



## **Are Gales of Creative Destruction Beginning to Blow in the Software Sector?**

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## **Abstract**

Recently the long and uninterrupted growth of market share of Microsoft in the server market has come to an end. The market arrival of ‘free/libre and open source software’ (FLOSS) is responsible for this dramatic change. This paper examines the peculiarity of ‘free/libre and open source software’ and the reasons for its dramatic market climb, with particular reference to the government sector - a sector where FLOSS has made important advances. The discussion includes a review of arguments against and in favour of the new software in public administrations, including its relation to the State’s mission of public good. A final section before the conclusions provides an overview of policy and use of FLOSS in national, city and regional government.

# Are Gales of Creative Destruction Beginning to Blow in the Software Sector?

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## 1 Introduction

A recent *Business Week* article under the name “The Linux, Special Report,” depicted the rise to market credibility of “free/libre and open source software” (FLOSS) in the world of industrial and financial business.<sup>1</sup> It reported a rise to 13.7% market share in the server market in a period of three years – a dramatic rise when considering that it meant the simultaneous end of the long and uninterrupted growth of market share by Microsoft NT/Windows in the server market. Indeed, for the first time a Microsoft’s long climb that reached a peak of 59.9% of the server market in 2002 has this year started to decline. And there is more to come since the prediction is for another 12.2% growth of market share, to a total of 25.2%, for “free/libre and open source software” in 2006.

What is “free/libre and open source software” and the reason for its dramatic market climb that threatens to overturn the seemingly unassailable market dominance of Microsoft in the server and client market? This paper aims at throwing light upon this new development in the global software market. It does so by looking at the rise of the new software in the government sector – a sector that shows characteristics particularly promising for its growth in the years to come.

The discussion is structured in the following major sections. Sections 2 and 3 deal with the characteristics and reasons for the name “free/libre and open source software” (FLOSS) and the challenge it presents to “proprietary software.”<sup>2</sup> Section 4 reviews the arguments against and in favour of the new software in public administrations, including its relation to the State’s mission of public good. Section 5 follows with a selective overview of policy and use of FLOSS in national, city and regional public administrations. The final section is the conclusion.

## 2 Free/libre and Open Source Software (FLOSS)

The radical idea challenging the heart of the “proprietary (closed)” way of making business in software originated with Richard Stallman. Back in September 1983, Stallman announced that he was to commence work on a Unix-like software system called GNU (for GNU’s not Unix) that everyone would be free to use, change, share, and improve. Work started in 1984 and in 1985 Stallman released the first major product of the system (GNU Emacs), along with his GNU Manifesto on free software.<sup>3</sup> He also created the Free Software Foundation (FSF)<sup>4</sup> to give institutional visibility to the GNU project and the “free software” movement. Most critically, Stallman began to

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<sup>1</sup> *Business Week*, The Linux, Special Report, 3 March 2003.

<sup>2</sup> Some authors prefer to talk of “closed software” rather than “proprietary software” given that the latter does not excluded opening the source code for access to others. Here however proprietary will also imply closed for access to source code.

<sup>3</sup> The concept of “free” in Stallman’s meaning is related to “freedom” rather than “gratis.”

<sup>4</sup> <http://www.fsf.com>

lay down the licensing principles that would bring about a fundamental challenge to the “proprietary” way of doing business. This consisted of a set of four freedoms:<sup>5</sup>

- Freedom 0 - the freedom to run a program, for any purpose
- Freedom 1 - the freedom to study how a program works, and adapt it to your needs
- Freedom 2 - the freedom to redistribute copies of a program so you can help your neighbour
- Freedom 3 - the freedom to improve the program, and release your improvements to the public, so that the whole community benefits

Later in 1989, a generic copyright cover for all GNU project software – the GNU General Public License (GPL), version 1.0, was published.

In parallel, the GNU project made important progress but had failed to develop the operating system kernel that was required to bring all the pieces together into a one single operating system. This honour went to Linus Torvalds in 1991, who as a graduate Finnish student used a \$3,500 386-computer to develop an elegant solution now known as Linux. Critically, Torvalds chose to adopt the GPL license for the Linux kernel, thus providing the critical missing piece to the GNU operating system. In time, the name Linux has become the popular way to refer to the entire operating system. But this is not only inaccurate. It is also unfair to the people who worked for almost 8 years laying the foundations of the software environment that eventually gave the Linux kernel its reason and reality.

A second innovation made by Linus Torvalds had equally momentous impact on the market emergence of what was until then as “free software.” He exploited the decentralized, collective development potential of the Internet to great benefit. He started work on the kernel, and rather than trying to complete the product alone, he decided to open the process to the contributions of others, while maintaining ultimate control on decisions. In this way, the development of Linux became the result of a collective learning environment, where the strategic task of the overall leader is to be the ultimate referee while stimulating, facilitating and maintaining the flows of ideas, knowledge, experience, etc.<sup>6</sup>

By the mid-1990s GNU/Linux and “free software” was gathering strength. The constituency began to grow rapidly and by late 1993 there were somewhere between 20,000 to 100,000 users.<sup>7</sup> The more it grew the more important became a strategic (philosophical) and tactical division that had been simmering inside the movement. The strategic division was among those who wanted to stick to, and those who wanted to move away from, the original allegiance to the concept of “free software” as related to “freedom.” The latter group saw the issue of freedom as more politically-laden and therefore dissonant with business. The tactical division originated in the confusion generated by the double meaning of the term “free” in the English language – “free” as in freedom and “free” as in gratis or zero cost. In particular, most business people would tend to think “gratis,” something that could be true or not in the business model of free software.

