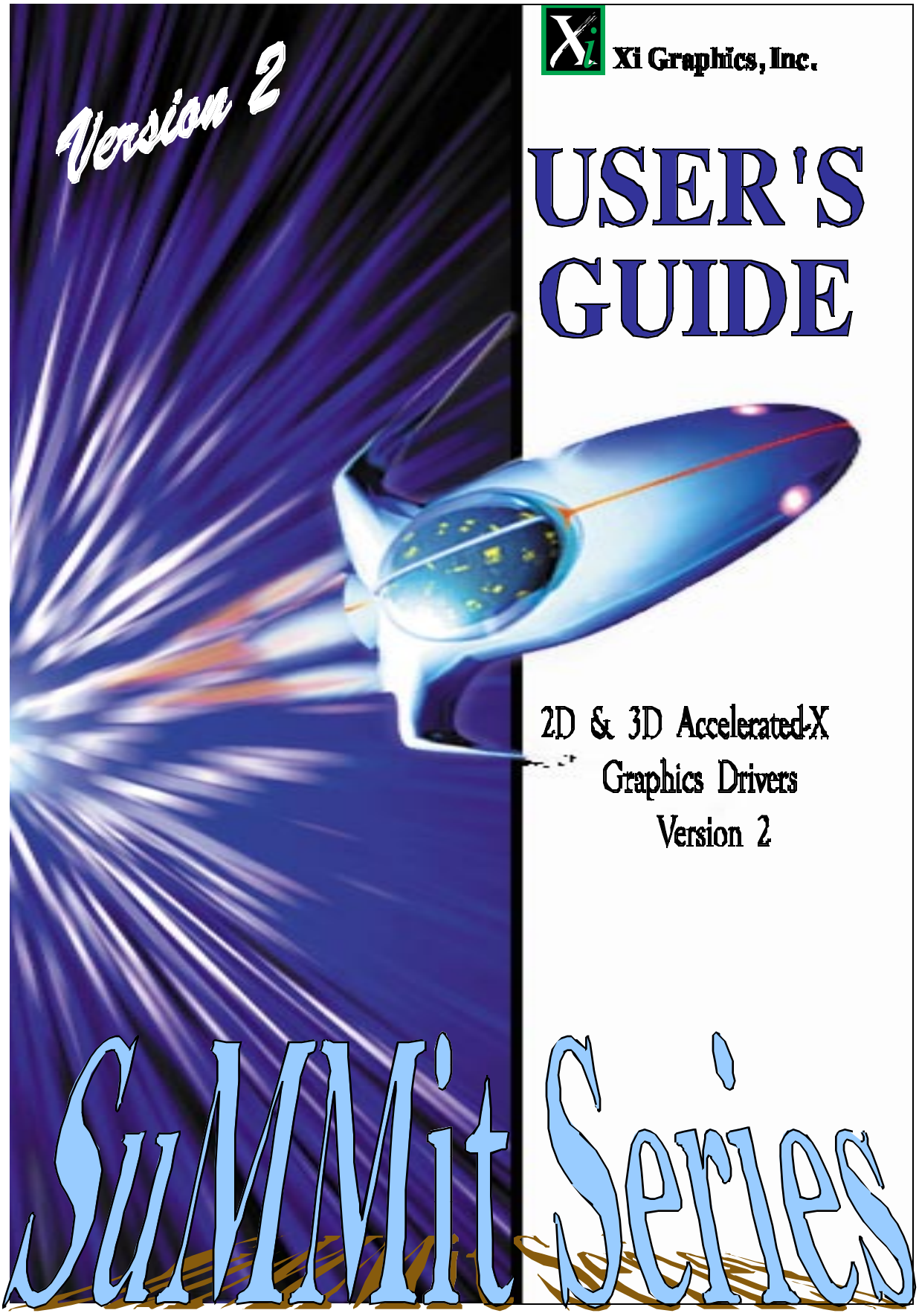

Xi Graphics, Inc.

USER'S GUIDE

2D & 3D Accelerated-X
Graphics Drivers
Version 2

SuMMit Series

Accelerated-X™

Summit Series

Version 2

Installation and User's Guide

Second Edition (October 2001)

This edition of the Accelerated-X Summit Series Display Servers Installation and User's Guide applies to the Summit Series Display Servers, version 2.

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Table of Contents

1 Introduction

This guide provides information about installing, configuring and beginning to use Accelerated-X Summit Series Graphics Drivers.

To install Accelerated-X Summit, read chapter 2 or 3, depending on your Operating System (Linux or Solaris). For tips on configuring Accelerated-X for maximum performance and usability, consult Chapter 4. 'Configuring Summit". For detailed information on specific hardware-accelerated and 3D features, review Chapter 5, 'Accelerated-X Summit Features,' and the Release Notes.

Apart from this printed documentation and the Release Notes, additional information is installed on-line with the product. On-line documentation covers the command line arguments for the Summit Accelerated-X Server and the file formats for the various configuration files for the product. The command ***man Xaccel*** should display the on-line manual pages. News and recent technical information is available on Xi Graphics' web site, http://www.xig.com.

Document Overview

Chapter 1 Introduction describes the layout of the manual, documentation conventions and suggested further reading.

Chapter 2 Installing Accelerated-X Summit on Linux documents the installation process for the Linux operating system. The installation process covers necessary Linux system features, requirements and copying the software to disk. Procedures for applying updates, upgrading and removing the software are also provided.

Chapter 3 Installing Accelerated-X Summit on Solaris documents the installation process for the Solaris operating system. The installation process covers necessary Solaris system features and requirements. Procedures for applying updates, upgrading and removing the software are also provided.

Chapter 4 Configuring Accelerated-X Summit provides the basic and advanced configuration information for Accelerated-X Summit Drivers, using the Xsetup configuration program.

Chapter 5 Accelerated-X Summit Features describes Accelerated-X advanced configuration techniques for users and system administrators. The information in this chapter should help to obtain maximum speed and performance from their systems.

Chapter 6 X Window System Overview gives an in-depth overview of the X Window system and how graphics devices are supported in a windowed environment.

Chapter 7 OpenGL Overview provides an overview of the OpenGL programming model and OpenGL features.

Chapter 8 Troubleshooting includes troubleshooting for both the installation process and for continued operation, as well as support information.

Chapter 9 File Names lists the file names that are common for each operating system and offers some operating system specific file names useful for the X Server.

Further Reading

X Window System Administraion

Mui and Pearce. "X Window System Administrator's Guide", O'Reilliy & Associates, 1992, ISBN 0-937175-83-8.

Basic X Window System Programming

Quercia and O'Reilly, "X Window System User's Guide", O'Reilly & Associates, 1991, ISBN 0-937175-61-7.

Advanced X Window System Programming

Johnson and Reichard, "Advanced X Window Applications Programming", M&T Books, 1994, ISBN 1-55828-344-7.

OpenGL Programming

Open GL ARB, Woo, Neider, Davis and Shreiner, "OpenGL Programming Guide", Addison Wesley, 1999, ISBN 0-201-60458-2.

Deep in the X Protocol

Scheifler and Gettys, "X Window System, Core library and standards", Digital Press, 1996, ISBN, 1-55558-154-4.

Scheifler and Gettys, "X Window System, Core extension protocols", Digital Press, 1996, ISBN 1-55558-148-X.

Scheifler & Gettys, "X Window System, Extension Libraries", Digital Press, 1996, ISBN 1-55558-146-3.

Documentation Conventions

The following documentation conventions are used throughout this guide:

Entity	***Representation***
File Name	*/etc/Xaccel.ini*
Command Name	*Xsetup*
Command	***man Xaccel***
Key Name	**Control-Alt-Backspace**
Command Output	"grzblf: no such files or directory"
Web Location (URL)	http://www.xig.com/

2 Installing Accelerated-X on Linux

This Chapter describes how to install, upgrade, update and remove Accelerated-X Summit on the Linux operating system. Installation of Accelerated-X Summit requires disabling any currently running X server, installing the xsvc driver, installing the Summit RPM and, optionally, rebooting your computer.

The Release Notes, found in the same location as the RPM, will provide more up-to-date information on current capabilities, and other issues you may need to know about that are not covered in this manual. It is strongly recommended that you read the Release Notes before proceeding.

Demo is Required

Accelerated-X Summit is supplied in RPM format for Linux systems. Almost all Linux systems these days support RPM. Initially, the RPM, once installed, will allow your server to run in 'Demo' mode. This means it will run for approximately 25 minutes. After 25 minutes, any keyboard or pointer activity will cause the server to terminate. You can restart the server any number of times.

Once you have tried out the demo, and are satisfied that it will work with your hardware and meet your needs, you can order a key (delivered via e-mail) that will activate the server for normal use. See http://www.xig.com to order a key for your server.

System Requirements

Accelerated-X Summit supports Linux kernel versions 2.2x and 2.4x. For optimum performance, we recommend the 2.4.x kernels. Accelerated-X Summit requires a glibc 2.1 compatible system. We no longer support glibc 2.0 or libc5. You can determine the version of the kernel you are running by using the 'uname-a' command.

You must have a supported video card or chipset. You will find a list of supported hardware on Xi Graphic's Web site at http://www.xig.com.

You must have the X Services (xsvc) kernel driver installed on your computer. See Appendix A for information on the xsvc driver. Accelerated-X Summit will not operate without the xsvc driver. Xsvc must also support the AGP bridge on your computer. If you are using a PCI only system, you must still install the xsvc driver.

See http://www.xig.com for information on the tested Linux distributions. Although we try to support as many distributions as possible, for various reasons, we cannot support them all.

Troubleshooting the Installation

If the installation procedure described below does not work for you, look at Chapter 8, "Troubleshooting", for further information. If you need additional assistance, go to the technical support web pages at http://www.xig.com.

Preparing to Install

1. Disable graphical logins

You should install Accelerated-X Summit from the Linux text console. If you try to install Accelerated-X while another X server is running, the system might become unstable. Many systems boot by default into the text login. In this case, you will not need to disable a graphical login.

If you are using a graphical login such as Xi Graphics DeXtop, disable it by running the command:

```
# /usr/dt/bin/dtconfig -d
```

On other systems, you will need to edit the file '/etc/inittab'. Change the file '/etc/inittab' so that it boots the system into run level 3 (instead of run level 5 by default):

Before:

```
/etc/inittab
...
id:5:initdefault
```

After:

```
# /etc/inittab
...
id:3:initdefault
```

After you make this change, reboot the system.

NOTE: On some distributions such as SuSE Linux, graphical login is enabled at run level 3 and text login is enabled with run level 2. Therefore, use run level 2 as the default.

1. Shut down the system and then reboot

Shut down the system with the command:

 # /sbin/shutdown –h +5 “Configuring new X server”

When the system has halted, turn off the power. Wait for at least ten seconds then turn the system back on. This will restore your graphics card to a stable state.

3. Login as the superuser

When the system has booted, login as root. If the system did not boot with a text login, please see step 1, or consult your system documentation for instructions on setting up text-mode login as the default.

Accelerated-X Summit Installation Procedure

This section assumes that you have already installed the xsvc kernel driver and tested it according to the README that accompanies the xsvc RPM. See Appendix A for a description of the xsvc kernel driver.

It is important, if you are installing an Accelerated-X Summit server that supports hardware OpenGL, that you remove any other OpenGL libraries on your system, typically Mesa. You cannot use Mesa with Accelerated-X Summit servers. Various Linux distributions install Mesa as part of the initial operating system installation. How this is removed depends largely on the distribution you are using.

On some systems, you can remove Mesa with the command:

rpm –e Mesa

On some systems, you will need to use the ‘—nodeps’ option to remove it, as in:

rpm –e --nodeps Mesa

Other distributions embed the Mesa libraries within other packages, like your X11 libraries. Obviously you will not want to remove your X11 libraries, or you will not be able to use your X software. If you are unable to remove your Mesa libraries, the Accelerated-X Summit RPM will try to save them somewhere harmless during installation.

Using RPM to Install Accelerated-X Summit

Installing the Accelerated-X Summit RPM file requires the use of the **rpm** command. The general format of this command is as follows:

rpm –i <rpmfile>

where <rpmfile> is the name of the RPM you downloaded. RPM files usually have a '.rpm' extension.

Some Linux distributions, such as Slackware, support the rpm command, but do not use the command to install their own packages during OS installation. In these cases, and in cases where you could not remove Mesa due to poor packaging practices by the Linux distribution in use, you may need to supply the '--nodeps' option to rpm to allow the package to be installed anyway. For example:

rpm –i --nodeps <rpmfile>

In very rare cases, you may need to use the '--force' option to rpm to install the package, as in:

rpm –i --nodeps --force<rpmfile>

You should not use the '--force' option unless you absolutely have to.

Once installation has started, you will be presented with the Xi Graphics End-User license agreement. Read the license, and when prompted, type 'accept' to continue installation. If you do not agree to the terms of the license, type 'no' and installation will be aborted.

Once installation is complete, you must run the Xsetup utility to configure your X server:

/usr/X11R6/bin/Xsetup

Instructions on configuring your new X server can be found in Chapter 3, 'Configuring Accelerated-X Summit.'

Test Your Server

To test for proper installation, start Accelerated-X Summit by using the command:

 # /usr/X11R6/bin/Xaccel

If you are presented with a graphical 'splash screen' with a Summit Accelerated-X logo, user configuration was successful. Press the **Control-Alt-Backspace** key chord. This will return you to a text mode command prompt. If you do not see the splash screen, run **/usr/X11R6/bin/Xsetup** program, as described in Chapter 3, 'Configuring Accelerated-X Summit', and verify that the settings are correct. If not, make the necessary changes, save, exit and repeat the 'Test Your Server' process. If the information appears to be correct, please contact Xi Graphics technical support (email support@xig.com) for assistance.

Restore graphical login

Once you have verified that 3D Accelerated-X has been configured correctly, re-enable any graphical login.

If using Xi Graphic's DeXtop, re-enable graphical login with the commands:

 # /usr/dt/bin/dtconfig –e

 # /usr/dt/bin/dtlogin –daemon

If you are not using a CDE implementation, undo the preparations you made in 'preparing to install.'

Congratulations! The installation process is complete. To learn more about the features of Accelerated-X Summit, please consult the rest of this manual.

Removing Accelerated-X Summit

To remove Accelerated-X Summit from your system, use the **rpm** command as in:

rpm –e <rpmfile>

In some cases you may need to use the '—nodeps' option to rpm, as in:

rpm –e –nodeps<rpmfile>

Upgrading Accelerated-X Summit

Follow the procedures to remove the currently installed version of Accelerated-X Summit, then follow the procedure to install the new version of Accelerated-X.

