

# SYMLINKS

A symbolic link, or symlink, is a type of file in a file system that acts as a reference or shortcut to another file or directory.

## Why use symlinks?

- **Flexibility in File Management:** Symlinks allow you to create shortcuts or references to files or directories located elsewhere in the filesystem. This can simplify file management by providing multiple access points to the same file or directory.
- **Reducing Redundancy:** Instead of duplicating files or directories, you can use symlinks to reference a single copy. This is useful for saving disk space and maintaining consistency.
- **Managing Large Directories:** Symlinks can help organize large directory structures by creating a more accessible hierarchy. For example, you can create a symlink to a deep directory structure in a more convenient location.
- **Simplifying Path Changes:** If you need to move a file or directory, you can update the symlink to point to the new location instead of updating every reference to the file or directory throughout your system.

The two different types of links used in file systems to reference files.

### 1. Soft links (symbolic links)

### 2. hard links

- A **soft link**, or symbolic link, is a file that points to another file or directory by storing its path.
- Soft link is the shortcut to a file, Soft link can be created for files and directory,
- It does not access the data available in the original file.
- Soft link has different inode number, permission and ownership as the original file.
- If the original file is deleted, soft link becomes invalid.

Softlink Syntax: **ln -s /path/to/target /path/to/symlink**

- A **hard link** is a direct reference to the file's inode (the data structure containing the file's metadata and data) on the file system.
- Hard link is the copy of the original file, Hard link can't be created for the directory.
- Hard link has same inode number, permission and ownership as the original file.
- If the original file is deleted, hard link file will contain data.
- If the earlier selected file is deleted, the [hard link](#) to the file will still contain the data of that file.

Hard link Syntax: **ln /path/to/target /path/to/hardlink**

## What is Inode?

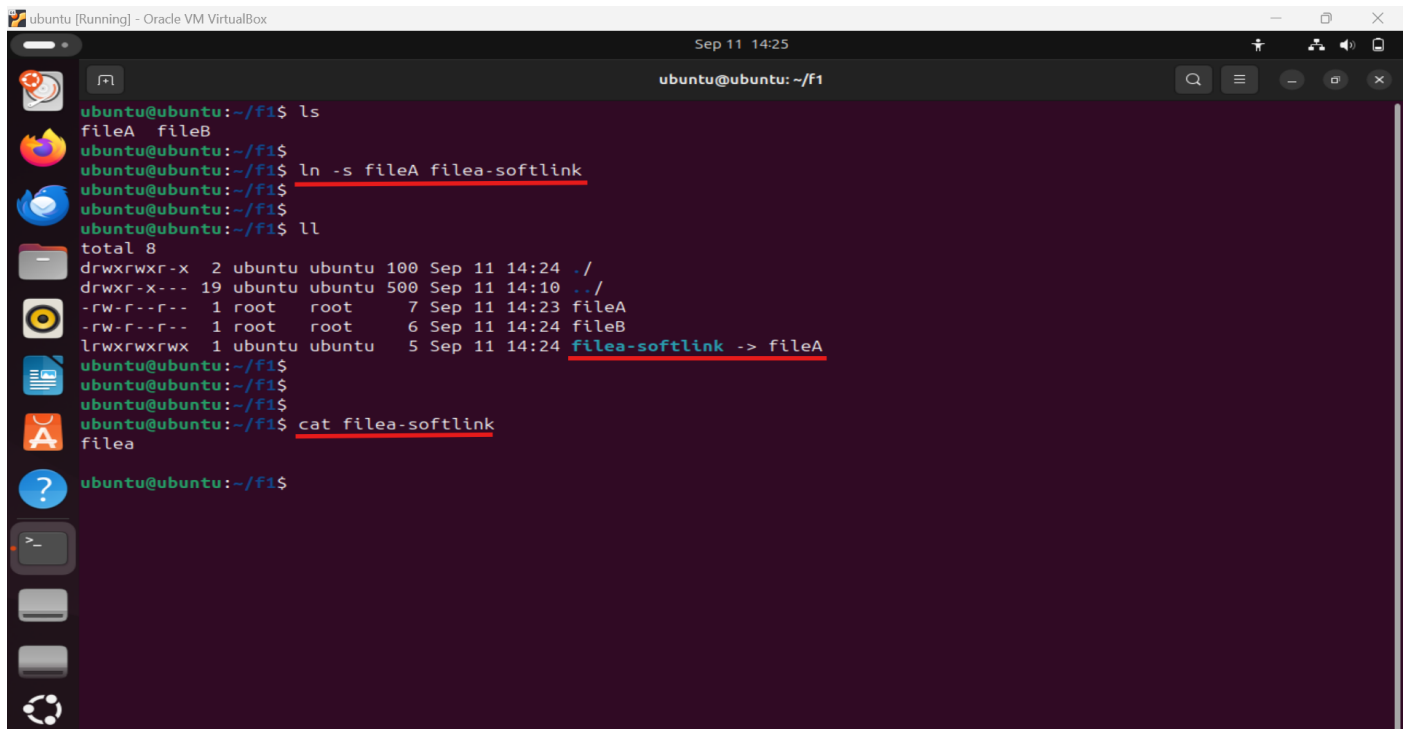
An **inode (Index Node)** is a fundamental data structure used in Unix-like file system to store information about a file or directory. The inode contains metadata that describes the file or directory but does not include the file name or actual data content.

