

Free and Open Source Software

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SSC TheAlternative | ETHZ and UZH

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Free

100 % unrelated to price:

- ▶ German: “frei”
- ▶ French: “libre”
- ▶ Italian: “libero”
- ▶ Romansh: “liber”

Open Source

Source code example:

```
#include <stdio.h>
#define N 10 //Larger N for slower learners

int main()
{
    int i;

    puts("Repeat after me:");

    for (i = 0; i < N; i++)
    {
        puts("FOSS is also great for non-programmers!");
    }

    return 0;
}
```

Software

Binary file hexadecimal view:

```
[...]  
00001660 43 00 5f 5f 69 6e 69 74 5f 61 72 72 61 79 5f 73 |C.__init_array_s|  
00001670 74 61 72 74 00 5f 47 4c 4f 42 41 4c 5f 4f 46 46 |tart._GLOBAL_OFF|  
00001680 53 45 54 5f 54 41 42 4c 45 5f 00 5f 5f 6c 69 62 |SET_TABLE.__lib|  
00001690 63 5f 63 73 75 5f 66 69 6e 69 00 5f 49 54 4d 5f |c_csu_fini._ITM_|  
000016a0 64 65 72 65 67 69 73 74 65 72 54 4d 43 6c 6f 6e |deregisterTMClon|  
000016b0 65 54 61 62 6c 65 00 64 61 74 61 5f 73 74 61 72 |eTable.data_star|  
000016c0 74 00 70 75 74 73 40 40 47 4c 49 42 43 5f 32 2e |t.puts@@GLIBC_2.|  
000016d0 32 2e 35 00 5f 65 64 61 74 61 00 5f 66 69 6e 69 |2.5._edata._fini|  
000016e0 00 5f 5f 6c 69 62 63 5f 73 74 61 72 74 5f 6d 61 |._.libc_start_ma|  
000016f0 69 6e 40 40 47 4c 49 42 43 5f 32 2e 32 2e 35 00 |in@@GLIBC_2.2.5.|  
00001700 5f 5f 64 61 74 61 5f 73 74 61 72 74 00 5f 5f 67 |__data_start.__g|  
00001710 6d 6f 6e 5f 73 74 61 72 74 5f 5f 00 5f 5f 64 73 |mon_start____ds|  
00001720 6f 5f 68 61 6e 64 6c 65 00 5f 49 4f 5f 73 74 64 |o_handle._IO_std|  
00001730 69 6e 5f 75 73 65 64 00 5f 5f 6c 69 62 63 5f 63 |in_used.__libc_c|  
00001740 73 75 5f 69 6e 69 74 00 5f 65 6e 64 00 5f 73 74 |su_init._end._st|  
00001750 61 72 74 00 5f 5f 62 73 73 5f 73 74 61 72 74 00 |art.__bss_start.|  
00001760 6d 61 69 6e 00 5f 4a 76 5f 52 65 67 69 73 74 65 |main._Jv_Registe|  
00001770 72 43 6c 61 73 73 65 73 00 5f 5f 54 4d 43 5f 45 |rClasses.__TMC_E|  
00001780 4e 44 5f 5f 00 5f 49 54 4d 5f 72 65 67 69 73 74 |ND__._ITM_regist|  
00001790 65 72 54 4d 43 6c 6f 6e 65 54 61 62 6c 65 00 5f |erTMCloneTable._|  
000017a0 69 6e 69 74 00 00 00 00 00 00 00 00 00 00 00 00 |init.....|  
[...]
```

How did we get to free and open?

Early Computing

~1950-1960: Public-domain software, academic “hacking” culture



Bendix G-15 photo by Gah4 - CC BY-SA 4.0 via Commons

Birth of the Proprietary Software Industry

~1970-1980:

- ▶ Increasingly easy to withhold control (e.g. binary-only distribution)
- ▶ United States vs. IBM (1969): “Bundled Software is anticompetitive”
- ▶ Computer Software Copyright Act (1980): “Software is patentable”

Confronting the Software Industry



- ▶ Promotes 4 universal freedoms: study, distribute, create, and modify computer software.
- ▶ Promotes moral obligation to use free software.
- ▶ “Ethical” (dogmatic?)

