CyberSnare

Roberto Di Cosmo
LIENS-DMI
Ecole Normale Supérieure
45, Rue d'Ulm - 75230 Paris CEDEX 05

E-mail: dicosmo@ens.fr
Web: http://www.dmi.ens.fr/~dicosmo

Since June 1998, this text has been available on the web at these sites:
http:// www.netaction.org/msoft/cybersnare.html
http://ourworld.compuserve.com/homepages/dkiechle/cybersnare.htm

Since March 1998, the original French version of this text has been available at
(Depuis le 20 mars 1998, la version originale française de ce texte est disponible au)
http://www.mmedium.com/dossiers/piege

During the last Christmas holidays, I was once again struck by the growing fascination of the media with the obscure object of desire hidden behind the words "computer", "multimedia", "web", "Internet", and the like. According to the media—as well as scores of self-appointed experts—one is a second-class citizen unless one possesses the latest (and most expensive) computer equipment to access the Promised Land of "cyberspace".

It is also hard to ignore the strange and ubiquitous notion that there is only one kind of computer: a PC with "Intel Inside" running one unavoidable piece of software: Microsoft Windows.[1]

This is all the more peculiar considering that this intellectual bowing to two American giants is reaching its peak just as the US seems to be emerging from a long sleep that allowed Intel and Microsoft to attain an almost total monopoly. In the process, an impressive number of companies, whose products were far superior, were destroyed. All this is thoroughly documented in several books available in the US, such as [1], [2], and [3].

For instance, I am thinking of the campaign started by Ralph Nader (the renowned consumer advocate who once succeeded in forcing GM to stop producing one of their vehicles deemed unsafe), as well as the suit the US Department of Justice has filed against Microsoft. I am especially thinking of the surprising reaction of the American public to recent polls on the Internet: an overwhelming majority is in favor of the DoJ's actions, even when the polls are conducted by companies like CNN who are predominantly pro-Microsoft in their articles. (CNN [4] and even ZDnet polls [5]; the latter was arbitrarily stopped at a certain date which was displayed on the page only after many letters of complaint.)

On the other hand, the French public is far from waking up. Lulled by the sweet voice of global conformism, it sleeps more and more soundly in the arms of Microsoft. People are dreaming of a joyful world in which a great philanthropist distributes free copies of Windows 95 to school children, with the only intention of helping them overcome their technological lag. They smile as they think of blue screens filled with reassuring messages explaining how a particular program caused a certain exception in a specific module—not because of Windows, of course, but due to an error in the program itself. They sleep soundly without wondering

[1] The confusion is such that one does not distinguish operating system from application software any longer. The press has written "Windows 97" when they were dealing with Windows 95 and the set of applications Word, Excel, etc. commonly referred to as "Office 97"!

why a computer much more powerful than the one that helped send men safely to the moon and back, is not capable of properly handling a document of a few hundred pages when it is running Microsoft Office, the favorite product of the pundits.

Chests of drawers and brainwashing

On several occasions, I have witnessed the depth of this hypnotic trance. The most amusing example occurred while travelling on a high-speed train some time ago. Laptops (those embryonic computers which cost as much as a small car, can be carried around in one's briefcase, and are frequently used for playing Solitaire) are proliferating these days—almost as much as mobile telephones, particularly on trains and in airplanes. During one of my trips, I was seated next to a very nice gentleman, a dynamic young executive, who was running the catastrophic (we shall soon see why) application Defrag on his computer. This program displays a pretty matrix filled with squares of various colors that scuttle hither and thither while the hard disk works overtime.

I could not resist the temptation (I hope this gentleman will forgive me should he recognize himself in this story); after complimenting him on his fine laptop, I asked him with feigned ignorance what this beautiful software was that I did not have on my own machine. With an expression combining condescension and pity, ("The poor man doesn't have this beautiful program!"), he answered that it was an important utility one needed to run once in a while "to make the machine go faster" by "defragmenting" the disk. He went on to recite the words from the Windows user manual by heart: the more the disk is being used, the more it becomes "fragmented". The more the disk is fragmented, the slower the machine runs. That is why he dutifully uses Defrag every time he gets the chance.

At this point, I took out my own laptop computer, which is not running Windows but GNU/Linux (an open and very powerful version of UNIX available for free and developed through the joint efforts of thousands of people on the Internet). Sounding very surprised, I said that all this puzzled me a great deal. On my laptop, the disk is barely fragmented, and the more I use it, the less fragmented it is. Our young executive, less comfortable now, replied that his laptop was running the latest version of Windows 95, produced by the greatest software company on the planet, and that I had to be wrong in some way.

I then tried to make him forget the propaganda that had intoxicated him thus far by explaining the fragmentation problem in a simple way. What follows is a short summary of a pleasurable conversation that lasted over half an hour. You probably know that your data is saved as "files" memorized on the hard disk of the computer. This hard disk is like a gigantic chest of drawers; each drawer has the same storage capacity (typically, 512 bytes[2]). Nowadays, each disk contains a few million drawers. If the data you want is stored in contiguous drawers, it can be accessed faster than if it is spread out (or "fragmented") all over the chest. There is nothing amazing about this; we experience it every day when we have to find a pair of matching socks: it is much faster if they are both in the same drawer. We can therefore agree that a tidy chest of drawers is more convenient than a messy one. The problem is finding a way to keep the chest arranged neatly when it is used.

