

# A PRIMER ON OPEN SOURCE SOFTWARE FOR BUSINESS PEOPLE AND LAWYERS

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## A Part of the Ecosystem

Open source<sup>†</sup> software is a part of the software ecosystem that affords software developers and users an alternative style of software development and distribution. It co-exists in that environment along with a broad spectrum of other development and distribution methods, including public domain software, freeware, shareware, proprietary commercial software and even vaporware. Open source software is found in development tools, operating systems and applications.<sup>‡</sup>

The principal proponent of open source software is the Free Software Foundation, which was founded in the mid-1980s by computer scientist Richard Stallman and which proclaims its primary missions to be: 1) promoting computer users' right to use, study, copy, modify, and redistribute computer programs; 2) promoting the development and use of free software and free documentation; 3) spreading awareness of the ethical and political issues of freedom in the use of software; 4) developing new free software; and 5) "making that software into a coherent system which can eliminate the need to use proprietary software."<sup>§</sup>

The goal of this paper is to help the reader gain a basic understanding of the differences between open source and commercial software in terms of some of the practical implications of each and some of the broader issues that software developers, governments and commercial enterprises might want to consider in terms of their own policies and acquisition activities, all

<sup>†</sup> The word "source" in the phrase "open source software" refers to the source code of a computer program. Computer programs or operating systems are originally written by a human being in a programming language. This is called the source code of the software. To be actually used by a computer, the program has to be translated by the computer from the source code into the machine language that the computer understands and can execute. This translation process is referred to as compiling. <http://iet.ucdavis.edu/glossary.cfm#s>. Source Code is the text that programmers type in and edit in order to produce programs you can run. To change a program, a programmer changes the source-code text and then generates a new version of the program from it. Without the source code one generally cannot modify or fix a program beyond narrow bounds foreseen by its original author. <http://www.google.com/search?hl=en&lr=&oi=defmore&q=define:source+code>.

<sup>‡</sup> For a directory of open source software, see <http://directory.fsf.org/>.

<sup>§</sup> See <http://www.fsf.org/fsf/fsf.html>.

bearing in mind not only the immediate costs and benefits, but also the longer range implications of how their decisions today will affect their economies and their standing in the world technology market tomorrow.

### **Some Helpful Definitions**

Traditionally, commercial or proprietary software is distributed only in binary, executable form, and its developers reserve to themselves the ability to know the source code, to modify the software, to distribute the software, and to authorize others to do those things. It is not unusual for commercial software developers to refer to their software source code as the “crown jewels” of the company and to jealously guard it against disclosure to others. At its most basic level, “open source software” is distinguished from proprietary software by the availability of source code to everyone who receives a license to use the software and, in many cases, by a broad authorization to modify and redistribute it in both binary and source code form.

Over the past several years, market forces have operated to bring about numerous variants of commercial and open source software, all of which have their own distinguishing features. Along that spectrum we can now find: 1) commercial “closed source” software, for which the source code is not available to anyone other than the original developer; 2) commercial “closed source” software, for which the source code is licensed to authorized users under strict confidentiality terms for their own use in maintaining and modifying the software; 3) “shared source” software, for which the source code is made available to licensees for limited purposes and subject to restrictions on use and disclosure; 4) “community source” software, for which the source code is available to a limited community of users for broad purposes but still subject to restrictions on use, modification and distribution; and 5) true “open source” software,

for which the source code is made available for “free” use, modification and distribution, but the license for which may be subject to conditions or obligations that make it unsuitable for commercial use (more on that later). Market forces are causing these scenarios to overlap and the distinctions between the various genre of software to become somewhat blurred, but they are still sufficiently vivid to generate a lot of debate. Much of that debate has been engendered by the “free software” movement, members of which advocate for free software with almost religious fervor.