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<sup>5</sup> <http://www.gnu.org/philosophy/free-sw.html>

<sup>6</sup> Raymond, E., "The Cathedral and the Bazaar" (original 1997), found in <http://catb.org/~esr/writings/cathedral-bazaar/>. Also, Evans, D., *Is Free Software the Way of the Future*, March 2003. Found in <http://www.microsoft.com/resources/sharedsource/Articles/EvansNERA.msp>

<sup>7</sup> Williams, S., *Free as in Freedom. Richard Stallman's Crusade for Free Software*, O'Reilly Online Catalogue, [www.oreilly.com](http://www.oreilly.com), CA, 2002.

In 1998, this division crystallized in the emergence of the term “open source software” and its institutional expression the Open Source Initiative (OSI).<sup>8</sup> Today, the institutional split is a conspicuous feature in the development of the overall movement. The depth of the split however contrasts with the great deal of unity at technological level, since both sides recommend very much the same software, something consistent with the idea that the social innovation rather than the technical innovation is the central factor to the overall movement.

This is the reason for the use by this paper of the term FLOSS<sup>9</sup> -free/libre and open source software: “free/libre” to try to eliminate potential confusion with the meaning “gratis” by attaching “libre” (the Spanish word for free as in freedom). The use of “open source” to specify the existence of the new camp; and the use of “and” to stress their philosophical and institutional distinctiveness; and the use of “software” – all in a single phrase to emphasise the fundamental technological (software) foundation uniting the two camps into a single overall movement.

### 3 FLOSS v/s proprietary (closed) software

Until recently competition between proprietary software companies has been the dominant way of making business in the software sector. The companies have legally closed access to the source code<sup>10</sup> of their products have sought to gain market advantage, particularly by “locking” users to strategic pervasive products such as operating systems and associated application software. In addition by “bundling” software they have used their dominance in one sector to expand their conquest of other markets – old and new. As a result, the market has tended to consolidate with dominant players sustained by a governance of legal exclusion of all others from access and use of the source code of their winning products.

For many, this arrangement may have look like the “natural” way of making business with software. The “gale force” market arrival of free/libre and open source software, however, has begun sweeping the edifice of this proprietary-based arrangement, with the creative destructive potential of a Schumpeterian innovation.<sup>11</sup>

In the case of free/libre and open source software, however, the primary destructive power lies not in the technology itself where. It rather lies in the challenge to the “exclusion effect” intrinsic to the governance of proprietary (closed) software. Thus, in this case, it is the social innovation rather than the technical innovation that has triggered the change. Of course, it is early days and we shall have to wait at least a decade before the real extent of the disruptive impact of the “challenger” software

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<sup>8</sup> <http://www.opensource.org>

<sup>9</sup> The term FLOSS was first used by a team of the Maastricht International Institute of Infonomics, See Ghosh, R., Krieger, B., Glott, R. and Robles, G., *Free /Libre and Open Source Software – Survey and Study, Part 2B: Open Source Software in the Public Sector: Policy within the European Union, Final Report*, June 2002. International Institute of Infonomics, University of Maastricht (the Netherlands) [www.infonomics.nl/FLOSS](http://www.infonomics.nl/FLOSS);

<sup>10</sup> Some authors prefer to talk of “closed software” rather than “proprietary software” given that the latter does not excluded opening the source code for access to others. Here however proprietary will also imply closed for access to source code.

<sup>11</sup> Schumpeter, J., *The Theory of Economic Development*, Harvard University Press, Cambridge, 1934. Also Schumpeter, J., *Capitalism, Socialism and Democracy*, Harper & Row, NY, 1942.

becomes clear, on both the global software sector and industry in particular and the fabric of society at large.

As said, one of the market sectors where the challenge of free/libre and open source software is beginning to make inroads is that of government. Below, the paper looks at some of the key reasons for this development, as well as the evidence that sustain the proposition that government may turn out to be a leading growth sectors for the new software. The discussion makes reference to both national and local/regional government levels.

#### **4 FLOSS in Government: The Case Against and in Favour**

FLOSS is beginning to make significant advances in the public administration (PA) sector. Some of the reasons for this are found in factors such as:

- ?? Increasing richness of GNU/Linux environment as more and better software and hardware is being produced, with Intel, for instance, making chips for GNU/Linux, established software suppliers such as IBM, HP, Oracle, etc. offering software and services, and the many FLOSS volunteer programmers working collectively to improve and further the development of FLOSS.
- ?? Market opportunity offered not only to Microsoft's competitors but also to new start-up companies such as Red Hat that makes a business by selling related software, technical support, maintenance for corporations, and distribution deals with, for instance, IBM, HP and Dell.
- ?? Market opportunity offered to all those customers who for one reason or another do not wish to depend on Microsoft's software completely and hence, do not like Microsoft's market oligopoly.

