Lecture 2

Working with Files and Directories

COP 3344 Introduction to UNIX

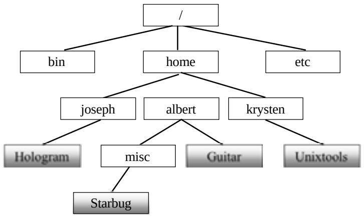
Fall 2007

Acknowledgment: These slides are modified versions of Prof. Sudhir Aggarwal's slides

Files

- Files
  - A well defined repository of information
    - Program or component of a program
    - Arbitrary text
    - An executable (binary text)
  - Special files called directories contain or point to other files
- Structure of Directories
  - Hierarchically structured like an inverted tree
  - `/` is the starting directory or “root”
- Pathnames
  - Locating a file by following a sequence of directories until you reach the file
  - `/` is also the separator between the directories and final file

File and directory examples



- Absolute pathnames start at root (`/`)
  - `/home/albert/misc/Starbug`
- Relative pathnames start at current directory
  - If current directory is home, then `joseph/Hologram` refers to `/home/joseph/Hologram`
- Use `mkdir` to make directories
  - Use `cd` to change directory

Pathnames

- Special symbols for current directory and parent
  - `..` is parent directory
  - `.` is current directory
- Referencing user directories
  - `~albert` is the absolute pathname to the user directory “albert”
  - `~` is shorthand for the absolute path to your own directory

Commands

- Commands typically refer to a Unix program located, for example, in `/usr/bin`
  - Structure of a command is typically:
    `commandname [flags] [parameters]`
- Flags
  - Commands may accept one or more flags
  - Flags start with “-” and separated from other flags and parameters by one or more spaces
  - Individual flags may be combined
- Parameters
  - Parameters are often filenames

Examples

- `ls –a –l`
- `ls –al`
- `cp /home/albert/cprogram sources`
- `cp ../testfiles/part1 .`

Some file commands

`ls`	list files
`cat`	view file contents
`more`	view file contents (pause each screen)
`touch`	creates file / updates time stamp
`cp`	copy file to a new file
`mv`	move file to a new directory, rename file
`rm`	delete file

Some directory commands

`pwd`	display absolute pathname to current directory
`mkdir`	create directory
`rmdir`	remove directory
`cd`	navigate directories

Characters in filenames

- File names can contain any characters except "`/`", but it is recommended that you use upper or lower case letters, numbers, and the characters "`-`" or "`.`"
- For example although a file name could contain a space or spaces:

  `confusing name`

  commands using this would not work correctly unless you tell the shell to not break an argument at the spaces by quoting the filename.

  `rm "confusing name"`

Wildcards

- An asterisk "`*`" matches any number of characters in a filename
  - `con*` will match `con,condor,constant.exe`
  - `*.c` will match all files that end in `.c`
  - `rm *` will remove all the files in a directory
- A "?" matches any single character in a filename
  - `b?t` will match `bit,bot,bat`
    - It will not match `bt` or `boot`
- Square brackets "`[]`" will match any one of the characters in the brackets
  - `[bhr]at` will match `bat,hat,rat`
- A hyphen "`-`" can be used to match any of a range of consecutive characters.
  - `chap[5-8].c` will match `chap5.c, chap6.c, chap7.c, chap8.c`

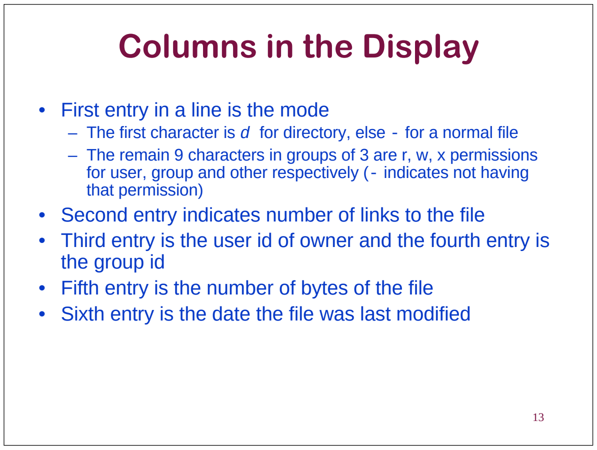
File Permissions

- Three types of processes can access a file
  - *u*ser or owner: process spawned by user who created the file
  - *g*roup: process spawned by members of the same group
  - *o*ther: process spawned by anyone else
- Permission types
  - *r*ead: access file or list directory
  - *w*rite: write to / remove file (directory)
  - e*x*ecute: run file as a program or enter directory

