DIS08 – Data Modeling

02 – Working with the Unix Shell

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Technology
Arts Sciences
TH Köln

Disclaimer

This lesson is based on the Library Carpentry

- https://librarycarpentry.org/lc-shell/

- Library Carpentry develops lessons and teaches workshops for and with people working in library- and information-related roles.
- Our goal is to create an on-ramp to empower this community to use software and data in their own work as well as be advocates for and train others in efficient, effective and reproducible data and software practices.

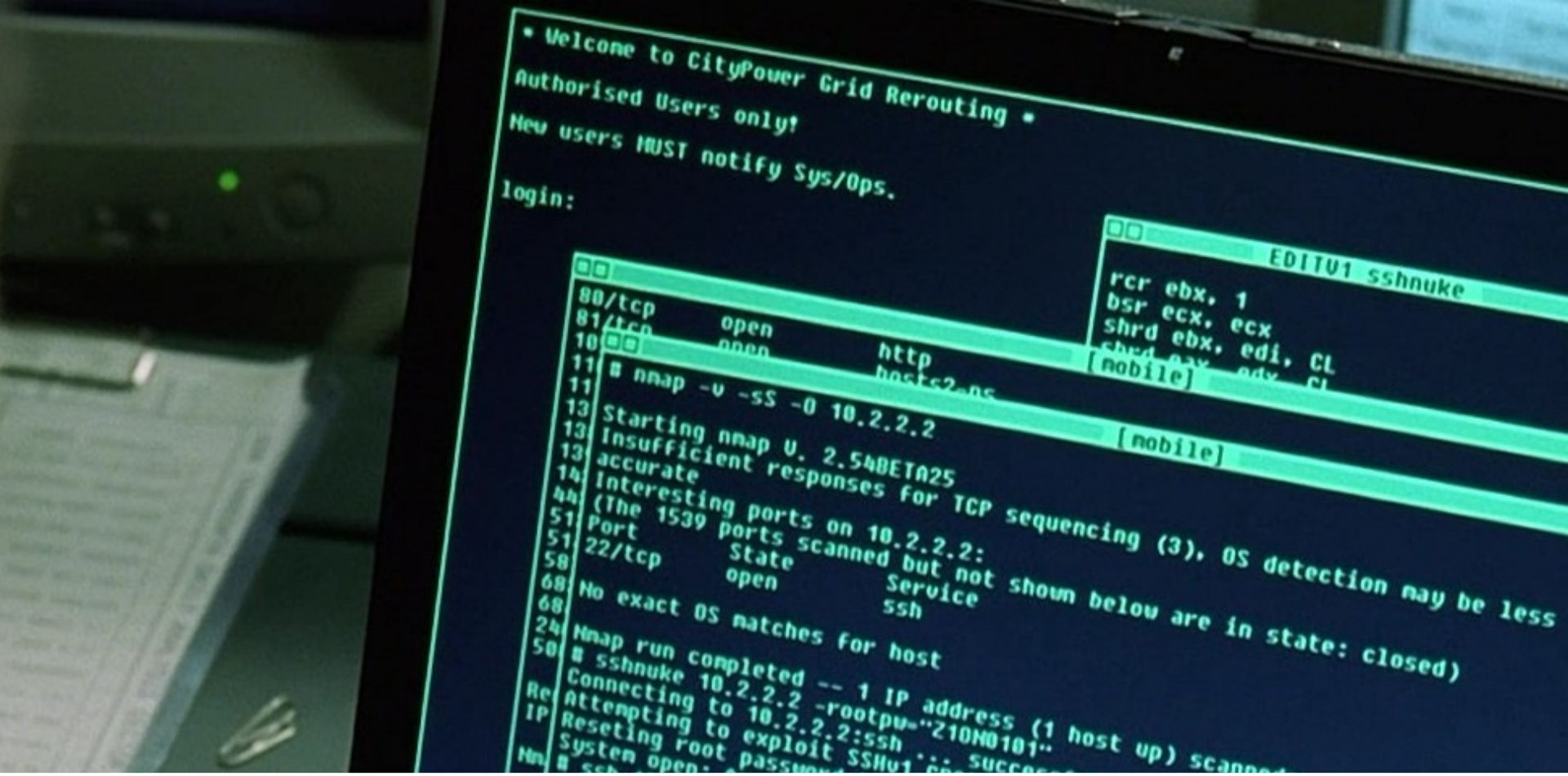
Agenda

This week's agenda

- What is the shell?
- Files and directories
- History and tab completion
- Counting and sorting contents in files
- Pipes and redirection

Next week

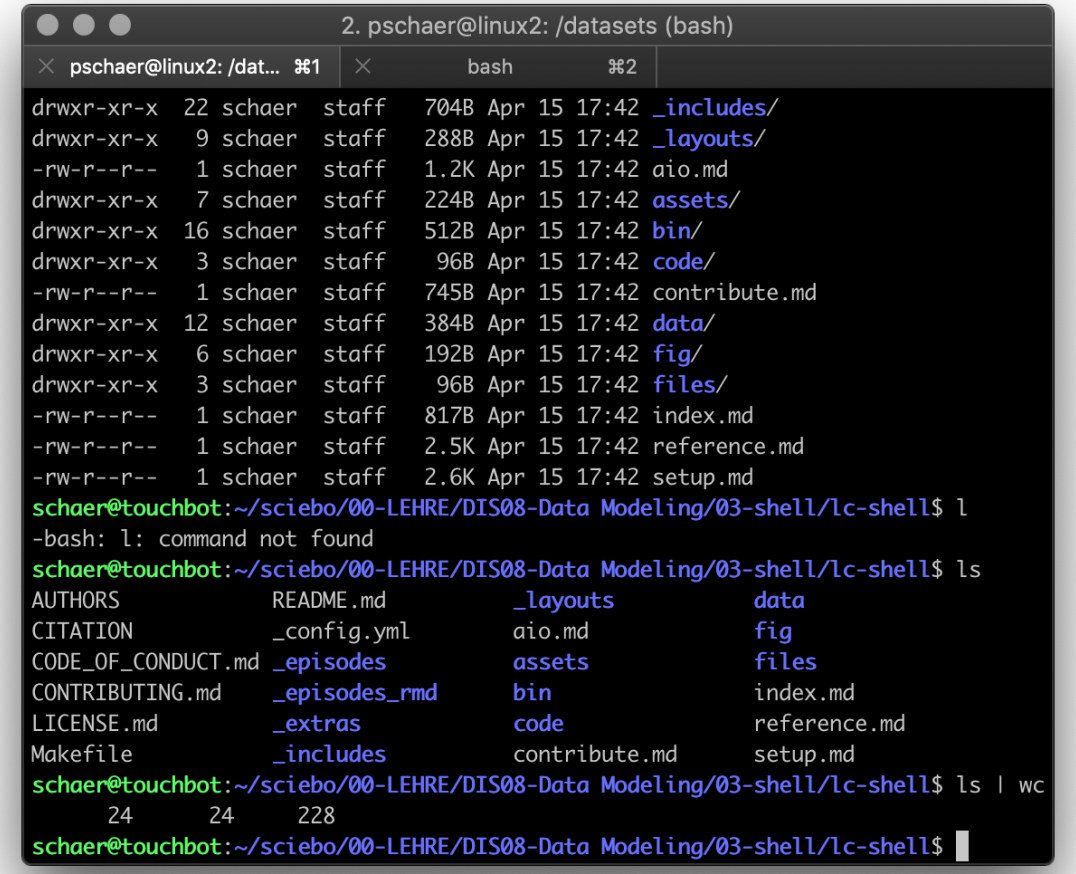
- Version Control Systems
- Git
- GitHub



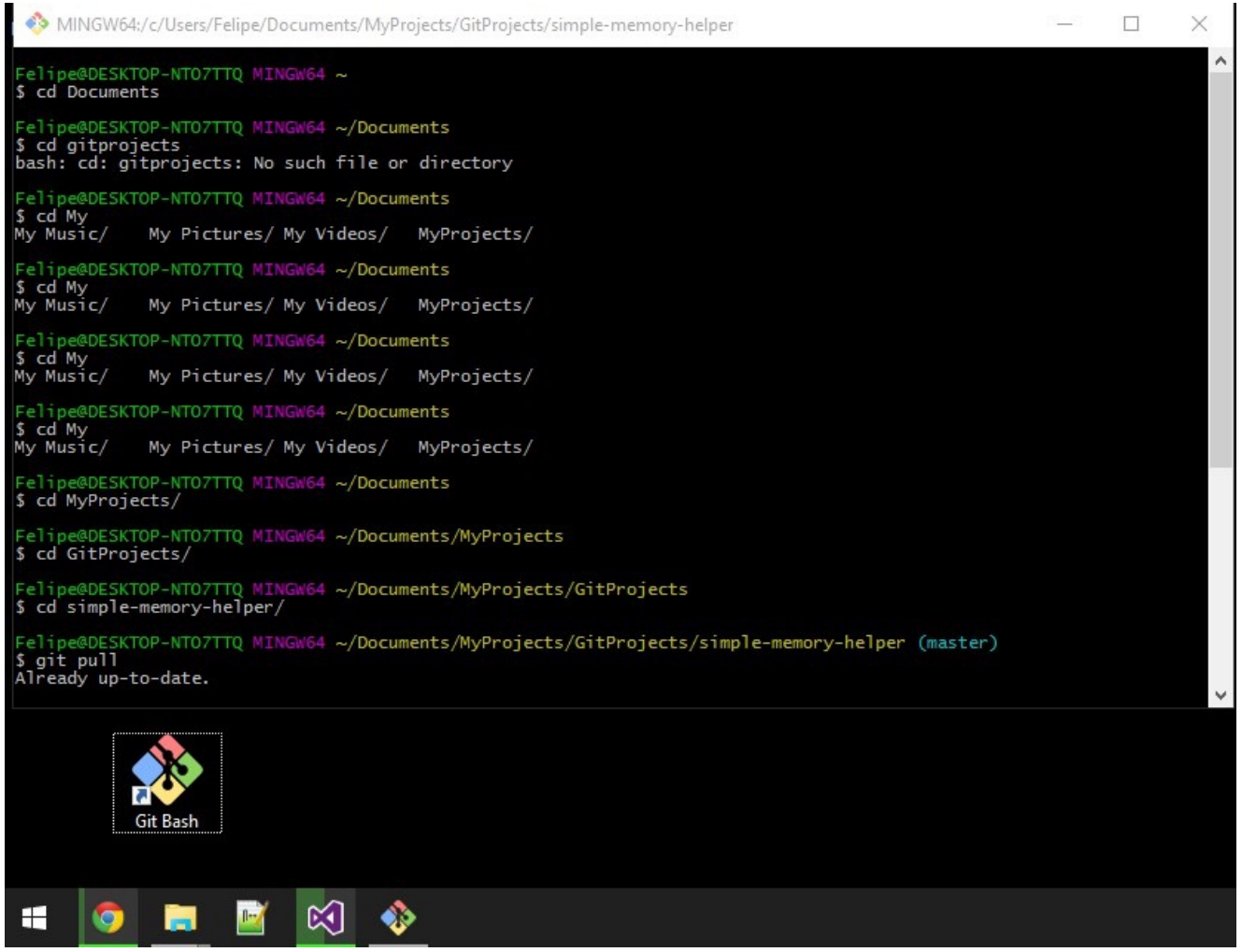
What is the shell?

And why should we use it?

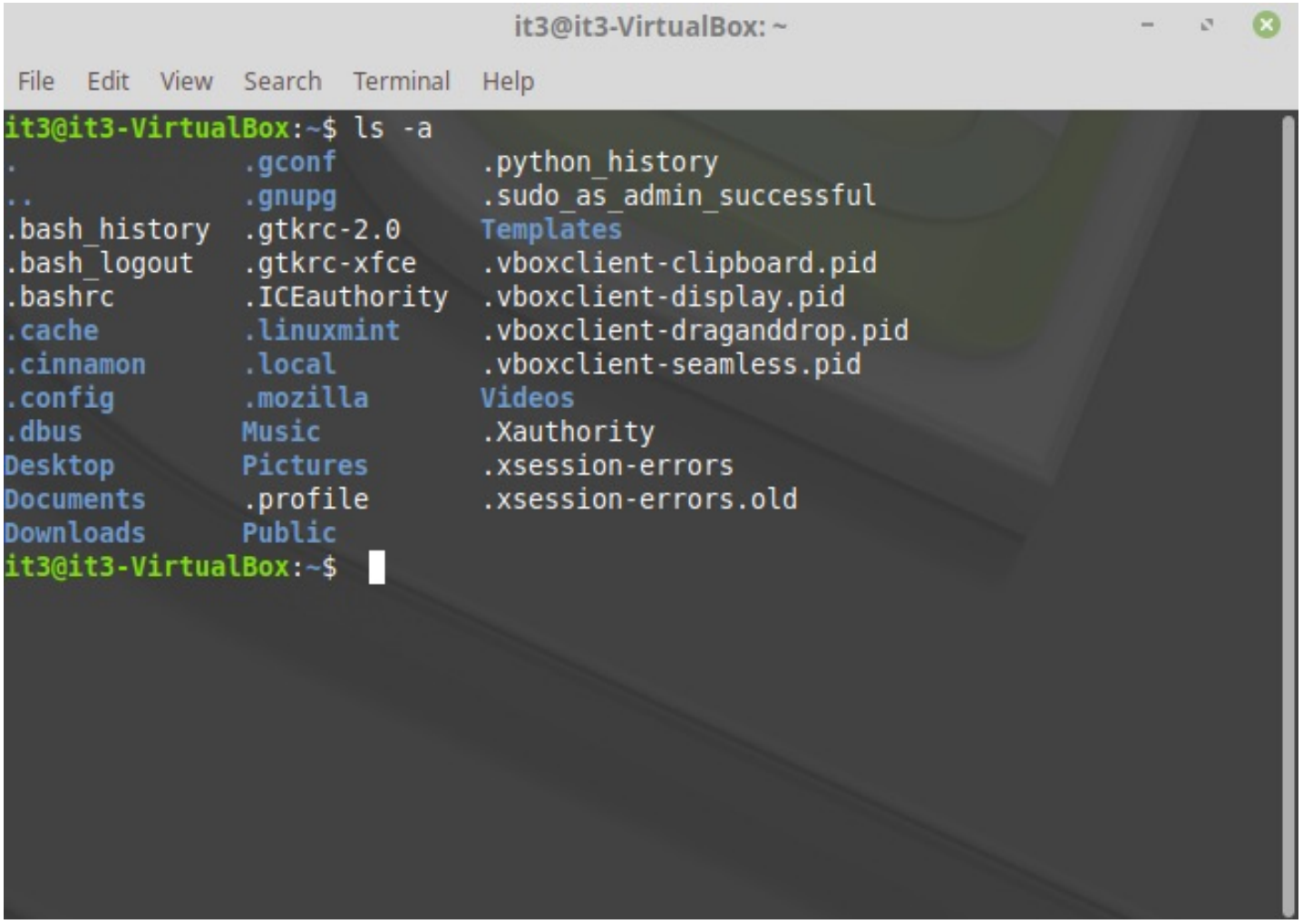
Terminal on the Mac



Git Bash on Windows



Terminal on Linux



What is the shell, and why to use it? #1

- The shell (sometimes referred to as the "Unix shell") is a program that allows you to **interact with your computer** using **typed text commands**.
- It is the primary interface used on **Linux** and **Unix-based** systems, such as **MacOS**, and can be installed optionally on other operating systems such as **Windows**.
- It is a "**command line interface**"
  - **instructions are given to the computer** by typing in commands, and it responds by performing a task or generating an output.
  - This output is often **directed to the screen**, but can also be directed to a file, or even to other commands, creating powerful chains of actions with very little effort.

