

# Module 5: Free Software

IT Exploration Training  
June 19-20-21-22, 2017  
By Eric V. Level

# Exploring These Questions...

- ① What is computer software?
- ② What is free computer software?
- ③ What are some examples?
- ④ Who uses it? Is it good?
- ⑤ Who writes this software?
- ⑥ Where can I get this software?
- ⑦ Any other free stuff?
- ⑧ Where can I learn more?



## ① What is Computer Software?

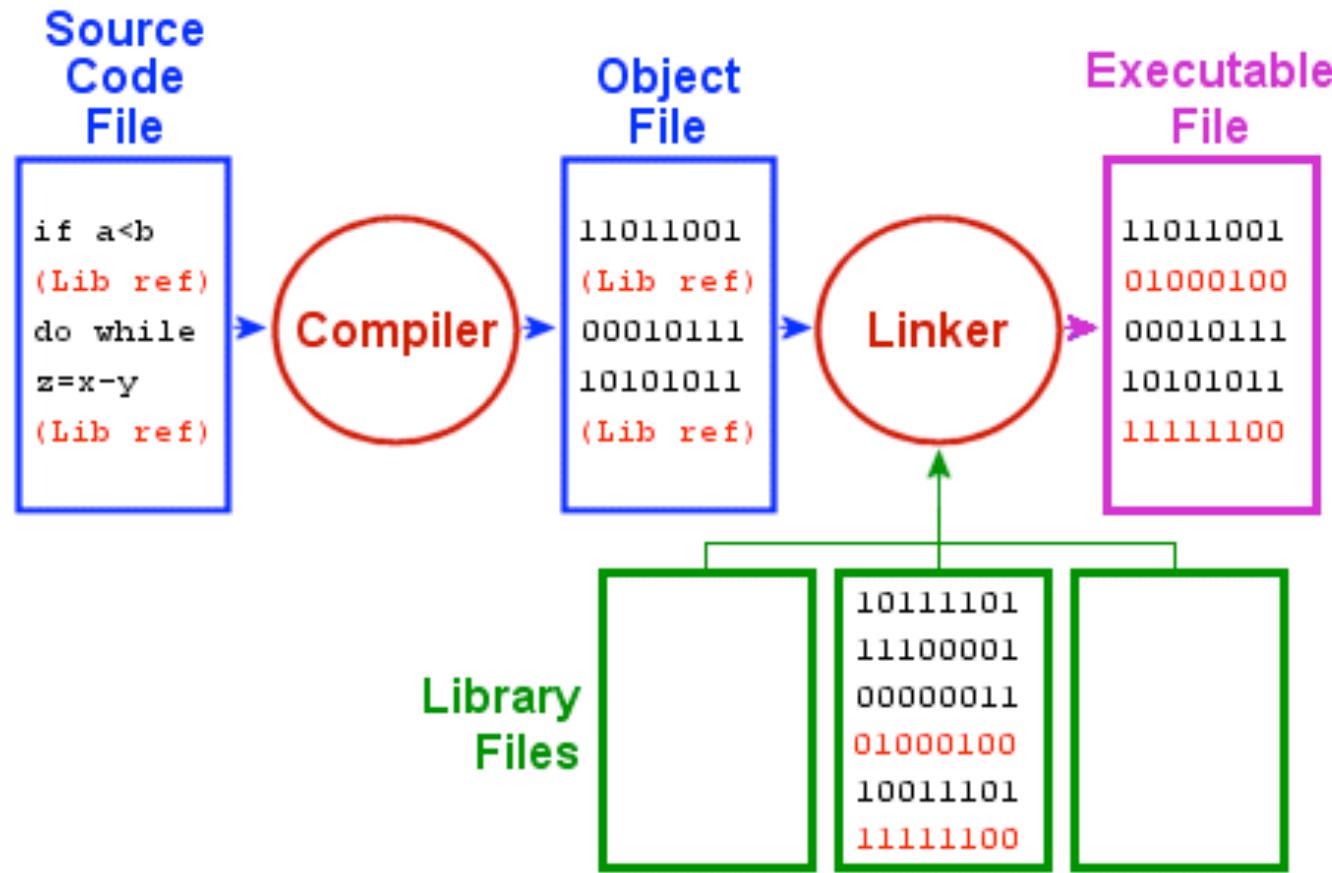
# Computer Software

- Computer software is written code that instructs computer hardware to perform tasks.
- Source code is written (mostly) by humans, using English-like programming languages.

```
while (true) { printf ("Hello."); }
```

# Turning Source into Executable Code

- This source code is then translated or compiled into machine code – the native language of the computer.
- Finally, the computer executes the program, by reading and translating its machine code into specific internal behavior.
- The computer thus carries out the computation intended when the source code was written.



# Compiling Source into Executable

# Facts about Computer Software

- It costs nearly nothing to make millions of copies of some software program – either source or executable.
- It costs nearly nothing to distribute these copies to anyone via the Web.
- Having the source, you can easily create machine code by compiling it.
- Having only the machine code, it is difficult to invert this process; that is, to recover the original source code by "reverse engineering."

# When Buying Computer Software...

- You get the executable or machine code, translated from the original source – but NO source code (it is "closed source").
- You get documentation – often electronic and on-line.
- You get a warranty of some sort that the software works as promised.
- But... you must first agree to a software license: the contract that specifies what you can and cannot do with your purchased software.



Standard Software Licensing:  
"You **Can't** Do This"

# What You Don't Get...

- The freedom to look at the Word source code: "open source."
- The freedom to make copies for installing on multiple computers.
- The freedom to give copies to others.
- The freedom to modify the source code for your own use.
- The freedom to do all of the above and get paid for your efforts – or to do it for no charge.



## ② What is **Free** Computer Software?

# Free Software

- Over the past 50 years, lots of free computer software has been written and distributed.
- Free software has different licensing rules versus the usual commercial stuff.
- Free software gives you more freedom than conventional licensed software.

# Beer vs. Speech?

- Some say that the "free" in "free software" is best defined as:

*'Free' as in 'free speech'; not as in 'free beer.'*

- Some prefer to use the term libre software, instead – since the French language does make this desired distinction:

*"Libre" means "free without legal consequences",  
"gratis" means "free without costs."*



Gratis Beer



Libre Speech

# Thus, Free Software...

- Costs nothing to acquire and use.
- Has different legal licensing restrictions – giving the user more (but not unlimited) freedoms.
- May allow access to its source code for study and modification...
- May allow the user to copy and redistribute the source code in both modified or unmodified forms – subject to a variety of conditions.

