Computer Networks Lab Assignment 2

Study of Linux Networking Commands

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1. ifconfig
   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.

```
omkar@omkar:~/Desktop$ ifconfig
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 5538  bytes 560729 (560.7 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 5538  bytes 560729 (560.7 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

wlp1s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.29.103  netmask 255.255.255.0  broadcast 192.168.29.255
        inet6 2405:201:1012:2032:ba3d:a939:d96b:3639  prefixlen 64  scopeid 0x0<global>
        inet6 fe80::ea8b:48b:15ed:7123  prefixlen 64  scopeid 0x20<link>
        inet6 2405:201:1012:2032:1a8b:db48:6e3b:80e9  prefixlen 64  scopeid 0x0<global>
        ether 14:13:33:8b:1b:8d  txqueuelen 1000  (Ethernet)
        RX packets 41834  bytes 38021359 (38.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 26667  bytes 8501053 (8.5 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

2. ip
   The 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 a tunnel over IP etc.

```
omkar@omkar:~/Desktop$ ip address
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: wlp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP group default qlen 1000
    link/ether 14:13:33:8b:1b:8d brd ff:ff:ff:ff:ff:ff
    inet 192.168.29.103/24 brd 192.168.29.255 scope global dynamic noprefixroute wlp1s0
       valid_lft 27604sec preferred_lft 27604sec
    inet6 2405:201:1012:2032:ba3d:a939:d96b:3639/64 scope global temporary dynamic
       valid_lft 3601sec preferred_lft 3601sec
    inet6 2405:201:1012:2032:1a8b:db48:6e3b:80e9/64 scope global dynamic mngtmpaddr noprefixroute
       valid_lft 3601sec preferred_lft 3601sec
    inet6 fe80::ea8b:48b:15ed:7123/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
omkar@omkar:~/Desktop$ ip link
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: wlp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP mode DORMANT group default qlen 1000
    link/ether 14:13:33:8b:1b:8d brd ff:ff:ff:ff:ff:ff
```

3. 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.

