

# Open Source Software – the Alternative for Africa

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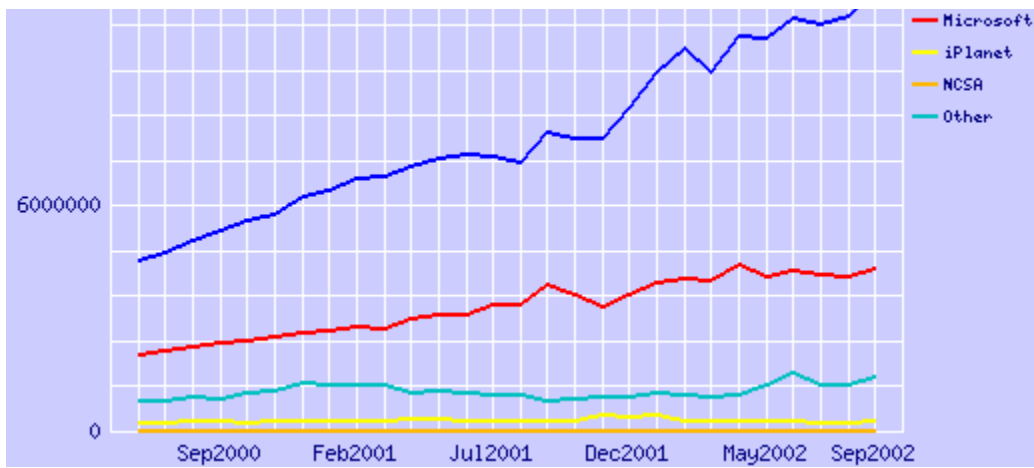
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In 1991 Linus Torvalds introduced a new paradigm in software development that is now maturing and has the potential to change the world. Torvalds called the program Linux, and it is Linux that gave the real boost to the Open Source Software philosophy.

(<http://cruel.org/freeware/cathedral.pdf>). This philosophy flies in the face of the accepted software development practices of today. Unlike Windows, Linux is free and can be customized to suit very specific individual needs because the source code is available online for anyone to edit. What this means effectively is that where propriety software is developed in-house and then released, Open Source software is under constant development because anyone in the world can change the code (<http://www.gnu.org> and <http://www.fsf.org>).

The basic idea behind open source is very simple: When programmers can read, redistribute, and modify the source code for a piece of software, the software evolves. People improve it, people adapt it, people fix bugs. And this can happen at a speed that, if one is used to the slow pace of conventional software development, seems astonishing. The open source community has learned that this rapid evolutionary process produces better software than the traditional closed model, in which only a very few programmers can see the source and everybody else must blindly use an opaque block of bits ([www.opensource.org](http://www.opensource.org)).

The difference between Open Source and Closed Source (proprietary) software paradigms goes deeper than just the fact that it is 'free' or 'open'. The underlying assumptions of software and software development are challenged by the Open Source movement. Erik Raymond tried to illustrate this paradigmatic difference by using the metaphors of the 'Cathedral' and the 'Bazaar'. The cathedral symbolizes commercial software development. The software is based on a thorough analysis and design specification and developed in a closed environment with dedicated software engineers. Testing plays an important part in the



cathedral paradigm. The software is tested until there are no more known bugs before it is released to the public. Once released, a new or updated version will be prepared in the same way. In the bazaar on the other hand, describes the Open Source paradigm. Within this paradigm, a single programmer or a group of programmers prepare a first version of the software. The software is released in a rudimentary forms, but with the code and unfortunately also with bugs. It is for the community to use, expand and further develop the software. Raymond illustrates the success of the bazaar approach with examples from Linux and Fetchmail, where a wild bunch of uncoordinated programmers provide widely used programs.

The Open Source movement is gaining momentum. More and more organizations are using tools that have been developed publicly. The best example of the success of an Open Source Software is the Apache Web server. [Netcraft's statistics on web servers](#) have consistently shown Apache (an OSS/FS web server) dominating the public Internet web server market ever since Apache grew into the #1 web server in April 1996. In September 2002, Netcraft counted more than 1,2 Million active websites using Apache, this is 66% while the runner up, Microsoft has a market share of 24%. The figures are summarized below.

This trend is reflected in the operating systems that is used. Netcraft probed the operating systems and found the following figures.

OS group	Percentage (March)	Percentage (June)	Composition
Windows	49.2%	49.6%	Windows 2000, NT4, NT3, Windows 95, Windows 98
[GNU/]Linux	28.5%	29.6%	[GNU/]Linux
Solaris	7.6%	7.1%	Solaris 2, Solaris 7, Solaris 8
BSD	6.3%	6.1%	BSDI BSD/OS, FreeBSD, NetBSD, OpenBSD
Other Unix	2.4%	2.2%	AIX, Compaq Tru64, HP-UX, IRIX, SCO Unix, SunOS 4 and others
Other non-Unix	2.5%	2.4%	MacOS, NetWare, proprietary IBM OSs
Unknown	3.6%	3.0%	not identified by Netcraft OS detector

Other good news for OSS movement ([http://www.dwheeler.com/oss\\_fs\\_why.html](http://www.dwheeler.com/oss_fs_why.html)):

- Sendmail is the leading email server
- PHP is the leading server-side scripting language
- OpenSSH (Secure Shell) is the Internet's #1 implementation of the SSH security protocol

At the users desktop, Open Source Software has not penetrated so well. At the moment GNU/Linux has a market share of 1.7%, but it is increasing. There are good reasons to expect growth. Davis Wheeler identifies three main reasons:

1. Good OSS/FS basic client software is available (KOffice, Open Office, Mozilla)
2. Microsoft is raising prices (subscription based approach ('licencing 6'))
3. Governments want open systems

