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What is X?

X is a “windowing” system used on Unix and Linux systems to provide a graphical environment. Windows subdivide the display screen; each represents an input/output stream between processor and display, and each may be used to run a particular program. Windows may overlap in a stack, and you may move from window to window as needed. Thus, you can use several different programs simultaneously and see the output on your screen in separate windows as if each were a separate terminal.

X supports text and graphics operations on both monochrome and color displays. X is also device-independent: Applications written for X can be displayed on any workstation that runs X. See the UNIX manual entry (type `man X`) for general information on X.

System Components

Servers and Clients

X comprises a server and one or more client processes. A server controls access to a particular display and monitors your use of the keyboard and mouse. Typically, your workstation has only one display and runs only one server. Client programs connect to the server for access to both the display and any keyboard and mouse activity that is meant for the client. For example, if you start a client called `xcalc` (a calculator), it connects to your server to display a calculator on your screen. If you move your mouse so that the cursor is over the calculator, the server sends any mouse clicks or keystrokes to `xcalc` as input.

In the standard SCS environment, an X server for your display is started from your `.login` file. Several X clients are also started automatically: a window manager, a terminal emulator, and a clock. The first two are described below along with a third that is started if you are using a workstation running LINUX.

The window manager

The window manager provides functions that perform operations on windows and icons such as raising, lowering, or moving. If you run X without also running the window manager client, you could have multiple windows; however, you would not be able to move the windows, or “raise” windows obscured by other windows. The default window manager supported by SCS Computing Facilities is **Metacity**.

Terminal Emulators

An Xterm can be easily accessed by right clicking on the desktop and selecting “xterm” from the drop down menu.

Desktop Environments

When X starts on a workstation running a facilitated installation of Red Hat Linux 9 or greater, the GNOME desktop environment will start by default. This “environment” provides for a drag-and-drop capable desktop, a panel that allows you to start programs and display their status and/or output, and a standardized “look and feel” for applications that comply with the standards of the desktop environment.

Resource Database

When you start an X server, it reads the `.xinitrc` file in your home directory. Typically, the first command in this file runs `xrdb`, which creates or modifies the resource database, a data structure internal to the server. This database records your preferences for client programs. These preferences, called resources, specify how an X program should look or behave. For example, you can make sure that `xclock` brings up an analog clock instead of a digital clock whenever you invoke it by specifying the `xclock` resource “analog” in your `.Xdefaults` file. Resources stored in a server are available for all clients connected to that server.

Getting Started

A graphical login screen will appear automatically once Fedora Core 3 is booted. If you are using Red Hat 9, you will need to type `startx`. The Gnome Desktop will then appear. Your home directory contains profile files that initialize your X environment.

If you have a nonstandard “.login” but want to compare it with how the standard login invokes X, we recommend that you look at the following SCS default profile files:

```
/usr/local/lib/profiles/login  
/usr/local/lib/profiles/cshrc
```

If you start X but don't have the files `.xinitrc`, `.Xdefaults`, or `.mwmrc`, they will be created for you. Note, however, that if you do have these files, the system will not automatically replace them with the standard ones. The standard profiles have the following paths:

```
/usr/local/lib/profiles/xinitrc  
/usr/local/lib/profiles/Xdefaults
```

The Default Environment Using GNOME

What is GNOME?