Despite its obvious differences from closed source, shared source and community source, a precise definition of “open source” software is elusive. A recent Google® search produced no less than 10 definitions from various sources, each of which gives a somewhat different perspective and slant.\*\* One helpful and concise definition is:

Open Source Software is software for which the underlying programming code is available to the users so that they may read it, make changes to it, and build new versions of the software incorporating their changes. There are many types of Open Source Software, mainly differing in the licensing term under which (altered) copies of the source code may (or must) be redistributed.††

### **Economic and Practical Realities**

Among the most significant practical differences between commercial and open source software are the way in which they are developed, the licensing schemes used in their distribution, their relationship to standards, and the so-called “total cost of ownership”. While a detailed discussion of these things is beyond the scope of this paper and has been the subject of

\*\* See <http://www.google.com/search?hl=en&lr=&oi=defmore&q=define:Open+source+software>.

†† See [www.cross-web.com/information/glossary.htm](http://www.cross-web.com/information/glossary.htm).

several multi-day conferences over the past few years, it may be helpful to make some general observations.

## Development

Open source software is typically developed by very talented individuals or by informal groups or “communities” of programmers who want to solve a technical problem and share the results with the rest of the world. Some advocates claim that the open source model generates a higher level of innovation, and some supporters claim that the open source model produces software that is technically equal or even superior to competing commercial products. Because of the way it is distributed, there may be a great variety of any given open source software “product”, including numerous derivatives that are relatively undocumented and may behave differently in subtle or not-so-subtle ways.

Commercial or proprietary software is generally designed and developed in response to market demand, or at least in response to a perceived market need. Its features tend to be market driven and user driven. Development is relatively structured and disciplined, and the resulting products tend to be relatively well documented, quality tested and supported. Features of commercial software generally are the subject of long term, market driven evolution. Of course the user pays for all these things, whether it wants them or not.

## Licensing Schemes

Commercial software developers use licensing schemes that: 1) exploit their intellectual property in ways that will generate enough revenue to pay their research, development, marketing and support costs and leave something left over for profit (sometimes a small profit,

and sometimes a monumental profit); and 2) limit scope of use, limit transferability, prohibit reverse engineering, limit warranties and limit liability. With commercial software, users pay for whatever benefit they get, and possibly for some benefit they don't need. Still, the fundamental economics of commercial software licensing is that each party gets an anticipated benefit at an anticipated cost.

The same is true for open source software, but the licensing model is very different. Open source does not necessarily mean that one can do whatever it wants to do with the software, although that is sometimes the case. There are two principal models. One, the BSD (an acronym for "Berkeley Software Distribution") model, is highly permissive and permits taking the software and doing pretty much whatever you wish with it, including modification and distribution of free or proprietary derivatives, provided that each copy contains a specified form of license that includes a copyright notice and a disclaimer of warranties and liability. The UNIX operating system is an example of software that was distributed under the BSD license (among other licensing channels), and Sun Microsystems' Solaris® operating system is an example of a proprietary derivative of BSD UNIX.

The other principal model permits free use, modification and redistribution of the software, but is highly restrictive. The most frequently encountered examples are the Free Software Foundation's General Public License ("GPL") and Lesser General Public License ("LGPL"), which permit modification and distribution of free derivatives, but which preclude the creation of proprietary derivatives. The Linux operating system is an example of an open source derivative of UNIX, and a number of popular software development tools such as the GNU C compiler are also distributed under the GPL. Because they are so frequently encountered and

have become the subject of much attention and debate, the GPL and LGPL are set forth in their entirety in the Appendix to this paper.

Another type of open source license is the “community source” license, the terms of which can vary widely depending on the “community” in which used. For example, an academic community license may be highly permissive, while the Sun Microsystems community license for the Java® platform is highly restrictive in important ways. For those interested in exploring the subject more deeply, the website of the Open Source Initiative provides more than 50 examples of different open source licenses in use today.<sup>‡‡</sup>

## Standards

Two of the things that make proprietary software proprietary are the ability of its owners to maintain intellectual property rights in its features and control its specifications. This can include application program interfaces (“APIs”) or other aspects that affect interoperability. Because of this, there has been a tendency among some open source advocates to equate “open source” with “open standards.” One could argue, however, that there are two primary ways in which “standards” come into being. One is by widespread adoption in the user market. The second is through standards setting organizations.

