

Administration av unix-lika system, Lab 3

4.1 Bootprocess

4.1.1 Grub

```
GNU nano 6.2 grub
# If you change this file, run 'update-grub' afterwards to update
# /boot/grub/grub.cfg.
# For full documentation of the options in this file, see:
#   info -f grub -n 'Simple configuration'

GRUB_DEFAULT=0
GRUB_TIMEOUT_STYLE=hidden
GRUB_TIMEOUT=10
GRUB_DISTRIBUTOR=`lsb_release -i -s 2> /dev/null || echo Debian`
GRUB_CMDLINE_LINUX_DEFAULT="quiet splash"
GRUB_CMDLINE_LINUX=""

# Uncomment to enable BadRAM filtering, modify to suit your needs
# This works with Linux (no patch required) and with any kernel that obtains
# the memory map information from GRUB (GNU Mach, kernel of FreeBSD ...)
GRUB_BADRAM="0x01234567 0xfefefefe 0x89abcd 0xfefefefef"

fillesten@fillesten-VirtualBox:/etc/default$ sudo update-grub
Sourcing file `/etc/default/grub'
```

4.1.2 Runlevels

```
done
fillesten@fillesten-VirtualBox:/etc/default$ runlevel
N 5
fillesten@fillesten-VirtualBox:/etc/default$ 
fillesten@fillesten-VirtualBox:/$ sudo telinit 3
```

Startar denna vy.

```
fillesten-VirtualBox login: fillesten
Password:
Welcome to Ubuntu 22.04.2 LTS (GNU/Linux 5.19.0-38-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

 * Introducing Expanded Security Maintenance for Applications.
   Receive updates to over 25,000 software packages with your
   Ubuntu Pro subscription. Free for personal use.

   https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

90 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

fillesten@fillesten-VirtualBox:~$ _
```

- 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.

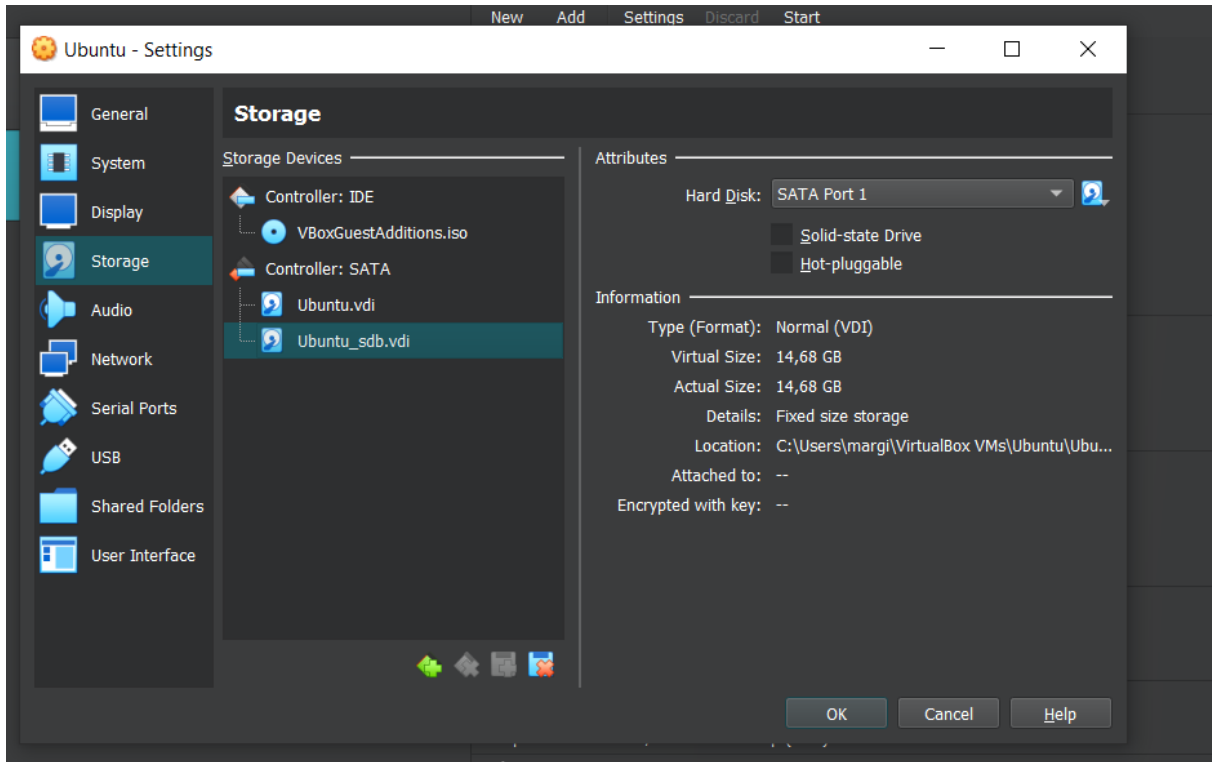
2. df -h, human readable.

