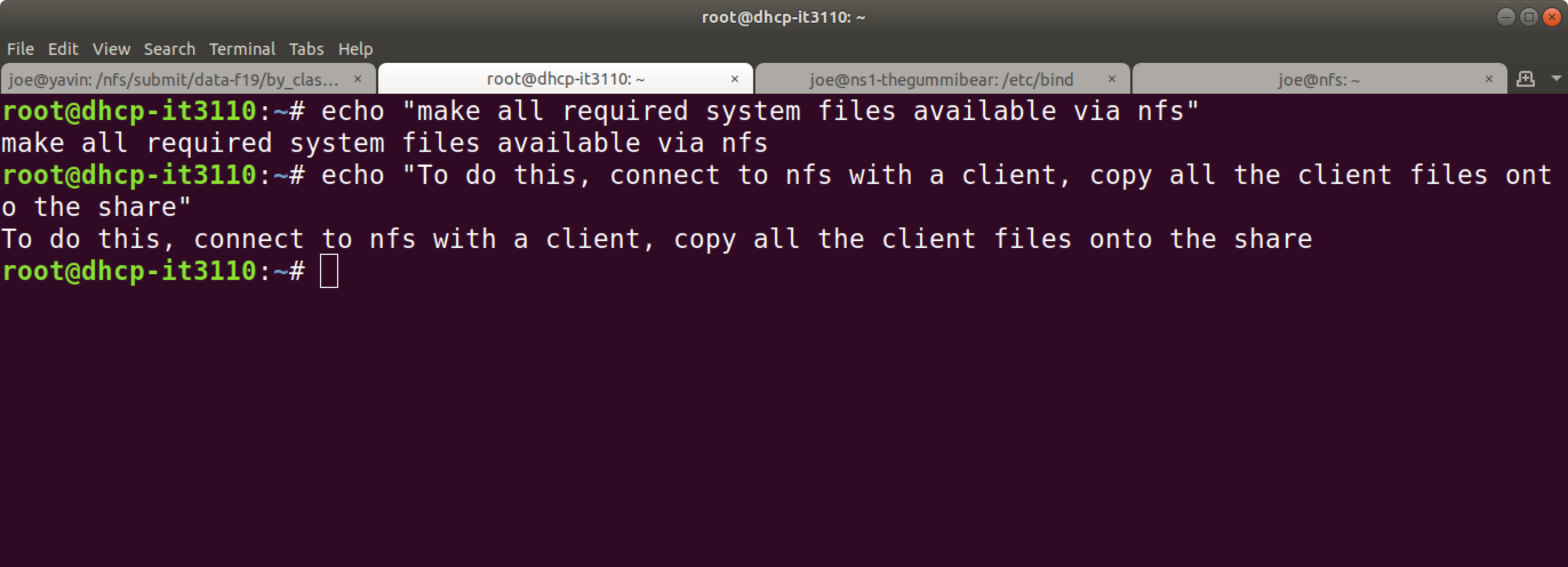
```
root@dhcp-it3110:~# echo "Create a ram disk for pxe clients to load"
Create a ram disk for pxe clients to load
root@dhcp-it3110:~# cp /etc/initramfs-tools/initramfs.conf /etc/initramfs-tools/initramfs.conf.0
root@dhcp-it3110:~# echo "Don't lose that backup file"
Don't lose that backup file
root@dhcp-it3110:~# vi /etc/initramfs-tools/initramfs.conf
```

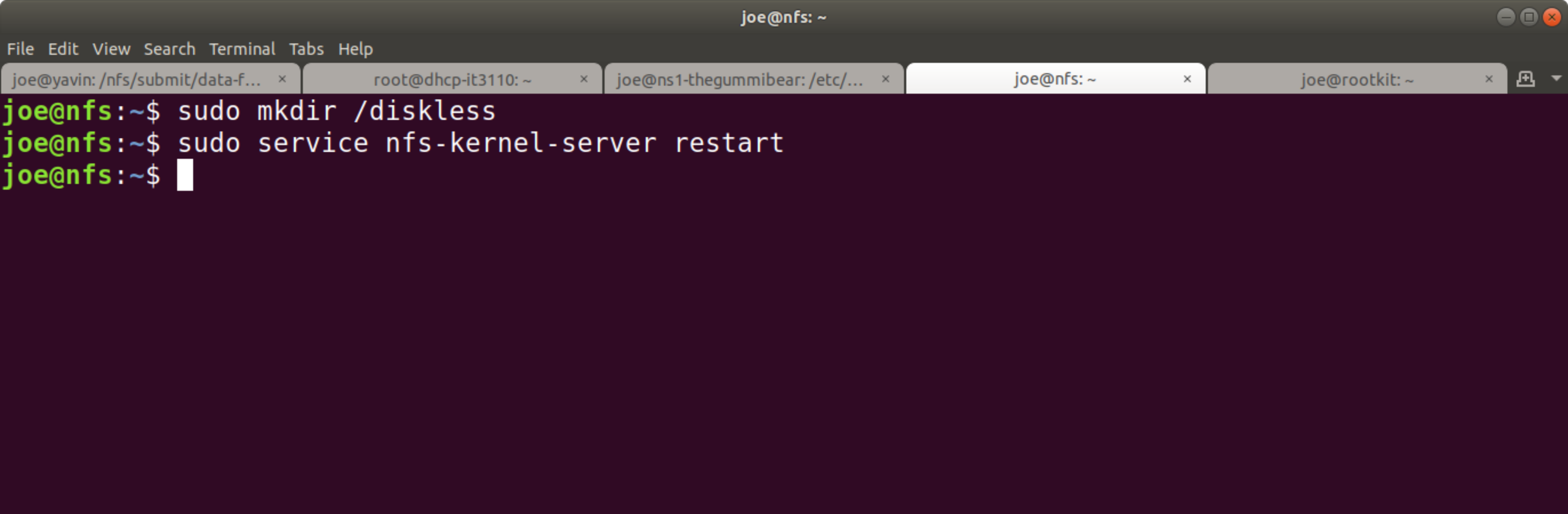
```
#
# initramfs.conf
# Configuration file for mkinitramfs(8). See initramfs.conf(5).
#
# Note that configuration options from this file can be overridden
# by config files in the /etc/initramfs-tools/conf.d directory.

#
# MODULES: [ most | netboot | dep | list ]
#
# most - Add most filesystem and all harddrive drivers.
#
# dep - Try and guess which modules to load.
#
# netboot - Add the base modules, network modules, but skip block devices.
#
# list - Only include modules from the 'additional modules' list
#

MODULES=netboot
BOOT=nfs

#
# BUSYBOX: [ y | n | auto ]
#
# Use busybox shell and utilities.  If set to n, klibc utilities will be used.
# If set to auto (or unset), busybox will be used if installed and klibc will
# be used otherwise.
"/etc/initramfs-tools/initramfs.conf" 74 lines, 1658 characters written
```

```
COMPCACHE_SIZE=""

#
# COMPRESS: [ gzip | bzip2 | lzma | lzop | xz ]
#

COMPRESS=gzip

#
# NFS Section of the config.
#

#
# DEVICE: ...
#
# Specify a specific network interface, like eth0
# Overridden by optional ip= bootarg
#

#see what your network device is called before editing this
DEVICE=ens18

#
# NFSROOT: [ auto | HOST:MOUNT ]
#

NFSROOT=auto
"/etc/initramfs-tools/initramfs.conf" 75 lines, 1723 characters written
```

```
root@dhcp-it3110:~# mkdir /var/lib/tftpboot/diskless1
root@dhcp-it3110:~# mkinitramfs -o /var/lib/tftpboot/diskless1/initrd.img
root@dhcp-it3110:~# echo "That created our initial ram disk"
That created our initial ram disk
root@dhcp-it3110:~# cp /boot/vmlinuz-`uname -r` /var/lib/tftpboot/diskless1/vmlinuz
```

