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# Linux Fundamentals



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## Workshop Pre-requisites

Participants attending the workshop should have

- Familiarity with Linux Fundamentals and commands
- Basic understanding of Python
- Participants should have the following installed on their machines
- Computer Machine with at least Core i3 and 4GB RAM running with Ubuntu

18.04 LTS ○ Anaconda for Linux - Python 3.7 version

[https://repo.anaconda.com/archive/Anaconda3-2020.02-Linux-x86\\_64.sh](https://repo.anaconda.com/archive/Anaconda3-2020.02-Linux-x86_64.sh)



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## Certifications

Certificates will be awarded to students upon successful completion of the workshop all workshop activities as follows:

1. Active participation in all the sessions
2. Timely submission of all the assignments and other activities
3. Scoring 50% or more in the final assessment

All of the course activities:

<https://futureskills.live/>

# Agenda

- The bite of history
- Birth of open source OS
- GNU project
- Free Open Source Software (FOSS)
- Operating system fundamentals
- Linux fundamentals



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# The challenges

- Computers as big as houses, even stadiums
- Every computer had a different operating system
- Software customized to serve a specific purpose
- Software for one given system didn't run on another system
- Both users and the system administrators can't work on another system.



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## Picture reflects

- ✓ Free of cost
- ✓ Sharing the valuable with others
- ✓ Flexibility to change as you wish
- ✓ Fastest
- ✓ Secure
- ✓ Supported by community



