

Filesystems

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At the root's terminal

1. Create a new directory tree /Pro/Pro1/Pro11/Pro111/ABC

As discussed, the users Marcella and Patrick are created:

```
root@server1:~  
File Edit View Search Terminal Help  
[nlaizon@server1 ~]$ su -  
Password:  
Last login: Sat Mar 30 06:30:48 PDT 2024 on pts/0  
[root@server1 ~]# useradd Marcella; passwd Marcella  
Changing password for user Marcella.  
New password:  
BAD PASSWORD: The password fails the dictionary check - it is too simplistic/sys  
tematic  
Retype new password:  
passwd: all authentication tokens updated successfully.  
[root@server1 ~]# useradd Patrick; passwd Patrick  
Changing password for user Patrick.  
New password:  
BAD PASSWORD: The password fails the dictionary check - it is too simplistic/sys  
tematic  
Retype new password:  
passwd: all authentication tokens updated successfully.  
[root@server1 ~]# tail -5 /etc/passwd  
eng2:x:1013:1020:./home/eng2:/bin/bash  
acc1:x:1014:1014:./home/acc1:/bin/bash  
acc2:x:1015:1015:./home/acc2:/bin/bash  
Marcella:x:1016:1023:./home/Marcella:/bin/bash  
Patrick:x:1017:1024:./home/Patrick:/bin/bash  
[root@server1 ~]#
```

Then creating the new directory:

```
root@server1:~  
File Edit View Search Terminal Help  
tematic  
Retype new password:  
passwd: all authentication tokens updated successfully.  
[root@server1 ~]# useradd Patrick; passwd Patrick  
Changing password for user Patrick.  
New password:  
BAD PASSWORD: The password fails the dictionary check - it is too simplistic/sys  
tematic  
Retype new password:  
passwd: all authentication tokens updated successfully.  
[root@server1 ~]# tail -5 /etc/passwd  
eng2:x:1013:1020:./home/eng2:/bin/bash  
acc1:x:1014:1014:./home/acc1:/bin/bash  
acc2:x:1015:1015:./home/acc2:/bin/bash  
Marcella:x:1016:1023:./home/Marcella:/bin/bash  
Patrick:x:1017:1024:./home/Patrick:/bin/bash  
[root@server1 ~]# mkdir -p /Pro/Pro1/Pro11/Pro111/ABC  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project1  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]#
```

2. Create two files named project1 and project2 under ABC directory.

```
root@server1:~  
File Edit View Search Terminal Help  
tematic  
Retype new password:  
passwd: all authentication tokens updated successfully.  
[root@server1 ~]# useradd Patrick; passwd Patrick  
Changing password for user Patrick.  
New password:  
BAD PASSWORD: The password fails the dictionary check - it is too simplistic/sys  
tematic  
Retype new password:  
passwd: all authentication tokens updated successfully.  
[root@server1 ~]# tail -5 /etc/passwd  
eng2:x:1013:1020::/home/eng2:/bin/bash  
acc1:x:1014:1014::/home/acc1:/bin/bash  
acc2:x:1015:1015::/home/acc2:/bin/bash  
Marcella:x:1016:1023::/home/Marcella:/bin/bash  
Patrick:x:1017:1024::/home/Patrick:/bin/bash  
[root@server1 ~]# mkdir -p /Pro/Pro1/Pro11/Pro111/ABC  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rw-r--r--. 1 root root 0 Apr 1 15:11 project1  
-rw-r--r--. 1 root root 0 Apr 1 15:11 project2  
[root@server1 ~]#
```

3. Allow any user to read, write and execute to the /Pro directory and subdirectories but only the user owner or root can delete or rename the files or subdirectories in the /Pro directory

I realize only afterward that a sticky bit is required. The permission allocation and sticky bit command would be `chmod -R 777 /Pro/`. However, the sticky bit is not used in the following questions.

```
root@server1:~  
File Edit View Search Terminal Help  
Retype new password:  
passwd: all authentication tokens updated successfully.  
[root@server1 ~]# tail -5 /etc/passwd  
eng2:x:1013:1020::/home/eng2:/bin/bash  
acc1:x:1014:1014::/home/acc1:/bin/bash  
acc2:x:1015:1015::/home/acc2:/bin/bash  
Marcella:x:1016:1023::/home/Marcella:/bin/bash  
Patrick:x:1017:1024::/home/Patrick:/bin/bash  
[root@server1 ~]# mkdir -p /Pro/Pro1/Pro11/Pro111/ABC  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rw-r--r--. 1 root root 0 Apr 1 15:11 project1  
-rw-r--r--. 1 root root 0 Apr 1 15:11 project2  
[root@server1 ~]# chmod -R 777 /Pro/  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111  
total 0  
drwxrwxrwx. 2 root root 38 Apr 1 15:11 ABC  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rwxrwxrwx. 1 root root 0 Apr 1 15:11 project1  
-rwxrwxrwx. 1 root root 0 Apr 1 15:11 project2  
[root@server1 ~]#
```