Let us now imagine an administration that keeps its folders in an enormous filing cabinet with millions of drawers. For the reasons mentioned above, we would like items pertaining to the same file to be stored in contiguous drawers. You now need to hire a secretary, and two candidates apply for the job, each with their own way of working. The first candidate just empties the drawers when a file is removed, splits up any new file into smaller piles of documents the size of a drawer, and randomly stuffs each pile into the first available empty drawer. When you mention that this makes it rather difficult to find all the files belonging to a

[2] A *byte* is an eight-digit binary number commonly used to measure the size of computer memory. Also used are *kilobyte*, *megabyte*, and *gigabyte*, as well as the abbreviations *Kb*, *Mb*, and *Gb*.

particular case, the response is that a dozen boys must be hired every weekend to put the chest back in order.

Instead, the second secretary maintains a list of contiguous empty drawers; every time a file is closed and removed from the drawers, the list is updated. When a new file arrives, the list is searched for a sufficiently long row of empty, contiguous drawers, and that is where the new file is placed. In this way, provided there is enough activity, the file cabinet is always tidy.

Without a doubt, it is the second secretary who should get the job, and our young executive very much agreed.

At this point, it was an easy matter to point out to him that Windows 95 was acting like the first secretary who needed boys to clean up the cabinet (the Defrag program), while GNU/Linux, acting like the smart secretary, had no need for them. By the time the train entered the station, our nice gentleman was not so happy any more: he had been taught that Defrag "makes the machine go faster", while we had just seen together that it is more accurate to say that Windows is slowing it down!

In fact, the problem of efficient disk management is quite old, and we have known for a long time how to deal with it (UNIX is much older than Microsoft, and it has had the "smart secretary" since 1984!). However, there is much worse than Defrag. Unfortunately, we do not have the time to relate all the juicy details that concern it in this space, but the Scandisk software, which is supposed to repair disks, presents unintelligible choices, the result of which is too often the downright destruction of the folder structure, even though the data would have been recoverable before running the program. Not only is this impossible under UNIX, unless you crush the disk with a hammer, but proper disk management methods have been part of basic courses in computer science for the last decade. The mere existence of a program like Defrag, or worse, the damages produced by one like Scandisk in Windows 95, ought to be enough reason for any intelligent IT manager to scratch Microsoft's name from his or her list of suppliers. But no, the brainwashing has been so effective, the sleep so deep, that in France we are ready to shift our banking systems over to Microsoft products and even choose them for the education of our children.

The marketing power of certain companies distorts reality to such an extent that one is led to firmly believe that the serious defects of some software products are, in fact, the latest must-have functionality. (Incidentally, the computer world has a fitting expression for this: "it's not a bug, it's a feature!"). Another part of the problem is that the specialists who have the knowledge necessary to undo these traps and point out the dangers and manipulations without being mistaken for "bashers" or, in the case of competitors, sore losers, have kept their mouths shut for too long. It is a strange phenomenon: on one hand, no serious-minded scientist wants to publish an article in today's so-called computer press, lest his reputation become tarnished for having mingled with hucksters. On the other hand, without the support of serious scientists, the computer press has become a questionable mirror of the computer industry's advertising campaigns, and thus, even more peddler-like and less likely to be approached by real experts.

An information tax

Even so, the Wintel monopoly that is settling in France and other parts of the world is so extensive—and not only economically—that one cannot remain silent any longer, no matter what the circumstances. The issue is not only accepting to live with bad technologies and disregarding that we could have much better ones; this has already happened many times, for example with VHS killing Video2000 and Betamax, both of which were of much higher quality[3]. It is also about our governments accepting a takeover of information by, and for the sole benefit of, Microsoft and Intel. I am sure that those of you who have some knowledge of

[3] See *Technologie et Marché : journal d'un consommateur insatisfait*, by the same author.

economics can already see what I am getting at: for several years, this monopoly has managed to impose a true *monopolistic tax*, i.e., to exploit the monopolist's power to sell at inflated prices, thus milking consumers who are forced to buy in one place only. And this tax is truly enormous. Worse, it leaves the European marketplace practically unnoticed, without creating any resources, and in fact destroying quite a few (for examples, see [6] and [7]).

Now let's see how this monopoly is gaining strength every day, keeping in mind the various risks, both economic and otherwise, it exposes us to on a daily basis. When dealing with computers, the possibilities afforded to ruthless companies are quite daunting. We will try to understand this, starting with all that does not necessarily qualify as downright illegal practices.

The characteristics of software

To begin to see how we pay a hidden tax every time we buy a PC[4] or Windows software, we have to become familiar with an aspect of the computer industry which distinguishes it from any other technological domain: the cost of duplicating products. Once a piece of software has been written, often at very high cost, it can be duplicated onto a CD-ROM for less than a dollar per copy. It may also be transmitted over a network at an expense that keeps shrinking; all this is *completely independent* of the quality and production cost of the original. The only items which are not of near-zero cost are the thousands of pages of paper manuals, and the dozens of disks necessary to store the software in the absence of a CD-ROM drive. Software editors, to whose advantage it obviously is to minimize this cost, have already found a solution: PCs sold in department stores come with bundled software, but seldom include any documentation on paper, except perhaps for some flimsy "Getting Started" leaflets. There are, of course, so-called online versions of the manuals; technically, nothing prevents you from spending a few hundred francs to print them out if you like. I have even noticed that a well-known Japanese company that sells some of the most expensive laptops on the market, does so without including the CD-ROM containing the operating system software. Everything is pre-installed on the hard disk, and it is up to the user to buy the forty or so diskettes needed for a backup and play the floppy shuffle for a day if he wants a permanent copy. Today, it is safe to say that with this procedure, *the cost of copying software is practically zero.*

A second important point is the legal status of software. For reasons which, upon reflection, are not very hard to grasp, software, this high technology marvel used by millions of people throughout the world in their daily professional life, this most complex object revered as the linchpin of a new industrial revolution, benefits from the same liability protection as a work of art. (Indeed, software industry firms are called "editors".) For example, there is no legal guarantee that shrink-wrapped software will serve any purpose, not even the one for which it is advertised. This situation may be acceptable when one buys a novel or a painting (*de gustibus...* said the Romans), but is absolutely unacceptable when it concerns software. It means that you cannot sue Microsoft for malpractice after discovering that Windows 95 is not designed in accordance with established and proven technologies, while you can sue an electrician or plumber whose work is not up to professional standards and norms.

