Linux, day 10

Objectives covered

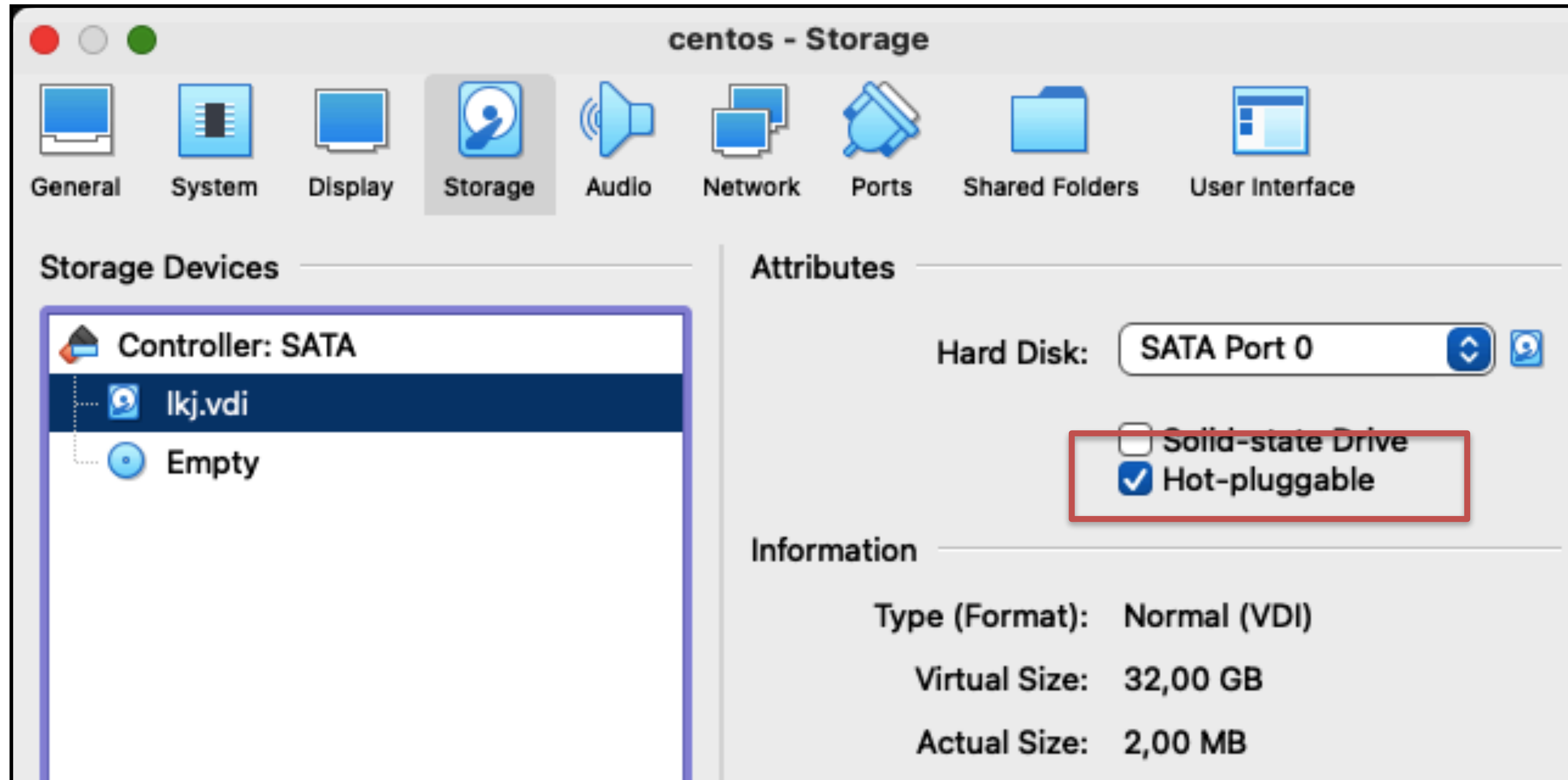| Objective	Summary	Book
1.1	Storage concepts	11
1.3	Given a scenario, manage storage in a Linux environment	11
2.1	PKI certificates	16

MDadm

Prepping your lab: VBox

- In VirtualBox, change the three dummy disks.
  - Enable hot-plugging.

Prepping your lab: VBox

Prepping your lab: mounts

- In the Linux VM verify the disks are unused.
  - *mount | grep "sd?"*
    - Unmount your mounts of *sdb*, *sdc* and *sdd*.
  - *grep -i "sd?" /etc/fstab*
    - Remove any lines for *sdb*, *sdc* and *sdd*.
  - *sudo mkdir /mnt/data*

Prepping disks for RAID

- Some people suggest you partition them,
  - Others say to just use the whole device.
  - *mdadm* says "partition table will be meaningless"
- Apply GPT partitioning.
  - Use partition type "*Linux RAID*" (29) in *fdisk.*
  - Or *"FD00"* in *gdisk.*

Prepping our disks (three times)

```
$ sudo fdisk /dev/sdb
g
n    # Three times enter, y to overwrite
t
29  # Type RAID
w
```

