

Lab 2A: 初识Linux之命令行简单练习

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学习目的

1. 常用命令的使用
 - 1.1 目录操作命令
 - 1.2 文件相关命令
 - 1.3 查看文件内容
 - 1.4 文件系统树命令
2. `man`的使用
3. `vim`练习
4. `sudoers`
 - 4.1 root用户用命令`visudo`修改文件`/etc/sudoers`
 - 4.2 将用户加入`wheel`组:
5. 学习总结

学习目的

1. 掌握常用的几个命令: `pwd`, `cd`, `ls`, `mkdir`, `cat`, `less`, `more`
2. 掌握查看`man`的一些简单技巧
3. 掌握编辑器`vim`的基本用法
4. 掌握将用户添加为`sudoers`的方法: `usermod`, `useradd`, `visudo`等

1. 常用命令的使用

1.1 目录操作命令

先解决几个哲学问题：我在哪里？我是谁？我要到哪里去？

- 查看当前用户所在的工作路径：

```
pwd
```

```
/home/liyuxuan5354
```

注意：所有的绝对路径都是从`/`开始的，这是所有路径的根路径（**root directory**）。文件目录系统就是一种典型的树状结构，根节点就是`/`。

- 系统都有谁登录进来了？

```
who
```

```
liyuxuan5354 pts/1    2025-03-27 18:11
```

- 改变当前用户的工作目录：

```
cd
```

注意：

- a. `cd /etc`后面加上路径就是切换到该路径`/etc`
 - b. `cd`后面不加参数就是切换到当前用户的家目录，每个用户都有自己的家目录，例如`root`默认为`/root`，而一般用户默认为`/home/$USERNAME`
 - c. `cd ~`也是切换到当前用户的家目录，如果换一下`cd ~bio`就是切换到`bio`用户的家目录了，当然你必须有权限才可以。
 - d. `cd /boot/gr`按下`TAB`键，可以提示后面的路径，如果是唯一的，会自动补全
 - e. `cd ..`可以进入上一级路径
- 查看目录下有什么？

```
ls
```

```
course lab1 lab1.tgz venv worm.fa worm.gtf
```

注意：

- a. `ls`后面不加任何参数和选项的话，输出的就是当前工作路径下的内容的列表。

- b. `ls /etc` 就是列出 `/etc` 目录下的内容。
- c. 观察一下, `ls -a` 相比 `ls` 输出的内容有何区别? 与 `ls -a` 呢?
- d. 我们再看看, `ls -l /etc` 与 `ls /etc` 又存在什么区别?
- e. `ls` 后面可以带多个路径, 如 `ls /bin /sbin`
- f. `ls -lh` 的 `-h` 选项的意义是什么?
- 新建目录: `mkdir`
 - a. 切换到用户的家目录, 创建目录 `~/bio2503/chap0{1..9}`
 - b. 创建目录 `~/bio2503/chap01/tmp`
 - c. 删除 `tmp` 目录
- 新建文件: `touch`
 - 进入目录 `~/bio2503/chap01`, 创建空文件 `README.md`
 - 文件第一行加入文字: `# Introduction to Linux Command Line`
- 查看文本文件的内容: `cat`, `less` 或者 `more`

好了, 我们就来先简单看看这几个命令吧。

1.2 文件相关命令

- `ls`, `file`, `touch`, `cp`, `mv`, `rm`, `rename`
 - a. 用 `ls` 命令列举出 `/bin` 目录下的文件
 - b. 用 `file` 命令查看文件 `/bin/cat`、`/etc/passwd` 和 `/usr/lib64/libc-2.17.so` 的文件类型
 - c. 进入 `~/bio2503/chap01` 目录
 - d. 用 `wget` 命令下载下面几个文件:

```
wget
https://upload.wikimedia.org/wikipedia/commons/5/56/
Tux.jpg
wget
https://upload.wikimedia.org/wikipedia/commons/a/af/
Tux.png
wget https://linux-training.be/linuxfun.pdf
```

