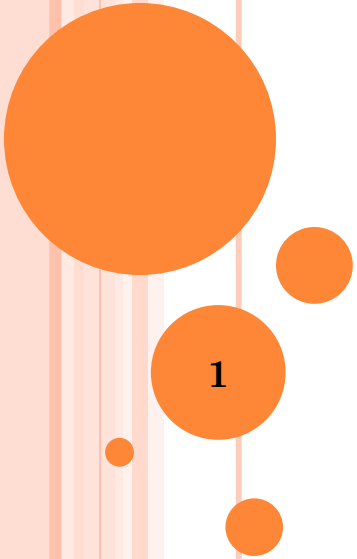
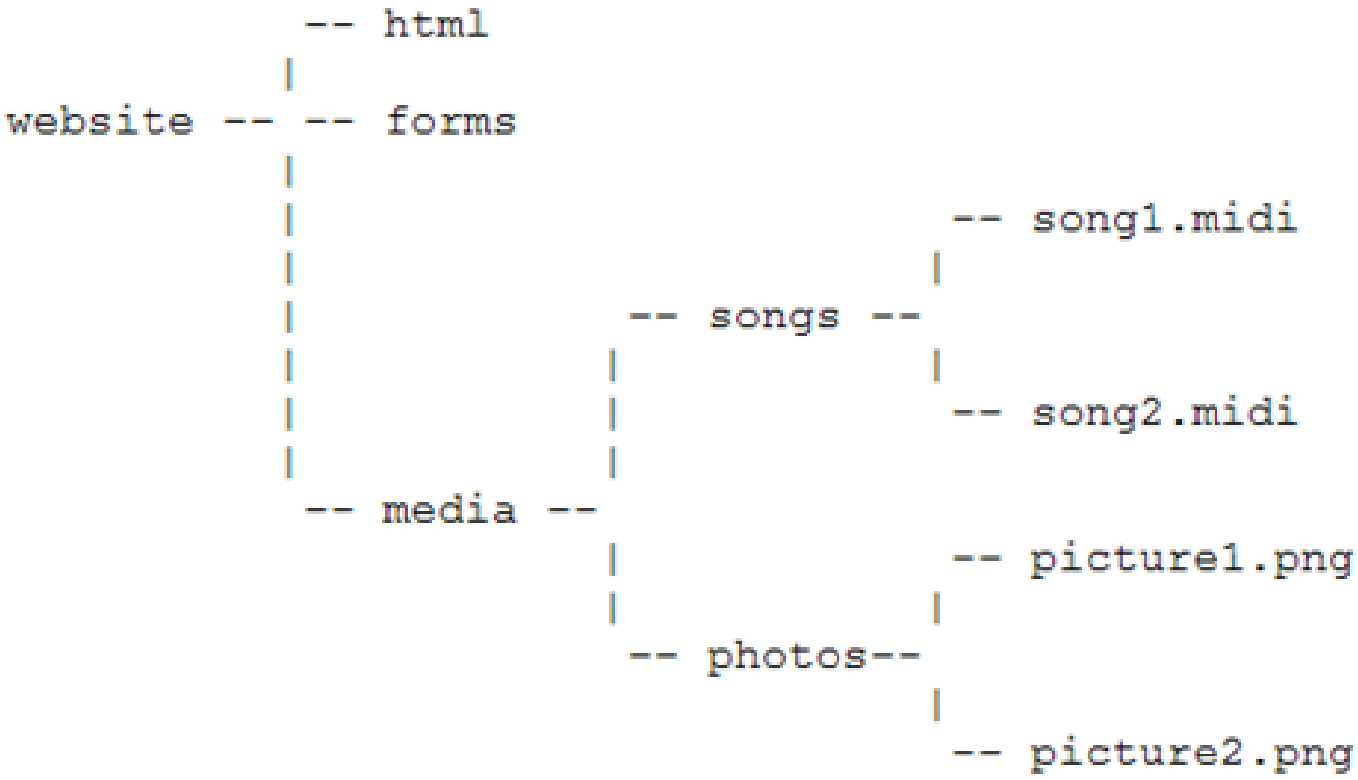