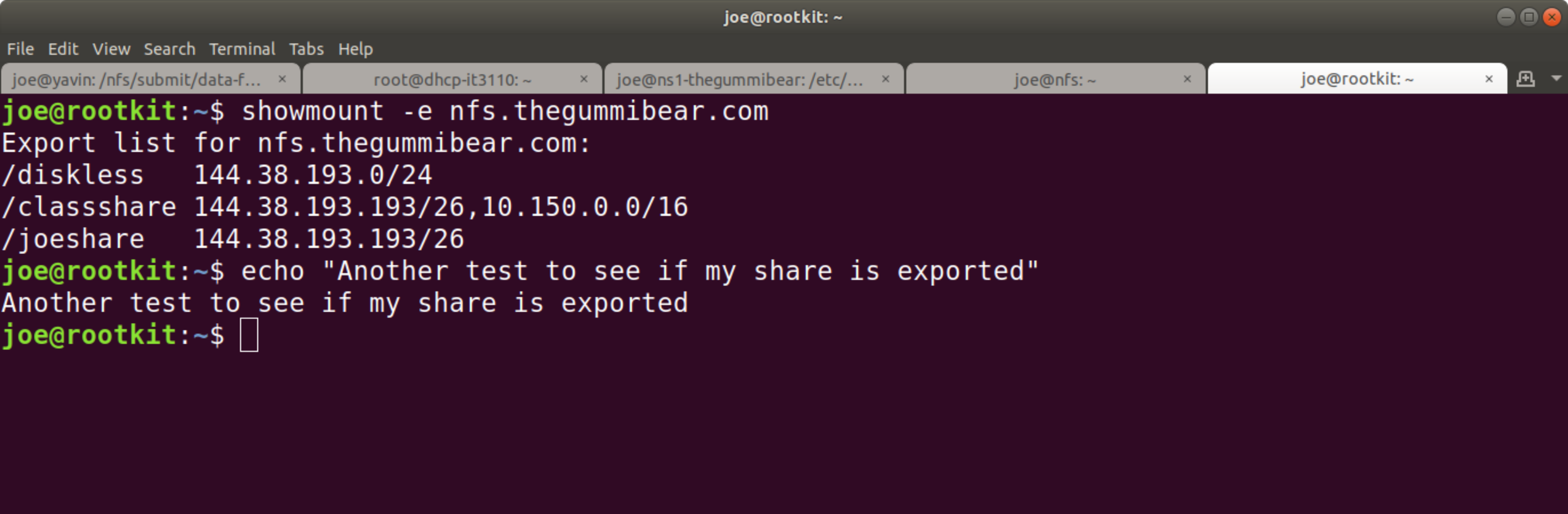

root@dhcp-it3110: ~
File Edit View Search Terminal Tabs Help
joe@yavin: /nfs/submit/data-f19/by_clas...
root@dhcp-it3110: ~
joe@ns1-thegummibear: /etc/bind
joe@nfs: ~
root@dhcp-it3110:~# echo "make all required system files available via nfs"
make all required system files available via nfs
root@dhcp-it3110:~# echo "To do this, connect to nfs with a client, copy all the client files ont
o the share"
To do this, connect to nfs with a client, copy all the client files onto the share
root@dhcp-it3110:~#

