csce215 — UNIX/Linux Fundamentals
Fall 2021 — Lecture Notes: Basics

This document contains slides from the lecture, formatted to be suitable for printing or individual reading, and with some supplemental explanations added. It is intended as a supplement to, rather than a replacement for, the lectures themselves — you should not expect the notes to be self-contained or complete on their own.

(1.1) The shell

When you give commands in a terminal window, you are interacting with a special program called a **shell**, whose job is to read, interpret, and execute the commands you give, usually by running other programs.

```
$ whoami
jokane
$ uptime -s
2021-10-18 13:05:39
```

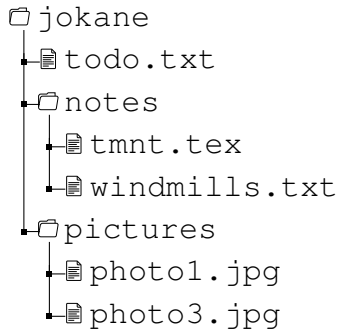
There are several shells that differ in the details of how certain commands work.

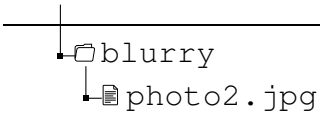
`bash`, `csh`, `fish`, `sh`, `tcsh`, `zsh`, ...

This course focuses on `bash`, which is the most commonly used shell and the default on most systems.

(1.2) Files and directories

Files are organized into a **hierarchy** of directories (a.k.a. folders).

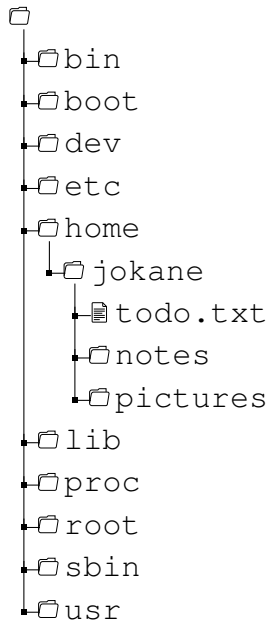




Every user has a **home directory** to store documents, code, etc.

(1.3) The root directory

Every file on a system lives somewhere in one big hierarchy that starts from a **root directory**.



(1.4) The current directory

Each program, including the shell, always has a **current directory** (a.k.a. **working directory**).

Most commands will, in general, operate on things in the current directory.

pwd	
Show the current directory.	

```
$ pwd
/home/jokane
```

(1.5) Changing directories: `cd`

We can change the current directory to move around.

`cd` 
Change the current directory.

```
$ pwd
/home/jokane
$ cd pictures
$ pwd
/home/jokane/pictures
```

Notice the / character for separating directory names.

(1.6) Listing files: `ls`

We'll often want to see what files and subdirectories are in the current directory.

`ls` 
Show a list of files and subdirectories. ('ell-ess', not 'one-ess')

```
$ pwd
/home/jokane/pictures
$ ls
blurry
photo1.jpg
photo3.jpg
```

You can also see the files in a specific directory:

```
$ ls blurry
photo2.jpg
```

Or the files that match a certain pattern:

```
$ ls photo*
photo1.jpg
photo3.jpg
```

(1.7) Getting more detail: ls -l

Often we want to know more than just a list of files.

ls

Show a list of files and subdirectories.

-l Show details about each file.
('dash ell', not 'minus one')

```
$ ls -l
total 128
drwxrwxr-x 2 jokane jokane  4096 Dec  7  1941 blurry
-rw-rw-r-- 1 jokane jokane 77931 Dec  7  1941 photo1.jpg
-rw-rw-r-- 1 jokane jokane 41772 Dec  7  1941 photo3.jpg
```

The output includes **type**, **permissions**, **owner**, **group**, **size** in bytes, and **modification date**.

(1.8) Other options for ls

ls

Show a list of files and subdirectories.

-a Show all files, even if their names start with a period.

-h Show sizes in a human-friendly format.
Use with -l.

```
$ ls -l -a -h
total 136K
drwxrwxr-x 3 jokane jokane 4.0K Dec  7  1941 .
drwxrwxr-x 4 jokane jokane 4.0K Dec  7  1941 ..
drwxrwxr-x 2 jokane jokane 4.0K Dec  7  1941 blurry
-rw-rw-r-- 1 jokane jokane  77K Dec  7  1941 photo1.jpg
-rw-rw-r-- 1 jokane jokane  41K Dec  7  1941 photo3.jpg
```

(1.9) Special directory names

There are several important shortcuts for referring to certain directories.

..	parent directory
.	current directory
~	home directory
/	root directory

(1.10) Examples with `ls`

From the pictures directory:

```
$ ls ..
notes
pictures
todo.txt
```

```
$ ls .
blurry
photo1.jpg
photo3.jpg
```

```
$ ls ~
notes
pictures
todo.txt
```

```
$ ls /
bin
boot
dev
etc
home
lib
proc
root
sbin
usr
```

```
$ ls /home
jokane
```

(1.11) Examples with `cd`

```
$ pwd
/home/jokane/pictures/blurry
$ cd ..
$ pwd
/home/jokane/pictures
$ cd .
$ pwd
/home/jokane/pictures
$ cd ~
$ pwd
/home/jokane
```

(1.12) Displaying the contents of a file

Sometimes we want to see what's in a file.

`cat` 
Show the contents of a file.

```
$ cat ~/notes/windmills.txt
In a village of La Mancha, the name of which I have no desire to call
to mind, there lived not long since one of those gentlemen that keep a
lance in the lance-rack, an old buckler, a lean hack, and a greyhound
for coursing. An olla of rather more beef than mutton, a salad on most
nights, scraps on Saturdays, lentils on Fridays, and a pigeon or so
extra on Sundays, made away with three-quarters of his income. The rest
of it went in a doublet of fine cloth and velvet breeches and shoes to
match for holidays, while on week-days he made a brave figure in his
best homespun. He had in his house a housekeeper past forty, a niece
under twenty, and a lad for the field and market-place, who used to
     . . .
     . . .
```

(1.13) Displaying a long file

Sometimes a file is too long for cat to be helpful.

less	
Show the contents of a file interactively, allowing scrolling and searching.	
arrow keys scroll	
/ search forward from here	
n search again	
g go back to the start	
G go back the end	
q quit	

```
$ less ~/notes/windmills.txt
```

(1.14) Getting more information

Linux systems have a built-in manual.

man

Show the documentation for a command.

```
$ man ls
$ man pwd
$ man man
```

This secretly uses less, so anything that works in less also works in man.

(1.15) Recording your work

You'll need to record your work in the labs.

asciinema

Record or playback a terminal session.

rec Record to a given file.

play Play back from a given file.

```
$ asciinema rec example.cast
asciinema: recording asciicast to example.cast
asciinema: press <ctrl-d> or type "exit" when you're done
...


$ asciinema play example.cast
```