Legislating for Innovation

An Open Letter to the United States Congress

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When it comes to strong intellectual property, where does the buck stop? Will it stop with us, when we act to legally empower innovators to build on the past? Will it stop with the youth of today, when they reach voting age and begin to judge elected officials by their own cultural norms and unflinching sensibilities? Or will it stop when American technological currency slumps, causing knowledge and jobs to move overseas?

The Shifting Face of Innovation

The United States is haunted by a specter of American ingenuity. At times, it wells up within us and makes us do and say odd things. We brandish our political power against nations where our copyrights are infringed, though we are unable to stop piracy on our own soil. We defend, in the name of “safeguarding innovation”, actions that squelch and squander genuine technical innovations. We let slide the rhetoric of intellectual property as a “natural right” though it flies in the face of centuries-old American wisdom, which says that ideas aren't meant to be kept in ivory towers, they're meant to be harnessed widely and built upon readily. In the name of this “natural” right, we're even prepared to neglect the ethical and social foundations of the computer and Internet revolutions.

In short, we are stuck on the notion that only unilateral creative monopolies and harsh penalties can give creators the incentive they need in order to innovate. For years, we have been steadily increasing our investment in this notion, allowing the rights of originators to overwhelm the rights of those who receive and apply ideas. The Bush administration is particularly committed to this notion, and has increased the stakes by weaving strong IP into the policy backbone of Bush's multi-billion-dollar R&D spending plan [ACIBooklet, 2]. I fear we are about to finally prove ourselves wrong, with serious economic and political repercussions.

The reason for this is the D in R&D. Development today is derivative development. Developers, be they artists or designers or engineers, depend on a balanced intellectual property system to ensure them the needed ease of access to existing IP upon which they are forever building. Since ideas are now moving from inception to commodity faster than ever before (and much faster than they reach the public domain), the licensing overhead faced by developers has risen. Historically, the organizations with the resources to support in-house development have also been capable of shielding developers from licensing issues; today, inexpensive hardware and software tools are expanding the playing field to include smaller businesses, the self-employed, and even hobbyists. Networks have brought these small, agile entities into contact, encouraging them to develop similarly agile models for collaborative and derivative development that are less hampered by pretenses of contract law. Such open development models have met with immediate success in the US and abroad. Ultimately, however, their growth is hampered by corporate cultural norms, market lock-in, and above all the difficulty of gaining access to other people's intellectual property.

With young America disillusioned, visionary developers restrained by the letter of the law and our market leadership at risk of usurpation, the time is ripe for us to confront the specter of American ingenuity with a refined understanding of how, and why, folks are innovating. We must call into question old priorities and assumptions#do rights holders really need so much power? Is it fair to expect development projects with no per-user revenue to pay royalties? Is it fair to ask Americans to strive for innovation when we're giving their predecessors ever-greater control over the ideas they need to use?#and we must be open to more creative strategies than simply “more copyright”. In this document, you'll find detailed political, technical and ethical analyses; the outline of a new direction for United States IP policies; and action items and strategic suggestions.

American Competitiveness Initiative

Innovation and leadership are buzzwords in America, and their usage points to an interesting dichotomy. We like to think of our technological leadership in the 21st-century world as something that comes naturally; yet increasingly, global competition and the needs of a crowded and troubled planet drive us to demand more rapid progress from the industry leaders of today and tomorrow. We acknowledged the challenges, and renewed our commitment to the spirit of opportunity and ingenuity that first earned us our lead, last year when President Bush announced the American Competitiveness Initiative. As a student of engineering, I applaud this timely initiative; I'm especially excited by the prospect of increased developer patronage. But I'm worried that some of the underlying policies will prove unhealthy for America and the world#a world in which, as the Internet increasingly reminds us, we are also citizens.