Updating Accelerated-X Summit

Updates are periodically announced on the 'summit-announce' mailing list. See Chapter 8, 'Troubleshooting', about subscribing to a mailing list.

To apply an update, download the update(s) from Xi Graphics' web site, http://www.xig.com, and follow the description in the associated text description file(s) for the update(s). Note that several updates may be required. These must be installed in ascending numerical order. Required updates are listed in the text description file.

If the update(s) applied were for hardware already supported by Accelerated-X Summit, you should be able to simply restart Accelerated-X Summit. Otherwise, if the update(s) included new hardware support, use the **/usr/X11R6/bin/Xsetup** command to (re)configure Accelerated-X Summit. Please refer to Chapter 3 for additional configuration information.

OpenGL Demos

We have compiled some OpenGL Demos that are available on our Web site. These include:

- GLUT demos, part of the GLUT toolkit which is freely available on the internet
- Glaze, a demo application from Evans & Sutherland that demonstrates some OpenGL features.
- Bzflag, a freely available game, which we here at Xi Graphics enjoy playing, er, testing frequently ;-)

3 Installing Accelerated-X on Solaris

This Chapter describes how to install, upgrade, update and remove Accelerated-X Summit on the Solaris/x86 operating system. Installation of Accelerated-X Summit requires disabling any currently running X server, installing the Summit package, and, optionally, rebooting your computer.

The Release Notes, found in the same location as the package file, will provide more up to date information on current capabilities, and other issues you may need to know about that are not covered in this manual. It is strongly recommended that you read the Release Notes before proceeding.

Demo is Required

Accelerated-X Summit is supplied in a compressed, **pkgadd** stream format for Solaris systems. Initially, the package, once installed, will allow your server to run in 'Demo' mode. This means it will run for approximately 25 minutes. After 25 minutes, any keyboard or pointer activity will cause the server to terminate. You can restart the server any number of times.

Once you have tried out the demo, and are satisfied that it will work with your hardware and meet your needs, you can order a key (delivered via e-mail) that will activate the server for normal use. See http://www.xig.com to order a key for your server.

System Requirements

Accelerated-X Summit is supported on Solaris 8 for Intel x86 processors.

You must have a supported video card or chipset. You will find a list of supported hardware on Xi Graphic's Web site at http://www.xig.com.

You must have the X Services (xsvc) kernel driver installed on your computer. See Appendix A for information on the xsvc driver. Accelerated-X Summit will not operate without the xsvc driver. Xsvc must also support the AGP bridge on your computer. If you are using a PCI only system, you must still install the xsvc driver.

Troubleshooting the Installation

If the installation procedure described below does not work for you, look at Chapter 8, "Troubleshooting", for further information. If you need additional assistance, go to the technical support web pages at http://www.xig.com.

Preparing to Install

1. Disable graphical logins

At the graphical login screen, select "Command Line Login" from the "Options" menu. Login as root, and run the command:

 # /usr/dt/bin/dtconfig -kill

This will stop the graphical login and allow you to begin installation.

2. Login as the superuser

Login as the root user from the text mode login prompt.

It is important if you are installing an Accelerated-X Summit server that supports hardware OpenGL, that you remove any other OpenGL libraries on your system, typically Mesa. You cannot use Mesa with Accelerated-X Summit, unless you are only interested in software (slow) rendering.

Accelerated-X Summit Installation Procedure

When you first download the package from Xi Graphic's ftp site, it will be in gzip com-pressed format, with a '.gz' extension.

First, uncompress the file:

gunzip <pkgfile>.gz

To install the package, you use the **pkgadd** utility. For example:

pkgadd –d <pkgfile>

where <pkgfile> is the name of the pkgadd format file obtained after decompressing it. Pkgadd format package files usually have a '.pkg' extension.

Confirm SETUID/SETGID Files

The installer asks if the file '/usr/openwin/bin/Xaccel' should be installed with setuid and/or setgid permissions. Enter [**y**] and then **Enter** to confirm.

Confirm Superuser Scripts

The installer asks if scripts can be executed with superuser permissions during the install. Enter [**y**] and then **Enter** to confirm.

The installer will list the files that are being unpacked.

Notes on the Install

Prior to using the server, please read the End User license for Accelerated-X Summit which is stored in /usr/openwin/lib/acceleratedx/etc/LICENSE. Using this server implies acceptance of the terms of this license.

A new '/etc/dt/config/Xservers' file is created during the install. The file is used by the Sun login manager to choose the X server. The original file is backed up as '/usr/dt/config/Xservers'. A line is added to the file '/usr/dt/lib/bindings' xmbind.alias', which describes the Accelerated-X keyboard mappings.

Once installation has completed, you must run the Xsetup utility to configure your X server:

/usr/openwin/bin/Xsetup

Instructions on configuring your new Xserver can be found in Chapter 3, 'Configuring Summit.'

Test Your Server

To test for proper installation, start Accelerated-X Summit by using the command:

 # /usr/openwin/bin/Xaccel

If you are presented with a graphical 'splash screen' with a Summit Accelerated-X logo, user configuration was successful. Press the **Control-Alt-Backspace** key chord. This will return you to a text mode command prompt. If you do not see the splash screen, run the **/usr/X11R6/bin/Xsetup** program, as described in Chapter 4, 'Configuring Accelerated-X Summit', and verify that the settings are correct. If not, make the necessary changes, save, exit and repeat the 'Test Your Server' process. If the information appears to be correct, please contact Xi Graphics technical support (email support@xig.com) for assistance.

Restore graphical login

To restore graphical login, run the following command:

 # /usr/dt/bin/dtlogin -daemon

Your installation is complete.

Removing Accelerated-X Summit

To remove Accelerated-X Summit from your system, use the **pkgrm** command as in:

pkgrm XiGSummit

Upgrading Accelerated-X Summit

Follow the procedures to remove the currently installed version of Accelerated-X, then follow the procedure to install the new version of Accelerated-X.

Updating Accelerated-X Summit

Updates are periodically announced on the 'summit-announce' mailing list. See Chapter 8, 'Troubleshooting', about subscribing to a mailing list.

To apply an update, download the update(s) from Xi Graphics' web site, http://www.xig.com, and follow the description in the associated text description file(s) for the update(s). Note that several updates may be required. These must be installed in ascending numerical order. Required updates are listed in the text description file.

If the update(s) applied were for hardware already supported by Accelerated-X Summit, your should be able to simply restart Accelerated-X. Otherwise, if the update(s) included new hardware support, use the **/usr/openwin/bin/Xsetup** command to (re)configure Accelerated-X Summit. Please refer to Chapter 4 for additional configuration information.

OpenGL Demos

We have compiled some OpenGL Demos that are available on our Web site. These include:

Note: These demos will only work if you are using an OpenGL 3D X server.

- GLUT demos, part of the GLUT toolkit which is freely available on the internet
- Glaze, a demo application from Evans & Sutherland that demonstrates some OpenGL features.
- Bzflag, a freely available tank game, which we here at Xi Graphics enjoy playing, er, testing frequently ;-)

4. Configuring Accelerated-X Summit

This chapter describes configuration using the *Xsetup* utility provided with Accelerated-X Summit Drivers. The purpose of this configuration is to create the settings unique to your particular system that reflect your Accelerated-X Summit preferences. *Xsetup* must be run with superuser privileges in order to save the new configuration successfully. If you wish to simply view the current configuration, the utility can be run with ordinary user privileges.

Starting the Xsetup Configuration Utility

To start *Xsetup*, type ***/usr/X11R6/bin/Xsetup*** from a command prompt.

Basic Configuration

The Xsetup utility is located in the X windows binaries directory which varies depending on your OS. For this chapter, we will use the convention 'XHOME' to refer to the location on your system where X related binaries are typically installed.

For Linux, XHOME is

/usr/X11R6

And for Solaris, XHOME is

/usr/openwin

The Xsetup utility is located in XHOME/bin/Xsetup. If you are currently running an X session, Xsetup will come up in graphical mode. If not, a text mode Xsetup will run. Text mode Xsetup is used to do basic configuration of your X server. For more detailed or advanced configuration, you will need to use Xsetup from within your X session. Graphical Xsetup contains full help on all aspects of configuring your X server.

To configure Accelerated-X Summit initially, or when using new hardware, use the following steps. For advanced configuration please refer the 'Advanced Configuration' section. Press the "**?**" help key in any screen to get some context sensitive help. Use the cursor keys to move around. Use the **Enter** key to change a selection. In some circumstances, the **Tab** key offers more information on configuration.

Overview:

1 Read the copyright information and support contact information.

2 Choose the Graphics Board.

3 Choose the Monitor.

4 Select the resolution.

5 Configure the mouse type.

6 Optional: Choose the keyboard national language.

7 Save and Exit

8 Test the Configuration: type ***/XHOME/Xaccel***
(Ctrl + Alt + Bkspc will stop Accelerated-X)

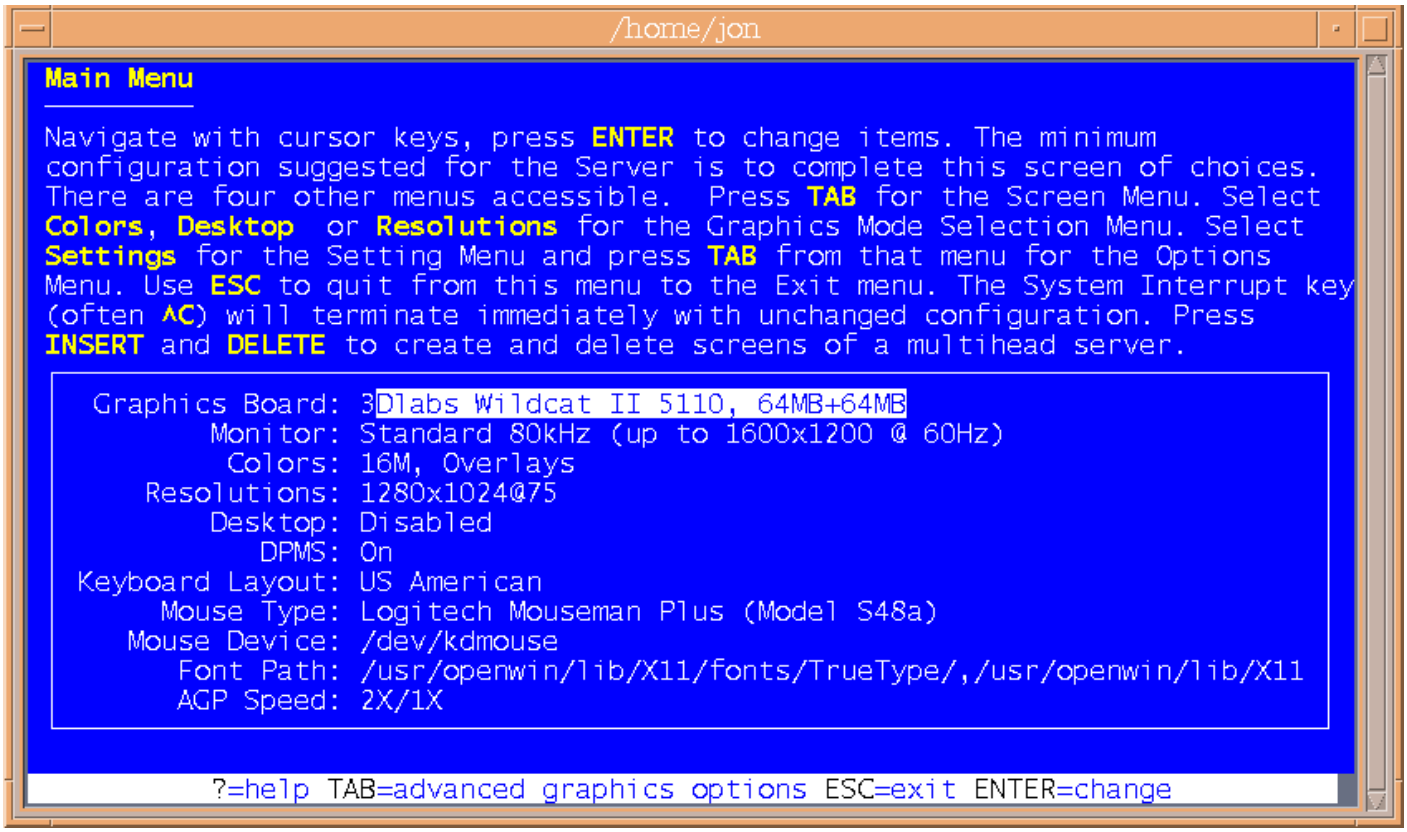


Figure 4-1: The Main Menu

Configure the Graphics Board

From the Main Menu press the **Enter** key to enter the Graphics Board section. Use the **Enter** key once your selection is highlighted within the scrolling list of supported Graphics Boards. You can type the first few letters of the manufacturers name to jump to different sections of the scrolling list.

To view detailed information about any Graphics Board use the **Tab** key to see a pop up information window of the highlighted Graphics Board. Press **Esc** to return to the Graphics Board selection list.

If your graphics board is not listed, it is possible that support for it has been added recently. X*i* Graphics' web site at http//:www.xig.com carries a recent list of supported hardware and update files.

Subscribe to our email service to be notified of updates and new support. For more information on this service, refer to Chapter 8, 'Troubleshooting'.

Pressing **TAB** on the main screen when the Board selection is highlighted will allow you to configure various options for your board, such as whether to enable Stereo, selecting a default visual, and allowing you to adjust some AGP and DMA settings.