```
omkar@omkar:~/Desktop$ traceroute www.google.com
traceroute to www.google.com (172.217.166.164), 30 hops max, 60 byte packets
 1  reliance.reliance (192.168.29.1)  5.424 ms  5.393 ms  5.382 ms
 2  10.62.184.1 (10.62.184.1)  5.370 ms  5.360 ms  5.348 ms
 3  172.31.3.64 (172.31.3.64)  7.365 ms  7.353 ms  7.344 ms
 4  192.168.92.240 (192.168.92.240)  7.376 ms  7.323 ms  7.351 ms
 5  172.26.106.117 (172.26.106.117)  7.296 ms  7.283 ms  7.264 ms
 6  172.26.106.99 (172.26.106.99)  7.253 ms 172.26.106.98 (172.26.106.98)  3.621 ms 172.26.106.99 (172.26.106.99)  4.394 ms
 7  192.168.92.160 (192.168.92.160)  5.107 ms 192.168.92.164 (192.168.92.164)  5.095 ms 192.168.92.160 (192.168.92.160)  5.085 ms
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  72.14.211.138 (72.14.211.138)  35.622 ms *  30.103 ms
14  * * 72.14.211.138 (72.14.211.138)  7.792 ms
15  108.170.232.202 (108.170.232.202)  9.269 ms * *
16  108.170.248.179 (108.170.248.179)  9.230 ms 108.170.238.198 (108.170.238.198)  8.757 ms 209.85.142.84 (209.85.142.84)  9.429 ms
17  108.170.248.193 (108.170.248.193)  9.722 ms 108.170.248.178 (108.170.248.178)  9.400 ms 108.170.248.193 (108.170.248.193)  7.195 ms
18  bom07s20-in-f4.1e100.net (172.217.166.164)  7.570 ms  7.588 ms 108.170.248.193 (108.170.248.193)  7.126 ms
omkar@omkar:~/Desktop$
```

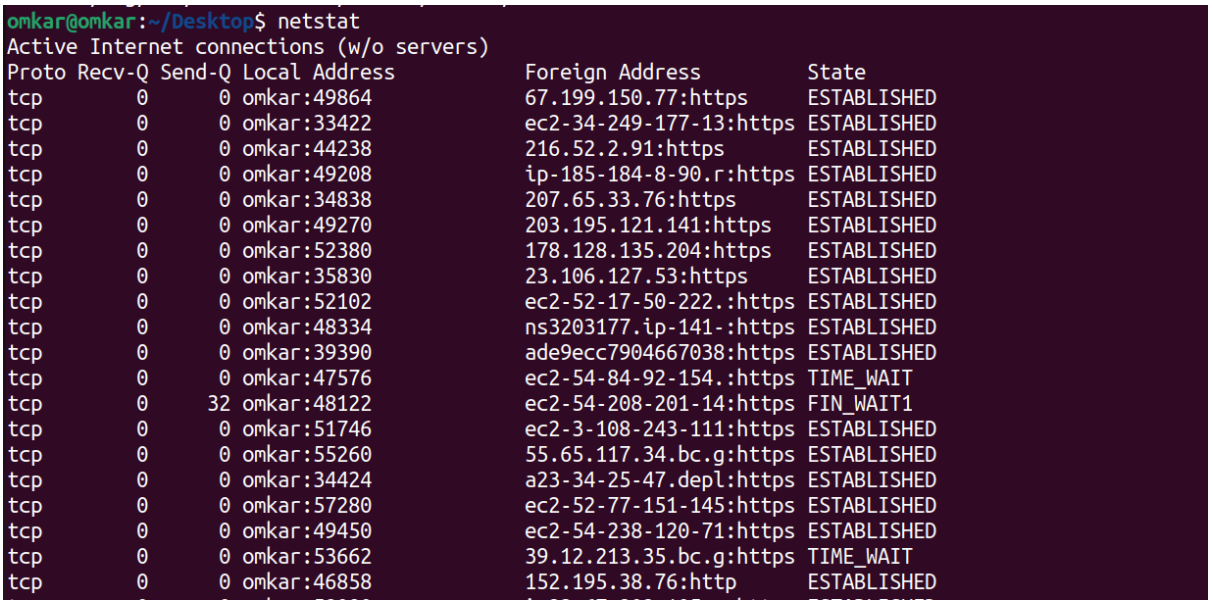
4. tracepath

   tracepath command in Linux is used to trace a path to the destination discovering MTU along this path. It uses a UDP port or some random port.

```
omkar@omkar:~/Desktop$ tracepath -n www.google.com
 1?: [LOCALHOST]                      0.006ms pmtu 1500
 1:  2405:201:1012:2032:aada:cff:fe11:f660                 1.975ms
 1:  2405:201:1012:2032:aada:cff:fe11:f660                 1.613ms
 2:  no reply
 3:  2405:203:400:100:172:31:3:64                         13.803ms
 4:  no reply
 5:  no reply
 6:  no reply
 7:  2001:4860:1:1::a14                                   29.751ms asymm  6
 8:  no reply
 9:  no reply
10:  no reply
11:  no reply
12:  no reply
13:  no reply
14:  no reply
15:  no reply
16:  no reply
17:  no reply
18:  no reply
19:  no reply
20:  no reply
21:  no reply
22:  no reply
23:  no reply
24:  no reply
25:  no reply
26:  no reply
27:  no reply
28:  no reply
29:  no reply
30:  no reply
     Too many hops: pmtu 1500
     Resume: pmtu 1500
```

5. 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 gets a response from the server/host this time is recorded which is called latency. Fast ping low latency means faster connection.

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



7. nslookup
   Nslookup (stands for “Name Server Lookup”) is a useful command for getting information from the 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.

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

Non-authoritative answer:
Name:   www.google.com
Address: 142.251.42.36
Name:   www.google.com
Address: 2404:6800:4009:829::2004
```

