FEATURE ARTICLE:

A Concise Introduction to Free and Open Source Software

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Abstract: *In the early days of information technology (IT), computers were delivered with operating systems and basic application software already installed, without additional cost, and in editable (source code) form. But as software emerged as a stand-alone product, the independent software vendors (ISVs) that were launched to take advantage of this commercial opportunity no longer delivered source code, in order to prevent competitors from gaining access to their trade secrets. The practice also had the (intended) result that computer users became dependent on their ISVs for support and upgrades. Due to the increasingly substantial investments computer users made in application software, they also became "locked in" to their hardware and software vendors' products, because of the high cost of abandoning, or reconfiguring, their existing application software to run on the proprietary operating system of a new vendor. In response, a movement in support of "free software" (i.e., programs accompanied both by source code as well as the legal right to modify, share and distribute that code) emerged in the mid 1980s. The early proponents of free software regarded the right to share source code as an essential freedom, but a later faction focused only on the practical advantages of freely sharable code, which they called "open source." Concurrently, the Internet enabled a highly distributed model of software development to become pervasive, based upon voluntary code contributions and globally collaborative efforts. The combined force of these developments resulted in the rapid proliferation of "free and open source software" (FOSS) development projects that have created many "best of breed" operating system and application software products, such that the economic importance of FOSS has now become very substantial. In this article, I trace the origins and theories of the free software and open source movements, the complicated legal implications of FOSS development and use, and the supporting infrastructural ecosystem that has grown up to support this increasingly vital component of our modern, IT based society.*

Introduction: If you have at least a passing acquaintance with information technology (IT), you will likely recognize the phrase "open source software" (OSS). If you're familiarity with the IT is more detailed, you will also have heard the phrase "free and open source software" (FOSS), and perhaps the somewhat puzzling word combination, "free, libre open source software" (FLOSS). Unless you have made an effort to dig deeper into what lies behind these acronyms, however, you may be at

[2] ***Disclosure:*** the author and his law firm have acted as legal counsel to a number of entities mentioned in this article, including the Free Standards Group, the Linux Foundation, United Linux, and the X Window Consortium. Note: all Web pages cited in this article were last accessed on October 19, 2009.

a loss to give a coherent definition of any of these phrases, much less a differentiated explanation of each.

The very existence of so many names for what would appear to be similar, or at least related, concepts suggests that there may be more to be learned than immediately meets the eye. And indeed this is the case. The evolution and current state of what of FOSS[3] includes elements of political philosophy, revolutionary zeal, technical development methodologies, traditional as well as radical legal theories, and cold, hard business pragmatism. Needless to say, such a rich stew of attributes is likely to present something of a challenge to anyone interested in gaining a quick understanding of exactly what this new IT phenomenon is all about – and why, in some ways, it is not a new phenomenon at all.

The reasons for investing the time to gain a better understanding of FOSS are several. From a sociological point of view, the FLOSS movement (as compared to the development of OSS) is part of a broader, socio-political movement, energized in part by the ability of the Internet to enable the sharing of information and the active collaboration of people on a global basis. That movement questions the utility and fairness of many traditional copyright and patent- based legal restrictions, and seeks to liberate information for the benefit of all. In the case of FLOSS, it also articulates a set of ethical rules intended not only to foster free access, but also to inspire – and in some cases require – those that benefit from such access to contribute their own modifications and additions to FLOSS back to the common weal as well.

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From an economic point of view, the FOSS development model is reordering the business realities of software development in multiple ways: for a developer, the per-business costs of development of a given piece of software can be radically reduced by participating in a development project in which many others contribute their efforts as well; for an end user, access to the source code of a FOSS product grants independence from a proprietary vendor, since the end user can adapt the code itself, or put development work out for competitive bidding; for software vendors, profit opportunities move towards value added services and away from product design; and from a marketplace perspective, the FOSS model presents a disruptive force that offers opportunities for both existing, as well as new, businesses to attack the dominance of entrenched market participants whose advantages rest on the proprietary development and sales model.

And finally, from an overall business perspective, FOSS has become so thoroughly embedded in the reality of the modern marketplace that effective IT procurement

[3] In this article, I use the word FOSS to mean software made available under a license that complies with the "free software" OR the "open source" definitions that are discussed further below; FLOSS to refer to software released under a license that satisfies the free software definition (and in all likelihood, but incidentally, the open source definition as well); and "OSS" to refer to software made available under a license that meets the open source, but not the free software, definition.

and management is becoming increasingly difficult absent a working knowledge of what FOSS is all about. Active participants in the development and use of FOSS products additionally need to know how FOSS can be expected to evolve in the future, and how the legalities of FOSS apply to anyone that participates in the development of FOSS, uses a FOSS product, or embeds any FOSS code in their own products for resale.

In this article, I will provide an overview of the history of FOSS and its champions, the major philosophical differences that divide FOSS from OSS developers, the multiple licenses under which FOSS is made available, and the principle non-profit institutions that support and promote FOSS. I will conclude with a brief bibliography of primary FOSS sources for those that wish to learn more than this necessarily superficial review can hope to provide regarding such a rich and complex topic.

I FOSS: The Basics

What exactly does someone mean when they use the acronym "FOSS" or the phrase "open source?"

What it is (and what it isn't): The answer is not only "it depends," but that it depends a lot more than one might think. At one extreme, it may mean very little, because the person using the phrase has only a very general idea of what the words mean. At the other, it may imply quite a broad spectrum of information, covering topics as varied as legal rights and obligations, development models and affiliation with social movements, and the modes of development. In other words, the words open source, and in particular, "free and open source software," may mean many things at once, as dictated by the context and the knowledge of the individual that uses them.

At the most basic level, OSS is simply a piece of software for which both machine readable (object) and human readable (source) code is supplied to the user. And sometimes, this is all that the words "open source" do connote, as when a single developer creates a piece of code and then posts it to the Internet at a public site with few, or no, restrictions on its reuse.

A popularly used FOSS program, however, is likely to have additional attributes that differentiate it from proprietary software. Most likely, it will have been developed, and will currently be maintained, at a public Web site that allows any interested programmer to sign up and offer to help, whether by pointing out bugs and suggesting ways to fix them, by actively participating in code development, or by helping document the ongoing work of others as it happens.

Moreover, the software that a given project makes available may be not just a single program, but a package of carefully integrated FOSS software intended for a particular purpose. The project making the package available may have actually developed only one or a few of the components, with the balance coming from other sources.

The project in question may have been started by a single individual, or by a group of individuals, or it might have been launched when a proprietary vendor released the object and source code to a product that it had developed, concluding that it would gain greater benefit as a result of doing so (e.g., by having continuing access to the same code at a lower cost, due to the labor contributed by non-employees, or by selling support services to the users that download the program for free).

The project may be supported or hosted in a variety of ways as well. Perhaps its existence is wholly virtual, with the code residing on a bank of servers hosting thousands of other FOSS projects, some inactive, while others hum with the activity of engineers spread around the globe, few, if any, of whom have every met – or perhaps even know each others real-world names. Or it may be supported primarily by a single vendor, with many of its most active participants working for that employer, and under the same roof.

What FOSS is not is an involuntary infringement on any developer's rights, a second best alternative to proprietary code, or a security risk to the enterprise

Legally, the term may imply that anyone can download the code and do whatever they want with it, so long as they do not try to sue the developer for any flaw in the code or infringement of the rights of any third party. Or it may indicate that anyone that changes the code and sells the modified version must contribute its own code back to the project as a matter of ethics and morality, as well as in response to a legal obligation.

What FOSS is *not* is an involuntary infringement on any developer's rights, a second best alternative to proprietary code, or a security risk to the enterprise.

And it certainly isn't a passing fad. FOSS is here to stay.

The value proposition: The value of "free software" for the customer sounds obvious. But for the developer, the appeal seems far less intuitive. In each case, though, the value is very real, and can be found in a variety of ways, some of which are not immediately obvious. Briefly stated, they are as follows:

For the customer: While individuals typically incur a one-time cost to acquire software and are then on their own, commercial customers are likely to make a more substantial investment in additional services, such as purchasing training for their employees to learn how to use the new software, and also ongoing "support" services (i.e., ensuring that there is someone at the end of the phone if problems are encountered installing, integrating, or operating the software on complex enterprise systems), as well as "maintenance" fees to ensure that they will get updates (e.g., bug fixes and improvements) after the software has been installed. They may also need to pay for hardware upgrades in order to be able to run the new software, and pay consultants and other service providers to plan and complete the upgrade.

The aggregate of all of these fees is the "total cost of ownership" of a given software package, and the total can be substantial, even where the software itself

can be obtained without charge. Similarly, while some FOSS distributions may be free (e.g., the OpenOffice office suite), a customer may decide to pay for a more fully featured version of the same software with ongoing, included service (e.g., Sun Microsystem's StarOffice version of the same basic software).

Will the final cost of a FOSS product therefore invariably be cheaper than the proprietary alternative? As can be imagined, the point is one that has been hotly debated, as well as the subject of a variety of studies, only some of which have been commissioned by parties with no vested interest in reaching one conclusion or the other. There is agreement, however, on a number of empirical, as well as experiential benefits to using FOSS over proprietary products:

- ✓ ***Access to code:*** When a user installs proprietary software, they become entirely dependent on the vendor for it's quality, improvement and performance, because the customer has neither the technical means (access to source code) nor the right (legal permission) to alter the code. If the customer needs new or different features, the vendor may or may not be willing to customize the program (either at all or at a price the customer is willing to pay), and if the vendor discontinues support for the product, or goes out of business, the customer is stranded.[4] In contrast, a customer with a FOSS alternative has the ability as well as the legal right to change the code any time that it wants to. It can also hire anyone it wants to help it change or maintain the code, and if the project that created the code goes dormant, it may be disappointed, but it will not be stranded.

  By analogy, the unlucky user of a proprietary product is like someone that rents a house from a distant and unresponsive landlord that may be erratic in its maintenance and someday may even go bankrupt, while the user of a FOSS product is like the owner of her own home, and is free to renovate whenever she wants, doing the work herself or contracting the carpentry and painting out to the lowest bidder.

- ✓ ***Freedom from lock in:*** While open standards increasingly give customers protection from "lock in" (i.e., dependency on a single vendor, and the certainty of significant switching costs if they wish to change vendors), changing from one product to another can still be difficult and expensive in many situations. In the case of systems based on Linux, the increasingly popular FOSS operating system (OS), there are currently over 600 independent "distributions," all based on the same core software (the Linux kernel). While application software will not always automatically run across all versions, all of the major distributions certify their products to the Linux Standards Base (LSB), a set of standards currently maintained by the Linux

[4] The standard defensive tactic for a licensee is to negotiate the placement in escrow of a periodically updated copy of the source code to the software, accessible only if the licensor fails to support the customer as promised. However, licensors are very unwilling to make such a term broadly available, and only the largest customers, and governments, are therefore able to obtain such a term with any frequency.

Foundation, in order to permit application software to run more interoperably across compliant distributions.[5]

- ✓ ***Release cycles and bug fixes:*** Well run FOSS projects are in constant motion, upgrading and fixing bugs on a real time basis. Customers can access this work on a far more frequent basis than users of proprietary products, who must wait until the vendor decides to incur the costs of making a minor or major release. Because the source code to FOSS is available to the customer, popular FOSS software also generates a flood of bug reports and suggested fixes, which are evaluated and implemented as appropriate on a constant basis.

