

## SETTING UP A LAN NETWORK

In this module, we have created a Local Area Network.

### Toolkit Used:

Workstation Operating System	Lubuntu 15.04	
External Network Interface Cards	Quantity	1
	Manufacturer	TP-LINK
	Model Number	TF-3200
Switches	Quantity	1
	Manufacturer	D-LINK
	Model Number	DES-10008A

Below are the steps followed while setting up a LAN.

### 1. Install DHCP Server:

Installed *isc-dhcp-server* to maintain server setup and configuration.

```
$ sudo apt-get install isc-dhcp-server.
```

### 2. Install webmin:

Installed webmin to configure and maintain the DHCP server.

a. Installed required dependencies:

```
$ sudo apt-get install perl libnet-ssleay-perl libauthen-pam-perl libpam-runtime openssl libio-pty-perl apt-show-versions python.
```

b. Downloaded Webmin:

```
$ wget http://prdownloads.sourceforge.net/webadmin/webmin_1.770_all.deb
```

c. Installed Webmin:

```
$ sudo dpkg --install webmin_1.770_all.deb
```

### 3. Renaming Network Cards

In the current workstation, *eth1* is connected to the MSIT LAN and *eth0* is the external NIC which is going to be used for setting up a LAN for IS specialization purposes. So, for

the better understanding and avoid confusion, we have renamed eth1 to WAN and eth0 to LAN.

```
$ sudo leafpad /etc/udev/rules.d/70-persistent-net.rules
```



```
*<70-persistent-net.rules>
File Edit Search Options Help
is automatically generated by the /lib/udev/write_net_rules
run by the persistent-net-generator.rules rules file.

odify it, as long as you keep each rule on a single
change only the value of the NAME= key.

0x13f0:0x0200 (sundance)
=="net", ACTION=="add", DRIVERS=="*", ATTR{address}=="c0:4a:00:00:de:61", ATTR{dev_id}=="0x0", ATTR{type}=="1", KERNEL=="eth*", NAME="LAN"

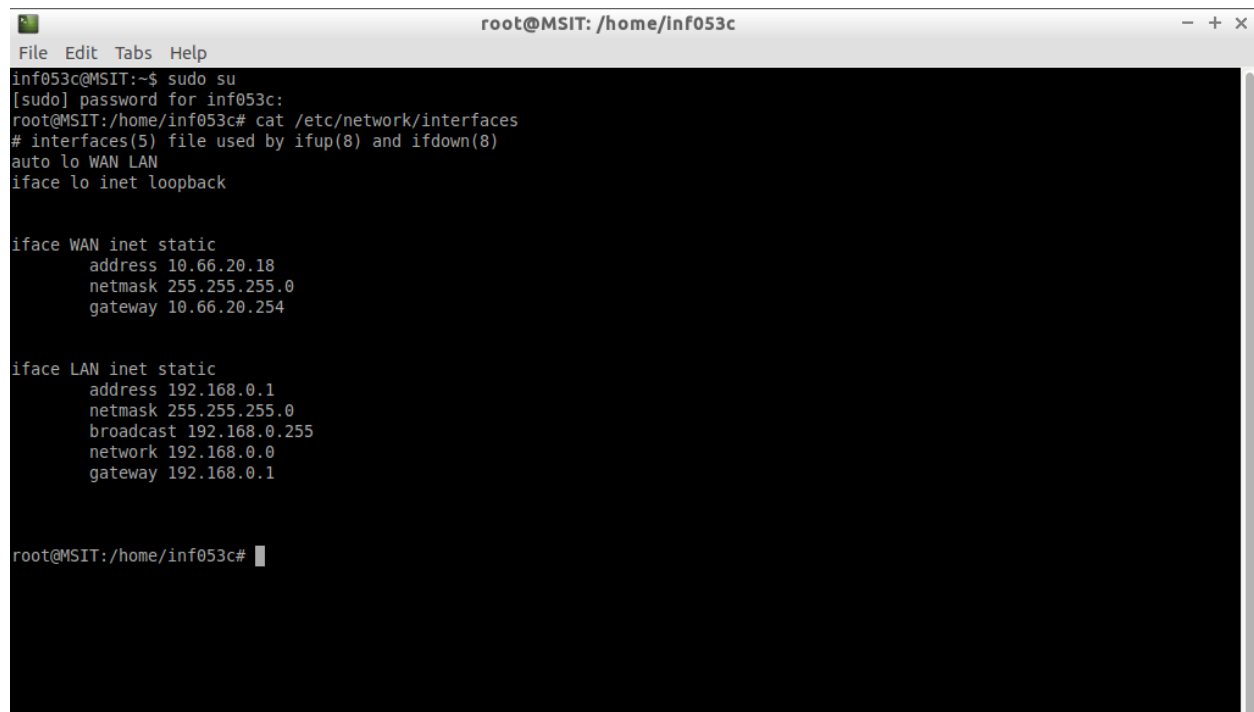
0x10ec:0x8139 (8139too)
=="net", ACTION=="add", DRIVERS=="*", ATTR{address}=="00:16:76:b9:00:a2", ATTR{dev_id}=="0x0", ATTR{type}=="1", KERNEL=="eth*", NAME="WAN"
```

