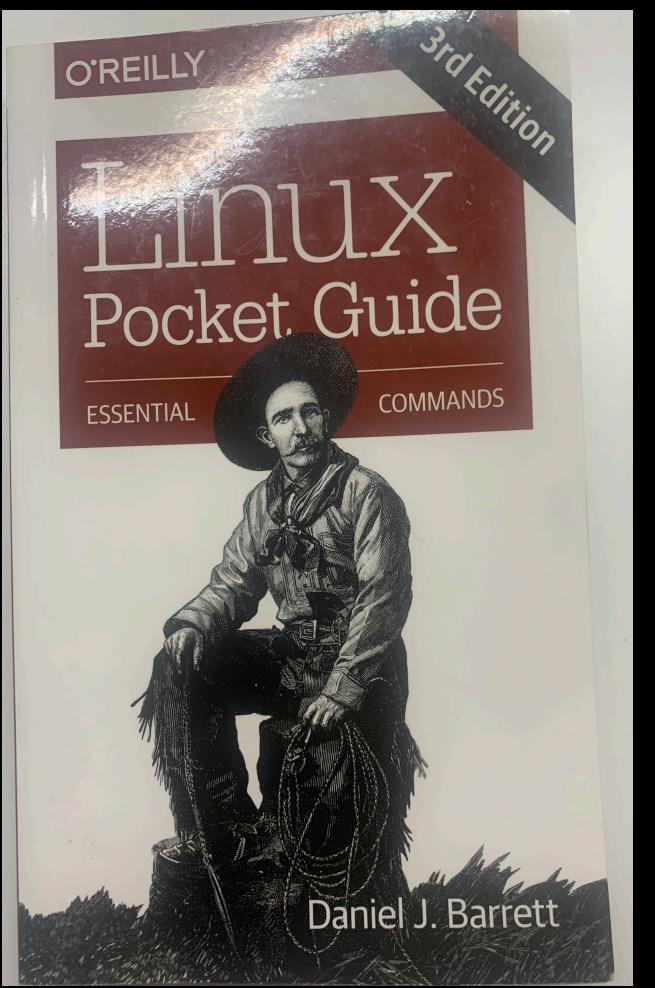
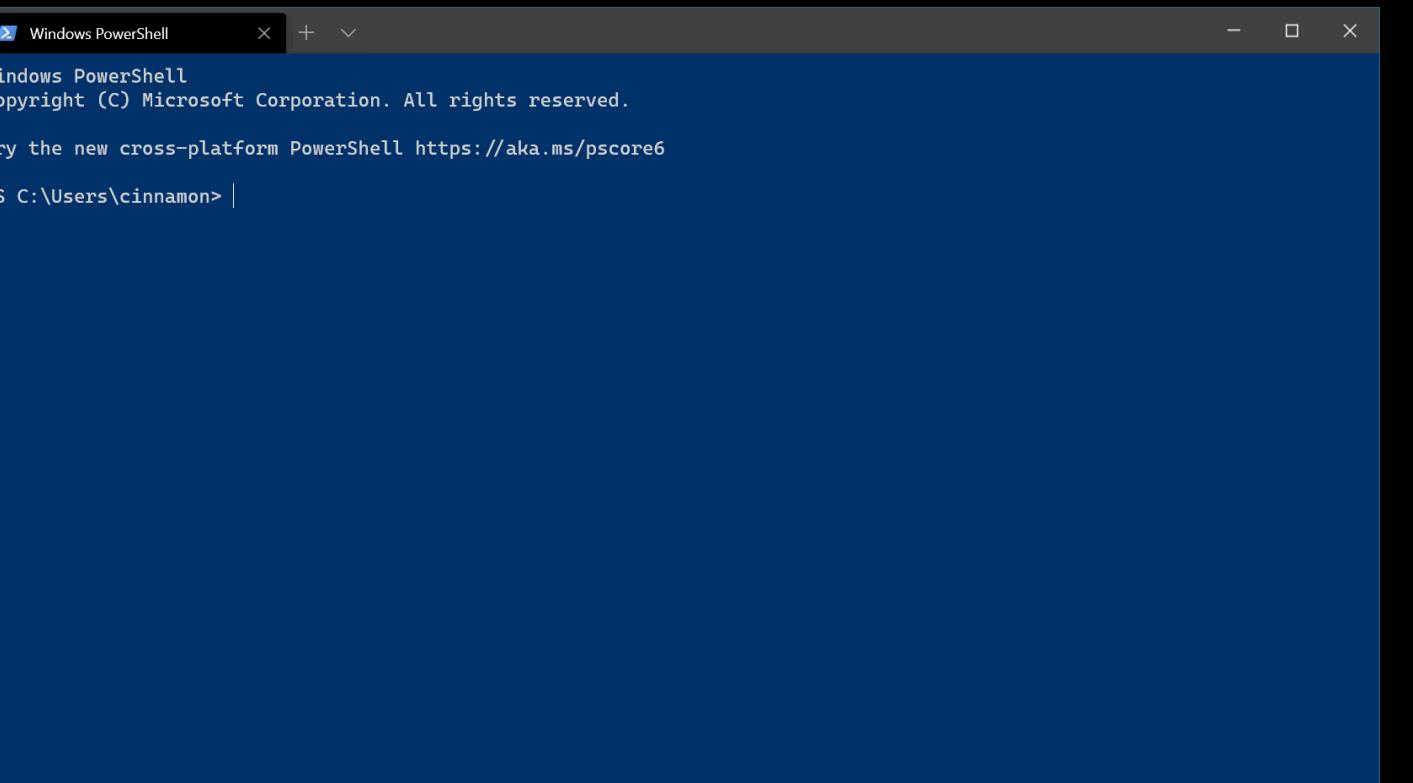


```
(base) friedbees@myMac ~ % ls -l
total 0
drwx-----@ 3 friedbees  staff   96 May  9  2020 Applications
drwx-----@ 9 friedbees  staff  288 Apr 26 19:23 Desktop
drwx-----+ 6 friedbees  staff  192 May  9  2020 Documents
drwx-----+ 10 friedbees staff  320 Apr 26 11:18 Downloads
drwx-----@ 70 friedbees staff 2240 Mar 14 15:44 Library
drwx-----+ 4 friedbees  staff  128 May  9  2020 Movies
drwx-----+ 4 friedbees  staff  128 Oct  5  2020 Music
drwx-----+ 4 friedbees  staff  128 May  9  2020 Pictures
drwxr-xr-x+ 7 friedbees staff  224 Apr 26 10:27 Public
(base) friedbees@myMac ~ %
```

