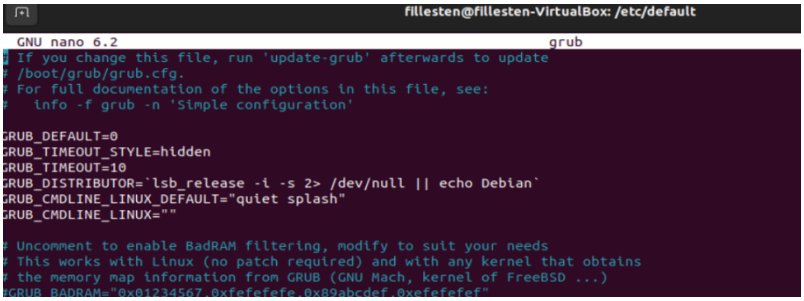
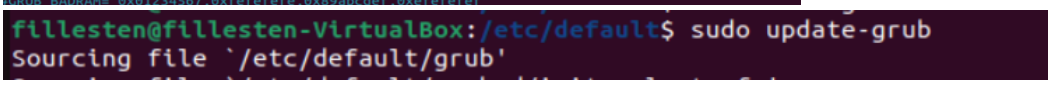
Administration av unix-lika system, Lab 3

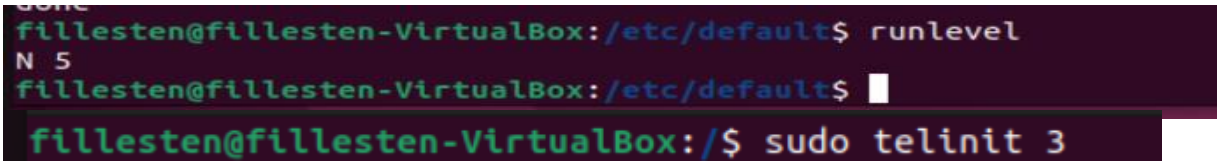
4.1 Bootprocess

4.1.1 Grub

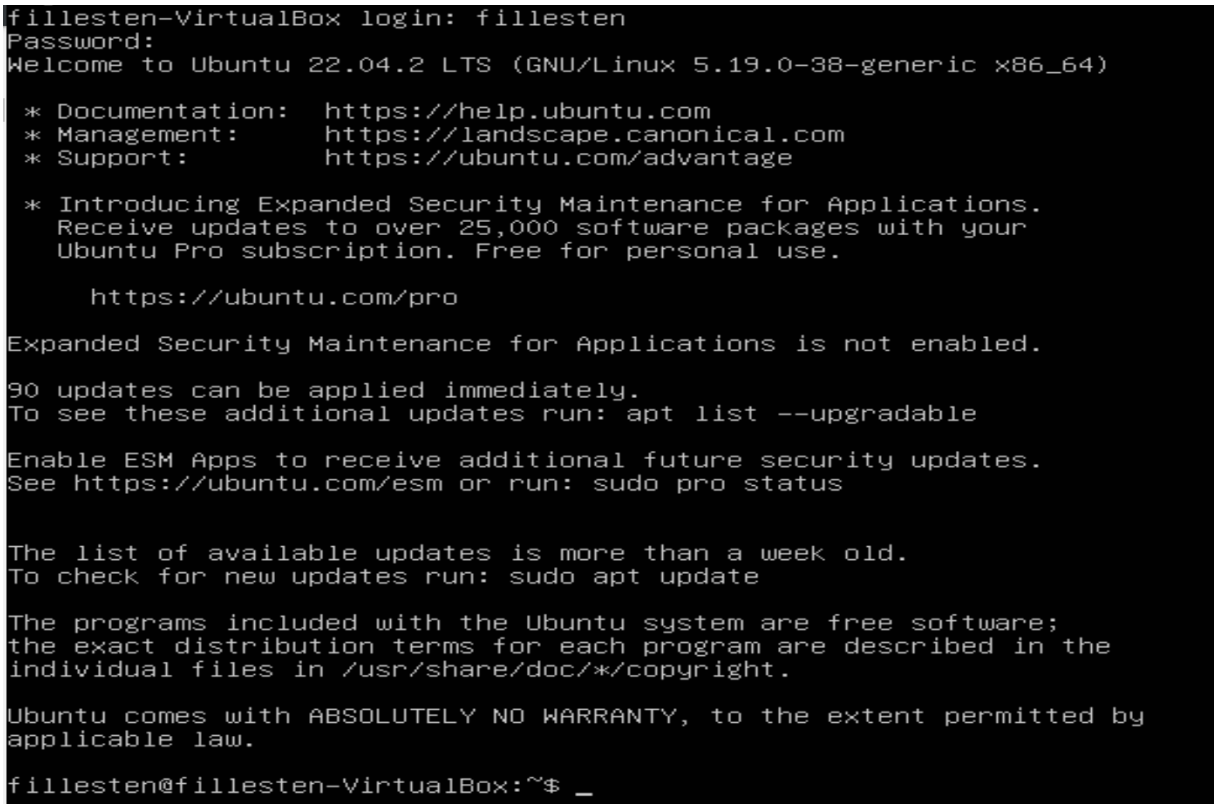




4.1.2 Runlevels



Startar denna vy.



- The links in /etc/rc?.d (range from 0-6, so for example /etc/rc4.d) to are symbolic links to scripts in /etc/init.d. They define which services start or stop in specific runlevels.

4.2 File System

I encountered a lot of errors here. These errors came about since when I created my ubuntu I never manually partitioned /dev/sda and instead automatically just installed everything. This led me to many errors on particularly 4 and later. I fixed this by adding a vdi from the virtualbox options.

1. Disk partition and free space: df, or use lsblk.

```
fillesten@fillesten-VirtualBox:/$ df
Filesystem     1K-blocks     Used Available Use% Mounted on
tmpfs             502700     1480    501220   1% /run
/dev/sda3       31790928 13890292  16260188  47% /
tmpfs            2513484        0   2513484   0% /dev/shm
tmpfs               5120        4      5116   1% /run/lock
/dev/sda2         524252     6220    518032   2% /boot/efi
tmpfs             502696      112    502584   1% /run/user/1000
/dev/sr0           51806    51806         0 100% /media/fillesten/VBox_GAs_7.0.6
/dev/sdb1       15046488       24  14260344   1% /dump
fillesten@fillesten-VirtualBox:/$
```

I took the screenshot after I did 4-9 because of my errors, that's why /dev/sdb1 is there and is mounted on /dump.

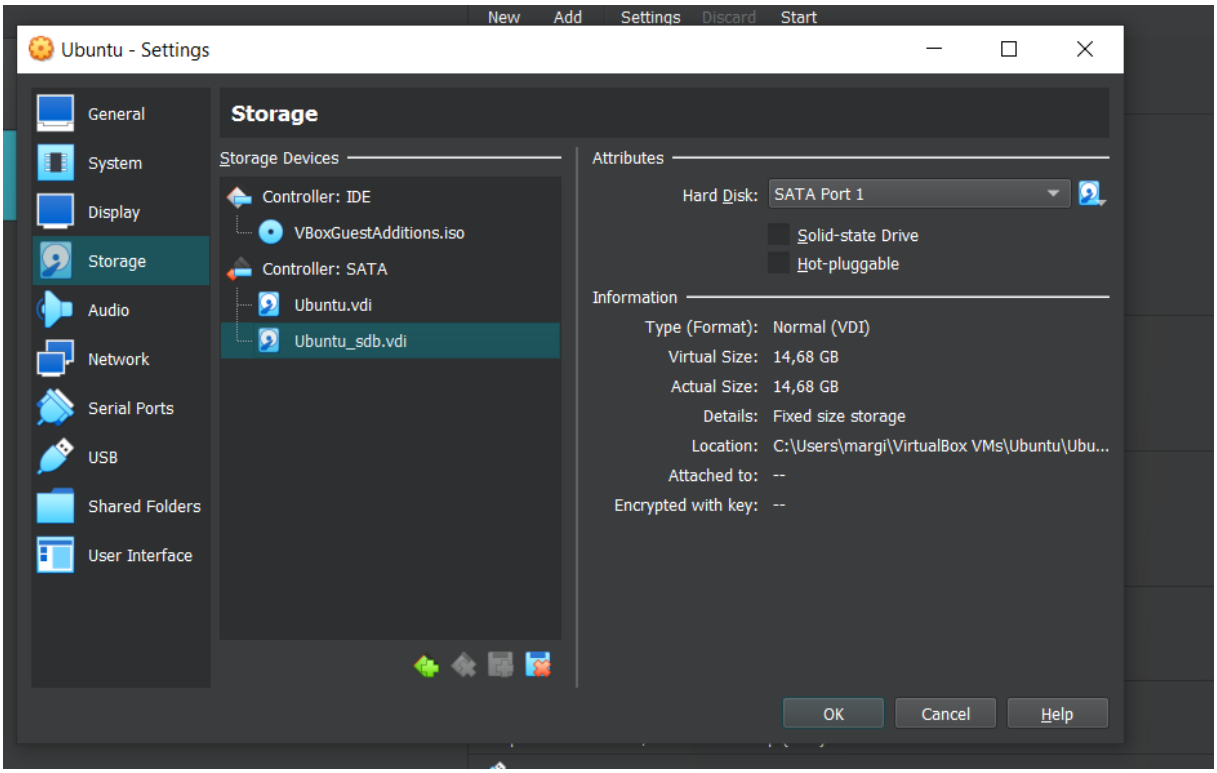
2. df -h, human readable.

```
fillesten@fillesten-VirtualBox:/$ df -h
Filesystem      Size  Used Avail Use% Mounted on
tmpfs           491M  1,5M  490M   1% /run
/dev/sda3        31G   14G   16G  47% /
tmpfs           2,4G     0  2,4G   0% /dev/shm
tmpfs           5,0M  4,0K  5,0M   1% /run/lock
/dev/sda2       512M  6,1M  506M   2% /boot/efi
tmpfs           491M  112K  491M   1% /run/user/1000
/dev/sr0         51M   51M     0 100% /media/fillesten/VBox_GAs_7.0.6
/dev/sdb1        15G   24K   14G   1% /dump
```

3. Desktop space, its high because I have a project containing large files from another course. If I move the files its around 4,0 k. Well, I crashed my first ubuntu I used for the lab so second screenshot is from the new ubuntu.

```
fillesten@fillesten-VirtualBox:/$ du -sh /home/fillesten/Desktop/
1,1M    /home/fillesten/Desktop/
fillesten@fillesten-VirtualBox:/$
fillesten@fillesten-VirtualBox:/$ sudo du -sh /home/fillesten/Desktop/
[sudo] password for fillesten:
4,0K    /home/fillesten/Desktop/
fillesten@fillesten-VirtualBox:/$
```

4. Crashed the system multiple times. I have crashed a lot of ubuntus now and all old screenshots of me doing 4.2, 4-9 are in either appendix A or B. I have given up on trying to show them in the right order, but all my work with failing filesystems and partitions are there. Trying this now:



Added an additional new hard disk drive, from the virtualbox options.
Here we see that I have 0 unpartitiononed space on my original harddrive.

```
loop10    7:10    0  53,3M  1 loop /snap/snapd/19457
loop11    7:11    0   452K  1 loop /snap/snapd-desktop-integration/83
sda       8:0     0  31,5G  0 disk
├─sda1    8:1     0     1M  0 part
├─sda2    8:2     0   513M  0 part /boot/efi
└─sda3    8:3     0    31G  0 part /var/snap/firefox/common/host-hunspell
                                  /
sdb       8:16    0  14,7G  0 disk
sr0      11:0     1  50,6M  0 rom  /media/fillesten/VBox_GAs_7.0.6
fillesten@fillesten-VirtualBox:/$ sudo fdisk /dev/sda

Welcome to fdisk (util-linux 2.37.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

This disk is currently in use - repartitioning is probably a bad idea.
It's recommended to umount all file systems, and swapoff all swap
partitions on this disk.


Command (m for help): F

Unpartitioned space /dev/sda: 0 B, 0 bytes, 0 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes

Command (m for help):
```

Sudo fdisk -l, to get this screenshot

```
Disk /dev/sda: 31,48 GiB, 33801388032 bytes, 66018336 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: FA51B2EA-6FF7-46BF-9793-BEEFF802FB7B

Device       Start      End  Sectors  Size Type
/dev/sda1     2048     4095     2048    1M BIOS boot
/dev/sda2     4096  1054719  1050624  513M EFI System
/dev/sda3  1054720 66017279 64962560   31G Linux filesystem


Disk /dev/sdb: 14,68 GiB, 15765291008 bytes, 30791584 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
```

Now for the actual partitioning…

```
fillesten@fillesten-VirtualBox:/$ sudo fdisk /dev/sdb
[sudo] password for fillesten:

Welcome to fdisk (util-linux 2.37.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0xfa347579.

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p):

Using default response p.
Partition number (1-4, default 1):
First sector (2048-30791583, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-30791583, default 30791583):

Created a new partition 1 of type 'Linux' and of size 14,7 GiB.

Command (m for help): p
Disk /dev/sdb: 14,68 GiB, 15765291008 bytes, 30791584 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xfa347579

Device     Boot Start      End  Sectors  Size Id Type
/dev/sdb1        2048 30791583 30789536 14,7G 83 Linux

Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.

fillesten@fillesten-VirtualBox:/$
```

5.

```
fillesten@fillesten-VirtualBox:/$ sudo mkfs.ext4 /dev/sdb1
mke2fs 1.46.5 (30-Dec-2021)
Creating filesystem with 3848692 4k blocks and 962880 inodes
Filesystem UUID: daf41225-62d6-447a-95f4-a5a2631e0385
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208

Allocating group tables: done
Writing inode tables: done
Creating journal (16384 blocks): done
Writing superblocks and filesystem accounting information: done

fillesten@fillesten-VirtualBox:/$
```

6. /dev/sda4: clean, shows file system is ok.

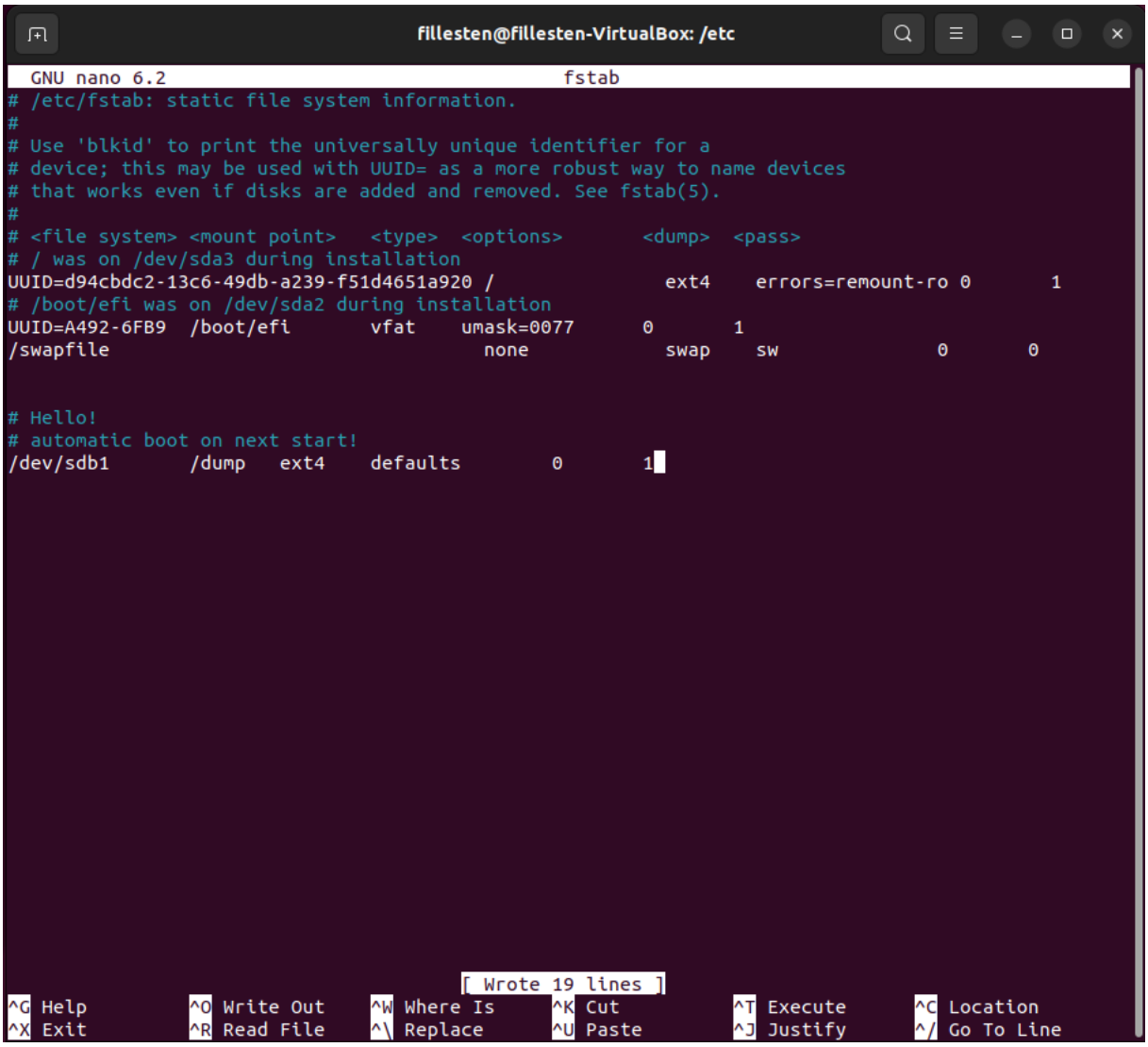
```
fillesten@fillesten-VirtualBox:/$ sudo fsck /dev/sdb1
fsck from util-linux 2.37.2
e2fsck 1.46.5 (30-Dec-2021)
/dev/sdb1: clean, 11/962880 files, 87076/3848692 blocks
fillesten@fillesten-VirtualBox:/$
```

7. See 8.
8. New mountpoint and mount new partition to /dump

```
fillesten@fillesten-VirtualBox:/$ ls
bin   cdrom  etc   lib    lib64   lost+found  mnt  proc  run   snap  swapfile  tmp  var
boot  dev    home  lib32  libx32  media       opt  root  sbin  srv   sys       usr
fillesten@fillesten-VirtualBox:/$ sudo mkdir dump
fillesten@fillesten-VirtualBox:/$ ls
bin   cdrom  dump  home  lib32  libx32      media  opt   root  sbin  srv       sys  usr
boot  dev    etc   lib   lib64  lost+found  mnt    proc  run   snap  swapfile  tmp  var
fillesten@fillesten-VirtualBox:/$ sudo mount /dev/sdb1 /dump
fillesten@fillesten-VirtualBox:/$ df -h
Filesystem      Size  Used Avail Use% Mounted on
tmpfs           491M  1,5M  490M   1% /run
/dev/sda3        31G   14G   16G  47% /
tmpfs           2,4G     0  2,4G   0% /dev/shm
tmpfs           5,0M  4,0K  5,0M   1% /run/lock
/dev/sda2       512M  6,1M  506M   2% /boot/efi
tmpfs           491M  112K  491M   1% /run/user/1000
/dev/sr0         51M   51M     0 100% /media/fillesten/VBox_GAs_7.0.6
/dev/sdb1        15G   24K   14G   1% /dump
fillesten@fillesten-VirtualBox:/$
```

9. fstab configuration.

```
fillesten@fillesten-VirtualBox:/etc$ sudo nano fstab
fillesten@fillesten-VirtualBox:/etc$
```



- See 2.
- See 3.
- See 4 and 5.
- See 9.
- Used the format they provided in comment.
  <file system> = the newly created file system, /dev/sda4
  <mount point> = the newly created mount point, /dump
  <type> = type of file system, I used ext4
  <options> I used default, defaults
  <dump> 0 means to not automatically backed up
  <pass> order to be checked during boot. 1 means first.

4.2.1 File-types and Links

1. File:

```
fillesten@fillesten-VirtualBox:/dev$ stat vcsu
  File: vcsu
fillesten@fillesten-VirtualBox:/etc/init.d$ stat ssh
  File: ssh
  Size: 4060            Blocks: 8          IO Block: 4096   regular file
Device: 803h/2051d      Inode: 527948      Links: 1
Access: (0755/-rwxr-xr-x)  Uid: (    0/    root)   Gid: (    0/    root)
Access: 2023-07-31 17:10:04.334873878 +0200
Modify: 2022-11-15 04:31:53.000000000 +0100
Change: 2023-07-31 17:10:01.230134284 +0200
 Birth: 2023-07-31 17:09:55.927628849 +0200
fillesten@fillesten-VirtualBox:/etc/init.d$
```

dev folder:

file in etc/init.d:

```
fillesten@fillesten-VirtualBox:/$ stat /dev
  File: /dev
  Size: 4280            Blocks: 0          IO Block: 4096   directory
Device: 5h/5d   Inode: 1           Links: 19
Access: (0755/drwxr-xr-x)  Uid: (    0/    root)   Gid: (    0/    root)
Access: 2023-10-19 13:39:27.886195749 +0200
Modify: 2023-10-19 11:41:26.494004633 +0200
Change: 2023-10-19 11:41:26.494004633 +0200
 Birth: 2023-10-19 10:32:46.449640664 +0200
fillesten@fillesten-VirtualBox:/$
```

etc/passwd file:

```
fillesten@fillesten-VirtualBox:/etc$ stat passwd
  File: passwd
  Size: 2990            Blocks: 8          IO Block: 4096   regular file
Device: 803h/2051d      Inode: 527961      Links: 1
Access: (0644/-rw-r--r--)  Uid: (    0/    root)   Gid: (    0/    root)
Access: 2023-10-19 12:44:43.816579536 +0200
Modify: 2023-07-31 17:10:04.271056320 +0200
Change: 2023-07-31 17:10:04.275044917 +0200
 Birth: 2023-07-31 17:10:04.271056320 +0200
fillesten@fillesten-VirtualBox:/etc$
```