## 4. DHCP & LAN Configuration

### I. Editing Network Interfaces:

Edited the network interfaces in order to configure the eth0

```
$ sudo leafpad /etc/network/interfaces
```



```
root@MSIT: /home/inf053c
File Edit Tabs Help
inf053c@MSIT:~$ sudo su
[sudo] password for inf053c:
root@MSIT:/home/inf053c# cat /etc/network/interfaces
# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo WAN LAN
iface lo inet loopback

iface WAN inet static
    address 10.66.20.18
    netmask 255.255.255.0
    gateway 10.66.20.254

iface LAN inet static
    address 192.168.0.1
    netmask 255.255.255.0
    broadcast 192.168.0.255
    network 192.168.0.0
    gateway 192.168.0.1

root@MSIT:/home/inf053c#
```

## II. Check IP Configuration

Check the IP Configuration of both LAN and WAN after editing interfaces.

*\$ sudo ifconfig*

```
root@MSIT: /home/inf053c
File Edit Tabs Help
root@MSIT:/home/inf053c# ifconfig
LAN      Link encap:Ethernet  HWaddr c0:4a:00:00:de:61
          inet addr:192.168.0.1  Bcast:192.168.0.255  Mask:255.255.255.0
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:16707 errors:0 dropped:0 overruns:0 frame:0
          TX packets:55349 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2710172 (2.7 MB)  TX bytes:70022708 (70.0 MB)

WAN      Link encap:Ethernet  HWaddr 00:16:76:b9:00:a2
          inet addr:10.66.20.18  Bcast:10.66.20.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:67072 errors:0 dropped:0 overruns:0 frame:0
          TX packets:21245 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:75002140 (75.0 MB)  TX bytes:3226331 (3.2 MB)

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:4941 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4941 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:816690 (816.6 KB)  TX bytes:816690 (816.6 KB)

root@MSIT:/home/inf053c#
```

## III. Listen for DHCP request

Because there is more than one network card in our workstation, we need to select the network card (WAN) on which our server will be listen for DHCP request.

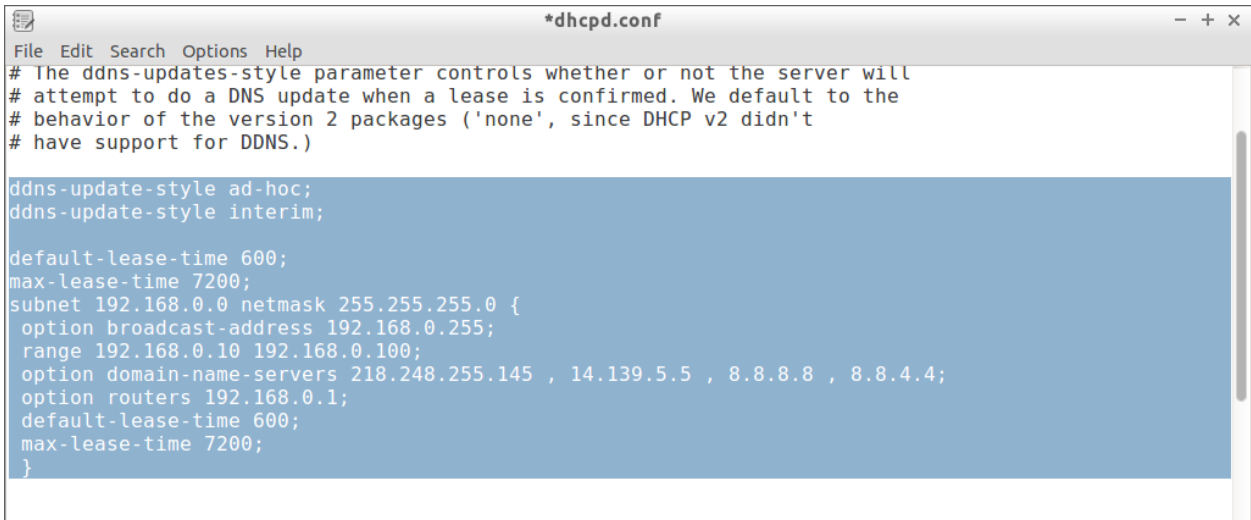
*\$ sudo leafpad /etc/default/isc-dhcp-server.*

```
isc-dhcp-server
File Edit Search Options Help
DHCPD_PID=/var/run/dhcp-server/dhcpd.pid
INTERFACES=WAN
```