In particular, I see both promise and danger in the administration's stated plans to modernize intellectual property (IP) law. The ACI trumpets America's "aggressive IP protection both domestically and overseas" as one of the administration's successes upon which it will build [ACI booklet, 10]. I think this is a mistake. Strong IP clearly benefits powerful entities in the tech sector and elsewhere, but it's also increasingly perceived as a barrier to independent developers and small businesses, especially in software and electronic media; hence I find the assertion that it leads to innovation and scientific advancement somewhat suspect. If the United States wants to hasten progress and improve its stature among the developed nations, it would do well to take this opportunity to define a clear and quite different direction for its policies on intellectual property, and on information generally.

That new direction, and why it is so badly needed, are the principal topics of my letter to you. I am currently in my last year of undergraduate studies at Franklin W. Olin College of Engineering, which was founded in 1997 to address the National Science Foundation's call for reforms in engineering education [About] and whose core values include stewardship and service, continuous improvement, and institutional agility. Olin is serious about information technology#we use computers for pretty much everything, and spend a great deal of money to put real-world engineering software at students' disposal#and in the course of my studies there, I have gained a deep respect for the power of information technology to change our world for the better, if we first permit it to change the rules of the game.

Such change takes time to complete, but it can begin right now. It begins when you decide to vote "No" on creating and enforcing new rights for intellectual property holders, and "Yes" on legislation that will protect consumers and improve the harmony between original and derivative authors. By doing so, you let the president and allied special interests know that you will not permit the spirit of collaboration and user centricity embodied by so much of modern technology to be sacrificed in the preservation of business as usual. You can harness ACI funds to much greater effect by instead requiring grant recipients to follow the principles of information ethics.

Information Ethics: Openness

To a greater or lesser extent, humans have always understood that information was different from other goods. To teach a man to fish was a service rendered, and worth some compensation for the trouble; but could the knowledge itself be assigned a price? Not easily. Depending on how it was used, the same information could make a living for one man, or two, or ten, or a whole village of fishermen. The more people shared in the knowledge, the greater the value it produced. Moreover, the greater the number of people engaged in that pursuit, the greater the discourse, and the faster fishing would improve in sophistication as a trade.

Hence, one of the basic ethical precepts of computing is sharing and openness. People are at their most productive when they are free to cooperate, and all else being equal, it's generally better that a person be allowed access to information than not. In fact it's best not to even have to ask permission, because communities based in and around information are typically decentralized and anonymous, and their efforts asynchronous.

As technological growth accelerated and mass media emerged, the notion of temporary monopolies as an incentive began to develop. But our founding fathers never lost their perspective. They understood the danger in treating disembodied information as property. In an 1813 letter addressing a patent dispute, Thomas Jefferson wrote:

> If nature has made any one thing less susceptible than all others of exclusive property, it is the action of the thinking power called an idea, which an individual may exclusively possess as long as he keeps it to himself; but the moment it is divulged, it forces itself into the possession of everyone, and the receiver cannot dispossess himself of it. Its peculiar character, too, is that no one possesses the less, because every other possesses the whole of it# That ideas should freely spread from one to another over the globe, for the moral and mutual instruction of man, and improvement of his condition, seems to have been peculiarly and benevolently designed by nature.
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> —Jefferson, "No Patents on Ideas"

His argument is as relevant now as ever, and I would generalize it as follows. There are two natural economic states for information: wholly private and wholly public. Where there is incentive only to sequester information (trade secrets, passwords and the like), it tends to function as a private good. If, on the other hand, it is desired that the information spread, it comes alive as a sort of public good#infinitely divisible, highly promiscuous and nearly impossible to restrain. Information does not naturally function as a club good (after the fashion of cable TV)#because it is not naturally susceptible to contract law#so over the years we have invested a lot of time and effort into learning how to corral it, to limit its ability to reproduce in the wild, using technology and law. This was always done in the name of promoting discourse and progress, and it fell to rights holders to secure their temporary monopolies through some validation process.

