**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, MacOS, Solaris, BSD, Linux (e.g. Mandrake, Red Hat, Slackware)
- Modern
  - Stable, flexible, configurable, allows multiple users and programs

**Why Unix?**

- Used in many scientific and industrial settings
- Open-source operating system (OS)
- Huge number of free and well-written software programs
- Excellent programming environment
- Internet servers and services run on Unix
  - Roughly 65% of the world's web servers are Linux/Unix machines running Apache

**Brief History of Unix**

- Ken Thompson and Dennis Richie originally developed the earliest versions of Unix at Bell Labs for internal use in the 1970s
  - Simple and elegant
  - 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

**Unix Variants**

- 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 (Darwin)
  - Linux (many flavors)

**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-based 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
Layers in a Unix-based System

Hardware
- CPU, memory, disks, terminals, etc.

Unix Operating System
- Process/memory management, file system, I/O

Standard Library
- open, close, read, write, etc.

Standard Utility Programs
- shells, editors, compilers, etc.

Users

System calls

User Interface

Library Interface

User mode

Kernel

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.

Unix Structure (cont.)

- Over two hundred *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
- 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 require additional arguments
  - `cat textfile`
  - `ls -l`

Command Syntax

- Commands must be entered exactly
  - `command options argument(s)`
- **Options** modify a command’s execution
- **Arguments** indicate upon what a command should act (often filenames)
Example Command: ls

- `ls -l`
- `ls -a`
- `ls -la`
- `ls -a; ls -l`
- `ls -al textfile1`
- `ls -al textfile1 textfile2`
- `ls -al directory`

Logging Out

- **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.