#### IV. Configure the DHCP server's config file

Edit the dhcp.conf file in order to make changes according to our convenience.

```
$ sudo nano /etc/dhcp/dhcpd.conf
```



```
*dhcpd.conf
File Edit Search Options Help
# The ddns-update-style parameter controls whether or not the server will
# attempt to do a DNS update when a lease is confirmed. We default to the
# behavior of the version 2 packages ('none', since DHCP v2 didn't
# have support for DDNS.)

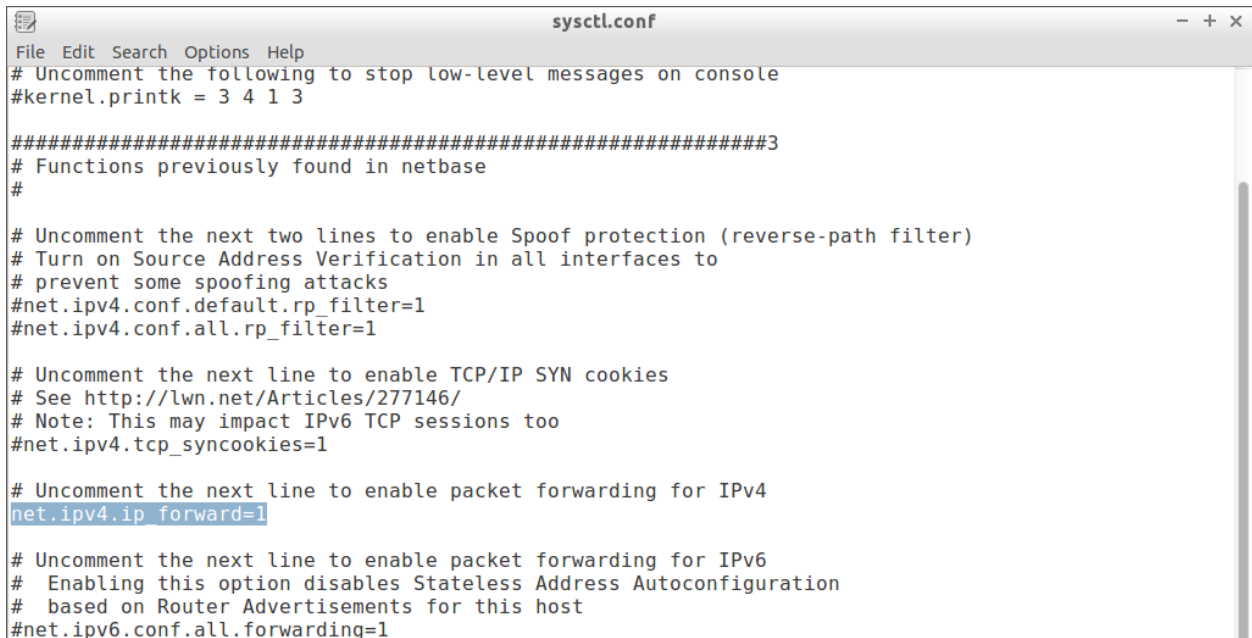
ddns-update-style ad-hoc;
ddns-update-style interim;

default-lease-time 600;
max-lease-time 7200;
subnet 192.168.0.0 netmask 255.255.255.0 {
    option broadcast-address 192.168.0.255;
    range 192.168.0.10 192.168.0.100;
    option domain-name-servers 218.248.255.145 , 14.139.5.5 , 8.8.8.8 , 8.8.4.4;
    option routers 192.168.0.1;
    default-lease-time 600;
    max-lease-time 7200;
}
```