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

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 ubuntu 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 unpartitioned 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...

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

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.

fillesteng@fillesteng-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

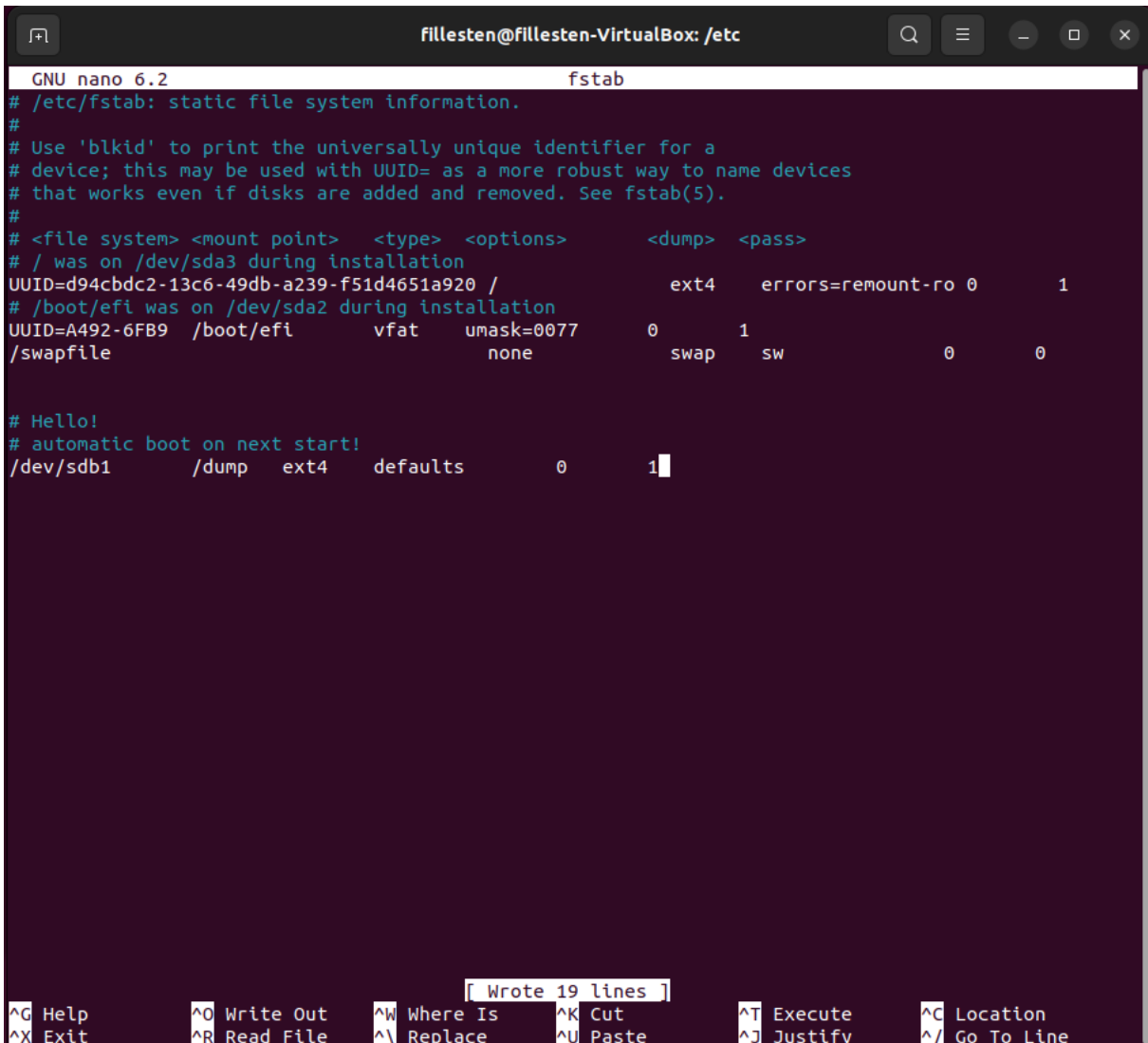
fillesten@fillesten-VirtualBox:/$ sudo mkdir dump
fillesten@fillesten-VirtualBox:/$ ls
bin  cdrom  dump  home  lib32  libx32  media  opt  root  sbin  srv  sys  usr
boot  dev  etc  lib  lib64  lost+found  mnt  proc  run  snap  swapfile  tmp  var