We are on the eve of change. A growing number of countries are starting to consider Open Source Software as a serious alternative ([www.apc.org](http://www.apc.org)). Brazil is one of the countries that has actively pursued the open source model. It was here that the first law regarding the use of open source software in the world was passed in March 2000

(<http://www.pernambuco.com/tecnologia/arquivo/softlivre1.html>). Brazil is one country that has a few experiences regarding policies to adopt open source software that have been successful, notably in the states of Rio Grande do Sul and Pernambuco. Also, the Brazilian Navy has been using open source software since last year. The South African is also a forefront player. In the wake of these developments, the South African government released a policy framework document in September 2002 by the open source work group of the Government Information Officers' Council (GITO), recommending that government "explicitly" support the adoption of open source software as part of its e-government strategy (<http://www.itweb.co.za/sections/computing/2002/0209091122.asp?O=FPL>) after a comprehensive study of the advantages and pitfalls of OSS for government requirements. The government's department of Communication has already begun the move to Open Source in

Africa by adopting Linux as their operating system. The South African government plans to save 3 billion Rands a year (approximately \$338 million USD), increase spending on software that stays in their country, and increase programming skill inside the country. South Africa reports that its small-scale introductions have already saved them 10 million Rands (approximately \$1.1 million USD).

Other countries are following. Similar moves are discussed by Taiwan, China, Peru, the UK and Germany<sup>1</sup>.

The most obvious advantage of Open Source software is cost. For Open Source software users (individuals and organizations) pay no licensing fee. Cost reduction is increasingly important in Africa, when less donor money becomes available. However, the "openness" and flexibility of Open Source software is more important when considering the question of sustainability in Africa. Open Source software can be customized and constantly revised to develop and change with the needs of the user. And where propriety software is very hardware intensive, Open Source software can be run on computers that are "obsolete" because it has been streamlined and customized accordingly.

South Africa's National Advisory Council on Innovations summarizes the major benefits of the open source software and the open standards as promoted in the bazaar paradigm (NACI January 2002- <http://www.naci.org.za/docs/opensource.html>):

- Reduced costs and less dependency on imported technology and skills
- Affordable software for individuals, enterprise and government
- Universal access through mass software rollout without costly licensing implications
- Access to government data without barrier of proprietary software and data formats
- Ability to customise software to local languages and cultures
- Lowered barriers to entry for software businesses
- Participation in global network of software development

Many parallels can be drawn between the Open Source philosophy and the African idea of "Ubuntu", which means that people [and ideas] grow and develop through other people. The

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<sup>1</sup> Bundesrechnungshof fordert Einsatz von Open Source, 25.02.2002, <http://www.heise.de/newsticker/data/anw-25.02.02-004/>

major challenge to bridge the growing technological and digital gaps (also labeled the “digital divide”) is to marry the community spirit of Africa with the community spirit of Open Source.

### **Open source initiatives in Africa**

Except for the developments in South Africa, the rest of the continent remains quiet in the active participation in the Open Source community. The reasons for this silence are not researched yet.

An new initiative with good potential is the Open Source Foundation for Africa (<http://osfa.allafrica.com/>). The initiative started during the ICT policy and civil society workshop in Addis Ababa, Ethiopia, when 82 participants from 25 different countries invited by [APC](#), [Article 19](#) and [UNECA](#) assembled to discuss ICTs in Africa. The workshop participants agreed that open source software is paramount to Africa's progress in the ICT arena, and began work on a coordinated approach to support open source development, distribution and integration. The Open Source Foundation envisions a future in which governments and the private sector embrace open source software and enlist local experts in adapting and developing appropriate tools, applications and infrastructures for an African technology renaissance. They foresee South-to-South cooperation in which students from Ghana to Egypt and Kenya to Namibia develop programs that are then adopted by software gurus in Nigeria, South Africa and Uganda in order to narrow the digital divide. At the moment this initiative is still in a talking mode, but we hope it will start to act soon.

At Uganda Martyrs University two projects were initiated last year. The first, also the most ambitious one, aims at replacing all proprietary software at the university campus. At the moment the first objectives are reached. In the second project we aim to revive old 386 computers in order to distribute them to local schools. Old computers are not, as most of the people in the industry think, useless and they are available in plenty. Mechanically they are still working in most of the cases, but they are outclassed by the software industry. New software requires too much capacity of the computer and the older software that is needed to get some performance is no longer available. On the basis of the work of the developers of IBM (<http://www-106.ibm.com/developerworks/linux>), the ICT team of the university, together with the University of Nijmegen in the Netherlands and a small German consulting firm, are trying to implement a lightweight Linux version. When successful, a new standard

distribution for primary and secondary schools can be prepared that can be used on donated computers.

## **Conclusion**

Adopting Open Source software paradigm in Africa provides important advantages and creates new opportunities. The most important advantage that access to the source code is that it allows the development of streamlined software for older types of hardware. The financial situation of many countries in Sub-Saharan Africa does not allow large investments in new and modern hardware. Streamlined software can extend the lifespan of computer hardware without compromising on functionality. At the same time it reduces costs arising from software licenses. The openness of the source code of the software also enables to learn from experiences of software developers world-wide and develop a technical pool of skills as people can be trained how to program and develop it. This move towards sustainable technology development in Africa is something that must be encouraged, as it will represent a significant change in the technological relationship between the North and the South, as we will no longer have to rely on the technical expertise of those in the First World. And this represents the first true step towards true sustainability.

**Origins:** Bruce Perens wrote the first draft of this document as "The Debian Free Software Guidelines", and refined it using the comments of the Debian developers in a month-long e-mail conference in June, 1997. He removed the Debian-specific references from the document to create the "Open Source Definition."

## The Open Source Definition (version 1.9)

### 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. The 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. The License must be technology-neutral**

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