Experiment No. 2

Aim: To use basic networking commands in Linux (ping, tracert, nslookup, netstat, ARP, RARP, ip, ifconfig, dig, route)

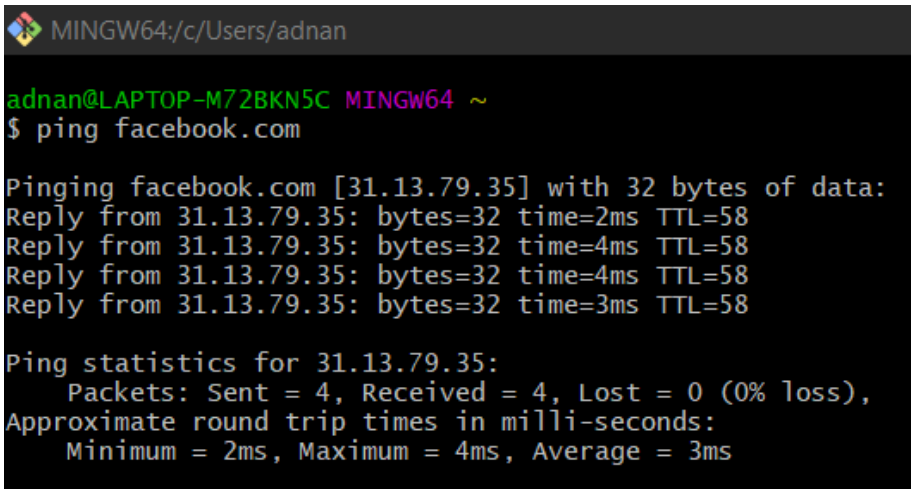
Requirements: Windows/Linux/MAC OS in PC/Laptop, compatible version of terminal in OS.

Theory:

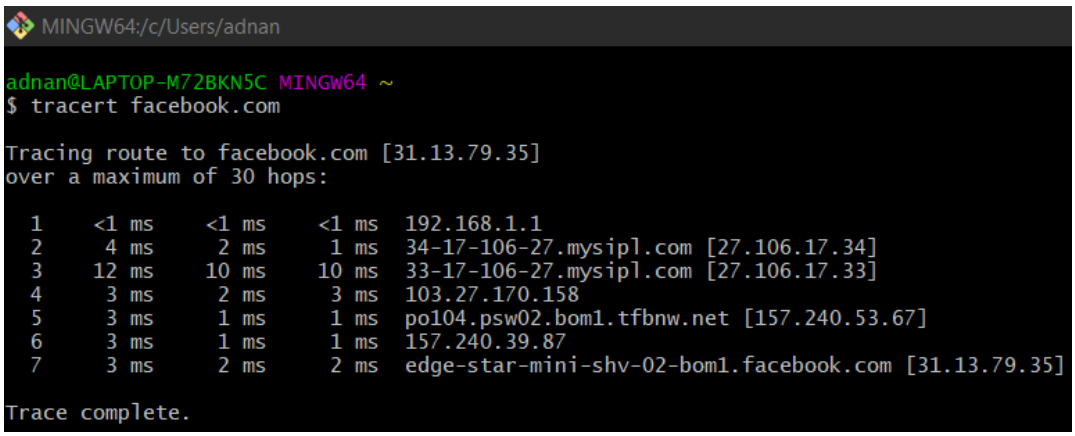
Networking commands	Operations
ping(packet internet groper)	This command is used to check the network connectivity between host and server/host.
tracert(trace route)	It's used to show the path from the source computer to the destination computer
nslookup**(**name server lookup**)**	It translates a domain name to an IP address and vice versa
netstat	Displays active TCP connections, ports on which the computer is listening, Ethernet statistics, the IP routing table, IPv4 statistics (for the IP, ICMP, TCP, and UDP protocols), and IPv6 statistics (for the IPv6, ICMPv6, TCP over IPv6, and UDP over IPv6 protocols).
arp(address resolution protocol)	Displays and modifies entries in the Address Resolution Protocol (ARP) cache.
rarp	RARP provides the opposite service to ARP in that it is used when only the ethernet address is known and the IP address is needed.
ip	This is used to assign an address to a network interface and/or configure network interface parameters on Linux operating systems
ipconfig/ifconfig	Displays all current TCP/IP network configuration values and refreshes Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings
dig(domain information groper)	The dig command, allows you to query information about various DNS records, including host addresses, mail exchanges, and name servers.
route	Displays and modifies the entries in the local IP routing table.

