## PRACTICE 4. Managing Files and Directories.

### Obtain the number of hard links in the HOME directory.

First, to understand this, let's talk about inodes. The data in the filesystem is held in blocks on the disk, and those blocks are collected together by an inode. You can think of the inode as THE file. Inodes lack filenames, though. That's where links come in.

A link is just a pointer to an inode. A directory is an inode that holds links. Each filename in a directory is just a link to an inode. Opening a file in Unix also creates a link, but it's a different type of link (it's not a named link). (<a href="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to-directories-not-allowed-in-unix-linux="https://unix.stackexchange.com/questions/22394/why-are-hard-links-to

adminsanti@servidorsanti:/home\$ ls -ld drwxr-xr-x 7 root root 4096 May 7 10:01 . adminsanti@servidorsanti:/home\$

## 2. Create two subdirectories of HOME and repeat the previous point. What difference there are? explain what happened.

Since two extra subdirectories have been created there has to be two new hardlinks that point the inodes of this subdirectories.

```
[sudo] password for adminsanti:
adminsanti@servidorsanti:/home$ sudo mkdir nuevodirB
adminsanti@servidorsanti:/home$ ls
DATA DELETE NOMBRE PROGC SCRIPTS adminsanti nuevodirA nuevodirB
adminsanti@servidorsanti:/home$ ls –ld
drwxr–xr–x 9 root root 4096 May 17 09:19 .
adminsanti@servidorsanti:/home$ _
```

3. Create a nonsymbolic link (hard) and a symbolic link on a file. Obtain theinode numbers of the three files (the two links and the original) and compare them. Try to do the same for a directory.

The hard link have the same inode number

Sudo In ejemplo linkduro Sudo In -s ejemplo linksimbolico

```
adminsanti@servidorsanti:/home$ ls –li ejemplo linkduro linksimbolico
131746 –rw–r––– 2 root root 49 May 17 09:48 ejemplo
131746 –rw–r––– 2 root root 49 May 17 09:48 linkduro
150095 lrwxrwxrwx 1 root root 7 May 17 09:48 linksimbolico –> ejemplo
adminsanti@servidorsanti:/home$ _
```

The hard link is not allowed. The symbolic link is allowed

```
adminsanti@servidorsanti:/home$ sudo In nuevodirA linkduronuevodirA
In: nuevodirA: hard link not allowed for directory
adminsanti@servidorsanti:/home$ sudo In -s nuevodirA linksimboliconuevodirA
adminsanti@servidorsanti:/home$ ls

DATA NOMBRE SCRIPTS ejemplo linksimbolico nuevodirA

DELETE PROGC adminsanti linkduro linksimboliconuevodirA nuevodirB
adminsanti@servidorsanti:/home$
```

4. Obtain a list Is -I of the directory where you created the ligatures. What are the differences in the file type of these three files?

```
adminsanti@servidorsanti:/home$ sado in -s ejemplo linksimbolico
adminsanti@servidorsanti:/home$ ls -li ejemplo linkduro linksimbolico
131746 -rw-r--r- 2 root root 49 May 17 09:48 ejemplo
131746 -rw-r--r- 2 root root 49 May 17 09:48 linkduro
150095 lrwxrwxrwx 1 root root 7 May 17 09:48 linksimbolico -> ejemplo
```

The firt two are regular files (-) but the last one is a symbolic link (I)

5. Contabilize the number of ligatures of the previous original file. Delete the soft ligature and recount the number of ligatures.

```
adminsanti@servidorsanti:/home$ ls -li ejemplo
131746 -rw-r--r-- 2 root root 49 May 17 09:48 ejemplo
adminsanti@servidorsanti:/home$ unlink linksimbolico
unlink: cannot unlink 'linksimbolico': Permission denied
adminsanti@servidorsanti:/home$ sudo unlink linksimbolico
adminsanti@servidorsanti:/home$ ls -li ejemplo
131746 -rw-r--r-- 2 root root 49 May 17 09:48 ejemplo
adminsanti@servidorsanti:/home$ _
```

## 6. Delete the ligature lasts and re-counts the number of ligatures. What is the difference between what we have obtained in point 4 and 5?

