Lecture 2

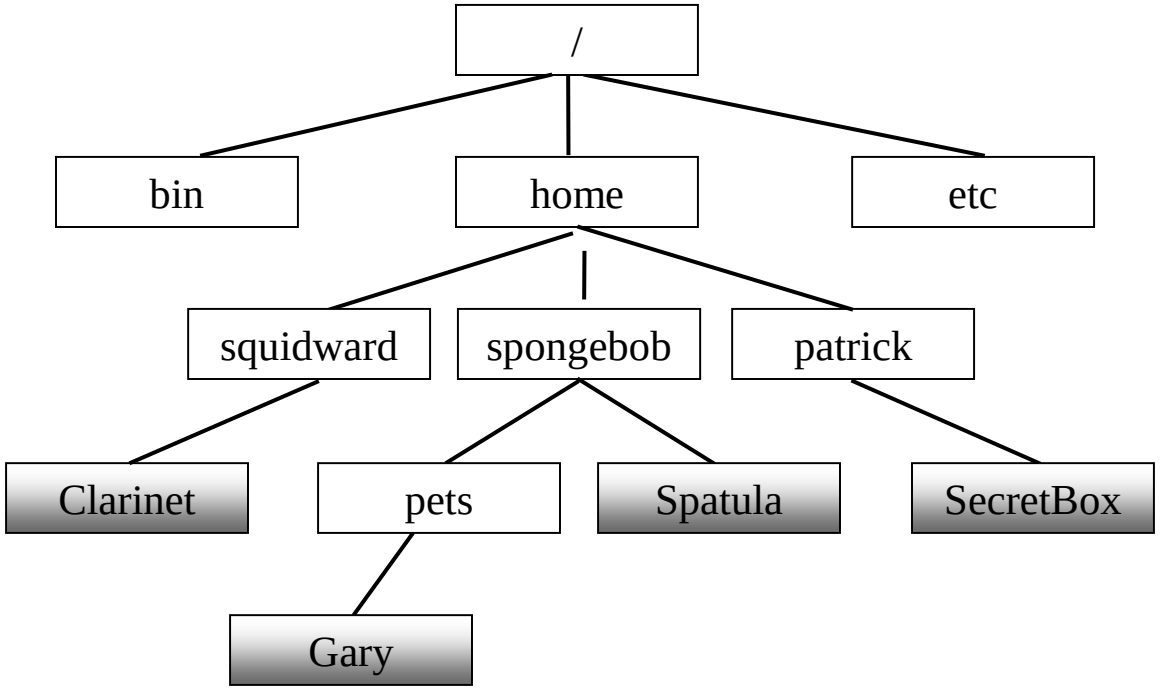
Working with Files and Directories

COP 3353 Introduction to UNIX

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

Example set of directories and files



More on pathnames

- Absolute pathnames start at root
  - /home/spongebob/pets/Gary
  - /bin
- Relative pathnames start at current directory
  - Suppose current directory is “home”, then:
  - squidward/Clarinet would refer to the same file as:
  - /home/squidward/Clarinet
- Special symbols for current directory and parent
  - “..” refers to parent directory (the directory “above”)
  - “.” is current directory
- Referencing user directories
  - `~squidward` is the absolute pathname to the user directory “squidward” (in the directory “home” in this example)
  - `~/` is shorthand for the absolute path to your own user directory

Try these examples:

- Suppose:
  - your username is “spongebob”
  - your current directory is “pets”
- Write the absolute pathnames for:
  - bin
  - Spatula
- Write the relative pathnames for:
  - Gary
  - home
  - Spatula
  - squidward
- Where could you use directory references? (~)

UNIX 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 are separated from other flags and parameters by one or more spaces
  - Individual flags may be combined under a single '–'
- Parameters
  - Parameters are often filenames and/or pathnames
  - Commands accept one or more parameters, separated by spaces

Examples

```
ls -a -l
ls -al
cp /home/albert/cprogram sources
cp ../testfiles/part1 .
wc -c -l thatfile
```

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

Some useful commands

- pwd
  - Prints the absolute pathname of the current directory
- ls –al
  - The ls command lists the files in a directory. The *a* flag displays all the files. The *l* flag gives detailed information.
- touch
  - The touch commands creates an empty file or updates the timestamp of an existing file
- cp
  - The copy command copies the contents of a file or directory to another file or directory (two parameters). The *i* flag asks before it replaces an existing file; the *r* flag recursively copies all subdirectories also.

Useful commands continued

- mv
  - The move command renames a file (it takes two arguments)
  - mv oldfilename newfilename
  - If the second argument is a directory it moves it to that directory
- wc
  - Counts the characters, lines, or words in a file
  - wc –w essay
- cd
  - Changes the current directory to another one
  - cd assignment1
  - cd ..
  - cd ../assignment1
- passwd
  - Run this to change your password

Useful commands continued

- man
  - Man pages, short for manual pages.
  - All UNIX and unix-like OS have this documentation application.
  - Similar to help, is self contained for each command.
- Command --help
  - All command have a help menu that can be accessed.
  - Simple to complex explanation flags and parameters

- more
  - Simple text viewer. Page through with space bar

- less
  - Better text viewer. Move with up/down arrows.
  - Can exit with “Shift-Z-Z”

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 “-” “.”
- 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. A hyphen “-” can be used to match any of a range of consecutive characters.
  - [bhr]at will match bat, hat and rat
  - chap[5-8].c will match chap5.c, chap6.c, chap7.c and chap8.c

File Permissions

- 3 types of processes can access a file
  - *u*ser or owner: process spawned by user who created 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 (1 block is 512 bytes) taken up by all the files

```
[sudhir@www scop3344]$ 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 scop3344]$
```

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 (usually 1)
- 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-x 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
```