What is the shell, and why to use it? #2

- Using a shell sometimes feels more like programming than like using a mouse.
  - Commands are "**complicated**" and **terse**, their names are frequently **cryptic**, and their output is lines of text rather than something visual like a graph.
  - On the other hand, with only a few keystrokes, the shell allows you to **combine existing tools into powerful pipelines** and to handle large volumes of data automatically.
  - This automation not only **makes you more productive**, but also improves the **reproducibility** of your workflows by allowing you to save and then repeat them with a few simple commands.
- **Understanding the basics of the shell** provides a **useful foundation** for learning to program, since some of the concepts you will learn here will translate to programming.

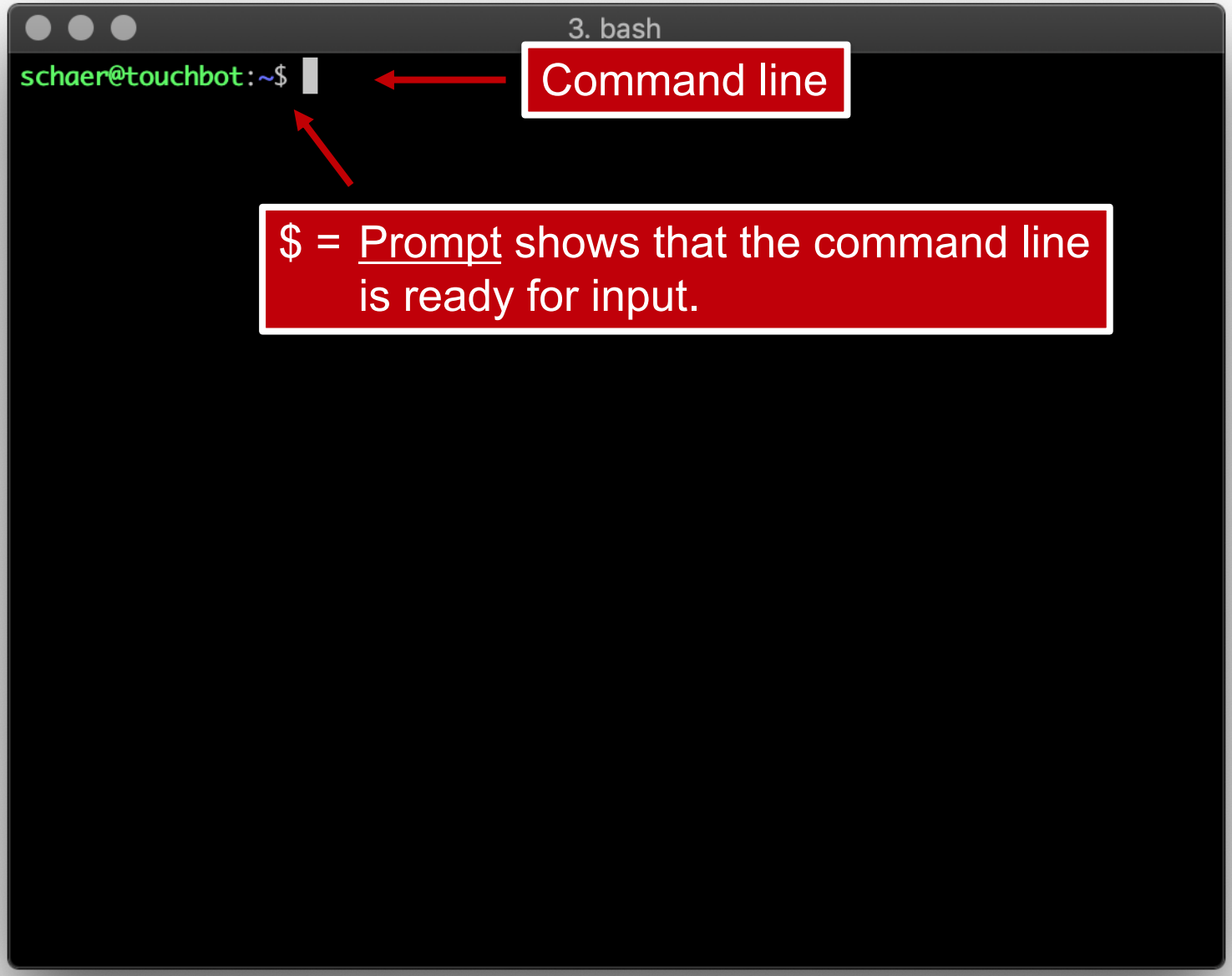
What is the shell, and why to use it? #3

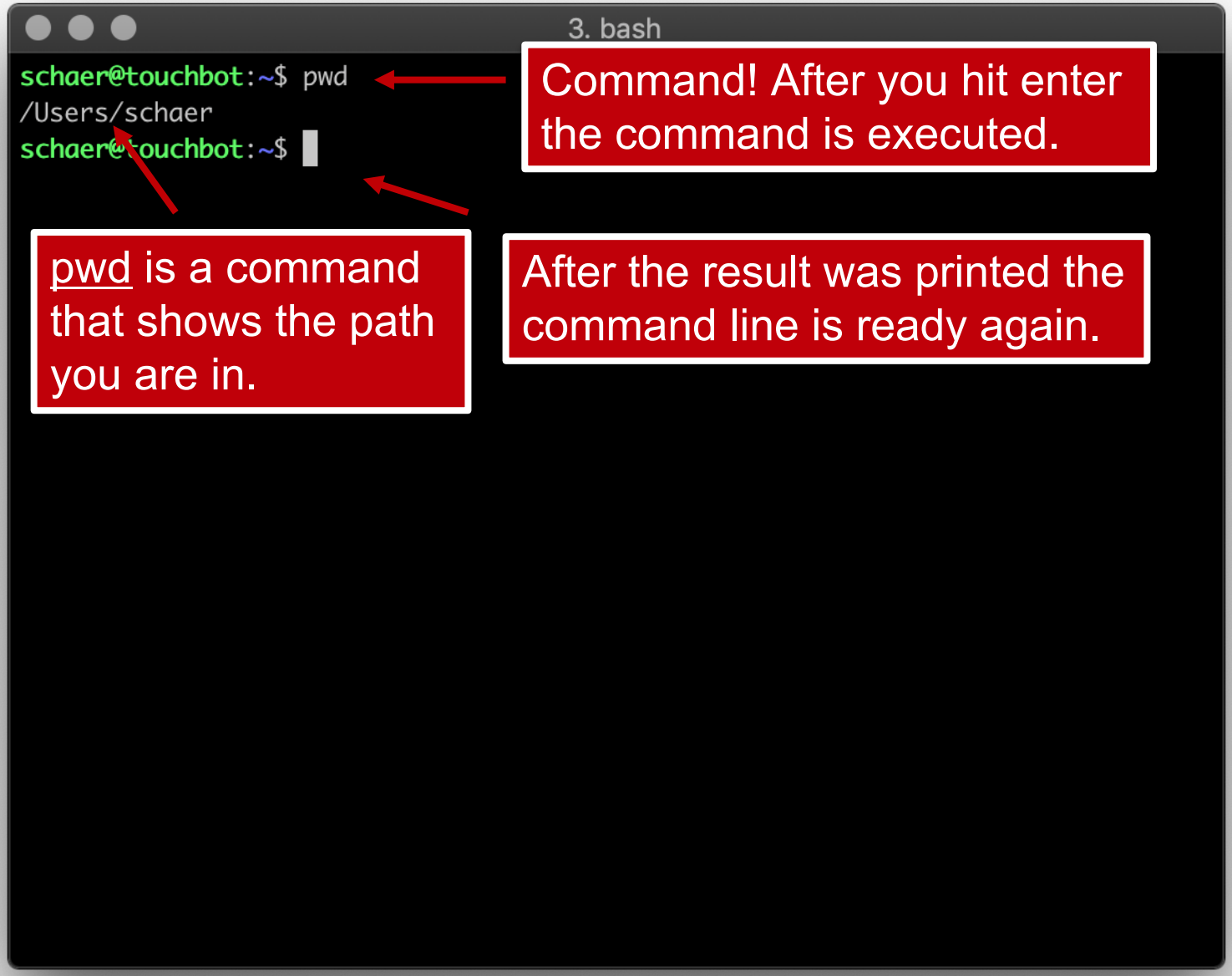
- The shell is one of the **most productive programming environments ever created**. Once mastered, you can use it to experiment with different commands interactively, then use what you have learned to automate your work.
- We will introduce **task automation** by looking at how data can be manipulated, counted, and mined using the shell.
- We will cover a small number of **basic commands**, which will constitute **building blocks** upon which more complex commands can be constructed to fit your data or project.
- Even if you do not do your own programming or your work currently does not involve the command line, **knowing some basics about the shell can be useful**.