4. Edit the two files project1 and project2 by adding "This is Project n"

```
root@server1:~  
File Edit View Search Terminal Help  
Marcella:x:1016:1023:./home/Marcella:/bin/bash  
Patrick:x:1017:1024:./home/Patrick:/bin/bash  
[root@server1 ~]# mkdir -p /Pro/Pro1/Pro11/Pro111/ABC  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project1  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]# chmod -R 777 /Pro/  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111  
total 0  
drwxrwxrwx. 2 root root 38 Apr  1 15:11 ABC  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rwxrwxrwx. 1 root root 0 Apr  1 15:11 project1  
-rwxrwxrwx. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project1  
This is project number 1.  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project2  
This is project number 2.  
[root@server1 ~]#
```

At Marcella's terminal, on home directory

5. Create a hard link to /Pro/Pro1/Pro11/Pro111/ABC/project1 named project1mlink

```
Marcella@server1:~  
File Edit View Search Terminal Help  
total 0  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project1  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]# chmod -R 777 /Pro/  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111  
total 0  
drwxrwxrwx. 2 root root 38 Apr  1 15:11 ABC  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rwxrwxrwx. 1 root root 0 Apr  1 15:11 project1  
-rwxrwxrwx. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project1  
This is project number 1.  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project2  
This is project number 2.  
[root@server1 ~]# su - Marcella  
[Marcella@server1 ~]$ ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1mlink  
[Marcella@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2mlink  
[Marcella@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCmlink  
[Marcella@server1 ~]$ ls  
ABCmlink project1mlink project2mlink  
[Marcella@server1 ~]$
```

6. Create a soft link to /Pro/Pro1/Pro11/Pro111/ABC/project2 named project2mlink

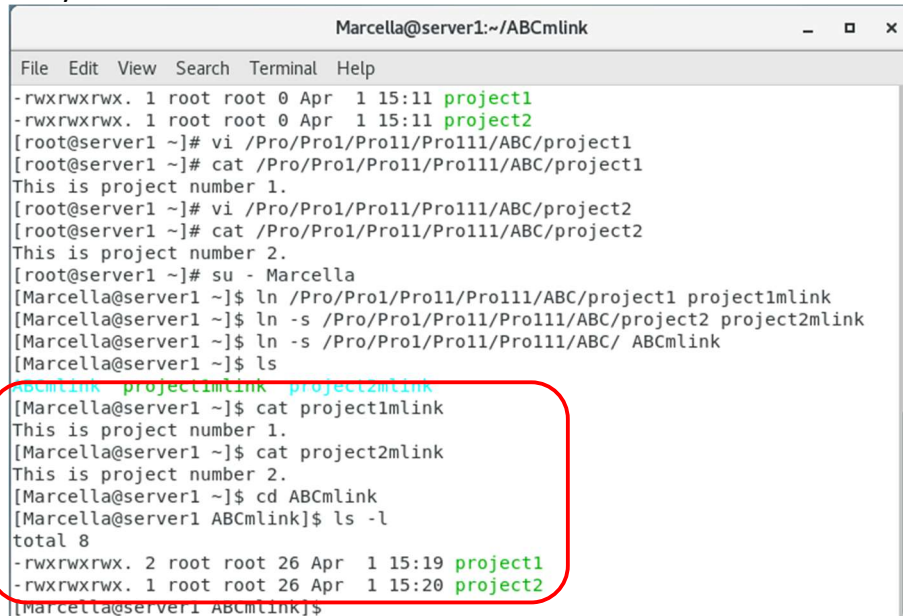
```
Marcella@server1:~  
File Edit View Search Terminal Help  
total 0  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project1  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]# chmod -R 777 /Pro/  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111  
total 0  
drwxrwxrwx. 2 root root 38 Apr  1 15:11 ABC  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rwxrwxrwx. 1 root root 0 Apr  1 15:11 project1  
-rwxrwxrwx. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project1  
This is project number 1.  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project2  
This is project number 2.  
[root@server1 ~]# su - Marcella  
[Marcella@server1 ~]$ ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1mlink  
[Marcella@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2mlink  
[Marcella@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCmlink  
[Marcella@server1 ~]$ ls  
ABCmlink project1mlink project2mlink  
[Marcella@server1 ~]$
```

7. Create a soft link to /Pro/Pro1/Pro11/Pro111/ABC/ named ABCmlink

```
Marcella@server1:~  
File Edit View Search Terminal Help  
total 0  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project1  
-rw-r--r--. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]# chmod -R 777 /Pro/  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111  
total 0  
drwxrwxrwx. 2 root root 38 Apr  1 15:11 ABC  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 0  
-rwxrwxrwx. 1 root root 0 Apr  1 15:11 project1  
-rwxrwxrwx. 1 root root 0 Apr  1 15:11 project2  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project1  
This is project number 1.  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project2  
This is project number 2.  
[root@server1 ~]# su - Marcella  
[Marcella@server1 ~]$ ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1mlink  
[Marcella@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2mlink  
[Marcella@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCmlink  
[Marcella@server1 ~]$ ls  
ABCmlink project1mlink project2mlink  
[Marcella@server1 ~]$
```

8. Verify your links by displaying the contents (cat filelink, cd directorylink)

They all work.

