Using Xinerama to MultiHead XFree86 V. 4.0+

Dennis Baker

<xinerama@ogrehut.com>

Revision History

Revision 3.0	2002−11−15	Revised by: drb
Major revision		

This document describes how to configure XFree86 Version 4.0+ with Multiple monitors and the Xinerama extentions.

Table of Contents

1. Introduction 1
1.1. Copyright 1
1.2. Disclaimer 1
1.3. Credits 2

2. Getting Started 3

3. Planning 4
3.1. What you need 4
3.2. Design Considerations 4
3.3. Layout 5

4. AutoMagic Video Card Set Up 6

5. Manual Video Card Set Up 8

6. Scan the PCI Bus 9

7. Editing your XConfig File 10
7.1. Adding your video cards 10
7.2. Identifying Your Video Cards 10
7.3. Configuring the Server Layout 10

8. Testing Your Configuration 12
8.1. Configuring X to Start Xinerama Automatically 12

9. Window Managers and Xinerama 13

10. Sample XF86Config Files 14

1. Introduction

Why do you need Xinerama ? And what is it ? The Xinerama extensions were introduced to the XFree86 system in version 4.0. Xinerama is an extension to XFree86 Release 6 Version 4.0 (X4.0) which allows applications and window managers to use the two (or more) physical displays as one large virtual display.

The beauty of the Xinerama extensions is that they are totally transparent to user space. Previously, applications could only reside on one of the displays and could not be moved between the two. Window managers had to be specially written to support the two displays. With Xinerama, window managers and applications don't have to be specially written to support the larger "Virtual Desktop" which Xinerama creates.

1.1. Copyright

If you have any questions, please contact `<xinerama@ogrehut.com>`

1.2. Disclaimer

No liability for the contents of this documents can be accepted. Use the concepts, examples and other content at your own risk. As this is a new edition of this document, there may be errors and inaccuracies, that may of course be damaging to your system. Proceed with caution, and although this is highly unlikely, the author(s) do not take any responsibility for that.

All copyrights are held by their by their respective owners, unless specifically noted otherwise. Use of a term in this document should not be regarded as affecting the validity of any trademark or service mark.

Naming of particular products or brands should not be seen as endorsements.

You are strongly recommended to take a backup of your system before major installation and backups at regular intervals.

1.3. Credits

Much of the introduction and first sections are based loosely on a document submitted to me from Nico Schottelius <nico-linux-xinerama -at- schottelius.org>.

Also thanks to the many people who have emailed me with spelling tips, and suggestions. I have incorporated them whenever I could.

The wonderful disclaimer on the prior page is brought to us courtesy of the thousands of lawyers in this wonderful country who put their own greed over common sense.

2. Getting Started

This is not meant to be a guide on how to set up your specific monitor, or videocard. In fact, I assume that you already have X Window running for your setup. Please refer to the XF86 Documentation for more information.

If you are using a single multiheaded card you will need to refer to your video card manufacturers instructions. I know that both nVidia and Matrox support Linux multihead setups. nVidia includes some documentation with their drivers, but I don't have one of these cards to test with so I don't have any specific details.

As far as I know, there are no limits to which video cards you can configure this way, nor does it seem to matter if you mix different types of video cards in a setup, The sample configuration I use in this documentation uses two different video cards, an AGP Fire GL 1000 and a PCI Matrox Millenium II. What effect this has on 3d Accelleration I don't know as I don't currently accellerate either of my video cards.

This Howto assumes that you know how to edit text files, do basic video card configuration for X Window, add and remove hardware from your system, start and stop system services, and follow simple instructions. If feel you will have trouble with any of these things, please seek help. I am not responsible if you damage any of your stuff.

3. Planning

Planning a Xinerama setup is pretty straight forward. There as essentially three things you need to take into account, screen resolution, color depth, and screen layout.

3.1. What you need

You will need at least 2 graphics cards (a dual headed one should work, too) and two monitors, an operating system on which XFree runs (for instance Linux or Solaris) and XFree86 version 4.0. I assume your setup works, and that your two video cards are supported by XFree86.

Unless you recently upgraded or installed linux you are probably running an older version of X. Verify that you are running version 4.0 or better by typing the following command:

```
papel:/ # X -version
```

You should now see something like this:

```
 XFree86 Version 4.0 / X Window System
 (protocol Version 11, revision 0, vendor release 6400)
 Release Date: 8 March 2000
        If the server is older than 6-12 months, or if your card is newer
        than the above date, look for a newer version before reporting
        problems.  (see http://www.XFree86.Org/FAQ)
 Operating System: Linux 2.3.46 i686 [ELF]
 Module Loader present
```

If the version is not 4.0 or higher (first line), you will need to upgrade. Use your distributions package manager to upgrade to version 4.0 or better or download it directly from XFree86 and install it.

```
ftp://ftp.xfree86.org/pub/XFree86/4.0/
```

or better use one of the mirrors found at

```
http://www.xfree86.org/4.0/ftp.html
```

After download the files install the new X with the Xinstall.sh shellscript. Please note, if you install X this way it is bypassing any package management your system has.

