

# FOSS: Why it is needed

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## Abstract

*Free and Open Source software is a matter of the users' freedom to run, copy, distribute, study, change and improve the software that easily can be adopted every where with less cost. This paper provides quantitative study on free and open source software (FOSS) based on some measures. The goal of this paper is to show that you should consider using FOSS when acquiring software. This paper focuses on examining FOSS on 6 factors. These factors are market share, reliability, performance, scalability, security, and total cost of ownership. It is shown clearly that FOSS will be the reflection point on the software and programming.*

**Keywords:** FOSS; Market share; Reliability; Performance; Scalability; Security, Cost of Ownership.

## 1. Introduction

Free software is a matter of the users' freedom to run, copy, distribute, study, change and improve the software. More precisely, it refers to four kinds of freedom, for the users of the software:

1. The freedom to run the program, for any purpose..
2. The freedom to study how the program works, and adapt it to your needs.
3. The freedom to redistribute copies so you can help your neighbor.
4. The freedom to improve the program, and release your improvements (and modified versions in general) to the public, so that the whole community benefits.

Free software does not mean non-commercial. A free program must be available for commercial use, commercial development, and commercial distribution. Commercial development of free software is no longer unusual; such free commercial software is very important. You may have paid money to get copies of free software, or you may have obtained copies at no charge. But regardless of how you got your copies, you always have the freedom to copy and change the software, even to sell copies.

The aim of this paper is to try explaining to all software consumers importance of using FOSS when looking for software, based quantitative measures.

In this paper a quantitative measurement approach based on some general

measures will be demonstrated along with some results that will emphasize the use of FOSS, and explain why it is needed.

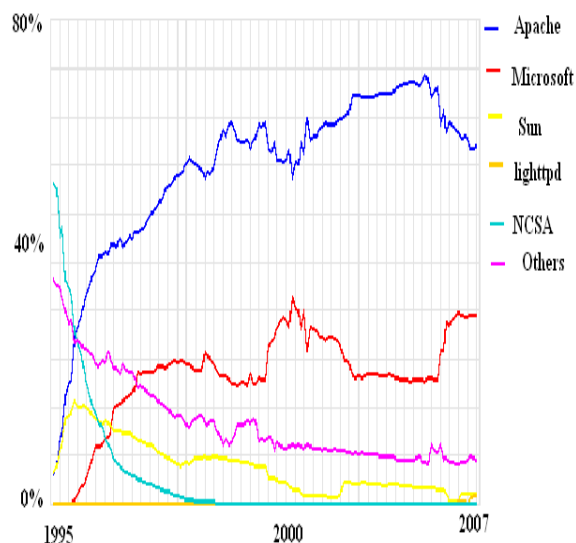
This paper is organized as follows. Section 2.0, defines market share as first measurement. Section 3.0, introduces the reliability as second measurement. Section 4.0, defines the performance as third measurement. Section 5.0, describes the scalability as fourth measurement. Section 6.0 introduces the security as fifth measurement. Section 7.0 defines the total cost of ownership as the sixth measurement. Results based on all of measurements will be presented and discussed, and short conclusion closes the paper.

## 2.0 Market Share

Many people think that a product is only a successful if it has significant market share. There is some rationale for this: products with big market shares get applications, trained users, and momentum that reduces future risk. There is an excellent evidence that FOSS has significant market share in numerous markets:

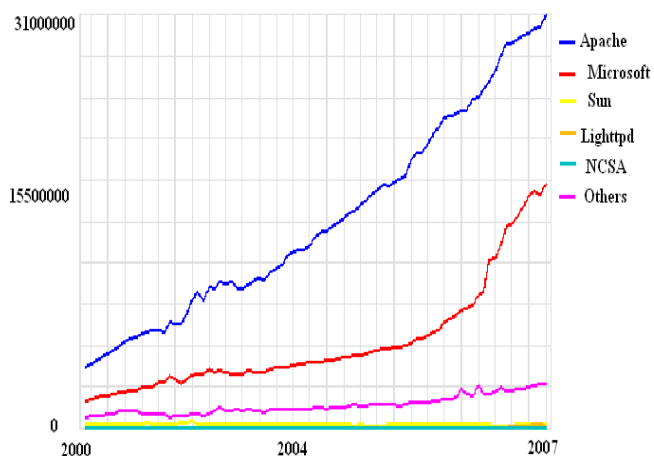
1. The most popular web server has always been FOSS. For example, Apache is currently #1 web server. Netcraft's statistics on web servers have consistently shown Apache (an FOSS web server) dominating the public Internet web server market ever since Apache grew into the #1 web server in April 1996. Before that time, the NCSA web server (Apache's ancestor) dominated the web from August 1995 through March 1996 - and it is also FOSS.

