school
of advanced
studies

школа
перспективных
исследований

The Digital Revolution and the Hackers Culture.

Elective course
3rd module (Feb-Mar) 2019

Fabio Grazioso

Lecture 7/8

summary

- Historical perspective
  - the evolution of Unix/Linux
- Sociological perspective
  - social media
- Technological perspective
  - text encoding

I think that I will develop in parallel those themes all along the course

Unix/Linux

historical excursus

Early steps

- The Unix operating system was created in 1969, at AT&T's Bell Labs (USA) by Ken Thompson, Dennis Ritchie, Douglas McIlroy, and Joe Ossanna
- When it was first released Unix was written in “machine language”.
- Later in 1973, it was rewritten in the C programming language by Dennis Ritchie, a high-level language. This made its porting to different computer platforms easier.
- In the meanwhile, AT&T had some legal problems (antitrust) and was forced to make the source code public.
- As a result, Unix became widely adopted by academic institutions and businesses.
- In 1984, AT&T divested itself of Bell Labs, so Bell Labs began selling Unix as a proprietary product, and users were no more legally allowed to modify it.

UNIX

source: Wikipedia

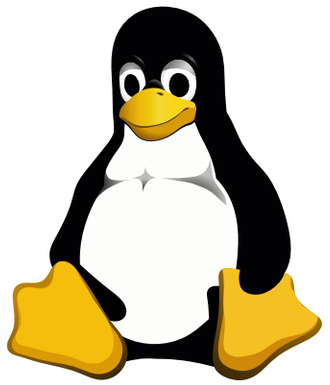
Early steps

- In 1983 by **Richard Stallman** started the GNU Project, with the goal of creating a "complete Unix-compatible software system" composed entirely of free software.
- In 1985, Stallman started the Free Software Foundation and wrote the GNU General Public License (GNU GPL) in 1989.
- By the early 1990s, many of the programs required in an operating system (such as libraries, compilers, text editors, a Unix shell, and a windowing system) were completed.

source: Wikipedia

Early steps

- In 1991, while attending the University of Helsinki, **Linus Torvalds** became curious about operating systems.
- Linus Torvalds has stated that if the GNU kernel had been available at the time (1991), he would not have decided to write his own.
- Torvalds started to study MINIX, an operating system created by Andrew S. Tanenbaum in 1987 as a minimal Unix-like operating system
- MINIX was targeted at students and others who wanted to learn the operating system principles, and the licensing terms prevented it from being free software.
- Frustrated by these restrictions in the licensing of MINIX, Torvalds he began to work on his own operating system kernel, which eventually became the **Linux** kernel.



source: Wikipedia

On 25 August 1991, (at age 21) Linus Torvalds announced this system in a Usenet posting to the newsgroup "**comp.os.minix**."

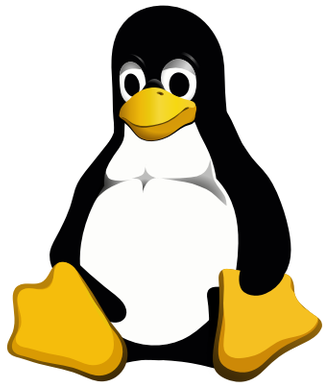
> Hello everybody out there using minix -
>
> I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. This has been brewing since april, and is starting to get ready. I'd like any feedback on things people like/dislike in minix, as my OS resembles it somewhat (same physical layout of the file-system (due to practical reasons) among other things).
>
> I've currently ported bash(1.08) and gcc(1.40), and things seem to work. This implies that I'll get something practical within a few months, and I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them :-)
>
> Linus (torvalds@kruuna.helsinki.fi)
>
> PS. Yes - it's free of any minix code, and it has a multi-threaded fs. It is NOT portable (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-(
>
> — *Linus Torvalds*

source: Wikipedia

Linux

- In the mid-1990s started the adoption of Linux in production environments, rather than being used only by hobbyists. In particular it started to take off first in the **supercomputing** community, where organizations such as NASA started to replace their increasingly expensive machines with clusters of inexpensive commodity computers running Linux.
- Commercial use began when Dell and IBM, followed by Hewlett-Packard, started offering Linux support to escape Microsoft's monopoly in the desktop operating system market.
- Today, Linux systems are used throughout computing, from embedded systems to virtually all **supercomputers**, and have secured a place in the market of **internet servers**.
- Use of Linux distributions in home and enterprise **desktops** has been growing. Linux distributions have also become popular in the **netbook** market, with many devices shipping with customized Linux distributions installed.
- Linux's greatest success is the **mobile device** market, with **Android** being one of the most dominant operating systems on smartphones.
- Linux **gaming** is also on the rise with Valve showing its support for Linux and rolling out its own gaming oriented Linux distribution.
- Linux distributions have also gained popularity with various local and **national governments**, such as the federal government of **Brazil**.

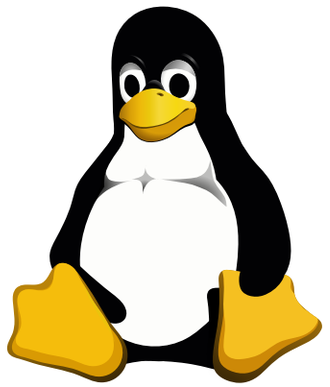
source: Wikipedia



Linux internal design

- Linux is a modular Unix-like operating system, deriving much of its basic design from Unix.
- It has a monolithic kernel, the Linux kernel, which handles process control, networking, access to the peripherals, and file systems.
- Device drivers are either integrated directly with the kernel, or added as modules that are loaded while the system is running.
- It also incorporates the C programming language library functions.
- The system also includes a popular Command Language Interface (CLI) “shell”, i.e. a text-commands based interface.
- The graphical user interface (GUI) used by most Linux systems is built on top of an implementation of the X Window System.
- Many other open-source software projects contribute in a “modular” way to Linux.

source: Wikipedia



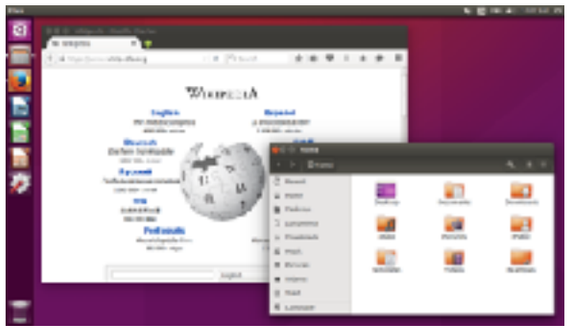
Linux appearance

- The user interface, also known as the shell, can be a **command-line interface** (CLI), or a **graphical user interface** (GUI).
- CLI shells are text-based user interfaces, which use text for both input and output. The dominant shell used in Linux is the Bourne-Again Shell (bash), originally developed for the GNU project. The CLI is particularly suited for automation of repetitive or delayed tasks, and provides very simple inter-process communication.

