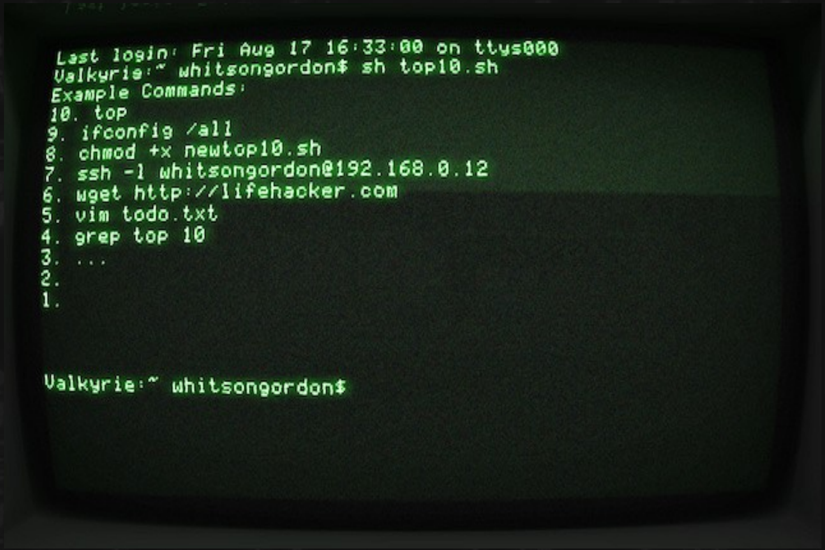
LIS-5364

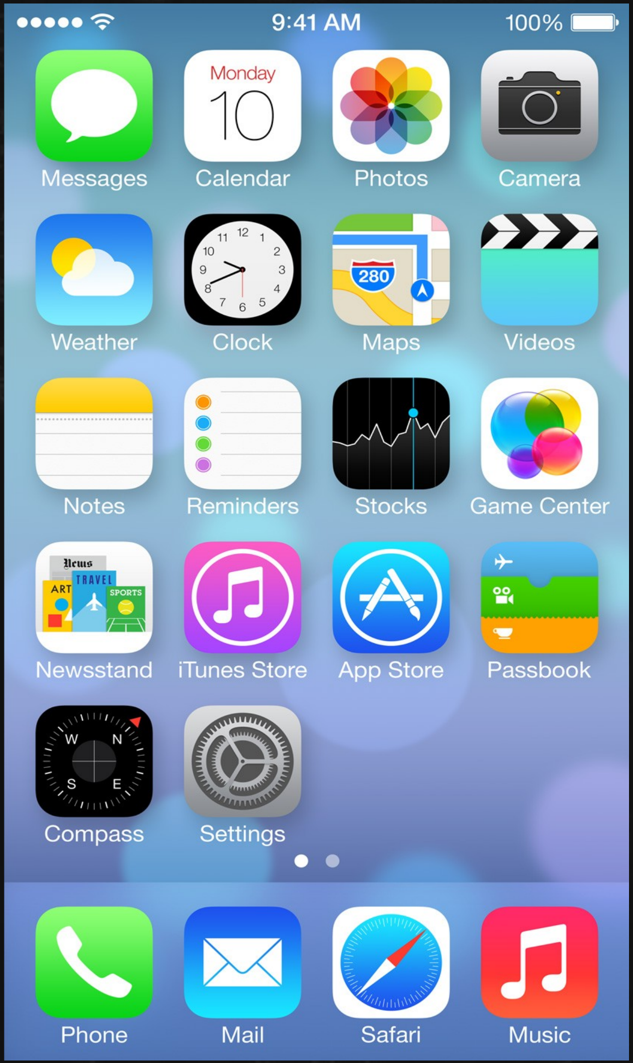
Linux/Unix Command Line Goodness

Which is "primitive?"



```
Last login: Fri Aug 17 16:33:00 on ttys000
Valkyrie:~ whitsongordon$ sh top10.sh
Example Commands:
10. top
9. ifconfig /all
8. chmod +x newtop10.sh
7. ssh -l whitsongordon@192.168.0.12
6. wget http://lifehacker.com
5. vim todo.txt
4. grep top 10
3. ...
2.
1.


Valkyrie:~ whitsongordon$
```



Why Command Line?

Because you can very quickly say/relate complex concepts in a concise way, by combining a series of simple symbols.

You know, like talking. Or writing.

Command line is the act of literally talking to the computer....unlike...

What's so bad about the mouse again?

"Caveman interface."