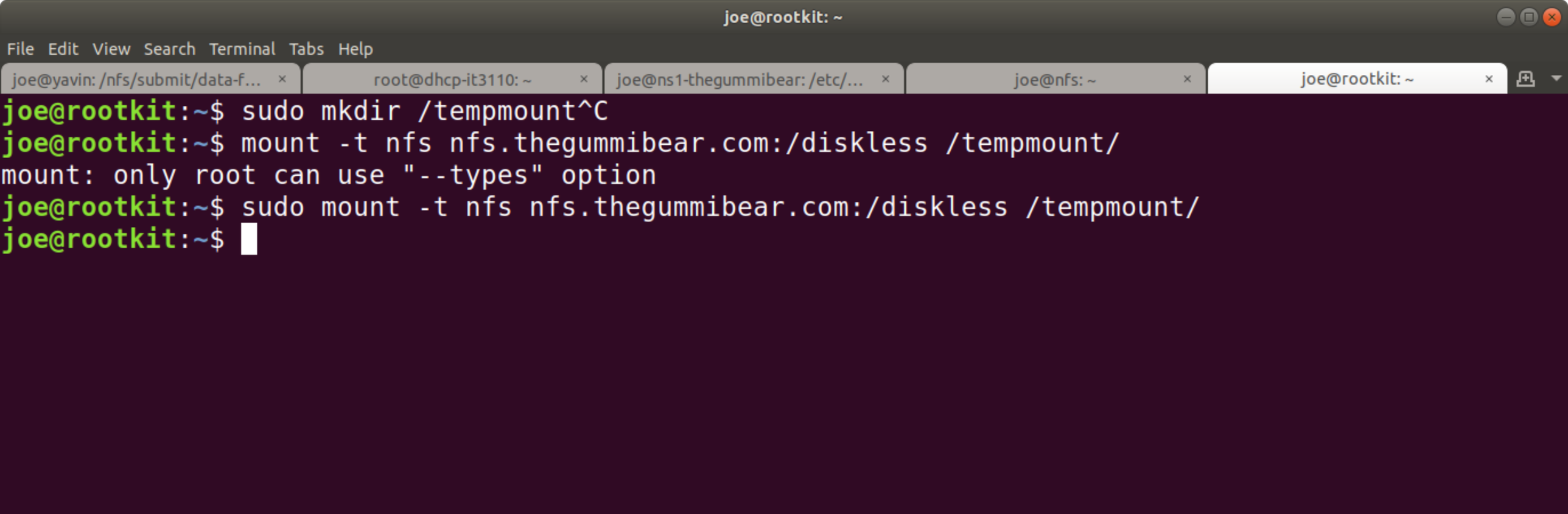
```
# /etc/exports: the access control list for filesystems which may be exported
#               to NFS clients.  See exports(5).
#
# Example for NFSv2 and NFSv3:
# /srv/homes       hostname1(rw,sync,no_subtree_check) hostname2(ro,sync,no_subtree_check)
#
# Example for NFSv4:
# /srv/nfs4        gss/krb5i(rw,sync,fsid=0,crossmnt,no_subtree_check)
# /srv/nfs4/homes  gss/krb5i(rw,sync,no_subtree_check)
#

/joeshare         144.38.193.193/26(rw,sync,no_subtree_check)
/classshare       10.150.0.0/16(ro)
/classshare       144.38.193.193/26(ro)

#added for diskless boot
/diskless         144.38.193.0/24(rw,sync,no_subtree_check,no_root_squash)
~
~
~
~
~
~
~
~
~
~
~
~
"/etc/exports" 17 lines, 621 characters written
```

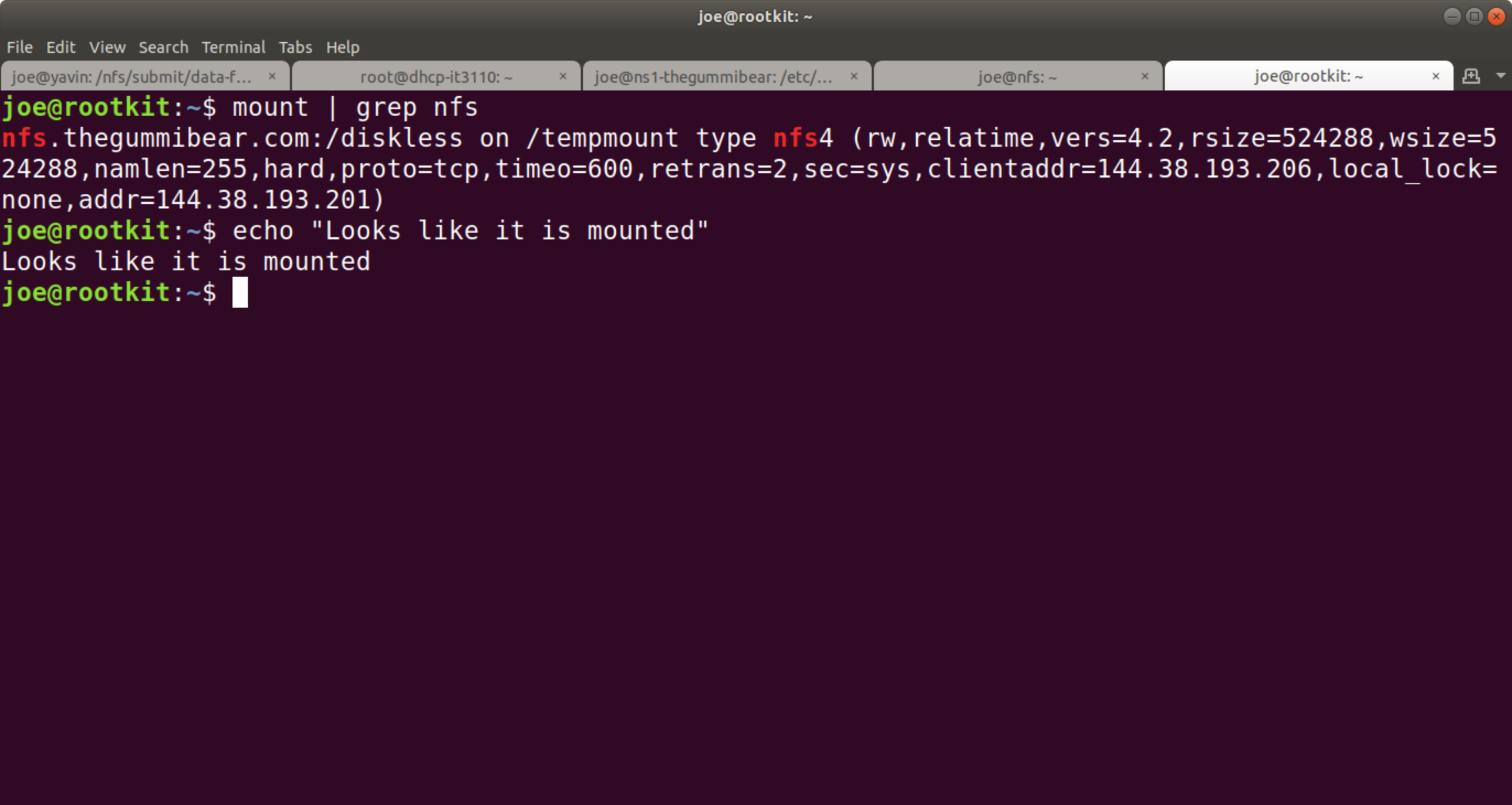

joe@nfs: ~
File Edit View Search Terminal Tabs Help
joe@yavin: /nfs/submit/data-f...
root@dhcp-it3110: ~
joe@ns1-thegummibear: /etc/...
joe@nfs: ~
joe@rootkit: ~
joe@nfs:~$ sudo mkdir /diskless
joe@nfs:~$ sudo service nfs-kernel-server restart
joe@nfs:~$

