CSC 4304 - Systems Programming
Fall 2010

LECTURE - I

INTRODUCTION

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Contact Information

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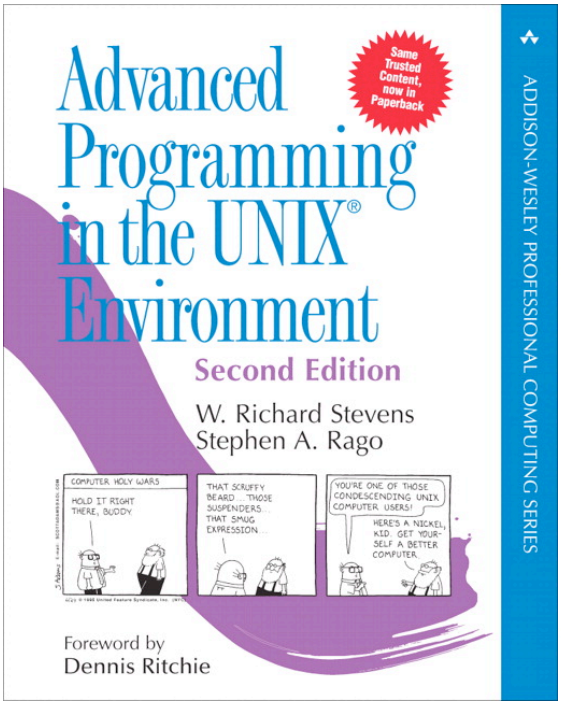
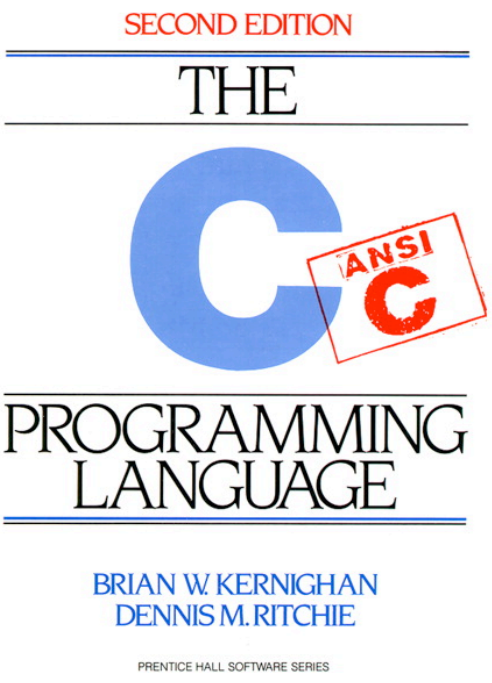
Logistics

- Course web page: http://www.cct.lsu.edu/~kosar/csc4304
  - All lecture notes will be available online
  - As well as homework assignments, projects and other important course information

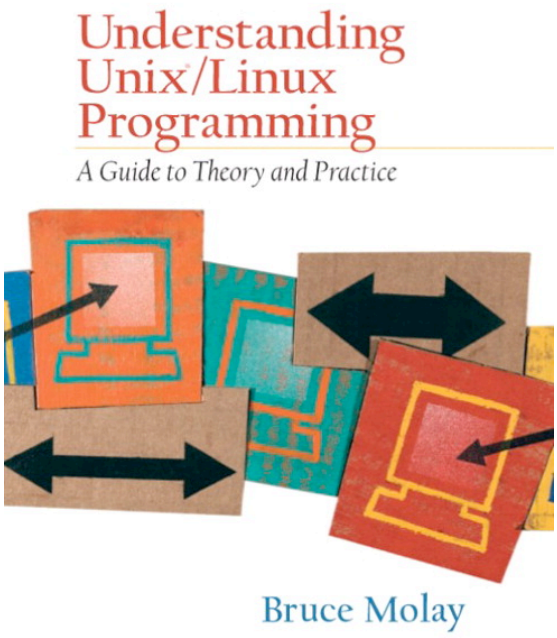
- Course mailing list: cs4304@cct.lsu.edu
  - Important course announcements including projects, homework assignments, and exams will be sent to this mailing list
  - Provide me with your active email address to be added to the class mailing list

Textbooks





Recommended Text



Grading

- The end-of-semester grades will be composed of:

– Pop Quizzes	: 5%	(~5)
– Homework	: 10%	(5)
– Projects	: 30%	(3)
– Midterm	: 25%	(1)
– Final	: 30%	(1)

You are expected to attend the classes and actively contribute via asking and/or answering questions.