- Pre-linguistic/animal-like
- "Point and grunt"

(Tablets and even "Minority Report" are cool and fun...but why is Charades a game?)

It's so easy, even...

Intelligence requires Language

Buttons and gestures are frequently convenient for repetitive tasks…

…but to do anything intelligent, you need LANGUAGE.

TEXT. Numbers and Letters.

Intelligence requires Language

This is why -

Behind EVERY GUI is text.

Rarely the other way around.

In the future: we can think about the "why," as well as how this could be done differently, perhaps a more or different hybrid approach.

Next weirdness: what is programming, even?

Next weirdness: what is programming or coding, even?

Changing your screensaver

Writer/Word

Calc/Excel

Macros

HTML?

Shell / Bash?

PHP/MYSQL?

Python/Perl/Ruby/Java/Javascript/C#? *interpreted/scripted*

C *compiled?*

Assembly (00 4E A3 77 8C 0A etc)

Machine (0010101001101010110 0)

Why is “scripting” NOT considered “real programming?”

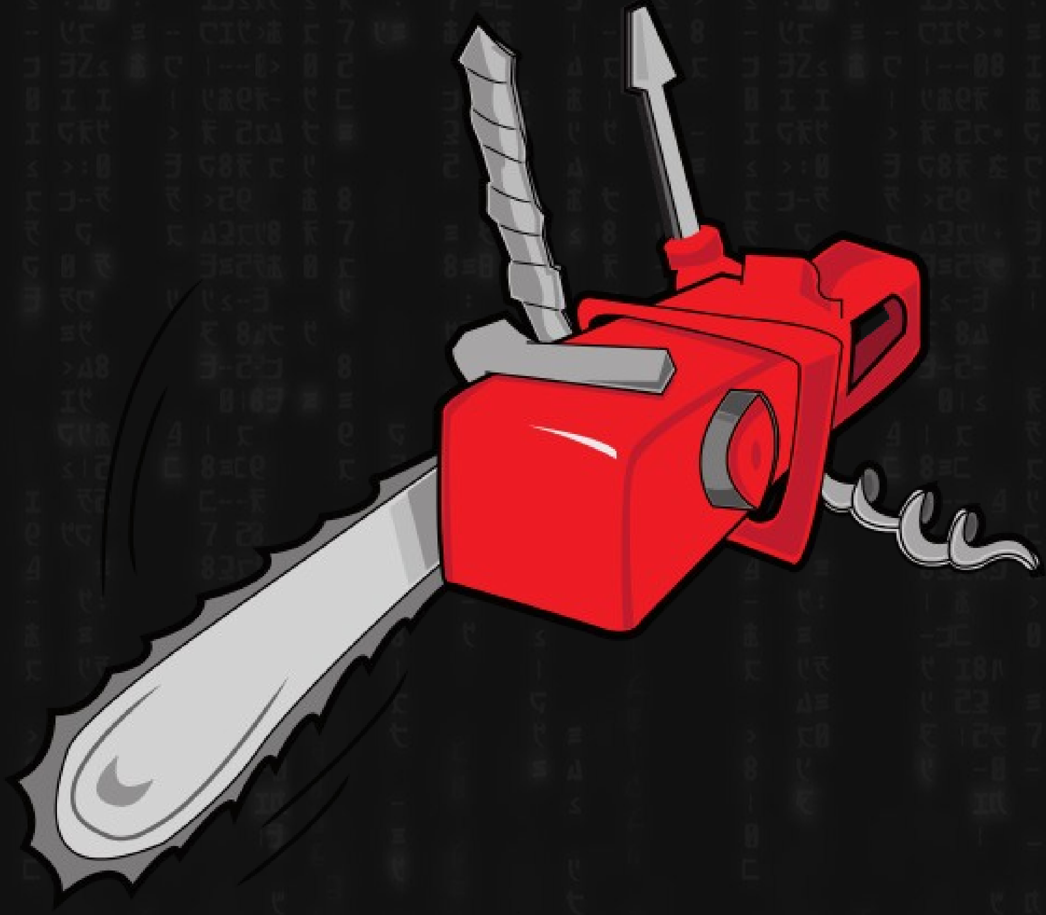
- Quick and dirty to write
- Slow to “work” (i.e. takes the machine longer, not optimized)
- Lacks “libraries” or “frameworks”
- Few tools/structures designed for reuse or collaboration

(but also, Lisps)

“Real” Programming Languages

(PHP, Javascript (?), C, Python, Ruby, Java etc.)

