

# 《Linux 操作系统》学生实验报告

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课程名称: Linux 操作系统

实验名称: 实验六\_磁盘管理

指导老师: 姚坤

## 一、实验任务

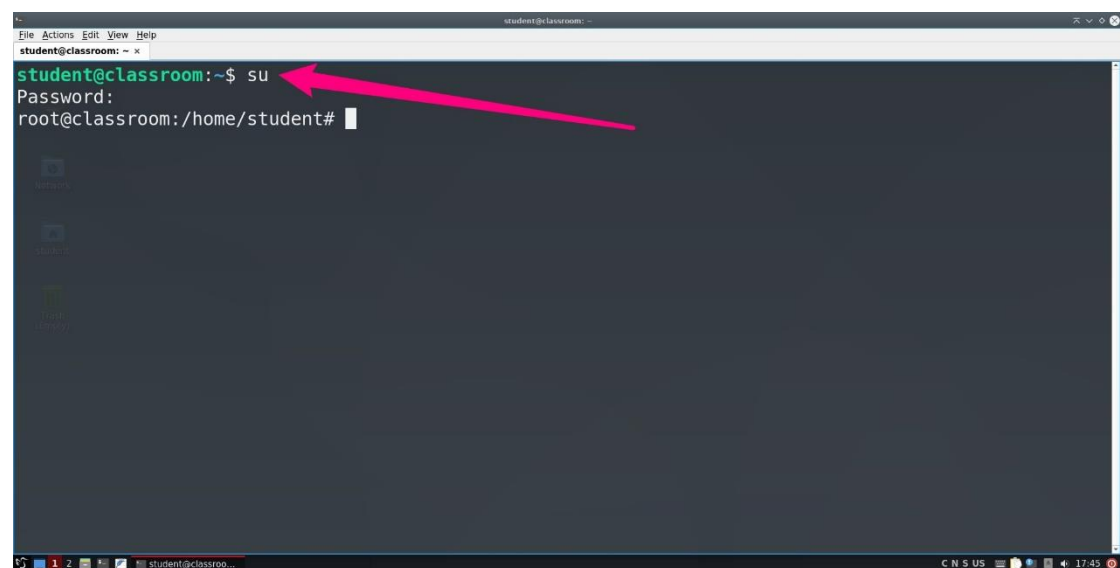
- 1.用 `df` 命令查看当前磁盘的分区、空间使用情况和每个分区的挂载点，然后在当前用户目录下创建一个文件夹（用自己的名字的拼音命名）；
- 2.安装 `quota` 软件包并用 `whereis` 查看 `quotacheck` 是否被安装；
- 3.给新硬盘分区并开启磁盘配额功能；
- 4.扫描所有支持磁盘配额的分区并在其当前目录下的挂载目录生成相应的配置文件；
- 5.为用户/组设置磁盘配额大小，设置配额为20M；
- 6.先关闭然后再开启磁盘配额功能；
- 7.进入第一步所创建的文件夹，然后写1G 的数据到当前文件夹下；
- 8.使用 `du` 查看当前文件夹或者生成的文件所占磁盘空间的大小。

## 二、实验记录及总结

### 1.实验过程的操作记录（用图文说明）

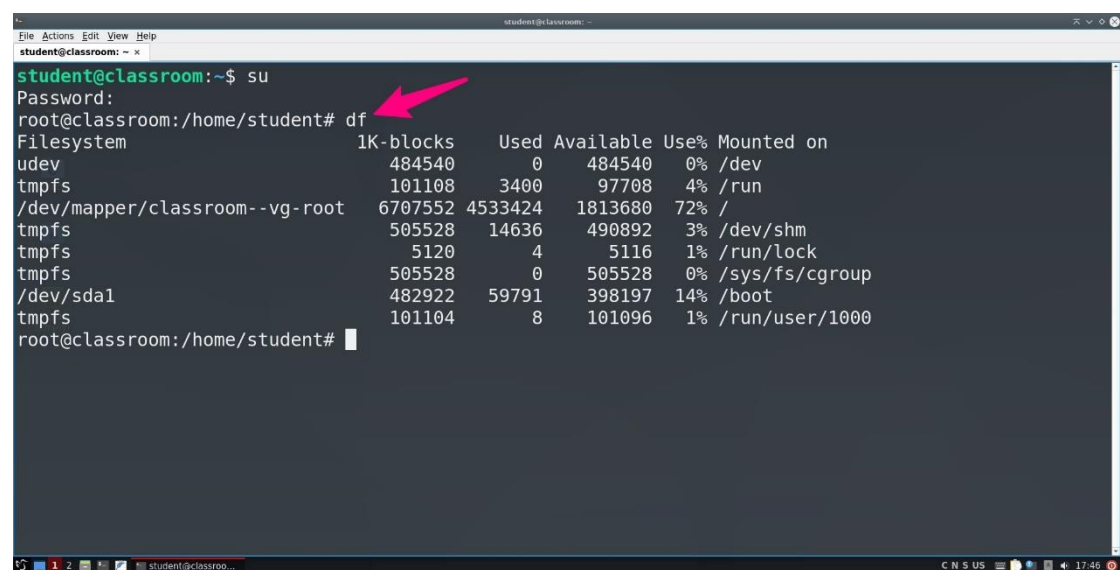
- (1) 用 `df` 命令查看当前磁盘的分区、空间使用情况和每个分区的挂载点，然后在当前用户目录下创建一个文件夹（用自己的名字的拼音命名）；

进入管理员模式



```
student@classroom: ~$ su
Password:
root@classroom:/home/student#
```

使用 df 命令查看磁盘



```
student@classroom: ~$ su
Password:
root@classroom:/home/student# df
```

Filesystem	1K-blocks	Used	Available	Use%	Mounted on
udev	484540	0	484540	0%	/dev
tmpfs	101108	3400	97708	4%	/run
/dev/mapper/classroom--vg-root	6707552	4533424	1813680	72%	/
tmpfs	505528	14636	490892	3%	/dev/shm
tmpfs	5120	4	5116	1%	/run/lock
tmpfs	505528	0	505528	0%	/sys/fs/cgroup
/dev/sda1	482922	59791	398197	14%	/boot
tmpfs	101104	8	101096	1%	/run/user/1000

