

# **ATI R200 + XFree86 4.x mini-HOWTO**

**Håvard Stranden**

---

# ATI R200 + XFree86 4.x mini-HOWTO

Håvard Stranden

Publication date 2003-09-21

## Abstract

This HOWTO is for anyone who owns an ATI Radeon 8xxx graphics card and wants it to function in a certain way or, in general, properly with XFree86, the X Window System. It describes the procedure of making XFree 4.x run on an ATI R200 (Radeon 8xxx series). There are several ways of doing this, with various results (further described below). If you know of any other ways (maybe better as well) of achieving the goal of this document, please let me know.

---

---

# Table of Contents

1. Copyright & License .....	1
2. System Requirements .....	2
3. The alternatives .....	3
Experiences with XFree86's driver .....	3
Experiences with ATI's own driver .....	3
Experiences with DRI's driver .....	3
Experiences with the GATOS project's driver .....	3
Thoughts on Schneider Digital's driver .....	3
Still Haven't Chosen One? .....	3
4. Step-by-step instructions .....	5
Alternative 1: Using XFree86's Radeon driver .....	5
Alternative 2: Using ATI's own R200 Driver .....	5
Alternative 3: Using DRI's Latest Radeon Driver .....	7
Alternative 4: Using the GATOS Project's Latest Driver .....	7
Alternative 5: Using Schneider Digital's drivers .....	8
5. Links .....	9
A. GNU Free Documentation License .....	10
PREAMBLE .....	10
APPLICABILITY AND DEFINITIONS .....	10
VERBATIM COPYING .....	11
COPYING IN QUANTITY .....	11
MODIFICATIONS .....	12
COMBINING DOCUMENTS .....	13
COLLECTIONS OF DOCUMENTS .....	13
AGGREGATION WITH INDEPENDENT WORKS .....	13
TRANSLATION .....	14
TERMINATION .....	14
FUTURE REVISIONS OF THIS LICENSE .....	14
How to use this License for your documents .....	14

---

# Chapter 1. Copyright & License

Copyright (c) 2002,2003 Håvard Stranden

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.1 or any later version published by the Free Software Foundation; with no Invariant Sections, with no Front-Cover Texts, and with no Back-Cover Texts. A copy of the license is included in Appendix A, *GNU Free Documentation License*, entitled "GNU Free Documentation License".

---

# Chapter 2. System Requirements

For this HOWTO to apply to you, you'll need the following hardware/software up and running:

## Hardware

- ATI R200 (Radeon 8xxx) based AGP card

## Software

- Linux kernel 2.4.x (check with `uname -r`)
- Glibc 2.2 (check with `/lib/libc.so.X` where X is a decimal number)
- XFree86 4.2.x for alternative 1 (check with `X -version`)
- XFree86 4.1.x for alternatives 2, 3 and 5 (check with `X -version`)
- XFree86 4.x for alternative 4 (check with `X -version`)

## Important

If you run XFree86 4.1.x/4.0.x on your computer, you can NOT use alternative 1, as shown above. Of course you can try it, but it won't work (or at least it didn't for me). Also, if you read The XFree86 Project [<http://www.xfree86.org/>]'s release notes [<http://www.xfree86.org/4.1.0/RELNOTES.html>] for XFree 4.1.x, you'll see that the R200 chipset is not listed as a supported chipset for the `radeon_drv.o` driver, which means that the Radeon 8xxx is NOT supported. However, if you read the release notes [<http://www.xfree86.org/4.2.0/RELNOTES.html>] for XFree 4.2.x, you'll see that the chipset IS supported by the same driver.

Once you have met the system requirements, it's time to decide which of the available alternatives to choose.

---

# Chapter 3. The alternatives

As you could see in Chapter 2, *System Requirements*, the alternatives you can choose may be limited by the XFree86 version you are running. It is very important that you check the dependencies first. If you don't meet the requirements, this HOWTO will not apply to you, and you may and probably will suffer a system crash if proceeding.

The various alternatives of this HOWTO will give variable results. I haven't tested every possible use of the card, but I have had a few experiences, and the drivers also provide some information.

## Experiences with XFree86's driver

This alternative is by far the simplest and safest way to set up your Radeon if you use XFree86. The bad news is that this driver only supports 2D (meaning DRI won't work).

## Experiences with ATI's own driver

This alternative uses ATI's own drivers for the Linux operating system. The drivers are developed by 3rd party Linux developers for ATI. The driver supports some 3D acceleration, and works almost "out of the box".

