LPIC-1 100-500 – Lesson 3

103.3 Perform basic file management

Introduction

- The UNIX philosophy:

  ”Everything is a file!”

- The above statement declares that all objects and structures in the UNIX world, exists in the form of files, or more correctly, file descriptors.

Copy files with `cp`

- **$ cp file1 file1.bak** # backup **file1**
- **$ cp ../file1 .** # copy **file1** from parent directory to current directory.

Options:

- **-a** # archive (preserve file attributes).
- **-f** # force overwrite destination file, if exists.
- **-r, -R** # copy recursively including sub-directories.
- **-i** # interactively confirm if you want the destination file to be overwritten.

Create directories with `mkdir`

- **`$ mkdir dir1 dir2`** `# create directories dir1 and dir2.`

Options:

- `-p # create hierarchy of directories.`
- **`-m 750`** `# create directory with permission 750 (octal).`

Move/Rename with `mv`

- **$ mv name1 name2** # rename **name1 to name2**.
- **$ mv ../name1 .** # move **name1** from the parent directory to the current.
- **$ mv /tmp/name1 ~/name2** # move **name1** to your home directory and rename to **name2**.

Options:

- **-f** # force overwrite destination file, if exists.
- **-i** # interactively confirm if you want the destination file to be overwritten.

Display files/directories with `ls`

- **$ ls** # Display files/directories in the current directory.
- **$ ls -la dir1** # detailed view of normal and hidden files and directories in the **dir1** directory.
- **$ ls -la .bashrc** # whatever starts with "." is a hidden file.

-rw------- 1 theo theo 3353 2011-04-29 13:29 .bashrc

Display files/directories with `ls`

- `$ ls -la .bashrc`
- `-rw------- 1 theo theo 3353 2011-04-29 13:29 .bashrc`

```
^          ^   ^   ^  ^           ^         ^
|          |   |   |  |           |         `filename
|          |   |   |  |           `datetime
|          |   |   |  `file size in bytes
|          |   |   `group
|          |   `owner
|          `number of hard links
`file type (d for directories) and permissions
```

Display files/directories with `ls`

- `drwxr-xr-x 144 root root 12288 2011-08-22 17:21 etc`
  `^`
  `the first character of the sequence, declares the file type`

Code	Description
-	Regular file
d	Directory
l	Symbolic Link: a file pointing to another file
p	Named pipe: used in inter process communication
s	Socket: used in network inter-communication
b	Block Device: files that represent devices where data flows in blocks larger than a byte, e.g. Hard Disks, CD-ROM, etc
c	Character Device: files that represent devices where data flows in one byte at a time, e.g. terminals, I/O ports, etc

Display files/directories with `ls`

Options:

- **-l** # display file in the long listing format.
- **-a, --all** # display hidden files as well as normal.
- **-R** # recursive listing of files/directories.
- **-h** # display size in human readable format, e.g. 3K 24M, 2.3G.
- **-d** # display information about directories instead of the content of directories.

Display files/directories with `ls`

- **-F** # display in this format: **“*/=>@|”**

```
    no symbol is for normal files
*   Executable
/   Directory
@   Symbolic Link
=   Socket
|   Pipe
```

Delete files with `rm`

- **$ rm file1 file2** # delete (definitively!) file **file1 and file2**.

Options:

- **-d** # delete directories when empty.
- **-f** # enforced, non-interactive deletion of files and directories.
- **-i** # interactively warn the user about the deleted files or directories.
- **-r,-R** # recursively delete files or directories.

WARNING! Never try this at home (or at work):

rm -rf / # deletes everything!

Delete directories with `rmdir`

- **$ rmdir dir1** # delete empty directory **dir1**.

Options:

- **-p** # delete parent and child directories,provided they are empty.

Show file status with `stat`

- **$ stat .bash_history** # shows useful information for files.

```
  File: .bash_history
  Size: 433956     Blocks: 848        IO Block: 4096   regular file
Device: fd01h/64769d  Inode: 3932171     Links: 1
Access: (0600/-rw-------)  Uid: ( 1000/theo)
Gid: ( 1000/theo)
Access: 2018-06-23 08:24:41.811736750 +0300
Modify: 2018-06-22 21:56:36.709083485 +0300
Change: 2018-06-23 08:24:41.811736750 +0300
```

Access: Last Access time.

Modify: Last modification of file content.

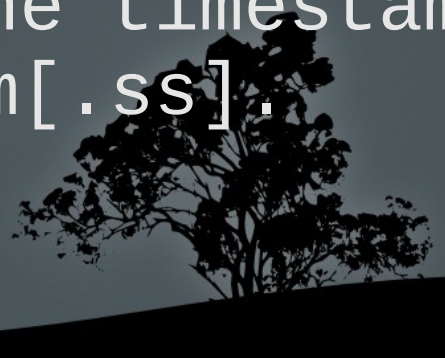
Change: Last modification of file attributes.