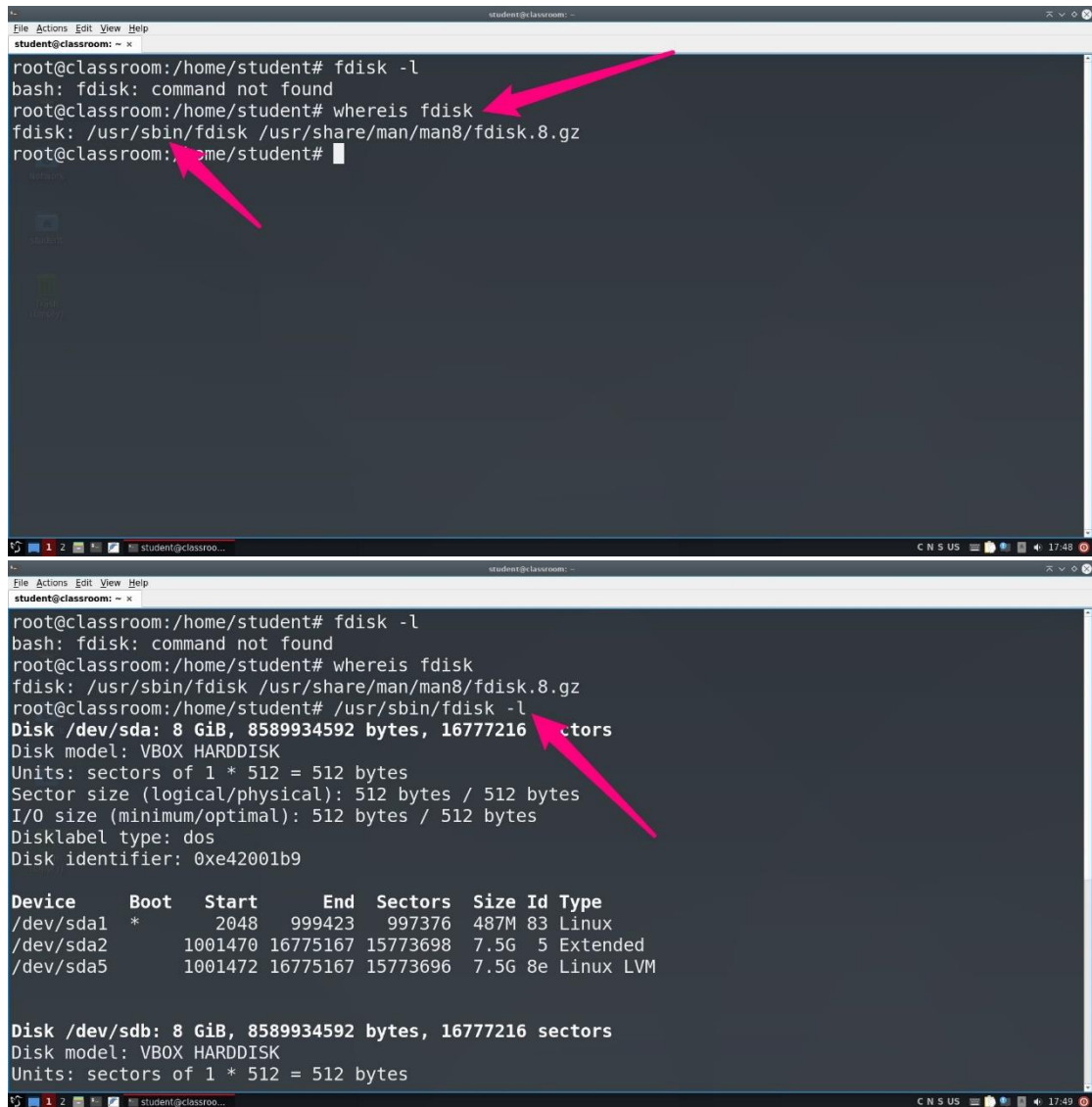
df 命令显示磁盘空间

```
student@classroom: ~
Password:
root@classroom:/home/student# df
Filesystem            1K-blocks    Used Available Use% Mounted on
udev                  484540         0   484540    0% /dev
tmpfs                 101108        3400   97708    4% /run
/dev/mapper/classroom--vg-root 6707552 4533424 1813680   72% /
tmpfs                 505528       14636  490892    3% /dev/shm
tmpfs                  5120           4    5116    1% /run/lock
tmpfs                 505528         0   505528    0% /sys/fs/cgroup
/dev/sda1             482922       59791  398197   14% /boot
tmpfs                 101104         8   101096    1% /run/user/1000
root@classroom:/home/student# df -h
Filesystem            Size  Used Avail Use% Mounted on
udev                 474M     0  474M   0% /dev
tmpfs                99M   3.4M   96M   4% /run
/dev/mapper/classroom--vg-root 6.4G  4.4G  1.8G  72% /
tmpfs                494M   15M  480M   3% /dev/shm
tmpfs                5.0M  4.0K  5.0M   1% /run/lock
tmpfs                494M     0  494M   0% /sys/fs/cgroup
/dev/sda1            472M   59M  389M  14% /boot
tmpfs                99M   8.0K   99M   1% /run/user/1000
root@classroom:/home/student#
```

df -T 列出文件系统的类型

```
root@classroom:/home/student# df -h
Filesystem            Size  Used Avail Use% Mounted on
udev                 474M     0  474M   0% /dev
tmpfs                99M   3.4M   96M   4% /run
/dev/mapper/classroom--vg-root 6.4G  4.4G  1.8G  72% /
tmpfs                494M   15M  480M   3% /dev/shm
tmpfs                5.0M  4.0K  5.0M   1% /run/lock
tmpfs                494M     0  494M   0% /sys/fs/cgroup
/dev/sda1            472M   59M  389M  14% /boot
tmpfs                99M   8.0K   99M   1% /run/user/1000
root@classroom:/home/student# df -T
Filesystem            Type      1K-blocks    Used Available Use% Mounted on
udev                 devtmpfs  484540         0   484540    0% /dev
tmpfs                tmpfs     101108        3400   97708    4% /run
/dev/mapper/classroom--vg-root ext4      6707552 4539728 1807376   72% /
tmpfs                tmpfs     505528       14636  490892    3% /dev/shm
tmpfs                tmpfs      5120           4    5116    1% /run/lock
tmpfs                tmpfs     505528         0   505528    0% /sys/fs/cgroup
/dev/sda1            ext2      482922       59791  398197   14% /boot
tmpfs                tmpfs     101104         8   101096    1% /run/user/1000
root@classroom:/home/student#
```

