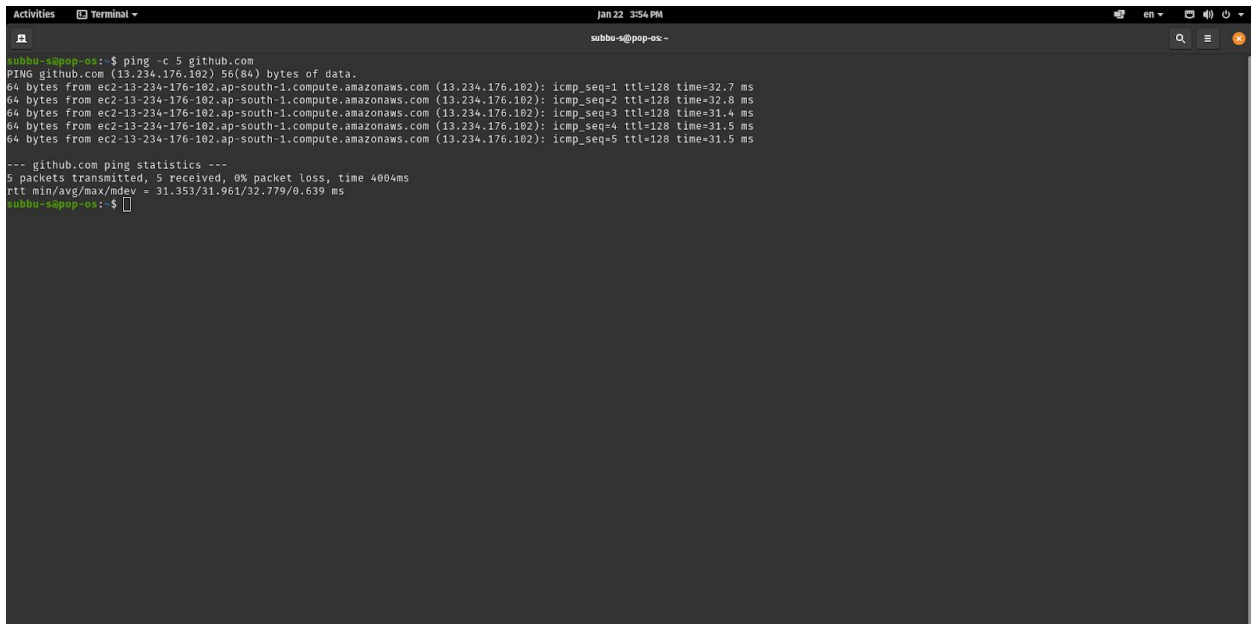


Networks Lab Experiment-1

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1. Ping



```
subbu-s@pop-os: ~$ ping -c 5 github.com
PING github.com (13.234.176.102) 56(84) bytes of data:
64 bytes from ec2-13-234-176-102.ap-south-1.compute.amazonaws.com (13.234.176.102): icmp_seq=1 ttl=128 time=32.7 ms
64 bytes from ec2-13-234-176-102.ap-south-1.compute.amazonaws.com (13.234.176.102): icmp_seq=2 ttl=128 time=32.8 ms
64 bytes from ec2-13-234-176-102.ap-south-1.compute.amazonaws.com (13.234.176.102): icmp_seq=3 ttl=128 time=31.4 ms
64 bytes from ec2-13-234-176-102.ap-south-1.compute.amazonaws.com (13.234.176.102): icmp_seq=4 ttl=128 time=31.5 ms
64 bytes from ec2-13-234-176-102.ap-south-1.compute.amazonaws.com (13.234.176.102): icmp_seq=5 ttl=128 time=31.5 ms

--- github.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 400ms
rtt min/avg/max/mdev = 31.353/31.961/32.779/0.639 ms
subbu-s@pop-os: ~$
```

Ping command is used to test if a networked device is reachable. It sends ICMP (Internet Control Message Protocol) request packets to the target host and waits for its reply.

-c flag is count which determines the number of packets to be sent. Ping also provides the statistics of results and reports packets loss and errors if any. TTL (time to live) is a mechanism that limits the lifetime of packets.