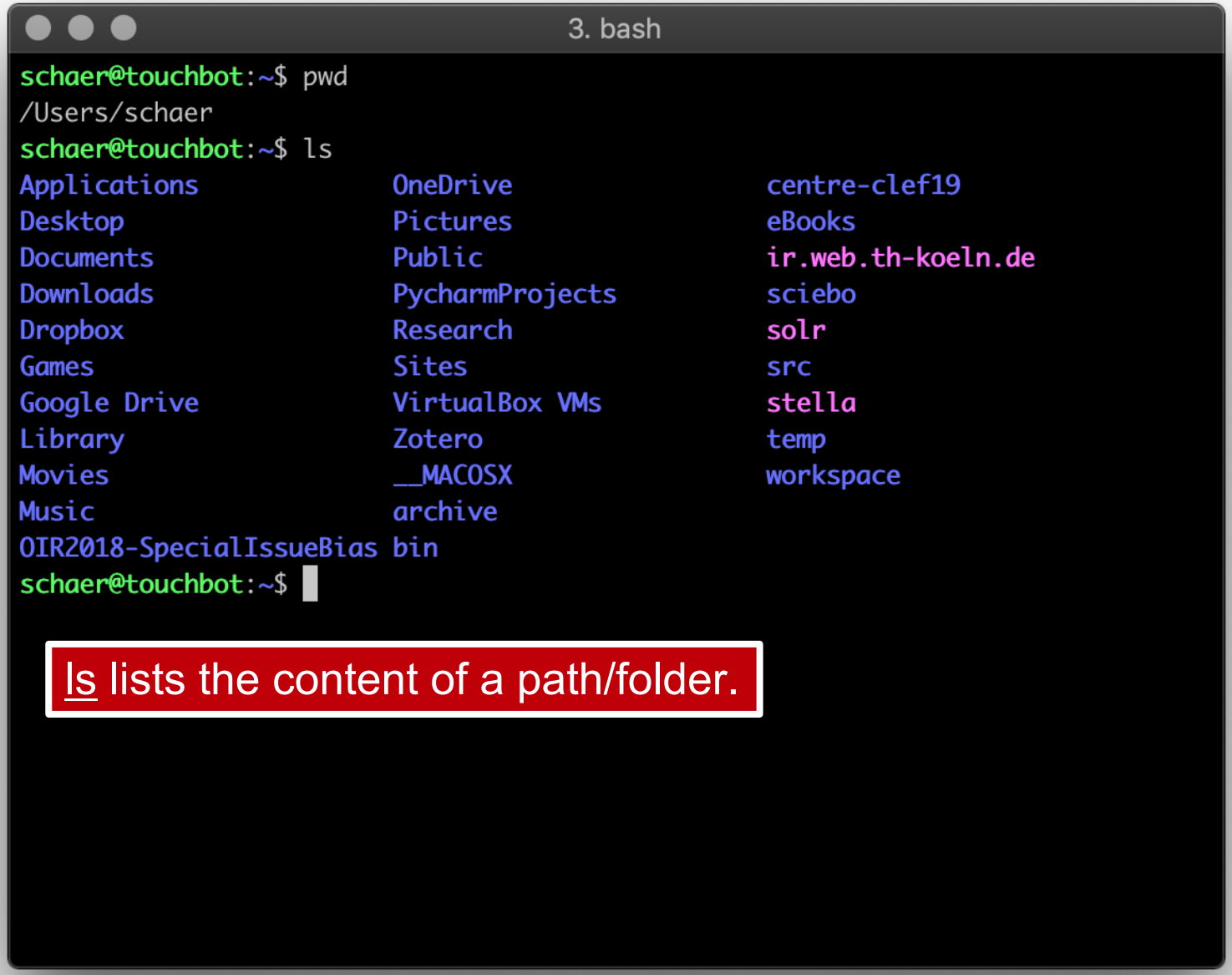
Power of the Shell – An example

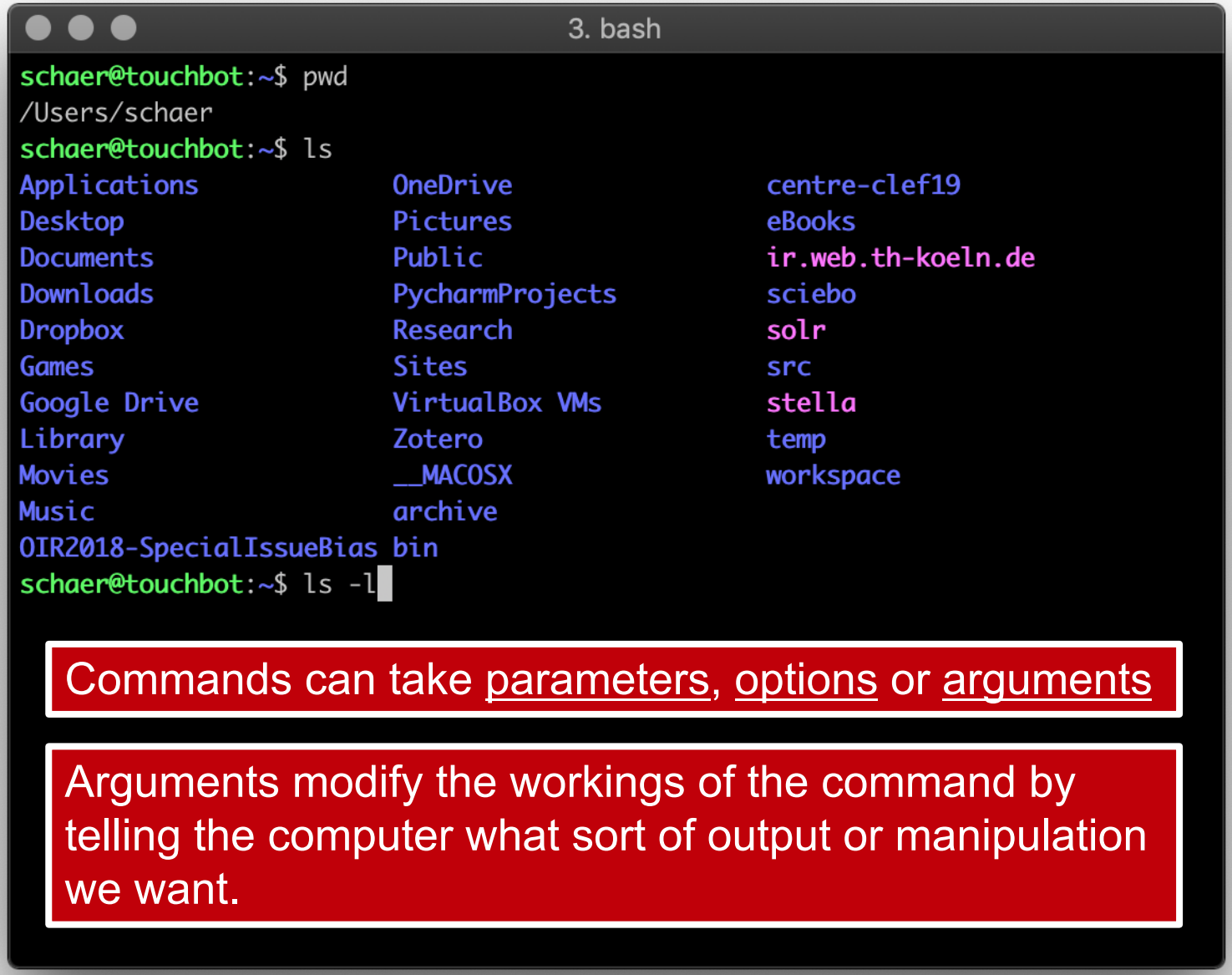
I got a zipped data set with ~50 Gbyte in a myriad of files.

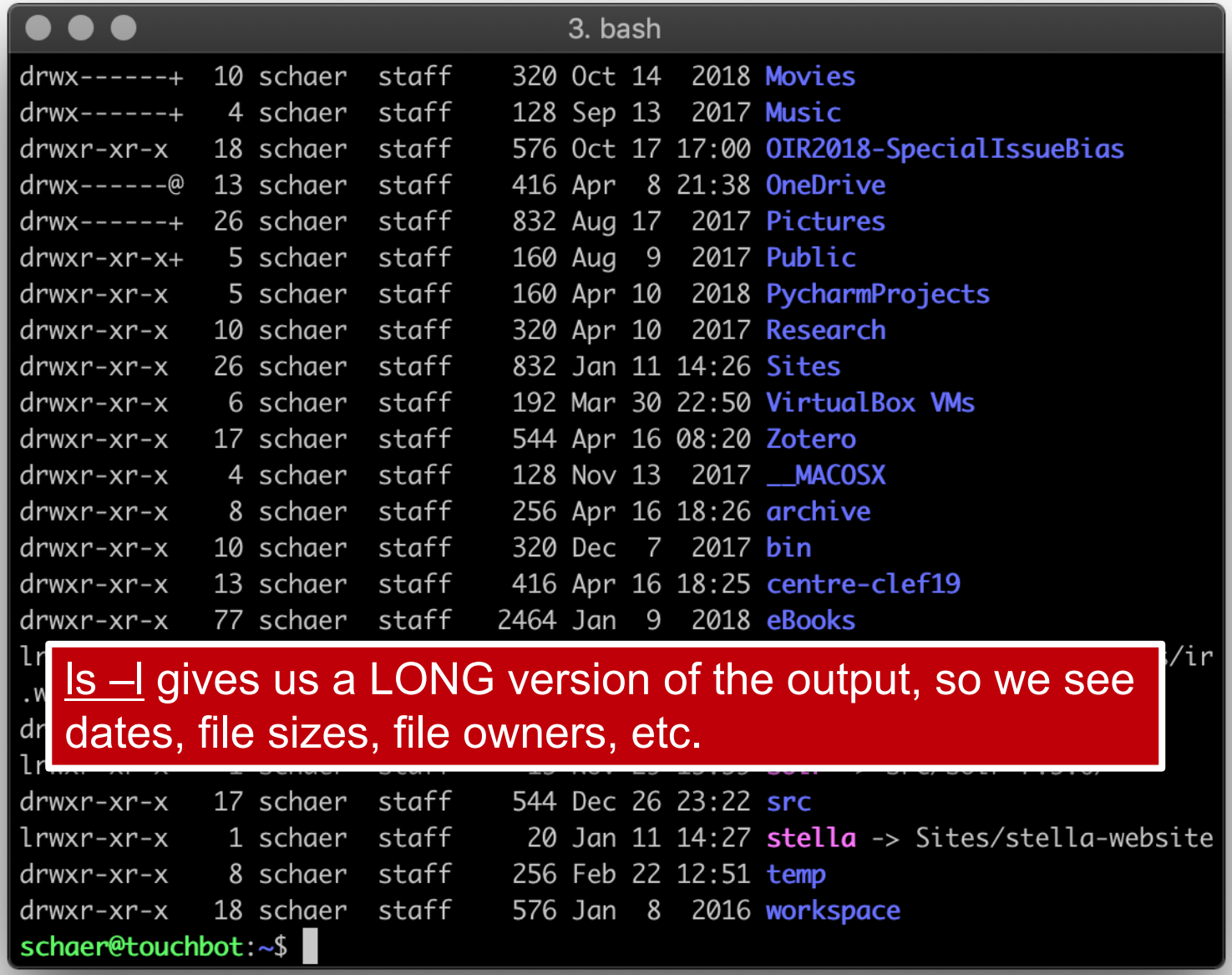
- How many files are there?
  - `$ ls | wc`
- How many files are in XML format?
  - `$ ls *.xml | wc`
- Move only a subset (XML files) to another folder
  - `$ mkdir ../xml`
  - `$ mv *.xml ../xml`
- All this is **impossible** using the Finder or the Explorer!

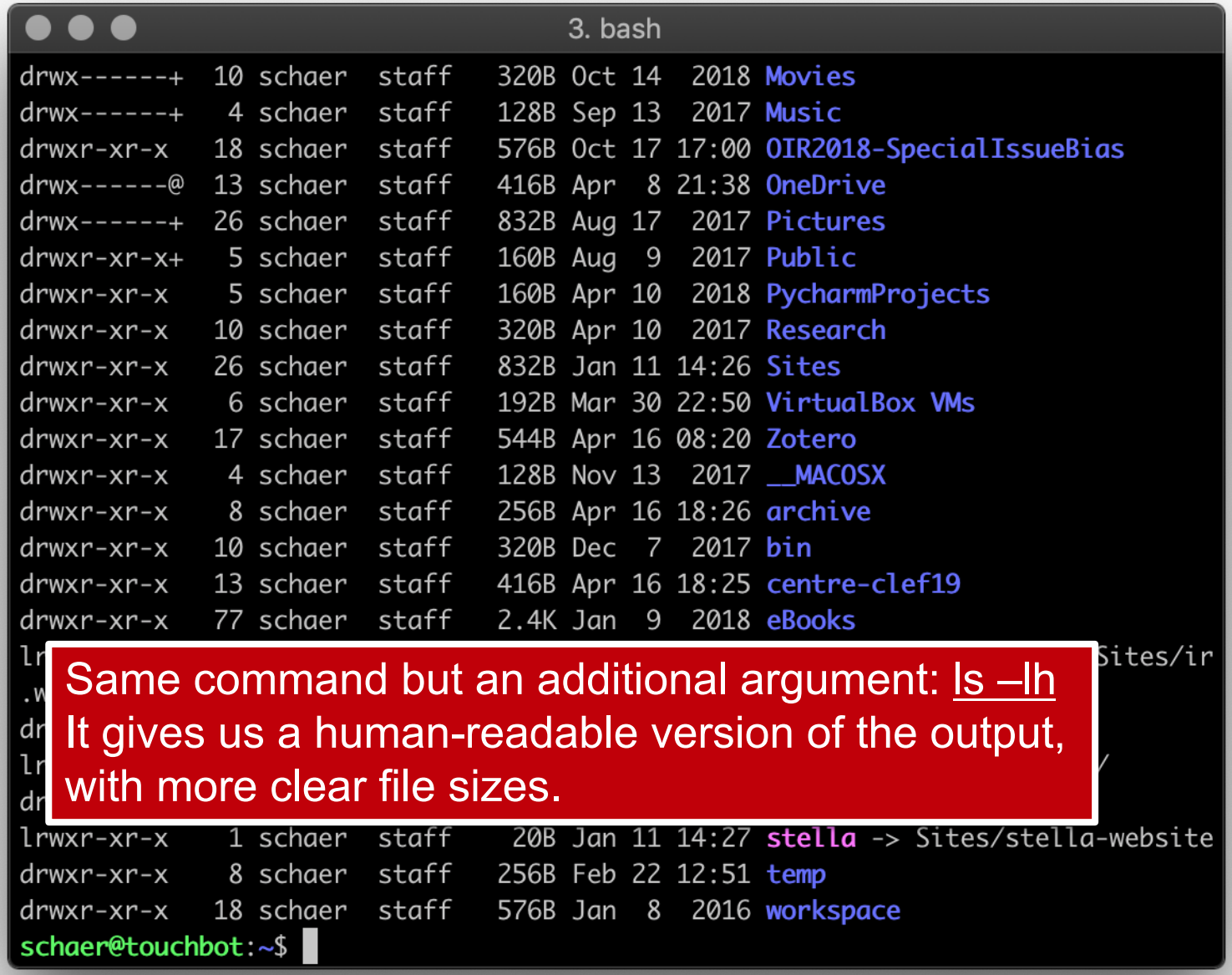

3. bash
schaer@touchbot:~$
Command line
$ = Prompt shows that the command line is ready for input.


3. bash
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$
Command! After you hit enter the command is executed.
pwd is a command that shows the path you are in.
After the result was printed the command line is ready again.


3. bash
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$ ls
Applications
Desktop
Documents
Downloads
Dropbox
Games
Google Drive
Library
Movies
Music
OIR2018-SpecialIssueBias
OneDrive
Pictures
Public
PycharmProjects
Research
Sites
VirtualBox VMs
Zotero
__MACOSX
archive
bin
centre-clef19
eBooks
ir.web.th-koeln.de
sciebo
solr
src
stella
temp
workspace
schaer@touchbot:~$
ls lists the content of a path/folder.


3. bash
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$ ls
Applications
Desktop
Documents
Downloads
Dropbox
Games
Google Drive
Library
Movies
Music
OIR2018-SpecialIssueBias
OneDrive
Pictures
Public
PycharmProjects
Research
Sites
VirtualBox VMs
Zotero
__MACOSX
archive
bin
centre-clef19
eBooks
ir.web.th-koeln.de
sciebo
solr
src
stella
temp
workspace
schaer@touchbot:~$ ls -l
Commands can take parameters, options or arguments
Arguments modify the workings of the command by telling the computer what sort of output or manipulation we want.


