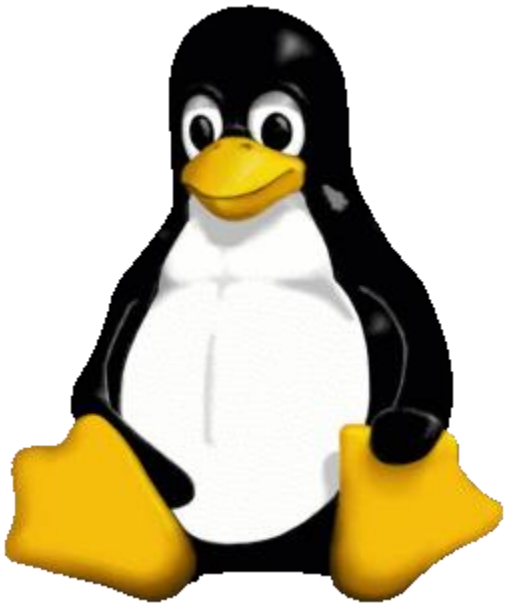
GNU/Linux

By Dr. Amir



About Linux course

- This is a course about Linux
- By the end of this course you will learn how to use Linux comfortably
- I believe that computer subjects can’t be fully understood by just reading text books. One needs to practice alongside the reading and lectures. Therefore You will be expected to do many exercises between each lectures.

Exam and Assignments

- There will be two assignments and a main exam during the term and the final mark will be a combination of both assignments and the final exam. So, it is a good idea to learn while you are here and practice it, after the lecture.
- You may use your mobile phone for purpose of translation, but not browsing the web, or communicating with others.

Text book and lectures

- You may find my lectures slightly different from the text book. For better understanding Linux, lectures are designed in a specific way. They may not be exactly in the same order with your text book. However your text book will stay as a guide for the course and syllabus. I may also encourage you to read different chapters of different books in addition to your text book.

Basic knowledge

Computer hardware

Computer Software

Operating System (OS)

Open Source

GPL

GNU

Kernel

Linux distro

GNOME

KDE

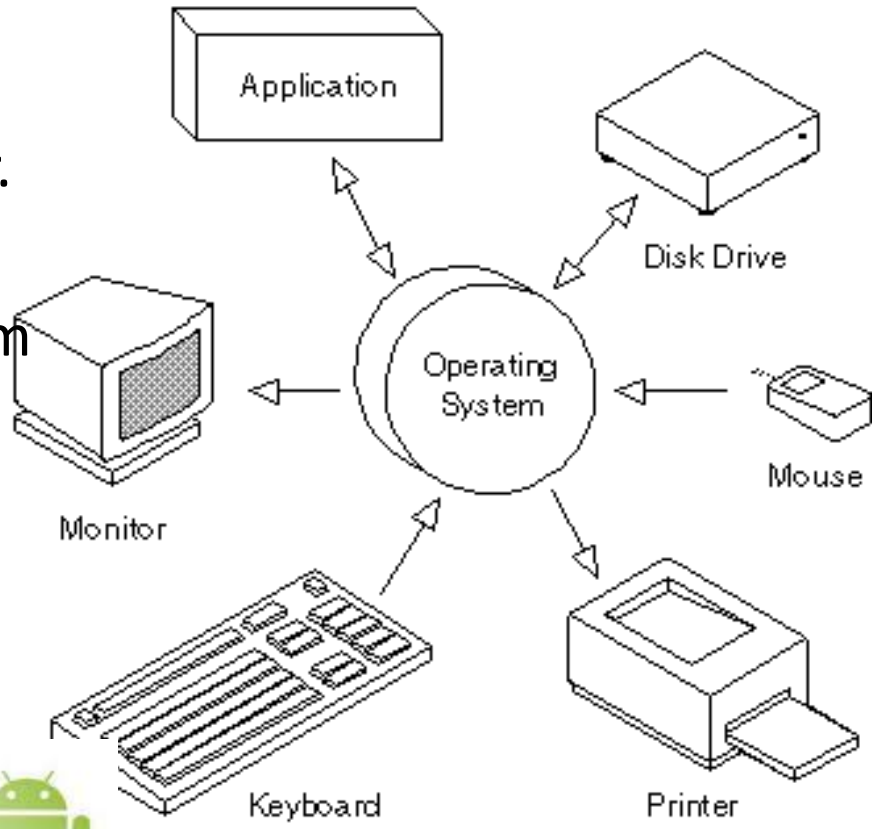
GUI

MULTICS – The multiplex Information and Computing Service

POSIX – Portable Operating System Interface for Computer Environments

What is an Operating System

- An operating System is a system software that manages computer hardware and software for the user.
- Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.