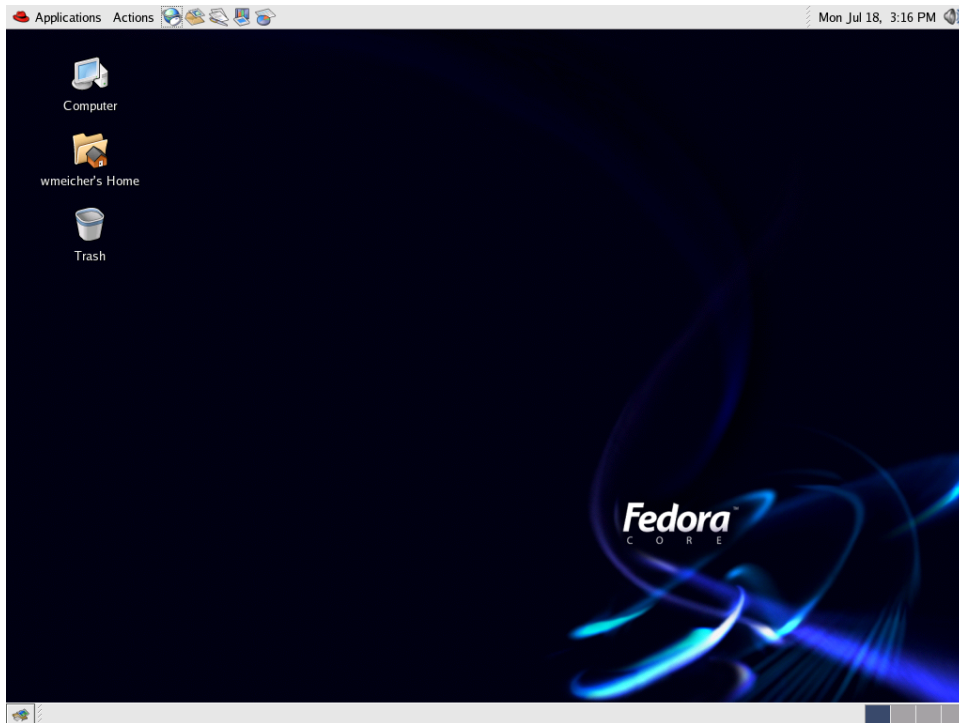
GNOME stands for GNU Network Object Model Environment. It is a desktop environment that helps users configure and use their workstations via a graphical interface. It consists of a number of components:

- The Panel: a combination status bar and application launcher.
- The Desktop: a drag and drop capable background for organizing shortcuts.
- Tools and Applications: a suite of utilities that provide a graphical interface for common applications and customization utilities.

GNOME also includes a set of standards used by programmers to help make the software on your machine cooperate and communicate more easily and effectively with each other.

The Initial Screen Configuration

The illustration below shows a workstation screen running GNOME and the Metacity window manager with the standard configuration. There are two main components to this configuration: the desktop and the panel.



The Desktop

The desktop provides not only a background for your screen but also serves a number of functions that help you to keep your workstation organized and efficient. Due to its drag-and-drop capabilities, the desktop can hold launchers which serve as shortcuts to your most important directories, internet URLs, and applications. The default desktop provides access to your home directory, your floppy drive, your CD-ROM drive, the Red Hat web site and a trash can used to delete unwanted files and shortcuts. To use these launchers, simply double click on them with the left mouse button and the item that the launcher refers to will open.

The desktop also provides you with a number of workspaces that you can use to organize your work. Each workspace is a separate desktop where you can store the various windows that you are using. This feature allows you to create customized workspaces that contain only the windows necessary to complete a given task, without windows from other tasks cluttering your view. You can change between workspaces by clicking on the boxes located in the center of the panel. Each box will take you to a different workspace.

The Panel

The panel is a strip that, by default, sits at the bottom of your desktop. It can hold a number of different components that can make interacting with your workstation faster and easier. The panel is drag-and-drop compliant and is capable of holding a number of different objects, including menus, launchers, applets, and some other special objects. As the principle component of interaction with a GNOME based system, it is important to become familiar with the components of the panel and their various capabilities.

Panel Objects

The panel is capable of housing a wide variety of objects that allow you perform numerous tasks including: launching applications, managing windows and workstations, searching for help and gathering information about the performance of your workstation. These are all accomplished through panel objects which sit inside the panel. There are five principle types of panel objects that perform specific tasks. They are:

- **Menus:** These objects, similar to the start menu in Windows operating systems and the apple menu in Macintosh operating systems present a list of program launchers, special items, applets, and submenus. Menu objects make the task of finding applications and applets easier and faster by allowing you to organize them quickly and simply.
- **Launchers:** Program launchers are panel objects that start a specified program when you click on them. Program launchers can be customized to launch applications with different options enabled or disabled. You can also specify the icon that you would like the launcher to display.
- **Applets:** Applets are special applications made to run within the panel. They can either provide information, entertain, or enhance interactivity. Like all objects in the panel, they can be customized.
- **Drawers:** Drawers are basically panel extensions that allow you to store more objects in the panel than the panel can visibly handle. Drawers, by default, have an icon that looks like a chest of drawers (although you are welcome to change the icon to anything that you like). As extensions of the panel, you can store any object that can operate within the panel inside a drawer. Drawers also can help to organize the panel and make it possible to keep your on-screen workspace simple and organized.
- **Special Objects:** There are a number of special objects that can live in the panel that allow users to perform specific tasks. For example, they can allow you to run programs from a command line dialog box, they can initiate your xScreensaver, or they can log you out of an X-Windows session.

