

The Business Value of Open Source Software

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March 26, 2010

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Abstract

Open source is more than just a category of software. It is at once a movement, a philosophy and a new form of intellectual property. It is viewed by some as a shining example of group effort for the common good, but is viewed by derision by others who see it as a cancer eroding the value of intellectual property. Despite these divergent views, the software currently developed and made available under open source licenses can provide significant value for a business willing to use it. This paper explores the modern open source movement from the 1980's to today, and details a number of case studies which demonstrate the value of using the software instead of similar proprietary software products. It provides a perspective on the total cost of ownership of open source software and details a framework for evaluating the use of open source in a business enterprise.

Introduction

Open source is a nebulous concept at best. To some, it is a philosophy that involves the free sharing of information. For them society is enriched by innovation and growth resulting from a vast shared knowledge base. To others, open source is more nefarious. It is instead a philosophy that runs counter to the concept of intellectual property. Under this interpretation, growth and innovation are hampered by information sharing because the incentive for innovation, economic gain, has been eliminated.

Despite these divergent interpretations open source software has a large installed base across a broad cross-section of business software. As users of open source software, businesses have found improved value, quality and security in the use of these technologies. Software companies like Red Hat, Canonical and others redistribute the software and charge for services. These successes have shown that profitable business models can be built upon open source licensing.

This paper will examine the potential for the use of open source software in a business enterprise. It will first provide a historical perspective on the open source movement. The current landscape of business software will be examined and a framework for evaluating the total cost of ownership for business software will be explained. The current status of open source in business, government and education will then be presented through case studies.

History of Open Source

The modern open source software movement has its roots in the early 1980's. Prior to the 1980s there are instances of groups sharing knowledge in the form of

patents and other intellectual property but they lacked the size and formal licensing agreements of today's movement. Richard Stallman's efforts represents the earliest organized effort to promote software sharing. Prior to Stallman's Free Software Foundation there were code sharing organizations, but Stallman provided additional structure to this approach and ultimately introduced licensing to further promote the effort.

Programmers and system administrators familiar with the relatively easy access to computers in 1960's and 1970's were becoming increasingly frustrated with the difficulty of accessing and modifying proprietary computer software, software owned and legally licensed by a developer or business enterprise. This lack of sharing and the resulting inability to fix and improve licensed software frustrated Richard Stallman. In 1985, Stallman, then a programmer at the Massachusetts Institute of Technology's Artificial Intelligence Laboratory, published the "GNU Manifesto," an article which is considered the foundation for the open source movement today. The article defined the goals of the GNU (GNU's Not Unix) Project, which was created to develop a free alternative to proprietary versions of the UNIX operating system (Stallman, 1985).

Stallman challenged the typical norms of the software industry on distribution and pricing. Even though GNU software would be offered free of charge in a manner similar to public domain works, the software would not be in the public domain - there would still an owner. In addition, everyone would be allowed to modify and redistribute the software if they chose to but they would not be allowed to sell it.

In the same year that the "GNU Manifesto" was published, Stallman founded the Free Software Foundation, a non-profit organization which would distribute software and

organize the followers of the GNU Project. The software distributed by the Free Software Foundation (FSF) is free but is still licensed under the GNU General Public License (GPL). The current version of this license, version 3 (2007) is built on the concepts of sharing both the software source code and the software product (Smith, 2007).

This form of licensing was different than proprietary licenses. You could share what you had created but you could not sell it. With proprietary software, sharing is strongly discouraged since the software source code is considered intellectual property. (This lack of sharing and the resulting inability to fix and improve licensed software frustrated Stallman.) With GPL, a legal environment was created where sharing was allowed and ownership of the work was maintained.

Similar software licenses were later developed which are variations on the open source license. These licenses often involve some component of closed source proprietary software. The term Free and Open Source Software (FOSS) is often used to distinguish completely open source software from the various hybrid licenses containing some portion of closed source.

Eric Raymond has written extensively on the benefits of the open source development model and has used the Linux operating system kernel as a prime example of its benefits. In "The Cathedral and the Bazaar" he theorizes that a flat organizational structure where all developers can see and review all of the source code and can contribute improvements as needed is much like a bazaar where many contribute and none are truly in charge. He theorizes that with complex software this approach works better than a traditional project structure which is a rigid top-down management

hierarchy. Raymond compares the top-down management structure to the process of building a cathedral (Raymond, 2000).

Businesses Software

Businesses commonly use a mix of application software to run their business. This portfolio of software includes infrastructure applications such as operating systems, databases, and basic network applications. Applications which directly support the business operation are part of this mix. Currently the majority of these these applications use the client-server model where they have a server component that handles business logic and accesses a database where information is stored, and a client component that manages the user interface. These applications include but are not limited to Enterprise Resource Planning software, Customer Relationship Management software, and Supply Chain Management software, logistical support systems, and help desk systems. Most of these systems are proprietary and have closed links to a database and client components.