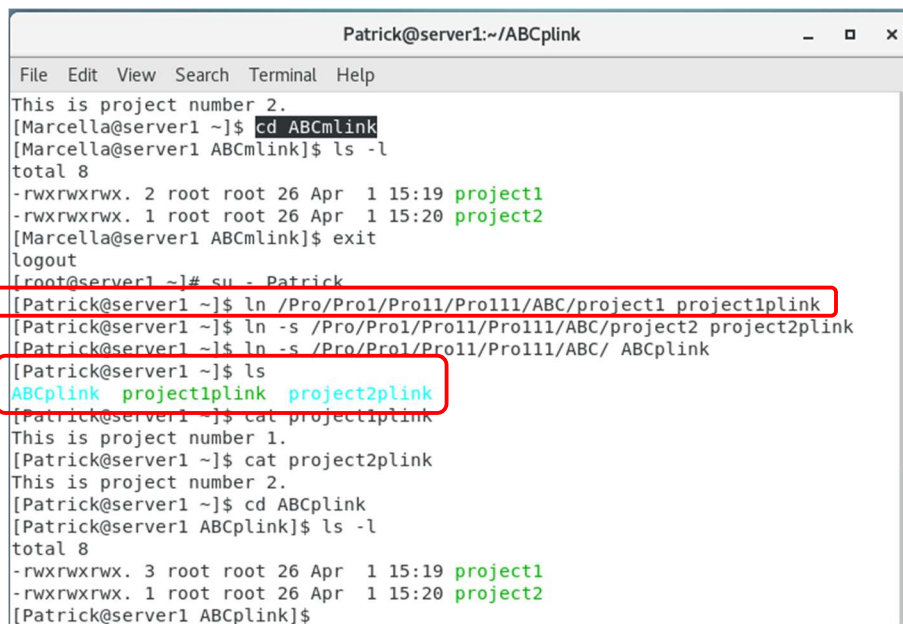


A terminal window titled 'Marcella@server1:~/ABCmlink' showing the verification of symbolic links. The user runs 'cat project1mlink' and 'cat project2mlink', both displaying 'This is project number 1.' and 'This is project number 2.' respectively. Then, the user runs 'cd ABCmlink' and 'ls -l', showing the directory contents including the symbolic links 'project1mlink' and 'project2mlink'. A red box highlights the 'cd' and 'ls' commands and their output.

```
Marcella@server1:~/ABCmlink
File Edit View Search Terminal Help
-rwxrwxrwx. 1 root root 0 Apr 1 15:11 project1
-rwxrwxrwx. 1 root root 0 Apr 1 15:11 project2
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project1
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project1
This is project number 1.
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project2
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project2
This is project number 2.
[root@server1 ~]# su - Marcella
[Marcella@server1 ~]$ ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1mlink
[Marcella@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2mlink
[Marcella@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCmlink
[Marcella@server1 ~]$ ls
ABCmlink project1mlink project2mlink
[Marcella@server1 ~]$ cat project1mlink
This is project number 1.
[Marcella@server1 ~]$ cat project2mlink
This is project number 2.
[Marcella@server1 ~]$ cd ABCmlink
[Marcella@server1 ABCmlink]$ ls -l
total 8
-rwxrwxrwx. 2 root root 26 Apr 1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr 1 15:20 project2
[Marcella@server1 ABCmlink]$
```