For government the reasons also relate to its particular double role as service providers and guarantors of the public good. Thus as service providers public authorities find themselves under increasing pressure to deliver better services for less cost ("more for less"), while as guarantors of the public good they are under increasing pressure for security, transparency, accountability, and equanimity regarding all citizens/customers. As a CEC FPVI report<sup>12</sup> put it:

government like business requires greater efficiency, productivity, cost reductions, and treating citizens like customers. As such, they share the need for business process re-engineering. On the other hand, government, unlike business cannot choose its customers and, indeed, people are more than just customers, they relate to government as legal subjects (forced to pay taxes), users (use information), customers (hospital services) and, generally, citizens who want to be: aware, considered, recognised participants in the democratic process, expressing his/her rights. In addition, governments also have stringent requirements such as:

- ?? exemplary public service ethics with a focus on non-economic policy issues such as welfare and health of the citizen, avoidance and/or closing of social, educational and financial gaps between all groups of the public
- ?? access for all
- ?? caring for a sustainable environment, affordable public transport, etc.

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<sup>12</sup> See report prepared by Prof. Alfonso Molina for the CEC under title *Technologies for Major Business and Work Challenges - Programme Consultation Meeting*, Brussels, 19-20 April 2001, CEC, Brussels, 21 May 2001. <http://www.cordis.lu/ist/fp6/fp6consult.htm>

- ?? mainly non-market driven supply and demand for e-service. No profit incentive.
- ?? provision of institutional and service framework for wider economy.
- ?? requirement for accountability, transparency and democratic practices.

These characteristics frame the growth of FLOSS in public authorities. They also frame the debate currently raging between advocates of proprietary software and those advocating FLOSS. Indeed, the arguments and counter-arguments cover multiple dimensions from cost comparisons to issues of privacy, security, transparency as well as job creation and local/regional economic development. Thus, most analyses seek to identify the advantages and disadvantages for governments of using FLOSS vis-à-vis proprietary software.<sup>13</sup>

Not surprisingly the advantages are largely rooted in the GPL approach and the “freedoms” associated with FLOSS, while the disadvantages are rooted in the fact that volunteer programmers are often too fragmented to present a credible business proposition to large customers. Of course the latter disadvantage does not apply to the FLOSS offer of large ICT companies such as IBM, Cisco, Siemens, HP, etc.

Thus among the advantages of FLOSS for e-government, the ethical and political advantages figure prominently, especially as access to the source code has significant implications for the ability of governments to fulfil key requirements of democratic responsibility towards their citizens. This is also an area where FLOSS and proprietary software show more clearly their differences, as compared for instance to total cost of ownership (TCO) which tends to depend on multiple influences. In this respect, it is worth reproducing the key arguments given by two members of parliament – Buenos Aires’ Senator Alberto Conde and Perú’s Congressman Edgar David Villanueva Nuñez - in defence of law projects they have promoted in their respective jurisdictions.<sup>14</sup>

The main tenets of the argument given by Conde and Villanueva are based not on issues of cost but on the ability of the State to fulfil its mission. For Conde, the State’s mission regarding data processing: “is to be the guardian of the public record: to maintain updated and accurate information about the identity and patrimony of its

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<sup>13</sup> Some interesting studies are: FSFeurope, *Free Software/Open Source: Information Society Opportunities for Europe?* [www.fsfeurope.org/coposys/index.en.html](http://www.fsfeurope.org/coposys/index.en.html); Wheeler, D. A., *Why Open Source Software/Free Software? Look at the Numbers!*, [www.dwheeler.com/oss\\_fs\\_why.html](http://www.dwheeler.com/oss_fs_why.html); Feller, J. and Fitzgerald B., *Understanding Open Source Software Development*, Addison-Wesley, UK, [www.opensource.ucc.ie/uossd/](http://www.opensource.ucc.ie/uossd/); Ghosh et.al. (2002, op. cit. , note 7; IDA, *Study into the use of Open Source Software in the Public Sector*, June 2001. <http://europa.eu.int/ISPO/ida/jsps/index.jsp?fuseAction=showDocument&documentID=333&parent=chapter&preChapterID=0-17-134>. From a Microsoft’s point of view, see Smith. B. L., *The Future of Software: Enabling the Market to Decide*, March 2003. Found in: <http://www.microsoft.com/resources/sharedsource/Articles/Future.mspx> Also, Evans, D., *Is Free Software the Wave of the Future?* March 2003. Found in: <http://www.microsoft.com/resources/sharedsource/Articles/EvansNERA.mspx>

<sup>14</sup> See letter dated 8<sup>th</sup> April 2002 from Dr. Edgar David Villanueva Nuñez, Congressman of the Republic of Perú, in reply to letter from Sr. Juan Alberto Gonzalez, General Manager of Microsoft Perú, dated 21<sup>st</sup> March 2002. 2002, and criticizing Proyecto de Ley N° 1609, “Software Libre en la Administración Pública,” promoted by Congressman Villanueva. The letters are found in <http://www.hispalinux.org>. See letter dated 28.11.2002 by Buenos Aires' Senator Alberto Conde's in reply to a letter dated 4.10.2002 by CESSI – the Cámara de Empresas de Software y Servicios Informáticos a local chamber of software entrepreneurs (sponsored by the telecom companies, Microsoft and Oracle). The letters are found in <http://proposicion.org.ar/doc/gob/Conde-281102/>.

citizens, of its interactions with these citizens, of its actions, etc.” This implies that the acquisition and use of information technology by the State should guarantee the following principles:

- ?? Security of the State and its citizens by ensuring that (a) only authorized persons have access to data, and (b) no third party can deny this access
- ?? Permanence of public data by ensuring that data will be available and accessible for the useful life of the data, often hundreds of years
- ?? Transparency and free access by citizens to public information by ensuring publication of all records with exception of those that will compromise the security of the State and of its citizens as required by the law

In accordance with both parliamentarians the proprietary licensing model is incompatible with the upholding of these principles given explicit prohibitions and practical restrictions imposed on licensees regarding the execution of tasks needed to uphold the principles. Amongst them:

1. Inspection of the programme's function. Only the original author has access to the source code of the programme, leaving the State unable to ensure by its own means the security of the software in relation with its mission of public good. Furthermore, citizens who have the right to know, for instance, how their taxes are calculated or their votes counted, are also denied this right by the lack of access to the source of code of the proprietary programmes that perform these functions. It must be taken into consideration that all software processes information and it is itself information, in a special format that enables machine interpretation that, in turns, leads to the execution of anticipated actions. In this sense, it is crucial information for the citizen who has the right to have access and learn –if s/he wishes- about information that directly concern the exercise of his/her rights in a democratic society.

2. Improvement of the programme's functionality. Only the original author has the right to correct errors, modify, or add to proprietary programmes, leaving the State dependent on a single provider and, consequently, without the freedom to take the best course of action if this were to differ from the supplier's alternative.

3. Preservation of technological neutrality. Given the strategic place of software such as operating systems, decisions that correspond to the State are implicitly dictated by the author of the programme, including choice of hardware platform and application programmes.

4. Provision of services independent of licensing details. Given the confusion sometimes generated by the different and changing models of proprietary licensing, the State run the risk of disruption of services that it must fulfil by obligation in a continuous, timely and effective manner. For instance, a misunderstanding about licensing terms, a change, expiration, or a price increase could force the State to suspend services unless it satisfies the terms of the supplier.

This highly unsatisfactory situation from the point of view of the State's mission of public good may be acceptable when there is no choice, for instance, in the case of a monopolistic situation. But it is not acceptable when there is a choice that better enables the State to fulfil the principles intrinsic to its mission. Today, this choice

exists in the form of FLOSS for many programmes. They give the State permission to carry out “without limits on time nor on number or type of computers, the execution, study, correction, improvement, expansion, and adaptation of the program in accordance with the necessities of the State, not those of the provider.”

A final consideration made by congressman Villanueva concerns the role of government particularly in facilitating economic development and employment through the software sector in developing countries such as Perú and Argentina. Responding to the idea that governments’ preference for FLOSS will lead to economic losses and decline in the software sector of countries such as Perú, Villanueva points out that:

“With regard to jobs generated by proprietary software, these deal mainly with small valued-added technical tasks. At local level, personnel providing technical support to transnational companies’ proprietary software are not able to solve a bug; not necessarily because of lack of technical capacity or talent, but rather because of lack of access to the source code where the repair must happen. Free software helps create more skilled jobs as well as stimulating an environment of free competition, where success only depends on the capacity to provide good technical support and quality of service. It also stimulates the market and increases the common reservoir of knowledge, opening alternatives to create services of greater value-added and quality, thus benefiting all parties: producers, service providers and consumers.”

In addition, Villanueva argues that by enabling work with free software for the State on a large scale, the [law] project stimulates the offer of better qualified professionals, as well as an increase in the experience of national technical personnel. This in turn will place Peruvian professionals in a competitive position to provide their services nationally and internationally

Along with the advantages specific to the State mission of public good, Table 1 lists other FLOSS advantages frequently mentioned.

<b>Table 1. Points Made in Favour of FLOSS</b>	
??	Lower costs due, for instance, to savings on continuous license fees and equipment replacement as FLOSS often performs satisfactorily on cheaper and even older equipment. The savings can then be used to help the local economy, for instance, by nurturing the FLOSS capacity in the region.
??	Equal or superior reliability, performance, scalability, and security due to extensive review and access to source code
??	Possibility of “forking” into alternative code base if necessary or convenient
??	No software obsolescence as FLOSS can be modified to take account of new requirements
??	Improvements in software skills base due to the ability access, scrutinize and analyse the inner workings of the software
??	No fees per copy can be requested for modified versions
??	No need for license management and policing given that there is no danger of employees using unauthorised copies
??	Affordable software for individuals, enterprise and government
??	Participation in global networks of collaborators from all over the world, benefiting from the sharing of expertise and experience in software development.
??	Access to the international FLOSS user community, often accessible and able to assist rapidly over long distances
??	Lowered barriers to entry for software businesses as no single entity controls the future of the software.
??	Stimulation of local software industry, leading to better local capacity to satisfy Government’ needs and to significant contribution to human resource development, especially in the area of ICT. In this

respect, government is well placed to lead the switch towards FLOSS in its jurisdiction given the role in education, e-government, e-business, etc. All this would act synergistically with the saving benefits already mentioned in the first point of this list.

- ?? Finally, for those governments interested in issues of freedom and e-democracy through technology, a switch to free software in the original Stallman's version also helps to "encourage the citizens to recognize and value freedom as computer users, leading society as a whole out of the burden and limitations of dependence on proprietary software."<sup>15</sup>

In contrast, Table 2 lists FLOSS disadvantages, frequently mentioned.