2. Link within same file system

```
fillesten@fillesten-VirtualBox:/lab2$ sudo touch file1.txt
fillesten@fillesten-VirtualBox:/lab2$ ls
file1.txt
fillesten@fillesten-VirtualBox:/lab2$ cd ..
fillesten@fillesten-VirtualBox:/$
fillesten@fillesten-VirtualBox:/$ ln -s /lab2/file1.txt mylink
ln: failed to create symbolic link 'mylink': Permission denied
fillesten@fillesten-VirtualBox:/$ sudo ln -s /lab2/file1.txt mylink
fillesten@fillesten-VirtualBox:/$ ls
bin    clear_tmp.sh  etc   lib    libx32      mnt    proc  sbin  swapfile  tmp
boot   dev           home  lib32  lost+found  mylink root  snap  sys       usr
cdrom  dump          lab2  lib64  media       opt    run   srv   test.sh   var
```

```
    19 lrwxrwxrwx   1 root root   15 okt 19 13:54 mylink -> /lab2/file1.txt
```

```
fillesten@fillesten-VirtualBox:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  snap  Templates  Videos
fillesten@fillesten-VirtualBox:~$ sudo ln -s /lab2/file1.txt linkInUserDirectory
fillesten@fillesten-VirtualBox:~$ ls
Desktop    Downloads            Music     Public  Templates
Documents  linkInUserDirectory  Pictures  snap    Videos
fillesten@fillesten-VirtualBox:~$ cd ..
fillesten@fillesten-VirtualBox:/home$ c d..
c: command not found
fillesten@fillesten-VirtualBox:/home$ cd ..
fillesten@fillesten-VirtualBox:/$ ls
bin    clear_tmp.sh  etc   lib    libx32      mnt    proc  sbin  swapfile  tmp
boot   dev           home  lib32  lost+found  mylink root  snap  sys       usr
cdrom  dump          lab2  lib64  media       opt    run   srv   test.sh   var
fillesten@fillesten-VirtualBox:/$
```

link outside file system

3. Same File system:

```
fillesten@fillesten-VirtualBox:/lab2$ sudo ln file2.txt hardLinkSame
fillesten@fillesten-VirtualBox:/lab2$ ls
file1.txt  file2.txt  hardLinkSame
fillesten@fillesten-VirtualBox:/lab2$ nano hardLinkSame
fillesten@fillesten-VirtualBox:/lab2$ ls -l
total 8
-rw-r--r-- 1 root root 0 okt 19 13:53 file1.txt
-rw-r--r-- 3 root root 8 okt 19 15:23 file2.txt
-rw-r--r-- 3 root root 8 okt 19 15:23 hardLinkSame
fillesten@fillesten-VirtualBox:/lab2$ ls -lahir
total 16K
1048961 -rw-r--r--  3 root root    8 okt 19 15:23 hardLinkSame
1048961 -rw-r--r--  3 root root    8 okt 19 15:23 file2.txt
1048960 -rw-r--r--  1 root root    0 okt 19 13:53 file1.txt
      2 drwxr-xr-x 22 root root 4,0K okt 19 15:23 ..
1048959 drwxr-xr-x  2 root root 4,0K okt 19 15:26 .
fillesten@fillesten-VirtualBox:/lab2$
```

Other file system:

- Inodes contain: File size, file permissions, user and group ownership, timstamps (birth, change and access), number of hard links, file type and other meta data. They are a reference to the actual data blocks that store the file content.
- What where the difference between the different files you were running stat(1) on?

The difference between the files were: size, permissions, filetype, timestamps (birth, change and access) and the inode number.

- Theoretical discuss hard and soft links
    - Hard Link: A hard link is a reference to an inode in a file system. It creates multiple directory entries (file names) that point to the same inode. All hard links to the same inode are essentially the same file, and changes to one hard link are reflected in all others. Hard links do not have a separate data block and do not contain a path to the target file; they directly reference the inode. You also cannot create a hard link to an outside file system.
    - Symbolic Link: A symbolic link is a separate file that contains a path or URL pointing to the target file or directory. Symbolic links are essentially pointers or shortcuts to other files or directories. They can span across different file systems and even point to non-existent targets.

  I think of the difference between the links like references in C++ (because they pretty much are the same). A hard link in unix is a like a reference in C++ so if a function with inparameter int x is called with int y and x is taken as a reference any changes to x inside the function gets applied y.

- Practical difference:
    - Hard Link: Changes made to the target file are immediately reflected in all hard links because they all point to the same inode. Hard links are useful for creating multiple references to the same data without duplicating storage.
    - Soft Link: Symbolic links are separate files that reference the target file by its path. If the target file is moved or deleted, the symbolic link becomes broken and points to a non-existent target. Symbolic links provide flexibility to link to files in different locations and even across file systems.

- Different usage scenarios:
    - Hard Links: Hard links are commonly used for creating backups, version control systems, and when you want multiple directory entries to refer to the same physical data. They save storage space because the data is shared.
    - Symbolic Links: Symbolic links are useful for creating references to files or directories in different locations, like linking configuration files, providing easy access to frequently used files, and creating cross-file system references. They offer more flexibility and are often used in situations where the target may change or is not always available.

4.3 Users, Groups and Permissions

4.3.1 User and Groups

1.

```
fillesten@fillesten-VirtualBox:/etc/skel$ sudo mkdir NewUserFile.ssh
[sudo] password for fillesten:
fillesten@fillesten-VirtualBox:/etc/skel$ ls -a
.  ..  .bash_logout  .bashrc  NewUserFile.ssh  .profile
```

2. Donald worked fine.

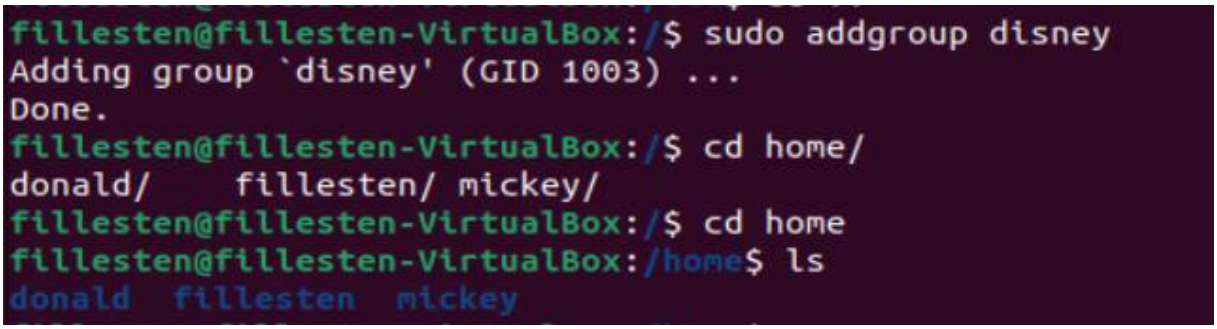
```
fillesten@fillesten-VirtualBox:/etc/skel$ sudo adduser donald
Adding user `donald' ...
Adding new group `donald' (1001) ...
Adding new user `donald' (1001) with group `donald' ...
Creating home directory `/home/donald' ...
Copying files from `/etc/skel' ...
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: password updated successfully
Changing the user information for donald
Enter the new value, or press ENTER for the default
        Full Name []: donald
        Room Number []: 1
        Work Phone []: 1234
        Home Phone []: 12345
        Other []: no
Is the information correct? [Y/n] y
```

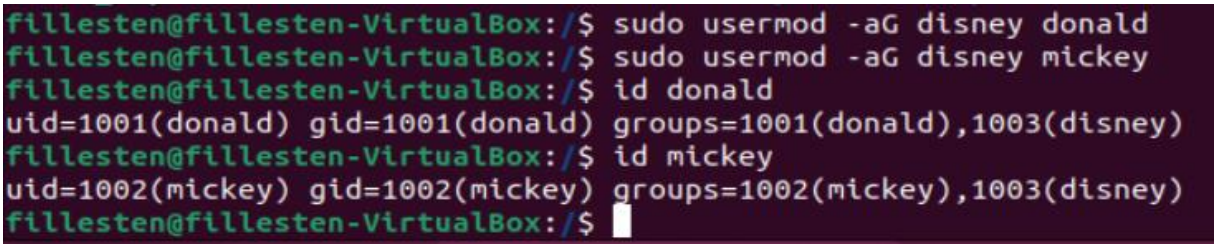
However for mickey I accidentally messed something up so had to remove some stuff and started over.

```
fillesten@fillesten-VirtualBox:/home$ ls
donald  fillesten  mickey
fillesten@fillesten-VirtualBox:/home$ mkrm mickey/
Command 'mkrm' not found, did you mean:
  command 'mkrc' from deb rcm (1.3.4-1)
Try: sudo apt install <deb name>
fillesten@fillesten-VirtualBox:/home$ sudo rm mickey/
[sudo] password for fillesten:
rm: cannot remove 'mickey/': Is a directory
fillesten@fillesten-VirtualBox:/home$ sudo rm -r mickey/
fillesten@fillesten-VirtualBox:/home$ lr
Command 'lr' not found, but can be installed with:
sudo apt install lr
fillesten@fillesten-VirtualBox:/home$ ls
donald  fillesten
```

```
fillesten@fillesten-VirtualBox:/etc/skel$ sudo adduser mickey
Adding user `mickey' ...
Adding new group `mickey' (1002) ...
Adding new user `mickey' (1002) with group `mickey' ...
The home directory `/home/mickey' already exists.  Not copying from `/etc/skel'.
adduser: Warning: The home directory `/home/mickey' does not belong to the user you are cu
rrently creating.
New password:
[1]+  Stopped                 sudo adduser mickey
fillesten@fillesten-VirtualBox:/etc/skel$ sudo adduser mickey
adduser: The user `mickey' already exists.
fillesten@fillesten-VirtualBox:/etc/skel$ sudo userdel mickey
fillesten@fillesten-VirtualBox:/etc/skel$ sudo adduser mickey
Adding user `mickey' ...
Adding new group `mickey' (1002) ...
Adding new user `mickey' (1002) with group `mickey' ...
Creating home directory `/home/mickey' ...
Copying files from `/etc/skel' ...
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: password updated successfully
Changing the user information for mickey
Enter the new value, or press ENTER for the default
        Full Name []: mickey
        Room Number []: 1
        Work Phone []: 12345
        Home Phone []: 1234
        Other []: yes
Is the information correct? [Y/n] y
fillesten@fillesten-VirtualBox:/etc/skel$
```

3.





