OpenGL

Version 1.1.0a Release Notes

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Contents

1.0 Introduction 1

2.0 Documentation 2

3.0 Prerequisites 3

3.1 Software 3

3.2 Hardware 3

4.0 System Installation 4

5.0 Configuring Metro-X for OpenGL 5

5.1 Using configX to Enable OpenGL 5

5.2 Configuring OpenGL Manually 5

5.3 Reserving Memory for REALimage OpenGL Driver 6

6.0 Recommended Reading 8

7.0 Direct Software Support 9

1.0. Introduction

OpenGL® is a widely-accepted application programming interface (API) for interactive 3D graphics rendering and 2D imaging. It provides device-independent support for common low-level 3D graphics drawing operations such as polygon specification, basic lighting control, transformation specification, and framebuffer operations like blending and depth-buffering. It also provides mechanisms for sending and retrieving 2D images to and from the framebuffer, and integrates 3D graphics with 2D imaging through texture mapping.

OpenGL is the premier environment for developing portable, interactive 2D and 3D graphics applications. Since its introduction in 1992, OpenGL has become the industry's most widely used and supported 2D and 3D graphics application programming interface (API), bringing thousands of applications to a wide variety of computer platforms. OpenGL fosters innovation and speeds application development by incorporating a broad set of rendering, texture mapping, special effects, and other powerful visualization functions.

This implementation of OpenGL was developed for the various systems listed in "Hardware" on page 3 running PowerMAX OS™.

2.0. Documentation

Table 2-1 lists the OpenGL 1.1.0a documentation available from Concurrent.

Table 2-1. OpenGL Version 1.1.0a Documentation

Manual Name	Pub. Number
OpenGL Version 1.1.0a Release Notes	0891083-1.1.0a

Copies of the Concurrent documentation can be ordered by contacting the Concurrent Software Support Center. The toll-free number for calls within the continental United States is 1-800-245-6453. For calls outside the continental United States, the number is 1-954-283-1822 or 1-305-931-2408.

Additionally, the documentation listed above is available:

- online using the X Window System utility, **nhelp**
- on the Concurrent Computer Corporation web site at www.ccur.com

3.0. Prerequisites

Prerequisites for OpenGL Version 1.1.0a are as follows:

3.1. Software

- PowerMAX OS™ operating system release 4.3 or later
- X Window System (X11 Version 6.4.1 or later)
- *(For local rendering)*

  Metro-X™ 4.3.5 or later (see “Configuring Metro-X for OpenGL” on page 5)

3.2. Hardware

- Any Night Hawk® Series 6000, Power Hawk™, TurboHawk™, PowerMAXION™, PowerStack™ or PowerStack™ II system
- *(For local hardware-accelerated OpenGL rendering)*

  Diamond FireGL 4000 PCI graphics card with 15 MB frame buffer, 16 MB texture memory (see “Reserving Memory for REALimage OpenGL Driver” on page 6)

- *(For local non-hardware-accelerated OpenGL rendering)*

  Any other video card supported by Metro-X for PowerMAX OS such as:

  - Matrox Millennium II
  - Matrox Millennium G200SD PCI
  - Cirrus 5446 SVGA

- *(For remote rendering)*

  A GLX-capable workstation or X™ terminal.

4.0. System Installation

The OpenGL product is installed as four standard PowerMAX OS software packages and utilizes the standard PowerMAX OS product installation mechanism, **pkgadd** (see **pkgadd(1)**).

The package names are:

glruntime OpenGL runtime libs and basic clients

Includes OpenGL (**libGL.so**) and GLX windowing (**libGLw.so**) shared libraries plus a few basic OpenGL clients.

This package should be installed on hosts wishing to execute one or more OpenGL client programs.

glxdrivers GLX extension and drivers for Metro-X

Adds OpenGL rendering capabilities to PowerMAX OS hosts equipped with Metro-X and certain graphics devices. Includes an Open GL server extension for Metro-X plus an OpenGL software-only renderer and accelerated OpenGL drivers for supported graphics devices.

This package should be installed on hosts equipped with Metro-X 4.3.5 and higher and one of the supported graphics device options. See “Hardware” on page 3 for more information.

gldevel OpenGL developer header files and libs

Includes 'C' language header files, compiled (static) libraries, manual page entries for GL, GLX, and GLU library functions, as well as documentation of GL, GLX, and GLU library specifications in PostScript® format. Requires **glruntime** to be installed.

This package should be installed on hosts equipped with `hc` or `c++` compiler that wish to develop OpenGL client applications.

glextras GLUT (OpenGL Utility Toolkit) and contributed OpenGL samples/demos

A collection of over 250 sample OpenGL programs and demos collected from various source, many with source code.

Requires **glruntime** package. Of course, sample source code is most useful if **gldevel** package is also installed.

These names are case-sensitive.

Please refer to the “Installing Add-on Software” chapter in the *System Administration Volume I* (0890429) manual and the *PowerMAX OS Release Notes* for instructions on software installation.

5.0. Configuring Metro-X for OpenGL

If your intended target of the GLX command stream is a local X server, it will be necessary to configure your X server appropriately. In addition to the installation and configuration steps outlined in the *Metro-X Release Notes*, the administrator is also required to configure the OpenGL extension and driver. This can be accomplished using either the **configX** GUI program, or by manual edits to the **/usr/lib/X11/Metro/XMetroconfig** file.

5.1. Using configX to Enable OpenGL

The **configX** GUI program provides point and click selection of the OpenGL driver. After installing the **glxdrivers** package, the Configuration pull-down menu will have an additional working item labelled GLX Extension... Selecting this menu item will pop-up an OpenGL configuration dialog with one of three possible settings:

- GLX Disabled
- GLX Software Only
- GLX Hardware Accelerated

Simply choose the type of OpenGL support that is desired, and click OK.

NOTE

If the GLX Hardware Accelerated button is grayed-out, you have probably selected a graphics card for which no hardware-accelerated OpenGL driver exists.

5.2. Configuring OpenGL Manually

The same goals can be accomplished by a couple of quick edits to the **XMetroconfig** file, usually found in the **/usr/lib/X11/Metro** directory. To turn on OpenGL support, add the following line to the Module section of your **XMetroconfig** file:

```
load "libgl.a"
```

To select the OpenGL driver, one must add an additional driver line to the Device section of this file as well. For example, adding the software GL driver to a typical Device section yields the following:

```
Section "Device"
    Identifier  "graphics0"
    BoardName   "Matrox Millennium II PCI (250 MHz) MGA 2164, TI 3026-250"
    Driver      "mga"

    Driver      "sigl_drv.o"
EndSection
```

Appending the driver sigl_drv.o line to the Device section will load the software GL renderer.

To enable hardware-accelerated rendering, a device-specific GL driver must be loaded in addition to the normal DDX driver. For example, the REALimage driver used with the Diamond FireGL 4000 graphics card will have a `Device` section that looks like this:

```
Section "Device"
    Identifier  "graphics0"
    BoardName   "Diamond FireGL 4000        REALimage 1000"
    Driver      "libREALimage.a"

    Driver      "esogl_drv.o"
EndSection
```

5.3. Reserving Memory for REALimage OpenGL Driver

If your system is equipped with a FireGL 4000 PCI graphics card, and you wish to use the hardware-acceleration features of the card, then an additional configuration step is needed. The administrator must reserve some real memory to be used for DMA buffers by the REALimage OpenGL driver. Not only must this memory be reserved, but it is also necessary to communicate the range of reserved memory to the driver by adding two special parameters to the **`XMetroconfig`** file.

NOTE

The **`configX`** program has no provision for this setting so it must be added by manually editing the **`XMetroconfig`** file.

The process for reserving memory also requires manual edits to `res_sect[]` table in **`/etc/conf/pack.d/mm/space.c`**. The **`diff`** listing below shows the addition of a typical entry to reserve 1 MB of real memory at physical address `0x01000000` [16MB].

```
-------------------------------------------------------------------
$ diff -c space.c.ORIG space.c
*** space.c.ORIG        Fri Jun  4 10:56:34 1999
--- space.c     Fri Apr  2 15:22:40 1999
***************
*** 37,41 ****
--- 37,42 ----

  struct res_sect res_sects[] = {
  /* r_start, r_len, r_flags */
+ { 0x01000000, 0x100000, 0 },
  { 0, 0, 0 }  /* This must be the last line, DO NOT change it. */
  };
-------------------------------------------------------------------
```

The 3D features of the REALimage OpenGL driver requires you to reserve 128K for each concurrently-bound OpenGL rendering context, plus one globally-shared 64K segment used for certain 2D operations. Thus, the segment described above could accommodate up to 7 concurrently-bound GL rendering contexts. The size you choose to reserve should depend upon your application, and could be quite a bit larger if many GL contexts are used.

After adding entries to **`/etc/conf/pack.d/mm/space.c`**, it will be necessary to rebuild the PowerMAX OS kernel. (See **`idbuild(1M)`** for more information.)

In addition to adding a line similar to the one above to your system's **`/etc/conf/pack.d/mm/space.c`** and rebuilding the PowerMAX OS kernel, one must also define the reserved physical memory base and length in the **`XMetroconfig`** file. To do so, add two similar option lines to the `ServerFlags` section of the **`XMetroconfig`** file, or add the entire section if it does not exist:

```
    Section "ServerFlags"
AllowMouseOpenFail
        Option "ReservedPhysMemBase" "0x01000000"
        Option "ReservedPhysMemSize" "0x00100000"
    EndSection
```

Be very careful to make sure that the address and length described in this file correspond exactly with the reserved range. Also, do not attempt to launch the X server with these lines until the kernel, rebuilt with the modified `res_sect[]` tables, has been installed and the system rebooted.

6.0. Recommended Reading

The following publications are shipped with the OpenGL product and are contained in the **gldevel** package in PostScript format (see “System Installation” on page 4 for more information):

- Chin, Norman, Chris Frazier, Paul Ho, Zicheng Lui, and Kevin P. Smith. “The OpenGL Graphics System Utility Library.” Silicon Graphics, Inc., March 1997.
- Karlton, Phil. “OpenGL Graphics with the X Window System.” Silicon Graphics, Inc., March 1997.
- Segal, Mark, and Kurt Akeley. “The OpenGL Graphics System: A Specification.” Edited by Chris Frazier. Silicon Graphics, Inc., March 1997.

The following publications are also recommended:

- Kilgard, Mark J. *OpenGL: Programming for the X Window System*. Reading: Addison-Wesley Developers Press, 1996.
- Neider, Jackie, Tom Davis, and Mason Woo. *OpenGL Programming Guide: The Official Guide to Learning OpenGL, Release 1*. Reading: Addison-Wesley Publishing Company, 1993.

7.0. Direct Software Support

Software support is available from a central source. If you need assistance or information about your system, please contact the Concurrent Software Support Center at 1-800-245-6453. Our customers outside the continental United States can contact us directly at 1-954-283-1822 or 1-305-931-2408. The Software Support Center operates Monday through Friday from 8 a.m. to 7 p.m., Eastern Standard time.

Calling the Software Support Center gives you immediate access to a broad range of skilled personnel and guarantees you a prompt response from the person most qualified to assist you. If you have a question requiring on-site assistance or consultation, the Software Support Center staff will arrange for a field analyst to return your call and schedule a visit.