CS F303 Computer Networks Lab1[25/01/2021]

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1. tcpdump

tcpdump is a cmd-line sniffer that dumps traffic on a network. Requires super-user privileges. *tcpdump* prints out a description of the contents of packets on a network interface that match the boolean *expression*. Tcpdump is a utility that is used to capture and analyse packets on a network interface.

2. ifconfig

It stands for interface configuration. **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. The output follows the following syntax: {interface_name, interface_status, broadcast_status, transmission_status, multicast.....}

```
rohit@rohit:~$ ifconfig
enx3c18a0955f87: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
       inet 192.168.0.33 netmask 255.255.255.0 broadcast 192.168.0.255
       inet6 fe80::ae08:1ee2:fd95:f9df prefixlen 64 scopeid 0x20<link>
       ether 3c:18:a0:95:5f:87 txqueuelen 1000 (Ethernet)
       RX packets 622845 bytes 643269105 (643.2 MB)
       RX errors 0 dropped 8361 overruns 0 frame 0
       TX packets 234858 bytes 49340599 (49.3 MB)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
       inet 127.0.0.1 netmask 255.0.0.0
       inet6 ::1 prefixlen 128 scopeid 0x10<host>
       loop txqueuelen 1000 (Local Loopback)
       RX packets 6331 bytes 664778 (664.7 KB)
       RX errors 0 dropped 0 overruns 0 frame 0
       TX packets 6331 bytes 664778 (664.7 KB)
       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

3. dig

Dig is a DNS look-up utility. Dig is a command line tool for querying and analysing DNS name servers. It collects data about the domain name servers.

```
rohit@rohit:~$ dig
; <<>> DiG 9.16.1-Ubuntu <<>>
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 14780
;; flags: qr rd ra; QUERY: 1, ANSWER: 13, AUTHORITY: 0, ADDITIONAL: 1
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
                                 IN
                                         NS
:: ANSWER SECTION:
                         600
                                 IN
                                         NS
                                                  g.root-servers.net.
                         600
                                 IN
                                         NS
                                                  h.root-servers.net.
                         600
                                 IN
                                         NS
                                                  i.root-servers.net.
                         600
                                 IN
                                         NS
                                                  j.root-servers.net.
                         600
                                 IN
                                         NS
                                                  k.root-servers.net.
                         600
                                 IN
                                         NS
                                                  l.root-servers.net.
                                         NS
                         600
                                 IN
                                                  m.root-servers.net.
                         600
                                 IN
                                         NS
                                                  a.root-servers.net.
                         600
                                 IN
                                         NS
                                                  b.root-servers.net.
                         600
                                 IN
                                         NS
                                                  c.root-servers.net.
                         600
                                 IN
                                         NS
                                                 d.root-servers.net.
                         600
                                 IN
                                         NS
                                                  e.root-servers.net.
                         600
                                 IN
                                         NS
                                                  f.root-servers.net.
;; Query time: 12 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Sat Jan 23 16:41:01 IST 2021
  MSG SIZE rcvd: 239
```

Here we are querying from using dig www.google.com. By default dig performs a lookup for an A record if no type argument is specified. The first line contains the version of dig[9.16.1] and global options are used. Question section displays the query while the answer section contains the desired record. We see that www.google.com, with a TTL of 171 seconds has an A record - 216.58.221.36. Last section displays the statistics i.e. query time.

```
rohit@rohit:~$ dig www.google.com
; <<>> DiG 9.16.1-Ubuntu <<>> www.google.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 60004
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;www.google.com.
                                         IN
;; ANSWER SECTION:
                                                 216.58.221.36
www.google.com.
                        171
                                 IN
                                         Α
;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Sat Jan 23 17:00:09 IST 2021
  MSG SIZE rcvd: 59
```

4. arp

It refers to Address Resolution Protocol. Arp manipulates or displays the kernel's IPv4 network neighbour cache. 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)

```
rohit@rohit:~$ arp
Address HWtype HWaddress Flags Mask Iface
dsldevice.lan ether ec:84:b4:ec:1c:f0 C wlo1
```

5. netstat

netstat is used to print network statistics like routing tables, active connections etc. Here, netstat displays the per protocol stats or network information for each port(TCP, UNIX) etc.