At Patrick's terminal, on home directory,

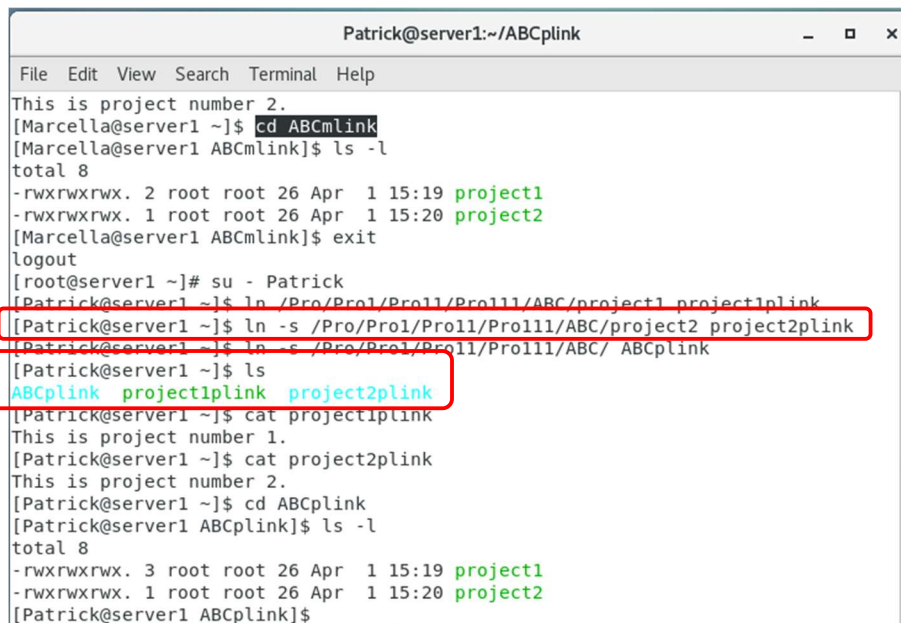
9. Create a hard link to /Pro/Pro1/Pro11/Pro111/ABC/project1 named project1plink



A terminal window titled 'Patrick@server1:~/ABCplink' showing the creation of hard links. The user runs 'ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1plink' and 'ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2plink'. Then, the user runs 'ls', showing the directory contents including the hard link 'project1plink' and the symbolic link 'project2plink'. A red box highlights the 'ln' commands and the 'ls' output.

```
Patrick@server1:~/ABCplink
File Edit View Search Terminal Help
This is project number 2.
[Marcella@server1 ~]$ cd ABCmlink
[Marcella@server1 ABCmlink]$ ls -l
total 8
-rwxrwxrwx. 2 root root 26 Apr 1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr 1 15:20 project2
[Marcella@server1 ABCmlink]$ exit
logout
[root@server1 ~]# su - Patrick
[Patrick@server1 ~]$ ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1plink
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2plink
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCplink
[Patrick@server1 ~]$ ls
ABCplink project1plink project2plink
[Patrick@server1 ~]$ cat project1plink
This is project number 1.
[Patrick@server1 ~]$ cat project2plink
This is project number 2.
[Patrick@server1 ~]$ cd ABCplink
[Patrick@server1 ABCplink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 26 Apr 1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr 1 15:20 project2
[Patrick@server1 ABCplink]$
```