Netcraft's survey published April 2007 polled all the web sites they could find (totaling 113,658,468 sites), and found that of all the sites they could find, counting by name, Apache had 58.86% of the market, while Microsoft had 31.13%. Figure 1.1 below shows the market share for Web Servers across all domains 1995-2007.



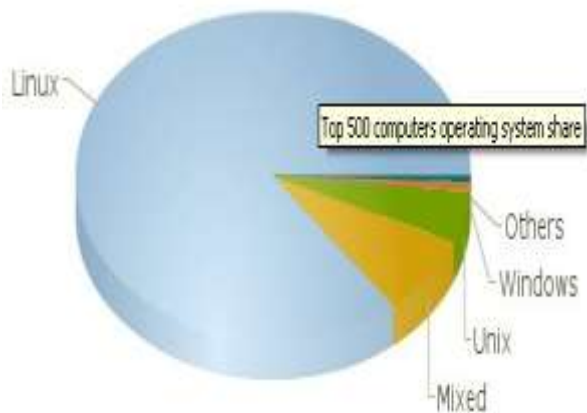
**Figure 1.1: Market Share for Web Server across all Domains**

An onther study carried out during the period 2000-2007 by Netcrafts showed how Apache is domonating 58.5% of market share compare to 34.44% to Microsoft based on counting the active web sites, as shown in Figure 1.2 below.



**Figure 1.2: Market Share for active Web Server**

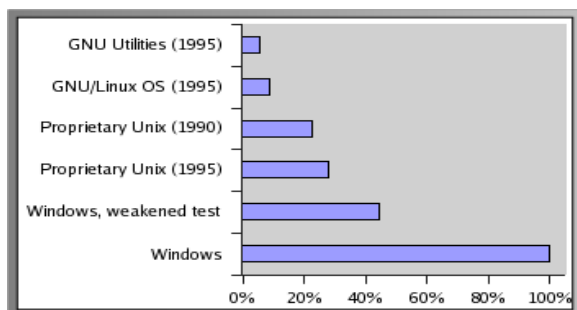
It also found (2006/2008) that Linux has bridge out and the largest computer market is in majority running Linux operating system as shwon in Figure 1.3 below.



**Figure 1.3: Operating System Family Share for 2006/2008.**

### 3.0 Reliability

Equivalent FOSS applications are more reliable, according to the Fuzz study (paper). The paper measured reliability by feeding programs random characters and determining which ones resisted crashing and freeze-ups. The study authors found that their approach still manages to find many errors in production software and is a useful tool for finding software flaws. Based on the test carried out by Fuzz it found out that the FOSS have less failure compared to microsoft as shown in Figure 1.4 below.



**Figure 1.4: Operating System Failure rate**

It also has been found by IBM that GNU/Linux highly reliable. IBM ran a series of extremely stressful tests for 30 and 60 days, and found that the Linux kernel and other core opeation system (OS) components -- including libraries, device drivers, file systems, networking, IPC, and memory management -- operated consistently and completed all the expected durations of runs with zero critical system failures. Linux system performance was not degraded during the long duration of the run, the Linux kernel properly scaled to use hardware resources (CPU, memory, disk) on SMP systems, the Linux system handled continuous full CPU load (over 99%) and high memory stress well, and the Linux system handled overloaded circumstances correctly. IBM declared that these tests demonstrate that “the Linux kernel and other core OS components are reliable and stable ... and can provide a robust, enterprise-level environment for customers over long periods of time.”