## Experiences with DRI's driver

This alternative seemed like a good idea after running tired on the DRI problems with both previous driver alternatives. DRI is the 3D part of XFree86, and is an independent project, releasing its own drivers. XFree86 has DRI implemented, but the drivers aren't the same. In fact, DRI has developed their own driver specifically for the R200 chipset, meaning it is a driver that supports 3D and works fine with X. Still, the driver supports hardly any of the later GL extensions, meaning more recent games like UT2003 won't run with it.

## Experiences with the GATOS project's driver

This alternative is a 3rd party alternative, meaning it can result in a much more unstable (and possibly damaged) system. I found this alternative to work rather well. The 3D support was equivalent with that of DRI (at least when I tried it), meaning this and the DRI alternative are almost equivalent.

## Thoughts on Schneider Digital's driver

This alternative is another 3rd party alternative, but this one's rather good. Schneider Digital [<http://www.schneider-digital.de/>] provides drivers for various cards, among them ATI R200/R300 [[http://www.schneider-digital.de/html/download\\_ati.html](http://www.schneider-digital.de/html/download_ati.html)]. The drivers are made for XFree 4.1+, and seem rather well developed. Note though that I haven't yet tried these drivers myself, but I still think they look like a very decent alternative.

## Still Haven't Chosen One?

I'd recommend you to use the DRI driver. I've had great experiences with this driver, although its GL support is somewhat narrow. If a more worthy 3D system is what you want, I'd recommend you to make

the upgrades necessary and go for Schneider Digital's driver or XFree86's own driver, but please give me some feedback if you do.

Now that you've been given the information you need to choose a driver, choose one and move on!

---

# Chapter 4. Step-by-step instructions

## Alternative 1: Using XFree86's Radeon driver

This alternative requires XFree 4.2 or later, and the installation or upgrade to this version is beyond the scope of this HOWTO (visit The XFree86 Project [<http://www.xfree86.org/>] for further information on how to upgrade or install XFree86). When XFree is installed and/or upgraded to the correct version, all you need to do is configure it. There are two ways of doing this that apply to all Linux distributions. You can either run **xf86config**, which is XFree86's own text-based configuration tool, or you can edit the configuration file by hand. Keep in mind that this HOWTO only describes how to configure the Radeon card, and XFree86 needs a lot more configuration than that to work.

If you choose to run **xf86config**, you will sooner or later come to the question, "Do you want to look at the card database? (y/n)". Answer **y** (yes), and press **ENTER**. Choose one of the cards that use the `ati` driver by keying in the number to its left and then pressing **ENTER**. Which card you choose does not matter, as long as you choose a card that runs the `ati` driver. You will then be asked to give an identifier string for your card. You can type anything you want, but I recommend you type something descriptive, such as "Radeon card". Finish the configuration process.

If you want to edit the configuration file manually, locate it (usually `/etc/X11/XF86Config`), and open it in your favorite editor. Find the place that says Section "Device". In this section, there should be a line saying Driver "somedrivervname". Edit this line so it says Driver "ati". Comment out all other lines in the Device section (add a # in front of them). Your device section should now look like this:

```
Section "Driver"
Identifier "some_identifier" (the identifier is your choice, but if you edit it,
make sure you update every reference to it in the config file).
Driver "ati"

# ...
# ...
```

You are now ready to run!

Configure the rest of XFree86, and you're ready to run!

## Alternative 2: Using ATI's own R200 Driver

ATI's R200 driver comes in three distributions - one for XFree4.1, one for XFree4.2 and one for XFree4.3. You can download ATI's driver from here [<http://mirror.ati.com/support/drivers/linux/radeon-linux.html>]. Sadly, for those of us who do not use a RedHat-based or other RPM-supporting distribution, the package is only available in RPM format. For those of us who do not have RPM support, `alien` is the program to use. Alien converts between various package formats. To convert the ATI driver package to a `.deb` package, use **alien --to-deb packagename.rpm**. To convert it to a `.tgz` package, use **alien --to-tgz packagename.rpm**.

You are now ready to install the driver. To install it, use:

- **rpm -i --force /path/to/packagename.rpm**, if you are installing the rpm package
- **dpkg -i --force-overwrite /path/to/packagename.deb**, if you made a `.deb` package



- `cd / && tar xzvf /path/to/packageName.tgz`, if you made a .tgz package.

You are now ready to configure the driver. To install it, issue the following commands as root:

```
cd /lib/modules/fglr200/build_mod/  
./make.sh  
cd /lib/modules/fglr200/  
./make_install.sh
```

The driver is now ready for use.