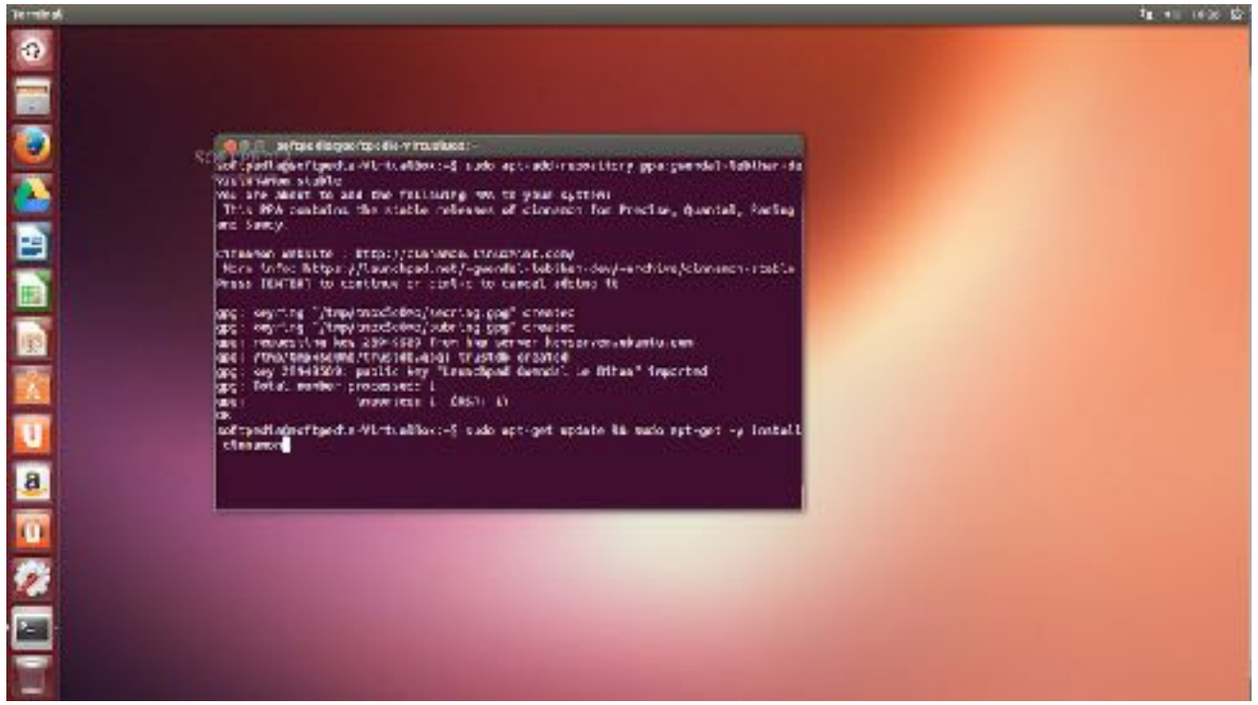
source: Wikipedia

Linux appearance

- For recent desktop systems, the default user interface is usually **graphical**, although the CLI is commonly available through terminal emulator windows or on a separate virtual console.
- The most popular graphical user interfaces, called also desktop environments, are KDE Plasma, GNOME, MATE, Cinnamon, Unity, LXDE, Pantheon and Xfce, though a variety of additional user interfaces exist.
- Most popular user interfaces are based on the X Window System, often simply called "X".
- Several types of window managers exist for X11.
- Window managers provide means to control the placement and appearance of individual application windows, and interact with the X Window System.



source: Wikipedia


sudo apt-add-repository ppa:gwendal-lebihan-dev
You are about to add the following PPA to your system:
This PPA contains the stable relase of cinnamon for Precise, Quantal, Raring and Saucy.
More info: https://launchpad.net/~gwendal-lebihan-dev/+archive/cinnamon-stable
Press [ENTER] to continue or ctrl-c to cancel adding it
gpg: keyring "/tmp/tmpcdcdmq/secring.gpg" created
gpg: keyring "/tmp/tmpcdcdmq/pubring.gpg" created
gpg: requesting key 2289E5B9 from hkp server keyserver.ubuntu.com
gpg: key 2289E5B9: public key "Launchpad Gwendal Le Bihan" imported
gpg: Total number processed: 1
gpg: imported: 1 (RSA: 1)
OK
sudo apt-get update && sudo apt-get -y install
cinnamon

cinnamon

Computer
Welcome Screen
All Applications
Accessories
Games
Graphics
Internet
Office
Programming
Sound & Video
Preferences
Administration
Places
Recent Files
LibreOffice
LibreOffice Calc
LibreOffice Draw
LibreOffice Impress
LibreOffice Math
LibreOffice Writer
Tutorials
Hardware database
Sponsors
Software Manager

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Activities
Wed 22:03
en
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X Window System
14 °C
Scattered clouds

