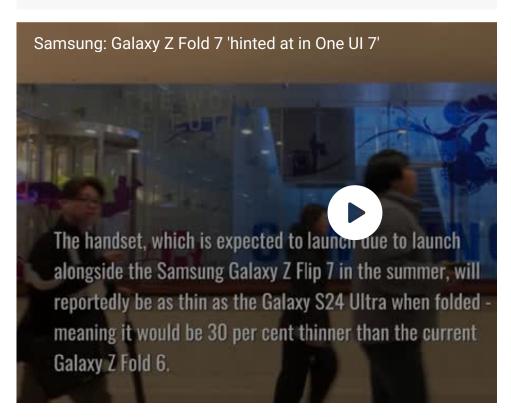




Linux Directory Structure and Important Files Paths Explained

Ravi Saive | Last Updated: November 15, 2023 | Read Time: 8 mins | Open Source | 60 Comments

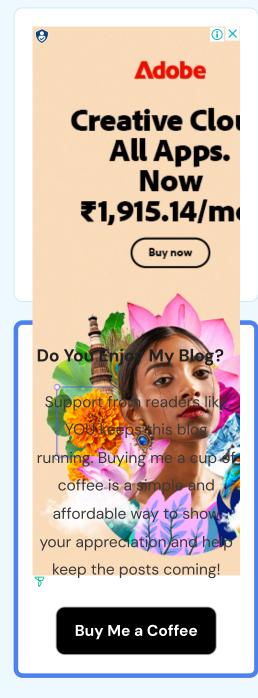


Brief: This article gives a breakdown of the Linux File System/directory structure, some of the critical files, their usability, and their location.

You must have probably heard that <u>everything is considered a file</u> in UNIX and UNIX derivatives such as Linux. If not a file, then it must be a running process.

There are three broad categories of files in Linux.

Search...



- Directory Files In Linux, directories are also categorized as files since they also serve as storage space for other files and folders.
- Device Files These are special files that provide an interface to device drivers which enable the usability of hardware devices on the system such as mice, keyboards, USB devices, hard drives, etc. These are found in the /dev directory.

Linux Directory Structure Diagram

A standard **Linux** distribution follows the directory structure as provided below with Diagram and explanation.



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Each of the above directories (which is a file, in the first place) contains important information, required for booting to device drivers, configuration files, etc. Describing briefly the purpose of each directory, we are starting hierarchically.

/ Directory

The <u>root directory</u>, denoted by a single forward slash (/), is the uppermost directory in the Linux directory structure. It contains all directories, sub-directories, and files on your Linux system. It's from the root directory where the Linux directory hierarchy starts.

NOTE: The root directory (/) should not be confused with the root home directory (/root).

```
total 28
1rwxrwxrwx
              1 root root
                              7 Oct 11
                                         2021 bin -> usr/bin
dr-xr-xr-x.
              5 root root 4096 Mar
drwxr-xr-x 20 root root 3040 Sep 29 16:27
drwxr-xr-x. 111 root root 8192 Sep 29 14:27
drwxr-xr-x.
                            39 Oct 11
                                        2021 home
             4 root root
                              7 Oct 11
                                         2021 lib -> usr/lib
1rwxrwxrwx
              1 root root
                                         2021 lib64 -> usr/lib64
                              9 Oct 11
1rwxrwxrwx
              1 root root
drwxr-xr-x.
              2 root root
                              6 Oct 11
                                         2021 media
drwxr-xr-x.
              2 root root
                              6 Oct 11
                                         2021 mnt
                             18 Aug 23 12:23 opt
drwxr-xr-x.
              3 root root
dr-xr-xr-x 159 root root
                                Jan
                                         2022
              8 root root 4096
                                 Sep 29 14:31 root
             35 root root 1000 Aug 23
drwxr-xr-x
                                        14:44
                                Oct 11
                                        2021 sbin -> usr/sbin
1rwxrwxrwx
              1 root root
drwxr-xr-x.
              2 root root
                                Oct 11
                                         2021 srv
             13 root root
                              0 Mar
dr-xr-xr-x
                                         2022
             10 root root 4096 Sep 29 15:08
drwxrwxrwt.
             14 root root
                            167 Mar
drwxr-xr-x.
                                         2022
             21 root root 4096 Aug 23 13:54
drwxr-xr-x.
```