Windows

The window manager, Metacity by default, encapsulates each window inside a frame that contains a number of interactive objects, known as *widgets* that allow you to control the behavior of the window.

The top of the window is called the *titlebar* and contains the window menu button on the left end and three control buttons, similar to those used in Microsoft Windows operating systems to the right that control window positioning. From left to right, they are the minimize button, the maximize button, and the close button. The space in between the menu button and the three control buttons is known as the title area. Around all sides and on all four corners of the window is a border that allows you to resize the window. Moving the mouse to a border will change your pointer to a resize arrow. There is also a scroll bar running down the right side of the window, just inside the border.

Only the active window can receive input from the keyboard and the mouse. Under the default GNOME environment, the title area of the active window is highlighted in a different color than the title area of all other windows on the screen. In order to interact with a window, you should click in it once to activate it.

Working with GNOME

Using Menus

GNOME uses a system of menus to help you control and configure your machine. The most important of these is the **Main Menu**, which in the default environment is the rightmost object in the panel, represented by the RedHat icon. The main menu behaves much like the “start” button in Microsoft Windows operating systems, presenting you with quick access to programs, internet shortcuts, applets, and other tools that allow you to run commands, configure your screen, and log out of the system.

The various submenus within the main menu help to maintain organization among the launchers that are available in the default environment. Initially, you will find the following submenus:

- Accessories, Games, Graphics, Internet, Office, Programming, Sound & Video, and System Tools: which provide access to most of the applications available on your system that have a graphical interface.
- Preferences: gives you fast access to a number of user configuration options.
- System Settings: provides an interface for making system-wide configuration changes. You must be root to use these.
- System Tools: provides access to a number of applications that simplify the administration of your workstation.

In addition to these submenus, the main menu gives you fast access to a number of other tools and functions:

- Help: starts a help browser with information about GNOME.
- Home Folder: displays the contents of your home directory.
- Network Servers: provides access to a number of MS Windows servers on the CS network.
- Run...: opens a single line command prompt, allowing you to enter commands as you would from inside a terminal window.
- Search for Files...: opens a utility for finding files.

- Open Recent: provides access to recently accessed documents.
- Lock Screen: This special menu object starts an xscreensaver which locks your screen. This feature is not supported in our environment for Red Hat 9, you will not be able to unlock your screen with the same userid and password combination that you use to log into your workstation. This feature does work for Fedora Core 3, however, and you simply use your Kerberos password to unlock your screen.
- Log out: is another special menu object that will log you out of your X session. This, in turn, will log you out of your workstation unless you uncomment the `set_no_X` variable in your `.login` file. Doing this will drop you to a console prompt. In this case, you will need to type `logout` to end your session.

In addition to the main menu, each window in GNOME contains a menu. In the default environment, in which GNOME works together with a window manager called Metacity, there will be a window menu button at the upper left corner of every window that has a title bar. Left-clicking on this button displays the window menu. This menu offers the following choices:

- Minimize: removes the window from the desktop. You can retrieve it by clicking on the bar displayed in the center of your panel that corresponds to the minimized window. When minimized, the icon on the left side of this bar will appear to be “greyed-out”.
- Maximize: increases the size of the window to fit the visible size of your display. Only the maximized window and the panel will be visible. You can return the window to normal size by selecting Unmaximize from the menu or by clicking the unmaximize button which is the second from the right in the menu bar of any maximized window.
- Roll Up: hides the contents of a window, displaying only the title bar.
- Move: positions the window according to the position of the cursor.
- Resize: resizes the window.
- Close: closes the window. If the window is the only or final remaining window for an application, that application will exit.
- Put on all workspace: makes the window appear on all virtual desktops.
- Move to...: places the window on a new desktop.