Gnome

Files
12:07 AM
Wikipedia - Mozilla Firefox
Wikipedia
https://www.wikipedia.org
Search
WIKIPEDIA
English
The Free Encyclopedia
Español
Deutsch
Русский
Português
Home
Recent
Home
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Pictures
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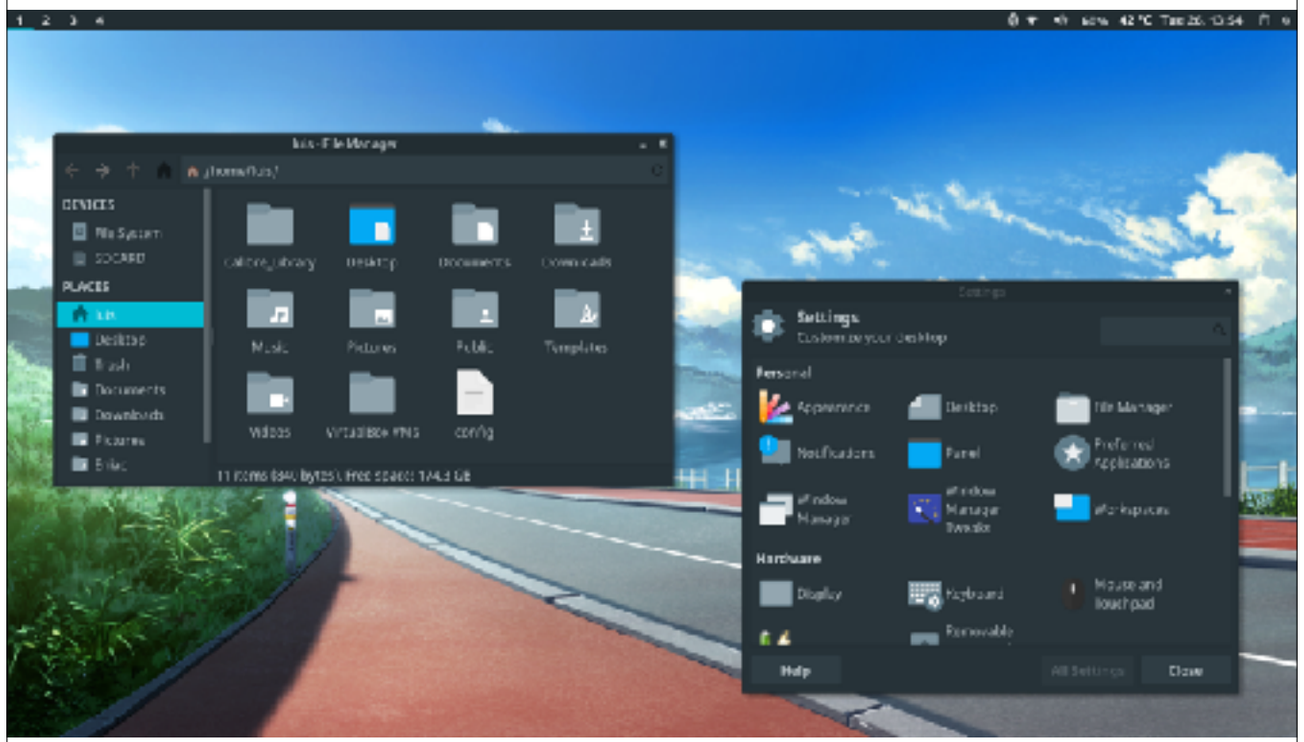
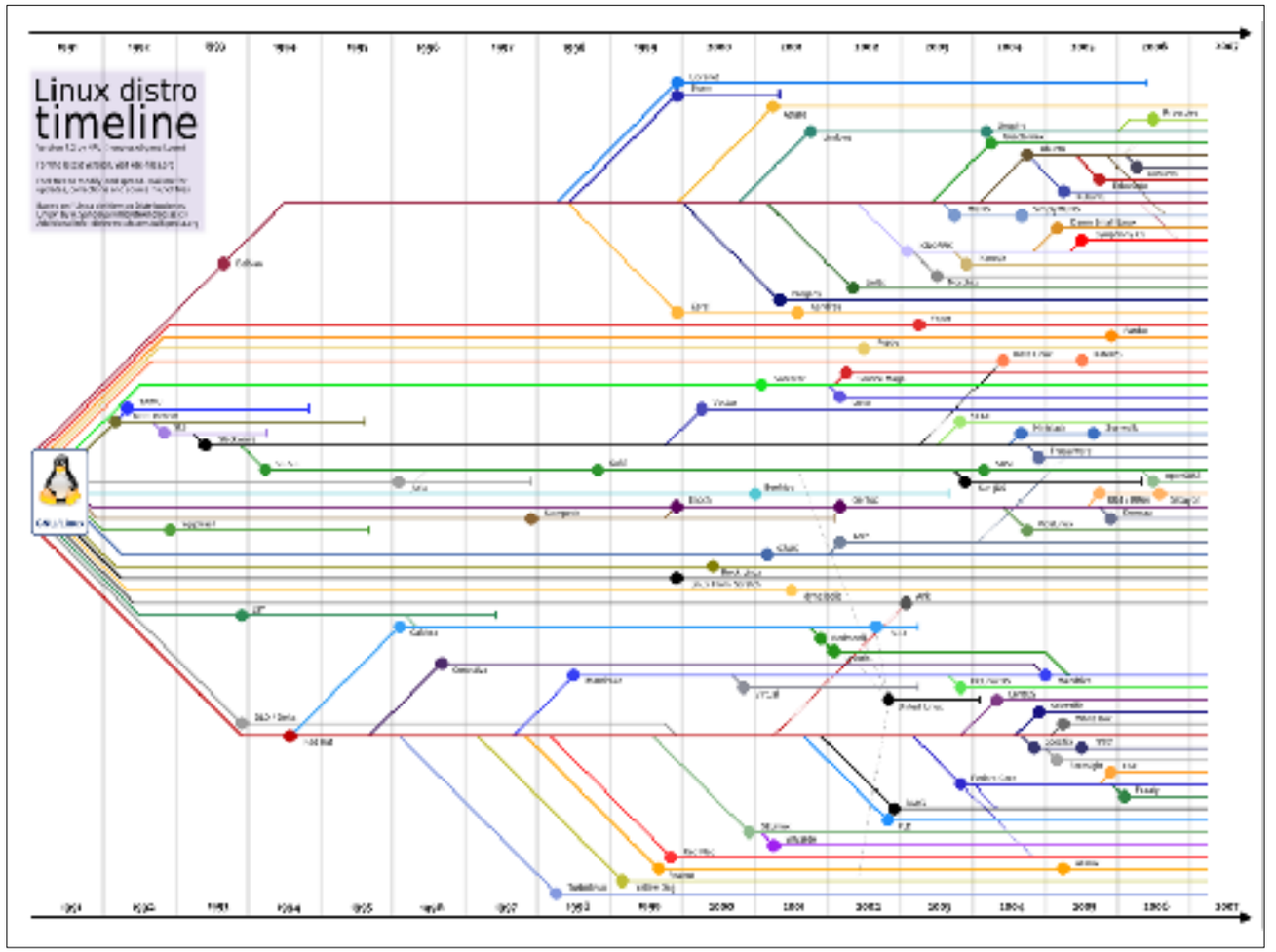
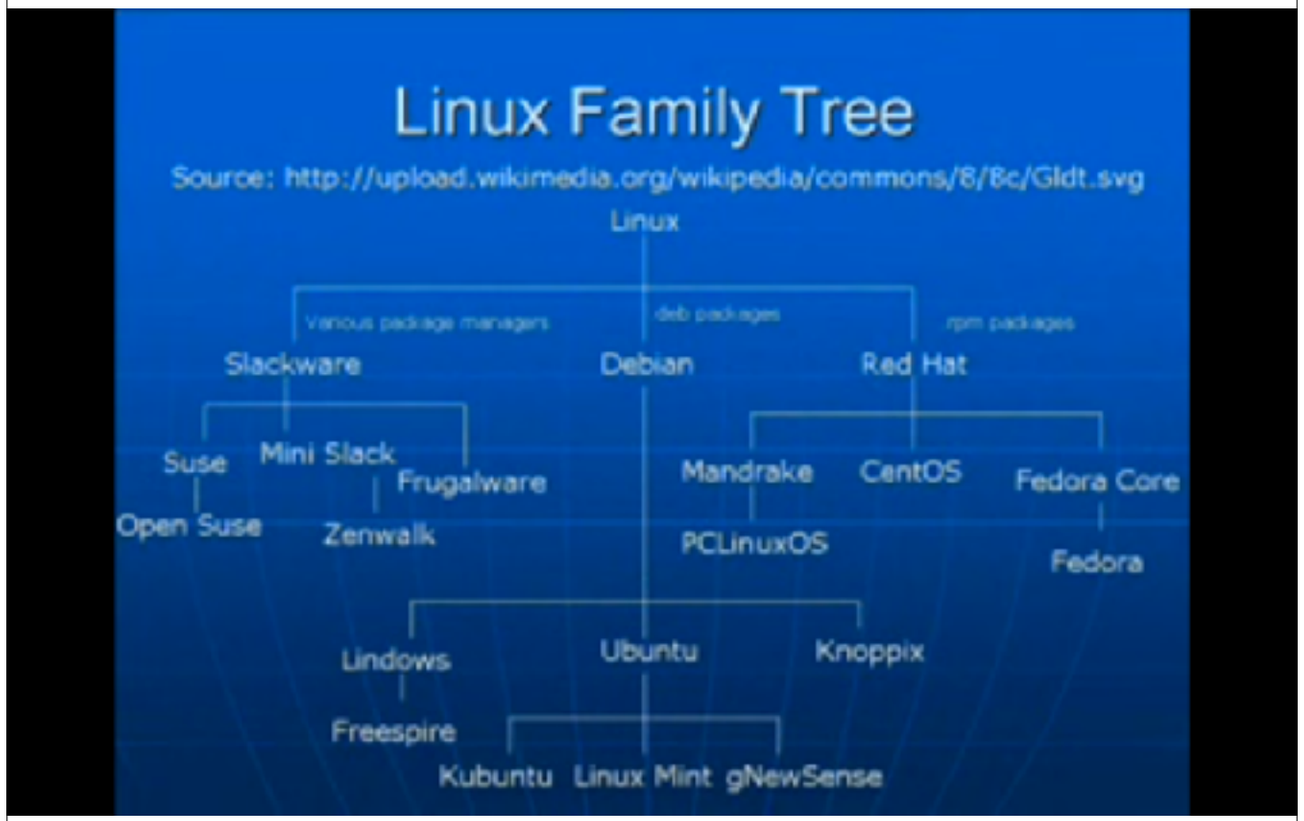
Templates
Videos
Examples

