Fall 2013

CEG 2350: OS Concepts and Usage

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CEG 2350: OS Concepts and Usage

Syllabus

Catalog Description

Provides introduction to Linux and Windows operating systems and system administration. Covers files and directories, ownership and sharing, programs and processes, system calls, libraries, dynamic linking, command line shells, scripting, regular expressions and secure network protocols.

4 credit hours, 3 hours lectures, 2 hours labs. Prerequisites: CS 1160 or CS 1180 or CEG 2170 (older numbers CS 240 or CS 220) or equivalent.

Overview

This is a freshman-level 4 credit hour course conducted in a 14-week semester. Its goal is to develop in the minds of students an effective operational model of computer systems running either Linux or Windows. This course is lab-oriented.

Course Materials

- Mark G. Sobell, "A Practical Guide to Linux Commands, Editors, and Shell Programming", Prentice Hall, 2012, 1200 pp. (required) http://proquest.safaribooksonline.com.ezproxy.libraries.wright.edu:2048/9780133085129
- Allen B. Downey, Think Python: How to Think Like a Computer Scientist, O'Reilly, 2012, 300 pp. http://www.greenteapress.com/thinkpython/ (recommended)
- William R. Stanek, Windows 7 Administrator's Pocket Consultant, Microsoft Press, 2009, 704 pp; http://proquest.safaribooksonline.com.ezproxy.libraries.wright.edu:2048/9780735634732 (recommended)
- 8GB or larger flash drive (required). Second flash drive of any size (recommended).

Prerequisites

General exposure to PCs, and MS Windows, which is so common that we do not list it as official prerequisites. CEG2350 does not assume prior exposure to Unix/Linux. Familiarity with a programming language (such as C++, or Java) is expected.

Content

The topics are grouped based on coherence. Even though there are nine items below, worth one week each, they are not to be taken literally as weekly schedules.

Unix/Linux command names are well-known, whereas their Windows-equivalents are often hidden behind a GUI; so, only Linux command names are shown, but the equivalent Windows operations are also included.

GUI and Windowing Systems. Mouse clicks etc. as events. Coupling of events to actions. Focus. Cut and paste models. X11, KDE, Gnome, xterm. Fonts, bit maps, vector drawings. Tiled and overlapped windows.

Files and directories. File names and extensions. Operations on files and directories. Compression. File systems: ISO9660, ext2/3/4, vfat, ntfs. Fragmentation. Sequential and random access. Large streaming files. rwx-permissions. Ownership and sharing. Access control lists. Alternate data streams. Hard and soft links. Commands: ls, ln, cp, mv, rm, cat, chmod, chown, umask, dd, gzip, tar, file, wc, sort, uniq.

Programs and Processes. System calls, libraries. Virtual memory. Loading. Dynamic linking. Unix/Linux ELF, COFF and a.out. Windows COM, EXE. Commands: kill, ps, top, nice, bg, fg, ldd, size, task manager.

Virtual Memory: Frames, Pages, Page Faults, Swaps, page tables, memory protection, page replacement.

Command Line Shells. Scripting languages. Linux bash. Python. File system browsers. Cygwin.

Utilities. Regular expressions, Version control. Commands: grep, diff, patch, make, find, od, svn.

Networking. Host names, IP addresses. Protocols. TCP and UDP. DNS. ports. URLs. Sockets. Clients and servers. Web browsers and clients. Secure shell, sftp. SSL/TSL. HTTPS. NFS and Samba. Commands: ssh, sftp, ping, traceroute, wget.

Users. Classes of users and their privileges. Passwords, MD5. Power users, Administrators, etc. SUID programs. Commands: passwd, newusers, userdel, sudo, su.

Programs: Compiling, Linking, Libraries, Exec formats. Building a Linux kernel from source. Dynamic Loading and Linking. The init process, Boot Scripts, Kernel Processes.

System Administration. File system integrity, virus scanning, patch management. Archives. System restore. Windows Registry. Booting of OS. Power on self test. BIOS. Boot loaders: NTLDR, GRUB. Process init. login. Suspend v. hibernation. Linux distributions: Debian, RedHat, etc. Windows. Registry. Open source movement. Commands and files: df, du, mount, umount, /etc/passwd, /etc/shadow, /etc/fstab, /etc/inittab, init.d scripts.

Processes, advanced. Single CPU Multi-tasking, multiple CPUs and SMP. Scheduling. Priorities. Signals. Virtual machines. Virtual Box and Virtual PC

Cloud Computing: Distributed Computing Models, Well-Known Storage Clouds, Well-Known Computing Clouds. Examples of Heavy Computations; Google app engine, Amazon web services.

Recap. Operating Systems? Kernels? Systems programs? Applications? Layered view. Components: Processes, Virtual Memory, File Systems, Networking, Events, and Device Drivers. Services: Resource management, protection, multi-programming, multi-tasking.

Grading

This course is lab-oriented. Expected number of labs: 12, worth 5% each, about one per week. Lab work is scheduled in Russ 355 with PCs that can dual boot into Linux or Windows.

Two on-line exams worth 15% and 25%. Course grades will be based on the total score as follows. A: 90-100%, B: 80-89%, C:70-79%, D: 60-69%, F: below 60%. Grades may be further curved if appropriate.