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## Should Business Adopt Free Software?

*Gilbert Robert and Frédéric Schütz*

*More than ever before, people are talking about the phenomenon of Free Software, which has been publicised by a growing number of articles in various journals and by the recent stances taken in its favour by large enterprises such as IBM, Sun and Hewlett-Packard. Free software and its flagship Linux are of interest to more and more people; individual users as well as those responsible for computing in multinational companies. Their needs are certainly not identical, but the same questions crop up time and time again. What is Linux? What can it add to my business? Is it compatible with Windows? What applications will run under it? I have heard that it is neither secure nor reliable. Is it supported? The aim of this article is to explain in more detail what Free Software is, and what its advantages are for users, and to provide an overview of its status in business, in particular by looking at the obstacles which still stand in the way of its use.*

**Keywords:** Free Software, Linux, GNU Licence, Enterprise, Reliability, Security, Data Permanence, Technical Assistance

### What is Free Software?

Contrary to what the ambiguity of the English language might lead one to suppose, the principal characteristic of *Free Software* is not the fact that it is free of charge, but that it is freely accessible. To illustrate this difference, you could liken the *source code* of a program to a music score, whilst the *program itself* would be the equivalent of its performance by an orchestra. In the case of Free Software, you have access to the score and you can play it again, in the same way or with another instrument or a different orchestration, whereas with *proprietary software*, you only hear the music and you cannot correct any wrong notes there might be, or change the whole thing to suit your taste. A concert might be completely free of charge, even if the composer refused to distribute the score of his work (as would be the case of proprietary software such as Microsoft Internet Explorer, which is distributed free of charge, but without its source code). Conversely, if the composer were prepared to distribute his score, it would not necessarily mean that the concert would be free of charge (as in the case of a piece of Free Software, which can be sold, but is supplied with its source code).

Contrary to what is widely thought, Free Software is not simply placed in the public domain by its author, who would thus abandon all his rights, but is subject to a licence that determines the rights and duties of those who use it. The most well-known and widely used licence is the *GNU General Public Licence* (GNU GPL), defined by Richard Stallman, founder of the *Free Software Foundation* (FSF). It places the use of software within a legal framework, humorously known as the *copyleft*, as opposed to the *copyright* that normal licences claim. By distributing his software under such a licence, an author guarantees to every user *four freedoms*, which define a piece of software as being free:

- the freedom to execute the program for whatever use he wishes;
- the freedom to study how the program works and to adapt it to meet his needs, which requires *access to the source code*;
- the freedom to redistribute copies;
- the freedom to enhance the program and to publish these enhancements.

So the software user has as many rights as its author, including that of reselling the software and any modifications he has made to it. The only constraint imposed on him by the GPL is that he cannot deprive other users of these freedoms; in other words, if he distributes amended versions of the software, he is also obliged to distribute the source code of his amendments. But this constraint only applies to modifications to the software itself, and not to other programs that interact with it, contrary to what Steve Ballmer, the CEO of Microsoft, recently described when he said that “*Linux is like a cancer (sic), which attaches itself to everything it touches*”. Therefore, the fact that GNU/Linux is an operating system distributed under GPL

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Licence does not mean that the source code of any program that runs under Linux has to be made public!

There are other sorts of licences for Free Software, such as the BSD licence, which, unlike the GPL, permits a developer to redistribute a modified version of a program without having to make public the modifications that he has made. In this way, publishers can incorporate elements of Free Software into products that are not themselves free, a fact that has enabled Microsoft, for example, to re-use pieces of code originating from Free Software such as the FreeBSD operating system, entirely legally in its programs, including Windows 2000.

### What are the advantages of Free Software in a business context?

Free software has significant technical advantages that are of benefit in a business context, particularly due to the availability of its source code. The advantages most often quoted include:

- *the use of open standards* and the respect of these standards, enabling compatibility between different products;
- *an increased level of security*;
- *the ability to be tailored for use with various platforms* (PC, Mac, Sparc, Alpha, IBM S/390 mainframes or even systems under development).

Unlike the majority of non-free solutions, the adoption of a GNU/Linux system, for example, does not require a complete transformation of a business information system, making an incremental migration possible on a service by service basis. Therefore, a file server that uses the Free Software Samba [12] can usefully replace an NT domain server, enabling its client PCs to continue running under Windows. An old machine, for example a Pentium 133, can very easily be recycled with the use of Free Software as a firewall or a mail server. Conversely, Alan Cox, one of the principal developers of the Linux kernel, recently emphasized, “*Choose a Microsoft server and you have to choose a Microsoft client. Choose Microsoft Project and you have to use a Microsoft operating system, and you may well have to use such systems on half your computers*”.

