

Web Design & Programming

Linux

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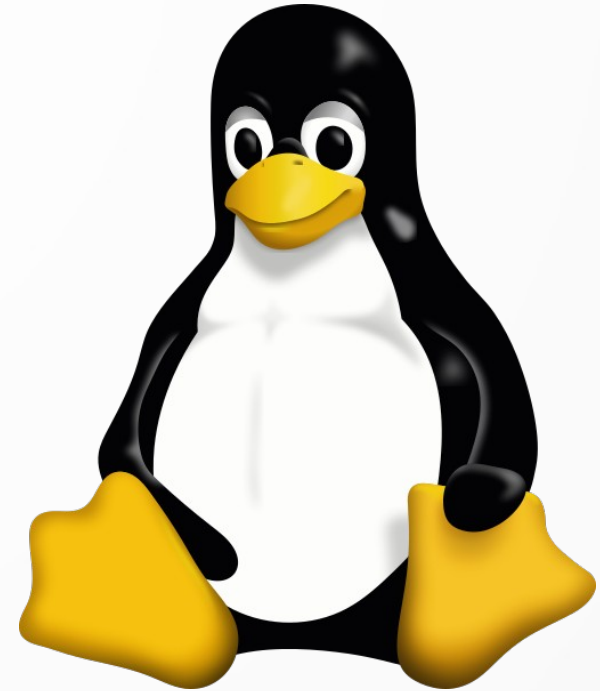
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What is Linux?

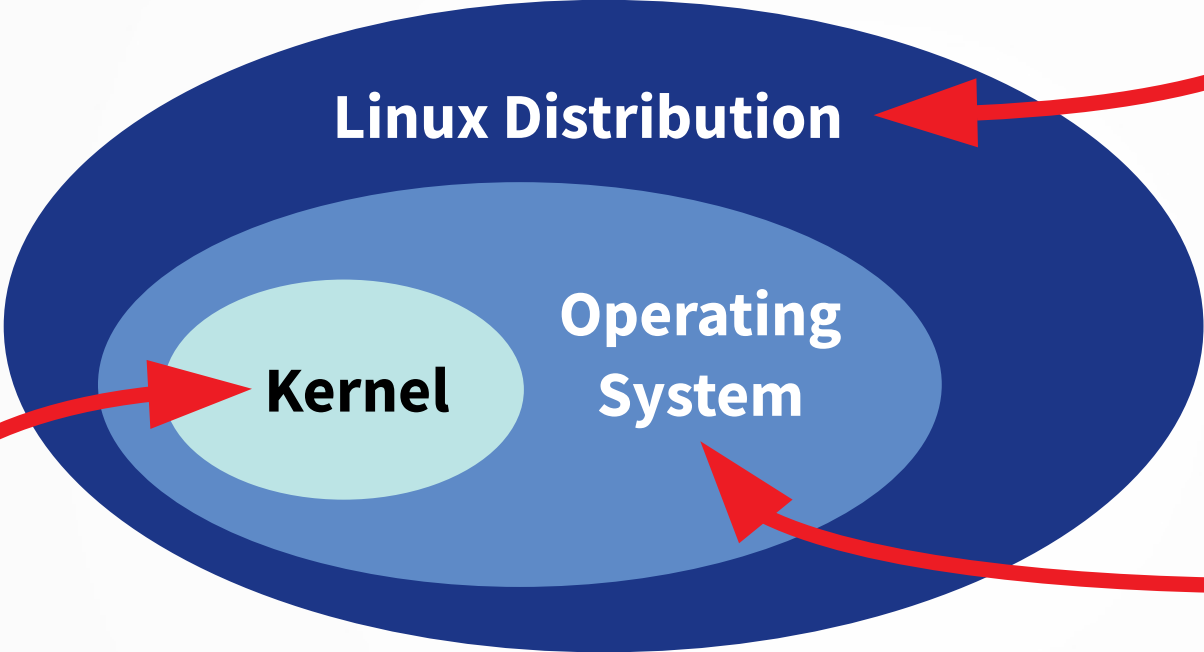
- Linux is an operating system, like Microsoft Windows, Apple Mac OS X and others.
- It has been created in 1991 by Linus Torvalds, from Finland, as a hobby.
- It is now supported and developed by many volunteers and companies around the world.



What is a Linux Distribution?