Commands and Output:

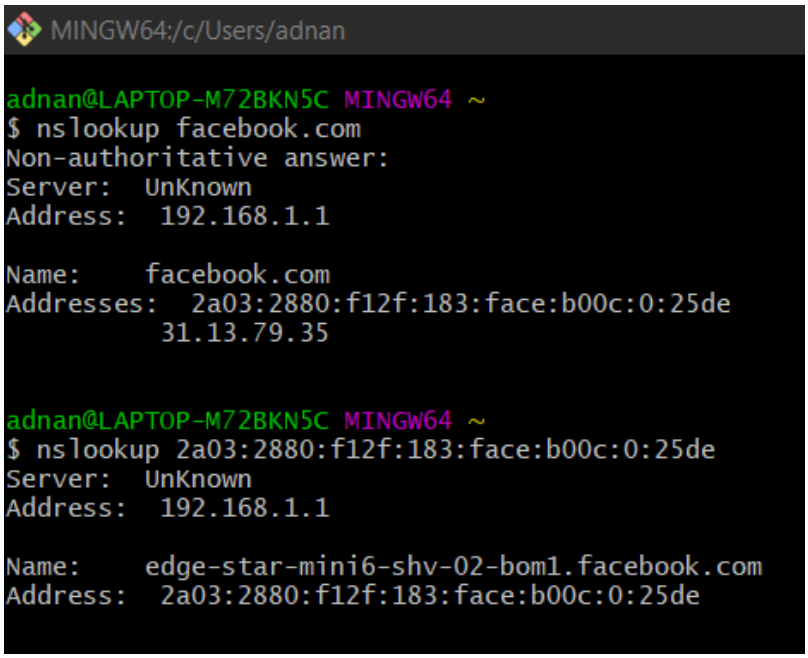
ping:



tracert:



nslookup:



netstat:

```
MINGW64:/c/Users/adnan

adnan@LAPTOP-M72BKN5C MINGW64 ~
$ netstat -ao

Active Connections

  Proto  Local Address          Foreign Address        State           PID
  TCP    0.0.0.0:135            LAPTOP-M72BKN5C:0      LISTENING       1320
  TCP    0.0.0.0:445            LAPTOP-M72BKN5C:0      LISTENING       4
  TCP    0.0.0.0:3306           LAPTOP-M72BKN5C:0      LISTENING       6344
  TCP    0.0.0.0:5040           LAPTOP-M72BKN5C:0      LISTENING       10180
  TCP    0.0.0.0:5357           LAPTOP-M72BKN5C:0      LISTENING       4
  TCP    0.0.0.0:5432           LAPTOP-M72BKN5C:0      LISTENING       6540
  TCP    0.0.0.0:33060          LAPTOP-M72BKN5C:0      LISTENING       6344
  TCP    0.0.0.0:49664          LAPTOP-M72BKN5C:0      LISTENING       900
  TCP    0.0.0.0:49665          LAPTOP-M72BKN5C:0      LISTENING       1004
  TCP    0.0.0.0:49666          LAPTOP-M72BKN5C:0      LISTENING       1972
  TCP    0.0.0.0:49667          LAPTOP-M72BKN5C:0      LISTENING       2216
  TCP    0.0.0.0:49668          LAPTOP-M72BKN5C:0      LISTENING       4648
  TCP    0.0.0.0:49676          LAPTOP-M72BKN5C:0      LISTENING       932
  TCP    0.0.0.0:50128          LAPTOP-M72BKN5C:0      LISTENING       4
  TCP    127.0.0.1:3213         LAPTOP-M72BKN5C:0      LISTENING       5924
  TCP    127.0.0.1:5354         LAPTOP-M72BKN5C:0      LISTENING       5028
  TCP    127.0.0.1:5354         LAPTOP-M72BKN5C:49670  ESTABLISHED     5028
  TCP    127.0.0.1:5354         LAPTOP-M72BKN5C:49671  ESTABLISHED     5028
  TCP    127.0.0.1:5939         LAPTOP-M72BKN5C:0      LISTENING       5584
  TCP    127.0.0.1:27015        LAPTOP-M72BKN5C:0      LISTENING       5020
  TCP    127.0.0.1:49670        LAPTOP-M72BKN5C:5354   ESTABLISHED     5020
  TCP    127.0.0.1:49671        LAPTOP-M72BKN5C:5354   ESTABLISHED     5020
  TCP    127.0.0.1:49672        LAPTOP-M72BKN5C:49673  ESTABLISHED     6344
  TCP    127.0.0.1:49673        LAPTOP-M72BKN5C:49672  ESTABLISHED     6344
```

