Computer Science 2211a/b
Software Tools and Systems Programming

Lab 0 – Introduction to UNIX on the GAUL subNetwork of Computer Science Network

The University of Western Ontario
Department of Computer Science

Western

Part 2 – Working with Directories

Part 2 – Working with Directories

The University of Western Ontario
Department of Computer Science

Western

Listing Directory Contents

- Use the **`ls`** command
- **Usage: `ls [-lah…] [DIRECTORY]`**
  - e.g. Display the contents of the current directory in columns

    `ls`
  - e.g. Display the contents of the current directory in a list

    `ls -l`
  - e.g. Display the contents of the **`/usr/bin`** directory in a list with "human readable" file sizes:

    `ls -lh /usr/bin` **(absolute path)**
  - e.g. Display the contents of the parent directory

    `ls ..` **(relative path)**

Western

Listing Directory Contents (cont'd...)

- **Hidden files / directories**
  - Names start with a period (**.**)
  - Not displayed unless we pass the **-a** argument to **ls**
  - e.g. Display the contents of the current directory in a list, including all hidden files:

```
ls -la
```

Displaying the Current Directory

- Use the **`pwd`** command
  - Short for *print working directory*
  - Displays the current working directory
    - i.e. the directory in which you're currently located

- Usage: **`pwd`**
  - Takes no arguments

Changing Directories

- Use the **`cd`** command
- Usage: **`cd DIRECTORY`**
  - e.g. Change to **`/usr/bin`**:

    `cd /usr/bin` **(absolute path)**
  - e.g. Change to the **`tmp`** directory, which is a subdirectory of the current directory:

    `cd tmp` **(relative path)**
  - e.g. Change back to the parent directory:

    `cd ..` **(relative path)**
  - e.g. Change back to your home directory:

    `cd`
  - e.g. Change back to the directory you were last in:

    `cd -`

Western

Changing Directories (cont'd...)

- Recall that **~** refers your home directory, and **~user** references the home directory of **user**:
  - e.g. Change to your home directory:

    cd **OR** **cd ~**
  - e.g. Change to **bob**'s home directory:

    cd ~bob

Western

Creating Directories

- Use the **`mkdir`** command

- Usage: **`mkdir DIRECTORY1 [DIRECTORY2]`** …
  - e.g. Create the directory **`tmp`** in the current directory

    `mkdir tmp`

  - e.g. Create the directories **`asn1`** and **`asn2`** in the current directory

    `mkdir asn1 asn2`

Western

Deleting Directories

- If the directory is empty, use the **`rmdir`** command

- Usage: **`rmdir DIRECTORY1 [DIRECTORY2]`** …
  - e.g. Remove the empty directory **`tmp`** in the current directory

    `rmdir tmp`

  - e.g. Remove the empty directories **`asn1`** and **`asn2`** in the current directory

    `rmdir asn1 asn2`

Western

Deleting Directories (cont'd…)

- If the directory is **not** empty, use the **`rm`** command

- Usage: **`rm -r DIRECTORY1 [DIRECTORY2]`** …
  - The **`-r`** flag tells **`rm`** to recursively remove all of the contents of the directory, and then the directory itself
  - e.g. Remove the non-empty directory **`tmp`** in the current directory

    ```
    rm -r tmp
    ```

  - e.g. Remove the non-empty directories **`asn1`** and **`asn2`** in the current directory

    ```
    rm -r asn1 asn2
    ```

Western

Part 3 – Working with Files

Part 3 – Working with Files

The University of Western Ontario
Department of Computer Science

Western

Displaying Files

- Use the **`cat`** command
  - Short for *catenate;* can be used to join (concatenate) files
  - Also used for displaying files

- **Usage: `cat FILE`**

  - e.g. Display **`README.txt`** located in the current directory:

    `cat README.txt` **(relative path)**

  - e.g. Display **`HELLO.txt`** located in tmp, which is a subdirectory of the current working directory:

    `cat tmp/HELLO.txt` **(relative path)**

  - e.g. Display **`GOODBYE.txt`** located in **`/usr/share`**:

    `cat /usr/share/GOODBYE.txt` **(absolute path)**

Western

Displaying Files with Pagers

- **Pager**
  - A command that displays one screen of text at a time
  - Waits for user to press a key and then displays the next screen

- **`more`**
  - Can only move forward
  - Press the **Spacebar** to move to next screen
  - Press **`q`** at any time to quit
  - e.g. Display **`README.txt`**: **`more README.txt`**

- **`less`**
  - Can move forward and backward
  - Use arrow keys to move up and down one line at a time
  - Press the **Spacebar** to move to next screen
  - Press **`Ctrl+b`** to move back one screen
  - Press **`q`** at any time to quit
  - e.g. Display **`README.txt`**: **`less README.txt`**

Western

Displaying Parts of Files

- **`head`**
  - Display the first **`n`** lines of a file (default is 10)
  - e.g. Display the first 10 lines of **`README`**: `head README`
  - e.g. Display the first 5 lines of **`README`**: `head -5 README`

- **`tail`**
  - Display the last **`n`** lines of a file (default is 10)
  - e.g. Display the last 10 lines of **`README`**: `tail README`
  - e.g. Display the last 3 lines of **`README`**: `tail -3 README`

Western

Deleting Files

- Use the **`rm`** command

- Usage: **`rm FILE1 [FILE2]`** …
  - e.g. Remove the file **`README`** in the current directory

    ```
    rm README
    ```

  - e.g. Remove the files **`t1.c`** and **`t2.c`** in the current directory

    ```
    rm t1.c t2.c
    ```

Western

Finding Files

- Use the **`find`** command
  - Recursively searches, starting from a given directory, for files and/or directories matching a given expression