2. Traceroute

```
subbu-sapop-os:~$ traceroute -I github.com
traceroute to github.com (13.234.210.38), 30 hops max, 60 byte packets
 1  _gateway (192.168.21.2)  0.747 ms  0.662 ms  0.608 ms
 2  * * *
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  ec2-13-234-210-38.ap-south-1.compute.amazonaws.com (13.234.210.38) 33.379 ms 32.781 ms 32.620 ms
subbu-sapop-os:~$
```

Traceroute tracks the path taken by the packets from the IP network to the network host given as an argument. It sends probe packets with small TTL and draws out an “time exceeded” reply from the gateway.

-I flag is used to select ICMP trace out method which uses ICMP echo packets for probes. The asterisk “ * ” are printed for a probe if there are no responses from probes within a certain time out.

3. Ifconfig

```
subbu-sapop-os:~$ ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
    inet 192.168.21.128  netmask 255.255.255.0  broadcast 192.168.21.255
    inet6 fe80::3102:489d:a624:64db  prefixlen 64  scopeid 0x20<link>
    ether 08:9c:29:95:84:64  txqueuelen 1000  (Ethernet)
    RX packets 2118  bytes 2785860 (2.7 MB)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 466  bytes 36100 (36.1 KB)
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

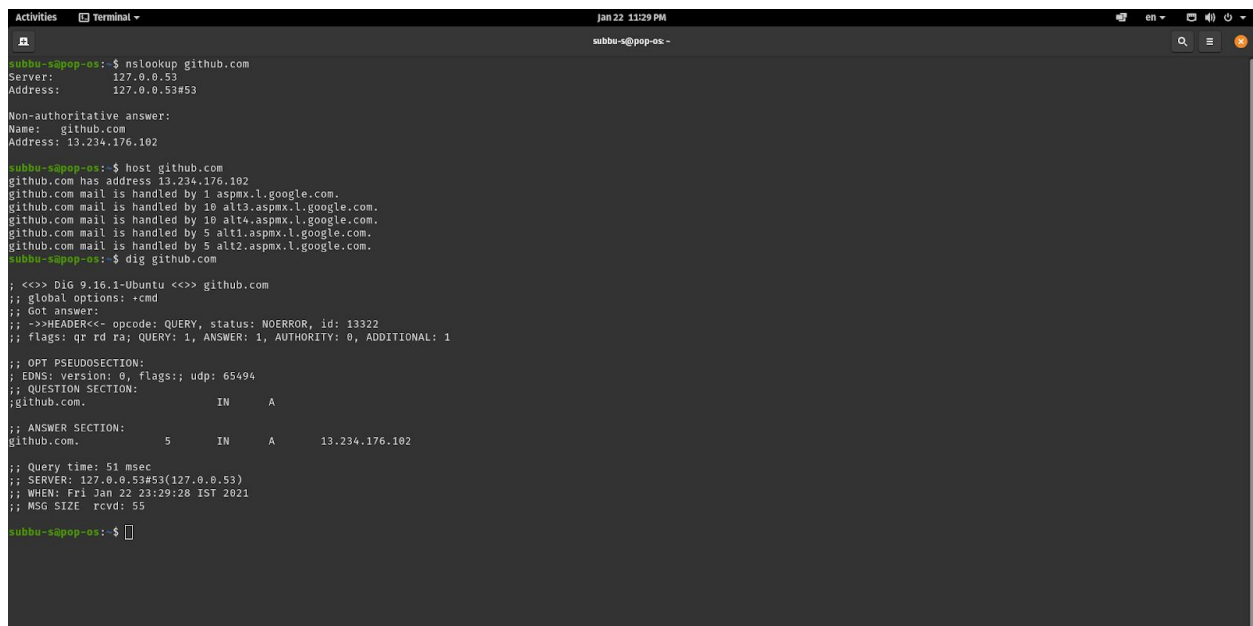
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
    inet 127.0.0.1  netmask 255.0.0.0
    inet6 ::1  prefixlen 128  scopeid 0x10<host>
    loop txqueuelen 1000  (Local Loopback)
    RX packets 162  bytes 13052 (13.0 KB)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 162  bytes 13052 (13.0 KB)
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

subbu-sapop-os:~$
```

Ifconfig means interface configuration. It is used to display current configurations information and is also used to configure network interfaces.