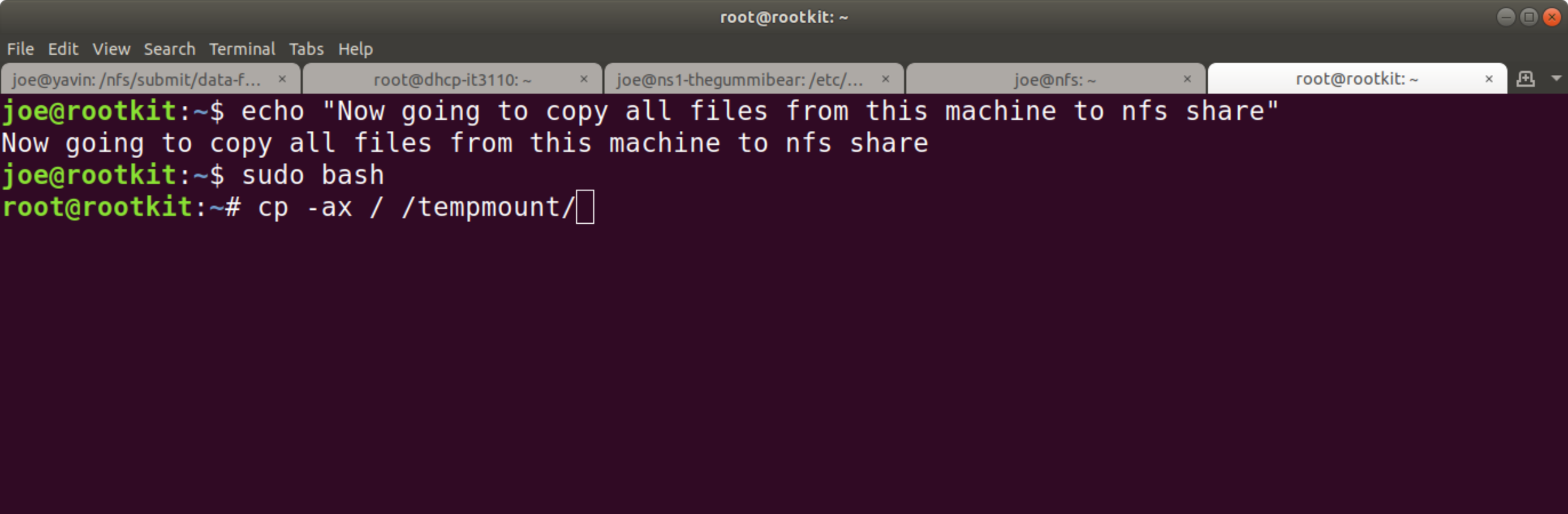
```
joe@rootkit:~$ ls
joe@rootkit:~$ echo "You can pick ANY machine to be your NFS client"
You can pick ANY machine to be your NFS client
joe@rootkit:~$ sudo apt install nfs-common
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  keyutils libevent-2.1-6 libnfsidmap2 libtirpc1 rpcbind
Suggested packages:
  open-iscsi watchdog
The following NEW packages will be installed:
  keyutils libevent-2.1-6 libnfsidmap2 libtirpc1 nfs-common rpcbind
0 upgraded, 6 newly installed, 0 to remove and 81 not upgraded.
Need to get 530 kB of archives.
After this operation, 1,737 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

```
joe@rootkit:~$ showmount -e nfs.thegummibear.com
Export list for nfs.thegummibear.com:
/diskless   144.38.193.0/24
/classshare 144.38.193.193/26,10.150.0.0/16
/joeshare   144.38.193.193/26
joe@rootkit:~$
```


joe@rootkit: ~
File Edit View Search Terminal Tabs Help
joe@yavin: /nfs/submit/data-f...
root@dhcp-it3110: ~
joe@ns1-thegummibear: /etc/...
joe@nfs: ~
joe@rootkit: ~
joe@rootkit:~$ showmount -e nfs.thegummibear.com
Export list for nfs.thegummibear.com:
/diskless 144.38.193.0/24
/classshare 144.38.193.193/26,10.150.0.0/16
/joeshare 144.38.193.193/26
joe@rootkit:~$ echo "Another test to see if my share is exported"
Another test to see if my share is exported
joe@rootkit:~$


joe@rootkit: ~
File Edit View Search Terminal Tabs Help
joe@yavin: /nfs/submit/data-f...
root@dhcp-it3110: ~
joe@ns1-thegummibear: /etc/...
joe@nfs: ~
joe@rootkit: ~
joe@rootkit:~$ sudo mkdir /tempmount^C
joe@rootkit:~$ mount -t nfs nfs.thegummibear.com:/diskless /tempmount/
mount: only root can use "--types" option
joe@rootkit:~$ sudo mount -t nfs nfs.thegummibear.com:/diskless /tempmount/
joe@rootkit:~$


joe@rootkit: ~
File Edit View Search Terminal Tabs Help
joe@yavin: /nfs/submit/data-f...
root@dhcp-it3110: ~
joe@ns1-thegummibear: /etc/...
joe@nfs: ~
joe@rootkit: ~
joe@rootkit:~$ mount | grep nfs
nfs.thegummibear.com:/diskless on /tempmount type nfs4 (rw,relatime,vers=4.2,rsize=524288,wsize=524288,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=144.38.193.206,local_lock=none,addr=144.38.193.201)
joe@rootkit:~$ echo "Looks like it is mounted"
Looks like it is mounted
joe@rootkit:~$


root@rootkit: ~
File Edit View Search Terminal Tabs Help
joe@yavin: /nfs/submit/data-f...
root@dhcp-it3110: ~
joe@ns1-thegummibear: /etc/...
joe@nfs: ~
root@rootkit: ~
joe@rootkit:~$ echo "Now going to copy all files from this machine to nfs share"
Now going to copy all files from this machine to nfs share
joe@rootkit:~$ sudo bash
root@rootkit:~# cp -ax / /tempmount/

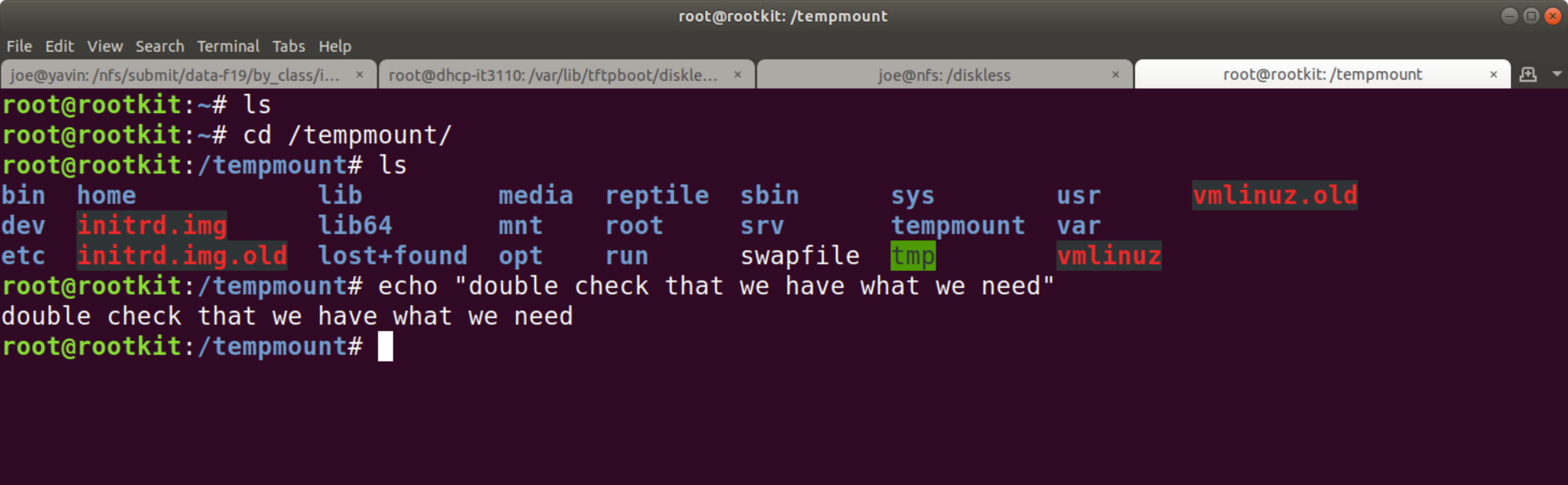
```
root@dhcp-it3110:~# echo "Go back and put your initram file back in correct location"
Go back and put your initram file back in correct location
root@dhcp-it3110:~# cp /etc/initramfs-tools/initramfs.conf.0 /etc/initramfs-tools/initramfs.conf
root@dhcp-it3110:~#
```