Working with the Software Industry



- ▶ Promotes open-source principles [2].
- ▶ “Rebranded” the free software movement.
- ▶ Google, Facebook, etc. produce open-source software.

2017 top Linux kernel contributor organizations [1]

Company	Changes	%
Intel	10,833	13.1%
none	6,819	8.2%
Red Hat	5,965	7.2%
Linaro	4,636	5.6%

How did we get to free and open?

Sticking together

FOSS

GNU Public License - based on the FSF's “four freedoms”

- ▶ The freedom to run the program as you wish, for any purpose
- ▶ The freedom to study how the program works, and change it so it does your computing as you wish
- ▶ The freedom to redistribute copies so you can help your neighbor
- ▶ The freedom to distribute copies of your modified versions to others

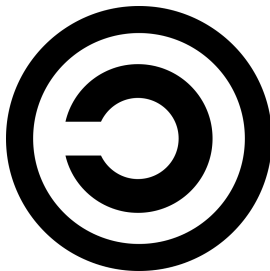
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Copyleft



- ▶ All derivatives must for ever stay free
- ▶ May restrict interaction with non-free programs (e.g. library linking)
- ▶ “Viral Licensing”

Performance

Linus' Law: “Given enough eyeballs, all bugs are shallow.”

You:

- ▶ experience less crashes.
- ▶ increase performance (especially for older hardware).
- ▶ get better support - if ever it still fails.

Education

You can:

- ▶ better manifest your intelligence and creativity.
- ▶ learn valuable, transferable skills.
- ▶ get better software habits
 - ▶ Open Formats
 - ▶ \LaTeX
 - ▶ Git
 - ▶ CLI

Empowerment

You:

- ▶ free yourself from vendor lock-in.
- ▶ get control over any service running on your system.
- ▶ innovate faster, never having to ask for permission.
- ▶ have more freedom, even than on the open market.

Security

You:

- ▶ benefit from more privacy.
- ▶ benefit from more safety.
- ▶ use software which is more transparent (as for government - i.e. trustworthy).
- ▶ have access to better encryption.

Sustainability

The Software:

- ▶ depends on no single entity for its continuity.
- ▶ can be improved by all and degraded by none.
- ▶ is reproducible and transparent (as for science - i.e. comprehensible).

You:

- ▶ Can pool your resources with the world.

What to look out for now and in the near future.

Software as a Service



- ▶ Also known as SaaS or “the cloud”.
- ▶ May be based on FOSS.
- ▶ Usage paradigm is unfree, closed, and unsustainable.

Regulation - from without

E.g. via laws and regulations:

- ▶ “Privacy” threatens admissible information sources.
- ▶ “Copyright” threatens admissible information matter.
 - ▶ Embrace, Extend, Extinguish as a business model.
- ▶ “Consumer Protection” threatens admissible information destinations.

Regulation - from within

E.g. via political “Codes of Conduct”, which can:

- ▶ make participation contingent on ideology (less free).
- ▶ encourage exclusion from the community (less open).
- ▶ reduce resource pooling (less sustainable).

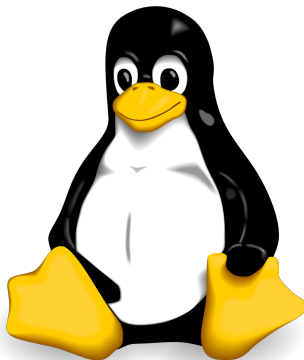
What to look out for now and in the near future.

App-ification / Containerization



- ▶ Possibly FOSS
- ▶ Centralized certification and/or distribution
- ▶ Every application as an island:
 - ▶ Reduces user control (less free).
 - ▶ Reduces system transparency (less open).
 - ▶ Reduces system resource pooling (less sustainable).

Linux Kernel



“Tux” by Larry Ewing, Simon Budig, Anja Gerwinski Licensed under Attribution via Commons

As of 2010 only 2% of the Linux Kernel was written by Linus Torvalds.

What kind of software is FOSS?