- Usage: **`find PATH EXPRESSION`**

  - e.g. Find all files and directories named **`README`** starting from the current directory:

    ```
    find . –name "README"
    ```

  - e.g. Find all files and directories with the extension **`.h`** starting from **`/usr/include`**:

    ```
    find /usr/include –name "*.h"
    ```

    `*` is called a *wildcard*

  - e.g. Find all files (but not directories) named **`backup`** starting from the current directory:

    ```
    find . –type f -name "backup"
    ```

  - e.g. Find all directories (but not files) named **`backup`** starting from the current directory:

    ```
    find . –type d -name "backup"
    ```

Western

Finding Content with Files

- Use the **grep** command
  - Prints all lines in a given file (or set of files) that contain a particular string
  - By default, search is case-sensitive; can use the **-i** option to make it case-insensitive

- Usage: **grep [OPTIONS] EXPRESSION FILENAME [FILENAME2…]**
  - e.g. Print all lines in the file **README** that contain the string **hello**:

```
grep "hello" README
```

  - Print all lines in the files **README** and **HELLO.txt** that contain the string **hello** in any case (e.g. **hello**, **HELLO**, **HeLLo**, etc.):

```
grep -i "hello" README HELLO.txt
```

  - e.g. Print all lines in all files in the current directory that contain the string **hello**:

```
grep "hello" *
```

Recall: * is called a *wildcard*

  - e.g. Print all lines in all files in /usr/share/doc containing the string **hello** in any case:

```
grep -i "hello" /usr/share/doc/*
```

Western

Part 4 – Moving Things Around

Part 4 – Moving Things Around

The University of Western Ontario
Department of Computer Science

Western

Moving Files and Directories

- Use the **mv** command

- Usage: **mv SOURCE [SOURCE2…] DESTINATION**
  - e.g. Move the file **README** to the **tmp** subdirectory

    ```
    mv README tmp
    ```

  - e.g. Move the directories **asn1** and **asn2** to the **tmp** subdirectory:

    ```
    mv asn1 asn2 tmp
    ```

  - e.g. Move the file **README** from the **tmp** subdirectory to the current directory:

    ```
    mv tmp/README .
    ```

Recall:

- . references the current directory

Renaming Files and Directories

- Use the **`mv`** command
  - Be careful not to overwrite an existing file
  - On GAUL, you'll be asked for confirmation if you try to overwrite a file
  - This is not the case on most other systems, though

- Usage: **`mv SOURCE DESTINATION`**
  - e.g. Rename **`README`** to **`HELLO`**:

    `mv README HELLO`
  - e.g. Rename the **`tmp`** directory to **`temp`**:

    `mv tmp temp`

Western

Copying Files and Directories

- To copy a file, use the **`cp`** command
- To copy a directory, use the **`cp`** command with the **`-r`** (recursive) flag

- Usage: **`cp [-r] SOURCE DESTINATION`**
  - e.g. Copy the file **`README`** to the **`tmp`** subdirectory

    `cp README tmp`
  - e.g. Copy the directory **`asn1`** and all of its contents to the **`assignments`** subdirectory:

    `cp -r asn1 assignments`
  - e.g. Copy the file **`README`** in the **`tmp`** subdirectory to the current directory:

    `cp tmp/README .`

Western

Getting Help with Commands

- Use the **`man`** command
  - Displays the *manpage* for a given command
  - *manpage* is a portmanteau of *manual* and *page*

- Usage:

```
man COMMAND
man -k KEYWORD
```

  - e.g. View the manpage for the **`rm`** command:

```
man rm
```

  - e.g. Search for manpages containing the keyword **`find`**:

```
man -k find
```

Western

Part 5 – Redirection

Redirection

- **In UNIX / Linux, everything is a file**
  - The keyboard is represented by a special file called **STDIN** (standard input)
  - The screen is represented by a special file called **STDOUT** (standard output)
  - **STDERR** (standard error) can also be used to separate error-related information

- **By default:**
  - Input comes from **STDIN** (i.e. the keyboard)
  - Output goes to **STDOUT** and **STDERR** (i.e. the monitor)

- **Redirection Operators**
  - **>** Output redirection
    e.g. **`ls -l > file.txt`**

    Redirect output to file.txt instead of **STDOUT**
  - **<** Input redirection
    e.g. **`sort < words.list`**

    Pass the contents of `words.list` to the `sort` command, instead of reading from **STDIN**

Western

Redirection

- **Other redirection operators:**
  - `>>` Append output
  - `>|` Force overwrite
  - `<<` Here document

- **Here document**
  - Allows you to write a complex, multi-line string that may contain quotes and other special characters
    - No need to escape quotes or special characters as one would normally have to do

    e.g.

```
$ sort <<EOF
hello
world
test
word list
EOF
```

Western

Summary / Cheat Sheet

The Basics

Login: SSH into `compute.gaul.csd.uwo.ca`

Logout: `exit`

Change password:

Working with Directories

Display the current directory: `pwd`

List the contents of a directory: `ls`

Change to another directory: `cd`

Create a directory: `mkdir`

Delete a directory: `rmdir` (empty)
`rm -r` (non-empty)

Special References

Reference	Description
`.`	Current directory
`..`	Parent directory
`~`	Your home directory
`~user`	The home directory of user

Working with Files

Delete a file: `rm`

Display a file: `cat`

Display a file one screen at a time: `more / less`

Display the first / last parts of a file: `head / tail`

Finding a file: `find`

Finding something within a file: `grep`

Moving, Renaming, and Copying

Move / rename a file or directory: `mv`

Copy a file or directory: `cp`

Other

Display a manpage: `man`

Western