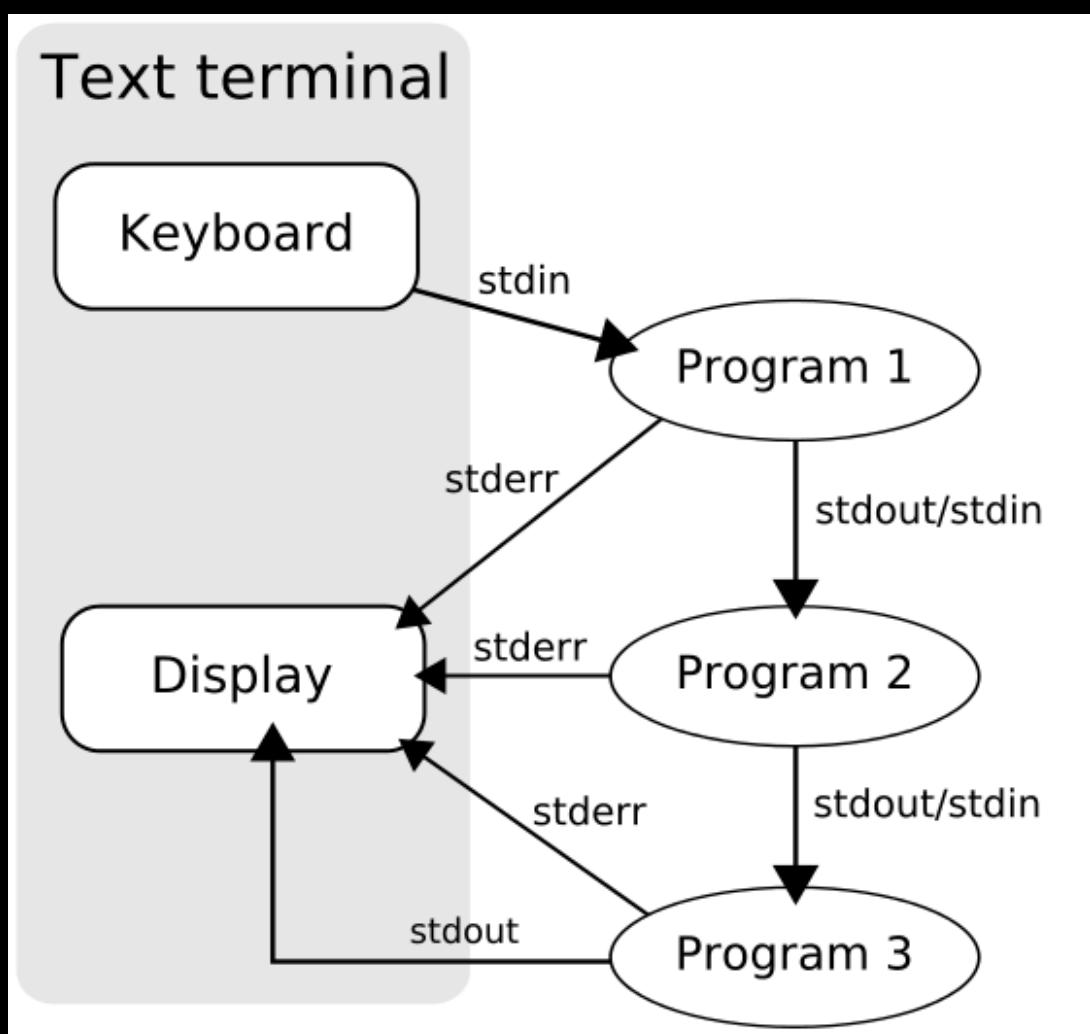


Linux/Mac 终端命令行操作介绍

Command-line Terminal programming intro



Friedbees 极客鸭鸭



Pipeline数据管道在Terminal中的实例

警告！

Disclaimer

- 本人非专业计算机（CS/IT）人士，制作本视频纯属基于兴趣与好奇，查询总结各种资料并制作视频，视频中的知识不能保证绝对严谨与正确。
- 本视频希望达到对任何对编程感兴趣的启蒙效果

提纲

Overview

Part 1

- 命令行编程：必要性
- 文件导航（File Navigation）
- 文件/文件夹操作处理（File Operation）
- 学习资源（useful resources）

