LPI 102 X Windows Study Notes

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October 22 2007 (Updated January 2010)

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The document is open for distribution and changes, as long as it mentions my name as the initial author.

Bibliography

- O'Reilly - LPI Linux Certification in a Nutshell, 2nd Edition
http://oreilly.com/catalog/9780596005283/index.html
- IBM - Linux Professional Institute (LPI) exam prep
www.ibm.com/developerworks/linux/lpi/

Errata

I'm willing to make major corrections, however I cannot guarantee the response time.

Please send an email to victorbrca@yahoo.ca with the following info:
Subject: LPI 101 correction
Include:
- Content to be corrected
- Page
- Source that proves you are right

Thanks!! ;)

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Topic 1.1.10

The X Window System

Objective 1: Install and Configure X11

- Most Linux distros automatically install either XFree86 or X.Org

An Overview Of X

- X is implemented using a client/server model
- Client and server are machine independent (they can exist on separate or on the same machine)
- X server manage hardware and do not define the look of the display
- X server is responsible for rendering various shapes and colors on the screen
- Examples of X servers:
  . Software from XFree86 that controls video device
  . XFree86 software on another system displaying programs running on your system
  . A dumb X terminal, which is a hardware device with no computing capabilities
- Examples of X clients:
  . A web browser
  . Mail programs like Evolution
  . Terminal emulators (gnome-terminal, xterm)
  . Window manager program (like black box, metacity)
- Window manager programs are responsible for window sizing, closing program windows, etc...
- Desktop environments (such as Gnome) include a window manager and other specific applications

Selecting And Configuring An X Server

- Both Xfree86 and X.Org provides support to a vast array of modern hardware

Supported Video Hardware

- It's important to verify support for the chosen hardware before installation

=> Your XFree86 version

- Choose a version that offers a good balance between stability and video support
- To check X version

```
$ /usr/X11R6/bin/X -version  # or X -version
X.Org X Server 1.4.0.90
```

=> Checking X.Org version

```
$ X -version

X Window System Version 7.1.1
Release Date: 12 May 2006
X Protocol Version 11, Revision 0, Release 7.1.1
Build Operating System: Linux 2.6.18-53.1.14.el5PAE i686 Red Hat, Inc.
Current Operating System: Linux centos 2.6.18-92.el5 #1 SMP Tue Jun 10 18:49:47 EDT 2008 i686
Build Date: 24 May 2008
Build ID: xorg-x11-server 1.1.1-48.41.el5
        Before reporting problems, check http://wiki.x.org
        to make sure that you have the latest version.
Module Loader present
```

=> The video chipset

- Video drivers are written for graphics chipset and not the video cards

=> Monitor type
- Able to handle almost every monitor (even more newer multisync monitors)
- Nonstandard monitors might require knowing some of its capabilities (vertical kHz and horizontal Hz refresh rate as well as resolutions in pixels). They usually can be found in the monitors manual

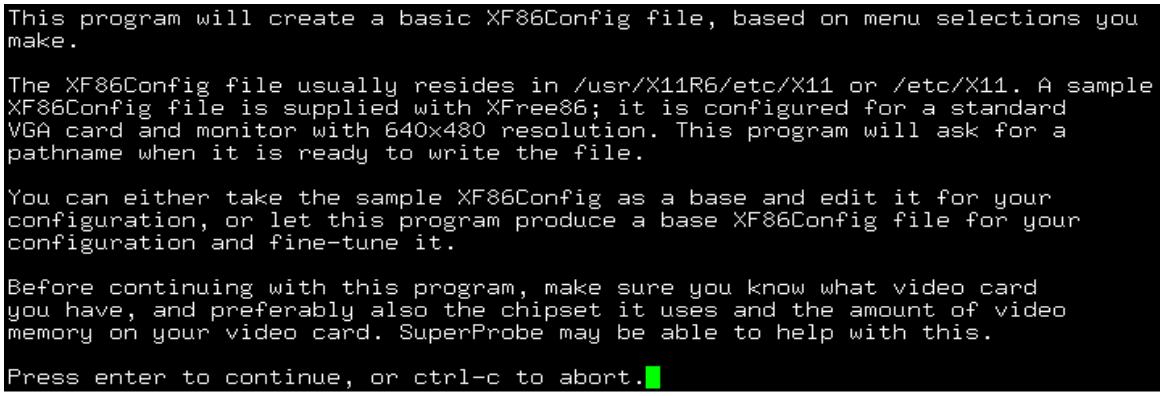
XFree86 Configuration

- Versions older than 4 needed a specific server for used chipset. Newer servers use a modular design that allows a single driver program to handle all supported chipset by calling driver modules
- Some applications might require Xfree86 to be re-installed using a newer version

Configuring an X Server and the XF86Config file

- Configuration differs between distributions, but basically involves on the creation of a configuration file called XFf86Config (there's also a utility named xf86config)

=> xf86config
- Original tool used to configure X
- Its a text-based program that prompts user for system information and then writes to the XF86Config file