At a time when the majority of workstations are connected to the Internet, one of the key arguments in favour of Free Software is that of information security. This major problem, which is not very visible most of the time, is often underestimated or relegated to the status of a background issue. This is all the more serious since the majority of people still think that proprietary software provides the best security because potential hackers cannot use the source code to identify weaknesses. This vision of *security by obscurity* does not hold true when you compare the number of security problems that affect free systems and non-free systems. In recent years, security problems detected by independent experts in systems as strategic as French banker's cards or the encoding of GSM mobile phone communications, the specifications of which were secret, have shown that this *black-box* principle acts primarily as a means of concealing the weaknesses of a system from its legitimate users. They have no means of verifying for themselves the security of the systems they are using, and are obliged to take the designers' promises at face value. And if these designers uncover a bug in one of their products, they might be tempted

to conceal it, rather than tarnish their brand image. That might seem paradoxical, but even in the highly sensitive area of cryptography, no system is considered secure unless it has been made available for study by the international community for several years without any faults being found, and no expert would be prepared to guarantee a non-public system.

One piece of Free Software will not be intrinsically more secure than another, even if the availability of its source code enables the number of people capable of discovering faults and correcting them to be increased. But if a fault is found and a correction suggested, this can be rapidly distributed to all users, who are not reliant upon the goodwill of the original publisher. Once they have been made public, therefore, the bugs in a piece of Free Software will be more rapidly corrected, which will, in fact, result in more secure software. One extremely graphic example of this is Interbase, a database distributed by Borland. For several years, it was being sold complete with an unintentional *back door*, a hidden error that provided hackers with easy access to all the data contained in the system without using the password. When Borland released the program source code, the problem was discovered and corrected very rapidly, instead of remaining hidden from users (but not necessary from hackers) for a long time to come.

But for an enterprise, apart from these technical qualities, other important factors can come into play:

- *independence from software publishers and their policies*, since the user has access to the source code and the specifications, and since standards are followed to the letter (dynamics of tools are guaranteed, reliability and security are increased);
- the fact of no longer having *a complicated licence to manage and to pay for*, of no longer running the risk of operating outside the law. Updates can therefore be planned without constraints and only if they are necessary.

Regarding independence, there are countless examples of businesses whose IT supplier has gone bankrupt. In French-speaking Switzerland, several small and medium-sized enterprises have found themselves with software (accounting and management software, for example) that it is impossible to modify. If there is a problem or a new requirement, the only solution is to completely replace it with a new system, but this double investment is beyond the means of most companies and there is nothing to prevent the same scenario occurring again. Conversely, users who decided to use the Nautilus file manager do not have this problem, because even though the Easel company, who designed it, went under in the recent collapse of .com companies, the fact that the software is free ensures that it can still evolve.

Regarding licences that are complex and difficult to follow, a member of AFUL, the French-Speaking Association of Linux and Free Software Users [2], recently revealed that the Business Software Alliance (BSA) <<http://www.bsa.org>> and Microsoft have sought redress from several French educational establishments for non-conformity, which has resulted in chief education officers and departmental and regional councils taking a stance in favour of Free Software and GNU/Linux. Since then, many establishments have been using the Star-

Office office automation suite <<http://www.staroffice.org>>, and are no longer buying Microsoft releases. At the Academy of Amiens, for example, all *proxy* servers (which hold Web pages to enable them to be broadcast more quickly across an internal network) have been migrated to GNU/Linux in 2001, and training courses on installing workstations and secure servers operating under GNU/Linux have been organised by teacher training colleges. In Switzerland, Microsoft in its November 2001 mail to 25,000 SMEs (small and medium-sized enterprises), in the context of an anti-pirating operation, requested a inventory of the hardware and software they use. This prompted many to change to Free Software. No one questions the illegality of software piracy, but the evidence recorded from SMEs by GULL show that the costs and disadvantages induced for them by such an intervention (resources necessary for setting up an inventory, reluctance to transmit precise informations about the computing inventory to an external company, purchase of possibly lacking licences, and update of old licences in order to secure the homogeneity of software versions) fully justify the change to Free Software, either integrally or step by step.

