intellectual property project

PROCEEDINGS

Technological Strategies for Protecting Intellectual Property in the Networked Multimedia Environment

COALITION FOR NETWORKED INFORMATION

INTERACTIVE MULTIMEDIA ASSOCIATION

JOHN F. KENNEDY SCHOOL OF GOVERNMENT
SCIENCE, TECHNOLOGY & PUBLIC POLICY PROGRAM

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
PROGRAM ON DIGITAL OPEN HIGH-RESOLUTION SYSTEMS

VOLUME 1 ISSUE 1 JANUARY 1994

The Journal of the Interactive Multimedia Association Intellectual Property Project

PROCEEDINGS

January 1994
Volume 1, Issue 1

The Journal of the Interactive Multimedia Association Intellectual Property Project

Published by:
Interactive Multimedia Association
Intellectual Property Project
3 Church Circle
Suite 800
Annapolis, MD 21401-1933
Phone: (410) 626-1380
FAX: (410) 263-0590

The Strategic Environment for Protecting Multimedia

by Brian Kahin

The advent of distributed computing over high-bandwidth wide-area networks looks like a worst-case scenario for intellectual property. Owners of content — text, images, music, motion pictures — are understandably fearful of releasing proprietary information into an environment which is lacking in security and has no accepted means of accounting for use and copying. The variety of formats and the variety of proprietary interests involved complicate the problem and attempts at solutions.

On April 2 and 3, 1993, four organizations involved in networking and multimedia issues sponsored a two-day workshop at Harvard's John F. Kennedy School of Government to address the problem. These organizations — the Coalition for Networked Information, the Interactive Multimedia Association, the MIT Program on Digital Open High Resolution Systems, and the Information Infrastructure Project in the Kennedy School's Science, Technology and Public Policy Program — represented a set of different perspectives on what all saw as a broad common problem. The workshop was designed to:

- map the territory between secure systems and the need for practical, user-friendly systems for marketing information resources and services;
- survey the technological landscape, evaluate the potential benefits and risks of different mechanisms, define a research agenda, and frame related implementation and policy issues;
- consider how and where within the overall infrastructure different technologies are best implemented; and
- present and analyze models for explaining protection systems and strategies.

Speakers were invited to address these issues along with the potential roles of particular technologies and mechanisms: billing servers; type-of-service identifiers; header descriptors; labeling and tagging; fingerprinting; digital signatures; contracting mechanisms; EDI (electronic data interchange); copy protection; serial copy management; authentication servers; software envelopes; encryption; display-only systems; concurrent use limitations; and structured charging.

In part the workshop responded to the continued dramatic growth of the global Internet and the planned National Research and Education Network (NREN), the follow-on to the federally funded portion of the domestic Internet. The Internet offers the beginning of a switched, multifunctional, multimedia environment for sharing resources and for marketing information products and services — in short, for applications and practices that will shape the broadband information infrastructure of the future. Complex network-accessible library systems have been designed and developed for disseminating nonproprietary information, but until there are adequate mechanisms and safeguards for handling proprietary information, investment will be inhibited.

At the urging of the Association of American Publishers and the Information Industry Association, Congress included in the High Performance Computing Act of 1991 provisions that appeared to address this problem. The National Research and Education Network was to:

> (1) be developed and deployed with the computer, telecommunications, and information industries....
>
> (5) be designed and operated so as to ensure the continued application of laws that provide network and information resources security measures, including those that protect copyright and other intellectual property rights....
>
> (6) have accounting mechanisms which allow users or groups of users to be charged for their usage of copyrighted materials available over the Network....
>
> [15 USC 5512(c)]

The Act also required the Director of the Office of Science and Technology Policy to report to Congress by the anniversary of the Act (i.e., December 9, 1992) on "how to protect the copyrights of material distributed over the Network...." [15 USC 5512(g)(5)]. H.R. 1757, the proposed "National Information Infrastructure Act of 1993" which has just passed the House, rewrites the provisions in the 1991 Act, preserving the mandate on copyright in the 1991 Act and adding a requirement for research on copyright protection.

However, federal agencies have yet to address these issues in depth. Many agency personnel, as well as many within academia and the private sector, believe that the protection of intellectual property on the NREN, as on any network, needs to be addressed at the an applications level, not within the design of the network. (Jerry Linn's paper in this volume takes this perspective.) Many also believe that the problem should be addressed first by the private sector. After all, since there is a market for networked information, there should be a market for technologies that protect intellectual property. Shouldn't the government focus its scarce resources on enabling resource- sharing within the research community, where there is relatively little need to protect intellectual property?