F



/boot Directory

This is one of the most vital directories in a Linux system. As the name infers, the boot directory contains <u>Linux boot files</u> such as the bootloader, the kernel, and its associated files. Files such as 'vmlinuz' represent the compressed image of the Linux kernel.

/etc Directory

The **/etc** directory contains system configuration files for all the services, scripts, and third-party applications that are installed. This directory is considered the nerve center of the Linux system.

```
]# 1s /etc/
adjtime
                                                        environment host.conf
                                                        ethertypes
aliases
                             cron. deny
                                                                     hostname
                                                        exports
                                                                     hosts
anacrontab
                             crontab
                                                        filesystems idmapd.conf
sound.conf
                                                                      inittab
                             crypttab
                                                                      inputro
                                                        fstab
                             csh.cshrc
                                                        fuse. conf
                             csh. login
oashrc
bindresvport. blacklist
                                                        gdbinit
                                                                      issue
                                                                      issue. net
                             /etc Directory in Linux
```

/home Directory

The **/home** directory is a directory that contains a user's personal folders and files. On a graphical Linux system, the home directory,

¥

In addition, the **/home** directory contains personal configuration files which are prefixed with a dot (.). These are hidden files that contain user-specific settings for the login shell session.

```
total 0
drwx-----. 2 rockylinux rockylinux 83 Jun 25 2021 rockylinux
drwx-----. 2 tecmint tecmint 83 Aug 23 19:48 tecmint

Home Directory in Linux
```

/root Directory

The **/root** directory is the home directory for the root user, which is also referred to as the root user's home directory (and not as the root (/) directory).

The root account also referred to as the superuser, administrative user, system administrator or just the root user has all the access to commands and system files in Linux.



The **/opt** directory is a directory that is reserved for add-on packages and third-party software applications that are not included by default in the system's official repositories.

For example, when you install applications such as <u>Skype</u>, **Discord**, **Spotify**, and <u>Java</u>, to mention a few, they get stored in the **/opt** directory.

/dev Directory

The **/dev** directory contains device files or special files for devices that are attached to the system such as the hard drive, keyboard, and mouse. As mentioned, these are not regular that a user can read and write to.

These are abstractions of standard devices that applications on your system interact with through input and output system calls.

```
autofs cpu fd input net raw sgl
block cpu_dma_latency
bsg disk
bus dm-0
cdrom dm-1
char dm-2
console dri
core fb0

[**read@tecmint:/home]**

//dev Directory in Linux
```

/var Directory

The **/var** directory stores system-generated variable files, which include log files, caches, and spool files just to mention a few.