Change timestamps of files with `touch`

- **$ touch .bash_history** # change datetime with current. As a side-effect it creates an empty file if the filename does not exist.

Options:

- **-a** # change only the access time.
- **-m** # change only the modified time.
- **-t 200302141625** # use different timestamp than current. The timestamp format is [[CC]YY]MMDDhhmm[.ss].



Find file type with `file`

- **$ file /bin/bash** # check the type of the **bash** file.
- **$ file /etc/fstab**
- **$ file /dev/cdrom**
- **$ file /dev/sr0**

Note: *the file extensions in Linux are optional and not indicative of the actual file type. The file type is determined by analyzing the file data.*

Process raw data with `dd`

- **`$ dd if=/dev/sda of=/media/external/disk.img`** # clone the disk **`/dev/sda`** to image file **`disk.img`**.

Options:

- **`conv=lcase`** # convert to lower case.
- **`bs=1024`** # set block size to 1024 bytes.
- **`count=3000`** # set the number of blocks the process should last.

*Note: if you set the wrong outfile (**of**) you can permanently loose all data on the destination device. Use with caution!*

Find files with `find`

- **$ find /etc** # find all files under **/etc**.
- **$ find / -name fstab** # find file **fstab** under the root directory “/”.
- **$ find /etc -name "*.conf"** # find all ending in .conf under /etc.

Find files with `find`

- **$ find /etc -size +4k** # find files bigger than 4 kB.
- **$ find /usr -size -64M** # find files smaller than 64 MB .
- **$ find /tmp -size +2k -size -4k** # find files between 2kB and 4 kB.
- **$ find /usr -size 6k** # find files between 5.1 kB and 6 kB.

Find files with `find`

- **$ find /usr -type f** # find all normal files under **/usr**.

Options:

- **-type b** # find block devices
- **-type c** # find character devices
- **-type d** # find directories
- **-type p** # find named pipes
- **-type l** # find symbolic links
- **-type s** # find sockets

Find files with `find`

- **$ find ~ -atime 3** # find files accessed 3 ago.
- **$ find ~ -mtime +3** # find files modified 4 or more days ago.
- **$ find ~ -ctime -3** # find files the status of which changed 4 or more days ago.

Find files with `find`

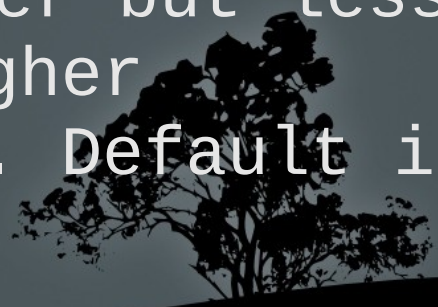
- **$ find /tmp -size -4k -ls** # execute **ls -l** on all found files.
- **$ find /usr/share -type f -exec file {} \;** # run the **file** command on all regular files.
- **$ find /tmp -ctime +15 -delete** # delete files older than 15 days.

Compress/Decompress files with `gzip` and `gunzip`

- **$ gzip movie.mpg** # create a compressed file **movie.mpg.gz**.
- **$ gunzip movie.mpg.gz** # decompress the compressed file to **movie.mpg**.

Options:

- **gzip -d** # identical **gunzip**.
- **-r** # recursive compression/ decompression when dealing with directories.
- **-1 .. -9** # **-1** compresses faster but less efficiently and **-9** has a higher compression ration but slow. Default is **-5**.



Compress/Decompress files with `bzip2` and `bunzip2`

- **bzip2** is considered a more efficient compression method than gzip.
- **`$ bzip2 movie.mpg`** `# create compressed archive` **`movie.mpg.bz2`**.
- **`$ bunzip2 movie.mpg.bz2`** `# decompress to` **`movie.mpg`**.

Options:

- **`bzip2 -d`** `# identical to` **`bunzip2`**.
- **`-1 .. -9`** `# -1 compresses faster but less efficiently and` **`-9`** `has a higher compression ration but slow. Default is` **`-5`**.

Compress/Decompress files with `xz` and `unxz`

- **xz** has an even higher compression ration than either bzip2 or gzip.
- **$ xz movie.mpg** # create compressed archive **movie.mpg.xz**.
- **$ unxz movie.mpg.xz** # decompress to **movie.mpg**.

Options:

- **xz -d** # identical to **unxz**.
- **-1 .. -9** # **-1** compresses faster but less efficiently and **-9** has a higher compression ration but slow. Default is **-5**.