However, while the Bush Administration saw the NREN program as focused on scientific research, the Clinton/Gore Administration envisions the NREN program, and more generally, the Internet, as part of a broad strategy to drive the development of a commercial informa-

tion infrastructure which encompasses mass-market publishing and entertainment. If this broader goal is legitimate grounds for public investment, then arguably the government should be involved in supporting mechanisms to protect intellectual property.

Certainly the benefits (new network-accessible resources, etc.) that could be generated by the availability of billing servers on the Internet could justify public investment. But is the federal government, which typically disseminates its own information for free or cost, a knowledgeable and careful enough sponsor to avoid skewing or prejudicing the playing field for private investment? If promulgation of standards would encourage private investment, might not private sector organizations proceeding through RFTs (requests for technology) do a better job leveraging the market? If the government is to be involved in standards development, what role should it play? There are many different models for government involvement, and broad industry support for standards, but little discussion of where or how federal support should be implemented.

The Content Owner's Perspective

Owners of rights to music, images, and other forms of content view the emerging network environment as the latest evolutionary stage to threaten the stability and security of the distribution chain. First there was the transformation of analog copying through xerography and electromagnetic recording (cassette recorders and VCRs). This was followed by the digitization of information and the development of the personal computer as a general purpose authoring and publishing machine of constantly increasing capacity and capability, able to manipulate not just text, but sound, images, and finally video. The final stage in this evolutionary path is switched broadband networking, which allows computer users to publish all over the world with great efficiency — a development already in evidence within well- networked research communities. Mindful of the free and promiscuous behavior of information in this increasingly functional and capacious environment, content owners have been understandably reluctant to license their property.

However, the evolution toward a user-enabling broadband environment actually brings with it an increased number of legal tools for protecting intellectual property (see Figure 1). True, there is some uncertainty about the application of these tools, but they offer important hooks that can be combined with other elements of a property protection strategy. Indeed, from the multimedia developer/producer's perspective, these tools may add to difficulties in licensing content, because of the need to clear additional rights.

Advancing technology also offers new prospects for securing proprietary information so that it cannot be copied casually, mediating access so that users can locate and use information easily, and assessing charges for access and use in a reasonable and comprehensible manner. There is a tension here between mechanisms that protect and control, on the one hand, and features and characteristics that foster interoperation and usability. Limiting technologies may directly inconvenience and frustrate users or add to the complexity of a product, increasing the likelihood of bugs — problems which have contributed to the failure of technological protections in the past.

environment	*available intellectual property tools*
print	*© reproduction*
electronic media	*© reproduction, public performance*
multimedia	*© reproduction, public performance, adaptation* *patent: manufacture, sale, use*
networked multimedia	*© reproduction, public performance, adaptation, public display* *patent: manufacture, sale, use*

Figure 1. Intellectual property tools in increasingly sophisticated environments

Software copy protection, which was commonplace in the mid-1980s, has been all but abandoned. This was partly because the Copyright Act allowed users to make backup copies, which legitimized the marketing and distribution of software that allowed minimally motivated users to unlock copy-protected software. Copy protection mechanisms thus proved ineffective for determined copiers while they remained awkward and frustrating for unsophisticated new users, the very people to whom software publishers were looking to expand the customer base. Copy protection also imposed unanticipated burdens on the support services that software publishers provided to their customers.

In 1984, ADAPSO (now the Information Technology Association of America) proposed an outboard hardware lock as an industry standard for copy protection. While this approach appeared more effective than software-based solutions, it also raised questions of who would pay to implement it, as well as possible antitrust problems. Hence, in place of copy protection, the software publishing industry has come to rely on the threat of lawsuits in the vulnerable corporate environment as a means of copyright enforcement.

The problems faced by the ADAPSO proposal can be addressed by legislation. In fact, in 1992 Congress amended the Copyright Act to mandate a closed hardware-secured environment incorporating serial copy management for next-generation digital audio recording technology (DART). This elaborate legislation included provisions for fees to be levied on hardware and recording media to compensate the owners of rights in music and sound recordings. However, the computer industry took care to ensure that the complex DART regime was strictly limited to consumer audio technology and did not affect the nascent multimedia industry.

The Copyright Act of 1976 was carefully designed to be technology-neutral. With the exception of the provisions on cable retransmission, it is an elegant piece of legislation in which general principles are applied with remarkable uniformity to many different kinds of works. But the practicalities of enforcing copyright protection reveal critical differences

among types of information. Whether the work is text, images, sound recording, video, or computer program makes a big difference — as does whether it is analog or digital, or whether it is mass- market or niche-market. The one-size-fits-all vision has been eroded by the need to address special problems within particular industries. So legislation has addressed these issues case by case, as in the 1980 amendments concerning computer software (codified as Section 117), the Record Rental Amendment Act of 1984, and the Computer Software Rental Amendments Act of 1990

The DART legislation is the latest example, and it foreshadows similar issues presented by the advent of digital video technology.