Early computers

Imagine computers as big as houses, even stadiums. There was one thing that made this even worse: every computer had a different operating system. Software was always customized to serve a specific purpose, and software for one given system didn't run on another system.

Computers were extremely expensive then, and to get the users to understand how they worked made it worse. The total cost per unit of computing power was enormous.

IBM
System/360
Model 91
computer

Birth of computer OS

All modern operating systems have their roots in 1969 when **Dennis Ritchie** and **Ken**

Thompson developed the **C** language and the Unix operating system at AT&T Bell Labs.

C language was especially developed for creating the UNIX system. Using this new technique, it was much easier to develop an operating system that could run on many different types of hardware.

70s

By 1975, when AT&T started selling Unix commercially, about half of the source code was written by others.

Other developers were not happy that a commercial company sold software that they had written; the resulting (legal) battle ended in there being two versions of Unix:

the official AT&T Unix, and **the free BSD Unix**.

Free software

- **Free software means the users have the freedom to run, copy, distribute, study, change and improve the software.**
- Free software is a matter of liberty, not price. To understand the concept, you should think of “free” as in “free speech”, not as in “free beer”.

80s

In the Eighties many companies started developing their own Unix: IBM created AIX, Sun SunOS (later Solaris), HP HP-UX and about a dozen other companies did the same.

The result was a mess of Unix dialects and a dozen different ways to do the same thing. And here is the first real root of **Linux**, when **Richard Stallman** aimed to end this era of Unix separation and everybody re-inventing the wheel by starting the GNU project (GNU is Not Unix)

GNU

- **GNU** is a Unix-like operating system. That means it is a collection of many programs: applications, libraries, developer tools, even games. The development of **GNU**, started in January 1984, is known as the GNU Project. Many of the programs in **GNU** are released under the auspices of the GNU Project; those we call **GNU packages**.
- The name "**GNU**" is a recursive acronym for "**GNU**'s Not Unix." "GNU" is pronounced *g'noo*, as one syllable, like saying "grew" but replacing the *r* with *n*.

90s – Linus and Linux

The Nineties started with **Linus Torvalds**, a Swedish speaking Finnish student, buying a 386 computer and writing a brand new **kernel** called **Linux Kernel**.

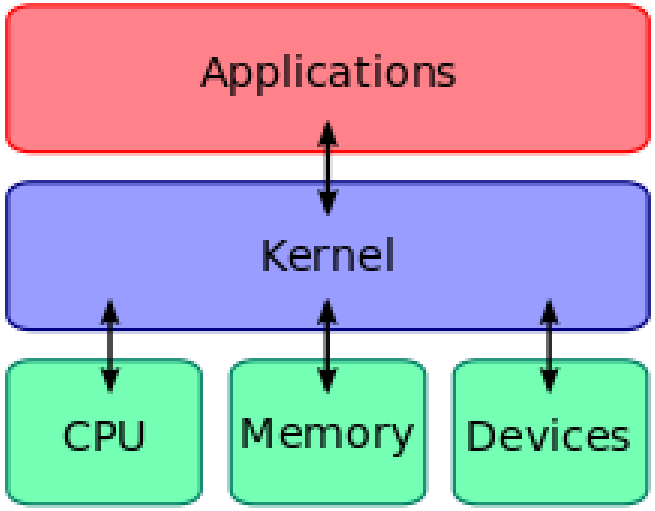
How to pronounce Linux?

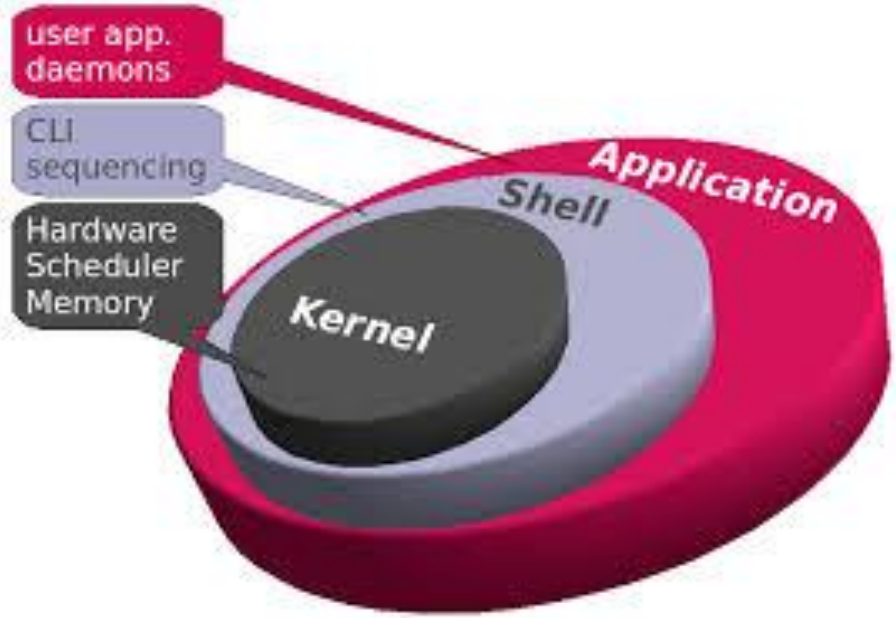
Why a clone of Unix?

