

File Systems 1

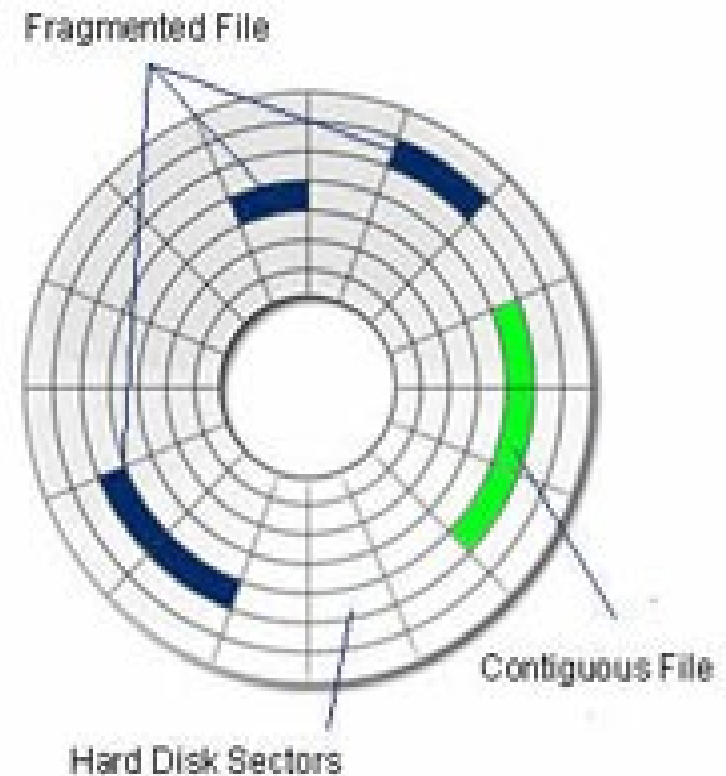
How billions of nano-scale variations in electric fields stored on magnetic platters spinning at thousands of RPMs read by microscopic ultra-sensitive heads moving at 90 miles an hour are represented in our modern computers as “File Systems”

What is a file?

- A file is a lot of 1s and 0s.
- Sometimes these 1s and 0s, when using a “codebook” (or encoding, e.g. ASCII or UTF) turn into human readable text. (.txt, .log)
- Other times these 1s and 0s can be structs and data structure 'dumps' from programs, or binary structures. (.exe, .so, .dll etc.)
- Sometimes files can represent whole file systems! (.iso, .bin files)
- So its all 1s and 0s, how do we store that in a computer?

What is a “Hard Drive”?

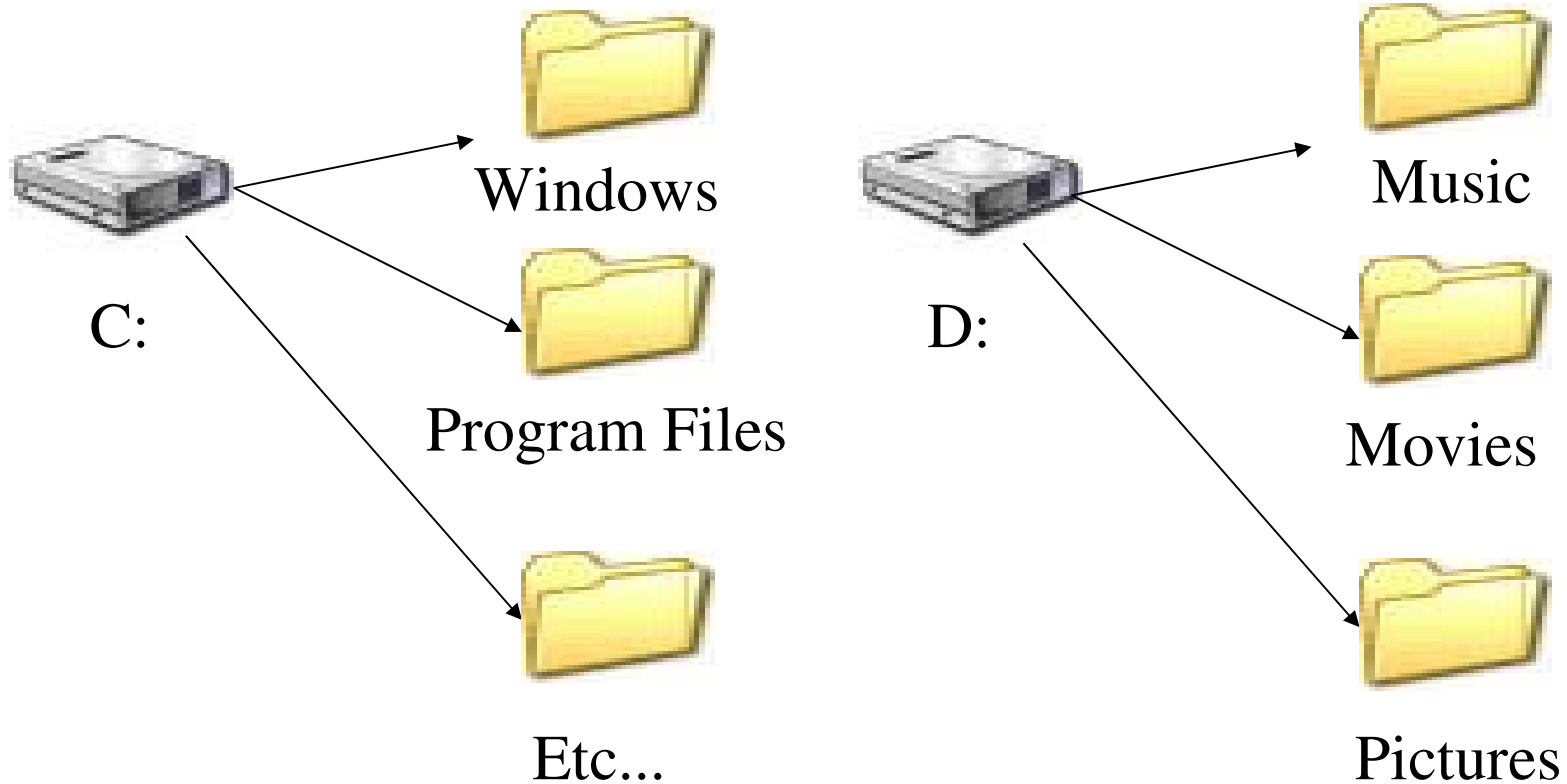
- Spinning magnetic *platters*
- Platters have *tracks* (rings) of *sectors*
- Files sit in multiple sectors, location determined by *File System*