同时可以使用 fdisk



```
root@classroom:/home/student# fdisk -l
bash: fdisk: command not found
root@classroom:/home/student# whereis fdisk
fdisk: /usr/sbin/fdisk /usr/share/man/man8/fdisk.8.gz
root@classroom:/home/student#
```

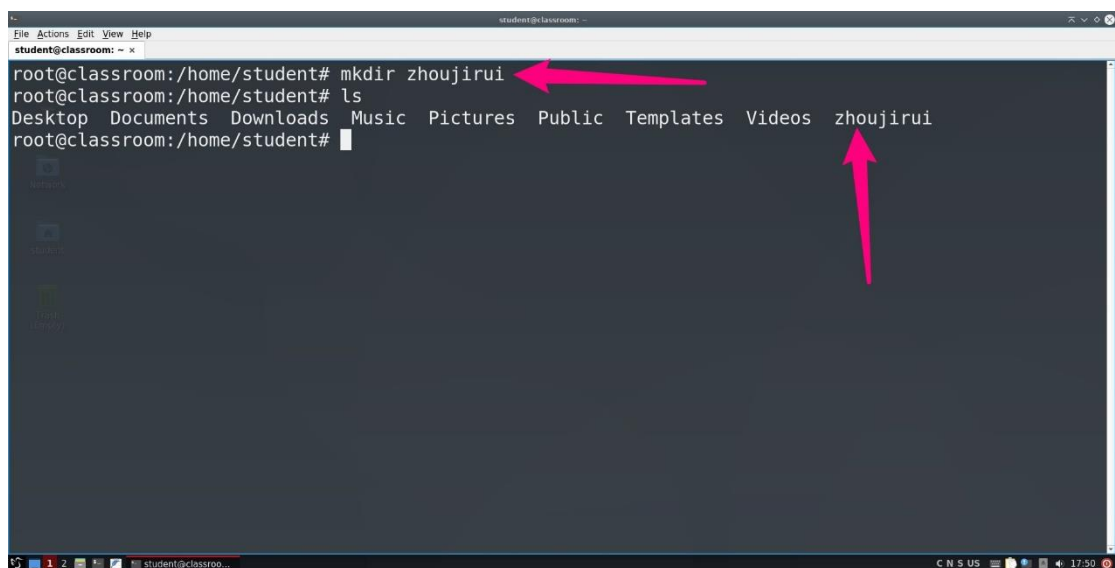
  

```
root@classroom:/home/student# fdisk -l
bash: fdisk: command not found
root@classroom:/home/student# whereis fdisk
fdisk: /usr/sbin/fdisk /usr/share/man/man8/fdisk.8.gz
root@classroom:/home/student# /usr/sbin/fdisk -l
Disk /dev/sda: 8 GiB, 8589934592 bytes, 16777216 sectors
Disk model: VBOX HARDDISK
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: 0xe42001b9

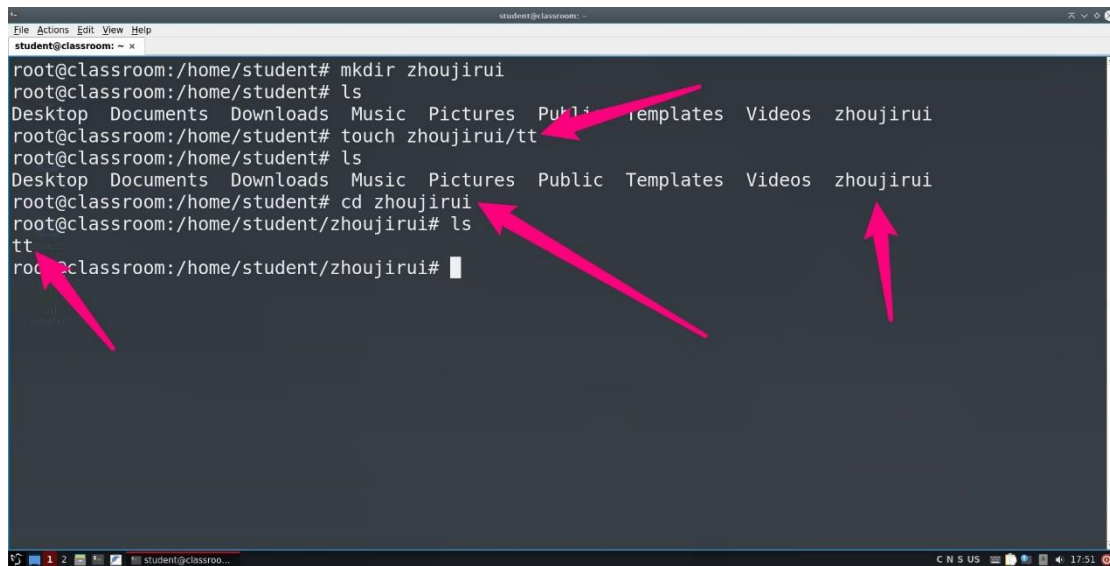
Device      Boot    Start        End    Sectors    Size Id Type
/dev/sda1   *          2048     999423     997376    487M 83 Linux
/dev/sda2             1001470    16775167    15773698     7.5G  5 Extended
/dev/sda5             1001472    16775167    15773696     7.5G 8e Linux LVM

Disk /dev/sdb: 8 GiB, 8589934592 bytes, 16777216 sectors
Disk model: VBOX HARDDISK
Units: sectors of 1 * 512 = 512 bytes
```