- Explain UID and GID: See the last image of 3.
    - Each user has their own UID, and this UID is used for various operations related to file permissions, process ownership, and more.
    - Users can belong to one or more groups, and each group has its own GID. Group memberships can determine access rights to shared resources.
- Inside /etc/skel I created a new folder called NewUserFile.ssh. When creating a new user all information from etc/skel is used.
- To create new users, I have to be root or use sudo. I do it by running the command adduser <new_username>. Then I fill in the additional information like name, phone, password etc about the new user. I created the group Disney with sudo which just finishes as you enter the command, however to add users to a group you similarly need the root or sudo privileges.
- 3 screenshots (below) which contain info from passwd: 1 is command and some output, 2 only output, 3 last output and 3 users, fillesten, Donald and mickey!

```
fillesten@fillesten-VirtualBox:/home$ cat /etc/passwd | cut -d: -f1
root
daemon
bin
sys
sync
games
man
lp
mail
news
uucp
proxy
www-data
backup
list
irc
gnats
nobody
systemd-network
systemd-resolve
```

```
systemd-network
systemd-resolve
messagebus
systemd-timesync
syslog
_apt
tss
uuidd
systemd-oom
tcpdump
avahi-autoipd
usbmux
dnsmasq
kernoops
avahi
cups-pk-helper
rtkit
whoopsie
sssd
speech-dispatcher
fwupd-refresh
nm-openvpn
saned
colord
```

```
saned
colord
geoclue
pulse
gnome-initial-setup
hplip
gdm
fillesten
vboxadd
sshd
donald
mickey
fillesten@fillesten-VirtualBox:/home$
```

4.3.2 Permissions

1.

```
fillesten@fillesten-VirtualBox:/home$ ls -l
total 12
drwxr-x---  3 donald    donald    4096 okt 19 16:10 donald
drwxr-x--- 17 fillesten fillesten 4096 okt 19 13:59 fillesten
drwxr-x---  3 mickey    mickey    4096 okt 19 16:12 mickey
fillesten@fillesten-VirtualBox:/home$
```

2. Before change

```
fillesten@fillesten-VirtualBox:/home$ ls -l
total 12
drwxr-x---  3 donald    donald    4096 okt 19 16:10 donald
drwxr-x--- 17 fillesten fillesten 4096 okt 19 13:59 fillesten
drwxr-x---  3 mickey    mickey    4096 okt 19 16:12 mickey
```

After change

```
fillesten@fillesten-VirtualBox:/home$ sudo chmod 770 donald
fillesten@fillesten-VirtualBox:/home$ sudo chmod u=rwx,g=rwx,o=--- mickey
fillesten@fillesten-VirtualBox:/home$ sudo chmod 770 fillesten
fillesten@fillesten-VirtualBox:/home$ ls -l
total 12
drwxrwx---  3 donald    donald    4096 okt 19 16:10 donald
drwxrwx--- 17 fillesten fillesten 4096 okt 19 13:59 fillesten
drwxrwx---  3 mickey    mickey    4096 okt 19 16:12 mickey
```

3.

```
fillesten@fillesten-VirtualBox:/$ cd dump
fillesten@fillesten-VirtualBox:/dump$ ls
lost+found
fillesten@fillesten-VirtualBox:/dump$ sudo mkdir DisneyFolder
fillesten@fillesten-VirtualBox:/dump$ ls
DisneyFolder  lost+found
fillesten@fillesten-VirtualBox:/dump$ sudo chgrp disney DisneyFolder
fillesten@fillesten-VirtualBox:/dump$ ls -l
total 20
drwxr-xr-x 2 root disney  4096 okt 19 18:10 DisneyFolder
drwx------ 2 root root   16384 okt 19 11:47 lost+found
fillesten@fillesten-VirtualBox:/dump$
```

- See task 3.
- Explaining the image below:

explain as much as you can about the file listed below

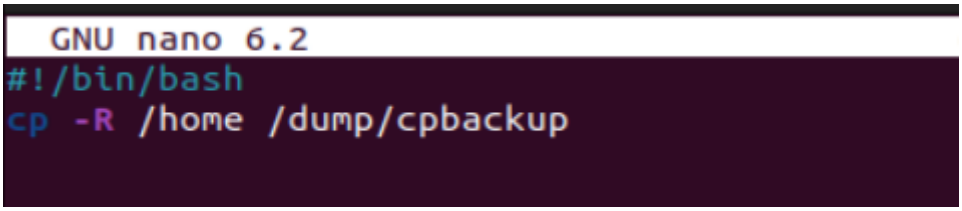
```
-rw-r--r-- 1 lennart lennart 5496 nov 10 17:40
    lab_assgn2.tex
```

-rw-r--r--: are the permissions, owner has read and write, group read only, others read only
1: number of hard links to the file.
lennart lennart: first lennart is owner of file, second lennart is group that owns file
5496: the size of the file in bytes
nov 10 17:40: timestamp of latest modification
lab_assgn2.tex: file name

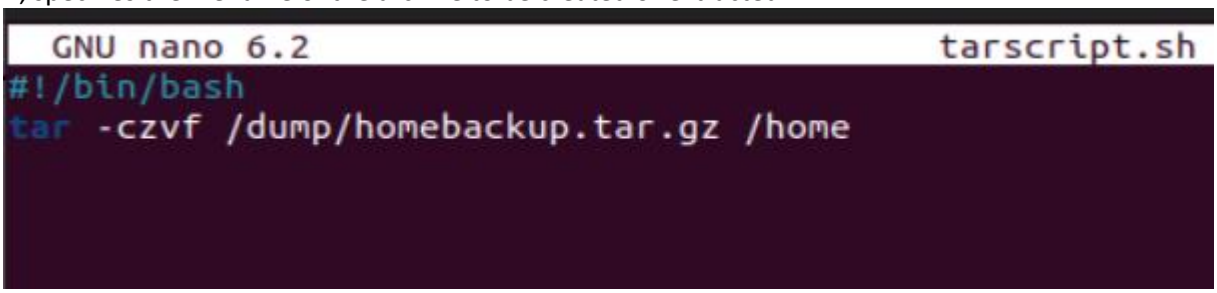
4.4 Backup and File Copy

1.

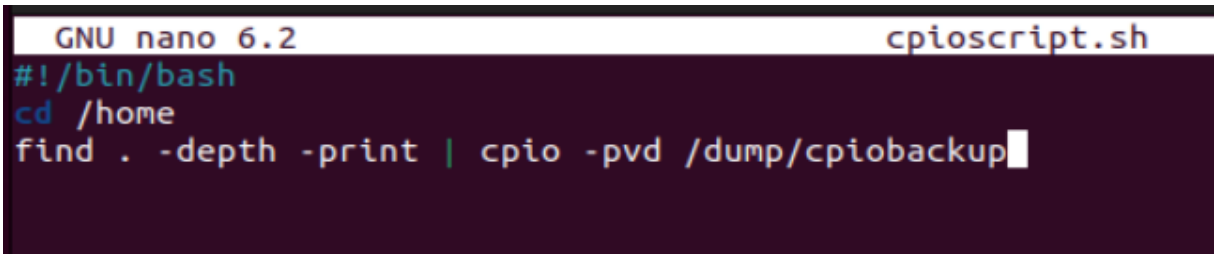
The cp script. This script uses the cp command to recursively (-R) copy the contents of my home folder to my backup location.



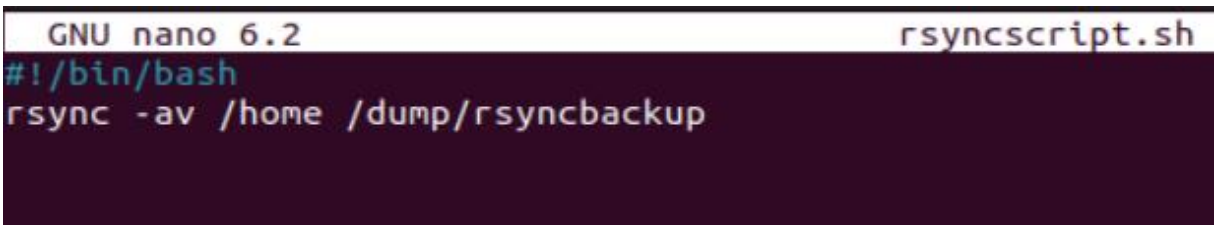
The tar script. /home is source of files, /dump/… is destination
-c, creates an archive by bundling files and directories together.
-z, uses gzip compression when creating a tar file, resulting in a compressed archive with the '.tar.gz' extension.
-v, displays verbose information, providing detailed output during the archiving or extraction process.
-f, specifies the filename of the archive to be created or extracted.



The cpio script. Copy in/out. The command copies files to and from archives. It uses find to find all regular files and subdirectories with -depth and lastly prints their name. This is then piped into cpio.
-p, preserve file structure
-v, makes cpio display information about the files being copied
-d, makes cpio create directories as necessary



The rsync script. Rsync is used for synchronizing files and directories between two locations.
-a, archive, is a combination of multiple flags. It preserves file attributes like permissions, timestamps and others.
-v, verbose, this flag makes rsync display detailed information about the files being copied.
home is source directory, dump/rsyncbackup is destination directory



2.

```
fillesten@fillesten-VirtualBox:/etc$
fillesten@fillesten-VirtualBox:/etc$
fillesten@fillesten-VirtualBox:/etc$ sudo dd if=/etc/passwd of=/backup/passwd.uppercase conv=ucase
6+1 records in
6+1 records out
3121 bytes (3,1 kB, 3,0 KiB) copied, 0,000132713 s, 23,5 MB/s
fillesten@fillesten-VirtualBox:/etc$
```

```
fillesten@fillesten-VirtualBox:/$ cd backup/
fillesten@fillesten-VirtualBox:/backup$ ls
cpioscript.sh  cpscript.sh  rsyncscript.sh  tarscript.sh
fillesten@fillesten-VirtualBox:/backup$ ls -l
total 16
-rw-r--r-- 1 root root 71 okt 19 19:50 cpioscript.sh
-rw-r--r-- 1 root root 39 okt 19 19:52 cpscript.sh
-rw-r--r-- 1 root root 46 okt 19 20:02 rsyncscript.sh
-rw-r--r-- 1 root root 52 okt 19 18:49 tarscript.sh
fillesten@fillesten-VirtualBox:/backup$ ls
cpioscript.sh  cpscript.sh  passwd.uppercase  rsyncscript.sh  tarscript.sh
fillesten@fillesten-VirtualBox:/backup$
fillesten@fillesten-VirtualBox:/backup$
fillesten@fillesten-VirtualBox:/backup$
```