Bash/Shell scripting



Also, waaay (too?) powerful?

```
sudo rm -rf /
```

- seriously, don't do this.

Various names for the stuff we do today:

Command line: Blinky cursor area that's literally asking you, "okay, now what?"

Terminal: App for command line (used to be the computer itself)

Shell: Any particular "type" of command-line environment. Examples are Bash, Fish, Zsh, MS-Dos, etc.

Bash: "Bourne Again Shell; the specific Linux/Unix shell we will use.

Scripting: Putting a bunch of shell commands in a file and running it as a program.

Users and Permissions
(they actually mean something here)

ROOT – Like "Administrator" or maybe "God"

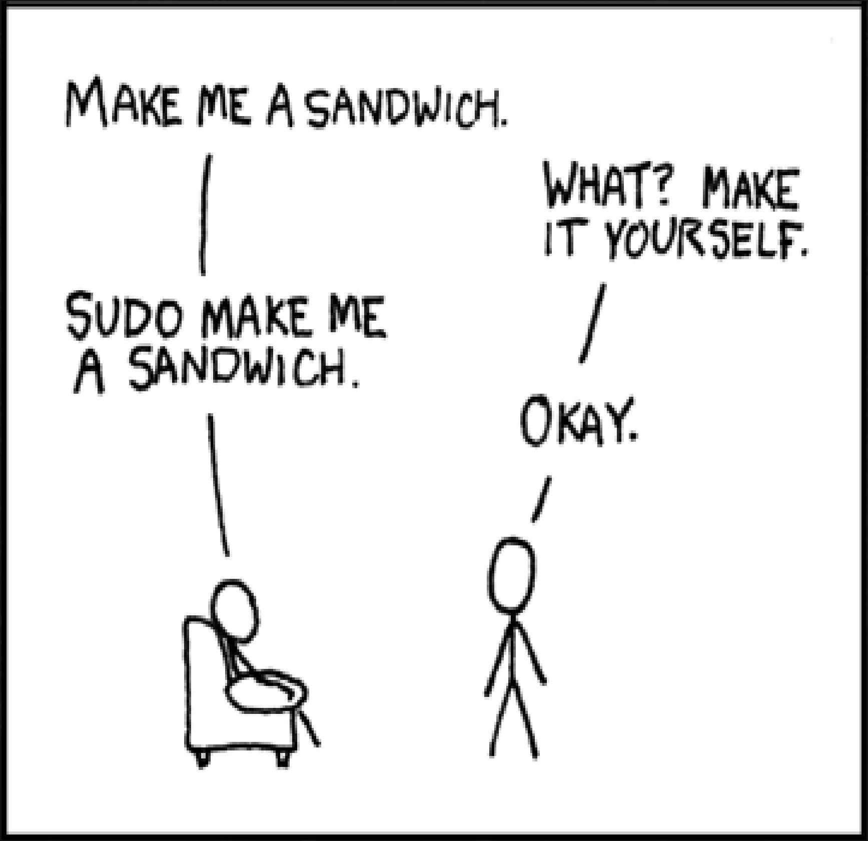
users – humans

(..and others – fake "users" to get tasks done)

Some systems (eg Ubuntu) allow for Super Users

S.U.- do "this" = `sudo`

And now…this makes sense



Permissions

aka why original windows was amazingly stupid because multiple people might want to sometimes use the same computer

Three major things you can do with files

READ (look at, view, listen to)

WRITE (and delete and edit)

EXECUTE (run as a program)

Three important "groups"

owner of the file

owner's group

everybody else

Permissions

Quick note on permissions for directories (kind of non-intuitive)

READ: Is able to read the directory listing

WRITE: Is able to change contents of the directory

(create new/delete existing files, or rename them)

EXECUTE: Is able to access/ go to the directory

Why Linux has/had not much of a virus problem

Windows historically does not distinguish between:

files you're meant to read/watch/hear/edit, and
files you're meant to run.

A piece of paper that says “Go jump off a bridge” is pretty harmless...unless....

