Computer Networks Lab(CS3272)

Assignment 01

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1. Read the man pages of ifconfig, ping, traceroute, arp, dig, nslookup, and netstat and write their utilities in brief.

ifconfig :-

- It is used to configure kernel-resident network interface controller (NIC) .

- If no arguments are given, then it displays the status of the currently active interfaces. If a single interface argument is given, then it displays the status of the given interface

ping <IP> :-

- It sends an ICMP ECHO_REQUEST to the given <IP>. It is generally used to check the machine’s connectivity to a network.

- It is used to check if we can access a URI/IP address or not

- -s [amount] flag is used to define the (amount+8) bytes that will be sent; 8 extra bytes are added to the number as header

- -c [count] flag is used to stop the ping process after sending ‘count’ ECHO_REQUEST.

- -i [interval] flag is used to wait ‘interval’ seconds between sending each packet.

traceroute <IP> :-

- Displays route packets trace to network host.

- It sends multiple packets to IP incrementing TTL(time to live) and listens for ICMP TIME_EXCEEDED reply from the network devices in the route of the packet between sender and destination server.

arp :-

- Configures and displays system’s ARP cache

- Used to link a logical address (IP) to a physical address (MAC)

dig <URL> :-

- dig(domain information groper) is used for interrogating DNS name servers.

- Performs a DNS lookup of the <URL> using the DNS IP mentioned in /etc/resolv.conf and returns the IP address.

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nslookup :-

- Used to query for Internet domain name servers, interactively or non-interactively, if the URL is given it is in non-interactive mode.

- We can do nslookup <IP> to reverse domain search, that is find the URL from IP.

netstat :-

- Print the network connections, routing tables, interface statistics, masquerade connections and multicast memberships. [Deprecated :- use ‘ss’]

- Displays protocol used by socket, state, foreign address of the AIC(Active Internet Connections) (TCP,UDP,UDPLite,raw)

2. Find the IP and hardware addresses of your machine using the ifconfig command.

   Output of **ifconfig**:-

```
vboxuser@Ubuntu:~/Desktop/NetworkingAssignments$ ifconfig -v enp0s3
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 10.0.2.15  netmask 255.255.255.0  broadcast 10.0.2.255
        inet6 fe80::8e89:db64:cd10:52fa  prefixlen 64  scopeid 0x20<link>
        ether 08:00:27:e2:91:87  txqueuelen 1000  (Ethernet)
        RX packets 467520  bytes 671006567 (671.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 58159  bytes 6746273 (6.7 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

IP address of my machine :- 10.0.2.15
Hardware address(ether) of my machine :- 08:00:27:e2:91:87

3. Use “ping <AnyURL>” command and find out
   i. the average RTT(round trip time).
   ii. the %packet loss.
   iii. size of packet that is sent to <AnyURL> server.
   iv. size of packet that is received by your machine.

   Output of **ping -c 5 www.google.com**

```
vboxuser@Ubuntu:~/Desktop/NetworkingAssignments$ ping www.google.com -c 5
PING www.google.com (142.250.66.4) 56(84) bytes of data.
64 bytes from bom07s35-in-f4.1e100.net (142.250.66.4): icmp_seq=1 ttl=116 time=102 ms
64 bytes from bom07s35-in-f4.1e100.net (142.250.66.4): icmp_seq=2 ttl=116 time=38.1 ms
64 bytes from bom07s35-in-f4.1e100.net (142.250.66.4): icmp_seq=3 ttl=116 time=37.8 ms
64 bytes from bom07s35-in-f4.1e100.net (142.250.66.4): icmp_seq=4 ttl=116 time=37.2 ms
64 bytes from bom07s35-in-f4.1e100.net (142.250.66.4): icmp_seq=5 ttl=116 time=85.0 ms