# The Costs of Free Software?

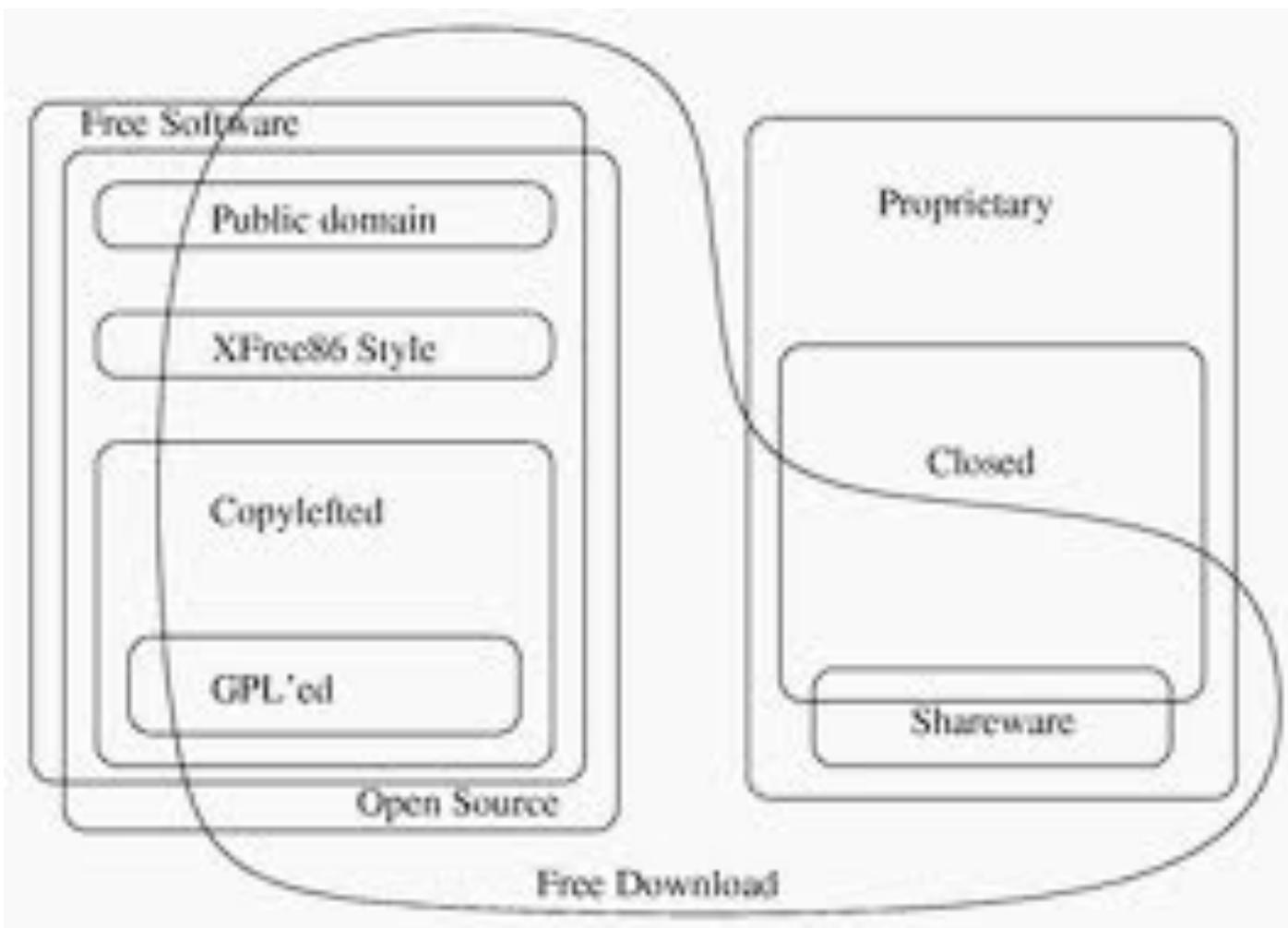
- Usually it is free to obtain the software, via downloads or getting it from others.
- However, fees may be charged for distribution (cost of CD/DVD).
- Thus, free software isn't always "free, as in free beer."

# Free Software Has Other Costs

- Installing, maintaining, and upgrading the software.
- Training and administering users.
- Time spent learning how to use it: ease-of-use costs.
- All of the above suggest the value of teaching students about free software.

# Free Software Licensing

- "Free" software includes many variations in licensing.
- Early free software licensing turned out to be too restrictive for some developers and end users.
- Alternatives emerged, with varying legal definitions.



