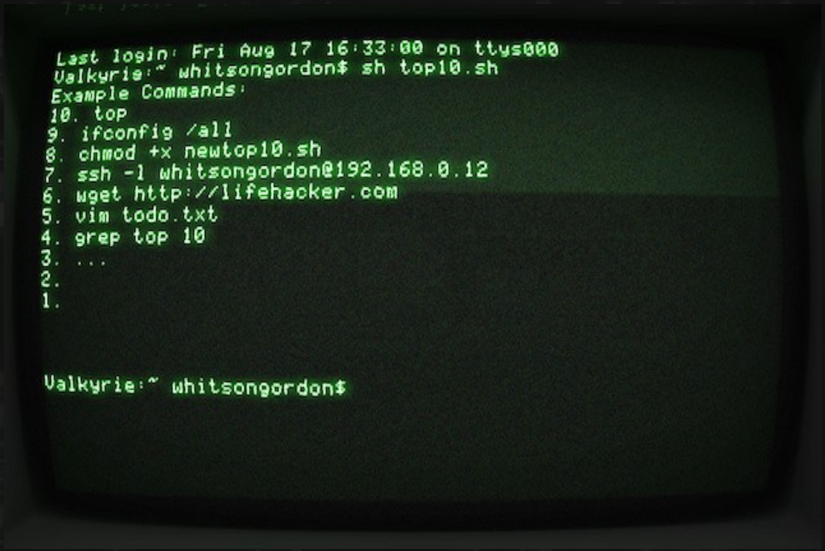
LIS-3353

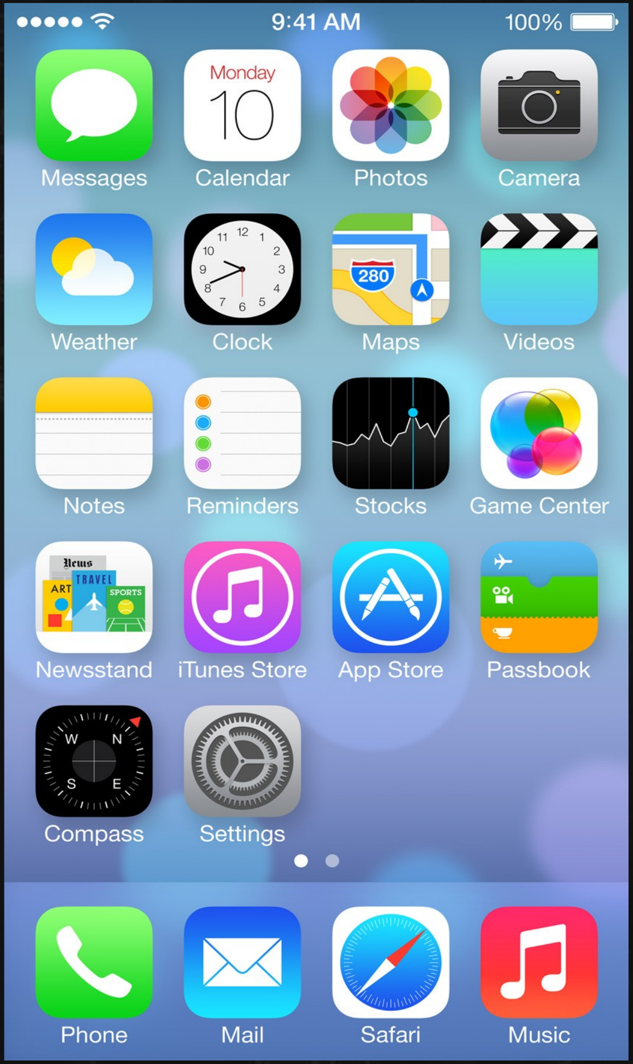
Linux and such…

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$
```



Controversial idea:

The mouse is the worst thing to ever happen to computers.

Why command line/text?

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...

This is cool

This is cool

Utterly inefficient and kind of stupid for the task, I mean, Google Maps is literally already MUCH better than this today, but cool.

What's so bad about the mouse and touchscreens,etc?

“Caveman interface.”

- Pre-linguistic/animal-like
- “Point and grunt”

(Tablets and even “Minority Report” etc, are cool and fun…but why is Charades a game?)

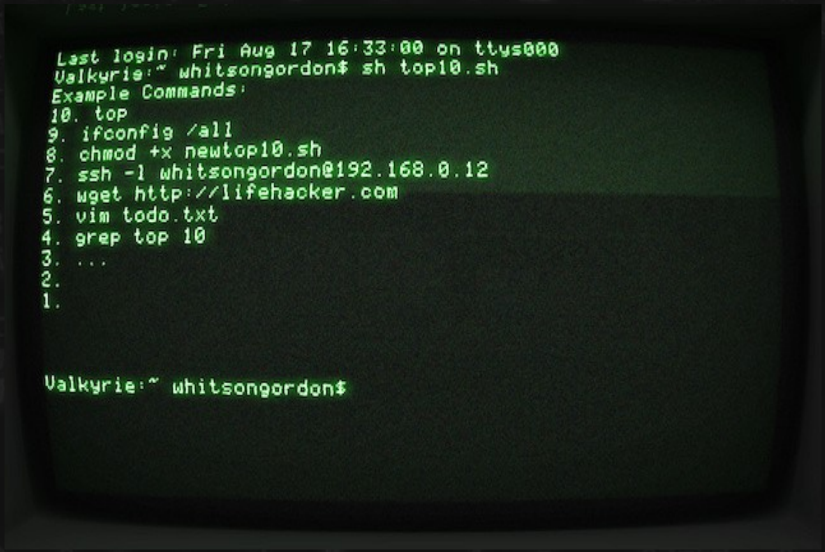
Intelligence requires Language

Buttons and gestures are frequently convenient for repetitive tasks...

...but to do anything intelligent, you need LANGUAGE.

TEXT. Numbers and Letters.

So again…



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4. grep top 10
3. ...
2.
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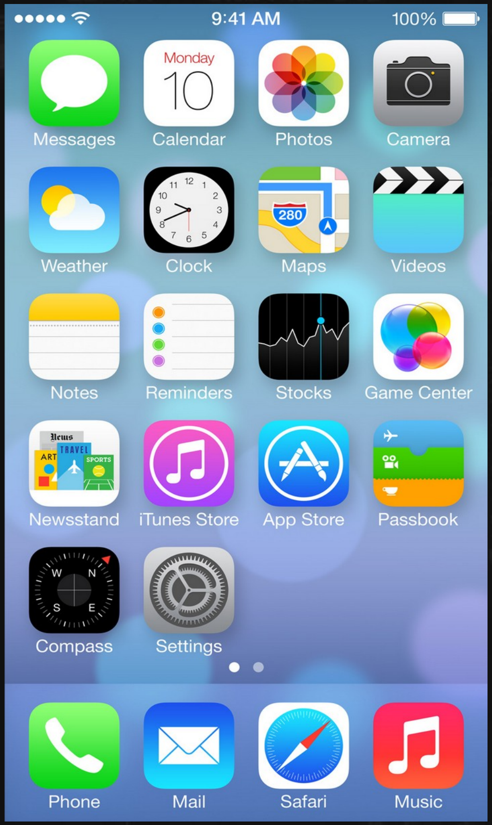
Valkyrie:~ whitsongordon$
```



literal infinity
bounded only by the limits
of all language and math

the 12 or so things the little
buttons it allows you to do

It's so easy, even...

© Splash

Either way…

Yes – early text was (and is?) ugly and unforgiving, and fixing that to various degrees propelled the big tech companies..

… but, along the way, restricting access to “back-end” text stuff helped create some of the messes we deal with today; including the oddness of programming languages.

So, “text”

- sane
- predictable
- simple
- infinitely useful and portable

…and formerly not sexy at all
it’s coming back, though…

Obvious old school text drawbacks

Though powerful; very “brittle” – this applies to most programming languages as well:

”You can understand this sentence tacos even though I put a random word in.”

(this will break many a text interface, badly)

Voice Interfaces (alexa, siri et al)

Interesting; and MUCH closer to the command line:

You tell it things, and it tries to do them. Some notable differences though

So, (old school) “text”

- sane
- predictable
- simple
- infinitely useful and portable
- but not “easy.” (requires precision, sometimes not useful feedback, not a lot of intuition

Voice Commands

- sane-ish?

- (somewhat) predictable

- NOT simple

- NOT infinitely useful or portable by any means. A VERY VERY limited set of commands.

(Can’t even play “old town road,” whats up with that?”)

Why, e.g. Linux?

1) Free and open
2) Language/Text Based

(These two are completely related; newer stuff tries to allow for more of 2 and/or 1; e.g. Mac OS X, Android)

The Unix Way

Write programs that do one thing and do it well.

Write programs to work together.

Write programs to handle text streams, because that is a universal interface.

Wow, so how do you kill a giant? (slowly)

- "Non-computer" devices
  - (thank you Moore's Law)
- The Internet

BOTH POWERED BY:

Free (and not-so-free-but-free-ish) Software

A bit more on the whole Free/Open Source thing:
(because English is silly)

"Free as in speech,
not free as in beer."

No restrictions (libre)

No cost (gratis)

Free Software (came first)

The principle?
Just like the "Golden Rule," really:

"We gave this to you for free, without restriction.
Please do the same **if** you choose to give it to others"

Alas, sometimes

“We gave this to you for free, without restriction.
Please do the same **if** you choose to give it to others”

In legalese?

The General Public License, or GPL.

Why not “public domain?”

Public Domain is the “without copyright” default.