  Or, as stated in what is often referred to as "Linus's Law" (as in Linus Torvalds, the originator and ongoing leader of Linux development): "Given enough eyeballs, all bugs are shallow." In contrast, proprietary vendors only receive complaints from customers, and then must then seek to replicate the and diagnose the problem before they can fix it.

- ✓ ***Security:*** While it may seem counterintuitive that code visible to anyone anywhere would be safer to use, popular FOSS programs are acknowledged to be more secure, largely for the same reasons just stated: because anyone can see the code, anyone can track down the source of a vulnerability, let project managers know of the cause of concern, and/or propose a fix herself. As a result, security issues can typically be identified, fixed, and propagated to all users faster than flaws in proprietary code.[6] As a result, FOSS is increasingly being used by defense, financial and other types of users where security concerns are greatest.[7]

For the developer: In the first instance, it is important to note that FOSS is created by individuals, rather than by companies. Individuals participate for many reasons, including enjoyment, challenge, gaining status within the project community, and gaining valuable job skills that enhance marketability and compensation potential.

Points of origin: Those first becoming acquainted with FOSS are often puzzled by the fact that there may be no physical "there" there, in the sense of a central development facility. This is hardly surprising, because in many cases there is no legal entity that owns, or that is responsible for creating or maintaining the code

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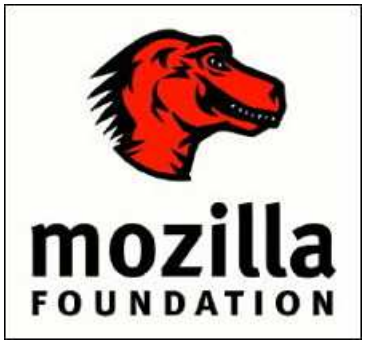
[5] The LSB was originally developed and maintained by the Free Standards Group. FSG was merged into Open Source Development Labs (OSDL) in early 2007, with the combined entity changing its name to the Linux Foundation. LF continues to maintain the LSB today.

[6] Indeed, popular FOSS projects can, and are, scanned on a regular basis and ranked for security and security improvements. In the most recent report (2009) in a series of studies originally launched at the request of the United States Department of Homeland Security, security scanning tools vendor Coverity announced that the incidence of flaws detected over a three year scan of 11 billion lines of code from 280 most-used open source projects (e.g., Firefox, Linux, PHP, Ruby and Samba) over three years had declined by 16%. See, Coverity Scan Open Source Report (2009) at: http://scan.coverity.com/report/Coverity_White_Paper-Scan_Open_Source_Report_2009.pdf

[7] A survey of Department of Defense IT managers conducted by MITRE in 2002 concluded that FOSS was essential to maintaining secure systems. *See*, United States Department of Defense, "Use of Free and Open Source Software ("FOSS") in the Department of Defense," Version 1.2.04 (MITRE, January 2, 2003), at: http://www.isd.mel.nist.gov/projects/rtlinux/dod-mitre-report.pdf

(Linux, which is created by a global network of thousands of individual developers, is a prime example). Instead, the code may simply be hosted, often for free, at a server farm maintained for that purpose by an organization such as SourceForge, which also provides a variety of supporting tools and services.

Other projects are supported by non-profit foundations formed for that purpose (e.g., the Mozilla Foundation, which supports the Firefox and Mozilla Web browsers). Only a small minority of FOSS projects are supported by for-profit corporations, such as Red Hat or Novell, two commercial companies that profit by offering unique Linux-kernel based distributions, plus support services, based upon the project that it funds (Fedora and SuSE, respectively).



While selling services is a popular model for profiting on FOSS, it is not the only one. Simply sharing the development costs of software with other companies needing the same software tools can lower the overhead for vendors. Again, just as collaboratively developed open standards permit competitors to vie with each other in other ways (e.g., by developing and selling proprietary features and services offered above the level of standardization), FOSS can enable entirely new and competitive business opportunities. A current example can be found in the mobile device (e.g., smartphones, PDAs and netbooks) marketplace, where multiple Linux-based operating systems (e.g., LiMO, Android, and Moblin) have been developed in order to fuel new opportunities for the companies that funded their initial development (multiple companies, in the case of LiMO, Google, in the case of Android, and Intel, in the case of Moblin).

The reality just described is of recent vintage, however, and many of the realizations outlined above were unknown to most current users as little as a decade ago. Given the breadth of uptake of FOSS in such a short period of time, how did such a counterintuitive transformation take place?

II A Brief History of FOSS

For reasons that will become clear, it is impossible to fully comprehend what FOSS is all about without understanding how it came about. Indeed, the early history of open source is as much a tale of techno-revolutionary vision as it is of computer coding. The details of this still-evolving process can (and already have) filled books, and thus the following overview will necessarily be both selective and brief.[8]

The rise of proprietary software. For most non-IT professionals, computer software became "real" around the time of the first sales of the first IBM PC in 1982. Following the initial success of Apple, and then IBM personal computers, almost all commonly used desktop software has been proprietary, meaning that the user must purchase a copy of the software from the company that developed it.

[8] For a more detailed account of the birth of FOSS, as told by someone who participated in that process, *see:* Salus, Peter H., *The Daemon, the Gnu and the Penguin* (Reed Media Services – 2009).

Having done so, a home computer user is dependent upon the same developer for any future upgrading of the product that may be needed to ensure that the owner can still make use of it. If the vendor goes out of business, or discontinues support for the software, the user will find that over time the product is likely to become useless, either because it will not run on a new computer or game console, or because its output (e.g., a document file or spreadsheet) can no longer be exchanged with another computer user.

The project may be supported or hosted in a variety of ways as well. Perhaps its existence is wholly virtual, with the code residing on a bank of servers hosting thousands of other FOSS projects, some inactive, while others hum with the activity of engineers spread around the globe, few, if any, of whom have every met – or perhaps even know each others real-world names. Or it may be

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Business users, including those with their own IT staffs, find themselves in the same position when they purchase proprietary software, for two reasons. First, the legal basis upon which businesses (like home users) obtain software is not a sale at all. Rather, the user obtains the rights to use the product under a "license." The transaction is superficially similar (i.e., the customer sends a check, and the vendor sends the software, and typically retains no right to demand its return). But the legal differences are nonetheless significant, because a license permits the software vendor to impose restrictions on use that would be impossible to enforce in the case of transaction structured as a sale – even the right to forbid the customer to make further use of the software if she violates the license terms.

Second, the product is provided only as "object code," meaning in a form that a computer can readily read and execute, but which a human being can only interpret with great effort through a process known as "reverse engineering." Only customers with a great deal of clout are able to require delivery of a copy of the software in "source code" form as well, which allows a developer to understand and change the product as they wish. By way of a very rough analogy, source code is to object code what a blueprint is to a finished building. Like a blueprint, access to source code provides a means by which a software architect can readily understand and change the design of a program. Source code also provides a roadmap permitting software engineers (and automated computer programs) to execute those changes.

Curiously, limiting software deliveries to object code only is a recent business practice rather than the original means by which software was made available to customers. In the early days of computers, vendors focused on hardware design, differentiating themselves from their competitors through hardware features and performance. The operating system for a computer, and often other software as well, was provided by the hardware vendor without additional charge, and in source as well as object code form so that the customer's own software engineers could build their own custom software to run on top of the vendor's OS.

This was good for the vendor for two reasons. First, because a robust industry of independent software vendors, or "ISVs," had not yet developed, and a computer is useless without software. As importantly, providing software in source code form encouraged a customer to change and build upon that software. Over time, this meant that a typical customer of a mainframe (and later a mini) computer would make a very substantial investment in the software it relied upon to run the core functions of its business (e.g., payroll, inventory, fulfillment, and so on). Since the hardware vendor owned the rights to the operating system upon which (typically only) its own computers ran, its customers became "locked in" by the very substantial costs required to adapt (or "port") the own custom software it had developed to the operating system of any other vendor.

Several developments in the marketplace changed this initial, easy-going approach to source code. One was a fundamental change in the market for operating systems, beginning with the decision by IBM to license from Microsoft, rather than internally develop or purchase, an OS for the line of "personal computers" that it decided to sell. It also opted to buy, rather than design, the computer processors that would power its new PC line – even though it already had an existing processor that would have been suitable for this use. That fateful decision allowed Microsoft, the owner of the OS selected by IBM, and Intel, the developer of the chip design, to license the same products to others. The result was the rapid development of the PC "clone" computer, an often cheaper unit that could be sold in direct competition with IBM – and was: in vast quantities.[9]

IBM introduces the PC
August 21, 1081

Microsoft made another crucial decision with broad and lasting impact on the development of software. Before it secured its OS contract with IBM, Microsoft had been a developer of compact versions of the BASIC programming language software for the Altair, Commodore, Apple II, Radio Shack TW-80 and other early computers with limited processing power. After Microsoft entered the OS market, it continued to launch application software, and preferentially for use on IBM and IBM clone PCs. Microsoft did give access to enough data about its DOS (and later Windows) OSs to other ISVs to allow them to develop their own application software for use on computers running Microsoft OSs, as well as to upgrade their products to run on new versions of DOS and Windows as Microsoft released them.[10]

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[9] Microsoft, as it turned out, was in the same situation as IBM, but it made a far shrewder decision. IBM was in a hurry to take delivery of the OS it had contracted for, and Microsoft did not, in fact, have an OS to ship. So it bought one instead, and then tuned it up for IBM's use. The name of the program that Microsoft purchased was DOS, and it licensed tens of millions of units of DOS to IBM and the clone vendors over the many years that followed, providing the foundation for the then-tiny company's phenomenal growth.

[10] Microsoft would only go so far, however, in enabling the efforts of its application software competitors, guaranteeing that Microsoft would retain advantages over its competitors (e.g., Microsoft could always release new versions of its application software before its competitors could whenever Microsoft released an OS upgrade). These, and other tactics that took advantage of Microsoft's ownership of the OS upon which PCs, and later servers, ran resulted in long battles with regulators in the United States, and later Europe. For a readable version of the very competitive development of

Until the rise of the clones, ISVs needed to create a new version of their software for each of the new small computers that were rapidly being offered in the marketplace, since each used its own, proprietary operating system. With the rapid domination of DOS-based PCs and PC clones over Apple and other brands, ISVs could develop a single version of a product that would run on a far larger market of business, and then home, computer users.

Microsoft Staff, 1978
Gates, lower left; Allen, l. rt.

Up until this point in time, software development, and particularly software development among individual developers, had been a largely collaborative process. Computer enthusiast clubs and cultures took root, particularly around universities like MIT. These self-described "hackers" often had access to the source code of commercial software, and would readily trade software with each other on floppy disks for exploration and experimentation. In these early days of mass access to computers, hackers viewed each other as fellow travelers on a common adventure, discovering and furthering a brave new world of IT-based innovation in a collaborative process.

All that now began to change.[11] As might be expected, ISVs had no incentive to make the source code for their products available to anyone. They also hired lawyers to draft licenses that would prohibit users (and competitors) from reverse engineering their products. As venture capitalists invested in these new companies, non-disclosure agreements followed, as did non-competition agreements (except in California, where they were made illegal). Soon, a cone of secrecy, and often litigation, settled over commercial software development. Not everyone was pleased.