- From the start, it was Linus' goal to have a free system that was completely compliant with the original UNIX.
- Two years after Linus' post, there were 12000 Linux users.
- Many people started to develop driver software for new hardware
- Thanks to these people, Linux is now not only ideal to run on new PC's, but is also the system of choice for old and exotic hardware that would be useless if Linux didn't exist.

What is kernel

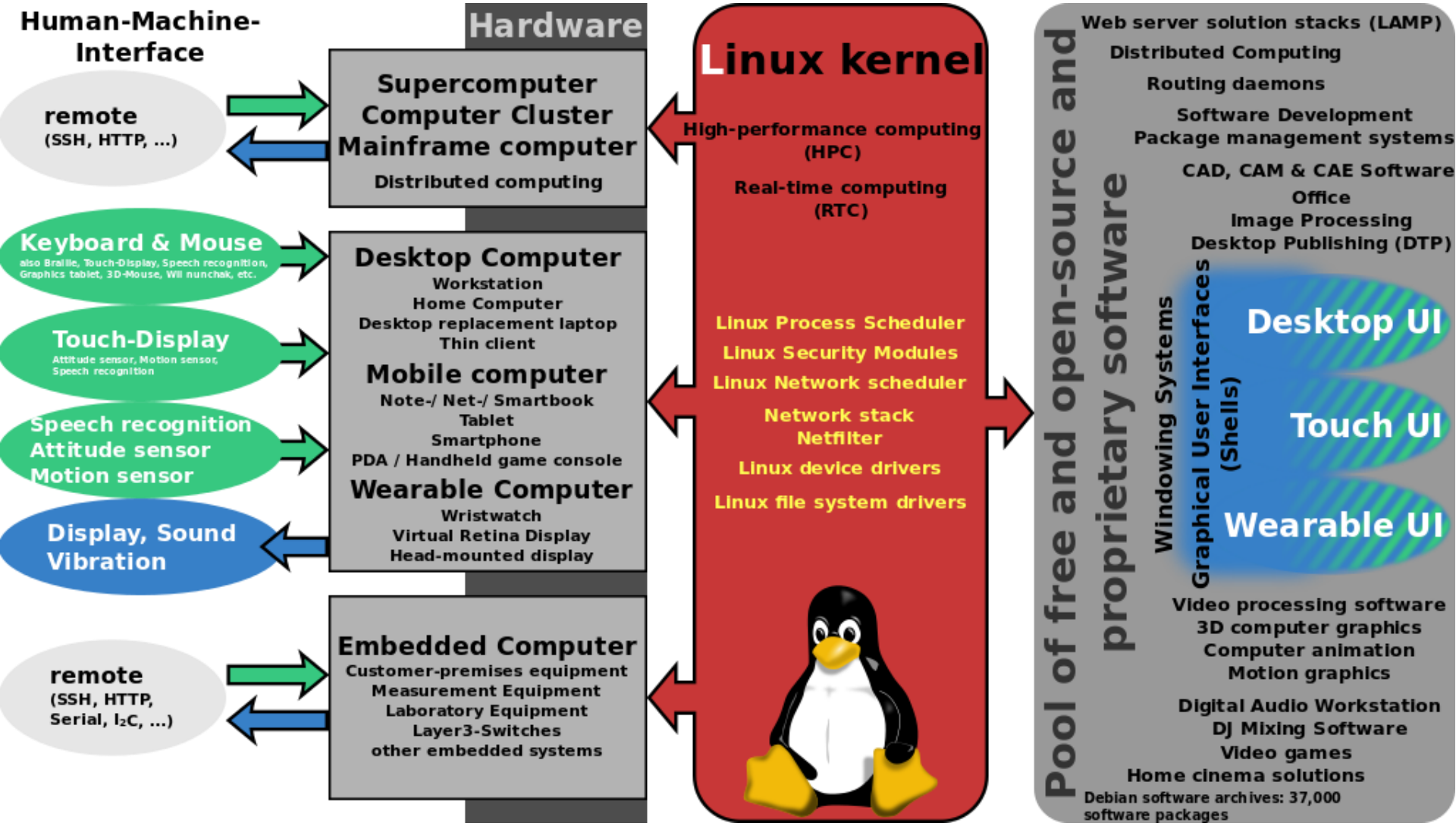
- In English it means the central or most important part of something.
- In Computer science, A **kernel** is the central part of an **operating system**. It manages the tasks of the computer and the **hardware** - most notably memory and **CPU** time.





