:50100  ESTABLISHED
  TCP    127.0.0.1:64133        DESKTOP-EQUT1I0:22112  ESTABLISHED
  TCP    127.0.0.1:64610        DESKTOP-EQUT1I0:64611  ESTABLISHED
  TCP    127.0.0.1:64611        DESKTOP-EQUT1I0:64610  ESTABLISHED
  TCP    127.0.0.1:64612        DESKTOP-EQUT1I0:64613  ESTABLISHED
  TCP    127.0.0.1:64613        DESKTOP-EQUT1I0:64612  ESTABLISHED
  TCP    127.0.0.1:64625        DESKTOP-EQUT1I0:64626  ESTABLISHED
  TCP    127.0.0.1:64626        DESKTOP-EQUT1I0:64625  ESTABLISHED
  TCP    127.0.0.1:64627        DESKTOP-EQUT1I0:64628  ESTABLISHED
  TCP    127.0.0.1:64628        DESKTOP-EQUT1I0:64627  ESTABLISHED
  TCP    127.0.0.1:65357        DESKTOP-EQUT1I0:1042   ESTABLISHED
  TCP    127.0.0.1:65358        DESKTOP-EQUT1I0:1042   ESTABLISHED
  TCP    192.168.1.75:139       DESKTOP-EQUT1I0:0      LISTENING
  TCP    192.168.1.75:49831     cdn-185-199-110-154:https  ESTABLISHED
  TCP    192.168.1.75:53717     ec2-52-0-252-2:https   ESTABLISHED
```

The netstat -a command displays all active network connections and listening ports on the system, showing both incoming and outgoing connections along with their status.

6. pathping

Syntax: **pathping destination**

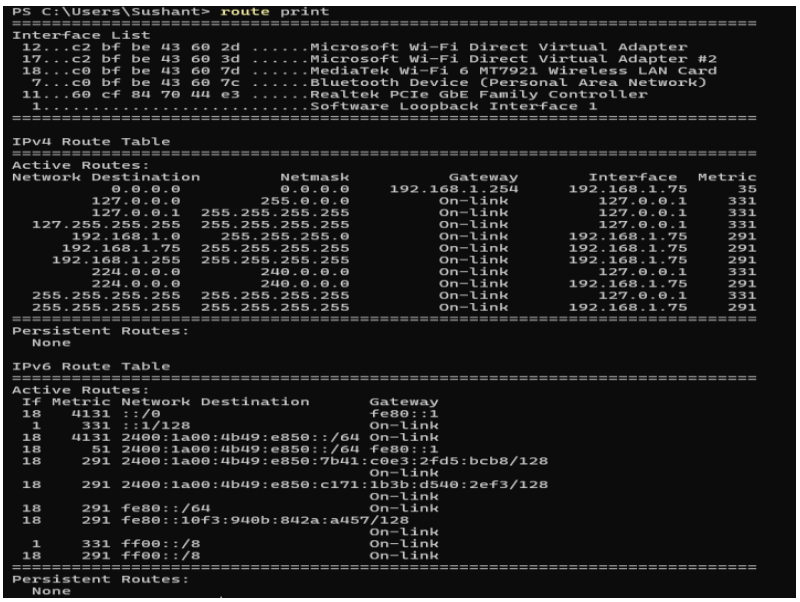
```
PS C:\Users\Sushant> pathping www.google.com

Tracing route to www.google.com [2404:6800:4002:803::2004]
over a maximum of 30 hops:
  0  DESKTOP-EQUT1I0.worldlink.com.np [2400:1a00:4b49:e850:c171:1b3b:d540:2ef3]
  1  2400-1a00-4b49.ip6.wlink.com.np [2400:1a00:4b49:e850::1]
  2  2400-1a00-4b04.ip6.wlink.com.np [2400:1a00:4b04::1]
  3  2400:1a00:0:45::8
  4     *     2400:1a00:0:40::170
  5  2400:1a00:0:41::170
  6  2400:1a00:0:41::128
  7  2400:1a00:dccc:1:72:9:128:67
  8     *        *        *
Computing statistics for 175 seconds...
           Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0                                           DESKTOP-EQUT1I0.worldlink.com.np [2400:1a00:4b49:e850:c171:1b3b:d540:2ef3]
                                 0/ 100 =  0%   |
  1    3ms     0/ 100 =  0%     0/ 100 =  0%  2400-1a00-4b49.ip6.wlink.com.np [2400:1a00:4b49:e850::1]
                                 0/ 100 =  0%   |
  2   10ms     0/ 100 =  0%     0/ 100 =  0%  2400-1a00-4b04.ip6.wlink.com.np [2400:1a00:4b04::1]
                                 0/ 100 =  0%   |
  3    6ms     0/ 100 =  0%     0/ 100 =  0%  2400:1a00:0:45::8
                                 0/ 100 =  0%   |
  4    6ms     0/ 100 =  0%     0/ 100 =  0%  2400:1a00:0:40::170
                                 0/ 100 =  0%   |
  5    8ms     0/ 100 =  0%     0/ 100 =  0%  2400:1a00:0:41::170
                                 0/ 100 =  0%   |
  6    9ms     0/ 100 =  0%     0/ 100 =  0%  2400:1a00:0:41::128
                                 0/ 100 =  0%   |
  7    9ms     0/ 100 =  0%     0/ 100 =  0%  2400:1a00:dccc:1:72:9:128:67
```

The pathping command displays detailed information about the network path to a destination by combining the features of ping and tracert, helping to identify packet loss and network delays at each hop.

7. Route

Syntax: **route print**



