

File System in Linux

What is File ?

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- A file, in the computer world, is a self-contained piece of information available to the operating system and any number of individual programs.

What is File System ?

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- A filesystem is the method and data structures that an operating system uses to keep track of files on a disk or partition; that is, the way the files are organized on the disk.

Features of Linux File System

- Supports for Different File Systems. For e.g:ext,ext2,MINIX,FAT etc.
- Linux does not uses letters to name Drives.
- Everything is treated as File .
- Linux distinguishes between uppercase and lowercase letters in the file system .
- Supports Inode Data Structure.

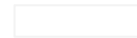
Windows VS Linux File System

Windows VS Linux File System

| Windows File System | Linux File System |
|--|--|
| Files are stored in Folders on different drives. E.g C,D etc | Files are stored in Tree like structure under Root Directory. |
| Devices are represented as G,H drives | Everything is represented as File |
| Application locks exclusive access to files | Application don't locks exclusive access to files |
| Same names to the files are not allowed in single folder | Same name of files are allowed provided they should use different case |

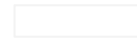
MINIX-The First File System

- Filename Length Restricted to 14 characters (30 in later versions).
- Limited Partition Size i.e 64 bytes.
- Mainly designed for teaching purposes.



Ext File System

- Released in 1992.
- Mainly designed to overcome size limitations of MINIX.
- Had significant problems so quickly superseded by EXT 2.



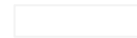
Ext 2 File System

- Quite Successful as compared to previous File Systems.
- Similar metadata structure to that of the EXT File System.
- Divided the data space in cylinders for better management.
- Significant issue of time required for fsck program.



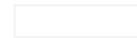
Ext 3 File System

- Developed to overcome the problem of fsck program in Ext 2.
- Introduced the concept of Journaling.
- Ext 3 File System can be used as Ext 2 File System.

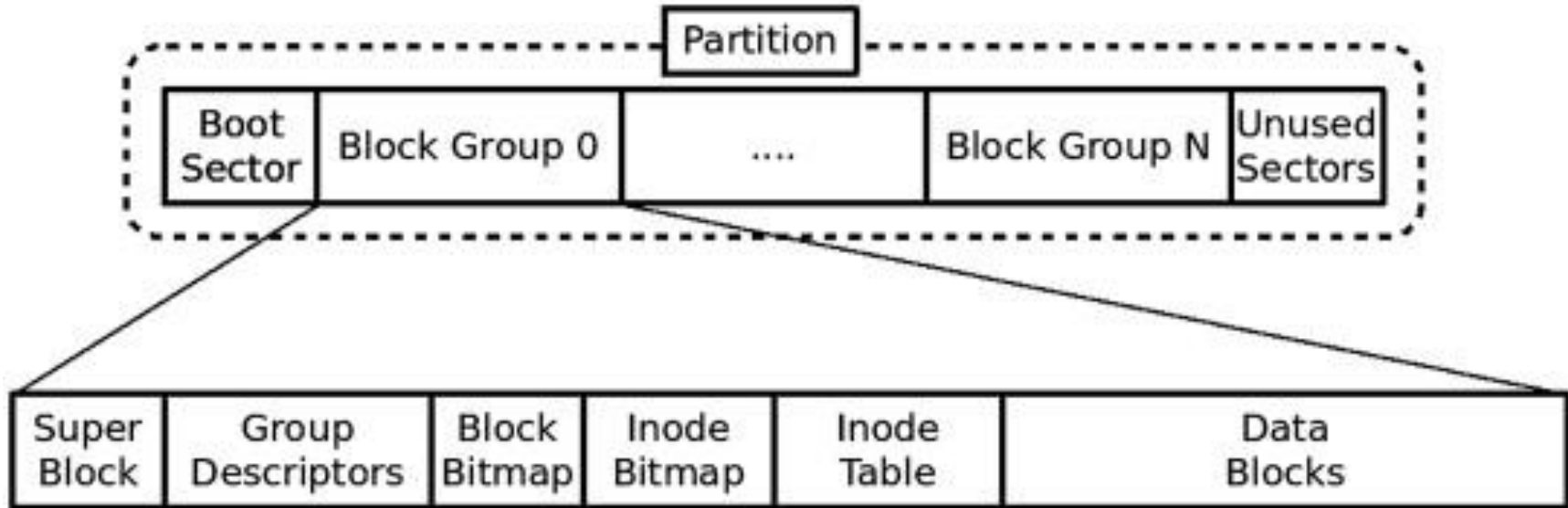


Ext 4 File System

- The EXT4 file system primarily improves performance, reliability, and capacity.
- To improve reliability, metadata and journal checksums were added.
- filesystem timestamps were improved.