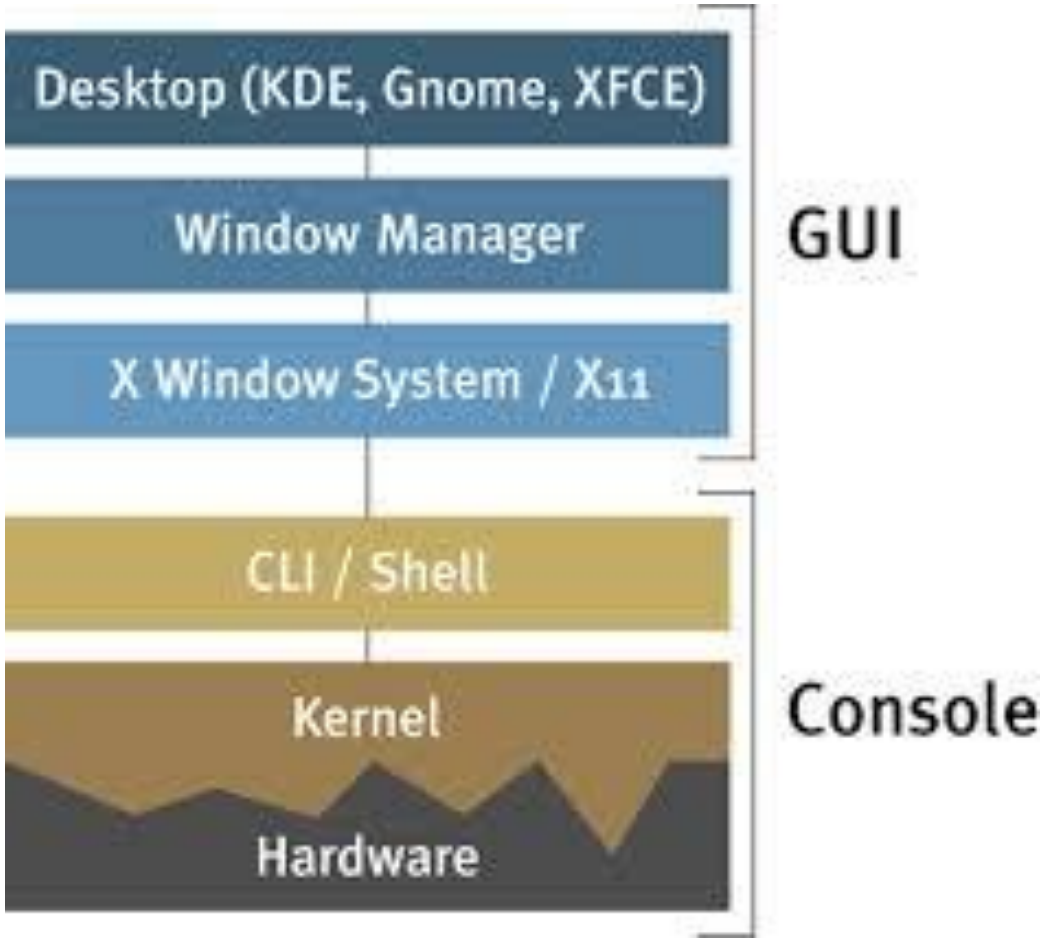
So, What is Linux

- Linux is not an Operating System. It is the **kernel**.
- A Linux **distribution** is a collection of (usually open source) software on top of a Linux **kernel** which is called **GNU/Linux** Operating System.
- A **distribution** (or short, **distro**) can bundle server software, system management tools, documentation and many desktop applications in a central secure **software repository**.



"Linux kernel ubiquity" by Shmuel Csaba Otto Traian.