If the thorny issue of software licences is removed, *businesses can switch their budgets to services and customising, and devote more resources to providing advice, training and technical support*. Whilst installation may be more expensive, one has to bear in mind that integration, customising, maintenance, security, upgrading and archiving will be a lot easier and cheaper to implement. Enterprises used to the recurring problems of IT maintenance can once again establish close relationships based on trust with the companies who are expanding on the basis of this new economic model of Free Software. These new companies should form links with businesses to offer a service centred around the rapid, low-cost implementation of servers (such as file and print servers, Web and e-mail servers, or even firewall servers), based on rapid application developments customised using the Free Software toolbox: Perl, Apache, Mysql, PostgreSQL, PHP, Zope, Python, Postfix...

### So it's powerful, reliable, and open ...

For a company, the *free* argument is not necessarily very important, compared with the advantage of having a single point of contact with a well-known name, and the guarantee of technical support, a hotline, and a fixed price. Philosophical considerations and IT *religious wars* are not amongst the preoccupations of the decision-makers, and the importance of hierarchical and commercial pressures is often underestimated. Why look for other solutions about which you know little, when you are offered an off-the-shelf package? Why take risks when you can cover yourself easily by choosing the world leader in the field?

What choice does the market have to offer? First of all, as far as servers are concerned, there's the Microsoft Windows solution, which represents about 40% of the market. Then there are Unix proprietary solutions such as the products offered by Sun or IBM, which are certainly very specialised, suitable for large critical systems and reliable, but which are too expensive and for which the associated skills are in short supply. Today, there are GNU/Linux and other free Unix solutions, which are not

yet very well-known, and can be obtained free of charge, or very cheaply if you buy an original CD and a printed manual (less than 67 € for a full release of Linux), which does not give a very credible impression compared with the usual level of IT budgets. Regarding workstations, the choice is even more limited, since Microsoft Windows has more than 85% of the market compared with about 6% for MacOS. Which way do you think the decision-maker is going to take his business?

However, it is now possible to hear a different story. Attitudes and IT managers change, and minds are becoming more receptive. At the exhibition "Computer 2001" in Lausanne, GULL members heard numerous positive reactions concerning the adoption of IT systems based on Free Software.

Apart from some *discontent regarding expensive upgrades and systems forever hanging up*, arguments were raised relating to indirect costs – the TCO (total cost of ownership) line – something that decision-makers all too often forget to take into account. These indirect costs result from more significant maintenance than planned, changes in strategy by the businesses publishing proprietary software, modifications due to unforeseen business problems and problems relating to IT security (viruses and unauthorised access).

As far as maintenance is concerned, a study carried out at the School of Engineering in Marseilles shows that the time required for the software maintenance of Windows servers is almost double that of Unix servers. In fact, a systems engineer spends more than 60% of his time on basic maintenance (user support and maintenance of a pool of machines running under Microsoft Windows) instead of concentrating on server maintenance, site security, monitoring technological developments, writing documents and considering long-term strategy. In Switzerland, a study by Swepix [17] has also shown that amongst the Web servers tested (in banks, insurance companies, public services and various enterprises), servers running under Windows IIS failed on average twice as often as an Apache server [10].

It is this reduction in costs resulting from the adoption of Free Software that is most often stressed when comparing different solutions. Enterprises are, of course, very sensitive to this argument, but one has to ask if, at the end of the day, the advantages which might become the most significant are not to be found elsewhere, namely in *data permanence* and *security*.

The *permanence of data and protocols* is important for guaranteeing the interoperability of applications and documents. We are constantly aware of the fact that we cannot read documents belonging to our neighbour, who has a different version of the same software. We could ask the question, "*will my data, which is saved in a proprietary format, be readable in 10 years' time?*" or, "*will this software still be processible in two or three years' time?*" The answer to these questions is unclear since we have no command over the specialist applications we are using, or the documents generated. So with the acceleration of the information society, we may jeopardise the IT investment of our enterprise in the medium or short term. Therefore, we must take account in our strategy of the important factor of data formats. If these formats are based on standards for which we have the source code, then we will always be able to re-use

them, to transcribe them in order to make use of them again, even in 20 years' time. XML is currently being mentioned a lot in this context. It is certainly a revolution in informational representation and it is highly likely that many tools will be based on this standard in the future. But for compatibility reasons, we still need to ensure that the XML standard is the same throughout the world!