8. dig
   dig command stands for ***Domain Information Groper***. It is used for retrieving information about DNS name servers.

```
omkar@omkar:~$ dig www.google.com

; <<>> DiG 9.18.1-1ubuntu1.3-Ubuntu <<>> www.google.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 11570
;; 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      A

;; ANSWER SECTION:
www.google.com.         112     IN      A       142.251.42.36

;; Query time: 7 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Sun Sep 10 16:11:15 IST 2023
;; MSG SIZE  rcvd: 59
```

9. route
   By utilizing the **route** command, Linux administrators and users can establish static routes, enabling precise control over network connectivity and optimizing data transmission.

```
omkar@omkar:~$ route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         reliance.relian 0.0.0.0         UG    600    0        0 wlp1s0
link-local      0.0.0.0         255.255.0.0     U     1000   0        0 wlp1s0
192.168.29.0    0.0.0.0         255.255.255.0   U     600    0        0 wlp1s0
omkar@omkar:~$
```

10. host

host command in Linux system is used for DNS (Domain Name System) lookup operations. In simple words, this command is used to find the IP address of a particular domain name.

```
omkar@omkar:~$ host www.google.com
www.google.com has address 142.250.192.68
www.google.com has IPv6 address 2404:6800:4009:830::2004
omkar@omkar:~$
```

11. 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.

```
omkar@omkar:~$ arp -v
Address                  HWtype  HWaddress           Flags Mask            Iface
reliance.reliance        ether   a8:da:0c:11:f6:60   C                     wlp1s0
Entries: 1      Skipped: 0      Found: 1
omkar@omkar:~$
```

12. iwconfig

iwconfig command in Linux is like **ifconfig** command, in the sense it works with kernel-resident network interface but it is dedicated to wireless networking interfaces only.

```
omkar@omkar:~$ iwconfig
lo        no wireless extensions.

wlp1s0    IEEE 802.11  ESSID:"JioFiber-Oak5G"
          Mode:Managed  Frequency:5.18 GHz  Access Point: A8:DA:0C:11:F6:62
          Bit Rate=585 Mb/s   Tx-Power=3 dBm
          Retry short limit:7   RTS thr:off   Fragment thr:off
          Power Management:on
          Link Quality=41/70  Signal level=-69 dBm
          Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
          Tx excessive retries:0  Invalid misc:0   Missed beacon:0
```

