



# OSS for Vital Public Projects

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I believe that open systems are the key to increasing the rate of information availability and technological progression in our global society. I am convinced that a concentrated effort in open development will benefit society as a whole. I consider open development to be especially valuable in the context of vital projects. By vital, I refer to causes that contribute to the well being of society as a whole. Examples of these critical causes include medical research, defense, communications, and environmental resource maximization. My theory is that if we can achieve the progressive speed, quality, and reliability that past open source projects have in working for these causes, we will see an overall improvement in human life. This is the ultimate goal. I am not the first person to see open source advantages:

*"Benefits are manifold... for education, non-profits, people/groups who simply can't afford them."<sup>1</sup>*

My plan for open advocacy involves four major steps:

1. Spread awareness about the possibilities of open development for vital projects. Concentration should include educating a team/community of open developers, and then government/ influential organizations.
2. Communicate with members of government/organizations to determine their goals.
3. Develop prototype projects within the open community in order to prove the validity/possibilities of open projects to organizations associated with vital projects (AMA, Nasal, NIH, NSF, DOD, etc).
4. Begin open development for vital projects (medical research, alternative energy sources, communications).

## RESEARCH QUESTIONS

1. What is the best way to apply open software to information availability and progression of the productivity of society?
2. What types of software do we need?
3. What is the most efficient way to spread awareness of the benefits of open source?
4. How can we convince people (and corporations and government) to break old habits and embrace open systems? We must clarify the benefits of open development tools, but what is the most efficient way for doing so?

## PRODUCTIVITY

Progress yields feelings of accomplishment and self-worth for humans. The leaders of our society should support this concept in order to better the lives of our global community. After all, productive individuals comprise a progressive society.

My theory is that open source software embraces human productivity. Briefly, my evidence includes the facts that:

1. OSS<sup>2</sup> projects promote code reuse. This means that society produces progressive technology, without having to reinvent the wheel with each for each step forward. (Efficiency)
2. The economic advantages that OSS offers business include cost efficiency, which ideally can be passed to consumers. (Economical)
3. OS projects are a collaborative learning experience. Developer communities yield skilled programmers, project designers, communicators, and project managers. These individuals can be critical members of government, academic, corporate, and entrepreneurial organizations. (Intellectual enrichment/training)
4. Open source projects follow the goals of a representative sector of society rather than those of a single firm. These goals are likely to mirror those of the public. (Objectives)
5. Open projects undergo rapid development, while showing fast turnaround time from request to implementation. These efforts are also very flexible in meeting customer needs. (Customization)

6. These projects incorporate the ideas and creativity from many backgrounds. Such diverse talent bases tend to produce creative and innovative tools. These tools will help create a progressive movement for vital projects. (Diverse talent base)
7. Open projects tend to yield products that are creative, have a low error tendency, and are created with care. These projects are subject to communal testing. This situation reveals weak points, possibilities for enhancement, and errors in the code. Coding errors have no place to 'hide' within compiled code as they would in commercial products. (Quality, security and reliability)

## OPEN SOURCE AND QUALITY

In my opinion, open development yields quality products. This is due to the fact that bugs can be eliminated, ideas can be incorporated, security holes can be patched, and a community can perform comprehensive testing. These facts are clear in my mind, so I see that vital public projects as efforts that require the attributes I associate with open projects. I believe that we will find a consensus opinion that such projects must be secure, reliable, creative, bug-free, and demonstrate a high level of quality. There are four primary reasons why I believe that OSS products are inclined to a high quality.

1. Open developers are not assigned specific tasks that they may or may not enjoy, instead concentrating in areas where they are interested and talented. Most people tend to excel at that which they enjoy.
2. Open developers are typically end users of their products. When project designers/implementation teams understand the needs of a finished product, requirements are likely to be addressed attentively.
3. Discovery of errors in open software is shared and conducted within the community. When a bug is discovered, there are individuals available to correct the problem.
4. Corporations take credit for commercial products. A hired developer has no incentive to perform above the requirement (even knowing that a project is flawed). In contrast, open developers are associated with their work. Peer review is extensive, and developers will go out of their way to ensure quality of work before releasing code to peers.

