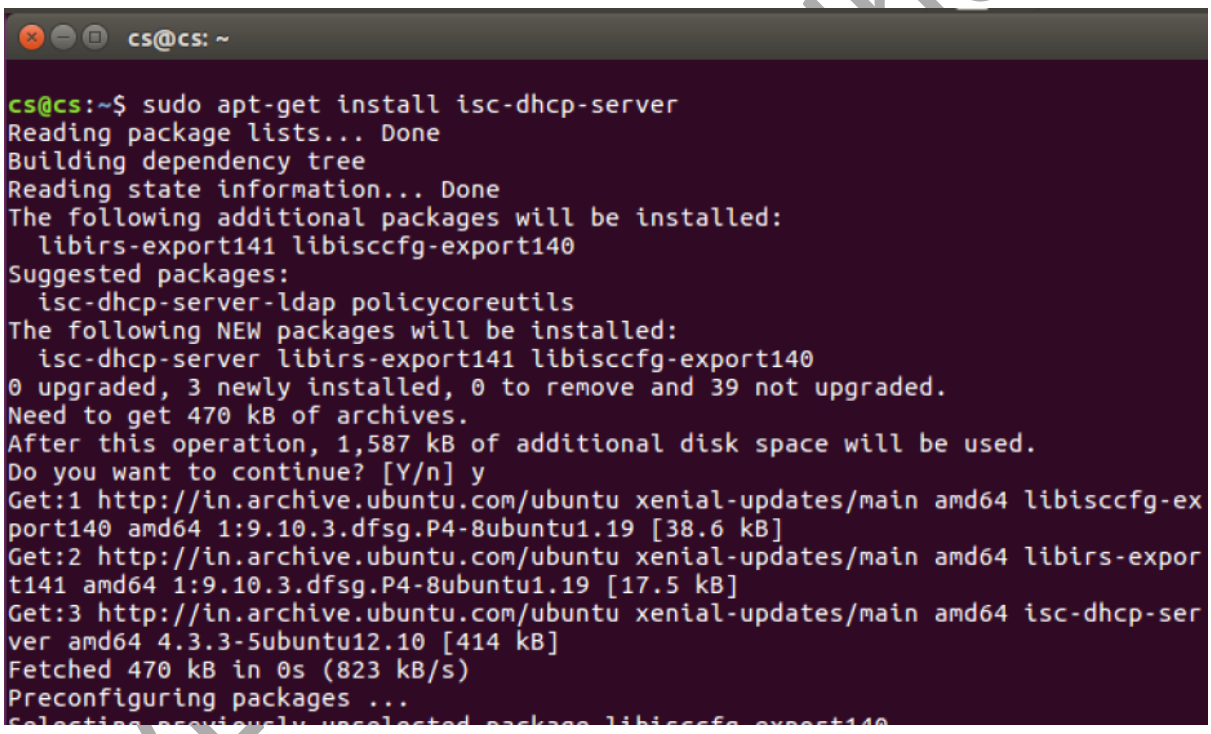
Practical No. 6

Aim: 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)

Description:

Define:
1. DHCP Server
2. NFS Server

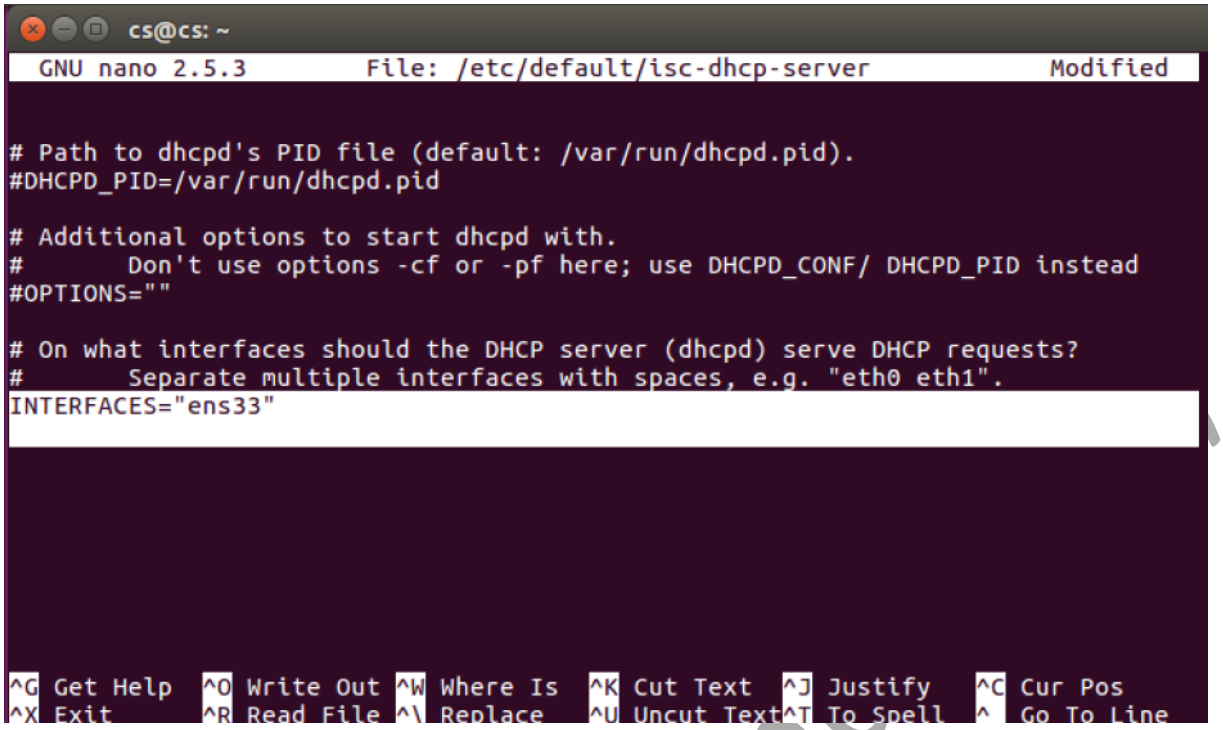
Steps:

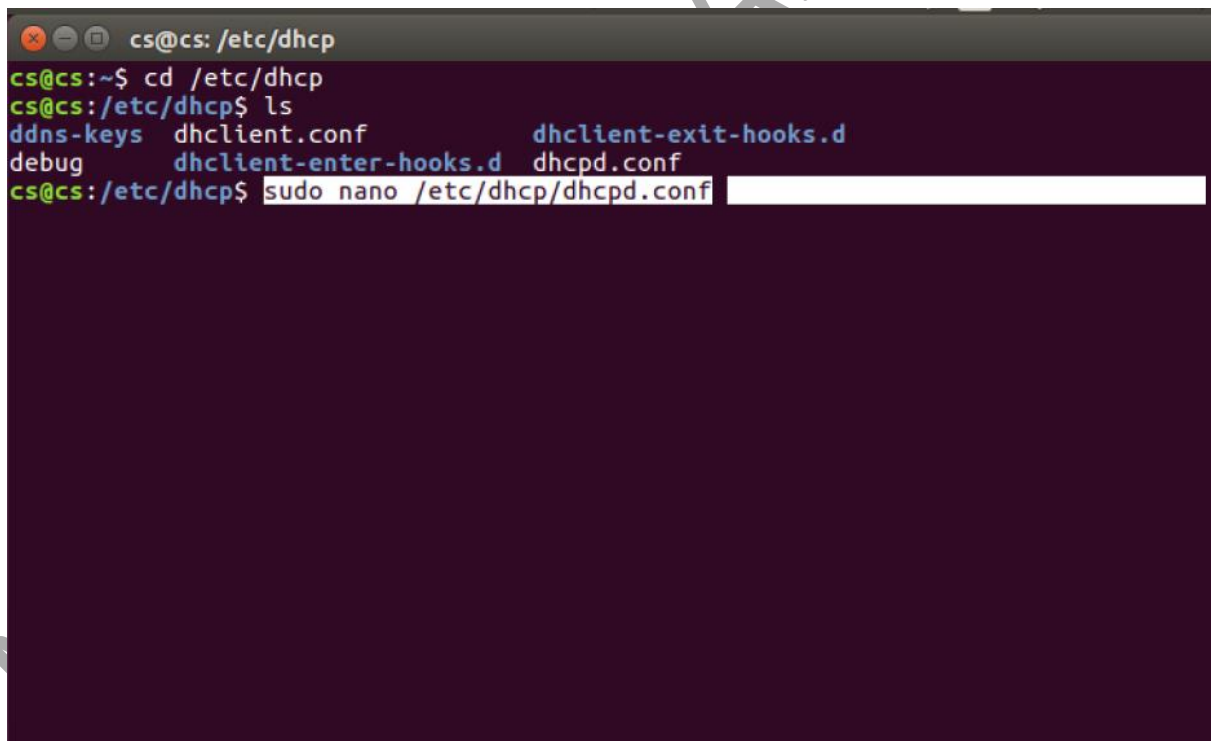


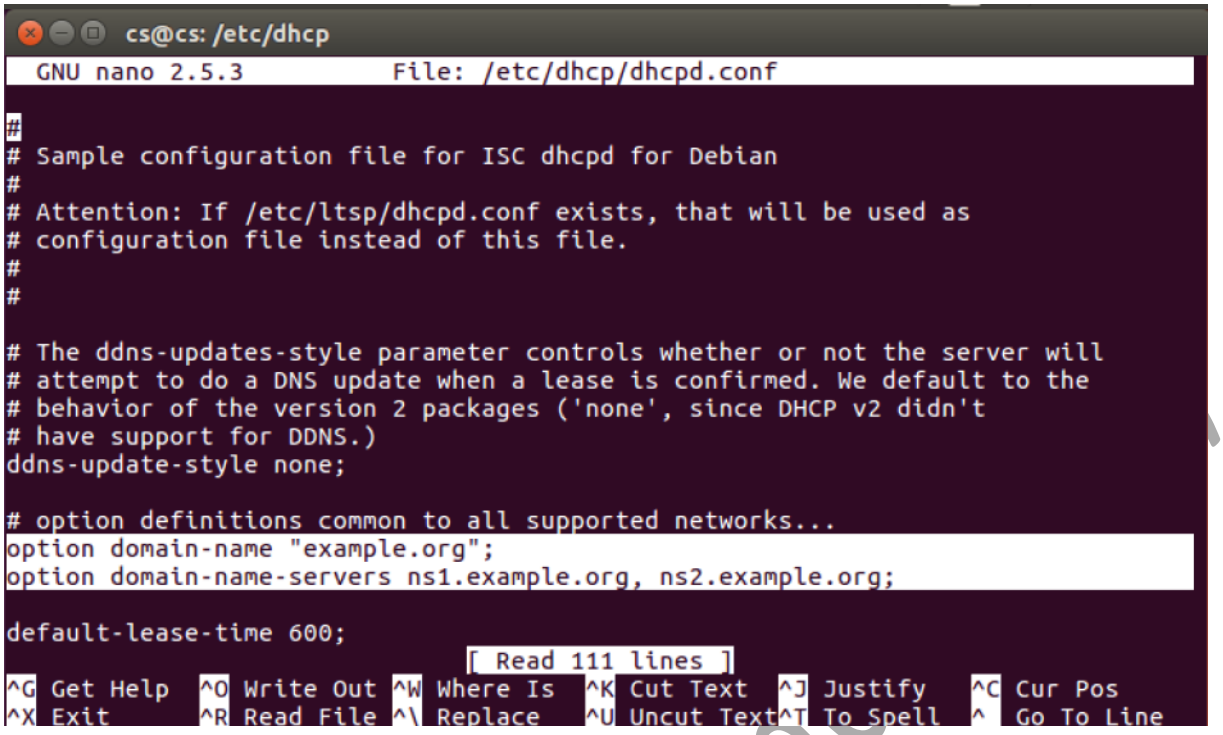
```
cs@cs:~$ ifconfig
ens33     Link encap:Ethernet  HWaddr 00:0c:29:1c:f5:7d
          inet addr:192.168.173.132  Bcast:192.168.173.255  Mask:255.255.255.0
          inet6 addr: fe80::c8fa:acec:af2:c62d/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2498 errors:0 dropped:0 overruns:0 frame:0
          TX packets:701 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:3415788 (3.4 MB)  TX bytes:55572 (55.5 KB)

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:330 errors:0 dropped:0 overruns:0 frame:0
          TX packets:330 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:27839 (27.8 KB)  TX bytes:27839 (27.8 KB)

cs@cs:~$
```

```
cs@cs:~$ sudo nano /etc/default/isc-dhcp-server
cs@cs:~$
```