## mkdir 创建目录



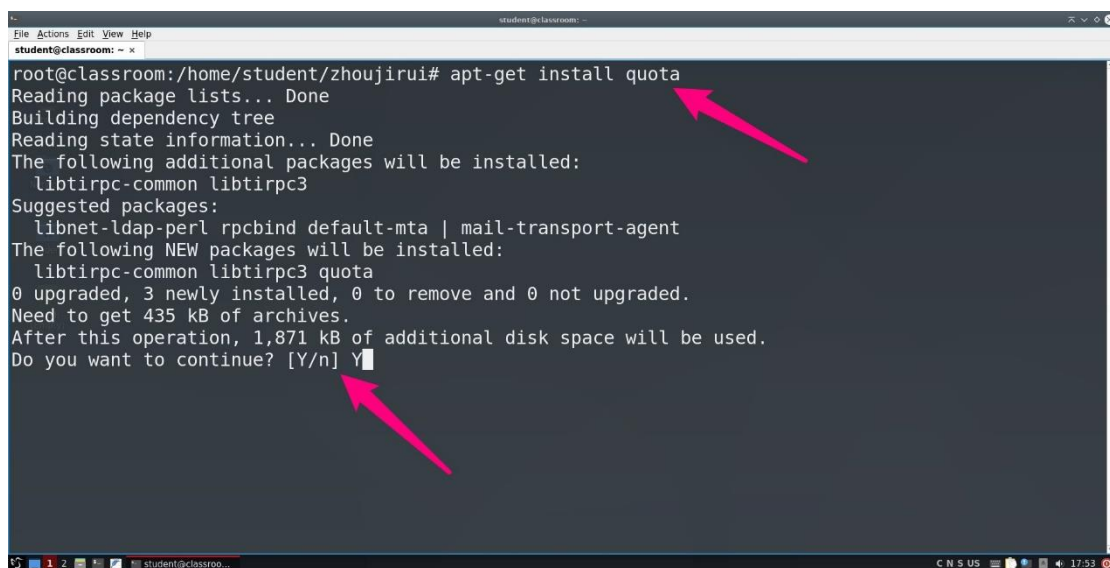
```
root@classroom:/home/student# mkdir zhoujirui
root@classroom:/home/student# ls
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui
root@classroom:/home/student#
```

A terminal window titled 'student@classroom: ~' showing a series of commands and their outputs. The commands are: 'mkdir zhoujirui', 'ls', 'touch zhoujirui/tt', 'ls', 'cd zhoujirui', and 'ls'. The outputs show the directory structure being created. Three red arrows point to specific parts of the output: one to 'zhoujirui' in the first 'ls' output, one to 'tt' in the second 'ls' output, and one to 'zhoujirui' in the third 'ls' output.

```
root@classroom:/home/student# mkdir zhoujirui
root@classroom:/home/student# ls
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui
root@classroom:/home/student# touch zhoujirui/tt
root@classroom:/home/student# ls
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui
root@classroom:/home/student# cd zhoujirui
root@classroom:/home/student/zhoujirui# ls
tt
root@classroom:/home/student/zhoujirui#
```

(2) 安装 quota 软件包并用 whereis 查看 quotacheck 是否被安装;

apt-get install 安装命令

A terminal window titled 'student@classroom: ~' showing the command 'apt-get install quota' and its output. The output includes package lists, dependency tree, state information, additional packages to be installed, suggested packages, and disk space requirements. Two red arrows point to specific parts of the output: one to 'apt-get install quota' and one to the 'Y' response to the confirmation prompt.

```
root@classroom:/home/student/zhoujirui# apt-get install quota
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libtirpc-common libtirpc3
Suggested packages:
  libnet-ldap-perl rpcbind default-mta | mail-transport-agent
The following NEW packages will be installed:
  libtirpc-common libtirpc3 quota
0 upgraded, 3 newly installed, 0 to remove and 0 not upgraded.
Need to get 435 kB of archives.
After this operation, 1,871 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

whereis 查找可执行文件位置

```
student@classroom: ~  
Get:3 http://mirrors.163.com/debian buster/main amd64 quota amd64 4.04-2+deb10u1 [325 kB]  
Fetched 435 kB in 0s (1,339 kB/s)  
Preconfiguring packages ...  
Selecting previously unselected package libtirpc-common.  
(Reading database ... 198421 files and directories currently installed.)  
Preparing to unpack .../libtirpc-common_1.1.4-0.4_all.deb ...  
Unpacking libtirpc-common (1.1.4-0.4) ...  
Selecting previously unselected package libtirpc3:amd64.  
Preparing to unpack .../libtirpc3_1.1.4-0.4_amd64.deb ...  
Unpacking libtirpc3:amd64 (1.1.4-0.4) ...  
Selecting previously unselected package quota.  
Preparing to unpack .../quota_4.04-2+deb10u1_amd64.deb ...  
Unpacking quota (4.04-2+deb10u1) ...  
Setting up libtirpc-common (1.1.4-0.4) ...  
Setting up libtirpc3:amd64 (1.1.4-0.4) ...  
Setting up quota (4.04-2+deb10u1) ...  
Processing triggers for systemd (241-7-deb10u5) ...  
Processing triggers for man-db (2.8.5-2) ...  
Processing triggers for libc-bin (2.28-10) ...  
root@classroom:/home/student/zhoulirui# whereis quotacheck  
quotacheck: /usr/sbin/quotacheck /usr/share/man/man8/quotacheck.8.gz  
root@classroom:/home/student/zhoulirui#
```

### (3) 给新硬盘分区并开启磁盘配额功能;

分区格式化命令 mkfs