3.2. Design Considerations

It is possible to have each physical screen in your Xinerama setup to have a different resolution. There are some advantages to this, I was able to use an old monitor which only operates at 640x480, and a bigger 17" at 1280x1024 in my setup. I have also heard of web developers and graphics designed who use one big "preview" screen and flank it with one or two smaller screens. I think this flexibility is one of the great things about the Xinerama extensions.

There are several UI issues which are specific to Xinerama with most current generation window managers (see Section 9) do not address well. The most anoying is the poor handling of dead areas.

Window managers assume the display area is a rectangle equal in size to the heighth and width of your total desktop. If you use more than one display resolution in a Xinerama setup your desktop will be non−rectangular. This results in "dead areas", areas which do not exist on your display, but window manager interpret as "Empty". Many window managers will try to utilize this dead area for new windows. The result is windows which are inaccessable. As window managers become Xinerama aware and this problem will go away quickly.

Window managers also don't handle the concept of maximizing a window when you are running Xinerama. Usually what happens is it maximizes your window across all available screens. Having Netscape spread across 2 displays is generally not the best way to surf the net.

Unlike with screen resolotion, Xinerama limits your entire virtual screen to one color depth. If you were planning on pulling out a cheap video card for your second display you need to keep this in mind. If your old video card only supports 8 bit color you might get a bigger display but most newer programs look lousy in 256 colors.

3.3. Layout

Layout decisions are fairly simple, you just need to decide how you want to physically lay out your monitors. Most people will simply place their monitors in a row and view their desktop as one giant monitor. It is also possible to overlap displays, or place them in more complex layouts. Keep in mind though what I said above about window managers expecting rectangular displays.

4. AutoMagic Video Card Set Up

This is a good time to back up your existing config file

I did it like this:

```
root# > cp /etc/X11/XF86Config /etc/X11/XFree86Config.working
```

Note: If your system may have two sets of config files XF86Config and XF86Config−4. You can either work with the XF86Config−4 files, or rename XF86Config−4 to somthing else and work with the XF86Config file. I will assume that you are working with the XF86Config file from here out. If you are working with XF86Config−4 or if your XF86Config file is located somewhere other than /etc/X11 you will need to adjust the commands accordingly.

The newer versions of X support automatic config file generation and it works very well. If this works for you you should be able to skip the next couple steps.

Put all of your video cards into your system and set up your monitors. Set everything up the way you want it when you are done, as you will have to repeat steps later if you change things.

This next step needs to be done from the console with−out X running. If you are in X, exit now. If your system uses a display manager such as xdm or gdm exit you need to stop that service.

If you need to stop a display manager from RedHat the easiest way is like this:

```
root# > telinit 3
```

for Debian or Libranet :

```
root# > /etc/init.d/xdm stop
```

If neither of these methods work you, reboot your computer and start up in single user mode.

Once you are at the console prompt and logged in as root run X with the configure option:

```
root# > X −configure
```

Once you have done this X will normally generate a configuration file called XF86Config.new in the home directory of the root user. Test out the configuration file to see if it starts X windows properly:

```
root# > X −xf86config /root/XF86Config.new
```

Chances are that your displays will come up with the generic X Windows startup screen. If so, you are golden and just need to do a little fine tuning. Exit X by pressing Control−Alt−Backspace and copy the new config file to the /etc/X11 directory:

```
root# > cp /root/XF86Config.new /etc/X11/XF86Config
```

Then continue to Section 7.3.

If your displays didn't come up properly continue to the next section to manually configure your cards.

5. Manual Video Card Set Up

If you didn't back up your XF86Config file in the previous section, do it now. For example:

```
root# > cp /etc/X11/XF86Config /etc/X11/XFree86Config.working
```

One card at a time manually configure and install each video card/ monitor combination you are going to have in your final setup. If you have several identical video cards you can get away with configuring one and copying the configuration for the other cards.

Note, it is possible configure and test your video cards without physically swapping them. If you use the technique in Section 6 below and specify the bus ID.

After you have each card set up, back up or print it's config file as you will need it later. Here's how I did it:

```
root# > cp /etc/X11/XF86Config /etc/X11/XFree86Config.Matrox
```

If your video cards are identical you can probably get away with just one copy. However don't skip this step, If all else fails this will be you backup config file incase my instructions lead you astray.

