



UPGRADE is the European Journal for the Informatics Professional, published bimonthly at <http://www.upgrade-cepis.org/>

UPGRADE is the anchor point for UPENET (UPGRADE European Network), the network of CEPIS member societies' publications, that currently includes the following ones:

- **Mondo Digitale**, digital journal from the Italian CEPIS society AICA
- **Novática**, journal from the Spanish CEPIS society ATI
- **OCG Journal**, journal from the Austrian CEPIS society OCG
- **Pliroforiki**, journal from the Cyprus CEPIS society CCS
- **Pro Dialog**, journal from the Polish CEPIS society PTI-PIPS

Publisher

UPGRADE is published on behalf of CEPIS (Council of European Professional Informatics Societies, <http://www.cepis.org/>) by **Novática** (<http://www.ati.es/novatica/>), journal of the Spanish CEPIS society ATI (*Asociación de Técnicos de Informática*, <http://www.ati.es/>)

UPGRADE monographs are also published in Spanish (full version printed; summary, abstracts and some articles online) by **Novática**, and in Italian (summary, abstracts and some articles online) by the Italian CEPIS society ALSI (*Associazione nazionale Laureati in Scienze dell'Informazione e Informatica*, <http://www.alsi.it/>) and the Italian IT portal **Tecnoteca** (<http://www.tecnoteca.it/>)

UPGRADE was created in October 2000 by CEPIS and was first published by **Novática** and **INFORMATIK/INFORMATIQUE**, bimonthly journal of SVI/FSI (Swiss Federation of Professional Informatics Societies, <http://www.svifsi.ch/>)

Editorial Team

Chief Editor: Rafael Fernández Calvo, Spain, rfcalvo@ati.es

Associate Editors:

- François Louis Nicolet, Switzerland, nicolet@acm.org
- Roberto Carniel, Italy, carniel@dg.t.uniud.it
- Zakaria Maamar, Arab Emirates, Zakaria.Maamar@zu.ac.ae
- Soraya Kouadri Mostefaoui, Switzerland, soraya.kouadrimostefaoui@unifr.ch

Editorial Board

- Prof. Wolfried Stucky, Former President of CEPIS
- Prof. Nello Scarabottolo, CEPIS Vice President
- Fernando Píera Gómez and Rafael Fernández Calvo, ATI (Spain)
- François Louis Nicolet, SI (Switzerland)
- Roberto Carniel, ALSI – Tecnoteca (Italy)

UPENET Advisory Board

- Franco Filippazzi (Mondo Digitale, Italy)
- Rafael Fernández Calvo (Novática, Spain)
- Veith Risak (OCG Journal, Austria)
- Panicos Masouras (Pliroforiki, Cyprus)
- Andrzej Marciniak (Pro Dialog, Poland)

English Editors: Mike Andersson, Richard Butchart, David Cash, Arthur Cook, Tracey Darch, Laura Davies, Nick Dunn, Rodney Fennemore, Hilary Green, Roger Harris, Michael Hird, Jim Holder, Alasdair MacLeod, Pat Moody, Adam David Moss, Phil Parkin, Brian Robson

Cover page designed by Antonio Crespo Foix, © ATI 2005

Layout Design: François Louis Nicolet

Composition: Jorge Llácer-Gil de Ramalos

Editorial correspondence: Rafael Fernández Calvo rfcalvo@ati.es

Advertising correspondence: novatica@ati.es

UPGRADE Newslist available at

<http://www.upgrade-cepis.org/pages/editinfo.html#newslist>

Copyright

© Novática 2005 (for monograph and cover page)

© CEPIS 2005 (for editorial, and sections MOSAIC and UPENET)

All rights reserved. Abstracting is permitted with credit to the source. For copying, reprint, or republication permission, contact the Editorial Team

The opinions expressed by the authors are their exclusive responsibility

ISSN 1684-5285

Monograph of next issue (December 2005)

The Semantic Web

The full schedule of UPGRADE is available at our website)

2 Editorial

In The Fifth Anniversary of UPGRADE — *Geoff McMullen* (President of CEPIS)

Monograph: Computing Omnipresence

(published jointly with Novática*)

Guest Editors: *José-Antonio Gutiérrez de Mesa, Daniel Rodríguez-García, and Miltiadis D. Lytras*

3 Presentation

An Outlook for Ubiquitous Computing: Computing Power Anywhere and in Any Device — *José-Antonio Gutiérrez de Mesa, Daniel Rodríguez-García, and Miltiadis D. Lytras*