Example Output

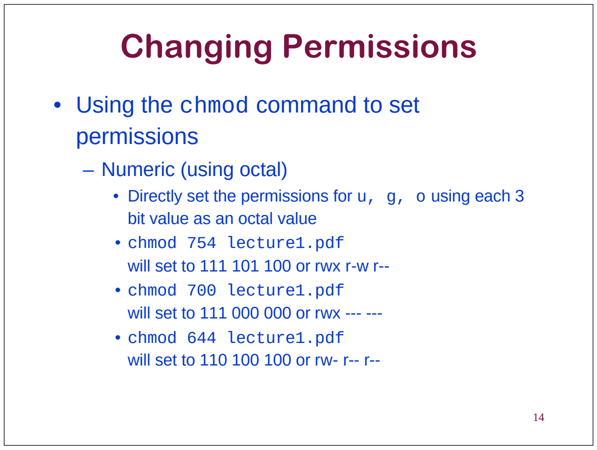
- Current permissions can be viewed using `ls -l`
  - First line is the number of disk blocks taken up by all the files

```
[sudhir@www 2007scop3344]$ ls -al
total 596
drwxr-xr-x   3 sudhir fac   4096 Jan 22 17:38 .
drwxr-xr-x  11 sudhir fac   4096 Jan  3 18:30 ..
-rw-r--r--   1 sudhir fac   4631 Jan 18 16:10 Assignment1.txt
drwxr-xr-x   3 sudhir fac   4096 Jan  9 17:07 index_files
-rw-r--r--   1 sudhir fac  51693 Jan 22 17:35 index.html
-rw-r--r--   1 sudhir fac 247017 Jan 18 10:51 Lecture1.pdf
-rw-r--r--   1 sudhir fac  92123 Jan 16 09:05 Lecture2.pdf
-rw-r--r--   1 sudhir fac 175410 Jan 22 17:24 Lecture3.pdf
[sudhir@www 2007scop3344]$
```



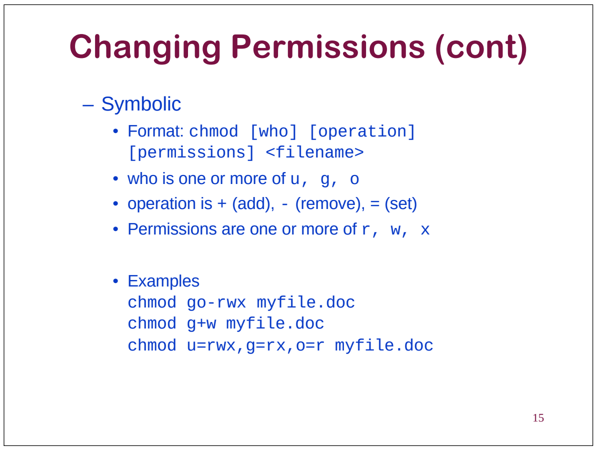
Columns in the Display

- First entry in a line is the mode
  - The first character is *d* for directory, else `-` for a normal file
  - The remain 9 characters in groups of 3 are r, w, x permissions for user, group and other respectively (`-` indicates not having that permission)
- Second entry indicates number of links to the file
- Third entry is the user id of owner and the fourth entry is the group id
- Fifth entry is the number of bytes of the file
- Sixth entry is the date the file was last modified



Changing Permissions

- Using the `chmod` command to set permissions
  - Numeric (using octal)
    - Directly set the permissions for `u, g, o` using each 3 bit value as an octal value
    - `chmod 754 lecture1.pdf`
      will set to 111 101 100 or rwx r-w r--
    - `chmod 700 lecture1.pdf`
      will set to 111 000 000 or rwx --- ---
    - `chmod 644 lecture1.pdf`
      will set to 110 100 100 or rw- r-- r--



Changing Permissions (cont)

- Symbolic
  - Format: `chmod [who] [operation] [permissions] <filename>`
  - who is one or more of `u, g, o`
  - operation is + (add), `-` (remove), = (set)
  - Permissions are one or more of `r, w, x`
  - Examples

```
chmod go-rwx myfile.doc
chmod g+w myfile.doc
chmod u=rwx,g=rx,o=r myfile.doc
```