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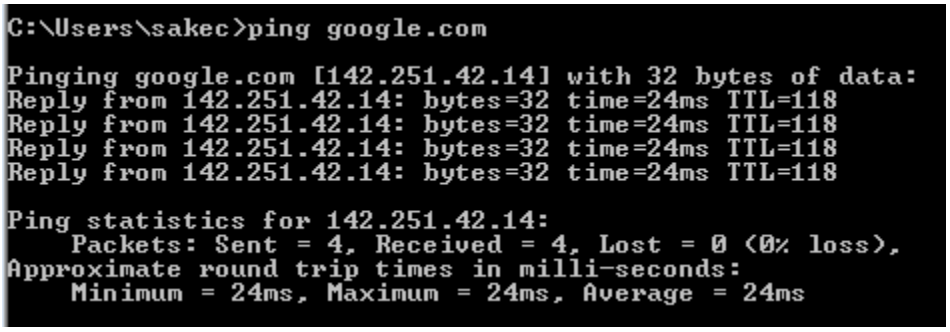
Experiment No. 2

Aim: Study and use basic networking commands in Linux (ping,tracert,nslookup,netstat,ARP,RARP,ip,ipconfig,dig,route).

Linux Commands:

1) **ping**: PING (Packet Internet Groper) command is used to check the network connectivity between host and server/host. This command takes as input the IP address or the URL and sends a data packet to the specified address with the message “PING” and get a response from the server/host this time is recorded which is called latency. Fast ping low latency means faster connection. Ping uses ICMP(Internet Control Message Protocol) to send an ICMP echo message to the specified host if that host is available then it sends ICMP reply message. Ping is generally measured in millisecond every modern operating system has this ping pre-installed.



2) **tracert**: traceroute command in Linux prints the route that a packet takes to reach the host. This command is useful when you want to know about the route and about all the hops that a packet takes.

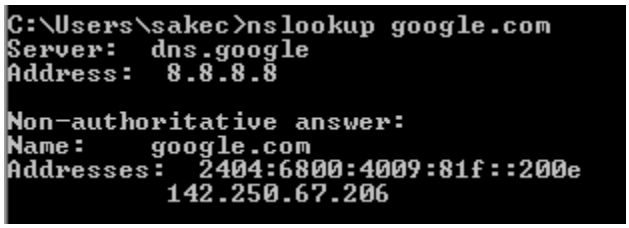
```
C:\Users\sakec>tracert google.com

Tracing route to google.com [142.251.42.14]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  172.16.60.1
  2     1 ms     1 ms     1 ms  115.113.39.65.static-mumbai.vsnl.net.in [115.113
.39.65]
  3     1 ms     1 ms     1 ms  115.113.165.197.static-mumbai.vsnl.net.in [115.1
13.165.197]
  4    32 ms    24 ms    25 ms  172.31.167.54
  5    16 ms    16 ms    16 ms  14.140.100.6.static-vsnl.net.in [14.140.100.6]
  6    20 ms    20 ms    22 ms  115.112.71.65.STDILL-Chennai.vsnl.net.in [115.11
2.71.65]
  7    20 ms    20 ms    20 ms  121.240.1.50
  8    25 ms    25 ms    26 ms  108.170.253.106
  9    25 ms    25 ms    25 ms  72.14.232.50
 10    24 ms    24 ms    25 ms  108.170.248.161
 11    24 ms    24 ms    24 ms  209.85.248.61
 12    24 ms    24 ms    24 ms  bom12s19-in-f14.1e100.net [142.251.42.14]

Trace complete.
```

3) **nslookup**: Nslookup (stands for “Name Server Lookup”) is a useful command for getting information from DNS server. It is a network administration tool for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or any other specific DNS record. It is also used to troubleshoot DNS related problems.



```
C:\Users\sakec>nslookup google.com
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
Name:    google.com
Addresses:  2404:6800:4009:81f::200e
          142.250.67.206
```

4) **netstat**: Netstat command displays various network related information such as network connections, routing tables, interface statistics, masquerade connections,multicast memberships etc.,

5) **ARP**: arp command manipulates the System's ARP cache. It also allows a complete dump of the ARP cache. ARP stands for Address Resolution Protocol. The primary function of this protocol is to resolve the IP address of a system to its mac address, and hence it works between level 2(Data link layer) and level 3 (Network layer).