The number of ligatures now is 1.

adminsanti@servidorsanti:/home\$ ls -li ejemplo
131746 -rw-r--r-- 2 root root 49 May 17 09:48 ejemplo
adminsanti@servidorsanti:/home\$ sudo unlink linkduro
adminsanti@servidorsanti:/home\$ ls -li ejemplo
131746 -rw-r--r-- 1 root root 49 May 17 09:48 ejemplo

#### 7. Create a soft link to the HOME directory.

I'm gonna check the original ligatures for /home

```
adminsanti@servidorsanti:/home$ ls –li
total 36
155975 drwxr–xr–x 2 root
                                                            4096 May
                                                                         7 10:01 DATA
4 17:47 DELETE
7 09:58 NOMBRE
                                            root
155974 drwxr-xr-x 3 root
150133 -rw-r--r-- 1 root
                                                            4096 May
15 May
                                            root
155962 drwxr-xr-x 2 root
                                                             4096 May 4 17:44 PR
                                            root
155963 drwxr-xr-x 2 root root 4096 May 4 17:45
155947 drwxr-xr-x 3 adminsanti adminsanti 4096 May 4 17:17
                                                            49 May 17 09:48 ejemplo
9 May 17 09:50 linksimboliconuevodirA -> nuevodirA
4096 May 17 09:19 nuevodirA
131746 -rw-r--r-- 1 root
150140 lrwxrwxrwx 1 root
                                            root
155958 drwxr-xr-x 2 root
                                            root
155980 drwxr-xr-x 2 root
                                                            4096 May 17 09:19 nuevodirB
                                            root
adminsanti@servidorsanti:/home$
```

#### THEN:

Using In -s /home /home/suavehome

```
root 4096 May 17 09:19 Nuevouling
adminsanti@servidorsanti:/home$ ln −s /home /home/suavehome
ln: failed to create symbolic link '/home/suavehome': Permission denied
adminsanti@servidorsanti:/home$ sudo ln −s /home /home/suavehome
[sudo] password for adminsanti:
```

#### Has the number of ligatures changed?

Yes, now there is one mor (before: 19, now: 20)

```
adminsanti@servidorsanti:/home$ 1s -1i /home

total 36

155975 drwxr-xr-x 2 root root 4096 May 7 10:01 DATA

155974 drwxr-xr-x 3 root root 4096 May 4 17:47 DELETE

150133 -rw-r--r-- 1 root root 15 May 7 09:58 NOMBRE

155962 drwxr-xr-x 2 root root 4096 May 4 17:44 PROGC

155963 drwxr-xr-x 2 root root 4096 May 4 17:45 SCRIPTS

155947 drwxr-xr-x 3 adminsanti adminsanti 4096 May 4 17:17 adminsanti

131746 -rw-r--r-- 1 root root 49 May 17 09:48 ejemplo

150140 lrwxrwxrwx 1 root root 9 May 17 09:50 linksimboliconuevodirA -> nuevodirA

155988 drwxr-xr-x 2 root root 4096 May 17 09:19 nuevodirB

150137 lrwxrwxrwx 1 root root 4096 May 17 09:19 nuevodirB

150137 lrwxrwxrwx 1 root root 5 May 18 09:13 suavehome -> /home
```

### Change to the newly created directory. In what directory are we really?

We are still at home directory.

```
adminsanti@servidorsanti:/home/suavehome$ cd /home/suavehome
adminsanti@servidorsanti:/home/suavehome$ ls -li
total 36
155975 drwxr-xr-x 2 root
155974 drwxr-xr-x 3 root
                                                         4096 May 7 10:01 DATA
4096 May 4 17:47 DELETE
                                          root
                                          root
                                                          15 May
150133 -rw-r--r-- 1 root
                                                                       7 09:58 NOMBRE
                                          root
155962 drwxr-xr-x 2 root root 4096 May 4 17:44 PROGC
155963 drwxr-xr-x 2 root root 4096 May 4 17:45 SCRIPTS
155947 drwxr-xr-x 3 adminsanti adminsanti 4096 May 4 17:17 adminsanti
                                                         49 May 17 09:48 ejemplo
9 May 17 09:50 linksimboliconuevodirA -> nuevodirA
4096 May 17 09:19 nuevodirA
131746 -rw-r--r-- 1
                           root
                                          root
150140 lrwxrwxrwx 1 root
                                          root
155958 drwxr-xr-x 2 root
                                          root
155980 drwxr-xr-x 2 root
                                                          4096 May 17 09:19 nuevodirB
                                          root
150137 lrwxrwxrwx 1 root
                                          root
                                                             5 May 18 09:13 suavehome -> /home
```

### 8. Observe the access rights of the different files in the dir HOME.

Para ". " y para ".." los permisos son drwxr-xr-x

Para los directorios : drwxr-xr-x

Para los cat: -rw-r-r-

The fiirst symbol is the type of file:

 $\mathbf{r}$  = read permission

**w** = write permission

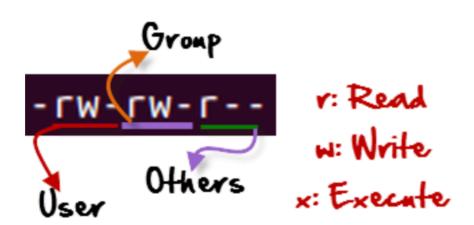
 $\mathbf{x} =$ execute permission

- = no permission

¿Cómo leer el resto de bits?