An ifconfig command with no flags will display all the active interfaces details and is also used to check assigned IP address for an server.

4. dig/nslookup/host



```
Activities Terminal
jan 22 11:29 PM
sibbu-s@pop-os: ~
sibbu-s@pop-os:~$ nslookup github.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   github.com
Address: 13.234.176.102

sibbu-s@pop-os:~$ host github.com
github.com has address 13.234.176.102
github.com mail is handled by 1 aspmx.l.google.com.
github.com mail is handled by 10 alt3.aspmx.l.google.com.
github.com mail is handled by 10 alt4.aspmx.l.google.com.
github.com mail is handled by 5 alt1.aspmx.l.google.com.
github.com mail is handled by 5 alt2.aspmx.l.google.com.
sibbu-s@pop-os:~$ dig github.com

;<<>> DiG 9.16.1-Ubuntu <<>> github.com
;; global options: +cmd
;; Got answer:
;; ->HEADER<- opcode: QUERY, status: NOERROR, id: 13322
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;github.com.                IN      A
;; ANSWER SECTION:
github.com.                 5       IN      A      13.234.176.102

;; Query time: 51 msec
;; SERVER: 127.0.0.53#53(127.0.0.53)
;; WHEN: Fri Jan 22 23:29:28 IST 2021
;; MSG SIZE rcvd: 55

sibbu-s@pop-os:~$
```

dig / nslookup / host commands are used as DNS (Domain Name System) lookup utilities. When provided with a domain name as arguments these commands will print the IP address for the corresponding domain names.

5. whois

When provided with a domain name as argument, whois fetches the information about the domain, its owner, owner's contact information, company that registers domain for the owner, servers that control domains DNS, creation and expiration dates etc

```
Activities Terminal - Jan 23 12:04 AM
subbu-s@pop-os: ~$ whois github.com
Domain Name: GITHUB.COM
Registry Domain ID: 1264983250 DOMAIN_COM-VRSN
Registrar WHOIS Server: whois.markmonitor.com
Registrar URL: http://www.markmonitor.com
Updated Date: 2020-09-08T09:18:27Z
Creation Date: 2007-10-09T18:20:50Z
Registry Expiry Date: 2022-10-09T18:20:50Z
Registrar: MarkMonitor Inc.
Registrar IANA ID: 292
Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
Registrar Abuse Contact Phone: +1.2083895740
Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibited
Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferProhibited
Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhibited
Name Server: DNS1.P08.NSONE.NET
Name Server: DNS2.P08.NSONE.NET
Name Server: DNS3.P08.NSONE.NET
Name Server: DNS4.P08.NSONE.NET
Name Server: NS-1283.AWSDNS-32.ORG
Name Server: NS-1707.AWSDNS-21.CO.UK
Name Server: NS-421.AWSDNS-52.COM
Name Server: NS-520.AWSDNS-01.NET
DNSSEC: unsigned
URL of the ICANN Whois Inaccuracy Complaint Form: https://www.icann.org/wicf/
>>> Last update of Whois database: 2021-01-22T18:21:40Z <<<

For more information on Whois status codes, please visit https://icann.org/epp

NOTICE: The expiration date displayed in this record is the date the
registrar's sponsorship of the domain name registration in the registry is
currently set to expire. This date does not necessarily reflect the expiration
date of the domain name registrant's agreement with the sponsoring
registrar. Users may consult the sponsoring registrar's Whois database to
view the registrar's reported date of expiration for this registration.

TERMS OF USE: You are not authorized to access or query our Whois
database through the use of electronic processes that are high-volume and
automated except as reasonably necessary to register domain names or
modify existing registrations; the Data in VeriSign Global Registry
Services' ('VeriSign') Whois database is provided by VeriSign for
information purposes only, and to assist persons in obtaining information
about or related to a domain name registration record. VeriSign does not
guarantee its accuracy. By submitting a Whois query, you agree to abide
```

6. route

```
Activities Terminal - Jan 23 12:12 AM
subbu-s@pop-os: ~$ route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default _gateway 0.0.0.0 UG 100 0 0 ens33
link-local 0.0.0.0 255.255.0.0 U 1000 0 0 ens33
192.168.21.0 0.0.0.0 255.255.255.0 U 100 0 0 ens33
subbu-s@pop-os: ~$
```

route command is used to show or modify the IP routing tables of the kernel. Simple route command without any arguments will display IP routing tables.

