

# Open source software and Linux introduction

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1. Open source software
2. Linux introduction
3. Other open source software
4. How to exchange open source software

# Open-source software

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- ❖ Operations on software
- ❖ Concept of free software or open source software
  - Software license
- ❖ Relationship between proprietary and open source software
- ❖ Business models for open-source software
- ❖ History of open-source software
- ❖ Some popular software licenses of open source software
  - Apache License
  - BSD License
  - GNU License
- ❖ Development models for open-source software

# Operations on software

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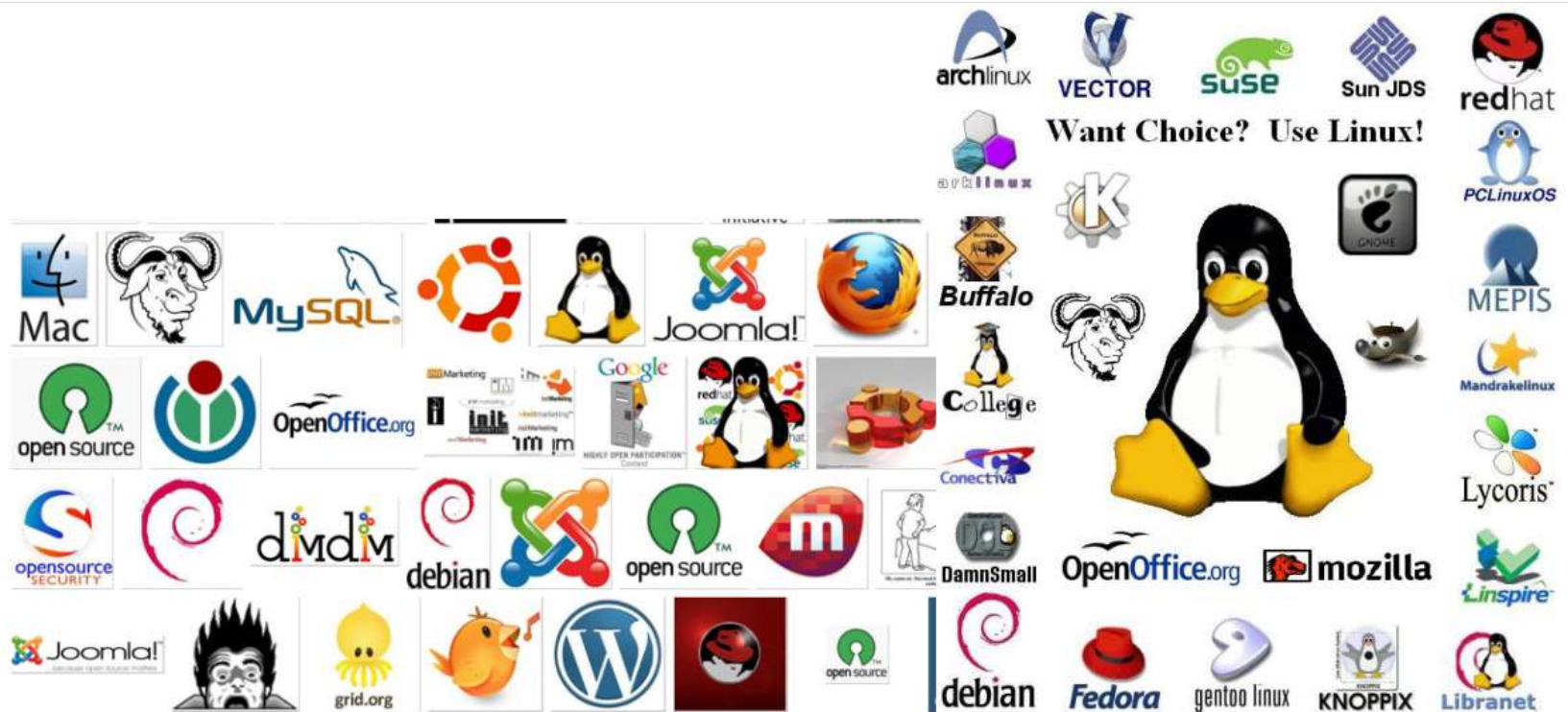
1. Software creation
2. Using software: personal, company, business, education, research
3. Modification, upgrading, improvement
4. Reverse engineering
5. Software distribution: built/binary version, source code, patches, upgrading.
6. Software management: allow/prohibit to execute the operations on software