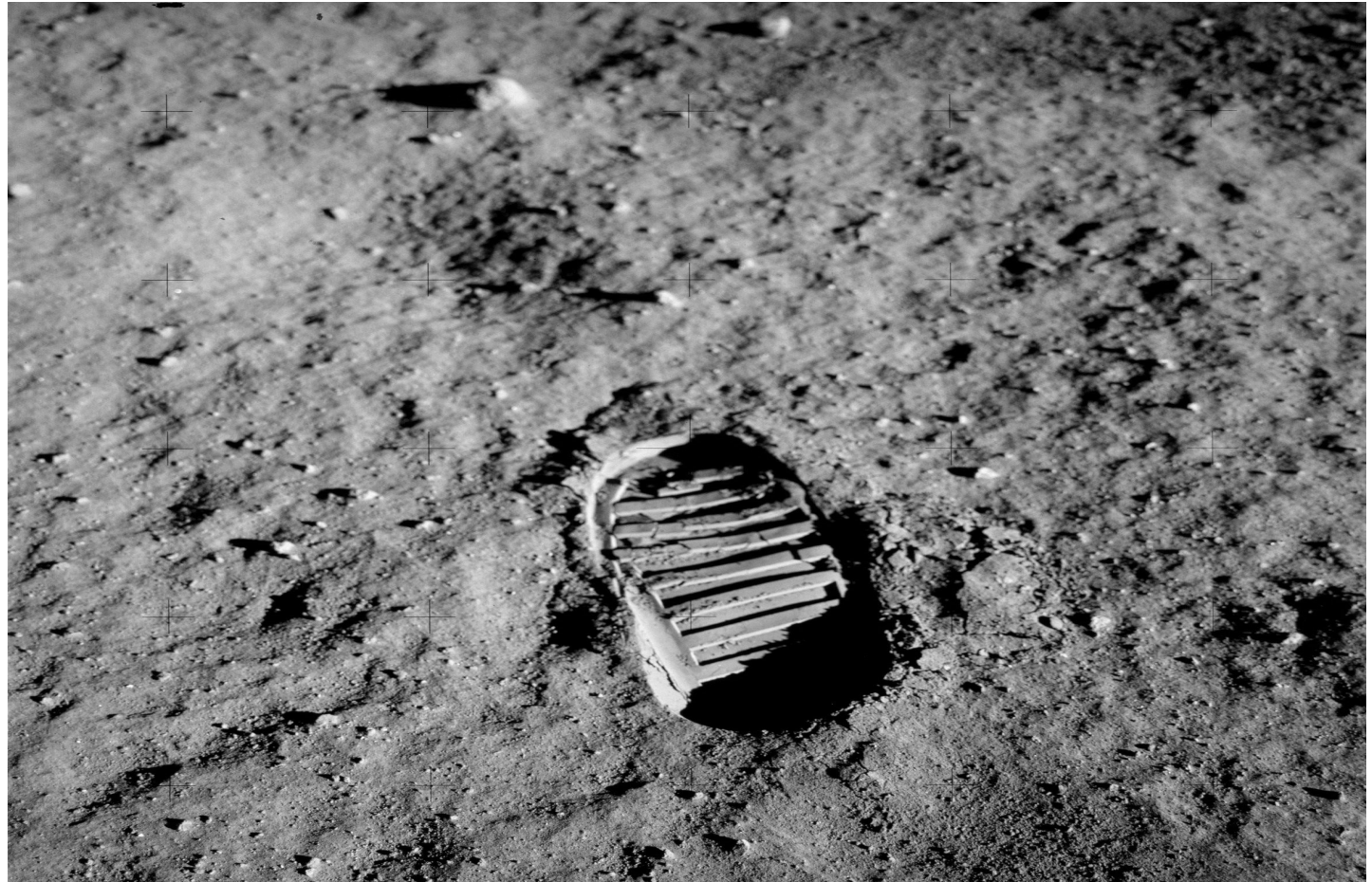


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When it all  
started?







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## 1969 - Dennis Ritchie and Ken Thompson at AT&T Bell labs

1. Simple and elegant.
2. Written in the C programming language instead of in assembly code.
3. Able to recycle code.





- **1975**
- AT&T started selling UNIX which had half of source code written by others.





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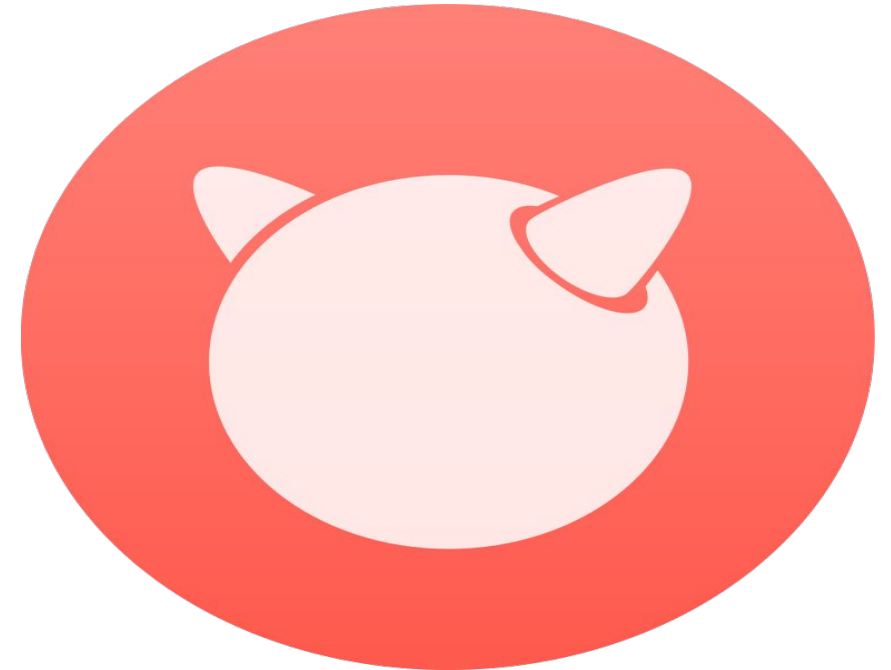
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## Legal Battle – Two versions



**Vs**



**Berkeley Software Distribution**



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- **1980s**
- Many UNIX dialects
- IBM – AIX
- SUN SunOS
- HP - HP UX





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- 1983
- GNU project
- Richard Stallman
- Free software concept
- Development of gcc,gdb,glibc and many more
- GNU Hurd – kernel project still under development
- **GNU was in need of Kernel which will complete its OS project.**





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## Fun facts

- **GNU – GNU Not Unix**
- Do you know where this word came from?