## BUG IDENTIFICATION AND REPARATION

Bugs are eliminated rapidly under open developmental models. This is due to the fact that errors in code are not hidden within compiled (locked) code when source available. When program logic is visible, and developers can examine errors, bugs are accessible for remedial efforts. I will argue that bugs are fixed within commercial products no sooner than when a manufacturer has capital, initiative, and time to fix them. In open source, a capable developer before the "wrong person discovers them" can identify problems.<sup>3</sup>

## SECURITY

Open Software is inclined to foster secure products. Security breaches are often possible via the bugs, or overlooked holes in software. In open code these holes are visible and reparable. It is harder to conceal an entity from a community than it is to hide it from a corporate department. There is greater volume of testing in a community than there is time/capital for within a business. We can look to many documented facts that exemplify the high level of security in Open Software:<sup>4</sup>

1. There are companies that insure corporate technology assets. For example, J.S. Wurzler Underwriting Managers provides "hacker insurance" against system downtime and site defacement. The firm charges up to 15% higher premiums when customers use Windows rather than a GNU Linux system.

- The Bugtraq database suggests that the least vulnerable OS is OSS and that proprietary systems can have as many as twice the amount of reported holes.
- SecurityPortal compiled a list showing the average amount of time that it takes for distributors to address security issues.

| Vendor           | Reparation Time |
|------------------|-----------------|
| Red Hat Linux    | 11.23 days      |
| Microsoft        | 16.1 days       |
| Sun Microsystems | 93 days         |

- CERT reports more IIS alerts than OSS flaws. (2001 Statistics)

| Platform | # Attacks  |
|----------|------------|
| IIS      | 31 million |
| Apache   | 22 million |

**RELIABILITY**

Open software is reliable. Peer review is effective for refining a product. Several research efforts have been targeted toward comparing the relative reliability of OSS and commercial products.<sup>5</sup>

- A 10-month ZDnet experiment found that GNU Linux is more reliable than Windows NT. Identical machines were loaded with Caldera Open Linux, Red Hat Linux, and Windows NT respectively.

| Platform | Crash frequency      | Repair time |
|----------|----------------------|-------------|
| NT       | Once every six weeks | 1/2 hour    |
| Linux    | Never                | N/A         |

- Bloor Research conducted a year long trial, comparing GNU Linux with Windows NT. In the end, GNet summarized the experiment's results with, "The winner here is clearly Linux."<sup>6</sup>

**SUCCESS IN OPEN DEVELOPMENT**

Open source projects have proven to yield successful products that are used extensively in our society. Such projects include several Internet services as DNS, sendmail, Apache, and Mozilla. One must recognize that these products have kept pace with the rapid pace of the development of Internet technology. To me, this suggests that open projects can keep a fast pace and likely undergo efficient development cycles.

**Current Open Projects**

- The "eEurope" project aims to achieve an "information society for all" incorporates the validity of open source work for public projects. The plan claims that, the EC and Member States will promote using "open source software in the public sector and e-government." This will include the central government departments and agencies, local government, volunteers, the public sector and the National Health Service.<sup>7</sup>

**Success in Medicine**

I think that software is so important to our near future due to recent explorations in medical technology (ie-genetics). Humans are not quite as capable with working with such exact data. We need powerful processing (hardware and intelligent software) to understand the possibilities of this science. Can we imagine the possibilities of extending the availability of medical care if the process can be successfully, and cost effectively automated? We could avoid harsh, expensive, and dangerous drugs in many cases. We could provide care for people in remote or underdeveloped areas. Several examples of vital OSS pieces can be viewed in the medical field today.

- The Integ Hospital Info System is and integrated hospital IS. Its functions include service to surgery, nursing, wards, labs admission, schedulers and communications.
- ezDICOM is a medical viewer for MRI, CT and ultrasound images. It reads and presents images in many incompatible proprietary formats.
- Open Microscopy Environment is a database backend program for creating five dimensional analytical biological microscopy and cell-based screening.<sup>8</sup>

- OmniGene is a project centralized at the whitehead institute. This project aims to standardize biological data interchange, in hopes of streamlining communication between researchers.<sup>9</sup> OmniGene uses the web to store, access, share, and display collective stores of data. Students and professionals can add to, maintain and interchange this collective data.<sup>10</sup>
- SBaGen is what I consider to be a revolutionary open public project. This project explores the use of binaural brain waves in easing medical ailments. This effectively has eased pain, sleeping troubles, and helped stabilize moods in test patients.<sup>11</sup>

**Current Open Projects – Space/Robots/Navigation**

In addition open tools have been developed in the fields of robotics, astronomy, and geographical information systems.

