



UNIVERSITY OF DHAKA

Department of Computer Science and Engineering

CSE-3111 : Computer Networking Lab

Lab Report 1 : Exercises on LAN configuration and
troubleshooting tools

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1 Introduction

A local area network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. A LAN comprises cables, access points, switches, routers, and other components that enable devices to connect to internal servers, web servers, and other LANs via wide area networks. It is crucial to set up a secure and reliable LAN network for a system, and this must be done with great care.

1.1 Objectives

The objective of this experiment is to use different LAN configuration tools in order to setup and maintain a consistent network between the systems. In this experiment we focus on the following:

- Diagnose network connectivity, track real-time pathways between current device and a network destination
- Setup and display different addresses related to network
- Configure necessary ports
- Select proper networking devices

2 Theory

To build a LAN, one has to distinguish the devices that will be connected via the network. One must also decide whether the medium of connection will be wired or wireless. It must be as brief as possible in terms of cable. After the setup, detailed testing should be conducted to ensure consistency and to detect and troubleshoot any problems that occur. To test the network in which our machine is currently connected to via WIFI network, we utilized some well-known Linux commands. But at first, we must install them.

```
sudo apt install net-tools
```

Running the above command will install the network tools we propose to use in this experiment. Here we have used ping, traceroute, ARP, Static routing, netstat, ifconfig, nslookup, whois, etc. to fulfil our objectives. The next section includes brief description of each of them.

```

tomal66@tomal-X412FA:~$ sudo apt install net-tools
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  chromium-codecs-ffmpeg-extra gstreamer1.0-vaapi libflashrom1 libftdi1-2
  libgstreamer-plugins-bad1.0-0 libva-wayland2
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 112 not upgraded.
Need to get 204 kB of archives.
After this operation, 819 kB of additional disk space will be used.
Get:1 http://bd.archive.ubuntu.com/ubuntu jammy/main amd64 net-tools amd64 1.60+
git20181103.0eebece-1ubuntu5 [204 kB]
Fetched 204 kB in 3s (79.7 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 212206 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20181103.0eebece-1ubuntu5_amd64.deb ..
.
Unpacking net-tools (1.60+git20181103.0eebece-1ubuntu5) ...
Setting up net-tools (1.60+git20181103.0eebece-1ubuntu5) ...
Processing triggers for man-db (2.10.2-1) ...
tomal66@tomal-X412FA:~$

```

Figure 1: Install command

3 Methodology

3.1 ping

The ping command sends one datagram per second and prints one line of output for every response received. The ping command calculates round-trip times and packet loss statistics, and displays a brief summary on completion. The ping command completes when the program times out or on receipt of a SIGINT signal. [1]

3.2 traceroute

Traceroute is a network diagnostic tool that tracks real time pathways taken by a packet on an IP network from source to destination. After, it reports the IP addresses of all the routers it pinged in between. This tool also records each hop's time to make packets during its route to the destination.

Usually, Traceroute uses Internet Control Message Protocol (ICMP) echo packets with variable time to live (TTL) values. Then, it calculates the response time of this hop. Also, Traceroute queries these hops several times to guarantee accuracy. This way, the measurement of that particular hop

becomes appropriate. Moreover, Traceroute also uses ICMP messages and TTL fields to function in the IP address header.

Therefore, Traceroute is beneficial for determining the response delays and routing loops in a network pathway across packet switched nodes. With the help of Traceroute, you can locate any point of failure you witness while routing to a specific location.

3.3 ifconfig

The “ifconfig” command is used for displaying current network configuration information, setting up an ip address, netmask, or broadcast address to a network interface, creating an alias for the network interface, setting up hardware address, and enable or disable network interfaces.[2]

3.4 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). [3]

3.5 rarp

rarp is abbreviation of Reverse Address Resolution Protocol which is a protocol based on computer networking which is employed by a client computer to request its IP address from a gateway server’s Address Resolution Protocol table or cache. The network administrator creates a table in gateway-router, which is used to map the MAC address to corresponding IP address.

This protocol is used to communicate data between two points in a server. The client doesn’t necessarily need prior knowledge the server identities capable of serving its request. Media Access Control (MAC) addresses requires individual configuration on the servers done by an administrator. RARP limits to the serving of IP addresses only.