The groundwork, of course, was laid at a time when reproducing large volumes of information was still prohibitively difficult and government offices were better equipped to handle the relatively low volume of intellectual property being published. Today, an ex-

plosion of knowledge and culture is occurring on the slender optic fibers of the Internet, much of it entirely non-commercial. Fueled by advertising dollars and the very human desire to contribute to something larger, community-owned intellectual property springs forth like a barn raised by an army of cheerful villagers. Current markets are still learning to value the opportunity embodied by this unhindered, “living” information, which lies not in that everyone can have it, but in what they can do with it.

Ethical Development Is Productive Development

In 1991, a student at Helsinki University began publishing computer code on the Internet for a system called Linux. Linux was to form the core of a free alternative to UNIX#an expensive commercial software system that was standard in industry and university research#with the added property that it would be lightweight enough to run on a PC. Some of the smartest programmers in the world had been trying to write that system for the better part of a decade, including MacArthur Fellowship winner Richard Stallman, whose work had stalled the previous year at the same point in the system[ESR, History]#the intricate inner core. But when Linux was released onto the Net, something startling happened.

A swarm of programmers, attracted by the challenge and the small amount of working code already in place, responded with bug fixes and contributed additional working code. They were just playing#tinkering with the code in their spare time#but each did his small part, and within a matter of months an early version of Linux was completed. That success drew more attention; by 1994 Linux had been combined with Stallman's code to produce a complete system on par with UNIX itself. Traditional software licensing models do not support this kind of community development, so it came as a shock to the industry that a team of any size could reproduce two decades' worth of development in so few years.

Three main factors contributed to the breakthrough. First, the Internet brought Linus Torvalds and his Linux code into contact with thousands of programming enthusiasts in a short span of time. Second, he released code changes on a regular basis, and was unusually receptive and responsive to contributions. Third, he chose a software license that treated information as a public good#rather than restrict, it protected the users' right to use, view, modify and redistribute the code. It was a license designed by Stallman to foster collaboration, and in the case of Linux it succeeded on a massive scale. By contrast, proprietary UNIX code may only be viewed under a non-disclosure agreement, after the payment of thousands of dollars in licensing fees; derivative works aren't allowed.

The lesson of the Linux story is that where information is concerned, ethically superior practices are often technically and economically superior as well. Linux was the defining success of what became known as open-source software (OSS), which in turn exemplifies a more general phenomenon of open development. Today, a thriving business community exists around the continued development and commercial sale of software which, like Linux, is free to download, distribute, use and modify. It is a prime example of the good that comes from properly observing information ethics.

Open and Closed Development

Open development is a powerful strategy for managing large knowledge bases that seems obvious in retrospect. Rooted in the technical practice of peer review, it stipulates that the greater the number of peers, the simpler it is to find and correct errors. Open development harnesses the capabilities of many contributors working independently, linked only by communication networks, to allow peer review and contribution on a large scale. In contrast, computer engineers long believed that while sharing and discussing ideas with colleagues abroad was useful, crafting a complex system must occur in isolation, carefully managed by a small hierarchy of craftsmen.

There is a mathematical foundation for this belief, although it was reinforced by non-disclosure agreements and rigid management practices. Programmer Fred Brooks wrote in The Mythical Man-Month that men and months are not interchangeable [Brooks, 16]; that is, a software project already underway cannot be expedited by adding manpower to it. Moreover, as a project grows in size and sophistication, the likelihood of unforeseen interactions between components can grow in an unmanageable fashion. This is why all computer operating systems are imperfect, and the smallest are usually the most robust.

But it's becoming impossible to stay small. Brooks also said that there could be “no silver bullet”#no intrinsic cure for the essential complexity of software [Brooks, 180]. In the years since, software has scaled to match the growing capacity of computer storage. New tools, new programming languages, and new design and management techniques have all contributed to lengthening the reach of programmers. And yet, commercial operating systems are still routinely shipped late, still failure-prone and still insecure. Despite the best engineering practices, they are becoming impossible to sustain [ESR, World Domination 201] (stale code and a shortfall of peer review are killing them), and it is likely that future commercial systems will have to depend on community software in the same manner as does Apple's Mac OS X, a derivative of FreeBSD Unix.

