

Free Software



SoftEng
<http://softeng.polito.it>

Version 1.0 – January 2024

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derived from a work of
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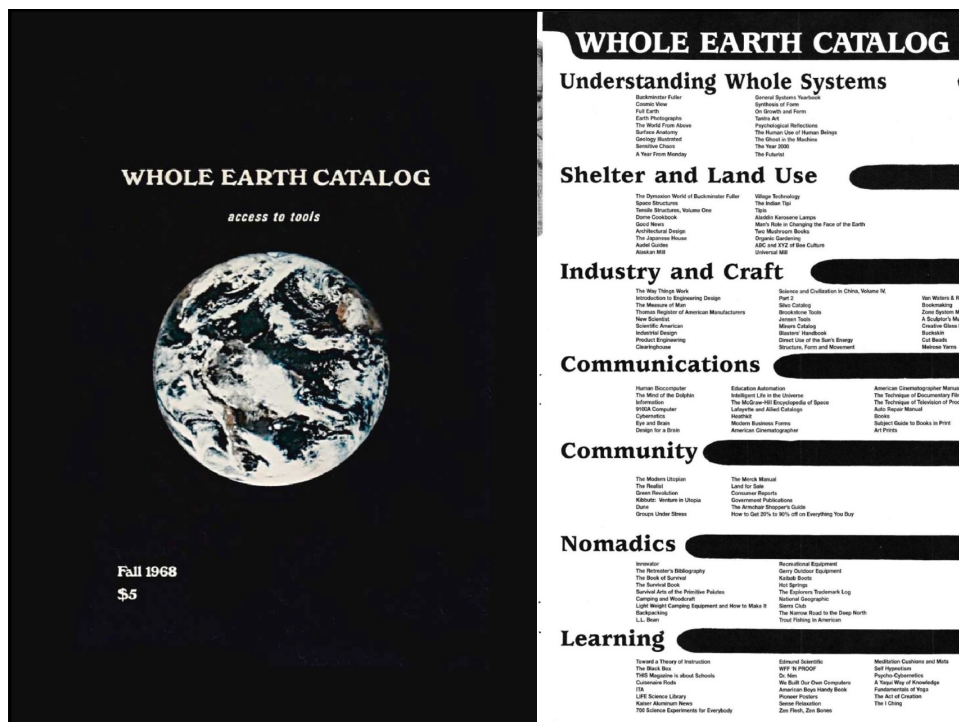
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Technologies of freedom

- Driven by spontaneous and idealistic collaborations until the late 70's
- Based on the counter-culture of the 60s, which promoted the development of personal tools

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Roots

*"[...] When I was young, there was an amazing publication called **The Whole Earth Catalog**, which was one of the bibles of my generation. It was created by a fellow named Stewart Brand not far from here in Menlo Park, and he brought it to life with his poetic touch. This was in the late 1960s, before personal computers and desktop publishing, so it was all made with typewriters, scissors and Polaroid cameras. It was sort of like Google in paperback form, 35 years before Google came along: It was idealistic, and overflowing with neat tools and great notions.[...]"*

Roots

"[...] Stewart and his team put out several issues of The Whole Earth Catalog, and then when it had run its course, they put out a final issue. It was the mid-1970s, and I was your age. On the back cover of their final issue was a photograph of an early morning country road, the kind you might find yourself hitchhiking on if you were so adventurous. Beneath it were the words: "Stay Hungry. Stay Foolish." It was their farewell message as they signed off. Stay Hungry. Stay Foolish. And I have always wished that for myself. And now, as you graduate to begin anew, I wish that for you.

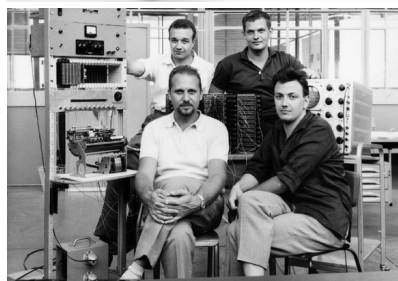
Stay Hungry. Stay Foolish."