Even worse, no one is responsible for any damage that the software could cause. Once again, it is reasonable that you cannot sue a musician if his latest techno CD bought by your son causes a family dispute in the course of which you break a very expensive piece of Chinese pottery. But it is totally unacceptable to be left without recourse if you were to lose 200 megabytes of valuable commercial data on your hard disk because of Windows 95's antique file system and its horrifying program, Scandisk. This is especially true since you could easily prove in court that the technology needed to design a vastly superior product, with which you would not have lost your data, has been available in the public domain since the 70s, and that

[4] Originally, "PC" just stood for "Personal Computer". Today, the term is used for a particular type of personal computers: the one that uses Intel and Intel-compatible processors.

the code itself, as used in the AT&T version of UNIX, has even been acquired by Microsoft. On the other hand, you can drag your electrician to court if he runs electrical wiring through the wooden moldings in your home[5].

Finally, a very serious consequence of this lack of accountability is that the "editors" of the software are in no way legally bound to correct errors and recognized failures in their products, even if those mistakes are voluntary. This means that the software "editors" can sell *whatever they like*, or rather, *whatever their marketing departments make you buy, with no obligation as to the products' fitness to purpose, while enjoying full legal immunity, even in the case of blatant dishonesty*. Better still, the customer may be forced to pay as much as the original product price for "updates" that in reality are nothing more than bug fixes.

These surprising legal aspects, which were probably justified when software was written by engineers in their garages, are absolutely baffling today when we have several international software corporations of astronomical financial clout. Moreover, the legal immunity does not benefit all software editors, only the most powerful ones. Indeed, a large company can and must force a software provider to sign a contract that clearly defines the deliverables in addition to certain guarantees. Alas, this is neither within reach of the average consumer, nor of most small businesses that run the risk of being purchased or destroyed in a short time if the editor they are dealing with has sufficient financial leverage.

I can very well imagine that, just like the young executive mentioned earlier, you are feeling slightly less comfortable by now: the Promised Land of cyberspace is starting to reveal many unfriendly dark sides, and that wonderful humanitarian company that was always presented to us as the finest in computer technology, and the living success of market economy, looks less and less philanthropic. Unfortunately, all this is only the beginning of our journey to the dark side of planet Microsoft. The worst is yet to come.

Manufacturers ambushed

Microsoft's monopoly allows it to easily get rid of yet another source of software marketing cost: technical support and distribution. Regarding the former, one can imagine that even though a company may not be legally bound to help install its software, it will still do so in order to retain its market share. Not to worry, Microsoft has the solution. Just take a look at the license agreement for Windows 95, of which I include this excerpt:

> 6. PRODUCT SUPPORT. Neither Microsoft Corporation, nor its affiliates, offer support for the SOFTWARE PRODUCT. For support, please contact the support number of the Computer Manufacturer included in the documentation of the COMPUTER.

Clever, isn't it? The burden is squarely put on the shoulders of the hardware manufacturers who are not responsible for items like Defrag, blue screens, and so on, but who will pay—literally—their consequences (I know something about this, given the number of times I have unsuccessfully tried to obtain telephone support for the installation of Windows onto the aforementioned Japanese laptop). If Windows 95 did not enjoy a monopoly position, computer manufacturers would happily rid themselves of such an arrangement.

As for the distribution of the software itself, once again, it is the manufacturers, assemblers, and resellers who pay: they have to "pre-install" Windows 95 on your machine. But there is an even better solution: the distribution, over the Internet, of software without any physical support. This is a stroke of genius: you pay for the programs and download them at your own expense (and quite an expense it is, considering the size of Microsoft Office these days), thus effectively lowering the "editor's" total cost of duplication and distribution to exactly zero

[5] A hazardous practice that is now illegal in Europe.

dollars and zero cents. If you are asking yourself why the president of a certain North-American country has strongly suggested that electronic commerce not be taxed, then you have part of the answer right here.

To sum it up: today, if your name is Microsoft, and *only* if it is Microsoft, you can sell just about anything. You need not guarantee any result nor fear being sued. You'll have a unit cost of next to zero and a retail price that never decreases[6]. In fact, you end up with pure profit[7].

It remains to be understood why, in addition to the average consumer (who does not understand computers), large companies, the media, and entire nations, which should have highly qualified IT professionals at their disposal, do not exercise their freedom to choose anything other than Microsoft products. To answer this question, it is not enough to consider the peddlers and merchandisers in the so-called specialized press, even though they clearly deserve part of the blame. We have to examine the dark side of this giant more closely, and we will begin to discover some shady practices which border on the illegal. To my regret, these are not documented anywhere by the [French] media, except in a few short-lived satirical pamphlets that are certainly not on the favorite reading list of corporate decision-makers.[8]

The Land of TechnoCretins…

To make things clearer, let's forget computers, software, and all that for a moment. We have been conditioned to consider these things useful but difficult, and to refrain from forming a personal opinion about them. They are, we are told, too complex, and we should limit ourselves to following the choices made by so-called experts (The American magazine *Byte*, a widely circulated publication, even has a logo that reads "Byte, because the experts decide").