8 The Critical Mass Problem of Mobile Ad-hoc Networks — Jörg Roth

14 Device and Context Influence on Wireless Infotainment Access: A Real World Story — *Tacha Serif and George Ghinea*

20 The Problems of Printing in Server-Based Computing Environments — *Luis Bengochea-Martínez*

26 Using FOAF to Support Community Building — *Brian Kelly and Leigh Dodds*

29 Towards Ubiquitous Computing with Quality of Web Service Support — *Yannis Makripoulias, Christos Makris, Yiannis Panagis, Evangelos Sakkopoulos, Poulia Adamopoulou, Maria Pontikaki, and Athanasios Tsakalidis*

35 The Open Source Software vs. Proprietary Software Debate and Its Impact on Technological Innovation — *Ricardo-José Rejas-Muslera, Juan-José Cuadrado-Gallego, Javier Dolado-Cosín, and Daniel Rodríguez-García*

39 Localization in Ubiquitous Computing Using Acoustic Sensor Network — *Carlos-Manuel De Marziani, Jesús Ureña-Ureña, Álvaro Hernández-Alonso, Manuel Mazo-Quintas, Ana Jiménez-Martín, Juan-Jesús García-Domínguez, José-Manuel Villadangos-Carrizo, and Fernando-Javier Álvarez-Franco*

46 Portable System For Patient Monitoring With Wireless Technologies — *José-Manuel Rodríguez-Ascariz, Luciano Boquete-Vázquez, Ignacio Bravo-Muñoz, and Pedro Martín-Sánchez*

53 SIGLAS: A Practical Case of The Application of Ubiquitous Computing in Warehouse Management — *José-Julio González-Pozo and Manuel Ortega-Cantero*

58 Ubiquitous E-Management of Indicators — *Eladio Domínguez-Murillo, Ángel De Miguel-Artal, Beatriz Pérez-Valle, Áurea Rodríguez-Villanueva, and María-Antonia Zapata-Abad*

UPENET (UPGRADE European Network)

61 From Pro Dialog (PIPS, Poland)

Computer Algebra Systems

Problems with A Heart-Shaped Curve — *Leszek Jankowski and Adam Marlewski*

68 From Mondo Digitale (AICA, Italy)

Web Engineering

A Quality Model for Websites — *Roberto Polillo*

* This monograph will be also published in Spanish (full version printed; summary, abstracts, and some articles online) by **Novática**, journal of the Spanish CEPIS society ATI (*Asociación de Técnicos de Informática*) at <http://www.ati.es/novatica/>, and in Italian (online edition only, containing summary, abstracts, and some articles) by the Italian CEPIS society ALSI (*Associazione nazionale Laureati in Scienze dell'informazione e Informatica*) and the Italian IT portal **Tecnoteca** at <http://www.tecnoteca.it/>.

The Open Source Software vs. Proprietary Software Debate and Its Impact on Technological Innovation

Ricardo-José Rejas-Muslera, Juan-José Cuadrado-Gallego, Javier Dolado-Cosín, and Daniel Rodríguez- García

Given the importance of the OSS (Open Source Software) vs. proprietary software debate - in economic and financial terms, and in terms of market opening and diversification, and even innovation - in this paper we examine the latest corporate movements and the most significant legislative trends in this area. At a Spanish national level, we make a brief review of domestic law, with special reference to the national anti-piracy plan, while at a worldwide level we take a look at the latest and most significant corporate movements and regulatory trends regarding this issue.

Keywords: Copyright Protection, Intellectual Property, Legal Protection of Computer Programmes, Open Source Software, OSS, Patents, Proprietary Software, Ubiquitous Software, Ubiquitous Computing,

1 Introduction

Technological innovation – in the field of information technology in general and in the field of software specifically – is emerging as a key factor in the development and general well-being of advanced industrial societies. The competitiveness of economic agents is in direct proportion to their capacity for innovation, and the wealth and level of development of nations is the result of the innovative capacity of each country.

One factor which will have a decisive impact on the structure and evolution of technological innovation policies and, more specifically, on software industry, is the final outcome of the OSS (Open Source Software) vs. proprietary software dilemma. This will depend on the dynamics of the market itself and, to a great extent, on the policies and regulations established by the national and supranational bodies working in this field.

The outcome of this debate will have a decisive impact on such important issues as business competitiveness, the opening and diversification of markets, and technological development in general.

All this is especially relevant to the area of ubiquitous computation, because the quest for innovation and the struggle for dominant positions in this field is particularly fierce, since ubiquitous computing has the potential to affect millions of consumers and virtually every market.