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- ***“GNU” is an ox like animal from South Africa.***



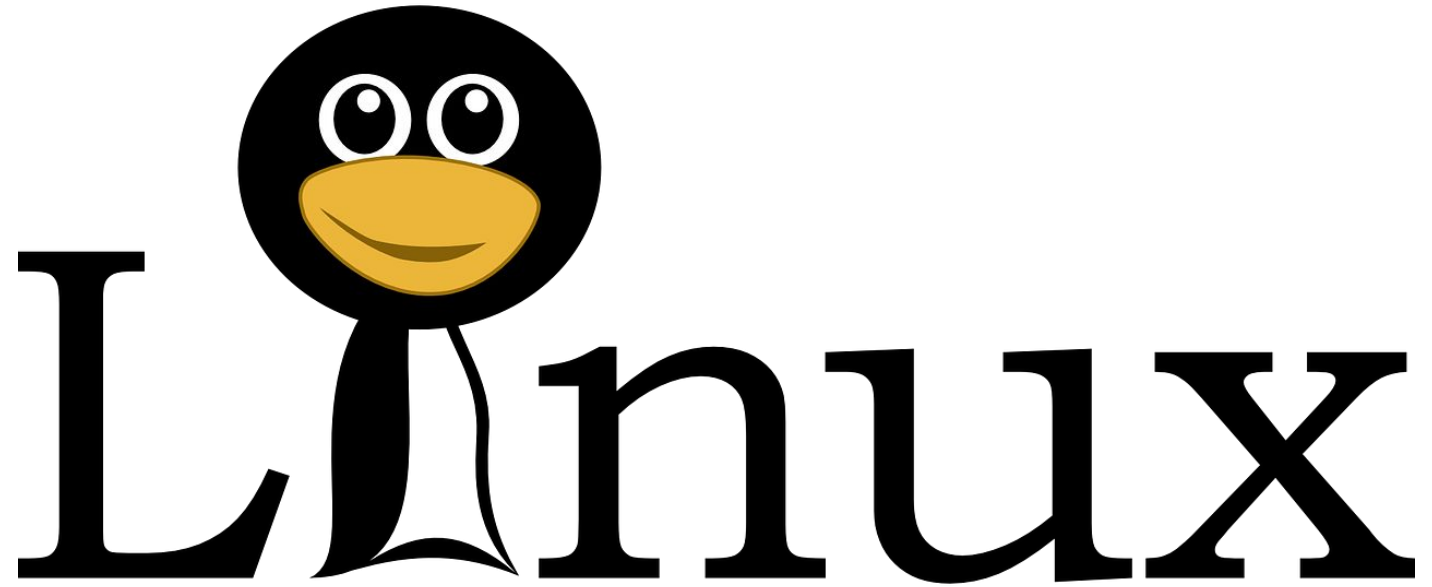


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- 1991
  - Linus Torvalds
  - Linux kernel project
  - Unix like OS kernel
  - GNU + Linux gave  
Free Open Source OS
- GNU/LINUX**





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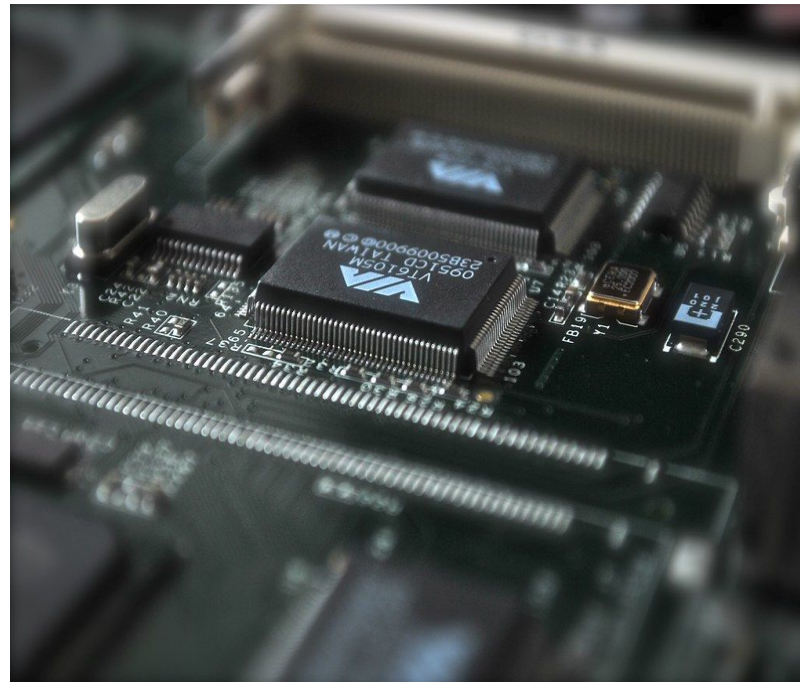


In the years to come it became popular on

**Servers**



**Embedded Hardware**



**Mobile Devices**





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## Poll Question

**What made linux popular ?**



## Does it have any license?

- GNU termed its license as GPL ( **G**eneral **P**ublic **L**icense )
- It talks about **Copylefted** programs that ensures that the end users the freedom to run, study, share, and modify the software but distribution must follow the terms of the license.
- Copyleft statement:
- “Verbatim copying and redistribution are permitted in any medium provided this notice is preserved.”