## Important

The driver will not load unless you tell your Linux system to load it every time at startup. To do this, you must find out where to tell your Linux which modules to load at startup. In Debian, you must add the following line to `/etc/modules`:

```
fglr200
```

Add the line to the end of the file. You are now ready to configure XFree86.

XFree86 can be configured in two ways: either by running **fglrxconfig** (supplied by the ATI driver), or by editing the `XF86Config` file manually.

If you choose to run **fglrxconfig**, the process is similar to a regular **xf86config** run, except for the choice of which screen card driver to use (which will automatically be set to the ATI Radeon driver).

If you want to edit the configuration file manually, locate it (usually `/etc/X11/XF86Config`), and open it in your favorite editor. Find the place saying `Section "Device"`. In this section, there should be a line saying `Driver "somedrivename"`. Edit this line so it says `Driver "fglr200"` and add the following lines right below that line:

```
Option "no_accel" "no"  
Option "no_dri" "no"  
Option "overlay" "off"
```

Comment out all other lines in the Device section (add a # in front of them). Your device section should now look like this:

```
Section "Driver"  
Identifier "some_identifier" (the identifier is your choice, but if you edit it,  
make sure you update every reference to it in the config file).  
Driver "fglr200"  
Option "no_accel" "no"  
Option "no_dri" "no"  
Option "overlay" "no"  
  
# ...  
# ...
```

You are now ready to run!

## Alternative 3: Using DRI's Latest Radeon Driver

The first thing you must do is to download the driver. You can download it from here [<http://dri.sourceforge.net/download.phtml>] (make sure you download the `r200-XXXXXXXX-i386.tar.bz2` package). After you have downloaded the driver, go to the directory you saved it in and type `tar jxvf packagename.tar.bz2`. Go to the new directory, (`cd dripkg/`), and type `./install.sh`. This will install the driver for you. You are now ready to configure XFree86, either by running `xf86config` or by editing the config file manually. The configuration process is exactly the same as in the section called “Alternative 1: Using XFree86's Radeon driver”, so just follow the configuration steps there.

You are now ready to run XFree86!

## Alternative 4: Using the GATOS Project's Latest Driver

The GATOS project is an independent developer team. They develop drivers and utilities for ATI cards. To install their driver with DRI-support, you need to download it from here [[http://gatos.sourceforge.net/project/showfiles.php?group\\_id=12629](http://gatos.sourceforge.net/project/showfiles.php?group_id=12629)]. Download the `ati.2` file for your appropriate XFree86 version. You also need a set of files to enable dri support. These files are called the `drm-kernel` module. They can only be downloaded from CVS. To download them, issue the following commands:

```
cvs -d:pserver:anonymous@cvs.gatos.sourceforge.net:/cvsroot/gatos login
cvs -z3 -d:pserver:anonymous@cvs.gatos.sourceforge.net:/cvsroot/gatos co drm-kernel
```

You are now ready to install the driver. Type the following commands to install it:

```
cd drm-kernel/
make -f Makefile.linux
cp radeon.o /lib/modules/`uname -r`/kernel/drivers/video/gatosdrm.o
modprobe gatosdrm
```

You now need to make Linux load the module `gatosdrm` each time at startup. To do this, find out where your Linux distribution keeps the list of modules to load at startup and add the line `gatosdrm` to the end of that file (in Debian, the file is `/etc/modules`).

You are now ready to install the GATOS driver for the Radeon card. To do so, type the following commands:

```
cd /usr
tar zxvf /path/to/name-of-ati.2-package.tar.gz
```

The driver is now installed.

You are now ready to configure XFree86. This can be done by running `xf86config`, or by editing the XFree86 configuration file manually. The configuration process is the same as for XFree86's own driver in the section called “Alternative 1: Using XFree86's Radeon driver”, so go back to that point and follow the XFree86 configuration process described there.

You are now ready to run XFree86!

## Alternative 5: Using Schneider Digital's drivers

Schneider Digital's driver is the one driver I haven't tried myself, but it seems like a serious attempt on making a decent ATI Radeon driver for Linux. Well, enough chatting, let's get down to business.