2 Legal Protection of Software in Spain and National Anti-Piracy Plan

The legal protection of software under the Spanish system is based on intellectual property rights - or copyright to

be more precise - the main features of which are outlined below:

1. The exclusion of software from patentability – i.e. from the protection afforded by industrial property rights. This has also been incorporated into the legislation of other European Community countries such as Germany, France,

Ricardo-José Rejas-Muslera is currently a full time lecturer of Software Engineering at the *Universidad Francisco de Vitoria*, Spain, and is completing his doctoral studies in the Dept. of Computer Science at the *Universidad de Alcalá de Henares*, Spain. He has extensive experience in management and planning positions in ICT projects, having held posts of responsibility in companies working in areas that coincide with his research interests. <rrejas@hotmail.com>

Juan-José Cuadrado-Gallego received his PhD in Computer Science from the *Universidad Carlos III de Madrid* where he lectured in Software Engineering. He is currently a senior lecturer at the *Universidad de Alcalá de Henares*, Spain. He has extensive research experience evidenced by the publication of numerous articles nationally and internationally, mainly on the subject of metrics, software measurement, and project estimation. He is currently one of the leading members of the Onto-Swebok project. <jjcg@uah.es>

Javier Dolado-Cosín is Professor of Computer Languages and Systems at the *Universidad del País Vasco*, Spain. His research is focused on project management and software engineering. He has published papers on software estimation, the ethics of computing, empirical software engineering, complex systems, ... He is a member of IEEE, ACM and ATI, and is co-editor of the “Software Engineering” technical section of the journal *Novática*. <dolado@si.ehu.es>

Daniel Rodríguez-García graduated in Computer Science at the *Universidad del País Vasco*, Spain, and received his PhD from the University of Reading, United Kingdom. He currently lectures at Reading in the Dept. of Computer Science and is a member of the ACET (Centre for Advanced Computing and Emerging Technologies). His research interests are focused on software engineering and include software metrics and measurement, software engineering experimentation and soft computing, and distributed systems. <d.rodriuezgarcia@reading.ac.uk>

¹ Available at <http://www.oepm.es/internet/legisla/dcho_eur/22cpe.htm>.

² Available at <http://www.wipo.int/treaties/es/ip/berne/pdf/trtdocs_wo001.pdf>.

United Kingdom, and Italy, in accordance with the Munich Convention of 1973 on patents¹.

2. For legislative purposes software is treated in the same way as literary, scientific, or artistic works which are protected by copyright under the 1883 Berne Convention for the Protection of Literary and Artistic Works².

3. The reference legal framework in this field is the European Union Directive on the legal protection of software [1] and the Spanish Intellectual Property Law [2]

4. The holder of these rights is a natural person who has created and "fixed in any tangible means of expression" a literary, artistic, or scientific work which is transferable to another natural or legal person. Rights over software are acquired at the moment of its creation.

5. With regard to copyright life, there are two situations depending on who the holder is. If the holder is a natural person, the exploitation rights of the work are deemed to belong to the author while he or she is still alive and a further seventy years after the author has died or been declared dead. In the case of a legal person the period is seventy years from January 1 of the year following the first lawful publication of the software, or the date of its creation if it has not been published. At the end of these periods the software passes into public domain, when it can be used by anyone providing that the authorship and integrity of the work are respected.

6. These rights are dual in nature:

a. Exploitation rights: Considering the property as an economic asset. In other words the right to make an economic gain from the software, and maintain an exclusive control over the exploitation of the work: reproduction, distribution, transfer, or public disclosure.

b. Moral rights. Of a strictly personal nature. Based on the authorship of the work, they are inalienable and unrenounceable. Among others, the right to publish the work under one's name, modify it, disseminate it, or withdraw it.

2.2 National Anti-Piracy Plan

Here we take a look at what is officially known as the Integrated Plan for the Reduction and Elimination of Intellectual Property Rights Infringements of April 8, 2005. The plan has a dual aim: to raise public awareness of such infringements and to bring offenders to justice, and is based on a series of urgent measures and a number of mid- and long-term strategies.

1. The plan aims not only to punish those who infringe intellectual property rights but also to raise consumer awareness of the harm that piracy does.

2. Among urgent measures to combat copyright infringement are:

a. The signature of a collaboration agreement between the Ministry of Culture and sectoral associations at a local authority level, intended to raise public awareness, establish guideline criteria for the measures to be undertaken, map the incidence of piracy in Spain, and implement training actions and advisory services in the matter at a local level.

b. Increased policing: creation of a special police task force, greater coordination between police forces, drawing up of permanent area action plans for the policing of piracy, and increased international and institutional cooperation.

c. Training and coordination measures and actions for the Department of Public Prosecutions.

d. The Ministry of Culture and the Ministry of Industry, Tourism and Trade will set up a working group involving intellectual property management offices and the technology industry in order to set up and develop self-regulatory mechanisms aimed at detecting and removing any unauthorized content in digital networks, and determining the identity of the infringers. The working group will also monitor the effectiveness of the plan's actions and measures.