Also a study has been carried out by Syscontrol AG's, found that Sites using Microsoft's IIS web serving software have over double the time offline (on average) than sites using the Apache software, according to a 3-month Swiss evaluation. This can be illustrated by Table 1.1

**Table 1.1: Average Downtime**

Downtime	Apache	Microsoft	Netscape	Other
September	5.21	10.41	3.85	8.72
October	2.66	8.39	2.80	12.05
November	1.83	14.28	3.39	6.85
Average	3.23	11.03	3.35	9.21

One problem with reliability measures is that it takes a long time to gather data on reliability in real-life circumstances. Thus,

there's more data comparing older Windows editions to older GNU/Linux editions. The key is that these comparisons are fair, because they compare contemporaneous products. The available evidence suggests that FOSS has a significant edge in reliability, at least in many circumstances.

#### 4.0 Performance

Comparing GNU/Linux and Microsoft Windows performance on equivalent hardware has a history of contentious claims and different results based on different assumptions. FOSS has at least shown that it's often competitive, and in many circumstances it beats the competition.

In a study carried out by Ed Bradford (manager of Microsoft Premier Support for IBM Software group, 2002), he published *Managing processes threads* in which he compared the performance of Red Hat Linux 7.2, Windows 2000 Advanced Server ("Win2K"), and Windows XP Professional ("WinXP"), all on a Thinkpad 600X with 320MiB of memory. Linux managed to create over 10,000 threads/second, while Win2K didn't quite manage 5,000 threads/second and WinXP only created 6,000 threads/second. In process creation, Linux managed 330 processes/second, while Win2K managed less than 200 processes/second and WinXP less than 160 processes/second.

It also found by eWeek found in its tests that the FOSS program MySQL was quite comparable to the proprietary Oracle database program, and the pair outperformed other proprietary programs.

#### 5.0 Scalability

More recent data from hows an increasing trend (Jay Lyman's) in using FOSS, article *Linux continues supercomputer domination*

notes that on the November 2005 Top500 list, 78% of the world's fastest machines (391/500) rely on Linux, far more than anything else. Seven of the top 10 systems are running GNU/Linux (the other three run AIX, UNICOS, and Super-UX), and as with the March 2005 survey, the fastest supercomputer in the world runs on GNU/Linux. In contrast, "Microsoft Windows didn't even turn up on the list." Erich Strohmaier, co-founder and editor of the Top500 list, said that the OSS/FS "Linux is the dominating OS in the supercomputing community and will keep this role... If anything, it will only enlarge its prevalence." In fact, he believes that "no other operating system is likely to be used as much as [GNU/]Linux in the foreseeable Top500 future." Strohmaier said there were at least two reasons for this: GNU/Linux was more cost-effective, and that it matches what many organizations already run on their servers. Instead, GNU/Linux "has become an industry standard in this community, and any other OS trying to break into this market (Mac OS X, Windows, etc.) would have to fight a steep, uphill battle."

#### 6.0 Security

Quantitatively measuring security is very difficult. However, here are a number of attempts to do so, and they suggest that FOSS is often superior to proprietary systems, at least in some cases. Study will focus comparing FOSS to Windows systems,

Communications of the ACM published "Increased Security through Open Source" by Hoepman and Jacobs, 2007, which stated that "We believe open source software is a necessary requirement to build systems that are more secure.... opening the source of existing systems will at first increase their exposure... However, this exposure (and the associated risk of using the system) can now be determined publicly. With closed source

systems the perceived exposure may appear to be low, while the actual exposure... may be much higher. Moreover, because the source is open... the period of increased exposure is short. In the long run, openness of the source will increase its security... [and] it allows users to make a more informed choice about the security of a system....”

Also The European Parliament approved A5-0264/2001 which calls “on the Commission and Member States to promote software projects whose source text is made public (open-source software), as this is the only way of guaranteeing that no backdoors are built into programmes [and calls] on the Commission to lay down a standard for the level of security of e-mail software packages, placing those packages whose source code has not been made public in the ‘least reliable’ category”.