- The Autonomous Systems Development Platform aims to develop navigation and behavioral software for real robots.
- GCollider is a simulation package for analyzing the possibility of a collision of two galaxies.
- The Geographical Information System Toolkit provides the tools for a GIS system according to OGIS standards.<sup>12</sup>

**ECONOMIC CONCERNS**

I feel the need to address the economic concerns associated with open projects. I was asked, "it is unclear how society can immediately benefit from simply having free software (when so much of the world doesn't even have reliable electricity." I don't associate open software with a lack of profit opportunity anymore. Open software does not have to be unprofitable just because the source code is available/free. For example, there is an opportunity for making money in supporting software. Open code is no exception. I have recognized several other methods in which to explore opportunity from open projects.

There are at least a handful of proven business models for pulling in a profit via open projects.<sup>13</sup> These include:

- Companies can market supporting services/merchandise for open (and free) code. These include distribution media, brand names, documentation, and support. Red Hat Linux sells distributions for consumers, small business, and corporations. This company also sells technical support to customers.
- Commercial firms use open source projects in order to earn a place in the market. With the validity of OSS projects proven, the firm may see a bright outlook for commercial sales. Netscape freely distributes software while building a position in the market for commercial products.
- When software is a necessary component for a commercial product, yet not the primary profit channel, businesses can also use open software. This firm has found that their interface cards and other products can use open source drivers at a lower cost than in house commercial tools.
- Companies utilize an earning process via "accessorizing." Companies market books, complete/turnkey systems configured with open software, or trivial items such as mugs, and t-shirts. O'Reilly Associates sells literature geared toward the open source community

**CASE EXAMPLES USING OPEN PROJECTS**

I have learned of several corporations, as well as governments that have recognized the appeal of open software.

**Private Sector**

There are Fortune 500 companies that have undergone open initiatives.<sup>14</sup> While my main concern in advocating OSS is not in the interest of the business sector, I do feel that it is necessary to recognize OSS here. My thoughts are that OSS has proven beneficial to large agendas, and these are the variant of project that the public sector initiates.

- IBM: Apache within WebSphere suite.
- Apple Computer: Partner with Apache, FreeBSD, NetBSD and other OSS developers for the Mac OS X platform.
- Corel: Linux vendor, Wine project.
- Netscape: Release Netscape Communicator and Netscape Navigator as open source software.<sup>15</sup>

### Corporate Decisions

Different firms express a decision for open source tools in many ways:

1. "The change from proprietary software to open source software will be as significant as the change from mainframe technology to personal computers...This will affect both home and business computing and change the way the world works."
2. "Traditional software development methods claim that open source...can not result in something reliable and well suited to customer needs. They are."<sup>16</sup>

### COMPARATIVE ANALYSIS: OPEN SOURCE VS. COMMERCIAL FIRM

A convincing argument for the move to open source software for mass public projects must address the performance of communal vs. commercial project results. I have not learned of any study fairly comparing the performance of open source projects with commercial firms in a controlled environment. Thus, I turn to the history of the industry for an analysis. It is not uncommon for business to imitate successful open works, nor is it uncommon for the open community to create projects mirroring successful (yet somehow flawed) commercial products. This happens, for example, when a firm is slow to fix various bugs in a product. I find it quite interesting to note the areas in which OSS has been so successful, that commercial firms have not even attempted to compete for market share. Sendmail is the number one MTA on the Internet.<sup>17</sup> The product is so successful that there is no incentive to develop a non-OSS tool.

1. A 2001 survey by K.J. Bernstein found that:

| % Internet email servers | Platform    |
|--------------------------|-------------|
| 42%                      | Sendmail    |
| 18%                      | MS Exchange |

2. The bind package is used in over 95% of domain name services on the Internet.<sup>18</sup>

#### OS Market

The OS market is an area in which we can examine competition between communal and commercial products. The popular search engine google.com uses gnu/Linux, while yahoo.com uses FreeBSD. Many ISPs also use OSS. Providers tend to host as many sites on one machine to cut costs. These examples are indicative of the overall picture of the industry.