At the same time, a second OS was becoming pervasive not only on Intel x86 computers, but on another new class of computers: the very successful "minicomputers" and work stations developed and sold by a host of companies such as Digital Equipment Corporation, Apollo, Sun Microsystems and Data General. The origins of that OS came about in 1969, when several Bell Labs employees decided to continue work, largely on their own initiative, on a scaled down version of the software (Multics) that was the subject of a collaborative project from which Bell Labs had just withdrawn. Over time, their work increased in scope.

At the time, AT&T (and therefore Bell Labs) was then subject to a regulatory consent decree dating back to 1949 that prohibited AT&T from, "engaging…in any business other than the furnishing of common carrier communications services." AT&T's could not directly commercialize OS software beyond its own internal use, so there were few impediments to the developers sharing it with others. When AT&T's legal department eventually became aware of what was happening, they

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the PC software marketplace, *see* my (as yet) unfinished eBook, ODF v. OOXML: War of the Words, at http://www.consortiuminfo.org/standardsblog/index.php?topic=20071125145019553

[11] Most famously, a young Bill Gates sent an "Open Letter to Hobbyists" in 1975, objecting to casual copying of Microsoft BASIC. While Gates' unhappiness was justified, the tone of his letter, which included the sentence, "As the majority of hobbyists must be aware, most of you steal your software," invoked a significant reaction.

consulted the language of the consent decree – and opted to straddle the regulatory fence. The lawyers concluded that UNIX (for that was the name the developers had given their work) could still be made publicly available, but only on request from academic and research institutions. Over time, word - and copies of the rapidly maturing OS – spread. By mid 1975, UNIX was officially in the hands of 33 labs, universities and secondary schools around the world, and doubtless on other computers on an unofficial basis.

Happily for AT&T, the trademark of the new OS did not have to be made freely available, and this provided the owner of that mark (which changed over time) with the legal right to limit the ability of anyone to use the UNIX name in connection with their product unless it conformed to the specification associated with the UNIX name (and unless they paid a trademark licensing fee as well).

Over time, UNIX became the OS foundation of choice on minicomputers and workstations (and later servers) the world over. Each vendor customized the original OS, but each vendor that wished to make use of the UNIX name could only go so far. The result was that UNIX-licensed OSs retained enough similarity – and therefore compatibility – with other UNIX licensed OSs to make it easier for a customer to migrate among them than it could among the mainframe computers sold by IBM and other vendors.[12] As a result, customers were less locked in to a single UNIX vendor, and ISVs were attracted to the growing market for UNIX-compatible application software.

There were other forces at play that ran counter to the increasingly proprietary nature of the marketplace. With so many PC and mini computers running the same, or a similar, operating system, there were incentives for ISVs in particular, and some hardware vendors, to facilitate the use of software across the hardware of multiple vendors without the need for expensive adaptation to run on each one. And with the advent of intense price competition among PC clone vendors, there were clear benefits to make as many parts (e.g., disk drives, connectors, memory chips, and so on) interchangeable as possible. The result was an increasing desire to develop open standards that would allow both hardware as well as software from different sources to be acquired and assembled into single, interoperable systems.[13]

The result was the evolution of a partly open (via open standards) and partly closed (through patents and licenses) marketplace in which vendors could control their products, while customers could enjoy a degree of competitive bidding between vendors. But developers could only collaborate among their co-workers, and customers were still subject to a large degree of lock in, especially in the case of software.

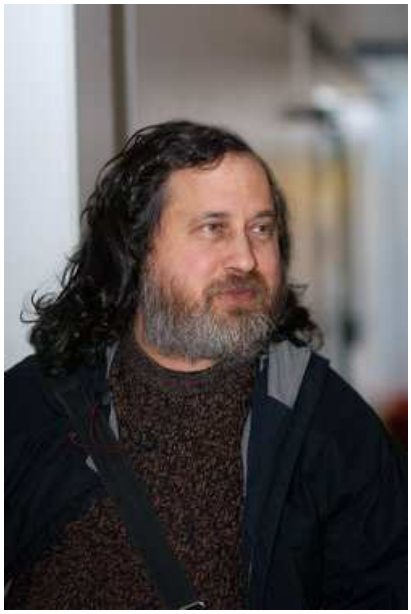
The Stallman revolution. Revolutions, by definition, are launched by revolutionaries, and often ones that have little patience for those that do not share their passion and their vision. The FLOSS revolution has been no exception to this rule, and certainly it has not lacked for proponents infused with the passion of their convictions. Some twenty-odd years after the genesis of the FLOSS movement,

[12] Usually, these proprietary versions were given names ending in "X" to indicate their lineage (e.g., AIX, developed by IBM, and HP-UX, from Hewlett-Packard.

[13] The process continues today, turbocharged by the Internet-enabled desire to potentially connect every computer, everywhere, to every other computer.

that emotional appeal continues to motivate tens of thousands of FLOSS advocates, even as OSS – its non-ideological stepchild – gathers increasing momentum in the (at best) values-neutral world of the commercial marketplace.

The universally acknowledged ideological founder and standard bearer of the FLOSS movement is Richard M. Stallman (more often referred to among the faithful simply as rms), a *magna cum laude* graduate of Harvard College who became exposed to computer programming while still in high school. In the years that followed his undergraduate years, Stallman pursued graduate studies, and then worked, in the hacker-based culture of the Artificial Intelligence (AI) Lab at MIT. But the culture of the AI lab soon began to change: employees were asked to sign non-disclosure agreements, and several of Stallman's co-workers left to pursue higher-paying jobs in two high-profile startup companies that were formed to focus on AI technology: Lisp Machines, Inc. and Symbolics, Inc. Stallman became increasingly militant in opposing these restrictive practices, and disappointed that fellow-hackers would forsake the open sharing of software for stock options in for-profit companies.[14]



Richard Stallman, 2009

In the fall of 1983, rms formed what he called the "GNU Project," the name being a recursive acronym of the statement "Gnu's Not Unix!" The concept behind the project was to develop a new OS that would be similar to, and mostly compatible with, UNIX, but which would include no proprietary UNIX code. And it would be available in source code form as well to anyone that wished to study it, share it, modify it, or publish their own modifications. In 1984, Stallman quit working at MIT to dedicate his full time to the GNU Project, unencumbered by the intellectual property rights (IPR) rules applicable to MIT employees. In 1985, he founded the Free Software Foundation as a non-profit, charitable organization to provide a vehicle to hire programmers to work on the GNU Project.

Stallman's project attracted both individual as well as academic and corporate contributors, and completed a variety of tools, components and libraries. It also incorporated other free software components into its evolving OS where available, such as the X Window System, a graphical user interface developed by the X Window Consortium.[15] But while the GNU Project eventually completed or incorporated most components of a complete OS, for a variety of reasons, some technical, it failed to complete a fully functional and reliable "kernel" for its

[14] Richard Stallman is as well known for the rough edges of his personality as he is for the brilliance of his thought leadership. Famously, he will not provide an interview to a journalist that does not agree in advance to use several of Stallman's preferred FOSS terms. For example, the journalist must use the phrase "GNU/Linux" to refer to the operating system more commonly referred to simply as "Linux," in order to acknowledge that the GNU Project came first, and that non-embedded "Linux" implementations will invariably include software developed by the GNU Project as well.

[15] The X Window System was an ambitious software development project hosted by MIT with industry support. The author assisted in the spin out of the Project in 1993 as an independent non-profit membership consortium, represented it until its eventual merger into The Open Group in [1989], and assisted in the development of one of the first open source licenses, now known as the "MIT License."

operating system (i.e., the software that serves the most basic core functions of an operating system).

At the same time that Stallman was managing the GNU Project, he was also maturing and codifying his ideology of software development and use. To Stallman, software was not simply a technical tool for managing or gaining value from computers, but a creative work that should stand on a par with literary and political works. Those that created computer code should also enjoy the same freedoms that journalists or other authors should enjoy, unconstrained by rules of secrecy that would be intolerable if the creative work in question was a political essay, as compared to compiler or text editor. While Stallman had no objection to an author (or other owner of the copyright in computer code) making money from computer code, the ideas and creativity captured in that code should be part of a greater commons.

As Stallman's thinking matured, he also came to believe that there should be limits on anyone "free riding" on the efforts of what commonly came to be called the work of the "community." If someone wished to make use of the labors of others by modifying code contributed to the community, they should be willing to make their own modifications available for the common good as well, at least if they hoped to make money reselling the modified work, as compared to simply making internal use of it.

To Stallman, software was not simply a technical tool for managing or gaining value from computers, but a creative work that should stand on a par with literary and political works

Stallman summarized his thinking in the early days of the GNU Project in the GNU Manifesto, first published in Dr. Dobb's Journal in March of 1985.[16] In that manifesto, Stallman described his motivation as follows, under the heading, "Why I Must Write GNU:"

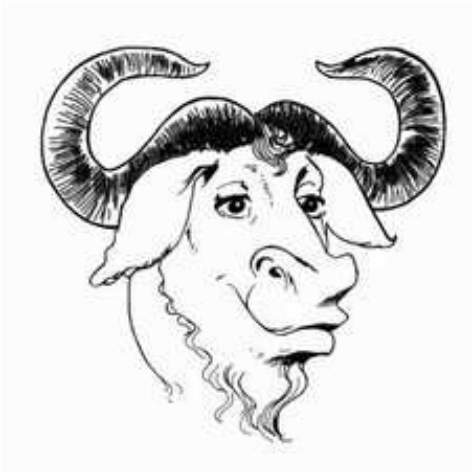
> I consider that the golden rule requires that if I like a program I must share it with other people who like it. Software sellers want to divide the users and conquer them, making each user agree not to share with others. I refuse to break solidarity with other users in this way. I cannot in good conscience sign a nondisclosure agreement or a software license agreement….So that I can continue to use computers without dishonor, I have decided to put together a sufficient body of free software so that I will be able to get along without any software that is not free….

Stallman expanded on this theme in a later section, titled "Why Many Programmers Want to Help:"

[16] The GNU Manifesto can be found in its original form, but with clarifying annotations, at the GNU Project Web site at: http://www.gnu.org/gnu/manifesto.html Additional material describing the Free Software philosophy can be found at this page of the Free Software Foundation Web site: http://www.gnu.org/gnu/manifesto.html

> Many programmers are unhappy about the commercialization of system software. It may enable them to make more money, but it requires them to feel in conflict with other programmers in general rather than feel as comrades. The fundamental act of friendship among programmers is the sharing of programs; marketing arrangements now typically used essentially forbid programmers to treat others as friends. The purchaser of software must choose between friendship and obeying the law. Naturally, many decide that friendship is more important. But those who believe in law often do not feel at ease with either choice. They become cynical and think that programming is just a way of making money.

> By working on and using GNU rather than proprietary programs, we can be hospitable to everyone and obey the law. In addition, GNU serves as an example to inspire and a banner to rally others to join us in sharing. This can give us a feeling of harmony which is impossible if we use software that is not free….



GNU Project Logo

Stallman spent a great deal of time in his manifesto responding, in Q and A format, to potential criticisms of his ideas from an economic perspective. He dispensed with the interests of existing OS vendors in a way that would, understandably, hardly endear himself to them:

> GNU will remove operating system software from the realm of competition. You will not be able to get an edge in this area, but neither will your competitors be able to get an edge over you. You and they will compete in other areas, while benefiting mutually in this one. If your business is selling an operating system, you will not like GNU, but that's tough on you. If your business is something else, GNU can save you from being pushed into the expensive business of selling operating systems.

