

CSE 390a Lecture 1

introduction to Linux/Unix environment

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<http://www.cs.washington.edu/390a/>

Lecture summary

- Course introduction and syllabus
- Unix and Linux operating system
- Introduction to Bash shell

Course Staff

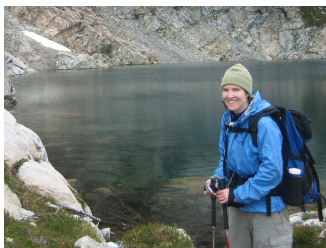
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 - Office hours: TBA, CSE 360

Course Introduction

- CSE390a
 - Collection of tools and topics not specifically addressed in other courses that CSE majors should know
 - *nix command line interface (CLI), Shell scripting, compilation tools (makefiles), version control...
 - Credit / No Credit course, determined by short weekly assignments and a "final" assignment

Bring to Class next week:

- Name
- Email address
- Year (1,2,3,4)
- Major
- Hometown
- Interesting Fact or what I did over break.



Operating systems

- What is an OS? Why have one?
- What is a Kernel?

Operating systems

- **operating system:** Manages activities and resources of a computer.
 - software that acts as an interface between hardware and user
 - provides a layer of abstraction for application developers
- **features provided by an operating system:**
 - ability to execute programs (and multi-tasking)
 - memory management (and virtual memory)
 - file systems, disk and network access
 - an interface to communicate with hardware
 - a user interface (often graphical)
- **kernel:** The lowest-level core of an operating system.

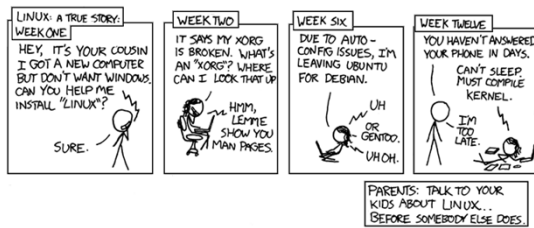


Unix

- **brief history:**
 - Multics (1964) for mainframes
 - Unix (1969)
 - K&R
 - Linus Torvalds and Linux (1992)
- **key Unix ideas:**
 - written in a high-level language (C)
 - virtual memory
 - hierarchical file system; "everything" is a file
 - lots of small programs that work together to solve larger problems
 - security, users, access, and groups
 - human-readable documentation included



On to Linux



Courtesy XKCD.com

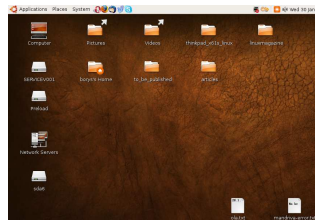
Linux

- **Linux:** A kernel for a Unix-like operating system.
 - commonly seen/used today in servers, mobile/embedded devices, ...
- **GNU:** A "free software" implementation of many Unix-like tools
 - many GNU tools are distributed with the Linux kernel
- **distribution:** A pre-packaged set of Linux software.
 - examples: Ubuntu, Fedora
- **key features of Linux:**
 - **open source software:** source can be downloaded
 - free to use
 - constantly being improved/updated by the community



Features of Linux

- X-windows
- window managers
- desktop environments
 - Gnome
 - KDE
- How can I try out Linux?
 - CSE basement labs
 - at home (install Linux via Live CD, virtual machine, etc.)
 - at tu shared server
- The Linux help philosophy: "RTFM" (Read the F***ing Manual)



Exercises

- Install Linux and boot it up successfully.
- Load the course web site in Linux.
- Install a new game on Linux and play it.
- Get Linux to play an MP3.

Shell

- **shell**: An interactive program that uses user input to manage the execution of other programs.
 - `bash` : the default shell program on most Linux/Unix systems
- Why should I learn to use a shell when GUIs exist?

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Shell

- **shell**: An interactive program that uses user input to manage the execution of other programs.
 - `bash` : the default shell program on most Linux/Unix systems
- Why should I learn to use a shell when GUIs exist?
 - faster
 - work remotely
 - programmable
 - customizable
 - repeatable

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Shell commands

command	description
<code>exit</code>	logs out of the shell
<code>ls</code>	lists files in a directory
<code>pwd</code>	outputs the current working directory
<code>cd</code>	changes the working directory
<code>man</code>	brings up the manual for a command

```
$ pwd
/homes/iws/dravir
$ cd CSE390
$ ls
file1.txt file2.txt
$ ls -l
-rw-r--r-- 1 dravir vgrad_cs 0 2010-03-29 17:45 file1.txt
-rw-r--r-- 1 dravir vgrad_cs 0 2010-03-29 17:45 file2.txt
$ cd ..
$ man ls
$ exit
```

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Relative directories

directory	description
<code>.</code>	the directory you are in ("working directory")
<code>..</code>	the parent of the working directory (<code>../..</code> is grandparent, etc.)
<code>~</code>	your home directory (on many systems, this is <code>/home/username</code>)
<code>~username</code>	<code>username</code> 's home directory
<code>~/Desktop</code>	your desktop

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Directory commands

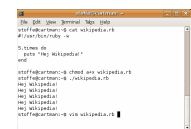
command	description
<code>ls</code>	list files in a directory
<code>pwd</code>	output the current working directory
<code>cd</code>	change the working directory
<code>mkdir</code>	create a new directory
<code>rmdir</code>	delete a directory (must be empty)

- some commands (`cd`, `exit`) are part of the shell ("builtins")
- others (`ls`, `mkdir`) are separate programs the shell runs

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Shell commands

- many accept **arguments** or **parameters**
 - example: `cp` (copy) accepts a source and destination file path
- a program uses 3 streams of information:
 - `stdin`, `stdout`, `stderr` (standard in, out, error)
- **input**: comes from user's keyboard
- **output**: goes to console
- **errors** can also be printed (by default, sent to console like output)
- parameters vs. input
 - *parameters*: before Enter is pressed; sent in by shell
 - *input*: after Enter is pressed; sent in by user



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Command-line arguments

- most options are a - followed by a letter such as -c
 - some are longer words preceded by two - signs, such as --count
- options can be combined: `ls -l -a -r` can be `ls -lar`
- many programs accept a --help or -help option to give more information about that command (in addition to man pages)
 - or if you run the program with no arguments, it may print help info
- for many commands that accept a file name argument, if you omit the parameter, it will read from standard input (your keyboard)

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Shell/system commands

command	description
<code>man</code> or <code>info</code>	get help on a command
<code>clear</code>	clears out the output from the console
<code>exit</code>	exits and logs out of the shell

command	description
<code>date</code>	output the system date
<code>cal</code>	output a text calendar
<code>uname</code>	print information about the current system

- "man pages" are a very important way to learn new commands
 - `man ls`
 - `man man`

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File commands

command	description
<code>cp</code>	copy a file
<code>mv</code>	move or rename a file
<code>rm</code>	delete a file
<code>touch</code>	create a new empty file, or update its last-modified time stamp

- caution: the above commands do not prompt for confirmation
 - easy to overwrite/delete a file; this setting can be overridden (how?)
- *Exercise* : Given several albums of .mp3 files all in one folder, move them into separate folders by artist.
- *Exercise* : Modify a .java file to make it seem as though you finished writing it on Dec 28 at 4:56am.

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