

# **Unix Shell (cont.)**

Comp-206 : Introduction to Software Systems  
Lecture 4

Alexandre Denault  
Computer Science  
McGill University  
Fall 2006

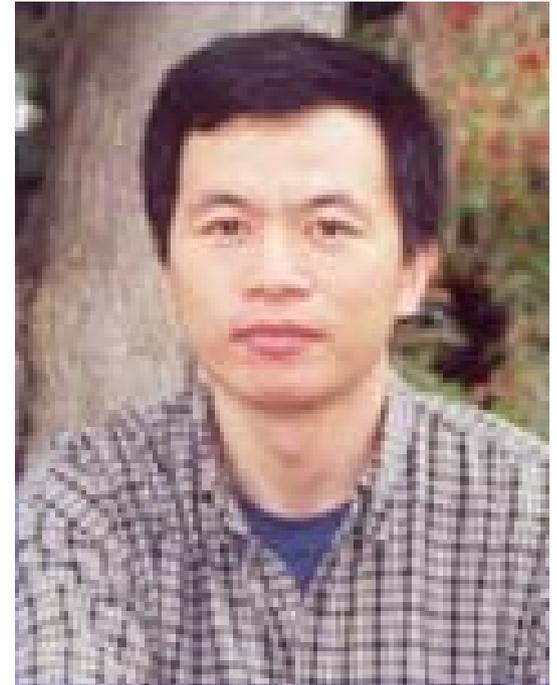
# Teacher's Assistants



Michael Hawker  
Monday, 14h30 to 16h30  
McConnell, Room 322



Robert Kaplow  
Wednesday, 9:30 to 11:30  
T.A. room, Trottier, 3<sup>rd</sup> floor



Jun Wang  
Friday, 14h00 to 16h00  
T.A. room, Trottier, 3<sup>rd</sup> floor

# The Plan

- Today : Finishing up the Unix Shell
- Week of Sept 18:  
    Python course by Professor Vangheluwe
- Week of Sept 25:  
    I'm back in town  
    Finishing up Shell Script and Python  
    Assignment 1

# The Quiz

- Give me the sequence of command needed to make file.txt writable only to me and readable to me and my group.
- Are the following path absolute or relative?
  - ♦ /usr/local/bin/bash
  - ♦ home/file.txt
  - ♦ ../usr/local/bin/bash
- What symbol is used to denote the home directory?
- What is the difference between redirection using the “>” sign and the “>>” sign?
- What is the name of the help system in Unix?
- Name two applications which are commonly used in redirection (at the end of a pipe).

# After login in . . .

- After login in, you will be presented with a command prompt.
- The `who am i` command displays the current user logged into the shell.
- You can type in commands. Once you press enter, the command is sent to the OS.
- You can type in multiple commands on one line by separating them with a semi-colon “;” .

```
cp app.log /var/backup;rm app.log
```

# Environment

- When a process is started, the OS sets up an environment for that process.
- This environment can be described by a collection of variables (environment variables).
  - ◆ These variables are accessible to any application launched from that environment
- The `env` command is used to display the current environment variables.
- The `setenv` command allows you to change an environment variable.
- The `echo` command can be used to print out individual environment variables.

```
echo $OS
```

# Environment Example

LOGNAME=adenau

HOME=/home/user/adenau

PATH=/bin:/usr/bin:/usr/local/bin

MAIL=/var/mail/adenau

SHELL=tcsh

SSH\_CONNECTION=132.206.51.226 2444 132.206.3.142 22

SSH\_TTY=/dev/pts/6

TERM=xterm

HOSTTYPE=i386-linux

VENDOR=intel

OSTYPE=linux

MACHTYPE=i386

SHLVL=1

PWD=/home/user/adenau

GROUP=unknown

# File Descriptors

- A file descriptor is created by the OS when a file is opened. The descriptor is the reference to that file.
- Unix has three special file descriptors which are always opened: STDIN, STDOUT and STDERR.
  - ♦ STDIN 0 (Standard In) : this is the channel where keys typed by the user are gathered.
  - ♦ STDOUT 1 (Standard Out) : this is the channel where normal application output is sent.
  - ♦ STDERR 2 (Standard Error) : this is the channel where error output is sent.
- Normal output and error output is separated on two different channels since they are often monitored in different ways.