3. bash
drwx------+ 10 schaer staff 320 Oct 14 2018 Movies
drwx------+ 4 schaer staff 128 Sep 13 2017 Music
drwxr-xr-x 18 schaer staff 576 Oct 17 17:00 OIR2018-SpecialIssueBias
drwx------@ 13 schaer staff 416 Apr 8 21:38 OneDrive
drwx------+ 26 schaer staff 832 Aug 17 2017 Pictures
drwxr-xr-x+ 5 schaer staff 160 Aug 9 2017 Public
drwxr-xr-x 5 schaer staff 160 Apr 10 2018 PycharmProjects
drwxr-xr-x 10 schaer staff 320 Apr 10 2017 Research
drwxr-xr-x 26 schaer staff 832 Jan 11 14:26 Sites
drwxr-xr-x 6 schaer staff 192 Mar 30 22:50 VirtualBox VMs
drwxr-xr-x 17 schaer staff 544 Apr 16 08:20 Zotero
drwxr-xr-x 4 schaer staff 128 Nov 13 2017 __MACOSX
drwxr-xr-x 8 schaer staff 256 Apr 16 18:26 archive
drwxr-xr-x 10 schaer staff 320 Dec 7 2017 bin
drwxr-xr-x 13 schaer staff 416 Apr 16 18:25 centre-clef19
drwxr-xr-x 77 schaer staff 2464 Jan 9 2018 eBooks
ls –l gives us a LONG version of the output, so we see dates, file sizes, file owners, etc.
drwxr-xr-x 17 schaer staff 544 Dec 26 23:22 src
lrwxr-xr-x 1 schaer staff 20 Jan 11 14:27 stella -> Sites/stella-website
drwxr-xr-x 8 schaer staff 256 Feb 22 12:51 temp
drwxr-xr-x 18 schaer staff 576 Jan 8 2016 workspace
schaer@touchbot:~$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drwxr-xr-x 26 schaer staff 832B Jan 11 14:26 Sites
drwxr-xr-x 6 schaer staff 192B Mar 30 22:50 VirtualBox VMs
drwxr-xr-x 17 schaer staff 544B Apr 16 08:20 Zotero
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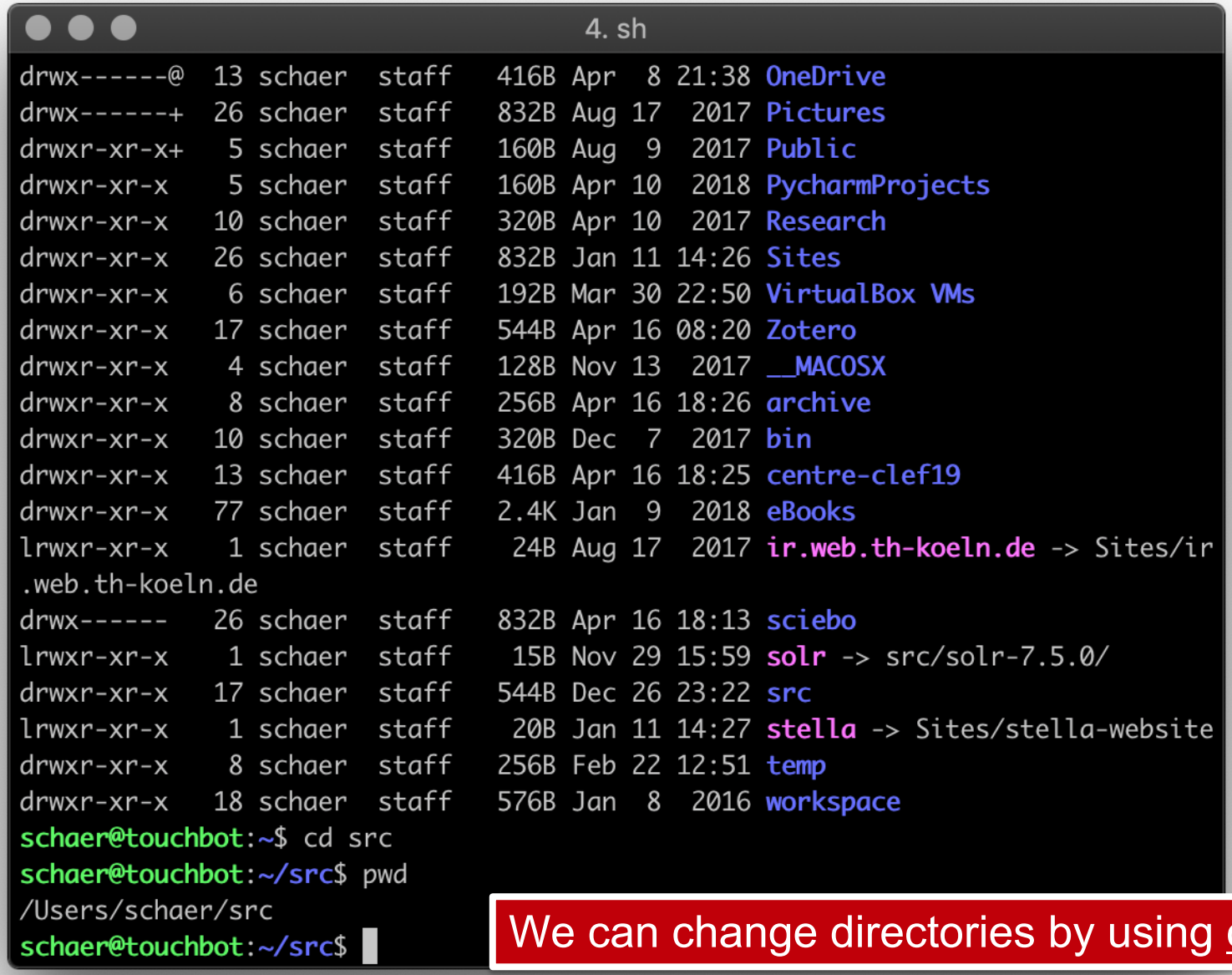
drwxr-xr-x 8 schaer staff 256B Apr 16 18:26 archive
drwxr-xr-x 10 schaer staff 320B Dec 7 2017 bin
drwxr-xr-x 13 schaer staff 416B Apr 16 18:25 centre-clef19
drwxr-xr-x 77 schaer staff 2.4K Jan 9 2018 eBooks
Same command but an additional argument: ls –lh
It gives us a human-readable version of the output, with more clear file sizes.
lrwxr-xr-x 1 schaer staff 20B Jan 11 14:27 stella -> Sites/stella-website
drwxr-xr-x 8 schaer staff 256B Feb 22 12:51 temp
drwxr-xr-x 18 schaer staff 576B Jan 8 2016 workspace
schaer@touchbot:~$


4. sh
drwx------@ 13 schaer staff 416B Apr 8 21:38 OneDrive
drwx------+ 26 schaer staff 832B Aug 17 2017 Pictures
drwxr-xr-x+ 5 schaer staff 160B Aug 9 2017 Public
drwxr-xr-x 5 schaer staff 160B Apr 10 2018 PycharmProjects
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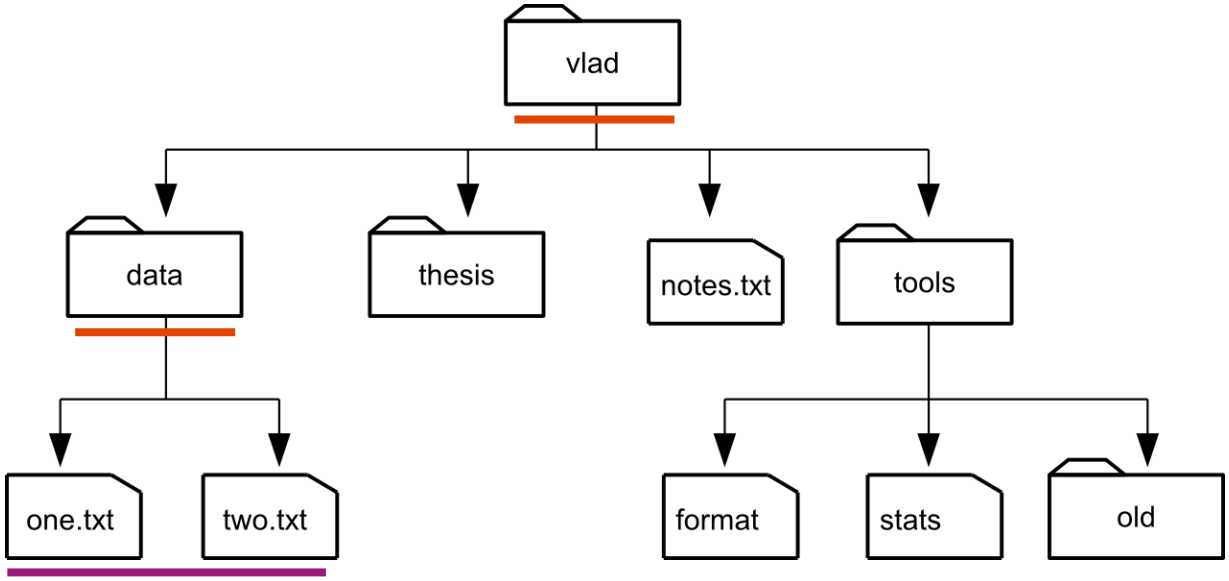
drwxr-xr-x 77 schaer staff 2.4K Jan 9 2018 eBooks
lrwxr-xr-x 1 schaer staff 24B Aug 17 2017 ir.web.th-koeln.de -> Sites/ir
.web.th-koeln.de
drwx------ 26 schaer staff 832B Apr 16 18:13 sciebo
lrwxr-xr-x 1 schaer staff 15B Nov 29 15:59 solr -> src/solr-7.5.0/
drwxr-xr-x 17 schaer staff 544B Dec 26 23:22 src
lrwxr-xr-x 1 schaer staff 20B Jan 11 14:27 stella -> Sites/stella-website
drwxr-xr-x 8 schaer staff 256B Feb 22 12:51 temp
drwxr-xr-x 18 schaer staff 576B Jan 8 2016 workspace
schaer@touchbot:~$ cd src
schaer@touchbot:~/src$ pwd
/Users/schaer/src
schaer@touchbot:~/src$
We can change directories by using cd.

Paths in a filesystem

- Paths guide the way through the **filesystem** giving access to all **directories**/folders and **files**.
- The filesystem is structured as a tree with a clear hierarchy.



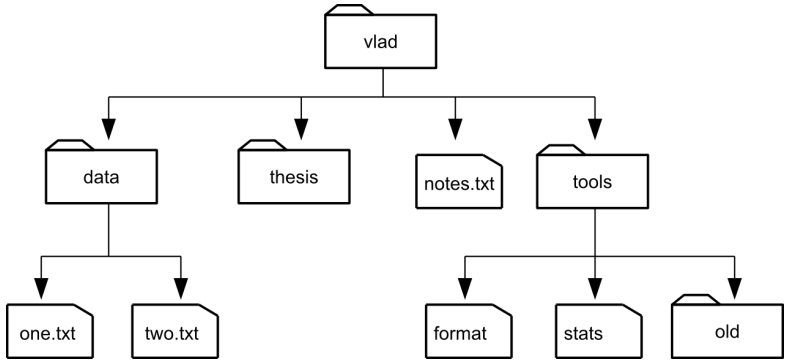
- A path to a file would look like this: `/vlad/data/one.txt`

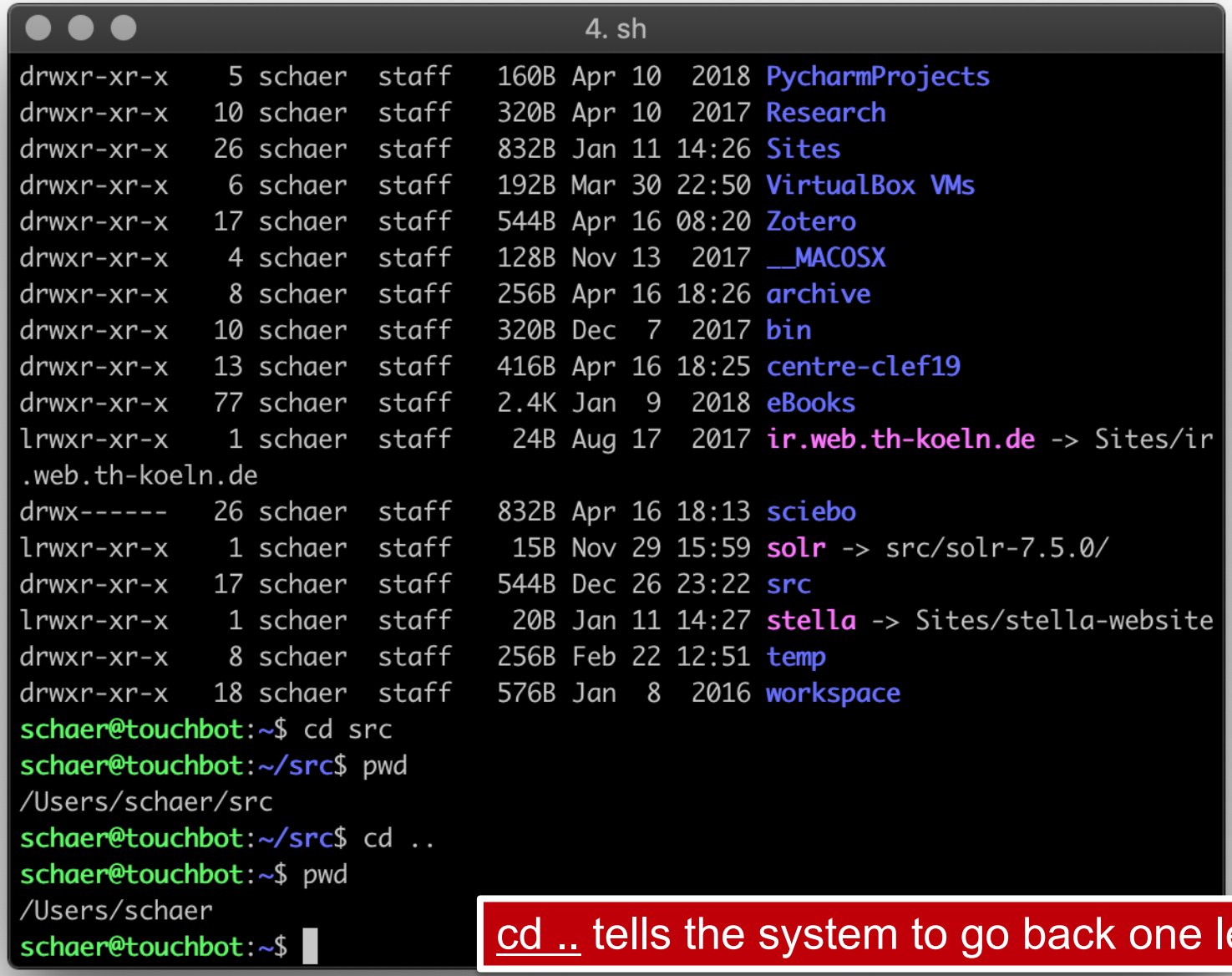
Absolute vs. relative paths

Path can be **absolute** or **relative**.