When a replacement machine is set up, the machine may or might not have an attached disk that may permanently store the IP Address so the RARP client program requests IP Address from the RARP server on the

router. The RARP server will return the IP address to the machine under the belief that an entry has been setup within the router table.

3.6 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. It is also used to troubleshoot DNS-related problems. [3]

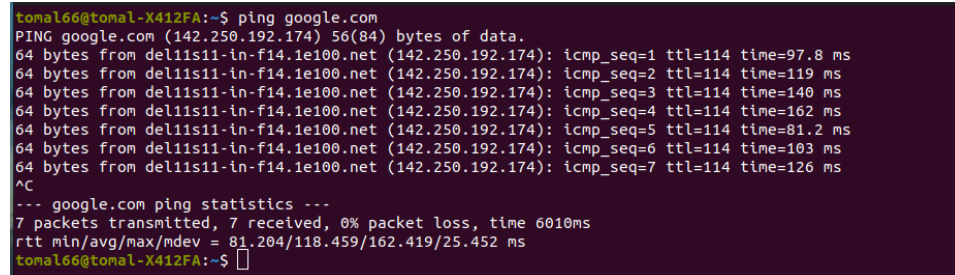
3.7 netstat

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

4 Experimental result

4.1 ping

Running commands in terminal:



```
tomal66@tomal-X412FA:~$ ping google.com
PING google.com (142.250.192.174) 56(84) bytes of data:
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=1 ttl=114 time=97.8 ms
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=2 ttl=114 time=119 ms
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=3 ttl=114 time=140 ms
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=4 ttl=114 time=162 ms
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=5 ttl=114 time=81.2 ms
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=6 ttl=114 time=103 ms
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=7 ttl=114 time=126 ms
^C
--- google.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6010ms
rtt min/avg/max/mdev = 81.204/118.459/162.419/25.452 ms
tomal66@tomal-X412FA:~$
```

Figure 2: Checking connection with google.com

```
tomal66@tomal-X412FA:~$ ping -c 3 google.com
PING google.com (142.250.192.174) 56(84) bytes of data:
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=1 ttl=114 time=133 ms
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=2 ttl=114 time=155 ms
64 bytes from del11s11-in-f14.1e100.net (142.250.192.174): icmp_seq=3 ttl=114 time=75.2 ms

--- google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 75.178/121.261/155.359/33.812 ms
tomal66@tomal-X412FA:~$
```

Figure 3: Limiting ping output count

4.2 traceroute

```
tomal66@tomal-X412FA:~$ traceroute google.com
traceroute to google.com (142.250.192.174), 30 hops max, 60 byte packets
 1 _gateway (192.168.1.1) 1.834 ms 3.611 ms 3.582 ms
 2 192.168.0.1 (192.168.0.1) 5.054 ms 5.040 ms 5.028 ms
 3 10.200.200.22 (10.200.200.22) 7.329 ms 8.534 ms 8.518 ms
 4 10.200.23.137 (10.200.23.137) 7.295 ms 12.395 ms 12.369 ms
 5 10.200.20.1 (10.200.20.1) 11.763 ms 12.352 ms 12.341 ms
 6 * * *
 7 hu-cig1-0000-cig2-0000.pico.net.bd (163.47.159.93) 6.135 ms 103.131.159.70 (103.131.159.70) 5.78
 4 ms 6.097 ms
 8 aes-static-109.34.144.59.airtel.in (59.144.34.109) 74.637 ms 75.427 ms 75.421 ms
 9 116.119.50.51 (116.119.50.51) 75.416 ms * 75.394 ms
10 142.250.169.206 (142.250.169.206) 74.049 ms 74.491 ms 74.485 ms
11 * * *
12 108.170.253.97 (108.170.253.97) 69.537 ms 142.251.55.28 (142.251.55.28) 68.325 ms 108.170.253.97
 (108.170.253.97) 68.773 ms
13 74.125.242.146 (74.125.242.146) 102.118 ms 108.170.253.104 (108.170.253.104) 38.628 ms 41.627 m
 s
14 72.14.239.58 (72.14.239.58) 84.582 ms 172.253.77.14 (172.253.77.14) 54.204 ms 142.251.248.248 (1
 42.251.248.248) 65.722 ms
15 172.253.66.107 (172.253.66.107) 53.359 ms 72.14.233.107 (72.14.233.107) 64.606 ms 74.125.243.97
 (74.125.243.97) 55.082 ms
16 74.125.243.97 (74.125.243.97) 52.104 ms 56.469 ms 172.253.73.195 (172.253.73.195) 52.059 ms
17 del11s11-in-f14.1e100.net (142.250.192.174) 55.514 ms 55.567 ms 74.125.244.193 (74.125.244.193)
 55.541 ms
tomal66@tomal-X412FA:~$
```