Indeed, in this regard, Stallman's words proved to be prophetic. Microsoft CEO Steven and Ballmer later compared the appeal of FOSS to that of communism, but one after another of the major non-OS software developers (eventually) came to embrace the economic advantages of embracing the open source development model, at least selectively.

Stallman took greater pains to justify his new development model and morality to individual software developers, providing the same answer in many ways, in response to the same question ("How will I make a living?") also asked from various perspectives. Still, he offered no concessions to individual programmers, either. Here is one example:

> Q: "Won't programmers starve?"
>
> A: I could answer that nobody is forced to be a programmer. Most of us cannot manage to get any money for standing on the street and making faces. But we are not, as a result, condemned to spend our lives standing on the street making faces, and starving. We do something else.
>
> But that is the wrong answer because it accepts the questioner's implicit assumption: that without ownership of software, programmers cannot possibly be paid a cent. Supposedly it is all or nothing.
>
> The real reason programmers will not starve is that it will still be possible for them to get paid for programming; just not paid as much as now.

And in a later response:

> It is not considered an injustice that sales clerks make the salaries that they now do. If programmers made the same, that would not be an injustice either. (In practice they would still make considerably more than that.)

Free software is a matter of liberty, not price
- Richard Stallman

But perhaps Stallman's most radical statement appears at the end of yet another formulation of the same question ("Won't everyone stop programming without a monetary incentive?"). That response ends as follows:

> What the facts show is that people will program for reasons other than riches; but if given a chance to make a lot of money as well, they will come to expect and demand it. Low-paying organizations do poorly in competition with high-paying ones, but they do not have to do badly if the high-paying ones are banned.

Over time, Stallman provided further articulations of his beliefs, including the Free Software Definition that he first published in basic form in the GNU Project Bulletin in February of 1988. In its current, more definitive, form, it reads as follows, (explanatory text not included):

> 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.
>
> Free software is a matter of the users' freedom to run, copy, distribute, study, change and improve the software. More precisely, it means that the program's users have the four essential freedoms:
>
> - The freedom to run the program, for any purpose (freedom 0).

- The freedom to study how the program works, and change it to make it do what you wish (freedom 1). Access to the source code is a precondition for this.

- The freedom to redistribute copies so you can help your neighbor (freedom 2).

- The freedom to improve the program, and release your improvements (and modified versions in general) to the public, so that the whole community benefits (freedom 3). Access to the source code is a precondition for this.

Stallman's second major contribution was on the legal front. Rms realized that in order for his ideological thoughts to be enforceable, they would need to be supported by legal agreements. He consulted various legal experts, but in the end personally drafted the licenses that he believed instantiated his vision, using plain English." The first was the GNU Public License ("GPL"), which was usefully updated useful two years thereafter. [17]

Current GPL version logo

Over time, the GPL became a very popular and widely implemented license, and the software (including Linux) that was released under it came to have great commercial and strategic value. As a result, when Stallman decided that it was time to revise the GPL again, the process was very long and convoluted, involving stakeholders of many types (both free software advocates as well as lawyers representing multinational IT corporations), with kindred spirit Eben Moglen, a Columbia Law School Professor and a founder of the Software Freedom Law Center, by turns channeling and serving as an intermediary between Stallman, who had the final word on all changes, and those that were on the four revision committees proposing, arguing for, and ultimately recommending final changes. The most recent version of the (GPL v.3) license was eventually released on June 20, 1987.[18]

Unlike most legal documents, the GPL in any of its forms is as much a community social covenant as it is a binding legal agreement. It sets forth the norms of conduct that it expects from those that will use the code that is made available under it, and also imposes good behavior requirements on its licensees. As a result, it is a source of some puzzlement for lawyers conditioned to seeing documents of a very different kind accompanying software. But it is also a kind of Declaration of Independence and Bill of Rights that continues to have an expanding impact.

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[17] The original version of the GPL, adopted February 1989, can be found here: http://www.gnu.org/licenses/old-licenses/gpl-1.0.txt The GPL v.2 is here: http://www.gnu.org/licenses/old-licenses/gpl-2.0.txt The text of the GPL v3, and related links and information, is maintained by the Free Software Foundation on this page: http://www.fsf.org/licensing/licenses/gpl.html

[18] Like most other members of the FOSS cast, Moglen is an outside personality. He is also a very skilled public speaker, and has become a major spokesperson for the free software movement. His personal Web page at Columbia University Law School can be found here: http://emoglen.law.columbia.edu/

Today, almost 25 years after Richard Stallman issued his GNU Manifesto, proprietary software is still legal, and programmers are making more money than ever creating it. But at the same time, more FOSS software than ever is being written, and often, as predicted by Stallman, by programmers working for free, on their own time, in exchange for the satisfaction and status they derive from identifying with, and participating in a community of like-minded, committed professionals.

The OSS alternative: Richard Stallman dedicated great time and effort to articulating and spreading his message, gaining many supporters and becoming the most visible leader of what came to be called the "free software movement." But while many resonated with some or all of his message, not all agreed that the development and use of proprietary software was immoral. In time, those who were attracted to the collaborative model of open source development and the availability of source code, but not to the full free software ideology or Stallman's often confrontational style, decided to part company with the free software movement. Thus it was that an ideology that claimed the right to "fork" a software program as a basic freedom encountered a political schism of its own.

The initial spokespersons of this new branch of software development thought were, most visibly, Eric S. Raymond and Bruce Perens. Like Richard Stallman, they gave a label to their preferred mode of software development, calling it "open source," thereby focusing on the factual availability of code, rather than on its ethical implications. And, like Stallman, they also founded (together with Jon "maddog" Hall and Larry Augustin, among others) a non-profit organization that incorporated the term that they had coined. Now programmers could rally to the call of either of two organizations: FSF, or the new Open Source Initiative.

Open Source Initiative logo

Raymond and Perens share several attributes with Stallman: each is a skilled and prolific writer, well able to articulate his thoughts in ways that help gather adherents to their views.[19] But their ideologies are different (in contrast to Stallman's willingness to impose limitations on personal conduct for community benefit, Raymond is a Libertarian). Each became uncomfortable with Stallman's emphasis on a code of software morality, while approving of the capability of the collaborative process to develop better code faster. When Netscape, locked in what proved to be mortal combat with Microsoft, announced in February, 1998 that it would make the source code of its browser software freely available, Raymond and his co-founders announced the formation of OSI to recognize and promote open source development as a process in which proprietary as well as free software developers alike could participate and find value.

[19] Like Stallman, Raymond also has some less than mainstream beliefs. His Wikipedia entry notes that he is "a neopagan [and] an avowed anarcho-capitalist."

Unlike Stallman, who would presumably not mine the disappearance of proprietary software from the face of the earth, the OSI founders took what they believed was a more pragmatic approach that was inclusive of traditional business interests. Indeed, they welcomed commercial interests to the party. Not surprisingly, this has led to a degree of periodic friction between the open source and free software communities. Officially, however, the Free Software Foundation positions the definitions and goals of the two movements as being complementary rather than antagonistic.

Raymond became the principal spokesperson for the open source concept, but Perens made a crucial contribution as well, acting as the principal draftsman for what the OSI founders called the "open source definition." While similar in some respects to Stallman's Free Software Definition, the definition the OSI adopted is more lengthy and detailed, in part because it seeks to establish the parameters within which a variety of different licenses can exist that can be created and proposed by anyone.[20] In contrast, the Free Software Definition maintained at the GNU Project Site is at any time supplemented in detail by only a few licenses, each developed and copyrighted by FSF.

The development, maintenance and most importantly) application of the Open Source Definition to specific license agreements proved to be OSI's great contribution. By defining the business boundaries of open source rather than strictly regimenting its definition, and by appointing itself as the arbiter of which licenses fit within that definition, the OSI achieved several important effects.

Unlike Stallman, the OSI founders took what they believed was a more pragmatic approach that was inclusive of traditional business interests

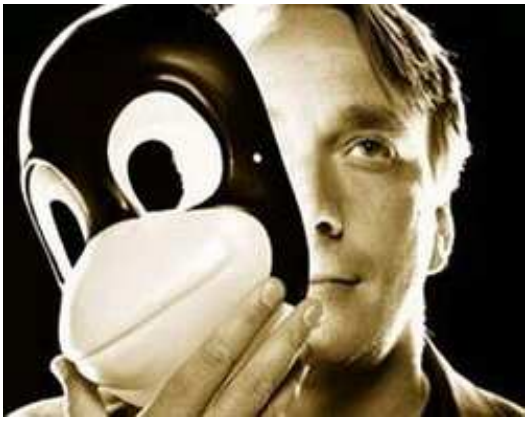
First, it allowed a fairly wide spectrum of permissions and obligations to fit within its definition, allowing a wider range of business models to be accommodated. As importantly, it allowed squeamish corporate attorneys to find their comfort zone by granting them the ability to submit the licenses they created (sometimes with only legally inconsequential or idiosyncratic differences from each other) to OSI for approval. The result, as discussed in the next section of this article, was a proliferation of OSI-approved licenses, many of which are seldom used in practice – but also a more rapid spread of FOSS software as well, including programs released, or contributed to, by traditionally conservative, multinational IT companies.

The rise of the Linux distribution: While rms and the GNU Project were making progress on many fronts with their free, alternative operating system, progress on one key component was lagging: the kernel that Stallman had named "Hurd." That component has to date still not been released in robust form, in part because in 1991 a student in Finland who had just purchased a new Intel 386-based computer decided to hack a kernel himself, for his own amusement and education.

[20] The Open Source definition appears as an Appendix at the end of this article, and can be found on line *at:* http://opensource.org/docs/osd

Famously, he posted a note to an Internet user group page on August 25, 1991 that began as follows:

> Hello everybody out there using minix —
>
> I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones…. I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them :-).



Linus Torvalds

At the time, virtually no one paid attention to the announcement. But the student who posted the modest announcement proved to be not only an extremely talented programmer, but a master in the entirely new discipline of managing the type of globally distributed, highly individualistic volunteer work force that the spread of Internet availability was only then making possible. His name was Linus Torvalds, and the name he gave to his little program, in honor of the UNIX program with which it was intended to be largely compatible, was "Linux." Soon, people were flocking to the project, and their work was made available almost immediately to anyone who was interested in watching what was going on, using what was being created, or joining in themselves.

The success Torvalds demonstrated in managing his increasingly ambitious project revealed the viability of an entirely new way to develop software – virtually and over great distances, allowing a critical mass of kindred spirits to gather to perform projects that never would have been launched if they were dependent on a local talent pool that needed to work under the same roof. Eric Raymond, of OSI fame, later described and popularized the new model in a seminal work he published in 1997, called The Cathedral and the Bazaar, which contrasted the traditional, slow-moving and methodical software development model (the "Cathedral") with the more chaotic, real time, "rough consensus and running code" development approach taking hold on the Internet (the "Bazaar").[21]

To the amazement of traditionalists, the Bazaar was capable of producing very good code – and quickly. Over the years that followed Torvalds' simple announcement, thousands of programmers from around the world contributed millions of lines of code to the project. The fantastic popularity of the Linux kernel effectively eliminated the need for the GNU Project to complete Hurd in order to achieve its ultimate goal of enabling a complete free and open OS.