The reality is that virtually all of the important “open standards” have been developed by consortia of representatives of private industry. Another reality is that open source software, by its very nature, tends to become non-standard because of the relative ease and freedom of making modifications. In fact, commercial distributors of open source software often deliberately modify it to distinguish themselves. So, for example, while IBM Corporation, The SCO Group,

<sup>‡‡</sup> <http://www.opensource.org/licenses/bsd-license.php>.

Inc., Red Hat, Inc. and Sun Microsystems, Inc. all distribute all distribute derivatives of the UNIX operating system, they are not all the same and do not represent a “standard”.

### Total Cost of Ownership

The term “open source” is commonly equated with the term “free software”, and many open source advocates argue that a key advantage of the open source solution is the ability to acquire software without paying a license fee. However, as the Free Software Foundation says, “‘Free software’ is a matter of liberty, not price. To understand the concept, you should think of ‘free’ as in ‘free speech,’ not as in ‘free beer.’”<sup>§§</sup> The software we typically think of as “open source” is indeed more or less free at the acquisition stage – that is, it can be acquired, copied and used without charge. However, when one considers the “cost” of software, it is important to consider the *total cost* of acquisition and use – *i.e.*, the “total cost of ownership”.

For example, consider the cost of customizing “free” software to meet the needs of a particular user. The features of commercial software tend to be the product of market research and investment in development with the needs of the user community or marketplace in mind. Even if not always a perfect fit, commercial software tends to be designed to provide a substantial solution for most users. In contrast, open source software is often developed without much regard for end users and is distributed in a form that is conducive to modification. To meet the needs of a particular user, it may need to be modified, sometimes at considerable expense. In addition, commercial software is commonly maintained and supported by the developer, whereas open source software commonly is not.

<sup>§§</sup> <http://www.gnu.org/philosophy/free-sw.html>.

When considering the cost of “free” software, it is important to have in mind such things as the cost of modifying, maintaining and supporting the software, the cost of required user and technical documentation (“free” software generally is not accompanied by either), the cost of quality assurance testing (“free” software is almost always devoid of warranties and most often is produced and distributed without the type of rigorous testing done by developers of commercial products), and the costs of customization, implementation, defect correction, ongoing development, and dealing with security issues. The cost of training should be considered at two levels – training of technical personnel, and training of end users – because the available labor pool will more likely be possessed of knowledge and skills developed through experience with commercial products and may lack the expertise needed to support and use “free” substitutes without additional, specialized training.

Ultimately, the cost/benefit analysis must be performed with this fundamental question in mind: does a proprietary solution require that the user pay too much for things it doesn’t need, or does it provide features and benefits that will enable the user to be productive in important ways not enabled by “free” competitive offerings absent additional investment that exceeds the overall cost of the commercial solution?

## **The GPL and LGPL**

The open source variant that has received the most attention – and that has caused the most sleepless nights among commercial software developers, investors and those involved in mergers and acquisitions of software companies – is software distributed under the Free Software Foundation’s General Public License (“GPL”) and Lesser General Public License

(“LGPL”). The genesis of the Free Software Foundation and its free software initiative (the “GNU Project”) is reported on its website as follows:

The GNU Project has developed a complete free software system named “GNU” (GNU’s Not Unix) that is upwardly compatible with Unix. Richard Stallman’s initial document on the GNU Project is called the GNU Manifesto, which has been translated into several other languages. The name “GNU” was chosen because it met a few requirements; firstly, it was a recursive acronym for “GNU’s Not Unix”, secondly, because it was a real word, and thirdly, it was fun to say (or Sing). We also have the Initial Announcement of the GNU Project, written in 1983.

The word “free” above pertains to freedom, not price. You may or may not pay a price to get GNU software. Either way, once you have the software you have three specific freedoms in using it. First, the freedom to copy the program and give it away to your friends and co-workers; second, the freedom to change the program as you wish, by having full access to source code; third, the freedom to distribute an improved version and thus help build the community. (If you redistribute GNU software, you may charge a fee for the physical act of transferring a copy, or you may give away copies.)

The GNU Project was conceived in 1983 as a way of bringing back the cooperative spirit that prevailed in the computing community in earlier days – to make cooperation possible once again by removing the obstacles to cooperation imposed by the owners of proprietary software.

