

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

BSD License - very permissive 3 clauses

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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
 - ▶ L^AT_EX
 - ▶ 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.

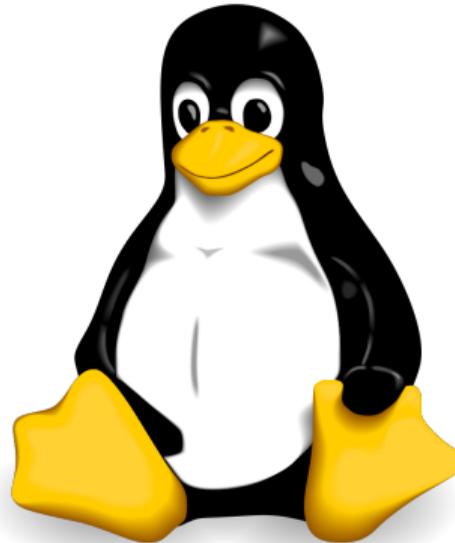
App-ification / Containerization



- ▶ 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).

What kind of software is FOSS?

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.

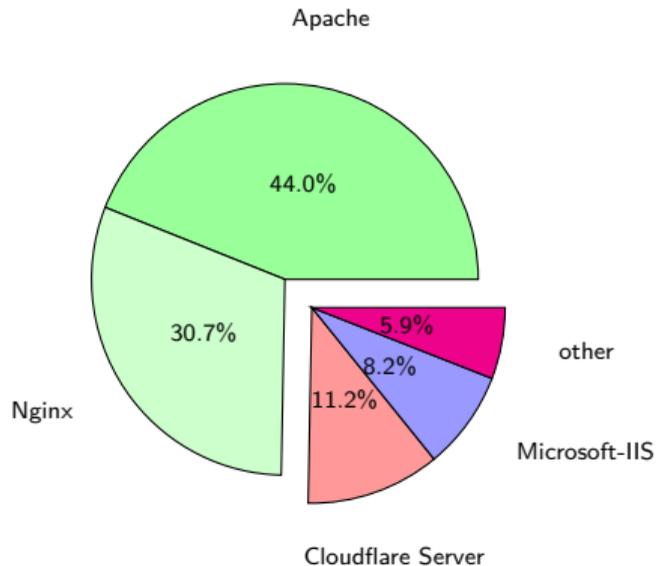


“Gnu-and-penguin-color” by FSF - CC BY-SA 3.0 via Commons

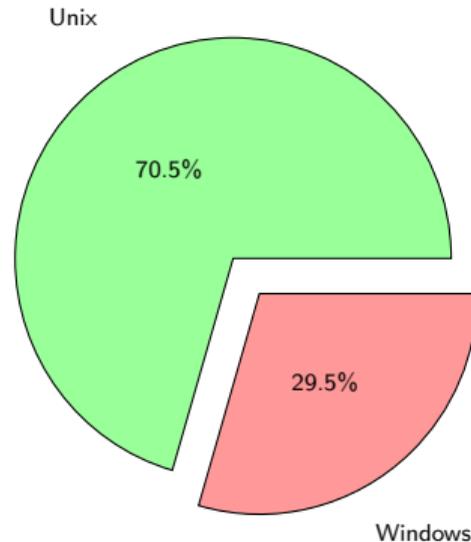
So Much More

- ▶ **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

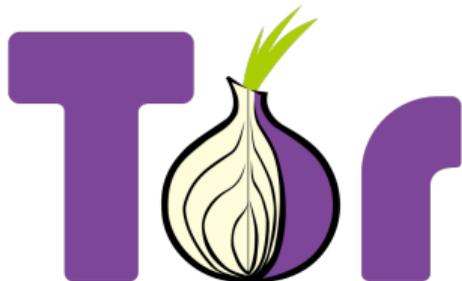


redhat®

©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 Universitatstrasse 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/`
- ▶ License: CC BY-SA 4.0

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).