**FOSS** ( **F**ree **O**pen **S**ource **S**oftware ) comes with freedom of

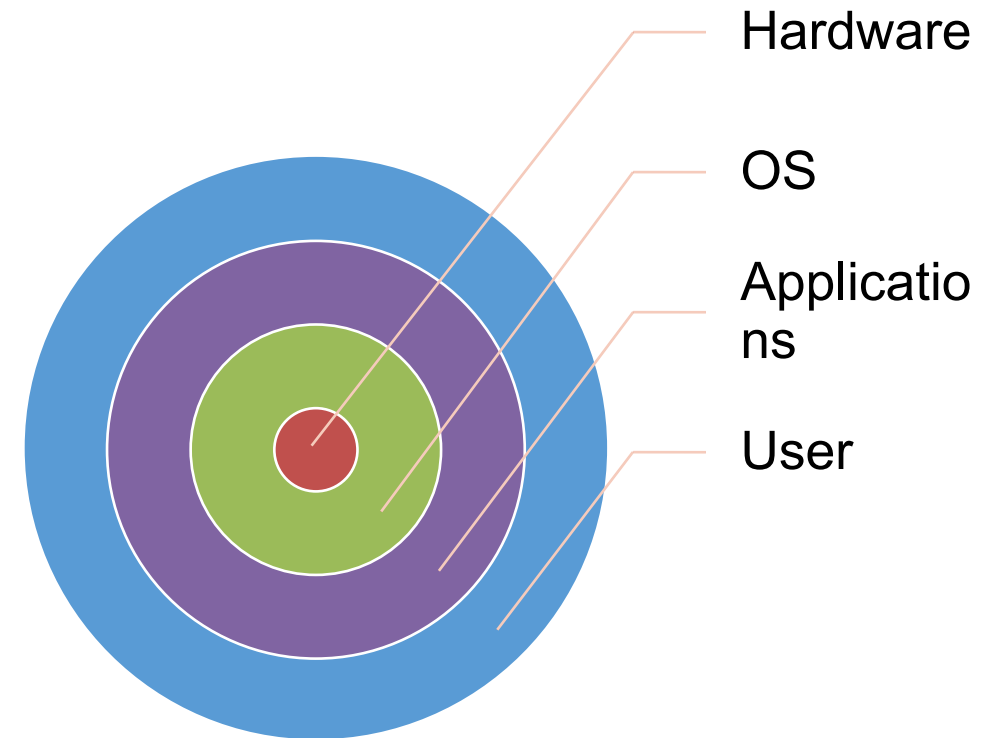
- Run the software for any purpose ( commercial / non commercial )
- Study software and change it
- Redistribute copies
- Distribute copies of modified versions





## What is **O**perating **S**ystem (**OS**)?

- Software that communicates with hardware and allow other programs to run while managing resources like memory and input / output functions







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# Functions of an OS

- Process management
- Interrupts handling
- Memory management
- File system management
- Device drivers
- Networking
- Security manage
- I/O management



# Types of Operating Systems

- **Tasks**
- **Uni tasking**
- **Multi tasking:** Two or more processes running at the same time
- **Users**
- **Single User**
- **Multi-user:** Two or more users work with the computer at the same time
- **Processing**
- **Uni processing**
- **Multiprocessing / threading:** Two or more parts of the same process running at the same time.
- **Timesharing**
- each task is given some time to execute and all tasks are given time so that all processes run seamlessly without any problem.



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# Components of an OS

Three elements of an OS

- **User Interface:**

The part of the OS that you interface with. It consist of CLI and GUI.

- **Kernel:**

The core(heart) of an OS that interacts with BIOS at one end and with UI at the other end.

