

System Administration for Beginners

Week 2 Notes

February 6, 2007

1 Announcements

1. You should have obtained an OCF account. If there were issues obtaining one, please see one of us after class. It will take approximately a week for the account to be activated; as long as the process has been started you should be fine.
2. We didn't receive Homework #1 in an email from everyone last week; this is important as we will use this to determine enrollment. Please try to send us the information as soon as possible. If you're joining us for the first time, please fill out the course survey.
3. The system (or lack thereof) of homework and lab submissions is a bit flawed; we are working on a system that will allow easier web submissions to keep track of what was submitted and so on.
4. The final project, some homework and labs will be done in groups of three. You'll need to have a group finalized by week 4, so get to know your classmates and figure out who you would like to work with.
5. Lecture notes, lab assignments, and other handouts will be up to you to print out on your own. We will be handing out Instructional EECS (*inst*) accounts to log on to the machines in Soda Hall and to print out course materials.

2 Pre-Lecture

1. Distribution of inst accounts.
2. Explanation of account types:

inst: These accounts, provided by the EECS department, are used primarily for logging into the Solaris machines located in Soda Hall. For the first few weeks of class, you will be using these accounts as a means to work on laboratory and homework assignments as well as logging into the workstations during class.

OCF: This is a supplementary account that will be used throughout the class. Most system administrators manage servers remotely over the Internet rather than being physically in front of the machine they are working on. Having a ‘remote’ account will help familiarize yourself in the same way that system administrators do.

project: The account you will be using for most of the course. Each project group will be granted their own ‘virtual’ server on which they will have complete control, like real-life system administrators. Unlike your OCF and inst accounts, which are limited by nature, you will be able to do practically anything on these GNU/Linux based accounts.

3. Homework and Laboratory Guidelines
4. Getting started with the Sun Workstations

3 Lecture: Introduction to UNIX

3.1 What is UNIX?

UNIX was an operating system that was designed in the 60’s at Bell Labs by a group of AT&T employees. It is in the same category as other operating systems as Microsoft Windows and Mac OS X. UNIX, however, is not a Windows or Mac OS X ‘clone’. In fact, Mac OS X is actually derived from a UNIX-like implementation called Berkeley Software Distribution (BSD).

UNIX turned out to be quite popular because it was well-designed and could be ported to various platforms, or different types of servers. It also had a set of very innovative features that no other operating system had at the time.

Unfortunately, UNIX was proprietary. It was like Microsoft Windows today, you had to buy a license to use (not own) the software, and you couldn’t modify the software. As a result, companies and universities began making UNIX-clones.

Eventually there were so many different clones that the name UNIX no longer applied to a single operating system, but to a category of operating systems. All the clones got together and decided to make a standard for UNIX compatibility called POSIX. The advantage of this standardization was that anything written for one clone that followed this standard could be used on another UNIX clone without too much work.

3.2 UNIX Variants – Solaris, BSD, Linux

From the mass of UNIX clones, the most popular and available ones now is Solaris, BSD, Windows, Mac OS, and Linux. Windows and Mac OS follow the UNIX’s proprietary operating type. Solaris until recently, was proprietary but in recent years, they have been heading towards becoming a free software.

3.2.1 Solaris

Solaris is one of the original versions of UNIX, and it has been proven to be a reliable and a powerful operating system for many companies today. Administrators of the Solaris operating system are the highest paid administrators in industry.

3.2.2 BSD

BSD is the Berkeley Software Distribution, and was developed here at UC Berkeley in the 1970s. BSD's main benefit is that it is completely free, in both senses of the word; there is no license fee, and you can modify and redistribute it with little restrictions. In fact, some Microsoft and Mac OS X can trace parts of their software to BSD. Lately though BSD's popularity has been falling to a new free software called Linux.

3.2.3 GNU and Linux

Linux is a pseudo-UNIX clone written by a Finnish student by the name of Linux Torvalds (hence the name), and has been rising in popularity in recent years. It departs from traditional UNIX design in many areas and has acquired a rapidly growing community of users and contributors. Like BSD, Linux is free to everyone, and anybody can modify it according to their needs (licensing, however, differs from distribution to distribution). You now find Linux in all sorts of devices, like PDAs, cell-phones, and routers. However, Linux generally sacrifices stability for flexibility, and, as a result, is not viewed as a very reliable UNIX platform (compared to Solaris). Nevertheless, Linux is favored by computer scientists and system administrators because of its rapid development and bleeding-edge (i.e., very up-to-date) feature set.