Business software licenses likely have restrictions. For example, limiting the number of users of the software, or the number of machines where the software may be installed, or the time period during which the software may be used. Most of these licenses do not allow the licensee to see or change the software source code. In addition to licensing fees, a business usually pays for some level of support or maintenance, a fee which allows the business to call the software vendor if the software fails to perform as expected and provides software updates.

Software licensing is a significant part of IT budgets. In the past decade, as IT budgets have been squeezed for various reasons, businesses have revisited IT expense

items looking for ways to reduce costs. Since technical staff is often a large part of IT expenses, a significant part of IT staff outsourcing was an attempt to reduce IT budgets. Software licensing fees have been reviewed in this time frame, but IT software portfolios have resisted major change.

Business software portfolios generally contain some mix of proprietary and non-proprietary software. Proprietary software packages often have various forms of lock-ins: proprietary linkages to other software packages. Switching to a one new software application may involve changing several other applications. Proprietary document formats may require involve converting a large collection of existing documents.

Many open source proponents feel that perceptions have a great deal with business reluctance to switch from proprietary software. They argue that negative perceptions of conversion are encouraged by proprietary software vendors. These negative perceptions manifest as *fear, uncertainty, and doubt* (FUD) a concept identified by Gene Amdahl in the 1970's when his company competed against the much larger, entrenched IBM (F.U.D., 2010). The term FUD refers to an effort to raise fear of the unknown in the minds of current customers considering a switch to a rival's product. Microsoft used this strategy to convince customers to continue to use its version of DOS (Disk Operating System) instead of its competition's (Irwin, 1998). More currently, a Microsoft executive was quoted saying, "The GPLs viral nature poses a threat to the intellectual property of any organization that derives its products from GPL source" (Microsoft, 2001).

Switching to Open Source: A Framework for Evaluation

A number of costs must be considered in switching to open source software. The sum of these factors is the total cost of ownership (TCO). The categories for these costs are as follows.

acquisition-	The cost of acquiring the software. With open source, this cost is close to zero. With proprietary software, this usually represents the licensing fee and may require an annual payment.
switching -	The cost which must be incurred before the new software can be used. This may include converting data, converting documents to be used by the new software, converting networks, converting hardware, or other activities.
training users -	The cost of training those who will use the new system. This is usually some form of end user training.
training support staff -	The cost of training those who will support the new system.
implementation-	The cost of implementing the new system. This may involve installing software on servers or clients and installing all necessary components required to support the new software.
maintenance -	The cost of maintaining the new software. This includes the cost of product support, providing someone to contact if the system does not performed as planned, and the cost of receiving regular updates of the software.

Some considerations with open source software are the technical quality of the software. Some consider open source software to be more reliable and more scalable because of the approach to developing the software (Raymond, 2000). It is also possible that IT technical staff often have some familiarity with the software, so the cost of training IT staff may not be that high. Since there are no proprietary licenses with open source, there are not periodic licensing payments. The cost of licensing is zero. There may be a support contract, but that is generally much less than maintenance agreements with proprietary software vendors. Since open source software is not subject to restrictive

licensing agreements, it provides a high level of customization to the businesses.

Database conversion and/or document conversion is usually a consideration in switching costs for all software applications, not just open source.

Case Studies of Open Source Adoption

There are numerous examples of successful open source adoption in government, education, and business. Detailed reports of savings are not commonly released by business organizations which are generally careful about releasing financial information. Governments and schools are more inclined to release financial information, so case studies which detail savings can be found there. The following sections provide a series of case studies of open source usage organized by category.

Open Source in Government

Tight government budgets often lead to careful attention to expenses on the part of government divisions and the military. Many parts of the U. S. Department of Defense use Linux. Brigadier General Nickolas G. Justice stated, “When we rolled into Baghdad, we did it using open source. It may come as a surprise to many of you, but the U.S. Army is 'the' single largest install base for Red Hat Linux. I'm their largest customer” (Jmv, 2007)

Another large user of Red Hat Linux is the Federal Aviation Administration (FAA). In 2006, the FAA decided it needed to overhaul its data center operations. The preliminary plans estimated costs of \$25 million using proprietary software and 18 months to complete the overhaul. By choosing Linux, the FAA saved about \$15 million and completed the overhaul in one-third the amount of time that was originally

anticipated (ECT News Staff, 2006). Besides the cost savings, the FAA fixed reliability and scalability issues it was having with its old system.

In 2003, the country of Spain wanted to promote computer skills to its citizens. They customized a version of Linux to get the specific features they wanted. Spain has realized significant savings from this effort (Ris, 2003).