In addition to the main and window menus, there are other menus that are available to you directly from the GNOME desktop. Clicking the right mouse button on the desktop displays a menu that allows you to configure the appearance of the desktop. From here you can create new launchers, organize your desktop and even change the background image.

Customizing Your Environment

There are a number of ways that you can customize your working environment to suit your needs. This chapter describes a number of basic modifications that you can make quickly and easily. Changes in GNOME are generally made through a graphical interface, while changes to X environments are usually made via configuration file modifications.

Customizing Your GNOME Desktop Environment

There are three principal components of the GNOME desktop environment that you can alter to suit your needs: the desktop, the panel, and the main menu. Most of these changes can be made from one of two locations: the GNOME control center and the context menu that appears when you right click on one of the components.

Using the GNOME Control Center

Most configuration changes for GNOME and for the Metacity window manager can be made through the Main Menu. You can find the relevant control panels under the preferences submenu. The various categories of configurable items are:

- About Myself: which customizes personal information.
 - Accessibility: which enables features that assist physically challenged users.
 - Background: which changes the background image.
 - CD Properties: which customizes the system's reaction to the insertion of cds and dvds.
 - File Management: which alters icon look and behavior.
- File Types and Programs: which allows you to associate file extensions with applications.
- Font: which configures default display fonts.
- Handheld PDA: which configures Palm Pilot synchronization.
- Keyboard: which alters keyboard behavior.
- Keyboard Shortcuts: which allows the creation of time-saving hotkeys that perform actions.
- Login Photo: is disabled, because gdm is not supported in our environment.
- Menu and Toolbar: which changes the look and feel of menus and toolbars.
- Mouse: which alters mouse behavior.
- Network Proxy: which allows users to direct network traffic from their workstation through a proxy. A direct connection is the default supported configuration.
- Passwords: is disabled in the SCS environment.
- Preferred Applications: which allows you to specify programs you would like to run by default for certain tasks.
- Screensaver: which configures screensaver module options.
- Sound: which controls audio preferences.

- Theme: which controls the appearance of windows, dialog boxes and warning messages.
- Windows: which configures mouse focus over windows.

More control panels for manipulating the Metacity window manager are available under **More Preferences**. To configure any item, simply choose it from the menu and select the options that you prefer from the choices that appear. **Close** exits the panel, applies your changes and makes them the default for future sessions.

Using Context Menus

You can also make changes to the configuration of your system through the series of context menus that appear when you right click on the desktop, the panel, and on desktop and panel objects.

Desktop Context Menus

By right-clicking on the desktop, it is possible to add new launchers, links to web pages, and shortcuts to directories. It also provides an easy way to organize and tile the icons that are already visible on the desktop.

Adding new items to the desktop: All you need to create new links and launchers is located in the context menu that appears when you right-click on the desktop. To add a link to a directory, select New Launcher. In the dialog box that appears, type the name of the directory, select directory as the type, and click OK. An icon will appear on the desktop that, when opened, will launch the GNOME File Manager to display the contents of the directory you specified. The same process applies to creating a URL link. Simply choose New Launcher from the context menu and select Link as the type in the window that appears. Then, enter the address of the web page you wish to access in the URL field. Once you click on OK, an icon will appear on the desktop that will launch netscape and navigate to the page that you chose.

To create shortcuts to your favorite programs, called launchers, choose New Launcher from the context menu. A window will appear. Enter the name of the launcher, a comment that will appear when you place your mouse pointer over the icon, and the path to the location of the program in the filesystem. Then choose the type of launcher. Typically here you should choose application. If the program that you specified must be run inside a terminal window, click on the check box labeled "Run in Terminal". Finally, choose an icon for your launcher by clicking on the box that by default displays "No Icon". A selection of icons will appear. To pick one, simply double click on it. To create the icon, click OK. To cancel the operation, click on Close

Removing desktop items: To remove items from the desktop, simply drag them to the trash can. You can also right-click on them and choose delete. A dialog box will appear to confirm your decision to delete. Click OK to delete the item.