Topic 07
Filesystem Basics

Contents

- File Navigation
- Important Directories
- Managing Files & Directories commands
- File Names and File Globbing
- Examining Files
- Editing Files with vi
- Locating Files with locate and find
- Compressing Files: gzip and bzip2
- Archiving Files with tar

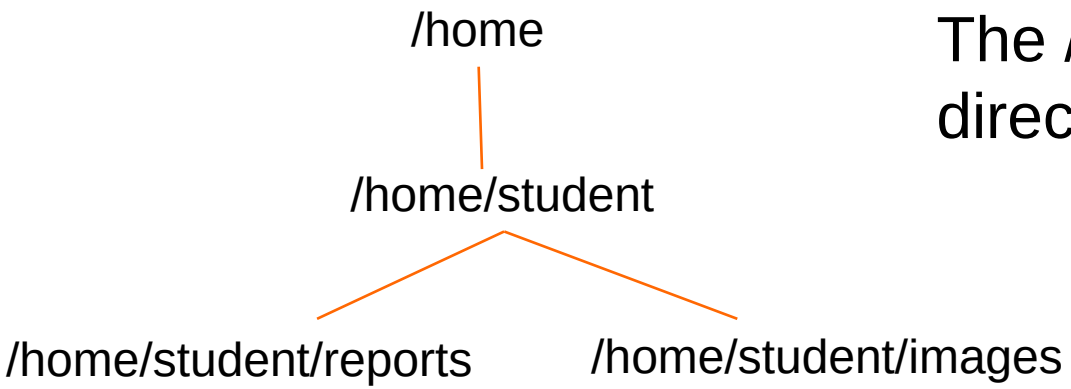
Filesystem Navigation



- Special Directory Names
  - . Current Working Directory
  - .. Parent Directory
  - ~ User's Home Directory
  - - Previous Working Directory

Directories

- The directory “.” refer to the directory itself.
- The directory “..” refer to the parent directory.
- Directories have at least a link count of 2. Once by itself, once by its parent directory, and one link for every child directory.