In 1971, when Richard Stallman started his career at MIT, he worked in a group which used free software exclusively. Even computer companies often distributed free software. Programmers were free to cooperate with each other, and often did.

By the 1980s, almost all software was proprietary, which means that it had owners who forbid and prevent cooperation by users. This made the GNU Project necessary.  
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In a paper entitled “The GNU Operating System and the Free Software Movement”, originally published in the book “Open Sources”, FSF founder Richard Stallman wrote:

Shortly before beginning the GNU project, I heard about the Free University Compiler Kit, also known as VUCK. (The Dutch word for “free” is written with a V.) This was a compiler designed to handle multiple languages, including C and Pascal, and to support multiple target machines. I wrote to its author asking if GNU could use it.

\*\*\* <http://www.gnu.org/gnu/gnu-history.html>.

He responded derisively, stating that the university was free but the compiler was not.

\*\*\*

The goal of GNU was to give users freedom, not just to be popular. So we needed to use distribution terms that would prevent GNU software from being turned into proprietary software. The method we use is called “copyleft”.

Copyleft uses copyright law, but flips it over to serve the opposite of its usual purpose: instead of a means of privatizing software, it becomes a means of keeping software free.

The central idea of copyleft is that we give everyone permission to run the program, copy the program, modify the program, and distribute modified versions – but not permission to add restrictions of their own. Thus, the crucial freedoms that define “free software” are guaranteed to everyone who has a copy; they become inalienable rights.

For an effective copyleft, modified versions must also be free. This ensures that work based on ours becomes available to our community if it is published. When programmers who have jobs as programmers volunteer to improve GNU software, it is copyleft that prevents their employers from saying, “You can't share those changes, because we are going to use them to make our proprietary version of the program.”

The requirement that changes must be free is essential if we want to ensure freedom for every user of the program. The companies that privatized the X Window System usually made some changes to port it to their systems and hardware. These changes were small compared with the great extent of X, but they were not trivial. If making changes were an excuse to deny the users freedom, it would be easy for anyone to take advantage of the excuse.

A related issue concerns combining a free program with non-free code. Such a combination would inevitably be non-free; whichever freedoms are lacking for the non-free part would be lacking for the whole as well. To permit such combinations would open a hole big enough to sink a ship. Therefore, a crucial requirement for copyleft is to plug this hole: anything added to or combined with a copylefted program must be such that the larger combined version is also free and copylefted.

The specific implementation of copyleft that we use for most GNU software is the GNU General Public License, or GNU GPL for short. We have other kinds of copyleft that are used in specific circumstances. GNU manuals are copylefted

also, but use a much simpler kind of copyleft, because the complexity of the GNU GPL is not necessary for manuals.<sup>†††</sup>

The thing that causes so many sleepless nights is that notion that supposedly proprietary software can become subject to the GNU license terms if it is deemed to be “based on”, “added to”, “combined with”, “derived from”, or a “modified version of” software distributed under one of the GNU licenses. The problem is that except in extreme cases, it is difficult to know with certainty exactly what these terms mean as used in the GNU licenses, and it is very easy for undisciplined programmers to tread the gray areas that could subject their employers’ proprietary software to the “copyleft” scheme. The most feared consequence is that their supposedly proprietary software could thus become subject to conditions or obligations that it be distributed free of charge with broad permissions to modify and redistribute and a requirement that the source code be made freely available to all licensees.

Much of the software distributed under the GPL is useful for providing needed functionality in larger systems, and programmers working on proprietary projects are sometimes tempted to simply patch them in, rather than creating equivalent functionality from scratch. In addition, many useful and popular programming and development tools are distributed under the GPL or LGPL, and some of those tools inject pieces of themselves into the software they are used to produce. In addition, it has been suggested that merely writing software to work with a particular GPL component might be enough to render the new software subject to the GPL.<sup>‡‡‡</sup> While it is fairly clear in some cases that the use of GPL code to build a new product would render the resulting product subject to the GPL, there are many instances in which that is not at all clear one way or the other. The notion that proprietary software can become subject to these

<sup>†††</sup> <http://www.gnu.org/gnu/thegnuproject.html> (footnote omitted).