# Directory Manipulation

- `cd [directory]`
  - ◆ change directory
- `ls [options] [directory or file] list`
  - ◆ directory contents or file permissions
- `mkdir [options] directory`
  - ◆ make a directory
- `pwd`
  - ◆ print working (current) directory
- `rmdir [options] directory`
  - ◆ remove a directory

# File Manipulation

- `chgrp [options] group file`
  - ♦ change the group of the file
- `chmod [options] permission file`
  - ♦ change file or directory access permissions
- `chown [options] owner file`
  - ♦ change the ownership of a file
- `cp [options] file1 file2`
  - ♦ copy file1 into file2. This command creates or overwrites file2.
- `mv [options] file1 file2`
  - ♦ move file1 into file2
- `rm [options] file`
  - ♦ remove (delete) a file or directory

# Options for cp, mv and rm

- -i : interactive (cp, mv and rm)
  - ♦ prompt and wait for confirmation before proceeding
- -r : recursive (cp, rm)
  - ♦ recursively visits a directory, first visiting the files and subdirectories beneath it
- -f : force : (mv, rm)
  - ♦ don't prompt for confirmation (overrides -i)

# System Resources

- `date [options]`
  - ◆ report the current date and time
- `du [options] [directory or file]`
  - ◆ report amount of disk space in use+
- `hostname/uname`
  - ◆ display or set the name of the current machine
- `man [options] command`
  - ◆ show the manual (man) page for a command
- `passwd [options]`
  - ◆ set or change your password
- `script file`
  - ◆ saves everything that appears on the screen to file until exit
- `which command`
  - ◆ reports the path to the command or the shell alias in use

# Process Management

- kill [options] [-SIGNAL] [pid#]
  - ◆ send a signal to the process with the process
- ps [options]
  - ◆ show status of active processes
- top
  - ◆ Application to monitor resource usage for active processes

# Active Processes

- The `ps` command is an ideal solution for troubleshooting problems processes.
- Although the command options have a tendency to change from one OS to another, here are some of the common options.
  - ♦ `-a` : all processes, all users
  - ♦ `-e` : environment/everything
  - ♦ `-g` : process group leaders as well
  - ♦ `-l` : long format
  - ♦ `-u` : user user oriented report
  - ♦ `-x` : even processes not executed from terminals
  - ♦ `-f` : full listing

# Archives

- An archive is a collection of files combined into one file.
  - ◆ Being one file, archives are easier to manipulate (move, store, copy, backup, etc).
  - ◆ Archives are often compressed, so they require less space.
- The two most common archive tools used on Unix systems is `tar` and `gzip` (`gunzip`).
  - ◆ Tar allows you to combine several files into a single file.
  - ◆ Gzip allows you to compress a single file.
  - ◆ To compress a collection of file, you need to use both tar and gzip.
- Other archive tools are available. Most of these will both combine and compress files.
  - ◆ Zip, bzip2, 7z, rar, arj, etc

- As previously mentioned, tar allows the manipulation (creation, extraction, etc) of archive files.
- When using tar, one of the following switches must be used:
  - ♦ -c : create a new tar archive
  - ♦ -r : update the tar archive
  - ♦ -x : extract from the tar archive
- The -f switch is very important since it specifies that the tar archive is a file.
- The -v switch activates verbose mode, which means the tar command will output lots of information.
- The -z switch allows you to compress the archive (the archive is compressed/decompressed using gzip).

# Tar (cont.)

- A file ending with the .tar extension is a tar archive file.
- A file ending with the .tgz extension is a compressed (gzipped) tar archive file.
- Here a few example of the tar command.
  - `tar -cvf log.tar *.log`
  - `tar -zcvf log.tgz *.log`
  - `tar -xvf log.tar /tmp/log`
  - `tar -zxvf log.tgz /tmp/log`
- The first two commands create an archive with log files. (one normal and one compress) The two following commands show how to extract those two archive.

# Other Unix commands

- `diff [options] file1 file2`
  - ♦ compare the two files
- `file [options] file`
  - ♦ classify the file type
- `find directory [options]`
  - ♦ find files matching a type or pattern
- `ln [options] source target`
  - ♦ link the source to the target

# Other Unix commands (cont.)

- `paste [options] file1 file2`
  - ◆ combines two files side-by-side
- `sort [options] file`
  - ◆ sort the lines of the file
- `touch [options] [date] file`
  - ◆ create an empty file, or update the access time
- `wc [options] [file(s)]`
  - ◆ display word (or character or line)

# In : Hard and Symbolic Links

- The `ln` command can be used to create links.
  - Two types of links exist in Unix.
- When creating a hard link, you are simply giving another name to a file.
  - The link will point to the same physical space on the disk.
  - A file can only be deleted once all its hard link are deleted.
- • When creating a symbolic link (using `ln -s`), a new file is created.
  - The new file automatically redirects to the target file.
  - Symbolic links can be created across volumes (or disks).
  - Deleting a symbolic link does not affect the target file.