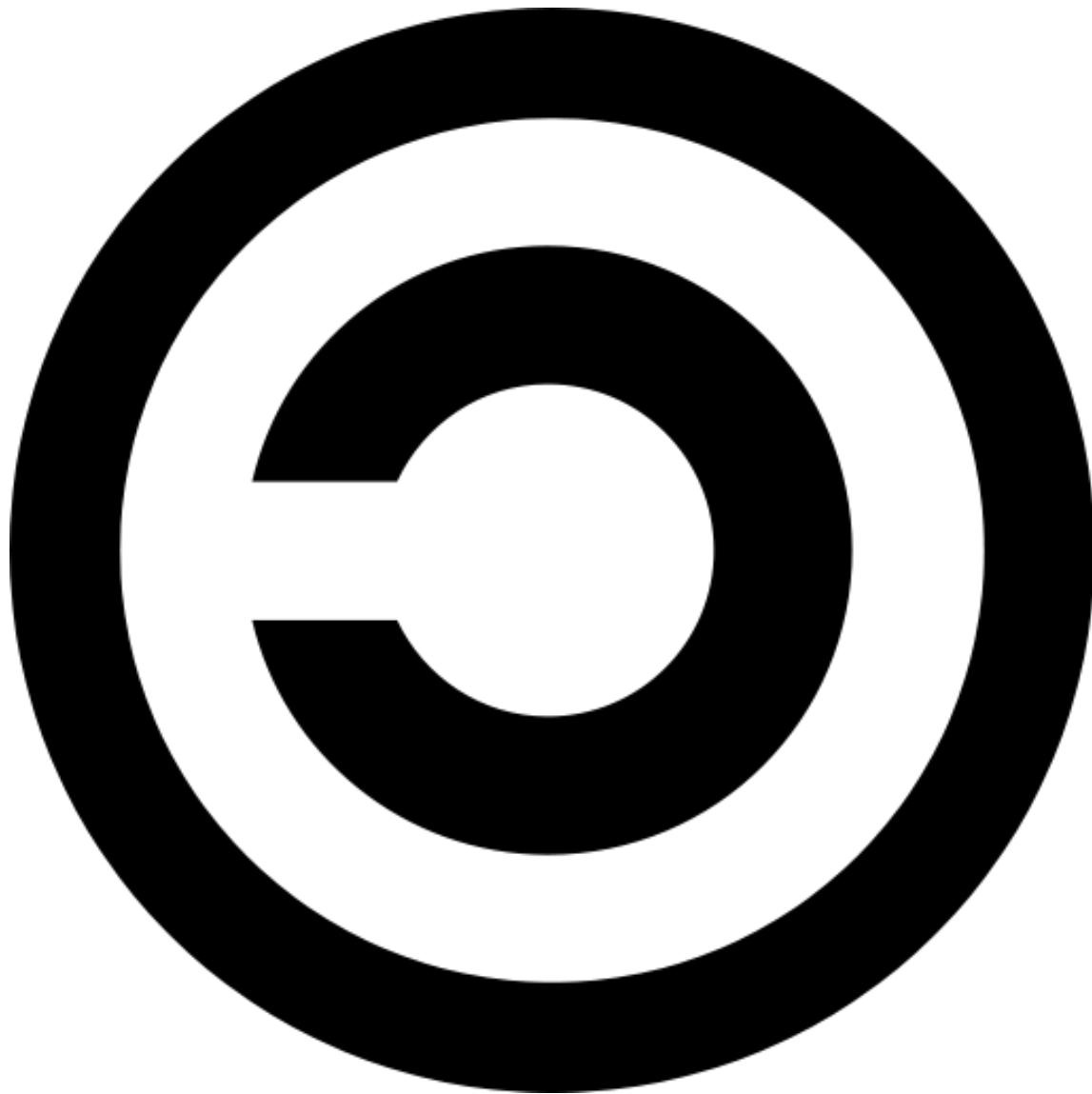
## Software Varieties

# Variety 1: Freeware

- Software that is free to download, install, and use
  - but other restrictions apply.
- Historically, this was the first variety.
- Software was free to acquire, bu usually copying not allowed.
- Early versions Unix OS (1970's) are an example – though far from the first.

# Variety 2: "Copyleft" Licensing

- The Free Software Foundation (FSF) was the earliest group (1985) to organize, promoting and enforcing "free software."
- Centered around legal concept of "copyleft" – which extends user rights, unlike copyright, which restrict them.
- Copyleft licenses give the rights to distribute copies and require the same rights to be preserved in modified versions of the work: "viral rights", since they propagate.



The Copyleft Logo

# Varieties 3 and Beyond: Variations

- Many "Open source" licenses involve more than just access to source code – with **\*many\*** variations.
- The Open Source Initiative provides a variety of different licensing options to interested developers.

<http://www.opensource.org>



open source  
initiative

OSI Logo

# OSI's Extra Requirements

- 1. Free Redistribution
- 2. Source Code
- 3. Derived Works
- 4. Integrity of The Author's Source Code
- 5. No Discrimination Against Persons or Groups
- 6. No Discrimination Against Fields of Endeavor
- 7. Distribution of License
- 8. License Must Not Be Specific to a Product
- 9. License Must Not Restrict Other Software
- 10. License Must Be Technology-Neutral



③ What are Some Examples?

# A Brief Survey

- Malwarebytes Antimalware: Malware detection & removal
- Mozilla and Firefox: Web browser
- GNU/Linux: Operating system and much more
- Apache Web Server: world's most popular
- Libre OpenOffice: MS Office-compatible suite

# Mozilla and Firefox

- Firefox is popular web browser (~20% market share)
- Started as code within original graphic web browser Mosaic, which morphed to Netscape.
- In the aftermath of the 1990's "browser wars" and Microsoft's victory, Netscape released source code to Mozilla Foundation.
- Mozilla oversees Firefox development, along with other open source projects.

# Firefox

- Constantly improved since 1999, making it an attractive browser option (20% market share).
- Also provides many excellent and free "add-ons": which extend Firefox by adding new browser features.
- **Activity:** run Firefox and install **Live HTTP Headers**. We'll run it together.
- **Activity:** Install **SQLite Manager**, which is a database inside Firefox that stores cookies. We'll see how it works in class.

Mozilla Firefox Web Browser — Get More From Your Firefox — Mobile, Add-ons & Other Stuff — mozilla.org

rowser — ...

www.mozilla.org/en-US/firefox/fx/?from=getfirefox

seSmart Diigolet nhcc ust linux mob mac screen Safari teaching Wiki-P WordsPlay News weather

DESKTOP MOBILE RELEASES ADD-ONS SUPPORT ABOUT mozilla

Your Firefox is up to date.  
Now get it on  
all your devices.

Find out how »



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Help refine and polish the  
newest features almost  
ready for prime time.

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Join the team

Volunteer with Firefox and help  
us build a brighter  
future for the Web.

Get involved »

Firefox

Browser — ...

www.mozilla.org/en-US/firefox/fx/?from=getfirefox

urSmart ① Diigolet nhcc lust linux mob mac screen Safari teaching Wiki-P WordSplay News weat

SQLite Manager - /Users/eric/Library/Application Support/Firefox/Profiles/4dsfje93.default/cookies.sqlite

cookies.sqlite

Master Table (1)  
Tables (1)  
moz\_cookies  
Views (0)  
Indexes (2)  
Triggers (0)

