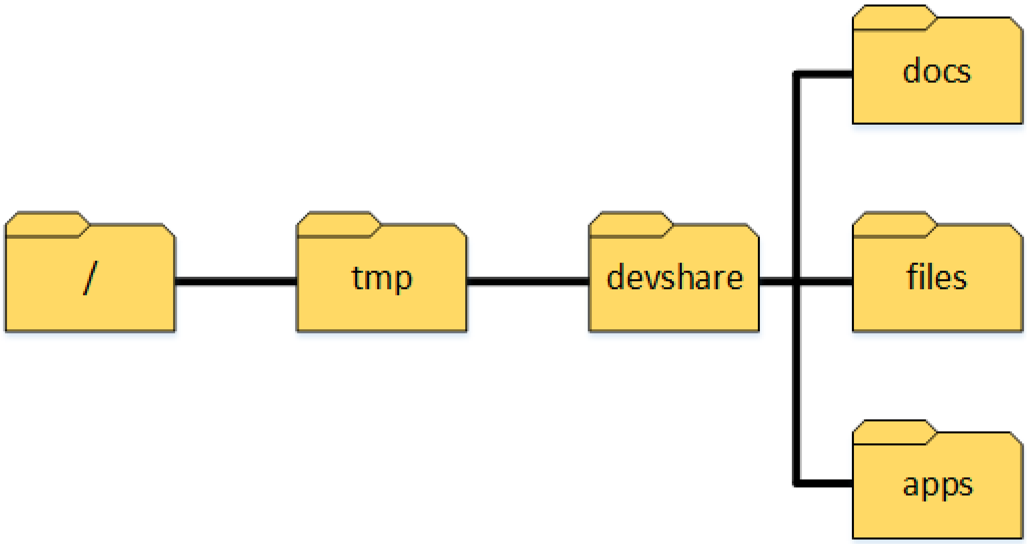
Linux Basics exam

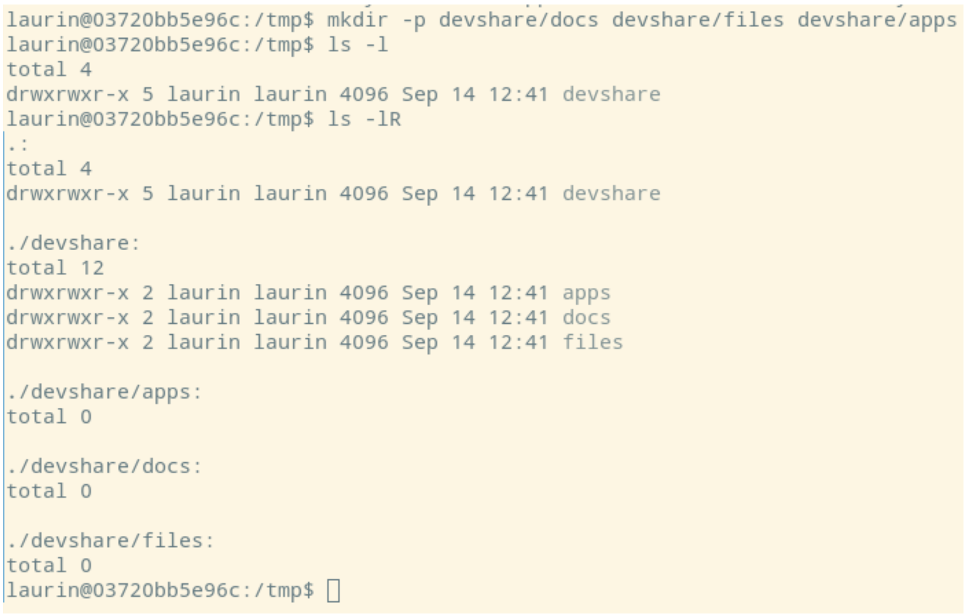
Write all answers here in this document. Use screenshots to support your answers. Screenshot must include the commands you used. For example a simple **ls** from a directory is not adequate. If screenshot won't cover your answer or is missing some essential parts, you may add written answer as well in addition to screenshot.

Return the exam document before the given deadline by email to the teacher in **PDF format**.

Maximum amount of points from the exam is 60 points. Question specific maximum points are marked after each question.

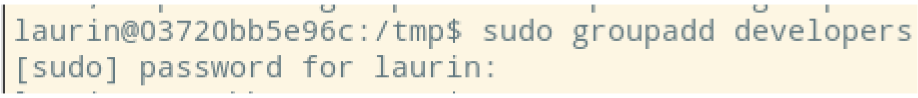
1. Create the directory structure presented below. [2p]