Permissions

(that funky line when you do a ls -l)

```
0123456789
-rwxr--r--
dr-x------
```

Permissions
(also, how computers work)

Octal	Text	Binary	Meaning
0	---	000	All types of access are denied
1	--x	001	Execute access is allowed only
2	-w-	010	Write access is allowed only
3	-wx	011	Write and execute access are allowed
4	r--	100	Read access is allowed only
5	r-x	101	Read and execute access are allowed
6	rw-	110	Read and write access are allowed
7	rwx	111	Everything is allowed

Permissions

Thus – permission types like

644

oge

owner can read and write (4+2)

group can only read (4)

others can only read (4)

Practical Permission problems you are likely to encounter:

- If you're unable to view, execute, or delete/change a file, try this.
- If you write a little shell script (.sh), remember to set it executable. (The only permission command I use on a regular basis is chmod +x “file.sh”)
- FAT and NTFS filesystems (the ones Windows use) don't have permissions, but Linux has to occasionally pretend they do, this causes problems.
- When you're taking a website online, this is often a difficult issue. (For a good reason; you don't want website visitors overwriting your critical files!)

File Paths

File paths are HIERARCHICAL and DELIMITED by backslashes, starting with root, at “/”, e.g.

`/media/cdrom/mypaper.txt`

signifies a file “mypaper.txt” in a folder called “cdrom”, and THAT folder is in a folder called media – and “media” is in the root directory.

SPECIAL FOLDERS:

`~` or `~/` signifies the user's home folder. i.e. if your username is fsmith, and you are logged in: `~/ = /home/fsmith/`

. (one period) refers to your current folder

..(two periods) refers to one folder up. Thus, if you're currently in `/home/fsmith` then `../` would refer to `/home`.

The LINUX Filesystem (EVERYTHING is a file!)

```
/bin, /sbin – Systemwide binaries
/boot – Boot Stuff
/dev - devices
/etc – (Some) helper files
/home/user – YOUR files & config (you can just back this up)
        .files (dotfiles)
/lib – Libraries (kind of like dlls)
/lost+found – improper shutdown?
/opt – non-default/weird programs
/mnt, /media – generic “mount points”
/proc – the actual running processes whooa
/usr – User stuff (mostly binaries)
/tmp – temp files
/var – other spooling data, logs
```

Linux/Unix Commands (verbs)

An action or program that a computer can do

Find them with “apropos,” learn about them with “man”

(check these out http://www.oreillynet.com/linux/cmd/)

Commands can optionally have ARGUMENTS, in the form of:

OPTIONS

- one dash + letter (`ls -a`)
- two dashes + words (`sort --reverse`)

EXPRESSIONS

- text; numbers; files; streams – things to be manipulated

Getting help

`man` (command)

`info` (might give you more info)

`apropos` (keyword to search)

`help` (pretty basic stuff)

but seriously, Google/Duckduckgo etc

File Manipulation

`ls` - list

`cd` – change directory

`rm` –remove (delete for good)

`mv` – move OR rename (they are literally the same thing, weird)

`cp` - copy

Viewing text and files

`cat` - "concatenate"

`less` - this is such a terribly bad joke I hate even explaning it

...but what about editing?

Editing Files

`nano/pico` (text-based, “normal” keys)

`vi/vim` (hardcore choice 1 universal,modal)

`emacs` (hardcore choice 2)

Multiple commands, one line

& - Run both simultaneously

&& - Run the first one, and then the second ONLY IF the first "succeeds," otherwise stop.

; - Run the first one, then the second regardless of what happens.

Pipes and redirects

Default behavior:

read from “stdin”, write to “stdout”

>	(over)write/replace a file
>>	write to/append to file
<	read from file
|	pipe output from first command into 2nd
tee	pipe AND write to stdout

Even MORE command line.

One quick command I totally forgot:

echo

(puts argument through stdout)

BASH

BASH (Bourne Again) Shell - others are fish and zsh, etc

Lots of “tricks” are available here, eg

- Tab completion
- Up arrow key for history
- Ctrl-R to search history

and many MANY more

More BASH

Furthermore, you can modify this environment to fit your needs, via:

```
.bashrc
```

(stuff here will be run everytime you open a terminal)

A great example is the “alias” command. If a command doesn't exist for what you want to do, just ,ake up your own!

```
alias modbash='gedit ~/.bashrc'
```

Opening Files

IN TERMINAL

```
    less
    cat  (stdout)
```

COMMAND/ARGUMENT STYLE

```
    gnome-open file
    vim textfile
    firefox localfile.html
    firefox http://slashdot.org
```

SORT

- - i = case INSENSITIVE
- - r = REVERSE
- - g = numbers
- - R = random

GREP (line matching)

```
grep OPTIONS PATTERN (FILE)
```

Can search over FILES or STDIN

Also, can search ONE FILE or MANY (check -d or -R)

useful flags:

-i (case insensitive)

-v (invert search/show NON-matches)

-l (just show matching FILES, not lines)