First, download the driver file for either XFree86 4.1.x [[http://www.schneider-digital.de/download/ati/glx1\\_linux\\_X4.1.zip](http://www.schneider-digital.de/download/ati/glx1_linux_X4.1.zip)], XFree86 4.2.x [[http://www.schneider-digital.de/download/ati/glx1\\_linux\\_X4.2.zip](http://www.schneider-digital.de/download/ati/glx1_linux_X4.2.zip)] or XFree86 4.3.x. [[http://www.schneider-digital.de/download/ati/glx1\\_linux\\_X4.3.zip](http://www.schneider-digital.de/download/ati/glx1_linux_X4.3.zip)].

The installation instructions for this driver are exactly the same as for the section called “Alternative 2: Using ATI's own R200 Driver”, so follow those.

Congratulations, you are now up and running! Please let me know about your experiences with this driver, as I didn't try it myself.

---

# Chapter 5. Links

- <http://mirror.ati.com/support/drivers/linux/radeon-linux.html> - ATIs R200 driver for XFree86 4.1.x/4.2.x
- <http://gatos.sf.net/> - The GATOS Projects homepage - ATI drivers and utilities
- [http://gatos.sourceforge.net/project/showfiles.php?group\\_id=12629](http://gatos.sourceforge.net/project/showfiles.php?group_id=12629) - The download section of the GATOS project's website.
- <http://dri.sf.net/> - The DRI Project, the Direct Rendering Infrastructure for XFree86. 3D Support, drivers and documentation.
- <http://dri.sourceforge.net/download.phtml> - The download section of the DRI's website.
- <http://www.cloudchaser.net/projects/ati-howto/> - The homepage of the HOWTO
- [http://www.schneider-digital.de/Schneider Digital's website](http://www.schneider-digital.de/Schneider-Digital's-website)

---

# Appendix A. GNU Free Documentation License

Version 1.1, March 2000

Copyright (C) 2000 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

## PREAMBLE

The purpose of this License is to make a manual, textbook, or other written document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondly, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

## APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you".

A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A "Secondary Section" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (For example, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License.

The "Cover Texts" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License.

A "Transparent" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, whose contents can be viewed and edited directly and

straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup has been designed to thwart or discourage subsequent modification by readers is not Transparent. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML designed for human modification. Opaque formats include PostScript, PDF, proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

## VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

## COPYING IN QUANTITY

If you publish printed copies of the Document numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a publicly-accessible computer-network location containing a complete Transparent copy of the Document, free of added material, which the general network-using public has access to download anonymously at no charge using public-standard network protocols. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

## MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

- A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
- B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has less than five).
- C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
- D. Preserve all the copyright notices of the Document.
- E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
- F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
- G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
- H. Include an unaltered copy of this License.
- I. Preserve the section entitled "History", and its title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.
- J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.
- K. In any section entitled "Acknowledgements" or "Dedications", preserve the section's title, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.
- L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.
- M. Delete any section entitled "Endorsements". Such a section may not be included in the Modified Version.
- N. Do not retitle any existing section as "Endorsements" or to conflict in title with any Invariant Section.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all

of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties--for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

## COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections entitled "History" in the various original documents, forming one section entitled "History"; likewise combine any sections entitled "Acknowledgements", and any sections entitled "Dedications". You must delete all sections entitled "Endorsements."

## COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

## AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, does not as a whole count as a Modified Version of the Document, provided no compilation copyright is claimed for the compilation. Such a compilation is called an "aggregate", and this License does not apply to the other self-contained works thus compiled with the Document, on account of their being thus compiled, if they are not themselves derivative works of the Document.



If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one quarter of the entire aggregate, the Document's Cover Texts may be placed on covers that surround only the Document within the aggregate. Otherwise they must appear on covers around the whole aggregate.

## TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License provided that you also include the original English version of this License. In case of a disagreement between the translation and the original English version of this License, the original English version will prevail.

## TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided for under this License. Any other attempt to copy, modify, sublicense or distribute the Document is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

## FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See <http://www.gnu.org/copyleft/>.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation.

## How to use this License for your documents

To use this License in a document you have written, include a copy of the License in the document and put the following copyright and license notices just after the title page:

Copyright (c) YEAR YOUR NAME. Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.1 or any later version published by the Free Software Foundation; with the Invariant Sections being LIST THEIR TITLES, with the Front-Cover Texts being LIST, and with the Back-Cover Texts being LIST. A copy of the license is included in the section entitled "GNU Free Documentation License".

If you have no Invariant Sections, write "with no Invariant Sections" instead of saying which ones are invariant. If you have no Front-Cover Texts, write "no Front-Cover Texts" instead of "Front-Cover Texts being LIST"; likewise for Back-Cover Texts.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.