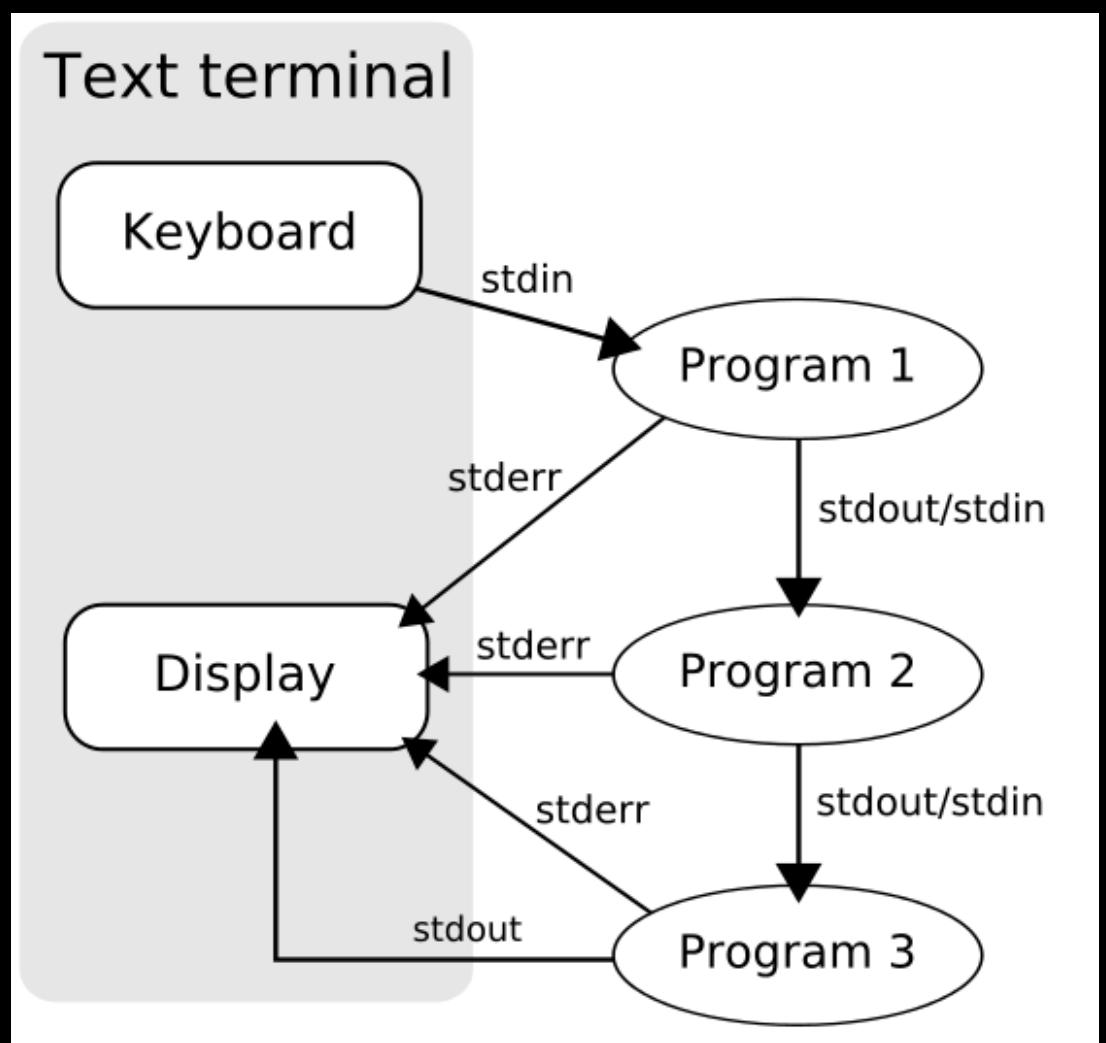
Part 2

- Mac 好用的快捷键（Mac Shortcuts）
- 演化历史，区分三种命令行工具（History, Difference between MS DOS, Bash, and PowerShell）

为什么使用命令行?

Why use Terminal?

- 什么是Terminal: 在Mac与Linux操作系统中的命令行应用程序
- 操作系统OS与编程语言 (例如: Python/Java/C++) 交流:
 - 在命令行中调用程序 (从代码文件如.py到) ;
 - 其他语言可以通过Terminal直接与操作系统OS进行交流;
- 最早实现的Pipeline概念 (例如: 程序1输出=>程序2输入=>最终结果)
- 程序执行的自动化 (如: 服务器定期调用程序检查链接, 记录状态等)
- 在过去没有可视化界面 (Graphical User Interface) (MS Windows/Mac OS) 之前, 所有用户操作都通过命令行完成



Pipeline数据管道在Terminal中的实例

文件导航

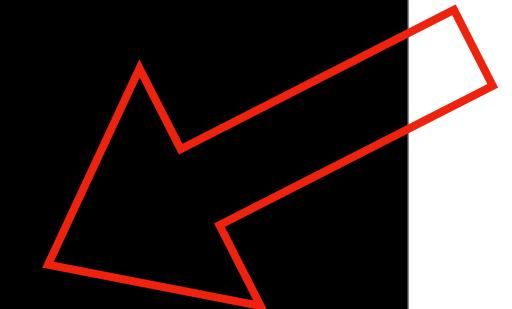
File Navigation

- 绝对地址 vs 相对地址 (Absolute directory path vs relative directory path)
 - 从根目录开始唯一的到达指定目标文件/文件夹的路径 (例如: /Users/user1/desktop/folder1/folder2/data.txt)
 - 给定Terminal所在的当前地址 (currently working directory) , 目标文件/文件夹的相对位置 (例如: folder1/folder2)
- 查看当前目录文件(listing):
 - `ls`(listing); `ls -l` (long listing); `ls -a` (all listing); `ls -la` (long+all listing); `ls /your/directory`
 - `pwd` (print working directory)
- 改变目录(change directory):
 - `cd`; `~` (用户根目录) ; `.` (当前所在目录) ; `..` (上层目录)
 - `/` (分隔符; 在开头: 代表绝对目录) ;
 - 开头就是文件 (夹) 名: 相对目录

文件处理

移动/删除/重命名

- rm (remove; 删除文件)
 - rm -rf dir (recursively, force; “跑路程序”)
- cp (copy; 复制文件)
- mv (move; 移动文件)
- touch (创建文件)
- mkdir (make directory; 建立文件)
- Cat (打印文件)
-



File Commands
<code>ls</code> - directory listing
<code>ls -al</code> - formatted listing with hidden files