France, decided to switch its parliament to open source technologies in 2007. The government converted 1,154 French parliamentary workstations to a Linux operating system using the open source OpenOffice as their office automation software, the open source Firefox web browser as their Web browser and an open-source e-mail client (Guillemin, 2006). Before switching, they conducted a survey to make sure that the open source software suited their needs. Including switching and training costs, the French government realized savings of half a million euro in IT costs. Those in charge of implementing the switch found resistance at first but in the end, the users easily adapted to the new software. They concluded that open source technology is ready for companies and the general public (European Communities, 2008).

In addition to the French Parliament, France's Gendarmerie Nationale, or the country's national police force plans on phasing out Windows completely and running Linux on all 90,000 of its computer systems. Lieutenant-Colonel Xavier Guimard stated that the switch from Windows XP to Linux was very easy for its users. He felt that the only difference between the two operating systems were the icons on the screen and the games they offered, which in his opinion is negligible. Guimard also added that the open source technology allowed greater flexibility in selecting software vendors and made integrating with the French Government much smoother (Paul, 2009).

The South African Social Security Agency (SASSA) was able to connect fifty rural states with a Linux system. When they first started switching to Linux, they saved about \$31,000 per site. Novell helped SASSA come up a plan for implementing the technology throughout South Africa. In 2007, the thirty-nine testing sites immediately experienced lower hardware, software, and infrastructure costs (Omni, 2009)..

Open Source in Education.

Novell has been chosen to support the IT infrastructure of thirty-three German Universities which has over 560,000 students and staff. This venture is targeted to relieve high IT costs and increase flexibility. All of the desktop and server software will be provided by Novell, which already has state-wide agreements with other German Universities (Savvas, 2007).

The state of Indiana has been rolling out Linux desktops to classrooms under the Affordable Classroom Computers for Every Secondary Student (ACCESS) program. Mike Huffman, special assistant for technology at the Indiana Department of Education indicated that by using open source software their cost per computer for desktop software is in the \$5 range (Moltzen, 2006).

Open Source in Business

Market share is the dollar amount of units of a product shipped in a given time frame. In evaluating market share for the OS server market, a recent IDC survey found Linux server shipments at approximately 15 %, but experts contend that the bulk of Linux server usage is not tracked by an OEM survey since Linux is most often installed after the hardware is purchased (Vaughan-Nichols, 2010). For example, the movie Avatar required significant graphical computing power requiring the use of 35,000 CPU cores on

4,000 HP blade computers. The server operating system used was the Ubuntu Linux distribution which also runs on 90% of the desktops at Weta digital, the firm responsible for rendering the movie (Kirkland, 2010). Estimates of installed base, the number of operating system installations for Linux as a server range from between 2 percent to 30 percent. These widely divergent values that make it difficult to use the statistics as a gauge of market acceptance (Halperin, 2007).

Adoption of Linux can meet with impediments in a business with entrenched Microsoft applications. Issues can involve integration with Active Directory, the conversion of documents in various formats, and Microsoft Exchange integration. Adding to the issues a business must face in considering Linux, in 2007 Microsoft announced that Linux infringed on over 200 of its patents, though they failed to elaborate on the specifics of those patent violations (Thurrott, 2007). Despite these issues, there are numerous case studies which indicate that issues and institutional resistance can be overcome and value can be found in open source adoption. A sampling of current Linux server applications demonstrates the broad reach and durability of Linux as a server platform. The following sections provide a number of case studies by platform category.

Open Source on the Server

The growth of the Internet in the late 1990s led to a dramatic increase in Web servers. The most popular web server in the world is Apache which as of February 2010 hosts 53.84% of the world's web sites (Netcraft LTD, 2010). Many of these web sites run Linux or an open source Unix derivative as a computing platform. Databases also run on servers. Two popular open source relational database servers, MySQL and PostgreSQL commonly run on the open source Linux platform.

Amazon.com, Inc., the largest online e-commerce retailer, says that it now uses Linux in every area of its business. They started a systematic deployment in 2000 with basic tasks. In 2001, Amazon reported to the Securities and Exchange Commission (SEC) that it spent \$54 million in the third quarter of that year compared to \$71 million in the prior year's third-quarter, a 17 million dollar savings (Shankland, Kane, and Lemos, 2001). Amazon in turn sells its Linux-based E-commerce platform to other online sellers such as "Toys 'R' Us, Target, Borders Group, Nordstrom, The Gap, CDNow and the National Basketball Association" (Shankland, 2004)

The Baldor Electric Company in Arkansas builds industrial electrical components. The company operates in more than 70 countries from 76 sales offices in the U.S. and worldwide. The company runs manufacturing sites in the U.S., Canada, England, Mexico and China. Baldor consolidated servers using the Linux operating system and reduced the space required for servers by 50% (IBM-Case-Study-1, 2010).