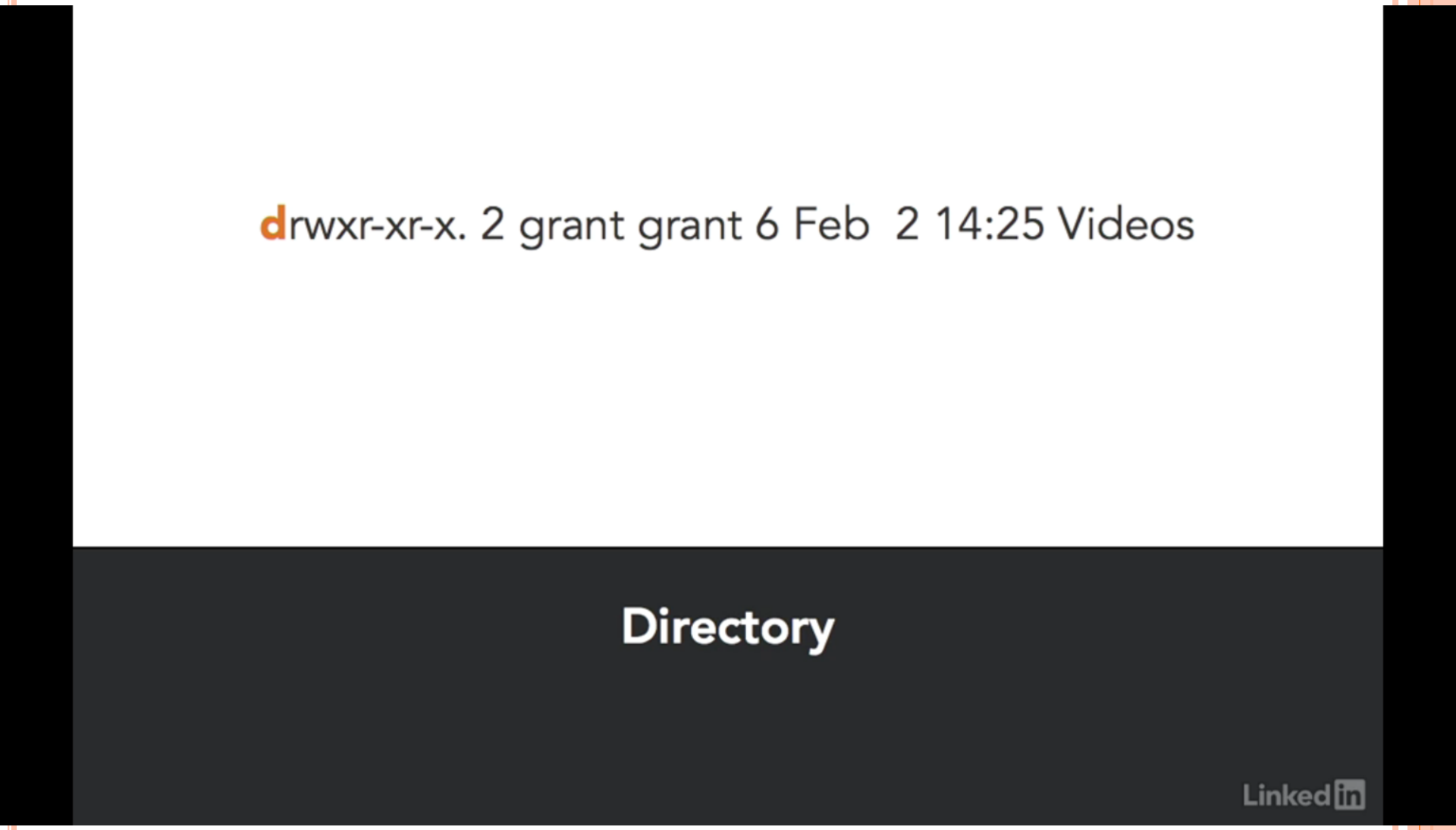


The /home/student directory has 4 links

Important Directories

/tmp	Temp files (required by X windows for non root login)
/etc	Configuration files
/bin and /usr/bin	Binary files (programs)
/sbin and /usr/sbin	Binary files for superuser root
/var	Files whose contents changes, eg log files
/boot	Holds the kernel image and boot loader files
/home	Users' home directories
/root	root's home directory
/media	removable media
/mnt	temp mount points (network / HDD)

First character



The following video tutorial shows you how to find out your dns server IP address assigned by an ISP router or dhcp server under Linux or Unix operating systems using both command line and graphical user interfaces:

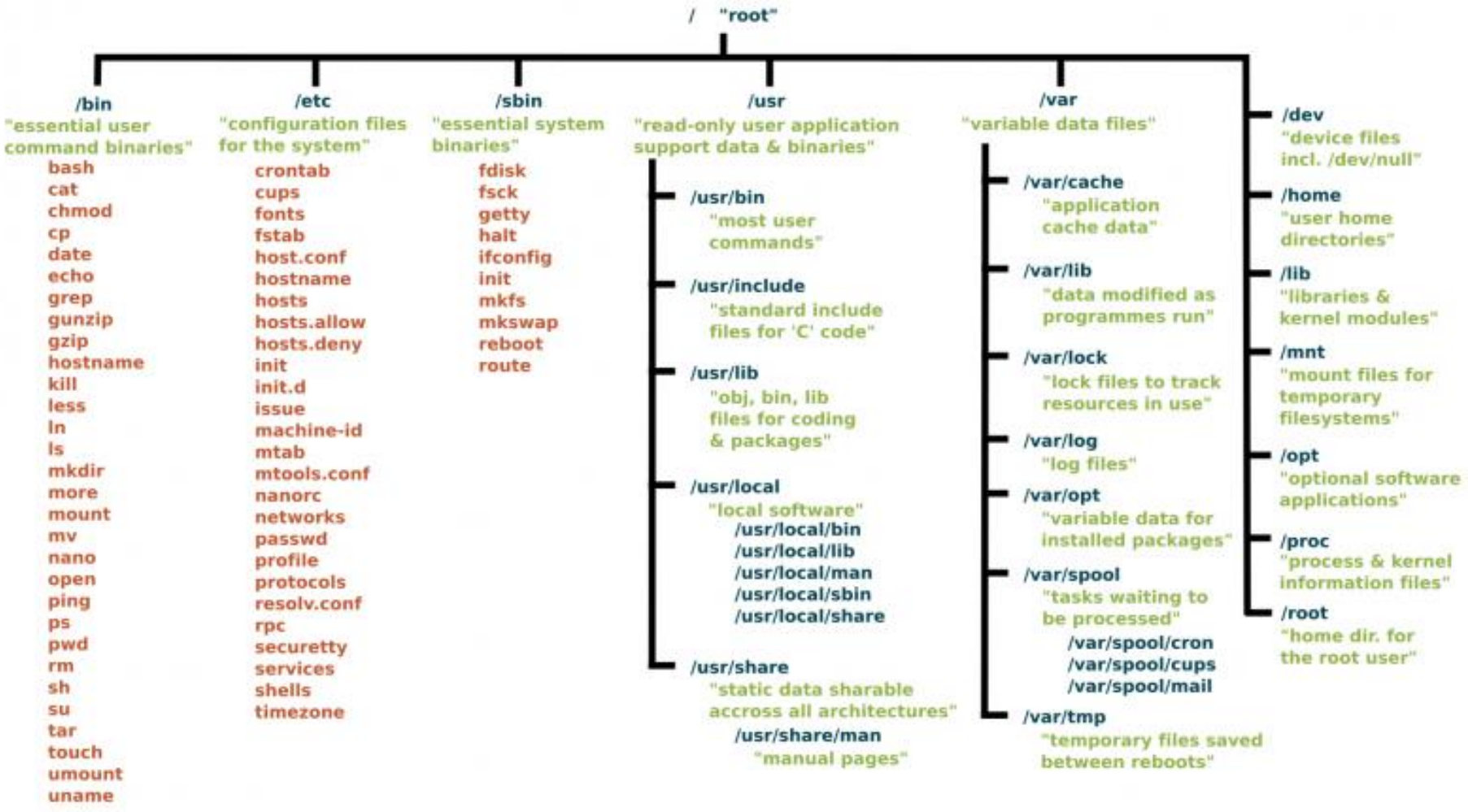
Further, you can use the dig command and host command to verify that DNS working:
$ host cyberciti.biz
$ dig nixcraft.com

$ cat /etc/resolv.conf

OR use the less command/more command shell pagers:

$ less /etc/resolv.conf

The Linux File system



https://www.linux.com/blog/learn/intro-to-linux/2018/4/linux-filesystem-explained

show me only the 1st Level of the directory tree starting at / (root)". The `-L` option tells `tree` how many levels down you want to see.

and storing temporal files. The number of entries in the file system can grow quite quickly.

Don't feel overwhelmed, though. Instead, try this:

```
tree -L 1 /
```

And you should see what is shown in Figure 1.

