

Slide 1

Administrivia

- Homework 9, due next Wednesday: Work through another editor tutorial and tell me what you learned.
- Homework 10, due next Wednesday: Talk about what you learned in the class, what could be better/different if the course is taught again, etc. (Sort of a long version of a minute essay.)
- Estimated grade based on attendance and homeworks 1 through 5 mailed today. Better estimate (up through homework 8) coming by end of week. Curve unlikely — more than half the class had over 90%!
- If you aren't happy with your likely grade, you can earn up to 30 points of extra credit by doing some extra work. This could be a shell-scripting project, a makefile project, etc. If you want to do this, talk to me by e-mail or in person.

Slide 2

A Little About X (“The X Window System”) — Basic Ideas

- Some operating systems include GUI support in the “kernel”. Unix takes a different, layered approach. Slower, but safer and more flexible.
- Basic idea — separate processing from GUI and allow them to be on the same computer or different computers:
 - X “client(s)” are programs that want to do GUI input/output — e.g., Mozilla, gv, etc.
 - X “server” manages display, accepts input. Can be a process running alongside clients, or a whole operating system (for an “X terminal”), or an application running on a different operating system (“X server/emulator for Windows”).
- X defines protocol for client/server communication.

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A Little About X — Application Programs

- How to write a program with a GUI? Can make calls to X library functions directly — set up window(s), main processing loop to handle “events”. (Example.)
- Or can use a higher-level “widget set” (buttons, menus, etc.): Motif, GTK, etc. (Why several? Well, this is Unix.)

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A Little About X — User Interface

- Separate “window manager” controls how user interacts with windows — how they’re arranged on the screen, how the user moves them around, etc. Examples include `twm`, `fvwm`, Window Maker. (Why several? You know.) `switchdesk` provides limited ability to change window manager. To tweak further, edit appropriate dot-something files in home directory.
- In addition, can have a “desktop environment” that provides additional features. Examples include CDE (Sun), KDE, Gnome. Desktop environments provide something that looks more like Mac/Windows interface, but at a performance cost.
- A somewhat (but not very) extreme view: “A window manager is a mechanism for managing xterms.”

A Little About X — Tips and Tricks

Slide 5

- To copy and paste text — highlight with left mouse button, paste with middle mouse button. Works with all “standard” X applications.
- Can start a second X server on Linux machines via:

```
X :1 -query machine -once
```

Switch back and forth with control-alt-F7/F8.
- RH 9 lab machines set up now so that when you `ssh` to another machine and run an X-using application, it automagically displays on your screen. Formerly, you had to set the `DISPLAY` environment variable and export it.

Course Wrap-Up — What I Hope You Got From This Class

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- More things in your “bag of tricks” (see next slide).
- Practice in reading man pages and otherwise learning more.
- Exposure to a different operating system / user interface paradigm — many small programs that work together, information kept in text files, emphasis on being expert-friendly and scriptable, etc.

Course Wrap-Up — Topics

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- Shell features — command history, redirecting input and output, scripting features (if/then/else and loops).
- Pipes.
- Filter programs (`awk`, `sed`, `grep`, etc.).
- Text editors.
- \LaTeX .
- `make` and makefiles.
- Regular expressions (for text editing, `grep`, etc.).

Minute Essay

Slide 8

- Reminder: Homework 8 due by 5pm today.