```
| Active Internet connections (y/o servers) | Active Internet Conn
```

6. telnet

The telnet command is used to communicate with another host using the *TELNET* protocol. Used to send commands to remote servers. Here I remotely established a connection to freechess.org's server.

7. traceroute

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. The first line of the traceroute output lists the destination system (www.google.com), destination IP address (216.58.221.36), and the maximum number of hops that will be used in the traceroute (64). The remainder of the output shows information on each hop, which is typically a router, in the path between the sender and the final destination.

```
rohit@rohit: $ traceroute www.google.com
traceroute to www.google.com (216.58.221.36), 64 hops max
     192.168.0.1 2.202ms 109.347ms
                                      2.061ms
 2
     10.195.128.1
                   10.993ms
                             19.873ms
                                       9.018ms
 3
     49.207.34.197
                                        15.397ms
                    13.518ms
                              15.055ms
     49.207.34.161
                    7.981ms
 4
 5
     49.207.47.205
                    13.688ms
                              11.220ms
                                        7.653ms
 6
     10.23.221.126
                    8.854ms 11.791ms
                                       15.614ms
 7
     216.239.47.98
                    19.571ms 12.425ms
                                        12.488ms
     216.239.57.33
                    19.624ms 28.930ms
                                        14.754ms
 8
     216.58.221.36
                    10.923ms
                              18.909ms
                                        8.896ms
 hitarohit. -S
```

8. ping

Used to check if a network is available and if the host is reachable, ping sends ICMP ECHO_REQUEST to network hosts. The **ping** command sends one datagram per second and prints one line of output for every response received.

```
ohit@rohit:~$ ping www.google.com
PING www.google.com (216.58.221.36) 56(84) bytes of data.
64 bytes from del03s07-in-f4.1e100.net (216.58.221.36): icmp_seq=1 ttl=118 time=8.20 ms
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=2 ttl=118 time=10.7
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=3 ttl=118 time=8.87
                                           (216.58.221.36): icmp_seq=4 ttl=118 time=12.0 (216.58.221.36): icmp_seq=5 ttl=118 time=10.7 (216.58.221.36): icmp_seq=6 ttl=118 time=8.64
64 bytes from del03s07-in-f4.1e100.net
          from del03s07-in-f4.1e100.net
  bytes
64 bytes from del03s07-in-f4.1e100.net
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=7 ttl=118 time=12.2
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=8 ttl=118 time=9.46
                                            (216.58.221.36): icmp_seq=9 ttl=118 time=11.6 ms
(216.58.221.36): icmp_seq=10 ttl=118 time=10.9 ms
  bytes
         from del03s07-in-f4.1e100.net
64 bytes from del03s07-in-f4.1e100.net
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=11 ttl=118 time=12.7
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=12 ttl=118 time=10.5 ms
                                            (216.58.221.36): icmp_seq=13 ttl=118 (216.58.221.36): icmp_seq=14 ttl=118
  bytes from del03s07-in-f4.1e100.net
                                                                                      time=13.0
64 bytes from del03s07-in-f4.1e100.net
                                                                                      time=51.5 ms
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=15 ttl=118 time=9.61 ms
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=16 ttl=118 time=11.8 ms
                                           (216.58.221.36): icmp_seq=17 ttl=118 (216.58.221.36): icmp_seq=18 ttl=118
  bytes from del03s07-in-f4.1e100.net
                                                                                      time=9.87
64 bytes from del03s07-in-f4.1e100.net
                                                                                     time=8.56 ms
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=19 ttl=118 time=13.0
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=20 ttl=118 time=12.7
                                           (216.58.221.36): icmp_seq=21 ttl=118 (216.58.221.36): icmp_seq=22 ttl=118
  bytes from del03s07-in-f4.1e100.net
                                                                                      time=11.3
64 bytes from del03s07-in-f4.1e100.net
                                                                                      time=12.7 ms
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp seq=23 ttl=118
                                                                                     time=13.8
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36): icmp_seq=24 ttl=118 time=10.5 ms
  bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36):
                                                               icmp_seq=25 ttl=118
                                                                                      time=10.9
                                                               icmp_seq=26 ttl=118
64 bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36):
                                                                                     time=12.3 ms
  bytes from del03s07-in-f4.1e100.net
                                            (216.58.221.36):
                                                               icmp_seq=27 ttl=118 time=9.83 ms
64 bytes from del03s07-in-f4.1e100.net
                                           (216.58.221.36): icmp_seq=28 ttl=118 time=12.4 ms
                                           (216.58.221.36): icmp_seq=29 ttl=118 time=14.7 ms
(216.58.221.36): icmp_seq=30 ttl=118 time=10.9 ms
  bytes from del03s07-in-f4.1e100.net
  bytes from del03s07-in-f4.1e100.net
64 bytes from del03s07-in-f4.1e100.net (216.58.221.36): icmp_seq=31 ttl=118 time=11.8 ms
```

9. top

Displays the process table in linux. It can display system summary information as well as a list of processes or threads currently being managed by the Linux kernel.