<code>cd dir</code> - change directory to <code>dir</code>
<code>cd</code> - change to home
<code>pwd</code> - show current directory
<code>mkdir dir</code> - create a directory <code>dir</code>
<code>rm file</code> - delete <code>file</code>
<code>rm -r dir</code> - delete directory <code>dir</code>
<code>rm -f file</code> - force remove <code>file</code>
<code>rm -rf dir</code> - force remove directory <code>dir</code> *
<code>cp file1 file2</code> - copy <code>file1</code> to <code>file2</code>
<code>cp -r dir1 dir2</code> - copy <code>dir1</code> to <code>dir2</code> ; create <code>dir2</code> if it doesn't exist
<code>mv file1 file2</code> - rename or move <code>file1</code> to <code>file2</code> if <code>file2</code> is an existing directory, moves <code>file1</code> into directory <code>file2</code>
<code>ln -s file link</code> - create symbolic link <code>link</code> to <code>file</code>
<code>touch file</code> - create or update <code>file</code>
<code>cat > file</code> - places standard input into <code>file</code>
<code>more file</code> - output the contents of <code>file</code>
<code>head file</code> - output the first 10 lines of <code>file</code>
<code>tail file</code> - output the last 10 lines of <code>file</code>
<code>tail -f file</code> - output the contents of <code>file</code> as it grows, starting with the last 10 lines