Figure 4: Tracking realtime pathway to access google.com

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ traceroute du.ac.bd  
traceroute to du.ac.bd (103.221.255.104), 30 hops max, 60 byte packets  
1 _gateway (192.168.1.1) 1.398 ms 2.441 ms 2.435 ms  
2 192.168.0.1 (192.168.0.1) 3.339 ms 3.331 ms 3.325 ms  
3 10.200.200.22 (10.200.200.22) 8.684 ms 9.232 ms 9.226 ms  
4 10.200.23.226 (10.200.23.226) 9.220 ms 9.198 ms 9.189 ms  
5 103.161.216.92 (103.161.216.92) 13.369 ms 12.607 ms 13.358 ms  
6 123.49.4.126 (123.49.4.126) 12.538 ms 9.397 ms 12.733 ms  
7 10.255.255.238 (10.255.255.238) 18.750 ms 19.119 ms 19.821 ms  
8 103.221.255.104 (103.221.255.104) 13.084 ms !X 13.064 ms !X 13.052 ms !X  
tomal66@tomal-X412FA:~$
```

Figure 5: Tracking real time pathway to access du.ac.bd

4.3 ifconfig

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ 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 2464 bytes 426681 (426.6 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 2464 bytes 426681 (426.6 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 192.168.1.107 netmask 255.255.255.0 broadcast 192.168.1.255  
    inet6 fe80::f998:1ce2:67ee:79ad prefixlen 64 scopeid 0x20<link>  
    ether 80:91:33:ba:d3:9f txqueuelen 1000 (Ethernet)  
    RX packets 400818 bytes 531756419 (531.7 MB)  
    RX errors 0 dropped 1 overruns 0 frame 0  
    TX packets 189716 bytes 23946288 (23.9 MB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
tomal66@tomal-X412FA:~$
```

Figure 6: Checking network devices

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ ifconfig -a  
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 2470 bytes 428737 (428.7 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 2470 bytes 428737 (428.7 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 192.168.1.107 netmask 255.255.255.0 broadcast 192.168.1.255  
    inet6 fe80::f998:1ce2:67ee:79ad prefixlen 64 scopeid 0x20<link>  
    ether 80:91:33:ba:d3:9f txqueuelen 1000 (Ethernet)  
    RX packets 400842 bytes 531762743 (531.7 MB)  
    RX errors 0 dropped 1 overruns 0 frame 0  
    TX packets 189717 bytes 23946362 (23.9 MB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
tomal66@tomal-X412FA:~$
```

Figure 7: Checking all network devices

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ ifconfig wlo1  
wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 192.168.1.107 netmask 255.255.255.0 broadcast 192.168.1.255  
    inet6 fe80::f998:1ce2:67ee:79ad prefixlen 64 scopeid 0x20<link>  
    ether 80:91:33:ba:d3:9f txqueuelen 1000 (Ethernet)  
    RX packets 400871 bytes 531772081 (531.7 MB)  
    RX errors 0 dropped 1 overruns 0 frame 0  
    TX packets 189717 bytes 23946362 (23.9 MB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
tomal66@tomal-X412FA:~$
```