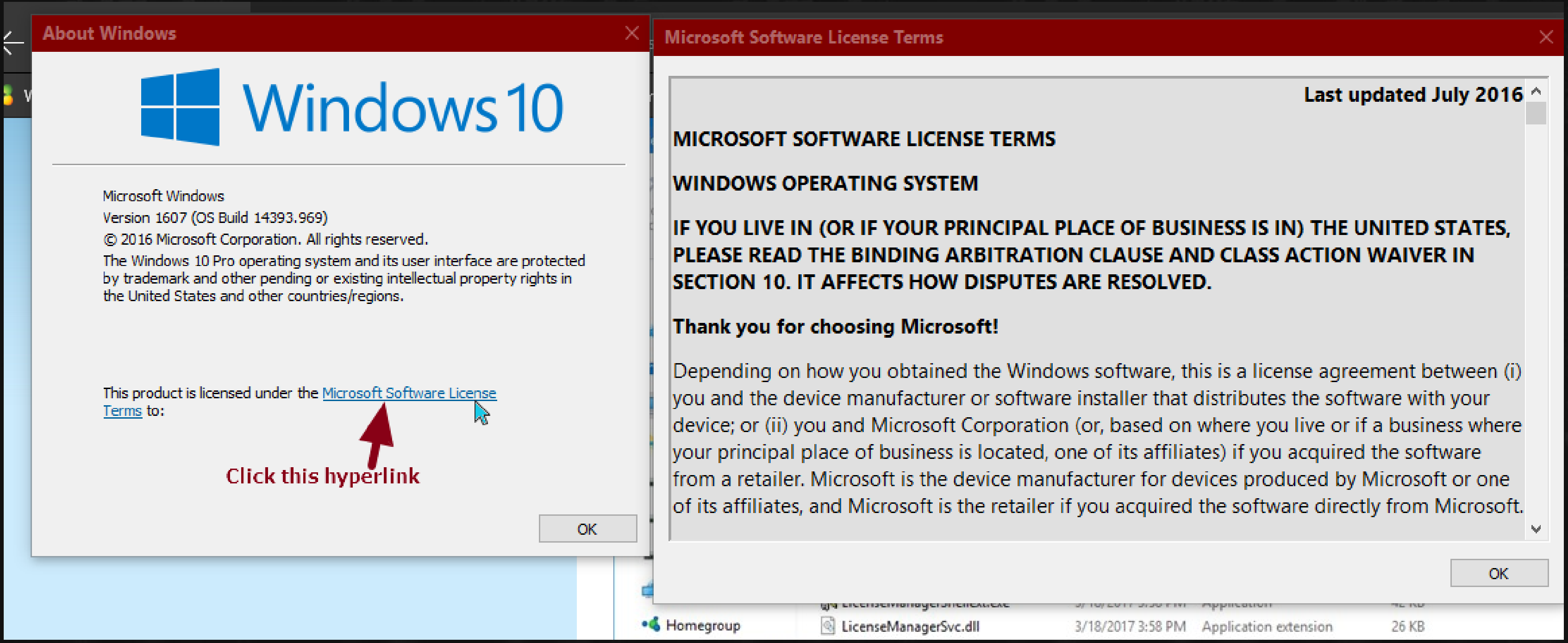
No restrictions at all? Seems right?

But think about, e.g. Shakespeare…..

How this works:

Who here owns Microsoft Software?

EULA
aka, all the stuff you can’t do…



About Windows
Windows 10
OK
Microsoft Software License Terms
OK
Homegroup
LicenseManagerSvc.dll 3/18/2017 3:58 PM Application extension 26 KB

Microsoft Windows
Version 1607 (OS Build 14393.969)
© 2016 Microsoft Corporation. All rights reserved.
The Windows 10 Pro operating system and its user interface are protected by trademark and other pending or existing intellectual property rights in the United States and other countries/regions.

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Click this hyperlink

Last updated July 2016

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WINDOWS OPERATING SYSTEM

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Depending on how you obtained the Windows software, this is a license agreement between (i) you and the device manufacturer or software installer that distributes the software with your device; or (ii) you and Microsoft Corporation (or, based on where you live or if a business where your principal place of business is located, one of its affiliates) if you acquired the software from a retailer. Microsoft is the device manufacturer for devices produced by Microsoft or one of its affiliates, and Microsoft is the retailer if you acquired the software directly from Microsoft.

GPL

Similar.

You don’t own it. But the terms are MUCH nicer.

GPL

You may copy

You may modify

You may keep forever and never give away, even if you change it
You may “sell,” even.

BUT

If you DO give to anyone? You MUST allow whoever you give it to all of the above (like everyone else did for you)

Real hard to sell the idea of making money with something that says "free" (Darn you, English)

So, "Open-Source" is adopted by some, and the definitions are slighly modified.

All free software is open source, but not all open source software is free (as in speech or otherwise)

And so, you get a mix....

This slide is better.

Free Software / FOSS / FLOSS

Here's some code, do what you want, but whatever you re-release? Share freely.

Non-free “Open Source”

Here's some code, do literally whatever you want.(even if you want to lock it back down)

Open Source ("permissive"/not "free")

You can do most anything with it, *including locking it back down.*

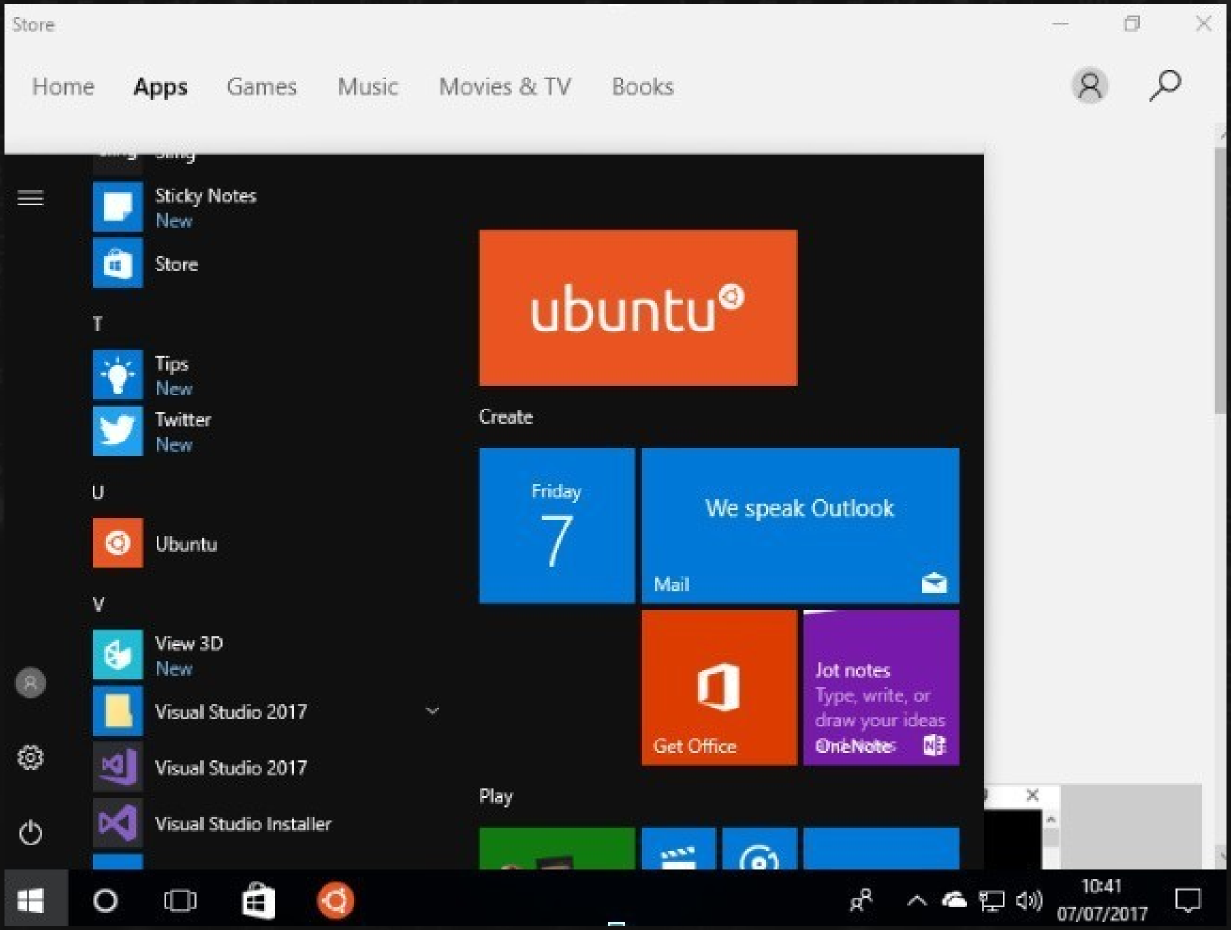
BSD, Apache Web Server, the MIT License

Free Software

- You can do anything with it yourself, EXCEPT you may NOT re-release it “closed.”

  GNU/Linux, Firefox

Unix Descendants
(aka, why am I talking about all this?)



Unix Descendants

(aka, why am I talking about all this?)

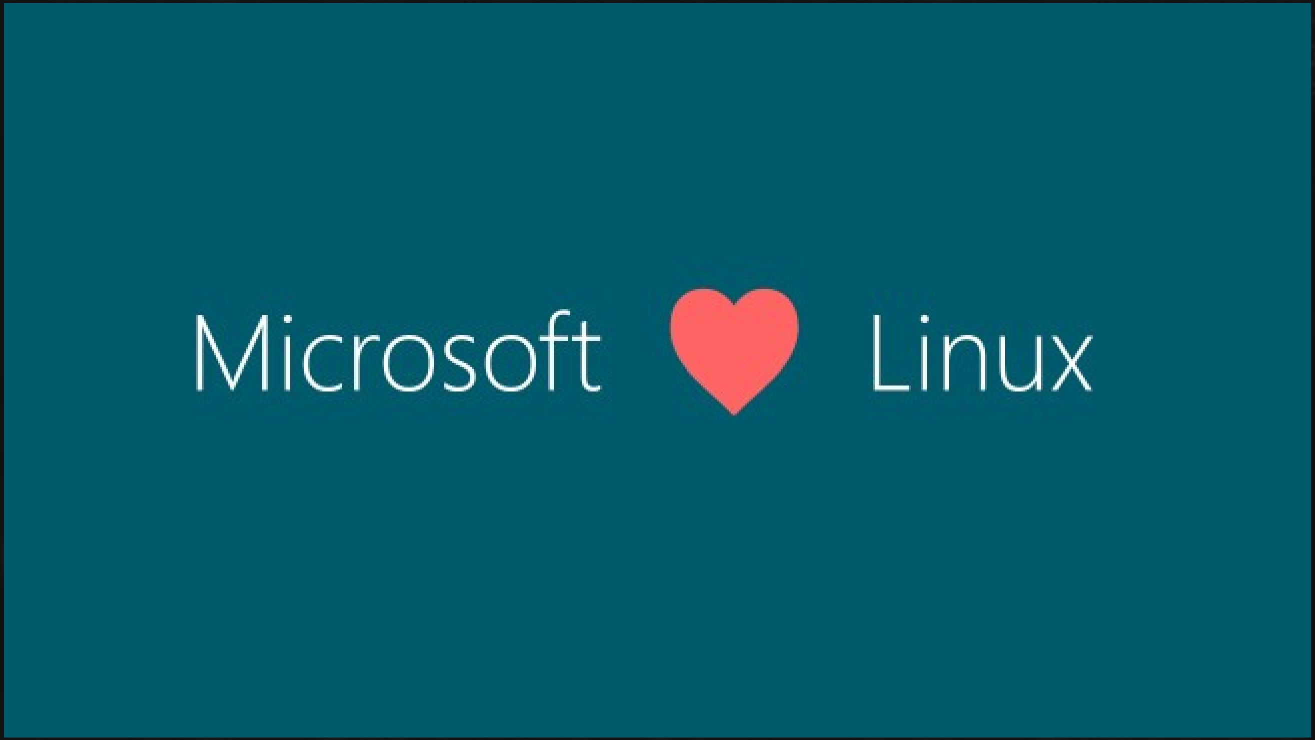
So: understanding Unix/Linux stuff will help you immensely with understanding the shape of the web.

ESPECIALLY file management, one of the most important things.