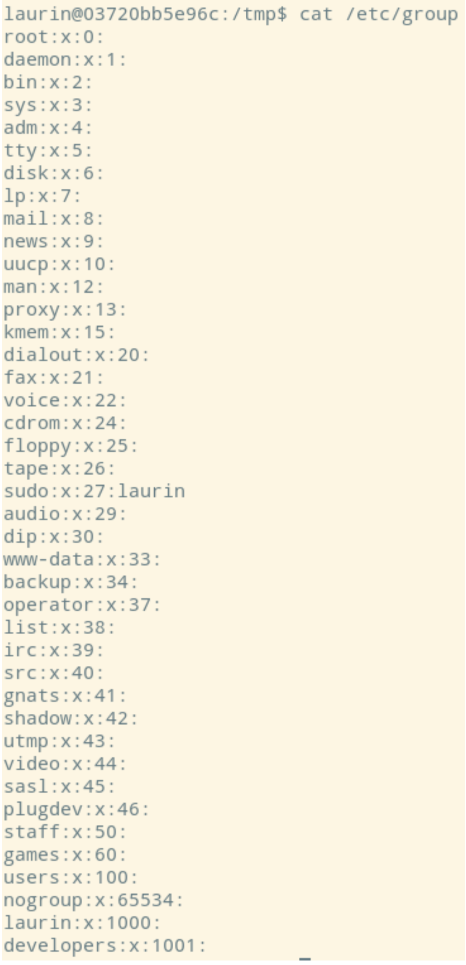


```
laurin@03720bb5e96c:/tmp$ mkdir -p devshare/docs devshare/files devshare/apps
laurin@03720bb5e96c:/tmp$ ls -l
total 4
drwxrwxr-x 5 laurin laurin 4096 Sep 14 12:41 devshare
laurin@03720bb5e96c:/tmp$ ls -lR
.:
total 4
drwxrwxr-x 5 laurin laurin 4096 Sep 14 12:41 devshare

./devshare:
total 12
drwxrwxr-x 2 laurin laurin 4096 Sep 14 12:41 apps
drwxrwxr-x 2 laurin laurin 4096 Sep 14 12:41 docs
drwxrwxr-x 2 laurin laurin 4096 Sep 14 12:41 files

./devshare/apps:
total 0

./devshare/docs:
total 0

./devshare/files:
total 0
laurin@03720bb5e96c:/tmp$ 
```

2. Create user group called *developers*. [2p]

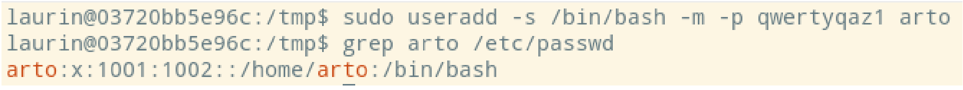


```
laurin@03720bb5e96c:/tmp$ sudo groupadd developers
[sudo] password for laurin:
```



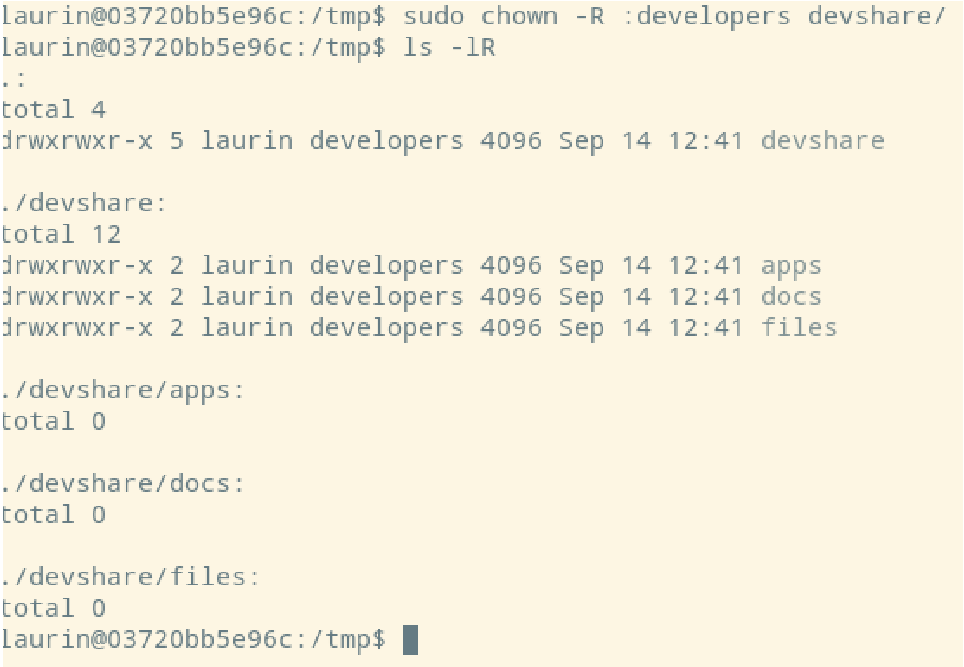
```
laurin@03720bb5e96c:/tmp$ cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:
tty:x:5:
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
proxy:x:13:
kmem:x:15:
dialout:x:20:
fax:x:21:
voice:x:22:
cdrom:x:24:
floppy:x:25:
tape:x:26:
sudo:x:27:laurin
audio:x:29:
dip:x:30:
www-data:x:33:
backup:x:34:
operator:x:37:
list:x:38:
irc:x:39:
src:x:40:
gnats:x:41:
shadow:x:42:
utmp:x:43:
video:x:44:
sasl:x:45:
plugdev:x:46:
staff:x:50:
games:x:60:
users:x:100:
nogroup:x:65534:
laurin:x:1000:
developers:x:1001:
```