Structure Browse & Search Execute SQL DB Settings

Enter SQL

SELECT \* FROM moz\_cookies

Run SQL Actions Last Error: not an error

id	name	value	host	path	expiry	lastAcce...	isSecure	isHttpOnly
1	Apache	10.190.9...	www.pay...	/	2270002...	1335045...	0	0
4	omgb	0	www.wor...	/	1355458...	1335047...	0	0
10	PREF	ID=33ed...	.google.c...	/	1387042...	1335191...	0	0
14	RMID	3280aa5...	.nytimes....	/	1355521...	1335013...	0	0
18	PRID	9FFE69A...	.ads.poin...	/	1577836...	1335186...	0	0
19	PRbu	EtChSkdDL...	.pointroll...	/	1577836...	1335186...	0	0
30	v5	AStfNhwE...	.imrworld...	/cgi-bin	1387057...	1335187...	0	0
31	IMRID	Tuppllops...	.imrworld...	/cgi-bin	1387057...	1335187...	0	0
33	UID	3757f48...	.scorecar...	/	1386193...	1335190...	0	0
34	UIDR	1323985...	.scorecar...	/	1386193...	1335190...	0	0
51	UID	4b67e3a...	.voicefive...	/	1386193...	1335187...	0	0
52	UIDR	1323985...	.voicefive...	/	1386193...	1335187...	0	0
53	obuid	1e37898...	.outbrain...	/	1355089...	1335063...	0	0
59	nyt-nofb	0	.nytimes....	/	1355521...	1335013...	0	0
67	NETID01	3bdb1ea...	.revsci.net	/	2333137...	1335185...	0	0
95	mc	4eea69b...	.quantser...	/	1481838...	1335190...	0	0
109	tribanalyt...	614e8d8...	www.lati...	/	1639345...	1334663...	0	0
137	s_vi	[CS]v1 27...	.trb.com	/	1481665...	1334663...	0	0
181	cli	1246770...	.collectiv...	/	1387057...	1335185...	0	0
195	ui	03fd189...	.legolas=...	/	1418593...	1335118...	0	0
227	_switchT...	69	.latimes.c...	/	1349905...	1334663...	0	0
229	AA002	1323985...	.atdmt.com	/	1386979...	1335187...	0	0
246	uid	c9e557d...	.invite...	/	1355521...	1335185...	0	0
252	bkp1		.bluekai.c...	/	1339537...	1335186...	0	0
254	bku	F9G99Wh...	.bluekai.c...	/	1339537...	1335186...	0	0
259	B	9gbc5il7...	.yahoo.com	/	1387137...	1335118...	0	0
281	_stid	CsRLj07q...	.sharethi...	/	1355521...	1335113...	0	0
319	_gads	ID=fcf63...	.startribu...	/	1387080...	1335063...	0	0