- **File Type, Permissions, Owner(UID), Group(GID) Size, Timestamps** (Includes various timestamps such as Creation Time, Modification Time, Access Time, Change Time), **Link Count, Pointers to Data Blocks**

Syntax: **ls -li [ls -li "file name"] (or) stat file name**

## SOFTLINK:

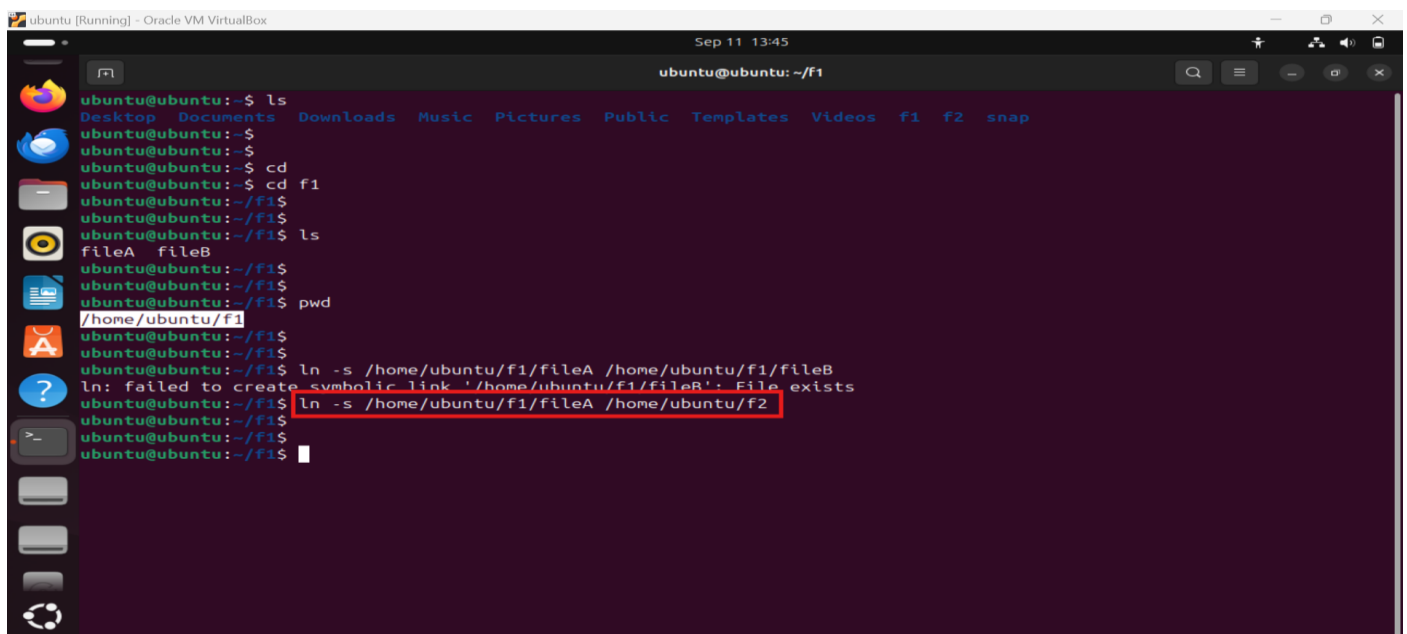
- In same directory



A terminal window titled 'ubuntu [Running] - Oracle VM VirtualBox' with a timestamp of 'Sep 11 14:25'. The prompt is 'ubuntu@ubuntu: ~/f1'. The user runs 'ls' showing 'fileA' and 'fileB'. Then they run 'ln -s fileA filea-softlink'. Next, they run 'll' showing a detailed file listing where 'filea-softlink' is listed as a symbolic link pointing to 'fileA'. Finally, they run 'cat filea-softlink' which outputs 'fileA'.

```
ubuntu@ubuntu: ~/f1
ubuntu@ubuntu:~/f1$ ls
fileA  fileB
ubuntu@ubuntu:~/f1$ ln -s fileA filea-softlink
ubuntu@ubuntu:~/f1$ ll
total 8
drwxrwxr-x  2 ubuntu ubuntu 100 Sep 11 14:24 ./
drwxr-x-- 19 ubuntu ubuntu 500 Sep 11 14:10 ../
-rw-r--r--  1 root  root   7 Sep 11 14:23 fileA
-rw-r--r--  1 root  root   6 Sep 11 14:24 fileB
lrwxrwxrwx  1 ubuntu ubuntu  5 Sep 11 14:24 filea-softlink -> fileA
ubuntu@ubuntu:~/f1$ cat filea-softlink
fileA
ubuntu@ubuntu:~/f1$
```

- In different directory.



A terminal window titled 'ubuntu [Running] - Oracle VM VirtualBox' with a timestamp of 'Sep 11 13:45'. The prompt is 'ubuntu@ubuntu: ~/f1'. The user runs 'ls' showing a directory listing. Then they run 'cd f1'. Next, they run 'ls' showing 'fileA' and 'fileB'. Then they run 'pwd' showing '/home/ubuntu/f1'. Finally, they run 'ln -s /home/ubuntu/f1/fileA /home/ubuntu/f1/fileB' which fails with the message 'ln: failed to create symbolic link '/home/ubuntu/f1/fileB': File exists'. Then they run 'ln -s /home/ubuntu/f1/fileA /home/ubuntu/f2' which succeeds.