Routing table is a data table stored in a network host that contains routes to particular network destinations, distances associated with those routes.

7. tcpdump

[illegible]

Tcpdump is a command-line packet analyser used to dump the traffic on a network. It prints the description of the packets on a network interface along with a time stamp. After completing capturing packets it prints out the report consisting of count of captured, received, dropped packets.

8. netstat

```

Activities [ Terminal ] Jan 23 12:06 AM subbu-s@pop-os-
subbu-s@pop-os:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 pop-os:35070          199.232.254.217:https   CLOSE_WAIT
udp        0      0 pop-os:bootpc         192.168.21.254:bootps   ESTABLISHED

Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags               Type               I-Node      Path
unix    4      [ ]                  DGRAM              25667        /run/systemd/notify
unix    2      [ ]                  DGRAM              43696        /run/user/1000/systemd/notify
unix    2      [ ]                  DGRAM              36248        /run/user/110/systemd/notify
unix    2      [ ]                  DGRAM              25684        /run/systemd/journal/syslog
unix   20      [ ]                  DGRAM              25692        /run/systemd/journal/dev-log
unix    9      [ ]                  DGRAM              25696        /run/systemd/journal/socket
unix    3      [ ]                  STREAM             CONNECTED     65696
unix    3      [ ]                  STREAM             CONNECTED     48163        /run/user/1000/bus
unix    3      [ ]                  STREAM             CONNECTED     37873        /run/user/110/pulse/native
unix    3      [ ]                  STREAM             CONNECTED     44527
unix    3      [ ]                  STREAM             CONNECTED     38850        /run/systemd/journal/stdout
unix    2      [ ]                  DGRAM              47736
unix    3      [ ]                  STREAM             CONNECTED     48819
unix    3      [ ]                  STREAM             CONNECTED     43278        /run/systemd/journal/stdout
unix    3      [ ]                  STREAM             CONNECTED     39779
unix    3      [ ]                  STREAM             CONNECTED     66235
unix    3      [ ]                  STREAM             CONNECTED     48124
unix    3      [ ]                  STREAM             CONNECTED     47203
unix    3      [ ]                  STREAM             CONNECTED     39816        a/tmp/.X11-unix/X0
unix    3      [ ]                  STREAM             CONNECTED     46865
unix    3      [ ]                  STREAM             CONNECTED     44707        /run/user/1000/bus
unix    3      [ ]                  STREAM             CONNECTED     38853
unix    3      [ ]                  STREAM             CONNECTED     46427        a/tmp/dbus-uFhxs97vmp
unix    3      [ ]                  STREAM             CONNECTED     27414        /run/systemd/journal/stdout
unix    3      [ ]                  STREAM             CONNECTED     70321        /run/user/1000/bus
unix    3      [ ]                  STREAM             CONNECTED     48707        /run/user/1000/bus
unix    3      [ ]                  STREAM             CONNECTED     37372        /run/systemd/journal/stdout
unix    3      [ ]                  STREAM             CONNECTED     37098        /run/user/110/bus
unix    3      [ ]                  STREAM             CONNECTED     47857        /run/systemd/journal/stdout
unix    3      [ ]                  STREAM             CONNECTED     46244
unix    3      [ ]                  STREAM             CONNECTED     49903
unix    3      [ ]                  STREAM             CONNECTED     41259        /run/systemd/journal/stdout
unix    3      [ ]                  STREAM             CONNECTED     38535        /run/dbus/system_bus_socket
unix    3      [ ]                  STREAM             CONNECTED     33018        /run/dbus/system_bus_socket
unix    3      [ ]                  STREAM             CONNECTED     88816
unix    3      [ ]                  STREAM             CONNECTED     47772
unix    3      [ ]                  STREAM             CONNECTED     48158        a/tmp/.ICE-unix/2377

