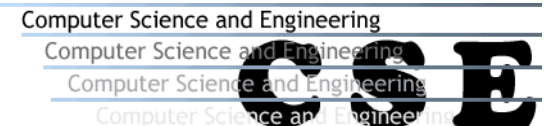


CSE 265: System and Network Administration

MW 2:10-3:00pm Packard 258
R 1:10-3:00pm Packard 112

<http://www.cse.lehigh.edu/~brian/course/sysadmin/>
Find syllabus, lecture notes, readings, etc.

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Who is this course for?

- Students interested in learning
 - The roles and responsibilities of a computer systems and network administrator
 - How to configure & manage their own linux systems
 - How to diagnose and debug problems
 - How some of the major system services operate
 - Why they need to be nice to the sysadmin
- UNIX/Linux familiarity and programming experience required (CSE17)

What will the course cover?

- Understand the role and responsibilities of a system administrator
- Configure the Linux operating system
- Describe the system boot process
- Setup and manage user accounts and groups
- Manage the resources and security of a computer running Linux
- Make effective use of Unix utilities and scripting languages (bash, Perl)
- Configure and manage simple network services on a Linux system
- Develop an appreciation of the documentation available as part of an installed Unix/Linux system

What will it not cover?

- Networking in depth
 - Take CSE342 or CSE404 instead
- Network security in depth
 - Take CSE343 instead
- Windows administration
- Many hardware issues
- All the details needed for certification
 - Lots of certification courses available

What does a sysadmin do?

What does a sysadmin do?

- User account management
- Hardware management
- Perform filesystem backups, restores
- Install and configure new software and services
- Keep systems and services operating
 - Monitor system and network
 - Troubleshoot problems
- Maintain documentation
- Audit security
- Help users, performance tuning, and more!

User Account Management

- User IDs
- Home directories (quotas, drive capacities)
- Mail
- Default startup files (paths)
- Permissions, group memberships, accounting and restrictions
- Communicating policies and procedures
- Disabling / removing user accounts

Hardware Management

- Capacity planning
- Hardware evaluation and purchase
- Inventory
- Adding and removing hardware
 - Configuration
 - Cabling, wiring, DIP switches, etc.
- Device driver installation
- System configuration and settings
- User notification and documentation

Data Backups

- Perhaps most important aspect!
- Disk and backup media capacity planning
- Performance, network and system impact
- Disaster recovery
 - Onsite/Offsite
 - Periodic testing
 - Multiple copies
- User communication
 - Schedules, restore guarantees and procedures, loss tolerance

Software Installation/Maintenance

- Evaluation of software
- Downloading and building (compiling)
- Installation
- Maintenance of multiple versions
- Security
- Patches and updates
- User notification, documentation

System Monitoring

- Hardware and services functioning and operational
- Capacity
 - Disk, RAM, CPU, network
- Security
 - Passwords
 - Break-ins
- System logs
 - Examination
 - Periodic rotation and truncation

Troubleshooting

- Problem discovery, diagnosis, and resolution
 - Root cause analysis
 - Often quite difficult!
- Often requires
 - Broad and thorough system knowledge
 - Outside experts
 - Luck
- Expediency

Local Documentation

- Administrative policies and procedures
 - Backup media locations
 - Hardware
 - Location
 - Description, configuration, connections
 - Software
 - Install media (or download location)
 - Installation, build, and configuration details
 - Patches installed
- Acceptable use policies

Security Concerns

- System logging and audit facilities
 - Evaluation and implementation
 - Monitoring and analysis
 - Traps, auditing and monitoring programs
- Unexpected or unauthorized use detection
- Monitoring of security advisories
 - Security holes and weaknesses
 - Live exploits

User Assistance

- Time intensive!
- Techniques
 - Help desks
 - Trouble-ticket systems
- Software availability and usage
- Software configuration settings
- Hardware usage, maintenance, and troubleshooting
- Writing FAQs

Administration Challenges

- Need
 - Broad knowledge of hardware and software
 - To balance conflicting requirements
 - Short-term vs. long-term needs
 - End-user vs. organizational requirements
 - Service provider vs. police model
 - To work well and efficiently under pressure
 - 24x7 availability
 - Flexibility, tolerance, and patience
 - Good communication skills
- People think of sysadmins only when things don't work!

Why (Red Hat/Fedora) Linux?