Archiving with `cpio`

- **$ ls . | cpio -ov > dir1.cpio** # archive the contents of current directory to **dir1.cpio**.
- **$ find ~ -mtime +365 | cpio -o > old.cpio** # archive files older than a year.
- **$ cpio -iv < dir1.cpio** # extract data from the **dir1.cpio** to current directory.

Options:

- **-o** # create archive
- **-i** # extract from archive
- **-v** # verbose display of data

Archiving with `tar`

- **$ tar cvf /media/external/backup.tar /home/user** # archive home directory to **backup.tar**.
- **$ tar xvf archive.tar** # extract data from **archive.tar** to current directory.
- **$ tar xvf archive.tar -C dir1** # extract data from **archive.tar** to directory **dir1**.

Archiving with `tar`

- **$ tar cvzf /media/external/backup.tar.gz ~** # archive home directory and compress using **gzip** (**backup.tgz** is another alternative extension).
- **$ tar cvf /media/external/backup.tar ~ ; gzip backup.tar** # equivalent to the command above.
- **$ tar cvjf /media/external/backup.tar.bz2 ~** # archiving and compression using **bzip2** (**backup.tbz2** is an alternative extension).
- **$ tar cvJf /media/external/backup.tar.xz ~** # archiving and compression using **xz** (**backup.txz** is an alternative extension).

Archiving with `tar`

- **$ tar xvzf /media/external/backup.tar.gz** # extract and uncompress with **gzip** of **backup.tar.gz** to current directory.
- **$ gunzip /media/external/backup.tar.gz ; tar xvf backup.tar** # equivalent to above.
- **$ tar xvjf /media/external/backup.tar.bz2 -C data** # extract and uncompress with **bzip2** of **backup.tar.bz2** to the **data** directory.
- **$ tar xvJf /media/external/backup.tar.xz -C data** # extract and uncompress with **xz** of **backup.tar.xz** to the **data** directory.

Archiving with `tar`

- **$ tar tvzf backup.tar.gz** # show contents of **backup.tar.gz**.

Options (dashes are optional)

- **-c** # create archive
- **-x** # extract archive **tar**
- **-t** # display contents of archive
- **-v** # verbose output
- **-z** # use **gzip** to (de)compress
- **-j** # use **bzip2** to (de)compress
- **-J** # use **xz** to (de)compress

Backup to a tape drive with `tar`

- **`$ tar --one-file-system cf /dev/st0 /`** `# backup the root directory to the magnetic tape drive` **`/dev/st0`** `without leaving the “/” filesystem.`
- **`$ tar xf /dev/st0 -C /`** `# recover the data from the tape to the root directory.`

”Nobody cares if you can backup, only if you can restore”
~ Ancient UNIX Proverb ~

”Only wimps use tape backup: *real* men just upload their important stuff on ftp, and let the rest of the world mirror it!”
~ Linus Torvalds ~

File Globbing

- The Shell has the option of matching File Names using **wildcards**.
- If we want to use the wildcard characters literary they have to be embraced in " " or ' ' or be ‘**escaped**’ using ‘\’.
- The difference between double quotes (" ") and single quotes (' ') is that double quotes return the value of shell/environment variables while single quotes interpret those literally.

File Globbing

Wildcard	Description
*	Match 0 or more characters
?	Match exactly one character
[char]	Match exactly one character, to the characters embraced in square brackets
[!char]	Match exactly one character, to the characters NOT embraced in square brackets
[a-z]	Match exactly one character, to the characters from a to z (lower case)
[!a-z]	Match exactly one character, NOT to the characters from a to z (lower case)
{string1,string2,string3,...}	Match a string with one of the strings embraced in curly brackets

File Globbing

- **$ ls /etc/*.co*** # matches files names containing **.co**.
- **$ cp /etc/*.c? .** # copy all files which their extension start with **c** and followed by any single character e.g. **/etc/bogofilter.cf**.
- **$ ls -ld .??*** # display all hidden files with at least two characters in their name.

File Globbing

- **$ mkdir dir with space** # this will create three different directories.
- **$ rmdir dir with space** # remove three different directories.
- **$ mkdir "dir with space"** # create a directory with spaces in its name.
- **$ rmdir dir\ with\ space** # backslash “\” “escapes” and so the whole expression references the directory.
- **$ rmdir 'dir with space'** # remove a directory with spaces in its name.

File Globbing

- **$ touch semicolon\;** # create file **semicolon;** (the ‘;’is part of the name).
- **$ rm semicolon\;** # delete file **semicolon;**
- **$ touch backslash** # create file **‘backslash\’**.
- **$ rm backslash** # delete file ‘**backslash\’**
- **$ echo "my home is $HOME"** # print **my home is /home/user**.
- **$ echo 'my home is $HOME'** # print **my home is $HOME**.

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