3. Create user *arto* with home directory and set bash as user's default shell. In addition, set user password. [3p]



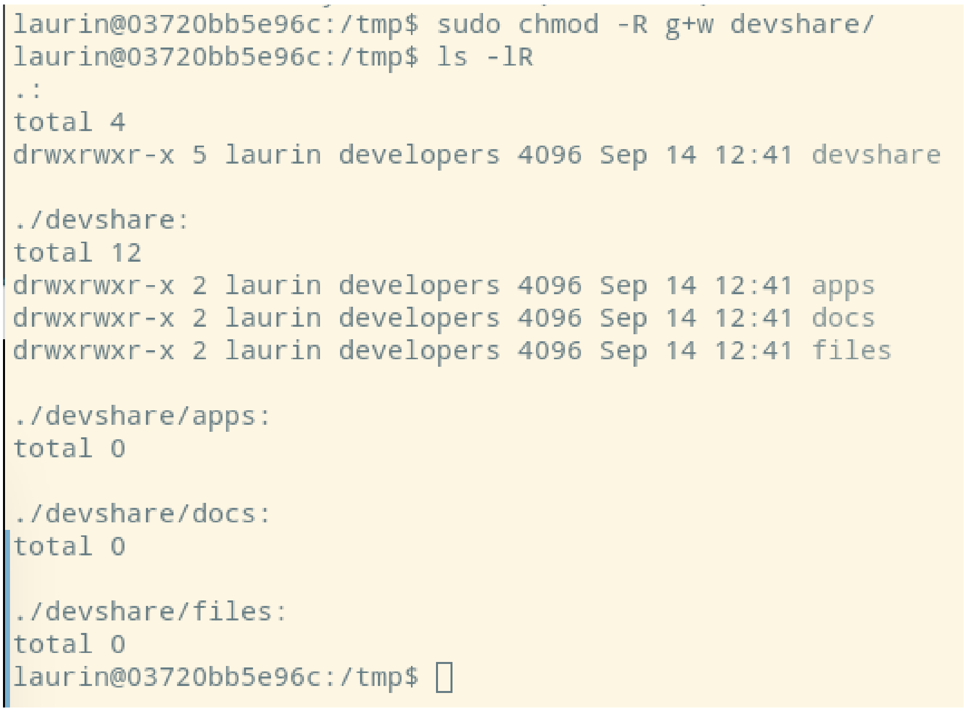
```
laurin@03720bb5e96c:/tmp$ sudo useradd -s /bin/bash -m -p qwertyqaz1 arto
laurin@03720bb5e96c:/tmp$ grep arto /etc/passwd
arto:x:1001:1002::/home/arto:/bin/bash
```

4. Change directory *devshare* owner group to be developers so that owner permissions inherit to subdirectories. [3p]



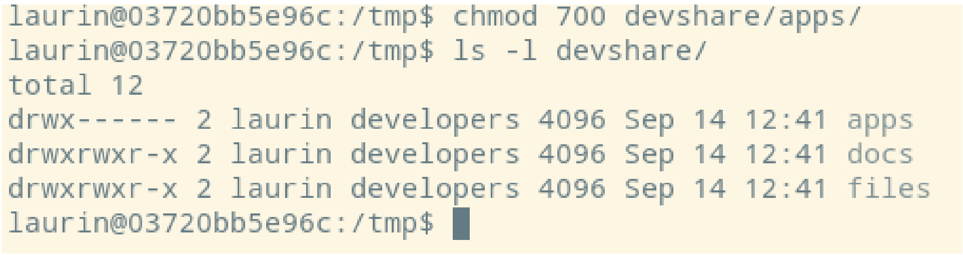
```
laurin@03720bb5e96c:/tmp$ sudo chown -R :developers devshare/
laurin@03720bb5e96c:/tmp$ ls -lR
.:
total 4
drwxrwxr-x 5 laurin developers 4096 Sep 14 12:41 devshare

./devshare:
total 12
drwxrwxr-x 2 laurin developers 4096 Sep 14 12:41 apps
drwxrwxr-x 2 laurin developers 4096 Sep 14 12:41 docs
drwxrwxr-x 2 laurin developers 4096 Sep 14 12:41 files

./devshare/apps:
total 0

./devshare/docs:
total 0

./devshare/files:
total 0
laurin@03720bb5e96c:/tmp$
```

5. Give write permissions for group developers to *devshare* directory and its subdirectories. [2p]



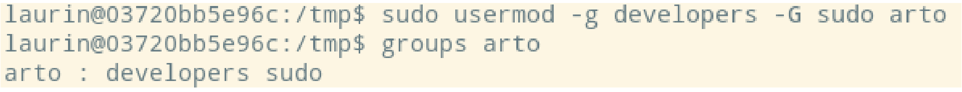
```
laurin@03720bb5e96c:/tmp$ sudo chmod -R g+w devshare/
laurin@03720bb5e96c:/tmp$ ls -lR
.:
total 4
drwxrwxr-x 5 laurin developers 4096 Sep 14 12:41 devshare

./devshare:
total 12
drwxrwxr-x 2 laurin developers 4096 Sep 14 12:41 apps
drwxrwxr-x 2 laurin developers 4096 Sep 14 12:41 docs
drwxrwxr-x 2 laurin developers 4096 Sep 14 12:41 files

./devshare/apps:
total 0

./devshare/docs:
total 0

./devshare/files:
total 0
laurin@03720bb5e96c:/tmp$
```

6. Change permissions for directory */tmp/devshare/apps* so that only directory owner has permissions for the directory. [2p]



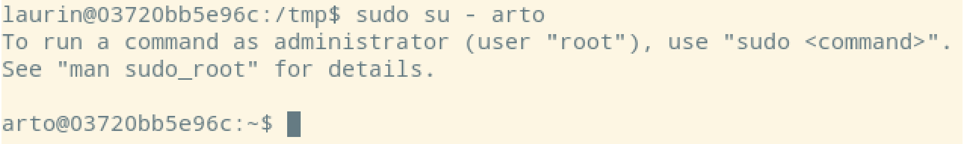
```
laurin@03720bb5e96c:/tmp$ chmod 700 devshare/apps/
laurin@03720bb5e96c:/tmp$ ls -l devshare/
total 12
drwx------ 2 laurin developers 4096 Sep 14 12:41 apps
drwxrwxr-x 2 laurin developers 4096 Sep 14 12:41 docs
drwxrwxr-x 2 laurin developers 4096 Sep 14 12:41 files
laurin@03720bb5e96c:/tmp$
```