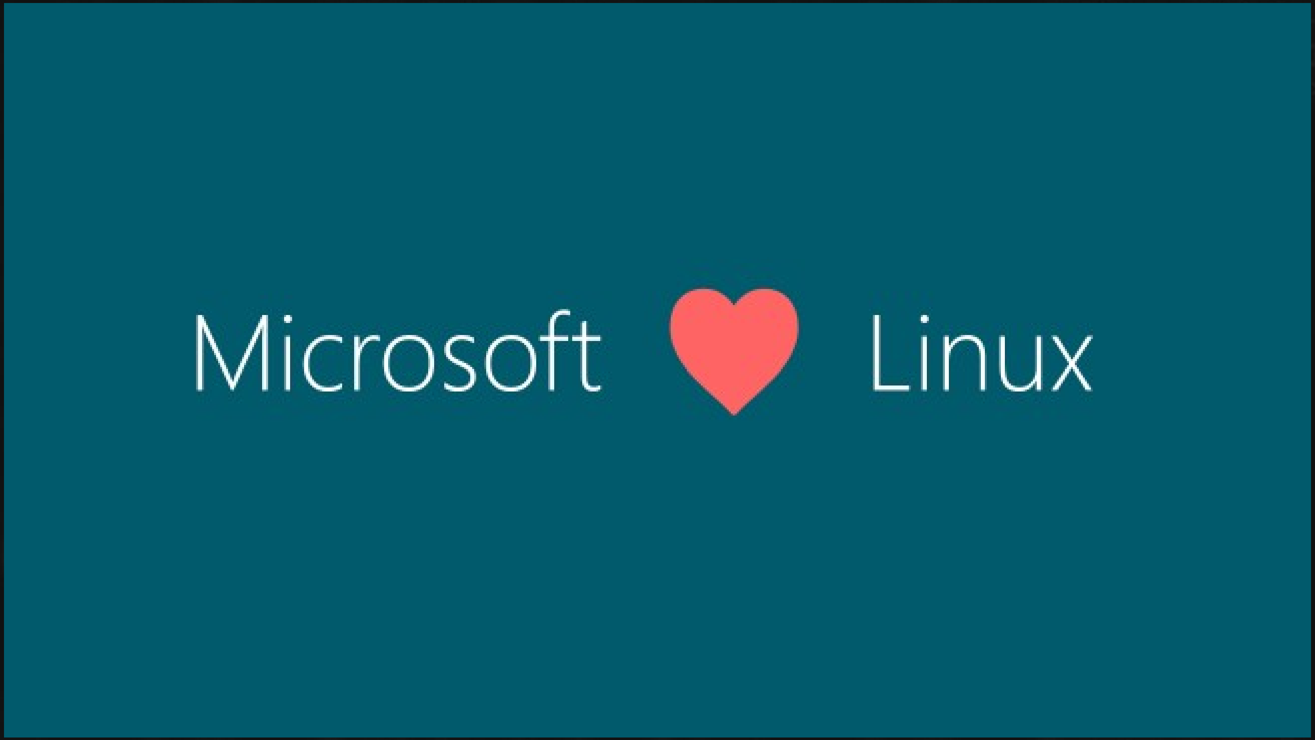
This is the main reason why I'm making you do a Linux install...because....

Some claim:

The OS wars are over, and “Linux” and “Open-Source” won.

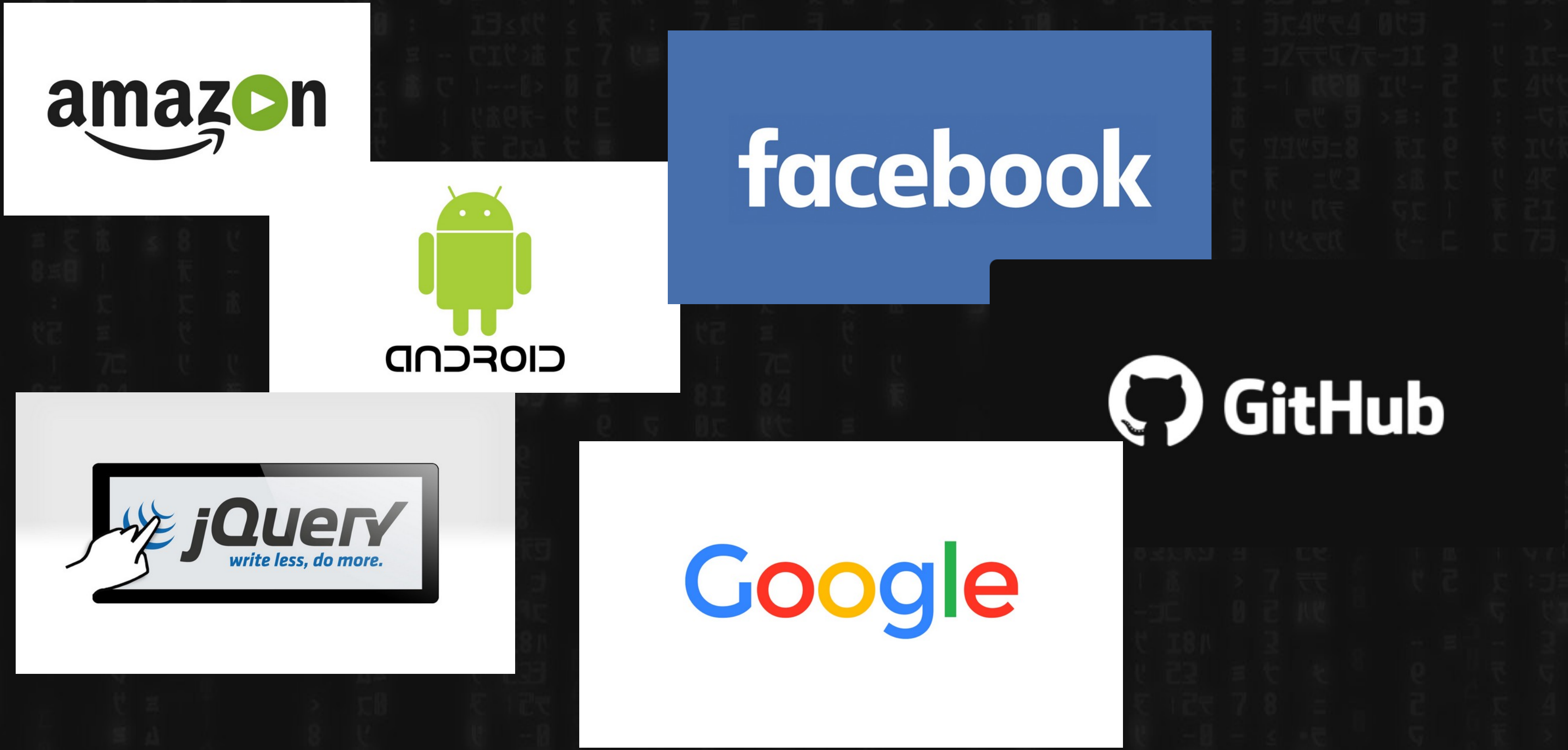


The OS wars are over, and “Linux” and “Open-Source” won.



...but

Did we get “Freedom” or something else?



All “Open-Source” powered…
…but also not particularly free.

Did we get "Freedom" or something else?

(lots of people don't say "Free Software" or "Linux" and even hate the GPL. Mostly .... Developers)

What is an OS, really?

Lots of different kinds of software at different levels.

(Apple/Windows just squishes them all together)

A rough car analogy

Linux is a Kernel

A rough car analogy

GNU is the other stuff. I don't know what all of it together is called because I'm not a car guy. But, you know, this:

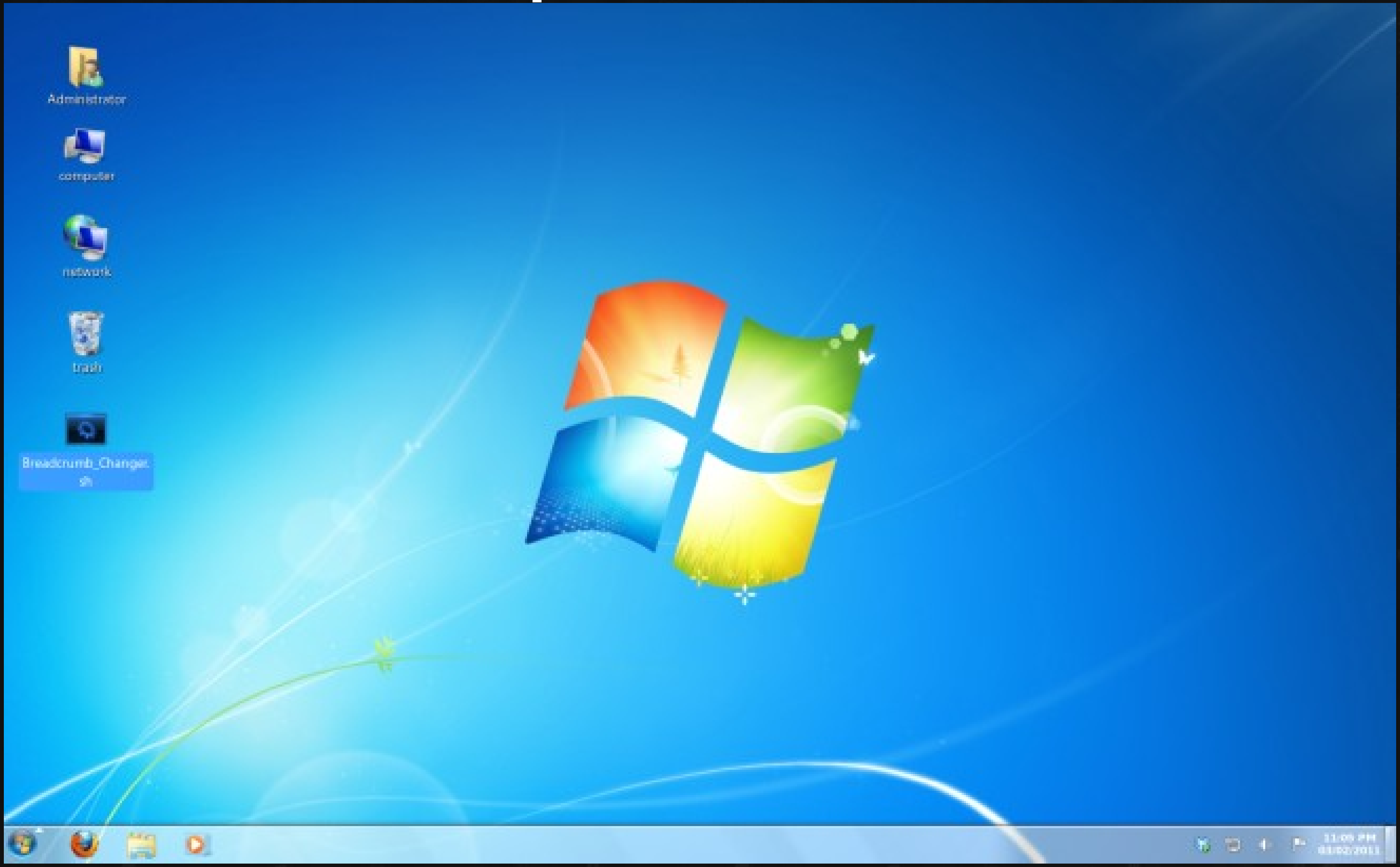
A rough car analogy

Ubuntu Linux? = Model/Make

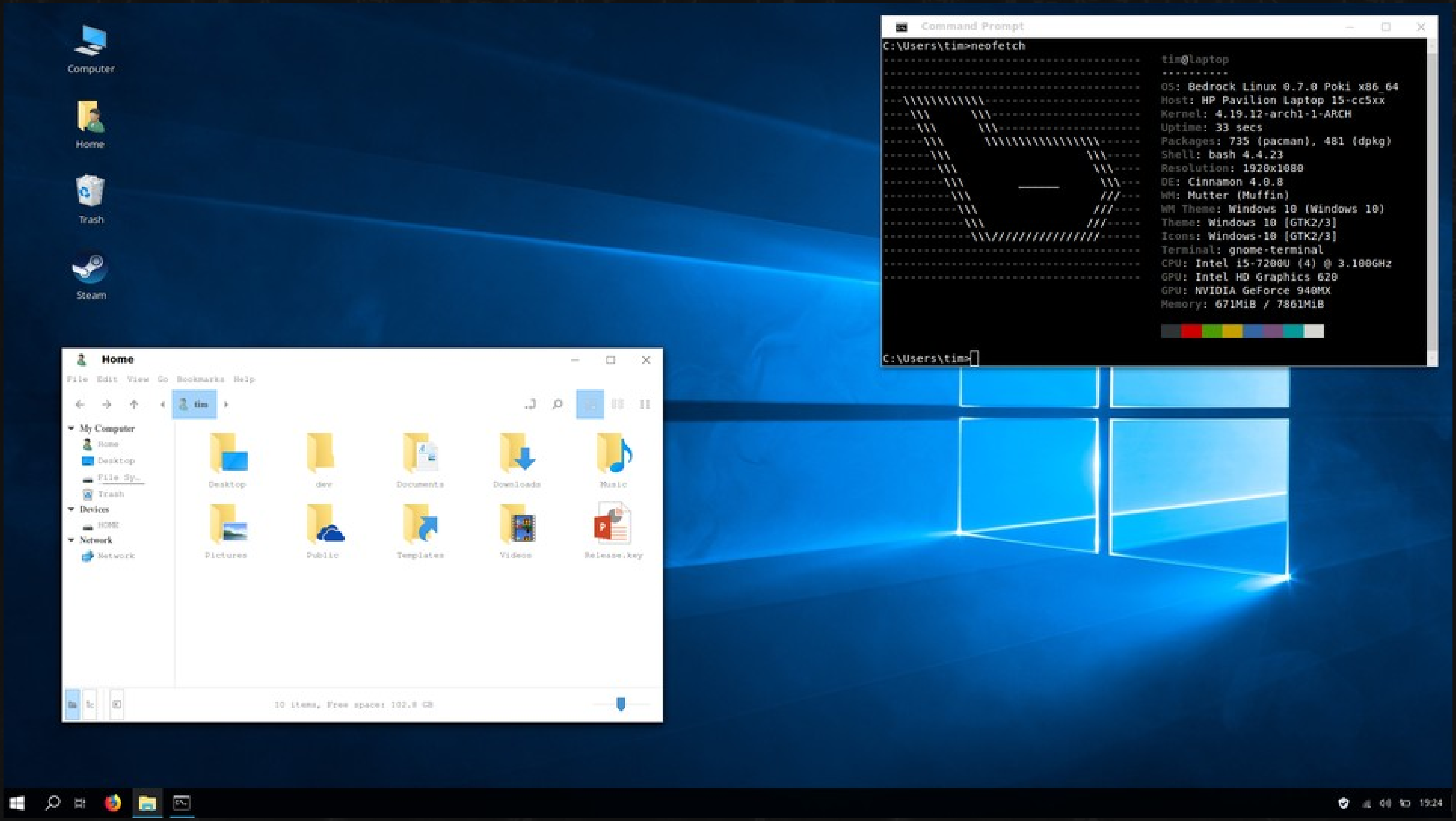
A rough car analogy

LXDE / Unity? / KDE / etc.

For comparison – Win 7?



Win 10?

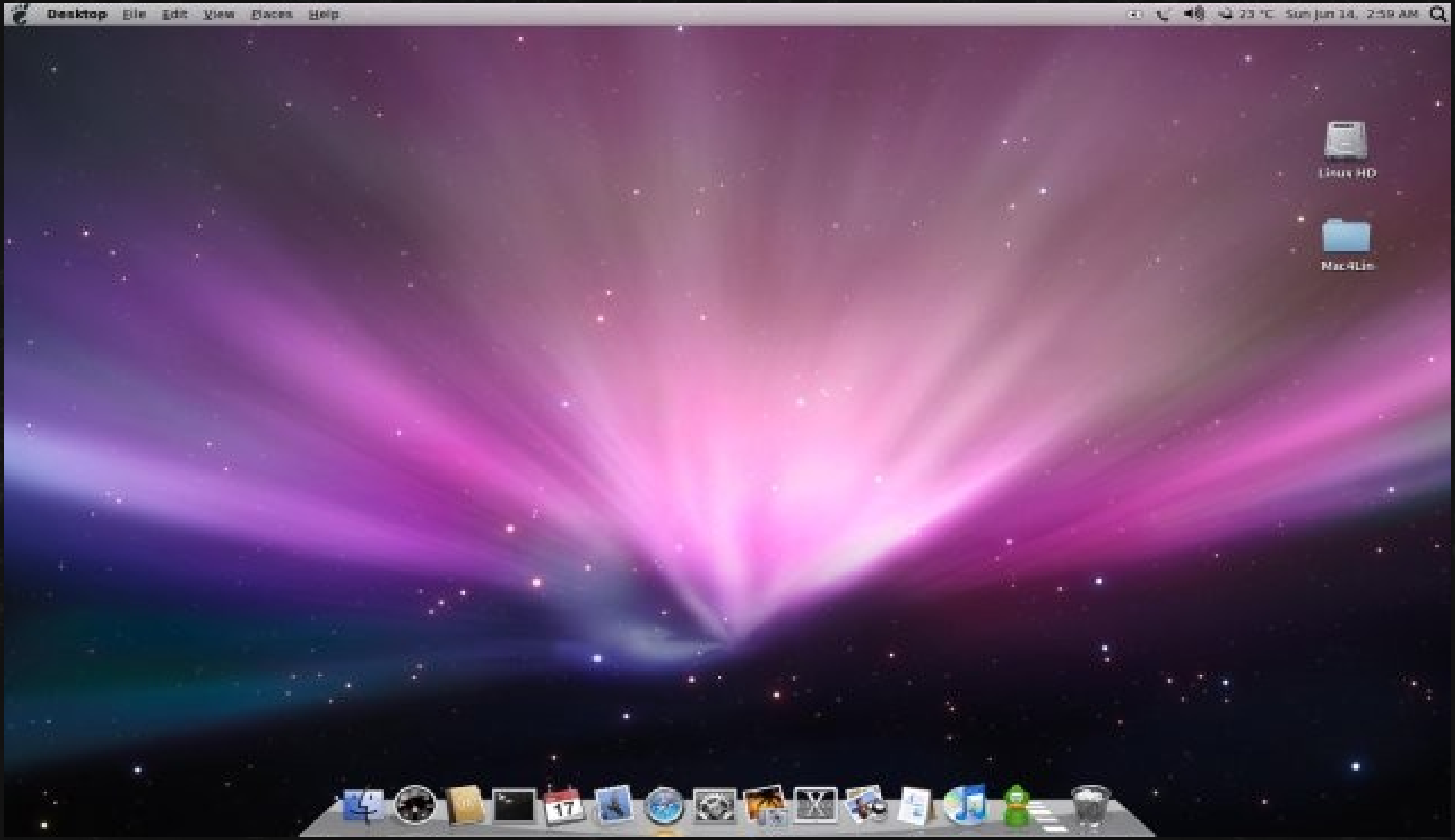


```
C:\Users\tim>neofetch
-------------------------------------   tim@laptop
-------------------------------------   ----------
-------------------------------------   OS: Bedrock Linux 0.7.0 Poki x86_64
---\\\\\\\\\\\\----------------------   Host: HP Pavilion Laptop 15-cc5xx
----\\\      \\\---------------------   Kernel: 4.19.12-arch1-1-ARCH
-----\\\      \\\--------------------   Uptime: 33 secs
------\\\      \\\\\\\\\\\\\\\\\------   Packages: 735 (pacman), 481 (dpkg)
-------\\\                    \\\-----   Shell: bash 4.4.23
--------\\\                    \\\----   Resolution: 1920x1080
---------\\\         ______     \\\---   DE: Cinnamon 4.0.8
----------\\\                   ///---   WM: Mutter (Muffin)
-----------\\\                 ///----   WM Theme: Windows 10 (Windows 10)
------------\\\               ///-----   Theme: Windows 10 [GTK2/3]
-------------\\\////////////////------   Icons: Windows-10 [GTK2/3]
-------------------------------------   Terminal: gnome-terminal
-------------------------------------   CPU: Intel i5-7200U (4) @ 3.100GHz
-------------------------------------   GPU: Intel HD Graphics 620
                                        GPU: NVIDIA GeForce 940MX
                                        Memory: 671MiB / 7861MiB



C:\Users\tim>
```

OS X (older)?


Desktop
File
Edit
View
Places
Help
23 °C
Sun Jun 14, 2:59 AM
Linux HD
Mac4Lin
17

Choices choices choices (for better or worse)