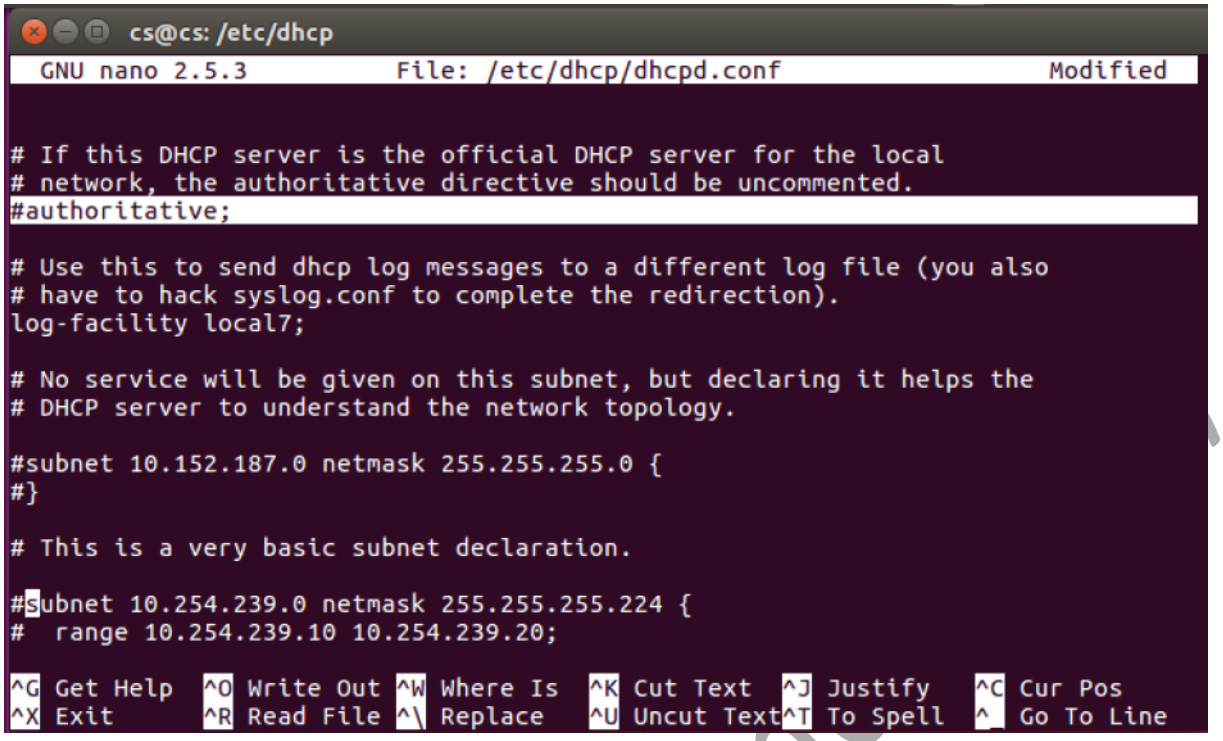
```
cs@cs: ~
  GNU nano 2.5.3        File: /etc/default/isc-dhcp-server


# Path to dhcpd's PID file (default: /var/run/dhcpd.pid).
#DHCPD_PID=/var/run/dhcpd.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".
INTERFACES=""


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

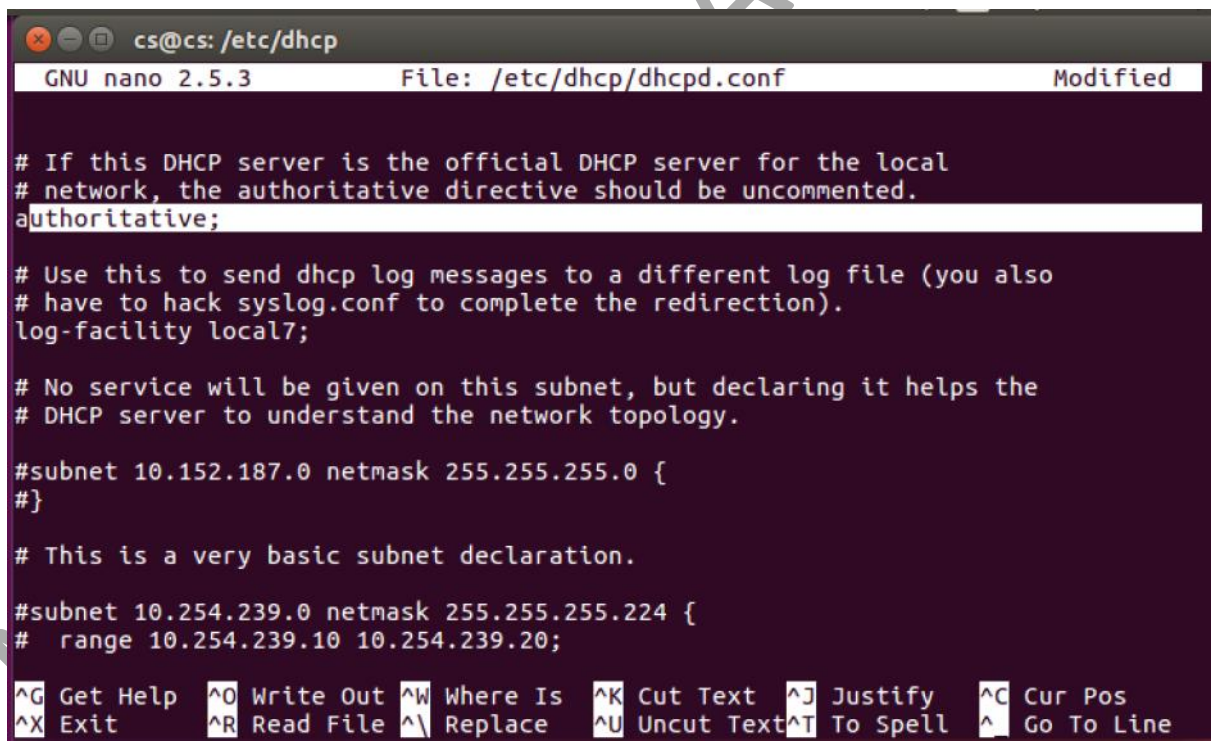

cs@cs: ~
GNU nano 2.5.3 File: /etc/default/isc-dhcp-server Modified
Path to dhcpd's PID file (default: /var/run/dhcpd.pid).
#DHCPD_PID=/var/run/dhcpd.pid
Additional options to start dhcpd with.
Don't use options -cf or -pf here; use DHCPD_CONF/ DHCPD_PID instead
#OPTIONS=""
# On what interfaces should the DHCP server (dhcpd) serve DHCP requests?
# Separate multiple interfaces with spaces, e.g. "eth0 eth1".
INTERFACES="ens33"
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line

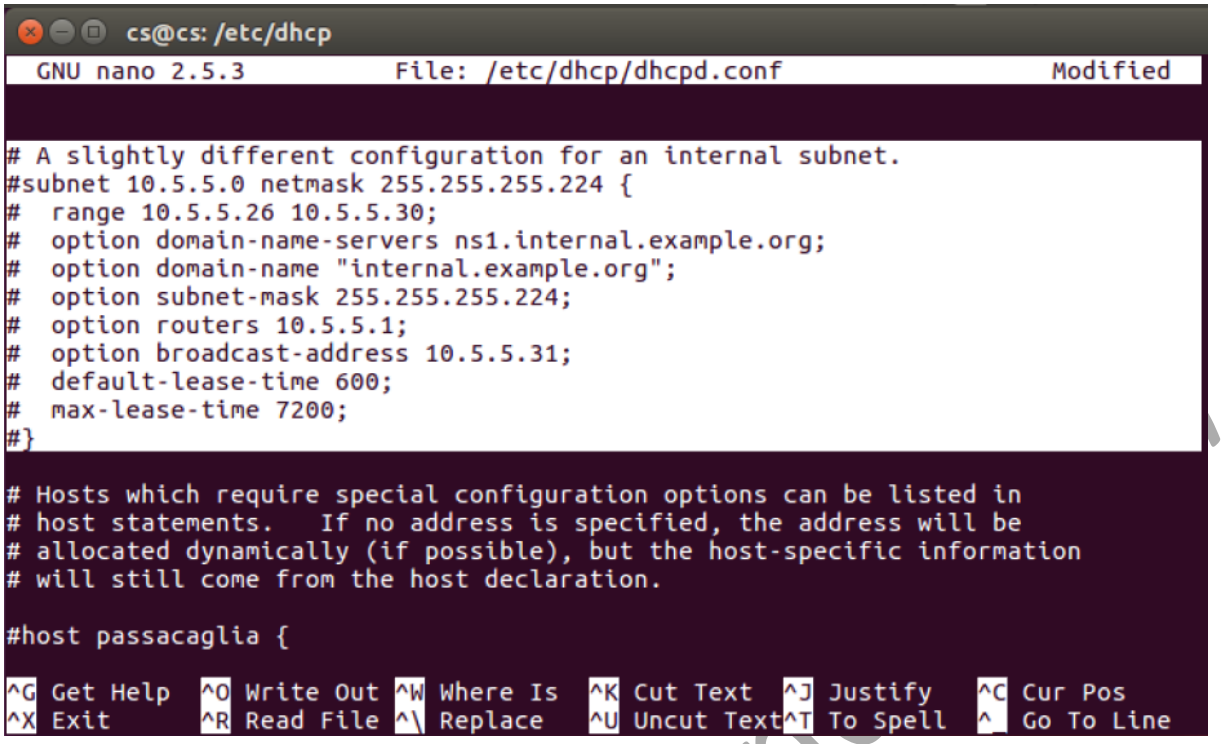

cs@cs: /etc/dhcp
cs@cs:~$ cd /etc/dhcp
cs@cs:/etc/dhcp$ ls
ddns-keys dhclient.conf dhclient-exit-hooks.d
debug dhclient-enter-hooks.d dhcpd.conf
cs@cs:/etc/dhcp$ sudo nano /etc/dhcp/dhcpd.conf

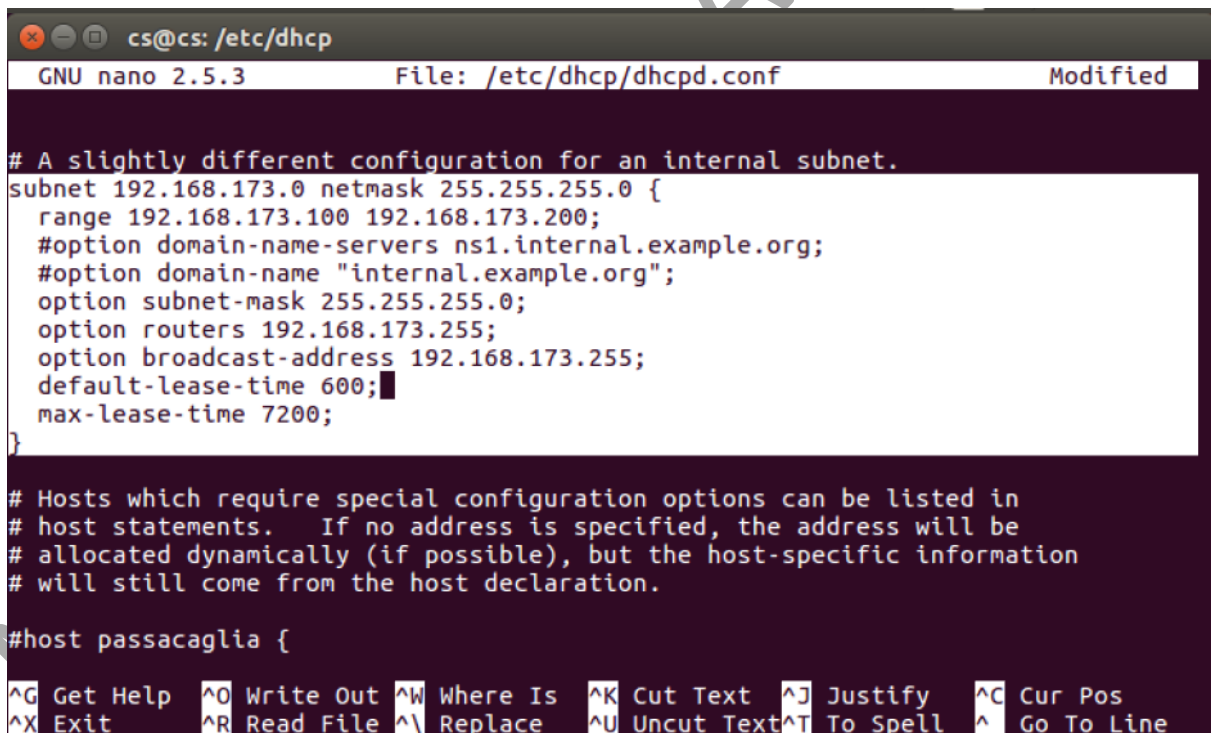

cs@cs: /etc/dhcp
GNU nano 2.5.3 File: /etc/dhcp/dhcpd.conf
#
Sample configuration file for ISC dhcpd for Debian
#
Attention: If /etc/ltsp/dhcpd.conf exists, that will be used as
configuration file instead of this file.
#
#
The ddns-updates-style parameter controls whether or not the server will
attempt 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 none;
option definitions common to all supported networks...
option domain-name "example.org";
option domain-name-servers ns1.example.org, ns2.example.org;
default-lease-time 600;
[Read 111 lines]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line

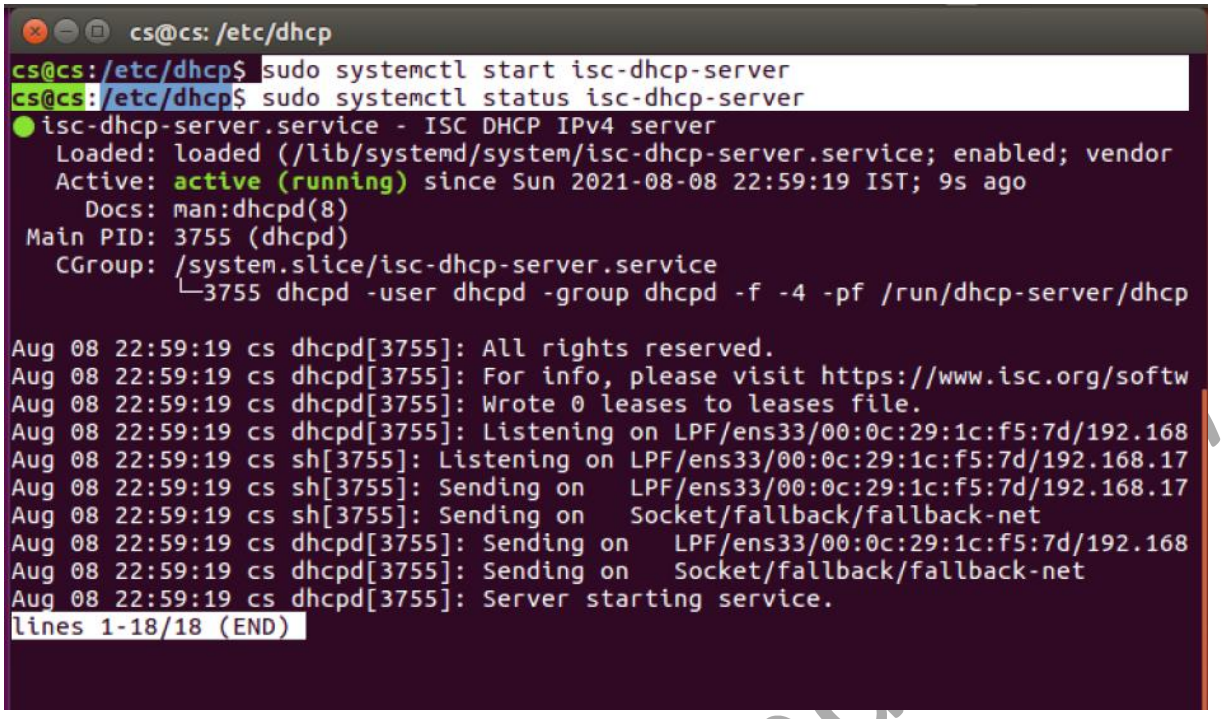

cs@cs: /etc/dhcp
GNU nano 2.5.3 File: /etc/dhcp/dhcpd.conf Modified
#
Sample configuration file for ISC dhcpd for Debian
#
Attention: If /etc/ltsp/dhcpd.conf exists, that will be used as
configuration file instead of this file.
#
#
The ddns-updates-style parameter controls whether or not the server will
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 none;
option definitions common to all supported networks...
#option domain-name "example.org";
#option domain-name-servers ns1.example.org, ns2.example.org;
default-lease-time 600;
[Read 111 lines]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line

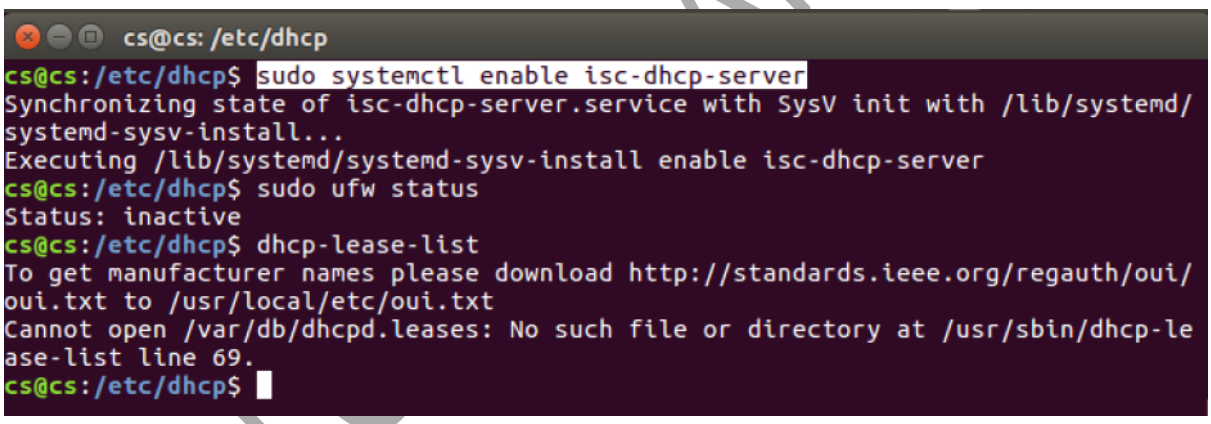

cs@cs: /etc/dhcp
GNU nano 2.5.3 File: /etc/dhcp/dhcpd.conf Modified