# What is open-source software?

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- ❖ Source code need to be provided publicly
- ❖ Some rights (copyright) normally belonging to the owner is provided with software license
  - Research, modify, upgrade
  - Distribution
- ❖ Examples of open-source software
  - Apache, Asterisk, Linux, Android Virtual Box
  - Open Office, Firefox, Hadoop, Scilab, Chromium (Web browser)
- ❖ OSS is usually free. Using OSS saved about 60 billions USD/year (Cnet, 2018)

# Some open-source software



# Distinguish OSS with other software types

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## ❖ proprietary software

- Can only use software some limited conditions
- Can not modify or reverse engineering

## ❖ Freeware

- You don't have to pay to use the software
- But they are not OSS

## ❖ Shareware

- Being provided free but limited functions
- Can only use full functions if paying fees

# OSS definition of Open Source Initiative

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## **Introduction**

Open source doesn't just mean access to the source code. The distribution terms of open-source software must comply with the following criteria:

### **1. Free Redistribution (Tự do phân phối)**

The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources.

The license shall not require a royalty or other fee for such sale



# OSS definition of Open Source Initiative (2)

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## **2. Source Code (Mã nguồn)**

The program must include source code, and must allow distribution in source code as well as compiled form.

Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge.

The source code must be the preferred form in which a programmer would modify the program.

Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

# OSS definition of Open Source Initiative (3)

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## **3. Derived Works (Cho phép thay đổi)**

The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software

## **4. Integrity of The Author's Source Code (không cho phép thay đổi rang buộc bản quyền)**

The license may restrict source-code from being distributed in modified form only if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time.

The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software

# OSS definition of Open Source Initiative (4)

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## **5. No Discrimination Against Persons or Groups (không phân biệt người hay nhóm)**

The license must not discriminate against any person or group of persons

## **6. No Discrimination Against Fields of Endeavor (không phân biệt mục đích sử dụng)**

The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research

## **7. Distribution of License**

The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

# OSS definition of Open Source Initiative (5)

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## **8. License Must Not Be Specific to a Product**

The rights attached to the program must not depend on the program's being part of a particular software distribution.

If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution

## **9. License Must Not Restrict Other Software (không hạn chế PM khác)**

The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software

# OSS definition of Open Source Initiative (5)

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## **10. License Must Be Technology-Neutral (Trung lập về công nghệ)**

No provision of the license may be predicated on any individual technology or style of interface.

– Open Source Initiative, <http://opensource.org/docs/osd>

→ Can be free or not but must be free of modifying and redistribution

# Business models for OSS

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- ❖ Cannot earn money using traditional methods
- ❖ How could we earn money or get benefits from OSS?
- ❖ The implementation of OSS in companies is technically difficult
  - ❖ Lack of official support
  - ❖ Training how to use software
  - ❖ Fast development and upgrading but can be no long-term development
- ❖ Provide services:
  - Training/ Solution (Redhat)
  - Technical support (Redhat)
  - Sponsorship/ advertisement (Firefox)
  - Make plugin for OSS (IBM – Eclipse)
  - Commercialise partly (2 versions parallel) – MySQL
  - Commercialise fully (only provide commercial version by closing OSS)
- Other benefits
  - Fame/reputation for developers joining OSS projects

# Redhat services

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Consultant

Training and certification

Technical support for software products

Technical management for software products

Provide OSS solution

Provide commercial products

# Canonical services

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

Education

Development

Certification

Technical support .....



# Compare open/non-open software

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Will OS destroy software market?