#### V. Enable IP Forwarding

Edit the sysctl.conf file to forward packets from WAN to LAN.  
Uncomment IPV4 packet forwarding line.

```
$ sudo nano /etc/sysctl.conf
```



```
sysctl.conf
File Edit Search Options Help
# Uncomment the following to stop low-level messages on console
#kernel.printk = 3 4 1 3

#####3
# Functions previously found in netbase
#

# Uncomment the next two lines to enable Spoof protection (reverse-path filter)
# Turn on Source Address Verification in all interfaces to
# prevent some spoofing attacks
#net.ipv4.conf.default.rp_filter=1
#net.ipv4.conf.all.rp_filter=1

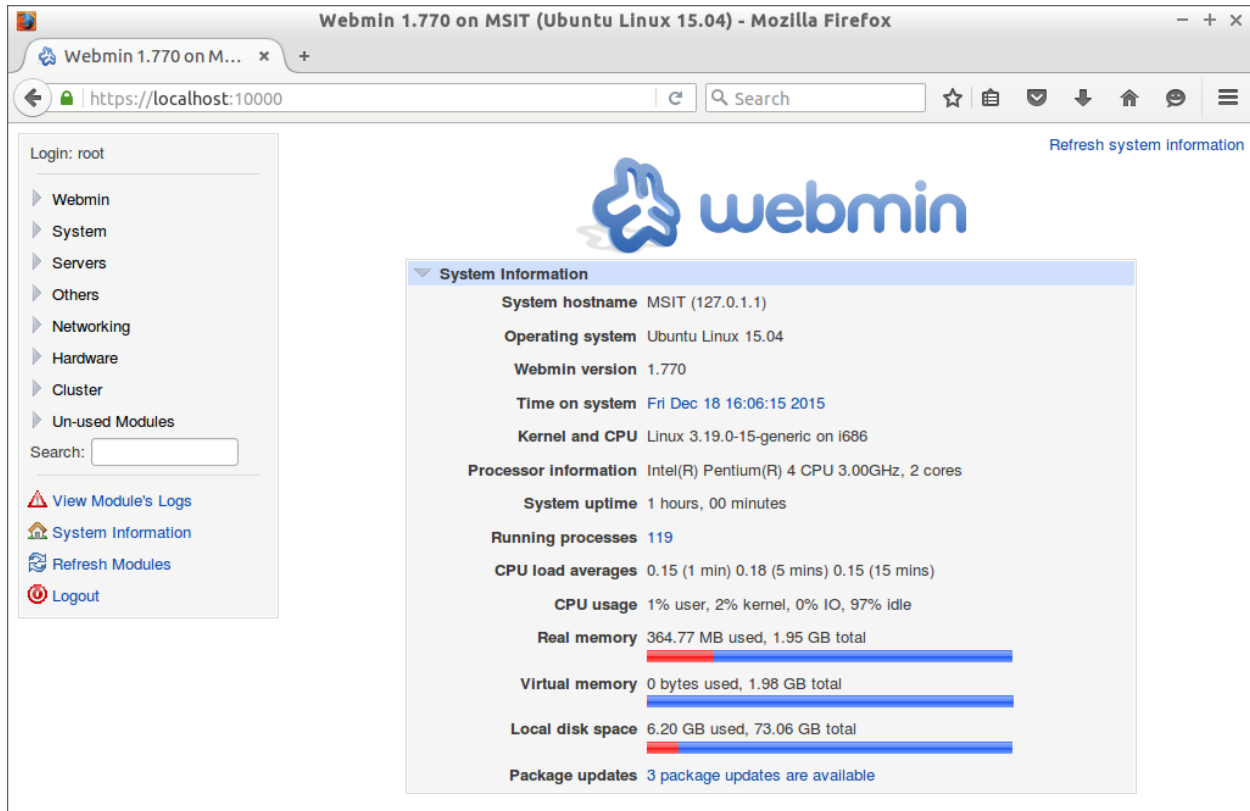
# Uncomment the next line to enable TCP/IP SYN cookies
# See http://lwn.net/Articles/277146/
# Note: This may impact IPv6 TCP sessions too
#net.ipv4.tcp_syncookies=1

# Uncomment the next line to enable packet forwarding for IPv4
net.ipv4.ip_forward=1

# Uncomment the next line to enable packet forwarding for IPv6
# Enabling this option disables Stateless Address Autoconfiguration
# based on Router Advertisements for this host
#net.ipv6.conf.all.forwarding=1
```

## VI. Login to Webmin

After configuring all our requirements, login to webmin (<https://localhost:10000/>) using root account.



## VII. Add Firewall Rules

### a. Enable MASQUERADE(NAT):

- Select Networking in the left menu bar.
- Select the Linux firewall from the Networking drop down menu.
- Configure the Linux Firewall such that it should do the network address translation for WAN interface.
- So, select “Do network address translation on external interface” for WAN.
- Select the “Setup firewall” finally.

Linux Firewall

Rules file /etc/iptables.up.rules

The IPTables firewall configuration on your system is about to be re-set. Webmin will set up new default rules, to be stored in the save file /etc/iptables.up.rules, with the initial settings based your selection of firewall type below..

☐ Allow all traffic  
☒ Do network address translation on external interface: WAN  
☐ Block all incoming connections on external interface: LAN  
☐ Block all except SSH and IDENT on external interface: LAN  
☐ Block all except SSH, IDENT, ping and high ports on interface: LAN  
☐ Block all except ports used for virtual hosting, on interface: LAN

Setup Firewall

### b. Save IP Table rules

After the above step, save the rules to iptables.up.rules file by clicking on 'Apply changes' in IP Tables.

Showing IPTable: Network address translation (nat)

Add a new chain named:

**Packets before routing (PREROUTING)**  
There are no rules defined for this chain.  
Set Default Action To: Accept Add Rule

**Incoming packets (INPUT) - Only applies to packets addressed to this host**  
There are no rules defined for this chain.  
Set Default Action To: Accept Add Rule

**Outgoing packets (OUTPUT) - Only applies to packets originated by this host**  
There are no rules defined for this chain.  
Set Default Action To: Accept Add Rule

**Packets after routing (POSTROUTING)**  
Select all. | Invert selection.

Action	Condition	Move	Add
<input type="checkbox"/> Masquerade	If output interface is WAN		↓ ↑

Select all. | Invert selection.

Set Default Action To: Accept Delete Selected Move Selected Add Rule

Apply Configuration Click this button to make the firewall configuration listed above active. Any firewall rules currently in effect will be flushed and replaced

Revert Configuration Click this button to reset the configuration listed above to the one that is currently active.

Activate at boot ☒ Yes ☐ No Change this option to control whether your firewall is activated at boot time or not.

Reset Firewall Click this button to clear all existing firewall rules and set up new rules for a basic initial configuration.