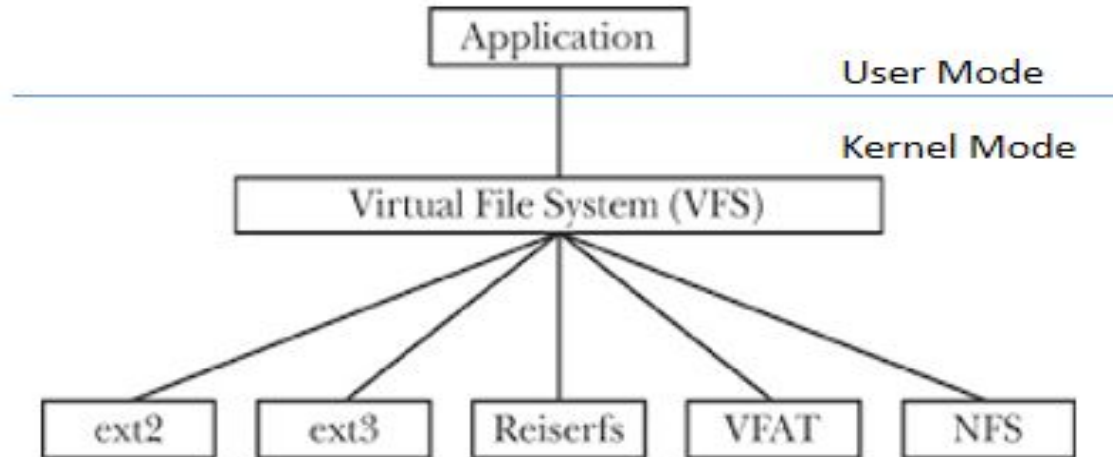


Physical Layout of Ext 4



Virtual File System

- A virtual file system also known as VFS is an abstraction layer that resides above a file system and provides an interface between the kernel and file system.



Advantages of VFS

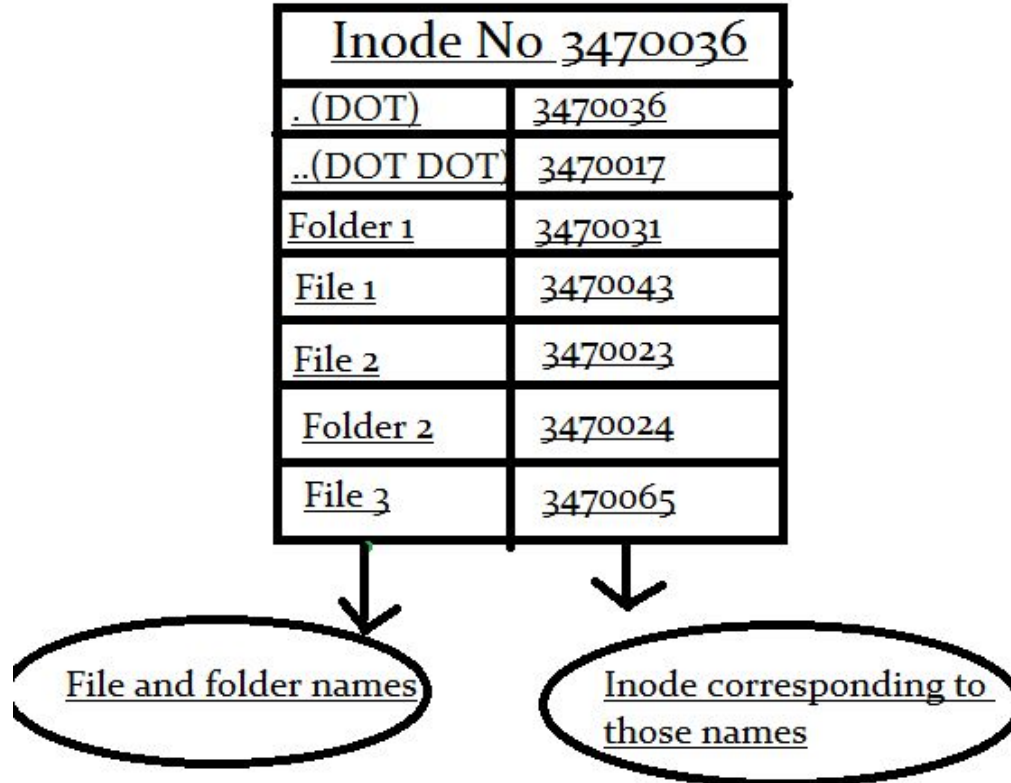
- Allowing dissimilar file system types to be implemented within the same structure.
- Providing the ability to uniquely represent a file throughout a network.
- Buffer Cache.