- Can earn money from OSS projects
- OSS can be an intermediary step to develop OSS
- Share development cost
- There is no economical obstruction (Ex: patches)
- There is no hidden mechanism

OSS can be develop

- According to user need
- No limit on creation
- Need law support

# Advantages of OSS

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Expand market

Establish industrial standards

Attract developers

Upgrade the development of technology

Provide reliable, stable, low-cost software

Flexible, creative, and innovative

No pressure from commercialisation

# Disadvantages

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Difficult to convince users except developers

No data about software functionalities

Hard to commercialise software

50-50 with hackers

# History of OSS

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1950-1960: free distribution because the limitation of hardware (Phần mềm được phân phối tự do vì phần cứng bị giới hạn (peculiarity, low number))

End of 1960s: price cost of software increased → software cost had been counted in installed hardware

1980s: Software industry started to provide binary version, prohibit to modify software

1980: Copyright law extended to computer software

# History of OSS (2)

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## ❖ Unix (1971):

- Multi-users, multi-tasking
- Reliable and stable
- Flexible, widely usage
- Influence on developers, including Bill Gates, Steve Jobs, etc.
- \$\$\$\$\$\$\$\$\$\$

## ❖ MINIX and Tannenbaum

- Andrew Tannenbaum developed MINIX (Mimic Unix) for teaching and research but not allowing to redistribute modified versions (can redistribute the original one freely)

## ❖ 1983: Richard Stallman, MIT started GNU Project with the ultimate goal: build an GNU OS (GNU's NOT Unix) like Unix but free

## ❖ 1984: GNU project list software products needed to develop a complete GNU OS → develop those software

# History of OSS (2)

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1985: Free Software Foundation (FSF) was established to support GNU project, definition of Free Software: free to modify, redistribute or sell (Copyleft)

The beginning of 1990s, most of GNU OS parts are ready except OS kernel (because software had been develop on Unix environment)

1991: Linus Tovalds introduce Linux kernel (Like-UNIX) free and modifiable

1992: Linux kernel applied GNU General Public license (GPL) and was integrated to GNU project and became Linux OS

1998: Open Source Initiative (OSI) was found

# Software copyright

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- ❖ Software copyright is the application of copyright law to machine-readable software. It regulates the rights of developers/inventors/companies making the software, including
  - Copy right
  - Redistribution right
  - Modification right
- ❖ OSS has copyright or not?
- ❖ OSS has copyright for some reasons
  - ❖ Showing the contribution of authors/developers
  - ❖ Enforcing their terms

# Software license

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- ❖ A software license is a legal instrument (usually by way of contract law, with or without printed material) governing *the use or redistribution* of software
- ❖ With proprietary software, it is the regulation that end-user can use one (or some) copies of the software without violating software copyright
- ❖ EULA (End-user license agreement)
- ❖ OSS is not limited users in term of using and redistribution



# Software license of proprietary software

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- ❖ Likely protect the rights of software inventors: COPYRIGHT
- ❖ Certain rights regarding the software are reserved by the software publisher
  - ❖ Software redistribution
  - ❖ Software management
- ❖ User can only use one copy of the software, need to pay more if using multiple copies for different computers
- ❖ Can not modify and upgrade software
- ❖ Can not reverse engineering
- ❖ Example
  - MS Excel EULA
  - MathWork Matlab

# MS Excel EULA

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- ❖ Can only use on a single computer
- ❖ Can not share through network connection
- ❖ Fair/Unfair?
- ❖ Need to use MS Excel on two computers → need to pay more

# Software license of OSS

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- ❖ Provide maximum rights to end users – Free
- ❖ Can modify, upgrade, and redistribute software, including source code: open source
- ❖ For most OSS license, OSS can be used in business purposes without paying fees for authors
- ❖ Some OSS licenses only allow redistribution for non-business purposes
- ❖ Limit software management to make sure software maintaining the free and open source (COPYLEFT)

