

Activity on Links

Benjamin McDonnough

1. The two text files have inode numbers 540514 and 540583 respectively. It also lists the permissions for the files (read and write for owners and groups and only read for others). It then gives the name of the user that created the file, the size for the file, and the date it was created.

```
mcdonn7[@numbat:w$ln -s file1.txt my_softlink
mcdonn7[@numbat:w$ln -s s -li
total 84
527592 drwxrwxr-x 2 gfhg123 gfhg123 4096 Mar  9  2013 asciiquarium_1.1
526670 -rw-rw-r-- 1 gfhg123 gfhg123 15436 Mar  9  2013 asciiquarium.tar.gz
529094 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Desktop
529099 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Documents
529096 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Downloads
540514 -rw-rw-r-- 1 gfhg123 gfhg123    6 Sep  9 14:01 file1.txt
540583 -rw-rw-r-- 1 gfhg123 gfhg123    6 Sep  9 14:01 file2.txt
529100 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Music
527820 lrwxrwxrwx 1 gfhg123 gfhg123    9 Sep 18 12:27 my_softlink -> file1.txt
529101 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Pictures
529098 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Public
529097 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Templates
529333 drwxr-xr-x 6 gfhg123 gfhg123 4096 Aug 28 12:15 Term-Animation-2.5
526949 -rw-rw-r-- 1 gfhg123 gfhg123 19506 Mar 26  2011 Term-Animation-2.5.tar.gz
529102 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Videos
mcdonn7[@numbat:w$
```

2. The original file and the soft link have different inode numbers because the soft link only points the path of the file while still being its own object therefore getting its own inode number. The softlink does not survive if the original file is deleted because the soft link is referencing the path of that file. If the reference is deleted, the softlink becomes a dangling link.

```
gfhg123@numbat: ~  
gfhg123@numbat:~$ vim ~/.bashrc  
gfhg123@numbat:~$ source ~/.bashrc  
mcdonn7[@numbat:w$vim ~/.bashrc  
mcdonn7[@numbat:w$source ~/.bashrc  
mcdonn7[@numbat:w$vim ~/.bashrc  
mcdonn7[@numbat:w$vim file1.txt  
mcdonn7[@numbat:w$vim file2.txt  
mcdonn7[@numbat:w$ls -li  
total 84  
527592 drwxrwxr-x 2 gfhg123 gfhg123 4096 Mar 9 2013 asciiquarium_1.1  
526670 -rw-rw-r-- 1 gfhg123 gfhg123 15436 Mar 9 2013 asciiquarium.tar.gz  
529094 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Desktop  
529099 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Documents  
529096 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Downloads  
540514 -rw-rw-r-- 1 gfhg123 gfhg123 6 Sep 9 14:01 file1.txt  
540583 -rw-rw-r-- 1 gfhg123 gfhg123 6 Sep 9 14:01 file2.txt  
529100 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Music  
529101 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Pictures  
529098 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Public  
529097 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Templates  
529333 drwxr-xr-x 6 gfhg123 gfhg123 4096 Aug 28 12:15 Term-Animation-2.5  
526949 -rw-rw-r-- 1 gfhg123 gfhg123 19506 Mar 26 2011 Term-Animation-2.5.tar.gz  
529102 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Videos  
mcdonn7[@numbat:w$  
mcdonn7[@numbat:w$rm file1.txt  
mcdonn7[@numbat:w$cat my_softlink  
cat: my_softlink: No such file or directory  
mcdonn7[@numbat:w$
```

3. The inode number for the original file and the hard link are the same. This is because the hard link points to the original file and not just the path of it. The hardlink still works even if the file is deleted. This is because of the link count on the file. This count starts at one and increments when a hard link is added. If the original file is deleted, the hard link survives.

```
gfhg123@numbat: ~
mcdonn7[@numbat:w$ln file2.txt my_hardlink
mcdonn7[@numbat:w$ls -li
total 88
527592 drwxrwxr-x 2 gfhg123 gfhg123 4096 Mar  9  2013 asciiquarium_1.1
526670 -rw-rw-r-- 1 gfhg123 gfhg123 15436 Mar  9  2013 asciiquarium.tar.gz
529094 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Desktop
529099 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Documents
529096 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Downloads
540514 -rw-rw-r-- 1 gfhg123 gfhg123 6 Sep 18 12:29 file1.txt
540583 -rw-rw-r-- 2 gfhg123 gfhg123 6 Sep  9 14:01 file2.txt
529100 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Music
540583 -rw-rw-r-- 2 gfhg123 gfhg123 6 Sep  9 14:01 my_hardlink
527820 lrwxrwxrwx 1 gfhg123 gfhg123 9 Sep 18 12:27 my_softlink -> file1.txt
529101 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Pictures
529098 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Public
529097 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Templates
529333 drwxr-xr-x 6 gfhg123 gfhg123 4096 Aug 28 12:15 Term-Animation-2.5
526949 -rw-rw-r-- 1 gfhg123 gfhg123 19506 Mar 26  2011 Term-Animation-2.5.tar.gz
529102 drwxr-xr-x 2 gfhg123 gfhg123 4096 Aug 21 13:01 Videos
mcdonn7[@numbat:w$
mcdonn7[@numbat:w$rm file2.txt
mcdonn7[@numbat:w$cat my_hardlink
World
mcdonn7[@numbat:w$
```