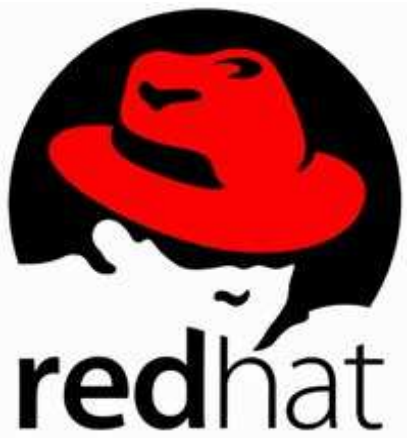
With the emergence of such a well-supported OS becoming evident and the demonstrated success of the distributed FOSS development model, a new type of

[21] *The Cathedral and the Bazaar* has appeared in print in a number of media, including in book form. Eric Raymond maintains a Web page with links to the full text of the essay in multiple languages, as well as additional information, at: http://www.catb.org/~esr/writings/cathedral-bazaar/

project began to proliferate. These projects were formed to assemble not just an OS, but a complete set of commonly desired application tools (e.g., word processors, spreadsheets, and so on) from the growing number of project-generated tools available, all well matched, and all licensed on FOSS terms. The result was that customers could download an increasingly wide range of free, useful, "out of the box" computer software environments from any Internet connection.

These "distributions" ("distros," for short) were often tailored to a particular type of user requirement, from ambitious (e.g., for high-powered business user) to narrow (e.g., to serve as an "embedded" system, perhaps buried under the hood of a car, invisible and unknown to its owner). The Linux kernel could invariably be found at the core of these distributions, together with some or most of the GNU Project's components as well. Stallman's Free Software Foundation asked users to call them "GNU/Linux" distributions, but predictably, the marketplace preferred the shorter "Linux," and in truth the GNU Project had also incorporated significant pieces of software developed by others (e.g., the X Window interface) without adding their names to the "GNU" handle.

Many of these new distribution projects were also formed on a non-profit basis. But entrepreneurs were figuring out how to make money from open source as well, most frequently by offering distribution and support services that their customers were willing to pay for – just as rms had supposed they would in his 1985 GNU Manifesto. When five-year old Linux distribution vendor Red Hat launched its wildly successful IPO in 1998, investors noticed.



Logo of Red Hat, the most commercially successful Linux distribution

What was perhaps more interesting was the way the realities of business and FOSS passion accommodated each other. The mixing of what might have seemed like oil and water was accomplished through the application of roughly comparable amounts of economic support, career opportunity and respect.

One model that emerged was a partnership of a semi-autonomous development project (sometimes legally separate, and sometimes not) that developed a FOSS product that could be downloaded for free, and a sheltering, supporting for-profit business that offered additional support and services (and sometimes additional software as well) to commercial customers for a fee. When this model flourished, the development project would have many participants that were not employees of the for-profit business at all. The Linux distributions supported in this fashion that are currently most commercially successful are Fedora, supported by Red Hat, and SUSE, supported by Novell, for enterprise users, and Ubuntu, supported by Canonical, a Linux distribution optimized for easy use on laptops and other personal computers. But there are very well supported distros that are entirely the product of non-profit, community efforts as well, including the Gentoo and Debian distributions.

Linux could be assembled with FOSS programs in other common and useful ways as well, with the best known being its inclusion in a "solution stack" deployed on the great majority (i.e., millions) of Web application servers in use today. That stack is commonly referred to by the acronym "LAMP," taken from the initials of its principal components: Linux, Apache HTTP Server software, the MySQL database package, and any of the following: PHP, Python, Perl (each, a Web scripting language).

Microsoft and FOSS: Richard Stallman had made no bones over the fact that an OS vendor would not be likely to be a big supporter of his GNU Project, and there is no company on earth that is more revenue-dependent on OS sales than Microsoft. Moreover, open source software could encroach on other Microsoft products as well, including the second major leg of its revenue stool, Office, the dominant productivity software package in use today.

Still, some (including Microsoft) did not take FLOSS seriously for many years, in part because they doubted that people would really produce complex software for free, and in part because the most visible advocate for FLOSS was Richard Stallman, who on occasion would arrive at public speaking engagements wearing a Biblical robe and, on his head, an ancient computer disk, providing a halo effect.

This lack of early credibility perhaps was crucial to the success of FLOSS, since it allowed the FLOSS culture to grow largely unmolested in the dark, left alone by competitive forces, well-meaning but misdirected lawyers seeking to constrain rights in the software being created, or journalists unable to properly understand or describe what was in fact emerging.

This lack of early credibility perhaps was crucial to the success of FLOSS, since it allowed the FLOSS culture to grow largely unmolested in the dark

By the time the commercial marketplace began to be aware that FOSS was proliferating everywhere – including in their own datacenters – the reality of FOSS development was already well proven, widely practiced, and broadly implemented.

Moreover, some major IT vendors began to grasp the strategic advantages that they could reap from even wider use of FOSS. Most notably, IBM announced in December of 2000 that it would invest $1 billion in enabling its products to run on Linux, and would assign 1500 of its engineers to create Linux products and services. The reality of so large and traditional an industry player as IBM making such a substantial strategic and economic commitment to FOSS was enough to boost the credibility of FOSS in general, and of Linux in particular, overnight.

But IBM sold hardware as well as software, and was moving forward with a business plan directed at greatly increasing its revenues from services as compared to products. The move also made sense, because the largest number of dollars that IBM customers spent on any vendor other than IBM frequently went to Microsoft. A dollar in an IT budget not spent on Windows was therefore a dollar that was once more up for grabs. Other vendors, such as Sun Microsystems, Hewlett-Packard, Hitachi and NEC decided that Linux could mesh well with their business models as well.

With almost all of its revenues deriving from software sales and services, of course, Microsoft was in a far more challenging position. Once it realized that FOSS could represent a true threat to its businesses, Microsoft spoke out publicly against FOSS, questioning its quality, total cost of ownership, security and stability. Over time, however, customers found that the most popular FOSS products consistently were of very high quality, were usually cheaper to own, could be readily modified, were more secure, and were constantly being updated and improved. Moreover, they enjoyed more price competition among competing vendors, and could change vendors far more easily.

Microsoft's efforts to undermine Linux had a predictable effect in the FOSS community. The dominant software vendor was already unpopular in some developer quarters, and during the course of a long-running government antitrust investigation many stories of hardball commercial behavior that had long been rumored were confirmed and reported publicly. Microsoft thus made itself into a public enemy against which the FLOSS and OSS communities could unite. The many Web sites that focused on FOSS became, and remain, perpetually awash in stories that report, or speculate, on what Microsoft might be up to next.

The present: Today, FOSS is firmly entrenched in many infrastructural niches, and gaining ground in applications as well. In the office productivity space, a variety of desktop (OpenOffice) and cloud (Google Docs) applications are gaining ground. Hundreds of millions of blogs run on WordPress software, and the vast majority of Web servers run on the LAMP stack. Meanwhile, SourceForge, the most popular free host for FOSS projects, reports that over 230,000 FOSS projects (not all active) reside on its servers. In the public sector, governments in many parts of the world (e.g., the European Union) look increasingly favorably on FOSS in their procurement activities, and more and more of the smartphones and other mobile, wireless devices that will outsell lap and desktop computers in the years to come run on one of a variety of flavors of Linux.

Most tellingly, even Microsoft appears to be turning a corner, with more and more of its internal teams turning to, or at least being open, to FOSS, if only because their customers give them no choice.

III Open Source Licenses and Legalities

As with each other major topic discussed above, the legal theories, agreements, and documentation that relate to FOSS are far to complex to explore more than superficially in an article of this type. But for current purposes, it is less important to acquire a deep knowledge of FOSS legal terms than it is to gain insight into why the legalities of FOSS are so important.

Threshold facts and principles: The interaction of FOSS and the law will seem like a hopeless jumble unless a few important facts are first understood:

- ✓ ***No one entity usually owns a FOSS product:*** For reasons that are partly historical and partly ideological, in most projects every individual developer that contributes a line of code will retain ownership of that line. As a result, any piece of FOSS is likely to have many authors. Since successful FOSS software undergoes constant improvements and corrections, the authors and their contributions are constantly changing as well. When you license a piece of FOSS, you therefore license not from one licensor, but from many – and perhaps from thousands.

- ✓ ***It takes a village to build a distro:*** FOSS comes in many pieces, large and small: text editors, libraries, interfaces, and much more. Because the store of available FOSS becomes ever larger and there is no reason to constantly reinvent the wheel, a FOSS application or OS is likely to include many modules and components borrowed from other projects as well as software developed by the project whose name is primarily associated with the application, OS or other software. (The same, incidentally, is also true of many proprietary packages, on which more below.)

- ✓ ***Rock, paper, scissors:*** Because of the heterogeneous nature of such "village" software, it will be likely that selections made on purely technical merit will result in a final package that includes modules that were developed under different license agreements. As a result, care must be taken to ensure that all of the licenses that relate to the constituent parts of the final package are at least minimally compatible, which can result in something of a dilemma at the end of a development project unless good legal hygiene was practiced along the way. (The problem is more severe for proprietary software vendors, because the developers that they employ are just as likely to be attracted by available FOSS tools and components as their FOSS project brethren – and may even participate in FOSS projects themselves. Such FOSS "contamination" can be particularly problematic if a FOSS component is included that was developed under a license containing a provision intended to trump all more restrictive terms applicable to any part of any product into which it is inserted.[22])

- ✓ ***It's not just about money:*** The "permissive" licenses discussed below include provisions that are intended to protect the strongly held personal beliefs of the developers that prefer such licenses. As a result, these licenses include rules that are social as well as economic in origin and effect.

- ✓ ***New wine in new bottles:*** While some parts of FOSS licenses are quite similar to their proprietary analogues, and are included for similar purposes (e.g., warranty disclaimer language), other parts seek to accomplish new and

[22] As can be imagined, the availability of an ever expanding cornucopia of FOSS components has resulted not only in headaches for vendors, but in nightmares for anyone involved in a technology merger or acquisition. Any transaction involving (especially) a software vendor now includes a meticulous, line by line, "codebase" analysis of all software that the acquirer will purchase, to determine what license terms apply to that line. Where issues are (almost inevitably) discovered, remediation then follows, which may include removal or replacement of code that is available only under terms deemed not to be acceptable by the acquirer. Not surprisingly, well-run software vendors have adopted detailed internal procedures intended to document, and a necessary, avoid the inclusion of software subject to such terms, and product and service providers (such as Black Duck Software) have emerged to serve the needs of developers and M&A firms alike.

novel results, often using language that is unfamiliar to lawyers. As a result, such licenses present new interpretive questions to judges, not all of which have, as yet, been answered. Where they have been addressed, it has been in the isolated courts of various jurisdictions. As a result, "settled law" may not be achieved on some new types of FOSS licenses for some time.