# Copyleft?

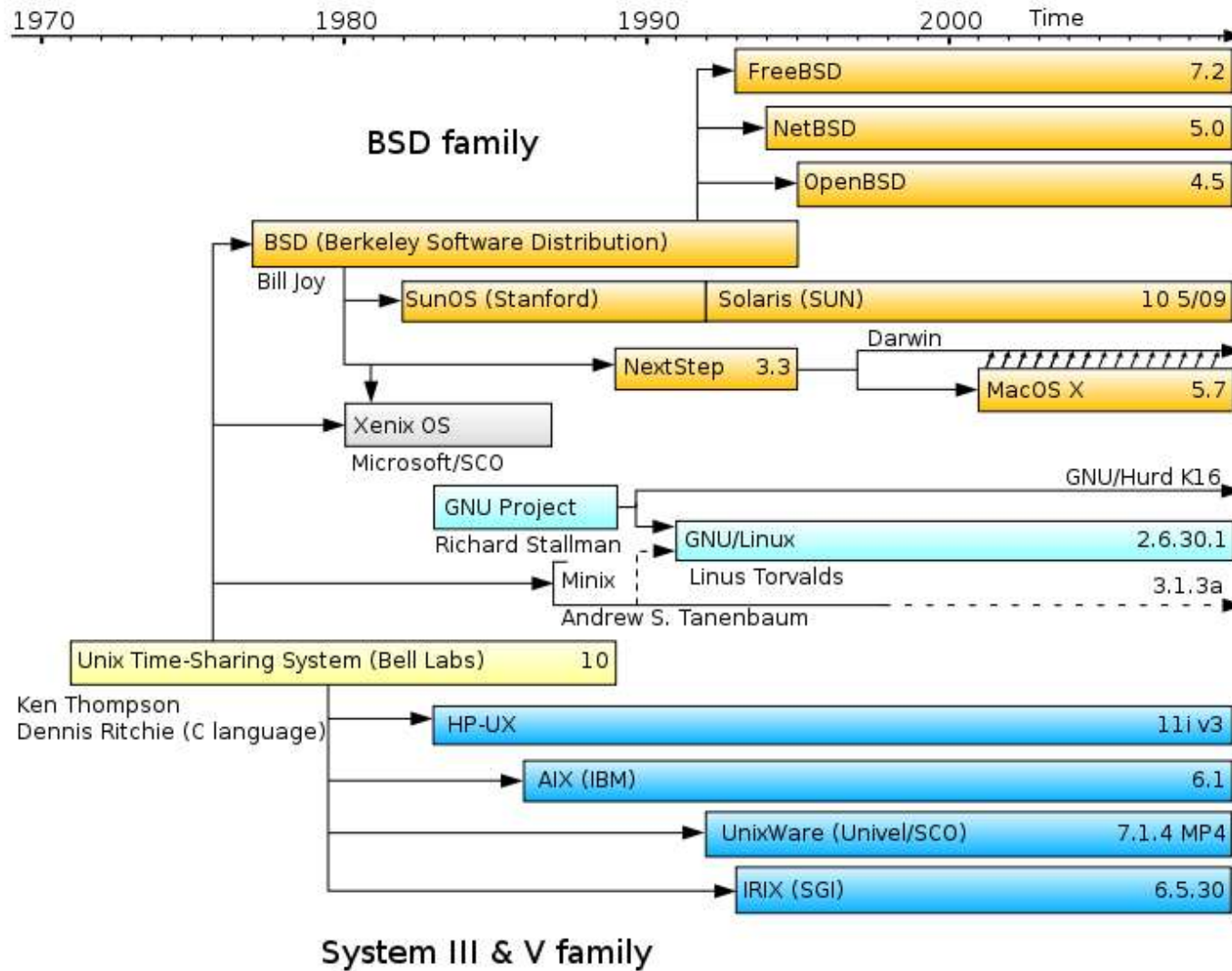
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- ❖ Là một loại giấy phép yêu cầu khi phân phối lại phần mềm (có chỉnh sửa hay không) phải giữ nguyên các điều kiện của giấy phép nguyên bản
  - Why do we need copyleft?
- ❖ Because without copyleft, OSS can be exploited to change to proprietary software → no more free
- ❖ Copyleft
  - Gives users/viewers the same rights as distributors (copying, distribution and modification)
  - Makes sure the freedom of software
  - Use copyright law to protect the freedom of the software

# OSS licenses

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- ❖ While authors want to provide source code for an OSS project, they likely provide it with a license
- ❖ There are more than 1400 OSS licenses
- ❖ Some licenses can only be used for a software product, while others can be used for multiple ones.
- ❖ Since 2008, OSS must follow copyright law as well (US law) → end-users must comply regulations in OSS licenses
- ❖ Some popular OSS licenses
  - Apache License
  - GNU General Public License, GNU Lesser General Public License - Copyleft
  - BSD License – modified versions can be redistributed with more limited restriction than the original version



# Apache license

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- ❖ The Apache License is a free software license authored by the Apache Software Foundation (ASF).
- ❖ Can use source code to develop free or non-free software
- ❖ Allow to distribute modified versions without the original license (không phải là copyleft)

# BSD License – 4-clause license

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# BSD License (new) – 3-clause license