If this DHCP server is the official DHCP server for the local
network, the authoritative directive should be uncommented.
#authoritative;
Use this to send dhcp log messages to a different log file (you also
have to hack syslog.conf to complete the redirection).
log-facility local7;
No service will be given on this subnet, but declaring it helps the
DHCP server to understand the network topology.
#subnet 10.152.187.0 netmask 255.255.255.0 {
#}
This is a very basic subnet declaration.
#subnet 10.254.239.0 netmask 255.255.255.224 {
range 10.254.239.10 10.254.239.20;
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line


cs@cs: /etc/dhcp
GNU nano 2.5.3 File: /etc/dhcp/dhcpd.conf Modified
If this DHCP server is the official DHCP server for the local
network, the authoritative directive should be uncommented.
authoritative;
Use this to send dhcp log messages to a different log file (you also
have to hack syslog.conf to complete the redirection).
log-facility local7;
No service will be given on this subnet, but declaring it helps the
DHCP server to understand the network topology.
#subnet 10.152.187.0 netmask 255.255.255.0 {
#}
This is a very basic subnet declaration.
#subnet 10.254.239.0 netmask 255.255.255.224 {
range 10.254.239.10 10.254.239.20;
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line


cs@cs: /etc/dhcp
GNU nano 2.5.3 File: /etc/dhcp/dhcpd.conf Modified
A slightly different configuration for an internal subnet.
#subnet 10.5.5.0 netmask 255.255.255.224 {
range 10.5.5.26 10.5.5.30;
option domain-name-servers ns1.internal.example.org;
option domain-name "internal.example.org";
option subnet-mask 255.255.255.224;
option routers 10.5.5.1;
option broadcast-address 10.5.5.31;
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 {
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line


cs@cs: /etc/dhcp
GNU nano 2.5.3 File: /etc/dhcp/dhcpd.conf Modified
# A slightly different configuration for an internal subnet.
subnet 192.168.173.0 netmask 255.255.255.0 {
range 192.168.173.100 192.168.173.200;
#option domain-name-servers ns1.internal.example.org;
#option domain-name "internal.example.org";
option subnet-mask 255.255.255.0;
option routers 192.168.173.255;
option broadcast-address 192.168.173.255;
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 {
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line



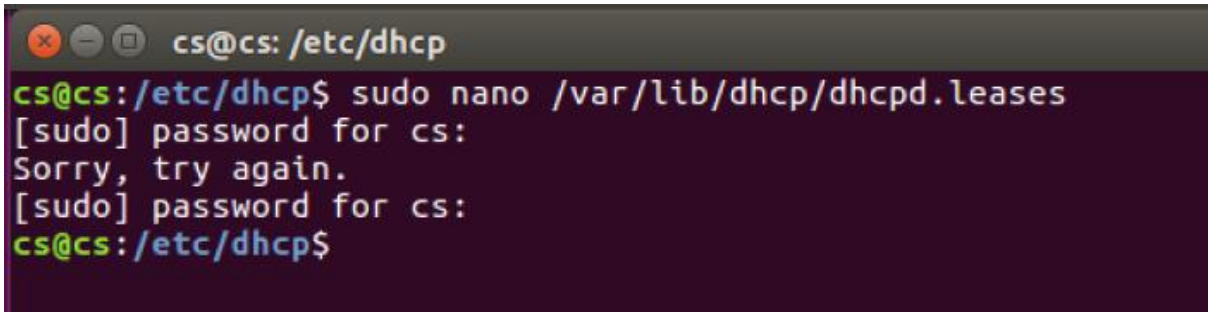


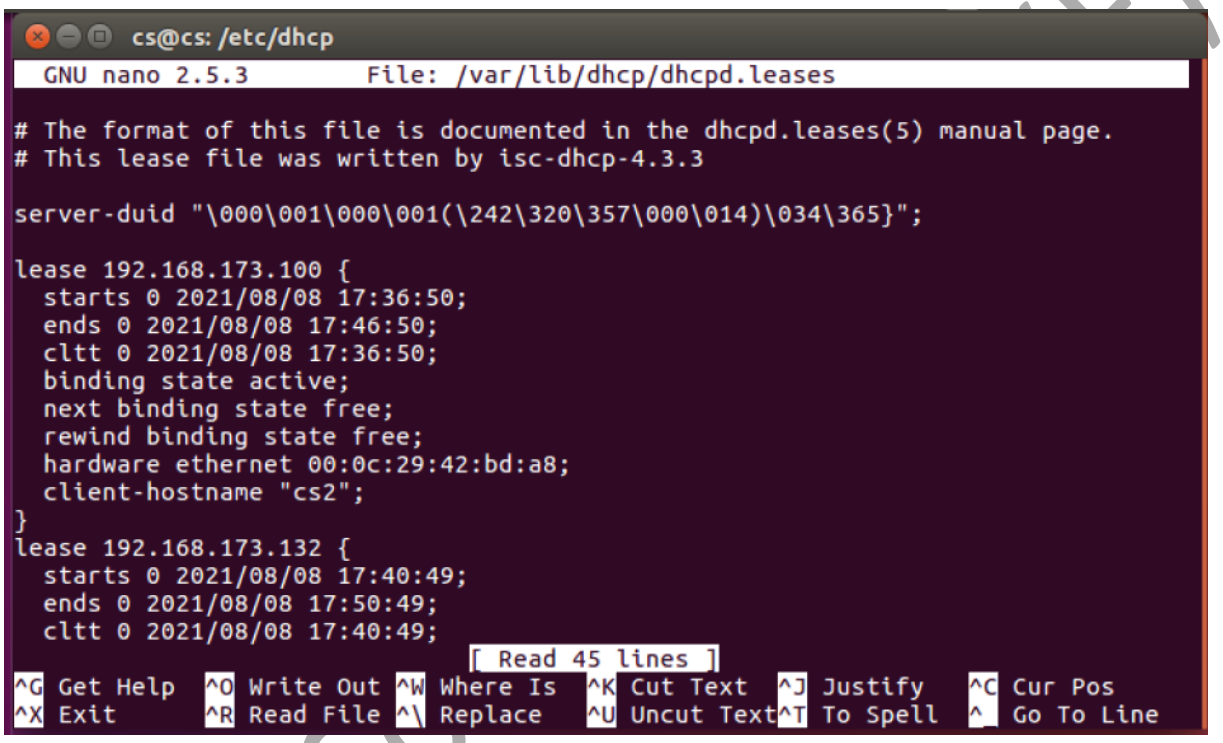
On Client Side:

```
cs2@cs2:~$ sudo nano /etc/network/interfaces
[sudo] password for cs2:
cs2@cs2:~$
```

```
cs2@cs2: ~
File  Edit  View  Search  Terminal  Help
  GNU nano 2.5.3          File: /etc/network/interfaces                Modified

# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
iface lo inet loopback
auto ens33
iface ens33 inet dhcp
```

```
cs@cs: /etc/dhcp
cs@cs:/etc/dhcp$ dhcpd
Internet Systems Consortium DHCP Server 4.3.3
Copyright 2004-2015 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/
unable to create icmp socket: Operation not permitted
Config file: /etc/dhcp/dhcpd.conf
Database file: /var/lib/dhcp/dhcpd.leases
PID file: /var/run/dhcpd.pid
Can't open /var/lib/dhcp/dhcpd.leases for append.

If you think you have received this message due to a bug rather
than a configuration issue please read the section on submitting
bugs on either our web page at www.isc.org or in the README file
before submitting a bug.  These pages explain the proper
process and the information we find helpful for debugging..

exiting.
cs@cs:/etc/dhcp$
```


cs@cs: /etc/dhcp
cs@cs:/etc/dhcp$ sudo nano /var/lib/dhcp/dhcpd.leases
[sudo] password for cs:
Sorry, try again.
[sudo] password for cs:
cs@cs:/etc/dhcp$


cs@cs: /etc/dhcp
GNU nano 2.5.3 File: /var/lib/dhcp/dhcpd.leases
The format of this file is documented in the dhcpd.leases(5) manual page.
This lease file was written by isc-dhcp-4.3.3
server-duid "\000\001\000\001(\242\320\357\000\014)\034\365}";
lease 192.168.173.100 {
starts 0 2021/08/08 17:36:50;
ends 0 2021/08/08 17:46:50;
cltt 0 2021/08/08 17:36:50;
binding state active;
next binding state free;
rewind binding state free;
hardware ethernet 00:0c:29:42:bd:a8;
client-hostname "cs2";
}
lease 192.168.173.132 {
starts 0 2021/08/08 17:40:49;
ends 0 2021/08/08 17:50:49;
cltt 0 2021/08/08 17:40:49;
[Read 45 lines]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line


cs2@cs2:~$ sudo systemctl restart networking
cs2@cs2:~$ ip a
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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP g
roup default qlen 1000
link/ether 00:0c:29:42:bd:a8 brd ff:ff:ff:ff:ff:ff
inet 192.168.173.100/24 brd 192.168.173.255 scope global ens33
valid_lft forever preferred_lft forever
inet 192.168.173.133/24 brd 192.168.173.255 scope global secondary dynamic e
ns33
valid_lft 590sec preferred_lft 590sec
cs2@cs2:~$

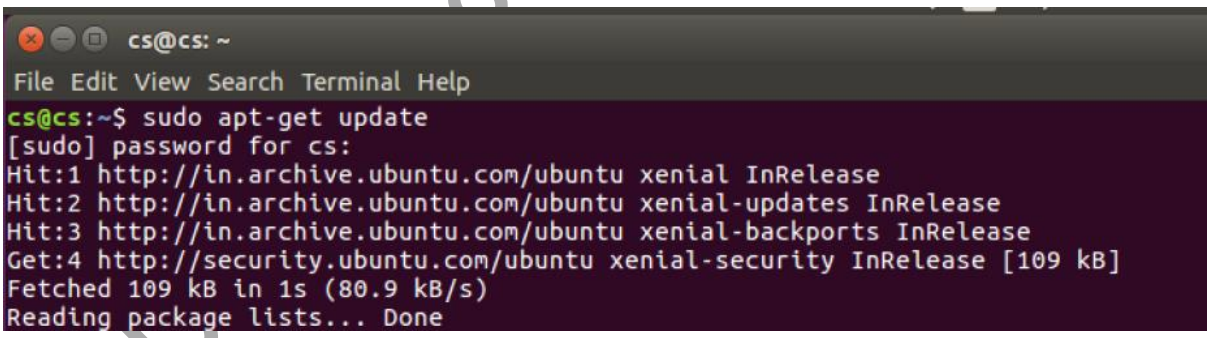
NFS

NFS, or Network File System, is a distributed file system protocol that allows you to mount remote directories on your server. This lets you manage storage space in a different location and write to that space from multiple clients. NFS provides a relatively quick and easy way to access remote systems over a network and works well in situations where the shared resources will be accessed regularly.

NFS Server IP 192.168.173.132
NFS Client IP 192.168.173.100

1. Install NFS Server

   To install NFS Server on ubuntu 16.04, Use the following commands with root privileges.
   sudo apt-get update
   sudo apt-get install nfs-kernel-server



```
cs@cs: ~
cs@cs:~$ 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 7 not upgraded.
Need to get 468 kB of archives.
After this operation, 1,847 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu xenial/main amd64 libnfsidmap2 amd64 0
.25-5 [32.2 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu xenial/main amd64 keyutils amd64 1.5.9
-8ubuntu1 [47.1 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libtirpc1 am
d64 0.2.5-1ubuntu0.1 [75.4 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu xenial-updates/main amd64 rpcbind amd6
4 0.2.3-0.2ubuntu0.16.04.1 [40.7 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu xenial-updates/main amd64 nfs-common a
md64 1:1.2.8-9ubuntu12.3 [185 kB]
```

2. Create NFS share Directory

   To share any directory on NFS server, You need to create a directory by following the commands.

   Public – read only

   Private – read, write

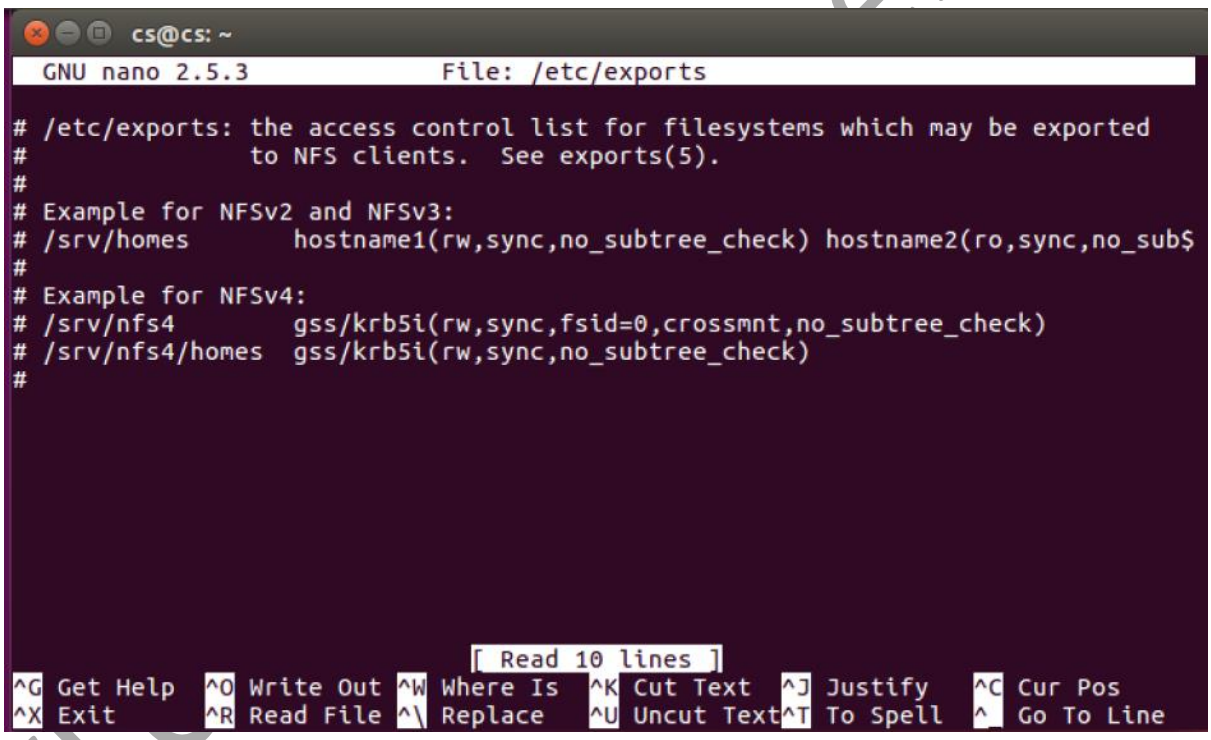
```
cs@cs: ~
cs@cs:~$ sudo mkdir /public
cs@cs:~$ sudo mkdir /private
cs@cs:~$ sudo chmod 755 /public/
cs@cs:~$ sudo chmod 777 /private
cs@cs:~$
```

3. Configure NFS Server with Shared Directory

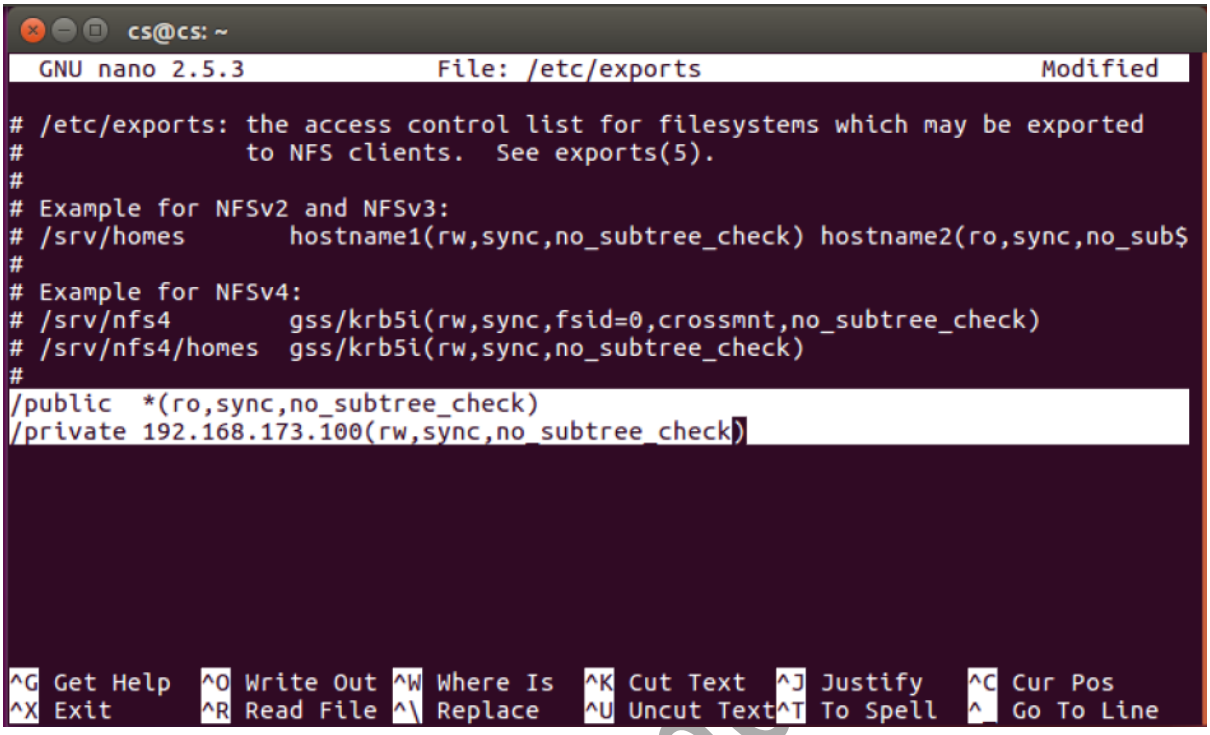
   To configure created directory with NFS server use the following commands.

   File to give shared definitions:

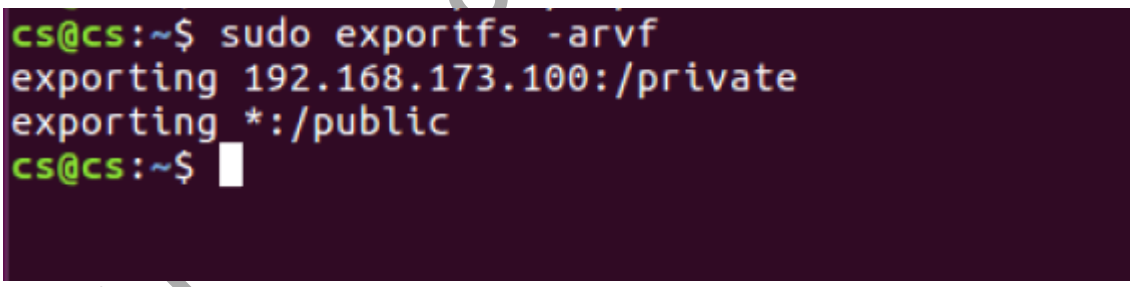
```
cs@cs:~$ sudo nano /etc/exports
```



   Add the given parameter.

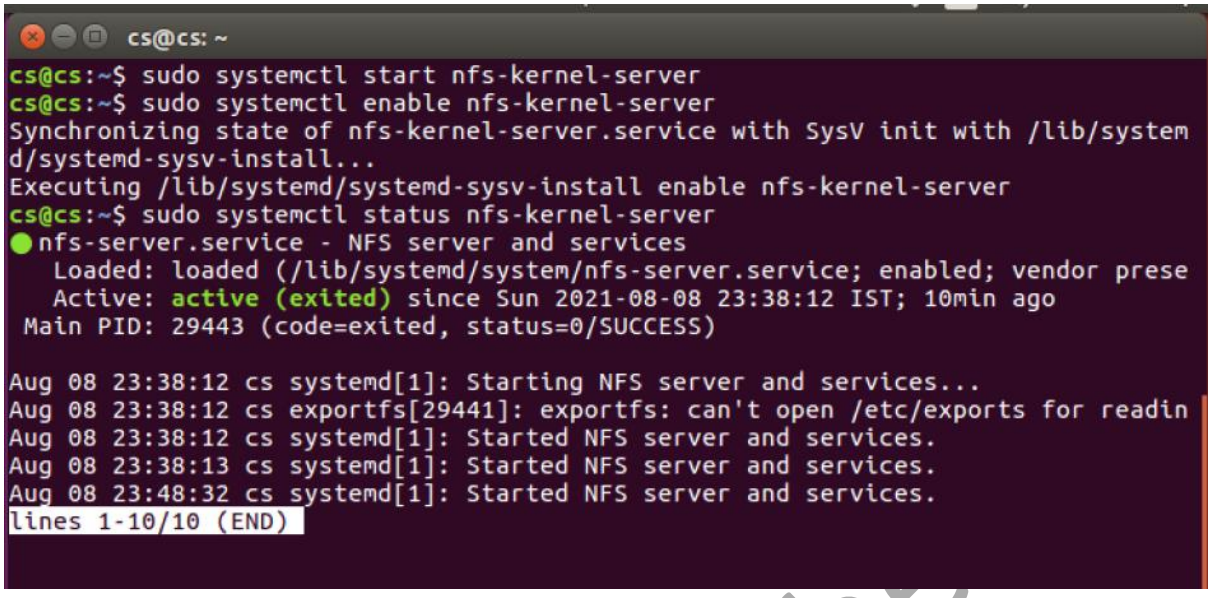


Save and exit from nano editor



4. Restart the NFS Service

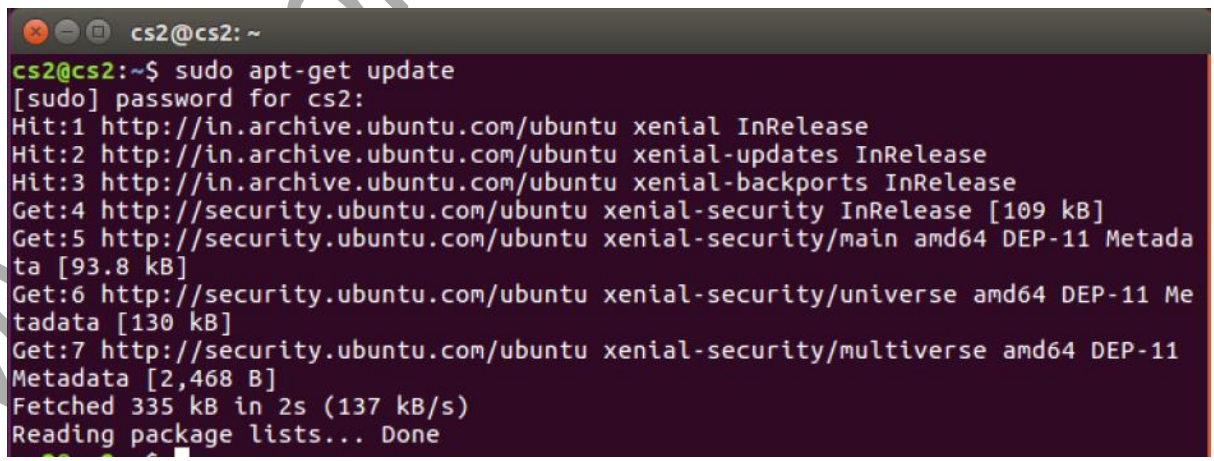
To get effect use the following commands.



NFS Server side configuration is completed.

5. NFS Client Configuration

   You need to install NFS client packages with root privileges using the given commands.