- e. 用 `file` 查看上面几个文件的文件类型

- f. 用 `mv` 修改 `JPG` 文件的扩展名为 `PDF` 后，查看文件类型是否有所改变。
- g. 创建目录 `./touched` 并进入该目录
- h. 用 `touch` 创建文件 `today` 和 `yesterday`
- i. 用 `touch -d` 修改 `yesterday` 的时间标签，令其符合昨天的日期
- j. 用 `cp` 创建文件 `yesterday` 的拷贝 `yesterday.bak`
- k. 将 `yesterday.bak` 文件更名为 `once`
- l. 创建目录 `~/testbackup`，并将 `touched` 目录下的文件全部复制到该目录
- m. 创建目录 `./etcbackup`，并将 `/etc` 目录下的所有 `*.conf` 文件复制到该目录。
- n. 用 `rename` 命令将 `./etcbackup` 下的所有 `*.conf` 文件更名为 `*.config` 文件

1.3 查看文件内容

`cat, tac, head, tail, less, more`

- 1. 列出文件 `/etc/services` 的前12行
- 2. 列出文件 `/etc/passwd` 的最后一行
- 3. 用 `cat` 命令在命令行上直接创建文件 `count.txt`:

```
One
Two
Three
Four
Five
```

- 4. 将文件 `count.txt` 复制为 `cnt.txt`
- 5. 用 `cat` 命令将文件 `count.txt` 复制为 `catcnt.txt`
- 6. 输出 `catcnt.txt` 文件中的内容，逆序输出
- 7. 用 `more` 和 `less` 分别查看 `/etc/services` 的内容
- 8. 用 `strings` 查看二进制文件 `/bin/passwd` 中的可读字符串。
- 9. 用 `ls` 命令找到目录 `/etc` 下最大的文件，并确定该文件的大小。

10. 打开两个终端，并在两个终端中都进入 `~/bio2503/chap01` 路径；在第一个终端中输入 `echo this is the first line > tailing.txt`，在第二个终端中输入 `tail -f tailing.txt`；回到第一个终端，输入 `echo this is another line >> tailing.txt`，在第二个终端中验证修改成功。用 `Ctrl-C` 停止第二个终端中的任务。
11. 用 `cat` 命令将 `tailing.txt` 和 `/etc/passwd` 中的内容连接后，输出到 `tailing.txt` 中。

1.4 文件系统树命令

1. 查看系统内核文件 `/boot/vmlinuz-*` 的文件大小。
2. 在当前目录下创建目录 `./test`，然后运行命令：

```
cd ./test
dd if=/dev/zero of=zeros.txt count=1 bs=100
od zeros.txt
```

上面命令中，`dd` 从文件 `/dev/zero` 中将大小为100字节的块（`bs=100`）复制1次（`count=1`）到文件 `zeros.txt`，然后用 `od` 查看八进制内容。通过这个实例，说明 `/dev/zero` 的功能是什么。

它是一个特殊的设备文件，读取时始终返回空字符（`\0`），常用于生成全零的文件或数据。

3. 留在这个路径，执行下面命令：

```
dd if=/dev/random of=random.txt count=1 bs=100
od random.txt
```

