Practical 6:- Configure DHCP Server, Configure DHCP (Dynamic Host Configuration Protocol) Server, Configure NFS Server to share directories on your Network, Configure NFS Client. (Ubuntu and Windows Client OS)

Solution:

Step 1:

Install the DHCP server, which you can do by running the following command.

```
ruchi12@ubuntu:~$ sudo apt-get install isc-dhcp-server
[sudo] password for ruchi12:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libirs-export160 libisccfg-export160
Suggested packages:
  isc-dhcp-server-ldap policycoreutils
The following NEW packages will be installed:
  isc-dhcp-server libirs-export160 libisccfg-export160
0 upgraded, 3 newly installed, 0 to remove and 3 not upgraded.
Need to get 509 kB of archives.
After this operation, 1,791 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

```
Need to get 509 kB of archives.
After this operation, 1,791 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libisccfg-export160 amd64 1:9.11
.3+dfsg-1ubuntu1.8 [45.5 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libirs-export160 amd64 1:9.11.3+
dfsg-1ubuntu1.8 [18.4 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu bionic-updates/main amd64 isc-dhcp-server amd64 4.3.5-3ubu
ntu7.1 [446 kB]
Fetched 509 kB in 10s (51.3 kB/s)
Preconfiguring packages ...
Selecting previously unselected package libisccfg-export160.
(Reading database ... 66858 files and directories currently installed.)
Preparing to unpack .../libisccfg-export160_1%3a9.11.3+dfsg-1ubuntu1.8_amd64.deb ...
Unpacking libisccfg-export160 (1:9.11.3+dfsg-1ubuntu1.8) ...
Selecting previously unselected package libirs-export160.
Preparing to unpack .../libirs-export160_1%3a9.11.3+dfsg-1ubuntu1.8_amd64.deb ...
Unpacking libirs-export160 (1:9.11.3+dfsg-1ubuntu1.8) ...
Selecting previously unselected package isc-dhcp-server.
Preparing to unpack .../isc-dhcp-server_4.3.5-3ubuntu7.1_amd64.deb ...
Unpacking isc-dhcp-server (4.3.5-3ubuntu7.1) ...
Processing triggers for ureadahead (0.100.0-21) ...
Setting up libisccfg-export160 (1:9.11.3+dfsg-1ubuntu1.8) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Processing triggers for systemd (237-3ubuntu10.24) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Setting up libirs-export160 (1:9.11.3+dfsg-1ubuntu1.8) ...
Setting up isc-dhcp-server (4.3.5-3ubuntu7.1) ...
Generating /etc/default/isc-dhcp-server...
Created symlink /etc/systemd/system/multi-user.target.wants/isc-dhcp-server.service → /lib/systemd/s
ystem/isc-dhcp-server.service.
Created symlink /etc/systemd/system/multi-user.target.wants/isc-dhcp-server6.service → /lib/systemd/
system/isc-dhcp-server6.service.
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Processing triggers for ureadahead (0.100.0-21) ...
Processing triggers for systemd (237-3ubuntu10.24) ...
```
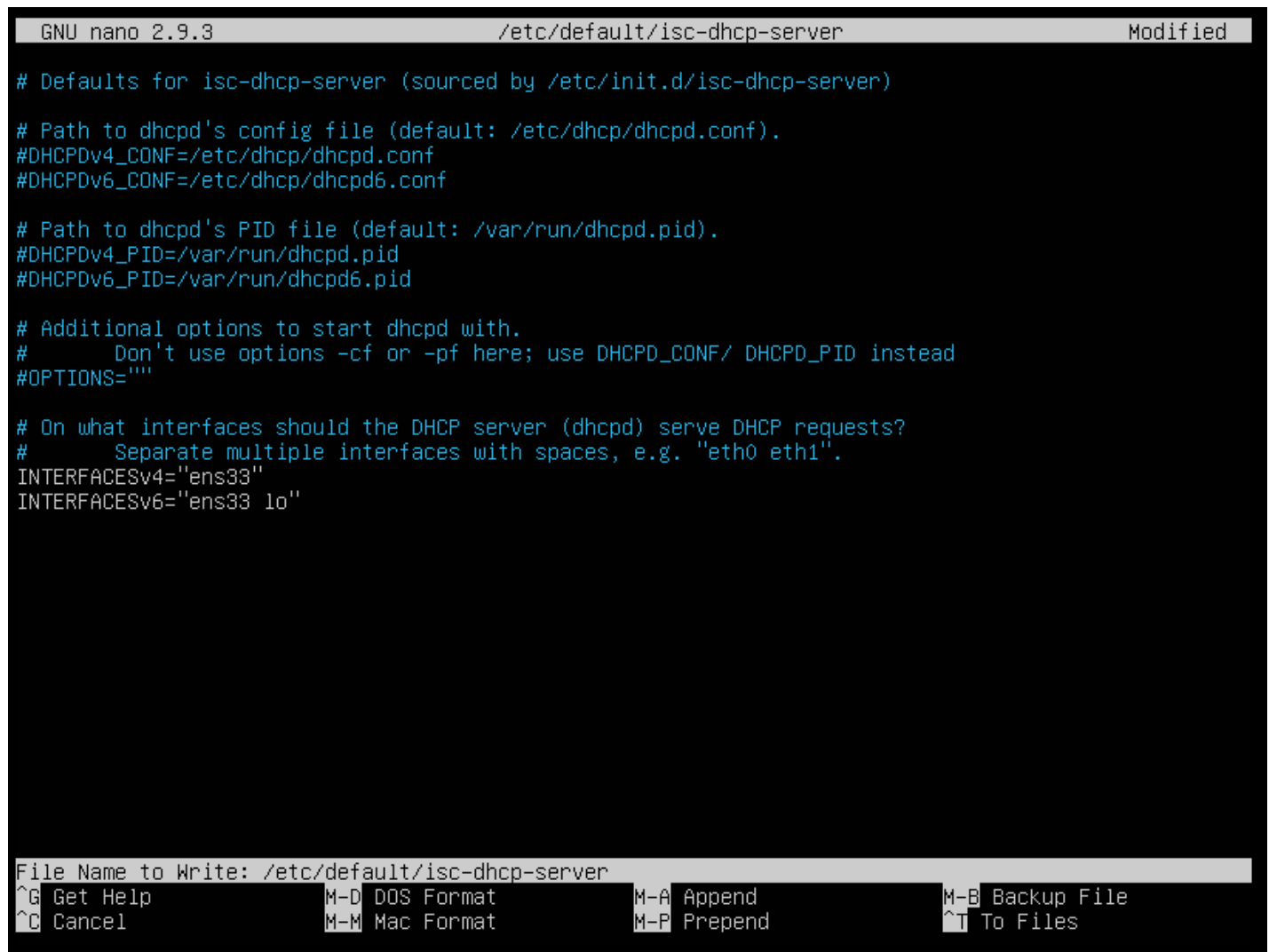
Step2:- Configure DHCP Server

After successfully installation of DHCP server, you need to assign network interface on which the DHCP server will serve. To do so, edit the default configuration file of the DHCP server via text editor through following command:

sudo nano /etc/default/isc-dhcp-server

Here you edit the value of interfacesv4 and write the one you want the dhcp server to serve request. If you have more than one interfaces dhcp serve to serve add them inside the quotes separating with space.

INTERFACESv4= "ens33"

INTERFACESv6 = "ens33 lo"

```
  GNU nano 2.9.3                        /etc/default/isc-dhcp-server                        Modified

# Defaults for isc-dhcp-server (sourced by /etc/init.d/isc-dhcp-server)

# Path to dhcpd's config file (default: /etc/dhcp/dhcpd.conf).
#DHCPDv4_CONF=/etc/dhcp/dhcpd.conf
#DHCPDv6_CONF=/etc/dhcp/dhcpd6.conf