3. The plan includes a series of measures intended to reduce or eliminate copyright infringement:

a. Measures of cooperation and collaboration between various government bodies, and between government bodies and the private sector. A commission is to be set up for that purpose.

b. Preventive measures aimed mainly at describing the problem of piracy in its various facets.

c. Public awareness campaigns in order to make the public aware of the serious harm caused by the infringement of intellectual property rights.

d. Regulatory measures, based primarily on an analysis of sector specific regulations.

e. Training measures with a dual purpose: to increase the effectiveness of agents engaged in the fight against piracy, and to promote research and development in this area.

3 International Corporate Trends and Movements

3.1 European Union Policy on OSS and Patents

As we mentioned earlier, the outcome of the debate between OSS and proprietary software will depend to a large extent on the policies and regulations that are in place at a national and a supranational level. We therefore need to take a look at where the European Union (EU) stands on this issue, as this may be enough to tip the balance one way or another.

Up until now it seems that there has been a slight bias towards the use of OSS, especially in ICT-related (Information and Communications Technologies) research projects and policies implementing framework programmes promoting *libre* and open source software, such as the eEurope 2000 action plan, the IDA programme (promoting Governmental Data Exchange), R&TD framework programmes, and other actions implemented by EU member states, usually associated with the acquisition of or migration to libre software by their respective government bodies.

However, a bitter debate has been raging within European institutions as to whether or not software should be patentable. This is evidenced by the fierce confrontation between the European Commission and the European Parliament over the famous "*Directive on the patentability of*

computer implemented inventions", which was finally resolved in July of this year with the almost unanimous rejection of the proposal by the European Parliament. According to official European Commission sources, they have no intention of submitting a new proposal either now or in the near future.

This controversy is fuelled by two clearly differentiated viewpoints:

1. Supporting the EC Directive are major corporations such as Microsoft or Nokia, Ericsson or Alcatel who maintain that this Directive will encourage innovation by protecting the rights of inventors and helping them to obtain a return on their R&D investment.

2. Against the Directive are the *libre* software user groups for whom the patentability of software would render more than half of the computer programs currently in use in the EU illegal. The Directive would only benefit the major software companies, to the detriment of small and medium size companies and software consumers, since it would allow the major software multinationals to legally prohibit the use of certain algorithms and computing formulas which have hitherto only been subject to copyright fees.

The manner in which this issue is resolved will to a large extent shape the future structure of the software market. If governmental and legislative institutions opt to encourage the use of OSS, they will give a huge boost to competition in this sector and will drive a change from a highly polarized oligopolistic market to a more competitive and open market which will benefit both the consumer and the general public. The downside is that it will be harder for companies to obtain a return on their innovation and development investment. If the decision goes the other way, the consequences will be the opposite of the above, since we should not lose sight of the fact that when a patent is granted for an invention or process, ultimately the State is awarding that invention a monopoly.

3.2 Corporate Concentration in Pacific Asia and Mobile Device Compatibility: Libre Software - TRON

The plethora of corporate movements taking place worldwide underscores the practical importance of the outcome of this debate. As an example of this in the field of ubiquitous computing, and more specifically in relation to mobile terminal, we go on to look at the strategies adopted by major companies in the sector to capture the massive Asian market.

This market is a good example of how a number of overly aggressive decisions taken by corporations and countries have stirred up the market to such an extent that from the dominant position in the mobile terminal software market held by Microsoft, founded on patent protection, the pendulum has swung to practically the opposite situation in which Microsoft's systems will have to be compatible with TRON (The Real-time Operating-system Nucleus) *libre* software, something akin to Windows XP having to be compatible with Linux.

In broad terms, this is what happened: Microsoft targeted its marketing strategy at the Asian market and, more

specifically, the Chinese market, leveraging its monopoly position in operating systems for mobile devices. At the same time, the region was being influenced two parallel developments:

1. On the one hand, China was migrating en masse to Linux as away of achieving technological independence while saving money on the computerization of the nation's public administration.

2. On the other hand, the Japanese technological industry was wilting under Microsoft's monopoly.

In an attempt to revive his country's ailing technological industry and at the same time take advantage of China's initiative, Japanese prime minister, Junichiro Koizumi, drew up a pact with the most important economic and governmental agents of Pacific Asia with the purpose of resurrecting the TRON operating system. Under the terms of this agreement, mobile device manufacturers would have to install software compatible with TRON if they wished to enter the Asian market. Encouraged by the prospect of accessing a huge market all set to usher in third generation mobile telephony, Microsoft changed its strategy and duly made their new systems TRON compatible in a joint project with Motorola and Symbian.