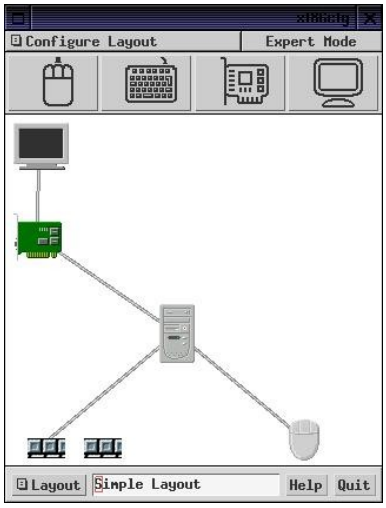


=> XF86Setup
- A graphical program that starts a basic vga X server (which should run on most hardware). It then allows user to select video chipset, monitor, mouse and keyboard types
- No longer distributed with XFree86

=> XFree86 -autoconfig
- The 'autconfig' option of Xfree86 will attempt to automatically configure the X server (however a configuration ifle is not written)

=> Xfree86 -configure
- This option may work if 'autoconfig' does not

=> xf86cfg
- Similar to Xfree86Setup, however provides a graphic block of the system instead of menu options
- You can right click an item to view or update it's information



=> Distribution specific tools
- Many distros also provided their own tools like Red Hat
  . redhat-config-xfree86
  . Xconfigurator (Red Hat 7 older)

XF86Config v3.3.3 and Sections
- The default location for XF86Config is under /usr/X11R6/lib/X11/, however most distros use /etc/X11/.

=> Files
- Provides font and RGB color information
  . FontPath “path” - Provides one or more locations for fonts
  . RgbPath - Table with numeric red/green/blue colors value with names for application where color names are required

```
Section "Files"
        RgbPath    "/usr/X11R6/lib/X11/rgb"
        FontPath   "unix/:-1"
EndSection
```

=> ServerFlags
- Provides customization of the X server (like hotkeys)

```
Section "ServerFlags"
EndSection
```

=> Keyboard
- Provides input device, parameters and mapping options

```
Section "Keyboard"
        Protocol    "Standard"
        AutoRepeat  500 5
        LeftAlt     Meta
        RightAlt    Meta
        ScrollLock  Compose
        RightCtl    Control
        XkbDisable
        XkbKeycodes      "xfree86"
        XkbTypes         "default"
        XkbCompat        "default"
        XkbSymbols       "us(pc101)"
        XkbGeometry      "pc"
        XkbRules         "xfree86"
        XkbModel         "pc101"
        XkbLayout        "us"
EndSection
```

=> Pointer
- Mouse

```
Section "Pointer"
        Protocol    "PS/2"
        Device      "/dev/mouse"
        Emulate3Buttons
        Emulate3Timeout    50
EndSection
```

=> Monitor
- Multiple sections (name Monitor) to configure monitors and their modes

```
Section "Monitor"
        Identifier "My Monitor"
        VendorName "Unknown"
        ModelName   "Unknown"
        HorizSync   31.5 - 64.3
        VertRefresh 50-90
        # 1280x1024 @ 61 Hz, 64.2 kHz hsync
        Mode "1280x1024"
                DotClock    110
                Htimings    1280 1328 1512 1712
                Vtimings    1024 1025 1028 1054
        EndMode
EndSection
```

=> Device
- Video hardware
- Can also be more than one instance

```
Section "Device"
        Identifier "My Video Card"
        VendorName "Unknown"
        BoardName  "Unknown"
        VideoRam   16256
EndSection
```

=> Screen
- Ties a device and a monitor together

```
Section "Screen"
        Driver       "svga"
        Device       "My Video Card"
        Monitor      "My Monitor"
        Subsection "Display"
                 Depth       32
                 Modes       "1280x1024"
                 ViewPort    0 0
        EndSubsection
EndSection
```

XF86Config v4 and Sections

- Default location is now under /etc/X11/
- Same as v3.3.3 with two small differences:
  . ServerLayout - Ties sections for screen, mouse and keyboard together
  . Mouse and keyboard are no longer under Keyboard and Pointer sections, but now under separate InputDevice section

```
Section "ServerLayout"
        Identifier     "XFree86 Configured"
        Screen      0  "Screen0" 0 0
        InputDevice    "Mouse0" "CorePointer"
        InputDevice    "Keyboard0" "CoreKeyboard"
EndSection

Section "InputDevice"
        Identifier "Keyboard0"
        Driver      "keyboard"
EndSection

Section "InputDevice"
        Identifier "Mouse0"
        Driver      "mouse"
        Option      "Protocol" "PS/2"
        Option      "Device" "/dev/mouse"
EndSection
```

X.Org Configuration

- Configuration file is name xorg.conf and can be locate in several places:
  . /etc/xorg.conf
  . /etc/X11/xorg.conf
  . /usr/X11R6/etc/xorg.conf
  . /usr/X11R6/lib/X11/xorg.conf.hostname
  . /usr/X11R6/lib/X11/xorg.conf

Configuring X.Org

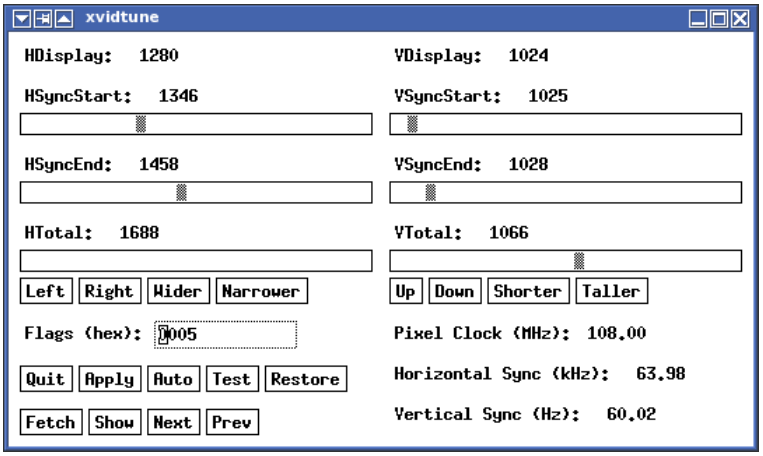
=> X -configure
- Loads each driver module, probes for new drivers and create a configuration file that is saved in the home directory of the user who started the server. The file is called xorg.conf.new