- **File Management System:**

Manages and organizes files



## What is a kernel?

- Core or nucleus or heart of an operating system
- Interacts with the hardware
- First program to get loaded when the system starts and runs till the session gets terminated
- Different from BIOS which is hardware dependent. Kernel is software dependent.



# Kernel Types

- **Monolithic**

- All OS related code are stuffed in a single module
- Available as a single file
- Advantage : Faster functioning

- **Micro**

- OS components are isolated and run in their own address space
- Device drivers, programs and system services run outside kernel memory space
- Supports modularity
- Lesser in size



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## Poll Question

**Which type of kernel is Linux?**





## Linux kernel key features

- Portability and hardware support. Runs on most architectures.
- Scalability. Can run on supercomputers as well as on tiny devices (4 MB of RAM is enough).
- Compliance to standards and interoperability.
- Exhaustive networking support.
- Security. It can't hide its flaws. Its code is reviewed by many experts.
- Stability and reliability.
- Modularity. Can include only what a system needs even at run time.
- Easy to program. You can learn from existing code. Many useful resources on the net.



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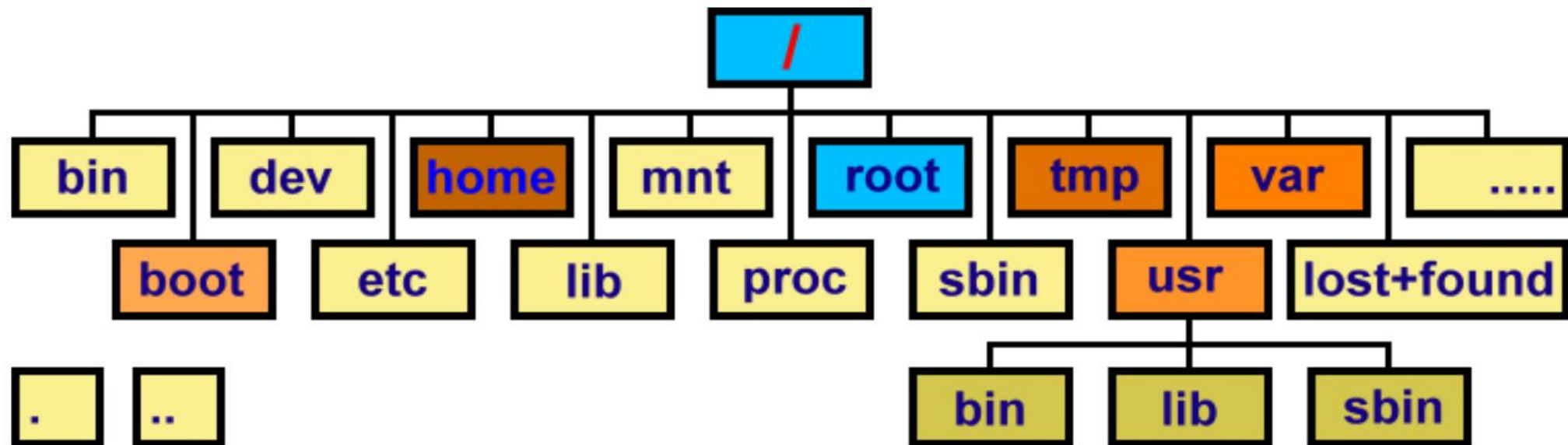
## Linux Distributions

 redhat	 MEPIS	 turbolinux	 LUNAR	 EvilEntity	 debian	 Vine Linux	 cAos/CentOS	 MiniKazit	 UTUTO
 archlinux	 m0n0wall	 Iand Linux	 Knoppix STD	 gentoo linux	 DeLi Linux	 Hiweed	 amlog	 slackware	 yellow dog
 Fedora	 LPG	 PLD	 SLAX	 COREL LINUX	 Progeny	 GEEBOX	 BIGLINUX	 FREEDUC	 Lycoris
 EnGarde	 Mandrakelinux	 BeatrIX	 Linspire	 suse	 中文延伸套件	 YOPER	 BearOps	 ASPLINUX	 kalango
 Slackintosh	 Frugalware	 Foresight	 Mint	 PCLinuxOS	 Haydar Linux	 sabayon	 ubuntu	 JULEX	 blag



# Linux File System

- The kernel maintains a single hierarchical directory structure to organize all files in the system. Microsoft Windows, each disk device has its own directory hierarchy.