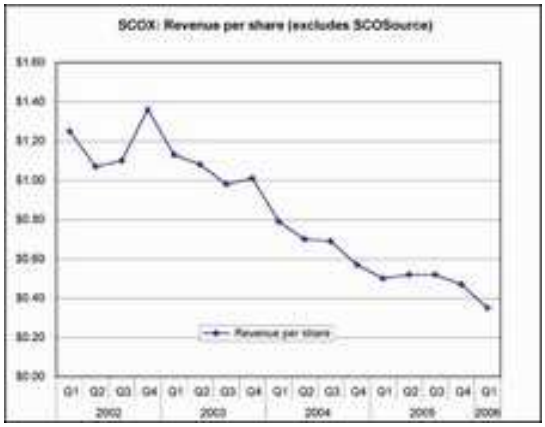
- ✓ ***It takes more than a license:*** Because any piece of FOSS software is likely to have many authors, each retaining ownership to her code, it is important for "contribution" (or similarly titled) documents to be in place between each developer and the project in which they participate, to be sure that a licensee of the software that the project makes available actually has the rights that they need. The process of collecting such rights is complicated by the fact that many contributors to a product may be subject to agreements with their employers that may be inconsistent with the rights needed by the project.

As can be seen, launching and maintaining a successful FOSS project, and distributing and using the results, takes place on a rather complicated legal landscape

- ✓ ***It's often all about copyrights:*** While some licenses (such as the GPL) include terms that are relevant, or that seek to influence behavior relating, to patents, the contribution agreements and distribution licenses that relate to FOSS deal often primarily with copyright and trademark rights. In contrast, a software license between two commercial entities may also give the licensee certain rights under patents that the licensor owns or controls. This dichotomy is in part due to the fact that those that contribute code to FOSS projects are not likely to control any patent claims that may be infringed by the use of the code that they contribute (and their employers may not, either). As a result, while the user of a popular FOSS product may have meaningful protection against an infringement suit as a practical matter, due to the market taboo against asserting patents against such programs, and the great number of allies that will spring to the defense of anyone that is attacked, a FOSS licensee does not receive the kind of warranty and indemnification protection that it might receive under a license to proprietary software. There are exceptions (e.g., in the case of some Linux distributions), in which a commercial distributor of the program chooses to step in and provide the same kind of warranty and indemnification protections to its customers.

As can be seen, launching and maintaining a successful FOSS project, and distributing and using the results, takes place on a rather complicated legal landscape. Unfortunately, some of the thousands of FOSS projects that have been launched (particularly in the early days) have paid comparatively little attention to the legal niceties that can make later use of their work product less problematic. However, best practices and supporting legal documentation for FOSS development are now broadly available, including at common FOSS project hosting sites, and such instances are therefore becoming less frequent.

SCO and the advent of FOSS Discipline: In an example of "good news/bad news," the FOSS development community became aware of the importance of maintaining legal discipline before the number of important FOSS projects began to proliferate greatly. The source of this raised awareness was a legal assault by a company called SCO Group. In June of 2002, SCO filed the first in a series of legal actions against implementers of Linux, alleging that the program contained "line by line" copies of SCO's proprietary UNIX software code.



SCO's stock price. It kept going down

What followed was a (still ongoing) series of high profile and vigorously waged battles involving SCO, on the one hand, and Novell and IBM on the other, in two separate suits.

The background for the SCO litigation is quite factually complex, in part as a result of the multiple transfers (some poorly documented) of ownership that had occurred over many years involving the copyrighted code of UNIX, and certain underlying patent rights. In part due to its tactics, in part due to the target (Linux – the poster program of the FOSS community), in part due to allegations that Microsoft was secretly funding SCO's campaign, and in part due to the great antipathy that many members of the FOSS hold for software patents in general, SCO was, and continues to be, excoriated as the Great Satan of the FOSS world.[23]

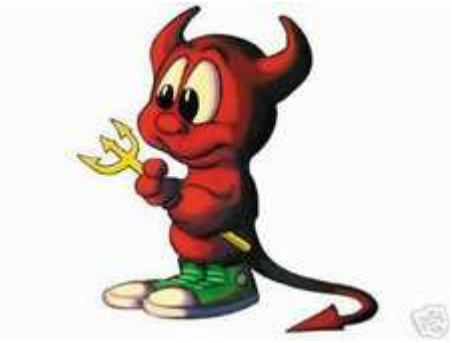
The good news, however, was that it was plain for all to see that paying attention to such annoyingly bureaucratic practices as collecting signed contribution agreements and checking the header files of contributed software files, no matter how small, really was important. Despite the fact that the courts have consistently found that SCO's allegations were groundless, the shock therapy applied by its boorish and anti-community behavior provided a lesson that may have averted many disasters of real consequence that otherwise might have followed.[24]

Permissive and restrictive licenses: The first licenses identifiable as "open source" licenses were very simple indeed, and focused on what a licensee could do, rather than what she couldn't. The common ancestor of all open source licenses is

[23] SCO management's seeming strategy of "litigation as a business" has not paid off well for the company's stockholders. SCO was twice delisted, and ultimately filed for bankruptcy, after spending millions of dollars per fiscal quarter on legal bills over the past seven years. As of this writing, the bankruptcy trustee is deciding whether to permit the company to reorganize, or to force it into liquidation.

[24] The SCO suits had a variety of ripple effects throughout the FOSS world. One was the shelving of a very promising joint venture, called United Linux LLC, that had been founded to accelerate the global adoption of Linux by allying the vendors of four of the primary Linux distributions. The intention was to create a common distribution that could be supported on a global basis by each of the four participants: Caldera, SuSE Linux, Turbolinux and Conectiva. Large vendors, such as IBM, could then distribute the software to their customers with greater assurance. Unfortunately, the CEO of Caldera was later replaced by a new CEO named Darl McBride, who had a very different vision of how to make money out of Linux. Not long after, Caldera changed its name to the SCO Group – and all further activity at one of my most promising FOSS clients ground to a halt, never to be revived.

generally agreed to be the "BSD License," used to distribute a "UNIX-like" OS created by the Computer Systems Research Group at the Berkeley campus of the University of California. That OS was initially based on UNIX code, but over time, the code was gradually replaced, resulting in a non-identical, but functionally similar version of UNIX (in other words, because it was new code, it would resemble, but not infringe the copyright of the UNIX OS).



Logo of BSD Linux

That simple text of the original BSD license read as follows:

> Copyright (c) 1998, Regents of the University of California
> All rights reserved.
>
> Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
>
> * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
> * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
> * All advertising materials mentioning features or use of this software must display the following acknowledgement:
>
> This product includes software developed by the University of California, Berkeley and its contributors.
>
> * Neither the name of the University of California, Berkeley nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.
>
> THIS SOFTWARE IS PROVIDED BY THE REGENTS AND CONTRIBUTORS "AS IS'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS AND CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

As can readily be seen, the license says little more than, "Do as you please, but let people know where this code came from – and don't sue us." The BSD License, and

the multiple, similar variations that followed, therefore came to be called "permissive" licenses.[25]

The availability of increasingly valuable code under permissive licenses had two predictable consequences: people used the code, and some of them used that code to make money. Since the license did not require commercial users to make their new code available on a similar basis, however, two more predictable things happened: First, such licensees often made the code they wished to sell available under proprietary licenses, and second, many developers that might have otherwise been happy to work gratis on code made available under a permissive license instead went to work for the high-paying, commercial vendors. Soon, there were multiple commercial, proprietary descendents of BSD Unix, including the version that helped launch Sun Microsystems.

The first open source licenses said little more than "Do as you please, but let people know where this code came from – and don't sue us."

Among those who were troubled by this behavior was Richard Stallman, who vowed to stop it. What Stallman did was to craft a license that would impose conditions on the reuse of FOSS that would map to the community values that he espoused. The result was a new type of license – the GNU General Public License, or GPL, already mentioned in the previous section of this article. The GPL was intended to impose obligations on the user that would guarantee that any modifications created by the licensee would be available on terms that would comply with the Free Software Definition (quoted earlier), principally by requiring that the licensee would distribute source code as well as binary code, and by prohibiting the licensee from adding any restrictive conditions that would subvert developer freedoms.

Stallman gave the name "copyleft" to the provisions that accomplished the more innovative of these goals. Because a license including copyleft terms restricted licensees to release their modified works only under license conditions that were in harmony with the terms of the original license, this category of agreements came to be called "restricted" licenses.

The evolution of the GPL: The first version of the GPL was based on precursor licenses used with GNU Project component programs, and allowed multiple FOSS programs to be combined more easily. It was first used in 1989, and amended in 1991, at which time a somewhat more permissive license adapted for use with libraries was also released. That license was initially called the Library General Public License, or LGPL. v.2 (to match the new version of the GPL, with which it harmonized), and later as the Limited General Public License.

The major evolutionary change from the first to the second version of the GPL was the addition of a broader, more free form legal obligation that Stallman called the

[25] Later versions of the BSD license eliminate the third bulleted term. The most commonly used permissive license today is usually thought to be the simpler "MIT License" drafted by the author and Bob Scheifler, the Executive Director of the X Consortium, which developed the user interface adopted by the GNU Project and still used in Linux distributions today. The text of that license can be found here: http://opensource.org/licenses/mit-license.php

"Liberty or Death" clause, a kind of catchall hammer clause intended to thwart any action that might result in a program downstream from the original, GPL licensor ever being able to restrict the required freedoms of its own licensees.

The third (and current) version of the GPL was not released until March of 2007, following a long and laborious process of discussions, public comments, and multiple discussion drafts. The reasons for the protracted process were several, reflecting the increasing commercial value of FLOSS programs released under the GPL (most notably, Linus Torvalds had switched the Linux kernel to GPLv2 from its earlier, permissive license), a desire to thwart certain types of behavior deemed by Stallman and others to be anti-community that had occurred in the marketplace that the terms of GPLv2 had been unable to prevent, the large number of changes and goals that the revision was meant to incorporate, and the systemic challenge of having so many cooks, both lawyers and non-lawyers alike – over 130 in all, broken up into four committees - operating within the textual confines of the same, very small kitchen.

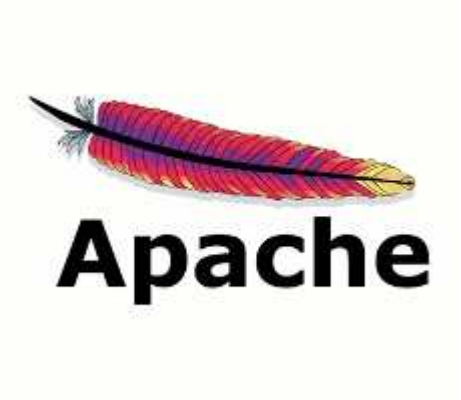
The result was a license that was applauded by many, but not all, constituencies. As a result, while new FOSS projects are more likely to be launched under GPLv3 than v2, and an increasing number of pre-existing projects are, or already have, migrated from GPLv2 to v3, some projects have either preferred not to migrate, or have been unable to do so, due to logistical difficulties (e.g., the inability to track down no longer active programmers owning the copyright to their included contributions).[26]

The GPL is unique in a variety of ways, not least among which is its iconic status as both a legal document as well as a social contract among those that adopt it. The result is that any legal challenge to the GPL would be deemed to be an attack upon the entire global community of FLOSS developers. Because so many commercial interests, and their customers, now rely so heavily upon FLOSS that is subject to the GPL, the license enjoys something of a legally untouchable status, and has attracted far fewer legal challenges than would normally be expected for such an innovative and broadly utilized license.

Other licenses: There are many other FOSS licenses in existence today, largely as a result of a process of evolution not unlike what can be observed in the biological world. After the FOSS appeared on the scene, some new project sponsors would tinker with the license of a predecessor, leading to the development of one evolutionary tree that grew out of the original BSD license. With the advent of the GPL, the same process was repeated, with proprietary vendors being particularly disposed to crafting their own variations on someone else's theme. Typically, the vendor or project that produced a new license would submit it to OSI for approval and entry on OSI's master list of approved licenses (other definitions and lists are maintained by, for example, the Debian Foundation).