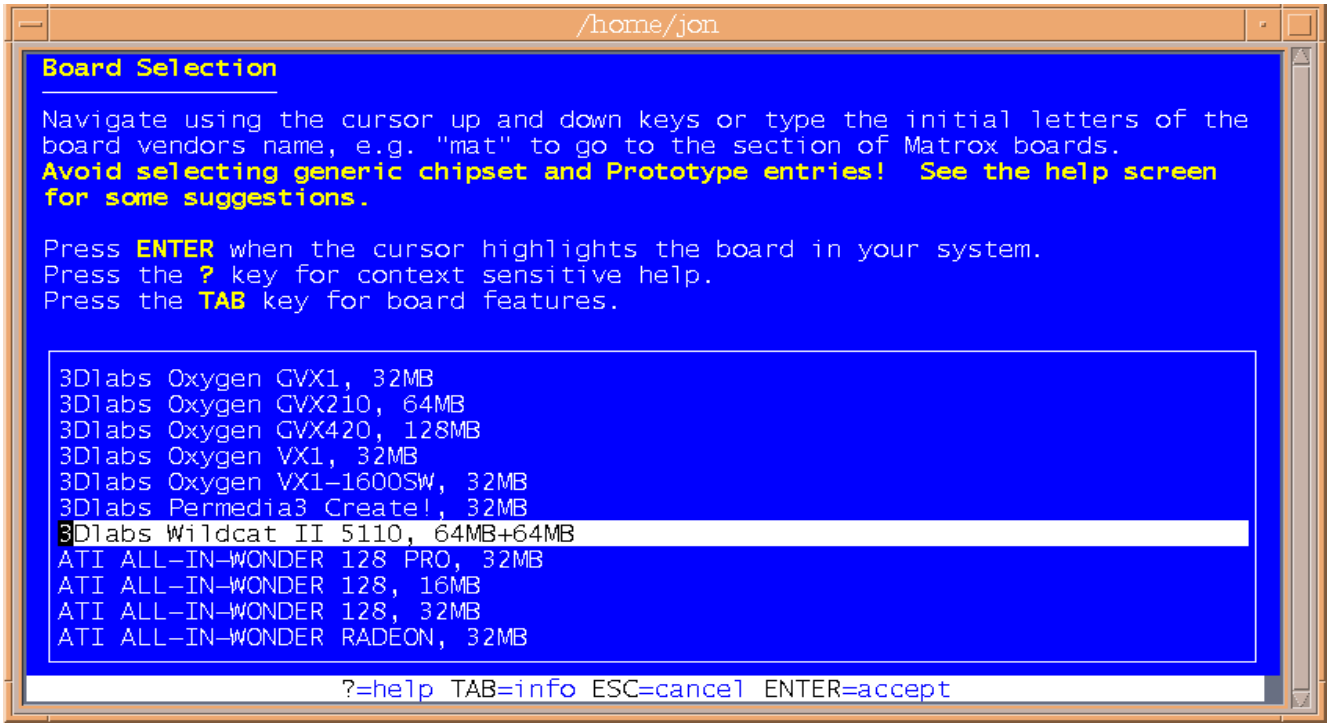
WARNING: Do not adjust AGP and DMA settings unless you know what you are doing. Improperly adjusting these values can hang your computer or introduce instability.

You can also enable DualView on this screen. If you enable DualView in text mode, the second monitor will be configured exactly as the first. Use Xsetup in graphical mode for more advanced configuration of DualView.

Although you can configure options such as DualView and Stereo on this screen, they will not have any effect if your server does not provide this functionality. For example, nothing will happen if you try to configure these options on a bronze edition server because a bronze server does not support these features.

Please see the Xi Graphics' Web site for further division of the features supported in each driver series.

Figure 4-2: The Graphics Subsystem Menu.



Configure the Monitor

From the Main Menu press the **Enter** key to enter the Monitor section. Use the **Enter** key once your selection is highlighted within the scrolling list of supported Monitors. You can type the first few letters of the manufacturer's name to jump to different sections of the scrolling list.

To view detailed information about any Monitor, use the **Tab** key to see a pop up information window of the highlighted Monitor. Press **Esc** to return to the Monitor selection list.

If your Monitor is not listed, use one of the Standard Monitor entries which use general settings. There should be a section in your monitor manual about technical specifications. Included in the list of specifications will be an entry for the maximum horizontal frequency. It may be called Max Hor Freq or some other similar abbreviation. The frequency should be shown in Kilohertz, KHz, kHz, or khz.

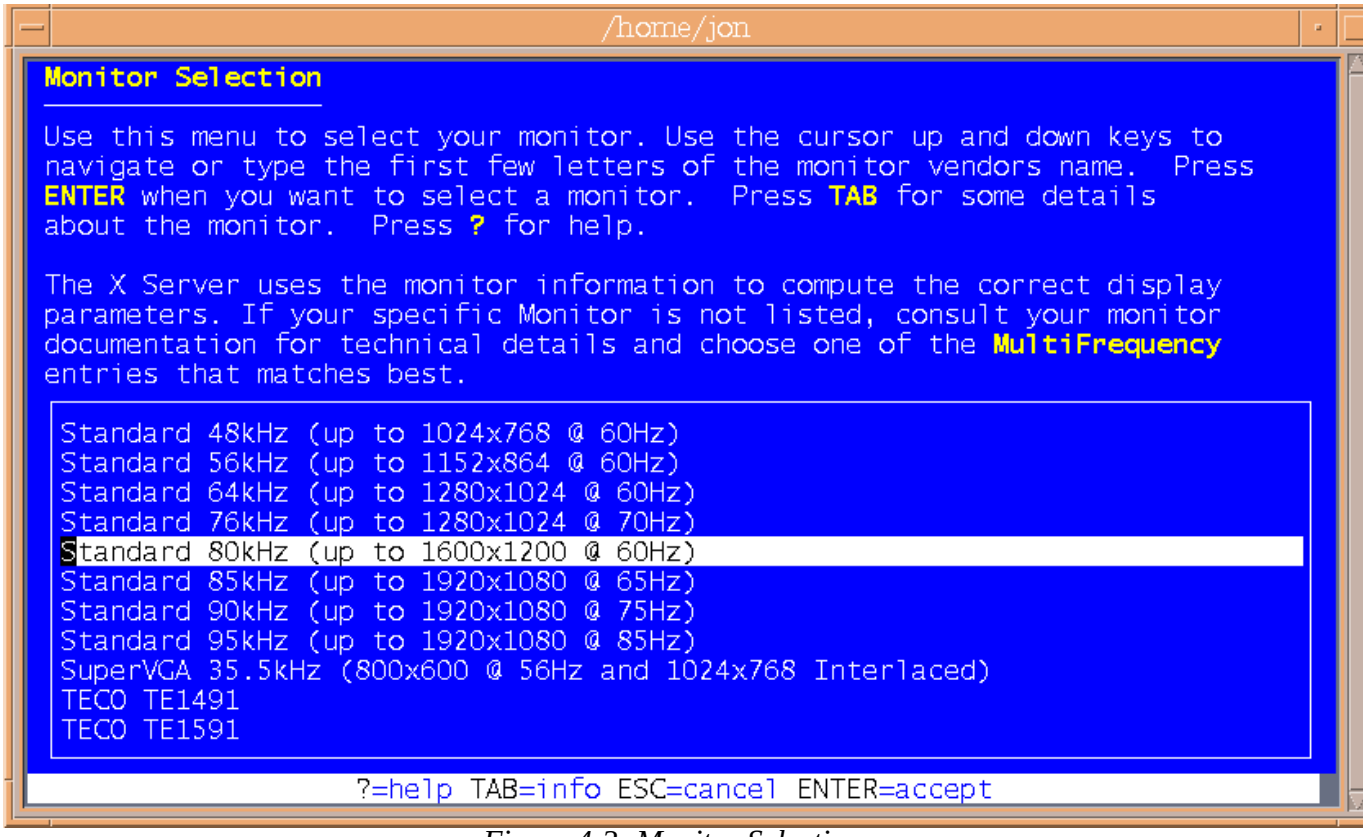


Figure 4-3: Monitor Selection

There are other frequencies such as the refresh rate, which will be shown in the Hertz or Hz, and the maximum bandwith which will be shown in Megahertz or MHz.

When you have determined the monitors maximum horizontal frequency, select the Standard Monitor whose frequency is equal to, or less than, the value you found for your monitor. Press Enter to confirm the choice, and you will be returned to the main menu.

Choose the Resolutions

In the Main Menu, use the **Cursor Up** and **Cursor Down** keys to move to the Resolutions choice. Press **Enter** to see a checkboard for Graphics Mode Selection. You should be in the Resolutions column. If not, use the **Cursor Right** and **Cursor Left** keys to move to the Resolutions column.

The list of resolutions offered is affected by the capabilities of the graphics hardware and monitor selection. Other factors affect the offered resolutions,

but they are not significant for the initial configuration of the Accelerated-X Summit Server.

Most graphic boards and display devices support more than one resolution entry. The maximum resolution selected will be the real size of your X Server display and the lower resolutions are the steps for hardware zooming, if using a variable resolution display device. Hot Key Zooming is enabled by default, but as explained above, it is really only useful when using an external analog monitor.

Select the Keyboard Layout

Accelerated-X Summit provides a large collection of national keyboard layouts that can be loaded at X server start-up time. This feature eliminates the requirement of using xmodmap to load the keymap from the client-side. Be aware that xmodmap files from previously installed Servers are likely to cause problems. If you have key problems after selecting the correct keyboard version, the cause is probably an obsoleted per-user or per-system keyboard mapping file.

From the Main Menu, use the **Cursor Up** and **Cursor Down** keys to move the highlighted text to Keyboard Layout and press the **Enter** key. A selection list appears in the main menu. Use the **Cursor Up** and **Cursor Down** keys to select the correct keyboard layout, and press **Enter** to choose and return to the Main Menu.

Note that the **Xsetup** program does not use the $LANG environment parameter to automatically set the keyboard type, because users may have a different keyboard from that implied by their locale.

Choose the Mouse Type and Device

Using the **Cursor Up** and **Cursor Down** keys, select the Mouse Type field and choose the Mouse Protocol used by your mouse. You must select the mouse type and device.

The device to use will vary with the mouse connection and operating system. If using the mouse directly, then you should consult your system documentation for the name of the device for use with your mouse. Xsetup will suggest likely device names when you change the protocol type.

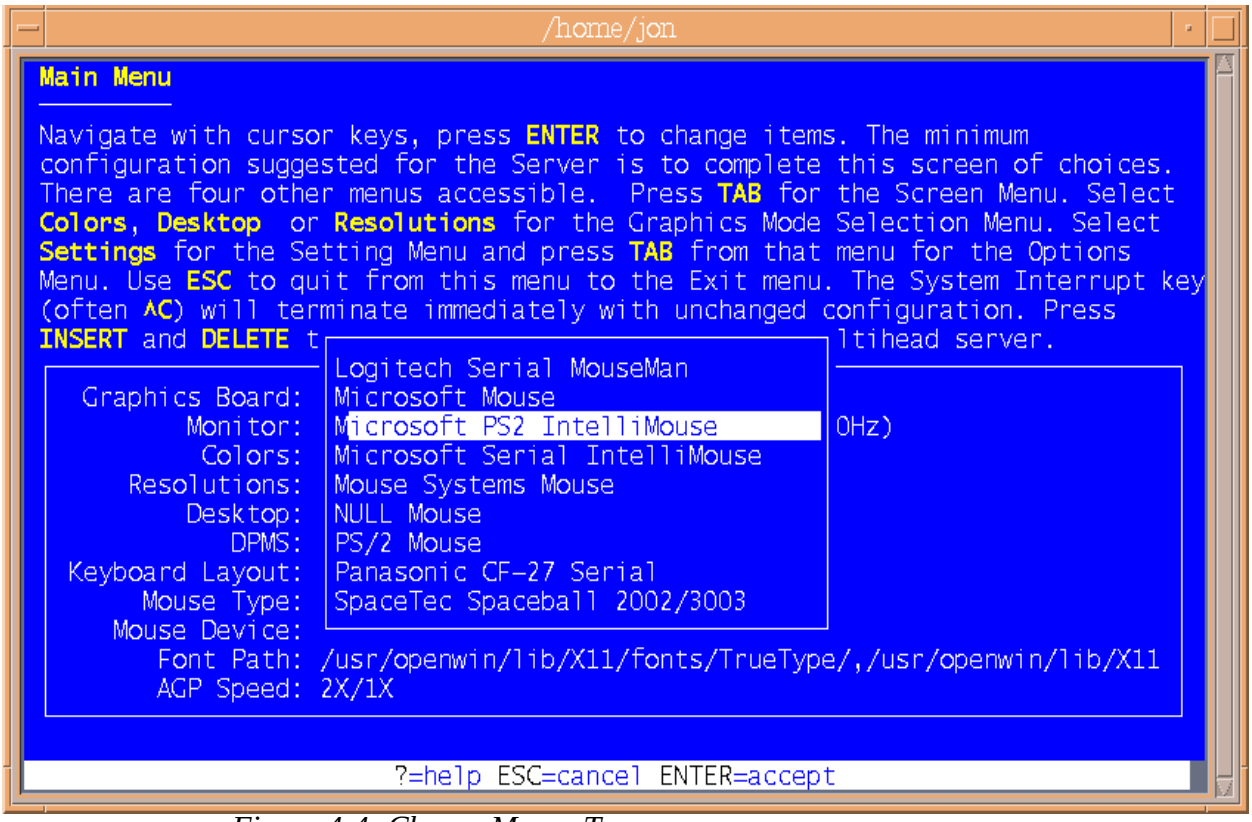


Figure 4-4: Choose Mouse Type

Default Button Handling

The Default maps the buttons as they physically exist. A three button device will have buttons mapped as buttons 1, 2 and 3. A two button mouse will have the buttons mapped as buttons 1 and 3.

AGP Speed

You should only modify this value if you are having problems with the default value for your card. On some mainboard and card combinations, you may need to set ‘AGP Speed’ to 1X in order to get reliable operation.

Save and Exit

When you have completed these configuration steps, you can save the configuration and terminate the configuration utility. In the Main Menu, press the **Esc** key. This will pop up a menu, offering a choice to save and exit. Use the **Cursor Up** key twice to select "Save and Exit" and press the **Enter** key. You will be offered a field in which you can change the name of the file to be written. Just hit the **Enter** key to accept the default configuration file name. The Xsetup program will write the configuration file and terminate.

Advanced Configuration

Accelerated-X Summit servers come with a new graphical Xsetup utility. Xsetup will run in graphical mode if you run it within an X session. This will be required in order to purchase a license for the server.

Graphical Xsetup is much more fully featured than the basic text mode setup that you run to initially configure your X server. It comes complete with on-line help that describes all of the configurables that are possible in Summit.

Following is a sample screen shot of the main screen for graphical Xsetup.