Nature of the Threat

The nature of the threat is important in assessing the need for special protection. There are three distinct possibilities. First, there is true piracy, the making of unauthorized copies for sale (or selling unauthorized access to transmissions); second is unauthorized copying in a business environment; third is erosion of the consumer market by copying and redistribution among family and friends.

Protection against piracy is facilitated by the fact that the bigger and more successful the operation, the more visible and vulnerable it becomes. Criminal penalties are available under the Copyright Act, which means that copyright owners can expect help directly from the government in such situations. But today the big piracy problems are concentrated in particular countries. Protection from foreign piracy ends up as a political issue: How much pressure is the U.S. willing to place on certain governments to crack down on pirate operations within their borders? Typically, this pressure is applied in the process of trade negotiations.

The second area, protecting against unauthorized copying within businesses, is an issue principally for software publishers. The Software Publishers Association (SPA) has developed a very effective program to combat the problem by advertising a hotline and relying on disaffected former employees to report improper copying. In this case, the threat of liability and attendant bad publicity appears to have had significant impact on software management practices, at least within the U.S.

The third area, erosion of the consumer market through consumer copying, is perhaps the most problematic. It is impractical, if not impossible, to control through litigation. Indeed, to some degree, consumer copying is a common, socially accepted practice. This is especially true for the copying of audiocassettes and CDs and for the videotaping of broadcast and cable television. The DART provision for serial copy protection is relatively weak in that it does not preclude making multiple copies from the original purchased product; it only precludes making copies from the copies. SPA opposed the DART legislation because it legitimized personal copying, thereby strengthening attitudes that might carry over to computer software. Ironically, unauthorized copying of software may, in fact, enhance opportunities to market new versions, as recent promotional offers of free financial management software have suggested.

Furthermore, the ability to make copies increases perceived value. For example, the licensing of movies to cable, including "pay-per-view,"

undoubtedly results in considerable home copying and retention of such copies by consumers. But the fact that consumers can get relatively high-quality copies in this manner (at least compared to copying from a videocassette) increases their willingness to pay for premium cable services and pay-per-view cable. This in turn is presumably reflected in the licensing fees that cable services are willing to pay movie studios for their product. Similarly, the fact that CDs can master better cassette copies than cassettes undoubtedly helps sustain higher retail prices for CDs.

There are also editorial and marketing strategies to minimize consumer erosion. In general, a product that is part of a series or a larger whole is less susceptible than a standalone product. Examples include the versions of software, the sound recordings of a particular artist or group, and subscriptions to a series.

While consumer copying of videocassettes, sound recordings, and computer software has been widespread, it is not clear that still images will be copied and circulated to the same degree. There is simply is not the same kind of substantial, specific demand for individual photographs that there is for popular songs, recent movies, and software. Images are generally marketed in collections, and indeed there may be a market for electronic image collections analogous to coffee table books or home videos. Such collections, like other CD-ROM-based multimedia products, would be difficult to duplicate for the foreseeable future, and extracted images may have little value in isolation.

It should be relatively easy for multimedia publishers to license works, and especially fragments of works, that have little value in isolation. Although content owners may well be concerned about context, a clip from a song or a movie may stimulate demand for the original. A run-time version of a software program may elicit interest in the fully functional original. Abstracts of journal articles can elicit interest in the full text.

These observations highlight the critical distinction between technology used to limit access and technology as a facilitator. The former includes restrictive technologies such as encryption, user authentication, and copy protection. Facilitative technology aims to provide a seamless interface to information which enables the user to navigate and synthesize the information as transparently as possible. This can add enormous value by putting information in a rich and useful context. The availability of functionally and contextually enriched information diminishes the value of the same information in flat and isolated form and therefore reduces incentives to extract and redistribute content. Of course, systems can combine restrictive and facilitative elements.

Online systems can also enable continuing contractual relationships between publishers and end-users. Contracts can supplement copyright protection and are especially important for databases of factual material, where copyright protection may not be available for individual records. By contrast, contracts are very difficult to establish in a retail sales environment, notwithstanding the ambitious claims in shrink-wrap licenses.