Linux GUI


Desktop (KDE, Gnome, XFCE)
Window Manager
X Window System / X11
CLI / Shell
Kernel
Hardware
GUI
Console

xWindow system

The **X Window System** (**X11**, **X**, and sometimes informally **X-Windows**) is a windowing system for **bitmap** displays, common on UNIX-like computer operating systems.

Window Manager

A **window manager** (WM) is system software that controls the placement and appearance of windows within a windowing system in a graphical user interface (GUI). It can be part of a **desktop environment** (DE) or be used standalone.

A list of window managers:
https://wiki.archlinux.org/index.php/Window_manager

Desktop environments

A **desktop environment** is a collection of software designed to give functionality and a certain **look and feel** to an operating system.

List of Desktop Environment

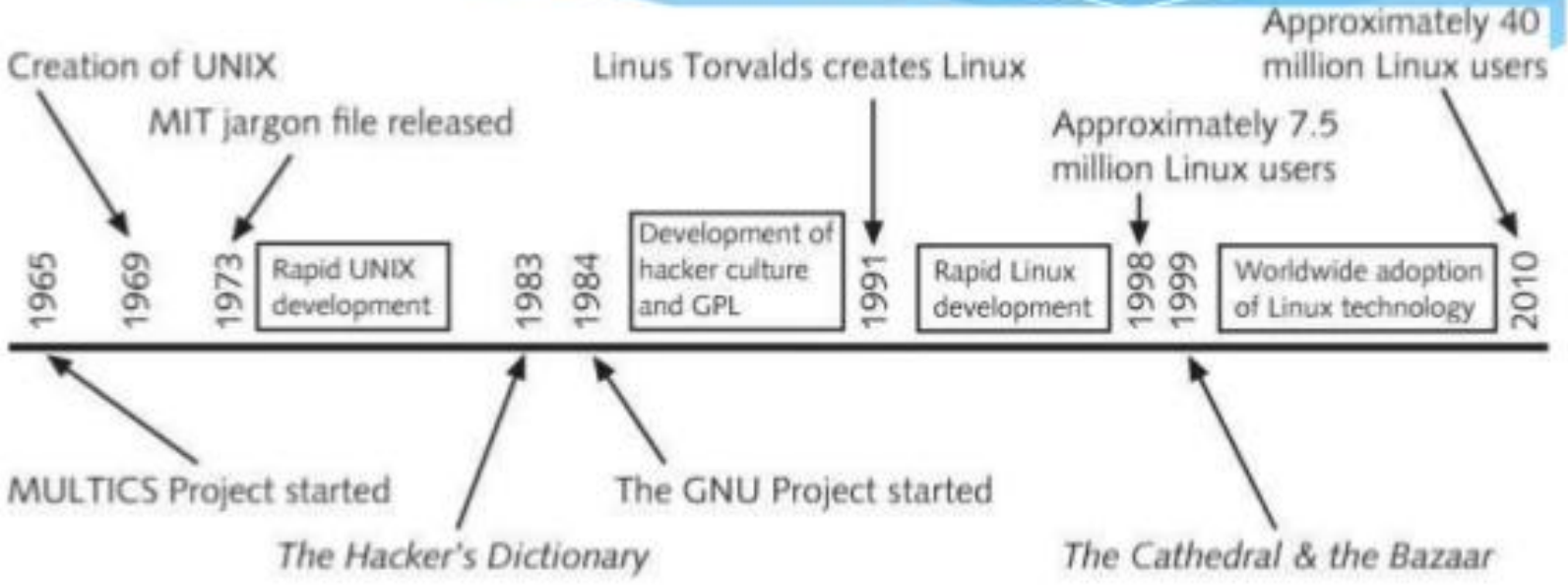
EDE
GNOME
KDE
LXDE
Mate
Trinity
Xfce - Fully featured lightweight desktop environment.