```
cs2@cs2: ~
File Edit View Search Terminal Help
cs2@cs2:~$ sudo apt-get install nfs-common
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libirs-export141 libisccfg-export140
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  keyutils libnfsidmap2 libtirpc1 rpcbind
Suggested packages:
  open-iscsi watchdog
The following NEW packages will be installed:
  keyutils libnfsidmap2 libtirpc1 nfs-common rpcbind
0 upgraded, 5 newly installed, 0 to remove and 39 not upgraded.
Need to get 380 kB of archives.
After this operation, 1,360 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

6. Create Mount Point

   To get access on nfs shared directory in nfs client machine, You need to create or use any others directory, Use the given command to create a mount point directory.

   To display mount enter server ip address

```
cs2@cs2: ~
cs2@cs2:~$ showmount -e 192.168.173.132
Export list for 192.168.173.132:
/public  *
/private 192.168.173.100
cs2@cs2:~$
```

   Temporary mounting file:

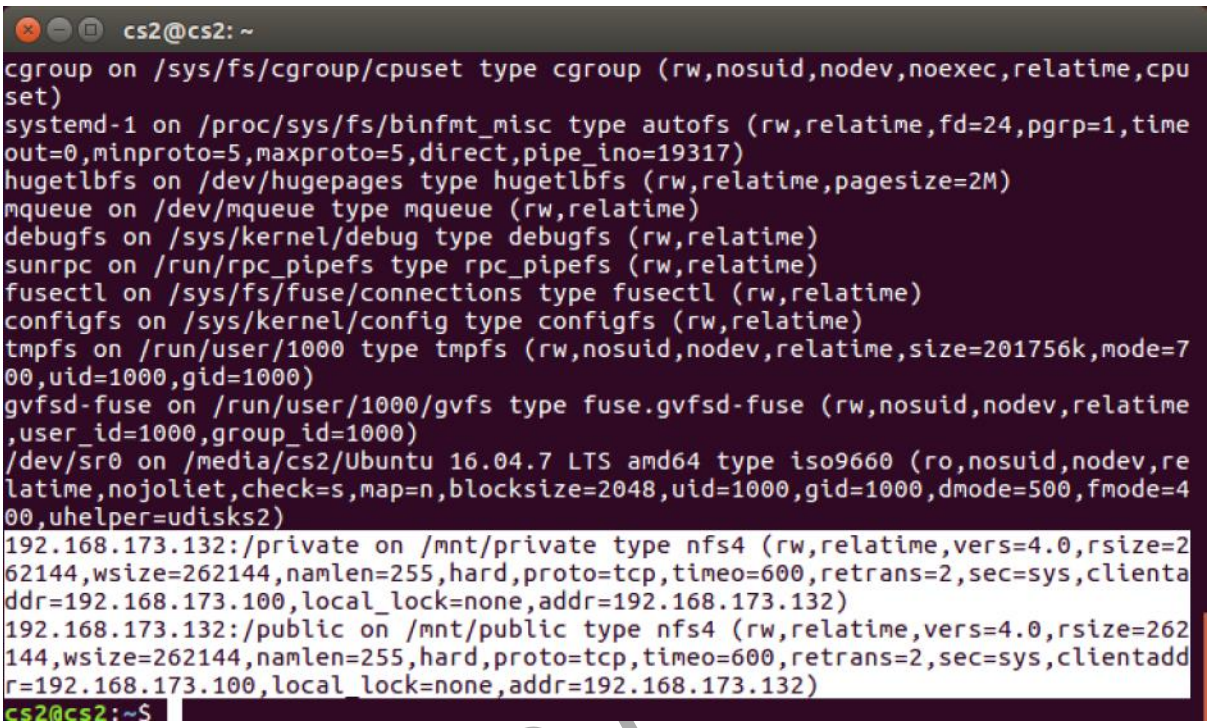
   sudo mkdir /mnt/public

   sudo mkdir /mnt/private

   sudo mount -t nfs 192.168.173.132:/public /mnt/public

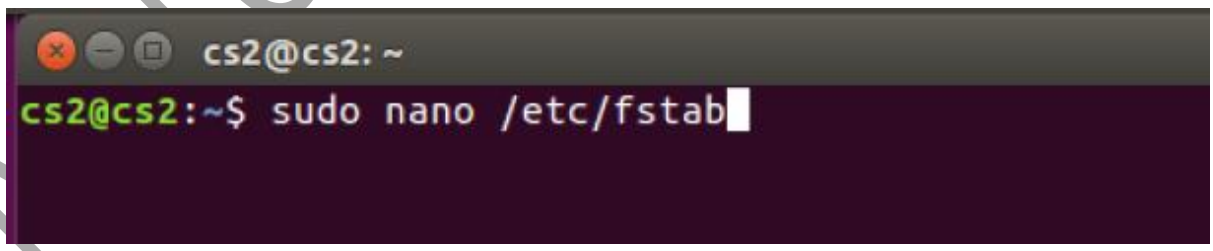
sudo mount -t nfs 192.168.173.132:/private /mnt/private