Process Management
<code>ps</code> - display your currently active processes
<code>top</code> - display all running processes
<code>kill pid</code> - kill process id <code>pid</code>
<code>killall proc</code> - kill all processes named <code>proc</code> *
<code>bg</code> - lists stopped or background jobs; resume a stopped job in the background
<code>fg</code> - brings the most recent job to foreground
<code>fg n</code> - brings job <code>n</code> to the foreground

File Permissions
<code>chmod octal file</code> - change the permissions of <code>file</code> to <code>octal</code> , which can be found separately for user, group, and world by adding:
• 4 - read (r)
• 2 - write (w)
• 1 - execute (x)
Examples:
<code>chmod 777</code> - read, write, execute for all
<code>chmod 755</code> - rwx for owner, rx for group and world
For more options, see <code>man chmod</code> .

SSH
<code>ssh user@host</code> - connect to <code>host</code> as <code>user</code>
<code>ssh -p port user@host</code> - connect to <code>host</code> on port <code>port</code> as <code>user</code>
<code>ssh-copy-id user@host</code> - add your key to <code>host</code> for <code>user</code> to enable a keyed or passwordless login

Searching
<code>grep pattern files</code> - search for <code>pattern</code> in <code>files</code>
<code>grep -r pattern dir</code> - search recursively for <code>pattern</code> in <code>dir</code>
<code>command grep pattern</code> - search for <code>pattern</code> in the output of <code>command</code>
<code>locate file</code> - find all instances of <code>file</code>

System Info
<code>date</code> - show the current date and time
<code>cal</code> - show this month's calendar
<code>uptime</code> - show current uptime
<code>w</code> - display who is online
<code>whoami</code> - who you are logged in as
<code>finger user</code> - display information about <code>user</code>
<code>uname -a</code> - show kernel information
<code>cat /proc/cpuinfo</code> - cpu information
<code>cat /proc/meminfo</code> - memory information
<code>man command</code> - show the manual for <code>command</code>
<code>df</code> - show disk usage
<code>du</code> - show directory space usage
<code>free</code> - show memory and swap usage
<code>whereis app</code> - show possible locations of <code>app</code>
<code>which app</code> - show which <code>app</code> will be run by default

Compression
<code>tar cf file.tar files</code> - create a tar named <code>file.tar</code> containing <code>files</code>
<code>tar xf file.tar</code> - extract the files from <code>file.tar</code>
<code>tar czf file.tar.gz files</code> - create a tar with Gzip compression
<code>tar xzf file.tar.gz</code> - extract a tar using Gzip
<code>tar cjf file.tar.bz2</code> - create a tar with Bzip2 compression
<code>tar xjf file.tar.bz2</code> - extract a tar using Bzip2
<code>gzip file</code> - compresses <code>file</code> and renames it to <code>file.gz</code>
<code>gzip -d file.gz</code> - decompresses <code>file.gz</code> back to <code>file</code>

Network
<code>ping host</code> - ping <code>host</code> and output results
<code>whois domain</code> - get whois information for <code>domain</code>
<code>dig domain</code> - get DNS information for <code>domain</code>
<code>dig -x host</code> - reverse lookup <code>host</code>
<code>wget file</code> - download <code>file</code>
<code>wget -c file</code> - continue a stopped download

Installation
Install from source: <code>./configure</code>
<code>make</code>
<code>make install</code>
<code>dpkg -i pkg.deb</code> - install a package (Debian)
<code>rpm -Uvh pkg.rpm</code> - install a package (RPM)

Shortcuts
<code>Ctrl+C</code> - halts the current command
<code>Ctrl+Z</code> - stops the current command, resume with <code>fg</code> in the foreground or <code>bg</code> in the background
<code>Ctrl+D</code> - log out of current session, similar to <code>exit</code>
<code>Ctrl+W</code> - erases one word in the current line
<code>Ctrl+U</code> - erases the whole line
<code>Ctrl+R</code> - type to bring up a recent command
<code>!!</code> - repeats the last command
<code>exit</code> - log out of current session

* use with extreme caution.



学习资源：小抄

Terminal可以执行的很多任务

- 设定文件权限 (File Permissions)
- 搜索文件 (grep语句: global regular expression print)
- 远程登录服务器，电脑终端 (SSH)
- 系统信息 (System Info)
- 文件压缩 (Compression)
- 网络操作 (Network) 下载
- ...