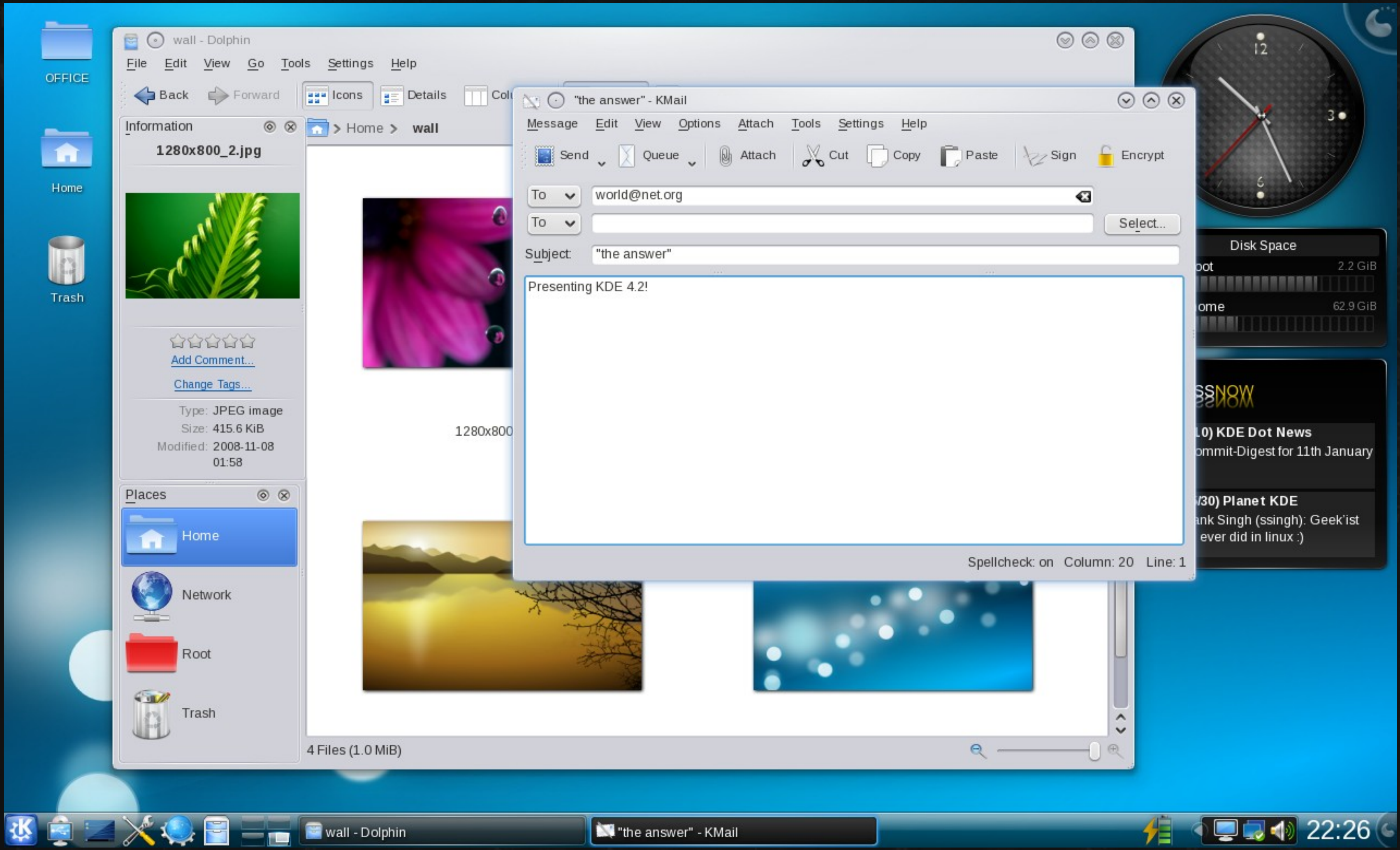
Linux has many different

“Desktop Environments”

(or Window Managers)

(which, to most, probably look like completely different operating systems)

KDE (old)



1280x800_2.jpg

Add Comment...

Change Tags...

Type: JPEG image

Size: 415.6 KiB

Modified: 2008-11-08 01:58

4 Files (1.0 MiB)

To: world@net.org

To:

Subject: "the answer"

Presenting KDE 4.2!

Spellcheck: on Column: 20 Line: 1

oot 2.2 GiB

ome 62.9 GiB

SSNOW

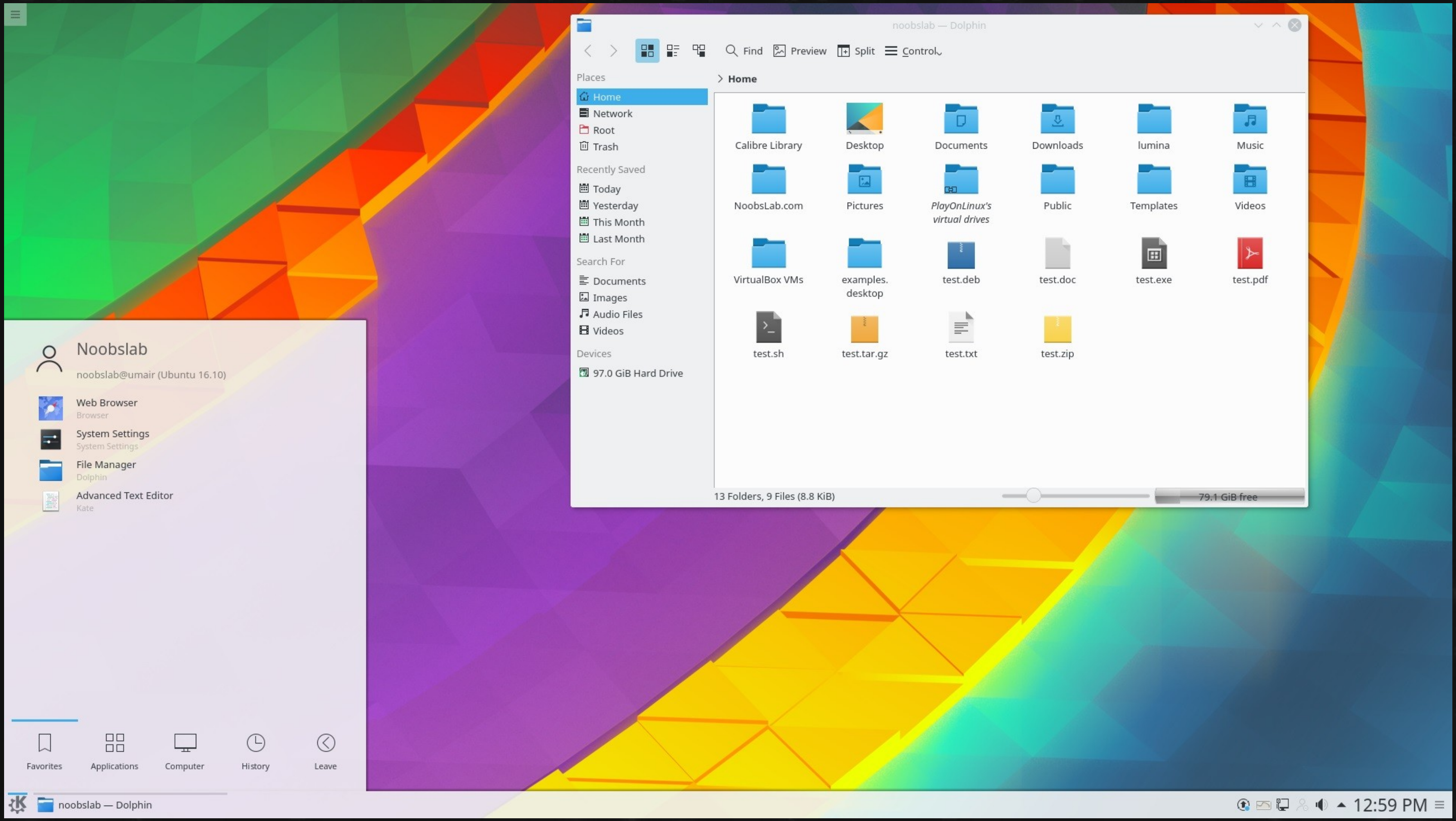
10) KDE Dot News

ommit-Digest for 11th January

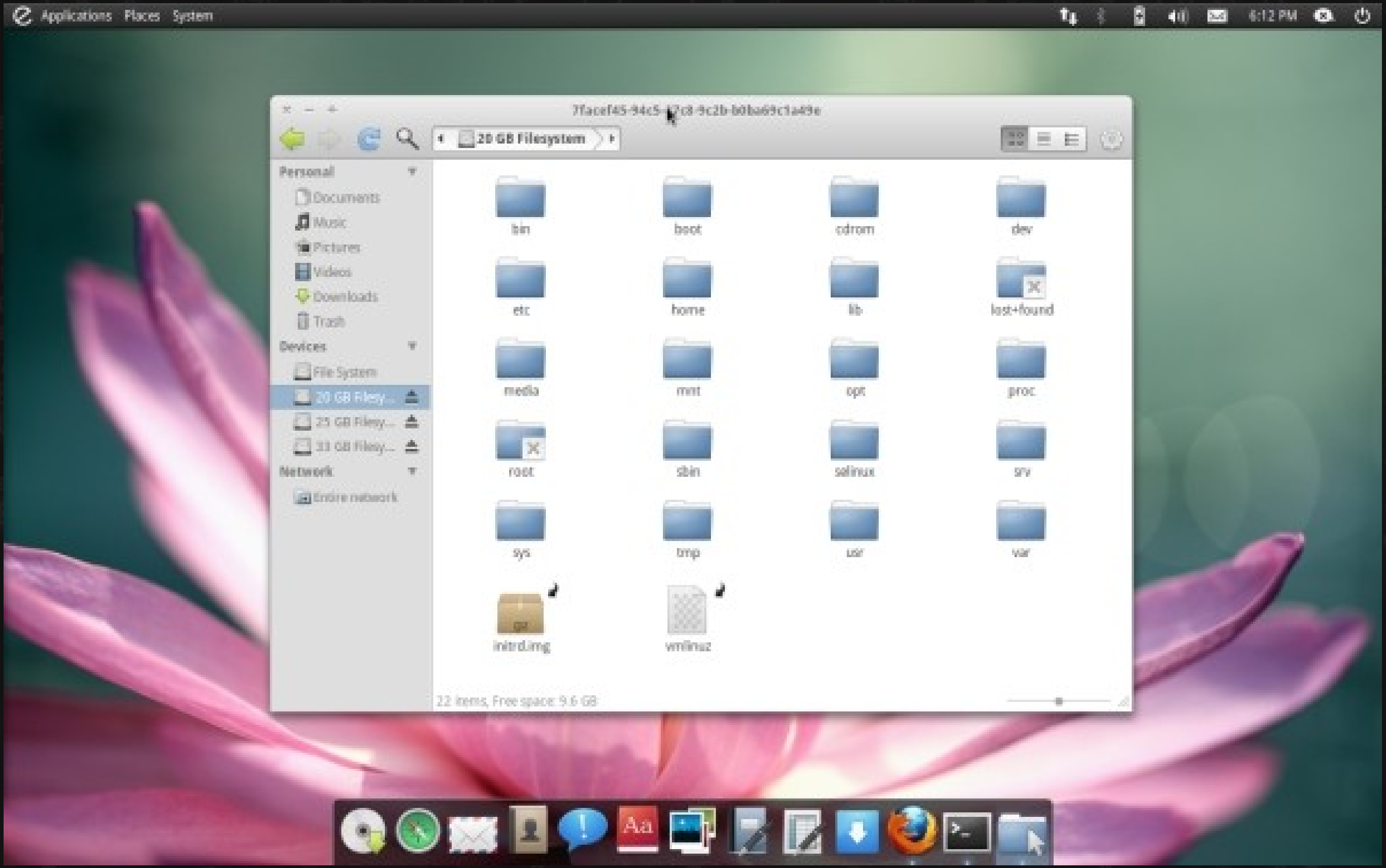
/30) Planet KDE

ank Singh (ssingh): Geek'ist ever did in linux :)