```
root@classroom:/home/student/zhoulirui# mkfs  
bash: mkfs: command not found  
root@classroom:/home/student/zhoulirui# whereis mkfs  
mkfs: /usr/sbin/mkfs.msdos /usr/sbin/mkfs.cramfs /usr/sbin/mkfs.ext2 /usr/sbin/mkfs /usr/sbin/mkfs.  
fat /usr/sbin/mkfs.ntfs /usr/sbin/mkfs.ext3 /usr/sbin/mkfs.exfat /usr/sbin/mkfs.bfs /usr/sbin/mkfs.  
ext4 /usr/sbin/mkfs.vfat /usr/sbin/mkfs.minix /usr/share/man/man8/mkfs.8.gz  
root@classroom:/home/student/zhoulirui#
```

mkfs.ext4 分区格式化为 ext4 文件系统

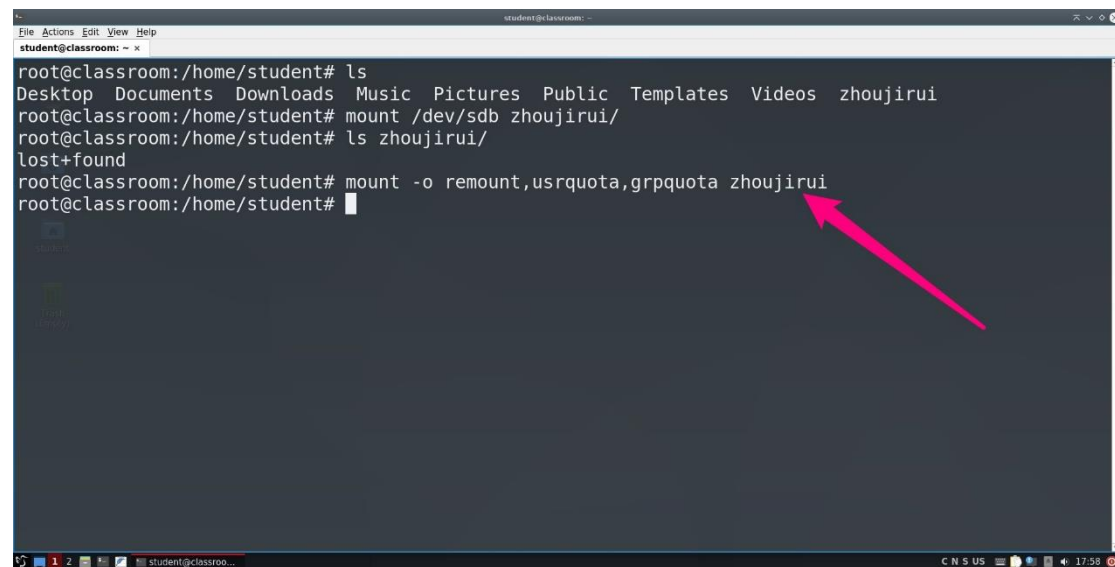


```
student@classroom: ~  
File Actions Edit View Help  
student@classroom: ~  
root@classroom:/home/student/zhoujirui# mkfs  
bash: mkfs: command not found  
root@classroom:/home/student/zhoujirui# whereis mkfs  
mkfs: /usr/sbin/mkfs.msdos /usr/sbin/mkfs.cramfs /usr/sbin/mkfs.ext2 /usr/sbin/mkfs /usr/sbin/mkfs.  
fat /usr/sbin/mkfs.ntfs /usr/sbin/mkfs.ext3 /usr/sbin/mkfs.exfat /usr/sbin/mkfs.bfs /usr/sbin/mkfs.  
ext4 /usr/sbin/mkfs.vfat /usr/sbin/mkfs.minix /usr/share/man/man8/mkfs.8.gz  
root@classroom:/home/student/zhoujirui# /usr/sbin/mkfs.ext4 /dev/sdb  
mke2fs 1.44.5 (15-Dec-2018)  
Creating filesystem with 2097152 4k blocks and 524288 inodes  
Filesystem UUID: a34dc6be-dd3d-4a2d-b3cd-443ca3483e18  
Superblock backups stored on blocks:  
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632  
  
Allocating group tables: done  
Writing inode tables: done  
Creating journal (16384 blocks): done  
Writing superblocks and filesystem accounting information: done  
  
root@classroom:/home/student/zhoujirui#
```

## mount 挂载命令

```
student@classroom: ~  
File Actions Edit View Help  
student@classroom: ~  
root@classroom:/home/student# ls  
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui  
root@classroom:/home/student# mount /dev/sdb zhoujirui/  
root@classroom:/home/student#  
  
root@classroom:/home/student# ls  
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui  
root@classroom:/home/student# mount /dev/sdb zhoujirui/  
root@classroom:/home/student# ls zhoujirui/  
lost+found  
root@classroom:/home/student#
```

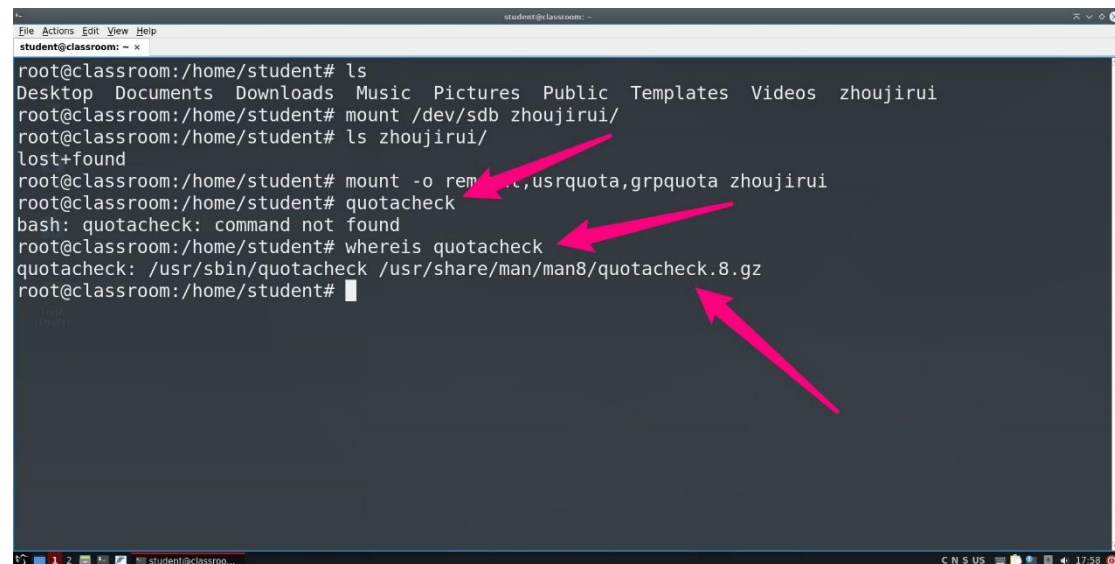
mount -o remount,usrquota,grpquota 配额权限分配