- Absolute paths always show the complete path starting from the **root** of the filesystem (marked by /)
- Relative paths show the path from your **current position** in the filesystem

- Example: Current position is `/vlad/data`
- The following paths to `one.txt` are the same:
  - `/vlad/data/one.txt`
  - `./one.txt`
  - `../data/one.txt`

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drwxr-xr-x 10 schaer staff 320B Apr 10 2017 Research
drwxr-xr-x 26 schaer staff 832B Jan 11 14:26 Sites
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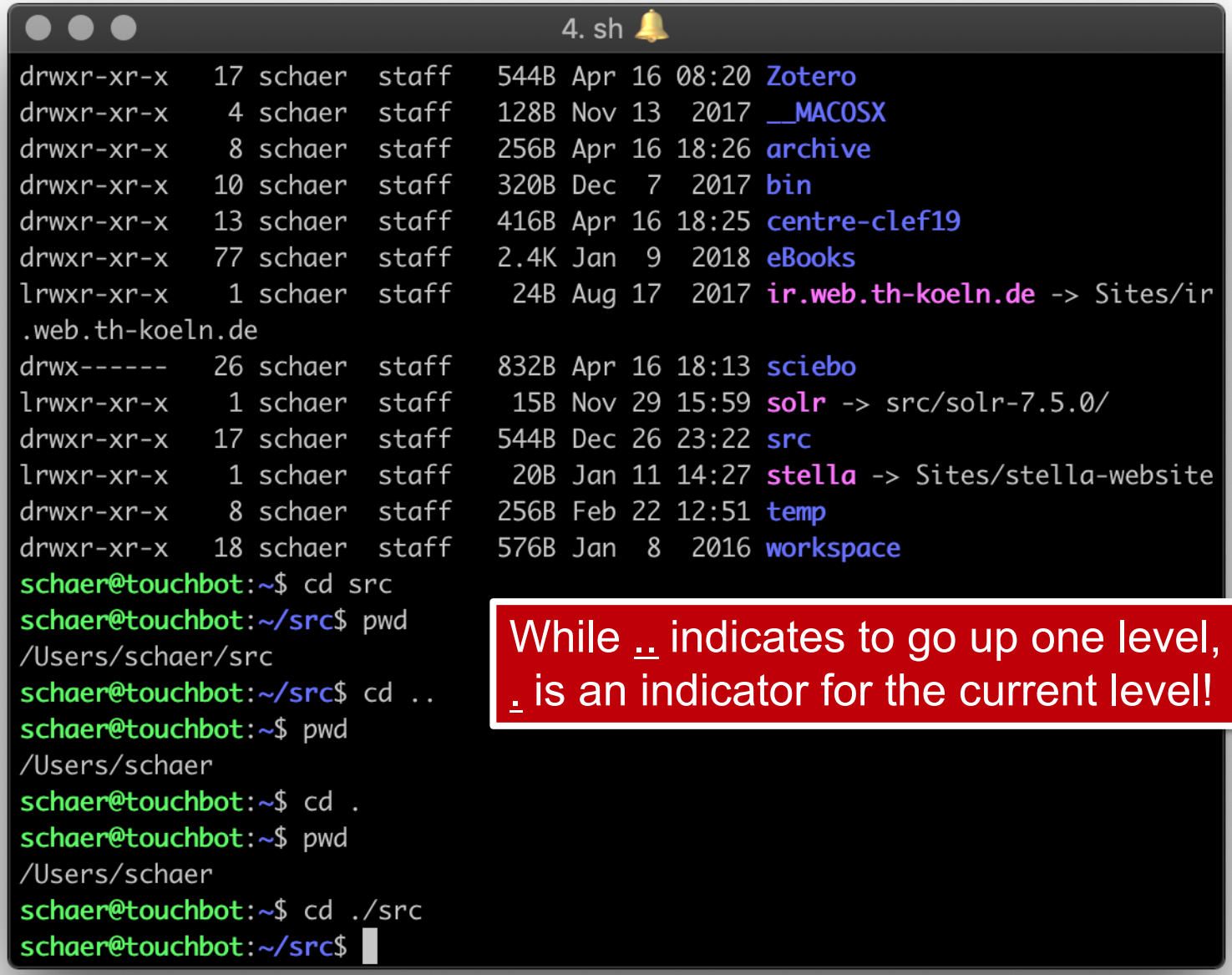
lrwxr-xr-x 1 schaer staff 24B Aug 17 2017 ir.web.th-koeln.de -> Sites/ir
.web.th-koeln.de
drwx------ 26 schaer staff 832B Apr 16 18:13 sciebo
lrwxr-xr-x 1 schaer staff 15B Nov 29 15:59 solr -> src/solr-7.5.0/
drwxr-xr-x 17 schaer staff 544B Dec 26 23:22 src
lrwxr-xr-x 1 schaer staff 20B Jan 11 14:27 stella -> Sites/stella-website
drwxr-xr-x 8 schaer staff 256B Feb 22 12:51 temp
drwxr-xr-x 18 schaer staff 576B Jan 8 2016 workspace
schaer@touchbot:~$ cd src
schaer@touchbot:~/src$ pwd
/Users/schaer/src
schaer@touchbot:~/src$ cd ..
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$
cd .. tells the system to go back one level.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drwxr-xr-x 8 schaer staff 256B Apr 16 18:26 archive
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drwx------ 26 schaer staff 832B Apr 16 18:13 sciebo
lrwxr-xr-x 1 schaer staff 15B Nov 29 15:59 solr -> src/solr-7.5.0/
drwxr-xr-x 17 schaer staff 544B Dec 26 23:22 src
lrwxr-xr-x 1 schaer staff 20B Jan 11 14:27 stella -> Sites/stella-website
drwxr-xr-x 8 schaer staff 256B Feb 22 12:51 temp
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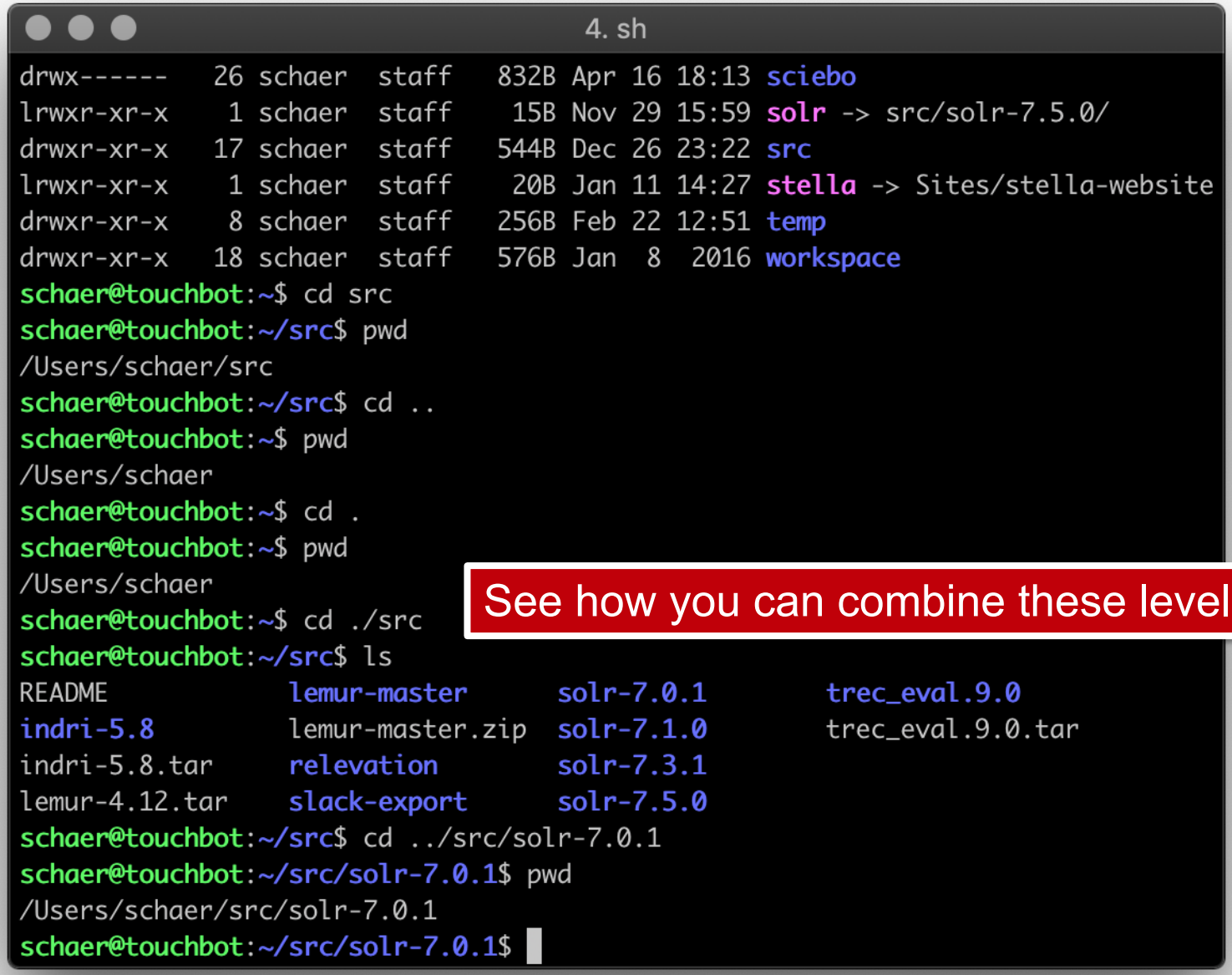
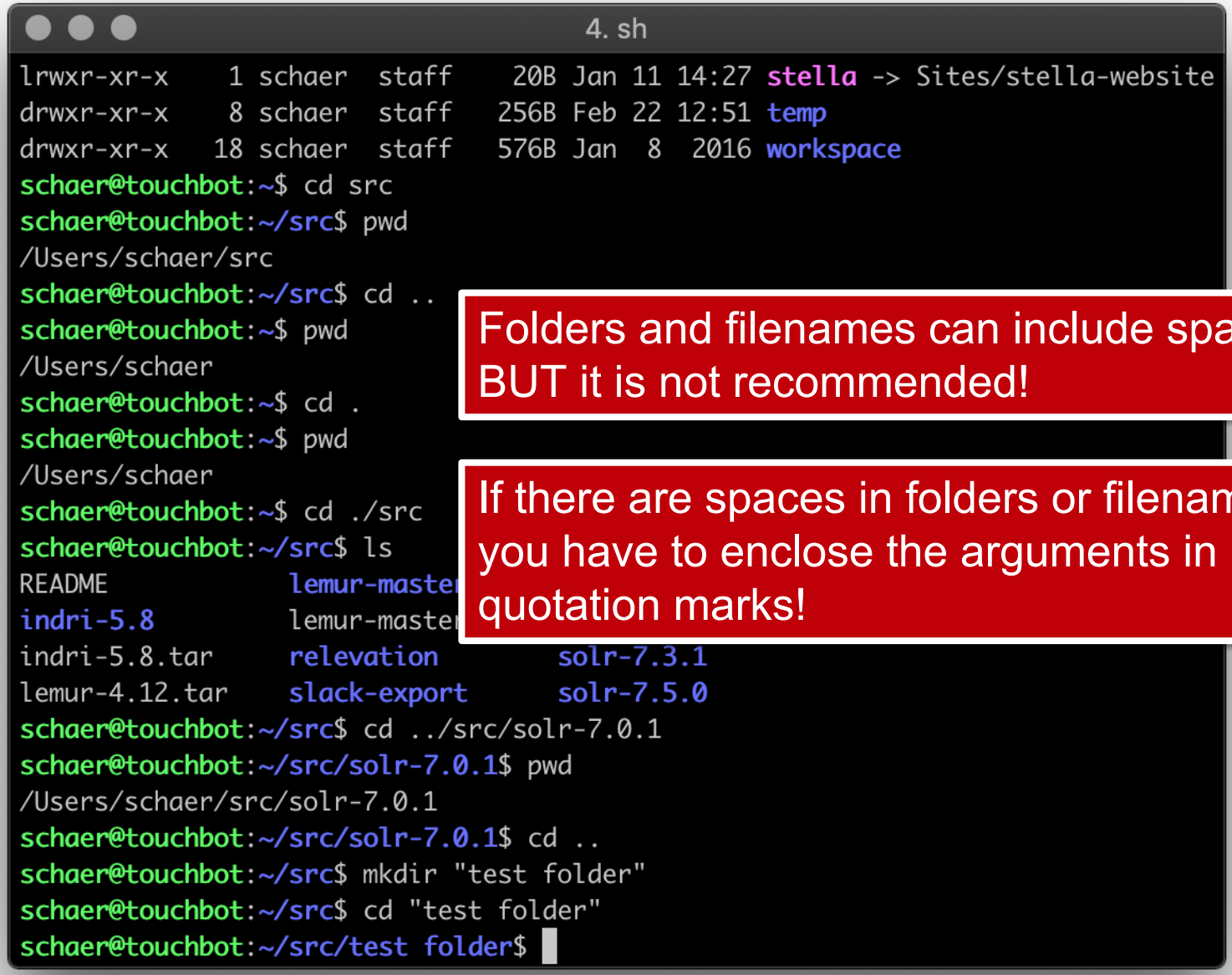
schaer@touchbot:~$ cd src
schaer@touchbot:~/src$ pwd
/Users/schaer/src
schaer@touchbot:~/src$ cd ..
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$ cd .
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$ cd ./src
schaer@touchbot:~/src$
While .. indicates to go up one level,
. is an indicator for the current level!


4. sh
drwx------ 26 schaer staff 832B Apr 16 18:13 sciebo
lrwxr-xr-x 1 schaer staff 15B Nov 29 15:59 solr -> src/solr-7.5.0/
drwxr-xr-x 17 schaer staff 544B Dec 26 23:22 src
lrwxr-xr-x 1 schaer staff 20B Jan 11 14:27 stella -> Sites/stella-website
drwxr-xr-x 8 schaer staff 256B Feb 22 12:51 temp
drwxr-xr-x 18 schaer staff 576B Jan 8 2016 workspace
schaer@touchbot:~$ cd src
schaer@touchbot:~/src$ pwd
/Users/schaer/src
schaer@touchbot:~/src$ cd ..
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$ cd .
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$ cd ./src
schaer@touchbot:~/src$ ls
README lemur-master solr-7.0.1 trec_eval.9.0
indri-5.8 lemur-master.zip solr-7.1.0 trec_eval.9.0.tar
indri-5.8.tar relevation solr-7.3.1
lemur-4.12.tar slack-export solr-7.5.0
schaer@touchbot:~/src$ cd ../src/solr-7.0.1
schaer@touchbot:~/src/solr-7.0.1$ pwd
/Users/schaer/src/solr-7.0.1
schaer@touchbot:~/src/solr-7.0.1$
See how you can combine these levels!


