The Linux File System

3. Introduction to Scientific Computing with Linux
Part I. Introduction

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Outline

What is File System?

It has got two meanings,

Variation 1

- ◇ File System is the "directory" structure or the hierarchy of your system
- ◇ On Linux and Unix, it is referred to as directory tree

This tutorial mainly focuses on the 1^{st} variation

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Variation 2

- A method or the way the files are organized on the disk or a partition on harddisk
- Example :
  - FAT16, FAT32, NTFS
  - ext2, ext3, ext4

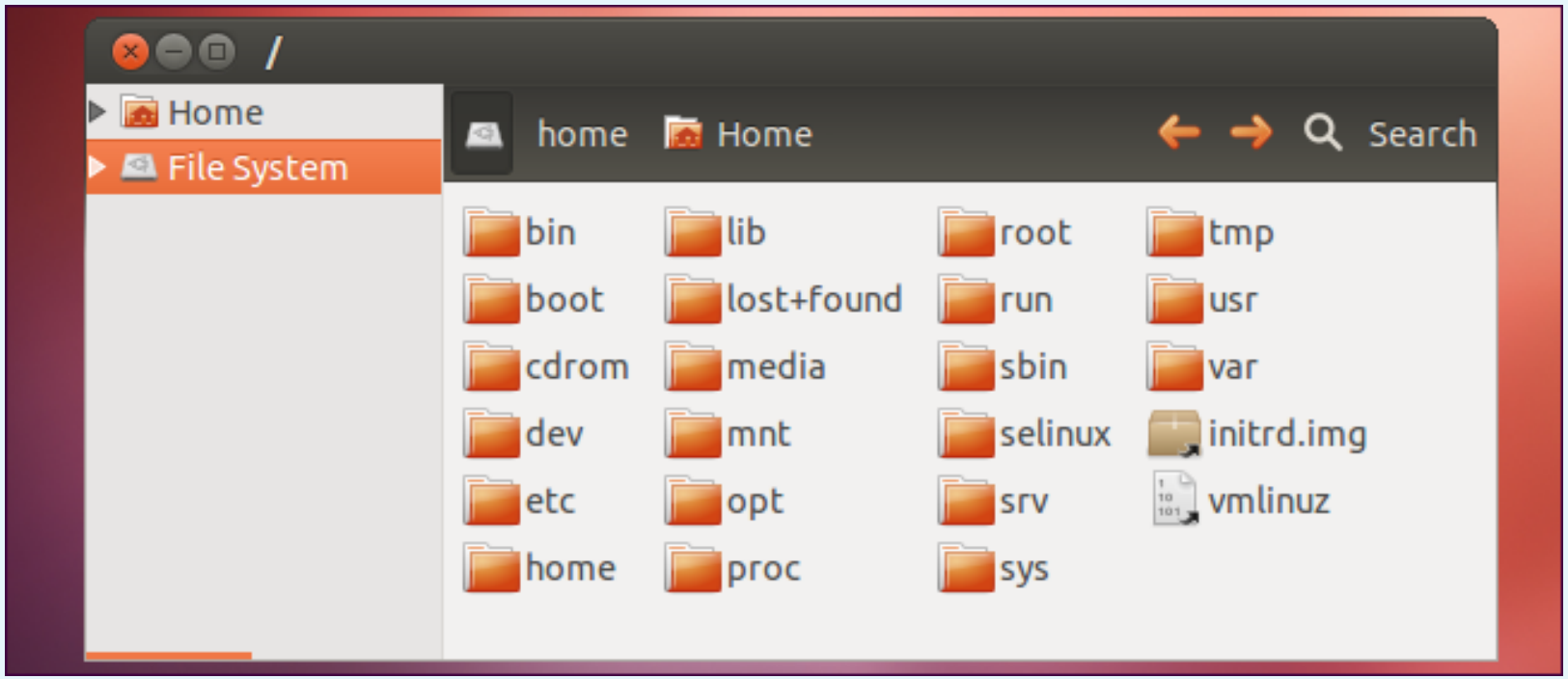
This tutorial mainly focuses on the 1^{st} variation

Filesystem Hierarchy Standard in Linux

To see the directory list

Open up a terminal and type in

```
ls -l / #directories under root
```



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- The partition in which the root file system resides on is mounted first during boot

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- Shared by the system with all the users

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So what is the kernel?

◇ Wiki: "The central core of the computer's OS"

◇ A software that interfaces with the hardware of your system

◇ Responsible for low-level tasks such as disk management, task management and memory management

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- /boot/grub contains GRUB (GNU GRand Unified Bootloader)

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- /dev/dsp (AUDIO devices)
- /dev/sda (SCSI - HDD devices)

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- A device can be created using "makedev" script located here

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Some of the contents of /etc

- /etc/bash.bashrc (System wide shell functions and aliases)
- /etc/X11 (X window system)
- /etc/apt (front-end dpkg package manager)
- /etc/dict.conf (Client for dictionary server)
- /etc/fstab (Config file for mount)

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- Contains personal configuration files (“.” files are hidden)

```
ls -a ~/ #List all the contents in home folder
```

- These personal configuration overrides the systemwide configuration

Some important contens of /home

- /home/.bashrc Personal settings for the shell
- /home/.fonts Directory for personal fonts

/root - Home of the root user

Wait.. Is there a root on root??

- Note the difference between the `/' and `/root'
- This is the administrator's home directory

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Why not in /home itself?

/home is often located in separate partition, this enables the sysadmin to access files even if the `/home' is not mounted

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- Essential files for basic system functionality

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- Similar to DLL files in Windows are located here

Some of the contents

- ◇ C programming code library is located here
- ◇ /lib/x86_64-linux-gnu/ (Contains platform/architecture dependent libraries)
- ◇ /lib/modules/ (Contains all kernal modules)

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How to Mount?

```
# mount device_file mountpoint
mount /dev/hda2 /home #/dev/hda2 is mounted on /home
```

/opt - Optional packages

- Location of all software and add-on packages which are not a part of the default installation

Some example OSS

openFOAM, xampp, google-chrome

- Similar to `Program Files' directory
- Programs to be invoked by users are located in /opt/'package name'/bin

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- ◇ All of them have a file size of ZERO!!
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Some utilities in /proc

- ◇ /proc/modules Status of kernel modules [a]
- ◇ /proc/meminfo Information about memory usage
- ◇ /proc/sys Directory containing system info. Customisation is possible

[a] Refer to `http://www.tldp.org/` for more info

/sbin - System Binaries

- Executables used for system maintenance and administrative tasks
- According to FSSTND (FileSystem Standard) "/sbin should contain only binaries essential for booting, restoring, recovering, and/or repairing the system"

Some utilities

fastboot, halt, fdisk, init, ifconfig, shutdown etc

/usr - User-share and Read-only data

- It contains programs, libraries, documentation etc for all user-related programs
- Contains the largest share of data on ths system

Some important contents

- /usr/bin - Contains majority of binaries (Eg: gcc, mozilla)
- /usr/doc - Central documentation directory
- /usr/include - Directory for header files
- /usr/local - Self-compiled programs
- /usr/share/man - Manual pages

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- /var/run - System info since boot

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- /var/tmp can also store temporary files that are large and need to exist for a longer time

Thank You!

References

- The Linux Documentation Project(TLDP), `http://www.tldp.org/LDP/Linux-Filesystem-Hierarchy/Linux-Filesystem-Hierarchy.pdf`
- `http://www.linfo.org/filesystem.html`
- Find a complete overview here, `https://www.blackmoreops.com/2015/06/18/linux-file-system-hierarchy-v2-0/`