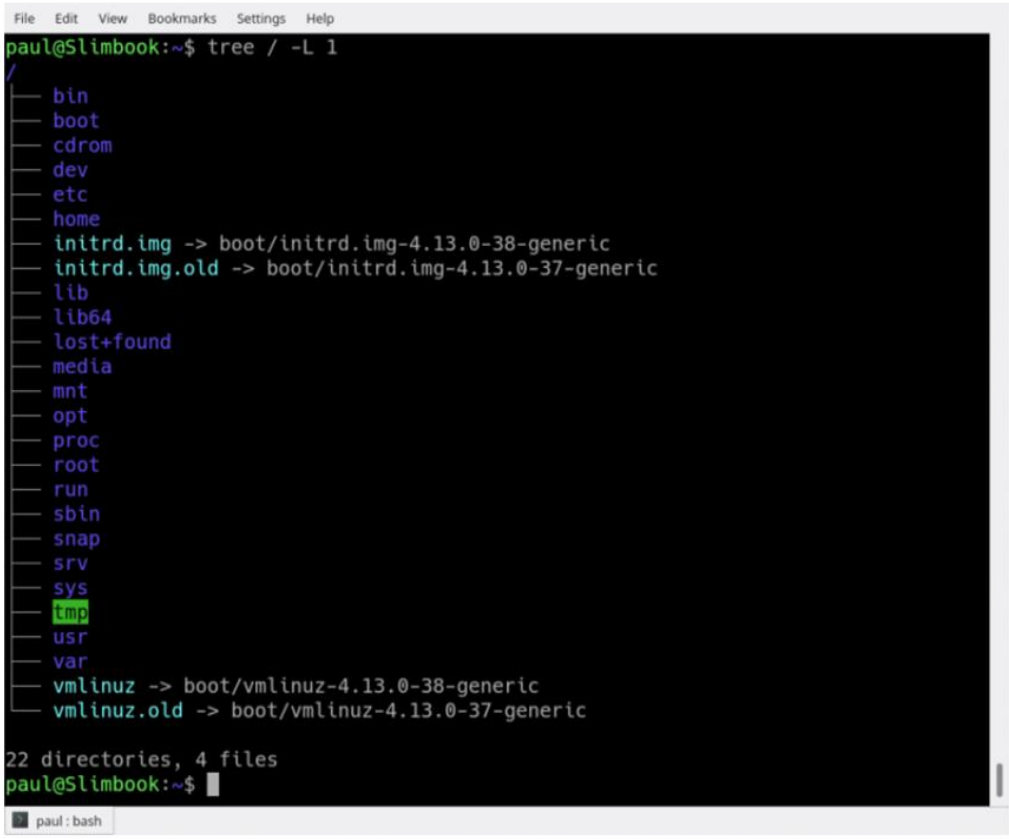


Figure 1: tree

Used with permission

The instruction above can be translated as "*show me only the 1st Level of the directory tree starting at / (root)*". The `-L` option tells `tree` how many levels down you want to see.

Most Linux distributions will show you the same or a very similar layout to what you can see in the image above. This means that even if you feel confused now, master this, and you will have a

Managing Files Commands

- The **>>** and > can be used to redirect output to a file (appending / overwriting it).
- The **cp** command copies files. (**-r** command recursively copies)
- The **mv** command moves or renames files.
- The **rm** command removes files. (**–r** command recursively removes)
- The **mkdir** command creates directories.
- The **rmdir** command removes empty directories.
- The **ls -R** displays entire directory trees.

Filenames and File Globbing

- File names can contain any character except "/".
- Files that start with a "." are hidden files.
- Wildcards can be used to match file names (file globbing).

Character	Effect
*	matches zero or more characters (except leading dot)
?	matches exactly one character (except leading dot)
[...]	matches exactly one character from the list or range
[^...]	matches exactly one character **not** from the list or range

Question

What is the command to list the files that start with system-config in /usr/share/doc?

Answer :

```
ls /usr/share/doc/system-config*
```

What is the command to list the files that start with the letter a, e, i, o or u in /usr/share/doc?