4. sh
lrwxr-xr-x 1 schaer staff 20B Jan 11 14:27 stella -> Sites/stella-website
drwxr-xr-x 8 schaer staff 256B Feb 22 12:51 temp
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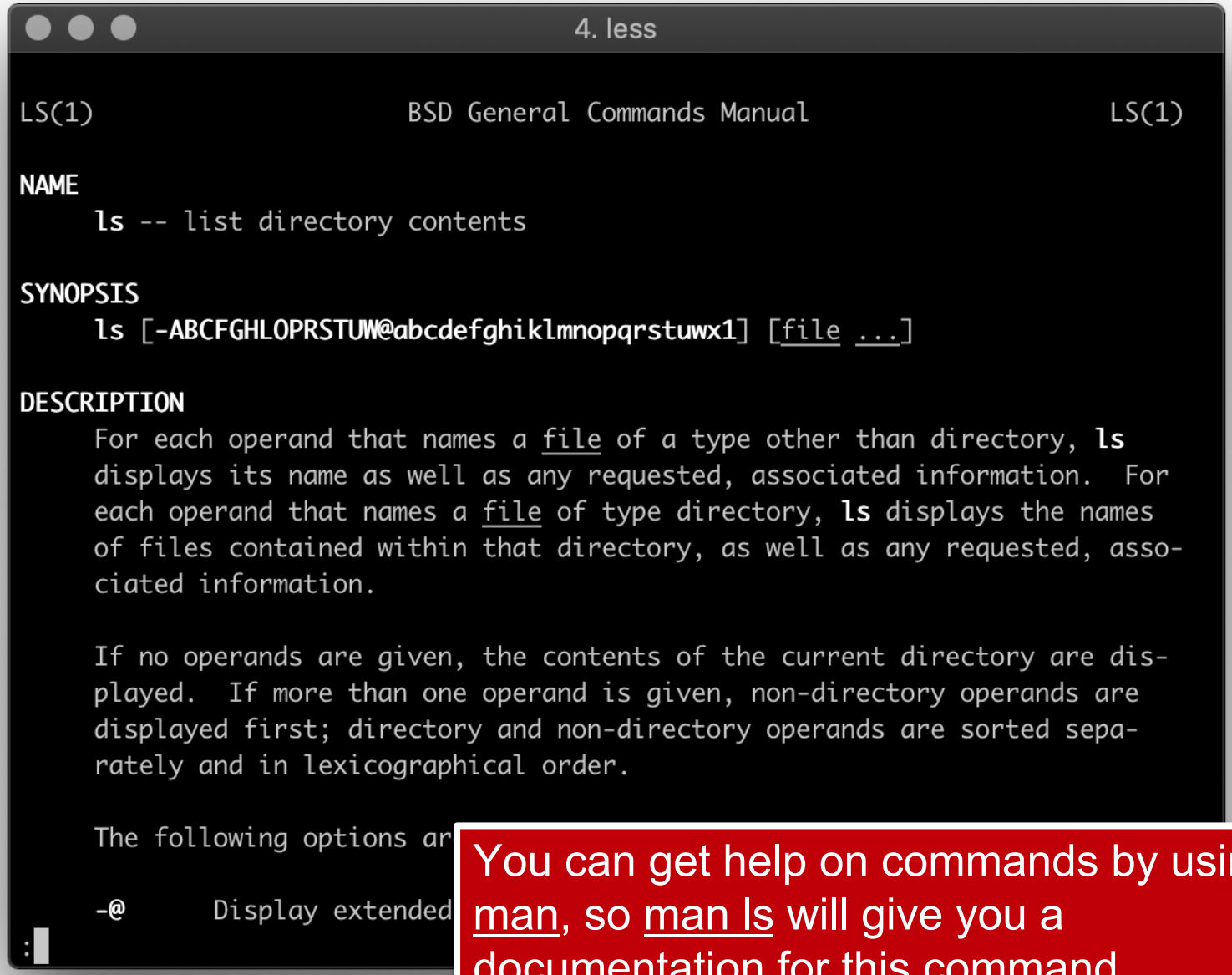
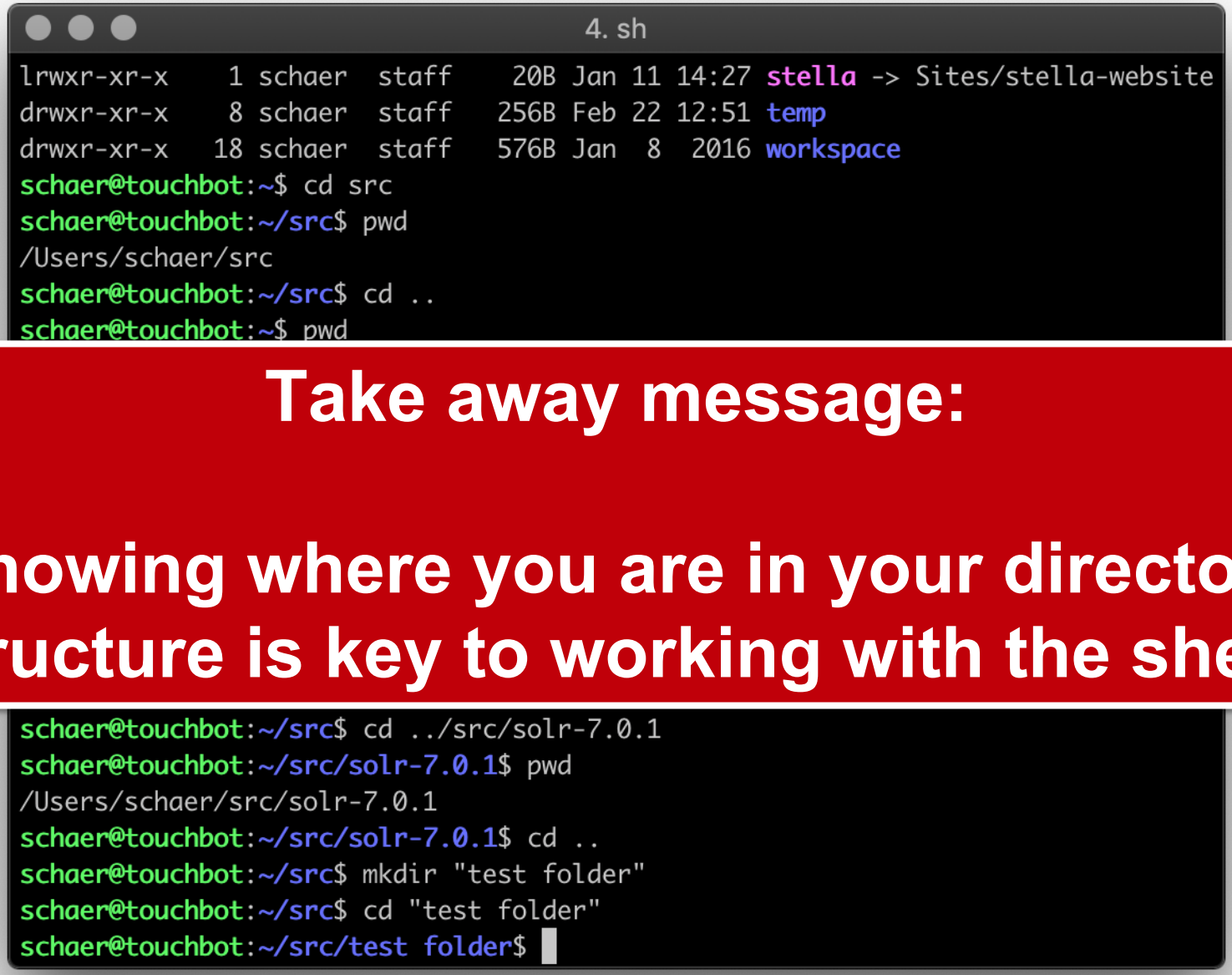
schaer@touchbot:~/src$ pwd
/Users/schaer/src
schaer@touchbot:~/src$ cd ..
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$ cd .
schaer@touchbot:~$ pwd
/Users/schaer
schaer@touchbot:~$ cd ./src
schaer@touchbot:~/src$ ls
README lemur-master
indri-5.8 lemur-master
indri-5.8.tar relevation solr-7.3.1
lemur-4.12.tar slack-export solr-7.5.0
schaer@touchbot:~/src$ cd ../src/solr-7.0.1
schaer@touchbot:~/src/solr-7.0.1$ pwd
/Users/schaer/src/solr-7.0.1
schaer@touchbot:~/src/solr-7.0.1$ cd ..
schaer@touchbot:~/src$ mkdir "test folder"
schaer@touchbot:~/src$ cd "test folder"
schaer@touchbot:~/src/test folder$
Folders and filenames can include spaces BUT it is not recommended!
If there are spaces in folders or filenames you have to enclose the arguments in quotation marks!



You can get help on commands by using man, so man ls will give you a documentation for this command.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schaer@touchbot:~/src$ pwd
/Users/schaer/src
schaer@touchbot:~/src$ cd ..
schaer@touchbot:~$ pwd
Take away message:
Knowing where you are in your directory structure is key to working with the shell!
schaer@touchbot:~/src$ cd ../src/solr-7.0.1
schaer@touchbot:~/src/solr-7.0.1$ pwd
/Users/schaer/src/solr-7.0.1
schaer@touchbot:~/src/solr-7.0.1$ cd ..
schaer@touchbot:~/src$ mkdir "test folder"
schaer@touchbot:~/src$ cd "test folder"
schaer@touchbot:~/src/test folder$

Some more shell “secrets”

Use TAB for auto-complete

- Hitting tab at any time within the shell will prompt it to attempt to auto-complete the line based on the files or sub-directories in the current directory.
- Where two or more files have the same characters, the auto-complete will only fill up to the first point of difference, after which we can add more characters, and try using tab again.

Command history

- Hit the Up key to see the last command, and the next, and the next
- `history` will print the whole history of all your last commands.

Canceling commands

- To cancel any ongoing processes in the Unix shell, hit Ctrl+X.

More shell commands

- `cat` read the content of a file and print it to `stdout`
- `head` read the beginning of a file and print it to `stdout`
- `tail` read the end of a file and print it to `stdout`
- `less` read the content of a file, print only so much that it fits on the screen. Hit spacebar to see next screen

These commands take many arguments like:

- `head -n 20`
- `head file1 file2 file3`

Any idea what this does?

Wildcards

- Wildcards are a feature of the shell and will therefore work with *any* command.
- The shell will expand wildcards to a list of files and/or directories before the command is executed, and the command will never see the wildcards.
  - * matches zero or more characters
  - ? matches exactly one character

```
ls *.pdf      -> ls 1.pdf temp.pdf klausur.pdf ...
ls c?de.pdf   -> ls cade.pdf code.pdf
```

Move, copy and delete files

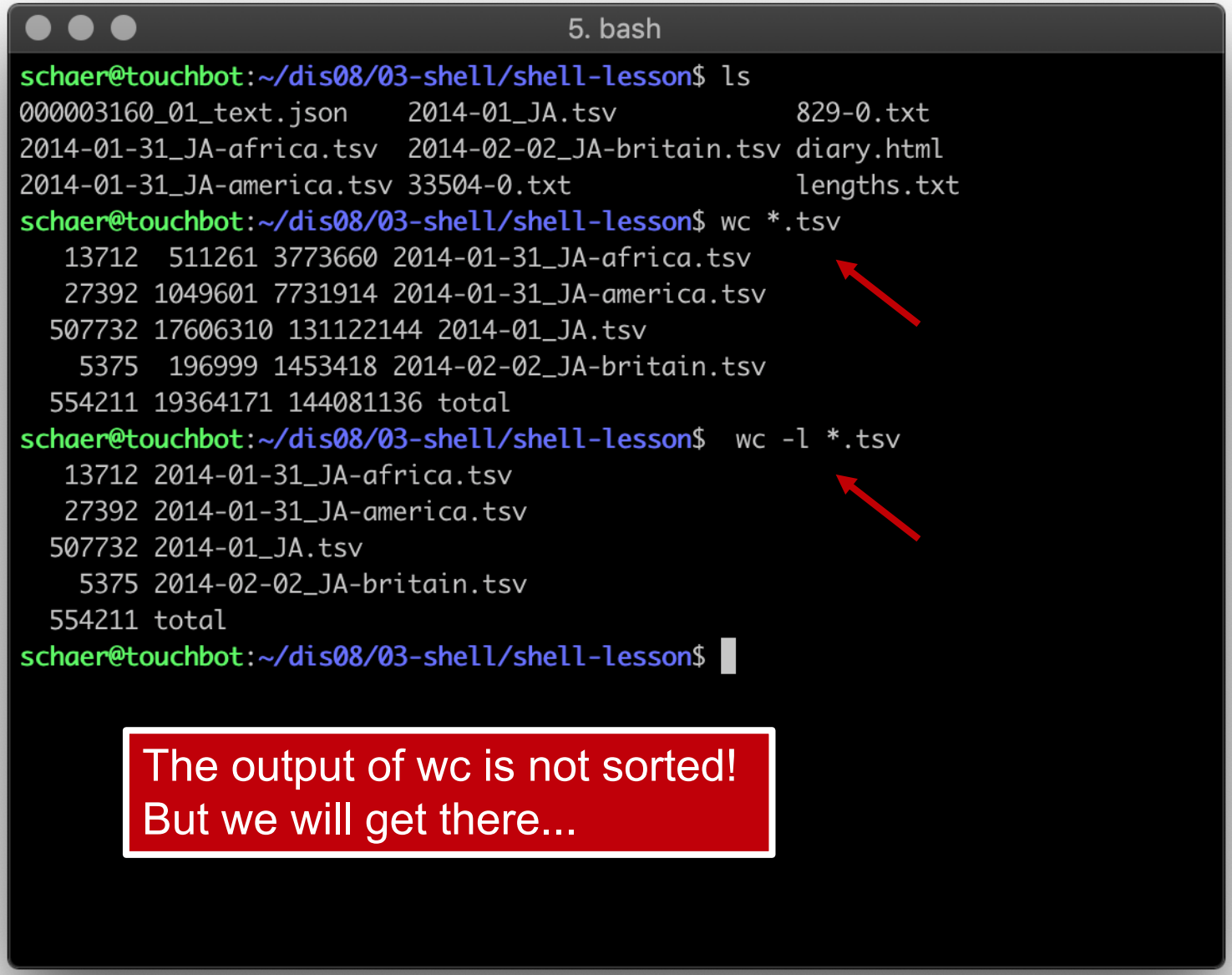
- `mv` move / rename a file or folder
- `cp` copy a file or folder
- `rm` remove file
- `touch` create new (and empty) file
- `mkdir` create directories
- `rmdir` remove directories

All the details can be found by using man

Counting and mining with the shell

- We will begin by counting the contents of files using the Unix shell. We can use the Unix shell to quickly generate counts from across files, something that is tricky to achieve using the graphical user interfaces of standard office suites.
- These commands are unlikely to revolutionise your work by themselves, but they're very versatile and will add to your foundation for working in the shell and for learning to code.