fillesten@fillesten-VirtualBox: /backup

```
  GNU nano 6.2                                  passwd.uppercase
ROOT:X:0:0:ROOT:/ROOT:/BIN/BASH
DAEMON:X:1:1:DAEMON:/USR/SBIN:/USR/SBIN/NOLOGIN
BIN:X:2:2:BIN:/BIN:/USR/SBIN/NOLOGIN
SYS:X:3:3:SYS:/DEV:/USR/SBIN/NOLOGIN
SYNC:X:4:65534:SYNC:/BIN:/BIN/SYNC
GAMES:X:5:60:GAMES:/USR/GAMES:/USR/SBIN/NOLOGIN
MAN:X:6:12:MAN:/VAR/CACHE/MAN:/USR/SBIN/NOLOGIN
LP:X:7:7:LP:/VAR/SPOOL/LPD:/USR/SBIN/NOLOGIN
MAIL:X:8:8:MAIL:/VAR/MAIL:/USR/SBIN/NOLOGIN
NEWS:X:9:9:NEWS:/VAR/SPOOL/NEWS:/USR/SBIN/NOLOGIN
UUCP:X:10:10:UUCP:/VAR/SPOOL/UUCP:/USR/SBIN/NOLOGIN
PROXY:X:13:13:PROXY:/BIN:/USR/SBIN/NOLOGIN
WWW-DATA:X:33:33:WWW-DATA:/VAR/WWW:/USR/SBIN/NOLOGIN
BACKUP:X:34:34:BACKUP:/VAR/BACKUPS:/USR/SBIN/NOLOGIN
LIST:X:38:38:MAILING LIST MANAGER:/VAR/LIST:/USR/SBIN/NOLOGIN
IRC:X:39:39:IRCD:/RUN/IRCD:/USR/SBIN/NOLOGIN
GNATS:X:41:41:GNATS BUG-REPORTING SYSTEM (ADMIN):/VAR/LIB/GNATS:/USR/SBIN/NOLOGIN
NOBODY:X:65534:65534:NOBODY:/NONEXISTENT:/USR/SBIN/NOLOGIN
SYSTEMD-NETWORK:X:100:102:SYSTEMD NETWORK MANAGEMENT,,,:/RUN/SYSTEMD:/USR/SBIN/NOLOGIN
SYSTEMD-RESOLVE:X:101:103:SYSTEMD RESOLVER,,,:/RUN/SYSTEMD:/USR/SBIN/NOLOGIN
MESSAGEBUS:X:102:105::/NONEXISTENT:/USR/SBIN/NOLOGIN
SYSTEMD-TIMESYNC:X:103:106:SYSTEMD TIME SYNCHRONIZATION,,,:/RUN/SYSTEMD:/USR/SBIN/NOLOGIN
SYSLOG:X:104:111::/HOME/SYSLOG:/USR/SBIN/NOLOGIN
_APT:X:105:65534::/NONEXISTENT:/USR/SBIN/NOLOGIN
TSS:X:106:112:TPM SOFTWARE STACK,,,:/VAR/LIB/TPM:/BIN/FALSE
UUIDD:X:107:115::/RUN/UUIDD:/USR/SBIN/NOLOGIN
SYSTEMD-OOM:X:108:116:SYSTEMD USERSPACE OOM KILLER,,,:/RUN/SYSTEMD:/USR/SBIN/NOLOGIN
TCPDUMP:X:109:117::/NONEXISTENT:/USR/SBIN/NOLOGIN
AVAHI-AUTOIPD:X:110:119:AVAHI AUTOIP DAEMON,,,:/VAR/LIB/AVAHI-AUTOIPD:/USR/SBIN/NOLOGIN
USBMUX:X:111:46:USBMUX DAEMON,,,:/VAR/LIB/USBMUX:/USR/SBIN/NOLOGIN
DNSMASQ:X:112:65534:DNSMASQ,,,:/VAR/LIB/MISC:/USR/SBIN/NOLOGIN
KERNOOPS:X:113:65534:KERNEL OOPS TRACKING DAEMON,,,:/:/USR/SBIN/NOLOGIN
AVAHI:X:114:121:AVAHI MDNS DAEMON,,,:/RUN/AVAHI-DAEMON:/USR/SBIN/NOLOGIN

^G Help      ^O Write Out  ^W Where Is   ^K Cut       ^T Execute    ^C Location   M-U Undo
^X Exit      ^R Read File  ^\ Replace    ^U Paste     ^J Justify    ^/ Go To Line M-E Redo
```

4.5 Sharing Files

4.5.1 File Transfer Protocol

1. ftp server running.

```
fillesten@fillesten-VirtualBox:/$ sudo systemctl status vsftpd
● vsftpd.service - vsftpd FTP server
     Loaded: loaded (/lib/systemd/system/vsftpd.service; enabled; vendor preset: enab>
     Active: active (running) since Wed 2023-10-25 12:21:12 CEST; 6min ago
    Process: 3886 ExecStartPre=/bin/mkdir -p /var/run/vsftpd/empty (code=exited, stat>
   Main PID: 3889 (vsftpd)
      Tasks: 1 (limit: 5801)
     Memory: 844.0K
        CPU: 25ms
     CGroup: /system.slice/vsftpd.service
             └─3889 /usr/sbin/vsftpd /etc/vsftpd.conf

okt 25 12:21:12 fillesten-VirtualBox systemd[1]: Starting vsftpd FTP server...
okt 25 12:21:12 fillesten-VirtualBox systemd[1]: Started vsftpd FTP server.
```

2. Inside etc/vsftpd.conf I have to uncomment the chroot_local_user=YES

```
fillesten@fillesten-VirtualBox:/etc$ sudo nano vsftpd.conf
fillesten@fillesten-VirtualBox:/etc$ service vsftpd restart
fillesten@fillesten-VirtualBox:/etc$
```

```
# the user does not have write access to the top level directory within the
# chroot)
chroot_local_user=YES
#chroot_list_enable=YES
# (default follows)
#chroot_list_file=/etc/vsftpd.chroot_list
```

```
fillesten@fillesten-VirtualBox:/etc$ sudo nano vsftpd.conf
fillesten@fillesten-VirtualBox:/etc$ service vsftpd restart
fillesten@fillesten-VirtualBox:/etc$
```

3.

```
fillesten@fillesten-VirtualBox:/etc$ sudo chgrp disney /dev/sdb1
fillesten@fillesten-VirtualBox:/etc$
fillesten@fillesten-VirtualBox:/etc$ ls -dl /dev/sdb1
brw-rw---- 1 root disney 8, 17 okt 23 18:26 /dev/sdb1
fillesten@fillesten-VirtualBox:/etc$
```

4.5.2 Network File System

Install the nfs server package

```
fillesten@fillesten-VirtualBox:/etc$ sudo apt install nfs-kernel-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  keyutils libevent-core-2.1-7 libnfsidmap1 nfs-common rpcbind
Suggested packages:
  open-iscsi watchdog
The following NEW packages will be installed:
  keyutils libevent-core-2.1-7 libnfsidmap1 nfs-common nfs-kernel-server rpcbind
0 upgraded, 6 newly installed, 0 to remove and 25 not upgraded.
Need to get 615 kB of archives.
After this operation, 2 235 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

Make directories for sharing

```
fillesten@fillesten-VirtualBox:/$ sudo mkdir private
fillesten@fillesten-VirtualBox:/$ sudo mkdir public
```

Change permissions on directories.

Public: Everyone can read and execute but owner can also write

Private: everyone can read, write, execute.

```
fillesten@fillesten-VirtualBox:/$ sudo chmod 755 public
fillesten@fillesten-VirtualBox:/$ sudo chmod 777 private
```

```
fillesten@fillesten-VirtualBox:/$ ls -l
total 2891868
lrwxrwxrwx   1 root root          7 okt 22 12:32 bin -> usr/bin
drwxr-xr-x   4 root root       4096 okt 23 13:58 boot
drwxrwxr-x   2 root root       4096 okt 22 12:35 cdrom
drwxr-xr-x  19 root root       4240 okt 25 14:19 dev
drwxr-xr-x   4 root root       4096 okt 25 12:17 dump
drwxr-xr-x 134 root root      12288 okt 25 15:17 etc
drwxr-xr-x   5 root root       4096 okt 25 11:58 home
lrwxrwxrwx   1 root root          7 okt 22 12:32 lib -> usr/lib
lrwxrwxrwx   1 root root          9 okt 22 12:32 lib32 -> usr/lib32
lrwxrwxrwx   1 root root          9 okt 22 12:32 lib64 -> usr/lib64
lrwxrwxrwx   1 root root         10 okt 22 12:32 libx32 -> usr/libx32
drwx------   2 root root      16384 okt 22 12:32 lost+found
drwxr-xr-x   3 root root       4096 okt 22 14:52 media
drwxr-xr-x   2 root root       4096 aug  8 00:52 mnt
drwxr-xr-x   3 root root       4096 okt 22 14:53 opt
drwxrwxrwx   2 root root       4096 okt 25 15:16 private
dr-xr-xr-x 291 root root          0 okt 23 15:47 proc
drwxr-xr-x   2 root root       4096 okt 25 15:16 public
```

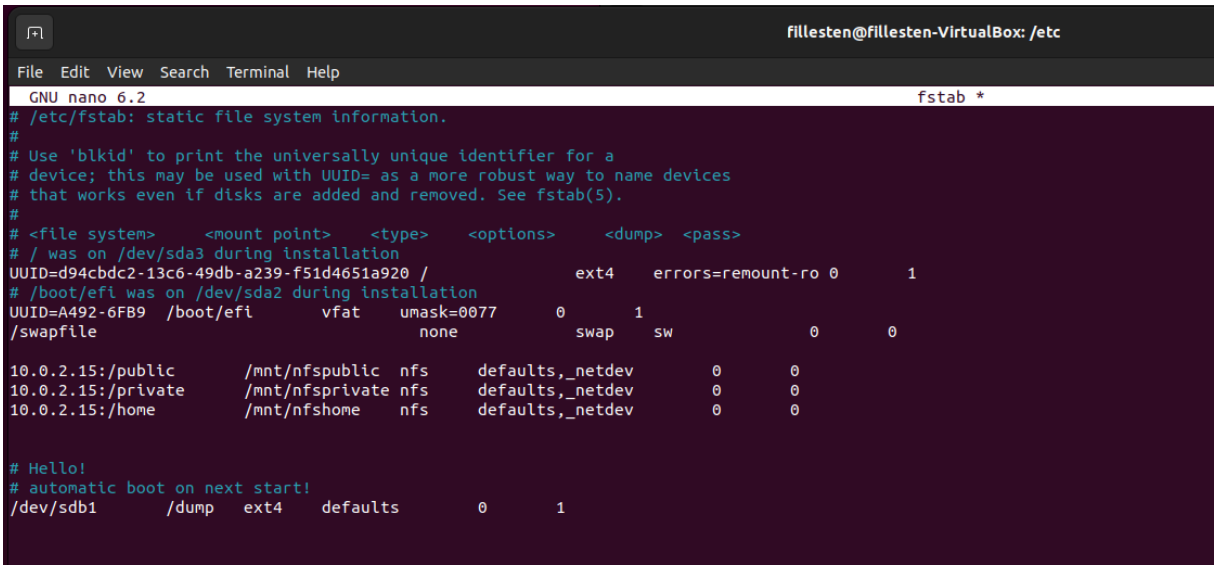
```
fillesten@fillesten-VirtualBox:/$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:7e:45:14 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
       valid_lft 72730sec preferred_lft 72730sec
    inet6 fe80::157c:880:4a98:b3cf/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
fillesten@fillesten-VirtualBox:/$
```

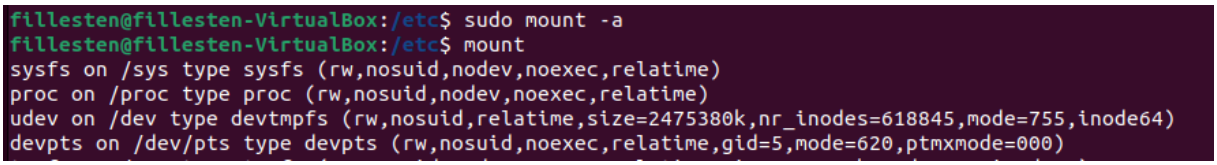
Ip address: 10.0.2.15
subnet mask /24 = 255.255.255.0.
so inside etc/exports.

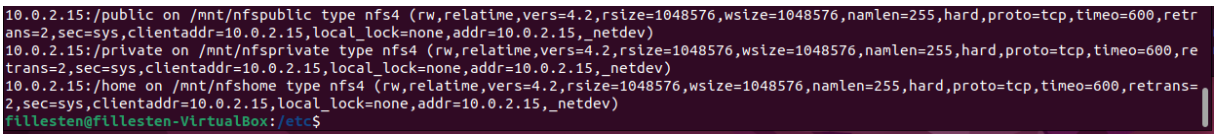
```
fillesten@fillesten-VirtualBox: /etc
File  Edit  View  Search  Terminal  Help
  GNU nano 6.2                                        exports
# /etc/exports: the access control list for filesystems which may be exported
#               to NFS clients.  See exports(5).
#
# Example for NFSv2 and NFSv3:
# /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)