Figure 8: Checking information of a specific device

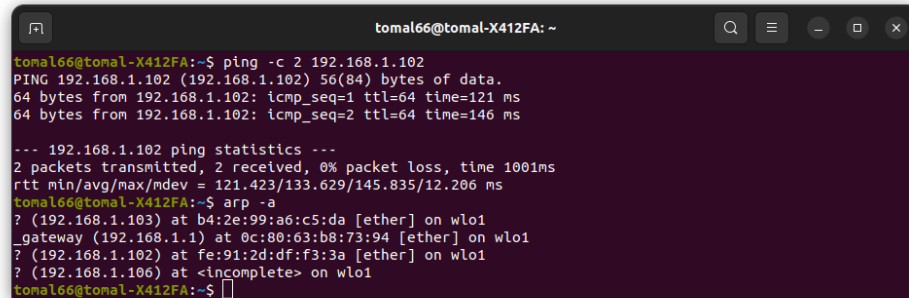

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ ifconfig -help  
Usage:  
ifconfig [-a] [-v] [-s] <interface> [[<AF>] <address>]  
[add <address>[/<prefixlen>]]  
[del <address>[/<prefixlen>]]  
[[.]broadcast [<address>]] [[.]pointopoint [<address>]]  
[netmask <address>] [dstaddr <address>] [tunnel <address>]  
[outfill <NN>] [keepalive <NN>]  
[hw <HW> <address>] [mtu <NN>]  
[[.]trailers] [[.]arp] [[.]allmulti]  
[multicast] [[.]promisc]  
[mem_start <NN>] [io_addr <NN>] [irq <NN>] [media <type>]  
[txqueuelen <NN>]  
[[.]dynamic]  
[up|down] ...  
  
<HW>=Hardware Type.  
List of possible hardware types:  
loop (Local Loopback) slip (Serial Line IP) cslip (VJ Serial Line IP)  
slip6 (6-bit Serial Line IP) cslip6 (VJ 6-bit Serial Line IP) adaptive (Adaptive Serial Line IP)  
ash (Ash) ether (Ethernet) ax25 (AMPR AX.25)  
netrom (AMPR NET/ROM) rose (AMPR ROSE) tunnel (IPIP Tunnel)  
ppp (Point-to-Point Protocol) hdlc ((Cisco)-HDLC) lapb (LAPB)  
arcnet (ARCnet) dlci (Frame Relay DLCI) frad (Frame Relay Access Device)  
sit (IPv6-in-IPv4) fddi (Fiber Distributed Data Interface) hippi (HIPPI)  
irda (IrLAP) ec (Econet) x25 (generic X.25)  
eui64 (Generic EUI-64)  
<AF>=Address family. Default: inet  
List of possible address families:  
unix (UNIX Domain) inet (DARPA Internet) inet6 (IPv6)  
ax25 (AMPR AX.25) netrom (AMPR NET/ROM) rose (AMPR ROSE)  
ipx (Novell IPX) ddp (Appletalk DDP) ec (Econet)  
ash (Ash) x25 (CCITT X.25)  
tomal66@tomal-X412FA:~$
```

Figure 9: All commands related to ifconfig

4.4 arp

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ arp -a  
? (192.168.1.103) at b4:2e:99:a6:c5:da [ether] on wlo1  
_gateway (192.168.1.1) at 0c:80:63:b8:73:94 [ether] on wlo1  
tomal66@tomal-X412FA:~$
```

Figure 10: Address Resolution protocol for all the devices

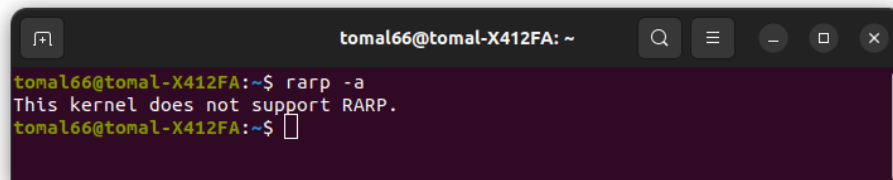
A terminal window titled 'tomal66@tomal-X412FA: ~' with search, menu, and window control icons. The terminal shows the execution of 'ping -c 2 192.168.1.102', displaying two successful ping responses with 121ms and 146ms round-trip times. This is followed by '--- 192.168.1.102 ping statistics ---' and a summary: '2 packets transmitted, 2 received, 0% packet loss, time 1001ms' with an rtt of '121.423/133.629/145.835/12.206 ms'. Finally, the 'arp -a' command is run, listing three entries: (192.168.1.103) at b4:2e:99:a6:c5:da [ether] on wlo1, _gateway (192.168.1.1) at 0c:80:63:b8:73:94 [ether] on wlo1, and (192.168.1.102) at fe:91:2d:df:f3:3a [ether] on wlo1. The last entry is followed by a question mark and '<incomplete>' on wlo1.

```
tomal66@tomal-X412FA:~$ ping -c 2 192.168.1.102
PING 192.168.1.102 (192.168.1.102) 56(84) bytes of data.
64 bytes from 192.168.1.102: icmp_seq=1 ttl=64 time=121 ms
64 bytes from 192.168.1.102: icmp_seq=2 ttl=64 time=146 ms

--- 192.168.1.102 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 121.423/133.629/145.835/12.206 ms
tomal66@tomal-X412FA:~$ arp -a
? (192.168.1.103) at b4:2e:99:a6:c5:da [ether] on wlo1
_gateway (192.168.1.1) at 0c:80:63:b8:73:94 [ether] on wlo1
? (192.168.1.102) at fe:91:2d:df:f3:3a [ether] on wlo1
? (192.168.1.106) at <incomplete> on wlo1
tomal66@tomal-X412FA:~$
```