Making a RAID1, with spare

- Remember how to use those backslashes?

```
$ sudo mdadm --create --verbose \
--level=1 --metadata=1.2 \
--raid-devices=2 /dev/md/MyRAID1 \
/dev/sdb /dev/sdc \
--spare-devices=1 /dev/sdd
```

Then use it

- Format, mount and use.

```
$ sudo mkfs.ext4 /dev/md/MyRAID1

$ sudo mount /dev/md/MyRAID1 /mnt/data

$ sudo touch /mnt/data/testfile
```

Saving your array config

- The location of the config file differs per Linux!
  - *sudo find /etc -name "mdadm.conf"*

```
$ sudo mdadm --detail --scan | \
sudo tee -a /etc/mdadm.conf
                        # Change that path!
```

Checking RAID health

- *mdadm* software RAID is pretty basic!
  - *cat /proc/mdstat*
  - *sudo mdadm --detail /dev/md/MyRAID1*
  - *journalctl | grep -e "kernel: md" -e "mdadm"*

Fun time

- On the guest OS, keep an eye on RAID.

```
$ sudo mdadm --monitor /dev/md/MyRAID1
```

Let's break it!

- If you're on **Windows**, use Powershell.

- Then first run:

```
PS> $VBox="C:\Program Files\Oracle\VirtualBox\"

PS> $env:path="${env:path};${VBox}"
```

Let's break it!

- We run this on our VirtualBox HOST system.

```
# Linux:
$ vboxmanage list vms -l | grep ".vdi"

# Powershell:
PS> vboxmanage list vms -l | Select-
String ".vdi"
```

Let's break it!

- VM and controller names may differ!

```
$ vboxmanage storageattach "Fedora" \
--storagectl "SATA" --port 2 \
--medium none
```

What happened?

- *mdadm* noticed the failure,

  - Grabbed the hot spare and started rebuilding.

  - The failed disk disappeared.

- Check "*/proc/mdstat*", "*mdadm*" and "*journalctl*".

Let's rebuild

- We will re-attach *dev/sdc.*

- Note: VM and controller names may differ!

```
$ vboxmanage storageattach "Fedora" \
--storagectl "SATA" --port 2 --type hdd\
--medium ${PATHto}/fedora_2.vdi
```

Let's rebuild

- And we will re-add the disk to the RAID set.

```
$ sudo mdadm --manage /dev/md/MyRAID1 \
 --add /dev/sdc

$ sudo cat /proc/mdstat
```

Done? Break it all.

```
$ sudo umount /mnt/data
$ sudo mdadm --stop /dev/md/MyRAID1

$ sudo mdadm --zero-superblock /dev/sdb
$ sudo mdadm --zero-superblock /dev/sdc
$ sudo mdadm --zero-superblock /dev/sdd
```
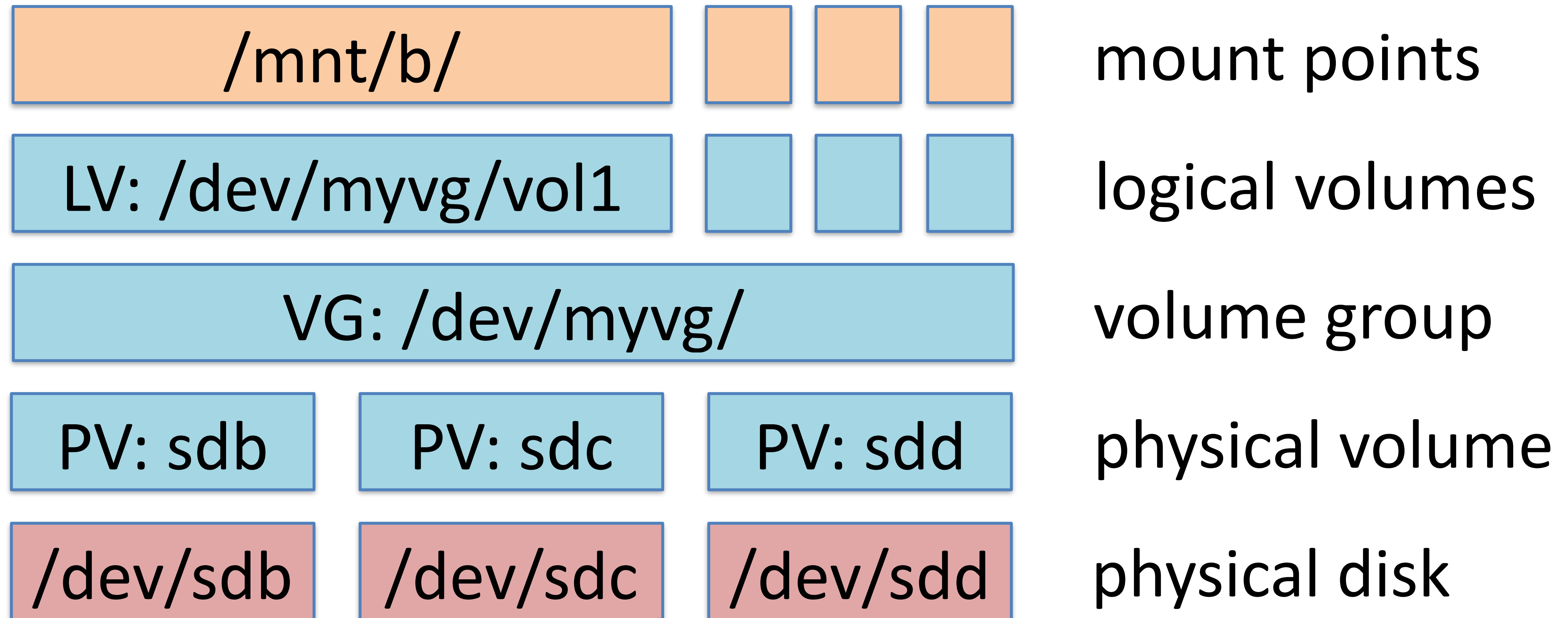
For your homework: RAID5