Panel Context Menu

- Adding items to the panel: The panel can also host launchers. To add a launcher to the panel, right-click anywhere on the panel. In the context menu that appears choose Panel -> Add to panel. In the sub-menu that opens you will see a list of objects that can be added to the panel. Select launcher to create a shortcut icon. This will open the Create Launcher applet described above that will create the launcher for you and place it in the panel.
- The panel can also host a variety of other objects including menus, drawers, applets, and special control buttons. To add one of these objects simply select them from the Panel -> Add to panel submenu that appears when you right-click on the panel. Once you choose one from the sub-menu, it will appear in the panel.
- Moving items in the panel: You can adjust the position of any object in the panel simply by right-clicking on the object and choosing move from the context menu that appears. Your mouse pointer will change to a set of crossed arrows and the movements of the mouse will shift the position of the object that you selected within the panel. Click the left mouse button when you wish to place the object.
- Removing panel items: To remove an object from the panel, right click on it and choose remove from panel. The object will disappear from the panel without confirmation.

Customizing Your X Environment

To understand where to go and what to do to customize your X environment, you should understand how your environment is created. When you log in on your workstation, the system reads your `.cshrc` and `.login` files. The latter normally executes a file called `/usr/local/lib/profiles/login.def`. This file sets paths and environment variables that enable your personal `.login` to start X without any problems.

Your default `.login` file can set the `XVERSION` environment variable and invokes the program `xinit`, which starts `X.xinit` reads a file called `.xinitrc`, which starts the window manager, runs `xrdb` (a program that loads user preferences specified in the file `.Xdefaults` into the resource database), a clock, an `xterm`, and any other applications you specify.

You can change many aspects of the default environment. Some of the more common adaptations are:

- Window size and placement
- Text font
- Background image
- Applications automatically started when X starts, for example, a telnet window or a clock program.
- Other window attributes, such as autoraise, reverse video, window title, and border width.

Mechanisms for Changing the Default Environment

You can change your X environment by:

Using command line switches. Use switches when starting an application from the command line, or put them in your `.xinitrc` file, which contains commands executed during start-up. Changing the `.xinitrc` file, `xinit` reads and executes commands in `.xinitrc` when it starts X. Typically, the window manager, an `xterm` window, and a clock are started in this file. However, you can start many other clients from this file. Storing application resources via `xrdb`. `xrdb` is a program that allows you to store user preferences (called resources) for X programs in a central, server-maintained database. Using resources eliminates the need to specify command line switches every time you start an application.

Customization Examples

This section illustrates a few of the most frequent environment modifications. Program manual pages contain information on program-specific customizations.

Making changes at the command line

You can use command line switches to modify all X applications. This mechanism affects only the current invocation of the application. For example, if you want to bring up a clock from the command line, you could type `xclock &` and the standard clock would appear. You could modify the clock's normal appearance and function by specifying some switches; the following line places a reverse-video digital clock five pixels from the lower right corner:

```
xclock -geometry -5-5 -digital -rv -chime &
```

The clock will chime once on the half hour and twice on the hour.

Find application switches in the manual page for each application. You may notice that many manual pages say their applications "accept all of the standard X Toolkit command line options". You'll find the complete list of these options in the man page `X(1)`, which you can view by entering `man X` at the command prompt. See the following table for some of the more commonly used options.

Starting Applications From Your .xinitrc File

xinit reads the file `.xinitrc` in your home directory when it starts **X**. `.xinitrc` contains applications that you wish to start automatically. The default `.xinitrc` contains lines that start a window manager, a clock, and an **xterm** window. Add to this file any other application that you would like to start at login. You can also change an application's default characteristics. For example, if you want to change the size of an **xterm** window, modify the `-geometry` switch to the line that invokes **xterm**. Or, if you use the **X** calculator often, add the following line to invoke it each time you log in:

```
xcalc -geometry -5-5 &
```

Caution: Be sure to put your personal additions before the command that starts your login **xterm**. If you don't, **xinit** will not reach them and they will never be started. Also, be sure to end each command line with an ampersand (&) so that the command is run in the background. If you don't do this, **X** will wait for the command to finish and won't proceed to the next line in the `.xinitrc` file.