=> xorgcfg
- A tool similar to xf86cfg

=> xorg86config
- Text-mode tool that prompts user for information (like horizontal and vertical refresh rate)
- Similar to xf86config

Tuning X

=> xvidtune
- Used to fine tune video display settings. Provides the same capabilities as a monitor menu (resize, move, etc...)



X Fonts

- Old systems support fonts via the X11 fonts system, however newer version of X servers include the Xft fonts system

The Xfs Font Server

- xfs is a server daemon that allows the share of fonts via network
- It can provide service to either local or network clients
- xfs can be started on shell by invoking its name - 'xfs'
- Configuration file can be found under /usr/X11R6/lib/X11/fs/config or in /etc/X11/fs/config (which can be a sym link)
- To start using xfs add the following lines to your X configuration

```
Section "Files"
        RgbPath   "/usr/X11R6/lib/X11/rgb"
        FontPath "unix/:-1"
EndSection
```

- Sample xfs config filesystem (/usr/X11R6/lib/X11/fs/config)

```
# xfs font server configuration file
#

# allow a max of 10 clients to connect to this font server
client-limit = 10

# when a font server reaches its limit, start up a new one
clone-self = on  # allows the service to start another instance of itself

# alternate font servers for clients to use
#alternate-servers = foo:7101,bar:7102

# where to look for fonts, the same as FontPath in an X configuration file
catalogue = /usr/share/X11/fonts/misc:unscaled,
        /usr/share/X11/fonts/75dpi:unscaled,
        /usr/share/X11/fonts/100dpi:unscaled,
        /usr/share/X11/fonts/Type1,
        /usr/share/X11/fonts/TTF,
        /usr/share/fonts/default/Type1,

# in 12 points, decipoints
default-point-size = 120
```

```
# 75 x 75 and 100 x 100
default-resolutions = 75,75,100,100

# use lazy loading on 16 bit fonts
deferglyphs = 16

# Log errors via syslog.
use-syslog = on

# For security, don't listen to TCP ports by default.
no-listen = tcp
```

xdpyinfo

- Displays information about X

```
$ xdpyinfo
name of display:    :0.0
version number:    11.0
vendor string:    The X.Org Foundation
vendor release number:    10400090
X.Org version: 1.4.0.90
maximum request size:  16777212 bytes
motion buffer size:  256
bitmap unit, bit order, padding:    32, LSBFirst, 32
image byte order:    LSBFirst
number of supported pixmap formats:    7
supported pixmap formats:
    depth 1, bits_per_pixel 1, scanline_pad 32
    depth 4, bits_per_pixel 8, scanline_pad 32
    depth 8, bits_per_pixel 8, scanline_pad 32
    depth 15, bits_per_pixel 16, scanline_pad 32
    depth 16, bits_per_pixel 16, scanline_pad 32
    depth 24, bits_per_pixel 32, scanline_pad 32
    depth 32, bits_per_pixel 32, scanline_pad 32
keycode range:    minimum 8, maximum 255
focus:  window 0x320553b, revert to Parent
number of extensions:    33
    BIG-REQUESTS
    Composite
    DAMAGE
    DOUBLE-BUFFER
    DPMS
    Extended-Visual-Information
    GLX
    MIT-SCREEN-SAVER
    MIT-SHM
    MIT-SUNDRY-NONSTANDARD
    RANDR
    RECORD
    RENDER
    SECURITY
    SGI-GLX
    SHAPE
    SYNC
    TOG-CUP
    X-Resource
    XAccessControlExtension
    XC-APPGROUP
    XC-MISC
    XFIXES
    XFree86-Bigfont
    XFree86-DGA
    XFree86-DRI
    XFree86-Misc
    XFree86-VidModeExtension
    XINERAMA
    XInputExtension
    XKEYBOARD
```

```
    XTEST
    XVideo
default screen number:    0
number of screens:    1

screen #0:
  dimensions:    1680x1050 pixels (444x277 millimeters)
  resolution:    96x96 dots per inch
  depths (7):    24, 1, 4, 8, 15, 16, 32
  root window id:    0x6b
  depth of root window:    24 planes
  number of colormaps:    minimum 1, maximum 1
  default colormap:    0x20
  default number of colormap cells:    256
  preallocated pixels:    black 0, white 16777215
  options:    backing-store NO, save-unders NO
  largest cursor:    64x64
  current input event mask:    0xfac033
    KeyPressMask             KeyReleaseMask           EnterWindowMask
    LeaveWindowMask          KeymapStateMask          ExposureMask
    StructureNotifyMask      SubstructureNotifyMask   SubstructureRedirectMask
    FocusChangeMask          PropertyChangeMask       ColormapChangeMask
  number of visuals:    17
  default visual id:  0x23
  visual:
    visual id:    0x23
    class:    TrueColor
    depth:    24 planes
    available colormap entries:    256 per subfield
    red, green, blue masks:    0xff0000, 0xff00, 0xff
    significant bits in color specification:    8 bits
```