#### Web Server OS Market

GNU/Linux is the number two serving OS on the Internet<sup>19</sup>

#### Web Server Market

This phenomenon of real life product comparison is visible in the web server market as well. In reality, the most 'popular' web server has always been an open source product. Netcraft's surveys find that Apache currently has twice the market share of the #2 product. Before Apache (prior to 1996), NCSA was the most popular product. (09/02)

| Platform  | Market share |
|-----------|--------------|
| Apache    | 66.04%       |
| Microsoft | 24.18%       |

### Public Sector Beneficiaries

Many public/government bodies have explored the possibilities/benefits of OSS. This phenomenon seems to have been concentrated in Europe and in Asia. A recent New York Times article reported that, "more than two dozen countries in Asia, Europe and Latin America include china and Germany, encouraging government agencies to use open source software — developed by communities of programmers who distribute the code without charge and donate their labor cooperatively debug, modify and otherwise improve the software." The following organizations have all explored/implemented Open Software in their mission:<sup>20</sup>

1. National Health Service of the United Kingdom
2. United Nations Food and Agriculture Organization

3. International Atomic Energy Agency
4. Canada has used OSS in the public Health service sector
5. Germany signed a deal with IBM via the country's Interior Minister, to use OSS to cut costs, lower dependence on a single vendor, and improve the nations' network security
6. The US consumer Project on Technology (lead by Ralph Nadir) gives reasons that the US government should support future OSS support
7. In addition, the governments of Peru, the UK, South Africa and Taiwan have expressed an interest in OS development
8. The German Ministry of the Interior forged a deal with IBM to standardize the German government on Linux and open source IT
9. China's post office runs on the platform; so too do France's culture, defense and education ministries<sup>21 2223</sup>
10. A European FLOSS study found that in Europe, Open Source software is utilized by:

43.7 % - German establishments

31.5 % - British 17.7% Swedish

The study claimed that the OSS rates in public sector were above average.<sup>24</sup>

### MILITARY OSS APPLICATION

Military and intelligence agencies in North America, Europe and Asia — including the U.S., Canada, Germany, France, England, Spain, China and Singapore — have invested in Linux systems. MITRE Corporation has done research in OSS in a military context. "A Business Case Study of Open Source Software," advocates OSS applicability in government software. In this paper, researchers claim that: "OSS encourages significant software development and code re-use, can provide important economic benefits, and has the potential for especially large direct and indirect cost savings for military systems that require large deployments of costly software products."<sup>25</sup>

1. In a separate report issued by MITRE for the DOD Information System (DISA) concluded that the abolishment of OSS would have "immediate, broad and strongly negative impacts on the ability of many sensitive and security-focused DoD groups to defend against cyber attacks." This report also claimed that the use of OSS in the Department of Defense is "widespread and should be expanded."<sup>26</sup>
2. The OSPR (Open Source Prototype Research) project aimed to analyze the performance of OSS in technical on site tests. The project conclusion claims: "Open Source Software development is a paradigm shift and has enormous potential for addressing government needs. Substantial technology leverage and cost savings can be achieved with this approach..."<sup>27</sup>
4. The paper "Open Source and These United States" by C. Justin Seiferth argues that open software may signify advantages in the US Department Defense. Seiferth claims that: "The Department of Defense can realize significant gains by the formal adoption, support and use of open licensed systems. We can lower costs and improve the quality of our systems and the speed at which they are developed...[and] increase interoperability among our own systems and those of our Allies."<sup>28</sup>

### PROJECT MANAGEMENT: CENTRALIZATION

I do believe that the long-term plan for productive open projects must include structure and organization. There should be a clearly identified central management team overseeing the project. With the benefit of many minds comes the opportunity for chaos. I don't see communication or group collaboration, as issues due to the fact OSS communities have had to collaborate using the Internet since the beginning. These communities have had to engineer effective communication models, and succeed in-group decision-making. I do feel that the issue of standardization could help streamline the development cycle for large/public projects. I would stress that it is important that this standardization cannot impede the creativity of production.

### REALISM

When one considers the amount of effort that must go into large software projects, he/she will see that the monetary and time investments are substantial. The end result is that OSS projects get the job done faster, cheaper and

more efficiently. For example, Red Hat Linux 7.1 contains over 30 million lines of source code. This effort represents an estimated 8,000 years of programming time and over one billion dollars. The release of Windows XP is also approximately 30 million lines of source code.<sup>29</sup>

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