- Need to use some OS to make ideas concrete
- Really only two choices:
 - Windows (I'm not qualified)
 - UNIX (and UNIX-like OSes such as Linux)
- Both are useful and common in the real world
- Linux is popular, free, and usable on personal machines, but also handles large-scale services
- Red Hat/Fedora is relatively polished, popular
 - I've been using it since ~1996
 - There are, of course, many alternatives

What is Linux?

much is courtesy of www.kernel.org

- Linux is a clone of the operating system Unix, written by a loosely-knit team of hackers across the Net. It aims towards POSIX and [Single UNIX Specification](#) compliance.
- Like any modern fully-fledged Unix, Linux includes true multitasking, virtual memory, shared libraries, demand loading, shared copy-on-write executables, proper memory management, and TCP/IP networking.
- Linux really refers to the kernel – most of the commands that you are familiar with are really separate programs, not specific to Linux, and often are part of the Free Software Foundation's GNU project.
- Linux was first developed for 32-bit x86-based PCs (386 or higher). These days it also runs on the [Compaq Alpha AXP](#), Sun [SPARC](#) and [UltraSPARC](#), [Motorola 68000](#), [PowerPC](#), [PowerPC64](#), [ARM](#), [IBM S/390](#), [MIPS](#), [HP PA-RISC](#), [Intel IA-64](#), [DEC VAX](#), [AMD x86-64](#) and more.
- Linux is easily ported to most general-purpose 32- or 64-bit architectures as long as they have a paged memory management unit (PMMU) and a port of the [GNU C compiler \(gcc\)](#).

Brief history of UNIX

- Originated as a research project in 1969 at AT&T Bell Labs
 - Made available to universities (free) in 1976
- Berkeley UNIX started in 1977 when UCB licensed code from AT&T.
- Berkeley Software Distribution started in 1977 with 1BSD, and ended in 1993 with 4.4BSD
- Licensing costs from AT&T increased, so Berkeley attempted to remove AT&T code, but ran out of funds before completion.
- Final release of AT&T-free code called 4.4BSD-Lite.
 - Most current BSD distributions (FreeBSD, NetBSD, OpenBSD) are derived from 4.4BSD-Lite.
- Most commercial versions of UNIX (Solaris, HP-UX, IRIX) are derived from the AT&T code

Brief history of Linux

- Created as a personal project (and still controlled) by Linux Torvalds, a Finnish graduate student, in 1991
- Conceived as an offshoot of Minix (a model OS)
 - Not derived from AT&T or BSD UNIX
- Red Hat (one of many Linux vendors) founded in 1993
- Kernel v1.0 released 1994
- Most recent kernel release is 2.6.23

Where to get answers

- Linux/UNIX documentation can be found in many places
 - Manual pages (man pages, using man command)
 - Texinfo documents (read with info command)
 - HOWTOs – focused descriptions of a topic
 - Distribution-specific documentation
 - Your favorite Web search engine
 - Will typically find online versions of the above

man pages

- Usually my first resource
- Provide OS installation-specific information
- Man pages document (almost) every command, driver, file format, and library routine
- “man -k topic” will list all man pages that use topic
- Parameters are not the same for every UNIX, e.g.:
 - Linux: man 4 tty
 - Solaris: man -s4 tty

man page organization

- Man pages are divided into sections (somewhat Linux specific)
 - 1: User-level commands and applications
 - 2: System calls and kernel error codes
 - 3: Library calls
 - 4: Device drivers
 - 5: Standard file formats
 - 6: Games and demonstrations
 - 7: Miscellaneous files and documents
 - 8: System administration commands
 - 9: Obscure kernel specs and interfaces
- Some sections are subdivided
 - 3M contains pages for math library
 - Section “h” often contains subcommands (such as bash built-in cmds)
- Sections 6 and 9 are typically empty

Where do we go from here?

- In this course, I'll assign homework projects that require root access on a RHEL/CentOS 5 system.
- In our first lab, you will be provided with a hard drive that can be used in the Sandbox lab (PL112) with the OS, and root privileges so that you will administer it.
- In addition, you can (and should) use
 - the department Suns for most things
 - A CentOS 5 system (on the CSE network) called `edgar.cse.lehigh.edu` to explore a minimal working system
- See course web page for syllabus and schedule for topics and readings.