**Table 2. Points Made Against FLOSS**

- ?? Not all software projects are useful or motivating to the volunteer programmers of the FLOSS constituency and this commonly implies a need for a large user base to provide the necessary volunteers. Of course, FLOSS operations seeking to make a business by developing and selling customised FLOSS services (e.g., website development) will not have this problem
- ?? Risk of sub-standard code as not all programmers are good or motivated by routine tasks of software development
- ?? Managing a FLOSS project is a convoluted process, and details are often overlooked. Difficult management of deadlines is risky, for instance, for projects with critical short-term deadlines. Funding is required for development and for a deployment system (concurrent version control, bug tracking, mailing lists, etc.).
- ?? Difficulties in modularity potentially leading to maintenance and reliability problems of FLOSS products
- ?? variety of motivations of volunteer programmers participating in FLOSS projects (e.g. anti-Microsoft, free software ideals, technical interest in coding) may blur definition of sharp a strategic focus for products
- ?? Complex hybrid FLOSS business models potentially leading to breakdown of trust. This implies a great weight of responsibility on FLOSS project leaders and champions, or gatekeepers, potentially leading to burn out
- ?? Destruction of jobs and economic opportunities by undermining software business based on proprietary intellectual property

## **5 Non-exhaustive Overview of Policy and Use of FLOSS in Government<sup>16</sup>**

In practice, it is difficult to estimate the volume of overall use of FLOSS and its particular use in the public sector.<sup>17</sup> However there seems to be large differences in FLOSS development and use both between and within EU member states, regions and cities, largely depending on the strength of government policies.

<sup>15</sup> Personal communications with R. Stallman, 13 April 2003 and 29 June 2003.

<sup>16</sup> Largely based on TeleCities, *Local/Regional Government Constituency Building (Sub-report)*, CEC Project Three Roses, IST – 2001 – 37967, April 2003. and, also, Ghosh et al. (2002), op. cit., note 7.

<sup>17</sup> Among the reasons found in Ghosh et (2002) al. are: impossibility of counting licenses; poor indication given by number of downloaded copies; poor indication given by the number of delivered pre-installed machines, and others.

## 5.1 FLOSS at National Government

Table 3 reproduces the findings of the Infonomics report by Ghosh et al (2002), regarding evolution of FLOSS at national level in some European countries.

<b>Table 3. Relationship between Policy and Developer Activity</b>				
	<b>Developers Activity</b>	<b>Implementation</b>	<b>Policy</b>	<b>Future Trends</b>
<b>France</b>	High	Ministries, Public Administration, National Education	strong	Growing Implementation, Stronger Policies
<b>Germany</b>	High	Parliament, Public Administration, Police	strong	Growing Implementation, Stronger Policies
<b>Spain</b>	Middle	Ministries, Public Administrations	starting	Growing Implementation, Developing Policies
<b>United Kingdom</b>	Middle	Public Health	increasing	Starting Implementation, Stronger Policies
<b>Austria</b>	Low	marginal	marginal	Implementation and Policy not expected in the near Future
<b>Belgium</b>	Low	National Army, Public Administration	starting	Growing Implementation, Developing Policies

Source. Ghosh et al. (2002), op. cit., note 7.

This shows the national governments of France and Germany pursuing strong policy approaches in favour of FLOSS development and implementation. Thus in France public sector institutions increasingly use FLOSS solutions for their IT systems since the end of the 1998. Among the main developments of the French Governmental Policy towards FLOSS in 2002 alone are:

- ?? *October 2002 - Report from the Working Group chaired by Hugues Rougier; Commissariat Général au Plan.* It encourages diversity of software by developing open standards and recommends the French administration to buy FLOSS in order to support modernization and offer a better public service to citizens.
- ?? *October 2002 - French legislative proposal n°117* (proposed by Mr. Cabanel, Mr. Laffitte and Mr. Trégouët) tends to generalize the use of FLOSS in French administration (PAs) and fixes the following deadlines
  - From 1<sup>st</sup> July 2003 all PAs to inter-exchange their data electronically
  - From 1<sup>st</sup> January 2004 all software used by PAs should be free, modifiable and with available source code
  - The same legislation creates an official Agency for the free software.
- ?? *December 2002 - ATICA Guidebook* to guide the selection and use of FLOSS licences by public administrations.<sup>18</sup>

In Germany the policy involvement of the Federal government in support of FLOSS is equally strong as that in France. The German government's motivation is based on the view that FLOSS offer clear political and economic benefits, manifested at three synergistic levels:

- ?? Improved security for the country as a result of reduction of dependence on monopolistic suppliers
- ?? Opportunity for further development of the German ICT industry

<sup>18</sup> Source. TeleCities, *Local/Regional Government Constituency Building (Sub-report)*, CEC Project Three Roses, IST – 2001 – 37967, April 2003.

?? Reduction of costs in the operation of public administrations. Expected savings are commonly a major criterion in feasibility studies of FLOSS adoption

The main government player driving FLOSS policy is the Ministry of Internal Affairs, with its Koordinierungs - und Beratungsstelle für Informationstechnik (KBSt) that coordinates and advises PAs on their FLOSS implementation processes. And the Ministry of Economy and Technology (Bundesministerium für Wirtschaft und Technologie – BMWI) which provides information for SME's and funds BerliOS, a platform mediating open source software and software projects like GnuPG, an encryption technology basing on OpenPGP standard.