3.3. Software Rights, with Special Reference to the Kodak vs. Sun Case.

Another interesting example of how patent based regulation can affect the market is the Kodak vs. Sun case. This case had a direct bearing on the world of ubiquitous computing since the lawsuit centred around the programming language Java.

In February, 2002, Kodak sued Sun Microsystems for infringing patents 5206951, 5421012 and 5226161, protecting a mechanism by which a program can request help from a processing system to delegate functions without Java implementation. The main characteristic of the Java is that it is a multiplatform language since it is interpreted by a built-in virtual machine.

In October of the same year a jury of the Rochester Federal District Court found in favour of Kodak who were claiming damages of some 1,000 million dollars from Sun. Payment of such damages would practically wipe Sun out, as its delicate financial situation could not withstand a payout of that magnitude.

The court's ruling also meant that, in practical terms, any language based on mechanisms similar to Java bytecodes, such as Microsoft's .NET or Python could be liable to similar lawsuits.

Sun appealed against the ruling and reached a settlement with Kodak whereby Sun would pay Kodak the sum of 92 million dollars in patent royalties. This meant that Sun, one of the world's leading companies in technological innovation and especially in Java programming languages, was able to stay in business and Kodak could not file any further lawsuits for the same infringements.

The importance of this matter lies in what would have happened if the court's initial ruling had been enforced. It

would have led to a serious brake on innovation in this area, since the patents in question affect not only all the drivers behind multi-task systems or frameworks such as OLE, COM or CORBA, but also the major manufacturers of Java-based products (such as SourceForge, Kronos, BEA Systems Inc) who have Sun Java licences.

4 Conclusions

The regulatory policies that eventually govern the legal protection of software, and consequently the accessibility and presence of OSS, will have a decisive impact on technological innovation and development in general and the software development market in particular.

If the balance tips in favour of the promotion and defence of competition by encouraging the dissemination of libre software, this should lead to a more plural and accessible market, the elimination of monopolies over technologies, and greater diversification in the development of technological innovation, though possibly at the price of making it difficult for companies to obtain worthwhile returns on their R&D investment. If the opposite outcome prevails, technological development will be concentrated in the major technological multinationals which would come to form a de facto oligopolistic market, with all the consequent social costs, barriers to new technologies, and economic inefficiencies. However, it would be easier for companies to get a return on their R&D investment, which would presumably encourage them to increase that investment and so give a boost to technological development.

All the above is possibly of even greater importance to the world of ubiquitous computing, since as its name implies, any regulatory, political, or corporate movement may affect millions of potential consumers across practically every economic and social sector.

Translation by Steve Turpin

References

- [1] Directive 91/250/EC on the legal protection of computer programmes. In the Official Journal of the European Union (OJEU), <<http://europa.eu.int/scadplus/leg/es/lvb/l26027.htm>>.
- [2] Redrafted Text of the Intellectual Property Law, Royal Legislative Decree 1/1996 of April 12 (published in the BOE [Spanish Official State Gazette] of April 24), modified by Law 5/1998, of March 6, <<http://inicia.es/of/tip/LPI.doc>>.
- [3] "Plan Integral del Gobierno para la disminución y eliminación de las actividades vulneradoras de la propiedad Intelectual" (Integrated Government Plan for the reduction and elimination of activities infringing intellectual property [rights]) of April 8, 2005, <http://www.mcu.es/gabipren/notas/2005/abril/cul_08_piratas.pdf>.
- [4] Miguel A. Davara Rodríguez. "Manual de Derecho Informático (Handbook on Computing Law)" (6th Edition), Thomson & Aranzadi, 2004.
- [5] WIPO Magazine, number 3, Geneva, May/June 2004. "Savvy Marketing: Merchandising of Intellectual Property Rights" <http://www.wipo.int/sme/en/documents/merchandising.htm> and "Accounting and Intellectual Property", <http://www.OMPI.int/freepublications/en/general/121/2004/wipo_pub_121_2004_05_06.pdf>.
- [6] WIPO Magazine, number 2, Geneva, March/April 2004. "Getting the most out of your trademark", <http://www.wipo.int/freepublications/en/general/121/2004/wipo_pub_121_2004_03-04.pdf>.
- [7] "Intellectual Property and SME's". WIPO, 2004, <http://www.wipo.int/sme/en/ip_business/index.htm>.