Hard and Soft links

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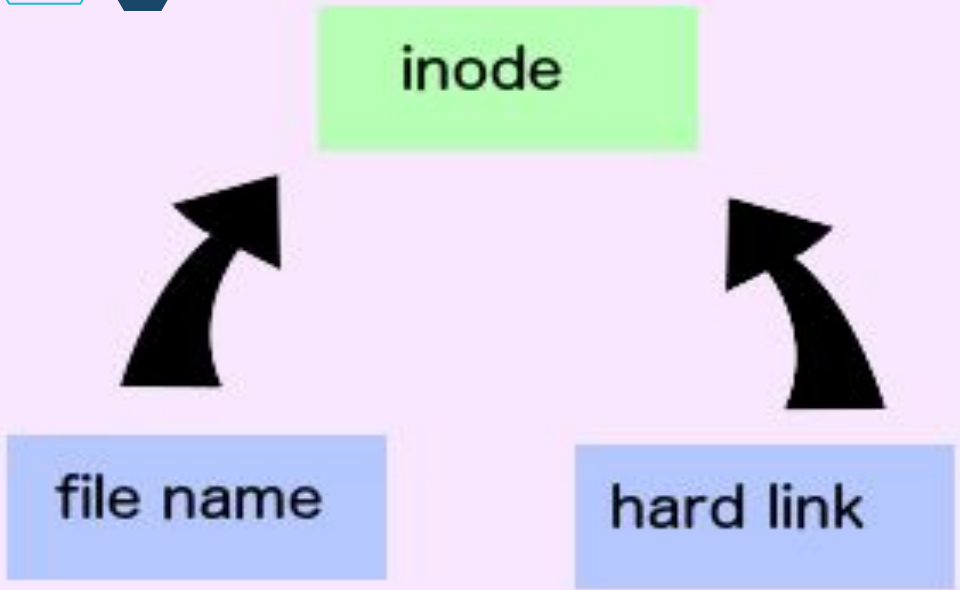
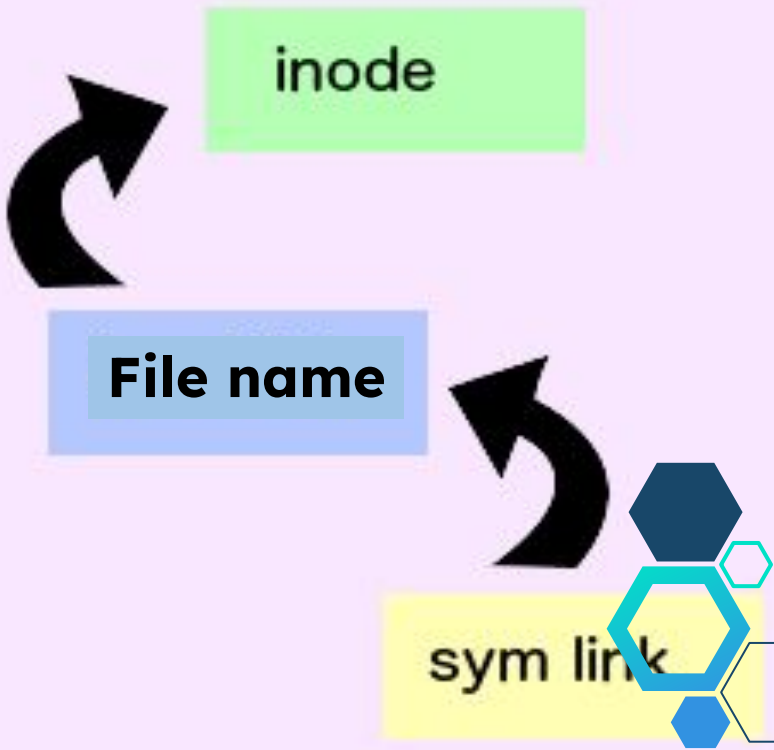
Hard Link



Symbolic Link



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Important Note!

Before starting this lesson,

- Launch your **Visual studio code**,
- Open a **terminal** or use the one that is opened
- Check the VMs on your computer
- Copy the **ID** of any server, resume or start it
- Connect remotely to your server

1 Introduction

What is a link?

Introduction

A **link** is a way in Linux used to connect files or directories

There are two types of links:

- **The Hard link**
- **The Soft or symbolic link**

Introduction

- A **symbolic or soft link** is an actual link to the original file, whereas a **hard link** is a mirror copy of the original file.
- If **you delete the original file, the soft link has no value, because it will point to a non-existent file.**
- But in the case of hard link, it is entirely opposite. Even **if you delete the original file, the hard link will still have the data of the original file.** Because hard link acts as a mirror copy of the original file.

2

The soft or symbolic link

What is a symlink?

The Soft link

The soft link is a link that:

- Can cross or span the file system,
- Allows you to create links between directories,
- Has a different **inode** number and file permissions than the original file
- Permissions will not be updated on the link if updated on the original file
- Has only the path to the original file, not its content.
- Has an arrow pointing to the original
- When the original document is deleted, the link is inactive

The Soft link creation

- To create a **Soft Link or Symbolic Link**, we use the command:
  - **# ln -s sourcefile targetfile**
- This will work for directories as well.
- **Example: # ln -s file2 file2link**

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The hard link

What is a hard link?