Other European countries are not that advanced as Germany and France but the trend is for an increment of FLOSS policy and implementation activities. For instance, in Spain there is as yet no official national policy but a good number of FLOSS activities are reported, for instance, implementation of GNU/Linux and other server applications like SamBA, NFS, Zope, or OpenSSH in institutions like the Senate, the Nuclear Security Council, the Ministry of Home Affairs, and the Ministry of Justice. An important FLOSS implementation in the public sector is Virtual MAP - a project by the Ministry of Public Administration that migrated to GNU/Linux 220 servers from the established Unix system. The decision to use GNU/Linux was cost-driven, favouring low-cost hardware and a MAP GNU/Linux distribution based on Debian, along with greater investment in personalization and training. Virtual MAP's final goal is to have GNU/Linux running on MAP's 400 servers connected to 4,000 clients.

In Italy, the development of FLOSS in e-government also shows a great deal of activity.<sup>19</sup> Thus Italy's Informatics Authority for Public Administrations (Autorità per l'Informatica della Amministrazione Pubblica – AIPA) has supported a series of studies on FLOSS' development models and experimental activities. For instance, in 2000, AIPA provided funding to the Scuola Superiore S. Anna di Pisa to work on a FLOSS-based ICT protocol system. The project is known as PA-Flow and is focused on an analysis and optimization of administrative procedures in Public Administrations through the practical experimentation of tools, methodologies and multi-disciplinary products. PA-Flow is important because the implementation of new technology in PAs is a complex organizational, legal and technical process and the project is using FLOSS to face this problem. PA-Flow aims at generating software for the experimentation of FLOSS tools in the management of PAs' information flows. This is the Free Software Information Protocol System, PA-Flow, developed by Icube (a company of the CDC Group) in collaboration with the Scuola S. Anna. The software will be released with GPL license in order to encourage experimentation in the largest possible number of situations. Also important is the role of the Italian Government through the Minister of Innovation and Technology, Lucio Stanca, who created a Commission to make recommendations on FLOSS in PAs

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<sup>19</sup> Based on Di Marcello, P., L'open Source ed il suo Utilizzo nella Pubblica Amministrazione Italiana, I.A.L. - University of Malta, Tesi di master realizzata durante lo stage presso il Consorzio Gioventù Digitale di Roma, March 2003.

## 5.2 *FLOSS at Regional and City Government*

Spain is particularly well known for the policy decisions to support FLOSS at the level of local/regional public administrations. Thus the regional government of Extremadura has adopted GNU/Linux as the official operating system to be used in the 670 schools of the region. The adapted version of GNU/Linux is referred to as Linex (for Extremadura) and the region is now training 15,000 teachers to ensure the success of the transformation. For one of the poorest regions of Spain and Europe, an impressive first result has been the increase in the ratio computer/student to one computer for every two students in the classroom.<sup>20</sup> This must certainly be one of the highest computer/student ratio in the world if we consider that in Scandinavia – one of the most advanced areas in the use of ICT - Stockholm has an average ratio of 5 students per computer.<sup>21</sup> Through the use of FLOSS and the determination of the of the Extremadura government not to miss the opportunity for development opened by the information society, we find the rather paradoxical situation that one of the poorest economically (at least in Europe) has become one of the richest computationally in education. Of course, the installation of computers does not imply an automatic transformation of the pedagogical processes of education and, since this installation is recent, we will have to wait some time to see the results in pedagogical terms. But one thing is certain, Extremadura is today in a much better position than most to start working at the pedagogical processes in a regional scale, while scores of city and regional authorities are still struggling with the limited computing resources for students. One point made by the people leading the change in Extremadura is that their achievement would have been impossible without the full adoption of FLOSS and the consequent stopping of licensing payments demanded by proprietary software.<sup>22</sup>

The region of Andalusia neighbours Extremadura, so it is not surprising to find that recently, in March 2003, la Junta de Andalucía published an official decree aimed at encouraging the information society in Andalusia by establishing the conditions for the use of FLOSS by the Andalusian Administration.<sup>23</sup> Education figures prominently in the official decree, thus:

In Chapter II – *Public Services in the Knowledge Society*, its Article 11 reads:

1. Public educational centres will be equipped with ICT-based educational programmes and materials, based preferably in free software.
2. Likewise, teachers will be encouraged to produce curricular programmes and materials based on ICT or for their use in Internet, specially those developments generated by means of free software

In Chapter III – *Digital Alphabetization and Accessibility to ICT's*, Article 31 takes FLOSS support much further:

1. In the acquisition of IT equipment for public educational centres, to be used in educational activities, it is made compulsory that all hardware be compatible with operating systems based on free software. Computers will have pre-installed all necessary Free Software for the specific intended use.

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<sup>20</sup> Results of research from visit to Extremadura during June 2003.

<sup>21</sup> Results of research from visit to Stockholm during May 2003.

<sup>22</sup> Results of research from visit to Extremadura during June 2003.

<sup>23</sup> BOJA N° 55, Boletín Oficial de la Junta de Andalucía, 21 March 2003. Andalusia is one of Spain's largest Autonomous Communities. It has 8 provinces with a population of 7,478,432 inhabitants or 17% of the total population of Spain

2. The IT equipment that the Administration of the Junta of Andalusia makes available at centres of Internet public access will use Free Software products in its operation.
3. The Administration of the Junta of Andalusia will promote diffusion and use geared to the educational, personal and domestic use of Free Software. To this end an online support service will be established for the installation and use of this type of products.