说明 `/dev/random` 的功能。

它是一个特殊的设备文件，提供随机数据，数据来源于系统的熵池，适用于需要高随机性的场景。

4. 下面两行命令的作用分别是什么？

```
ls -l /dev/sd*
ls -l /dev/tty* /dev/input/mou*
```

- `ls -l /dev/sd*`: 列出 `/dev` 目录下所有以 `sd` 开头的设备文件（通常是磁盘设备）的详细信息。
 - `ls -l /dev/tty* /dev/input/mou*`: 列出 `/dev` 目录下所有以 `tty` 开头的设备文件（通常是终端设备）和 `/dev/input` 目录下所有以 `mou` 开头的设备文件（通常是鼠标设备）的详细信息。
5. 用 `cat` 查看 `/etc/hosts` 和 `/etc/resolv.conf`，你认为这两个文件的功能分别是什么？
- `/etc/hosts` 用于本地主机名解析，`/etc/resolv.conf` 用于配置DNS服务器。
6. 目录 `/etc/skel` 中有哪些文件，包含隐藏文件在内。
- `/etc/skel` 目录中包含创建新用户时默认复制的文件，通常用于设置新用户的主目录结构，包含隐藏文件（如 `.bashrc`、`.profile` 等）。
7. 文件 `/proc/cpuinfo` 中包含什么内容。通过输出，判断你的Linux运行在什么样的CPU上？
- `/proc/cpuinfo` 文件包含关于CPU的详细信息，如型号、核心数、频率、缓存大小等。
 - 通过输出可以判断CPU的型号和架构（如Intel、AMD、ARM等）。
8. `/var/log` 是一个文件还是一个目录？`/var/spool` 呢？
- `/var/log`: 它是一个目录，用于存储系统日志文件。
 - `/var/spool`: 它也是一个目录，用于存储等待处理的任务或数据（如打印队列、邮件队列等）

2. `man` 的使用

首先我们来查看一下 `man` 的手册：

```
man man
```

了解一下怎么使用 `man`。按下 `q` 键可以退出，按下 `/keyword` 可以在帮助文档中搜索关键词 `keyword`。

请尝试回答一下下面的问题：

1. 一般的命令行手册主要分为几节？每节都有什么功能？

- a. • • 1. 用户命令 (**User Commands**) : 普通用户可执行的命令，如 `ls`、`cd` 等。

- **2. 系统调用 (System Calls) :** 内核提供的系统调用函数, 如 `open`、`read` 等。
- **3. 库函数 (Library Functions) :** 标准库函数, 如 `printf`、`malloc` 等。
- **4. 设备文件 (Devices) :** 设备文件和特殊文件的说明, 如 `/dev/sda`、`/dev/tty` 等。
- **5. 文件格式 (File Formats) :** 配置文件和数据文件的格式说明, 如 `/etc/passwd`、`/etc/hosts` 等。
- **6. 游戏 (Games) :** 系统提供的游戏程序。
- **7. 杂项 (Miscellaneous) :** 其他未分类的内容, 如宏包、协议等。
- **8. 系统管理命令 (System Administration Commands) :** 系统管理员使用的命令, 如 `ifconfig`、`mount` 等。

2. `man 3 printf` 与 `man 1 printf` 有何区别? 这里的数字的意义是什么?

- `man 3 printf`: 查看 `printf` 函数的库函数手册 (第3节), 主要说明 `printf` 在C语言标准库中的用法和参数。
- `man 1 printf`: 查看 `printf` 命令的用户命令手册 (第1节), 主要说明 `printf` 在shell中的用法和参数。
- **数字的意义:** 数字表示手册的节号, 不同节号对应不同类型的文档。

3. `man -k` 的功能是什么?

- `man -k`: 根据关键字搜索手册页的简短描述。例如, `man -k printf` 会列出所有与 `printf` 相关的手册页。
- 该命令等同于 `apropos` 命令。

4. `man hier` 可以输出文件系统层次架构中每个目录的存在意义, 那么

- 目录 `/etc` 下面存放什么? 系统文件
- `/usr/lib64` 呢? `/usr/include` 呢? `/usr/bin` 呢? 其实 `usr` 是 `unix system resource` 的缩写。
 - `/usr/lib64`: 存放64位系统的共享库文件。
 - `/usr/include`: 存放C/C++头文件。
 - `/usr/bin`: 存放用户可执行的程序文件。
- `/boot` 呢?
 - `/boot`: 存放系统启动所需的文件, 如内核文件 `vmlinux`、初始化内存盘文件 `initrd.img`、引导程序 `grub` 等。