Check http://xwinman.org/ for more details

2015

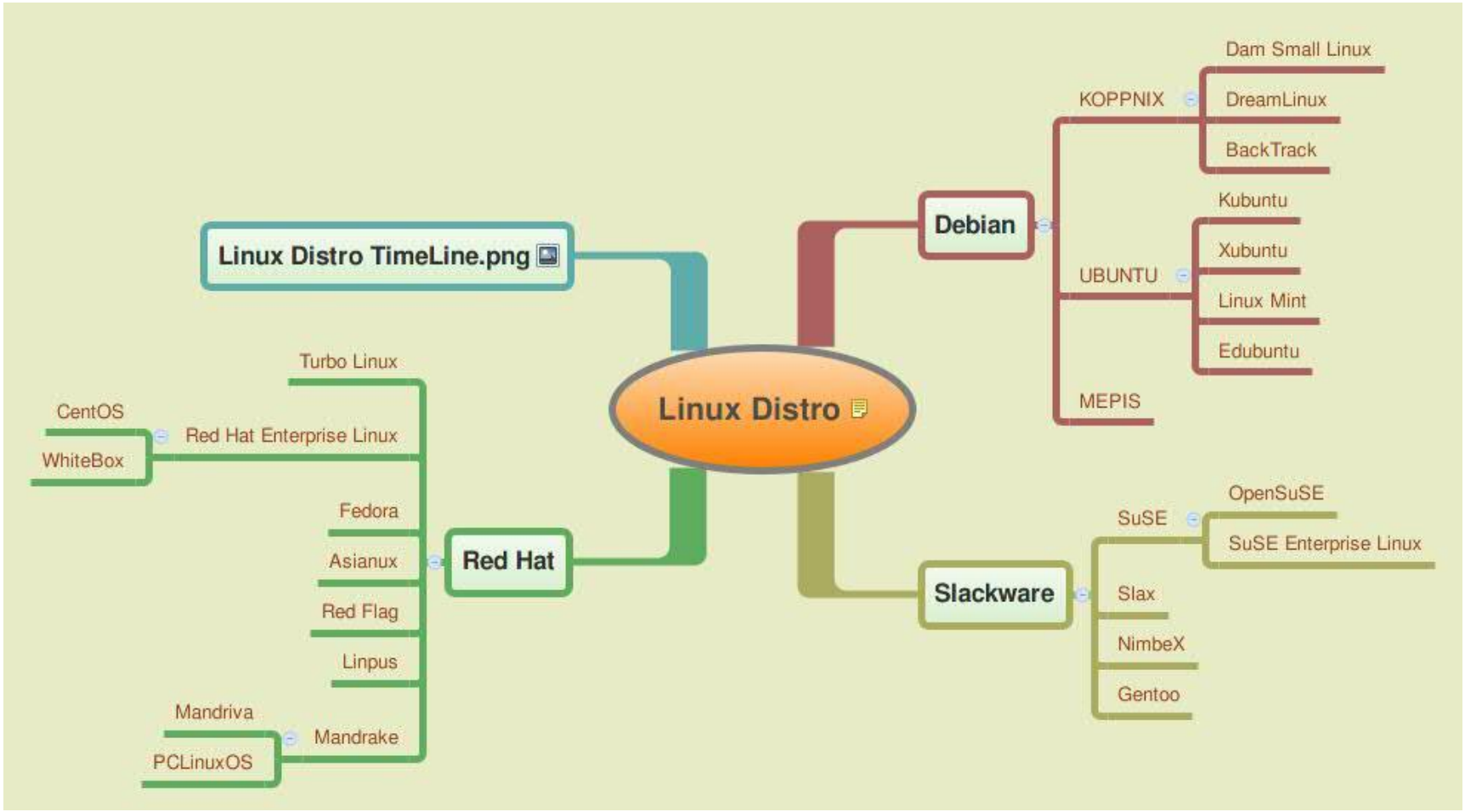
Today more than **%97** of the world's supercomputers (including the complete **top 10**), more than **%80** of all smartphones, many millions of desktop computers, around **%70** of all web servers, a large chunk of tablet computers, and several appliances (dvd-players, washing machines, dsl modems, routers, self-driving cars, space station laptops...) run Linux. Linux is by far the most commonly used operating system in the world.