At the level of information security, large enterprises have no trouble in considering the problems related to accessing the Internet in their entirety. This is not the case with small and medium-sized enterprises (SMEs), for whom security is often analogous with virus protection. However, in both cases we should remember, as mentioned in the previous chapter, that security is achieved through the control of our computing environment, and therefore by the availability of source code and documentation (voluminous in the case of Free Software). IT security is only in its infancy, and at a time when we are talking of e-government, e-voting and e-commerce we must be aware of the dangers posed by unauthorised access to internal information systems, and the considerable damage that can be caused by viruses.

Having put forward the principal advantages of Free Software, there is no better way of convincing oneself than to look at the experience of one of our more entrepreneurial neighbours. In Geneva, CERN has chosen to reduce the diversity of its IT equipment and maintain a total of 6,000 GNU/Linux machines, 3,500 Windows machines, 3,000 Unix machines and 1,200 printers. In this scientific environment, Free Software is a frequent choice for users who have significant requirements in terms of computing time, particularly since it is possible to parameterise the system so that the maximum of resources is available for calculations (for example, a graphical interface is of no use on a particular system and only slows down calculations). We can also mention the Geneva Observatory [14], which has installed a farm of 64 machines using GNU/Linux that work together to carry out astronomical simulations; Shell, which uses a farm of 1,024 IBM servers with GNU/Linux for petroleum research, and the extreme example of the search engine Google <<http://www.Google.com>> which owes its success to the use a farm of 8,000 servers using this same system! On Free Software Day, organised by the Technological Observatory of the State of Geneva and GULL [19], Edouard Soriano, director of the DAPSYS company, explained how, thanks to the choice of Linux in the critical environment of medical imagery at the Grangettes clinic, he has been able to dispense with costly proprietary solutions, at the same time ensuring a calmer economic future and guaranteed long-term access to data.

In the same vein, the Louvre museum in Paris has decided to develop a digitising system for all of its works, which will be based on Free Software, in order to make the investment more long-lasting and to avoid changes in strategy of proprietary database management solutions that would cost a fortune. This solution of using Free Software will enable images to be held on a Linux 2.2 file server and an index to be created in a document base in only a few weeks. The solution, conceived by HP, could be distributed free of charge to all the other museums in the world.

In the list of those who have chosen GNU/Linux, we could also mention many large enterprises such as IKEA, le Figaro, Mercedes, Boeing and also l'Oréal, but there are also small and medium-sized enterprises who have selected this route to manage secure access to the Internet for their intranets, the sharing of files, printers and also for managing information using a Web server and an e-mail server.

For a long time, Free Software has had to bear the brunt of criticism concerning the lack of professional support and maintenance. In fact, it is inconceivable that an enterprise would consider moving towards free solutions if no guarantee of IT support were offered. In the face of this gap in the market, several companies have been founded, first of all in France with, amongst others, companies such as Alcôve [7], Easter-Eggs [8] or Aurora <<http://www.aurora-linux.com/>>, and more recently and closer to home, in French-speaking Switzerland, with companies such as Goelaan [5] and ProLibre [6].

As you can see, there is no shortage of arguments for adopting Free Software in an enterprise environment. However, the broader route of Free Software, with its undeniable technical qualities and increasing number of professional offerings, is filled with obstacles of a completely different kind.

### The obstacles

There are, of course, obstacles to the adoption of Free Software in enterprises and public administration. One of the most well-known is, without a doubt, the *ignorance concerning the phenomenon of Free Software*, carefully maintained by various factions, the first of which, unsurprisingly, is Microsoft, who have recently published a document entitled "*Linux in Retail and Hospitality*" [20] from which several extracts follow:

- *Less Secure: Open Source means that anyone can get a copy of the source code. Developers can find security weaknesses very easily with Linux. The same is not true with Microsoft Windows. Security weaknesses under Linux are effectively found by experts before the hackers find them rather than the other way round, and releases are published very rapidly.*
- *Support/Maintenance Costs: support and maintenance for Linux is not free. Most Linux distributors make their money by selling their services. Support options vary by vendor and can get quite expensive for the enterprise. You will have to pay for support when you need it. Even if it is strictly speaking correct to say that Linux service companies bill for their support and services, this article seems to imply that the same services are free for the Windows platform.*
- *And finally, a paragraph that requires no comment when one compares the open and free structure of Free Software development with the centralised development carried out by Microsoft: Lack of Formal Development Schedule, Research, and Standards: With Linux, no formal development schedule or set of standards exists. There are thousands of developers contributing to it from all over the world, with no accountability to the retail industry. Linus Torvalds makes the final decision about what gets included in the latest Linux release, and he has no accountability to the retail industry. There is no formal research and development proc-*

ess with Linux. Microsoft plans to spend over \$4 billion in R&D in 2001 and listens to the retail industry.