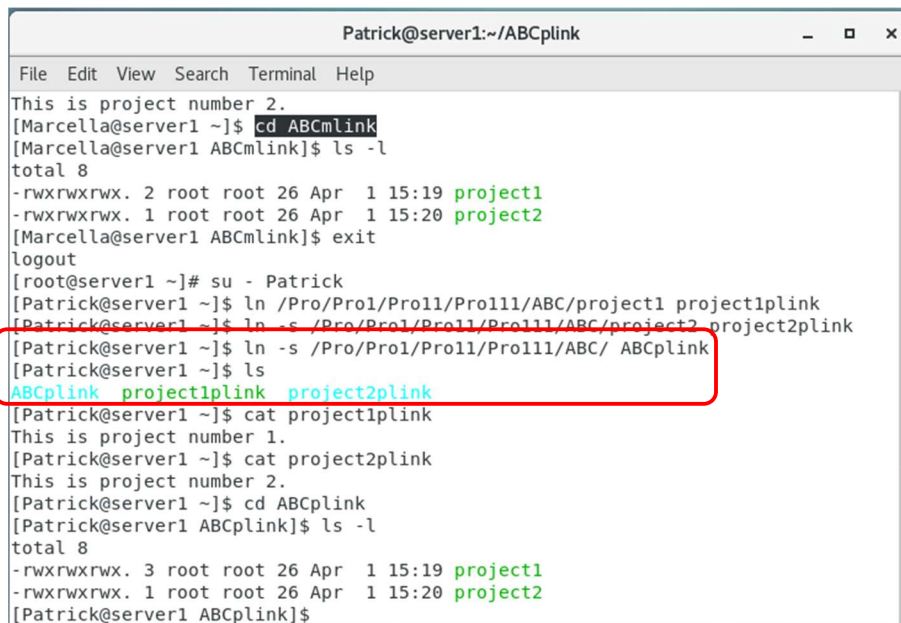

10. Create a soft link to /Pro/Pro1/Pro11/Pro111/ABC/project2 named project2plink



A terminal window titled "Patrick@server1:~/ABCplink" showing a sequence of commands. The user Marcella starts in the home directory, navigates to "ABCmlink", and lists files, showing "project1" and "project2". After exiting, the user su's to Patrick. Patrick then runs a series of commands to create soft links: "ln -s /Pro/Pro1/Pro11/Pro111/ABC/project1 project1plink", "ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2plink", and "ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCplink". These three commands are highlighted with a red box. Finally, Patrick runs "ls" and lists the directory contents, showing "ABCplink", "project1plink", and "project2plink", which are also highlighted with a red box. The terminal then shows the contents of the links and the directory listing from within the "ABCplink" directory.

```
Patrick@server1:~/ABCplink
File Edit View Search Terminal Help
This is project number 2.
[Marcella@server1 ~]$ cd ABCmlink
[Marcella@server1 ABCmlink]$ ls -l
total 8
-rwxrwxrwx. 2 root root 26 Apr  1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr  1 15:20 project2
[Marcella@server1 ABCmlink]$ exit
logout
[root@server1 ~]# su - Patrick
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project1 project1plink
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2plink
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCplink
[Patrick@server1 ~]$ ls
ABCplink project1plink project2plink
[Patrick@server1 ~]$ cat project1plink
This is project number 1.
[Patrick@server1 ~]$ cat project2plink
This is project number 2.
[Patrick@server1 ~]$ cd ABCplink
[Patrick@server1 ABCplink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 26 Apr  1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr  1 15:20 project2
[Patrick@server1 ABCplink]$
```

11. Create a soft link to /Pro/Pro1/Pro11/Pro111/ABC/ named ABCplink



A terminal window titled "Patrick@server1:~/ABCplink" showing a sequence of commands. The user Marcella starts in the home directory, navigates to "ABCmlink", and lists files, showing "project1" and "project2". After exiting, the user su's to Patrick. Patrick then runs a series of commands to create soft links: "ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1plink", "ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2plink", and "ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCplink". These three commands are highlighted with a red box. Finally, Patrick runs "ls" and lists the directory contents, showing "ABCplink", "project1plink", and "project2plink", which are also highlighted with a red box. The terminal then shows the contents of the links and the directory listing from within the "ABCplink" directory.

```
Patrick@server1:~/ABCplink
File Edit View Search Terminal Help
This is project number 2.
[Marcella@server1 ~]$ cd ABCmlink
[Marcella@server1 ABCmlink]$ ls -l
total 8
-rwxrwxrwx. 2 root root 26 Apr  1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr  1 15:20 project2
[Marcella@server1 ABCmlink]$ exit
logout
[root@server1 ~]# su - Patrick
[Patrick@server1 ~]$ ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1plink
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2plink
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCplink
[Patrick@server1 ~]$ ls
ABCplink project1plink project2plink
[Patrick@server1 ~]$ cat project1plink
This is project number 1.
[Patrick@server1 ~]$ cat project2plink
This is project number 2.
[Patrick@server1 ~]$ cd ABCplink
[Patrick@server1 ABCplink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 26 Apr  1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr  1 15:20 project2
[Patrick@server1 ABCplink]$
```

12. Verify your links by displaying the contents (cat file_link , cd directory_link)

```
Patrick@server1:~/ABCplink
File Edit View Search Terminal Help
This is project number 2.
[Marcella@server1 ~]$ cd ABCmlink
[Marcella@server1 ABCmlink]$ ls -l
total 8
-rwxrwxrwx. 2 root root 26 Apr  1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr  1 15:20 project2
[Marcella@server1 ABCmlink]$ exit
logout
[root@server1 ~]# su - Patrick
[Patrick@server1 ~]$ ln /Pro/Pro1/Pro11/Pro111/ABC/project1 project1plink
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/project2 project2plink
[Patrick@server1 ~]$ ln -s /Pro/Pro1/Pro11/Pro111/ABC/ ABCplink
[Patrick@server1 ~]$ ls
ABCplink project1plink project2plink
[Patrick@server1 ~]$ cat project1plink
This is project number 1.
[Patrick@server1 ~]$ cat project2plink
This is project number 2.
[Patrick@server1 ~]$ cd ABCplink
[Patrick@server1 ABCplink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 26 Apr  1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr  1 15:20 project2
[Patrick@server1 ABCplink]$
```

At the root's terminal

13. Modify the files project1 and project2 by adding some words

```
root@server1:~
File Edit View Search Terminal Help
[Patrick@server1 ~]$ cat project2plink
This is project number 2.
[Patrick@server1 ~]$ cd ABCplink
[Patrick@server1 ABCplink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 26 Apr  1 15:19 project1
-rwxrwxrwx. 1 root root 26 Apr  1 15:20 project2
[Patrick@server1 ABCplink]$ exit
logout
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project1
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project1
This is project number 1.
This was added at question 13 of the assignment. Still project number 1.
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project2
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project2
This is project number 2.
This was added at question 13 of the assignment. Still project number 2.
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project3
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC
total 8
-rwxrwxrwx. 3 root root 99 Apr  1 15:38 project1
-rwxrwxrwx. 1 root root 99 Apr  1 15:39 project2
-rw-r--r--. 1 root root  0 Apr  1 15:40 project3
[root@server1 ~]#
```