The History of Linux



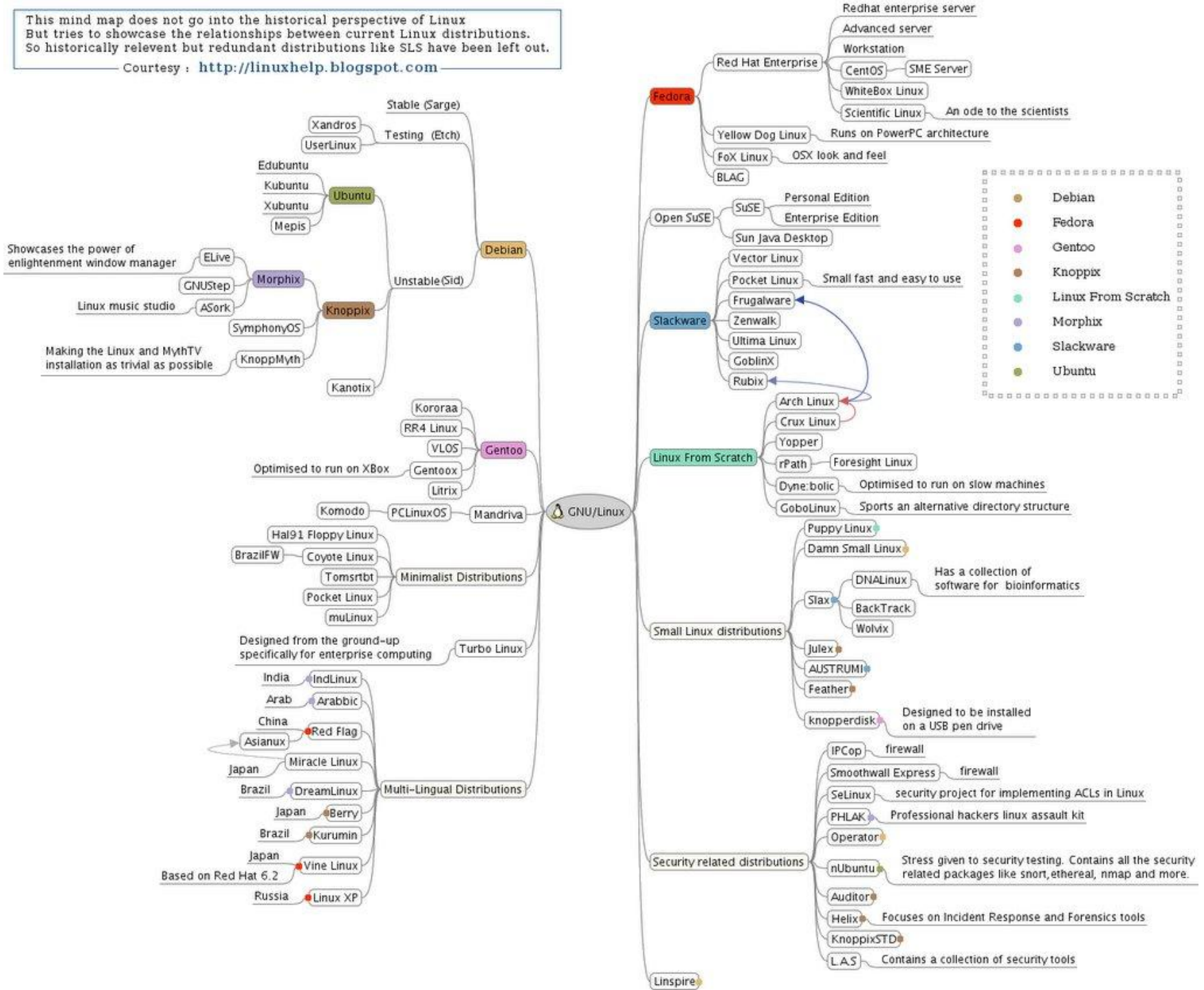
Timeline of UNIX and Linux development

Different Linux distro



This mind map does not go into the historical perspective of Linux
But tries to showcase the relationships between current Linux distributions.
So historically relevent but redundant distributions like SLS have been left out.

Courtesy : http://linuxhelp.blogspot.com



Which Linux distro is better?

Different **Linux** distros are not the same as different version of **Windows**.

Choice and flexibility are the hallmarks of a Linux distribution. With proprietary the **Windows** and **OS X**, you're stuck with the system as designed and can't make changes no matter how unpleasant you may find the experience. **Linux** distributions are free of such limitations.

Each **distro** has the **Linux kernel** at its core, but builds on top of that with its own selection of other components, depending on the target audience of the **distro**.

Most **Linux** users switch between **distros** until they finally find the one that best suits their needs.

There is no company behind Debian. Instead there are thousands of well organised developers that elect a Debian Project Leader every two years. Debian is seen as one of the most stable Linux distributions. It is also the basis of every release of Ubuntu.

Canonical started sending out free compact discs with Ubuntu Linux in 2004 and quickly

became popular for home users (many switching from Microsoft Windows). Canonical

wants Ubuntu to be an easy to use graphical Linux desktop without need to ever see a

command line. Of course they also want to make a profit by selling support for Ubuntu.