7. Set *developers* as *arto's* primary group and add *arto* to group *sudo*. [3p]



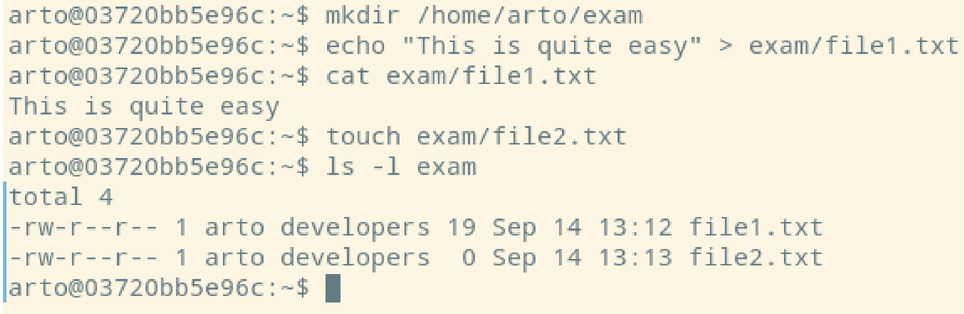
```
laurin@03720bb5e96c:/tmp$ sudo usermod -g developers -G sudo arto
laurin@03720bb5e96c:/tmp$ groups arto
arto : developers sudo
```

8. Switch to user arto so that the whole environment will be changed (do the following exercises as user arto!) [3p]



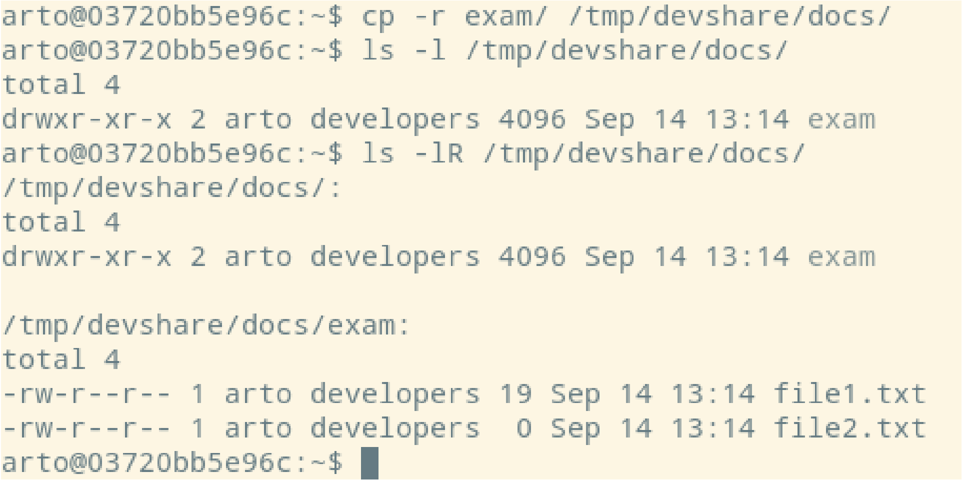
```
laurin@03720bb5e96c:/tmp$ sudo su - arto
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

arto@03720bb5e96c:~$ 
```

9. Create a new directory called *exam* to *arto's* home directory using absolute path. Create the following two files inside *exam* directory using relative path: *file1.txt* and *file2.txt*. Write the following line to *file1.txt*: **This is quite easy**. [4p]



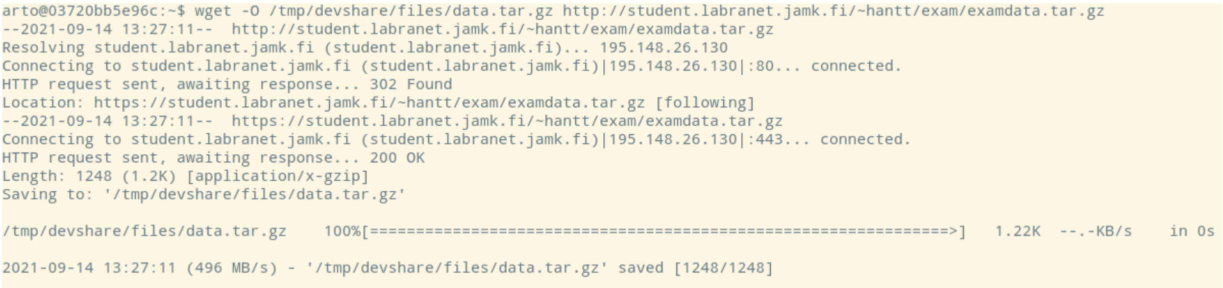
```
arto@03720bb5e96c:~$ mkdir /home/arto/exam
arto@03720bb5e96c:~$ echo "This is quite easy" > exam/file1.txt
arto@03720bb5e96c:~$ cat exam/file1.txt
This is quite easy
arto@03720bb5e96c:~$ touch exam/file2.txt
arto@03720bb5e96c:~$ ls -l exam
total 4
-rw-r--r-- 1 arto developers 19 Sep 14 13:12 file1.txt
-rw-r--r-- 1 arto developers  0 Sep 14 13:13 file2.txt
arto@03720bb5e96c:~$ 
```