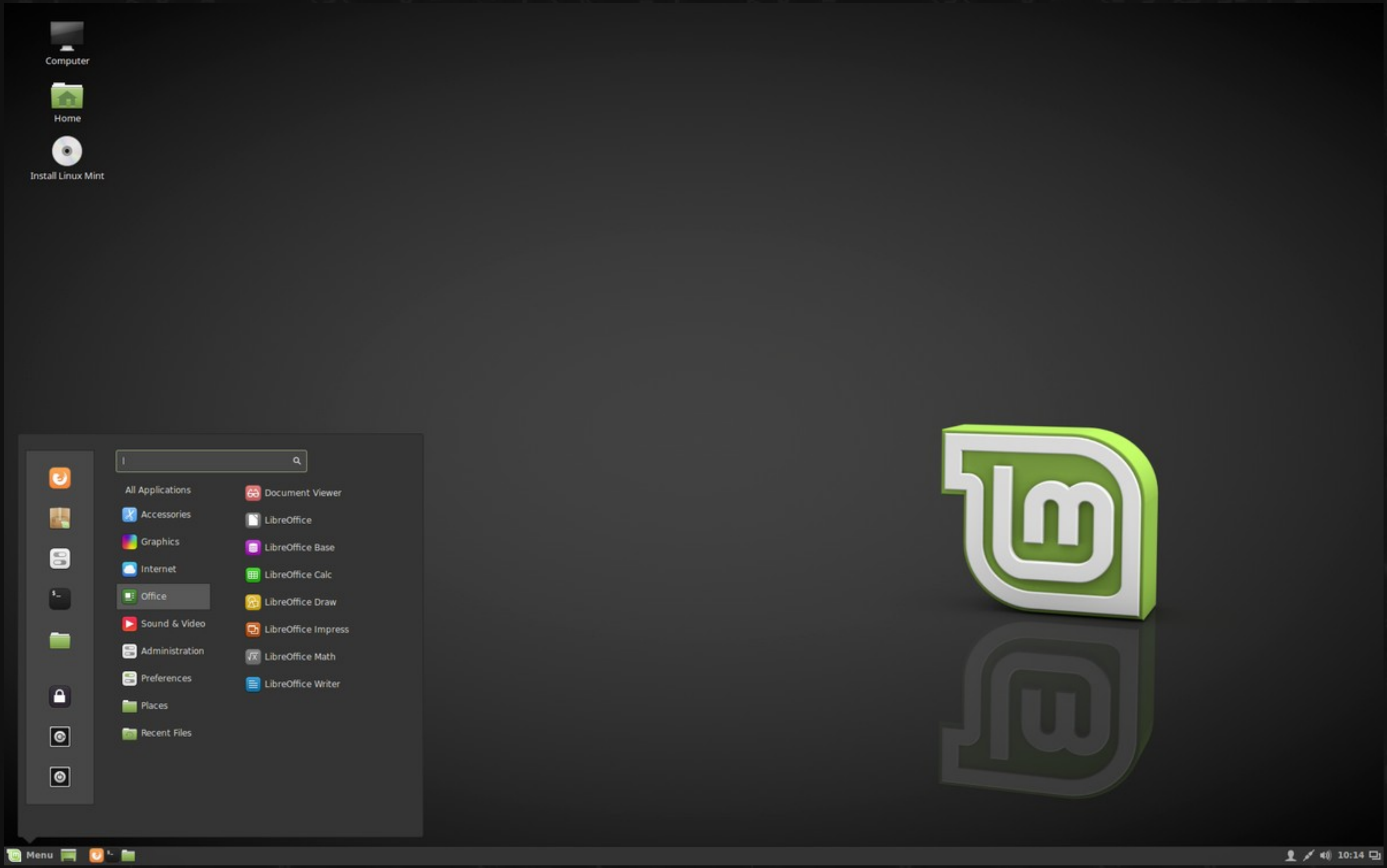
KDE


noobslab — Dolphin
Find
Preview
Split
Control
Places
Home
Network
Root
Trash
Recently Saved
Today
Yesterday
This Month
Last Month
Search For
Documents
Images
Audio Files
Videos
Devices
97.0 GiB Hard Drive
Home
Calibre Library
Desktop
Documents
Downloads
lumina
Music
NoobsLab.com
Pictures
PlayOnLinux's virtual drives
Public
Templates
Videos
VirtualBox VMs
examples.desktop
test.deb
test.doc
test.exe
test.pdf
test.sh
test.tar.gz
test.txt
test.zip
13 Folders, 9 Files (8.8 KiB)
79.1 GiB free
Noobslab
noobslab@umair (Ubuntu 16.10)
Web Browser
Browser
System Settings
System Settings
File Manager
Dolphin
Advanced Text Editor
Kate
Favorites
Applications
Computer
History
Leave
noobslab — Dolphin
12:59 PM

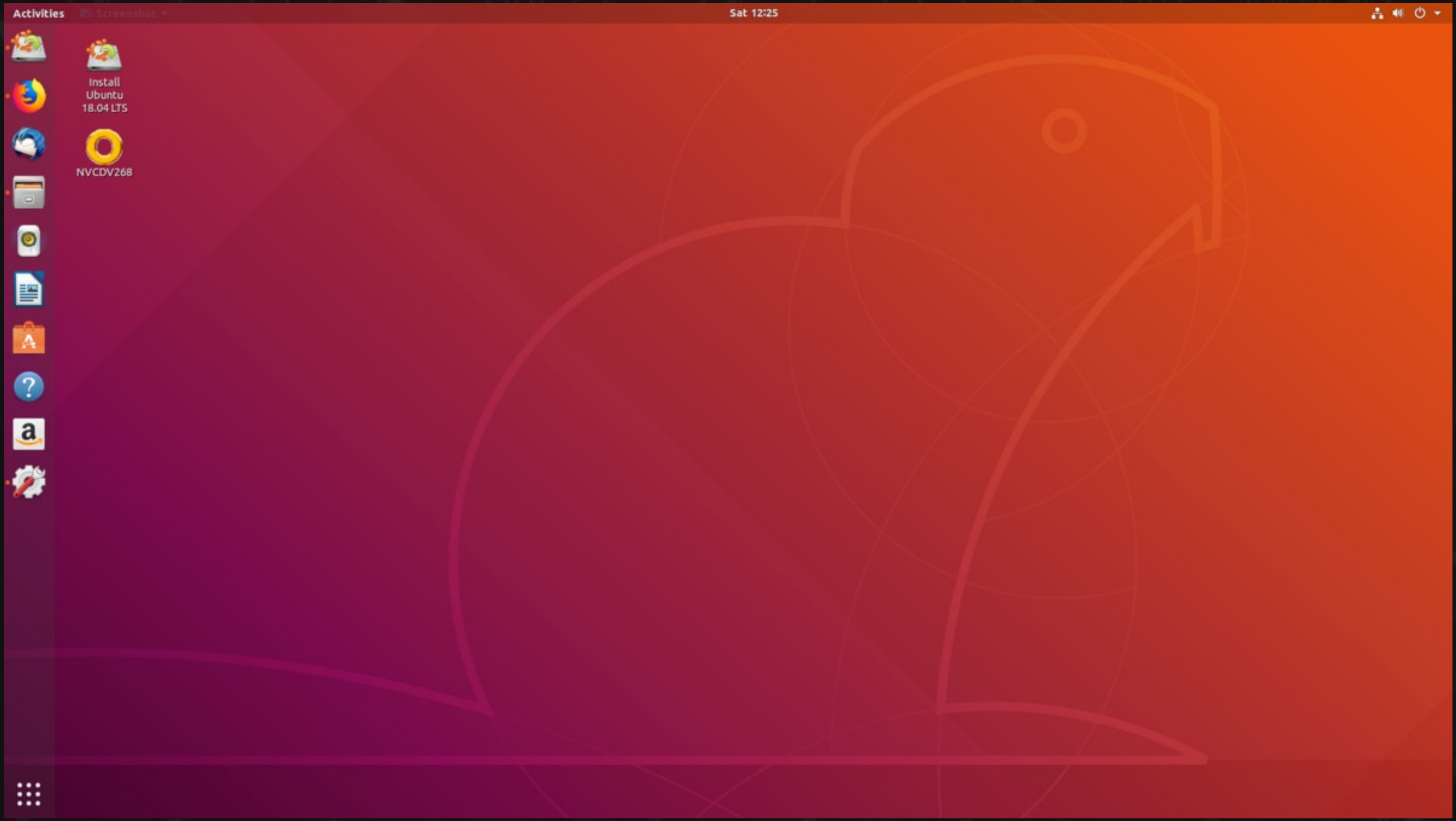
Elementary


Applications
Places
System
6:12 PM
7facef45-94c5-42c8-9c2b-b0ba69c1a49e
20 GB Filesystem
Personal
Documents
Music
Pictures
Videos
Downloads
Trash
Devices
File System
20 GB Filesy...
25 GB Filesy...
33 GB Filesy...
Network
Entire network
bin
boot
cdrom
dev
etc
home
lib
lost+found
media
mnt
opt
proc
root
sbin
selinux
srv
sys
tmp
usr
var
initrd.img
vmlinuz
22 items, Free space: 9.6 GB

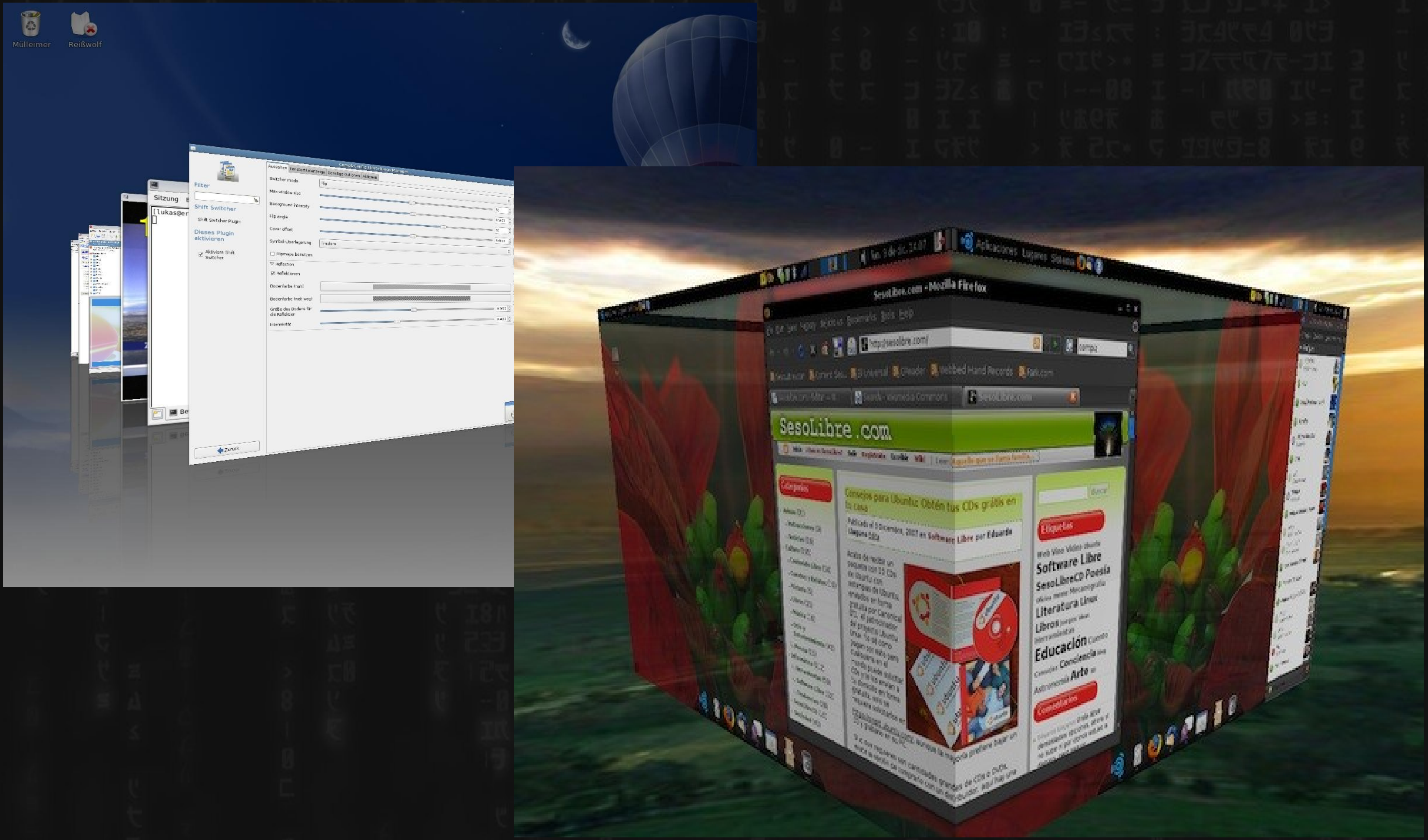
Linux Mint


Computer
Home
Install Linux Mint
All Applications
Accessories
Graphics
Internet
Office
Sound & Video
Administration
Preferences
Places
Recent Files
Document Viewer
LibreOffice
LibreOffice Base
LibreOffice Calc
LibreOffice Draw
LibreOffice Impress
LibreOffice Math
LibreOffice Writer
Menu
10:14