Figure 11: Address Resolution protocol for all the devices after adding new device

4.5 rarp

A terminal window titled 'tomal66@tomal-X412FA: ~' with search, menu, and window control icons. The terminal shows the execution of 'rarp -a', which results in the message 'This kernel does not support RARP.'.

```
tomal66@tomal-X412FA:~$ rarp -a
This kernel does not support RARP.
tomal66@tomal-X412FA:~$
```

Figure 12: rarp (not supported by current kernel)

4.6 nslookup

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ nslookup google.com  
Server:      127.0.0.53  
Address:     127.0.0.53#53  
  
Non-authoritative answer:  
Name:   google.com  
Address: 142.250.192.174  
Name:   google.com  
Address: 2404:6800:4002:816::200e  
tomal66@tomal-X412FA:~$
```

Figure 13: Command to find the address record for a domain

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ nslookup 203.188.252.55  
55.252.188.203.in-addr.arpa    name = mail.devorbd.com.  
55.252.188.203.in-addr.arpa    name = mail.bangamata.com.  
55.252.188.203.in-addr.arpa    name = mail.boononltd.com.  
55.252.188.203.in-addr.arpa    name = mail.ecocupbd.com.  
55.252.188.203.in-addr.arpa    name = vdom.bangla.net.  
55.252.188.203.in-addr.arpa    name = mail.riversidefashion.net.  
55.252.188.203.in-addr.arpa    name = mail.bhlbd.net.  
55.252.188.203.in-addr.arpa    name = mail.mnbdonline.com.  
55.252.188.203.in-addr.arpa    name = mail.ahjute.com.  
55.252.188.203.in-addr.arpa    name = mail.matrainteriors.net.  
55.252.188.203.in-addr.arpa    name = mail.taqwahoney.com.  
55.252.188.203.in-addr.arpa    name = mail.janatamcs.com.  
55.252.188.203.in-addr.arpa    name = mail.msoftbd.com.  
55.252.188.203.in-addr.arpa    name = mail.icl-bd.com.  
55.252.188.203.in-addr.arpa    name = mail.kgbtex.com.  
  
Authoritative answers can be found from:  
tomal66@tomal-X412FA:~$
```

