CS2204: Introduction to Unix

Spring 2006

Class Meeting 1

* Notes adapted by Alexey Onufriev from previous work by other members of the CS faculty at Virginia Tech

What is Unix?

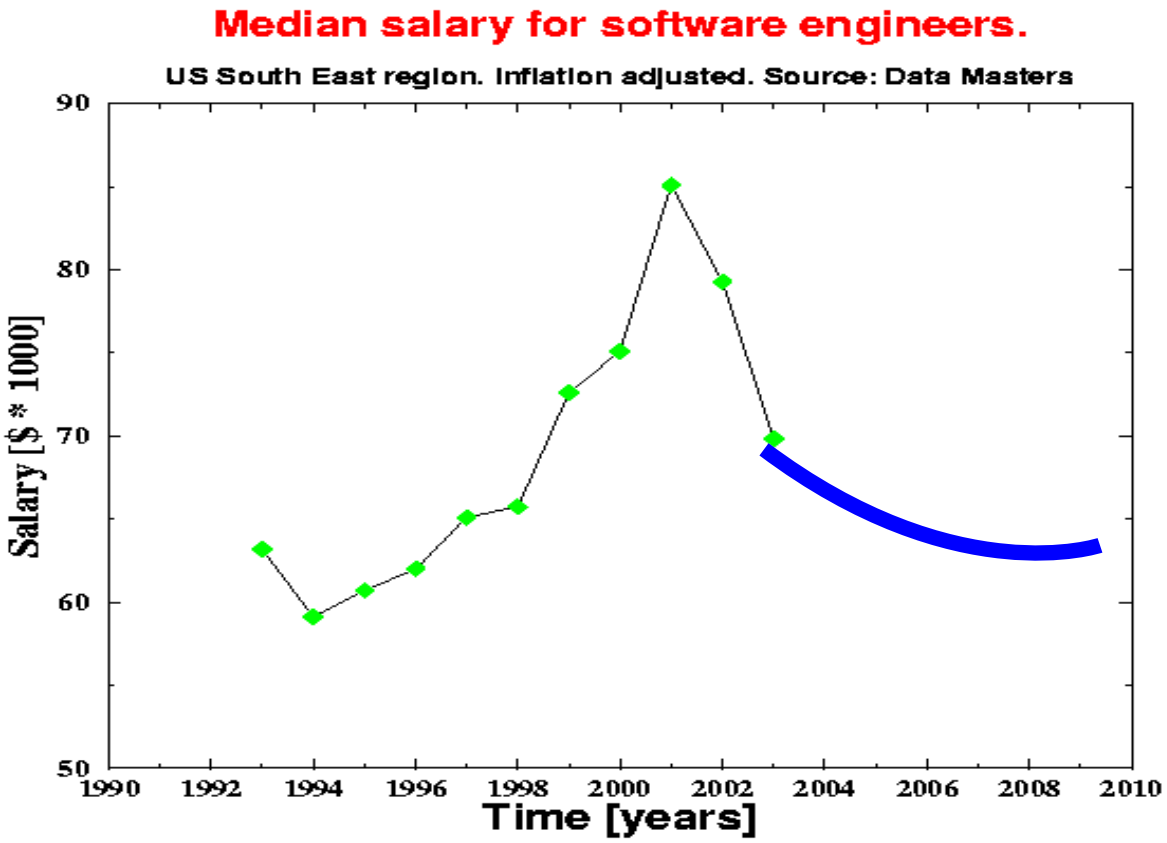
- A ***modern*** computer ***operating system***
- Operating System
  - "a program that acts as an intermediary between a user of the computer and the computer hardware"
  - Software that manages your computer's resources (files, programs, disks, network)
  - Examples: Windows, MacOSX, Solaris, BSD, Linux (*e.g.* Mandrake, Red Hat, Slackware, SUSE)
- Modern
  - Stable, flexible, configurable, allows multiple users and programs

Why Learn Unix?