SQLite 3.7.7.1 Gecko 11.0 0.7.7 Exclusive Number of Rows Returned: 3129

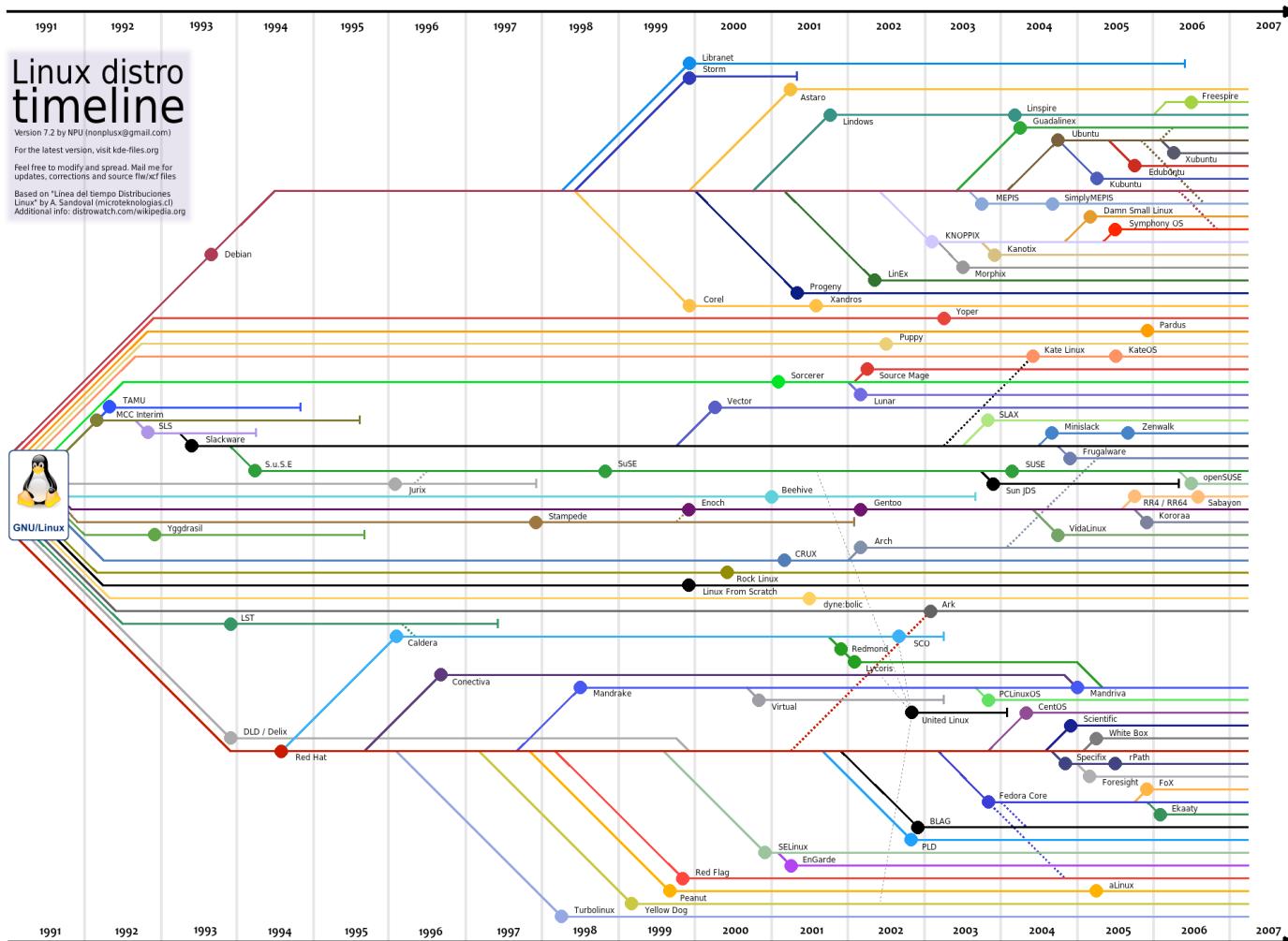
SQLite Manager: Firefox Add-on

# GNU/Linux

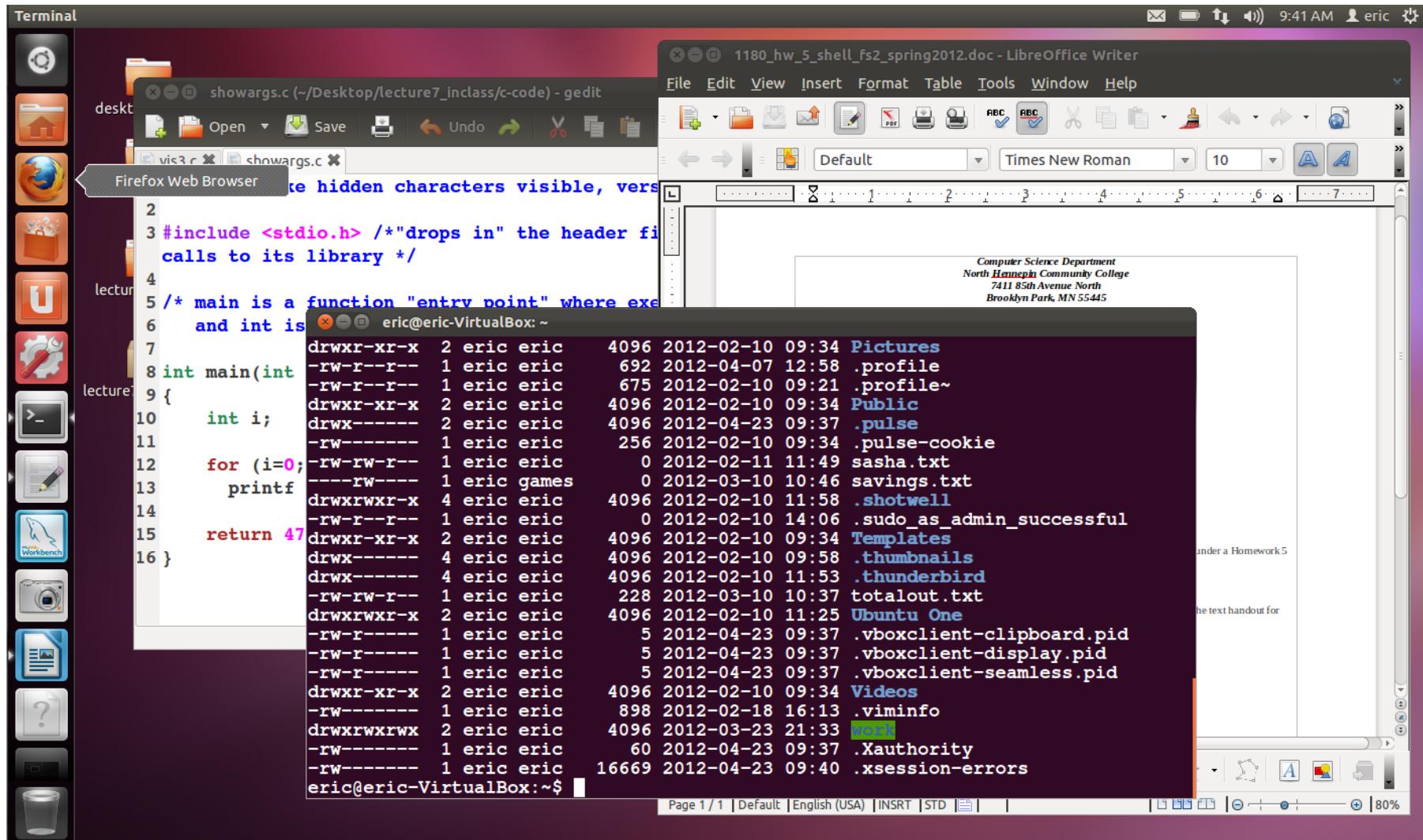
- Linus Torvalds wrote earliest versions of Unix-like OS in 1991, later dubbed "Linux."
- He invited participation of others, and enabled much open contribution.
- Used GNU's tools to write Linux source – so some (esp RSM) call it "GNU/Linux"
- Usage took off in early 1990's.

# Linux Distros

- Freedom to alter and distribute: many different Linux distributions or "distros."
- All built on same Linux "core" – called the kernel.
- One of the most popular is Ubuntu Linux, due to its ease of use and installation by non-expert computer users.



