

LPIC-1 101-500 – Lesson 22

104.6 Create and change hard and symbolic links

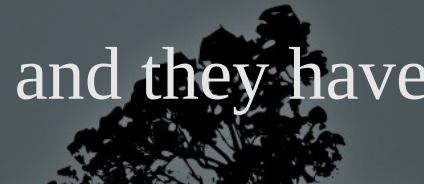


Links


- Sometime the need arises for a file to exist in different locations or with different names.
- It will be ineffective to have two copies of the same file because there should be sync mechanism in place to sync changes.
- The problem described above can be easily solved with the use of hard links or soft links (aka symbolic links or symlinks).



Symbolic Links (Symlinks)

- **Symlinks** are simple pointers to other files or directories that are called **targets**. Targets can be placed on the same filesystem as the symlink or a separate local or network filesystem.
 - They can point to normal files, directories or other types of files.
 - They are labeled: `lrwxrwxrwx`, during long listing (`ls -l`).
 - They don't have their own permissions but they point to the permissions of the targets.
 - They are a different file from their target and they have a different inode.
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Hard Links

- Hard links are alternative names for the same file and they share the same inode.
 - In effect all file names are hard links pointing to an inode.
 - Because they share the same inode they are restricted to the same filesystem.
 - They respond somewhat faster.
 - They apply only in normal files, not directories or other types.
 - There is no easy way to detect which file names point to the same file (inode) unless you look into the inode id.
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Find and list symbolic links

- `# ls -l /lib | grep lrwxrwxrwx # show`
`# all symlinks`
`# under /lib.`

```
...  
lrwxrwxrwx 1 root root      15 2011-08-  
27 07:51 libbz2.so.1 -> libbz2.so.1.0.4  
...
```

- `# find /etc -type l -exec ls -l {} \;`
`# find symlinks under /etc.`

```
...  
lrwxrwxrwx 1 root root 15 2011-10-14  
13:51 /etc/blkid.tab -> /dev/.blkid.tab  
...
```

There no easy way to tell which symlinks point to a target.

Find and list hard links

- `# ls -li /sbin/mkfs.ext2` # the third column shows that
the number of hard links is
5. In the first column we
see the inode id.

```
2752605 -rwxr-xr-x 5 root root 60408 2011-03-17 20:09  
/sbin/mkfs.ext2
```

- `# df /sbin/mkfs.ext2` # find in which
filesystem
/sbin/mkfs.ext2 belongs.

Filesystem	1K-blocks	Used	Available	Use%
Mounted on				
/dev/sda2	124958620	74728000	43883052	64%
/				

- `# find / -xdev -inum 2752605` # find all file names with
inode=2752605. The `-xdev` option forces `find` to look
only the the root filesystem (/).

Create symlinks with `ln`

- `$ ln -s sfile.test symlink.test # create a symlink symlink.test with the sfile.test file as a target in the working directory.`
- `$ ls -li s*.test # target and symlink have different inodes.`

```
131724 -rw-r--r-- 1 theo theo 0 2011-11-25 07:34  
sfile.test  
131726 lrwxrwxrwx 1 theo theo 10 2011-11-25 07:35  
symlink.test -> sfile.test
```
- `$ ln -s /etc/fstab # create a symbolic link with the same name as the target, in the working directory.`
- `$ ls -l fstab # verify the symlink.`

```
lrwxrwxrwx 1 theo theo 10 2011-11-25 07:41 fstab ->  
/etc/fstab
```
- `$ ln -s /etc/fstab fstab.slink # create a symlink named fstab.slink and target /etc/fstab, in the current directory`

Create symlinks with `ln`

- `$ ln hfile.test hardlink.test # create hard link hardlink.test using as target the inode of file hfile.test in the current directory.`
- `$ ls -li h*.test # both files share the same # inode.`
`131728 -rw-r--r-- 2 theo theo 0 2011-11-25 07:48 hardlink.test`
`131728 -rw-r--r-- 2 theo theo 0 2011-11-25 07:48 hfile.test`
- `# ln /usr/bin/ssh /usr/local/bin/ssh-new # create a new hard-link ssh-new in another directory. Both files must be on the same filesystem!`
- `$ ln /usr/bin/ssh # we are not allowed to # create hard links to a # file we are not owners!`
`ln: creating hard link './ssh' => '/usr/bin/ssh':`
`Operation not permitted`

Properties of symbolic links

- `$ chmod 640 symlink.test # this will change the permissions of the target not the symlink.`
- `$ ls -l s*.test # only the permissions of the target have # changed.`

```
-rw-r----- 1 theo theo 0 2011-11-25 07:34 sfile.test  
lrwxrwxrwx 1 theo theo 10 2011-11-26 06:09 symlink.test ->  
sfile.test
```
- `$ rm symlink.test # deletes the symlink not the target!`
- `$ rm sfile.test # deleting the target will result in a broken link.`

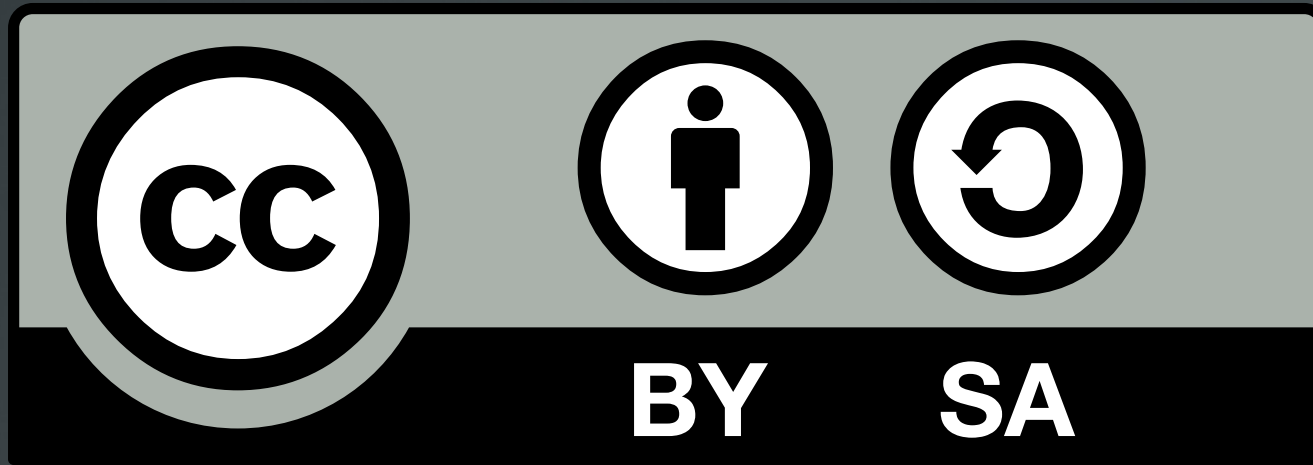


Properties of hard links

- `$ chmod 640 hardlink.test # this will change the permissions of all hard links of a file because they share the same inode.`
- `$ ls -li h*.test # verify the permissions.`
`131728 -rw-r----- 2 theo theo 0 2011-11-25 07:48 hardlink.test`
`131728 -rw-r----- 2 theo theo 0 2011-11-25 07:48 hfile.test`
- `$ rm hardlink.test # deleting a hard link does not delete the file. It just reduces the number of hard links.`
- `$ ls -li h*.test # only 1 hard link remains.`
`131728 -rw-r----- 1 theo theo 0 2011-11-25 07:48 hfile.test`
- `$ rm hfile.test # deleting the last hard link point to the 131728 inode will delete the file definitely!`



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