13. curl

curl is a command-line tool to transfer data to or from a server, using any of the supported protocols (HTTP, FTP, IMAP, POP3, SCP, SFTP, SMTP, TFTP, TELNET, LDAP, or FILE).

```
omkar@omkar:~$ curl www.google.com
<!doctype html><html itemscope="" itemtype="http://schema.org/WebPage" lang="en-IN"><head><meta content="text/html; charset=UTF-8" http-equiv="Content-T
ype"><meta content="/images/branding/googleg/1x/googleg_standard_color_128dp.png" itemprop="image"><title>Google</title><script nonce="uZBLRH_uW6VuM9lgP
PtnyA">(function(){var _g={kEI:'5p_9ZOzUAunu1sQPhcOxuAY',kEXPI:'0,1359409,6058,207,2414,2390,2316,383,246,5,1129120,1197758,643,380089,16115,28684,22430
,1362,284,12029,17586,4998,17075,38444,2872,2891,4139,7615,606,60690,16105,230,1014,1,16918,2650,4,32894,13063,13660,4437,22601,6636,7596,1,11943,30211,
2,16737,23024,5679,1021,31121,4569,6258,23418,1252,29390,3674,2,2,1,6959,19673,8155,7381,2,15967,873,19636,5,1922,7838,1941,22908,19551,20198,928,19209,
14,82,13332,6874,8377,3787,4264,10909,2306,1578,1519,3030,5629,481,4554,487,4665,1804,7734,25363,7424,8193,298,8545,6146,11713,1991,5923,5769,6973,3,9,4
129,1271,3592,5209428,711,2,195,47,396,5994423,2803118,3311,141,795,19735,1,1,346,8436,80,1,53,4,8,22,7,12,9,76,1,1,88,1,1,1,1,1,1,1,2,1,1,1,2,1,1,26,23
941644,397,182,4043528,1007,15666,39282,1400657,23759270,8163,3396,6940,2708,2880,335,1262,3551,1708,1020,3703,240,1968,3163,220,986,1945,1689,14,284,24
02,2324,1,472,2448,1547,564,264,2,3,2814,412,363,118,1255,2174,2561,2401,1598,1036,839,2,2,53,308,10,5,16,3,146,1507,194,493,2,498,295,49,577,3,82,832,7
44,1923,503,370,3111,894,884,781,99,711,509,142,61,278,156,1219,377,619,1448,4,277,96,100,179,60,465,775,2,1066,94,1373,39,498,174,1,1,262,177,459,7,1,8
,439,5,706,11,188,1205,2054,41,203,290,6,7,181,452,620,1222,12,64,66,2,3,2,128,614,1087,1,1114,560,97,737,196,540,337,853,139,2,382,161,6,7,459,282,2,12
8,217,620,259,184,39,143,1017,1598,608,267,363,1,265,340,111,370,1371,4,149',kBL:'p7Qf',kOPI:89978449};(function(){var a;(null==(a=window.google)?0:a.st
vsc)?google.kEI=_g.kEI:window.google=_g;}).call(this);})();(function(){google.sn='webhp';google.kHL='en-IN';})();(function(){
var h=this||self;function l(){return void 0!==window.google&&void 0!==window.google.kOPI&&0!==window.google.kOPI?window.google.kOPI:null};var m,n=[];fun
ction p(a){for(var b;a&&(!a.getAttribute||!(b=a.getAttribute("eid")));)a=a.parentNode;return b||m}function q(a){for(var b=null;a&&(!a.getAttribute||!(b=
a.getAttribute("leid")));)a=a.parentNode;return b}function r(a){/^http:/i.test(a)&&"https:"===window.location.protocol&&(google.ml&&google.ml(Error("a")
,!1,{src:a,glmm:1}),a="");return a}