Xset

- User configuration utility for X

```
$ xset -display :0 -q
Keyboard Control:
  auto repeat:  on    key click percent:  0    LED mask:  00000002
  auto repeat delay:  500    repeat rate:  30
  auto repeating keys:  00ffffffdffffbbf
                        fadfffdfffdfe5ef
                        ffffffffffffffff
                        ffffffffffffffff
  bell percent:  50    bell pitch:  400    bell duration:  100
Pointer Control:
  acceleration:  2/1    threshold:  4
Screen Saver:
  prefer blanking:  yes    allow exposures:  yes
  timeout:  0    cycle:  0
Colors:
  default colormap:  0x20    BlackPixel:  0    WhitePixel:  16777215
Font Path:
  /home/victor/.gnome2/share/cursor-
fonts,/usr/share/fonts/X11/misc,/usr/share/fonts/X11/100dpi/:unscaled,/usr/share/fonts/X11/75dpi
/:unscaled,/usr/share/fonts/X11/Type1,/usr/share/fonts/X11/100dpi,/usr/share/fonts/X11/75dpi,/va
r/lib/defoma/x-ttcidfont-conf.d/dirs/TrueType,/home/victor/.gnome2/share/fonts
Bug Mode: compatibility mode is disabled
DPMS (Energy Star):
  Standby: 0    Suspend: 0    Off: 0
  DPMS is Enabled
  Monitor is On
File paths:
  Config file:  /etc/X11/xorg.conf
  Modules path: /usr/lib/xorg/modules
  Log file:     /var/log/Xorg.0.log
```

Installing Fonts

Installing Xft Fonts

=> 1st Method
- Install fonts on one of the known fonts directories
  . ~/.fonts
  . /usr/share/X11/fonts/
  . /usr/local/share/fonts/
  . /usr/X11R6/lib/X11/lib/fonts/ (as list in /usr/X11R6/lib/X11/fs/config)
- Either wait for Xft to load the fonts when it has a chance or manually purge the load with command 'fc-cache'

=> 2nd Method
- Add the fonts directory to the 'files' section in 'FontPath' in the X config file

```
Section "Files"
        RgbPath
        FontPath
        FontPath
        FontPath
EndSection
```

- Either wait for Xft to load the fonts when it has a chance or manually purge the load with command 'fc-cache'

Notes:
- xset can also be used to display font path
- Further control of Xft can be achieved from a system file (/etc/fonts/fonts.conf) or a user file (~/.fonts.conf)

Installing Core X11 fonts
- Files in the Bitmap Distributions Format (.bdf) need to be converted to Portable Compiled Format (.pcf) and then compressed.

1- Convert fonts with 'bdftopcf
```
$ bdftopcf font.bdf -o font.pcf
```

2- Compress fonts with gzip
```
$ gzip font.pcf
```

3- Create a folder and copy fonts to the folder
```
# mkdir /usr/local/share/fonts/bitmap/ ; cp font.pcf /usr/local/share/fonts/bitmap/
```

4- Run mkfontdir to create the fonts.dir file
```
# mkfontdir /usr/local/share/fonts/bitmap/
```

5- Added the new font path via 'xset' or permanently to the X config file (Xfree86Config or xorg.conf)

Note: Scalable fonts (like TrueType and Type1) require require the command 'mkfontscale' to be run before step 4, which will create a fonts.scale file

Updating font path with xset
- Adding directories temporally can be done with xset
- Folders can be added to the beginning of the path with '+fp', and to the end with 'fp+'
- Folders can be deleted from the beginning with '-fp' and from the end with 'fp-'

```
$ xset +fp /usr/local/share/fonts/bitmap/ -display 0:0
```

Controlling X Applications With .Xresources

- Many X applications have a built-in options that examines a file within the user's home directory for configuration (.Xresources)
- File format is the following:

```
program*resource: value
```

  . program - name of the program
  . resource - Settings allowed by the program
  . value - resource value

- Examples:

```
xterm*background: Black
xterm*foreground: Wheat
xterm*cursorColor: Orchid
xterm*reverseVideo: false
```

Objective 2: Set Up a Display Manager

Displays Managers

- Display manager is the tool that manages X sessions on physical displays for both local and remote connections
- Also provides user authentication via a graphical login screen
- Types covered on test can be XDM, GDM and KDM

Runlevels

=> Red Hat

runlevels ID	Description
0	Halt
1	Single user
2	Full multi-user with no networking
3	Full multi-user, console logins only
4	Not used/User definable
5	Full multi-user, with display manager as well as console logins
6	Reboot

```
# grep 'id' /etc/inittab
id:5:initdefault:
```

=> Debian Linux (except Ubuntu, which uses 'upstart')

runlevels ID	Description
0	Halt
1	Single user mode
2-5	Full multi-user with console logins and display manager if installed
6	Reboot

Running [X\|K\|G]DM Manually

- Needs a working X server in order to run.
- Invoke it's name to start it - 'xdm'

Running [X\|K\|G]DM Automatically

- System that supports runlevels

```
# add this to /etc/inittab to run it under runlevel 5
x:5:respawn:/usr/X11R6/bin/xdm -nodaemon
```