Running X Clients From Foreign Hosts

Glossary

Active window	Window currently accepting keyboard and mouse input. There can be only one active window per screen. Make a window active by placing the mouse pointer in it and clicking the left mouse button.
Click	Press and release a mouse button.
Client	Any application that relies on the X server for IO.
Cut and paste	Select text region and copy it using the mouse.
Double click	Quickly press and release a mouse button twice.
Display	Your workstation's video screen. A workstation may have more than one display. Displays are numbered, starting with 0.
Geometry	Width, height, and position of application window, measured in pixels or characters, depending on what the application expects.
Iconify a window	Reduce a window to a small image called an icon, or to an entry in the icon manager window.
Input	Information given to a program via keyboard or mouse.
Listener	The active window.
Mouse cursor	The symbol in an xterm window that looks like a large capital "I". Its position is controlled using the mouse, and its appearance differs according to the application.
Press	Press down and hold a key or a mouse button.
Release	Release a key or a mouse button.
Resources	Specifications of window appearance or program behavior. The man pages list resources for each X program.
Resource database	Storage place for user preferences. It is accessible to all clients of the X server, regardless of the host machine.
Root window	Large, normally grey window that appears to be under the other windows and that almost covers your screen as X starts.
Scrolling	The process by which text in xterm windows may be moved up and down using scrollbars on the left side of the window.
Terminal emulator	Program such as xterm that behaves like a terminal: accepts text input/ output, mouse clicks, etc.
Titlebar	The horizontal bar at the top of a window.
Window	Visually, a subdivision of your screen. A window may act as a terminal, or display output from a program, such as the window containing the clock. When the mouse cursor is in a window, that window is the

“active” window and receives all keyboard and mouse input; its titlebar is a horizontal grey rectangle.

X Utilities

Short descriptions of many X utilities are listed below. See the corresponding man pages for more details.

Miscellaneous Utilities

- xbiff** Displays a little image of a mailbox: the flag on the mailbox goes up and the mailbox beeps when new mail arrives.
- xcalc** Emulates a TI-30 or an HP-10C calculator.
- xclock** Displays the time in analog or digital form. You may specify how often the time is updated. (See /usr/local/lib/profiles/xinitrc for samples.)
- xinit** Starts the **X** Window System server: normally called from your .login file. (See /usr/local/lib/profiles/login, the standard login file.)
- xpostit** Displays on-screen Post-it® notes. All six sizes of Post-it notes may be displayed, edited, and saved to disk files. Notes may be resized.
- xrefresh** Repaints all or part of your screen: useful when system messages have cluttered your screen.
- xstdcmap** Selectively defines standard colormap properties. It is intended to be run from a user’s **X** startup script to create standard colormap definitions in order to facilitate sharing of scarce colormap resources among clients.
- xterm** Provides DEC VT102 and Tektronix 4014 compatible terminals for programs that can’t use the window system directly.
- xloadimage, xsetbg, xvview** Displays images in an **X11** window or loads them onto the root window. See the manual entry for supported image types.

A variety of image manipulations can be specified, including gamma correction, brightening, clipping, dithering, depth-reduction, rotation, and zooming.
- xv** Displays images in the GIF, PBM, PGM, PPM, **X11** bitmap, JPEG, Sun Rasterfile, and PM formats on 1-, 4-, 6-, 8-, 16-, 24-, and 32-bit **X** displays. **xv** will also read compressed versions of these files.

Adjusting Your X Environment

xset	Sets various user preference options of the display such as: bell volume, key click, font path, mouse tracking, autorepeat, and screen saver parameters.
xsetroot	Tailors the appearance of the background (“root”) window on a workstation display running X .
xmodmap	Configures the keyboard to your personal tastes; usually run from your “.xinitrc” file.
xrdb	Stores preferences about color, fonts, etc. in your X resource database.
xscreensaver	Locks the local X display (and server) until a password is entered.
xmag	Magnifies portions of the screen.
xkill	Kills a client by its X resource: forces the X server to close connections to clients. (Dangerous, but useful for aborting programs.)

Cut Buffer and Clipboard

xclipboard	Collects and displays text selections that are sent to the <i>clipboard</i> by other clients. It is typically used to save clipboard selections for later use. It stores each clipboard selection as a separate string, each of which can be selected.
xcutsel	Copies the current selection into a cut buffer and makes a selection that contains the current contents of the cut buffer. It acts as a bridge between applications that don’t support selections and those that do.