So let's leave these experts aside for a while, and take a short trip to an imaginary world: The Land of TechnoCretins. There, a company, let's call it MacroPress, has little by little gained total control of all the print shops on the planet. It does not control the newspapers directly, but it prints them with the MacroPress character set, of which it is the sole owner. One day, after a large advertising campaign to praise a new character set that will modernize newspapers, it starts printing everything in Klingonian type (the alphabet of the Klingons from the famous Star Trek series) in such a way that no one can read the new books and newspapers without resorting to the MacroPress Lens, available for sale at every newsstand where it is distributed at the newspaper publishers' expense. The public, delighted by the wonderful technological innovation, adapts and buys the Lens. Encouraged by the success of this initiative, MacroPress begins changing its character sets periodically, first every year, then every six months. The old Lenses cannot read the new print, and they have to be renewed at great expense every two or three months. A competitor of MacroPress sees a golden opportunity: to produce a MiniLens, much less expensive than MacroPress' Lens, and to sell it at newsstands. But the newsstands have an exclusivity agreement with MacroPress and refuse to distribute the MiniLens. Worse, MacroPress sues the competitor who is guilty of having analyzed the Klingonian characters in order to build the MiniLens, thereby violating MacroPress' copyright, and wins the case.

---

[6] Unlike the price of hardware which is constantly falling, Microsoft software never gets noticeably cheaper. On the contrary, sometimes it gets more expensive with each version. For example, the suggested retail price of Windows 95 in France is currently 1,270 francs (not including tax) whereas it cost less than 800 francs when it came out in 1995.

[7] Most software editors sell their products without a real guarantee, but few manage to equal Microsoft in combining such an impressive array of advantages. Only Microsoft has the power to impose its products and thereby collect a real tax on computing.

[8] I am thinking of "Le Virus Informatique" and "Les puces informatiques" (see [8]).

... is closer than you think

But what idiots, you say, no one would be fooled to such an extent! Well, let me tell you that the Land of TechnoCretins is not that far away. Two years ago, I needed to submit a grant request to the EEC to cover the visit of an English researcher to our laboratory. To do this, I tried to obtain a form, and I was told that the simplest way would be to download it from the European Union web server <www.cordis.lu>, since getting a hardcopy might take a long time. Thus, I came across a document we will call <foo.doc>, written with Microsoft Word for Windows version whatever. In other words, Klingonian. No problem, I said confidently, we have a few Macintoshes in the lab with the Microsoft Word 6.0 "Lens". It is a more recent version from the same company, so it will know how to read the document. I said this around 10 a.m., but to my surprise, Microsoft Word for Macintosh crashed the machine after ten minutes of "conversion". I had to turn the computer off and back on again, losing all of my work.

At this point, a real battle with the "Lens" ensued. I emerged victorious, but exhausted, around 7 p.m., with a version of the form filled in, obtained by printing pages one at a time, and thanks to complex manipulations I don't want to go into. Suffice it to say that I really felt like suing someone, without much hope of being able to do so. And all that for what? To complete an extremely simple form with the fields First name, Last name, etc. which could very easily have been prepared with an open file format, such as HTML, used on the Web since 1991. In the course of the last two years, <www.cordis.lu> hasn't changed a thing. The site is much prettier, but the forms and documents containing vital information that should be openly accessible and free of charge, are still presented in a proprietary format. Usually, this format is Microsoft's, and, unbelievably, compatible only with Microsoft products for PC. Consequently, our laboratory will soon be forced to buy a PC with Windows 95 and Microsoft Office merely to read EEC documents. The Klingonian Lens is making headway…

Regarding the Lens, the file format changes from version to version in such a way that Word 5.0 cannot work with Word 7.0 files. Even worse, Word 6.0 for Macintosh has trouble reading Word for Windows documents. We are literally trapped! It is not enough to buy Word once, one has to pay again for each version, just to be able to continue reading other people's files. If, by chance, one has bought an add-on product for version 5.0, say, a Spanish dictionary, it will have to be bought again for the new version. The old one will now be "incompatible", even though Spanish has not changed a great deal in the meantime. This is, in fact, a kidnapping of your information: once data is entered into Word or Money, there is no easy way to recover and transfer it to another piece of software if you no longer wish to buy Microsoft products. Great care has been taken not to give you efficient converters to other formats[9]. Moreover, legislation has been proposed prohibiting the use of proprietary file formats, or even their analysis, by competitors of the owner of the formats. If adopted, a company selling a "MiniLens" would be in violation of the Copyright[10]. But it is *our* data that is at stake here. Welcome to the Land of TechnoCretins!

Dubious practices

Let's summarize! The technique is simple: on one hand, valuable information is being locked into a proprietary format that is constantly being updated. Users must then buy upgrades for all their applications every six to twelve months just to be able to continue reading their own data or access information that does not need to be stored in this proprietary format. On the other hand, competitors are trapped: they are not given the full documentation, and arbitrary

[9] From http://microsoft.com/office/office/viewers.asp, one can now download an impressive number of converters and viewers, but these only serve to convert between incompatible Microsoft formats and not to free users from the monopolist's grasp (you must have a PC with Windows to use this software). What we need are free and documented formats, the exact opposite of Microsoft's philosophy.