This is clearly disinformation, and we are leaving the technical field here to enter the realm of propaganda. The method used here is to create doubt and fear concerning the choice of solutions incompatible with the *standard*, and there is no hesitation in reversing roles in order to do this. Free software quite rightly has the reputation of being compatible with standards. In conjunction with this, Microsoft are also using a technique that they themselves call “*Embrace and Extend*” in order to develop the *loyalty* of customers against their will. This technique consists of using a tried and tested data format or standard open trade-in protocol, but modifying it slightly so that it is incompatible with other software. This is the case, for example, with the MS Exchange mail server, or the Kerberos security protocol.

The other counter-current, more serious and more subtle, is in the *legal field*. Faced with their inability to control and master this movement, large enterprises are attempting to use the commercial weapon of software patents. In theory, it is not currently possible in Europe to patent software, as this is protected against unauthorised copying by copyright law. However, the United States has extended the area of patentability to include non-material goods such as software and business methods, and thousands of patents have been applied for, most of them for methods that are trivial and very general. Unlike copyright, which only protects the software itself, these patents protect the underlying ideas, and effectively serve to eliminate all competition. By patenting the format of documents produced by a piece of software, for example, a publisher can prevent any other program from reading this format, and thus prevent users from accessing their own data without going via the publisher’s program. Stéphane Fermigier, president of the AFUL, remarks that “*patents are therefore a very powerful brake on interoperability and can only result in reinforcing or extending existing monopolistic situations*”. Some industrial protagonists are currently pressing for Europe to adopt the same system, but developers and managers of small and medium-sized European companies in the field of information technology and telecommunications are, generally speaking, opposed to software patents, as shown by the 97,000 signatures collected on the petition for a *Europe without software patents* [23].

All this goes to show that convincing and attempting to impose GNU/Linux and Free Software in a business environment or in public services is not easy. The history of computing and technology in general has shown on several occasions that it is not necessarily the best product that becomes the most popular, but often the one with the most significant financial, legal and marketing influence, or the one that is first on the market. So what are the arguments that could change the course of history, then?

### The course of history

Decisive arguments might be the advent in the world of Free Software of heavyweights such as IBM, Oracle, Sun and HP, whose presence alone is enough to create an impression of

credibility; and political willpower, as in the case of several countries including France, Germany, Mexico and China.

Recent statements by Microsoft, in particular those made by Craig Mundie, Senior Vice-President, in *The Commercial Software Model* [26], and also in internal documents revealed to the public in October 1998 (the famous *Halloween documents* [21]) seem to show a certain nervousness on the part of the giant who has had a rough ride, and lead us to believe that changes are definitely afoot. But if history is to be any guide, says Stéphane Bortzmeyer in his article *After Word: the future of word processing* [40], then it’s the change in paradigm that will overthrow this monopolistic situation. *BUNCH* (the group of IBM’s official competitors in the 1970s) was unable to weaken Big Blue’s domination. It was only those who did not imitate IBM, i.e. Digital, Apple, Commodore and Atari, who transformed a monopolistic market into a competitive market, by paving the way for microcomputing.

*GNU/Linux and Free Software are a new paradigm*. They pave the way for a new economic model that uses the Internet as a work base, and the organised bazaar to produce high quality tools. Figures exist to show that this new economic model is working, since the leading Free Software is widely used. For example, the domain name server (DNS) *bind* represents 90% of all servers in the United States, the three e-mail servers *sendmail*, *postfix* and *qmail* represent 70%, and the most well-known, the *Apache* Web server, represents more than 60% of all servers installed throughout the world. An IDC study has shown that Linux’s market share is growing more rapidly than anticipated. It was projected to be the number two in 2002 or 2003, but it had already achieved this by 1999. Another study by Forester Research has shown that 56% of global corporations use Free Software. Another tangible sign is the fact that Linux is gradually replacing proprietary Unix solutions such as Silicon Graphics’ IRIX product and IBM’s AIX. For its part, Hewlett-Packard has hired Bruce Perens, a long-standing defender of free and open systems, as *Strategic Advisor for Open Source Initiatives*, and may soon make a move. If the advent of the *economic* world in the domain of Free Software is desirable in order to project a more *professional* image, one has to question why these enterprises are investing what are sometimes considerable sums of money (\$1 billion by IBM in 2001) in developing free or Open Source applications.