### c. Observe IP Table Changes

Observe the changes made to the iptables.up.rules result in modification of /etc/network/interfaces file

*\$ sudo cat /etc/network/interfaces*

```

root@MSIT: /home/inf053c
File Edit Tabs Help
inf053c@MSIT:~$ sudo su
[sudo] password for inf053c:
root@MSIT:/home/inf053c# cat /etc/network/interfaces
# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo WAN LAN
iface lo inet loopback

iface WAN inet static
    address 10.66.20.18
    netmask 255.255.255.0
    gateway 10.66.20.254

iface LAN inet static
    address 192.168.0.1
    netmask 255.255.255.0
    broadcast 192.168.0.255
    network 192.168.0.0
    gateway 192.168.0.1
    post-up iptables-restore < /etc/iptables.up.rules

```

### d. Activate Network Interfaces

Make sure that both LAN and WAN is up and running. If in case anyone of the interfaces is down, activate it before proceeding.

Webmin 1.770 on MSIT (Ubuntu Linux 15.04) - Mozilla Firefox

Google Webmin 1.770 on M... x +

https://localhost:10000

Login: root

- Webmin
- System
- Servers
- Others
- Networking
  - Bandwidth Monitoring
  - Linux Firewall
  - Network Configuration
  - NIS Client and Server
  - PPP Dialup Client
  - TCP Wrappers

Module Index

## Network Interfaces

Active Now Activated at Boot

Interfaces listed in this table will be activated when the system boots up, and will generally be active now too.

Select all. | Invert selection. | Add a new interface. | Add a new bridge.

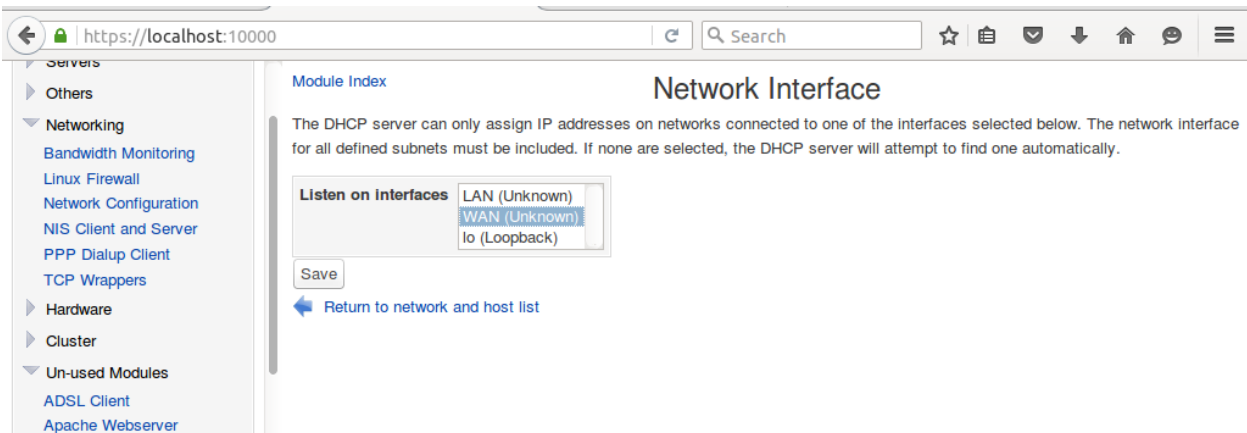
Name	Type	IPv4 address	Netmask	IPv6 address	Activate
<input type="checkbox"/> LAN	Unknown	192.168.0.1	255.255.255.0		Yes
<input type="checkbox"/> WAN	Unknown	10.66.20.18	255.255.255.0		Yes
lo	Loopback	No address configured	None		Yes

Select all. | Invert selection. | Add a new interface. | Add a new bridge.