```
top - 18:44:14 up
                    4:52, 1 user, load average: 0.77, 0.72, 1.12
                     1 running, 393 sleeping,
                                                                  0 zombie
Tasks: 394 total,
                                                   0 stopped,
%Cpu(s): 6.3 us, 1.4 sy
MiB Mem : 7834.8 total,
                                                  0.1 wa, 0.0 hi, 0.6 si, 0.0 st
01.3 used, 2411.5 buff/cache
                    1.4 sy,
                              0.0 ni, 91.6 id,
                               2122.1 free,
                                               3301.3 used,
MiB Swap:
             2048.0 total,
                               1771.4 free,
                                                276.6 used.
                                                                3672.7 avail Mem
                                                                        TIME+ COMMAND
    PID USER
                    PR
                        NI
                               VIRT
                                       RES
                                               SHR S
                                                       %CPU
                                                             %MEM
                         0 5943868
                                    352748
                                            120244
                                                       18.2
                                                                    10:50.25 chrome
  14681 rohit
                    20
                                                               4.4
                                             96340 S
                                                       15.2
   3132 rohit
                    20
                         0 5266792 314388
                                                               3.9
                                                                    45:08.26 gnome-shell
                                                                    29:25.14 Xorg
   2784 rohit
                    20
                         0 1206692 102332
                                             78616 S
                                                        8.3
                                                              1.3
   5235 rohit
                    20
                         0
                           1483144
                                    159824
                                             74872 S
                                                        7.9
                                                              2.0
                                                                    49:51.78 chrome
                         0 3830248 453668
                                                   S
                                                                    33:56.14 chrome
   5068 rohit
                    20
                                            113076
                                                        5.3
                                                              5.7
                           974416
                                             39484 S
   4802 rohit
                    20
                                     57724
                                                        3.0
                                                               0.7
                                                                     1:14.53 gnome-terminal-
                           238064
   2934 rohit
                    20
                         Θ
                                      7580
                                              5824 S
                                                                     0:43.76 ibus-daemon
                                                        1.3
                                                              0.1
                    20
                         0
                           1628440
                                     96196
                                             59476
                                                   S
                                                                     6:13.46 chrome
   5245 rohit
                                                        1.3
                                                               1.2
                                                                     1:33.96 FoxitReader
                           2794940
                                    120792
                                                              1.5
  21592 rohit
                    20
                         0
                                             58788 S
                                                        1.0
  20136 rohit
                    20
                         0 5920460
                                    328936
                                             96168 S
                                                        0.7
                                                                     1:54.04 chrome
                                                               4.1
                    0
                       -20
                                                                     0:01.50 kworker/0:1H-events_highpri
    309 root
                                  0
                                         0
                                                 0
                                                   Ι
                                                        0.3
                                                              0.0
   1302 root
                    20
                         0
                              81884
                                      3844
                                              3492
                                                        0.3
                                                              0.0
                                                                     0:01.95 irqbalance
                                                                     0:11.21 ibus-extension-
   2970 rohit
                    20
                         0
                            275124
                                     25576
                                             19084 S
                                                        0.3
                                                              0.3
                                              6528 S
                                                               0.1
   3028 rohit
                    20
                         0
                            162684
                                      6852
                                                        0.3
                                                                     0:10.82 ibus-engine-sim
                    20
                         0 5789016
                                    131792
                                             80152 S
                                                        0.3
                                                                     0:58.94 chrome
   5371 rohit
                                                              1.6
   7907 rohit
                    20
                         0
                           5772000
                                    107280
                                             82252
                                                        0.3
                                                               1.3
                                                                     0:10.09 chrome
   7963 rohit
                    20
                         0
                           9815.0m 173556
                                             93364 S
                                                        0.3
                                                                     0:50.65 chrome
                                                               2.2
  27147 root
                    20
                         0
                                  0
                                         0
                                                 0
                                                   Ι
                                                        0.3
                                                              0.0
                                                                     0:08.27 kworker/u16:56-i915
  30332 root
                    20
                         0
                                  0
                                         0
                                                 0
                                                   I
                                                        0.3
                                                              0.0
                                                                     0:05.52 kworker/5:3-events
                           5850800 195168
                                            117932 S
  33612 rohit
                    20
                         0