The Hard link

A Hard link is one that:

- Can’t cross the file system boundaries (i.e. A hard link can only work on the same filesystem)
- Can’t link directories
- Has the same **inode** number and permissions with the original file
- Permissions will be updated if we change the permissions of the source file
- To create a hard link, we use the command:

  # ln sourcefile targetfile

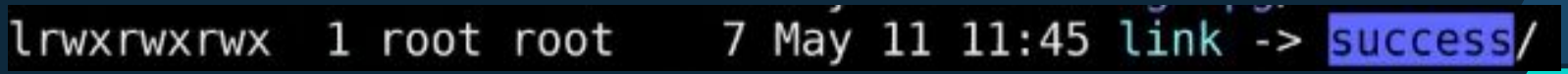
4 Practice

Let’s do some practice on hard and soft link

Practice on soft link

Practice on Soft Link

- In the root, let's create a directory called **success**. And create a soft link to that directory (the name of the soft link is **link**)
  - **# cd**
  - **# mkdir success**
  - **# ln -s success link**
  - **# ll**



Practice on Soft Link

Now, let's create a file called **file1** in the directory **link**

- **# cd link**
- **# pwd**
- **# touch file1**
- **# ls**
- **# pwd**

```
root@osboxes:~# cd link
root@osboxes:~/link# pwd
/root/link
root@osboxes:~/link# touch file1
root@osboxes:~/link# ls
file1
root@osboxes:~/link# pwd
/root/link
```

Practice on Soft Link

- Now, let's go back to the directory **success** and check if it has a content
  - **# cd ..**
  - **# pwd**
  - **# ls success**
- **Success contains the file file1**

```
root@osboxes:~/link# cd ..
root@osboxes:~# pwd
/root
root@osboxes:~# ls success
file1
```

Practice on Soft Link

- Let's us check the inodes.
- To do it, you need to add the option **i** to **ls -l**
  - **# ls -li**

```
root@osboxes:~# ls -li
total 4
8388626 lrwxrwxrwx 1 root root    7 May 11 11:45 link -> success
8388624 drwxr-xr-x 2 root root 4096 May 11 11:46 success
```

Practice on Soft Link

- So, a soft link is just **another door entry to a file or directory**
- If we remove the directory **success**, the link will become **red** to indicate that it is **no more active**
  - **# rm -rf** success then **# ll**

```
lrwxrwxrwx  1 root root    7 May 11 11:45 link -> success
```

- If we **cd** in **link**, we will get a **No such file or directory**

```
root@osboxes:~# cd link
bash: cd: link: No such file or directory
```

Practice on Soft Link

- If we re-create a directory called **success**, the **link will be restored**
- **# mkdir success** then **# ll**

```
lrwxrwxrwx  1 root root    7 May 11 11:45 link -> success/
```

- **# cd link**

```
root@osboxes:~# cd link
root@osboxes:~/link#
```

- Also, the inodes are differents (**8388626** and **8388624**) **# ls -li**

```
8388626 lrwxrwxrwx 1 root root    7 May 11 11:45 link -> success
8388624 drwxr-xr-x 2 root root 4096 May 11 11:46 success
```

What is an inode?

What is an Inode?

- An **inode** is a number attached to every file or directory on the system to identify it.
- It is like a **document metadata**
- With the **inode**, the system knows:
  - Who owns a file,
  - Who has permissions to access it and who don't,
  - The group in which the file belongs,
  - when the file was created, When it was lastly modified etc.

Practice on Hard link

Practice on Hard Link

- Let's create a new file called **hardlink** and put some content in there
  - **# cd** then **# pwd** to make sure you are back in the root directory
  - **# touch hardlink**
  - **# echo "we are learning about Soft and Hard links" >> hardlink**
- Display the content of the file with cat
  - **# cat hardlink**

Practice on Hard Link

- Now, let's create a hard link called **backup** to that file (**hardlink**)
  - **# ln hardlink backup**
  - **# ll**

```
-rw-r--r--  2 root root   41 May 11 11:51 backup
-rw-------  1 root root 2126 May 11 10:45 .bash_history
-rw-r--r--  1 root root 3106 Apr  9  2018 .bashrc
drwx------  2 root root 4096 Aug  5  2019 .cache/
drwx------  3 root root 4096 May  3 18:10 .gnupg/
-rw-r--r--  2 root root   41 May 11 11:51 hardlink
```

- You can see that the content in **backup** is the same as the one in **hardlink**.
- If you add something in **hardlink**, it will automatically be added to the file **backup**, and vice-versa.

Practice on Hard Link

- Let’s check the inodes: **# ls -li**

```
8388624 -rw-r--r-- 2 root root   41 May 11 11:51 backup
8388624 -rw-r--r-- 2 root root   41 May 11 11:51 hardlink
```

- They have the same **inode**

Practise this notions and make sure you understand.

Question: In which measure is this important according to you?

Play with the options and make more research be better understand

The idea here is to understand the concepts not to memorize them

See you guys in the next lesson!

Thanks!

Any questions?

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