# Linux Distro Timeline



# Ubuntu Linux Desktop

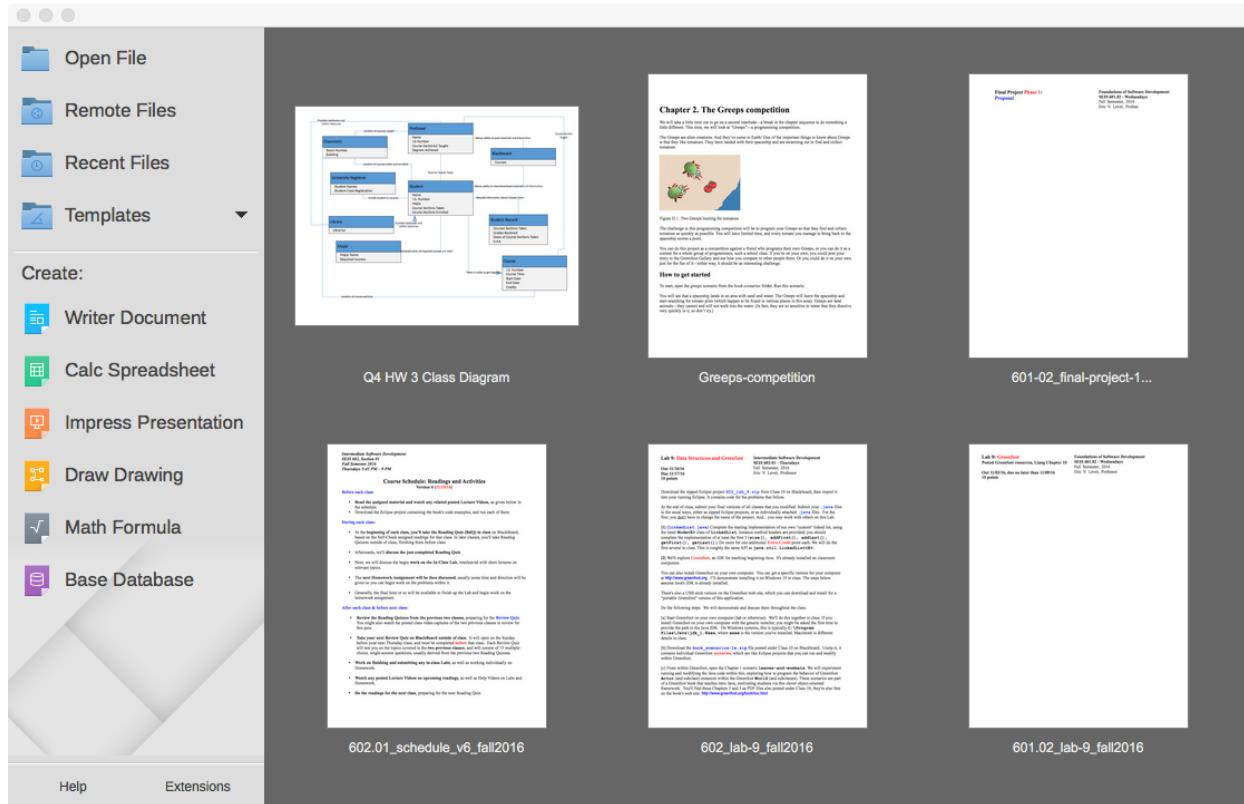
# Apache Web Server

- Born from IBM-donated source code in 1995 (worth \$50M?).
- Grew in popularity along with the Web.
- Very fast, very bug-free, very flexible.
- Can run on any computer, but best on Linux.
- Currently about 40% of all active web servers, worldwide.

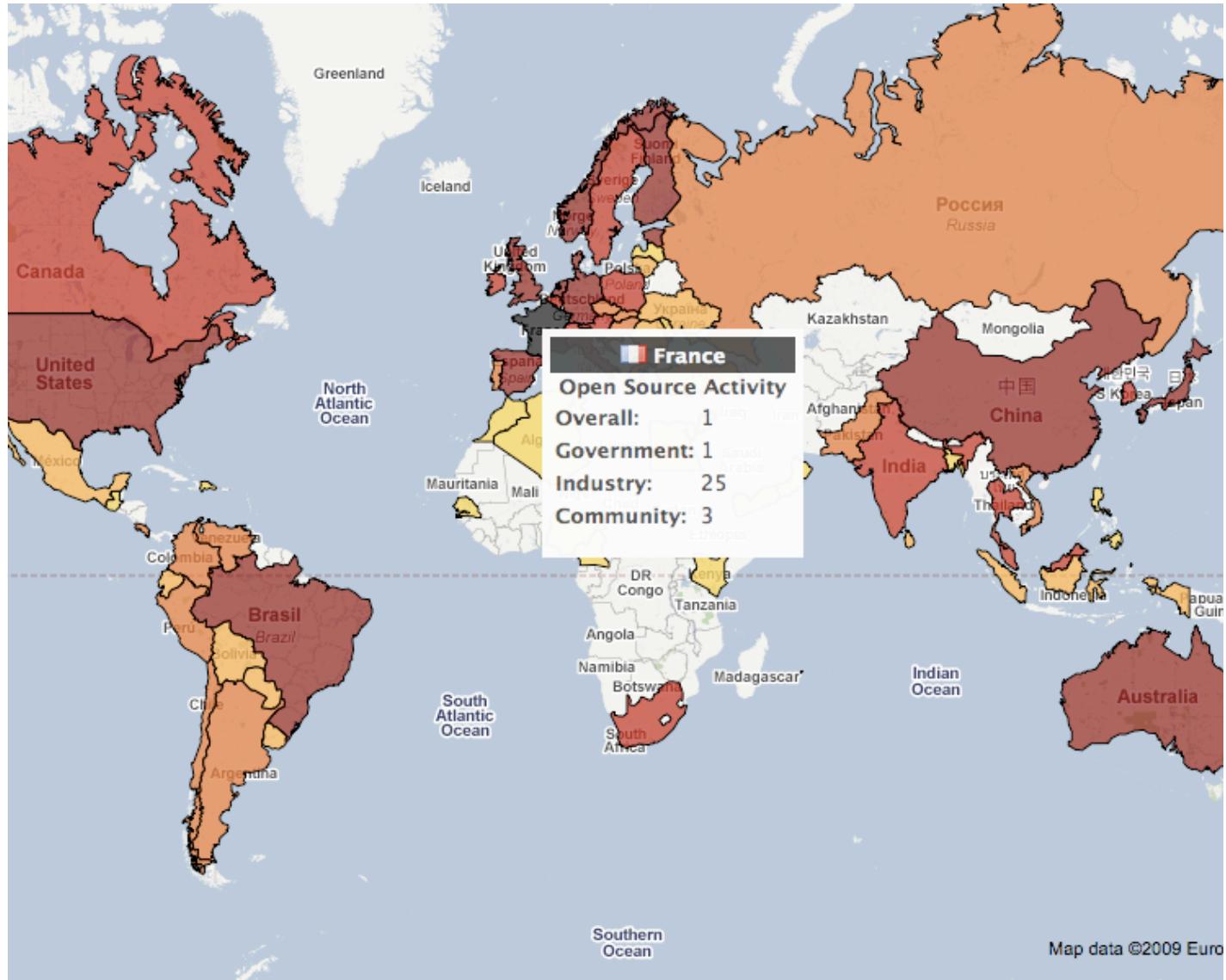
# LibreOffice

- A complete suite of business productivity applications: word processor, spreadsheet, drawing program, presentation slides editor, database.
- Microsoft Office compatible!
- Started as Sun Microsystems product, then released to open source in 2000.
- Oracle acquired Sun in 2010, then released it to Apache for hosting and development.
- Because of open source community's concern about the long-term prospects of the project, it was **forked** or "cloned" in 2010, with development continuing by the LibreOffice open source developers.
- Most Linux distros automatically include LibreOffice, this variant of OpenOffice.

# LibreOffice Download Page



## Opening a LibreOffice Document



④

Who Uses It? Is It Good?

# ④ Is It Any Good? Who Uses It?

- Some is better than others – but many, many people and institutions use it.
- US Department of Defense: SELinux
  - Security Enhanced Linux
- Many other US government and state agencies
- Peru uses it, because of lower costs for poorer citizens.
- Many, many others...