- `/home` 呢？
 - `/home`：存放普通用户的主目录，每个用户通常有一个独立的子目录，如 `/home/username`。

另外，查看特定的命令，我们可以看到更详细的帮助信息：

```
man ls
```

得到的帮助信息简单如下：

```
LS(1P)                                POSIX Programmer's Manual
                                LS(1P)

PROLOG

    This manual page is part of the POSIX Programmer's Manual.
    The Linux implementation
    of this interface may differ (consult the corresponding
    Linux manual page for
    details of Linux behavior), or the interface may not be
    implemented on Linux.

NAME

    ls - list directory contents

SYNOPSIS

    ls [-CFRacdilqrту1][-H | -L ][-fgmnopsx][file...]

...
```

可以看到

- 第一行可以看出：`ls` 命令属于 `1P` 节，也就是常规命令。
- 从 `NAME` 节可以看到该命令的作用。
- 从 `SYNOPSIS` 可以看到 `ls` 命令的语法，这里所有 `[]` 内的都是命令的可选项，也就是这个命令可以完全不带选项和参数。
- 后面的 `OPTIONS` 节可以看到每个选项的意义和用法。

回答下面的问题：

- 默认的情况下 `ls` 的输出结果是按照什么进行排序的？

按照文件名的字母顺序进行排序（升序）

- 如果想要按照日期进行降序排序，该加入哪些选项？

使用 `-t` 选项按修改时间排序，`-r` 选项反转排序顺序（即降序）

- 按照文件大小呢？

使用 `-s` 选项按文件大小排序，`-r` 选项反转排序顺序（即降序）

- 如果想要显示文件大小的时候单位改为其他单位，比如MB，比如KB，如何修改命令？

使用 `-h` 选项以人类可读的格式显示文件大小（自动选择合适的单位，如KB、MB、GB）

3. vim练习

输入 `vimtutor` 命令即可进入教程模式进行学习。

```
## 3.1 ESC mode
```

```
—
```

```
|             hint: if you accidentally start typing text, press  
ESC
```

```
|      .----- .   to leave insert mode and u to undo any changes.
```

```
|      |      |
```

```
\_____/      |
```

```
|
```

```
|
```

```
\____.
```

```
|      .----- .
```

```
|      |      |
```


Aaas Gregor Samsa awokke onne moorning frrom uneeasy ddreams hhe
founnd
himmself trransformed inn hiis bbed intoo a giiigantic insecct.

It was a bright cold day in April, and the clocks were striking
thirteen.

TWwo househollllds, bothe alikee inf dignityyyy,
IIIn fair% Verrrrrona, whereq wiiie lay# ou987r sc"ene,
Frrom ++ancient grudddge brrrreak tto #new mutiny,,,
where7 ciiviil blo*od mak^es civil h=ands uncclean.

3.3 Text editing - insertion

Make the pairs of lines match up by inserting the missing text.
Hint: if you're having trouble with the escape key, try Ctrl-[
instead.

Oliver w the vim of matic course of trea decep.
Oliver was the victim of a systematic course of treachery and
deception.

Now Bumble was at, and a choic;
Now, Mr. Bumble was a fat man, and a choleric;

Th as no great cons to the ch.
This was no very great consolation to the child.

'P, ir, I ome mo'
'Please, sir, I want some more.'

'We re o nction tse nture,' sd te old gntlmn
'We refuse to sanction these indentures,' said the old gentleman

ere poston of airs d n all impro.
Here the position of affairs had not at all improved.

3.4 Text editing - appending

Complete the lines by filling in the missing word, then pressing A
to append to the line. Remember, return the cursor to the left with
O.

"I am afraid, my dear , that most of your conclusions we
"I am afraid, my dear Watson, that most of your conclusions were
erroneous.

I laughed incredulously Sherlock Holmes leaned back in h
I laughed incredulously as Sherlock Holmes leaned back in his
settee

"Mr. Holmes, they w the footprints of a gigantic h
"Mr. Holmes, they were the footprints of a gigantic hound!"

"Do you mean that wife and you wi
"Do you mean that your wife and you wish to leave?"

"I heard it distinctly, am sure that it was really the sob o
"I heard it distinctly, and I am sure that it was really the sob of
a woman."

