Introduction to UNIX

Credit Where Credit is Due

- These slides for CSC209H have been developed by Sean Culhane, a previous instructor: I have modified them for this presentation of the course, but must acknowledge their origins!

Logging in (1.1)

- Login name, password
- System password file: usually "**`/etc/passwd`**"
- **`/etc/passwd`** has 7 colon-separated fields:

```
maclean:x:132:114:James MacLean:
^^^1^^^ 2 ^3^ ^4^ ^^^^^^5^^^^^^^
        /u/maclean:/var/shell/tcsh
        ^^^^^6^^^^ ^^^^^^^^7^^^^^^^^
```

1: user name
2: password (hidden)
3: uid
4: gid
5: "in real life"
6: $HOME
7: shell

Shells (1.2)

- Bourne shell, C shell, Korn shell, tcsh
  - command line interpreter that reads user input and executes commands

```
> ls -l /var/shell
  total 6
  lrwxrwxrwx 1 root 12 May 15 1996 csh -> /usr/bin/csh
  lrwxrwxrwx 1 root 12 May 15 1996 ksh -> /usr/bin/ksh
  lrwxrwxrwx 1 root 17 May 15 1996 newsh -> /local/sbin/newsh
  lrwxrwxrwx 1 root 11 May 15 1996 sh -> /usr/bin/sh
  lrwxrwxrwx 1 root 15 May 15 1996 tcsh -> /local/bin/tcsh
```

newsh “man page”

```
newsh
   newsh - shell for new users
SYNOPSIS
   newsh
DESCRIPTION
   newsh shows the CDF rules, runs passwd to force the user  to
   change  his  or  her  password,  and runs chsh to change the
   user's shell to the default system shell (/local/bin/tcsh).
FILES
   /etc/passwd
SEE ALSO
   passwd(1), chsh(1)
HISTORY
   Written by John DiMarco at the University of Toronto, CDF
```

Files and Directories (1.5)

- UNIX filesystem is a hierarchical arrangement of directories & files
- Everything starts in a directory called <u>root</u> whose name is the single character `/`
- <u>Directory</u>: file that contains directory entries
- File name and file attributes
  - type
  - size
  - owner
  - permissions
  - time of last modification

Files: an example

```
> stat /u/maclean
```

```
  File: "/u/maclean" -> "/homes/u1/maclean"
  Size: 17   Allocated Blocks: 0            Filetype: Symbolic Link
  Mode: (0777/lrwxrwxrwx)   Uid: (    0/    root)  Gid: ( 1/ other)
Device: 0/1  Inode: 221       Links: 1         Device type: 0/0
Access: Sun Sep 13 18:32:37 1998
Modify: Fri Aug 28 15:42:09 1998
Change: Fri Aug 28 15:42:09 1998
```

Directories and Pathnames

- Command to create a directory: **`mkdir`**
- Two file names automatically created:
  - current directory (“`.`”)
  - parent directory (“`..`”)

- A pathname is a sequence of 0 or more file names, separated by **`/`**, optionally starting with a **`/`**
  - *absolute* pathnames: begins with a **`/`**
  - *relative* pathnames: otherwise

Working directory

- Current working directory (cwd)
  - directory from which all relative pathnames are interpreted
- Change working directory with the command: **`cd`** or **`chdir`**
- Print the current directory with the command: **`pwd`**
- Home directory: working directory when we log in
  - obtained from field 6 in **`/etc/passwd`**
- Can refer to home directory as **`~maclean`** or **`$HOME`**

Permissions (1.6)

- When a file is created, the UID and GID of the creator are remembered
- Every named file has associated with it a set of permissions in the form of a string of bits:

rwxs	rwxs	rwx
owner	group	others

mode	regular	directory
r	read	list contents
w	write	create and remove
x	execute	search
s	setuid/gid	n/a

- setuid/gid executes program with user/group ID of file's owner
- Use **`chmod`** to change permissions

Input and Output (1.7)

- File descriptor
  - a small non-negative integer used by kernel to identify a file

- A shell opens 3 descriptors whenever a new program is run:
  - *standard input* (normally connected to terminal)
  - *standard output*
  - *standard error*

- Re-direction:

```
ls >file.list
```

Basic UNIX Tools

```
man  ("man -k", "man man") (1.13)
ls -la ("hidden files")
cd
pwd
du, df
chmod
cp, mv, rm  (in cshrc: "alias rm rm -i" ... )
mkdir, rmdir (rm -rf)
diff
grep
sort
```

More Basic UNIX Tools

```
more, less, cat
head, tail, wc
compress, uncompress,
gzip, gunzip, zcat
lpr, lpq, lprm
quota –v a209xxxx
pquota –v a209xxxx
logout, exit
mail, mh, rn, trn, nn
who, finger
date, password
```

C Shell Commands

`which`

`echo`

`bg, fg, jobs, kill, nice`

`alias, unalias`

`dirs, popd, pushd`

`exit`

`source`

`rehash`

`set/unset`

Additional Commands

arch

cal

ps

hostname

clear

tar

uptime

xdvi

gs, ghostview

setenv, printenv