[26] As of this writing, the Linux kernel remains under the GPL v2, in part because Linus Torvalds does not agree with some of the new terms added to GPL v3, and in part due to the fact that even a desired migration would be problematic, in light of the fact that the whereabouts of so many previously active, but no longer contributing, owners of kernel code is not known. Consequently, their permission to change the terms under which their code could be licensed cannot be easily obtained.

Over time, many of the branches on these initial trees withered, resulting in a number of early licenses effectively being abandoned (i.e., they are rarely selected by new projects, and existing projects that originally made use of them may have migrated to a different license). Today, it is commonly acknowledged that there are more OSI-approved licenses (a total of 64 active, non-retired license and 10 licenses that have been superseded or retired are currently listed at the OSI site), with too few differences, than makes objective sense. In fact, only a handful of licenses are employed by the vast majority of all projects. They include the following: New and Simplified BSD, MIT, Apache 2.0, Mozilla 1.1, Common Development and Distribution License, Eclipse Public License, GPLv2 and V3, and the LGPLv2 and v3.



Logo of the Apache Foundation

There have been a variety of efforts to create taxonomies of FOSS licenses in order to make it easier for new projects to select the license that best meets their goals, and for existing ones to understand the consequences of accepting code subject to other licenses.[27]

Open source practice: While the goals of FOSS are straightforward, the legalities are not. Merging code together from multiple sources into both FOSS as well as proprietary products creates many traps for the unwary, both on the business (e.g., code contamination) as well as the legal (misunderstanding what a given license term is intended to address) side of the house.

The GPL (versions 2 and 3) in particular seek to achieve a variety of significant, and sometimes subtle, legal and commercial goals, and the elements of the social contract underlying these terms is as important as the strict legal terms. Concluding that a particular type of behavior is "legal" while ignoring the way in which the behavior may be regarded in the FOSS community can result in undesired business, if not necessarily legal, consequences.

Finally, as noted, the body of case law that is available for courts to consult I crafting their own decisions relating to these new licenses is, as yet, scant. For all these reasons, anyone doing business in the open source area, and their legal counsel, should take the time to understand the emerging lore, as well as the law, before they become too-deeply involved.

IV The FOSS Ecosystem

As the production and utilization of FOSS has expanded, an increasingly varied ecosystem has evolved to promote the use of FOSS, and to support and protect those that develop and use FOSS it. The principal components of that ecosystem are as follows:

[27] OSI's category page can be found here: http://opensource.org/licenses/category

Projects and Foundations: At the top of the pyramid are the projects and foundations that develop and maintain the most respected and implemented FOSS packages, such as Web server software (the Apache Foundation), browsers (the Mozilla Foundation), the Linux kernel, the most popular Linux distributions (e.g., Fedora, SuSE, Debian, Ubuntu, Gentoo, Mandriva, and so on), and other widely adopted protocols and software (e.g., Samba, OpenOffice, and so on). Other foundations have been formed to support broader goals, such as the Eclipse Foundation, which provides a "commercially friendly" OSS development environment.

As earlier noted, projects may be supported by independent, non-profit corporations formed for that purpose (e.g., Mozilla and the GNU Project), by for-profit companies (e.g., the Fedora project, by Red Hat; Ubuntu, by Canonical; and the OpenOffice project, by Sun) that have revenue-producing businesses based upon the FOSS projects they support, or by no one at all, as is the case with the vast majority of all FOSS projects, most of which are hosted by source code repositories.

Source Code Repositories: Developing and distributing FOSS requires almost no supporting infrastructure at all, as was demonstrated by the rapid success of the Linux kernel project, which was almost accidentally launched by Linus Torvalds. Given the plummeting cost of server space, the proven ability of highly distributed development teams to form and work together, and the viral way in which IT information spreads on the Web, the only real challenge to launching a new project is attracting and holding the interest of its volunteer participants.

The conjunction of community spirit (and sometimes Web advertising opportunities or indirect corporate benefits) has therefore led to the launching of a variety of free hosting platforms, usually referred to as "source code repositories," that provide not only server space and visibility to volunteers, but a variety of other services as well, such as development tools, legal contribution agreement forms, the opportunity to designate a distribution license, and a communication platform. Perhaps the best known of these repositories is SourceForge, which was launched in late 1999, and as of early 2009, reported over 2,000,000 registered users and more than 230,000 active (and inactive) FOSS projects. Other hosts, both generic as well as more likely to host projects in certain IT areas, include RubyForge, LaunchPad and JavaForge.

Commercial Code Repositories: Not surprisingly, conservative, traditional corporations (and their legal staffs) have found the wild and wooly world of SourceForge projects to be disconcerting, at the same time as they have often found the output of such efforts to be commercially tempting. The result has been the creation of foundations for what might be thought of as the hosting of "domesticated" OSS (although not FLOSS) projects, with the foundation providing rule sets, legal agreements, code review, road map parameters, and other infrastructural items that give for-profit sponsors comfort that the output of the development projects that they underwrite or launch will meet their perceived

needs, while still seeking to provide enough independence that non-employees will also wish to contribute. Two bear special mention:

Eclipse Foundation: EF was launched in late 2001 by IBM with the support of multiple partners, including Red Hat and SuSE. Its purpose was to host the creation of open source software development tools, based upon a platform that IBM had developed and made available as open source for that purpose. As stated in EF's first press release, EF would provide:

Eclipse Foundation logo

> …a common set of services and [establish] the framework, infrastructure and interactive workbench used by project developers to build application software and related elements….The Eclipse Platform provides source code building blocks, plug-in frameworks and running examples that facilitate application tools development. A complete sample plug-in based integrated development environment for creating Java applications (JDT) is included. Code access and use is controlled through the Common Public License allows individuals to create derivative works with worldwide re-distribution rights that are royalty free.[28]

However, EF was not initially formed as an independent organization. While it was managed by a "Board of Stewards," IBM retained various rights that somewhat limited the appeal of the project to the marketplace at large. Eventually, IBM agreed to spin EF out as an independent legal entity. The new, self-governing organization was announced on February 2, 2004, with a membership and governance structure reminiscent of that of a standards consortium, but with additional features adapted to accommodate open source technical participation on a more independent and community accessible basis.[29] EF became much more successful after this transition. Today, it boasts many active projects in a variety of areas, and its membership has doubled to more than 160 companies (both large and small), non-profits and universities.

CodePlex and CodePlex Foundation: In May of 2006, Microsoft launched a SourceForge-like site called, CodePlex.com to host open source code development generally, and in particular to spur OSS development around its .Net framework.[30] That site has been successful, and today hosts many projects. As the latest in its tentative steps towards engagement with OSS development, Microsoftannounced the formation of the CodePlex Foundation in September of 2009 as a new non-profit foundation.[31] The mission, governance structure, and level of independence

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[28] Eclipse Foundation Forms to Deliver New Era Application Development Tools, Press Release (November 21, 2001), *at:* http://www.eclipse.org/org/pr.html

[29] Eclipse Forms Independent Organization, Press Release (February 4, 2004), *at:* http://www.eclipse.org/org/press-release/feb2004foundationpr.html

[30] Microsoft Announces CodePlex, a New Collaborative Development Portal, Press Release (June 27, 2006), *at:* http://www.microsoft.com/presspass/press/2006/jun06/06-27CodePlexPR.mspx

[31] CodePlex Foundation home page, September 10, 2009.

of the Foundation are still evolving during a 100 day transition under a Microsoft designated interim Board of Directors.

The press release announcing the formation of the CodePlex Foundation states that it was formed:

> …with the mission of enabling the exchange of code and understanding among software companies and open source communities…[and] as a forum in which open source communities and the software development community can come together with the shared goal of increasing participation in open source community projects. The CodePlex Foundation will complement existing open source foundations and organizations, providing a forum in which best practices and shared understanding can be established by a broad group of participants, both software companies and open source communities.[32]

Logo of Microsoft's CodePlex Foundation

As of this writing, the CodePlex Foundation is a work in progress, but one which demonstrates the continuing evolution of the marketplace as the traditional world of proprietary software comes to grips with the increasing importance of FOSS to IT customers.[33]

FOSS vendors: While the FOSS development model has not (as yet) often provided the golden goose that venture capital investors briefly hoped it would, there have been solid investment wins in a number of cases, including Red Hat, the most successful Linux distribution vendor and still an independent, public company, and MySQL, a popular relational database management system owned and sponsored by a Swedish company, MySQL AB. MySQL was acquired by Sun Microsystems for approximately $1 billion in February 2008.

For profit corporations do, however, reap great commercial value from FOSS, and in consequence provide an enormous amount of support for FOSS, not only through direct monetary contributions to projects and supporting institutions (such as the Linux Foundation), but by allowing (or directing) their employees to participate in FOSS projects, which in turn redounds to their own benefit in a variety of ways (e.g., by gaining first-hand familiarity with code evolution as it happens and future direction as it is decided).

Major multinational companies that have made particularly visible contributions and strategic commitments to FOSS include Google, Hewlett-Packard, Hitachi, IBM, Oracle, Motorola, NEC, and Sun Microsystems, among many others.

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[32] Ibid.

[33] I have written two extensive analyses of the initial governance structure and business plan of the CodePlex Foundation, which appear in this issue of Standards Today. They originally appeared in the Standards Blog, where they can be found here: http://www.consortiuminfo.org/standardsblog/article.php?story=20090914102959510 and here: http://www.consortiuminfo.org/standardsblog/article.php?story=20090930123746629

Promotion, support and protection: An extremely varied mix of non-profit entities has been founded to support, promote, and protect either FOSS in general, or particular FOSS software products in particular. As a gross generalization, they fall into two categories: those founded by groups of individual developers, sometimes with corporate support, and those founded by corporations, usually hoping for community participation.

Logo of MySQL ABS

Two organizations of the former type that have already been discussed in detail are the ***Free Software Foundation*** (FSF) (formed to promote the Free Software Definition and support the GNU Project, and later undertaking additional work, such as the evolution of the GPL and other FOSS licenses), and the Open Source Initiative (OSI) (formed in part as a delayed reaction to FSF, and principally known today as the repository of the Open Source Definition and the list of OSI-approved OS licenses). Several organizations of the corporate-initiated kind have been formed to either protect, or to demonstrate the determination to protect, FOSS from perceived enemies. The formation of such well-funded entities was important in the early days of the commercialization of Linux, due to the potential impact of the SCO suits on prospective customers (SCO originally sued four Linux end users, although those cases were stayed while SCO, Novell and IBM engaged in serial legal warfare). These organizations continue to play important, though different, roles today for two reasons.

The first is an area of rising concern, represented by the proliferation of patent "trolls" (i.e., non-vendor companies that develop and patent technology – or simply purchase patents – for the purpose of demanding the payment of patent royalties from those that do produce products or provide services that would be infringed by the patents). The patent licensing business model is currently on the rise, and is likely to continue to cause angst to the FOSS community as new mechanisms (e.g., patent auctions) are introduced to help the owners of inactive patents monetize these intangible assets.

A more episodic concern arises from the periodic veiled, and sometimes not so veiled, threats by Microsoft to assert what it claims are 235 patents infringed by popular FOSS software, such as Linux, OpenOffice, and email messaging programs.