# Why Choose Open Source?

- Wikipedia says:
- "The debate over *open source* vs. *closed source* (alternatively called proprietary software) is sometimes heated."
- "The top four reasons ... individuals or organizations choose open-source software are:
  - 1) lower cost,
  - 2) security,
  - 3) no vendor 'lock in', and
  - 4) better quality.

# Companies Use Free Software

- Commercial businesses (who often package it with their for-\$ products)
  - IBM
  - Microsoft
  - Oracle
  - Apple
  - Google
- And all of the above create and distribute open source – to some degree or another.

# Individuals Use Free Software

- Because it's free.
- Because they can't what they need anywhere else.
- Because they are curious as to how it works.
- And it helps them improve their computer skills.



## ⑤ Who Writes this Software?

# Free Software Isn't New

- People have been sharing software since the earliest days of computing.
- IBM even distributed source code for its 1950's mainframes.
- But as people realized the value of software, more and more restrictions emerged.



Ken Thompson and Dennis Ritchie

# Ken and Dennis's Excellent Adventure: Unix and C

- Ken Thompson wrote the first version of Unix in late 1969 – at Bell Labs.
- Dennis Ritchie convinced him to rewrite it in his new language C a few years later.
- Magic! The combination clicked, and this new OS gained in popularity.

# Running Unix in the 1970's

- Unix first was used internally in Bell Labs for document processing.
- Ken provided the Unix source code to others in academic or government orgs at \$100 cost: early open source.
- A generation of grad students grew up Unix and C.
- They had open access to the inner workings of this \*really\* good operating system and \*really\* good programming language, including...



Richard M. Stallman

# What Richard Did...

- PhD from Harvard, and worked at MIT in late 1970's, writing lots of software.
- Left in early 1980's, upset with how software was being "commercialized."
- Founded GNU (Gnu's Not Unix) in 1983: an effort to create a free Unix-like Operating System (OS).

# GNU Hurd

- The original goal of GNU was to create a free Unix-like kernel called **GNU Hurd**.
- An operating system kernel is the "core code" of the operating system.
- However, the approach that was tried (called "microkernel architecture" proved too difficult.
- Meanwhile, someone else was developing another Unix-like kernel...



Linus Torvalds

# What Linus Did...

- Linus Torvalds created a simpler OS kernel, starting in 1991: Linux.
- Linus' management style and development approach helped Linux to become very popular, very quickly.
- GNU tools were introduced early in the Linux kernel development, and used ever since.

# Linus' Laws of Open Source

- Users should be treated as co-developers: let users help debug the code.
- Release early and often: get new versions out as quickly as possible.
- Several versions: always have a stable version of some project available, along with a new, experimental versions.
- Use a dynamic decision making structure for deciding how to develop a project.

# Big Companies are Contributors

- Big companies have also contributed to free software.
- IBM provides Linux as an OS option on all of their computers, and has contributed its code to open source.
- Microsoft, Facebook, and Google have all contributed code to open source efforts.
- But perhaps the most interesting player is....



About Google Products

## Web



### Web Search

Search billions of web pages



### iGoogle

Add news, games and more to your Google homepage



### Bookmarks

Access your bookmarks and starred items



### Chrome

A browser built for speed, simplicity and security



### Toolbar

Add a search box to your browser

## Mobile



### Mobile

Get Google products on your mobile phone



### Maps for mobile

View maps, your location and get directions on your phone



### Search for mobile

Search Google wherever you are

## Media



### YouTube

Watch, upload and share videos



### Google Play

Your music, movies, books, and Android apps available anywhere



### Books

Search the full text of books



### Image Search

Search for images on the web



### News

Search thousands of news stories



### Video Search

Search for videos on the web



### Picasa

Find, edit and share your photos



### Picnik

Fast, easy and fun photo-editing

Some Google Stuff



Community of Open Source Developers

# Millions of Contributors

- Many people from around the world have contributed to open source projects.
- This "Open Source Community" has been essential in supporting both Richard and Linus's efforts.
- See Slashdot (a developer "social site") for examples of this community's culture and concerns: <http://slashdot.org>

Open source is good for me. I will fully embrace it.  
Open source is good for me. I will fully embrace it.  
Open source is good for me. I will fully embrace it.  
Open source is good for me. I will fully embrace it.  
Open source is good for me. I will fully embrace it.  
Open source is good for me. I will fully embrace it.



## ⑥ Where Can I Get This Software?

# Starting Points

- Ask your computer-savvy friends!
- Search the web.
  - But **be careful**: some malware sites masquerade as legitimate free software sites.
- Here are a few places to start.

# SourceForge

- A big repository of open-source projects, for both producers (developers) and consumers (you):  
<http://sourceforge.net>
- Includes apps for Windows, Macintosh, Linux, iPhone, and Android platforms
- Not everything is of uniform quality – so look for site recommendations and "Staff Picks"
- A specialized "sub-site" deals with Windows software:  
[osswin.sourceforge.net](http://osswin.sourceforge.net)

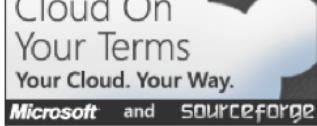
# sourceforge.net's Home Page

SOURCEFORGE [Browse](#) [Blog](#) [Support](#) [Jobs](#) [Newsletters](#) [Resources](#) [Register](#) [Log In](#)

## Find, Create, and Publish Open Source software for free

Search from thousands of software titles

TODAY:  4,230,217 DOWNLOADS  4,069 CODE COMMITS  2,423 FORUM POSTS  524 BUGS TRACKED  MORE DETAILS

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+ more Mainframe Programmer Analyst  
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**Project of the Month**

**Elastix**  Elastix is an appliance software that integrates the best tools available for Asterisk-based PBXs into a easy-to-use interface. It also adds its own set of utilities to make it the best software package available for open source telephony. [Read more.](#)  **Download** Elastix-2.3.0-i...iso

**Clam AntiVirus**  The free cross-platform antivirus software tool-kit always up to date  **Download** clamav-0.97.4.tar.gz

# GitHub

- GitHub (<https://github.com>) is a site with a massive number of repositories.
- A repository is a collection of files, available for download by using a URL like this:  
[https://github.com/moxie47/module\\_5.git](https://github.com/moxie47/module_5.git)
- Many open source projects are hosted on **GitHub**, with contributions from developers from around the world.
- The command line tool **Git** (developed by Linus Torvalds in 2006) is a distributed version control system, allowing coordination among many users.
- Download and install Git on your own PC:  
<https://git-scm.com/>



## ⑦ Any Other Free Stuff ?

# The Spread of Free Content

- "Free Software" has spawned a cultural movement.
- The idea of sharing content freely with others has influenced domains such as books, music, videos, and even college courses!
- Here are a few examples...