function t(a,b,c,d,k){var e="";-1===b.search("&ei=")&&(e="&ei="+p(d),-1===b.search("&lei=")&&(d=q(d))&&(e+="&lei="+d));d="";var g=-1===b.search("&cshid=
")&&"slh"!==a,f=[];f.push(["zx",Date.now().toString()]);h._cshid&&g&&f.push(["cshid",h._cshid]);c=c();null!=c&&f.push(["opi",c.toString()]);for(c=0;c<f.
length;c++){if(0===c||0<c)d+="&";d+=f[c][0]+"="+f[c][1]}return"/"+(k||"gen_204")+"?atyp=i&ct="+String(a)+"&cad="+(b+e+d)};m=google.kEI;google.getEI=p;go
ogle.getLEI=q;google.ml=function(){return null};google.log=function(a,b,c,d,k,e){e=void 0===e?l:e;c||(c=t(a,b,e,d,k));if(c=r(c)){a=new Image;var g=n.len
gth;n[g]=a;a.onerror=a.onload=a.onabort=function(){delete n[g]};a.src=c}};google.logUrl=function(a,b){b=void 0===b?l:b;return t("",a,b)};}).call(this);(
function(){google.y={};google.sy=[];google.x=function(a,b){if(a)var c=a.id;else{do c=Math.random();while(google.y[c])}google.y[c]=[a,b];return!1};google
.sx=function(a){google.sy.push(a)};google.lm=[];google.plm=function(a){google.lm.push.apply(google.lm,a)};google.lq=[];google.load=function(a,b,c){googl
e.lq.push([[a],b,c])};google.loadAll=function(a,b){google.lq.push([a,b])};google.bx=!1;google.lx=function(){};var d=[];google.fce=function(a,b,c,e){d.pu
sh([a,b,c,e])};google.qce=d;}).call(this);google.f={};(function(){
document.documentElement.addEventListener("submit",function(b){var a;if(a=b.target){var c=a.getAttribute("data-submitfalse");a="1"===c||"q"===c&&!a.elem
ents.q.value?!0:!1}else a=!1;a&&(b.preventDefault(),b.stopPropagation())},!0);document.documentElement.addEventListener("click",function(b){var a;a:{for
(a=b.target;a&&a!==document.documentElement;a=a.parentElement)if("A"===a.tagName){a="1"===a.getAttribute("data-nohref");break a}a=!1}a&&b.preventDefault
()},!0);}).call(this);</script><style>#gbar,#guser{font-size:13px;padding-top:1px !important;}#gbar{height:22px}#guser{padding-bottom:7px !important;tex
t-align:right}.gbh,.gbd{border-top:1px solid #c9d7f1;font-size:1px}.gbh{height:0;position:absolute;top:24px;width:100%}@media all{.gb1{height:22px;margi
n-right:.5em;vertical-align:top}#gbar{float:left}}a.gb1,a.gb4{text-decoration:underline !important}a.gb1,a.gb4{color:#00c !important}.gbi .gb4{color:#dd
8e27 !important}.gbf .gb4{color:#900 !important}
</style><style>body,td,a,p,.h{font-family:arial,sans-serif}body{margin:0;overflow-y:scroll}#gog{padding:3px 8px 0}td{line-height:.8em}.gac_m td{line-hei
ght:17px}form{margin-bottom:20px}.h{color:#1967d2}em{font-weight:bold;font-style:normal}.lst{height:25px;width:496px}.gsfi,.lst{font:18px arial,sans-ser
if}.gsfs{font:17px arial,sans-serif}.ds{display:inline-box;display:inline-block;margin:3px 0 4px;margin-left:4px}input{font-family:inherit}body{backgrou
```

