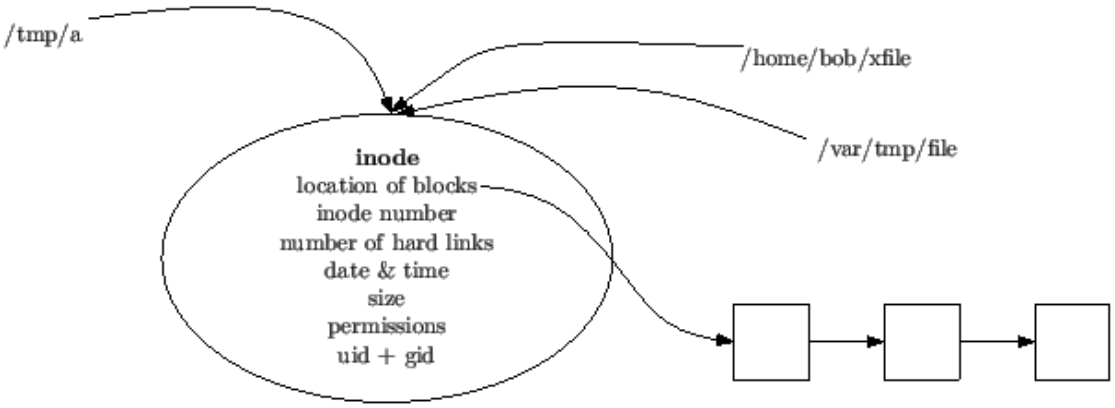
INODE, HARD LINK & SYMBOLIC LINK

INODE:

- An inode is an index node. It serves as a unique identifier for a specific piece of metadata on a given filesystem.
- Inode stores the file type, permissions, ownership, file size, timestamp, disk location, or memory location.
- Inodes keep track of all the files on a Linux system



Command:

ls –li - -> Displaying detailed information for each file and directory, including the inode number.

- `$ ls -li /tmp/a /home/bob/xfile /var/tmp/file`
  `114693 -rw-r-r- 3 hjc hjc 5 Sep 6 13:55 /tmp/a`
  `114693 -rw-r-r- 3 hjc hjc 5 Sep 6 13:55 /home/bob/xfile`
  `114693 -rw-r-r- 3 hjc hjc 5 Sep 6 13:55 /var/tmp/file`

`114693 is inode number`

- **Stat** command use to get the file details

- [**root@ip-172-31-28-228 /app]# stat index.js**

File: index.js

Size: 3553 Blocks: 8 IO Block: 4096 regular file

Device: fd00h/64768d Inode: 9257429 Links: 1

Access: (0644/-rw-r--r--) Uid: (0/ root) Gid: (0/ root)

Access: 2024-02-25 13:20:27.000000000 +0000

Modify: 2024-02-25 13:19:53.000000000 +0000

Change: 2025-06-12 10:14:39.078991580 +0000

Birth: 2025-06-12 10:14:39.078991580 +0000

SYMLINK vs HARDLINK

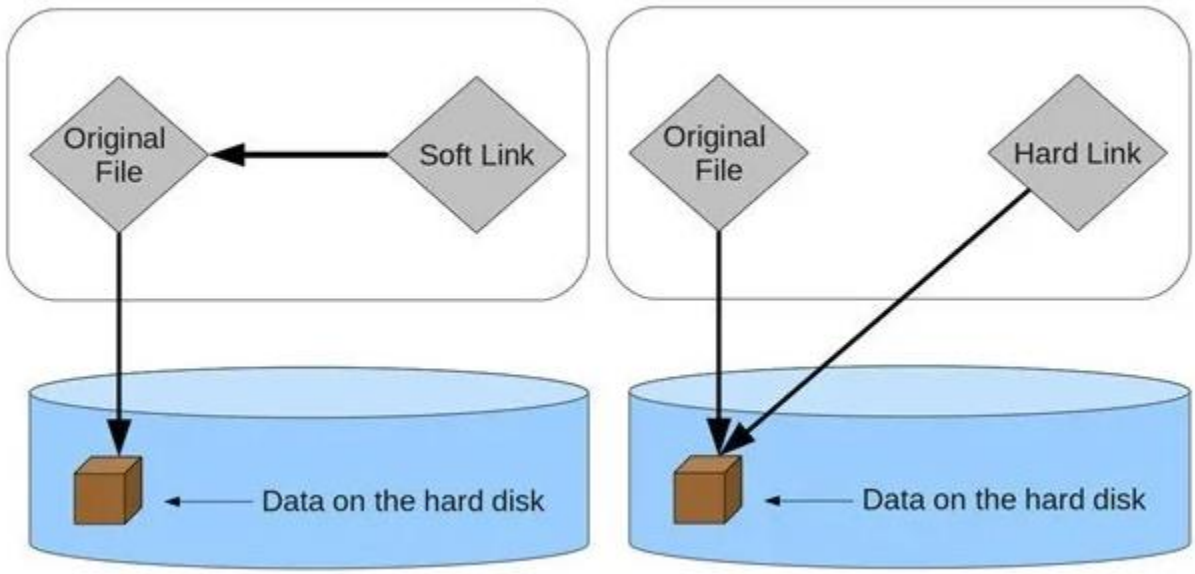
Symlinks (symbolic links or soft links) and hard links are both ways to create multiple access points or aliases for files and directories within a file system.