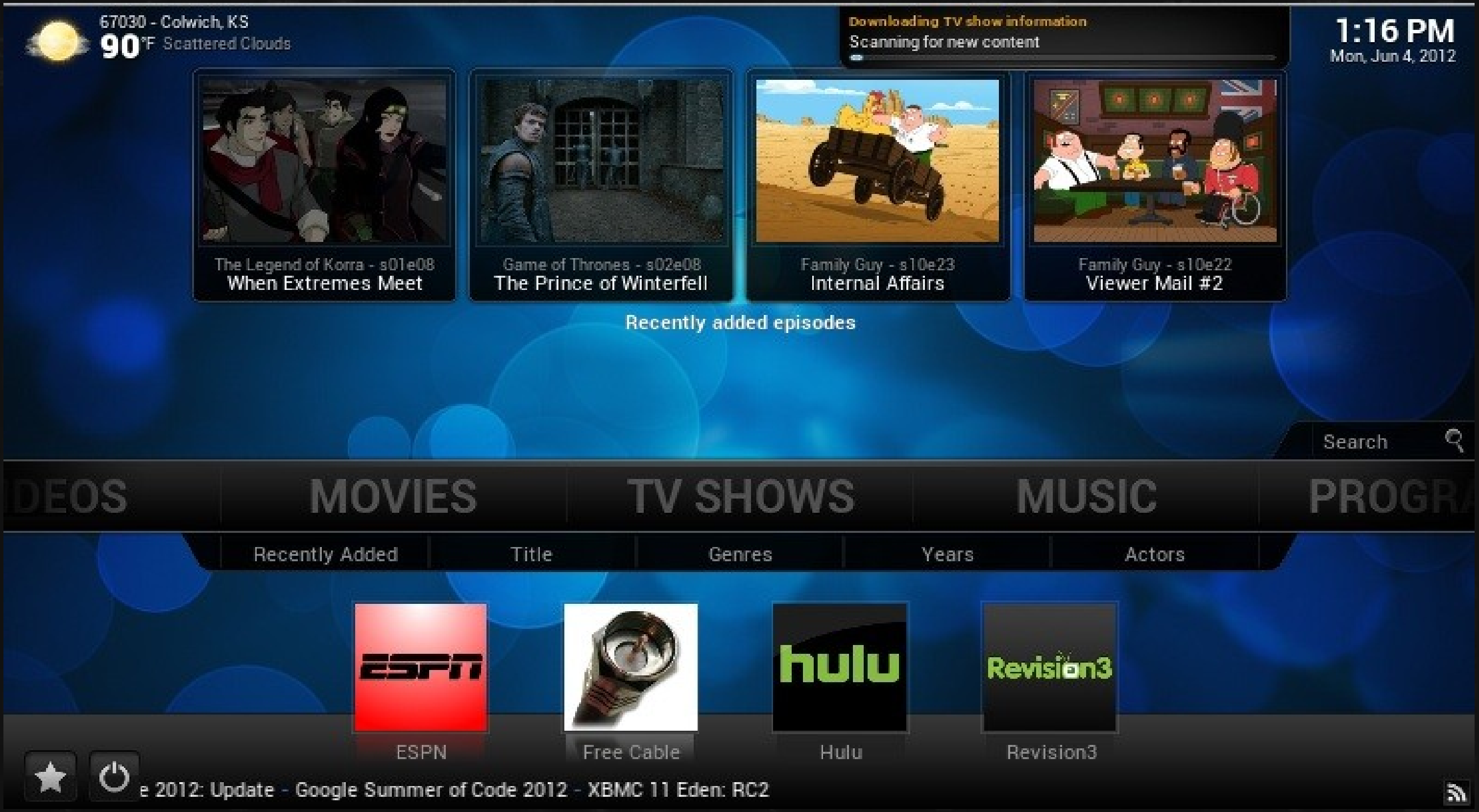
Ubuntu (GNOME)



Fancy compiz fanciness



OpenElec (XBMC/Kodi)



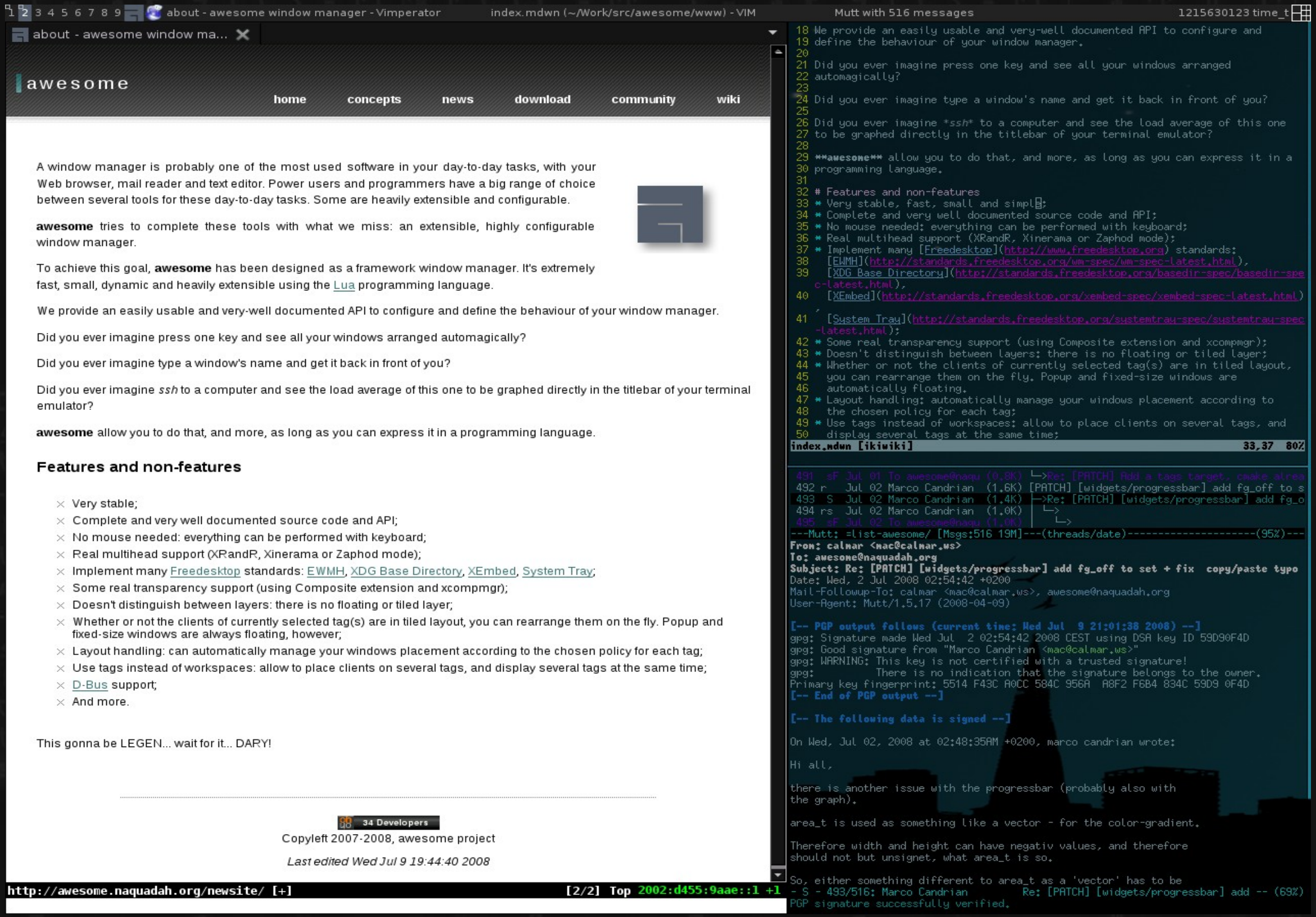
Downloading TV show information

Scanning for new content

Kali Linux

Applications
Places
Tue Feb 10, 1:04 PM
root
Click to view your appointments and tasks
Computer
KALI LINUX™
“the quieter you become, the more you are able to hear”
http://www.tecmint.com

Awesome



1 2 3 4 5 6 7 8 9
about - awesome window manager - Vimperator
index.mdwn (~/Work/src/awesome/www) - VIM
Mutt with 516 messages
1215630123 time_t
about - awesome window ma...
awesome
home
concepts
news
download
community
wiki

A window manager is probably one of the most used software in your day-to-day tasks, with your Web browser, mail reader and text editor. Power users and programmers have a big range of choice between several tools for these day-to-day tasks. Some are heavily extensible and configurable.

awesome tries to complete these tools with what we miss: an extensible, highly configurable window manager.

To achieve this goal, **awesome** has been designed as a framework window manager. It's extremely fast, small, dynamic and heavily extensible using the Lua programming language.

We provide an easily usable and very-well documented API to configure and define the behaviour of your window manager.

Did you ever imagine press one key and see all your windows arranged automagically?

Did you ever imagine type a window's name and get it back in front of you?

Did you ever imagine *ssh* to a computer and see the load average of this one to be graphed directly in the titlebar of your terminal emulator?

awesome allow you to do that, and more, as long as you can express it in a programming language.

Features and non-features

- Very stable;
- Complete and very well documented source code and API;
- No mouse needed: everything can be performed with keyboard;
- Real multihead support (XRandR, Xinerama or Zaphod mode);
- Implement many Freedesktop standards: EWMH, XDG Base Directory, XEmbed, System Tray;
- Some real transparency support (using Composite extension and xcompmgr);
- Doesn't distinguish between layers: there is no floating or tiled layer;
- Whether or not the clients of currently selected tag(s) are in tiled layout, you can rearrange them on the fly. Popup and fixed-size windows are always floating, however;
- Layout handling: can automatically manage your windows placement according to the chosen policy for each tag;
- Use tags instead of workspaces: allow to place clients on several tags, and display several tags at the same time;
- D-Bus support;
- And more.