# Path to dhcpd's PID file (default: /var/run/dhcpd.pid).
#DHCPDv4_PID=/var/run/dhcpd.pid
#DHCPDv6_PID=/var/run/dhcpd6.pid

# Additional options to start dhcpd with.
#        Don't use options -cf or -pf here; use DHCPD_CONF/ DHCPD_PID  instead
#OPTIONS=""

# On what interfaces should the DHCP server (dhcpd) serve DHCP requests?
#        Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACESv4="ens33"
INTERFACESv6="ens33 lo"

















File Name to Write: /etc/default/isc-dhcp-server
^G Get Help          M-D DOS Format      M-A Append          M-B Backup File
^C Cancel            M-M Mac Format      M-P Prepend         ^T To Files
```

Once the interfaces assigned, you can proceed to dhcp server configuration. To configure the dhcp server edit the dhcpd.config file via any text editor. To do so, type the command below:-

 # sudo nano /etc/dhcp/dhcpd.config

In this configuration file, we have mentioned the local domain name, DNS, IP address range from which IP's will be assigned to client, default and max lease time.

```
  GNU nano 2.9.3                        /etc/dhcp/dhcpd.conf                          Modified

 # range dynamic-bootp 192.168.3.10 192.168.3.200;
  #option broadcast-address 192.168.3.255;
  #option routers 192.168.3.1;
#}

# A slightly different configuration for an internal subnet.
subnet 192.168.3.0 netmask 255.255.255.0
{
  range 192.168.3.100 192.168.3.200;
  option domain-name-servers ns1.internal.example.org;
  option domain-name "ruchi.org";
  option subnet-mask 255.255.255.0;
  option routers 192.168.3.1;
  option broadcast-address 192.168.3.255;
  default-lease-time 600;
  max-lease-time 7200;
}_

# Hosts which require special configuration options can be listed in
# host statements.   If no address is specified, the address will be
# allocated dynamically (if possible), but the host-specific information
# will still come from the host declaration.

#host passacaglia {
#   hardware ethernet 0:0:c0:5d:bd:95;
#   filename "vmunix.passacaglia";
#   server-name "toccata.example.com";
#}

# Fixed IP addresses can also be specified for hosts.   These addresses
# should not also be listed as being available for dynamic assignment.
# Hosts for which fixed IP addresses have been specified can boot using

^G Get Help    ^O Write Out   ^W Where Is    ^K Cut Text    ^J Justify     ^C Cur Pos     M-U Undo
^X Exit        ^R Read File   ^\ Replace     ^U Uncut Text  ^T To Spell    ^_ Go To Line  M-E Redo
```

Restart the dhcp server and it will start serve according to your configuration. To restart typoe:

sudo systemctl restart isc-dhcp-server

```
ruchi12@ruchiserver:~$ systemctl restart isc-dhcp-server
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-units ===
Authentication is required to restart 'isc-dhcp-server.service'.
Authenticating as: ruchiserver (ruchi12)
Password:
==== AUTHENTICATION COMPLETE ===
```

Assign fixed IP address to client with specific MAC address

If you want to assign specific IP address to specific client you can use client's MAC address to achieve that goal.

To check MAC address on the client's machine run.

#ifconfig

The out will look like the one below