```
# D-I config version 2.0
# search path for the c32 support libraries (libcom32, libutil etc.)
path ubuntu-installer/amd64/boot-screens/
include ubuntu-installer/amd64/boot-screens/menu.cfg
default ubuntu-installer/amd64/boot-screens/vesamenu.c32
#prompt 0
timeout 10
label ubuntu
  menu default
  menu label ubuntu
  kernel ubuntu-installer/amd64/linux
  append ks=https://gist.githubusercontent.com/funzoneq/d77369203ea447dc3cc2/raw/9c494980ca877683
e3db7643fa5934f1aed55be8/ubuntu.ks vga=normal initrd=ubuntu-installer/amd64/initrd.gz ramdisk_siz
e=16432 root=/dev/rd/0 rw --
label debian
  menu default
  menu label debian
  kernel debian-installer/amd64/linux
  append vga=normal initrd=debian-installer/amd64/initrd.gz ramdisk_size=16432 root=/dev/rd/0 rw
--
~
~
~
~
~
~
~
~
~
~
"pxelinux.cfg/default" 17 lines, 762 characters
```

```
# D-I config version 2.0
# search path for the c32 support libraries (libcom32, libutil etc.)
path ubuntu-installer/amd64/boot-screens/
include ubuntu-installer/amd64/boot-screens/menu.cfg
default ubuntu-installer/amd64/boot-screens/vesamenu.c32
#prompt 0
timeout 10
label ubuntu
  menu default
  menu label ubuntu
  kernel ubuntu-installer/amd64/linux
  append ks=https://gist.githubusercontent.com/funzoneq/d77369203ea447dc3cc2/raw/9c494980ca877683e3db76
43fa5934f1aed55be8/ubuntu.ks vga=normal initrd=ubuntu-installer/amd64/initrd.gz ramdisk_size=16432 root
=/dev/rd/0 rw --
label debian
  menu default
  menu label debian
  kernel debian-installer/amd64/linux
  append vga=normal initrd=debian-installer/amd64/initrd.gz ramdisk_size=16432 root=/dev/rd/0 rw --
label diskless
  kernel diskless1/vmlinuz
  append root=/dev/nfs initrd=diskless1/initrd.img nfsroot=144.38.193.201:/diskless ip=dhcp rw
~
~
~
~
~
~
~
"pxelinux.cfg/default" 20 lines, 899 characters
```

```
root@dhcp-it3110:/var/lib/tftpboot# cd diskless1/
root@dhcp-it3110:/var/lib/tftpboot/diskless1# ls
initrd.img  vmlinuz
root@dhcp-it3110:/var/lib/tftpboot/diskless1# ls -la
total 37424
drwxr-xr-x 2 root root     4096 Jan 27 11:29 .
drwxrwxr-x 4 root root     4096 Jan 27 11:28 ..
-rw-r--r-- 1 root root 30008670 Jan 27 11:29 initrd.img
-rw------- 1 root root  8302232 Jan 27 11:29 vmlinuz
root@dhcp-it3110:/var/lib/tftpboot/diskless1# echo "Maybe fix some permissions"
Maybe fix some permissions
root@dhcp-it3110:/var/lib/tftpboot/diskless1# chmod 644 *
root@dhcp-it3110:/var/lib/tftpboot/diskless1#
```