### An economic model – a new paradigm

Players such as Sun and SAP have many reasons for entering the free world, but the key reason is doubtless the desire to counteract competition in a market that has monopolistic tendencies. This means that minority enterprises whose products have a negligible market share have an interest in developing them along free lines, in the hope of increasing their distribution and then capitalising on this by developing other value-added services. Using this principle, SAP has opened up the code for its SAPdb database, hoping to create a benchmark in the field based on a piece of software that had sunk into oblivion.

But this principle is also valid in the case of an internal development that one wishes to maintain so that it does not get

completely forgotten. This is what Matra division has chosen to do by opening up the code for *OpenCascade* [11], its 3D modeller, which represents several tens of man-years of effort and an investment of € 75 million. In a conventional scenario, this too would probably have sunk into oblivion. Now that the software has been opened up, a spin-off has been created, generating revenue thanks to services relating to the software, and already totalling 130 clients in 17 countries.

We should not forget that only 15% of computer specialists are paid to produce software that will be available on the market. 85% of the lines of code *written* every day are only intended for internal purposes, and opening them up would not jeopardise the lucrative activities of these enterprises. Of course, in certain specific applications, it is the knowledge of these enterprises that is contained in the programs, and to distribute them free of charge would be suicidal, but most of the time, enterprises have the same needs and are reinventing the wheel, at a time when IT specialists are in short supply. In cases such as this, Free Software enables these developments to be mutualised, and this is what Sourceforge, for example, is proposing (23,000 projects, 200,000 registered developers), enabling developers to work together via the Internet.

Free software and extensive distribution are the best methods of imposing a standard if it is accepted by the community. Such standards are published, and favour compatibility between software, unlike proprietary standards, which are generally conceived to retain the user by preventing him from using software other than that produced by the creator of the *standard*. The most flagrant example of this is the Internet, which is entirely based on free standards and could never have spread as it did if it had been conceived based on proprietary standards that only worked with certain systems. Conversely, the .NET platform planned by Microsoft is an attempt to construct an additional, closed, service network on top of Internet protocols, in order to prevent other software from accessing it.

It is clear that there are interesting arguments and commercial potential in favour of Free Software. *Revenue is thus shifted onto services*, and the client has a lot to gain in this situation, since service is precisely the key element of the Open Source business model. Alain Lefebvre, Vice President of the SQLI group, stresses that “*we are entering the service era after having successively experienced the material era and the software era*”.

If we wish to change the established order, we will have to topple the huge pyramid of inertia and set an example. It is at this stage that governments and political figures have a duty to intervene.

### Political commitment

In some countries, political commitment on this subject is becoming more and more evident. For example, the report by the French MP Thierry Carcenac entitled “*Pour une Administration Electronique citoyenne*” (“In support of socially aware electronic public services”) [16], addressed to the Prime Minister, stresses that “*for a certain number of tasks, Open Source software has proved itself to be reliable, effective, secure, and financially competitive*”. This report proposes placing all

developments carried out by or for public services under an Open Source or similar type of licence, and also creating a distribution base for public services. It also adds that, in a government context, the open and public nature of the source code of Free Software allows data permanence and security to be improved. Moreover, the co-operative nature of the development enables extensive testing to be carried out, thus assuring the robustness of software products. The forum that followed this report resulted in a broad debate, in which most of the contributors showed a strong partiality for consolidating the place of Free Software in public service information systems.

During a conference on Free Software at the EPFL (the Federal Institute of Technology in Lausanne) on 12 June 2001, Jean-Pierre Archambault, currently at the *Mission for the Monitoring of Technology* at the National Centre for Teaching Documentation in France (CNDP), talked about the recent stances of the French state in favour of Free Software, and showed that the trend had begun, and that a real will existed on the part of heads of public services and institutions. To cite just a few examples, the Ministry of Culture has started migrating 400 servers to GNU/Linux, and the French Inland Revenue, very conscious of security problems, has chosen the same system for its 950 servers. As for China and Mexico, they have taken radical measures, migrating all of their administrative systems to Linux *Red Flag* and all of their schools, a total of 150,000 establishments, to GNU/Linux respectively.