arp:

```
MINGW64:/c/Users/adnan

adnan@LAPTOP-M72BKN5C MINGW64 ~
$ arp -a

Interface: 192.168.56.1 --- 0x7
  Internet Address      Physical Address      Type
  192.168.56.255        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

Interface: 192.168.1.108 --- 0xe
  Internet Address      Physical Address      Type
  192.168.1.1           38-6b-1c-be-27-71     dynamic
  192.168.1.105         34-ce-00-23-01-1d     dynamic
  192.168.1.255         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
```

ip:

```
adnan@adnan-VirtualBox:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:17:b3:0f brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
       valid_lft 85211sec preferred_lft 85211sec
    inet6 fe80::a614:9179:6a9f:bf95/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
adnan@adnan-VirtualBox:~$ ip link ls up
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:17:b3:0f brd ff:ff:ff:ff:ff:ff
adnan@adnan-VirtualBox:~$
```

Ipconfig/ifconfig:

```
adnan@LAPTOP-M72BKN5C MINGW64 ~
$ ipconfig

Windows IP Configuration


Ethernet adapter Ethernet:

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

Ethernet adapter Ethernet 2:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::bde0:e9ac:a1e2:4330%7
   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  . :

Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::f9b5:dc45:7c55:698a%14
   IPv4 Address. . . . . . . . . . . : 192.168.1.108
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.1.1

Ethernet adapter Ethernet 3:

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

Ethernet adapter Bluetooth Network Connection:

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

dig:

```
adnan@adnan-VirtualBox:~$ dig linux.org

; <<>> DiG 9.16.6-Ubuntu <<>> linux.org
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 52074
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;linux.org.                     IN      A

;; ANSWER SECTION:
linux.org.              300     IN      A       104.21.50.111
linux.org.              300     IN      A       172.67.161.161

;; Query time: 8 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Sun Aug 01 18:46:18 IST 2021
;; MSG SIZE  rcvd: 70
```

route:

```
adnan@LAPTOP-M72BKN5C MINGW64 ~
$ route print
===========================================================================
Interface List
  6...54 05 db 10 4a 64 ......Realtek PCIe GbE Family Controller
  7...0a 00 27 00 00 07 ......VirtualBox Host-Only Ethernet Adapter
 21...a4 b1 c1 17 71 a5 ......Microsoft Wi-Fi Direct Virtual Adapter
 11...a6 b1 c1 17 71 a4 ......Microsoft Wi-Fi Direct Virtual Adapter #2
 14...a4 b1 c1 17 71 a4 ......Intel(R) Wi-Fi 6 AX201 160MHz
  9...00 ff 6c d4 a8 15 ......TeamViewer VPN Adapter
 20...a4 b1 c1 17 71 a8 ......Bluetooth Device (Personal Area Network)
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0      192.168.1.1    192.168.1.108     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     192.168.1.108    291
    192.168.1.108  255.255.255.255         On-link     192.168.1.108    291
    192.168.1.255  255.255.255.255         On-link     192.168.1.108    291
     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
        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     192.168.1.108    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      192.168.56.1    281
  255.255.255.255  255.255.255.255         On-link     192.168.1.108    291
===========================================================================
Persistent Routes:
  None

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  1    331 ::1/128                  On-link
  7    281 fe80::/64                On-link
 14    291 fe80::/64                On-link
  7    281 fe80::bde0:e9ac:a1e2:4330/128
                                    On-link
 14    291 fe80::f9b5:dc45:7c55:698a/128
                                    On-link
  1    331 ff00::/8                 On-link
  7    281 ff00::/8                 On-link
 14    291 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

Conclusion: We have successfully executed and got the output of basic networking commands (ping, tracert, nslookup, netstat, ARP,RARP, ip, ifconfig, dig, route) in Linux Shell.