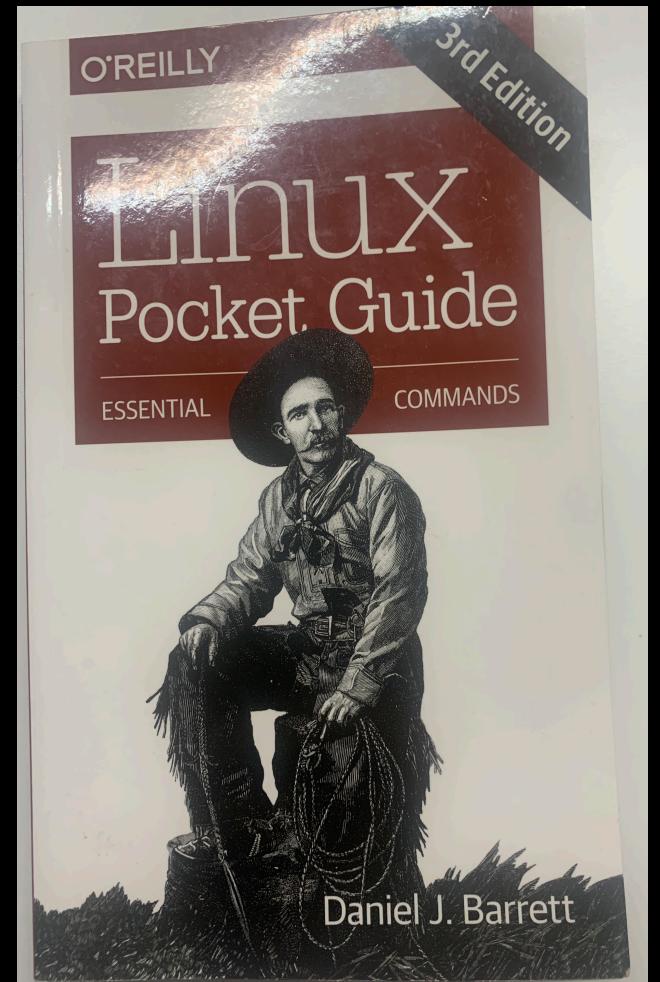
File Commands	System Info
ls - directory listing	date - show the current date and time
ls -al - formatted listing with hidden files	cal - show this month's calendar
cd dir - change directory to <i>dir</i>	uptime - show current uptime
cd - change to home	w - display who is online
pwd - show current directory	whoami - who you are logged in as
mkdir dir - create a directory <i>dir</i>	finger user - display information about <i>user</i>
rm file - delete <i>file</i>	uname -a - show kernel information
rm -r dir - delete directory <i>dir</i>	cat /proc/cpuinfo - cpu information
rm -f file - force remove <i>file</i>	cat /proc/meminfo - memory information
rm -rf dir - force remove directory <i>dir</i> *	man command - show the manual for <i>command</i>
cp file1 file2 - copy <i>file1</i> to <i>file2</i>	df - show disk usage
cp -r dir1 dir2 - copy <i>dir1</i> to <i>dir2</i> ; create <i>dir2</i> if it doesn't exist	du - show directory space usage
mv file1 file2 - rename or move <i>file1</i> to <i>file2</i> if <i>file2</i> is an existing directory, moves <i>file1</i> into directory <i>file2</i>	free - show memory and swap usage
ln -s file link - create symbolic link <i>link</i> to <i>file</i>	whereis app - show possible locations of <i>app</i>
touch file - create or update <i>file</i>	which app - show which <i>app</i> will be run by default
cat > file - places standard input into <i>file</i>	Compression
more file - output the contents of <i>file</i>	tar cf file.tar files - create a tar named <i>file.tar</i> containing <i>files</i>
head file - output the first 10 lines of <i>file</i>	tar xf file.tar - extract the files from <i>file.tar</i>
tail file - output the last 10 lines of <i>file</i>	tar czf file.tar.gz files - create a tar with Gzip compression
tail -f file - output the contents of <i>file</i> as it grows, starting with the last 10 lines	tar xzf file.tar.gz - extract a tar using Gzip
ps - display your currently active processes	tar cjf file.tar.bz2 - create a tar with Bzip2 compression
top - display all running processes	tar xjf file.tar.bz2 - extract a tar using Bzip2
kill pid - kill process id <i>pid</i>	gzip file - compresses <i>file</i> and renames it to <i>file.gz</i>
killall proc - kill all processes named <i>proc</i> *	gzip -d file.gz - decompresses <i>file.gz</i> back to <i>file</i>
bg - lists stopped or background jobs; resume a stopped job in the background	Network
fg - brings the most recent job to foreground	ping host - ping <i>host</i> and output results
fg n - brings job <i>n</i> to the foreground	whois domain - get whois information for <i>domain</i>
chmod octal file - change the permissions of <i>file</i> to <i>octal</i> , which can be found separately for user, group, and world by adding:	dig domain - get DNS information for <i>domain</i>
<ul style="list-style-type: none"> ● 4 - read (r) ● 2 - write (w) ● 1 - execute (x) 	dig -x host - reverse lookup <i>host</i>
Examples: chmod 777 - read, write, execute for all chmod 755 - rwx for owner, rx for group and world For more options, see man chmod .	wget file - download <i>file</i>
ssh	wget -c file - continue a stopped download
ssh user@host - connect to <i>host</i> as <i>user</i>	Installation
ssh -p port user@host - connect to <i>host</i> on port <i>port</i> as <i>user</i>	Install from source: ./configure
ssh-copy-id user@host - add your key to <i>host</i> for <i>user</i> to enable a keyed or passwordless login	make
command grep pattern - search for <i>pattern</i> in the output of <i>command</i>	make install
locate file - find all instances of <i>file</i>	dpkg -i pkg.deb - install a package (Debian)
	rpm -Uvh pkg.rpm - install a package (RPM)
Shortcuts	
	Ctrl+C - halts the current command
	Ctrl+Z - stops the current command, resume with fg in the foreground or bg in the background
	Ctrl+D - log out of current session, similar to exit
	Ctrl+W - erases one word in the current line
	Ctrl+U - erases the whole line
	Ctrl+R - type to bring up a recent command
	!! - repeats the last command
	exit - log out of current session