Answer :

```
ls /usr/share/doc/[aeiou]*
```

Sample usage [edit]

The following example demonstrates the output of the `ls` command given two different arguments (`pwd` is a command that shows the present working directory, or in other words, the folder you are currently in):

```
$ pwd
/home/fred
$ ls -l
drwxr--r--   1 fred  editors   4096  drafts
-rw-r--r--   1 fred  editors  30405  edition-32
-r-xr-xr-x   1 fred  fred      8460  edit
$ ls -F
drafts/
edition-32
edit*
```

In this example, the user `fred` has a directory named `drafts`, a regular file called `edition-32`, and an executable named `edit` in his home directory. `ls` uses Unix file permission notation to indicate which users or groups are allowed to access each file or directory.

```
drwxr--r--   1 fred  editors   4096  Mar 1  2007 drafts
```

In this example, `drafts` is a directory (denoted by the file descriptor `d`), and the characters after this indicate the permissions:

- `rwx`: the owner (`fred`) has the right to read (`r`), write (`w`) and execute (`x`)
- `r--`: group members (users part of the `editors` group) have read-only permissions; write and execute are not permitted, as denoted by the hyphen characters (`-`)
- `r--`: others (users aside from the owner or members of `editors`) have read-only permissions; write and execute are not permitted

See also [edit]

- chown

Examining Files

- The **file** command displays a file's type.

Regular File	-	Storing data
Directory	`d`	Organising files
Symbolic Link	`l`	Shortcut to other files
Character Device Node	`c`	Accessing data
Block Device Node	`b`	Accessing data
Named Pipe	`p`	Interprocess communication
Socket	`s`	Interprocess communication

Examining Files (Device Nodes)

- Device nodes exist in /dev, and act as a conduit (to read/write data) to/from a device driver.
- Block devices read and write information in blocks at a time. Examples are hard drives and CD drives.
- Character devices read and write information as a stream of bytes. Examples are keyboards and printers.
- Terminals have device nodes, example, /dev/tty1 to /dev/tty6 for the 6 virtual consoles

Examining Files

- The **ldd** command shown any linked dynamic library required by the program.
- The **less** command is used to display the contents of a file, one page at a time.
- The **head** and **tail** commands display the first or last few lines of a file.

Editing Files with vi

- The **vi** editor is the most popular text Linux editor.
- There are 3 commonly used modes in vi :
  - **Command / normal** mode : When vi starts, it is automatically in this mode. Keying "i“, “I”, “a”, “A”, “o” or “O” will put it in to Text Input mode.
  - **Insert (Text Input)** mode : In this mode, you can key in text. The word "INSERT" appears at the bottom of the screen. Pressing "Esc" will return to Command mode.
  - **Command-line** mode : From command mode use colon followed by a command. For example keying “:wq” to write and quit vi.

Editing Files with vi

Some useful commands in Command mode

i	insert text before the cursor
I	insert text at beginning of current line
a	insert text after the cursor
A	insert text at end of current line
o	open a blank above current line to insert text
O	open a blank line below current line to insert text
x	delete the current character
dd	delete the current line and put into buffer
D	delete the rest of the line from the cursor
yy	copy the current line to the buffer
p	paste contents of buffer after cursor position
P	paste contents of buffer before cursor position
u	undo last operation

Editing Files with vi

Some useful commands in Command-line mode

:q quit vi

:q! quit vi without saving changes

:w save file and remain in vi

:wq save file and quit vi

:w *file* save file under new name *file* and remain in vi.

- You will try vi in your practical session

Record and replay commands in vi

- Sometimes you may need to repeat some commands in the vi editor
- Can use the recording and replay function in the normal / command mode.
  - Start recording (in command mode)
    - q *letter* ← Any letter to identify the register where the recorded actions will be stored
  - Stop recording (in command mode)
    - q
  - Replay
    - @ *letter*

letter -- User defined register key i.e. “a” or “z”

Locate

- An indexed search from the database **/var/lib/mlocate/mlocate.db**
- Database created / updated when **updatedb** command is executed.
- Return results fast.