```

9. dstat

```

activities  terminal  jan 23 12:24 AM  subbu-s@pop-ek-
subbu-s@pop-os:~$ dstat
You did not select any stats, using -cdng by default.
--total-cpu-usage-- -dsk/total- -net/total- ---paging-- ---system--
dev  r/s  w/s  blk/s  in  out  in  out
1 1 98 151 56 141 277 142 319
1 1 99 32 164 166 868 182 382
1 1 98 516 248 248 344 221
1 1 98 513 247 194 384
1 1 98 113 249 153 314
1 1 97 128 295 141 880
1 1 96 12 376 892
1 1 98 6896 294 651
1 1 99 123 264
1 1 99 148 244
1 1 96 368 892
1 1 98 298 878
1 1 99 296 390
1 1 98 221 102
1 1 99 174 306
1 1 98 157 291
1 1 98 166 188
1 1 98 189 323
1 1 99 157 269
1 1 98 144 313
1 1 98 159 258
1 1 98 162 277
1 1 99 172 337
1 1 98 160 287
1 1 99 148 259
1 1 99 182 318
1 1 98 112 257
1 1 99 148 310
1 1 97 162 289
1 1 97 177 313
1 1 98 185 314
1 1 98 188 275
1 1 98 149 264
1 1 99 210 352
1 1 99 212 287

```

dstat is a tool used to generate statistics from system resources such as CPU, I/O devices, Networks etc

dstat without any arguments displays statistics of major OS components: CPU, Disk, Network, Paging, System stats in the same order

10. Ifstat

Ifstat is used to report network interface statistics and displays network's bandwidth consumption and speed at regular intervals of time.

Acts similar to iostat / vmstat which reports io and virtual memory statistics respectively.

```
Activities Terminal - Jan 23 12:32 AM
subbu-s@pop-os:~$ ifstat
ens33
KB/s in KB/s out
0.47 0.47
0.69 1.44
0.27 0.27
0.00 0.00
0.00 0.00
0.12 0.18
0.51 0.68
0.54 0.95
0.41 0.43
0.00 0.00
0.76 0.78
0.21 0.21
0.23 0.23
0.18 0.19
0.00 0.00
0.06 0.06
0.23 0.23
0.00 0.00
0.06 0.06
0.00 0.00
0.12 0.12
0.00 0.00
0.12 0.12
1.00 4.09
35.24 2.98
0.00 0.00
0.23 0.23
0.06 0.06
0.06 0.06
22.66 4.58
0.06 0.06
514.80 20.12
1170.35 18.85
0.00 0.00
1002.13 7.52
439.73 5.28
1.12 3.14
0.06 0.06
23.13 2.41
^C 443.64 14.91
```

11. Wget

```
Activities Terminal - Jan 23 12:34 AM
subbu-s@pop-os:~$ wget github.com
--2021-01-23 00:33:21-- http://github.com/
Resolving github.com (github.com)... 13.234.210.38
Connecting to github.com (github.com)[13.234.210.38]:80... connected.
HTTP request sent, awaiting response... 301 Moved Permanently
Location: https://github.com/ [following]
--2021-01-23 00:33:21-- https://github.com/
Connecting to github.com (github.com)[13.234.210.38]:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [text/html]
Saving to: 'index.html'

index.html                               [ <-> ] 186.71K --.-KB/s in 0.1s

2021-01-23 00:33:21 (1.81 MB/s) - 'index.html' saved [191187]

subbu-s@pop-os:~$ ls
Desktop  Documents  Downloads  expos  index.html  Music  myexpos  mynexpos  nespos.tar.gz  Pictures  Public  Templates  'Untitled Document 1'  'Untitled Document 2'  Videos
subbu-s@pop-os:~$
```

Wget utility helps us to download files from the web when provided with an url or domain name as argument. It retrieves files using HTTP, HTTPS, FTP and FTPS protocols which are widely used.

If download fails it keeps on trying until it retrieves the whole file which is suitable over slow and unstable connections.