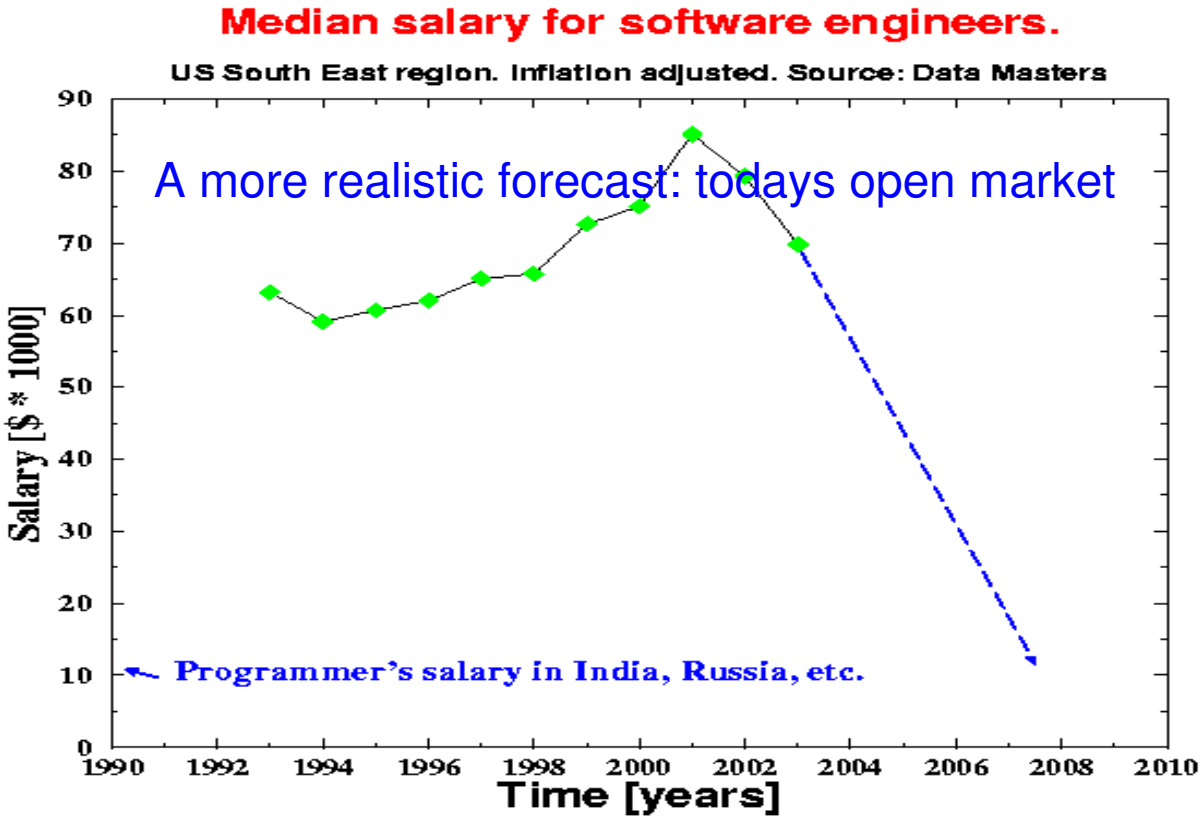
- Will make you a better computer scientist
- UNIX is a building block for many CS concepts
- Open source and stable (no viruses, worms, etc)
- Used in many scientific and industrial settings.
- Huge number of **free** and **well-written** software programs
- Excellent programming environment
- Roughly 65% of the world's web servers are Linux/Unix machines running Apache.

Example: Unix Open Office

And if that's not enough...



That should do it.



Que faire?

- Become a *versitile.*
- Aim for a highly creative job (these will survive)
- Always learn new things, be ready to re-profile
- Train yourself to solve open-ended problems

Brief History of Unix

- Ken Thompson and Dennis Ritchie originally developed the earliest versions of Unix at Bell Labs for internal use in the 1970s
  - Simple and elegant
  - Meant for programmers and experts
  - Written in a high-level language instead of assembly language
    - Small portion written in assembly language (kernel)
    - Remaining code written in C on top of the kernel
- http://www.bell-labs.com/history/unix/