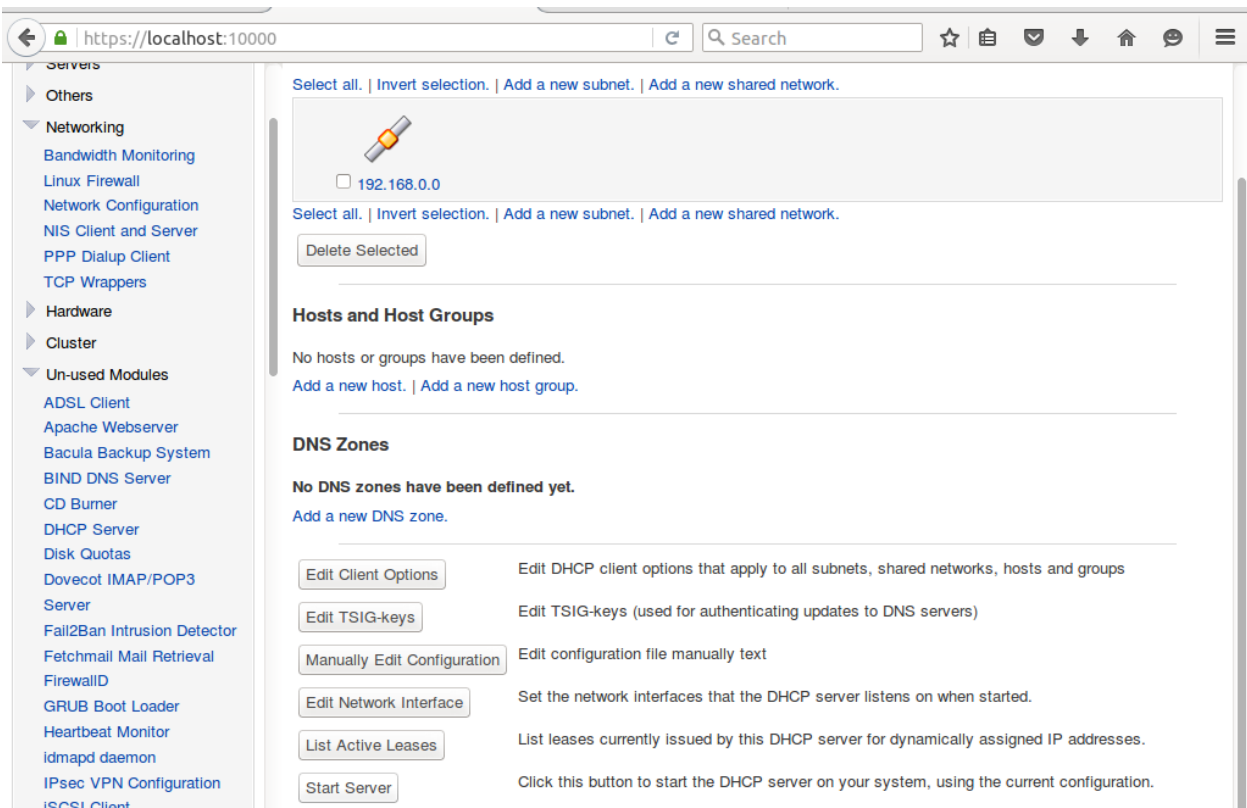
Delete Selected Interfaces Delete and Apply Selected Interfaces Apply Selected Interfaces

Return to network configuration

## VIII. Listen to WAN Interface



## IX. Start the DHCP Server





## 5. Results:

Three personal workstations are connected to the switch which is connected the DHCP Server. The DHCP server automatically allocates IP Addresses to them.

IP address	WorkStation Name
192.168.0.11	Kittu
192.168.0.12	H3M4
192.168.0.13	HR

Details can be observed in the screenshot.  
It is the result of system log file (/var/log/syslog).