Free software is starting to make an appearance in the public sector in Switzerland as well. In Geneva, several teachers have shared their experiences of using Free Software, either within the field of *teaching* (with StarOffice), or in administration (with file servers using Samba and free databases for managing marks). Very recently, a GNU/Linux server using Apache and Perl has been implemented at the *Palais de Justice* in Geneva to provide access to legal files relating to the Geneva area [15].

In other countries, we are finding that the political will to promote Free Software is often linked to problems of national security. So it is quite simply inconceivable for Germany, France and the United States not to have complete control over their sensitive information systems (military systems in particular), and this cannot be achieved with proprietary programs. The Germans were the first to react, by banning all *Microsoft products from sensitive equipment* [28] in the Ministry of Foreign Affairs and the Defence Ministry. The European Community’s recent report [24] on the Echelon surveillance network *suggests that European institutions and the public services of member states promote projects relating to software for which the source code is published, since this is the only way of guaranteeing that it will not contain any back doors (hidden faults)*.

Even more important, perhaps, is the fact that democracy is also implicated. Controversy has been raging in Belgium over the use of proprietary systems for managing electronic voting, an area in which transparency must be absolute in a democracy. Proceedings are taking place in Belgian courts, with citizens having argued that it was impossible for them to be convinced of the transparency of a ballot and the absence of any vote rigging if they were not permitted to check the voting system.

Therefore the use of Open Software, which enables anybody (provided they have the relevant skills) to check the working of the system, is indispensable in order to prevent the voting process residing in the hands of a few technical experts. The government of Geneva is unfortunately in the process of going down the wrong track with a pilot project for Internet voting, the implementation of which has been entrusted to two commercial companies. There are indications that a completely proprietary solution will be chosen, over which citizens will have no direct control.

### The future ...

So we are discovering that changes are going on in the software world at various different levels. With the adoption of the “*Nouvelles Technologies de l'Information et de la Communication*” (New Information and Communication Technologies) initiative (NTIC), a decisive step for many companies, interoperability must be guaranteed, as must the permanence and security of information systems. Following the pain engendered by the arrival of the year 2000, with numerous costly migrations and system upgrades, engineers and decision-makers are more and more hesitant to follow the breakneck pace of developments in computer hardware and software. Changes are taking place too rapidly, and strategies are changing quickly – Novell today, Lotus Notes tomorrow, Windows XP the day after, and why not lease software and use decentralised .NET technology next month? We need to do some serious thinking, and what is certain today is that there are new parameters and arguments to take into account. As Bill Gates emphasised, “*this ecosystem in which Free Software and commercial software co-exist is essentially very healthy, because users always have a choice*”. Maybe he should have said “*have to make yet another choice*” instead.

Being objective, Free Software is currently a solution for enterprises when it comes to servers, where the free operating systems GNU/Linux, FreeBSD and OpenBSD are often quoted as examples. The same does not apply to workstations, where specialist applications such as CAO, DAO, accounting and stock management have not yet been ported on to free platforms. Even if office automation suites such as *StarOffice* <<http://www.staroffice.org>> from Sun Microsystems, or KDE's *KOffice* <<http://www.kde.org>> are quality alternatives to Microsoft Office, secretaries are not yet ready to dispense with the latter. Only when we start attaching more importance to data formats than to the applications that manipulate them will we have made a big step towards data compatibility and permanence. The Free Software movement has shown itself to be very dynamic and a source of new ideas, innovation and sharing. Even if Free Software has not finished developing by a long way yet, it will certainly not entirely replace proprietary products, which are very effective, particularly in specialist areas, and it is likely that the two worlds will co-exist, each one concentrating on the areas in which it performs best.

Most of the world's major discoveries and their consequences have been the result of collaborative work and the free exchange of information. Even in medical research, where competition is rife, collaboration between research institutes is

necessary. As Roberto di Cosmo, Professor of Computing at the University of Paris VII says, “*Free software is not only a good idea, it is also a necessity*”. If Free Software is a necessity for business and the economy in general, it also has an important role to play in education, where the concepts of plurality, freedom and equality are fundamental, but this is a different debate that warrants a separate article all of its own.

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