MAWLANA BHASHANI SCIENCE AND TECHNOLOY UNIVERSITY

Santosh,Tangail – 1902

Course Title: Computer Networks

Assignment Title: Linux assignment-02

Submitted by,

                           Submitted to,

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1) Introduction

If you have a network that ranges from 192.168.1.0 to 192.168.1.255 explain why individual devices in the network can only be assigned IP addresses in the range of 192.168.1.1 to 192.168.1.254. **(Write down the answers in your written report).**

Answer:
If I have network address from 192.168.1.1 to 192.168.1.255, then we can say that:

The network identifier would be 192.168.1.0 -
An address like 192.168.0.0 becomes unusable for any other purpose after it's established as a network number. If an administrator assigns 192.168.0.0 to any device on the network as a static IP address, the network stops functioning until that device is taken offline. As a network number, this address is used in routing tables and by routers to share network information with each other.

The broadcast address would be 192.168.1.255 -
A *broadcast address* is a network *address* used to transmit to all devices connected to a multiple-access communications network. A message sent to a *broadcast address* may be received by all network-attached hosts. A data packet is transmitted from one point to all users of a messaging network in this way. This occurs with the use of the broadcast address.
So, valid IP addresses would be 192.168.1.1 to 192.168.1.254.

2) Find IP & MAC

Find out about network and hardware information for the computer you are currently using. **(Write down the IP and MAC address of your computer in   your written report).**

Answer:

My IP address is 192.168.0.101 and my MAC address is 28:c6:3f:25:b7:19

```
                              naim@ahadul ~                        —  □  ✕

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naim@ahadul ~ $ ip -c address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t 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: eno1: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc pfifo_fast state DOW
N group default qlen 1000
    link/ether ac:e2:d3:50:a4:3e brd ff:ff:ff:ff:ff:ff
3: wlo1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group defa
ult qlen 1000
    link/ether d4:25:8b:aa:ca:df brd ff:ff:ff:ff:ff:ff
    inet 192.168.0.106/24 brd 192.168.0.255 scope global dynamic wlo1
       valid_lft 85978sec preferred_lft 85978sec
    inet6 fe80::42ee:871a:a139:b6fd/64 scope link
       valid_lft forever preferred_lft forever
naim@ahadul ~ $ █
```

3) Routing Table basics

Now, enter the command: **"$ netstat -r"** to print your computers routing table.
Explain (very briefly) the different columns: **Destination, Gateway, Genmask, Flags, MSS, Window, irtt and Iface, (write the answer in your written report in table form).**

Answer:

When a router receives a packet, it examines the destination IP address, and looks up into its Routing Table to figure out which interface packet will be sent out.

```
naim@ahadul ~ $ netstat -r
Kernel IP routing table
Destination     Gateway         Genmask         Flags  MSS Window  irtt Iface
default         192.168.0.1     0.0.0.0         UG       0 0         0 wlo1
link-local      *               255.255.0.0     U        0 0         0 wlo1
192.168.0.0     *               255.255.255.0   U        0 0         0 wlo1
```

Destination: The network ID or destination corresponding to the route.

Gateway: This column indicates the defined gateway for the network. If you see an * in this column, it means that no forwarding gateway is needed for the specified network.

Genmask: The mask that is used to match a destination IP address to the network ID.

Flags: The U output in this columns means that the route is up. The G output indicates that specified gateway should be used for this route. D stands for dynamically installed, M stands for modified, and R means reinstated.

MSS: The MSS column indicates the default Maximum Segment Size for TCP connections over this route.

Windows: The Window column indicates the default window size for TCP connections over this route.

Irtt: The Irtt column indicates the Initial Round Trip Time for this route.

Iface: The Iface column shows the network interface. If you had more than one interface, you would see lo (for loopback), eth0 (first Ethernet device), and eth1 (for the second Ethernet device), and so on for the number of interfaces you have installed.

4) Virtual Interfaces

  Linux offers the possibility to   set up interfaces according to your networking needs.
  For instance, if needed, you can configure an interface for multiple IP addresses by
  creating new virtual interfaces with another IP address.

a) Create a new virtual interface with following IP address, 192.168.2.32 an netmask
  255.255.255.0 then check to see if the interface was created successfully? **(save a print screen of your interface table to display in your written report document).**

  b) Now, you need to set up a route for this interface so that your computer can see it.