* use with extreme caution.



学习资源

- 一些油管资源：
 - <https://www.youtube.com/watch?v=CpTfQ-q6MPU>
 - **Corey Schafer** (非常推荐) Linux/Mac Tutorial系列视频：
 - 播放列表： <https://www.youtube.com/playlist?list=PL-osiE80TeTvGhHkpVfmKWOiIPF8UVy6c>
- Linux Pocket Guide：类似于小字典，查询语句，没事可以翻翻，没必要记忆，熟能生巧（中文版链接：<http://product.dangdang.com/25240373.html>，读书软件看也可）
-



总结

- 个人感觉：如果刚上本科或者年纪更小，英语课程既能提高英语又能学习知识，一举两得！
- 希望能打消初学者对命令行有个大体掌握，不要被黑色屏幕吓到，Terminal架起在操作系统，程序，用户，以及网络中不同终端沟通的桥梁。简单的Terminal语句可以实现非常多的功能。例如：
 - 下载安装程序
 - (Linux) : sudo apt-get install my-sql
 - 快速查找文件
 - 查找Mac上所有安装过的程序：grep 'Installed' /private/var/log/install.log
 - 命令行快速登录程序
 - 打开网址：open http://www.bilibili.com
 - 定期运行程序 (crontab)
 - 定期执行python程序(例如：下载获取时间天气信息)：

Crontab -e (编辑crontab) 输入如下命令，保存。

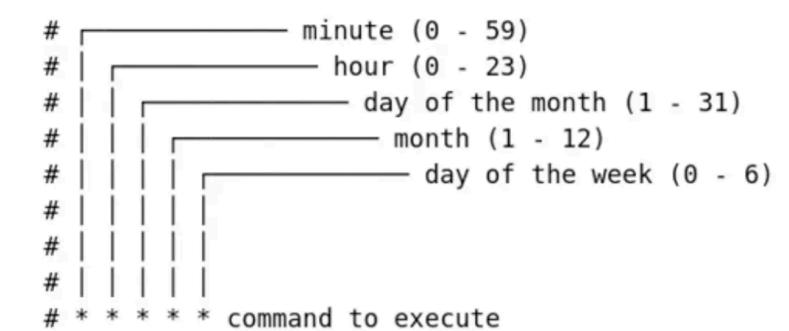
```
* * * * * /usr/bin/python /path/to/file/<FILENAME>.py /path/to/file/<FILENAME>.log
```

How to Schedule a Task With Cron

Cron uses schedule expressions to know when you want to execute a task.

It has 5 parameters (* * * * *) to let you choose when you want to run your script:

- the minute,
- the hour,
- the day of the month,
- the month,
- the day of the week.