- Systems that not support runlevel

```
# add to /etc/rc.local
xdm
```

Stopping [X|K|G]DM

- To stop xdm, first make sure all X sessions under it's management are logged out (otherwise it could result in loss of data)

```
$ killall xdm
      #or
$ /etc/init.d/gdm [start|stop ]
```

Configuring XDM

- Distributed as part of Xfree86 and X.org
- Main configuration file is /etc/X11/xdm/xdm-config
- Is configured by a series of files located in /etc/X11/xdm/

=> Xsetup_0
- Script started before the login screen
- Includes commands to set colors, display graphics or run other programs
- Allows user to customize the greeting (login window)

=> Xservers
- Associates the X display name (:0, :1) for local X server or a foreign display (like X terminal)

=> Xaccess
- Controls inbound access from remote hosts
- Controls how XDM communicates with terminals that support XDMCP (X Display Manager Control Protocol)
- Uses UDP, port 177

=> Xresources
- Similar to .Xresources
- Holds configuration for some of the xdm resources (including the graphical login)
- Can be edited to modify the appearance of the xdm login screen

=> Xsession
- This a script that is run after a good login.
- It also looks for ~/.xsession and runs it

=> xdm-config
- Associates xdm configuration with other files in this list

Basic XDM Customization

- Looks of the graphical xdm login screen can be configured in /etc/X11/xdm/Xresources. Exclamation marks (!) are used for comments

```
! Xresources file
xlogin*borderWidth: 10
xlogin*greeting: Welcome to Linux on CLIENTHOST
xlogin*namePrompt: Login:\040
xlogin*fail: Login incorrect - try again!
xlogin*failColor: red
xlogin*Foreground: Yellow
xlogin*Background: MidnightBlue
```

- Command line options for the X server can also be entered under /etc/X11/xdm/Xservers

```
# Overwrites color depth to 24 bits per pixel
```

:0 local /usr/X11R6/bin/X -bpp 24

- Additional X programs or settings cal be added to /etc/X11/xdm/Xsetup_0

```
#!/bin/sh
# Xsetup - Adds a solid color and a clock to xdm login
/usr/X11R6/bin/xsetroot -solid "#356390"
```

/usr/X11R6/bin/xclock -digital -update 1 -geometry -5-5 &

Checking Screen Resolution And Depth

- Depth refers to the number of bits that make every pixel (bits per pixel, or bitplanes)
- Information from Wikipedia:
  . 8-bit = 256 colors
  . 16-bit = 65536 colors
  . 24-bit truecolor uses 8 bits to represent red, 8 bits to represent blue and 8 bits to represent green. 28 = 256 levels of each of these three colors can therefore be combined to give a total of 16,777,216 mixed colors (256 × 256 × 256)
  . 32-bit = 4.2 billion colors.

=> Getting screen resolution and depth with 'xwininfo'

```
$ xwininfo -display :0 -root

xwininfo: Window id: 0x6b (the root window) (has no name)

  Absolute upper-left X:  0
  Absolute upper-left Y:  0
  Relative upper-left X:  0
  Relative upper-left Y:  0
  Width: 1680
  Height: 1050
  Depth: 24
  Visual Class: TrueColor
  Border width: 0
  Class: InputOutput
  Colormap: 0x20 (installed)
  Bit Gravity State: NorthWestGravity
  Window Gravity State: NorthWestGravity
  Backing Store State: NotUseful
  Save Under State: no
  Map State: IsViewable
  Override Redirect State: no
  Corners:  +0+0  -0+0  -0-0  +0-0
  -geometry 1680x1050+0+0
```

KDM

- Version3 uses a kdmrc configuration file located in $KDEDIR/share/config/kdm (where $KDEDIR usually is /etc/kde3/kdm/)

```
$ grep -v '#' kdmrc

[General]
ConfigVersion=2.1
Xservers=/opt/kde/share/config/kdm/Xservers
PidFile=/var/run/xdm.pid

[Xdmcp]
Enable=false
Xaccess=/opt/kde/share/config/kdm/Xaccess
Willing=/opt/kde/share/config/kdm/Xwilling

[Shutdown]

[X-*-Core]
Authorize=true
Resources=/opt/kde/share/config/kdm/Xresources
Setup=/opt/kde/share/config/kdm/Xsetup
Startup=/opt/kde/share/config/kdm/Xstartup
Reset=/opt/kde/share/config/kdm/Xreset
Session=/opt/kde/share/config/kdm/Xsession
UserPath=/opt/kde/bin:/usr/local/bin:/usr/bin:/bin:/usr/X11R6/bin:/usr/games
SystemPath=/opt/kde/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/X11R6/
bin
AllowRootLogin=false
AllowNullPasswd=false
AllowShutdown=Root
```

GDM
- Uses a configuration file, gdm.config, usually located in /etc/X11/gdm/
- Can also be configured with the command 'gdmsetup'

Objective 4: Install and Customize a Window Manager Environment

Definition
- A windows manager is required to provide basic window frames and controls
- Examples are twm, FVWM, FVWM2, AfterStep, Blackbox, Fluxbox, IceWM, Enlightenment

Desktop Managers
- Provide taskbars, launchers and many other settings

Starting X And A Default Window Manager
- X can be started by invoking it's name 'X', however a window manager, an application and a basic X access authority are also needed

Configuration files for startx (and xinit)