--- www.google.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4009ms
rtt min/avg/max/mdev = 37.246/60.086/102.386/27.971 ms
```

   i. the average RTT(round trip time) is **60.086 ms**
   ii. the %packet loss is **0%**
   iii. size of packet that is sent to <AnyURL> server is **64 bytes (max(76,byteSize+8))**
   iv. size of packet that is received by your machine is **64 bytes**

4. Use “dig <AnyURL>” command and find out
   i. theIP address of <AnyURL>.
   ii. theIP addresses of local DNS servers of IIEST.

   Output of **dig www.google.com**

```
; global options: +cmd
; Got answer:
; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 18725
; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
; QUESTION SECTION:
;www.google.com.                        IN      A

; ANSWER SECTION:
www.google.com.         188     IN      A       142.250.192.68

; Query time: 44 msec
; SERVER: 8.8.8.8#53(8.8.8.8) (UDP)
; WHEN: Wed Jan 03 12:36:27 IST 2024
; MSG SIZE  rcvd: 59

vboxuser@Ubuntu:~/Desktop/NetworkingAssignments$ dig www.iiests.ac.in

; <<>> DiG 9.18.12-0ubuntu0.22.04.3-Ubuntu <<>> www.iiests.ac.in
; global options: +cmd
; Got answer:
; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 39210
; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
; QUESTION SECTION:
;www.iiests.ac.in.              IN      A

; ANSWER SECTION:
www.iiests.ac.in.       3600    IN      A       14.139.223.183
www.iiests.ac.in.       3600    IN      A       14.139.223.168

; Query time: 80 msec
; SERVER: 8.8.8.8#53(8.8.8.8) (UDP)
; WHEN: Wed Jan 03 12:37:43 IST 2024
```

i. theIP address of **www.google.com** :- **142.250.192.68**
ii. theIP addresses of local DNS servers of IIEST are:- **14.139.233.183 and 14.139.223.168**

5. Use “traceroute <AnyURL>” and find out
   i. number of hops in between your machine and <AnyURL> server.
   ii. the IP address of your network gateway of your subnet.

   Output of traceroute **www.google.com :-**

```
skfard@hamsa:~/NetworkAssignments$ traceroute google.com
traceroute to google.com (142.250.183.206), 30 hops max, 60 byte packets
 1  * * _gateway (10.2.0.1)  6.562 ms
 2  * * *
 3  10.119.235.13 (10.119.235.13)  535.561 ms  7.955 ms  8.490 ms
 4  10.173.35.185 (10.173.35.185)  552.096 ms  103.085 ms  103.546 ms
 5  10.255.238.166 (10.255.238.166)  103.987 ms  104.328 ms  105.042 ms
 6  10.152.7.214 (10.152.7.214)  237.078 ms  551.726 ms  546.694 ms
 7  72.14.204.62 (72.14.204.62)  41.148 ms  53.515 ms 142.250.172.80 (142.250.172.80)  51.993 ms
 8  * * *
 9  108.170.231.78 (108.170.231.78)  51.524 ms 72.14.237.10 (72.14.237.10)  51.239 ms 108.170.248.177 (108.170.248.177)  53.282 ms
10  108.170.248.170 (108.170.248.170)  53.250 ms 108.170.248.179 (108.170.248.179)  51.312 ms 108.170.248.170 (108.170.248.170)  53.
114 ms
11  142.250.226.67 (142.250.226.67)  51.618 ms  51.614 ms bom07s33-in-f14.1e100.net (142.250.183.206)  34.638 ms
```

   i. number of hops in between your machine and <AnyURL> server are **11**
   ii. the IP address of your network gateway of your subnet is the **first traceroute IP address :- 10.2.0.1**

6. Use “arp” command to find out the MAC address of the device that is performing as your network gateway.

   Output of arp:-