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- ❖ Allow to distribute software without limiting purposes
- ❖ Copyright warning and the same content of denying responsibility of any damage while using (capitalised texts)
- ❖ Same as 4-clause license but removing clause 3 about advertisement
- ❖ OSI approved this license with the name The BSD License
- ❖ FSF approved this license compatible with GNU GPL. It was named Modified BSD License

# FreeBSD License – 2-clause license

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- ❖ Remove clause-3 and clause-4 in comparison with the original license
- ❖ Compatible with GNU GPL

So, BSD License only protect the copyright on the distribution version but the modified versions are not forced to be OSS

# GNU General Public License

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- ❖ The most popular OSS license : Linux, GCC, MySQL, etc.
- ❖ Approved by FSF
- ❖ Copyleft
- ❖ Can be used for many software products
- ❖ Three versions

# GNU GPL v1 (1989)

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Prevent the redistribution with limiting user freedom

Require the source code and binary versions go together

Modified or integrated software from the original one must be distributed by GNU GPL as well

No software price mentioned

# GNU GPL v2 (1990)

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Added clause: Liberty or Death

If the receivers (users) get the software with GPL license cannot redistribute software with full free rights, they cannot redistribute the software

# GNU – Lesser GPL

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- ❖ GNU LGPL is used for libraries
- ❖ Stands in between copyleft and BSD
- ❖ Software was “originated” from LGPL must be allowed to modify source code, reverse engineering, and debug.
- ❖ Independent software using LGPL libraries don’t count as “originated” from those libraries
  - Can be used GNU LGPL to write non-free software

# GNU GPL v3 (2007)

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- ❖ It states that GPL software can be sold with any price → no limitation of commercialisation
- ❖ Distributors cannot restrict rights provided by GPL



# Development models for OSS Mô hình phát triển PMMNM - nhà thờ

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## ❖ Cathedral

- Traditional model
- Code developed between releases is restricted to an exclusive group of software developers
- Freedom of members is limited
- Example: GCC, Linux kernel

## ❖ Bazaar

- Over the Internet in view of the public
- Users can be developers as well
- High freedom
- Early released version
- Modules
- Integrate new modules regularly
- Three versions: stable, beta, night version
- The inventor of this process: Linus Torvalds

# Linux introduction

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- ❖ Originated from GNU project to generate an UNIX-similar OS but free and open-soure
- ❖ GNU components developed on Unix can work independently
- ❖ Linus Tovalds created Linux kernel, and then integrated other components to make the first version of GNU Linux

# Linux kernel

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Contains basic components to exploit computer resources (both software and hardware)

1994: 1.0

1999: 2.2.0

2001: 2.4

2003: 2.6.0

2009: 2.6.3

First number: major release

Second number: minor revision number

- Odd: experimental version
- Even: stable version

Remaining number(s): depend on distributors

# Linux components

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Kernel

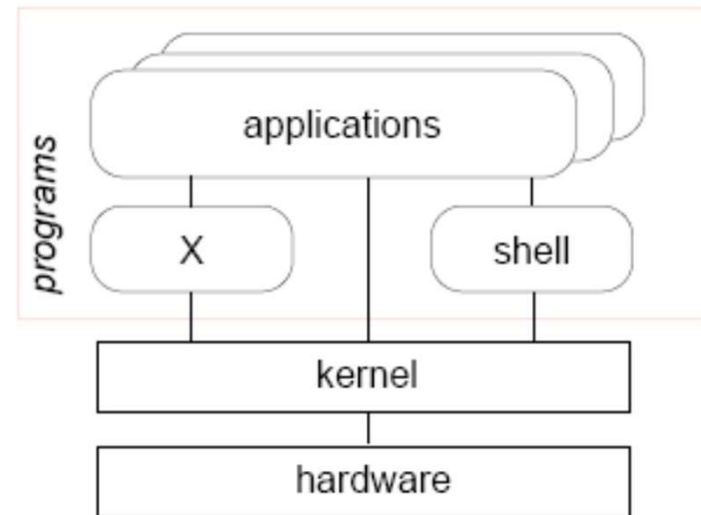
Drivers

System software

Application software

X Windows

GUI software



# Linux functionalities

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Open source

- Unlimited innovation?