The personal computer



Olivetti Programma 101 o P101
(a.k.a. 'perottina')



- Developed by Pier Giorgio Perotto at Olivetti between 1962 and 1964
- In the market from 1965 to 1971
- 44.000 pieces sold
- RAM 1920 bit
- 35 kg
- Integrated printer
- Innovative design by Arch. Bellini
- \$3200

Image source: wikipedia

Roots



"I dreamed of a friendly machine to which I could delegate those operations that are the cause of mental fatigue and errors, a machine that could learn and then meekly execute, that stored data and instructions that were simple and intuitive, whose use was within everyone's reach, that cost little and was the size of the other office products to which people were accustomed. I had to create a new language that did not need the interpreter in a lab coat."

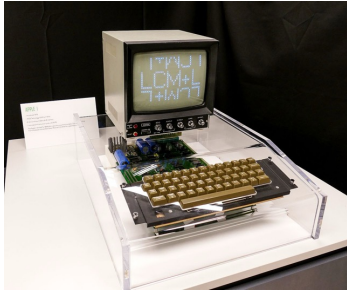
Roots

Available instructions:

- the four basic mathematical operations (addition, subtraction, multiplication and division);
- the square root;
- operations with registers: zeroing, moving data between them, reading from the user;
- definitions of line labels, conditional and unconditional jumps;
- printing the value of a register.

Roots

Apple I, 1976



Commodore VIC-20, 1980



IBM PC, 1981

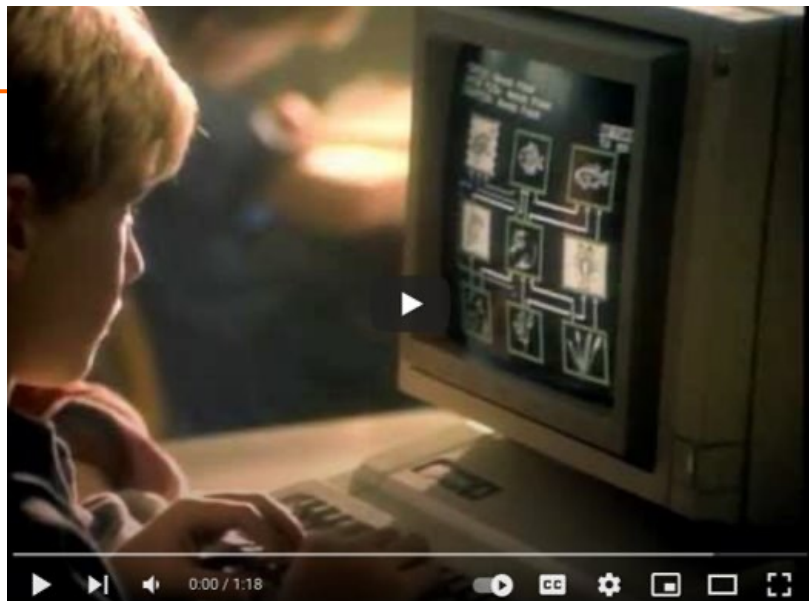


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Olivetti M24 (1983)

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https://www.youtube.com/watch?app=desktop&v=rxNjx_VWJ8U

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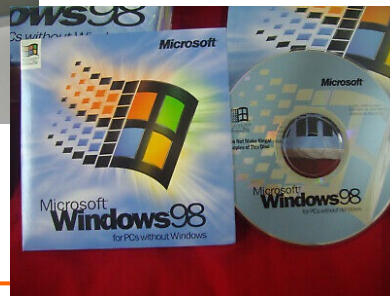
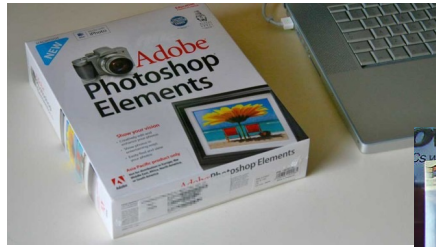
The PC architecture principles