(This sample screen shot is from the Desktop Platinum Series Server for Solaris 8)

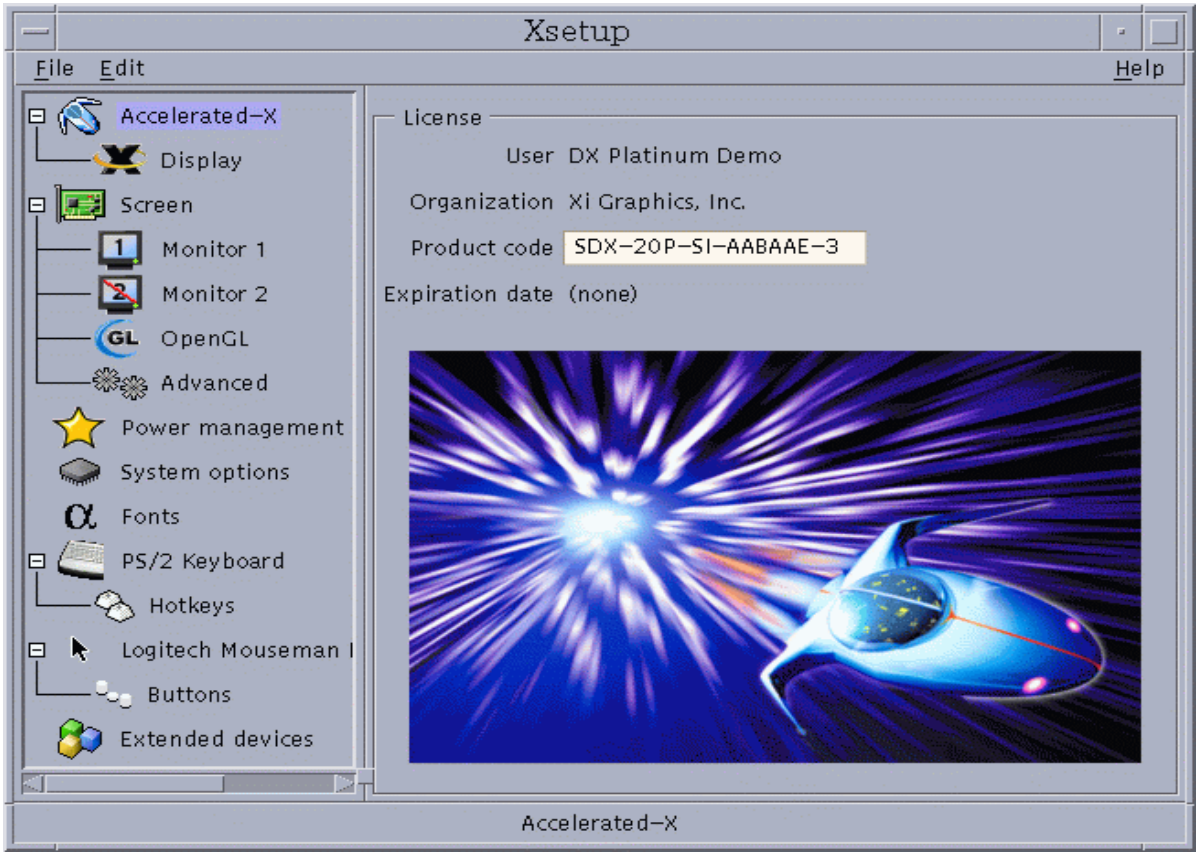


Figure 4-5: Sample - Graphical Xsetup Main Screen

5. Accelerated-X Summit Features

This chapter describes the features of Accelerated-X Summit, and how to use them. Many of the features described can be configured with Xsetup.

Graphical Xsetup

A new graphical setup utility is provided with the Accelerated-X Summit Drivers. Although the text-mode setup can configure basic capabilities, the graphical setup is much more fully featured, allowing, among other things:
Allowing…

- …the user to obtain the product code required to license the server
- …full configuration of DualView, ZoomView and SplitView setups
- …real-time calibration of the gamma correction for each monitor
- …re-mapping/disabling of device buttons
- …re-mapping/disabling of hot-key sequences
- …touchscreen calibration
- …configuration of some 3D options (for 3D capable servers)

Many of these features can be controlled in real-time without having to restart the X server.

Generally, a user should use the text-mode Xsetup for initial configuration, and use the graphical Xsetup within the X session to perform further, more detailed configuration. Only the root user can save these values permanently for the next session.

Enhanced Gamma Correction

Gamma correction compensates for differences in the way that monitors display colors according to a well-known function. Proper gamma settings ensure that colors are displayed properly over a wide variety of other display devices that have also been properly adjusted.

Gamma is particularly important in both 3D and XVideo windows. It can be configured independently for each monitor on your system, if you are using a multi-head server, or a card that supports DualView. The graphical Xsetup utility provides a ‘Color Correction Wizard’ that will allow you to calibrate in real-time, the proper gamma settings for each of your monitors.

XVideo Extension Support

Accelerated-X Summit supports the XVideo extension, including the QueryPort Attributes and XvImage related functions. This extension is only available for graphics hardware that supports a hardware video window that can do YUV to RGB conversion as well as upscaling.

Please see the release notes or the XiG Summit webpage for details on supported hardware.

Every graphics driver that supports a video window exports at least one XVideo adaptor named "codec". This adaptor is used to support an XvImage, allowing a client to transfer raw image data to the XServer in YUV color format. The XServer uses the video window hardware to transform the data to RGB color space as well as to scale the data to the desired output size.

Under the Linux operating system, Accelerated-X Summit also supports video capture from a separate PCI capture card via the Video for Linux (v41) driver. If such a device is present, the XServer manages the device automatically, allowing clients to use the XvPutVideo routine to display captured video on the graphics desktop.

Accelerated-X Summit also supports video capture using selected graphics cards that have a video capture chip integrated in them. Please see the Release Notes or the Xi Graphic's Summit Web page for a list of these cards. This functionality is supported in Linux and Solaris.

For video capture, we recommend using the X Video and Media Player (Xvamp). Xvamp is tailored specifically for Accelerated-X Summit and implements all applicable XVideo attributes and encodings that are exported by the Xserver. Please see the Xi Graphic's Web page for details on obtaining and installing xvamp.

Power Throttle

On laptops, extra steps have been taken in Accelerated-X Summit to reduce power consumption. This is enabled automatically when possible. Depending on the laptop, this can add another 1 – 3 hours of battery life compared to other X servers.

APM

Accelerated-X Summit will support Advanced Power Management automatically, if configured on your Linux system. APM is not yet supported on Solaris.

OpenGL

If your server is OpenGL capable, full compliance with OpenGL version 1.2.1 is provided. On some hardware, even 3D textures are supported. Following are some features of the OpenGL implementation.

The 3D OpenGL pipeline has been completely re-written since the first version of 3D Accelerated-X v1 was released. Many bottlenecks have been removed and bugs have been addressed. Software transform and lighting have been highly optimized, and performance has increased dramatically. Accelerated-X Summit uses a unified driver interface that allows optimization for both hardware and software transform and lighting. This results in significantly faster performance in both cases.

Processor Specific Instructions

Under Linux using a 2.4.x kernel, special processor instructions such as Intel's SSE, SSE2, and AMD's 3Dnow instructions are used. This can enhance performance significantly in certain applications. This feature is not available under Solaris, or any Linux kernel other than 2.4.x.

OpenGL Stereo support.

With most cards, quad-buffered OpenGL stereo support is provided. Check the card page on our website at http://www.xig.com to see if your card supports stereo under Accelerated-X Summit.

Stereo viewing has been tested with StereoGraphics (www.stereographics.com) and Elsa Revelator (www.elsa.com) stereo glasses. Additionally, any VESA compliant stereo device that connects to a VESA stereo connector should work.

Stereo requires about double the memory and processing power that non-stereo modes require. We recommend that you have a card with at least 32MB of framebuffer memory, and a Monitor that can support at least a 100Hz vertical refresh rate.. On some monitors, you may need to reduce the resolution of your screen in order to attain these high refresh rates.

OpenGL Direct Rendering with XDA

If you are using an OpenGL capable server, Direct Rendering support is provided, if allowed by your system administrator. Direct Rendering allows OpenGL clients to render directly to the hardware without using the X server to do so. This improves 3D performance significantly. XiG Direct Access (XDA) is our extension that we use to provide this functionality. It is included with all 3D capable servers. XDA rendering will only work if the client is local (on the same machine as your X

server). For remote OpenGL clients, the GLX protocol, utilizing Indirect Rendering is always used.

See Appendix A, "The X Services Kernel Driver", for information on how to enable ordinary users to use Direct Rendering with XDA.

To optionally disable the use of XDA for an OpenGL application, set the environment variable 'OGL_NO_DIRECT' before you run your application:

```
$ export OGL_NO_DIRECT=1
```

Synchronized buffer swapping

Accelerated-X Summit can be configured to synchronize front to back buffer swapping on a vertical retrace. This allows much smoother animations and eliminates tearing artifacts that happen as rendering occurs in a double buffered window that is being swapped at the time.

Note however, that enabling vertical sync will reduce performance.

You can enable vertical sync using the graphical Xsetup utility.

Monitors

Custom Refresh Rates

You can configure custom monitor refresh rates in Xsetup (in increments of 1 HZ). Refresh rates are limited by the capabilities of your graphics board and monitor. See Chapter 4 for more information about configuring the refresh rates.

DPMS (Standby, Suspend, Sleep)

Accelerated-X Summit fully implements the Display Power Management System, used to conserve power and extend monitor life. You can configure DPMS settings in Xsetup, or use the program 'xset'.

Analog and Digital Flat Panels / LCD Monitors

To use an analog flat panel, select your specific monitor, or select a Standard Multifrequency monitor in Xsetup. To use an LCD monitor with the Laptop Accelerated-X server, choose an LCD monitor entry (e.g. "LCD SVGA").

Digital flat panels use the corresponding Digital Flat Panel monitor entry (e.g. "Digital Flat Panel SXGA"). Check Xi Graphic’s Web site for a list of supported boards that are compatible with digital flat panels.

DVI Connectors

Boards with standard DVI connectors are supported. DVI carries both analog and digital signals, which outputs to either an analog monitor or a digital flat panel over the same connector. If you are using an analog monitor, select your specific monitor or a Standard Multifrequency monitor in Xsetup. If you are using a flat panel, choose a "Digital Flat Panel" monitor.

DDC Support

Accelerated-X Summit supports DDC to read digital monitor information. This is used to identify monitors and probe their capabilities.

Internal and External Display Switching for Laptops

On laptops, the display can be set to the internal LCD, the external monitor, or both on the fly. To cycle between displays, use the keys [Control-Alt-Tab]. The default screen to start up on (internal/external) can be configured in xsetup.

Screens

Overlays and Count Transparency

Overlays are supported on boards that have special hardware support for them. When Overlays are enabled, both TrueColor and PseudoColor visuals are available. This is useful for running applications that require both visuals, without having to reconfigure and restart the server.

Accelerated-X Summit implements non-destructive overlays, where each visual is in a separate color plane. Another approach is destructive overlays, where visuals are in a single plane. Applications benefit from non-destructive overlays because graphics exposures are reduced. Destructive overlays are significantly slower because data are lost when a window is obscured, thus forcing exposures.

To enable Overlays, select the Overlay color depth in Xsetup.

In overlays, the PseudoColor visual has 255 colors with one color reserved as a transparent color. Some applications that use the PseudoColor visual expect that there are 256 colors, and will not work if they can only allocate 255 colors. Accelerated-X can work around this problem if you enable the "Count Transparency" option in Xsetup.

Configuring the Default Visual

You can choose the default visual that applications use. This is useful to work around a problem where some applications designed for a specific visual do not start.

You can select which X visual is the default in Xsetup. The available visuals depend on the currently configured color depth. For 24bpp and 16bpp color depths, you can select one of two visuals: TrueColor or DirectColor. For overlays, you can select between PseudoColor(Overlay), GrayScale(Overlay) or TrueColor visuals.

Virtual Desktops

A virtual desktop is enabled when the desktop height or width is larger than the viewport height and width. If you have a small monitor, or one that is not capable of high resolutions, your desktop can be larger than the monitor's maximum resolution.

VT Switching

Linux supports switching from the X server to another "virtual terminal" (VT). The other VT can be a text console, or another X server. Switching is controlled with the keys [Control-Alt-F1] through [Control-Alt-Fn]. VT switching is useful for system maintenance. If you do not want users to have access to the console or other X sessions, you can disable VT switching in Xsetup.

Multihead

With the Accelerated-X Summit Server and boards(s) that support multihead, up to 16 monitors (or "heads") can be used at once on a single system. Each head is a separate screen; applications on a screen cannot be moved to the other screens. Each screen can have a separate window manager, or a single desktop environment such as CDE can control all screens.

If you move the cursor past the edge of a screen, Accelerated-X warps the cursor to another screen. The physical arrangement of screens is controlled by the screen grid in Xsetup.

See Chapter 4 for more information on configuring multihead in Xsetup.

DualView and ZoomView

Accelerated-X Summit has new interactive features that allow DualView cards a lot of flexibility in the way that they can display the desktop. This section describes how to use these new features.

The graphical Xsetup utility provides a very intuitive interface for configuring DualView and ZoomView setups.

DualView Zooming/Panning (Both Monitors)

If multiple desktop resolutions are configured in Xsetup, both monitors can be zoomed using the standard hotkey sequences <Control-Alt-KP_Plus> or <Control-Alt-KP_Minus> (the keypad +/- keys). In this case, both monitors display the same resolution, but they are locked together (either adjacent horizontally, or adjacent vertically). When the cursor moves beyond the edge of the viewport, both monitors will pan at the same time across the desktop.

DualView Zooming/Panning (One Monitor)

Accelerated-X Summit also gives you the option of panning and zooming one monitor at a time, without effecting the display of the other. This is accomplished by toggling zoom and pan control between 3 states: primary monitor locked, secondary monitor locked or both monitors locked.

When both monitors are locked, they have the same resolution and have a predefined relative offset in the desktop, which is the same mode as described above. When either one of the monitors is unlocked, it can be zoomed and panned across the desktop without affecting the display of the other monitor. When a monitor is locked, it does not respond to zooming with <Control-Alt-KP_Plus> or <Contol-Alt-KP_Minus>, or panning when the mouse moves beyond the edge of the viewport.

To toggle between the 3 states, use the hotkey <Control-Alt-KP_Enter>.

ZoomView

Accelerated-X Summit supports ZoomView on boards and laptops that can support DualView. ZoomView displays the same desktop on 2 monitors. By using the hotkey sequences <Control-Alt-KP_Minus> and <Control-Alt-KP_Plus>, you can change the zoom on one of the monitors. This is useful if you want to expand a portion of the desktop without losing sight of the portions that are cropped in the viewport.

Input Devices

International and Custom Keyboards

To use an international keyboard with Accelerated-X, select the appropriate keyboard for your locale in Xsetup. You can change key assignments while Accelerated-X is running with the 'xmodmap' utility.

Accelerated-X fully implements the XKB extension, and can read compiled XKM keymap files. To use a custom keyboard with Accelerated-X, create a custom XKM file with the utility 'xkbcomp'. Make a backup of the current XKM file in the "AcceleratedX/ keyboards" (e.g. "us.xkm"). On Linux systems, the Accelerated-X server directory is located in '/usr/X11R6/lib/X11', and on Solaris it is in /usr/openwin/lib'. Copy the custom XKM file over the current XKM file.