Otherwise, everyone else on the network will be able to reach the new interface except you. Issue the needed command, then issue   the "$ netstat" --r" command and
check if the route to your added interface is visible **(save a print screen of your routing table to display in your written report document together with the command(s) you used to set up the interface).**

c) Next remove the route for this interface, **(write down the command(s) in your written report).**

d) Then remove the interface completely, **(write down the command(s) in your written report).**

Answer:

a) Creating Virtual Interface :
sudo ip addr add 192.168.2.32/24 brd + dev eno1 label eno1:vir

b) Inserting Interface in the Routing Table:
sudo route add default gw 192.168.2.32

```
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File  Edit  View  Search  Terminal  Help
naim@ahadul ~ $ netstat -r
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
default         192.168.2.32    0.0.0.0         UG      0 0            0 eno1
default         192.168.0.1     0.0.0.0         UG      0 0            0 wlo1
link-local      *               255.255.0.0     U       0 0            0 wlo1
192.168.0.0     *               255.255.255.0   U       0 0            0 wlo1
192.168.2.0     *               255.255.255.0   U       0 0            0 eno1
naim@ahadul ~ $ sudo route add default gw 192.168.2.32
sudo: unable to resolve host ahadul: Connection timed out
[sudo] password for naim:
SIOCADDRT: File exists
naim@ahadul ~ $ netstat -rn
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
0.0.0.0         192.168.2.32    0.0.0.0         UG      0 0            0 eno1
0.0.0.0         192.168.0.1     0.0.0.0         UG      0 0            0 wlo1
169.254.0.0     0.0.0.0         255.255.0.0     U       0 0            0 wlo1
192.168.0.0     0.0.0.0         255.255.255.0   U       0 0            0 wlo1
192.168.2.0     0.0.0.0         255.255.255.0   U       0 0            0 eno1
naim@ahadul ~ $ ▮
```

c) Deleting Interface from Routing table:
sudo route delete default gw 192.168.2.32

```
naim@ahadul ~ $ sudo ip addr delete 192.168.2.32 dev eno1:vir
sudo: unable to resolve host ahadul
[sudo] password for naim:
Warning: Executing wildcard deletion to stay compatible with old scripts.
         Explicitly specify the prefix length (192.168.2.32/32) to avoid this warning.
         This special behaviour is likely to disappear in further releases,
         fix your scripts!
naim@ahadul ~ $ ifconfig
eno1      Link encap:Ethernet  HWaddr ac:e2:d3:50:a4:3e
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:1164 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1164 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:116721 (116.7 KB)  TX bytes:116721 (116.7 KB)

wlo1      Link encap:Ethernet  HWaddr d4:25:8b:aa:ca:df
          inet addr:192.168.0.106  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::42ee:871a:a139:b6fd/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:23990 errors:0 dropped:0 overruns:0 frame:0
          TX packets:12974 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:34322460 (34.3 MB)  TX bytes:1352221 (1.3 MB)
```

d) Deleting Virtual Interface:

sudo ip addr delete 192.168.2.32/24 dev eno1:vir

```
                                    naim@ahadul ~

File  Edit  View  Search  Terminal  Help

naim@ahadul ~ $ ifconfig
eno1      Link encap:Ethernet  HWaddr ac:e2:d3:50:a4:3e
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

eno1:vir  Link encap:Ethernet  HWaddr ac:e2:d3:50:a4:3e
          inet addr:192.168.2.32  Bcast:192.168.2.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:1148 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1148 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:113693 (113.6 KB)  TX bytes:113693 (113.6 KB)

wlo1      Link encap:Ethernet  HWaddr d4:25:8b:aa:ca:df
          inet addr:192.168.0.106  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::42ee:871a:a139:b6fd/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:23846 errors:0 dropped:0 overruns:0 frame:0
          TX packets:12921 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:34310967 (34.3 MB)  TX bytes:1345211 (1.3 MB)
```

```
naim@ahadul ~ $ sudo ip addr delete 192.168.2.32 dev eno1:vir
sudo: unable to resolve host ahadul
[sudo] password for naim:
Warning: Executing wildcard deletion to stay compatible with old scripts.
         Explicitly specify the prefix length (192.168.2.32/32) to avoid this warning.
         This special behaviour is likely to disappear in further releases,
         fix your scripts!
naim@ahadul ~ $ ifconfig
eno1      Link encap:Ethernet  HWaddr ac:e2:d3:50:a4:3e
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:1164 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1164 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:116721 (116.7 KB)  TX bytes:116721 (116.7 KB)

wlo1      Link encap:Ethernet  HWaddr d4:25:8b:aa:ca:df
          inet addr:192.168.0.106  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::42ee:871a:a139:b6fd/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:23990 errors:0 dropped:0 overruns:0 frame:0
          TX packets:12974 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:34322460 (34.3 MB)  TX bytes:1352221 (1.3 MB)
```