Examples of these defensive, and sometimes offensive, organizations are the ***Linux Foundation***, which was formed in 2005 as a result of the union of the ***Free Standards Group*** (which maintained the Linux Standards Base) and ***Open Source Development Labs*** (OSDL), formed in 2000 for a variety of purposes supportive of Linux adoption by enterprise users. Beginning in June of 2003, OSDL provided financial independence to Linus Torvalds, by making him an "OSDL Fellow," allowing him to dedicate his full time to supporting the Linux kernel. OSDL also became the funding vehicle for a "Linux Defense Fund" when the SCO litigation erupted onto the scene. That fund (still in existence) was formed to underwrite the cost of providing legal counsel for Linus Torvalds and other kernel developers in the event that they were drawn into the SCO litigation.

Today, the Linux Foundation provides a broad variety of promotional, educational, supportive and protective functions, including reimbursing travel expenses for key kernel developers, organizing and hosting community meetings and conferences, developing and hosting a variety of Web sites (including Linux.com, which it acquired in early 2009), hosting development of discrete activities (e.g., the FOSSBazaar informational site and the Moblin mobile Linux operating system project), and much more. The Linux Foundation is funded primarily by membership fees paid by its corporate members in three categories of membership (Silver, Gold and Platinum) with ascending fees.

A for-profit entity formed exclusively for protective purposes is the ***Open Invention Network*** (OIN), established in 2005 by IBM, Novell, Phillips, Red Hat and Sony with a very substantial initial capitalization in order to fund the purchase of patents that might otherwise be asserted against Linux or a variety of other important, Linux-related FOSS software. Once purchased, these patents can then be asserted defensively by member FOSS users against any companies that might allege that FOSS programs they use infringe the third party's patents. OIN seeks to increase the scope of its net of protection by recruiting additional members, and by entering into cross licenses with non-member companies under terms that allow all members and cross-licensees to use the growing pool of owned and licensed patents in the event that they are sued.

More recently, OIN has engaged in additional activities, sometimes on a collaborative basis with other Linux ecosystem members (e.g., the Linux Foundation), such as the "Linux Defenders" program, which seeks to weed out poor quality patent before they are allowed to issue, and "Linux Defenders 911," which provides a place for commercial and community members to seek assistance if they are "victimized" by parties "antagonistic to Linux and true innovation."

At the opposite end of the corporate to Floss spectrum are organizations like the Software Freedom Law Center, which has more of the character, and engages in activities more similar to, a legal aid clinic. The SFLC focuses to a much greater degree on the needs of the individual community developer and of FLOSS projects of any size, and provides free legal services to its non-profit clients. It also provides helpful publications on FLOSS topics, such as development best practices. In recent years, it has begun representing FLOSS projects in asserting the GPL against commercial company GPL licensees that may be violating its terms.

The Blogosphere: There are an astonishing number of sites, both traditionally commercial (e.g., LinuxToday, which is owned by Jupiter Media), semi-commercial (e.g., SlashDot, which takes advertising but very much has a community vibe at all levels) as well as non-commercial (e.g., GrokLaw) that focus significantly or almost exclusively on FOSS or FLOSS-related news. Some, such as GrokLaw, have generated great respect for the thoroughness and consistency of their reporting over the years, and have become the "go to" sources of information on topics such

as the SCO litigation. Many accept contributions of news (often in addition to publishing their own reporting), or pointers to news, allowing such sites to aggregate large amounts of information in real time for a global audience. As a result, not many facts (or, for that matter, rumors) of interest to the FOSS community escape the notice of Linux blogs and news sites. Such sites also often provide a rallying point for action plans to coalesce among FLOSS community members.

V Summary (and a Look into the Future)

The development of the FOSS phenomenon has been unique in a variety of ways, both social and legal, economic and political. While this process has been historically unique, what we have already witnessed may be but a harbinger of further revolutions of similar impact yet to come, as our traditionally industrial, nationally-based societies complete their transition into a more singular, globally interconnected, technology based economy and society. If this is the case, then the careful study of the FOSS phenomenon as it has developed to date, and the close observation of how it evolves in the future, will be particularly instructive.

But in either case, there can be little doubt that FOSS is here to stay, or that the commercial significance of software developed within the FOSS process will continue to grow. What is less certain is exactly how the FOSS political, social and technical phenomenon will continue to evolve in the years to come. Some of the more interesting questions remaining to be answered include the following:

There can be little doubt that FOSS is here to stay, or that the commercial significance of software developed within the FOSS will continue to grow.

- ✓ ***Political evolution:*** Will the revolutionary zeal of Richard Stallman and his supporters sustain, or, as with so many social and political movements of the past, will it dissipate as younger developers, accustomed to the ready availability of source code, begin to take FLOSS for granted?

- ✓ ***Developer leverage:*** Today, the ability of software engineers from around the world to collaborate in the development of software of great commercial value has given them unprecedented power and independence over the direction of their efforts, relative to the multinational corporations that increasingly rely upon FOSS projects to advance their own fortunes. This dependence by corporations on forces beyond their immediate control runs counter to their traditional risk-avoidance goals and strategies. Will the unprecedented influence currently enjoyed by collaborative pools of individual software engineers ("labor") sustain, or will the traditional advantages of corporations ("management") find a way to reassert themselves over time, resulting in the "capture" of the FOSS process? And if this happens, will it result in a "lose/lose" scenario, killing the creativity and energy that power the FOSS phenomenon?

- ✓ ***Legal developments:*** Some of the most commonly employed FLOSS licenses (e.g., the GPL, versions 2 and 3) have innovative features that have

as yet rarely been interpreted in court. Will they be upheld in court, and if not, how will the FOSS community revise these essential tools?

- ✓ ***Government uptake and endorsement:*** Many governments (e.g., in the European Union) favor FOSS for social, economic and policy reasons. Will FOSS become increasingly favored for government procurement, and if so, what impact will the exercise of such substantial buying power have on software development and commercialization practices generally?

- ✓ ***Best practices:*** While the best FOSS projects are extremely successful, they often depend on the skills and leadership of individuals. At the same time, the legal and economic status (e.g., unincorporated, incorporated, sponsored, and so on) of projects is as likely to have been the result of accident as design. Given the increasing importance of FOSS software and the likelihood that such programs will remain useful over long periods of time, the stability and success of FOSS projects will become increasingly important. Will best practices of formation, governance, management and distribution be compiled, and if compiled, broadly implemented?

- ✓ ***Support:*** Will questions such as these be answered as the result of haphazard evolution, or through thoughtful and respectful support from affected stakeholders, and if so, by which stakeholders?

- ✓ ***Influence:*** The principles underlying FOSS have broad applicability to, and have also borrowed from, other current movements involving "openness," in areas such as content (scientific information, music files, visual images, etc.) and government access and participation. How will these concurrent forces continue to affect, and be informed by, each other?

- ✓ ***Patent law:*** Software has been broadly patentable for the last decade in the United States, but not elsewhere. Today, there is great unhappiness among a surprising range of stakeholders over what is perceived to be (at best) flaws in the U.S. patent system, from the grant of overly broad patents to the costs and variability in outcome (often depending on which Federal district court a plaintiff chooses as the venue in which to bring its lawsuit), and (at worst) the lack of justification for applying patent protection to software inventions at all. Will the courts in the U.S. continue to narrow the gate through which successful patents can be granted and successfully enforced, or perhaps overrule their own earlier holdings that software can be patented at all? If so, what will the impact be upon the software development industry, and its practices?

The answers to questions such as these will be interesting indeed. If they are the right answers, they will have a substantial and positive impact on our economy as well. Needless to say, it will be in the best interests of all if individual developers, corporations, and governments around the world are aware of the mutual benefits to be gained from FOSS, and work together to nurture the unique and revolutionary process that has already produced such useful – and perhaps surprising – results.

Appendix:

Open Source Initiative Open Source Definition

Introduction

Open source doesn't just mean access to the source code. The distribution terms of open-source software must comply with the following criteria:

1. Free Redistribution

The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.

2. Source Code

The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

3. Derived Works

The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

4. Integrity of The Author's Source Code

The license may restrict source-code from being distributed in modified form *only* if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

5. No Discrimination Against Persons or Groups

The license must not discriminate against any person or group of persons.

6. No Discrimination Against Fields of Endeavor

The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

7. Distribution of License

The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

8. License Must Not Be Specific to a Product

The rights attached to the program must not depend on the program's being part of a particular software distribution. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.

9. License Must Not Restrict Other Software

The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.

10. License Must Be Technology-Neutral

No provision of the license may be predicated on any individual technology or style of interface.

As accessed from the OSI site at *http://opensource.org/docs/osd on October 1*2, 2009

Selective Bibliography:

Core Reading: While there are many academic and popular articles that relate to FOSS, the first-hand literature relating to the theory, origins, and significance of OSS, and especially of FLOSS, is more limited. The following list is of the latter variety, and includes a number of works that anyone should consider "must reads" to gain insight into FOSS from an insider's point of view.

DiBona, Stone, and Cooper, *Open Sources 2.0: The Continuing Evolution* (O'Reilly Media 2005)
http://www.amazon.com/Open-Sources-2-0-Continuing-Evolution/dp/0596008023

Gay (ed.), *Free Software, Free Society: Selected Essays of Richard M. Stallman* (Free Software Foundation 2002)
http://www.amazon.com/Free-Software-Society-Selected-Stallman/dp/1882114981

Raymond, *The Cathedral & the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary* (O'Reilly Media 2001)
http://www.amazon.com/Cathedral-Bazaar-Musings-Accidental-Revolutionary/dp/0596001088

Rosen, *Open Source Licensing: Software Freedom and Intellectual Property Law* (Prentice Hall 2004)

http://www.amazon.com/Open-Source-Licensing-Software-Intellectual/dp/0131487876

Salus, *The Daemon, the Gnu and the Penguin* (Reed Media 2008)
http://www.amazon.com/Daemon-Gnu-Penguin-Peter-Salus/dp/097903423X

Also consider:

Lessig, *Free Culture: The Nature and Future of Creativity* (Penguin 2005)
http://www.amazon.com/Free-Culture-Nature-Future-Creativity/dp/0143034650

Wheeler, David, Why Open Source Software / Free Software (OSS/FS, FLOSS, or FOSS)? Look at the Numbers! (Revised April 16, 2007)
http://www.dwheeler.com/oss_fs_why.html

Ongoing commentary: The number of Linux and FLOSS-related blogs and news sites are legion. Here are three examples that provide active, ongoing commentary from a range of viewpoints:

Asay, Matt: The Open Road (CNET.news.com): *Matt is a prolific poster, and writes from the business/OSS point of view*
http://news.cnet.com/openroad/

Jones, Pamela: Groklaw: *PJ is a champion of the FLOSS viewpoint, and has been the "go to" authority for reporting on legal news of significance to FLOSS for years. Groklaw is particularly known for its thorough coverage of the SCO litigation. The site has a very active community of followers and participants, and PJ's posts always inspire extensive discussions)*
http://www.groklaw.net

Linux Foundation Blogs: *Includes the blog entries of multiple authors, including LF Executive Director Jim Zemlin, Community Manager Brian Proffitt, and (occasionally) Linus Torvalds. My blog entries are cross-posted to the LF site as well*
http://www.linuxfoundation.org/news-media/blogs/browse-blogs