10. Copy the *exam* directory to previously created directory */tmp/devshare/docs*. [2p]

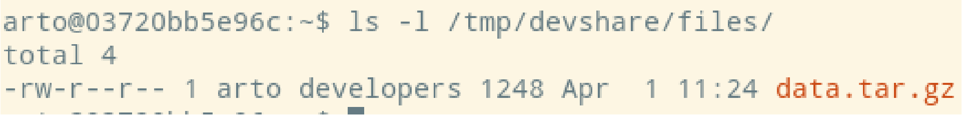


```
arto@03720bb5e96c:~$ cp -r exam/ /tmp/devshare/docs/
arto@03720bb5e96c:~$ ls -l /tmp/devshare/docs/
total 4
drwxr-xr-x 2 arto developers 4096 Sep 14 13:14 exam
arto@03720bb5e96c:~$ ls -lR /tmp/devshare/docs/
/tmp/devshare/docs/:
total 4
drwxr-xr-x 2 arto developers 4096 Sep 14 13:14 exam

/tmp/devshare/docs/exam:
total 4
-rw-r--r-- 1 arto developers 19 Sep 14 13:14 file1.txt
-rw-r--r-- 1 arto developers  0 Sep 14 13:14 file2.txt
arto@03720bb5e96c:~$ 
```

11. Download the following package using wget tool and move it to directory */tmp/devshare/files* with a new name *data.tar.gz*: http://student.labranet.jamk.fi/~hantt/exam/examdata.tar.gz. [3p]

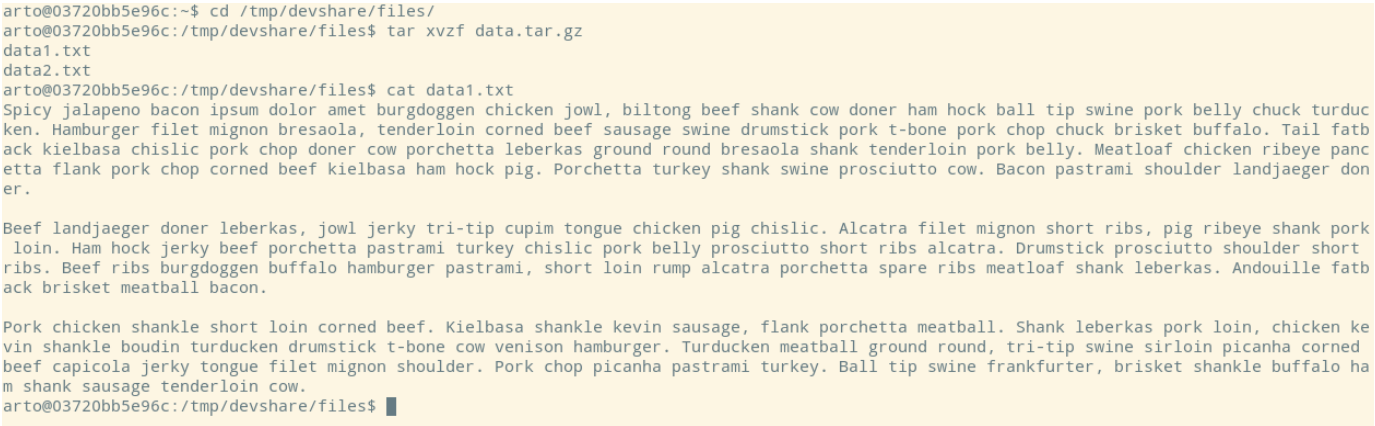


```
arto@03720bb5e96c:~$ wget -O /tmp/devshare/files/data.tar.gz http://student.labranet.jamk.fi/~hantt/exam/examdata.tar.gz
--2021-09-14 13:27:11--  http://student.labranet.jamk.fi/~hantt/exam/examdata.tar.gz
Resolving student.labranet.jamk.fi (student.labranet.jamk.fi)... 195.148.26.130
Connecting to student.labranet.jamk.fi (student.labranet.jamk.fi)|195.148.26.130|:80... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://student.labranet.jamk.fi/~hantt/exam/examdata.tar.gz [following]
--2021-09-14 13:27:11--  https://student.labranet.jamk.fi/~hantt/exam/examdata.tar.gz
Connecting to student.labranet.jamk.fi (student.labranet.jamk.fi)|195.148.26.130|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1248 (1.2K) [application/x-gzip]
Saving to: '/tmp/devshare/files/data.tar.gz'

/tmp/devshare/files/data.tar.gz    100%[===============================================================>]   1.22K  --.-KB/s    in 0s

2021-09-14 13:27:11 (496 MB/s) - '/tmp/devshare/files/data.tar.gz' saved [1248/1248]
```