X Window “dumps”

- xwd** Stores a window images in a specially formatted dump file. This file can then be read by various other **X** utilities for redisplay, printing, editing, formatting, archiving, image processing, etc.
- xwud** Displays (in a window) an image saved in a specially formatted dump file, such as produced by **xwd(1)**.
- xpr** Formats a window dump file (as produced by **xwd(1)**) for output on PostScript printers, the Digital LN03 or LA100, the IBM PP3812 page printer, the HP LaserJet (or other PCL printers), or the HP PaintJet.
- xdpr** Uses the commands **xwd(1)**, **xpr(1)**, and **lpr(1)** to dump an **X** window, process it for a particular printer type, and print it out on the printer of your choice. This is the easiest way to get a printout of a window.

X Status Utilities

- appres** Lists the resources seen by an application of the specified class and instance name. Used to determine which resources a particular program would load. For example,
% **appres XTerm**
would list the resources that any xterm program would load. To also match particular instance names,
% **appres XTerm myxterm**
If no application class is specified, the class -NoSuchClass- (which should have no defaults) is used.
- xauth** Displays and edits the authorization information used in connecting to the **X** server. This program is usually to extract authorization records from one machine and merge them in on another (as is the case when using remote logins or to grant access to other users).
- xdpyinfo** Displays the capabilities of a server, the predefined values for various parameters used in communicating between clients and the server, and the different types of screens and visuals that are available.
- xev** Creates a window and then asks the **X** server to send it notices called events whenever anything happens to the window (such as being moved, resized, typed in, clicked in, etc.). It is useful for seeing what causes events to occur and to display the information that they contain.
- xlsatoms** Lists the interned atoms. By default, all atoms starting from 1 (the lowest atom value defined by the protocol) are listed until unknown atom is found. If an explicit range is given, xlsatoms will try all atoms in the range, regardless of whether or not any are undefined.
- xlsclients** Lists the client applications running on a particular display.
- xprop** Displays window and font properties in an **X** server.

- xshowcmap** Displays the contents of the currently active colormap in a window. Shows a square for every color currently defined in the server's active colormap. The number of squares is the number of colormap cells the server supports.
- xwininfo** Displays information about windows.

X Resource Utilities

- editres** Displays the full widget hierarchy of any X Toolkit client that speaks the Editres protocol. In addition editres will help the user construct resource specifications, allow the user to apply the resource to the application and view the results dynamically.
- listres** Generates a list of a widget's resource database. The class in which each resource is first defined, the instance and class name, and the type of each resource is listed.

Font Utilities and Conversion Programs

- xfd** Creates a window containing the name of the font being displayed, a row of command buttons, several lines of text for displaying character metrics, and a grid containing one glyph per cell. The characters are shown in increasing order from left to right, top to bottom.
- xfontsel** Allows you to examine samples of fonts and determine the full name (X Logical Font Description) for a font, using a "point and click" interface.
- xlsfonts** Lists names of fonts available.

Bitmap Utilities

- bitmap, bmtoa, atobm** **bitmap** creates or edits rectangular images made up of 1's and 0's. Bitmaps are used in X for defining clipping regions, cursor shapes, icon shapes, and tile and stipple patterns.

The **bmtoa** and **atobm** filters convert bitmap files to and from ASCII strings. They are most commonly used to quickly print out bitmaps and to generate versions for including in text.

FIG

- xfig** Facility for Interactive Generation of figures: Menu-driven tool that allows you to draw and manipulate objects interactively in an X window. Requires a three-button mouse.

- f2p** Translates fig output into pic language.
- f2ps** Translates xfig output format into the PostScript language.
- fig2dev** Translates Fig code to various graphics languages.
- transfig** Creates a makefile to translate figures described in Fig code, PostScript, or PIC into a specified LaTeX graphics language.

X Interfaces to Other Programs

- xman** Manual page browsing program for the X Window System.
- xmh** X interface to the MH message handling system. This program has no local support.
- xrn** X-based interface to the USENET news system that uses the NNTP remote news server for accessing newsgroups and articles.

Display/demo Programs

- maze** An automated maze program
- plaid** Paint some plaid-like patterns in an X window
- puzzle** 15-puzzle game for X
- xeyes** Eyes on the screen track your mouse cursor
- xgc** X graphics demo
- xlogo** X Window System logo