The GNU/Linux Operating System

Developed by the FSF:

- ▶ GNU Compiler Collection
- ▶ GNOME
- ▶ GNU Octave, GnuCash, etc.

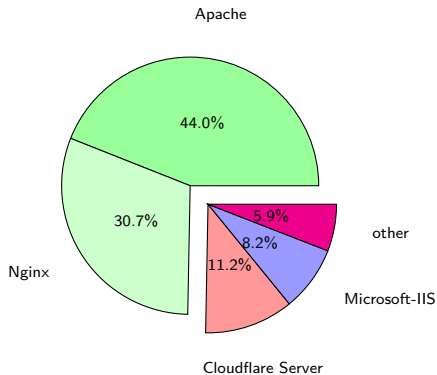


“Gnu-and-penguin-color” by FSF - CC BY-SA 3.0 via Commons

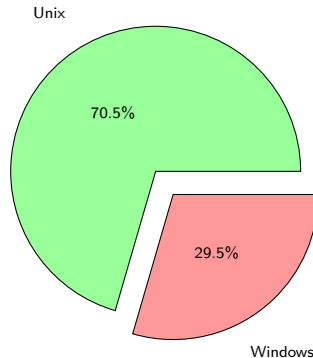
So Much More

- ▶ **Desktop:** Chromium, Firefox, LibreOffice, L^AT_EX, etc.
- ▶ **Multimedia:** mpv, mpd, Gmpc, VLC etc.
- ▶ **Scientific:** NumPy, matplotlib, NiPype, JabRef, R, etc.
- ▶ **Server/Cloud:** Apache, Openstack, WordPress, etc.
- ▶ **Graphics:** RawTherapee, GIMP, Inkscape, etc.
- ▶ etc.

The Internet



Web Server Market Share 2019-10-04 via w3techs



Website OS Market Share 2019-10-04 via w3techs

Public Institutions

- ▶ Governments (benefits: strategic, economic)
- ▶ ETH
 - ▶ Linux cluster running CentOS
 - ▶ Fedora/Windows dual boot on public computers
- ▶ UZH
 - ▶ OpenStack-based cluster (ScienceCloud)

Businesses



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Businesses

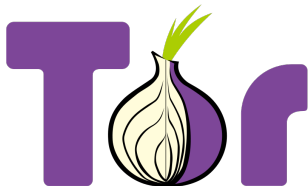


redhat®

©Red Hat, Inc.

- ▶ Founded 1993
- ▶ 2015–2018 stock price $\beta_{\text{RHT}} = 1.16$ (e.g. $\beta_{\text{MSFT}} = 1.22$)
- ▶ Very diverse open source products, e.g. OpenStack, RHEL, CloudForms

The Persecuted



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Free and Open by design, not by convention.

► Whistleblowers

► Marginalized Gvmnts.

► (Alleged) Criminals

The Busy and Creative

- ▶ Students
- ▶ Scientists
- ▶ Engineers
- ▶ Analysts
- ▶ Artists

*Get the opportunity to learn **the right way**, keep the freedom to do it **your way**.*

Most of all: You

- ▶ The sooner the better
- ▶ Less time-intensive than 1KP
- ▶ You have already started!

What now?

- ▶ Q&A round
in a few seconds
- ▶ Come to the next “Linux Days” events: <http://thealternative.ch/>
- ▶ Join the next “Stammtisch”:
18:00 Thursday, March 12 - Learning Spaces on the E Floor of ETH Building
CHN Universitätestrasse 16
- ▶ Give us feedback!
<https://feedback.thealternative.ch/>

These Slides

▶ Latest Slides:

`https://gitlab.ethz.ch/thealternative/courses/blob/master/FOSS_course/slides.pdf`

▶ Source:

`https://gitlab.ethz.ch/thealternative/courses/blob/master/FOSS_course/`

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References

- [1] J. Corbet and G. Kroah-Hartman.
2017 Linux Kernel Development Report.
www.linuxfoundation.org/2017-linux-kernel-report-landing-page/ (via the Linux Foundation).
- [2] Open Source Initiative.
The Open Source Definition.
opensource.org/docs/osd (via the Internet Archive).