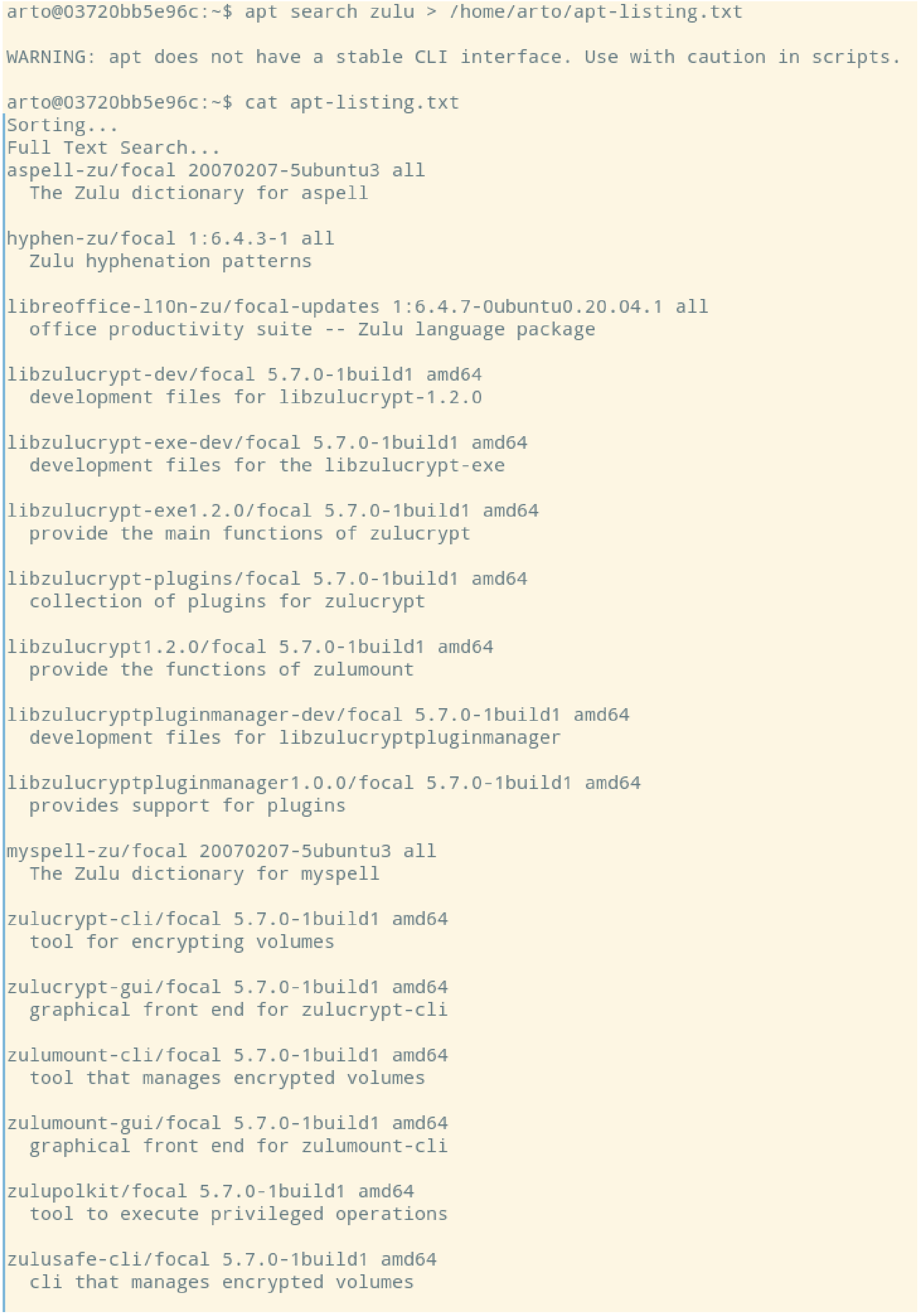
```
arto@03720bb5e96c:~$ ls -l /tmp/devshare/files/
total 4
-rw-r--r-- 1 arto developers 1248 Apr  1 11:24 data.tar.gz
```

12. Extract the package data.tar.gz with one command. Print the content of file *data1.txt* to command line. [2p]



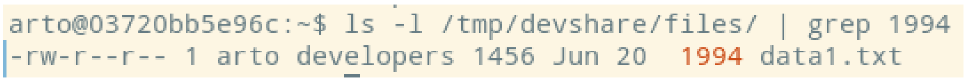
```
arto@03720bb5e96c:~$ cd /tmp/devshare/files/
arto@03720bb5e96c:/tmp/devshare/files$ tar xvzf data.tar.gz
data1.txt
data2.txt
arto@03720bb5e96c:/tmp/devshare/files$ cat data1.txt
Spicy jalapeno bacon ipsum dolor amet burgdoggen chicken jowl, biltong beef shank cow doner ham hock ball tip swine pork belly chuck turduc
ken. Hamburger filet mignon bresaola, tenderloin corned beef sausage swine drumstick pork t-bone pork chop chuck brisket buffalo. Tail fatb
ack kielbasa chislic pork chop doner cow porchetta leberkas ground round bresaola shank tenderloin pork belly. Meatloaf chicken ribeye panc
etta flank pork chop corned beef kielbasa ham hock pig. Porchetta turkey shank swine prosciutto cow. Bacon pastrami shoulder landjaeger don
er.

Beef landjaeger doner leberkas, jowl jerky tri-tip cupim tongue chicken pig chislic. Alcatra filet mignon short ribs, pig ribeye shank pork
 loin. Ham hock jerky beef porchetta pastrami turkey chislic pork belly prosciutto short ribs alcatra. Drumstick prosciutto shoulder short
ribs. Beef ribs burgdoggen buffalo hamburger pastrami, short loin rump alcatra porchetta spare ribs meatloaf shank leberkas. Andouille fatb
ack brisket meatball bacon.

Pork chicken shankle short loin corned beef. Kielbasa shankle kevin sausage, flank porchetta meatball. Shank leberkas pork loin, chicken ke
vin shankle boudin turducken drumstick t-bone cow venison hamburger. Turducken meatball ground round, tri-tip swine sirloin picanha corned
beef capicola jerky tongue filet mignon shoulder. Pork chop picanha pastrami turkey. Ball tip swine frankfurter, brisket shankle buffalo ha
m shank sausage tenderloin cow.
arto@03720bb5e96c:/tmp/devshare/files$ █
```