Ubuntu



XFCE


Linux distro
timeline


Linux Family Tree
Source: http://upload.wikimedia.org/wikipedia/commons/8/8c/Gldt.svg
Linux
Various package managers
deb packages
rpm packages
Slackware
Debian
Red Hat
Suse
Mini Slack
Frugalware
Mandrake
CentOS
Fedora Core
Open Suse
Zenwalk
PCLinuxOS
Fedora
Lindows
Ubuntu
Knoppix
Freespire
Kubuntu
Linux Mint
gNewSense

TIMELINE OF
25 YEARS OF LINUX
IT'S FOSS

Slackware

- Slackware is a Linux distribution created by Patrick Volkerding in 1993.
- Originally based on Softlanding Linux System, Slackware has been the basis for many other Linux distributions, most notably the first versions of SUSE Linux distributions, and is **the oldest distribution that is still maintained**.
- Slackware aims for design **stability** and **simplicity** and to be the most "Unix-like" Linux distribution. In contrast to most modern Linux distributions, Slackware provides **no graphical installation procedure** and no automatic dependency resolution of software packages. It uses plain text files and only a small set of shell scripts for configuration and administration. Without further modification it boots into a command-line interface environment.
- Because of its many conservative and simplistic features, Slackware is often considered to be **most suitable for advanced and technically inclined Linux users**.
- Slackware is available for the IA-32 and x86_64 architectures, with a port to the ARM architecture. While Slackware is mostly free and open source software, it does not have a formal bug tracking facility or public code repository, with releases periodically announced by Volkerding.
- There is no formal membership procedure for developers and Volkerding is the primary contributor to releases.