4. Three things that hard links are useful for is:

1. Creating/maintaining backups. If the original file is deleted, the hardlink still functions making it an excellent backup tool.
2. De-duplication. This allows for the system to house one copy of the original file and have several hardlinks to it to manage storage well. This is helpful when you need the same file in multiple locations.
3. Lastly it maintains persistent access to the file. For instance, if the file is moved, or the name is changed, hardlinks help to mitigate losing the file (location or deletion).

5. Three things soft links are useful for:

1. Softlinks can link files that are in different filesystems. This is something that hard links cannot do.

2. Softlinks can be used for directories as well as files meaning that you can create shortcuts for directories.

3. Softlinks are also used for different program versions.

6. The bin and sbin are soft links because of modern linux having the usr partition that now holds most binaries that are needed, creating a simplified and unified filesystem instead of having /bin and /sbin containing critical binaries separately. Stdin, stdout, and stderr are soft links in /dev because they are pseudo-devices that are used for I/O streams and not physical devices.

Stdin points to /proc/self/fd/0

Stdout points to /proc/self/fd/1

Stderr points to /proc/self/fd/2

/dev contains device files.

/proc is a pseudo-filesystem that contains files and directories that represent a hierarchical view of current, running processes.

/proc/self is a softlink that points to the /proc directory of the process that is currently accessing it.

/proc/self/fd contains softlinks to file descriptors of the current process.

0, 1, and 2 are standard file descriptors for every process: 0 is input, 1 is output, and 2 is error

7.

The last screenshot is the command that I used to be able to call the command from any directory without using ./ . I created a soft link in the directory /usr/local/bin and that allowed me to be able to complete this.

```
gfhg123@numbat: /tmp
mcdonn7[@numbat:w$cd /tmp
mcdonn7[@numbat:w$ls
snap-private-tmp
systemd-private-6f9e953523b34f53a5407043b3cdfae1-colord.service-7mIBRM
systemd-private-6f9e953523b34f53a5407043b3cdfae1-fwupd.service-pxzX0V
systemd-private-6f9e953523b34f53a5407043b3cdfae1-ModemManager.service-8HjY5z
systemd-private-6f9e953523b34f53a5407043b3cdfae1-polkit.service-YRALuf
systemd-private-6f9e953523b34f53a5407043b3cdfae1-power-profiles-daemon.service-f
lR9ex
systemd-private-6f9e953523b34f53a5407043b3cdfae1-spice-vdagentd.service-QvzH4D
systemd-private-6f9e953523b34f53a5407043b3cdfae1-switcheroo-control.service-of71
yK
systemd-private-6f9e953523b34f53a5407043b3cdfae1-systemd-logind.service-Sso8wp
systemd-private-6f9e953523b34f53a5407043b3cdfae1-systemd-oomd.service-j1KG04
systemd-private-6f9e953523b34f53a5407043b3cdfae1-systemd-resolved.service-Tnw5oG
systemd-private-6f9e953523b34f53a5407043b3cdfae1-systemd-timesyncd.service-V9pBc
6
systemd-private-6f9e953523b34f53a5407043b3cdfae1-ubuntu-advantage-desktop-daemon
.service-koNfKr
systemd-private-6f9e953523b34f53a5407043b3cdfae1-upower.service-nTdp4w
mcdonn7[@numbat:w$my_prog
Hello World
mcdonn7[@numbat:w$

mcdonn7[@numbat:w$cd /var
mcdonn7[@numbat:w$my_prog
Hello World
mcdonn7[@numbat:w$

mcdonn7[@numbat:w$sudo sudo ln -s /home/gfhg123/my_prog /usr/local/bin/my_prog
mcdonn7[@numbat:w$
```