3.5: Deletion commands

Move the cursor to the first letter of the word to be deleted, then
press
dw to delete the entire word. Rinse and repeat.

The rabbit-hole VIM went straight on like a IS tunnel for some way,
and
then GOOD dipped suddenly down, IT so suddenly that Alice had not a
moment
to WILL think MAKE about YOU stopping herself before she found
herself falling
down a very deep HAPPY well.

Either the well was GIVE very deep, or she fell very ALL slowly,
for she
had plenty of YOUR time as she went down to look about her MONEY
and to
wonder TO what was going to happen VIM next. First, she tried to
look down
and SAVE make out what THE she was coming to, but it was too dark
to see

anything; CHILDREN then she looked at the sides of the well, IN and noticed
that UGANDA they were filled with cupboards STAY and book-shelves;
here and
there she AWAY saw maps and pictures hung FROM upon pegs. She took
down a
jar from EMACS one of the shelves as she passed; it was IT labelled
'ORANGE MARMALADE', but WILL to her great disappointment it BREAK
was empty:
she did YOUR not like to drop the jar FINGERS for fear of killing
somebody,
so AND managed to put it into one of the cupboards THUMBS as she
fell past it.

3.6: More deletion commands

Place the cursor on the first incorrect character of each line
and press d\$ to delete to the end of the line.

The Owl and the Pussycat went to sea[this is a bit that you need to
delete]

In a beautiful pea-green boat,IT WASN'T MADE OF PEAS

They took some honey, and plenty of money,***Always important to
take money***

wrapped up in a five pound note. #Or \$8.07 USD on 14 Nov 2010

The Owl looked up to the stars above,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

And sang to a small guitar, /* with only 5 strings */

"O lovely Pussy! O Pussy, my love,(Owls are known to be very
passionate)

what a beautiful Pussy you are, you are, you are,++++++++++++++

what a beautiful Pussy you are." {Delete me please, I don't belong
here}

Pussy said to the Owl "You elegant fowl, <http://flic.kr/p/6chRZS>

How charmingly sweet you sing. @@Funfact - owls have the sweetest
birdsong

O let us be married, too long we have tarried; A little TOO much
tarrying

But what shall we do for a ring?" The eternal question.

3.7: Using a count for a motion

Try to move from the point marked 'a' to the point marked 'b' using one command (e.g. 3e or 2w).

a b

e stands for the end of the word.

a b

w means word, that is, move to the next word.

a b c d

punctuation counts as a word, so this comma, and this one, count.

c a b

use 0 to jump to the first character of the line.

a b c

Zero One Two Three Four Five Six Seven Eight Nine Ten

3.8: Using a count to delete more

Delete the uppercase words using d{number}motion. To delete 2 words, use

d2w, to delete 3, use d3w, etc. Always start on the first letter of the word.

Jack and Jill UP GOT JACK went up AND HOME DID TROT the Hill
to fetch AS FAST AS HE COULD a pail of CAPER water
Jack HE WENT TO BED fell down and AND BOUND HIS HEAD broke his
crown
And WITH VINEGAR Jill came AND BROWN PAPER tumbling after.

Old WHEN SHE GOT THERE Mother Hubbard
Went THE CUPBOARD to the WAS BARE cupboard
To SO THE POOR LITTLE DOGGIE get her poor HAD NONE doggie a bone,

Little Bo BUT WHEN SHE AWOKE peep has lost SHE FOUND IT A JOKE her
sheep

And FOR THEY WERE doesn't know ALL STILL FLEETING where to find them.

Leave THEN UP SHE TOOK them alone and HER LITTLE CROOK they'll come home,

Bringing DETERMINED FOR their tails TO FIND THEM behind them.

Little Bo SHE FOUND THEM INDEED peep

fell fast BUT IT MADE HER HEART BLEED asleep

And FOR THEY LEFT dreamt she THEIR TAILS BEHIND THEM heard them bleating,

3.9: Operating on lines

Delete the lines that don't belong below using dd. It's up to you to

pick which ones don't belong!