```
cp: cannot create directory '/tempmount/boot': Permission denied
cp: preserving times for '/tempmount/': Permission denied
joe@rootkit:~$
joe@rootkit:~$ echo "Now going to copy all files from this machine to nfs share"
Now going to copy all files from this machine to nfs share
joe@rootkit:~$ sudo bash
root@rootkit:~# cp -ax / /tempmount/
cp: preserving permissions for ‘/tempmount/var/log/journal/5222d50469bb4fa996c3085874a87018/system@5b04
90c4355540a1a9b1033a552e4c0a-0000000000000001-0005902a79a08571.journal’: Operation not supported
cp: preserving permissions for ‘/tempmount/var/log/journal/5222d50469bb4fa996c3085874a87018/system@5b04
90c4355540a1a9b1033a552e4c0a-00000000000005cc-00059ca905912418.journal’: Operation not supported
cp: preserving permissions for ‘/tempmount/var/log/journal/5222d50469bb4fa996c3085874a87018/user-1000@2
4dbef2ad29b4162adee56520de8119a-00000000000002ce-0005902a7a91d658.journal’: Operation not supported
cp: preserving permissions for ‘/tempmount/var/log/journal/5222d50469bb4fa996c3085874a87018/system.jour
nal’: Operation not supported
cp: preserving permissions for ‘/tempmount/var/log/journal/5222d50469bb4fa996c3085874a87018/user-1000.j
ournal’: Operation not supported
cp: preserving permissions for ‘/tempmount/var/log/journal/5222d50469bb4fa996c3085874a87018’: Operation
 not supported
cp: preserving permissions for ‘/tempmount/var/log/journal’: Operation not supported



^C
root@rootkit:~# echo "I hope my copy is done"
I hope my copy is done
root@rootkit:~#
```


root@rootkit: /tempmount
File Edit View Search Terminal Tabs Help
joe@yavin: /nfs/submit/data-f19/by_class/i...
root@dhcp-it3110: /var/lib/tftpboot/diskle...
joe@nfs: /diskless
root@rootkit: /tempmount
root@rootkit:~# ls
root@rootkit:~# cd /tempmount/
root@rootkit:/tempmount# ls
bin home lib media reptile sbin sys usr vmlinuz.old
dev initrd.img lib64 mnt root srv tempmount var
etc initrd.img.old lost+found opt run swapfile tmp vmlinuz
root@rootkit:/tempmount# echo "double check that we have what we need"
double check that we have what we need
root@rootkit:/tempmount#

```
root@rootkit:/tempmount# ls dev/
root@rootkit:/tempmount# cp -ax /dev/* dev/
cp: preserving permissions for ‘dev/sg0’: Operation not supported
cp: preserving permissions for ‘dev/snd/timer’: Operation not supported
cp: preserving permissions for ‘dev/snd/seq’: Operation not supported
cp: preserving permissions for ‘dev/sr0’: Operation not supported
```

```
bin   home            lib         media   reptile  sbin      sys       usr      vmlinuz.old
dev   initrd.img      lib64       mnt     root     srv       tempmount var
etc   initrd.img.old  lost+found  opt     run      swapfile  tmp       vmlinuz
root@rootkit:/tempmount# ls dev/
autofs           input                psaux     tty13  tty35  tty57     ttyS2   vcs
block            kmsg                 ptmx      tty14  tty36  tty58     ttyS20  vcs1
bsg              lightnvm             pts       tty15  tty37  tty59     ttyS21  vcs2
btrfs-control    log                  random    tty16  tty38  tty6      ttyS22  vcs3
bus              loop0                rfkill    tty17  tty39  tty60     ttyS23  vcs4
cdrom            loop1                rtc       tty18  tty4   tty61     ttyS24  vcs5
char             loop2                rtc0      tty19  tty40  tty62     ttyS25  vcs6
console          loop3                sda       tty2   tty41  tty63     ttyS26  vcsa
core             loop4                sda1      tty20  tty42  tty7      ttyS27  vcsa1
cpu_dma_latency  loop5                sg0       tty21  tty43  tty8      ttyS28  vcsa2
cuse             loop6                sg1       tty22  tty44  tty9      ttyS29  vcsa3
disk             loop7                shm       tty23  tty45  ttyprintk ttyS3   vcsa4
dvd              loop-control         snapshot  tty24  tty46  ttyS0     ttyS30  vcsa5
ecryptfs         mapper               snd       tty25  tty47  ttyS1     ttyS31  vcsa6
fb0              mcelog               sr0       tty26  tty48  ttyS10    ttyS4   vfio
fd               mem                  stderr    tty27  tty49  ttyS11    ttyS5   vga_arbiter
full             memory_bandwidth     stdin     tty28  tty5   ttyS12    ttyS6   vhci
fuse             mqueue               stdout    tty29  tty50  ttyS13    ttyS7   vhost-net
hidraw0          net                  tty       tty3   tty51  ttyS14    ttyS8   vhost-vsock
hpet             network_latency      tty0      tty30  tty52  ttyS15    ttyS9   zero
hugepages        network_throughput   tty1      tty31  tty53  ttyS16    uhid
hwrng            null                 tty10     tty32  tty54  ttyS17    uinput
i2c-0            port                 tty11     tty33  tty55  ttyS18    urandom
initctl          ppp                  tty12     tty34  tty56  ttyS19    userio
root@rootkit:/tempmount#
```

```
root@nfs:/diskless# vi etc/fstab
```

root@nfs: /diskless

File Edit View Search Terminal Tabs Help

joe@yavin: /nfs/submit/data-f19/by_class/i... × | root@dhcp-it3110: /var/lib/tftpboot/diskle... × | root@nfs: /diskless × | root@rootkit: /tempmount ×