INODE

Inode Number and Inode Table

- An Inode number is a uniquely existing number for all the files in Linux and all Unix type systems.
- A Inode Table stores the Inode numbers.

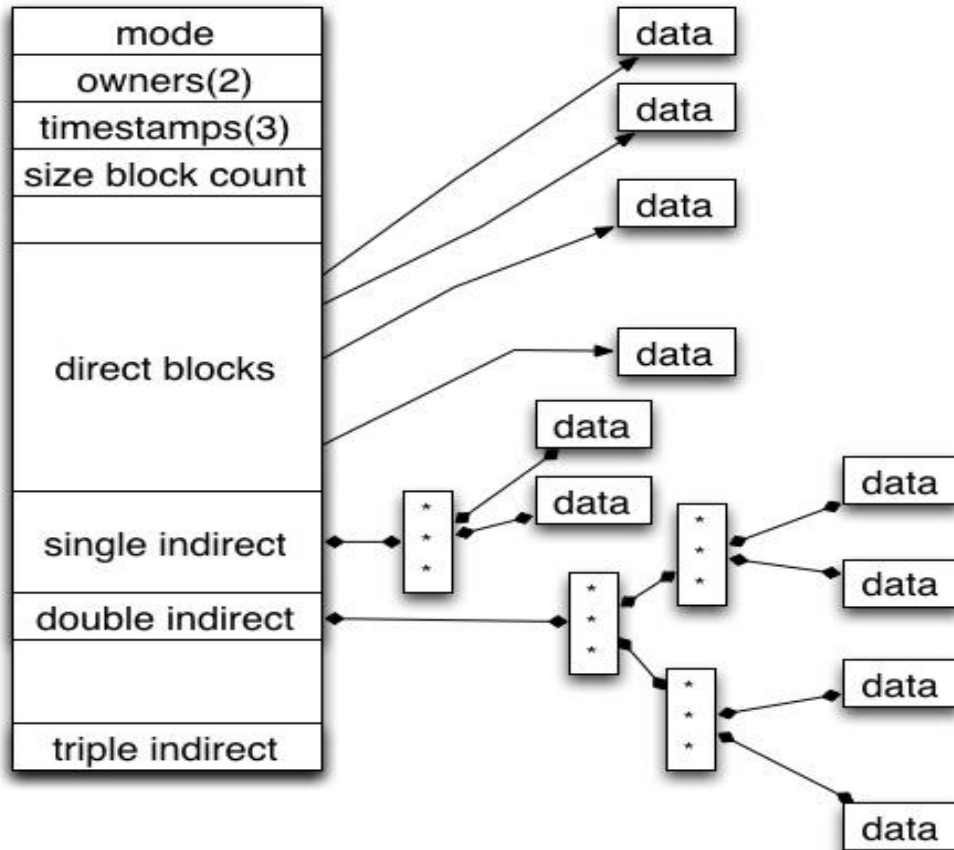
Inode Structure of Directory



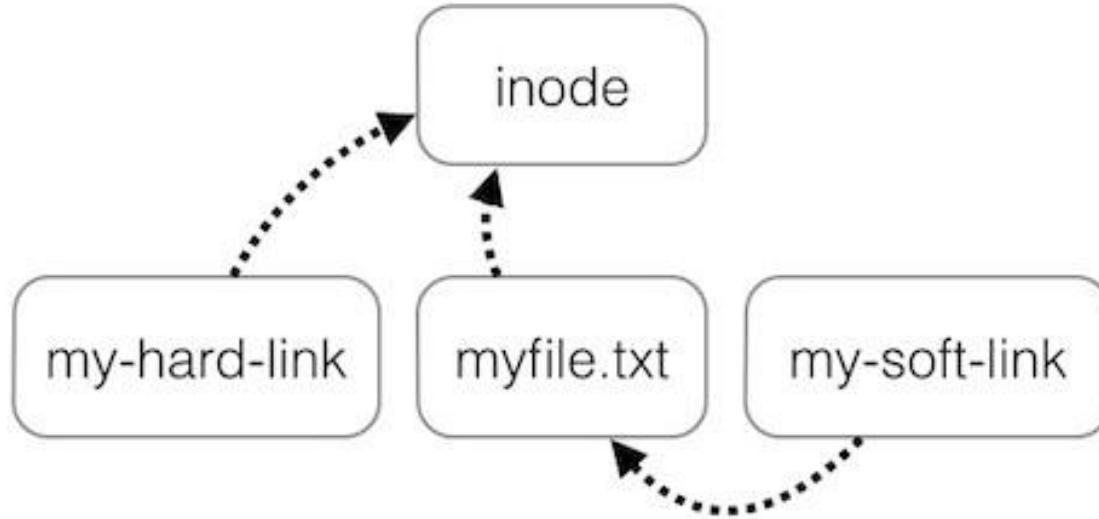
Inode Field

- **Mode** : Node description(file or dir) and user permissions.
- **Owner Information** : User and group Owner.