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

Interface: 172.16.60.25 --- 0xa
  Internet Address      Physical Address      Type
  169.254.44.33         b0-83-fe-77-40-74     dynamic
  169.254.149.35        8c-ec-4b-c5-f3-19     dynamic
  172.16.60.1           d4-76-a0-01-3a-48     dynamic
  172.16.60.4           2c-44-fd-12-65-26     dynamic
  172.16.60.5           2c-44-fd-1b-16-1e     dynamic
  172.16.60.11          8c-ec-4b-c5-f3-28     dynamic
  172.16.60.13          8c-ec-4b-c9-30-3c     dynamic
  172.16.60.14          2c-44-fd-12-5e-fa     dynamic
  172.16.60.17          d4-c9-ef-ef-7a-05     dynamic
  172.16.60.21          2c-44-fd-1b-d0-45     dynamic
  172.16.60.24          c0-25-a5-c7-cc-de     dynamic
  172.16.60.41          8c-ec-4b-c9-31-98     dynamic
  172.16.60.42          c0-25-a5-c7-ce-2a     dynamic
  172.16.60.46          8c-ec-4b-c9-30-2e     dynamic
  172.16.60.48          c0-25-a5-c7-cf-c5     dynamic
  172.16.60.50          b0-83-fe-84-c9-7f     dynamic
  172.16.60.57          8c-ec-4b-c9-2f-34     dynamic
  172.16.60.62          b0-83-fe-84-cd-46     dynamic
  172.16.60.64          b0-83-fe-84-c9-85     dynamic
  172.16.60.73          90-8d-6e-8a-f3-86     dynamic
  172.16.60.77          c0-25-a5-c6-53-af     dynamic
  172.16.60.78          b0-83-fe-84-d0-40     dynamic
  172.16.60.80          8c-ec-4b-c9-2e-c3     dynamic
  172.16.60.86          8c-ec-4b-c9-2f-3f     dynamic
  172.16.60.89          b0-83-fe-84-cb-25     dynamic
  172.16.60.90          8c-ec-4b-c9-31-f8     dynamic
  172.16.60.92          8c-ec-4b-c5-f3-1b     dynamic
  172.16.60.93          b0-83-fe-77-47-24     dynamic
  172.16.60.94          8c-ec-4b-c9-32-3f     dynamic
  172.16.60.96          b0-83-fe-84-cb-24     dynamic
  172.16.60.97          b0-83-fe-77-4d-48     dynamic
  172.16.60.98          b0-83-fe-84-c8-c4     dynamic
  172.16.60.100         8c-ec-4b-c5-da-96     dynamic
  172.16.60.101         b0-83-fe-77-47-28     dynamic
  172.16.60.102         b0-83-fe-84-c8-cb     dynamic
  172.16.60.103         8c-ec-4b-c9-2f-59     dynamic
  172.16.60.104         8c-ec-4b-c5-da-98     dynamic
  172.16.60.107         8c-ec-4b-c9-2f-46     dynamic
  172.16.60.108         b0-83-fe-77-8d-29     dynamic
  172.16.60.110         8c-ec-4b-c1-c0-9c     dynamic
  172.16.60.111         b0-83-fe-77-47-2c     dynamic
  172.16.60.113         8c-ec-4b-c9-32-3a     dynamic
  172.16.60.116         8c-ec-4b-c9-2e-cf     dynamic
  172.16.60.117         2c-44-fd-18-9f-66     dynamic
  172.16.60.124         c0-25-a5-c7-cb-f0     dynamic
  172.16.60.128         b0-83-fe-84-cd-45     dynamic
  172.16.60.129         74-46-a0-98-c6-21     dynamic
  172.16.60.134         8c-ec-4b-c5-f2-63     dynamic
  172.16.60.141         b0-83-fe-84-c8-72     dynamic
  172.16.60.143         2c-44-fd-18-a0-7d     dynamic
  172.16.60.144         40-61-86-c5-e1-ab     dynamic
  172.16.60.151         8c-ec-4b-c1-c3-f3     dynamic
  172.16.60.157         b0-83-fe-77-47-20     dynamic
```