# ro = read only, rw = read write
# sync = reply to requests are only done after changes have been committed to a stable storage
# no_root_squash = allows root user on NFS client host to access NFS mounted directory with the same rights as superuser
# no_subtree_check = determine whether NFS should check that the path to a shared directory is a true subtree of the export path

/public 10.0.2.15/24(ro,sync,no_root_squash,no_subtree_check)
/private 10.0.2.15/24(rw,sync,no_root_squash,no_subtree_check)
/home 10.0.2.15/24(rw,sync,no_root_squash,no_subtree_check)
```

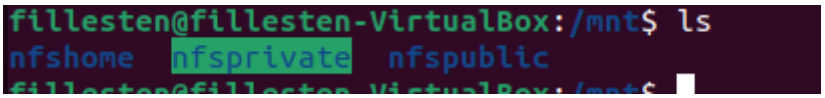
```
fillesten@fillesten-VirtualBox:/$ sudo exportfs -a
fillesten@fillesten-VirtualBox:/$
```

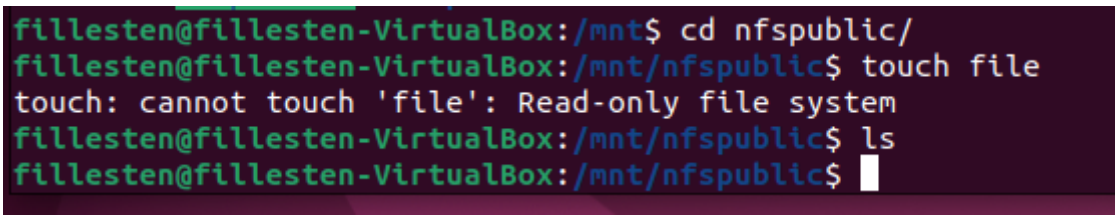
```
fillesten@fillesten-VirtualBox:/$ sudo systemctl restart nfs-kernel-server
fillesten@fillesten-VirtualBox:/$ sudo systemctl enable nfs-kernel-server
Synchronizing state of nfs-kernel-server.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable nfs-kernel-server
fillesten@fillesten-VirtualBox:/$ sudo systemctl status nfs-kernel-server
● nfs-server.service - NFS server and services
     Loaded: loaded (/lib/systemd/system/nfs-server.service; enabled; vendor preset: enabled)
    Drop-In: /run/systemd/generator/nfs-server.service.d
             └─order-with-mounts.conf
     Active: active (exited) since Wed 2023-10-25 19:32:27 CEST; 7s ago
   Main PID: 6188 (code=exited, status=0/SUCCESS)
        CPU: 5ms

okt 25 19:32:26 fillesten-VirtualBox systemd[1]: Starting NFS server and services...
okt 25 19:32:27 fillesten-VirtualBox systemd[1]: Finished NFS server and services.
fillesten@fillesten-VirtualBox:/$
```

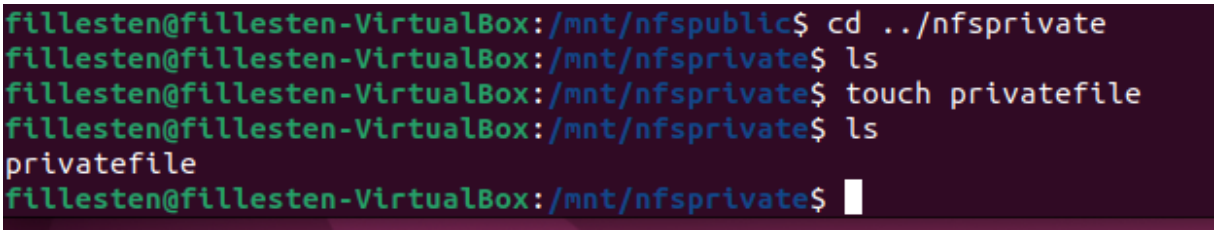

fillesten@fillesten-VirtualBox: /etc
File Edit View Search Terminal Help
GNU nano 6.2 fstab *
/etc/fstab: static file system information.
#
Use 'blkid' to print the universally unique identifier for a
device; this may be used with UUID= as a more robust way to name devices
that works even if disks are added and removed. See fstab(5).
#
# <file system> <mount point> <type> <options> <dump> <pass>
# / was on /dev/sda3 during installation
UUID=d94cbdc2-13c6-49db-a239-f51d4651a920 / ext4 errors=remount-ro 0 1
# /boot/efi was on /dev/sda2 during installation
UUID=A492-6FB9 /boot/efi vfat umask=0077 0 1
/swapfile none swap sw 0 0
10.0.2.15:/public /mnt/nfspublic nfs defaults,_netdev 0 0
10.0.2.15:/private /mnt/nfsprivate nfs defaults,_netdev 0 0
10.0.2.15:/home /mnt/nfshome nfs defaults,_netdev 0 0
Hello!
automatic boot on next start!
/dev/sdb1 /dump ext4 defaults 0 1

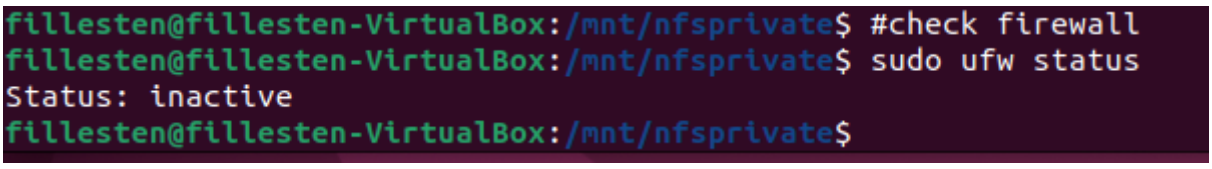

fillesten@fillesten-VirtualBox:/etc$ sudo mount -a
fillesten@fillesten-VirtualBox:/etc$ mount
sysfs on /sys type sysfs (rw,nosuid,nodev,noexec,relatime)
proc on /proc type proc (rw,nosuid,nodev,noexec,relatime)
udev on /dev type devtmpfs (rw,nosuid,relatime,size=2475380k,nr_inodes=618845,mode=755,inode64)
devpts on /dev/pts type devpts (rw,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=000)


10.0.2.15:/public on /mnt/nfspublic type nfs4 (rw,relatime,vers=4.2,rsize=1048576,wsize=1048576,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=10.0.2.15,local_lock=none,addr=10.0.2.15,_netdev)
10.0.2.15:/private on /mnt/nfsprivate type nfs4 (rw,relatime,vers=4.2,rsize=1048576,wsize=1048576,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=10.0.2.15,local_lock=none,addr=10.0.2.15,_netdev)
10.0.2.15:/home on /mnt/nfshome type nfs4 (rw,relatime,vers=4.2,rsize=1048576,wsize=1048576,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=10.0.2.15,local_lock=none,addr=10.0.2.15,_netdev)
fillesten@fillesten-VirtualBox:/etc$


fillesten@fillesten-VirtualBox:/mnt$ ls
nfshome nfsprivate nfspublic


fillesten@fillesten-VirtualBox:/mnt$ cd nfspublic/
fillesten@fillesten-VirtualBox:/mnt/nfspublic$ touch file
touch: cannot touch 'file': Read-only file system
fillesten@fillesten-VirtualBox:/mnt/nfspublic$ ls
fillesten@fillesten-VirtualBox:/mnt/nfspublic$


fillesten@fillesten-VirtualBox:/mnt/nfspublic$ cd ../nfsprivate
fillesten@fillesten-VirtualBox:/mnt/nfsprivate$ ls
fillesten@fillesten-VirtualBox:/mnt/nfsprivate$ touch privatefile
fillesten@fillesten-VirtualBox:/mnt/nfsprivate$ ls
privatefile
fillesten@fillesten-VirtualBox:/mnt/nfsprivate$


fillesten@fillesten-VirtualBox:/mnt/nfsprivate$ #check firewall
fillesten@fillesten-VirtualBox:/mnt/nfsprivate$ sudo ufw status
Status: inactive
fillesten@fillesten-VirtualBox:/mnt/nfsprivate$

NFS proof:

Here i remove the testfile, in /private, then I check for any files and see 0 files. Then I move over to mnt/nfsprivate and create a file there. Navigates back to /private and check if there is a file. There is a file in /private, the nfs works!

4.5.3 Samba – A windows SMB / CIFS file server for UNIX