```
# /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=9babeace-ed9c-486e-a21d-7670e6b74046 /               ext4    errors=remount-ro 0       1
/swapfile                                 none            swap    sw              0       0
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
"etc/fstab" 10 lines, 550 characters
```

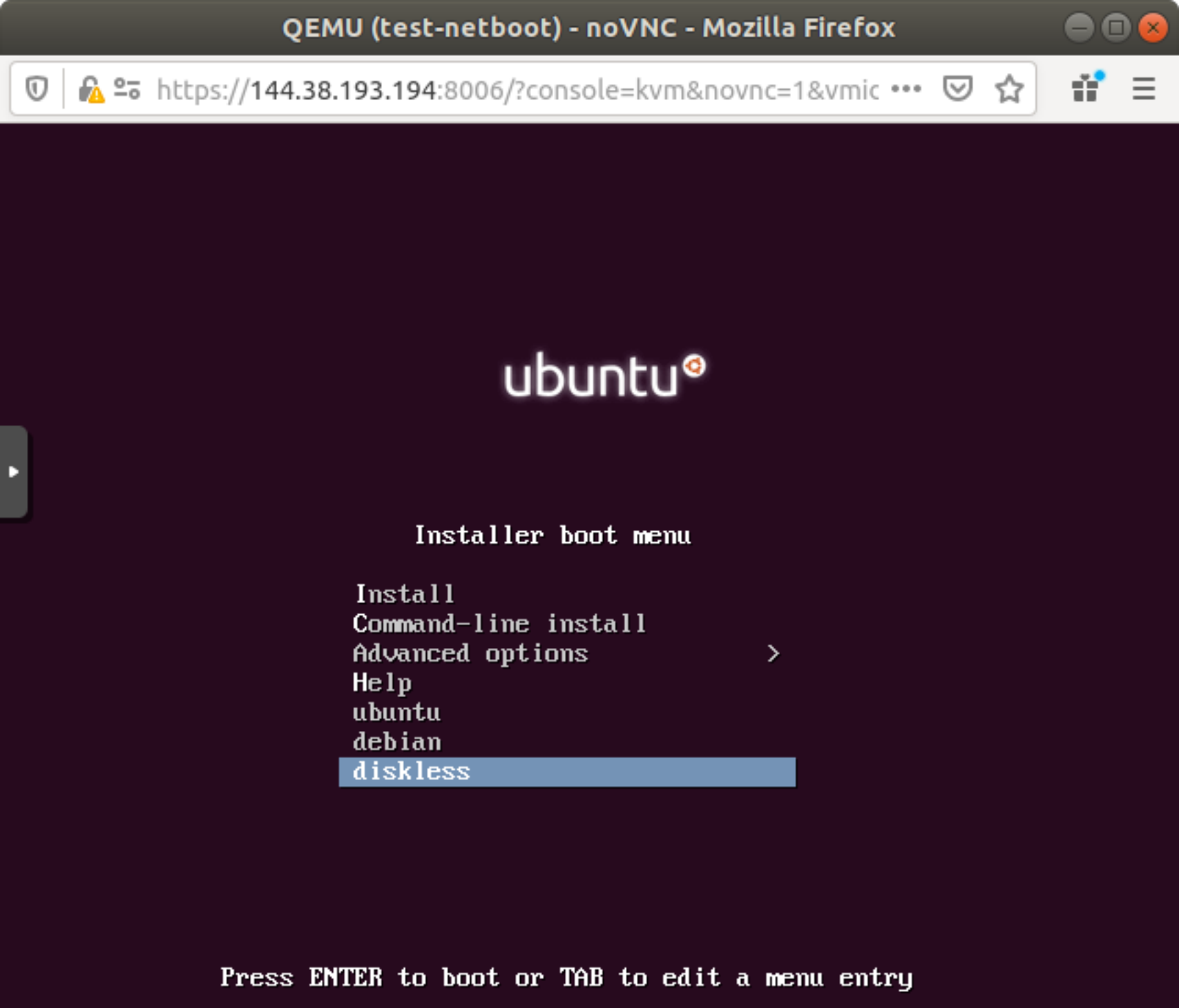
root@nfs: /diskless

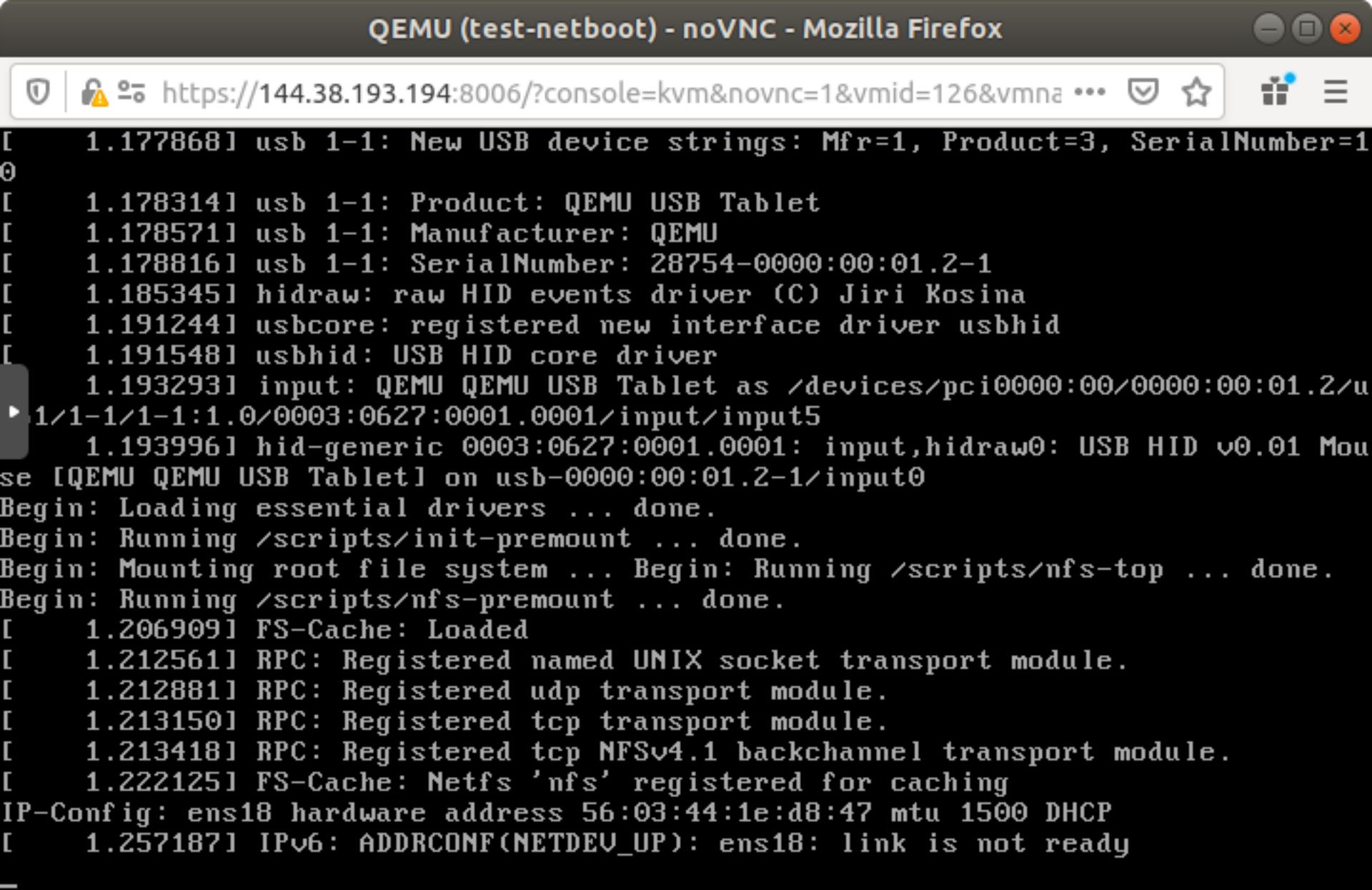
File Edit View Search Terminal Tabs Help

joe@yavin: /nfs/submit/da... | root@dhcp-it3110: /var/lib... | root@nfs: /diskless | joe@rootkit: ~ | joe@yavin: ~/Pictures/disk... | joe@yavin: ~/Pictures/disk...