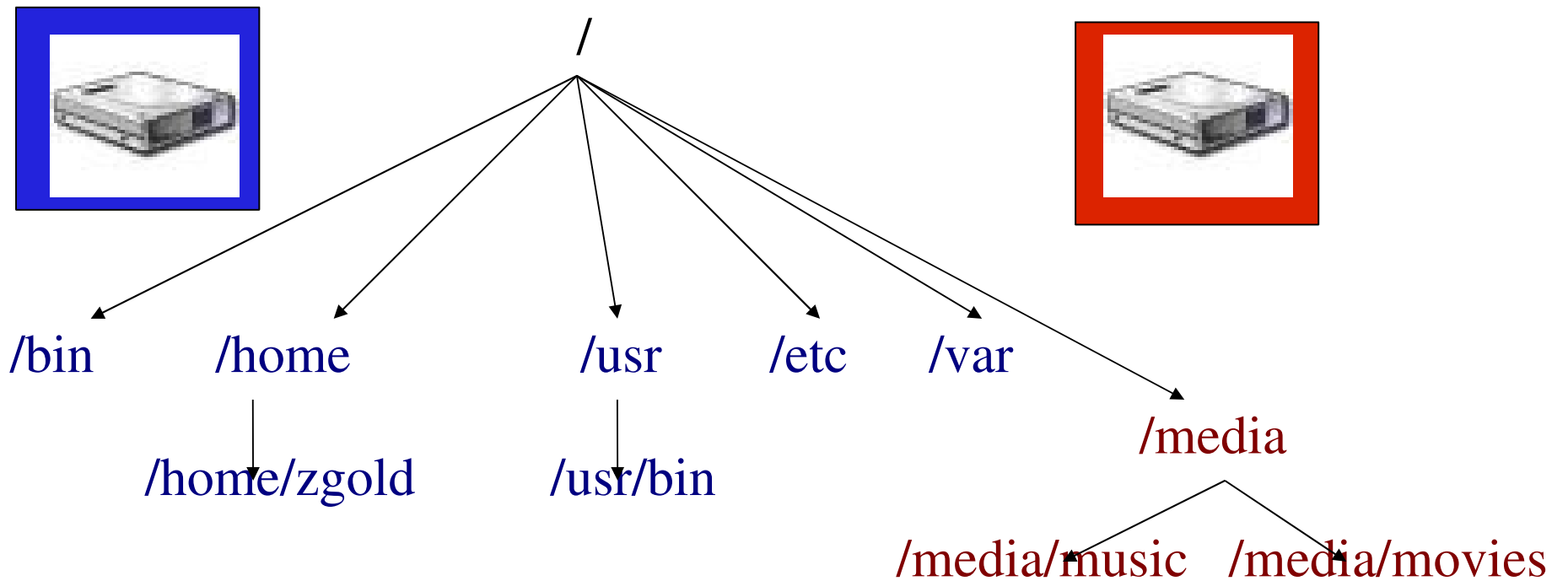
Disk to Partition to File Systems

- *Partition: A logical section of a disk. Each partition normally has its own file system.*
- *File System: A data structure that translates the physical (sector) view of a disc into a logical (files, directories) structure*