14. Create a new file named project3 under ABC directory

```
root@server1:~  
File Edit View Search Terminal Help  
[Patrick@server1 ~]$ cat project2plink  
This is project number 2.  
[Patrick@server1 ~]$ cd ABCplink  
[Patrick@server1 ABCplink]$ ls -l  
total 8  
-rwxrwxrwx. 3 root root 26 Apr  1 15:19 project1  
-rwxrwxrwx. 1 root root 26 Apr  1 15:20 project2  
[Patrick@server1 ABCplink]$ exit  
logout  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project1  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project1  
This is project number 1.  
This was added at question 13 of the assignment. Still project number 1.  
[root@server1 ~]# vi /Pro/Pro1/Pro11/Pro111/ABC/project2  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project2  
This is project number 2.  
This was added at question 13 of the assignment. Still project number 2.  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project3  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 8  
-rwxrwxrwx. 3 root root 99 Apr  1 15:38 project1  
-rwxrwxrwx. 1 root root 99 Apr  1 15:39 project2  
-rw-r--r--. 1 root root  0 Apr  1 15:40 project3  
[root@server1 ~]#
```

At Patrick's and Marcella's terminals

15. Verify if there is changes on your links by displaying the contents (cat file_link , cd directory_link)

Still work under Marcella's terminal:

```
Marcella@server1:~/ABCmlink  
File Edit View Search Terminal Help  
[root@server1 ~]# cat /Pro/Pro1/Pro11/Pro111/ABC/project2  
This is project number 2.  
This was added at question 13 of the assignment. Still project number 2.  
[root@server1 ~]# touch /Pro/Pro1/Pro11/Pro111/ABC/project3  
[root@server1 ~]# ls -l /Pro/Pro1/Pro11/Pro111/ABC  
total 8  
-rwxrwxrwx. 3 root root 99 Apr  1 15:38 project1  
-rwxrwxrwx. 1 root root 99 Apr  1 15:39 project2  
-rw-r--r--. 1 root root  0 Apr  1 15:40 project3  
[root@server1 ~]# su - Marcella  
Last login: Mon Apr  1 15:22:05 PDT 2024 on pts/0  
[Marcella@server1 ~]$ cat project1mlink  
This is project number 1.  
This was added at question 13 of the assignment. Still project number 1.  
[Marcella@server1 ~]$ cat project2mlink  
This is project number 2.  
This was added at question 13 of the assignment. Still project number 2.  
[Marcella@server1 ~]$ cd ABCmlink  
[Marcella@server1 ABCmlink]$ ls -l  
total 8  
-rwxrwxrwx. 3 root root 99 Apr  1 15:38 project1  
-rwxrwxrwx. 1 root root 99 Apr  1 15:39 project2  
-rw-r--r--. 1 root root  0 Apr  1 15:40 project3  
[Marcella@server1 ABCmlink]$
```


Still work under Patrick's terminal:

```
Patrick@server1:~/ABCplink
File Edit View Search Terminal Help
This was added at question 13 of the assignment. Still project number 2.
[Marcella@server1 ~]$ cd ABCmlink
[Marcella@server1 ABCmlink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 99 Apr  1 15:38 project1
-rwxrwxrwx. 1 root root 99 Apr  1 15:39 project2
-rw-r--r--. 1 root root  0 Apr  1 15:40 project3
[Marcella@server1 ABCmlink]$ exit
logout
[root@server1 ~]# su - Patrick
Last login: Mon Apr  1 15:32:01 PDT 2024 on pts/0
[Patrick@server1 ~]$ cat project1plink
This is project number 1.
This was added at question 13 of the assignment. Still project number 1.
[Patrick@server1 ~]$ cat project2plink
This is project number 2.
This was added at question 13 of the assignment. Still project number 2.
[Patrick@server1 ~]$ cd ABCplink
[Patrick@server1 ABCplink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 99 Apr  1 15:38 project1
-rwxrwxrwx. 1 root root 99 Apr  1 15:39 project2
-rw-r--r--. 1 root root  0 Apr  1 15:40 project3
[Patrick@server1 ABCplink]$
```

At the root's terminal,

16. You decided to delete the file project1, but before the delete, you have to find all hard links to project1

- Find the inode number of project1 (take note)
- Find all the files with the same inode number

```
root@server1:~
File Edit View Search Terminal Help
logout
[root@server1 ~]# su - Patrick
Last login: Mon Apr  1 15:32:01 PDT 2024 on pts/0
[Patrick@server1 ~]$ cat project1plink
This is project number 1.
This was added at question 13 of the assignment. Still project number 1.
[Patrick@server1 ~]$ cat project2plink
This is project number 2.
This was added at question 13 of the assignment. Still project number 2.
[Patrick@server1 ~]$ cd ABCplink
[Patrick@server1 ABCplink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 99 Apr  1 15:38 project1
-rwxrwxrwx. 1 root root 99 Apr  1 15:39 project2
-rw-r--r--. 1 root root  0 Apr  1 15:40 project3
[Patrick@server1 ABCplink]$ exit
logout
[root@server1 ~]# ls -li /Pro/Pro1/Pro11/Pro111/ABC/project1
4694941 /Pro/Pro1/Pro11/Pro111/ABC/project1
[root@server1 ~]# find / -xdev -inum 4694941
/home/Marcella/project1mlink
/home/Patrick/project1plink
/Pro/Pro1/Pro11/Pro111/ABC/project1
[root@server1 ~]#
```