¥

```
nt:/home]# 1s -1 /var
total 12
drwxr-xr-x
             2 root root
                            19 Apr 12
                                       2021 account
drwxr-xr-x.
            2 root root
                            6 Oct 11
                                       2021 adm
                           141 Aug 23 12:37 cache
drwxr-xr-x. 12 root root
drwxr-xr-x.
            3 root root
                           18 Oct 11
                                      2021 db
                           18 Oct 11
                                       2021 empty
drwxr-xr-x.
             3 root root
drwxr-xr-x.
             2 root root
                            6 Oct 11
                                       2021 ftp
            2 root root
drwxr-xr-x.
                            6 Oct 11
                                       2021 games
           2 root root
3 root root
                            6 Oct 11
drwxr-xr-x.
                                       2021 gopher
                                       2021 kerberos
drwxr-xr-x.
                           18 Nov
                                   9
drwxr-xr-x. 41 root root 4096 Aug 23 14:44 lib
                            6 Oct 11
                                      2021 local
drwxr-xr-x.
            2 root root
            1 root root
1rwxrwxrwx.
                           11 Jun 25
                                      2021 lock -> ../run/lock
drwxr-xr-x. 17 root root 4096 Sep 29 14:28 <mark>lo</mark>g
1rwxrwxrwx
            1 root root
                           10 Oct 11
                                       2021 mail -> spool/mail
drwxr-xr-x.
            2 root root
                            6 Oct 11
                                       2021 nis
                             6 Oct 11
drwxr-xr-x.
             2 root root
                                       2021 opt
drwxr-xr-x. 2 root root
                                       2021 preserve
                            6 Oct 11
            1 root root
                            6 Jun 25
1rwxrwxrwx.
                                       2021 run -> ../run
                           72 Oct 11
drwxr-xr-x.
             7 root root
                                      2021 spool
drwxrwxrwt. 6 root root 4096 Sep 29 14:27 tmp
drwxr-xr-x.
            4 root root
                           33 Aug 23 12:52
drwxr-xr-x. 2 root root
                             6 Oct 11 2021 yp
                         /var Directory in Linux
```

/bin Directory

The **/bin** directory contains user binaries, executable programs, and common system commands that are used by all users in the system. These include <u>ls</u>, <u>pwd</u>, <u>cat</u>, **mkdir**, <u>cd</u>, **mv**, <u>cp</u>, <u>du</u>, <u>df</u>, <u>tar</u>, <u>rpm</u>, <u>wc</u>, <u>history</u>, etc.

```
edgepaint ifnames

a2x editdiff iio_event_monitor

a2x.py efikeygen iio_generic_buffer

ab efisiglist info

ac egrep infocmp

aclocal

aclocal-1.16 elfedit innochecksum

acyclic enc2xs install

addr2line encguess install

alias env install

apropos envsubst intel-speed-select

arch espdiff intltool-extract
```

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The **/sbin** directory contains executable files, utilities, and system commands that are reserved for the root user or a user with root privileges. Such commands include halt, reboot, mkfs, <u>fsck</u>, <u>fdisk</u>, halt, <u>iptables</u>, <u>ifconfig</u>, <u>ip</u>, <u>swapon</u>, etc.

```
accessdb
accton
debugts
debugts
gluster
groupadd
iptables-translate
iptubes-translate
iptubes-translate
iptunnel
addpart
devlink
groupmems
irqbalance
igtubalance
iscsiadm
igcsiadm
agetty
dmfilemapd
group
alternatives
dmidecode
grpconv
alternatives
dmsetup
grpunconv
apachectl
applygnupgdefaults
arp
tpd

/sbin Directory in Linux
```

/usr Directory

The **/usr** directory ranks as one of the most important directories due to the enormous amount of data it holds. The directory contains system-wide read-only files. These include libraries, user binaries and their documentation, programs, and system utilities.

```
nt:/home]# 1s -1 /usr/
total 184
              2 root root 36864 Aug 23 20:35 bin
dr-xr-xr-x.
drwxr-xr-x
                           6 Nov 3
                                       2021 etc
             2 root root
             2 root root
                              6 Oct 11
                                        2021 games
drwxr-xr-x.
drwxr-xr-x.
             42 root root
                           8192 Aug 23 17:35
drwxr-xr-x
             3 root root
                             53 Oct 28 2021 java
             38 root root
                           4096 Aug 23 17:33 lib
dr-xr-xr-x.
  -xr-xr-x.
             68 root root 49152
                                Aug 23 17:35
                          4096 Aug 23 17:32 libexec
drwxr-xr-x.
             35 root root
drwxr-xr-x.
             13 root root
                            142 Aug 23 17:37 local
dr-xr-xr-x.
             2 root root 16384
                                Aug 23 17:32 sbin
drwxr-xr-x. 131 root root 4096 Aug 23 18:41 share
                             34 Oct 11
drwxr-xr-x.
              4 root root
                                        2021 src
         x 1 root root
mint:/home|#
1rwxrwxrwx
                             10
                                Oct 11
                                         2021 tmp -> ../var/tmp
                       /usr Directory in Linux
```

/proc Directory

The <u>/proc directory</u> is somewhat of a strange directory. It is a virtual or pseudo filesystem that contains vital information about running processes. It is considered the control and information center for the Linux kernel.