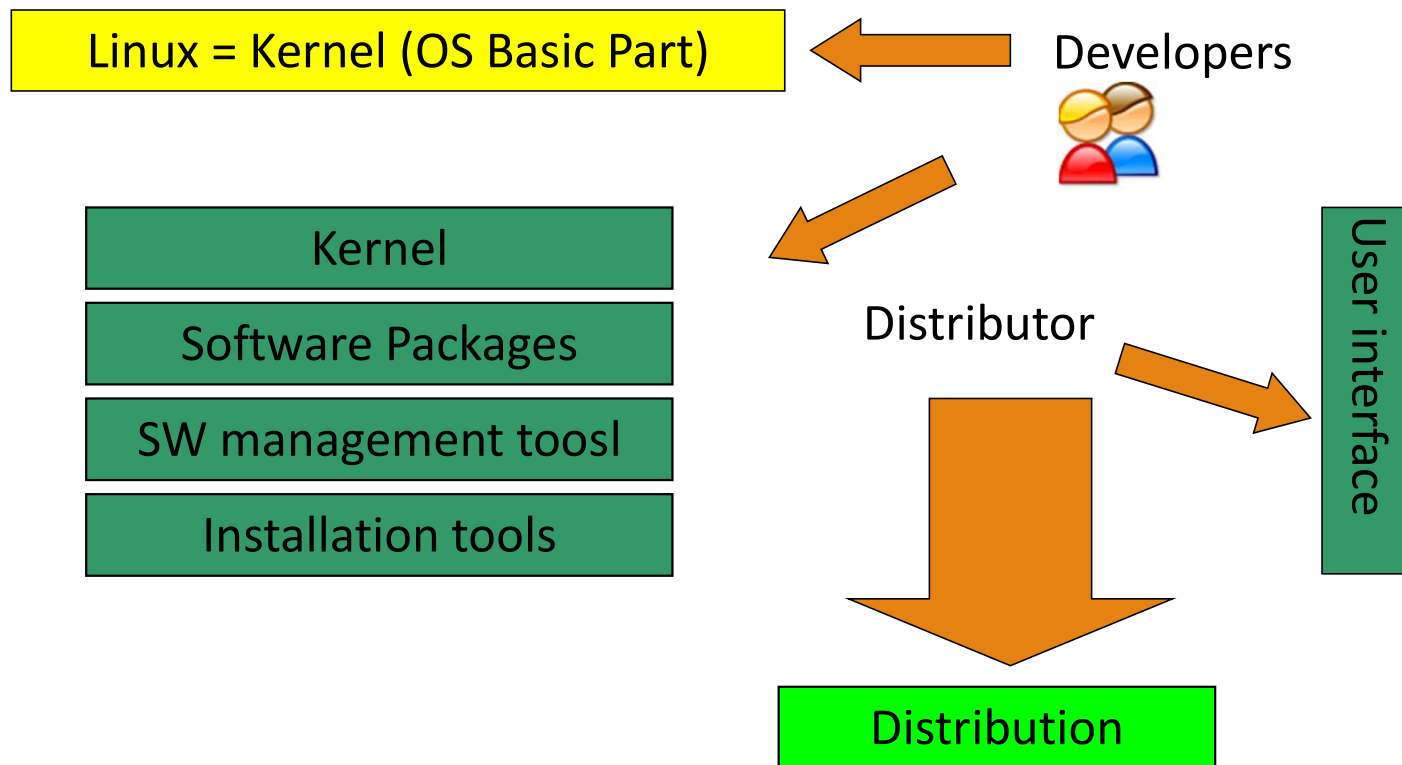
Support many hardware types

Many distribution

Inherit Unix characteristics

- Portability
- Multiusers, multi-tasking
- A single system file
- Shell
- Networking

