CS1004: Intro to CS in Java, Spring 2005

Lecture #3: Intro to UNIX

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Administrivia

- Second section now open, its lectures start today
- See full details on integrated class homepage: http://cs1004.cs.columbia.edu
- If you still need to register for this class, come see me afterwards
- Homeworks will be the same, exams different
  - HW1 going up this afternoon
- More TAs assigned, office hours posted
- How to use the webboard…

Editors, redux

- Pico: The "Pine Composer" – *very* easy to use, but very plain-jane
- Emacs: "Editor MACroS"
  - Extremely powerful
  - http://c2.com/cgi/wiki?EmacsStandsFor
- Vi: "Visual Interpreter"
  - Want to be l33ter than me? Learn this
- Windows tools, IDEs: you can use, but not supported
  - ***Don't*** *use Microsoft Word for code!*

Emacs

- My editor of choice
- Better than pico, easier than vi
- Easy to start up on cunix, except…
- In "default" configuration, no pull-down menus, and not particularly easy to use
- What we'd like is for emacs to pop up a full-featured window on our screen
- Two ways to do this:
  - Enable the "UNIX GUI" environment
  - Run emacs on our own machine (outside of CUNIX)

X

- The X Window System is the GUI for UNIX
- Invented at MIT in the 80s
  - X11 (i.e., version 11) was released in the 90s
- Supports "remote displays" over the network
  - "X server" is the display: you can download one for Windows at http://www.cs.columbia.edu/crf/crf-guide/resources/software/xwin32.html

Using X

- Use the "X Forwarding" option in PuTTY
  1. In PuTTY Configuration, under Connection/SSH/Tunnels, put a checkmark in "Enable X11 forwarding"
  2. Go to Session => click Default Settings => click Save
  3. Exit configuration tool
  4. Start X server, and then connect to CUNIX
     - (If X server prompts a connection dialog, you can just cancel it)
- Why?
  - emacs is 100 times easier to use this way

What's Java, by the way?

- It's a programming language
- Java Development Kit (JDK) contains tools to use the programming language:
  - javac: A tool to *compile* programs (text) into a useable form (binary code)
  - java: A runtime environment to run the programs that have been compiled
- In total, an environment for programming algorithms
- Lots of other tools out there: optional and on your own

Hello, world!

- First Java program

1. Use PuTTY to connect to CUNIX
2. Make a directory for your program
3. Use emacs to write the program
4. Use javac to compile the program
5. Use java to run the program
   - Note the lack of the .java extension

Hello, world! (II)

- Here's what we're going to write:

```
public class HelloWorld {
  public static void main(String[] args) {
    System.out.println("Hello world!");
  }
}
```

Working outside of CUNIX

- Windows has a command prompt called "cmd" (NT/2k/XP) or "command" (95/98/Me)
- Java Development Kit from Sun gives you java, javac
- Emacs can be downloaded for free, too
  - You can also download an "Integrated Development Environment", or IDE
- See the resources page for links to the above

Transferring files

- Tools to copy files to and from your PC
- SCP: Secure Copy
- AcIS provides WinSCP for free
  - http://www.columbia.edu/acis/software/winscp/
- On Mac, use Fugu
  - http://www.columbia.edu/acis/software/fugu/

Other useful utilities

- finger, who, w: See who's logged in, get more info
- lookup: Columbia's white pages
  - Not everyone is listed though
- fortune: OK, not necessarily useful, but fun

Other things you can do on your CUNIX account

- Use it as backup for your home computer
  - Within limits – "**quota -l**" will tell you how much space you have
- Use it as a calculator (bc, xcalc)
- Make a webpage
  - This used to be utterly, completely novel back in 1995…

What's HTML?

- HyperText Markup Language
- In your webbrowser, choose View => Source to see what it looks like
- How do you write it?
  - Using a text editor (like primitive code)
  - Using an HTML editor (like FrontPage)
- How do you learn it?
  - Lots of free tutorials on the web
  - http://www.w3schools.com/ is one of my favorites
- Don't confuse HTML and HTTP

What's hypertext?

- "A term coined by Ted Nelson around 1965 for a collection of documents (or "nodes") containing cross-references or "links" which, with the aid of an interactive browser program, allow the reader to move easily from one document to another."
- HTML is one hypertext markup language that lets you *hyperlink* multiple HTML pages together

Simple HTML example

```
<html>
  <head>
    <title>Sample page</title>
  </head>
  <body>
    <h1>This is a sample page!</h1>
    Isn't it rather dull?
  </body>
</html>
```

Setting up your webpage on CUNIX

- Create the HTML files, either directly on CUNIX or on your PC (use WinSCP to transfer them over in the latter case)
- Create a directory called **public_html** and put some files into it
  - The "default" page is **index.html**
- Let's try this right now…
- To access your homepage, navigate to **http://www.columbia.edu/~username**

It doesn't work!

- Remember I mumbled something about permissions earlier?
- We need to give others the permission to view our material
- **By default**, only you have the right to view data in your home directory for privacy purposes
- How can we change this?

UNIX permissions model

- UNIX uses a three-tier permission model
  - User – meaning "myself"
  - Group – meaning "my peers"
  - All – meaning "the world"
- Three kinds of permissions on **both** files and folders
  - Read
  - Write
  - Execute (run programs or enter a folder)
- Tool used to view permissions: **ls -l**
- Tool used to change permissions: **chmod**

UNIX permissions, cont'd

- What does the first column of **ls -l** mean?

```
drwxr-xr-x
```

- It's a directory
- I have read, write, execute (enter) permissions on the directory
- Group and all have read and execute permission on the directory

How to change permissions?

- chmod takes two parameters
  - The permission directive, which has three characters: `a+r`
    - For whom you're going to change (**U**ser, **G**roup, **A**ll)
    - How you're going to change it (**+** is add, **-** is remove)
    - What you're going to change (**R**ead, **W**rite, e**X**ecute)
  - What you're going to change
- Use **ls -l** to verify
- Be careful when removing permissions!

Webpage permission primer

- For webpages, *all* must have permission to read the file
- For directories containing webpages, *all* must have permission to execute the directory
  - Often, both read and execute permission are given; the read permission enables "directory browsing" where appropriate
- We're not going to worry about group permissions for now

So what's the bottom line?

- chmod a+r index.html
  - Gives everyone permission to read the file
  - Can also use *filename globbing:* chmod a+r *.html
  - Filename globbing works for other commands, too
- chmod a+rx public_html
  - Gives everyone permission to enter and list the contents of public_html
- Now let's try visiting the page

Homework 1

- Written part will have some basic algorithm-like brainteasers and UNIX comprehension questions
- Programming part will be multipart:
  - Get a CUNIX account
  - Register on the class webboard
  - Set up your homepage
  - Practice compiling Java code that we will provide you
- For those of you who are UNIX geeks, feel free to time yourself. ;-)

Additional resources

- Web-based tutorials on UNIX and emacs:
  - http://www.columbia.edu/acis/webdev/unix/index.html
  - http://www.columbia.edu/acis/publications/emacs.html
  - More links on Resources page
- AcIS will have hands-on training sessions in 252 ET
  - See class homepage
  - Did anyone go?
- Come see me or the TAs: we're happy to help
  - **Earlier** rather than later!

Next time

- Finish up on HTML and permissions
- Define algorithms more precisely
- A brief history of Computer Science
- Start discussing some of those unambiguous operations in Java (i.e., Java expressions)