Figure 14: Reverse DNS lookup

```
tomal66@tomal-X412FA: ~  
tomal66@tomal-X412FA:~$ nslookup -type=any google.com  
Server:      127.0.0.53  
Address:     127.0.0.53#53  
  
Non-authoritative answer:  
Name:   google.com  
Address: 142.250.192.78  
Name:   google.com  
Address: 2404:6800:4009:829::200e  
google.com      rdata_257 = 0 issue "pki.goog"  
google.com      nameserver = ns3.google.com.  
google.com      text = "docuSign=1b0a6754-49b1-4db5-8540-d2c12664b289"  
google.com      text = "google-site-verification=TV9-DBe4R80X4v0M4U_bd_J9cp0JM0nkft0jAgjnsQ"  
google.com      text = "docuSign=05958488-4752-4ef2-95eb-aa7baba3bd0e"  
google.com      text = "globalsign-smime-dv=CDYX+XFHUw2wml6/Gb8+59BsH3IKzUr6c1l2BPvqKX8="  
google.com      rdata_65 = 1 , alpn="h2,h3"  
google.com      text = "v=spf1 include:spf.google.com ~all"  
google.com      text = "webexdomainverification.8VX6G=6e6922db-e3e6-4a36-904e-a805c28087fa"  
google.com      text = "MS=E4A68B9AB28B96708CE15412F62916164C0B280B"  
google.com      nameserver = ns4.google.com.  
google.com      nameserver = ns1.google.com.  
google.com      text = "Facebook-domain-verification=22rn551cu4k0ab0bxsw536tlds4h95"  
google.com      origin = ns1.google.com  
google.com      mail addr = dns-admin.google.com  
google.com      serial = 502902363  
google.com      refresh = 900  
google.com      retry = 900  
google.com      expire = 1800  
google.com      minimum = 60  
google.com      mail exchanger = 10 smtp.google.com.  
google.com      text = "apple-domain-verification=30afIBcvSuDV2PLX"  
google.com      nameserver = ns2.google.com.  
google.com      text = "atlassian-domain-verification=5YjTnMnjI92awqkx2oXmBaD60Td9zNon9r6eakvHX6877zzkFQto8PQ9QsKnbf4I"  
google.com      text = "google-site-verification=w08N7L1JTHtkeZj49swvWM48f8_9xveREV4oB-0Hf5o"  
google.com      text = "onetrust-domain-verification=de01ed21f2fa4d8781cbc3ffb89cf4ef"  
  
Authoritative answers can be found from:  
tomal66@tomal-X412FA:~$
```

Figure 15: Lookup for any record

4.7 netstat

```
tomal66@tomal-X412FA: ~
tomal66@tomal-X412FA:~$ netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:ipp            0.0.0.0:*               LISTEN
tcp        0      0 localhost:5433           0.0.0.0:*               LISTEN
tcp        0      0 localhost:postgresql     0.0.0.0:*               LISTEN
tcp        0      0 localhost:domain         0.0.0.0:*               LISTEN
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN
udp        0      0 0.0.0.0:44965           0.0.0.0:*               *
udp        0      0 localhost:domain         0.0.0.0:*               *
udp        0      0 tomal-X412FA:bootpc     _gateway:bootps        ESTABLISHED
udp        0      0 0.0.0.0:631             0.0.0.0:*               *
udp        0      0 0.0.0.0:mdns             0.0.0.0:*               *
udp        0      0 localhost:42464          localhost:42464         ESTABLISHED
udp6       0      0 [::]:59048              [::]:*                  *
udp6       0      0 [::]:mdns                [::]:*                  *
raw6       0      0 [::]:ipv6-icmp          [::]:*                  7
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags   Type       State      I-Node  Path
unix   2      [ ACC ] STREAM    LISTENING  28689    /run/irqbalance/irqbalance
836.sock
unix   2      [ ACC ] STREAM    LISTENING  31299    @/tmp/.ICE-unix/1809
unix   2      [ ACC ] STREAM    LISTENING  29859    @/tmp/dbus-eMxXxnwo
unix   2      [ ACC ] STREAM    LISTENING  31452    @/tmp/.X11-unix/X0
unix   2      [ ACC ] STREAM    LISTENING  31454    @/tmp/.X11-unix/X1
unix   2      [   ] DGRAM     CONNECTED  31902    /run/user/1000/systemd/not
ify
unix   2      [ ACC ] STREAM    LISTENING  31905    /run/user/1000/systemd/pri
vate
unix   2      [ ACC ] STREAM    LISTENING  31911    /run/user/1000/bus
```

Figure 16: Enlist all listening ports

```
tomal66@tomal-X412FA: ~
tomal66@tomal-X412FA:~$ netstat -at
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 localhost:ipp            0.0.0.0:*               LISTEN
tcp        0      0 localhost:5433           0.0.0.0:*               LISTEN
tcp        0      0 localhost:postgresql     0.0.0.0:*               LISTEN
tcp        0      0 localhost:domain         0.0.0.0:*               LISTEN
tcp6       0      0 ip6-localhost:ipp       [::]:*                  LISTEN
tomal66@tomal-X412FA:~$
```

Figure 17: Enlist all listening tcp ports

5 Experience

1. We had to use some lan configuration tools on Linux
2. We used terminal and command line keywords to perform the experiment

References

- [1] Pimylifeup : <http://pimylifeup.com/>
- [2] Techmint : <http://techmint.com/>
- [3] GeeksForGeeks : <http://www.geeksforgeeks.com/>