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Free and Open Source Software

Horea Christian

SSC TheAlternative | ETHZ and UZH

February 26, 2020

Free

100 % unrelated to price:

- ▶ German: "frei"
- ▶ French: "libre"
- ▶ Italian: "libero"
- ▶ Romansh: "liber"

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What does FOSS stand for?

Open Source

Source code example:

```c
#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 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 2e 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............|
[...]
```

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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

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How did we get to free and open?

Birth of the Proprietary Software Industry

~1970-1980:

▶ Increasingly easy to withold control (e.g. binary-only distribution)

▶ United States vs. IBM (1969): "Bundled Software is anticompetitive"

▶ Computer Software Copyright Act (1980): "Software is patentable"

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How did we get to free and open?

Confronting the Software Industry

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

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How did we get to free and open?

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%

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How did we get to free and open?

Sticking together

FOSS

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Key ideas of 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

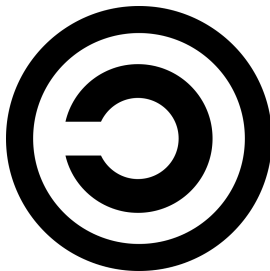| Acronym	History	Licences	Advantages	Challenges	Examples	Users/Developers	Meta
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Key ideas of FOSS

BSD License - very permissive 3 clauses

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Key ideas of FOSS

Copyleft

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

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Why is FOSS awesome?

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.

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Why is FOSS awesome?

Education

You can:

▶ better manifest your intelligence and creativity.

▶ learn valuable, transferable skills.

▶ get better software habits
    ▶ Open Formats
    ▶ LaTeX
    ▶ Git
    ▶ CLI

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Why is FOSS awesome?

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.

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Why is FOSS awesome?

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.

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Why is FOSS awesome?

Sustainability

"the quality of being able to continue over a period of time"

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.

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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.

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

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).

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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).

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What kind of software is FOSS?
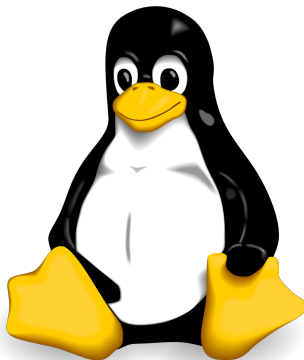
Linux Kernel

"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.

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What kind of software is FOSS?

The GNU/Linux Operating System

Developed by the FSF:

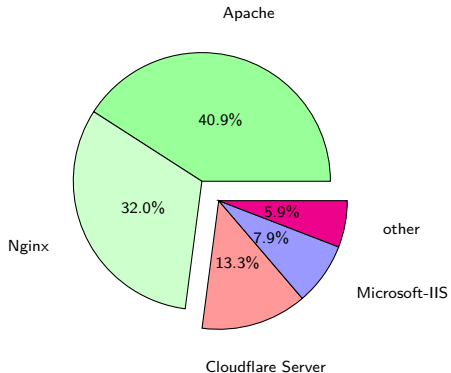▶ GNU Compiler Collection

▶ GNOME

▶ GNU Octave, GnuCash, etc.

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

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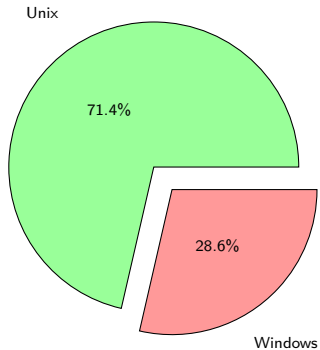○○○○○○○

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What kind of software is FOSS?

So Much More

▶ Desktop: Chromium, Firefox, LibreOffice, LaTeX, 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.

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Who benefits from FOSS?

The Internet

Web Server Market Share 2020-02-26 via w3techs

Website OS Market Share 2020-02-26 via w3techs

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Who benefits from FOSS?

Public Institutions

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

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Who benefits from FOSS?

Businesses

"Chromium Material Icon" by The Chromium Project - CC BY 2.5 via Commons

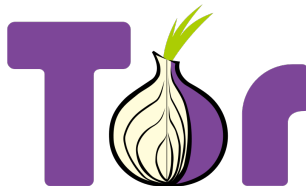"Google Chrome Material Icon" by Google, Google Play. - BSD License via Commons

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Who benefits from FOSS?

Businesses

©Red Hat, Inc.

- ▶ Founded 1993, subsidiary of IBM since 2019
- ▶ 2015–2018 stock price $\beta_{\mathrm{RHT}} = 1.16$ (e.g. $\beta_{\mathrm{MSFT}} = 1.22$)
- ▶ Very diverse open source products, e.g. OpenStack, RHEL, CloudForms

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Who benefits from FOSS?

The Persecuted

"Tor-logo-2011-flat" by Tor Project - CC BY 3.0 via Commons

Free and Open by design, not by convention.

- ▶ Whistleblowers
- ▶ Marginalized Gvmts.
- ▶ (Alleged) Criminals

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Who benefits from FOSS?

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**.

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Who benefits from FOSS?

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 5 - Katholische Hochschulgemeinde Zürich AKI, 2nd floor,
  Hirschengraben 86, 8001

▶ 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

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[2] Open Source Initiative.
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