Another option is to pass the '-xkbmap' option with the custom XKM file to Accelerated-X when it starts, e.g.:

 # Xaccel -xkbmap custom.xkm

Joysticks and Spaceballs

Accelerated-X Summit supports joysticks and Spaceballs. They can be used as extended XInput devices. Joystick support is operating system dependent, and is currently only supported on Linux.

Touchscreens

Accelerated-X Summit supports touchscreens with graphics cards. Touchscreens can be used as the core pointer, or by an application to read extended XInput device data.

Calibration corrects for scale, tilt, and swapped device axes. Once a touch screen is calibrated, you can choose to have extended XInput device data transformed to screen relative coordinates. Therefore, your application does not need to include calibrating logic.

See Chapter 4 for information on configuring touch screen support in Xsetup.

USB Mice and Keyboards

USB mice and keyboards are supported by Accelerated-X Summit. USB support is operating system dependent, and is currently available for Linux and Solaris.

In Linux or Solaris, if your USB keyboard works in the console, then no special configuration is necessary.

Please read the Linux kernel documentation for more information on how to set up USB and raw event devices.

To use a USB mouse in Linux, select the, "Linux USB mouse" entry and set the device to "/dev/input/eventN" .

Accelerated-X Summit supports USB mice under Solaris. In Xsetup, select the Solaris USB Mouse.

Tablets

Accelerated-X Summit supports Wacom and Intuos tablets. Tablets can be operated in relative and absolute modes. Tilt and the 4D mouse mode of Intuos tablets are also supported.

Velvet Mouse

The velvet mouse feature makes the X pointer more responsive to mouse movements. Events from mouse devices are processed as soon as they arrive. Even if Accelerated-X is busy with a number of tasks, the pointer moves smoothly across the screen. This eliminates jumpy behavior that might cause you to lose track of the pointer.

If possible, velvet mouse is enabled by default for all devices. You can disable this feature for a particular device in Xsetup. To turn on velvet mouse, edit the device and set Asynchronous to ‘On.’ To disable, set Asynchronous to ‘Off.’

Configurable Button Events

Accelerated-X Summit can translate each input device button to one of the 5 X11 buttons. This is useful for setting up mice for left handed users, or to disable buttons. See Chapter 4, “Configuration” for more information.

Multiple Devices as the Core Pointer

You can control the pointer position with any combination of mice, touchscreens, and tablets. This feature is enabled in Xsetup if the device mode is configured as "Pointer". This feature is disabled by setting the device mode to "Extended".

Design

X Window System Specification Conformance

Accelerated-X Summit is conformant with the X Window System specifications. Each driver passes the X Window System conformance test before it is released.

Dynamically Loadable Modules

Major portions of the Accelerated-X Summit Server consist of dynamically loadable modules. This enforces a well-defined and consistent interface between the modules and the core executable. Drivers are isolated from unwanted or unexpected interactions, increasing the stability of the server. This design also facilitates rapid driver development and distribution. Updates can be issued for the specific modules that are affected.

Advanced Memory Management

Accelerated-X Summit uses its own memory allocator, which is optimized for memory allocation patterns that are typical for an X Server. This improves overall speed.

Automated Problem Reporting

If Accelerated-X Summit crashes, it will generate a stack trace indicating where the crash occurred. This information is recorded in the panic file "/var/adm/XNpanic" where N is the display number of the server that crashed (e.g. "/var/adm/X0panic"). Accelerated-X normally sends crash reports to the system administrator. If you have a persistent crash, please send the panic file to bugs@xig.com. Server startup and other diagnostic information is logged in /var/adm/X0messages.

Extensions

XInput

Accelerated-X Summit gives clients access to input devices with the XInput extension. This extension is designed to be used with a variety of input devices, such as touchscreens, joysticks, and trackballs. Applications can read and write information to the devices.

For more information about programming with the XInput extension, read the XInput documentation available from the X Consortium FTP site, ftp://ftp.x.org.

X Keyboard Extension (XKB)

Accelerated-X Summit fully supports the X Keyboard Extension (XKB). XKB is a very flexible specification that can be used to fine-tune the keyboard layout and keyboard symbols. Accelerated-X uses XKM files to describe the keyboard. These can be generated from an XKB source file with the program xkbcomp. See the xkbcomp man page for more information about compiling XKM files.

X Full Screen (XFS) and VMware

Accelerated-X Summit includes the X Full Screen extension (XFS). This extension enables VMware to run a host operating system in full screen.

6. X Window System Overview

X servers are central to the X Window System. To extract the maximum performance from a system, it is useful to know a little about the X Window System, X servers and PC's. This chapter offers a high level overview of the X Window System, the graphics subsystem of a PC and how the X server acts to link them.

X Window System Overview

The X Window System can be defined as a client-server, networked, extensible, heterogenous, operating system independent, graphics hardware independent, windowed graphical system. Properly, it can be called either the X Window System or X.

The functions of the X Window System are described by a formal set of specifications and adopted standards. These documents are the X Window System. There is no reference implementation, but there are formal test suites to check that the specifications have been correctly implemented.

X Window System Implementations

Development procedures for formal specifications often include the creation of a Sample Implementation (SI). The SI is intended to show that draft specifications are adequate to create full implementations based on the written specifications. The commercial members of the X Consortium and the X Project Team of The Open Group have created a set of SI's for the X Window System specifications.

Organizations may rename, compile and ship the SI as their own product, with or without source or binary additions. If an implementation is created from the specifications and refined for customer use, it can offer higher performance than those based upon or using the plain SI. For example, workstation vendors may take the SI and rework it or discard it and re-implement from the specifications.

Accelerated-X uses the SI when it cleaves closely to the final specification and offers adequate performance. Slower, less reliable or incorrect SI's are usually discarded and may be implemented from scratch if there is sufficient customer demand.

Testing X Window System Implementations

Test Suites are available to check that the X Window System specifications have been correctly implemented. X servers that adhere to the specifications will give more consistent image displays than X servers that fail. If the freely available X Test Suite is used, note that it was developed for X11 Release 4. The arc drawing tests produce misleading results when used with X11R5 and later. Recent commercial test suites available from The Open Group offer more tests and correct the deficiencies in the X Test Suite.

Although specification conformance is essential, other factors play an important part in user perception of an implementation. Some of these are measured by other tests. For example, speed tests are available for X Servers. Some features that make a difference to the user interface are not measured by any current test.

X is Client-Server

In a client-server system, software is broken into at least two components. Clients are typically the piece of software that interacts with the user and are designed to fulfill a special single purpose. A distinguishing feature is that clients typically provide vertical integration in a business environment while servers offer horizontal services for all parts of the business. There are usually more client programs and systems than servers and their systems.

Clients can be a word processor, spreadsheet or a customized sales order entry system or some other user application with a defined business objective. Servers are usually a part of the system that offer a generalized mechanism for access to a specified range of services; they may even be an indistinguishable part of the operating system. A server might provide printing services that will handle print jobs from a spreadsheet or word processor or an order entry system. Print servers know all about network printing jobs, and nothing about the business applications, just as the client knows nothing about accepting networked printing jobs.

In X, the server interfaces with the graphical hardware so it runs on local computing equipment. The clients may be local, running on the same system, or remote, running on another machine with a network connection.

Separation of the client and server has both strengths and weaknesses. If the specifications are well designed and are complete and unambiguously written, the clients and the servers can be developed separately and combined when needed. The X Window System is well specified for client-server designs and has been established in heterogenous working environments for more than a decade.

If either application or X server diverge from the specifications, it can make development, deployment and support unpleasantly difficult. X Window System specification conformance is a significant issue in using X servers and X applications.

X is Networked

X applications can be connected to the X Server by a network or by a local connection. There is no requirement for any application to be on any particular system, except for the X Server, which should be on the same system as the graphics hardware. All X clients connect to at least one X Server.

The speed of the connection often determines the maximum speed of the application. Network connections may be local, that is, within a single system. Well designed local connection methods can improve speed, and may improve the speed of application response.

Accelerated-X Summit Drivers offer local and network connections and may offer a high speed local connection mechanism intended for a small number of graphics intensive applications.

X is Extensible

Extensibility refers to a property of the X communications protocol. X servers are allowed to offer extra services, known as X extensions. These can be defined as publicly specified services or private or proprietary services. Extensions permit the X Window System to be enhanced for unusual application requirements or to adapt to evolving graphical user interface needs.

Applications can query the X server for offered extensions. Extensions offered by the X server can determine the behavior of applications. X servers should offer a well-implemented set of extensions, with full conformance to the specifications.

Accelerated-X Summit Drivers offer most of the extensions defined by The Open Group. The offered extensions are in conformance with the specifications rather than the SI. A few proprietary extensions are offered for use by the configuration utility and for the shared memory local connection.

X is Heterogenous and Operating System Independent

Applications and the X server can be hosted by just about any computer and operating system. The X communications protocol offers that two applications on completely different processor types running completely different operating systems can display their graphical output on yet a third type of processor and

operating system. All that is required is a common network connection to the X server and the presence and use of the X libraries on the application systems.

A good X server will offer a significant amount of freedom from operating system specific behavior. Ideally, the operating system changes will also be entirely invisible, though this is not always practicable.

Accelerated-X Summit Drivers use a technique that offers binary identical object modules for the majority of the X server for all operating systems on the same processor type. The operating system independent dynamic linking mechanism means that the behavior of the X server is identical across supported operating systems.

X is Graphics Hardware Independent

There is a minimal definition of the hardware requirements of the graphics subsystem. All that is needed is some display memory, a keyboard and pointing device. No hardware accelerator is required. However, graphical hardware acceleration can significantly speed up many X operations.

An ideal X Server would offer access to all the hardware facilities that were possible in the hardware. In practice, some X Servers offer less than the hardware can accomplish. Although hardware independence is a possibility within X, it does not mean that X Server developers must ignore hardware facilities. Instead, X Server developers should identify ways to map the hardware capabilities to features within X.

Accelerated-X Summit Drivers offer the widest range of visual types and highest speed. If the graphics hardware is able to support it, advanced features such as overlays and hardware gamma color correction are offered. This results in some graphics boards offering features or speed that can not be presented on less capable hardware.

X is a Windowed Graphical System

Instead of a single application monopolizing the whole graphical display, many applications may share a single screen. Each of these applications may be running on separate systems at full speed and concurrently updating the display.

Screen content is divided into windows and an application will normally open a main (top level) window and child windows for special purposes inside that. In the X Window System even buttons, menus and elevator bars are windows. They are just specific ways of using the generalized idea of a window.

Controlling the placement of top level windows and determining which application windows are visible is a job given to a Window Manager process. As with almost everything in the X Window System the Window Manager may be

one of many different types so long as it respects the X Window System standard for Window Manager functions. The ICCCM (Inter-Client Communication Conventions Manual) describes Window Manager interactions.

Similarly, a drag and drop manager process may be provided separately or integrated within the window manager. The drag and drop manager may conform to public or proprietary protocols. In either case, communication between the window manager, the drag and drop manager and the X server should allow the user full visibility and control over the objects on the graphical desktop.

The X server is one of a collection of processes that supports a graphical user interface. Deficiencies in any of the components will detract from the enjoyable use of the graphics system. A good X server allows other software to show itself to the best advantage.

X, Color and Resolution

When a client is started, it queries the X server for the current resolution and color depth. There is no mechanism to notify the client if either of these change. In consequence X servers offer a fixed resolution and color depths.

Your PC and the X Server

Inside a PC are lots of subsystems. The most significant subsystem for the X server is the graphics subsystem. This consists of all the parts needed by an X server. The X server extends from controlling the contents of the display device to its' control by the keyboard and one or more pointing devices. Network connections are also important for connecting to clients and font server.

Well designed and implemented X Servers will provide a fast response to user inputs, conformant and correct displays, high graphical speed and a low system impact. Poorly developed X Servers can damage hardware, provide unpredictable response to input unpredictable response times, crash, display incorrect images and thrash the memory and i/o subsystems.

Graphics Subsystem Overview

The complete graphics subsystem consists of an interface to the host computer to accept pre-computed graphical data, or commands for drawing graphics, a graphics engine to process graphics commands, some memory to store the graphics images, sections to control the output to one or more display devices, the display devices and the input devices. The complete graphics subsystem is a significant fraction of the total system cost and is very important for user perception of the system.

The description given below is deliberately rather vague. Modern graphics chips offer all sorts of variations. If you want more details, there are recommendations for further reading in Chapter 1.

The section labelled "CRTC" is the Cathode Ray Tube Controller, and this provides the signals to sweep the electron beam around the display screen. It has to be tightly synchronized with the RAMDAC, which reads the graphics memory. When the two are correctly synchronized, a stable image is presented on the monitor, and display contents will reflect data stored in the graphics memory.

Graphics memory contents can be altered by the host processor or the graphic engine. If a program computes an image, it can ask to have the image data deposited in the graphics memory. The image will be displayed exactly as the application computed it. This is what happens with static images downloaded for a web page. Pre-computed graphics images are taken from a remote system and displayed by a web browser without change. The X server can not accelerate pre-computed graphical images.

If the program issues graphics drawing requests instead, such as "draw this line", "fill this circle with color" or "draw this text", the graphics engine can be programmed to help. In this case, less data is sent to the graphics subsystem, so more drawing can be done in the same time. The graphics engine calculates what should be put into the graphics memory and writes it. A web browser downloads the text and then instructs the X server to draw text in a given font somewhere in its window. This lets the X server accelerate the text displayed on a web page. Bus interfaces are very important for speed and system stability. Incorrect programming of the graphics memory and graphics engine can halt the system unpredictably.

CRTC

CRTCs are crucial to the X server. Failure to correctly set up the CRTC can result in incorrect timings being delivered to the display device. Bad timings can damage the display device. Some X servers offer configuration by directly programming values used by the CRTC. Great care must be taken using this type of configuration or incorrect timings can be used.

RAMDAC

The RAMDAC handles the interpretation of color from the digital data. The RAMDAC has its own little piece of memory that describes how to map the input data values into output values for each of the Red, Green and Blue colors of a display monitor. The way in which the Color Look Up Table (CLUT) is used determines the visual classes offered by the X server.

The output of the RAMDAC is fed to the CRT or via other electronics to a flat panel display. The X server is responsible for setting up and controlling the RAMDAC. Failures in RAMDAC control cause noisy displays, poor synchronization, bad color control and reduce the capabilities offered by the X server.

Graphics Engine Drivers

The main role of an X server is to convert graphics hardware independent drawing requests into graphics engine specific drawing commands. This is analogous to the role of a device driver but is operated by a user level program rather than the kernel.

