Experiment No. 2

Aim: Use basic networking commands in Linux (ping, tracert, nslookup, netstat, ARP, RARP, io, ifconfig,dig, route)

Resource required: Operating System – Linux/Windows, Internet connectivity.

Theory: In Linux environment, various networking commands play a pivotal role in troubleshooting, diagnosing network issues, & managing network configurations. These commands provide valuable insights into network connectivity, address resolution, routing, and DNS resolution. Below are some of the commands commonly used in Linux.

1. Ping   : The ping command is used to check the connectivity between the local host and a remote host

or IP address. It sends ICMP echo request packets to the destination and waits for an ICMP echo reply

to confirm the reachability.

Example: ping www.instagram.com

```
C:\Users\janu>ping 192.168.184.222

Pinging 192.168.184.222 with 32 bytes of data:
Reply from 192.168.184.222: bytes=32 time<1ms TTL=128
Reply from 192.168.184.222: bytes=32 time<1ms TTL=128
Reply from 192.168.184.222: bytes=32 time<1ms TTL=128
Reply from 192.168.184.222: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.184.222:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

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

Pinging www.google.com [2404:6800:4009:82f::2004] with 32 bytes of data:
Reply from 2404:6800:4009:82f::2004: time=132ms
Reply from 2404:6800:4009:82f::2004: time=352ms
Reply from 2404:6800:4009:82f::2004: time=697ms
Reply from 2404:6800:4009:82f::2004: time=315ms

Ping statistics for 2404:6800:4009:82f::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 132ms, Maximum = 697ms, Average = 374ms
```

2. Traceroute   : The traceroute command helps identify the route and network hops taken by packets

from the local host to a remote destination. It shows the IP addresses of intermediate devices,

allowing you to pinpoint any connection issues.

Example: traceroute www.amazon.com

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

Tracing route to google.com [2404:6800:4009:80d::200e]
over a maximum of 30 hops:

  1     4 ms     3 ms     3 ms  2409:40c2:2016:eba2::64
  2    51 ms   242 ms   197 ms  2405:200:5205:23:3924:110:3:106
  3    45 ms    44 ms    46 ms  2405:200:5205:23:3925::1
  4     *        *        *     Request timed out.
  5     *        *        *     Request timed out.
  6   138 ms   113 ms   265 ms  2405:200:801:3000::74
  7     *        *        *     Request timed out.
  8     *        *        *     Request timed out.
  9   171 ms    95 ms   197 ms  2001:4860:1:1::170
 10   307 ms   138 ms   159 ms  2001:4860:1:1::170
 11   357 ms   124 ms   376 ms  2404:6800:8201:240::1
 12     *      142 ms     *     2001:4860:0:1::55d2
 13   167 ms   162 ms   222 ms  2001:4860:0:1::1840
 14   246 ms   224 ms   113 ms  2001:4860::9:4001:7733
 15   191 ms     *      179 ms  2001:4860:0:1::7977
 16   101 ms   122 ms   173 ms  2001:4860:0:1::5cd3
 17   141 ms   116 ms   180 ms  bom05s15-in-x0e.1e100.net [2404:6800:4009:80d::200e]

Trace complete.
```

3. nslookup   : The nslookup command is used to query DNS (Domain Name System) servers for DNS-

related information. It allows you to retrieve DNS records, such as A, CNAME, MX, and more,

associated with a specific domain name.

Example: nslookup www.twitter.com

```
C:\Users\janu>nslookup
Default Server:  UnKnown
Address:  192.168.184.116

> google.com
Server:  UnKnown
Address:  192.168.184.116

Non-authoritative answer:
Name:     google.com
Addresses:  2404:6800:4009:80d::200e
            142.251.221.238

