CS 35L Software Construction Lab
Week 1

Reminders

- Please buy Beaglebone Green Wireless boards by 5th week.
- Submissions on CCLE
- Questions on Piazza

Special Permissions

- sticky bit
  - On shared directories, it locks files within the directory from being modified/deleted by users other than the file creator, owner of the directory, or root, even if others have write and execute permissions. (Example: /tmp)

Sticky bit example

```
mkdir allAccess
chmod 777 allAccess
ls -l
    drwxrwxrwx 2 isha csgrad 4096 Oct 24 15:43 allAccess
ls -l allAccess
    -rwxrwxrwx 1 isha    csgrad 0 Oct 24 15:48 file1
    -rwxrwxrwx 1 user1 csgrad 0 Oct 24 16:11 file2
    -rwxrwxrwx 1 user2 csgrad 0 Oct 24 16:15 file3

chmod +t allAccess
ls -l
    drwxrwxrwt 2 isha csgrad 4096 Oct 24 16:19 allAccess

mv   /home/allAccess/file2   /home/allAccess/file3
mv: cannot move `/home/allAccess/file2' to `/ home/allAccess/file3': Operation not
permitted
```

Special permissions

- setuid, setgid
  - The **setuid** (set user id) is a permission bit, that allows anyone to exec a program with the permissions of its owner. The **setgid** (set group id) is a bit that allows to exec a program with the permissions of the group owner.
  - chmod u+s file1
  - chmod g+s file1
  - -rwSrwSrwx 1 isha csgrad 0 2016-07-01 02:46 file1
- Used for /usr/bin/passwd to enable a regular user to change login password.

diff

- A file comparison utility that outputs the differences between two files.
- Shows the changes between one version of a file and a former version of the same file
- Usage
  - diff original_file new_file
  - diff –u original_file new_file (unified format)

- **file1.txt**:
  I need to buy apples.
  I need to run the laundry.
  I need to wash the dog.
  I need to get the car detailed.
- **file2.txt**:
  I need to buy apples.
  I need to do the laundry.
  I need to wash the car.
  I need to get the dog detailed.

- diff file1.txt file2.txt
  2,4c2,4
  < I need to run the laundry.
  < I need to wash the dog.
  < I need to get the car detailed.

  > I need to do the laundry.
  > I need to wash the car.
  > I need to get the dog detailed.

- **file1.txt**:
  I need to go to the store.
  I need to buy some apples.
  When I get home, I'll wash the dog.
- **file2.txt**:
  I need to go to the store.
  I need to buy some apples.
  Oh yeah, I also need to buy grated cheese.
  When I get home, I'll wash the dog.

- diff file1.txt file2.txt
  2a3
  > Oh yeah, I also need to buy grated cheese.

- **file1.txt**:
  I need to go to the store.
  I need to buy some apples.
  When I get home, I'll wash the dog.
  I promise.
- **file2.txt**:
  I need to go to the store.
  I need to buy some apples.
  When I get home, I'll wash the dog.

- diff file1.txt file2.txt
  4d3
  < I promise.

- **file1.txt**:
  apples
  oranges
  kiwis
  carrots
- **file2.txt**:
  apples
  kiwis
  carrots
  grapefruits

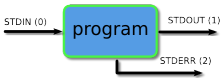
- diff -u file1.txt file2.txt
  --- file1.txt 2014-08-21 17:58:29.764656635 -0400
  +++ file2.txt 2014-08-21 17:58:50.768989841 -0400
  @@ -1,4 +1,4 @@
  apples
  -oranges
  kiwis
  carrots
  +grapefruits

wget

- A computer program that retrieves content from web servers
- Usage
  – wget <URL>

Piping and Redirection

- Every program we run on the command line automatically has three data streams connected to it.
  – STDIN (0) - Standard input (data fed into the program)
  – STDOUT (1) - Standard output (data printed by the program, defaults to the terminal)
  – STDERR (2) - Standard error (for error messages, also defaults to the terminal)



Piping and redirection is the means by which we may connect these streams between programs and files to direct data in useful ways.

Pipe

- It lets you feed the output from the program on the left as input to the program on the right.
- Example –
  - **ls | head -3**
    barry.txt
    bob
    example.png
  - **ls | head -3 | tail -1**
    example.png
  - **ls | wc –l**

Redirection (>,>>,<)

- > STDOUT output should be redirected to the file. If the file already exists it will be overwritten.
- >> STDOUT output should be redirected to the file but instead of overwriting, append it to the file if it exists.
- < Read STDIN/input from the file.
- 2> Redirect STDERR to the file specified.

Emacs

"The customizable, extensible, self documenting display editor"

- Customizable (no programming)
  - Users can customize font, colors, etc
- Extensible (programming required)
  - Run Lisp scripts to define new commands
- Self-documenting
  - C-h r (manual) and C-h t (tutorial)
- https://www.gnu.org/software/emacs/refcards/pdf/refcard.pdf

Getting Started

- Install emacs
  - Should be installed already
- Emacs has both GUI and CLI
- All emacs commands start with "C" or "M"
  - "C" = ctrl; "M" = alt (Windows) / option(Mac)
- Starting emacs
  - emacs <filename>
- Exiting emacs
  - C-x C-c

Basic Editing

- **Insert text** by simply typing it
- **Undo** by typing C-x u
- **Save changes** by typing C-x C-s
- **Copy, cut, paste**
  - C-space (starts selecting region)
  - M-w (copy a region)
  - C-w (cuts a region)
  - C-k (kill a line)
  - C-y (yank/paste)

More commands

- Search – C-s
- Replace – M-%
- Accessing menu – F10
- Switch buffer – C-x b
- Switch current window – C-x o
- Kill the current window – C-x 0 (zero)
- Help – C-h

Moving around

Keystrokes	Action
C-p	Up one line
C-n	Down one line
C-f	Forward one character
C-b	Backward one character
C-a	Beginning of line
C-e	End of line
C-v	Down one page
M-v	Up one page
M-f	Forward one word
M-b	Backward one word
M-<	Beginning of buffer
M->	End of buffer
C-g	Quit current operation

Directory edit (dired) (C-x d)

- Creates an Emacs buffer containing list of directory contents
- Allows you to operate on files
- Allows you to navigate filesystem
- d - select for deletion, x - actually deletes
- + - new directory, C-x C-f new file in directory, g - refresh dired buffer
- ! - run shell command
- https://www.gnu.org/software/emacs/refcards/pdf/dired-ref.pdf

Other features

- Emacs as lisp interpreter
  - M-x lisp-interpreter
    - Alternatively, use *scratch* buffer
  - type (random) or (+ 1 2) or (setq x 2) then C-j
  - M-: and an expression to evaluate, e.g. (* 1 2 3)
- Run shell command - M-!
- Tutorial