5) Add a New Network

  Add a new network. Obviously, first you need to be aware of your network
address,   netmask, gateway and what ethernet device you wish to set up   for it.
               However, to keep things simple but still get a feel for the
principle, in our case we will use the values for the primary network you belong
to.

a) Enter the command needed to add another network with the   same values
as your
 primary network meaning: **(yourPrimaryNetorkAddress) and
(netmaskForYourNetwork), (write down the command(s) in your written report).**

b) Assign the default gateway for your newly added network (tip the same default

gateway as you primary network), **(yourDefaultGatewayAddress)**

c) Look for your newly added network in your routing table by   issuing the **"$ netstat -r"** command. You should now   have a double setup of your primary network in the
 table **(save a print screen of your routing table to display in your written report document).**

d) Now, remove your changes meaning the double routing table setup for your primary network. First issue the command needed to delete your newly added route then issue the command to delete your newly added default gateway. **(write down the command(s) in your written report)**

6) Multinetwork Scenario Configuration

You should now set up a working routing table for a multi--network scenario. Assume that you have two network cards available connected to two different LANs. The destination of the first network is, 10.0.2.0 with netmask 255.0.0.0 and the second, 192.168.1. with netmask 255.255.255.0. Furthermore, a firewall is assumed to exist between the two networks, where network card eth0   is attached to the 10.0.2.0 network and eth1 is attached to the 192.168.1.0 network. To forward
packets on the Internet the firewall needs to   route packets from the 10.0.2.0 network through the 192.168.1.0 network. The firewall system must be set up with two IP   addresses, 10.0.2.1 on eth0 and   192.168.1.25 on eth1. The gateway to the Internet   on the 192.168.1.0 network   should be 192.168.1.1.

Provide the necessary commands to route on the firewall/router system:
 a) Assign the firewall IP addresses to eth1 and eth2.
 b) Add the routes for the networks, i.e.,192.168.1.0 on eth1 and 10.0.2.0 on eth0
 c) Assign the Internet gateway (meaning: 192.168.1.1) as the default gateway.
(Write down the command(s) in your written report)

d) Enter the necessary command(s) in order for packets belonging to computers in the 10.0.2.0 network to be routed to the 192.168.1.0 network and the Internet. In other words this should tell each computer on the 10.0.2.0, which the default gateway is, i.e., your firewall/router. You do not need to worry about the route

back configuration it is enough to assign the proper default gateway for the 10.0.2.0 network. **(write down the command(s) in your written report)**

Answer:

Linux easily manages multiple network interface adapters. Laptops typically include both wired and wireless interfaces, and may also support WiMax interfaces for cellular networks. Linux desktop computers also support multiple network interfaces, and you can use your Linux computer as a multi-network client, or as a router for internal networks; such is the case with a couple of my own systems. Every network interface has its own configuration file in the /etc/sysconfig/network-scripts directory. Each interface has a configuration file named ifcfg-X, where X is the number of the interface, starting with zero or 1 depending upon the naming convention in use; for example /etc/sysconfig/network-scripts/ifcfg-eth0 for the first Ethernet interface. Most of the other files in the /etc/sysconfig/network-scripts directory are scripts used to start, stop and perform various network configuration activities.

Each interface configuration file is bound to a specific physical network interface by the MAC address of the interface.

There are many configuration options for the interface configuration files. These are some of the more common options:

□DEVICE: The logical name of the device, such as eth0 or enp0s2.

□HWADDR: The MAC address of the NIC that is bound to the file, such as

  00:16:76:02:BA:DB

□ ONBOOT: Start the network on this device when the host boots. Options are yes/no. This is typically set to "no" and the network does not start until a user l ogs in to the desktop. If you need the network to start when no one is logged in, set this to "yes".

□IPADDR: The IP Address assigned to this NIC such as 192.168.0.10

□BROADCAST: The broadcast address for this network such as 192.168.0.255

□NETMASK: The netmask for this subnet such as the class C mask 255.255.255.0

□NETWORK: The network ID for this subnet such as the class C ID 192.168.0.0▯

□SEARCH: The DNS domain name to search when doing lookups on unqualified hostnames such as "example.com" BOOTPROTO: The boot protocol for this interface. Options are static, DHCP, bootp, none. The "none" option defaults to static.