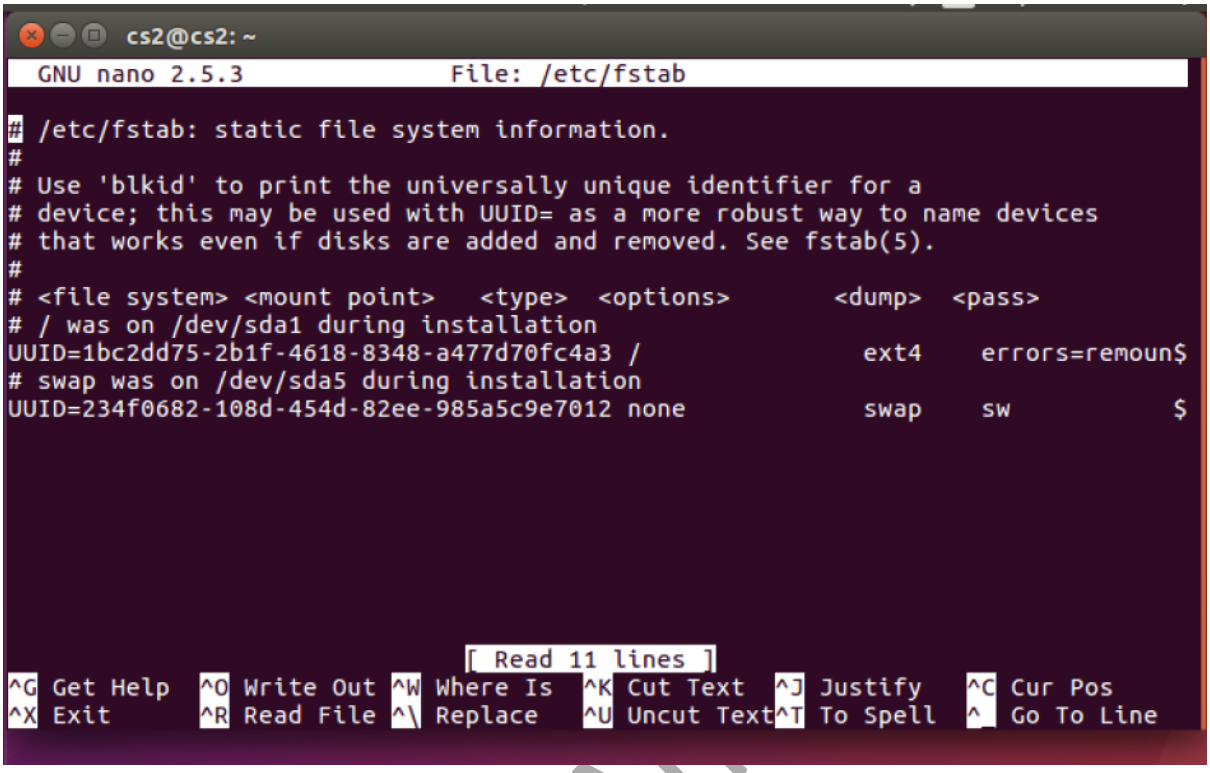
mount

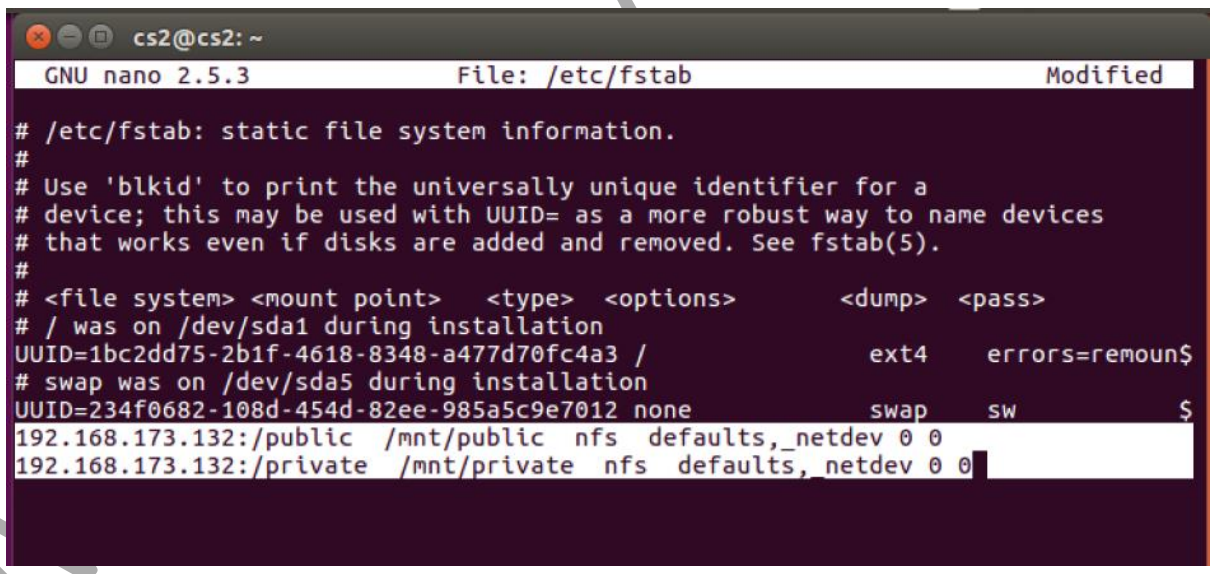


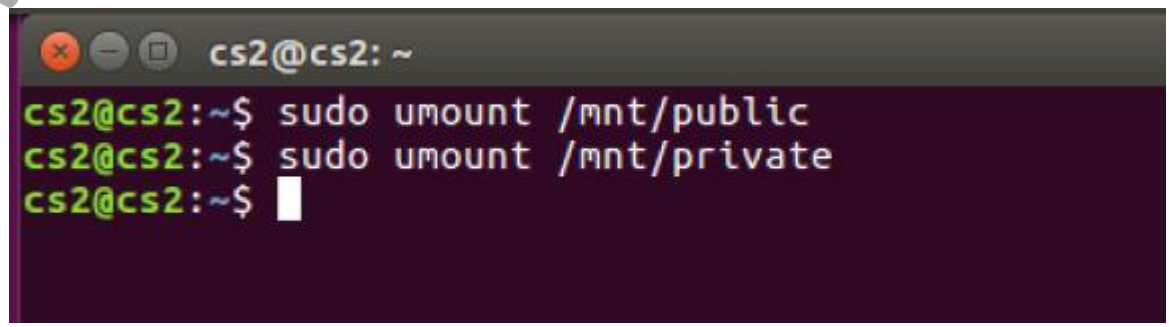
If incorrect mount done then - umount /mnt/private OR umount /mnt/public

Permanent mounting file:

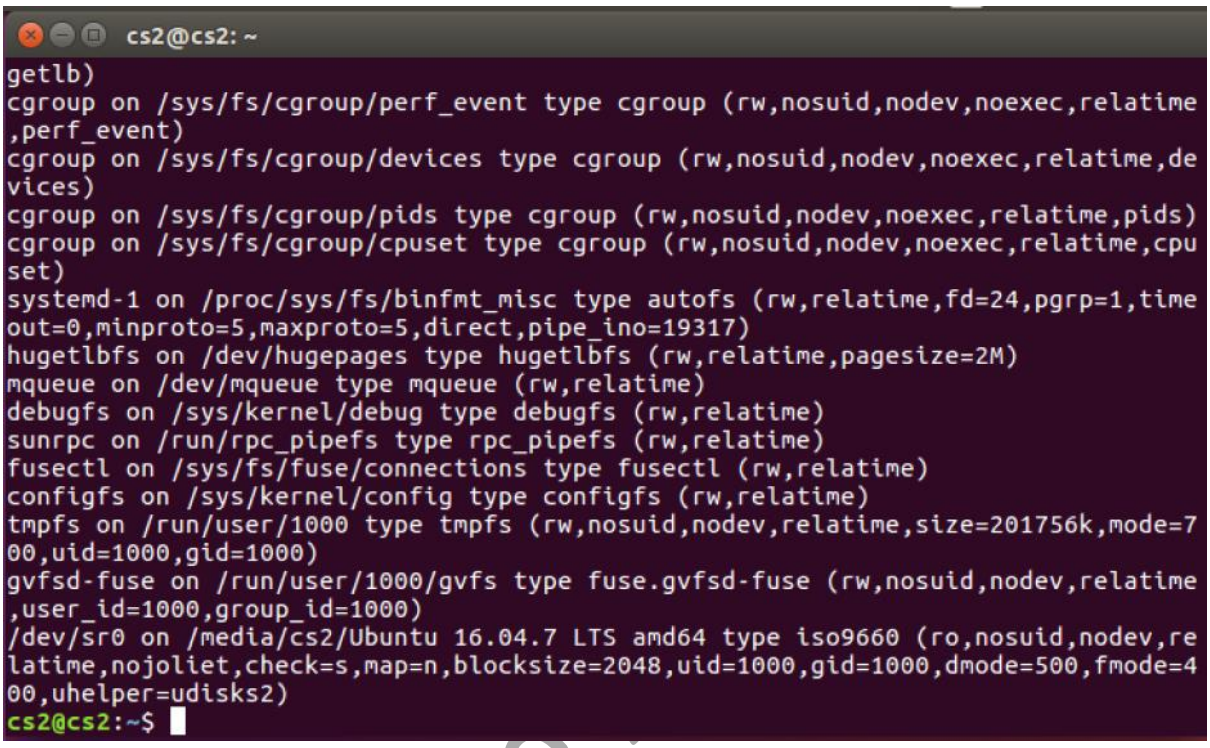


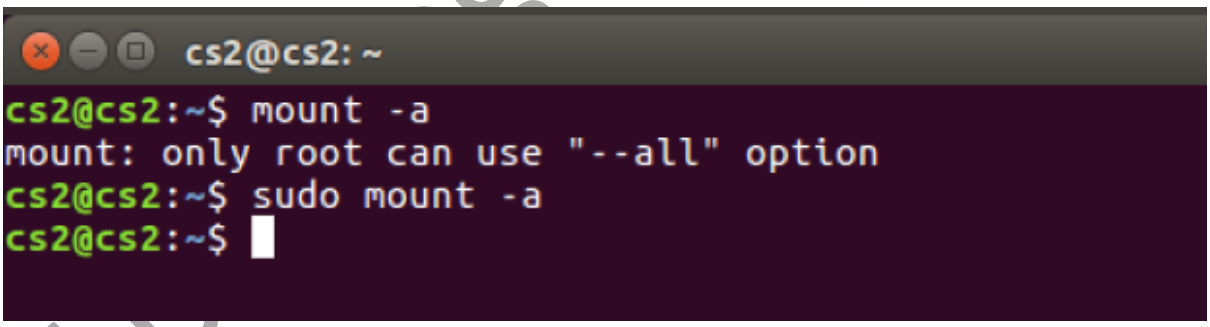

cs2@cs2: ~
GNU nano 2.5.3 File: /etc/fstab
/etc/fstab: static file system information.
#
Use 'blkid' to print the universally unique identifier for a
device; this may be used with UUID= as a more robust way to name devices
that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/sda1 during installation
UUID=1bc2dd75-2b1f-4618-8348-a477d70fc4a3 / ext4 errors=remoun$
# swap was on /dev/sda5 during installation
UUID=234f0682-108d-454d-82ee-985a5c9e7012 none swap sw $
[Read 11 lines]
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^_ Go To Line