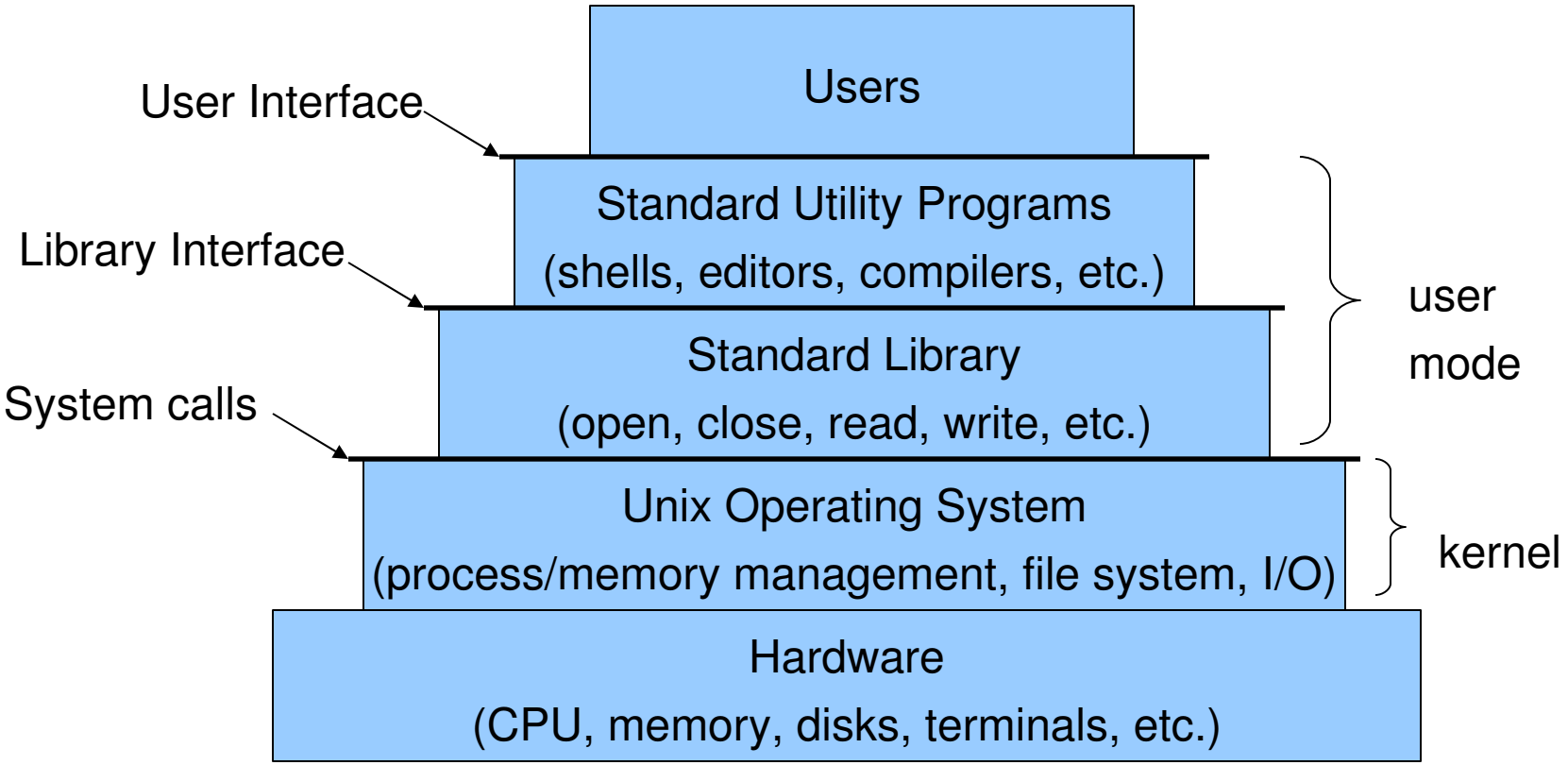
Brief History of Linux

- *Andrew Tanenbaum*, a Dutch professor developed MINIX to teach the inner workings of operating systems to his students
- In 1991 at the University of Helsinki, *Linus Torvalds*, inspired by Richard Stallman's GNU free software project and the knowledge presented in Tanenbaum's operating system, created Linux, an open-source, Unix-like operating system
- Over the last decade, the effort of thousands of open-source developers has resulted in the establishment of Linux as a stable, functional operating system
- http://www.linuxgazette.com/node/9721

Unix Variants (Flavours)

- Two main threads of development
  - Berkeley software distribution (http://www.bsd.org)
  - Unix System Laboratories (http://www.unix.org)
- Sun: SunOS, Solaris
- SGI: Irix
- FreeBSD, OpenBSD, NetBSD
- Hewlett-Packard: HP-UX
- Apple: OSX (based on BSD)
- Linux (many flavours)

Layers in a Unix-based System



Unix Structure

- The ***kernel*** is the core of the Unix operating system, controlling the system hardware and performing various low-level functions. Other parts of a Unix system (including user programs) call on the kernel to perform services for them.
- The ***shell*** accepts user commands and is responsible for seeing that they are carried out.
- The ***filesystem*** organizes all of the information on the computer and provides access to it for programs.

Unix Structure (cont.)

- Many hundreds ***utility*** programs or ***tools*** are supplied with the Unix system. These utilities (or commands) support a variety of tasks such as copying files, editing text, performing calculations, and **developing software**.
- This course will introduce a limited number of these utilities and tools, focusing on those that aid in software development.

Getting Started

- Logging in to a Unix machine requires an account on that system. Admin = root.
- After logging in, some information about the system will be displayed, followed by a ***shell prompt***, where commands may be entered
  - $
  - %
  - #
  - username@hostname>
  - hostname%

The Shell

- The ***shell*** is the program you use to send commands to the Unix system
- Some commands are a single word
  - `who`
  - `date`
  - `ls`
- Others use additional information
  - `more textfile`
  - `ls -l /home/onufriev`

Command Syntax

- Commands must be entered exactly
- Be careful! Some commands can be very destructive. (e.g. `rm junk*` vs. `rm junk *`) NO RECOVERY IN UNIX.
  ask your TA how to safeguard against accidental file removal (alias rm to mv)
- Syntax: **command** *options argument(s)*
- **Options** modify a command's execution
- **Arguments** indicate on what a command should act (often filenames)

Example Commands: ls, cd, mkdir

- `ls -l` // shows content of current directory + file attributes
- `ls -a`
- `ls -la`
- `cd` // move one level up in the directory tree
- `mkdir MYDIRECORY` // create directory MYDIRECTORY
- `cd MYDIRECTORY`
- `touch myfile` // creates an empty file myfile
- `ls -l myfile`

If you don’t see a shell prompt…

- A program is probably running
- If you see a special program prompt, try to quit the program (`quit, bye, exit`)
- If you see nothing, you can usually
  - Stop the program with CTRL-z (program will wait until started again by “bg &”)
  - Interrupt the program with CTRL-c (program will usually die)

Ending your session

- **Always** log out when you are done
- Use the `exit` command to log out of a shell
- **Note**: If you are running in a windowing environment, logging out of a shell only ends that shell. You must also log out of the windowing system, typically selecting an option from a menu.