[10] In 1991, Richard Stallmann toured Europe to warn the EEC against the dangers of a tacit agreement to this veritable scandal. Some of his arguments are presented in [9].

variations are introduced with the sole purpose of not allowing the products they develop to work correctly. Worse, if the competitors manage to find out that one of these modifications' only purpose is to make their products work less well than that of the monopolist, they are guilty of reverse engineering (the computer equivalent of taking apart the engine of a VW Beetle to find out how it works)[11].

This latter technique is particularly powerful if the software publisher owns the operating system and graphical interface (Windows 95) as well as the applications (MS Word, Excel etc.). It is then technically possible to modify the system to make competing products unstable or unusable, while improving the performance of one's own products (a current practice that relies on a contrived usage of DLLs). This has been done in Windows NT Workstation: the number of simultaneous accesses to the machine has been artificially limited to 10, which makes a Netscape web server unusable on machines running under NT Workstation (see [13] and [14]). To get around this, users must buy the much more expensive NT Server, which is shipped with a free copy of Microsoft's web server pre-installed. This puts Netscape out of the picture. You can understand the Machiavellian simplicity of Microsoft's maneuver even better, once you know that the parts of NT Workstation and NT Server that one pays for are identical [15], [16], give or take a few lines of code.

The net result of these dubious practices is simple: it prevents users from choosing something other than a Microsoft product. This, along with the reduction of the costs and risks to zero, as seen above, allows the monopolist to establish a real tax on information of which Microsoft is the sole beneficiary. After all, if Bill Gates has been welcomed at the *Elysée* Palace with the honors normally reserved for a head of state, it is probably because he is the cyber version of the tax collector. This tax is in no way virtual: enormous amounts of money leave the European Union every year in exchange for low quality products that make us more and more dependent on poor technology from overseas. Furthermore, this technology is distributed in Europe at exorbitant prices, much higher than those charged in America or Canada.

Don't be fooled by those who tell you that software in Europe is more expensive because it has to be translated, for example into French. If you visit Microsoft's web site, you will find that they consider it "illegal" (*sic*) to buy the French versions of their software in Canada, where they are much less expensive than in Europe, and to use them in France [17]. What about "free" trade? We are milked like dumb cows, and the passive attitude of the European governments, which is starting to look too much like active cooperation if we think of <http://www.cordis.lu>, is absolutely inexplicable in the face of this horrendous waste.

Getting around the law

We now get to those actions that are downright illegal. Let's start with "bundled sales", which are prohibited in France (Book I, Chapter II, section 1 of the consumer law states that it is illegal to tie the sale of one product to the purchase of another) and in Europe (see articles 85 and especially 86 of the treaty, and the very detailed [18] for information on how they are applied). What this means, is that it is against the law for any vendor to force you to buy a product you don't want along with the product you are interested in. It doesn't prevent the sale of assorted "bundles" in supermarkets, provided that the customer has the option of buying the components separately, if he so desires, and without a surcharge. However, for many years, the largest PC vendors have not permitted the purchase of a computer without Microsoft software (Windows 95 or NT today, DOS or Windows 3.x in the past). You can personally verify this by visiting Dell's or Gateway's Web sites, for example. True, you can "build your own computer", but there is no way to remove the Microsoft "Lens" from the components, despite the fact that software and hardware are two very different products (even

[11] For the history of a real case, see Stac vs. Microsoft in [10]. Fortunately, things have evolved in Europe where a limited form of reverse engineering is now permitted [11]. Worth noting is also the open opposition against any legislation that would enforce an interoperability of systems [12].

though some try their best to hide this from us[12]). What is worse, you can't even determine the price of the software. (These prices are often much lower than the retail prices, because they are part of nondisclosure agreements. One such agreement was recently condemned by an EEC court of law and declared an illegal sales practice).

So you can get an idea of the economics at stake, consider the case of a university in the Paris area which, a few months ago, bought 15 PCs to install GNU/Linux on. We do not know for sure how much a hardware vendor has to pay for Windows 95, but if we believe what is said in [7], Office PME, the street price of which is double that of Windows 95's, is sold to OEMs for about $100. We can therefore estimate that Windows 95 is sold to OEMs for about $50, and even assuming that hardware vendors do not make any profit on the software (which I doubt since pre-installation is a service that has a cost), this university has been forced to pay 15 times $60, or $900, for a product it did not want. In other words, in this particular case, the French government gave a $900 subsidy to Microsoft, a non-European company neither known for being on the verge of bankruptcy, nor in dire need of government assistance. If we extrapolate and consider all purchases made by French universities using GNU/Linux, we are dealing with millions of dollars every year. One really begins to wonder who the real pirates are! I cannot understand the reasons for such a waste, especially when we are being told that the state's coffers are empty.

If you try hard, and I mean *really* hard, it *may* be possible, at least in theory, to get your software money back after a purchase, once again by harassing the hardware manufacturers, but this is a tedious exercise reminiscent of an obstacle course. In our school, several researchers and students have bought desktop or laptop computers in order to install GNU/Linux or NextStep. They all had to buy Windows as well and were never able to get their money back. This is where the most important source of profit for Microsoft lies, and this is why we can talk about a real tax on computers: each purchased PC represents so many dollars into Microsoft's deep pockets, whether the customer wants their product or not. It is for ten years of such practices, which made the wealth of the company and killed competition, that Microsoft was reprimanded by American and European courts in 1995, unfortunately without any financial consequences [19]. This means that the booty from this theft remained in the pockets of the thief, in exchange for the promise not to relapse. Perhaps it is because the verdict lacked a punitive element that it is still very difficult today to buy a PC without Windows, unless one is willing to resort to small vendors. The case of Dell and Gateway is the norm, and each PC bought is one more "Windows user" in the statistics, even if the first thing this user does is trash Windows 95 in order to install GNU/Linux.