Windows File systems



Unix File Systems



Important Directories

- /home/<YOURUSERNAME>/
(*c:/documents and settings/user/My Documents/*)
 - Where all your 'stuff' is kept
- /usr/bin
(*'almost' like c:/program files/*)
 - Where all your executable files are
- /usr/lib/
(*'almost' like c:/windows/system32/*)
 - Where all the dynamically linked libraries go
- /etc
(*'almost' like the registry*)
 - Configuration

“CWD” and Paths

- *CWD – Current Working Directory*
- *Path – Location of a node relative to the root “/” (or C:/ in windows)*
- *Some sample paths:*
 - /home/zgold/homework/assignment1.doc*
 - /media/music/SpiceGirls.mp3*
 - /media/music/90s Music/../SpiceGirls.mp3*

What the ...

- In a file path the '.' character has special significance.
- '.' : *The current working directory*
- '..' : *The level above the CWD*

Changing Directories

- If you're CWD is /home/zgold and you wish to navigate to /home you use the 'cd' command.

For example:

```
/home/zgold # cd ..
```

```
/home # cd zgold
```

```
/home/zgold # cd /
```

```
/ #
```

The home directory

- `/home/zgs #`
 - Every user on a Linux machine gets a folder in the `/home` directory with their username (on Eniac its first letter/username e.g. `/home/z/zgs`).
- Home directory can be accessed via shortcut “`~`”
- `/media # cd ~/stuff`
`/home/zgs/stuff #`


Relative Paths and |Paths|

- Relative Path: “I'm going to the gym”
 - We understand because we're at Penn and the only 'the gym' we know of is Potruck, on 36th and walnut.
 - *shhh* Hutchinson doesn't exist in this analogy.
- I'm going to the Potruck gym on 36th and Walnut in Philadelphia PA, 19104
 - We understand because you told us explicitly what you're talking about

Unix Equivalent

- Absolute:
/media/music/ # cd /media/music/SpiceGirls
/media/music/SpiceGirls/ #
- Relative:
/media/music/ # cd SpiceGirls
/media/music/SpiceGirls/ #

LiSting

- A directory is a folder, . It holds stuff.
- To find out what the CWD has, you **LiSt** it
- `/media/ # ls`
music movies games pictures WOOT.mp3
`/media/ # cd music`
`/media/music #`

Why do the commands all argue?

- Sometimes we want to give commands more detail about what we want them to do.
- We call these extra details “arguments”. For example *ls* can tell us more information about the contents of a directory with the “-l” argument.

```
/media/ # ls -l
```

```
drwxr-xr-x 3 zgold zgold 632 Jun 22 20:33 music
```

```
drwxr-xr-x 3 zgold zgold 280 Jun 22 20:33 movies
```

```
drwxr-xr-x 3 zgold zgold 632 Jun 22 20:33 pictures
```

Memorizing arguments

- Commands have many possible command line arguments (a.k.a. switches, or options).
- You must of course memorize all of them for every command.
- .. or just man them!

Giving in to the 'man'

- 'man' is a command, short for manual, which will produce a veritable encyclopedia for almost every command.
- All man pages include a synopsis of all command line options in the beginning.
`/home/zgold # man ls`

NAME

ls - list directory contents

.....

Playing with Files

- `cp <source> <destination>`
Copy a file from source to destination
- `mv <source> <destination>`
Move a file from source to destination
- `rm <source>`
Remove a file from the file system's records
(*DIFFERENT* from deleting. Does not actually
remove 1s and 0s of the file.)

Appendix of Terms/Commands

- *Partition* – Section of a disk
- *File System* – Storage system for turning file names into disk locations
- Mount location – location in a unix file system where a drive or data source resides
- cd – change directory
- cwd – current working directory
- pwd – print working directory
- ls – list contents of cwd
- cp – copy a file
- mv – move a file

Homework 1b

- Use the commands here to navigate around your Linux setup, become comfortable with them.
- When done, email me a file called “~/.bash_history”. This will contain a record of all the commands you typed in, simply to show me that you've been doing stuff.
 - (Does not show output of commands, so no privacy issues).
- Due next week.