# Free Tutorial Videos

- YouTube (a Google subsidiary) has \*many\* tutorial videos, on almost any subject.
- Many of these have been created by the Khan Academy, started by A. Khan.
- The Academy has created over 3000 tutorials covering many subjects.
- <http://www.khanacademy.org/>

# Free Textbooks

- The "Open Textbook" movement is part of the trend towards use of open content in education.
- A list of sites is at:
  - <https://www.lifewire.com/free-textbooks-online-3482755>

# Free Educational Material

- Many colleges and universities are putting their materials their courses online.
- Some of this material is free, and even enrollment in the courses can be free.
- The MIT OpenCourseWare Project is an example, with material from > 2000 courses available:

<http://ocw.mit.edu/index.htm>

# More Free Education

- Coursera is a private, for-profit educational organization, which has plans to offer free college courses.
- It has full video lectures and materials development by professors from Stanford, Princeton, U Penn, and U Michigan.

<http://www.coursera.org>

# And Still More...

- Udacity is a private institution of higher education, offering free online computer science classes to everyone.
- Founded and funded by Stanford professor Sebastian Thrun and others.

<http://www.udacity.com/>



learning more

## ⑧ Where Can I **Learn More?**

# Some More Resources

- Wikipedia (another "open source"-inspired project) has good coverage of popular free software. Use it to look up specific projects:

<http://en.wikipedia.org/>

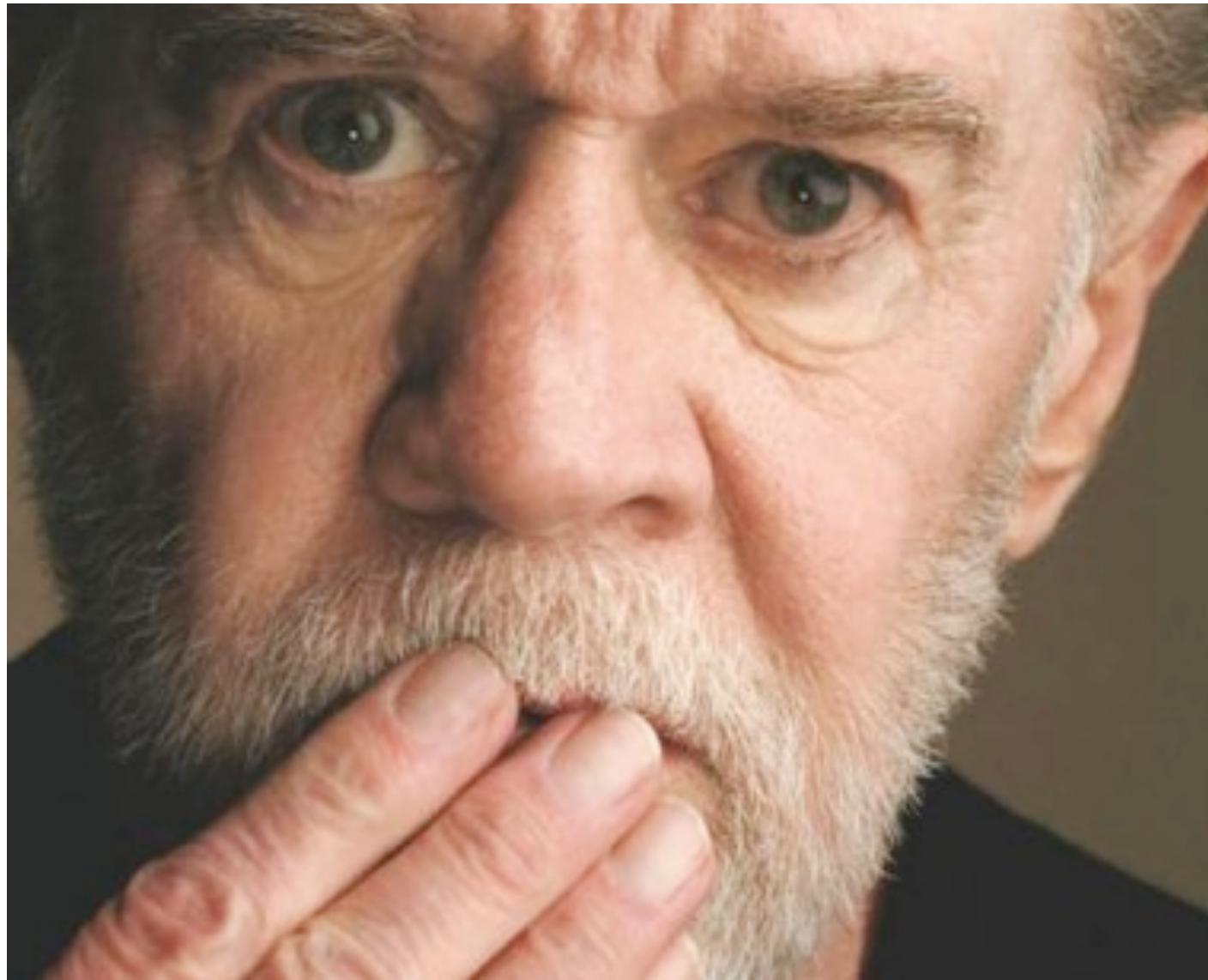
- YouTube has many videos discussing specific open source tools and other free software (search for it):

<http://youtube.com>

# And a Few More...

- Slashdot is a good place to read about open source culture, news, and other projects:  
<http://www.slashdot.com>
- Stack Overflow is a online community of programmers, helping to answer all sorts of questions about software and programming.

<https://stackoverflow.com/>



Any Questions ???

# USB Key Activity

- We'll show how to use the provided 16GB USB stick ("key").
- It contains **Portable Apps**, allowing you to run many different free programs without installing them on a PC.
- You can also boot your PC into **Ubuntu Linux**, running this operating system
  - Be careful! DO NOT INSTALL Linux on your PC unless you want to.