A look at the possible future of education

Now, what can happen if we don't wake up from our deep sleep and let ourselves be pushed into the traps of an industry and education system computerized by a private monopoly? Thanks to the so-called French technology lag, it is possible to answer this question. For better or worse, other countries are years ahead, and this should allow us to contemplate a number of possible futures.

Let's start with the immediate future. We do not need to look any further than Switzerland. On October 8th, 1997, the Swiss Minister of Finance announced an agreement with Microsoft. As a result of this agreement, the Swiss administration will make 2,500 computers available to the schools, while the American giant will contribute the same number of licenses for Microsoft products and train 600 educators to use the PCs [20] (a similar gift has been made to South Africa). In other words, for less than the cost of an advertising campaign, our monopolist has gained total control of computer education in Swiss schools, and thus, of Swiss companies, for by the time the students reach the job market, they will know nothing

[12] The author of this article has not limited his research to the Web. A few telephone calls were enough to confirm that it is *impossible* to buy a computer without Microsoft software from Gateway or Dell.

but Microsoft Office. Looking into the future, this is not a good deal for Switzerland, but at least they have not paid for Microsoft software.

Or more accurately, not yet, since they could be asked to pay up at a future date, as is currently happening in Japan. Last December, Microsoft announced the suppression of site licenses (an accounting scheme for licenses in a company or university that allows paying for software in proportion to actual usage, as opposed to the number of computers on which it is installed) to their Japanese customers. This decision implies a considerable and unjustified surcharge that the Japanese will have to pay since there are no more Microsoft competitors to turn to.

Let's look a little further into the future: California State University (CSU) is currently endorsing the creation of a corporation, the CETI, by Microsoft, GTE, Fujitsu, and Hughes Electronics. CETI will have the monopoly of renewing the computer infrastructure of CSU's 23 university campuses, where there are more than 350,000 students and teachers. In exchange for investing of a few hundred million dollars into the network infrastructure over the next ten years, CSU will let CETI choose the computers and software supported on campus, and the proposal is crystal clear on this point: it will be Windows 95, Windows NT, and Microsoft Office *only*. The projected profits for CETI, in addition to the impact on the education of tomorrow's executives, which will be made possible by the creation of specialized courses on proprietary computer science, round up to a few billion dollars over ten years. Note that this only includes the monopolist sale of proprietary hardware and software to students and teachers who will not be able to follow courses without using this equipment (see [21] and, for the decision to re-examine the deal, [22]).

The stakes: controlling the information

But the commercial and political issues at stake go far beyond education and business management. This is not just about selling computers and software, but about total control of any form of transmission and processing of information, be it in education, banking, the new and old media, or right down to the privacy of our own personal correspondence. A player capable of securing a monopoly in handling this information will be in a position to tax any computer operation (for example, in the form of a percentage of the transaction amount, or *vigorish*), as has been written by Nathan Myrhvold, Microsoft's CTO, in an internal note that is now part of the DoJ file and which the Wall Street Journal reviewed last year [23].

But such a monopolist can also force you to give up a growing part of your personal freedom, which can generate far greater profits. Just think about the fact that all types of information can be digitized and thus handled by a computer, and that it is, in principle, possible to keep track of any computer operation. For instance, while you are comfortably seated in front of your multimedia PC looking at nice pictures on the Internet, it will be possible to copy your banking data, or assemble and use, unbeknownst to you, your personal and psychological profiles. Web browsers started doing that ages ago using "cookies" [24], and some companies like Sidewalk, a Microsoft subsidiary, force you to agree to a true violation of your privacy before they allow you to access their service [25]). Thanks to unsafe proprietary extensions, such as Microsoft's ActiveX, it will be possible to have money stolen from your bank account while you surf the web. This has been unambiguously demonstrated by a group of computer scientists from Hamburg on German television, as well as in a few publications. In France, the press did not pick up the story at all (see [26] for details).

Even if Microsoft does not exploit the security holes in its system, others can do it for them. Today, a virus may be transported in the simplest of Word documents, and if you make purchases on the Internet based on "secure" transactions, your credit card number can be hacked at a cost of eight hours of computing time on a student's machine. Plenty to worry about, especially if one considers the recent agreement between the French bank *Crédit*

Lyonnais and Microsoft regarding the management of the bank's client accounts using the Web (see [27]).

It is equally possible to trace your physical movements, which are revealed without your knowledge by your credit card and cellular phone activity, as has been shown during the recent Swiss scandal or the OM-Valenciennes case (in this context, it may be a good idea to start worrying about the merger of the Microsoft Network in France with France Télécom's Wanadoo service).

To reach such a position without undue risk of getting caught with one's hand in the cookie jar, it is necessary to control the whole technological chain: the computer must use a specific piece of software, capable of gathering information behind the user's back, the Internet service providers need to implement methods to keep track of the duration and type of the connections, and the sites that contain the information the user is looking for must use specific software that is able to keep a trace of which documents were accessed, and to identify the user by communicating with his or her browser. Most importantly, all this has to happen *without the user becoming aware of it.* Today, any average computer programmer can easily ascertain whether a certain browser is revealing your identity to less than trustworthy servers. This is possible because we are using protocols that are in the public domain and must remain there to allow pieces of software produced by different companies to work together reasonably well. However, if tomorrow there is only one software producer left in the market, it is likely that the exchange of information will be effected by far less transparent means that will be difficult to expose and analyze, again because of the laws governing reverse engineering.

As you can see, all this is not only a matter of choosing a word processor.