`$ sudo tail -50 /var/log/syslog`

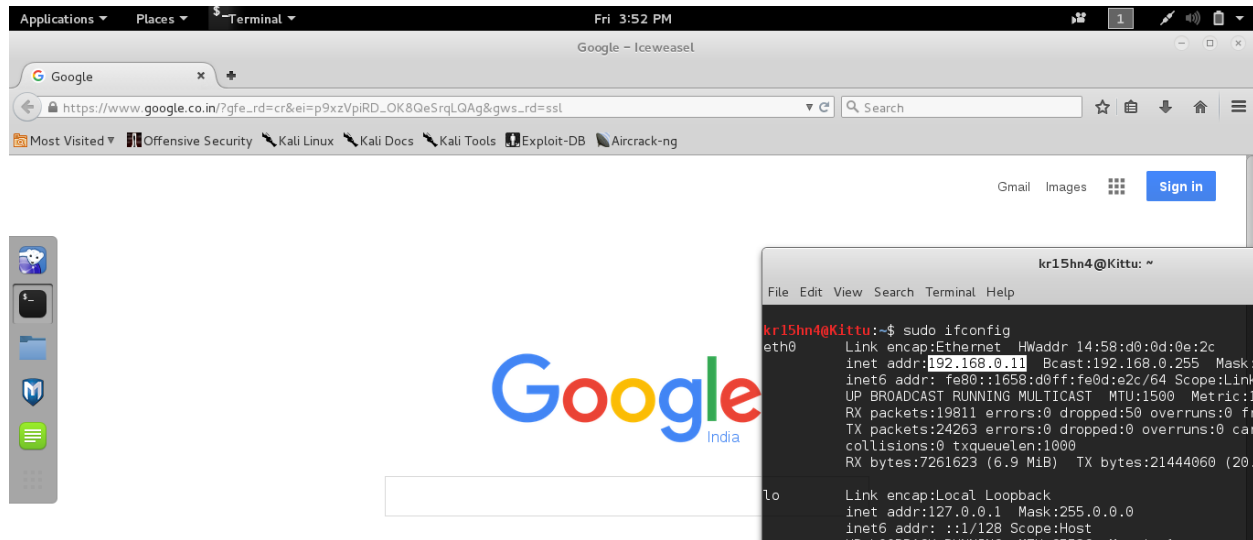
```

root@MSIT: /home/inf053c
File Edit Tabs Help
Dec 18 15:29:25 MSIT dhcpd: DHCPDISCOVER from b8:2a:72:c9:d1:4b via LAN
Dec 18 15:29:26 MSIT dhcpd: DHCPOFFER on 192.168.0.13 to b8:2a:72:c9:d1:4b (HR) via LAN
Dec 18 15:29:26 MSIT dhcpd: DHCPREQUEST for 192.168.0.13 (192.168.0.1) from b8:2a:72:c9:d1:4b (HR) via LAN
Dec 18 15:29:26 MSIT dhcpd: DHCPACK on 192.168.0.13 to b8:2a:72:c9:d1:4b (HR) via LAN
Dec 18 15:31:02 MSIT systemd[1]: Created slice user-110.slice.
Dec 18 15:31:02 MSIT systemd[1]: Starting user-110.slice.
Dec 18 15:31:02 MSIT systemd[1]: Starting User Manager for UID 110...
Dec 18 15:31:02 MSIT systemd[1]: Started Session c3 of user lightdm.
Dec 18 15:31:02 MSIT systemd[1]: Starting Session c3 of user lightdm.
Dec 18 15:31:02 MSIT systemd[1769]: Reached target Paths.
Dec 18 15:31:02 MSIT systemd[1769]: Starting Paths.
Dec 18 15:31:02 MSIT systemd[1769]: Reached target Sockets.
Dec 18 15:31:02 MSIT systemd[1769]: Starting Sockets.
Dec 18 15:31:02 MSIT systemd[1769]: Reached target Timers.
Dec 18 15:31:02 MSIT systemd[1769]: Starting Timers.
Dec 18 15:31:02 MSIT systemd[1769]: Reached target Basic System.
Dec 18 15:31:02 MSIT systemd[1769]: Starting Basic System.
Dec 18 15:31:02 MSIT systemd[1769]: Reached target Default.
Dec 18 15:31:02 MSIT systemd[1769]: Startup finished in 40ms.
Dec 18 15:31:02 MSIT systemd[1]: Started User Manager for UID 110.
Dec 18 15:31:03 MSIT systemd[1769]: Starting Default.
Dec 18 15:32:16 MSIT kernel: [ 1606.892445] LAN: Link down
Dec 18 15:32:32 MSIT kernel: [ 1622.466933] LAN: Link up
Dec 18 15:32:32 MSIT kernel: [ 1622.467188] LAN: Link changed: 100Mbps, full duplex
Dec 18 15:32:42 MSIT dhcpd: DHCPREQUEST for 192.168.0.11 from 14:58:d0:0d:0e:2c (Kittu) via LAN
Dec 18 15:32:42 MSIT dhcpd: DHCPACK on 192.168.0.11 to 14:58:d0:0d:0e:2c (Kittu) via LAN
Dec 18 15:33:21 MSIT dhcpd: DHCPREQUEST for 192.168.0.13 from b8:2a:72:c9:d1:4b (HR) via LAN
Dec 18 15:33:21 MSIT dhcpd: DHCPACK on 192.168.0.13 to b8:2a:72:c9:d1:4b (HR) via LAN
Dec 18 15:33:39 MSIT dhcpd: DHCPREQUEST for 192.168.0.12 from 74:e6:e2:18:25:d9 (H3M4) via LAN
Dec 18 15:33:39 MSIT dhcpd: DHCPACK on 192.168.0.12 to 74:e6:e2:18:25:d9 (H3M4) via LAN
Dec 18 15:34:20 MSIT org.gtk.vfs.Daemon[1777]: A connection to the bus can't be made
Dec 18 15:34:20 MSIT org.gtk.vfs.Daemon[1777]: g_dbus_connection_real_closed: Remote peer vanished with error: Underlying GIO
Stream returned 0 bytes on an async read (g-io-error-quark, 0). Exiting.
Dec 18 15:34:20 MSIT systemd[1]: Stopping User Manager for UID 110...
Dec 18 15:34:20 MSIT systemd[1769]: Reached target Shutdown.
Dec 18 15:34:20 MSIT systemd[1769]: Starting Shutdown.
Dec 18 15:34:20 MSIT systemd[1769]: Starting Exit the Session...
Dec 18 15:34:20 MSIT systemd[1769]: Stopped target Default.
Dec 18 15:34:20 MSIT systemd[1769]: Stopping Default.
Dec 18 15:34:20 MSIT systemd[1769]: Stopped target Basic System.

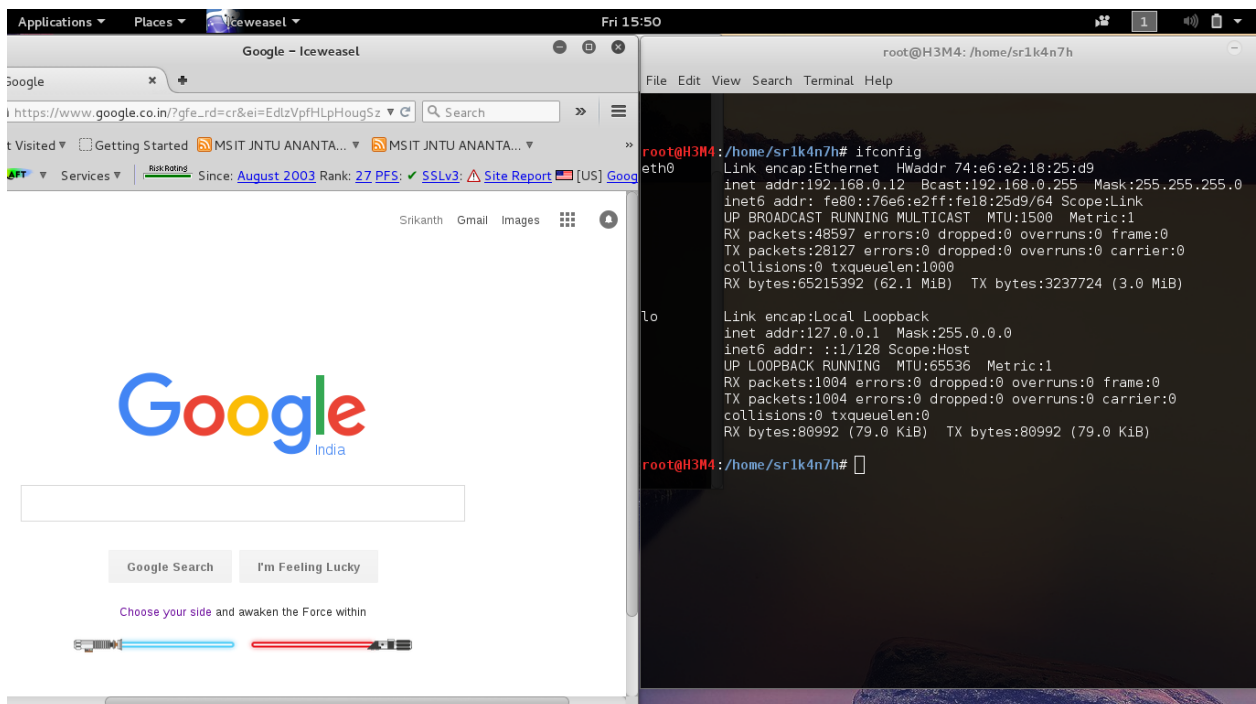
```