- `wc` number of lines, words, bytes and chars in files
- `wc -l` number of lines in files
- `sort` sort the content of a file, line by line
- `sort -n` sort the content of a file, numerical-based


5. bash
schaer@touchbot:~/dis08/03-shell/shell-lesson$ ls
000003160_01_text.json 2014-01_JA.tsv 829-0.txt
2014-01-31_JA-africa.tsv 2014-02-02_JA-britain.tsv diary.html
2014-01-31_JA-america.tsv 33504-0.txt lengths.txt
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc *.tsv
13712 511261 3773660 2014-01-31_JA-africa.tsv
27392 1049601 7731914 2014-01-31_JA-america.tsv
507732 17606310 131122144 2014-01_JA.tsv
5375 196999 1453418 2014-02-02_JA-britain.tsv
554211 19364171 144081136 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc -l *.tsv
13712 2014-01-31_JA-africa.tsv
27392 2014-01-31_JA-america.tsv
507732 2014-01_JA.tsv
5375 2014-02-02_JA-britain.tsv
554211 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$
The output of wc is not sorted!
But we will get there...

Example: Finding the shortest file...

- Disclaimer: If we only have a handful of files to compare, it might be faster or more convenient to just check with Microsoft Excel, OpenRefine or your favourite text editor.
- BUT when we have tens, hundreds or thousands of documents, the Unix shell has a clear speed advantage.
- The real power of the shell comes from being able to **combine commands** and **automate tasks**, though. We will touch upon this slightly.

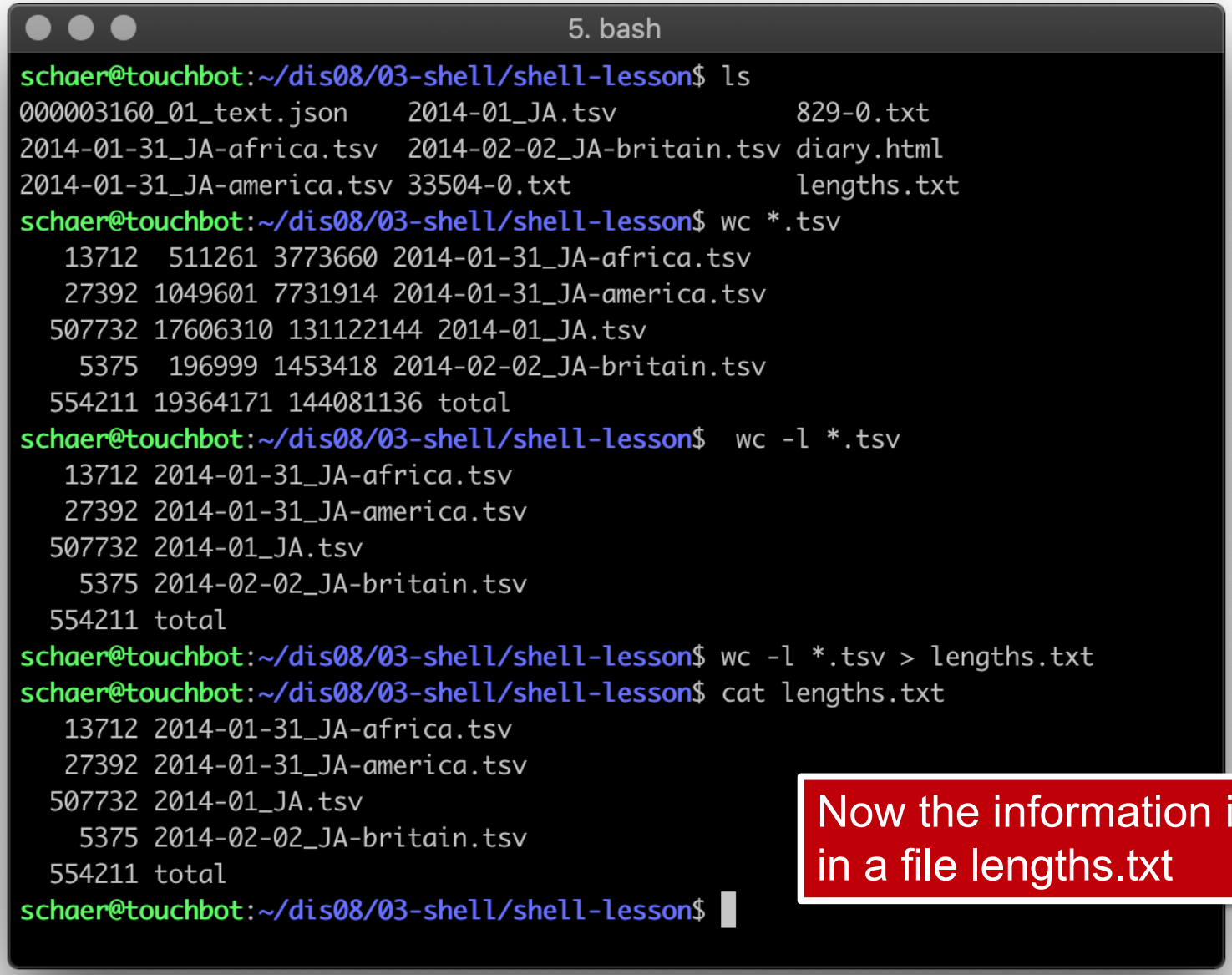
- For now, we'll see how we can build a simple pipeline to find the **shortest file** in terms of number of lines.

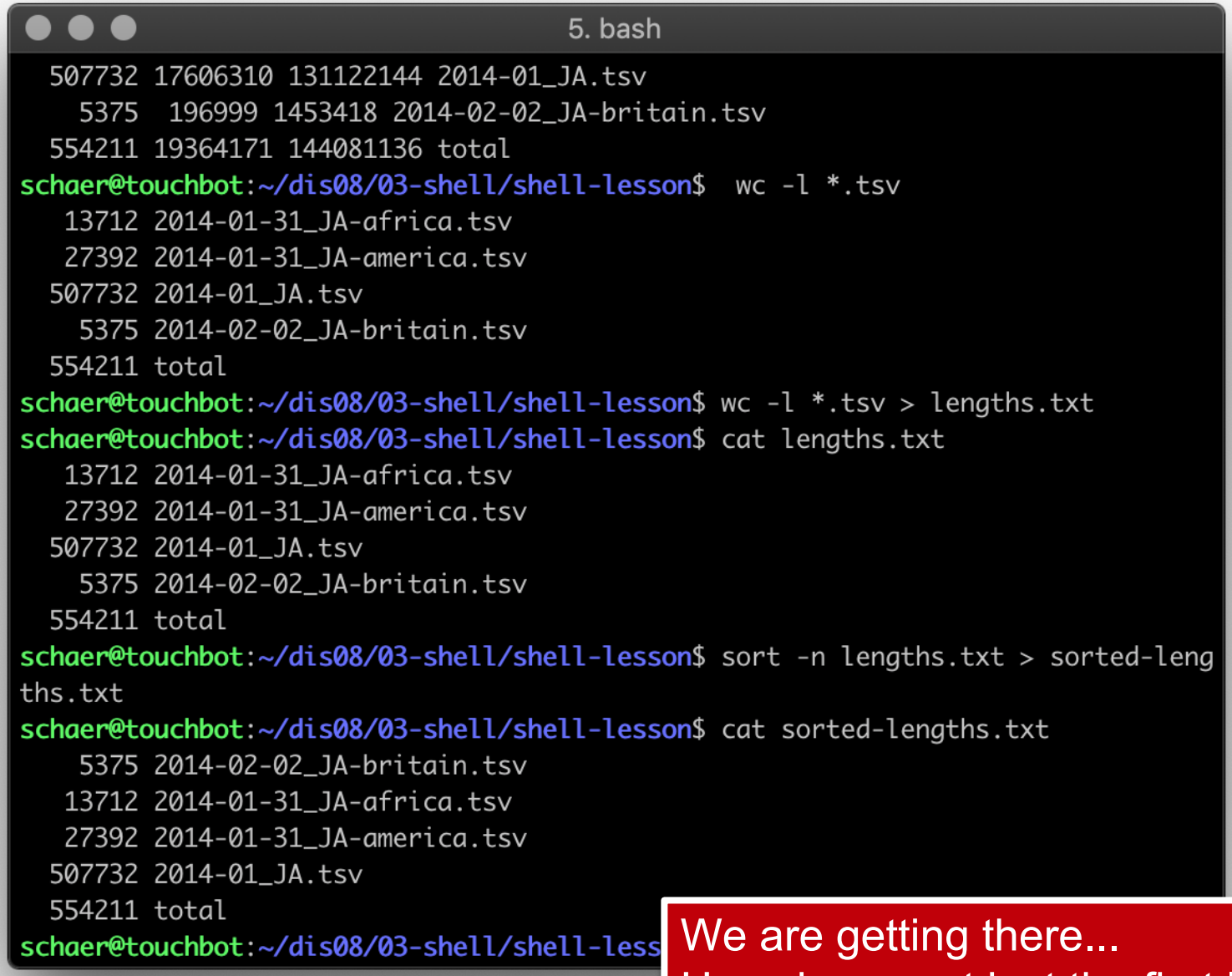
Pipes and redirections

- Up to now all output was written to `stdout` in the shell. But you can *redirect* the output from the command to a file using the **'greater than' sign (>)**:
  - `history > history.txt`
  - `cat *.txt > all.txt`

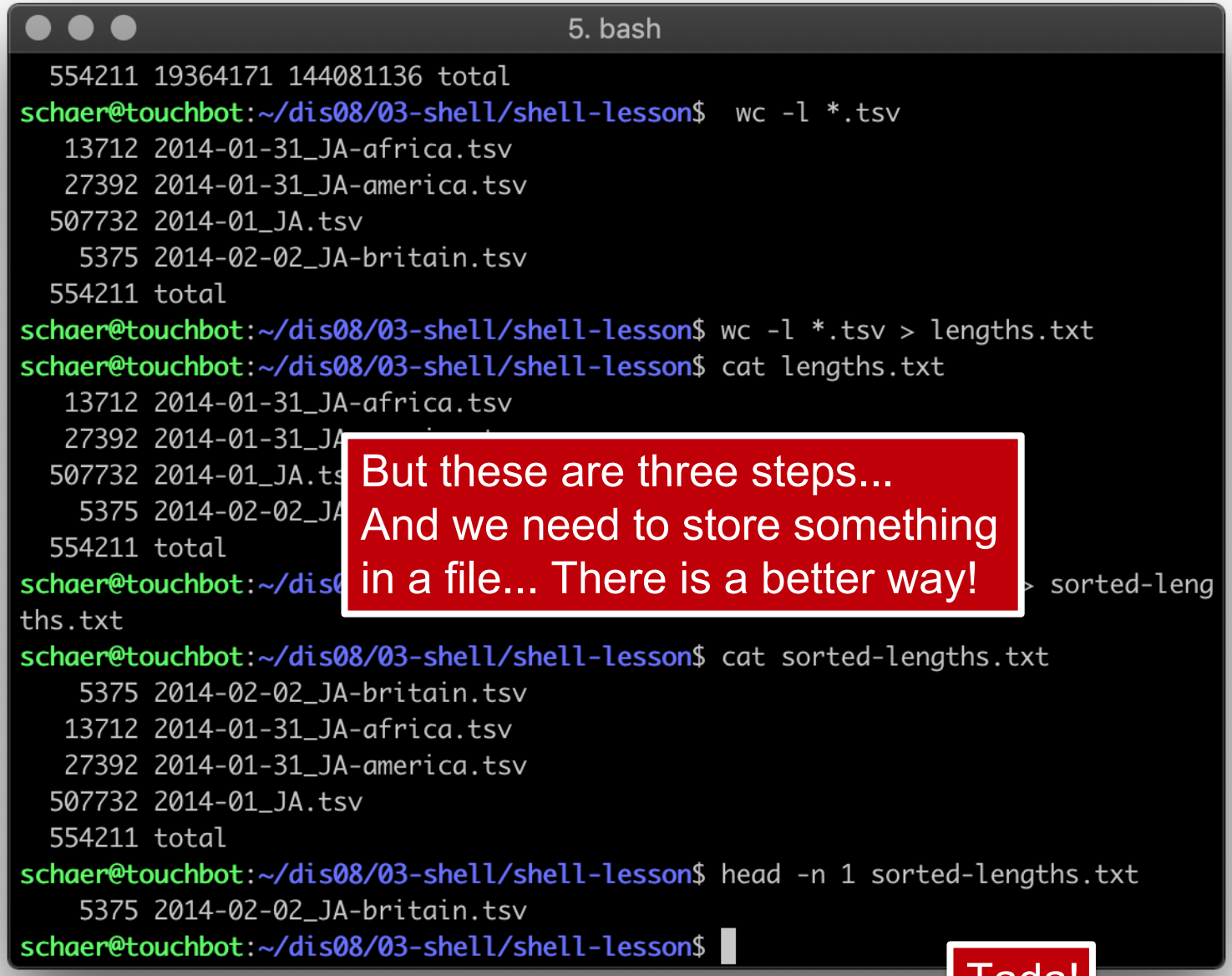
- An even mightier instrument is the **pipe |**
  - It allows to redirect the output to another program
  - `cat *.txt | wc`