```
ruchi12@ubuntu:~$ ifconfig
ens33      Link encap:Ethernet  HWaddr 00:0c:29:24:c7:9a
           inet addr:192.168.3.101  Bcast:192.168.3.255  Mask:255.255.255.0
           inet6 addr: fe80::cf6d:edb4:fc62:9a3f/64 Scope:Link
           UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
           RX packets:177439 errors:0 dropped:0 overruns:0 frame:0
           TX packets:71063 errors:0 dropped:0 overruns:0 carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:233284394 (233.2 MB)  TX bytes:4871063 (4.8 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:29540 errors:0 dropped:0 overruns:0 frame:0
           TX packets:29540 errors:0 dropped:0 overruns:0 carrier:0
           collisions:0 txqueuelen:1000
           RX bytes:2043776 (2.0 MB)  TX bytes:2043776 (2.0 MB)
```

Step 3:-   Client side configuration

❖ On client machine, you need to make sure that Automatic (DHCP) method is set in IPv4 settings and restart your connection if you are already connected.

❖ To do so follow these steps. Press on network connection icon on the top right corner of your screen, make sure "Enable Networking" is checked, disconnect from you current network if you are connected and press edit connections as it's shown in the screenshot below:
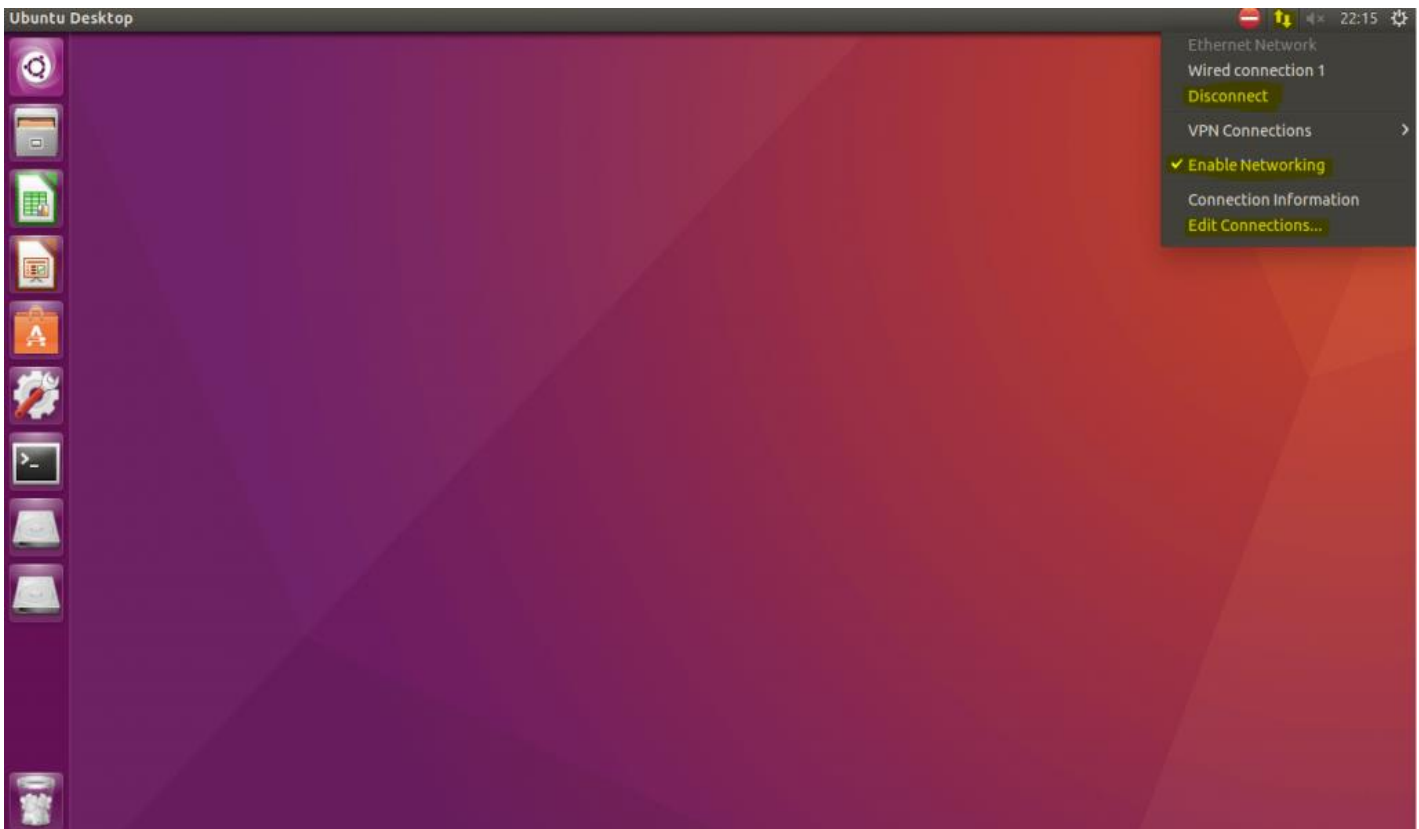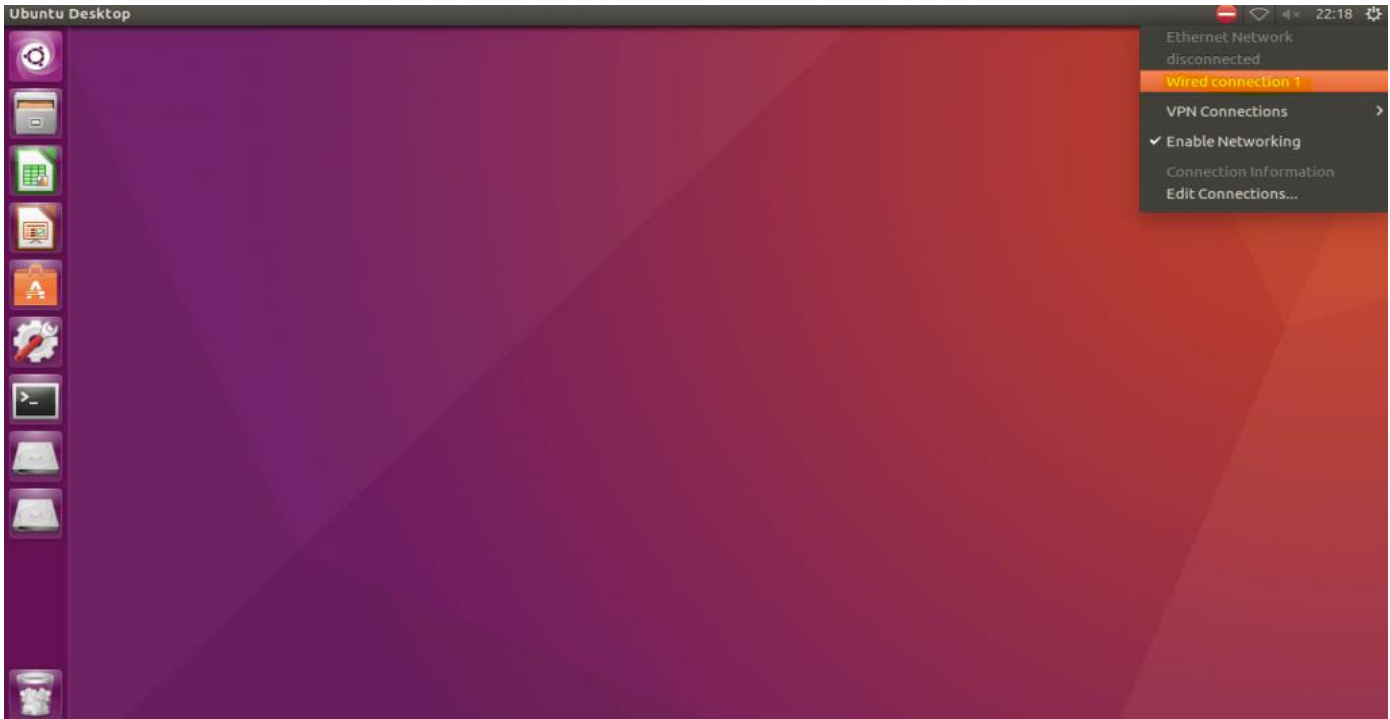
Once "Edit connections" window is opened, select your connection and press edit:
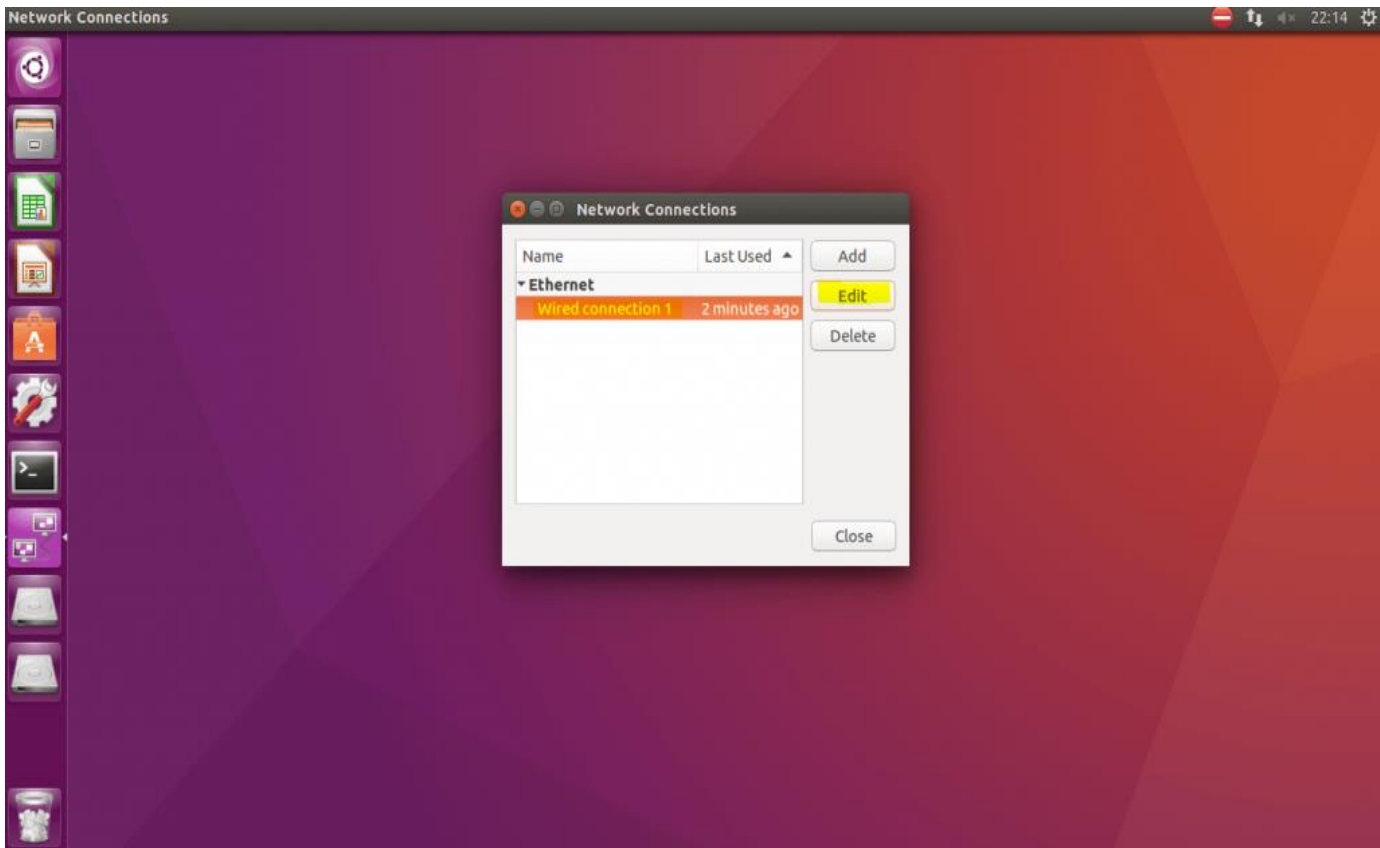
In the opened window select IPv4 Settings tab, choose Automatic (DHCP) as default method and press "Save" button:
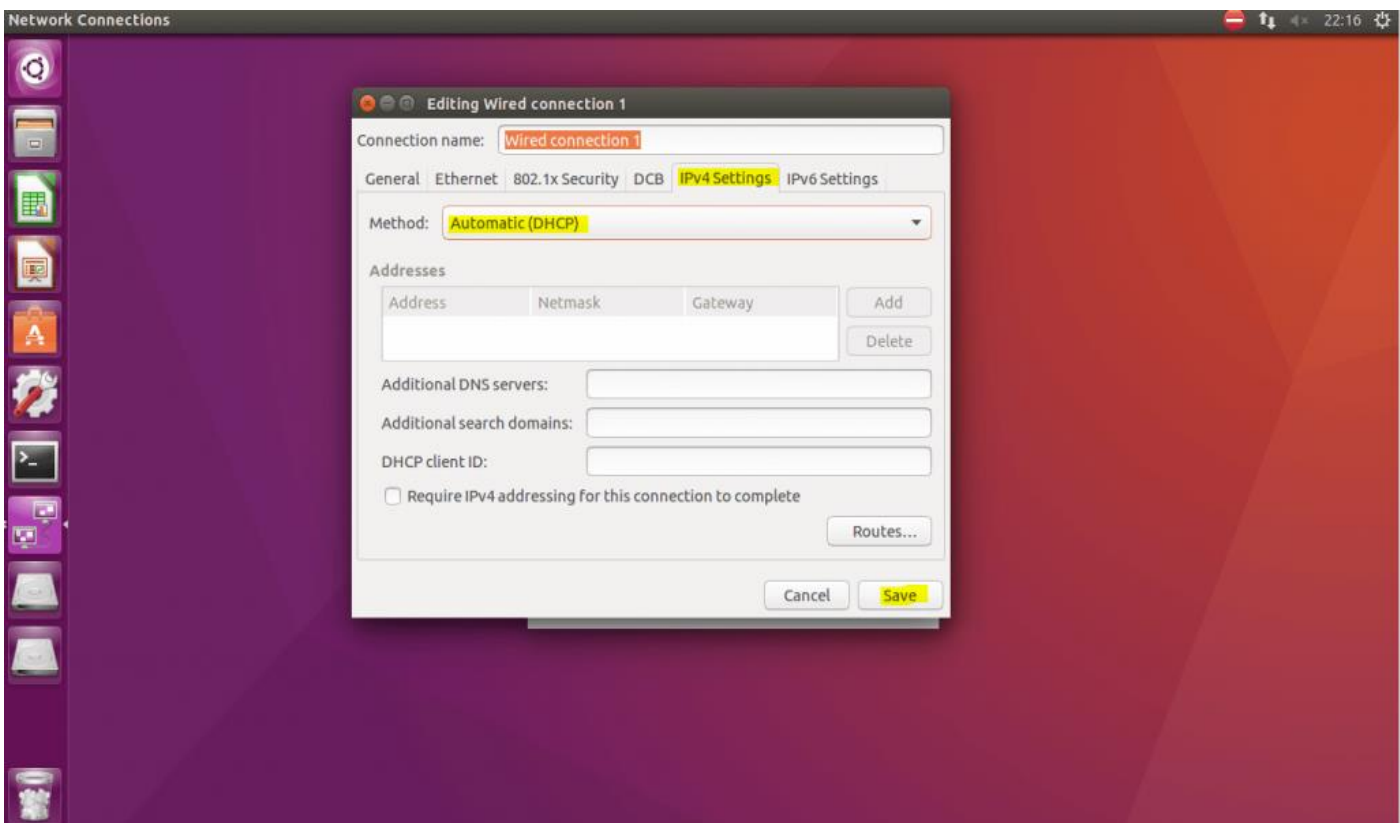
Close all opened windows, press on the network connections icon again and press on your connection name to connect to the network.

Once all these steps are done, the client machine will get the IP address from DHCP server. However, there can be cases when just disconnect/connect will not make changes happen. For that cases you can restart network service to apply changes and receive IP address from new DHCP server as we have set the isc-dhcp-server as authoritative.

 # sudo systemctl restart NetworkManager.service

After network service restart, if you check network configuration. You will see output like the one below:

```
ruchi12@ubuntu:~$ sudo systemctl restart NetworkManager.service
ruchi12@ubuntu:~$ ifconfig
ens33     Link encap:Ethernet  HWaddr 00:0c:29:24:c7:9a
          inet addr:192.168.3.101  Bcast:192.168.3.255  Mask:255.255.255.0
          inet6 addr: fe80::cf6d:edb4:fc62:9a3f/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:177469 errors:0 dropped:0 overruns:0 frame:0
          TX packets:71124 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:233287856 (233.2 MB)  TX bytes:4877836 (4.8 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:29766 errors:0 dropped:0 overruns:0 frame:0
          TX packets:29766 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2058006 (2.0 MB)  TX bytes:2058006 (2.0 MB)

ruchi12@ubuntu:~$
```

Step 4:- Configure NFS Server.

Step 4.1 – Install NFS Server on Ubuntu
Use the following command to install the required packages to configure the NFS server.
 # sudo apt-get install nfs-kernel-server

```
ruchi12@ubuntu:~$ sudo apt-get install nfs-kernel-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  keyutils libnfsidmap2 libtirpc1 nfs-common rpcbind
Suggested packages:
  open-iscsi watchdog
The following NEW packages will be installed:
  keyutils libnfsidmap2 libtirpc1 nfs-common nfs-kernel-server rpcbind
0 upgraded, 6 newly installed, 0 to remove and 81 not upgraded.
Need to get 490 kB of archives.
After this operation, 1,703 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