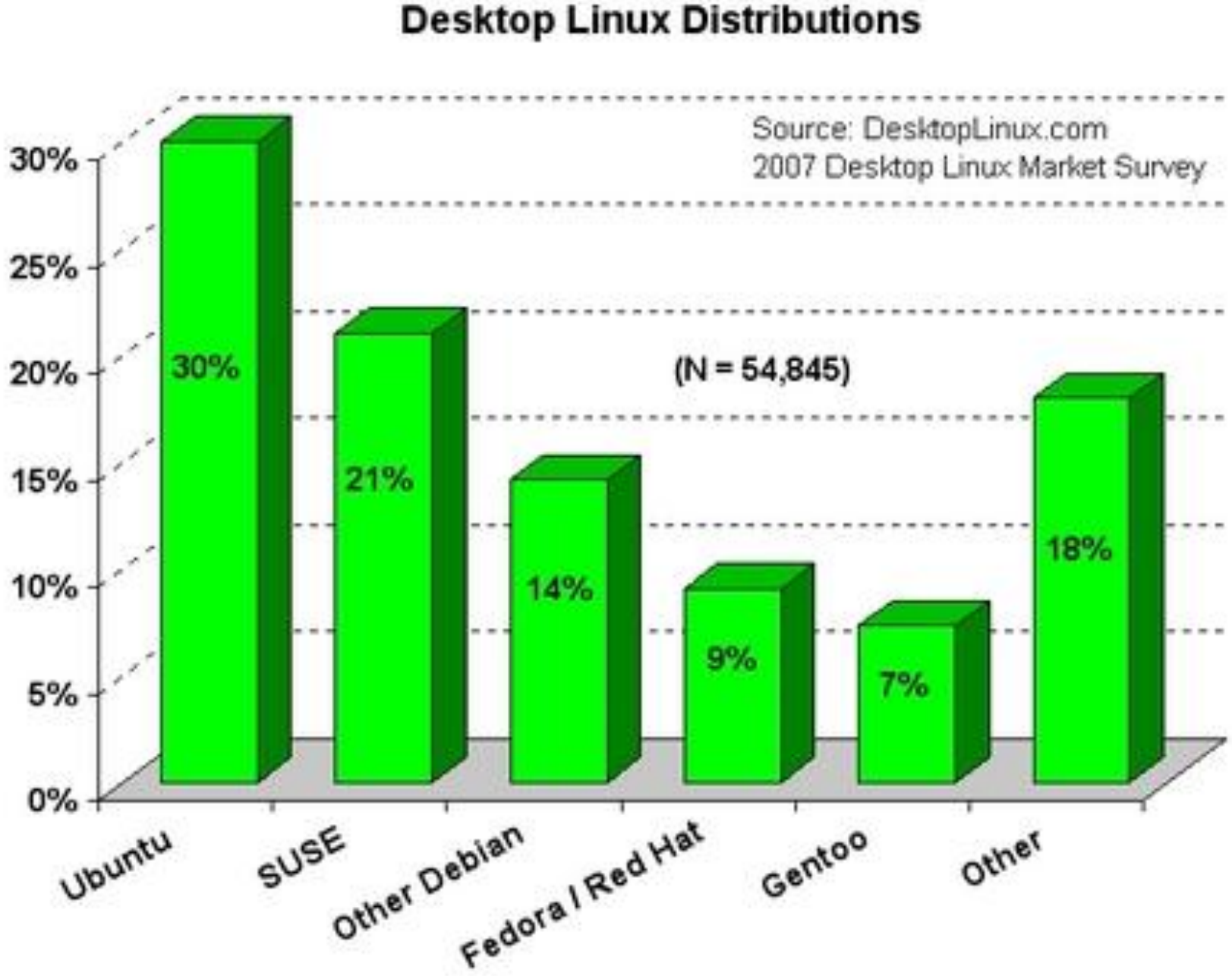
Red Hat

Red Hat is a billion dollar commercial Linux company that puts a lot of effort in developing Linux.

They have hundreds of Linux specialists and are known for their excellent support. They give their products (Red Hat Enterprise Linux and Fedora) away for free.

Distributions like **CentOS**, **Oracle Enterprise Linux** and **Scientific Linux** are based on **Red Hat Enterprise Linux** and share many of the same principles, directories and system administration techniques. **Linux Mint**, **Edubuntu** and many other ***buntu** named distributions are based on **Ubuntu** and thus share a lot with **Debian**. There are hundreds of other Linux distributions.

There are two key reasons for Mint's stellar rise in the popular distro charts. One is that it's based on Ubuntu, and the other is that despite being based on Ubuntu, its default desktop is much more traditional than Ubuntu's controversial Unity interface.


Desktop Linux Distributions
Source: DesktopLinux.com
2007 Desktop Linux Market Survey
(N = 54,845)
30%
25%
20%
15%
10%
5%
0%
30%
21%
14%
9%
7%
18%
Ubuntu
SUSE
Other Debian
Fedora / Red Hat
Gentoo
Other

Time for demonstration!