```
fillesten@fillesten-VirtualBox:/private$ sudo apt install samba
Reading package lists... Done
Building dependency tree... Done
```

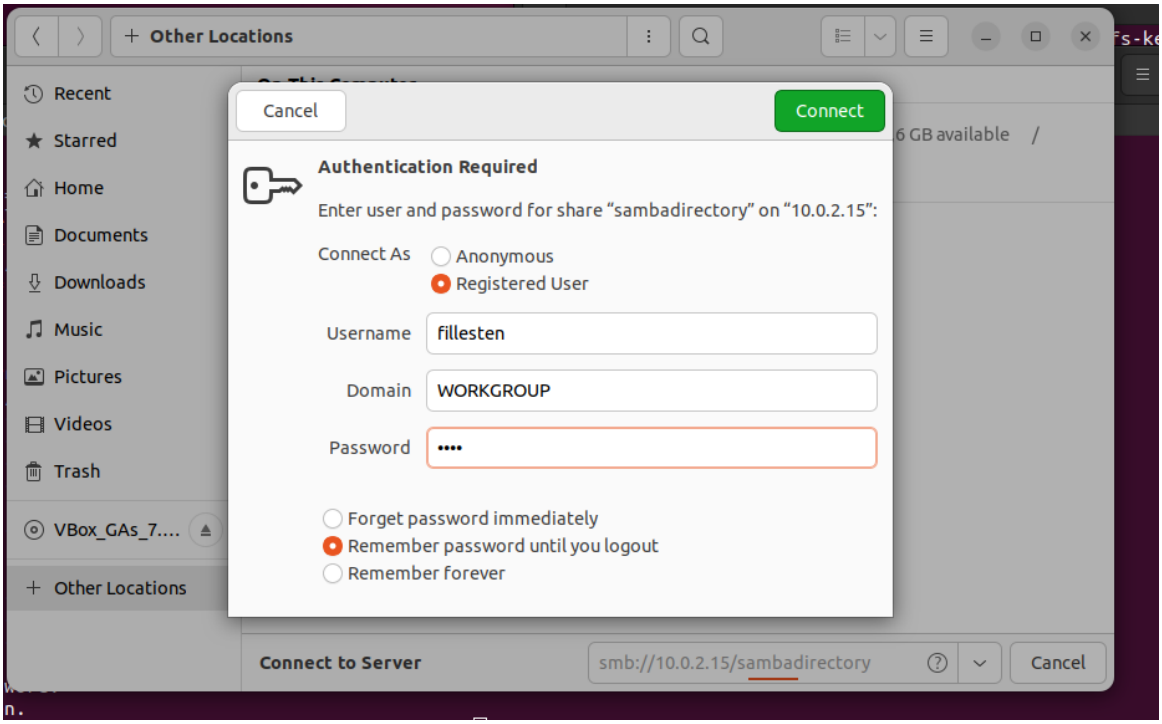
```
fillesten@fillesten-VirtualBox:~$ sudo mkdir /home/fillesten/sambadirectory
fillesten@fillesten-VirtualBox:~$ ls
Desktop  Documents  Downloads  Music  Pictures  private  public  Public  sambadirectory  snap  Templates  Videos
fillesten@fillesten-VirtualBox:~$
```

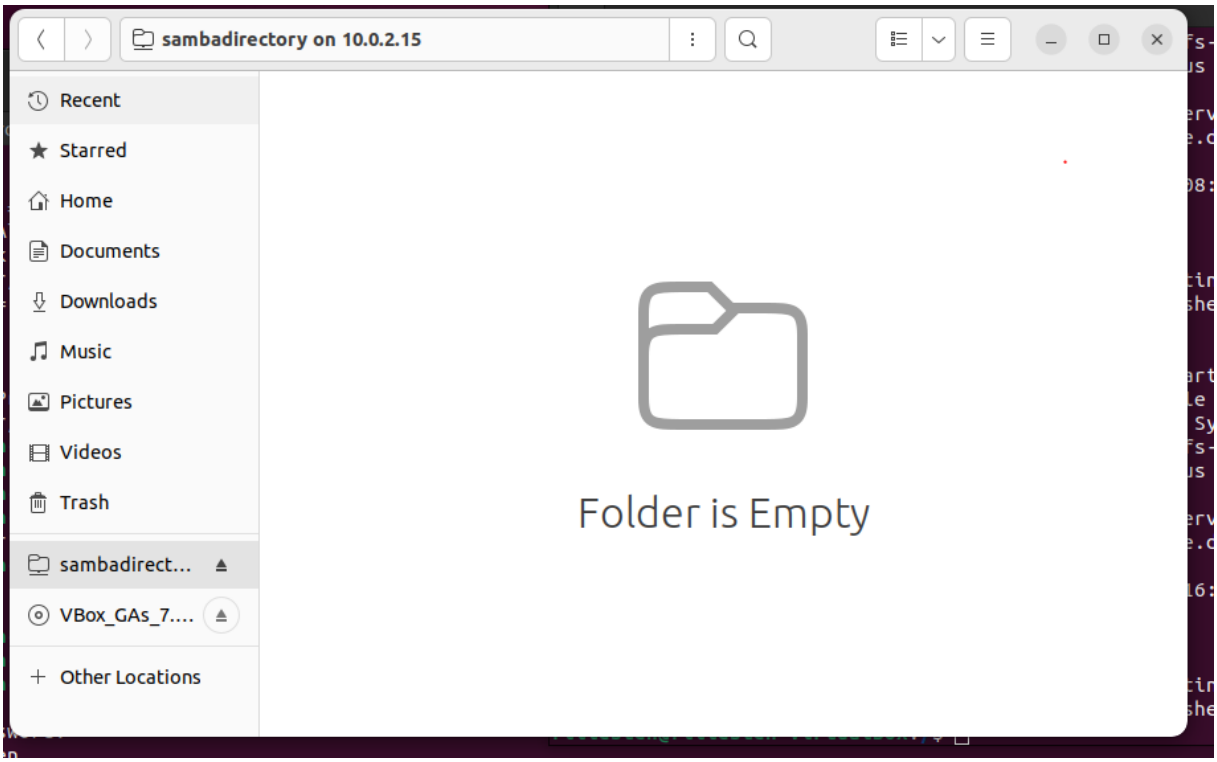
```
[sambadirectory]
   comment = Samba on ubuntu
   path = /home/fillesten/sambadirectory
   read only = no
   browsable = yes
```

```
fillesten@fillesten-VirtualBox:/$ sudo systemctl restart smbd
[sudo] password for fillesten:
fillesten@fillesten-VirtualBox:/$ sudo ufw allow samba
Rules updated
Rules updated (v6)
fillesten@fillesten-VirtualBox:/$
```

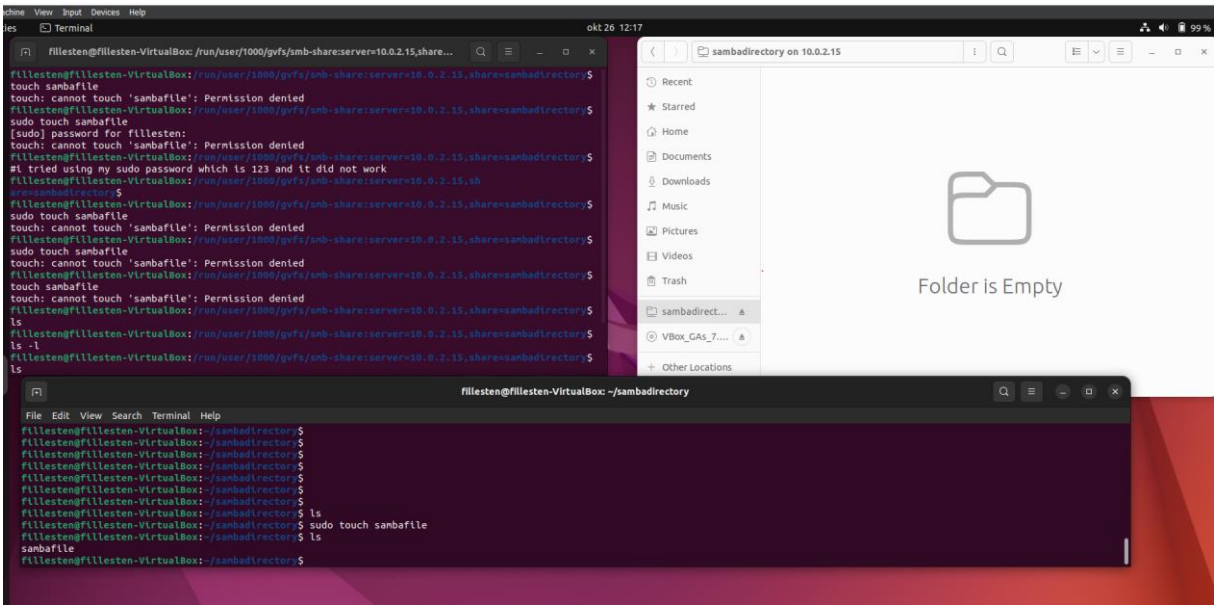
```
fillesten@fillesten-VirtualBox:/$ sudo smbpasswd -a fillesten
New SMB password:
Retype new SMB password:
Added user fillesten.
fillesten@fillesten-VirtualBox:/$
```

Password is 1234, for myself to remember.

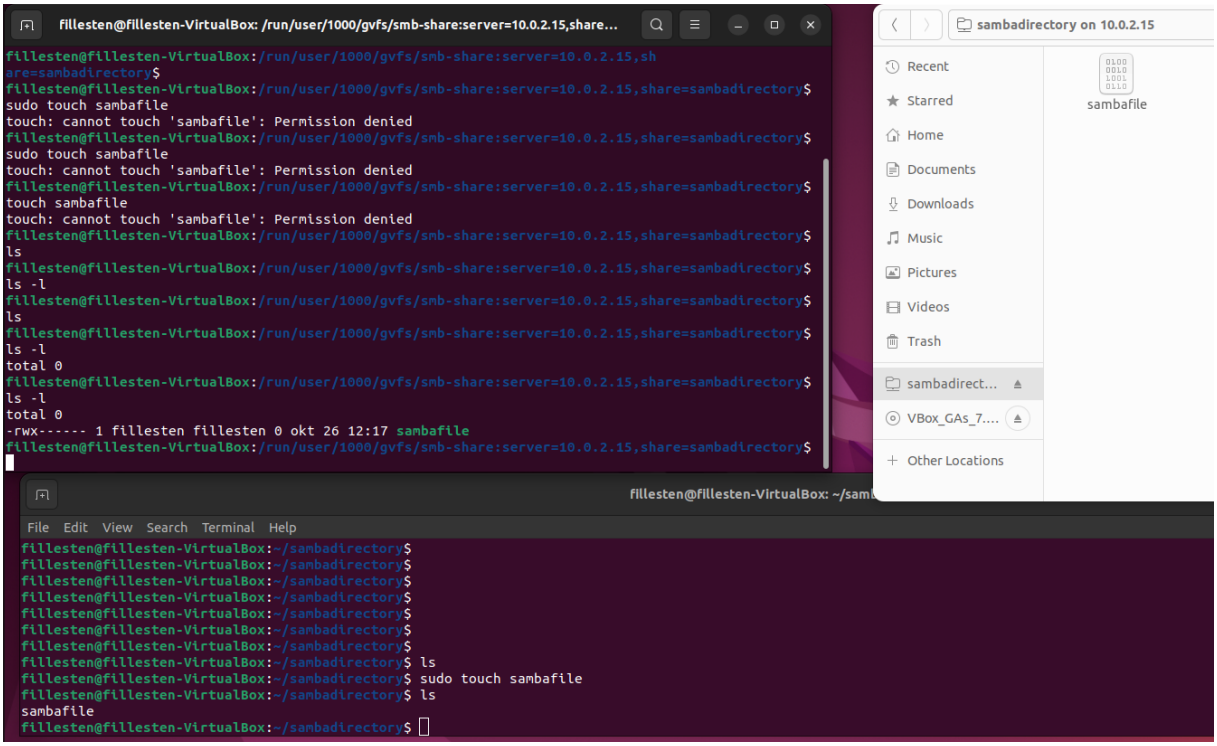



sambadirectory on 10.0.2.15
Recent
Starred
Home
Documents
Downloads
Music
Pictures
Videos
Trash
sambadirect...
VBox_GAs_7....
Other Locations
Folder is Empty

Samba proof:


fillesten@fillesten-VirtualBox: /run/user/1000/gvfs/smb-share:server=10.0.2.15,share...
touch sambafile
touch: cannot touch 'sambafile': Permission denied
sudo touch sambafile
[sudo] password for fillesten:
touch: cannot touch 'sambafile': Permission denied
#i tried using my sudo password which is 123 and it did not work
sudo touch sambafile
touch: cannot touch 'sambafile': Permission denied
ls
ls -l
sambadirectory on 10.0.2.15
Folder is Empty
fillesten@fillesten-VirtualBox: ~/sambadirectory
File Edit View Search Terminal Help
ls
sudo touch sambafile
ls
sambafile

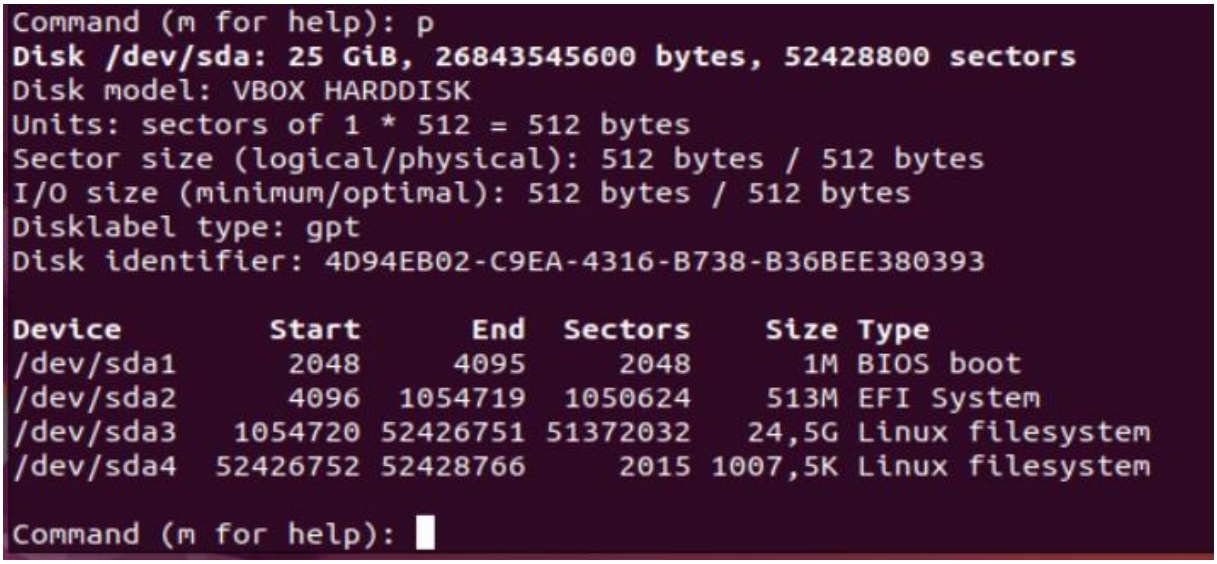
So by just updating or clicking another file destination in the file thing , I clicked Home and then back the file is now there.



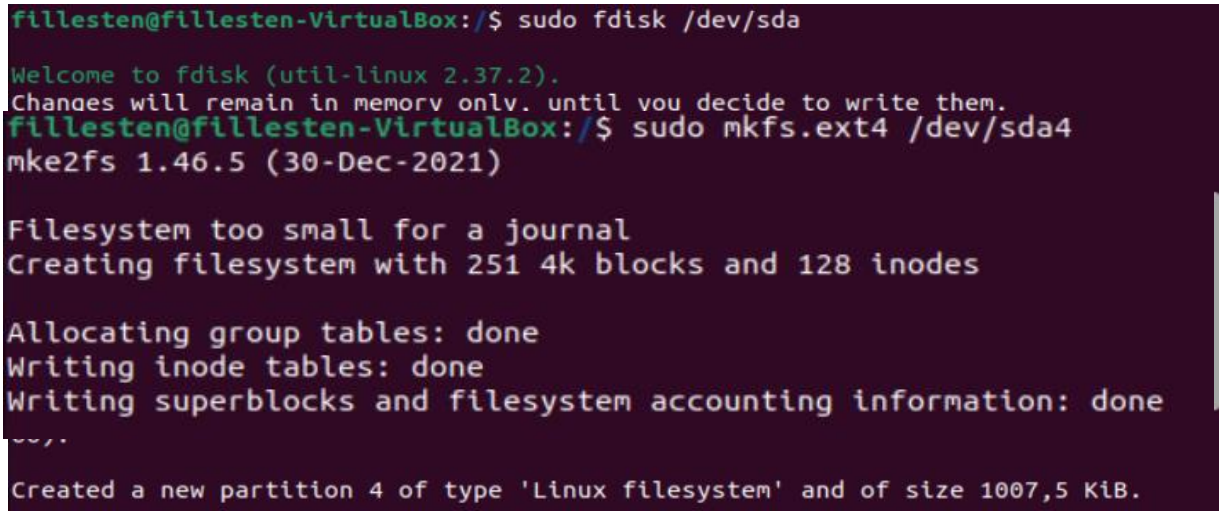
- Follow the steps I took in 4.5.1, 4.5.2 and 4.5.3.
    - FTP: I had to uncomment chroot_local_user=YES.
    - NFS I had to find my ip address and then set up the server accordingly.
    - Samba was easiest, the trickiest part of it was to add it to the file application. With smb://<ip_address>/<createddirectory>
- File permissions:
    - FTP: one can use the vsftpd.conf file to manage permissions
    - NFS: utilizing the exports file and make restrictions in different folders there
    - Samba: same as FTP.
- Screenshots of working FTP, NFS and Samba are in in 4.5.1, 4.5.2 and 4.5.3 respectively.

Appendix A:

The appendices are not a part of the solution to the lab.



messing up with sda4:



```
Disk /dev/sda: 25 GiB, 26843545600 bytes, 52428800 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: 4D94EB02-C9EA-4316-B738-B36BEE380393

Device       Start      End  Sectors  Size Type
/dev/sda1     2048     4095     2048    1M BIOS boot
/dev/sda2     4096  1054719  1050624  513M EFI System
/dev/sda3  1054720 52426751 51372032 24,5G Linux filesystem
```

```
fillesten@fillesten-VirtualBox:/$ sudo fdisk -l /dev/s
/dev/sda   /dev/sda1  /dev/sda2  /dev/sda3  /dev/sr0
```

```
fillesten@fillesten-VirtualBox:/$ sudo mkfs.ext4 /dev/sda4
mke2fs 1.46.5 (30-Dec-2021)

Filesystem too small for a journal
Creating filesystem with 251 4k blocks and 128 inodes

Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done
```

Appendix B: Second failed attempt at partitioning.

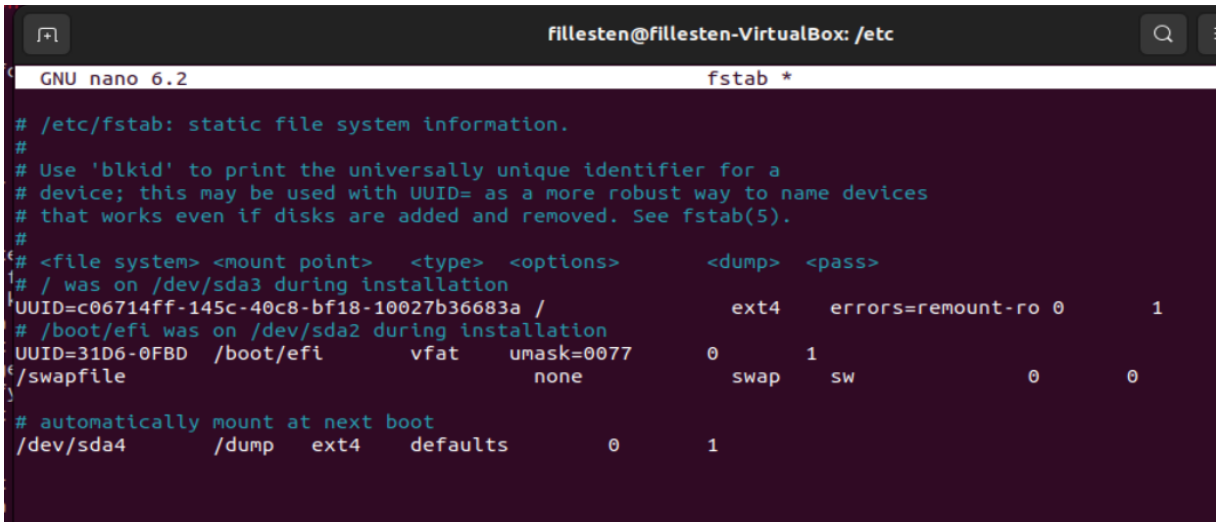
```
fillesten@fillesten-VirtualBox:/$ sudo fdisk /dev/sda3

Welcome to fdisk (util-linux 2.37.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

This disk is currently in use - repartitioning is probably a bad idea.
It's recommended to umount all file systems, and swapoff all swap
partitions on this disk.

The device contains 'ext4' signature and it will be removed by a write command. See fdisk(8)
 man page and --wipe option for more details.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0x7f01cd56.

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-51372031, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-51372031, default 51372031):

Created a new partition 1 of type 'Linux' and of size 24,5 GiB.

Command (m for help): w
The partition table has been altered.
Failed to add partition 1 to system: Invalid argument

The kernel still uses the old partitions. The new table will be used at the next reboot.
Syncing disks.

fillesten@fillesten-VirtualBox:/$ df -h
```

```
fillesten@fillesten-VirtualBox:/$ sudo fsck /dev/sda4
fsck from util-linux 2.37.2
e2fsck 1.46.5 (30-Dec-2021)
/dev/sda4: clean, 11/128 files, 18/251 blocks
fillesten@fillesten-VirtualBox:/$
```

```
fillesten@fillesten-VirtualBox:/$ sudo mkdir /dump
fillesten@fillesten-VirtualBox:/$ ls
bin             dev   lib     lost+found  proc  snap      test.sh
boot            dump  lib32   media       root  srv       tmp
cdrom           etc   lib64   mnt         run   swapfile  usr
clear_tmp.sh    home  libx32  opt         sbin  sys       var
```

```
fillesten@fillesten-VirtualBox:/$ sudo mount /dev/sda4 /dump
```

```
fillesten@fillesten-VirtualBox:/dump$ df -h
Filesystem      Size  Used Avail Use% Mounted on
tmpfs           347M  1,6M  345M   1% /run
/dev/sda3        24G   15G  8,3G  64% /
tmpfs           1,7G     0  1,7G   0% /dev/shm
tmpfs           5,0M  4,0K  5,0M   1% /run/lock
/dev/sda2       512M  6,1M  506M   2% /boot/efi
/dev/sr0         51M   51M     0 100% /media/fillesten/VBox_GAs_7.0.6
tmpfs           347M  120K  346M   1% /run/user/1000
/dev/sda4       956K   24K  864K   3% /dump
fillesten@fillesten-VirtualBox:/dump$
```


fillesten@fillesten-VirtualBox: /etc
GNU nano 6.2 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/sda3 during installation
UUID=c06714ff-145c-40c8-bf18-10027b36683a / ext4 errors=remount-ro 0 1
# /boot/efi was on /dev/sda2 during installation
UUID=31D6-0FBD /boot/efi vfat umask=0077 0 1
/swapfile none swap sw 0 0
automatically mount at next boot
/dev/sda4 /dump ext4 defaults 0 1