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.

```
fillemen@fillemen-VirtualBox:/etc$ sudo nano fstab
fillemen@fillemen-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=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

# Hello!
# automatic boot on next start!
/dev/sdb1    /dump    ext4     defaults        0        1
```

[Wrote 19 lines]

^G Help ^O Write Out ^W Where Is ^K Cut ^T Execute ^C Location
^X Exit ^R Read File ^_ Replace ^U Paste ^J Justify ^_ Go To Line

- 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, timestamps (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 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 currently 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.

```
fillesten@fillesten-VirtualBox:/$ sudo addgroup disney
Adding group `disney' (GID 1003) ...
Done.
fillesten@fillesten-VirtualBox:/$ cd home/
donald/    fillesten/ mickey/
fillesten@fillesten-VirtualBox:/$ cd home
fillesten@fillesten-VirtualBox:/home$ ls
donald  fillesten  mickey
```

```
fillesten@fillesten-VirtualBox:/$ sudo usermod -aG disney donald
fillesten@fillesten-VirtualBox:/$ sudo usermod -aG disney mickey
fillesten@fillesten-VirtualBox:/$ id donald
uid=1001(donald) gid=1001(donald) groups=1001(donald),1003(disney)
fillesten@fillesten-VirtualBox:/$ id mickey
uid=1002(mickey) gid=1002(mickey) groups=1002(mickey),1003(disney)
fillesten@fillesten-VirtualBox:/$
```

- 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
uidd
systemd-oom
tcpdump
avahi-autoipd
usbmux
dnsmasq
kernoops
avahi
cups-pk-helper
rtkit
whoopsie
sssd
speech-dispatcher
fwupd-refresh
nm-openvpn
sane
colord
```

```
sane
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.

```
GNU nano 6.2
#!/bin/bash
cp -R /home /dump/cpbackup
```

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.

```
GNU nano 6.2 tarscript.sh
#!/bin/bash
tar -czvf /dump/homebackup.tar.gz /home
```

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

```
GNU nano 6.2 cpioscript.sh
#!/bin/bash
cd /home
find . -depth -print | cpio -pvd /dump/cpiobackup
```

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

```
GNU nano 6.2 rsyncscript.sh
#!/bin/bash
rsync -av /home /dump/rsyncbackup
```

2.

```
fillestn@fillestn-VirtualBox:/etc$  
fillestn@fillestn-VirtualBox:/etc$  
fillestn@fillestn-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  
fillestn@fillestn-VirtualBox:/etc$
```

```
fillestn@fillestn-VirtualBox:/$ cd backup/  
fillestn@fillestn-VirtualBox:/backup$ ls  
cpioscript.sh  cpscript.sh  rsyncscript.sh  tarscript.sh  
fillestn@fillestn-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  
fillestn@fillestn-VirtualBox:/backup$ ls  
cpioscript.sh  cpscript.sh  passwd.uppercase  rsyncscript.sh  tarscript.sh  
fillestn@fillestn-VirtualBox:/backup$  
fillestn@fillestn-VirtualBox:/backup$  
fillestn@fillestn-VirtualBox:/backup$
```

```
fillestn@fillestn-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/SPPOOL/LPD:/USR/SBIN/NOLOGIN  
MAIL:X:8:8:MAIL:/VAR/MAIL:/USR/SBIN/NOLOGIN  
NEWS:X:9:9:NEWS:/VAR/SPPOOL/NEWS:/USR/SBIN/NOLOGIN  
UUCP:X:10:10:UUCP:/VAR/SPPOOL/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  
DNSSMASQ:X:112:65534:DNSSMASQ,,,:/VAR/LIB/MISC:/USR/SBIN/NOLOGIN  
KERNNOOPS: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: enable)
   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, status=0)
    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 /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,wsz=1048576,namlen=255,hard,proto=tcp,timeo=600,retr
ans=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,wsz=1048576,namlen=255,hard,proto=tcp,timeo=600,re
trans=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,wsz=1048576,namlen=255,hard,proto=tcp,timeo=600,retr
ans=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 nfspprivate 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:

```
fillesten@fillesten-VirtualBox:/private$ ls
privatefile
fillesten@fillesten-VirtualBox:/private$ sudo rm privatefile
fillesten@fillesten-VirtualBox:/private$ ls
fillesten@fillesten-VirtualBox:/private$ cd ../mnt/nfsprivate
fillesten@fillesten-VirtualBox:/mnt/nfsprivate$ touch privatefile
fillesten@fillesten-VirtualBox:/mnt/nfsprivate$ cd /private
fillesten@fillesten-VirtualBox:/private$ ls
privatefile
fillesten@fillesten-VirtualBox:/private$
```

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
```

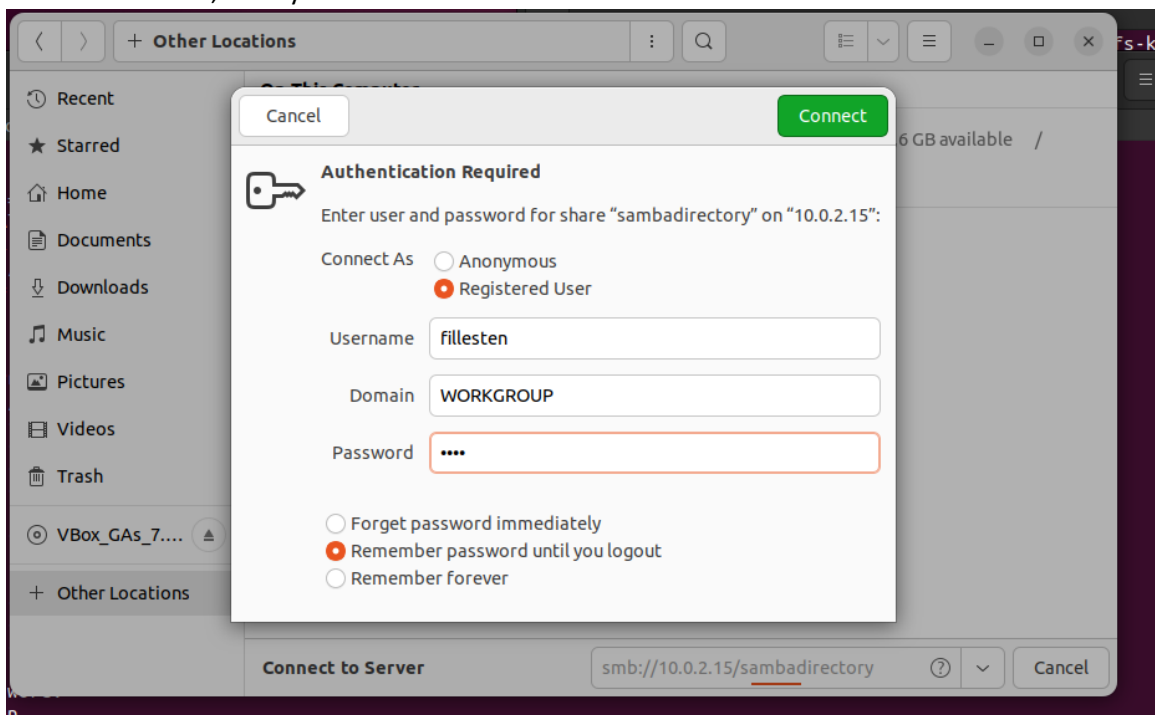
```
fillesten@fillesten-VirtualBox:~$ sudo mkdir /home/fillesten/sambadirectory
fillesten@fillesten-VirtualBox:~$ ls
Desktop  Documents  Downloads  Music  Pictures  private  public  Public  sambadirectory  snap  Templates  Videos
fillesten@fillesten-VirtualBox:~$
```

