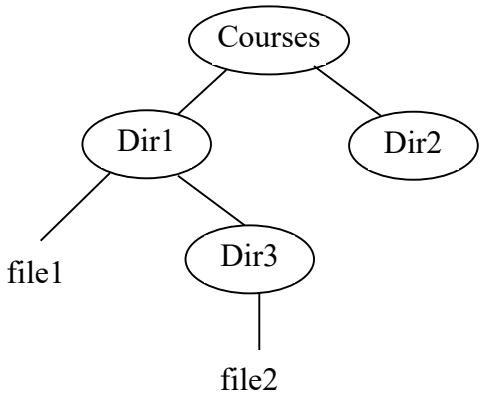
Solution of the TP n°3: Physical and symbolic links and i-nodes

Exercise n° 1 : Creating links on files

1) Create the following tree structure in your working directory.




```
mkdir -p Courses/Dir1/Dir3 Courses/Dir2; touch Courses/Dir1/file1 Courses/Dir1/Dir3/file2
```

2) Using the command ***echo***, write "Third TP on links and i-nodes" in the file ***file2***.

```
echo "Third TP on links and i-nodes" >> Courses/Dir1/Dir3/file2
```

3) Create a physical link to the file ***file2*** in the directory ***Courses*** under the name ***fiile2-phy***.

```
ln Courses/Dir1/Dir3/file2  Courses/file2-phy
```

4) List the contents of the directory ***Dir1*** with details of each item.

```
ls -lR Courses/Dir1
```

5) Modify the contents of the file ***file2-phy*** using the command ***echo***. What do you notice for the file ***file2***? In a similar way, modify the file ***file2*** and consult the file ***file2-phy***. What do you notice?

```
You can see that changing one has repercussions on the other
```

6) Change the access permissions for the file ***file2*** for the members of the group. What do you notice about the file ***file2-phy***?

```
chmod g-rw Courses/Dir1/Dir3/file2

We notice that changing access rights on file2 is reflected on file2-phy
```

7) Create a symbolic link to the file ***file2*** in the directory ***Courses*** under the name ***file2-sym***.

```
ln -s Courses/Dir1/Dir3/file2  Courses/file2-sym
```

8) View all the information about the files ***file2-phy*** and ***file2-sym***. What differences do you notice?

```
ls -l Courses/file2-phy
ls -l Courses/file2-sym
```

- *file types are different*
- *access rights are different*
- *file sizes are different*

9) Try changing the access permissions to the file ***file2-sym***. What do you find?

```
It is not possible to change access permissions
```

10) Change the access permission for the directory ***Dir1*** so that you no longer have access to it. Try displaying the contents of ***file2-phy*** and ***file2-sym***. What do you notice?

```
chmod u-x Courses/Dir1
```

```
You can display the contents of file2-phy but not file2-sym because the
latter passes through file2 which is contained in the directory Dir1 (no
access rights).
```

11) Change the access rights of the directory ***Dir1*** again to gain access to it. Move the file ***file2*** into the directory ***Dir1***. Try displaying the contents of the files ***file2-phy*** and ***file2-sym***. What do you notice?

```
chmod u+x Courses/Dir1
```

```
It is possible to display the contents of fiile2-phy but not for fiile2-
sym because it is linked to the file file2 that has been moved.
```

12) Move the file ***file2*** back into the directory ***Dir3***. Try again to display the contents of the files ***file2-phy*** and ***file2-sym***. Remove the file ***file2***. What do you notice?

```
It is possible to display the contents of file2-phy but not for file2-
sym (broken link).
```

<u>Exercise n° 2</u>: Creating links on directories

1) Re-create the file ***file2*** in the directory ***Dir3*** with the same contents as in exercise 1?
2) Now take a closer look at the directory ***Dir2***. How many links are there in this directory?

```
Usually 2 links
```

3) In the directory ***Dir2***, create a sub-directory called ***Dir21***. How many links are there in this directory? Explain.

```
mkdir Courses/Dir2/Dir21
```

4) Create a physical link called ***Dir3-phy*** from the directory ***Dir3*** to the directory ***Courses***. What do you notice?

ln Courses/Dir1/Dir3 Courses/Dir3-phy

```
This is not possible even in superuser mode in some cases.
```

5) Create a symbolic link called ***Dir3-sym*** from the directory ***Dir3*** to the directory ***Courses***.

ln Courses/Dir1/Dir3 Courses/Dir3-sym

6) Create a symbolic link called ***Dir3-sym-sym*** from the directory ***Dir3-sym*** into the directory ***Dir2***.

   ln –s Courses/Dir3-sym Courses/Dir2/Dir3-sym-sym

7) Move to the directory ***Dir3*** from the directory "***Courses***", then move up to the parent directory using the command ***cd..***.
8) What happens if you use the command ***ls-Ral*** on ***Dir3-sym***? and on ***Dir3-sym-sym***?

   It gives us the links to which they are associated

<u>Exercise n° 3</u>: i-nodes (index nodes)

1) Display the i-node number of the file ***file1***. Copy the file ***file1*** into the directory ***Dir21***. What is its i-node number?

   ls –i Courses/Dir1/file1

   Example:1059695

   cp Courses/Dir1/file1 Courses/Dir2/Dir21

   Example : 1310776

The inodes of these two files are different because the files occupy two different locations on the storage medium.

2) Change the name of this file to ***file2*** (***file1*** placed in ***Dir21)***. Does the i-node number change?

   mv *Courses/Dir2/Dir21/file1 Courses/Dir2/Dir21/file2*

   No, it's the same inode

3) In the directory ***Dir3***, create a file named ***file3***. In the directory ***Courses***, create a symbolic link and a physical link to this new file, naming them ***file3-sym*** and ***file3-phy*** respectively.

   touch Courses/Dir1/Dir3/file3

   ln –s Courses/Dir1/Dir3/file3 Courses/file3-sym

   ln –s Courses/Dir1/Dir3/file3 Courses/file3-phy

4) Display the i-node number of the file ***file3-sym*** by listing the entire directory ***Courses*** and then listing just the file ***file3-sym***. What do you notice?

   It's the same because nothing has been done to the reference file file3.

5) Compare the i-node numbers between the file ***file3*** in the directory ***Dir3***, ***file3-sym*** and ***file3-phy***. What do you notice?

   file3 and file3-phy have the same inode and the inode of file3-sym is different.

6) Now look at the i-node number of the root and your home directory.

   They are different

   The root inode is 2

   ls -ai /