source: Wikipedia

slackware
linux

Debian

- Debian is a Unix-like operating system consisting entirely of **free software**. Ian Murdock started the Debian Project on August 16, 1993.
- Debian 0.01 was released on September 15, 1993, and the first stable version, 1.1, was released on June 17, 1996.
- The Debian stable branch is the **most popular edition for personal computers** and network servers, and is used as the basis for many other distributions.
- Debian is one of the **earliest** operating systems based on the Linux kernel. The project's work is carried out over the Internet by a team of volunteers guided by the Debian Project Leader and three foundational documents: the Debian Social Contract, the Debian Constitution, and the Debian Free Software Guidelines.
- Debian has been openly developed and freely distributed **according to the principles of the GNU Project** founded by Richard Stallman.
- This philosophy drew the support of the Free Software Foundation, which sponsored the project from November 1994 to November 1995.
- When the sponsorship ended, the Debian Project formed **Software in the Public Interest** to continue financially supporting development.

source: Wikipedia

debian

Red Hat

- Red Hat, Inc. is an American multinational software company providing open-source software products to the enterprise community. Founded in 1993, Red Hat has its corporate headquarters in Raleigh, North Carolina, with other offices worldwide.
- Red Hat has become associated to a large extent with its enterprise operating system Red Hat Enterprise Linux and with the acquisition of open-source enterprise middleware vendor JBoss. Red Hat also offers Red Hat Virtualization (RHV), an enterprise virtualization product. Red Hat provides storage, operating system platforms, middleware, applications, management products, and support, training, and consulting services.
- Red Hat creates, maintains, and contributes to many free software projects. It has acquired several proprietary software product codebases through corporate mergers and acquisitions and has released such software under open-source licenses. As of March 2016, Red Hat is the second largest corporate contributor to the Linux kernel version 4.14 after Intel.
- On October 28, 2018, **IBM** announced its intent to acquire Red Hat for $34 billion.

source: Wikipedia

Ubuntu

- Ubuntu is a free and open-source Linux distribution **based on Debian**. Ubuntu is officially released in three editions: Desktop, Server, and Core (for IoT devices and robots).
- Ubuntu is a popular operating system for cloud computing, with support for OpenStack.
- Ubuntu is released **every six months**, with long-term support (LTS) releases every two years. The latest release is 18.10 ("Cosmic Cuttlefish"), and the most recent long-term support release is 18.04 LTS ("Bionic Beaver"), which is supported until 2028.
- Ubuntu is developed by Canonical and the community under a **meritocratic governance model**. Canonical provides security updates and support for each Ubuntu release, starting from the release date and until the release reaches its designated end-of-life (EOL) date.
- Canonical **generates revenue** through the sale of **premium services** related to Ubuntu.
- Ubuntu is named after the **African philosophy** of ubuntu, which Canonical translates as "humanity to others" or "I am what I am because of who we all are".

source: Wikipedia

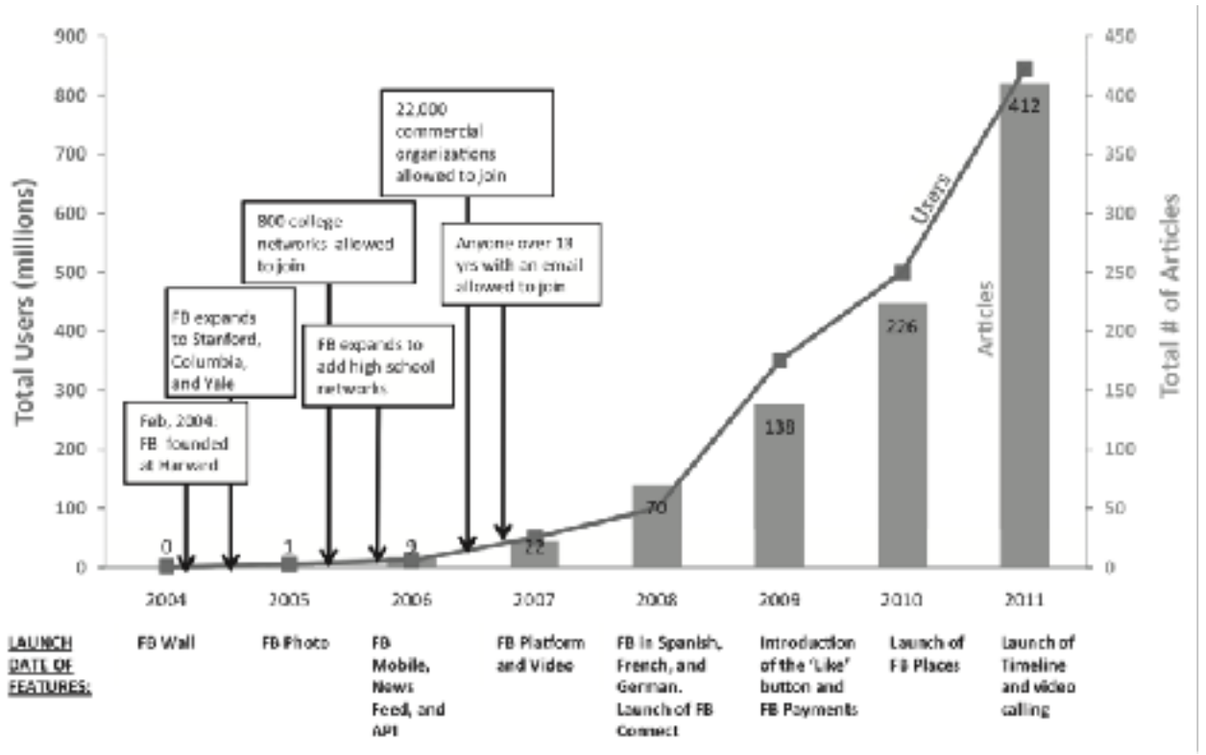
Social media

Facebook studies

- The social impact of social media is studied by a large community of scholars
- In the 2012 review article: “A Review of Facebook Research in the Social Sciences”, by Wilson et al., the authors group the over 400 articles they study in 5 categories:
  - descriptive analysis of users,
  - motivations for using Facebook,
  - identity presentation,
  - the role of Facebook in social interactions,
  - privacy and information disclosure

Descriptive analysis of users

Who is using Facebook, and what are users doing while on Facebook?