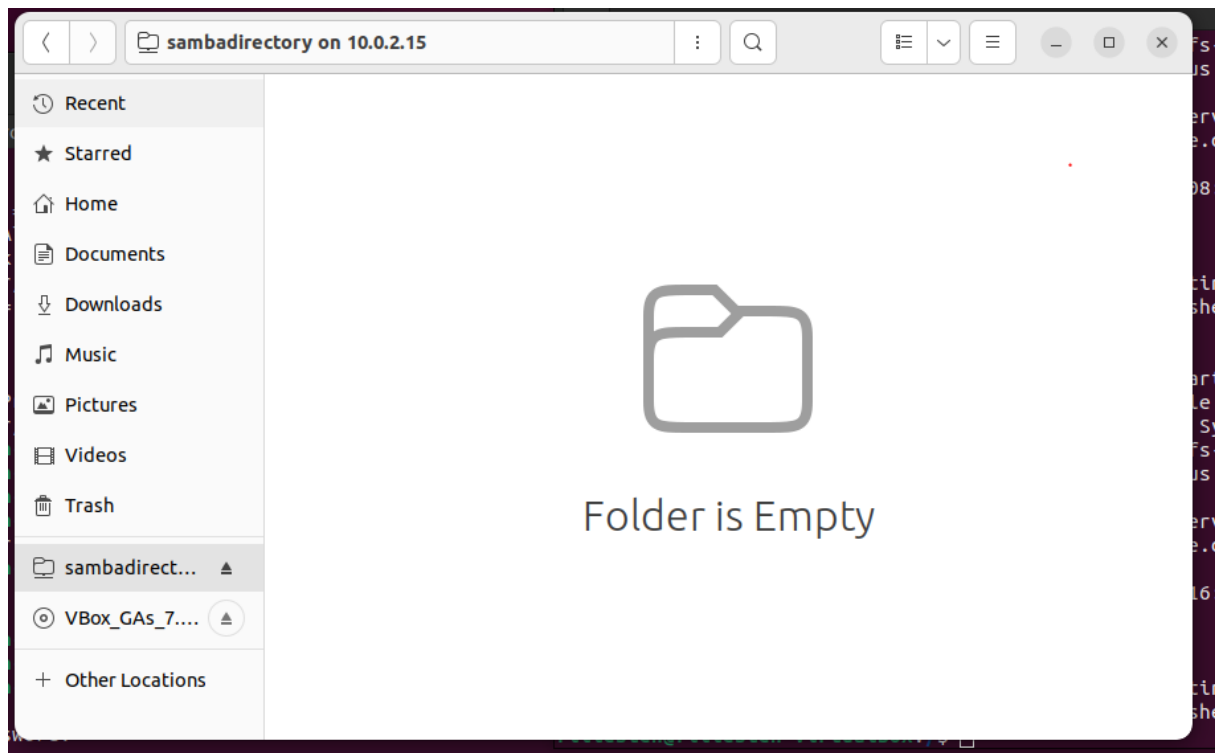
```
[sambadirectory]
comment = Samba on ubuntu
path = /home/fillesten/sambadirectory
read only = no
browsable = yes
```

```
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:/$
```

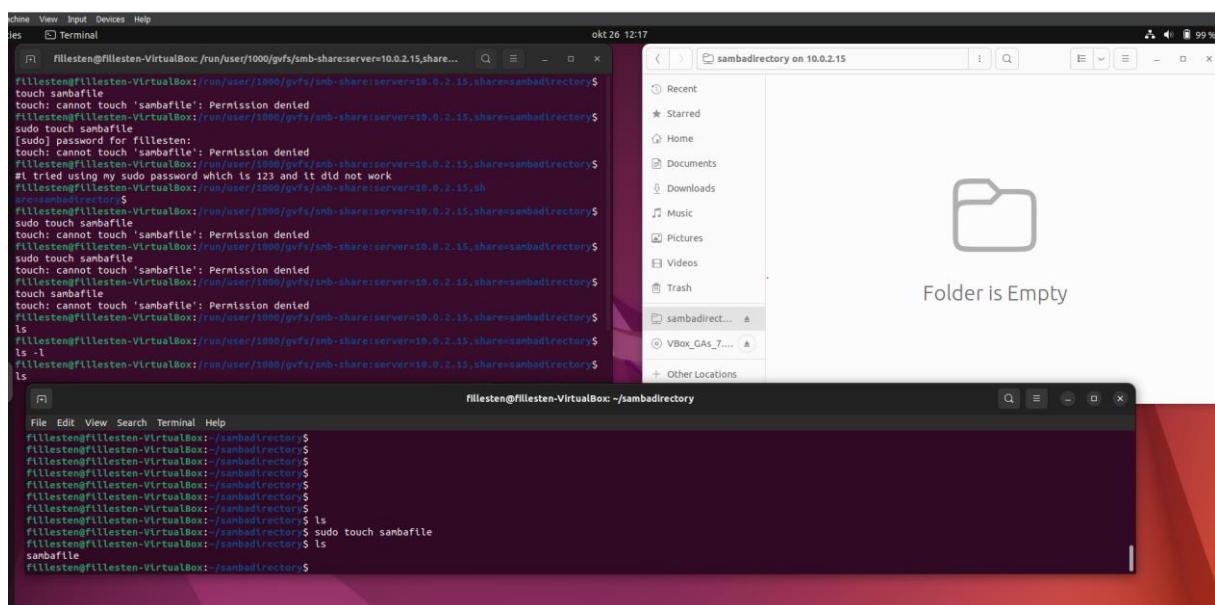
```
fillesten@fillesten-VirtualBox:/$ sudo smbpasswd -a fillesten
New SMB password:
Retype new SMB password:
Added user fillesten.
fillesten@fillesten-VirtualBox:/$
```