Fortunately, open development isn't economic voodoo; the necessary preconditions are easily reproduced [ESR, CatB]. A variety of

widely accepted, ready-made licenses exist covering software, music and other media in such a manner as to promote sustained collaboration and safeguard user rights. The Internet serves to bring together communities of interested authors and users who want to contribute in some small way#some for the recognition, some to satisfy their own egos, some merely because they want to build something for their own use, and could use the help. The sponsoring organizations have even more varied reasons for participating#branding and advertising, market positioning, enterprise sales, or simply to lend credibility to a project. With the help of a savvy coordinator, these communities exhibit self-organized leadership in which the most competent members receive the greatest influence.

Ironically, this trend, which seems particularly poised to breathe new life into the software and electronic media industries, is most threatened by the biggest players in those industries. In the last ten years, they have come to understand the Internet's potential for deconstructing old paradigms, and have fought to stem the tide. Their weapons are fear, uncertainty, doubt#and intellectual property law.

Information Ethics: Sovereignty

> “Control over the use of one's ideas” really constitutes control over other people's lives; and it is usually used to make their lives more difficult.
>
> —Stallman, 37

As I have said, there are problems in the interaction between digital objects and contract law. Specifically, it is nearly impossible in practice to contract away the freedom to share without simultaneously losing several other significant freedoms, and even after these concessions, enforcement is no simple matter. Publishers may feel that it is your job to make up for their ineffectiveness, but I think a better solution is to place limits on the waiving of user rights. They may believe respecting copyright is more important than respecting the American people, but I do not.

Another basic ethical precept of computing is sovereignty. Computer systems are designed to be as open-ended and flexible as our imagination#a whole digital universe in microcosm, with the machine's owner for a deity and programs acting as agents of his will. Software provides many useful abstractions to shield the human from risks and managerial headaches associated with such power, but it's still there. Indeed, it is very hard to engineer safe spaces into that universe where the owner is not all-powerful. This is why WIPO member nations in 1996 (and congress in 1998, in the Digital Millennium Copyright Act) were persuaded to adopt anti-circumvention and Internet takedown provisions that would lend the force of law to imperfect technological protections.

The DMCA appears on its surface to be a clean fix for a nasty problem. Applied broadly, however, and taken together with other measures passed before and since, it implies an astonishing reduction of users' power. Case law [Grokster, Blizzard, ElcomSoft] demonstrates that anti-circumvention not only threatens fair use by consumers, it is an effective guise for legal intimidation against would-be competitors and researchers seeking to assess or emulate a product. Rather than encouraging development of newer, better content protection standards that allow peer review and offer technology firms a level playing field, the law encourages powerful consortiums to develop less sophisticated, less thoroughly tested standards under a veil of secrecy, using exorbitant licensing fees as both a source of funding and a way of screening who gets access to the technology. They rely on “security through obscurity”, an object of cynicism among software engineers and a temptation toward mischief among cyber-criminals.

I believe these and other problems are symptomatic of a new balance congress has struck, over the past ten years, at the behest of individuals and corporations who want unreasonably strong copyright. In the digital age, these groups “find themselves to be the beneficiaries of new advantages and the victims of new disadvantages, and respond about the way you would expect them to, with efforts to regain old benefits while retaining the new ones.” [Littman, Chapter 2] The DMCA is just one of a host of legislation that they have brought to you for approval#some of it already enacted, some still pending, but all seemingly founded in the notion that it's okay for rights holders to control every single step in the electronic tango of obtaining, using and transferring digital media, and to hunt down those who defy them like rats. The potential for liability in consuming and sharing media, and especially in creating derivative works, has never been greater than it is today; neither has the sense of public disillusionment been stronger.