Wilson et al., “A Review of Facebook Research in the Social Sciences” (2012)

statistics

- 1.52 billion daily active users on Facebook on average for December 2018
- 2.32 billion monthly active users on Facebook as of December 31, 2018

(source: Facebook)

https://newsroom.fb.com/company-info/

Motivations for using Facebook

Why do people use Facebook?

Motivations for using Facebook

- external press
- internal motivations
- Minimizing loneliness
- relieve boredom

Wilson et al., “A Review of Facebook Research in the Social Sciences” (2012)

One subcategory emphasized the external press that encour- aged users to engage in Facebook-related behaviors, such as the features on the site like the birthday reminder or automatic e-mails sent by Facebook to users

However, the majority of articles fell into another subcategory, which focused on internal motivations for Facebook use, such as the need for social engagement

Together, these studies dem- onstrate that a complex relationship exists between differing types of user engagement and the consequent benefits gained from Facebook use. Future studies are needed to map the intri- cacies of this relationship and to unpack the psychological processes that drive them.

It is equally clear that researchers do not know exactly why Facebook has become so popular

Identity presentation

How are people presenting themselves on Facebook?

Identity presentation

- […] research has supported this finding, concluding that although some self-enhancement may occur, profile owners are generally portraying a fairly accurate representation of their offline identity (Waggoner, Smith, & Collins, 2009; Weisbuch, Ivcevic, & Ambady, 2009).
- Offline relationships tend to lead to Facebook Relationships, rather than the other way around.
- cuLtural norms may also influence how users portray themselves on Facebook.

Wilson et al., “A Review of Facebook Research in the Social Sciences” (2012)

Unlike many other social networking sites (e.g., Badoo, Habbo), offline relationships tend to lead to Facebook relationships, rather than the other way around (Lampe et al., 2006; Ross et al., 2009). Therefore, if an owner presented inaccurate or enhanced information on their Facebook profile, their online friends, who also know the user from offline con- texts, would realize that the user was not telling the truth

Assumptions about the perceived audience as well as cul- tural norms may also influence how users portray themselves on Facebook. One study showed that students in the United States were more inclined than German students to post inap- propriate content on Facebook (Karl, Peluchette, & Schlaegel, 2010a, 2010b), which parallels previous research on differing conventions between the two countries (Hofstede, 1991) and points to the influence of cultural norms on Facebook identity construction.

The role of Facebook in social interactions

How is Facebook affecting relationships among groups and individuals?

The role of Facebook in social interactions

- Relationships between companies and customers
- Student–faculty relation- ships
- Interactions between businesses and employees
- Tension across social spheres (overlapping social groups)

Wilson et al., “A Review of Facebook Research in the Social Sciences” (2012)

Privacy and information disclosure

Why are people disclosing personal information on Facebook despite potential risks?

Privacy and information disclosure

- Facebook administrators have the incen- tive to keep security and access controls weak by design in order to encourage information exchange and increase their company's value to advertisers.

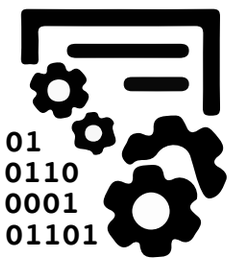
- Facebook has both a comprehensive privacy- protection architecture and significant privacy problems

- […] Awareness of privacy and security issues had increased, […] users' attitudes shifted toward greater privacy concern over time.

Wilson et al., "A Review of Facebook Research in the Social Sciences" (2012)

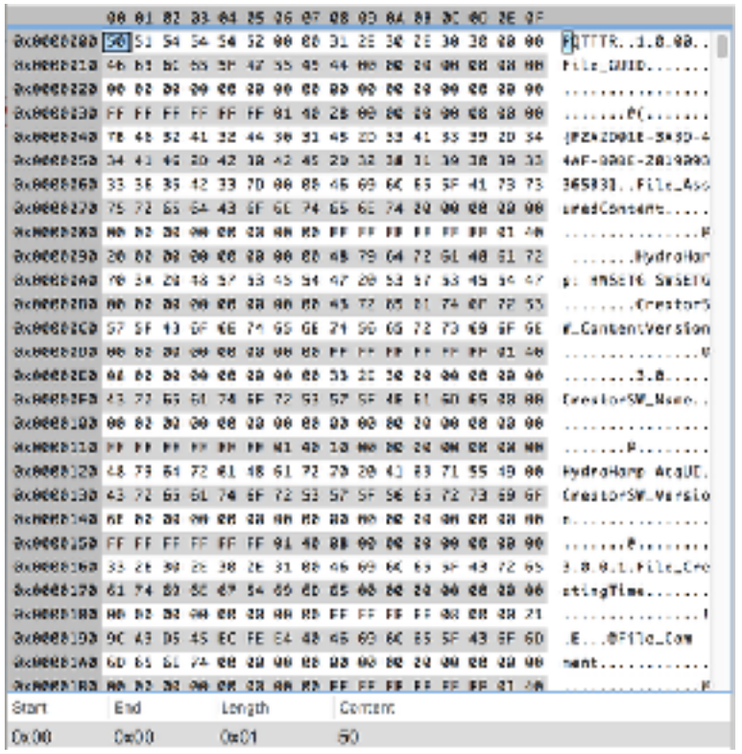
text files and
text encodings

Binary files



a file is a container of information. A “peace”, a part of information.
And it is stored somewhere.
Specially when the data is a big amount of data, we just use binary numbers, one after the other, to store these data.