Password is 1234, for myself to remember.

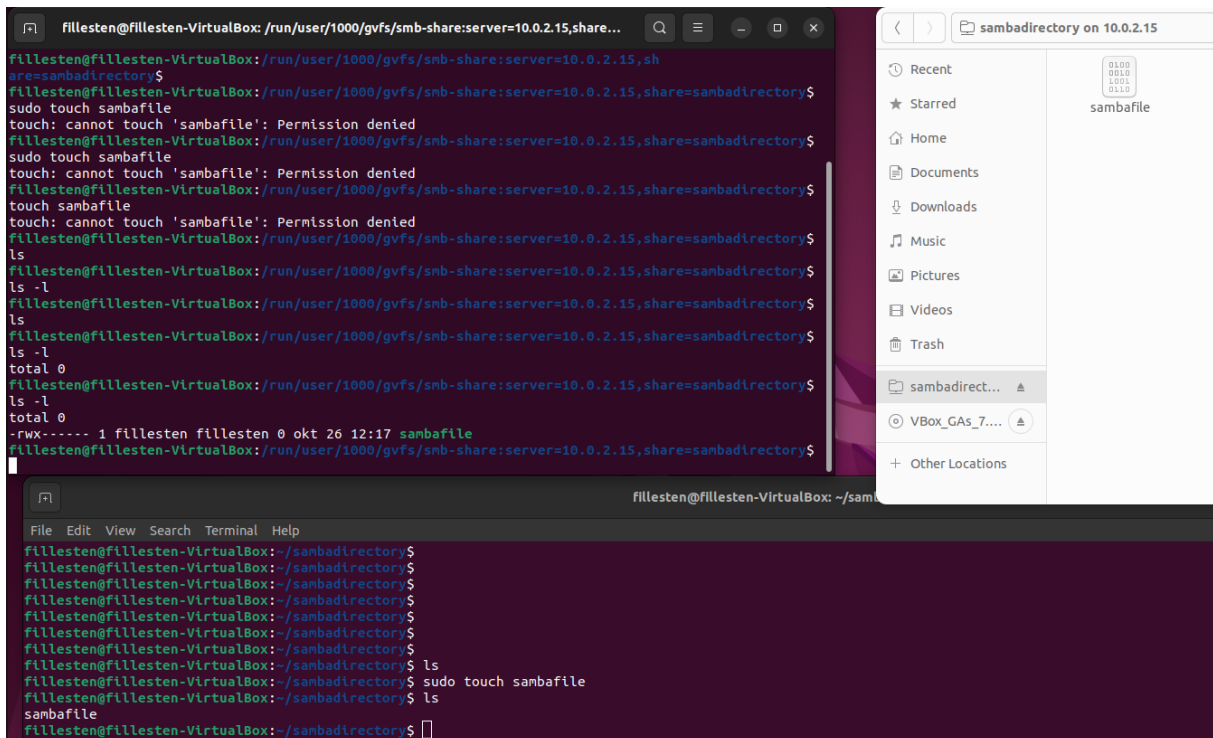




Samba proof:



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.

```
Command (m for help): p
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
/dev/sda4        52426752 52428766     2015    1007,5K Linux filesystem

Command (m for help):
```

messing up with sda4:

```
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.
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

Created a new partition 4 of type 'Linux filesystem' and of size 1007,5 KiB.
```

```
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
```