<sup>‡‡‡</sup> See <http://kerneltrap.org/node/view/1735>.

open source license terms by the inadvertent inclusion of a small piece of open source code has prompted some to refer to GPL/LGPL code as “viral”.

Many questions about the subtle implications of the GNU licenses and their impact on the real world of software development and distribution will remain unanswered absent judicial construction, and a full discussion of those issues is beyond the scope of this paper. To provide some food for thought, however, here is a list of some of the open questions that are keeping people awake at night:

1. Are the GPL and the LGPL contracts that impose affirmative obligations on the licensees, thus exposing them to claims for specific performance in the event of breach, or are they merely conditional authorizations, such that the failure for example to make source code available to downstream licensees is a failure of condition that renders the licensee liable for copyright infringement?
2. Are employees of proprietary software companies generally deemed authorized to bind their employers to the terms of the GPL and LGPL merely by downloading and using the open source tools?
3. Even if the GPL or LGPL is deemed to be accepted and enforceable in a given instance, are there particular terms of the license that may not be enforceable because they are unconscionable, preempted by federal law, contrary to public policy, or for some other reason?
4. Does the notion of a “derivative” as used in the GPL and LGPL have its technical legal meaning under traditional copyright law, or does it mean something different in the context of a “copyleft” license?
5. What does it mean to “combine” proprietary software with a GPL or LGPL software component? Does it mean only literally grafting it in or “static linking” when the program is created, or can it also include “dynamic linking” when the program runs on the end user’s computer? And can it also include programs that interoperate with GPL or LGPL software if they are sufficiently tightly coupled?
6. Is it possible to “cure” the inadvertent or unauthorized use of GPL or LGPL code in a proprietary product by removing it or replacing it with a new proprietary component, even after the initial “infected” version has been distributed?
7. Is the act of providing copies of software to corporate affiliates a “distribution” within the meaning of the GPL and LGPL?

8. Is the act of making software passively available for download over the Internet a “distribution” within the meaning of the GPL and LGPL?
9. Is the act of making software functionality available over the Internet (*e.g.*, in the case of an application service provider) a “distribution” of that software within the meaning of the GPL and LGPL?
10. What are the patent implications of the GPL and LGPL?
11. In the case of a dispute over the meaning of a particular term in the GPL or LGPL, whose intention governs – *i.e.*, the intention of the parties to the particular licensing transaction in which the license was used, or the intention of the person or organization (*i.e.*, the Free Software Foundation) that created the license document?<sup>§§§</sup>
12. What policies and practices are appropriate for developers of proprietary software to ensure that their products are not affected by the GPL or LGPL?
13. What type of due diligence is appropriate for one planning to acquire or invest in an enterprise whose value depends on the proprietary character of its software?
14. What are the audit and disclosure obligations of a publicly held company whose value depends on the proprietary character of its software?

## **Conclusion**

The members of the independent software industry have led us into a time of change not seen by the world since the industrial revolution. The billions of dollars of investment they have made in the development of their technology never would have come about without protection of the fruits of their intellectual labors. At the same time, open source software is well established as part of the software ecosystem and affords software developers and users an important alternative style of software development and distribution. There is a need and a purpose for both.

In making decisions about whether to adopt open source software solutions or pay for commercial ones, it is important to consider how the open source solution compares to the

<sup>§§§</sup> For the Free Software Foundation’s answers to questions about the GPL and LGPL, *see* <http://www.fsf.org/licenses/gpl-faq.html>.

commercial one in terms of not only its technical characteristics, but also in terms of the overall investment and total cost of ownership. It is also important to consider whether the use of an open source solution would meet the user's needs with respect to operational compatibility with other programs and with respect to the user's need to transact and interact with third parties in industries and markets in which commercial products are the *de facto* standard.

Finally, it is important to be aware that the open source movement is motivated not only to provide benefits to the software developer and user communities through the distribution of "free" software, but also to eliminate the need to use proprietary software. Through lobbying and other efforts, the open source movement has persuaded some companies and even some governments to adopt a bias toward open source products, and the GNU Project's GPL and LGPL have raised many serious questions about the proprietary integrity of software developed in private enterprise. It is hoped that this paper has provided some helpful background and food for thought.

# APPENDIX

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The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus

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