
CSE 390a

Lecture 1

introduction to Linux/Unix environment

slides created by Marty Stepp, modified by Jessica Miller & Ruth Anderson

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

Lecture summary

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

Course Staff

- Me:
 - Ruth Anderson, rea@cs
 - Office hours: Mon 2:30-3:30pm, Tues 10:00-11:00am, 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.

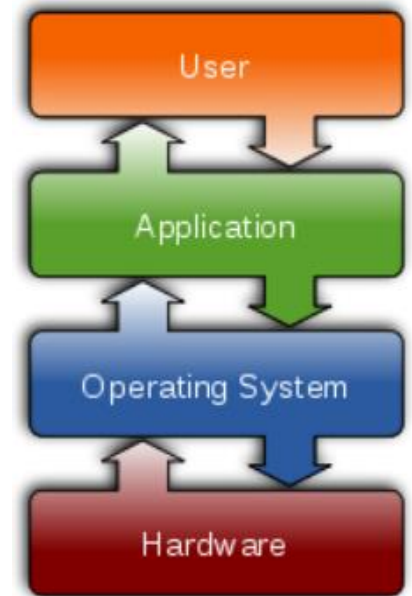


Operating systems

- 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.



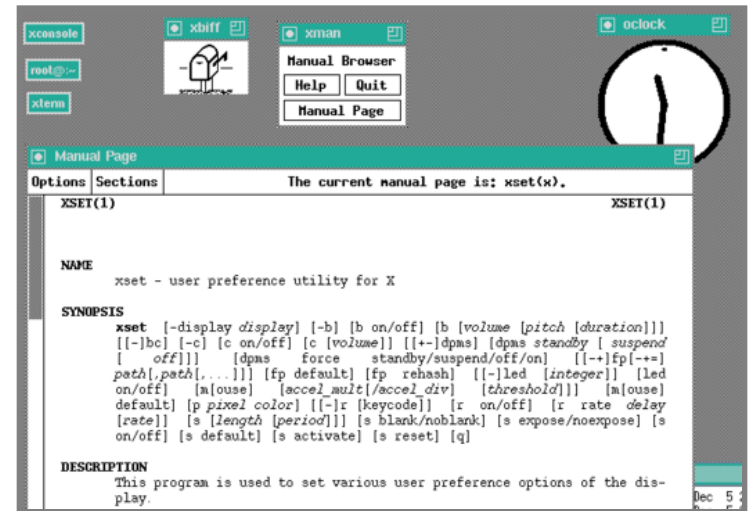
Unix

- 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



The screenshot shows a window titled "Manual Page" displaying the manual for the 'xset' utility. The window has a title bar with "xconsole", "xbiff", "xman", and "oclock". Below the title bar is a "Manual Browser" window with "Help", "Quit", and "Manual Page" buttons. The main window content includes a table with "Options" and "Sections" columns, and a text area showing the manual text for 'xset(1)'. The text includes the name, synopsis, and description of the utility.

```
xset(1)                                XSET(1)

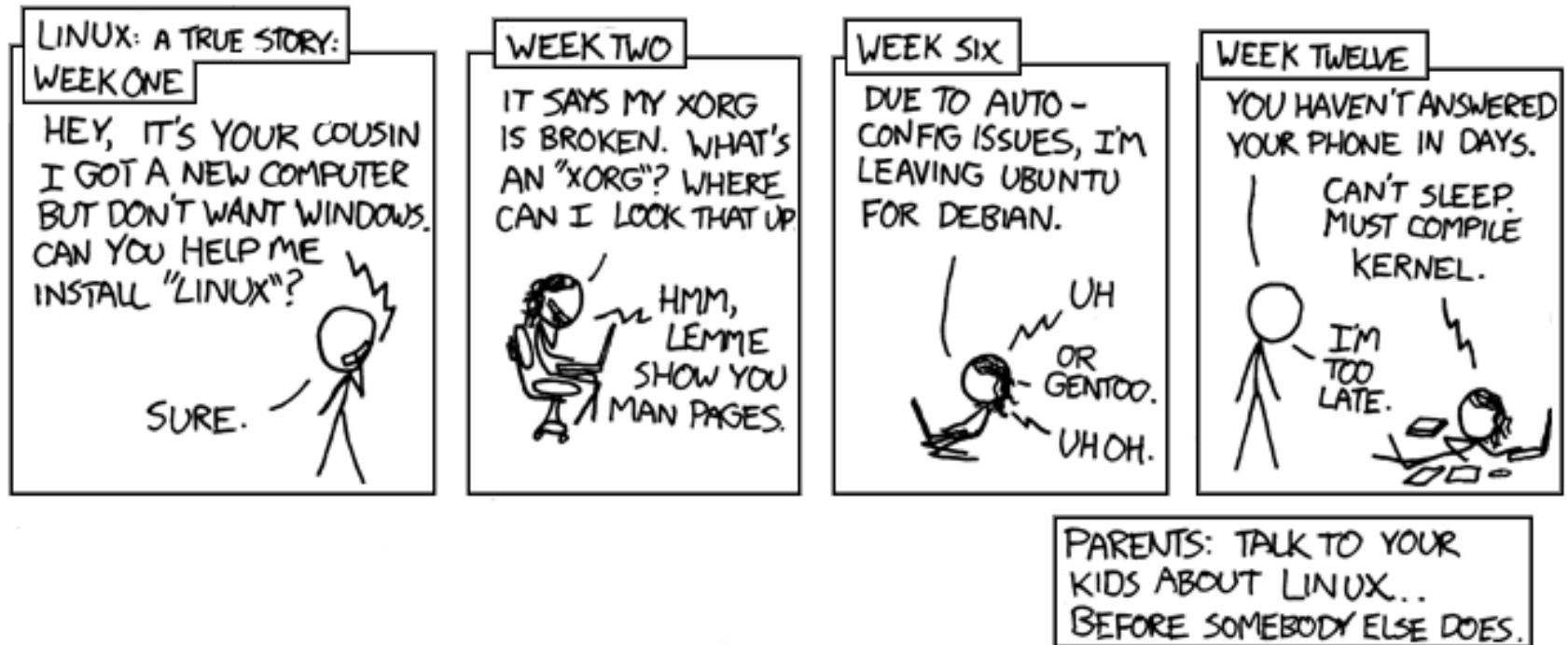
NAME
    xset - user preference utility for X

SYNOPSIS
    xset [-display display] [-b] [b on/off] [b [volume [pitch [duration]]]
    [[-]bc] [-c] [c on/off] [c [volume]] [[+]-dpms] [dpms standby [suspend
    [ off]]] [dpms force standby/suspend/off/on] [[-+]fp[+]=]
    path[,path,...]]] [fp default] [fp rehash] [[-]led [integer]] [led
    on/off] [m[ouse] [accel_mult[/accel_div] [threshold]]] [m[ouse]
    default] [p [pixel color] [[-]r [keycode]] [r on/off] [r rate delay
    [rate]] [s [length [period]]] [s blank/noblank] [s expose/noexpose] [s
    on/off] [s default] [s activate] [s reset] [q]

DESCRIPTION
    This program is used to set various user preference options of the dis-
    play.

Dec 5 1992
```