File	Description
$HOME/.xinitrc	User - Starts client applications
$HOME/.xserverrc	User - Overrides default X server configurations
/usr/X11R6/lib/X11/xinit/xinitrc	System - Start client applications
/usr/X11R6/lib/X11/xinit/xserverrc	System - Overrides default X server configurations
$HOME/.Xresources	User - Resources for X applications
$HOME/.Xmodmap	User - Keyboard and mouse settings
/usr/X11R6/lib/X11/xinit/.Xresources	System - Resources for X applications
/usr/X11R6/lib/X11/xinit/.Xmodmap	System - Keyboard and mouse settings

xrdb
- Window attributes (height, width, geometry, etc...) are store in a resource database, which is built from resource files using 'xrdb'

```
XRDB(1)                                                          XRDB(1)

NAME
       xrdb - X server resource database utility

SYNOPSIS
       xrdb [-option ...] [filename]

DESCRIPTION
       Xrdb  is  used to get or set the contents of the RESOURCE_MANAGER prop-
       erty on the root window of screen 0, or the  SCREEN_RESOURCES  property
       on  the root window of any or all screens, or everything combined.  You
       would normally run this program from your X startup file.
```

xmodmap
- Sets keyboard and mouse bindings

```
XMODMAP(1)                                                      XMODMAP(1)

NAME
       xmodmap  - utility for modifying keymaps and pointer button mappings in X

SYNOPSIS
       xmodmap [-options ...] [filename]

DESCRIPTION
       The xmodmap program is used to edit and display the  keyboard  modifier
       map  and  keymap  table that are used by client applications to convert
       event keycodes into keysyms.  It is usually run from the user's session
       startup  script to configure the keyboard according to personal tastes.
```

xwininfo
- Displays information about a window

```
XWININFO(1)                                                    XWININFO(1)

NAME
       xwininfo - window information utility for X

SYNOPSIS
       xwininfo  [-help]  [-id  id]  [-root]  [-name  name] [-int] [-children]
       [-tree] [-stats] [-bits]  [-events]  [-size]  [-wm]  [-shape]  [-frame]
       [-all] [-english] [-metric] [-display display]

DESCRIPTION
       Xwininfo  is a utility for displaying information about windows.  Vari-
       ous information is displayed depending on which options  are  selected.
       If no options are chosen, -stats is assumed.

       The  user  has the option of selecting the target window with the mouse
       (by clicking any mouse button in the desired window) or  by  specifying
       its  window  id on the command line with the -id option.  Or instead of
       specifying the window by its id number, the -name option may be used to
       specify which window is desired by name.  There is also a special -root
       option to quickly obtain information on the screen's root window.
```

editres
- Customize resources for windows on screen and save them on a file for 'xdrb'

```
EDITRES(1)                                                      EDITRES(1)

NAME
       editres - a dynamic resource editor for X Toolkit applications

SYNTAX
       editres [ -toolkitoption ... ]

OPTIONS
       Editres accepts all of the standard X Toolkit command line options (see
       X(7)).  The order of the command line options is not important.

DESCRIPTION
       Editres is a tool that allows users and application developers to  view
       the  full widget hierarchy of any X Toolkit application 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.  Once the user  is  happy
       with  a  resource specification editres will append the resource string
       to the user's X Resources file.
```

xev
- Starts a window and displays codes related to events (like mouse over, mouse click, window focus, etc...)

```
XEV(1)                                                                  XEV(1)

NAME
       xev - print contents of X events

SYNOPSIS
       xev  [-display displayname] [-geometry geom] [-bw pixels] [-bs {NotUse-
       ful,WhenMapped,Always}] [-id windowid] [-s] [-name string] [-rv]

DESCRIPTION
       Xev creates a window and then asks the X server to send it events when-
       ever  anything  happens to the window (such as it being moved, resized,
       typed in, clicked in, etc.).  You can also attach  it  to  an  existing
       window.   It  is  useful  for seeing what causes events to occur and to
       display the information that they contain; it is essentially  a  debug-
       ging and development tool, and should not be needed in normal usage.
```

Window Customization Files
- Most Window Managers also provide a file for customization
- Example files for twm:
  . /usr/X11R6/lib/X11/twm/system.twmrc)
  . ~/.twmrc
  . ~/.twmrc0, ~/.twmrc1 (For multiple displays)

The Xfree86 Setup Process

1- User or system calls startx script
2- startx call xinit
  a. A Xinirc script that calls X programs. Script could be user based (~/.xinitrc) or systemwide (/etc/X11/xinit/xinitrc)
  b. Server options, like X authority info
3- xinit launches Xfree86 and the chosen Xinitrc script
4- Xfree86 starts
5- Client programs and window manager found in the Xinitrc script start

=> Xinitrc example script

```
# The user may have their own clients they want to run.  If they don't,
# fall back to system defaults.
if [ -f $HOME/.Xclients ]; then
    exec $SSH_AGENT $DBUS_LAUNCH $HOME/.Xclients || \
    exec $SSH_AGENT $HOME/.Xclients
elif [ -f /etc/X11/xinit/Xclients ]; then
    exec $SSH_AGENT $DBUS_LAUNCH /etc/X11/xinit/Xclients || \
    exec $SSH_AGENT /etc/X11/xinit/Xclients
else
    # Failsafe settings.  Although we should never get here
    # (we provide fallbacks in Xclients as well) it can't hurt.
    [ -x /usr/bin/xsetroot ] && /usr/bin/xsetroot -solid '#222E45'
    [ -x /usr/bin/xclock ] && /usr/bin/xclock -geometry 100x100-5+5 &
    [ -x /usr/bin/xterm ] && xterm -geometry 80x50-50+150 &
    [ -x /usr/bin/twm ] && /usr/bin/twm
fi
```