An opportunity for Europe and employment

Here, my surprise at the passive attitude, or even collusion, of our media reaches its peak: we are in the process of ratifying and praising practices worthy of buccaneers, even though our economic independence is at stake. I could understand if Americans paid little attention to where the millions of dollars were coming from since they land in the pockets of one of their fellow citizens. What I cannot comprehend is how we can close our eyes here in Europe while this money is coming out of our purses.

It must be said that the EEC has not remained totally inactive in this area, and a large-scale investigation of the dubious practices we have now learned to recognize appears to be going on [28]. Reading between the lines of some speeches made by members of the DGIV, this investigation seems to follow the same direction as the one launched by the FTC in Japan not long ago. However, this is not enough: given the speed of technological advances in information processing, inquiries end after the damage has already been inflicted. If, as in the 1995 agreement, no financial penalties are imposed, as some indiscretions suggest, none of this is very useful.

What we need is an active policy in the field of computer science and information processing. We do have the technological means for such a policy; let us not forget that European know-how is frequently superior to what can be found on the other side of the Atlantic. To give just two examples, one of the authors of NextStep, often called "the most respected piece of software on the planet," is French, and Europe is at the forefront in developing formal methods of software verification. These methods have led to the successful completion of a large number of vitally important projects, the most recent of which was the second launch of the Ariane 5 rocket.

There is a unique opportunity for Europe to liberate itself from the American technological monopoly, and thereby give an enormous advantage to its companies and schools. The technology lag we hear so much about is actually our greatest advantage: it means that we have not yet completely fallen into the trap towards which we are being pushed. We must

remember that missing the boat is not such a bad thing, if this boat will eventually sink. We can still choose to provide our companies and children with low cost access to free, open, reliable, and efficient computing, as a growing number of competent computer scientists are demonstrating, by, whenever possible, selecting free, open and modifiable software that is far superior to pre-installed, questionable products. Moreover, this choice represents an enormous potential for creating new jobs.

A possible alternative: freely accessible software

When choosing software for our high schools and colleges to introduce our children to computing, we do not have to limit ourselves to the suspect and dubious gifts of cyber-monopolists. Instead of a proprietary system that crashes very often, changes version all the time and for no reason, and for which the source code is not available, we can select a freely accessible, open, and stable system. Contrary to a popular misconception, free software has had ample time to prove itself [29]). Furthermore, such software allows students to work and learn in total security while affording inquisitive minds the opportunity to acquire an advanced and intelligent computing knowledge: the availability of the source code makes it possible to "open the hood" and even, if desired, to "take the engine apart" to see how it works.

As to furnishing the so-called large accounts with computer systems, it is preferable to rely on software that comes with source code and documentation, is constantly verified and updated by a technologically competent community, and can be adapted to everyone's needs at little cost. Some serious studies, conducted by independent consulting firms, have accurately evaluated the economic and strategic advantages a company can gain by choosing solutions based on open rather than monopolistic software (for instance, see [30] and [31], [32]). We can also find several examples of European companies that have successfully put this theory into practice before exporting it across the Atlantic (see [33] and the ever-growing list [34]).

All this is possible without investing a single cent, thanks to a project started about fifteen years ago by Richard Stallman and the Free Software Foundation. The stated objective was to produce a completely free operating system called GNU [35]. This work has recently been completed through the effort of thousands of competent people who have answered Linus Torvalds' call from every corner of the globe. Their joint (and non-profit) contributions permitted the completion of a free and open operating system. It is a version of Unix known as Linux (see [36], [37]), but it would probably be more accurate to call it GNU/Linux [38] as we have done throughout this article. The story of GNU/Linux brings to mind three words that should not only be dear to the French: liberty, equality, fraternity. For this system, one can now find almost everything: Web servers, a Java virtual machine, DOS emulators, GNU tools, and even office suites. There is nothing to pay to obtain these base products. The European Union could lend a helping hand to this benevolent endeavor: a few hundred thousand dollars, a laughable amount on a European scale, could, if well spent, allow the rapid completion of projects such as GNUstep [39], promote the further development of GNU/Linux, and establish a top-quality open platform for interoperable office suites.

The choice of an open and freely accessible system can neutralize the information tax and thus favor employment while making our companies more competitive. The money that doesn't go up in smoke (through Windows) can be productively used to pay for maintenance contracts with local computer service professionals who will adapt the system to the specific needs of the companies. This creates a true area of growth. Jobs will be created for engineers, who will be *responsible* for the quality of their product, and not just for under-paid salespeople who attempt to *sell* something that they have no control over and that generates profits, which go elsewhere.

In any event, these kinds of jobs will be essential to France in the near future in order to operate and maintain the computer networks that will be installed in high schools as part of the "Internet for Everyone" plan. We must, at all cost, avoid repeating the "guru-in-the-box"

mistake, i.e., the belief that the installation manual carries the sum total of the knowledge required to operate a computer. It is this erroneous notion that turned a huge number of Thomson personal computers, built for the 1981 “Computer Science for the Masses” project, into rather expensive paperweights.

In conclusion

Computers provide us with the potential to revolutionize our daily lives, but it is our responsibility to choose whether this revolution will end in an obscure technological Middle Ages, dominated by a few feudal lords who seize control of writing and any other means of communication to collect a tax every time we breathe, or if we can achieve an open and modern world, where the free flow of information allows us to capitalize on the immense promise of limitless cooperation and sharing of knowledge.

Acknowledgements

This English version of the original French text would not have seen the light without the efforts of Philippe Regnauld `<regnauld@deepo.prosa.dk>` and Alban Chevignard `<albc@javanet.com>`, who made the initial translation, and Daniel and Vicki Kiechle `<dkiechle@csi.com>` who deeply revised and improved it, bringing it to the current state.