Once you have all of your displays configured you are almost there...

6. Scan the PCI Bus

For this portion you need all of your video cards in your system and your monitors plugged in appropriately. Set everything up the way you want it when you are done, as you will have to repeat steps later if you change things.

This next step needs to be done from the console with−out X running. If you are in X, exit now. If your system uses a display manager such as xdm or gdm exit you need to stop that service.

If you need to stop a display manager from RedHat the easiest way is like this:

```
root# > telinit 3
```

for Debian, Storm or Corel :

```
root# > /etc/init.d/xdm stop
```

If neither of these methods work you, reboot your computer and start up in single user mode.

In a multi−head setup you need to explicitly identify each video card in your config file. To do this you need to use the PCI Bus Identifier your system assigns the card. At this time, all video cards need to be in your system.

To find out what your PCI bus IDs are:

```
root# > XFree86 −scanpci
```

X will then output a code for each device on your PCI bus.

```
(0:0:0) Intel 82443BX Host
(0:1:0) Intel 82443BX AGP
(0:7:0) Intel 82371AB PIIX4 ISA
(0:7:1) Intel 82371AB PIIX4 IDE
(0:7:2) Intel 82371AB PIIX4 USB
(0:7:3) Intel 82371AB PIIX4 ACPI
(0:9:0) Adaptec 2940U/UW
(0:11:0) 3COM 3C900 10b Combo
(0:12:0) Matrox unknown card (0x2007) using a Matrox MGA 2164W
(1:0:0) unknown card (0x1092/0x0152) using a Texas Instruments Permedia 2
```

PCI cards and devices are identified with a leading 0, AGP cards with a 1. In my case I have a Matrox Millenium II (0:12:0) and a Diamond FireGL(1:0:0). Find your video cards and write down the numbers associated with them. It is important that you know which number goes with which card.

7. Editing your XConfig File

If I haven't lost you so far, we are in the home stretch now. This section is pretty confusiing so I suggest you also read the manpage for XF86Config, or at least skim it. Do it now... I'll wait.

```
root# > man XF86Config
```

7.1. Adding your video cards

Open your current XF86Config file and scroll down to the Monitor Section. You want to copy the following sections from the device specific XF86Config backup files you created above : Monitor, Device, Screen. These sections should go in your XF86Config file after the coresponding section in the file you have open. As you copy each section make certain that the Identifier is unique for each section, you will reference these Identifiers later.

Clear as Mud Right? You should now have a Monitor Section, a Device Section, and a Screen Section for EACH video card/monitor combination, each Section should have a unique Identifier. If you are still confused reread the prior paragraph. If that doesn't help, look at Section 10 I have included at the end. You did read the manpage right?

7.2. Identifying Your Video Cards

Now you need to add the coresponding PCI BusID as an option at the end of each Device Section. The entry should look like this: BusID "PCI:0:12:0", substituting the three numbers with the PCI bus ID which identifies YOUR video card you should have this ID from Section 6. Here is a sample Device Section for one of my video cards.

```
Section "Device"
    Identifier  "FireGL"
    Driver      "glint"
    BusID      "PCI:1:0:0"
EndSection
```

Please note, even AGP cards use this layout.

7.3. Configuring the Server Layout

Now you need to edit the ServerLayout Section at the end of the XF86Config File. The ServerLayour Section is exactally that, it tells you what Screens to use, how to lay them out logically, and what input devices to assign to them. Your current layout is for one screen, keyboard, and mouse. For each Screen section you have created about you need reference in this section for them to appear in your display.

Using the existing screen reference as a starting point, create additional references for your other Screen Sections. The reference looks like this:

```
Screen "Screen 2" Relationship "Screen 1"
```

This defines the relationship between the "Screen 2" and "Screen 1". Valid Relationships include: RightOf, Below, Above, LeftOf, Absolute X Y, Relative. Use of the first four relationships is pretty obvious as illustrated in my sample:

```
Section "ServerLayout"
    Identifier  "Simple Layout"
    Screen "Screen 2"
    Screen "Screen 1" RightOf "Screen 2"
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection
```

I have other examples in Section 10.

8. Testing Your Configuration

Once you have completed changing your XF86Config file, save it and your can now test your configuration :

```
 root# > startx -- +xinerama
```

Hopefully you can now enjoy X with multiple partners... er that is, Monitors.

8.1. Configuring X to Start Xinerama Automatically

The easiest way to have X start up with the Xinerama extentions is to add an option in the "ServerFlags section. as follows:

```
Section "ServerFlags"
  Option "Xinerama" "true"

EndSection
```

Now Xinerama should start every time you start X.

9. Window Managers and Xinerama

As I mentioned above, a window manager does not need to be written to support Xinerama. However there are certain enhancements which window manager developers can do to make Xinerama users lives easier. Features which I thought were desireable include:

* Intelligent placement of windows.

– Window managers should not place windows in dead areas or across the borders of two heads.

– New windows should be placed in the current desktop.

* Maximizing windows should maximize the window to the current head only.

* Window Movements should have edge resistance between heads (Much like they have resistance to other windows).

* Dialogs and informative messages should not pop up Between Heads.

In my older howto I had listed a lot of Window Managers and their level of support for Xinerama. But most of that information is obsolete now. Most modern window managers support Xinerama to some extent.

10. Sample XF86Config Files

My current XF86Config File :

```
Section "Module"
    Load        "dbe"   # Double buffer extension
    SubSection  "extmod"
      Option    "omit xfree86-dga"   # don't initialise the DGA extension
    EndSubSection
    Load        "type1"
    Load        "freetype"
# This loads the GLX module
#    Load       "glx"
EndSection

Section "Files"
    RgbPath     "/usr/X11R6/lib/X11/rgb"
    FontPath   "/usr/X11R6/lib/X11/fonts/local/"
    FontPath   "/usr/X11R6/lib/X11/fonts/misc/"
    FontPath   "/usr/X11R6/lib/X11/fonts/75dpi/:unscaled"
    FontPath   "/usr/X11R6/lib/X11/fonts/100dpi/:unscaled"
    FontPath   "/usr/X11R6/lib/X11/fonts/Type1/"
    FontPath   "/usr/X11R6/lib/X11/fonts/Speedo/"
    FontPath   "/usr/X11R6/lib/X11/fonts/75dpi/"
    FontPath   "/usr/X11R6/lib/X11/fonts/100dpi/"
# The module search path.  The default path is shown here.
#    ModulePath "/usr/X11R6/lib/modules"
EndSection

Section "ServerFlags"
  Option "Xinerama" "true"
EndSection

Section "InputDevice"
    Identifier  "Keyboard1"
    Driver      "Keyboard"
    Option "AutoRepeat" "500 30"
    Option "XkbRules"   "xfree86"
    Option "XkbModel"   "pc101"
    Option "XkbLayout"  "us"
EndSection

Section "InputDevice"
    Identifier  "Mouse1"
    Driver      "mouse"
    Option "Protocol"    "PS/2"
    Option "Device"      "/dev/psaux"
EndSection

Section "Monitor"
    Identifier  "Mini"
    HorizSync   31.5
    VertRefresh 50-90
EndSection

Section "Monitor"
    Identifier  "Impression"
    HorizSync   31.5 - 82.0
    VertRefresh 50-100
EndSection
```

```
# Video Card #1, Matrox Millenium II PCI Video Card
Section "Device"
    Identifier  "Matrox"
    Driver      "mga"
    VideoRam 8192
    BusID      "PCI:0:12:0"
EndSection

# Video Card # 2, Fire GL 1000 AGP video card.
Section "Device"
    Identifier  "FireGL"
    Driver      "glint"
    #VideoRam    8192
    BusID      "PCI:1:0:0"

EndSection

Section "Screen"
    Identifier  "Screen 2"
    Device      "FireGL"
    Monitor     "Impression"
    DefaultDepth 16

    Subsection "Display"
        Depth       16
        Modes       "1280x1024" "640x480"
        ViewPort    0 0
    EndSubsection
EndSection

# My Miniature monitor,  notice that I used the virtual option so it is
#   the same heighth as the larger monitor,  this is not necessary.
Section "Screen"
    Identifier  "Screen 1"
    Device      "Matrox"
    Monitor     "Mini"
    DefaultDepth 16

    Subsection "Display"
        Depth       16
        Modes       "640x480"
        ViewPort    0 0
        Virtual     640 1024
    EndSubsection
EndSection

Section "ServerLayout"
    Identifier  "Simple Layout"
    Screen "Screen 2"
    Screen "Screen 1" Rightof "Screen 2"
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection
```

An alternate ServerLayout Section with one Monitor above the other.

```
Section "ServerLayout"
    Identifier  "Simple Layout"
    Screen "Screen 2"
    Screen "Screen 1" Below "Screen 2"
```

```
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection
```

Screens can overlap too. In this configuration I make the two monitors overlap by 80 pixels..

```
Section "ServerLayout"
    Identifier  "Simple Layout"
    Screen "Screen 2"
    Screen "Screen 1" Relative "Screen 2" 1200 0
    InputDevice "Mouse1" "CorePointer"
    InputDevice "Keyboard1" "CoreKeyboard"
EndSection
```