There are many companies making graphics chips. Each of these companies has one or more current families of chips. The low-level graphics commands differs significantly between families of graphics chips even when from the same manufacturer. Within a family of chips the manufacturer may create incompatible variants for special needs such as lower power consumption or with new commands for higher speed.

The lifetime of a graphics chip family is somewhere between a few months and few years. The lifetime of a single variant of a chip family is between a few weeks and about eighteen months. The effect is that there is at least one new chip variant every week, which requires testing and possibly engineering or research effort. Failures in graphics engine control may result in failing X conformance, sub-optimal performance and even different drawing on different versions of the same chip.

Dynamic Hardware Cursor Support

Hardware cursors improve the response time of the pointer to mouse motion especially when the system is busy drawing graphics. A hardware cursor needs only a few bytes of data to update the position. A software cursor must erase the old cursor drawing, restore the previous window contents obscured by the software cursor and then draw the cursor at the new position.

Under some conditions, such as specific resolutions or refresh rates or particular sizes of cursor, some graphics hardware can not support a hardware cursor. It is possible to design an X server so that it will dynamically switch between software

and hardware cursors, though this is found in very few X servers because of the extra complexity for the graphics chip driver developer.

Failures in hardware cursor control may cause the cursor to appear as a large square of unusual color. If an X server that does not offer dynamic switching is asked for a larger cursor than the hardware supports, the results may include abnormal X server termination, unexpected system halt or simply failures to display the new cursor.

Accelerated-X Summit Drivers support dynamic switching of hardware and software cursors as needed.

Non-display Graphics Memory

If the graphics board memory is larger than required to support the displayed resolution, non-display graphics memory is available. This memory can be used to improve the speed of the display by caching frequently used graphical objects in it. Careful design of the X server can allow this memory to be used and consequent speed improvements to be delivered.

If an X server fails to use non-display memory, the impact is seen as reduced speed for certain types of operation. The cache algorithms also affect the speed. More effective cache algorithms make better use of the memory.

Accelerated-X Summit Drivers make extensive use of non-display memory for graphical operations and caches. The algorithms have been tuned for high speed with most applications.

VT Switching

Switching between graphical and text modes requires that the X server connect with the operating system to completely change the handling of the graphics subsystem. The keyboard must be switched from a special raw mode to a mode that provides normal command line input. The mouse must be relinquished in case another program needs it. The graphics chip must be reinitialized and the previous text or graphics mode restored.

Unsurprisingly, this is an operation that can cause significant problems, such as race conditions. Well designed X servers should provide a safe and reliable VT switch. Historical quirks of graphics chip design can result in some unsafe modes of operation, which are nonetheless accessible from the operating system.

Accelerated-X Summit Drivers use a conservative algorithm for VT switching. This offers the greatest system reliability at the expense of a failure to support the less safe switching modes.

Colors, Speed and X

The screen image is composed of dots of red, green and blue color. Many dots are normally addressed as a single picture element (pixel) even at high resolution for the display. Each pixel has a single selectable color made from the separate red, green and blue components. At 1152x864 resolution, there are a little under one million pixels on the screen. If the DAC supports 8 bit conversion from digital to analog, then each of the color components can be given 256 degrees of intensity from nothing to maximum intensity. That gives a total of 256x256x256 possible colors, about 16 million resolvable colors. If the DAC supports 6 bit conversion then the number of represented colors is about 250,000. Notice that there is a difference between the number of bits that can be set in the color request and the number of bits used. It is possible to ask for 8 bits of each color component, but for the hardware to deliver only 6 bits for each color component.

The color of each pixel can be represented in a total of 8 bits, offering 256 out of 16 million possible colors to choose from; in 16 bits when there is a choice of 65,536 colors out of the 16 million possible colors; finally the color could be represented in 24 bits offering the full 16 million different colors concurrently. The number of bits requested per pixel is a measure of the color depth.

When using 256 color mode, one byte is needed to represent each pixel. This is usually the fastest color depth for an X Server. When using 65,536 color modes, two bytes are needed to specify a pixels' color. An X server using dual ported memory, such as VRAM or WRAM, should benchmark image displays such as Shm-PutImage at approximately half the speed of the 8 bit mode in 16 bit per pixel (bpp) mode. In 24 bpp packed mode, presenting 16 million colors, an X server on a VRAM or WRAM graphics subsystem should benchmark ShmPutImage image displays at approximately one third the 8 bit mode speed. Note that hardware accelerated operations do not follow the rule of speed being related to depth, especially with modern packetised memory such as SGRAM.

The ratio of color depth and speed can be affected by the design of the X server and the intrinsic capabilities of the hardware. Some graphics chips do not offer hardware acceleration in 24 bit color. Some memory types offer lower data rates at higher color depths. Single ported graphics memory devices, such as DRAM, EDO DRAM and SGRAM will slow any X Server by reducing the time available for drawing, though the reduction in speed is not as severe with modern graphics memory types as it is with the older plain DRAM.

Using benchmarks to assess the impact of color depth on application speed is often inadequate. Because 65,536 color mode (16 bit color depth) offers 256 times as many colors applications that require a lot of color dithering in 8 bit mode can look much better in 16 bpp. It might appear that increasing to 24 bpp would offer even better color handling. In practice a dithered 16 bpp image looks better than an 8

bpp image and often displays faster than a 24 bpp image. Some MPEG players or other color shading software may be faster in 16 bpp (65,536 color) mode than in 8 bit or 24 bit mode. Things get even more complex when true OpenGL 3D hardware acceleration is considered!

What About 32 bpp?

Most PC graphics subsystems offer 8 bit digital to analog converters. A very few offer 6 bit conversion by ignoring the least significant 2 bits of the 8 bit data. An even smaller number offer 10 bit DAC's. There are three colors and most boards offer 8 bit data conversion, so 24 color bits are available. If the DAC or CLUT offers only 6 bit data, then an effective 18 bit color is available but is represented using 24 bits of color. Some X servers may offer 32 bpp, but really they are just presenting 18 effective bits or 24 bit data using 32 bits of storage.

With current display technology most humans can not separate the 256 shades each of red, green or blue, much less the combined total of 16.7 million colors. 24 bit color is adequate for common display purposes and higher color depths are not available.

Display Devices

There are currently two types of display devices offered for PC's. The standard CRT based monitor is well established. This is a variable resolution device permitting one of several different resolutions to be shown full screen. The other common display device has a fixed resolution where a single full screen display must precisely match the resolution of the display. This is normal for Flat Panel Displays, the most popular of which are the LCD panels in portable computers.

The X server controls the display device, not just the contents of the display. Incorrect timing signals generated by an X server can damage both CRT and LCD panels. Proper design of the X server can eliminate or significantly reduce the risk.

There are some characteristic color problems with CRT displays caused by nonlinear responses in the glowing phosphors. Gamma color correction can be applied either in software or by the X server programming the RAMDAC. Color temperature correction must be applied in software but can be supported by the X server.

Hardware Zoom and Pan

Using a variable resolution display device can allow the X server to offer a hardware zoom function assisted by hardware support with panning around the true display area. The X server displays a lower resolution area within the real display area.

Users will find that centering the zoom on the current cursor position is convenient and natural. Most X servers that offer a zoom function will center the zoom on the current center of the panned area, which is a less intuitive navigation.

Accelerated-X Summit Drivers provide a pointer centered hardware zoom with pan.

Display Power Management Services

CRT displays can consume as much energy as four light bulbs and often consume more energy than all the rest of the computer. DPMS offers a mechanism to reduce the energy demand for unused display devices by using the graphics subsystem to notify the display device that it should use less energy. There are three energy-reducing steps each of which uses progressively less energy. The deeper energy savings take longer to offer a usable display when they return to the full power -state.

Monitors that do not support DPMS can be safely used with DPMS control. They will not save energy, and some of them might indicate that there is an input error. This might be done by beeping. These messages are annoying, but harmless.

Control of energy use is handled by the CRTC. Many X servers offer some form of DPMS control. Failures in handling DPMS are usually harmless. 3D Accelerated-X supports the X specification for DPMS handling on all capable graphics hardware.

Software Gamma Color Correction

Applications can be developed to use the X Color Management System (XCMS) version of color allocation rather than the default simple color allocation model. If using XCMS, the application calculates the color correction using values that the X server provides. The program xcmsdb will show whether the X server supports color correction factors for software supported color correction. Using software color correction requires changing the application and the X server must support the root window property that provides color correction factors.

Very few X servers provide the correction factors when they are initially started. The correction factors may be separately calculated and stored in the X server using the **xcmsdb** program, but since this is an extra step, it is rarely performed.

Accelerated-X Summit Drivers provide software correction factors when initially started. The software correction factors can be modified using the xcmsdb program. Hardware supported correction factors can only be changed by terminating and restarting the X server.

Hardware Gamma Color Correction

Most graphics hardware can provide gamma color correction in the hardware. In this case, software does not need to be modified, but the X server must offer access to this mode.

Accelerated-X Summit Drivers offer hardware gamma color corrected services for all capable graphics hardware by default.

Software Color Temperature Correction

Applications that use XCMS can also take advantage of software color temperature correction. The X server holds the data for use by applications. As with software gamma color correction, support in the Server is rare.

Accelerated-X Summit Drivers provide software color temperature correction factors when initially started. The software correction factors can be modified using the xcmsdb program.

Overlays

A few graphics hardware subsystems offer the right hardware to support overlays. Overlays are often presented as a 24 bit per pixel image plane with an 8 bit overlay plane using transparency. This mode can offer significant memory savings over using a pure 24 bpp Server while still supporting color hungry applications, without any software changes. There are additional ways in which a programmer can take advantage of overlays.

Overlays require special hardware features and extensive changes within the X server.

Accelerated-X Summit Series supports 24bpp image plane with 8bpp transparent overlays (255 colors) on all capable graphics hardware. Note that the 3D Accelerated-X Server normally pretends that the overlay offers 256 colors even though one color is reserved for transparency.

This is because some software that requires 8bpp operation becomes confused when using a 255 color, 8bpp PseudoColor visual type. The 3D Accelerated-X Server can be configured to correctly present the number of colors actually available.

Input Devices

The X Window System requires two input devices for operation, a keyboard and a pointing device. Because X was designed to run on any hardware in any national language, the keyboard is mapped to a hardware neutral representation. Pointing devices such as mice, digitizer tablets, touchscreens and joysticks are candidates to be used as pointing devices.

The X server connects to the system keyboard and pointing device, and maps their input to X representations for use by the Window Manager and other applications.

Pointer Response Time

Although the pointer hardware provides immediate signals when it moves or when the buttons are pressed and released, the X server controls the user perception of responsiveness. X servers based on the sample implementation use a simple input model that can result in pointer input being ignored for tens of seconds. The visible effect is that pointer motion results in unpredictable and jerky cursor motion on the display when the X server is busy rendering.

Applications can also be blamed for poor pointer response times. An application can send tens of seconds of display images to the Server. Even if the X server passes the pointer activity to the application very quickly, the application may have buffered so much output that the response takes seconds to appear. This problem has to be corrected in the application, rather than in the X server.

Careful design of the X server input handling with the right support from the operating system, can result in smooth motion and predictable user response times. If applications are also written to take advantage of fast Server response times they can offer reduced response times.

Accelerated-X Summit Series supports the Velvet Mouse feature for reduced pointer response times, when the operating system is capable of supporting it.

Keyboard Layout

There are dozens of variants of PC keyboard for national language needs. X servers can be modified for user preferences, perhaps using the xmodmap program. Alternatively, since national language keyboards for PC's have well defined layouts, predefined keyboard mappings can be made available during configuration.

Other Input Devices

The XInput Extension allows the X server to offer many different types of input device. The most common alternative input device types are tablets, joysticks, spaceballs, and touchscreens. The X server must connect with the operating system and the device to provide support which is then accessible via the extension.

Memory Management

The X server stores transient data for itself, and for applications. Applications can cause data storage in the X server by creating windows and also by creating

properties and associating data with the properties. The X server also loads fonts on request and keeps the fonts available. Some of the data must be preserved for as long as the X server runs and some data is released within milliseconds of its allocation.

Server memory management has to deal with long term and short term memory allocation and a wide range of memory storage sizes. This is unlike the memory allocations normally targeted by UNIX memory allocators. The normal UNIX model is for short-lived processes each doing a small task. The memory management requirements of these tasks usually require best speed and are not concerned with the behavior over long periods.

Because the X server is so long lived and can grow to tens of megabytes in response to valid application requests and then shrink to a few megabytes after the transient burst, special memory management techniques can improve Server speed, reduce the impact of the Server memory use on the system and allow the process to shrink.

The X server must also handle the graphics subsystem memory. Careful design of the memory model in the graphics subsystem can result in improved speed. For optimum speed the Server should use non-display memory for the activities that yield the best speed improvements. The activities that benefit may vary between families or variants of a graphics chip.

Memory management becomes even more significant when considering 3D applications. These applications typically use large amounts of non-display memory as well as huge amounts of display memory. Just starting a 3D application may cause tens of megabytes of system memory to be allocated for double buffering, stencil buffers and so on. Unless carefully managed this can have a significant adverse effect on total system performance.

7. OpenGL

Overview

OpenGL allows applications to request 3D objects to be displayed. It is currently the most popular and wide spread 3D application interface library, having been implemented on UNIX, Linux and Windows systems. OpenGL does not offer any mechanism for handling user input nor does it define which 3D operations are performed in hardware. This makes OpenGL adaptable to a range of operating environments, but usually requires an existing graphics framework to offer input services and other management functions.

An Application Program Interface (API) is intended for the use of developers so that they can access a set of related functions. Some API's do not require much operating system or other support outside the library linked to the application. OpenGL is among the group of API's that requires a driver interface, to which the API will translate requests for action.

OpenGL drawing requests made by applications need to be translated into drawing functions for the graphics board. This is usually performed by a device level driver. Accelerated-X Summit can control the use of device level graphics hardware, known as Indirect Rendering. The OpenGL library can include device specific control (direct rendering) and Accelerated-X Summit provides access to the graphics hardware. The efficiency of each choice depends upon the design of the application and the graphics hardware.

Data for Indirect Rendering is provided to the X Server via the GLX extension protocol. This protocol is defined by OpenGL specifications to permit interoperation of OpenGL implementations between different systems on a network, or over a local connection from a program on the same machine. Special communication channels for applications can be offered, but these can be subject to proprietary interface protocols. Accelerated-X offers the GLX extension for application communications with the OpenGL engine.

Accelerated-X Summit also supports Direct Rendering by a client via the X Direct Access (XDA) extension. This extension is used by the OpenGL libraries we supply. No applications need to be changed or recompiled to take advantage of Direct Rendering. The use of Direct or Indirect rendering is transparent to the OpenGL application, though an application can specifically request Direct or Indirect rendering, if it so chooses, through the normal OpenGL API.