In Italy, local and regional authorities are also starting to implement FLOSS initiatives and, particularly, some regional administrations are already adopting legislation on the matter.

Thus, on 2<sup>nd</sup> July 2002, the Toscana region made public a regional law on free software. Among the most important points it states:

“HEADING I – GENERAL PRINCIPLES

**Art. 1** (purpose of the law)

1. The Region favours informatic pluralism, guaranteeing access and freedom to choose in the generation of informatic platforms, thus eliminating all barriers due to diversity of standards.
2. The diffusion and development of free software is favoured ... in consideration of its positive impact on the public economy, on competition and market transparency, on the development of scientific and technological research. The Regional Administration ... privileges the use of free software.”

Along with the Toscana Region’s adoption of free software, the Firenze Council has approved (Ordine del Giorno no. 620 - 16/12/02) the creation of the new portal *People* for Firenze’s citizens and enterprises – and the software to be used will be primarily free software. Likewise, in the province of Milan, the City Council of Lodi has adopted a proposal supporting the introduction of free software as an alternative to proprietary software in the local authority. According to the Lodi Council only free software offers a paradigm of security, compatibility, accessibility and stability in such a way as to guaranteeing efficiency and productivity to the public administration, at the same time as helping to reduce the costs of updating. Other local governments adopting or considering FLOSS include: Council of Argenta, Council of Luco dei Marsi, Council of Pescara, Council of Modena and also the large Lazio region which has collaborated with IBM to realize a solution in GNU/Linux environment.<sup>24</sup>

### 5.2.1 Four brief cases on adoption of FLOSS: email server, desktop and firewall.

This section provides an idea of some of the real processes of FLOSS adoption by city and regional governments.

(1) *FLOSS Email Server Application in Nottingham City Council.* The Nottingham City Council is a major economic player and the largest employer in the City of Nottingham, with over 16000 employees. The Council has completely moved its email system to FLOSS with excellent reported results. Indeed, the reported results show major improvements regarding the key challenge facing local authorities today, namely, the delivery of better services at lower costs, or what has been referred as “more for less.” Thus, the estimated total cost after about a year, according to Heggs, is about £60,000 (including Suse’s consulting fee), amounting to a rate of £8 per end-user mailbox over a year. In addition, in the first six months the system crashed about 12 times - 6 due to failed disk drives and 6 due to the shortage of disk space – a rate

<sup>24</sup> <http://www-3.ibm.com/software/success/cssdb.nsf/cs/NAVO-5DMV8T?OpenDocument&Site=linuxatibm>

comparable to two days of operation of the older system. Considering that the email traffic on the network increased eightfold after the FLOSS system went live this was clearly superior reliability and cost-performance. For the Council's ICT staff the added bonus was an improvement in the quality of work since they can now concentrate on new projects rather than on routine support. The Nottingham City Council is certainly impressed with the results achieved by FLOSS. This means that FLOSS solutions will be given serious consideration as the Council comes up for new software investments in the future, particularly, if savings, reliability and openness similar to those achieved in the email system are possible.

(2) *FLOSS Network and Desktop Application in Central Scotland Police.* The Central Scotland Police (CS Police) faced a strategic problem. How to ensure that every office in the region has access to the same range and quality of computer facilities, regardless of location and staffing levels, and at a cost that allows the force to invest the most in servicing and protecting the public. Given the limited resources, the challenge was not straightforward for the CS Police, especially as the region has all types of communities, from heavily populated cities in the southeast to sparsely populated rural communities in the northwest. A change in Microsoft licensing policy CS Police perceived as increasing their costs and making even more difficult to fulfil the aspiration of expanding computing power to the everybody in the CS force triggered a shift towards open source. This makes use of Sun StarOffice technology, including 400 networked PC/Windows desktops shared among the 30 offices' servers and over 1000 users. The results reported by the CS Police are significant: savings of almost a quarter of a million pounds and the extension of computing applications to users who in the past would have been excluded by cost. In addition, it has been found that StarOffice has advantages in online documentation, complex calculations, and other areas while maintaining compatibility with Microsoft Office.

(3) *FLOSS Desktop Application at the West Yorkshire Police.*- The Police Information Technology Organization (PITO) for England and Wales had is supporting a trial to examine the potential issues with and benefits of, using GNU/FLOSS solutions on police forces desktops – up to 60,000 of them.<sup>25</sup> As a result, in October 2002 the West Yorkshire Police begun to take delivery of the first low cost GNU/Linux-based desktop computers as part of a trial that will migrate existing police applications to the GNU/Linux operating system (Red Hat Linux version 8) and will make use of netproject's Secure Open Desktop Architecture. The software environment includes Linux, OpenOffice, GNOME, Evolution and WINE. The GNU/Linux computers are low-cost at £299 per piece (exc. VAT) and are manufactured by the Taiwanese company GCI – with European headquarters in Telford. They come with smartcard readers –using Gemplus's smart card technology- for better security and to enable police to log on at any of them. West Yorkshire police has a total of 3,500 desktop computers with the result that wider deployment would mean substantial savings for the force.