There are practical limits to technology-mediated access. Online vendors have pioneered the use of complex pricing algorithms in which

users pay for connect time, searches, hits, and volume — all of which relate to cost or value. But most users, especially inexpert users, prefer the flat-rate pricing associated with CD- ROM databases, which is easy to budget for and encourages experimentation and use. Most consumer online services now mix a flat rate for basic services with metering for premium services. Flat-rate pricing is the norm for most information transactions: books, cable television, multimedia products, videocassettes, CDs, newspapers, videogames, computer software....

Flat-rate pricing is not necessarily per-copy. Software, for example, may be licensed on a per-copy, per-user, per-machine, per-site, concurrent-use basis, or some combination thereof. Licensing the software for use only on a particular computer may have made sense for mainframes, but it fits less well in a distributed computing environment in which users may have access to several computers at different times. There is growing acceptance of concurrent licensing (with software lockout when the authorized number of users is reached) as a fair method of licensing programs for use over a local area network. Per-copy licensing remains easy to enforce under copyright law and, in fact, provides the basis for SPA's auditing and enforcement program. However, few individual users are inclined to uninstall software from one computer just so they can use it temporarily on another.

Pricing and licensing strategy can be viewed as a kind of soft intellectual property protection. If users feel that prices are fair and reasonably related to use, they will be less inclined to look outside legitimate distribution channels or to make copies for friends.

Labeling is another soft strategy that can take on a wide variety of forms: copyright notices on every page; "FBI warnings" on videocassettes; personalized sign-on screens; appeals to the user's sense of fair play and appreciation for the product or service. Labeling can usually be embedded in the content, so that it cannot easily be removed. It thereby diminishes the experiential value of the content (which is therefore less likely to be redistributed) or makes it clear that copies are derived improperly from the original context. Alternatively, labeling can be made invisible so that it becomes a "fingerprint," which, when properly decoded, reveals the original source of pirate copies.

Figure 2 illustrates strategic options for network publishing along two dimensions. The vertical dimension extends from inclusive strategies to facilitate use and expand the market to exclusive strategies which maintain the market by excluding nonpaying users. The horizontal dimension shows the spectrum of strategic tools that extend from marketing and legal tools on the left to purely technological tools on the right.

The diagram shows the importance of expanding the network of users as well as the need to limit that network. At the policy end, one former objective is typically assigned to the marketing department, the latter to the legal department. These divisions embody different cultures and sometimes do not communicate well with each other. However, the technology end of the diagram is entirely in the hands of designers and engineers. The exclusive mechanisms and the inclusive mechanisms, like the designers and the engineers, must work well together to co-exist in the same product.

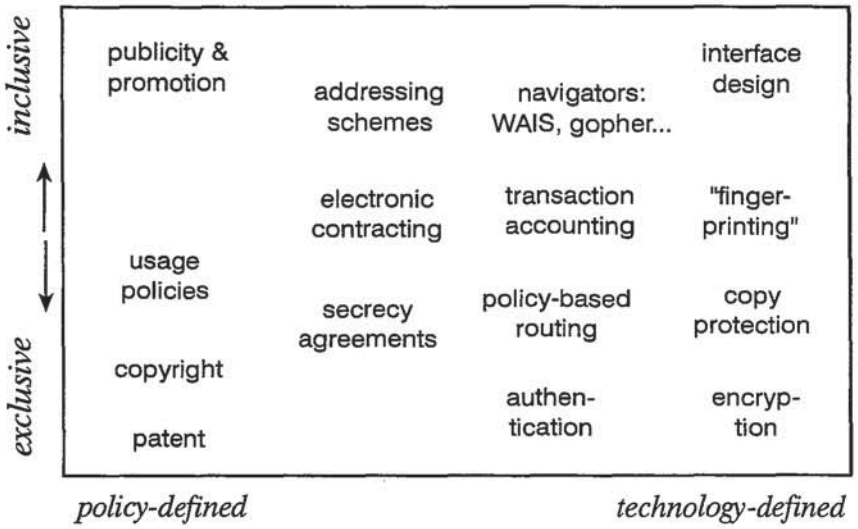

Figure 2. Strategic dimensions for network publishing

In the end, corporate strategy must integrate tools for identifying and controlling intellectual property with a broad understanding of marketplace realities and the legal framework for licensing distribution and use. While there remains great uncertainty about how multimedia information will be stored, processed, and delivered, and uncertainty about the scope and characteristics of the market, it is clear that the options are many and that navigating the networked multimedia environment demands unprecedented thought and skill.

BIOGRAPHY

Brian Kahin is Director of the Information Infrastructure Project in the Science, Technology and Public Policy Program at Harvard's John F. Kennedy School of Government and General Counsel for the Interactive Multimedia Association. He recently edited *Building Information Infrastructure* (McGraw-Hill, 1992), a collection on papers on issues in the development of the National Research and Education Network.