Step 4.2 – Export Shares over NFS
Now edit the nfs server exports configuration file in a nano text editor as following:
 # sudo nano /etc/exports

```
ruchi12@ubuntu:~$ sudo nano /etc/exports
```

Add following settings:
/home   192.168.3.101(rw, sync, no_root_squash, no_subtree_check)
Check update through **ifconfig** command:

```
ruchi12@ubuntu:~$ sudo nano /etc/exports
ruchi12@ubuntu:~$ ifconfig
ens33     Link encap:Ethernet  HWaddr 00:0c:29:24:c7:9a
          inet addr:192.168.3.101  Bcast:192.168.3.255  Mask:255.255.255.0
          inet6 addr: fe80::cf6d:edb4:fc62:9a3f/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:185609 errors:0 dropped:0 overruns:0 frame:0
          TX packets:76062 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:241429226 (241.4 MB)  TX bytes:5356505 (5.3 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:33952 errors:0 dropped:0 overruns:0 frame:0
          TX packets:33952 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2332236 (2.3 MB)  TX bytes:2332236 (2.3 MB)

ruchi12@ubuntu:~$
```

Step 4.3– Mount Share on Client Machine

After completing set up on the server side, login to clients system where we need to configure NFS client and mount exported directory by NFS server.

Install following packages on NFS client system, which is required to mount the remote directory using NFS protocol.

 # sudo apt-get install nfs-common

```
ruchi12@ubuntu:~$ sudo apt-get install nfs-common
Reading package lists... Done
Building dependency tree
Reading state information... Done
nfs-common is already the newest version (1:1.3.4-2.1ubuntu5.2).
nfs-common set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 81 not upgraded.
```

Then edit /etc/fstab file

#sudo nano /etc/fstab

Add the following line in the file. Replace nfs-server-ip with the ip address of the first Ubuntu computer.

Nfs-server-ip: /home/username /mnt/nfs-share   nfs   rw, soft, intr, noatime, x-gvfs-show

The above line will mount the home directory under /mnt/nfs-share directory in read and write mode.

Save and close the file. Then create the mount point

#sudo mkdir /mnt/nfs-share

Next run the below command

#sudo mount –a

Now you can access the server's home directory in your file manager.

If you want to share your home directory with all computers in your home network, then add this line in **/etc/export** file supposing 192.168.3.1 is the ip address of your router.

/home/username   192.168.3.1/24(rw, sync, no_root_squash, no_subtree_check)