*: 每一单位

* * * * *: 每秒钟都运行一次

/5 * * * *: 每5秒钟运行一次

30 12 * * 4: 每周四12:30运行一次

30 12 * * 4,5: 每周四周五12:30运行一次

30 12 * * 1-3: 每周四-周三12:30运行一次

Mac Terminal命令行常用快捷键

快速移动光标的方法

 control 控制键

-  : 移动到命令行之首, a代表first letter
-  : 移动到命令行之尾, e代表end letter
-  : 删除光标之后的内容, k代表kill 
-  : 命令行清空置顶

 option 选择键

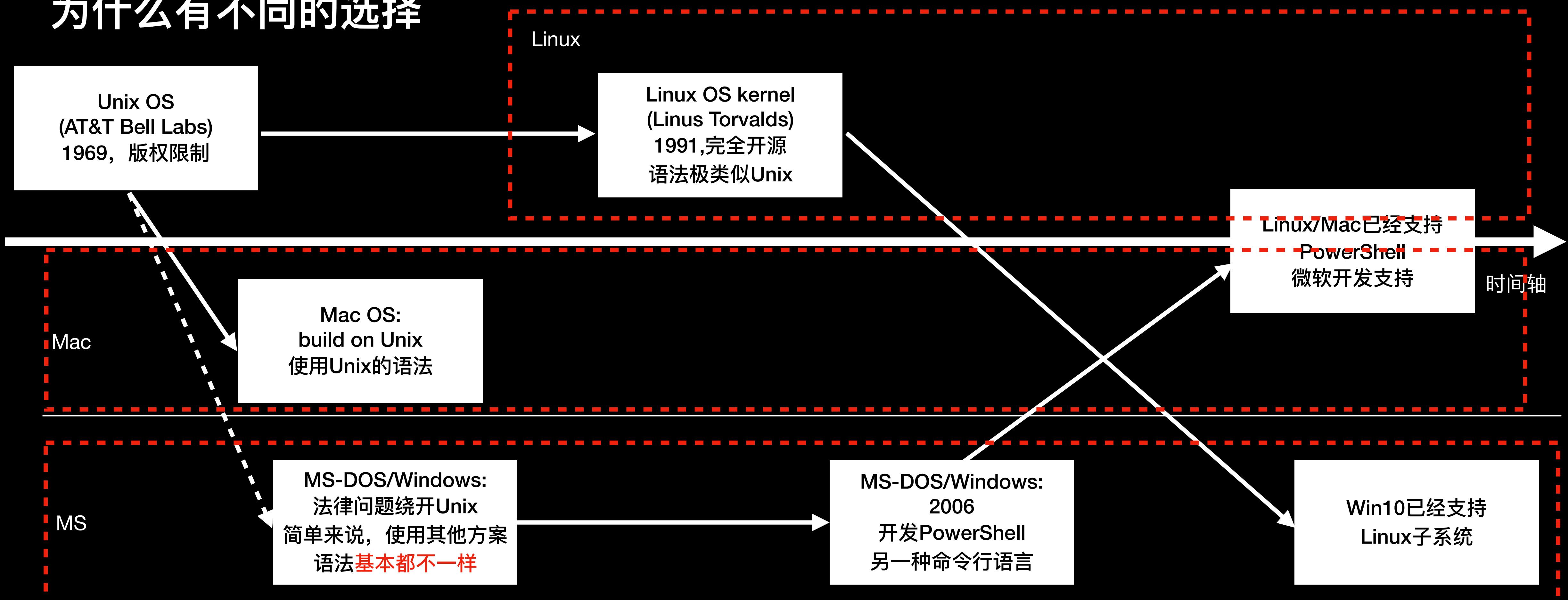
-  : 拖动十字光标  决定光标位置
-  or  : 移动到前/后的空格位置

记住这些够用了，还有更多快捷键：

<https://stackoverflow.com/questions/81272/how-to-move-the-cursor-word-by-word-in-the-os-x-terminal>

<https://www.tecmint.com/linux-command-line-bash-shortcut-keys/> (Linux操作基本一致)

彩蛋①：当今主流的Terminal命令行发展历程 为什么有不同的选择



1. PowerShell sets WSL
2. Microsoft Store download required Linux system (such as Ubuntu)

Reference link:

<https://ubuntu.com/tutorials/ubuntu-on-windows#3-enable-wsl>

当今主流的Terminal历史与发展历程

部分参考资料

- <https://www.quora.com/If-macOS-is-Unix-and-Linux-was-inspired-Unix-then-what-is-Windows-based-on-and-why-was-it-implemented-like-this-by-Bill-Gates>
- PowerShell历史: <https://en.wikipedia.org/wiki/PowerShell>
- Linux/Windows基本命令对应表: <https://www.geeksforgeeks.org/linux-vs-windows-commands/>
- 定期运行程序: <https://www.jcchouinard.com/python-automation-with-cron-on-mac/>