Chapter 14: Filesystem Links

Introduction to links

- A link is a way to make a file's data accessible via more than one filename
- Two types of links are available:
  - Soft links
  - Hard links

Soft links

- Also called Symbolic Links
- A file type designed to point to another file
- Example: `/etc/mtab` points to `/proc/mounts`

Soft links

- The `/boot/grub/grub.conf` file is a regular file that stores text data
- When `/etc/grub.conf` is accessed, the link is followed
- Example: `more /etc/grub.conf` would really display `/boot/grub/grub.conf`

Why Soft links?

- Soft links are excellent for creating "shortcuts"
- The icons on a Windows desktop are often soft links (shortcuts)
- When a system file is moved to another location by the developers, soft links are created to make it easier for administrators and users to find the new location

Soft link details

- Soft links identified with `ls -l`

lrwxrwxrwx. 1 root root 22 Nov 6 2012 /etc/grub.conf -> ../boot/grub/grub.co

  - File type is "l"
  - Pointer shows file that link points to
  - Permissions on the soft link file are almost always rwxrwxrwx
- Permissions on the "linked to" file still apply

Soft link details

- Use `ln -s` to create a soft link:

  `ln -s original_file link_file_name`

  The link_file_name should not already exist
- Example:

$ ln -s ./file1.txt ./file2.txt
$ ls -l ./file*
-rw-rw-r-- 1 sysadmin sysadmin 0 Jul 27 04:12 ./file1.txt
lrwxrwxrwx 1 sysadmin sysadmin 11 Jul 27 04:13 ./file2.txt -> ./file1.txt

Hard links

- Hard links are two or more files that share the same inode (index node – contains file info including location on the disk) number
- Hard links are exactly identical to the original in every way except the file name
- Hard links are created using the `ln` command without using the `-s` option

Viewing Hard links

- Hard links identified with `ls -l`
- The link count (2) indicates how many hard links there are to the file
- Example:

```
$ ls -l hosts
-rw-rw-r-- 1 sysadmin sysadmin 0 Oct 17 19:59 hosts
$ ln hosts myhosts
$ ls -l hosts myhosts
-rw-rw-r-- 2 sysadmin sysadmin 0 Oct 17 19:59 hosts
-rw-rw-r-- 2 sysadmin sysadmin 0 Oct 17 19:59 myhosts
```

Shared inodes

- Hard links are sometimes difficult to find
- Since hard links share the same inode, they will have the same inode number
- This can be displayed with the `ls -li` command:

$ ls -li hosts myhosts
23338 -rw-rw-r-- 2 sysadmin sysadmin 0 Oct 17 19:59 hosts
23338 -rw-rw-r-- 2 sysadmin sysadmin 0 Oct 17 19:59 myhosts

Finding hard links

- If hard links are in different directories, they may be hard to find
- Determine the inode number and use the `find` command with –`inum` to search

```
$ ls -i hosts
23338 hosts
$ find -inum 23338
./hosts
./myhosts
```

Advantages of Hard links

- Advantages of hard links have over soft links:
  - Hard linked files are indistinguishable by programs from regular files
  - If files are hard linked then they are always contained within one filesystem
  - It is easy to find files that are hard linked
  - Removing hard links doesn't remove the actual data unless you remove all of the hard links

Advantages of Soft links

- Advantages of soft links have over hard links:
  - Soft links can be made to a directory file; hard links can not
  - Soft links can be made from a file on one filesystem to a file on another filesystem; hard links can not
  - Soft links are very visual because the output of the `ls -l` command displays which file the soft link is pointing to