17. Remove the ABC directory (including files inside)

I understand that option -f would be useful here.

```

root@server1:/Pro/Pro1/Pro11/Pro111
File Edit View Search Terminal Help
[Patrick@server1 ABCplink]$ ls -l
total 8
-rwxrwxrwx. 3 root root 99 Apr  1 15:38 project1
-rwxrwxrwx. 1 root root 99 Apr  1 15:39 project2
-rw-r--r--. 1 root root  0 Apr  1 15:40 project3
[Patrick@server1 ABCplink]$ exit
logout
[root@server1 ~]# ls -i /Pro/Pro1/Pro11/Pro111/ABC/project1
4694941 /Pro/Pro1/Pro11/Pro111/ABC/project1
[root@server1 ~]# find / -xdev -inum 4694941
/home/Marcella/project1mlink
/home/Patrick/project1plink
/Pro/Pro1/Pro11/Pro111/ABC/project1
[root@server1 ~]# cd /Pro/Pro1/Pro11/Pro111/
[root@server1 Pro111]# ls
ABC
[root@server1 Pro111]# rm -r ABC
rm: descend into directory 'ABC'? y
rm: remove regular file 'ABC/project1'? y
rm: remove regular file 'ABC/project2'? y
rm: remove regular empty file 'ABC/project3'? y
rm: remove directory 'ABC'? y
[root@server1 Pro111]# ls
[root@server1 Pro111]#

```

At Patrick's and Marcella's terminals

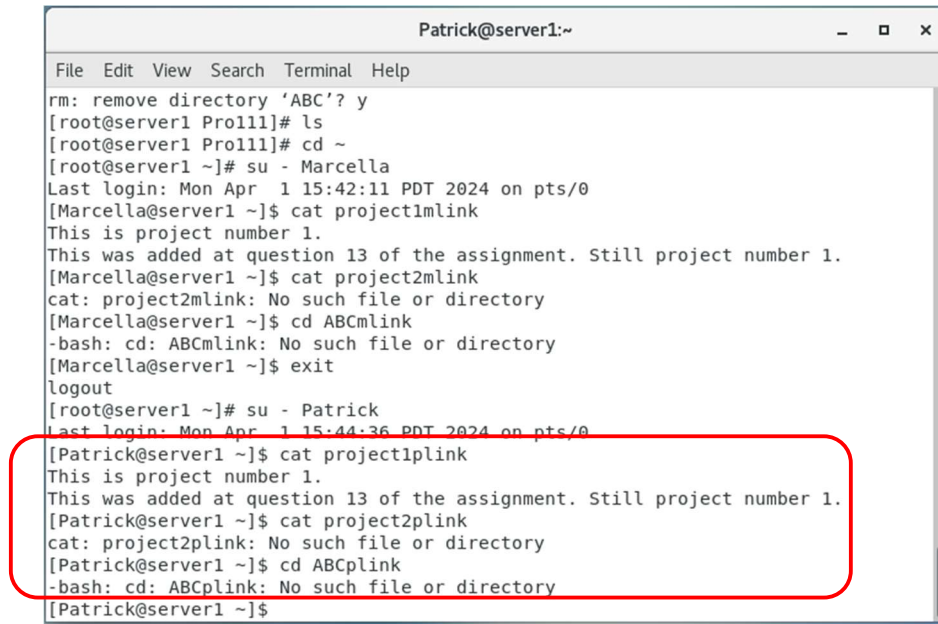
18. Is the project1 link still useful? Why?

The link to project1 still works both with Marcella (the screenshot below) and Patrick (the screenshot that follow). We can still read from the link using cat. That is because the hard link to project1 is a copy of the file within the user home directory, just under the name of the link. The hard link does not attach to the file in the original location.

```

Marcella@server1:~
File Edit View Search Terminal Help
/home/Marcella/project1mlink
/home/Patrick/project1plink
/Pro/Pro1/Pro11/Pro111/ABC/project1
[root@server1 ~]# cd /Pro/Pro1/Pro11/Pro111/
[root@server1 Pro111]# ls
ABC
[root@server1 Pro111]# rm -r ABC
rm: descend into directory 'ABC'? y
rm: remove regular file 'ABC/project1'? y
rm: remove regular file 'ABC/project2'? y
rm: remove regular empty file 'ABC/project3'? y
rm: remove directory 'ABC'? y
[root@server1 Pro111]# ls
[root@server1 Pro111]# cd ~
[root@server1 ~]# su - Marcella
Last login: Mon Apr  1 15:42:11 PDT 2024 on pts/0
[Marcella@server1 ~]$ cat project1mlink
This is project number 1.
This was added at question 13 of the assignment. Still project number 1.
[Marcella@server1 ~]$ cat project2mlink
cat: project2mlink: No such file or directory
[Marcella@server1 ~]$ cd ABCmlink
-bash: cd: ABCmlink: No such file or directory
[Marcella@server1 ~]$