14. wget

Wget is the non-interactive network downloader which is used to download files from the server even when the user has not logged on to the system and it can work in the background without hindering the current process.

```
omkar@omkar:~$ wget www.google.com
--2023-09-10 16:23:49--  http://www.google.com/
Resolving www.google.com (www.google.com)... 2404:6800:4009:829::2004, 142.250.192.68
Connecting to www.google.com (www.google.com)|2404:6800:4009:829::2004|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [text/html]
Saving to: ‘index.html’

index.html                              [ <=>                                                                ]  20.32K  --.-KB/s    in 0s

2023-09-10 16:23:49 (107 MB/s) - ‘index.html’ saved [20810]
```

15. telnet

The **telnet** command is used to create a remote connection with a system over a TCP/IP network. It allows us to administrate other systems by the terminal. We can run a program to conduct administration.

```
omkar@omkar:~$ telnet localhost
Trying 127.0.0.1...
telnet: Unable to connect to remote host: Connection refused
omkar@omkar:~$ telnet hostname/IP address
telnet: could not resolve hostname/IP/address: Servname not supported for ai_socktype
omkar@omkar:~$
```

16. whois

Whois is a command-line utility used in Linux systems to retrieve information about domain names, IP addresses, and network devices

registered with the Internet Corporation for Assigned Names and Numbers (ICANN).

```
omkar@omkar:~$ whois google.com
   Domain Name: GOOGLE.COM
   Registry Domain ID: 2138514_DOMAIN_COM-VRSN
   Registrar WHOIS Server: whois.markmonitor.com
   Registrar URL: http://www.markmonitor.com
   Updated Date: 2019-09-09T15:39:04Z
   Creation Date: 1997-09-15T04:00:00Z
   Registry Expiry Date: 2028-09-14T04:00:00Z
   Registrar: MarkMonitor Inc.
   Registrar IANA ID: 292
   Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
   Registrar Abuse Contact Phone: +1.2086851750
   Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibited
   Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferProhibited
   Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhibited
   Domain Status: serverDeleteProhibited https://icann.org/epp#serverDeleteProhibited
   Domain Status: serverTransferProhibited https://icann.org/epp#serverTransferProhibited
   Domain Status: serverUpdateProhibited https://icann.org/epp#serverUpdateProhibited
   Name Server: NS1.GOOGLE.COM
   Name Server: NS2.GOOGLE.COM
   Name Server: NS3.GOOGLE.COM
   Name Server: NS4.GOOGLE.COM
   DNSSEC: unsigned
   URL of the ICANN Whois Inaccuracy Complaint Form: https://www.icann.org/wicf/
>>> Last update of whois database: 2023-09-10T11:00:13Z <<<
```

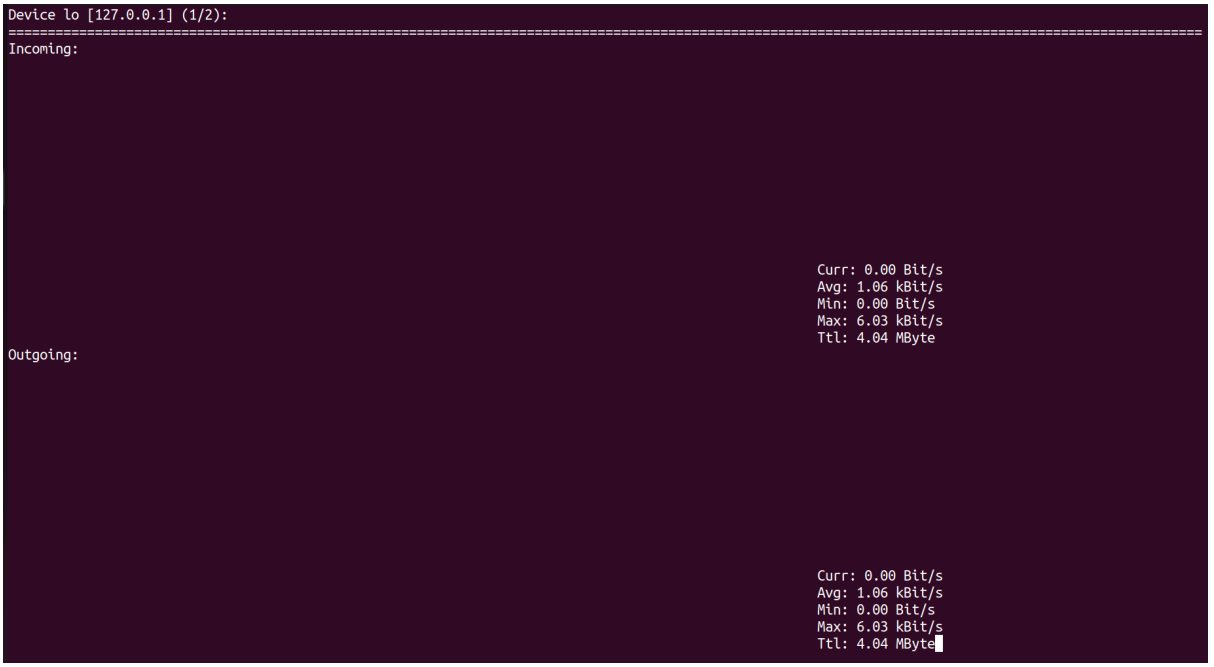
17. ifplugstatus

This command tells us whether a cable is plugged into our network interface or not.

```
omkar@omkar:~$ ifplugstatus
lo: link beat detected
wlp1s0: link beat detected
omkar@omkar:~$
```

18. nload

nload is a command-line tool used for monitoring network traffic and bandwidth usage in real-time. It will display the incoming and outgoing traffic using two graphs. This console-based application also displays info like the total amount of transferred data and min/max network.



20. mail

Linux **mail** command is a command-line utility that allows us to send emails from the command line.