



UNIX window systems

CS 2204

Class meeting 12



Why window systems?

- Increased usability due to
 - Visibility
 - Graphical representation of programs
 - See multiple environments at once
 - Direct manipulation
 - “Knowledge in the world”
- Enables powerful graphics programs



Window systems and UNIX

- Most UNIX users can be considered experts, and are fiercely protective of the command line (for good reason)
- However, all current UNIX systems have a built-in window system - the advantages are inescapable



X Windows

- Practically all UNIX window systems are based on X Windows
- The standard version is called X11
- Very complex system with many parts
- Basically, X11:
 - Manages the screen space
 - Draws simple graphics
 - Assigns rectangular regions to various programs



X's client-server architecture

- X is actually meant to work over the network
- X server: software that runs on the machine where the program's output will be displayed
- X client: program running on the same or another machine
- Client sends drawing and other X commands to the server, which displays the results



Historical use of X

- Users sat at “X terminals” - graphical terminals that only knew how to run an X server
- They logged in to other UNIX machines remotely and ran X clients there
- This gave users the benefits of a window system without the need for a full-featured computer on every desk



Features of X

- Transparent remote execution
- Gives programs their own virtual screen
- Includes important windowing concepts:
 - Window damage
 - Window reveal events
 - Backing store
- X11 programs are highly portable



Window managers

- Not part of X11 itself
- Run on top of X11
- Place borders, decorations on windows
- Handle input from users
- There are many, many choices with different “look & feel”



Desktop environments

- Yet another layer, running on top of window managers
- Complete the desktop metaphor with:
 - Iconic access to files and directories
 - Overall system menus / toolbars
 - Trash can
 - etc.
- GNOME is one example



Fun examples

- Xtools on Mac OSX
- Rooted vs. rootless mode
- Various window managers
- Running an X client remotely
- Virtual X terminal