Passive vs Active Learning

After 2 weeks, we tend to remember:

Passive learning

- 10% of what we read
- 20% of what we hear
- 30% of what we see (pictures)
- 50% of what we hear and see

Active learning

- 70% of what we say
- 90% of what we say and do

How to Become an Active Learner

- Recall prior materials
- Answer a question
- Guess the solution first (even guessing wrong will help you to remember the right approach)
- Work out the next step before you have to read on
- Think of an application
- Imagine that you were the professor and think about how you would give a test on the subject material so that key concepts and results will be checked.
- Summarize a lecture, a set of home work or a lab in your own words concisely.

Rules

- No late homework/project submissions accepted!
- You are encouraged to bring your laptops to the class to go over some of the exercises together.
- Exams will be closed book.
- You are only responsible from material covered in the class, homework, and projects.
- Academic dishonesty will be treated seriously.

Introduction

What is Systems Programming?

- **Programming where the software and hardware meet or where the application interfaces with the operating system (OS).**
- **Includes issues such as: resource management (CPU and memory), process scheduling, concurrency and performance.**

What Expect to Learn?

1. Using the C programming language, its constructs and grammar, to create system software.
2. Usage of makefiles, linking, object files, loading, symbol resolution, shared and static libraries, debugging, and execution of system programs.
3. UNIX OS concepts such as: process, program, process groups, signals, running programs, process control, address space, user and kernel modes, system calls, and context switching.
4. File I/O (i.e. open, close, read, write, seek)
5. Using sockets to implement client-server and network programs.
6. Using thread execution models (e.g. Posix threads).
7. Handle signals and exceptions within a process and to control processes.
8. Different approaches of concurrent programming.

UNIX BASICS

logon

- ssh classes.csc.lsu.edu -l username
  - or:
- ssh username@classes.csc.lsu.edu
- passwd: change password
- putty: a free telnet/ssh client
- ls /bin (ls /usr/bin)
- man ...
- text editing: vi, emacs, pico

Vi Editor

- vi filename
  - a: enter *insert* mode, after the cursor
  - i: enter *insert* mode, before the cursor
  - O: enter *insert* mode, above the cursor
  - o: enter *insert* mode, below the cursor
  - r: replace one character under the cursor
  - u: undo the last change to the file.
  - x: delete character under the cursor
  - yy: copy line
  - dd: delete line
  - :w: write
  - :q: quit
  - **:q!**: quit without saving changes
  - **/keyword** : search for the keyword in text
  - **:n** : go to line number n

- Vi tutorial: http://www.gnulamp.com/vi.html

Emacs Editor

- Emacs filename
  - CTRL-d : delete one character
  - CTRL-k : delete one line
  - CTRL-y : paste
  - CTRL-x 2 : split window into 2 (horizontal)
  - CTRL-x 3 : split window into 2 (vertical)
  - CTRL-x o : switch window
  - CTRL-x 1 : kill all other windows
  - CTRL-x u : undo (also CTRL-_)
  - CTRL-x CTRL-f: open file
  - CTRL-x CTRL-b: open buffer (CTRL-x b: switch to buffer)
  - CTRL-s : search
  - CTRL-x CTRL-s: save file
  - CTRL-x CTRL-c: quit
- Emacs Tutorial: http://www.gnu.org/software/emacs/

Files and Directories

- directory operations
  - ls: list
  - cd: change directory
  - pwd: print working directory
  - mkdir: create directory
  - rmdir: remove directory
- file operations
  - cp: copy
  - rm: delete
  - mv: move (rename)
  - cat, more, less: examine
- file permissions: rwx rwx rwx
  user group others
  - chmod 755 filename (or chmod u+r filename) (or chmod u=rwx)

Processes

- ps : list currently active user processes
- ps aux: list all active processes in long format
- kill n : kill process with id=n
- kill -9 n : force to kill

- CTRL-z : push to background
- fg : bring to foreground (also fg n: bring nth process)

- top: system utilization information
- time command : calculate time for a given command

Summary

- UNIX Basics
  - Logging in
  - Text editing
  - File and directory operations
  - Processes

- HW: login to classes server, and try everything we have learned today!
- Read Chapter 1 from Kernighan & Ritchie

Acknowledgments

- Advanced Programming in the Unix Environment by R. Stevens
- The C Programming Language by B. Kernighan and D. Ritchie
- Understanding Unix/Linux Programming by B. Molay
- Lecture notes from B. Molay (Harvard), T. Kuo (UT-Austin), G. Pierre (Vrije), M. Matthews (SC), and B. Knicki (WPI).