cs2@cs2: ~
GNU nano 2.5.3 File: /etc/fstab Modified
/etc/fstab: static file system information.
#
Use 'blkid' to print the universally unique identifier for a
device; this may be used with UUID= as a more robust way to name devices
that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/sda1 during installation
UUID=1bc2dd75-2b1f-4618-8348-a477d70fc4a3 / ext4 errors=remoun$
# swap was on /dev/sda5 during installation
UUID=234f0682-108d-454d-82ee-985a5c9e7012 none swap sw $
192.168.173.132:/public /mnt/public nfs defaults,_netdev 0 0
192.168.173.132:/private /mnt/private nfs defaults,_netdev 0 0

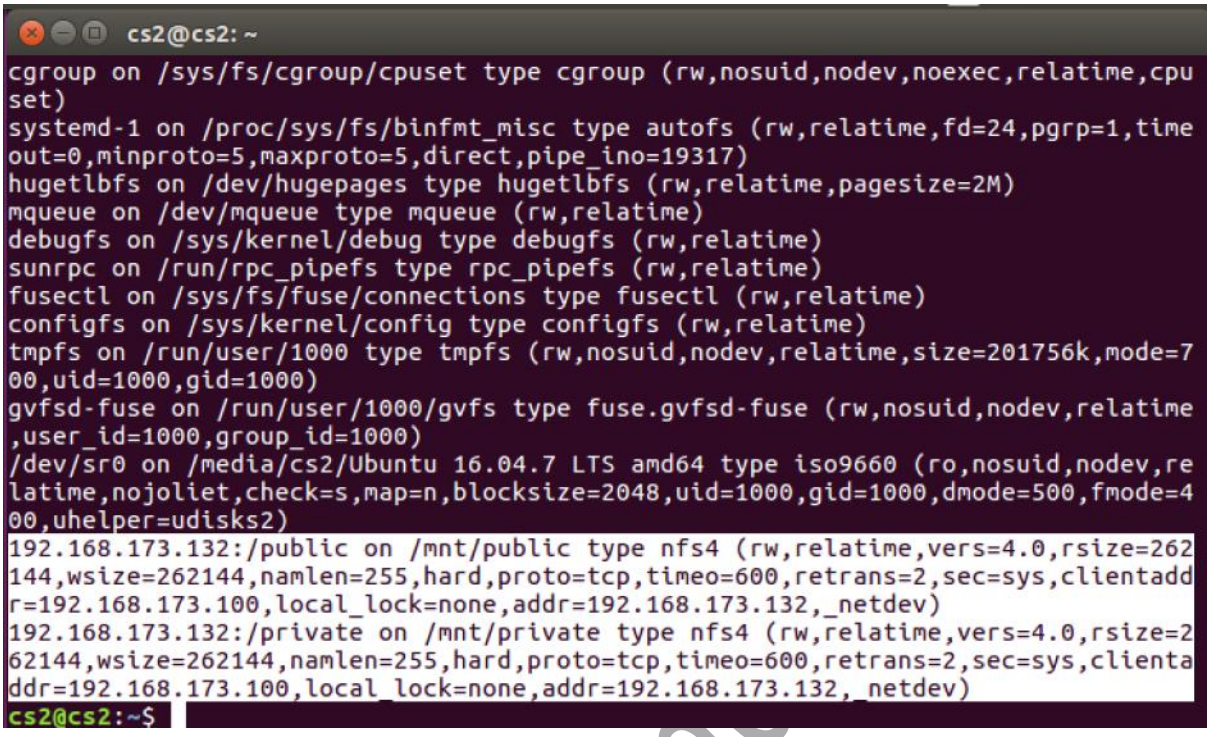

cs2@cs2: ~
cs2@cs2:~$ sudo umount /mnt/public
cs2@cs2:~$ sudo umount /mnt/private
cs2@cs2:~$

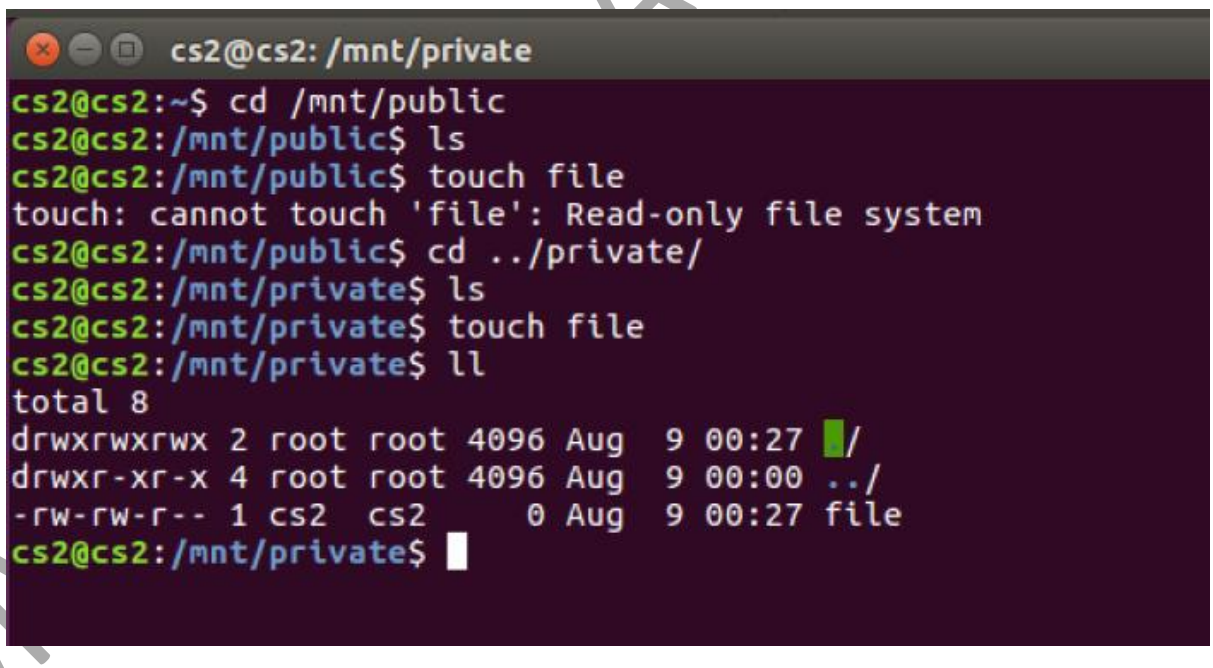
Execute mount command





After executing mount command:


cs2@cs2: ~
cgroup on /sys/fs/cgroup/cpuset type cgroup (rw,nosuid,nodev,noexec,relatime,cpuset)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs (rw,relatime,fd=24,pgrp=1,timeout=0,minproto=5,maxproto=5,direct,pipe_ino=19317)
hugetlbfs on /dev/hugepages type hugetlbfs (rw,relatime,pagesize=2M)
mqueue on /dev/mqueue type mqueue (rw,relatime)
debugfs on /sys/kernel/debug type debugfs (rw,relatime)
sunrpc on /run/rpc_pipefs type rpc_pipefs (rw,relatime)
fusectl on /sys/fs/fuse/connections type fusectl (rw,relatime)
configfs on /sys/kernel/config type configfs (rw,relatime)
tmpfs on /run/user/1000 type tmpfs (rw,nosuid,nodev,relatime,size=201756k,mode=700,uid=1000,gid=1000)
gvfsd-fuse on /run/user/1000/gvfs type fuse.gvfsd-fuse (rw,nosuid,nodev,relatime,user_id=1000,group_id=1000)
/dev/sr0 on /media/cs2/Ubuntu 16.04.7 LTS amd64 type iso9660 (ro,nosuid,nodev,relatime,nojoliet,check=s,map=n,blocksize=2048,uid=1000,gid=1000,dmode=500,fmode=400,uhelper=udisks2)
192.168.173.132:/public on /mnt/public type nfs4 (rw,relatime,vers=4.0,rsize=262144,wsize=262144,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=192.168.173.100,local_lock=none,addr=192.168.173.132,_netdev)
192.168.173.132:/private on /mnt/private type nfs4 (rw,relatime,vers=4.0,rsize=262144,wsize=262144,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=192.168.173.100,local_lock=none,addr=192.168.173.132,_netdev)
cs2@cs2:~$


cs2@cs2: /mnt/private
cs2@cs2:~$ cd /mnt/public
cs2@cs2:/mnt/public$ ls
cs2@cs2:/mnt/public$ touch file
touch: cannot touch 'file': Read-only file system
cs2@cs2:/mnt/public$ cd ../private/
cs2@cs2:/mnt/private$ ls
cs2@cs2:/mnt/private$ touch file
cs2@cs2:/mnt/private$ ll
total 8
drwxrwxrwx 2 root root 4096 Aug 9 00:27 ./
drwxr-xr-x 4 root root 4096 Aug 9 00:00 ../
-rw-rw-r-- 1 cs2 cs2 0 Aug 9 00:27 file
cs2@cs2:/mnt/private$