A 2002 survey of developers found that GNU/Linux systems are relatively immune from attacks from outsiders. Evans Data Corp.’s Spring 2002 Linux Developer Survey surveyed over 400 GNU/Linux developers, and found that Linux systems are relatively immune from attacks from outsiders. Even though computer attacks have almost doubled annually since 1988 (according to CERT), 78% of the respondents to the GNU/Linux developers survey have never experienced an unwanted intrusion and 94% have operated virus-free. Clearly, the survey shows that GNU/Linux “doesn’t get broken into very often and is even less frequently targeted by viruses,” according to Jeff Child (Evans Data Corp.’s Linux Analyst); and claims that “Linux systems are relatively immune from attacks from outsiders.” Child notes that it’s much harder to hack a knowledgeable owner’s system (and most Linux developers have hands-on, technical knowledge) and that because there are fewer desktop GNU/Linux systems there are fewer viruses being created to attack GNU/Linux. The developers being surveyed attributed the low incidence of

attacks to the Open Source Software (OSS) environment; “more than 84% of Linux developers believe that Linux is inherently more secure than software not created in an OSS environment,” and they ranked “Linux’s security roughly comparable in security to Solaris and AIX ... and above any of the Windows platforms by a significant margin.”

An analysis of security reports by Nicholas Petreley, 2004 (paper: “Security Report: Windows vs Linux”) found that a much larger percentage of Windows vulnerabilities are critical compared to Red Hat Linux.

More recent summaries on 2005 by David Hammond’s suggested Internet Explorer is still more dangerous than the FOSS Firefox. This can be shown through the summary as shown in Table 1.2.

**Table 1.2: Software Dangerous**

Feature	Internet Explorer	Firefox	Opera
Historical quantity	43	21	23
Present quantity	25	4	0
Historical relative danger	121	56	59
Present relative danger	50	9	0

It appears that FOSS systems are in many cases better - not just equal - in their resistance to attacks as compared to proprietary software.

## 7.0 Total Cost of Ownership

Total cost of ownership is an important measure; it doesn’t matter if a product starts out cheaply if it costs you more down the line. However, TCO is extremely sensitive to the set of assumptions you make.

FOSS isn’t cost-free, because you’ll still spend money for paper documentation, support, training, system administration, and so on, just as you do with proprietary systems. In many cases, the actual programs in OSS/FS

distributions can be acquired freely by downloading them (linux.org provides some pointers on how to get distributions). However, most people (especially beginners and those without high-speed Internet connections) will want to pay a small fee to a distributor for a nicely integrated package with CD-ROMs, paper documentation, and support. Even so, FOSS costs far less to acquire.

Long-term upgrade costs are far less for OSS/FS systems. For example, upgrading a Microsoft system will typically cost around half the original purchase. What's worse, you are essentially at their mercy for long-term pricing, because there is only one supplier (see Microsoft Turns the Screws). In contrast, the GNU/Linux systems can be downloaded (free), or simply re-purchased (generally for less than \$100), and the single upgrade be used on every system. This doesn't include technical support, but the technical support can be competed (a situation that's not practical for proprietary software). An anti-trust lawyer would say that FOSS technical support is "contestable." In short, if you don't like your GNU/Linux supplier.

FOSS does not impose license management costs, does not in practice include noxious licensing clauses, and avoids nearly all licensing litigation risks.

OSS/FS runs faster on faster hardware, of course, but many OSS/FS programs can use older hardware more efficiently than proprietary systems, resulting in lower hardware costs - and in some cases requiring no new costs (because "discarded" systems can suddenly be used again). For example, the minimum requirements for Microsoft Windows 2000 Server (according to Microsoft) are a Pentium-compatible CPU (133 MHz or higher), 128 MiB of RAM minimum (with 256MiB the "recommended minimum"), and a 2 GB hard drive with at least 1.0 GB free. According to Red Hat, Red Hat Linux 7.1 (a common distribution of

GNU/Linux) requires at a minimum an i486 (Pentium-class recommended), 32MiB RAM (64MiB recommended), and 650MB hard disk space (1.2 GB recommended).

FOSS tends to require less ongoing administration; a survey of European governments found that administrators of FLOSS systems can handle 35% more PCs per IT administrator than administrators of proprietary systems.

In survey (2005) by InformationWeek reported that GNU/Linux was cheaper than mainframe systems, Windows, and Unix according to 70% of the

## 8.0 Conclusion

based on the survey that carried out on FOSS compared to Windows system, it is clear that large, middle and small scale enterprises should change to using FOSS as good alternative to the exist software because of its reliability, performance, scalability, security, and cost of ownership.

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