- Knowable hardware, with open interfaces
- Possibility to install multiple operating systems
- Operating systems that can execute any software

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Birth of software industry

- Consequence of personal computer
- Initially as “shrink-wrapped” software



Source: search on Google images

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Software legal protection

- Extensive debate during the 70s
- US Commission on New Technological Uses of Copyrighted Works (CONTU) established in 1974.
 - CONTU decided that "*computer programs, to the extent that they embody an author's original creation, are proper subject matter of copyright.*"
- - N.B. copyright protection extends only to expressions of ideas, not to ideas

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Computer Software Copyright Act

- In 1980, the US Congress added the definition of "*computer program*" to 17 U.S.C. § 101 and amended 17 U.S.C. § 117 to allow the owner of the program to make another copy or adaptation for use on a computer.
- Since then, as sharing copyrighted text is a crime, sharing copyrighted software is a crime too

Patent protection ?

- A patent is a set of exclusionary rights granted by a state to a patent holder for a limited period of time (e.g., 20 years).
- It is a legal title that gives the inventor an exclusive monopoly of exploitation of her invention limited in time and territory
- Patents apply to an invention, i.e. a product or a process that provides a new way of doing something, or offers a new technical solution to a problem.

Patent protection ?

- In 1981, the U.S. Supreme Court, in *Diamond v. Diehr*, ruled for the first time admitting the patentability of software
- In June 2014, the US Supreme Court decided that software consisting of an abstract idea is not eligible for patent protection

Software legal protection

- However:
 - the issue of software patenting is still open and the expression "software patent" itself has not been clearly defined;
 - the law relating to the patentability of software is not harmonized internationally: some countries accept patentability of computer software, others recognize only inventions assisted by computer software.

UNIX

- Originally a common project by MIT, AT&T Bell Labs, and General Electric (Multics for the GE-645) in the mid-1960s
- At that time, Bell System was forbidden from entering any business other than "common carrier communications services", and it was required to license any patents it had upon request (decree from 1956)

UNIX

- 1982: Breakup of the Bell System
- AT&T Corporation relinquished control of the Bell Operating Companies
 - → The 1956 decree that had prevented the company from commercializing Unix, did not apply anymore
 - → AT&T promptly introduced Unix System V into market, although leading to problems of fragmentation and incompatibility



GNU

- By Richard Stallman, founder of:
 - the GNU project (GNU Is Not UNIX, 1983)
 - <https://www.gnu.org/>
 - the free software (or open source) movement (Free Software Foundation, 1985, <https://www.fsf.org/>)
- Creation of commons on a voluntary basis by means of copyright law to **preserve** freedom and rights
- Ethical, political and societal basis

Commons

- «The original meaning of the term 'commons' comes from the way communities managed land that was held 'in common' in medieval Europe. Along with this shared land a clear set of rules was developed by the community about how it was to be used.»

<https://iasc-commons.org/about-commons/>

Commons

- Most generally: resources, natural and cultural, that are shared by many people.
 - Natural commons
 - Urban commons
 - Cultural commons
 - ...
 - Digital commons

Public domain

- “Public domain, category of creative works that are unprotected by intellectual property law. Since these works cannot be owned, they are free for anyone to use, adapt, reproduce, or distribute for commercial and noncommercial purposes.”

<https://www.britannica.com/topic/public-domain>

The 4 freedoms of Free Software

Freedom 0

The freedom to run the program as you wish, for any purpose

The 4 freedoms

Freedom 1

The freedom to study how the program works, and change it so it does your computing as you wish

(Access to the source code is a precondition for this)

The 4 freedoms

Freedom 2

The freedom to redistribute copies so you can help your neighbor

The 4 freedoms

Freedom 3

The freedom to distribute copies of your modified versions to others. By doing this you can give the whole community a chance to benefit from your changes.