```
ubuntu@ubuntu: ~/f1
ubuntu@ubuntu:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos  f1  f2  snap
ubuntu@ubuntu:~$ cd f1
ubuntu@ubuntu:~/f1$ ls
fileA  fileB
ubuntu@ubuntu:~/f1$ pwd
/home/ubuntu/f1
ubuntu@ubuntu:~/f1$ ln -s /home/ubuntu/f1/fileA /home/ubuntu/f1/fileB
ln: failed to create symbolic link '/home/ubuntu/f1/fileB': File exists
ubuntu@ubuntu:~/f1$ ln -s /home/ubuntu/f1/fileA /home/ubuntu/f2
ubuntu@ubuntu:~/f1$
```

```
ubuntu [Running] - Oracle VM VirtualBox
Sep 11 13:46
ubuntu@ubuntu: ~/f2

ubuntu@ubuntu:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos  f1  f2  snap
ubuntu@ubuntu:~$
ubuntu@ubuntu:~$ cd f2
ubuntu@ubuntu:~/f2$
ubuntu@ubuntu:~/f2$ ls
fileA  fileC  fileD
ubuntu@ubuntu:~/f2$
ubuntu@ubuntu:~/f2$ cat fileA
fileA
ubuntu@ubuntu:~/f2$
```

- After removing the original file soft link is not available.

```
ubuntu [Running] - Oracle VM VirtualBox
Sep 11 13:49
ubuntu@ubuntu: ~/f2

ubuntu@ubuntu:~$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  Templates  Videos  f1  f2  snap
ubuntu@ubuntu:~$
ubuntu@ubuntu:~$ cd f1
ubuntu@ubuntu:~/f1$
ubuntu@ubuntu:~/f1$ ls
fileA  fileB
ubuntu@ubuntu:~/f1$
ubuntu@ubuntu:~/f1$ sudo rm fileA
ubuntu@ubuntu:~/f1$
ubuntu@ubuntu:~/f1$ ls
fileB
ubuntu@ubuntu:~/f1$
ubuntu@ubuntu:~/f1$ cd f2
bash: cd: f2: No such file or directory
ubuntu@ubuntu:~/f1$
ubuntu@ubuntu:~/f1$ cd
ubuntu@ubuntu:~$
ubuntu@ubuntu:~$ cd f2
ubuntu@ubuntu:~/f2$
ubuntu@ubuntu:~/f2$ ls
fileA  fileC  fileD
ubuntu@ubuntu:~/f2$
```

```
ubuntu@ubuntu:~/f2$ ls
fileA  fileC  fileD
ubuntu@ubuntu:~/f2$
ubuntu@ubuntu:~/f2$
ubuntu@ubuntu:~/f2$ cat fileA
cat: fileA: No such file or directory
ubuntu@ubuntu:~/f2$
```