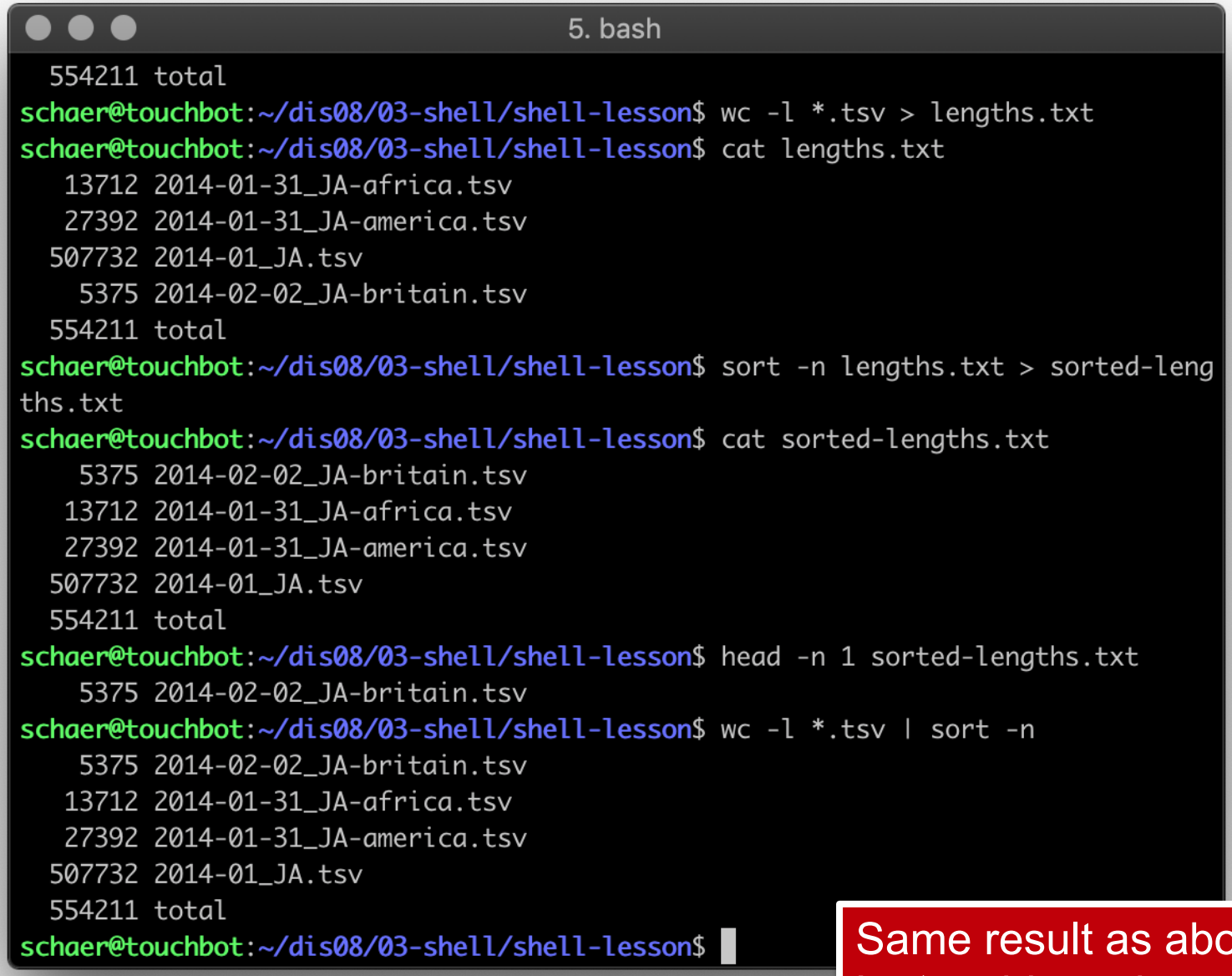
- It can take some time to fully grasp pipes and use them efficiently, but it's a very powerful concept that you will find not only in the shell, but also in most programming languages.


5. bash
schaer@touchbot:~/dis08/03-shell/shell-lesson$ ls
000003160_01_text.json 2014-01_JA.tsv 829-0.txt
2014-01-31_JA-africa.tsv 2014-02-02_JA-britain.tsv diary.html
2014-01-31_JA-america.tsv 33504-0.txt lengths.txt
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc *.tsv
13712 511261 3773660 2014-01-31_JA-africa.tsv
27392 1049601 7731914 2014-01-31_JA-america.tsv
507732 17606310 131122144 2014-01_JA.tsv
5375 196999 1453418 2014-02-02_JA-britain.tsv
554211 19364171 144081136 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc -l *.tsv
13712 2014-01-31_JA-africa.tsv
27392 2014-01-31_JA-america.tsv
507732 2014-01_JA.tsv
5375 2014-02-02_JA-britain.tsv
554211 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc -l *.tsv > lengths.txt
schaer@touchbot:~/dis08/03-shell/shell-lesson$ cat lengths.txt
13712 2014-01-31_JA-africa.tsv
27392 2014-01-31_JA-america.tsv
507732 2014-01_JA.tsv
5375 2014-02-02_JA-britain.tsv
554211 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$
Now the information is stored in a file lengths.txt

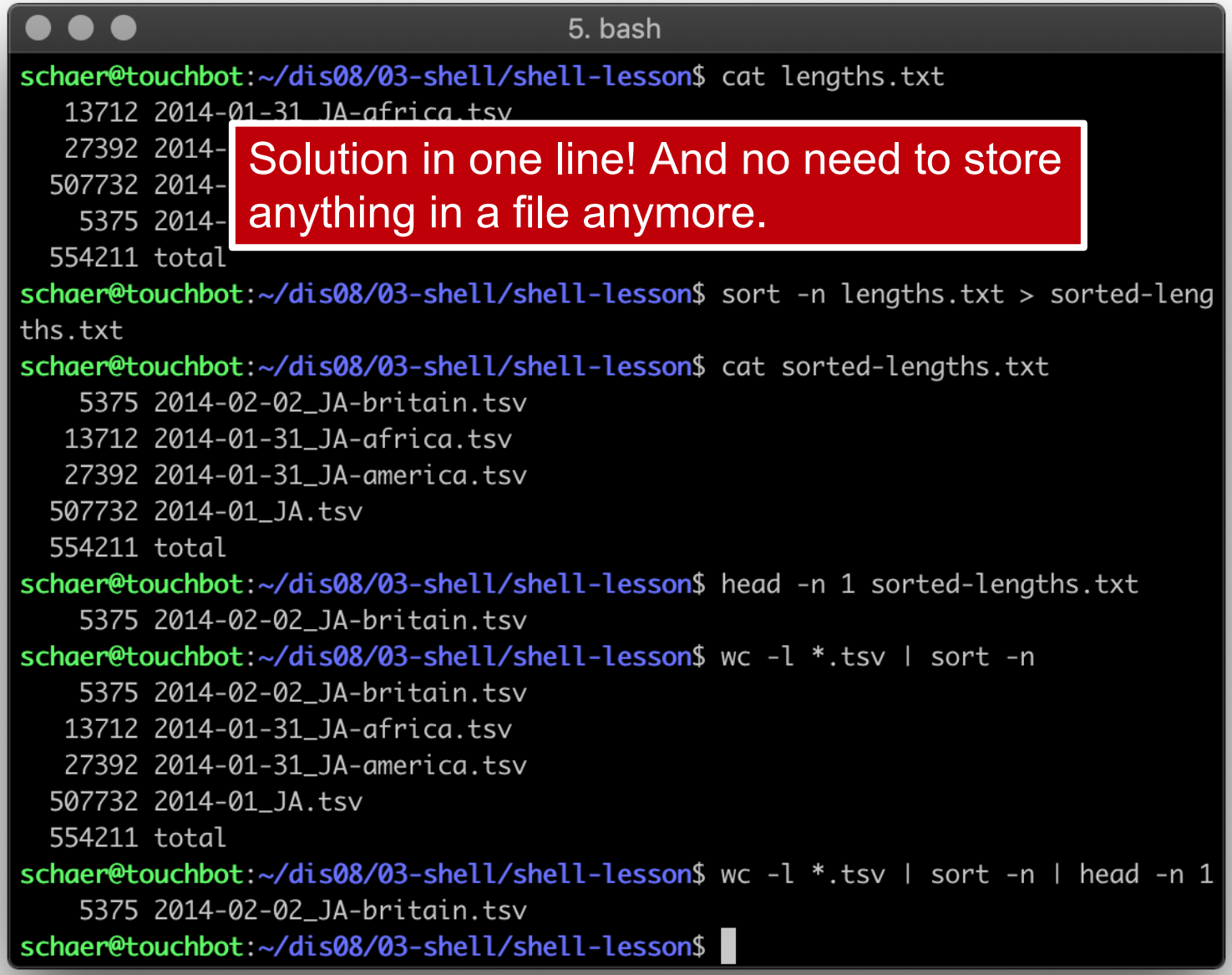


We are getting there...
How do we get just the first line?

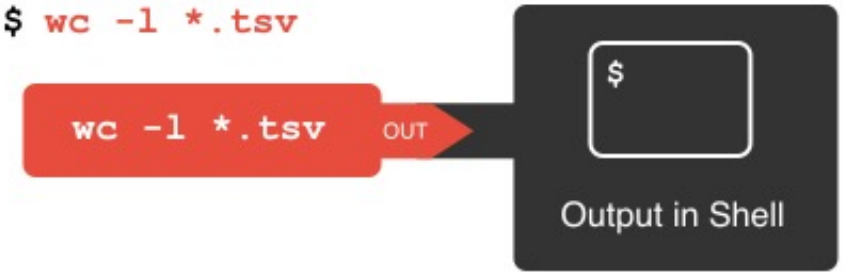

5. bash
554211 19364171 144081136 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc -l *.tsv
13712 2014-01-31_JA-africa.tsv
27392 2014-01-31_JA-america.tsv
507732 2014-01_JA.tsv
5375 2014-02-02_JA-britain.tsv
554211 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc -l *.tsv > lengths.txt
schaer@touchbot:~/dis08/03-shell/shell-lesson$ cat lengths.txt
13712 2014-01-31_JA-africa.tsv
27392 2014-01-31_JA
507732 2014-01_JA.ts
5375 2014-02-02_JA
554211 total
schaer@touchbot:~/dis0
> sorted-leng
ths.txt
schaer@touchbot:~/dis08/03-shell/shell-lesson$ cat sorted-lengths.txt
5375 2014-02-02_JA-britain.tsv
13712 2014-01-31_JA-africa.tsv
27392 2014-01-31_JA-america.tsv
507732 2014-01_JA.tsv
554211 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$ head -n 1 sorted-lengths.txt
5375 2014-02-02_JA-britain.tsv
schaer@touchbot:~/dis08/03-shell/shell-lesson$
But these are three steps...
And we need to store something
in a file... There is a better way!
Tada!



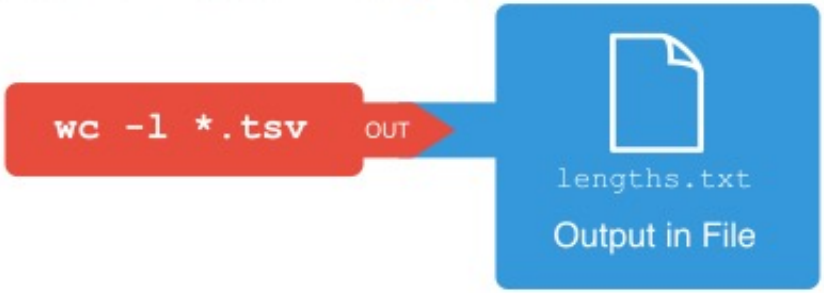
Same result as above!
Let‘s add another pipe...


5. bash
schaer@touchbot:~/dis08/03-shell/shell-lesson$ cat lengths.txt
13712 2014-01-31_JA-africa.tsv
27392 2014-
507732 2014-
5375 2014-
554211 total
Solution in one line! And no need to store anything in a file anymore.
schaer@touchbot:~/dis08/03-shell/shell-lesson$ sort -n lengths.txt > sorted-leng
ths.txt
schaer@touchbot:~/dis08/03-shell/shell-lesson$ cat sorted-lengths.txt
5375 2014-02-02_JA-britain.tsv
13712 2014-01-31_JA-africa.tsv
27392 2014-01-31_JA-america.tsv
507732 2014-01_JA.tsv
554211 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$ head -n 1 sorted-lengths.txt
5375 2014-02-02_JA-britain.tsv
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc -l *.tsv | sort -n
5375 2014-02-02_JA-britain.tsv
13712 2014-01-31_JA-africa.tsv
27392 2014-01-31_JA-america.tsv
507732 2014-01_JA.tsv
554211 total
schaer@touchbot:~/dis08/03-shell/shell-lesson$ wc -l *.tsv | sort -n | head -n 1
5375 2014-02-02_JA-britain.tsv
schaer@touchbot:~/dis08/03-shell/shell-lesson$

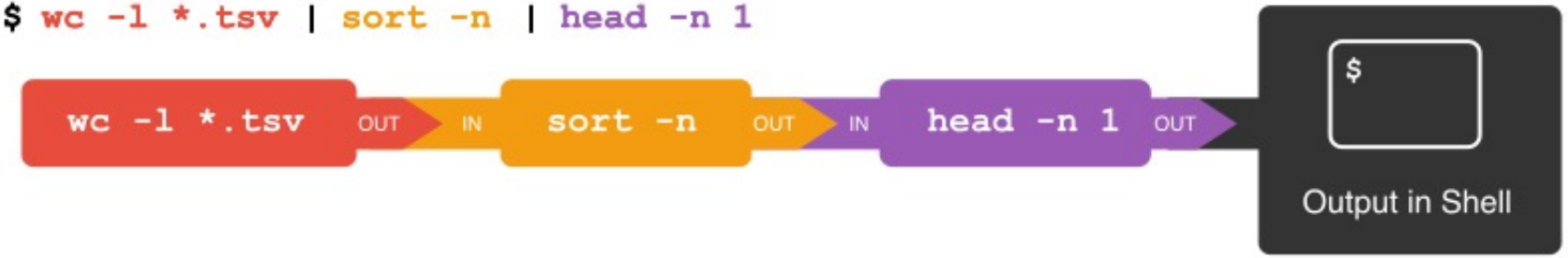
```
$ wc -l *.tsv
```




```
$ wc -l *.tsv > lengths.txt
```




```
$ wc -l *.tsv | sort -n | head -n 1
```



Pipes and filters

- This simple idea is why Unix has been so successful. Instead of creating enormous programs that try to do many different things, Unix programmers focus on creating **lots of simple tools that each do one job well**, and that **work well with each other**.
- This programming model is called "**pipes and filters**".
- We've already seen pipes; a filter is a program like `wc` or `sort` that transforms a stream of input into a stream of output.
- Almost all of the standard Unix tools can work this way: unless told to do otherwise, they read from standard input, do something with what they've read, and write to standard output.

Pipes and filters

- The key is that any program that reads lines of text from standard input and writes lines of text to standard output can be combined with every other program that behaves this way as well. You can and should write your programs this way so that you and other people can put those programs into pipes to multiply their power.

Quiz time!

- `wc -l *.tsv | sort -n | head -n 1`
- We know what this pipeline does…!
- What would happen if you piped this into `cat`?

Exercise 2: The Unix Shell (3 pts)

2.1: Shell Tutorial

- Complete the lessons from the interactive online course at linuxjourney.com on learning the command line. Do the quizes in each of the lectures.

2.2: Count the Lines

- Use your new knowledge to count the number of lines in your `introduction.md` file from exercise 1.
- Redirect the result to a file, e.g. `lines.txt`.
- Print the content of the file to the console.

More details on our central GitHub repo.