(Access to the source code is a precondition for this)

Free software

- A software is **free software** (not *for free*) if the user can enjoy all the four freedoms
- The 4 freedoms are made possible by using a copyright license

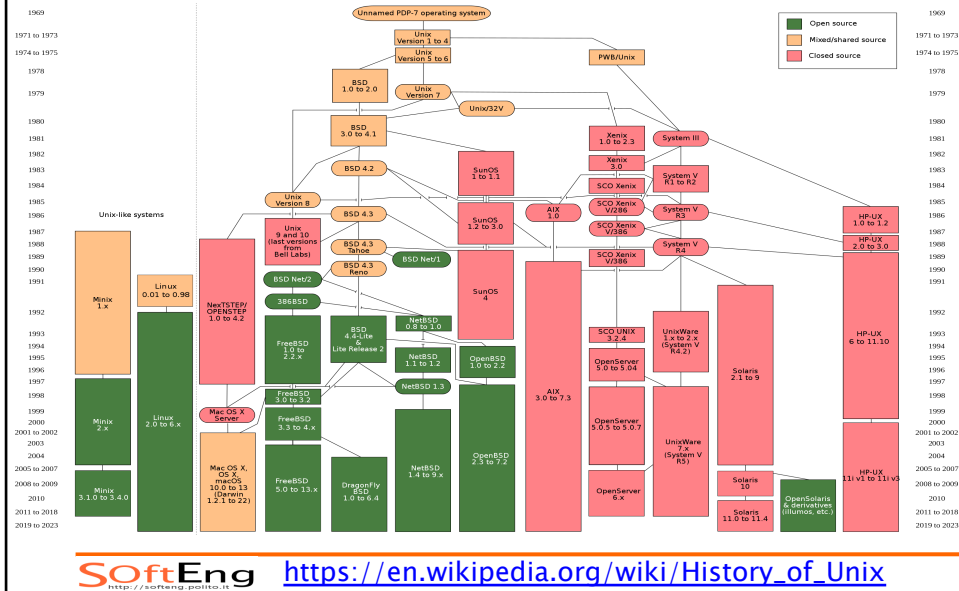
GNU general public license

- GNU general public license (GPL, 1989)
- 4 freedoms + copyleft obligation:
"what is free, must remain free."
<https://www.gnu.org/licenses/gpl-3.0.en.html#license-text>
- Copyleft applies also to modified free software
 - As "share alike" *Creative Common license*

Strategic goal

- Strategic goal: to have a PC with all free software—from the operating system on up
- The most popular result: LINUX kernel, developed by Linus Torvalds and made public in 1992
- GNU-Linux: the whole O.S.

History of Unix



<https://www.softwareheritage.org/>

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Software is the key
to access information and
a fundamental part of
human heritage

We are building the universal software archive



Collect
Preserve
Share

We **collect** and **preserve** software in source code form, because software embodies our technical and scientific knowledge and humanity cannot afford the risk of losing it.

Software is a precious part of our cultural heritage. We curate and make accessible all the software we collect, because only by **sharing** it we can guarantee its preservation in the very long term.

Browse the archive

Discover our mission

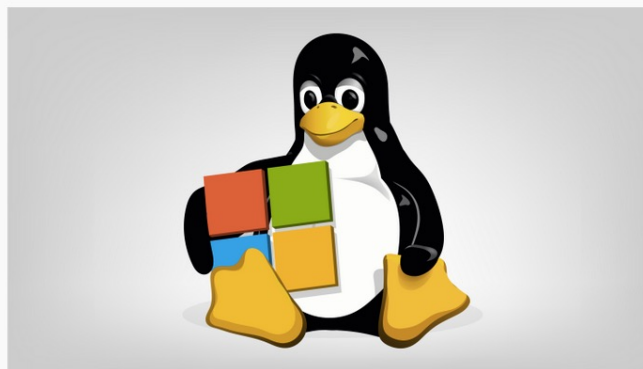
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<https://softwareheritage.org/>

Spin-off and Challenges

Microsoft joins the Linux Foundation

Posted Nov 16, 2016 by **Frederic Lardinois** (@frederic)



How is this for a surprise: Microsoft today **announced** that it is joining the **Linux Foundation** as a high-paying **Platinum member**.