```
#deleted everything
/dev/nfs        /       nfs     defaults        1       1
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
"etc/fstab" 2 lines, 48 characters written
```

root@nfs: /diskless
File Edit View Search Terminal Tabs Help
joe@yavin: /nfs/submit/data-f19/by_class/i...
root@dhcp-it3110: /var/lib/tftpboot/diskle...
root@nfs: /diskless
root@rootkit: /tempmount
root@nfs:/diskless# vi etc/fstab
root@nfs:/diskless# echo "now testboot a vm"
now testboot a vm
root@nfs:/diskless#


QEMU (test-netboot) - noVNC - Mozilla Firefox
https://144.38.193.194:8006/?console=kvm&novnc=1&vmic
ubuntu
Installer boot menu
Install
Command-line install
Advanced options >
Help
ubuntu
debian
diskless
Press ENTER to boot or TAB to edit a menu entry


QEMU (test-netboot) - noVNC - Mozilla Firefox
https://144.38.193.194:8006/?console=kvm&novnc=1&vmid=126&vmna
[1.177868] usb 1-1: New USB device strings: Mfr=1, Product=3, SerialNumber=1
0
[1.178314] usb 1-1: Product: QEMU USB Tablet
[1.178571] usb 1-1: Manufacturer: QEMU
[1.178816] usb 1-1: SerialNumber: 28754-0000:00:01.2-1
[1.185345] hidraw: raw HID events driver (C) Jiri Kosina
[1.191244] usbcore: registered new interface driver usbhid
[1.191548] usbhid: USB HID core driver
[1.193293] input: QEMU QEMU USB Tablet as /devices/pci0000:00/0000:00:01.2/u
sb1/1-1/1-1:1.0/0003:0627:0001.0001/input/input5
[1.193996] hid-generic 0003:0627:0001.0001: input,hidraw0: USB HID v0.01 Mou
se [QEMU QEMU USB Tablet] on usb-0000:00:01.2-1/input0
Begin: Loading essential drivers ... done.
Begin: Running /scripts/init-premount ... done.
Begin: Mounting root file system ... Begin: Running /scripts/nfs-top ... done.
Begin: Running /scripts/nfs-premount ... done.
[1.206909] FS-Cache: Loaded
[1.212561] RPC: Registered named UNIX socket transport module.
[1.212881] RPC: Registered udp transport module.
[1.213150] RPC: Registered tcp transport module.
[1.213418] RPC: Registered tcp NFSv4.1 backchannel transport module.
[1.222125] FS-Cache: Netfs 'nfs' registered for caching
IP-Config: ens18 hardware address 56:03:44:1e:d8:47 mtu 1500 DHCP
[1.257187] IPv6: ADDRCONF(NETDEV_UP): ens18: link is not ready


QEMU (test-netboot) - noVNC - Mozilla Firefox
https://144.38.193.194:8006/?console=kvm&novnc=1&vmid=126&vmna
Starting Network Name Resolution...
[FAILED] Failed to start Network Name Resolution.
See 'systemctl status systemd-resolved.service' for details.
[OK] Stopped Network Name Resolution.
[FAILED] Failed to start Network Name Resolution.
See 'systemctl status systemd-resolved.service' for details.
[OK] Reached target Host and Network Name Lookups.
[OK] Reached target Network.
AILED] Failed to start Network Time Synchronization.
e 'systemctl status systemd-timesyncd.service' for details.
OK] Stopped Network Time Synchronization.
[FAILED] Failed to start Network Time Synchronization.
See 'systemctl status systemd-timesyncd.service' for details.
[OK] Reached target System Initialization.
[OK] Listening on UUID daemon activation socket.
[OK] Listening on D-Bus System Message Bus Socket.
[OK] Reached target Sockets.
[OK] Reached target Basic System.
Starting System Logging Service...
Starting OpenBSD Secure Shell server...
Starting LSB: Record successful boot for GRUB...
Starting Accounts Service...
Starting Dispatcher daemon for systemd-networkd...
[OK] Started D-Bus System Message Bus.

```
root@nfs:/diskless# vi etc/fstab
root@nfs:/diskless# echo "now testboot a vm"
now testboot a vm
root@nfs:/diskless# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default 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: ens18: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 42:c2:21:fc:5a:c4 brd ff:ff:ff:ff:ff:ff
    inet 144.38.193.201/26 brd 144.38.193.255 scope global ens18
       valid_lft forever preferred_lft forever
    inet6 2001:1948:e10:2273:40c2:21ff:fefc:5ac4/64 scope global dynamic mngtmpaddr noprefixroute
       valid_lft 2591976sec preferred_lft 604776sec
    inet6 fe80::40c2:21ff:fefc:5ac4/64 scope link
       valid_lft forever preferred_lft forever
root@nfs:/diskless# ls
bin   home           lib         media  reptile  sbin      sys        usr      vmlinuz.old
dev   initrd.img     lib64       mnt    root     srv       tempmount  var
etc   initrd.img.old lost+found  opt    run      swapfile  tmp        vmlinuz
root@nfs:/diskless# vi etc/netplan/01-netcfg.yaml
root@nfs:/diskless# echo "Make sure the vm will boot dhcp"
Make sure the vm will boot dhcp
root@nfs:/diskless#
```