HARDLINK:

A hard link can only refer to a file on the same file system. The inode and file data are permanently deleted when the number of hard links is zero.

SYMLINK:

A soft link, sometimes called a symbolic link or symlink, points to the location or path of the original file.



To create a hard link: **ln**

To create a soft link: **ln -s**

SYMLINK creation:

- [root@ip-172-31-28-228 /app]# echo "Hello World" > hello.txt
- [root@ip-172-31-28-228 /app]# ls -li

total 20

9257427 -rw-r--r-- 1 root root 142 Feb 25 2024 DbConfig.js

9257428 -rw-r--r-- 1 root root 1882 Feb 25 2024 TransactionService.js

9257431 -rw-r--r-- 1 root root   12 Jun 12 10:31 **hello.txt**

9257429 -rw-r--r-- 1 root root 3553 Feb 25 2024 index.js

- [root@ip-172-31-28-228 /app]# ln -s hello.txt hi.txt
- [root@ip-172-31-28-228 /app]# ls -li

total 20

9257427 -rw-r--r-- 1 root root 142 Feb 25 2024 DbConfig.js

9257428 -rw-r--r-- 1 root root 1882 Feb 25 2024 TransactionService.js

9257431 -rw-r--r-- 1 root root   12 Jun 12 10:31 hello.txt

9257432 lrwxrwxrwx 1 root root   9 Jun 12 10:35 **hi.txt -> hello.txt**

9257429 -rw-r--r-- 1 root root 3553 Feb 25 2024 index.js

- [root@ip-172-31-28-228 /app]# rm -rf hello.txt
- [root@ip-172-31-28-228 /app]# ls -li

total 16

9257427 -rw-r--r-- 1 root root 142 Feb 25 2024 DbConfig.js

9257428 -rw-r--r-- 1 root root 1882 Feb 25 2024 TransactionService.js

9257432 lrwxrwxrwx 1 root root   9 Jun 12 10:35 hi.txt -> hello.txt

9257429 -rw-r--r-- 1 root root 3553 Feb 25 2024 index.js

Hardlink creation:

- [root@ip-172-31-28-228 /app]# echo "Hello Jyothi" > jyothi.txt
- [root@ip-172-31-28-228 /app]# ls -li

total 20

9257427 -rw-r--r-- 1 root root 142 Feb 25 2024 DbConfig.js

9257428 -rw-r--r-- 1 root root 1882 Feb 25 2024 TransactionService.js

9257429 -rw-r--r-- 1 root root 3553 Feb 25 2024 index.js

9257431 -rw-r--r-- 1 root root   13 Jun 12 10:39 jyothi.txt

- [root@ip-172-31-28-228 /app]# ln jyothi.txt jack.txt
- [root@ip-172-31-28-228 /app]# ls -li

total 24

9257427 -rw-r--r-- 1 root root 142 Feb 25 2024 DbConfig.js

9257428 -rw-r--r-- 1 root root 1882 Feb 25 2024 TransactionService.js

9257429 -rw-r--r-- 1 root root 3553 Feb 25 2024 index.js

9257431 -rw-r--r-- 2 root root   13 Jun 12 10:39 jack.txt

9257431 -rw-r--r-- 2 root root   13 Jun 12 10:39 jyothi.txt

- [root@ip-172-31-28-228 /app]# rm -rf jyothi.txt
- [root@ip-172-31-28-228 /app]# ls -li

total 20

9257427 -rw-r--r-- 1 root root 142 Feb 25 2024 DbConfig.js

9257428 -rw-r--r-- 1 root root 1882 Feb 25 2024 TransactionService.js

9257429 -rw-r--r-- 1 root root 3553 Feb 25 2024 index.js

9257431 -rw-r--r-- 1 root root   13 Jun 12 10:39 jack.txt

SYMLINK and HARDLINK difference

SYMLINK	HARDLINK
A symlink is a special type of file that contains a path to the target file or directory it refers to.	A hardlink is a directory entry that directly associates a name with the data (inode) of a file.
It points to the *pathname* of the target file or directory.	It points to the *inode* of the target file.
Symlinks can point to files or directories located on different file systems or partitions.	Hardlinks can only exist within the same file system.
If the original file or directory is deleted, the symlink becomes a "broken" or "dangling" link, meaning it no longer points to a valid location.	Deleting a hardlink does not delete the file's data. The data remains accessible as long as at least one hardlink to it exists.
A symlink has its own unique inode number, separate from the target file or directory.	Hardlinks share the same inode number as the original file.
Used to create shortcuts or aliases, organize files, save disk space (by avoiding data duplication), and link to files or directories that don't exist yet.	Used to create multiple references to the same file data, providing redundancy, backups, and efficient data organization within the same file system.