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<sup>25</sup> "Linux Desktop Computing for UK Police," news posted on netproject's website on 20 January 2002, found in <http://www.netproject.com/blank.html>. See also *LinuxUser*, "UK police investigate desktop Linux," February 2002, p.8, available in <http://www.linuxuser.co.uk/articles/issue18/lu18-News.pdf>. And *DesktopLinux.com*, "Linux looked at for 60,000 police desktop computers," 21 January 2002, found in <http://desktoplinux.com/news/NS5941090625.html>.

(4) *Linux Firewall Application at Schwäbisch Hall.* The German City of Schwäbisch Hall has decided that the increasing shift towards the Internet raised security concerns that required an effective response in the form of “a cold standby firewall’ in a pseudo-cluster architecture. They adopted SuSE Linux Firewall on CD, since it provided all the necessary functionality such as support, documentation, and above all, regular system maintenance. Following this success, in November 2002, the city announced a project to deploy SuSE Linux on IBM Intel-based servers and up to 400 desktops. Initially, the project will migrate 120 client computers from Windows and Microsoft Office to the SuSE Linux Enterprise Client and OpenOffice.org for 120, reaching up to 400 in the final stage. At the server level, SuSE Linux Enterprise Server will be implemented on IBM’s eServer xSeries systems. The savings to be realized by the changeover are estimated at more than 100,000 Euro.

Further, evidence of FLOSS spread comes not just from Nottingham City Council but also from other UK Councils, for instance, Penwith District Council in Cornwall, which has shifted some 300 desktops due to “lower licensing costs.” Now, in mid-2003, Newham has commissioned a feasibility study potentially leading to the migration of its 5,000 desktop computers to FLOSS. This move is seen of particular significance because of its potential to spread to a group of seven neighbouring councils involved with Newham in a successful e-government ‘pathfinder’ project completed in 2002.<sup>26</sup>

#### 5.2.2 *Indicative survey of FLOSS use, plans and intentions by some European local/regional authorities*

A simple indicative survey of FLOSS in European local/regional authorities was conducted between January and March 2003. It made use of the facilities and members of the three most important networks of regions and cities working for the information society in Europe: Telecities, ERIS@ and ELANET. A total of 22 administrations responded to the survey and the results are shown in Table 5.

<b>Table 4. Use, Plans and Intentions by Some European Local/Regional Authorities Regarding FLOSS (Jan-March 2003)</b>	
<i>Current Use, Plans and Intentions</i>	
??	77% of respondents stated that FLOSS played a part in the strategic direction of their organisations, and of these 84 % felt that they could identify a FLOSS constituency in their area.
??	36% of the respondents are considering adopting FLOSS as part of the IT strategy.
??	68% of respondents stated that there was a definable constituency that could promote FLOSS in their respective regions
??	22% of the respondent’s administrations have already implemented some form of FLOSS. Of these, 100% have implemented FLOSS at the server level with Linux Apache. And 50% have utilised FLOSS for security and authentication.

<sup>26</sup> Parkinson, D., “UK Councils dump Windows for Linux,” *Silicon.com*, 6 June 2003, found in <http://www.zdnet.co.uk/business/0,39020645,2135726,00.htm>.

***Perceived Obstacles to the Adoption of FLOSS<sup>27</sup>***

- ?? 100% felt that the FLOSS license posed no problems to the adoption of FLOSS solutions since their internal procurement rules allowed them to utilise FLOSS technologies.
- ?? 80% felt that the largest obstacle to adoption of FLOSS is the lack of in-house expertise as well as of software support.
- ?? 40% felt that sustainability was an issue and 10% felt that cost was a barrier.

These results are indicative of local/regional FLOSS activity in Europe as well as of the concerns of ICT managers and decision-makers regarding the need for access to FLOSS expertise and capacities to be sure of realizing the promise of lower-cost and sustainability of the FLOSS model. They do not allow the extrapolation of an accurate picture of the extent and depth of FLOSS activity in local/regional authorities, but they tend to confirm that the cases we have visited during the discussion are certainly not isolated cases.

## **6 Conclusion**

The evidence presented in this paper suggests that the market arrival of “free/libre and open source software” (FLOSS) represents the start of a major disruption in the historical development of the global software market and industry. The peculiar case of FLOSS however is that its disruptive power does not lie primarily in the technology, but rather in the revolutionary challenge that its intellectual property approach presents to proprietary (closed) software, with its intrinsic “exclusion effect.”

It is still early days to determine the extent of the impact FLOSS will eventually have, but it seems already clear that the government sector at national, city and regional levels is destined to play a major role in it. This is due not just for competitive market reasons that include issues of cost and security but, also, the suitability of FLOSS’s governance of “freedom of source code” to the fulfilment of governments’ mission of public good. A distinctive FLOSS advantage shown by the paper is that its adoption seems to enable public administrations to achieve results that the alternative proprietary software did not allow them to reach. The case of Extremadura and Central Scotland Police are highly revealing in this respect.

The displacement of an entrenched pervasive technology such as Microsoft desktop software, however, will not come easy. Today, this type of proprietary software has the strength of a long and widely established global presence buttressed by a large accumulated base of users. Yet as has recurrently happened with information technology, just when the market position of dominant players looks unassailable, a new development comes to disrupt the play and throw the game open once again. This time it is the turn of FLOSS to spoil the established game!

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<sup>27</sup> It must be noted that replies to this section were given by only 22% of the total number of respondents, of which 40% were FLOSS adopters; 10% were at planning stage; and another 40% had no plans to adopt FLOSS solutions.