```
vboxuser@Ubuntu:~/Desktop/NetworkingAssignments$ arp
Address                  HWtype  HWaddress           Flags Mask            Iface
10.0.2.2                 ether   52:54:00:12:35:02   C                     enp0s3
```

   MAC address(HWaddress) is :- **52:54:00:12:35:02**

7. Use “nslookup <AnyURL>” command and find out the IP address of <AnyURL>. Use “nslookup <IP address>” command and perform reverse domain lookup.

Output of **nslookup www.google.com**

```
vboxuser@Ubuntu:~/Desktop$ nslookup www.google.com
Server:         8.8.8.8
Address:        8.8.8.8#53

Non-authoritative answer:
Name:   www.google.com
Address: 142.250.193.4
Name:   www.google.com
Address: 2404:6800:4002:81a::2004
```

IP address of www.google.com is **142.250.193.4**

Reverse Domain Lookup

Output of **nslookup 142.250.193.4**

```
vboxuser@Ubuntu:~/Desktop$ nslookup 142.250.193.4
4.193.250.142.in-addr.arpa      name = del11s14-in-f4.1e100.net.

Authoritative answers can be found from:
```

Name of the server is del11s14-in-f4.1e100.net

8. Use netstat command and find out the active connections of your machine.

   Output of **netstat:-**

```
vboxuser@Ubuntu:~/Desktop/NetworkingAssignments$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 10.0.2.15:46666         10.2.1.40:ssh           ESTABLISHED
tcp        0      0 10.0.2.15:36772         10.2.1.40:ssh           ESTABLISHED
tcp        0      0 10.0.2.15:57294         209.100.149.34.bc:https ESTABLISHED
tcp        0      0 10.0.2.15:47808         93.243.107.34.bc.:https ESTABLISHED
tcp        0      0 10.0.2.15:36394         239.237.117.34.bc:https TIME_WAIT
tcp        0      0 10.0.2.15:47812         93.243.107.34.bc.:https ESTABLISHED
udp        0      0 10.0.2.15:bootpc        10.0.2.2:bootps         ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type       State         I-Node   Path
unix  3      [ ]         STREAM     CONNECTED     25277
unix  3      [ ]         STREAM     CONNECTED     24421    /run/user/1000/at-spi/bus
unix  3      [ ]         STREAM     CONNECTED     23767
unix  3      [ ]         STREAM     CONNECTED     24437    /run/user/1000/bus
unix  3      [ ]         STREAM     CONNECTED     24603    @/home/vboxuser/.cache/ibus/dbus-JKLLHWRu
unix  3      [ ]         STREAM     CONNECTED     20403
unix  3      [ ]         STREAM     CONNECTED     353422
unix  3      [ ]         STREAM     CONNECTED     24104    /run/user/1000/bus
unix  3      [ ]         STREAM     CONNECTED     23592
unix  3      [ ]         STREAM     CONNECTED     19606
unix  3      [ ]         STREAM     CONNECTED     24450    /run/user/1000/pulse/native
unix  3      [ ]         STREAM     CONNECTED     22451
unix  3      [ ]         STREAM     CONNECTED     23329
unix  3      [ ]         SEQPACKET  CONNECTED     36374
unix  3      [ ]         STREAM     CONNECTED     24239    /run/user/1000/bus
unix  3      [ ]         STREAM     CONNECTED     24086
unix  3      [ ]         STREAM     CONNECTED     24077
unix  3      [ ]         STREAM     CONNECTED     29336
unix  2      [ ]         DGRAM      CONNECTED     18817
unix  3      [ ]         STREAM     CONNECTED     45081
unix  2      [ ]         DGRAM      CONNECTED     21794
unix  3      [ ]         STREAM     CONNECTED     26773
unix  3      [ ]         STREAM     CONNECTED     25889    /run/systemd/journal/stdout
unix  3      [ ]         SEQPACKET  CONNECTED     28408
unix  3      [ ]         STREAM     CONNECTED     27679    /run/user/1000/bus
unix  3      [ ]         STREAM     CONNECTED     26262    /run/user/1000/at-spi/bus
```