Note: Xinitrc varies between distributions. They might also include additional files (like the above example with ~/.Xclients)

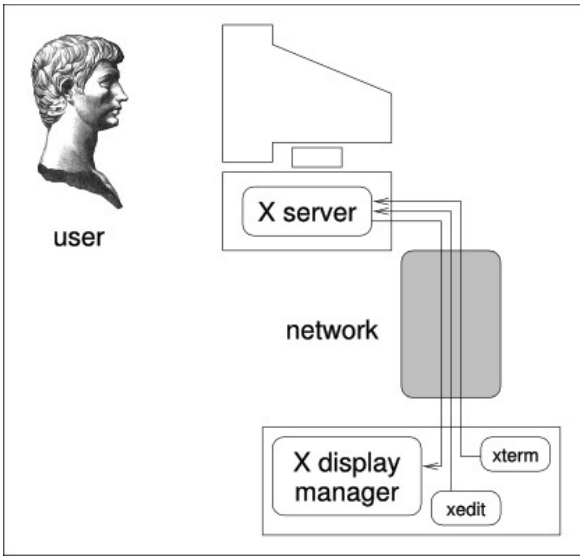
Desktops

Gnome
- Gnome is configured mostly with .XML files
- Locations for files can be:
  . /etc/gconf/
  . /etc/gnome-vfs2..3/
  . Hidden subfolders in user directory that start with “g”
- Two tool are commonly used for configuring Gnome:
  . gconf-editor - GUI
  . gconftool-2 - command line

KDE
- Uses plain text files with UTF-8 encoding for non ASCII characters
- Configuration files have sections enclosed in square brackets (just like KDM)
- System files are located in $KDEDIR/share/config (where $KDEDIR can be /etc/kde3/kdm, /etc/opt/kde3, etc...)
- Files can be edited manually or with a tool (like KconfigEditor or distribution specific)

X Terminals

An X terminal runs an X server. (In X, the usage of "client" and "server" is from the viewpoint of the programs: the X server supplies a screen, keyboard, mouse and touchscreen to client applications.) This connects to an X display manager (introduced in X11R3) running on a central machine, using XDMCP (X Display Manager Control Protocol, introduced in X11R4)



xdm for Terminals
- To use an X terminal with your host, xdm must first be running on the host machine. The host listens for inbound connections from the X terminals using XDMCP, the xdm Control Protocol (the default port for xdmcp is 177). When a request is received, xdm responds with the same graphical login screen that's used on the local system. The difference is that the X server is implemented in the X terminal hardware, not in the XFree86 software on the xdm host, and all of the graphics information is transmitted over the network.
- Access to xdm daemons is set under /etc/X11/xdm/Xaccess
- A name of a host indicates that it's allowed. A name of a host starting with a exclamation mark (!) indicates that the host is blocked
- * as a wildcard can also be used
*.example.com # allowed
!xterm1.anotherexample.com # not allowed

xterm
- xterm is a terminal emulator (replacement for hardware terminals)
- The standard terminal emulator distributed with X
- Understands DEC VT and Tektronix
- Main configuration file is located under (/usr/lib/X11/app-defaults/XTerm), but it also takes configurations from ~/.Xdefaults

Light Terminal Emulators (VT102)
- rxvt
- aterm

X Libraries
- X applications also depend on libraries. Xfree86 includes a number of traditional libraries
- Many applications also are developed using toolkits that are not available with Xfree86. An example is Gnome, which depends on Gimp Tool Kit (Gimp Tool Kit)

Remote X Clients
- The X Window System is a network protocol, which allows the usage across the network
- X server connections are not encrypted, so a tunneled connection (like ssh) for non local users is strongly advised
- The DISPLAY variable allows to configure the display of an application to a remote machine
- DISPLAY variable components:
```
[host]:display[.screen]
```

  . host - Hostname, FQDN or IP or host. The local system will be used if omitted
  . display - Display output to be directed to. A single system can handle multiple outputs. Colon is required even if host is omitted
  . screen - Used on multiple monitor systems to specify the monitor. The default monitor will be used if omitted
- Examples:
```
# default on localhost
:0
# default on a remote host
pcname:0
# second display of the first screen on a remote host
192.168.10.2:2.0
```

X Security
- Without security, rogue applications can snoop traffic between machine (like keyboard strokes), crash X and many other bad things
- Security can be done via host-based access control and MIT-MAGIC-COOKIE-1 authentication

Host Access Control
- Uses a hostlist as a form of authentication-
- Not as secure as all users within a host will have access

```
XHOST(1)                                                        XHOST(1)

NAME
       xhost - server access control program for X

SYNOPSIS
       xhost [[+-]name ...]

DESCRIPTION
       The xhost program is used to add and delete host names or user names to
       the list allowed to make connections to the X server.

OPTIONS
       [+]name The given name (the plus sign is optional) is added to the list
```

```
              allowed to connect to the X server.  The name  can  be  a  host
              name or a user name.

       -name   The  given  name is removed from the list of allowed to connect
              to the server.  The name can be a host name  or  a  user  name.
              Existing  connections  are  not  broken,  but  new  connection
              attempts will be denied.  Note  that  the  current  machine  is
              allowed  to be removed; however, further connections (including
              attempts to add it back) will not be permitted.  Resetting  the
              server  (thereby  breaking  all connections) is the only way to
              allow local connections again.

       +       Access is granted to everyone, even if they aren't on the  list
              (i.e., access control is turned off).

       -       Access  is  restricted  to only those on the list (i.e., access
              control is turned on).

       nothing If no command line arguments are given,  a  message  indicating
              whether  or not access control is currently enabled is printed,
              followed by the list of those allowed to connect.
```