## V. Linux distribution versions



# Some popular distributions of Linux

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## ❖ Debian

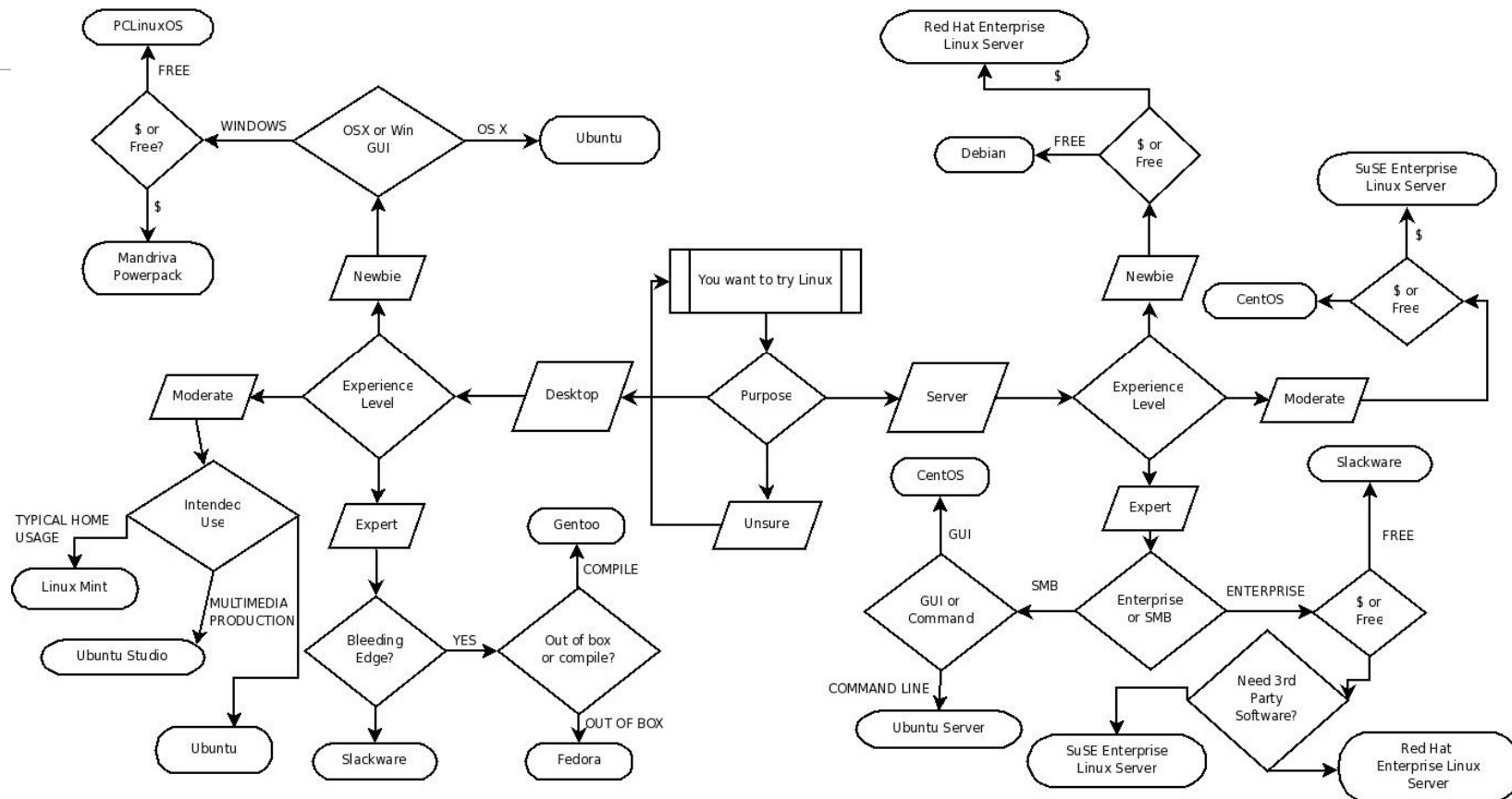
- Knoppix
- Ubuntu

## ❖ Fedora (sponsored by Red Hat)

- Fedora
- CentOS
- Red Hat Enterprise Linux

# Pick the right distribution for your needs

## LINUX DISTRIBUTION CHOICE FLOW CHART





# 3. Some other OSS

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## Linux

- Webserver
- Mail server
- KDE, GNOME, .....

## Other OSs

- Open Office
- Gimp
- FireFox
- LaTeX

# How to exchange/support OSS development

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- ❖ CVS (Concurrent Versions System) to manage versions
- ❖ SVN (Apache Subversion) to manage versions
- ❖ Use repositories containing source code on websites, allowing OSS project to host and manage the progress of OSS development. Mostly support CVS and SVN
  - Example: Sourceforge, github, gitlab, etc.