```



```
Patrick@server1:~  
File Edit View Search Terminal Help  
rm: remove directory 'ABC'? y  
[root@server1 Pro111]# ls  
[root@server1 Pro111]# cd ~  
[root@server1 ~]# su - Marcella  
Last login: Mon Apr 1 15:42:11 PDT 2024 on pts/0  
[Marcella@server1 ~]$ cat project1mlink  
This is project number 1.  
This was added at question 13 of the assignment. Still project number 1.  
[Marcella@server1 ~]$ cat project2mlink  
cat: project2mlink: No such file or directory  
[Marcella@server1 ~]$ cd ABCmlink  
-bash: cd: ABCmlink: No such file or directory  
[Marcella@server1 ~]$ exit  
logout  
[root@server1 ~]# su - Patrick  
Last login: Mon Apr 1 15:44:36 PDT 2024 on pts/0  
[Patrick@server1 ~]$ cat project1plink  
This is project number 1.  
This was added at question 13 of the assignment. Still project number 1.  
[Patrick@server1 ~]$ cat project2plink  
cat: project2plink: No such file or directory  
[Patrick@server1 ~]$ cd ABCplink  
-bash: cd: ABCplink: No such file or directory  
[Patrick@server1 ~]$
```

19. Is the project2 link still useful? Why?

Please have a look at the screenshots in question 18 to get proof that the soft link to project2 is not useful at all. That is because the soft link attaches to the file in its original location. Once the file in the original location is deleted, the soft link no longer has any attachment. The name of the soft link is also painted in a very particular color, as seen in the screenshot in question 22.

20. Is the ABC link still useful? Why?

Please have a look at the screenshots in question 18 to get proof that the soft link to ABC directory is not useful at all. That is because the soft link attaches to the directory in its original location. Once the directory in the original location is deleted, the soft link no longer has any attachment. The name of the soft link is also painted in a very particular color, as seen in the screenshot in question 22.

At the root's terminal

21. Find all the files with the same inode number of project1

```
root@server1:~  
File Edit View Search Terminal Help  
This was added at question 13 of the assignment. Still project number 1.  
[Patrick@server1 ~]$ cat project2plink  
cat: project2plink: No such file or directory  
[Patrick@server1 ~]$ cd ABCplink  
-bash: cd: ABCplink: No such file or directory  
[Patrick@server1 ~]$ exit  
logout  
[root@server1 ~]# find / -xdev -inum 4694941  
/home/Marcella/project1mlink  
/home/Patrick/project1plink  
[root@server1 ~]# find / -xdev -inum 4694941 -exec rm {} \;  
[root@server1 ~]# su - Marcella  
Last login: Mon Apr 1 16:06:05 PDT 2024 on pts/0  
[Marcella@server1 ~]$ ls  
ABcmLink project2mlink  
[Marcella@server1 ~]$ exit  
logout  
[root@server1 ~]# su - Patrick  
Last login: Mon Apr 1 16:07:48 PDT 2024 on pts/0  
[Patrick@server1 ~]$ ls  
ABCplink project2plink  
[Patrick@server1 ~]$ exit  
logout  
[root@server1 ~]#
```

22. Delete all the hard links to project1

```
root@server1:~  
File Edit View Search Terminal Help  
This was added at question 13 of the assignment. Still project number 1.  
[Patrick@server1 ~]$ cat project2plink  
cat: project2plink: No such file or directory  
[Patrick@server1 ~]$ cd ABCplink  
-bash: cd: ABCplink: No such file or directory  
[Patrick@server1 ~]$ exit  
logout  
[root@server1 ~]# find / -xdev -inum 4694941  
/home/Marcella/project1mlink  
/home/Patrick/project1plink  
[root@server1 ~]# find / -xdev -inum 4694941 -exec rm {} \;  
[root@server1 ~]# su - Marcella  
Last login: Mon Apr 1 16:06:05 PDT 2024 on pts/0  
[Marcella@server1 ~]$ ls  
ABcmLink project2mlink  
[Marcella@server1 ~]$ exit  
logout  
[root@server1 ~]# su - Patrick  
Last login: Mon Apr 1 16:07:48 PDT 2024 on pts/0  
[Patrick@server1 ~]$ ls  
ABCplink project2plink  
[Patrick@server1 ~]$ exit  
logout  
[root@server1 ~]#
```