Van agrupados de tres en tres:

- -los tres primeros para el usuario
- -los tres siguiuentes para el grupo
- -los ultimos para el "mundo"1



permissions.html#:~:text=There%20are%20three%20user%20types,into%20Absolute%20and%20Symbolic%20mode [consultada: 18 mayo 2021].

<sup>&</sup>lt;sup>1</sup> Guru99. "File Permissions in Linux/Unix: How to Read/Write & Change?"[en línea]. *Guru*<sup>99</sup>. <a href="https://www.guru99.com/file-">https://www.guru99.com/file-</a>

### 9. Establishes and removes rights on a file to other users

Using the comand chmod. In the example I added write permission and the deleted it

Operator	Description
+	Adds a permission to a file or directory
-	Removes the permission
=	Sets the permission and overrides the permissions set earlier.

The various owners are represented as -

User Denotations		
u	user/owner	
g	group	
0	other	
a	all	

```
adminsanti@servidorsanti:/home/suavehome$ ls —li /home/ejemplo
131746 —rw—r—— 1 root root 49 May 17 09:48 /home/ejemplo
adminsanti@servidorsanti:/home/suavehome$ chmod o+w /home/ejemplo
chmod: changing permissions of '/home/ejemplo': Operation not permitted
adminsanti@servidorsanti:/home/suavehome$ sudo chmod o+w /home/ejemplo
[sudo] password for adminsanti:
adminsanti@servidorsanti:/home/suavehome$ ls —li /home/ejemplo
131746 —rw—r——rw— 1 root root 49 May 17 09:48 /home/ejemplo
adminsanti@servidorsanti:/home/suavehome$ sudo chmod o—w /home/ejemplo
adminsanti@servidorsanti:/home/suavehome$ ls —li /home/ejemplo
131746 —rw—r——r—— 1 root root 49 May 17 09:48 /home/ejemplo
adminsanti@servidorsanti:/home/suavehome$
```

#### 10. Change the owner of a file.

In the above example the owner is "root" (Is -I shows it). I used chown to change it:

```
adminsanti@servidorsanti:/home/suavehome$ ls –l /home/ejemplo
–rw–r––– 1 root root 49 May 17 09:48 /home/ejemplo
adminsanti@servidorsanti:/home/suavehome$ sudo chown adminsanti /home/ejemplo
adminsanti@servidorsanti:/home/suavehome$ ls –l /home/ejemplo
–rw–r––– 1 adminsanti root 49 May 17 09:48 /home/ejemplo
adminsanti@servidorsanti:/home/suavehome$
```

### 11. Give complete permissions in the files that the user creates and make sure that the others can only read and execute them.

Por defecto los usuarios tendran estos permisos si uso umask2

Use umask followed by the mask representing what you want to deny.				
Command	Filters	Description	Created directories will have this permission	Created files will have this permission
\$ umask		Deny nobody anything.	drwxrwxrwx	rw-rw-rw-
\$ umask 006	rw-	Deny rw to others, but allow everyone to list directories	drwxrwxx	rw-rw
\$ umask	rwx	Deny rwx to others	drwxrwx	rw-rw
\$ umask 077	rwxrwx	Deny rwx to others and to the group. Only you can access	drwx	rw
\$ umask 777	rwxrwx	Deny rwx to everyone (including the owner)	d	

Según la siguiente captura en valores octales sería: umask 050

El problema es que cuando quiero comprobarlo creando en /home un archivo cat me dice que no tengo permisos, así que tengo que usar sudo cat > ejemplo; pero entonces no me deja no sé si por que está bien el umask y entonces ya no me deja escribir o porque hay algún problema.

<sup>&</sup>lt;sup>2</sup> KEIROZM.COM. "Default permissions for users, directories and files on linux: examples"[en línea]. *keirozm.com.* <a href="https://queirozf.com/entries/default-permissions-for-users-directories-and-files-on-linux-examples">https://queirozf.com/entries/default-permissions-for-users-directories-and-files-on-linux-examples</a> [consultado: 20 mayo 2021].

Each access level (read, write, execute) has an octal value:

Access level	Octal value
Read	4
Write	2
Execute	1

Each identity (user, group, others) has a position:

Identity	Position
User	First or left-most
Group	Middle
Others	Last or right-most

The absolute mode syntax states the desired permissions from left to right.

How do I grant the user (owner) read, write, and execute, the group read-only, and all others no access to file2 by using absolute mode?

# chmod 740 file2

# 12. Give yourself and the members of your group complete permission on your files, but not allowing anyone (others) to do anything with them.

El comando sería umask 007