I warmly thank them all for their support and dedication. It is a reason for hope that this translation from French (as well as ongoing translations to other languages) has been carried out thanks to precisely the kind of barrierless cooperation that only an open and modern world computer network can guarantee.

References

[1]
Wallace (James) et Erickson (Jim). - *Hard Drive: Bill Gates and the Making of the Microsoft Empire*. - Harperbusiness, 1993. ISBN 0887306292.

[2]
Cringely (Robert X.). - *Accidental Empires : How the Boys of Silicon Valley Make Their Millions, Battle Foreign Competition, and Still Can't Get a Date*. - Harperbusiness, 1996. ISBN 0887308554.

[3]
Wallace (James). - *Overdrive : Bill Gates and the Race to Control Cyberspace*. - John Wiley and Sons, 1997. ISBN 0471180416.

[4]
CNN - U.S. vs. Microsoft. http://cnn.com/SPECIALS/1997/microsoft/poll.

[5]
Zdnn news special: DoJ-microsoft round 2, microsoft comes out swinging. http://www.zdnet.com/zdnn/special/msdoj2.html.

[6]
Perspectives. http://www.news.com/Perspectives/Soapbox/rs12_30_97a.html?nd.

[7]
M.V. - Microsoft m'a tué. *Science et Vie Micro (SVM)*, no 157, février 1998, p. 69.

[8]
Le virus informatique. http://www.virus.ldh.org/.

[9]
Stallman (Richard M.). - The right to read. *Communications of the ACM*, vol. 40, n'27 2, février 1997. Available on the Web at http://www.gnu.org/people/rms.html.

[10]
Schulmann (Andrew). - LA law. The Stac case judged February 23, 1994, in Los Angeles http://www.dap.csiro.au/Interest/LA-Law.html.

[11]
The CLRC recommendations on reverse engineering and decompilation: giving local developers an equal right to compete. http://www.sisa.org.au/SISASubmission1.html.

[12]
Microsoft & others oppose interoperability in HR 1555. http://www.essential.org/listproc/info-policy-notes/msg00158.html.

[13]
PC WEEK: Netscape to present DOJ with Microsoft antitrust info. http://www.zdnet.com/pcweek/news/0819/19edoj.html.

[14]
ftp://ftp.ora.com/pub/examples/windows/win95.update/ntwk4.html.

[15]
Le virus informatique/page27. http://www.virus.ldh.org/virus/num_01/pages/page27.html.

[16]
Minimal NT Server/Workstation Differences.
http://software.ora.com/News/ms_internet_andrews.html.

[17]
Dossier Piratage- 10 questions - Microsoft France.
http://www.microsoft.com/france/piratage/question.htm.

[18]
http://europa.eu.int/en/comm/dg04/public/en/art8586.pdf.

[19]
Bulletin UE 07-1994 (fr): 2.4.1 Engagement de Microsoft envers la Commission européenne.
http://europa.eu.int/abc/doc/off/bull/fr/9407/p204001.htm.

[20]
Swiss schools to get MS software. http://www.news.com/News/Item/0,4,15086,00.html.

[21]
MS college deal protest escalates. http://www.news.com/News/Item/0,4,17212,00.html.

[22]
Cal State delays MS pact. http://www.zdnet.com/zdnn/content/zdnn/0107/269241.html.

[23]
Elmer-DeWitt (Philip). - Bill Gates wants a piece of everybody's action. *Time*, 6/5/95.

[24]
Corr (O. Casey). - Cybersnoops on the loose; web-site surfers beware: Software 'cookies' gathering personal data. *The Seattle Times*, 8/10/97.

[25]
http://seattle.sidewalk.com/link/43750. **Beware!** The text is formatted in such a way that the access conditions are all the way to the right—so far that they cannot be read by most browsers without scrolling. Be sure to scroll to the right and read the conditions before you agree to anything.

[26]
ActiveX - Conceptional Failure of Security.
http://www.iks-jena.de/mitarb/lutz/security/activex.en.html.

[27]
http://www.microsoft.com.

[28]
http://europa.eu.int/en/comm/dg04/speech/six/en/sp96016.htm.

[29]
http://www.netaction.org/articles/freesoft.html.

[30]
http://www.smets.com.

[31]
Lang (Bernard). - Des logiciels libres à la disposition de tous. *Le monde diplomatique*, janvier 1998. - Aussi disponible comme
http://www.monde-diplomatique.fr/md/1998/01/LANG/9761.html.

[32]
Lang (Bernard) et Guédon (Jean-Claude). - Linux, mini OS contre maxi exploitation. *Libération*, 7 novembre 1997. - Aussi disponible comme
http://pauillac.inria.fr/~lang/ecrits/libe/www.liberation.com/multi/tribune/art/tri971107.html.

[33]
http://mercury.chem.pitt.edu/~angel/LinuxFocus/English/November1997/article9.html.

[34]
Freeware usage. http://pauillac.inria.fr/lang/hotlist/free/use/.

[35]
http://www.gnu.org.

[36]
http://www.linux.org.

[37]
Linux center. http://www.math.jussieu.fr/fermigie/linux-center/.

[38]
http://www.gnu.org/gnu/linux-and-gnu.html.

[39]
http://www.NMR.EMBL-Heidelberg.DE/GNUstep/.

[40]
Love (James) et Nader (Ralph). - Microsoft, monopole du prochain siècle? *Le monde diplomatique*, novembre 1997.