Maines Paper and Food Service, Inc. is the second largest independent systems foodservice distributor in the U.S.. Based on requests from customers and a desire to make useful information available, Maines made a decision to bring its business intelligence applications to the Web for customer review. The solution was to run DB2 database and Cognos business intelligence running on Linux . (IBM-Case-Study-2, 2010)

Linux servers are often chosen for high-volume applications. Chi-X, a pan-European equity exchange uses the Linux operating system to handle trades. In addition, the Chicago Mercantile Exchange (CME) and New York Stock Exchange (NYSE) run Linux systems (Vaughan-Nichols, 2009).

Though Google is generally secretive about its computing environment, the company is reported to use over 400, 000 customized versions of Linux to support its operations (Google, 2010). Yahoo! is also reported to use Linux on many of its servers.

Open Source on the Desktop

Open source on the desktop is commonly composed of, but not limited to, the Linux operating system, the KDE or GNU desktop (the desktop GUI is a separate component with Linux), the Firefox web browser, the Thunderbird mail client or the Evolution mail client, and the OpenOffice office automation suite. Desktop penetration is sometimes measured using web server statistics which involves web servers processing requests gathering information about the client requestor. These statistics are not entirely accurate (a Linux client can pretend to be Windows), but do provide some useful information. According to a recent survey, the Linux desktop grew 62% from 2007 to 2008, leaving it with an estimated 2% of the desktop market. The Apple percentage of the market is much larger and Microsoft dominates with over 90% of the market (Derringer, 2009).

There are some case studies of open source successes on the desktop. After finding that they were not in compliance with Microsoft licensing agreements and paying \$65,000 in fines and licensing fees, Ernie Ball Guitar Strings decided to make the switch to open source and eliminate all Microsoft products from their business. They use a combination of Red Hat Linux as their desktop operating system and the OpenOffice office automation suite on their desktop systems. A company spokesperson indicated that contrary to analysts estimates that it would cost \$1,250 per user to switch to open source,

they did it for much less and registered an \$80,000 savings immediately by switching (Becker, 2003).

Conclusion

This paper has provided historical perspective on and examined the current status of open source software. While open source may have started as a fringe movement of disgruntled software developers, the products developed under this model power the majority of the Web and have a significant presence in the software portfolio of many businesses. The value of the open source software has been proven, yet many businesses are reluctant to adopt due to a variety of potential issues.

Software switching costs cannot be generalized, so statements about the switching costs for open source software must be evaluated carefully. Given the unique nature of business software installations, each site should conduct their own evaluation before settling on an estimate of cost.

Wherever change is required there will be resistance. Large ERP implementations are notorious for being disruptive and expensive, yet businesses which have persisted and seen implementations to completion have enjoyed long term benefits. Converting to open source may incur short term expenses, but in the long term annual license fees and potential forced upgrades will be eliminated from IT expenses generating significant savings.

Reports of market share should be evaluated based on the knowledge the open source is distributed differently. Hardware bundled with software is based on agreements that tend to favor existing vendors, which in the area of operating systems is largely

Microsoft. Linux is resold by Red Hat and Novell, companies whose size and current market share are dwarfed by Microsoft. Both Red Hat and Suse Linux (distributed by Novell) can be downloaded and installed easily and legally. What Red Hat and Novell provide are additional services and support which many installations and businesses may not require.

The Future of Open Source

The potential business value has been demonstrated in a number of business cases over the past decade. Virtualization and the trend towards cloud computing have created additional opportunities for open source. Complete open source environments can be installed and configured (provisioned) in a matter of minutes, completely removing the need to commit physical hardware to the use of open source. The stability and scalability of Linux platforms have also made it one of the most common platforms for virtualization.

Open source now has a significant foothold in the mobile computing environment, with Linux embedded in Google's Android and favored by Verizon as a mobile computing platform. Google has encouraged open development on the Android platform. Likewise, new computing form factors such as Apple's iPad and a growing interest in netbook PCs has been coupled with robust new development platforms which make software development easier and more accessible to the open source developer.

New platforms and low cost, scalable and robust open source operating systems such as Linux will reduce the importance of branded operating systems among the user community or lead to a re-branding (Google's Chrome is a Linux operating system kernel and a lightweight desktop and Web browser). Microsoft's weak penetration of the mobile

market will reduce the possibility of various vendor lock-ins and persistent incompatibility issues that plagued the Windows platform raising switching costs and making transitions difficult. For these reasons, newer computing platforms are more likely to see open source applications and easier interoperability between applications providing opportunities for businesses to gain further value by committing to license-free, low-cost, robust open source software.

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