- Needs three virtual disks!

```
$ sudo mdadm --create --verbose \
--level=5 --metadata=1.2 \
--raid-devices=3 /dev/md/MyRAID5 \
/dev/sdb /dev/sdc /dev/sdd
```

LVM

LVM concepts

/mnt/b/	mount points
LV: /dev/myvg/vol1	logical volumes
VG: /dev/myvg/	volume group
PV: sdb PV: sdc PV: sdd	physical volume
/dev/sdb /dev/sdc /dev/sdd	physical disk

Prepping our disks (three times)

```
$ sudo fdisk /dev/sdb
g
n    # Three times enter, y to overwrite
t
30   # Type LVM
```

Creating phys. volumes

- This adds the device to LVM control

```
$ sudo pvcreate /dev/sdb1
$ sudo pvcreate /dev/sdc1
$ sudo pvcreate /dev/sdd1
```

That may fail...

- "*pvcreate*" will notice if disks are re-used.
  - Wipe and try again!

```
$ sudo wipefs -a /dev/sdb
$ sudo wipefs -a /dev/sdc
$ sudo wipefs -a /dev/sdd
```

Making the volume group

- This collects the disks for usage.

```
$ sudo vgcreate myvg \
/dev/sdb1 /dev/sdc1 /dev/sdd1

$ sudo vgdisplay myvg
```

Our first volume!

- This collects the disks for usage.

```
$ sudo lvcreate -L 50M -n vol1 myvg

$ sudo vgdisplay
$ sudo lvdisplay
```

Then use it

- Format, mount and use.

```
$ sudo mkfs.ext4 /dev/myvg/vol1

$ sudo mount /dev/myvg/vol1 /mnt/data

$ sudo touch /mnt/data/testfile
```

Check things out

- The commands start with pv*, vg*, lv*.

pvdisplay	Show all physical volumes
vgdisplay	Show all volume groups
lvdisplay	Show all logical volumes

Resizing file systems

- For example, on a volume that was 50 MB.

```
$ sudo lvresize -L 70M /dev/myvg/vol1

$ sudo resize2fs /dev/myvg/vol1
```

Tear it all down!

- Breaking what we made is easy.

```
$ sudo umount /mnt/data
$ sudo lvremove /dev/myvg/vol1
$ sudo vgremove /dev/myvg
$ sudo pvremove /dev/sdb1 /dev/sdc1 \
 /dev/sdd1
```

LAB: NFS server

Time for research

- Can you make the following?
  - Setup your Ubuntu VM as NFS server.
  - Make /var/userdata on Ubuntu.
  - Make that directory an NFS file share.
  - Setup Fedora as NFS client, and mount the share.

Closing

Homework

- Reading:
  - Chapter 12
  - Chapter 21
  - Chapter 23
  - Chapter 26

Homework

- Go do:
  - Retry your RAID1 setup, incl. the "failed" device.
  - Use your three disks to make one *mdadm* RAID5.
  - On the RAID5 set, make an LVM volume group
    - And a 100MB logical volume, on */mnt/data*.

Homework

/mnt/b/	mount
LV: /dev/myvg/vol1	log. vol
VG: /dev/myvg/	vol. grp.
PV: /dev/md/MyRAID5	phys. vol.
/dev/md/MyRAID5	MDadm
/dev/sdb /dev/sdc /dev/sdd	phys. disk

Advanced homework

- Go do:
  - Take the 100MB logical volume you made.
    - And expand it to 150MB.
    - You need to grow both the logical volume,
    - as well as the file system.

Reference materials

Resources

- [Example of using quota with Ubuntu](#)

- [Using autofs to mount NFS shares](#)

- [An introduction to udev device manager](#)

- [Auto-mounting a LUKS encrypted volume](#)

- [Device mapper and udev (Redhat)](#)

- [Understanding Linux dm-multipath](#)

Resources

- [How to create RAID arrays with mdadm](#)

- [mdadm cheat sheet](#)

- [A Linux user's guide to LVM](#)

- [Venafi - Diffie-Hellman vs RSA](#)