```
root@classroom:/home/student# ls
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui
root@classroom:/home/student# mount /dev/sdb zhoujirui/
root@classroom:/home/student# ls zhoujirui/
lost+found
root@classroom:/home/student# mount -o remount,usrquota,grpquota zhoujirui
root@classroom:/home/student#
```

(4) 扫描所有支持磁盘配额的分区并在其当前目录下的挂载目录生成相应的配置文件;

quotacheck -avugn



```
root@classroom:/home/student# ls
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui
root@classroom:/home/student# mount /dev/sdb zhoujirui/
root@classroom:/home/student# ls zhoujirui/
lost+found
root@classroom:/home/student# mount -o remount,usrquota,grpquota zhoujirui
root@classroom:/home/student# quotacheck
bash: quotacheck: command not found
root@classroom:/home/student# whereis quotacheck
quotacheck: /usr/sbin/quotacheck /usr/share/man/man8/quotacheck.8.gz
root@classroom:/home/student#
```



```
student@classroom: ~  
root@classroom:/home/student# ls  
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui  
root@classroom:/home/student# mount /dev/sdb zhoujirui/  
root@classroom:/home/student# ls zhoujirui/  
lost+found  
root@classroom:/home/student# mount -o remount,usrquota,grpquota zhoujirui  
root@classroom:/home/student# quotacheck  
bash: quotacheck: command not found  
root@classroom:/home/student# whereis quotacheck  
quotacheck: /usr/sbin/quotacheck /usr/share/man/man8/quotacheck.8.gz  
root@classroom:/home/student# /usr/sbin/quotacheck -avugn  
quotacheck: Your kernel probably supports journaled quota but you are not using it. Consider switch  
ing to journaled quota to avoid running quotacheck after an unclean shutdown.  
quotacheck: Scanning /dev/sdb [/home/student/zhoujirui] done  
quotacheck: Cannot stat old user quota file /home/student/zhoujirui/aquota.user: No such file or di  
rectory. Usage will not be subtracted.  
quotacheck: Cannot stat old group quota file /home/student/zhoujirui/aquota.group: No such file or  
directory. Usage will not be subtracted.  
quotacheck: Cannot stat old user quota file /home/student/zhoujirui/aquota.user: No such file or di  
rectory. Usage will not be subtracted.  
quotacheck: Cannot stat old group quota file /home/student/zhoujirui/aquota.group: No such file or  
directory. Usage will not be subtracted.  
root@classroom:/home/student# whereis quotacheck  
quotacheck: /usr/sbin/quotacheck /usr/share/man/man8/quotacheck.8.gz  
root@classroom:/home/student# /usr/sbin/quotacheck -avugn  
quotacheck: Your kernel probably supports journaled quota but you are not using it. Consider switch  
ing to journaled quota to avoid running quotacheck after an unclean shutdown.  
quotacheck: Scanning /dev/sdb [/home/student/zhoujirui] done  
quotacheck: Cannot stat old user quota file /home/student/zhoujirui/aquota.user: No such file or di  
rectory. Usage will not be subtracted.  
quotacheck: Cannot stat old group quota file /home/student/zhoujirui/aquota.group: No such file or  
directory. Usage will not be subtracted.  
quotacheck: Cannot stat old user quota file /home/student/zhoujirui/aquota.user: No such file or di  
rectory. Usage will not be subtracted.  
quotacheck: Cannot stat old group quota file /home/student/zhoujirui/aquota.group: No such file or  
directory. Usage will not be subtracted.  
quotacheck: Checked 3 directories and 0 files  
quotacheck: Old file not found.  
quotacheck: Old file not found.  
root@classroom:/home/student# quotaon  
bash: quotaon: command not found  
root@classroom:/home/student# whereis quotaon  
quotaon: /usr/sbin/quotaon /usr/share/man/man8/quotaon.8.gz  
root@classroom:/home/student#  
quotacheck: Your kernel probably supports journaled quota but you are not using it. Consider switch  
ing to journaled quota to avoid running quotacheck after an unclean shutdown.  
quotacheck: Scanning /dev/sdb [/home/student/zhoujirui] done  
quotacheck: Cannot stat old user quota file /home/student/zhoujirui/aquota.user: No such file or di  
rectory. Usage will not be subtracted.  
quotacheck: Cannot stat old group quota file /home/student/zhoujirui/aquota.group: No such file or  
directory. Usage will not be subtracted.  
quotacheck: Cannot stat old user quota file /home/student/zhoujirui/aquota.user: No such file or di  
rectory. Usage will not be subtracted.  
quotacheck: Cannot stat old group quota file /home/student/zhoujirui/aquota.group: No such file or  
directory. Usage will not be subtracted.  
quotacheck: Checked 3 directories and 0 files  
quotacheck: Old file not found.  
quotacheck: Old file not found.  
root@classroom:/home/student# quotaon  
bash: quotaon: command not found  
root@classroom:/home/student# whereis quotaon  
quotaon: /usr/sbin/quotaon /usr/share/man/man8/quotaon.8.gz  
root@classroom:/home/student# /usr/sbin/quotaon -vug zhoujirui  
/dev/sdb [/home/student/zhoujirui]: group quotas turned on  
/dev/sdb [/home/student/zhoujirui]: user quotas turned on  
root@classroom:/home/student#
```