Hint: Precede the command with a count to delete multiple lines, e.g. 2dd - delete two lines.

I said a hip hop, hippie to the hippie

I wandered lonely as a cloud

That floats on high o'er vales and hills,

When all at once I saw a crowd,

The hip, hip a hop, and you don't stop, a rock it

To the bang bang boogie, say, up jump the boogie

A host, of golden daffodils;

To the rhythm of the boogie, the beat

Beside the lake, beneath the trees,

Now, what you hear is not a test, I'm rapping to the beat

And me, the groove, and my friends are gonna try to move your feet

Fluttering and dancing in the breeze.

3.10: The undo command

Fix the errors below. Undo the corrections one-by-one with u, then try

redoing them with CTRL-R. Also, try out undoing a whole line with U.

There on**ce was a bu()gg\$\$y AI

who d%*ecided ^^^ her su""bject & should d+ie.

When the plot was uncovered,
The sub|j|e|cted disc\o/vered
That sadly the cake was @ a l-i-e.

There SOMEBODY once SET UP was a US man THE from BOMB deep space
And all MAIN you SCREEN could TURN see ON was his face
It ALL seemed YOUR that BASE ARE his BELONG gig TO US
Was YOU HAVE NO CHANCE to TO SURVIVE MAKE make YOUR TIME you move
zig
Or FOR else he GREAT would take JUSTICE all your base

There ~once~ was (a) gal "from" [Peru]
whose #limericks# {stopped} on %%line%% two.

3.11: The block comment and uncomment

Instructions:

Comment and then uncomment the following C code.

1. Press "CTRL+v" to enter the "Visual Block" mode;
2. Use "UP" or "DOWN" key to select the rows;
3. Press "I" to enter the insert mode (to uncomment, press "x" or "d")
4. Insert the comment sign "//" at the start of one line
5. Press "ESC" twice

```
#include <stdio.h>
```

```
int main(){  
    int x = 5;  
    int y[4] = {0,1,2,3};  
    printf("The first one of y is %d\n", y[0]);  
    printf("The length of y is %d\n", ADD HERE);  
    printf("The size of x is %d\n", sizeof(x));  
  
    return 0;  
}
```


4. sudoers

细心的同学可能已经发现，我们有时候运行一些命令如 `yum` 的时候，只有 `root` 才有权限执行，这样对于普通用户来说每次都得用 `su - root` 切换到 `root` 用户才能进一步工作，这样是一件比较繁琐的事。而用 Ubuntu 的同学就简单多了，可以直接使用 `sudo` 执行某些 `root` 用户才能执行的命令。那么有什么办法呢？有，我可以将某些用户设置为 `sudoers`，这样就可以使用 `sudo` 命令了。

4.1 root 用户用命令 `visudo` 修改文件 `/etc/sudoers`

执行 `visudo` 的方式与 `vim` 的编辑方式完全一致。

将下面第二行行前面的注释 `#` 去掉：

```
## Same thing without a password  
# %wheel    ALL=(ALL)    NOPASSWD: ALL
```

或者更上面一行：

```
## Allows people in group wheel to run all commands  
# %wheel    ALL=(ALL)    ALL
```

这表示 `wheel` 组的用户任何地方执行任何指令。前者不用输入用户自己的密码，后者则需要输入密码执行。

4.2 将用户加入 `wheel` 组：

```
usermod -a -G wheel bio
```

就是将 `bio` 用户加入 `wheel` 组。

大功告成！现在 `bio` 用户就可以执行 `sudo` 命令了。你可以自己试试看。

至于要不要输入密码，全凭你的喜好。

5. 学习总结

通过本次学习，我对Linux系统中的常用命令、文件系统结构、手册页的使用、权限管理以及文本编辑工具vim有了更深入的理解和掌握。

学习到了很多linux里的基本命令，对相关命令有了基本认识，收获颇丰，为今后的学习和工作打下了坚实的基础。