- Provides access to all local users

```
xhost +local:
```

MIT-MAGIC-COOKIE-1 Authentication
- xdm generates a 128-bit key, which is stored under .Xauthotity
- A user can also extract his key with 'xauth extract' and send it to another user so he can merge it to his file with 'xauth merge'
- Root can also assign another users key to an environment variable

```
export XAUTHORITY=~user1/.Xauthority
```

Cheat Tables

X Commands

Command	Type	Usage	Details
xf86config	XFree86	Text-mode tool to configure X	
XF86Setup	Xfree86	GUI program to configure X	No longer distributed
xfree86 -autoconfig	Xfree86	Attempts to auto configure X	Does not create config file
xfre86 -configure	Xfree86	Another option to configure X	Used if '-autoconfig' does not work
xf86cfg	Xfree86	GUI program to configure X. Provides a hardware diagram	
X -configure	X.Org	Loads driver modules, probe drivers and create a config file	
xorgcfg	X.Org	Similar to xf86cfg	
xorg86config	X.Org	Text-mode tool to configure X (similar to xf86config)	
xvidtune	X	Similar to monitor options (geometry, move, etc...)	
xset	X	User utility to customize X	
xdpyinfo	X	Displays information about X	
xwininfo	X	Displays window information	
xrdb	X	X resource database utility	
xmodmap	X	Sets keyboard and mouse bindings	
editres	X	Customize resources for windows on screen and save them on a file for 'xdrb'	

xev	X	Starts a window and displays codes related to events	
xhost	X	Access control program for X	
xauth extract	X	Exports MIT-MAGIC key	
xauth merge	X	Mergers another user MIT-MAGIC key	
fc-cache	Fonts	Loads font database	
mkfontdir	Fonts	Creates an index of the fonts in a directory	
mkfontscale	Fonts	Creates an index of scalable fonts in a directory	
gdmsetup	GDM	Configures login for GDM	
gconf-editor	Gnome	GUI editor	
gconftool-2	Gnome	Command line editor	
KConfigEditor	KDE	GUI editor	

Files

File	Type	Usage	Details
/usr/X11R6/lib/X11/	Xfree86	Default location for XF86Config v3	
/etc/X11/	Xfree86	Common location for XF86Config and default for v4	
XF86Config	Xfree86	Configuration file for Xfree86	
xorg.conf	X.Org	Configuration file for X.Org	
/etc/xorg.conf	X.Org	Default location for xorg.conf	
/etc/X11/xorg.conf	X.Org	Default location for xorg.conf	
/usr/X11R6/etc/xorg.conf	X.Org	Default location for xorg.conf	
/usr/X11R6/lib/X11/xorg.conf	X.Org	Default location for xorg.conf	
/usr/X11R6/lib/X11/xorg.conf.hostname	X.Org	Default location for xorg.conf	
/usr/X11R6/lib/X11/fs/config	Fonts	Configuration file for Xfs	
/etc/X11/fs/config	Fonts	Configuration file for Xfs	Can be a sym link
~/.fonts	Fonts	User fonts directory	
/usr/share/X11/fonts/	Fonts	System fonts directory	
/usr/local/share/fonts/	Fonts	System fonts directory	
/usr/X11R6/lib/X11/lib/fonts/	Fonts	System fonts directory	
Xsetup_0	XDM	Script that loads the login screen and it's programs	
Xservers	XDM	Associates X display name	
Xaccess	XDM	Controls inbound access from remote hosts	
Xresources	XDM	Holds configuration for X resources (including login)	
Xsession	XDM	Script that runs after a good login	Looks for ~/.xsession and runs it
xdm-config	XDM	Defines the names and locations of the other configuration files and the basic access permissions	
$KDEDIR/share/config/kdm/kdmrc	KDM	Configuration file for KDM	
/etc/X11/gdm/gdm.config	GDM	Configuration file for GDM	
$HOME/.xinitrc	X	User - Starts client applications	
$HOME/.xserverrc	X	User - Overrides default X server configurations	
/usr/X11R6/lib/X11/xinit/xinitrc	X	System - Start client applications	
/usr/X11R6/lib/X11/xinit/xserverrc	X	System - Overrides default X server configurations	

$HOME/.Xresources	X	User - Resources for X applications	
$HOME/.Xmodmap	X	User - Keyboard and mouse settings	
/usr/X11R6/lib/X11/xinit/.Xresources	X	System - Resources for X applications	
/usr/X11R6/lib/X11/xinit/.Xmodmap	X	System - Keyboard and mouse settings	
$DISPLAY	X	Holds current display name	
~/.Xauthority	X	MIT-MAGIC-COOKIE key	
$KDEDIR/share/config	KDE	KDE system configuration file	
/etc/gconf/	Gnome	Gnome system configuration files	
/etc/gnome-vfs2.3/	Gnome	Gnome system configuration files	
~/.gconf, ~/.gconf, ~/.gnome, ~/.gnome2	Gnome	Gnome user configuration files	