                                                        0.3
                                                               2.4
                                                                     0:47.97 chrome
  38285 rohit
                    20
                              12364
                                      4332
                                              3392 R
                                                                     0:00.16 top
                                                        0.3
                                                               0.1
                    20
                         0
                             169820
                                     12724
                                              7884 S
                                                                     0:45.09 systemd
      1 root
                                                        0.0
                                                              0.2
      2
                    20
                         0
                                                 0
                                                                     0:00.04 kthreadd
        root
                                         0
                                                        0.0
                                                               0.0
                                                                     0:00.00 rcu_gp
                    0
                       -20
                                                 0
      3 root
                                  0
                                         0
                                                        0.0
                                                              0.0
      4 root
                    0
                       -20
                                  0
                                          0
                                                 0
                                                        0.0
                                                               0.0
                                                                     0:00.00 rcu_par_gp
                    0
                       -20
                                                 0
                                                                     0:00.00 kworker/0:0H-kblockd
      6 root
                                  0
                                         0
                                                   Ι
                                                        0.0
                                                              0.0
      9
        root
                    0
                       -20
                                  0
                                          0
                                                 0
                                                        0.0
                                                               0.0
                                                                     0:00.00 mm_percpu_wq
     10 root
                    20
                         0
                                  0
                                         0
                                                 0 S
                                                        0.0
                                                               0.0
                                                                     0:00.86 ksoftirgd/0
                         0
                                  0
     11 root
                    20
                                         0
                                                 0
                                                   Ι
                                                        0.0
                                                               0.0
                                                                     0:29.48 rcu_sched
                                                                     0:00.09 migration/0
0:00.00 idle_inject/0
     12 root
                   rt
                         0
                                  0
                                         0
                                                 0 S
                                                        0.0
                                                              0.0
     13 root
                   -51
                         0
                                  0
                                         0
                                                 0
                                                        0.0
                                                              0.0
     14 root
                    20
                         0
                                  0
                                         0
                                                 0 S
                                                        0.0
                                                                     0:00.00 cpuhp/0
                                                               0.0
                         0
                                  0
                                                 0 S
     15 root
                    20
                                         0
                                                        0.0
                                                              0.0
                                                                     0:00.00 cpuhp/1
     16 root
                   -51
                         0
                                  0
                                          0
                                                 0
                                                   S
                                                        0.0
                                                               0.0
                                                                     0:00.00 idle inject/1
                         0
                                  0
                                                 0
                                                   S
                                                                     0:00.25 migration/1
     17 root
                    rt
                                         0
                                                        0.0
                                                              0.0
                    20
                         0
                                  0
                                          0
                                                                     0:01.11 ksoftirqd/1
     18 root
                                                 0
                                                        0.0
                                                               0.0
                                                                     0:00.00 kworker/1:0H-kblockd
                    0
                       -20
                                  0
                                          0
                                                 0 I
     20 root
                                                        0.0
                                                              0.0
                                  0
                                          0
                                                 0 S
                                                        0.0
                                                              0.0
                                                                     0:00.00 cpuhp/2
     21 root
                    20
                         0
```

10. wall

wall command in Linux system is used to write a message to all users. In the below example, the message "Hello World" will be broadcasted to all users.

rohit@rohit:~\$ wall "Hello World"

11. uptime

Uptime is a **command** that returns information about how long your system has been running together with the current time, number of users with running sessions, and the system load averages for the past 1, 5, and 15 minutes. As clear from the example the current time is 19:10:59, machine has been up since 5h 20mins with one user and system load average values have been shown.

```
rohit@rohit:~$ uptime
  19:10:59 up  5:19,  1 user, load average: 2.34, 1.49, 0.93
rohit@rohit:~$ uptime -p
up 5 hours, 20 minutes
rohit@rohit:~$
```

12. nslookup

Nslookup command is used to query domain name servers and return the mapping from the domain name to IP address. Here we query server = 127.0.0.53 for domain name www.google.com and it returns us the IP address and port used. In this case, a "non-authoritative answer" notification is given, as the local DNS server was unable to answer the query itself, and instead had to contact one or more other name servers. IPv4 and IPv6(longer ones) addresses of www.google.com are returned.

```
rohit@rohit:~$ nslookup www.google.com
Server: 127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name: www.google.com
Address: 216.58.221.36
Name: www.google.com
Address: 2404:6800:4002:806::2004
```