13. Find results for string **zulu** using apt package management and redirect the results to file *apt-listing.txt* in *arto's* home directory using absolute path. [3p]



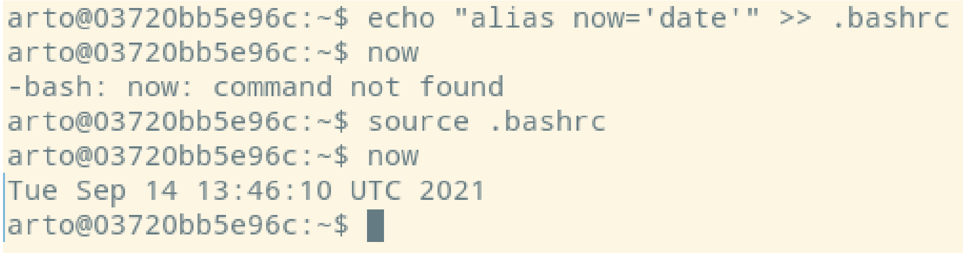
```
arto@03720bb5e96c:~$ apt search zulu > /home/arto/apt-listing.txt

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

arto@03720bb5e96c:~$ cat apt-listing.txt
Sorting...
Full Text Search...
aspell-zu/focal 20070207-5ubuntu3 all
  The Zulu dictionary for aspell

hyphen-zu/focal 1:6.4.3-1 all
  Zulu hyphenation patterns

libreoffice-l10n-zu/focal-updates 1:6.4.7-0ubuntu0.20.04.1 all
  office productivity suite -- Zulu language package

libzulucrypt-dev/focal 5.7.0-1build1 amd64
  development files for libzulucrypt-1.2.0

libzulucrypt-exe-dev/focal 5.7.0-1build1 amd64
  development files for the libzulucrypt-exe

libzulucrypt-exe1.2.0/focal 5.7.0-1build1 amd64
  provide the main functions of zulucrypt

libzulucrypt-plugins/focal 5.7.0-1build1 amd64
  collection of plugins for zulucrypt

libzulucrypt1.2.0/focal 5.7.0-1build1 amd64
  provide the functions of zulumount

libzulucryptpluginmanager-dev/focal 5.7.0-1build1 amd64
  development files for libzulucryptpluginmanager

libzulucryptpluginmanager1.0.0/focal 5.7.0-1build1 amd64
  provides support for plugins

myspell-zu/focal 20070207-5ubuntu3 all
  The Zulu dictionary for myspell

zulucrypt-cli/focal 5.7.0-1build1 amd64
  tool for encrypting volumes

zulucrypt-gui/focal 5.7.0-1build1 amd64
  graphical front end for zulucrypt-cli

zulumount-cli/focal 5.7.0-1build1 amd64
  tool that manages encrypted volumes

zulumount-gui/focal 5.7.0-1build1 amd64
  graphical front end for zulumount-cli

zulupolkit/focal 5.7.0-1build1 amd64
  tool to execute privileged operations

zulusafe-cli/focal 5.7.0-1build1 amd64
  cli that manages encrypted volumes
```

14. List the content from *files* directory using long listing format so that only objects (files, directories, links etc.) that have last been edited in year 1994 will be listed. [4p]



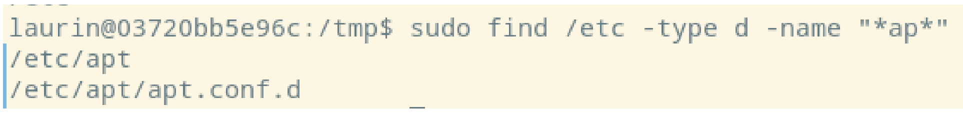
```
arto@03720bb5e96c:~$ ls -l /tmp/devshare/files/ | grep 1994
-rw-r--r-- 1 arto developers 1456 Jun 20  1994 data1.txt
```

15. Create new permanent alias for user *arto*, which will print the current date to command line. Verify that yout alias works. [5p]



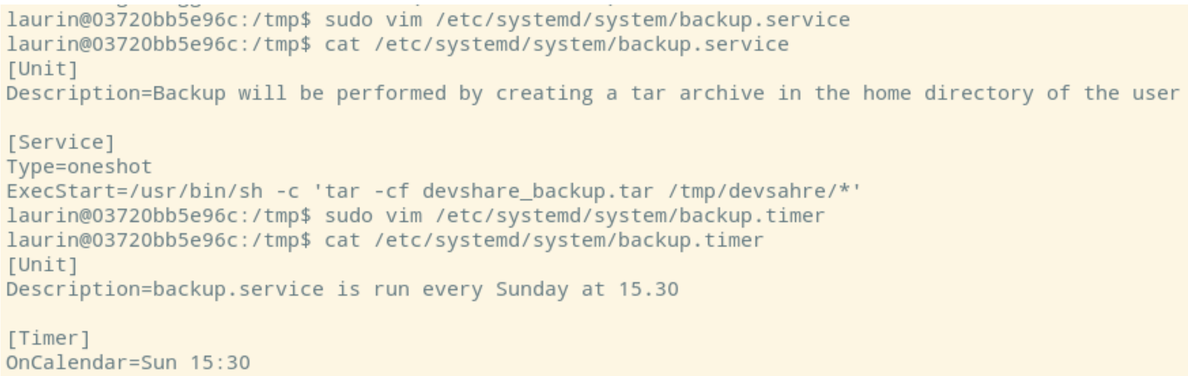
```
arto@03720bb5e96c:~$ echo "alias now='date'" >> .bashrc
arto@03720bb5e96c:~$ now
-bash: now: command not found
arto@03720bb5e96c:~$ source .bashrc
arto@03720bb5e96c:~$ now
Tue Sep 14 13:46:10 UTC 2021
arto@03720bb5e96c:~$
```