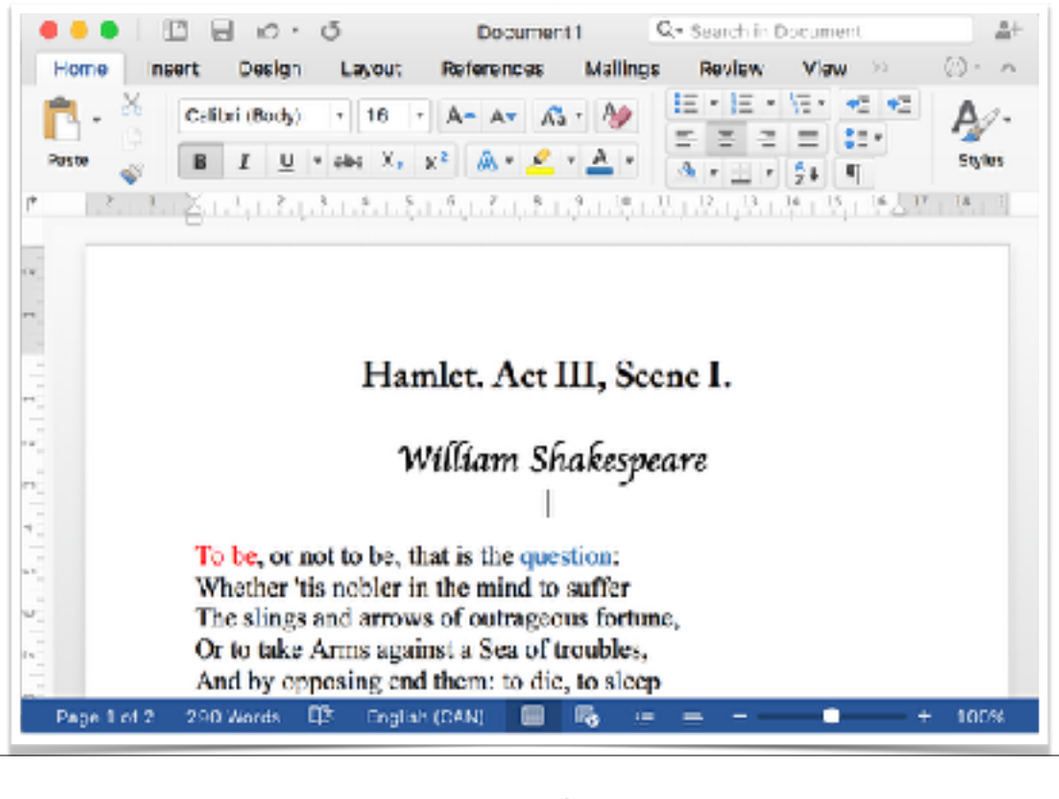
Edit (visualize) Binary files



Start	End	Length	Content
0x00	0x00	0x01	50

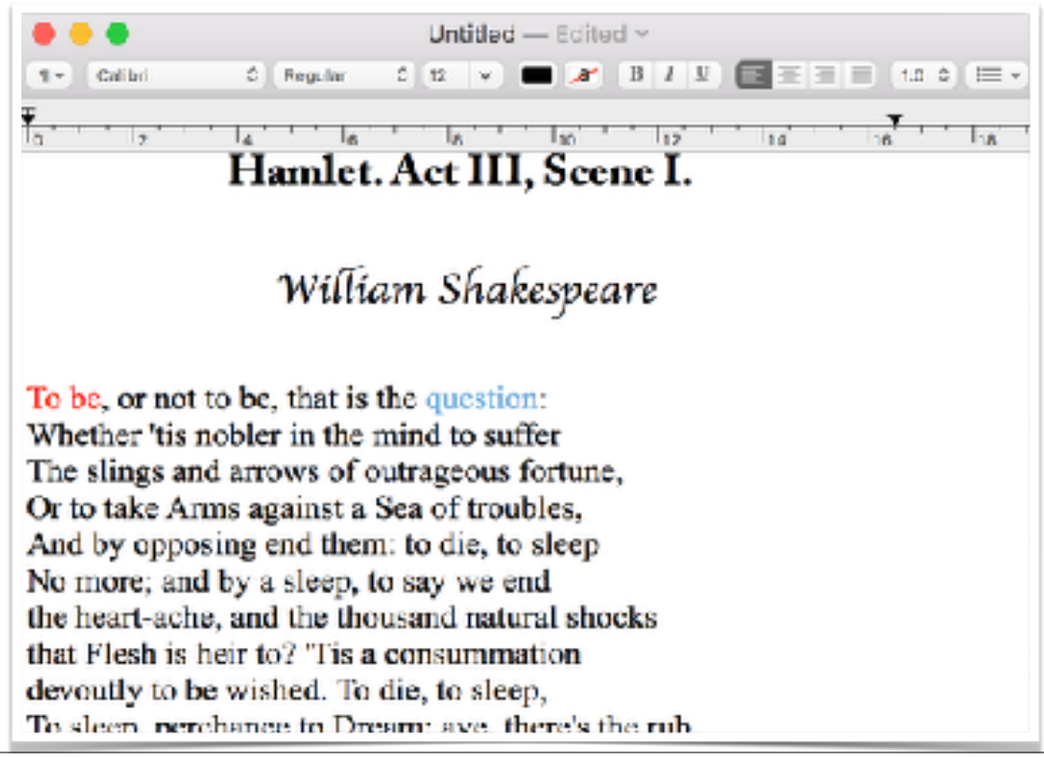
specially when the data is a big amount of data, we just use binary numbers, one after the other, to store these data.

text files



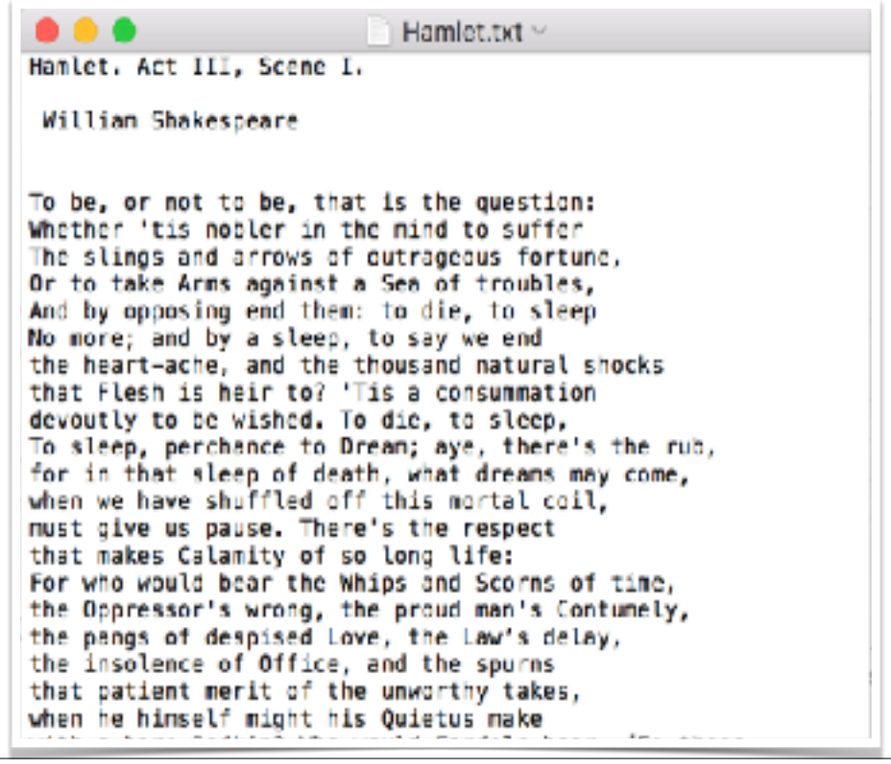
Talking about files, one of the **types of files** we can save in a computer is a **text file**.
This is a text file that I have created with **Microsoft Word**.
What do you see? (difference with plain text)