/mnt Directory

The **/mnt** directory along with its subdirectories is a directory intended to be used as a temporary mount point for <u>mounting</u> <u>storage devices</u> such as Hard disk drives, USB drives, and CDROMs.

```
.nt:~]# 1s -1 /mnt/
total 101
dr-xr-xr-x 1 root root
                         2048 Aug 19
                                      2021 boot
dr-xr-xr-x 1 root root 2048 Aug 19
                                      2021 casper
dr-xr-xr-x 1 root root 2048 Aug 19
                                      2021 dists
                                      2021 EFI
dr-xr-xr-x 1 root root 2048 Aug 19
dr-xr-xr-x
           1 root root
                        2048 Aug 19
                                      2021 install
dr-xr-xr-x 1 root root 34816 Aug 19
                                      2021 isolinux
   -r--r-- 1 root root 53487 Aug 19
                                      2021 md5sum.txt
dr-xr-xr-x 1 root root 2048 Aug 19
                                      2021 pool
dr-xr-xr-x 1 root root 2048 Aug 19
                                      2021 preseed
lr-xr-xr-x 1 root root
[rest0tecmint:~]#
                            1 Aug 19
                                      2021 ubuntu -> .
                      mnt Directory in Linux
```

/sys Directory

Y

```
tecmint:~]# 1s -1 /sys
total 0
             2 root root 0 Jan 3 2022 block
drwxr-xr-x
drwxr-xr-x 35 root root 0 Jan 3 2022 <mark>bus</mark>
drwxr-xr-x 58 root root 0 Jan 3 2022 class
drwxr-xr-x 4 root root 0 Jan 3 2022 <mark>dev</mark>
drwxr-xr-x 15 root root 0 Jan 3 2022 devices
drwxr-xr-x 6 root root 0 Jan 3 2022 firmware
drwxr-xr-x
             7 root root 0 Jan 3 2022 fs
drwxr-xr-x
             2 root root 0 Jan 3 2022 hypervisor
drwxr-xr-x 15 root root 0 Jan 3 2022 <mark>kernel</mark>
drwxr-xr-x 149 root root 0 Jan 3 2022 module
drwxr-xr-x 2 root root 0 Jan 3 2022 <mark>power</mark>
                    /sys Directory in Linux
```

/media Directory

The **/media** directory is a directory where the system mounts removable media such as USB drives.

```
/media Directory in Linux
```

/run Directory

The **/run** directory is a temporary filesystem that contains volatile runtime data that shows the system has since it was booted. Files under the **/run** directory must be deleted (removed or truncated as convenient) at the start of the boot process.

```
agetty.reload console dbus firewalld gssproxy.sock auditd.pid criu dmeventd-client chrony cryptsetup faillock gssproxy.pid initramfs

/run Directory in Linux
```

/tmp Directory

ть



Do not delete files under the/tmp directory unless you know exactly what you are doing! Many of these files are critical for presently running programs and removing them may affect a system crash.

```
| 1s /tmp/
| hsperfdata_root | systemd-private-f61af026a088492a87bb73074cd0fdf7-chronyd.service-7VRJ6e |
| systemd-private-f61af026a088492a87bb73074cd0fdf7-httpd.service-azhcRh |
| systemd-private-f61af026a088492a87bb73074cd0fdf7-mariadb.service-GNrCwg |
| systemd-private-f61af026a088492a87bb73074cd0fdf7-mariadb.service-GNrCwg |
| tmp Directory in Linux
```

/lib Directory

The **/lib** directory stores all the essential standard libraries required by user binaries in the **/bin** directory.

```
binfmt.d dracut firewalld games java jvm-private cpp eclipse firmware gcc jvm kbd debug environment.d fontconfig grub jvm-commmon kernel [vacuation of the content of the c
```

/lost+found Directory

The **lost+found** directory is installed during the installation of Linux, useful for recovering files that may be broken due to unexpected shut-down.