- Linux is only a kernel, by itself it doesn't allow an end-user to do anything.
- A distribution is an organized set of applications, tools and other pieces of software ready to use, on the top of a Linux kernel.

All software packaged to be used with a Linux system, from the most basic text editor to databases



All utilities and libraries needed to use the system (printing, graphical display, configuration tools, ...)

The layer between the hardware and every piece of software, managing all resources (memory, storage, network, ...)

Few Linux Distributions

- Debian
- Ubuntu
- Red Hat
- And plenty of others...
- Some distributions have also different editions for desktop or server usage.



debian



Ubuntu



Red Hat

The Command Line

- Using a Linux distribution with a graphical user interface (GUI) does not necessarily require a lot of training; it's pretty similar to other systems.
- You can also use the command line interface (CLI), also known as “shell”.
- There is usually no graphical interface on a Linux server, the CLI will be your only option to manage the system.

Users and Groups

- One specific account exists to manage the system: *root*¹.
- All other accounts are users; few are system accounts, most are for end-users.
- Users can be grouped by groups, every user is at least member of one group.

1: Ubuntu is a notable exception

Files and File System

- Files are organized in a very hierarchical way.
- The apex of the file system is / (root).
- (Almost) everything is a file.

Filesystem Hierarchy Standard

/bin, /sbin	binaries
/boot	boot configuration
/dev	devices
/etc	configuration files
/home	end-users files
/lib	libraries
/proc	processes
/root	root's home directory
/tmp	system temporary folder
/usr	applications
/var	“variable” files

File Permissions

- There is three type of permissions that could be set on a file or a directory:
 - read
 - write
 - execute ¹
- On each file or directory, permissions are defined for the user, the group and others (those who are not the user or a member of the group).

1: this permission is also used to grant or limit access to a directory

SELinux

- *Security-Enhanced Linux* is an additional layer of security used by few Linux distributions (specifically Red Hat).
- SELinux can be used to define more granular permissions, with a “deny by default” policy.
- Applications that are working “out-of-the-box” on other distribution may require specific policies if SELinux is enabled.

Processes

- A process is a program running in memory, and using other resources as needed (network, graphical display, etc).
- The main states for a process are: running, waiting or blocked, and then terminated.
- Processes are linked to a user, and all are related to the main system process.

System Help

- Almost all commands are documented with a manual page ('manpage').
- To access a manpage, just enter: `man command`
- To quit the man page, press the 'q' key.
- Manual pages are also available for configuration files, system calls or libraries.

Chaining Commands

- Sometimes you want to use different commands to refine a result.
- The shell uses pipes to create a workflow between commands.
- The "vertical bar" character (aka 'pipe') is used to pass the result from a command to another.

Writing Scripts

- A shell script (or script for short) is a text file with all the commands, options and variables needed for a specific task.
- A Bash script should begin with a specific first line, to start the interpreter properly; usually `#!/bin/bash`
- The pound sign (#) is used to comment a line.
- The file needs to be made executable.

Log Files

- Many system and application events are recorded in various log files.
- Files are kept usually for few weeks.
- Log files can be aggregated and parsed for troubleshooting, performance evaluation or security audits.

Scheduled Tasks

- Cron is the standard tool to schedule jobs.
- Each user can be allowed to use a crontab.
- Tasks can also be defined for the whole system.

Remote Access - OpenSSH

- OpenSSH is the standard tool to provide remote access to a Linux system.
- OpenSSH is using encryption to authenticate each end and to protect the network traffic.
- Authentication can be performed with regular username and password; more and more often this is replaced by a public-key authentication.
- Various utilities are also available to transfer files and other network related operations.
- OpenSSH uses port TCP/22.

System Security

- Apply updates when they are published; always keep your system current.
- Backup the system and the data files.
- Keep all the services and permissions to a minimum.
- Maintain at minimum a test environment and a production environment.
- Check and audit the system on a regular basis.

- **Tux, the Linux mascot: Wikimedia Commons**

<https://en.wikipedia.org/wiki/File:Tux.svg>

- **Debian Logo: Wikimedia Commons**

<https://en.wikipedia.org/wiki/File:Debian-OpenLogo.svg>

- **Ubuntu Logo: Wikimedia Commons**

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- **Red Hat Logo: Wikimedia Commons**

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