## Linux File System

Directory	Content
/bin	Common programs, shared by the system, the system administrator and the users.
/boot	The startup files and the kernel, vmlinuz. In some recent distributions also grub data. Grub is the GRand Unified Boot loader and is an attempt to get rid of the many different boot-loaders we know today.
/dev	Contains references to all the CPU peripheral hardware, which are represented as files with special properties.
/etc	Most important system configuration files are in /etc, this directory contains data similar to those in the Control Panel in Windows
/home	Home directories of the common users.
/initrd	(on some distributions) Information for booting. Do not remove!
/lib	Library files, includes files for all kinds of programs needed by the system and the users.
/lost+found	Every partition has a lost+found in its upper directory. Files that were saved during failures are here.



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/misc	For miscellaneous purposes.
/mnt	Standard mount point for external file systems, e.g. a CD-ROM or a digital camera.
/net	Standard mount point for entire remote file systems
/opt	Typically contains extra and third-party software.
/proc	A virtual file system containing information about system resources. More information about the meaning of the files in proc is obtained by entering the command <b>man proc</b> in a terminal window. The file proc.txt discusses the virtual file system in detail.
/root	The administrative user's home directory. Mind the difference between /, the root directory and /root, the home directory of the <i>root</i> user.
/sbin	Programs for use by the system and the system administrator.
/tmp	Temporary space for use by the system, cleaned upon reboot, so don't use this for saving any work!
/usr	Programs, libraries, documentation etc. for all user-related programs.



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## Self study

Link to access courses online

<https://bit.ly/3ezw8VR>





## References

1. Image - free - [https://www.flickr.com/photos/toddle\\_email\\_newsletters/7002322316](https://www.flickr.com/photos/toddle_email_newsletters/7002322316)
2. Image - share - <https://www.pxfuel.com/en/search?q=shares>
3. Image - freedom - <https://www.publicdomainpictures.net/en/view-image.php?image=273080&picture=hiking-freedom>
4. Image – usain bolt - [https://en.wikipedia.org/wiki/File:Usain\\_Bolt,\\_Anniversary\\_Games,\\_London\\_2013.jpg](https://en.wikipedia.org/wiki/File:Usain_Bolt,_Anniversary_Games,_London_2013.jpg)
5. Image – security - <https://www.pexels.com/photo/internet-screen-security-protection-60504/>
6. Image – Dahi Handi - [https://commons.wikimedia.org/wiki/File:Dahi\\_Handi\\_Jay\\_Bharat\\_Seva\\_Sangh.jpg](https://commons.wikimedia.org/wiki/File:Dahi_Handi_Jay_Bharat_Seva_Sangh.jpg)
7. Image – footprint on moon - [https://en.wikipedia.org/wiki/Apollo\\_11#/media/File:Apollo\\_11\\_bootprint.jpg](https://en.wikipedia.org/wiki/Apollo_11#/media/File:Apollo_11_bootprint.jpg)
8. Image – C - <https://pxhere.com/en/photo/935973>
9. Image – Unix - [https://commons.wikimedia.org/wiki/File:UniX\\_Logo.png](https://commons.wikimedia.org/wiki/File:UniX_Logo.png)
10. Image – sold - <https://www.publicdomainpictures.net/en/view-image.php?image=205335&picture=sold-stamp>
11. Image – at&t - <https://www.flickr.com/photos/jeepersmedia/14023087010>
12. Image – BSD - [https://commons.wikimedia.org/wiki/File:Antu\\_distributor-logo-freebsd.svg](https://commons.wikimedia.org/wiki/File:Antu_distributor-logo-freebsd.svg)
13. Image – dialects - <https://pxhere.com/en/photo/1056707>
14. Image – GNU - <https://commons.wikimedia.org/wiki/File:Gnu-head-30-years-anniversary.svg>
15. Image – gnu - <https://pixabay.com/photos/gnu-nature-animal-wildlife-namibia-4900473/>
16. Image – linux - <https://www.needpix.com/photo/92909/linux-logo-penguin-tux-text-free-vector-graphics-free-pictures-free-photos-free-images>
17. Image – servers - <https://pxhere.com/en/photo/1241325>
18. Image – Embedded - <https://www.flickr.com/photos/npobre/4484863605>
19. Image – mobile devices - <https://pxhere.com/en/photo/945391>