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The /srv directory is the service directory and is abbreviated as 'srv'. This directory contains server-specific and service-related files.

Exploring Important file, their location, and their Usability

Linux is a complex system that requires a more complex and efficient way to start, stop, maintain and reboot a system, unlike Windows. There is a well-defined configuration file, binaries, man pages, info files, etc. for every process in Linux.

In addition to the major directories, here is a list of some of the prominent files and directories and their uses.

- /boot/vmlinuz : The Linux Kernel file.
- /dev/hda: Device file for the first IDE HDD (Hard Disk Drive).
- /dev/hdc : Device file for the IDE Cdrom, commonly.
- /dev/sda: Device file for the first SATA Drive (Hard Disk Drive).
- /dev/null: A pseudo-device, that doesn't exist. Sometimes garbage output is redirected to /dev/null, so that it gets lost, forever.
- /etc/bashrc: This file contains system-wide defaults, functions, and aliases among other files that are used by all the system users.
- /etc/crontab: This is a system-wide file that is uniquely formatted to schedule or <u>automate system tasks on a Linux</u> system.
- /etc/exports: A file that determines which file systems are exported to remote hosts and specifies options.
- /etc/fstab : This is a special file that contains information

- /etc/hosts: This is a configuration file that maps system hostnames to their corresponding IP addresses.
- /etc/hosts.allow: The file specifies which hosts are permitted to connect to the local system.
- /etc/host.deny: The file specifies which hosts are denied access and services on the local machine.
- /etc/issue : Contains a pre-login message.
- /etc/modules: This file contains the names of kernel modules that should be loaded at boot time, one per line.
- /etc/motd: motd stands for a message of the day, the message users get upon login.
- /etc/mtab : A read-only file that contains a list of currently mounted filesystems.
- /etc/passwd : A file that contains the <u>system user's</u> <u>information</u> such as the username, UID, GID, and login shell among others
- /etc/printcap: Contains printer information that is generated by the /etc/cups/printers.conf file.
- /etc/profile: Contains Linux system-wide environment and other startup scripts.
- /etc/profile.d : Application script, executed after login.
- /etc/rc.d : Information about run level specific script.
- /etc/rc.d/init.d : Run Level Initialisation Script.
- /etc/resolv.conf: This is a DNS resolver file. It specifies how the system leverages DNS to resolve hostnames.
- /etc/security: Contains configuration files for various PAM modules.
- /etc/skel: This is a directory that contains a set of user configuration files that are copied to the user's home directory when a user is created.

- /usr/bin/X11: This directory contains infinitely nested directories and binaries for the X Windows System.
- /usr/include: The directory contains header files for C compilers. This includes stdio.h, stdlib.h, and string.h among others.
- /usr/share : Shared directories of man files, info files, etc.
- /usr/lib : This directory consists of object files and directories
- /usr/sbin: The directory contains binaries with superuser privileges or for System Administration.
- /proc/cpuinfo: The file contains system info including CPU model, model name, number of cores, and clock speed to mention a few files.
- /proc/interrupts : Information about the current interrupts being utilized currently.
- /proc/ioports: The file contains all the Input/Output addresses used by devices on the server.
- /proc/meminfo: A file that stores memory usage information including swap information.
- /proc/modules : A file that lists all the modules being used by the kernel
- /proc/mount : The file contains detailed mounted filesystem information.
- /proc/stat: The file contains detailed information about the system and kernel activity.
- /proc/swaps : The file contains information about the swap file.
- /proc/version: The file contains Linux version information.
- /var/log/lastlog: A binary file that contains information about the last successful user logins.

- /var/log/syslog: A file that contains non-critical system logs.
- /var/log/wtmp: A file listing the login time and duration of each user on the system currently.

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