3.3 Why Use UNIX?

Superficially, UNIX isn't too different from Microsoft Windows or Mac OS X. Most UNIX clones have Graphical User Interfaces (GUI), and doing tasks like writing email or documents, browsing the internet, and chatting on instant messenger have little difference across operating systems.

Technically speaking, UNIX offers many advantages over Windows and OS X in regards to operating as a server, since UNIX was designed from the beginning to be used as a server operating system: some of its features aren't as friendly to a person new to the UNIX operating systems. It was designed with the system administrator in mind instead of the end-user. Things like the command line, and the sometimes lack of the familiar features that Windows and Mac OS X offer aren't always available in the same manner in UNIX.

Practically UNIX is preferred by many users because its features allow it to be more secure, stable and faster than Windows or OS X as a server. User control in UNIX is fine grained, to such a point that you can specify exactly what a user can and can't do, unlike in OS X and Windows where there are

generic and less-specific settings for users. Upgrades in UNIX systems do not require reboots; in fact, it is not uncommon for a UNIX system to be running for years. Depending upon the application, UNIX is also many times faster.

3.4 Why not to Use UNIX?

- If you depend on software that runs only on Windows or Mac OS X. Gamers and graphic artists are almost limited to these operating systems for their needs.
- Your hardware is not supported. Microsoft Windows is the world's most popular operating system, companies tend to design drivers for only Windows. However, in recent years with the rise of personal UNIX systems many companies have begun to provide drivers for UNIX. If not, there is a large user-driven community out there that will write drivers for your hardware.
- You don't like the command-line.

3.5 Terminal & Shell

The terminal is a tool for entering data into and displaying data from a computer. For now, its main purpose will be to feed your commands to the shell. There are multiple terminals available – older terminals featured a monitor and keyboard that would allow you to interact with a mainframe that was not necessarily in front of you. Current terminals are computer programs (there are terminals developed for almost any operating system) that provide access to other programs. There are different terminals with many features, but they practically work all in the same way.

We won't be using the GUI in this course, not if we can help it at least. A system administrator is most likely to work on the server remotely, and even when they aren't working remotely they will end up using a simple command line. A text-based interface is the most efficient way of working remotely, and also it provides to be less of a distraction when a system administrator is working. In the world of UNIX anything that you want to do can be done on the command line.

The terminal allows us to access the computer, but requires another program to process commands. The shell is a computer program that takes your commands, sends it to the operating system which it will then process and execute. Like terminals, shells come in different variations and feature sets. The two most popular shells are `tcsh` and `bash`. `Tcsh` is the default shell on Solaris and BSD systems while `bash` is the default shell for Linux. You are welcome to choose which shell to use; you can always run a different shell in a shell by typing in the name of the shell you would like to use.

3.6 Basic Commands

NOTE: The commands you will be learning today deal with the Solaris version. There is a slightly different form of syntax in commands between Solaris and Linux, so if any command you use does not work as expected (regardless of which version you are working with), check the documentation. In the end, knowing the syntax of both versions is to your advantage as you will be able to work on either system, a skill-set that is in high demand in mixed-environments.

3.6.1 Documentation and Help

Commands: man, apropos, info

Google as a way of life - online documentation - mailing lists - books

3.6.2 File and Directory Manipulation

Commands: ls, cd, chmod, chown, chgrp, mkdir, rm, rmdir, touch, file, du, cp, pwd, less, more, cat

the UNIX file system - case-sensitivity - lack of file extensions - tab-completion
- directories and devices as files - owners and permissions

3.6.3 Process Control

Commands: ps, kill, pkill

process ID (PID) - process owner - signals

3.6.4 Text Editors

Commands: emacs, vim, pico, nano

the plaintext file

3.6.5 Network Utilities

Commands: wget, links

the command-line interface

4 Extra Resources

- See the 'Resources' link on the DeCal webpage.
- <http://docs.linux.com/search.pl?tid=89> - Some fun guides to familiarize yourself with the command line (scroll to the bottom and start with the first article).