16. **Return to your previous user**. Find directories with name including the string **ap** inside */etc* directory using administrative privileges. [3p]

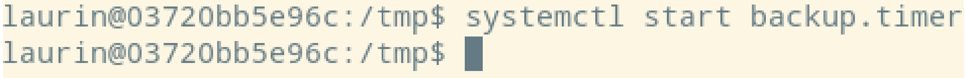


```
laurin@03720bb5e96c:/tmp$ sudo find /etc -type d -name "*ap*"
/etc/apt
/etc/apt/apt.conf.d
```

17. Use systemd timer to schedule a backup of *devshare* directory to your user's home directory using tar command. Backup should be taken every Sunday at 15.30. [5p]



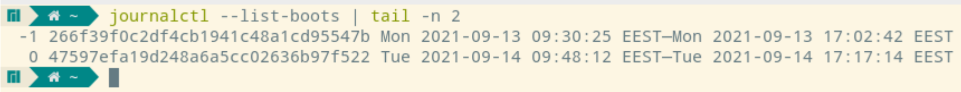
```
laurin@03720bb5e96c:/tmp$ sudo vim /etc/systemd/system/backup.service
laurin@03720bb5e96c:/tmp$ cat /etc/systemd/system/backup.service
[Unit]
Description=Backup will be performed by creating a tar archive in the home directory of the user

[Service]
Type=oneshot
ExecStart=/usr/bin/sh -c 'tar -cf devshare_backup.tar /tmp/devsahre/*'
laurin@03720bb5e96c:/tmp$ sudo vim /etc/systemd/system/backup.timer
laurin@03720bb5e96c:/tmp$ cat /etc/systemd/system/backup.timer
[Unit]
Description=backup.service is run every Sunday at 15.30

[Timer]
OnCalendar=Sun 15:30
```



```
laurin@03720bb5e96c:/tmp$ systemctl start backup.timer
laurin@03720bb5e96c:/tmp$
```

I have to add here that I did this exam in an Ubuntu docker container and this image does not support systemd since this is against the philosophy of using containers. With "systemctl list-timers" we could list the timers here.

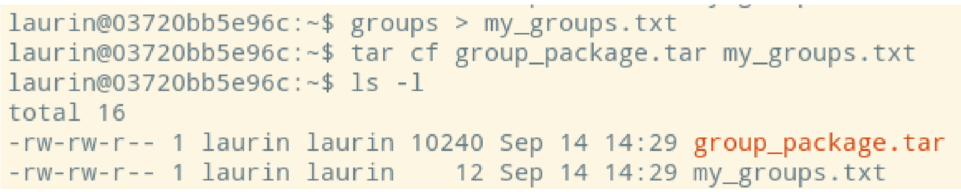
18. At what time, was the previous the system boot? [3p]



```
 ~  journalctl --list-boots | tail -n 2
 -1 266f39f0c2df4cb1941c48a1cd95547b Mon 2021-09-13 09:30:25 EEST—Mon 2021-09-13 17:02:42 EEST
  0 47597efa19d248a6a5cc02636b97f522 Tue 2021-09-14 09:48:12 EEST—Tue 2021-09-14 17:17:14 EEST
 ~ 
```

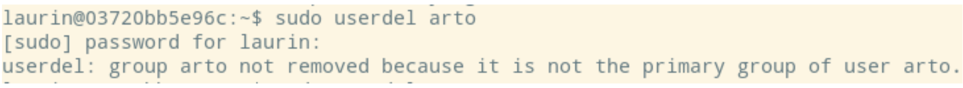
The screenshot above is from my host Linux work machine (running Manjaro) because the docker container with linux does not have the journalctl because it does not have systemd.

19. List your user's groups and write the output to file called *my_groups.txt*. Then create a tar archive called *group_package.tar* including that file. [3p]

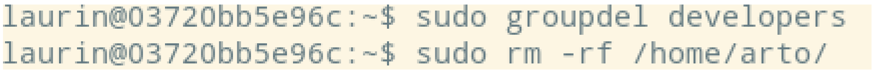


```
laurin@03720bb5e96c:~$ groups > my_groups.txt
laurin@03720bb5e96c:~$ tar cf group_package.tar my_groups.txt
laurin@03720bb5e96c:~$ ls -l
total 16
-rw-rw-r-- 1 laurin laurin 10240 Sep 14 14:29 group_package.tar
-rw-rw-r-- 1 laurin laurin    12 Sep 14 14:29 my_groups.txt
```

20. Remove group *developers*, user *arto* and arto's home directory from the system. [3p]



```
laurin@03720bb5e96c:~$ sudo userdel arto
[sudo] password for laurin:
userdel: group arto not removed because it is not the primary group of user arto.
```



```
laurin@03720bb5e96c:~$ sudo groupdel developers
laurin@03720bb5e96c:~$ sudo rm -rf /home/arto/
```