<https://techcrunch.com/2016/11/16/microsoft-joins-the-linux-foundation>

See also <https://www.linuxfoundation.org/about/members>

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Write unit tests for this function

GitHub Copilot

```
import unittest
import datetime

class TestParseExpenses(unittest.TestCase):
    def test_parse_expenses_with_valid_input(self):
        expenses_string = '2023-01-02 ~34.01 USD\n2023-01-03 ~34.01 USD\n2023-01-04 ~34.01 USD'
        expected_output = [(datetime.datetime(2023, 1, 2), 34.01, 'USD'), (datetime.datetime(2023, 1, 3), 34.01, 'USD'), (datetime.datetime(2023, 1, 4), 34.01, 'USD')]
        self.assertEqual(parse_expenses(expenses_string), expected_output)

    def test_parse_expenses_with_empty_input(self):
        expenses_string = ''
        expected_output = []
        self.assertEqual(parse_expenses(expenses_string), expected_output)

if __name__ == '__main__':
    unittest.main()
```

The code assumes that the datetime module is imported. The test cases cover different scenarios such as valid input, empty input, input with comments, invalid date format, and invalid value format.

parse_expenses.py

```
import datetime

def parse_expenses(expenses_string):
    """Parse the list of expenses and return the list of triples (date, amount, currency)
    Ignore lines starting with #.
    Parse the date using datetime.
    Example expenses_string:
    2023-01-02 ~34.01 USD
    2023-01-03 ~34.01 USD
    2023-01-04 ~34.01 USD
    """
    expenses = []
    for line in expenses_string.splitlines():
        if line.startswith("#"):
            continue
        date, value, currency = line.split(" ")
        expenses.append((datetime.datetime.strptime(date, "%Y-%m-%d"),
                        float(value),
                        currency))
    return expenses

expenses_data = '''2023-01-02 ~34.01 USD
2023-01-03 ~34.01 USD
2023-01-04 ~34.01 USD'''
```

<https://github.com/features/copilot>

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The ethical licences

- <https://ethicalsource.dev/licenses/>

ethical source:
open source,
evolved.

The true measure of the success of open source is its real-world impact: how the technologies we develop can help promote positive social, cultural, and political change.

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Creative commons



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- Open Street Map
 - License: ODC Open Database License
 - <https://opendatacommons.org/>
- Arduino
 - License: CC-BY-SA
- Open Hardware Licenses
 - <https://ohwr.org/licences>

See also: Ciurcina, M. (2017). Free Software Licenses and Other Free Licenses: Genetic Code of Digital Common Goods. *DigitCult-Scientific Journal on Digital Cultures*, 2(1), 15-24.

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Overview of free sw licenses

- https://en.wikipedia.org/wiki/Comparison_of_free_and_open-source_software_licenses_-_General_comparison
- <https://www.gnu.org/licenses/license-list.html#SoftwareLicenses>
- <https://opensource.org/licenses/>
- <https://www.synopsys.com/blogs/software-security/top-open-source-licenses/>

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Classification of licences

- Non copy-left: e.g., BSD, MIT, Apache
- Strong copy-left: E.g., GNU-GPL
- Weak copy-left:
 - not all derivative works inherit the copyleft license
 - E.g., GNU-LGPL, MPL
- Network copy-left
 - code available also for remote users
 - E.g., GNU-AGPL, EUPL

ACTIVITY

1. Choose a license for your software
2. Put indication of the license and its text on your Github repository
3. Write the license name and version in the shared repository file
4. Briefly explain why you chose it at the last sprint review (demo #4)