```
PS C:\Users\Sushant> route print
===========================================================================
Interface List
 12...c2 bf be 43 60 2d ......Microsoft Wi-Fi Direct Virtual Adapter
 17...c2 bf be 43 60 3d ......Microsoft Wi-Fi Direct Virtual Adapter #2
 18...c0 bf be 43 60 7d ......MediaTek Wi-Fi 6 MT7921 Wireless LAN Card
  7...c0 bf be 43 60 7c ......Bluetooth Device (Personal Area Network)
 11...60 cf 84 70 44 e3 ......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    192.168.1.254    192.168.1.75     35
        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
      192.168.1.0    255.255.255.0         On-link       192.168.1.75    291
     192.168.1.75  255.255.255.255         On-link       192.168.1.75    291
    192.168.1.255  255.255.255.255         On-link       192.168.1.75    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       192.168.1.75    291
  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       192.168.1.75    291
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
 18   4131 ::/0                    fe80::1
  1    331 ::1/128                 On-link
 18   4131 2400:1a00:4b49:e850::/64 On-link
 18     51 2400:1a00:4b49:e850::/64 fe80::1
 18    291 2400:1a00:4b49:e850:7b41:c0e3:2fd5:bcb8/128
                                   On-link
 18    291 2400:1a00:4b49:e850:c171:1b3b:d540:2ef3/128
                                   On-link
 18    291 fe80::/64                On-link
 18    291 fe80::10f3:940b:842a:a457/128
                                   On-link
  1    331 ff00::/8                 On-link
 18    291 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

The route command is used to view, add, modify, or delete entries in the IP routing table of the system, which controls how network packets are forwarded.

8. arp -a

Syntax : **arp -a**

```
PS C:\Users\Sushant> arp -a

Interface: 192.168.1.75 --- 0x12
  Internet Address      Physical Address      Type
  192.168.1.106         00-22-6d-e1-d4-8d     dynamic
  192.168.1.254         c4-48-fa-06-54-70     dynamic
  192.168.1.255         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
```

The arp -a command is used to display the current ARP (Address Resolution Protocol) cache, showing the mapping of IP addresses to their corresponding MAC addresses on the local network.

9. hostname

Syntax :**hostname**

```
PS C:\Users\Sushant> hostname
DESKTOP-EQUT1I0
```

The hostname command is used to display the name of the computer or device on the network, which identifies it within a network.

10. getmac

Syntax : **getmac**

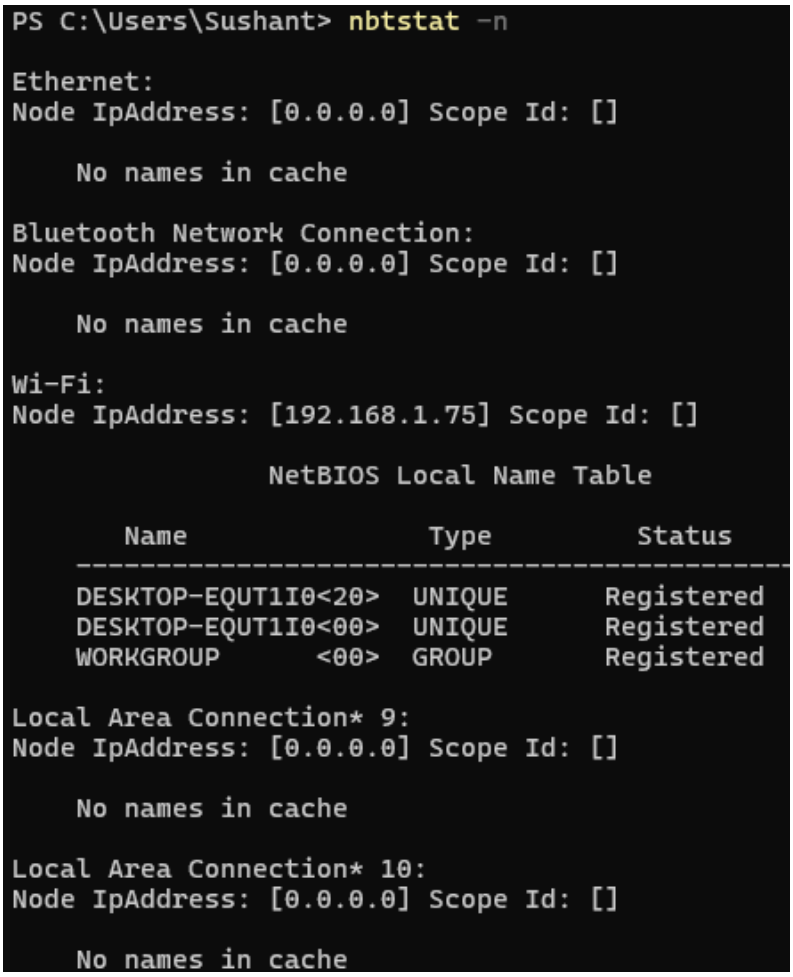
```
PS C:\Users\Sushant> getmac

Physical Address    Transport Name
=================== ============================================================
60-CF-84-70-44-E3   Media disconnected
C0-BF-BE-43-60-7D   \Device\Tcpip_{FCA014C6-1E24-4B1A-9D72-BB9D4C99CD81}
C0-BF-BE-43-60-7C   Media disconnected
```

The getmac command is used to display the MAC addresses of all network adapters on the system.

11. nbstat -n

Syntax: **nbstat-n**



The nbtstat -n command is used to display the NetBIOS names that are registered locally on your computer, along with their status (unique or group). This helps in troubleshooting name resolution issues on a local network.

Discussion:

The lab effectively achieved its objective of familiarizing us with important network commands used for testing and troubleshooting. By running these commands and interpreting their outputs, we gained a clearer understanding of network configuration, connectivity, routing diagnostics, and related processes.

Conclusion:

Thus, various network commands were carried out to test and troubleshoot the network.