3D graphics hardware varies dramatically. For example, memory layouts may vary in complexity and functionality. 3D operations may be performed by a single instruction in some hardware, and in other hardware 3D operations must be performed by multiple instructions.

Intermixing 2D and 3D operations often requires that the 3D hardware engines work in limited ways. Consequently, a 3D image drawn full screen can be faster than the same image being drawn into a window.

Image Quality

The X Window System usually defines operations down to the pixel. Lines can be precisely described as to their appearance in each pixel of the screen. This level of control transitions well to performing 3D operations. The X Window System Standards, combined with OpenGL specifications, provides 3D images that look identical when displayed on different hardware.

OpenGL Speed

Under the X window system, the speed of Accelerated-X Summit Drivers is usually measured by taking the average of the speeds of lots of individual operations. OpenGL speed is often measured in two different ways, reflecting two different uses of OpenGL.

For games work, the current benchmark most used is scene frame rates, or Frames Per Second (FPS). FPS is dominated by the size of the window or screen. Because the benchmark is to view a completed scene, every pixel must be drawn for the scene, for each new frame. The more pixels, the more time will be taken to draw the scene. When using FPS as the comparison for scene speeds, make sure the windows used are the same size.

Triangle drawing rates dominate another aspect of 3D work, mostly used for technical drawings and 3D visualization. A series of Viewperf benchmarks emphasizes triangle drawing rates. The basic triangle drawing benchmark is the speed of drawing a triangle strip. This is a triangle of given dimensions, to which another point is added to make one more triangle. Extra triangles can be formed by adding just one more point for each new triangle. This reduces the data bandwidth for requesting new triangles and so stresses the speed at which the triangle can be drawn.

Memory Utilization

Working in 3D requires more graphics memory compared to 2D windowing systems. Typically, at least four times the memory should be available for 3D use, as would be used for 2D operation. Memory allocation is heavier than most 2D windowing systems, because 8 bit color depth (256 colors) is not enough to present nicely shaded 3D images. At a minimum, 16 bits per pixel should be used, requiring twice as much memory to hold data for each pixel.

The resolution of 1152x864 is useful for demonstrating memory usage, because an 8 bit color depth in 2D will use 1MB of graphics
memory at that resolution. If running at 16 bits per pixel, 2MB of graphics memory will be needed for 2D work.

For 3D work, assume that 16 bits per pixel color depth is required and that the display resolution of 1152x864 will be used. As well as the displayed 2MB of graphics memory, many programs will want to make use of double buffering; this technique uses extra non-display memory to prepare an image and then swaps it with the currently displayed image so that an image is never seen while being drawn. Double buffering makes moving images look smoother. Just adding double buffering causes a doubling of the amount of memory. A graphics card needs at least 4MB in order to offer 1152x864 in 16bpp with double buffering.

3D applications can use a lot of textures. Texture memory should be roughly equal to the amount of display memory, which means a factor of three times the amount of display memory is needed as compared to 2D. Finally, Z (or depth) buffers, stencil buffers and other data caches account for at least one more screenful of data. If your application is using OpenGL quad-buffered stereo rendering, the memory requirements may be doubled again, since new front, back, and other ancillary buffers may need to be created and managed to support the extra viewing channel.

Current recommendations are to provide four times as much memory as is needed for 2D systems. To run at 1600x1200 in 24 bits per pixel color depth will require at least 24MB of graphics memory (1600x1200 = 1.9MB/byte of color depth, 24 bit color depth requires at least 3 bytes and the amount of non-display memory is three times that required for the display).

3D applications and rendering software will usually require much more memory than a 2D application. If using 3D applications for the first time, consider increasing the amount of system memory in addition to the graphics memory.

Interactivity

Accelerated-X Summit Drivers include special features to improve the interactive response of OpenGL. The most important of these is the feature known as Velvet Mouse. If the rendering engine is busy with large queues of drawing requests, then the system can become unresponsive to user input by keyboard and mouse. Velvet Mouse technology allows an application to receive user input events as they happen, rather than after a massive drawing queue has been exhausted. If Velvet Mouse is disabled, applications may have buffered twenty to thirty seconds worth of drawing before the mouse or keyboard response is passed to the application. Without Velvet Mouse, the application will appear to respond slowly, when the problem is in the X Server.

Note that applications can be designed in such a way that they may still respond slowly, even though Velvet Mouse is available in the X Server.

Other Programming API's

OpenGL is a low level API for 3D graphics drawing. Programmers often need higher level API's that are more specific to the application they are developing, which also build upon the OpenGL API. Game developers often use API's built on OpenGL. One of the most commonly used high level API is the Graphics Language Utility Toolkit (GLUT).

Before OpenGL was developed, Silicon Graphics offered Iris GL. Although it offers the ability to run a program on one system and display the output to another, some SGI specific mechanisms are used to do so. Applications written for Iris GL should be source code compatible with OpenGL and most Iris GL programs should work correctly if recompiled and linked against OpenGL. Old Iris GL applications will not work if the display system offers OpenGL rather than Iris GL.

Compatibility

Xi Graphics is a member of the OpenGL Linux Standards Base group. It is intended that Xi Graphics OpenGL implementations will be compatible with and conformant to the Linux OpenGL Standards Base. This should permit interoperation between Xi Graphics and any other Linux based OpenGL implementation.

Conformance

SGI provides a conformance test suite for OpenGL implementations. Xi Graphics is required to use and pass the test suite by Silicon Graphics before using the OpenGL trademark. In addition to the conformance test suite, other tests are also run to check that the OpenGL implementation works correctly. All 3D software released by Xi Graphics is and will continue to be OpenGL compliant.

8. Troubleshooting

The following troubleshooting tips may help if difficulties are encountered when using Accelerated-X Summit. If you encounter a problem that is not listed here, additional resources are listed at the end of this chapter. Also, an FAQ section is available on Xi Graphic's web site at http://www.xig.com.

Installation

My Graphics Hardware doesn't Appear to Work.

First verify that your graphics hardware is on the list of supported graphics hardware. Once you have verified support, check the Xi Graphics' web site http://www.xig.com for updates that relate to your hardware. Xi Graphics constantly adds support for new graphics hardware and updates existing support. Once you have downloaded and installed all the relevant updates, use the Xsetup configuration utility to configure Accelerated-X Summit. For configuration information, please refer to Chapter 3, 'Configuring Accelerated-X Summit.'

Performance

3D operation seems slow.

1. Under Linux, verify that MTRR functionality is enabled within the kernel:

    # cat /proc/mtrr

If this file does not exist, MTRR must be enabled within the kernel configuration. The kernel will need to be recompiled to reflect support for MTRR. (Please consult your operating system manual). Under Solaris, MTRR is always available if the processor supports it.

2. Reference the Xi Graphics website, www.xig.com, to verify which features are accelerated by your hardware. Please note not all hardware provides acceleration for all 3D operations in all color depths and resolutions. If a 3D operation is not accelerated by hardware, it is necessary to do the operation in a software only mode, which will significantly reduce performance. Please consult your graphics hardware owner's manual.

3. Make sure you have enough system memory. 3D applications require significantly more memory than 2D applications. If you do not have enough memory, your system may suffer heavy swapping.

4. Ensure your application is using Xi Graphics OpenGL libraries. You can use the 'ldd' command to see which libraries the application is using. For example, under Linux:

ldd /usr/X11R6/lib/xglinfo

```
libGLU.so.1 =>  /usr/lib/libGLU.so.1 (0x4001c000)
libGL.so.1 =>  /usr/lib/libGL.so.1  (0x4009e000)
libXext.so.6 =>  /usr/X11R6/lib/libXext.so.6  (0x400ce000)
libX11.so.6 =>  /usr/X11R6/lib/libX11.so.6  (0x400db000)
libm.so.6  =>  /lib/libm.so.6  (0x4018e000)
libc.so.6  =>  /lib/libc.so.6  (0x401ac000)
libXda.so.1 =>  /usr/X11R6/lib/libXda.so.1  (0x402e2000)
libdl.so.2  =>  /lib/libdl.so.2  (0x402ec000)
/lib/ld-linux.so.2 =>  /lib/ld-linux.so.2  (0x40000000)
```

libXda is our direct rendering library. It's presence here indicates that our libGL and libGLU libraries are being used. Use of other vendor's OpenGL libraries will reduce performance, if the application will function at all.

5. Under Linux, if you are using DRI or agpgart in your kernel, you should disable them. They may interfere with the proper operation of Summit Drivers.

6. Disable Overlays:
If Overlays are not required, it is recommended to disable them. Overlays can lower performance.

My Machine Hangs at Startup or After a 3D Application has been Started

1. Some mainboard and video card combinations do not play well together. In some cases, both the mainboard and the video card may claim to be able to use high AGP speeds, such as 2x or 4x modes, even though in reality, it may not be very stable. The first thing to try, if you are using an AGP card is to use Xsetup to change the AGP speed to 1x. This may improve stability.

2. If you are using an older version of the AMD K6 processor under linux, you may suffer locks or incorrect rendering when Accelerated-X Summit attempts to use the AMD 3Dnow processor instructions for 3D operations. The only work around in these cases is to remove the 3Dnow module as root:

```
cd /usr/X11R6/lib/X11/AcceleratedX/modules
mv ogl_k3d.mod ogl_k3d.mod.notused
```

Then restart your X server.

3. If you are using an AMD K7 processor, you may need to set your AGP speed in Xsetup to 1x to get reliable performance. Problems with Matrox and ATI cards have been seen in AGP 2x/4x speeds on some motherboards using this processor.

Compatibility

My OpenGL Application does not Function with Accelerated-X Summit.

The application could have been designed with a particular system in mind, possibly using proprietary extensions that are not available with a standard distribution of OpenGL.

My Non-OpenGL application does not function with Summit.

MESA

Due to proprietary extensions, applications designed using MESA may not run on OpenGL - based systems. Work-arounds and fixes may be available. Please consult with the vendor of the application.

Glide

Due to proprietary extensions, applications designed using Glide are not compatible with OpenGL - based systems.

Extension problems

Accelerated-X Summit may not offer support for XFree86 specific extensions, please visit www.xig.com or email support@xig.com to inquire about support for specific extensions.

Additional Resources

Included with the product is a Release Notice. The Release Notice documents variations of procedures and information contained in this manual, known after the manual was written. Corrections in the Release Notice supercede the contents of the manual.

Additionally, the Xi Graphics web site (http://www.xig.com) contains up to date information. Announcements about new graphics board support and new FAQ content are sent out on the summit-announce mailing list. Details about the mailing lists are given below.

Contacting Support

If you feel you need to contact support to report a problem, please run the **Xsupport** script and send the output along with your report to support@xig.com.

Under linux, the Xsupport script is located in:

/usr/X11R6/lib/X11/AcceleratedX/bin/Xsupport

Under Solaris, it is located in:

/usr/openwin/lib/AcceleratedX/bin/Xsupport

The output of this script will provide important information about your system to Xi Graphics' support.

Automated panic email

Accelerated-X Summit can often generate readable stack trace and configuration information. This information is very helpful for reproducing problems and improving the reliability of Accelerated-X Summit.

By default, this information is emailed to "root@localhost". Xi Graphics has a special email address for automated panic email reports, "bugs@xig.com". Note that this email address should not be used for general technical support questions.

To configure the automated panic email address, edit the Xsiteinfo file. The path is /usr/X11R6/lib/X11/AcceleratedX/etc/Xsiteinfo for linux, and /usr/openwin/lib/Acceleratedx/etc/Xsiteinfo for Solaris. The line to change is the one about the BugReportEmail address:

BugReportEmail = "bugs@xig.com";

Mailing Lists

Xi Graphics maintains several mailing lists for Accelerated-X users. Mailing lists offer a mechanism where a single email can be sent to a large number of users. Users can control which and how many lists they are subscribed to.

The summit-announce mailing list

The summit-announce mailing list is for users who want to keep up with the latest update announcements. Announcements are issued for new graphics board support or other updates.

The summit-users mailing list

This mailing list is intended for use by Accelerated-X Summit users wanting to communicate with other Accelerated-X Summit users. The list is read by Xi Graphics employees and they often answer questions about Accelerated-X or graphics boards, however it is not intended as a technical support forum. Questions about support will be redirected to the Xi Graphics Technical Support staff (support@xig.com).

Subscribing to a mailing list

To subscribe to the summit-announce mailing list, send an email to majordomo @xig.com with any subject. The body of the message should read:

subscribe summit-announce

The mailing list manager program will subscribe the address from which email has been sent. Note that lists are configured to request confirmation. If a different address should be subscribed use the line:

subscribe summit-announce (YOUR_OTHER_ADDRESS)

Where (YOUR_OTHER_ADDRESS) is replaced by the other address to be subscribed. The confirmation request will be sent to the alternative address to be subscribed, not the address mailed from.

Unsubscribing from the mailing list

Send an email to majordomo@xig.com, replace the word "subscribe" in the message with "unsubscribe". Other email addresses can also be unsubscribed.

9. File Names

Each of the operating systems supported has their own file layout. There is one common point below which the majority of the Accelerated-X Summit Server supporting files can be found. This is sometimes referred to as XACCELHOME.

Operating System	XACCELHOME
Linux	/usr/X11R6/lib/X11/AcceleratedX
Solaris	/usr/openwin/lib/X11/AcceleratedX

The Accelerated-X Summit Server configuration file is /etc/Xaccel.ini on all supported operating systems.

Site Information File

The file $XACCELHOME/etc/Xsiteinfo contains a few fields of interest to system administrators. The Xsetup program reads the Xsiteinfo file to get support and other contact information. The file also stores the BugReportEmail address used for automated X Server panic reports.

X Extensions

Normally, the Accelerated-X Summit Server will load an extension when it is required. The $XACCELHOME/etc/Xextensions file permits an extension to be loaded when the server is started.

X Font Renderers

The $XACCELHOME/etc/Xrenderers file describes the mapping between font file suffix and the evoked font rendering engine. It is unlikely that this file should need modifying.

X Banner

The Accelerated-X Summit Server normally shows a banner when started. The files are kept in Sun raster image format in the $XACCELHOME/etc/Xlogo.im* files. The different files provide images for different color depths. This banner is not normally shown when using a graphical login manager such as xdm, KDE's kdm or the CDE dtlogin.

X Timings

The $XACCELHOME/etc/Xtimings file contains the precompiled VESA timings for monitor support.

Linux

Server Name

/usr/X11R6/bin/Xaccel

Mouse Ports and Protocols

Connection type	port name	protocol
PS/2	/dev/psaux	PS/2
COM1	/dev/ttyS0	varied serial
COM2	/dev/ttyS1	varied serial
USB	/dev/input/mice	PS/2 MS Intellimouse
USB	/dev/input/event	USB Mouse

Note that customers have very occasionally come across serial mice that only worked when used with /dev/cua0 or /dev/cua1.

Solaris

Server Name

/usr/openwin/bin/Xaccel

Mouse Ports and Protocols

Connection type	port name	Protocol
PS/2	/dev/kdmouse	PS/2
USB	/dev/mouse	USB Mouse
COM1	/dev/tty00	Varied serial

Glossary

Accumulation Buffer

Local or System Memory which is used to accumulate a series of images, generated in the color buffer. An accumulation buffer can be used for effects such as depth of field, motion blur, and full-scene antialiasing.

Aliasing

A rendering technique which is used to assign color to pixels. Produces a stair-stepping effect which is also known as jaggies.

Alpha

Alpha components are used to control color blending. Alpha is a fourth color component.

Ambient

Ambient is light that is distributed in all directions.

Animation

Rendering repeated images of a scene.

Antialiasing

Antialiasing is a process used to increase clarity, definition, jaggies, and correctness of a rendered image.

API

Application Programming Interface. Provided as a library and a set of documents, describing functionality to software developers.

BIGREQUESTS

This extension is transparently implemented by the X libraries. If the Server offers this extension, then large data requests can be made using very large packets, rather than breaking up the request into multiple smaller requests. The use of BIGREQUESTS should be entirely invisible to applications, other than by some speed increase.

Bit

Binary digit. A state variable having only two possible values: 0 or 1.

Bitmap

An array of bits.

Bitplane

An array of bits mapped directly with pixels. Framebuffers are a stack of bitplanes.

Blending

The process of combining two color components into one component.

Buffer

A collection or group of bitplanes which store only a single component (such as depth) or a single index (such as the color).

CLUT

See Color Look Up Table.

Color Depth

The number of discrete colors that can be offered is a consequence of the number of bits used to represent the color. The more bits, the more available colors.

Color Index

Representing a color by name, rather than by value.

Color Look Up Table

Given an input value from display memory, the Color Look Up Table translates the input value into a desired binary value to drive the color for the screen.

Color map

A table of index-to-RGB mappings that is accessed by the display-hardware

Colormap Flashing

If competing applications need to reprogram the CLUT to provide a wide range of colors, as you switch focus between applications, the unfocused application might show horrible colors. This is a consequence of reprogramming the CLUT for the needs of each application. The effect can be avoided by sharing color maps, using a higher color depth or using hardware that offers multiple concurrent colormaps. Most PC graphics boards only offer a single colormap.

CRTC

Cathode Ray Tube Controller. This device provides the control signals for a rasterized display device, memory references for the RAM-DAC via a shift register and a pixel clock that drives the RAMDAC.

Cursor

The visual representation of the pointer.

DAC

Digital to Analog Converter. The final output stage of a RAMDAC, this device converts the binary values from the CLUT into an analog voltage.

Double Buffer Extension

See DOUBLE-BUFFER.

Depth

The z window coordinate.

Depth Buffer

Memory that stores the depth value at every pixel.

Display Memory

See also Non-display Memory. Multiplying the horizontal resolution by the vertical resolution by the number of bytes required for the color depth yields the amount of memory required for display purposes on the graphics board.

DOUBLE-BUFFER

Contexts with front and back color buffers. This reduces an effect known as tearing, in which a visible image is partially drawn, paused and then completed. This isvisually disturbing in 3D and movie related images.

Extensibility

A feature of certain designs, so that new features can be added without invalidating previously developed programs. The X Window System communicates using the X Protocol. The X Protocol definition has been static at X version 11 since about 1987. Extensions have brought this to Release 6.4 as of 1998.

Flat Panel Display

Flat panel displays are display devices that includes LCD panels and Plasma Display Panels.

Fog

Used to simulate atmospheric effects, such as haze, fog, smog, and depth perception.

Focus

Many windows can be open concurrently. Normally only one window is designated to receive input from the keyboard. That window is the window with focus. Window Managers usually show the window with focus, with a different border decoration, so that you can quickly identify the focus.

Font Server

See X Font Server.

Frame Buffer

Refers to all of the buffers of a window or context.

FPD

See Flat Panel Display.

Gouraud Shading

The smoothing of colors across a polygon or line, which produces a smooth variation in color. Also referred to as smooth shading.

Graphics Board

A graphics subsystem delivered as a plug in board solution.

Graphics Subsystem

The part of a computer containing graphical display memory, CRTC, graphics engine(s) and RAMDAC. A graphics subsystem may be integral to the computer design, as it is in a portable computer, or may be modular, as it is in a graphics board for a desktop computer.

Hot Key

A key combination recognized by software. It is possible to disable a Hot Key, or to reassign the function to another key combination. 3D Accelerated-X Hot Keys can be disabled. They cannot be reassigned.

ICCCM

Inter Client Communication Conventions Manual. This is the document that suggests many of the things expected of a Window manager, cooperating processes and color sharing practices.

Image

An array of pixels which can exist in client memory or in the frame-buffer.

Image Plane

An image plane is where complex graphics can be drawn. Overlay and underlay planes are usually used for less complex graphics. The image plane, the underlay and overlays may be offered in different color depths.

Image Primitive

A bitmap or an image.

Immediate Mode

The immediate execution of OpenGL commands when they are called.

Jaggies

See Aliasing.

Lighting

Computing the color of a vertex based on current lights, material properties, and lighting-model modes.

Line

A straight region of finite width between two vertices.

LBX

See Low Bandwidth X.

Local Client Acceleration

See Shared Memory Local Transport.

Low Bandwidth X

A protocol that is intended for use over low bandwidth communication services.

Luminance

The brightness of a given surface.

MIT-SCREEN-SAVER

This extension supports user settings for screen saver features.

MIT-SHM

The Shared Memory extension offers a high bandwidth local connection for some image transfers to and from the Server. Program must be modified to use this extension, unlike the Xi Graphics Shared Memory Local Transport (Local Client Acceleration).

Monitor

The hardware device which is used to display images located in the framebuffer.

Motion Blurring

A rendering technique which uses accumulation buffers to simulate a moving object or a moving camera.

Non-display Memory

See also Display Memory. If the graphics board has memory not used for display purposes, this is non-display memory. It can be used for speed improving caches, and to provide such features as Z buffers for 3D work, and hardware double buffering.

NURBS

Non-Uniform Rational B-Spline.

OpenGL

A 3D specification from Silicon Graphics. A compliance test kit is provided by Silicon Graphics which must be passed before an implementation can be OpenGL Compliant.

Overlay

Two or more drawing areas within the X Display Server. Drawing in one area does not affect the contents of the other area, data is then preserved. The drawing areas can be in different color depths. Applications that have different color depth requirements can coexist in the same display.

Overlay Plane

See also Overlay and Image Plane. An overlay plane is a drawing area that appears to lie in front of the primary image plane. With suitable hardware, one or more overlay planes can be offered.

PEX

PHIGS Extension to X. This is a specification describing how the graphical operations in PHIGS are mapped to the operations of the X Window System.

PHIGS

Programmers Hierarchical Interactive Graphics System. An early API offering 3D representation of graphical data.

Pixel

A pixel is the smallest picture element. A pixel consists of only one color.

Pixel Clock

A device for timing operations of a graphics subsystem.

Point

An exact location in space.

Polygon

A surface bounded by edges specified by vertices.

Pointing Device

An input device that navigates the cursor focus.

Primitive

Within OpenGL, a point, line, polygon, bitmap, or image.

Proxy Server

A Server that acts in place of the real server. X Proxy Servers are most often used in firewalls to provide access under some security controls, and may be used as a mechanism to reduce network band-width requirements (see LBX).

Quadrilateral

A polygon with four edges.

RAMDAC

Random Access Memory Digital to Analog Convertor. A component of a graphics board which is crucial in controlling an analog monitor.

Rasterized

A point, line, polygon, bitmap or image that is converted to fragments which corresponds to a pixel in the framebuffer.

RECORD

An extension oriented towards reproducible test environments. Applications must be modified to use the RECORD extension.

Rendering

The process of converting primitives to an image in the framebuffer. This is the primary operation of OpenGL.

RGBA

Red, Green, Blue, Alpha.

RGBA mode

A context within OpenGL which has the color buffers stored in red, green, blue, and alpha color components, rather than color indices.

Resolution

The number of discrete pixels measured across the screen and down the screen, given as the horizontal resolution multiplied by the vertical resolution.

Shading

The interpolation of color within the interior of a polygon. Shading can also occur between the vertices of a line, during rasterization.

Shared Memory Local Transport

After an initial local connection is established and the XSMTSIZE environment parameter is present, a local connection is established using shared memory. This offers a high bandwidth connection from the client to the Server. This is useful when the client is band-width limited by the connection to the Server.

Shared Memory Extension

See MIT-SHM

SHAPE

An extension which allows the definition and use of non-rectangular windows. An application that has been modified to use SHAPE can present a mask for the window shape and the Server will display a window of the appropriate shape.

Shift Register

Part of the CRTC section of the graphics subsystem. The shift register presents memory addresses to the RAMDAC.

Single-Buffering

OpenGL contexts that don't have back color buffers are single-buffered.

Stencil Buffer

Memory which can be used in conjunction with the depth buffer for specific operations such as masking.

Stereo

The computation of separate images for each eye. Stereo requires special hardware, such as synchronized monitors or glasses.

SYNC

Another extension for the X Server, supported by library functions. Applications must be modified to use the Synchronization request. When used, applications can ensure that operations on the Serves are correctly coordinated.

Textures

Images that can be used to modify the color of fragments produced by rasterization.

Texture Mapping

Applying textures to a surface.

Underlay plane

See also Overlays and Image Plane. An underlay plane lies behind the primary image plane. Planes in front of the lowest underlay plane usually offer some form of transparency.

Vertex

A point in three-dimensional space.

Virtual Desktop

When the Server's resolution exceeds the current display resolution, some part of the image may not be visible. This mode is called a virtual desktop. A mechanism is offered to move the visible area around the virtual desktop.

Visual

A graphics board usually includes a RAMDAC. The RAMDAC includes a CLUT. A Visual describes how the CLUT is programmed. There are six standard Visual types, which can be divided into gray/color, programmable/static and bitmasked/indexed types. For example, a color programmable indexed type is a member of the PseudoColor Visual Class. A color non-programmable bitmasked type is a True-Color Visual.

Window

A rectangular region of the framebuffer which have pixels all of the same buffer configuration.

Wireframe

Objects that contain line segments only.

X

See X Window System.

X Display Server

A network accessible program that offers graphical input and output services to an X client.

X Font Server

A network accessible program that offers font descriptions to one or more X Servers.

X Image Extension

Allows many image processing operations to be performed inside the X Server. This reduces the bandwidth requirements of an application, since it need not locally compute each new image and push it to the Server. Applications must be extensively modified to take ad-vantage of XIE.

X Server

See X Display Server.

X Window System

A networked, extensible, hardware neutral, operating system independent, windowed graphical system. The X Window System was developed to link previously incompatible computers into a seamless homogeneous graphical computing environment and was adopted by all workstation vendors.

X3D-PEX

This extension provides support for a 3D extension to the X Server. See also PEX and PHIGS.

XIE

See X Image Extension.

XInputExtension

This extension, often known as XInput, offers additional input devices. The devices may be used to replace the default keyboard and pointing device, and may offer features for special application environments such as 3D input device

Appendix

A. The X Services (xsvc) Kernel Driver

This section describes the X Services (xsvc) kernel driver provided by Xi Graphics, Inc..

Overview

This kernel driver provides various services to the Accelerated-X X Server, including the ability to use system memory for texture storage, and Direct Memory Access (DMA) for AGP cards using the AGP GART interface. Using AGP on an AGP based video card can allow the video hardware to access system memory directly, providing additional memory in which to store textures and other data used for 3D rendering.

In general, the xsvc driver increases the performance of your video card substantially, and is a required component of Accelerated-X Summit Series.

If you are not using an AGP card (for example, PCI), xsvc will still be used to provide DMA, as well as providing the infrastructure required for supporting direct rendering, utilizing Xi Graphic's X Direct Access (XDA) extension. XDA allows applications to render to the video hardware directly without using the overhead of the GLX encode/decode path to and from the X server. This will significantly enhance performance, and all of this will be transparent to the application.

Xsvc is provided as a separate package for Linux and Solaris systems, and must be installed before installing Accelerated-X Summit Drivers.

Direct Rendering with XDA

In order for clients to utilize XDA for direct rendering, the client application must have write access to the /dev/xsvc device node. By default, the device is not installed with permissions necessary to allow an ordinary user to run XDA applications. In these cases, GLX, or indirect rendering, will be used. This is done as a security precaution. If you do not trust the users on your system, do not allow ordinary users to have write access to /dev/xsvc.

If you are the only user on your system, or you trust all of the users who have access to your system, you can simply set write permissions on /dev/xsvc for all users by:

chmod 666 /dev/xsvc

If you only want to allow certain users to be able to run direct rendering applications on your system, you must add those users to the 'graphics' group. This group is created for you when the package is installed.

Assuming you have a user who you want to be able to run a direct rendering client, 'herbert', you would do the following:

```
# as root
groupadd graphics
usermod –G graphics herbert

chgrp graphics /dev/xsvc
chmod 664 /dev/xsvc
```

If 'herbert' was already logged in, he would need to logout and back in again for the new group membership to take effect. Once logged in, only 'herbert' (and of course, root) would be able to run applications that utilize direct rendering via XDA.

AGP Bridge Support

At this time, the following AGP bridges are supported:

AMD 761	AMD 762
AMD 751	
Ali M1541	Ali M1542
Ali M1621	
Intel 440EX/LX	Intel 440BX/ZX
Intel 440GX	Intel 815
Intel 840	Intel 820
Intel 850	Intel 860
SiS 5591	SiS 540
SiS 530	SiS 620
SiS 630	SiS 730
VIA VT82C597	VIA VT82C598MVP
VIA VT82C691/693	VIA VT82C693A
VIA VT82C694X	VIA VT8371
KT133	

If you are using an AGP system, your AGP bridge must be supported in order to use xsvc, and as a consequence, Accelerated –X Summit Drivers.

Additional Information

For an up to date list of supported bridges, and other specifics about the xsvc driver, get the README.xsvc file from our ftp site at ftp://ftp.xig.com/. This document is Linux centric, but we will support the same bridges under both Linux and Solaris. At this time, source code for xsvc is provided on our ftp site.