```
student@classroom: ~
quotacheck: Cannot stat old group quota file /home/student/zhoujirui/aquota.group: No such file or directory. Usage will not be subtracted.
quotacheck: Cannot stat old user quota file /home/student/zhoujirui/aquota.user: No such file or directory. Usage will not be subtracted.
quotacheck: Cannot stat old group quota file /home/student/zhoujirui/aquota.group: No such file or directory. Usage will not be subtracted.
quotacheck: Checked 3 directories and 0 files
quotacheck: Old file not found.
quotacheck: Old file not found.
root@classroom:/home/student# quotaon
bash: quotaon: command not found
root@classroom:/home/student# whereis quotaon
quotaon: /usr/sbin/quotaon /usr/share/man/man8/quotaon.8.gz
root@classroom:/home/student# /usr/sbin/quotaon -tug zhoujirui
/dev/sdb [/home/student/zhoujirui]: group quotas turned on
/dev/sdb [/home/student/zhoujirui]: user quotas turned on
root@classroom:/home/student# ls
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui
root@classroom:/home/student# cd zhoujirui
root@classroom:/home/student/zhoujirui# ls
aquota.group aquota.user lost+found
root@classroom:/home/student/zhoujirui#
```

(5) 为用户/组设置磁盘配额大小，设置配额为20M;

用户:

```
student@classroom: ~
root@classroom:/home/student# /usr/sbin/edquota -u student
```

The image displays three sequential screenshots of a terminal window running GNU nano 3.2, editing a file at /tmp//EdP.aTI10bY. The terminal shows the process of setting disk quotas for user 'student' (uid 1000) on the filesystem /dev/sdb.

**Screenshot 1 (Top):** Shows the initial state of the disk quotas. The 'hard' limit for blocks is currently 0. A pink arrow points to the 'hard' column header.

Filesystem	blocks	soft	hard	inodes	soft	hard
/dev/sdb	0	0	0	0	0	0

**Screenshot 2 (Middle):** Shows the 'hard' limit for blocks being set to 20480. A pink arrow points to the value 20480.

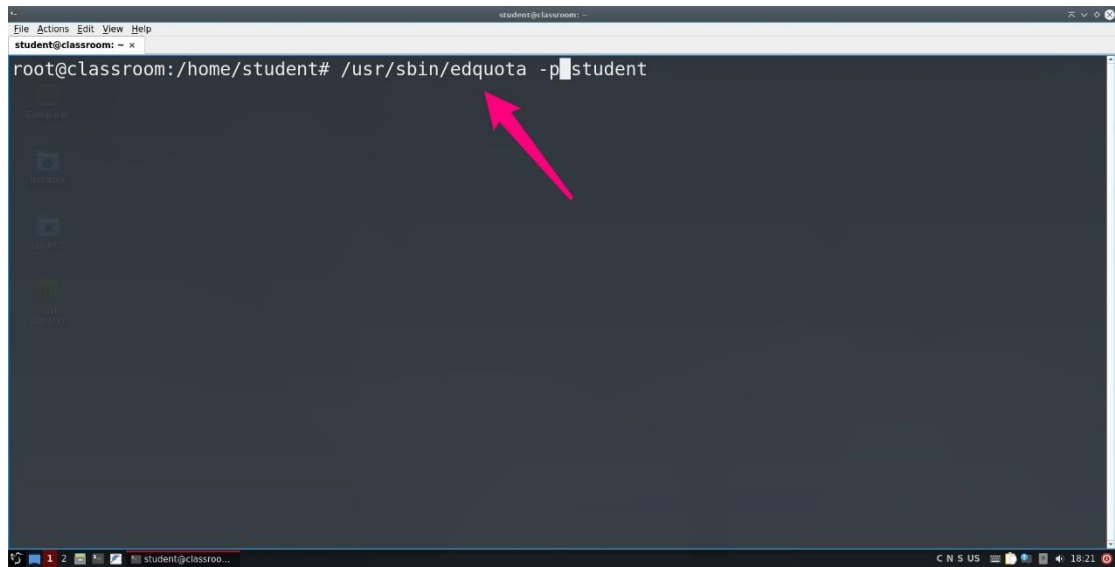
Filesystem	blocks	soft	hard	inodes	soft	hard
/dev/sdb	0	0	20480	0	0	0

**Screenshot 3 (Bottom):** Shows the 'Save modifications?' prompt. A pink arrow points to the 'Y' (Yes) option.

Save modifications? (Answering "No" will DISCARD changes.)

Y Yes  
N No

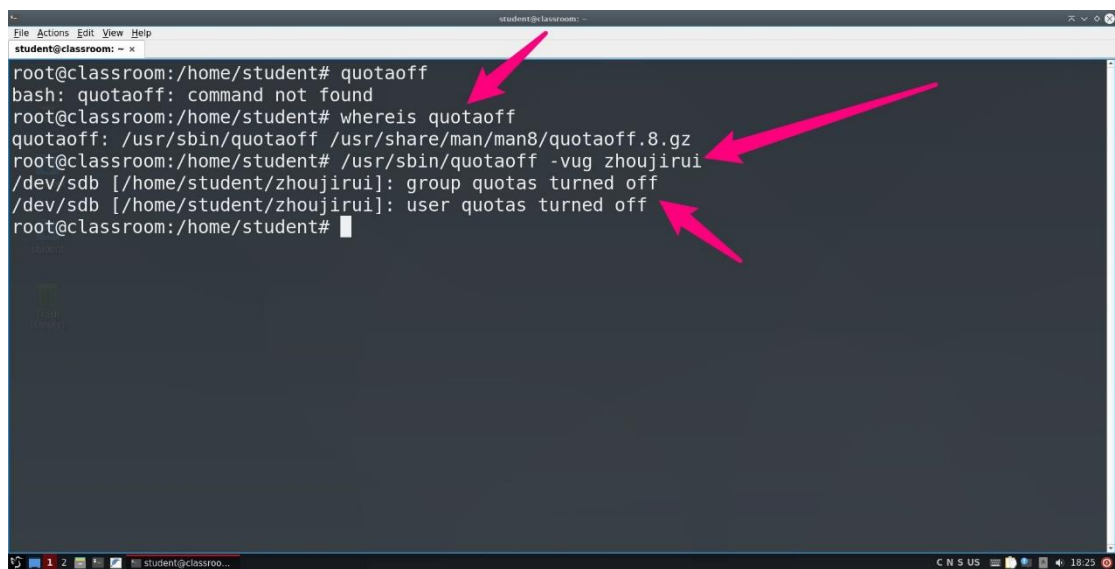
组:



```
student@classroom: ~  
root@classroom:/home/student# /usr/sbin/edquota -p student
```

(6) 先关闭然后再开启磁盘配额功能;

quotaoff 关闭 quotaon 开启



```
student@classroom: ~  
root@classroom:/home/student# quotaoff  
bash: quotaoff: command not found  
root@classroom:/home/student# whereis quotaoff  
quotaoff: /usr/sbin/quotaoff /usr/share/man/man8/quotaoff.8.gz  
root@classroom:/home/student# /usr/sbin/quotaoff -vug zhoujirui  
/dev/sdb [/home/student/zhoulirui]: group quotas turned off  
/dev/sdb [/home/student/zhoulirui]: user quotas turned off  
root@classroom:/home/student#
```

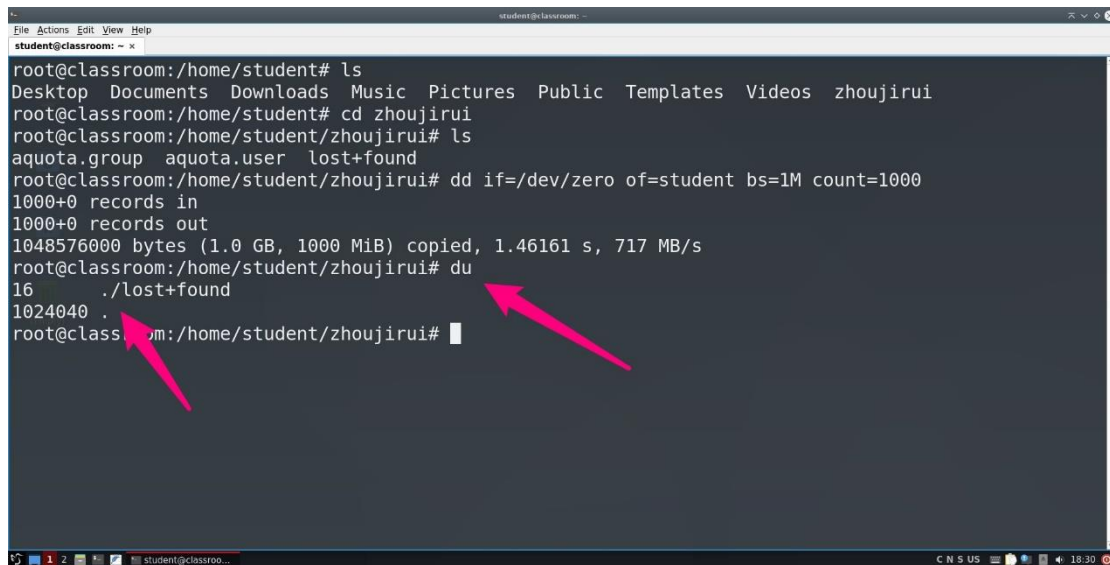
```
student@classroom: ~
File Actions Edit View Help
student@classroom: ~ x
root@classroom:/home/student# quotaoff
bash: quotaoff: command not found
root@classroom:/home/student# whereis quotaoff
quotaoff: /usr/sbin/quotaoff /usr/share/man/man8/quotaoff.8.gz
root@classroom:/home/student# /usr/sbin/quotaoff -vug zhoujirui
/dev/sdb [/home/student/zhoujirui]: group quotas turned off
/dev/sdb [/home/student/zhoujirui]: user quotas turned off
root@classroom:/home/student# /usr/sbin/quotaon -vug zhoujirui
/dev/sdb [/home/student/zhoujirui]: group quotas turned on
/dev/sdb [/home/student/zhoujirui]: user quotas turned on
root@classroom:/home/student#
```

(7) 进入第一步所创建的文件夹，然后写1G的数据到当前文件夹下；

```
student@classroom: ~
File Actions Edit View Help
student@classroom: ~ x
root@classroom:/home/student# ls
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui
root@classroom:/home/student# cd zhoujirui
root@classroom:/home/student/zhoujirui# ls
aquota.group aquota.user lost+found
root@classroom:/home/student/zhoujirui# dd if=/dev/zero of=student bs=1M count=1000
1000+0 records in
1000+0 records out
1048576000 bytes (1.0 GB, 1000 MiB) copied, 1.46161 s, 717 MB/s
root@classroom:/home/student/zhoujirui#
```



(8) 使用 **du** 查看当前文件夹或者生成的文件所占磁盘空间的大小。



```
root@classroom:/home/student# ls
Desktop Documents Downloads Music Pictures Public Templates Videos zhoujirui
root@classroom:/home/student# cd zhoujirui
root@classroom:/home/student/zhouljirui# ls
aquota.group aquota.user lost+found
root@classroom:/home/student/zhouljirui# dd if=/dev/zero of=student bs=1M count=1000
1000+0 records in
1000+0 records out
1048576000 bytes (1.0 GB, 1000 MiB) copied, 1.46161 s, 717 MB/s
root@classroom:/home/student/zhouljirui# du
16      ./lost+found
1024040 .
root@classroom:/home/student/zhouljirui#
```

## 2.学会使用什么做什么事情;

- (1) 学会了如何检查磁盘空间的占用情况
- (2) 学会了统计目录或文件所占磁盘空间大小
- (3) 学会了挂载文件系统
- (4) 检查磁盘的使用空间与限制
- (5) 学会了打开与关闭磁盘空间限制
- (6) 学会了为指定用户分配限额
- (7) 学会了显示用户或工作组的磁盘配额信息
- (8) 学会了显示文件系统的配额信息
- (9) 学会了卸载文件系统

## 3.在实验过程中遇到了什么问题? 是如何解决的?

在实验过程中, 遇到了好几个命令, 系统提示找不到的情况。



刚开始以为是命令没有安装，可是通过 `whereis` 命令查询后，发现是有该命令的，所以原因是该命令没有配置环境变量，所以只能进入到命令的安装目录下再使用该命令。

**4.还有什么问题尚未解决？可能是什么原因导致的。**

在使用 VM Virtual Box 时，一但我改变虚拟机的窗口大小后，虚拟机就黑屏了并且重启也没有效果，只能重新安装虚拟机。