A generation of bright, creative Americans has grown accustomed to using the PC for all these things, often at odds with the hard line on intellectual property. To refuse to yield an inch is to ensure that the generation's full potential to contribute, technically and culturally, will not be realized#they'll be too concerned with keeping their amazing projects small and under the radar. In lesser circumstances, I would not expect you to be moved#given enough time, the market will probably self-correct. Unfortunately, the true costs of this mistake are externalities, which we as a nation can no longer afford to bear: the social cost of an inbred popular culture that drives its critics underground; the technical cost of open-source software rendered moot because of software patents and possible infringing uses; the economic cost of small, agile design firms never getting off the ground, because they can hardly even name (let alone afford to license) all the features someone has managed to get a patent for; the political cost of further electoral controversies involving closed-source voting systems that the public doesn't trust.

The bottom line is that complex systems need widespread peer review to ensure correctness and security, and those making creative contributions need to be able to safely assume permission to build on the work of those who have come before. In this age of accelerated development, that a work may remain under copyright for up to 95 years doesn't even look reasonable on paper. If the market is in a rut, it's in a rut because the government has enabled it to remain so by broadening, lengthening and strengthening intellectual property. Supporters of strong copyright may come to regret this, when they discover that no amount of R&D funds can overcome our stagnation and regain for America the respect of other, more farsighted states. I could be wrong; I hope that I am wrong. But I do not wish to take the risk.

What to Do

Short-term Legislative Agenda

I have argued that the natural characteristics of information technology#mutability, versatility, and rapid efficient dispersal#are the primary basis of its power, and that by blithely imposing our property customs and other rules of the physical world, we are wasting the technology's potential. This should not be taken to imply that the concept of intellectual property is unworkable#far from it. The worst of the trouble stems from a combination of careless execution, technological shortcomings and failure to understand the technology's ethical implications (the latter mostly on the part of the judiciary), and can be addressed with small changes to the legal code. A few such bills are already making their way through the legislature, as are several that would almost certainly worsen the situation.

- FAIR USE Act of 2007 (H.R. 1201) - yay
- Patent Reform Act of 2005 (H.R. 2795) - yay
- Digital Media Consumers' Rights Act (H.R. 1201) (2005) - yay
- BALANCE Act (H.R. 4536) (outdated) - yay
- PIRATE Act (S. 2237) - nay
- Broadcast Flag acts:
    1. Audio Broadcast Flag Act (H.R. 4861) - nay
    2. Digital Transition Content Security Act (H.R. 4569) - nay
- INDUCE Act (S. 2560) - nay
- PERFORM Act (H.R. 5361 / S. 2644) - nay
- Public Domain Enhancement Act (H.R. 2408) # nay
- Intellectual Property Protection Act of 2007 - nay

Long-term Legislative Agenda

In the longer view of the situation, I see the need for more drastic changes, which I doubt the present congress could accept. From the perspective of reform-minded developers, today's intellectual landscape is akin to the Old West, complete with land grabs, squatters, racketeers and hotshot sheriffs. The constant possibility of legal wrangling is making it unsafe for “civilized” development by those who cannot afford lawyers for bodyguards. This predicament will change only when we rewrite the DMCA from scratch and remove the double-jeopardy of legal and technological protections.

Worst offenders:

- NET Act

- Pirate Act
- Copyright Term Extension Act

There are two possible approaches to enforcement once the DMCA's anti-circumvention provisions are voided. Properly implemented, technology looks out for itself, whereas with statutory protection many offenses will go undetected. On the other hand, statutory protection is friendlier to fair use and exemptions, allows general-purpose access to data and is thus potentially more ethical. On grounds of feasibility, I personally advocate developing open standards for technological protection, to be used in concert with compulsory licensing and automated collection systems, and some limitations on allowable terms of licensing for protected content that is marketed to home users. I also recommend doing away with software patents, which almost invariably cover the things programmers take for granted, while the real fruits of their labor are covered by copyright.

- Open DRM standards, specifics (MPEG-21, OpenTC)
- Mandatory licensing
- Automated collection & derivation history metadata systems

Policy Agenda

- Betamax doctrine
- WIPO treaties: be careful what you sign
- Pro-open stance, ACI policy/funding orientation
- Dedicated institutional FOSS R&D dollars
- Commit to using FOSS-friendly systems and media in gov't offices

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