On to Linux



Courtesy XKCD.com

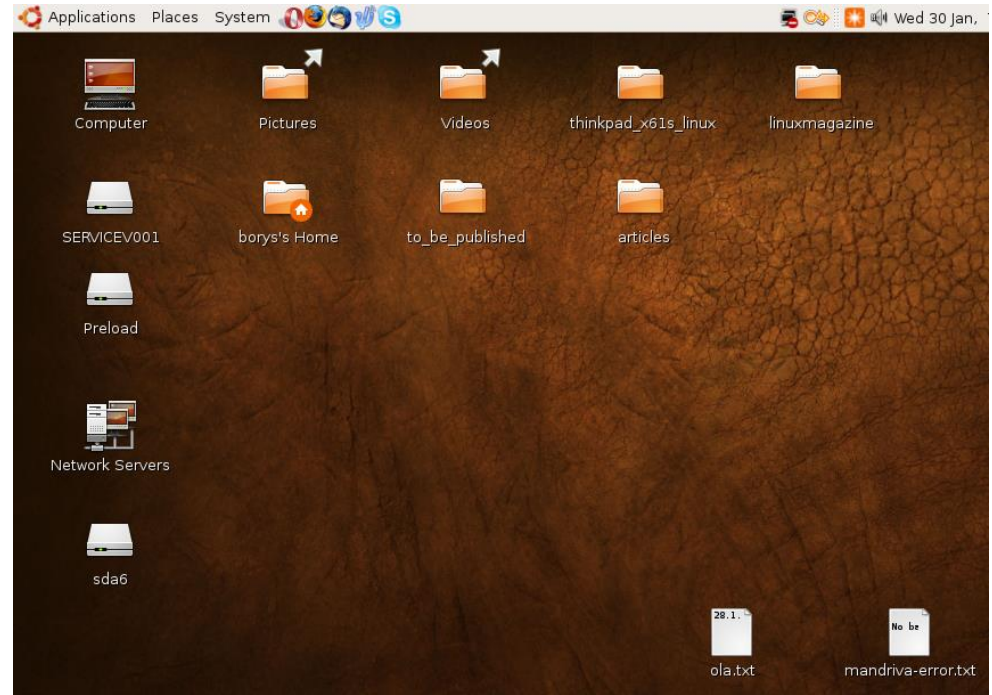
Linux

- **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



Linux Desktop

- 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.)
 - attu shared server
- The Linux help philosophy: "RTFM" (Read the F***ing Manual)



Things you can do in Linux

- Load the course web site in a browser
- Install and play games
- Play MP3s
- Edit photos
- IM, Skype

Shell

- **shell**: An interactive program that uses user input to manage the execution of other programs.
 - A command processor, typically runs in a text window.
 - User types commands, the shell runs the commands
 - Several different shell programs exist:
 - bash : the default shell program on most Linux/Unix systems
 - We will use bash
 - Other shells: Bourne, csh, tsch
- Why should I learn to use a shell when GUIs exist?

Why use a shell?

- Why should I learn to use a shell when GUIs exist?
 - faster
 - work remotely
 - programmable
 - customizable
 - repeatable

Shell commands

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

```
$ pwd
/homes/iws/rea
$ cd CSE390
$ ls
file1.txt file2.txt
$ ls -l
-rw-r--r-- 1 rea    fac_cs 0 2012-03-29 17:45 file1.txt
-rw-r--r-- 1 rea    fac_cs 0 2012-03-29 17:45 file2.txt
$ cd ..
$ man ls
$ exit
```

Relative directories

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

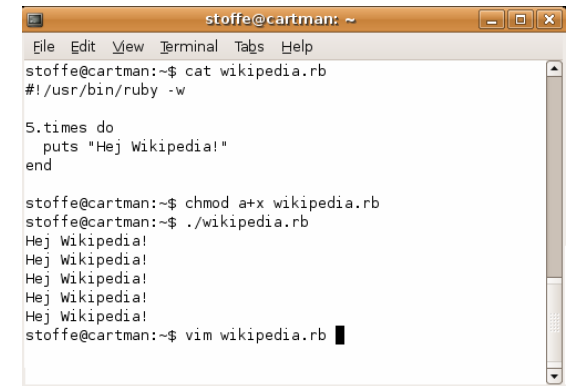
Directory commands

| 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

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



```
stoffe@cartman: ~  
File Edit View Terminal Tabs Help  
stoffe@cartman:~$ cat wikipedia.rb  
#!/usr/bin/ruby -w  
  
5.times do  
  puts "Hej Wikipedia!"  
end  
  
stoffe@cartman:~$ chmod a+x wikipedia.rb  
stoffe@cartman:~$ ./wikipedia.rb  
Hej Wikipedia!  
Hej Wikipedia!  
Hej Wikipedia!  
Hej Wikipedia!  
Hej Wikipedia!  
stoffe@cartman:~$ vim wikipedia.rb
```

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)

Shell/system commands

| command | description |
|-------------|--|
| man or info | get help on a command |
| clear | clears out the output from the console |
| exit | exits and logs out of the shell |

| command | description |
|---------|--|
| date | output the system date |
| cal | output a text calendar |
| uname | print information about the current system |

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

File commands

| command | description |
|---------|--|
| cp | copy a file |
| mv | move or rename a file |
| rm | delete a file |
| touch | 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.

Exercise Solutions

- caution: the `cp`, `rm`, `mv` commands do not prompt for confirmation
 - easy to overwrite/delete a file; this setting can be overridden (how?)
 - Use “-i” with the command, “interactive” to prompt before overwrite
- *Exercise* : Given several albums of `.mp3` files all in one folder, move them into separate folders by artist.
 - `mkdir U2`
 - `mkdir PSY`
 - `mkdir JustinBieber`
 - `mv GangnamStyle.mp3 PSY/`
 - `mv Pride.mp3 U2/`
- *Exercise* : Modify a `.java` file to make it seem as though you finished writing it on Dec 28 at 4:56am.
 - `touch -t 201212280456 Hello.java`