> ^Z

C:\Users\janu>nslookup google.com
Server:  UnKnown
Address:  192.168.184.116

Non-authoritative answer:
Name:     google.com
Addresses:  2404:6800:4009:80d::200e
            142.251.221.238
```

4. ARP (Address Resolution Protocol)   : . The arp command is used to view and manage the ARP

cache, which maps IP addresses to MAC addresses. ARP is essential for resolving IP addresses to the

corresponding hardware addresses on a local network.

Example: arp -a

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

Interface: 192.168.1.102 --- 0x7
  Internet Address      Physical Address      Type
  192.168.1.1           00-1e-a6-a7-0c-80     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

C:\Users\janu>arp -g

Interface: 192.168.1.102 --- 0x7
  Internet Address      Physical Address      Type
  192.168.1.1           00-1e-a6-a7-0c-80     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
```

5. Netstat   : The netstat command displays various network-related information, including active network

connections, listening ports, routing tables, and statistics about network interfaces.

Example: netstat www.google.com

```
C:\Users\janu>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    192.168.1.102:53612    dns:https              TIME_WAIT
  TCP    192.168.1.102:53613    dns:https              TIME_WAIT
  TCP    192.168.1.102:53615    dns:https              TIME_WAIT
  TCP    192.168.1.102:53616    dns:https              TIME_WAIT
  TCP    192.168.1.102:53617    dns:https              TIME_WAIT
  TCP    192.168.1.102:53618    dns:https              TIME_WAIT
  TCP    192.168.1.102:53619    dns:https              TIME_WAIT
  TCP    192.168.1.102:53620    dns:https              TIME_WAIT
  TCP    192.168.1.102:53621    dns:https              TIME_WAIT
  TCP    192.168.1.102:53622    dns:https              TIME_WAIT
  TCP    192.168.1.102:53623    dns:https              TIME_WAIT
  TCP    192.168.1.102:53624    dns:https              TIME_WAIT
  TCP    192.168.1.102:53625    dns:https              TIME_WAIT
  TCP    192.168.1.102:53626    dns:https              TIME_WAIT
  TCP    192.168.1.102:53627    52.108.44.3:https      ESTABLISHED
  TCP    192.168.1.102:53628    dns:https              TIME_WAIT
  TCP    192.168.1.102:53629    dns:https              TIME_WAIT
  TCP    192.168.1.102:53631    1drv:https             TIME_WAIT
  TCP    192.168.1.102:53632    4.213.25.241:https     ESTABLISHED
  TCP    192.168.1.102:53633    20.44.229.112:https    TIME_WAIT
  TCP    192.168.1.102:53634    4.213.25.241:https     ESTABLISHED
  TCP    192.168.1.102:53635    52.104.6.27:https      TIME_WAIT
  TCP    192.168.1.102:53636    a23-221-52-97:https    ESTABLISHED
```

6. RARP (Reverse Address Resolution Protocol)   : While RARP is less commonly used today, the rarp

command was traditionally used to obtain an IP address from a MAC address.

Example: rarp -a

7. ip   : The ip command is a versatile tool used for various network-related tasks, such as configuring

network interfaces, routing, and managing network addresses.
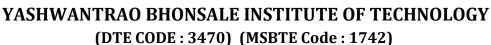
Example: ip addr show

8. ifconfig   : The ifconfig command, while still widely used, is gradually being replaced by the ip

command. It allows you to configure and display information about network interfaces.

Example: ifconfig

```
C:\Users\janu>ipconfig

Windows IP Configuration


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::151d:200b:2a5a:f9d0%7
   IPv4 Address. . . . . . . . . . . : 192.168.1.102
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.1.1
```

9. Dig   : The dig command is a powerful tool for querying DNS servers directly. It provides more

detailed information than nslookup, including additional DNS record types like TXT, PTR, and SOA.

Example: dig www.bewakoof.com

10. Route   : The route command displays and manages the kernel's IP routing table. It allows you to add,

delete, or modify routes to direct network traffic.

Example: route -n

Conclusion: In this practical, we explored essential Linux networking commands that help in monitoring, troubleshooting, and configuring network connections. Each command plays a crucial role in understanding how systems interact within a network.