- **Size** : Size in bytes.
- **Timestamp** : Creation and modification time Inode
- **Datablocks** : Pointers to data.

Inode Structure of File



Softlink and Hardlink

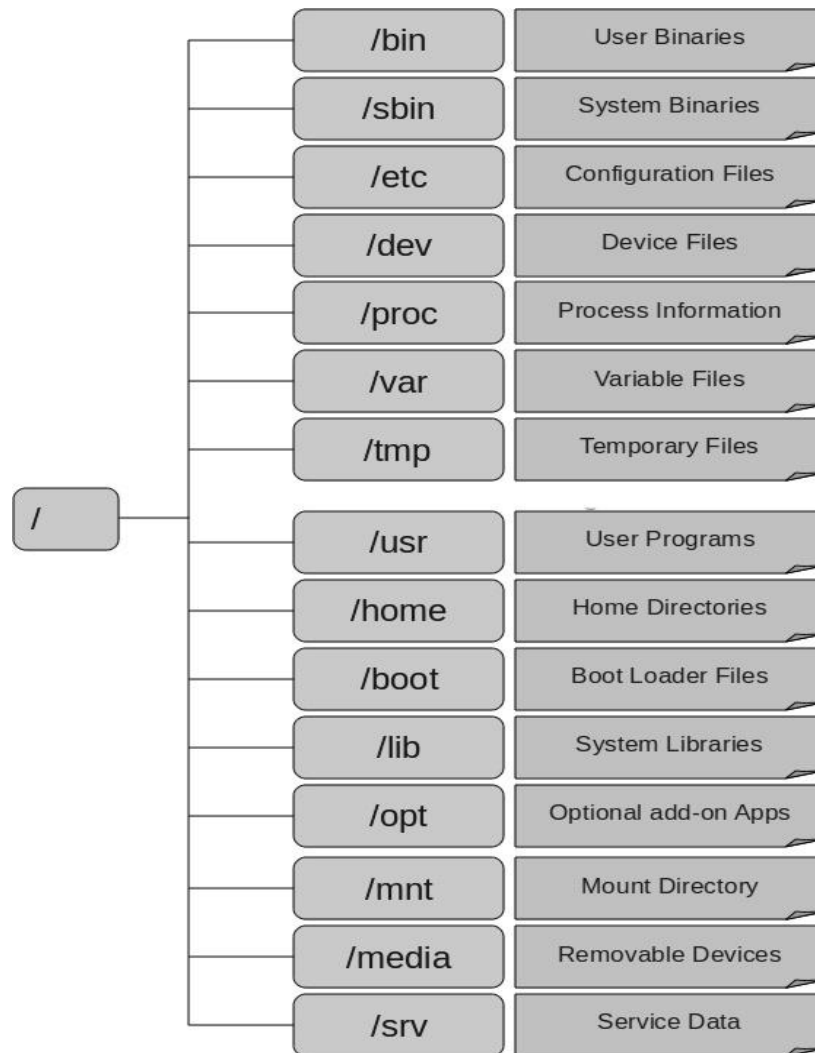


Directory Structures in Linux

Directories

- /
- /sbin
- /etc
- /dev
- /proc
- /var
- /tmp
- /bin
- /home
- /boot
- /lib
- /mnt
- /opt
- /media

Directories



Thank You...