```
  172.16.60.158         8c-ec-4b-c9-2f-4f     dynamic
  172.16.60.177         8c-ec-4b-c9-2e-c2     dynamic
  172.16.60.180         f4-8e-38-94-83-ec     dynamic
  172.16.60.181         b0-83-fe-84-c8-9c     dynamic
  172.16.60.192         8c-ec-4b-c1-c2-df     dynamic
  172.16.60.196         84-69-93-51-47-ab     dynamic
  172.16.60.198         2c-44-fd-12-60-4f     dynamic
  172.16.60.199         c0-25-a5-c7-cd-82     dynamic
  172.16.60.203         90-8d-6e-8b-43-75     dynamic
  172.16.60.204         c0-25-a5-c7-cb-87     dynamic
  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
```

6) **ip**: ip command in Linux is present in the net-tools which is used for performing several network administration tasks. IP stands for Internet Protocol. This command is used to show or manipulate routing, devices, and tunnels.ip command is used to perform several tasks like assigning an address to a network interface or configuring network interface parameters.It can perform several other tasks like configuring and modifying the default and static routing, setting up tunnel over IP, listing IP addresses and property information, modifying the status of the interface, assigning, deleting and setting up IP addresses and routes.

```
[root@localhost ~]# ip link
1: lo: <LOOPBACK> mtu 65536 qdisc noop state DOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UNKNOWN mode DEFAULT group default qlen 1000
    link/ether 02:ce:3d:6a:2a:37 brd ff:ff:ff:ff:ff:ff
```

7) **ipconfig**: ifconfig(interface configuration) command is used to configure the kernel-resident network interfaces. It is used at the boot time to set up the interfaces as necessary. After that, it is usually used when needed during debugging or when you need system tuning. Also, this command is used to assign the IP address and netmask to an interface or to enable or disable a given interface.

```
C:\Users\sakec>ipconfig

Windows IP Configuration


Ethernet adapter Local Area Connection:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::3153:2e16:27a5:9335%10
   IPv4 Address. . . . . . . . . . . : 172.16.60.25
   Subnet Mask . . . . . . . . . . . : 255.255.254.0
   Default Gateway . . . . . . . . . : 172.16.60.1

Tunnel adapter isatap.{57913325-BCCD-4A33-B7CE-402EC9636C0D}:

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

8) **dig**: dig command stands for Domain Information Groper. It is used for retrieving information about DNS name servers. It is basically used by network administrators. It is used for verifying and troubleshooting DNS problems and to perform DNS lookups.

```
[root@localhost ~]# dig google.com

; <<>> DiG 9.11.24-RedHat-9.11.24-2.fc33 <<>> google.com
;; global options: +cmd
;; connection timed out; no servers could be reached
```

9) **route**: This command is to display all the connections and also the path and routes od all conections established by the ip addresses.

```
C:\Users\sakec>route PRINT
===========================================================================
Interface List
 10...74 46 a0 8f 72 6a ......Realtek PCIe GBE Family Controller
  1...........................Software Loopback Interface 1
 11...00 00 00 00 00 00 00 e0 Microsoft ISATAP Adapter
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0      172.16.60.1    172.16.60.25     276
        127.0.0.0        255.0.0.0         On-link         127.0.0.1     306
        127.0.0.1  255.255.255.255         On-link         127.0.0.1     306
  127.255.255.255  255.255.255.255         On-link         127.0.0.1     306
      172.16.60.0    255.255.254.0         On-link      172.16.60.25     276
     172.16.60.25  255.255.255.255         On-link      172.16.60.25     276
    172.16.61.255  255.255.255.255         On-link      172.16.60.25     276
        224.0.0.0        240.0.0.0         On-link         127.0.0.1     306
        224.0.0.0        240.0.0.0         On-link      172.16.60.25     276
  255.255.255.255  255.255.255.255         On-link         127.0.0.1     306
  255.255.255.255  255.255.255.255         On-link      172.16.60.25     276
===========================================================================
Persistent Routes:
  Network Address          Netmask  Gateway Address  Metric
          0.0.0.0          0.0.0.0      172.16.60.1  Default
===========================================================================

IPv6 Route Table
===========================================================================
Active Routes:
 If Metric Network Destination      Gateway
  1    306 ::1/128                  On-link
 10    276 fe80::/64                On-link
 10    276 fe80::3153:2e16:27a5:9335/128
                                    On-link
  1    306 ff00::/8                 On-link
 10    276 ff00::/8                 On-link
===========================================================================
Persistent Routes:
  None
```

Conclusion: Hence, in this experiment, we have successfully studied some important networking commands and also implemented them in Linux.