**Individual Screenshots:**

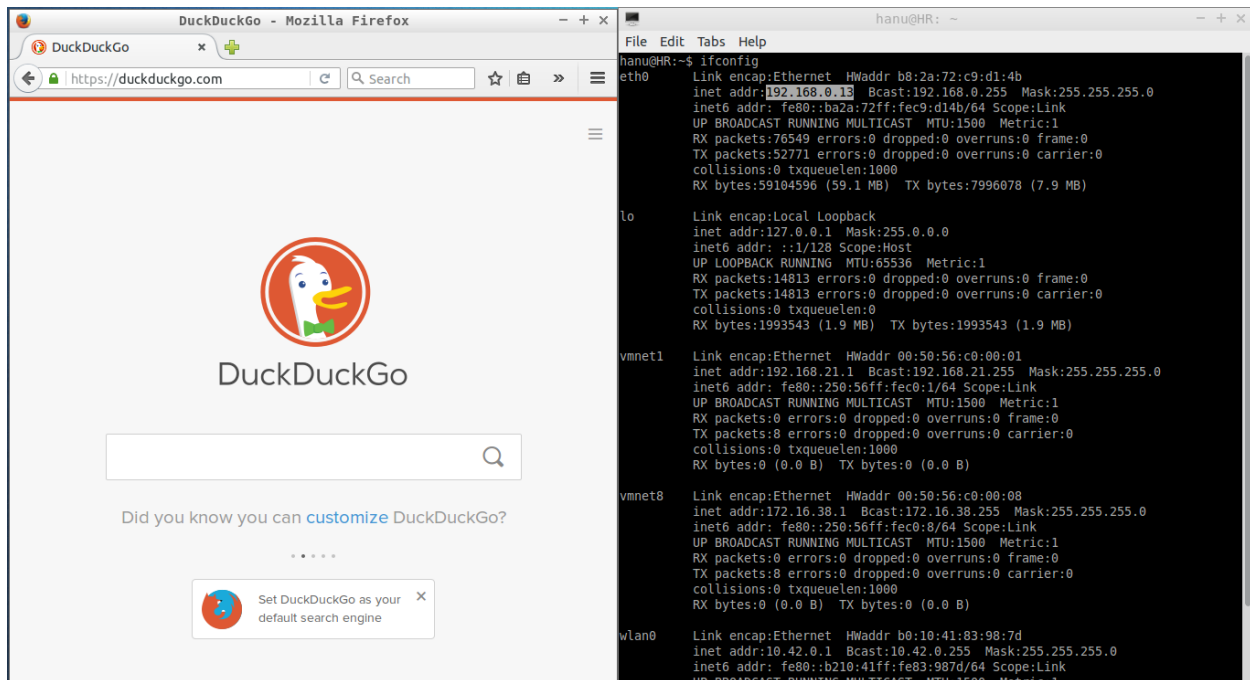
- Kirshnama Naidu – 140A1J0004 , IP : 192.168.0.11 (Kittu)



- Srikanth Narayanaraju – 140A1J0005 , IP : 192.168.0.12 (H3M4)



- Hanumanth Reddy – 140A1J0002 , IP : 192.168.0.13 (HR)



## LAB Setup:

