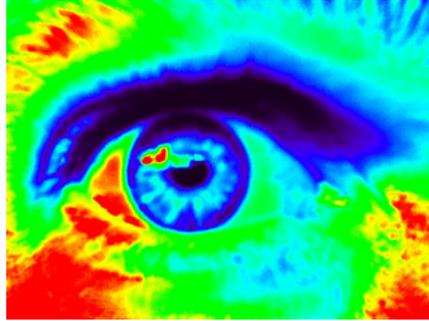
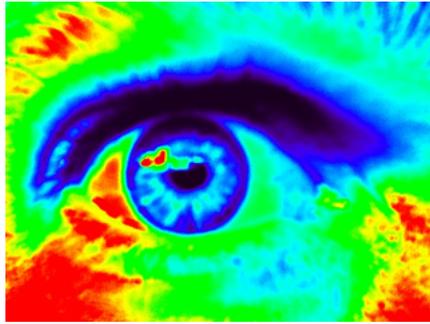


Viz Roll: Users Guide



Version 5.0 Edition



Viz Roll: Users Guide:

Version 5.0 Edition

Published Jul 2008

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Preface

The Viz Roll is used to build scientific visualization clusters with Rocks. Traditional Rocks-based compute clusters consist of a single Frontend machine and several back end Compute machines. However, a Rocks-based visualization cluster is composed of Tile machines instead of Compute machines. A Tile machine must have an nVidia graphics card and may drive one or two LCD monitors (or projectors). The major visualization-middleware components are DMX¹, Chromium² and SAGE³.

DMX is part of the XFree86 project and has origins in the Xinerama code used to create a single X11 root window that spans across two physical monitors. DMX extends this to create a single root window (desktop) that spans across a rectangular wall of monitors or projectors. Although DMX can display OpenGL applications, it is recommended that Chromium be used with DMX for all OpenGL code. This Roll supports the use of DMX with and without Chromium support. It also supports Chromium in stand-alone mode for use without DMX.

SAGE (Scalable Adaptive Graphics Environment) is developed by the Cavern Group at the Electronic Visualization Laboratory (EVL) at the University of Illinois Chicago (UIC). SAGE can display both OpenGL and raw pixel blasting applications at full speed on large-scale tile displays. Applications must be written specifically for the SAGE environment, unlike DMX and Chromium. However, applications such as the SAGE version of mplayer can play HD quality movies over a 60 tile wall at full speed, which is not possible using DMX (or Chromium).

Notes

1. <http://dmx.sourceforge.net/>
2. <http://chromium.sourceforge.net/>
3. <http://www.evl.uic.edu/cavern/sage/>

Chapter 1. Overview

Table 1-1. Summary

Name	viz
Version	5.0
Maintained By	Rocks Group
Architecture	i386, x86_64
Compatible with Rocks™	5.0

Table 1-2. Roll Compatibility

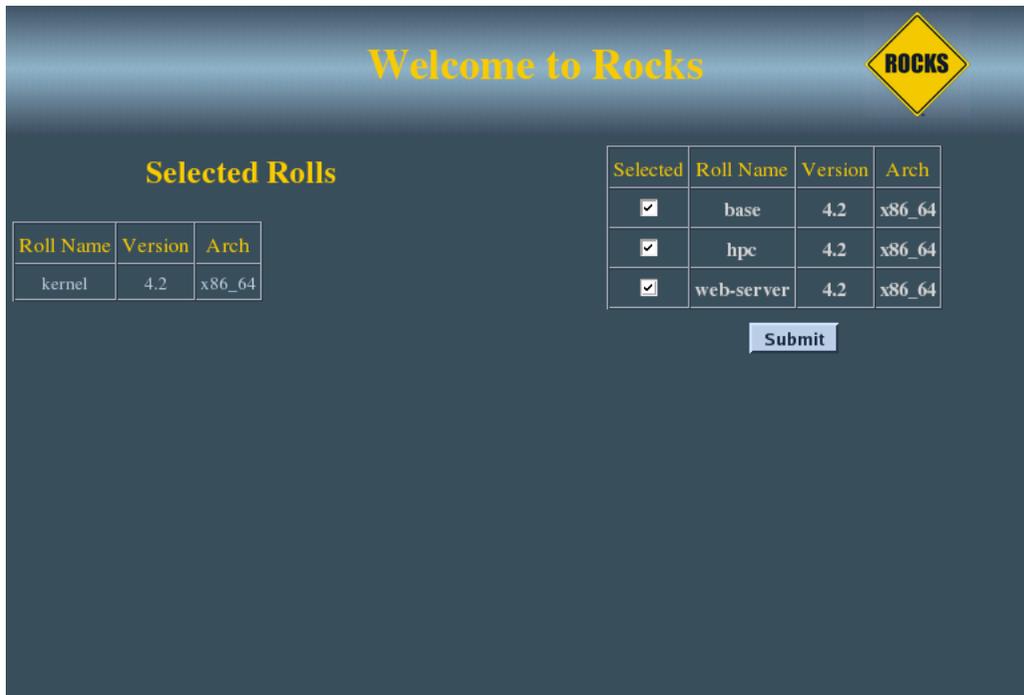
Roll	Requires ^a	Optional ^b	Conflicts
alpha		X	
area51		X	
base	X		
bio		X	
condor		X	
ganglia		X	
grid		X	
hpc	X		
java	X		
kernel	X		
os (disk 1)	X		
os (disk 2)	X		
os (disk 3)	X		
os (disk 4)	X		
os (disk 5)	X		
os (disk 6)	X		
os (disk 7)	X		
pbs		X	
service-pack	X		
sge		X	
viz	X		
web-server		X	
xen			X

Roll	Requires ^a	Optional ^b	Conflicts
<p>Notes:</p> <ul style="list-style-type: none">a. You may also substitute your own OS CDs for the Rocks™ OS Roll CDs. In this case you must use all the CDs from your distribution and not use any of the Rocks™ OS Roll CDs.b. Only Rolls that have been verified as compatible with this Roll are listed. Other Rolls will likely work, but have not been tested by the maintainer of this Roll.			

Chapter 2. Installing

2.1. On a New Server

The viz Roll should be installed during the initial installation of your server (or cluster). This procedure is documented in section 1.2 of the Rocks™ usersguide. You should select the viz Roll from the list of available rolls when you see a screen that is similar to the one below.

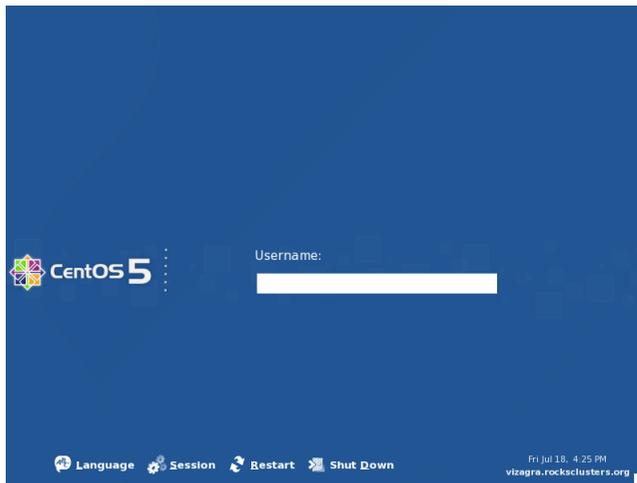


2.2. On an Existing Server

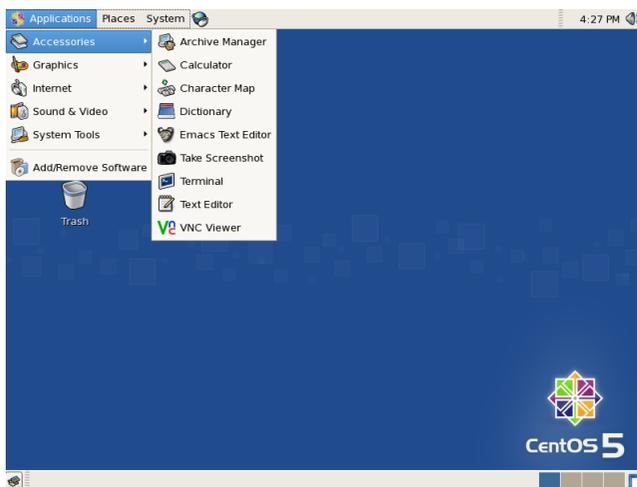
The viz Roll may not be installed on an already existing server. The only supported method of installation is to install the Roll at the time of the server installation.

2.3. Configuring the Frontend

1. After the frontend is installed and booted, you'll see an X11-based login screen, as shown below. Login as 'root' using the password you supplied during the frontend installation.



2. Once the root account GNOME session starts use the menus to open a new terminal window.



3. Since this is the first root login you will send to set up your ssh key. This is identical to the standard behavior in Rocks, however, since you are using the Viz Roll the first login is graphical rather than text mode. Hit return to accept the default value for the location of the key (`/root/.ssh/id_rsa`), next enter the passphrase you wish to use for the root SSH key.

It doesn't appear that you have set up your ssh key.

This process will make the files:

```
/root/.ssh/id_rsa.pub
/root/.ssh/id_rsa
/root/.ssh/authorized_keys
```

Generating public/private rsa key pair.

Enter file in which to save the key (`/root/.ssh/id_rsa`):

Created directory `'/root/.ssh'`.

Enter passphrase (empty for no passphrase):

Enter same passphrase again:

Your identification has been saved in `/root/.ssh/id_rsa`.

Your public key has been saved in `/root/.ssh/id_rsa.pub`.

The key fingerprint is:

```
10:95:6c:71:96:b2:0b:55:4e:fb:0a:2d:6d:b6:46:4f root@vizagra.rockclusters.org
```

```
[root@vizagra ~]#
```

2.4. Configuring the Wall

2.4.1. Install the Tile Nodes

```
# insert-ethers
```

Select 'Tile' as the appliance type and boot the tile node on the bottom left (the bottom node in the first column). Once a node has completed the installation and reboot it will start an X11 session but may have the incorrect video resolution, this will get fixed later on.

After all the tiles in the first column are installed, exit 'insert-ethers' by hitting the 'F8' key. Then, restart insert-ethers with the flag:

```
# insert-ethers --cabinet=1
```

Now install the bottom node in the second column.

Repeat the above process for each node in each column. Once all the nodes have been installed your wall should look like the following.



After all the tile nodes have been installed, you'll need to configure a file that describes your videowall. If your wall is built for one Tile node for each LCD Display follow the instruction in the next section. Otherwise skip to the subsequent section to configure your wall in TwinView mode.

2.4.2. Configure the Wall (one node per display)

In this step you will create an XML file that describes the physical layout of your wall. The syntax is very simple and the XML itself maps to the dimensions of the wall. Each *col* tag describes a vertical column of the wall, with the nodes listed bottom to top. The very first *col* section lists the Tile nodes comprising the far left side of the wall, and from there the next section moves to the right.

The *defaults* tag lists the resolution of each display, where the resolutions is assumed to be identical on all machines. The *hres* and *vres* attributes describe the horizontal and vertical resolution of the tile nodes' screens and the

hborder, and *vborder* are parameters used to hide display mullions, the units are pixels. The values in the below example work well with Dell 2405FPW displays.

1. Create an initial tilelayout.xml file:

```
# rocks list viz layout > /tmp/tilelayout.xml
```

2. Edit /tmp/tilelayout.xml and make sure you supply a 'defaults' section at the top of the file.

```
<wall>
  <defaults card="1" hres="1920" vres="1200"
    hborder="80" vborder="80"/>

  <col>
    <display host="tile-0-0"/>
    <display host="tile-0-1"/>
    <display host="tile-0-2"/>
    <display host="tile-0-3"/>
  </col>
  <col>
    <display host="tile-1-0"/>
    <display host="tile-1-1"/>
    <display host="tile-1-2"/>
    <display host="tile-1-3"/>
  </col>
  <col>
    <display host="tile-2-0"/>
    <display host="tile-2-1"/>
    <display host="tile-2-2"/>
    <display host="tile-2-3"/>
  </col>
  <col>
    <display host="tile-3-0"/>
    <display host="tile-3-1"/>
    <display host="tile-3-2"/>
    <display host="tile-3-3"/>
  </col>
  <col>
    <display host="tile-4-0"/>
    <display host="tile-4-1"/>
    <display host="tile-4-2"/>
    <display host="tile-4-3"/>
  </col>
</wall>
```

3. After you update your tilelayout XML, now apply it to the database:

```
# rocks create viz layout /tmp/tilelayout.xml
```

4. Finally, reconfigure your tiles:

```
# rocks sync viz
```

This will generate `xorg.conf` files for each tile node, copy them to the tile nodes, and restart the X11 server. Once the Tile nodes restart X11 your wall should look like the following picture. Note that each display is labeled according the connected Tile node.



Completed installation for a standard visualization wall.

2.4.3. Configure the Wall (two nodes per display - TwinView)

TwinView support is when a single nVidia card can support two displays, that is, one tile node drives two displays. This section describes how you configure your viz cluster when your Tile nodes are in TwinView mode. For details on the XML syntax please see the above section. The difference in the TwinView configuration is each Tile node is listed in twice in the XML.



When connecting a single video card to two display you must connect the primary video connector to the LCD above (or to the left) of the secondary connector.

1. This simplest method to create you layout XML is to start from scratch rather than modifying the defaults as is documented in the non-twinview section above.

Here is the relevant portion of `/tmp/tilelayout.xml`:

```
<wall>
  <defaults card="1" hres="1920" vres="1200" hborder="80" vborder="80"/>

  <col>
    <display host="tile-0-0"/>
    <display host="tile-0-1"/>
    <display host="tile-0-2"/>
  </col>
  <col>
    <display host="tile-0-0"/>
    <display host="tile-0-1"/>
  </col>
```

```

    <display host="tile-0-2"/>
</col>
<col>
    <display host="tile-1-0"/>
    <display host="tile-1-1"/>
    <display host="tile-1-2"/>
</col>
<col>
    <display host="tile-1-0"/>
    <display host="tile-1-1"/>
    <display host="tile-1-2"/>
</col>
<col>
    <display host="tile-2-0"/>
    <display host="tile-2-1"/>
    <display host="tile-2-2"/>
</col>
</wall>

```

2. After you update your tilelayout XML, now apply it to the database:

```
# rocks create viz layout /tmp/tilelayout.xml
```

3. Finally, reconfigure your tiles:

```
# rocks sync viz
```

This will generate xorg.conf files for each tile node, copy them to the tile nodes, then restart the X11 server. Once the Tile nodes restart X11 your wall should look like the following picture. Note that each display is labeled according the connected Tile node.



Completed installation for a TwinView visualization wall.

Chapter 3. Using

3.1. Controlling Mullions

The Viz Roll supports control over hiding of pixels behind LCD mullions (bezels) for DMX, Chromium, and SAGE. The default is to not hide the bezels. In this mode all images rendered on the wall will display all pixels. This effect can be distracting for movies and other moving images. The `rocks enable hidebezels` and `rocks disable hidebezels` commands can be used to control this behavior.

3.2. Chromium

Chromium is used to display OpenGL applications on the wall. It can be used both with and without DMX (next section). Chromium support is controlled by the `rocks enable chromium` and `rocks disable chromium` commands. Once enabled all dynamically linked OpenGL application will use the Chromium GL libraries. Some newer applications may contain code written to a later OpenGL specification than is supported by Chromium, however, most application work without any source code changes.

3.3. DMX

DMX is used to create a single X11 desktop (using the FVWM window manager) on the wall. DMX works best on small walls and also supports OpenGL application. For larger walls performance will suffer, and Chromium will need to be enabled to run OpenGL applications at a reasonable speed. DMX can be started using the `rocks start dmx` command.

3.4. SAGE

SAGE can be started and stopped using the `rocks start sage` and `rocks stop sage` commands. The Rocks integration of SAGE differs from the standard EVL practices of deploying SAGE in two ways. First, starting SAGE will create a per-user copy of `/opt/sage` in `~/.sage` and all configuration files will be generated into this user directory. Second, the `rocks stop sage` command is used by the GUI to kill all SAGE processes, this new kill behavior can take several seconds to track done orphaned SAGE processes.

Chapter 4. Command Reference

4.1. create

4.1.1. create viz layout

rocks create viz layout {file}

Creates the Tile Layout table in the cluster database. If an XML file is provided the layout is taken from this file, otherwise a default layout is computed from the rack and cabinet number of all the tiles.

arguments

file

XML description of the wall.

examples

```
# rocks create viz layout layout.xml
```

Creates the layout from the layout.xml file.

4.2. disable

4.2.1. disable chromium

rocks disable chromium

Disable Chromium for all dynamically linked OpenGL applications.

examples

```
$ rocks disable chromium
```

4.2.2. disable hidebezels

rocks disable hidebezels

Disable Bezel Hiding mode.

examples

```
$ rocks disable hidebezels
```

4.3. enable

4.3.1. enable chromium

rocks enable chromium

Enable Chromium for all dynamically linked OpenGL applications.

examples

```
$ rocks enable chromium
```

4.3.2. enable hidebezels

rocks enable hidebezels

Enable Bezel Hiding mode.

examples

```
$ rocks enable hidebezels
```

4.4. list

4.4.1. list dmX layout

rocks list dmX layout

Generates the DMX configuration file for the Wall. This can be used to recreate the user's ~/.dmxrc file based on the Rocks defaults.

examples

```
$ rocks list dmx layout
```

4.4.2. list host xconfig

rocks list host xconfig {host...}

Lists the X11 Xorg configuration for the given list of hosts. If no host list is provided the configuration for the current machine is listed.

arguments

host

Zero or more host names.

examples

```
$ rocks list host xconfig
```

Lists the X11 configuration for the local host.

```
$ rocks list host xconfig tile-0-0 tile-0-1
```

Lists the X11 configuration for tile-0-0 and tile-0-1.

4.4.3. list viz layout

rocks list viz layout

List the XML representation of the Video Wall layout stored in the cluster database. This XML can be edited and fed back into the database to change the physical layout of the tile display wall.

examples

```
$ rocks list viz layout
```

4.5. report

4.5.1. report sage audio

rocks report sage audio

Reports the configuration for the SAGE Audio streams to go the the master node

examples

```
$ rocks report sage audio
```

4.5.2. report sage fsmanager

rocks report sage fsmanager

Reports the configuration for the SAGE Free Space Manager.

examples

```
$ rocks report sage fsmanger
```

4.5.3. report sage layout

rocks report sage layout

Reports the SAGE tile layout configuration file.

examples

```
$ rocks report sage layout
```

4.6. start

4.6.1. start chromium

rocks start chromium {app} {port} [mtu=*int*] [port=*int*]

Starts a Chromium application either inside or outside of DMX. This command is used internally by the system (by scanning the user's `~/.crconfig` file) and is of limited value when called directly by the user.

arguments

app

Name of the GL application.

port

Mothership port number.

parameters

[mtu=*int*]

Size in KByte for Chromium MTU (default is 10MB).

[port=*int*]

Same as port argument.

examples

```
$ rocks start crapp glxgears 10075
```

Start glxgears using chromium using mothership on port 10075

4.6.2. start dmx

rocks start dmx [display=*int*] [hidebezels=*bool*] [wm=*string*]

Starts a DMX session.

parameters

[display=*int*]

X11 display numbers (default is 1).

[hidebezels=*bool*]

Set the TRUE to hide the LCD bezels (default is false).

`[wm=string]`

Name of window manager to use (default is fvwm).

examples

```
$ rocks start dmx
```

4.6.3. start sage

rocks start sage

Starts a SAGE session.

examples

```
$ rocks start sage
```

4.6.4. start xlogo

rocks start xlogo

Starts the XLogo application on the local host root X11 window. This is used to help align the tiles of a wall.

examples

```
$ rocks start xlogo
```

4.7. stop

4.7.1. stop host sage

rocks stop host sage [host...]

Stops a SAGE session on a given host

arguments

[host]

Zero, one or more host names.

examples

```
$ rocks stop sage host tile
```

Kills SAGE processes on the tile nodes

4.7.2. stop sage

rocks stop sage

Stops a SAGE session.

examples

```
$ rocks stop sage
```

4.7.3. stop xlogo

rocks stop xlogo

Stops the XLogo display test pattern.

examples

```
$ rocks stop xlogo
```

4.8. sync

4.8.1. sync viz

rocks sync viz

Generates a new X11 configuration for each tile node on the frontend and then copies the files to the nodes. After the copy all tile nodes are reset (not re-installed) to restart X11. This should be used push out changes when the layout of the wall changes.

examples

```
# rocks sync viz
```

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Rocks(r)
www.rocksclusters.org
version 5.0 (V)

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B.1. Cg

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B.2. chromium

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d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

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B.8. fltk

FLTK License
December 11, 2001

The FLTK library and included programs are provided under the terms of the GNU Library General Public License (LGPL) with the following exceptions:

1. Modifications to the FLTK configure script, config header file, and makefiles by themselves to support a specific platform do not constitute a modified or derivative work.

The authors do request that such modifications be contributed to the FLTK project - send all contributions to "fltk-bugs@fltk.org".

2. Widgets that are subclassed from FLTK widgets do not constitute a derivative work.
3. Static linking of applications and widgets to the FLTK library does not constitute a derivative work and does not require the author to provide source code for the application or widget, use the shared FLTK libraries, or link their applications or widgets against a user-supplied version of FLTK.

If you link the application or widget to a modified version of FLTK, then the changes to FLTK must be provided under the terms of the LGPL in sections 1, 2, and 4.

4. You do not have to provide a copy of the FLTK license with programs that are linked to the FLTK library, nor do you have to identify the FLTK license in your program or documentation as required by section 6 of the LGPL.

However, programs must still identify their use of FLTK. The following example statement can be included in user documentation to satisfy this requirement:

```
[program/widget] is based in part on the work of  
the FLTK project (http://www.fltk.org).
```

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Version 2, June 1991

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[This is the first released version of the library GPL. It is
numbered 2 because it goes with version 2 of the ordinary GPL.]

Preamble

The licenses for most software are designed to take away your
freedom to share and change it. By contrast, the GNU General Public
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free software--to make sure the software is free for all its users.

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The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

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A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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- b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

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d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

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This option is useful when you wish to copy part of the code of

the Library into a program that is not a library.

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If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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- b) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
- c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
- d) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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END OF TERMS AND CONDITIONS

Appendix: How to Apply These Terms to Your New Libraries

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To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the library's name and a brief idea of what it does.>  
Copyright (C) <year> <name of author>
```

```
This library is free software; you can redistribute it and/or  
modify it under the terms of the GNU Library General Public  
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```

```
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```

```
You should have received a copy of the GNU Library General Public  
License along with this library; if not, write to the Free  
Software Foundation, Inc., 675 Mass Ave, Cambridge, MA 02139, USA.
```

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

```
Yoyodyne, Inc., hereby disclaims all copyright interest in the  
library 'Frob' (a library for tweaking knobs) written by James Random Hacker.
```

<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

That's all there is to it!

B.9. ffmpeg

ffmpeg and the associated libraries EXCEPT liba52 and libpostproc are licensed under the Lesser GNU General Public License.

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B.10. freealut

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Version 2, June 1991

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numbered 2 because it goes with version 2 of the ordinary GPL.]

Preamble

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in new free programs; and that you know you can do these things.

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Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

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B.11. fvwm

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B.12. libiec61883

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B.13. libmad

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```
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```

```
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B.14. libraw1394

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B.15. mpeg2dec

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B.16. mplayer

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[This is the first released version of the library GPL. It is
numbered 2 because it goes with version 2 of the ordinary GPL.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

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Our method of protecting your rights has two steps: (1) copyright the library, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the library.

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Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that companies distributing free software will individually obtain patent licenses, thus in effect transforming the program into proprietary software. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License, which was designed for utility programs. This license, the GNU Library General Public License, applies to certain designated libraries. This license is quite different from the ordinary one; be sure to read it in full, and don't assume that anything in it is the same as in the ordinary license.

The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve

this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

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A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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- a) The modified work must itself be a software library.
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- c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.
- d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline

functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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- b) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
- c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
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For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally

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END OF TERMS AND CONDITIONS

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<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

That's all there is to it!

B.19. plib

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As a special exception Steve Baker gives permission to link these libraries with proprietary software and distribute the resulting executable without including that proprietary code in any distribution as the LGPL would normally dictate.

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4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy

from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

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```
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```
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library 'Frob' (a library for tweaking knobs) written by James Random Hacker.
```

```
<signature of Ty Coon>, 1 April 1990  
Ty Coon, President of Vice
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That's all there is to it!

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(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative

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```
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## **B.23. SimGear**

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The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

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"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

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Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

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For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

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```

```
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## **B.24. vlc**

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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

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## **B.25. VTK**

```
Program: Visualization Toolkit
Module: $RCSfile: appendix.sgml,v $
Language: C++
Date: $Date: 2006/09/11 18:16:24 $
Version: $Revision: 1.2 $
```

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

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- c) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.
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That's all there is to it!

## gpl.txt

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```
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```

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```
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```

```
<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice
```

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## **Notes**

1. <http://cvs.rocksclusters.org>