text files



This is another software, more simple.
What do you see? (difference with plain text)

text files



This is another software, more simple.
What do you see? (plain text)

ascii characters

American Standard Code for Information Interchange (ASCII)

010 0000	32	space	100 0001	65	A	110 0001	97	a
010 0001	33	!	100 0010	66	B	110 0010	98	b
010 0010	34	"	100 0011	67	C	110 0011	99	c
010 0011	35	#	100 0100	68	D	110 0100	100	d
010 0100	36	$	100 0101	69	E	110 0101	101	e
010 0101	37	%	100 0110	70	F	110 0110	102	f
010 0110	38	&	100 0111	71	G	110 0111	103	g
010 0111	39	'	100 1000	72	H	110 1000	104	h
010 1000	40	(	100 1001	73	I	110 1001	105	i
010 1001	41	)	100 1010	74	J	110 1010	106	j
010 1010	42	*	100 1011	75	K	110 1011	107	k
010 1011	43	+	100 1100	76	L	110 1100	108	l
010 1100	44	,	100 1101	77	M	110 1101	109	m
010 1101	45	-	100 1110	78	N	110 1110	110	n
010 1110	46	.	100 1111	79	O	110 1111	111	o
010 1111	47	/	101 0000	80	P	111 0000	112	p
011 0000	48	0	101 0001	81	Q	111 0001	113	q
011 0001	49	1	101 0010	82	R	111 0010	114	r
011 0010	50	2	101 0011	83	S	111 0011	115	s
011 0011	51	3	101 0100	84	T	111 0100	116	t
011 0100	52	4	101 0101	85	U	111 0101	117	u
011 0101	53	5	101 0110	86	V	111 0110	118	v
011 0110	54	6	101 0111	87	W	111 0111	119	w
011 0111	55	7	101 1000	88	X	111 1000	120	x
011 1000	56	8	101 1001	89	Y	111 1001	121	y
011 1001	57	9	101 1010	90	Z	111 1010	122	z

one of the first encodings (1963)
ASCII specifies a correspondence between digital bit patterns and character symbols

ascii encoding

- The best known and most widely used character encoding standard is the **American Standard Code for Information Interchange** (ASCII).
- The first version of ASCII was published in **1964** as a standard way of representing textual data in computer memory and sending it over communication links between computers.
- ASCII is based on a **seven-bit byte**. Each byte represented a character, and characters were represented by assigning them to individual binary numbers.

ascii encoding

what is the highest value that we can write with 7 binary digits?

$$\begin{array}{ccccccc} 2^6 & 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 \end{array}$$

$$\begin{array}{cccccccc} 2^7 & 2^6 & 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{array}$$

$$2^7 = 128$$

ascii encoding

- Perhaps the main deficiency in ASCII comes from the “A” in its name: **American**. ASCII is an American standard, and was designed for the storage and transmission of English text. 95 characters are sufficient for representing English text, barely, but that’s it. On early teletype machines, ASCII could also be used to represent the accented letters found in many European languages, but this capability disappeared in the transition from teletypes to **CRT terminals**.

Unicode

- Unicode is the latest of several attempts to solve this Tower of Babel problem by creating a universal character encoding.
- Its main way of doing this is to increase the size of the possible encoding space by **increasing the number of bits used to encode each character**.
- Most other character encodings are based upon an **eight-bit byte**, which provides enough space to encode a maximum of **256 characters** (in practice, most encodings reserve some of these values for control signals and encode fewer than 256 characters).

Unicode

- Unicode uses a 16-bit word to encode characters, allowing up to 65,536 characters to be encoded. 65,000 characters, with careful management, is enough to allow encoding of the vast majority of characters in the vast majority of written languages in use today.

- The current version of Unicode, version 3.2, actually encodes 95,156 different characters—it actually does use a scheme to represent the less-common characters using two 16-bit units, but with 50,212 characters actually encoded using only a single unit, you rarely encounter the two-unit characters. In fact, these 50,212 characters include all of the characters representable with all of the other character encoding methods that are in reasonably widespread use.

UTF-8

- UTF-8 is a variable width character encoding capable of encoding all 1,112,064 valid code points in **Unicode** using one to four 8-bit **bytes**.

- The name is derived from Unicode Transformation Format – 8-bit.

cyrillic

0410	А	0430	а
0411	Б	0431	б
0412	В	0432	в
0413	Г	0433	г
0414	Д	0434	д
0415	Е	0435	е
0416	Ж	0436	ж
0417	З	0437	з
0418	И	0438	и
0419	Й	0439	й
041A	К	043A	к
041B	Л	043B	л
041C	М	043C	м
041D	Н	043D	н
041E	О	043E	о
041F	П	043F	п
0420	Р	0440	р
0421	С	0441	с
0422	Т	0442	т
0423	У	0443	у
0424	Ф	0444	ф
0425	Х	0445	х
0426	Ц	0446	ц
0427	Ч	0447	ч
0428	Ш	0448	ш
0429	Щ	0449	щ
042A	Ъ	044A	ъ
042B	Ы	044B	ы
042C	Ь	044C	ь
042D	Э	044D	э
042E	Ю	044E	ю
042F	Я	044F	я