

Linux Luminarium

The File System
pwn.college

A deeper look at files

There are many different types of files. You can use `ls -ld /path/to/your/file` to check.

```
yans@asdf ~ $ ls -ld /home/yans/flags
ldrwxr-xr-x 2 yans users 4096 Aug 19 06:30 /home/yans/flags
yans@asdf ~ $ ls -ld /home/yans/flags/TOPSECRET
lrw-r--r-- 1 yans users 18 Aug 19 06:30 /home/yans/flags/TOPSECRET
yans@asdf ~ $
```

Types:

- is a **regular file**
- d is a **directory** (yes, directories are actually just special files!)
- l is a **symbolic link** (a file that transparently points to another file or directory)
- p is a **named pipe** (also known as a FIFO. You will get very familiar with these this module!)
- c is a **character device file** (i.e., backed by a hardware device that produces or receives data streams, such as a microphone)
- b is a **block device file** (i.e., backed by a hardware device that stores and loads blocks of data, such as a hard drive)
- s is a **unix socket** (essentially a local network connection encapsulated in a file)

Symbolic (AKA soft) links?

A symbolic/soft link is a special type of file that references another file.

They are created `ln -s` (`-s` stands for symbolic. Read the man page!).

```
yans@asdf ~ $ ln -s flags/TOPSECRET link_to_the_flag
yans@asdf ~ $ ls -l
total 24
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 Desktop
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 Documents
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 Downloads
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 Pictures
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 code
drwxr-xr-x 2 yans users 4096 Aug 19 06:30 flags
lrwxrwxrwx 1 yans users 15 Aug 19 07:29 link_to_the_flag -> flags/TOPSECRET
yans@asdf ~ $ cat ./link_to_the_flag
pwn_college{1337}
yans@asdf ~ $
```

You can also link directories:

```
yans@asdf ~ $ ln -s flags link_to_flags_dir
yans@asdf ~ $ ls -ld link_to_flags_dir
lrwxrwxrwx 1 yans users 5 Aug 19 07:32 link_to_flags_dir -> flags
yans@asdf ~ $ cat link_to_flags_dir/TOPSECRET
pwn_college{1337}
yans@asdf ~ $
```

Symbolic link gotchas

Beware: symbolic links to relative paths are relative to the directory containing the link!

```
yans@asdf ~ $ ln -s flags/TOPSECRET link_to_the_flag
yans@asdf ~ $ ls -l link_to_the_flag
lrwxrwxrwx 1 yans users 15 Aug 19 07:45 link_to_the_flag -> flags/TOPSECRET
yans@asdf ~ $ cat link_to_the_flag
pwn_college{1337}
yans@asdf ~ $ mv link_to_the_flag /tmp
yans@asdf ~ $ ls -l /tmp
total 0
lrwxrwxrwx 1 yans users 15 Aug 19 07:45 link_to_the_flag -> flags/TOPSECRET
yans@asdf ~ $ cat /tmp/link_to_the_flag
cat: /tmp/link_to_the_flag: No such file or directory
yans@asdf ~ $
```

vs absolute path:

```
yans@asdf ~ $ ln -s /home/yans/flags/TOPSECRET link_to_the_flag
yans@asdf ~ $ ls -l link_to_the_flag
lrwxrwxrwx 1 yans users 26 Aug 19 07:49 link_to_the_flag -> /home/yans/flags/TOPSECRET
yans@asdf ~ $ cat link_to_the_flag
pwn_college{1337}
yans@asdf ~ $ mv link_to_the_flag /tmp
yans@asdf ~ $ ls -l /tmp/link_to_the_flag
lrwxrwxrwx 1 yans users 26 Aug 19 07:49 /tmp/link_to_the_flag -> /home/yans/flags/TOPSECRET
yans@asdf ~ $ cat /tmp/link_to_the_flag
pwn_college{1337}
yans@asdf ~ $
```

Hard links?

The existence of soft links implies a hard link.

Hard links (created with `ln` without the `-s` argument) reference the original file directly by performing magic with scary words such as "inode".

```
yans@asdf ~ $ ln flags/TOPSECRET hard_link_to_flag
yans@asdf ~ $ ls -l
total 28
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 Desktop
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 Documents
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 Downloads
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 Pictures
drwxr-xr-x 2 yans users 4096 Aug 19 06:27 code
drwxr-xr-x 2 yans users 4096 Aug 19 07:33 flags
-rw-r--r-- 2 yans users  18 Aug 19 06:30 hard_link_to_flag
yans@asdf ~ $ cat hard_link_to_flag
pwn_college{1337}
yans@asdf ~ $
```

A hard link is an equally "valid" reference to the original file as the original file itself. It is a file that happens to be backed by the same data as the original.