This gonna be LEGEN... wait for it... DARY!

34 Developers

Copyleft 2007-2008, awesome project

Last edited Wed Jul 9 19:44:40 2008

```
http://awesome.naquadah.org/newsite/ [+]                                  [2/2] Top 2002:d455:9aae::1 +1
```

```
We provide an easily usable and very-well documented API to configure and
define the behaviour of your window manager.

Did you ever imagine press one key and see all your windows arranged
automagically?

Did you ever imagine type a window's name and get it back in front of you?

Did you ever imagine *ssh* to a computer and see the load average of this one
to be graphed directly in the titlebar of your terminal emulator?

**awesome** allow you to do that, and more, as long as you can express it in a
programming language.

# Features and non-features
* Very stable, fast, small and simple;
* Complete and very well documented source code and API;
* No mouse needed: everything can be performed with keyboard;
* Real multihead support (XRandR, Xinerama or Zaphod mode);
* Implement many [Freedesktop](http://www.freedesktop.org) standards:
  [EWMH](http://standards.freedesktop.org/wm-spec/wm-spec-latest.html),
  [XDG Base Directory](http://standards.freedesktop.org/basedir-spec/basedir-spe
c-latest.html),
  [XEmbed](http://standards.freedesktop.org/xembed-spec/xembed-spec-latest.html)
,
  [System Tray](http://standards.freedesktop.org/systemtray-spec/systemtray-spec
-latest.html);
* Some real transparency support (using Composite extension and xcompmgr);
* Doesn't distinguish between layers: there is no floating or tiled layer;
* Whether or not the clients of currently selected tag(s) are in tiled layout,
  you can rearrange them on the fly. Popup and fixed-size windows are
  automatically floating.
* Layout handling: automatically manage your windows placement according to
  the chosen policy for each tag;
* Use tags instead of workspaces: allow to place clients on several tags, and
  display several tags at the same time;
index.mdwn [ikiwiki]                                                 33,37  80%
```

```
491  sF Jul 01 To awesome@naqu (0.8K) └─>Re: [PATCH] Add a tags target, cmake alrea
492 r   Jul 02 Marco Candrian  (1.6K) [PATCH] [widgets/progressbar] add fg_off to s
493  S  Jul 02 Marco Candrian  (1.4K) ├─>Re: [PATCH] [widgets/progressbar] add fg_o
494 rs  Jul 02 Marco Candrian  (1.0K) │ └─>
495  sF Jul 02 To awesome@naqu (1.0K) │   └─>
---Mutt: =list-awesome/ [Msgs:516 19M]---(threads/date)-----------------------(95%)---
From: calmar <mac@calmar.ws>
To: awesome@naquadah.org
Subject: Re: [PATCH] [widgets/progressbar] add fg_off to set + fix  copy/paste typo
Date: Wed, 2 Jul 2008 02:54:42 +0200
Mail-Followup-To: calmar <mac@calmar.ws>, awesome@naquadah.org
User-Agent: Mutt/1.5.17 (2008-04-09)

[-- PGP output follows (current time: Wed Jul  9 21:01:38 2008) --]
gpg: Signature made Wed Jul  2 02:54:42 2008 CEST using DSA key ID 59D90F4D
gpg: Good signature from "Marco Candrian <mac@calmar.ws>"
gpg: WARNING: This key is not certified with a trusted signature!
gpg:          There is no indication that the signature belongs to the owner.
Primary key fingerprint: 5514 F43C A0CC 584C 956A  A8F2 F6B4 834C 59D9 0F4D
[-- End of PGP output --]

[-- The following data is signed --]

On Wed, Jul 02, 2008 at 02:48:35AM +0200, marco candrian wrote:

Hi all,

there is another issue with the progressbar (probably also with
the graph).

area_t is used as something like a vector - for the color-gradient.

Therefore width and height can have negativ values, and therefore
should not but unsignet, what area_t is so.

So, either something different to area_t as a 'vector' has to be
- S - 493/516: Marco Candrian          Re: [PATCH] [widgets/progressbar] add -- (69%)
PGP signature successfully verified.
```

Let's take a trip...

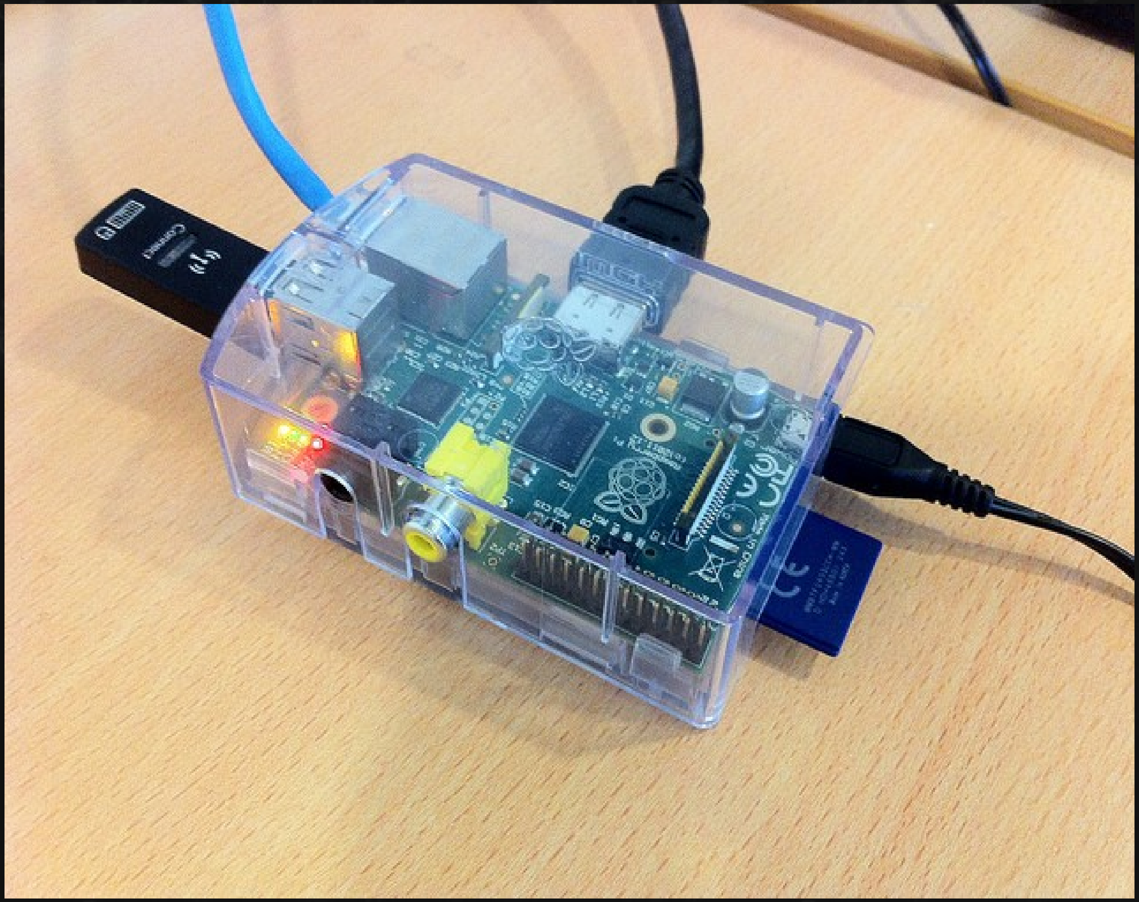
Here.

Torch/cci/etc (maybe?)

jrm4.com (HostDime)

And finally. My House.

(not my actual house. Too messy.)



COMMAND LINE INTRO

(did we get this far?)

Shell Scripting / The command line.

That default thing that comes up on all the unixy-linuxy systems everywhere.

It’s a text interface. You type commands into it and the computer responds.

And it’s also a “programming” language. As in, you can type in more than one command in a row, save it to a file, and run the file. So, you know, “programming.”

(quotes will be explained later)

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”

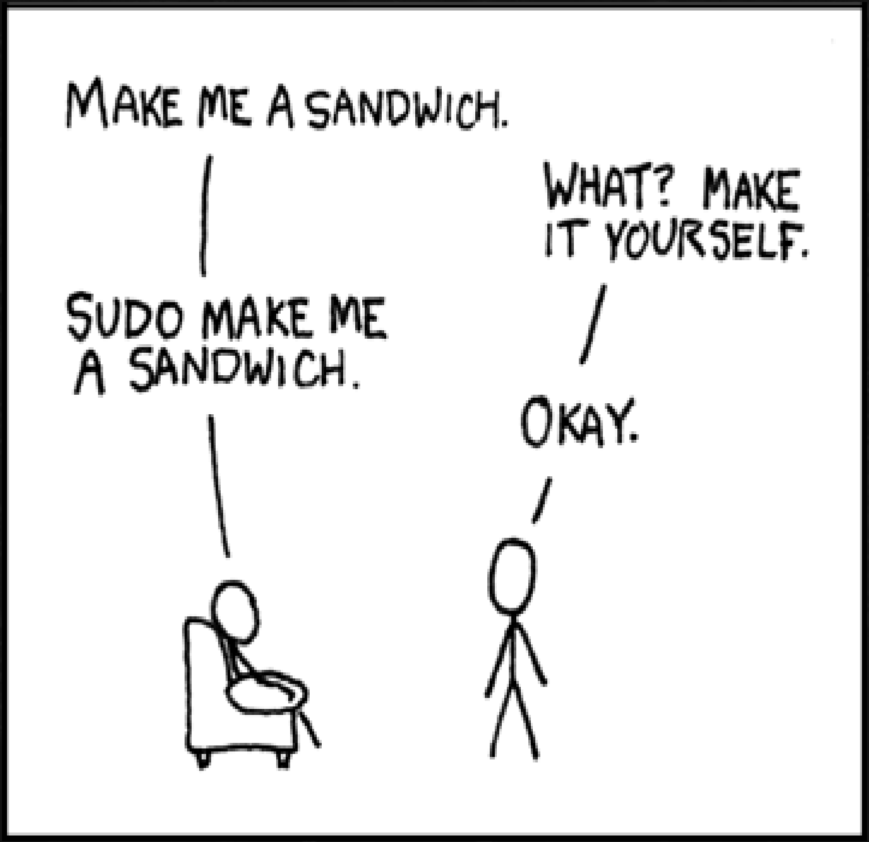
users – humans

(..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



Congrats..

Nothing from HERE forward on THIS set of slides
will be on the quiz, unless it is also found elsewhere.

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 for directories

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 no 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....

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

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” - but kind of funny that it’s usually used to just view. Ah, Unix.

`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

(this is where the power is)

Default behavior: read from “stdin”, write to “stdout”

OR, the below…

>	(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, nicely)
printf for “raw”

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='nano ~/.bashrc'
```

Opening Files

IN TERMINAL

```
less
cat   (stdout)
```

COMMAND/ARGUMENT STYLE

```
xdg-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)