The find command syntax

Search for files on demand (no indexing needed)

Common options

-size *n*c File with size *n* bytes.

Eg. `find /etc/sysconfig -type f -size 65c`

-size +*n*c File with at least size *n* bytes.

Eg. `find /etc/sysconfig -type f -size +5000c`

-size +*n*k File with at least size *n* kilobytes.

Eg. `find /etc/sysconfig -type f -size +10k`

Actions for the find command

-exec *command* ;	Execute *command* on matching files. Use {} to indicate where filename should be substituted
-ok *command* ;	Like -exec, but prompt for each file
-ls	List file in ls -dils format

Compressing Files: gzip and bzip2

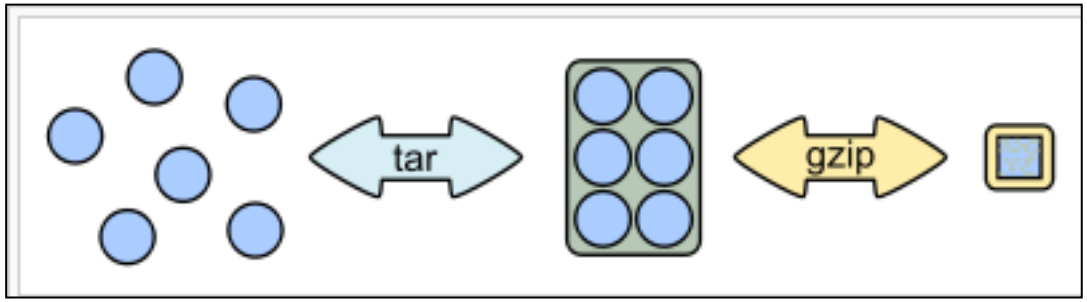
- The **gzip** command is the most commonly used compression utility.
  - gzip files are uncompressed with the commands **gunzip** or **gzip -d**
  - gzip -r (recursive) will traverse the directory structure and compress all files.
- The **bzip2** command produces more compact compressed files but is more CPU intensive.
  - bzip2 files are uncompressed with the commands **bunzip2** or **bzip2 -d**

Archiving Files with tar

- The **tar** command can archive an entire directory structure into a single file. (called **tarball**)
- Archive files usually have file extension of .tar (so that you know what to do)
- Example
  - ./music.tar

Archiving Files with tar

- tar function can be summarized as:



Source : http://en.wikipedia.org/wiki/Tar_%28file_format%29

- Note : When extracting a compressed archive file, it is not necessary to have the -z or -j switch, as the tar command will recognise that the archive file is compressed, and decompress it accordingly.

Archiving Files with tar

Common tar switches:

-c create a new archive file

-t list the contents of an archive file

-x extract files from an archive file

-f *archive_file* specify the archive filename

-v verbose mode

-z compress the archive file using gzip (resulting file usually have file extension of .tar.gz or .tgz.

-j compress the archive file using bzip (resulting file usually have file extension of tar.bz2 or .tb2 or .tbz2 or .tbz2

Demo

Downloading Wordpress

Before downloading the Wordpress archive, first create a directory which will hold our WordPress files:

```
sudo mkdir -p /var/www/example.com
```

The next step is to download the latest version of WordPress from the WordPress download page using the following wget command:

```
cd /tmp
wget https://wordpress.org/latest.tar.gz
```

Once the download is complete, extract the archive and move the extracted files into the domain's document root directory:

```
tar xf latest.tar.gz
sudo mv /tmp/wordpress/* /var/www/example.com/
```


Note: you will try this in your assignment

tar

Summary

- File Navigation
- Important Directories
- Managing Files and Directories
- File Names and File Globbing
- Examining Files
- Editing Files
- Locating Files with locate and find
- Compressing Files: gzip and bzip2
- Archiving Files with tar